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# TEST REPORT

## FOR FCC PART 15 SUBPART C 15.249

Report Reference No. ....: CTL1511193366-WF

Compiled by:  
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Tracy Qi  
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*Tracy Qi*

Product Name.....: Computer Speaker

Model/Type reference .....: MS515

List Model(s).....: MS450, SE55, MS520, MS630, MS435, MB315, MB500

Trade Mark .....: August

FCC ID .....: 2AFCM-MS515

Applicant's name .....: **August International Ltd**

Address of applicant .....: Swains Mill, Crane Mead, Ware, Herts, SG12 9PY, United Kingdom

Test Firm .....: **Shenzhen CTL Testing Technology Co., Ltd.**

Address of Test Firm .....: Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

Test specification.....:

Standard.....: **FCC Part 15.249:**Operation within the bands 920-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0 - 24.25 GHz.

TRF Originator .....: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF .....: Dated 2011-01

Date of Receipt.....: Nov. 19, 2015

Date of Test Date.....: Nov. 19, 2015 - Nov. 24, 2015

Data of Issue.....: Nov. 25, 2015

Result.....: Positive

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# TEST REPORT

<b>Test Report No. :</b>	<b>CTL1511193366-WF</b>	Nov. 25, 2015
		Date of issue

Equipment under Test : Computer Speaker

Model /Type : MS515

Listed Models : MS450, SE55, MS520, MS630, MS435, MB315,  
MB500

**Applicant** : **August International Ltd**

Address : Swains Mill, Crane Mead, Ware, Herts, SG12 9PY,  
United Kingdom

**Manufacturer** : **August International Ltd**

Address : Guohong Mansion, Qinghu Road, Longhua District,  
Shenzhen, China

<b>Test result</b>	<b>Pass *</b>
--------------------	---------------

\* In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**\*\* Modified History \*\***

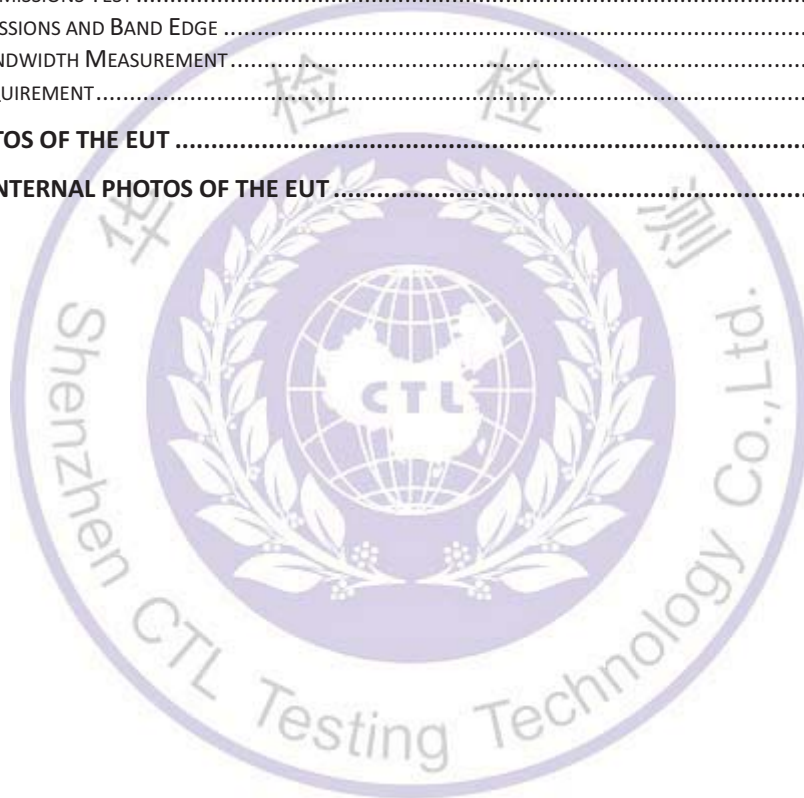
Version	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2015-11-25	CTL1511193366-WF	Tracy Qi



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# 1. SUMMARY

## 1.1. TEST STANDARDS

The tests were performed according to following standards:

**FCC Rules Part 15.249:** Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

**ANSI C63.10:2013 :** American National Standard for Testing Unlicensed Wireless Devices

**ANSI C63.4: 2014:** –American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz  
Range of 9 kHz to 40GHz

## 1.2. Test Description

FCC PART 15.249		
FCC Part 15.249(a)	Field Strength of Fundamental	PASS
FCC Part 15.209	Spurious Emission	PASS
FCC Part 15.209	Band edge	PASS
FCC Part 15.215(c)	20dB bandwidth	PASS
FCC Part 15.207	Conducted Emission	PASS
FCC Part 15.203	Antenna Requirement	PASS



### 1.3. Test Facility

#### 1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

#### 1.3.2 Laboratory accreditation

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

##### IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

##### FCC-Registration No.: 970318

Shenzhen CTL Testing Technology 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 970318, December 19, 2013.

### 1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 2. GENERAL INFORMATION

### 2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

### 2.2. General Description of EUT

Product Name:	Computer Speaker
Model/Type reference:	MS515
Power supply:	DC 3.7V from battery
<b>Bluetooth 3.0</b>	
Version:	Supported BT3.0+EDR
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PCB Antenna
Antenna gain:	0.5dBi
<b>Bluetooth BLE</b>	
Supported type:	Version 4.0 for low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Antenna type:	PCB Antenna
Antenna gain:	0.5dBi

Note: For more details, please refer to the user's manual of the EUT.

## 2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing. There are 79 channels provided to the EUT and Channel 00/39/78 were selected for BT3.0 testing, and 40 channels provided to the EUT and Channel 00/19/39 were selected for BT4.0 testing.

### Operation Frequency BT3.0 :

Channel	Frequency (MHz)
<b>00</b>	<b>2402</b>
01	2403
⋮	⋮
38	2440
<b>39</b>	<b>2441</b>
40	2442
⋮	⋮
77	2479
<b>78</b>	<b>2480</b>

### Operation Frequency List BT4.0 :

Channel	Frequency (MHz)
<b>00</b>	<b>2402</b>
02	2404
03	2406
⋮	⋮
<b>19</b>	<b>2440</b>
⋮	⋮
37	2476
38	2478
<b>39</b>	<b>2480</b>



## 2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.1 2	2015/06/02	2016/06/01
LISN	R&S	ESH2-Z5	860014/010	2015/06/02	2016/06/01
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2015/06/02	2016/06/01
EMI Test Receiver	R&S	ESCI	103710	2015/06/02	2016/06/01
Spectrum Analyzer	Agilent	E4407B	MY41440676	2015/05/21	2016/05/20
Controller	EM Electronics	Controller EM 1000	N/A	2015/05/21	2016/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2015/05/19	2016/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2015/05/19	2016/05/18
Amplifier	Agilent	8349B	3008A02306	2015/05/19	2016/05/18
Amplifier	Agilent	8447D	2944A10176	2015/05/19	2016/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2015/05/20	2016/05/19
High-Pass Filter	K&L	9SH10-2700/X1 2750-O/O	N/A	2015/05/20	2016/05/19
High-Pass Filter	K&L	41H10-1375/U1 2750-O/O	N/A	2015/05/20	2016/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2015/06/02	2016/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2015/06/02	2016/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2015/06/02	2016/06/01
RF Cable	Megalon	RF-A303	N/A	2015/06/02	2016/06/01

The calibration interval was one year

## 2.5. Related Submittal(s) / Grant(s)

This submittal(s) (test report) is intended to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

### 3. TEST CONDITIONS AND RESULTS

#### 3.1. Conducted Emissions Test

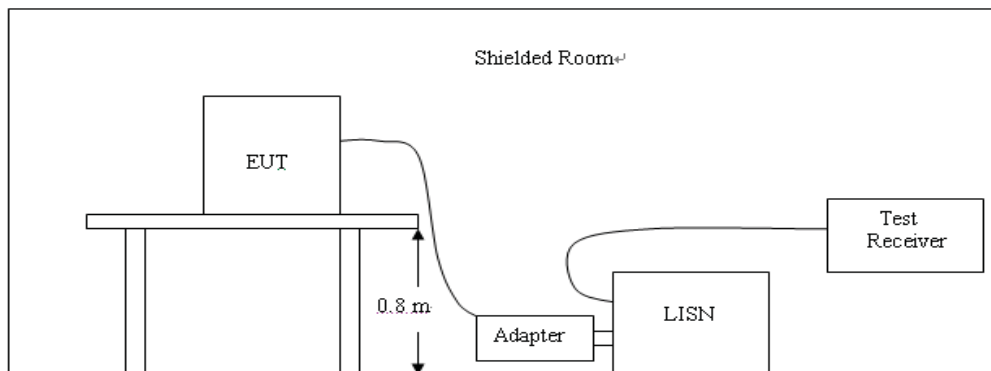
##### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

##### TEST CONFIGURATION



##### TEST PROCEDURE

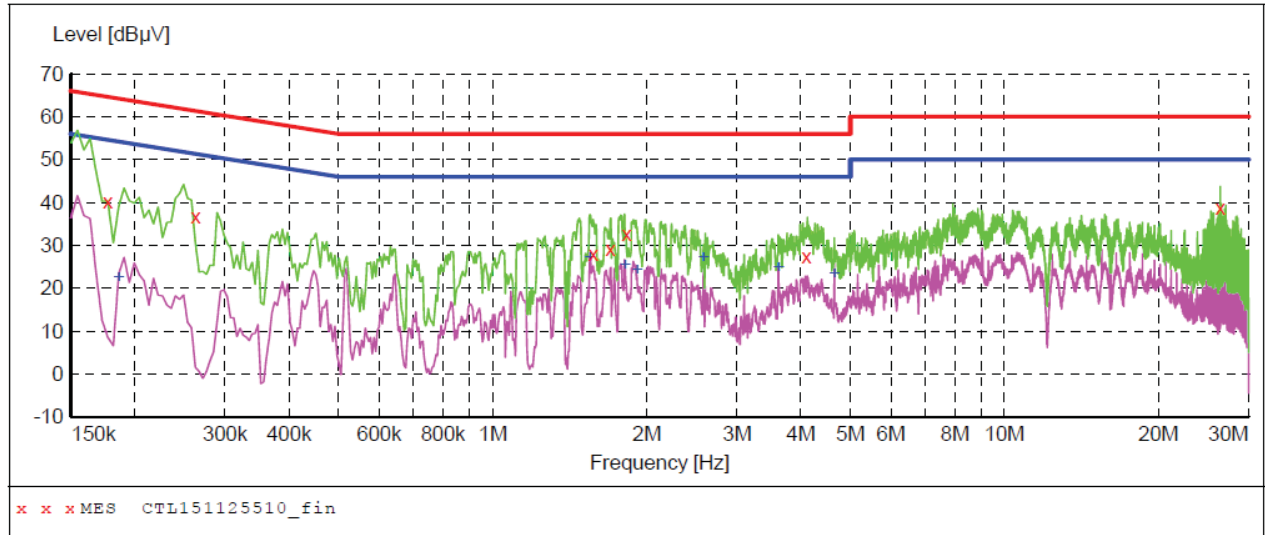
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

**TEST RESULTS**

Remark: All modes of GFSK, Pi/4 DQPSK, 8DPSK and BLE were test at Low, Middle, and High channel; only the worst result of 8DPSK High Channel was reported as below:

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL151125510\_fin"**

11/25/2015 11:04AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.177001	40.30	10.2	65	24.3	QP	L1	GND
0.262501	36.70	10.2	61	24.7	QP	L1	GND
1.572001	27.90	10.3	56	28.1	QP	L1	GND
1.698001	29.00	10.3	56	27.0	QP	L1	GND
1.824001	32.60	10.3	56	23.4	QP	L1	GND
4.101001	27.30	10.4	56	28.7	QP	L1	GND

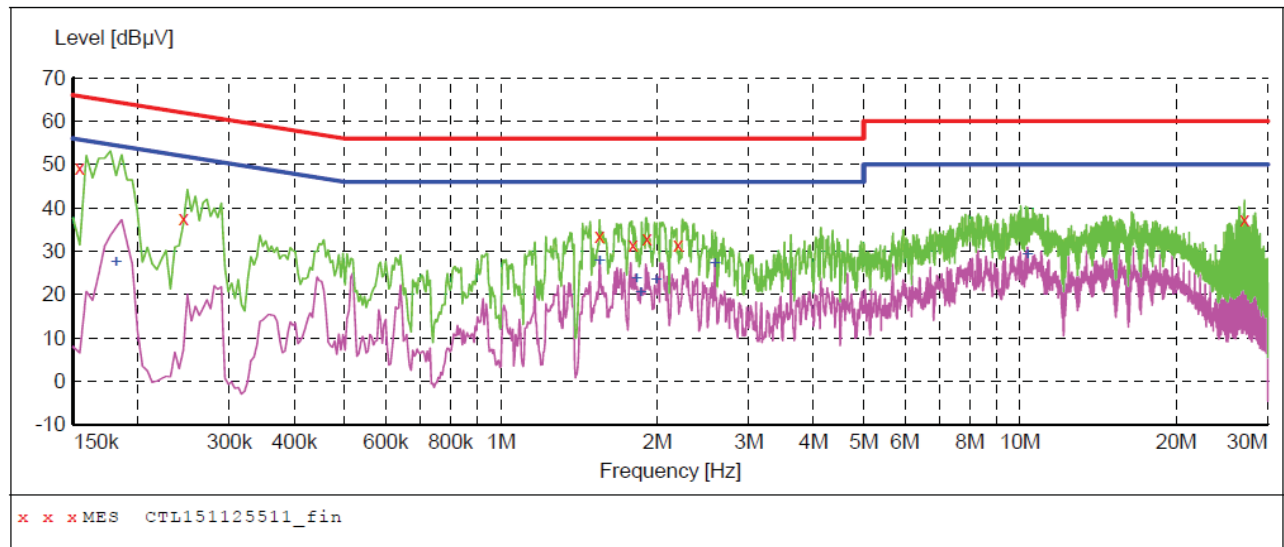
**MEASUREMENT RESULT: "CTL151125510\_fin2"**

11/25/2015 11:04AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.186001	22.50	10.2	54	31.7	AV	L1	GND
1.549501	27.10	10.3	46	18.9	AV	L1	GND
1.815001	25.40	10.3	46	20.6	AV	L1	GND
1.914001	24.10	10.3	46	21.9	AV	L1	GND
2.584501	27.00	10.4	46	19.0	AV	L1	GND
3.615001	24.80	10.4	46	21.2	AV	L1	GND

**SCAN TABLE: "Voltage (9K-30M) FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL151125511\_fin"**

11/25/2015 11:08AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.154501	49.30	10.2	66	16.5	QP	N	GND
0.244501	37.60	10.2	62	24.3	QP	N	GND
1.549501	33.40	10.3	56	22.6	QP	N	GND
1.797001	31.60	10.3	56	24.4	QP	N	GND
1.909501	32.90	10.3	56	23.1	QP	N	GND
2.193001	31.30	10.4	56	24.7	QP	N	GND

**MEASUREMENT RESULT: "CTL151125511\_fin2"**

11/25/2015 11:08AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.181501	27.50	10.2	54	26.9	AV	N	GND
1.549501	27.70	10.3	46	18.3	AV	N	GND
1.824001	23.70	10.3	46	22.3	AV	N	GND
1.860001	20.50	10.3	46	25.5	AV	N	GND
1.990501	23.30	10.3	46	22.7	AV	N	GND
2.584501	27.10	10.4	46	18.9	AV	N	GND

## 3.2. Radiated Emissions and Band Edge

### Limit

According 15.249, the field strength of emissions from intentional radiators operated within 2400MHz-2483.5 MHz shall not exceed 94dB $\mu$ V/m (50mV/m):

FCC PART 15.249(d) 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 §15.209, whichever is the lesser attenuation.

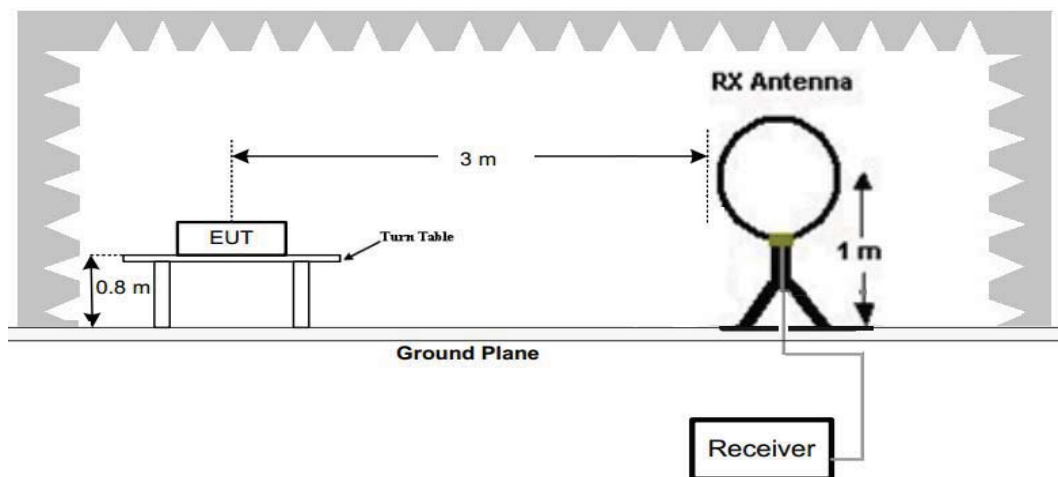
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

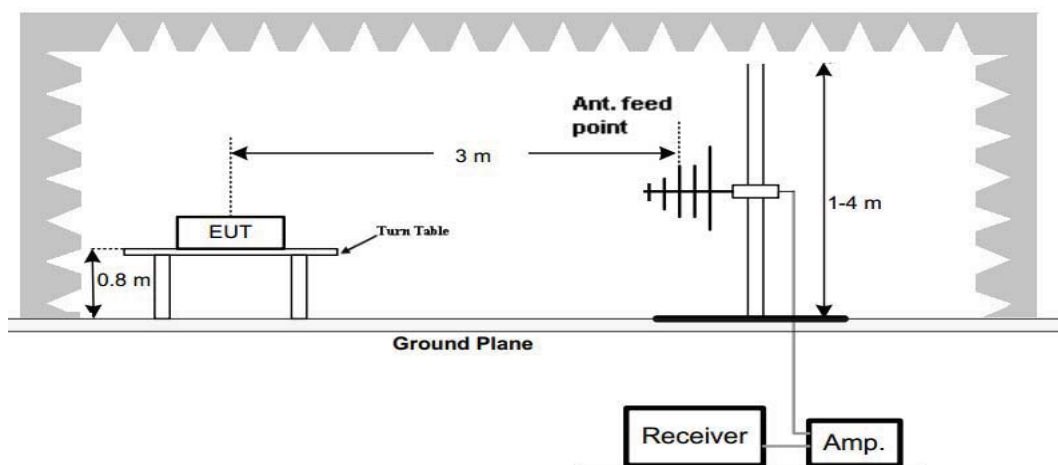
Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

### TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz

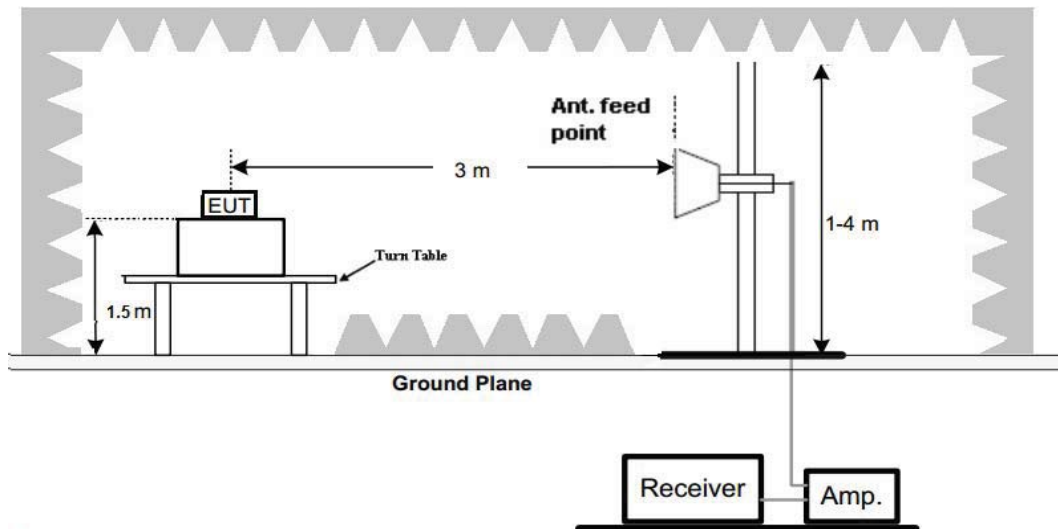


(B) Radiated Emission Test Set-Up, Frequency below 1000MHz





## (C) Radiated Emission Test Set-Up, Frequency above 1000MHz

**Test Procedure**

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

**TEST RESULTS**

Remark:

1. All modes of GFSK, Pi/4 DQPSK, 8DPSK and BLE were test at Low, Middle, and High channel; only the worst result of GFSK DH5 low Channel was reported for below 1GHz test.
2. For BT3.0 above 1GHz test all modes of GFSK, Pi/4 DQPSK, and 8DPSK were test at Low, Middle, and High channel; only the worst result of GFSK DH5 was reported.
3. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.

**For 9 KHz-30MHz**

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Result
0.40	54.26	95.56	41.30	PK	PASS
1.57	55.69	63.69	8.00	QP	PASS
12.69	56.98	69.54	12.56	QP	PASS
20.87	59.55	69.54	9.99	QP	PASS

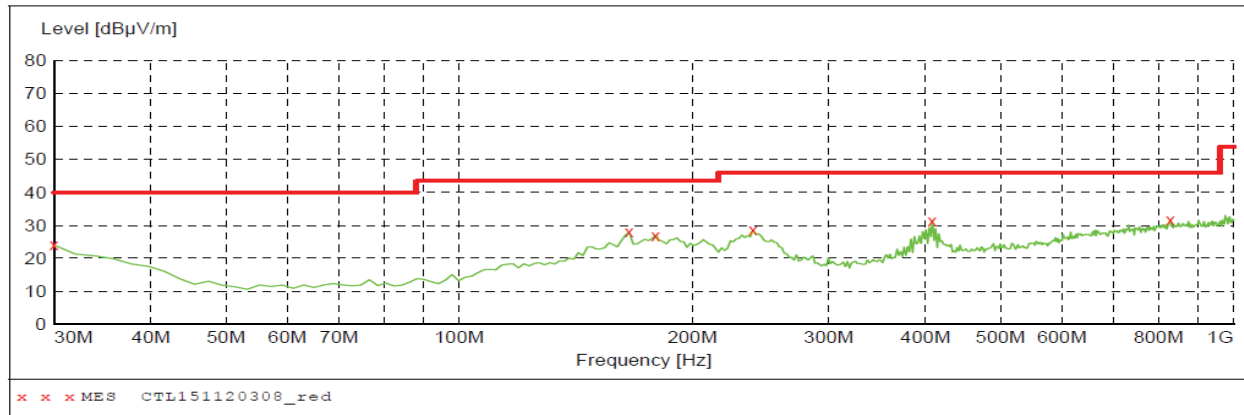


## For 30MHz-1GHz

## Horizontal

**SWEEP TABLE: "test (30M-1G)"**

Short Description: Field Strength  
 Start Stop Detector Meas. IF Transducer  
 Frequency Frequency Time Bandw.  
 30.0 MHz 1.0 GHz MaxPeak 300.0 ms 120 kHz JB1

**MEASUREMENT RESULT: "CTL151120308\_red"**

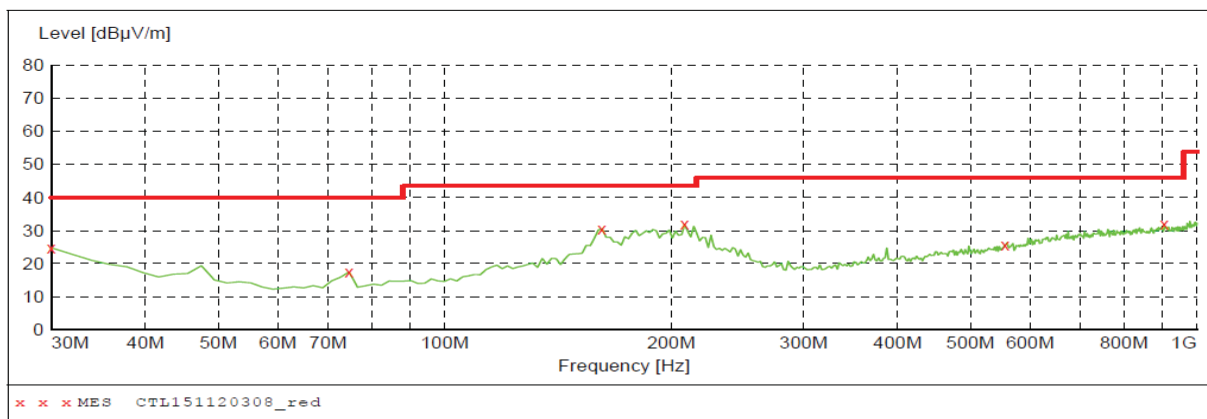
11/20/2015 2:24PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.00	20.8	40.0	16.0	---	0.0	0.00	HORIZONTAL
165.800000	27.90	13.5	43.5	15.6	---	0.0	0.00	HORIZONTAL
179.380000	27.00	13.0	43.5	16.5	---	0.0	0.00	HORIZONTAL
239.520000	28.60	13.7	46.0	17.4	---	0.0	0.00	HORIZONTAL
408.300000	31.40	18.3	46.0	14.6	---	0.0	0.00	HORIZONTAL
829.280000	31.80	25.0	46.0	14.2	---	0.0	0.00	HORIZONTAL

## Vertical

**SWEEP TABLE: "test (30M-1G)"**

Short Description: Field Strength  
 Start Stop Detector Meas. IF Transducer  
 Frequency Frequency Time Bandw.  
 30.0 MHz 1.0 GHz MaxPeak 300.0 ms 120 kHz JB1

**MEASUREMENT RESULT: "CTL151120308\_red"**

11/20/2015 2:24PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.80	20.8	40.0	15.2	---	0.0	0.00	VERTICAL
74.620000	17.50	8.3	40.0	22.5	---	0.0	0.00	VERTICAL
161.920000	30.60	13.6	43.5	12.9	---	0.0	0.00	VERTICAL
208.480000	31.90	14.0	43.5	11.6	---	0.0	0.00	VERTICAL
555.740000	25.50	21.1	46.0	20.5	---	0.0	0.00	VERTICAL
904.940000	32.00	26.0	46.0	14.0	---	0.0	0.00	VERTICAL

**For 1GHz to 25GHz****BT3.0 GFSK Mode (above 1GHz)**

Frequency(MHz):				2402		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2402.00	95.48	PK	114	18.52	62.08	28.78	4.61	0.00	33.40
1	2402.00	87.59	AV	94	6.41	54.19	28.78	4.61	0.00	33.40
2	2390.00	38.41	PK	74	35.59	5.09	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54	--	--	--	--	--	--
3	2400.00	46.25	PK	74	27.75	12.86	28.78	4.61	0.00	33.39
3	2400.00	--	AV	54	--	--	--	--	--	--
4	4804.00	57.54	PK	74	16.46	53.03	33.49	6.91	35.89	4.51
4	4804.00	46.59	AV	54	7.41	42.08	33.49	6.91	35.89	4.51
5	5003.75	43.41	PK	74	30.59	36.62	33.99	7.03	34.23	6.79
5	5003.75	--	AV	54	--	--	--	--	--	--
6	7206.00	45.26	PK	74	28.74	34.15	36.95	9.18	35.03	11.11
6	7206.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):				2402		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2402.00	95.87	PK	114	18.13	62.47	28.78	4.61	0.00	33.40
1	2402.00	87.45	AV	94	6.55	54.05	28.78	4.61	0.00	33.40
2	2390.00	37.69	PK	74	36.31	4.37	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54	--	--	--	--	--	--
3	2400.00	45.87	PK	74	28.13	12.48	28.78	4.61	0.00	33.39
3	2400.00	--	AV	54	--	--	--	--	--	--
4	4804.00	56.29	PK	74	17.71	51.78	33.49	6.91	35.89	4.51
4	4804.00	47.56	AV	54	6.44	43.05	33.49	6.91	35.89	4.51
5	5350.20	45.14	PK	74	28.86	37.58	34.69	7.23	34.36	7.56
5	5350.20	--	AV	54	--	--	--	--	--	--
6	7206.00	43.65	PK	74	30.35	32.54	36.95	9.18	35.03	11.11
6	7206.00	--	AV	54	--	--	--	--	--	--

**REMARKS:**

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.

Frequency(MHz):				2441		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2441.00	96.59	PK	114	17.41	63.08	28.85	4.66	0.00	33.51
1	2441.00	88.14	AV	94	5.86	54.63	28.85	4.66	0.00	33.51
2	4075.50	42.26	PK	74	31.74	37.69	32.89	6.44	34.76	4.57
2	4075.50	--	AV	54	--	--	--	--	--	--
3	4882.00	55.25	PK	74	18.75	48.99	33.60	6.95	34.30	6.26
3	4882.00	48.78	AV	54	5.22	42.52	33.60	6.95	34.30	6.26
4	5075.50	43.26	PK	74	30.74	36.13	34.24	7.08	34.19	7.13
4	5075.50	--	AV	54	--	--	--	--	--	--
5	7323.00	45.74	PK	74	28.26	34.04	37.46	9.23	35.00	11.70
5	7323.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):				2441		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2441.00	96.41	PK	114	17.59	62.90	28.85	4.66	0.00	33.51
1	2441.00	87.59	AV	94	6.41	54.08	28.85	4.66	0.00	33.51
2	4528.75	43.26	PK	74	30.74	38.12	32.90	6.74	34.50	5.14
2	4528.75	--	AV	54	--	--	--	--	--	--
3	4882.00	56.87	PK	74	17.13	50.61	33.60	6.95	34.30	6.26
3	4882.00	48.45	AV	54	5.55	42.19	33.60	6.95	34.30	6.26
4	5105.50	42.36	PK	74	31.64	35.10	34.34	7.09	34.17	7.26
4	5105.50	--	AV	54	--	--	--	--	--	--
5	7323.00	45.58	PK	74	28.42	33.88	37.46	9.23	35.00	11.70
5	7323.00	--	AV	54	--	--	--	--	--	--

## REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.

Frequency(MHz):				2480		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2480.00	95.62	PK	114	18.38	62.00	28.92	4.70	0.00	33.62
1	2480.00	87.14	AV	94	6.86	53.52	28.92	4.70	0.00	33.62
2	2483.50	45.26	PK	74	28.74	11.63	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54	--	--	--	--	--	--
3	2500.00	40.25	PK	74	33.75	6.57	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54	--	--	--	--	--	--
4	4960.00	55.26	PK	74	18.74	50.34	33.84	7.00	35.92	4.92
4	4960.00	46.36	AV	54	7.64	41.44	33.84	7.00	35.92	4.92
5	5335.50	43.45	PK	74	30.55	35.90	34.68	7.22	34.35	7.55
5	5335.50	--	AV	54	--	--	--	--	--	--
6	7440.00	46.45	PK	74	27.55	34.50	37.64	9.28	34.97	11.95
6	7440.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):				2480		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2480.00	95.57	PK	114	18.43	61.95	28.92	4.70	0.00	33.62
1	2480.00	87.25	AV	94	6.75	53.63	28.92	4.70	0.00	33.62
2	2483.50	45.45	PK	74	28.55	11.82	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54	--	--	--	--	--	--
3	2500.00	38.69	PK	74	35.31	5.01	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54	--	--	--	--	--	--
4	4960.00	56.98	PK	74	17.02	52.06	33.84	7.00	35.92	4.92
4	4960.00	46.14	AV	54	7.86	41.22	33.84	7.00	35.92	4.92
5	5320.25	44.25	PK	74	29.75	36.72	34.66	7.21	34.35	7.53
5	5320.25	--	AV	54	--	--	--	--	--	--
6	7440.00	44.15	PK	74	29.85	32.20	37.64	9.28	34.97	11.95
6	7440.00	--	AV	54	--	--	--	--	--	--

## REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.



**BT4.0 GFSK Mode (above 1GHz)**

Frequency(MHz):				2402		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2402.00	88.48	PK	114	25.52	55.08	28.78	4.61	0.00	33.40
1	2402.00	79.10	AV	94	14.9	45.70	28.78	4.61	0.00	33.40
2	2390.00	37.54	PK	74	36.46	4.22	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54	--	--	--	--	--	--
3	2400.00	38.54	PK	74	35.46	5.15	28.78	4.61	0.00	33.39
3	2400.00	--	AV	54	--	--	--	--	--	--
4	4804.00	46.62	PK	74	27.38	42.11	33.49	6.91	35.89	4.51
4	4804.00	--	AV	54	--	--	--	--	--	--
5	5211.75	39.45	PK	74	34.55	32.06	34.55	7.15	34.31	7.39
5	5211.75	--	AV	54	--	--	--	--	--	--
6	7206.00	40.36	PK	74	33.64	29.25	36.95	9.18	35.03	11.11
6	7206.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):				2402		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2402.00	88.74	PK	114	25.26	55.34	28.78	4.61	0.00	33.40
1	2402.00	78.36	AV	94	15.64	44.96	28.78	4.61	0.00	33.40
2	2390.00	36.62	PK	74	37.38	3.30	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54	--	--	--	--	--	--
3	2400.00	38.74	PK	74	35.26	5.35	28.78	4.61	0.00	33.39
3	2400.00	--	AV	54	--	--	--	--	--	--
4	4804.00	46.59	PK	74	27.41	42.08	33.49	6.91	35.89	4.51
4	4804.00	--	AV	54	--	--	--	--	--	--
5	5015.50	38.74	PK	74	35.26	31.90	34.03	7.04	34.24	6.84
5	5015.50	--	AV	54	--	--	--	--	--	--
6	7206.00	40.52	PK	74	33.48	29.41	36.95	9.18	35.03	11.11
6	7206.00	--	AV	54	--	--	--	--	--	--

**REMARKS:**

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.

Frequency(MHz):				2440		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2440.00	88.41	PK	114	25.59	54.90	28.85	4.65	0.00	33.51
1	2440.00	79.33	AV	94	14.67	45.82	28.85	4.65	0.00	33.51
2	4457.50	39.98	PK	74	34.02	34.97	32.86	6.69	34.54	5.01
2	4457.50	--	AV	54	--	--	--	--	--	--
3	4880.00	45.41	PK	74	28.59	39.16	33.60	6.95	34.30	6.25
3	4880.00	--	AV	54	--	--	--	--	--	--
4	5378.75	38.56	PK	74	35.44	30.61	34.72	7.25	34.01	7.95
4	5378.75	--	AV	54	--	--	--	--	--	--
5	7320.00	42.42	PK	74	31.58	30.73	37.46	9.23	35.00	11.69
5	7320.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):				2440		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2440.00	88.62	PK	114	25.38	55.11	28.85	4.65	0.00	33.51
1	2440.00	79.41	AV	94	14.59	45.90	28.85	4.65	0.00	33.51
2	3910.75	39.23	PK	74	34.77	34.52	33.27	6.30	34.86	4.71
2	3910.75	--	AV	54	--	--	--	--	--	--
3	4880.00	46.32	PK	74	27.68	39.96	33.60	6.95	34.19	6.36
3	4880.00	--	AV	54	--	--	--	--	--	--
4	5211.50	38.50	PK	74	35.5	30.91	34.55	7.15	34.11	7.59
4	5211.50	--	AV	54	--	--	--	--	--	--
5	7320.00	42.74	PK	74	31.26	31.05	37.46	9.23	35.00	11.69
5	7320.00	--	AV	54	--	--	--	--	--	--

## REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.



Frequency(MHz):				2480		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2480.00	88.25	PK	114	25.75	54.63	28.92	4.70	0.00	33.62
1	2480.00	78.41	AV	94	15.59	44.79	28.92	4.70	0.00	33.62
2	2483.50	38.66	PK	74	35.34	5.03	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54	--	--	--	--	--	--
3	2500.00	37.51	PK	74	36.49	3.83	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54	--	--	--	--	--	--
4	4960.00	48.32	PK	74	25.68	43.40	33.84	7.00	35.92	4.92
4	4960.00	--	AV	54	--	--	--	--	--	--
5	5317.25	40.26	PK	74	33.74	32.74	34.66	7.21	34.34	7.52
5	5317.25	--	AV	54	--	--	--	--	--	--
6	7440.00	43.12	PK	74	30.88	31.17	37.64	9.28	34.97	11.95
6	7440.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):				2480		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2480.00	88.52	PK	114	25.48	54.90	28.92	4.70	0.00	33.62
1	2480.00	79.11	AV	94	14.89	45.49	28.92	4.70	0.00	33.62
2	2483.50	38.25	PK	74	35.75	4.62	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54	--	--	--	--	--	--
3	2500.00	37.51	PK	74	36.49	3.83	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54	--	--	--	--	--	--
4	4960.00	48.74	PK	74	25.26	43.82	33.84	7.00	35.92	4.92
4	4960.00	--	AV	54	--	--	--	--	--	--
5	5215.50	39.45	PK	74	34.55	32.05	34.56	7.15	34.31	7.40
5	5215.50	--	AV	54	--	--	--	--	--	--
6	7440.00	41.36	PK	74	32.64	29.41	37.64	9.28	34.97	11.95
6	7440.00	--	AV	54	--	--	--	--	--	--

## REMARKS:

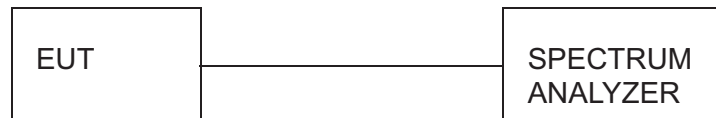
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.

### 3.3. Occupied Bandwidth Measurement

#### Limit

N/A

#### Test Configuration



#### Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

#### Test Results

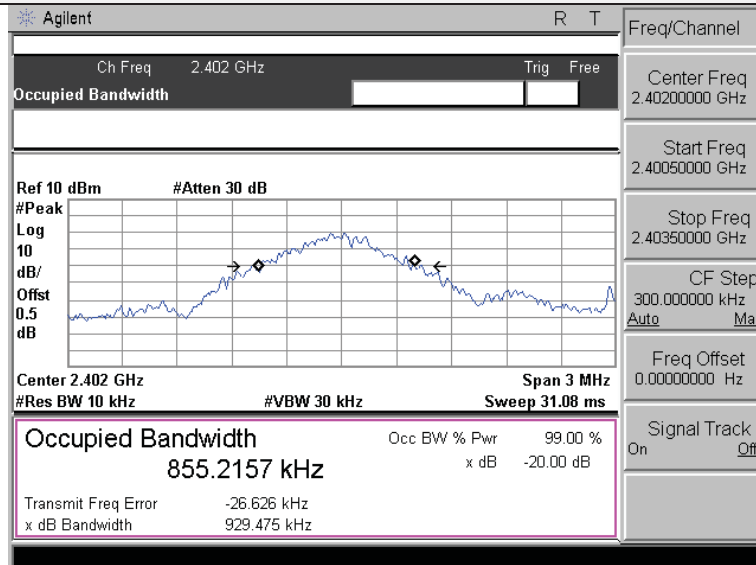
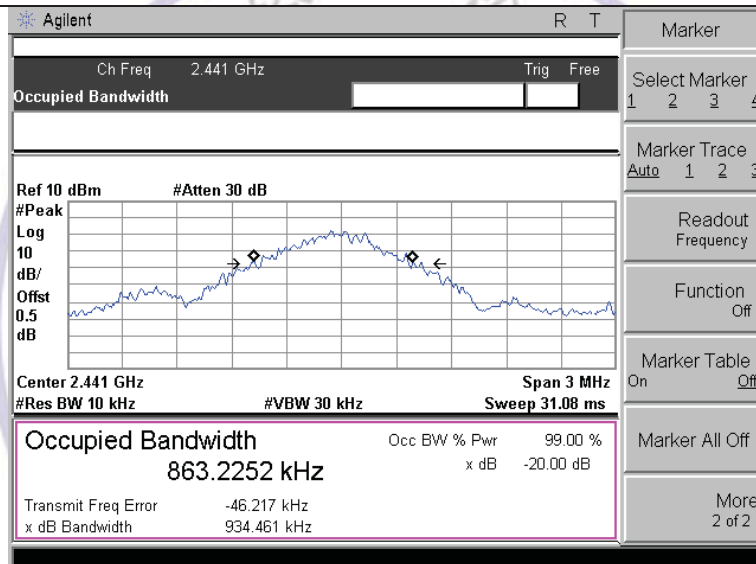
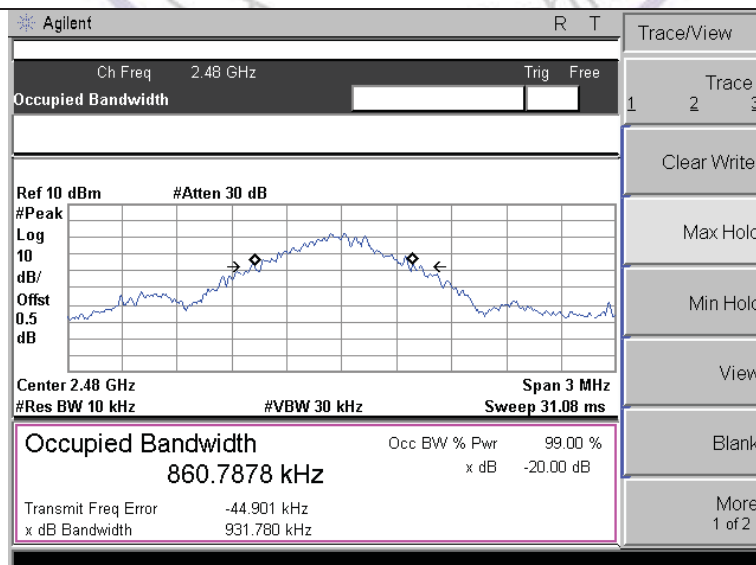
##### **BT3.0**

Modulation	Channel	99% OBW (MHz)	20dB bandwidth (MHz)	Result
GFSK	CH00	0.855	0.929	Pass
	CH39	0.863	0.934	
	CH78	0.861	0.932	
$\pi/4$ DQPSK	CH00	1.181	1.290	
	CH39	1.168	1.273	
	CH78	1.166	1.228	
8DPSK	CH00	1.168	1.251	
	CH39	1.161	1.262	
	CH78	1.159	1.269	

##### **BT4.0**

Modulation	Channel	99% OBW (MHz)	20dB bandwidth (MHz)	Result
GFSK	CH00	1.030	1.104	Pass
	CH19	1.021	1.093	
	CH39	1.023	1.098	

Test plot as follows:

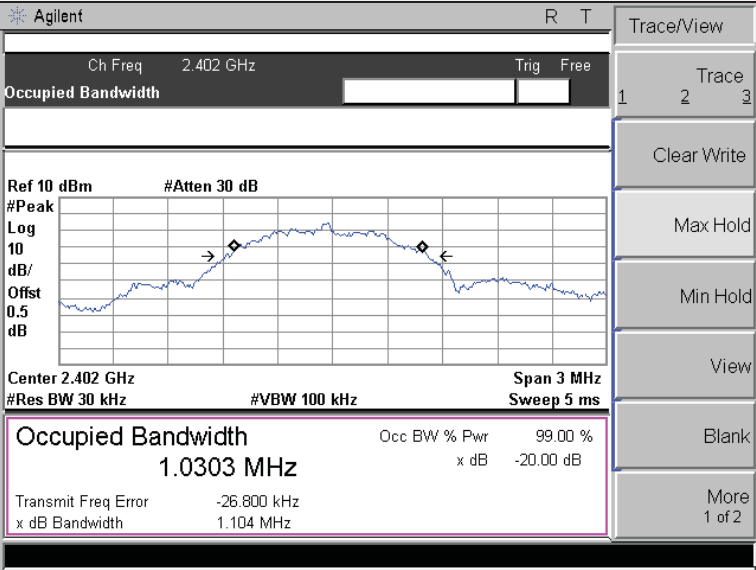
**BT3.0****GFSK Modulation****CH00****CH39****CH78**



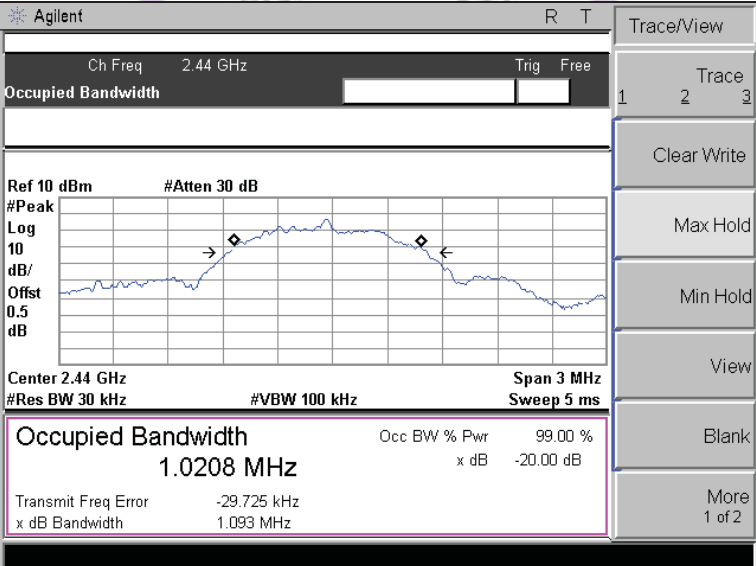
8DPSK Modulation	
<div><div><div>Agilent</div><div>Ch Freq 2.402 GHz</div><div>Trig Free</div><div>Occupied Bandwidth</div><div><div>Ref 10 dBm</div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>0.5</div><div>dB</div></div><div><div>Center 2.402 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 5 ms</div></div><div><div>Occupied Bandwidth</div><div>1.1678 MHz</div><div>Transmit Freq Error</div><div>-32.410 kHz</div><div>x dB Bandwidth</div><div>1.251 MHz</div></div><div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div></div></div><div><div>Trace/View</div><div>Trace 1 2 3</div><div>Clear Write</div><div>Max Hold</div><div>Min Hold</div><div>View</div><div>Blank</div><div>More 1 of 2</div></div></div>	
CH00	
<div><div><div>Agilent</div><div>Ch Freq 2.441 GHz</div><div>Trig Free</div><div>Occupied Bandwidth</div><div><div>Ref 10 dBm</div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>0.5</div><div>dB</div></div><div><div>Center 2.441 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 5 ms</div></div><div><div>Occupied Bandwidth</div><div>1.1614 MHz</div><div>Transmit Freq Error</div><div>-45.751 kHz</div><div>x dB Bandwidth</div><div>1.262 MHz</div></div><div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div></div></div><div><div>Trace/View</div><div>Trace 1 2 3</div><div>Clear Write</div><div>Max Hold</div><div>Min Hold</div><div>View</div><div>Blank</div><div>More 1 of 2</div></div></div>	
CH39	
<div><div><div>Agilent</div><div>Ch Freq 2.48 GHz</div><div>Trig Free</div><div>Occupied Bandwidth</div><div><div>Ref 10 dBm</div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>0.5</div><div>dB</div></div><div><div>Center 2.48 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 5 ms</div></div><div><div>Occupied Bandwidth</div><div>1.1591 MHz</div><div>Transmit Freq Error</div><div>-46.624 kHz</div><div>x dB Bandwidth</div><div>1.269 MHz</div></div><div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div></div></div><div><div>Trace/View</div><div>Trace 1 2 3</div><div>Clear Write</div><div>Max Hold</div><div>Min Hold</div><div>View</div><div>Blank</div><div>More 1 of 2</div></div></div>	
CH78	

BT4.0

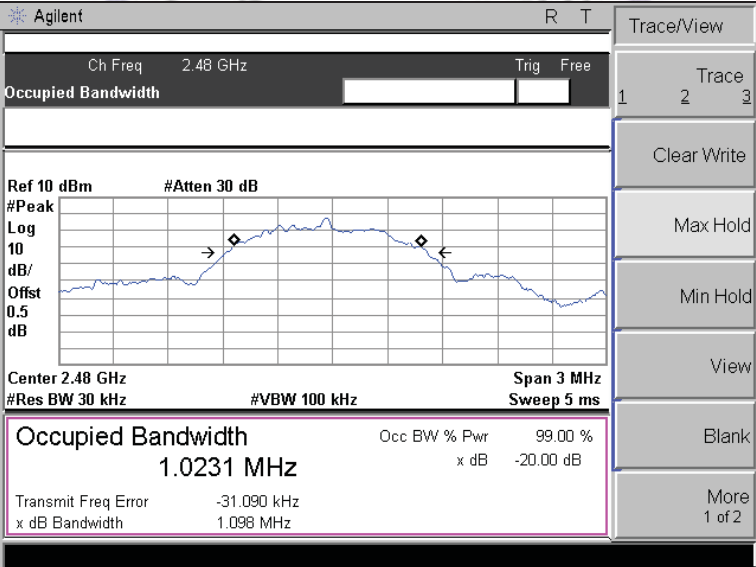
GFSK Modulation



CH00



CH19



CH39



### 3.4. Antenna Requirement

#### Standard Applicable

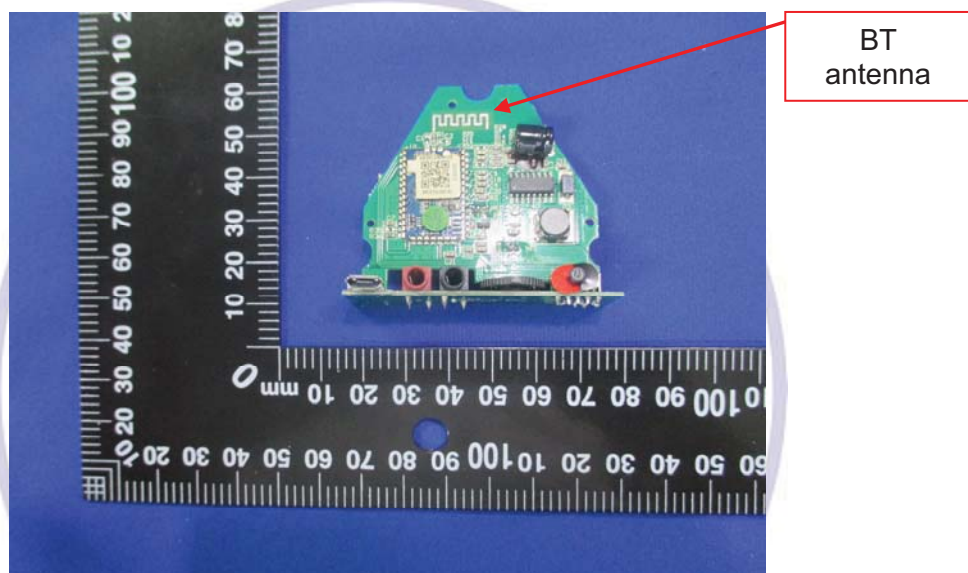
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

#### **Refer to statement below for compliance.**

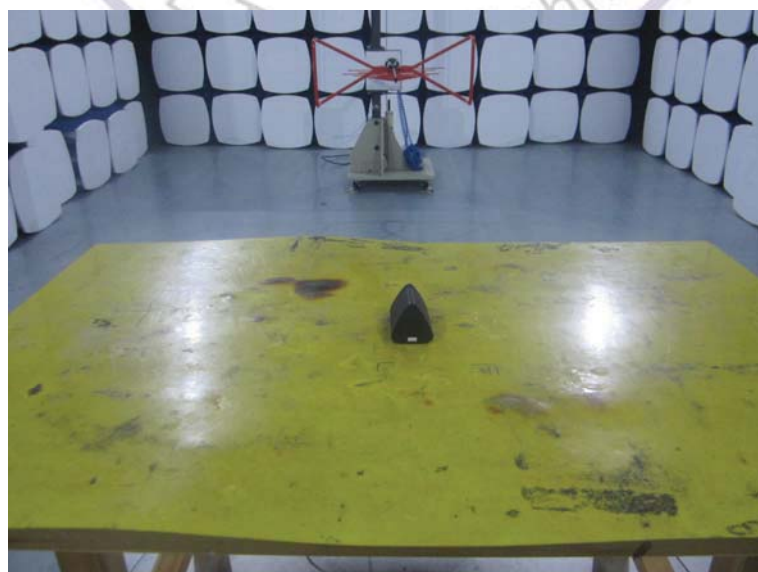
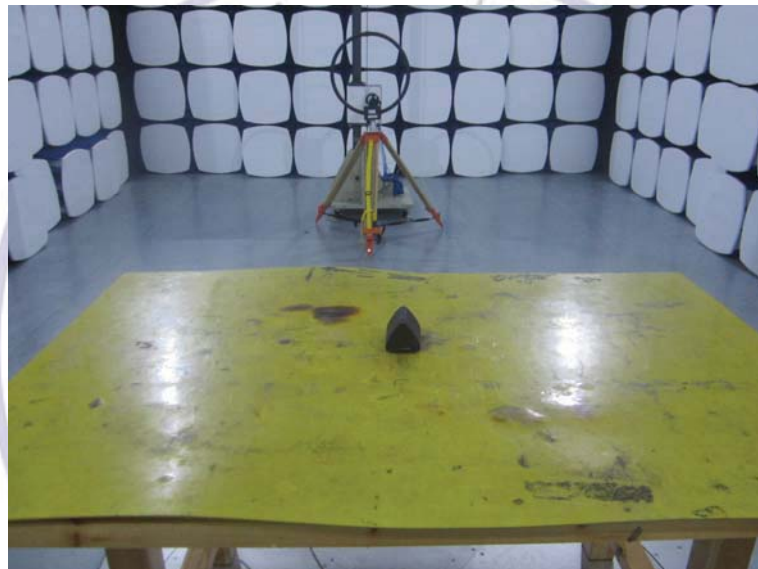
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

#### Antenna Connected Construction

The antenna used in this product is an internal Antenna, The directional gains of antenna used for transmitting is 0.50dBi.



## 4. Test Setup Photos of the EUT



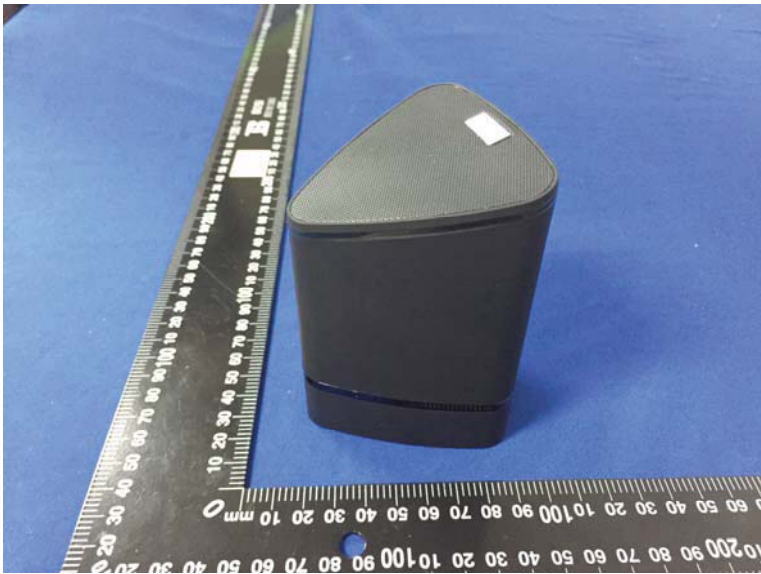


## 5. External and Internal Photos of the EUT

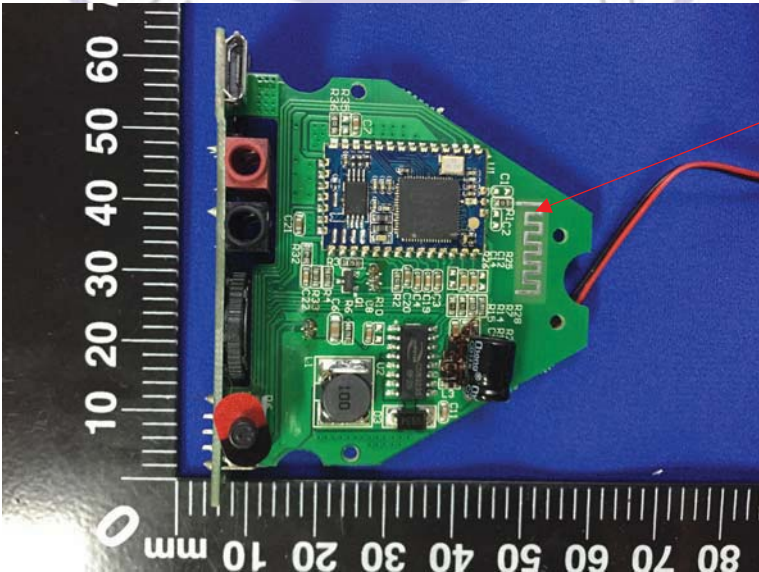
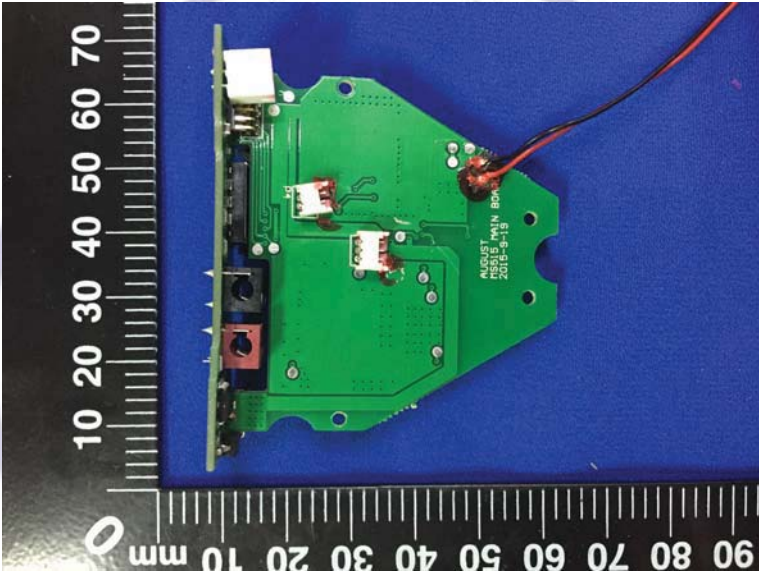
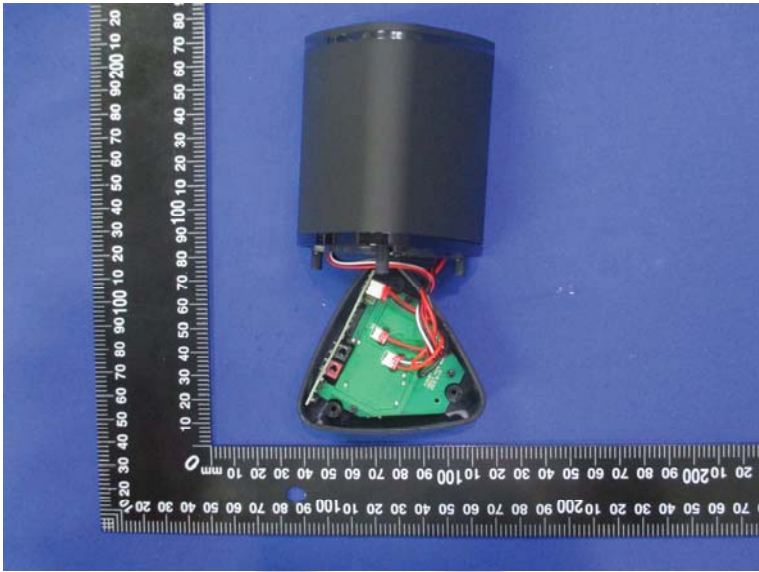
### External Photos of EUT





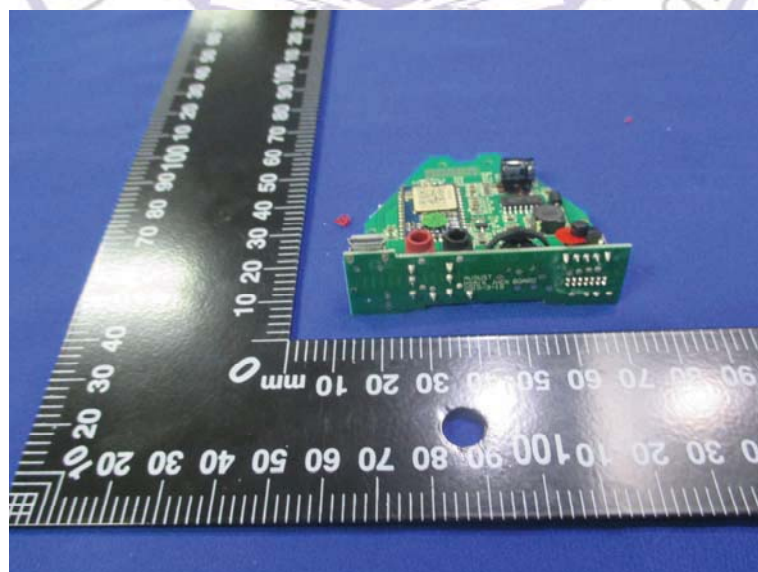
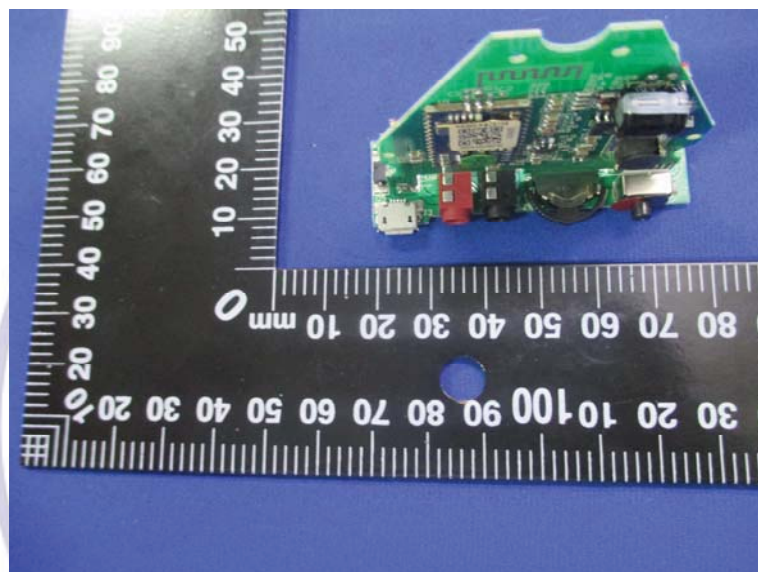
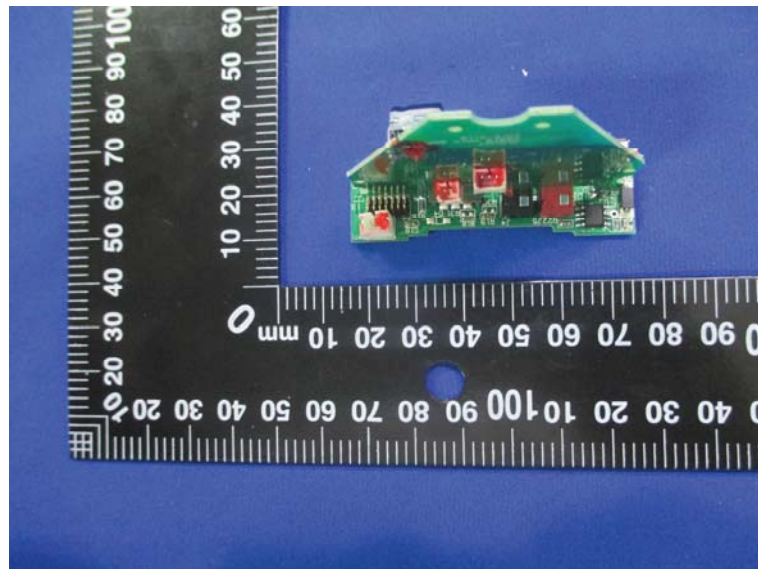


Internal Photos of EUT



BT antenna





\*\*\*\*\* End of Report \*\*\*\*\*