

## **FCC TEST REPORT**

**For**

**Shenzhen Indesign Technology Ltd.**

### **Bluetooth Vase Speaker**

Trade Name :  $\pi$ /Design-Pie

Model No. : PIE-V001, PIE-V002, PIE-V003, PIE-V004, PIE-A001, PIE-A002  
All the model are the same circuit and RF module,except the appearance colour, this report only test mode name: PIE-V001

FCC ID : 2ADGR-PIE-V001

Frequency range : 2402-2480MHz

Number of Channel : 79CH

Type of antenna : Internal monopole Antenna

Applicant : Shenzhen Indesign Technology Ltd.  
2/F, Mu Building, Design Industrial Park,NO.3838,NanShan Blvd.  
Nan Shan District, Shen Zhen, China

Regulation : FCC Rules and Regulations Part 15 Subpart C Section 15.249

Prepared by : WST Certification & Testing (HK) Limited  
Address : 12/F., San Toi Building,137-139 Connaught Road Central,  
Hong Kong, China

Report No.: : WST20141022003

Test Date : Oct. 22-28, 2014

Date of Report : Oct. 28, 2014

## TABLE OF CONTENT

Description	Page
Test Report Declaration	
<b>1.1 TEST PROCEDURES AND RESULTS .....</b>	<b>4</b>
1.2. Test Facility .....	4
<b>1. GENERAL INFORMATION .....</b>	<b>5</b>
2.1. General Information.....	5
<b>2. TEST INSTRUMENT USED.....</b>	<b>6</b>
<b>3. OPERATION OF EUT DURING TESTING .....</b>	<b>7</b>
<b>4. CONDUCTED EMISSIONS TEST.....</b>	<b>9</b>
4.1. Conducted Power Line Emission Limit .....	9
4.2. Test Setup .....	9
4.3. Test Procedure.....	10
4.4. Test Result.....	10
<b>5. RADIATED EMISSION TEST .....</b>	<b>11</b>
5.1. Radiation Limit .....	11
5.2. Test Setup .....	11
5.3. Test Procedure.....	12
5.4. Test Result.....	13
<b>6. BAND EDGE .....</b>	<b>15</b>
6.1. Limits .....	15
6.2. Test Procedure.....	15
6.3. Test Result.....	15
<b>7. OCCUPIED BANDWIDTH MEASUREMENT .....</b>	<b>18</b>
7.1. Test Setup .....	18
7.2. Test Procedure.....	18
7.3. Measurement Equipment Used .....	18
7.4. Test Result.....	18
<b>8. ANTENNA REQUIREMENT .....</b>	<b>20</b>
<b>9. PHOTOGRAPH OF TEST .....</b>	<b>21</b>

## TEST REPORT DECLARATION

Applicant : Shenzhen Indesign Technology Ltd.  
Manufacturer : Shenzhen Indesign Technology Ltd.  
EUT Description : Bluetooth Vase Speaker

Model NO. : PIE-V001, PIE-V002, PIE-V003, PIE-V004, PIE-A001,  
PIE-A002  
All the model are the same circuit and RF module, except  
the appearance colour, this report only test mode name:  
PIE-V001  
Serial NO. : N/A  
Power Supply : DC 5V

**Measurement Procedure Used:**

FCC Rules and Regulations Part 15 Subpart C Section 15.249

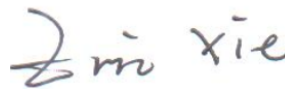
**ANSI C63.4:2009**

The device described above is tested by WST Certification & Testing (HK) Limited to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.249 limits. The measurement results are contained in this test report and WST Certification & Testing (HK) Limited. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of WST Certification & Testing (HK) Limited.

Date of Test: Oct. 22-28, 2014

Prepared by:



Project Engineer(Eric Xie)

Reviewed by:



Project Supervisor(Nico Lee)

Approved by:



Technical Director (Kait Chen)

## 1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

## 1.2. Test Facility

Test Firm	Shenzhen CTL Testing Technology Co., Ltd. Certificated by FCC, Registration No.: 970318
Address	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road. Nanshan, Shenzhen, China
Tel	86-755-89486194
Fax	86-755-89486194

### Measurement Uncertainty

Conducted Emission Expanded Uncertainty	= 3.20dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.10dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.32dB, k=2

## 1. GENERAL INFORMATION

### 2.1. General Information

EUT	:	Bluetooth Vase Speaker
Model Number	:	PIE-V001, PIE-V002, PIE-V003, PIE-V004, PIE-A001, PIE-A002 All the model are the same circuit and RF module,except the appearance colour, this report only test mode name: PIE-V001
Frequency Range	:	2402-2480MHz
Number of Channels	:	79CH
Antenna Gain	:	0dBi
Modulation mode	:	GFSK
Applicant	:	Shenzhen Indesign Technology Ltd. 2/F, Mu Building, Design Industrial Park,NO.3838,NanShan Blvd. Nan Shan District, Shen Zhen, China
Manufacturer	:	Shenzhen Indesign Technology Ltd. 2/F, Mu Building, Design Industrial Park,NO.3838,NanShan Blvd. Nan Shan District, Shen Zhen, China
Test Date	:	Oct. 22-28, 2014

## 2. TEST INSTRUMENT USED

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/12	2015/07/11
EMI Test Receiver	R&S	ESCI	103710	2014/07/12	2015/07/11
Spectrum Analyzer	Agilent	E4407B	MY45108355	2014/07/12	2015/07/11
Controller	EM Electronics	Controller EM 1000	N/A	2014/07/12	2015/07/11
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2014/07/12	2015/07/11
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2014/07/12	2015/07/11
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2014/07/12	2015/07/11
LISN	R&S	ENV216	101316	2014/07/12	2015/07/11
LISN	SCHWARZBECK	NSLK8127	8127687	2014/07/12	2015/07/11
Microwave Preamplifier	HP	8349B	3155A00882	2014/07/12	2015/07/11
Amplifier	HP	8447D	3113A07663	2014/07/12	2015/07/11
Transient Limiter	Com-Power	LIT-153	532226	2014/07/12	2015/07/11
Radio Communication Tester	R&S	CMU200	3655A03522	2014/07/12	2015/07/11
Temperature/Humidity Meter	zhicheng	ZC1-2	22522	2014/07/12	2015/07/11
SIGNAL GENERATOR	HP	8647A	3200A00852	2014/07/12	2015/07/11
Wideband Peak Power Meter	Anritsu	ML2495A	220.23.35	2014/07/12	2015/07/11
Climate Chamber	ESPEC	EL-10KA	A20120523	2014/07/12	2015/07/11
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	/	2014/07/12	2015/07/11
High-Pass Filter	K&L	41H10-1375/U12750-O/O	/	2014/07/12	2015/07/11

### 3. OPERATION OF EUT DURING TESTING

Operating Mode

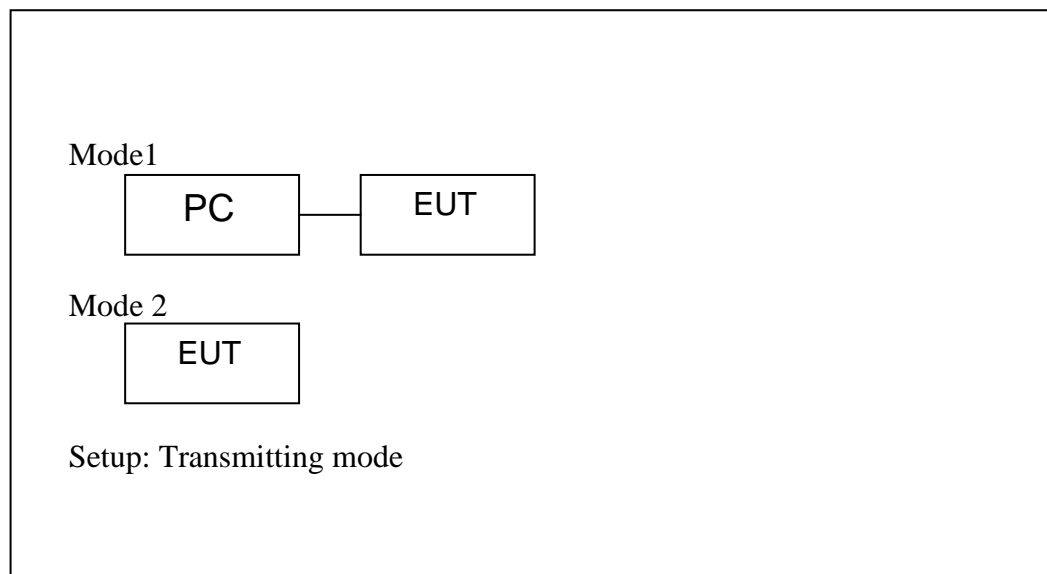
The mode is used: **Transmitting mode**

Low Channel: 2402MHz

Middle Channel: 2440MHz

High Channel: 2480MHz

Test Setup



## Channel list for Bluetooth

Frequency Band	Channel Number	Frequency
2402~2480MHZ	0	2402MHZ
	1	2403MHZ
	:	:
	38	2440 MHZ
	39	2441 MHZ
	40	2442 MHZ
	:	:
	77	2479 MHZ
	78	2480 MHZ

## 4. CONDUCTED EMISSIONS TEST

### 4.1. Conducted Power Line Emission Limit

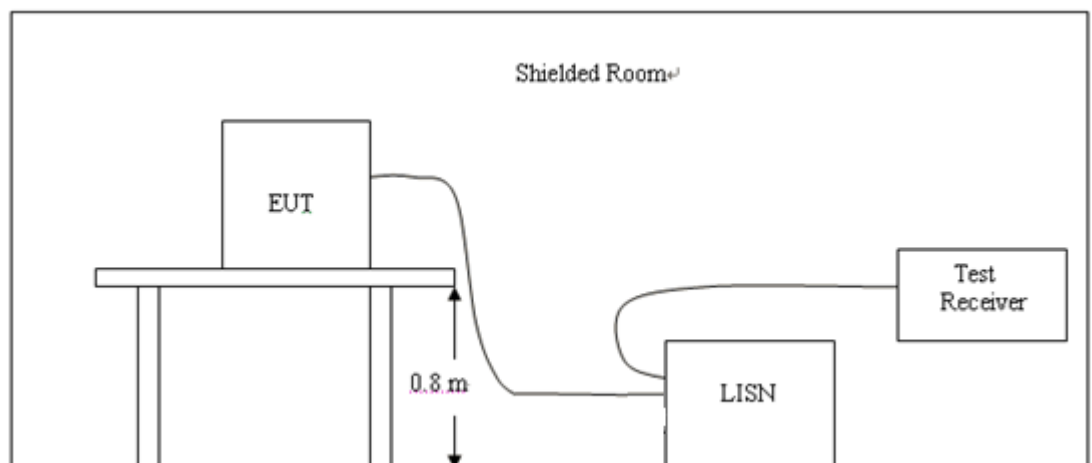
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

\* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

### 4.2. Test Setup

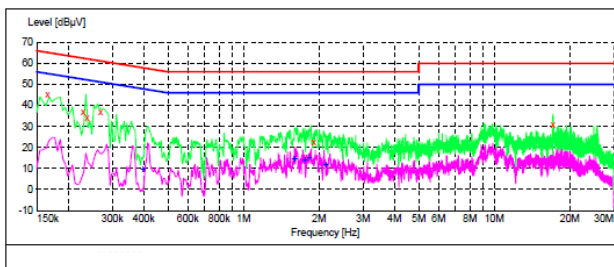


### 4.3. Test Procedure

- 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 C63.4.
- 2, Support equipment, if needed, was placed as per ANSI C63.4.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 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.

### 4.4. Test Result

PASS

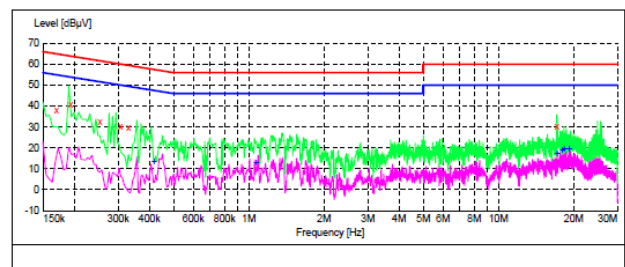


MEASUREMENT RESULT:

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	FE
0.166000	45.10	10.2	65	20.1	QP	L1	GND
0.230000	36.90	10.2	62	25.5	QP	L1	GND
0.238000	34.00	10.2	62	28.2	QP	L1	GND
0.270000	37.10	10.2	61	24.0	QP	L1	GND
1.910000	22.80	10.3	56	33.2	QP	L1	GND
17.168000	30.90	10.8	60	29.1	QP	L1	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	FE
0.398000	9.60	10.2	48	38.3	AV	L1	GND
1.592000	14.70	10.3	46	31.3	AV	L1	GND
1.598000	14.70	10.3	46	31.3	AV	L1	GND
1.754000	14.20	10.3	46	31.8	AV	L1	GND
1.832000	15.60	10.3	46	30.4	AV	L1	GND
2.126000	12.30	10.4	46	33.7	AV	L1	GND



MEASUREMENT RESULT:

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	FE
0.170000	38.20	10.2	65	26.8	QP	N	GND
0.194000	40.70	10.2	64	23.2	QP	N	GND
0.254000	32.60	10.2	62	29.0	QP	N	GND
0.306000	30.10	10.2	60	30.0	QP	N	GND
0.330000	29.70	10.2	60	29.8	QP	N	GND
17.162000	30.30	10.8	60	29.7	QP	N	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	FE
0.418000	13.70	10.2	48	33.8	AV	N	GND
1.070000	13.10	10.3	46	32.9	AV	N	GND
17.144000	17.50	10.8	50	32.5	AV	N	GND
18.050000	19.10	10.8	50	30.9	AV	N	GND
18.350000	19.80	10.9	50	30.2	AV	N	GND
19.250000	19.80	10.9	50	30.2	AV	N	GND

## 5. RADIATED EMISSION TEST

### 5.1. Radiation Limit

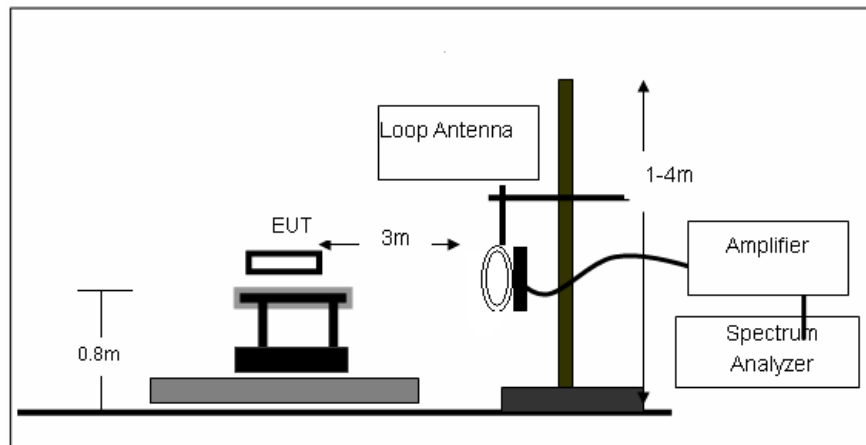
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

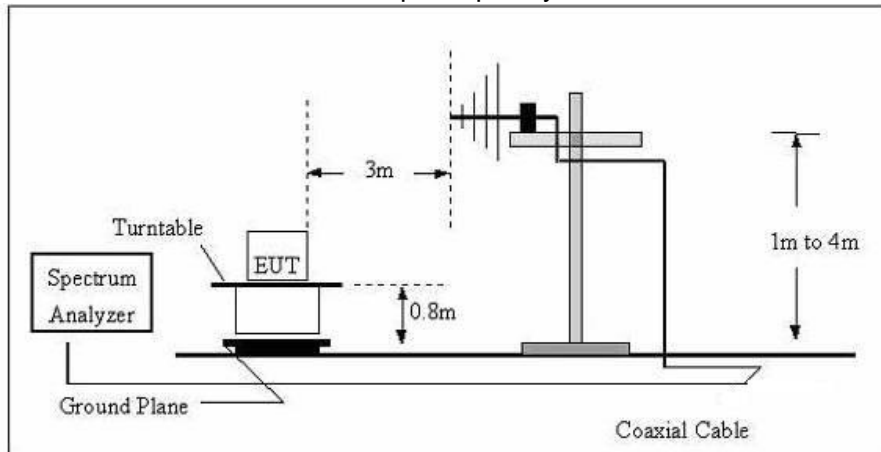
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

### 5.2. Test Setup

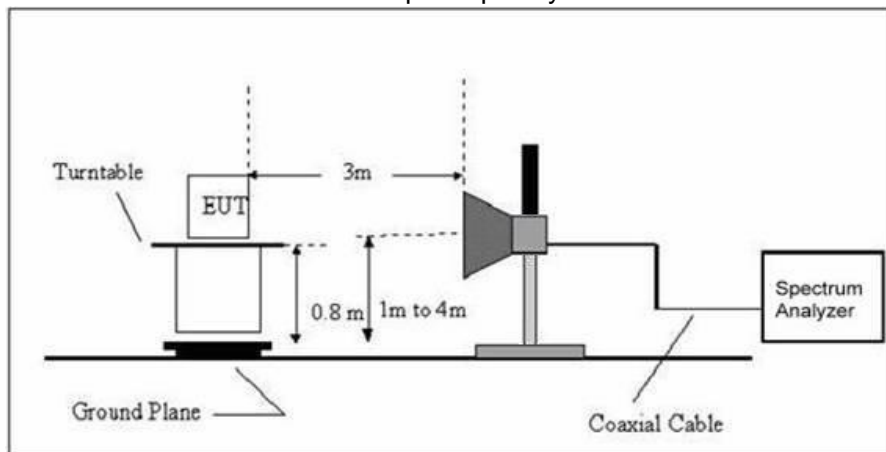
#### (1) Radiated Emission Test-Up Frequency Below 30MHz



## (2) Radiated Emission Test-Up Frequency 30MHz~1GHz



## (3) Radiated Emission Test-Up Frequency Above 1GHz



### 5.3. Test Procedure

1. The EUT is placed on a turntable, which is 0.8m 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 varied from 1m to 4m to find out the highest emissions.
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. Based on the Frequency Generator in the device include 26MHz. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

**Note:**

Three axes are chosen for pretest, the Y axis is the worst mode for final test.

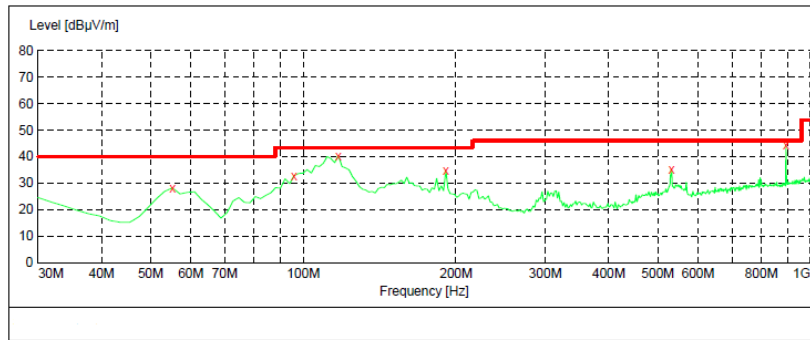
For battery operated equipment, the equipment tests shall be performed using a new battery.

## 5.4. Test Result

PASS

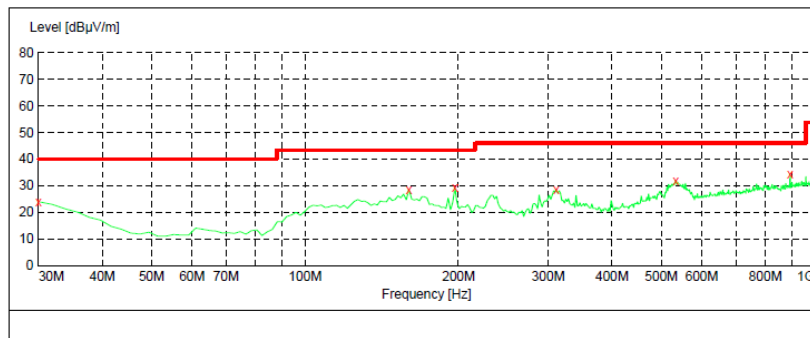
All the test modes completed for test. The worst case of Radiated Emission is playing music; the test data of this mode was reported.

Below 1GHz Test Results:



**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
55.220000	28.20	8.3	40.0	11.8	---	0.0	0.00	VERTICAL
95.960000	32.80	10.6	43.5	10.7	---	0.0	0.00	VERTICAL
117.300000	40.30	15.1	43.5	3.2	---	0.0	0.00	VERTICAL
191.020000	34.70	13.4	43.5	8.8	---	0.0	0.00	VERTICAL
532.460000	35.20	20.6	46.0	10.8	---	0.0	0.00	VERTICAL
895.240000	44.20	26.0	46.0	1.8	---	0.0	0.00	VERTICAL



**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.00	21.1	40.0	16.0	---	0.0	0.00	HORIZONTAL
159.980000	28.60	13.9	43.5	14.9	---	0.0	0.00	HORIZONTAL
196.840000	29.20	13.8	43.5	14.3	---	0.0	0.00	HORIZONTAL
311.300000	28.50	15.7	46.0	17.5	---	0.0	0.00	HORIZONTAL
534.400000	31.90	20.6	46.0	14.1	---	0.0	0.00	HORIZONTAL
895.240000	34.30	26.0	46.0	11.7	---	0.0	0.00	HORIZONTAL

Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

## Above 1 GHz Test Results:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
2480	V	Peak	76.46	-3.30	73.16	113.98	-40.82
2480	H	Peak	72.44	-3.30	69.14	113.98	-44.84
4960	V	Peak	49.19	3.90	53.09	74.00	-20.91
4960	H	Peak	45.51	3.90	49.41	74.00	-24.59
7440	V		---				
7440	H		---				
Others			---				

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
2441	V	Peak	76.26	-3.40	72.86	113.98	-41.12
2441	H	Peak	72.38	-3.40	68.98	113.98	-45.00
4882	V	Peak	49.50	3.70	53.20	74.00	-20.80
4882	H	Peak	45.87	3.70	49.57	74.00	-24.43
7323	V		---				
7323	H		---				
Others			---				

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
2402	V	Peak	76.22	-3.30	72.92	113.98	-41.06
2402	H	Peak	71.72	-3.30	68.42	113.98	-45.56
4804	V	Peak	49.43	3.50	52.93	74.00	-21.07
4804	H	Peak	45.34	3.50	48.84	74.00	-25.16
7206	V		---				
7206	H		---				
Others			---				

## Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

## 6. BAND EDGE

### 6.1.Limits

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.

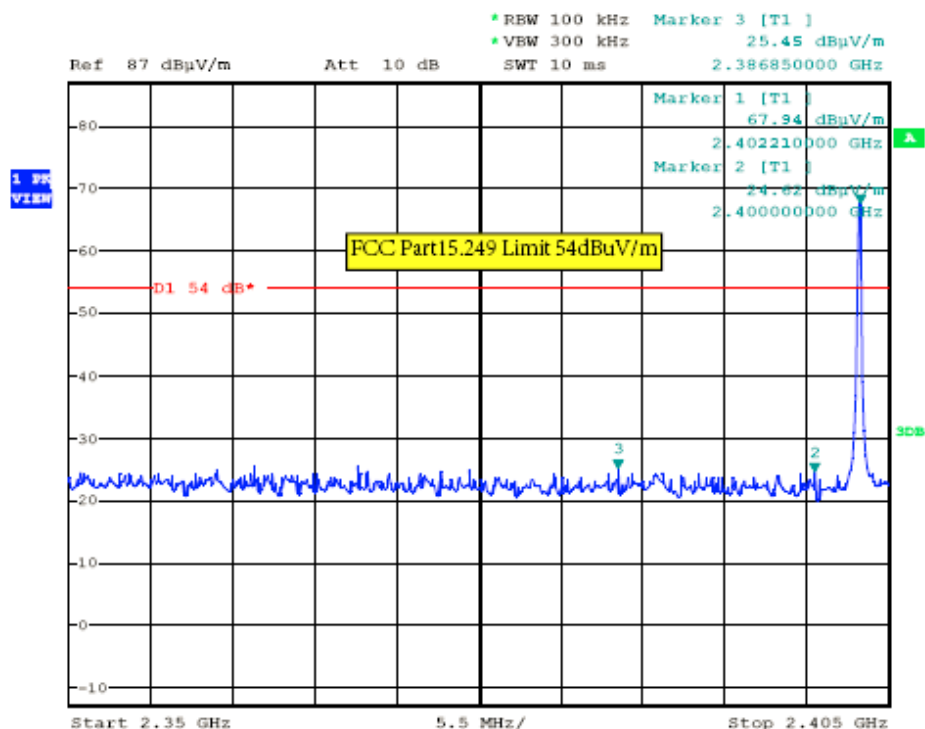
### 6.2.Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength. The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBM to 300 KHz, to measure the conducted peak band edge.

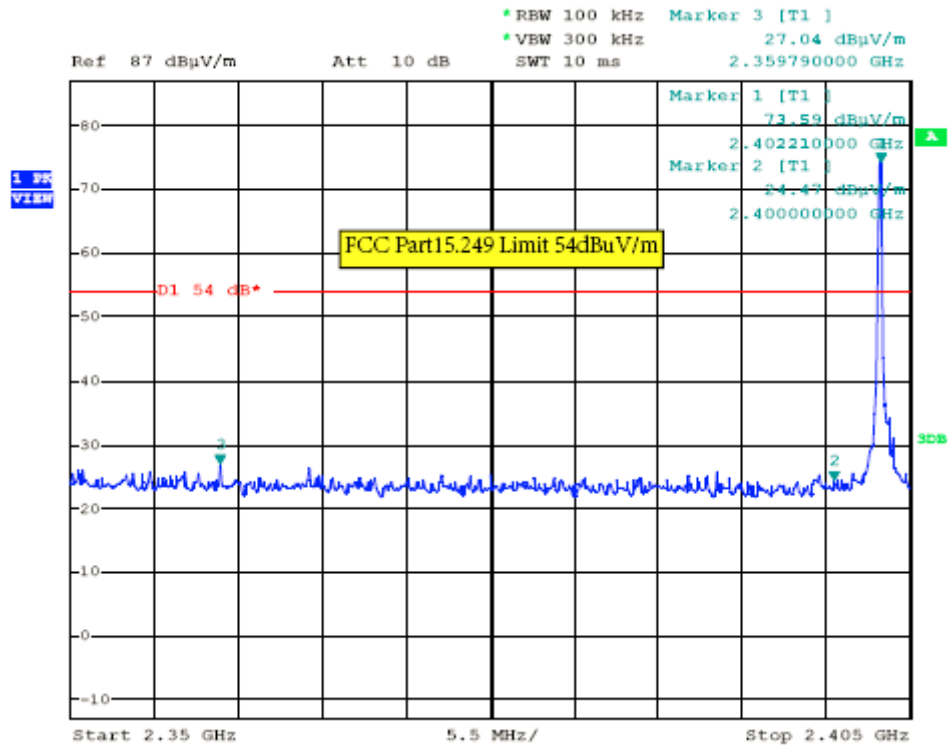
### 6.3.Test Result

**PASS**

Polarity: Hor.



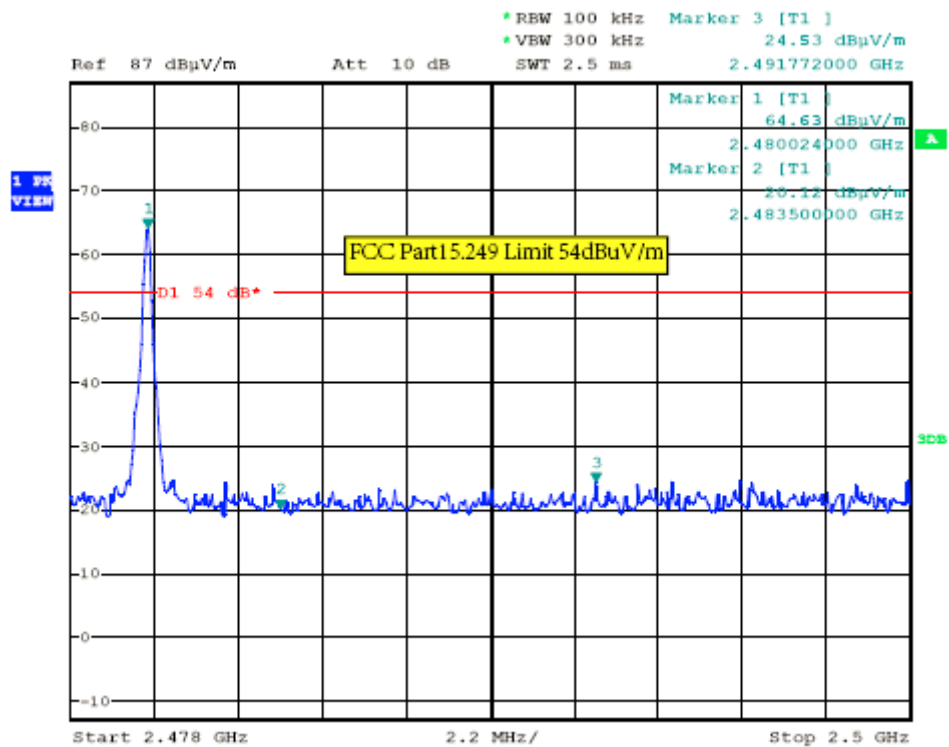
Polarity: Ver.



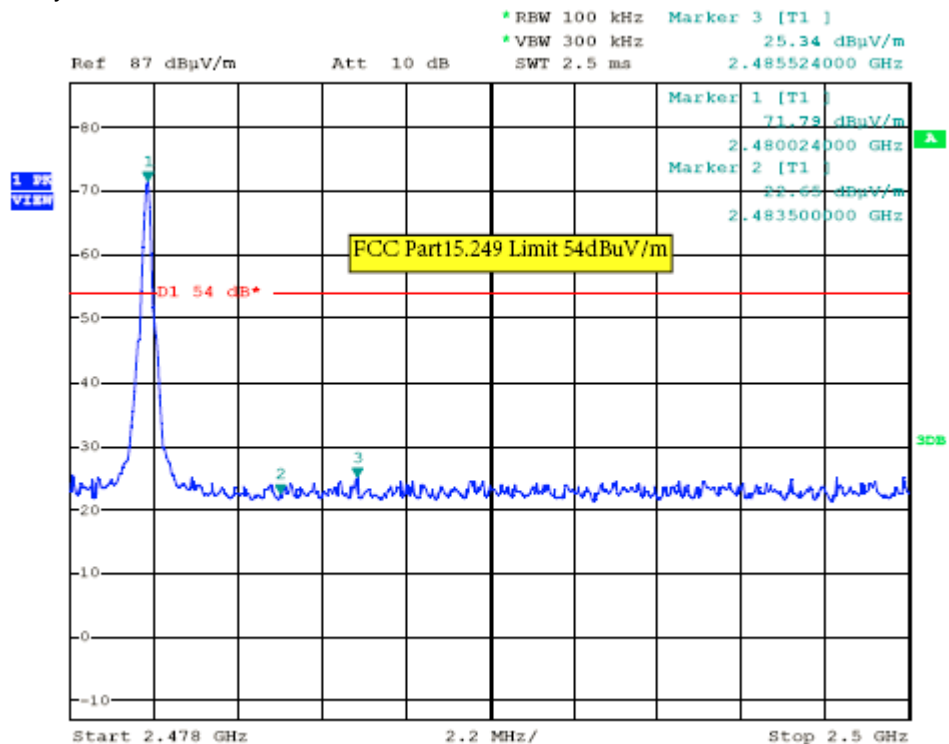
Note:

1. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.
2. The average measurement was not performed when the peak measured data under the limit of average detection.

Polarity: Hor.



Polarity: Ver.



Note:

1. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.
2. The average measurement was not performed when the peak measured data under the limit of average detection.

## 7. OCCUPIED BANDWIDTH MEASUREMENT

### 7.1. Test Setup

Same as Radiated Emission Measurement

### 7.2. Test Procedure

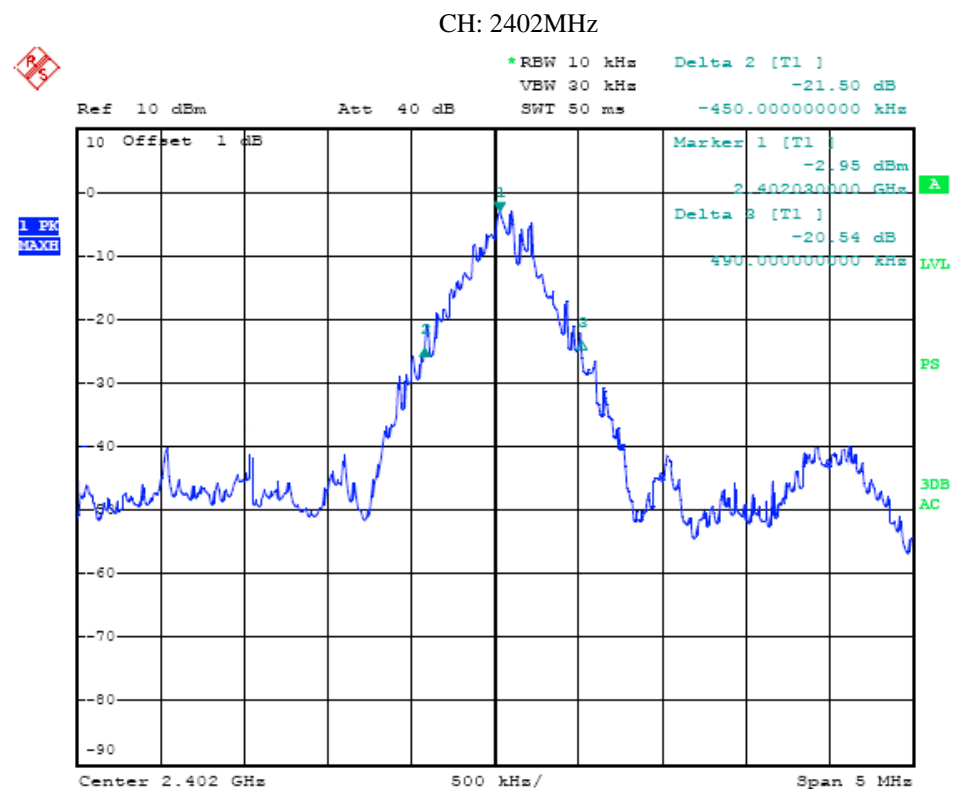
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.239(a): RBW= 10KHz. VBW= 30 KHz, Span=1MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

### 7.3. Measurement Equipment Used

Same as Radiated Emission Measurement

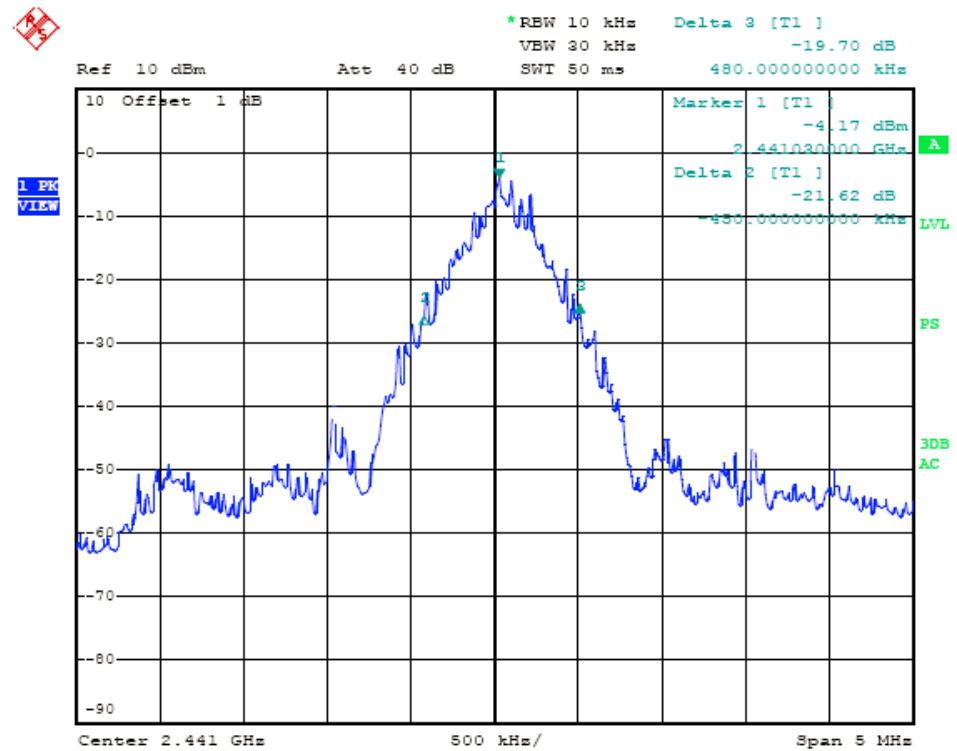
### 7.4. Test Result

**PASS**



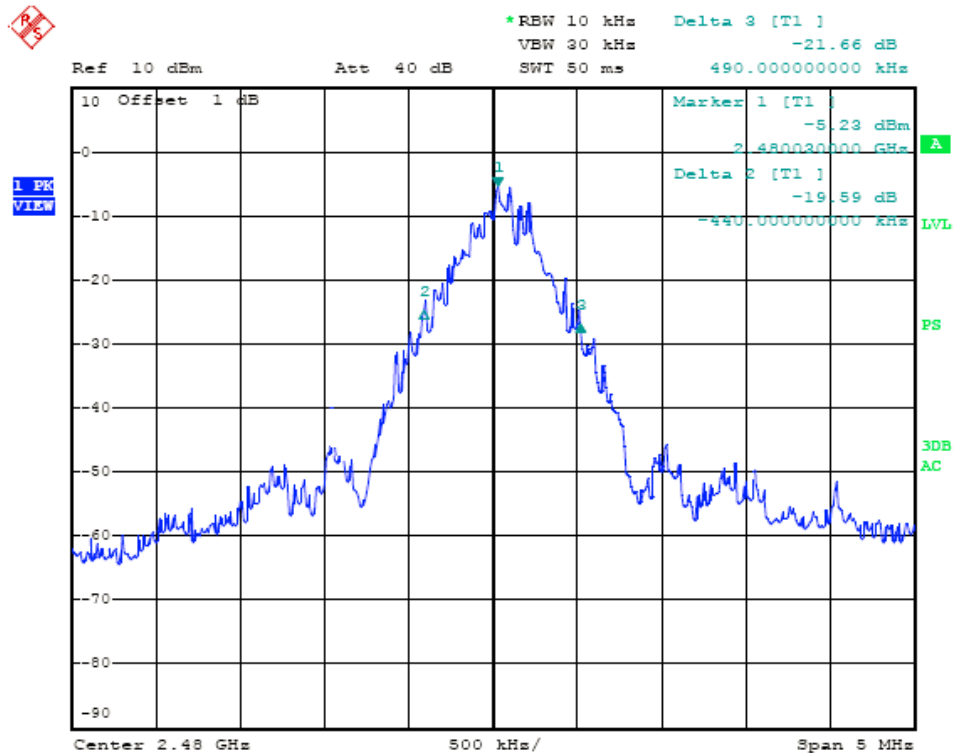
20dB Bandwidth: 940.00KHz

CH: 2441MHz



20dB Bandwidth: 930.00KHz

CH: 2480MHz



20dB Bandwidth: 930.00KHz

## 8. 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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

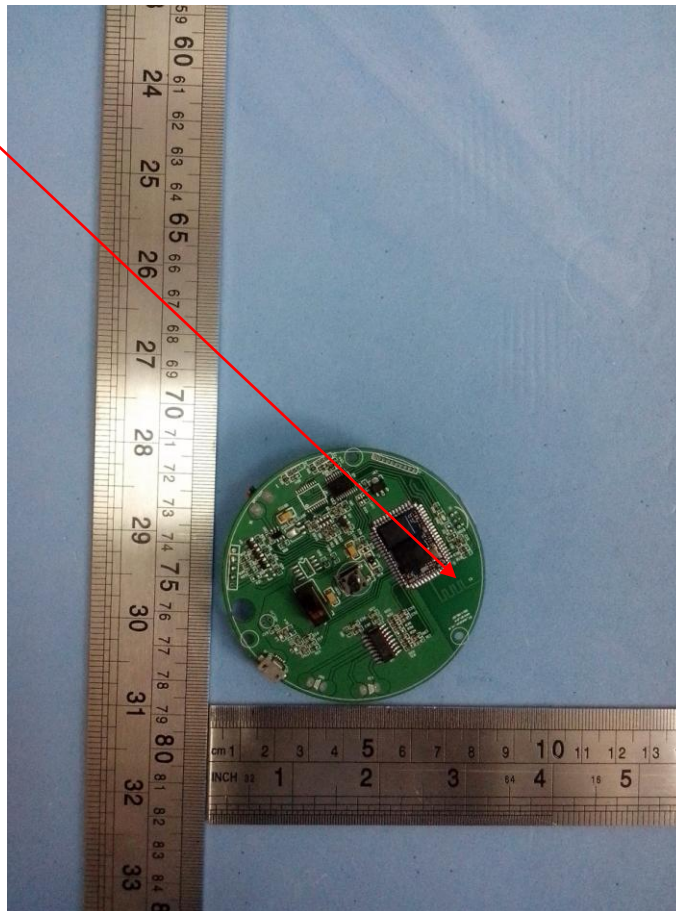
### Refer to statement below for compliance.

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 a PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

ANTENNA



## 9. PHOTOGRAPH OF TEST

### Radiated Emission





### Conducted Power Line Emission

