



Shenzhen Global Test Service Co.,Ltd.

1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....: GTSR17030079-01

FCC ID..... : 2ALNA-ICBTS11

Compiled by

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Date of issue.....: Mar. 29, 2017

Representative Laboratory Name .: Shenzhen Global Test Service Co.,Ltd.

Address: 1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

Applicant's name: Shenzhen Thousandshores Technology Co., Ltd.

Address: 5th Floor, Chuangxin Building, Seven-star Creative Square, No.2 North Alley, Chuangye 2nd Road, Bao'an District 28th, Shenzhen

Test specification

Standard: **FCC Part 15.247-2015: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**

TRF Originator.....: Shenzhen Global Test Service Co.,Ltd.

Master TRF.....: Dated 2014-12

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Test item description: Waterproof Wireless Speaker

Trade Mark: iClever

Manufacturer: **Shenzhen Thousandshores Technology Co., Ltd.**

Model/Type reference.....: IC-BTS11

Listed Models: /

Modulation Type: GFSK

Operation Frequency.....: From 2402MHz to 2480MHz

EUT Type: Production Unit

Hardware Version: HB-JLC-S5021-6611CX_V1.2

Software Version: V1.1

Rating: DC 3.7V

Result.....: **PASS**

TEST REPORT

Test Report No. : GTSR17030079-01	Mar. 29, 2017
	Date of issue

Equipment under Test : Waterproof Wireless Speaker

Model /Type : IC-BTS11

Listed Models : /

Applicant : **Shenzhen Thousandshores Technology Co., Ltd.**

Address : 5th Floor, Chuangxin Building, Seven-star Creative Square, No.2
North Alley, Chuangye 2nd Road, Bao'an District 28th, Shenzhen

Manufacturer : **Shenzhen Thousandshores Technology Co., Ltd.**

Address : 5th Floor, Chuangxin Building, Seven-star Creative Square, No.2
North Alley, Chuangye 2nd Road, Bao'an District 28th, Shenzhen

Test Result:	PASS
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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.

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1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 V03r05](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Mar. 16, 2017
Testing commenced on	:	Mar. 16, 2017
Testing concluded on	:	Mar. 29, 2017

2.2. Product Description

Name of EUT	Waterproof Wireless Speaker
Trade Mark	iClever
Model Number	IC-BTS11
List Model	/
FCC ID	2ALNA-ICBTS11
Antenna Type	Internal Antenna
Bluetooth FCC Operation frequency	2402MHz-2480MHz
Bluetooth Modulation	GFSK
Bluetooth	Supported BT4.0
Antenna gain	-0.66dBi

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 230V / 50 Hz	<input type="radio"/> 120V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.7V

2.4. Short description of the Equipment under Test (EUT)

This is a Waterproof Wireless Speaker.

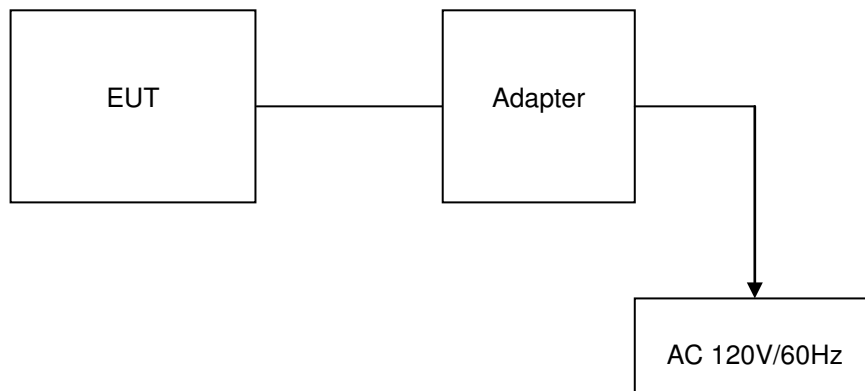
For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

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 40 channels provided to the EUT. Channel 00/19/39 was selected to test.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2ALNA-ICBTS11** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - Supplied by the lab

<input type="radio"/> Adapter	M/N:	AK931KX
	Manufacturer:	OPPO

2.9. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

Shenzhen CTL Testing Technology Co., Ltd.

1/F.-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, Guangdong, China

3.2. Test Facility

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

FCC-Registration No.: 964637

Shenzhen Global Test Service 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 964637, Jul 24, 2015.

CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

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.

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(1)	Maximum output power	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	Band edge compliance conducted	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205	Band edge compliance radiated	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions conducted	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions radiated	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Remark:

1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

3.5. 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 Global Test Service 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 Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

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

3.6. Equipments Used during the Test

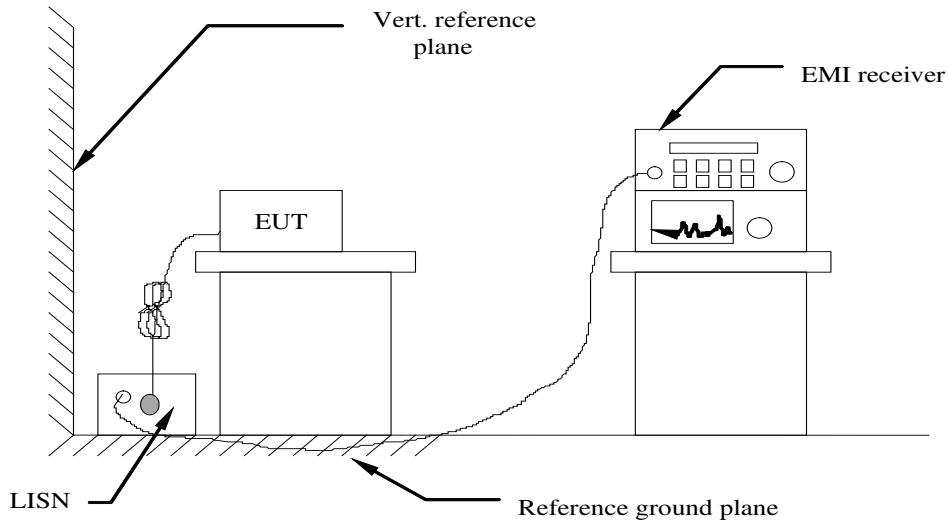
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2016/05/28	2017/05/27
LISN	R&S	ESH2-Z5	893606/008	2016/05/27	2017/05/26
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	101102	2016/06/26	2017/06/25
Spectrum Analyzer	Agilent	N9020A	MY48010425	2016/06/17	2017/06/16
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
Active Loop Antenna	SCHWARZBEC K	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2016/05/20	2017/05/19
RF Cable	HUBER+SUHNER	RG214	N/A	2016/05/20	2017/05/19
Data acquisition card	Agilent	U2531A	TW53323507	2016/05/20	2017/05/19
Power Sensor	Agilent	U2021XA	MY5365004	2016/05/20	2017/05/19

Note: The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

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 The EUT received DC 5V power, the 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.

AC Power Conducted Emission Limit

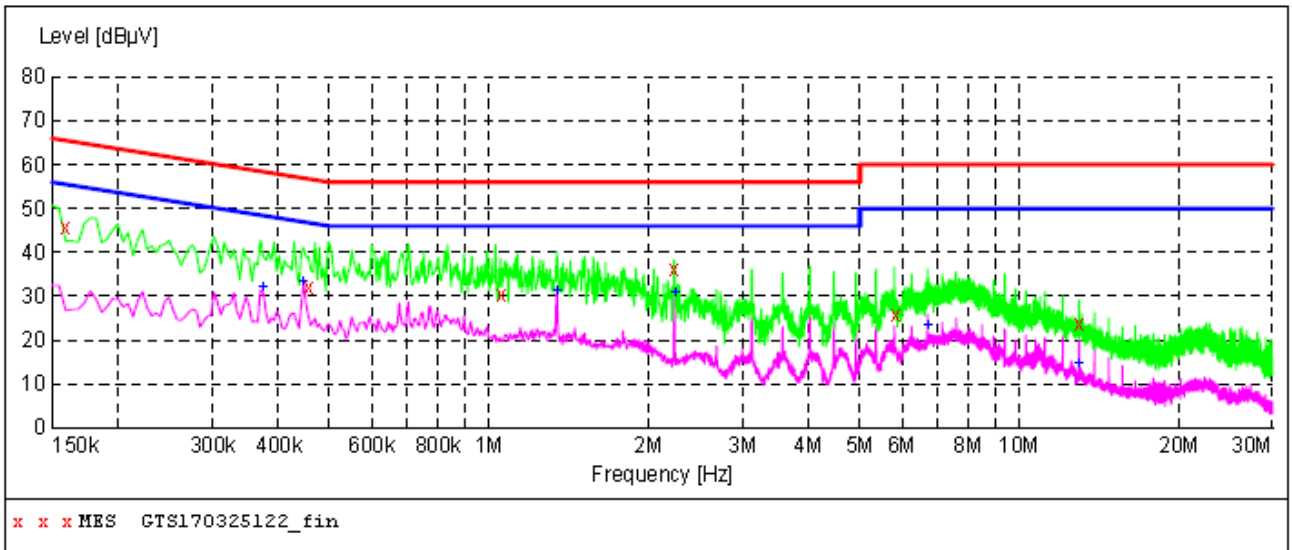
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

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 RESULTS

Power supply:	DC 5V from Adapter AC 120V/60Hz	Polarization	L
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MEASUREMENT RESULT: "GTS170325122_fin"

3/25/2017 10:56AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	45.60	10.0	66	19.9	QP	L1	GND
0.456000	32.10	9.8	57	24.7	QP	L1	GND
1.059000	30.50	9.6	56	25.5	QP	L1	GND
2.238000	36.30	9.5	56	19.7	QP	L1	GND
5.833500	25.80	9.2	60	34.2	QP	L1	GND
12.979500	23.80	8.4	60	36.2	QP	L1	GND

MEASUREMENT RESULT: "GTS170325122_fin2"

3/25/2017 10:56AM

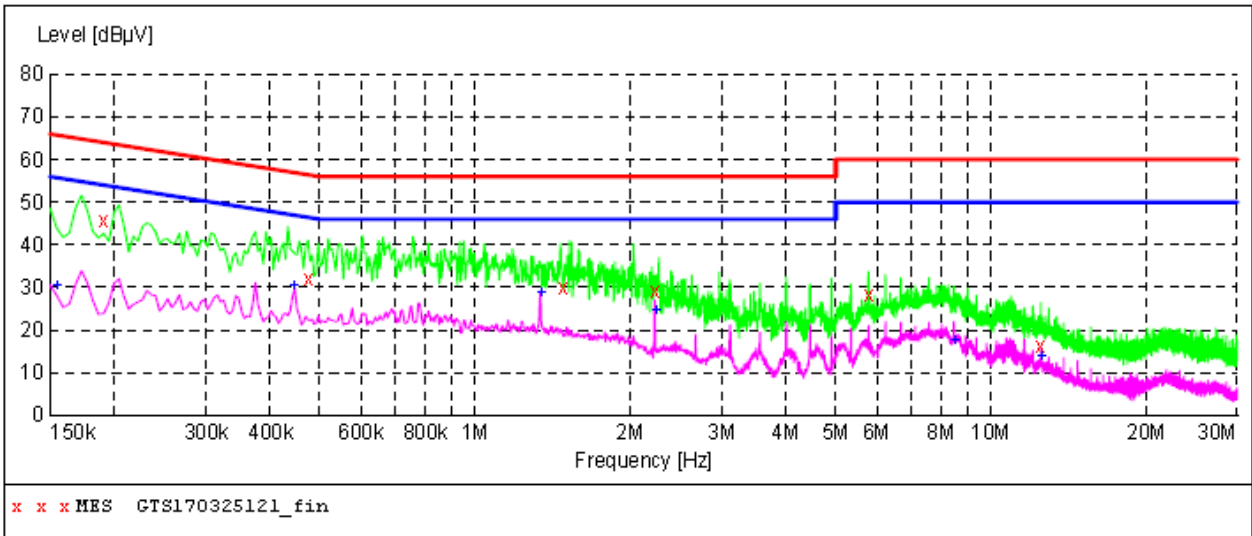
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.375000	32.00	9.8	48	16.4	AV	L1	GND
0.447000	33.20	9.8	47	13.7	AV	L1	GND
1.342500	31.40	9.6	46	14.6	AV	L1	GND
2.238000	30.80	9.5	46	15.2	AV	L1	GND
6.715500	23.20	9.1	50	26.8	AV	L1	GND
12.975000	14.70	8.4	50	35.3	AV	L1	GND

Power supply:

DC 5V from Adapter
AC 120V/60Hz

Polarization

N



MEASUREMENT RESULT: "GTS170325121_fin"

3/25/2017 10:52AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190500	45.60	10.0	64	18.4	QP	N	GND
0.474000	32.20	9.8	56	24.2	QP	N	GND
1.482000	30.00	9.6	56	26.0	QP	N	GND
2.233500	29.00	9.5	56	27.0	QP	N	GND
5.815500	28.50	9.2	60	31.5	QP	N	GND
12.462000	16.10	8.5	60	43.9	QP	N	GND

MEASUREMENT RESULT: "GTS170325121_fin2"

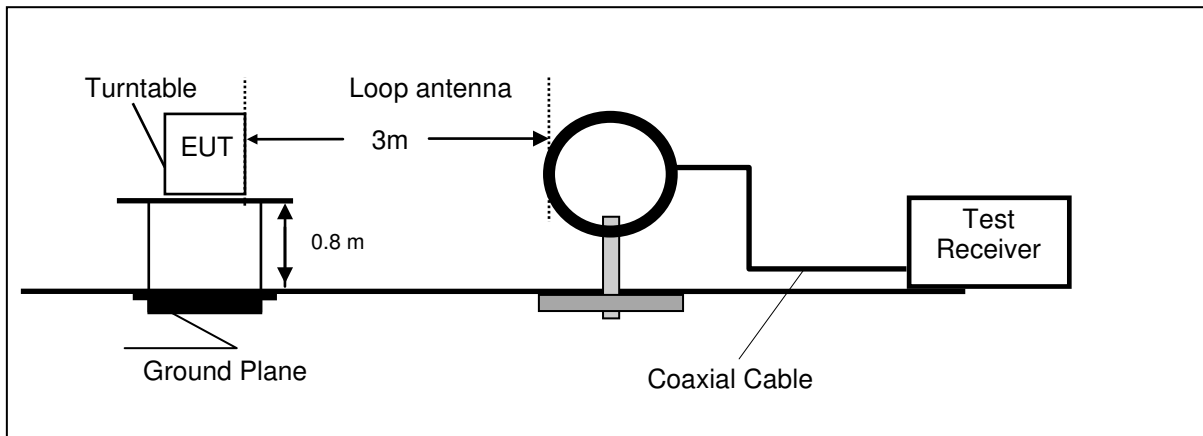
3/25/2017 10:52AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	30.40	10.1	56	25.4	AV	N	GND
0.447000	30.20	9.8	47	16.7	AV	N	GND
1.342500	28.80	9.6	46	17.2	AV	N	GND
2.238000	24.70	9.5	46	21.3	AV	N	GND
8.506500	17.60	9.0	50	32.4	AV	N	GND
12.534000	13.80	8.5	50	36.2	AV	N	GND

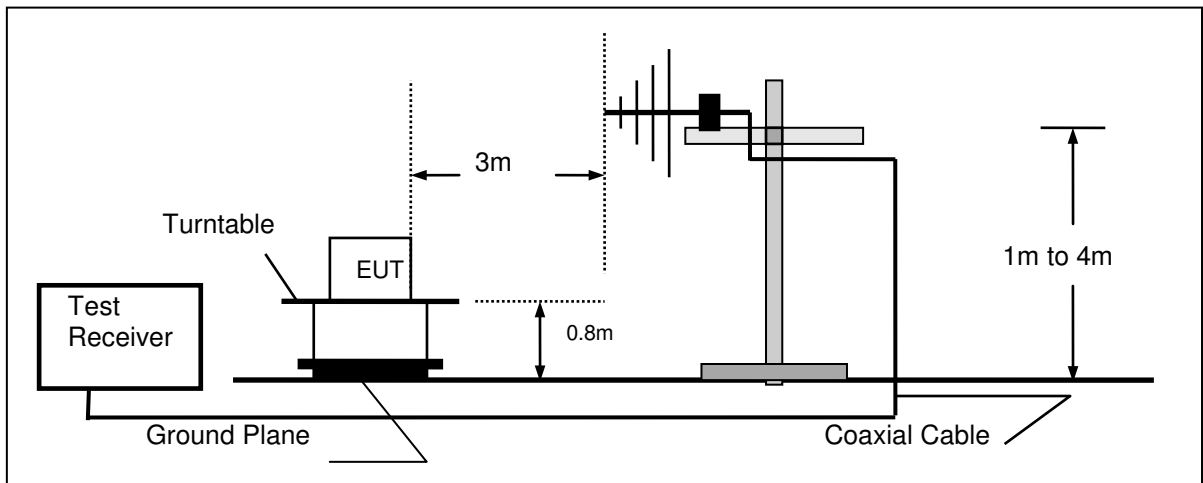
4.2. Radiated Emission

TEST CONFIGURATION

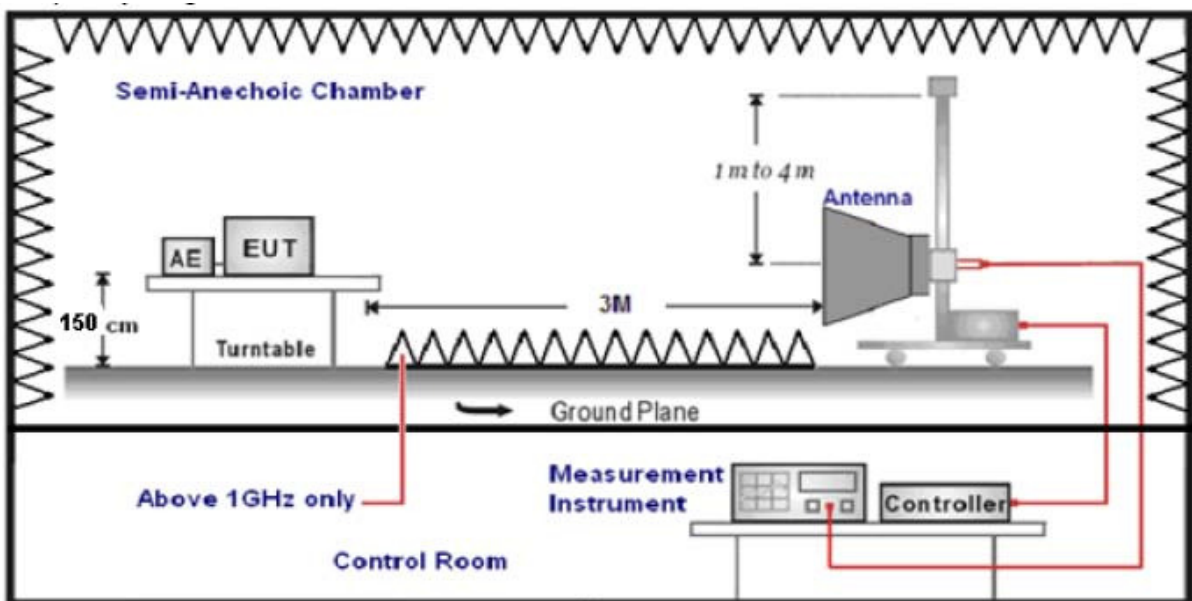
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

- The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
- 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.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.
- The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

- Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(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

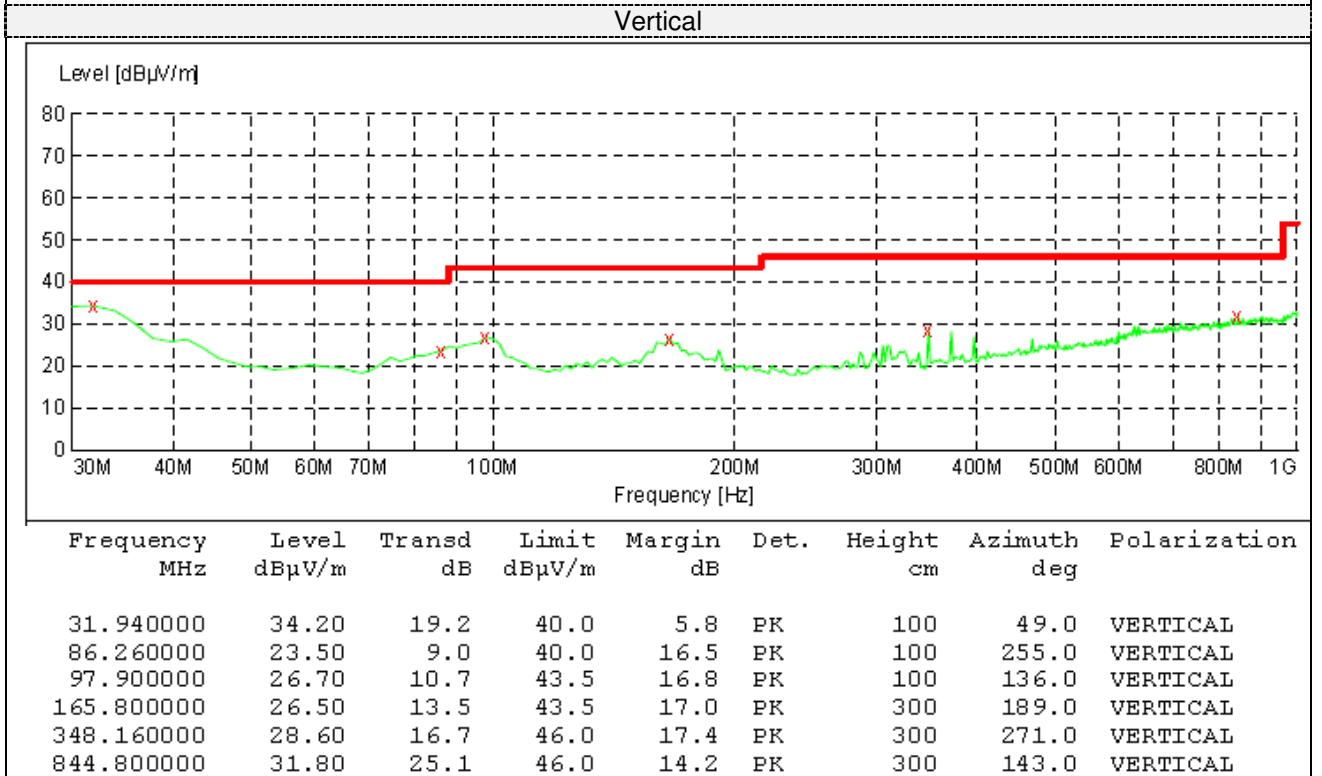
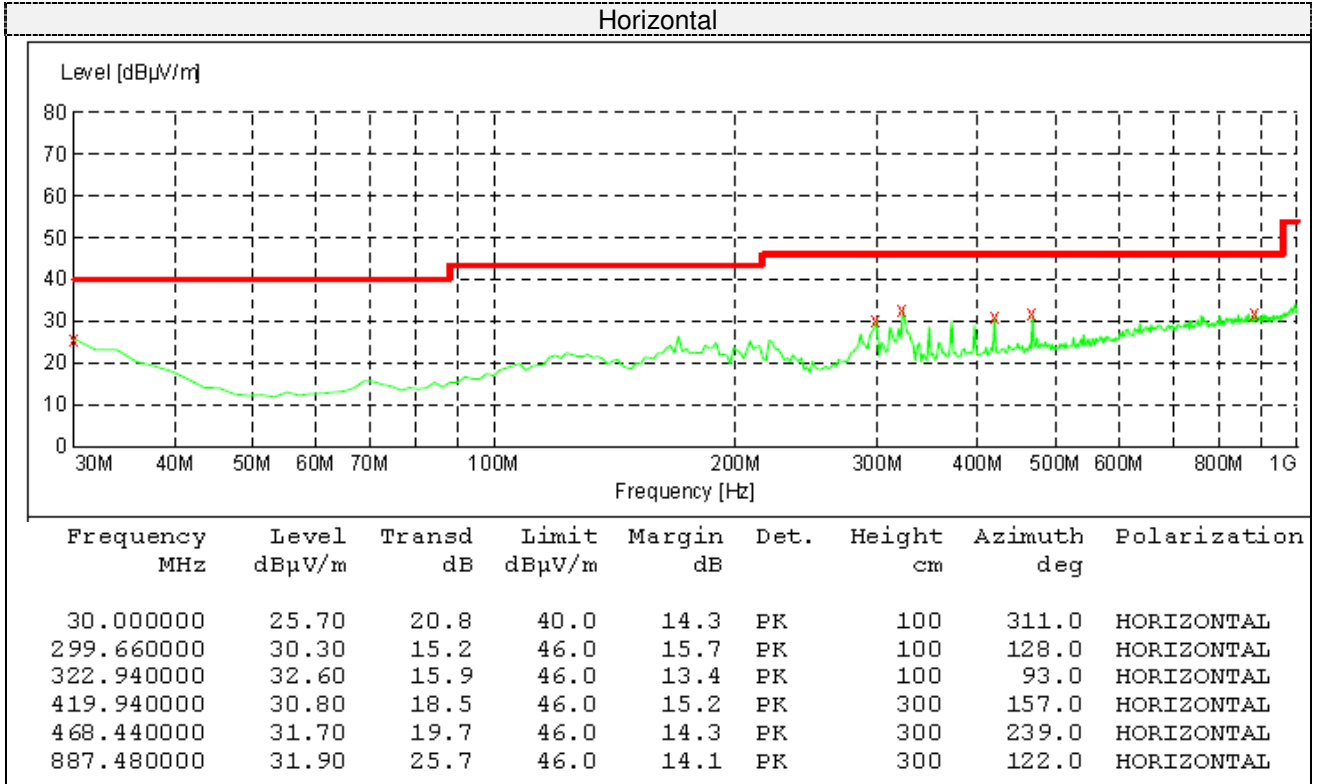
TEST RESULTS

Remark: Test site: Shenzhen CTL Testing Technology Co., Ltd.

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Result
0.11	59.27	106.78	47.51	QP	PASS
3.57	43.21	69.54	26.33	QP	PASS
15.22	44.65	69.54	24.89	QP	PASS
21.61	43.59	69.54	25.95	QP	PASS

For 30MHz to 1000MHz



For 1GHz to 25GHz

Frequency(MHz):				2402			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4804.00	51.61	PK	74.00	22.39	1.00 H	165	49.71	31.42	6.98	36.5	1.90
1	4804.00	42.05	AV	54.00	11.95	1.00 H	165	40.15	31.42	6.98	36.5	1.90
2	7206.00	51.62	PK	74.00	22.38	1.00 H	84	41.02	37.03	8.87	35.3	10.60
2	7206.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2402			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4804.00	50.66	PK	74.00	23.34	1.00 V	224	48.76	31.42	6.98	36.5	1.90
1	4804.00	41.38	AV	54.00	12.62	1.00 V	224	39.48	31.42	6.98	36.5	1.90
2	7206.00	51.29	PK	74.00	22.71	1.00 V	136	40.69	37.03	8.87	35.3	10.60
2	7206.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2440			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4880.00	52.71	PK	74.00	21.29	1.00 H	99	50.65	30.98	7.58	36.5	2.06
1	4880.00	40.63	AV	54.00	13.37	1.00 H	99	38.57	30.98	7.58	36.5	2.06
2	7320.00	51.65	PK	74.00	22.35	1.00 H	106	40.73	37.66	8.56	35.3	10.92
2	7320.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2440			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4880.00	50.54	PK	74.00	23.46	1.00 V	144	48.48	30.98	7.58	36.5	2.06
1	4880.00	41.68	AV	54.00	12.32	1.00 V	144	39.62	30.98	7.58	36.5	2.06
2	7320.00	50.87	PK	74.00	23.13	1.00 V	271	39.95	37.66	8.56	35.3	10.92
2	7320.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2480			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4960.00	49.65	PK	74.00	24.35	1.00 H	201	46.58	31.47	7.80	36.2	3.07
1	4960.00	40.37	AV	54.00	13.63	1.00 H	201	37.30	31.47	7.80	36.2	3.07
2	7440.00	50.47	PK	74.00	23.53	1.00 H	169	38.73	38.32	8.72	35.3	11.74
2	7440.00	--	AV	--	--	--	--	--	--	--	--	--

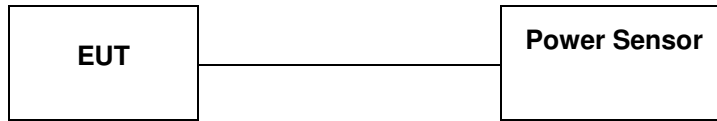
Frequency(MHz):				2480			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4960.00	50.34	PK	74.00	23.66	1.00 V	166	47.27	31.47	7.80	36.2	3.07
1	4960.00	40.64	AV	54.00	13.36	1.00 V	166	37.57	31.47	7.80	36.2	3.07
2	7440.00	51.38	PK	74.00	22.62	1.00 V	132	39.64	38.32	8.72	35.3	11.74
2	7440.00	--	AV	--	--	--	--	--	--	--	--	--

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.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2.

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

LIMIT

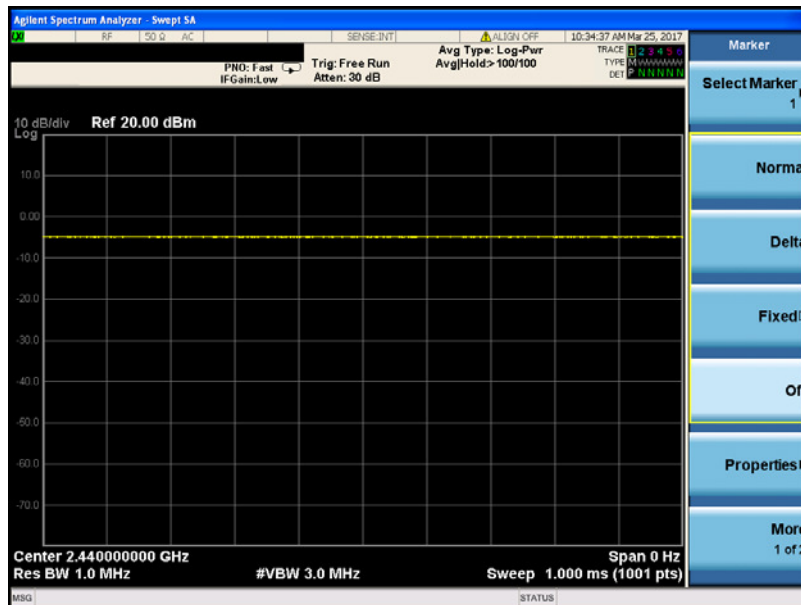
The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

Type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	0	-4.54	-5.32	30	Pass
	19	-4.84	-5.53		
	39	-5.32	-5.94		

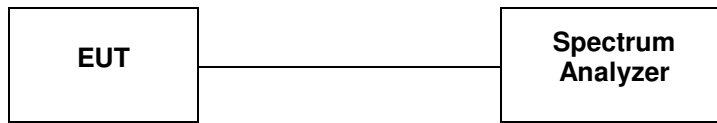
Note: The test results including the cable lose.

Duty cycle used in all test items: 100%



4.4. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

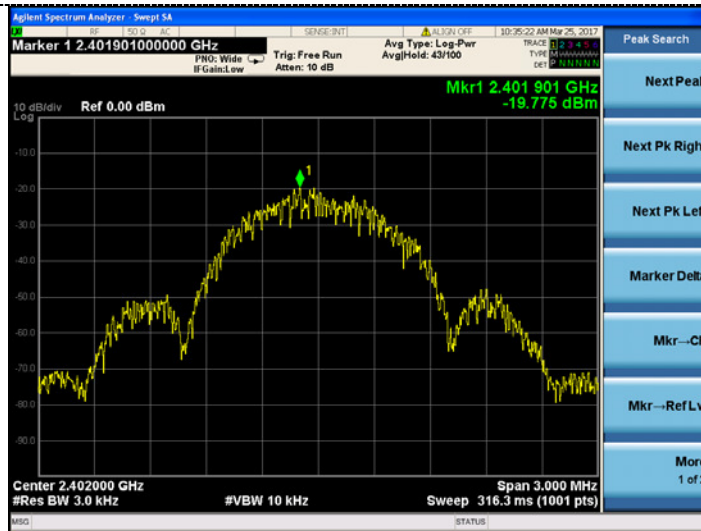
1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 3 kHz.
3. Set the VBW = 10 kHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8 dBm.

LIMIT

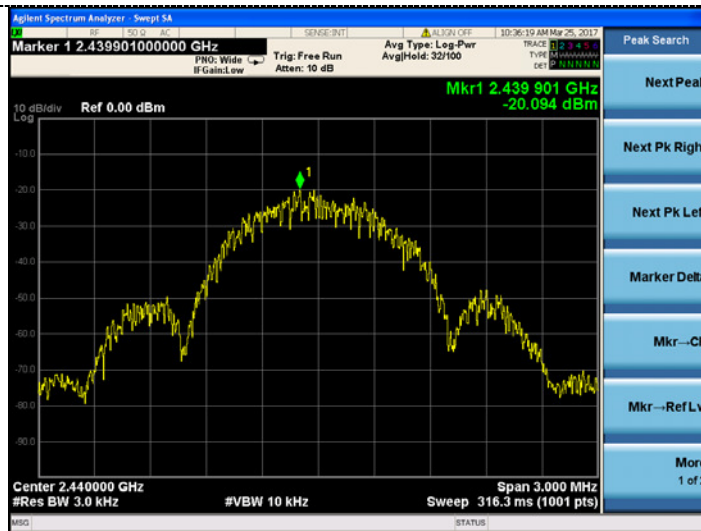
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST RESULTS

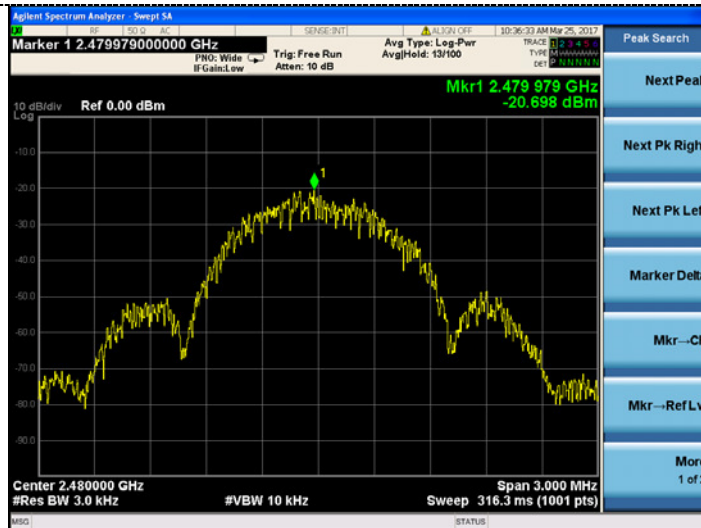
Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
GFSK	0	-19.78	8.00	Pass
	19	-20.09		
	39	-20.70		



CH0



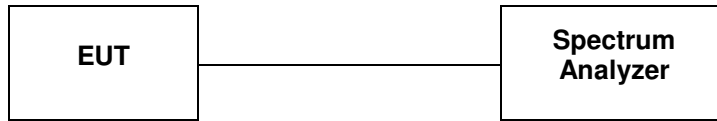
CH19



CH39

4.5. 6dB Bandwidth

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 RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

TEST RESULTS

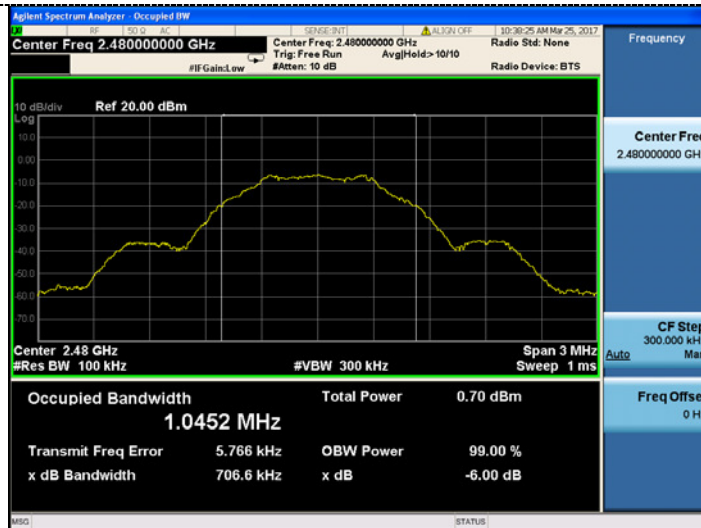
Type	Channel	6dB Bandwidth (KHz)	Limit (KHz)	Result
GFSK	0	685.0	≥ 500	Pass
	19	698.1		
	39	706.6		



CH0



CH19



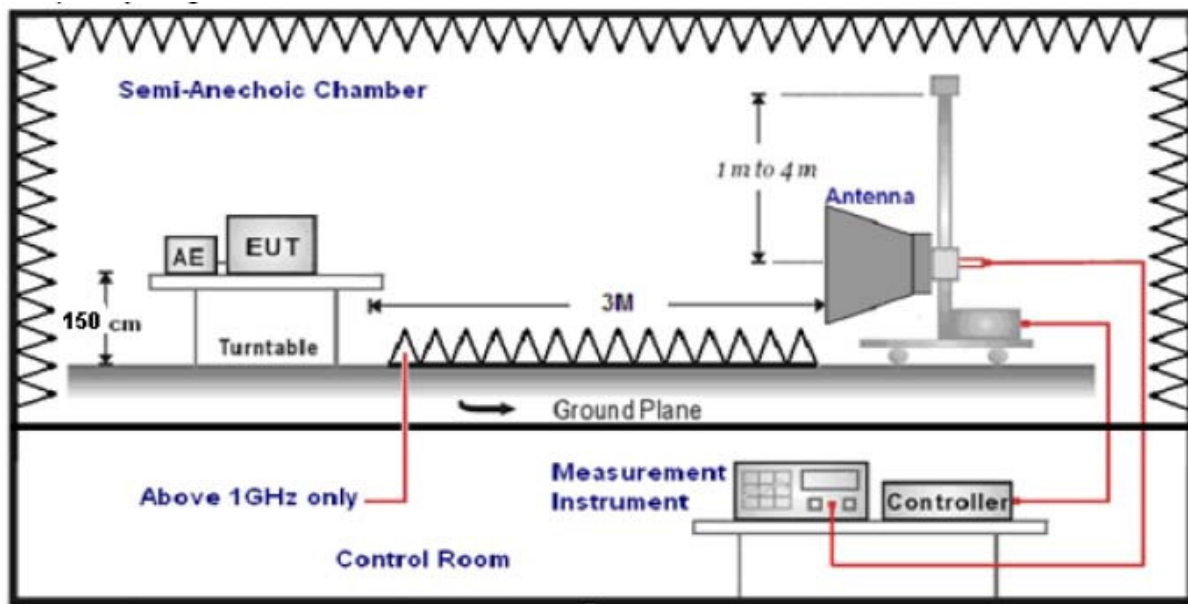
CH39

4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was placed on a 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..
5. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

LIMIT

Below -20dB of the highest emission level in operating band.
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)

TEST RESULTS

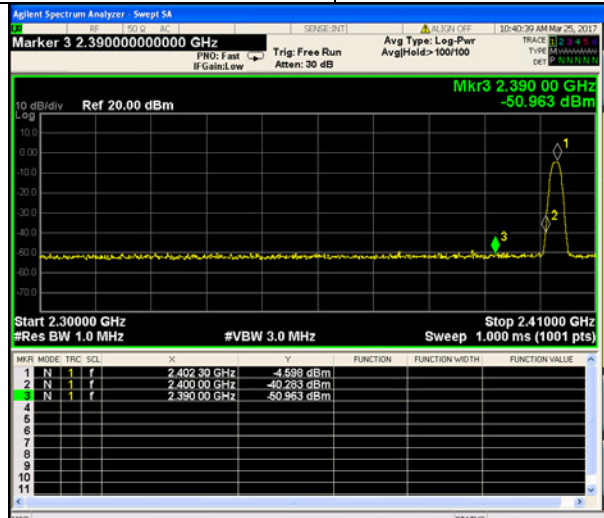
Remark: Test site: Shenzhen CTL Testing Technology Co., Ltd.

4.6.1 For Radiated Bandedge Measurement

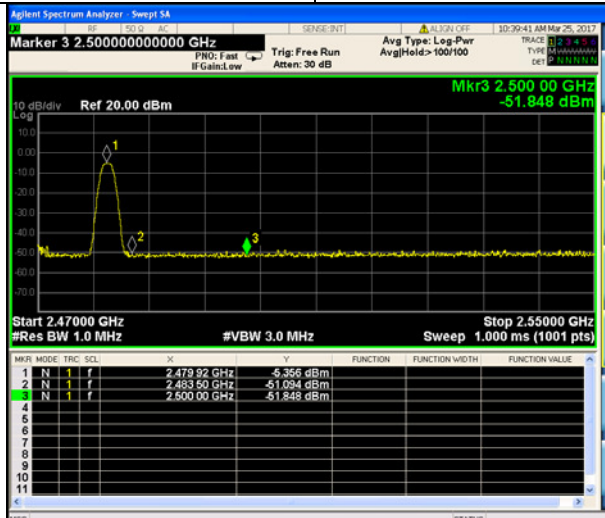
Frequency(MHz):			2402			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390.00	52.36	PK	74.00	21.64	1.00	173	57.67	27.49	3.32	36.12	-5.31
2390.00	41.47	AV	54.00	12.53	1.00	173	46.78	27.49	3.32	36.12	-5.31
Frequency(MHz):			2402			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390.00	51.27	PK	74.00	22.73	1.00	229	56.58	27.49	3.32	36.12	-5.31
2390.00	41.69	AV	54.00	12.31	1.00	229	47.00	27.49	3.32	36.12	-5.31
Frequency(MHz):			2480			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.50	50.18	PK	74.00	23.82	1.00	76	55.90	27.45	3.38	36.55	-5.72
2483.50	40.29	AV	54.00	13.71	1.00	76	46.01	27.45	3.38	36.55	-5.72
Frequency(MHz):			2480			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.50	50.66	PK	74.00	23.34	1.00	185	56.38	27.45	3.38	36.55	-5.72
2483.50	41.39	AV	54.00	12.61	1.00	185	47.11	27.45	3.38	36.55	-5.72

4.6.2 For Conducted Bandedge Measurement

Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-35.69	-20	PASS
2483.50	-45.74	-20	PASS



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 GHz	-4.698 dBm			
2	N	1	f	2.400 GHz	-40.283 dBm			
3	N	1	f	2.390 GHz	-50.963 dBm			

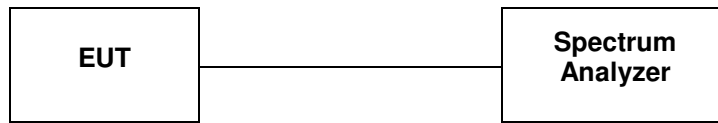


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.47992 GHz	-5.356 dBm			
2	N	1	f	2.48350 GHz	-51.094 dBm			
3	N	1	f	2.500 GHz	-51.848 dBm			

2402	2480
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4.7. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 , For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz;For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz;For 10MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength , and measure frequency range from 9KHz to 25GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.
3. For below 30MHz, For 9KHz-150kHz, 150K-10MHz, We use the RBW 1KHz, 10KHz, So the limit need to be calculated by " $10\lg(BW1/BW2)$ ". for example For 9KHz-150kHz, RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

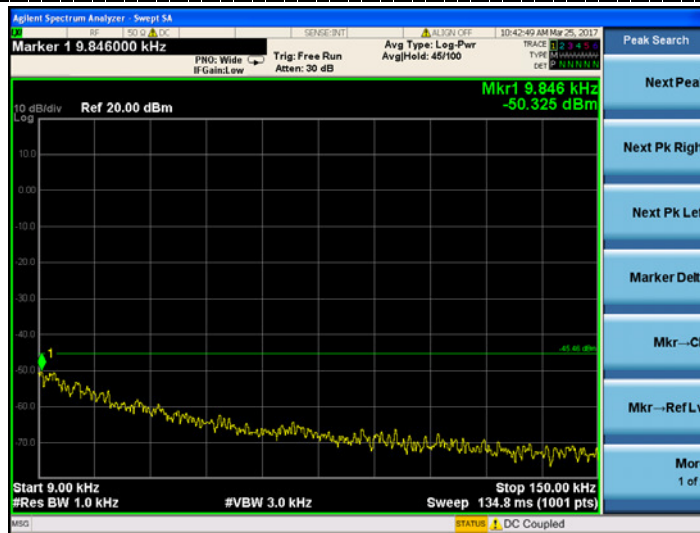
TEST RESULTS

Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

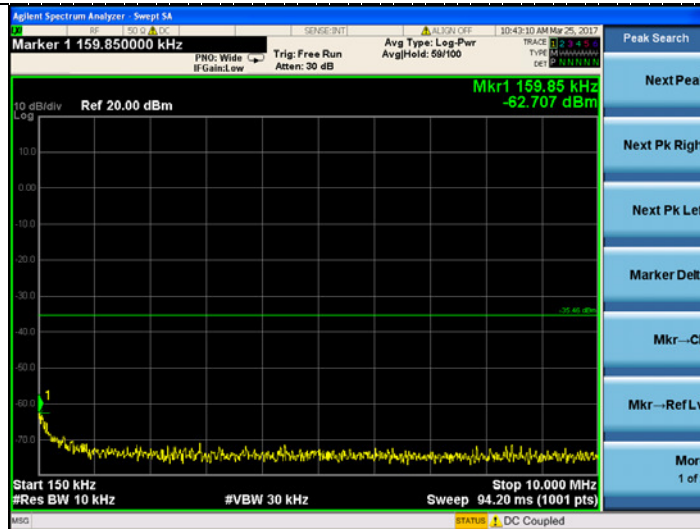
Test Mode:	GFSK	Test channel :	0
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Channel 0

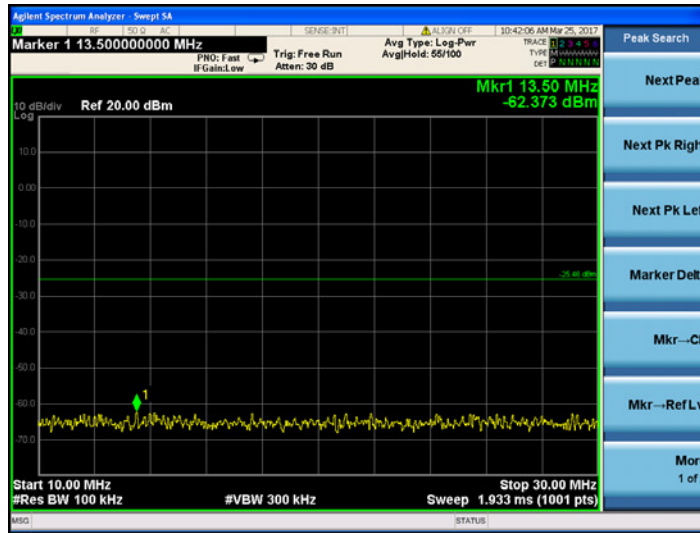


9KHz~0.15MHz

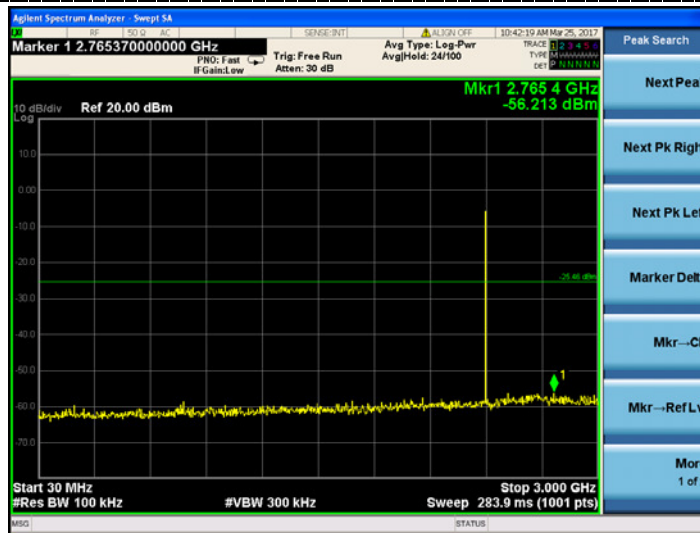


0.15MHz~10MHz

Test Mode:	GFSK	Test channel :	0
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10MHz~30MHz



30MHz~3GHz

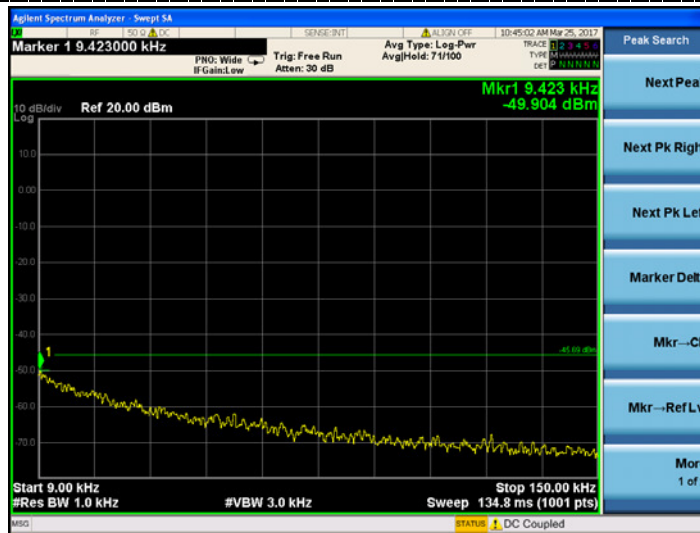


3GHz~25GHz

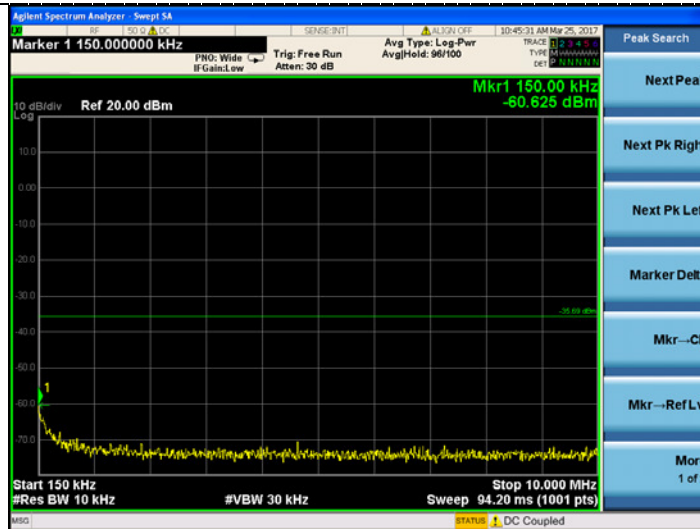
Test Mode:	GFSK	Test channel :	19
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Channel 19

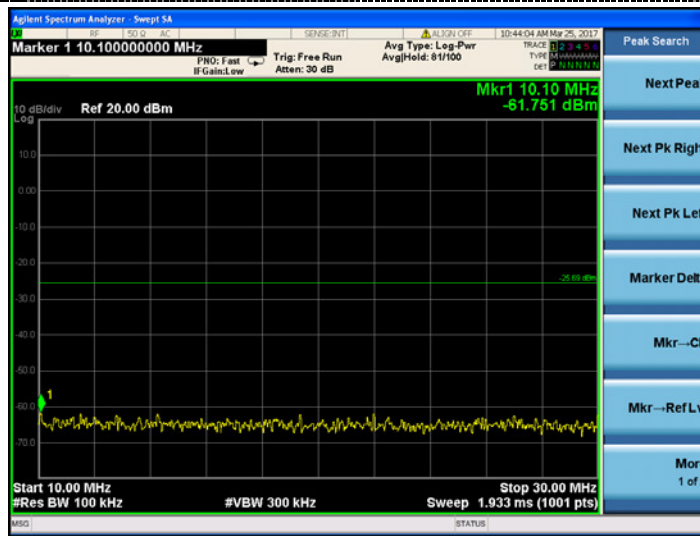


9KHz~0.15MHz

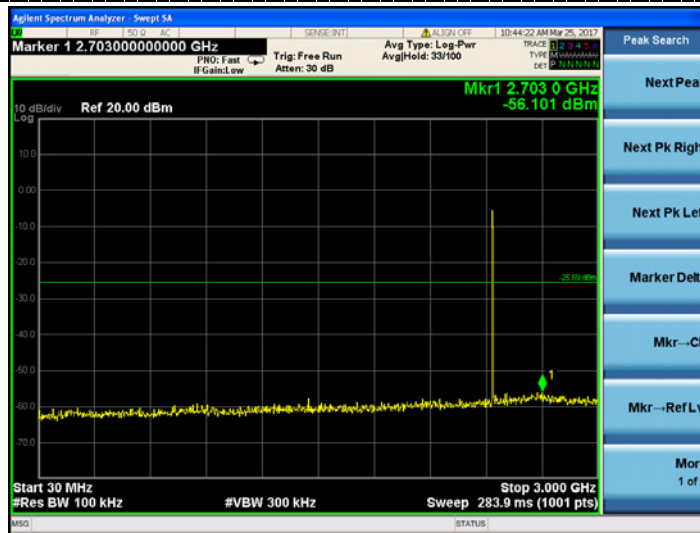


0.15MHz~10MHz

Test Mode:	GFSK	Test channel :	19
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10MHz~30MHz



30MHz~3GHz

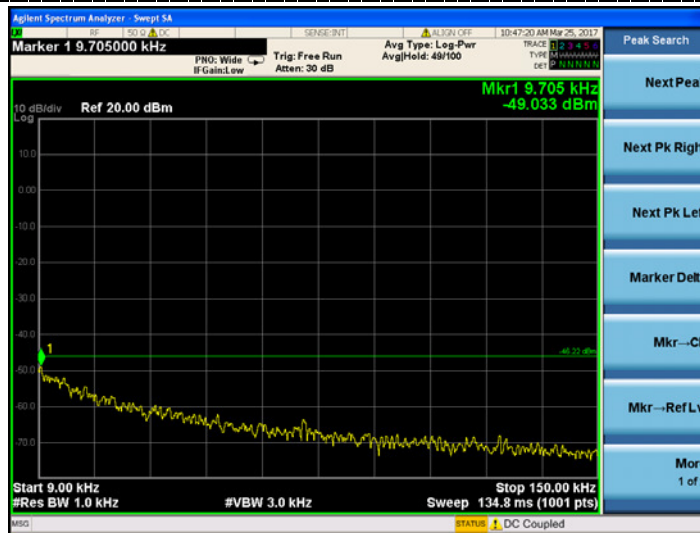


3GHz~25GHz

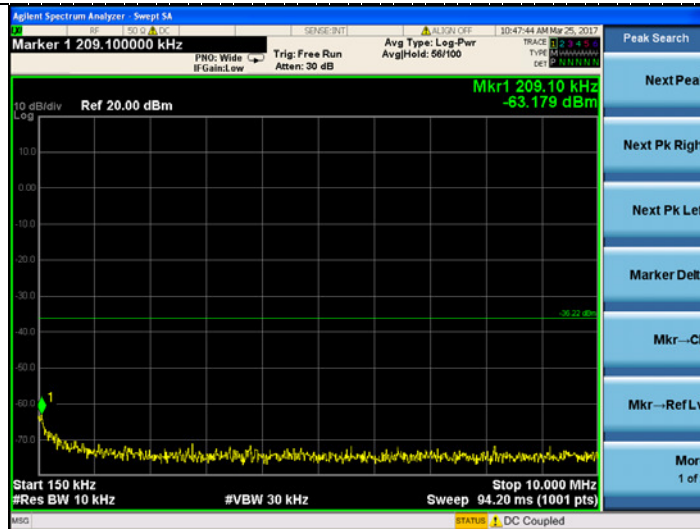
Test Mode:	GFSK	Test channel :	39
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Channel 39

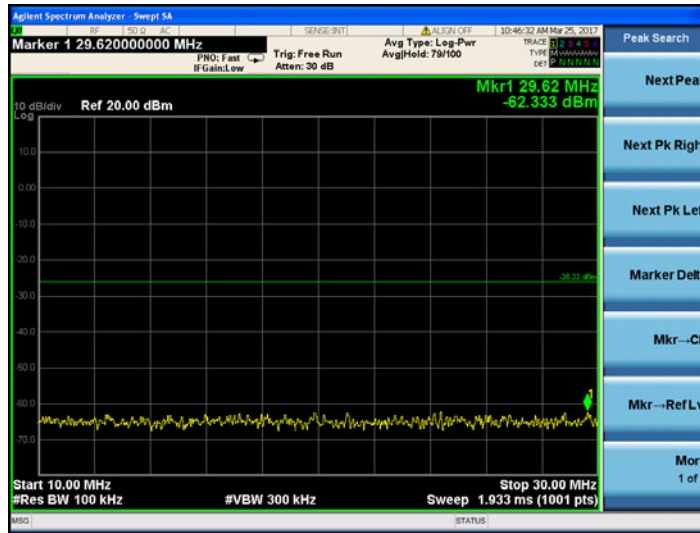


9KHz~0.15MHz

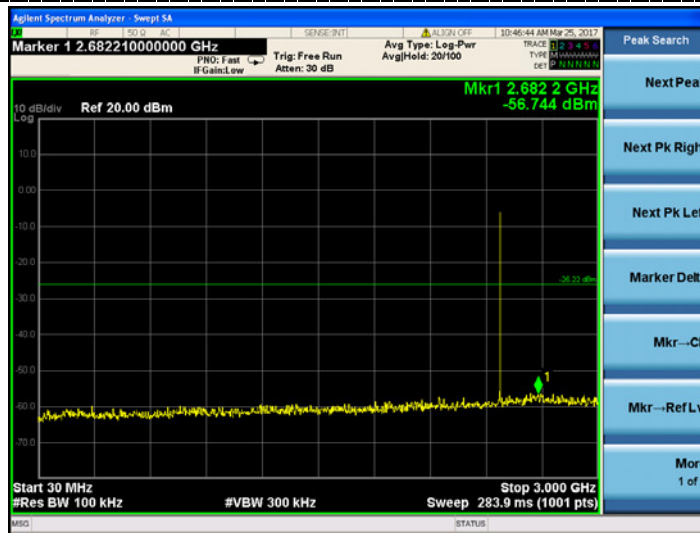


0.15MHz~10MHz

Test Mode:	GFSK	Test channel :	39
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10MHz~30MHz



30MHz~3GHz



3GHz~25GHz

4.8. Antenna Requirement

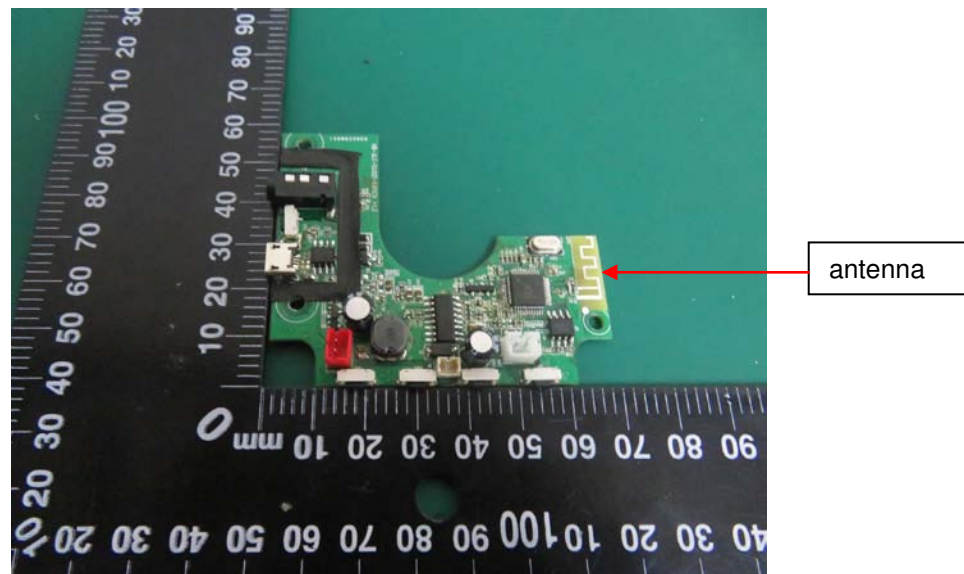
Standard Applicable

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.

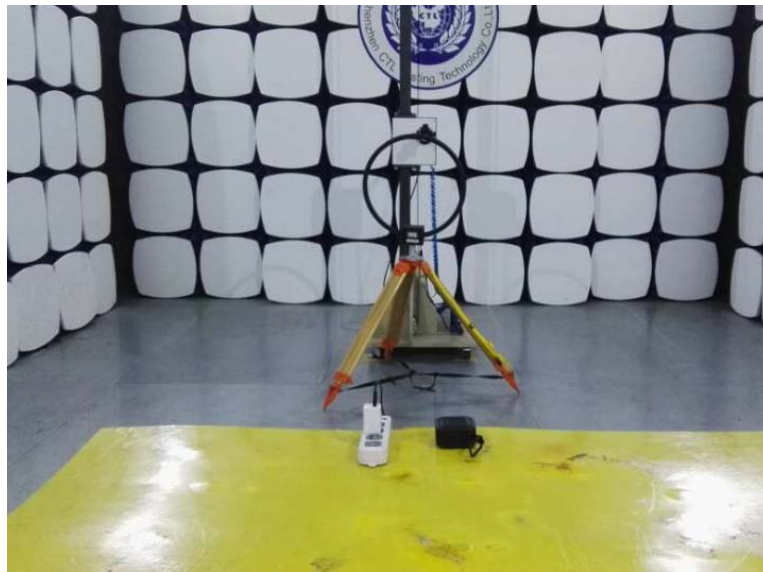
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Antenna Information

The antenna is layout on PCB board, The directional gains of antenna used for transmitting is -0.66dBi.



5. Test Setup Photos of the EUT

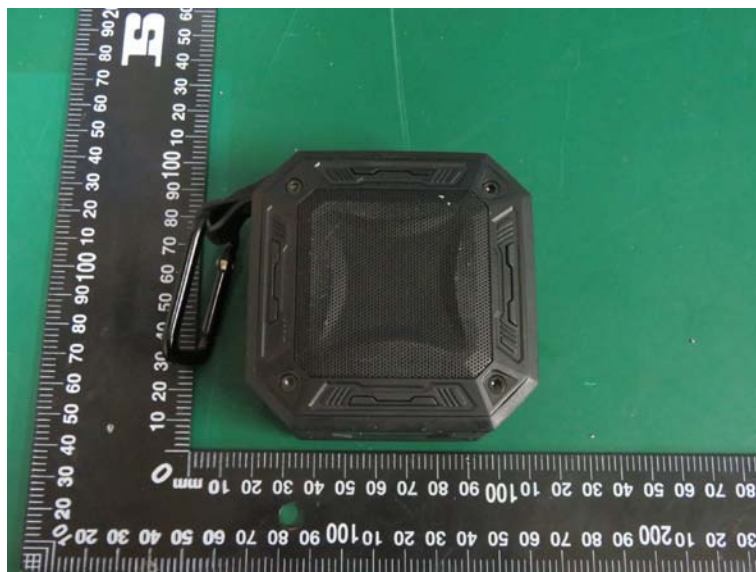




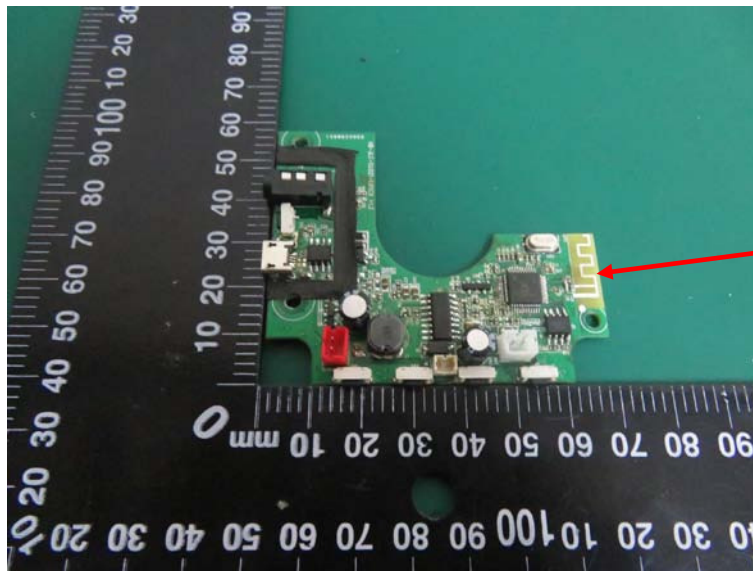
6. External and Internal Photos of the EUT

External Photos

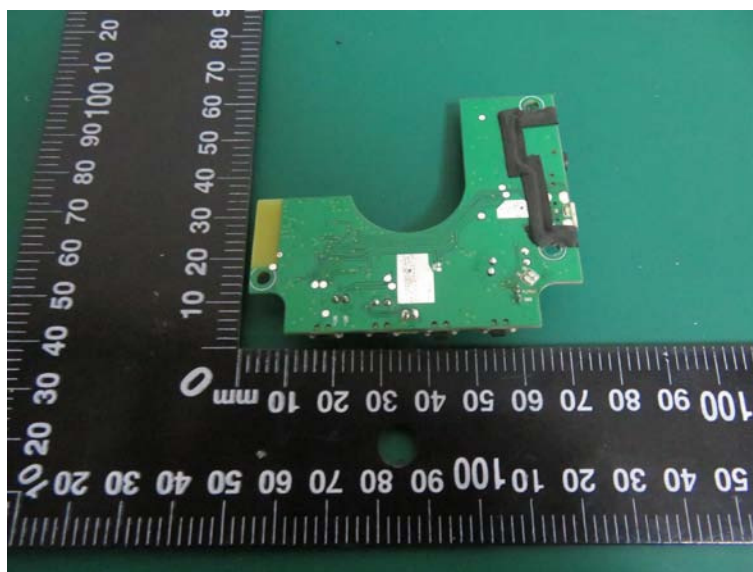


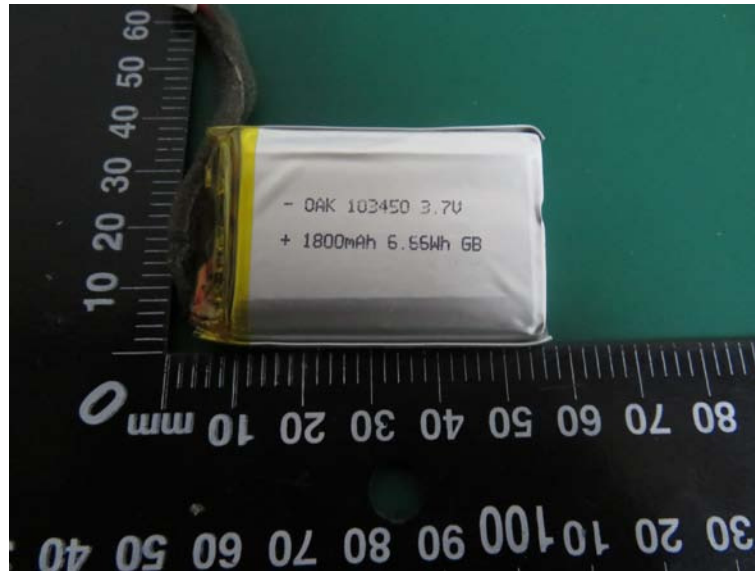


Internal Photos



BT Antenna





.....End of Report.....