

FCC 47 CFR PART 15 SUBPART C TEST REPORT

For

SUNJOY INDUSTRIES(JIASHAN)CO.,LTD

JiaShan Dev.Zone,Phase 4,ZheJiang P.R.China

Model: HT-018

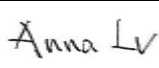
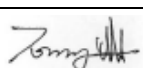
This Report Concerns: Original Report		Equipment Type: Multimedia speaker	
Test Engineer:	Anna Lv		
Report No.:	17ZCTE0110001FR		
FCC ID:	2AKWTHT-018		
Receive EUT Date/Test Date:	Dec 20, 2016 / Dec 22, 2016- Jan. 06, 2017		
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1. Summary of test results

Description of Test Item	Standard	Results
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10 :2013	PASS
20dB Bandwidth	FCC Part 15: 15.215 ANSI C63.10 :2013	PASS
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10 :2013	PASS
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	PASS
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	PASS
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10 :2013	PASS
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.10 :2013	PASS
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10 :2013	PASS
Antenna requirement	FCC Part 15: 15.203	PASS

2. General test information

2.1. Description of EUT

EUT* Name	:	Multimedia speaker
Model Number	:	HT-018
Trade Mark	:	--
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 3.7V from built-in battery and DC 5V from external power adapter
Radio Specification	:	Bluetooth V2.1+EDR
Operation frequency	:	2402MHz -2480MHz
Modulation	:	GFSK, $\pi/4$ -QPSK, 8-DPSK
Data rate	:	1Mbps, 2Mbps, 3Mbps
Antenna Type	:	Integrated antenna, maximum PK gain:0dBi
Date of Receipt	:	Dec. 20, 2016
Sample Type	:	Single

Note: EUT is the abbr.of equipment under test.

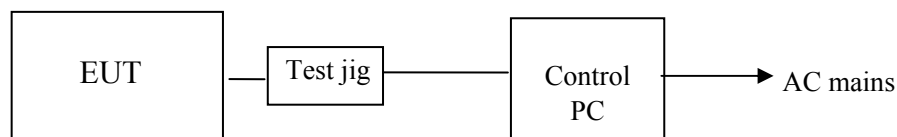
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
Power adapter	Shenzhen Zhongling Electronic Technology Co.,Ltd.	ZAU-B050050A-04	/

2.3. Assistant equipment used for test

Description of Assistant	Manufacturer	Model number or Type	EMC Compliance	SN
Notebook	DELL	Latitude D610	FCC DOC	00045-534-136-300

2.4. Block diagram of EUT configuration for test



EUT's Bluetooth module was connected to a special test jig provided by manufacturer which has a standard RSS-232 connector to connect to control PC, and the control PC will run a special test software "RF Control Kit v1.0.exe" provided by manufacturer to control EUT work in test mode as blow table.

Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
GFSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
8-DPSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
GFSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
$\pi/4$ -QPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
8-DPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480

Note1: Some modes not apply for all the test items.

Note2: For $\pi/4$ QPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, so except output power, all other items final test were only performed with 8-DPSK and GFSK.

2.5. Test environment conditions

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

Temperature range:	21-25°C
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6. Test Facility

Test Location	Dongguan Dongdian Testing Service Co., Ltd
Address	No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Dongguan City, Guangdong Province, 523808, China
Accreditation Certificate	<p>Dongguan Dongdian Testing Service Co., Ltd.</p> <p>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 270092, Renewal date March 11, 2015, valid time is until July 12, 2017.</p> <p>The 3m Alternate Test Site of Dongguan Dongdian Testing Service Co., Ltd. Has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.10288A on April 23, 2015, valid time is until April 23, 2018.</p>

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2.7. Measurement uncertainty

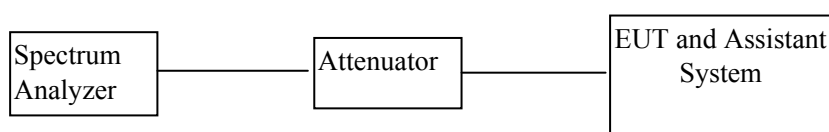
PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.32dB
Radiated Disturbance, 9k to 30 MHz	2.76dB (9KHz-150KHz) 2.45dB(150KHz-30MHz)
Radiated Disturbance, 30 to 1000 MHz	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Radiated Disturbance, 1 to 18 GHz	4.10dB(1-6GHz) 4.40dB (6GHz-18Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Maximum Peak Output Power

3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1 Y

3.2. Block diagram of test setup



3.3. Limits

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts, the e.i.r.p shall not exceed 4W.

3.4. Test Procedure

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable and though a 10dB attenuator.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Measure the maximum output power of EUT by spectrum analyzer with PK detector and RBW=2MHz(above 6dB bandwidth of measured signal), VBW=3MHz

Note: The attenuator loss was inputted into spectrum analyzer as amplitude offset.

3.5. Test Result

EUT: Multimedia speaker M/N: HT-018				
Mode	Freq (MHz)	Result (dBm)	Limit (dBm)	Conclusion
GFSK	2402	1.23	30	PASS
	2441	1.45	30	PASS
	2480	1.67	30	PASS
$\pi/4$ QPSK	2402	1.01	21	PASS
	2441	1.23	21	PASS
	2480	1.45	21	PASS

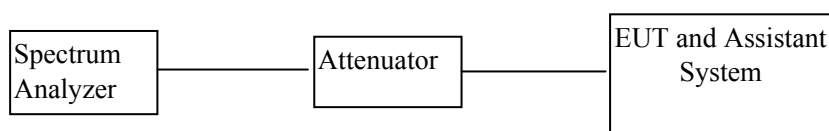
8-DPSK	2402	0.56	21	PASS
	2441	0.67	21	PASS
	2480	0.89	21	PASS

4. 20dB Bandwidth

4.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1 Y

4.2. Block diagram of test setup



4.3. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.4. Test Procedure

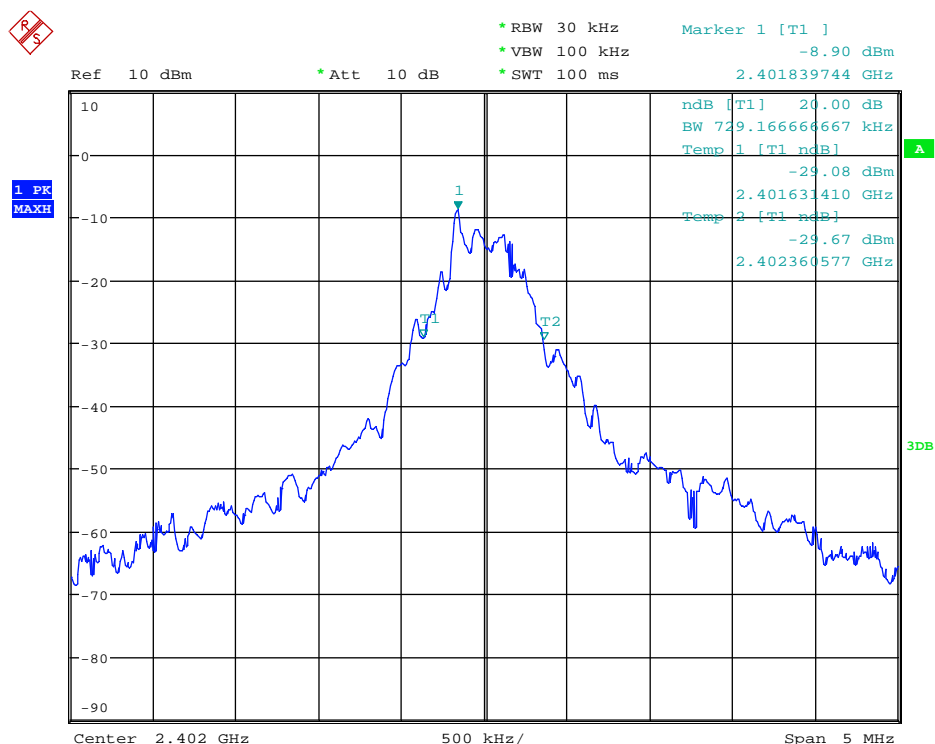
- (1) Configure EUT and assistant system according clause 2.4 and 4.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable and through a 10dB attenuator.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.5. Test Result

EUT: Multimedia speaker M/N: HT-018					
Mode	Freq (MHz)	Result (MHz)	Limit (MHz)	Margin (MHz)	Conclusion
GFSK	2402	0.729	/	/	PASS
	2441	0.729	/	/	PASS
	2480	0.729	/	/	PASS
8-DPSK	2402	1.138	/	/	PASS
	2441	1.138	/	/	PASS
	2480	1.138	/	/	PASS

4.6. Original test data

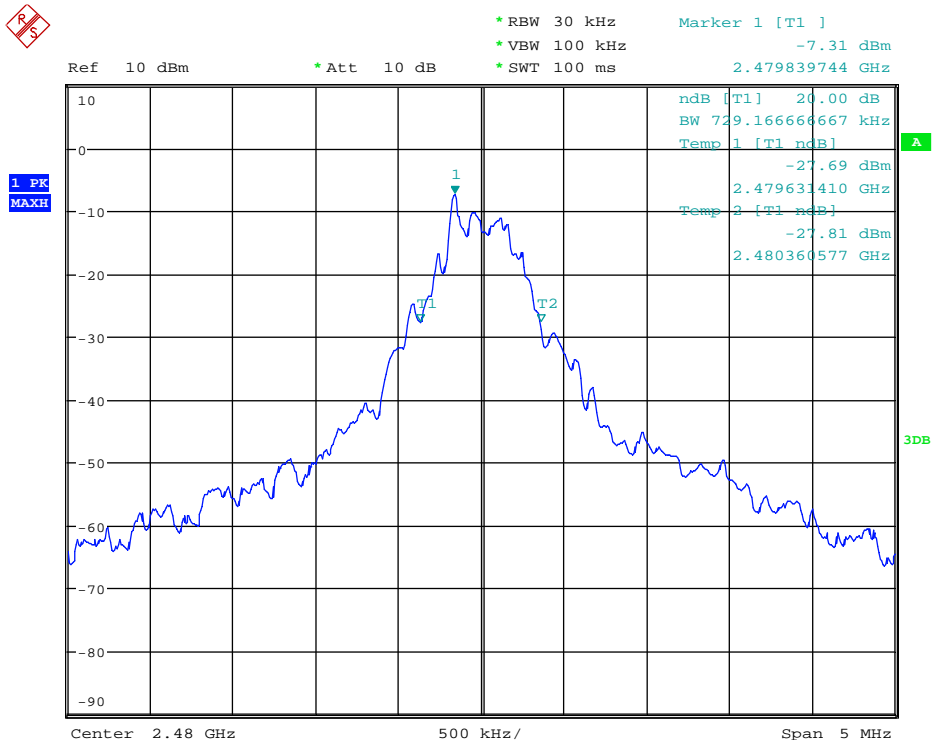
GFSK Mode



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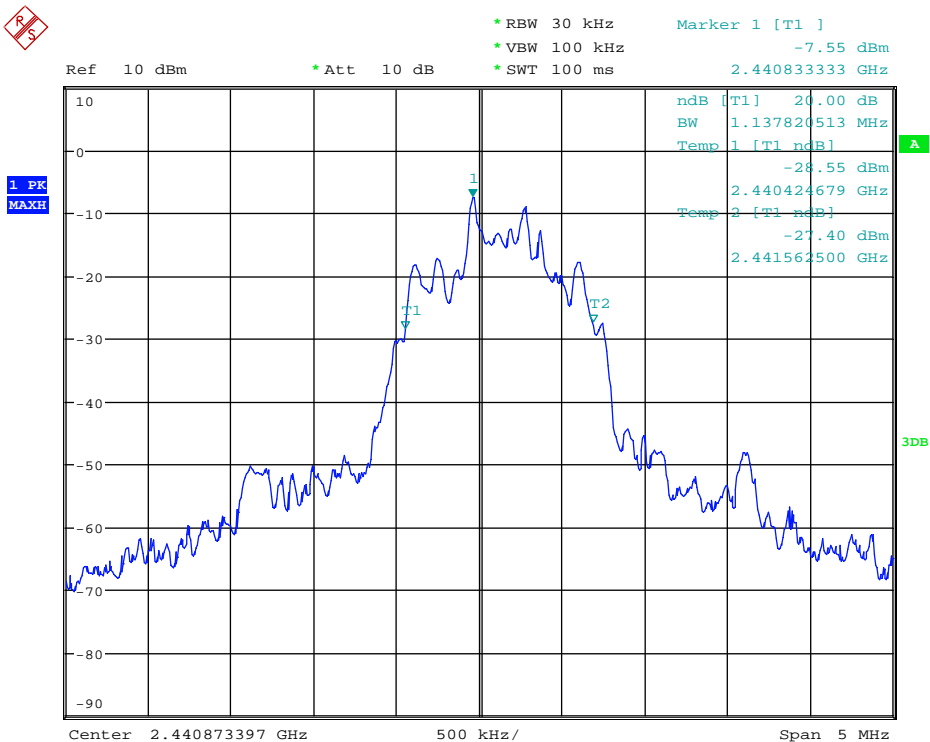
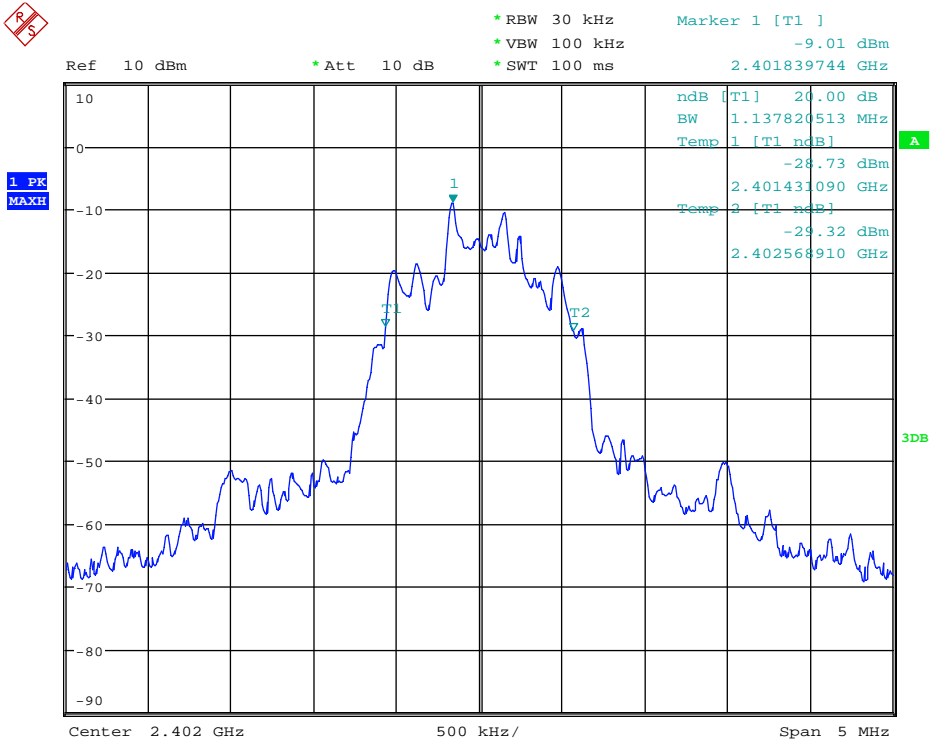


8-DPSK Mode

Shenzhen ZCT Technology Co., Ltd.

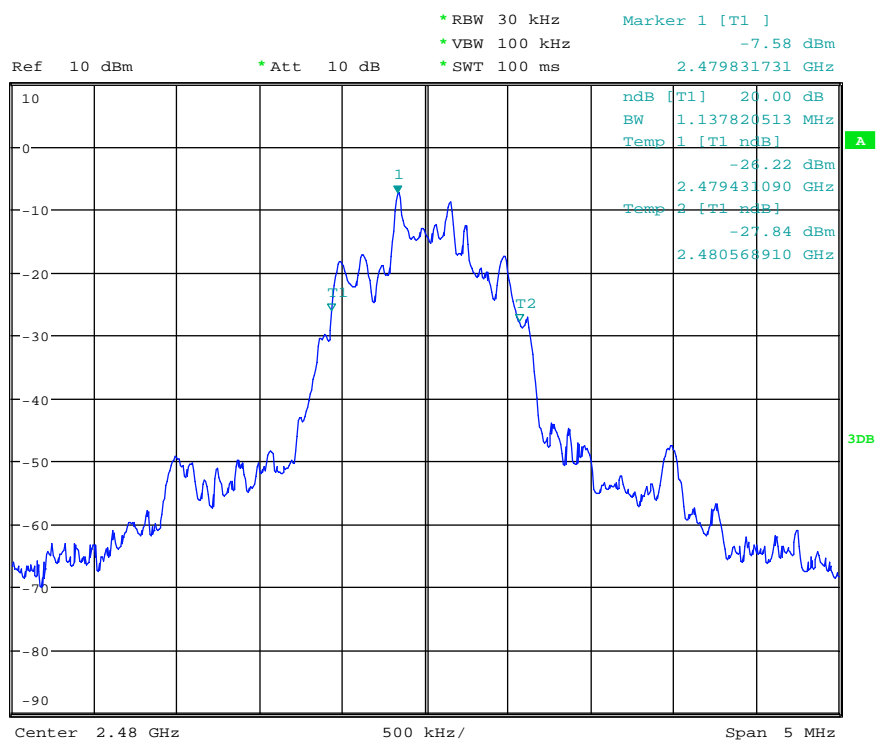
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1 PK
MAXH

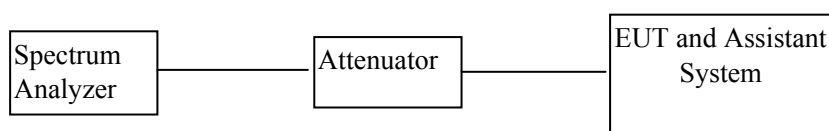


5. Carrier Frequency Separation

5.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1 Y

5.2. Block diagram of test setup



5.3. Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.4. Test Procedure

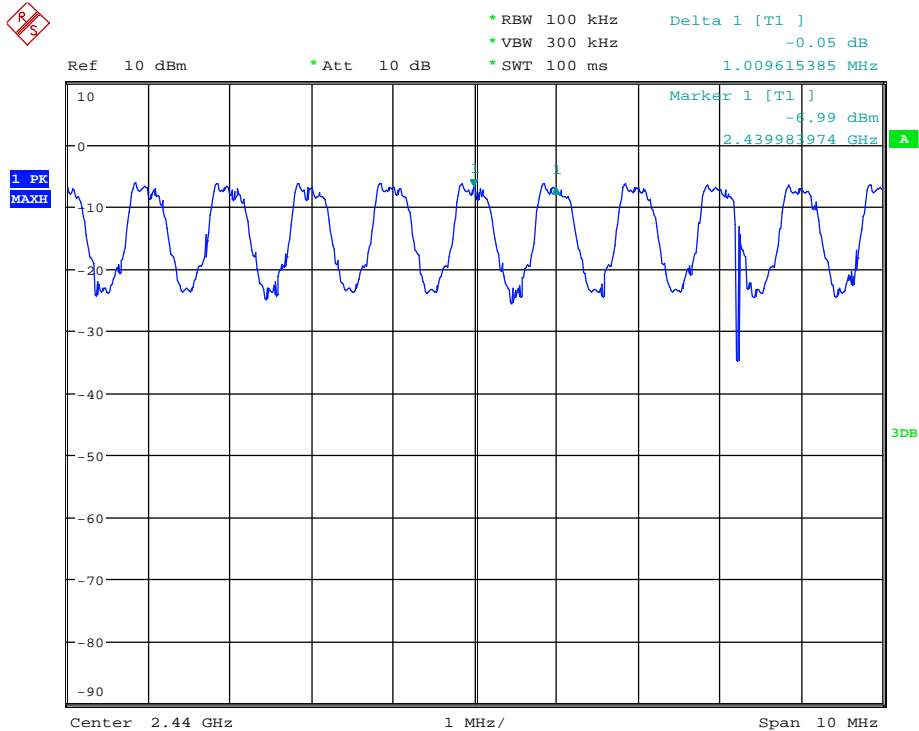
- (1) Configure EUT and assistant system according clause 2.4 and 5.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable and though a 10dB attenuator.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) The carrier frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW.

5.5. Test Result

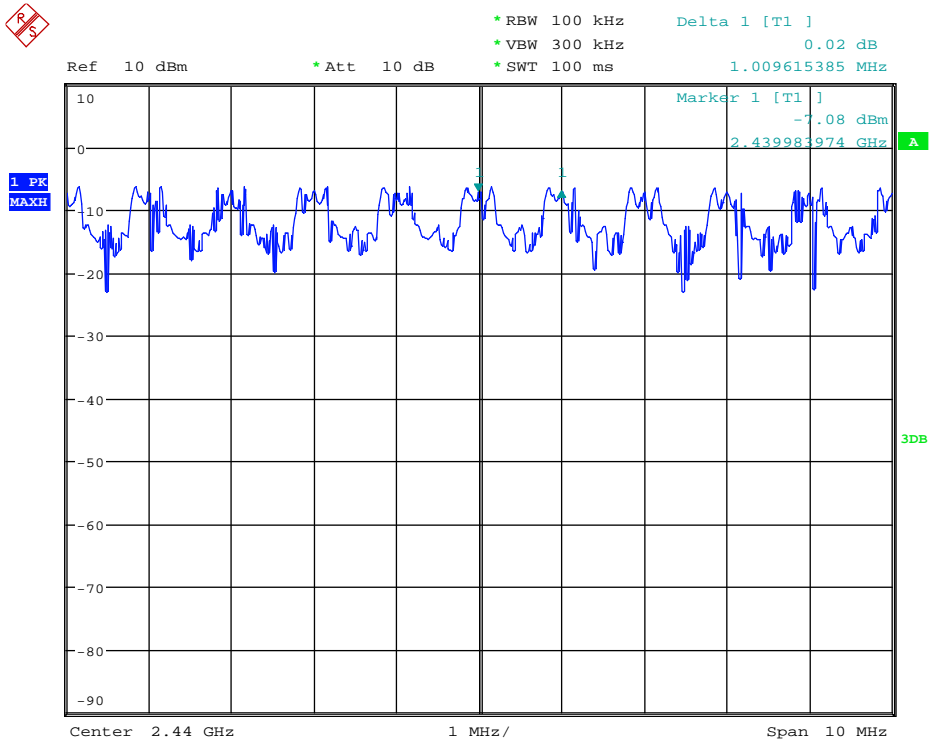
EUT: Multimedia speaker M/N: HT-018				
Mode	Channel separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz) 2/3 of 20dB bandwidth	Conclusion
GFSK	1.0	0.729	0.486	PASS
8-DPSK	1.0	1.138	0.759	PASS

5.6. Original test data

GSK



8-DPSK

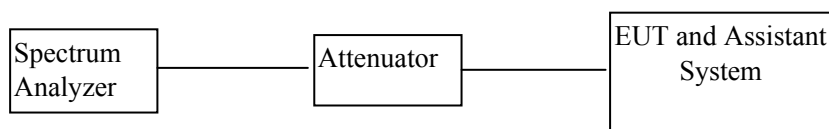


6. Number Of Hopping Channel

6.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1 Y

6.2. Block diagram of test setup



6.3. Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

6.4. Test Procedure

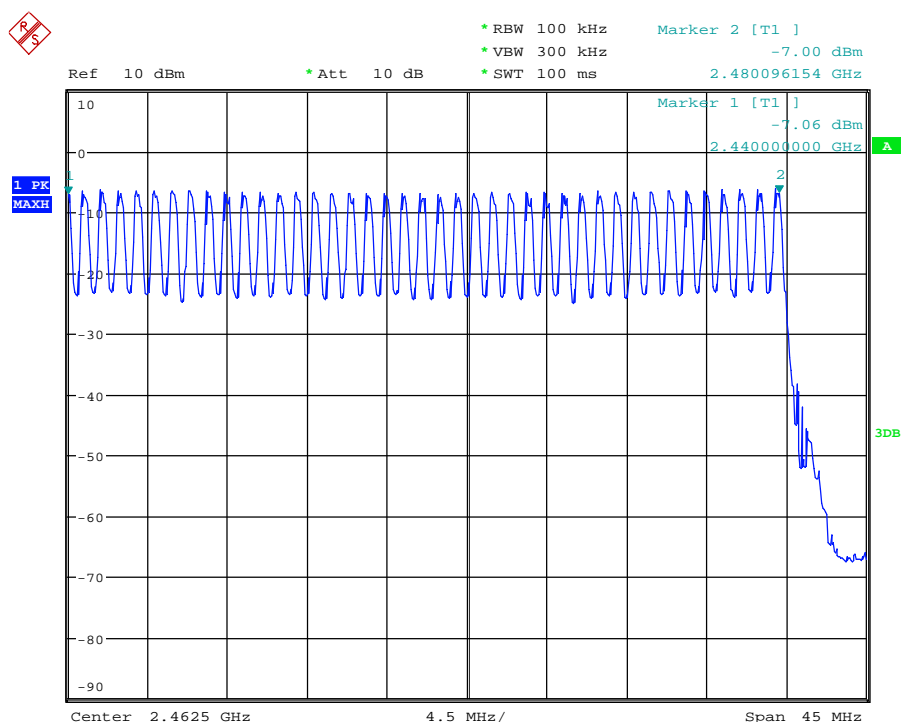
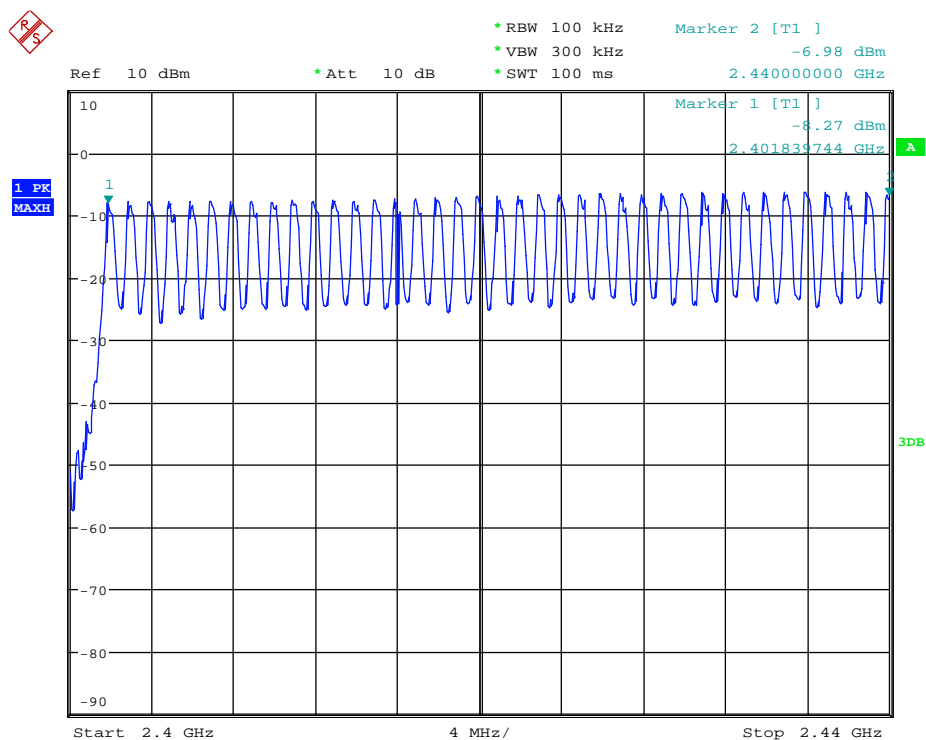
- (1) Configure EUT and assistant system according clause 2.4 and 6.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable and though a 10dB attenuator.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) The number of hopping channel was measured by spectrum analyzer with 300 kHz RBW and 1MHz VBW.

6.5. Test Result

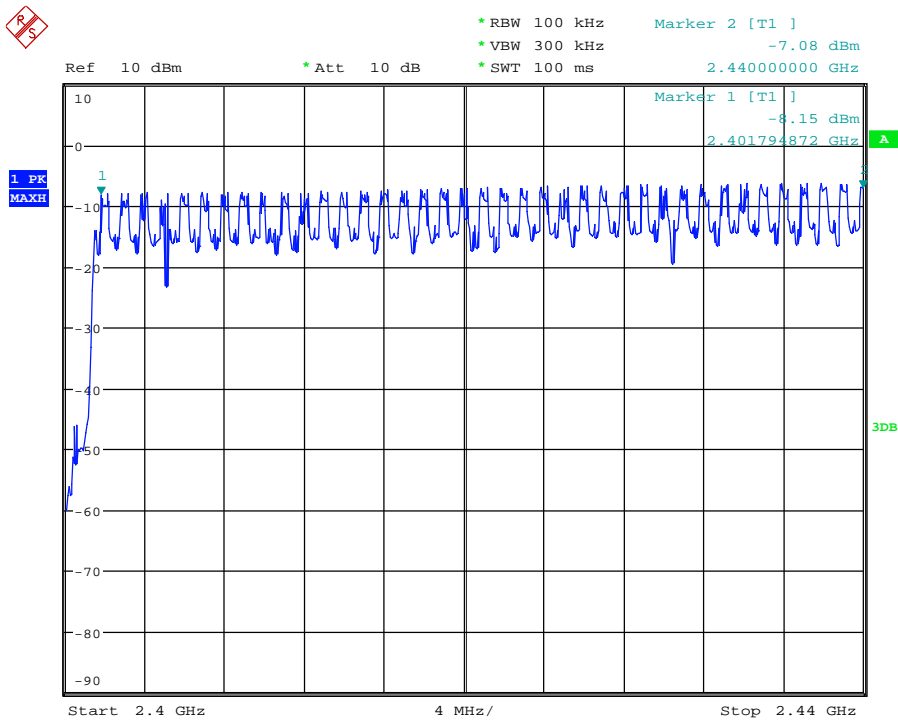
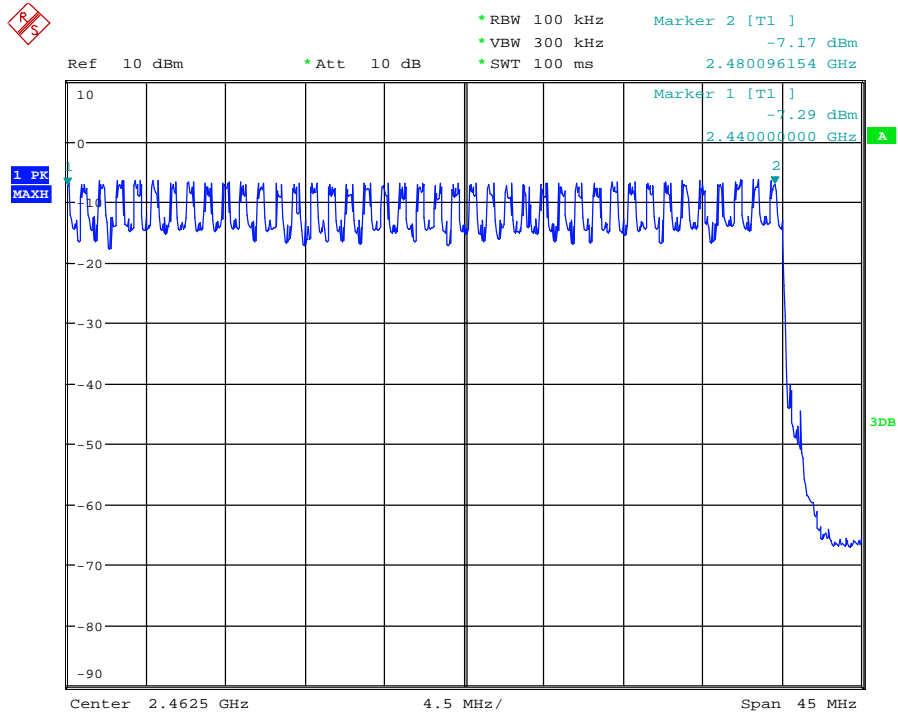
EUT: Multimedia speaker M/N: HT-018			
Mode	Number of hopping channel	Limit	Conclusion
GFSK	79	>15	PASS
8-DPSK	79	>15	PASS

6.6. Original test data

GFSK:



8-DPSK:

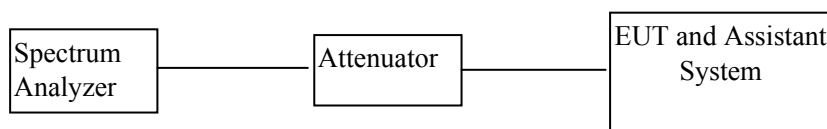


7. Dwell Time

7.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1 Y

7.2. Block diagram of test setup



7.3. Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

7.4. Test Procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula Dwell time = total hops * pulse's on time.

DH1 Packet permit maximum $1600 / 79 / 2 = 10.12$ hops per second in each channel (1 time slot RX, 1 time slot TX). So, total hops is $10.12 \times 31.6 = 320$.

DH3 Packet permit maximum $1600 / 79 / 4 = 5.06$ hops per second in each channel (3 time slots RX, 1 time slot TX). So, total hops is $5.06 \times 31.6 = 160$.

DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel (5 time slots RX, 1 time slot TX). So, total hops is $3.37 \times 31.6 = 106.6$.

3DH1 Packet permit maximum $1600 / 79 / 2 = 10.12$ hops per second in each channel (1 time slot RX, 1 time slot TX). So, total hops is $10.12 \times 31.6 = 320$.

3DH3 Packet permit maximum $1600 / 79 / 4 = 5.06$ hops per second in each channel (3 time slots RX, 1 time slot TX). So, total hops is $5.06 \times 31.6 = 160$.

3DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel (5 time slots RX, 1 time slot TX). So, total hops is $3.37 \times 31.6 = 106.6$.

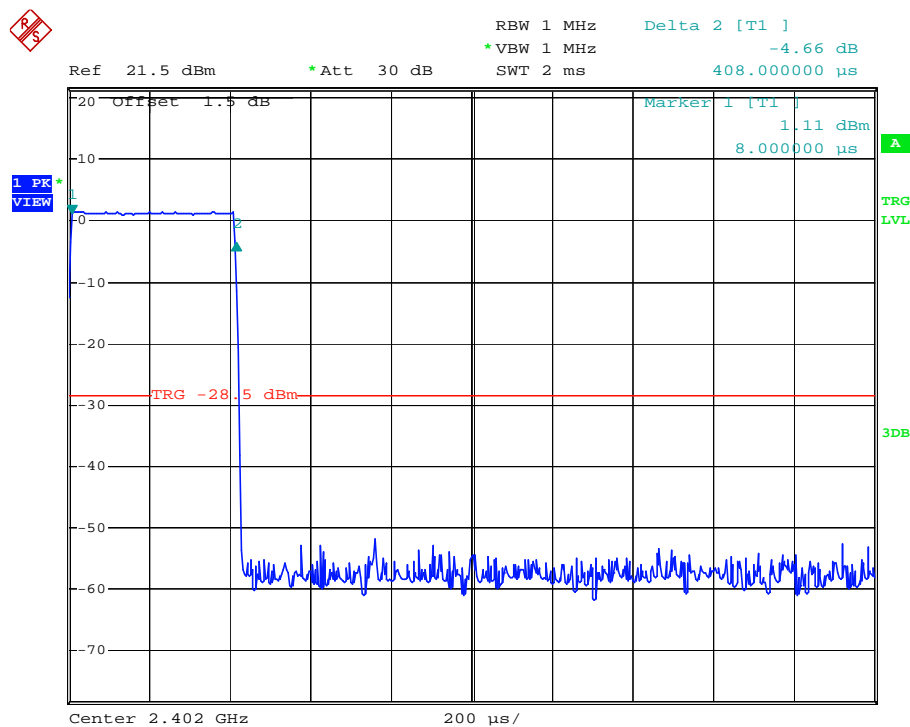
7.5. Test Result

Mode	Pulse's on time (ms)	Total hops	Dwell time (s)	Limit	Conclusion
DH1	0.41	320	0.131	<400ms	PASS
DH3	1.67	160	0.267	<400ms	PASS
DH5	2.93	106.6	0.312	<400ms	PASS
3-DH1	0.43	320	0.138	<400ms	PASS
3-DH3	1.68	160	0.269	<400ms	PASS
3-DH5	2.39	106.6	0.255	<400ms	PASS

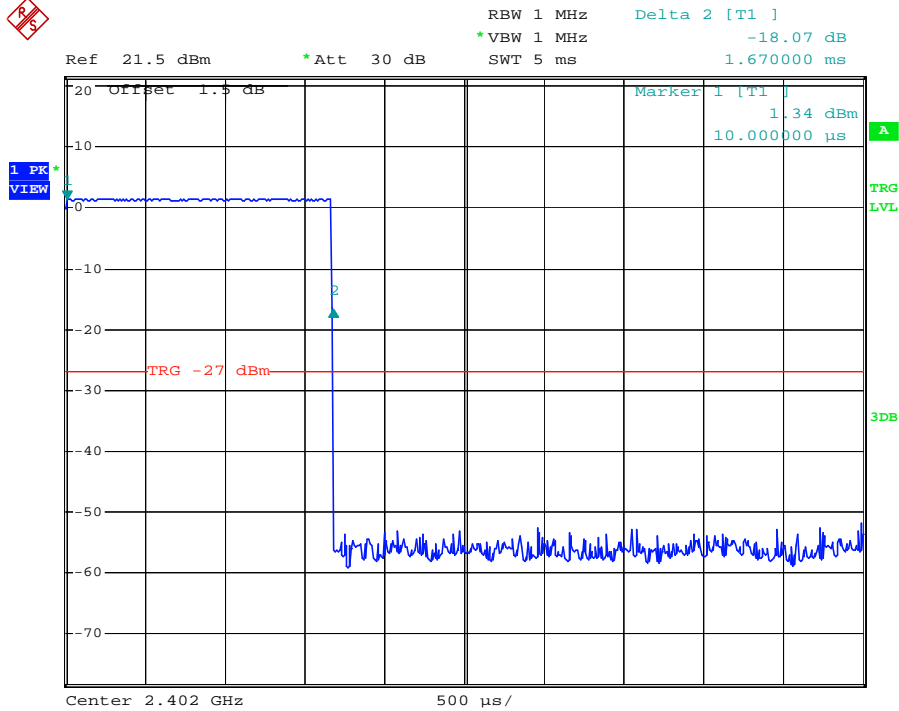
Note: Dwell time = total hops *pulse's on time.

7.6. Original test data

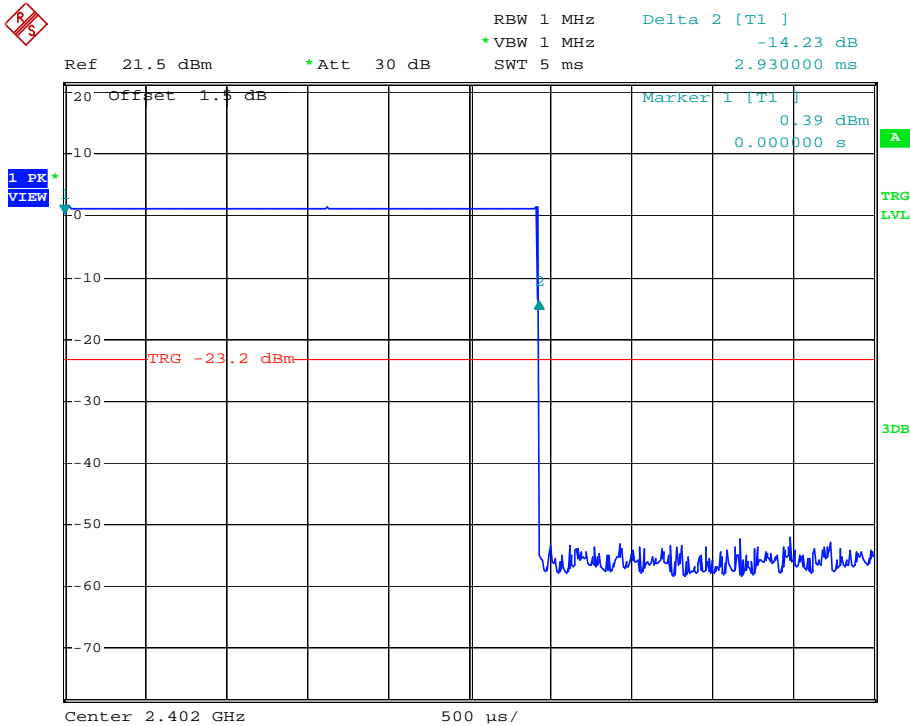
DH1



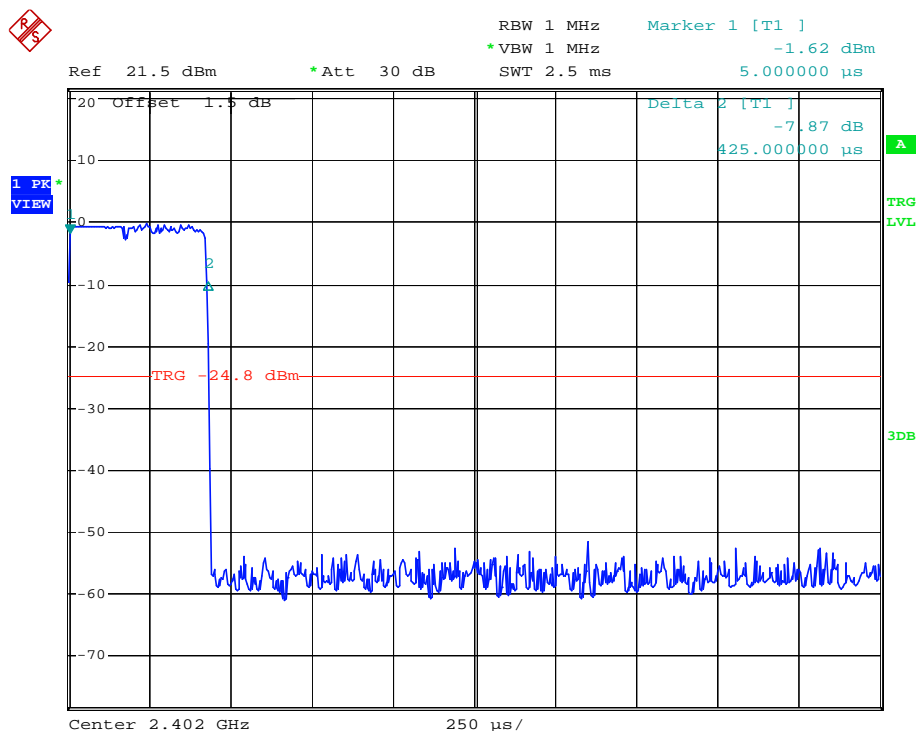
DH3



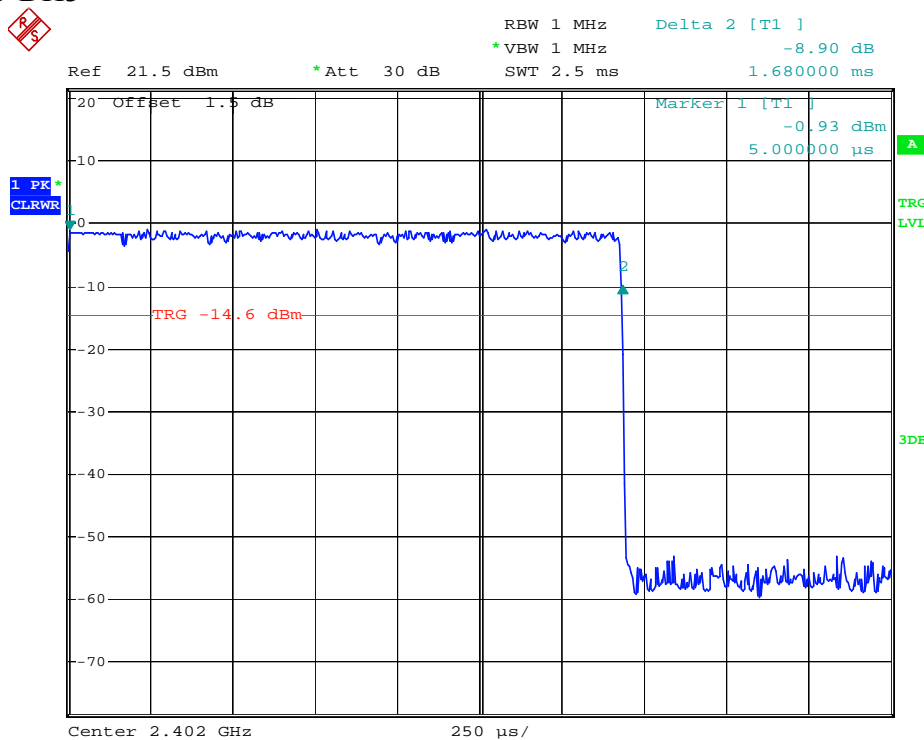
DH5



3-DH1



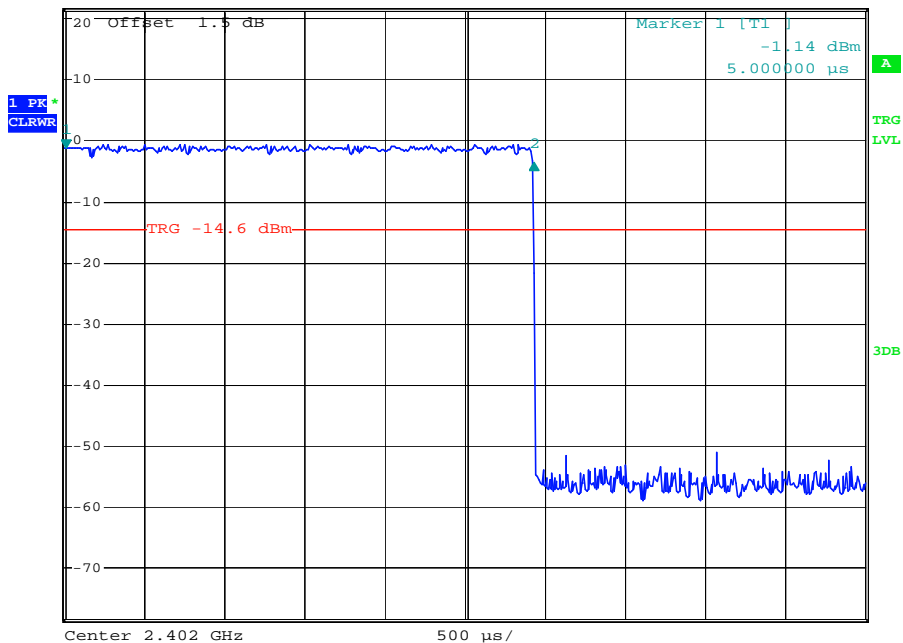
3-DH3



3-DH5



Ref 21.5 dBm *Att 30 dB RBW 1 MHz Delta 2 [T1]
 *VBW 1 MHz -2.39 dB
 SWT 5 ms 2.930000 ms



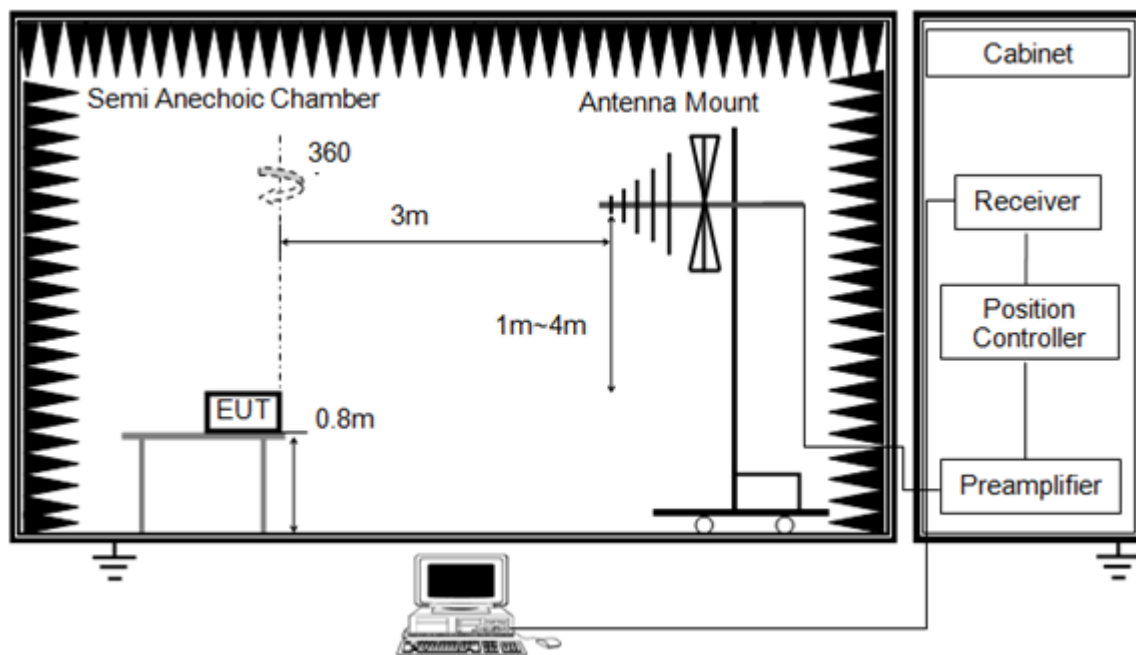
8. Radiated emission

8.1. Test equipment

Item	Description	Manufacturer	Model	serial Number	libration Date	libration Due Date
1	EMI Test Receiver	R&S	ESU8	100316	2016/10/16	2017/10/16
2	Spectrum analyzer	R&S	FSU26	66.1660.26	2016/10/16	2017/10/16
3	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/10/27	2017/10/27
4	Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	2016/10/27	2017/10/27
5	Double Ridged Horn Antenna	R&S	HF907	100276	2016/10/12	2017/10/12
6	Pre-Amplifier	R&S	SCU-01	10049	2016/10/16	2017/10/16
7	Pre-amplifier	A.H.	PAM-0118	360	2016/10/16	2017/10/16
8	RF Cable	HUBSR	CP-X2	W11.03	2016/10/16	2017/10/16
9	RF Cable	HUBSER	CP-X1	W12.02	2016/10/16	2017/10/16
10	MI Cable	HUBSER	C1-01-01-1M	1091629	2016/10/16	2017/10/16
11	Test software	Audix	E3	11111b	/	/

8.2. Test setup and procedure

Below 1GHz

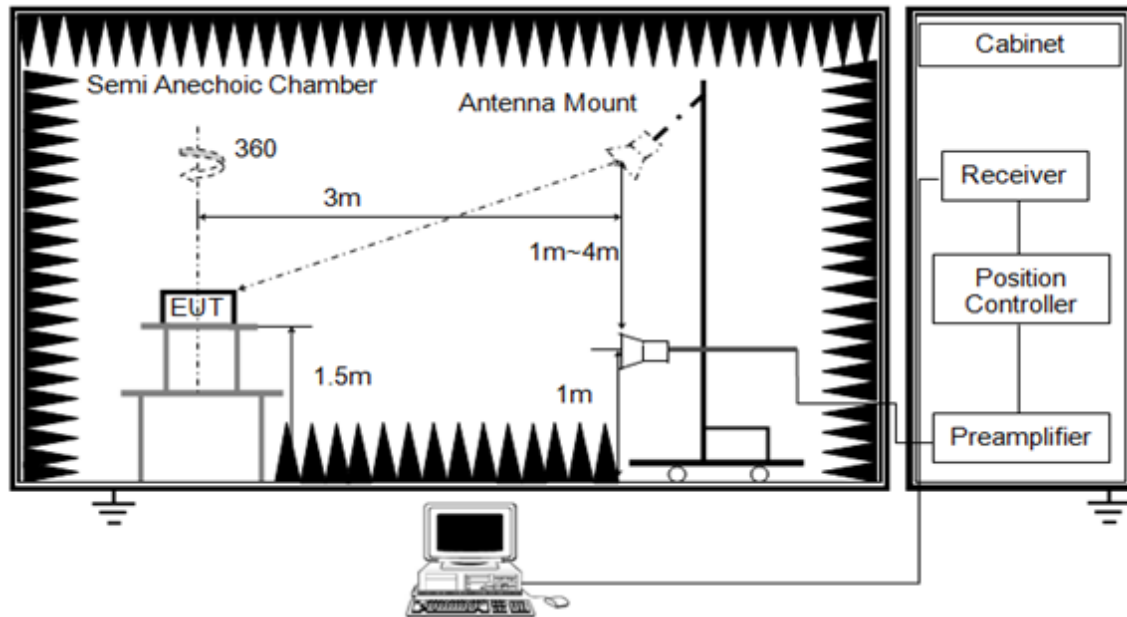


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)
- 8 For emissions below 1GHz, according explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1GHz, the final test was only performed with EUT working in GFSK, Tx 2441MHz mode.

ABOVE 1G



The setting of the spectrum analyzer

RBW	1M
VBW	3M/10Hz for Average
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: $\text{Antenna Factor} + \text{Cable Loss} + \text{Read Level} - \text{Preamp Factor} = \text{Level}$
6. For measurement above 1GHz, the emission measurement will be measured by the peak detector and the AV detector.
7. For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

8. According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

8.3. Limit

8.3.1 Please refer to FCC §15.205 and §15.209

Please refer to FCC §15.247 (a)(d)(e)

The field strength of emissions from intentional radiators operated within these frequency bands			
Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3

Emissions radiated outside of the specified frequency bands			
Frequency Range (MHz) 30 - 88	Field Strength Limit (uV/m) at 3 m 100	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

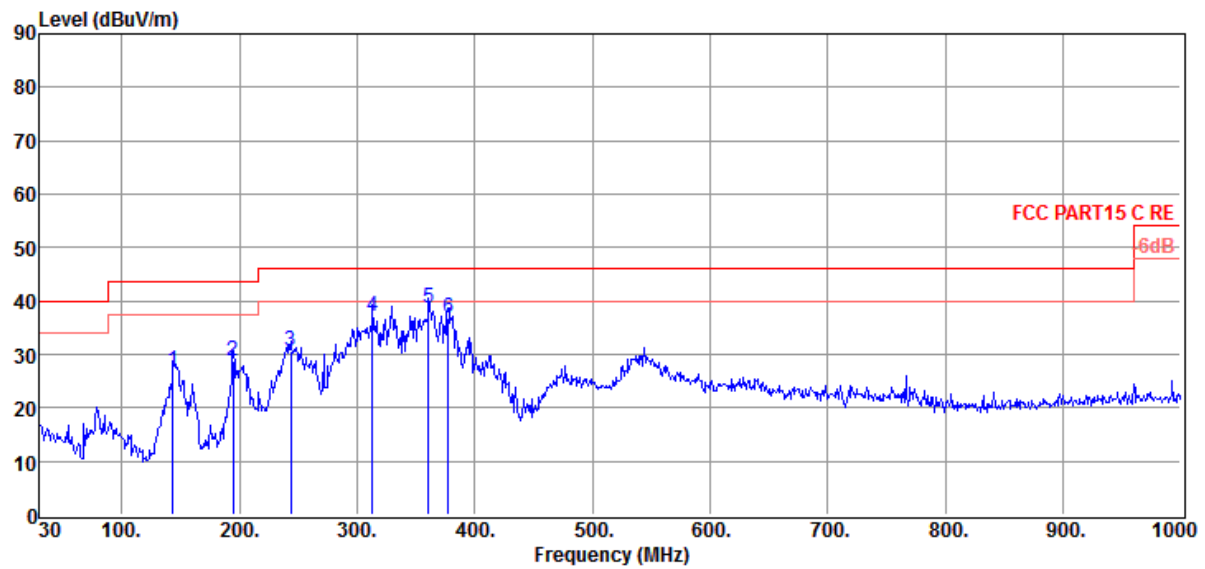
8.4. Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

Test Result: Compliant.

SPURIOUS EMISSIONS BELOW 1 GHz
(TX mode, HORIZONTAL)

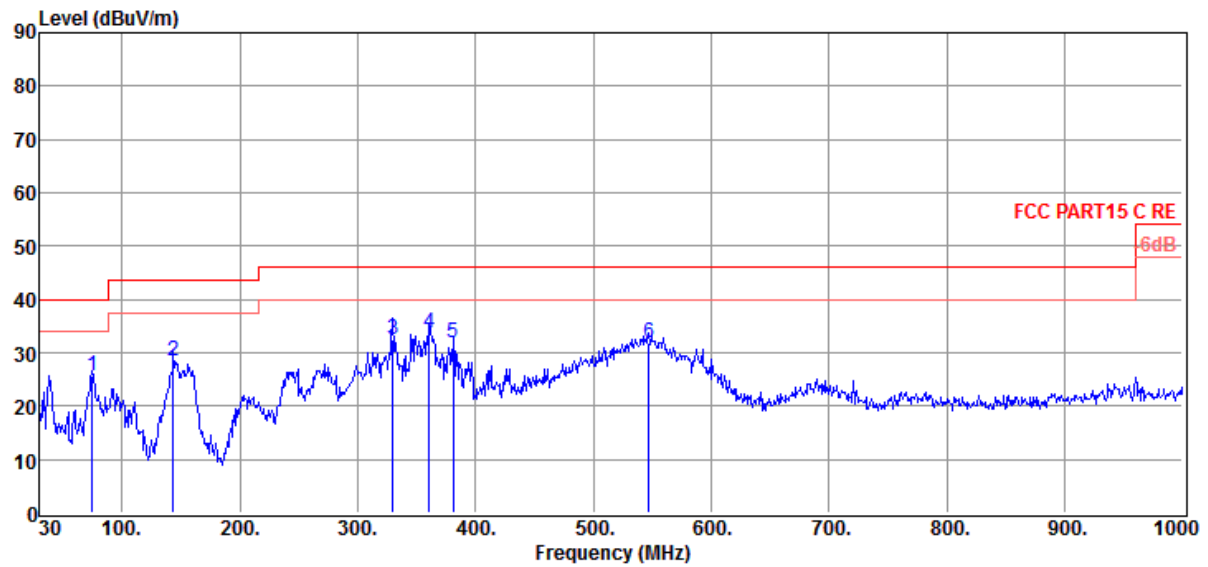


Item (Mark)	Freq (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	143.49	58.18	8.23	40.91	1.39	26.89	43.50	-16.61	QP	HORIZONTAL
2	194.90	57.94	10.57	41.49	1.74	28.76	43.50	-14.74	QP	HORIZONTAL
3	243.40	58.81	12.08	42.23	1.91	30.57	46.00	-15.43	QP	HORIZONTAL
4	313.24	64.05	13.28	42.40	2.23	37.16	46.00	-8.84	QP	HORIZONTAL
5	360.77	64.40	14.43	42.73	2.48	38.58	46.00	-7.42	QP	HORIZONTAL
6	377.26	62.36	14.59	42.73	2.54	36.76	46.00	-9.24	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor

2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit

(TX mode, VERTICAL)



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	74.62	54.35	8.23	38.03	1.02	25.57	40.00	-14.43	QP	VERTICAL
2	143.49	59.69	8.23	40.91	1.39	28.40	43.50	-15.10	QP	VERTICAL
3	329.73	59.12	13.80	42.58	2.28	32.62	46.00	-13.38	QP	VERTICAL
4	360.77	59.51	14.43	42.73	2.48	33.69	46.00	-12.31	QP	VERTICAL
5	381.14	57.48	14.68	42.73	2.55	31.98	46.00	-14.02	QP	VERTICAL
6	547.01	54.42	17.44	43.10	3.10	31.86	46.00	-14.14	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor

2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit

SPURIOUS EMISSIONS (1~18GHz)

Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
GFSK CH0 Tx Mode									
2402.00	98.03	28.93	43.49	6.47	89.94	74.00	15.94	Peak	VERTICAL
4804.00	49.99	34.01	44.06	9.32	49.26	74.00	-24.74	Peak	VERTICAL
17541.00	36.76	43.38	40.86	18.92	58.20	74.00	-15.80	Peak	VERTICAL
17541.00	26.67	43.38	40.86	18.92	48.11	54.00	-5.89	Average	VERTICAL
2402.00	100.55	28.93	43.49	6.47	92.46	74.00	18.46	Peak	HORIZONTAL
4808.00	53.85	34.01	44.06	9.32	53.12	74.00	-20.88	Peak	HORIZONTAL
17218.00	38.61	42.87	41.10	18.85	59.23	74.00	-14.77	Peak	HORIZONTAL
17218.00	25.89	42.87	41.10	18.85	46.51	54.00	-7.49	Average	HORIZONTAL
GFSK CH39 Tx Mode									
2440.00	98.02	29.03	43.49	6.53	90.09	74.00	16.09	Peak	VERTICAL
4880.00	51.57	34.29	44.03	9.41	51.24	74.00	-22.76	Peak	VERTICAL
17507.00	37.34	43.34	40.80	18.91	58.79	74.00	-15.21	Peak	VERTICAL
17507.00	28.26	43.34	40.80	18.91	49.71	54.00	-4.29	Average	VERTICAL
2440.00	101.26	29.03	43.49	6.53	93.33	74.00	19.33	Peak	HORIZONTAL
4880.00	53.13	34.29	44.03	9.41	52.80	74.00	-21.20	Peak	HORIZONTAL
17796.00	37.78	43.67	41.44	19.01	59.02	74.00	-14.98	Peak	HORIZONTAL
17796.00	27.36	43.67	41.44	19.01	48.60	54.00	-5.40	Average	HORIZONTAL
GFSK CH78 Tx Mode									
2480.00	104.19	29.18	43.50	6.57	96.44	74.00	22.44	Peak	HORIZONTAL
4960.00	60.58	34.34	44.01	9.48	60.39	74.00	-13.61	Peak	HORIZONTAL
4960.00	50.23	34.34	44.01	9.48	50.04	54.00	-3.96	Average	HORIZONTAL
17830.00	40.06	43.79	41.44	19.03	61.44	74.00	-12.56	Peak	HORIZONTAL
17830.00	28.19	43.79	41.44	19.03	49.57	54.00	-4.43	Average	HORIZONTAL
2480.00	98.37	29.18	43.50	6.57	90.62	74.00	16.62	Peak	VERTICAL
4960.00	48.67	34.34	44.01	9.48	48.48	74.00	-25.52	Peak	VERTICAL
17473.00	37.07	43.30	40.80	18.91	58.48	74.00	-15.52	Peak	VERTICAL
17473.00	28.95	43.30	40.80	18.91	50.36	54.00	-3.64	Average	VERTICAL

Note: 1.30MHz~18GHz: (Scan with GFSK CH0,39,78; $\pi/4$ -QPSK CH0,39,78; 8-DPSK CH0,39,78, the worst case is GFSK Tx Mode)

2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

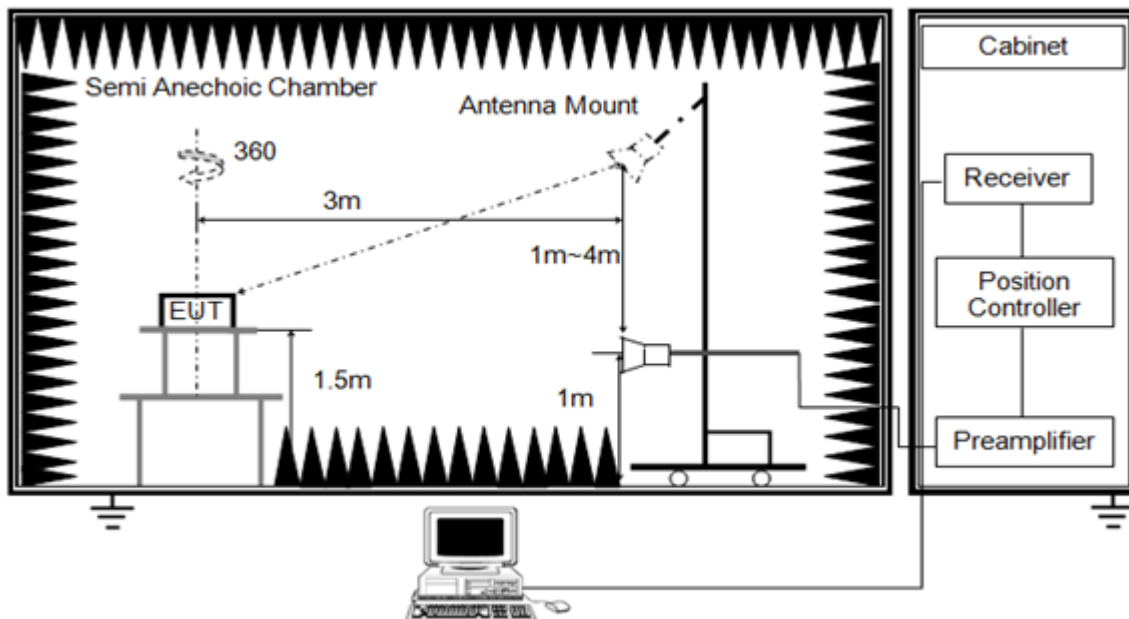
Note2: According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

9. Band Edge Compliance

9.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2016/10/16	2017/10/16
2	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	2017/10/16
3	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/10/27	2017/10/27
4	Double Ridged Horn Antenna	R&S	HF907	100276	2016/10/12	2017/10/12
5	Pre-Amplifier	R&S	SCU-01	10049	2016/10/16	2017/10/16
6	Pre-amplifier	A.H.	PAM0-0118	360	2016/10/16	2017/10/16
7	RF Cable	R&S	R01	10403	2016/10/16	2017/10/16
8	RF Cable	R&S	R02	10512	2016/10/16	2017/10/16

9.2. Block diagram of test setup



9.3. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

9.4. Test Procedure

Same with clause 8.4 except change investigated frequency range from 2310MHz to 2415MHz and 2475MHz to 2500MHz.

9.5. Test Result and Data

Test Result: Compliant..

EUT: Multimedia speaker M/N: HT-018		
Mode	Freq (MHz)	Conclusion
GFSK	Hopping off 2402	PASS
	Hopping off 2480	PASS
	Hopping on	PASS
8-DPSK	Hopping off 2402	PASS
	Hopping off 2480	PASS
	Hopping on	PASS

9.6. Original test data

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
GFSK CH0 Tx Mode										
1	2390.00	48.31	28.70	43.48	6.47	40.00	74.00	-34.00	Peak	HORIZONTAL
1	2390.00	49.33	28.70	43.48	6.47	41.02	74.00	-32.98	Peak	VERTICAL
GFSK CH78 Tx Mode										
1	2483.50	59.98	29.18	43.50	6.57	52.23	74.00	-21.77	Peak	HORIZONTAL
2	2492.05	54.66	29.18	43.50	6.57	46.91	74.00	-27.09	Peak	HORIZONTAL
1	2483.50	54.43	29.18	43.50	6.57	46.68	74.00	-27.32	Peak	VERTICAL
2	2494.13	51.32	29.18	43.50	6.59	43.59	74.00	-30.41	Peak	VERTICAL

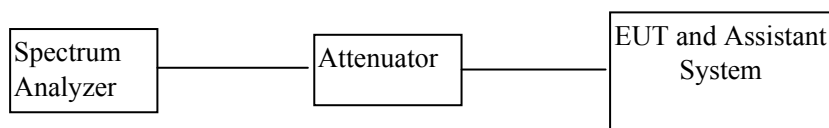
Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
8-DPSK CH 78 Tx										
1	2483.50	59.99	29.18	43.50	6.57	52.24	74.00	-21.76	Peak	HORIZONTAL
1	2483.50	54.72	29.18	43.50	6.57	46.97	74.00	-27.03	Peak	VERTICAL
8-DPSK CH 0 Tx										
1	2390.00	48.49	28.70	43.48	6.47	40.18	74.00	-33.82	Peak	VERTICAL
1	2390.00	48.94	28.70	43.48	6.47	40.63	74.00	-33.37	Peak	HORIZONTAL

10. Band Edge Compliance (conducted method)

10.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	R&S	FSU	1166.1660.26	2016/10/16	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2016/08/18	1 Y

10.2. Block diagram of test setup



10.3. Limit

All restriction band should comply with 15.209, other emission should be at least 20dB below the fundamental.

10.4. Test result

Mode	Freq (MHz)	Conclusion
GFSK	Hopping off 2402	PASS
	Hopping off 2480	PASS
	Hopping on	PASS
8-DPSK	Hopping off 2402	PASS
	Hopping off 2480	PASS
	Hopping on	PASS

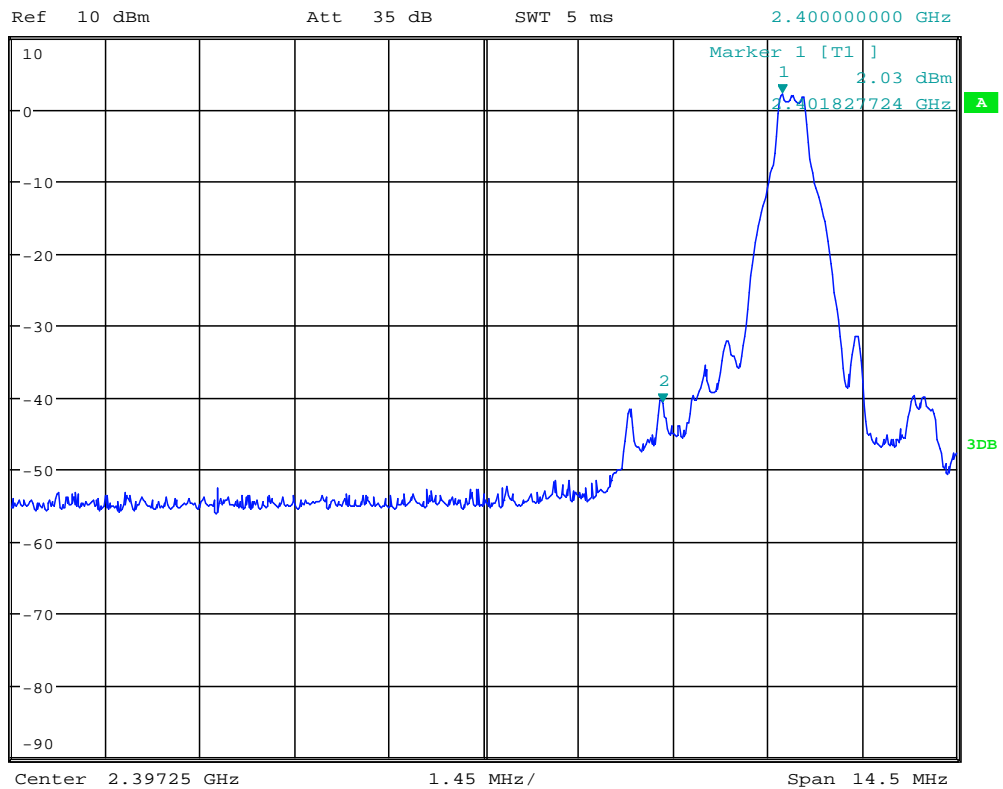
10.5. Original test data

GFSK



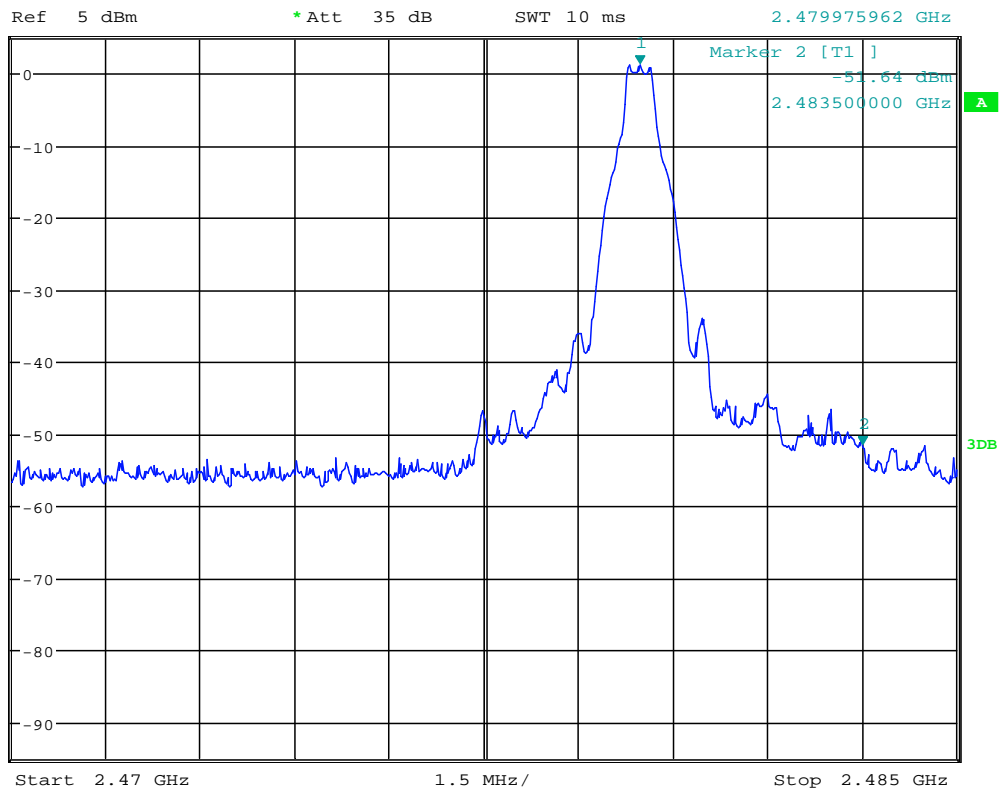
*RBW 100 kHz
*VBW 300 kHz
SWT 5 ms

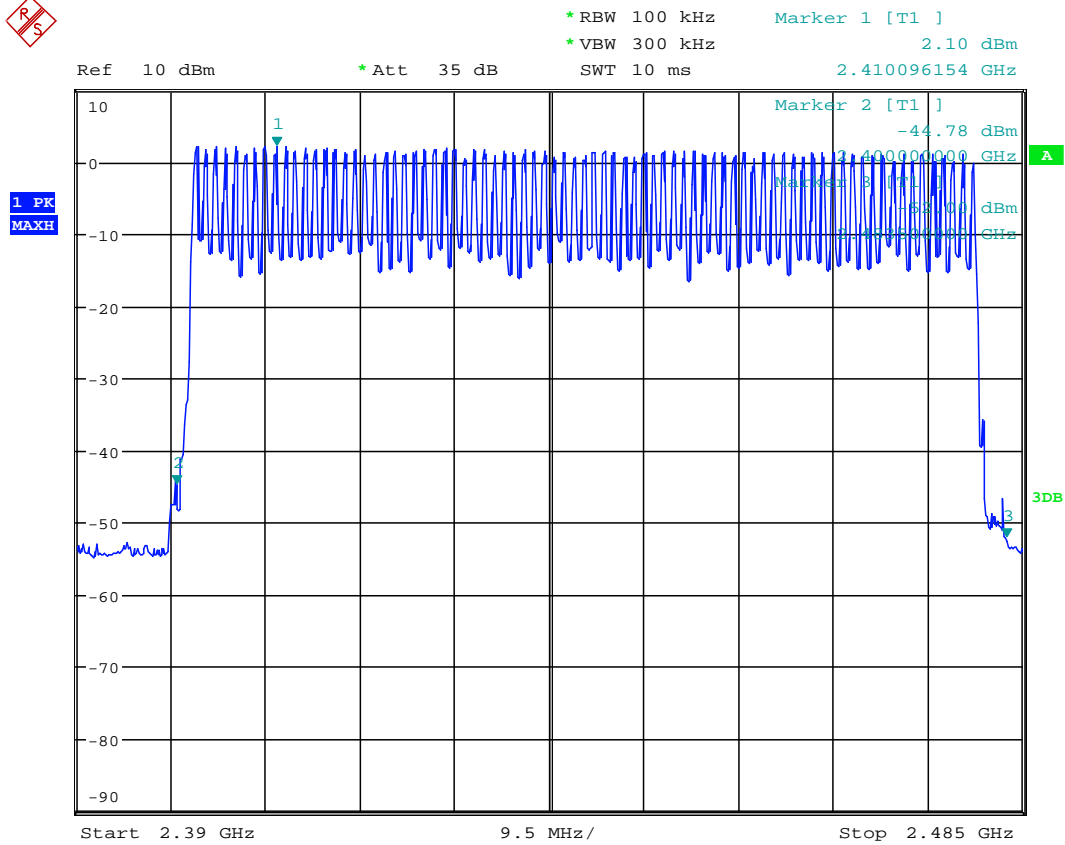
Marker 2 [T1]
-40.66 dBm
2.400000000 GHz



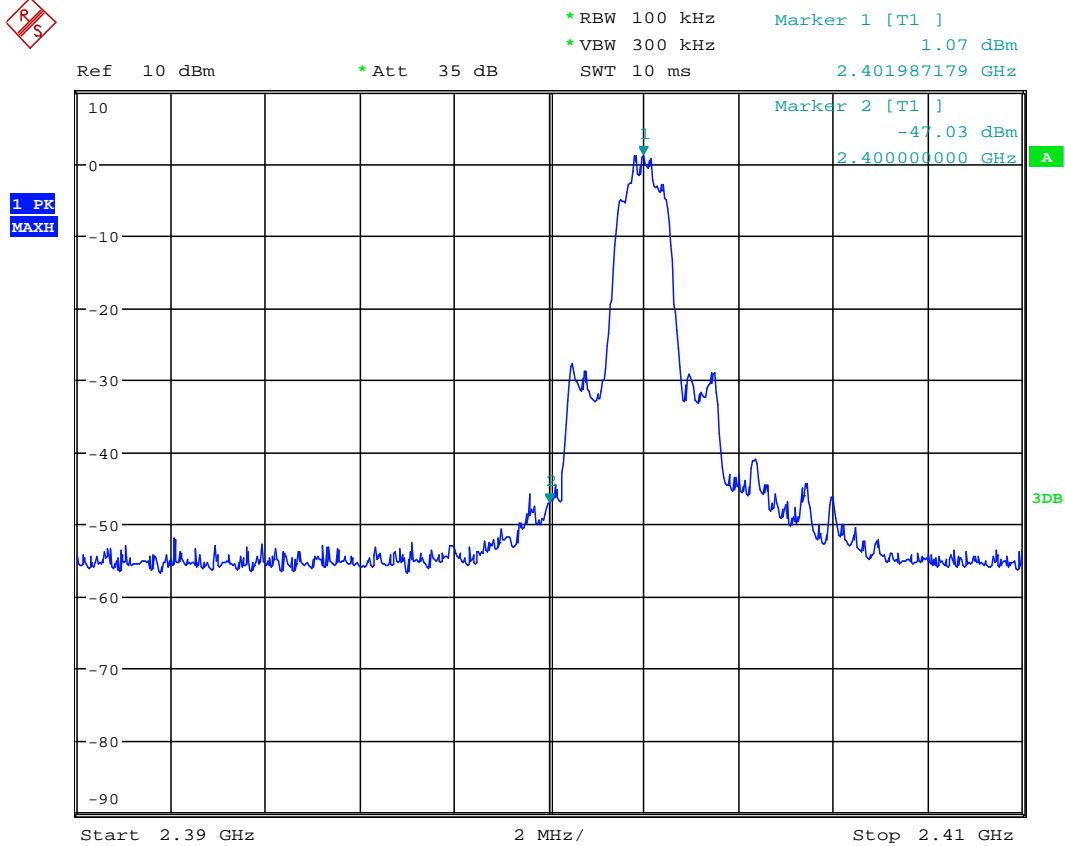
*RBW 100 kHz
*VBW 300 kHz
SWT 10 ms

Marker 1 [T1]
1.03 dBm
2.479975962 GHz



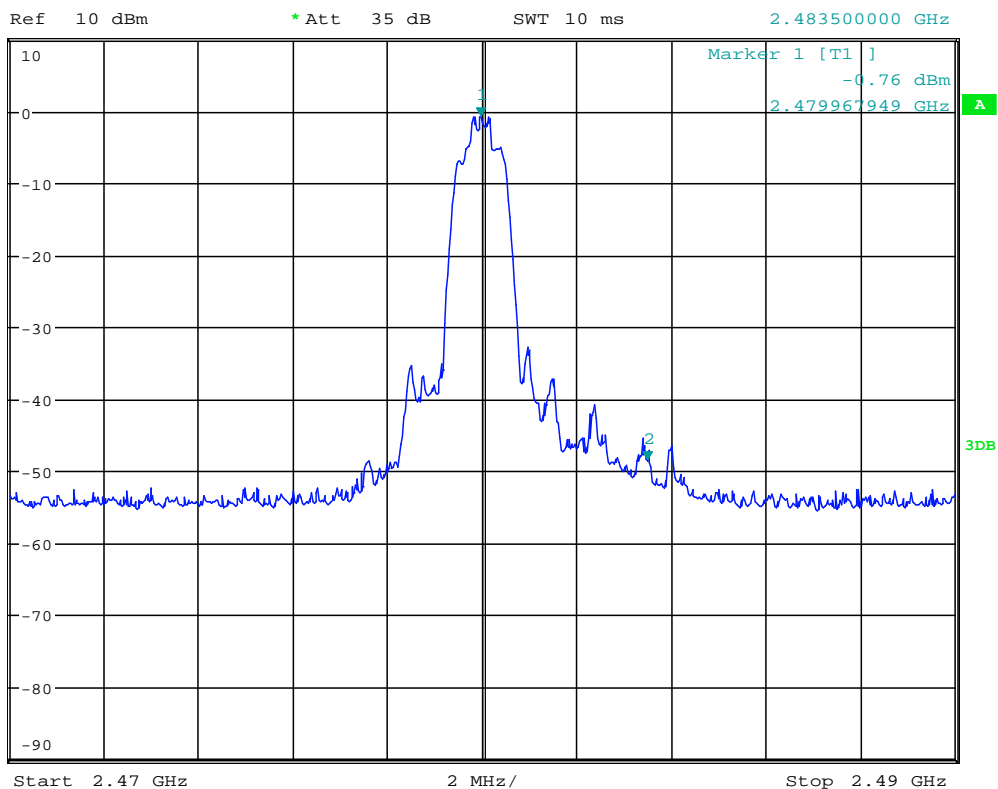


8-DPSK

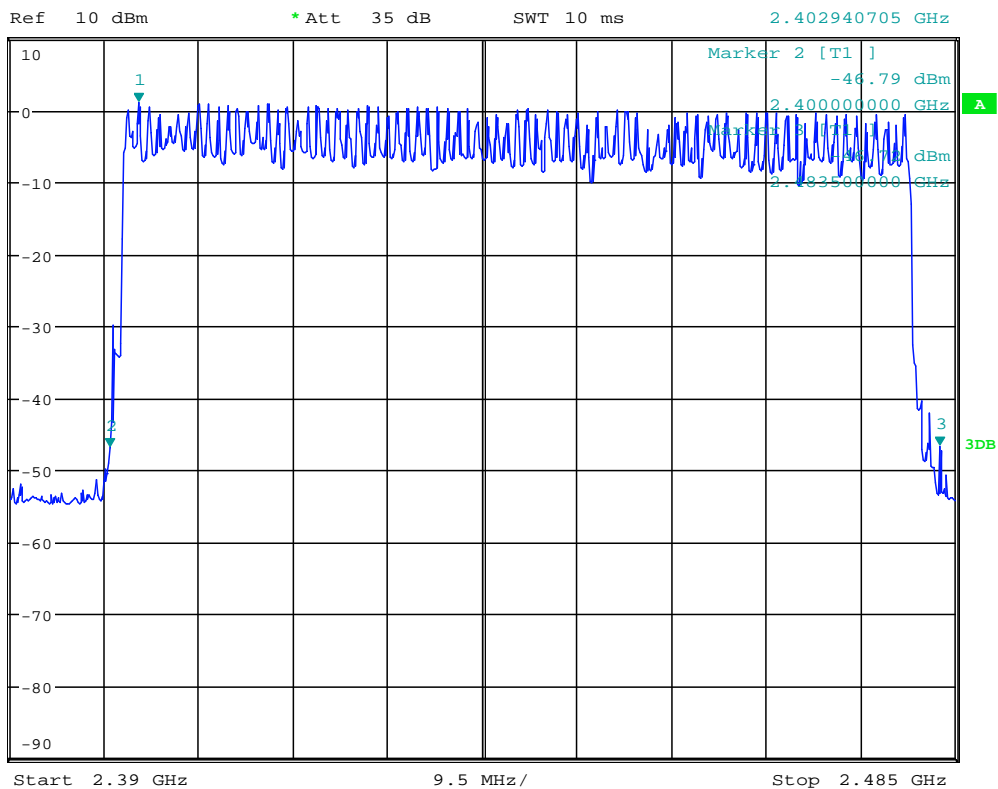




*RBW 100 kHz Marker 2 [T1]
 *VBW 300 kHz -48.41 dBm
 SWT 10 ms 2.483500000 GHz



*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz 0.99 dBm
 SWT 10 ms 2.402940705 GHz

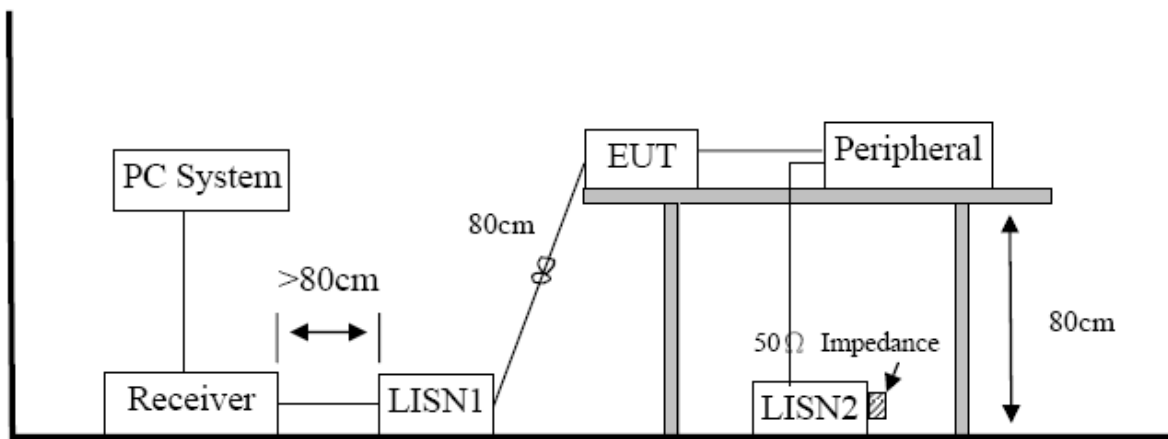


11. Power Line Conducted Emission

11.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	R&S	ESU8	100316	2016/10/16	2017/10/16
2	LISN 1	R&S	ENV216	101109	2016/10/16	2017/10/16
3	LISN 2	R&S	ESH2-Z5	100309	2016/10/16	2017/10/16
4	Pulse Limiter	R&S	ESH3-Z2	101242	2016/10/16	2017/10/16

11.2. Test setup and procedure



11.3. Power Line Conducted Emission Limits(Class B)

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

11.4. Test Data

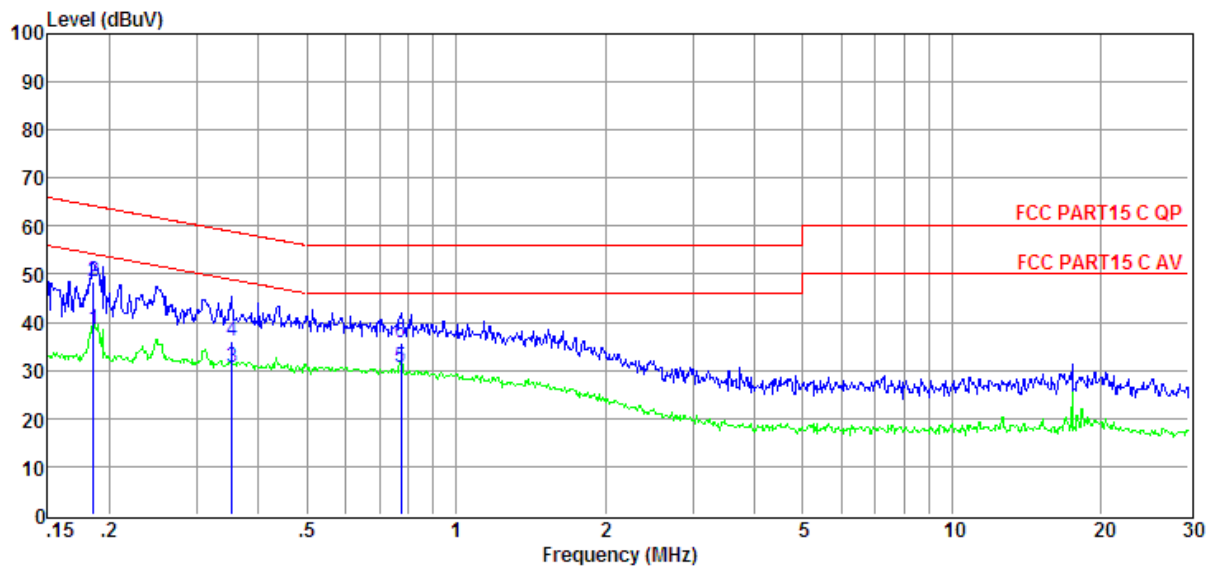
Test Result: Compliant..

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: “----” means average detection; “-----” mans peak detection

Conducted Emission Test Result

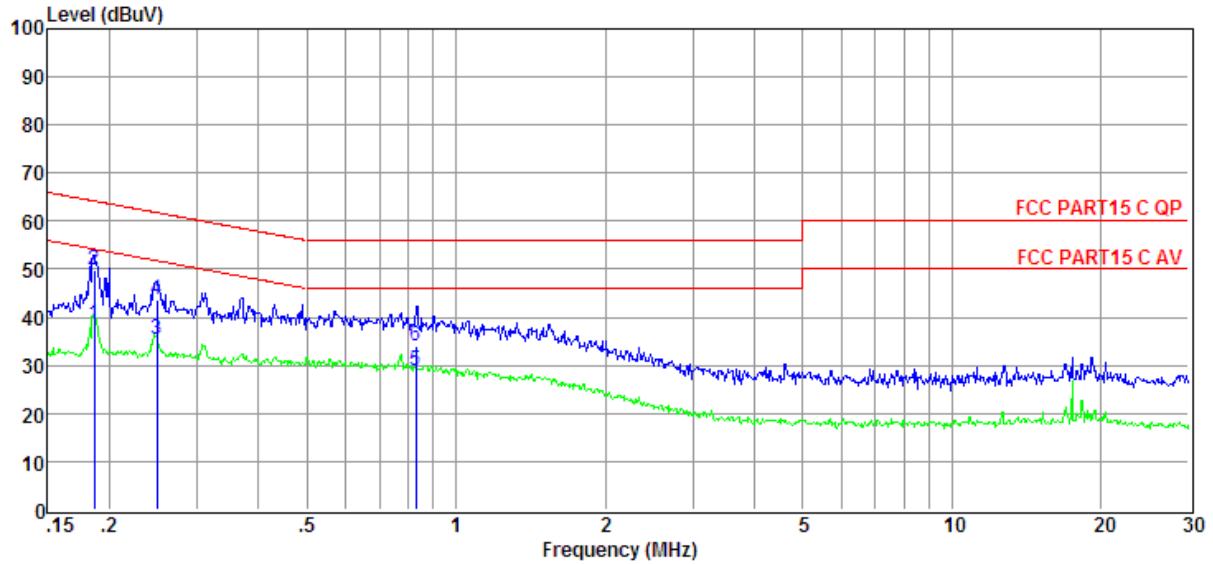
LINE



Item (Mark)	Freq (MHz)	Read Level (dBμV)	LISN Factor (dB)	Cable Loss (dB)	Result Level (dBμV)	Limit Line (dBμV)	Over Limit (dB)	Detector	Phase
1	0.19	28.90	9.59	0.10	38.59	54.24	-15.65	Average	LINE
2	0.19	38.88	9.59	0.10	48.57	64.24	-15.67	QP	LINE
3	0.35	20.97	9.61	0.10	30.68	48.87	-18.19	Average	LINE
4	0.35	26.30	9.61	0.10	36.01	58.87	-22.86	QP	LINE
5	0.78	20.66	9.62	0.20	30.48	46.00	-15.52	Average	LINE
6	0.78	25.86	9.62	0.20	35.68	56.00	-20.32	QP	LINE

Conducted Emission Test Result

NEUTRAL



Item (Mark)	Freq (MHz)	Read Level (dBμV)	LISN Factor (dB)	Cable Loss (dB)	Result Level (dBμV)	Limit Line (dBμV)	Over Limit (dB)	Detector	Phase
1	0.19	28.86	9.66	0.10	38.62	54.20	-15.58	Average	NEUTRAL
2	0.19	40.09	9.66	0.10	49.85	64.20	-14.35	QP	NEUTRAL
3	0.25	25.68	9.66	0.10	35.44	51.78	-16.34	Average	NEUTRAL
4	0.25	33.73	9.66	0.10	43.49	61.78	-18.29	QP	NEUTRAL
5	0.83	19.01	9.64	0.20	28.85	46.00	-17.15	Average	NEUTRAL
6	0.83	24.28	9.64	0.20	34.12	56.00	-21.88	QP	NEUTRAL

12. Antenna Requirements

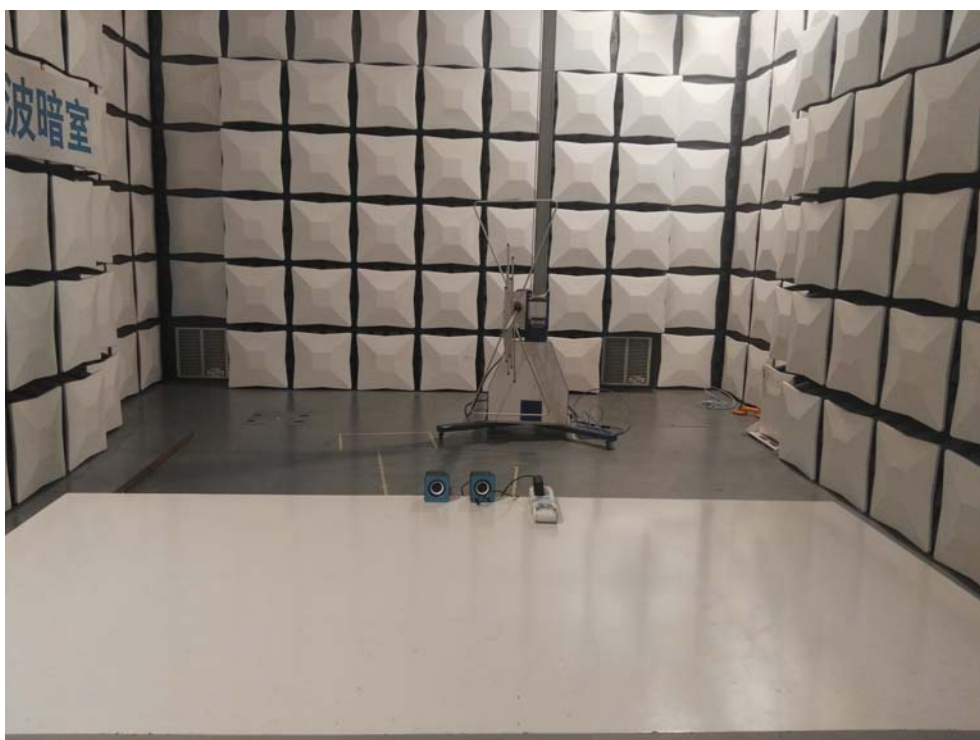
12.1. Limit

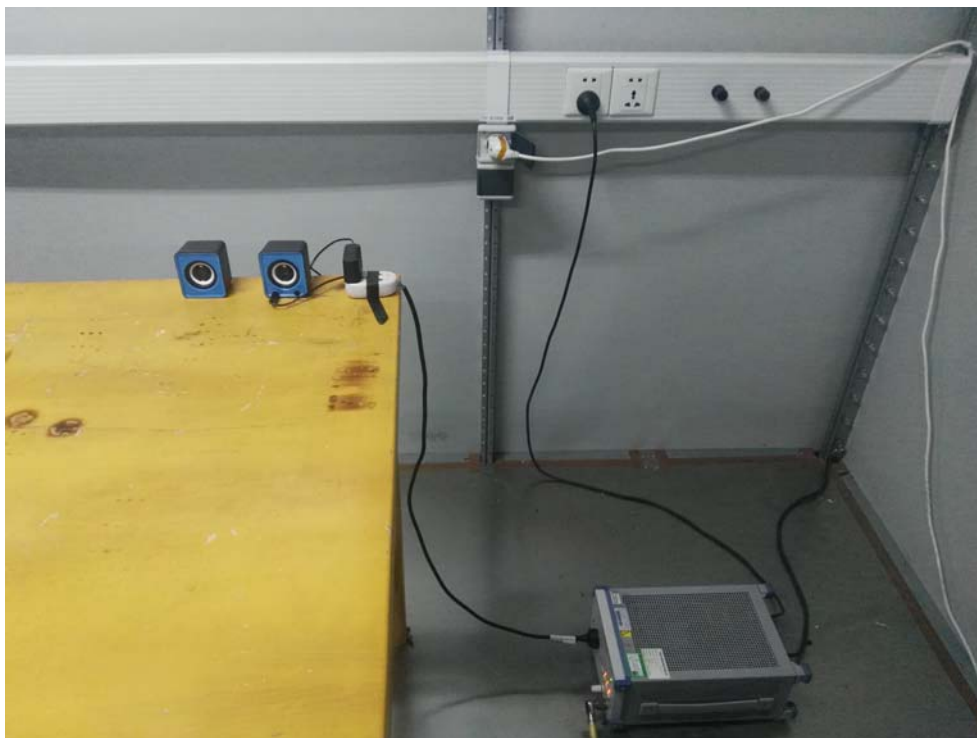
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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.

12.2. Result

The antenna used for this product is Integrated antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

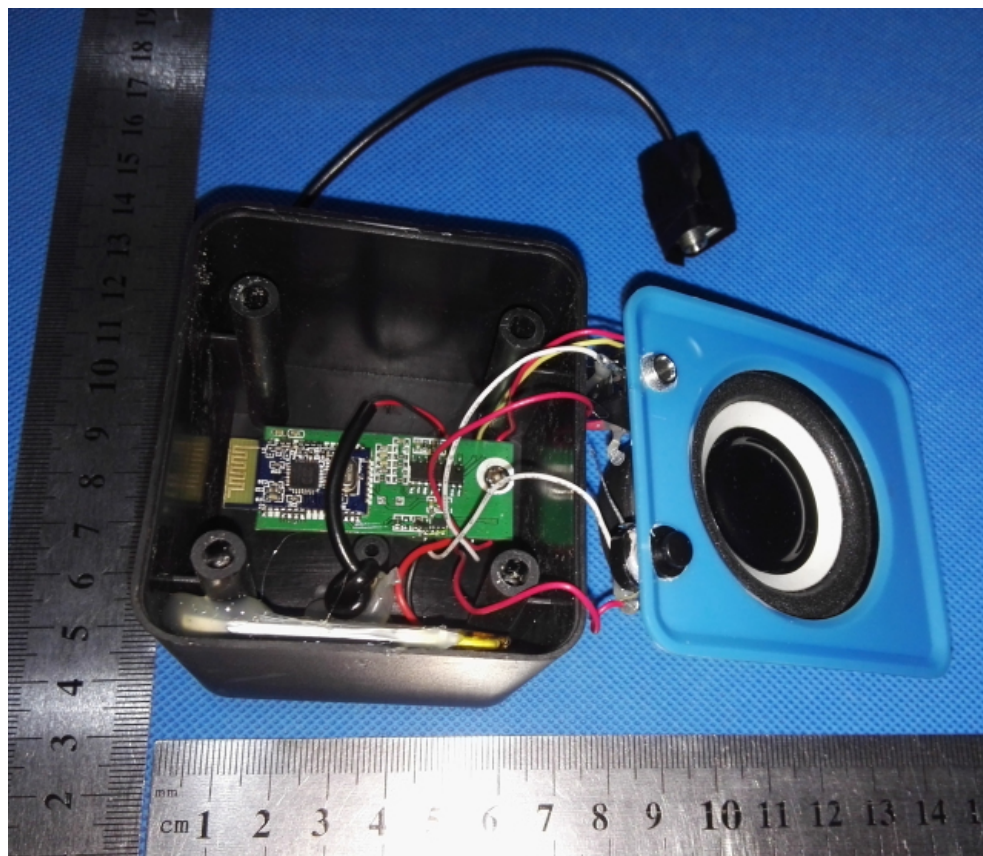
13. Test setup photograph

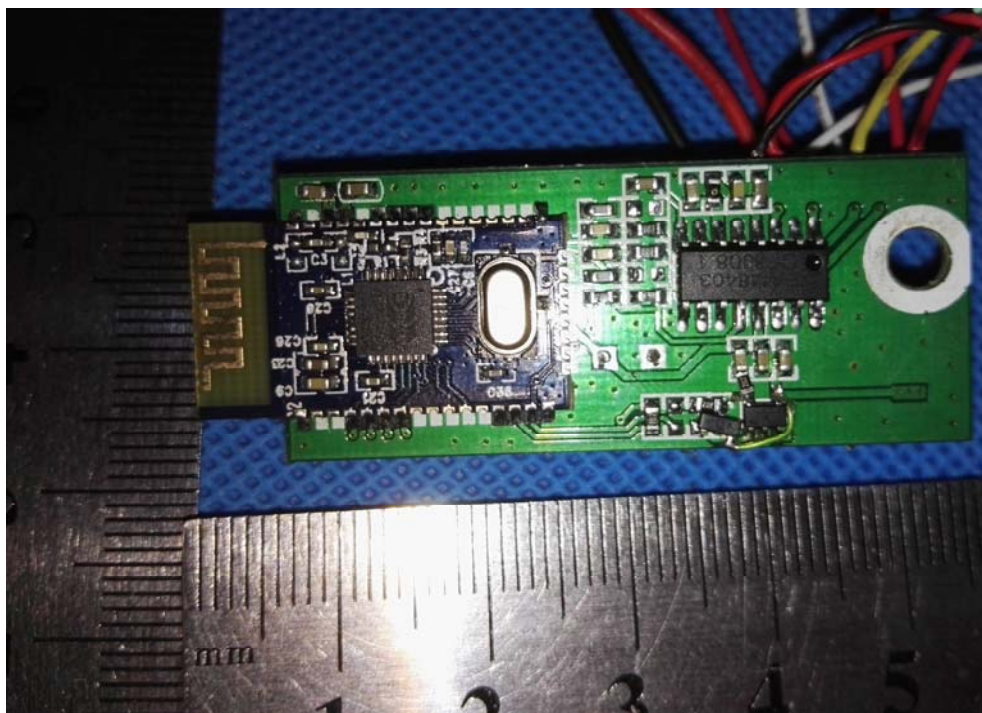
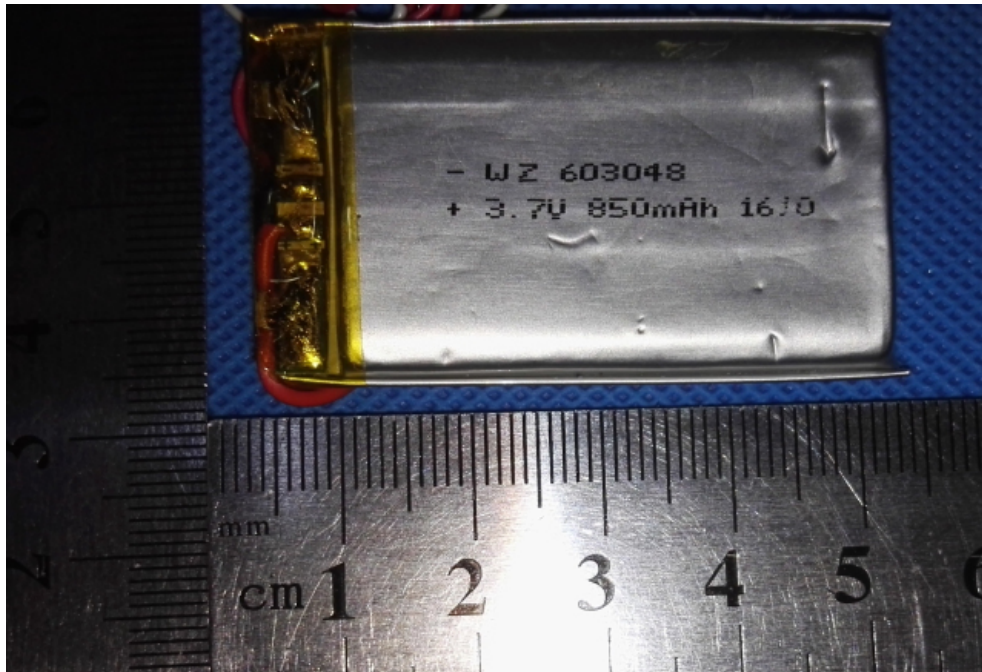


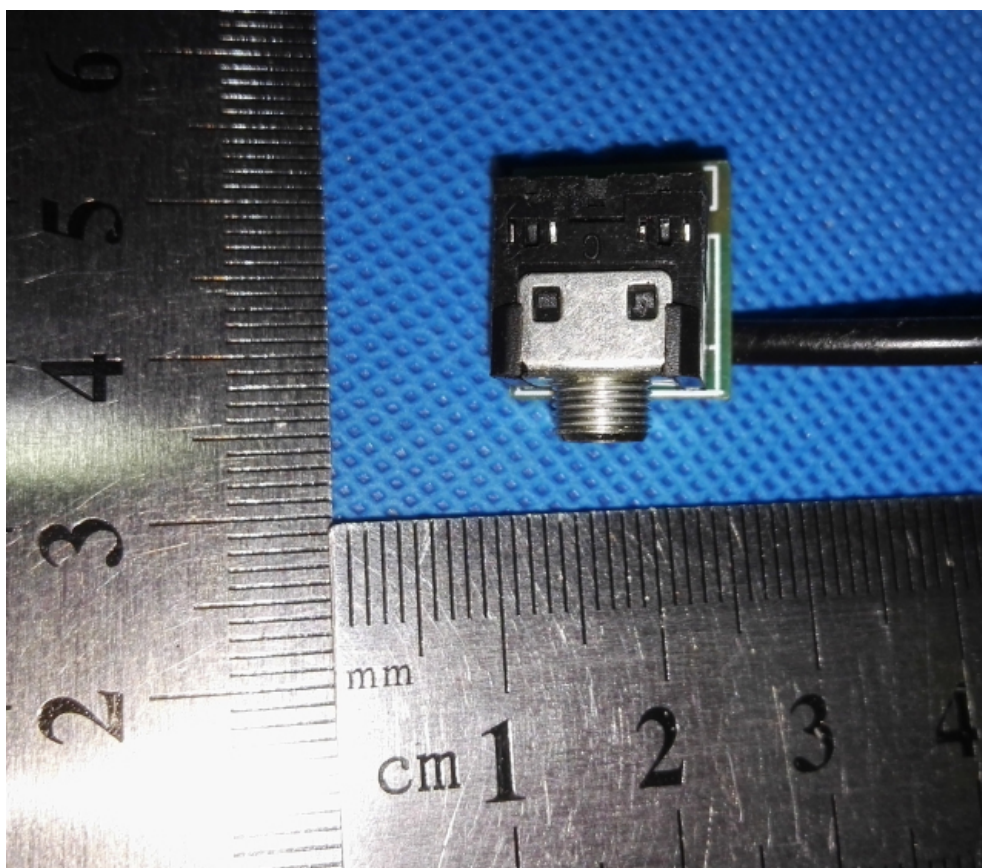
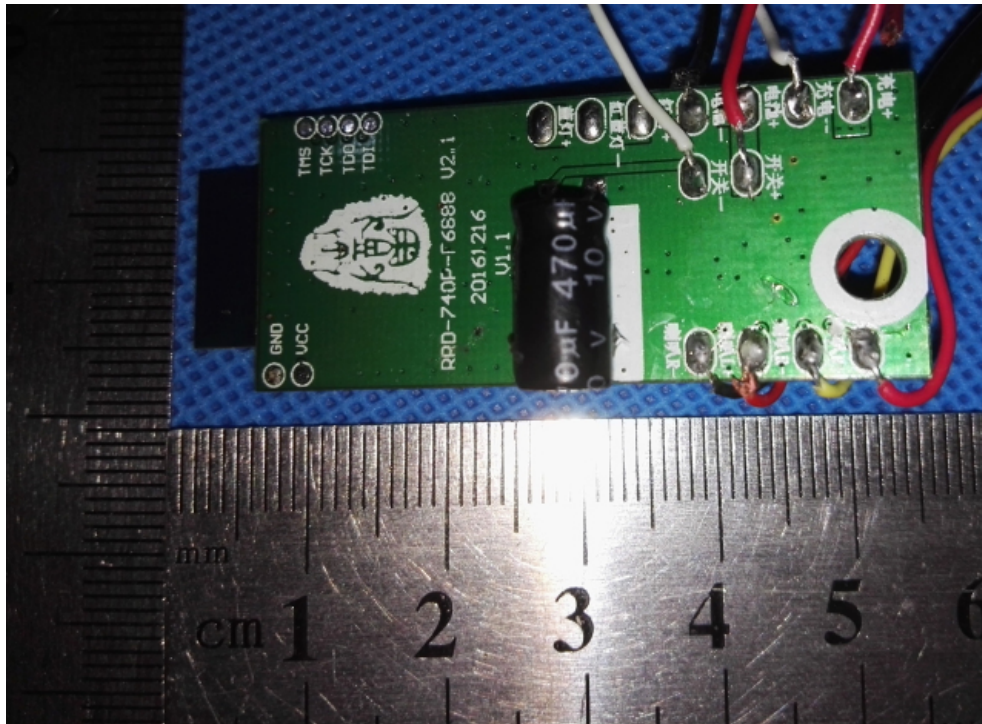


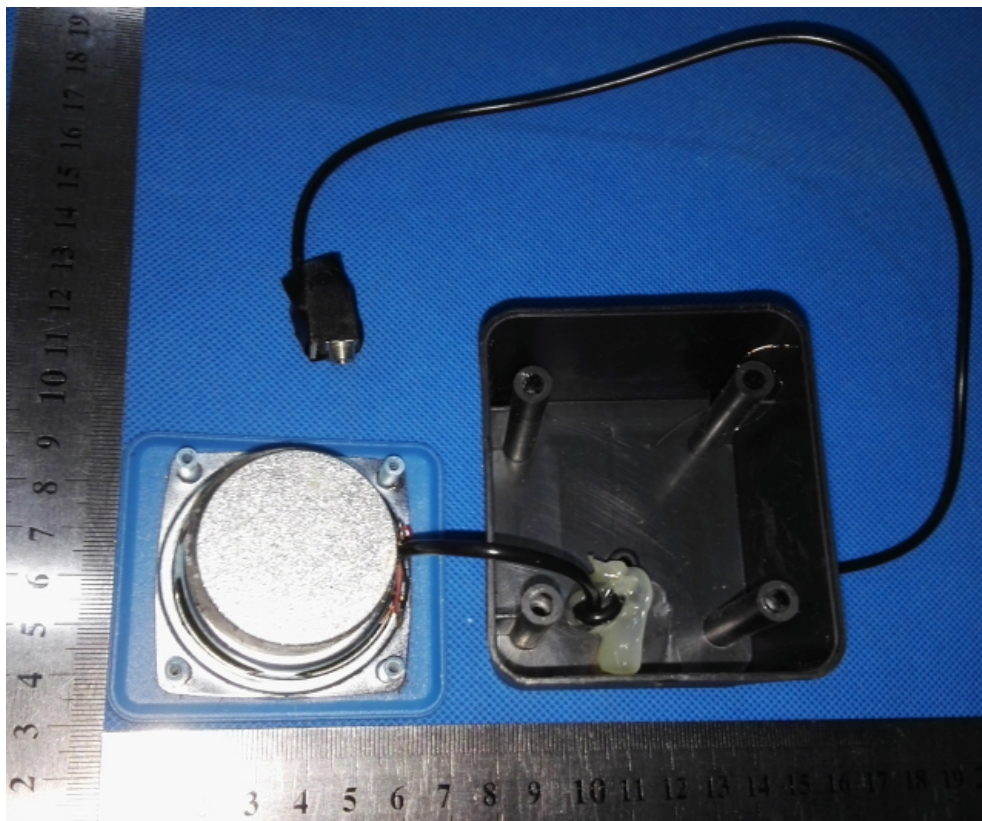
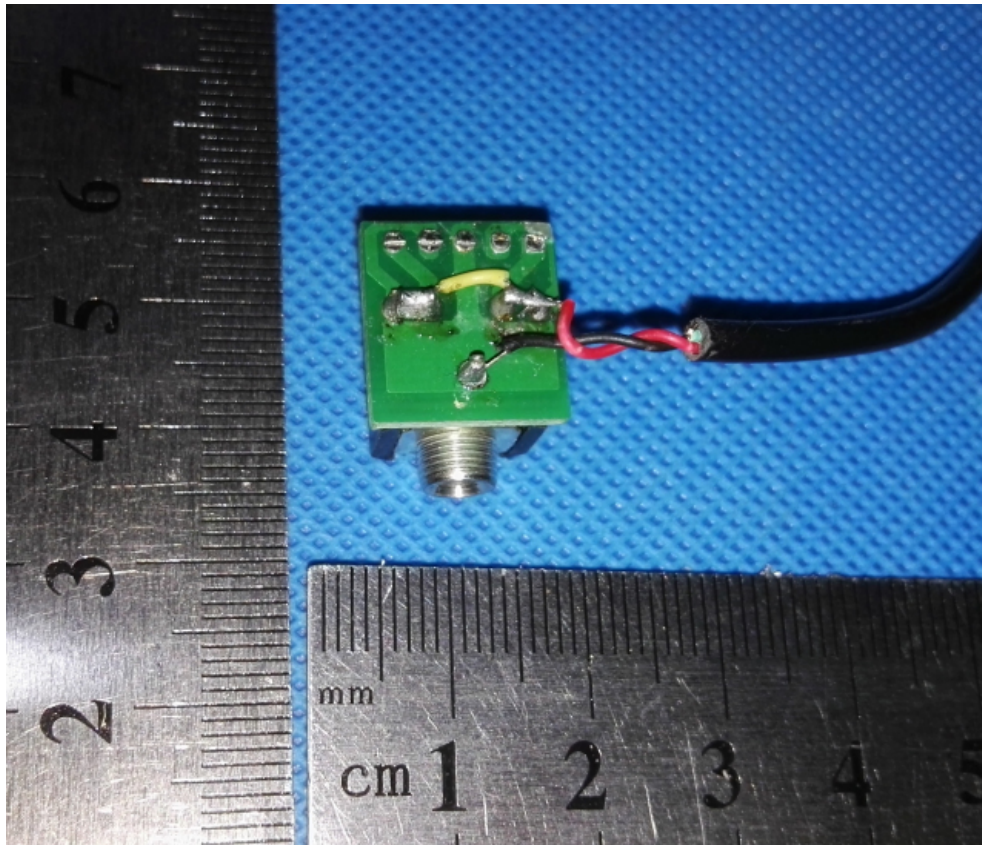
14. Photos of the EUT











END OF REPORT