



FCC TEST REPORT

Prepared For :	ARGENTOSC
Product Name:	Shower Speaker
Model :	SP58116-WH, SP58116-BL,SP58116-BK, PO#7020, PO#7021, PO#7082
Prepared By :	Shenzhen United Testing Technology Co., Ltd. 4F, Block B Unit 2, Jianxing Building, Chaguang Industry Area, Na District, Shenzhen, China Tel: 86-755-86180996 Fax: 86-755-86180156
Test Date:	August 12, 2014 to September 09, 2014
Date of Report :	September 09, 2014
Report No.:	UNI-1408119

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TABLE OF CONTENTS

1.0	TEST CERTIFICATION.....	3
2.0	Test Equipment.....	5
3.0	Technical Details.....	6
4.0	Test Lab Details.....	6
5.0	Power Line Conducted Emission Test.....	7
5.1	Schematics of the Test.....	7
5.2	Test Method and Test Procedure.....	7
5.3	Configuration of the EUT.....	7
5.4	EUT Operating Condition.....	8
5.5	Conducted Emission Limit.....	8
5.6	Test Result.....	8
6.0	Radiated Emission test.....	11
6.1	Test Method and Test Procedure.....	11
6.2	Configuration of the EUT.....	11
6.3	EUT Operation Condition.....	11
6.4	Radiated Emission Limit.....	12
7.0	20dB Bandwidth Measurement.....	22
8.0	Maximum Peak Output Power.....	34
9.0	Carrier Frequency Separation.....	37
10.0	Number of Hopping Channel.....	41
11.0	Time of Occupancy (Dwell Time).....	45
12.0	Out of Band Measurement.....	58
13.0	Antenna Requirement.....	71
14.0	FCC Label.....	72
15.0	Photo of Test Setup and EUT View.....	73



1 TEST CERTIFICATION

Product:	Shower Speaker
Model:	SP58116-WH, SP58116-BL, SP58116-BK, PO#7020, PO#7021, PO#7082
Applicant:	ARGENTOSC 1407 Broadway Suite 2201 New York, NY 10018
Factory:	Shenzhen Ground Enterprises Co., Ltd. Room 618/620, No.B Yongqi Commercial Building, Yintian Industry Park, Xixiang Town, Baoa'an District, Shenzhen, Guangdong, China 518001
Trade Mark:	N/A
Tested:	August 12, 2014 to September 09, 2014
Test Voltage:	DC3.7V Powered Built-In Battery
Operational Frequency Range:	Bluetooth: 2402-2480MHz
Modulation Type:	Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel	79Channel for Bluetooth
Frequency Selection	By software
Antenna:	Integral antenna with Gain 2.0 dBi
FCC ID:	2AC5VGROUND009
Applicable Standards:	FCC Part 15.247

The test report was prepared by Shenzhen United Testing Technology Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by : Michael Su
Michael Su /Assistant Engineer

Reviewer : Mike Yong
Mike Yong/Supervisor

Approved & Authorized Signer : Hoffer Lau
Hoffer Lau/ Manager



2.0 Test Equipment					
Item	Test Equipment	Manufacturer	Model No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	June. 30 2014	June. 29 2015
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	Jul. 03 2014	Jul. 02 2015
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	Feb. 25 2014	Feb. 24 2015
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	June 29 2014	June 28 2015
6	Horn Antenna	ETS-LINDGREN	3160	June. 30 2014	June. 29 2015
7	EMI Test Software	AUDIX	E3	N/A	N/A
8	Amplifier(100kHz-3GHz)	HP	8347A	Jul. 03 2014	Jul. 02 2015
9	Amplifier(2GHz-20GHz)	HP	8349B	Jul. 03 2014	Jul. 02 2015
10	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	June. 30 2014	June. 29 2015
11	Band filter	Amindeon	82346	June. 30 2014	June. 29 2015
12	Constant temperature and humidity box	Oregon Scientific	BA-888	May 11 2014	May 10 2015
13	D.C. Power Supply	Instek	PS-3030	May 11 2014	May 10 2015
14	Universal radio communication tester	Rohde & Schwarz	CMU200	May 11 2014	May 10 2015
15	Splitter	Agilent	11636B	May 11 2014	May 10 2015
16	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jul. 03 2014	Jul. 02 2015
17	LISN	Schwarebeck	NSLK 8126	Jul. 03 2014	Jul. 02 2015



3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

Requirement	CFR 47 Section	Result	Notes
Antenna Requirement	15.203, 15.247(b)(4)	PASS	Complies
Maximum Peak Out Power	15.247 (b)(1), (4)	PASS	Complies
Carrier Frequency Separation	15.247(a)(1)	PASS	Complies
20dB Channel Bandwidth	15.247 (a)(1)	PASS	Complies
Number of Hopping Channels	15.247(a)(iii), 15.247(b)(1)	PASS	Complies
Time of Occupancy (Dwell Time)	15.247(a)(iii)	PASS	Complies
Spurious Emission, Band Edge, and Restricted bands	15.247(d),15.205(a), 15.209 (a),15.109	PASS	Complies
Conducted Emissions	15.207(a), 15.107	PASS	Complies
RF Exposure	15.247(i), 1.1307(b)(1)	PASS	Complies

4.0 Test LAB Details

All Tests Performed at

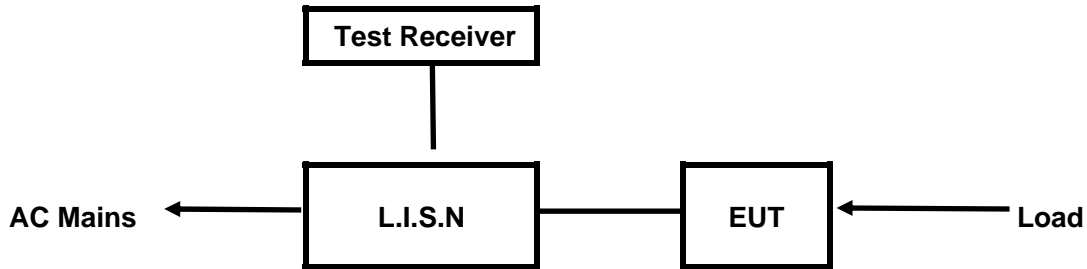
Name: ShenZhen CTL Testing Technology Co.,Ltd

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

FCC Registration Number: 970318

5. Power Line Conducted Emission Test

5.1 Schematics of the test



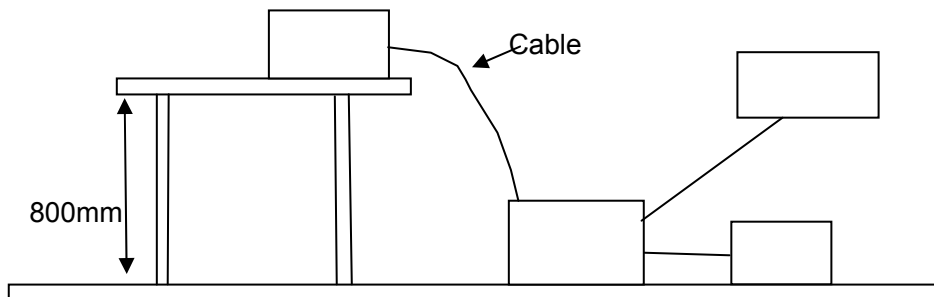
EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2003. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 -2003.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

79 channels are provided to the EUT



A. EUT

Device	Manufacturer	Model	FCC ID
Shower Speaker	Shenzhen Ground Enterprises Co., Ltd.	SP58116-WH, SP58116-BL, SP58116-BK, PO#7020, PO#7021, PO#7082	2AC5VGROUND009

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
Power Supply	Flypower	ASP0501000	VOC	1.2m unshielded output cable

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4 -2003.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.107, 15.207

Frequency (MHz)	Class A Limits (dBµV)		Class B Limits (dBµV)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

- Notes: 1. *Decreasing linearly with logarithm of frequency.
 2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.



A: Conducted Emission on Live Terminal (150kHz to 30MHz)

EUT Operating Environment

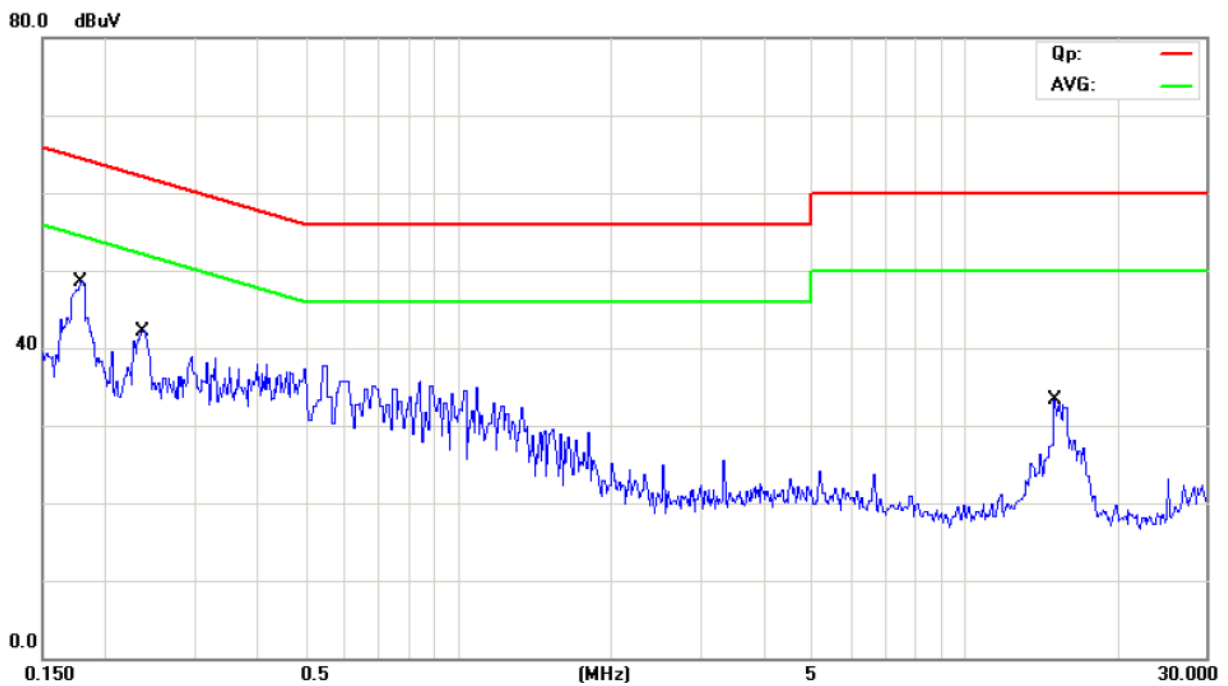
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa

EUT set Condition: Keep Bluetooth Transmitting

Equipment Level: Class B

Results: Pass

Please refer to following diagram for individual



Frequency (MHz)	Line	Reading(dBμV)		Limit(dBμV)	
		Quasi-peak	Average	Quasi-peak	Average
0.177	Live	47.93	18.33	64.61	54.61
0.235	Live	41.59	23.19	62.25	52.25
15.008	Live	33.10	34.50	60.00	50.00



B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)

EUT Operating Environment

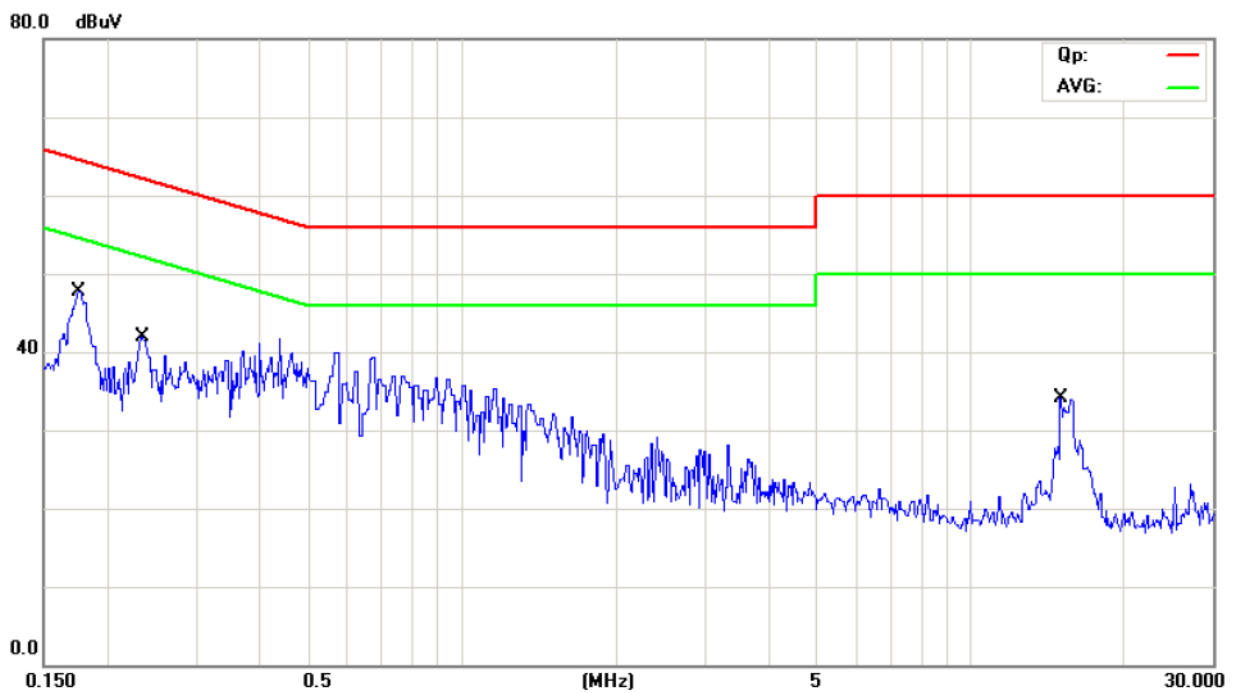
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa

EUT set Condition: Keep Bluetooth Transmitting

Equipment Level: Class B

Results: Pass

Please refer to following diagram for individual



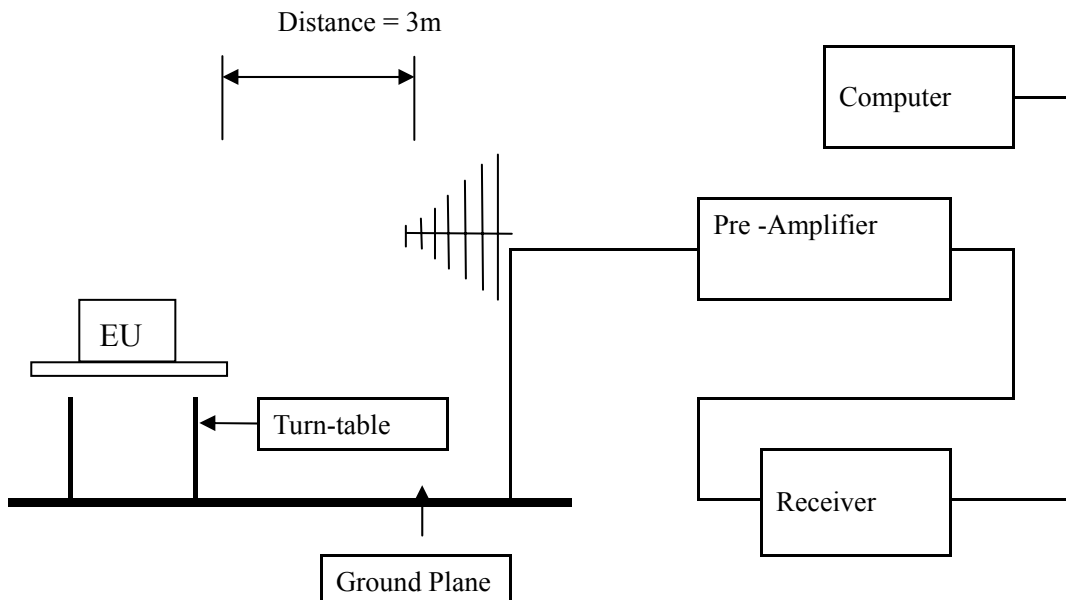
Frequency (MHz)	Line	Reading(dBμV)		Limit(dBμV)	
		Quasi-peak	Average	Quasi-peak	Average
0.177	Neutral	47.83	29.73	64.61	54.61
0.236	Neutral	40.79	25.89	62.21	52.21
15.007	Neutral	33.00	34.40	60.00	50.00

6 Radiated Emission Test

6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.4 –2003. The radiated test was performed at CTL Laboratory. This site is on file with the FCC laboratory division, Registration No.807767
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2003.
- (3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
- (6) The antenna polarization : Vertical polarization and Horizontal polarization.

Block diagram of Test setup



6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition



Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

Frequencies in restricted band are complied to limit on Paragraph 15.209 and 15.109

Frequency Range (MHz)	Distance (m)	Field strength (dBμV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the higher limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
 4. This is a handheld device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
 5. GFSK Modulation was the worst case

A: Radiated Disturbance In Horizontal (30MHz----1000MHz)

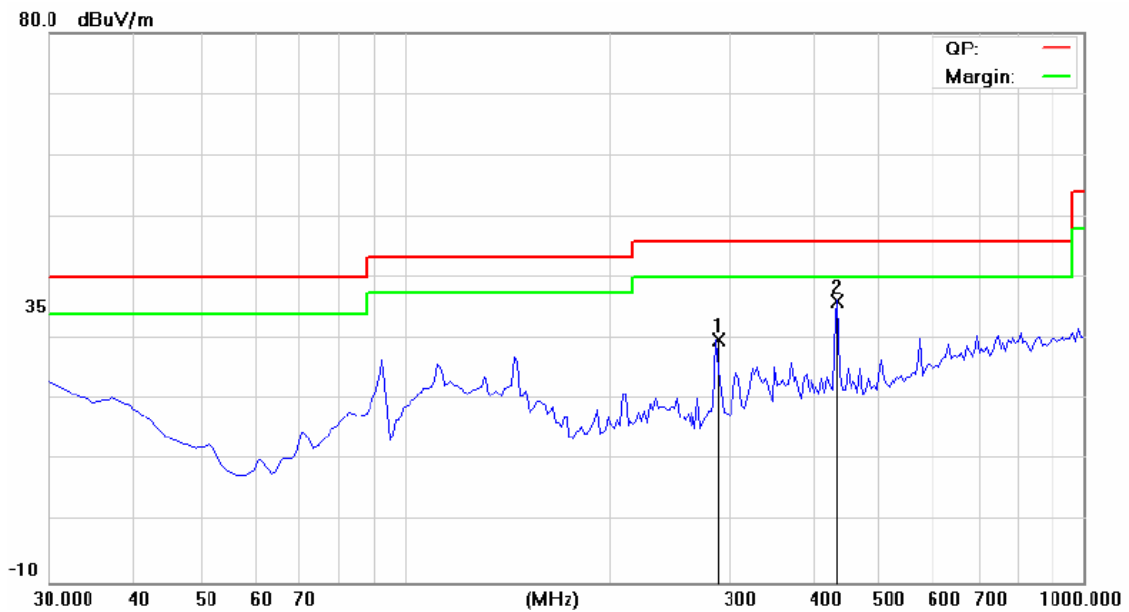
EUT set Condition: Keep Bluetooth Transmitting

Level: Class B

Results: PASS

Please refer to following diagram for individual

Picture of the test



Frequency (MHz)	Level@3m (dBμV/m)	Antenna Polarity	Limit@3m (dBμV/m)
289.47	29.89	H	46.00
432.02	36.21	H	46.00

B: Radiated Disturbance In Vertical (30MHz----1000MHz)

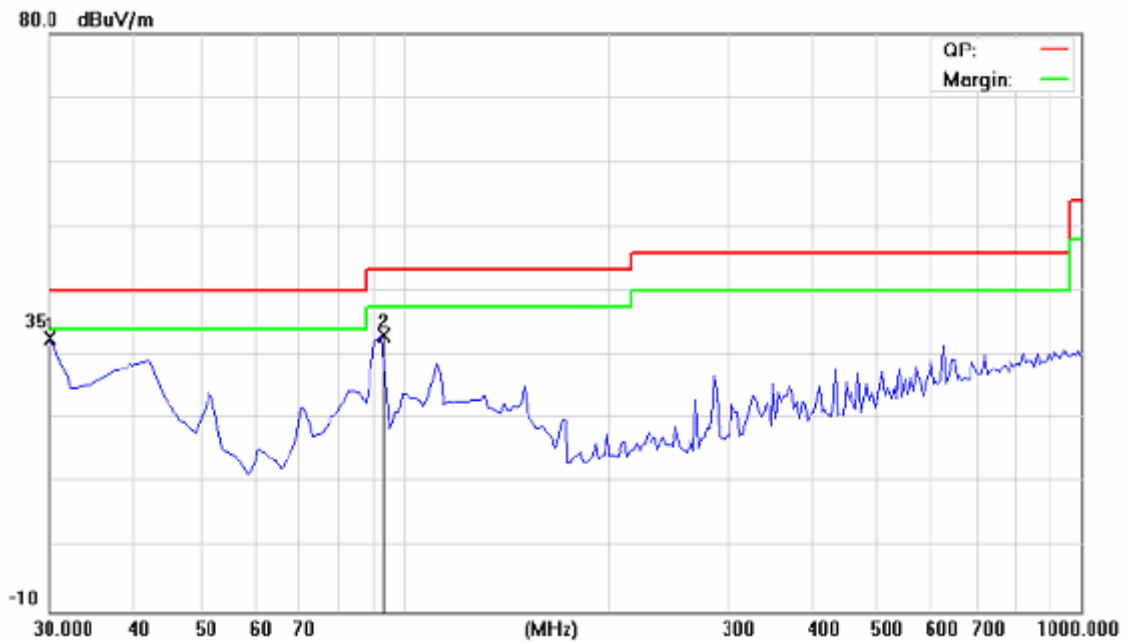
EUT set Condition: Keep Bluetooth Transmitting

Level: Class B

Results: PASS

Please refer to following diagram for individual

Picture of the test



Frequency (MHz)	Level@3m (dBμV/m)	Antenna Polarity	Limit@3m (dBμV/m)
30.02	32.73	V	40.00
93.05	33.08	V	43.50



Operation Mode: Transmitting under Low Channel (2402MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Antenna Polarity	Limit@3m (dBµV/m)
4804	--	H/V	74(Peak)/ 54(AV)
7206	--	H/V	74(Peak)/ 54(AV)
9608	--	H/V	74(Peak)/ 54(AV)
12010	--	H/V	74(Peak)/ 54(AV)
14412	--	H/V	74(Peak)/ 54(AV)
16814	--	H/V	74(Peak)/ 54(AV)
19216	--	H/V	74(Peak)/ 54(AV)
21618	--	H/V	74(Peak)/ 54(AV)
24020	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “---” means that the emissions level is too low to be measured

Operation Mode: Transmitting g under Middle Channel (2441MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Antenna Polarity	Limit@3m (dBµV/m)
4882	--	H/V	74(Peak)/ 54(AV)
7323	--	H/V	74(Peak)/ 54(AV)
9764	--	H/V	74(Peak)/ 54(AV)
12205	--	H/V	74(Peak)/ 54(AV)
14646	--	H/V	74(Peak)/ 54(AV)
17087	--	H/V	74(Peak)/ 54(AV)
19528	--	H/V	74(Peak)/ 54(AV)
21969	--	H/V	74(Peak)/ 54(AV)
24410	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “---” means that the emissions level is too low to be measured



Operation Mode: Transmitting under High Channel (2480MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Antenna Polarity	Limit@3m (dBμV/m)
4960	--	H/V	74(Peak)/ 54(AV)
7440	--	H/V	74(Peak)/ 54(AV)
9920	--	H/V	74(Peak)/ 54(AV)
12400	--	H/V	74(Peak)/ 54(AV)
14880	--	H/V	74(Peak)/ 54(AV)
17360	--	H/V	74(Peak)/ 54(AV)
19840	--	H/V	74(Peak)/ 54(AV)
22320	--	H/V	74(Peak)/ 54(AV)
24800	--	H/V	74(Peak)/ 54(AV)

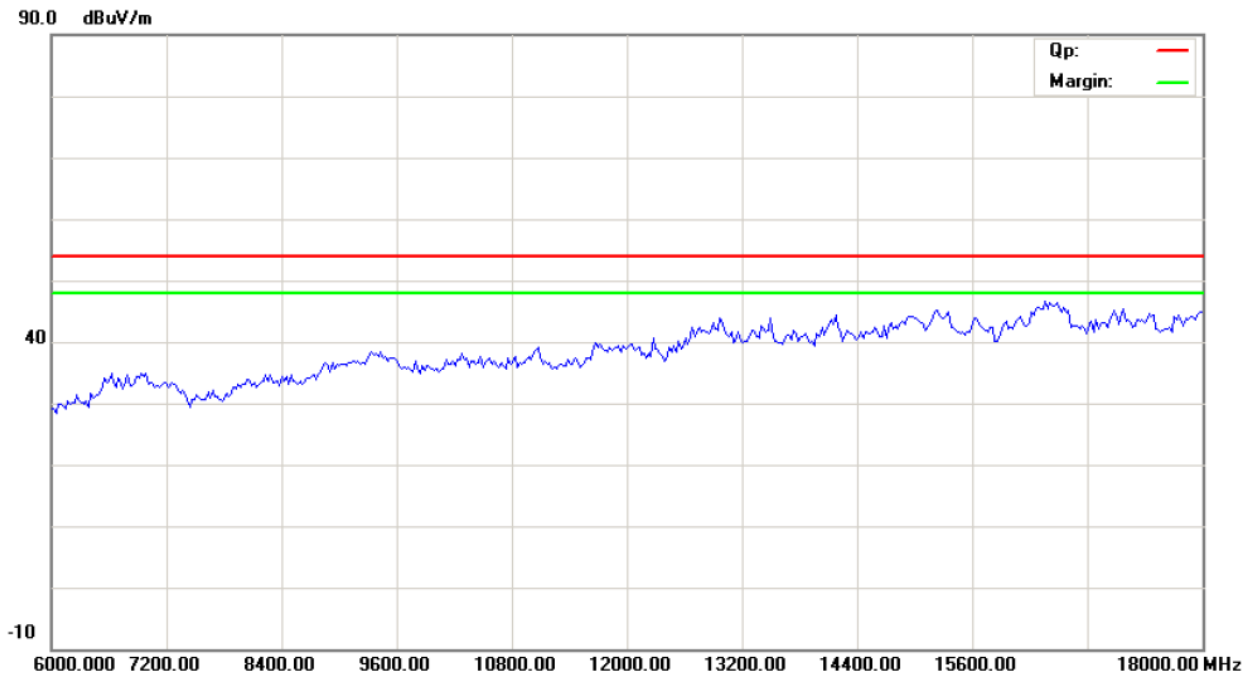
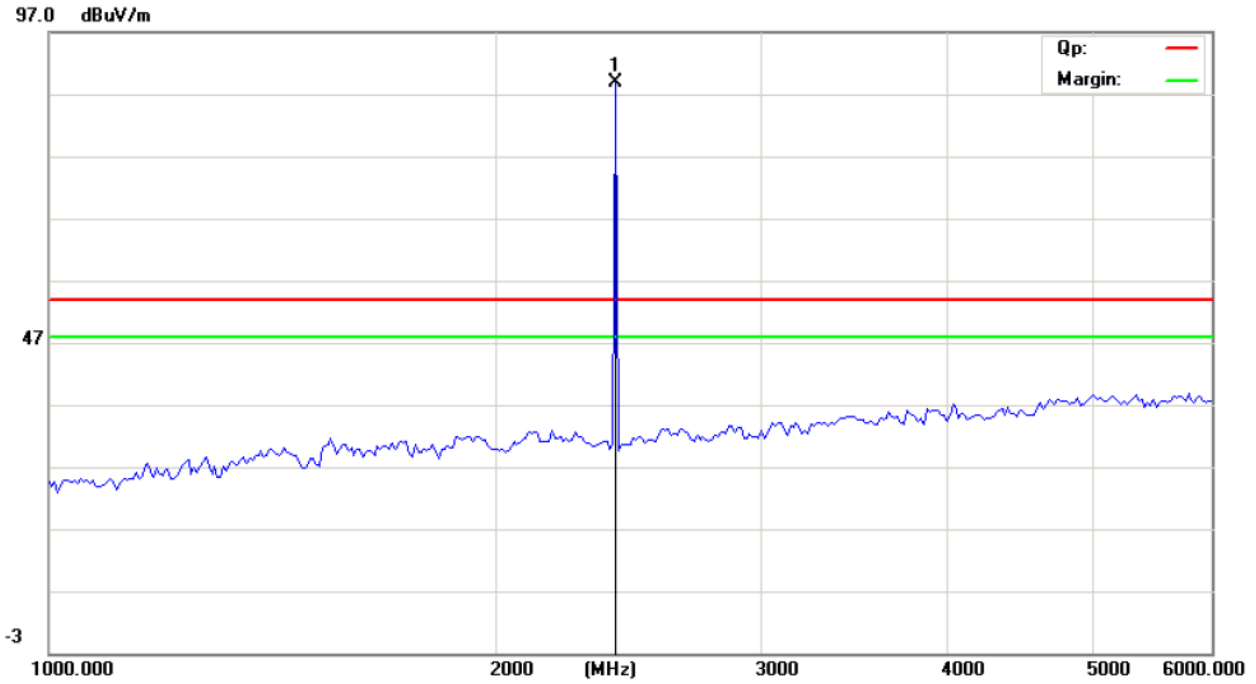
Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured



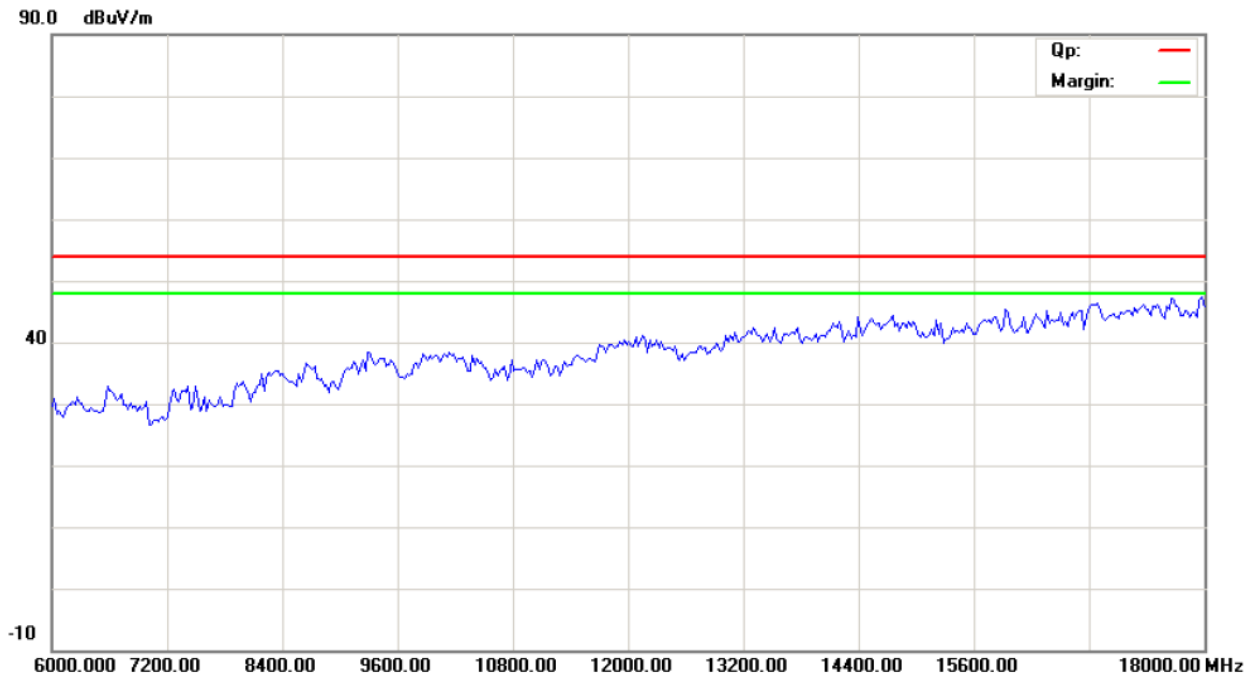
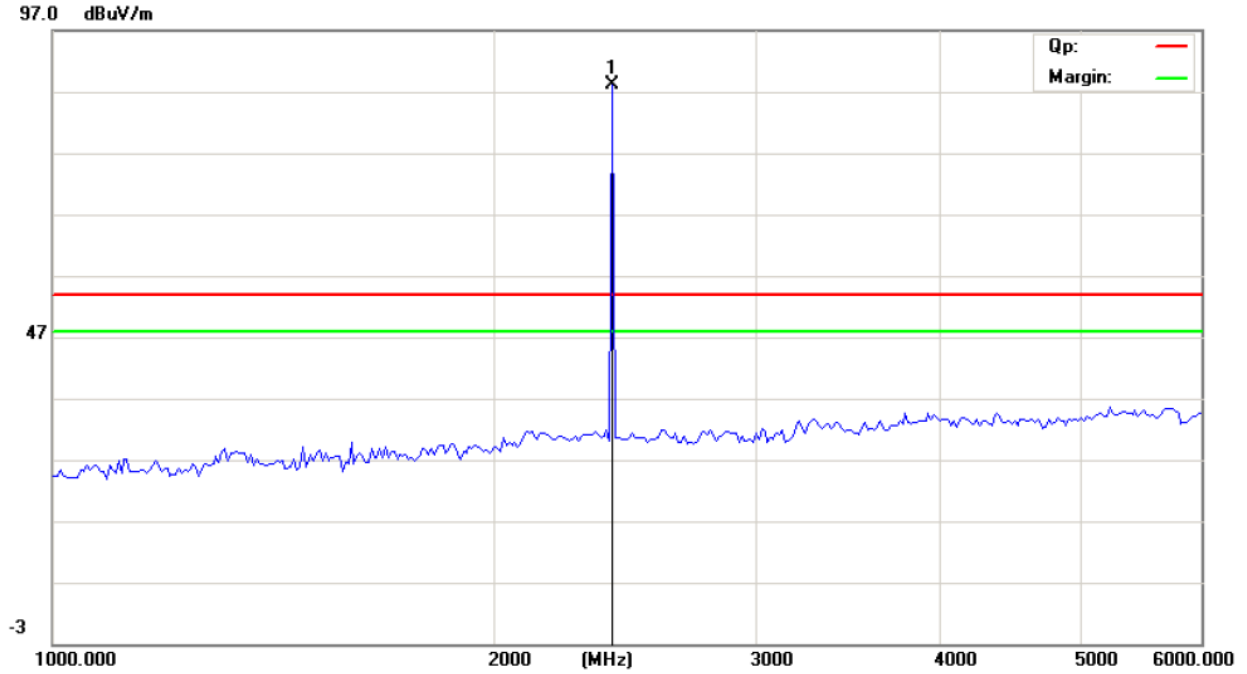
Please refer to the following test plots for details:

Low Channel: Horizontal



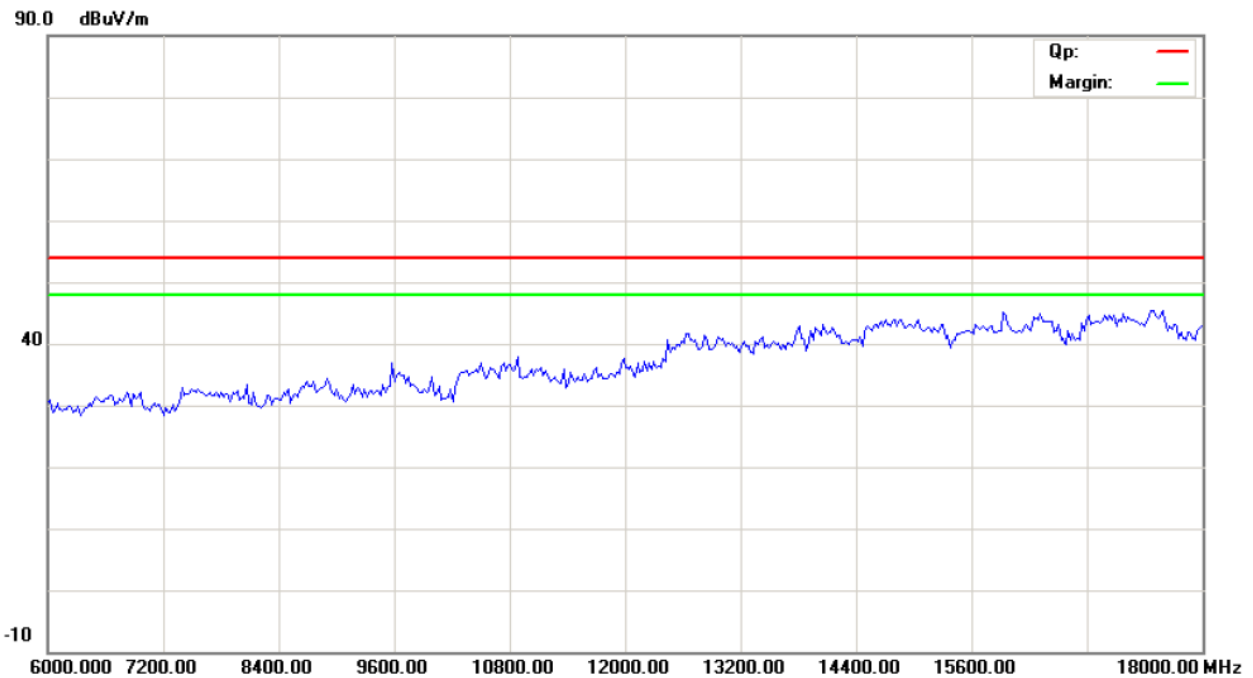
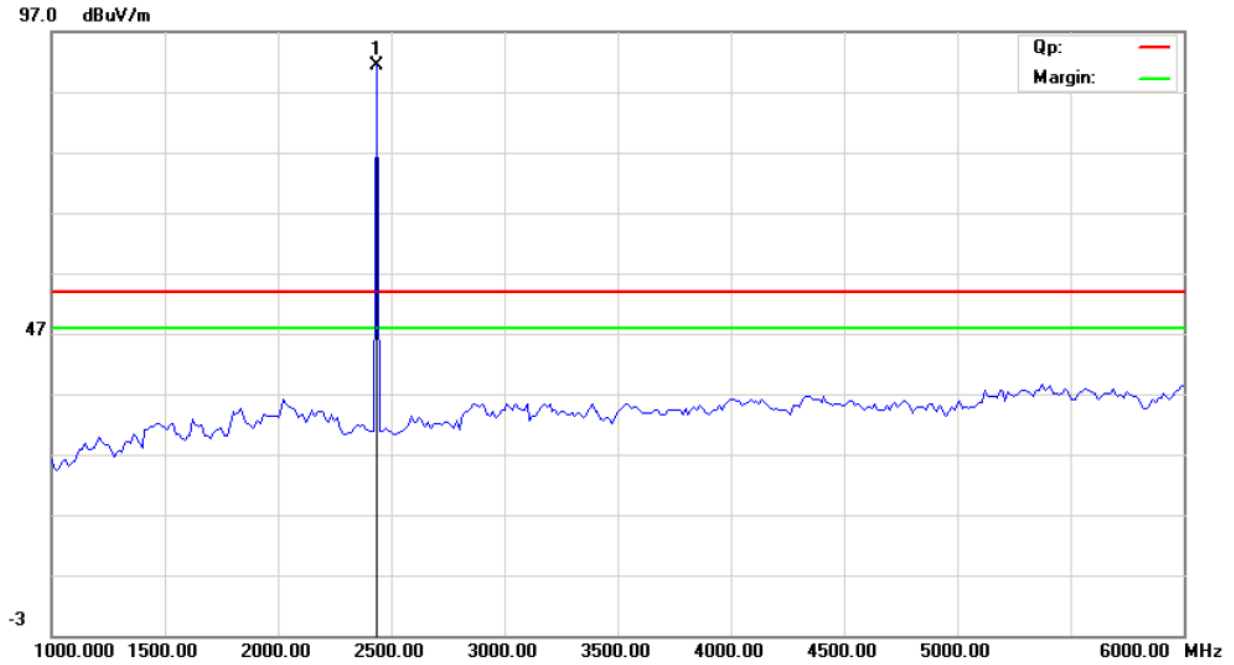


Low Channel : Vertical



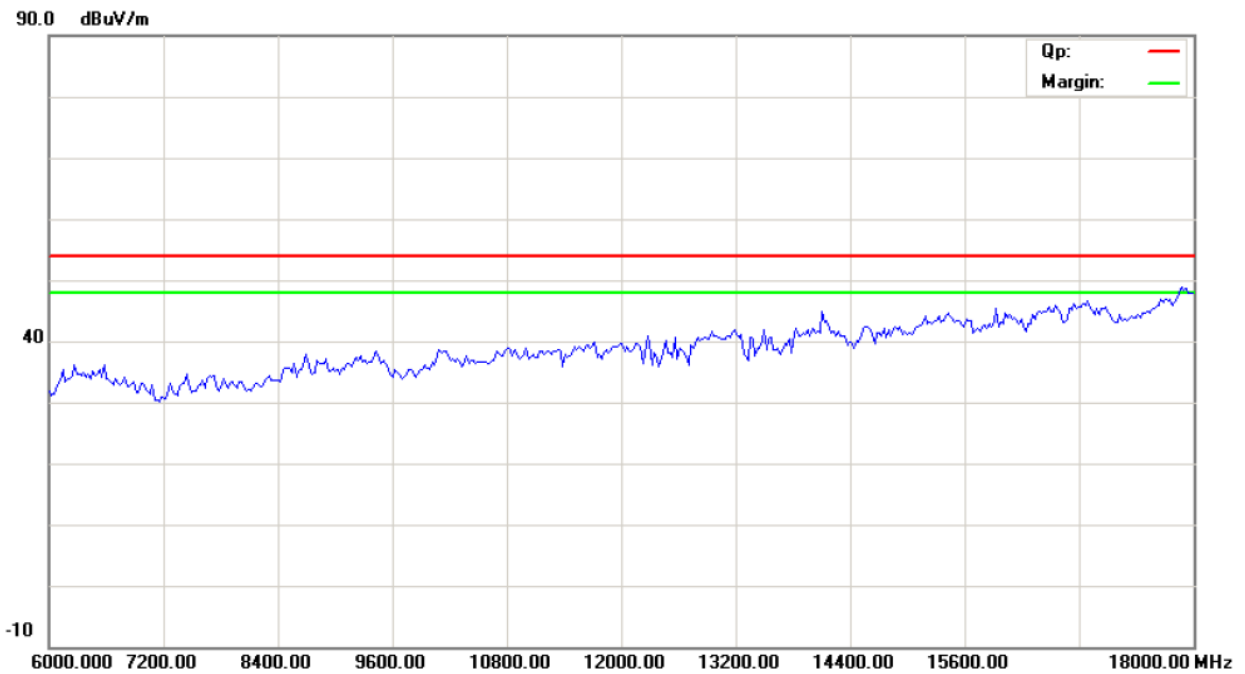
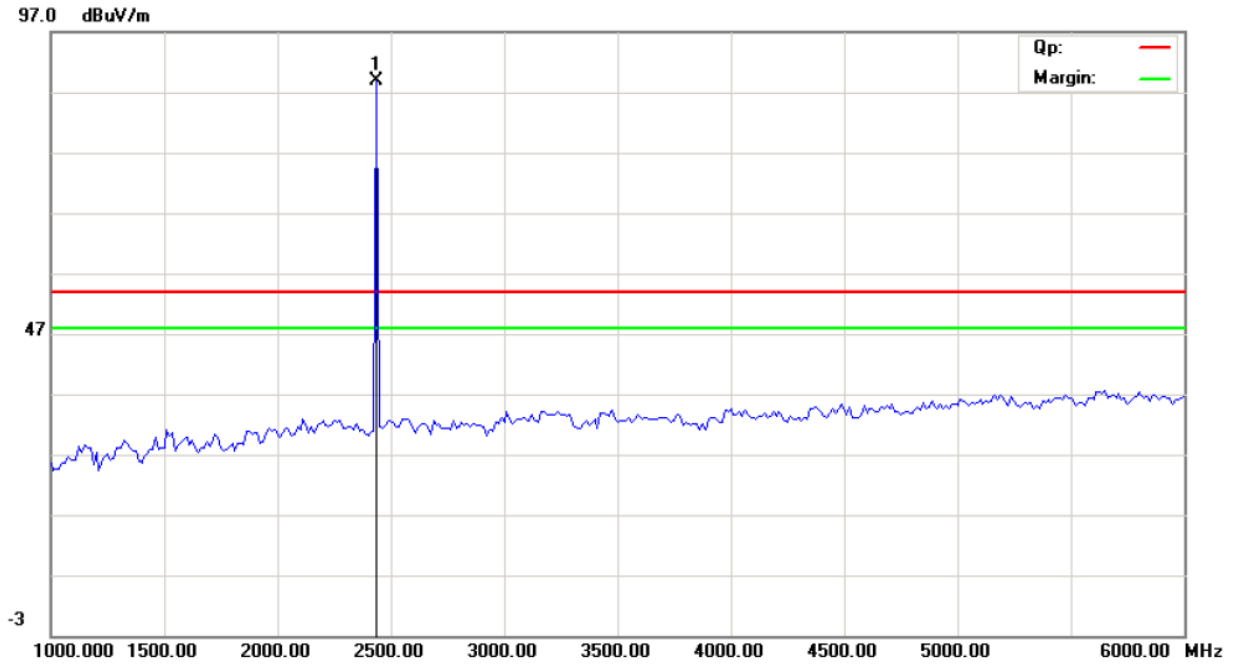


Middle Channel : Horizontal



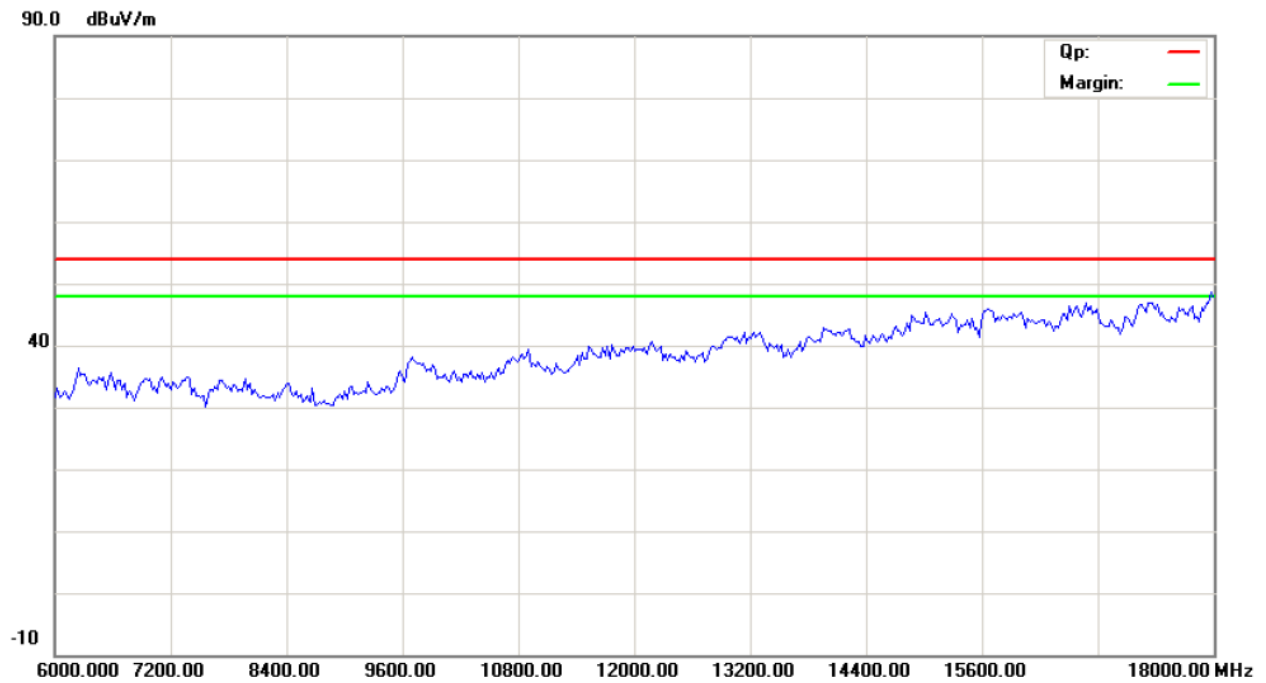
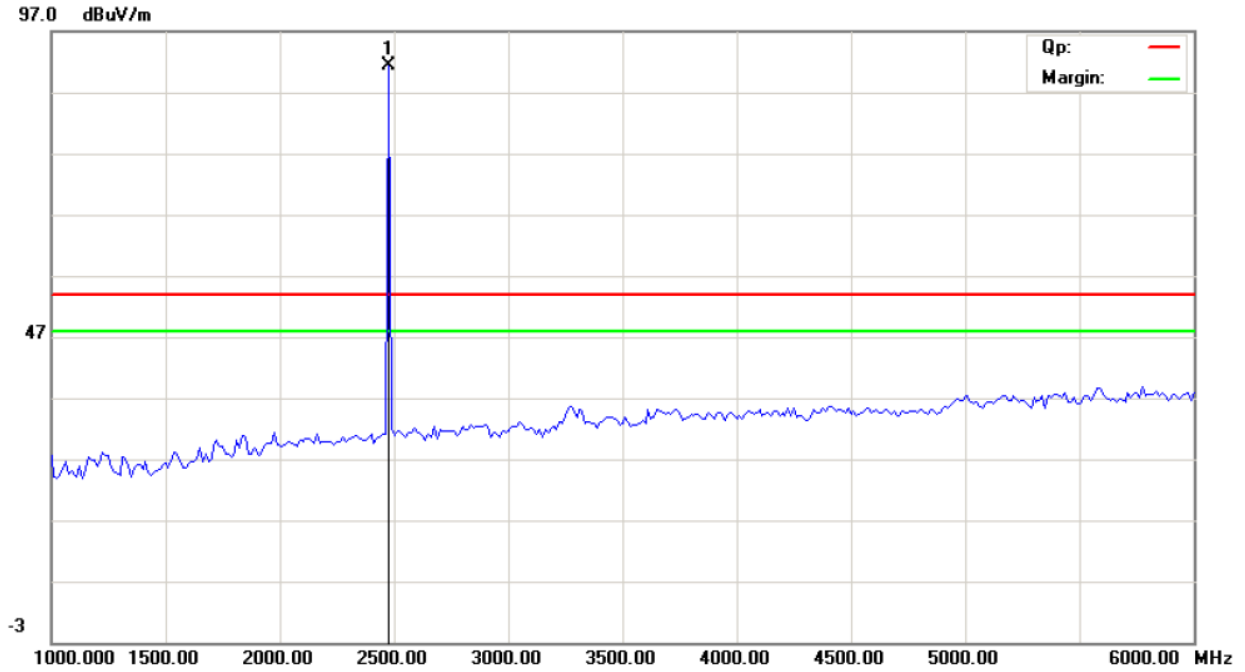


Middle Channel :: Vertical



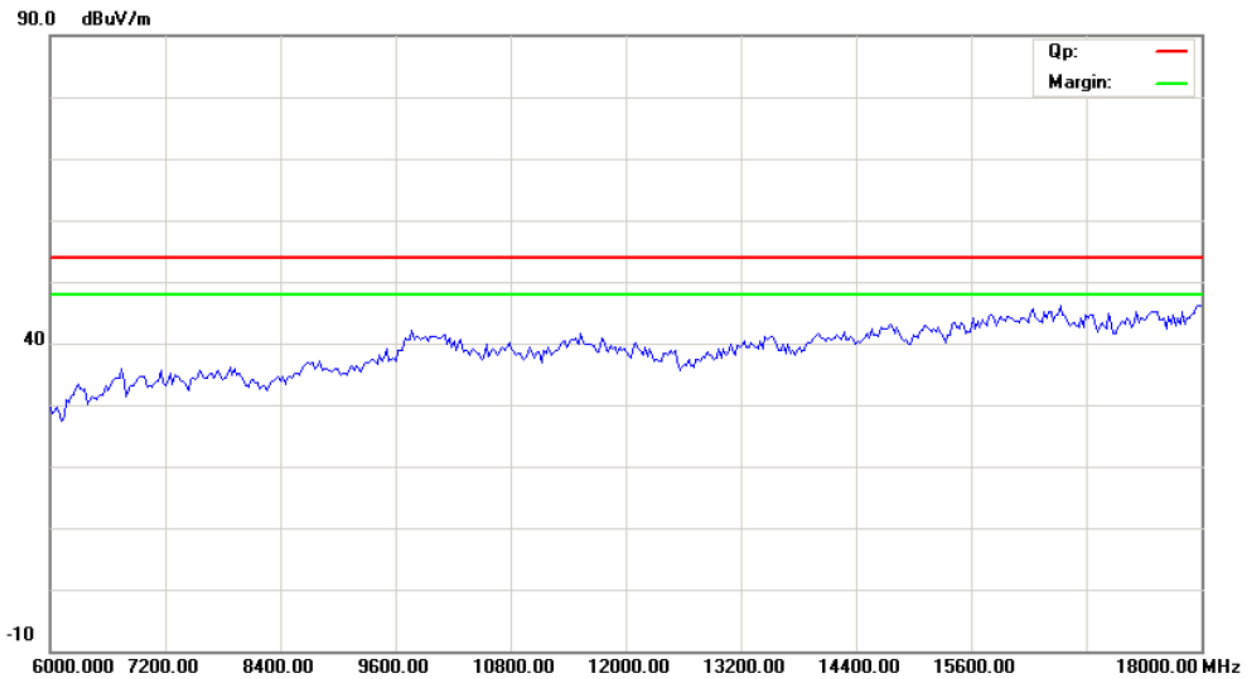
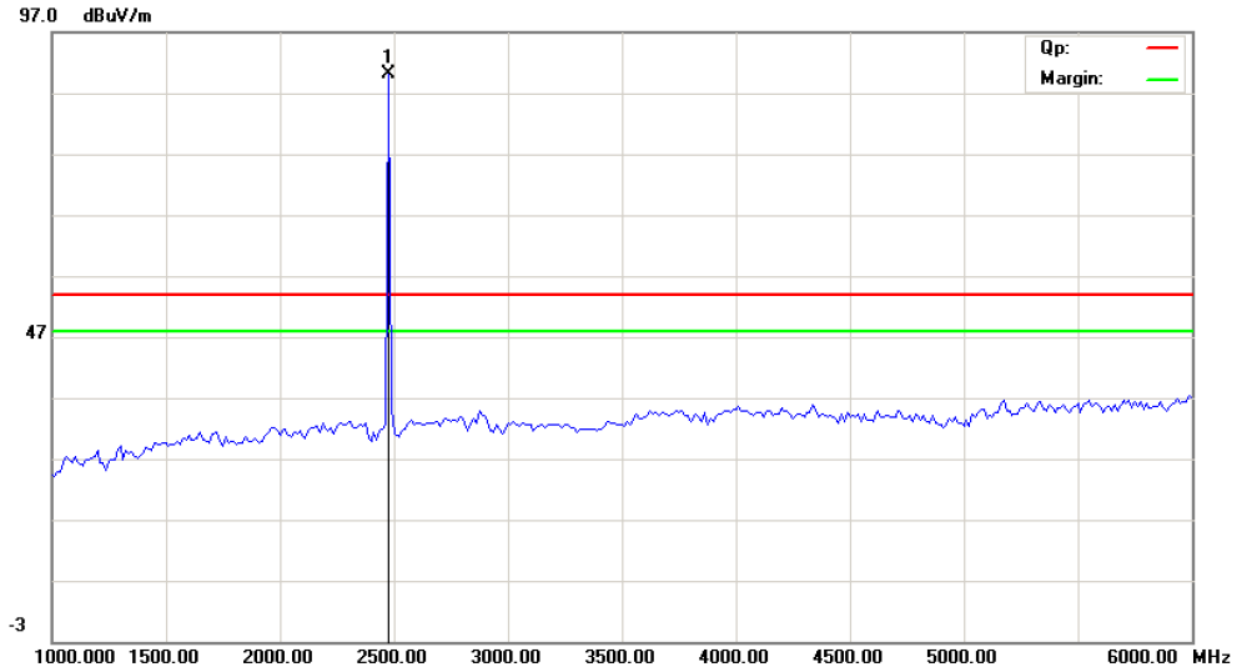


High Channel : Horizontal





High Channel : Vertical



Note: for the radiated emissions above 18G, it is the floor noise.



7.0 20dB Bandwidth Measurement

7.1 Regulation

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.

7.2 Limits of 20dB Bandwidth Measurement

N/A

7.3 Test Procedure.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span =3MHz, RBW =30 kHz, VBW=100 kHz, Sweep = auto
Detector function = peak, Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
6. Repeat above procedures until all frequencies measured were complete.

7.4 Test Result

Type of Modulation: GFSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	858	--	Pass
Middle	2441	846	--	Pass
High	2480	846	--	Pass



Test Figure:

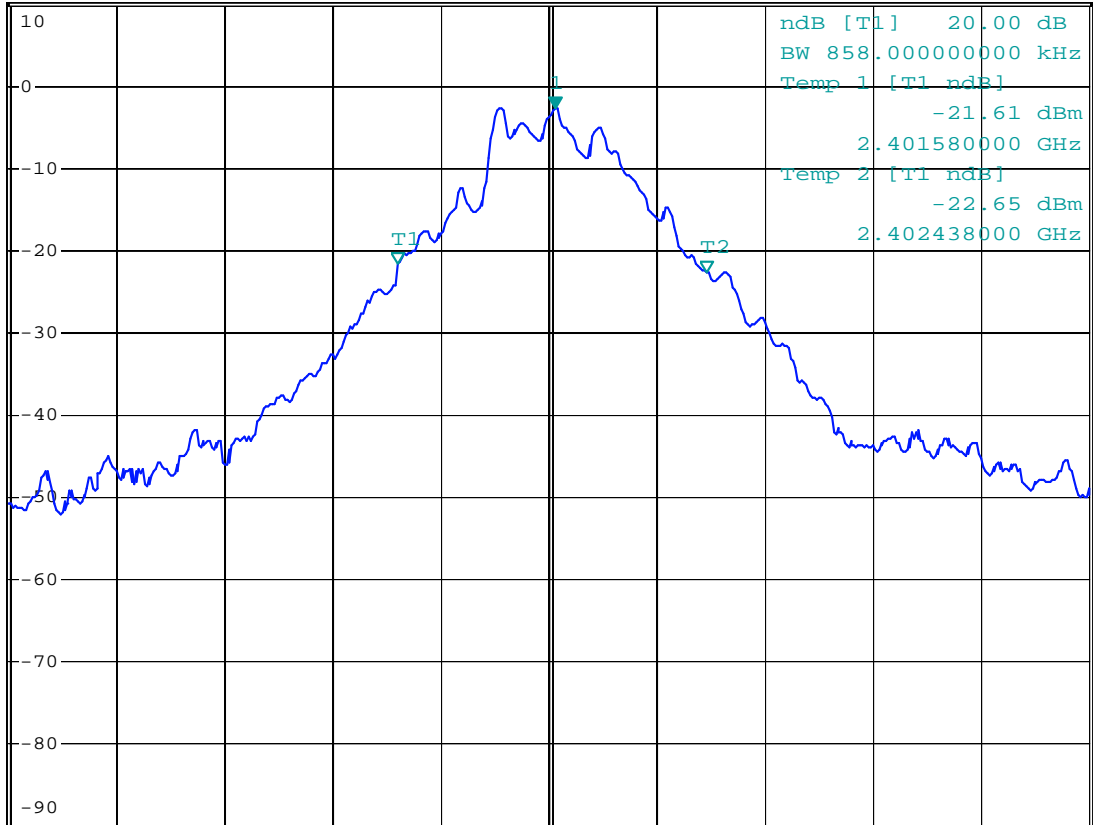
1. Condition: Low Channel



MARKER 1
 2.402018 GHz
 Ref 10 dBm * Att 20 dB

* RBW 30 kHz Marker 1 [T1]
 * VBW 100 kHz -2.62 dBm
 * SWT 5 ms 2.402018000 GHz

1 PK
MAXH



Center 2.402 GHz 300 kHz/ Span 3 MHz

Date: 9.SEP.2014 17:45:41



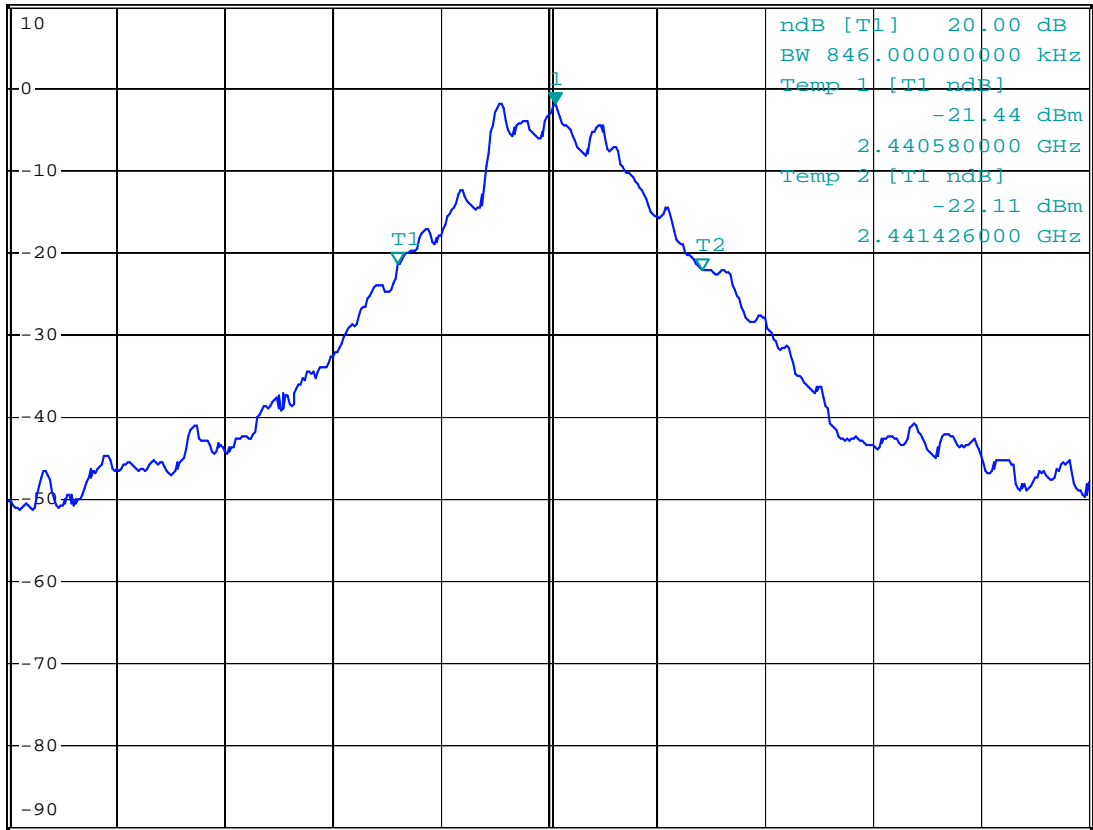
2. Condition: Middle Channel



MARKER 1
2.441018 GHz
Ref 10 dBm * Att 20 dB

* RBW 30 kHz Marker 1 [T1]
* VBW 100 kHz -2.00 dBm
* SWT 5 ms 2.441018000 GHz

1 PK
MAXH



Center 2.441 GHz 300 kHz/ Span 3 MHz

Date: 9.SEP.2014 17:46:24



3. High Channel

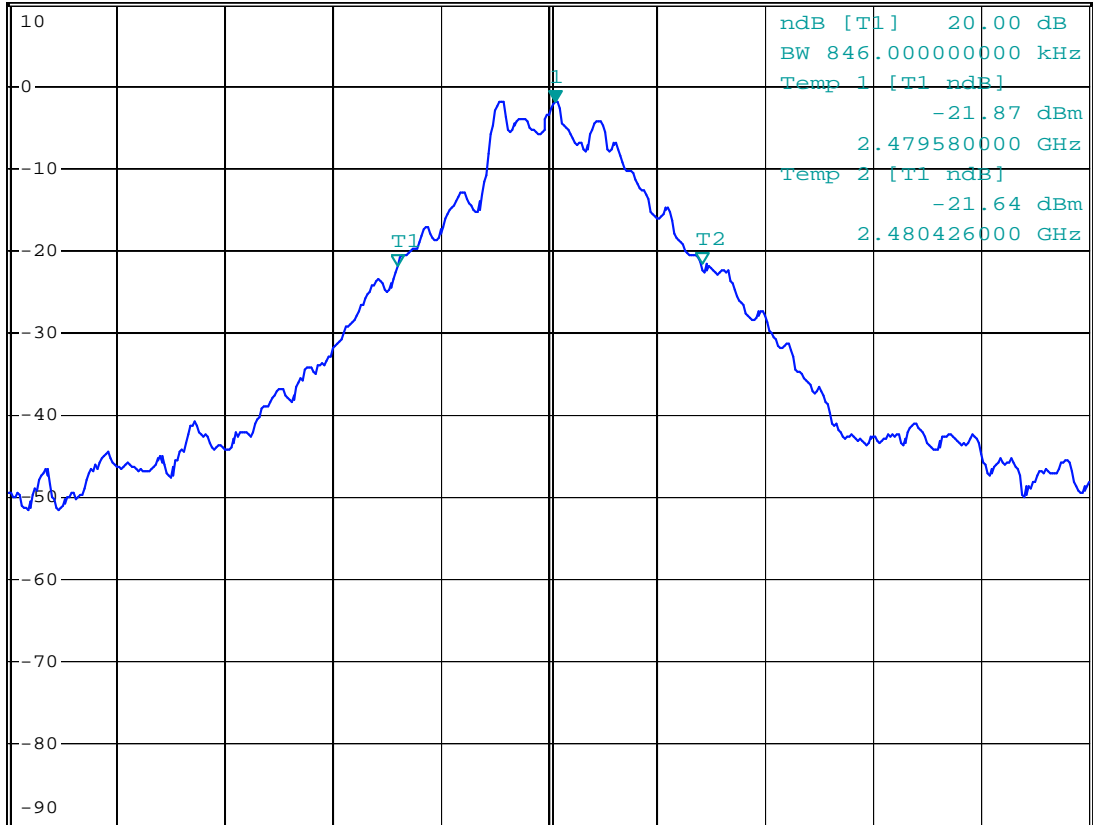


MARKER 1
2.480018 GHz

Ref 10 dBm *Att 20 dB

*RBW 30 kHz Marker 1 [T1]
*VBW 100 kHz -1.82 dBm
*SWT 5 ms 2.480018000 GHz

1 PK
MAXH



Center 2.48 GHz 300 kHz/ Span 3 MHz

Date: 9.SEP.2014 17:50:06



Test Result

Type of Modulation: $\pi/4$ DQPSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	1224	--	Pass
Middle	2441	1224	--	Pass
High	2480	1224	--	Pass

Test Figure:

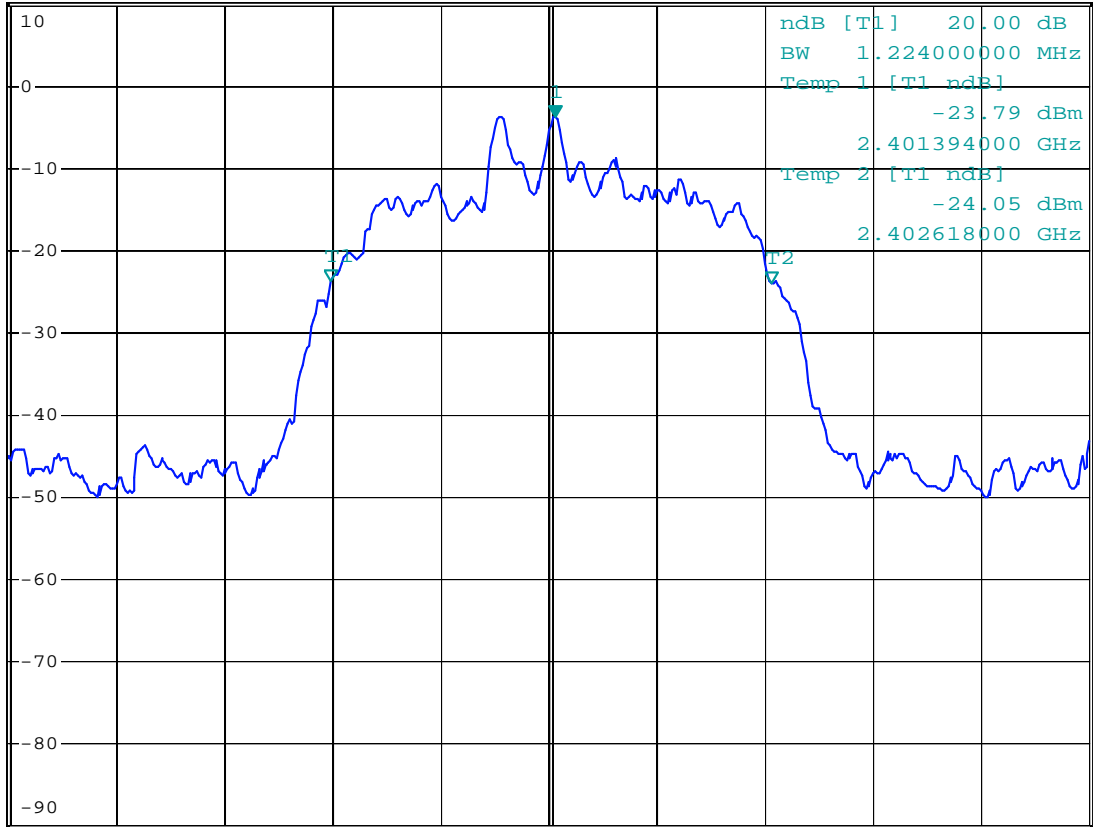
1. Condition: Low Channel



MARKER 1
2.402018 GHz
Ref 10 dBm *Att 20 dB

*RBW 30 kHz Marker 1 [T1]
*VBW 100 kHz -3.66 dBm
*SWT 5 ms 2.402018000 GHz

1 PK
MAXH



A

3DB

Center 2.402 GHz

300 kHz/

Span 3 MHz

Date: 9.SEP.2014 17:44:59



2. Condition: Middle Channel

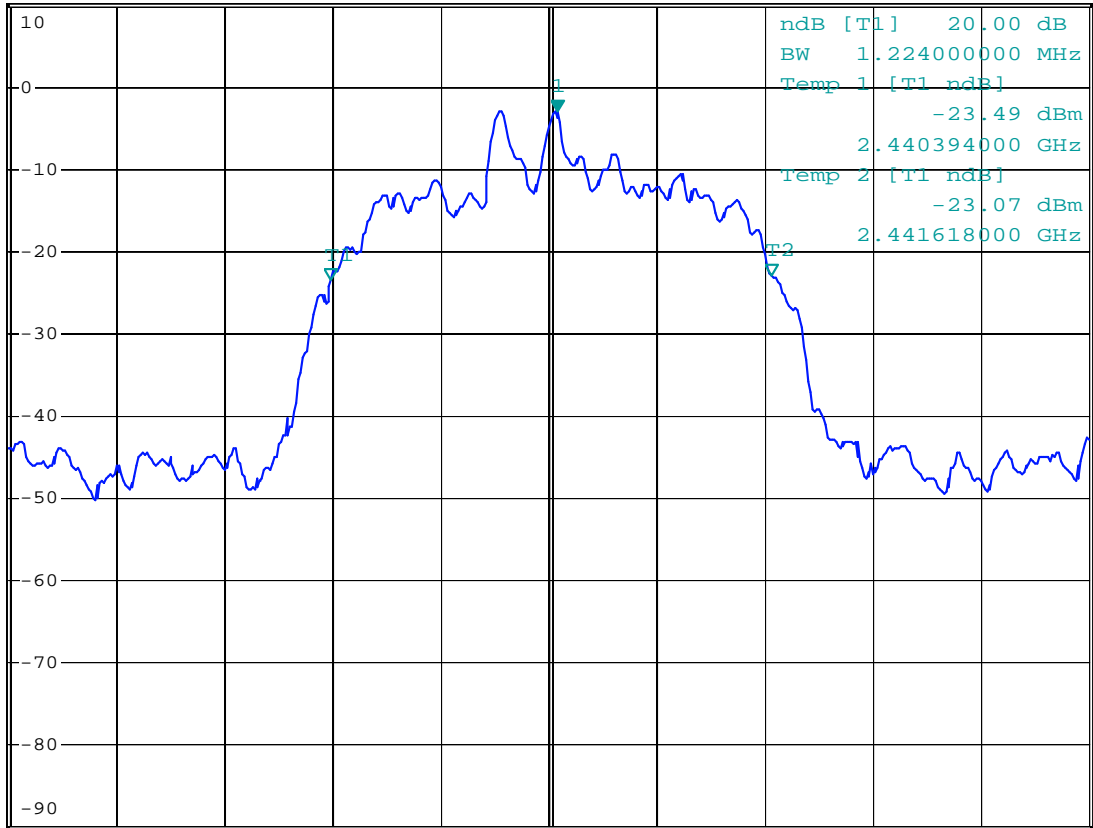


MARKER 1
2.441024 GHz

Ref 10 dBm * Att 20 dB

* RBW 30 kHz Marker 1 [T1]
* VBW 100 kHz -3.04 dBm
* SWT 5 ms 2.441024000 GHz

1 PK
MAXH



Center 2.441 GHz 300 kHz/ Span 3 MHz

Date: 9.SEP.2014 17:46:54



3. High Channel

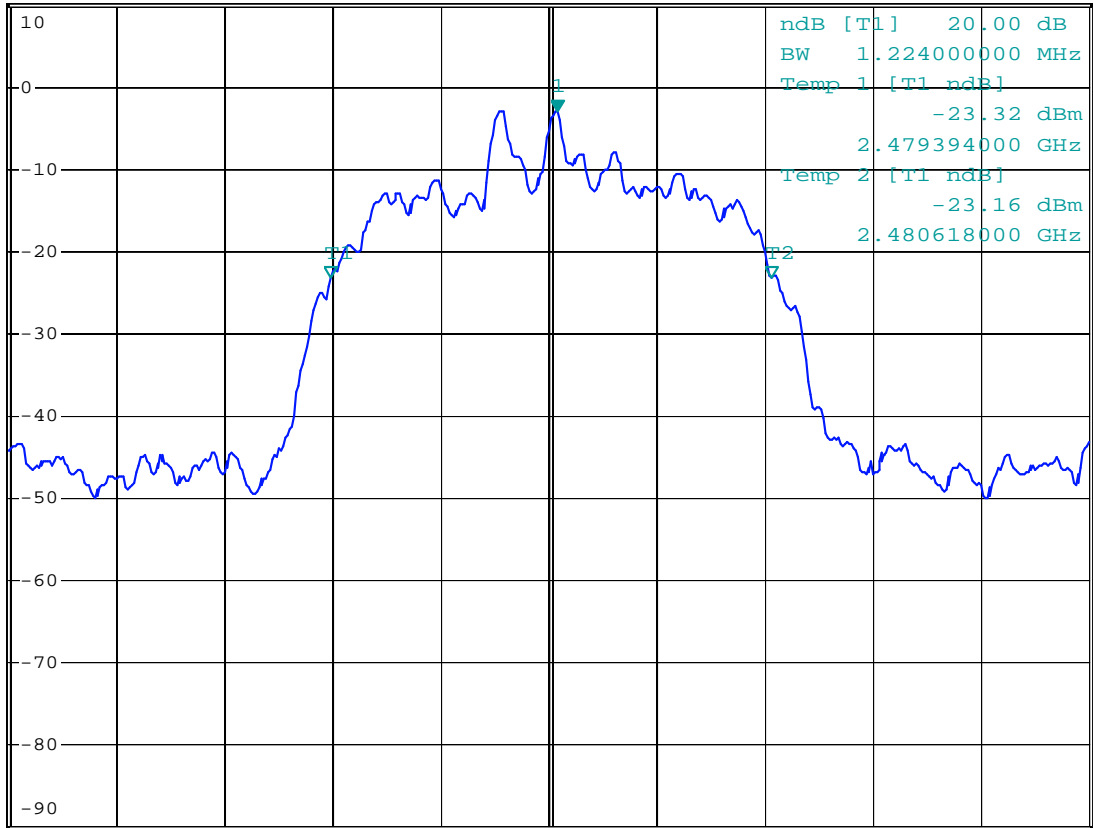


MARKER 1
2.480024 GHz

Ref 10 dBm * Att 20 dB

* RBW 30 kHz Marker 1 [T1]
* VBW 100 kHz -2.93 dBm
* SWT 5 ms 2.480024000 GHz

1 PK
MAXH



Center 2.48 GHz

300 kHz/

Span 3 MHz

Date: 9.SEP.2014 17:49:18



優耐檢測

Shenzhen United Testing Technology Co., Ltd.

Report No.: UNI-1408119

Test Result

Type of Modulation: 8DPSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	1218	--	Pass
Middle	2441	1266	--	Pass
High	2480	1224	--	Pass



Test Figure:

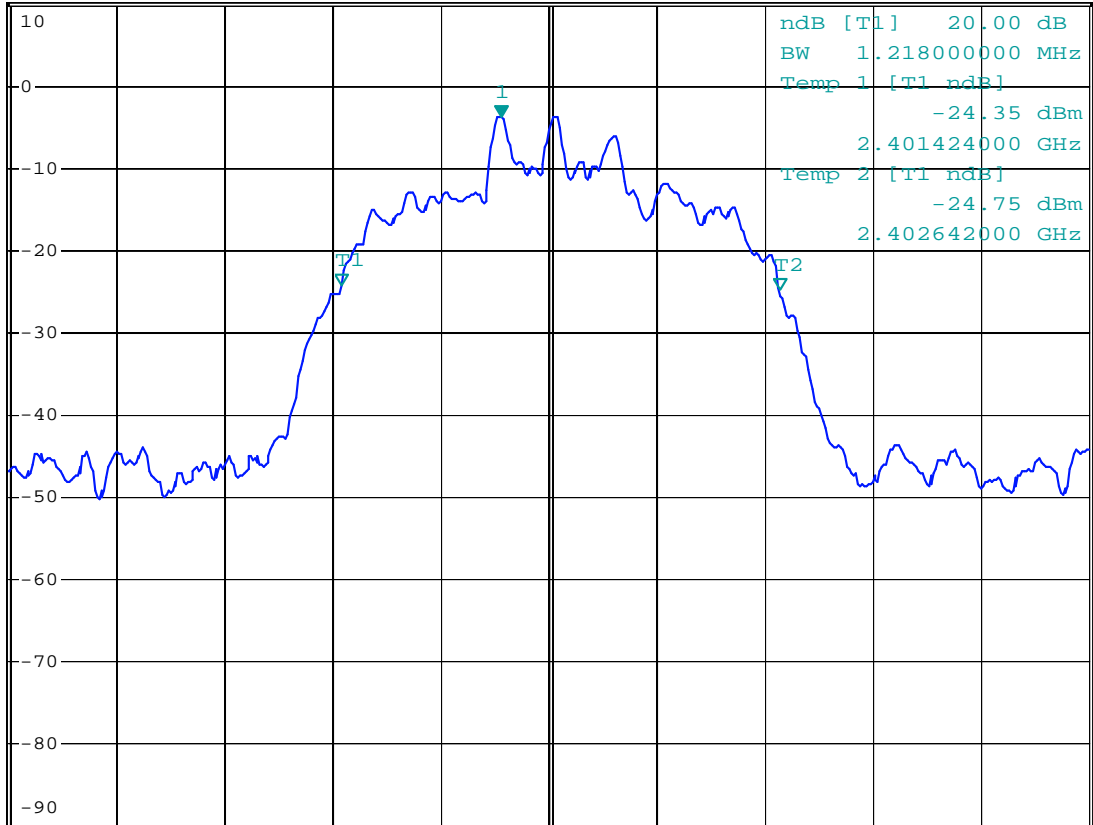
1. Condition: Low Channel



ndB DOWN VALUE
20 dB
Ref 10 dBm * Att 20 dB

* RBW 30 kHz Marker 1 [T1]
* VBW 100 kHz -3.65 dBm
* SWT 5 ms 2.401868000 GHz

1 PK
MAXH



Center 2.402 GHz 300 kHz/ Span 3 MHz

Date: 9.SEP.2014 17:44:20

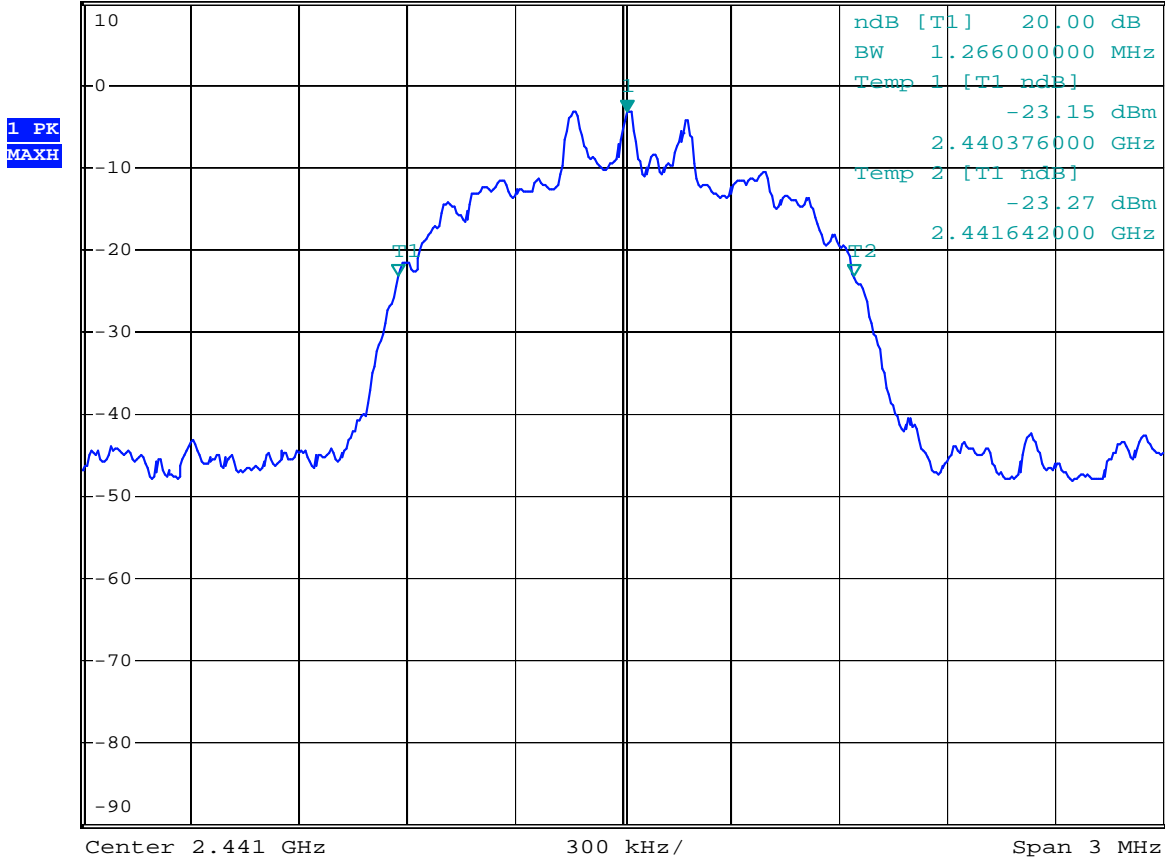


2. Condition: Middle Channel



MARKER 1
 2.441012 GHz
 Ref 10 dBm * Att 20 dB

* RBW 30 kHz Marker 1 [T1]
 * VBW 100 kHz -3.23 dBm
 * SWT 5 ms 2.441012000 GHz



Date: 9.SEP.2014 17:47:36



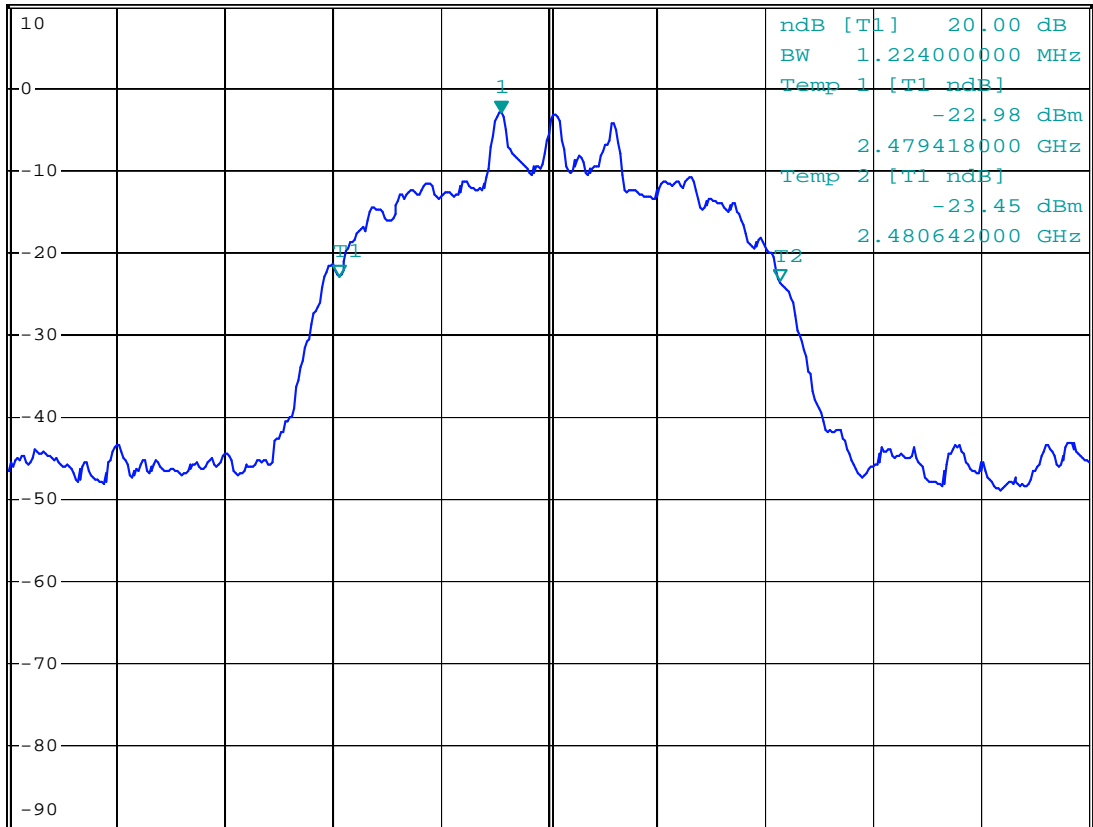
3. High Channel



MARKER 1
 2.479868 GHz
 Ref 10 dBm *Att 20 dB

*RBW 30 kHz Marker 1 [T1]
 *VBW 100 kHz -2.98 dBm
 *SWT 5 ms 2.479868000 GHz

1 PK
MAXH



Center 2.48 GHz 300 kHz/ Span 3 MHz

Date: 9.SEP.2014 17:48:20



8. Maximum Peak Output Power

8.1 Regulation

According to §15.247(b)(1), 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 2400-2483.5MHz band:0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Limits of Maximum Peak Output Power

The Maximum Peak Output Power Measurement is 30dBm.

8.3 Test Procedure

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel ; RBW > the 20 dB bandwidth of the emission being measured ; VBW = RBW=3MHz ; Sweep = auto ; Detector function = peak ; Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
4. Repeat above procedures until all frequencies measured were complete.



8.4 Test Results

Type of Modulation: GFSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	0.56	30	Pass
Middle	2441	0.72	30	Pass
High	2480	1.23	30	Pass

Note: 1. the result basic equation calculation as follow:

Peak Power Output = Peak Power Reading + Cable loss + Attenuator

2. The worse case was recorded

Type of Modulation: 11/4DQPSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	-1.05	30	Pass
Middle	2441	-0.87	30	Pass
High	2480	-0.22	30	Pass

Note: 1. the result basic equation calculation as follow:

Peak Power Output = Peak Power Reading + Cable loss + Attenuator

2. The worse case was recorded



優耐檢測

Shenzhen United Testing Technology Co., Ltd.

Report No.: UNI-1408119

Type of Modulation: 8DPSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	-0.76	30	Pass
Middle	2441	-0.39	30	Pass
High	2480	-0.06	30	Pass

Note: 1. the result basic equation calculation as follow:

$$\text{Peak Power Output} = \text{Peak Power Reading} + \text{Cable loss} + \text{Attenuator}$$

2. The worse case was recorded



9. Carrier Frequency Separation

9.1 Regulation

According to §15.247(a)(1), 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.

9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

9.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW) \geq 1% of the span; Video (or Average) Bandwidth (VBW) \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.



9.4 Test Result

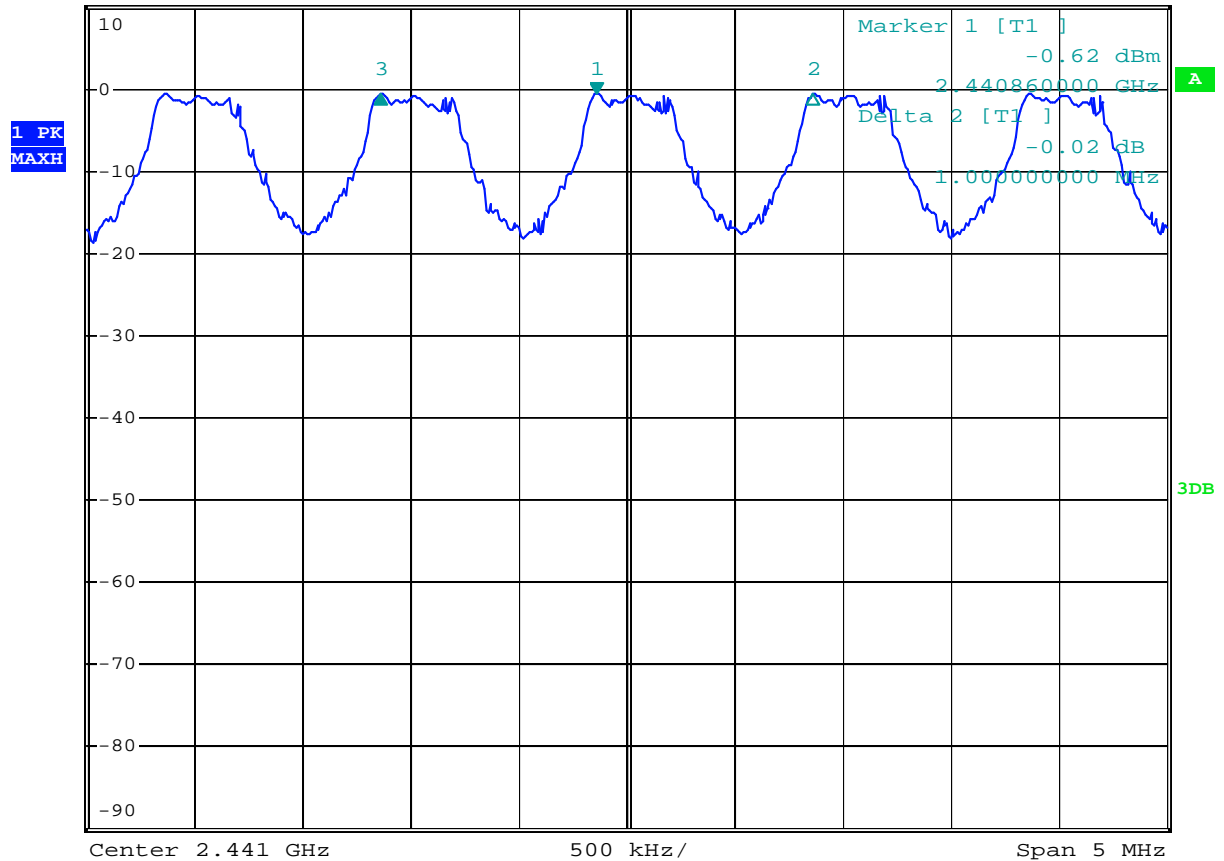
Type of Modulation: GFSK

EUT	Shower Speaker	Model	SP58116-WH
Mode	Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH
Carrier Frequency Separation	Limit		Pass/ Fail
1.000MHz	≥ 25 kHz or 2/3 of 20 dB bandwidth		Pass

Test Plots



Ref 10 dBm * Att 20 dB * RBW 100 kHz Delta 3 [T1] -0.02 dB
 * VBW 300 kHz * SWT 10 ms -1.000000000 MHz



Date: 9.SEP.2014 17:15:44



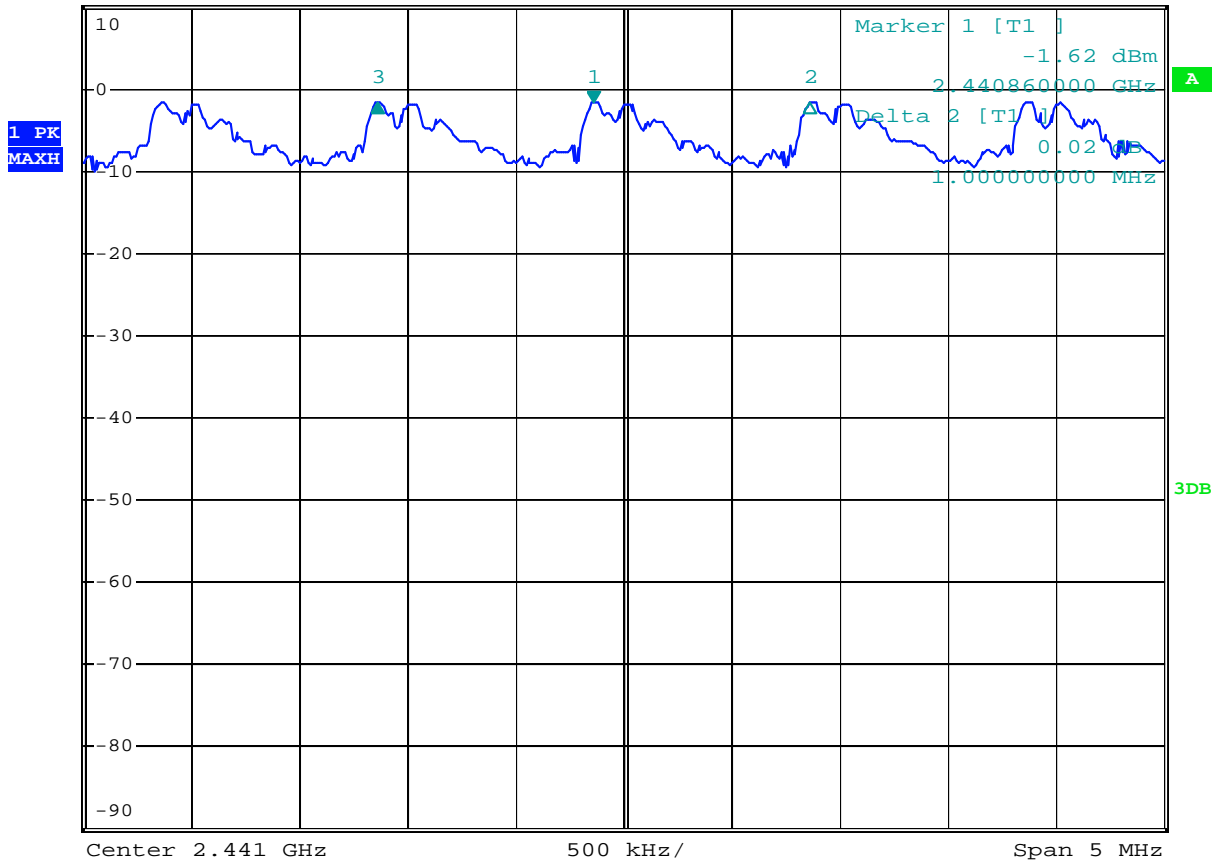
Type of Modulation: $\pi/4$ DQPSK

EUT	Shower Speaker	Model	SP58116-WH
Mode	Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH
Carrier Frequency Separation	Limit		Pass/ Fail
1.000MHz	≥ 25 kHz or 2/3 of 20 dB bandwidth		Pass

Test Plots



Ref 10 dBm * Att 20 dB * RBW 100 kHz Delta 3 [T1] -0.03 dB
 * VBW 300 kHz * SWT 10 ms -1.000000000 MHz



Date: 9.SEP.2014 17:12:49



Type of Modulation: 8DPSK

EUT	Shower Speaker	Model	SP58116-WH
Mode	Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH
Carrier Frequency Separation	Limit		Pass/ Fail
1.000MHz	≥ 25 kHz or 2/3 of 20 dB bandwidth		Pass

Test Plots



DELTA MARKER 3

-1 MHz

Ref 10 dBm

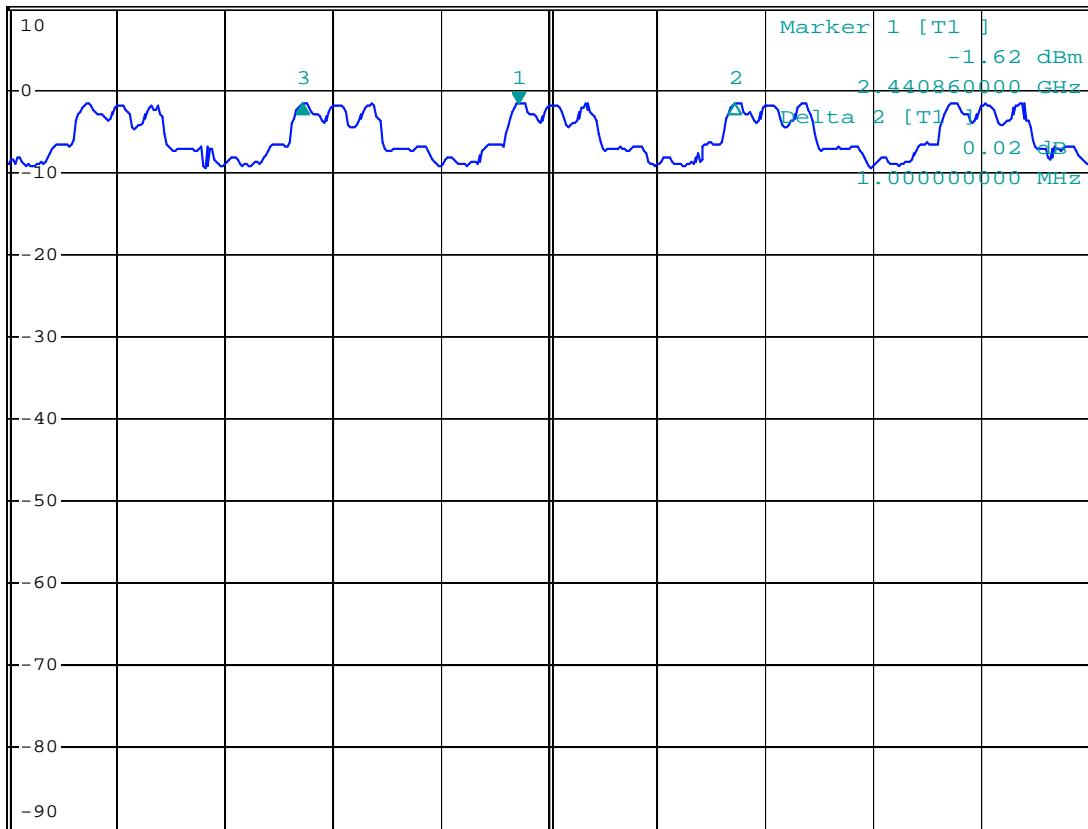
*Att 20 dB

*RBW 100 kHz Delta 3 [T1]

*VBW 300 kHz -0.01 dB

*SWT 10 ms -1.000000000 MHz

1 PK
MAXH



Center 2.441 GHz

500 kHz/

Span 5 MHz

Date: 9.SEP.2014 17:09:07



10. Number of Hopping Channels

10.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), 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.

10.2 Limits of Number of Hopping Channels

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

10.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW=100kHz, VBW=300 kHz;
Sweep = auto; Detector function = peak; Trace = max hold
3. Record the number of hopping channels.



10.4 Test Result

Type of Modulation: GFSK

EUT	Shower Speaker	Model	SP58116-WH	
Mode	Hopping On	Input Voltage	DC3.7V	
Temperature	24 deg. C,	Humidity	56% RH	
Operating Frequency	Number of hopping channels		Limit	Pass/ Fail
2402-2480MHz	79		≥ 15	Pass

Test Plot

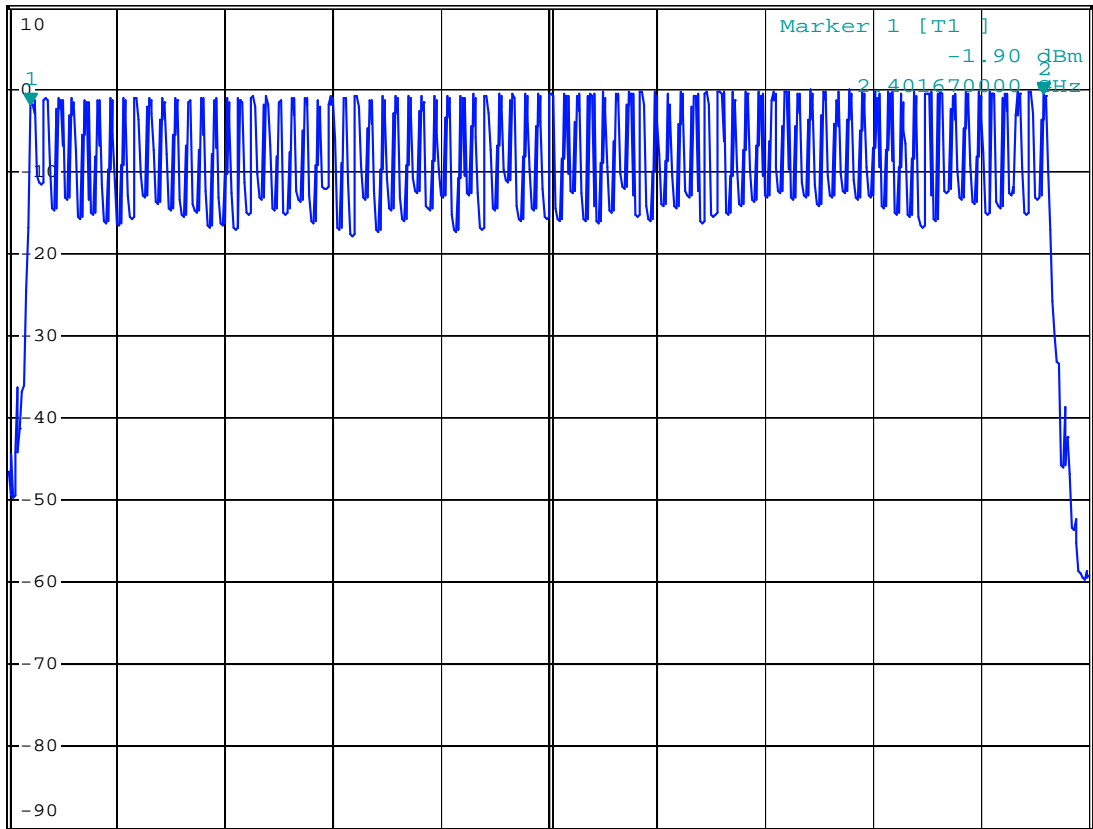


MARKER 2
2.479993 GHz

Ref 10 dBm * Att 20 dB

* RBW 100 kHz Marker 2 [T1]
* VBW 300 kHz -0.69 dBm
* SWT 10 ms 2.479993000 GHz

1 PK
MAXH



Start 2.4 GHz 8.35 MHz/ Stop 2.4835 GHz

Date: 9.SEP.2014 16:56:09



Type of Modulation: $\pi/4$ DQPSK

EUT	Shower Speaker	Model	SP58116-WH
Mode	Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH
Operating Frequency	Number of hopping channels	Limit	Pass/ Fail
2402-2480MHz	79	≥ 15	Pass

Test Plot

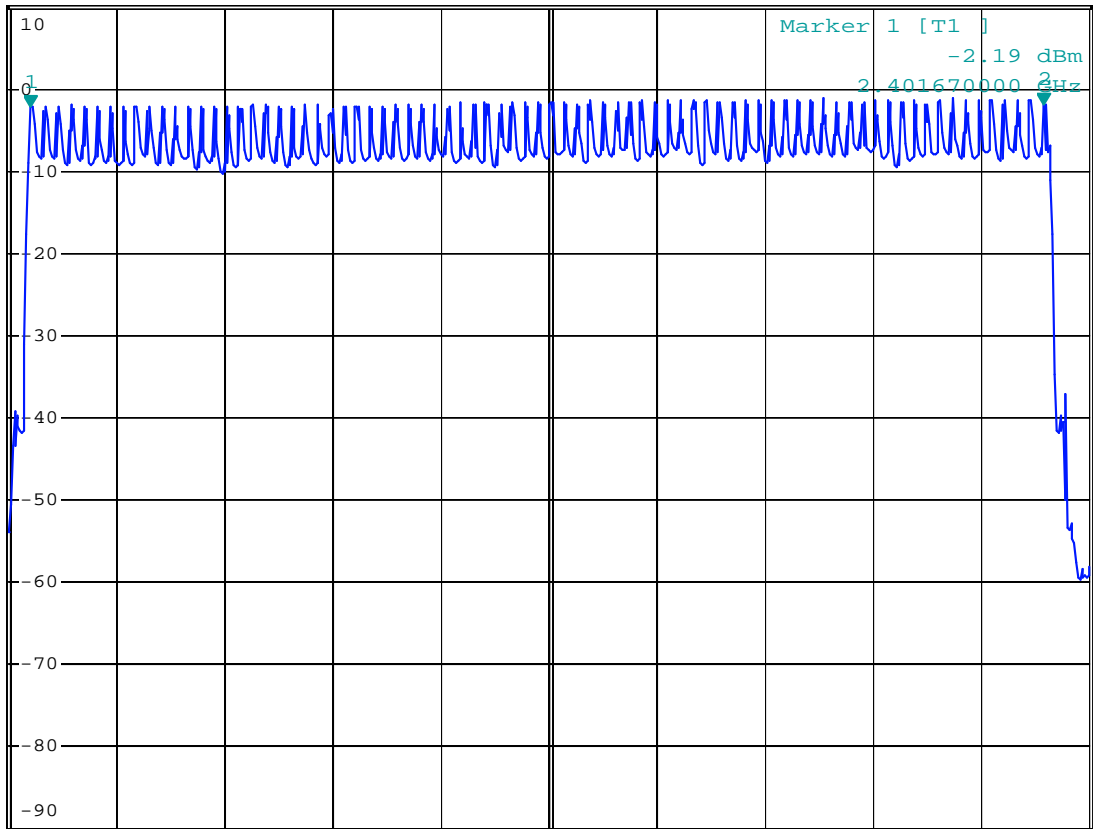


MARKER 2
2.479993 GHz

Ref 10 dBm * Att 20 dB

* RBW 100 kHz Marker 2 [T1]
* VBW 300 kHz -1.88 dBm
* SWT 10 ms 2.479993000 GHz

1 PK
MAXH



Start 2.4 GHz 8.35 MHz/ Stop 2.4835 GHz

Date: 9.SEP.2014 16:52:07



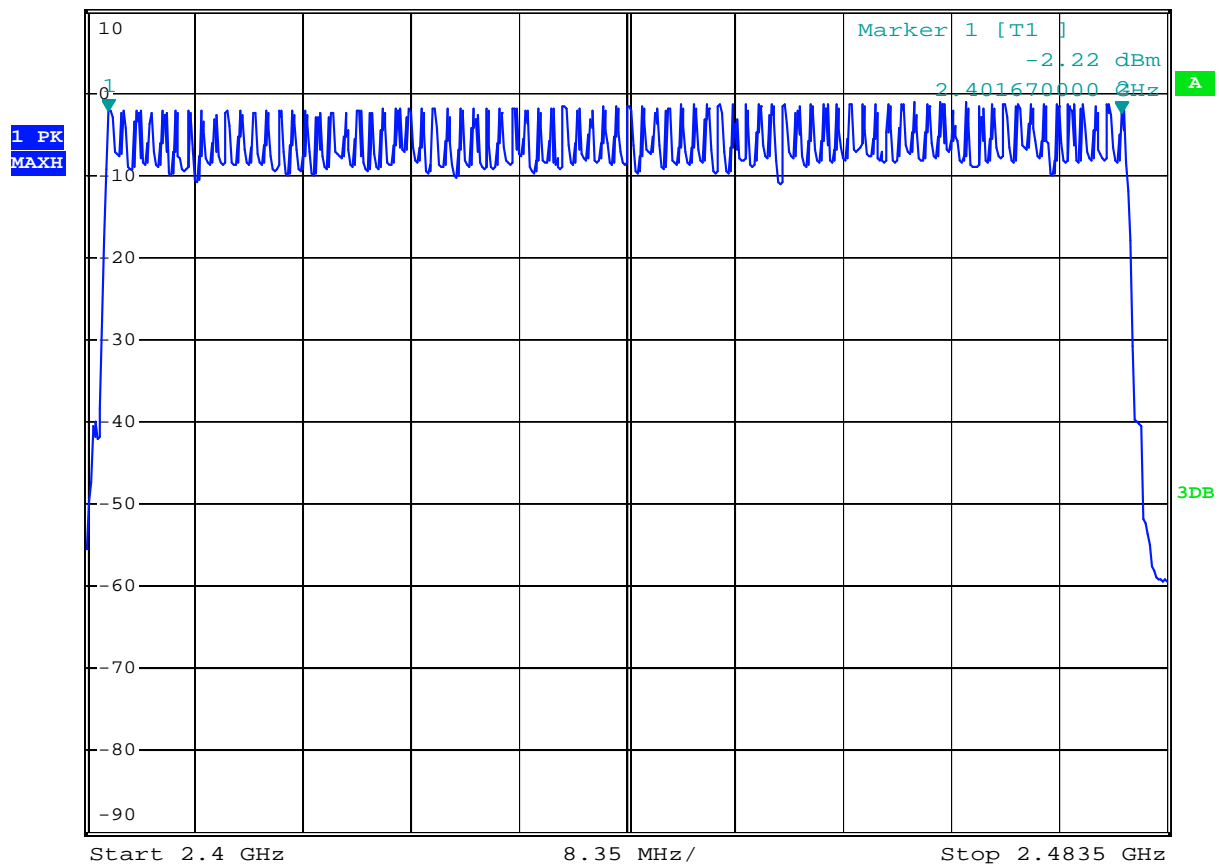
Type of Modulation: 8DPSK

EUT	Shower Speaker	Model	SP58116-WH
Mode	Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH
Operating Frequency	Number of hopping channels	Limit	Pass/ Fail
2402-2480MHz	79	≥ 15	Pass

Test Plot



Ref 10 dBm * Att 20 dB * RBW 100 kHz Marker 2 [T1]
 * VBW 300 kHz -2.35 dBm
 * SWT 10 ms 2.479993000 GHz



Date: 9.SEP.2014 17:00:25



11. Time of Occupancy (Dwell Time)

11.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

11.2 Limits of Carrier Frequency Separation

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

11.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW \geq RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold
3. Measure the dwell time using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.
5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.



11.4 Test Result

Type of Modulation: GFSK

EUT	Shower Speaker		Model	SP58116-WH
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Reading	Hopping Rate	Actual	Limit
Low	2.96ms	266.667 hop/s	0.316s	0.4s
Middle	2.96ms	266.667 hop/s	0.316s	0.4s
High	3.02	266.667 hop/s	0.322s	0.4s

Actual = Reading × (Hopping rate / Number of channels) × Test period, Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

Note: DH5 was the worse case



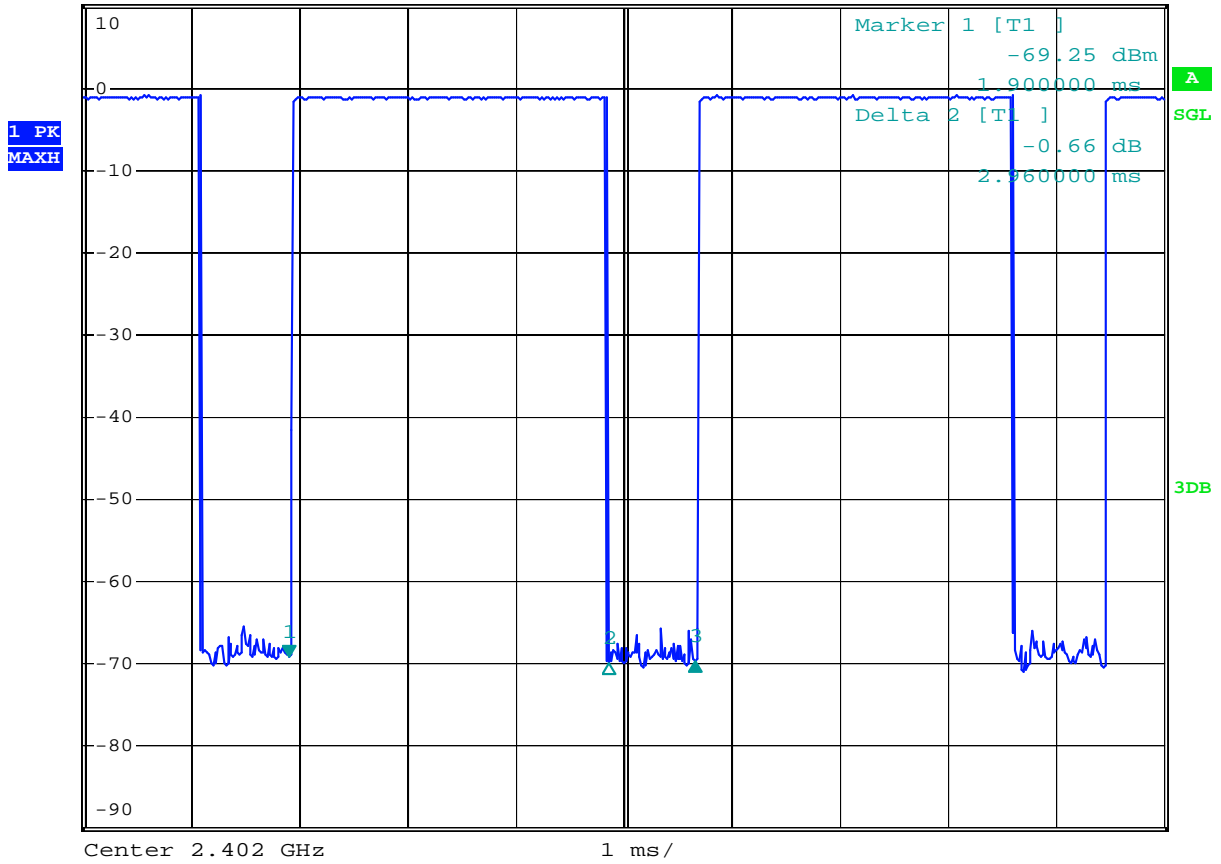
Test Plots:

Low Channel:



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz -0.39 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 18:01:43

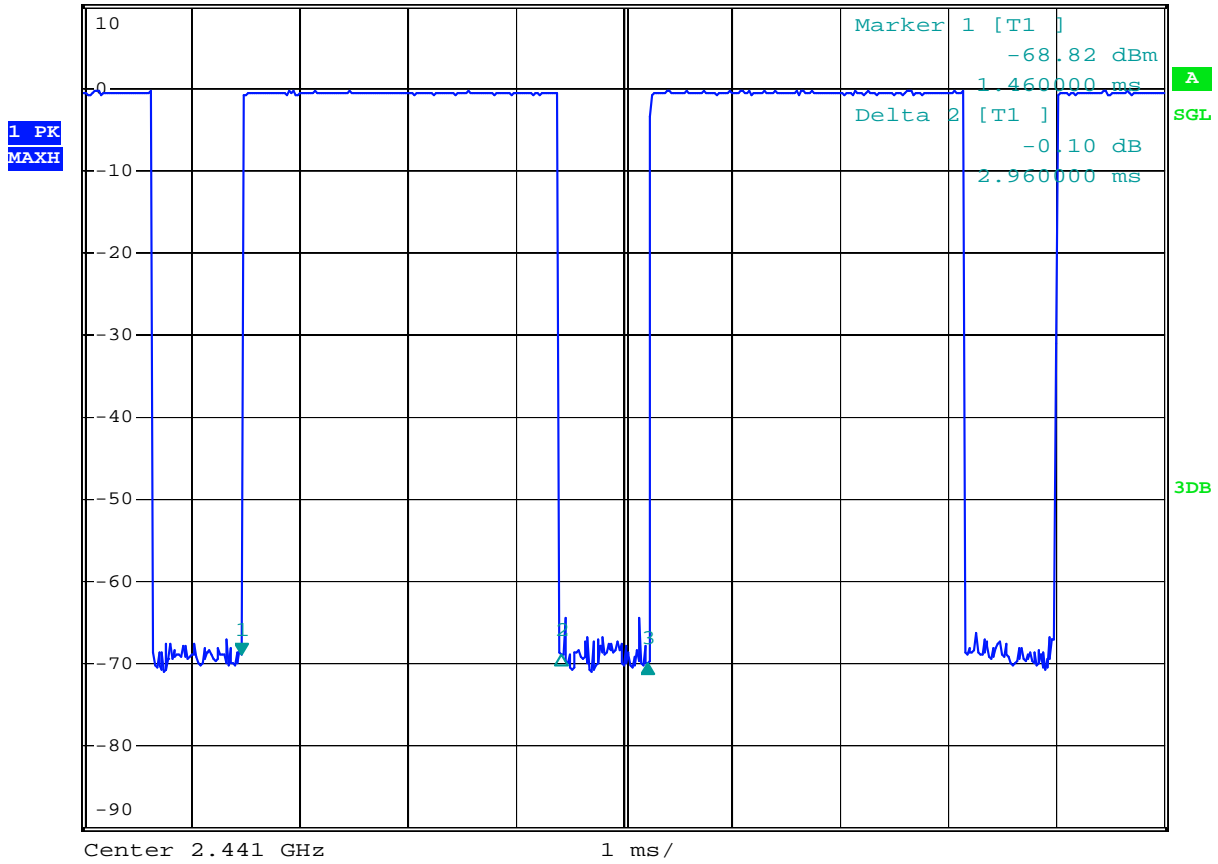


Middle Channel:



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz -1.11 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 17:59:55

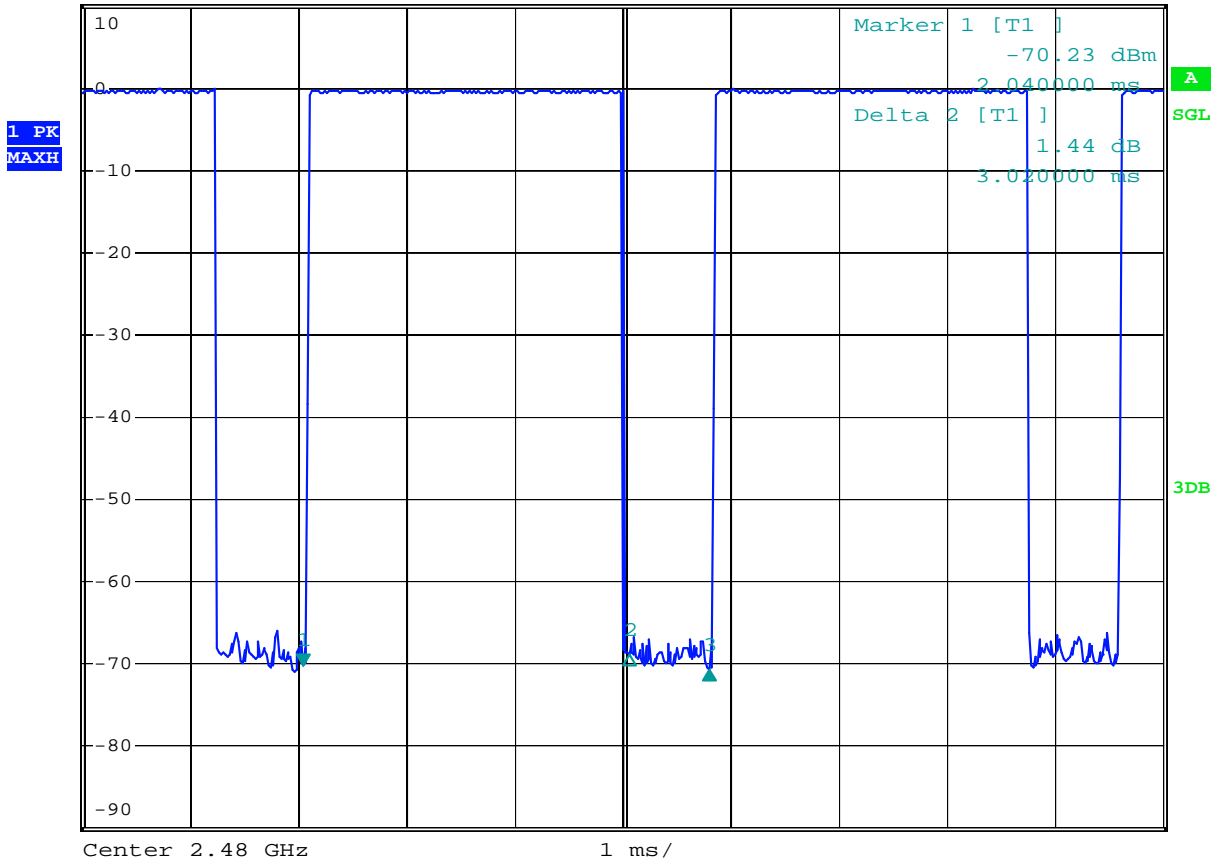


High Channel



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz -0.51 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 17:51:55



Test Result

Type of Modulation: $\pi/4$ DQPSK

EUT	Shower Speaker		Model	SP58116-WH	
Mode	Keep Transmitting		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel	Reading	Hopping Rate	Actual	Limit	
Low	2.96ms	266.667 hop/s	0.316s	0.4s	
Middle	2.98ms	266.667 hop/s	0.318s	0.4s	
High	2.98ms	266.667 hop/s	0.318s	0.4s	

Actual = Reading × (Hopping rate / Number of channels) × Test period, Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

Note: DH5 was the worse case



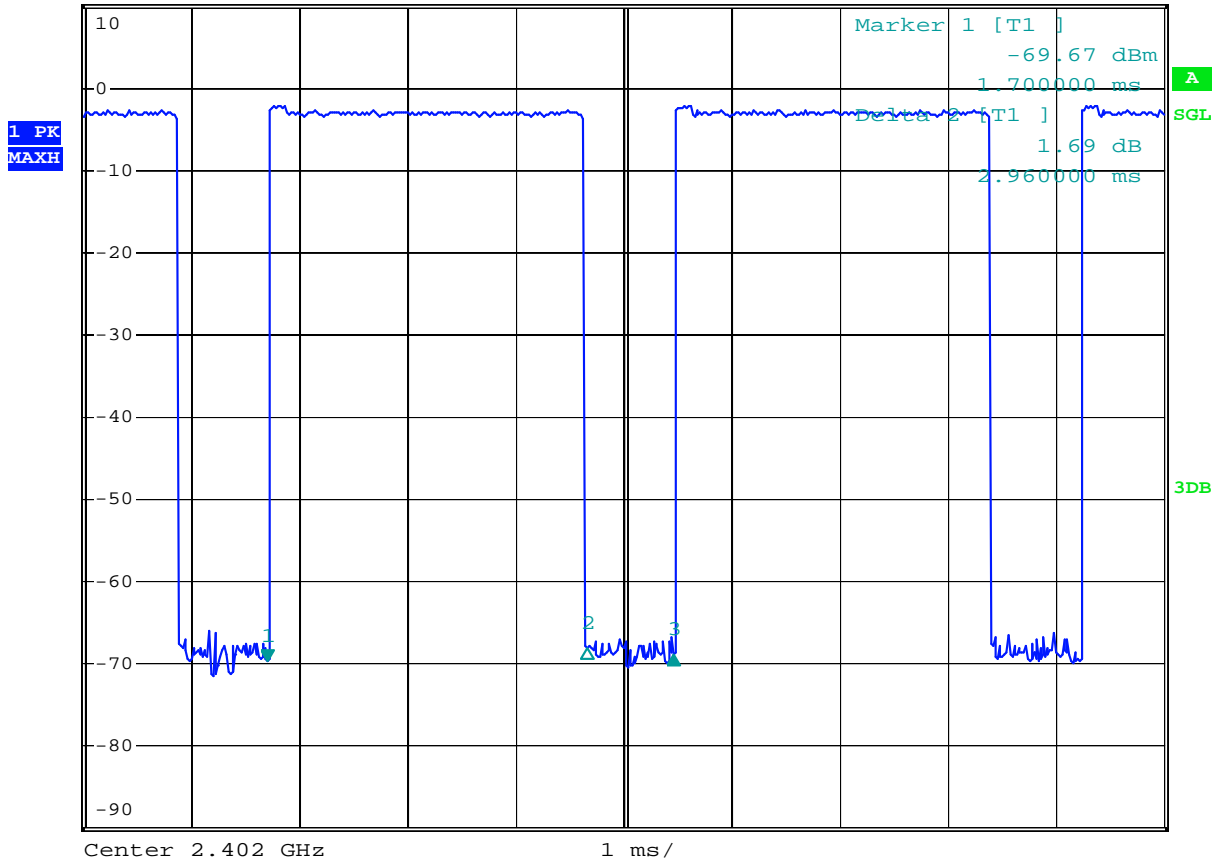
Test Plots:

Low Channel:



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz 0.78 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 18:03:03

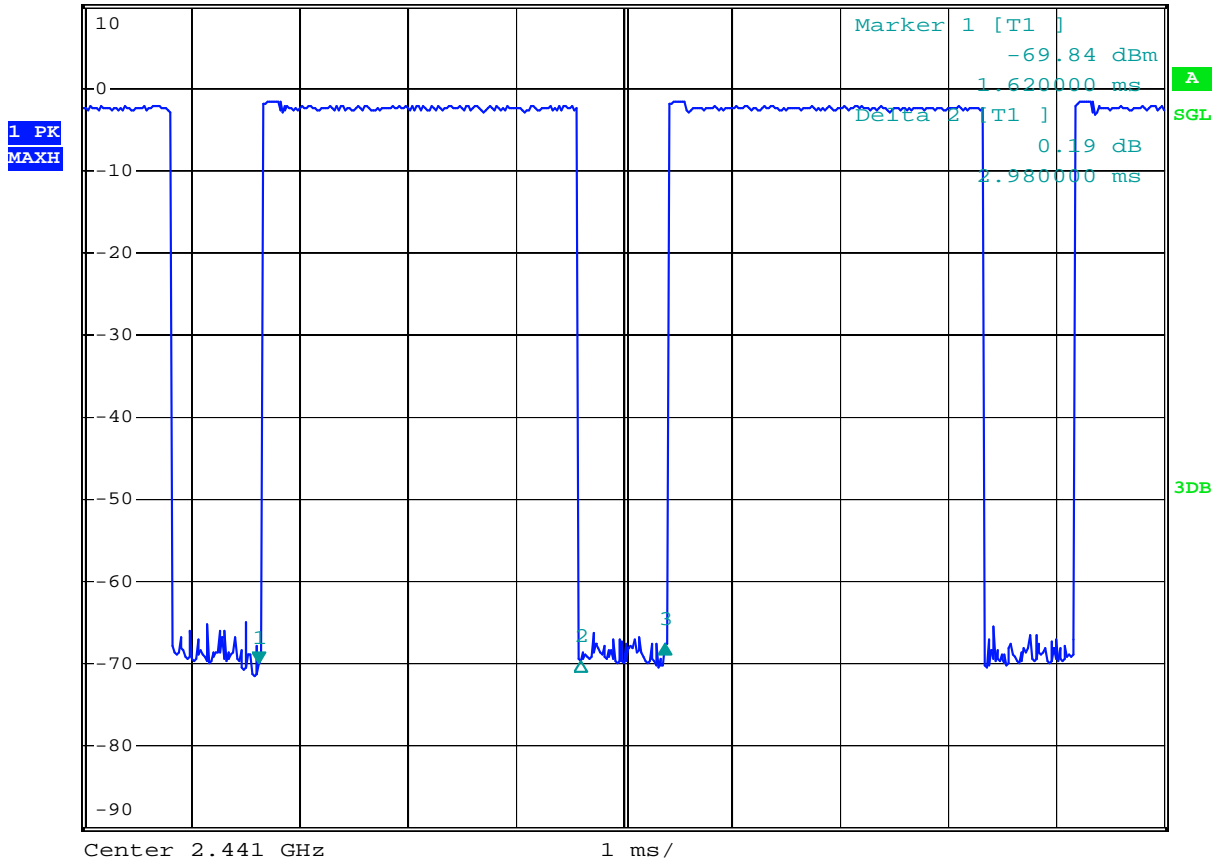


Middle Channel:



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz 2.27 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 17:58:47

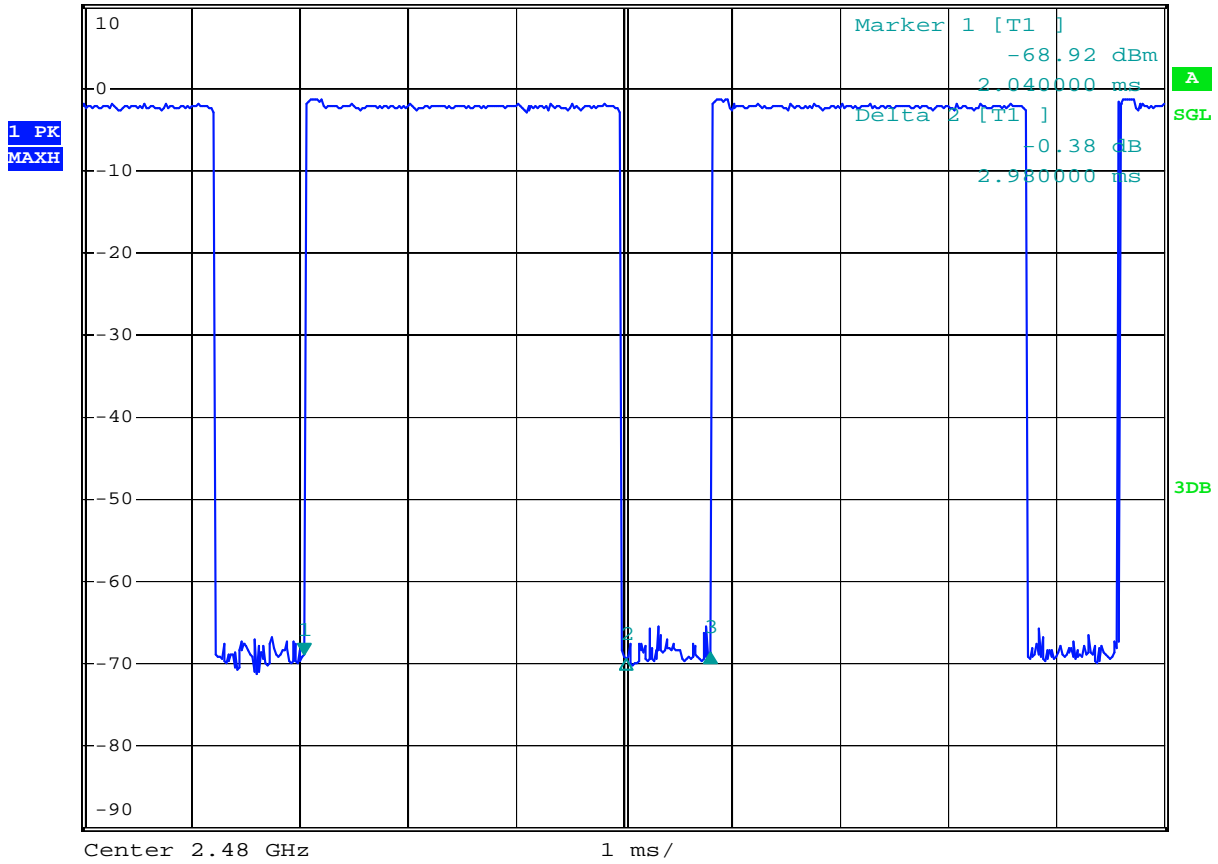


High Channel



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz 0.39 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 17:54:00



Type of Modulation: 8DPSK

EUT	Shower Speaker		Model	SP58116-WH	
Mode	Keep Transmitting		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel	Reading	Hoping Rate	Actual	Limit	
Low	2.98ms	266.667 hop/s	0.318s	0.4s	
Middle	2.98ms	266.667 hop/s	0.318s	0.4s	
High	3.00ms	266.667 hop/s	0.320s	0.4s	

Actual = Reading × (Hopping rate / Number of channels) × Test period, Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

Note: DH5 was the worse case



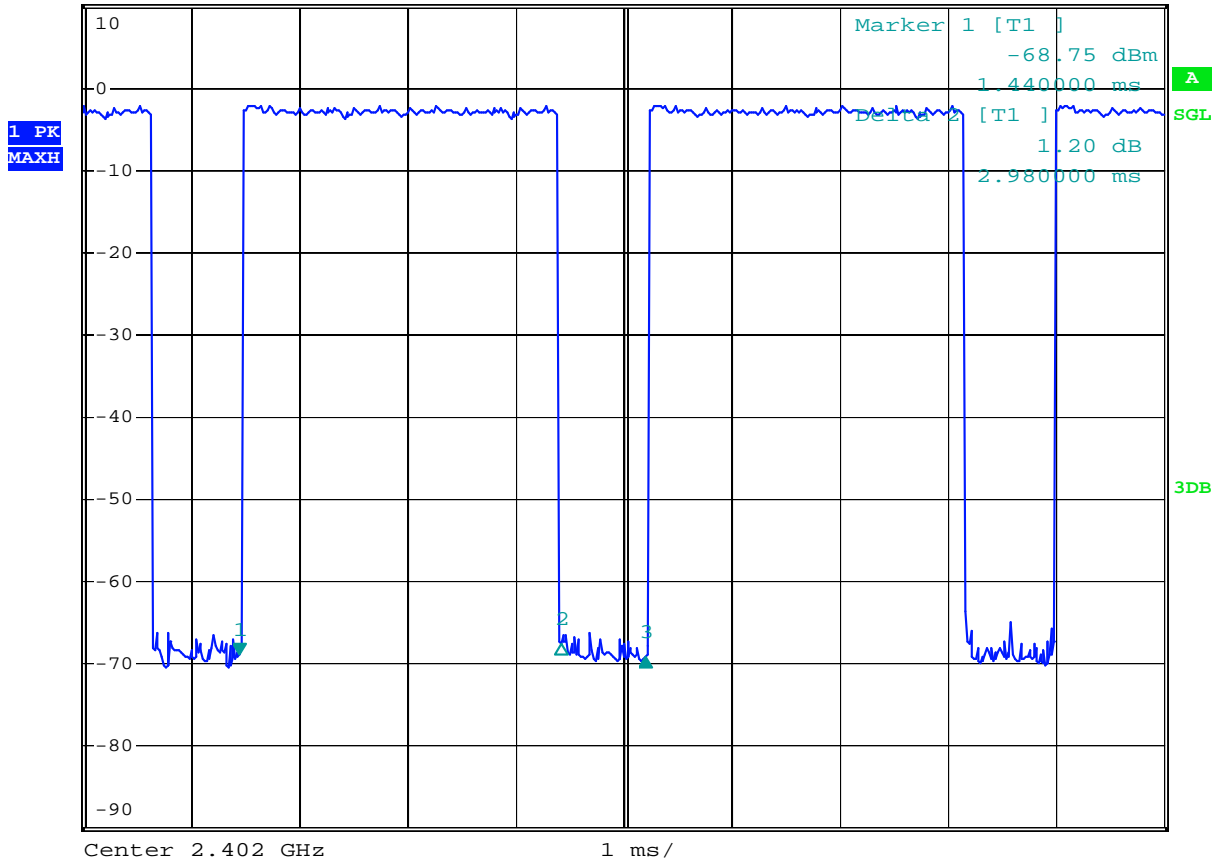
Test Plots:

Low Channel:



DELTA MARKER 3
3.76 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz -0.37 dB
SWT 10 ms 3.760000 ms



Date: 9.SEP.2014 18:04:28



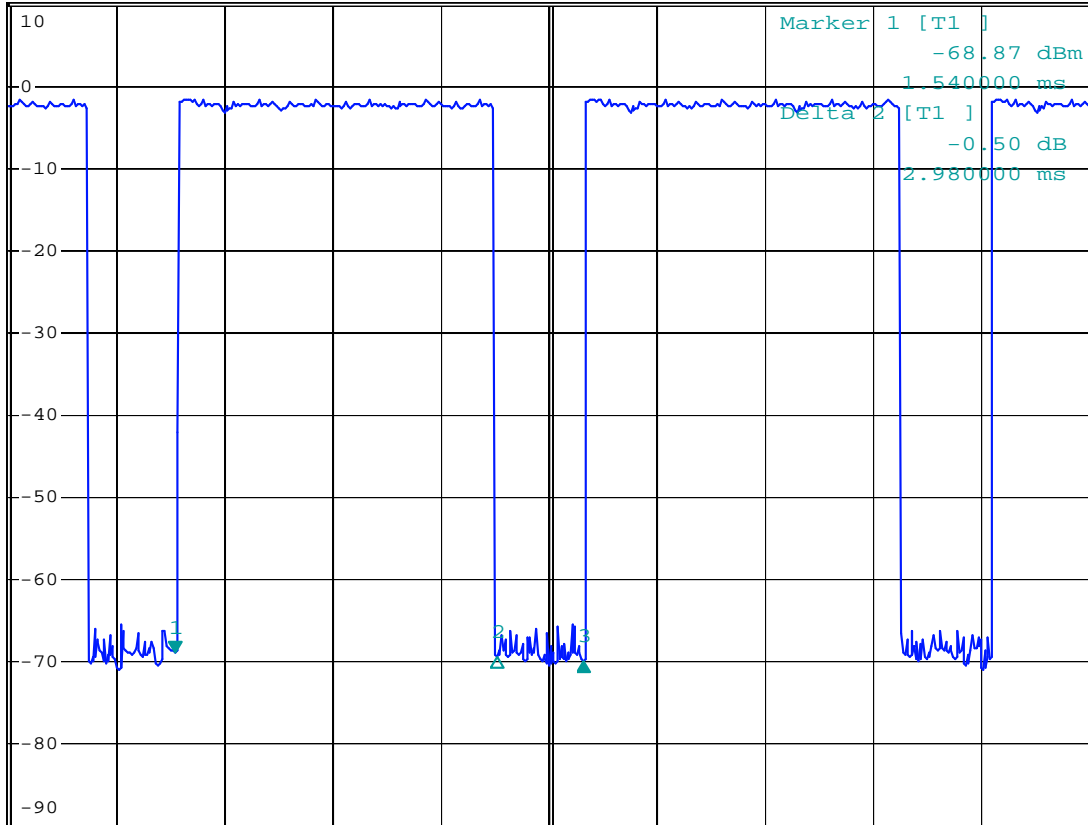
Middle Channel:



DELTA MARKER 3
3.78 ms
Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
*VBW 1 MHz -0.95 dB
SWT 10 ms 3.780000 ms

1 PK
MAXH



Center 2.441 GHz 1 ms/

Date: 9.SEP.2014 17:57:20



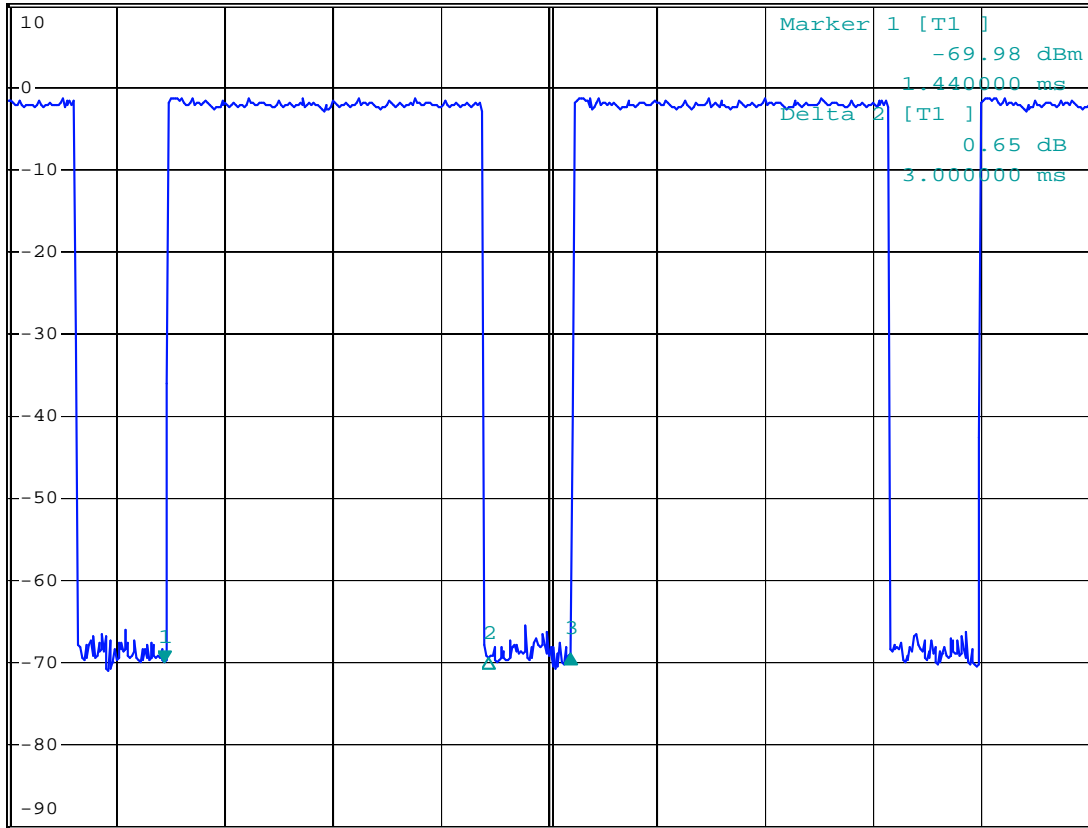
High Channel



DELTA MARKER 3
 3.76 ms
 Ref 10 dBm *Att 20 dB

RBW 1 MHz Delta 3 [T1]
 *VBW 1 MHz 1.14 dB
 SWT 10 ms 3.760000 ms

1 PK
MAXH



A

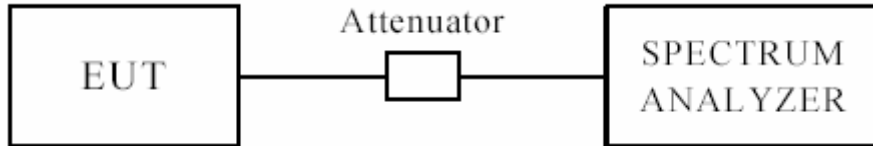
3DB

Center 2.48 GHz 1 ms/

Date: 9.SEP.2014 17:56:30

12 Out of Band Measurement

12.1 Test Setup



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

12.2 Limits of Out of Band Emissions Measurement

1. Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

12.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of

radiated emission test. Peak values with RBW=VBW=1MHz and PK detector.

For bandage test, the spectrum set as follows: RBW=100, VBW=300 kHz. A conducted measurement used

Note: 1. this is a handheld device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), after pre-test. It was found that the worse radiated emission was get at the lying position. the worse case was recorded

2. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

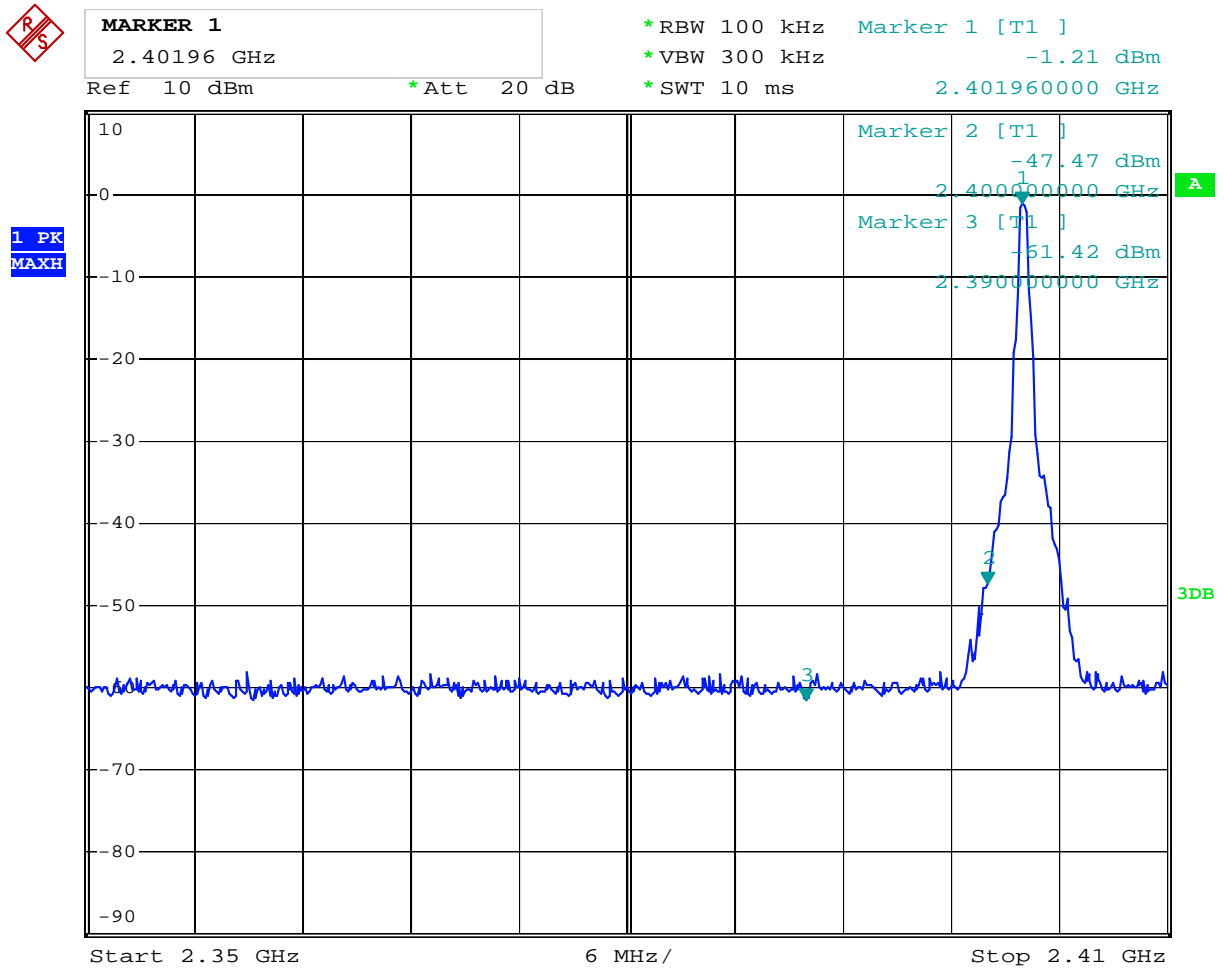


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Low Channel
Mode	Keeping Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2390MHz	PK (dBμV/m)	35.6	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:34:48

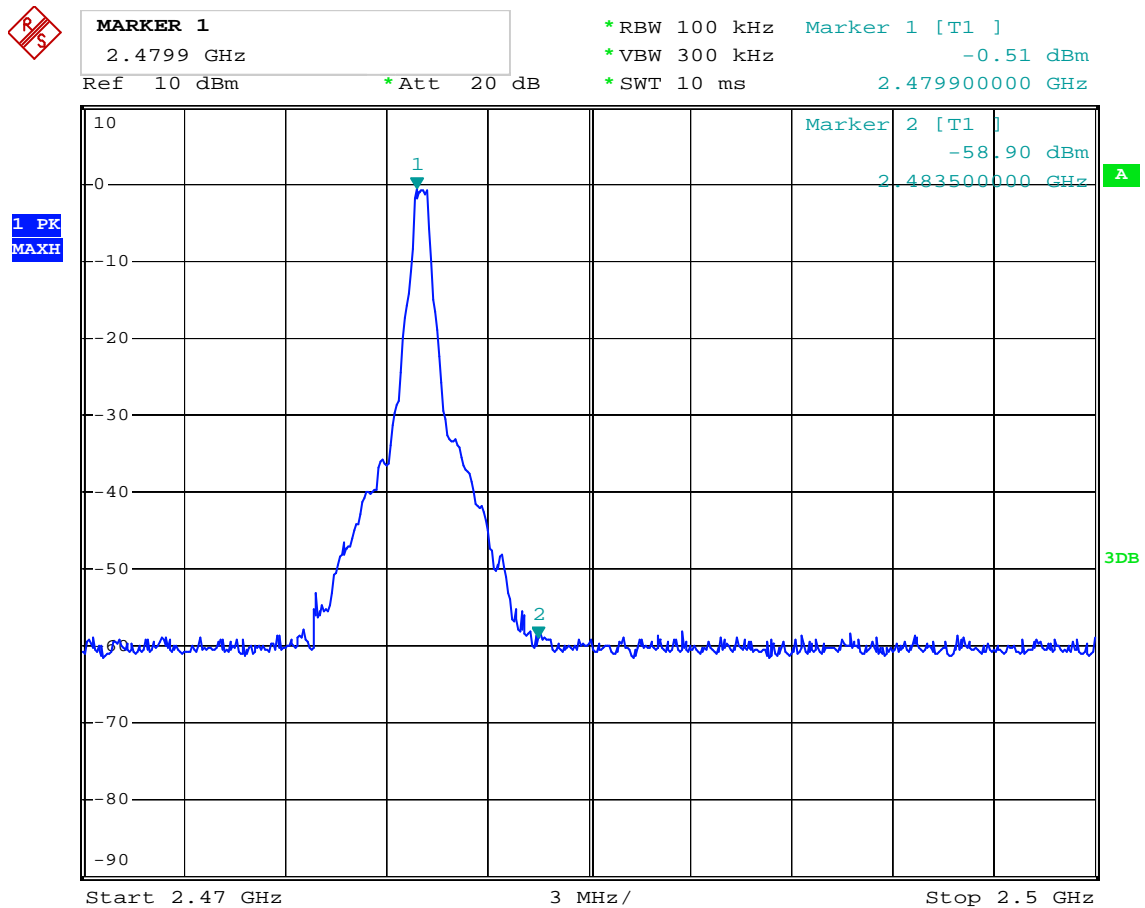


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	High Channel
Mode	Keeping Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2483.5MHz	PK (dBμV/m)	36.4	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:30:05

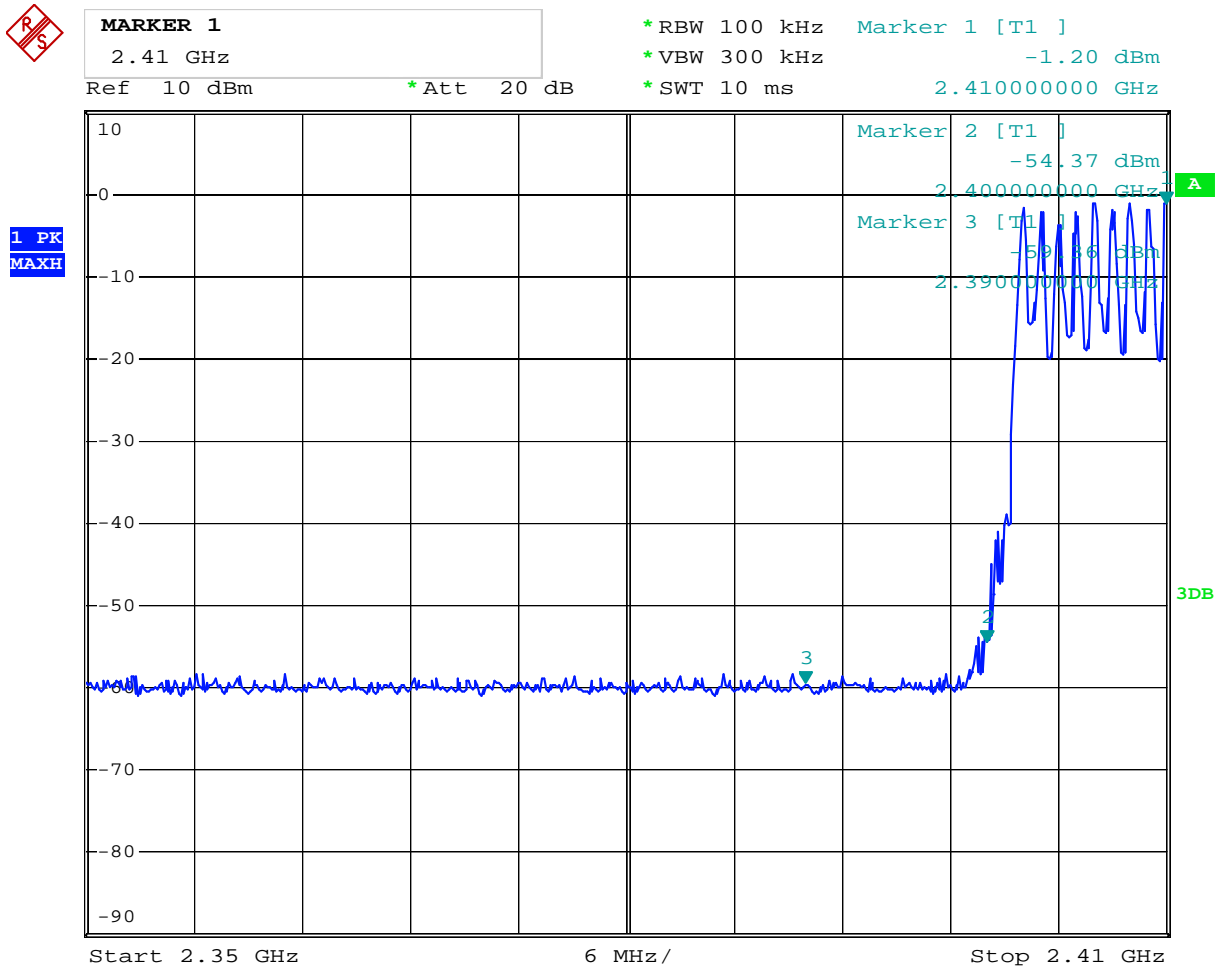


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Hopping mode
Mode	Hopping On		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2390MHz	PK (dBμV/m)	35.9	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:35:56

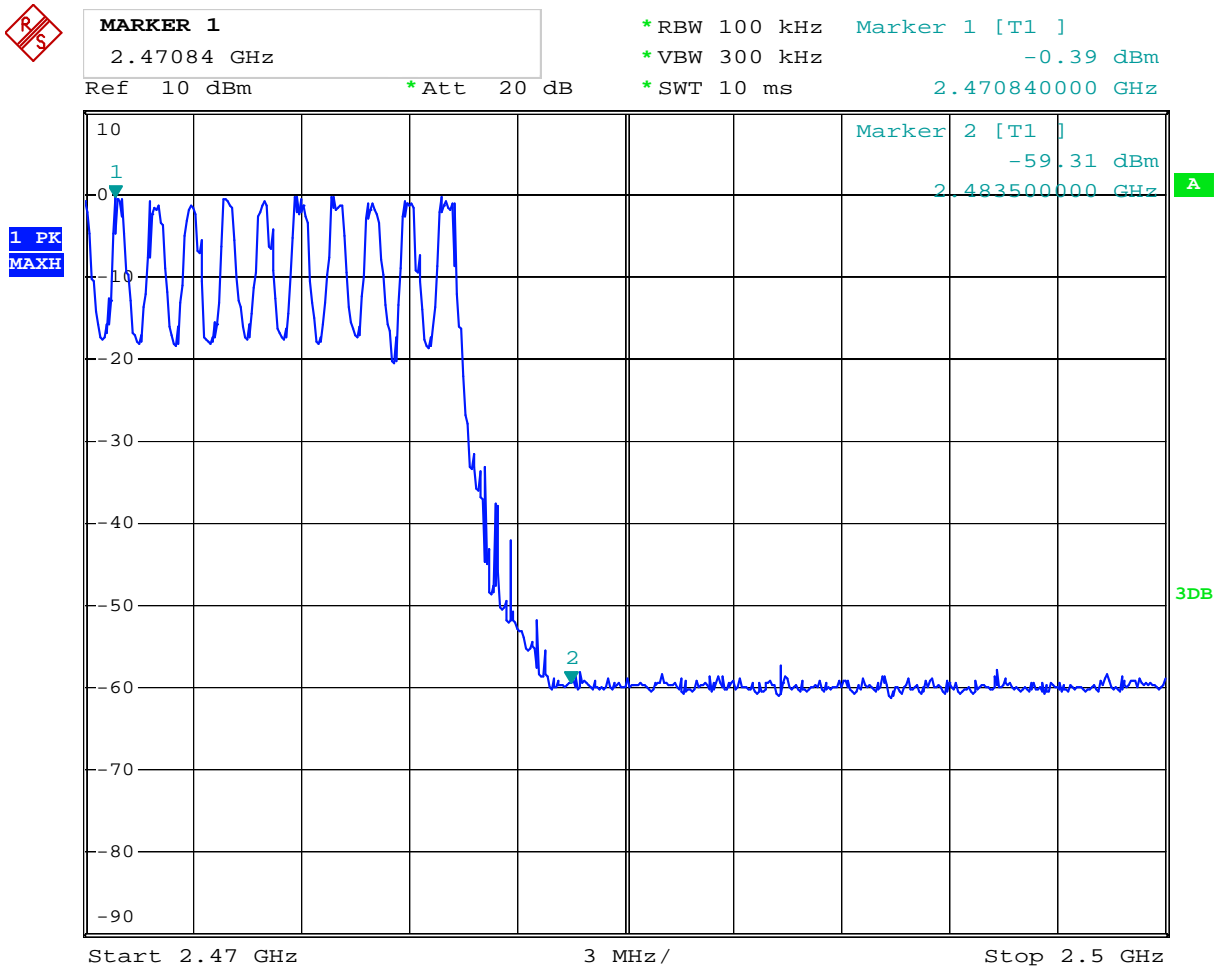


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Hopping mode
Mode	Hopping On		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2483.5MHz	PK (dBμV/m)	36.7	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:29:30

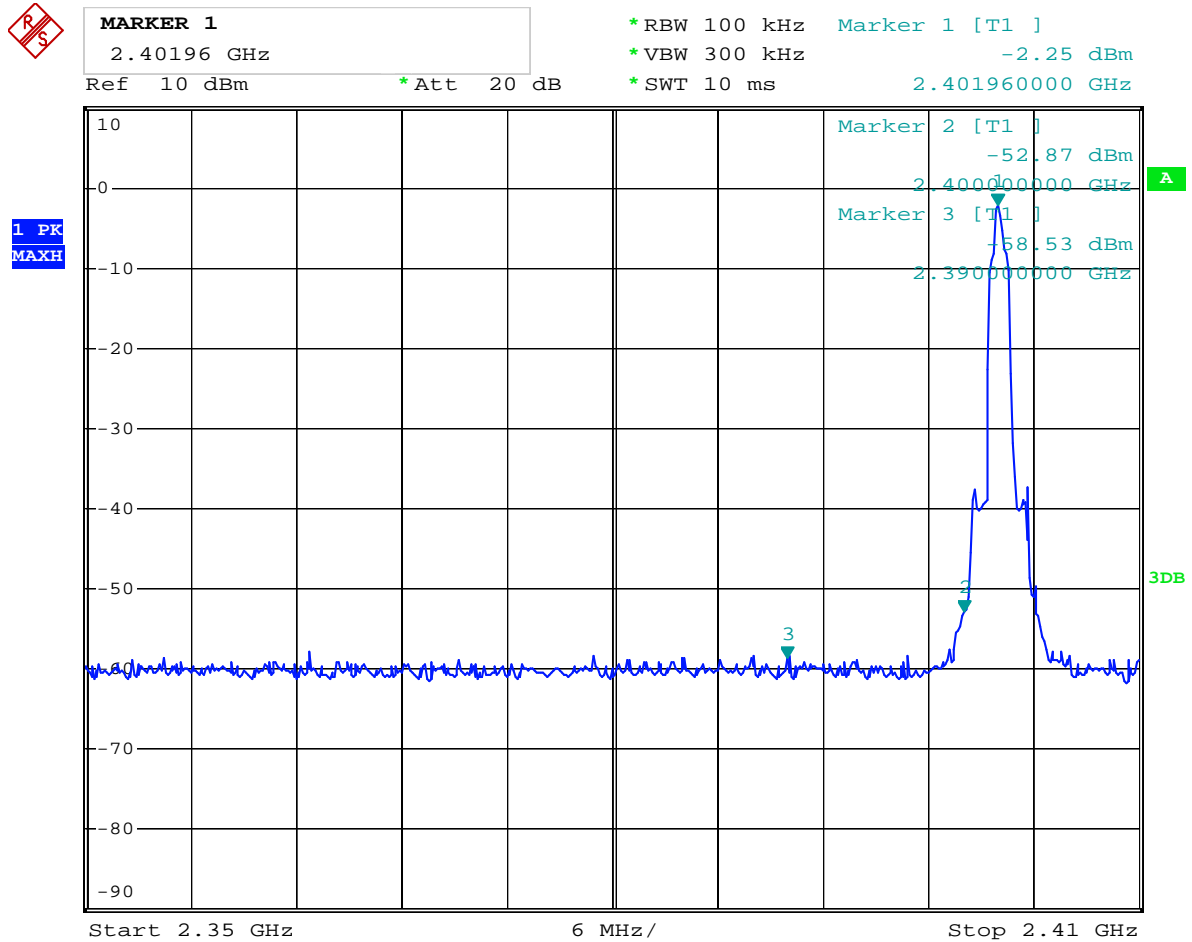


Type of Modulation: $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Low Channel
Mode	Keeping Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2390MHz	PK (dB μ V/m)	36.0	Limit	74(dB μ V/m)
	AV(dB μ V/m)	--		54(dB μ V/m)

Test Figure:



Date: 9.SEP.2014 17:33:50



優耐檢測

Shenzhen United Testing Technology Co., Ltd.

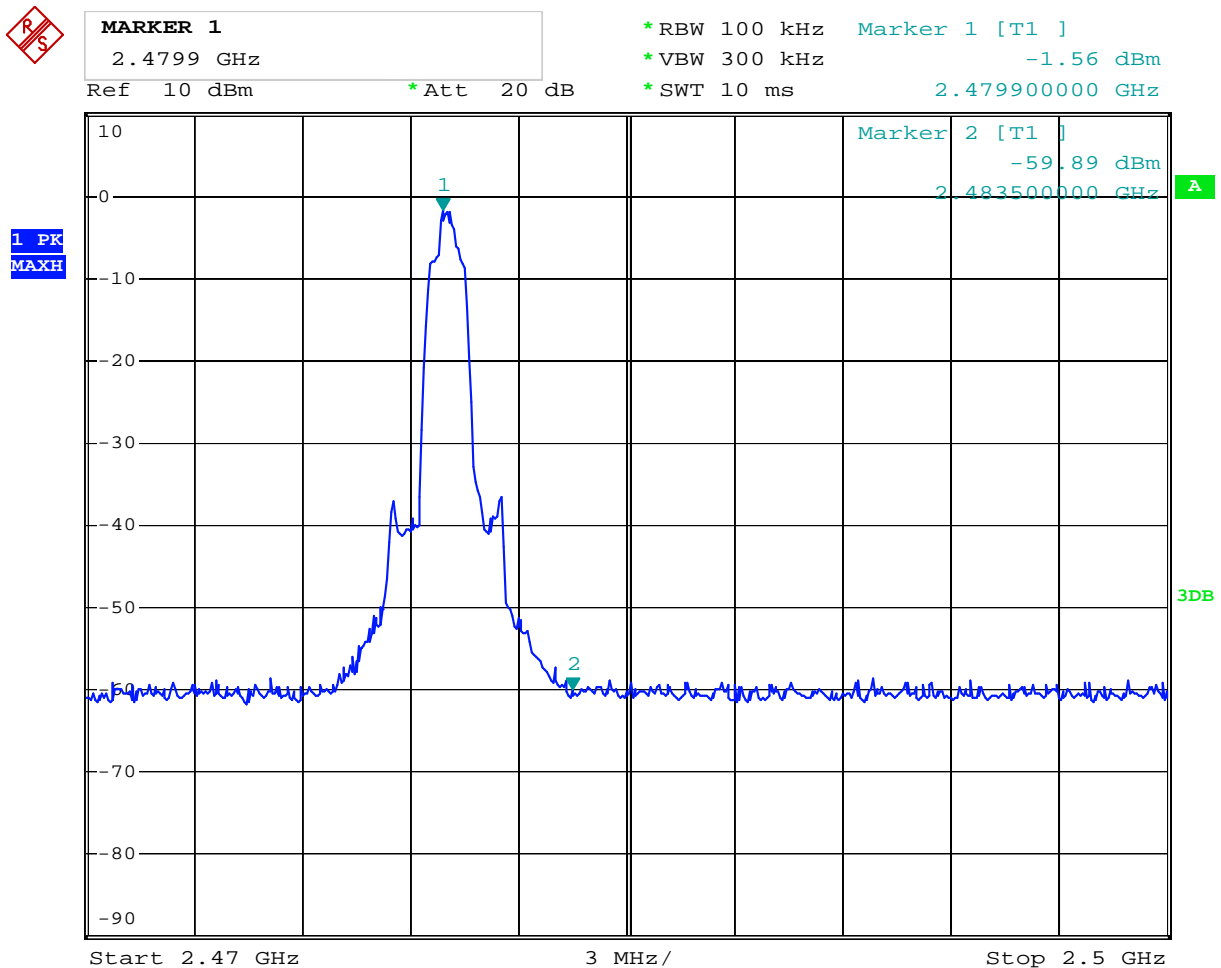
Report No.: UNI-1408119

Type of Modulation: $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	High Channel
Mode	Keeping Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2483.5MHz	PK (dB μ V/m)	37.2	Limit	74(dB μ V/m)
	AV(dB μ V/m)	--		54(dB μ V/m)

Test Figure:



Date: 9.SEP.2014 17:30:38

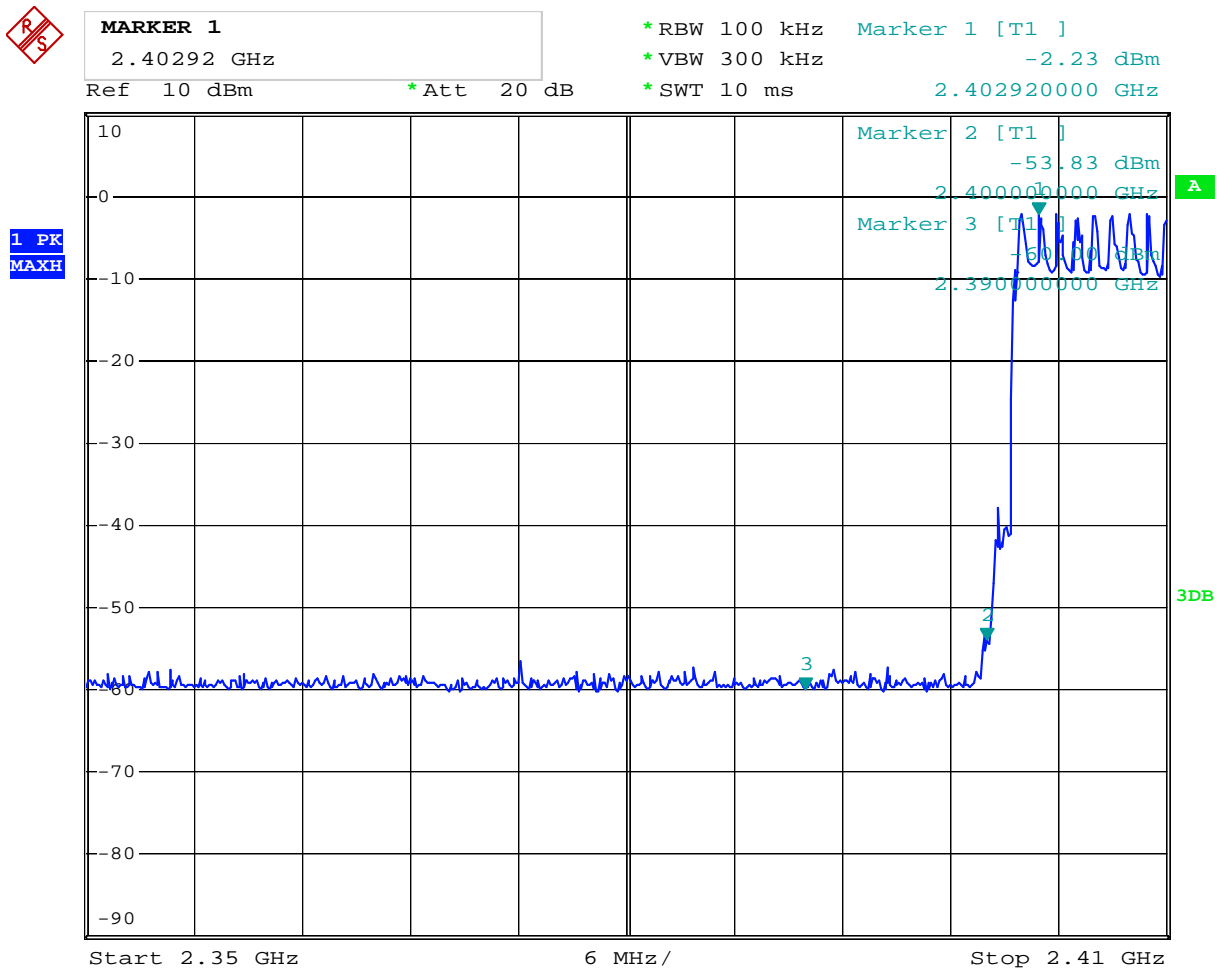


Type of Modulation: $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Hopping mode
Mode	Hopping On		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2390MHz	PK (dB μ V/m)	34.9	Limit	74(dB μ V/m)
	AV(dB μ V/m)	--		54(dB μ V/m)

Test Figure:



Date: 9.SEP.2014 17:39:04

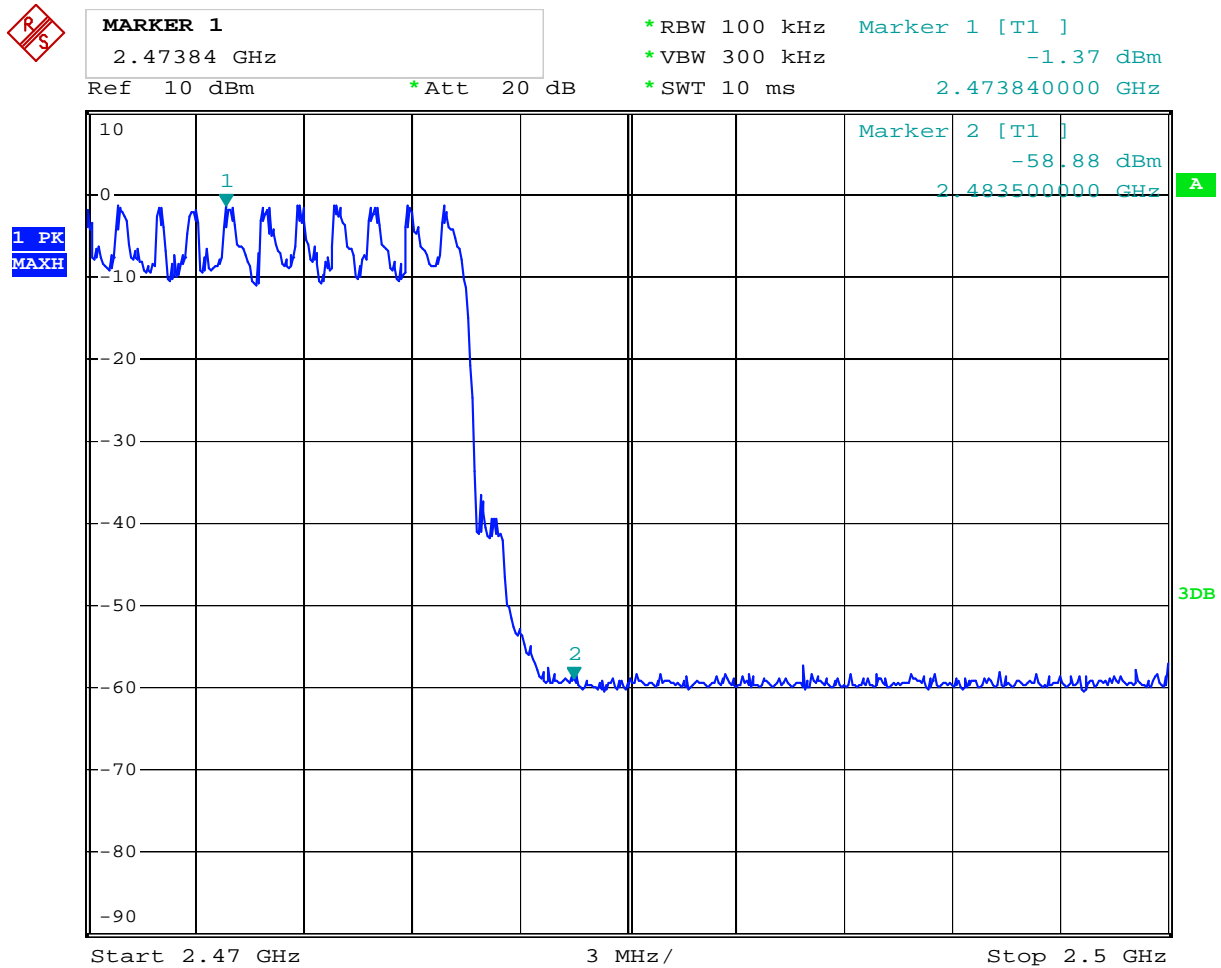


Type of Modulation: $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Hopping mode
Mode	Hopping On		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2483.5MHz	PK (dB μ V/m)	37.2	Limit	74(dB μ V/m)
	AV(dB μ V/m)	--		54(dB μ V/m)

Test Figure:



Date: 9.SEP.2014 17:28:01

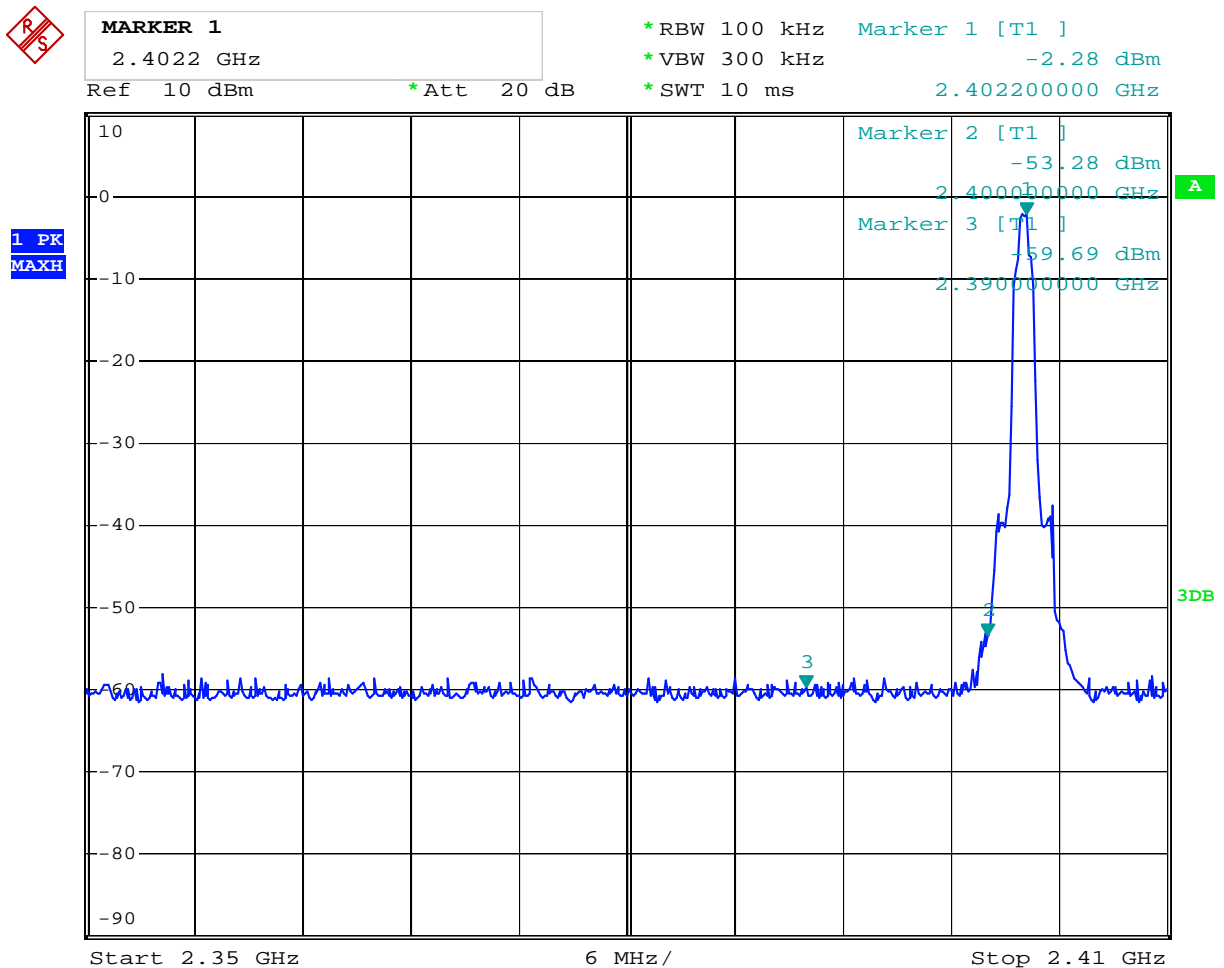


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Low Channel
Mode	Keeping Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2390MHz	PK (dBμV/m)	37.1	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:32:59

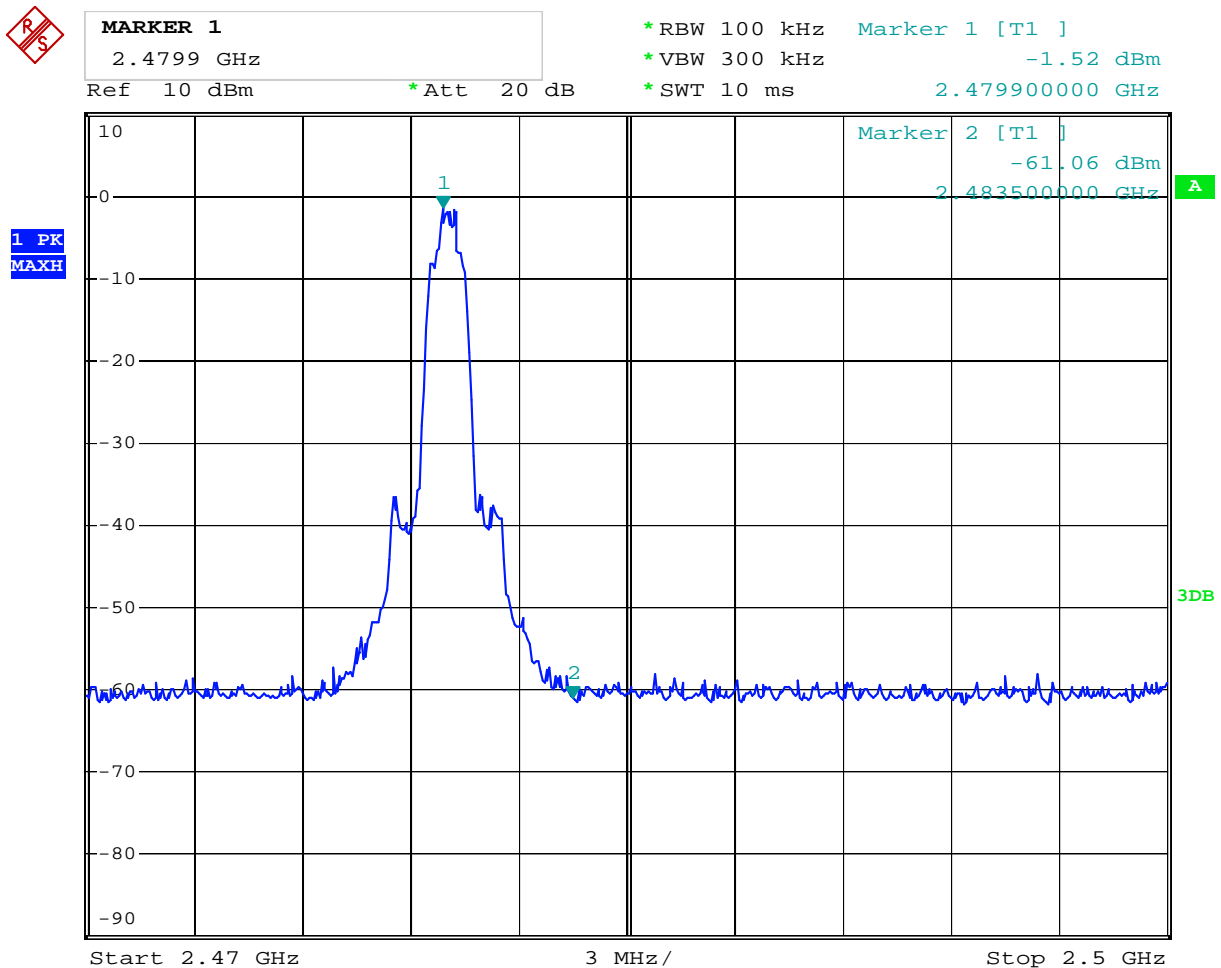


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	High Channel
Mode	Keeping Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2483.5MHz	PK (dBμV/m)	38.2	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:31:49

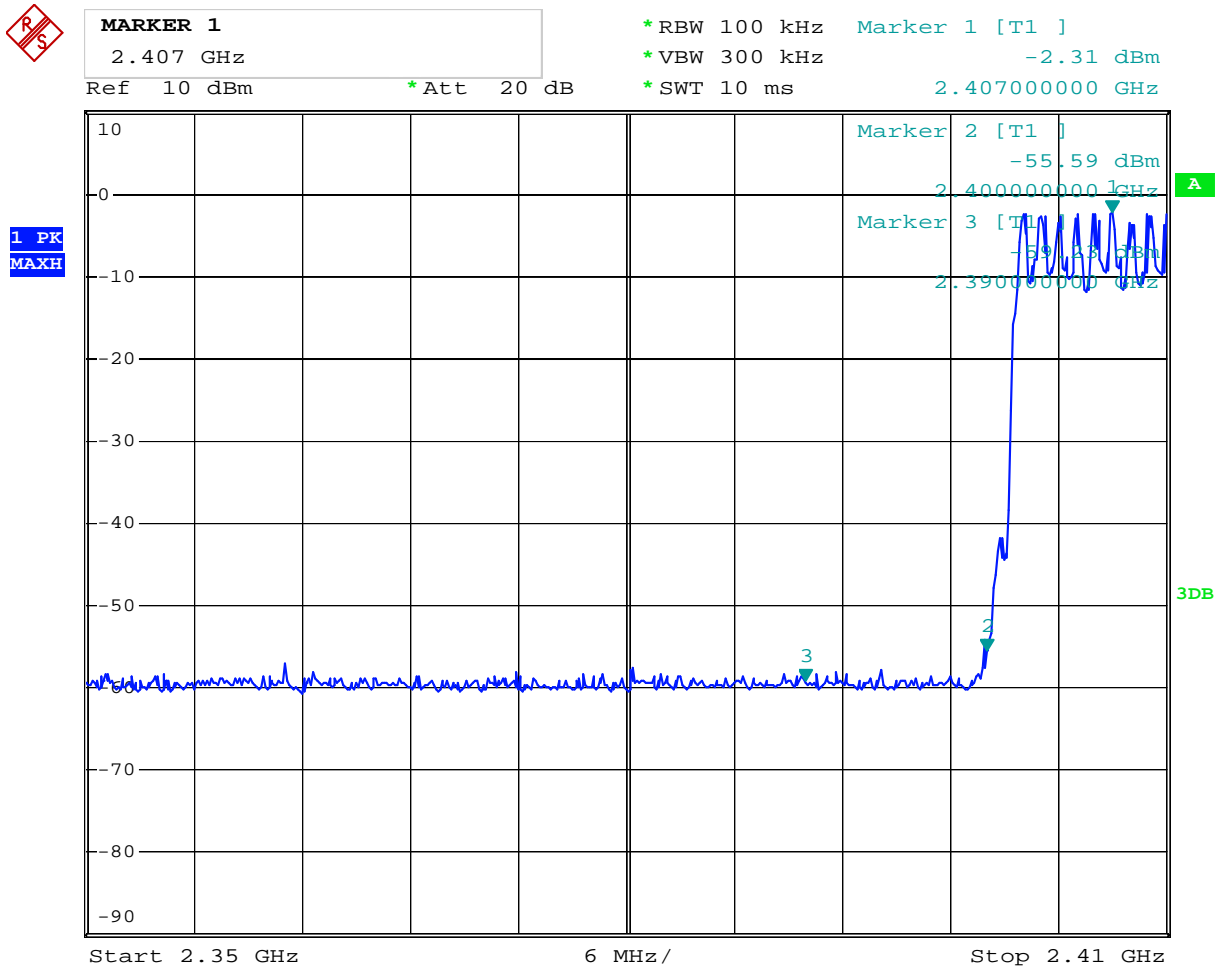


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Hopping mode
Mode	Hopping On		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2390MHz	PK (dBμV/m)	35.8	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:42:38

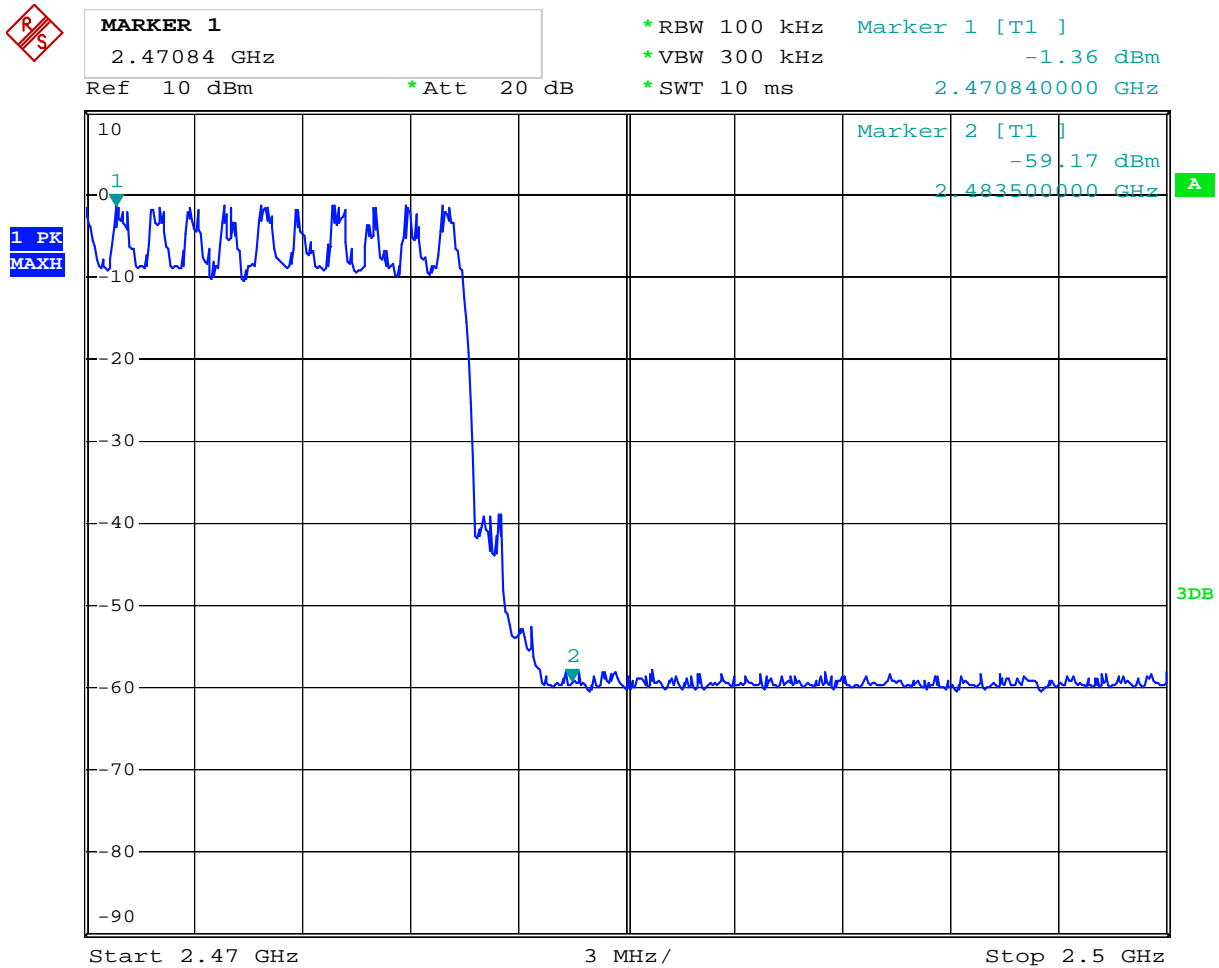


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Shower Speaker		Test Mode:	Hopping mode
Mode	Hopping On		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band 2483.5MHz	PK (dBμV/m)	37.7	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 9.SEP.2014 17:25:39



13.0 Antenna Requirement

13.1 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 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

13.2 Antenna Connected constructions

The antenna is integral antenna. The maximum Gain of this antenna is 2.0dBi

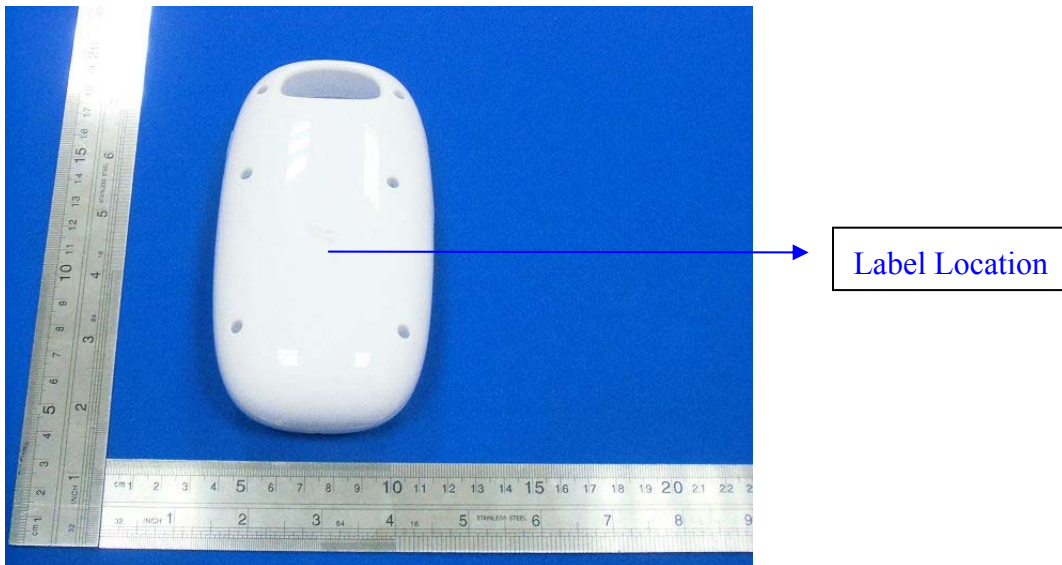
14.0 FCC ID Label

FCC ID: 2AC5VGROUND009

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:

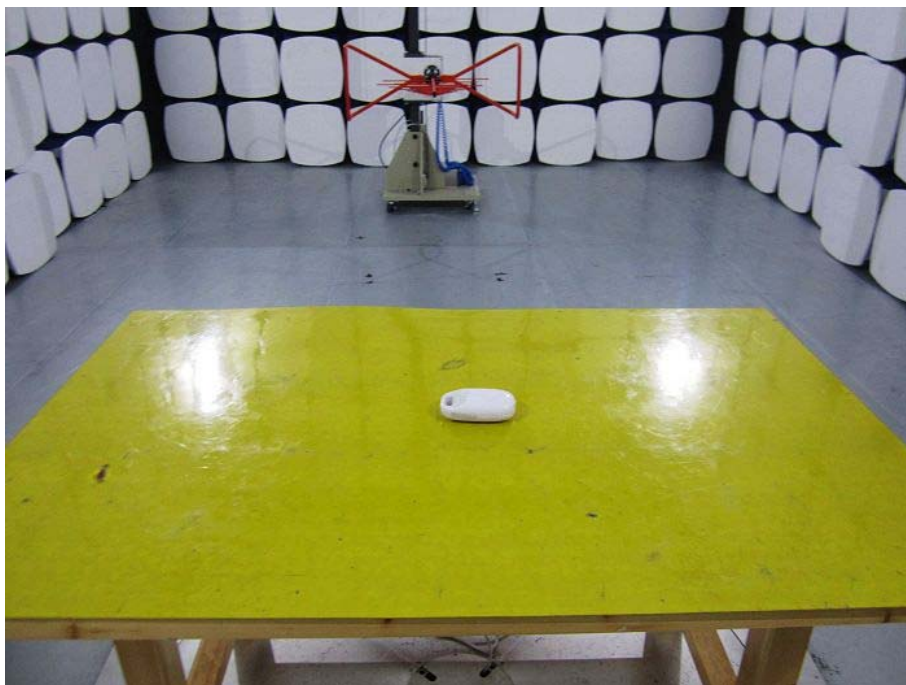
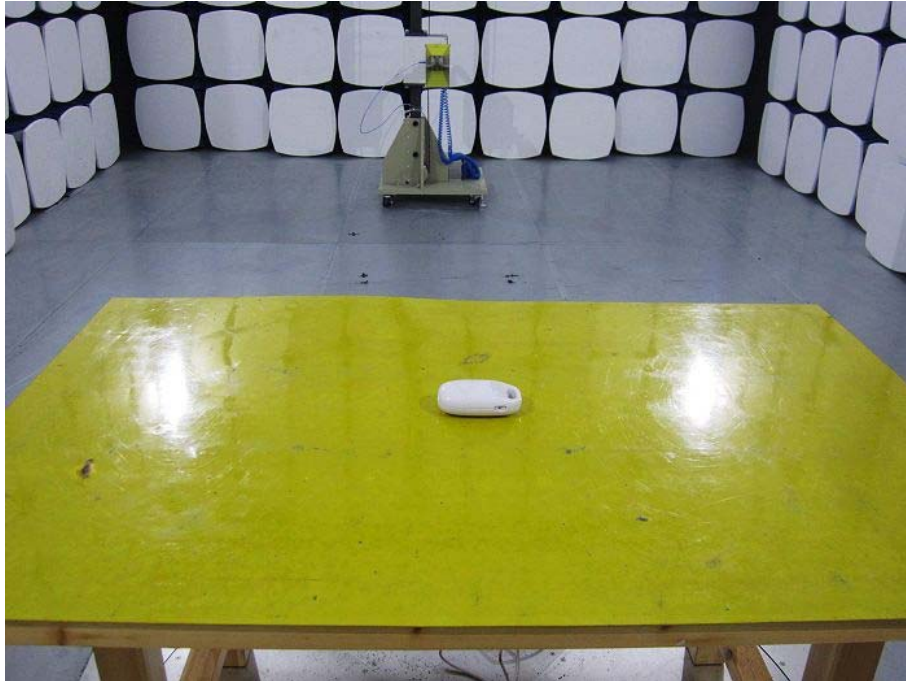


15 PHOTOGRAPHS OF THE TEST CONFIGURATION

Conducted Emissions



Radiated Emissions



PHOTOGRAPHS OF EUT



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

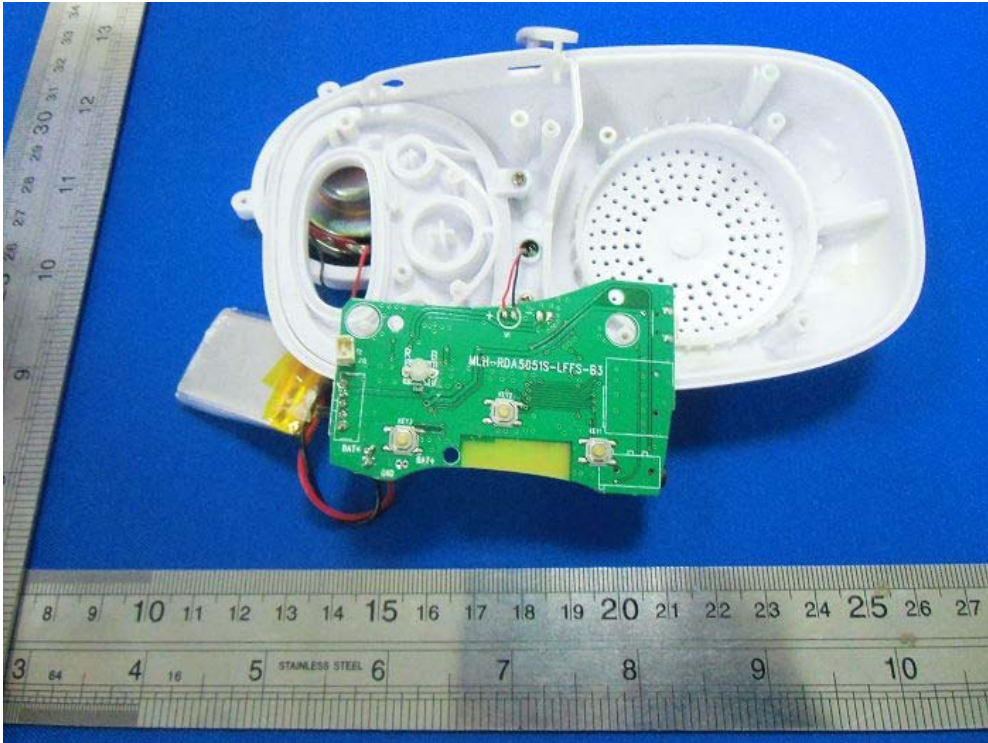


Photo 7



Photo 8

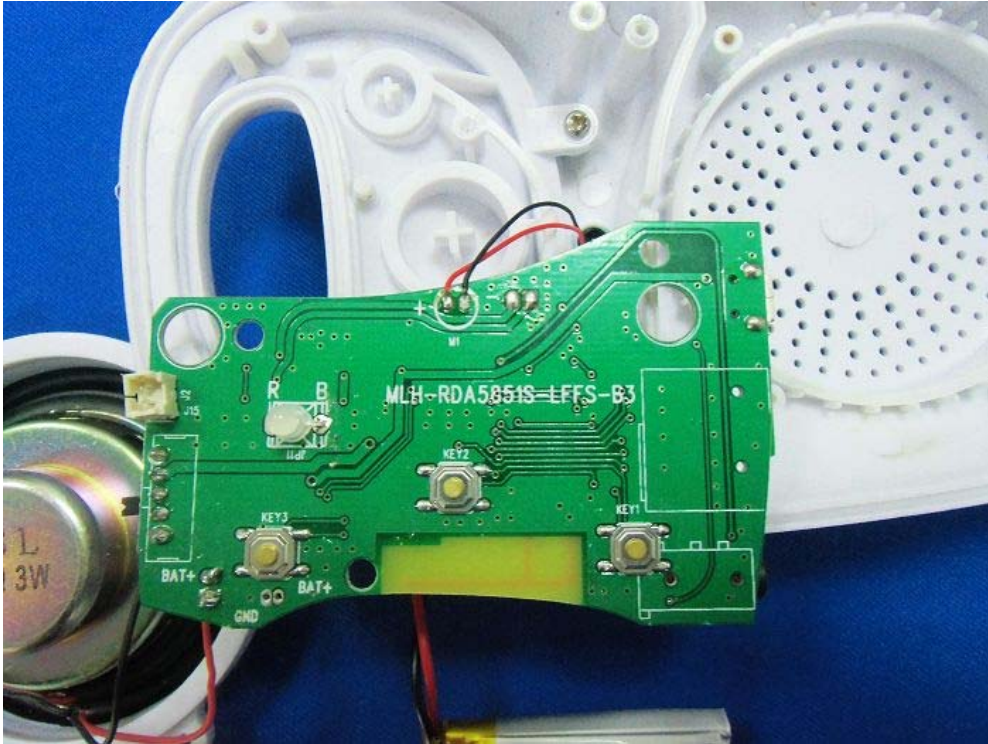


Photo 9



Photo 10

The Report End