FCC TEST REPORT

Prepared For :	E-Fi Technologies（HK）Company Limited
Product Name:	Bluetooth Speaker
Model :	OontZ Angle PLUS
Prepared By :	Shenzhen BATT Testing Technology Co., Ltd. 11F, Bldg.B, Xinbaoyuan, Xinanhu Commercial city, Bao'an District, Shenzhen, Guangdong, China. Tel: 86-755-27753991 Fax: 86-755-27754182
Test Date:	September 22, 2014 to October 09, 2014
Date of Report :	October 10, 2014
Report No.:	BATT201409135FCC

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1 TEST CERTIFICATION

Product:	Bluetooth Speaker
Model:	OontZ Angle PLUS
Applicant:	E-Fi Technologies（HK）Company Limited UNIT A3, 9/F SILVERCORP INTERNATIONAL TOWER, 707-713 NATHAN ROAD, MONGKOK, KOWLOON, HONG KONG.
Manufacturer:	E-Fi Technologies（HK）Company Limited UNIT A3, 9/F SILVERCORP INTERNATIONAL TOWER, 707-713 NATHAN ROAD, MONGKOK, KOWLOON, HONG KONG.
Factory:	E-Fi Technologies（HK）Company Limited UNIT A3, 9/F SILVERCORP INTERNATIONAL TOWER, 707-713 NATHAN ROAD, MONGKOK, KOWLOON, HONG KONG.
Trade Mark:	N/A
Tested:	Sep 22, 2014 to Oct 09, 2014
Test Voltage:	DC5V Powered by power supply
Operational Frequency Range:	2402-2480MHz
Modulation Type:	GFSK, Π/4DQPSK, 8DPSK
Number of Channel	79
Frequency Selection	By software
Antenna:	PCB antenna with Gain 1.13dBi
FCC ID:	2ADCW-PLUS
Applicable Standards:	FCC Part 15.247

The test report was prepared by Shenzhen BATT 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 : Hellen Xiao

Hellen XiaoAssistant

Reviewer : Mike Yong

Mike Yong/Supervisor

Approved & Authorized Signer : Jones Song

Jones Song/ Manager

2.0 Test Equipments

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2014-08-26	2015-08-25
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	2014-08-26	2015-08-25
Impuls-Begrenzer	ROHDE&SCHWARZ	ESH3-Z2	100281	2014-08-26	2015-08-25
Loop Antenna	EMCO	6502	00042960	2014-08-26	2015-08-25
ESPI Test Receiver	ROHDE&SCHWARZ	ESI26	838786/013	2014-08-26	2015-08-25
3m OATS	--	--	N/A	2014-08-26	2015-08-25
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170399	2014-08-26	2015-08-25
Horn Antenna	SCHWARZBECK	BBHA 9120	D143	2014-08-26	2015-08-25
Power meter	Anritsu	ML2487A	6K00003613	2014-08-26	2015-08-25
Power sensor	Anritsu	MA2491A	32263	2014-08-26	2015-08-25
Bilog Antenna	Schwarebeck	VULB9163	9163/142	2014-08-26	2015-08-25
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2014-08-26	2015-08-25
9*6*6 Anechoic	--	--	N/A	2014-08-26	2015-08-25
EMI Test Receiver	RS	ESCS30	100139	2014-08-26	2015-08-25
LISN	RS	ESH2-Z5	100225	2014-08-26	2015-08-25
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2014-08-26	2015-08-25
Pre-Amplifier	A.H.	PAM-0126	1415261	2014-08-26	2015-08-25

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

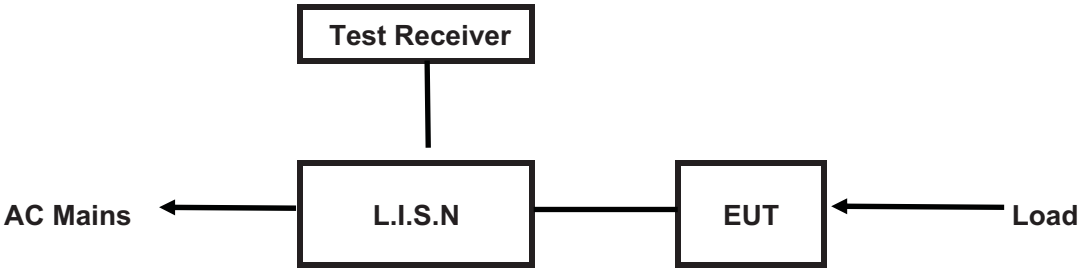
Name: Shenzhen Emtek Co., Ltd.

Address: Bldg. 69, Majialong Industry Zone,,Nanshan District,Shenzhen, Guangdong, 518052China

FCC Registration Number: 406365

5. Power Line Conducted Emission Test

5.1 Schematics of the test

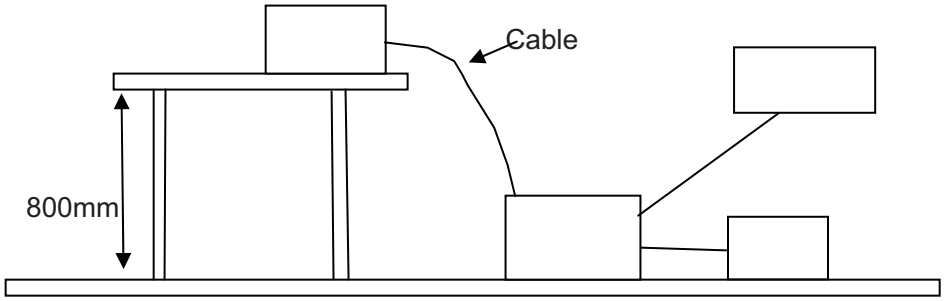


EUT: Equipment Under Test

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.

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
Bluetooth Speaker	E-Fi Technologies（HK）Company Limited	OontZ Angle PLUS	2ADCW-PLUS

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Rating
Power Supply	JODEWAY	JOD-050200A3	VOC	Input: 100-240V~, 0.3A; Output: DC5V, 2A
Keyboard	IBM	KB-0225	DOC	--
PC	IBM	IBM	DOC	--
Mouse	BIGCOW	BIGCOW	DOC	--
Monitor	BENQ	TFT19W80PS	DOC	--

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: 25℃ Humidity: 75%RH Atmospheric Pressure: 101 KPa

EUT set Condition: Keep Transmitting

Equipment Level: Class B

Results: Pass

Please refer to following diagram for individual

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2050	37.15	0.00	37.15	63.41	-26.26	QP	
2		0.2050	29.63	0.00	29.63	53.41	-23.78	AVG	
3		0.2600	37.39	0.00	37.39	61.43	-24.04	QP	
4		0.2600	34.44	0.00	34.44	51.43	-16.99	AVG	
5		0.5250	35.57	0.00	35.57	56.00	-20.43	QP	
6	*	0.5250	34.62	0.00	34.62	46.00	-11.38	AVG	
7		1.0500	33.31	0.00	33.31	56.00	-22.69	QP	
8		1.0500	30.54	0.00	30.54	46.00	-15.46	AVG	
9		1.3100	30.97	0.00	30.97	56.00	-25.03	QP	
10		1.3100	29.21	0.00	29.21	46.00	-16.79	AVG	
11		2.0600	30.48	0.00	30.48	56.00	-25.52	QP	
12		2.0600	27.46	0.00	27.46	46.00	-18.54	AVG	

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

EUT Operating Environment

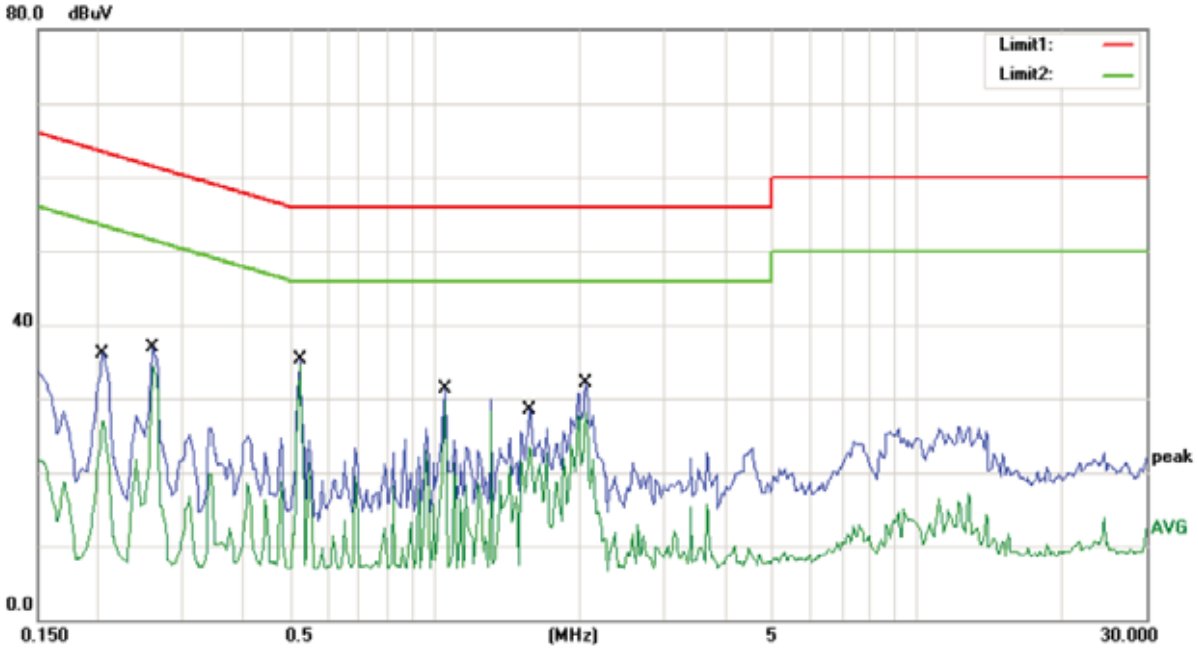
Temperature: 25℃ Humidity: 75%RH Atmospheric Pressure: 101 KPa

EUT set Condition: Keep Transmitting

Equipment Level: Class B

Results: Pass

Please refer to following diagram for individual



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2050	36.18	0.00	36.18	63.41	-27.23	QP	
2		0.2050	26.93	0.00	26.93	53.41	-26.48	AVG	
3		0.2600	36.81	0.00	36.81	61.43	-24.62	QP	
4		0.2600	34.37	0.00	34.37	51.43	-17.06	AVG	
5		0.5250	35.35	0.00	35.35	56.00	-20.65	QP	
6	*	0.5250	34.56	0.00	34.56	46.00	-11.44	AVG	
7		1.0500	31.26	0.00	31.26	56.00	-24.74	QP	
8		1.0500	29.66	0.00	29.66	46.00	-16.34	AVG	
9		1.5750	28.52	0.00	28.52	56.00	-27.48	QP	
10		1.5750	23.45	0.00	23.45	46.00	-22.55	AVG	
11		2.0600	32.13	0.00	32.13	56.00	-23.87	QP	
12		2.0600	28.19	0.00	28.19	46.00	-17.81	AVG	

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 EMTEK Laboratory. This site is on file with the FCC laboratory division, Registration No. 406365

(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.

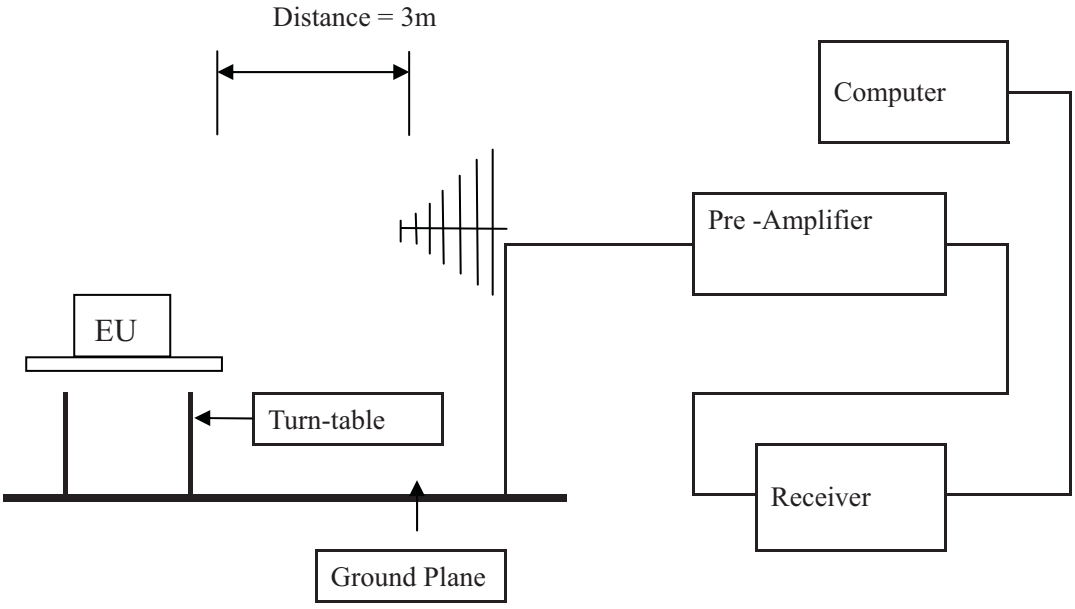
(3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements 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. Worse case was recorded (GFSK Modulation mode was the worse case)

Test result

General Radiated Emission Data and Harmonics Radiated Emission Data

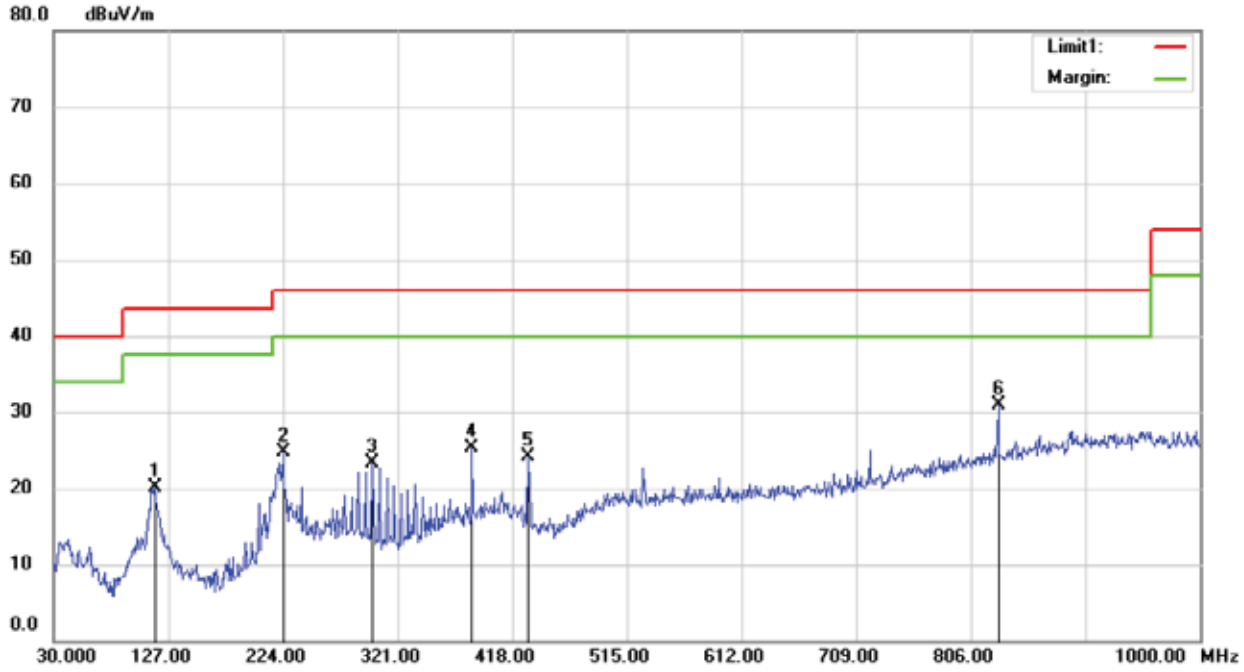
Radiated Emission In Horizontal (30MHz----1000MHz)

EUT set Condition: Keep Transmitting

Results: **Pass**

Test Figure:

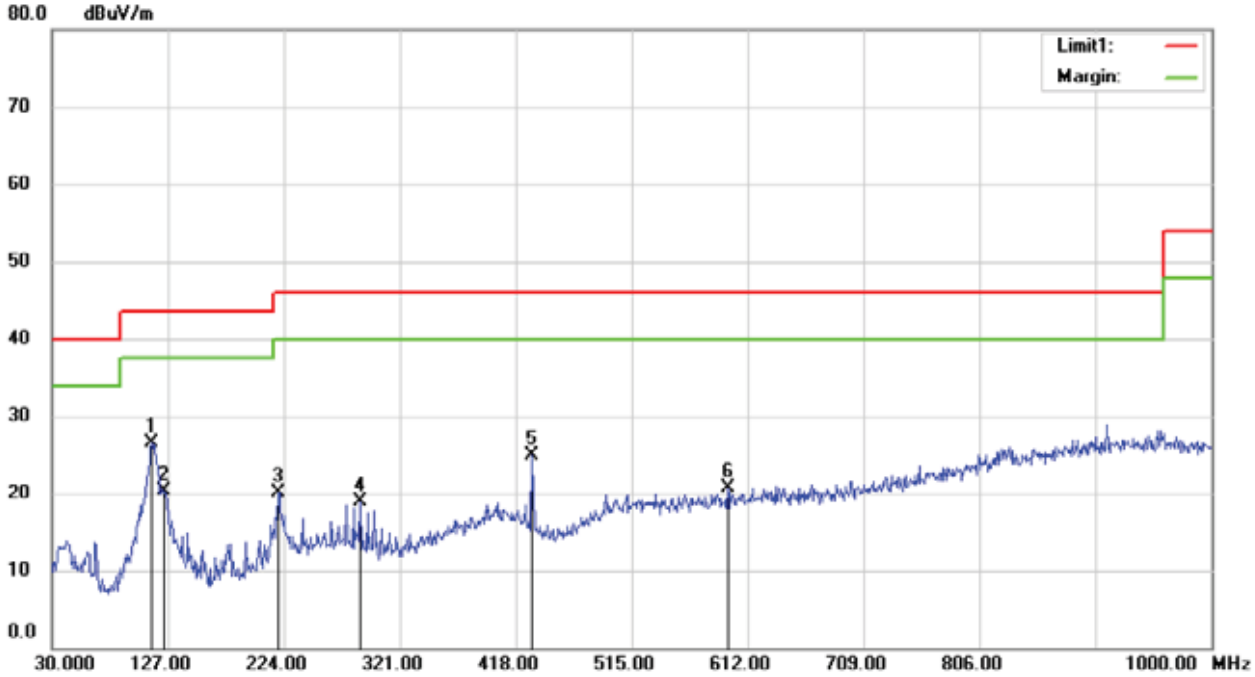
H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		115.3600	35.49	-15.36	20.13	43.50	-23.37	QP			
2		224.0000	40.61	-15.86	24.75	46.00	-21.25	QP			
3		299.6600	37.21	-13.81	23.40	46.00	-22.60	QP			
4		384.0500	35.14	-9.77	25.37	46.00	-20.63	QP			
5		431.5800	34.51	-10.45	24.06	46.00	-21.94	QP			
6	*	829.2800	33.16	-2.20	30.96	46.00	-15.04	QP			

Test Figure:

V



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	113.4200	41.38	-14.94	26.44	43.50	-17.06	QP			
2		124.0900	36.96	-16.72	20.24	43.50	-23.26	QP			
3		219.1500	36.56	-16.37	20.19	46.00	-25.81	QP			
4		288.0200	32.04	-13.07	18.97	46.00	-27.03	QP			
5		431.5800	35.42	-10.45	24.97	46.00	-21.03	QP			
6		595.5100	27.73	-7.02	20.71	46.00	-25.29	QP			

Operation Mode: Transmitting under Low Channel (2402MHz)

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4804	--	H	74(Peak)/ 54(AV)
4804	--	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 (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4882	--	H	74(Peak)/ 54(AV)
4882	--	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)

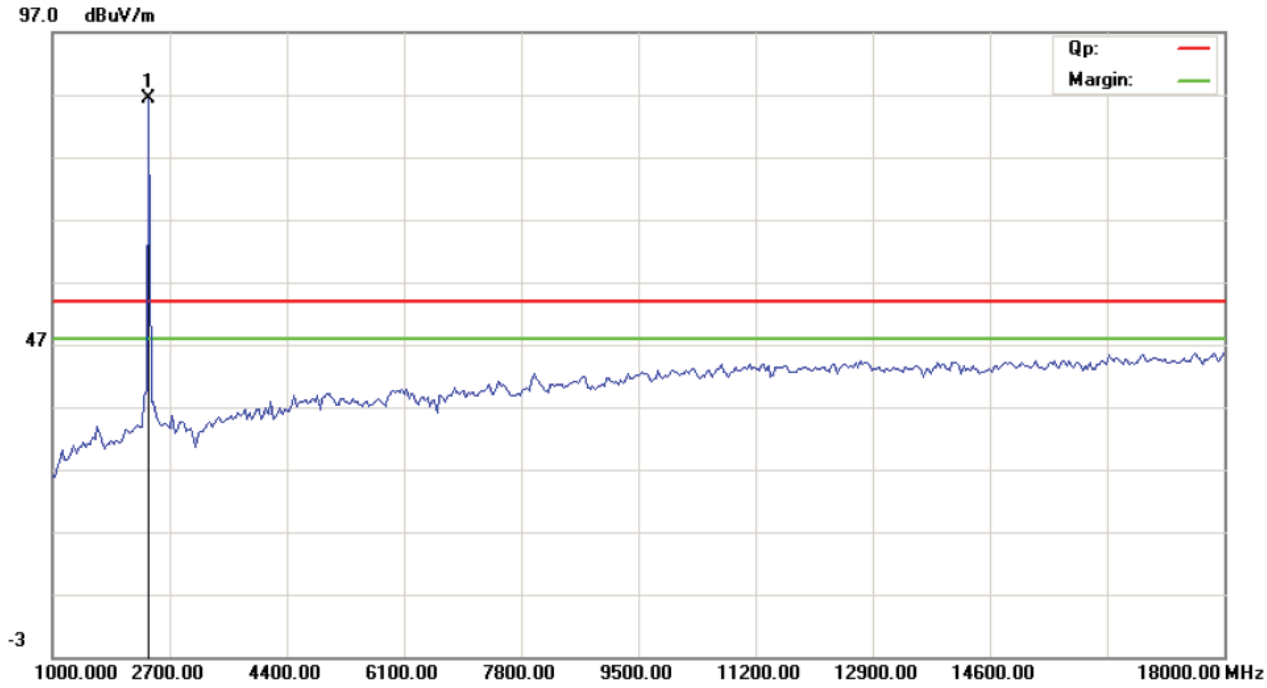
Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4960.	--	H	74(Peak)/ 54(AV)
4960.	--	V	74(Peak)/ 54(AV)
7440	--	H/V	74(Peak)/ 54(AV)
9920	--	H/V	74(Peak)/ 54(AV)
12400	--	H/V	74(Peak)/ 54(AV)
14880	--	H/V	74(Peak)/ 54(AV)
17360	--	H/V	74(Peak)/ 54(AV)
19840	--	H/V	74(Peak)/ 54(AV)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

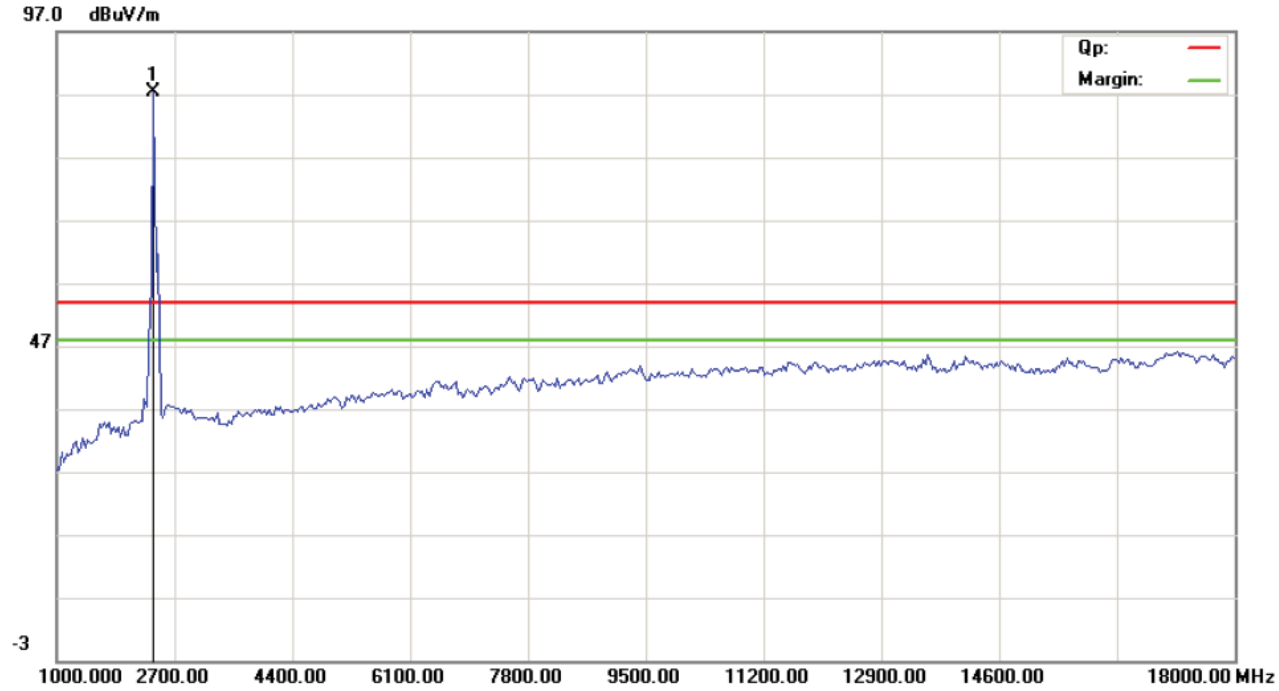
2. Remark “---” means that the emissions level is too low to be measured

Please refer to the following test plots for details:

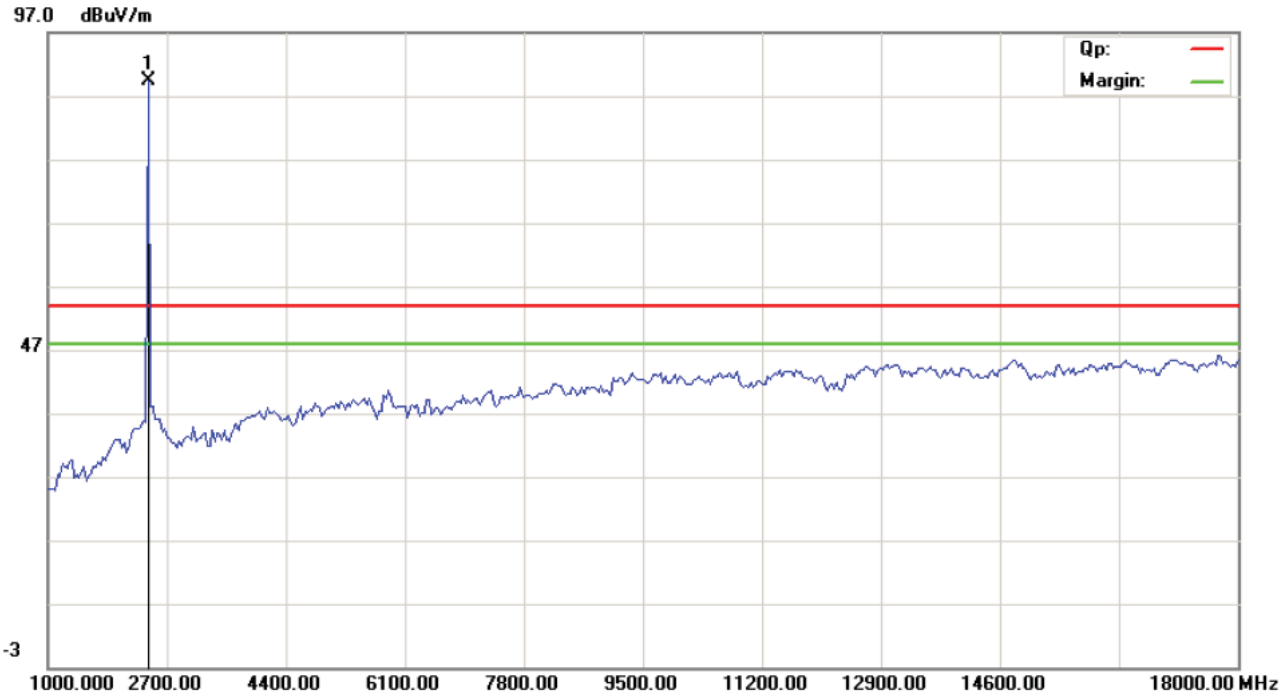
Low Channel: Horizontal



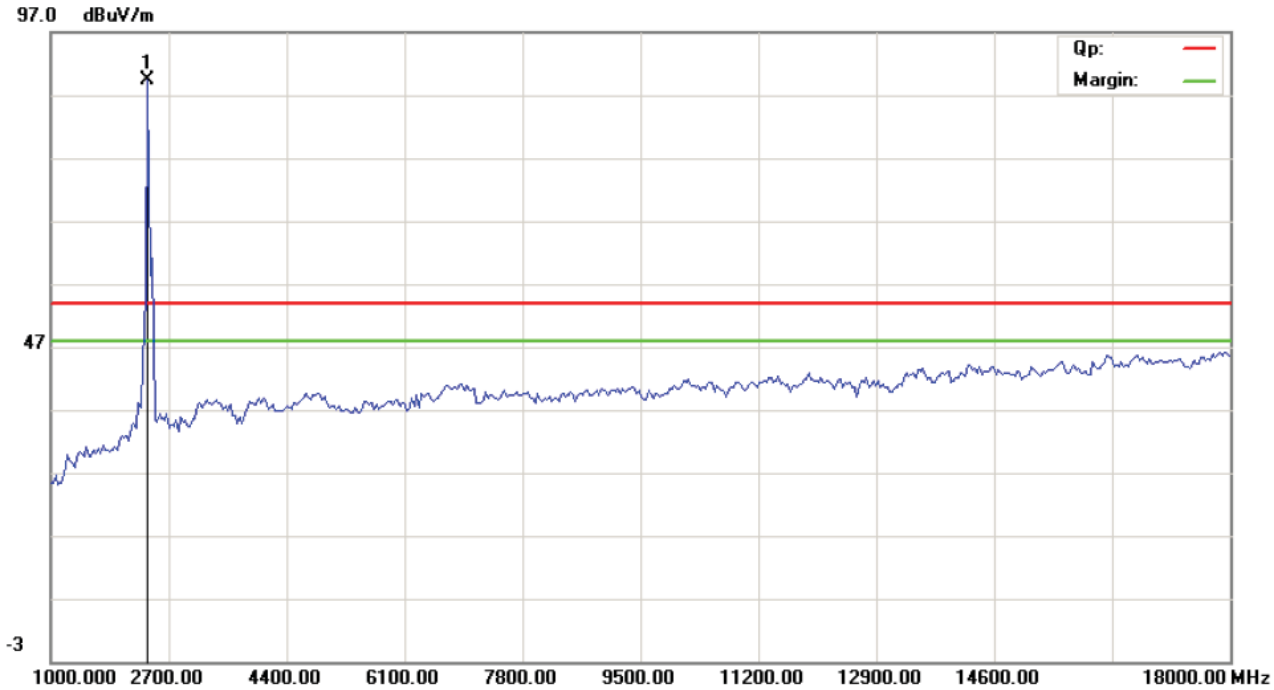
Low Channel : Vertical



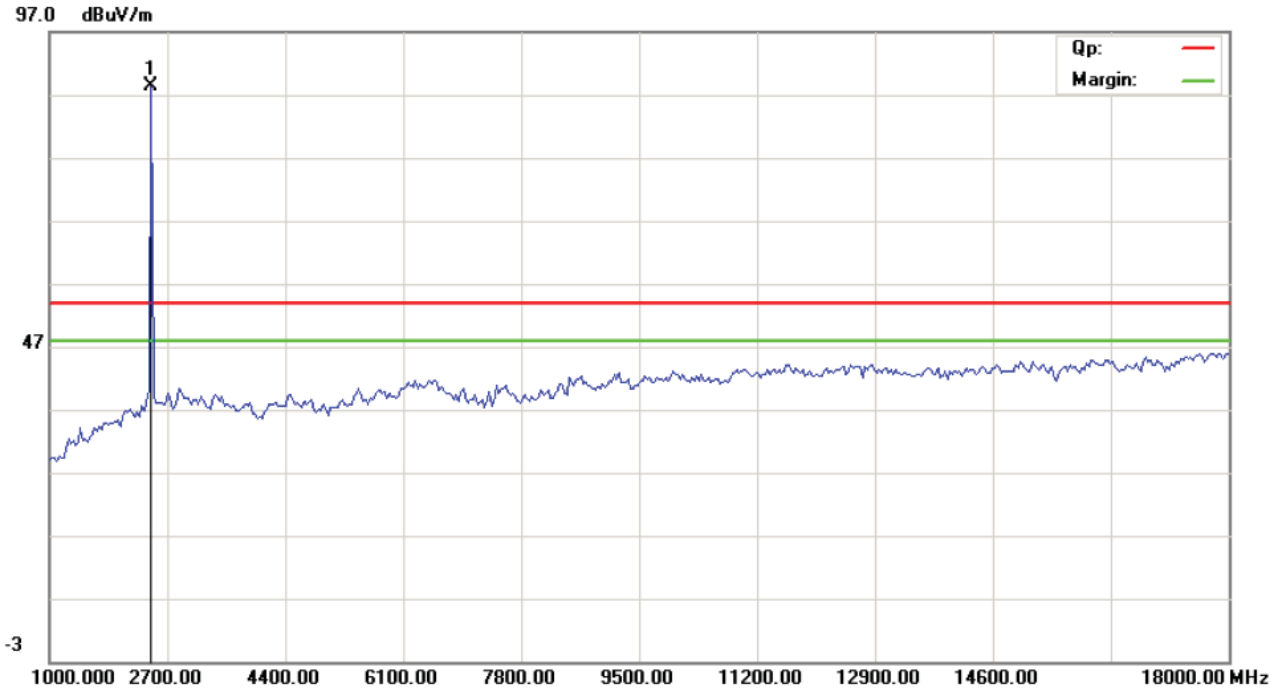
Middle Channel : Horizontal



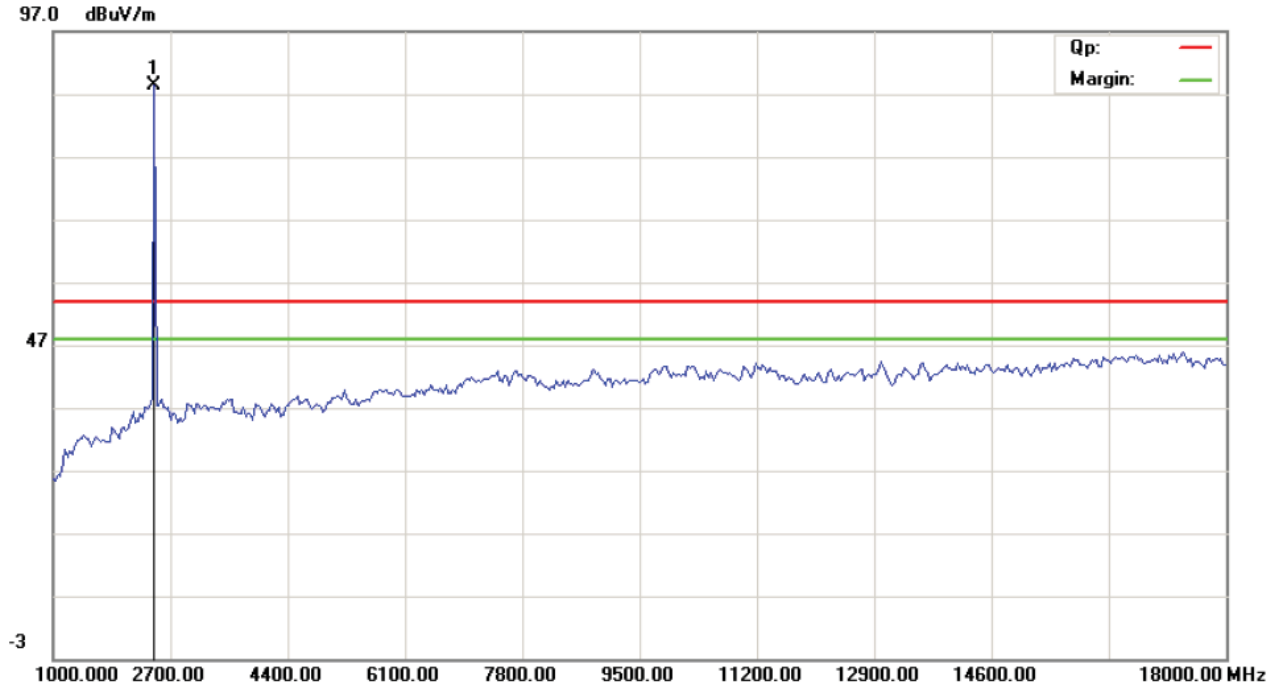
Middle Channel :: Vertical



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 =5MHz, 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

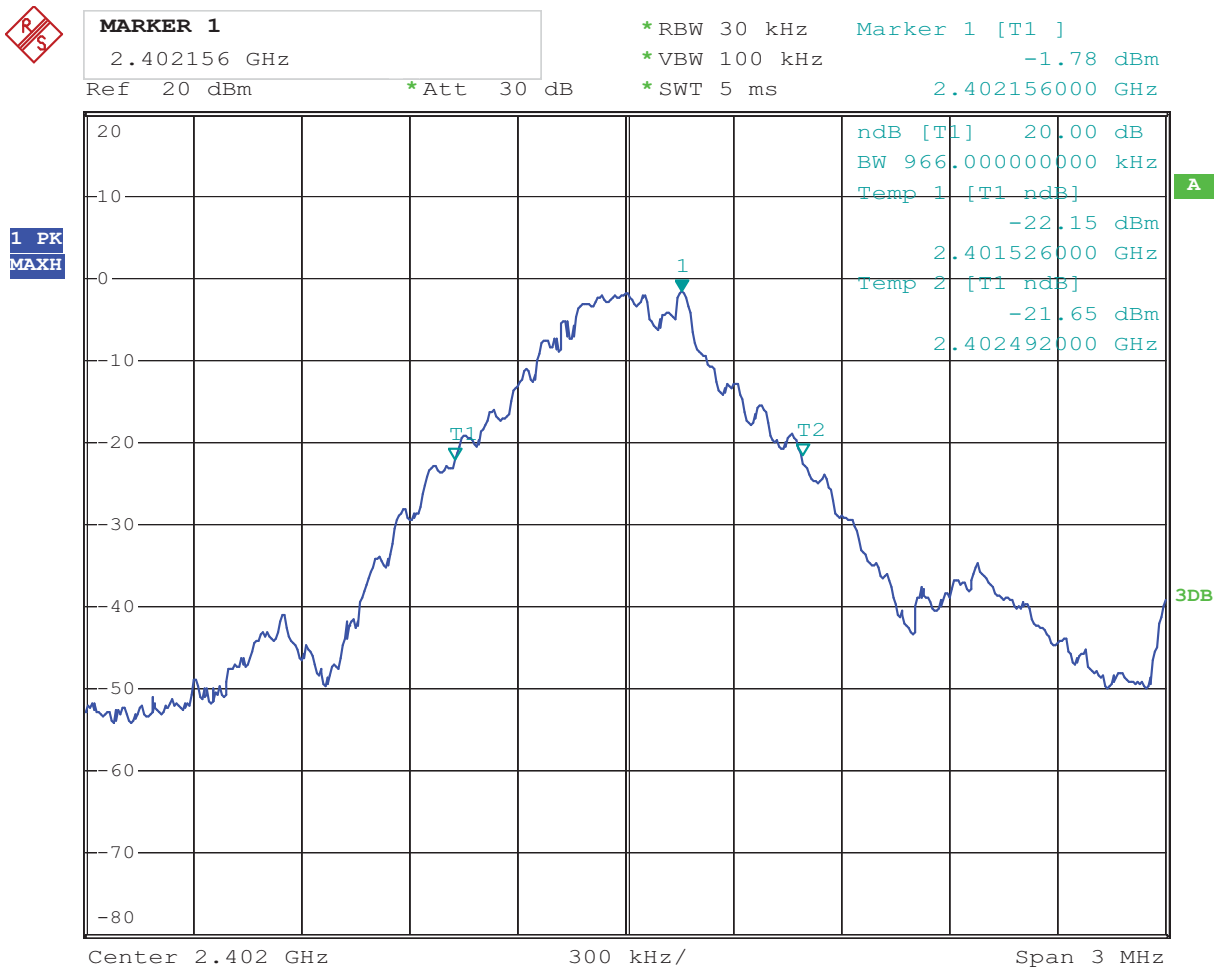
Type of Modulation: GFSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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	966	--	Pass
Middle	2441	966	--	Pass
High	2480	900	--	Pass

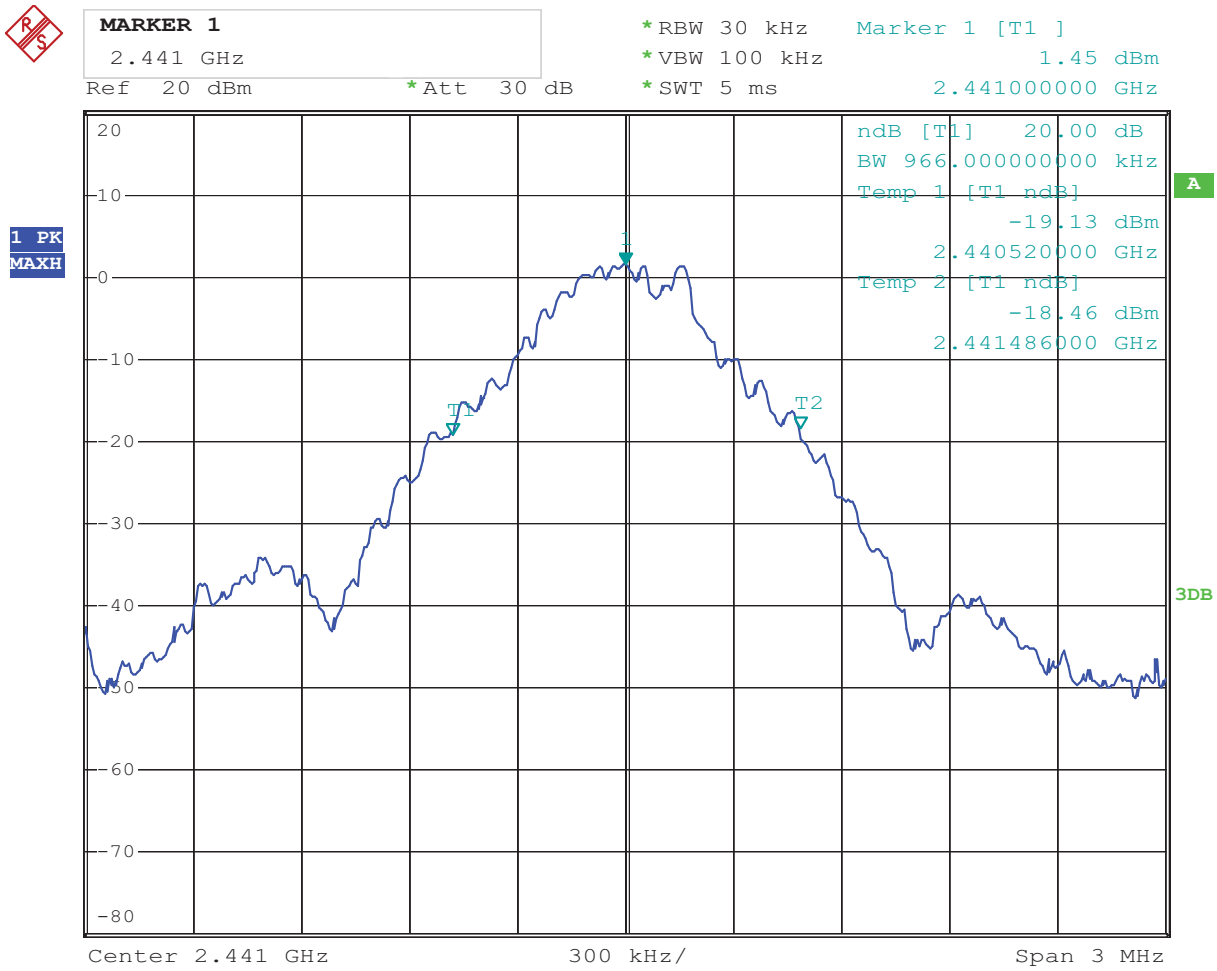
Test Figure:

1. Condition: Low Channel



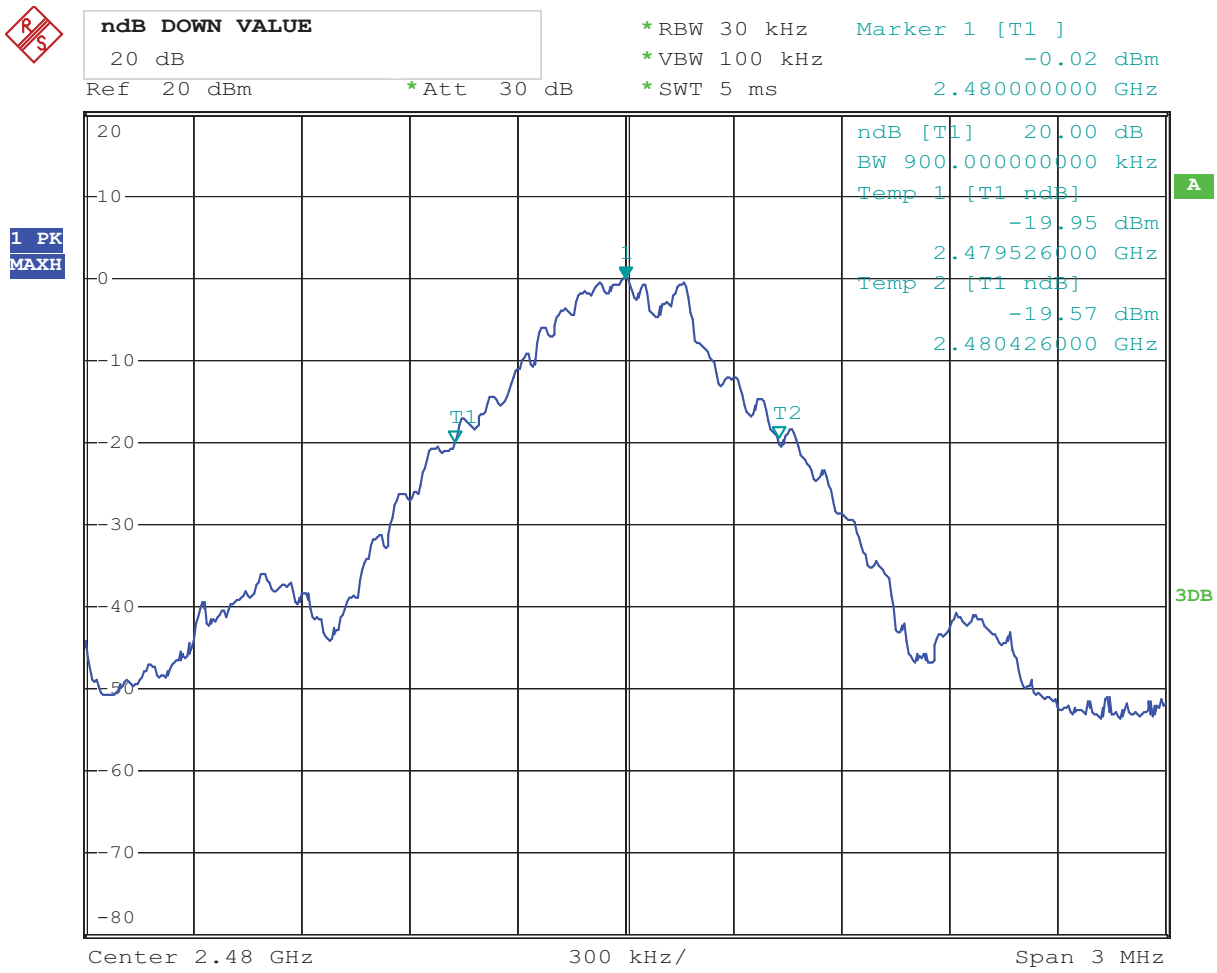
Date: 24.SEP.2014 17:38:04

2. Condition: Middle Channel



Date: 24.SEP.2014 17:36:50

3. High Channel



Date: 24.SEP.2014 17:35:47

Test Result

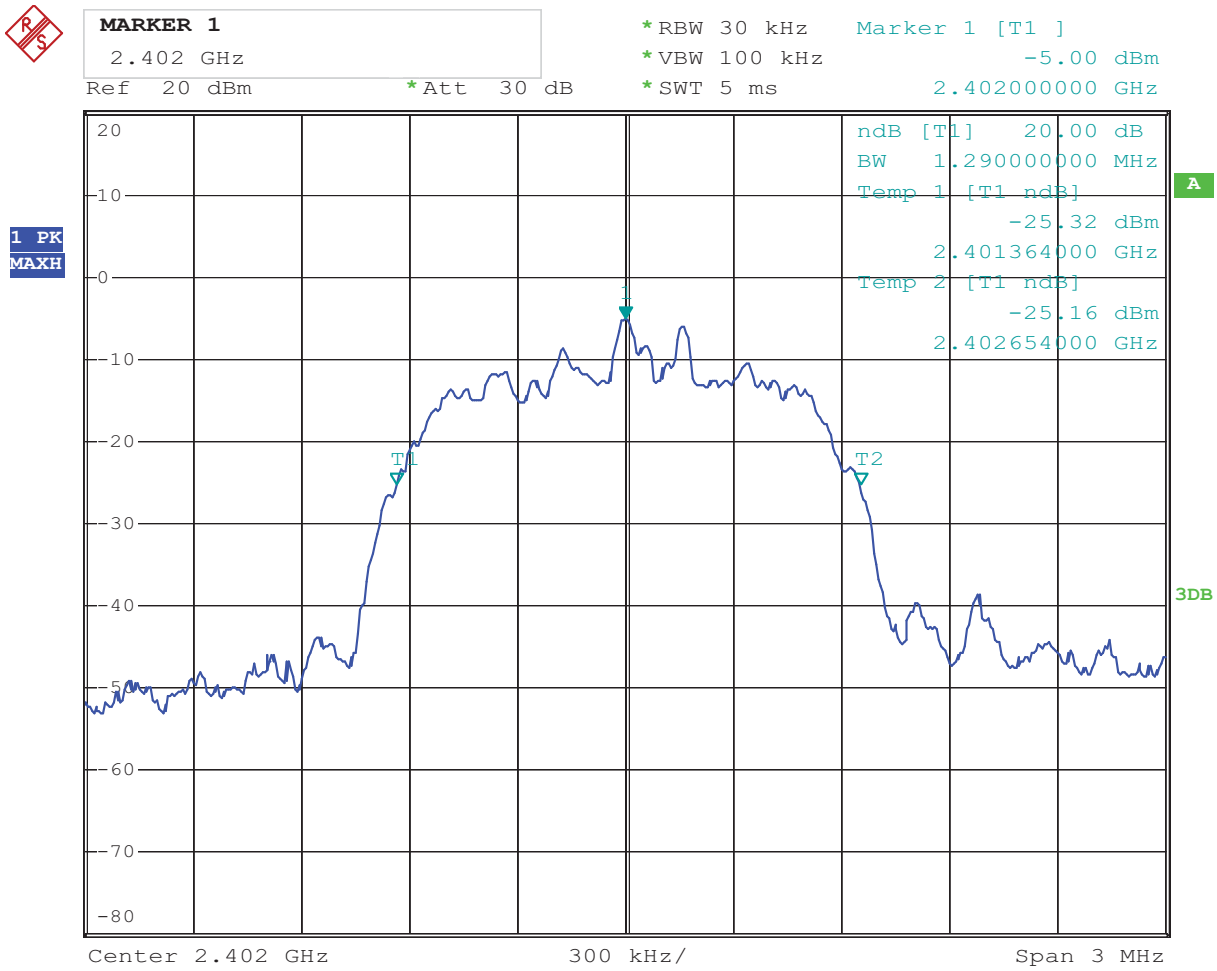
Type of Modulation: Л/4DQPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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	1290	--	Pass
Middle	2441	1284	--	Pass
High	2480	1284	--	Pass

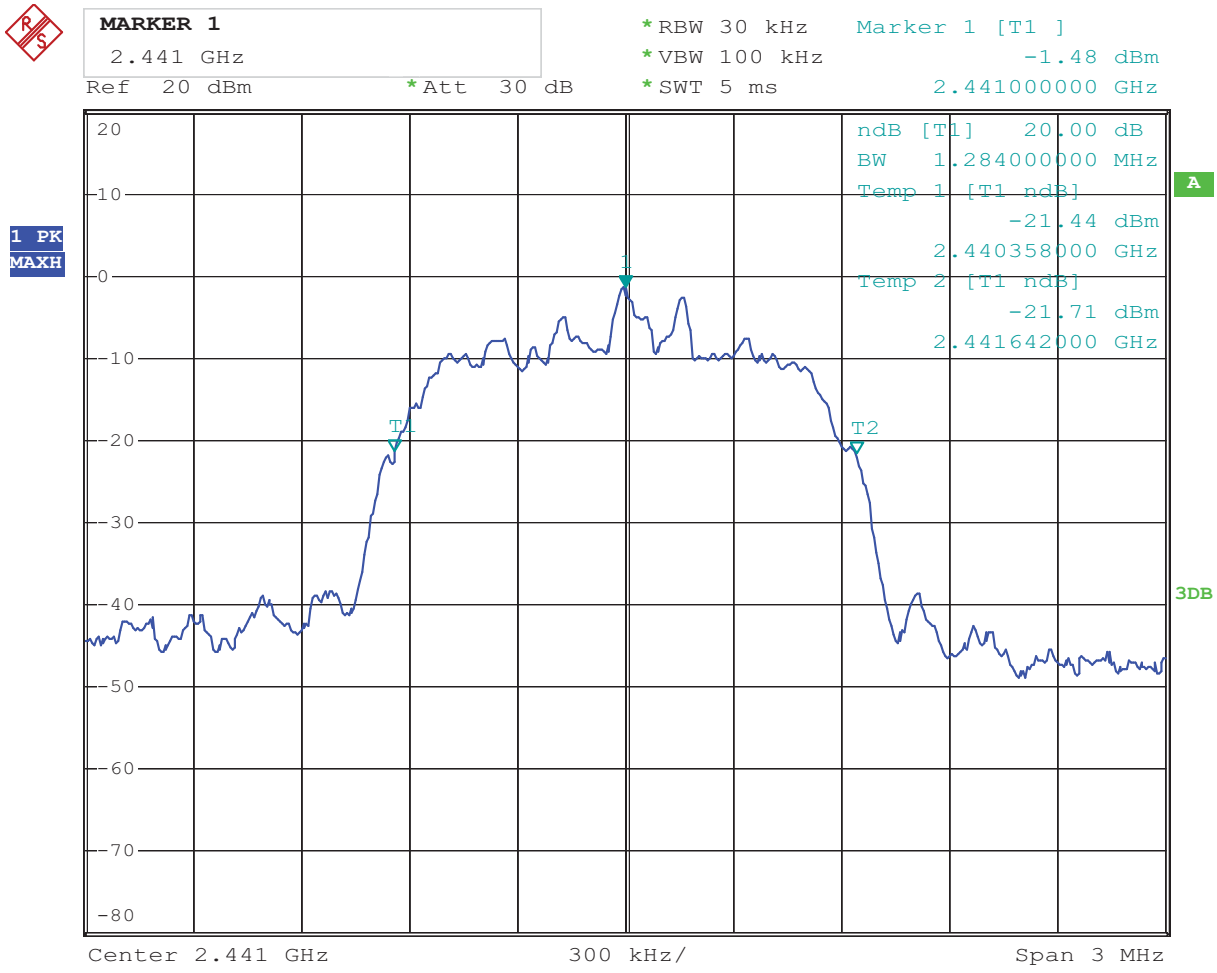
Test Figure:

1. Condition: Low Channel



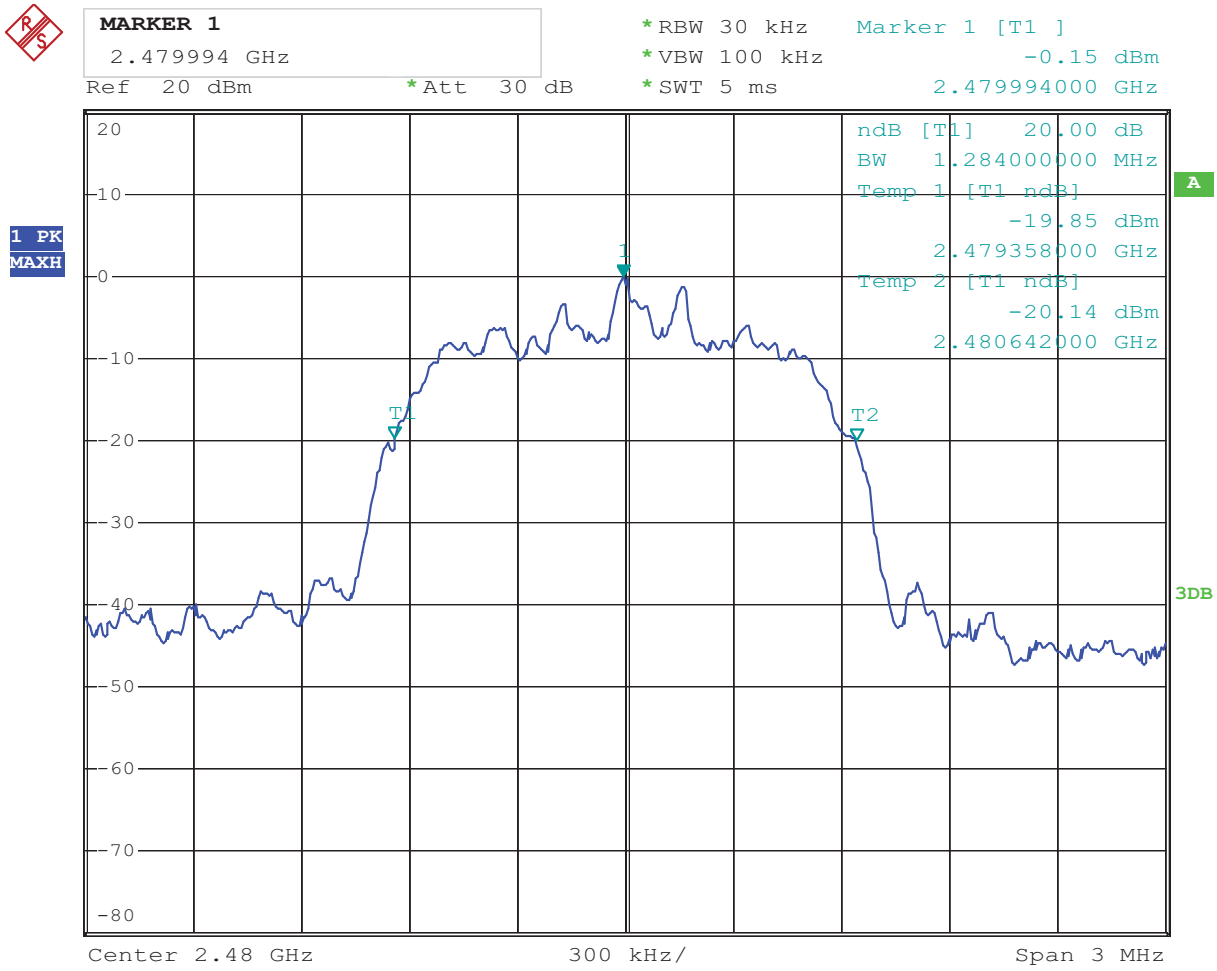
Date: 24.SEP.2014 17:39:04

2. Condition: Middle Channel



Date: 24.SEP.2014 17:39:50

3. High Channel



Date: 24.SEP.2014 17:40:30

Test Result

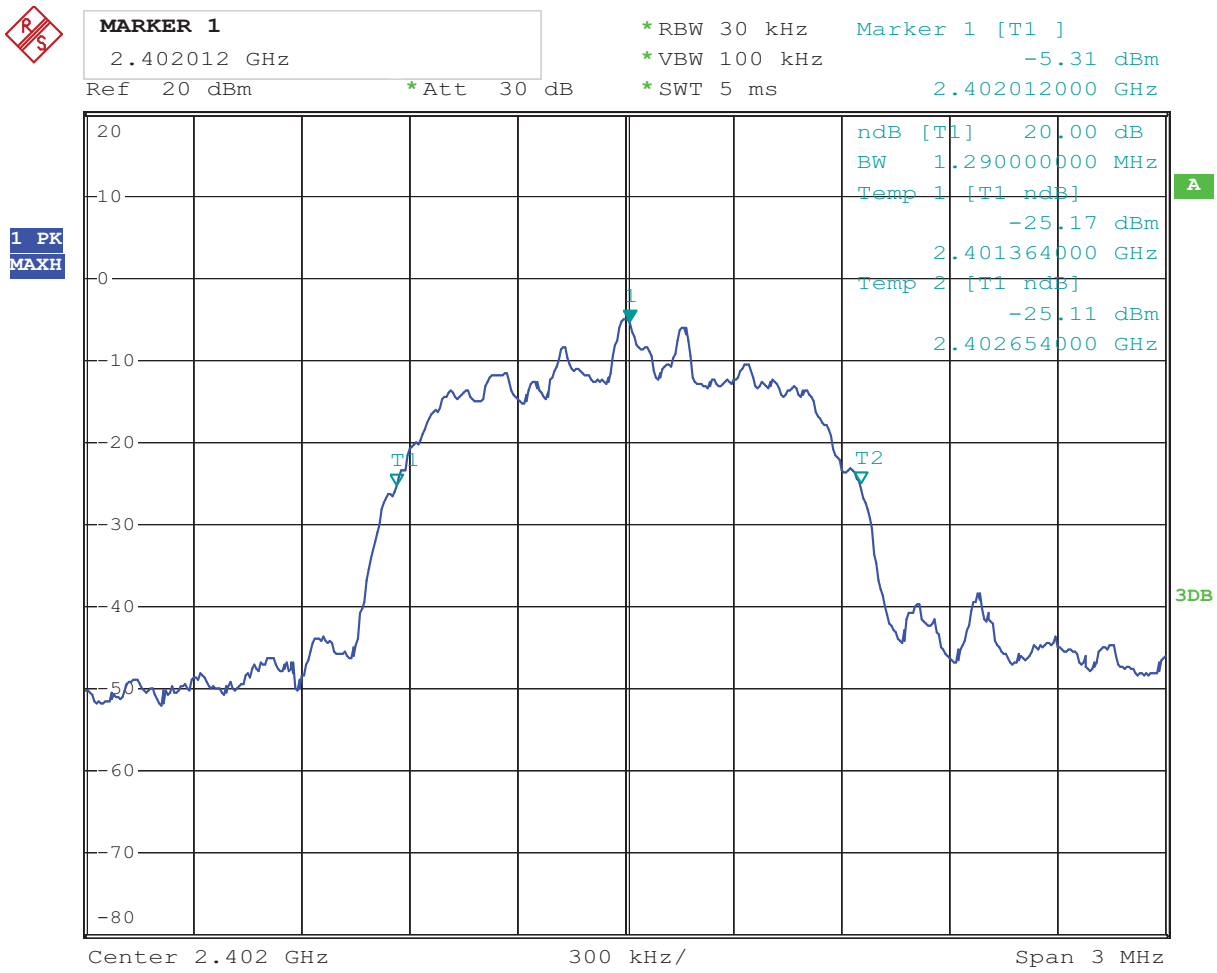
Type of Modulation: 8DPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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	1290	--	Pass
Middle	2441	1284	--	Pass
High	2480	1278	--	Pass

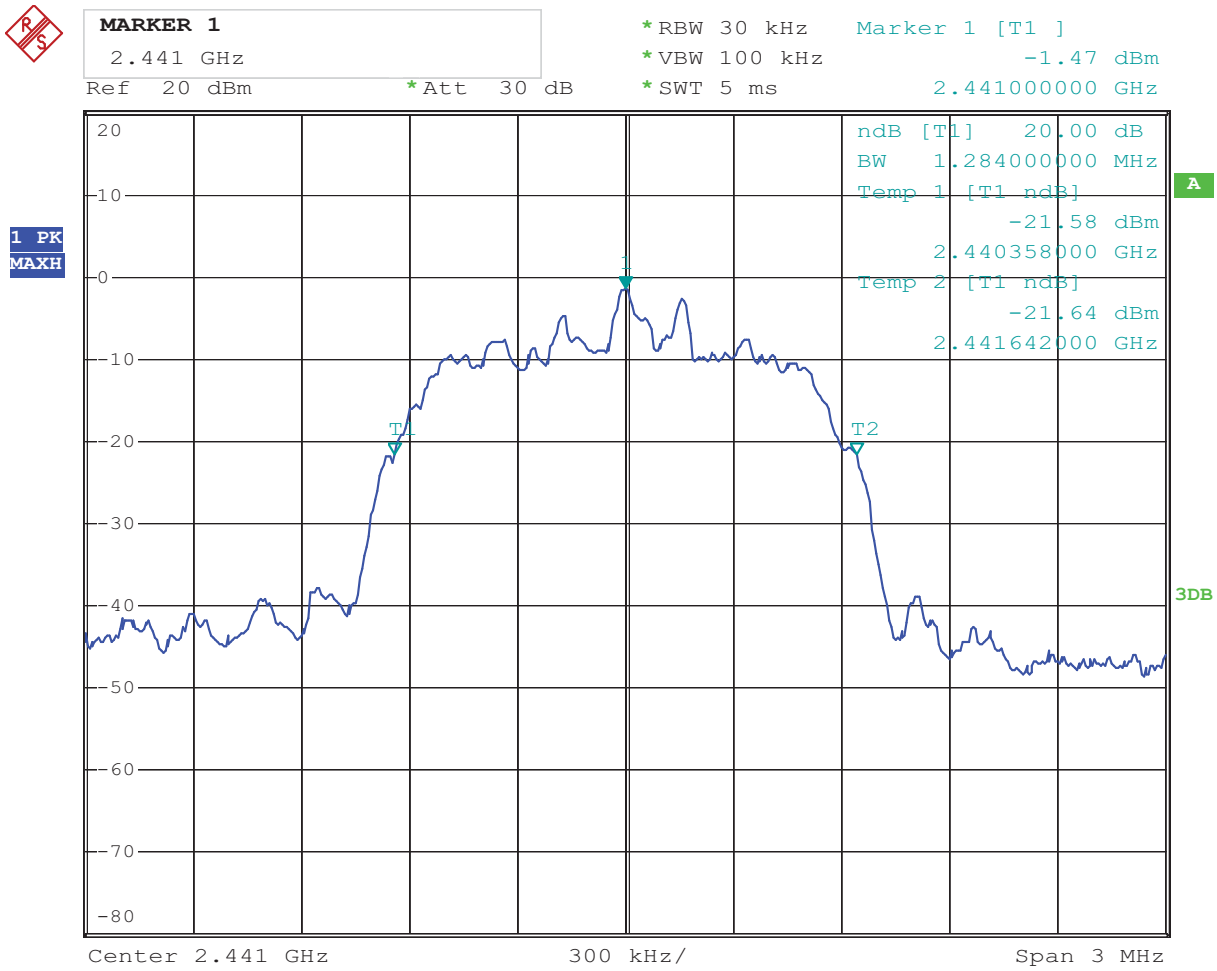
Test Figure:

1. Condition: Low Channel



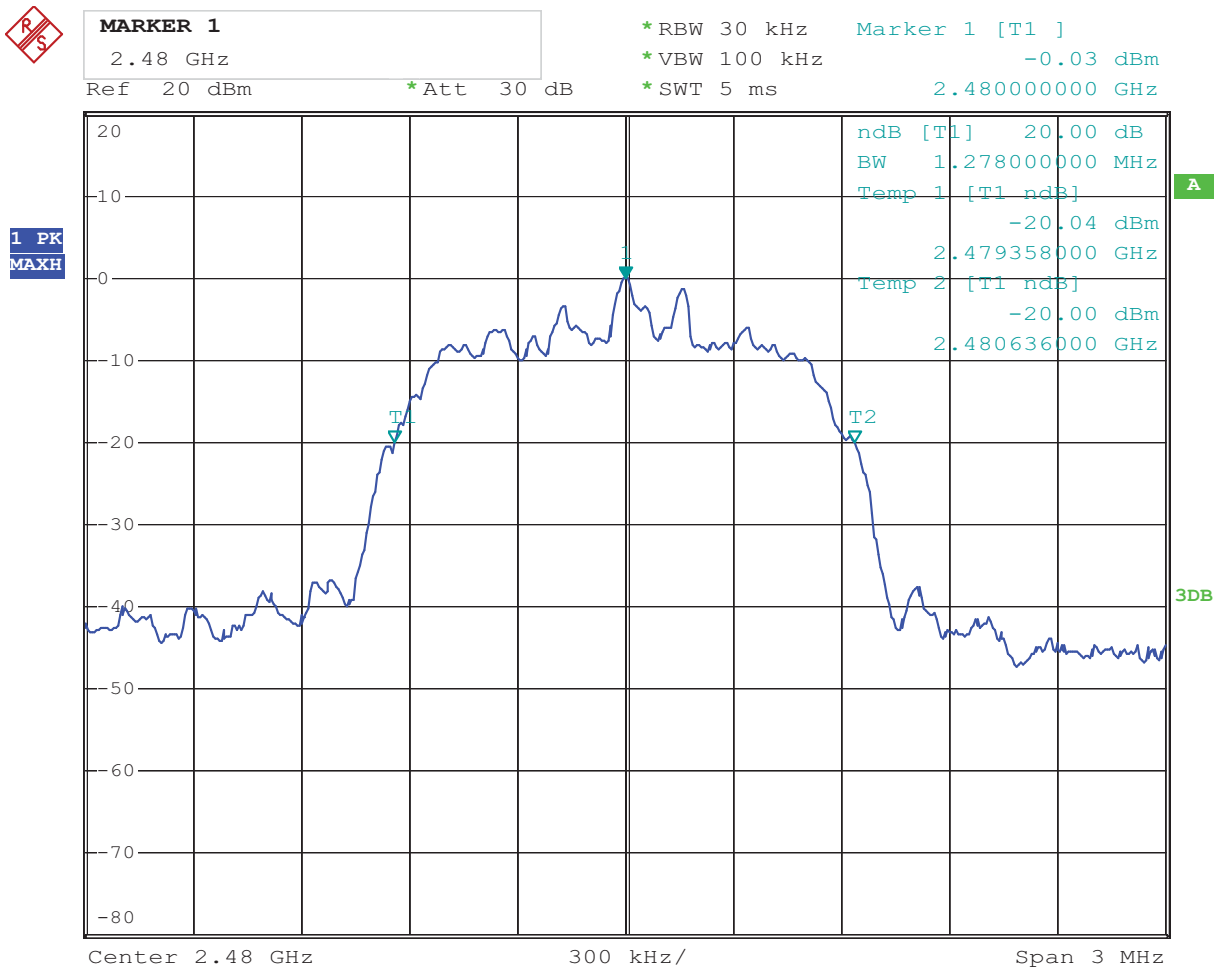
Date: 24.SEP.2014 17:44:15

2. Condition: Middle Channel



Date: 24.SEP.2014 17:42:23

3. High Channel



Date: 24.SEP.2014 17:41:22

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.

8.4Test Results

Type of Modulation: GFSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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	1.46	30	Pass
Middle	2441	4.43	30	Pass
High	2480	**5.50**	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: Л/4DQPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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	-1.24	30	Pass
Middle	2441	2.21	30	Pass
High	2480	3.61	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: 8DPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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	-1.21	30	Pass
Middle	2441	2.27	30	Pass
High	2480	3.70	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

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) ≥ 1% of the span; Video (or Average) Bandwidth (VBW) ≥ 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.

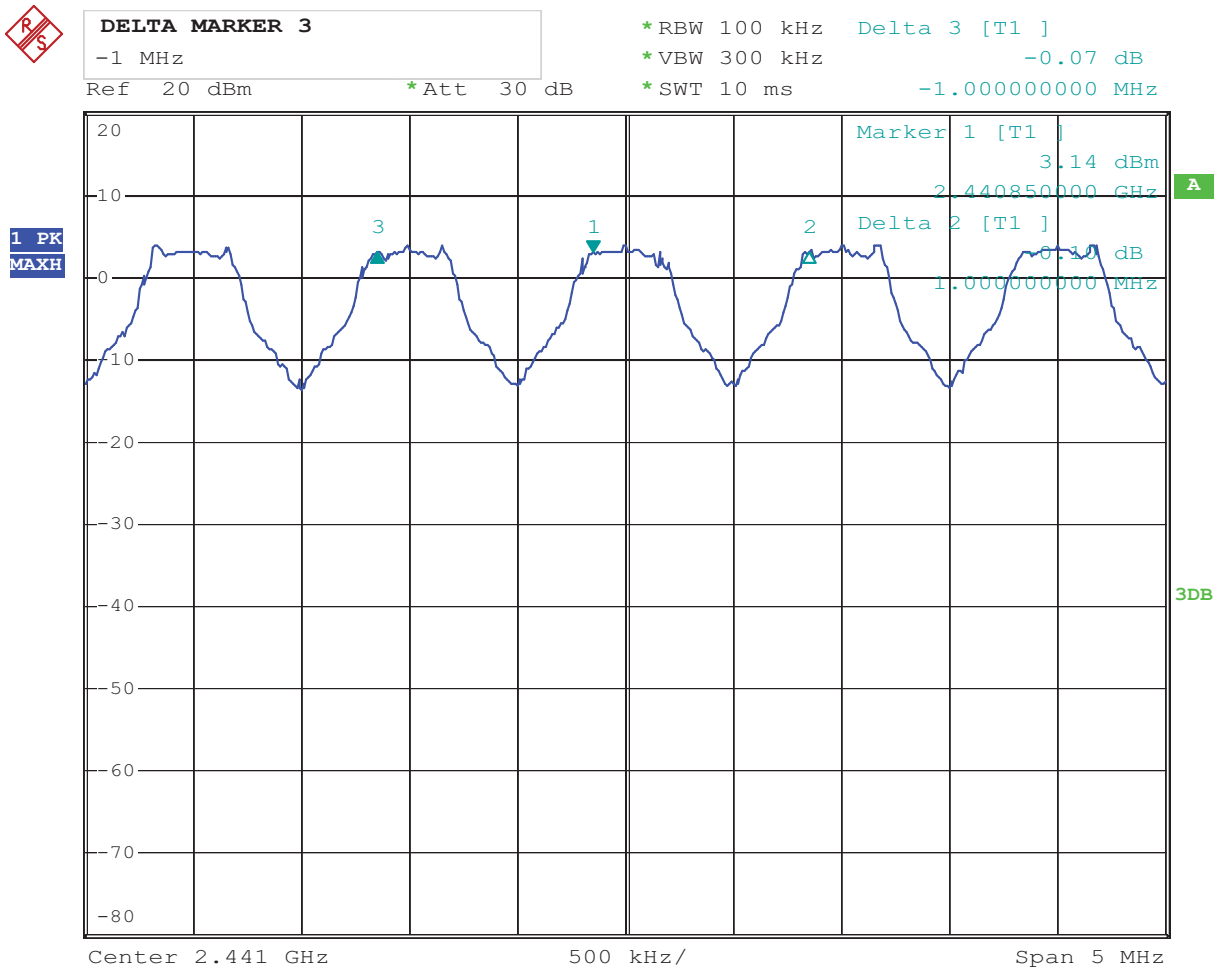
9.4Test Result

Type of Modulation: GFSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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



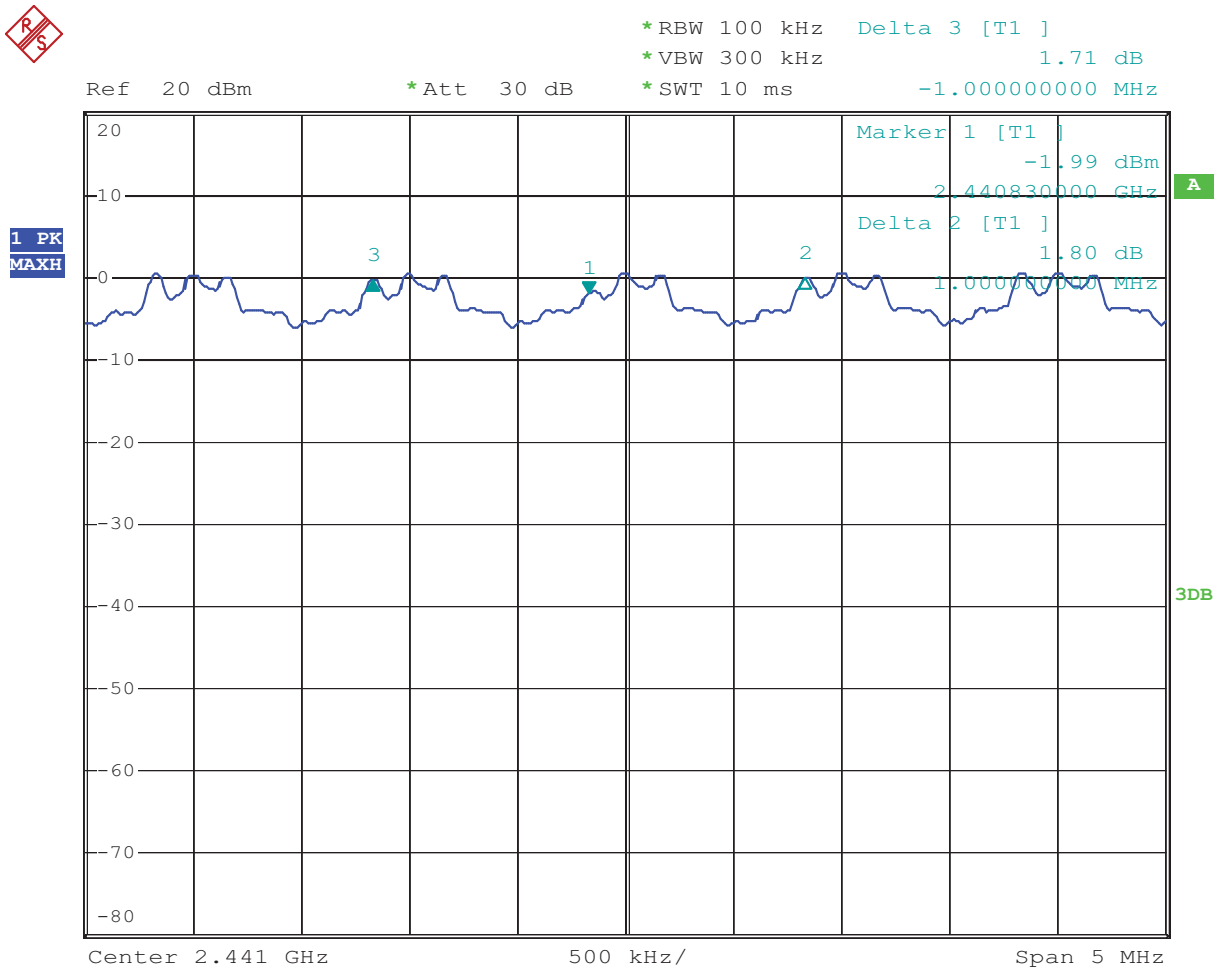
Date: 24.SEP.2014 17:03:01

Type of Modulation: Л/4DQPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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



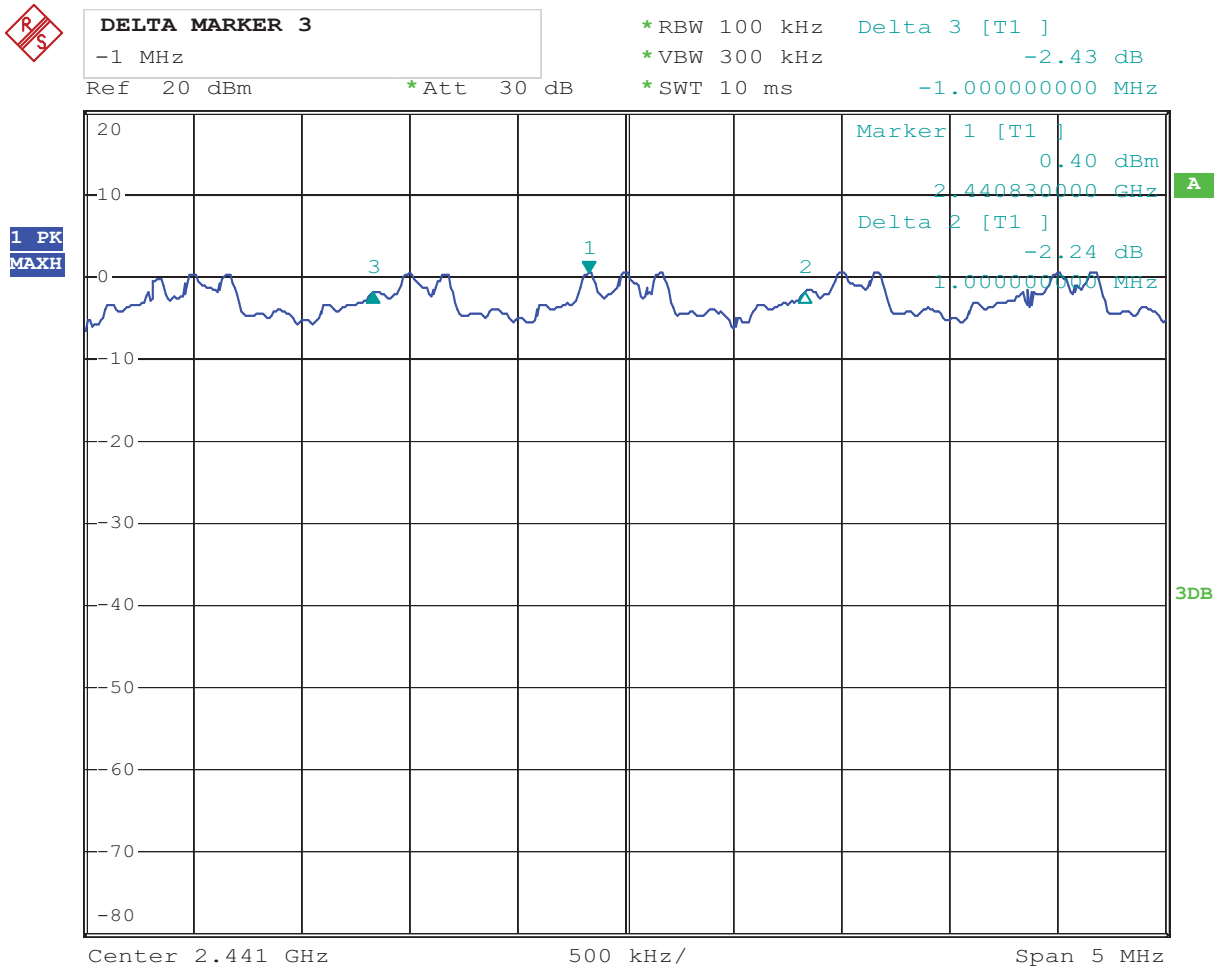
Date: 24.SEP.2014 15:07:34

Type of Modulation: 8DPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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



Date: 24.SEP.2014 13:20:28

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=VBW=100 kHz;
Sweep = auto; Detector function = peak; Trace = max hold
3. Record the number of hopping channels.

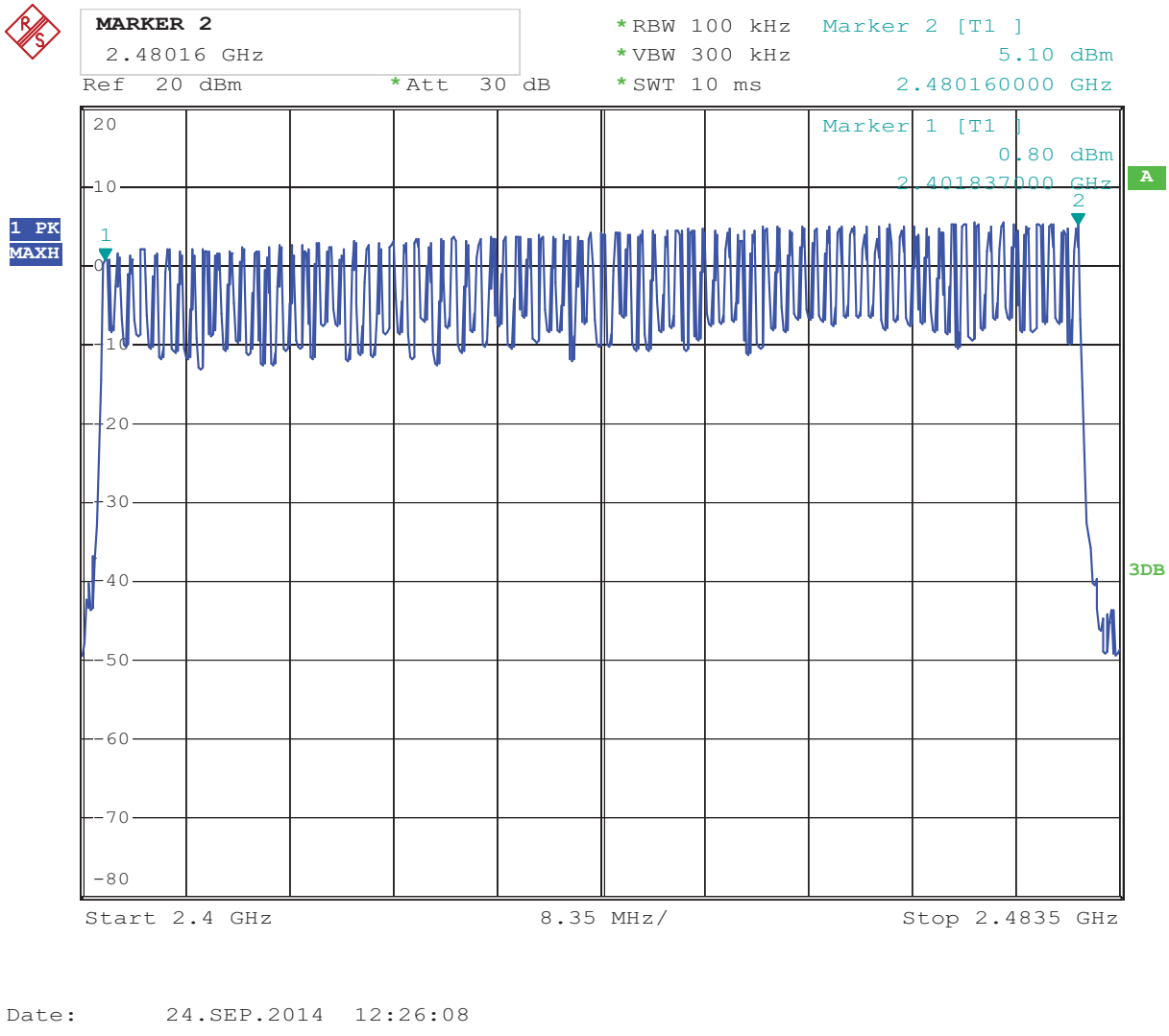
10.4Test Result

Type of Modulation: GFSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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

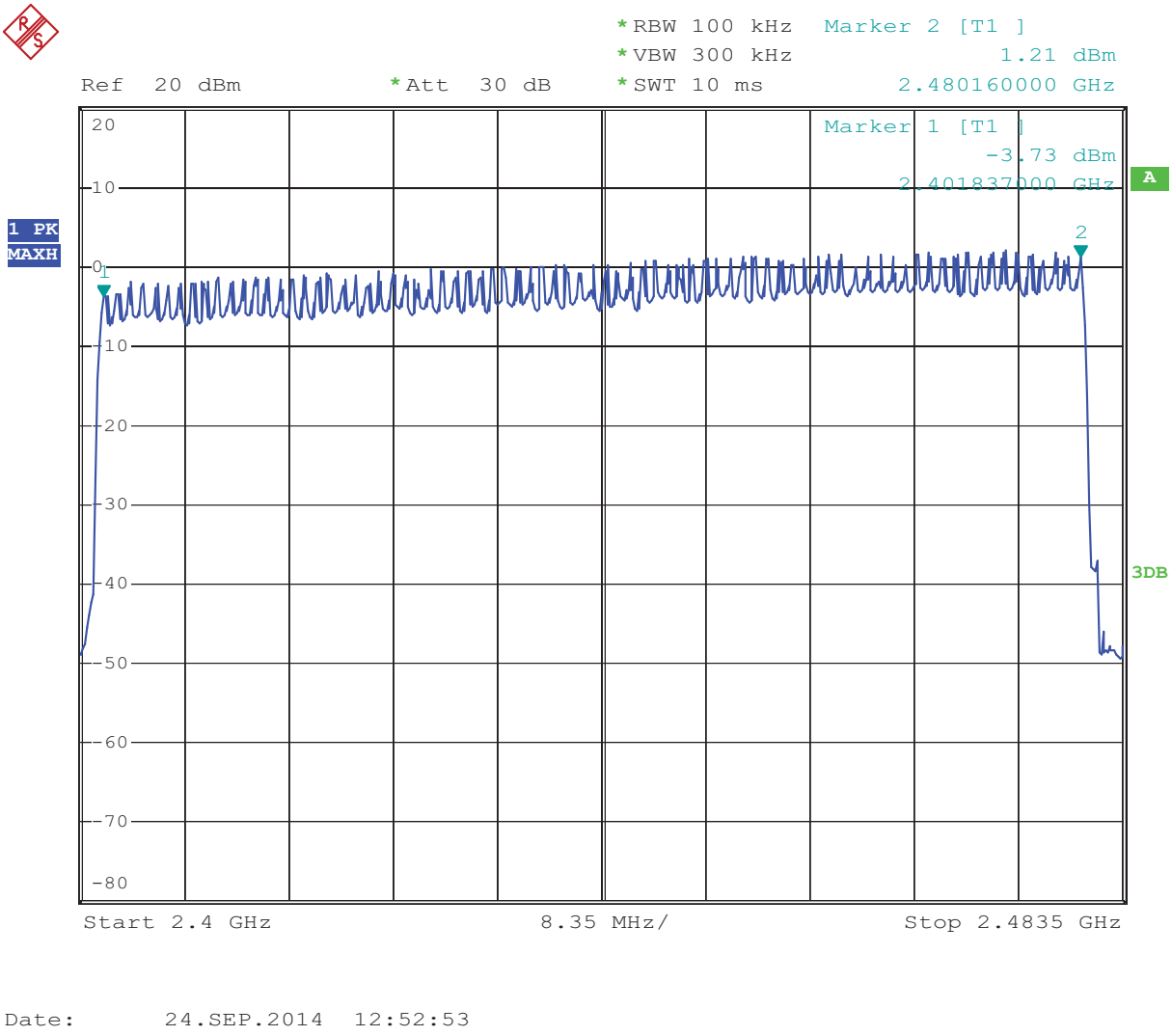


Type of Modulation: Л/4DQPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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

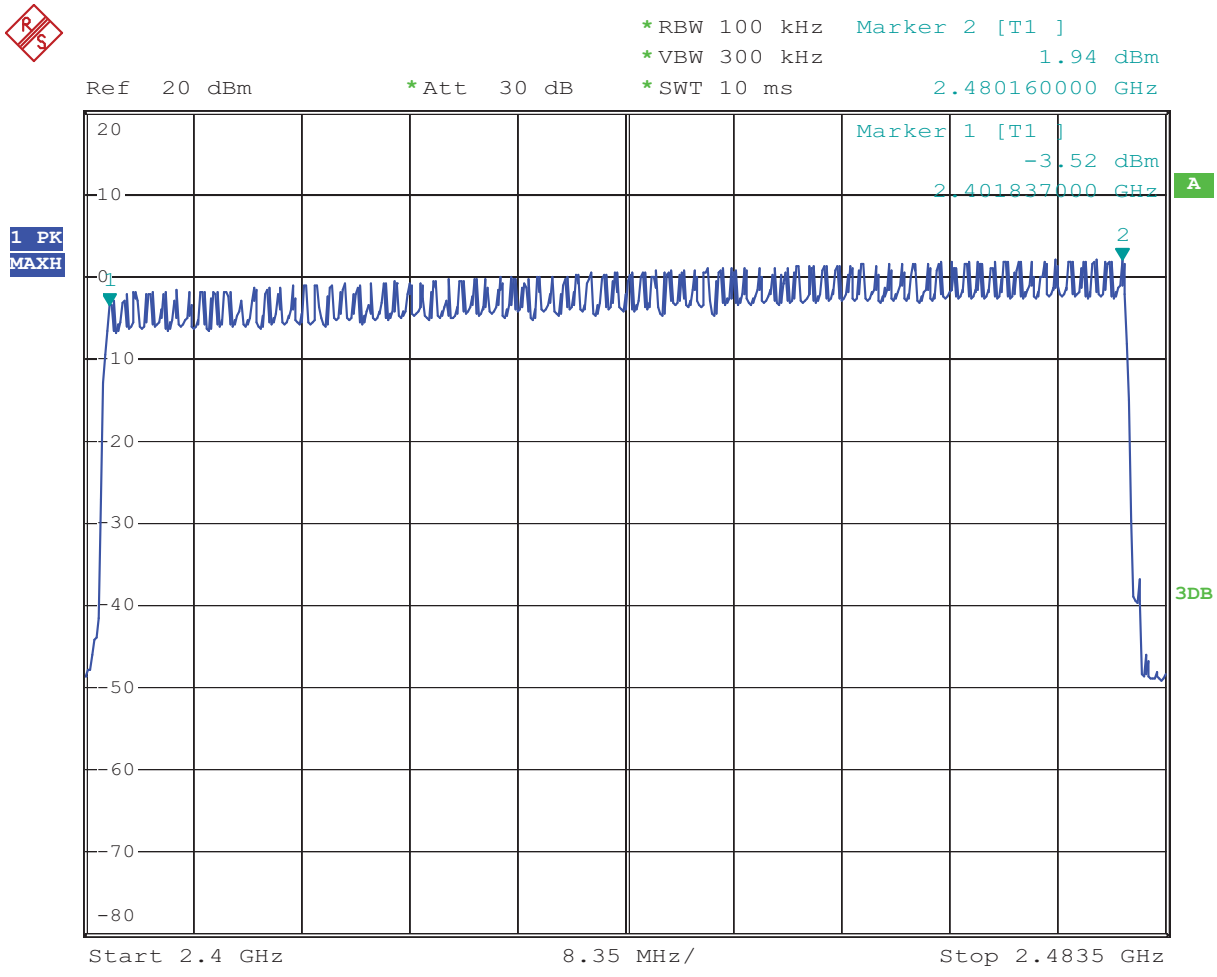


Type of Modulation: 8DPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
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



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 ≥ 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	Bluetooth Speaker	Model	OontZ Angle PLUS
Mode	Keep Transmitting	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH

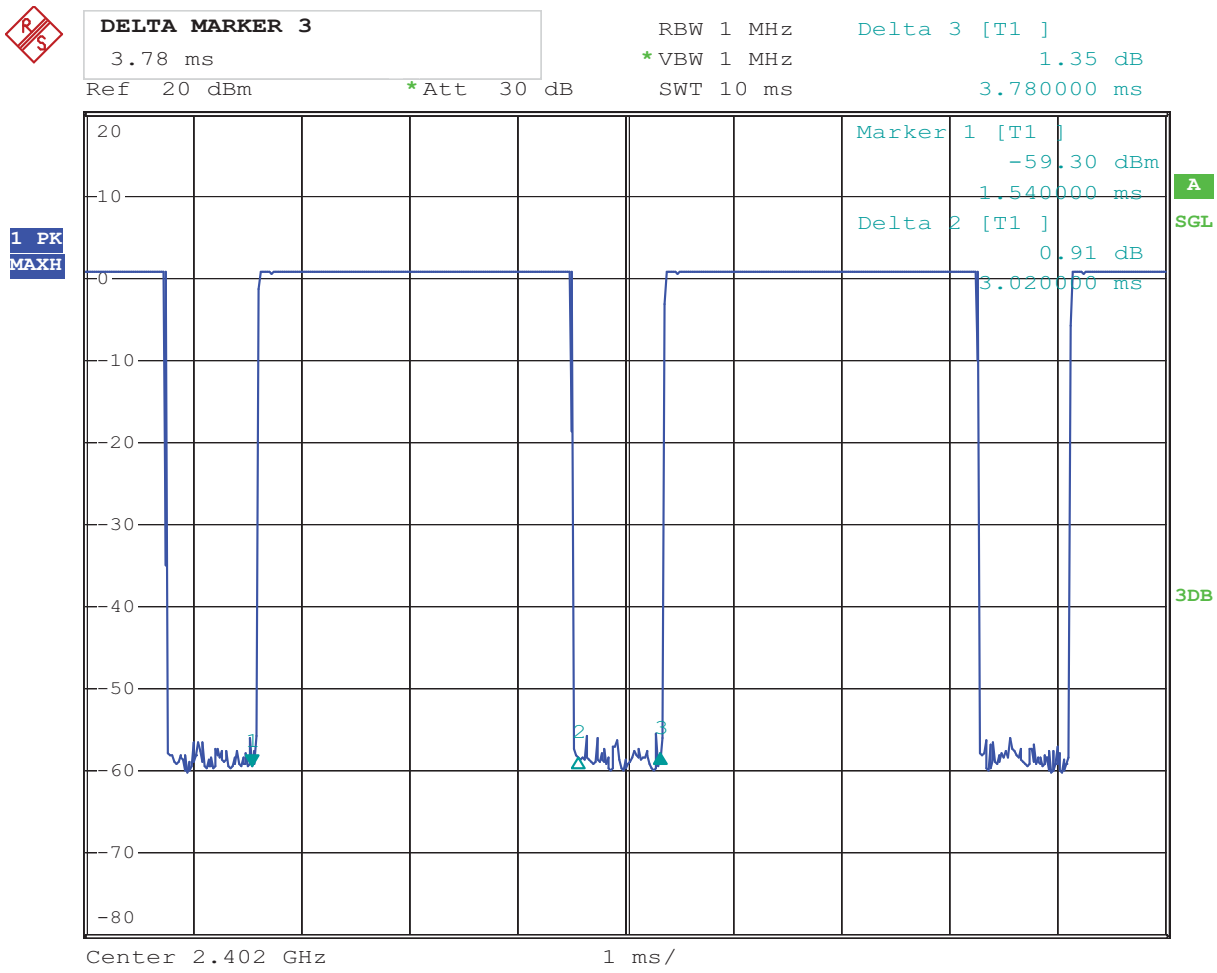
Channel	Reading	Hoping Rate	Actual	Limit
Low	3.02ms	266.667 hop/s	0.322s	0.4s
Middle	3.00ms	266.667 hop/s	0.320s	0.4s
High	3.02ms	266.667 hop/s	0.322s	0.4s

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

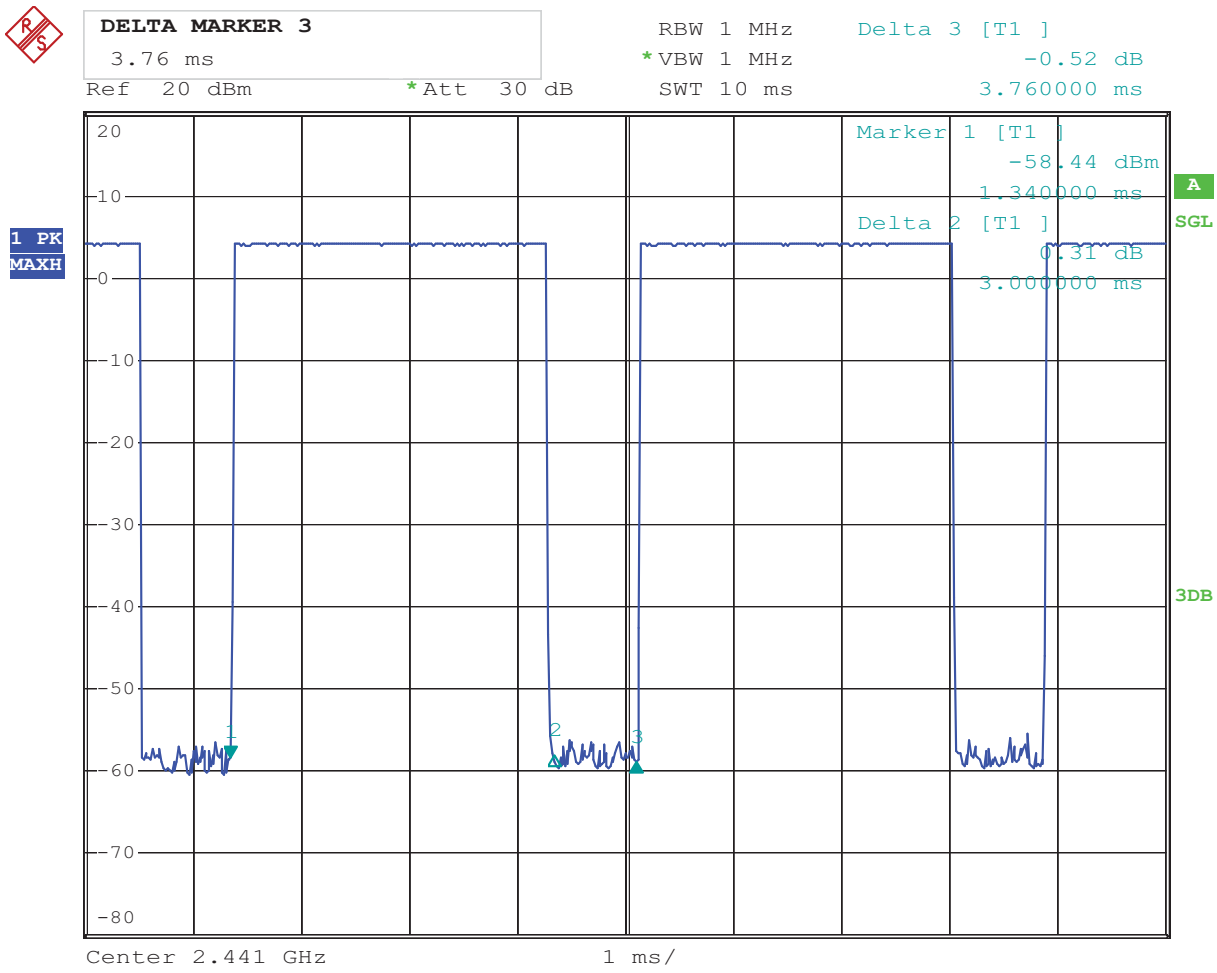
Test Plots:

Low Channel:



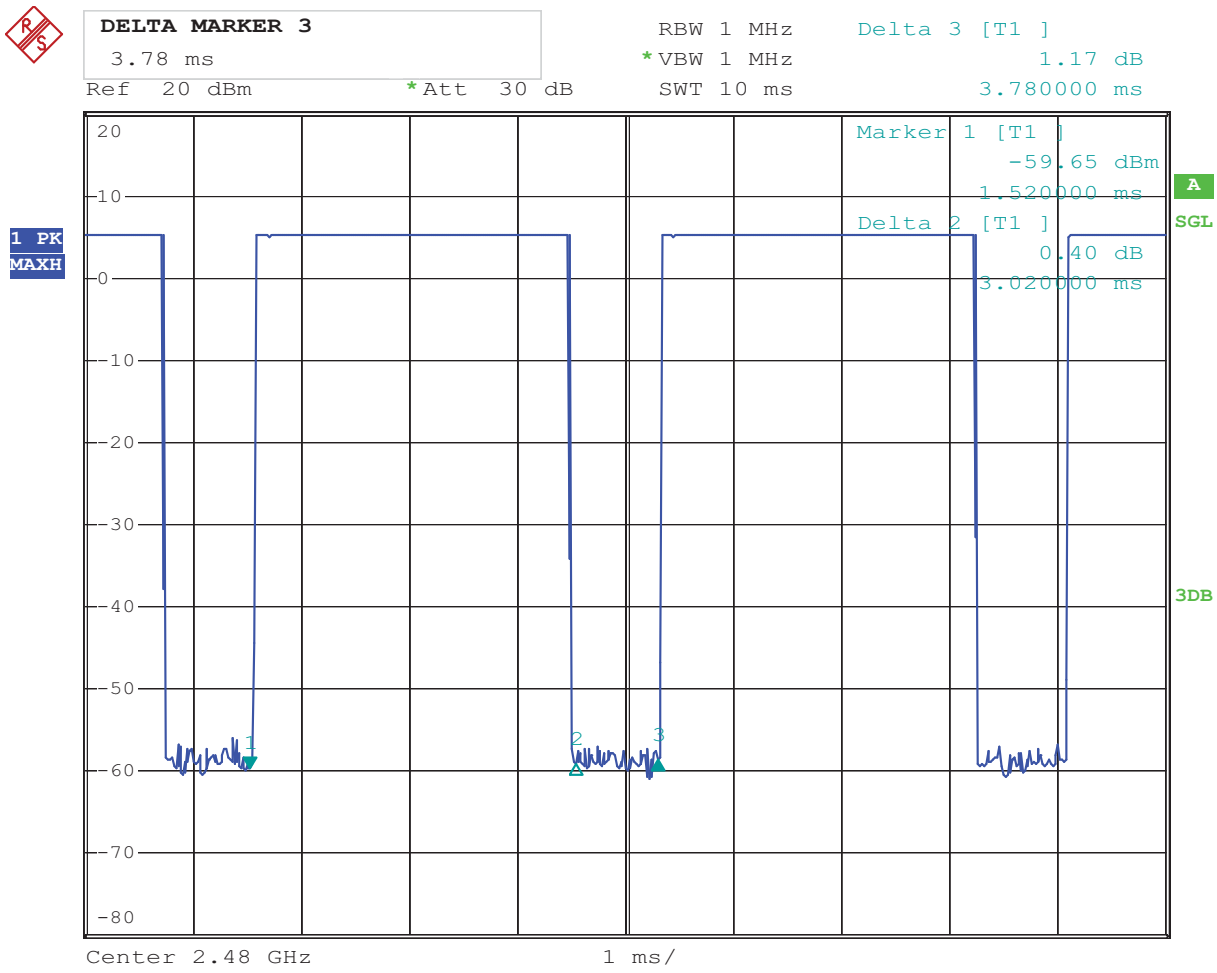
Date: 24.SEP.2014 17:51:48

Middle Channel:



Date: 24.SEP.2014 17:51:08

High Channel



Date: 24.SEP.2014 17:50:23

Test Result

Type of Modulation: Л/4DQPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
Mode	Keep Transmitting	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH

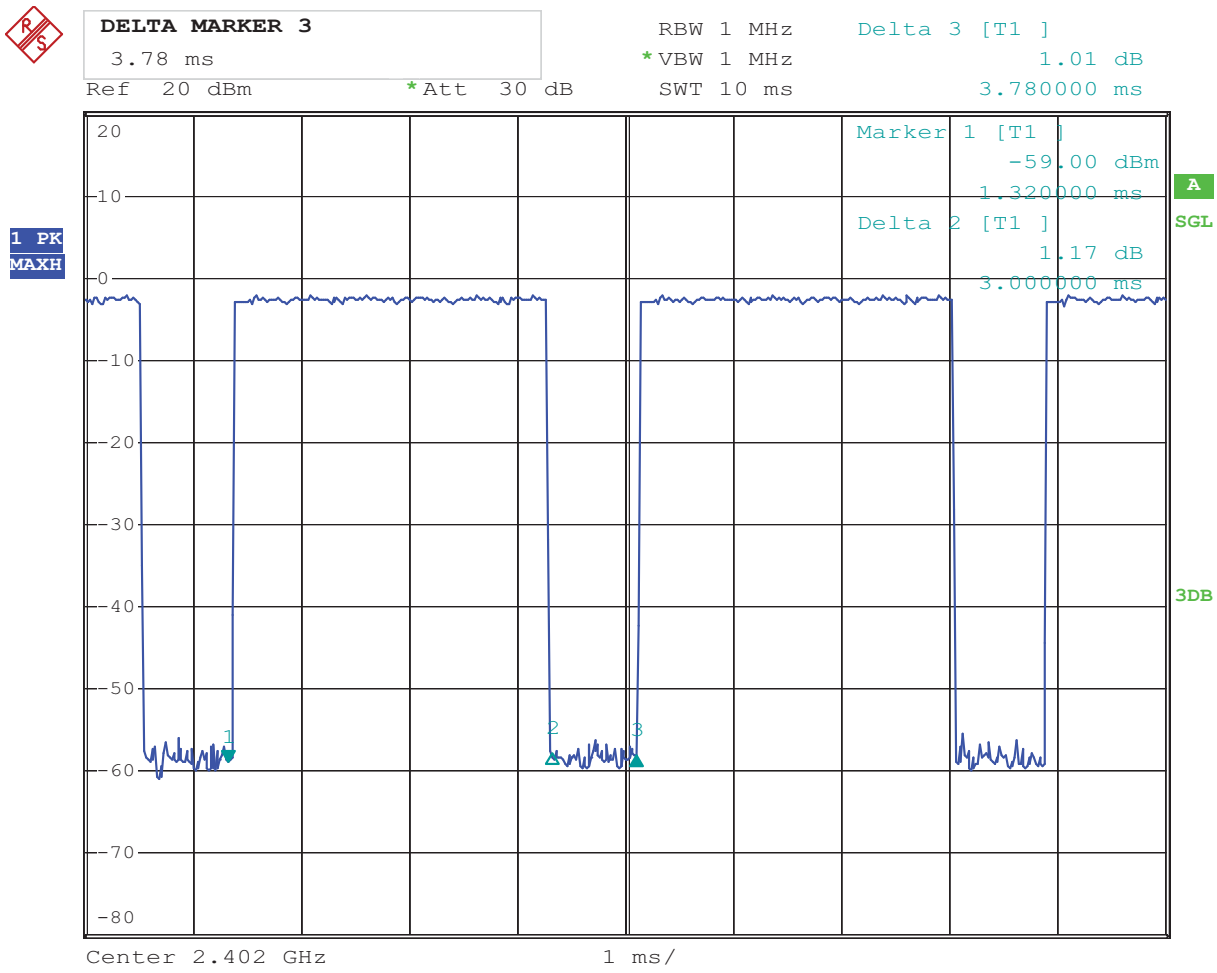
Channel	Reading	Hoping Rate	Actual	Limit
Low	3.00ms	266.667 hop/s	0.320s	0.4s
Middle	3.04ms	266.667 hop/s	0.324s	0.4s
High	2.98ms	266.667 hop/s	0.318s	0.4s

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

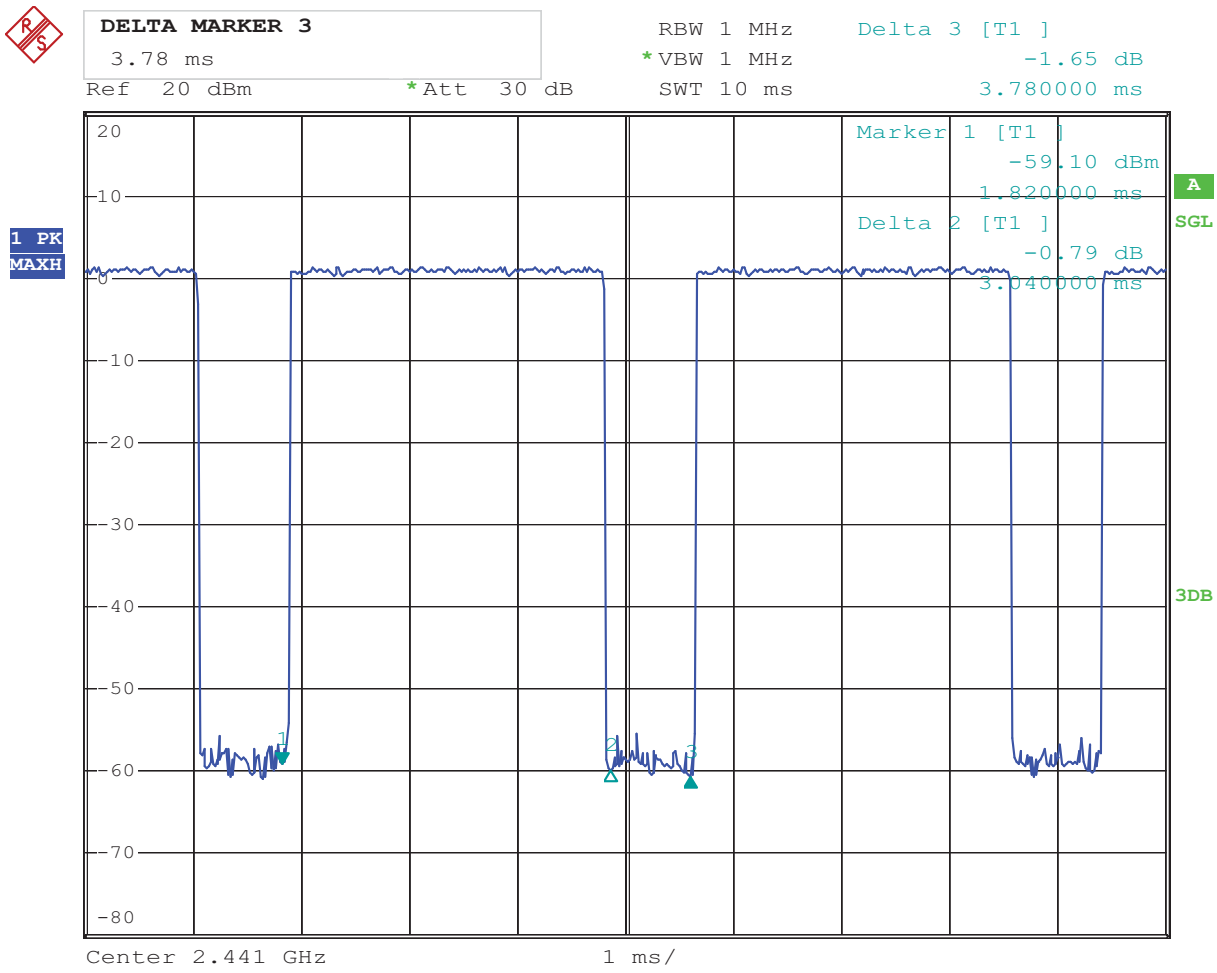
Test Plots:

Low Channel:



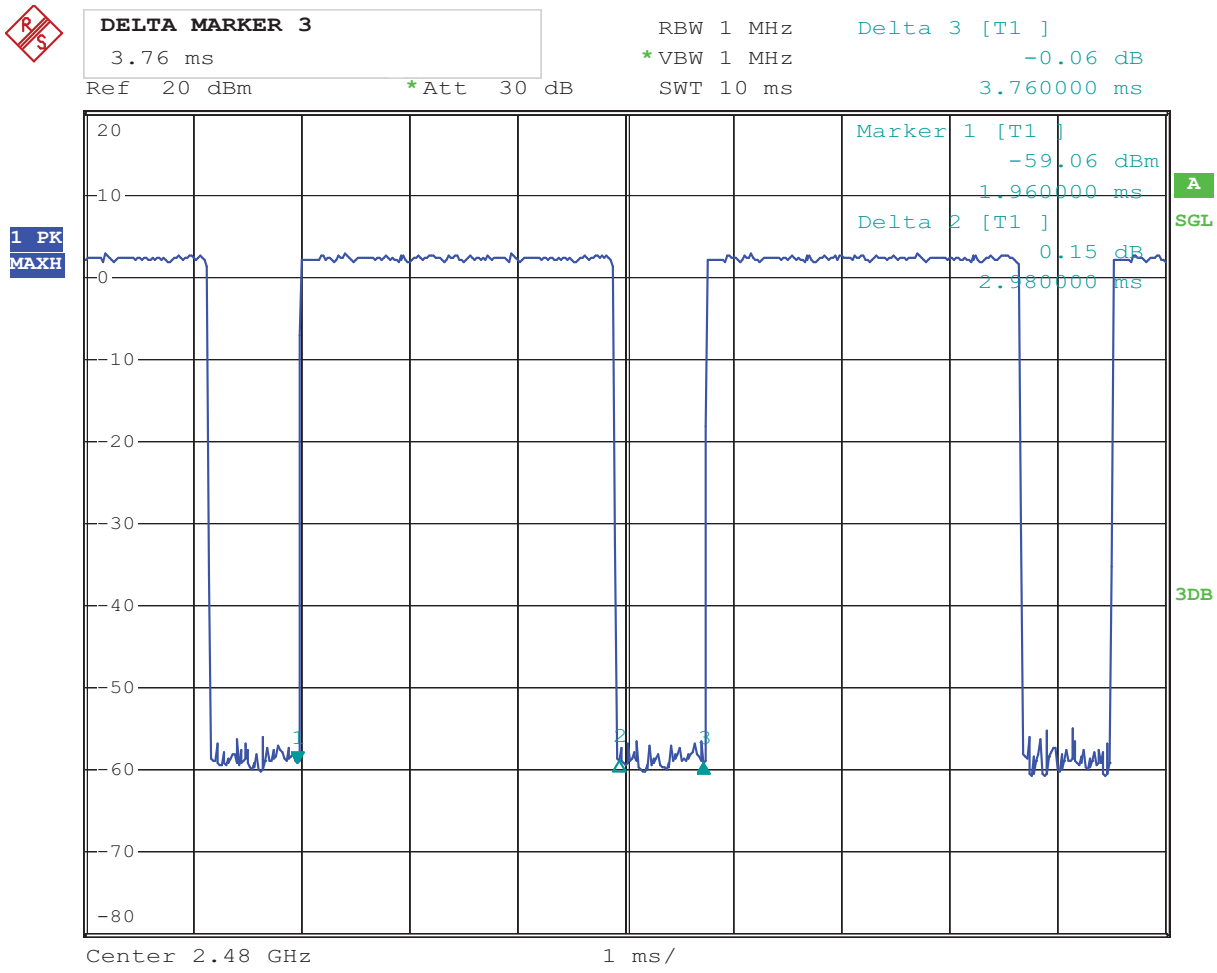
Date: 24.SEP.2014 17:52:47

Middle Channel:



Date: 24.SEP.2014 17:53:33

High Channel



Date: 24.SEP.2014 17:54:13

Type of Modulation: 8DPSK

EUT	Bluetooth Speaker	Model	OontZ Angle PLUS
Mode	Keep Transmitting	Input Voltage	DC3.7V
Temperature	24 deg. C,	Humidity	56% RH

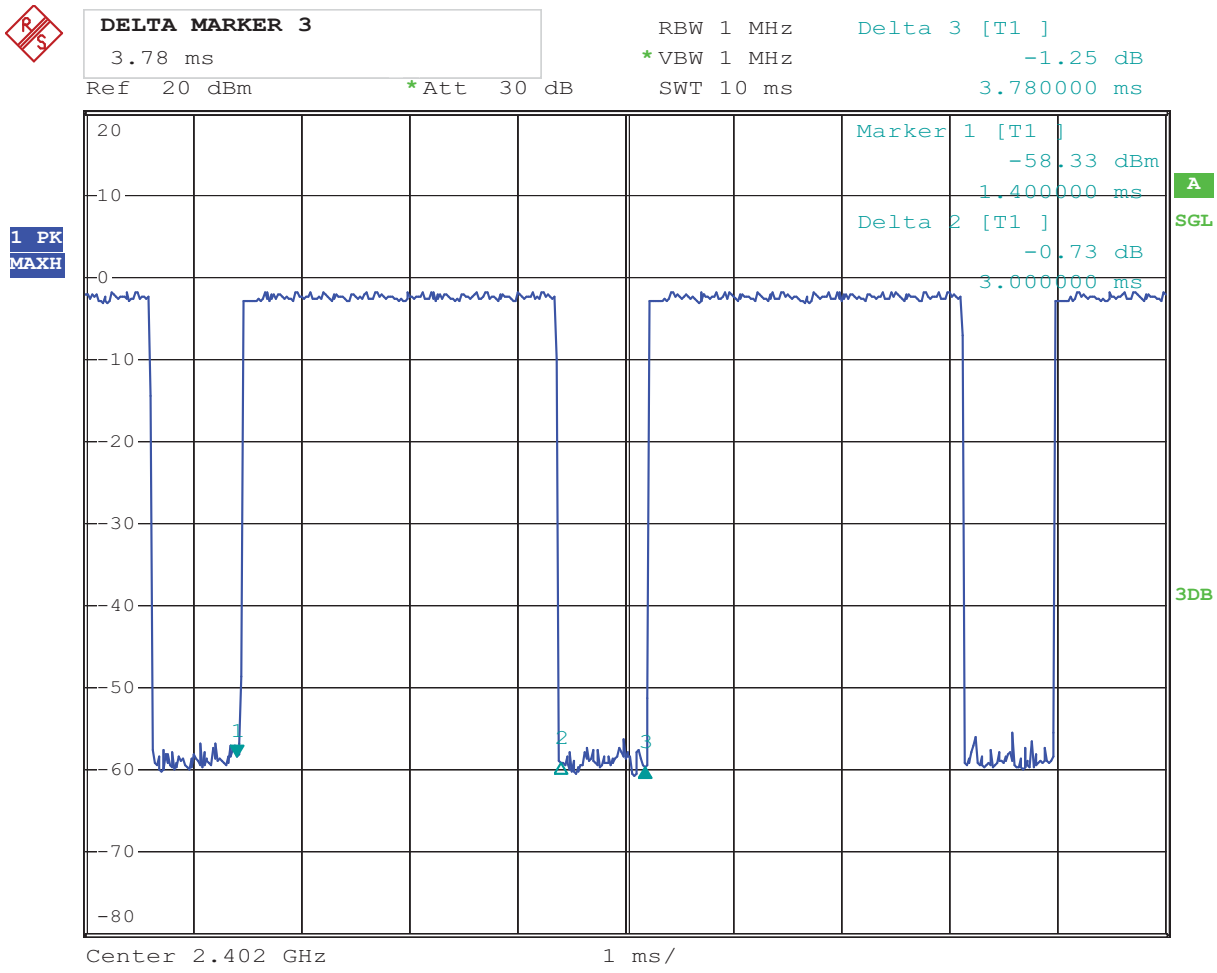
Channel	Reading	Hoping Rate	Actual	Limit
Low	3.00ms	266.667 hop/s	0.320s	0.4s
Middle	3.04ms	266.667 hop/s	0.324s	0.4s
High	3.04ms	266.667 hop/s	0.324s	0.4s

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.

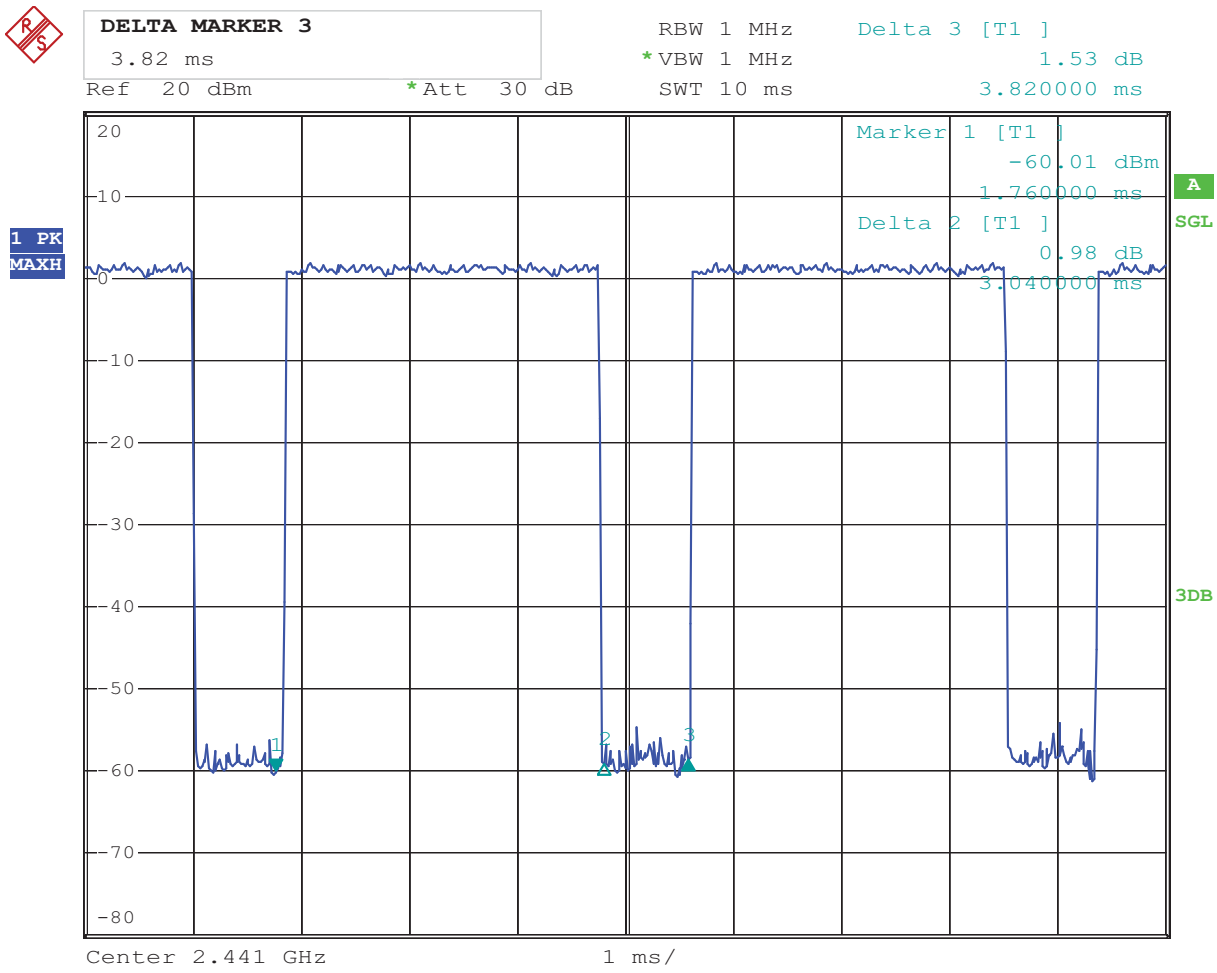
Note: DH5 was the worse case

Test Plots:

Low Channel:

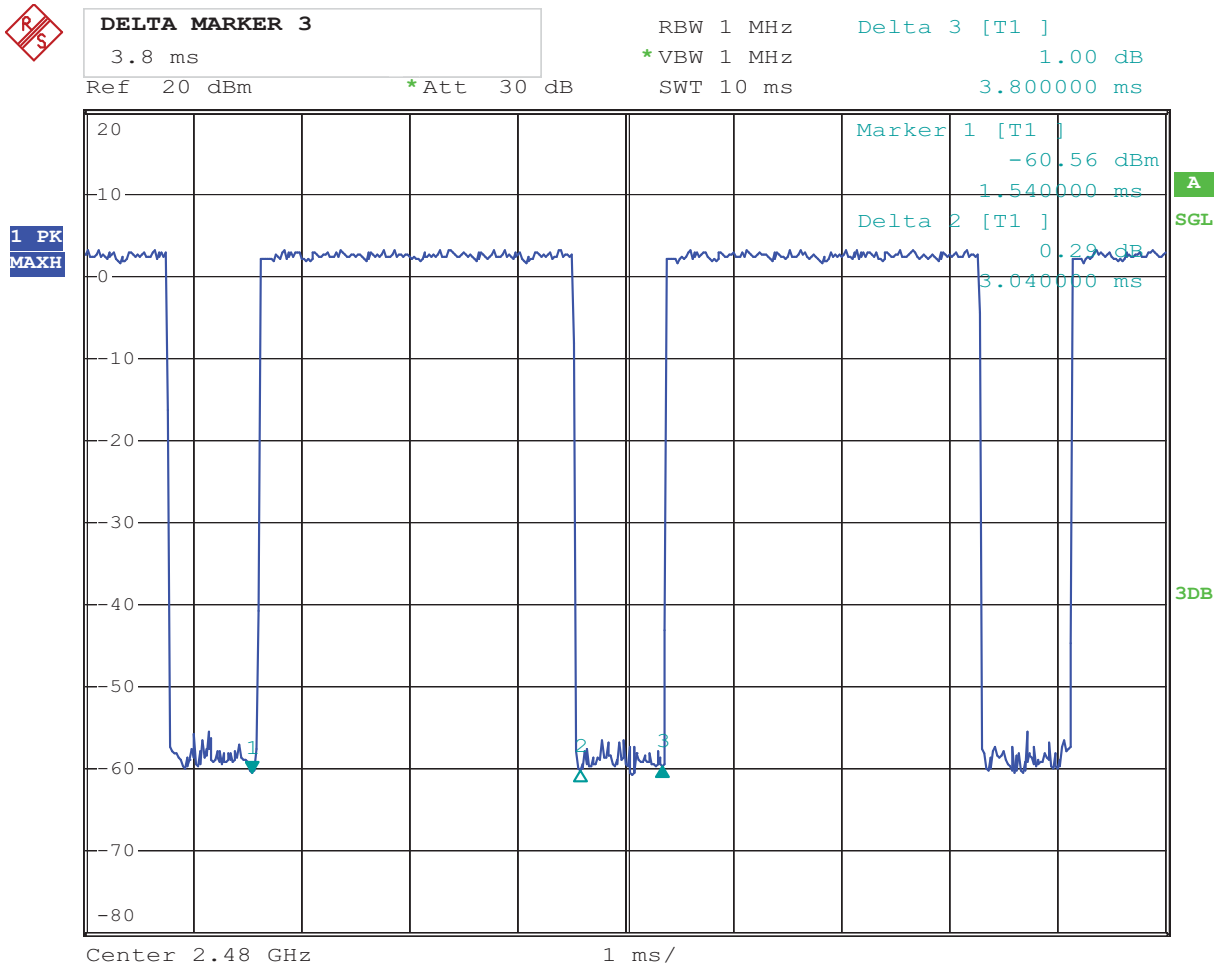


Middle Channel:



Date: 24.SEP.2014 17:55:42

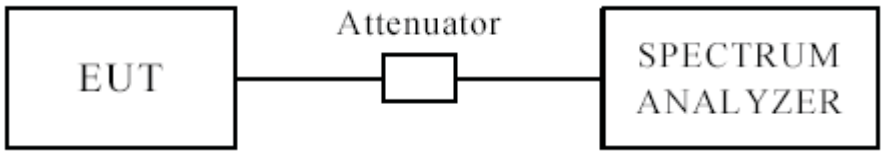
High Channel



Date: 24.SEP.2014 17:54:57

1.1.1. 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

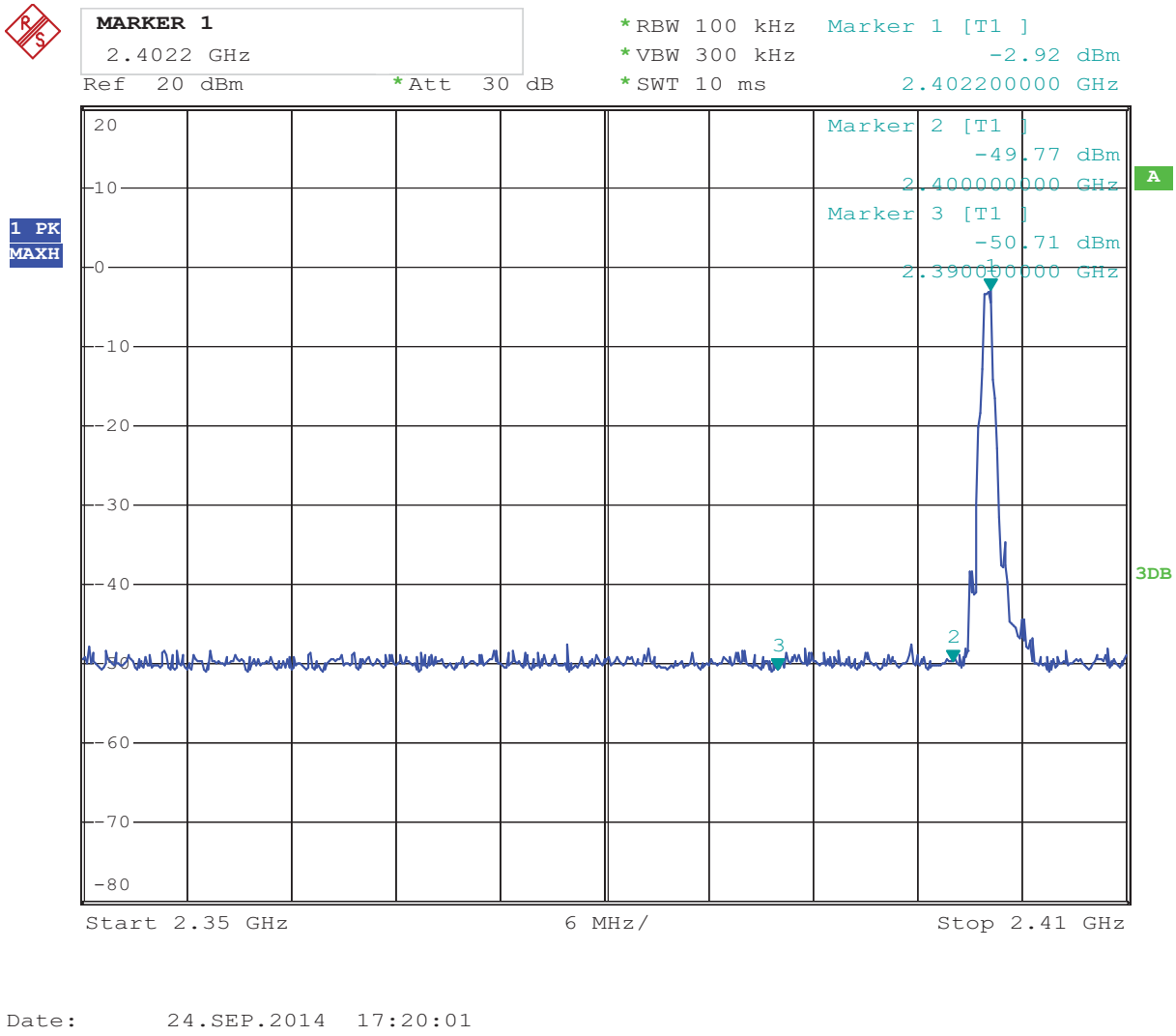
Note: For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	35.9	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:

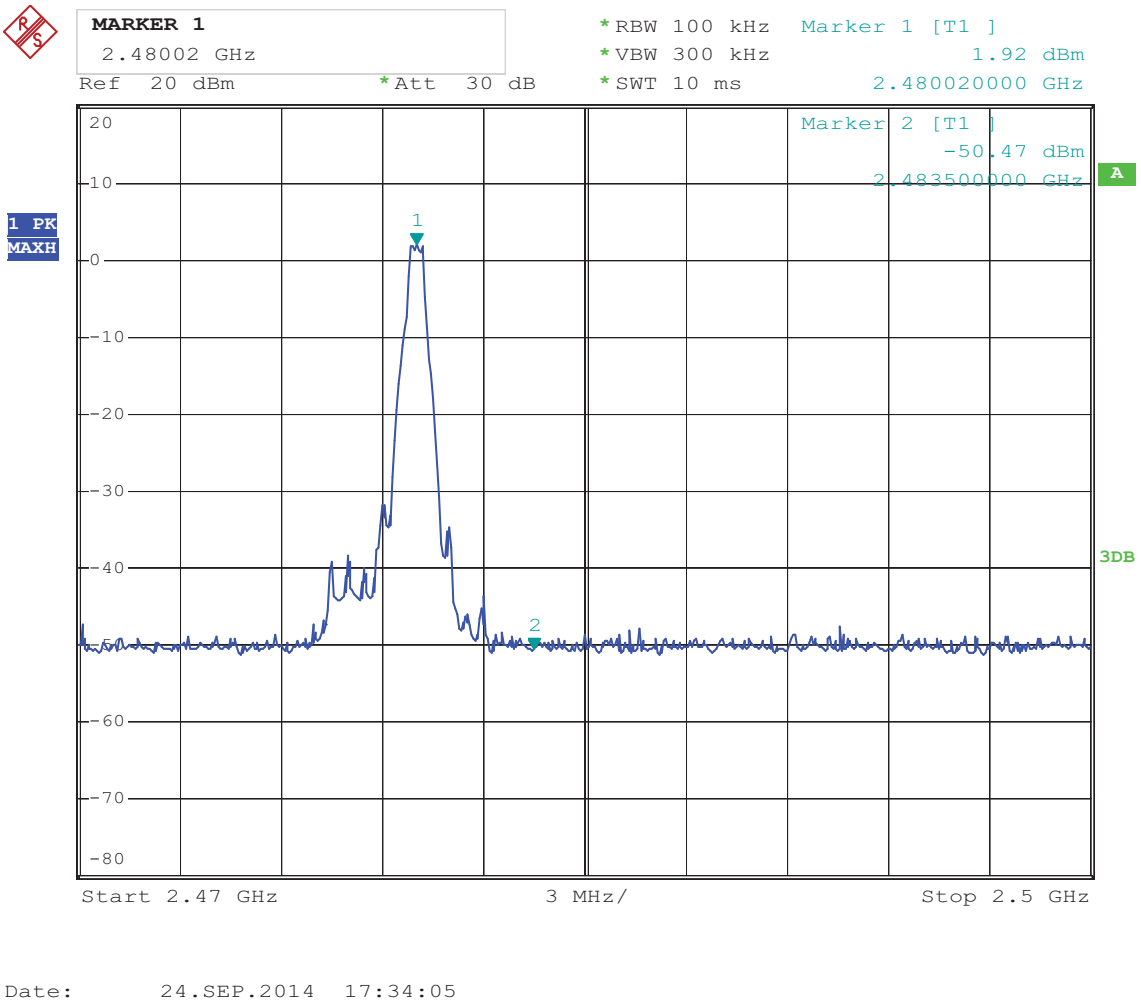


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	37.3	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:

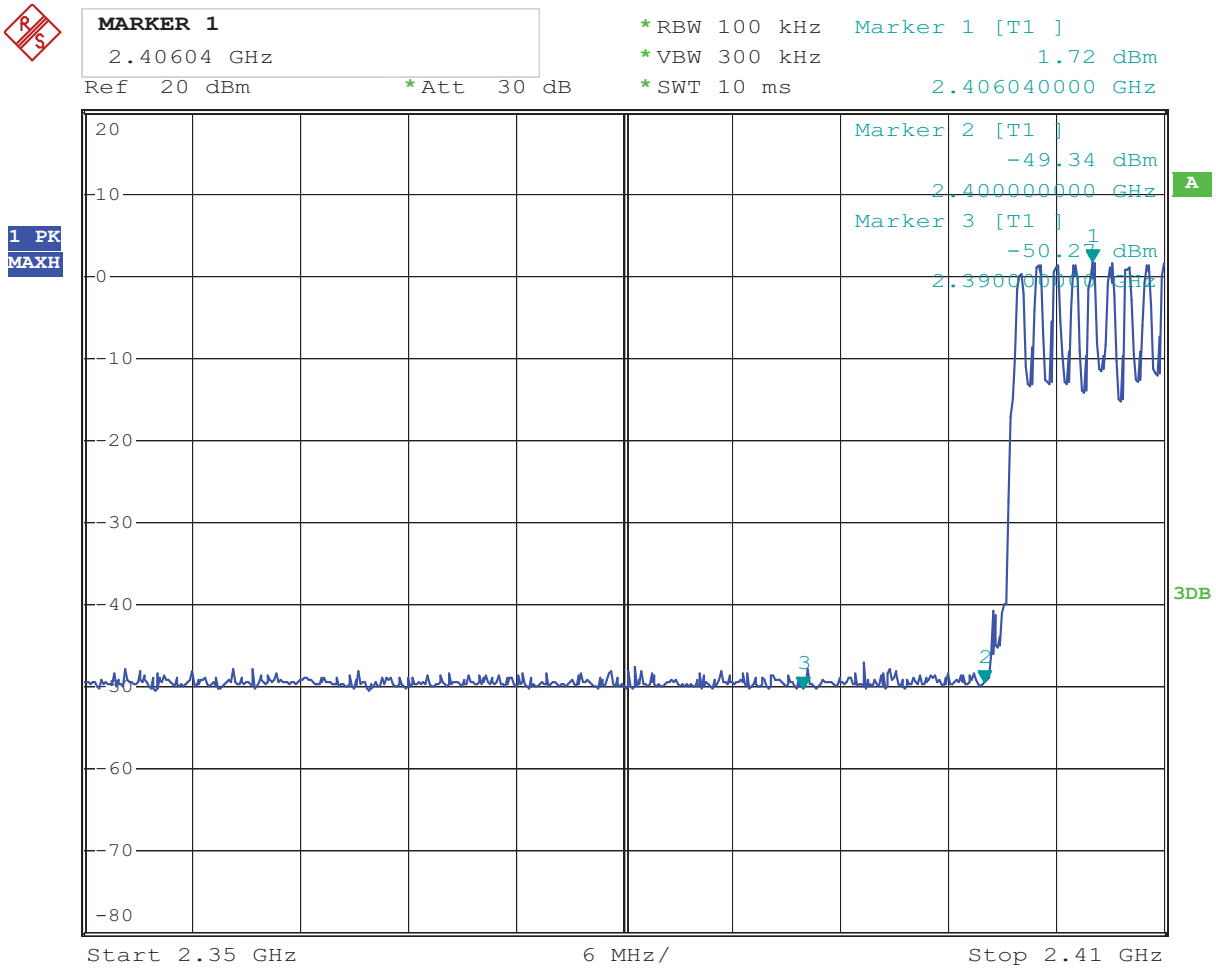


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	35.3	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



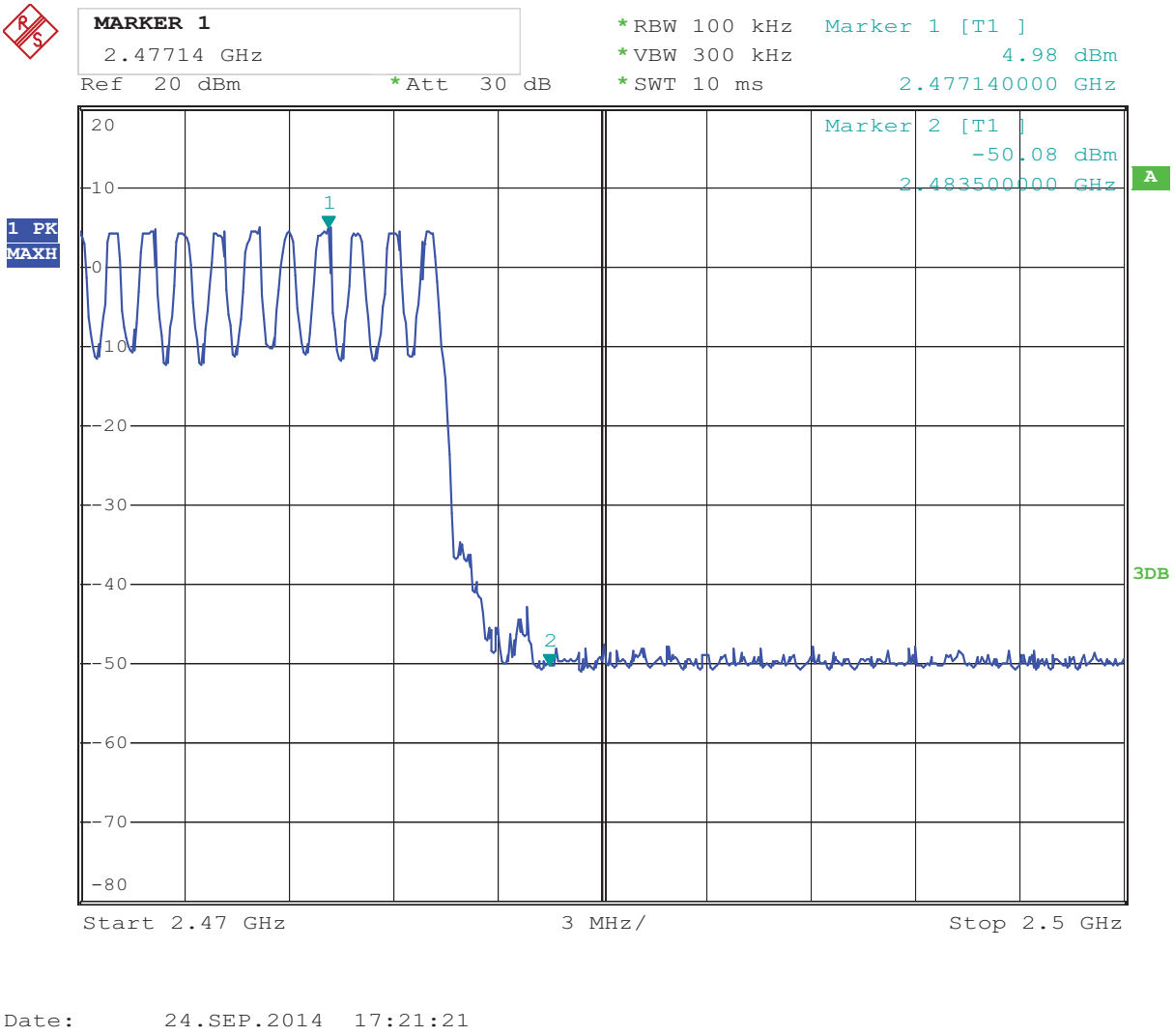
Date: 24.SEP.2014 17:05:44

Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	38.0	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:

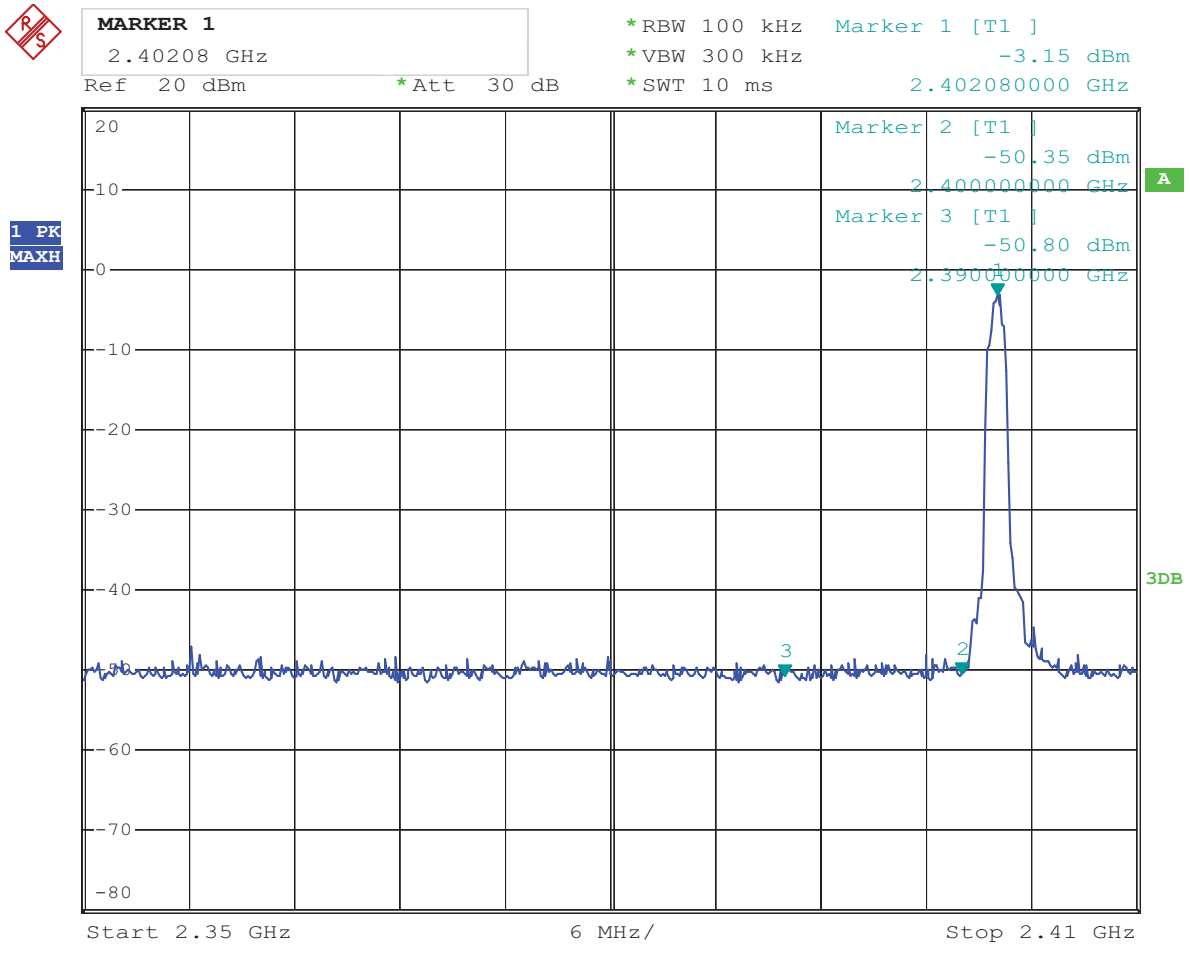


Type of Modulation: Л/4DQPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	36.2	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



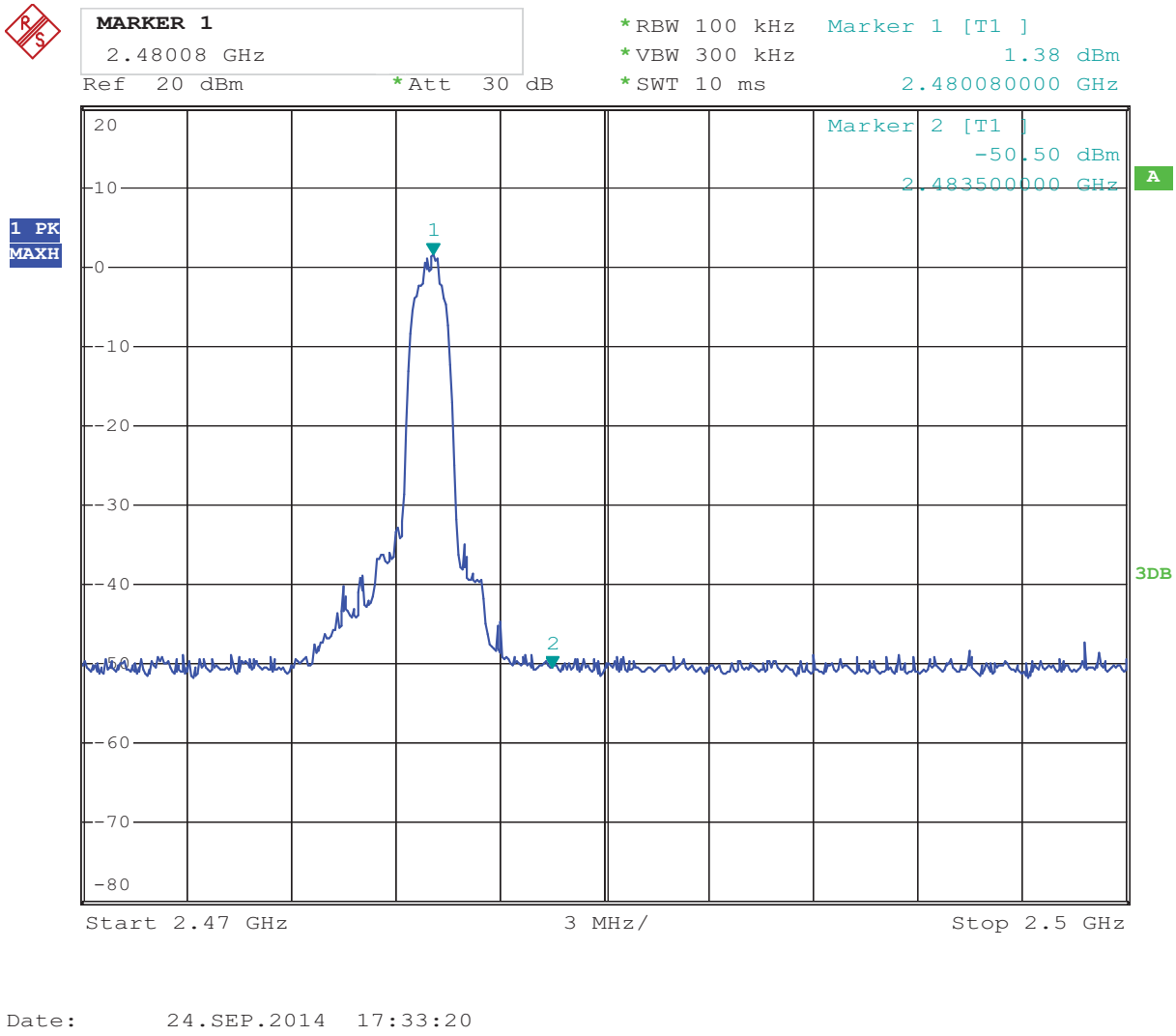
Date: 24.SEP.2014 17:18:50

Type of Modulation: Л/4DQPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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:

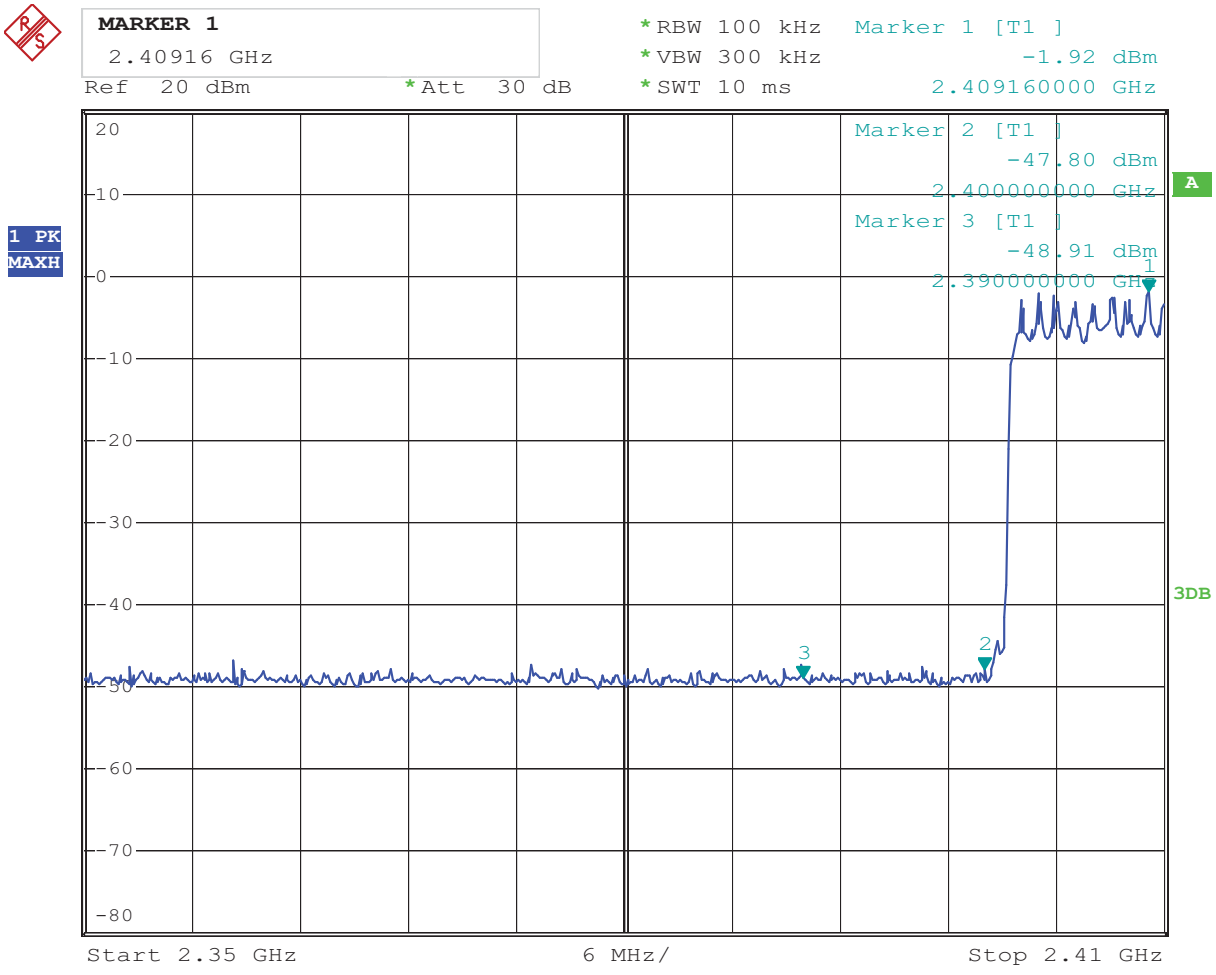


Type of Modulation: Л/4DQPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	35.5	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:

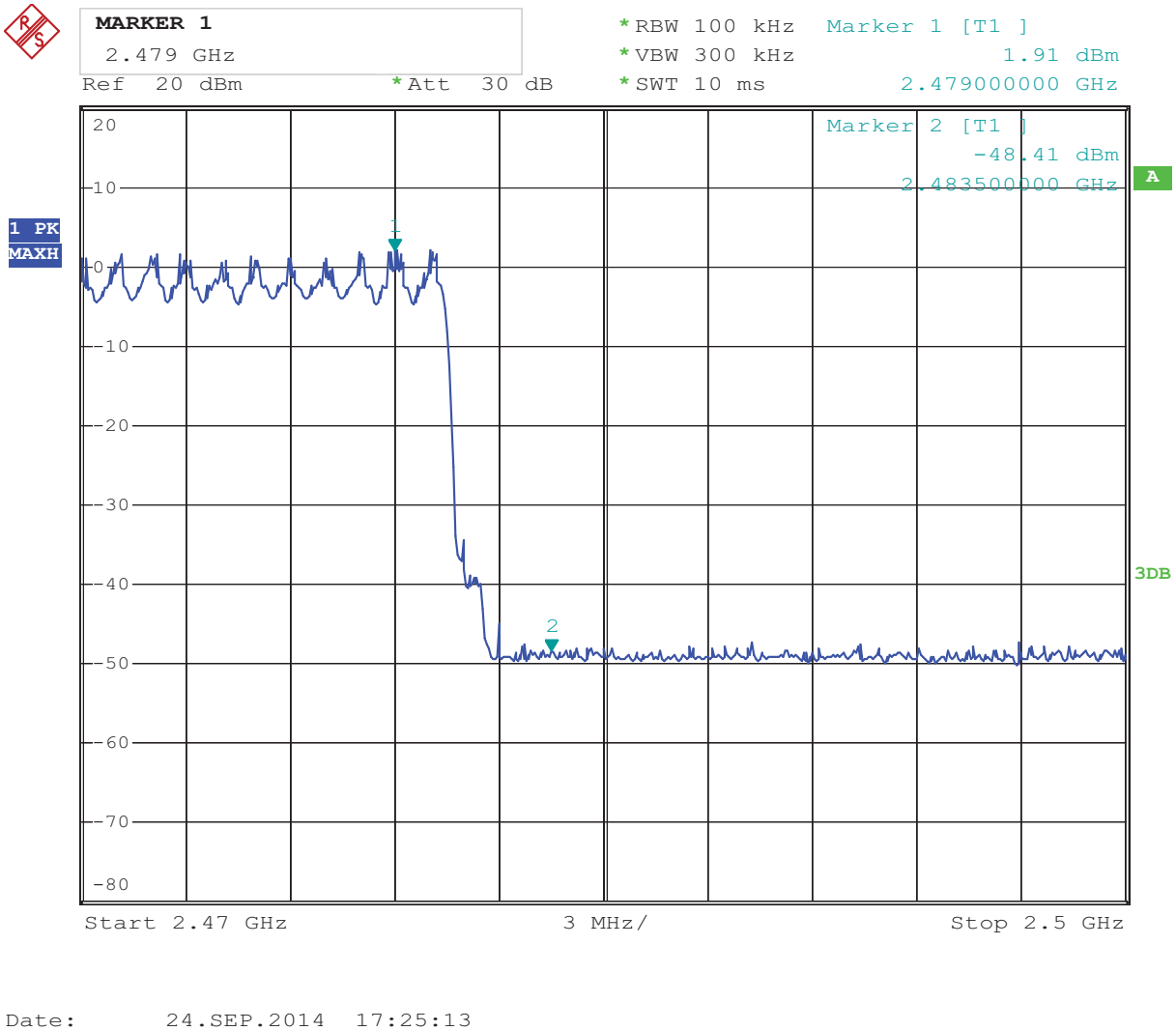


Type of Modulation: Л/4DQPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	37.6	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



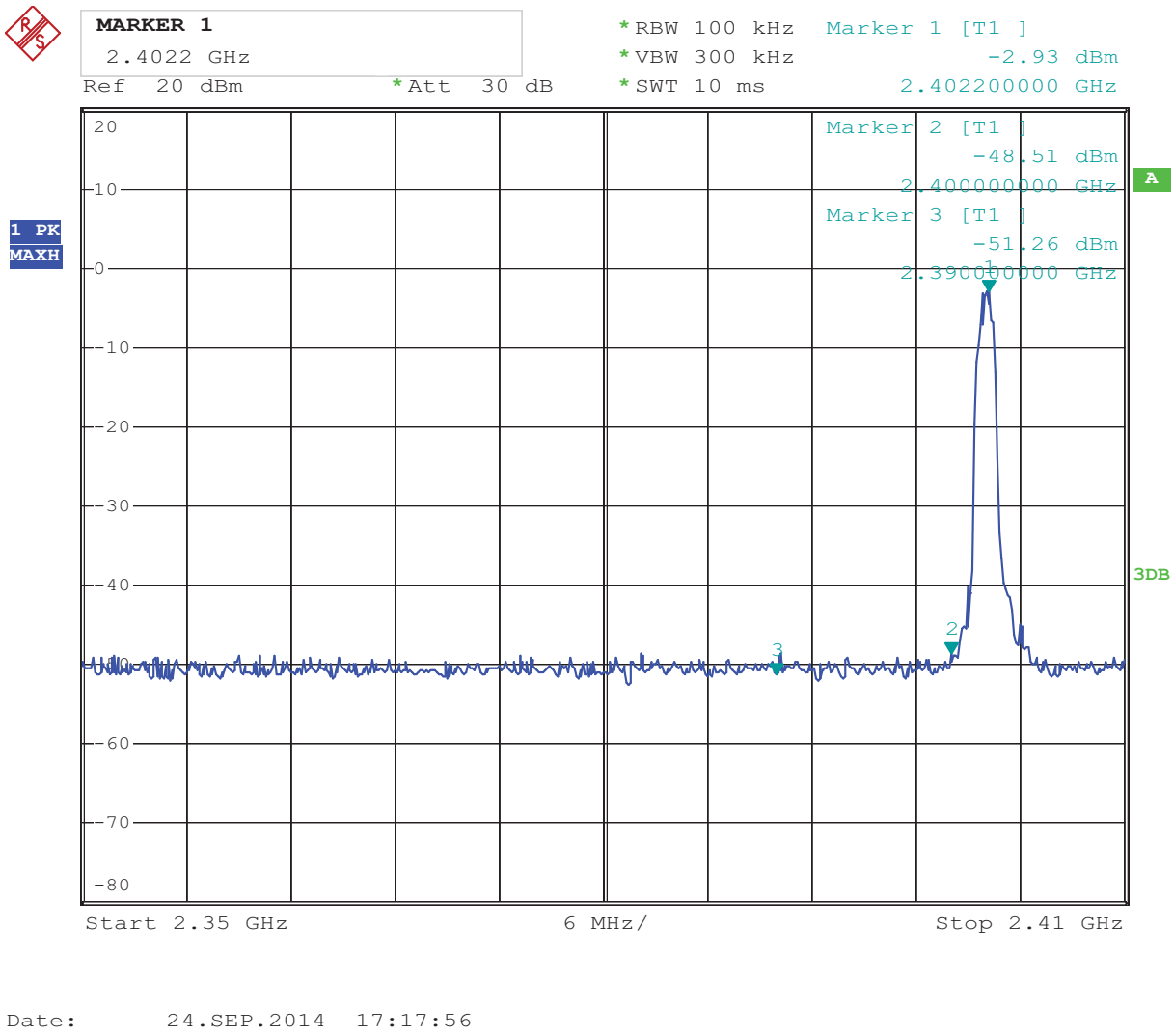
Date: 24.SEP.2014 17:25:13

Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	35.8	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:

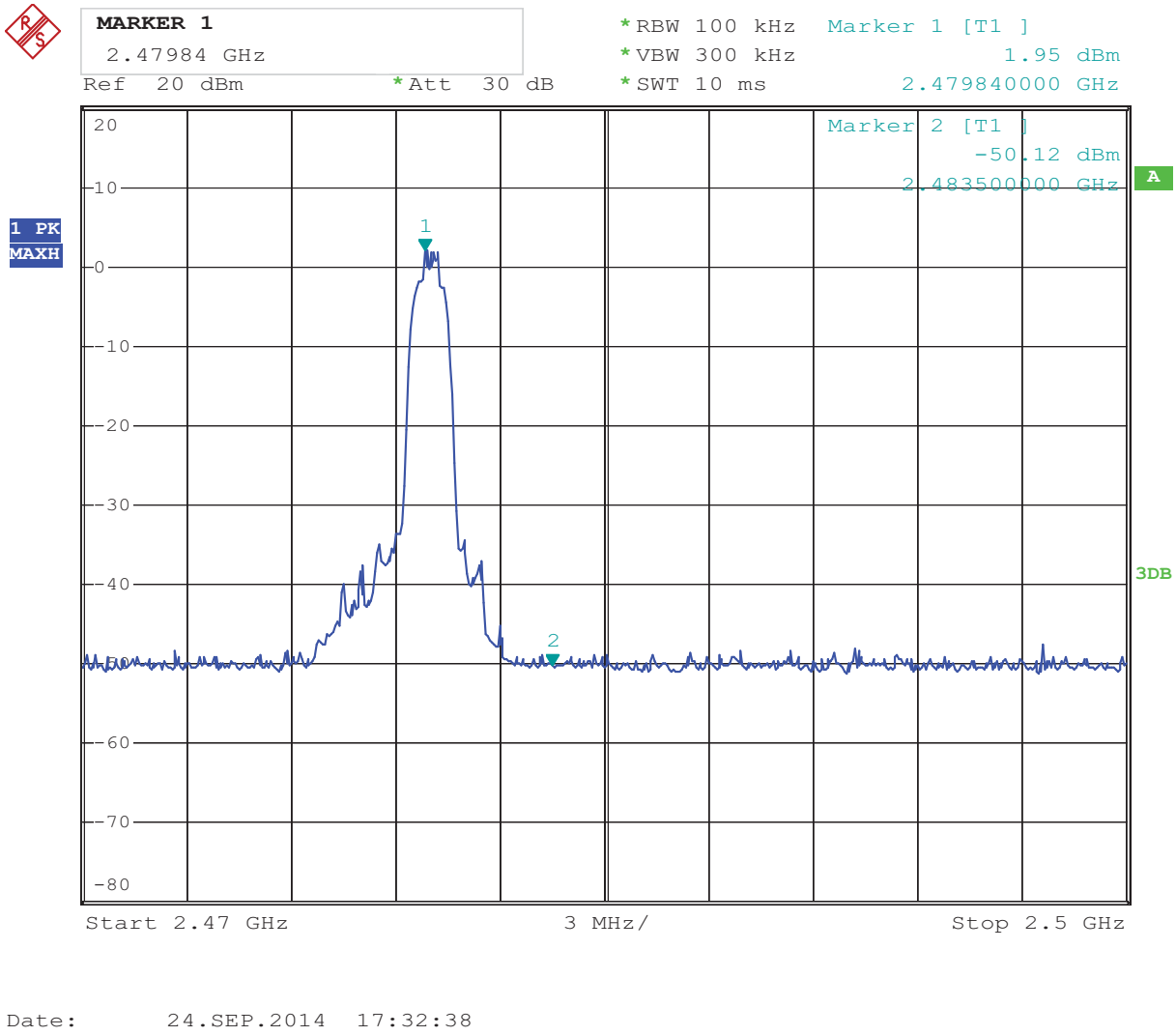


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	37.7	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:

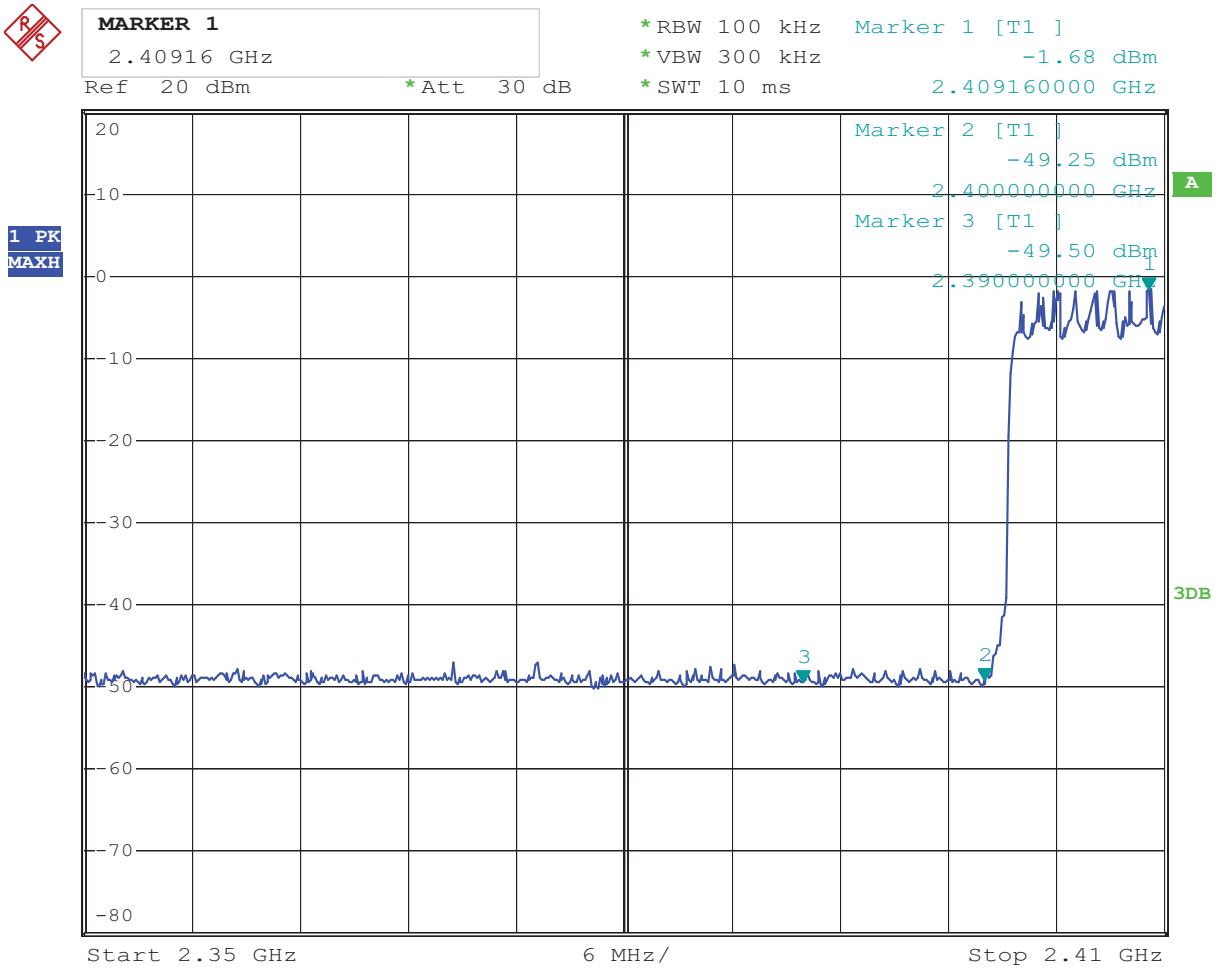


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	36.3	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



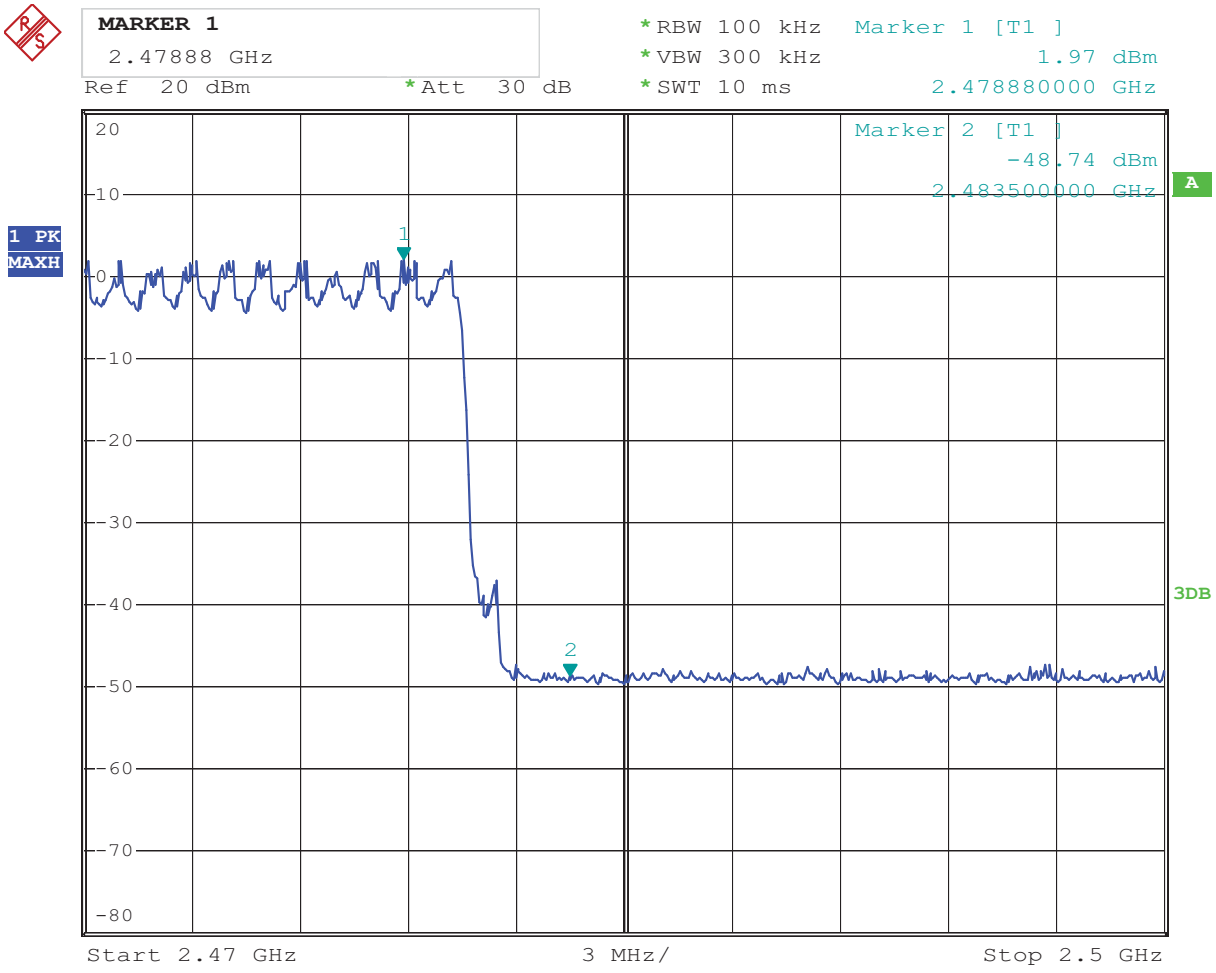
Date: 24.SEP.2014 17:17:12

Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	Bluetooth 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)	38.5	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 24.SEP.2014 17:31:48

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 mount in dB that the directional gain of the antenna exceeds 6 dBi.

13.2 Antenna Connected constructions

The antenna is PCB antenna. The maximum Gain of this antenna is 1.13 dBi

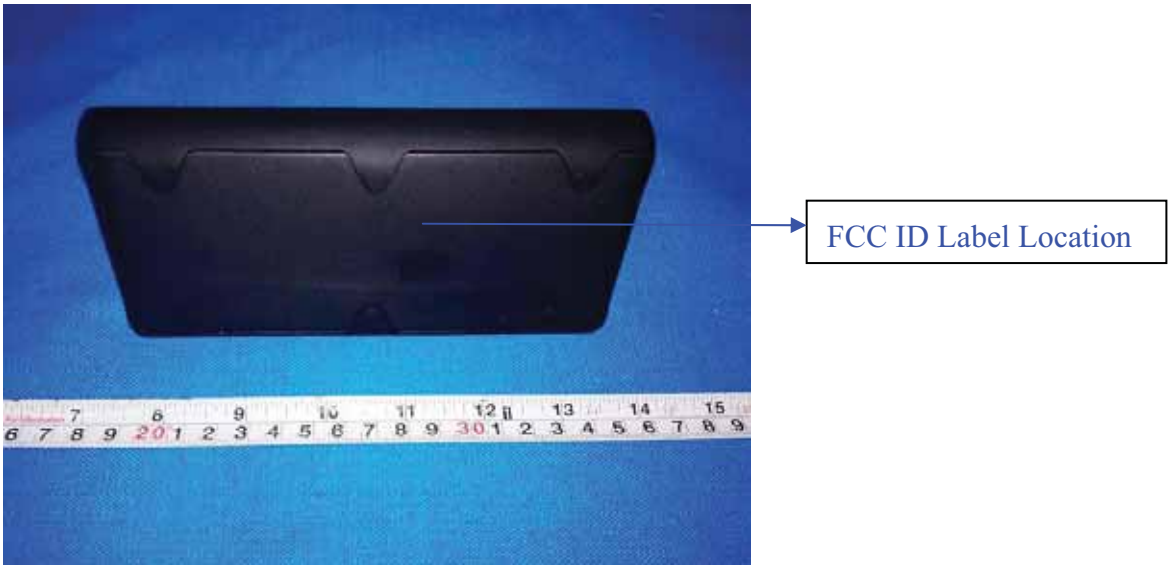
14.0 FCC ID Label

FCC ID: 2ADCW-PLUS

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.

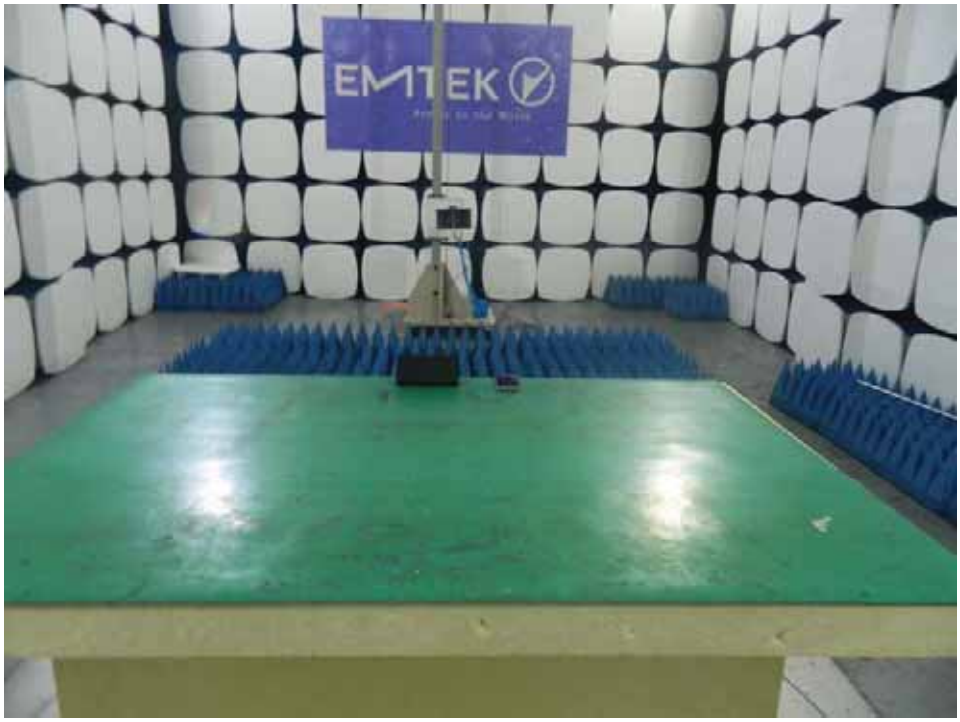
Mark Location:

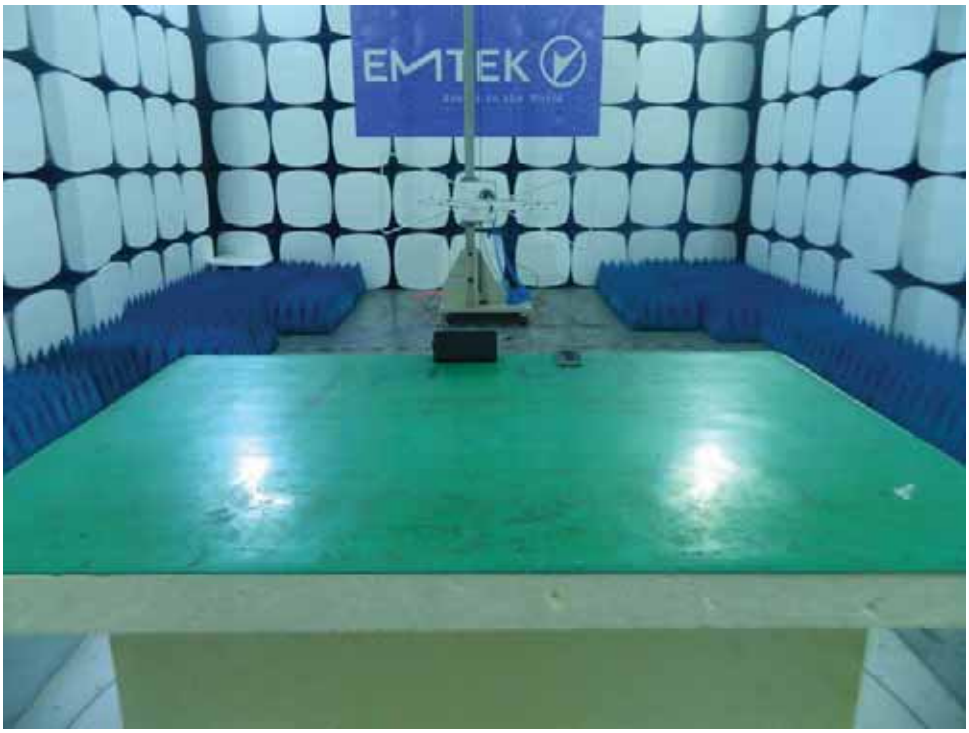


15 PHOTOGRAPHS OF THE TEST CONFIGURATION

Conducted Emissions

Radiated Emissions





PHOTOGRAPHS OF EUT

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

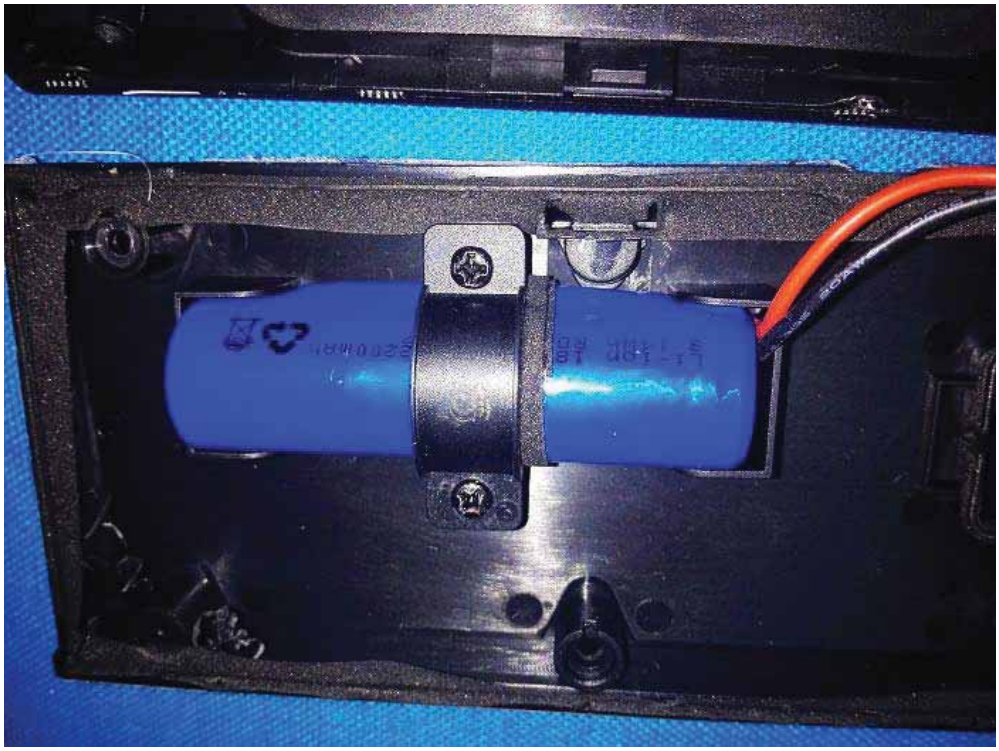


Photo 8

Photo 9

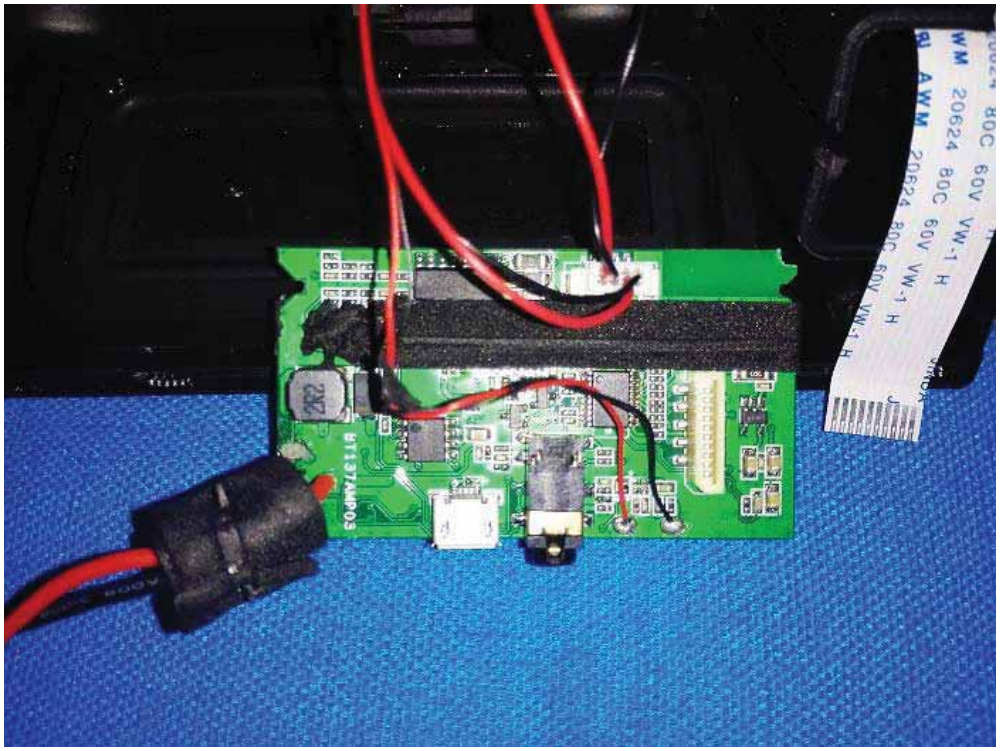


Photo 10

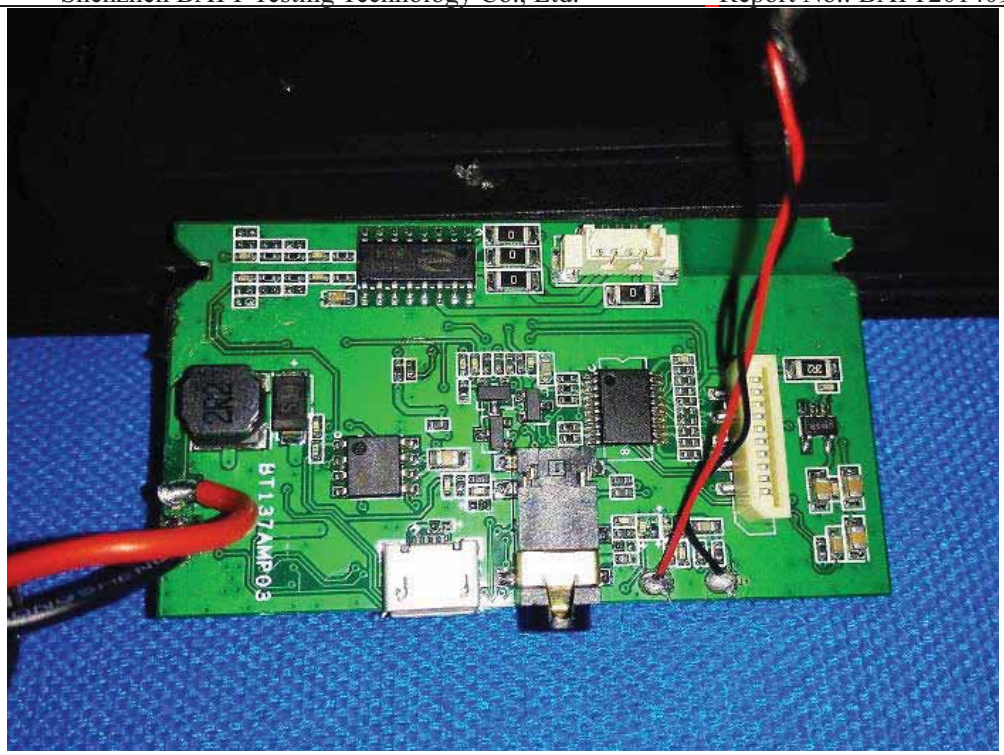


Photo 11

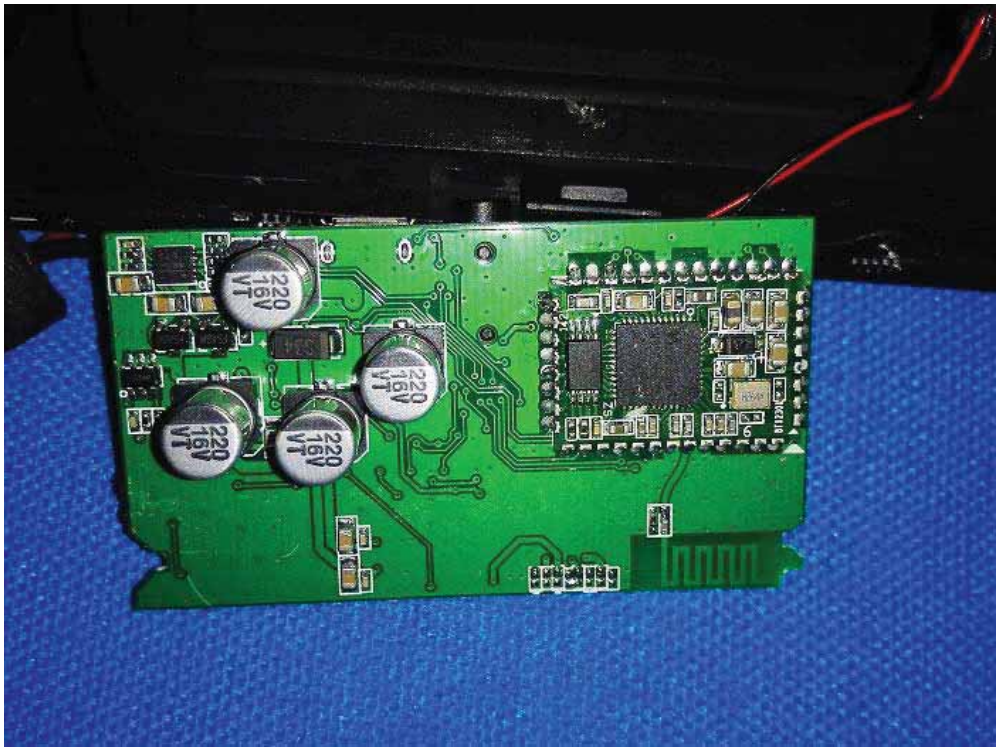


Photo 12

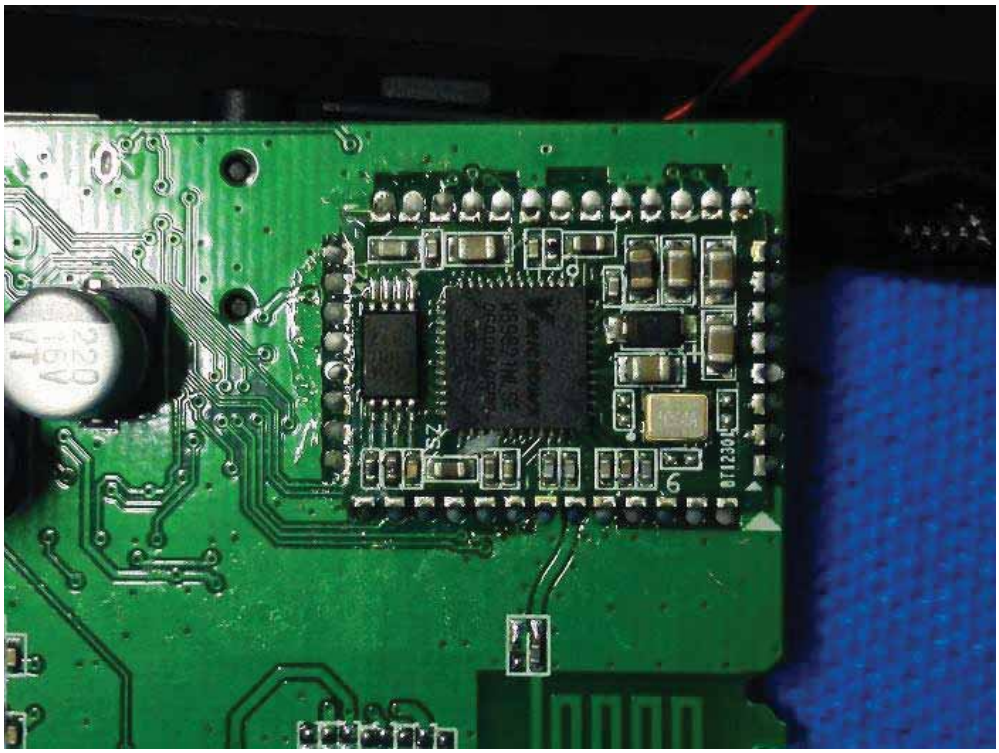


Photo 13

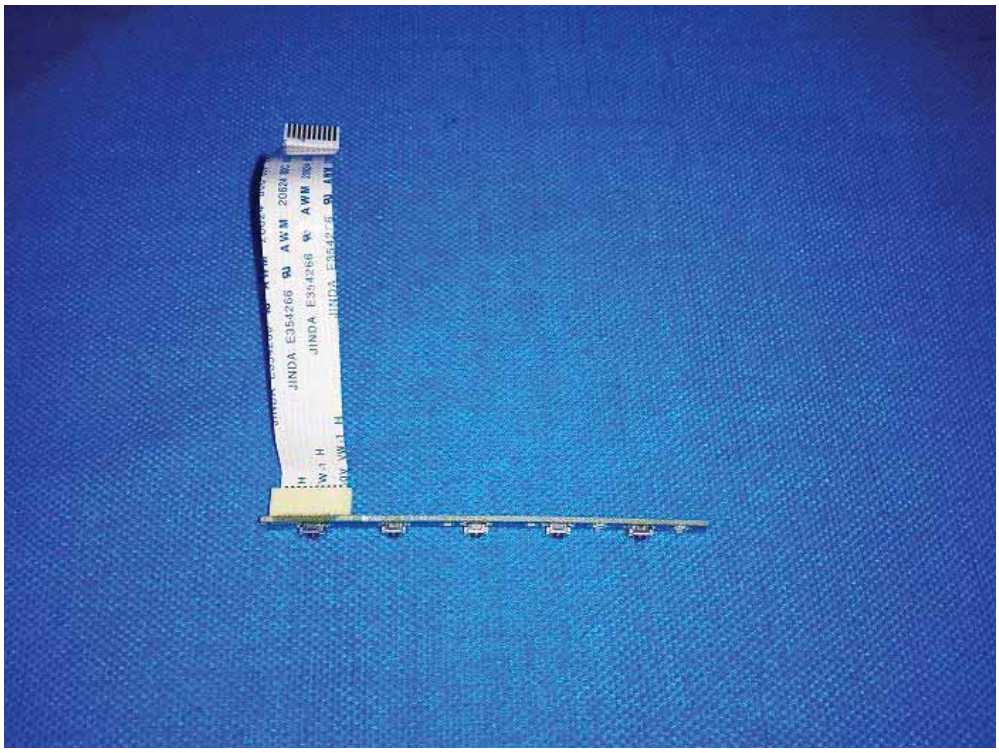


Photo 14

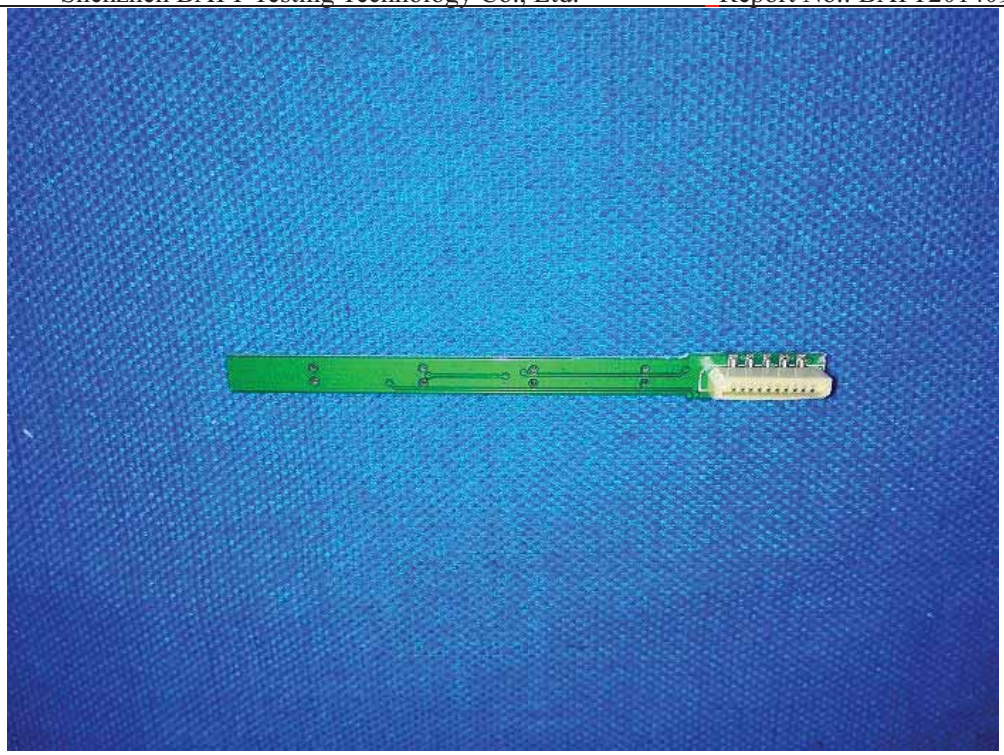


Photo 15

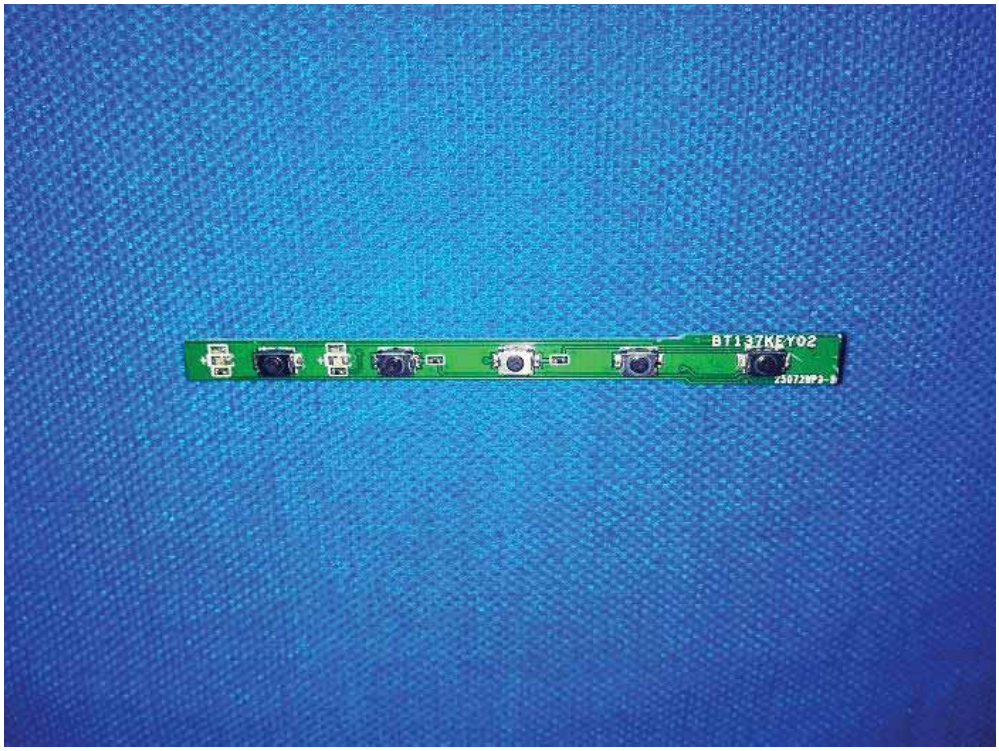


Photo 16

The Report End