



# FCC TEST REPORT

Prepared For :	ARCTIC (HK) Ltd
Product Name:	P324BT Bluetooth Headphones with Microphone
Model :	P324BT
Prepared By :	Shenzhen United Testing Technology Co., Ltd. 4F, Block B Unit 2, Jianxing Building, Chaguang Industry Area, Nanshan District, Shenzhen, China Tel: 86-755-86180996 Fax: 86-755-86180156
Test Date:	November 01, 2014 to November 16, 2014
Date of Report :	November 16, 2014
Report No.:	UNI-1411006-01

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# 1 TEST CERTIFICATION

<b>Product:</b>	<b>P324BT Bluetooth Headphones with Microphone</b>
<b>Model:</b>	<b>P324BT</b>
<b>Applicant:</b>	<b>ARCTIC (HK) Ltd</b> <b>Unit 2304   Nina Tower 2   8 Yeung Uk Road   Hong Kong</b>
<b>Factory:</b>	<b>Cyber Blue(HK) Ltd</b> <b>12th Floor, Guanghao International Building, Meilong Road, Longhua District, Shenzhen, China</b>
<b>Trade Mark:</b>	<b>Arctic</b>
<b>Tested:</b>	<b>November 01, 2014 to November 16, 2014</b>
<b>Test Voltage:</b>	<b>DC3.7V Powered Built-In Battery</b>
<b>Operational Frequency Range:</b>	<b>Bluetooth: 2402-2480MHz</b>
<b>Modulation Type:</b>	<b>Bluetooth: GFSK, <math>\pi/4</math>DQPSK, 8DPSK</b>
<b>Number of Channel</b>	<b>79 Channels for Bluetooth</b>
<b>Frequency Selection</b>	<b>By software</b>
<b>Antenna:</b>	<b>PCB antenna with Gain 2.0 dBi</b>
<b>FCC ID:</b>	<b>Z3AP324BT</b>
<b>Applicable Standards:</b>	<b>FCC Part 15.247</b>

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

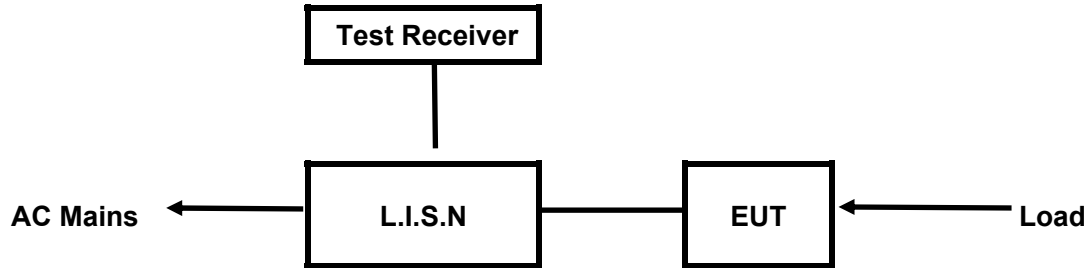
Name: ShenZhen CTL Testing Technology Co.,Ltd

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



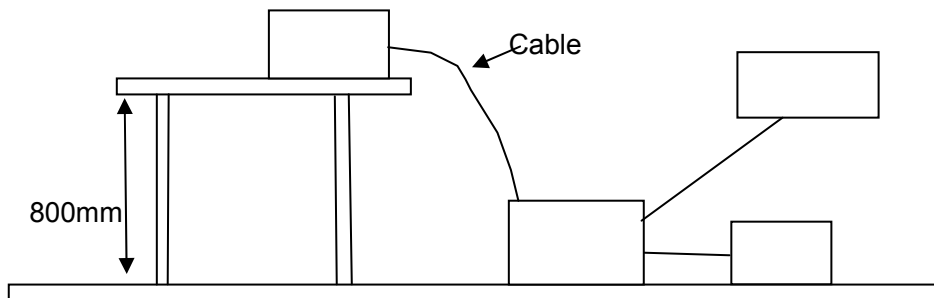
EUT: Equipment Under Test

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
P324BT Bluetooth Headphones with Microphone	Cyber Blue(HK) Ltd	P324BT	Z3AP324BT

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**

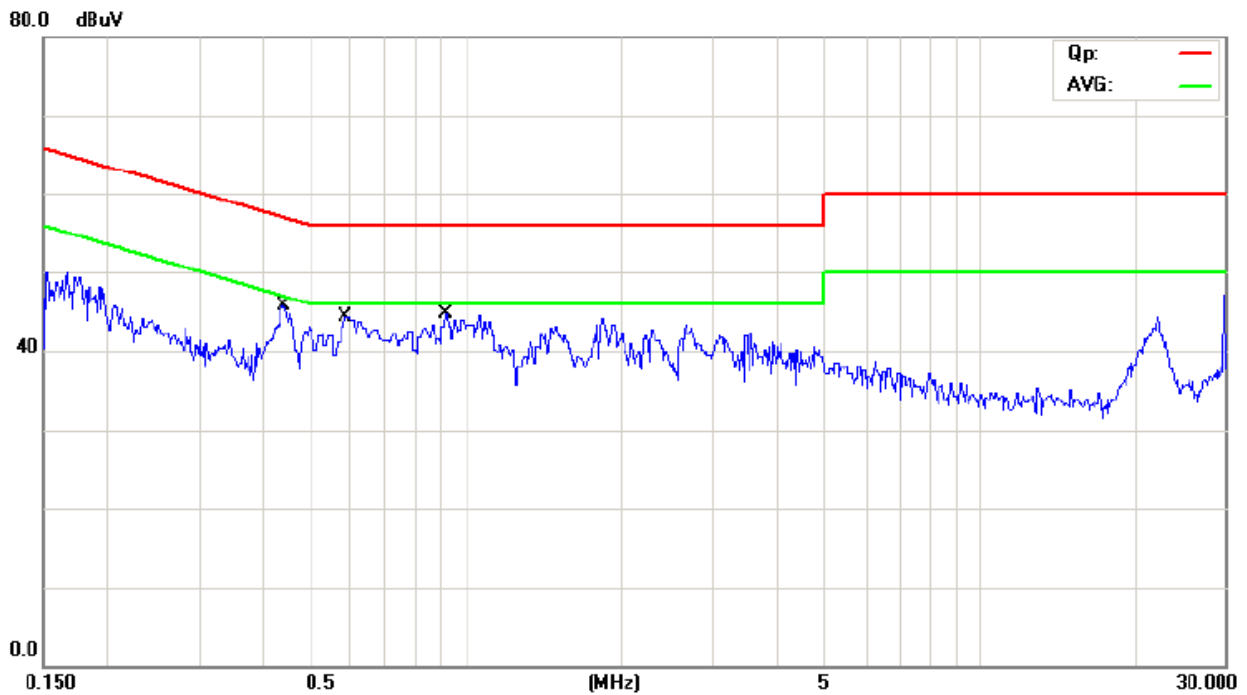
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa

**EUT set Condition: Keep Bluetooth Transmitting**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.4360	-7.70	11.30	3.60	57.14	-53.54	QP	
2		0.4360	-13.60	11.30	-2.30	47.14	-49.44	AVG	
3		0.9121	-8.20	11.81	3.61	56.00	-52.39	QP	
4		0.9121	-14.00	11.81	-2.19	46.00	-48.19	AVG	
5		0.5868	-7.40	11.46	4.06	56.00	-51.94	QP	
6	*	0.5868	-13.50	11.46	-2.04	46.00	-48.04	AVG	





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

**EUT Operating Environment**

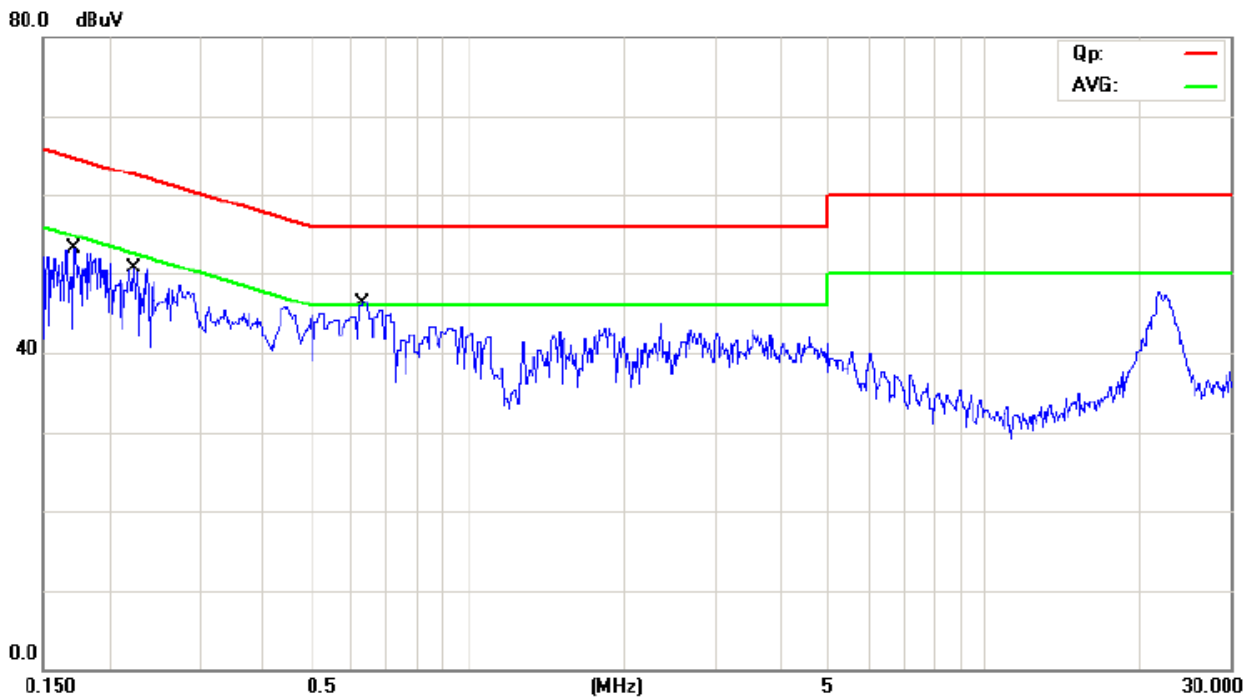
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa

**EUT set Condition: Keep Bluetooth Transmitting**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual



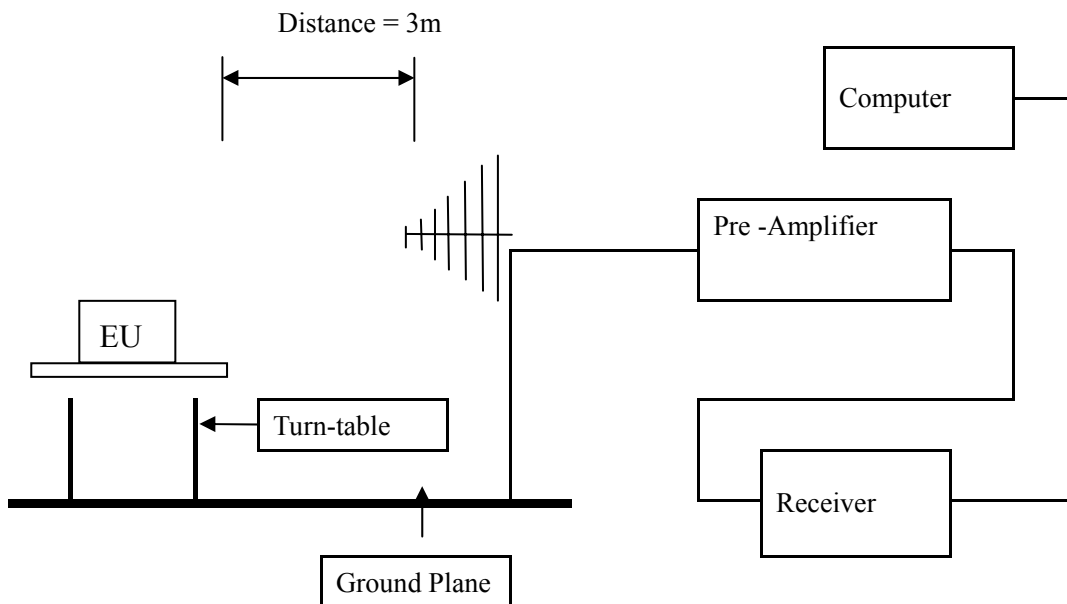
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1723	-7.70	11.02	3.32	64.85	-61.53	QP	
2		0.1723	-13.50	11.02	-2.48	54.85	-57.33	AVG	
3		0.2248	-7.70	11.08	3.38	62.64	-59.26	QP	
4		0.2248	-13.60	11.08	-2.52	52.64	-55.16	AVG	
5		0.6306	-8.00	11.51	3.51	56.00	-52.49	QP	
6	*	0.6306	-13.90	11.51	-2.39	46.00	-48.39	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 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 (dB $\mu$ V/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

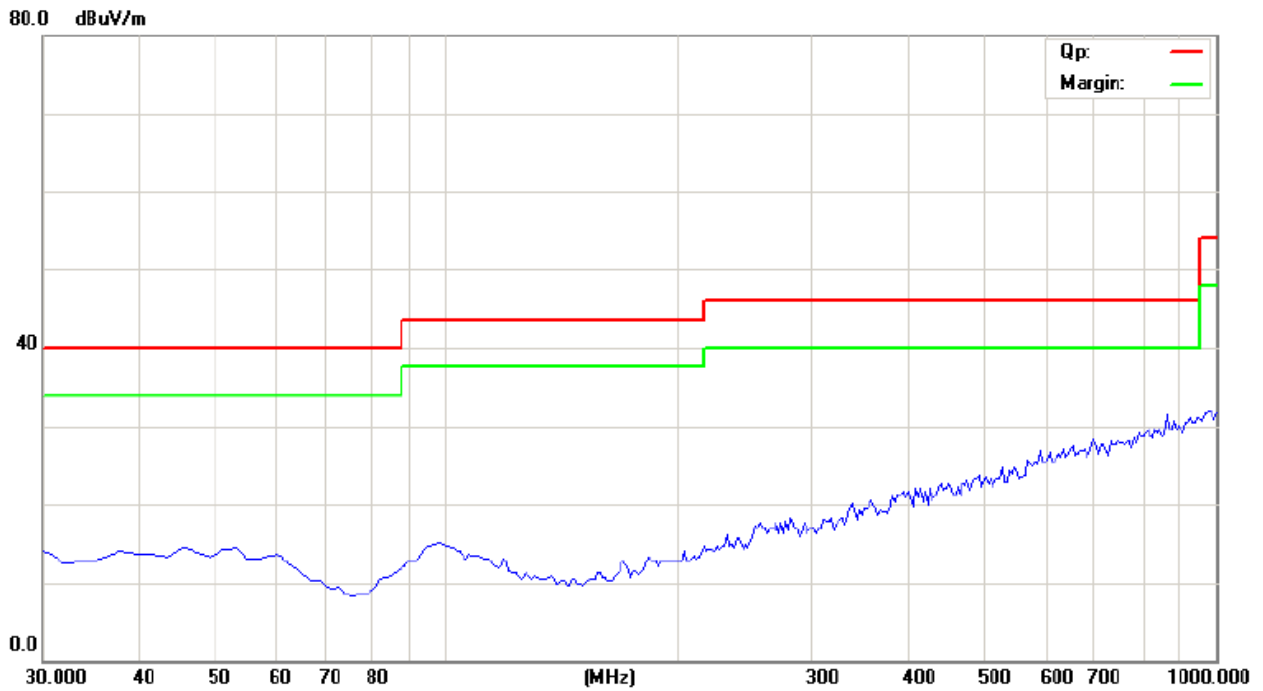


Table with 4 columns: Frequency (MHz), Level@3m (dBμV/m), Antenna Polarity, Limit@3m (dBμV/m). Row 1: --, --, H, --

-The test data shows much less than the limit, no necessary take down the results.



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

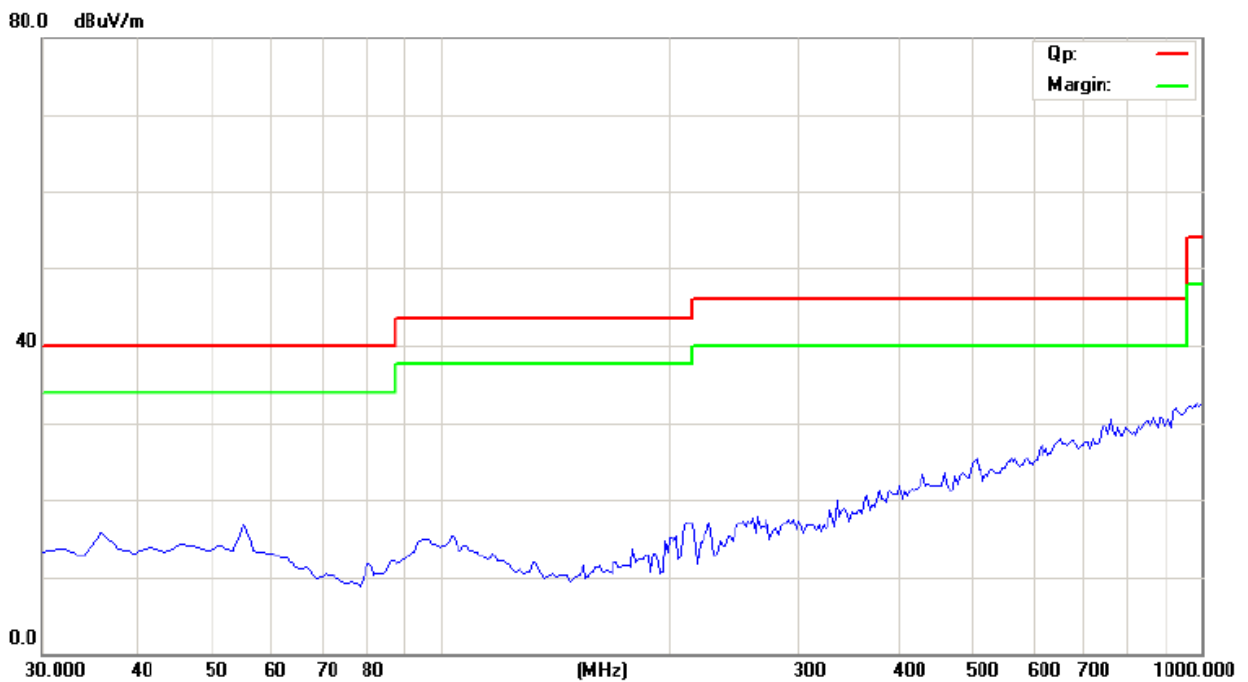
**EUT set Condition: Keep Bluetooth Transmitting**

**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)
--	--	V	--

-The test data shows much less than the limit, no necessary take down the results.



**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)

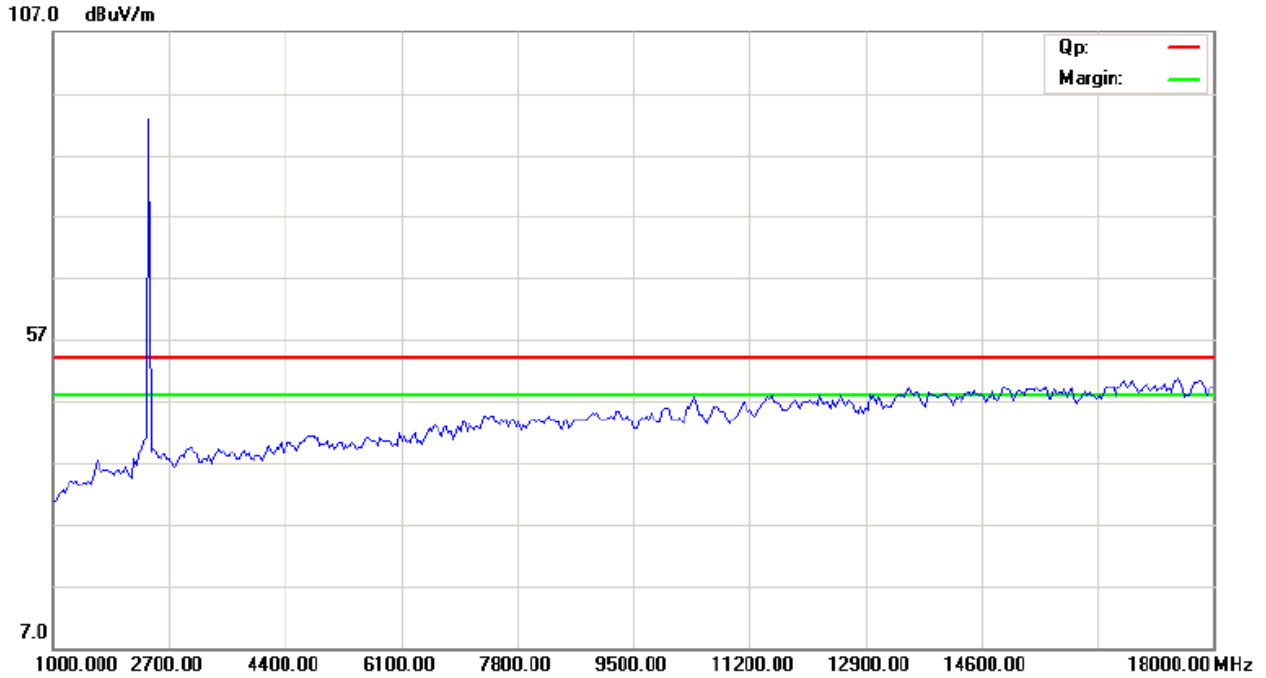
Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

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

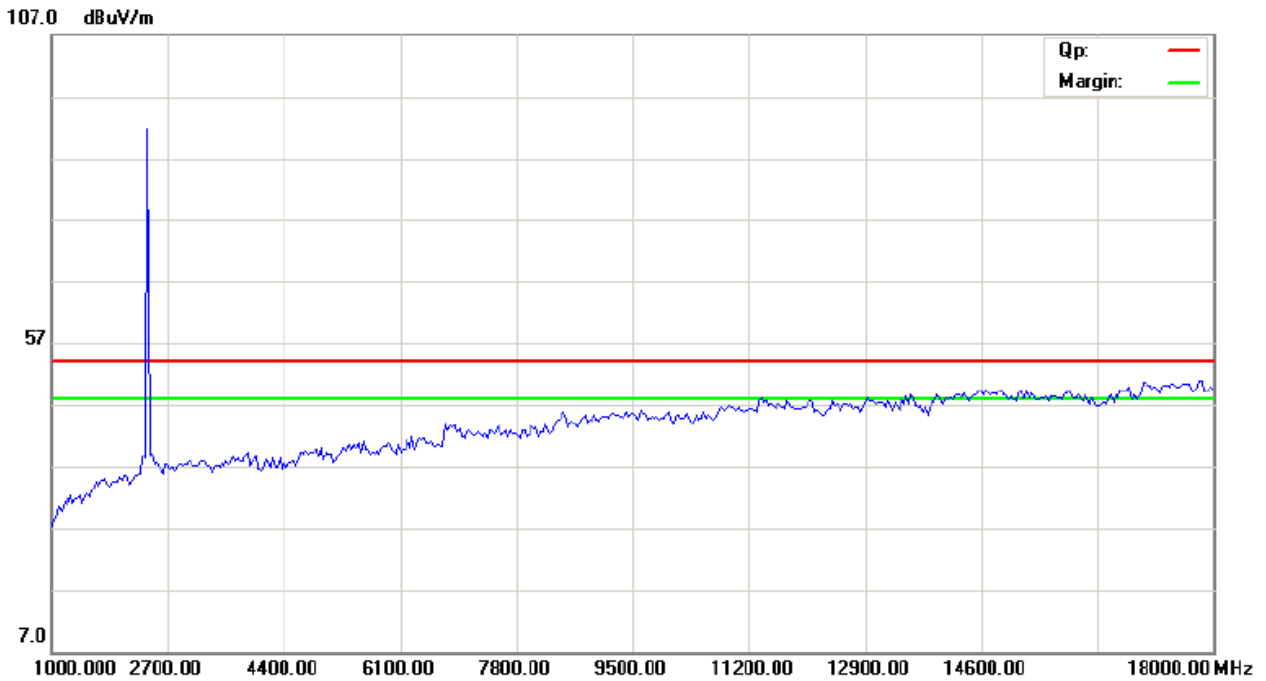


Please refer to the following test plots for details:

**Low Channel: Horizontal**



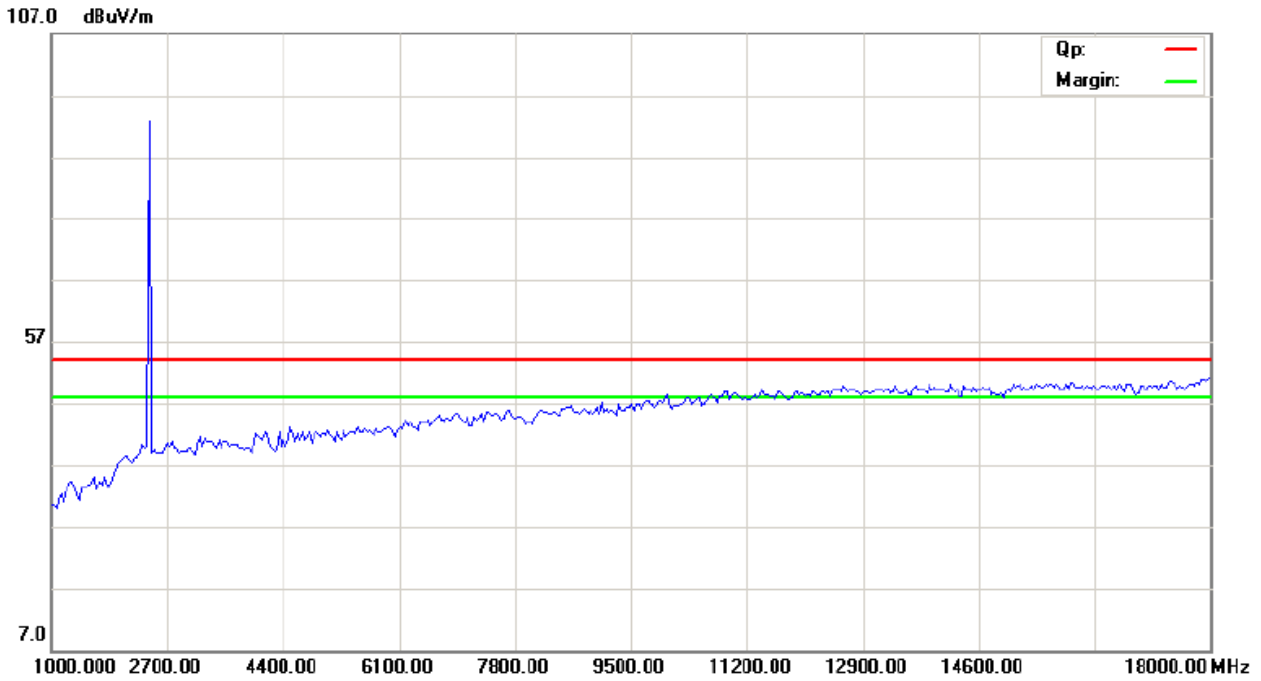
**Low Channel : Vertical**



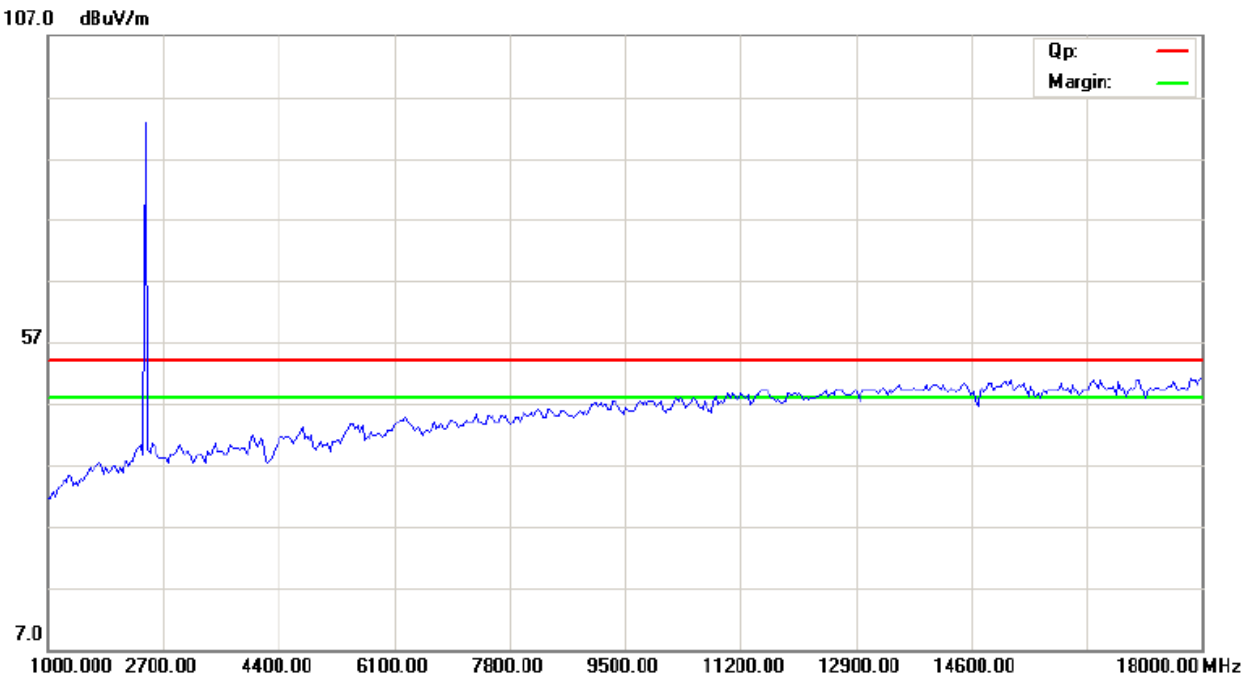




Middle Channel : Horizontal

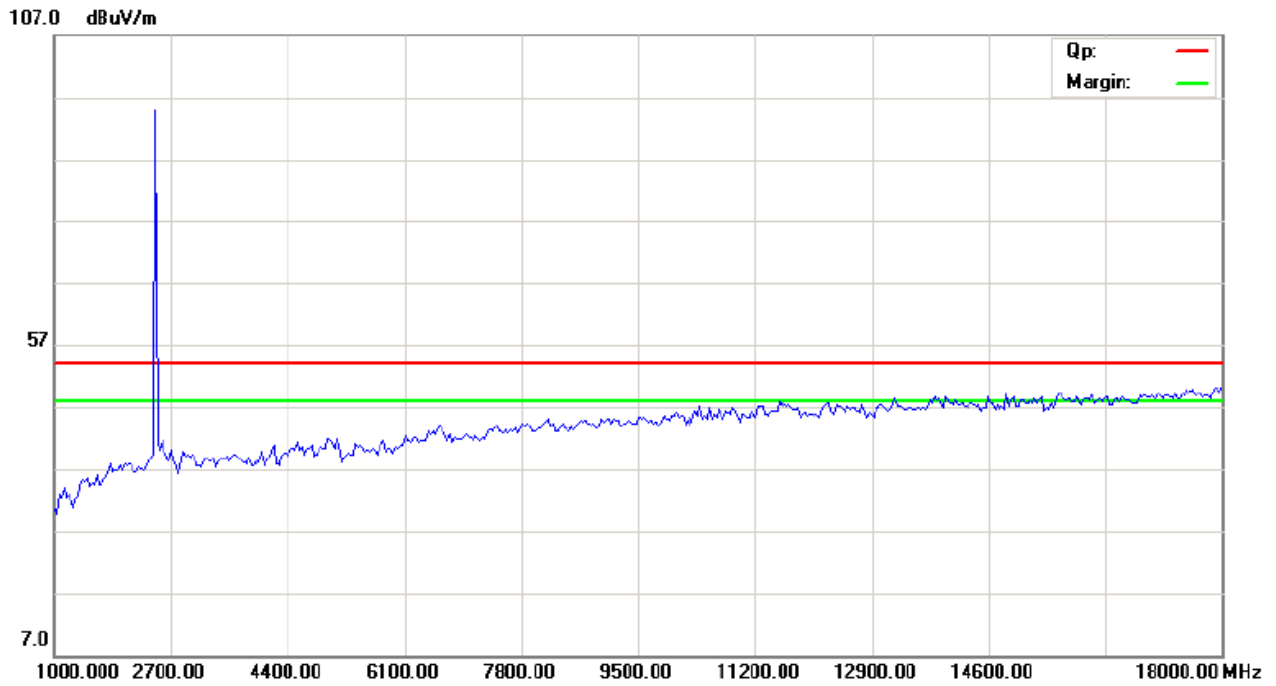


Middle Channel : Vertical

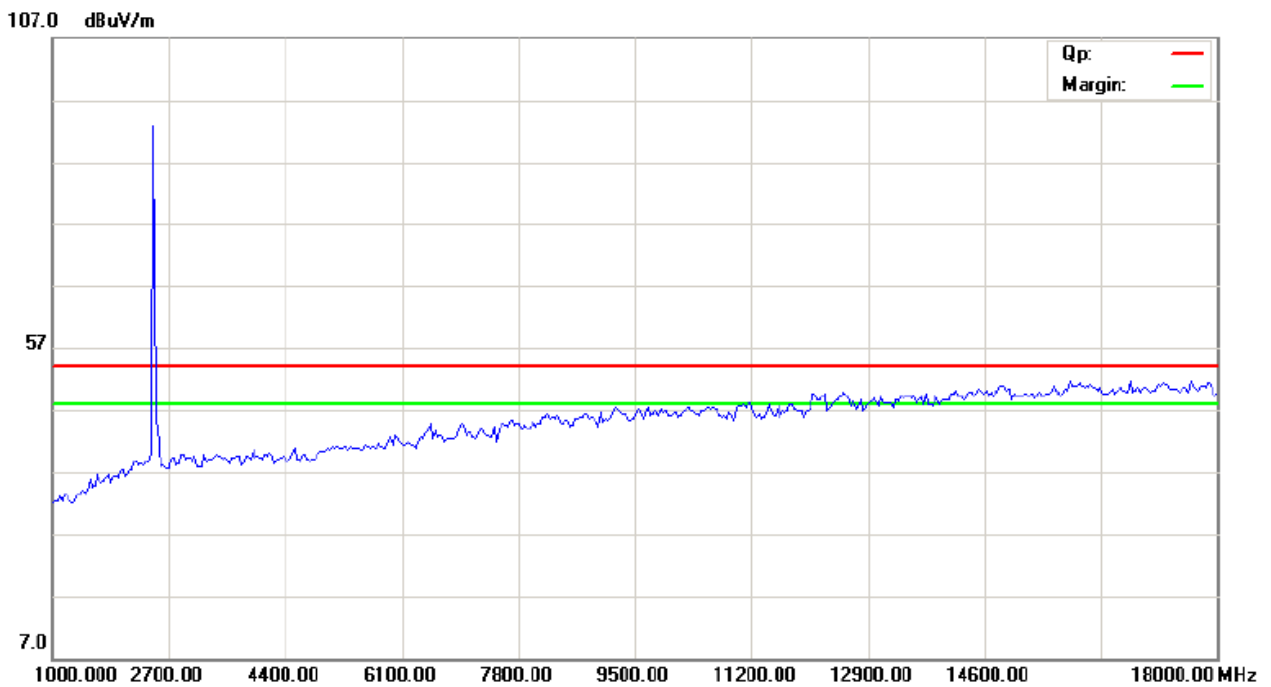




High Channel : Horizontal



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	P324BT Bluetooth Headphones with Microphone		Model	P324BT
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	949.900	--	Pass
Middle	2441	955.912	--	Pass
High	2480	907.816	--	Pass

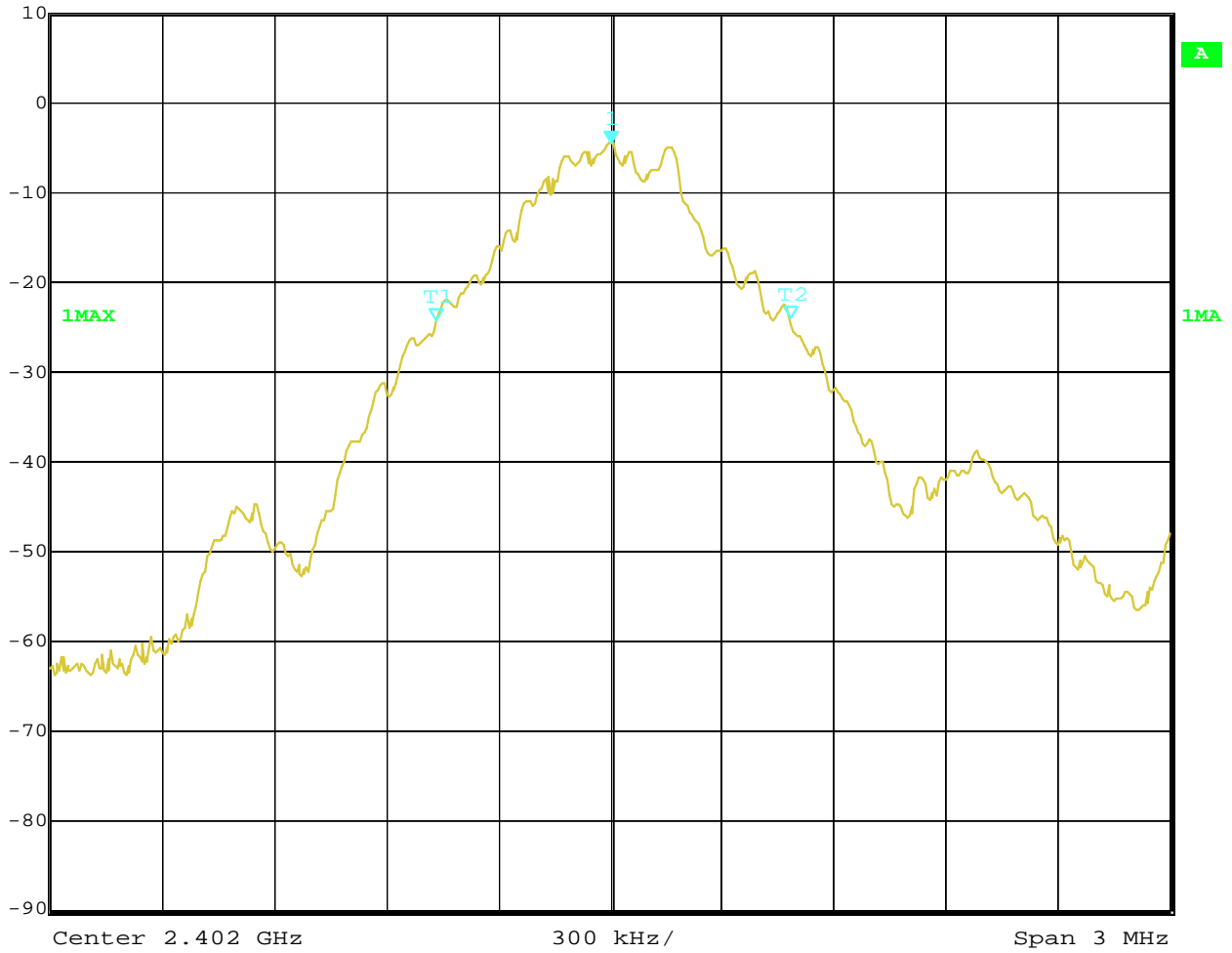


Test Figure:

1. Condition: Low Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz	Unit	dBm
	BW 949.89979960 kHz	SWT	10 ms		



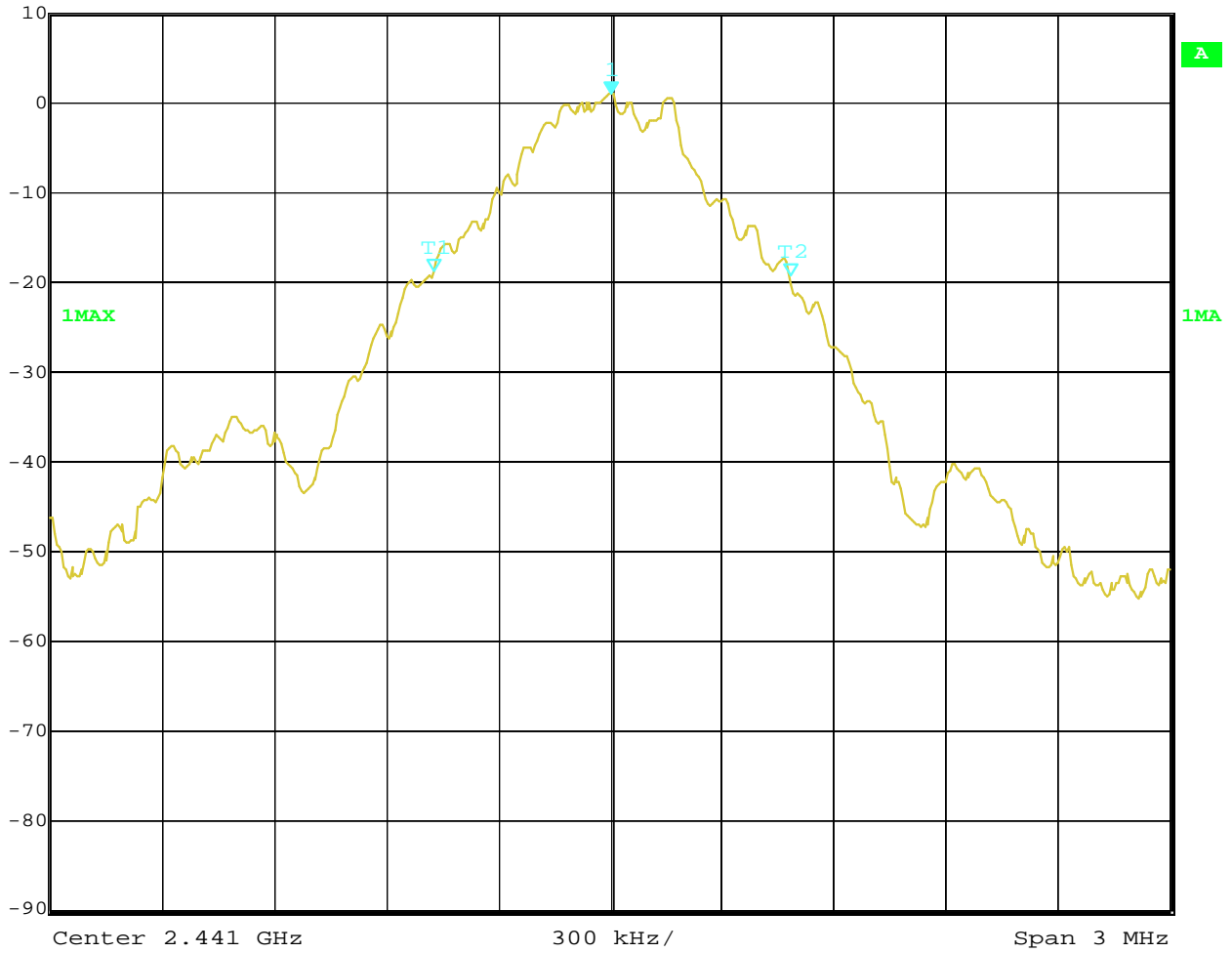
Date: 5.NOV.2014 14:09:14



### 2. Condition: Middle Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB            20.00 dB	VBW	100 kHz		
	BW 955.91182365 kHz	SWT	10 ms	Unit	dBm



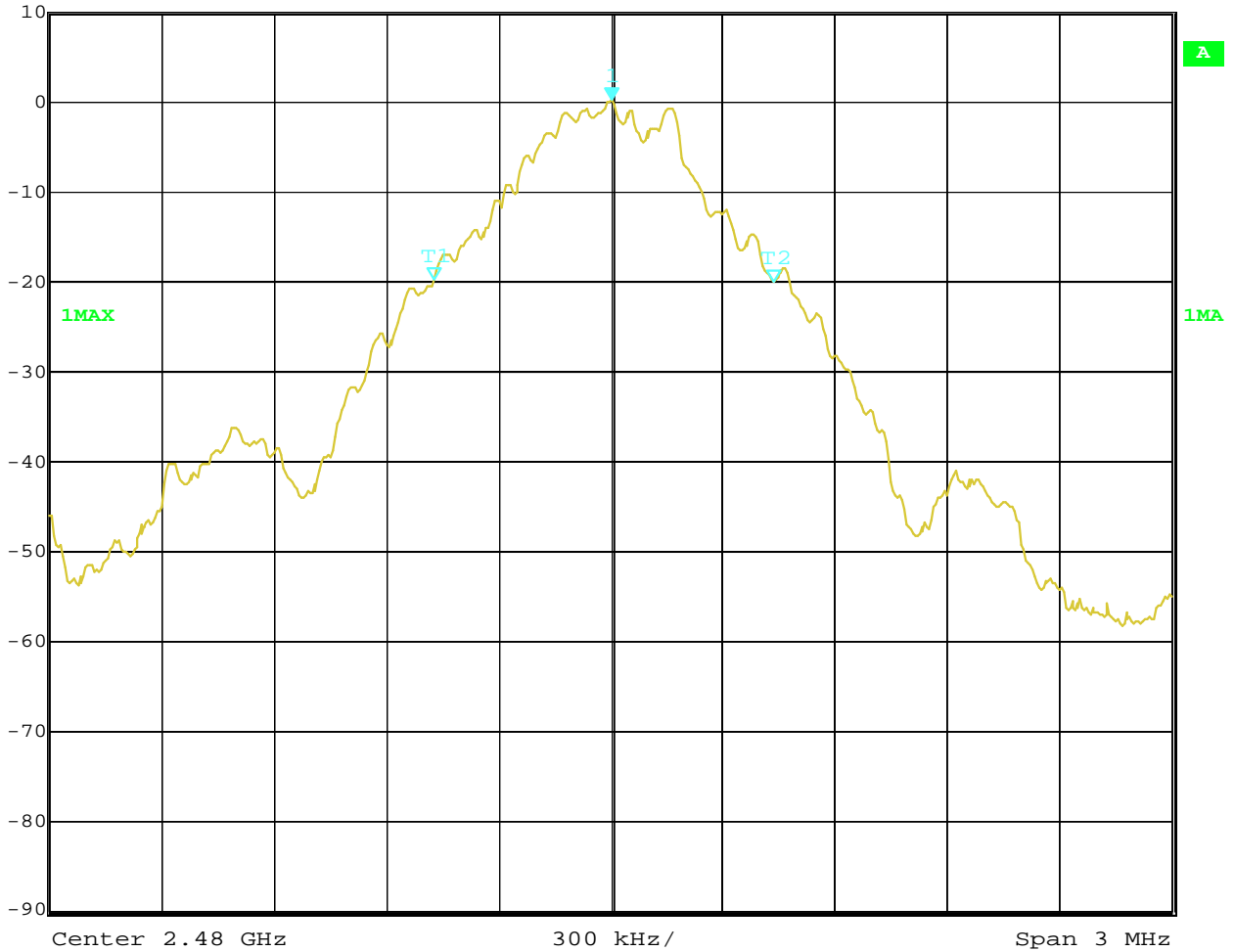
Date: 5.NOV.2014 14:10:35



### 3. High Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz		
	BW 907.81563126 kHz	SWT	10 ms	Unit	dBm



Date: 5.NOV.2014 15:46:17



Test Result

Type of Modulation: **π/4DQPSK**

EUT	P324BT Bluetooth Headphones with Microphone		Model	P324BT
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	1292.585	--	Pass
Middle	2441	1274.549	--	Pass
High	2480	1274.549	--	Pass

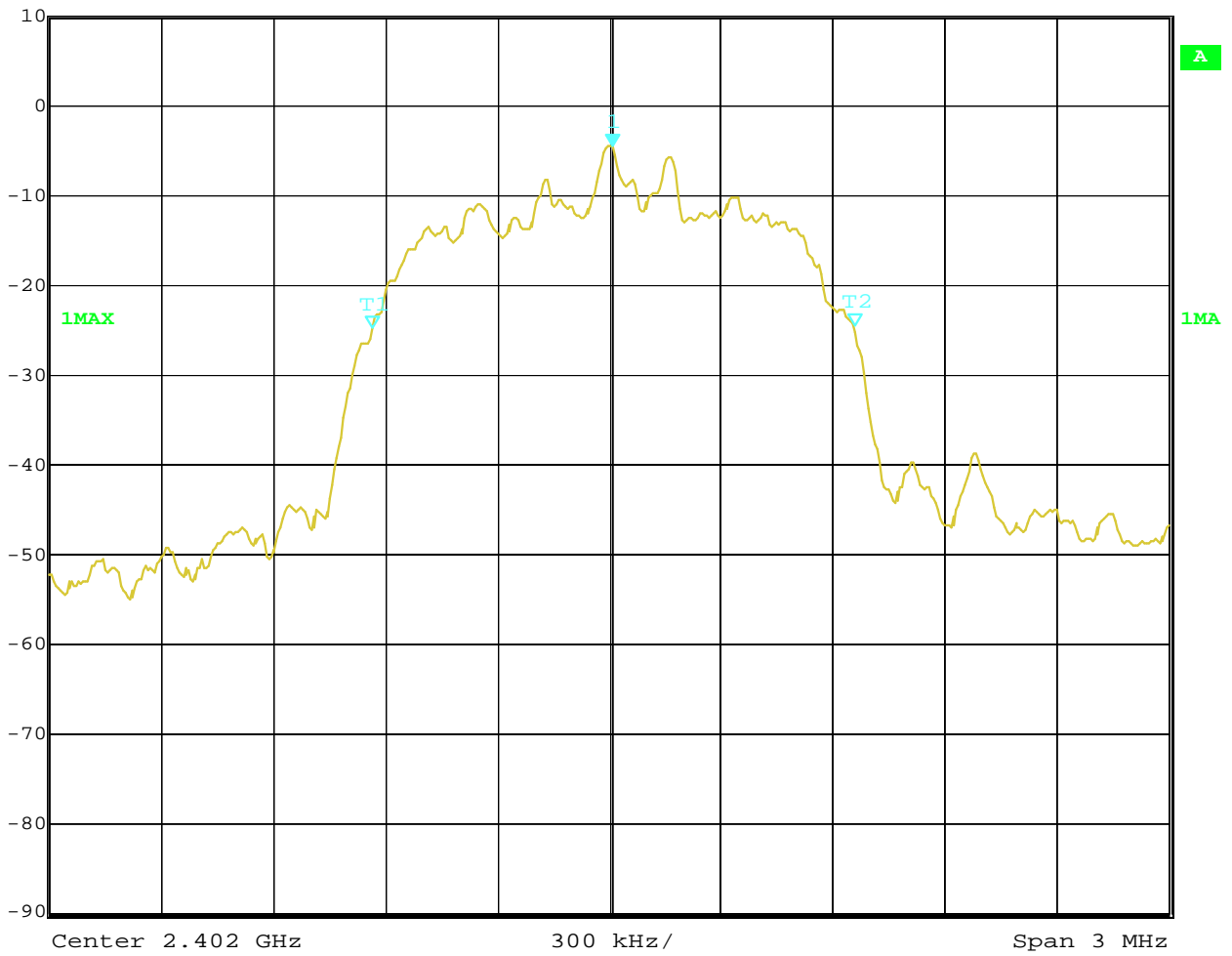


Test Figure:

1. Condition: Low Channel



Ref Lvl	10 dBm	Marker 1 [T1 ndB]	ndB	20.00 dB	RBW	30 kHz	RF Att	20 dB
		BW	1.29258517 MHz		VBW	100 kHz	Unit	dBm
					SWT	10 ms		



Date: 5.NOV.2014 14:08:00





優耐檢測

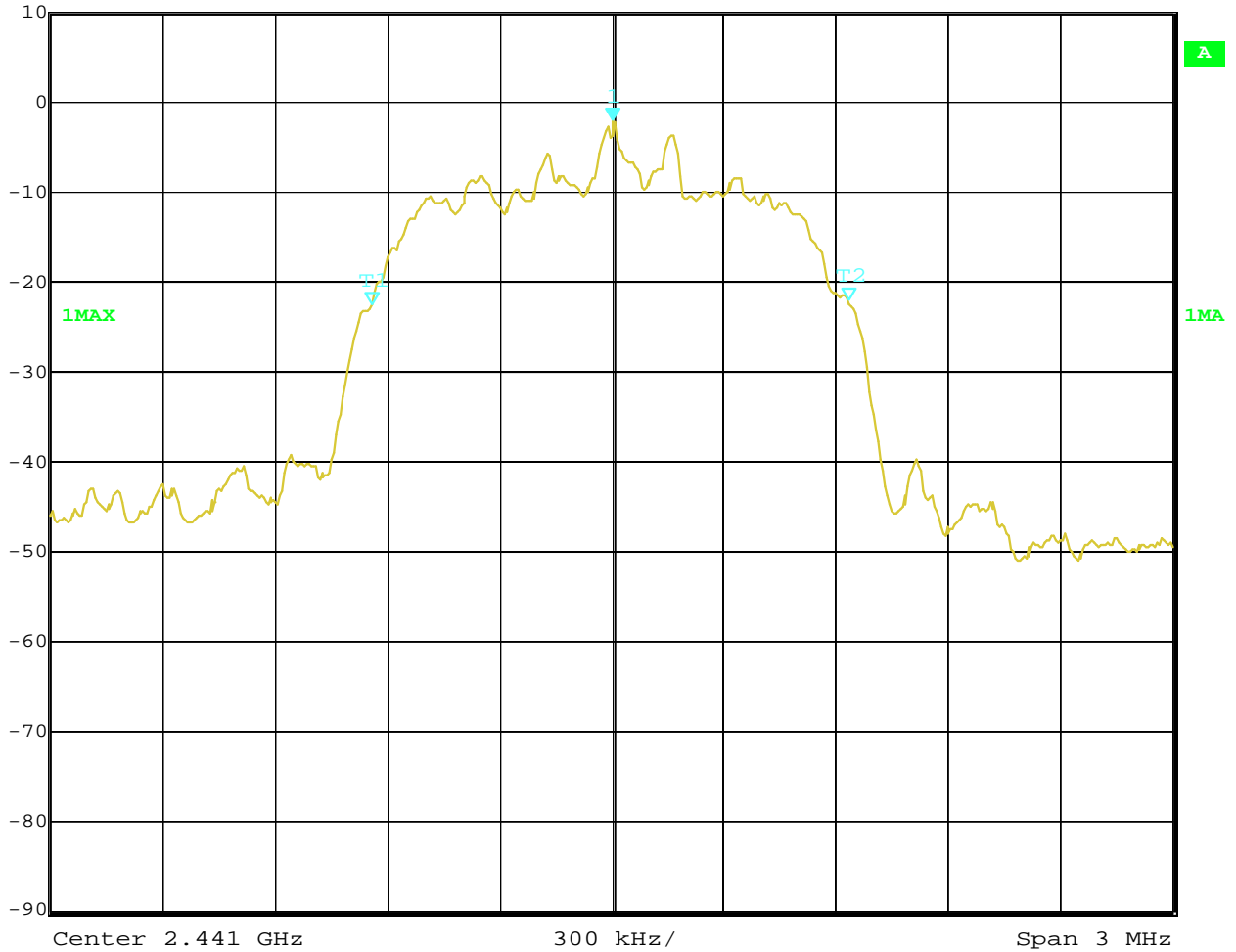
Shenzhen United Testing Technology Co., Ltd.

Report No.: UNI-1411006-01

2. Condition: Middle Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz		
	BW 1.27454910 MHz	SWT	10 ms	Unit	dBm



Date: 5.NOV.2014 14:11:45



# 優耐檢測

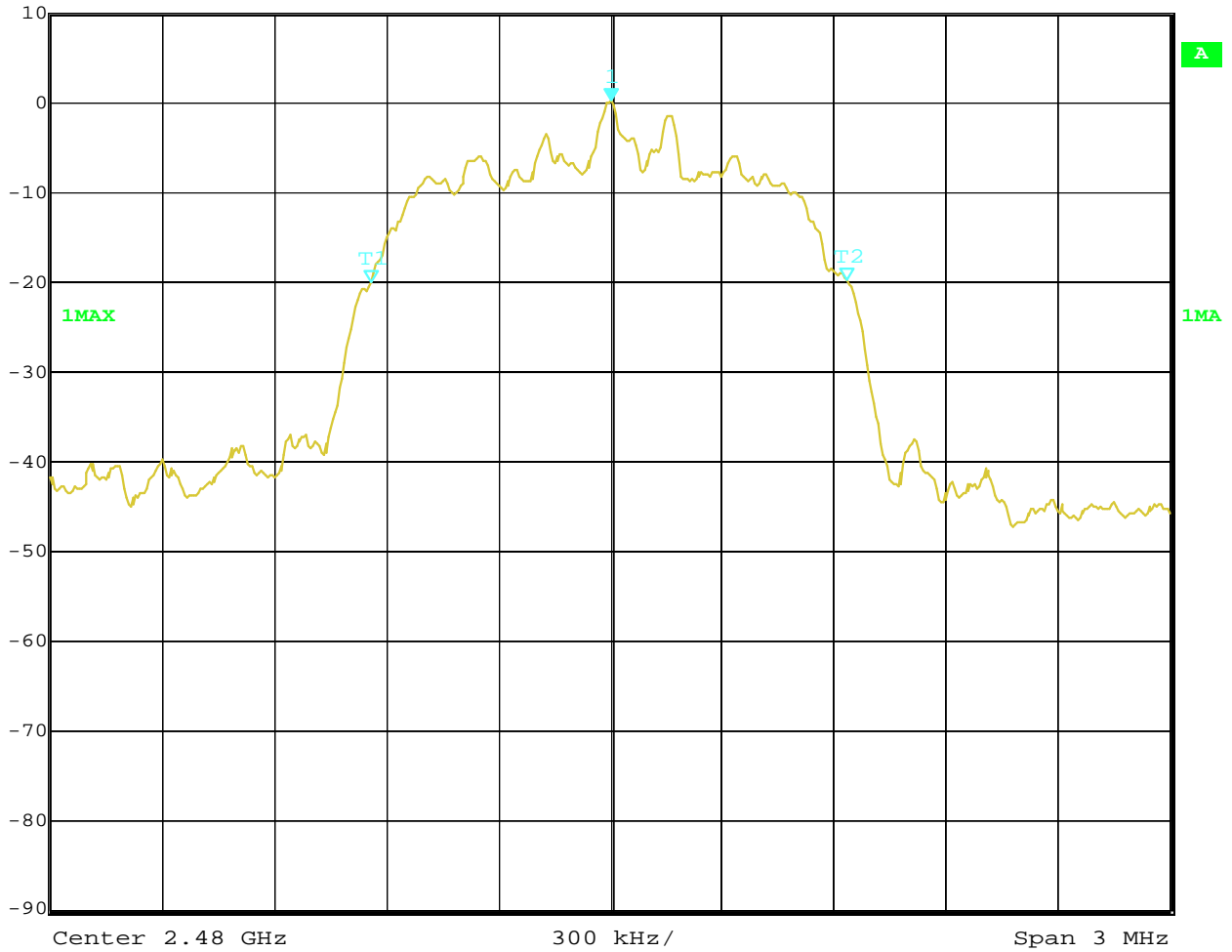
Shenzhen United Testing Technology Co., Ltd.

Report No.: UNI-1411006-01

## 3. High Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz		
	BW 1.27454910 MHz	SWT	10 ms	Unit	dBm



Date: 5.NOV.2014 15:44:32



Test Result

Type of Modulation: 8DPSK

EUT	P324BT Bluetooth Headphones with Microphone		Model	P324BT
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	1292.585	--	Pass
Middle	2441	1286.573	--	Pass
High	2480	1286.573	--	Pass

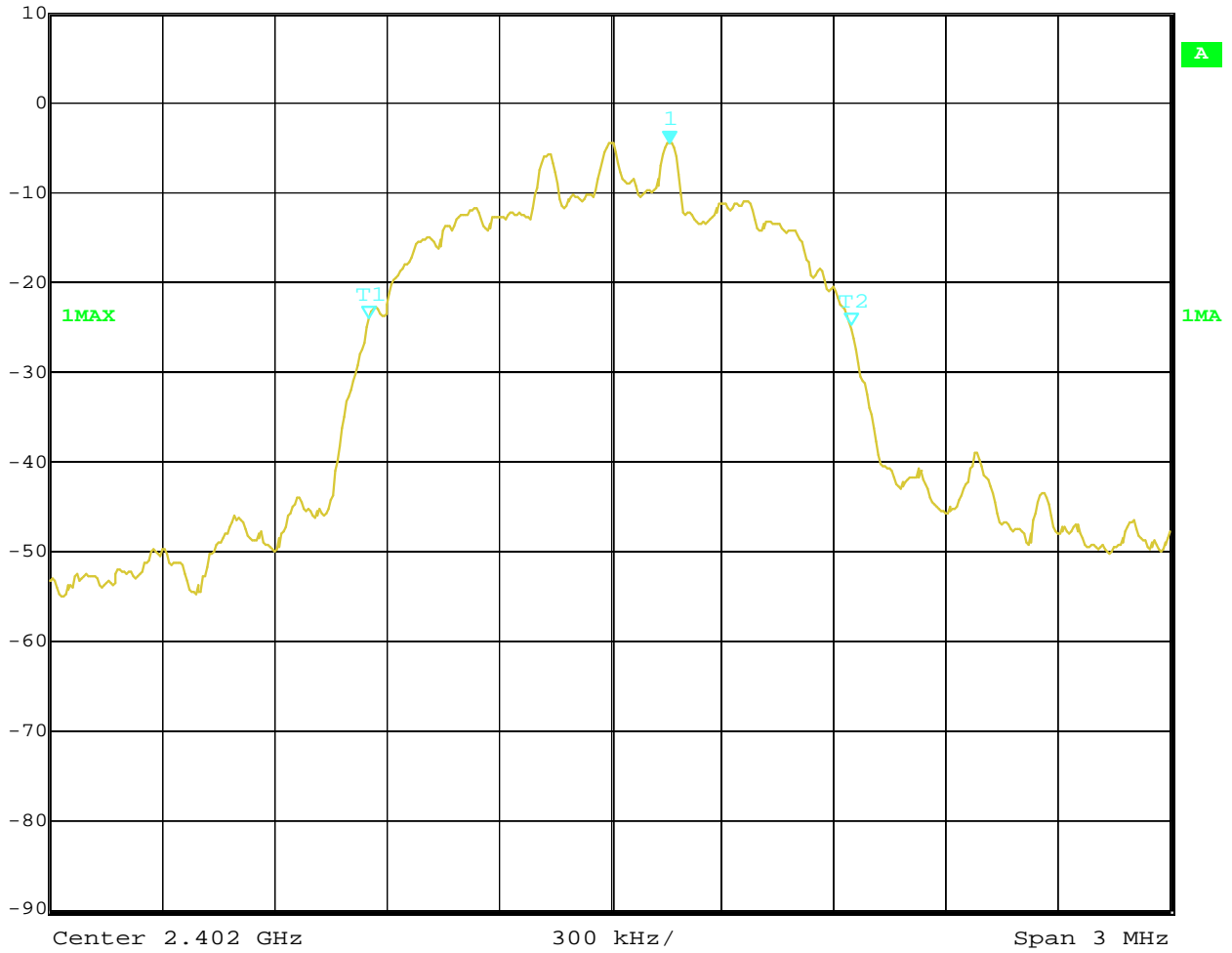


Test Figure:

1. Condition: Low Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz		
	BW 1.29258517 MHz	SWT	10 ms	Unit	dBm



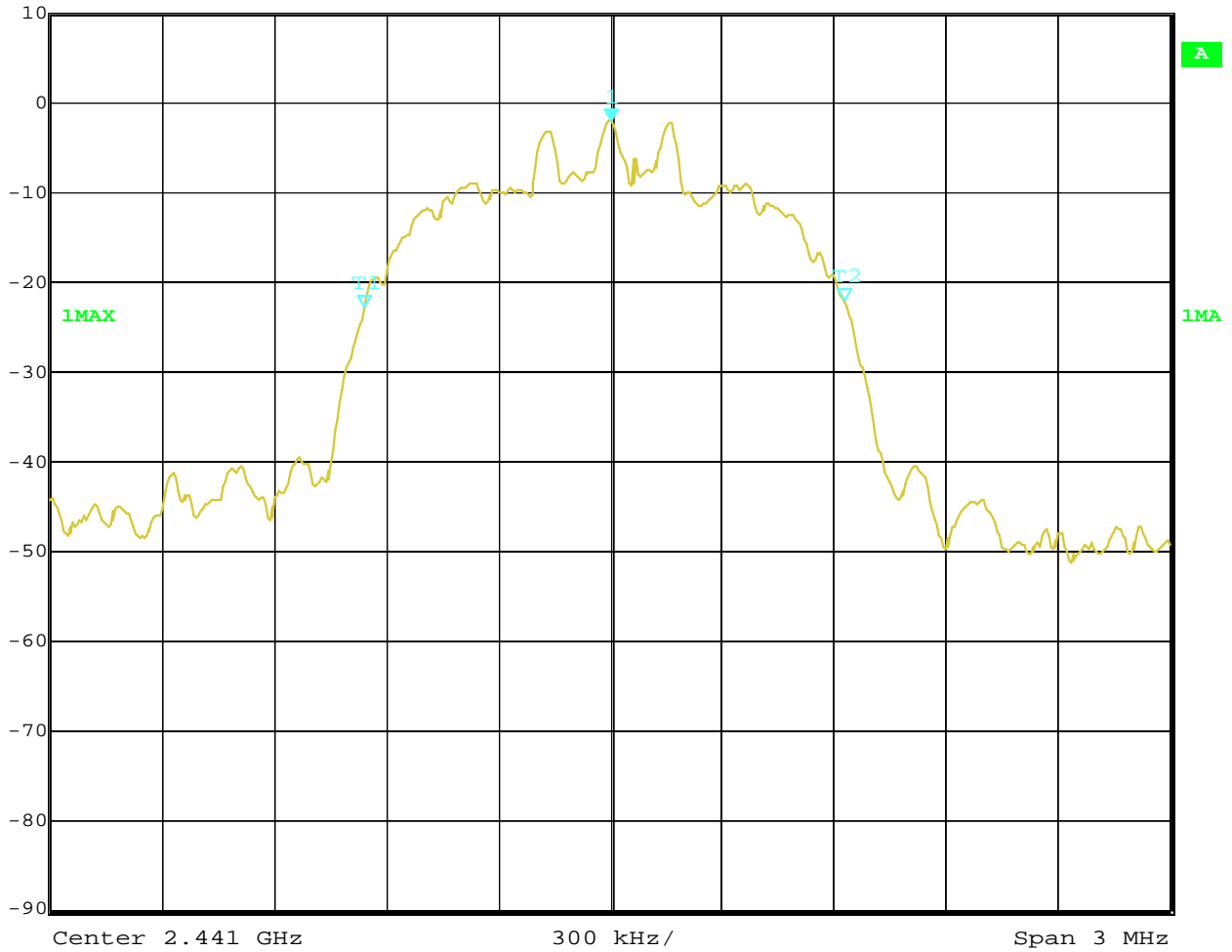
Date: 5.NOV.2014 14:05:51



2. Condition: Middle Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz		
	BW 1.28657315 MHz	SWT	10 ms	Unit	dBm



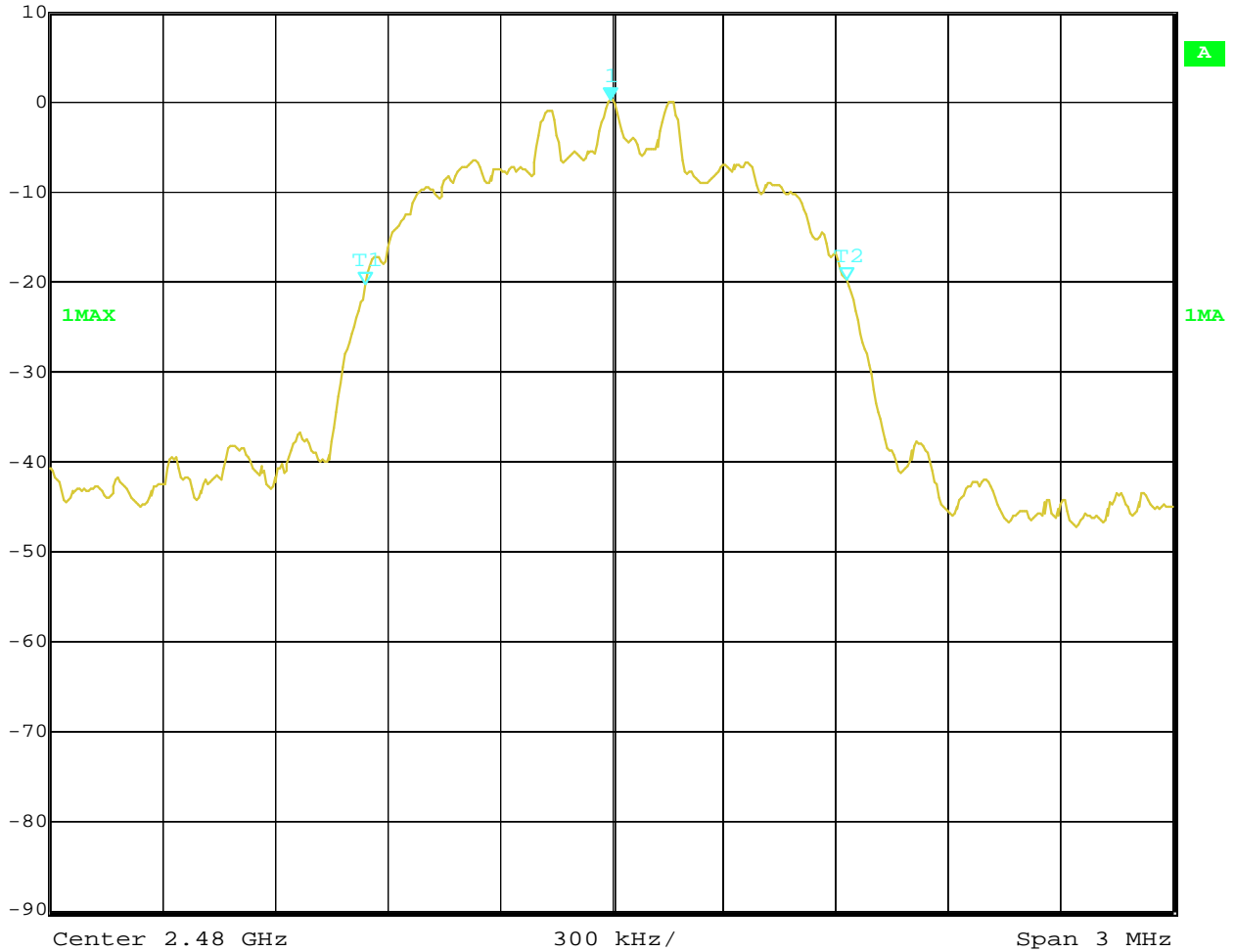
Date: 5.NOV.2014 14:12:42



### 3. High Channel



Ref Lvl	Marker 1 [T1 ndB]	RBW	30 kHz	RF Att	20 dB
10 dBm	ndB 20.00 dB	VBW	100 kHz		
	BW 1.28657315 MHz	SWT	10 ms	Unit	dBm



Date: 5.NOV.2014 15:43:25



## 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	P324BT Bluetooth Headphones with Microphone		Model	P324BT
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	1.06	30	Pass
Middle	2441	1.99	30	Pass
High	2480	4.26	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: π/4DQPSK

EUT	P324BT Bluetooth Headphones with Microphone		Model	P324BT
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	-1.31	30	Pass
Middle	2441	0.94	30	Pass
High	2480	3.21	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	P324BT Bluetooth Headphones with Microphone		Model	P324BT
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	1.33	30	Pass
High	2480	3.59	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	P324BT Bluetooth Headphones with Microphone	Model	P324BT
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 3 [T1]

RBW 100 kHz RF Att 20 dB

Ref Lvl -0.05 dB

VBW 300 kHz

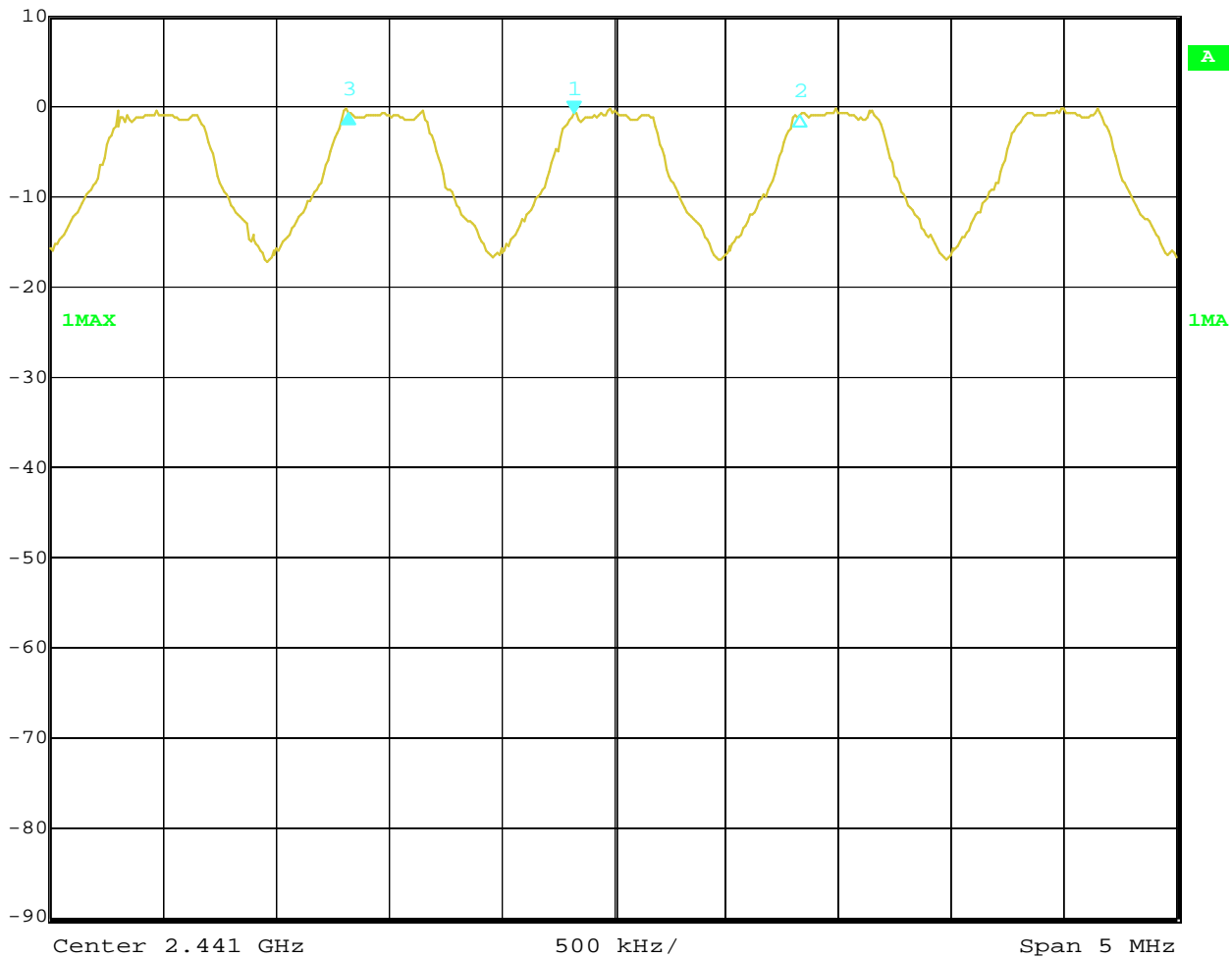
10 dBm

-1.00000000 MHz

SWT 21 ms

Unit

dBm



Date: 5.NOV.2014 11:25:08



Type of Modulation:  $\pi/4$ DQPSK

EUT	P324BT Bluetooth Headphones with Microphone	Model	P324BT
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 3 [T1]

RBW 100 kHz RF Att 20 dB

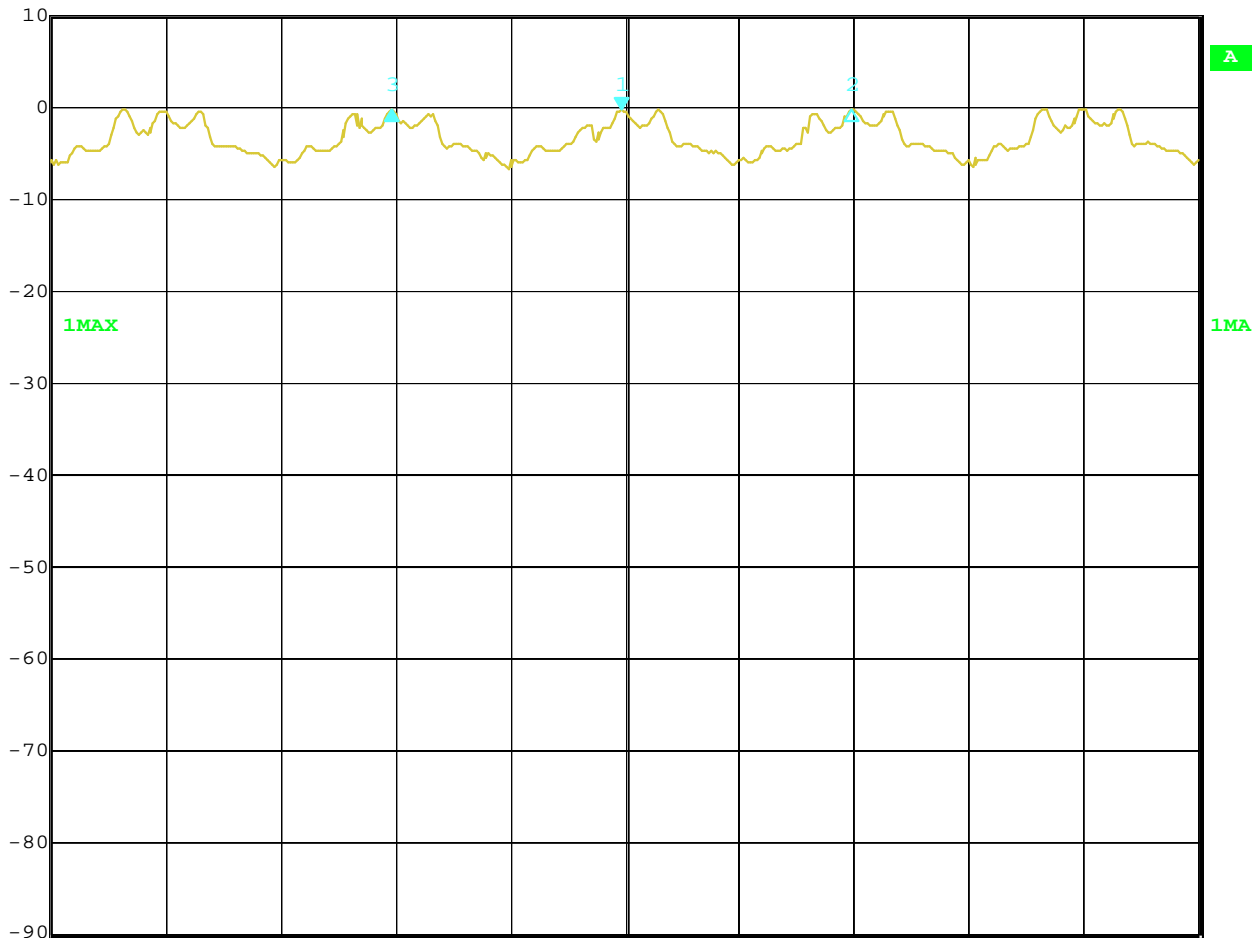
Ref Lvl -0.04 dB

VBW 300 kHz

10 dBm -1.00000000 MHz

SWT 21 ms

Unit dBm



Center 2.441 GHz

500 kHz/

Span 5 MHz

Date: 5.NOV.2014 11:40:59



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Shenzhen United Testing Technology Co., Ltd.

Report No.: UNI-1411006-01

Type of Modulation: 8DPSK

EUT	P324BT Bluetooth Headphones with Microphone	Model	P324BT
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 3 [T1]

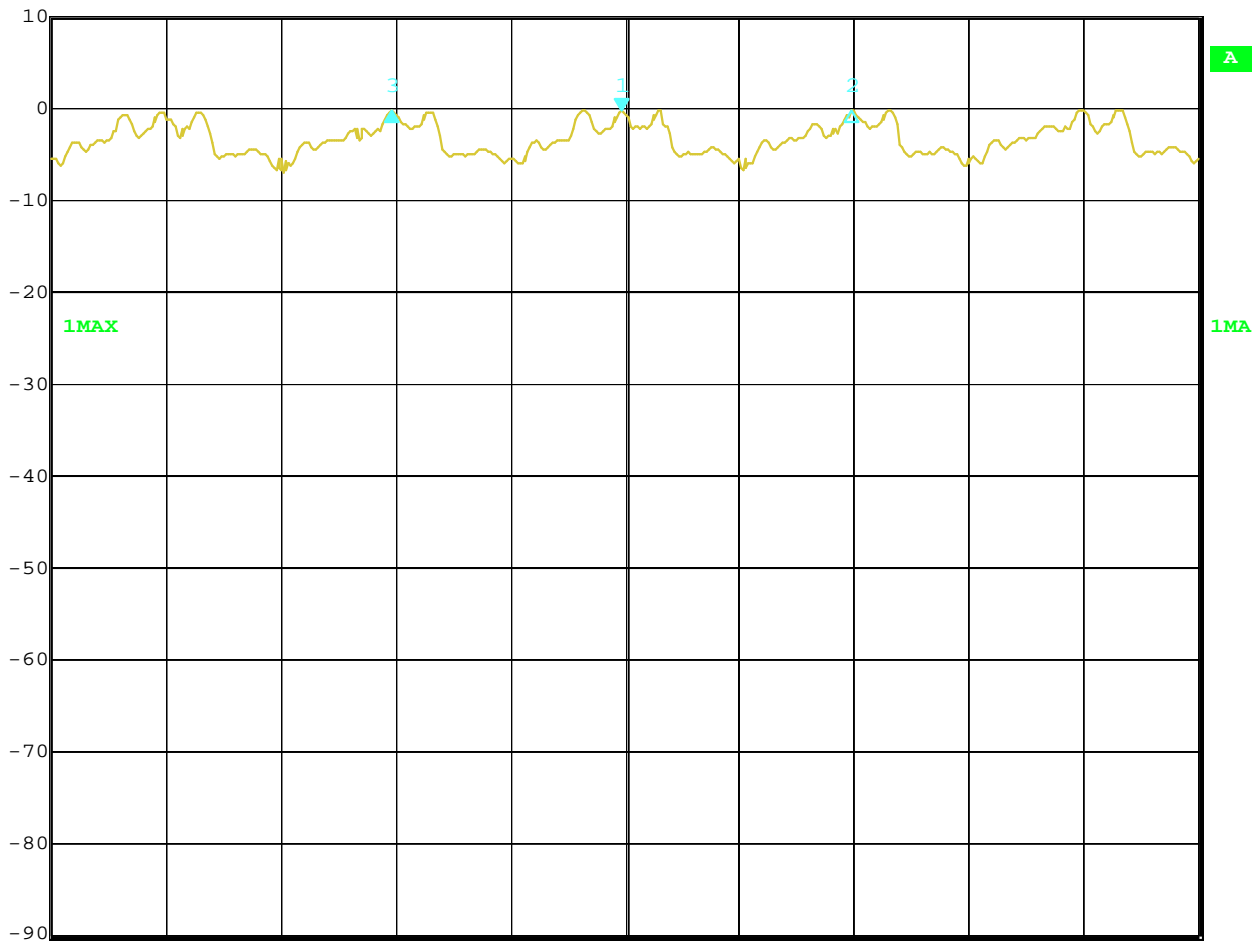
RBW 100 kHz RF Att 20 dB

Ref Lvl -0.04 dB

VBW 300 kHz

10 dBm -1.00000000 MHz

SWT 21 ms Unit dBm



Center 2.441 GHz

500 kHz/

Span 5 MHz

Date: 5.NOV.2014 11:54:18



## 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	P324BT Bluetooth Headphones with Microphone	Model	P324BT	
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 1 [T1]

RBW 100 kHz RF Att 20 dB

Ref Lvl

-3.72 dBm

VBW 300 kHz

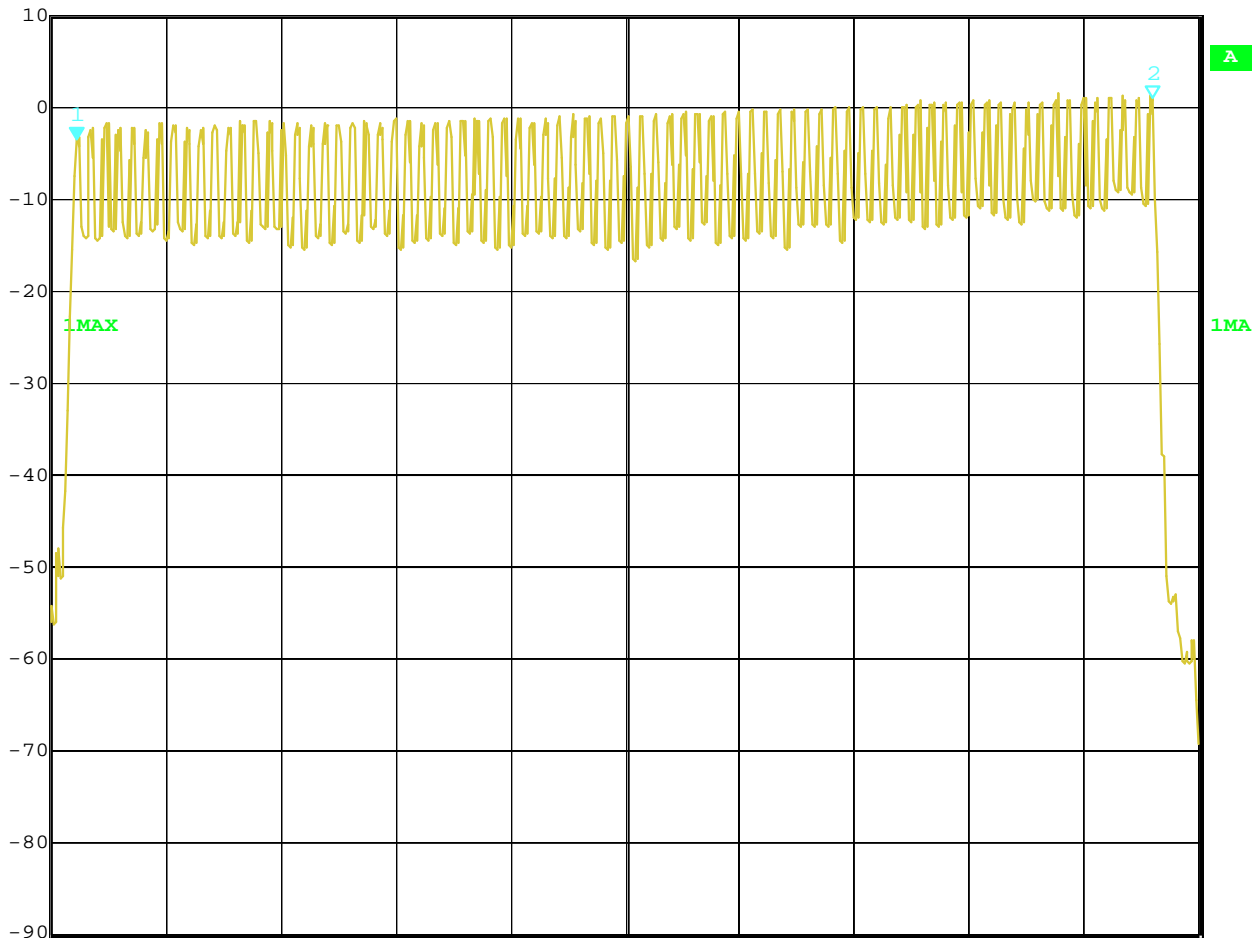
10 dBm

2.40184068 GHz

SWT 21 ms

Unit

dBm



Start 2.4 GHz

8.35 MHz/

Stop 2.4835 GHz

Date: 5.NOV.2014 11:22:16



Type of Modulation:  $\pi/4$ QPSK

EUT	P324BT Bluetooth Headphones with Microphone	Model	P324BT
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	$\geq 15$	Pass

Test Plot



Marker 2 [T1]

RBW 100 kHz RF Att 20 dB

Ref Lvl

-0.66 dBm

VBW 300 kHz

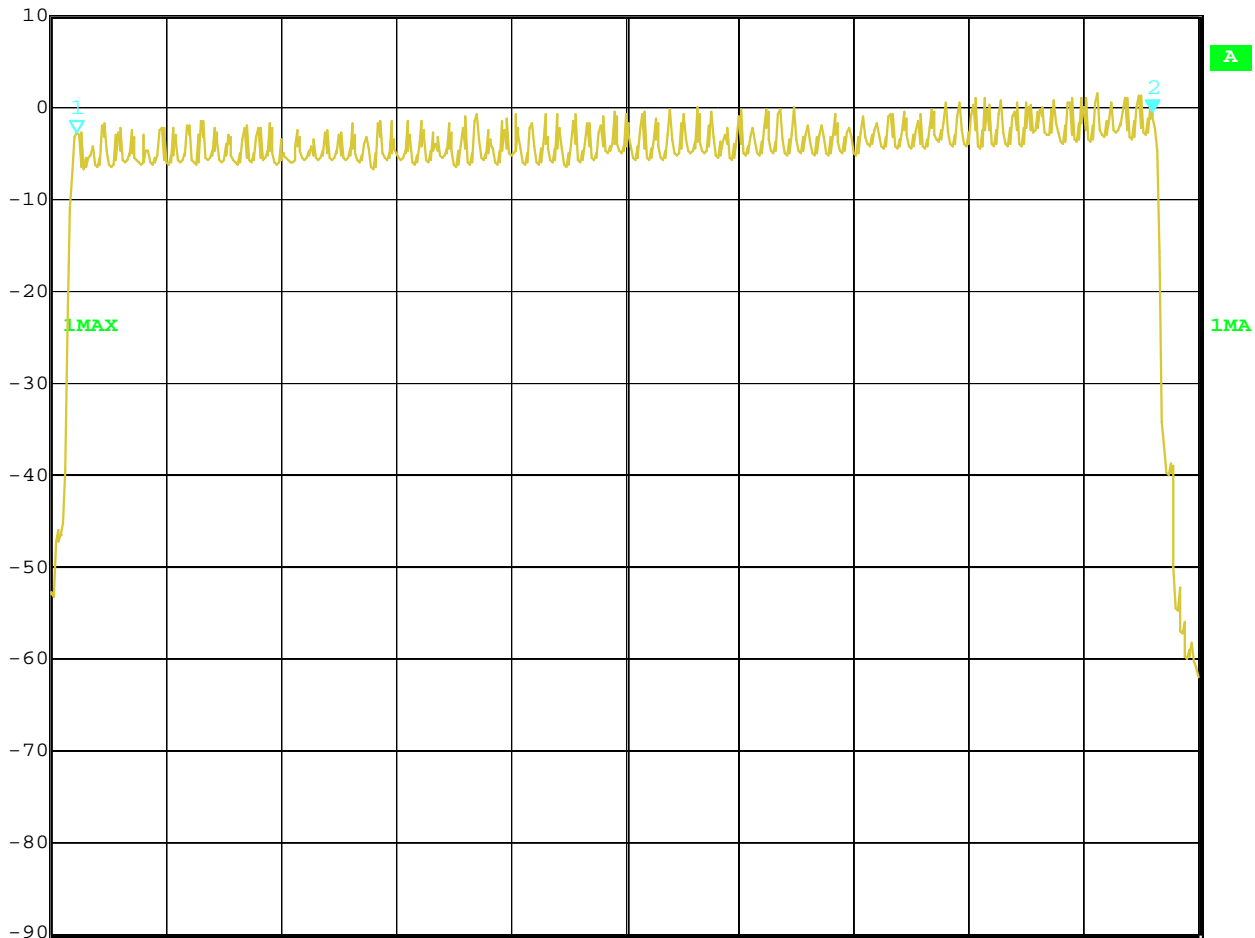
10 dBm

2.48015331 GHz

SWT 21 ms

Unit

dBm



Start 2.4 GHz

8.35 MHz/

Stop 2.4835 GHz

Date: 5.NOV.2014 11:12:48





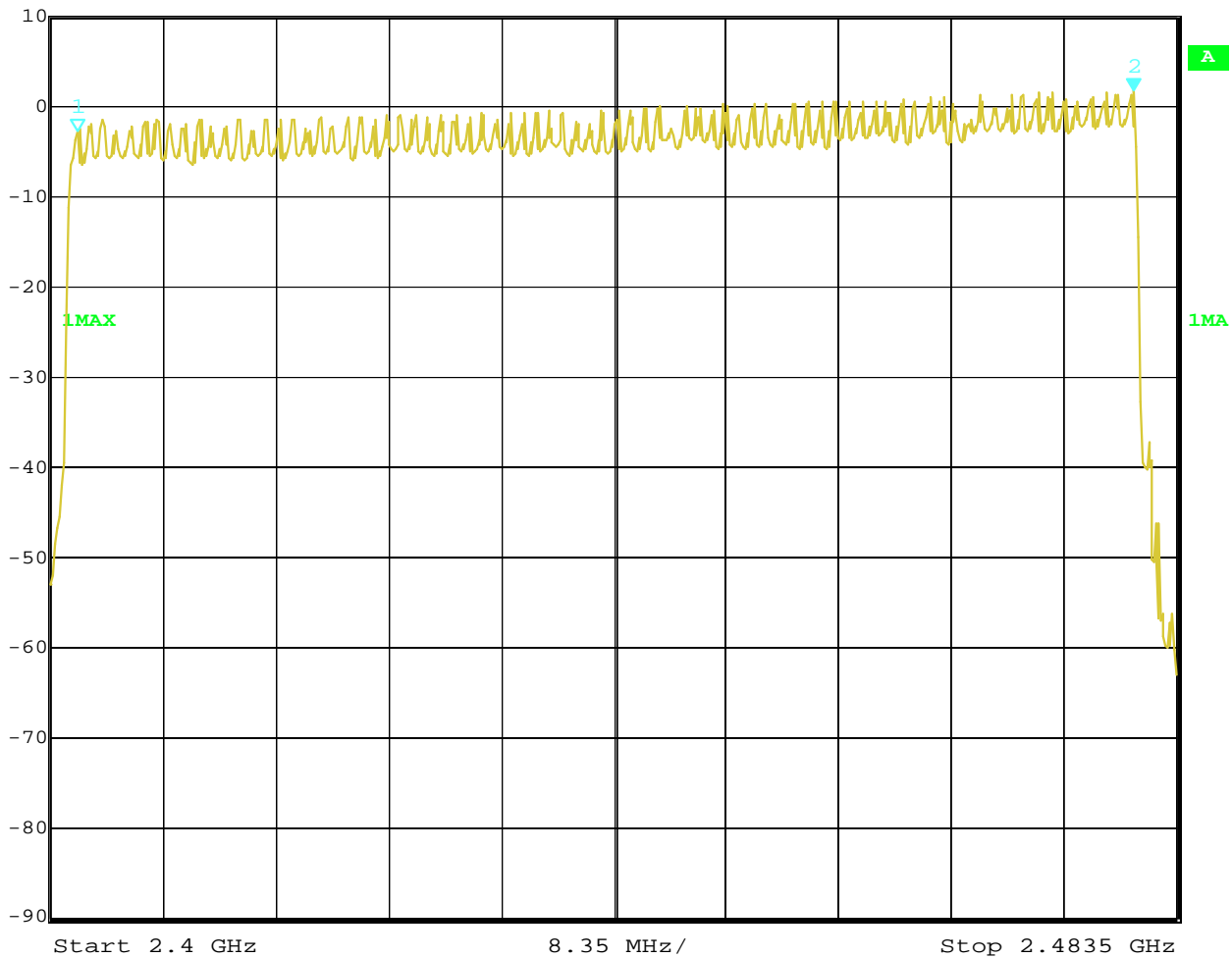
Type of Modulation: 8DPSK

EUT	P324BT Bluetooth Headphones with Microphone	Model	P324BT
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 [T1]      RBW 100 kHz      RF Att 20 dB  
 Ref Lvl 1.66 dBm      VBW 300 kHz  
 10 dBm      2.48032064 GHz      SWT 21 ms      Unit dBm



Date: 5.NOV.2014 11:20:20



## 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	P324BT Bluetooth Headphones with Microphone		Model	P324BT
Mode	Keep Transmitting		Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Reading	Hopping Rate	Actual	Limit
Low	2.99ms	266.667 hop/s	0.319s	0.4s
Middle	2.97ms	266.667 hop/s	0.317s	0.4s
High	2.99ms	266.667 hop/s	0.319s	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**



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Shenzhen United Testing Technology Co., Ltd.

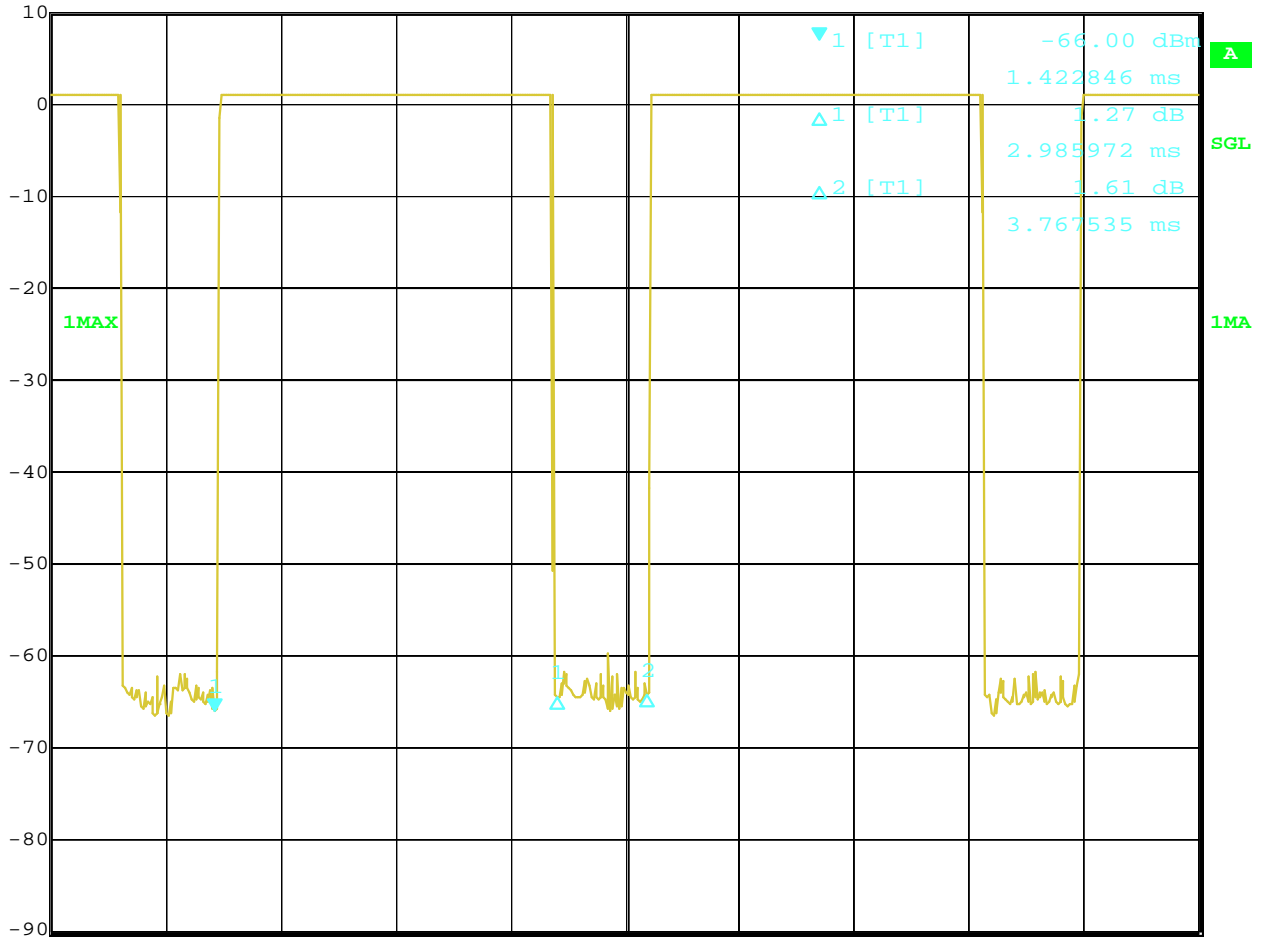
Report No.: UNI-1411006-01

Test Plots:

Low Channel:



Ref Lvl	10 dBm	Marker 1 [T1]	-66.00 dBm	RBW	1 MHz	RF Att	20 dB
			1.422846 ms	VBW	1 MHz		
				SWT	10 ms	Unit	dBm



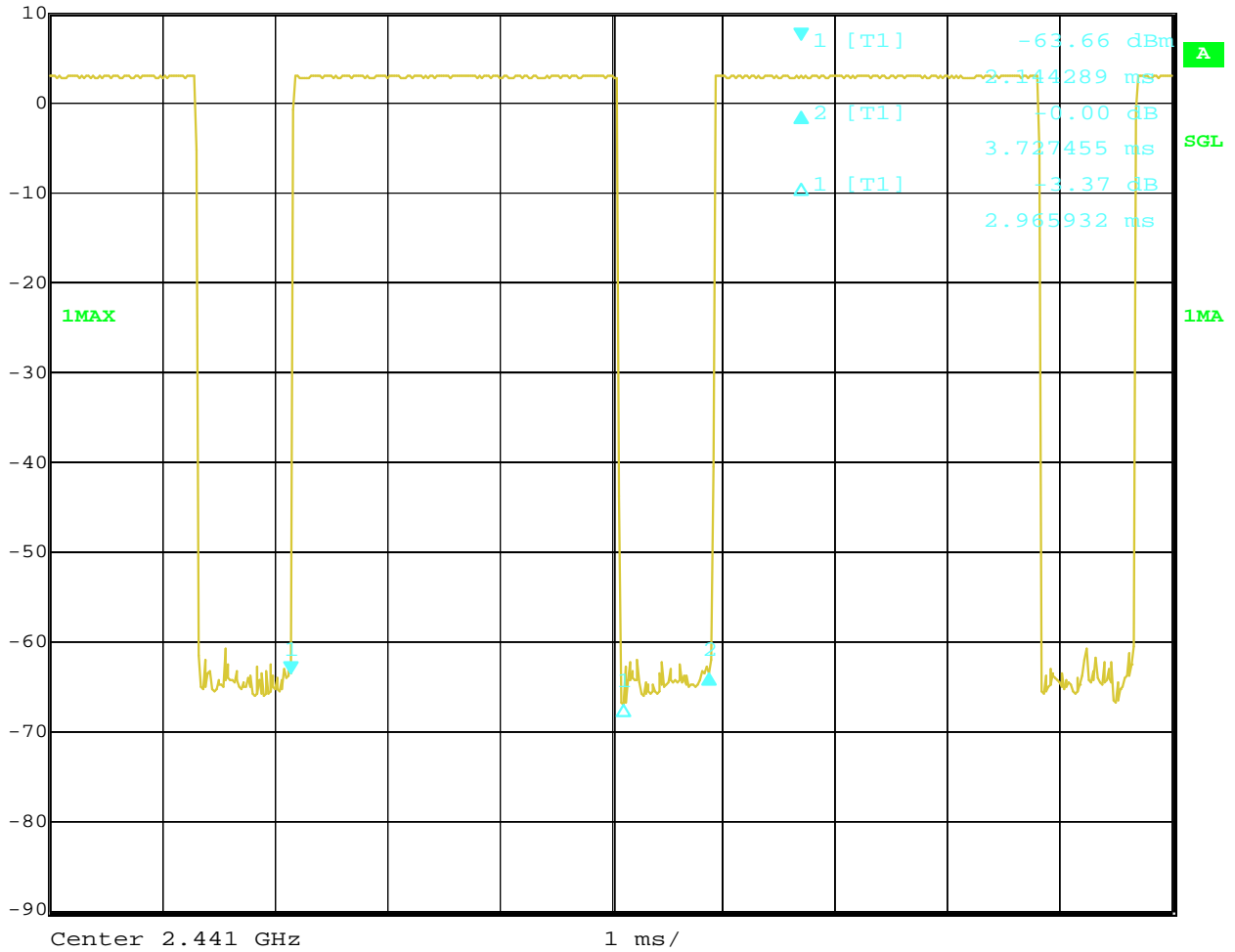
Date: 10.NOV.2014 17:09:27



Middle Channel:



Ref Lvl	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
10 dBm	-0.00 dB	VBW	1 MHz		
	3.727455 ms	SWT	10 ms	Unit	dBm



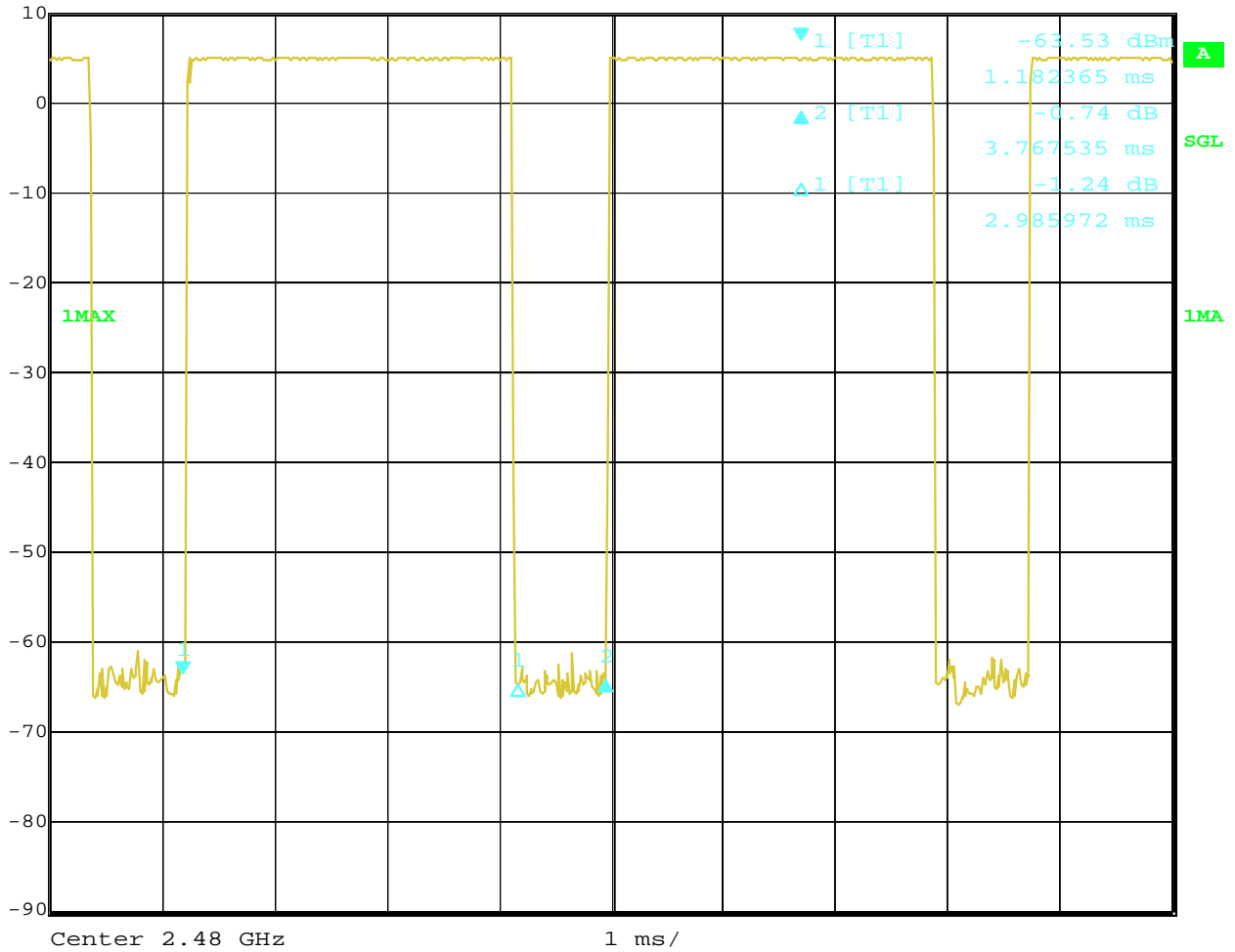
Date: 10.NOV.2014 17:11:36



High Channel



Ref Lvl	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
10 dBm	-0.74 dB	VBW	1 MHz		
	3.767535 ms	SWT	10 ms	Unit	dBm



Date: 10.NOV.2014 17:12:47



Test Result

Type of Modulation:  $\pi/4$ DQPSK

EUT	P324BT Bluetooth Headphones with Microphone		Model	P324BT	
Mode	Keep Transmitting		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel	Reading	Hopping Rate	Actual	Limit	
Low	3.01ms	266.667 hop/s	0.321s	0.4s	
Middle	2.97ms	266.667 hop/s	0.317s	0.4s	
High	2.99ms	266.667 hop/s	0.319s	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**

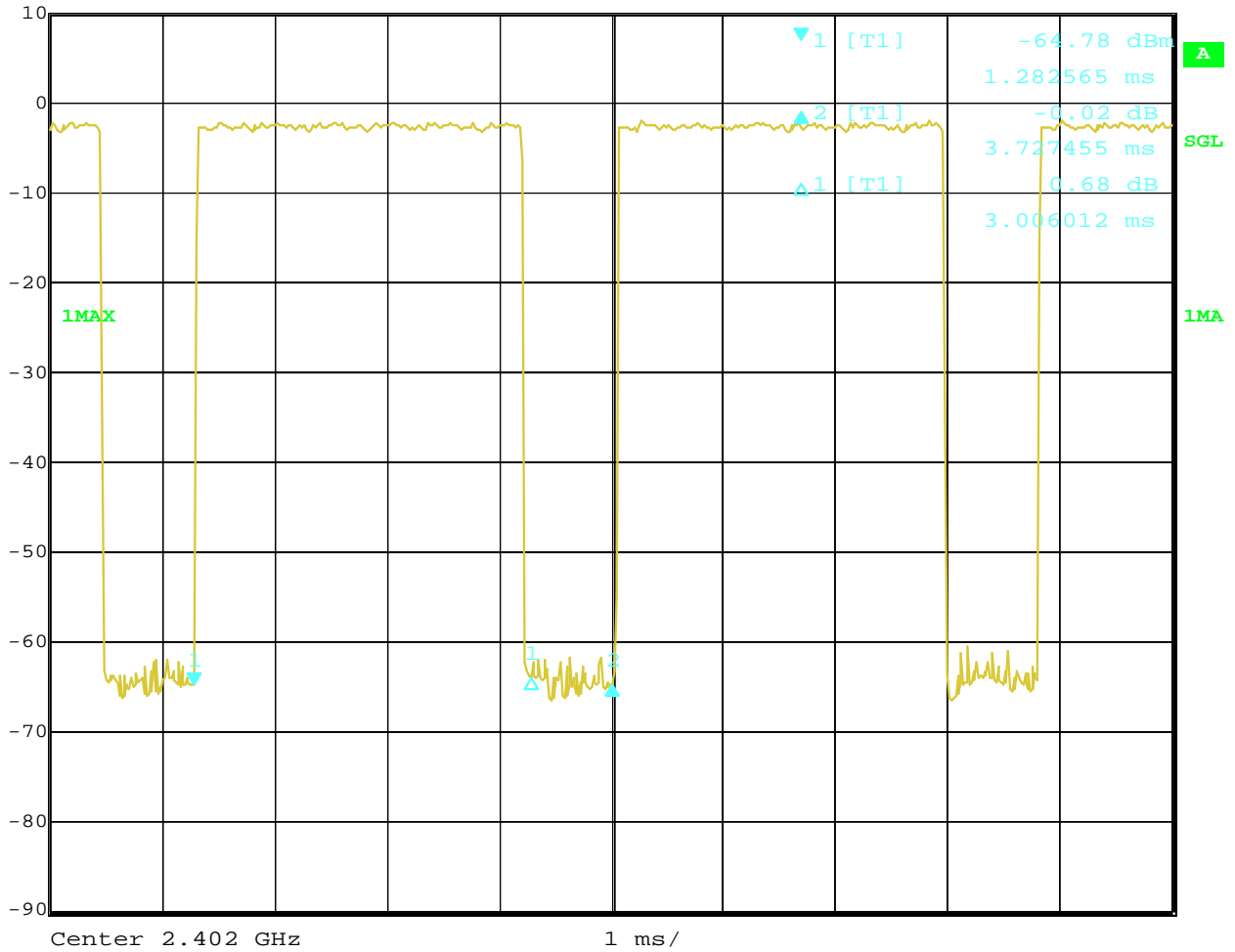


Test Plots:

Low Channel:



Ref Lvl	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
10 dBm	-0.02 dB	VBW	1 MHz		
	3.727455 ms	SWT	10 ms	Unit	dBm



Date: 10.NOV.2014 17:16:11

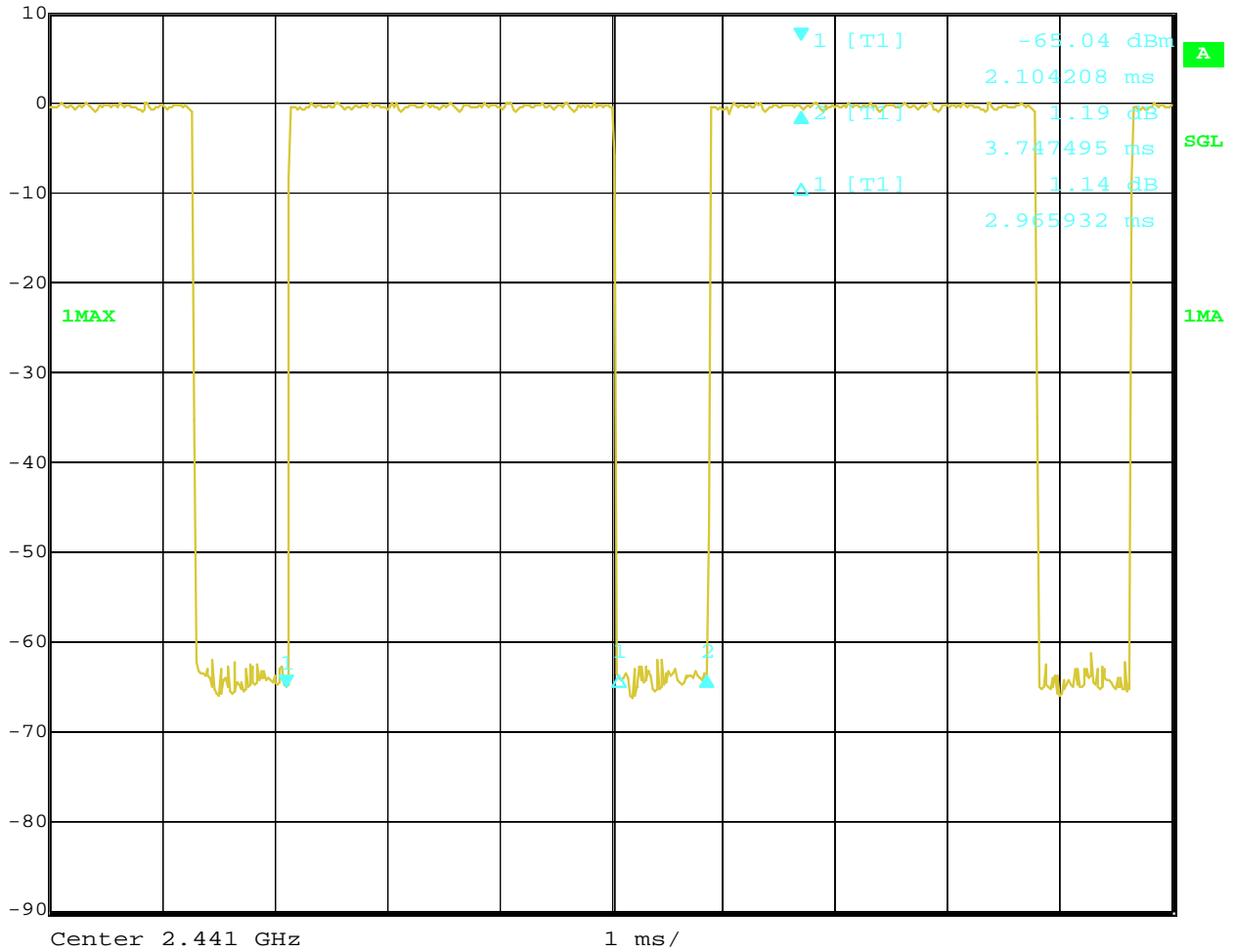




Middle Channel:



Ref Lvl	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
10 dBm	1.19 dB	VBW	1 MHz		
	3.747495 ms	SWT	10 ms	Unit	dBm



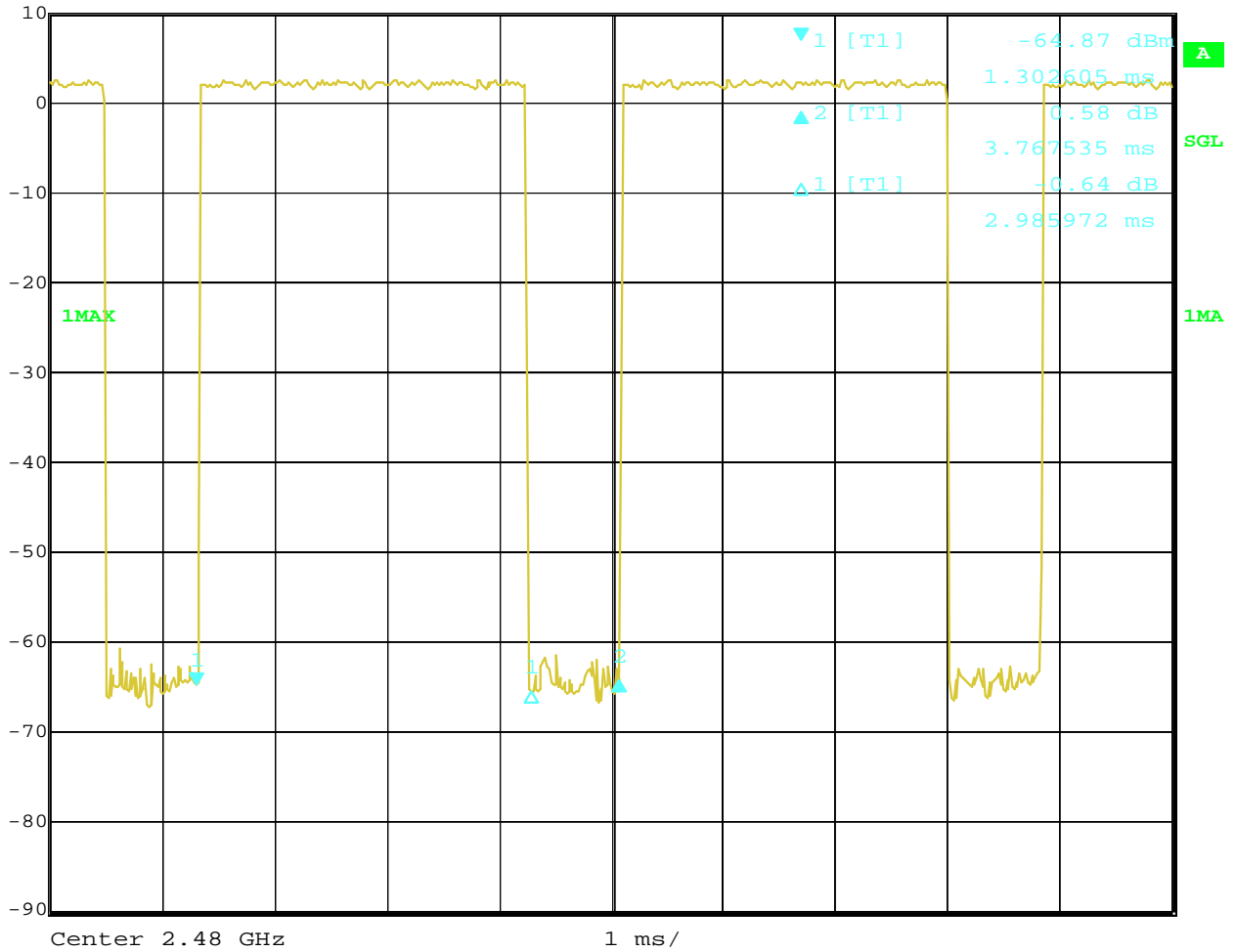
Date: 10.NOV.2014 17:15:22



High Channel



Ref Lvl	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
10 dBm	0.58 dB	VBW	1 MHz		
	3.767535 ms	SWT	10 ms	Unit	dBm



Date: 10.NOV.2014 17:14:08



Type of Modulation: 8DPSK

EUT	P324BT Bluetooth Headphones with Microphone		Model	P324BT	
Mode	Keep Transmitting		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel	Reading	Hopping Rate	Actual	Limit	
Low	2.99ms	266.667 hop/s	0.319s	0.4s	
Middle	3.05ms	266.667 hop/s	0.325s	0.4s	
High	3.03ms	266.667 hop/s	0.323s	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**

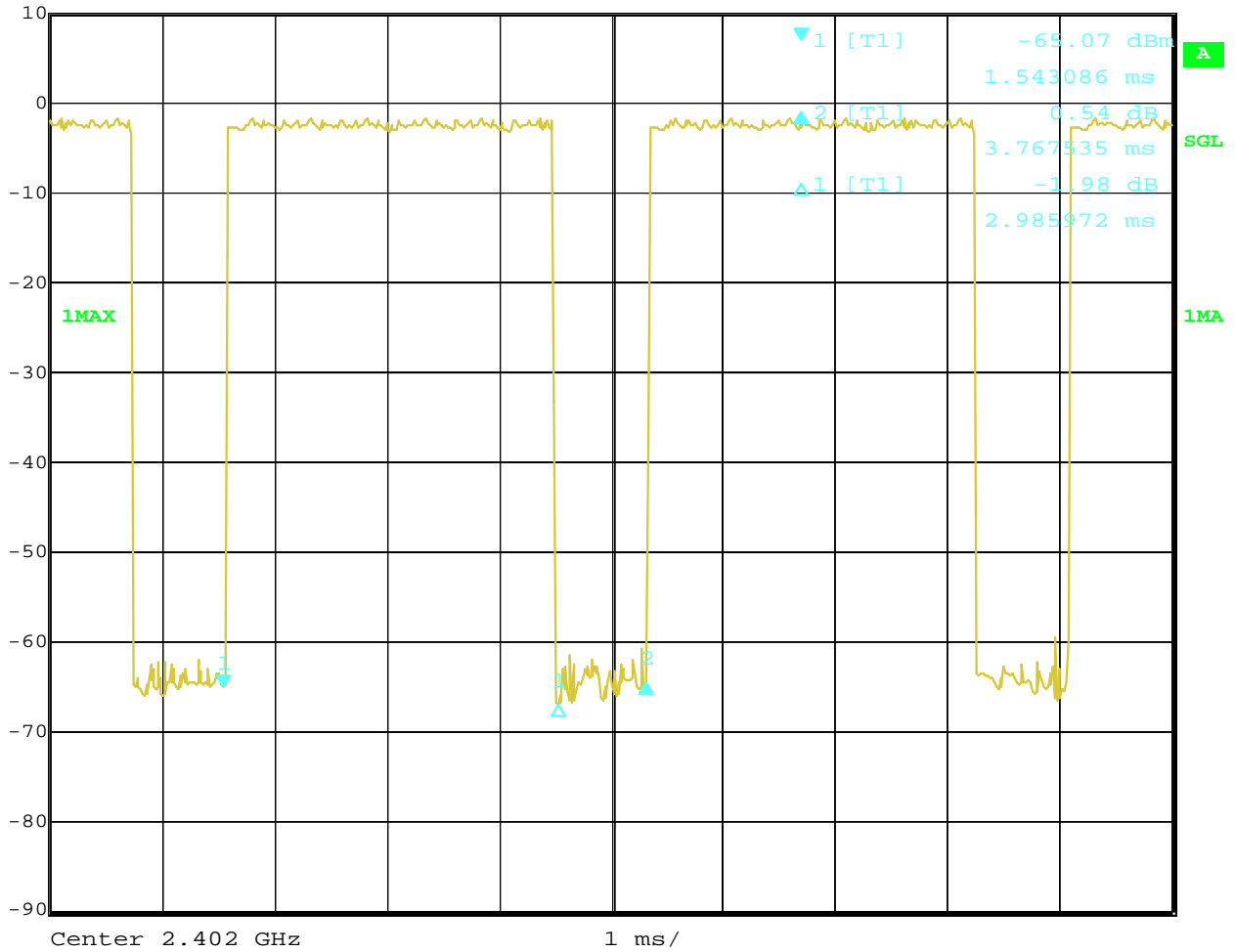


Test Plots:

Low Channel:



	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
Ref Lvl	0.54 dB	VBW	1 MHz		
10 dBm	3.767535 ms	SWT	10 ms	Unit	dBm



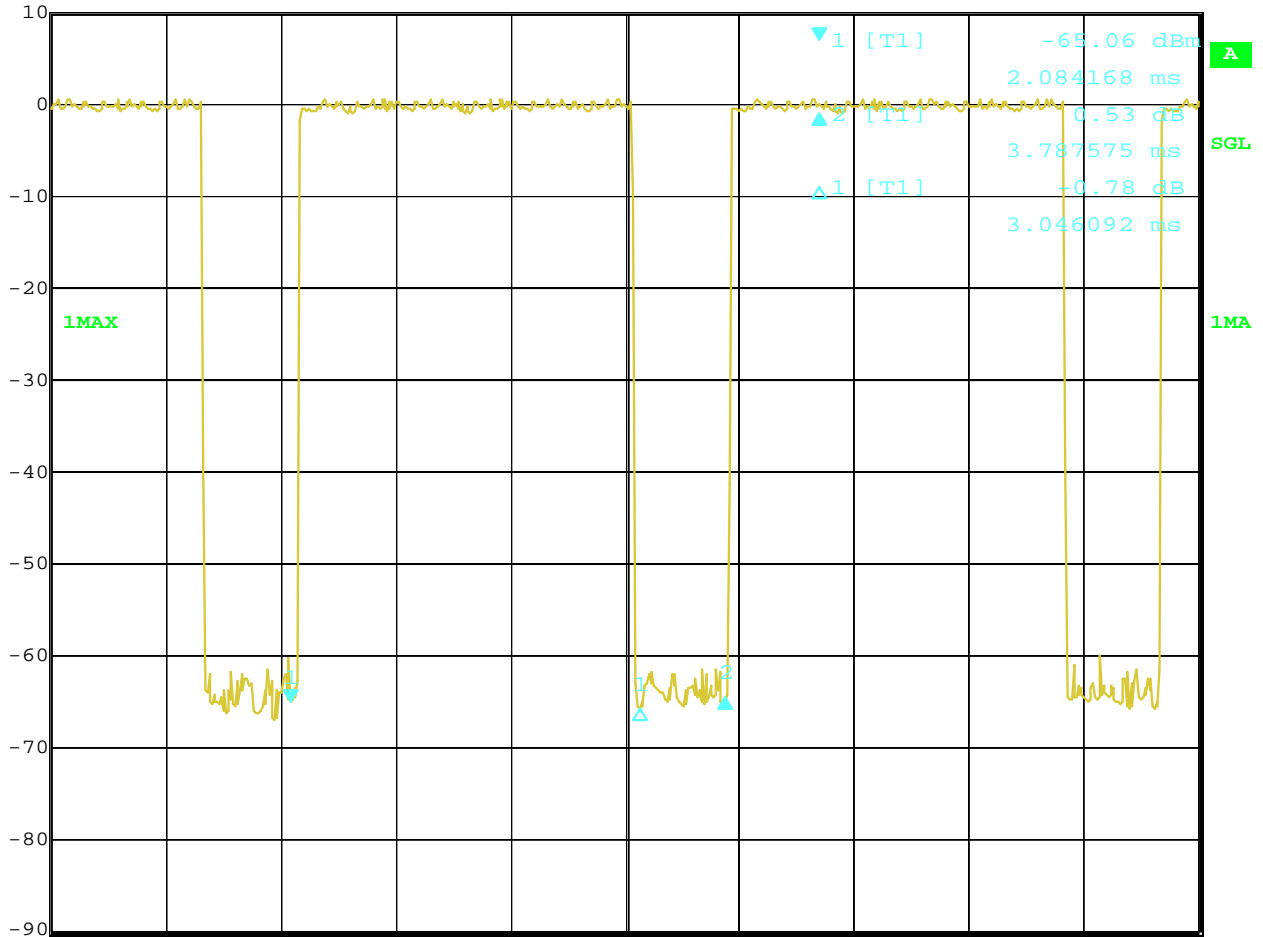
Date: 10.NOV.2014 17:17:03



Middle Channel:



	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
Ref Lvl	0.53 dB	VBW	1 MHz		
10 dBm	3.787575 ms	SWT	10 ms	Unit	dBm



Center 2.441 GHz 1 ms/

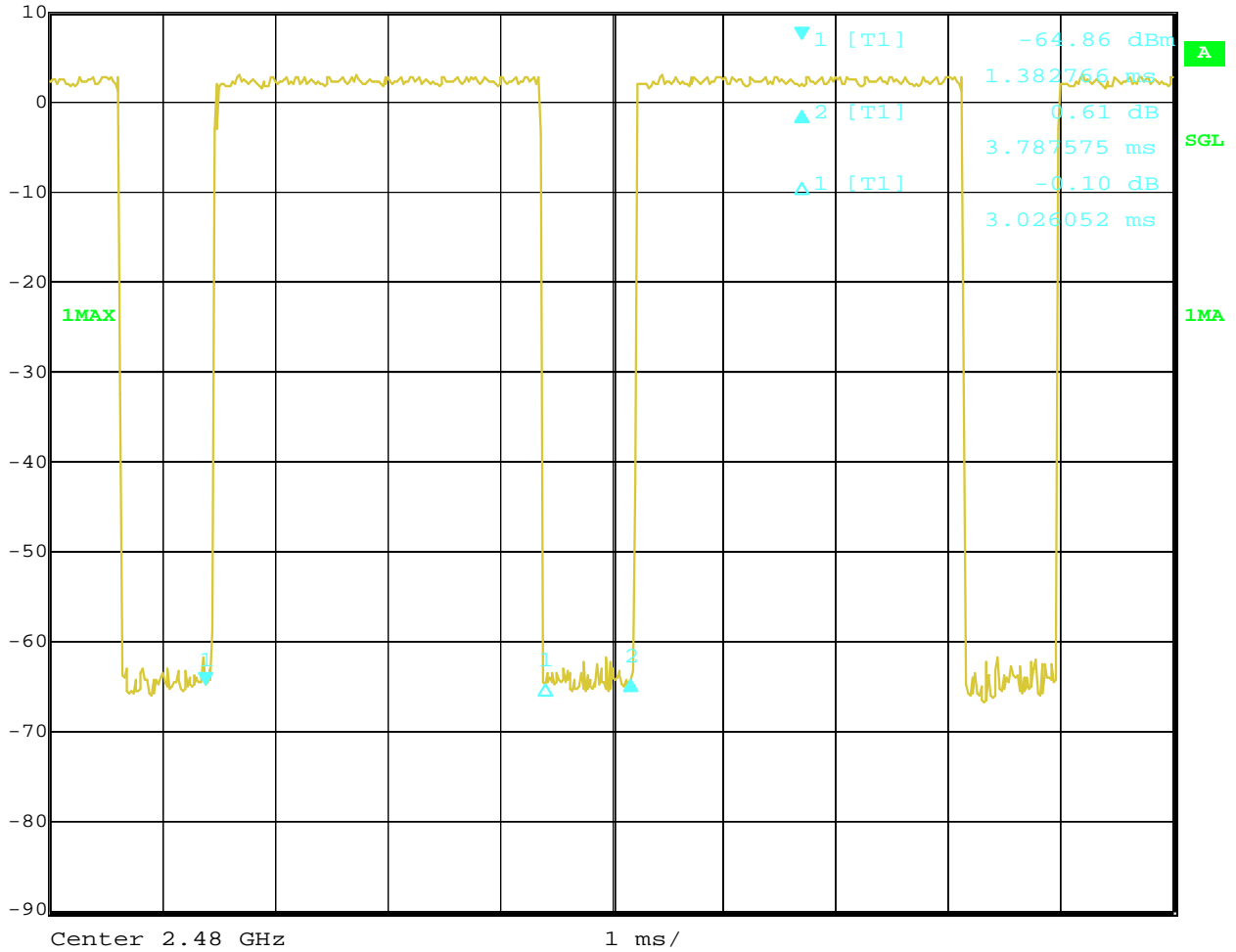
Date: 10.NOV.2014 17:18:24



High Channel



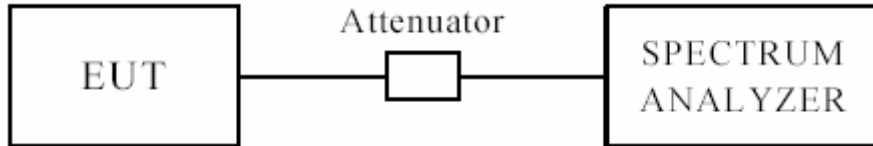
Ref Lvl	Delta 2 [T1]	RBW	1 MHz	RF Att	20 dB
10 dBm	0.61 dB	VBW	1 MHz		
	3.787575 ms	SWT	10 ms	Unit	dBm



Date: 10.NOV.2014 17:19:17

**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.
- 3.H and V polarity all have been tested only worse case is reported

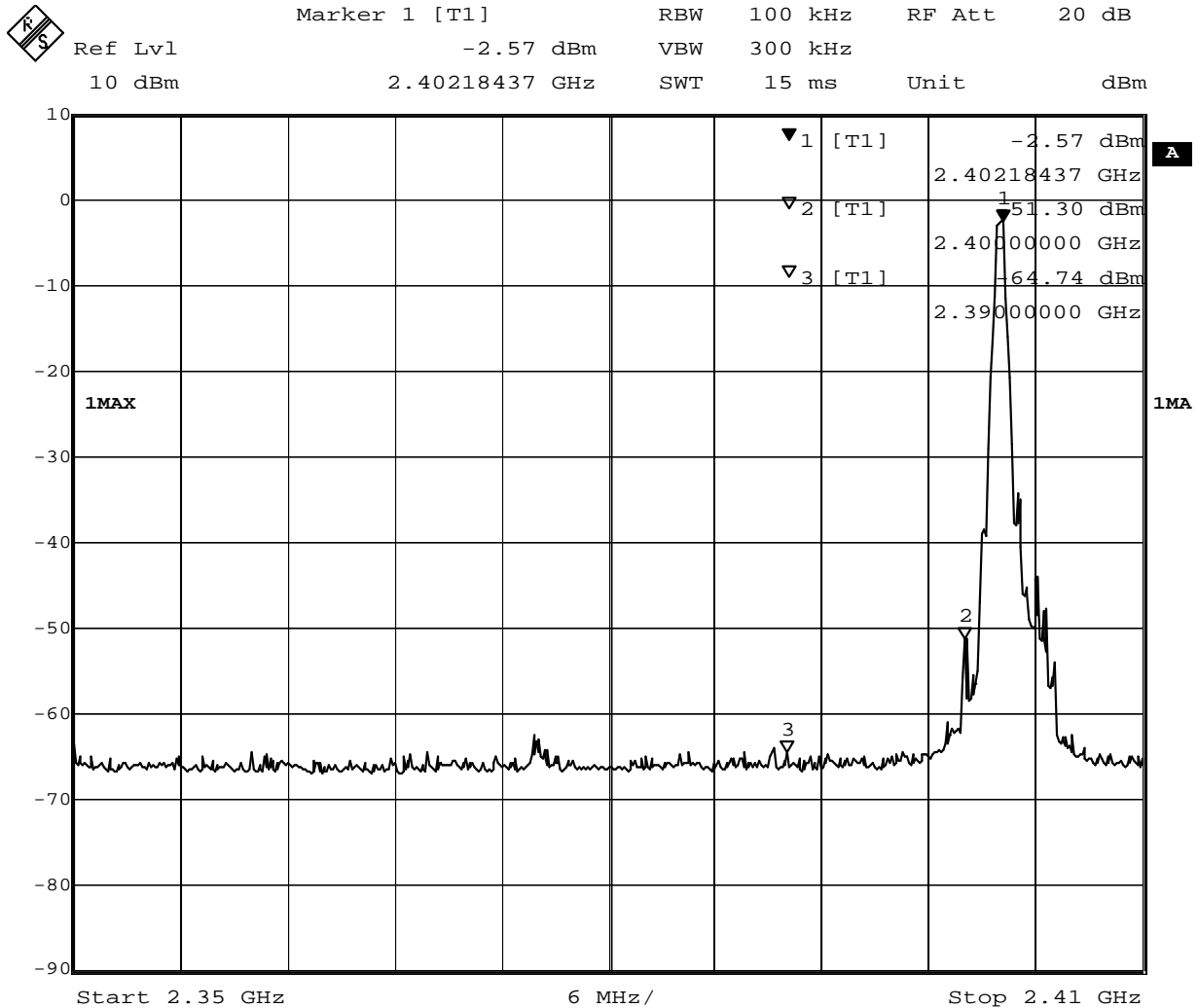


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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)	36.9	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 15.NOV.2014 15:24:21



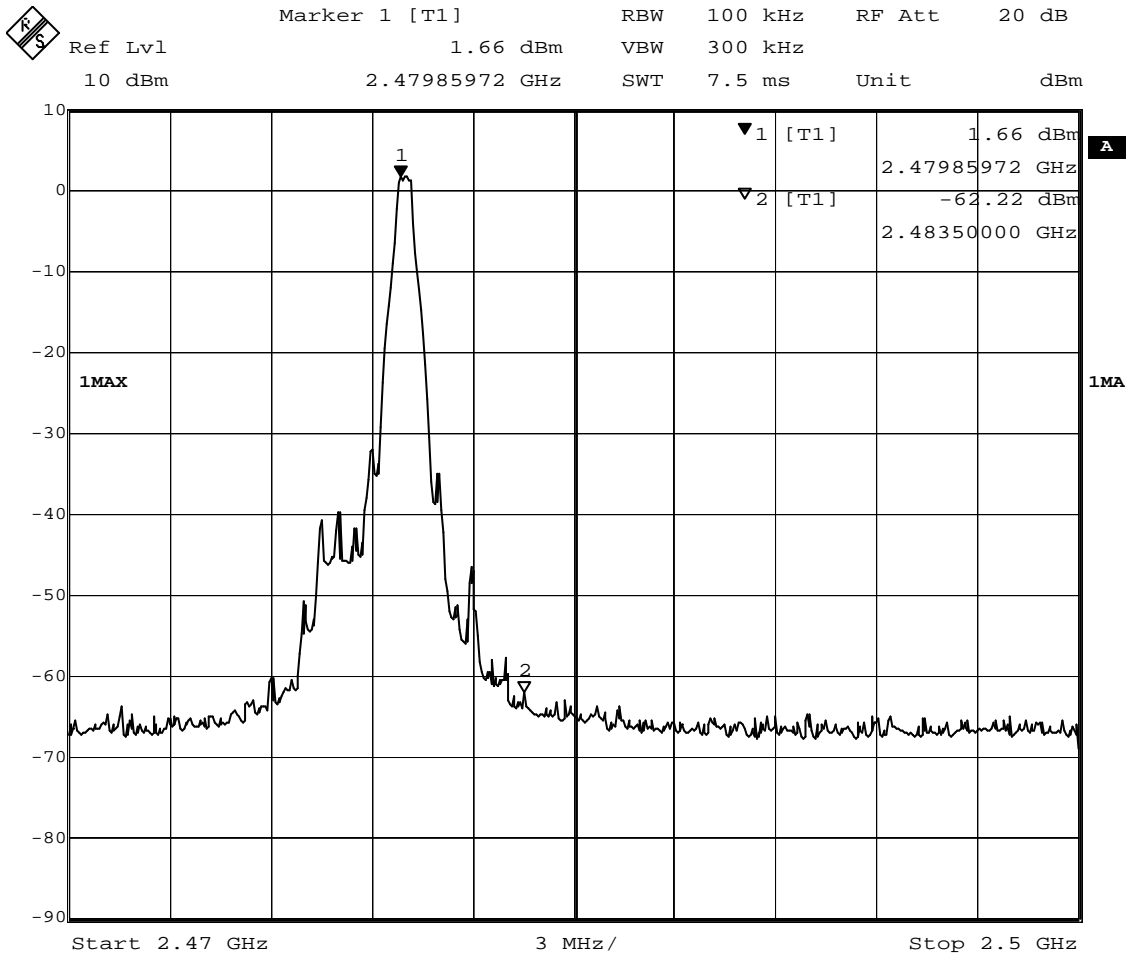


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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: 15.NOV.2014 15:52:55

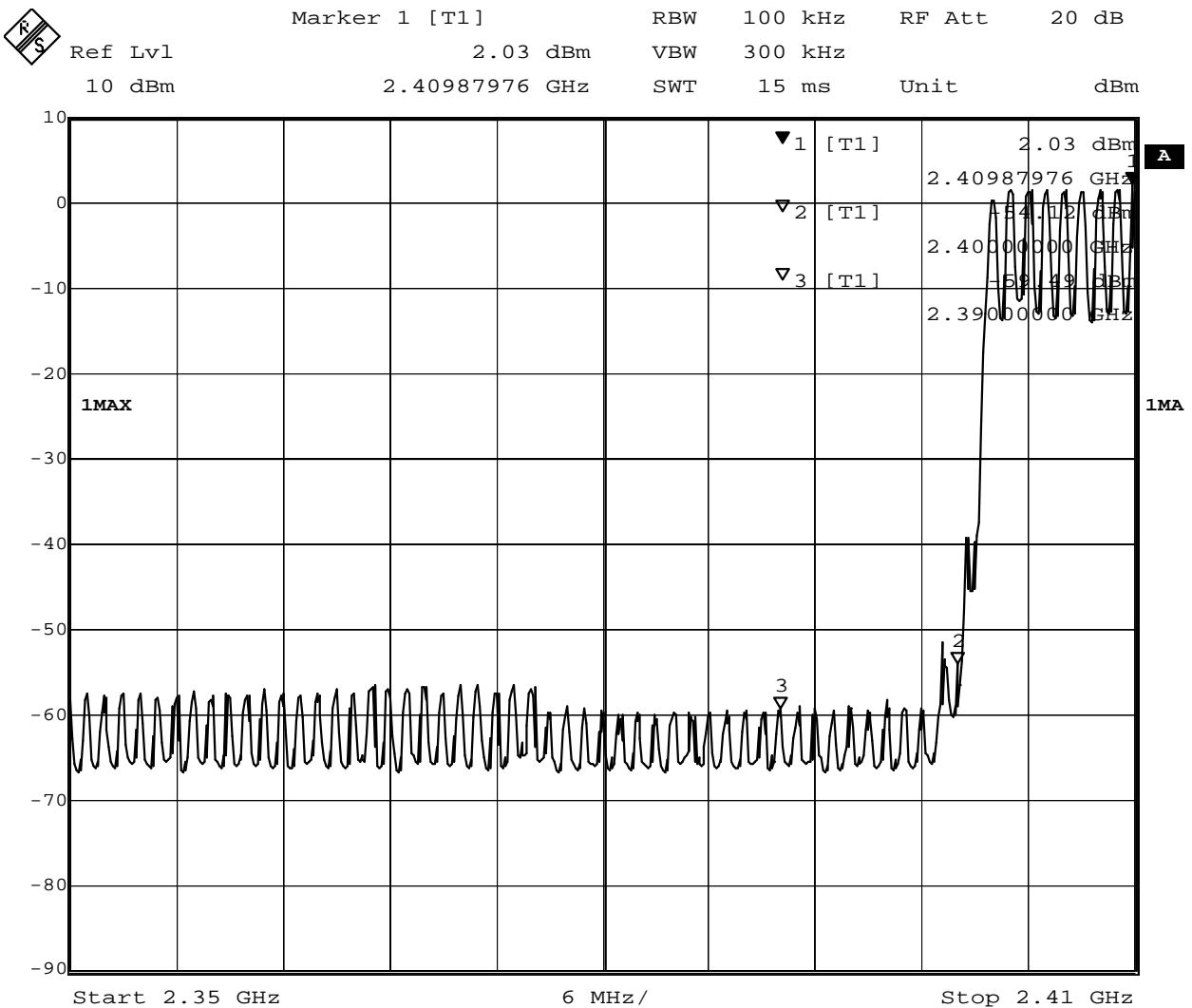


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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)	36.5	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 15.NOV.2014 15:10:16

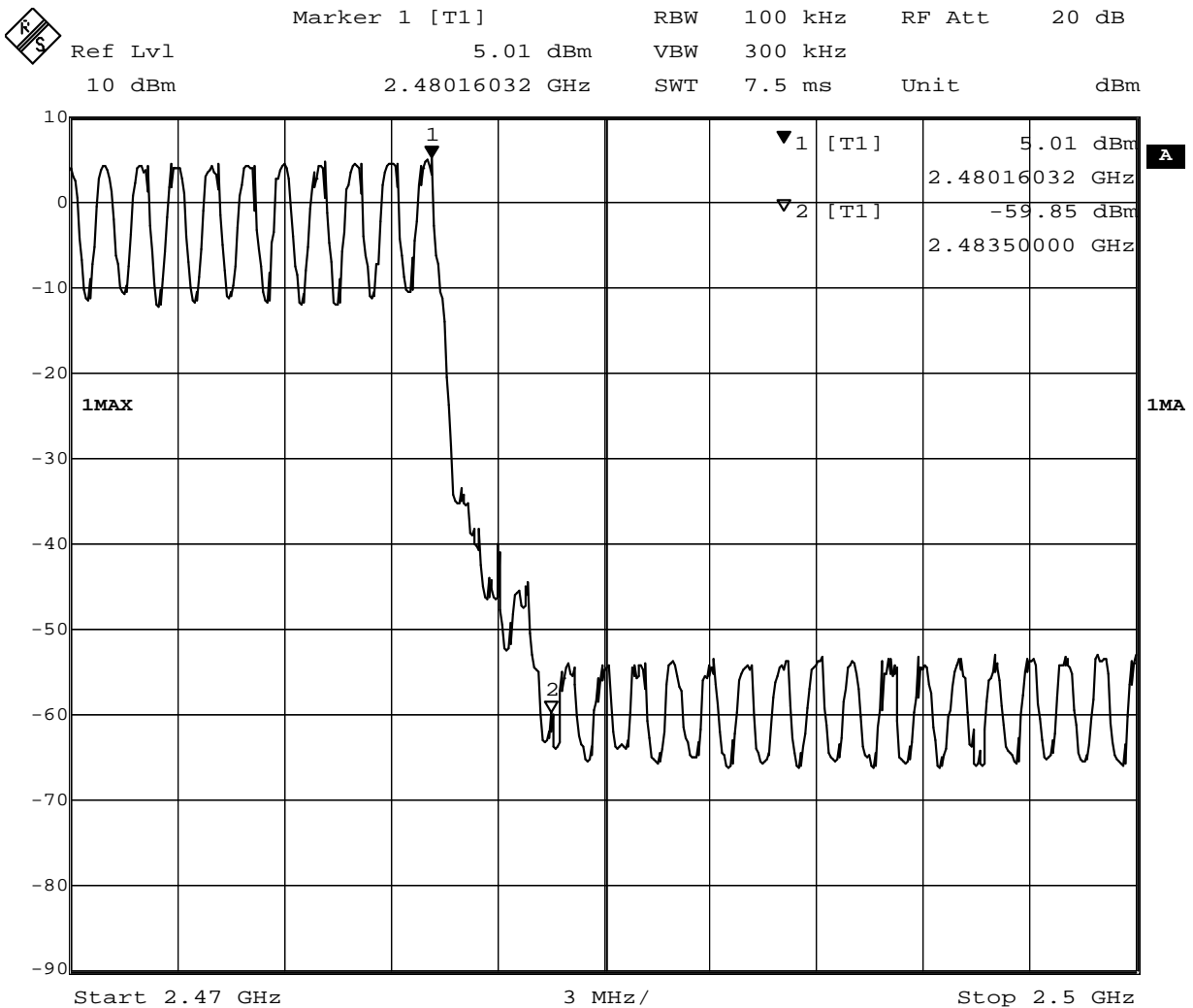


Type of Modulation: GFSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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 $\mu$ V/m)	38.1	Limit	74(dB $\mu$ V/m)
	AV(dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



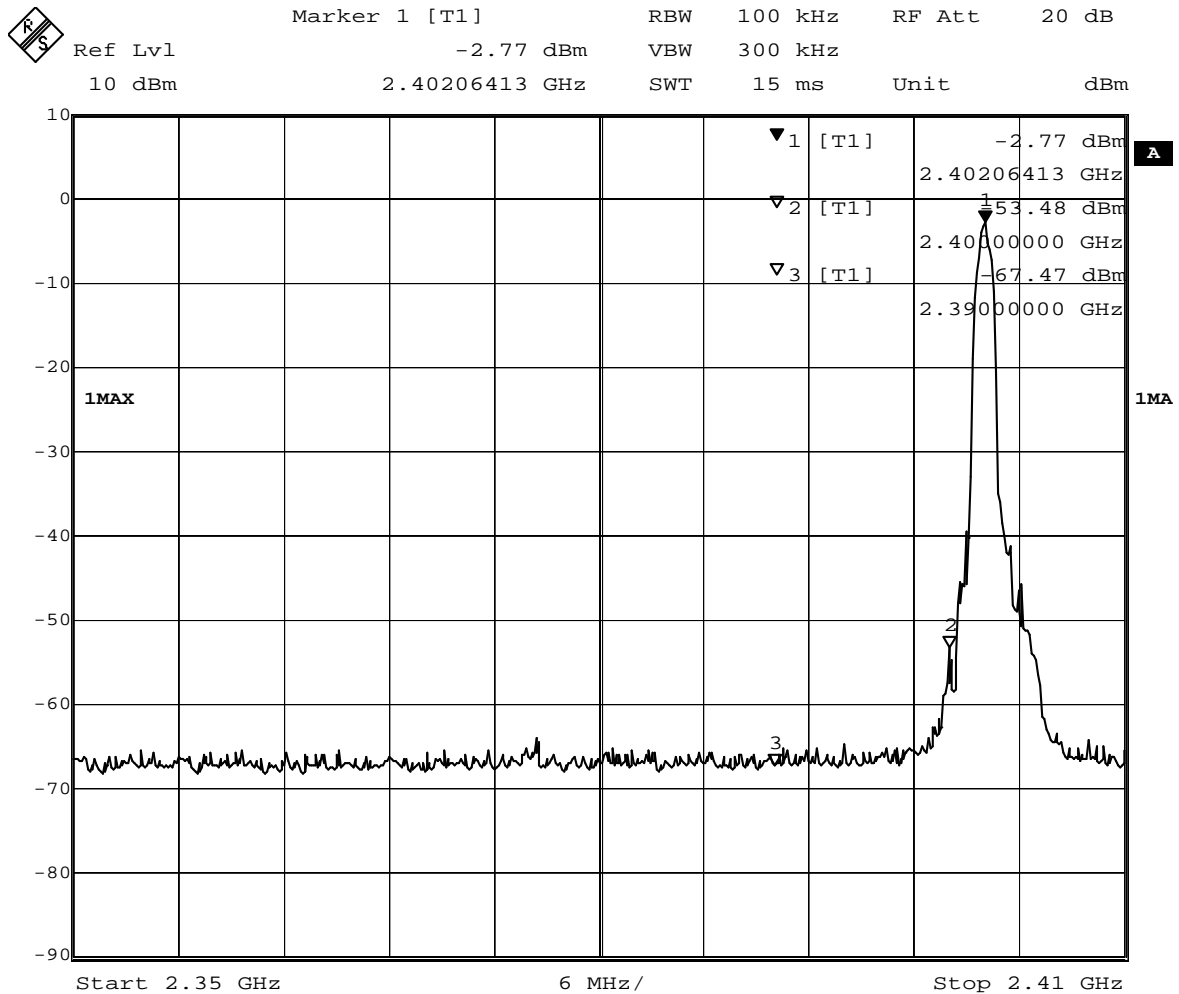
Date: 15.NOV.2014 14:34:28

Type of Modulation:  $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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 $\mu$ V/m)	37.2	Limit	74(dB $\mu$ V/m)
	AV(dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 15.NOV.2014 15:22:38

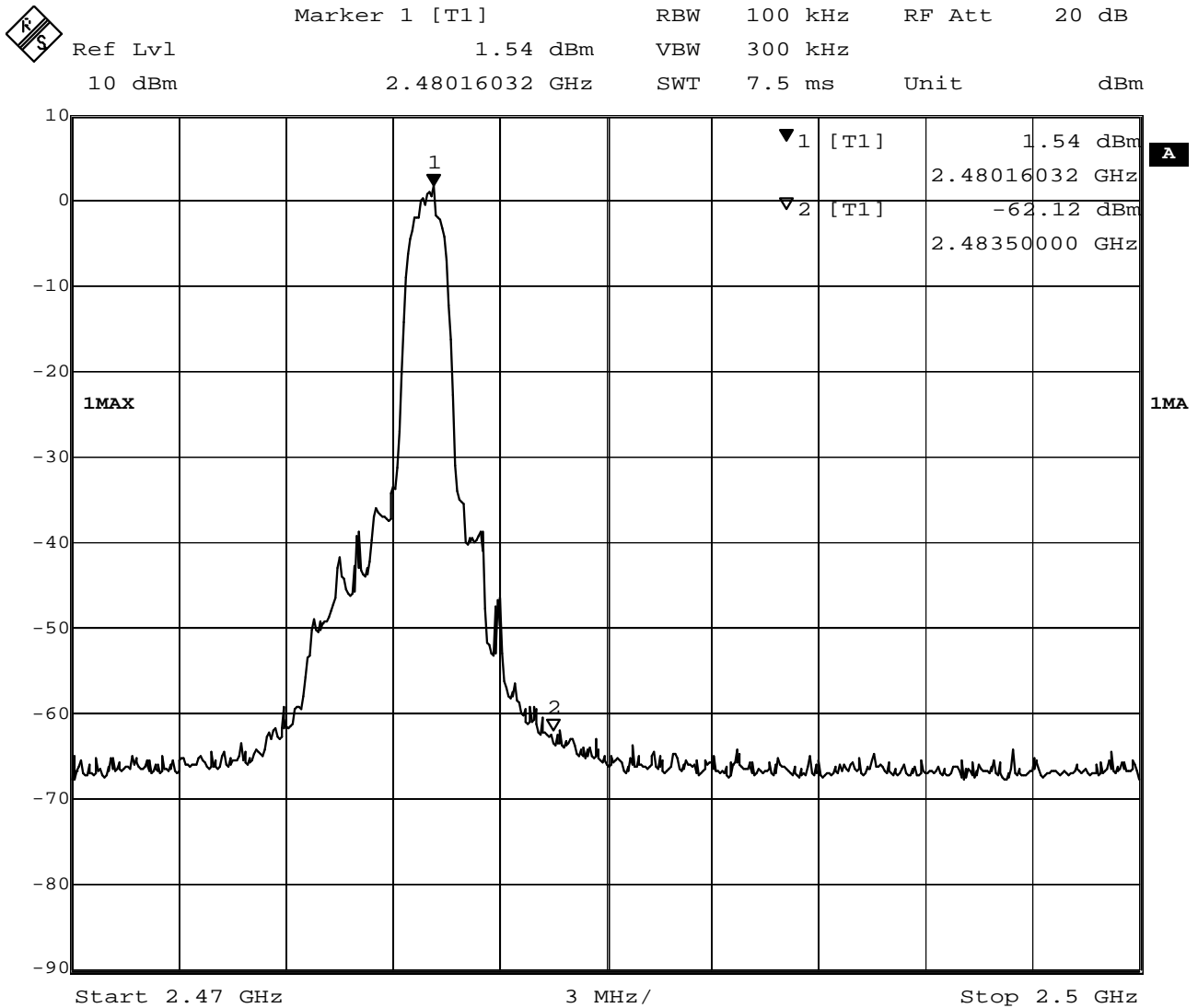


Type of Modulation:  $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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 $\mu$ V/m)	37.8	Limit	74(dB $\mu$ V/m)
	AV(dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 15.NOV.2014 14:55:45

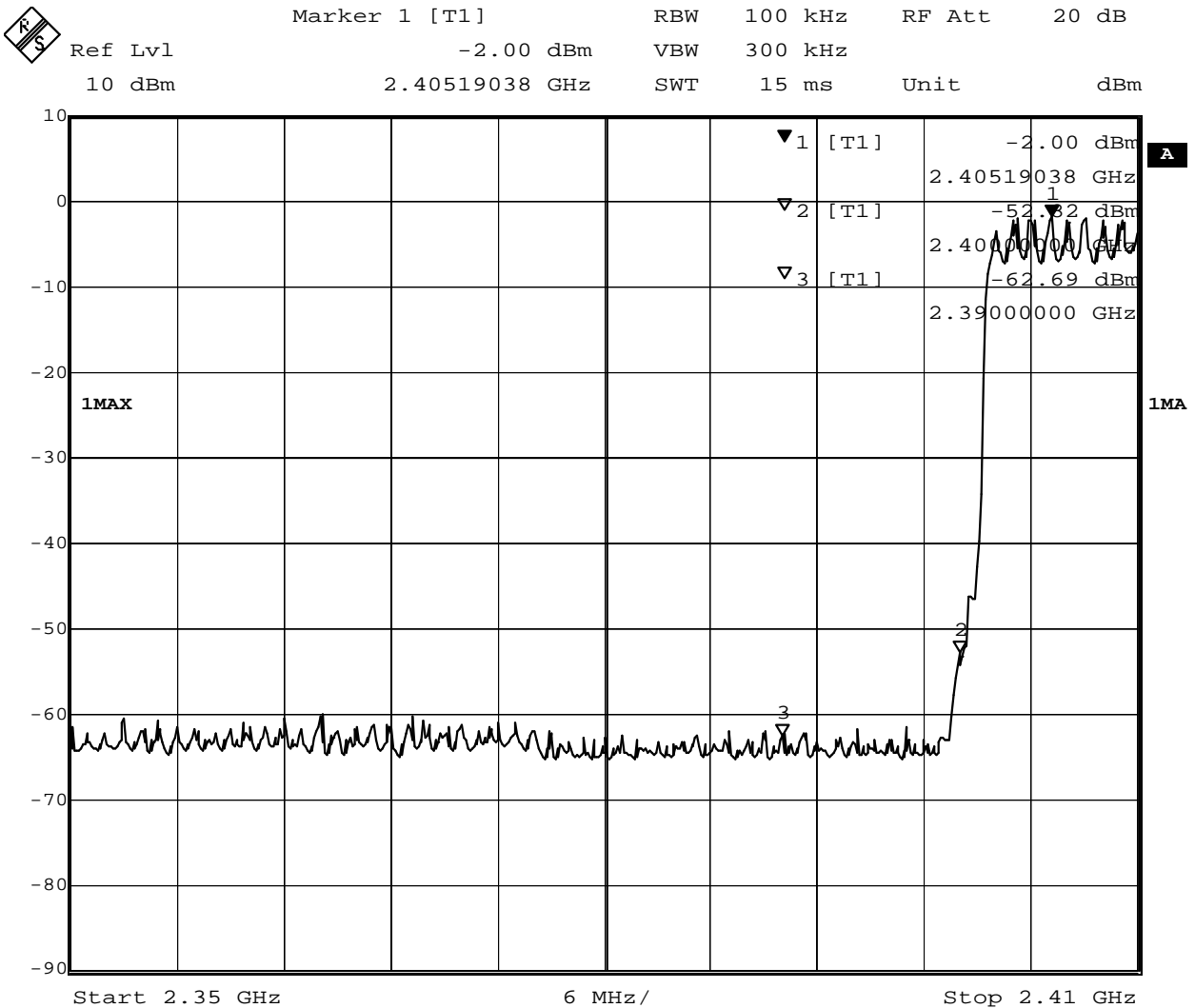


Type of Modulation:  $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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 $\mu$ V/m)	36.9	Limit	74(dB $\mu$ V/m)
	AV(dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



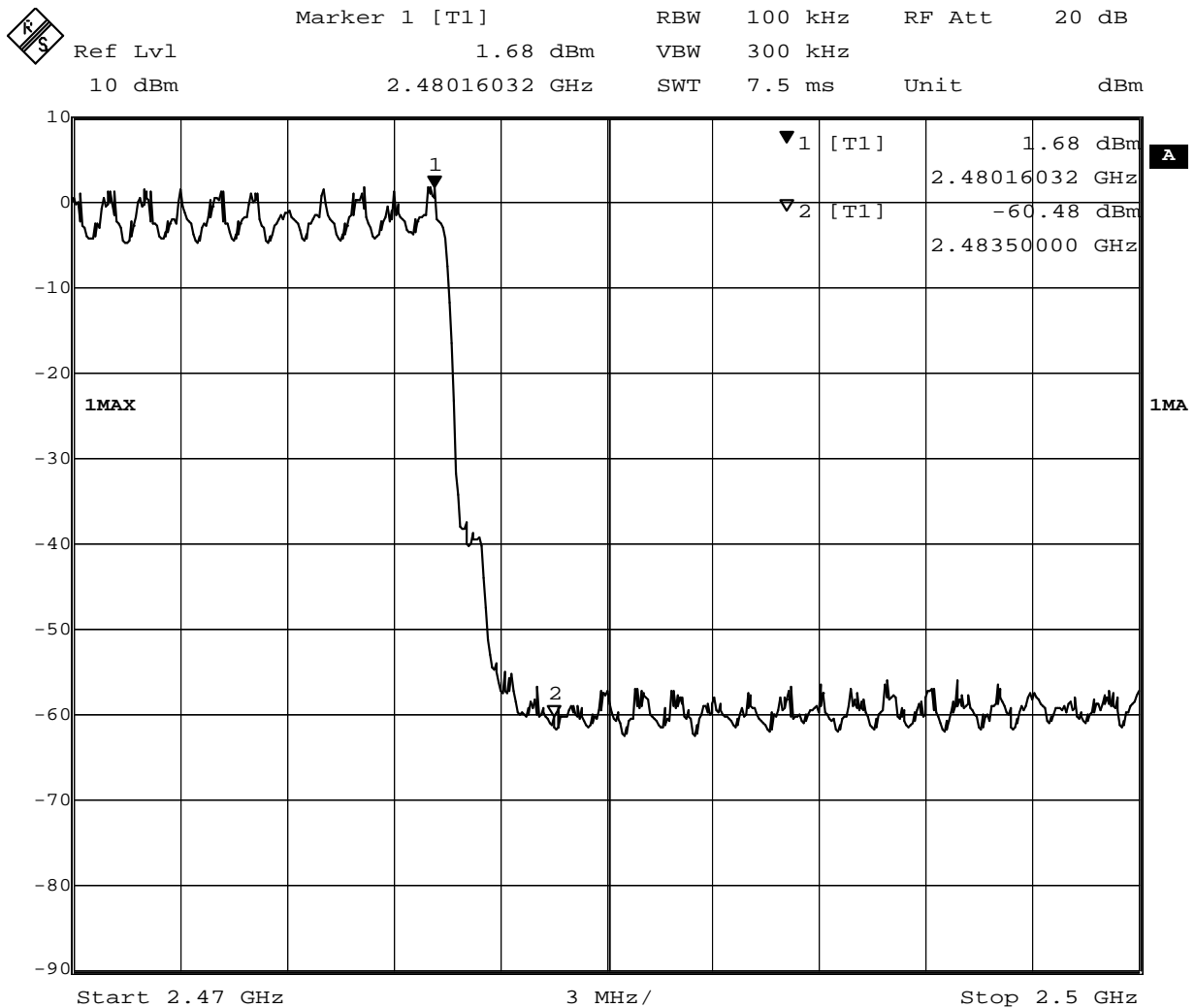
Date: 15.NOV.2014 15:18:05

Type of Modulation:  $\pi/4$ DQPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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 $\mu$ V/m)	38.8	Limit	74(dB $\mu$ V/m)
	AV(dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 15.NOV.2014 14:41:21

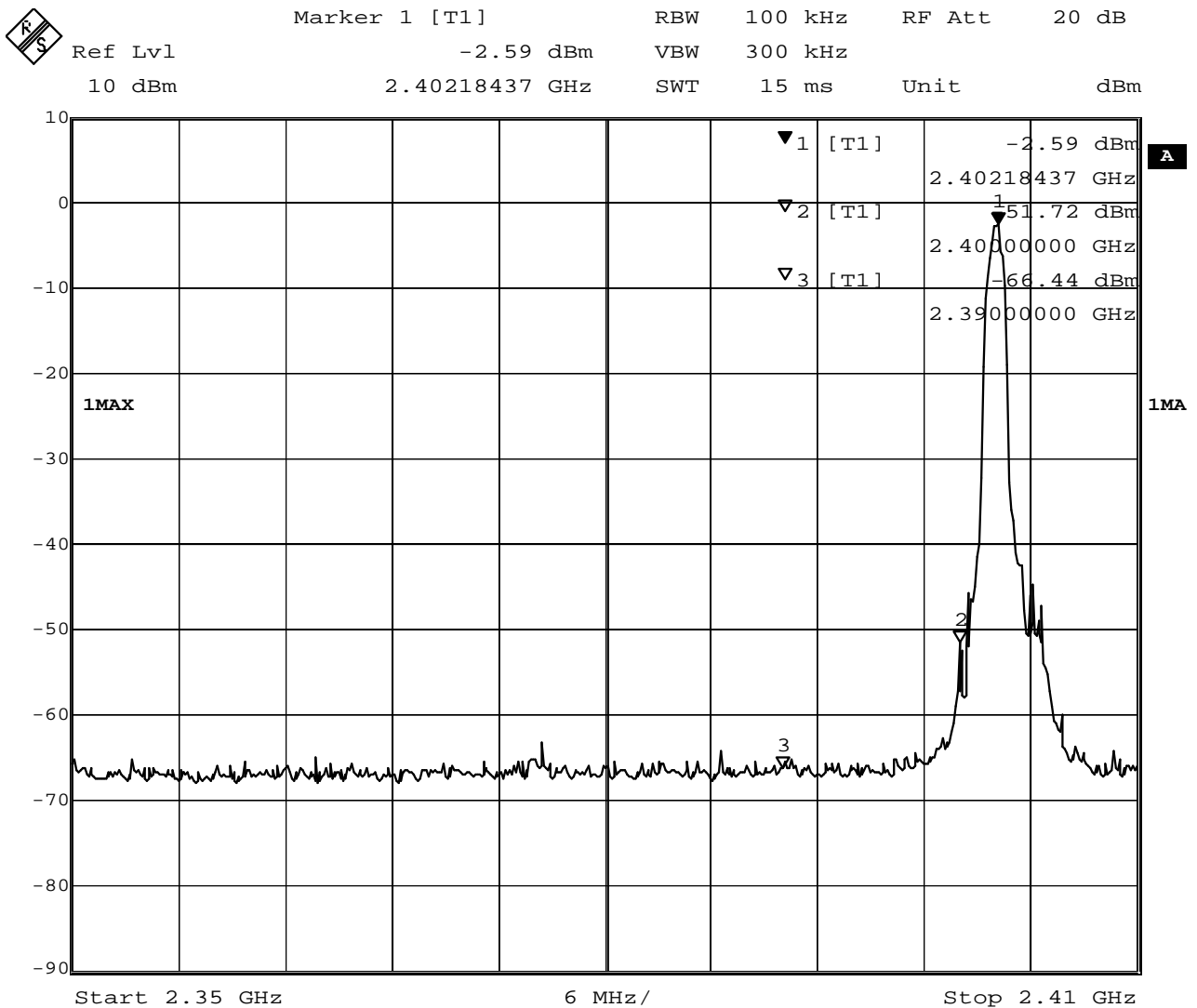


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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)	37.6	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 15.NOV.2014 15:21:47



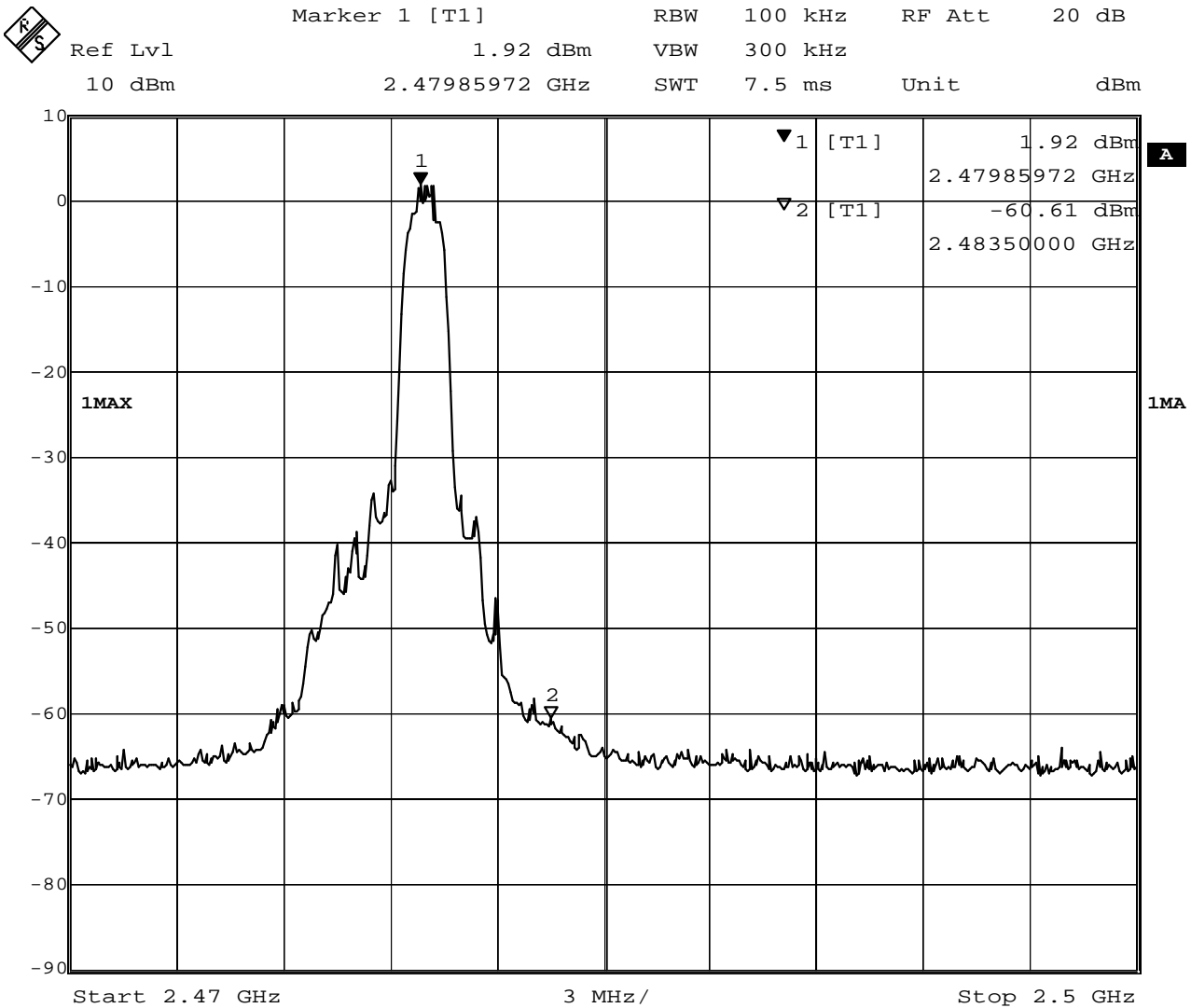


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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)	38.7	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 15.NOV.2014 14:54:17

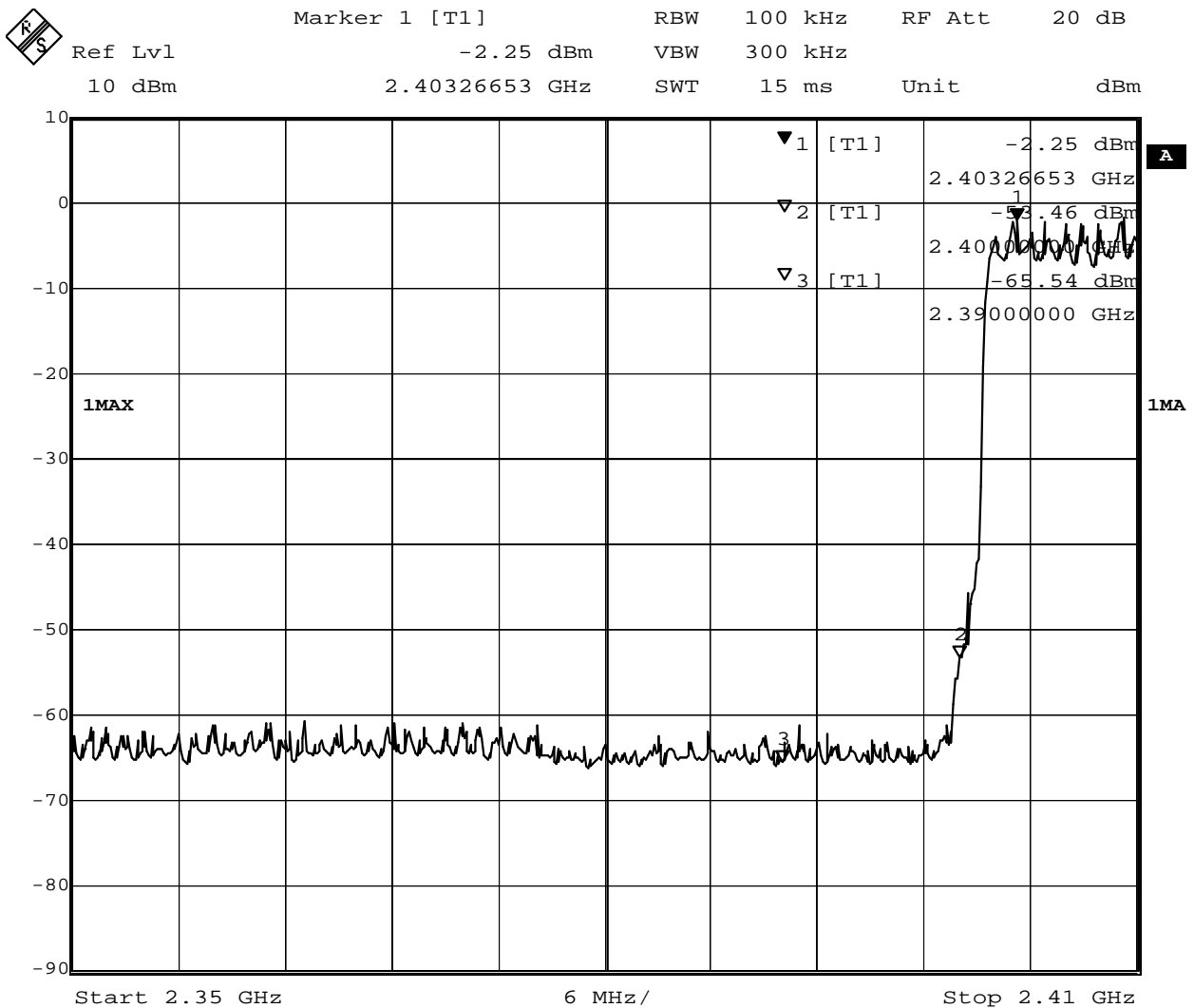


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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)	37.9	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 15.NOV.2014 15:21:10

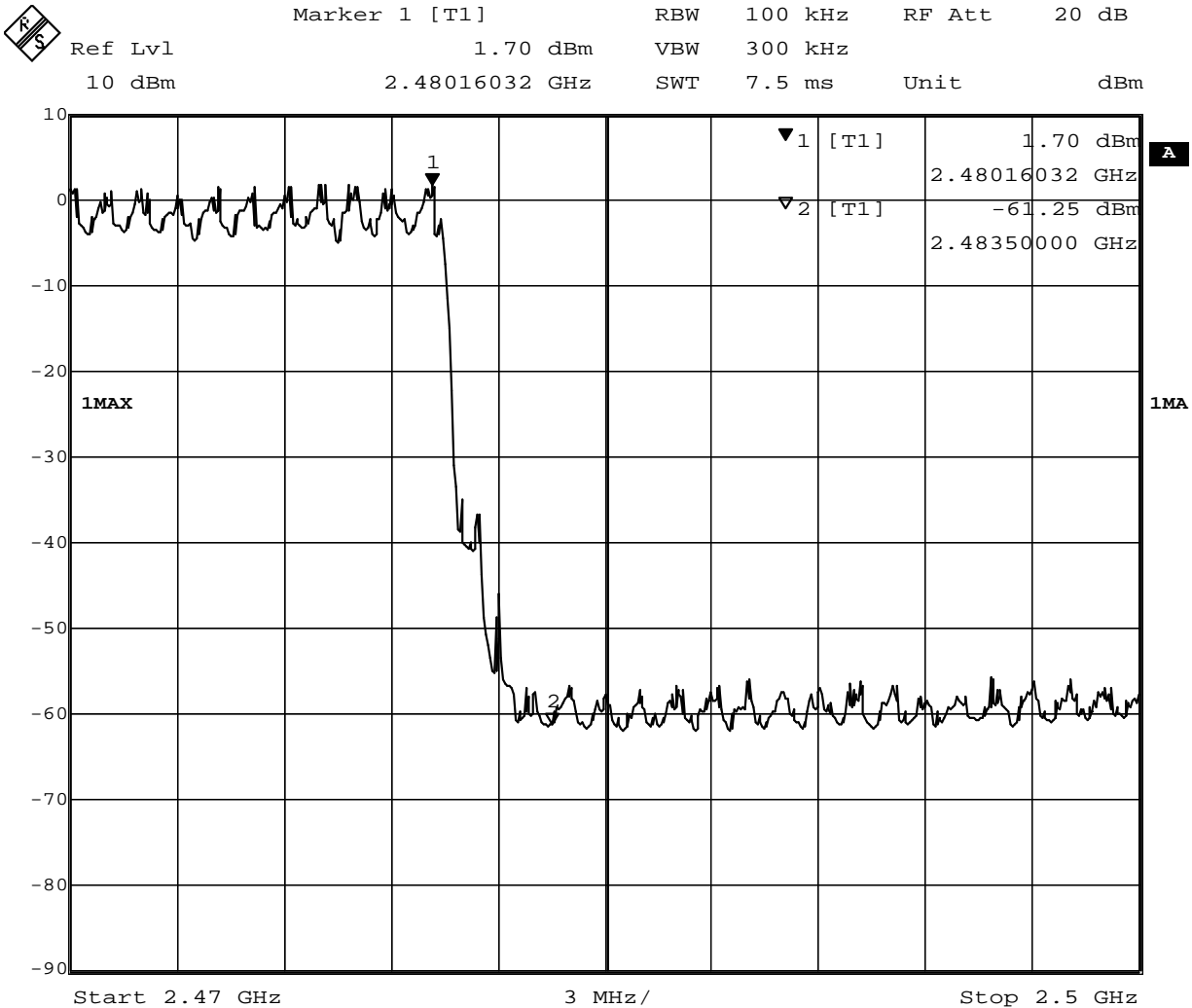


Type of Modulation: 8DPSK

12.4 Out of Band Test Result

Product:	P324BT Bluetooth Headphones with Microphone		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)	38.7	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

Test Figure:



Date: 15.NOV.2014 14:48:20



### 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 PCB antenna. The maximum Gain of this antenna is 2.0dBi

**14.0 FCC ID Label**

**FCC ID: Z3AP324BT**

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:**



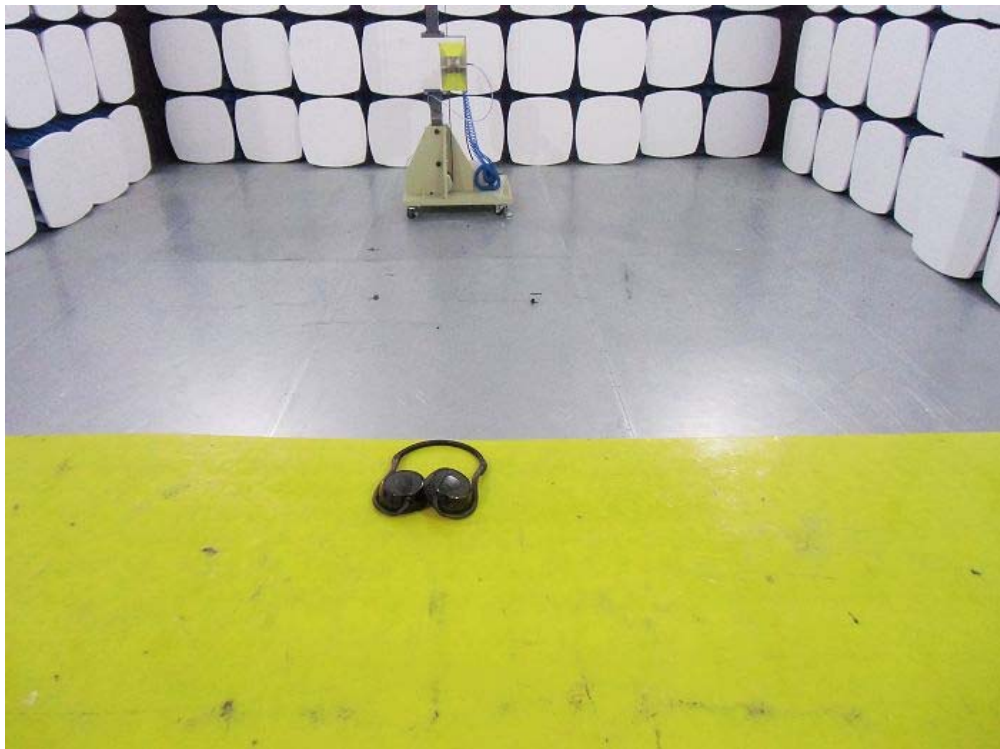
Label Location

## 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

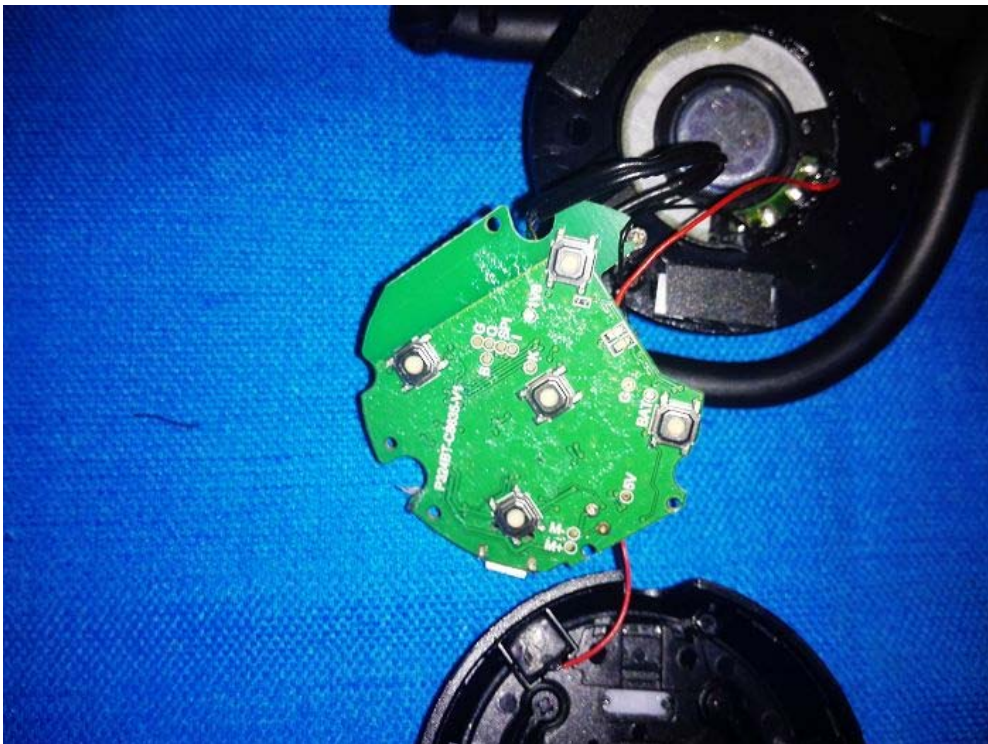


Photo 10

**The Report End**