

APPLICATION CERTIFICATION FCC Part 15C

On Behalf of
THUMBS UK(UK)LTD

WIRELESS HEADPHONES

Model No.: WIRLSHPWHPRM, WIRLSHPPKPRM, WIRLSHPBKPRM

FCC ID: 2AHHEWIRLSHPPRM

Prepared for : THUMBS UK(UK)LTD
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Report No. : ATE20190761
Date of Test : May 7-May 10, 2019
Date of Report : May 23, 2019

TABLE OF CONTENTS

Description	Page
Test Report Certification	
1. GENERAL INFORMATION	5
1.1. Description of Device (EUT)	5
1.2. Accessory and Auxiliary Equipment	5
1.3. Description of Test Facility	6
1.4. Measurement Uncertainty	6
2. MEASURING DEVICE AND TEST EQUIPMENT	7
3. OPERATION OF EUT DURING TESTING	8
3.1. Operating Mode	8
3.2. Configuration and peripherals	8
4. TEST PROCEDURES AND RESULTS	9
5. 20DB BANDWIDTH TEST	10
5.1. Block Diagram of Test Setup	10
5.2. The Requirement For Section 15.247(a)(1)	10
5.3. EUT Configuration on Measurement	10
5.4. Operating Condition of EUT	10
5.5. Test Procedure	10
5.6. Test Result	11
6. CARRIER FREQUENCY SEPARATION TEST	15
6.1. Block Diagram of Test Setup	15
6.2. The Requirement For Section 15.247(a)(1)	15
6.3. EUT Configuration on Measurement	15
6.4. Operating Condition of EUT	15
6.5. Test Procedure	16
6.6. Test Result	16
7. NUMBER OF HOPPING FREQUENCY TEST	20
7.1. Block Diagram of Test Setup	20
7.2. The Requirement For Section 15.247(a)(1)(iii)	20
7.3. EUT Configuration on Measurement	20
7.4. Operating Condition of EUT	20
7.5. Test Procedure	20
7.6. Test Result	21
8. DWELL TIME TEST	22
8.1. Block Diagram of Test Setup	22
8.2. The Requirement For Section 15.247(a)(1)(iii)	22
8.3. EUT Configuration on Measurement	22
8.4. Operating Condition of EUT	22
8.5. Test Procedure	22
8.6. Test Result	23
9. MAXIMUM PEAK OUTPUT POWER TEST	33
9.1. Block Diagram of Test Setup	33
9.2. The Requirement For Section 15.247(b)(1)	33
9.3. EUT Configuration on Measurement	33
9.4. Operating Condition of EUT	33
9.5. Test Procedure	33
9.6. Test Result	34

10. RADIATED EMISSION TEST	38
10.1. Block Diagram of Test Setup	38
10.2. The Requirement For Section 15.247(d)	39
10.3. Transmitter Emission Limit	40
10.4. Restricted bands of operation	41
10.5. Configuration of EUT on Measurement	41
10.6. Test Procedure	42
10.7. Data Sample	43
10.8. Test Result	43
11. BAND EDGE COMPLIANCE TEST	71
11.1. Block Diagram of Test Setup	71
11.2. The Requirement For Section 15.247(d)	71
11.3. EUT Configuration on Measurement	71
11.4. Operating Condition of EUT	71
11.5. Test Procedure	72
11.6. Test Result	72
12. AC POWER LINE CONDUCTED EMISSION TEST	82
12.1. Block Diagram of Test Setup	82
12.2. Test System Setup	82
12.3. Test Limits	83
12.4. Configuration of EUT on Measurement	83
12.5. Operating Condition of EUT	83
12.6. Test Procedure	83
12.7. Data Sample	84
12.8. Test Result	84
13. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST.....	87
13.1. Block Diagram of Test Setup	87
13.2. The Requirement For Section 15.247(d)	87
13.3. EUT Configuration on Measurement	87
13.4. Operating Condition of EUT	87
13.5. Test Procedure	88
13.6. Test Result	88
14. ANTENNA REQUIREMENT	92
14.1. The Requirement	92
14.2. Antenna Construction	92

Test Report Certification

Applicant : THUMBS UK(UK)LTD
Address : Unit L, Braintree Industrial Estate, Braintree Road HA4 0EJ,
Ruislip, LONDON, United Kingdom
Product : WIRELESS HEADPHONES
Model No. : WIRLSHPWHPRM, WIRLSHPPKPRM, WIRLSHPBKPRM

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test :

May 7-May 10, 2019

Date of Report :

May 23, 2019

Prepared by :

Star Yang
(Star Yang, Engineer)

Approved &
Authorized Signer :

Sean Liu
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product	:	WIRELESS HEADPHONES
Model Number	:	WIRLSHPWHPRM, WIRLSHPPKPRM, WIRLSHPBKPRM (Note: We hereby state that these models are identical in interior structure, electrical circuits and components, It's just that the appearance is different in color, Therefore, only model WIRLSHPWHPRM is for tested.)
Bluetooth version	:	V5.0+EDR
Frequency Range	:	2402-2480MHz
Channel Spacing	:	1MHz
Number of Channels	:	79
Antenna Gain(Max)	:	-0.68dBi
Antenna type	:	Integral Antenna
Modulation mode	:	GFSK, $\pi/4$ DQPSK
Rating	:	DC 3.7V

1.2. Accessory and Auxiliary Equipment

Notebook PC:	Manufacturer: Lenovo
	M/N: ThinkPad X240
	S/N: n.a

1.3. Description of Test Facility

EMC Lab	: Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358
	Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2
	Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193
	Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	: Shenzhen Accurate Technology Co., Ltd.
Site Location	: 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.4. Measurement Uncertainty

Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	= 4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 05, 2019	One Year
EMI Test Receiver	Rohde&Schwarz	ESR	101817	Jan. 05, 2019	One Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 05, 2019	One Year
Pre-Amplifier	Agilent	8447D	294A10619	Jan. 05, 2019	One Year
Pre-Amplifier	Compliance Direction	RSU-M2	38322	Jan. 05, 2019	One Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 05, 2019	One Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 05, 2019	One Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 05, 2019	One Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 05, 2019	One Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 05, 2019	One Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10S S	N/A	Jan. 05, 2019	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-23 75/2510-60/11SS	N/A	Jan. 05, 2019	One Year
Conducted Emission Measurement Software: ES-K1 V1.71					
Radiated Emission Measurement Software: EZ EMC V1.1.4.2					

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: Transmitting mode

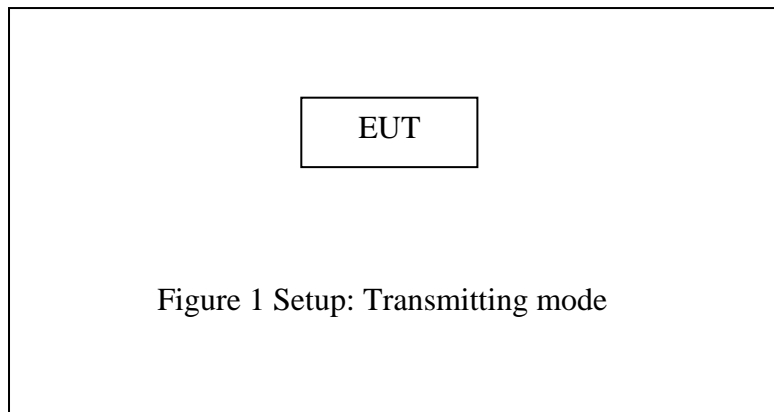
Low Channel: 2402MHz

Middle Channel: 2441MHz

High Channel: 2480MHz

Hopping

3.2.Configuration and peripherals



4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)	Carrier Frequency Separation Test	Compliant
Section 15.247(a)(1)(iii)	Number Of Hopping Frequency Test	Compliant
Section 15.247(a)(1)(iii)	Dwell Time Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d) Section 15.209	Radiated Emission Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.207	AC Power Line Conducted Emission Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

5. 20DB BANDWIDTH TEST

5.1. Block Diagram of Test Setup



5.2. The Requirement For Section 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.

5.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

5.5. Test Procedure

5.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.5.2. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW.

5.5.3. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

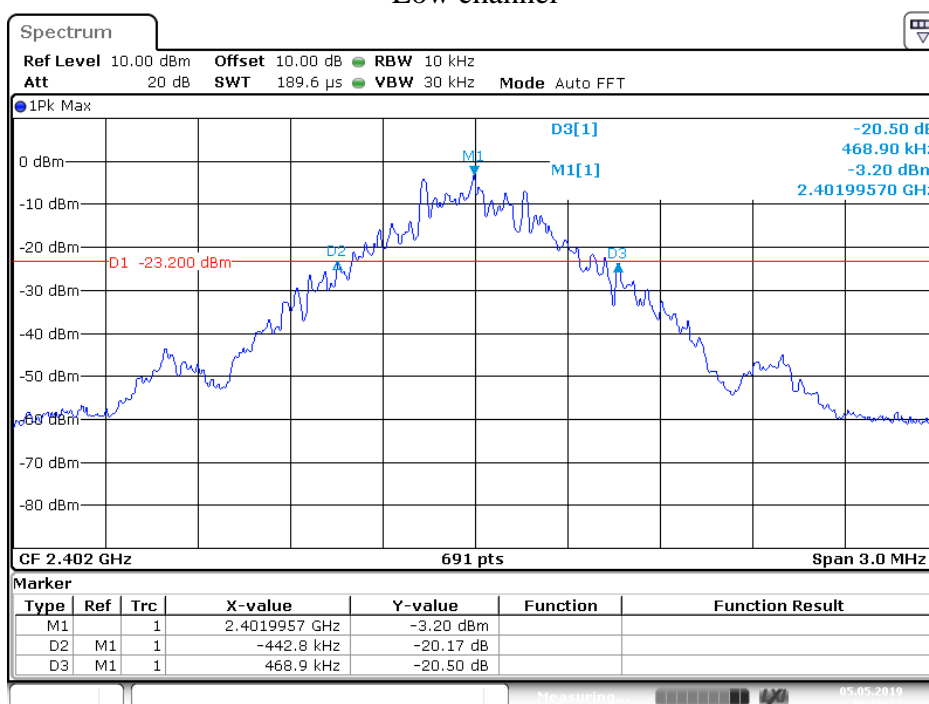
5.6. Test Result

Channel	Frequency (MHz)	GFSK mode 20dB Bandwidth (MHz)	$\pi/4$ DQPSK mode 20dB Bandwidth (MHz)	Result
Low	2402	0.912	1.285	Pass
Middle	2441	0.912	1.285	Pass
High	2480	0.912	1.281	Pass

The spectrum analyzer plots are attached as below.

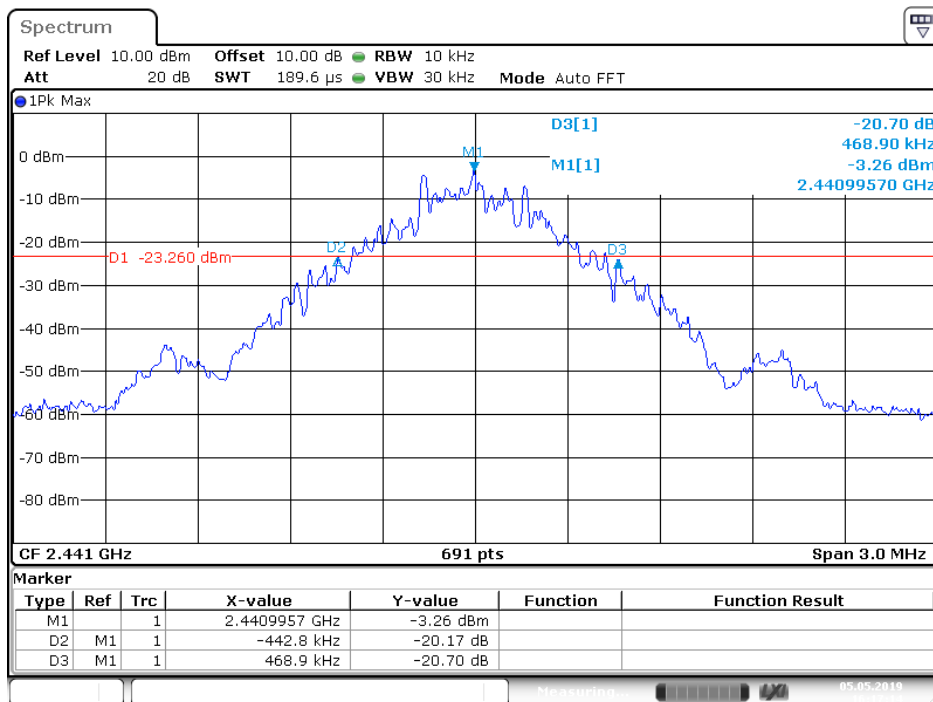
GFSK Mode

Low channel



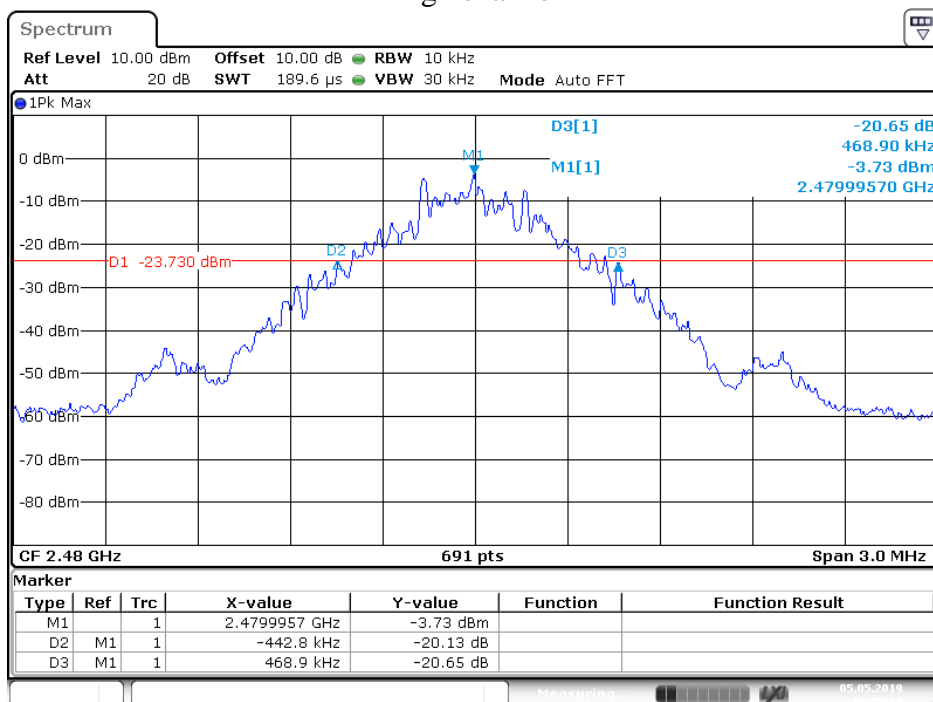
Date: 5.MAY.2019 16:18:32

Middle channel



Date: 5.MAY.2019 16:17:14

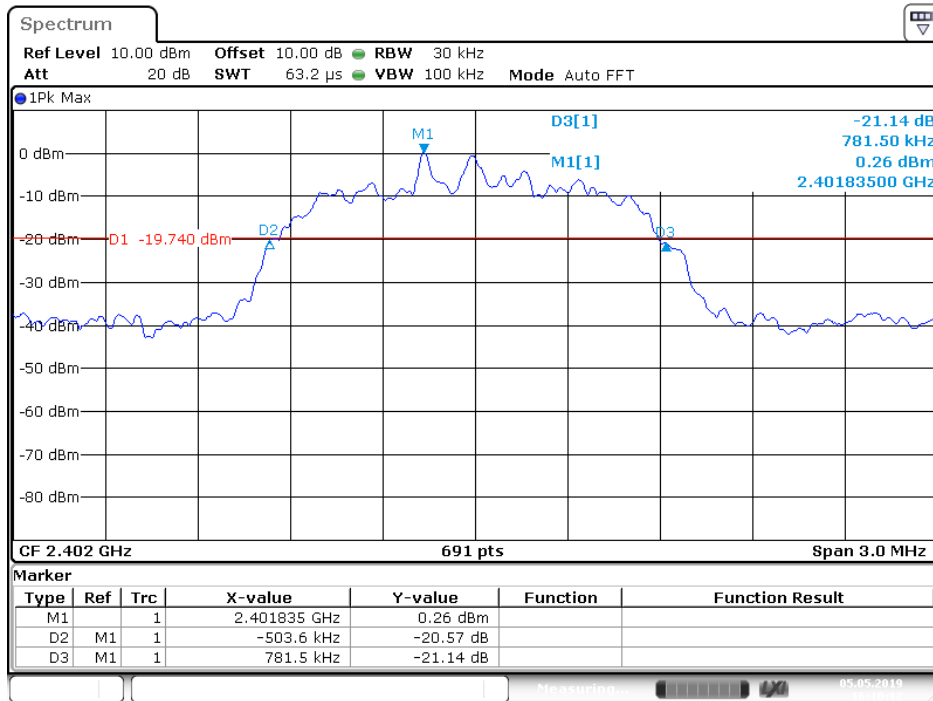
High channel



Date: 5.MAY.2019 16:15:15

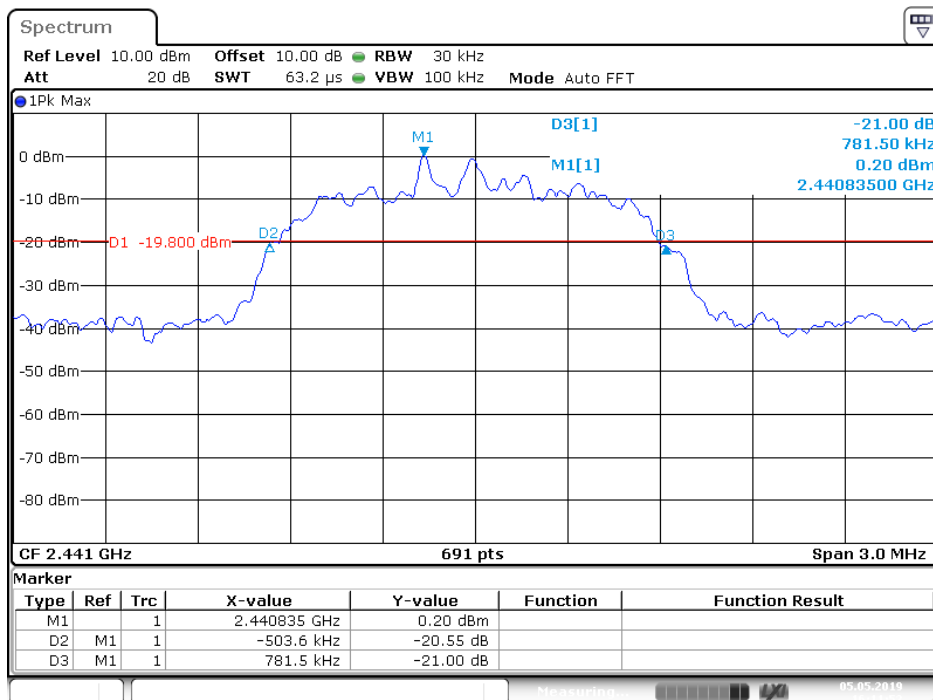
$\pi/4$ DQPSK Mode

Low channel



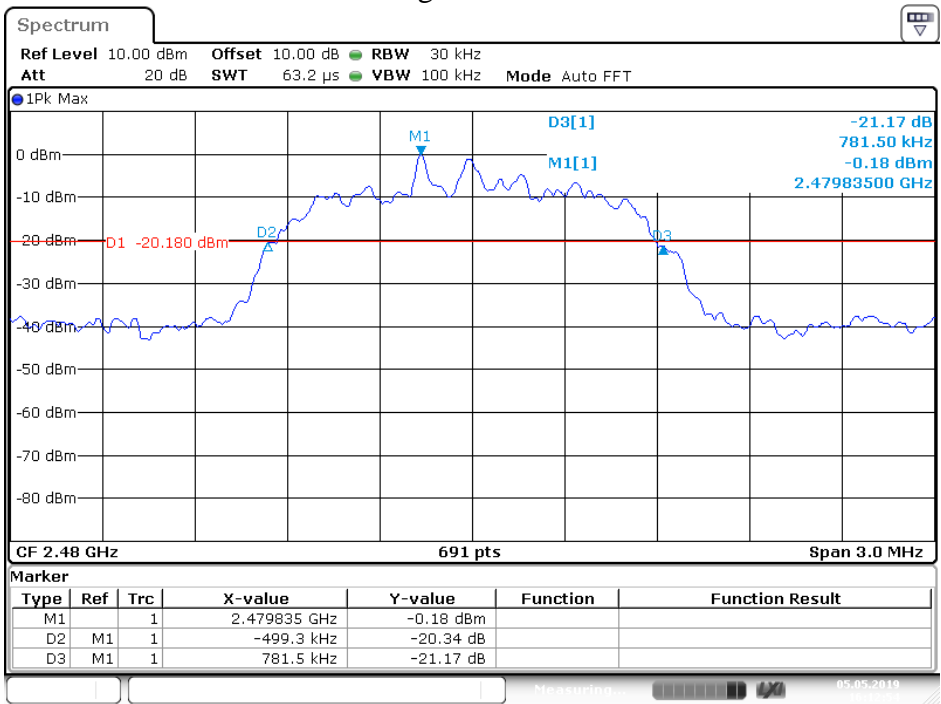
Date: 5.MAY.2019 16:10:12

Middle channel



Date: 5.MAY.2019 16:11:52

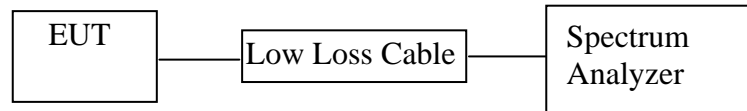
High channel



Date: 5.MAY.2019 16:12:53

6. CARRIER FREQUENCY SEPARATION TEST

6.1. Block Diagram of Test Setup



6.2. The Requirement For Section 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

6.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

6.5. Test Procedure

6.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz. Adjust Span to 3MHz.

6.5.3. Set the adjacent channel of the EUT Maxhold another trace.

6.5.4. Measurement the channel separation

6.6. Test Result

GFSK mode

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.0029	25KHz or 2/3*20dB bandwidth	Pass
	2403			
Middle	2440	1.0029	25KHz or 2/3*20dB bandwidth	Pass
	2441			
High	2479	1.0029	25KHz or 2/3*20dB bandwidth	Pass
	2480			

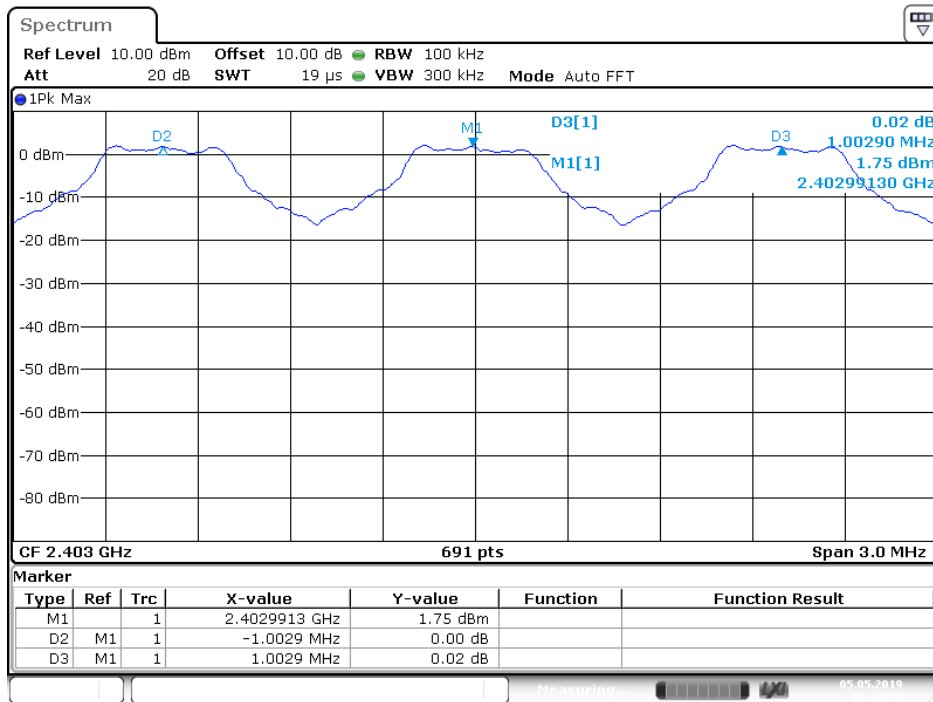
$\pi/4$ DQPSK Mode

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.0029	25KHz or 2/3*20dB bandwidth	Pass
	2403			
Middle	2440	1.0029	25KHz or 2/3*20dB bandwidth	Pass
	2441			
High	2479	1.0029	25KHz or 2/3*20dB bandwidth	Pass
	2480			

The spectrum analyzer plots are attached as below.

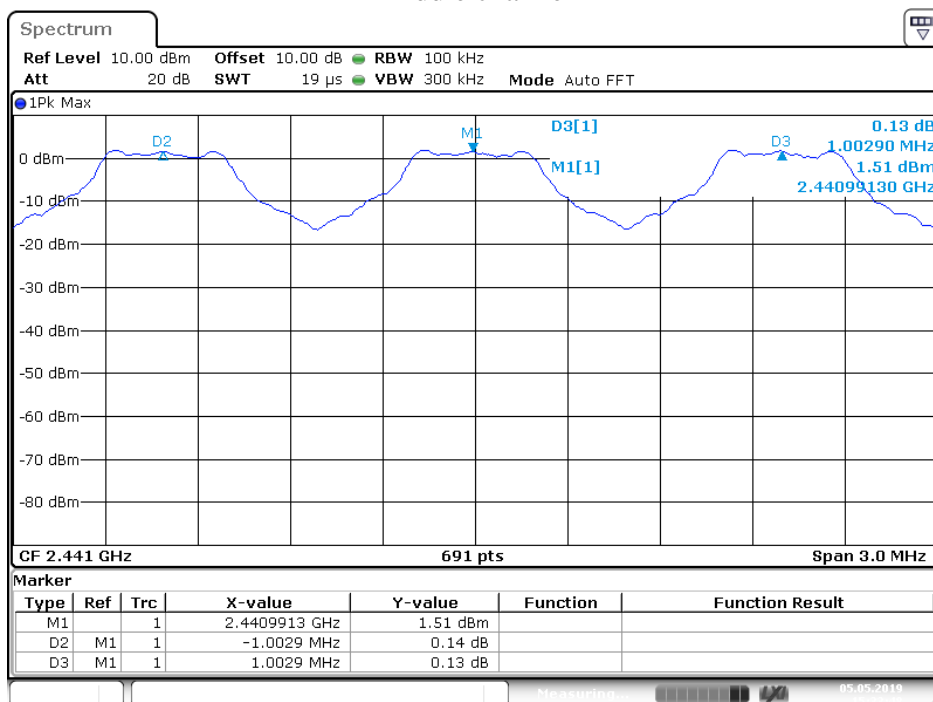
GFSK Mode

Low channel



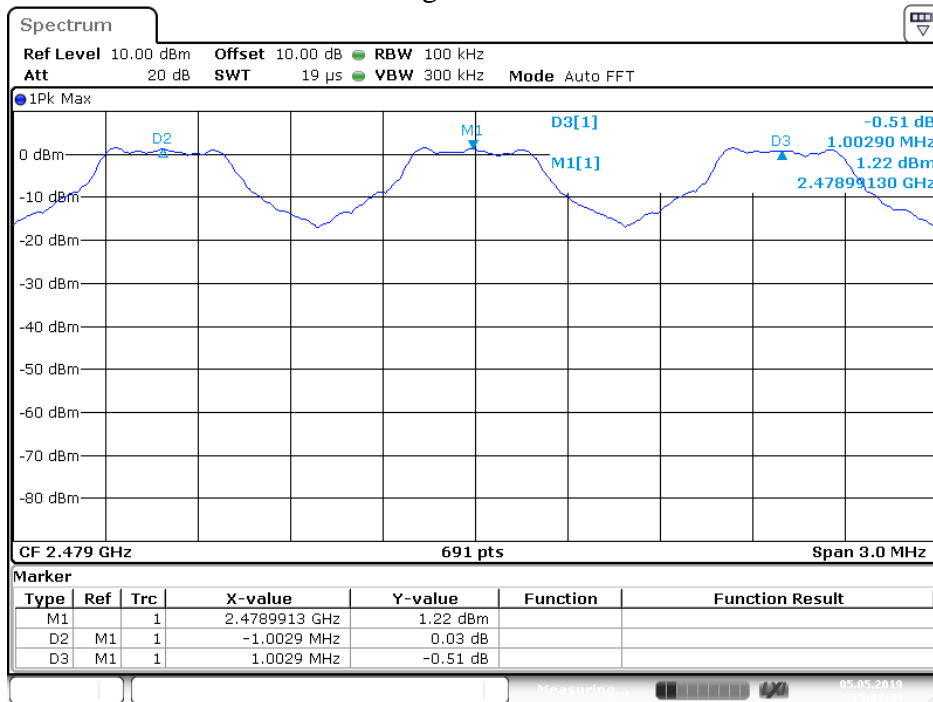
Date: 5.MAY.2019 15:32:40

Middle channel



Date: 5.MAY.2019 15:33:48

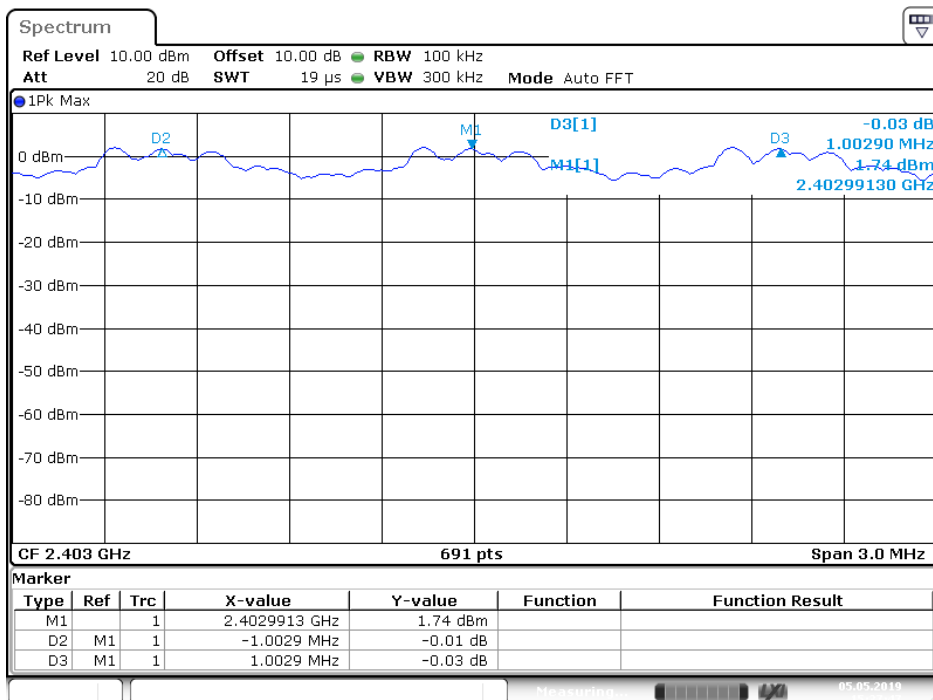
High channel



Date: 5.MAY.2019 15:34:44

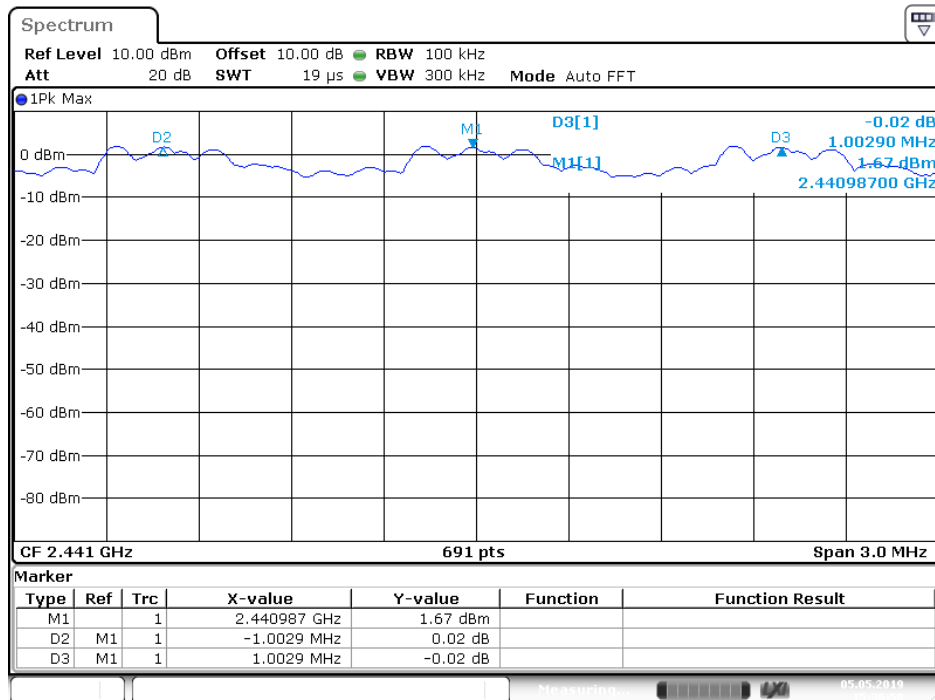
$\pi/4$ DQPSK Mode

Low channel



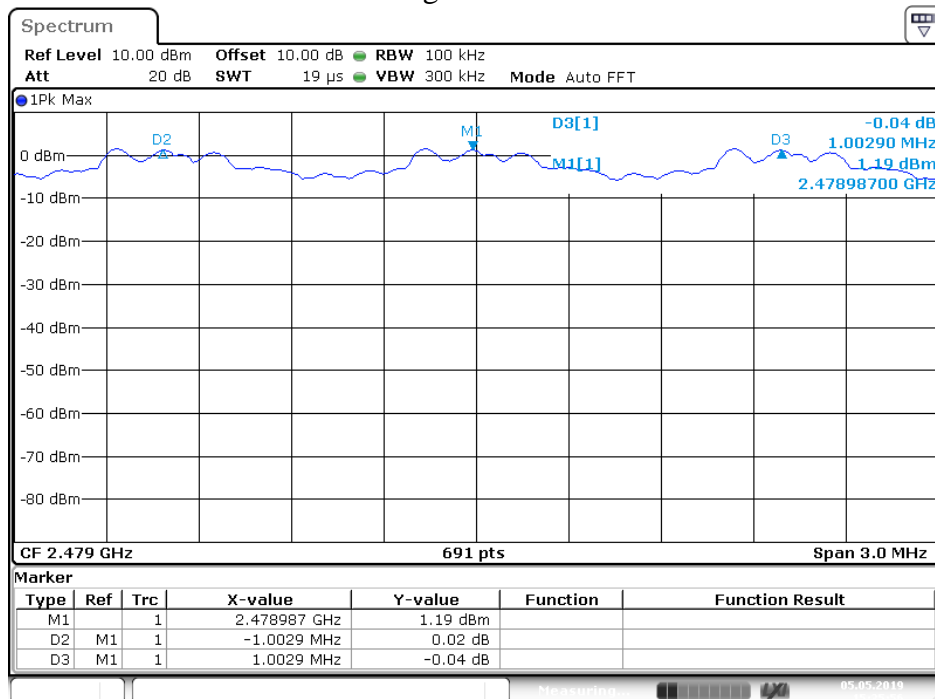
Date: 5.MAY.2019 15:37:47

Middle channel



Date: 5.MAY.2019 15:36:50

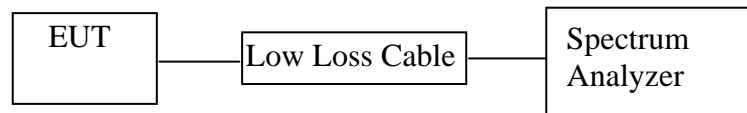
High channel



Date: 5.MAY.2019 15:35:56

7. NUMBER OF HOPPING FREQUENCY TEST

7.1. Block Diagram of Test Setup



7.2. The Requirement For Section 15.247(a)(1)(iii)

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

7.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX (Hopping on) modes measure it.

7.5. Test Procedure

7.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2. Set the spectrum analyzer as Span=90MHz, RBW=100 kHz, VBW=300 kHz.

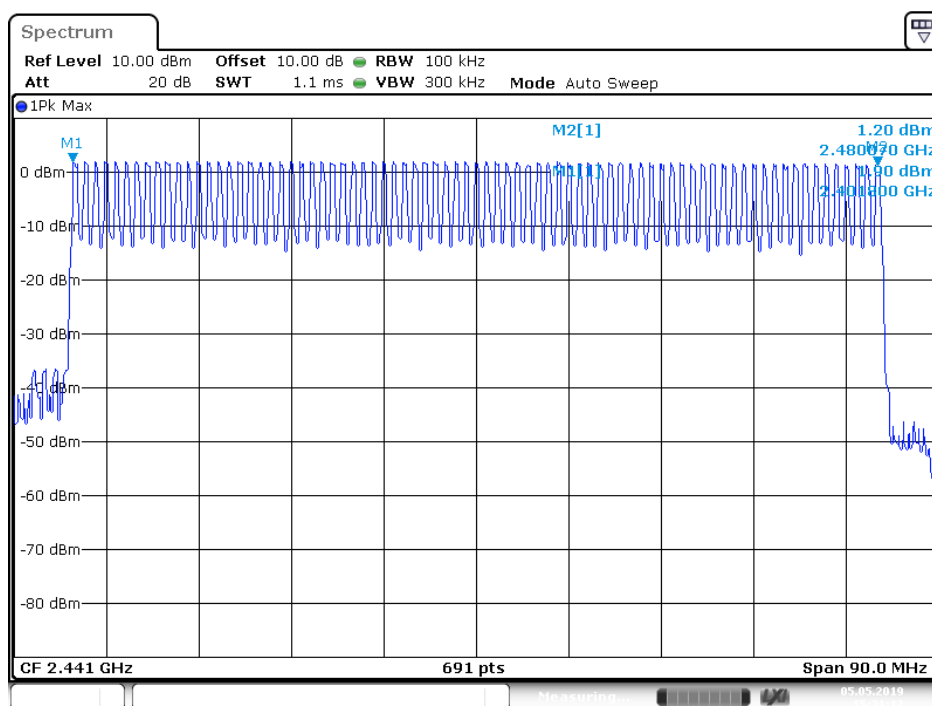
7.5.3. Max hold, view and count how many channel in the band.

7.6.Test Result

Total number of hopping channel	Measurement result(CH)	Limit(CH)	Result
	79	≥ 15	Pass

The spectrum analyzer plots are attached as below.

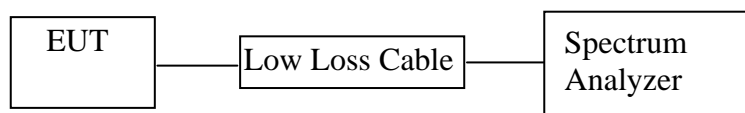
Number of hopping channels (GFSK Mode)



Date: 5.MAY.2019 15:31:12

8. DWELL TIME TEST

8.1. Block Diagram of Test Setup



8.2. The Requirement For Section 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.

8.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

8.5. Test Procedure

8.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.2. Set center frequency of spectrum analyzer = operating frequency.

8.5.3. Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz, Adjust Sweep=5ms, 10ms, 15ms. Get the pulse time.

8.5.4. Repeat above procedures until all frequency measured were complete.

8.6. Test Result

GFSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.391	125.12	400
	2441	0.399	127.68	400
	2480	0.406	129.92	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2 \times 79)) \times 31.6$				
DH3	2402	1.667	266.72	400
	2441	1.667	266.72	400
	2480	1.667	266.72	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4 \times 79)) \times 31.6$				
DH5	2402	2.935	313.07	400
	2441	2.913	310.72	400
	2480	2.935	313.07	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6 \times 79)) \times 31.6$				

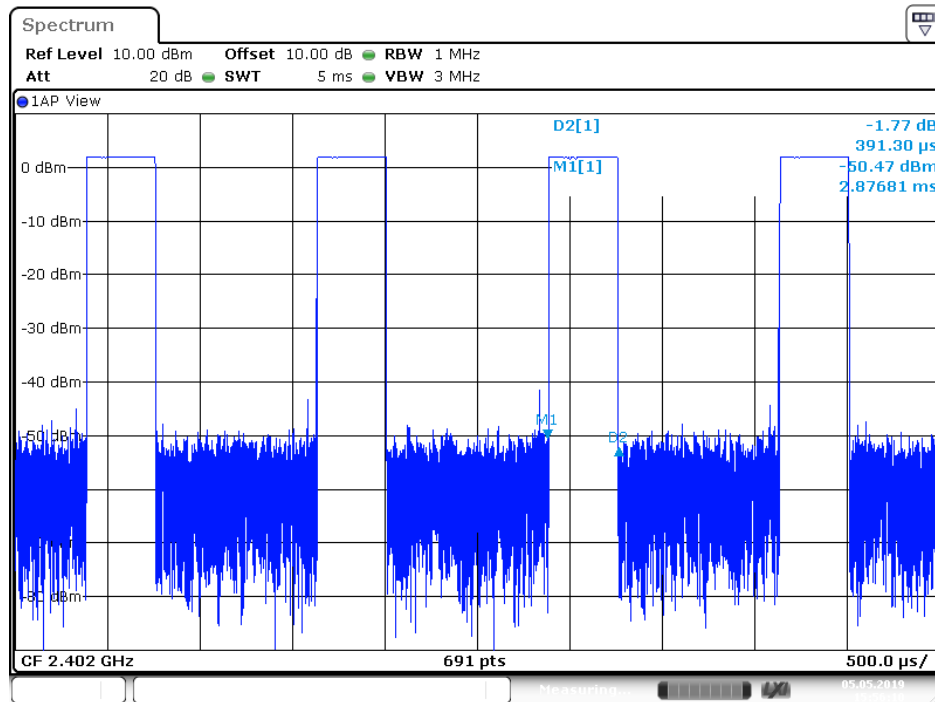
$\pi/4$ DQPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
2DH1	2402	0.406	129.92	400
	2441	0.406	129.92	400
	2480	0.406	129.92	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2 \times 79)) \times 31.6$				
2DH3	2402	1.667	266.72	400
	2441	1.667	266.72	400
	2480	1.667	266.72	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4 \times 79)) \times 31.6$				
2DH5	2402	2.935	313.07	400
	2441	2.935	313.07	400
	2480	2.935	313.07	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6 \times 79)) \times 31.6$				

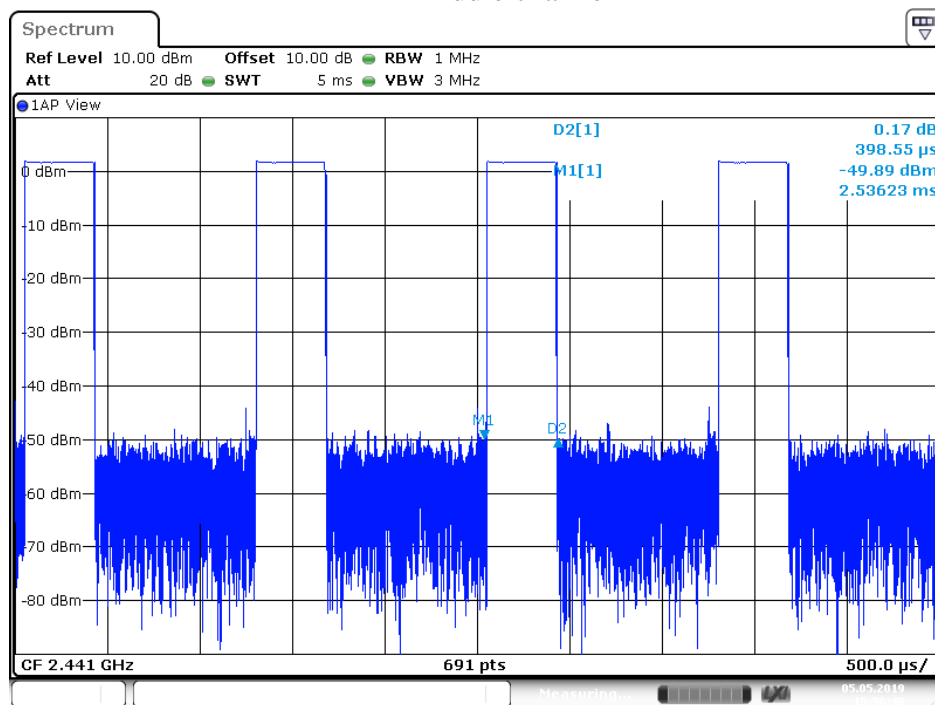
The spectrum analyzer plots are attached as below.

GFSK Mode

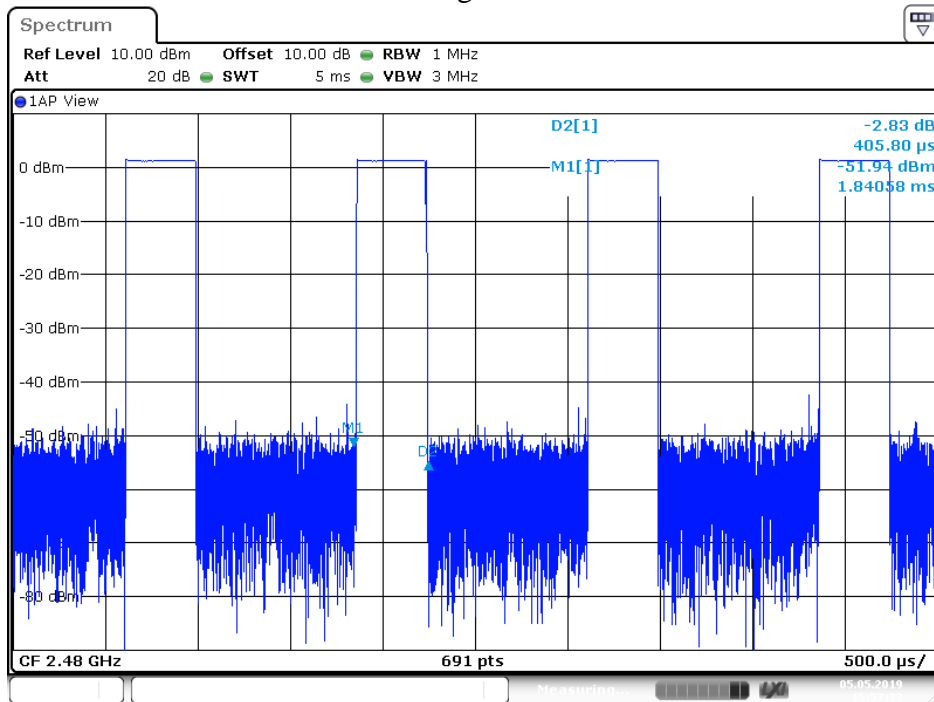
DH1 Low channel



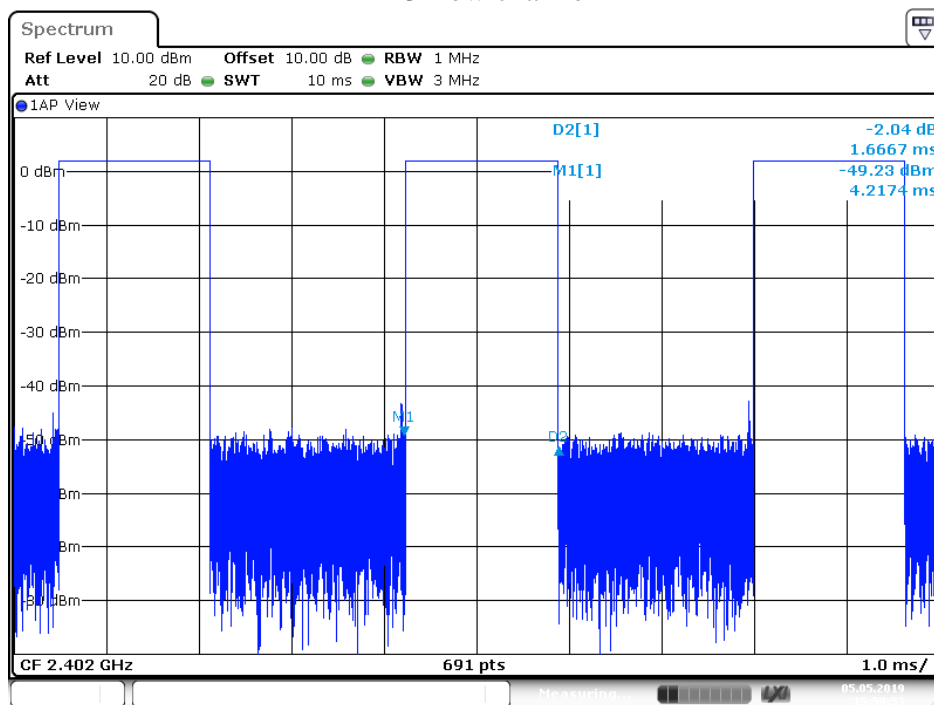
DH1 Middle channel



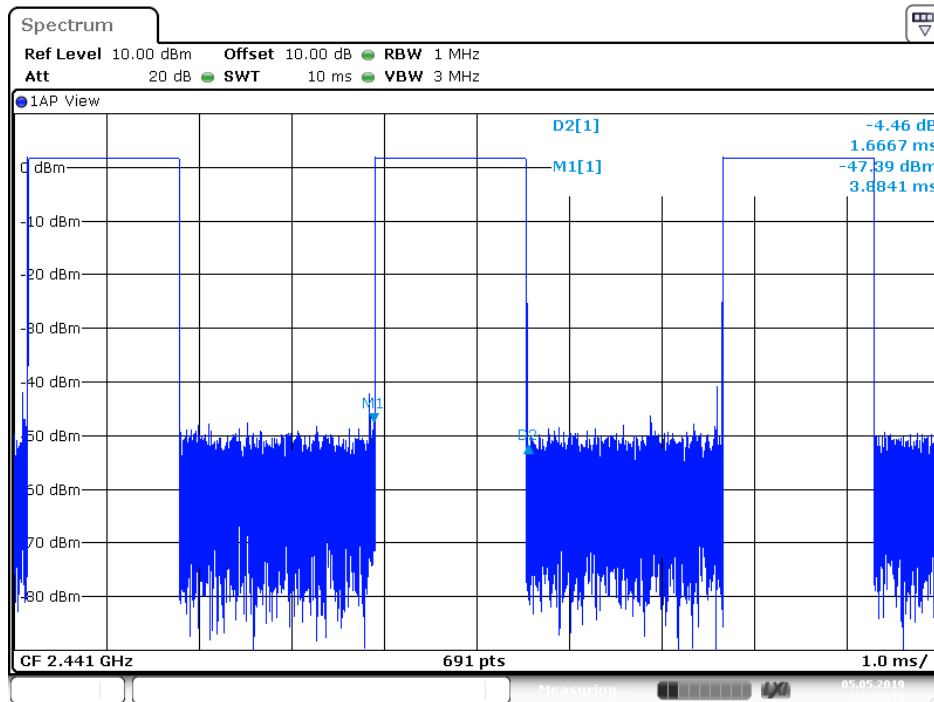
DH1 High channel



DH3 Low channel

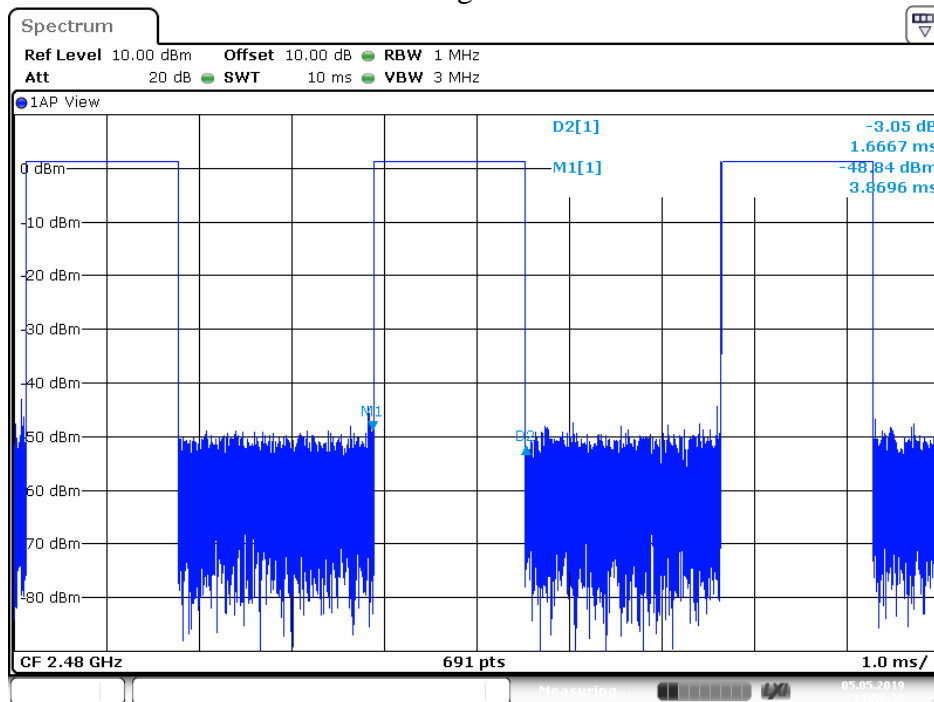


DH3 Middle channel



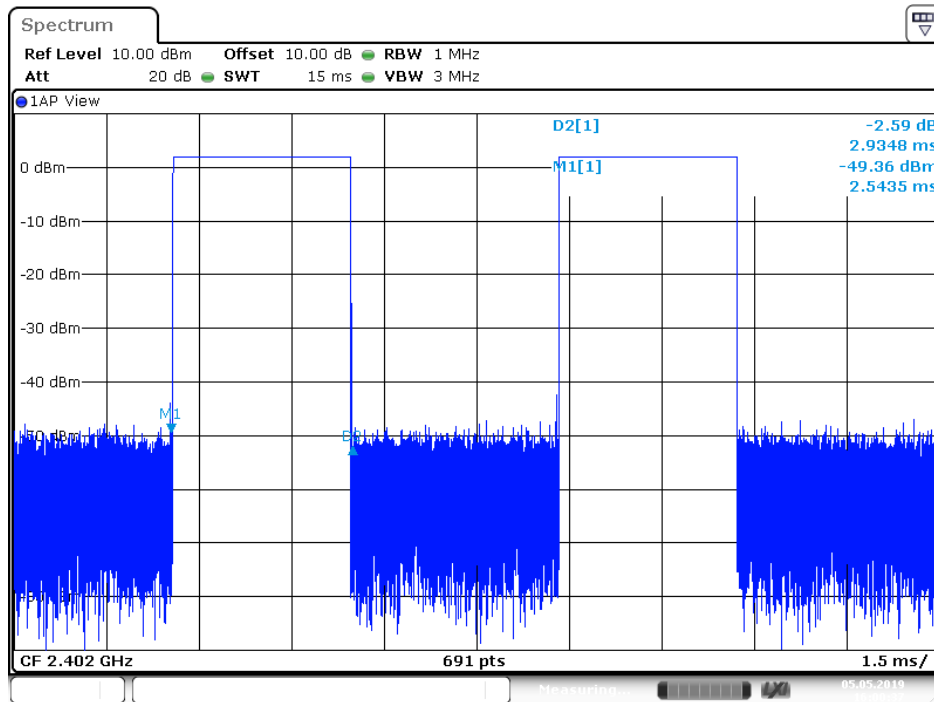
Date: 5.MAY.2019 15:59:13

DH3 High channel



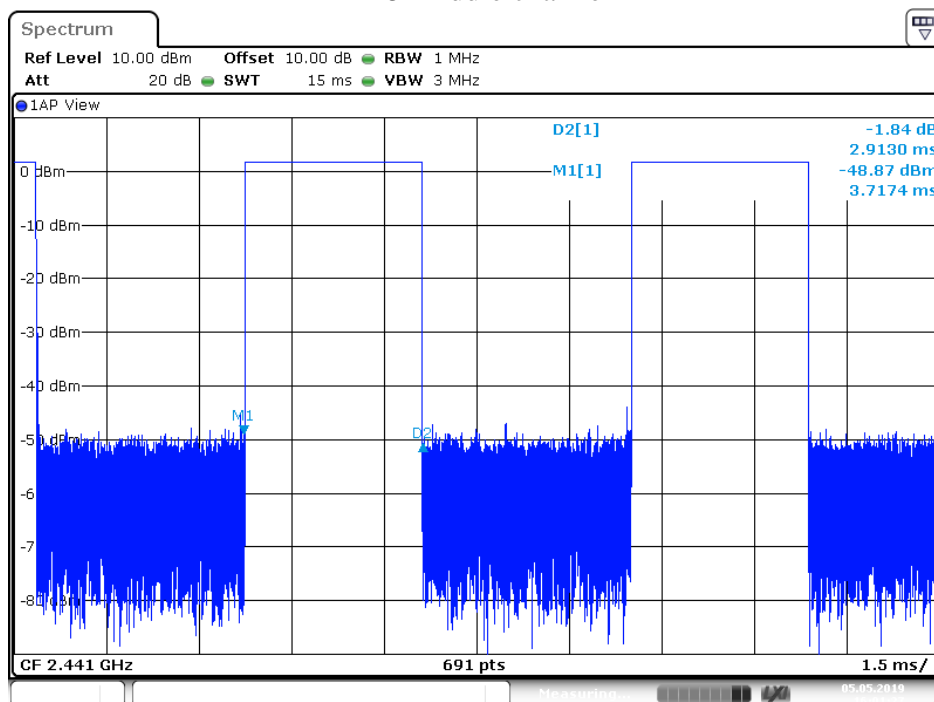
Date: 5.MAY.2019 15:58:36

DH5 Low channel



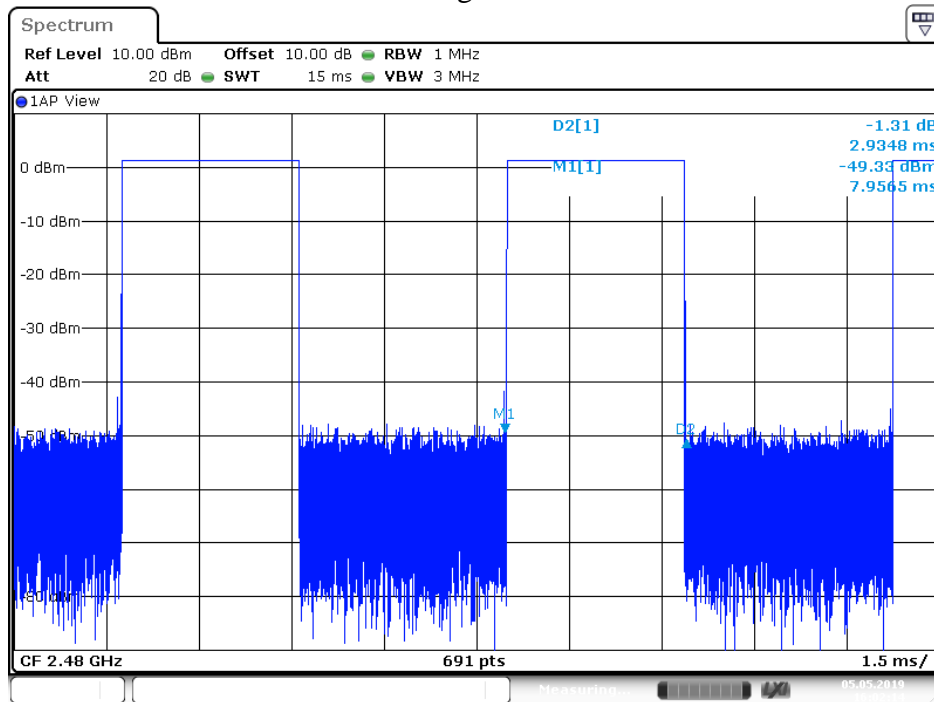
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DH5 Middle channel



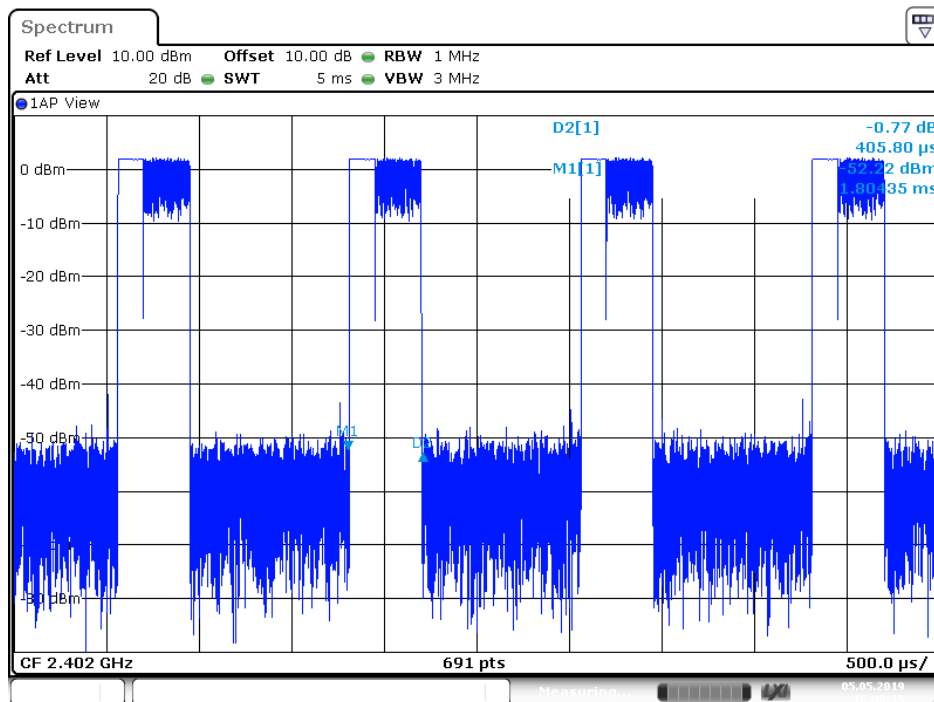
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DH5 High channel

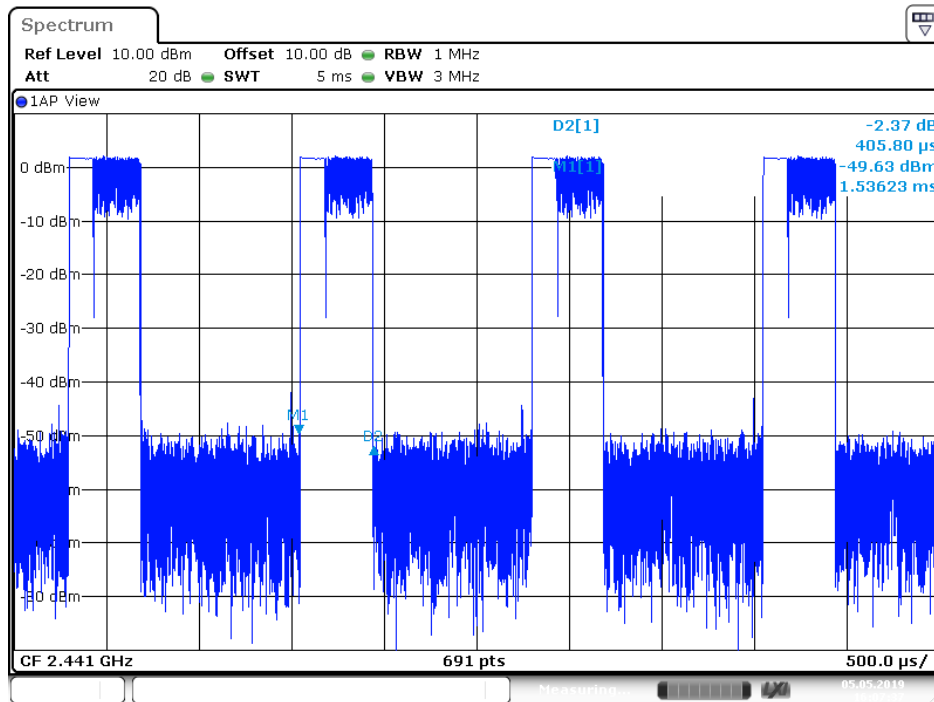


$\pi/4$ DQPSK Mode

2DH1 Low channel

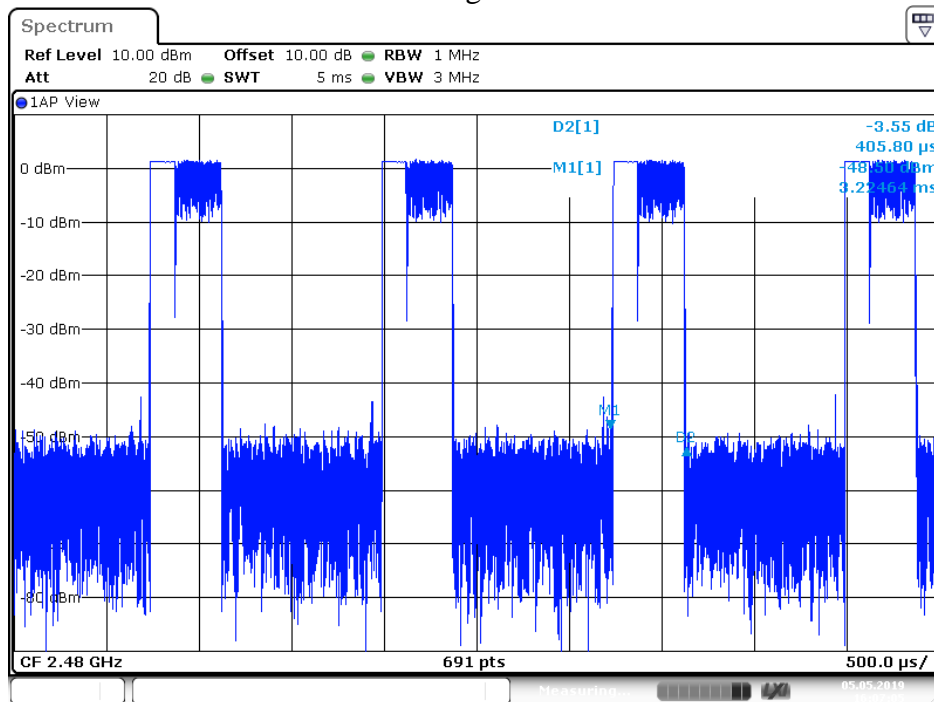


2DH1 Middle channel



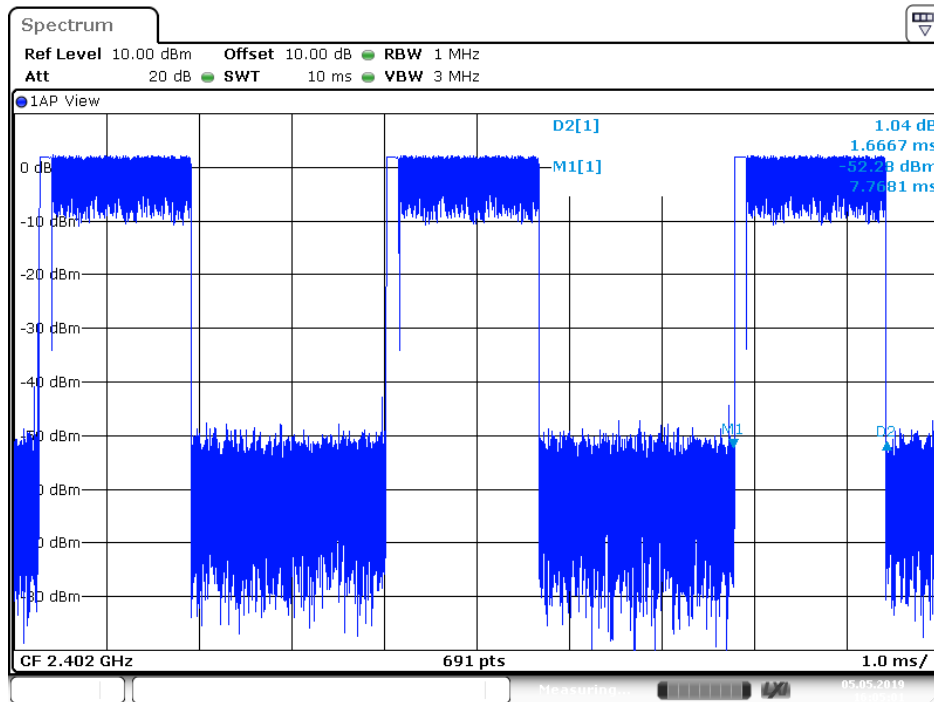
Date: 5.MAY.2019 16:07:37

2DH1 High channel



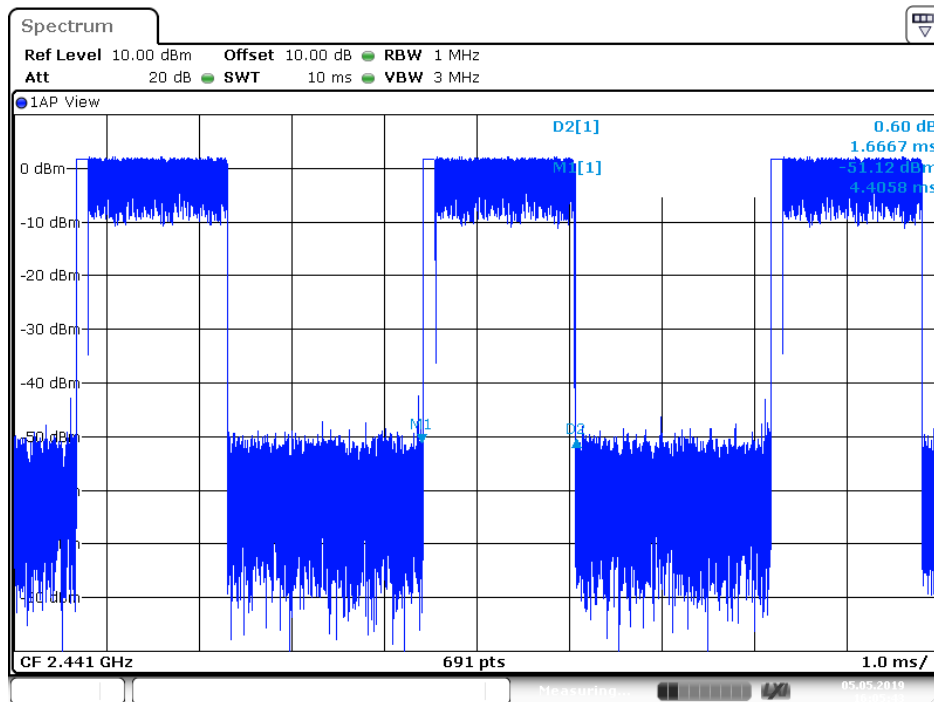
Date: 5.MAY.2019 16:07:05

2DH3 Low channel



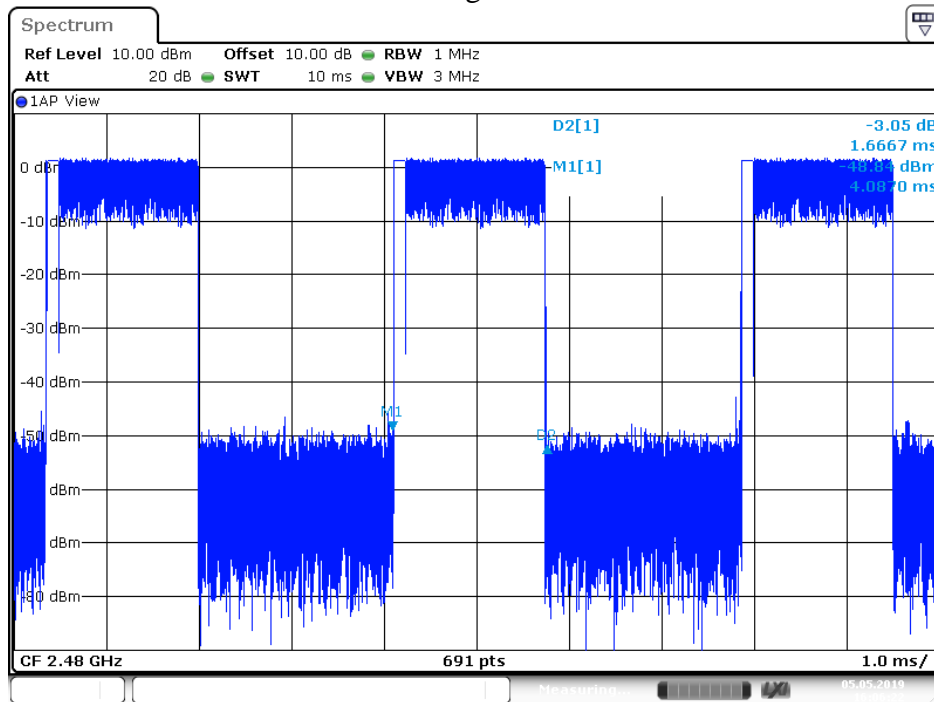
Date: 5.MAY.2019 16:05:01

2DH3 Middle channel



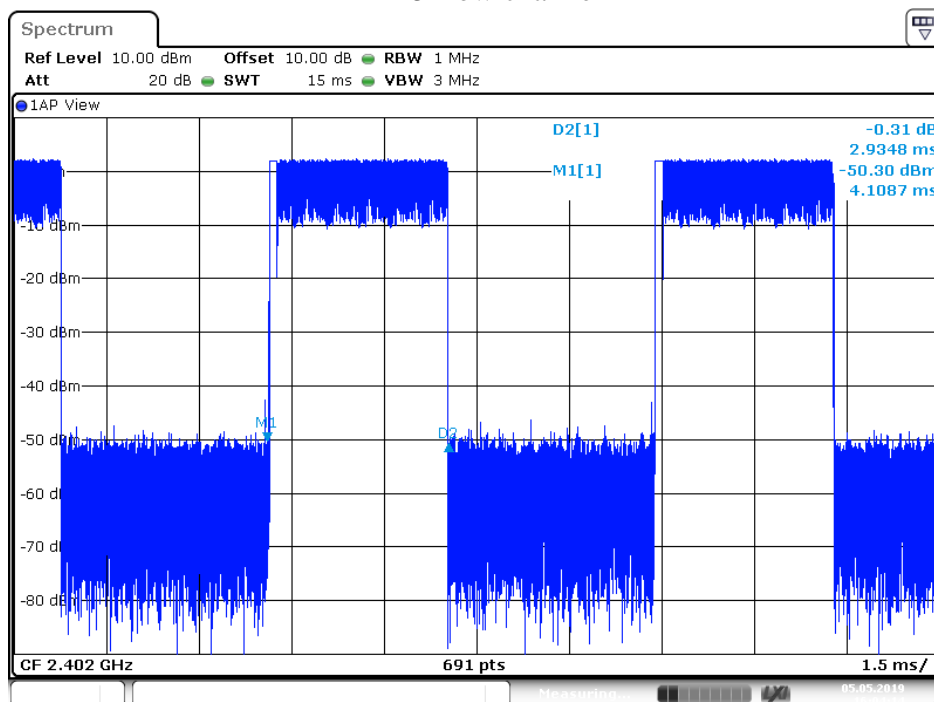
Date: 5.MAY.2019 16:05:43

2DH3 High channel



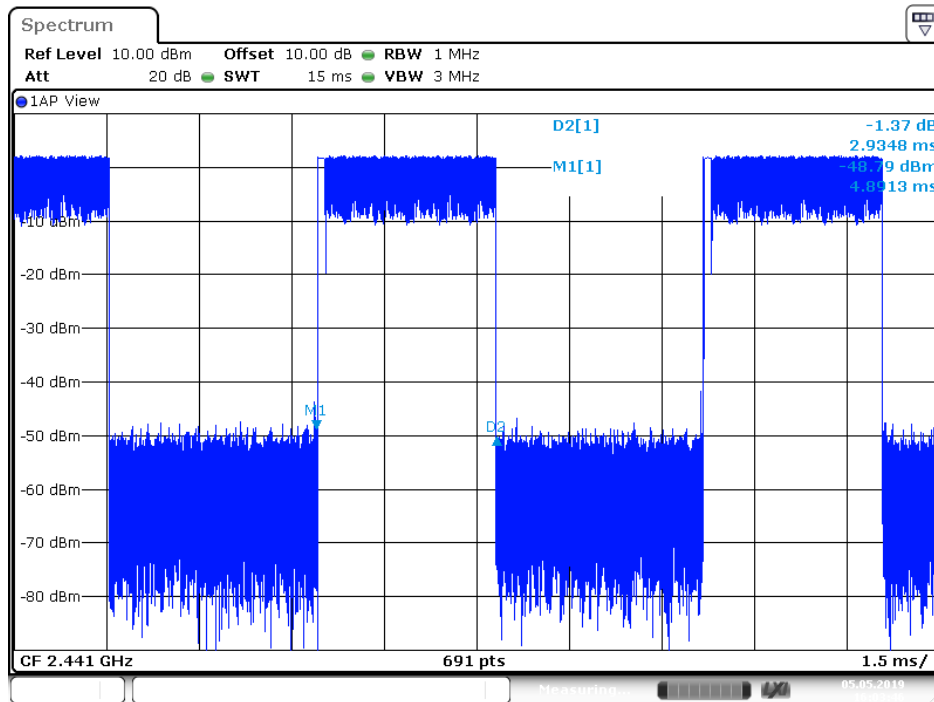
Date: 5.MAY.2019 16:06:22

2DH5 Low channel

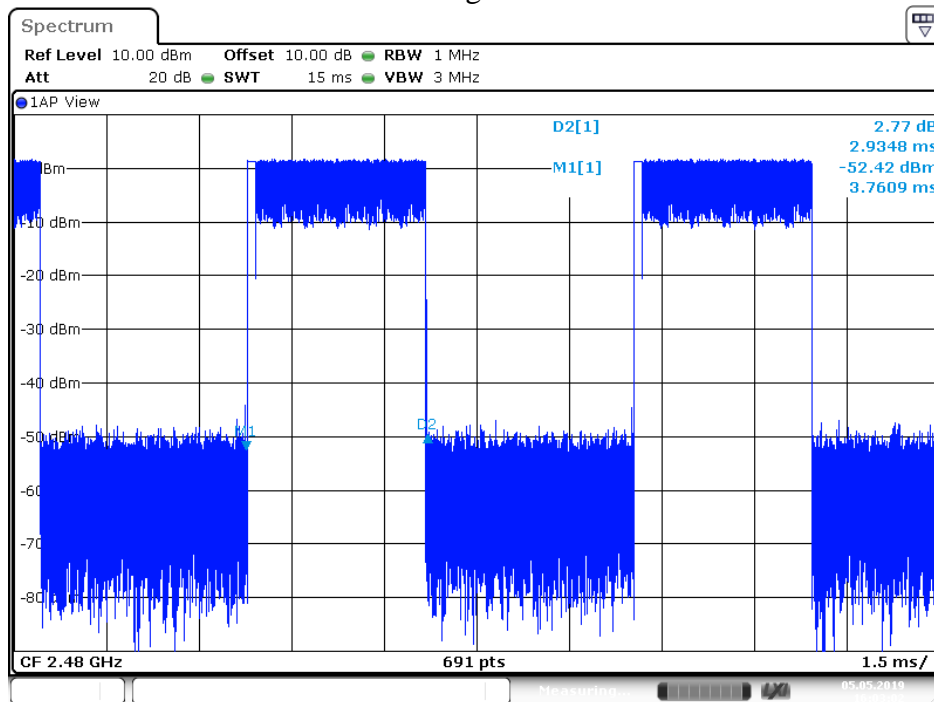


Date: 5.MAY.2019 16:04:14

2DH5 Middle channel



2DH5 High channel



9. MAXIMUM PEAK OUTPUT POWER TEST

9.1. Block Diagram of Test Setup



9.2. The Requirement For Section 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.

9.3. EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4. Operating Condition of EUT

9.4.1. Setup the EUT and simulator as shown as Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

9.5. Test Procedure

9.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

9.5.2. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz for GFSK mode

9.5.3. Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz for other mode

9.5.4. Measurement the maximum peak output power.

9.6.Test Result

GFSK Mode

Frequency (MHz)	Maximum peak conducted output power (dBm/W)	e.i.r.p. (dBm/W)	Limits dBm / W	Result
2402	2.12/0.0016	1.44/0.0014	21 / 0.125	Pass
2441	2.05/0.0016	1.37/0.0014	21 / 0.125	Pass
2480	1.60/0.0014	0.92/0.0012	21 / 0.125	Pass

$\pi/4$ DQPSK Mode

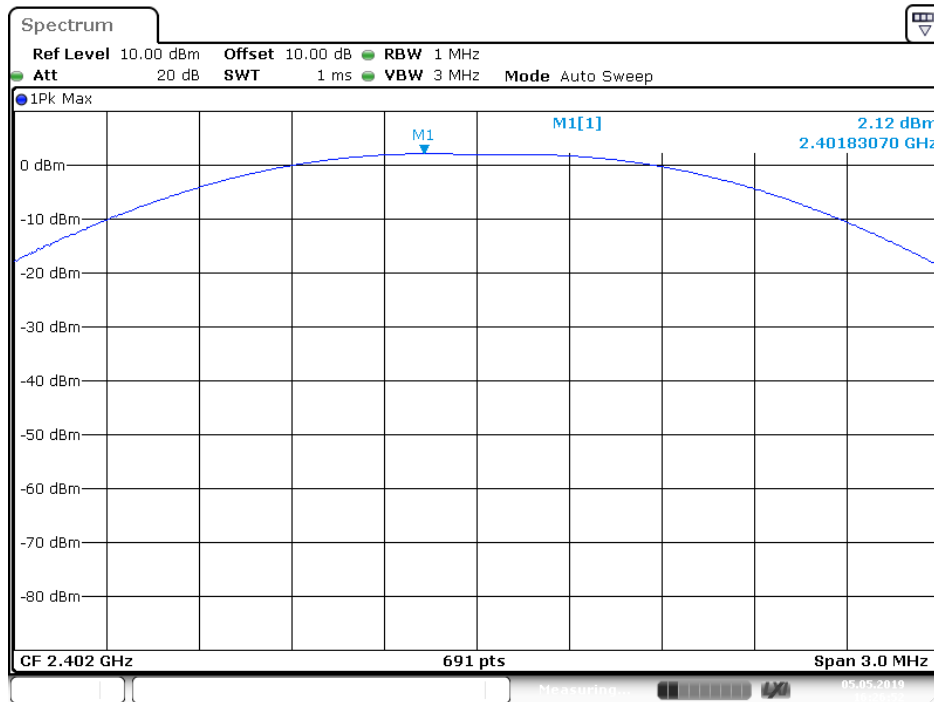
Frequency (MHz)	Maximum peak conducted output power (dBm/W)	e.i.r.p. (dBm/W)	Limits dBm / W	Result
2402	2.84/0.0019	2.16/0.0016	21 / 0.125	Pass
2441	2.75/0.0019	2.07/0.0016	21 / 0.125	Pass
2480	2.30/0.0017	1.62/0.0015	21 / 0.125	Pass

Note: e.i.r.p= Maximum peak conducted output power+antenna gain(-0.68dBi)

The spectrum analyzer plots are attached as below.

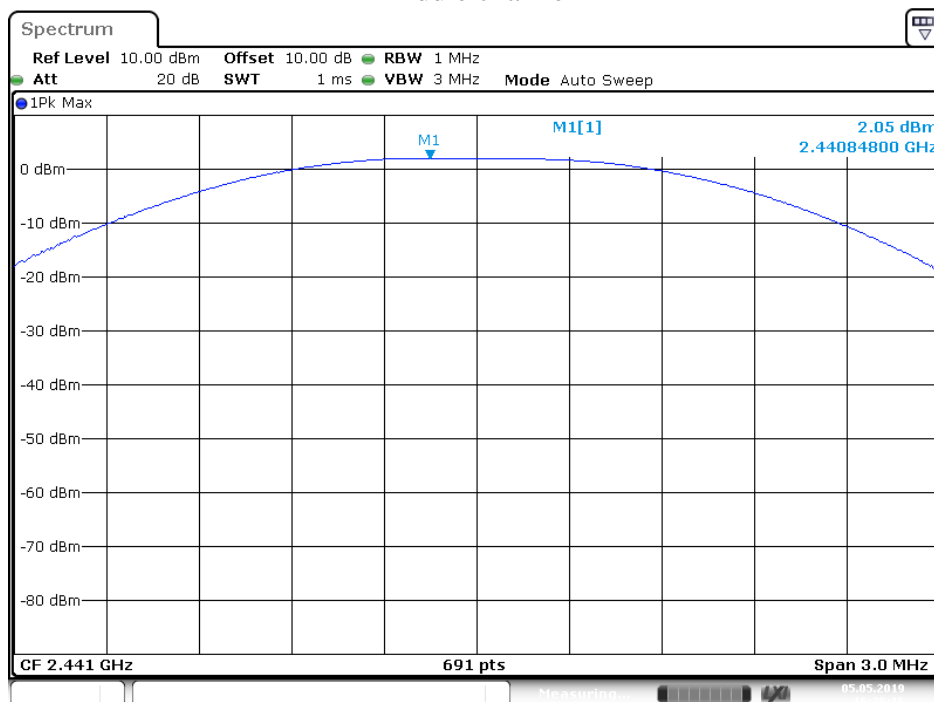
GFSK Mode

Low channel



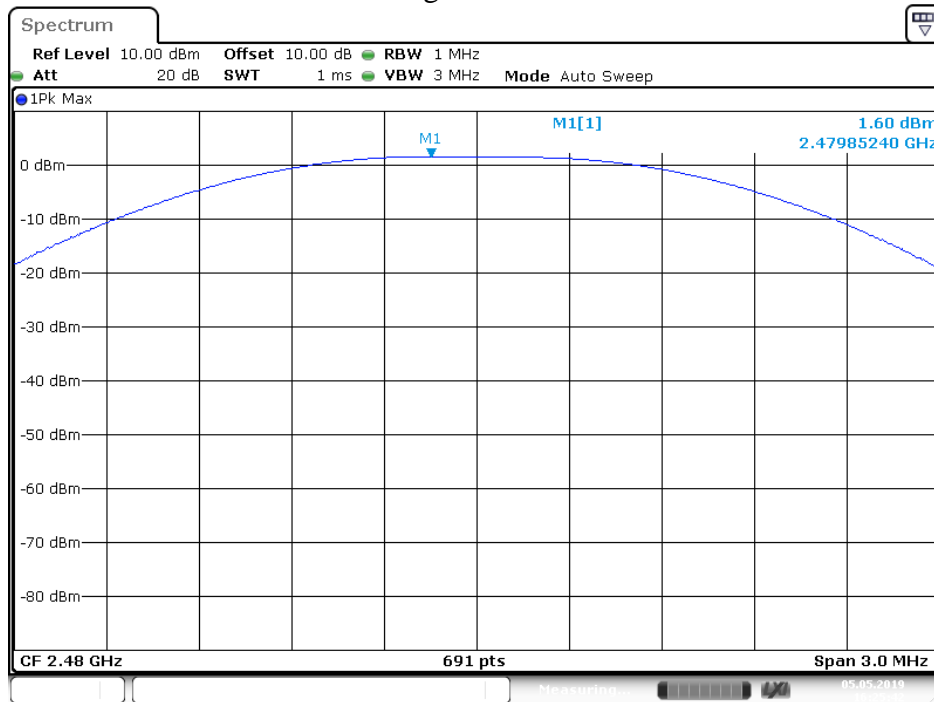
Date: 5.MAY.2019 16:26:52

Middle channel



Date: 5.MAY.2019 16:26:16

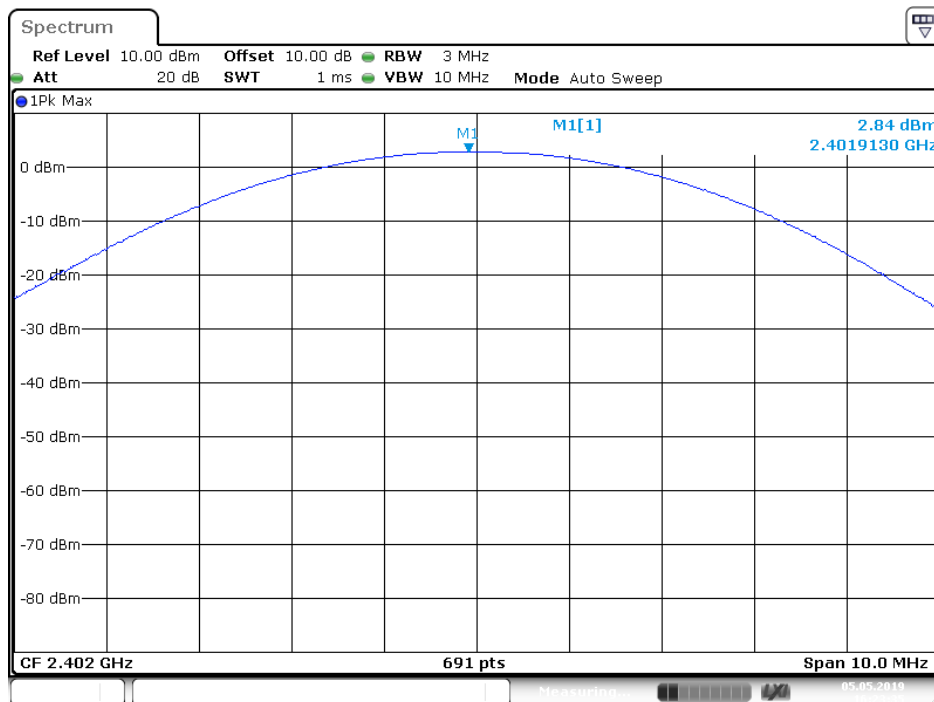
High channel



Date: 5.MAY.2019 16:25:42

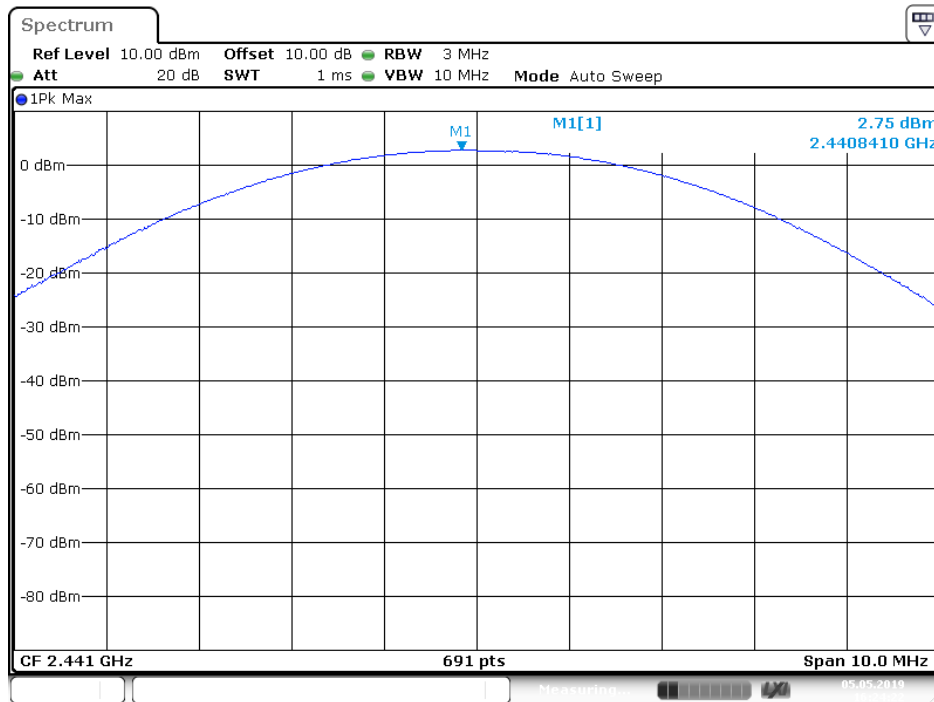
$\pi/4$ DQPSK Mode

Low channel



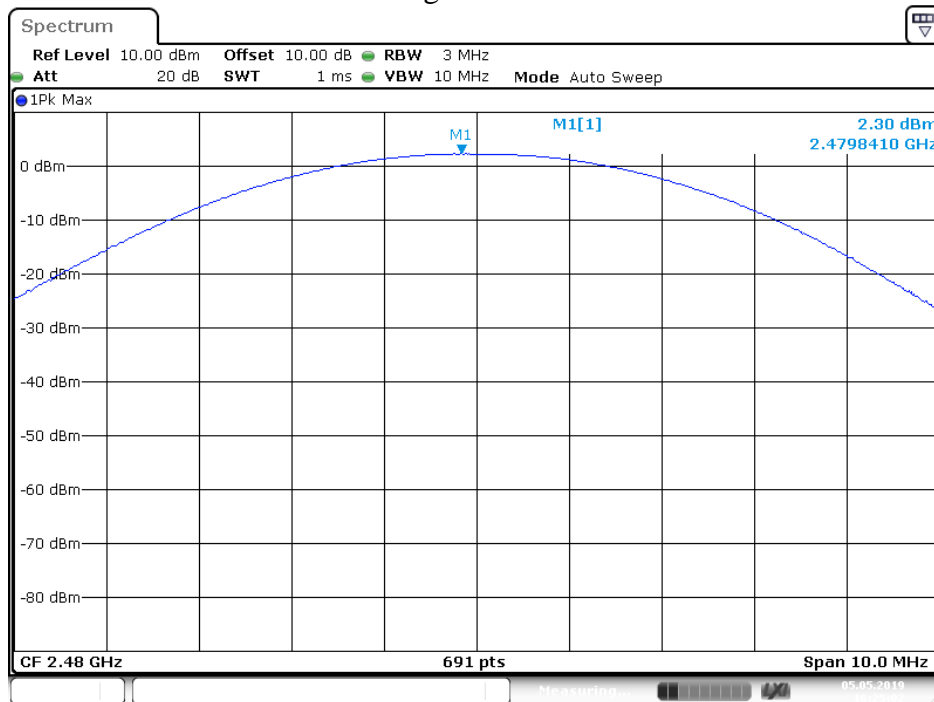
Date: 5.MAY.2019 16:23:35

Middle channel



Date: 5.MAY.2019 16:24:21

High channel

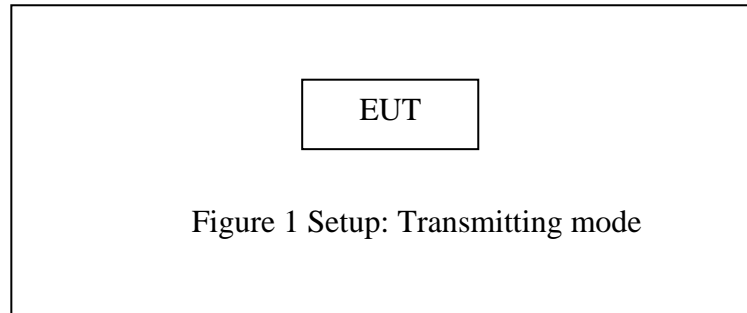


Date: 5.MAY.2019 16:25:02

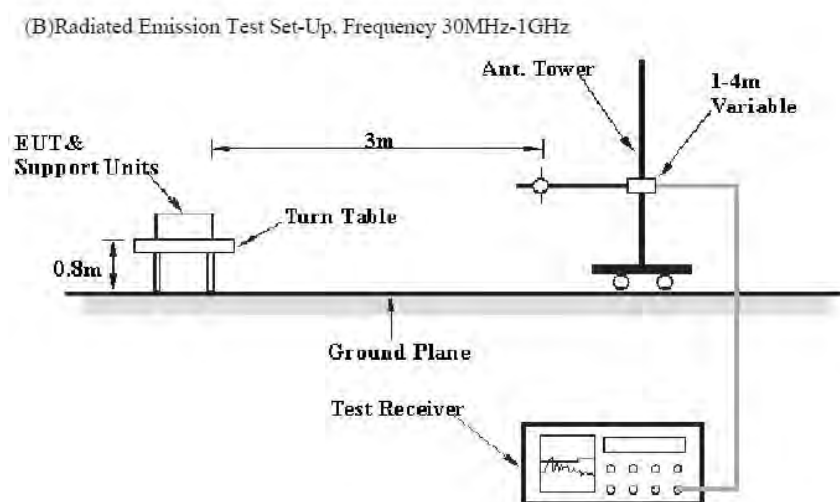
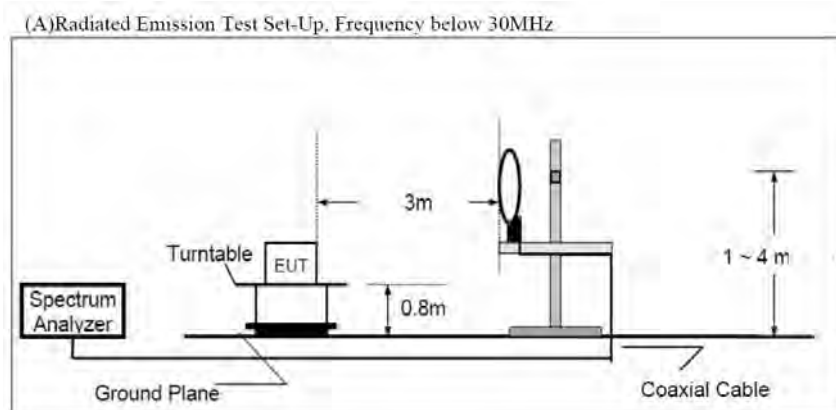
10.RADIATED EMISSION TEST

10.1.Block Diagram of Test Setup

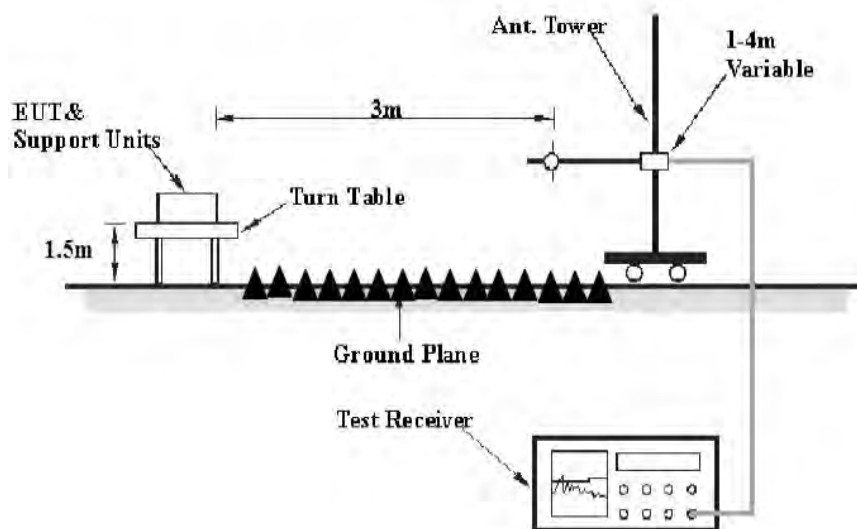
10.1.1.Block diagram of connection between the EUT and peripherals



10.1.2.Semi-Anechoic Chamber Test Setup Diagram



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



10.2.The Requirement For Section 15.247(d)

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

10.3. Transmitter Emission Limit

Radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength ($\mu\text{V/m}$ at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) ($\mu\text{A/m}$)	Measurement distance (m)
9 - 490 kHz ¹	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

10.4.Restricted bands of operation

10.4.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

10.5.Configuration of EUT on Measurement

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.6. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

10.7.Data Sample

Frequency (MHz)	Reading (dB μ v)	Factor (dB/m)	Result (dB μ v/m)	Limit (dB μ v/m)	Margin (dB)	Remark
X.XX	48.69	-13.35	35.34	46	-10.66	QP

Frequency(MHz) = Emission frequency in MHz

Reading(dB μ v) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain

Result(dB μ v/m) = Reading(dB μ v) + Factor(dB/m)

Limit (dB μ v/m) = Limit stated in standard

Margin (dB) = Result(dB μ v/m) - Limit (dB μ v/m)

QP = Quasi-peak Reading

Calculation Formula:

Margin(dB) = Result (dB μ V/m)–Limit(dB μ V/m)

Result(dB μ V/m)= Reading(dB μ V)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

10.8.Test Result

Pass.

The frequency range from 9KHz to 26.5GHz is investigated.

Note: 1.We tested GFSK mode, $\pi/4$ DQPSK Mode, and recorded the worse case data ($\pi/4$ DQPSK mode) for all test mode.

The spectrum analyzer plots are attached as below.

9kHz-30MHz test data

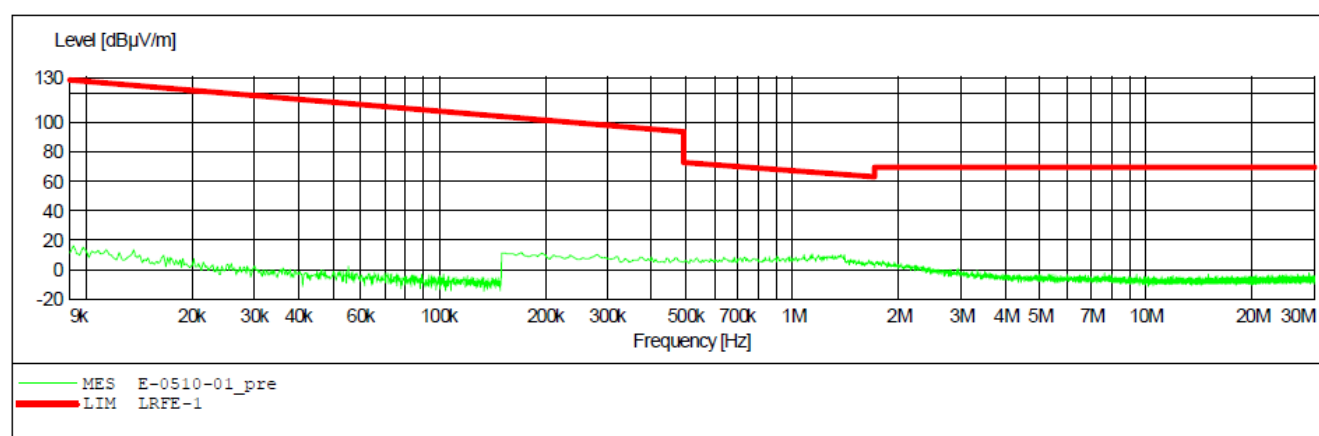
ACCURATE TECHNOLOGY CO.,LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2402MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: X
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70			
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



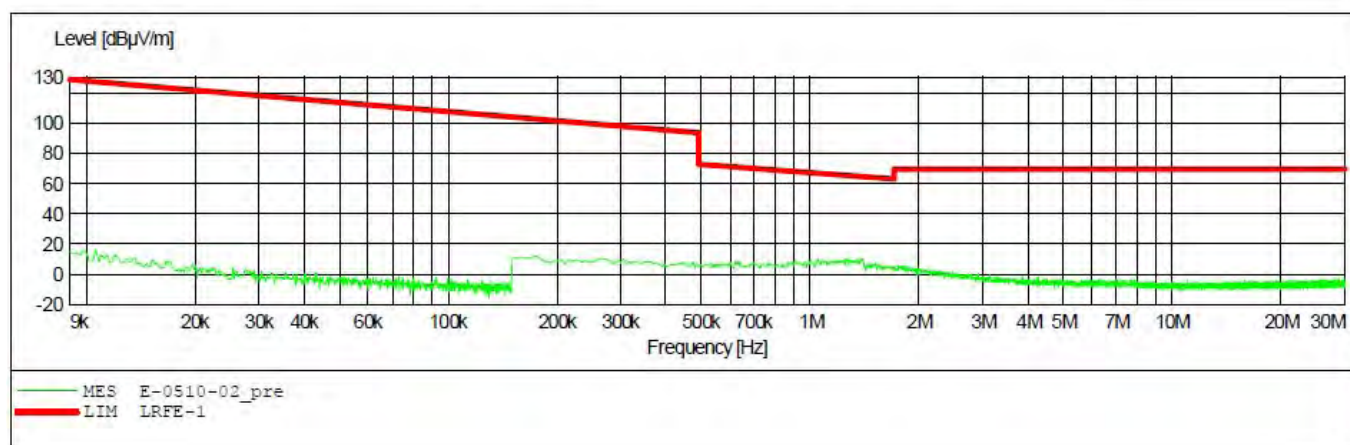
ACCURATE TECHNOLOGY CO.,LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2402MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Y
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			SUB STD VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



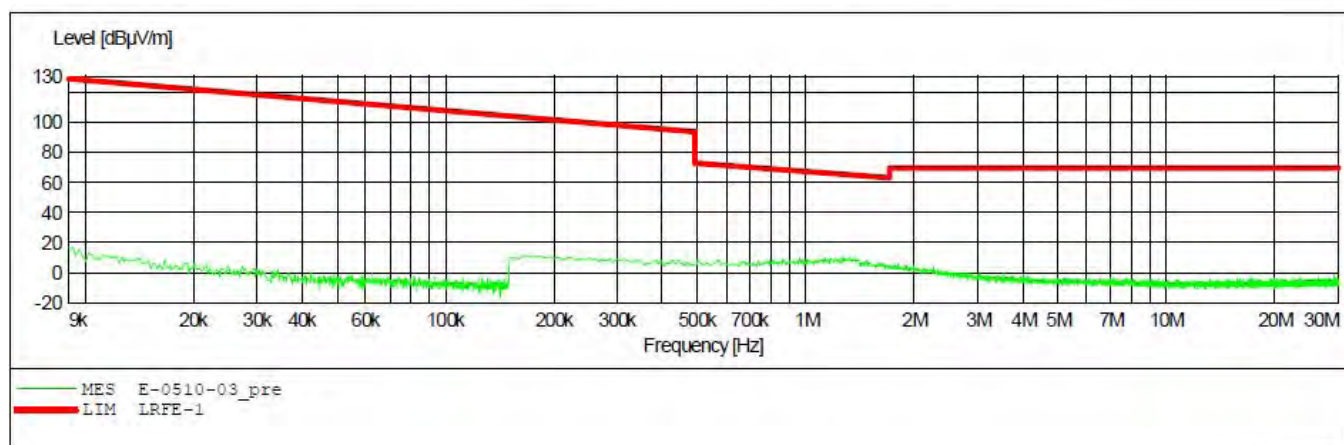
ACCURATE TECHNOLOGY CO.,LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2402MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Z
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



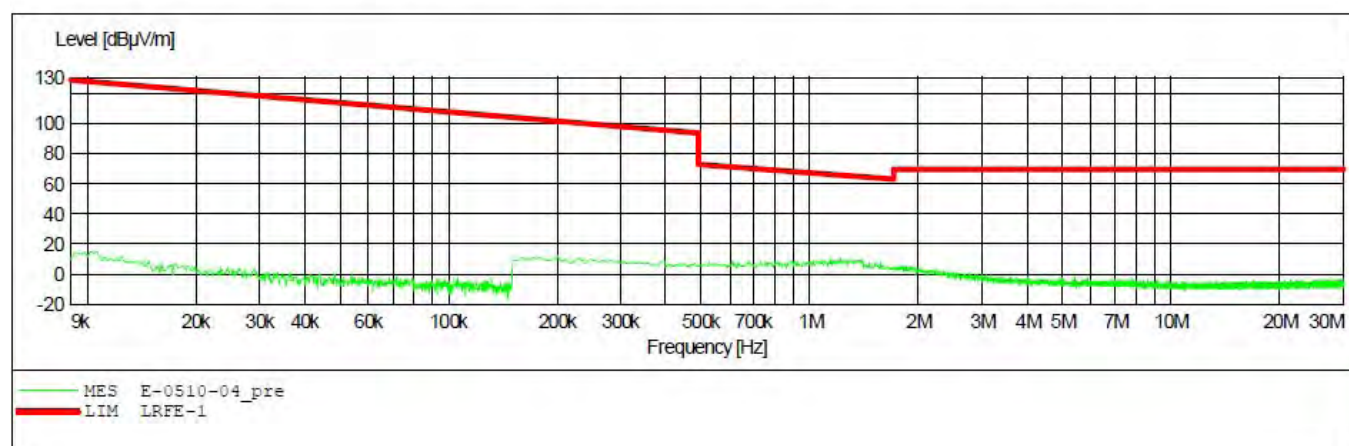
ACCURATE TECHNOLOGY CO.,LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2441MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: X
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			SUB_STD VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



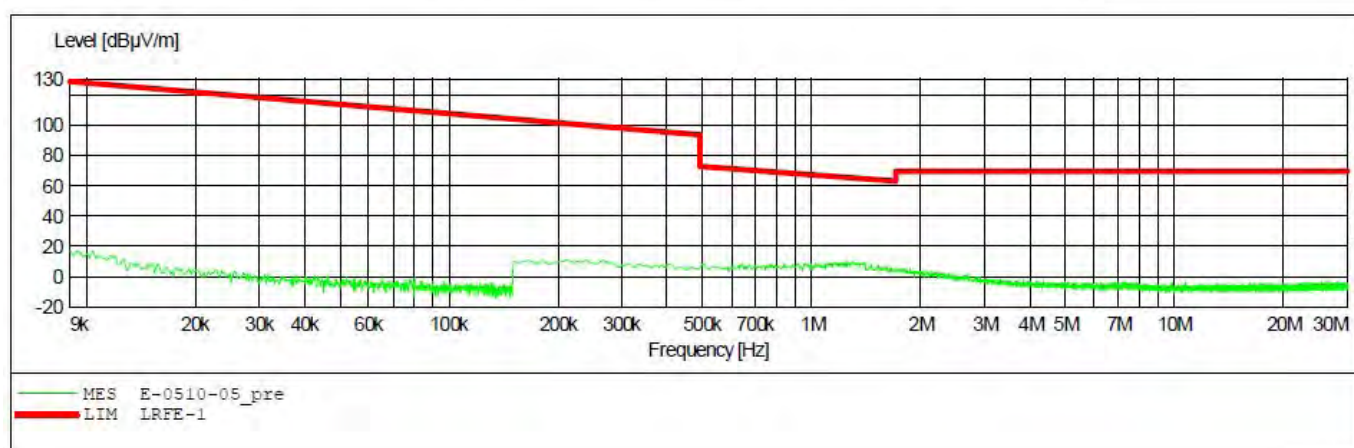
ACCURATE TECHNOLOGY CO.,LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2441MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Y
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			SUB STD VTERM2 1.70			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



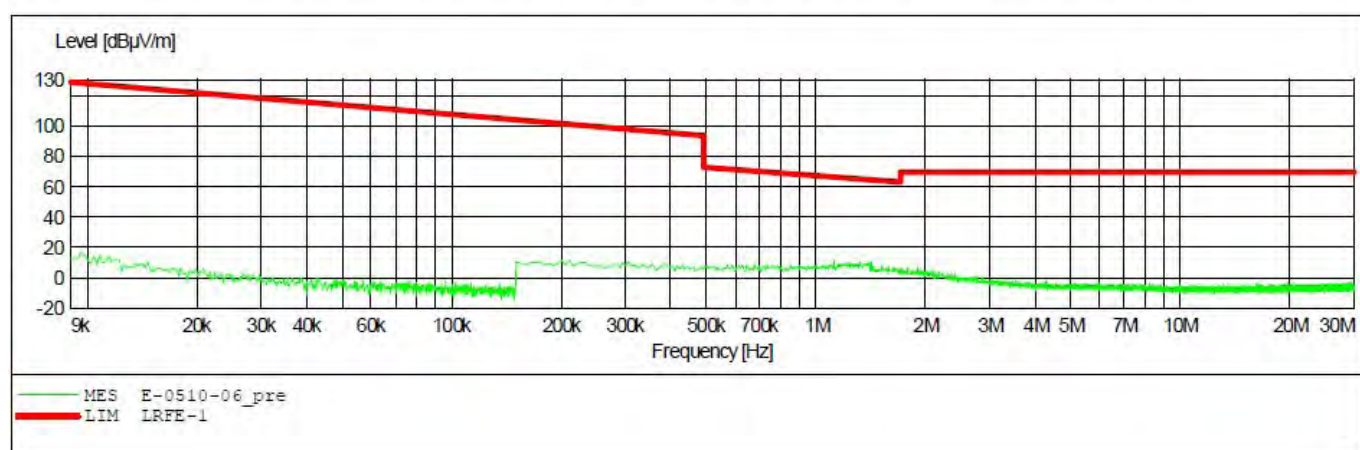
ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2441MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Z
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB STD VTERM2 1.70			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



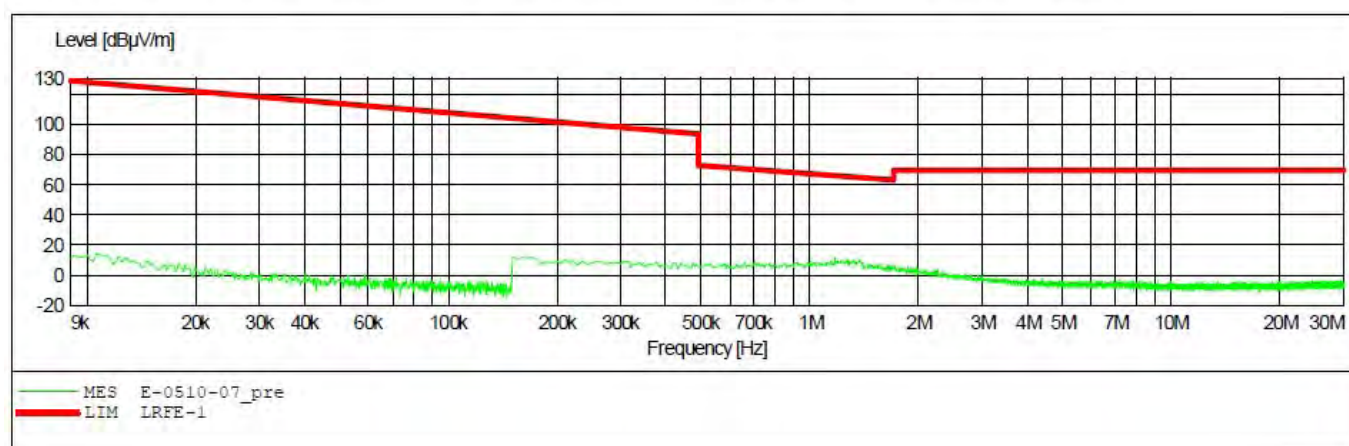
ACCURATE TECHNOLOGY CO., LTD

FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2480MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: X
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description:			SUB_STD_VTERM2 1.70			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



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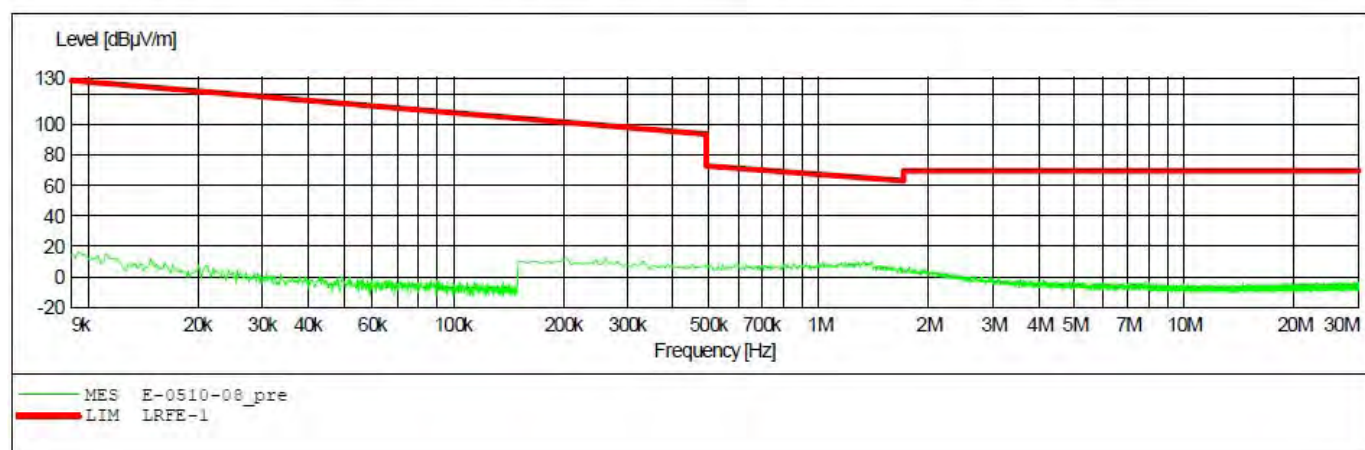
FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2480MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Y
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description: _SUB STD VTERM2 1.70

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



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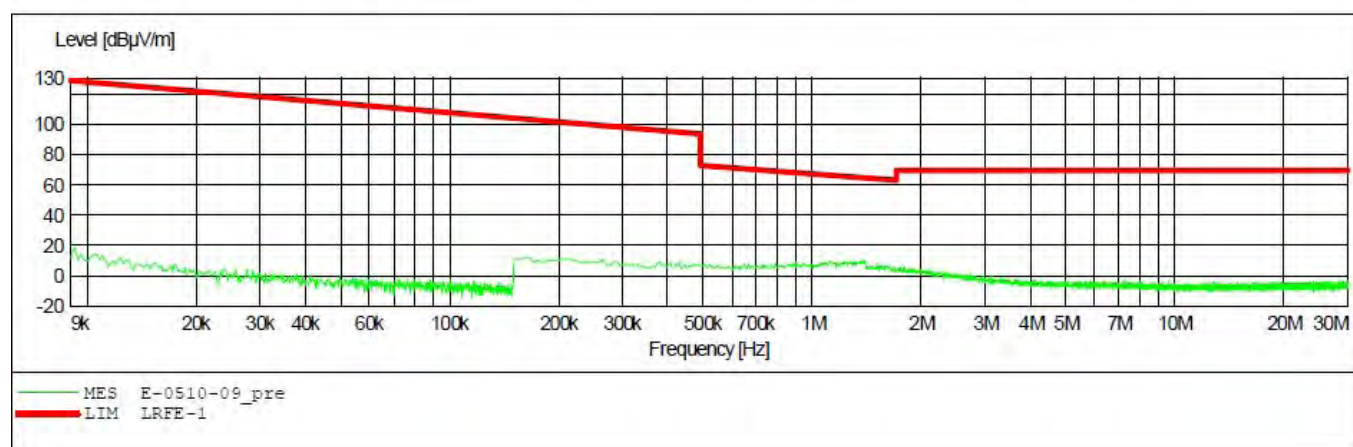
FCC Part 15C 3m Radiated

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: TX 2480MHz
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Z
 Comment: 2019-5-10

SCAN TABLE: "LFRE Fin"

Short Description: _SUB_STD VTERM2 1.70

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



30MHz-1GHz Test data



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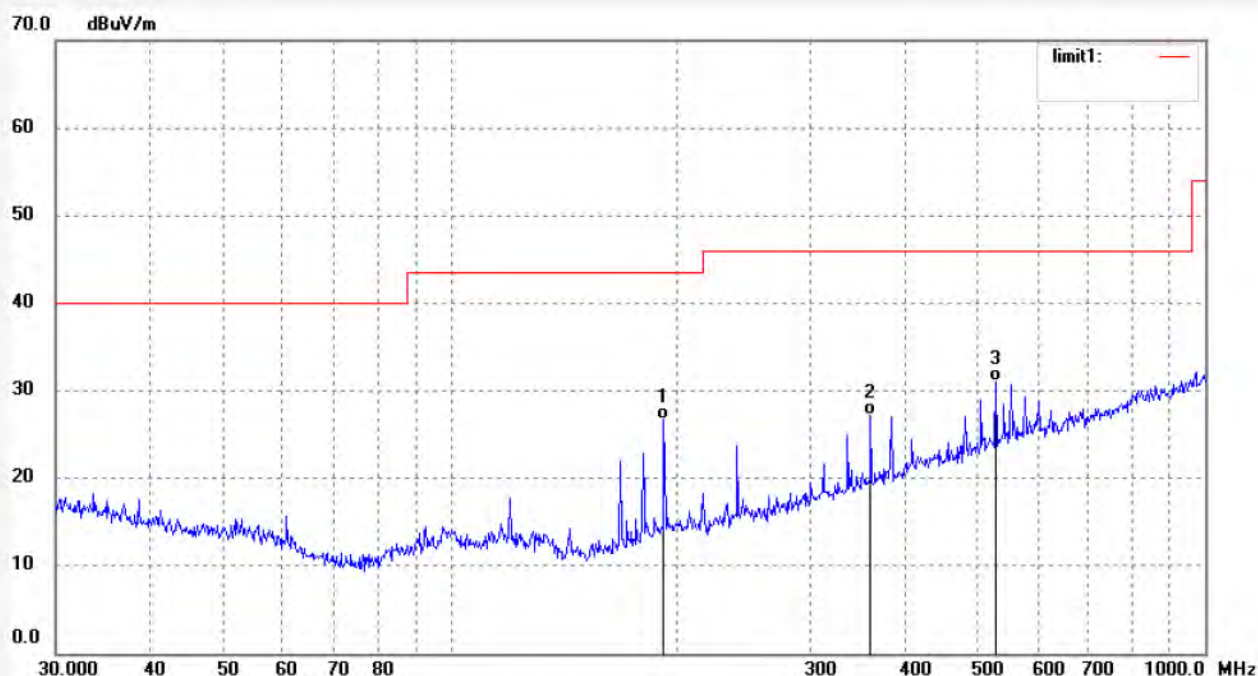
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1507
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2402MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:





ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

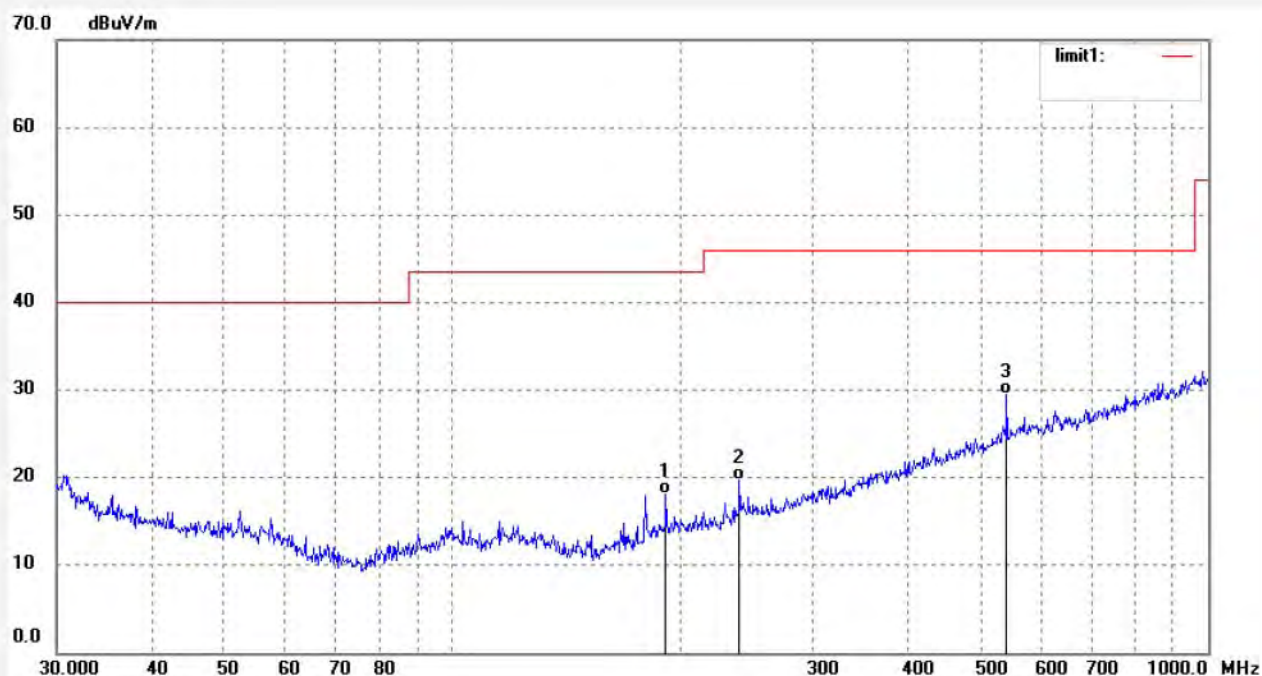
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1508
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2402MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	191.7450	30.53	-12.42	18.11	43.50	-25.39	QP			
2	239.9874	30.24	-10.62	19.62	46.00	-26.38	QP			
3	541.3724	32.80	-3.31	29.49	46.00	-16.51	QP			



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

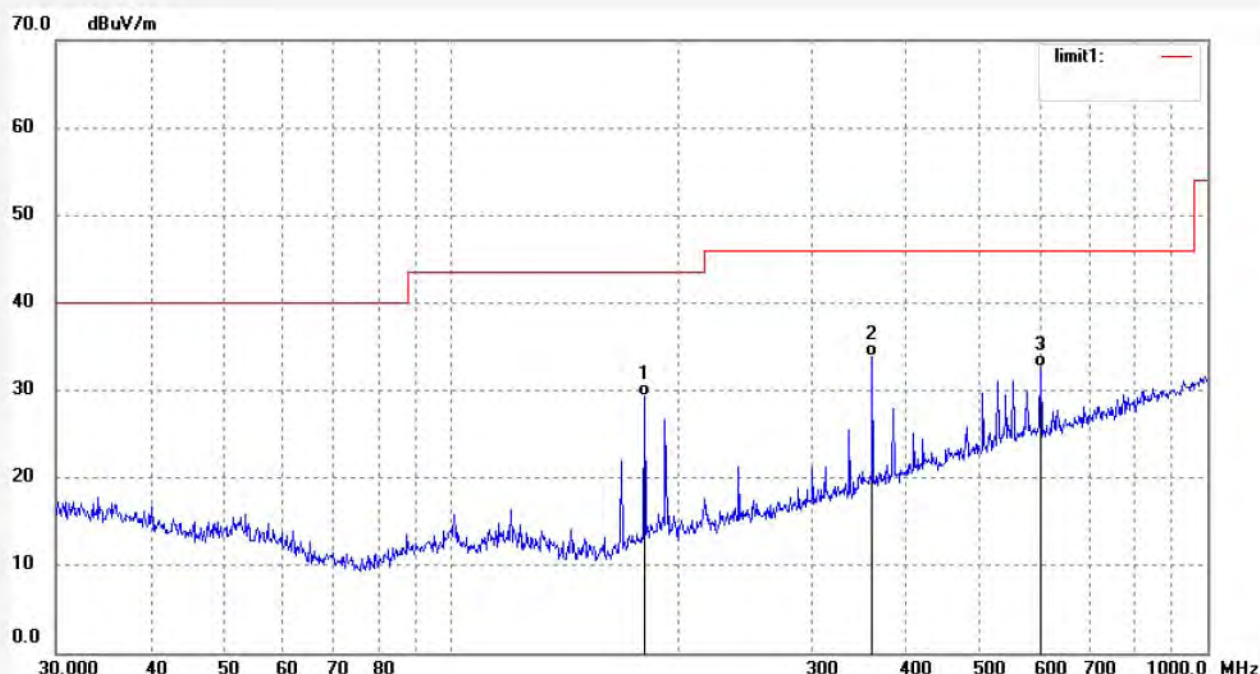
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1510
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2441MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:





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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1509

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2441MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical

Power Source: DC 3.7V

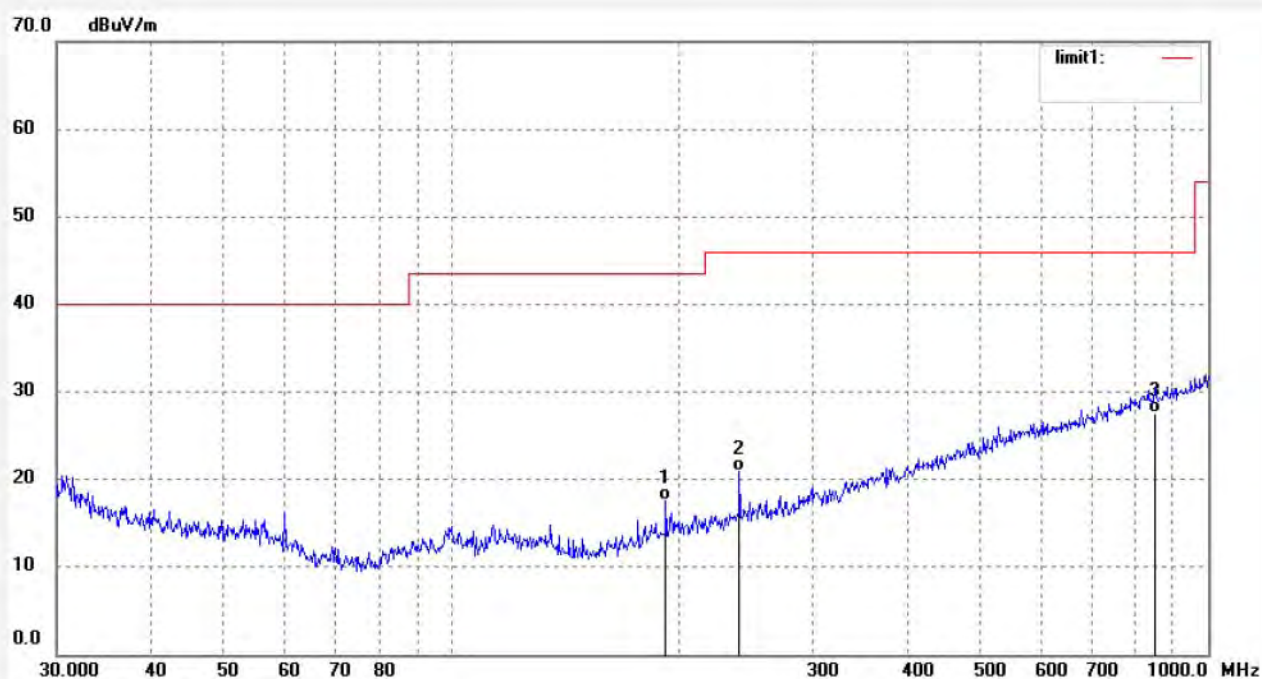
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	191.7450	30.09	-12.42	17.67	43.50	-25.83	QP			
2	239.9874	31.47	-10.62	20.85	46.00	-25.15	QP			
3	851.0353	25.99	1.57	27.56	46.00	-18.44	QP			



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Job No.: LGW2019 #1511

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2480MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal

Power Source: DC 3.7V

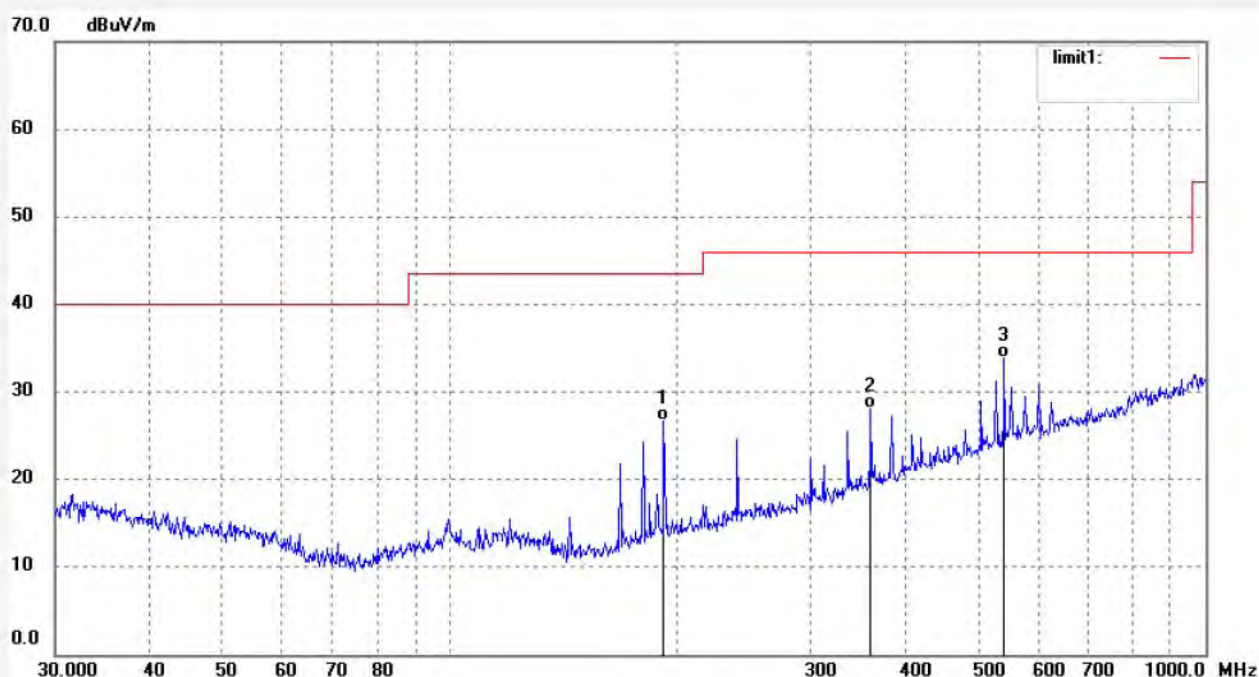
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	191.7450	39.05	-12.42	26.63	43.50	-16.87	QP			
2	360.4476	35.32	-7.26	28.06	46.00	-17.94	QP			
3	541.3724	37.22	-3.31	33.91	46.00	-12.09	QP			



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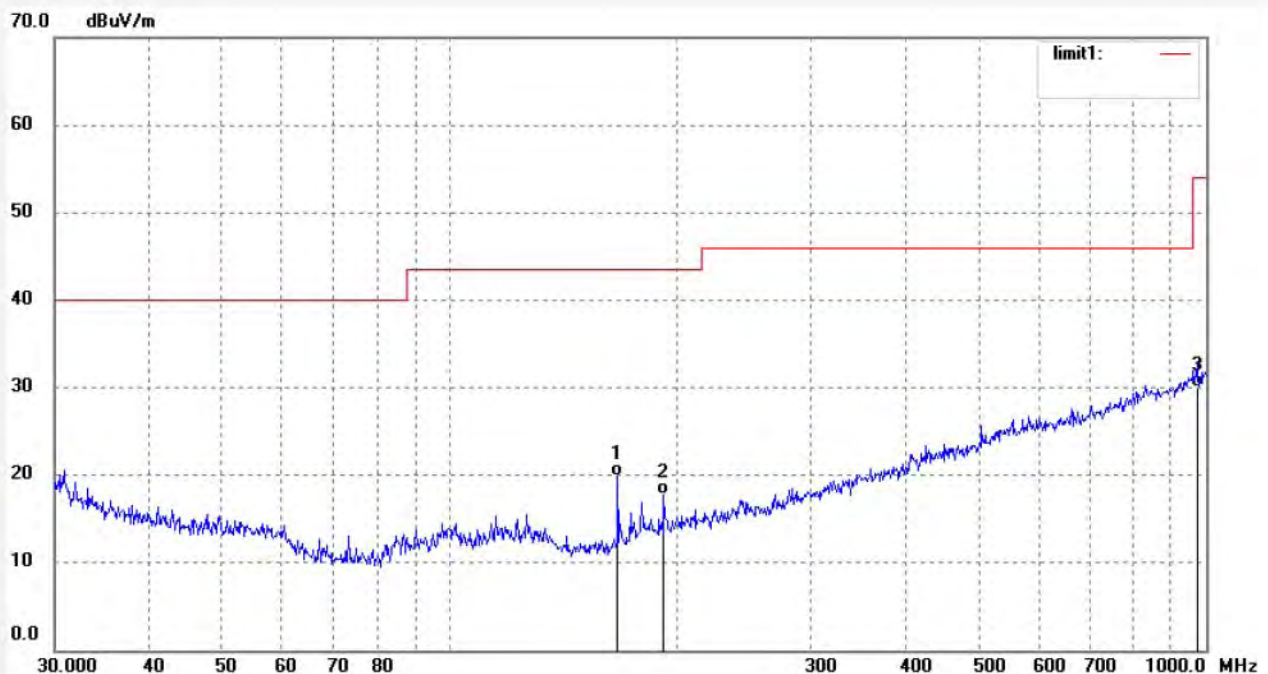
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Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1512
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2480MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	166.6513	33.88	-14.07	19.81	43.50	-23.69	QP			
2	191.7450	30.21	-12.42	17.79	43.50	-25.71	QP			
3	972.3374	26.55	3.43	29.98	54.00	-24.02	QP			

1GHz-18GHz test data



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Fax:+86-0755-26503396

Job No.: LGW2019 #1475

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2402MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal

Power Source: DC 3.7V

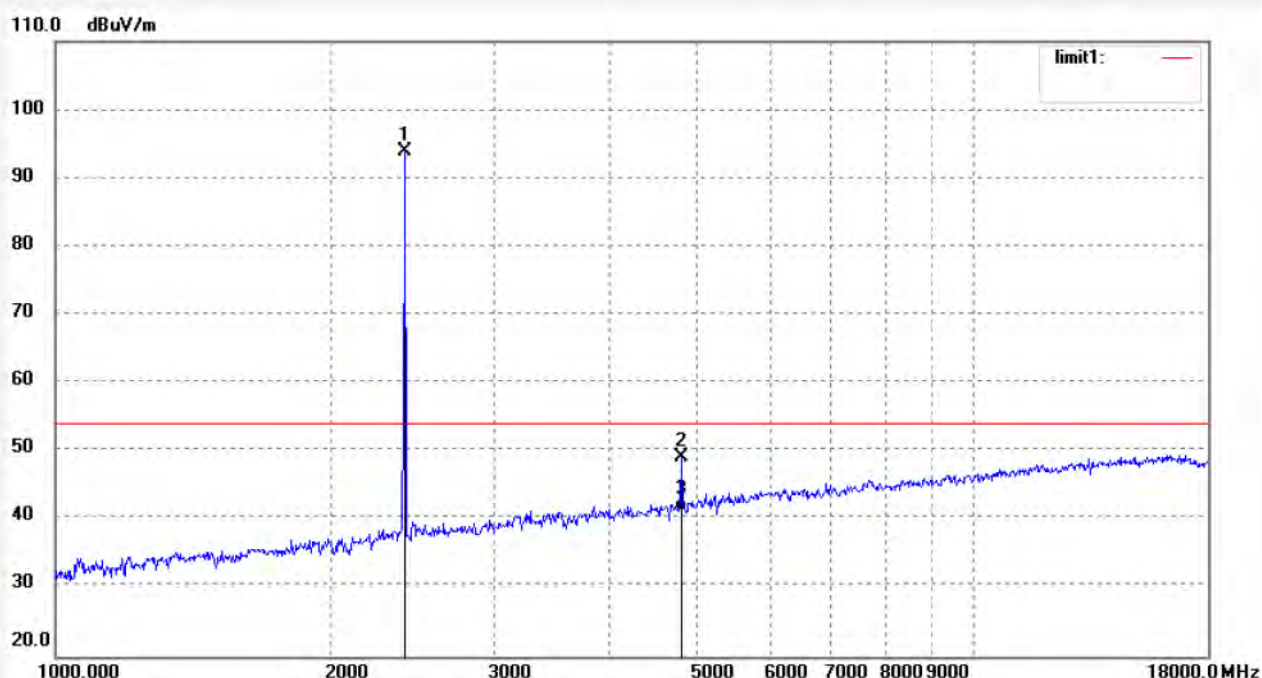
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	93.01	0.89	93.90	/	/	peak			
2	4804.024	41.83	7.40	49.23	74.00	-24.77	peak			
3	4804.024	33.84	7.40	41.24	54.00	-12.76	AVG			



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Site: 2# Chamber

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Fax:+86-0755-26503396

Job No.: LGW2019 #1476

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2402MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical

Power Source: DC 3.7V

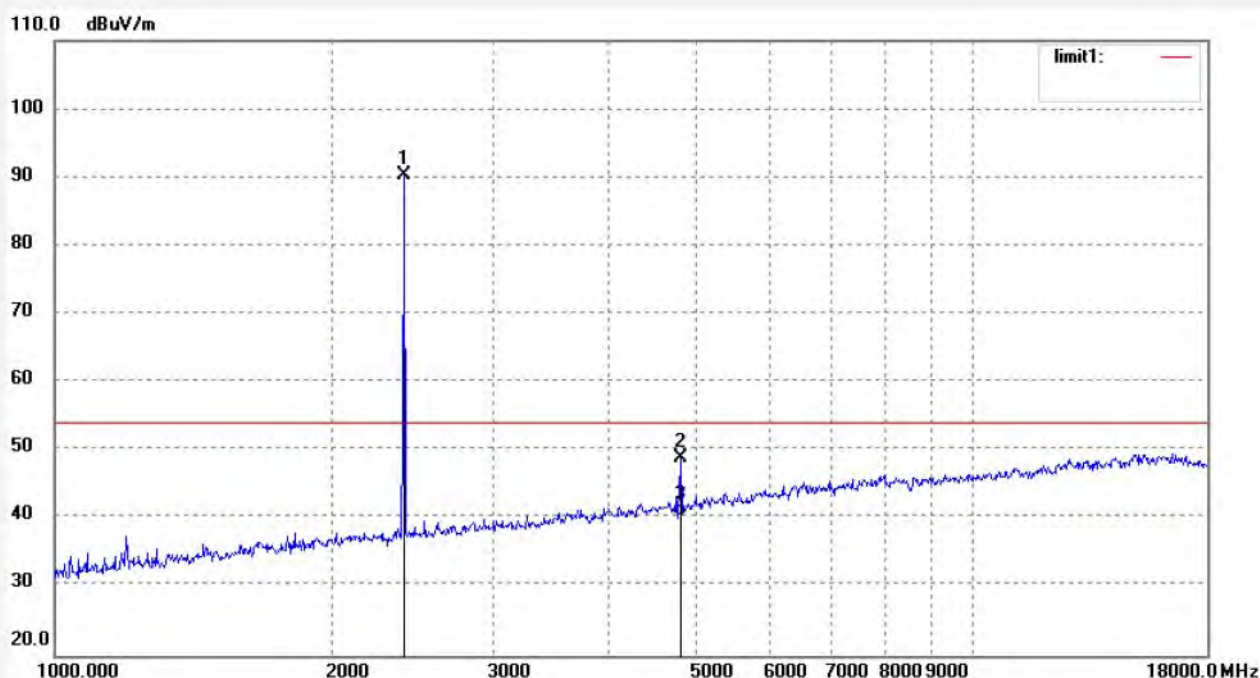
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	89.53	0.89	90.42	/	/	peak			
2	4804.028	41.54	7.40	48.94	74.00	-25.06	peak			
3	4804.028	32.95	7.40	40.35	54.00	-13.65	AVG			



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Site: 2# Chamber

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Fax:+86-0755-26503396

Job No.: LGW2019 #1479

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2441MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal

Power Source: DC 3.7V

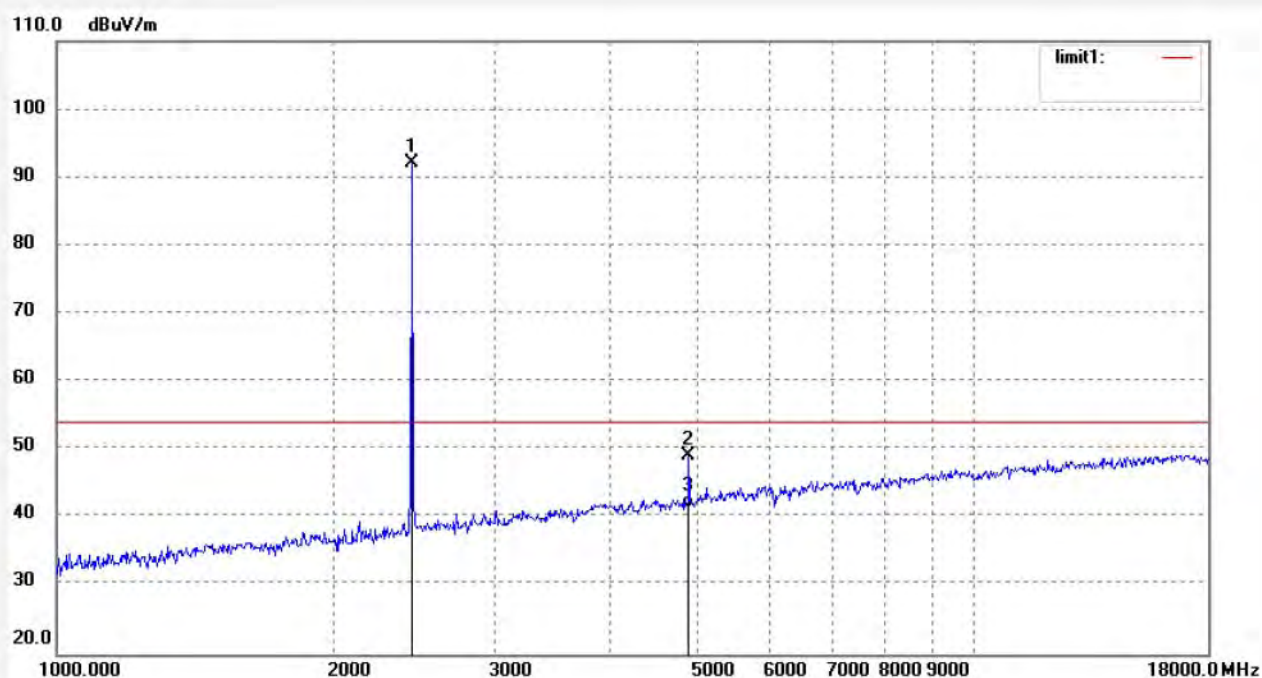
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	91.03	1.06	92.09	/	/	peak			
2	4882.028	41.02	8.11	49.13	74.00	-24.87	peak			
3	4882.028	33.46	8.11	41.57	54.00	-12.43	AVG			



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Site: 2# Chamber

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Fax:+86-0755-26503396

Job No.: LGW2019 #1480

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2441MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical

Power Source: DC 3.7V

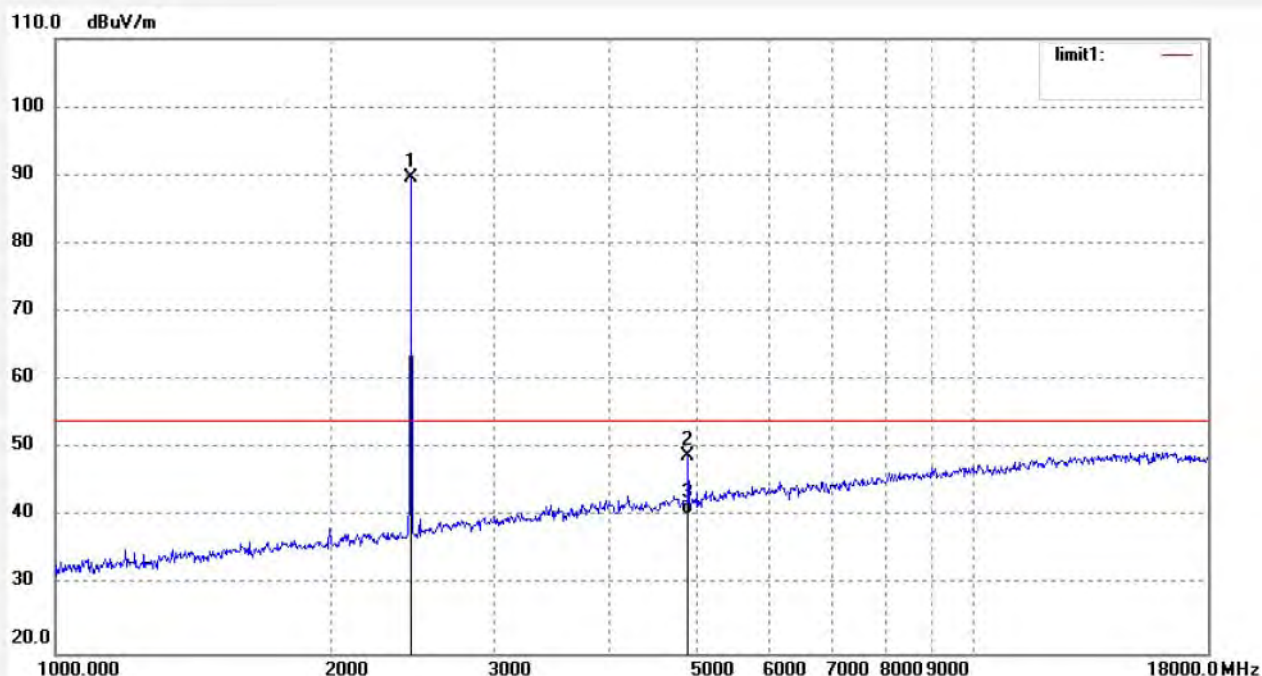
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	88.50	1.06	89.56	/	/	peak			
2	4882.026	40.86	8.11	48.97	74.00	-25.03	peak			
3	4882.026	32.26	8.11	40.37	54.00	-13.63	AVG			



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Fax:+86-0755-26503396

Job No.: LGW2019 #1482

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2480MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal

Power Source: DC 3.7V

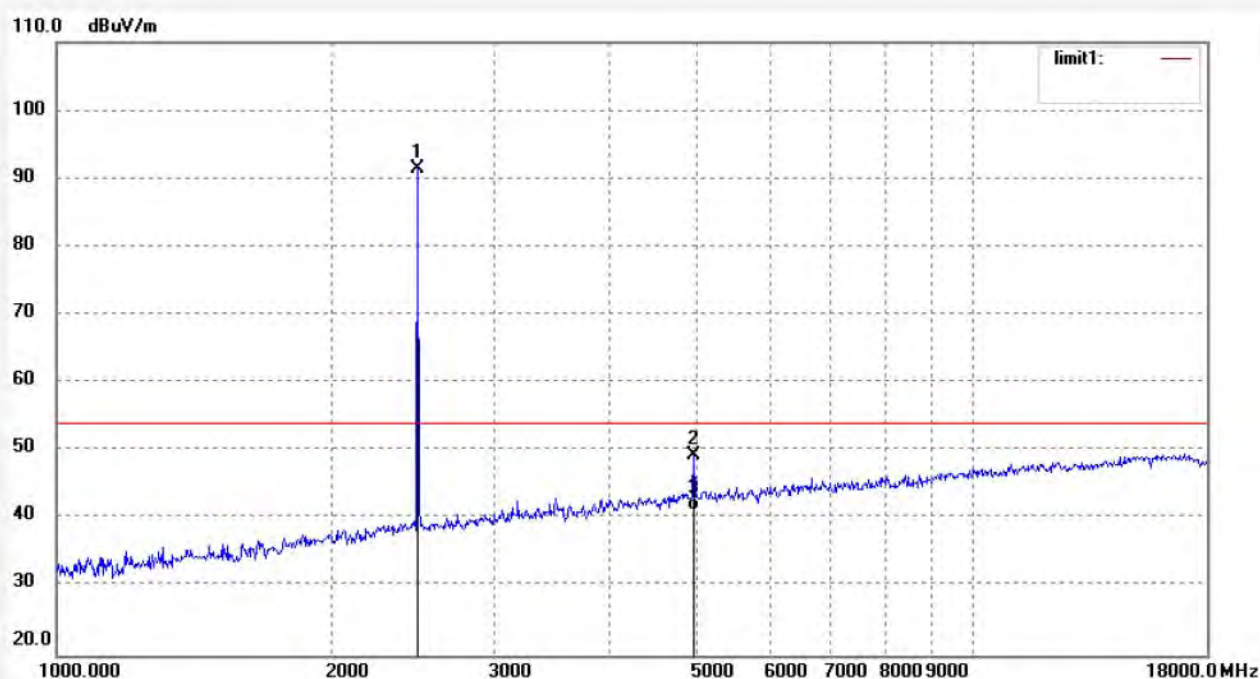
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	90.23	1.10	91.33	/	/	peak			
2	4960.029	40.76	8.60	49.36	74.00	-24.64	peak			
3	4960.029	32.71	8.60	41.31	54.00	-12.69	AVG			



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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1481

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2480MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical

Power Source: DC 3.7V

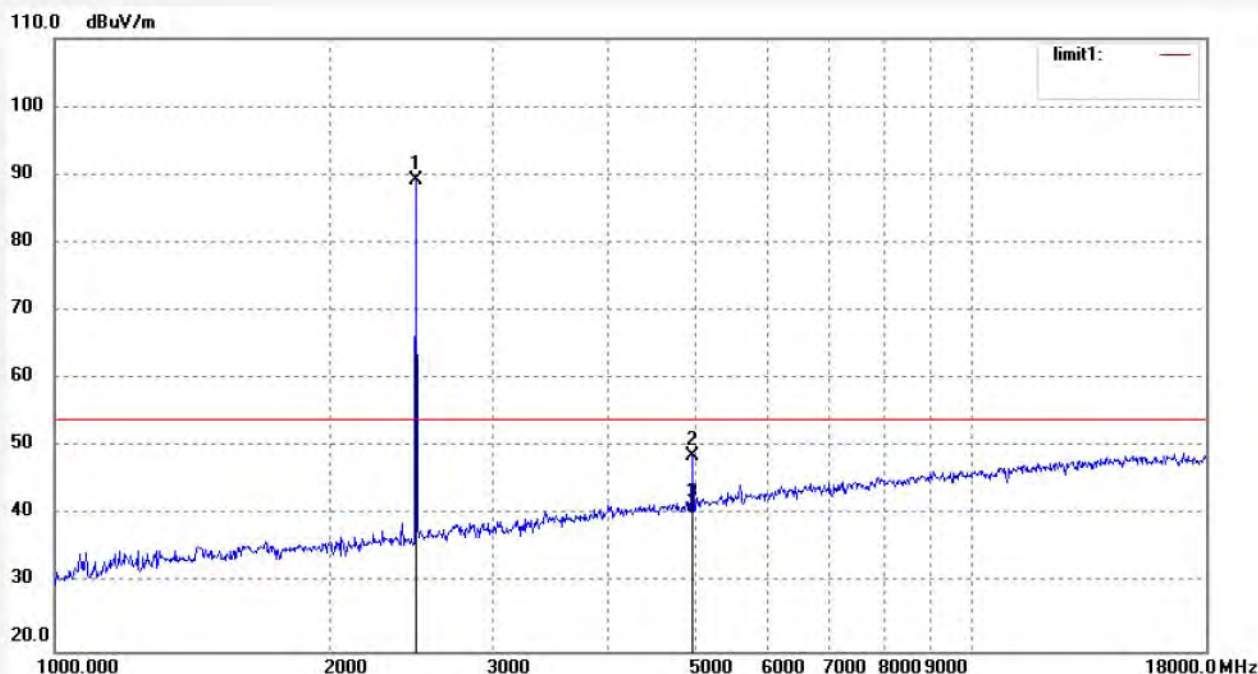
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	88.17	1.10	89.27	/	/	peak			
2	4960.029	40.17	8.60	48.77	74.00	-25.23	peak			
3	4960.029	31.64	8.60	40.24	54.00	-13.76	AVG			

18GHz-26.5GHz test data



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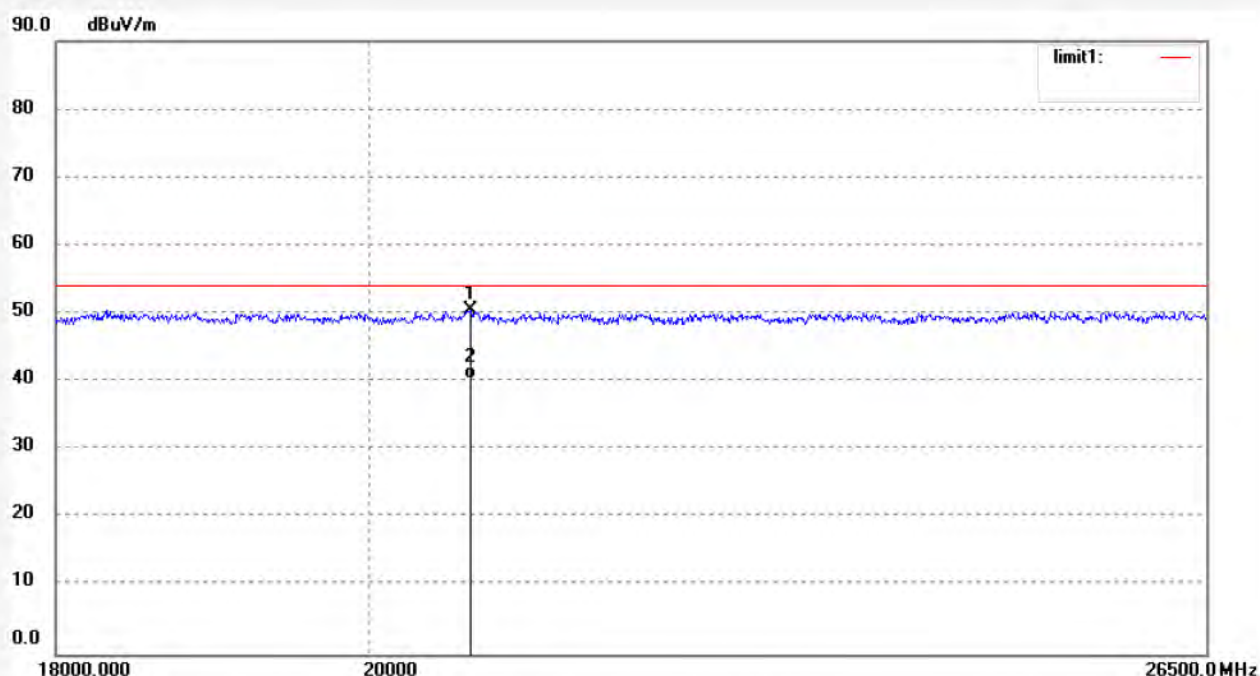
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2019 #1486
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2402MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	20697.166	19.09	31.33	50.42	74.00	-23.58	peak			
2	20697.166	9.02	31.33	40.35	54.00	-13.65	AVG			



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Fax:+86-0755-26503396

Job No.: LGW2019 #1485

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2402MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical

Power Source: DC 3.7V

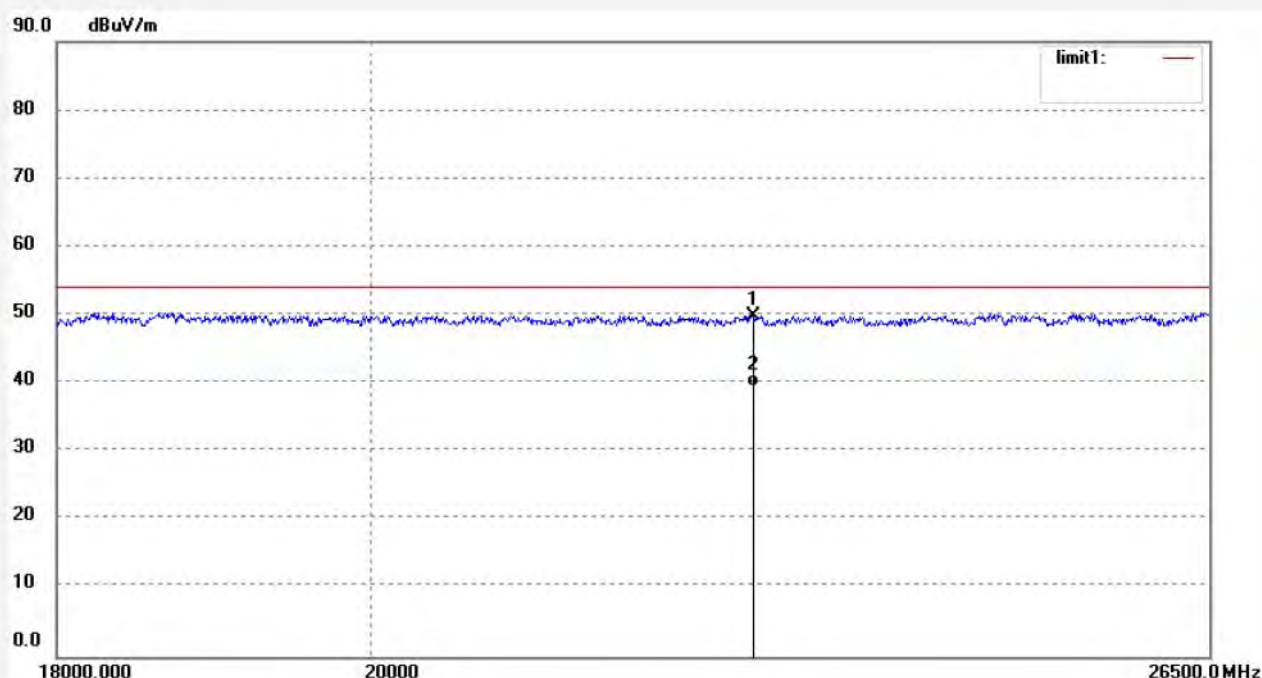
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22736.752	17.63	32.24	49.87	74.00	-24.13	peak			
2	22736.752	7.31	32.24	39.55	54.00	-14.45	AVG			



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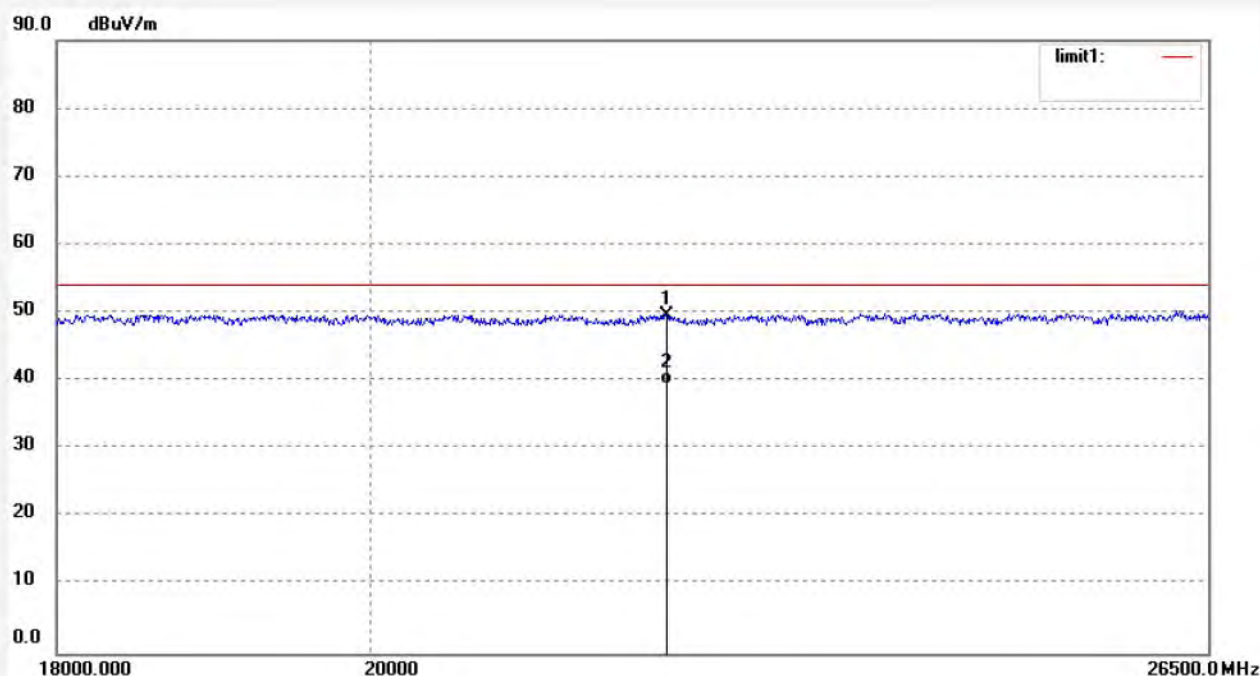
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1487
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2441MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22095.223	17.45	32.24	49.69	74.00	-24.31	peak			
2	22095.223	7.21	32.24	39.45	54.00	-14.55	AVG			



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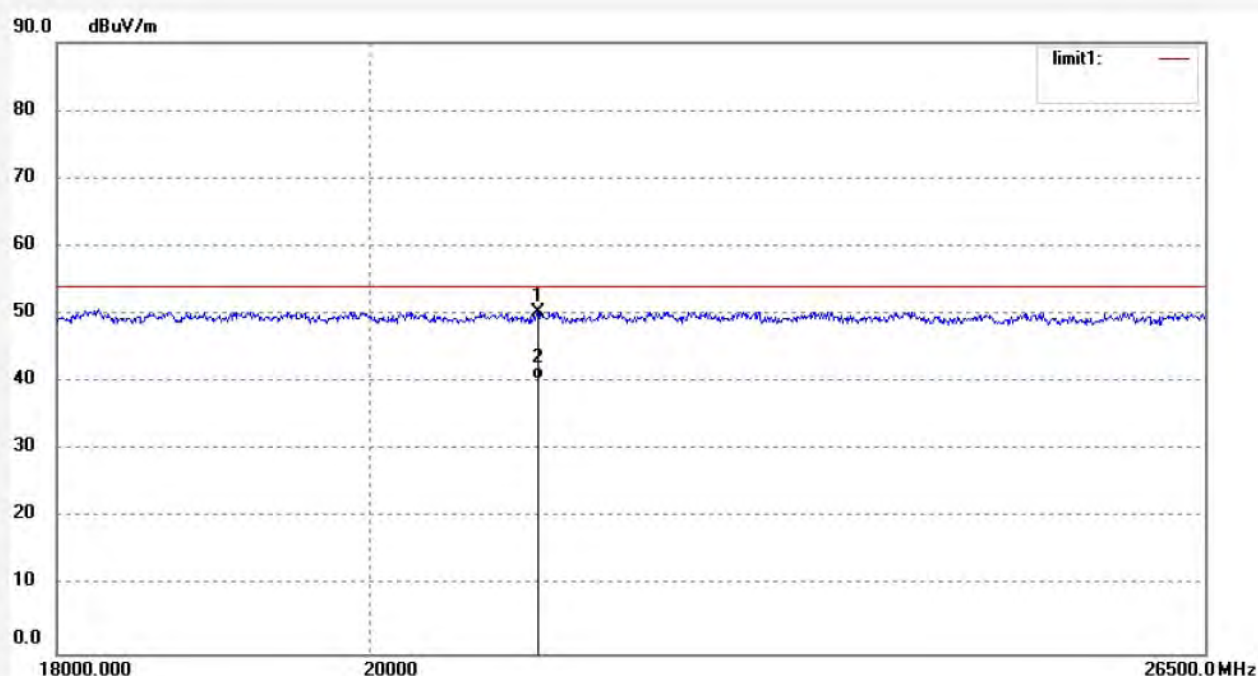
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1488
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2441MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21166.709	17.96	32.29	50.25	74.00	-23.75	peak			
2	21166.709	8.05	32.29	40.34	54.00	-13.66	AVG			



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Fax:+86-0755-26503396

Job No.: LGW2019 #1490

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2480MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal

Power Source: DC 3.7V

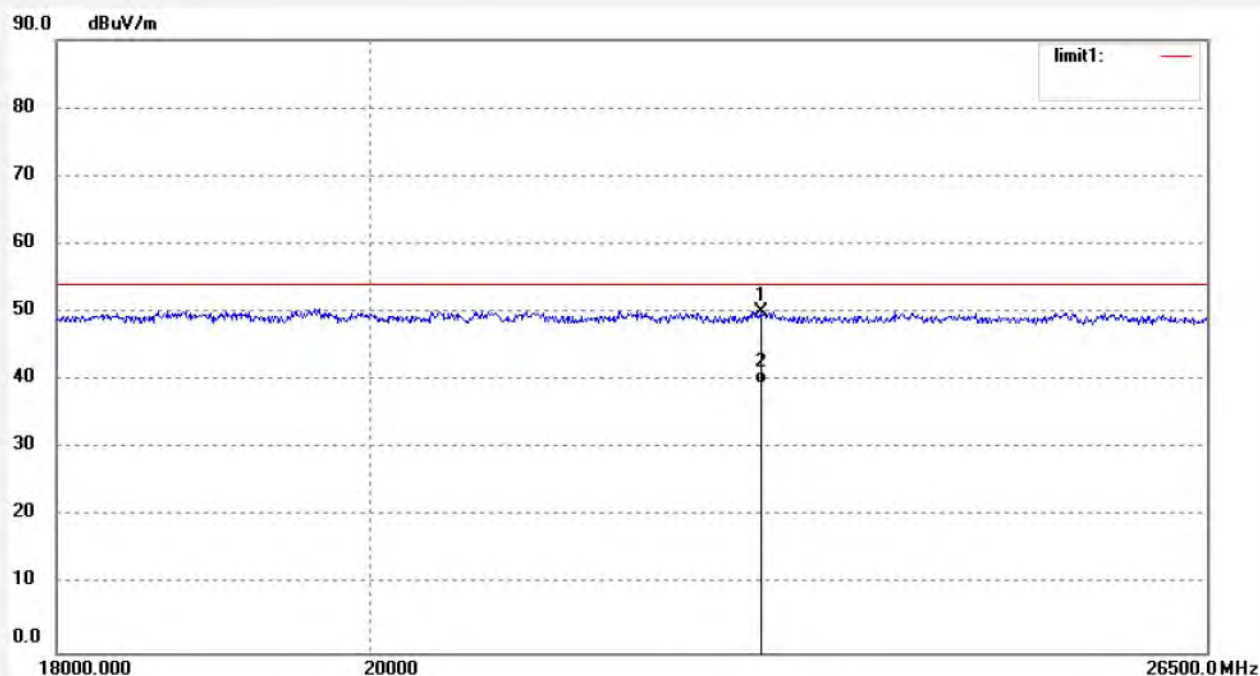
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22816.035	17.67	32.31	49.98	74.00	-24.02	peak			
2	22816.035	7.14	32.31	39.45	54.00	-14.55	AVG			



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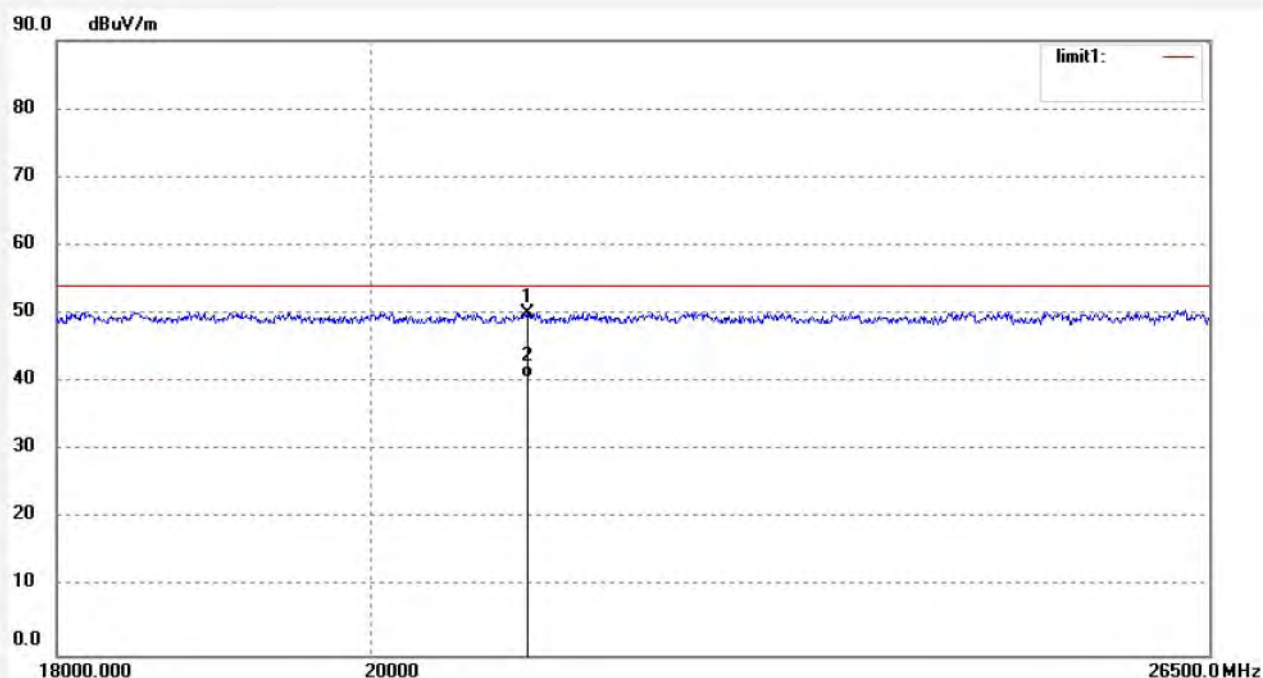
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1489
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2480MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

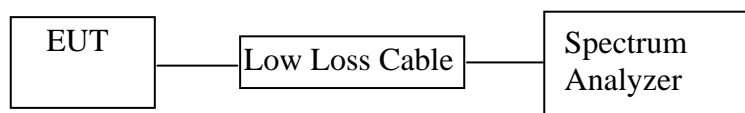
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21076.847	17.77	32.33	50.10	74.00	-23.90	peak			
2	21076.847	8.24	32.33	40.57	54.00	-13.43	AVG			

11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



11.2.The Requirement For Section 15.247(d)

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

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

11.4.1.Setup the EUT and simulator as shown as Section 11.1.

11.4.2.Turn on the power of all equipment.

11.4.3.Let the EUT work in TX (Hopping off, Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

11.5.Test Procedure

11.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

11.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with convenient frequency span including 100 kHz bandwidth from band edge.

11.5.3.The band edges was measured and recorded.

11.6.Test Result

Non-hopping mode

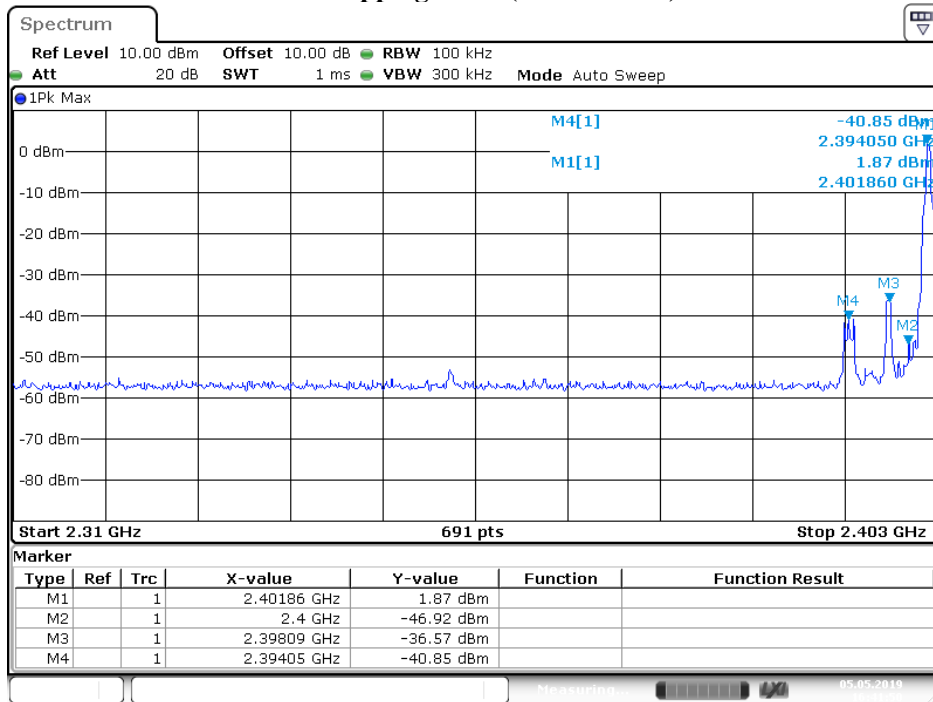
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)	Result
GFSK mode			
2400.00	38.44	> 20dBc	Pass
2483.50	47.09	> 20dBc	Pass
$\pi/4$ DQPSK mode			
2400.00	38.37	> 20dBc	Pass
2483.50	47.09	> 20dBc	Pass

Hopping mode

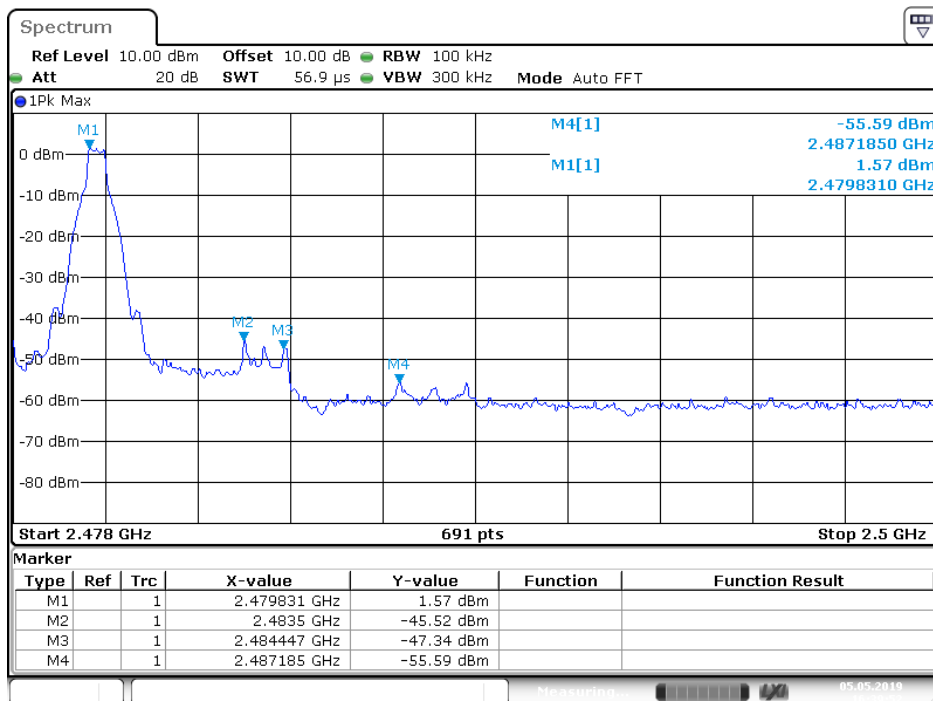
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)	Result
GFSK mode			
2400.00	38.67	> 20dBc	Pass
2483.94	49.04	> 20dBc	Pass
$\pi/4$ DQPSK mode			
2400.00	40.44	> 20dBc	Pass
2483.91	47.53	> 20dBc	Pass

The spectrum analyzer plots are attached as below.

Non-hopping mode (GFSK Mode)

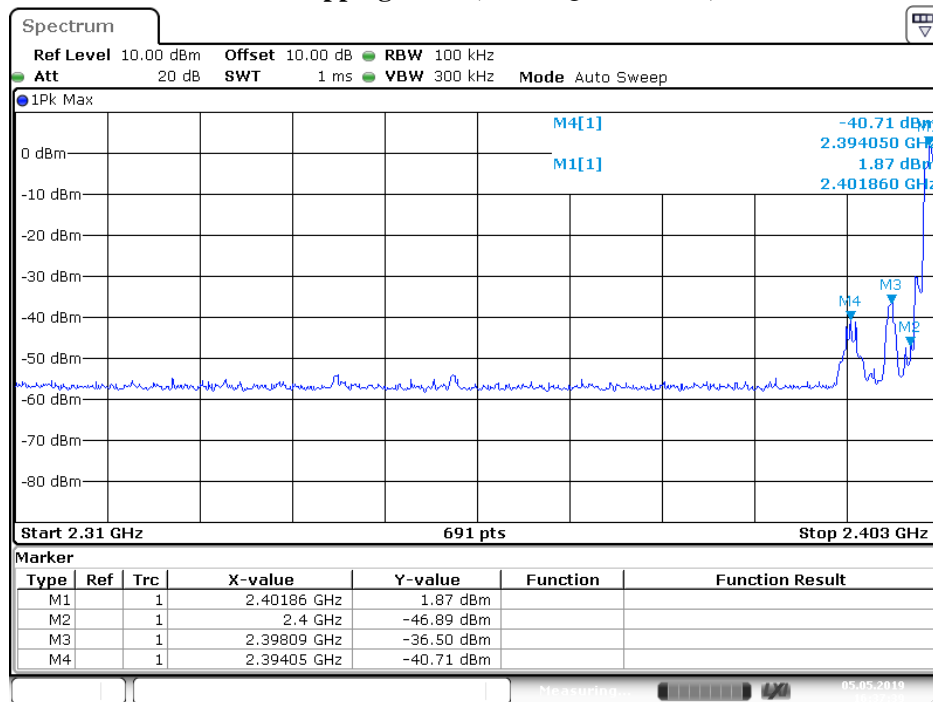


Date: 5.MAY.2019 16:41:50

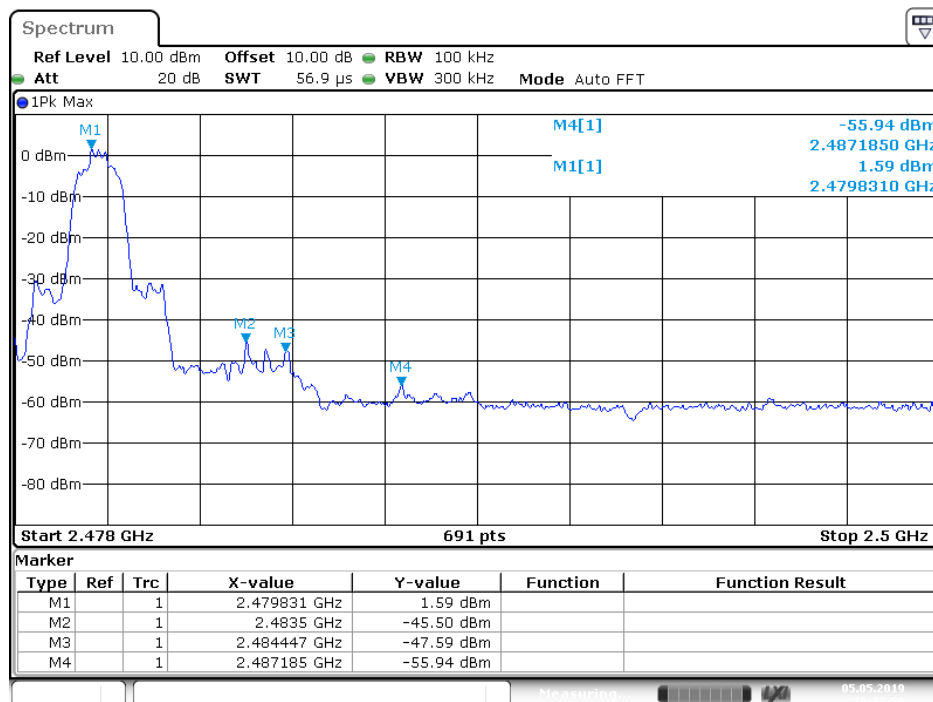


Date: 5.MAY.2019 16:39:52

Non-hopping mode ($\pi/4$ DQPSK Mode)

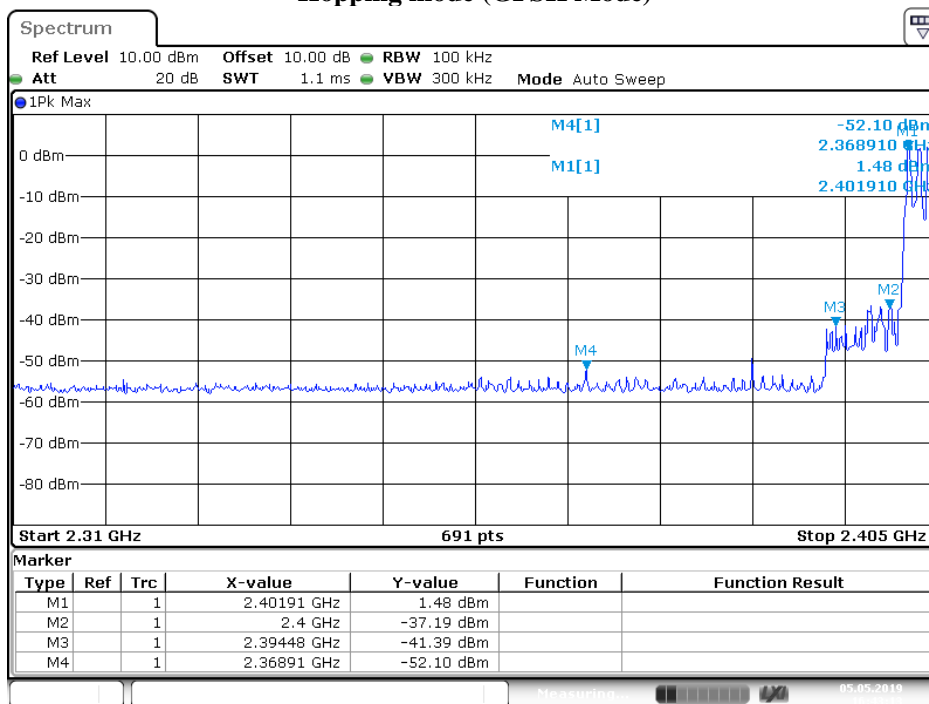


Date: 5.MAY.2019 16:37:39

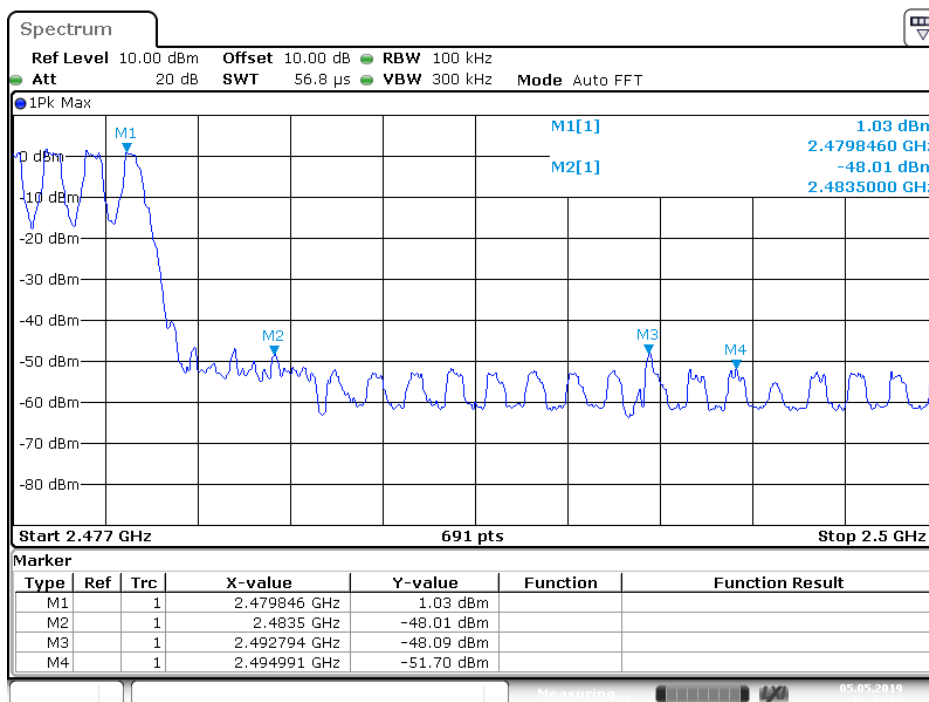


Date: 5.MAY.2019 16:38:55

Hopping mode (GFSK Mode)

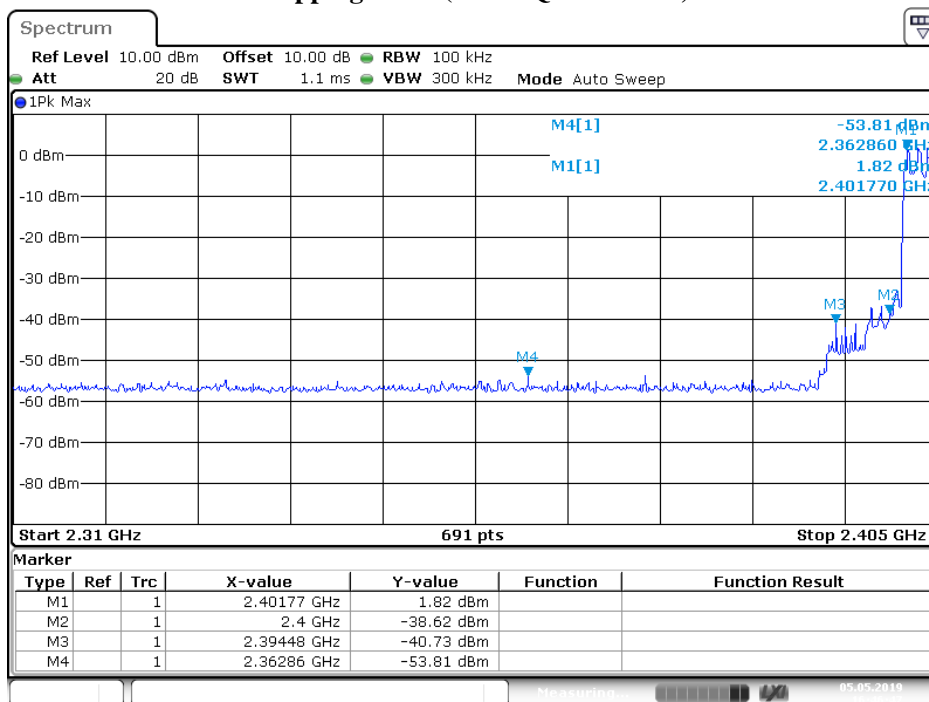


Date: 5.MAY.2019 16:43:12

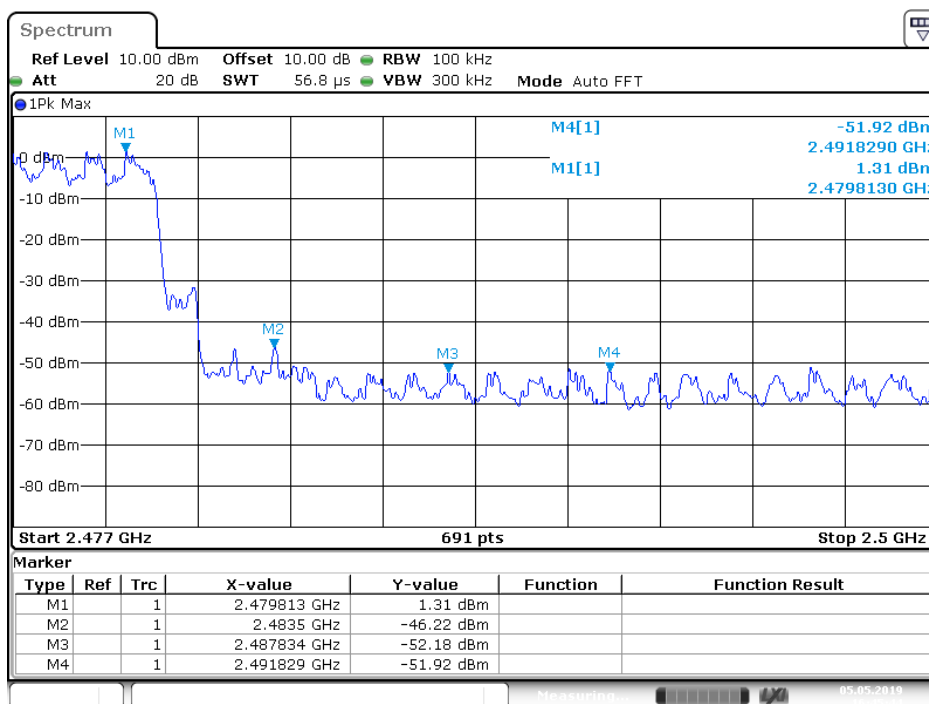


Date: 5.MAY.2019 16:44:30

Hopping mode ($\pi/4$ DQPSK Mode)



Date: 5.MAY.2019 16:46:47



Date: 5.MAY.2019 16:45:44

Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:
Result = Reading + Corrected Factor
3. Display the measurement of peak values.

Test Procedure:

The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Let the EUT work in TX (Hopping off, Hopping on) modes measure it.
We select 2402MHz, 2480MHz TX frequency to transmit(Hopping off mode).
We select 2402-2480MHz TX frequency to transmit(Hopping on mode).

During the radiated emission test, the spectrum analyzer was set with the following configurations:

- 1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
- 2.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- 3.All modes of operation were investigated and the worse case($\pi/4$ DQPSK Mode) emissions are reported.

Non-hopping mode



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Site: 2# Chamber

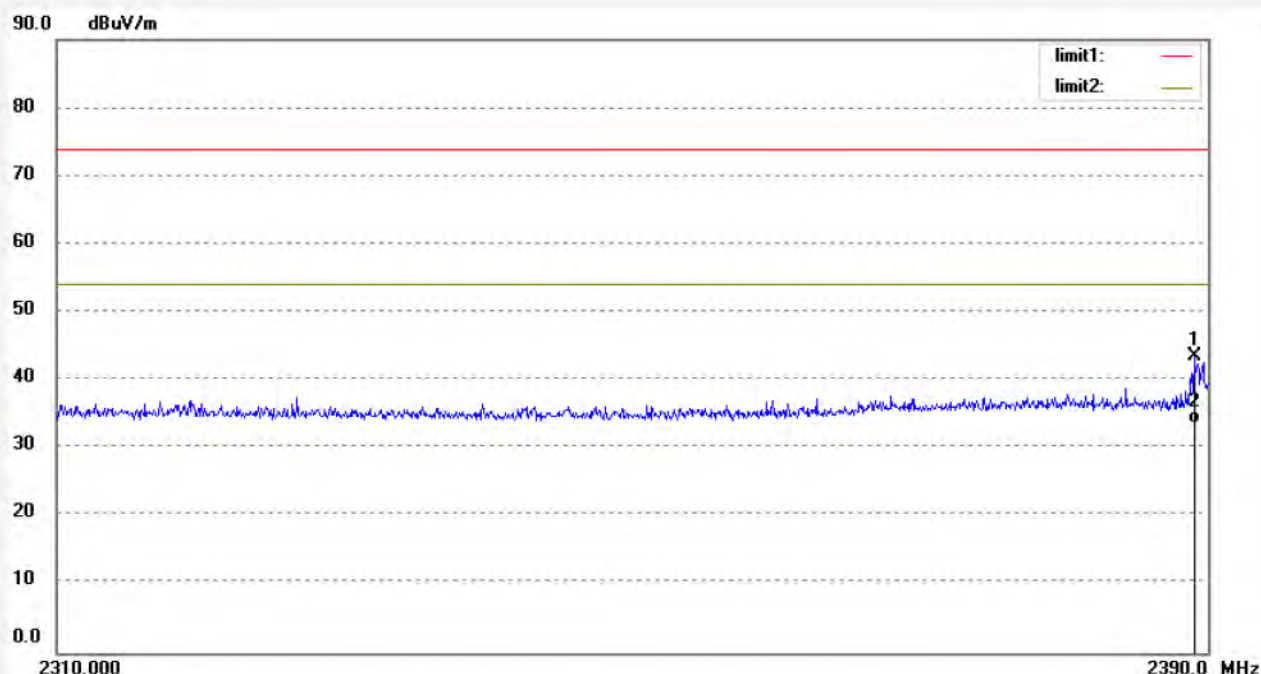
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1478
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2402MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2389.040	42.64	0.79	43.43	74.00	-30.57	peak			
2	2389.040	32.89	0.79	33.68	54.00	-20.32	AVG			



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Site: 2# Chamber

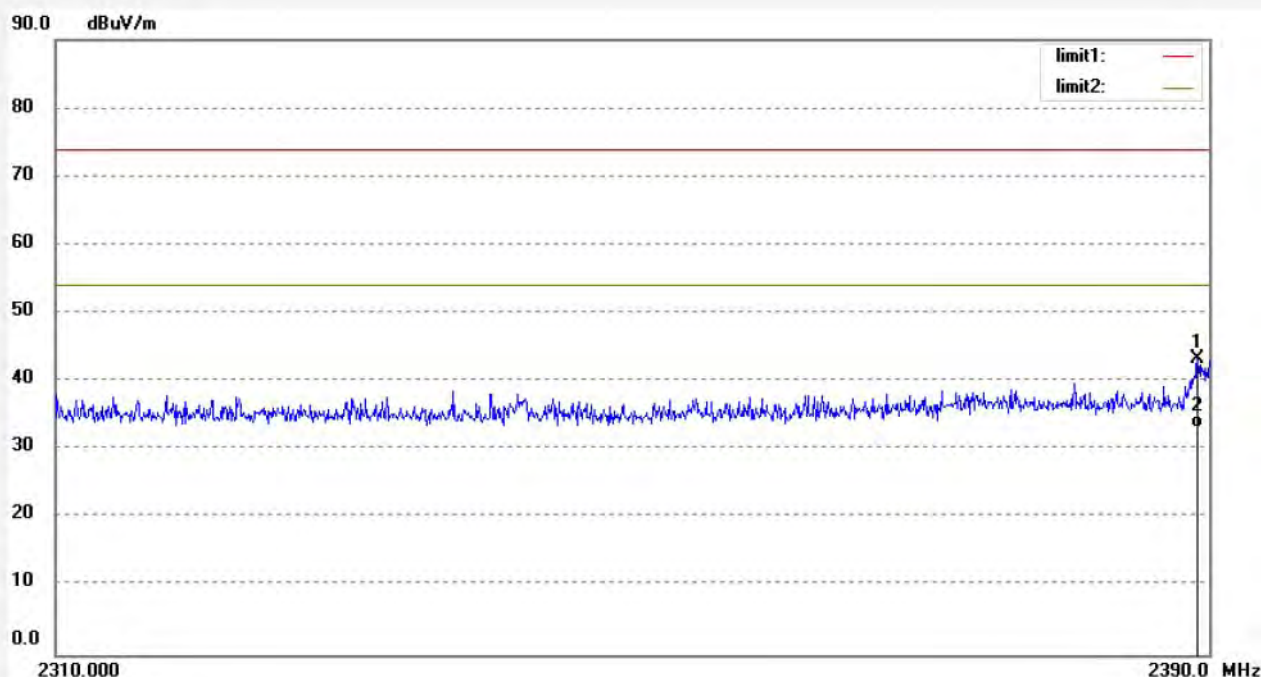
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1477
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2402MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2389.200	42.63	0.79	43.42	74.00	-30.58	peak			
2	2389.200	32.45	0.79	33.24	54.00	-20.76	AVG			



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Site: 2# Chamber

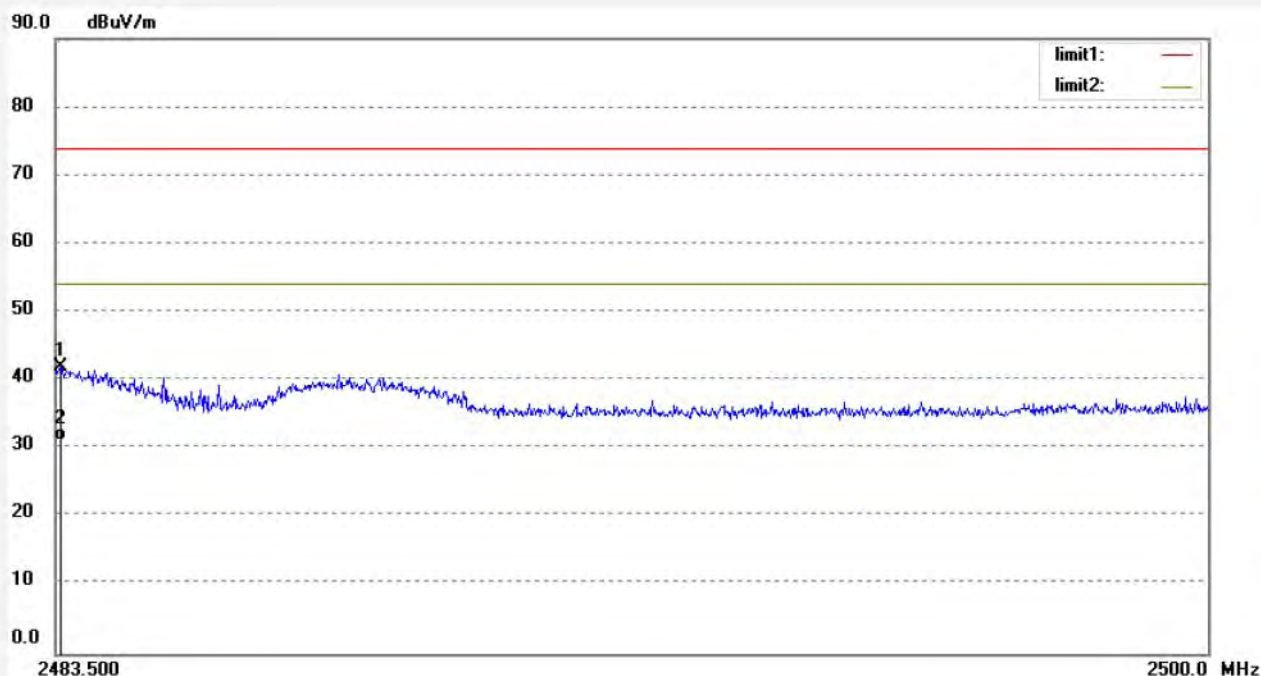
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1483
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: WIRELESS HEADPHONES
Mode: TX 2480MHz
Model: WIRLSHPWHPRM-FOB
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/05/05/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.582	40.86	1.10	41.96	74.00	-32.04	peak			
2	2483.582	30.14	1.10	31.24	54.00	-22.76	AVG			



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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2019 #1484

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: WIRELESS HEADPHONES

Mode: TX 2480MHz

Model: WIRLSHPWHPRM-FOB

Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical

Power Source: DC 3.7V

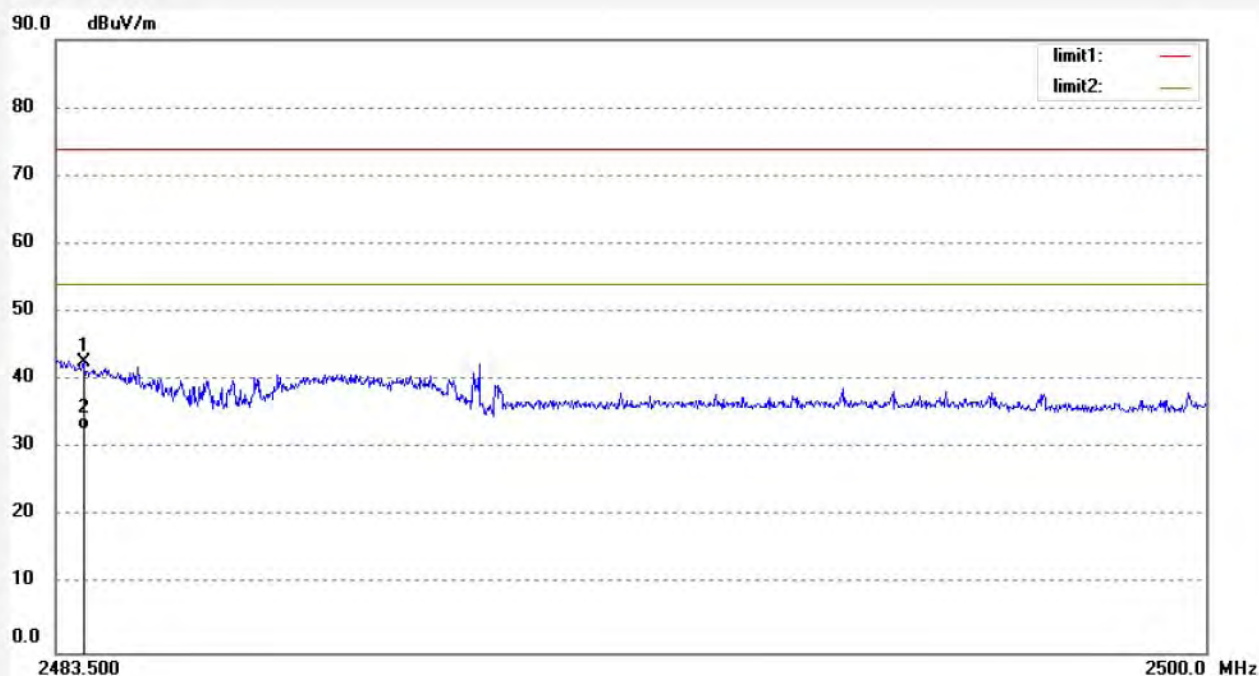
Date: 19/05/05/

Time:

Engineer Signature: WADE

Distance: 3m

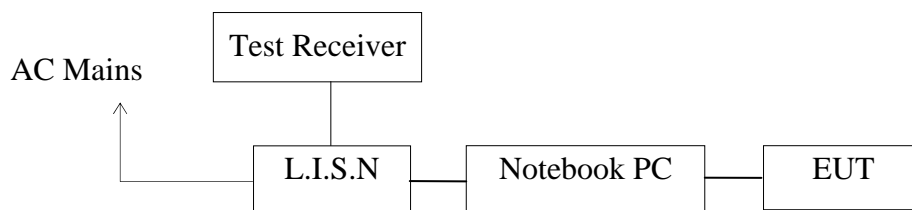
Note:



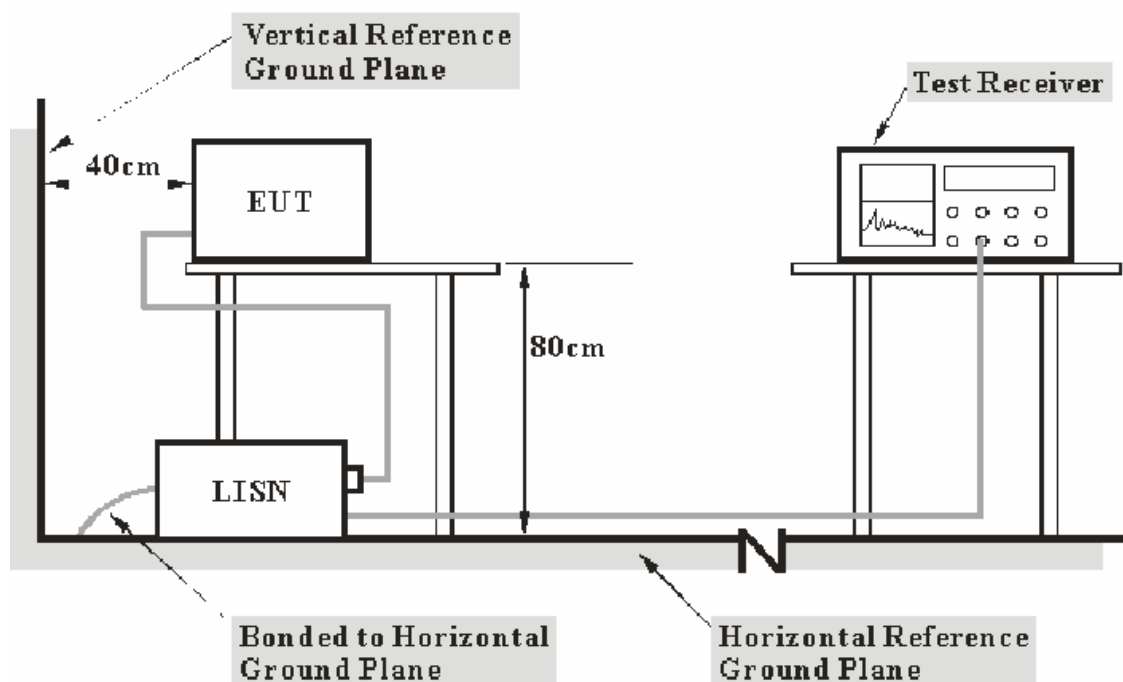
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.896	41.66	1.09	42.75	74.00	-31.25	peak			
2	2483.896	31.55	1.09	32.64	54.00	-21.36	AVG			

12.AC POWER LINE CONDUCTED EMISSION TEST

12.1.Block Diagram of Test Setup



12.2.Test System Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

12.3.Test Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies.		
NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

12.4.Configuration of EUT on Measurement

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

12.5.Operating Condition of EUT

12.5.1.Setup the EUT and simulator as shown as Section 12.1.

12.5.2.Turn on the power of all equipment.

12.5.3.Let the EUT work in test mode and measure it.

12.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2014 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

12.7.Data Sample

Frequency (MHz)	Transducer value (dB)	QuasiPeak Level (dBμV)	Average Level (dBμV)	QuasiPeak Limit (dBμV)	Average Limit (dBμV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	10.5	51.1	34.2	56.0	46.0	4.9	11.8	Pass

Frequency(MHz) = Emission frequency in MHz

Transducer value(dB) = Insertion loss of LISN + Cable Loss

Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

Margin = Limit (dBμV) - Level (dBμV)

12.8.Test Result

Pass.

The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

The spectral diagrams are attached as below.

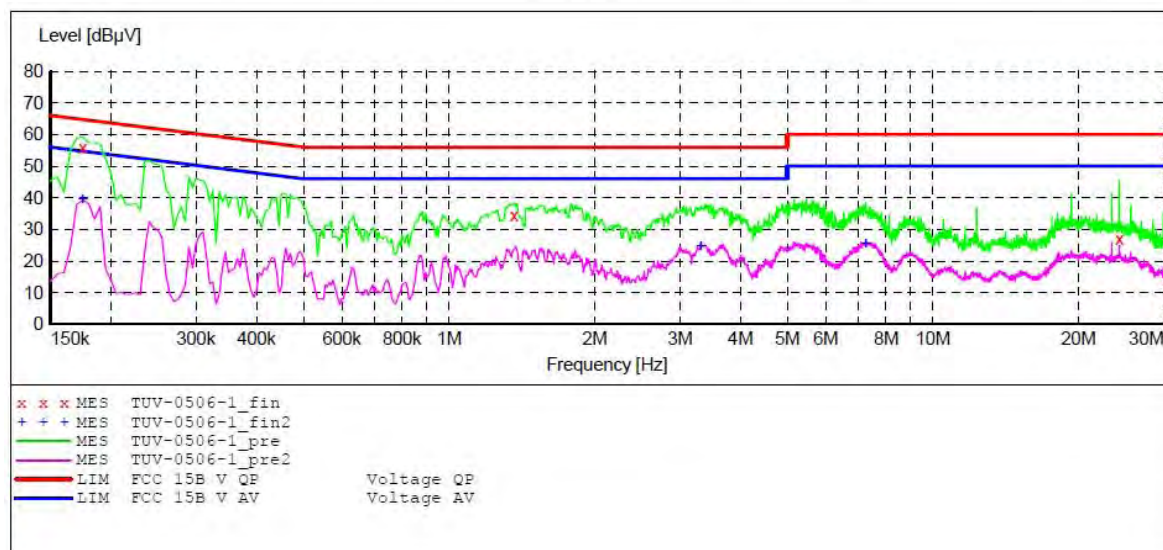
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CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK(UK) LTD
 Operating Condition: BT Communication
 Test Site: 1#Shielding Room
 Operator: WADE
 Test Specification: N 120V/60Hz
 Comment: Mains port
 Start of Test: 5/6/2019 /

SCAN TABLE: "V 9K-30MHz fin"

Short Description:		_SUB_STD VTERM2 1.70					
Start	Stop	Step	Detector	Meas.	IF	Transducer	
Frequency	Frequency	Width		Time	Bandw.		
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	NSLK8126 2008	
			Average				
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	NSLK8126 2008	
			Average				



MEASUREMENT RESULT: "TUV-0506-1_fin"

5/6/2019

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.175000	55.70	10.5	65	9.0	QP	N	GND
1.360000	34.50	10.9	56	21.5	QP	N	GND
24.295000	27.10	11.5	60	32.9	QP	N	GND

MEASUREMENT RESULT: "TUV-0506-1_fin2"

5/6/2019

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.175000	39.50	10.5	55	15.2	AV	N	GND
3.310000	24.80	11.1	46	21.2	AV	N	GND
7.260000	25.60	11.2	50	24.4	AV	N	GND

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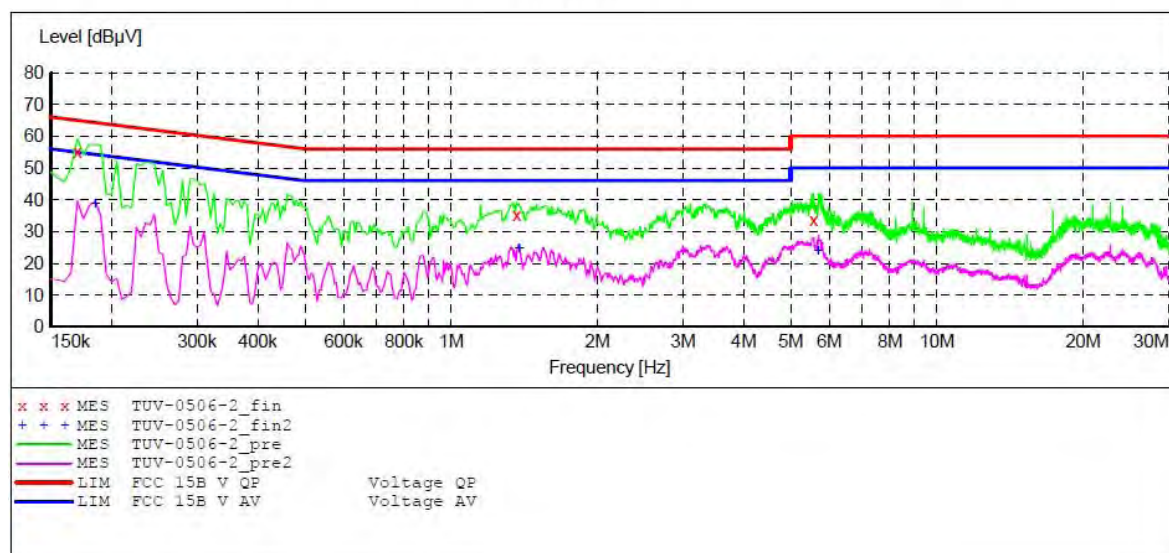
CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: WIRELESS HEADPHONES M/N:WIRLSHPWHPRM-FOB
 Manufacturer: THUMBS UK (UK) LTD
 Operating Condition: BT Communication
 Test Site: 1#Shielding Room
 Operator: WADE
 Test Specification: L 120V/60Hz
 Comment: Mains port
 Start of Test: 5/6/2019 /

SCAN TABLE: "V 9K-30MHz fin"

Short Description: SUB STD VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	NSLK8126 2008
			Average			
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	NSLK8126 2008
			Average			



MEASUREMENT RESULT: "TUV-0506-2_fin"

5/6/2019

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.170000	55.00	10.5	65	10.0	QP	L1	GND
1.365000	35.10	10.9	56	20.9	QP	L1	GND
5.570000	33.50	11.2	60	26.5	QP	L1	GND

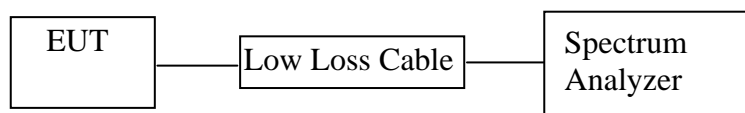
MEASUREMENT RESULT: "TUV-0506-2_fin2"

5/6/2019

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.185000	38.70	10.5	54	15.6	AV	L1	GND
1.380000	24.80	10.9	46	21.2	AV	L1	GND
5.700000	23.80	11.2	50	26.2	AV	L1	GND

13.CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

13.1.Block Diagram of Test Setup



13.2.The Requirement For Section 15.247(d)

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

13.3.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

13.4.Operating Condition of EUT

13.4.1.Setup the EUT and simulator as shown as Section 13.1.

13.4.2.Turn on the power of all equipment.

13.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

13.5.Test Procedure

13.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

13.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz

13.5.3.The Conducted Spurious Emission was measured and recorded.

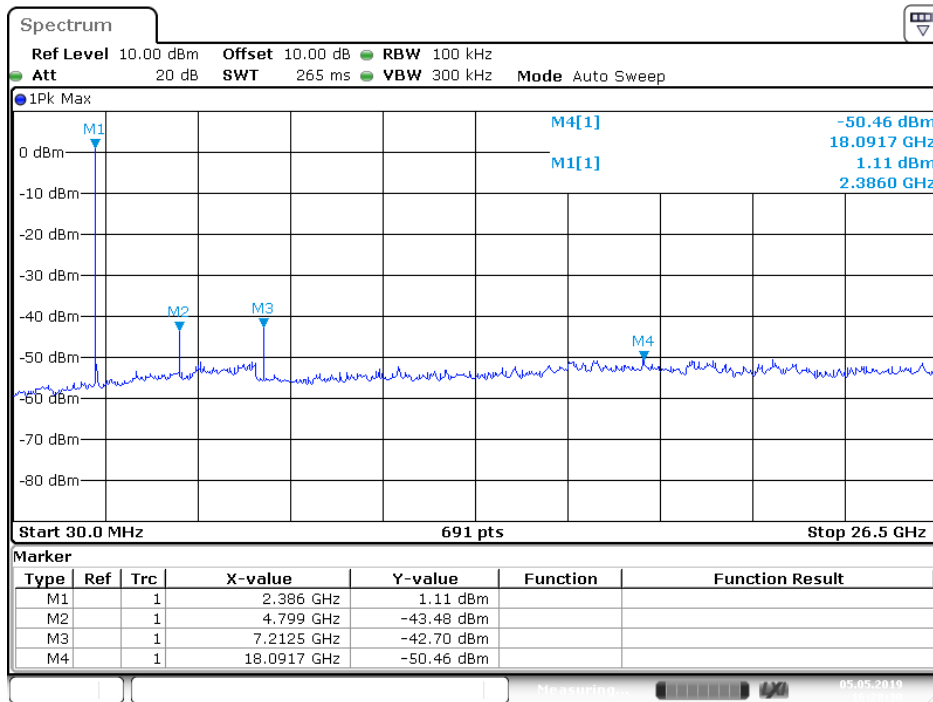
13.6.Test Result

Pass.

The spectrum analyzer plots are attached as below.

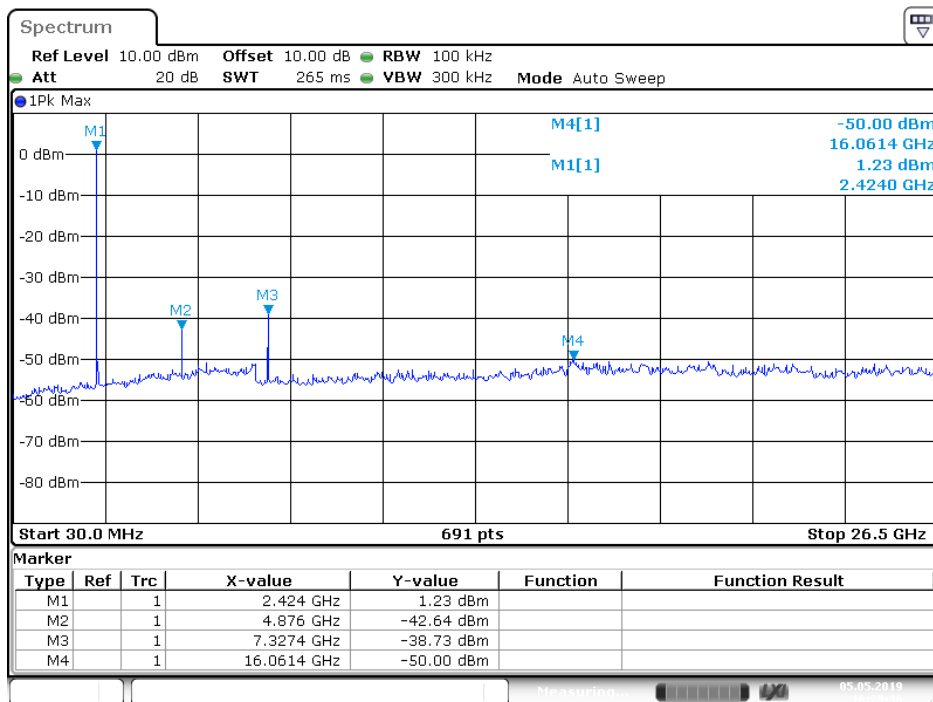
GFSK mode

Low Channel



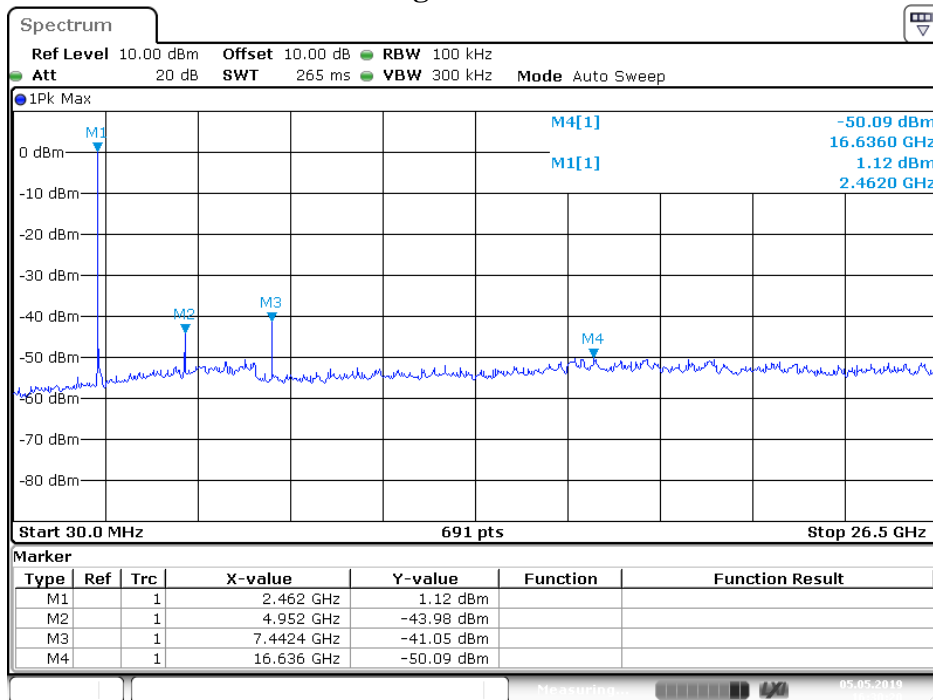
Date: 5.MAY.2019 16:28:30

Middle Channel



Date: 5.MAY.2019 16:29:36

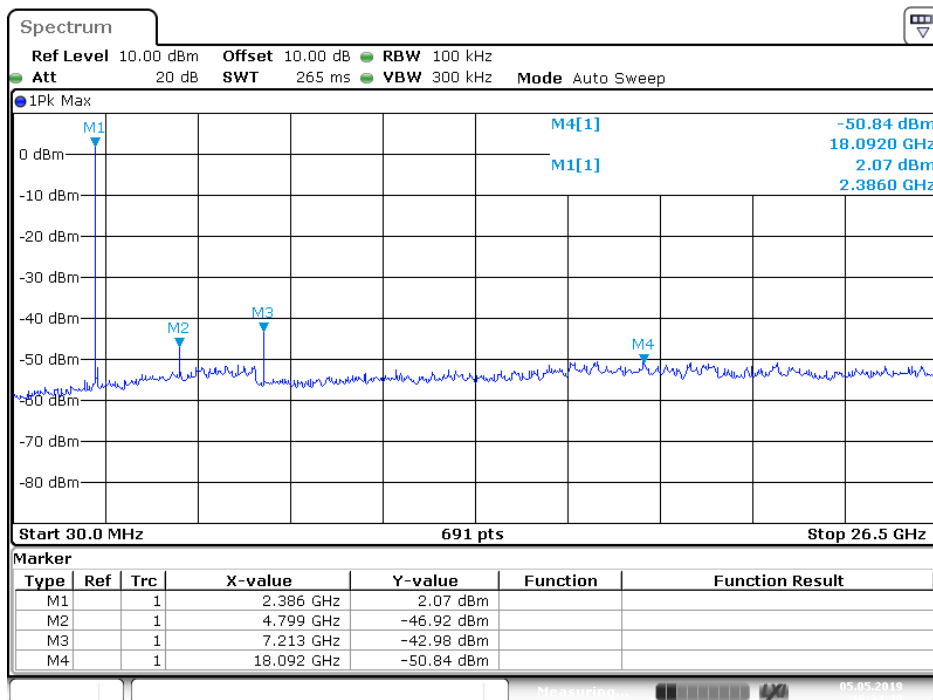
High Channel



Date: 5.MAY.2019 16:30:20

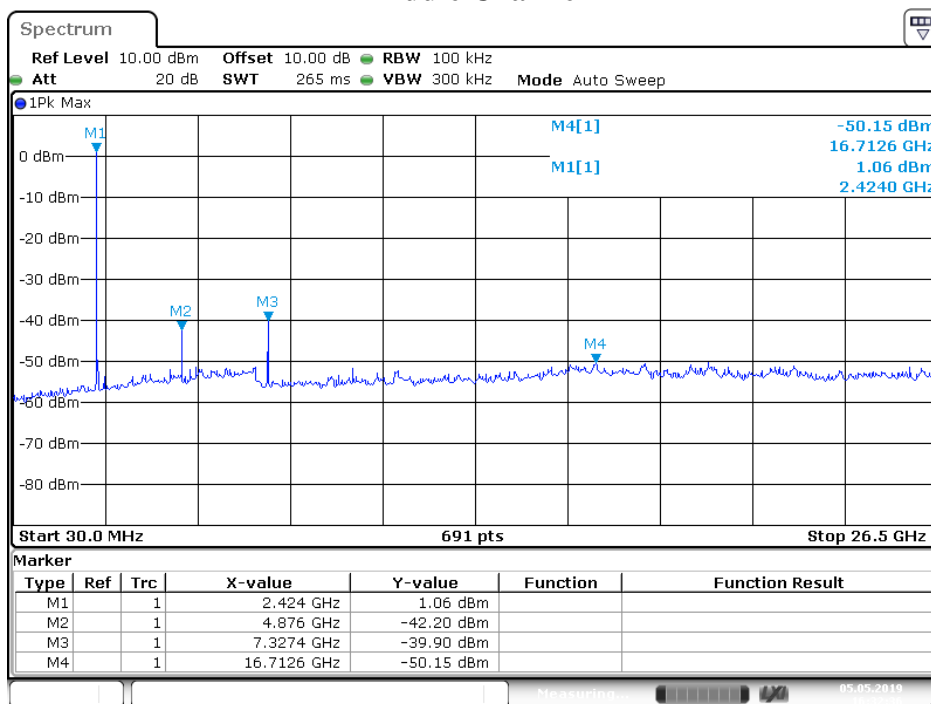
$\pi/4$ DQPSK mode

Low Channel



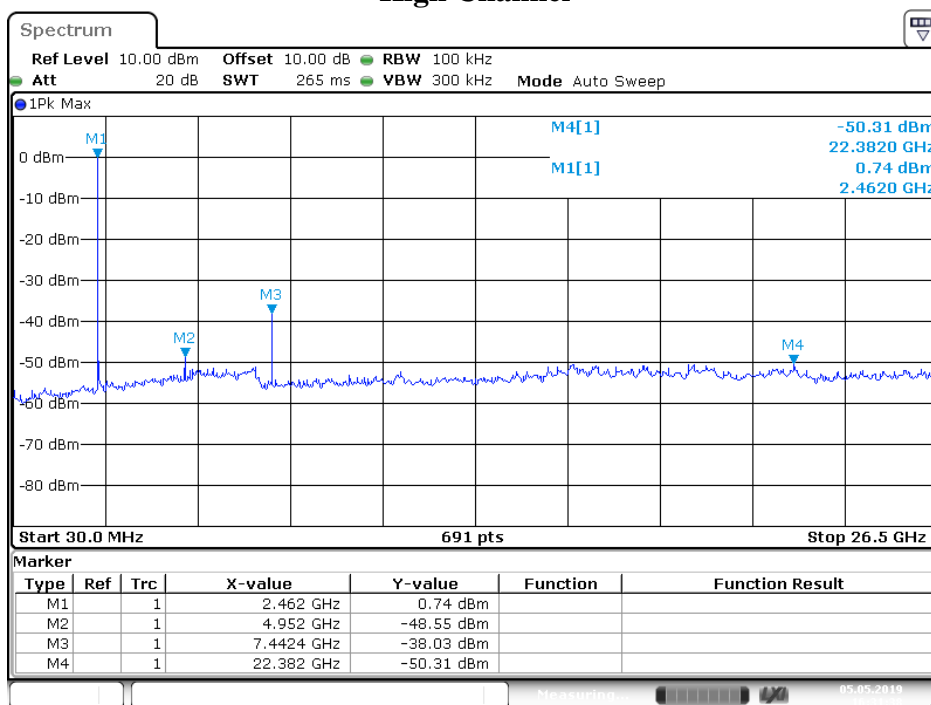
Date: 5.MAY.2019 16:34:48

Middle Channel



Date: 5.MAY.2019 16:32:36

High Channel



Date: 5.MAY.2019 16:31:37

14.ANTENNA REQUIREMENT

14.1.The Requirement

According to 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.

14.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Max Antenna gain of EUT is -0.68dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

******* End of Test Report *******