APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
THUMBS UK(UK)LTD

Bluetooth Neckband Sports Earphones
Model No.: BTNCKEPPKPRM, BTNCKEPBKPRM

FCC ID: 2AHHEBTNCKEPPRM

Prepared for	:	THUMBS UK(UK)LTD
Address	:	Unit L, Braintree Industrial Estate, Braintree Road HA4 0EJ, Ruislip, London, United Kingdom
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
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Report No.	:	ATE20190963
Date of Test	:	June 19-June 24, 2019
Date of Report	:	June 28, 2019

TABLE OF CONTENTS

Description Page

Test Report Certification

Applicant	:	THUMBS UK(UK)LTD
Address	:	Unit L, Braintree Industrial Estate, Braintree Road HA4 0EJ, Ruislip, London, United Kingdom
Product	:	Bluetooth Neckband Sports Earphones
Model No.	:	BTNCKEPPKPRM, BTNCKEPBKPRM

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 :	June 19-June 24, 2019
Date of Report :	June 28, 2019
Prepared by :	(Star Yang, Engineer)
Approved & Authorized Signer :	(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

Product	:	Bluetooth Neckband Sports Earphones
Model Number	:	BTNCKEPPKPRM, BTNCKEPBKPRM (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 BTNCKEPBKPRM 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, π/4 DQPSK
Rating	:	DC 3.7V

1.2.General Disclaimer

The test results presented in this report relate only to the object tested.
The information supplied by the customer can affect the validity of results.

1.3.Accessory and Auxiliary Equipment

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

1.4.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 (ISEDC) 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

1.5.Measurement Uncertainty

Radiated Emission Expanded Uncertainty (9kHz-30MHz)	:	U=2.66dB, k=2
Radiated Emission Expanded Uncertainty (30MHz-1000MHz)	:	U=4.28dB, k=2
Radiated Emission Expanded Uncertainty (1G-18GHz)	:	U=4.98dB, k=2
Radiated Emission Expanded Uncertainty (18G-26.5GHz)	:	U=5.06dB, k=2
Conduction Emission Expanded Uncertainty (Mains ports, 9kHz-30MHz)	:	U=2.72dB, 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 (Radiated Emission)	Compliance Direction	RSU-M2	38322	Jan. 05, 2019	One Year
Pre-Amplifier (Radiated Emission)	Agilent	8447D	294A10619	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-10SS	N/A	Jan. 05, 2019	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 05, 2019	One Year
RF Coaxial Cable (Conducted Emission)	SUHNER	N-2m	No.2	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	RESENBERGER	N-12m	No.11	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	RESENBERGER	N-0.5m	No.12	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-2m	No.13	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-0.5m	No.15	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-2m	No.16	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	RESENBERGER	N-6m	No.17	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

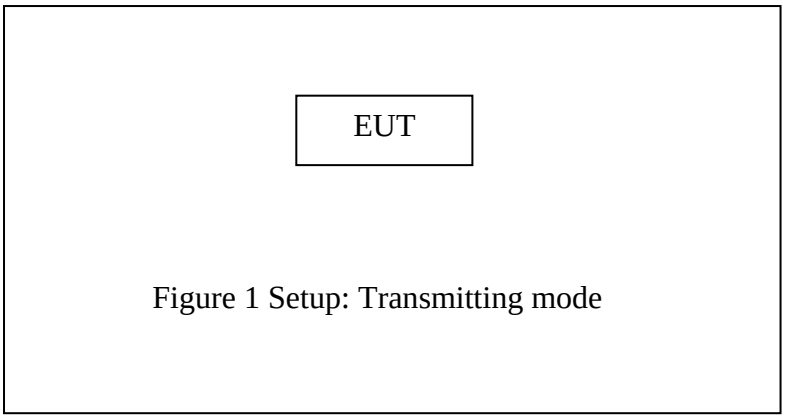


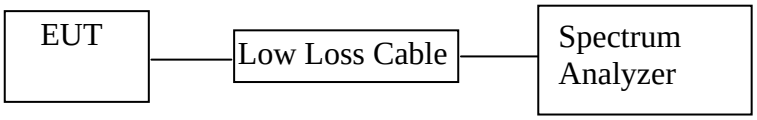
Figure 1 Setup: Transmitting mode

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.Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

5.5.2.The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.

5.5.3.RBW shall be in the range of 1% to 5% of the OBW and VBW shall be approximately three times RBW.

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

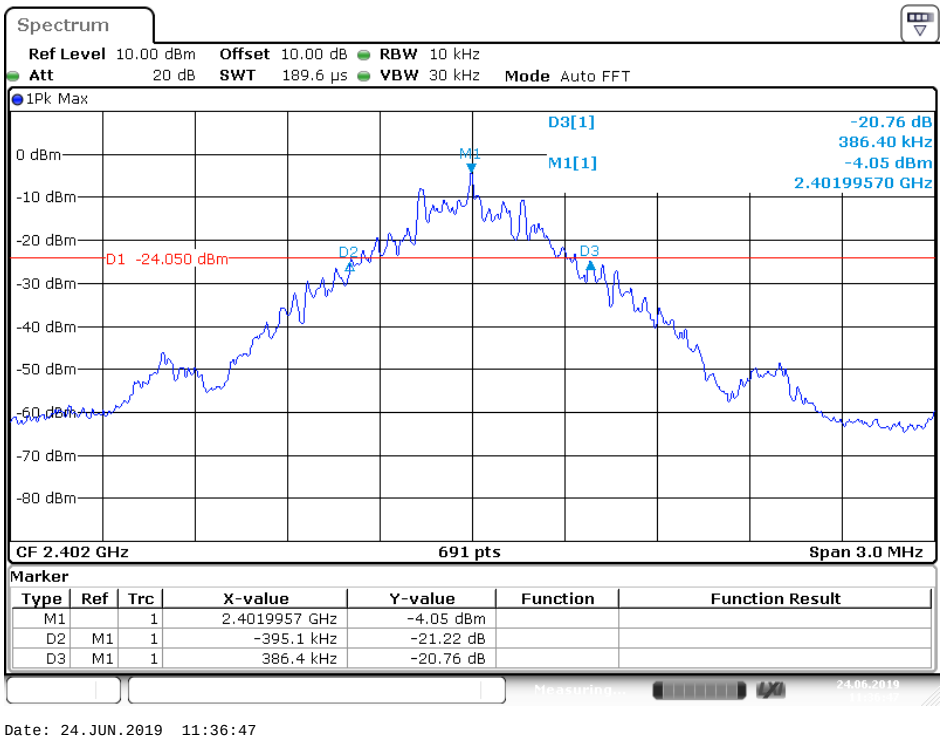
5.6.Test Result

Channel	Frequency (MHz)	GFSK mode 20dB Bandwidth (MHz)	π /4 DQPSK mode 20dB Bandwidth (MHz)	Result
Low	2402	0.782	1.246	Pass
Middle	2441	0.782	1.250	Pass
High	2480	0.782	1.250	Pass

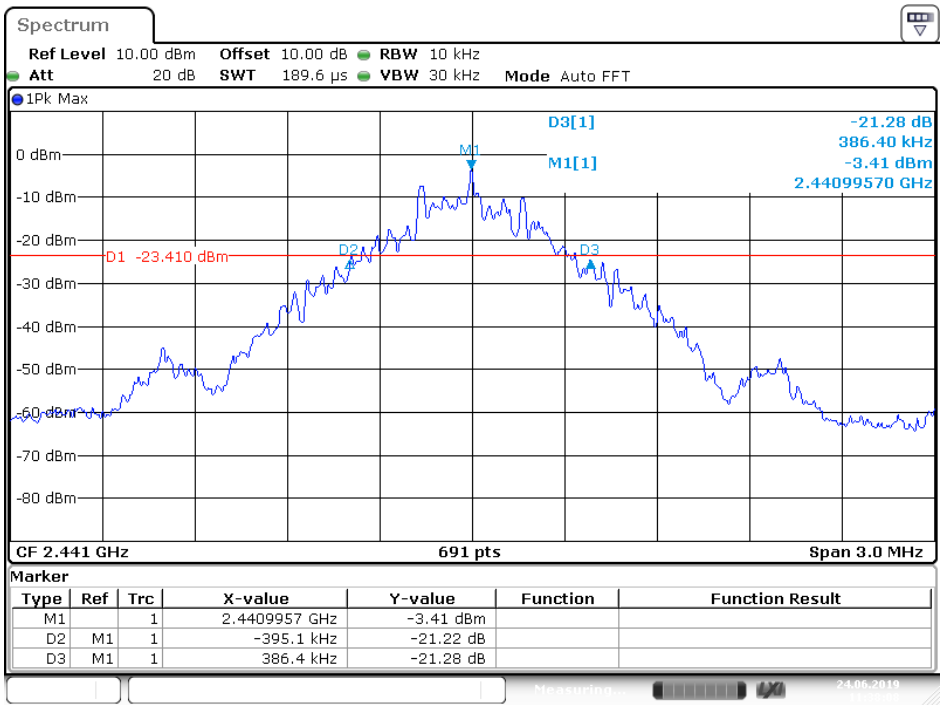
The spectrum analyzer plots are attached as below.

GFSK Mode

Low channel



Middle channel



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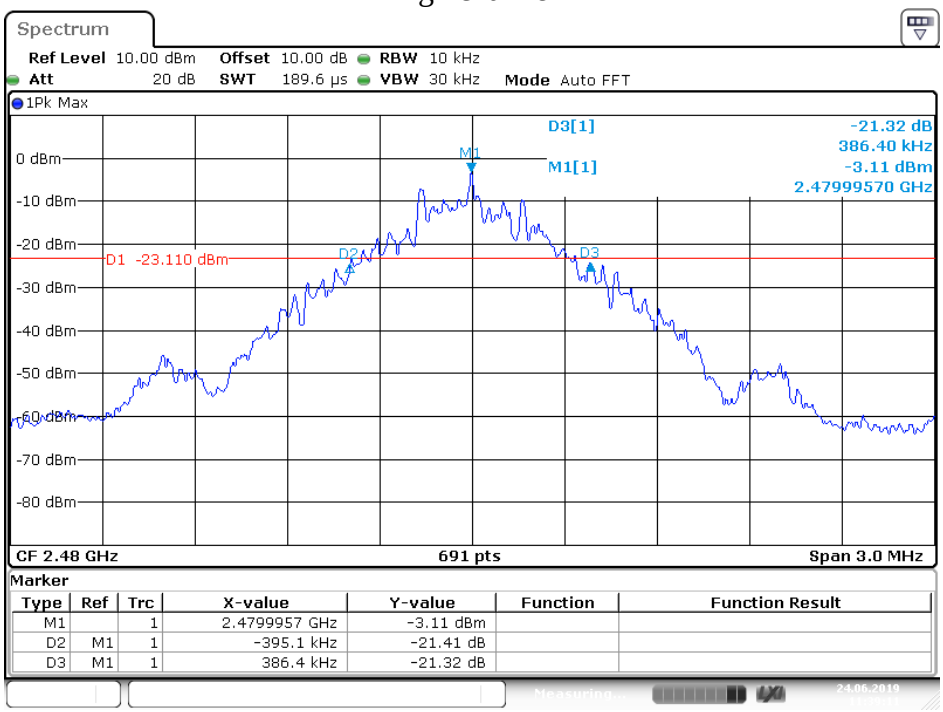
High channel



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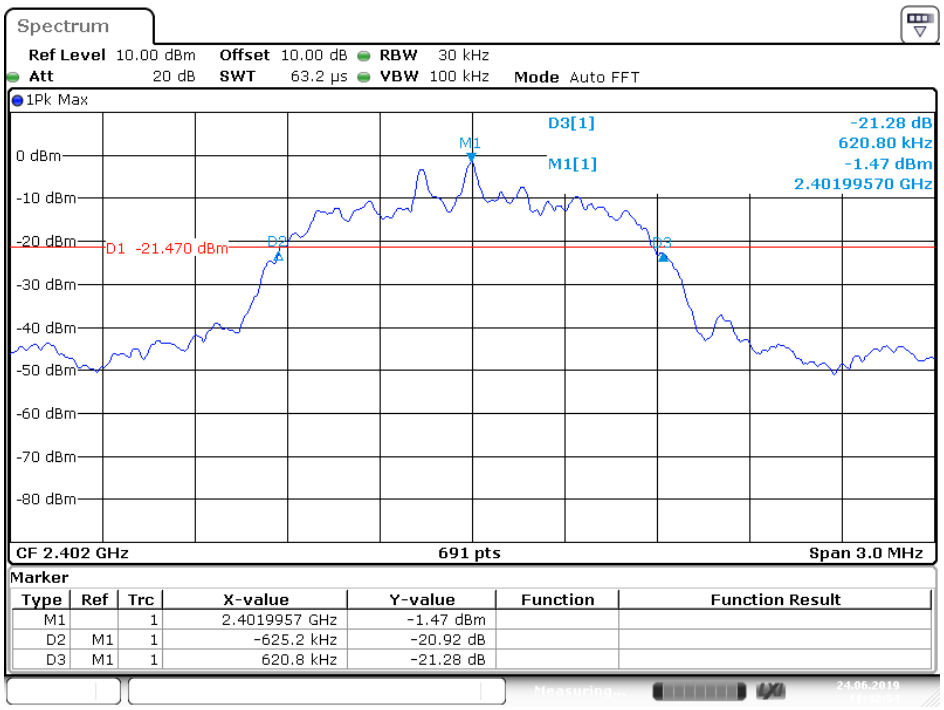
π /4 DQPSK Mode

Low channel



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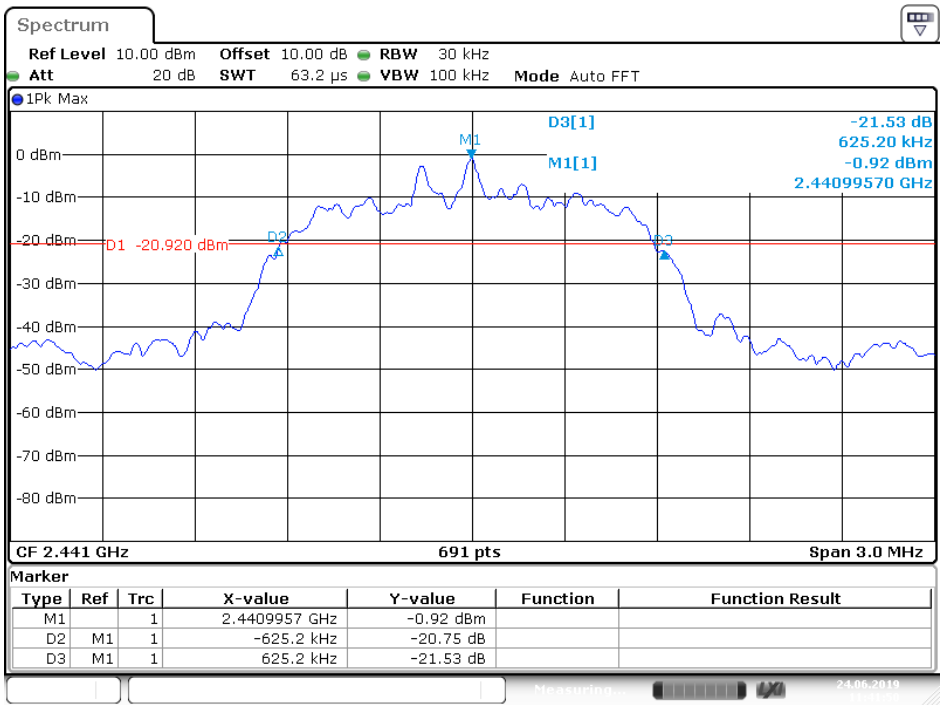
Middle channel



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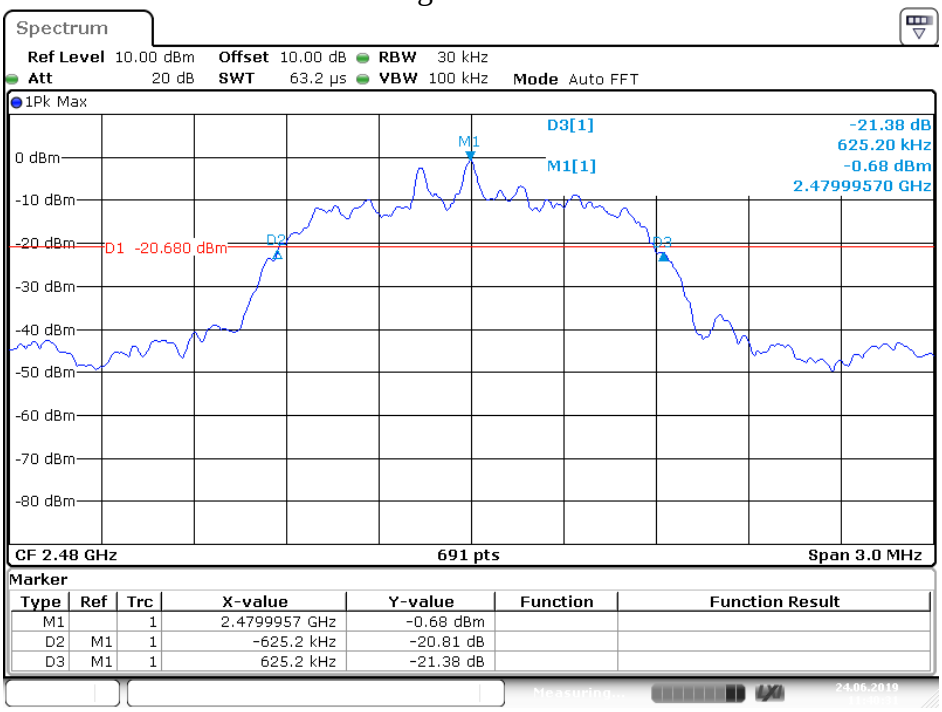
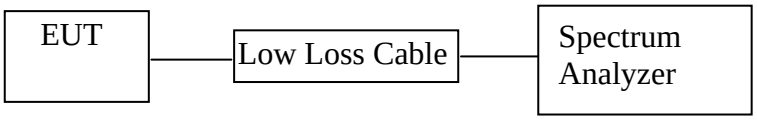
High channel



Date: 24.JUN.2019 11:40:31

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			

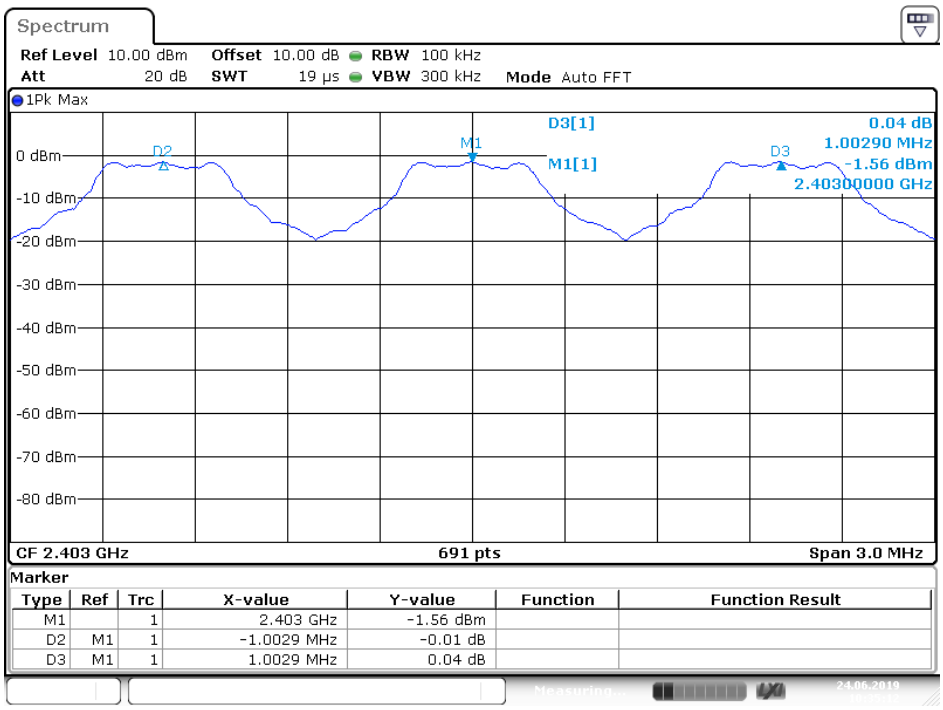
π /4 DQPSK Mode

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



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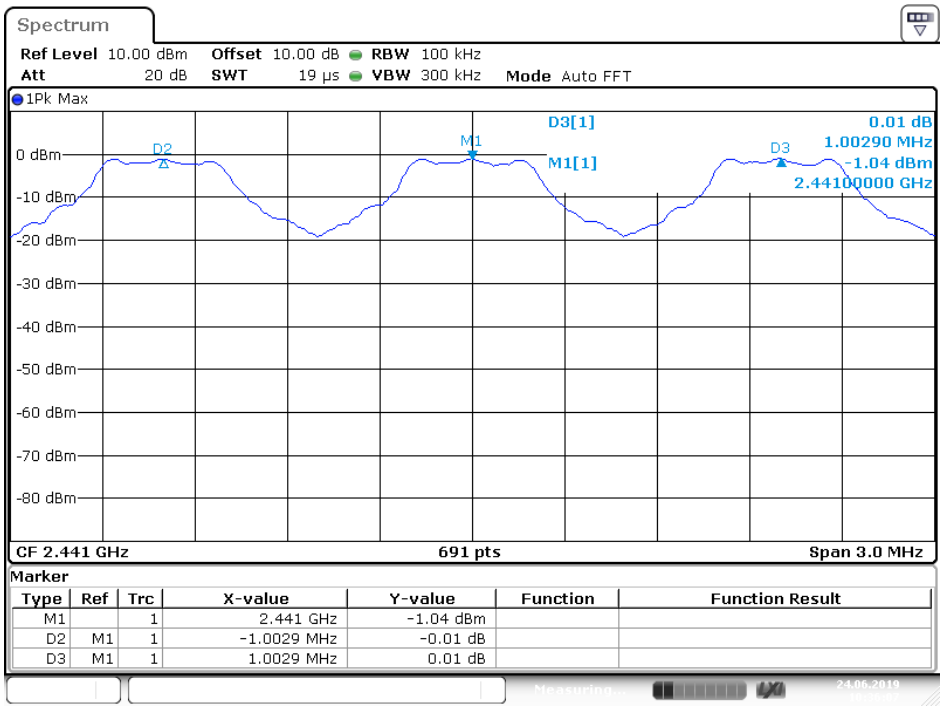
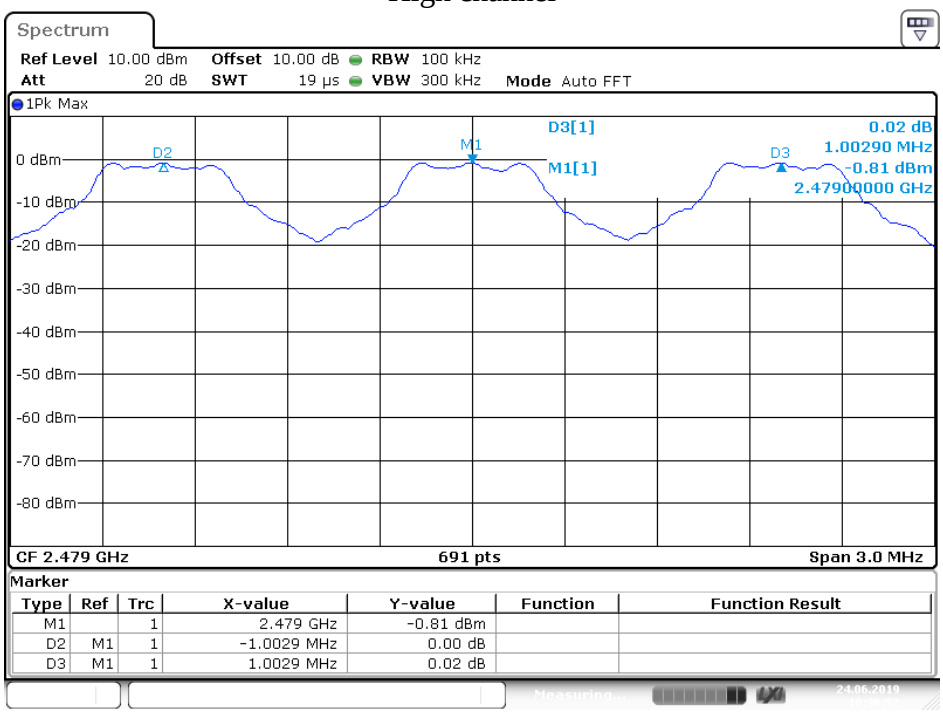
Middle channel



Date: 24.JUN.2019 10:36:07

High channel



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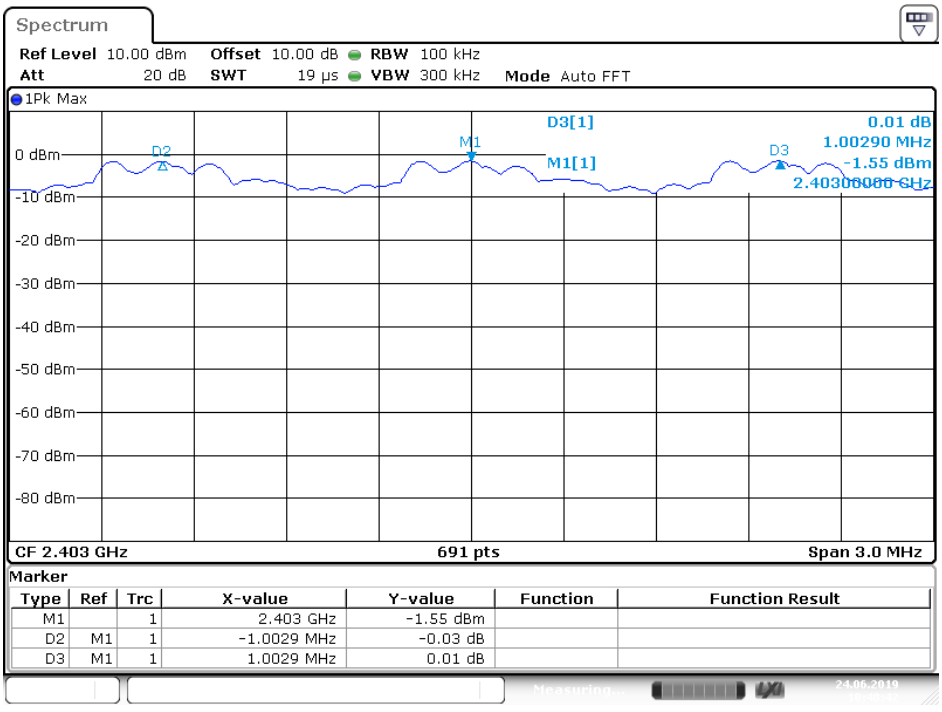
π /4 DQPSK Mode

Low channel



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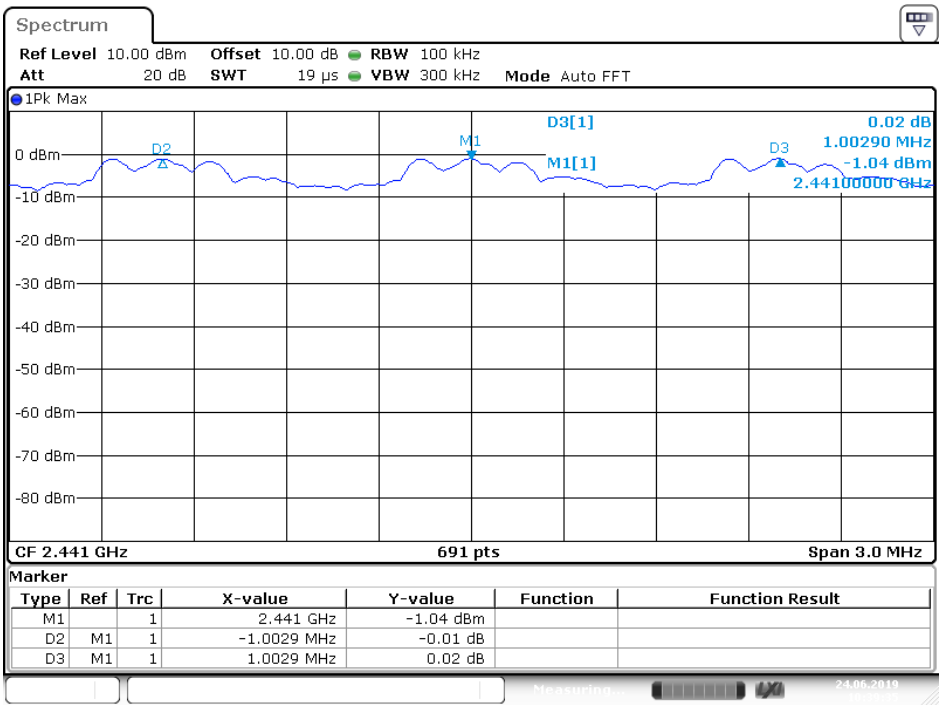
Middle channel



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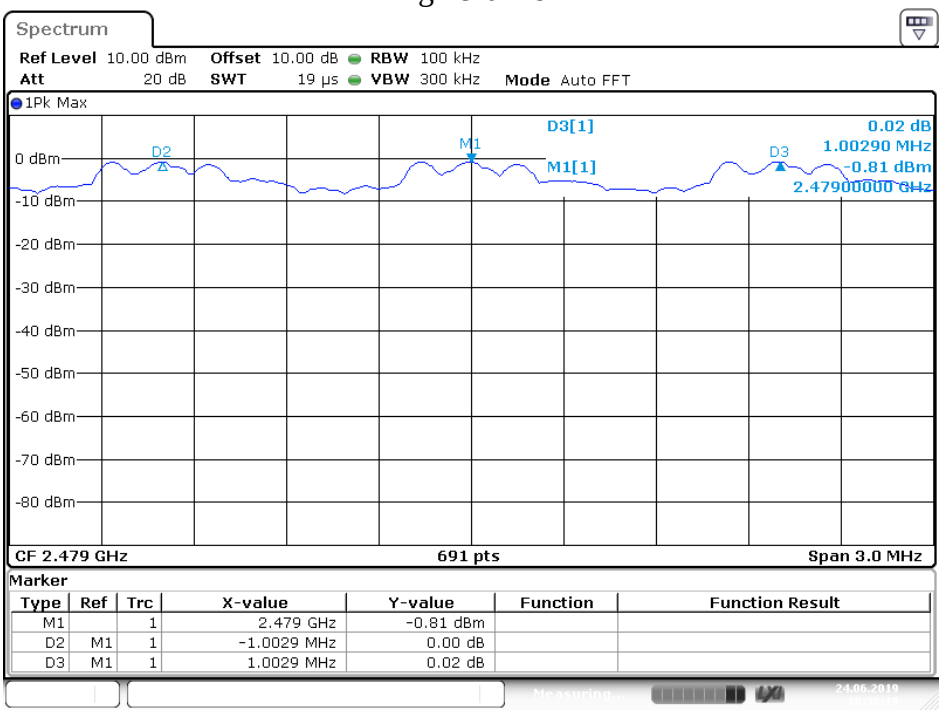
High channel



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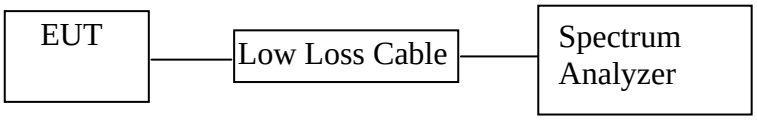
7. NUMBER OF HOPPING FREQUENCY TEST

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.

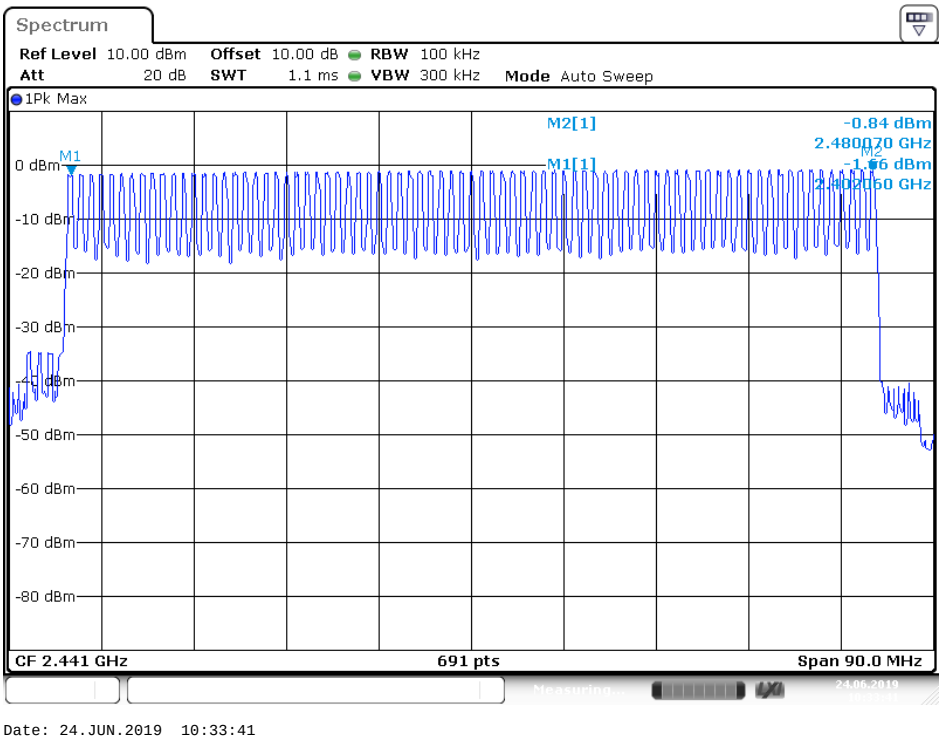
7.5.3.Max hold, view and count how many channel in the band.

7.6.Test Result

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

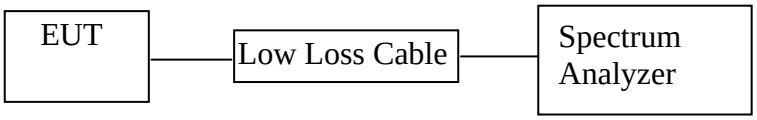
The spectrum analyzer plots are attached as below.

Number of hopping channels (GFSK Mode)



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	0.428	136.96	400
	2441	0.428	136.96	400
	2480	0.428	136.96	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(2*79))×31.6				
DH3	2402	1.696	271.36	400
	2441	1.696	271.36	400
	2480	1.696	271.36	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(4*79))×31.6				
DH5	2402	2.957	315.41	400
	2441	2.957	315.41	400
	2480	2.957	315.41	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(6*79))×31.6				

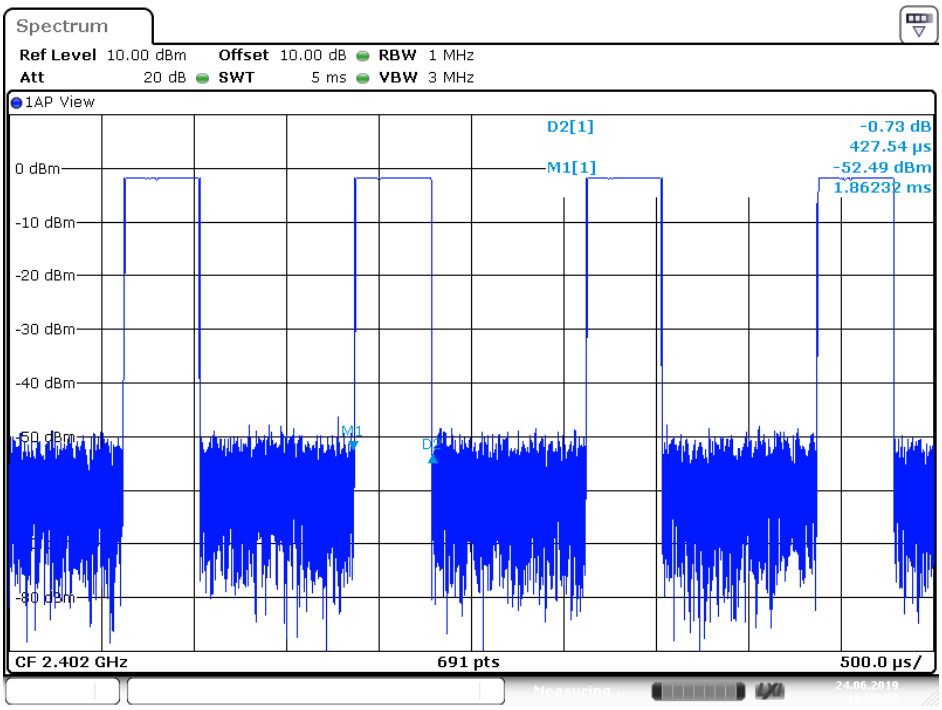
π /4 DQPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
2DH1	2402	0.435	139.20	400
	2441	0.442	141.44	400
	2480	0.435	139.20	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(2*79))×31.6				
2DH3	2402	1.696	271.36	400
	2441	1.710	273.60	400
	2480	1.710	273.60	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(4*79))×31.6				
2DH5	2402	2.978	317.65	400
	2441	2.978	317.65	400
	2480	2.978	317.65	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(6*79))×31.6				

The spectrum analyzer plots are attached as below.

GFSK Mode

DH1 Low channel



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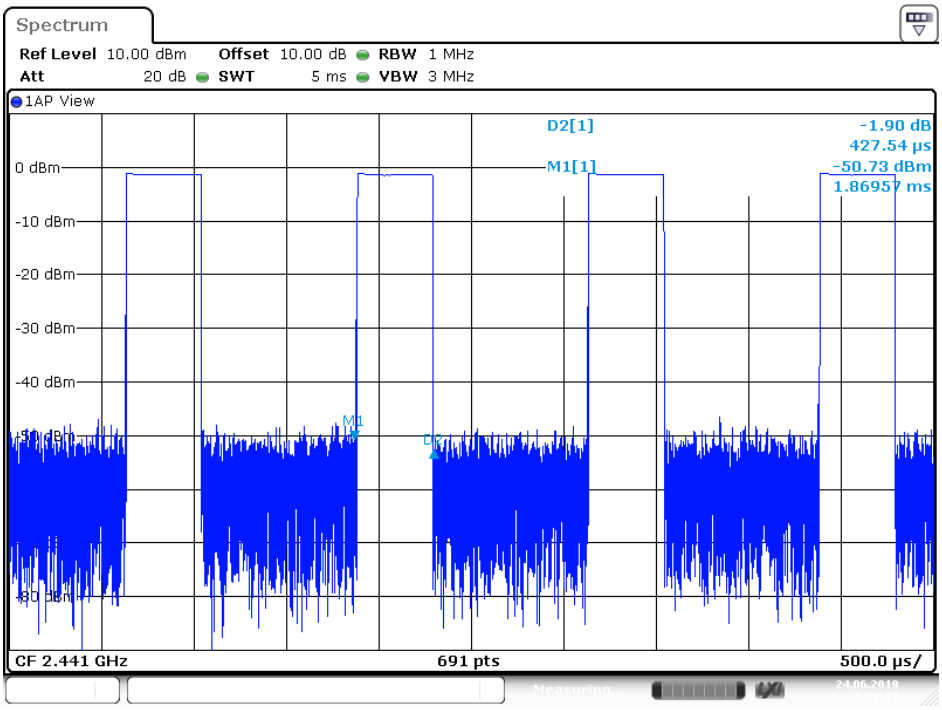
DH1 Middle channel



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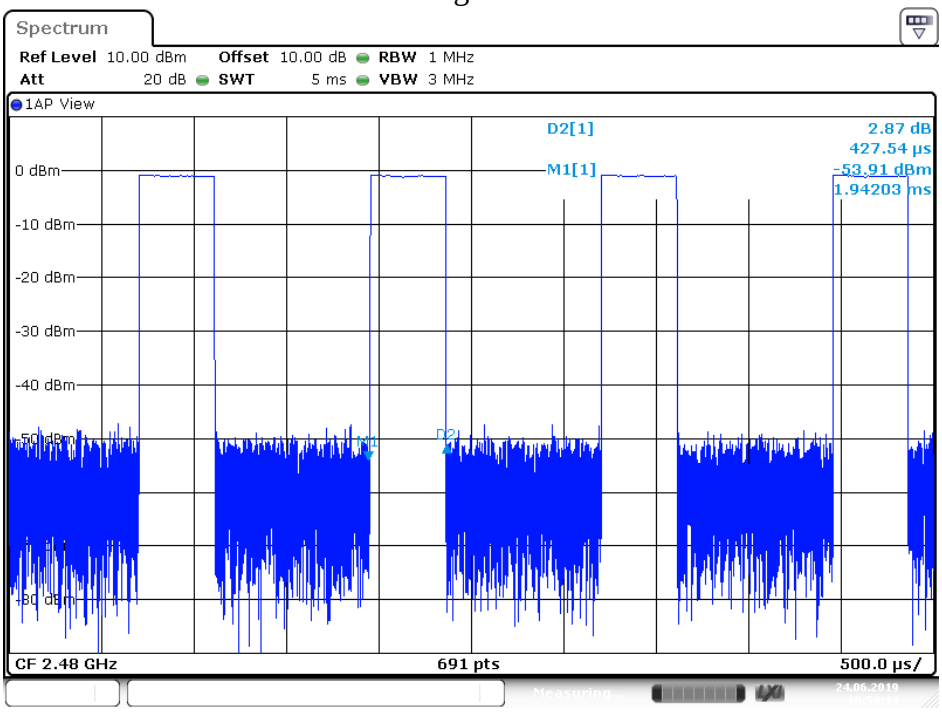
DH1 High channel



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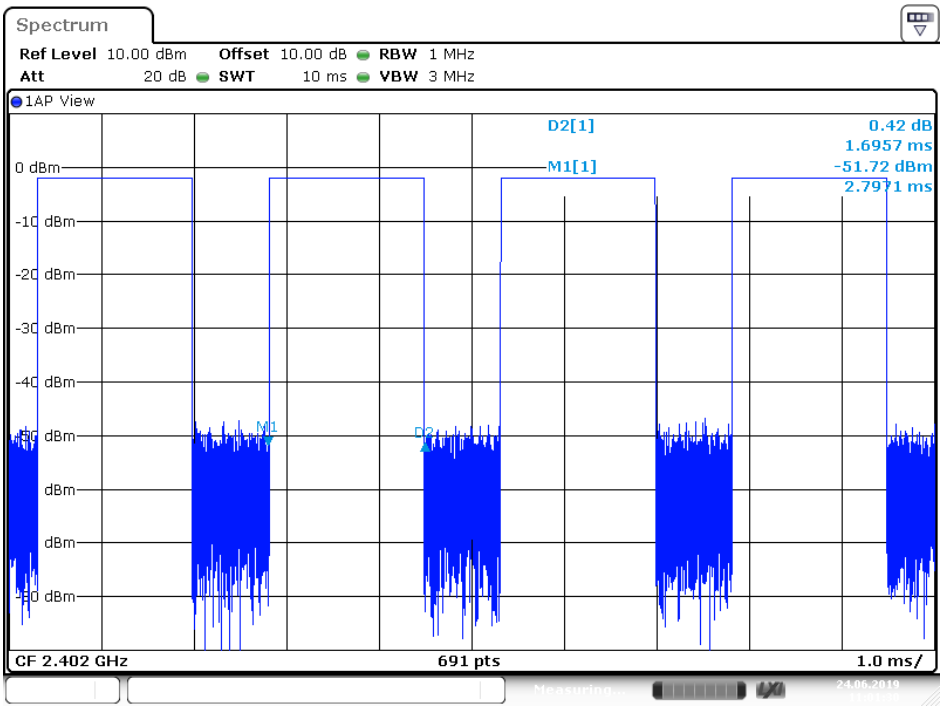
DH3 Low channel



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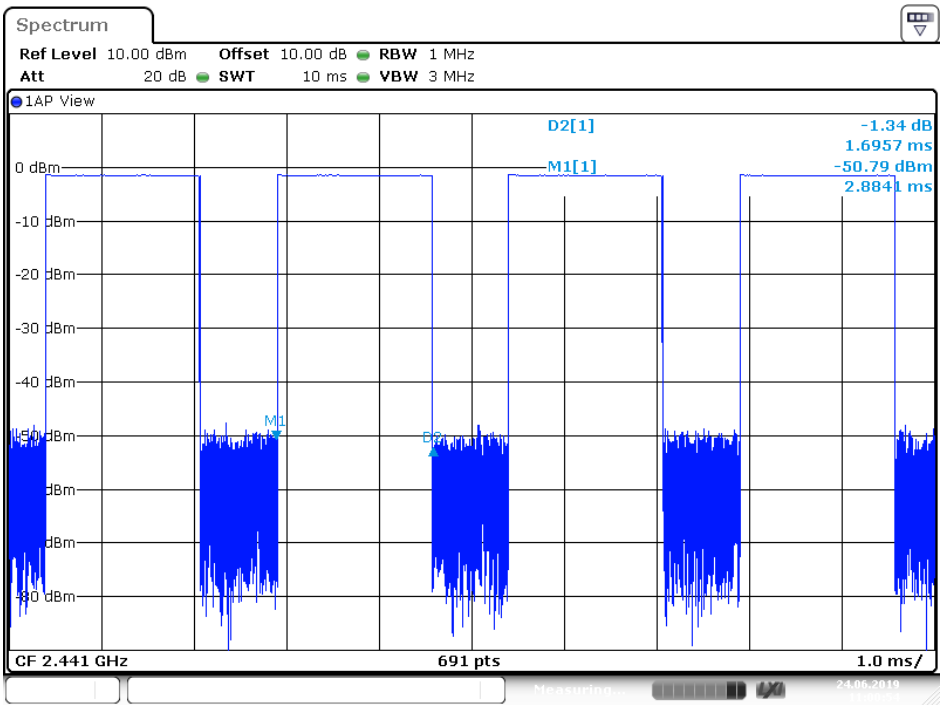
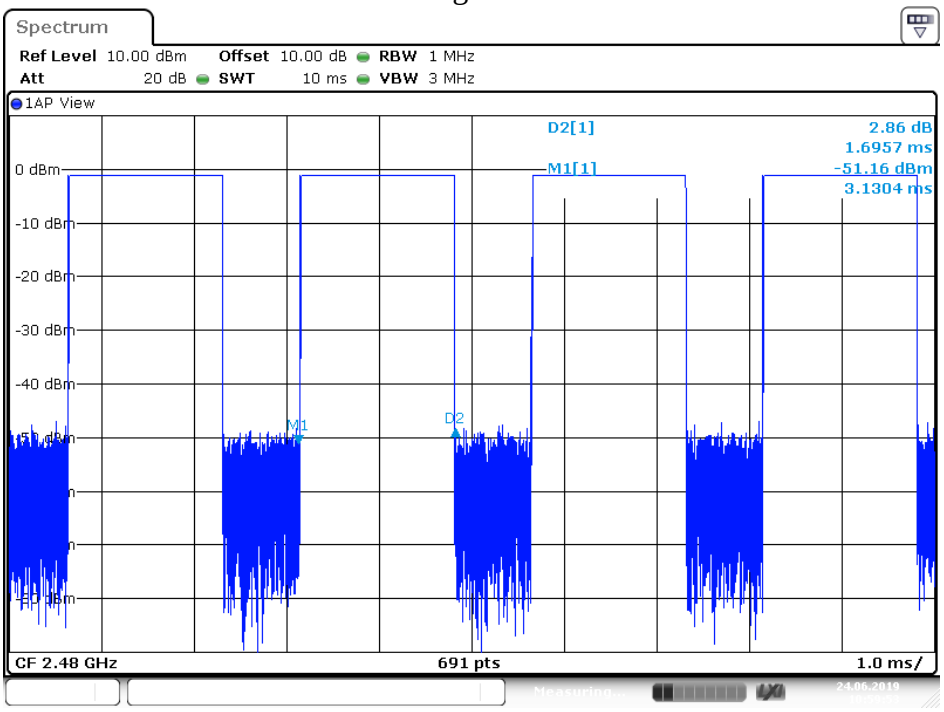
DH3 Middle channel



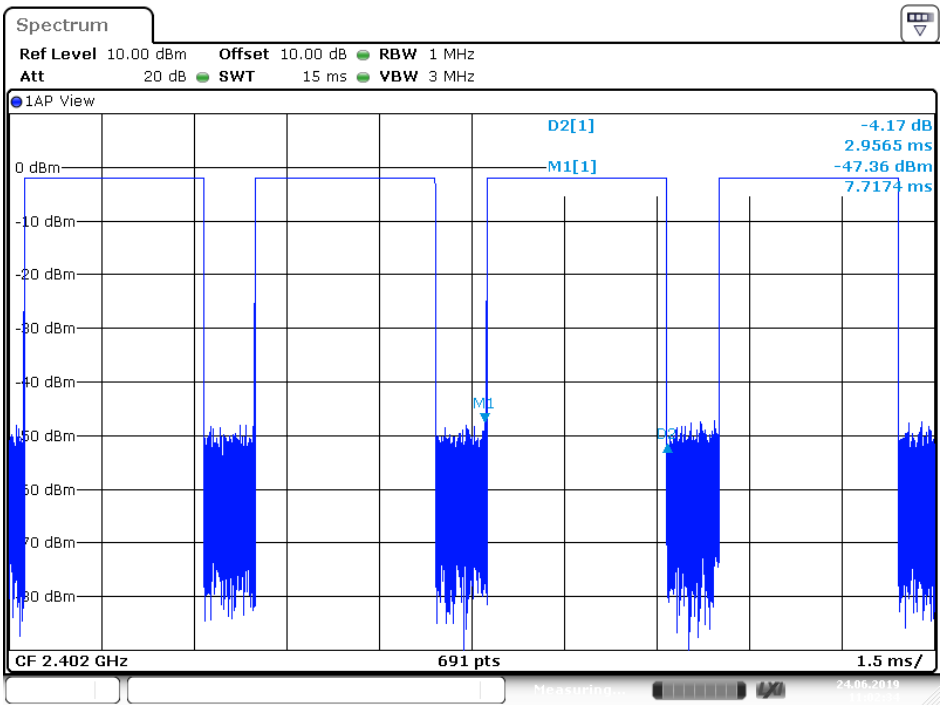
Date: 24.JUN.2019 11:00:55

DH3 High channel



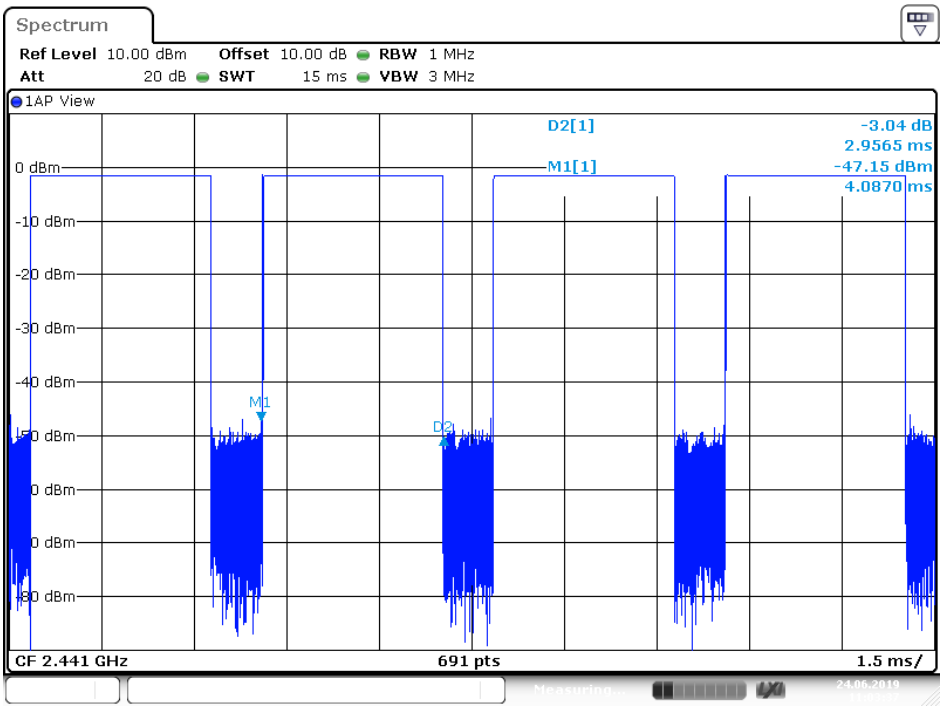
Date: 24.JUN.2019 10:59:54

DH5 Low channel



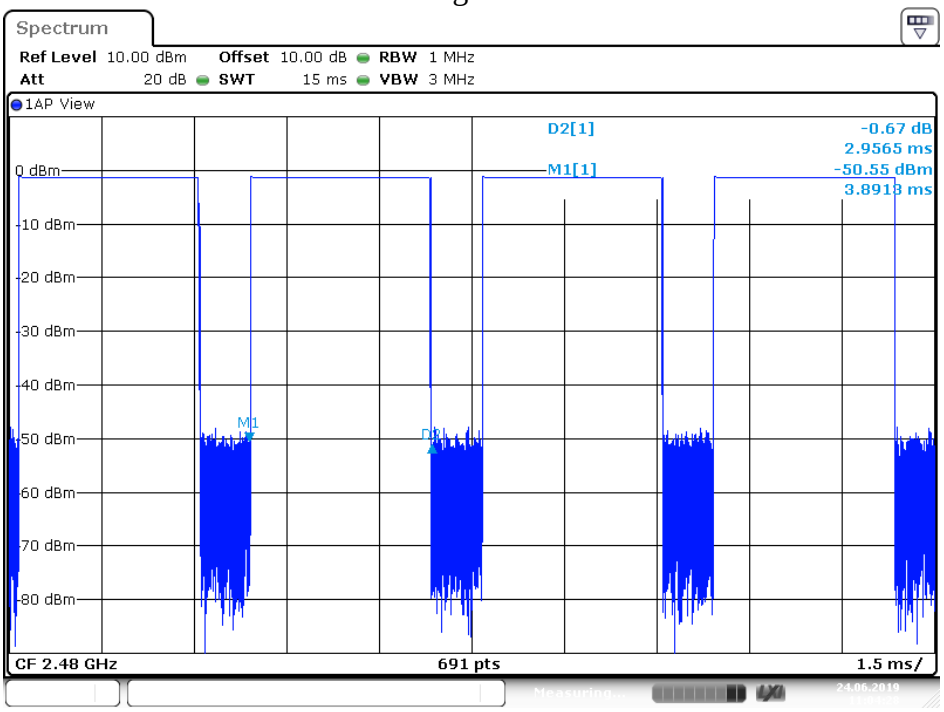
Date: 24.JUN.2019 11:02:34

DH5 Middle channel



Date: 24.JUN.2019 11:03:37

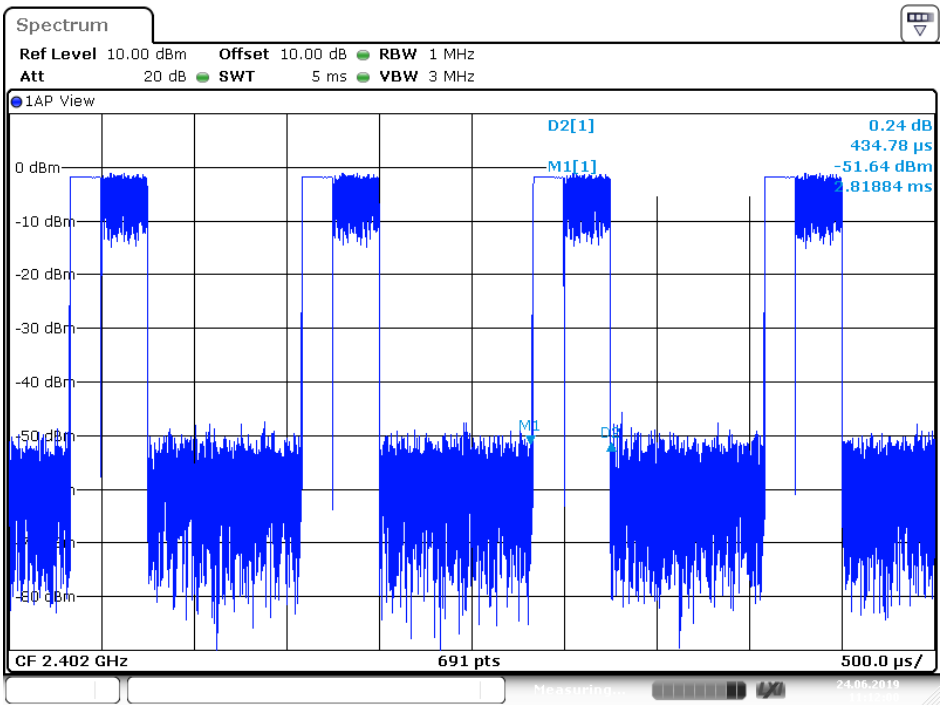
DH5 High channel



Date: 24.JUN.2019 11:04:28

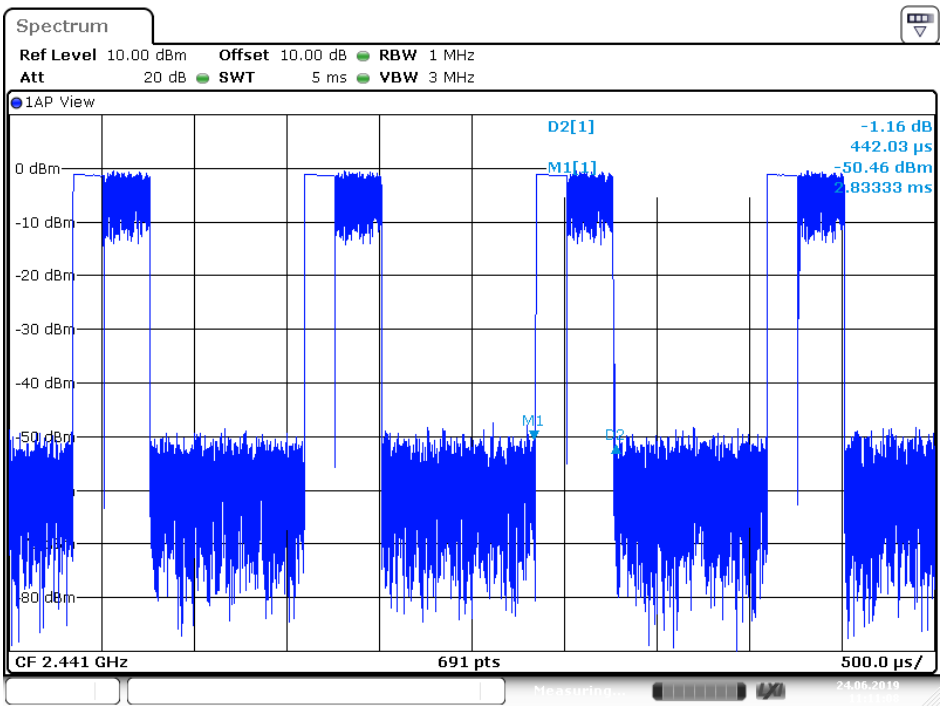
π /4 DQPSK Mode

2DH1 Low channel



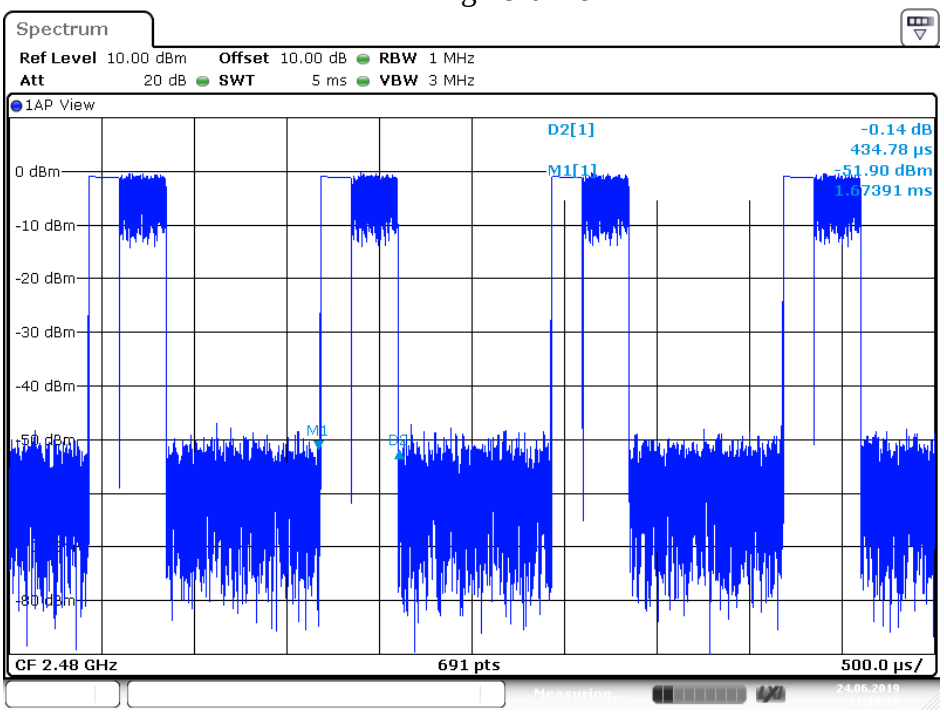
Date: 24.JUN.2019 11:12:00

2DH1 Middle channel



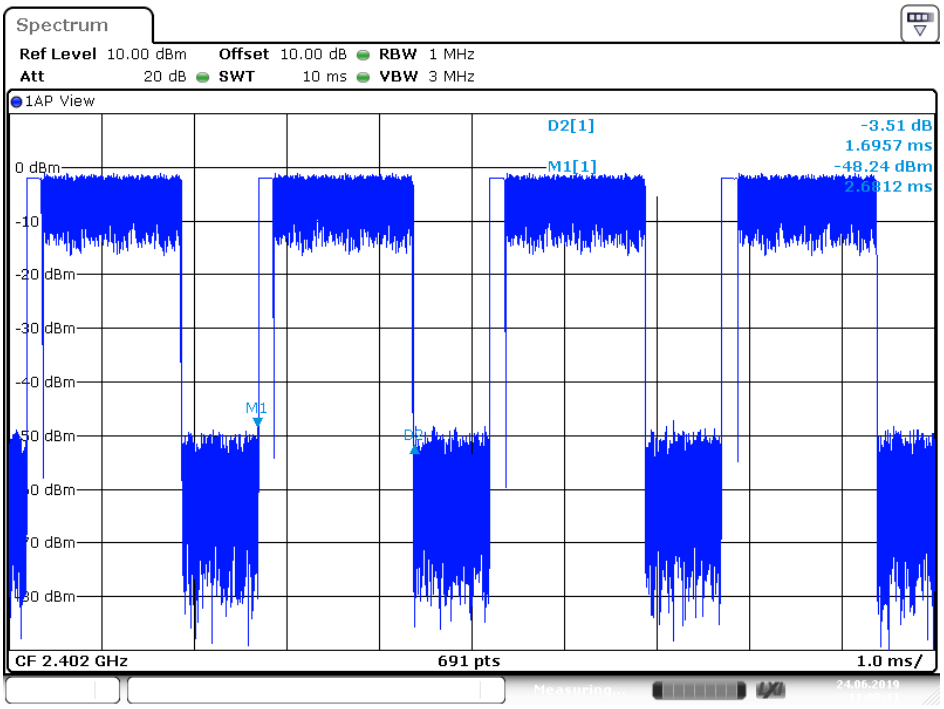
Date: 24.JUN.2019 11:11:08

2DH1 High channel



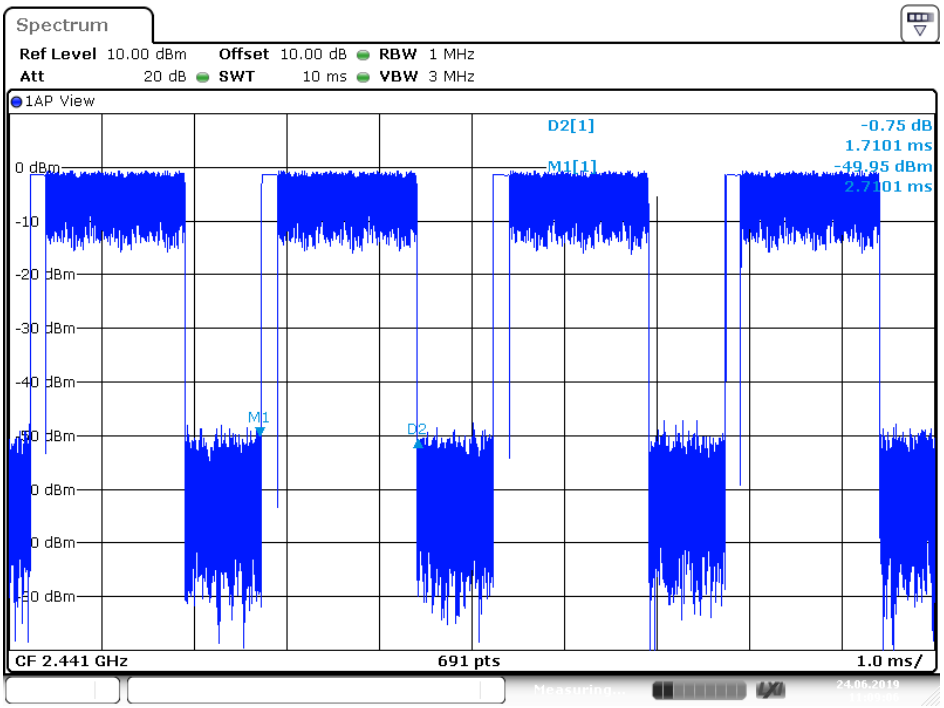
Date: 24.JUN.2019 11:10:29

2DH3 Low channel



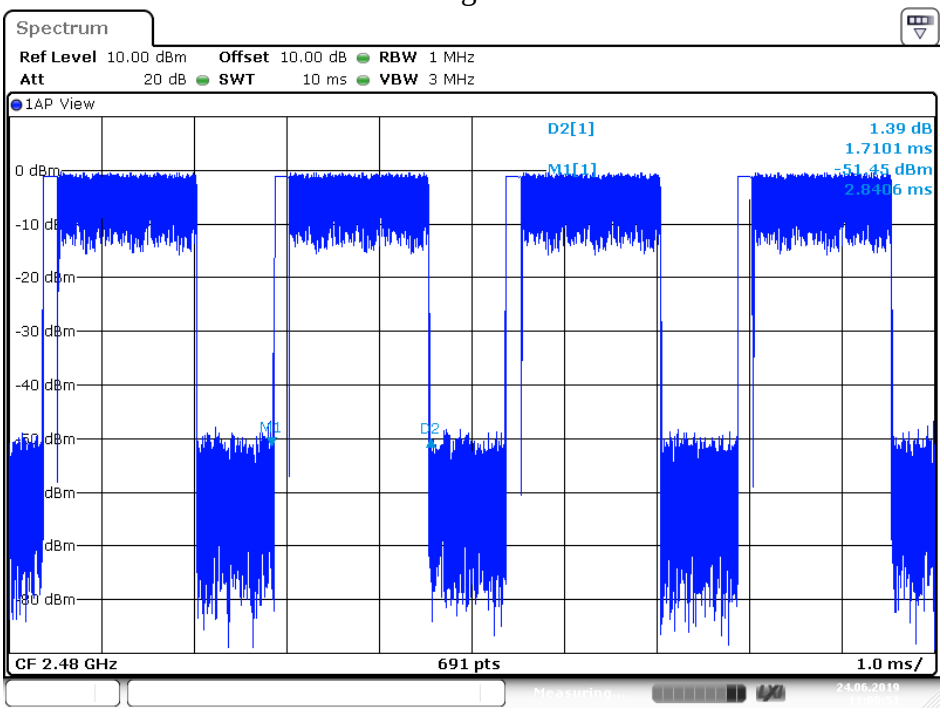
Date: 24.JUN.2019 11:08:11

2DH3 Middle channel



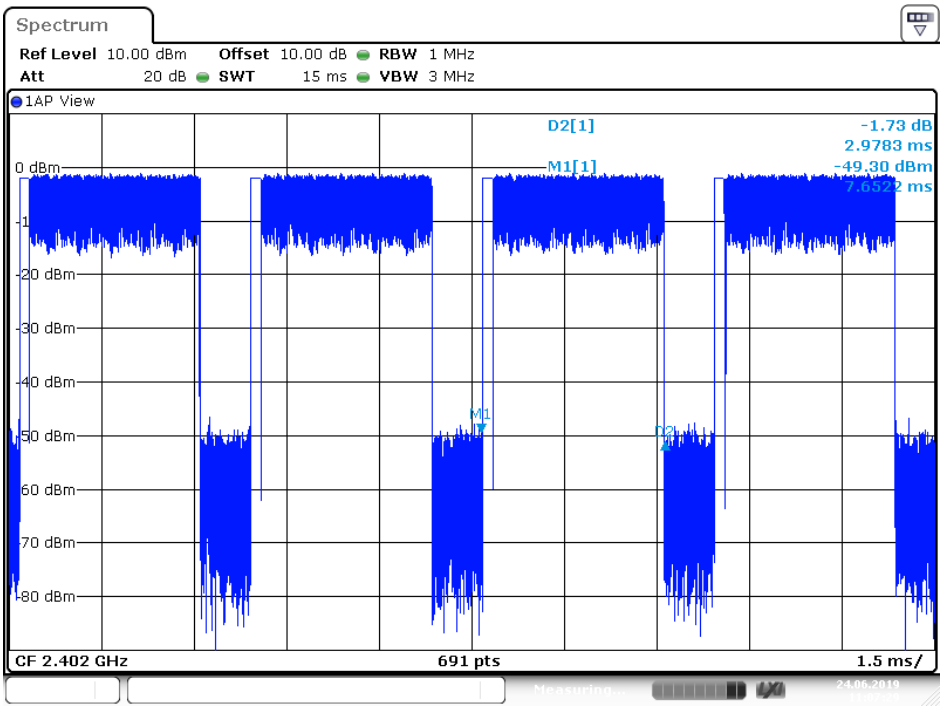
Date: 24.JUN.2019 11:09:06

2DH3 High channel



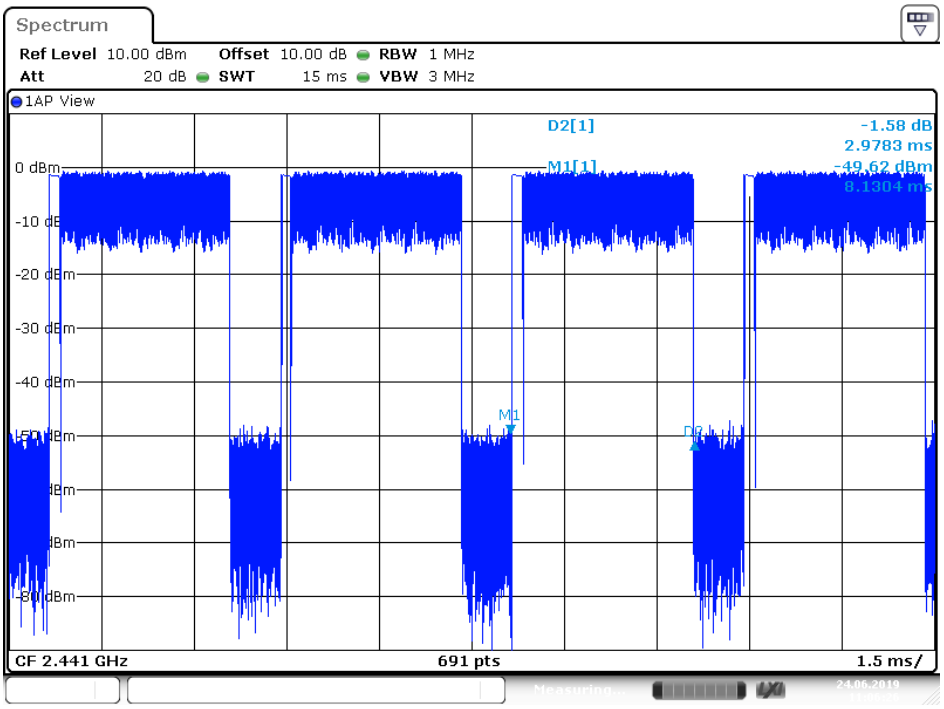
Date: 24.JUN.2019 11:09:51

2DH5 Low channel



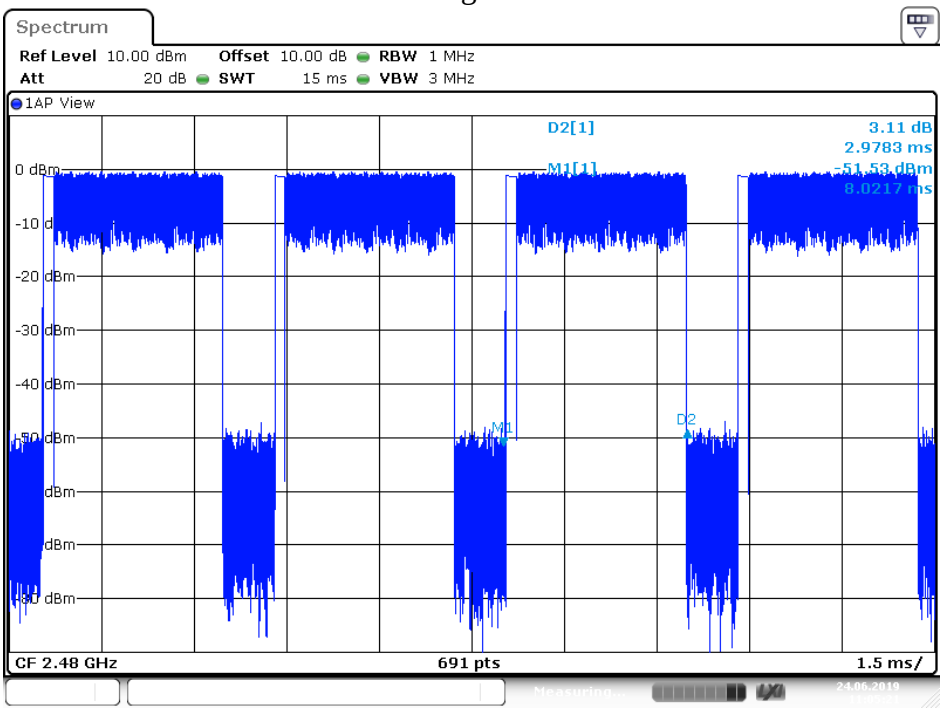
Date: 24.JUN.2019 11:07:29

2DH5 Middle channel



Date: 24.JUN.2019 11:06:26

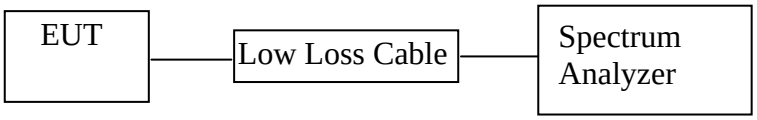
2DH5 High channel



Date: 24.JUN.2019 11:05:21

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)	Limits (dBm / W)	Result
2402	-1.30/0.007	21 / 0.125	Pass
2441	-0.78/0.0008	21 / 0.125	Pass
2480	-0.54/0.0009	21 / 0.125	Pass

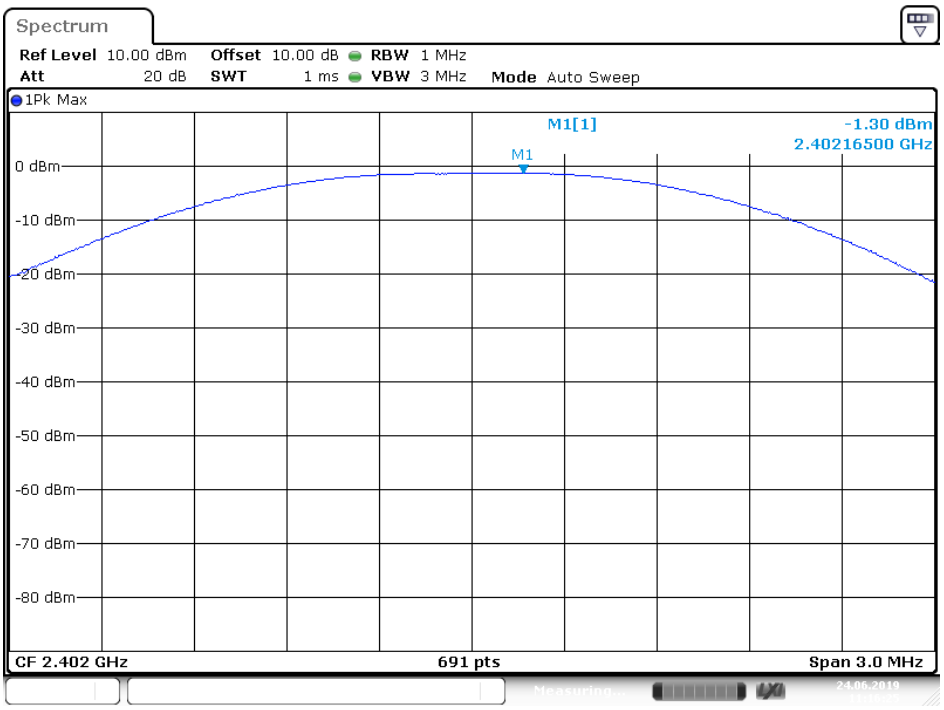
π /4 DQPSK Mode

Frequency (MHz)	Maximum peak conducted output power (dBm/W)	Limits dBm / W	Result
2402	0.00/0.0010	21 / 0.125	Pass
2441	0.53/0.0011	21 / 0.125	Pass
2480	0.78/0.0012	21 / 0.125	Pass

The spectrum analyzer plots are attached as below.

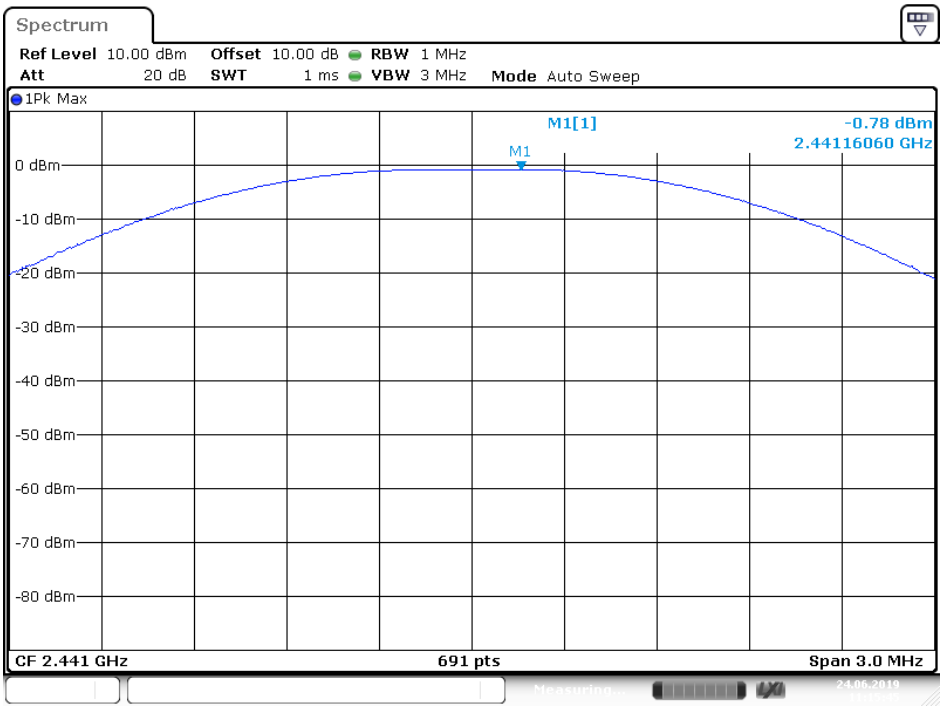
GFSK Mode

Low channel



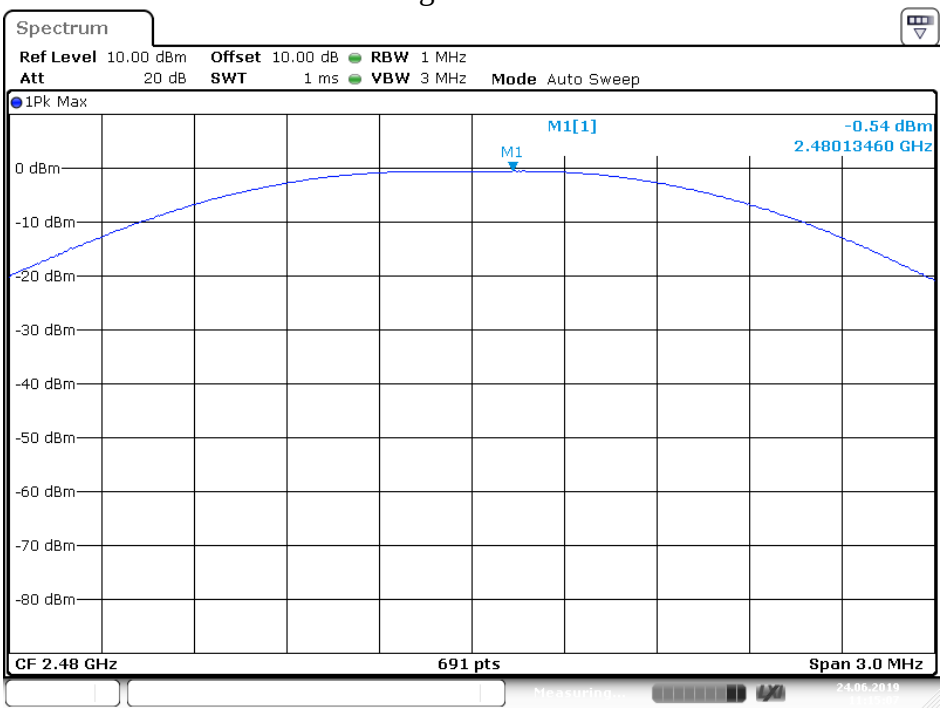
Date: 24.JUN.2019 11:16:25

Middle channel



Date: 24.JUN.2019 11:15:45

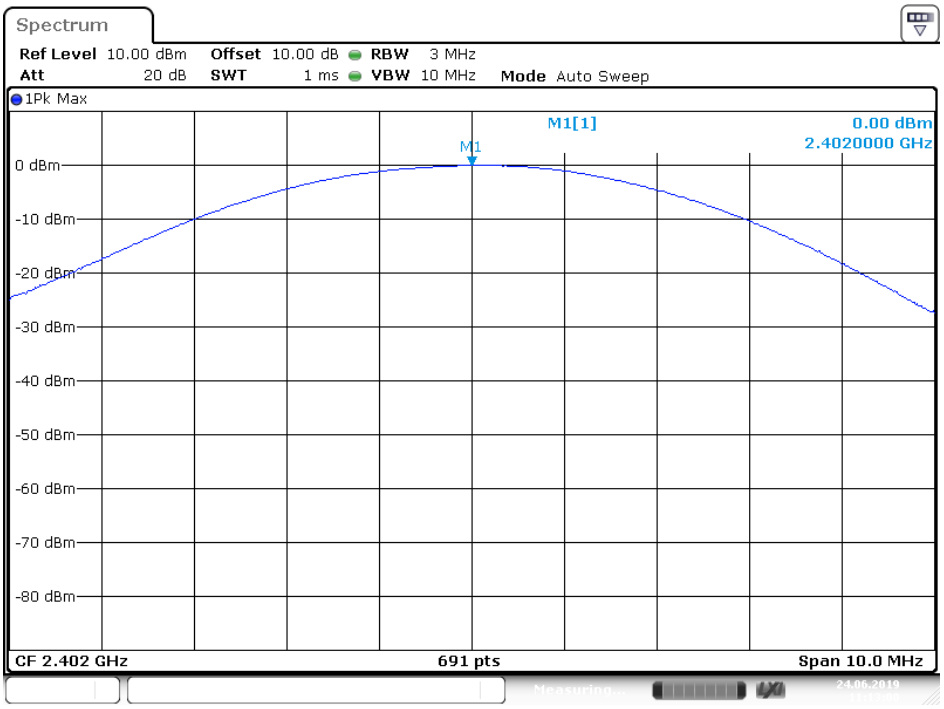
High channel



Date: 24.JUN.2019 11:15:07

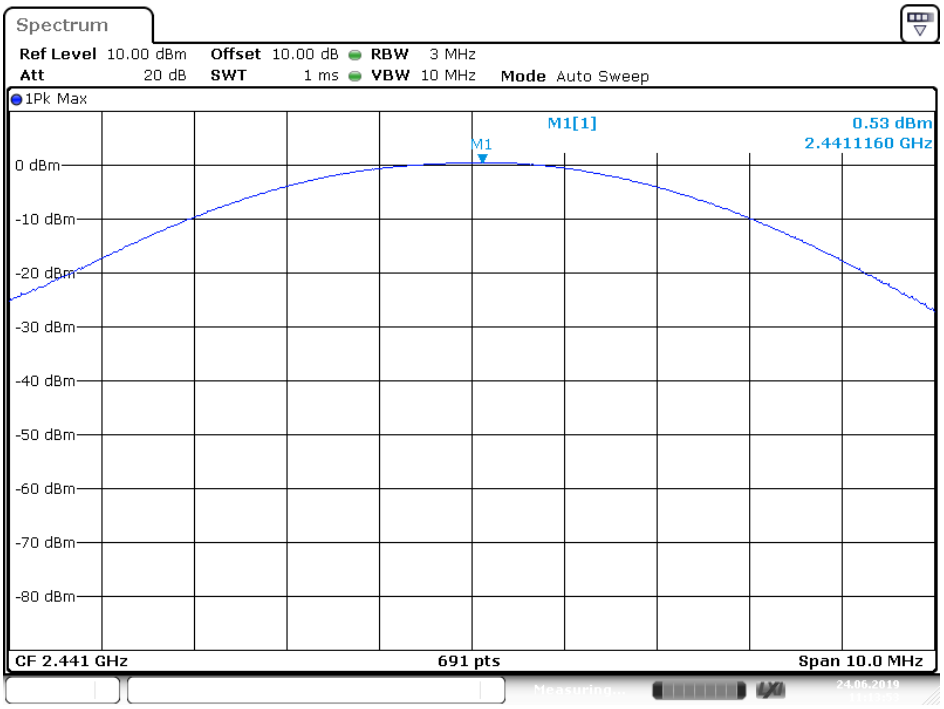
π /4 DQPSK Mode

Low channel



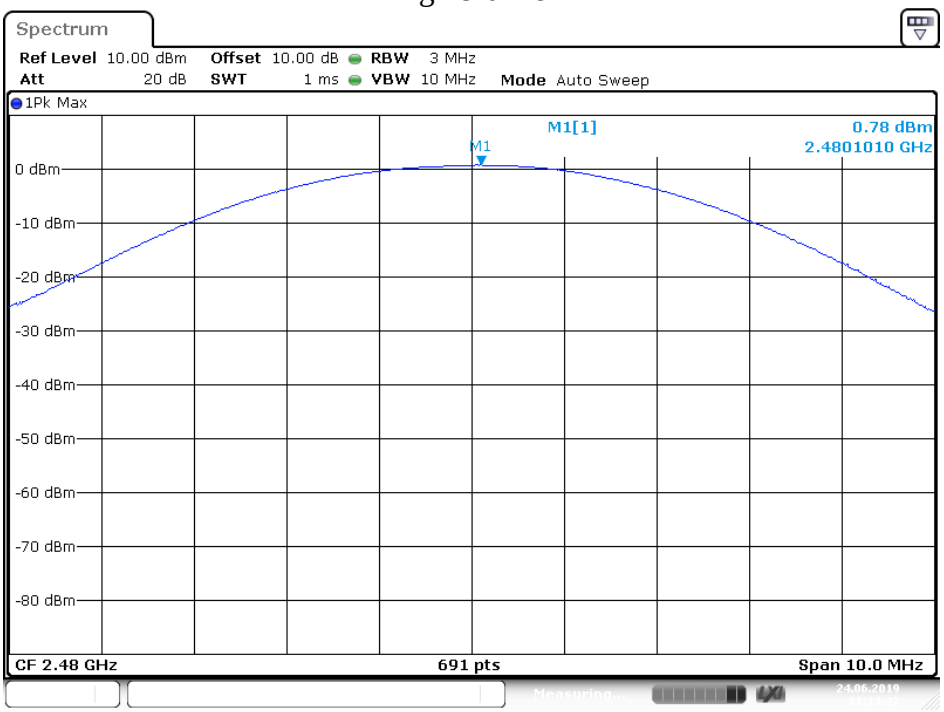
Date: 24.JUN.2019 11:13:00

Middle channel



Date: 24.JUN.2019 11:13:53

High channel



Date: 24.JUN.2019 11:14:27

10.RADIATED EMISSION TEST

10.1.Block Diagram of Test Setup

10.1.1.Block diagram of connection between the EUT and peripherals

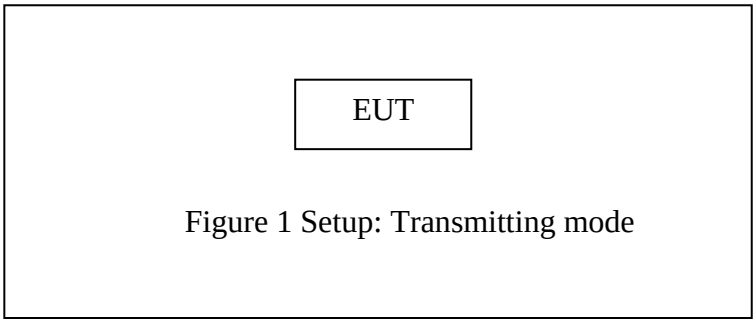
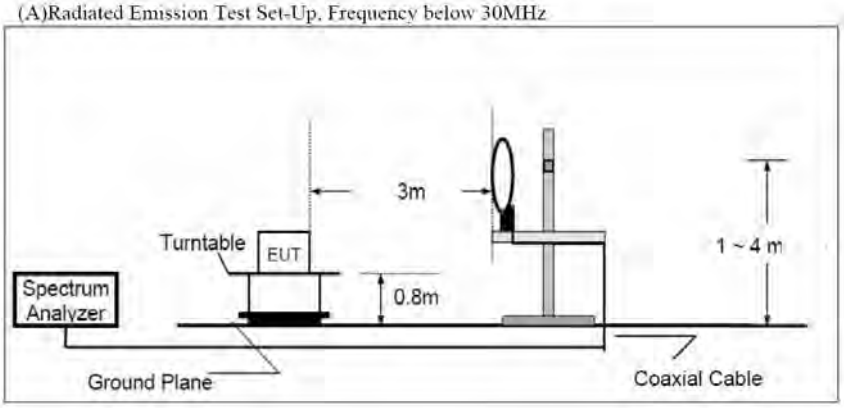


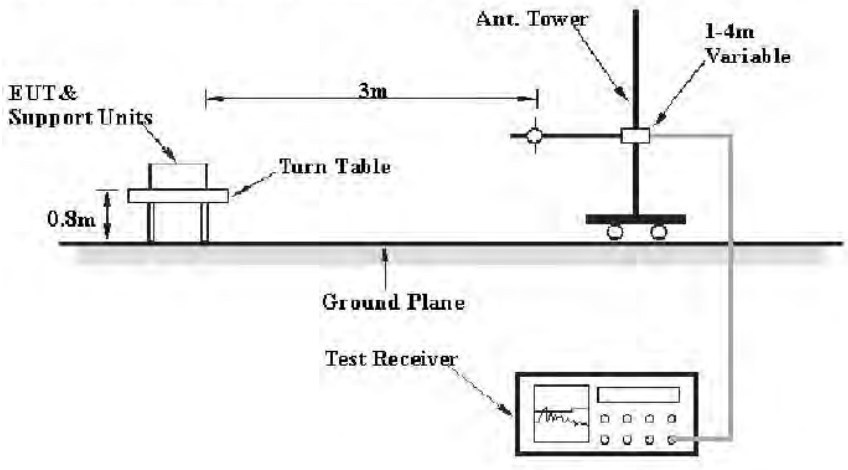
Figure 1 Setup: Transmitting mode

10.1.2.Semi-Anechoic Chamber Test Setup Diagram

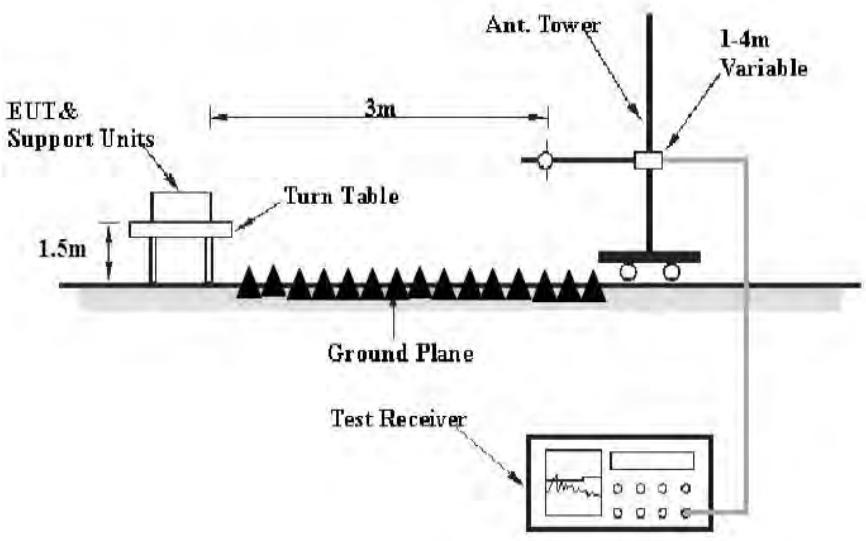
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



(B)Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(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 (μV/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) (μA/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			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 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 Section15.209 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 (dBμv)	Factor (dB/m)	Result (dBμv/m)	Limit (dBμv/m)	Margin (dB)	Remark
X.XX	48.69	-13.35	35.34	46	-10.66	QP

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ 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, π/4 DQPSK Mode, and recorded the worse case data (π/4 DQPSK mode) for all test mode.

The spectrum analyzer plots are attached as below.

9kHz-30MHz test data

ACCURATE TECHNOLOGY CO.,LTD

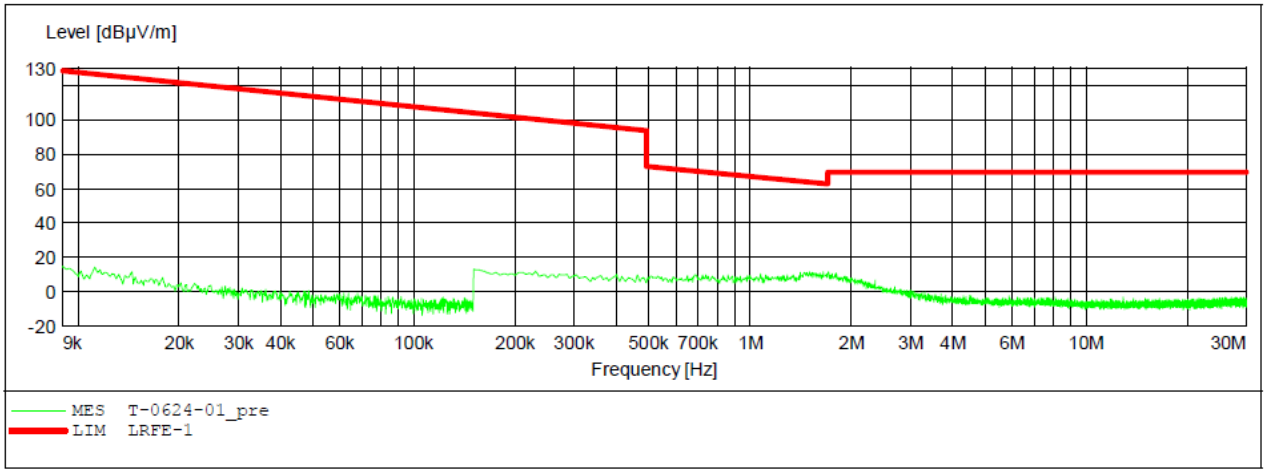
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2402MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: X
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

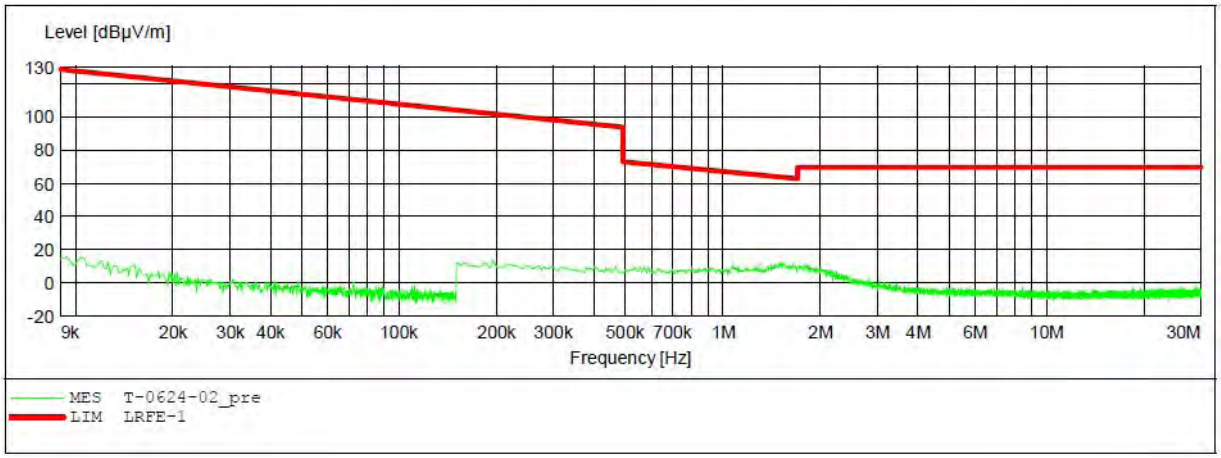
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2402MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Y
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

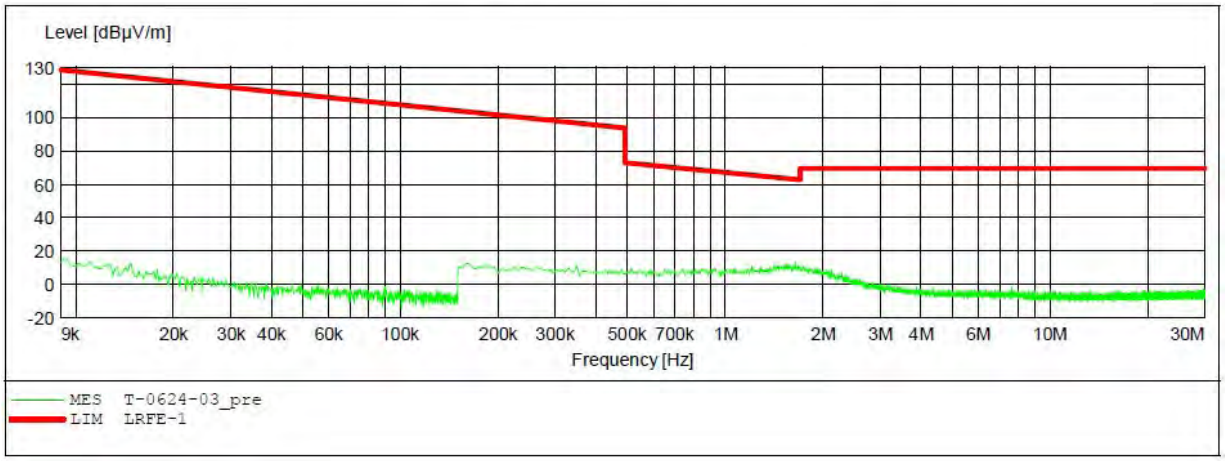
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2402MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Z
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

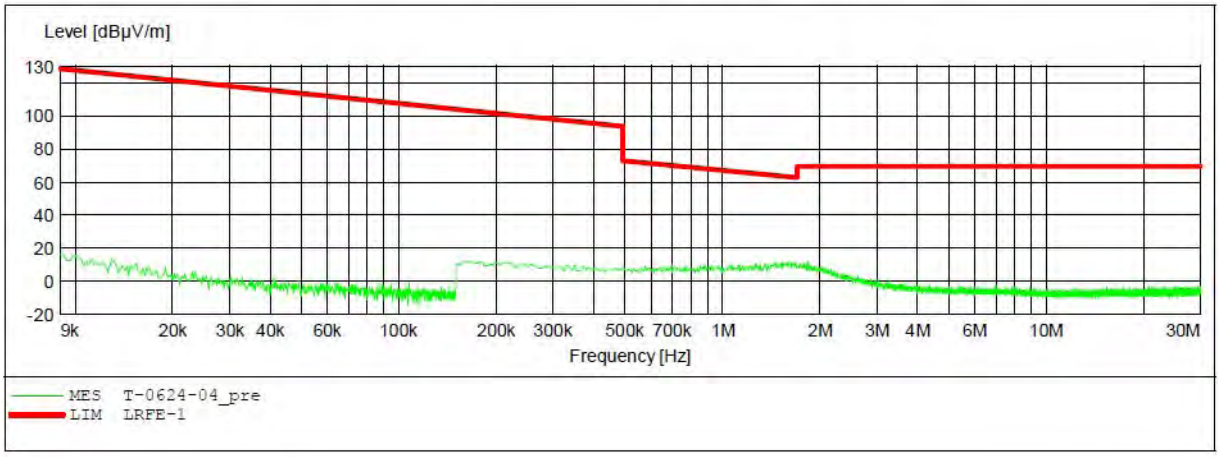
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2441MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: X
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

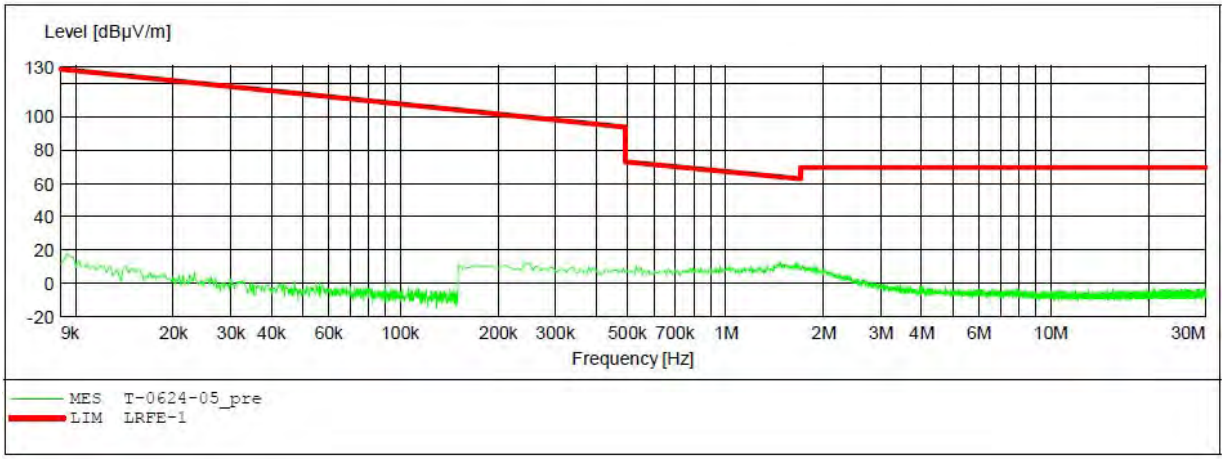
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2441MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Y
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

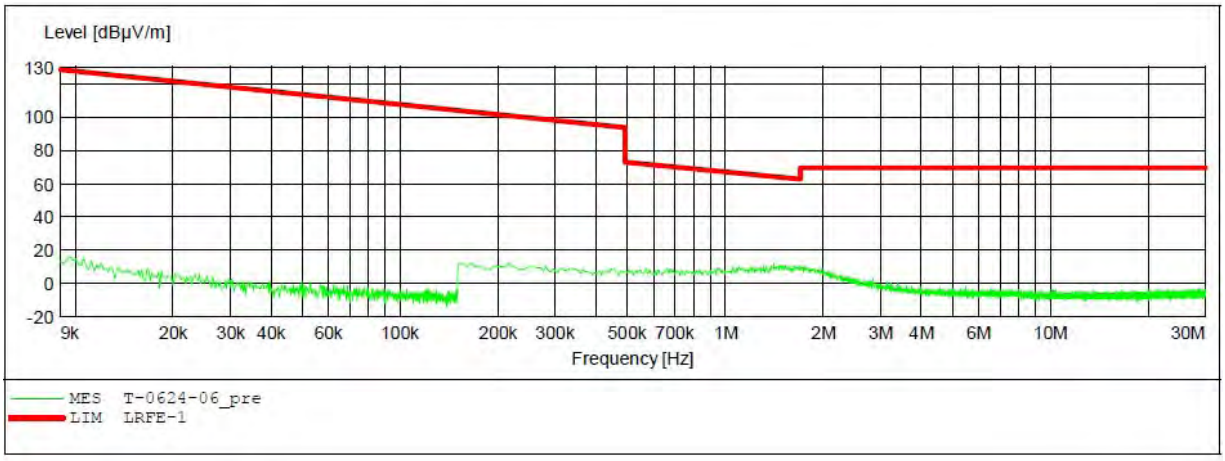
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2441MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Z
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

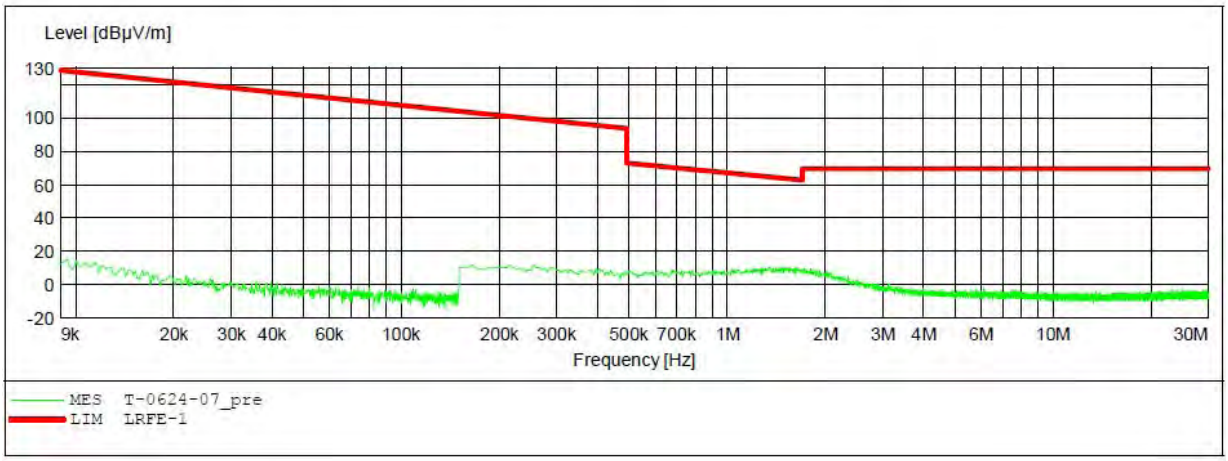
FCC Part 15C 3M Radiated

EUT:	Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer:	THUMBS UK(UK)LTD
Operating Condition:	TX 2480MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	X
Start of Test:	2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

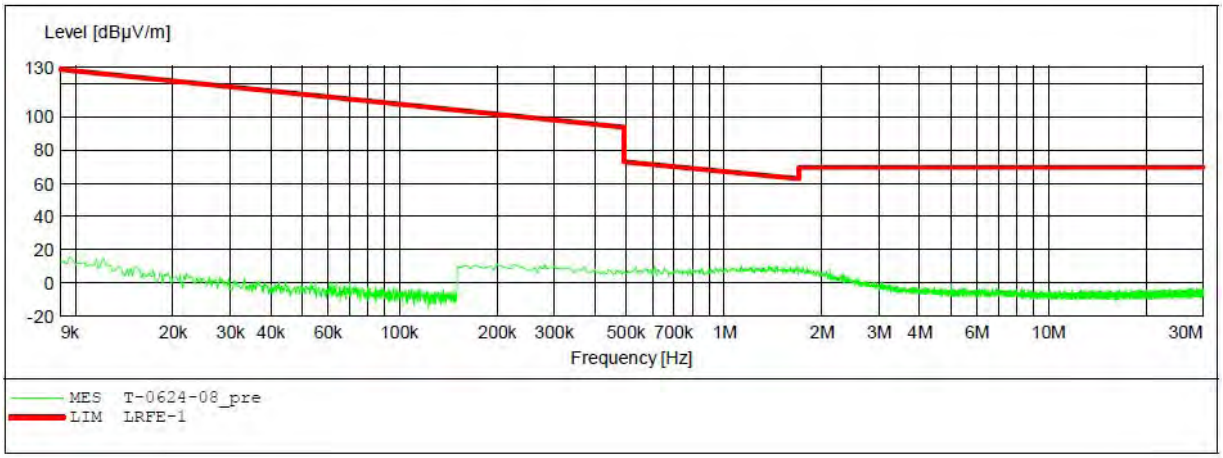
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2480MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Y
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



ACCURATE TECHNOLOGY CO.,LTD

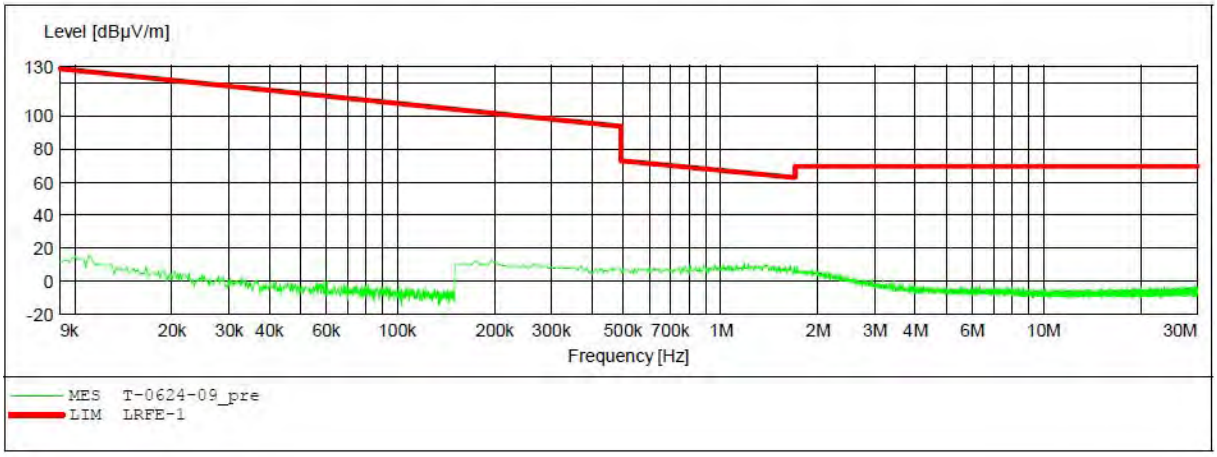
FCC Part 15C 3M Radiated

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: TX 2480MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Z
Start of Test: 2019-6-24 /

SCAN TABLE: "LFRE 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	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M

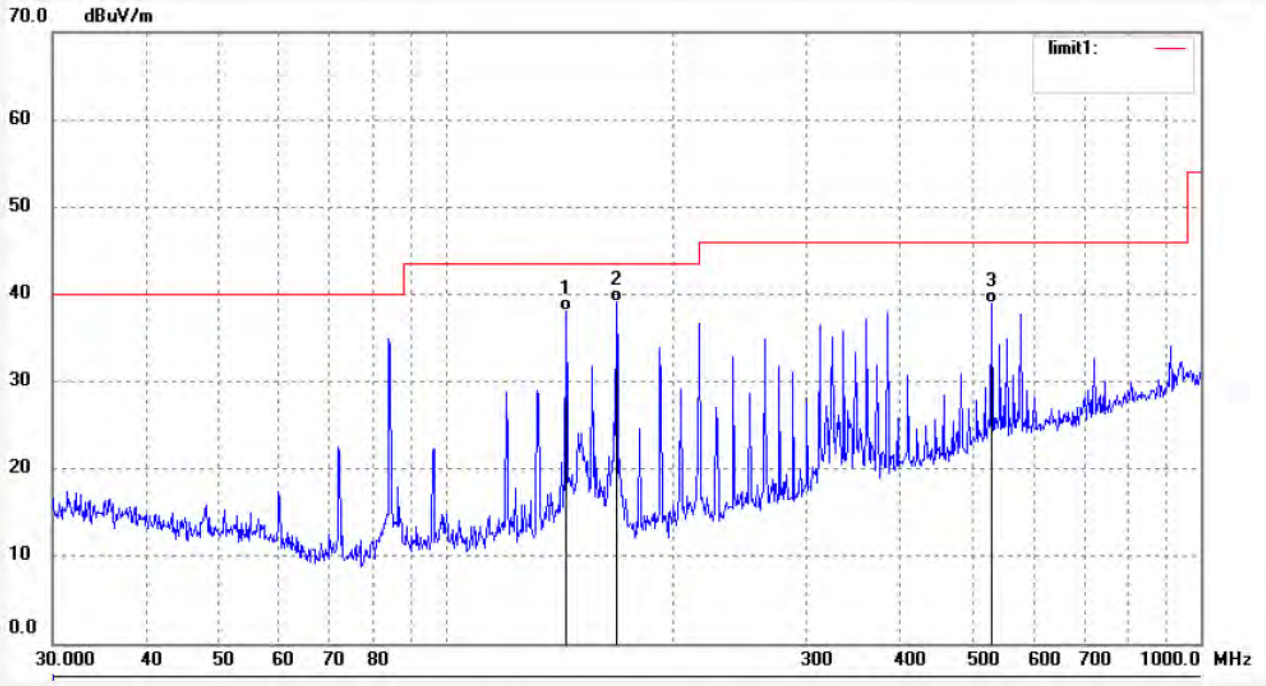


30MHz-1GHz Test data

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 #2505	Polarization: Horizontal
Standard: FCC Part 15C 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/06/24/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Neckband Sports Earphones	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: BTNCKEPBKPRM	
Manufacturer: THUMBS UK(UK)LTD	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	143.8294	53.12	-15.11	38.01	43.50	-5.49	QP			
2	167.8242	52.99	-13.88	39.11	43.50	-4.39	QP			
3	528.2458	42.64	-3.71	38.93	46.00	-7.07	QP			

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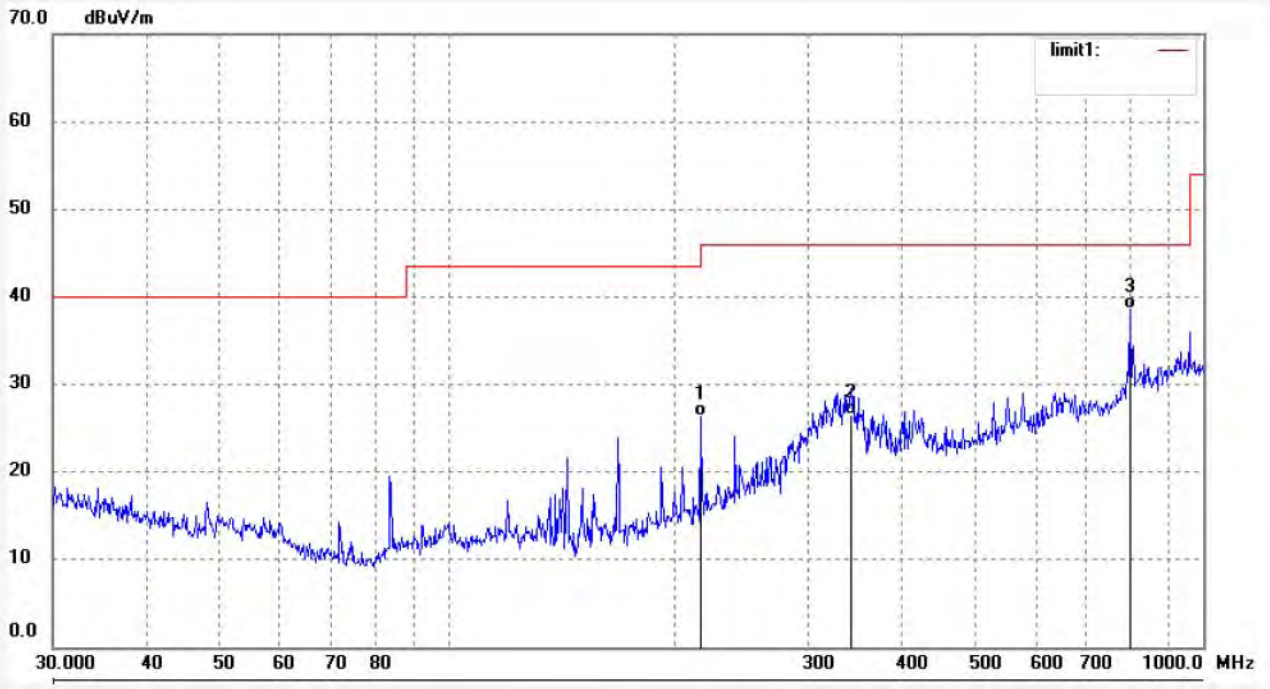
Job No.: LGW2019 #2504
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2402MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	216.0240	38.07	-11.66	26.41	46.00	-19.59	QP			
2	341.9786	34.23	-7.68	26.55	46.00	-19.45	QP			
3	798.9796	37.72	0.81	38.53	46.00	-7.47	QP			

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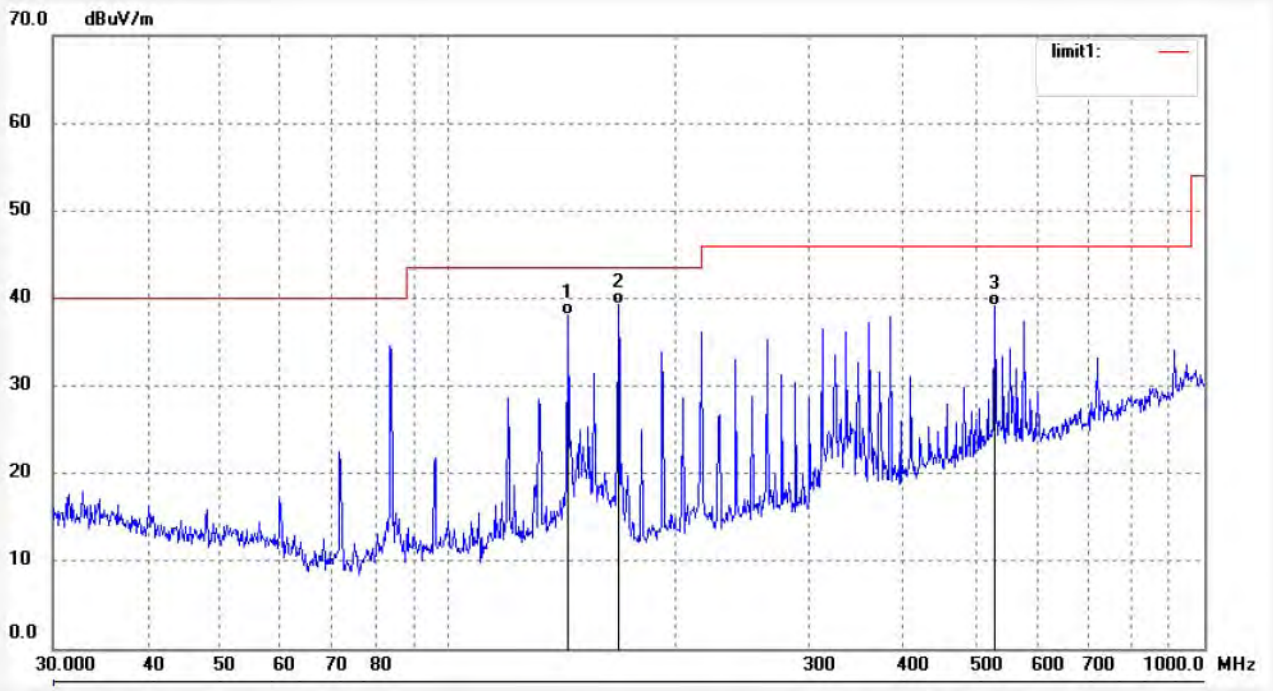
Fax:+86-0755-26503396

Job No.: LGW2019 #2506
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2441MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	143.8294	53.16	-15.11	38.05	43.50	-5.45	QP			
2	167.8242	53.18	-13.88	39.30	43.50	-4.20	QP			
3	528.2458	42.81	-3.71	39.10	46.00	-6.90	QP			

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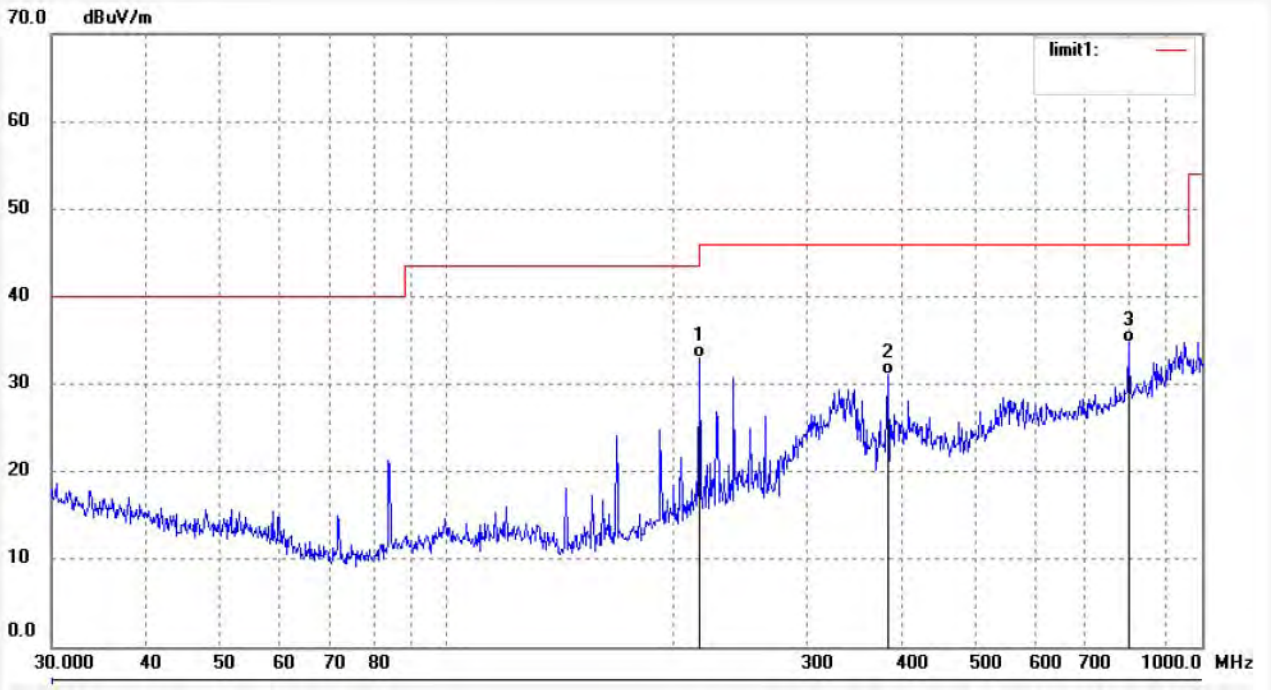
Job No.: LGW2019 #2507
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2441MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	216.0240	44.68	-11.66	33.02	46.00	-12.98	QP			
2	383.9318	38.07	-6.94	31.13	46.00	-14.87	QP			
3	798.9796	33.94	0.81	34.75	46.00	-11.25	QP			

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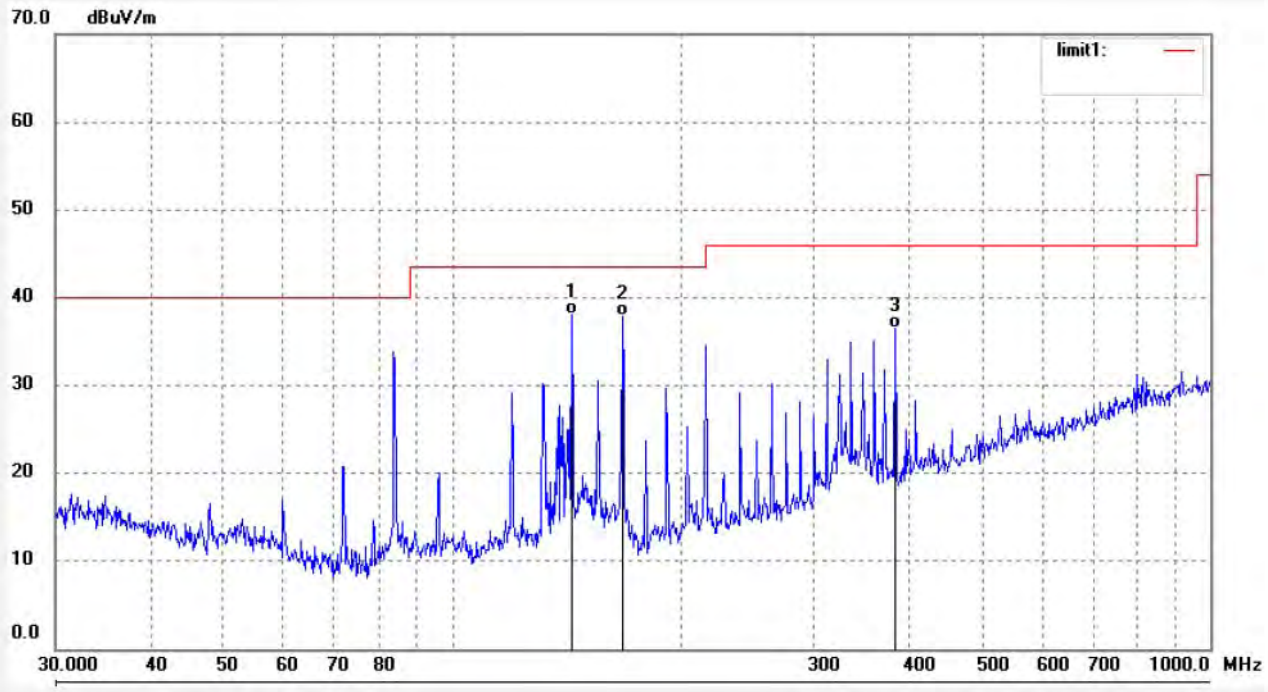
Fax:+86-0755-26503396

Job No.: LGW2019 #2509	Polarization: Horizontal
Standard: FCC Part 15C 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/06/24/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Neckband Sports Earphones	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: BTNCKEPBKPRM	
Manufacturer: THUMBS UK(UK)LTD	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	143.8294	53.12	-15.11	38.01	43.50	-5.49	QP			
2	167.8242	51.83	-13.88	37.95	43.50	-5.55	QP			
3	383.9318	43.41	-6.94	36.47	46.00	-9.53	QP			

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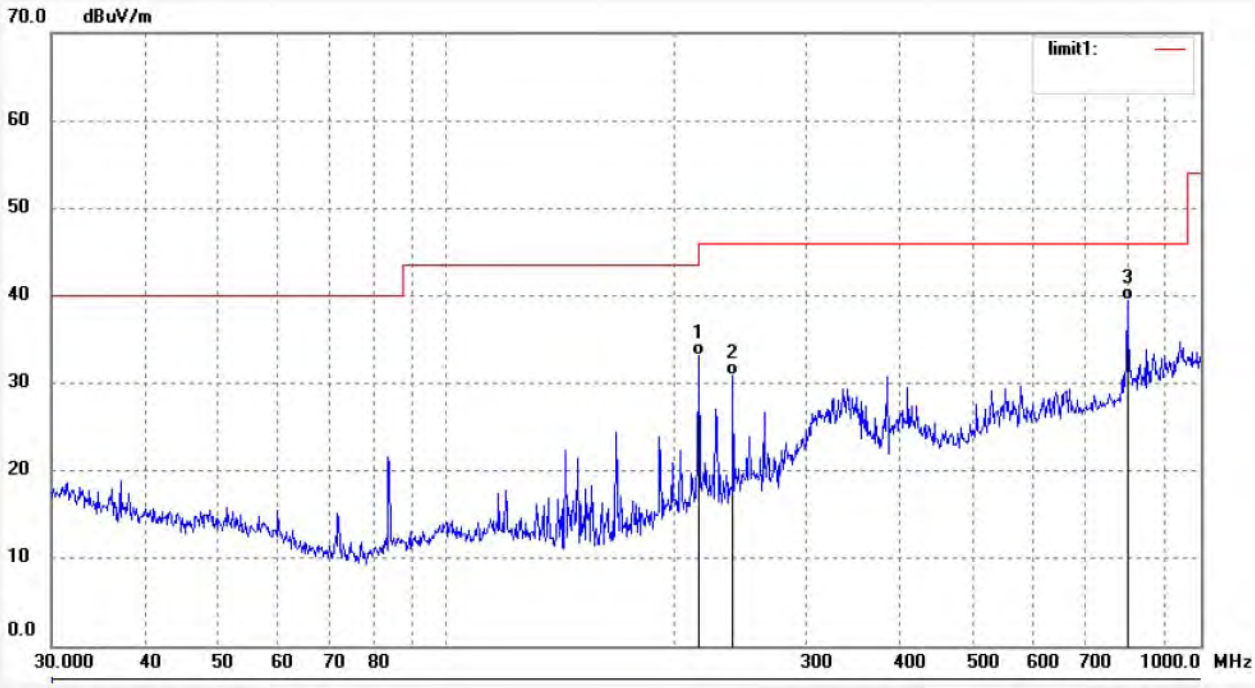
Fax:+86-0755-26503396

Job No.: LGW2019 #2508
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	216.0240	44.78	-11.66	33.12	46.00	-12.88	QP			
2	239.9874	41.53	-10.62	30.91	46.00	-15.09	QP			
3	798.9796	38.62	0.81	39.43	46.00	-6.57	QP			

1GHz-18GHz test data

ACCURATE TECHNOLOGY CO., LTD.
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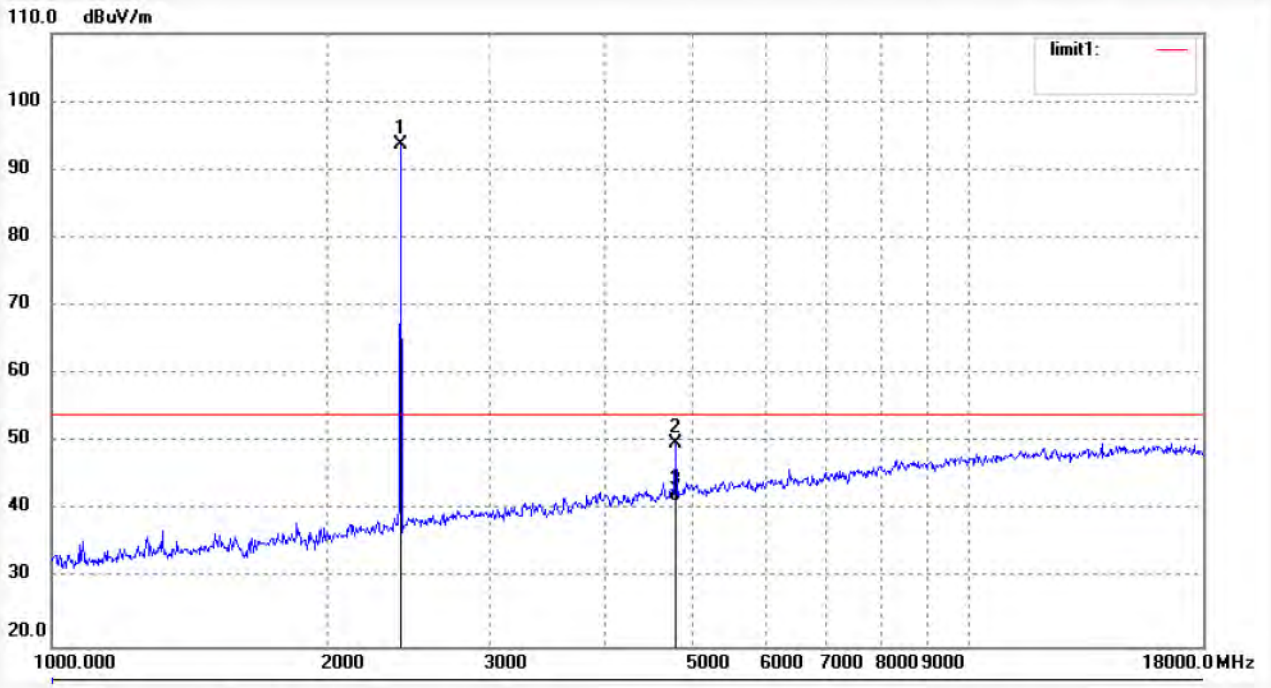
Fax:+86-0755-26503396

Job No.: LGW2019 #2470
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2402MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	92.85	0.89	93.74	/	/	peak			
2	4804.026	42.46	7.40	49.86	74.00	-24.14	peak			
3	4804.026	33.95	7.40	41.35	54.00	-12.65	AVG			

ACCURATE TECHNOLOGY CO., LTD.
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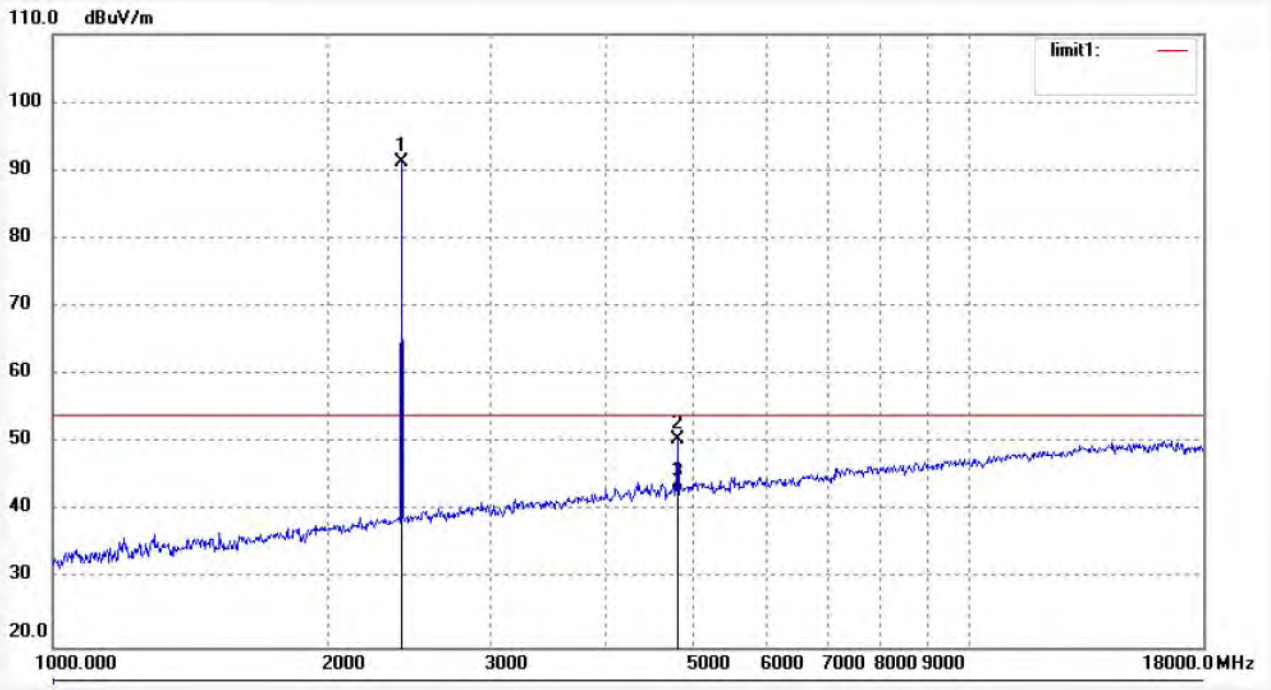
Fax:+86-0755-26503396

Job No.: LGW2019 #2471
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2402MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	90.29	0.89	91.18	/	/	peak			
2	4804.025	43.03	7.40	50.43	74.00	-23.57	peak			
3	4804.025	35.17	7.40	42.57	54.00	-11.43	AVG			

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F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
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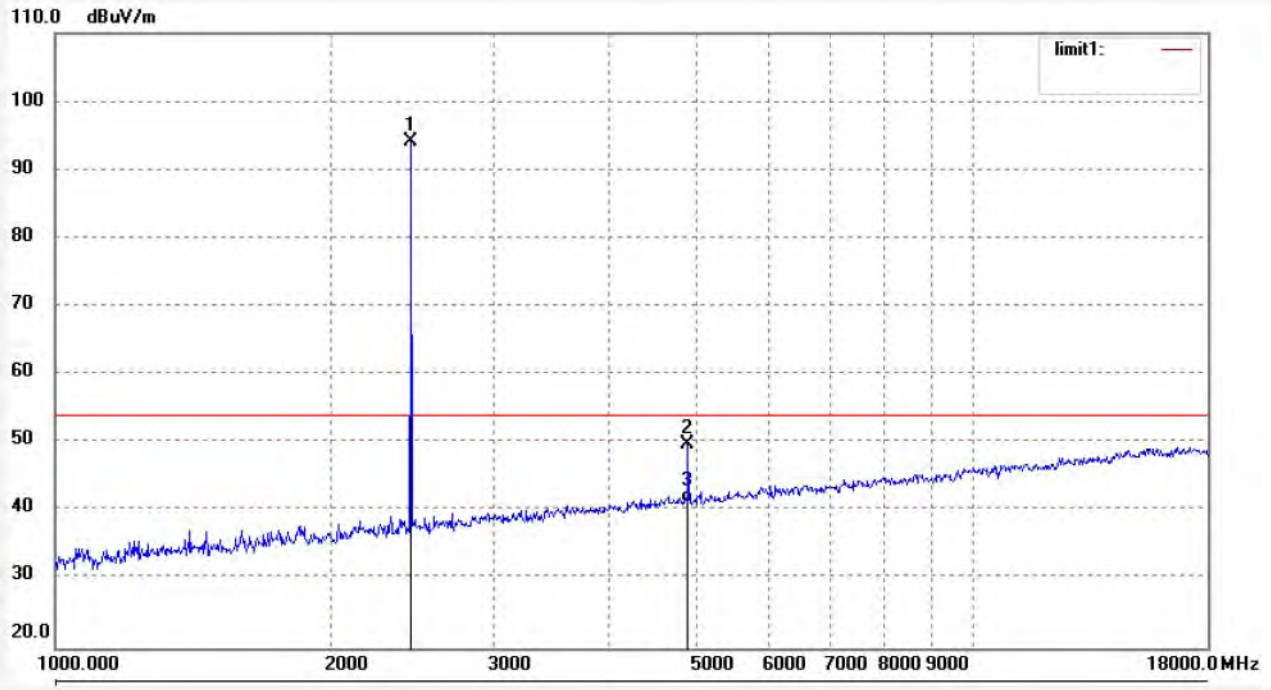
Fax:+86-0755-26503396

Job No.: LGW2019 #2474
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2441MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



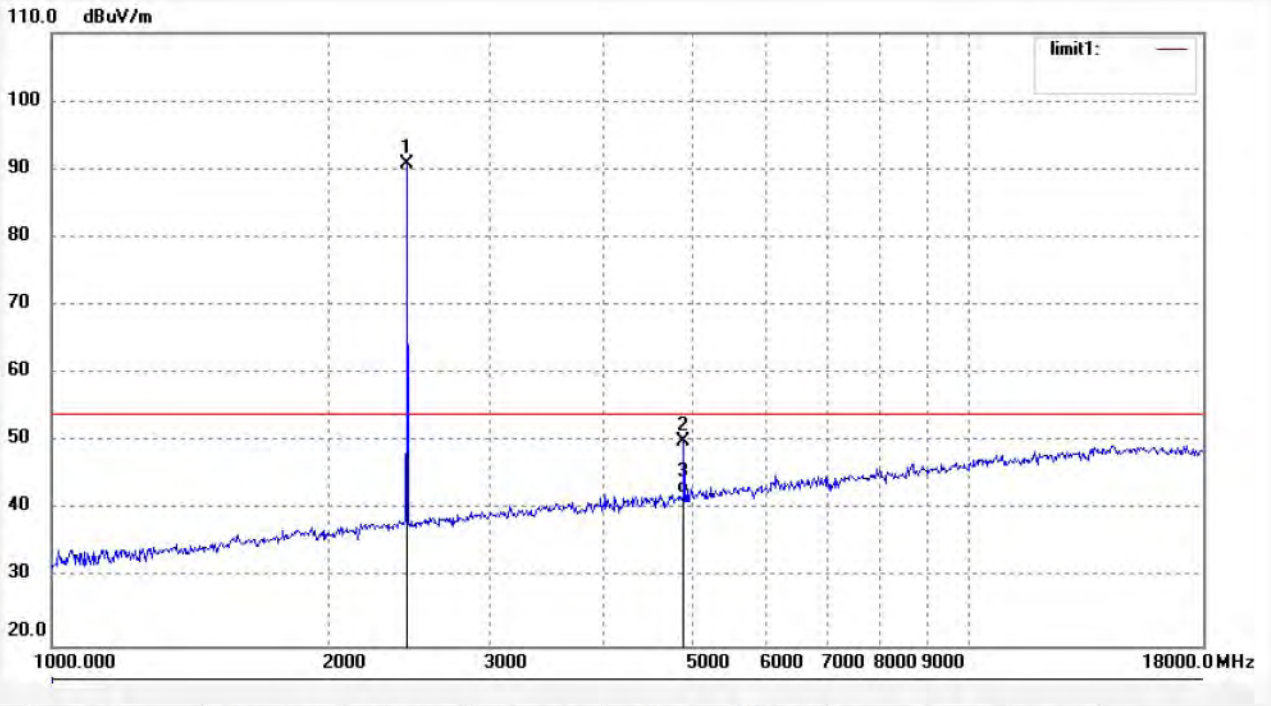
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	93.17	1.06	94.23	/	/	peak			
2	4882.027	41.61	8.11	49.72	74.00	-24.28	peak			
3	4882.027	33.21	8.11	41.32	54.00	-12.68	AVG			

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 #2475
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2441MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	89.74	1.06	90.80	/	/	peak			
2	4882.029	41.93	8.11	50.04	74.00	-23.96	peak			
3	4882.029	34.25	8.11	42.36	54.00	-11.64	AVG			

ACCURATE TECHNOLOGY CO., LTD.
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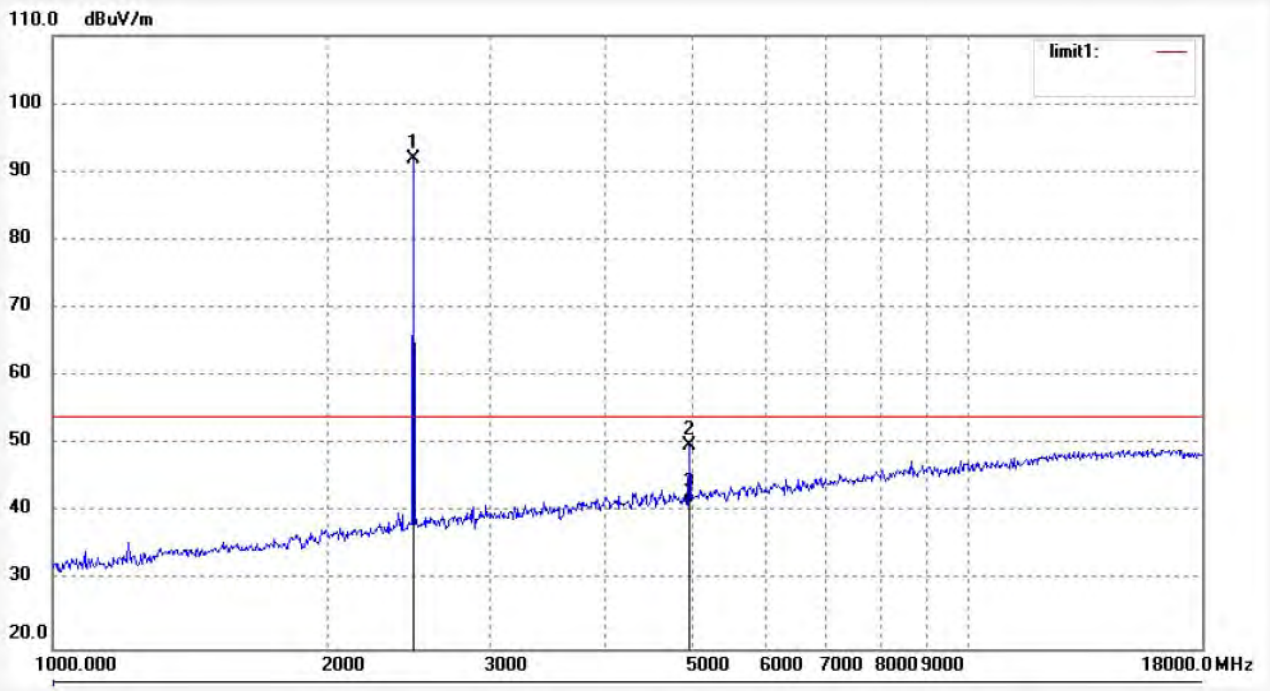
Job No.: LGW2019 #2477
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	90.77	1.10	91.87	/	/	peak			
2	4960.028	41.31	8.60	49.91	74.00	-24.09	peak			
3	4960.028	32.64	8.60	41.24	54.00	-12.76	AVG			

ACCURATE TECHNOLOGY CO., LTD.
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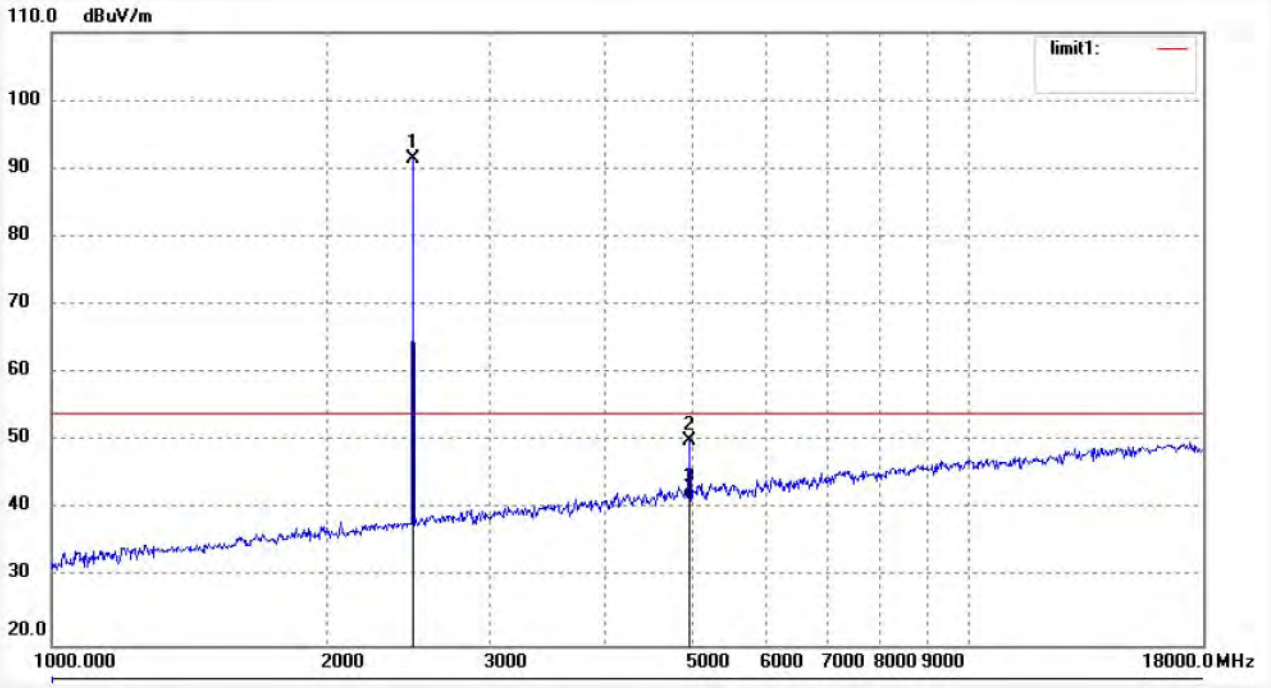
Job No.: LGW2019 #2476
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	90.31	1.10	91.41	/	/	peak			
2	4960.027	41.36	8.60	49.96	74.00	-24.04	peak			
3	4960.027	32.88	8.60	41.48	54.00	-12.52	AVG			

18GHz-26.5GHz test data

ACCURATE TECHNOLOGY CO., LTD.
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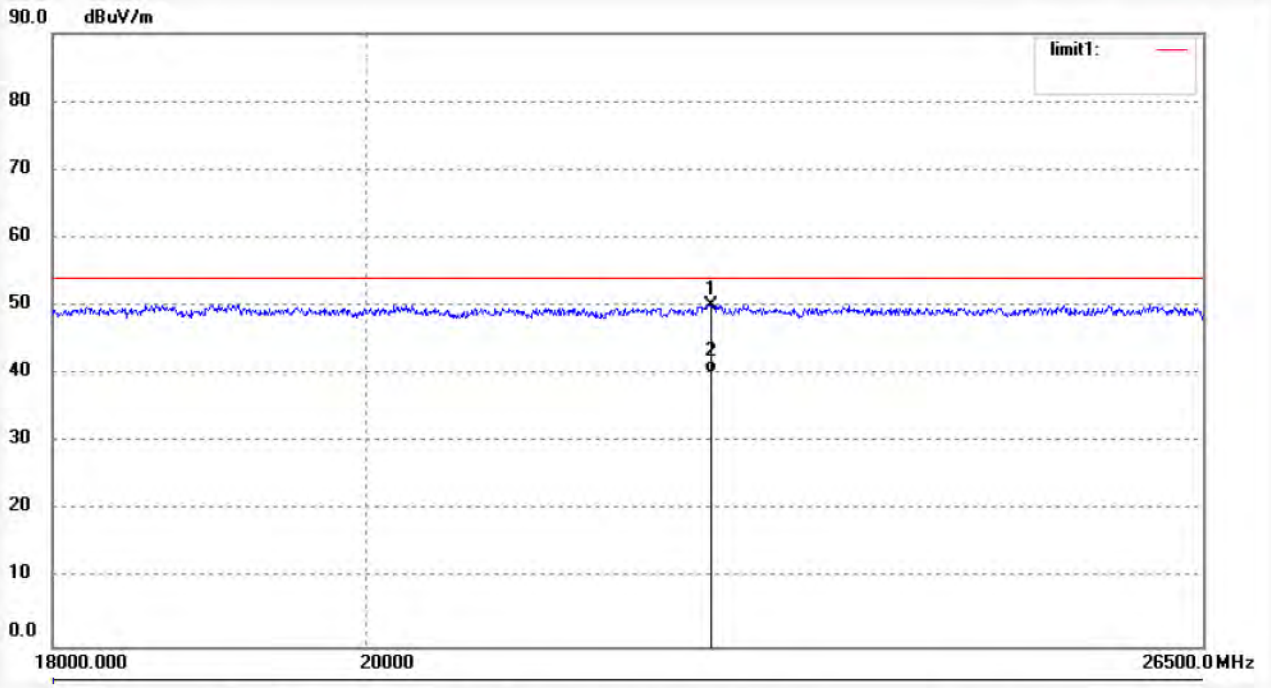
Fax:+86-0755-26503396

Job No.: LGW2019 #2481
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2402MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	22457.079	17.57	32.49	50.06	74.00	-23.94	peak			
2	22457.079	7.75	32.49	40.24	54.00	-13.76	AVG			

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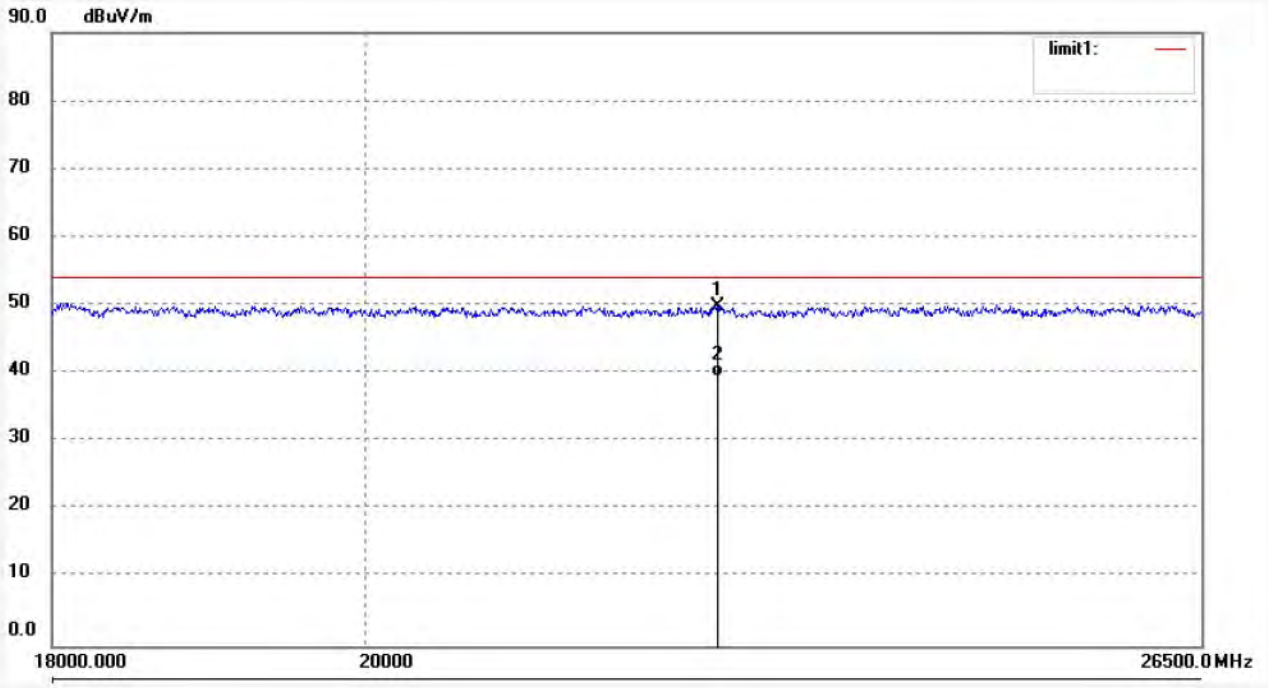
Job No.: LGW2019 #2480
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2402MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	22517.962	17.69	32.08	49.77	74.00	-24.23	peak			
2	22517.962	7.46	32.08	39.54	54.00	-14.46	AVG			

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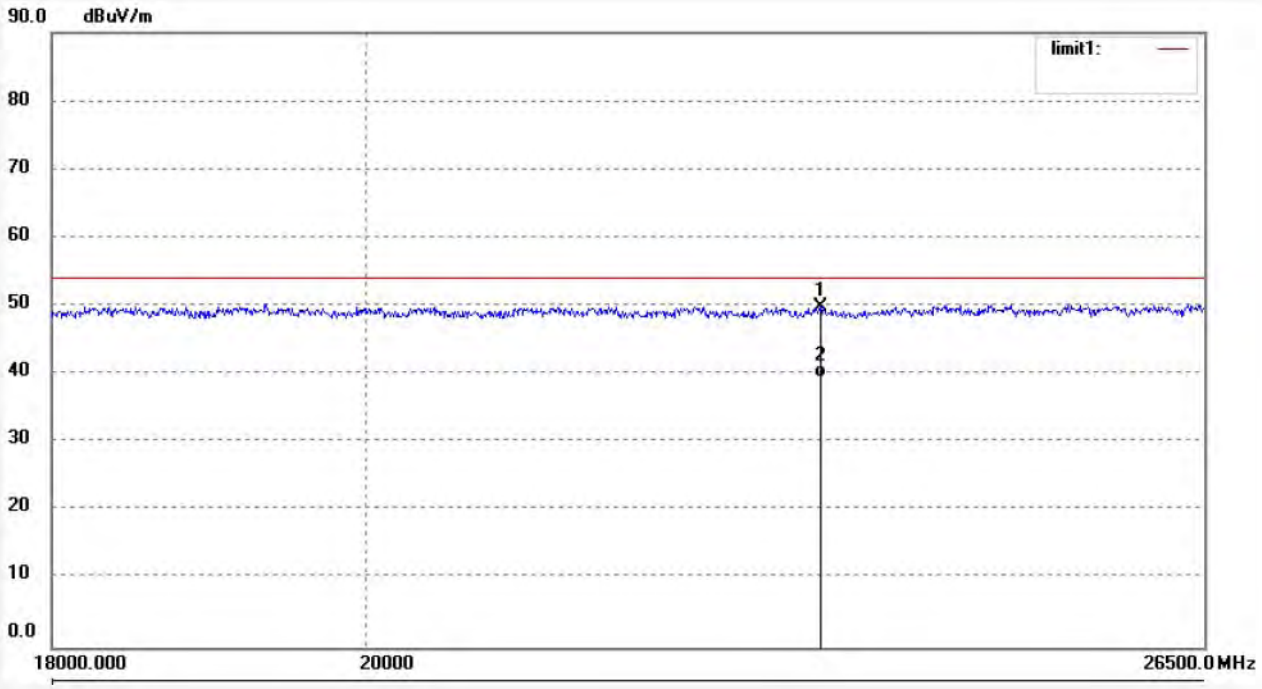
Job No.: LGW2019 #2482
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2441MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	23297.576	17.35	32.40	49.75	74.00	-24.25	peak			
2	23297.576	7.05	32.40	39.45	54.00	-14.55	AVG			

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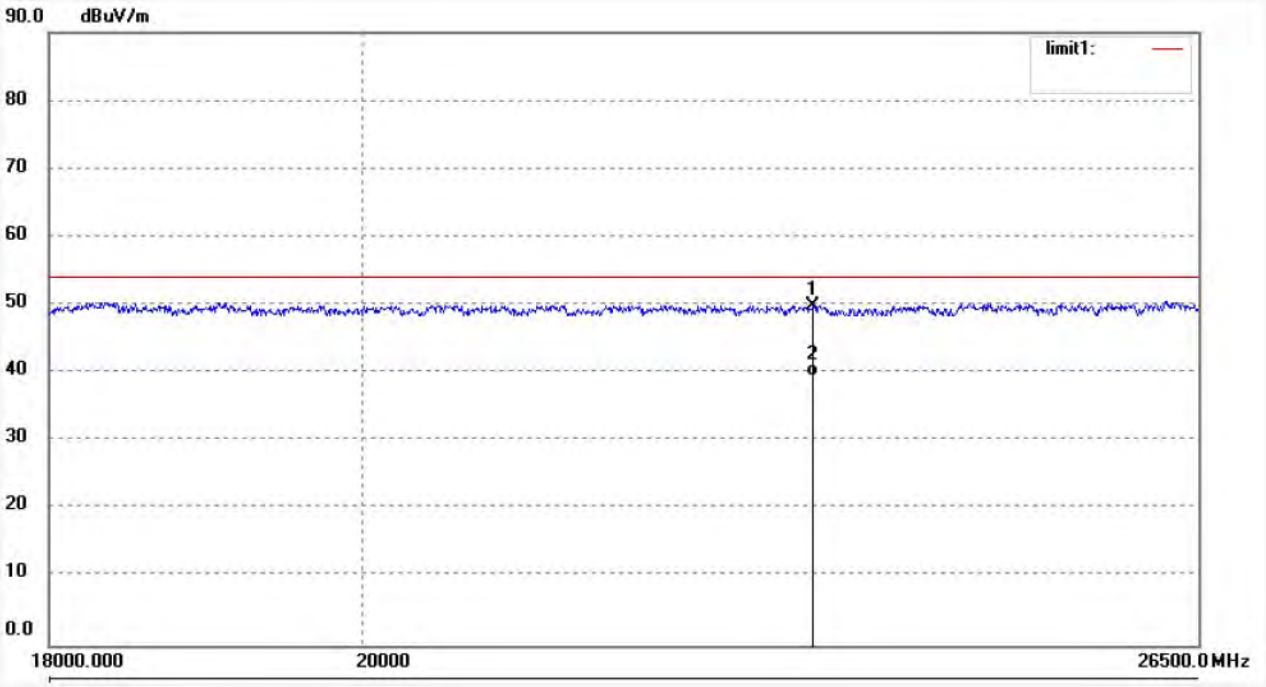
Job No.: LGW2019 #2483
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2441MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	23279.561	17.60	32.31	49.91	74.00	-24.09	peak			
2	23279.561	7.14	32.31	39.45	54.00	-14.55	AVG			

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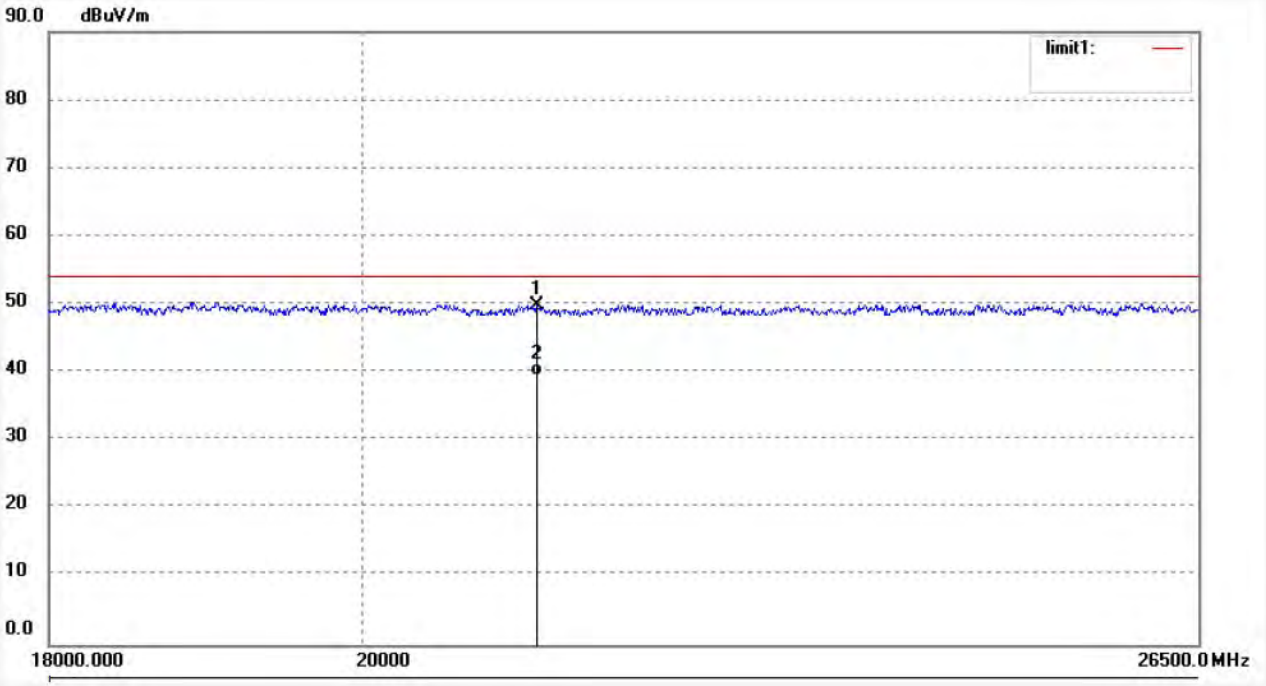
Job No.: LGW2019 #2485
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	21215.887	18.46	31.38	49.84	74.00	-24.16	peak			
2	21215.887	8.07	31.38	39.45	54.00	-14.55	AVG			

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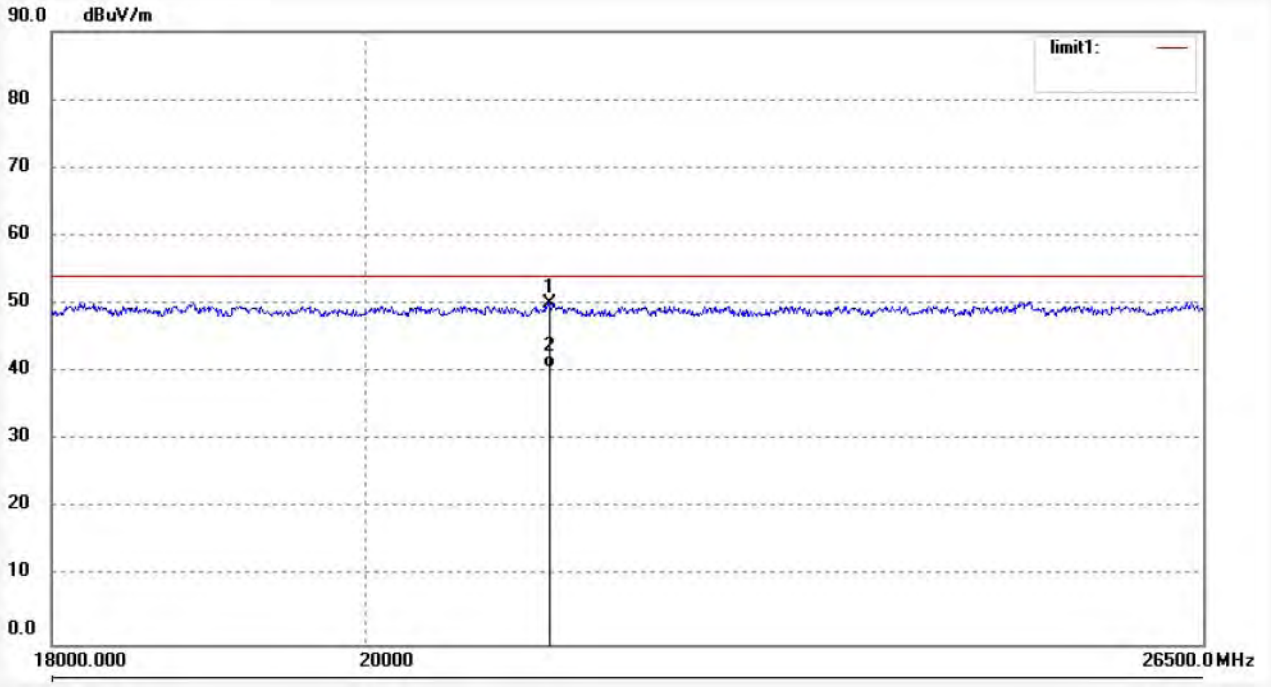
Job No.: LGW2019 #2484
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
Time:
Engineer Signature: WADE
Distance: 3m

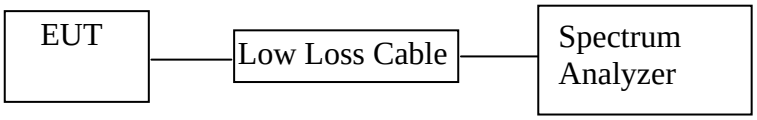
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21273.405	17.84	32.24	50.08	74.00	-23.92	peak			
2	21273.405	8.30	32.24	40.54	54.00	-13.46	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

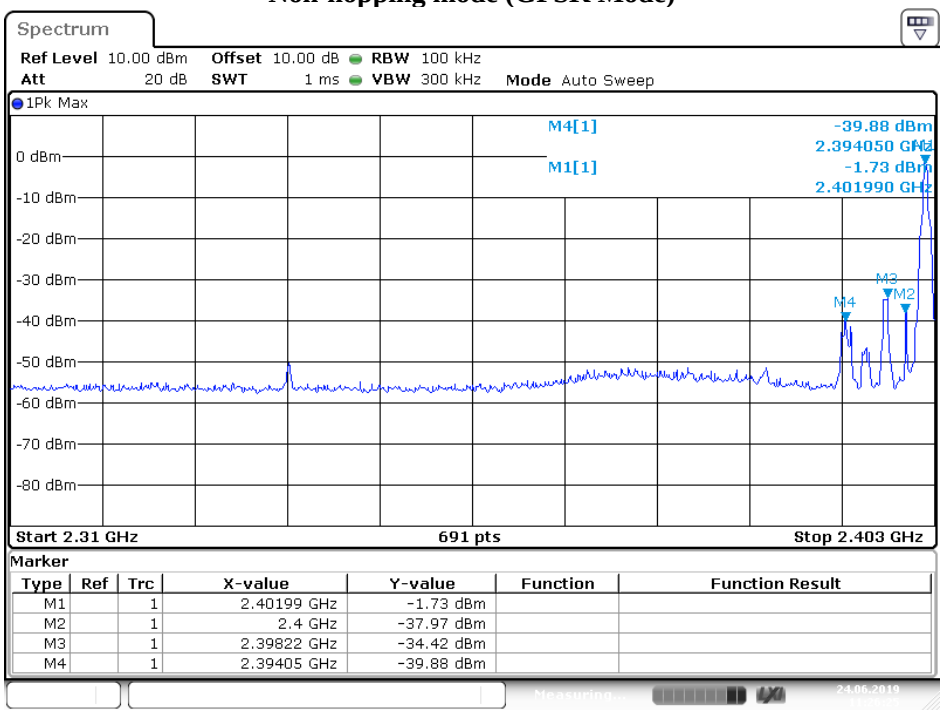
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)	Result
GFSK mode			
2400.00	32.69	> 20dBc	Pass
2483.50	39.85	> 20dBc	Pass
π /4 DQPSK mode			
2400.00	32.60	> 20dBc	Pass
2483.50	40.07	> 20dBc	Pass

Hopping mode

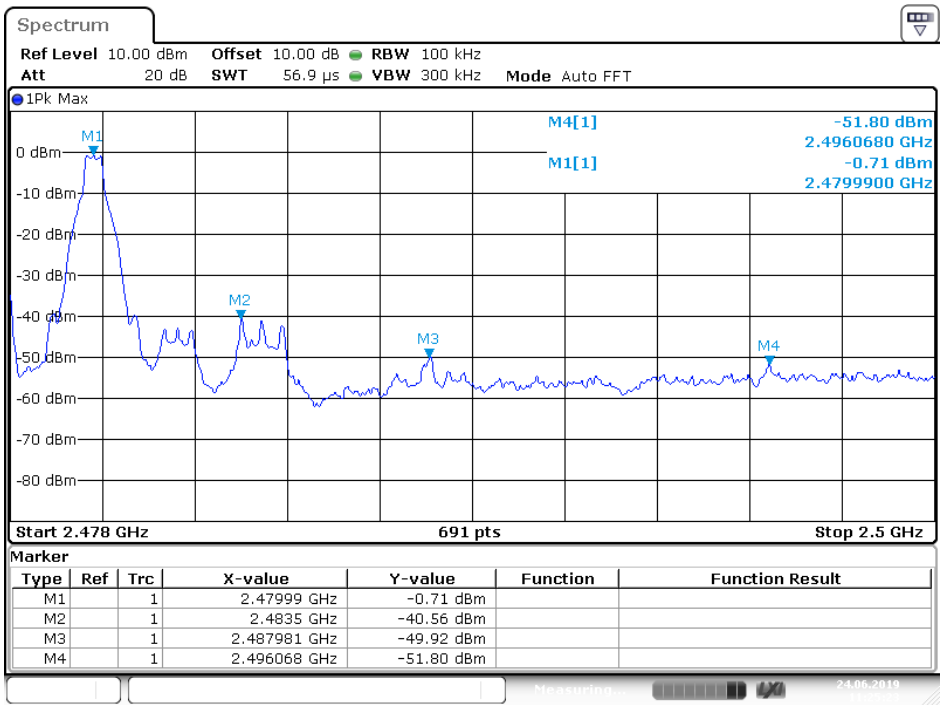
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)	Result
GFSK mode			
2400.00	33.56	> 20dBc	Pass
2483.94	40.71	> 20dBc	Pass
π /4 DQPSK mode			
2400.00	33.40	> 20dBc	Pass
2483.91	40.43	> 20dBc	Pass

The spectrum analyzer plots are attached as below.

Non-hopping mode (GFSK Mode)

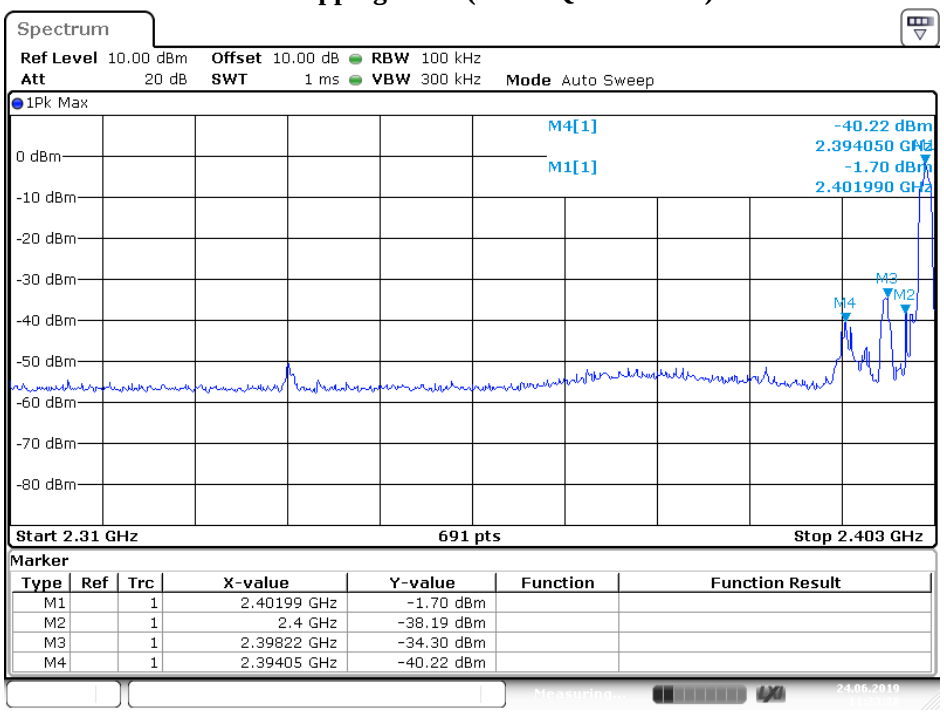


Date: 24.JUN.2019 11:26:25

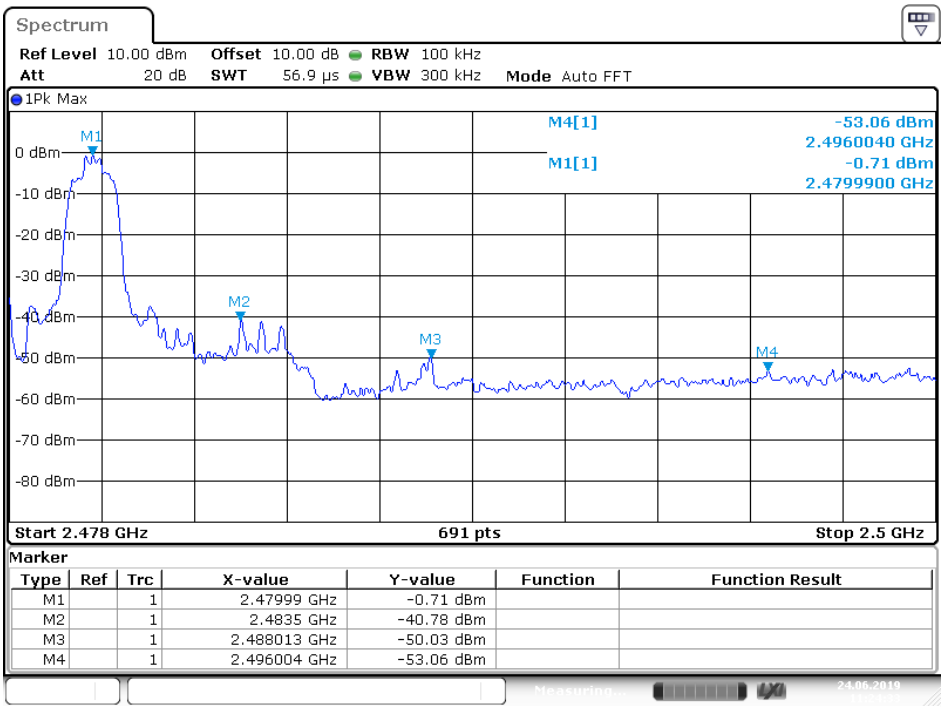


Date: 24.JUN.2019 11:25:23

Non-hopping mode (π /4 DQPSK Mode)

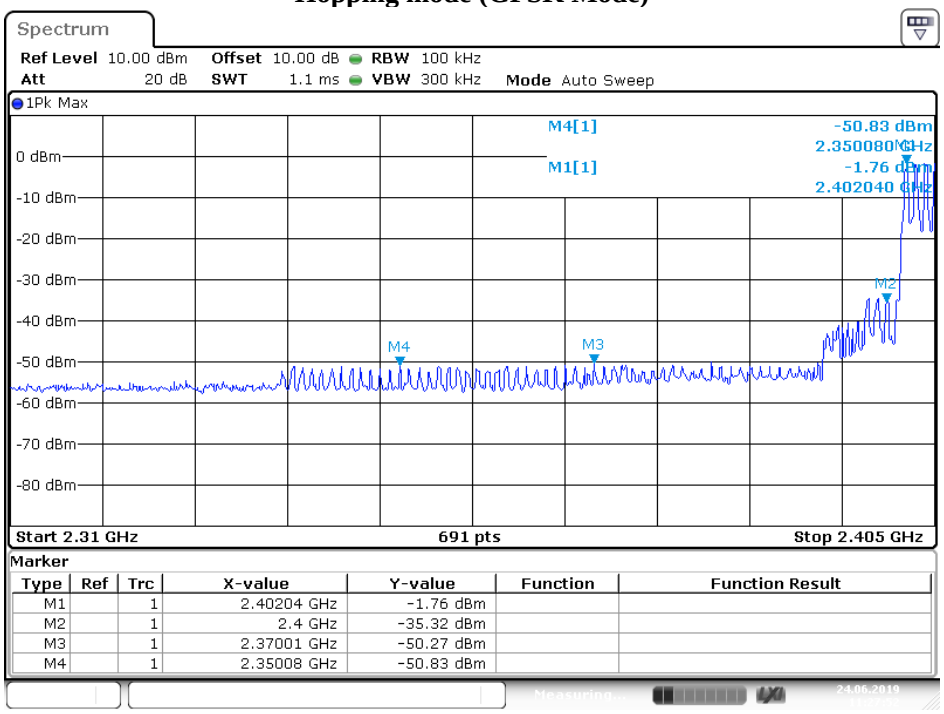


Date: 24.JUN.2019 11:23:28



Date: 24.JUN.2019 11:24:33

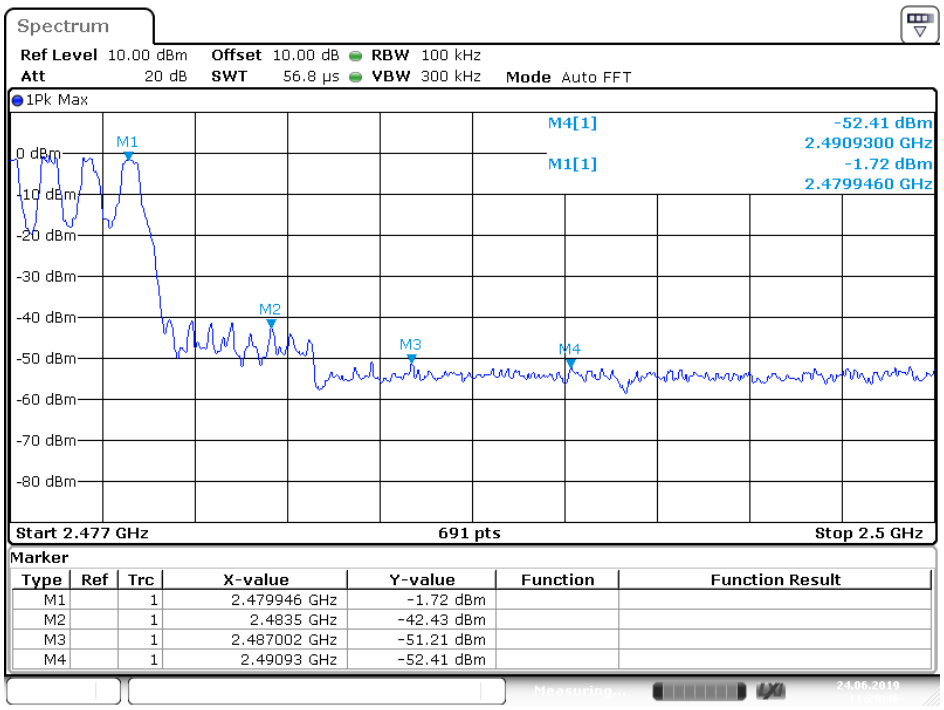
Hopping mode (GFSK Mode)



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40204 GHz	-1.76 dBm		
M2		1	2.4 GHz	-35.32 dBm		
M3		1	2.37001 GHz	-50.27 dBm		
M4		1	2.35008 GHz	-50.83 dBm		

Date: 24.JUN.2019 11:27:52

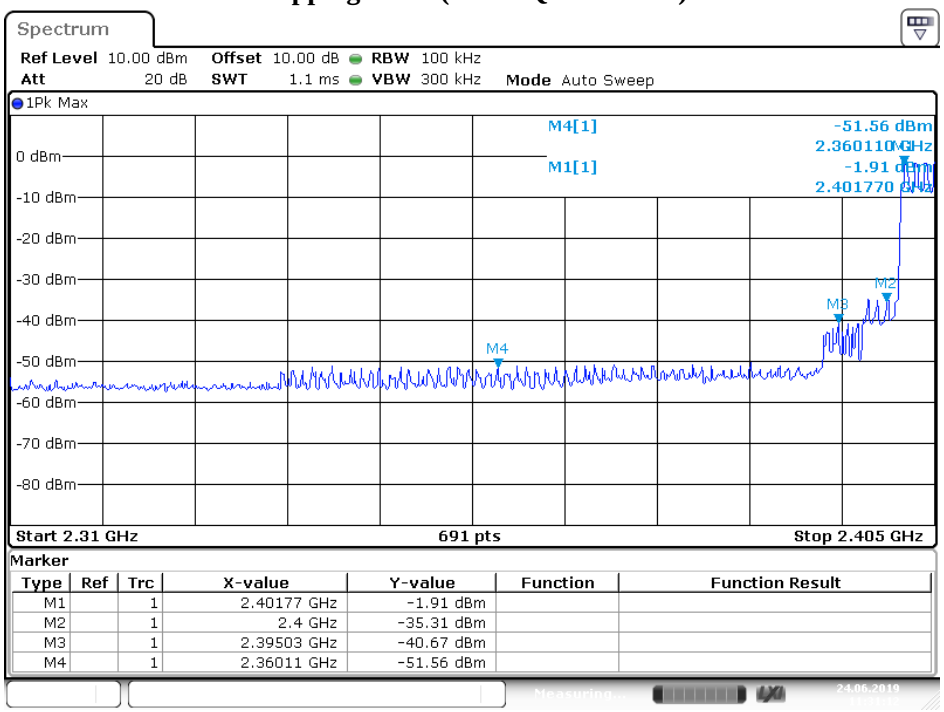


Marker

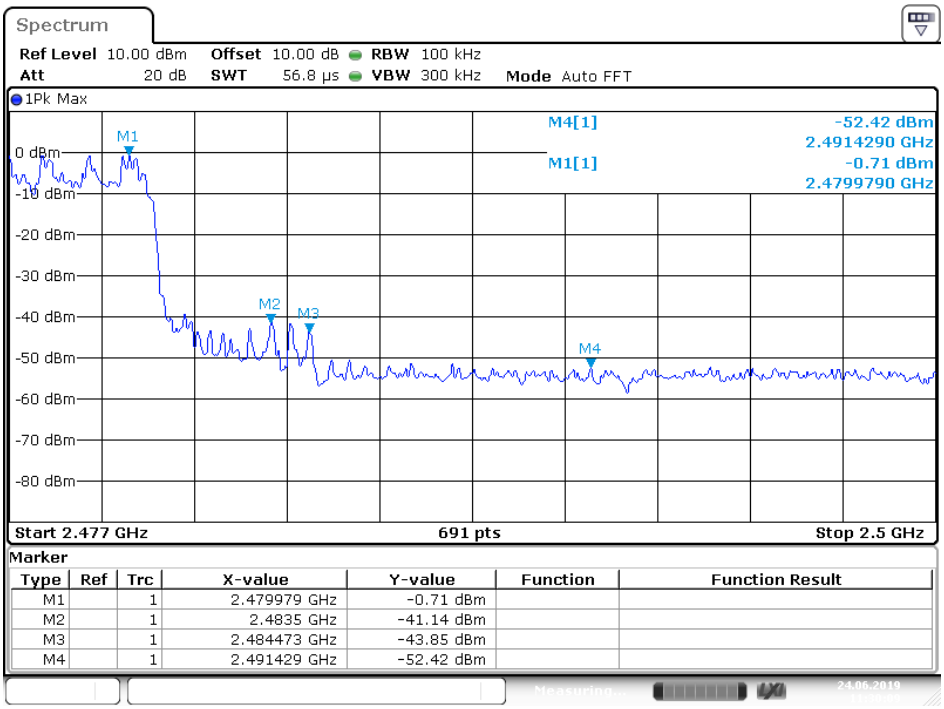
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479946 GHz	-1.72 dBm		
M2		1	2.4835 GHz	-42.43 dBm		
M3		1	2.487002 GHz	-51.21 dBm		
M4		1	2.49093 GHz	-52.41 dBm		

Date: 24.JUN.2019 11:28:46

Hopping mode (π /4 DQPSK Mode)



Date: 24.JUN.2019 11:31:12



Date: 24.JUN.2019 11:30:10

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(π/4 DQPSK Mode) emissions are reported.

Non-hopping mode

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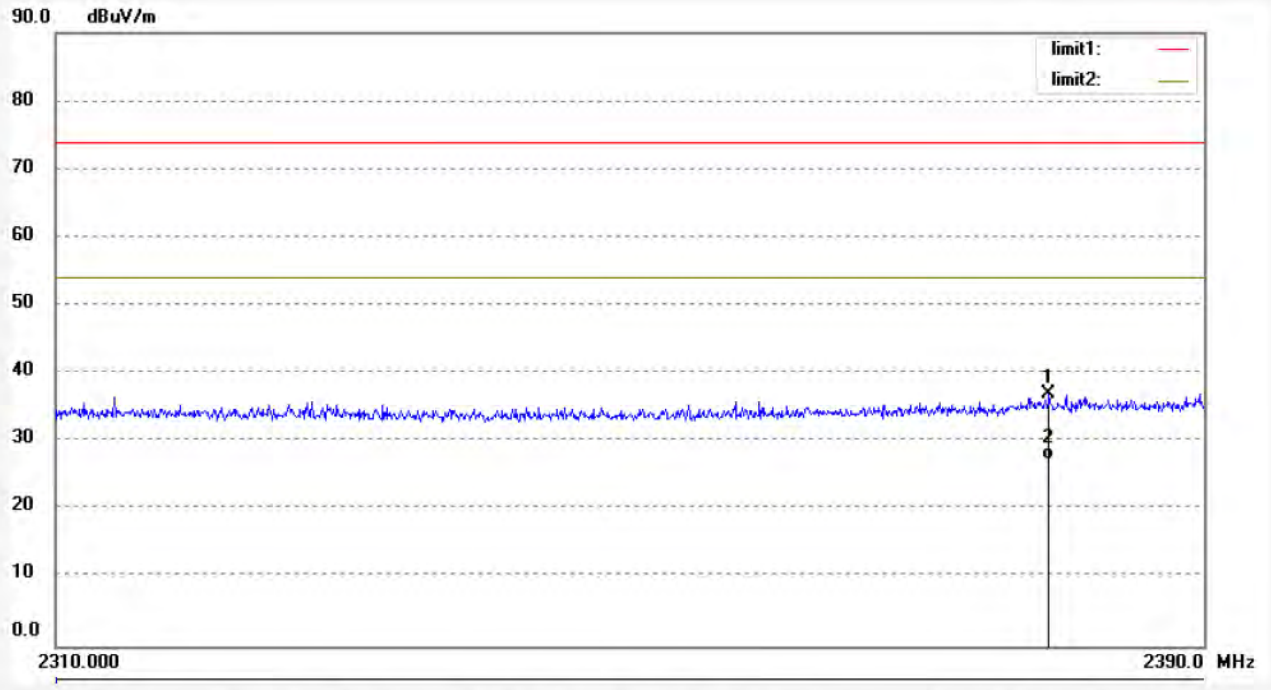
Job No.: LGW2019 #2473	Polarization: Horizontal
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/06/24/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Neckband Sports Earphones	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: BTNCKEPBKPRM	
Manufacturer: THUMBS UK(UK)LTD	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2379.120	36.31	0.72	37.03	74.00	-36.97	peak			
2	2379.120	26.63	0.72	27.35	54.00	-26.65	AVG			

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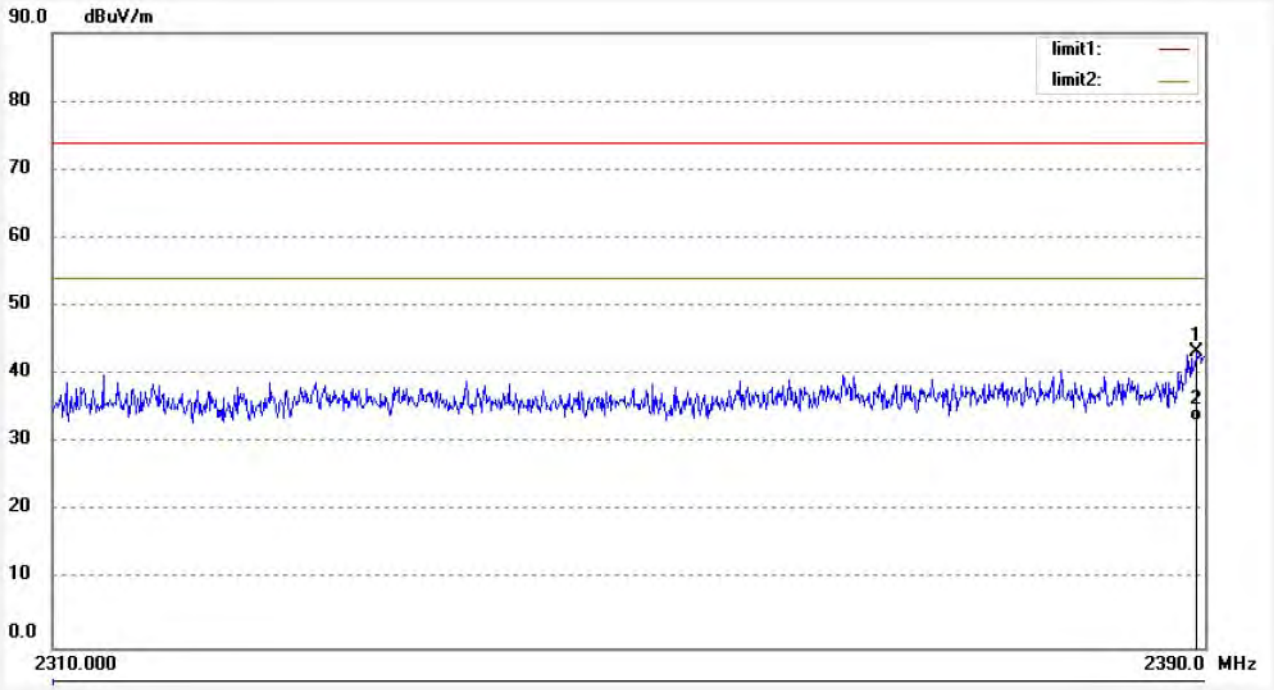
Job No.: LGW2019 #2472
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2402MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
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	2389.440	42.47	0.79	43.26	74.00	-30.74	peak			
2	2389.440	32.45	0.79	33.24	54.00	-20.76	AVG			

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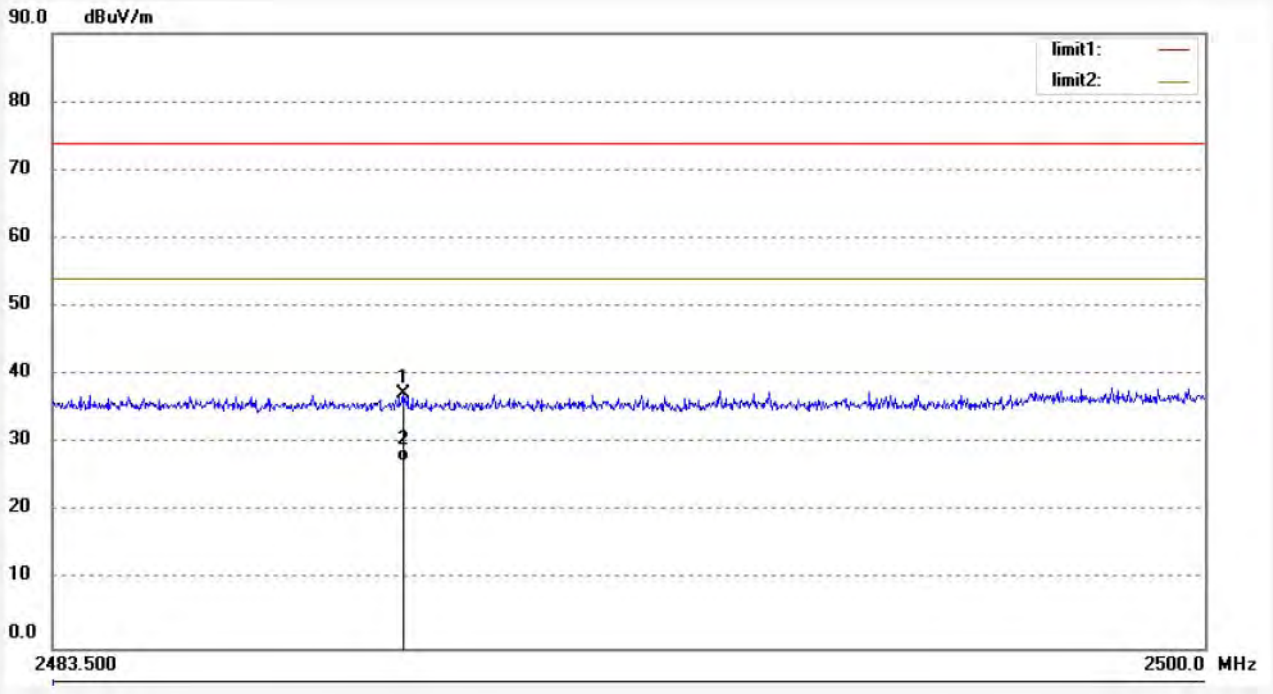
Job No.: LGW2019 #2478
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 19/06/24/
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	2488.516	36.24	1.10	37.34	74.00	-36.66	peak			
2	2488.516	26.35	1.10	27.45	54.00	-26.55	AVG			

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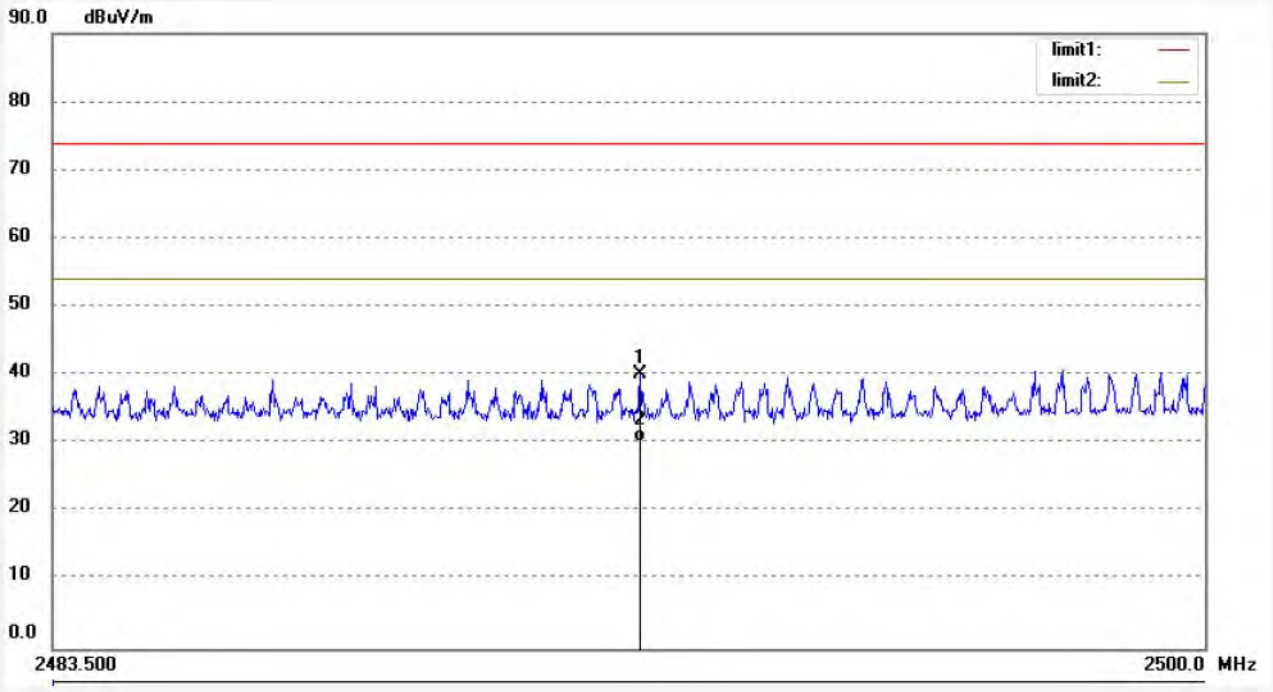
Job No.: LGW2019 #2479
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Neckband Sports Earphones
Mode: TX 2480MHz
Model: BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD

Polarization: Vertical
Power Source: DC 3.7V
Date: 19/06/24/
Time:
Engineer Signature: WADE
Distance: 3m

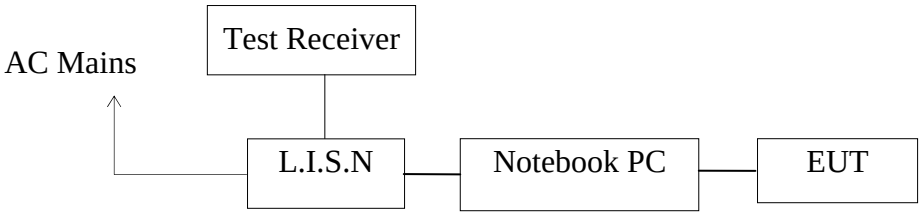
Note:



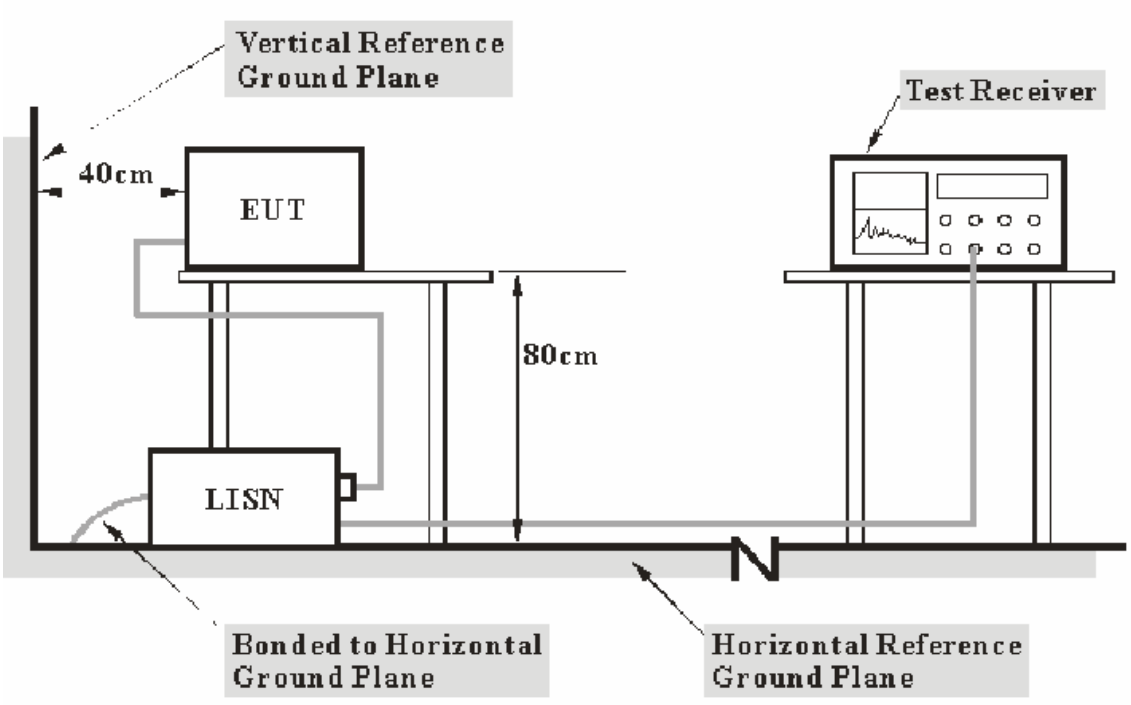
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2491.915	39.03	1.10	40.13	74.00	-33.87	peak			
2	2491.915	29.15	1.10	30.25	54.00	-23.75	AVG			

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.

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.

ACCURATE TECHNOLOGY CO.,LTD

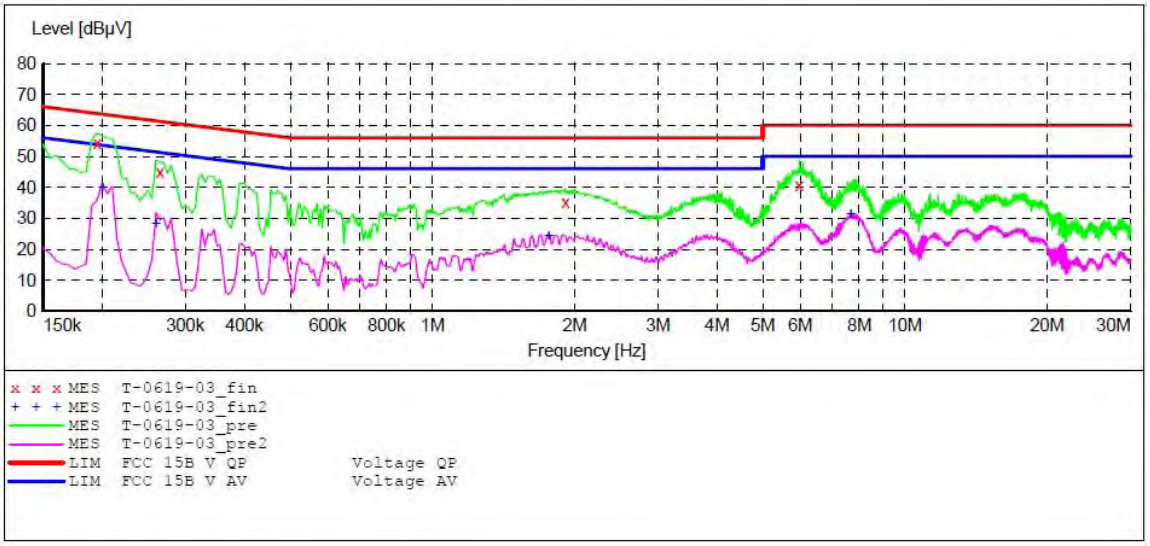
CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: BT Communication
Test Site: 1#Shielding Room
Operator: WADE
Test Specification: L 120V/60Hz
Comment:
Start of Test: 6/19/2019 /

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 Average	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "T-0619-03_fin"

6/19/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	54.40	10.5	64	9.4	QP	L1	GND
0.265000	45.00	10.6	61	16.3	QP	L1	GND
1.910000	35.30	11.0	56	20.7	QP	L1	GND
5.970000	40.50	11.2	60	19.5	QP	L1	GND

MEASUREMENT RESULT: "T-0619-03_fin2"

6/19/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.200000	39.90	10.5	54	13.7	AV	L1	GND
0.260000	28.10	10.6	51	23.3	AV	L1	GND
1.760000	24.30	11.0	46	21.7	AV	L1	GND
7.680000	31.40	11.2	50	18.6	AV	L1	GND

ACCURATE TECHNOLOGY CO.,LTD

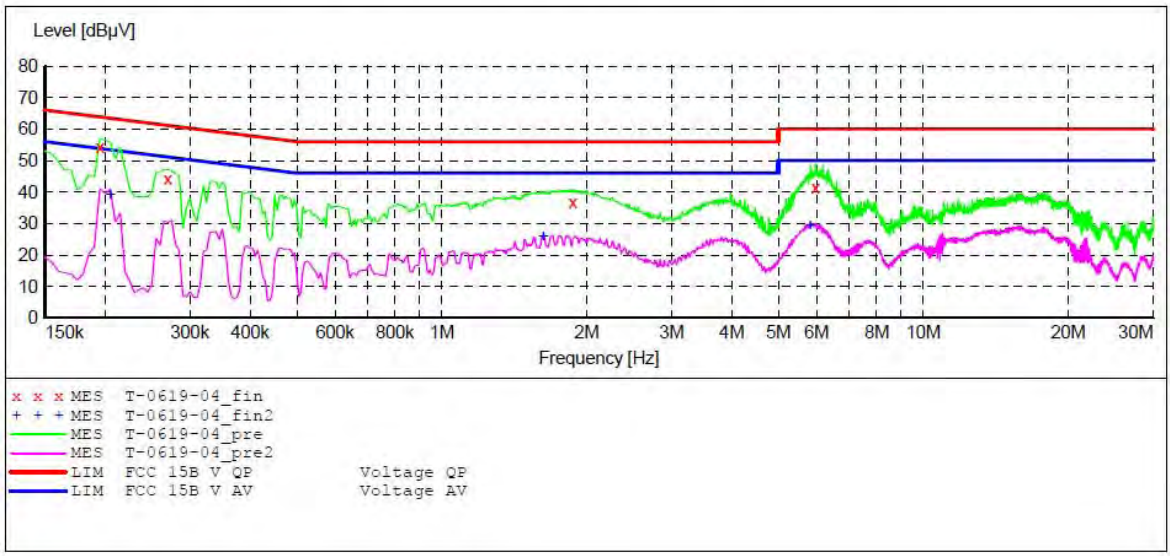
CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: Bluetooth Neckband Sports Earphones M/N:BTNCKEPBKPRM
Manufacturer: THUMBS UK(UK)LTD
Operating Condition: BT Communication
Test Site: 1#Shielding Room
Operator: WADE
Test Specification: N 120V/60Hz
Comment:
Start of Test: 6/19/2019 /

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 Average	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "T-0619-04_fin"

6/19/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	54.20	10.5	64	9.6	QP	N	GND
0.270000	44.30	10.6	61	16.8	QP	N	GND
1.870000	36.90	11.0	56	19.1	QP	N	GND
5.970000	41.20	11.2	60	18.8	QP	N	GND

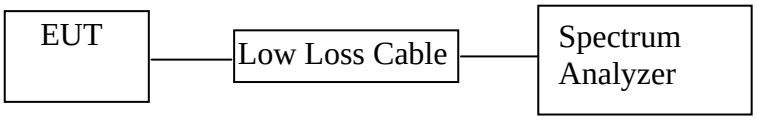
MEASUREMENT RESULT: "T-0619-04_fin2"

6/19/2019

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.205000	39.10	10.5	53	14.3	AV	N	GND
1.625000	25.80	10.9	46	20.2	AV	N	GND
5.820000	29.40	11.2	50	20.6	AV	N	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.

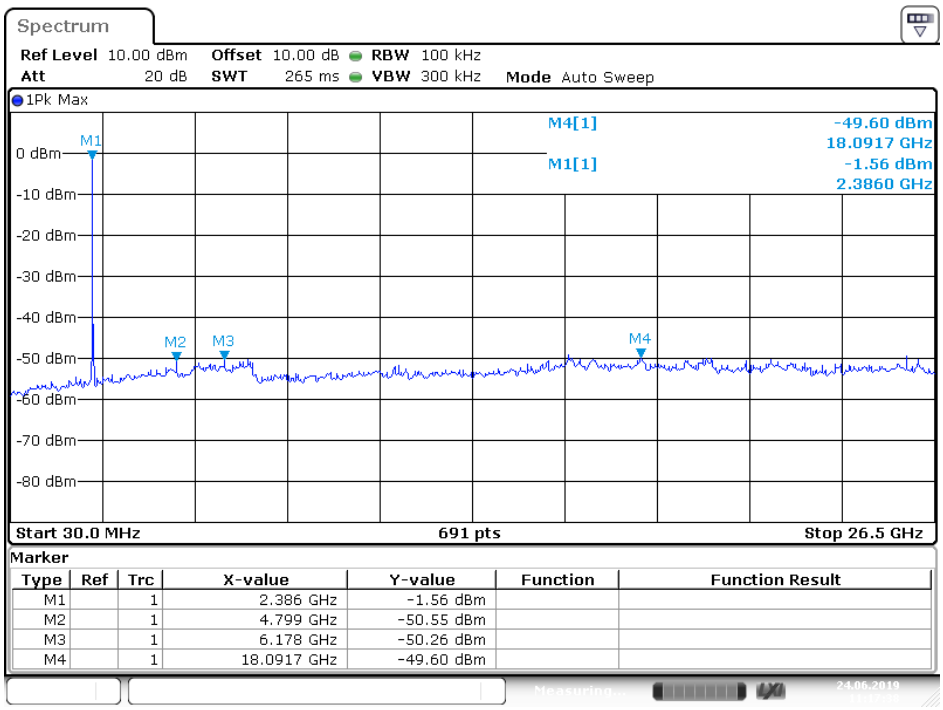
13.6.Test Result

Pass.

The spectrum analyzer plots are attached as below.

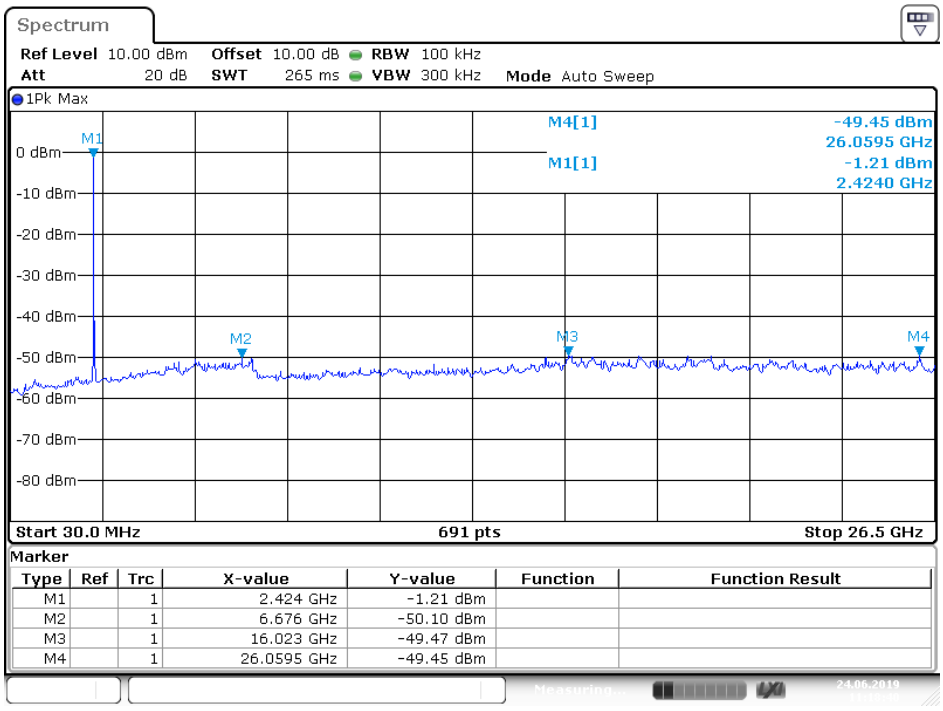
GFSK mode

Low Channel



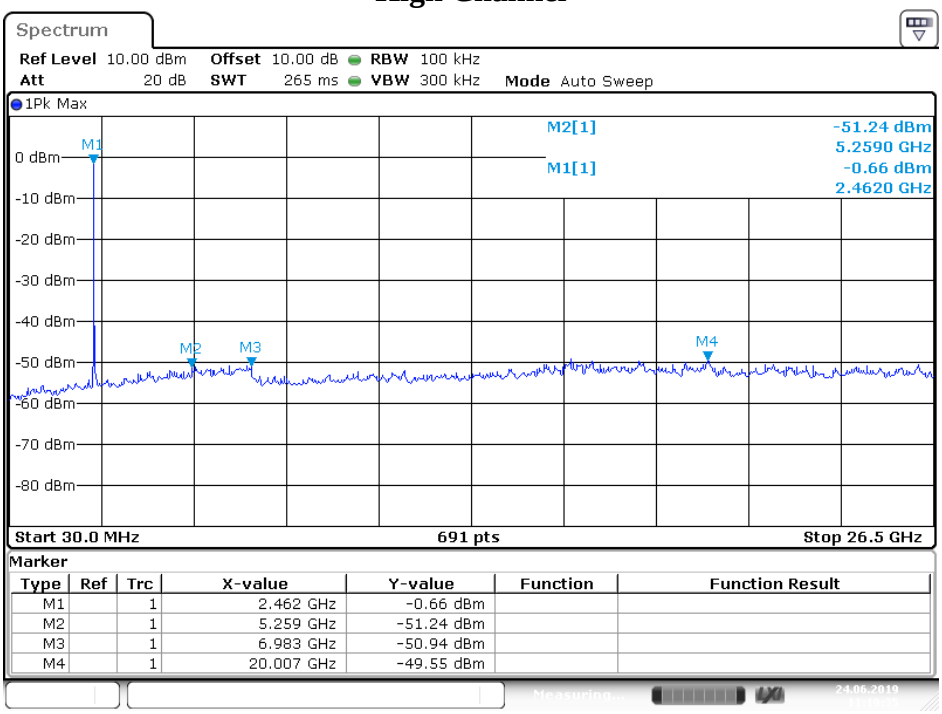
Date: 24.JUN.2019 11:17:38

Middle Channel



Date: 24.JUN.2019 11:18:40

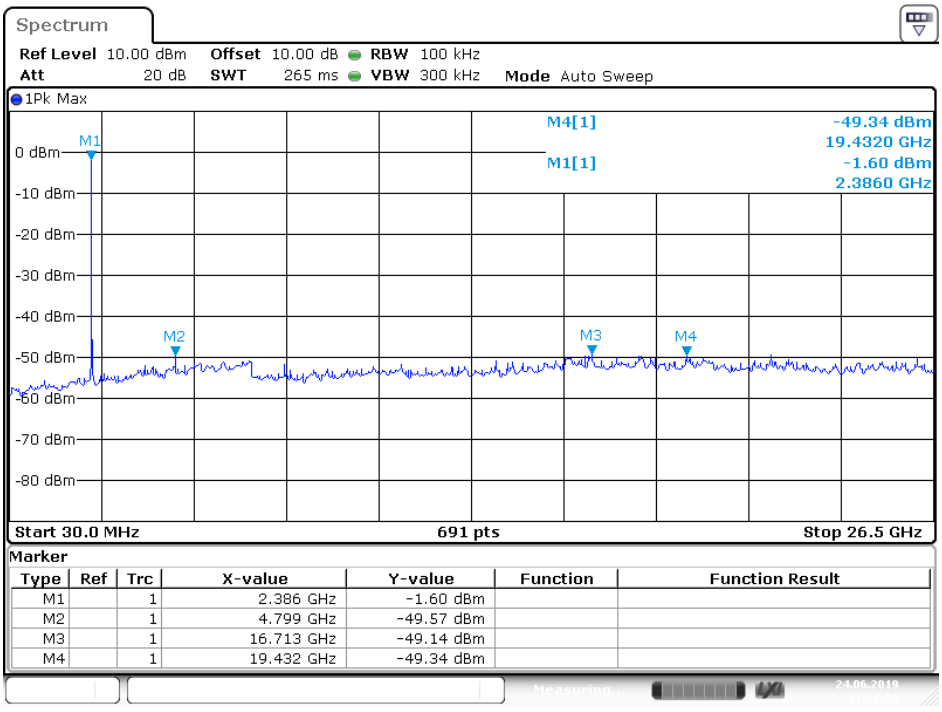
High Channel



Date: 24.JUN.2019 11:19:35

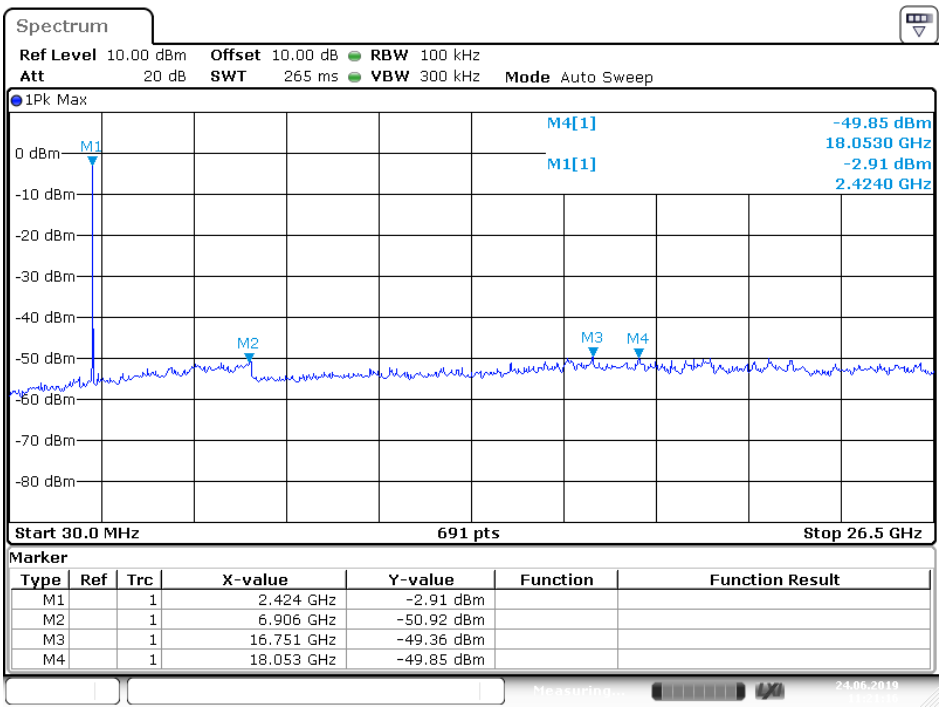
π/4 DQPSK mode

Low Channel



Date: 24.JUN.2019 11:22:06

Middle Channel



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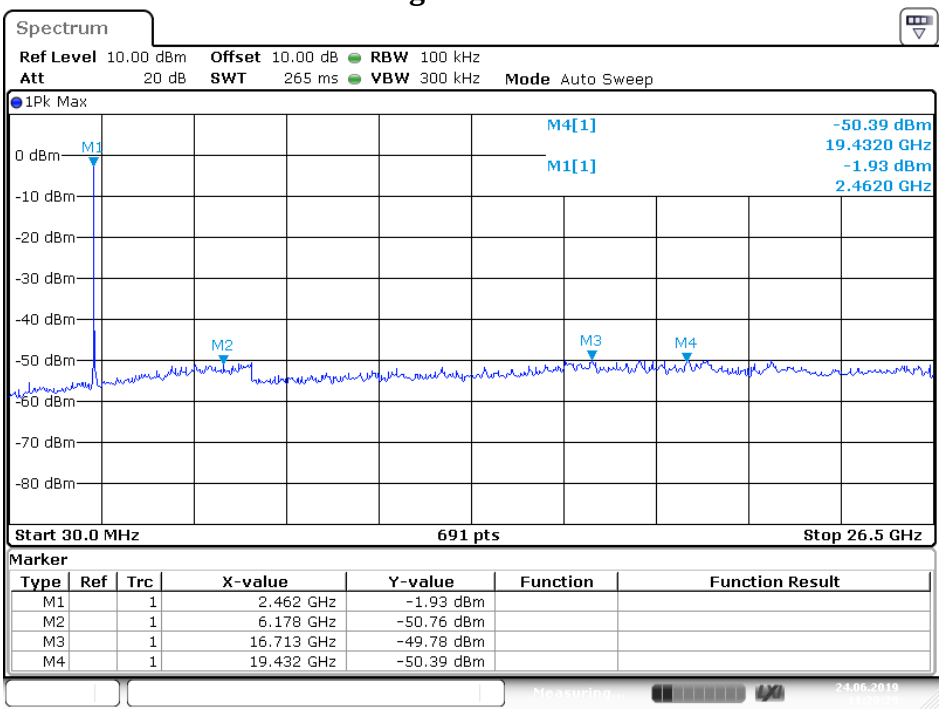
High Channel



Date: 24.JUN.2019 11:20:29

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 *******