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

Bluetooth Speaker

Model No.: SPKRWIRBLKPRM, SPKRWIRBLUPRM, SPKRWIRPNKPRM, SPKRWIRYLWPRM, SPKRWIRGRPRM, SPKRWIRGRNPRM

FCC ID: 2AHHESPKRWIRPRM

Prepared for	:	THUMBS UP(UK)LTD
Address	:	Unit L, Braintree Industrial Estate, Braintree Road HA4 0EJ, Ruislip, LONDON, United Kingdom
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
Address	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.
		Tel: (0755) 26503290 Fax: (0755) 26503396

Report No.	:	ATE20181631
Date of Test	:	July 29-August 7, 2018
Date of Report	:	August 30, 2018

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 6
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 23
8.6. Test Result 23
9. MAXIMUM PEAK OUTPUT POWER TEST 34
9.1. Block Diagram of Test Setup 34
9.2. The Requirement For Section 15.247(b)(1) 34

9.3. EUT Configuration on Measurement 34
9.4. Operating Condition of EUT 34
9.5. Test Procedure 34
9.6. Test Result 35
10. RADIATED EMISSION TEST 39
10.1. Block Diagram of Test Setup 39
10.2. The Requirement For Section 15.247(d) 40
10.3. Transmitter Emission Limit 41
10.4. Restricted bands of operation 42
10.5. Configuration of EUT on Measurement 42
10.6. Test Procedure 43
10.7. Data Sample 44
10.8. The Field Strength of Radiation Emission Measurement Results 44
11. BAND EDGE COMPLIANCE TEST 72
11.1. Block Diagram of Test Setup 72
11.2. The Requirement For Section 15.247(d) 72
11.3. EUT Configuration on Measurement 72
11.4. Operating Condition of EUT 72
11.5. Test Procedure 73
11.6. Test Result 73
12. AC POWER LINE CONDUCTED EMISSION FOR FCC PART 15 SECTION 15.207(A) 83
12.1. Block Diagram of Test Setup 83
12.2. Test System Setup 83
12.3. Power Line Conducted Emission Measurement Limits 84
12.4. Configuration of EUT on Measurement 84
12.5. Operating Condition of EUT 84
12.6. Test Procedure 84
12.7. Data Sample 85
12.8. Power Line Conducted Emission Measurement Results 85
13. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST 88
13.1. Block Diagram of Test Setup 88
13.2. The Requirement For Section 15.247(d) 88
13.3. EUT Configuration on Measurement 88
13.4. Operating Condition of EUT 88
13.5. Test Procedure 89
13.6. Test Result 89
14. ANTENNA REQUIREMENT 93
14.1. The Requirement 93
14.2. Antenna Construction 93

Test Report Certification

Applicant	:	THUMBS UP(UK)LTD
Manufacturer	:	THUMBS UP(UK)LTD
Product	:	Bluetooth Speaker
Model No.	:	SPKRWIRBLKPRM, SPKRWIRBLUPRM, SPKRWIRPNKPRM, SPKRWIRYLWPRM, SPKRWIRGRPRM, SPKRWIRGRNPRM

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 :	July 29-August 7, 2018
Date of Report:	August 30, 2018
Prepared by :	(Stan Yang, Engineer)
Approved & Authorized Signer :	(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

EUT	:	Bluetooth Speaker
Model Number	:	SPKRWIRBLKPRM, SPKRWIRBLUPRM, SPKRWIRPNKPRM, SPKRWIRYLWPRM, SPKRWIRGRPRM, SPKRWIRGRNPRM (Note: We hereby state that these models are identical in interior structure, only model name difference for different color, Therefore, only model SPKRWIRGRNPRM is for tests.)
Bluetooth version	:	V4.1 classic mode
Frequency Range	:	2402MHz-2480MHz
Number of Channels	:	79
Antenna Gain(Max)	:	0dBi
Antenna type	:	Integral Antenna
Modulation mode	:	GFSK, π/4 DQPSK, 8DPSK
Trade Name	:	N/A
Rating	:	DC 3.7V
Applicant	:	THUMBS UP(UK)LTD
Address	:	Unit L, Braintree Industrial Estate, Braintree Road HA4 0EJ, Ruislip, LONDON, United Kingdom
Manufacturer	:	THUMBS UP(UK)LTD
Address	:	Unit L, Braintree Industrial Estate, Braintree Road HA4 0EJ, Ruislip, LONDON, United Kingdom

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 (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

1.4.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	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 06, 2018	Jan. 05, 2019
EMI Test Receiver	Rohde& Schwarz	ESR	101817	Jan. 06, 2018	Jan. 05, 2019
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 06, 2018	Jan. 05, 2019
Pre-Amplifier	Agilent	8447D	294A10619	Jan. 06, 2018	Jan. 05, 2019
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 06, 2018	Jan. 05, 2019
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 06, 2018	Jan. 05, 2019
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 06, 2018	Jan. 05, 2019
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 06, 2018	Jan. 05, 2019
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 06, 2018	Jan. 05, 2019
Open Switch and Control Unit	Rohde&Schwarz	OSP120 + OSP-B157	101244 + 100866	Jan. 06, 2018	Jan. 05, 2019
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 06, 2018	Jan. 05, 2019
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 06, 2018	Jan. 05, 2019
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 06, 2018	Jan. 05, 2019
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

EUT

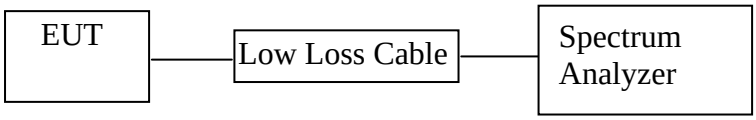
Figure 1 Setup: Transmitting mode

4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	AC Power Line Conducted Emission Test	Compliant
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 15.247(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)

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 RBW should be 1%~5% of OBW.

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

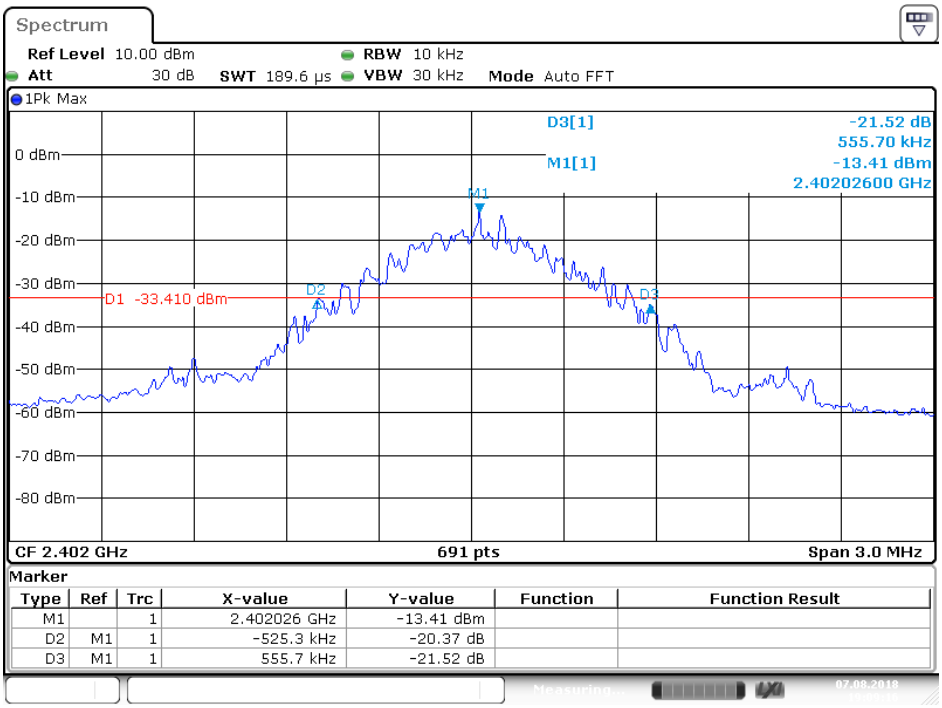
5.6.Test Result

Channel	Frequency (MHz)	GFSK mode 20dB Bandwidth (MHz)	8DPSK mode 20dB Bandwidth (MHz)	Result
Low	2402	1.081	1.520	Pass
Middle	2441	1.081	1.515	Pass
High	2480	1.025	1.515	Pass

The spectrum analyzer plots are attached as below.

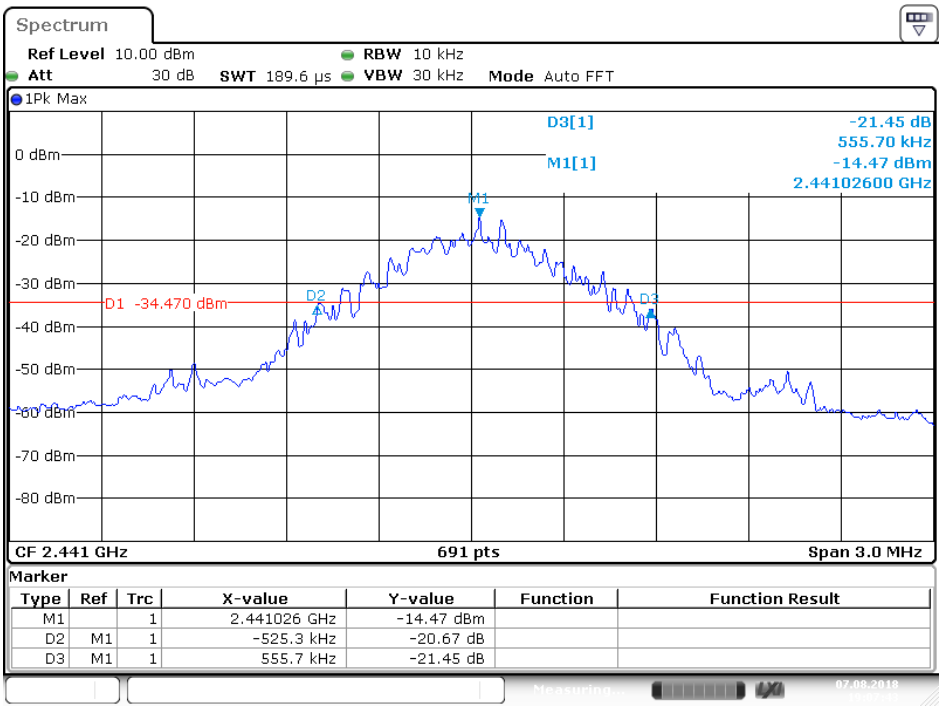
GFSK Mode

Low channel



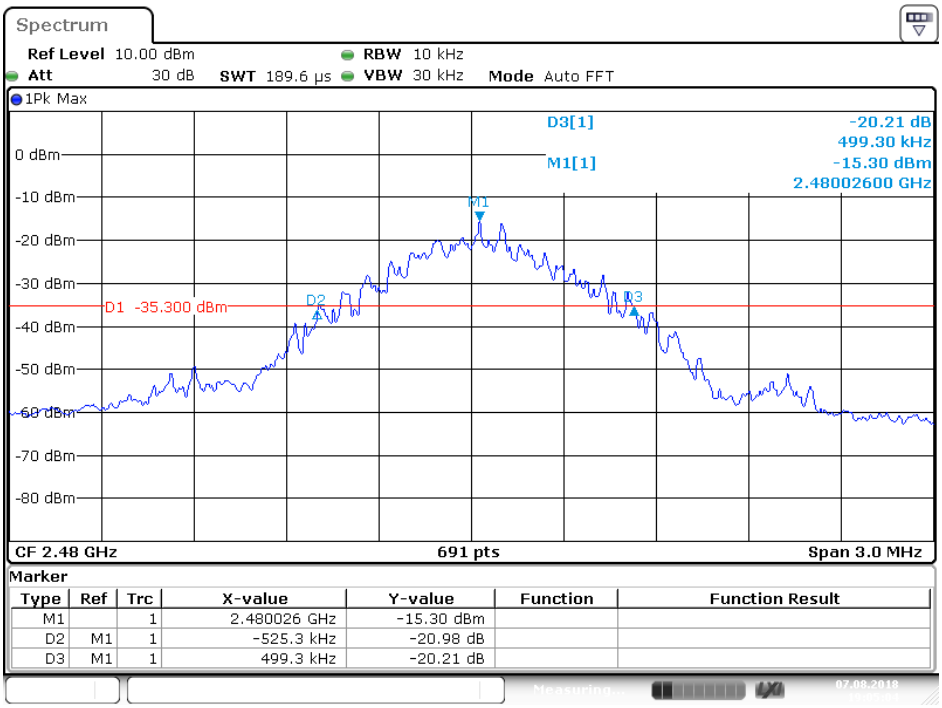
Date: 7.AUG.2018 19:09:16

Middle channel



Date: 7.AUG.2018 19:07:43

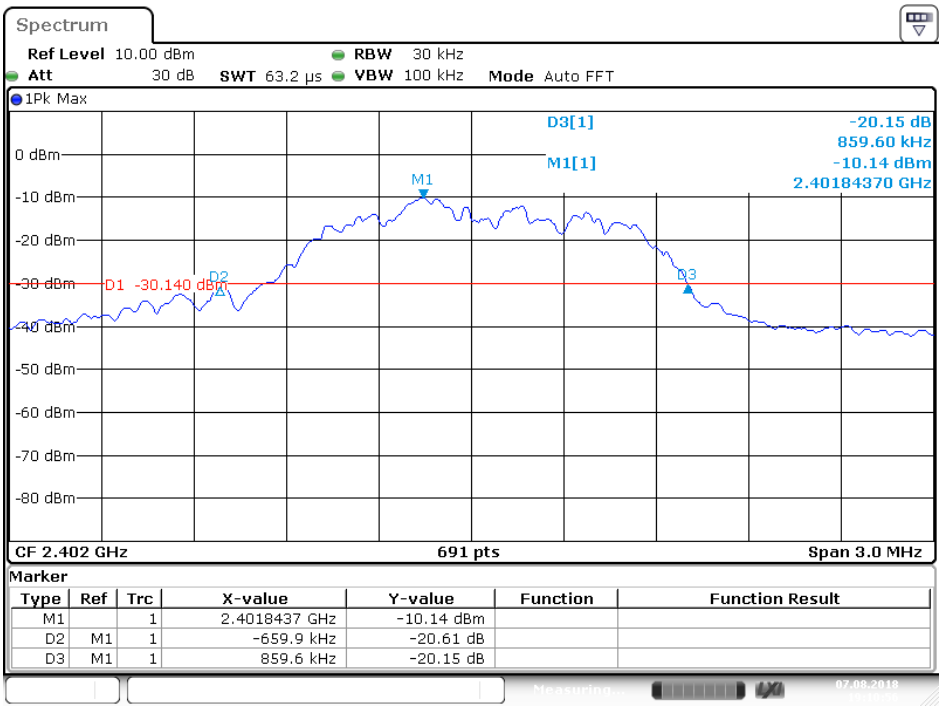
High channel



Date: 7.AUG.2018 19:05:04

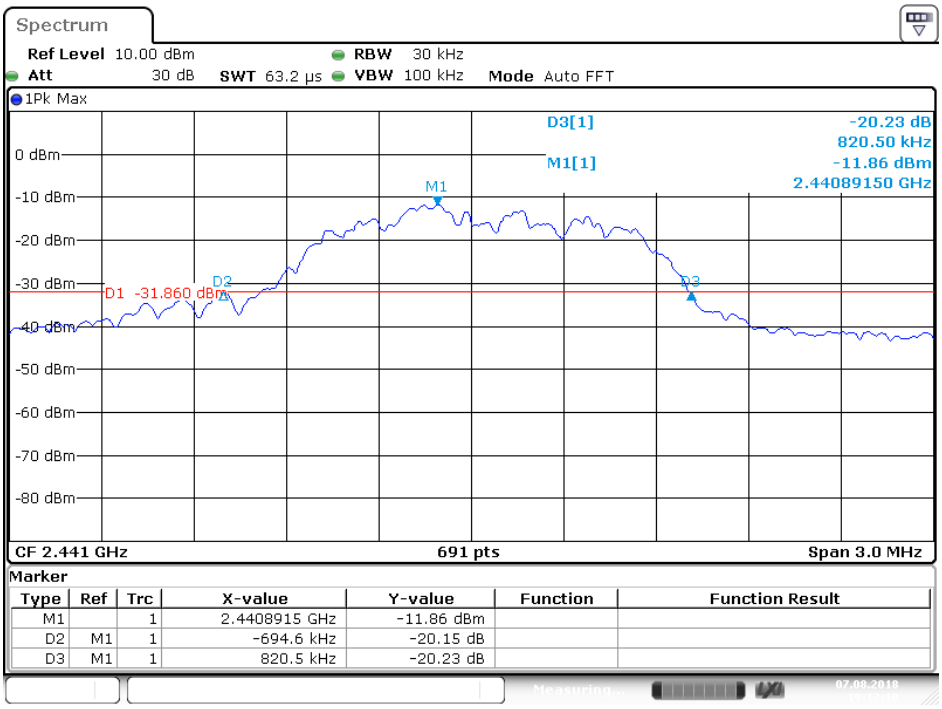
8DPSK Mode

Low channel



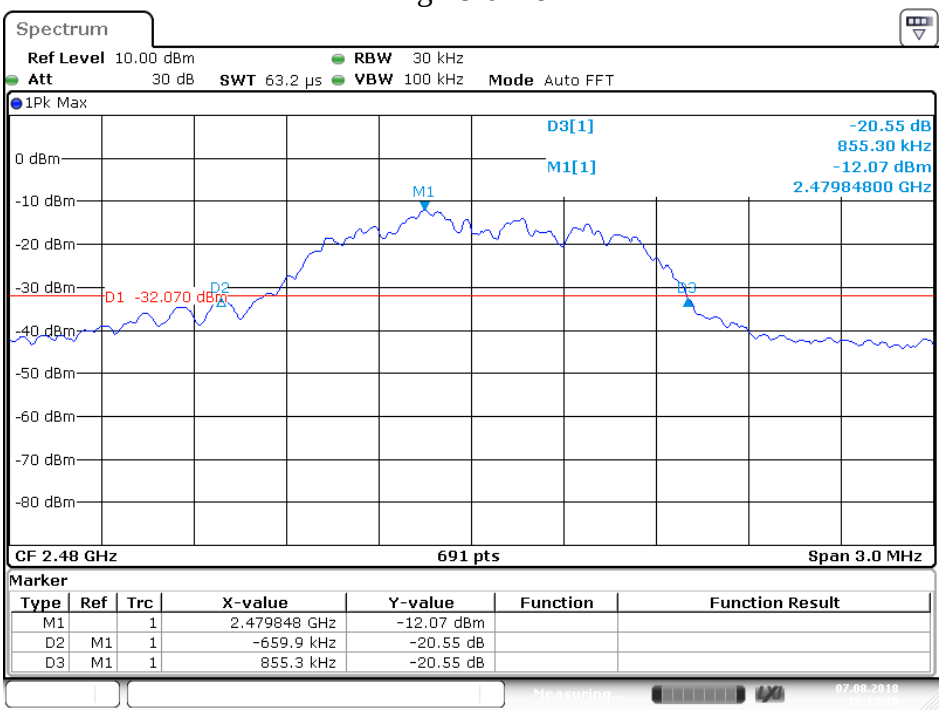
Date: 7.AUG.2018 19:10:56

Middle channel



Date: 7.AUG.2018 19:12:11

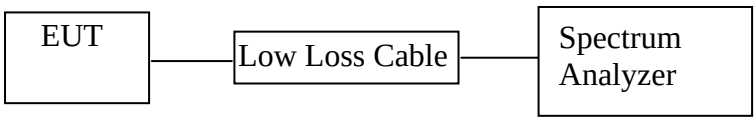
High channel



Date: 7.AUG.2018 19:13:17

6. CARRIER FREQUENCY SEPARATION TEST

6.1.Block Diagram of Test Setup



6.2.The Requirement For Section 15.247(a)(1)

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			

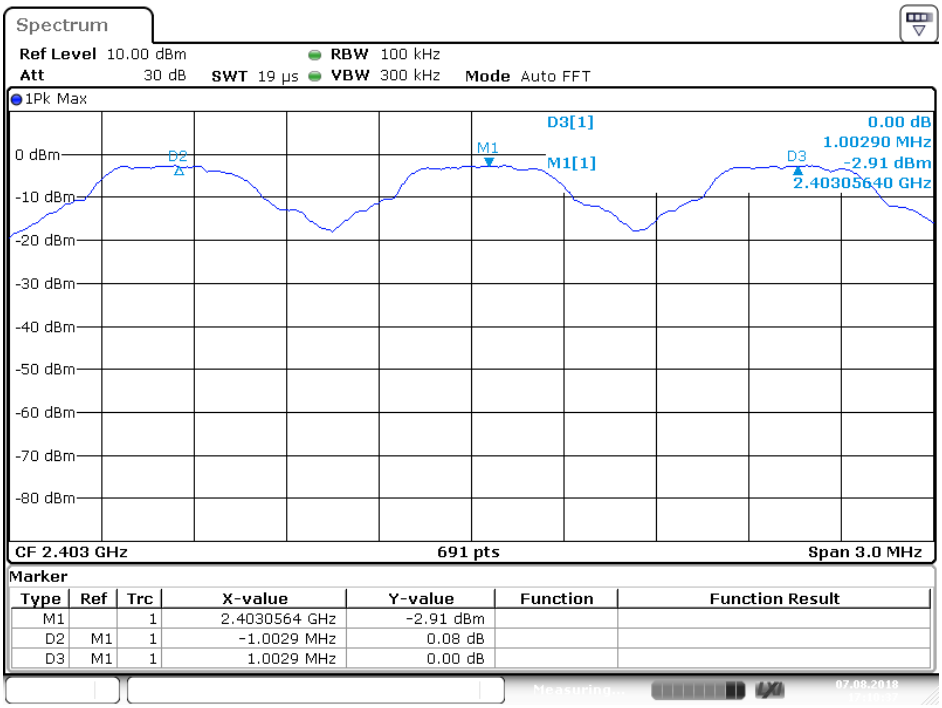
8DPSK Mode

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.

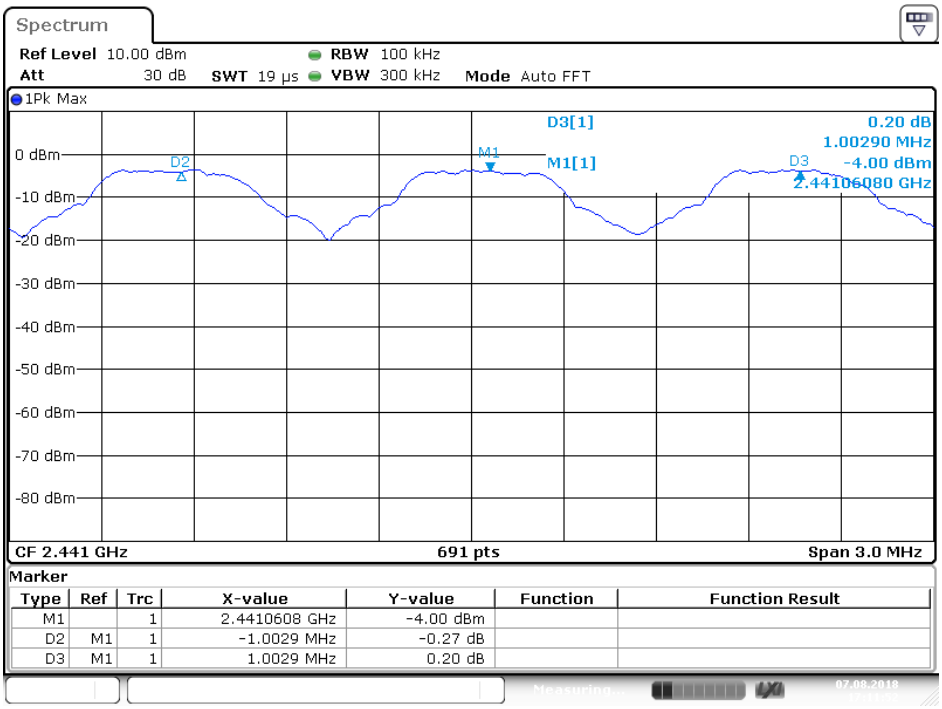
GFSK Mode

Low channel



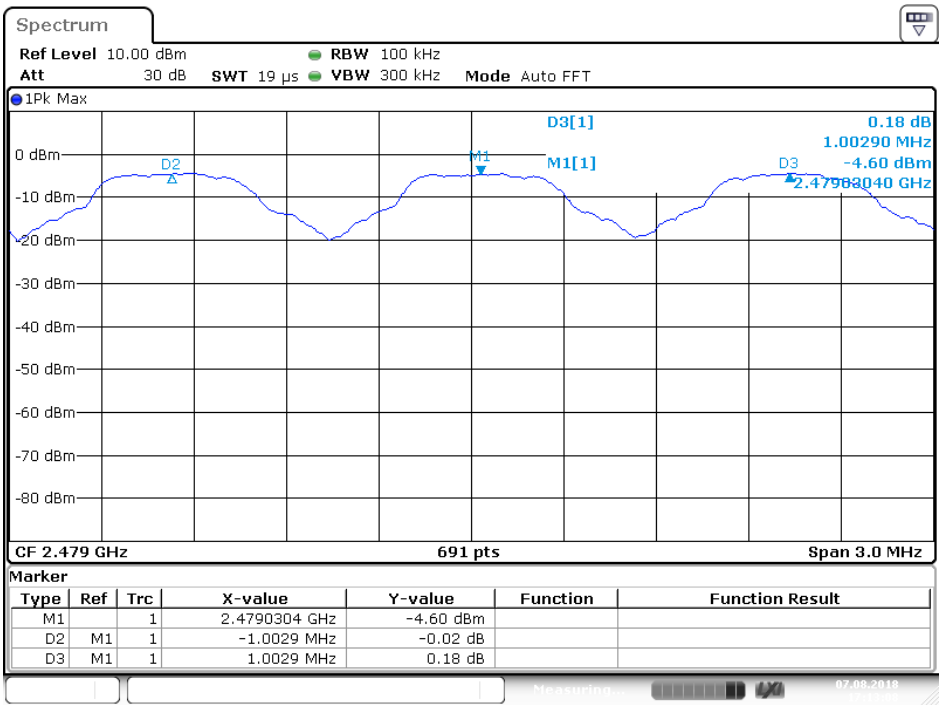
Date: 7.AUG.2018 17:10:38

Middle channel



Date: 7.AUG.2018 17:11:53

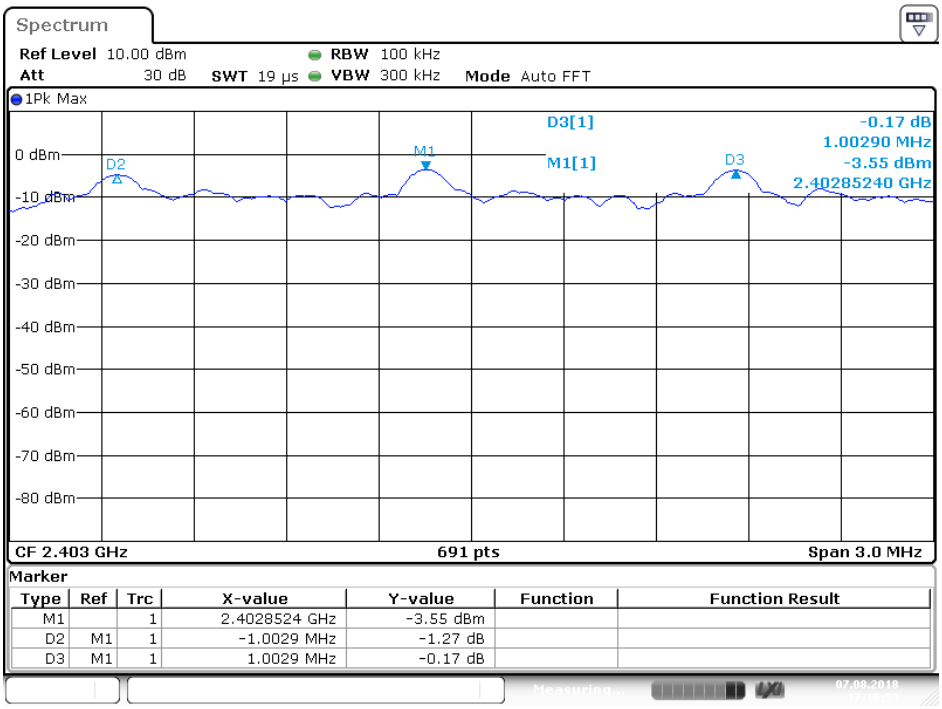
High channel



Date: 7.AUG.2018 17:13:09

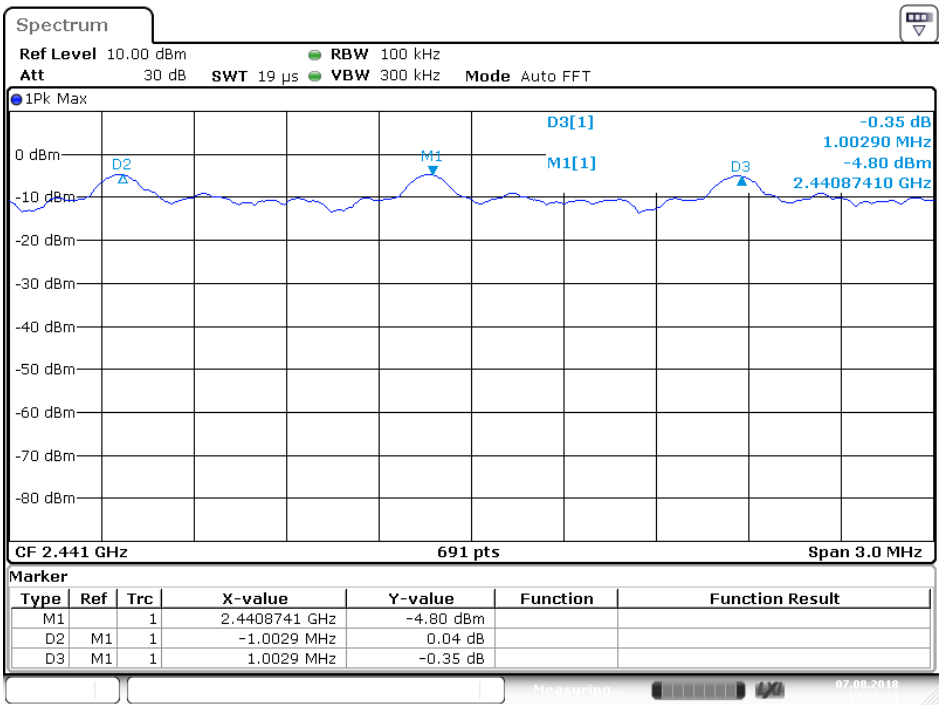
8DPSK Mode

Low channel



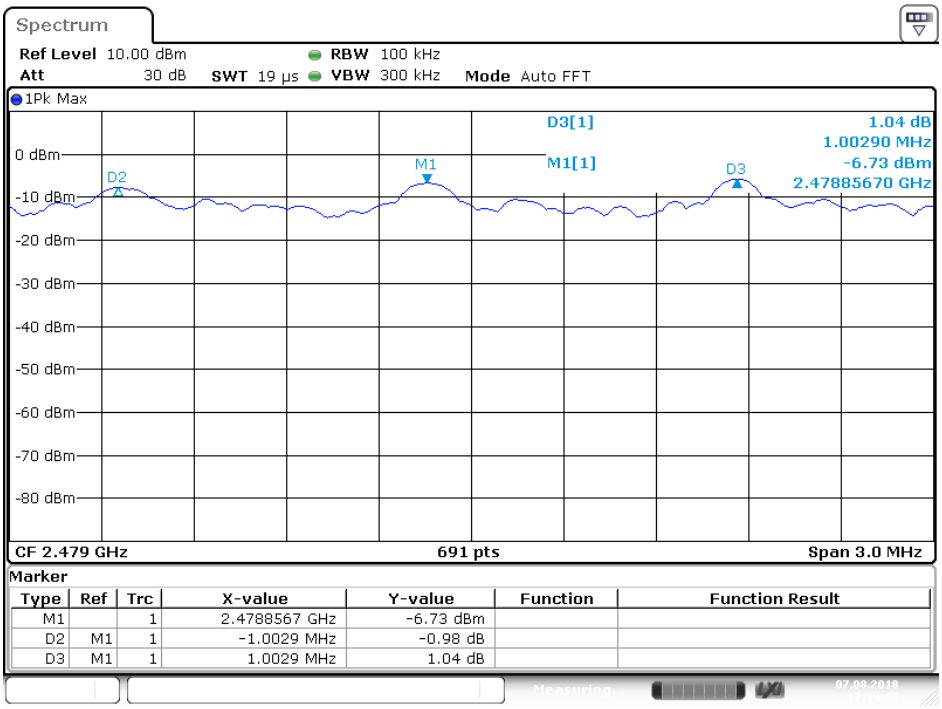
Date: 7.AUG.2018 17:16:54

Middle channel



Date: 7.AUG.2018 17:15:45

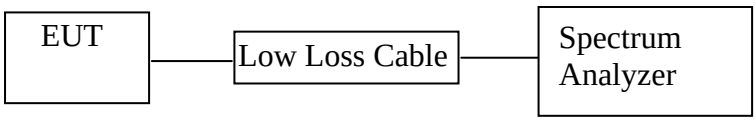
High channel



Date: 7.AUG.2018 17:14:16

7. NUMBER OF HOPPING FREQUENCY TEST

7.1.Block Diagram of Test Setup



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

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.

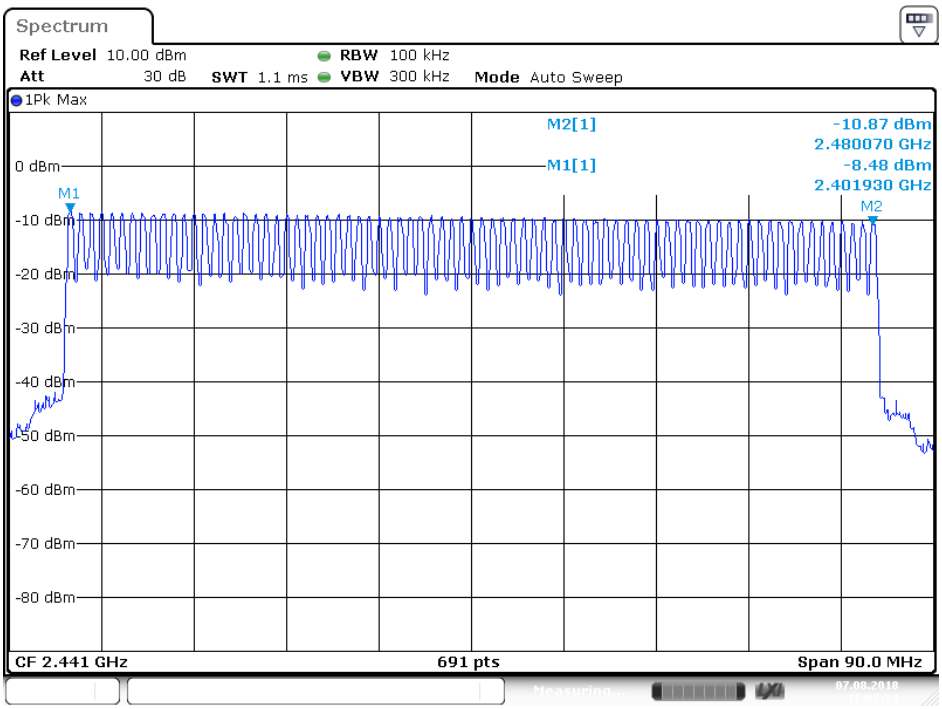
7.5.3.Max hold, view and count how many channel in the band.

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.

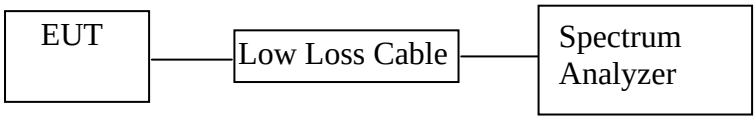
Number of hopping channels (GFSK)



Date: 7.AUG.2018 17:07:55

8. DWELL TIME TEST

8.1.Block Diagram of Test Setup



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

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

Pass.

GFSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.428	136.96	400
	2441	0.413	132.16	400
	2480	0.420	134.40	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(2*79))×31.6				
DH3	2402	1.652	264.32	400
	2441	1.710	273.60	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	2.978	317.65	400
	2441	3.000	320.00	400
	2480	2.935	313.07	400
A period transmit time = 0.4 × 79 = 31.6 Dwell time = pulse time × (1600/(6*79))×31.6				

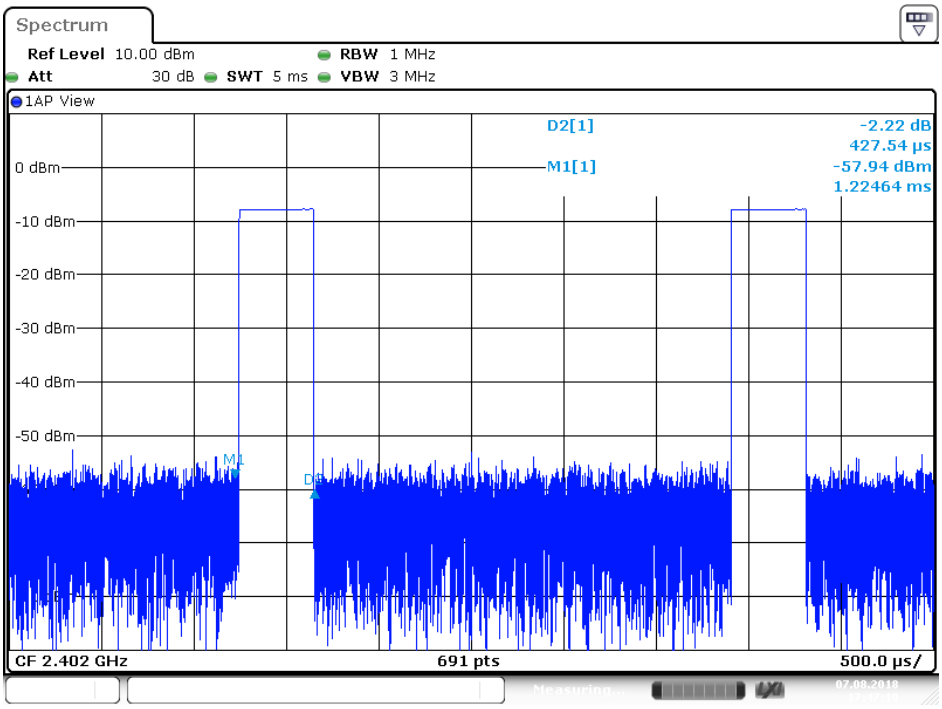
8DPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
3DH1	2402	0.370	118.40	400
	2441	0.413	132.16	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				
3DH3	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				
3DH5	2402	2.957	315.41	400
	2441	2.978	317.65	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				

The spectrum analyzer plots are attached as below.

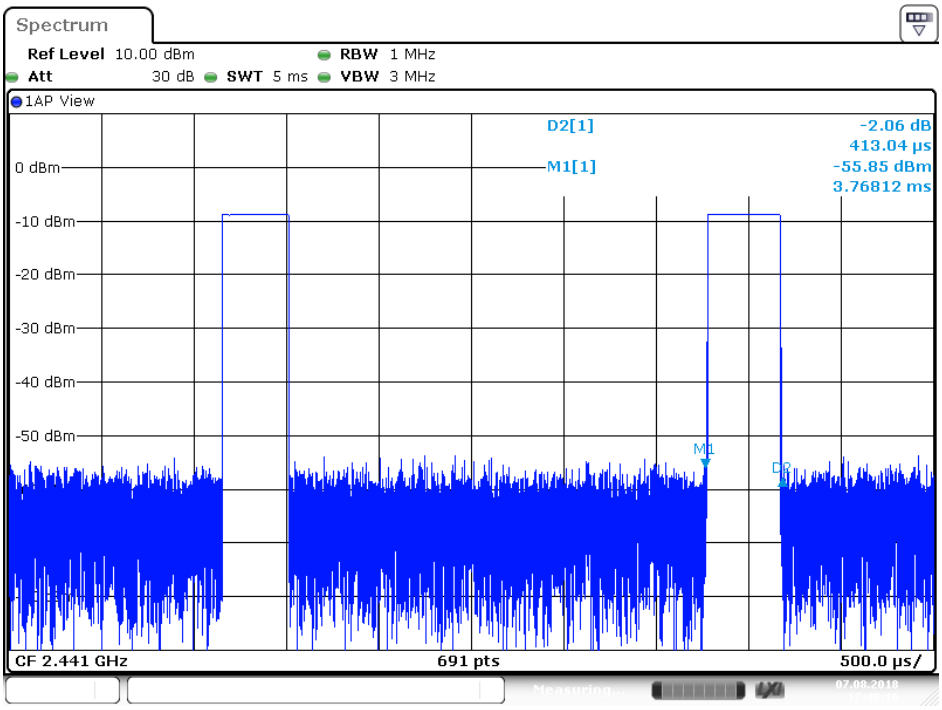
GFSK Mode

DH1 Low channel



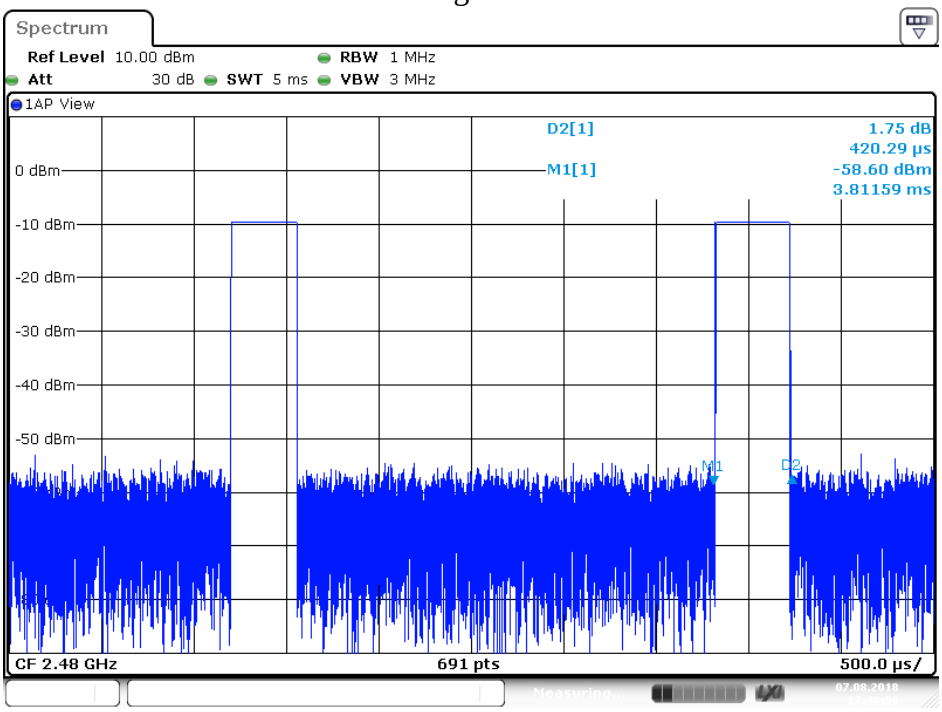
Date: 7.AUG.2018 17:47:10

DH1 Middle channel



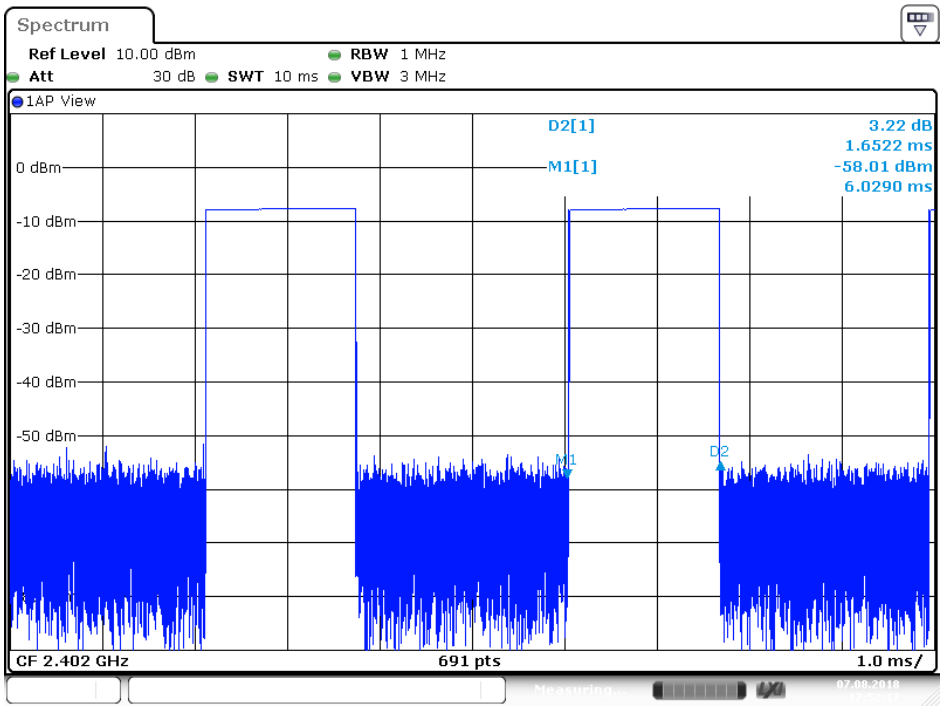
Date: 7.AUG.2018 17:48:17

DH1 High channel



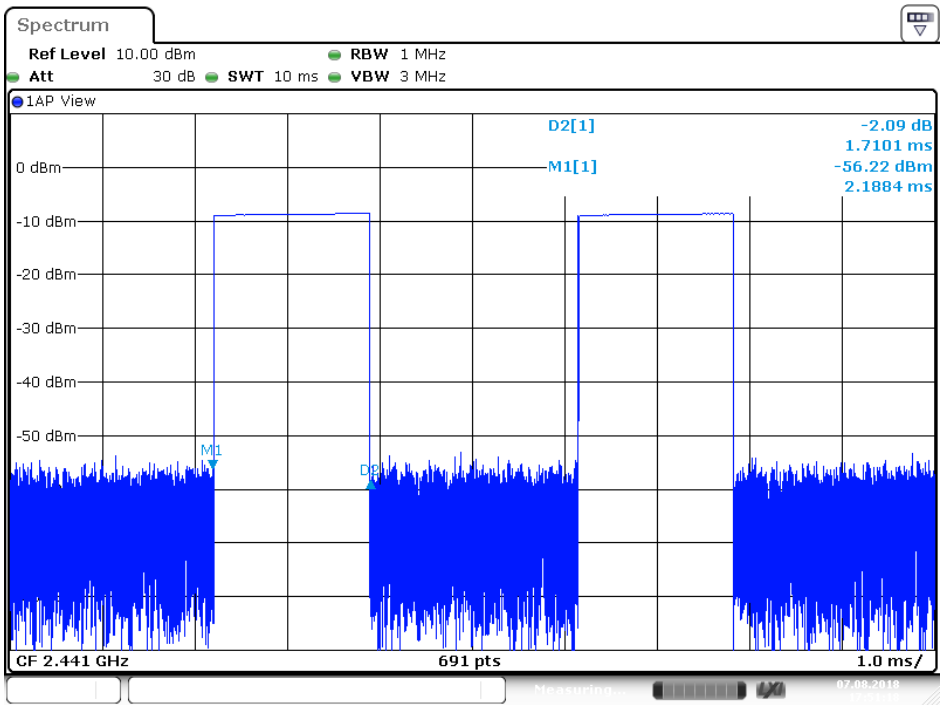
Date: 7.AUG.2018 17:48:59

DH3 Low channel



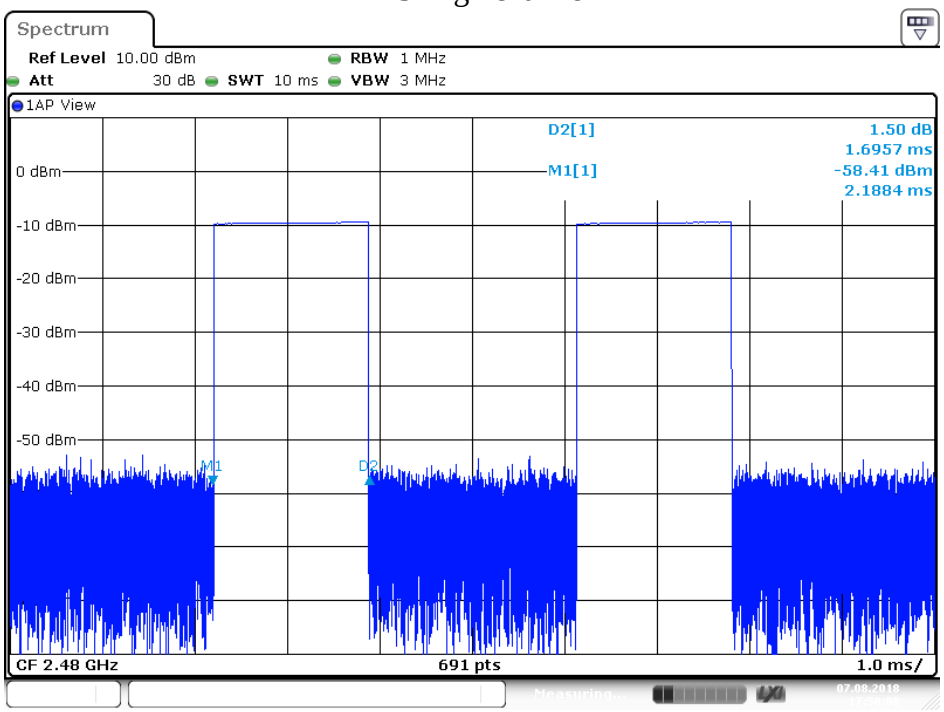
Date: 7.AUG.2018 17:52:18

DH3 Middle channel



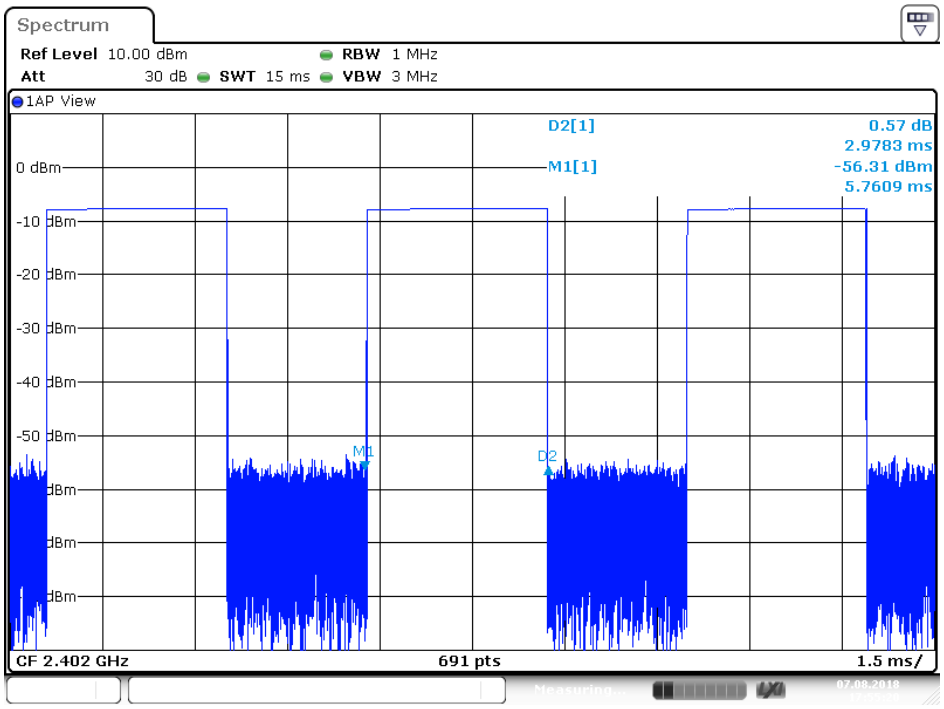
Date: 7.AUG.2018 17:51:18

DH3 High channel



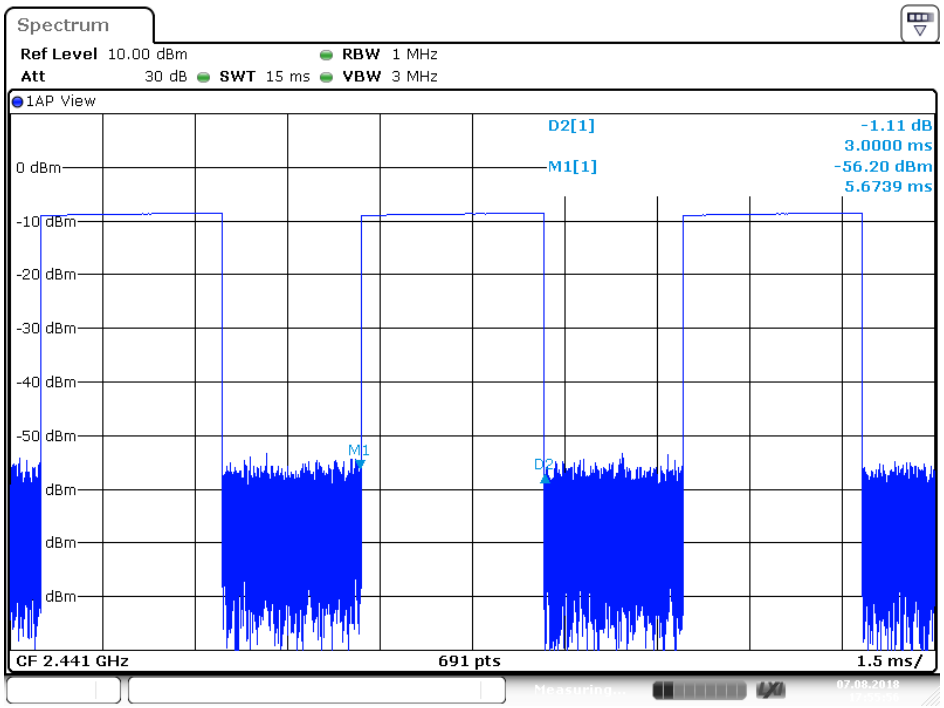
Date: 7.AUG.2018 17:50:08

DH5 Low channel



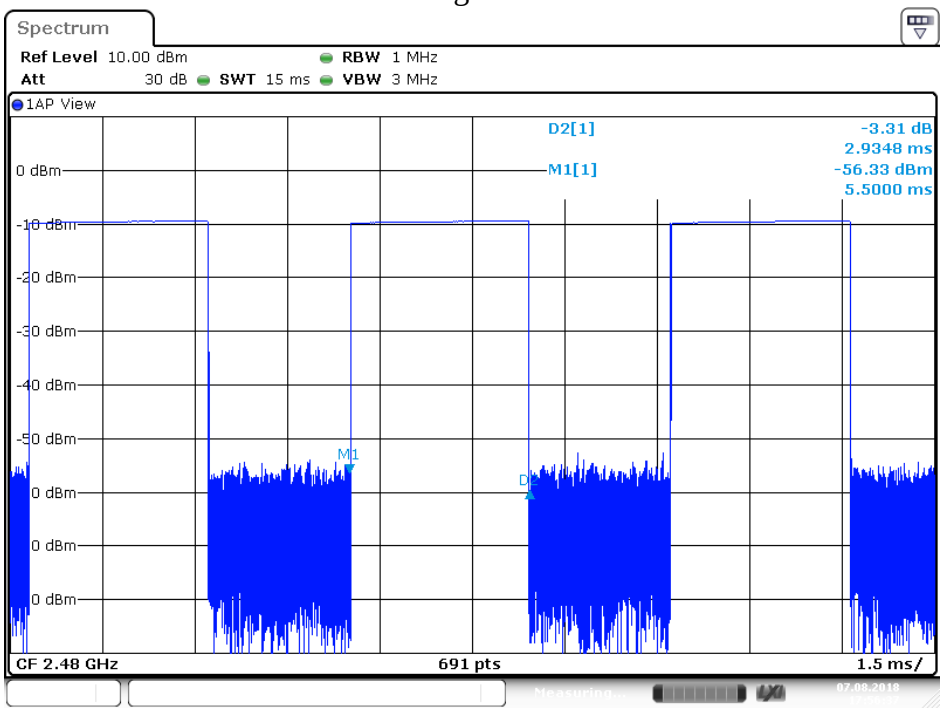
Date: 7.AUG.2018 17:55:20

DH5 Middle channel



Date: 7.AUG.2018 17:55:57

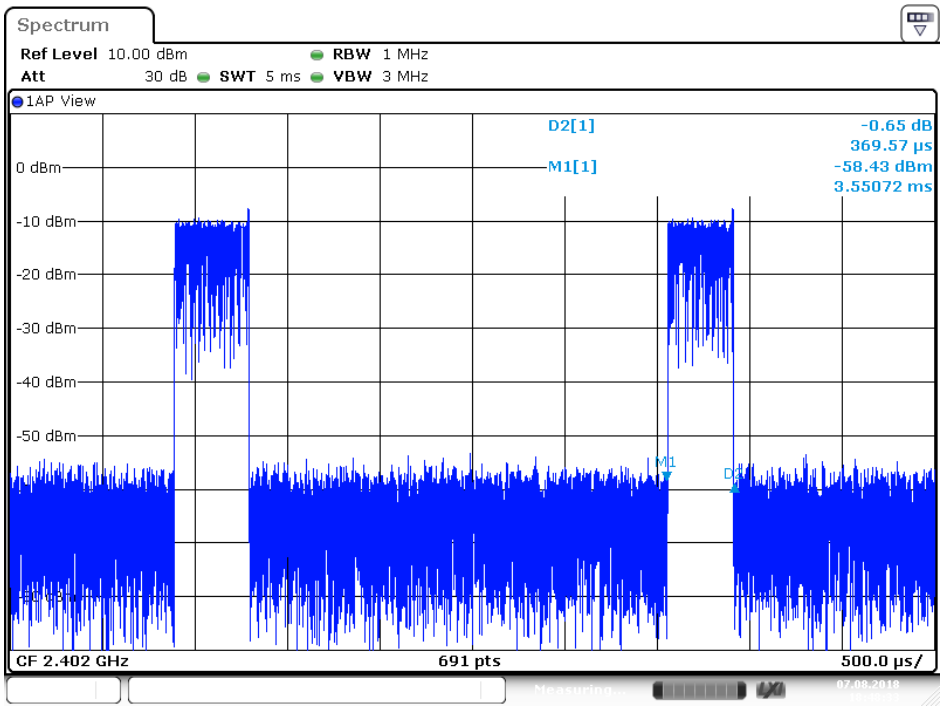
DH5 High channel



Date: 7.AUG.2018 17:56:38

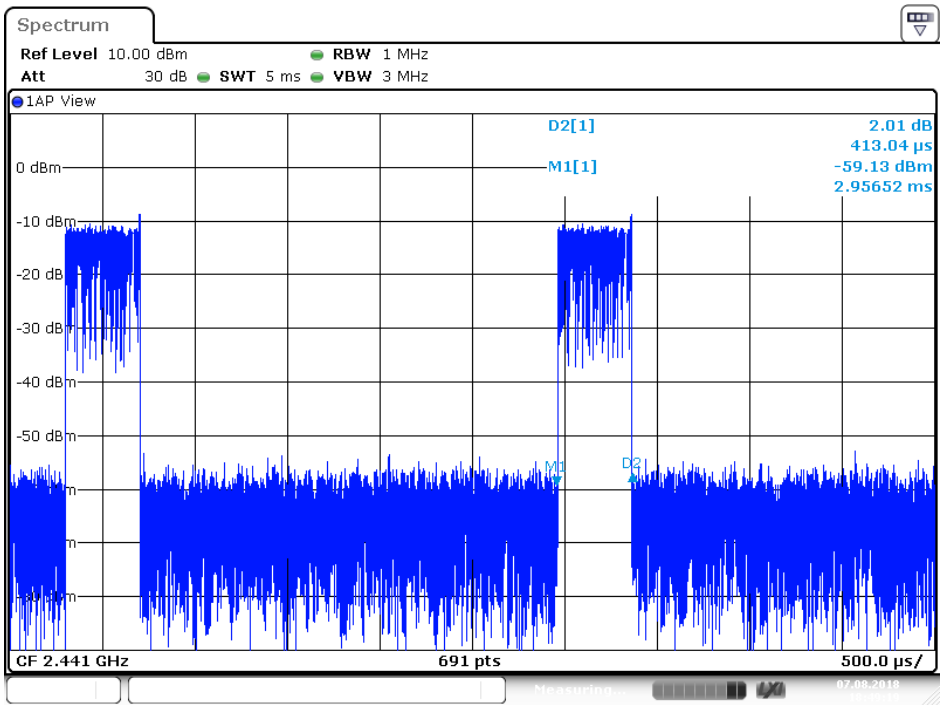
8DPSK Mode

3DH1 Low channel



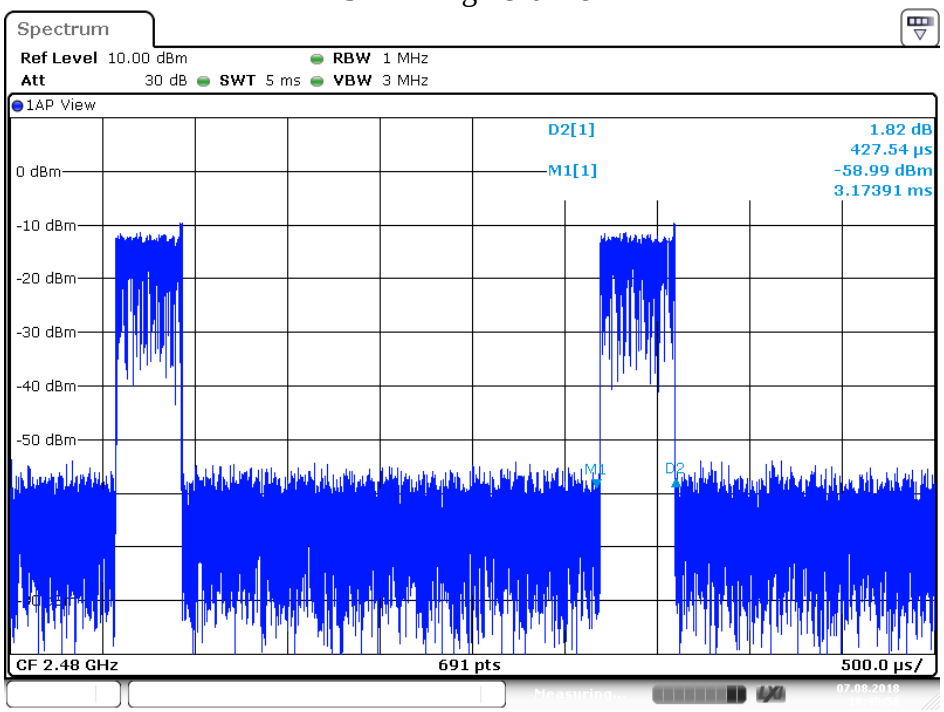
Date: 7.AUG.2018 18:48:33

3DH1 Middle channel



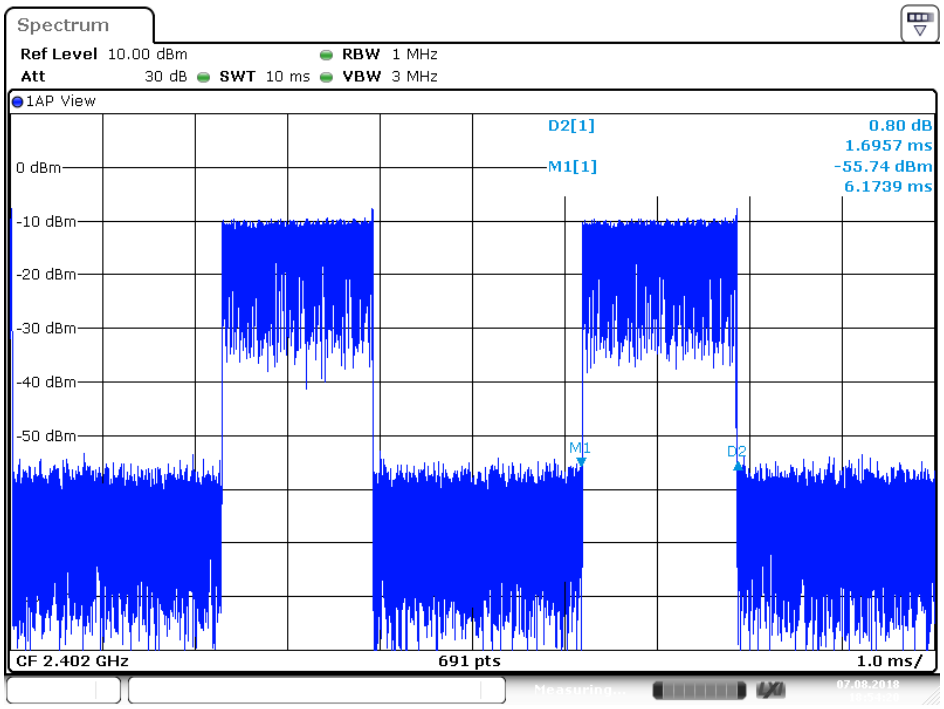
Date: 7.AUG.2018 18:49:19

3DH1 High channel



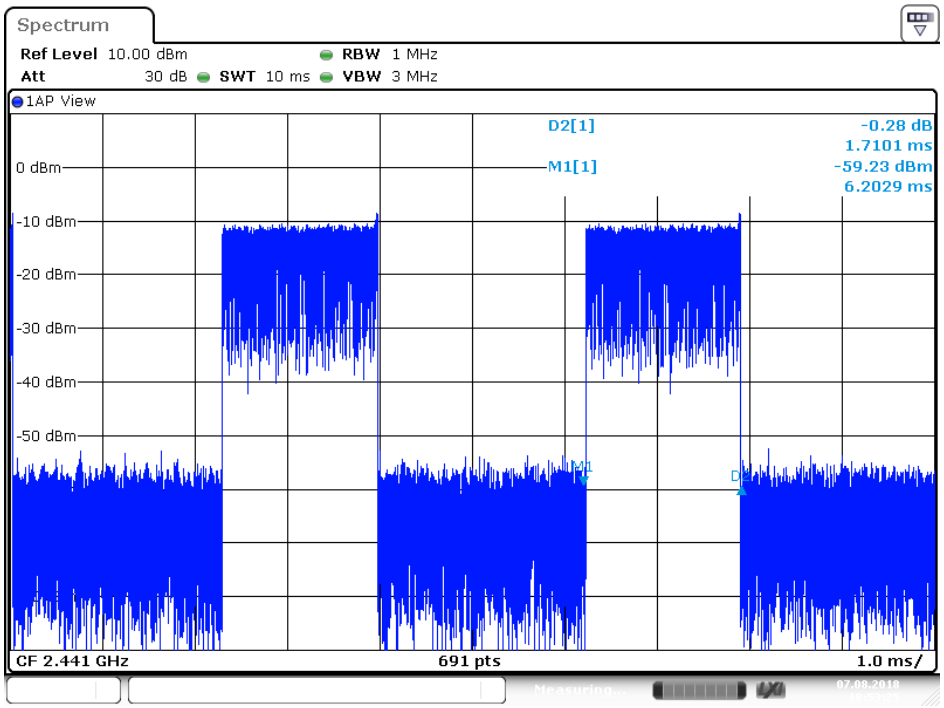
Date: 7.AUG.2018 18:49:57

3DH3 Low channel



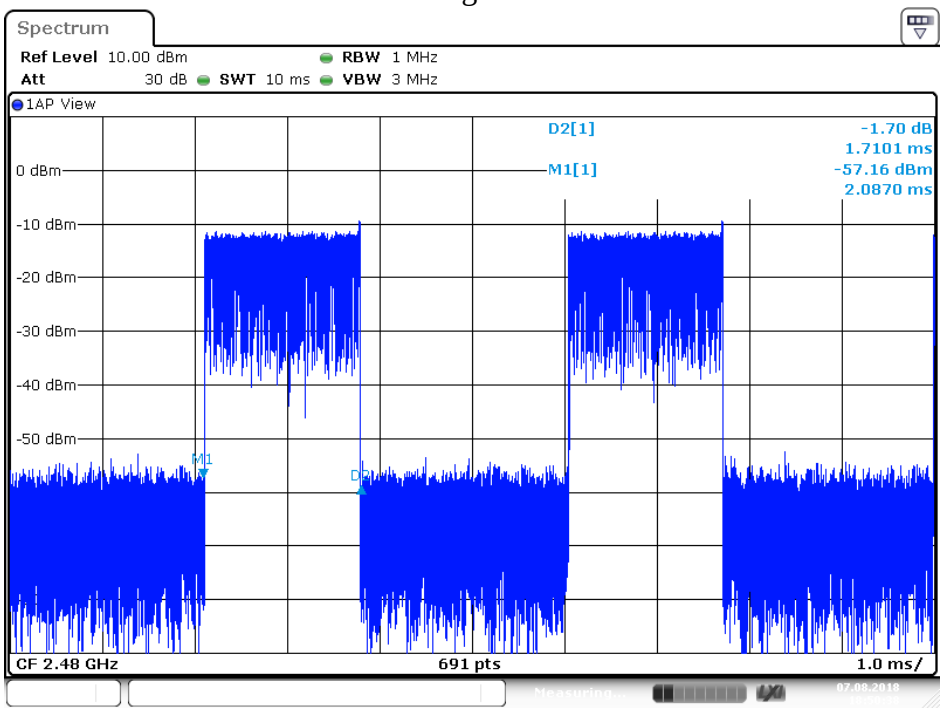
Date: 7.AUG.2018 18:54:21

3DH3 Middle channel



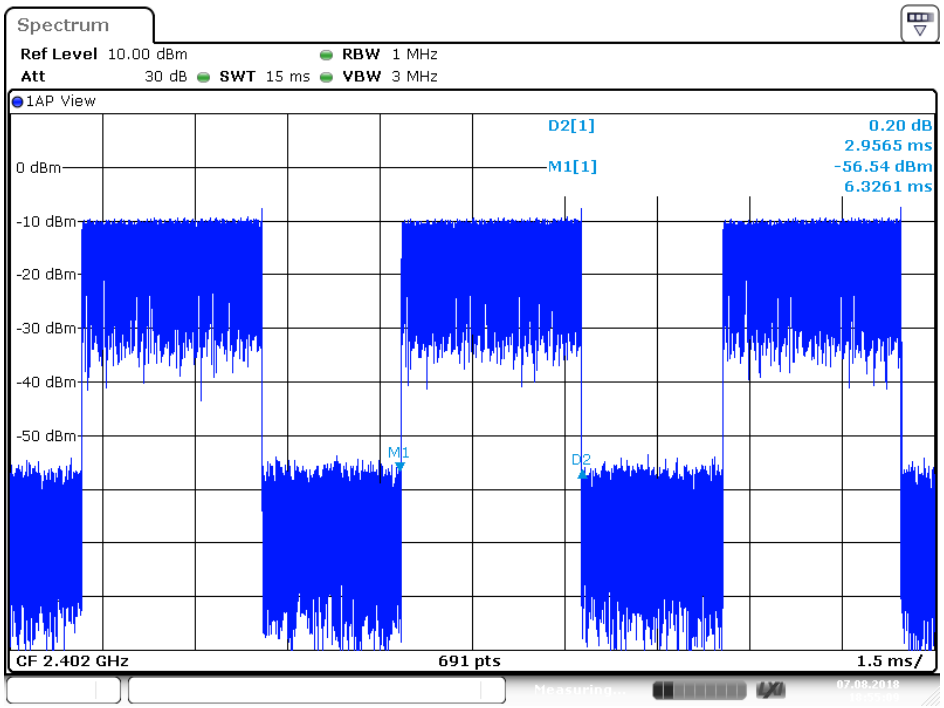
Date: 7.AUG.2018 18:53:26

3DH3 High channel



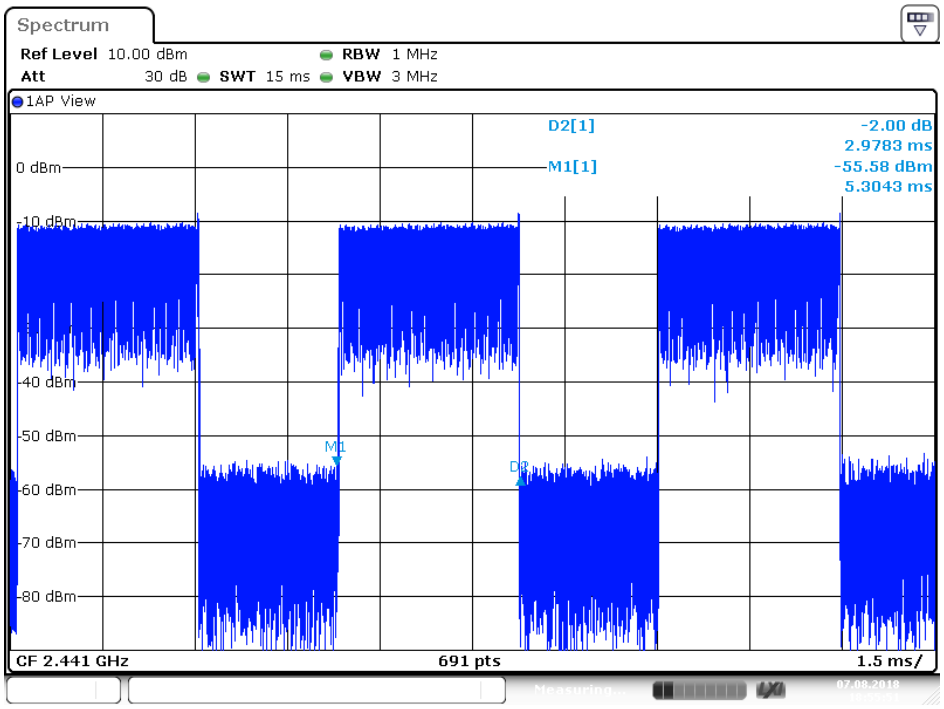
Date: 7.AUG.2018 18:50:38

3DH5 Low channel



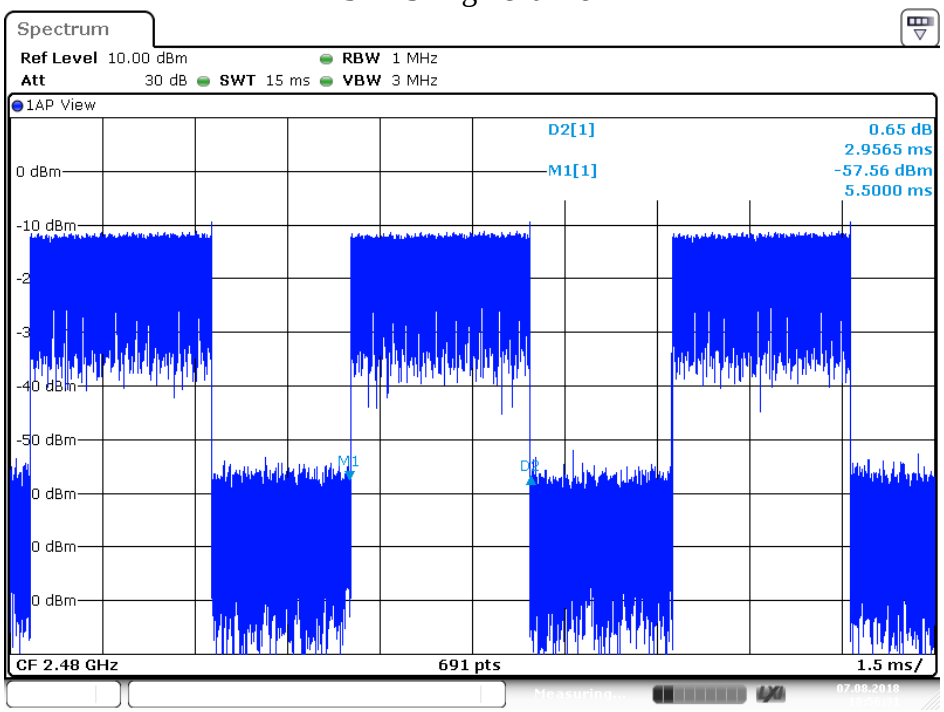
Date: 7.AUG.2018 18:55:09

3DH5 Middle channel



Date: 7.AUG.2018 18:55:52

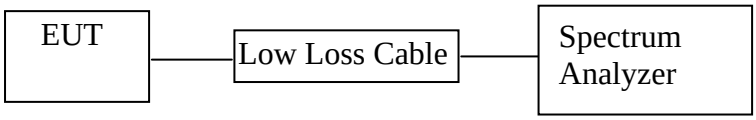
3DH5 High channel



Date: 7.AUG.2018 18:56:32

9. MAXIMUM PEAK OUTPUT POWER TEST

9.1.Block Diagram of Test Setup



9.2.The Requirement For Section 15.247(b)(1)

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 ∏/4-DQPSK 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	-1.34/0.0007	-1.34/0.0007	21 / 0.125	Pass
2441	-2.34/0.0006	-2.34/0.0006	21 / 0.125	Pass
2480	-3.20/0.0005	-3.20/0.0005	21 / 0.125	Pass

8DPSK Mode

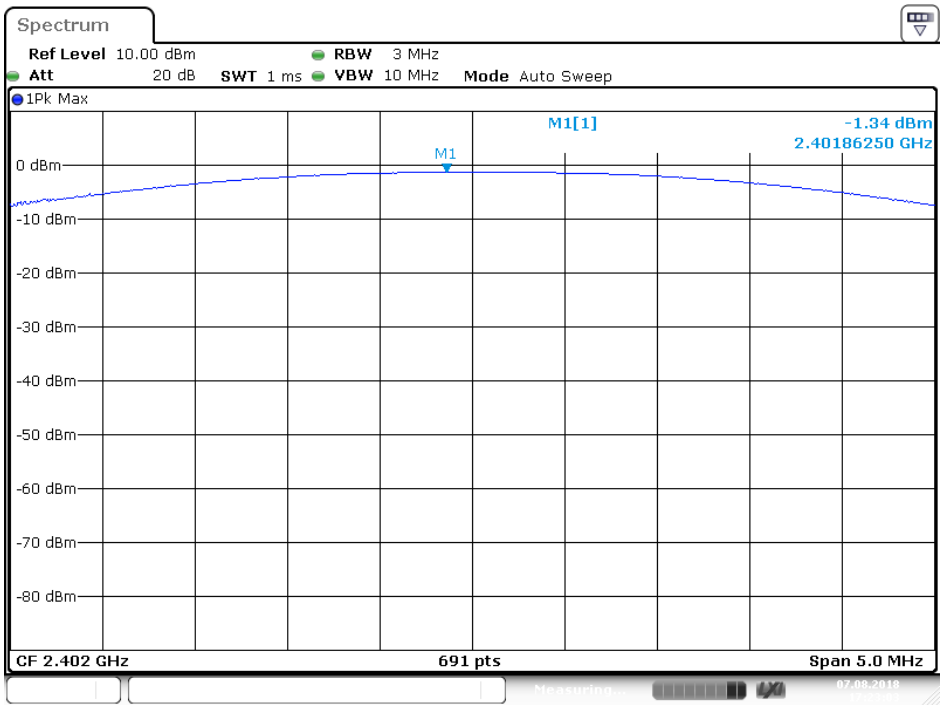
Frequency (MHz)	Maximum peak conducted output power (dBm/W)	e.i.r.p. (dBm/W)	Limits dBm / W	Result
2402	-1.64/0.0007	-1.64/0.0007	21 / 0.125	Pass
2441	-2.65/0.0005	-2.65/0.0005	21 / 0.125	Pass
2480	-3.51/0.0004	-3.51/0.0004	21 / 0.125	Pass

Note: e.i.r.p= Maximum peak conducted output power+Antenna gain(0 dBi)

The spectrum analyzer plots are attached as below.

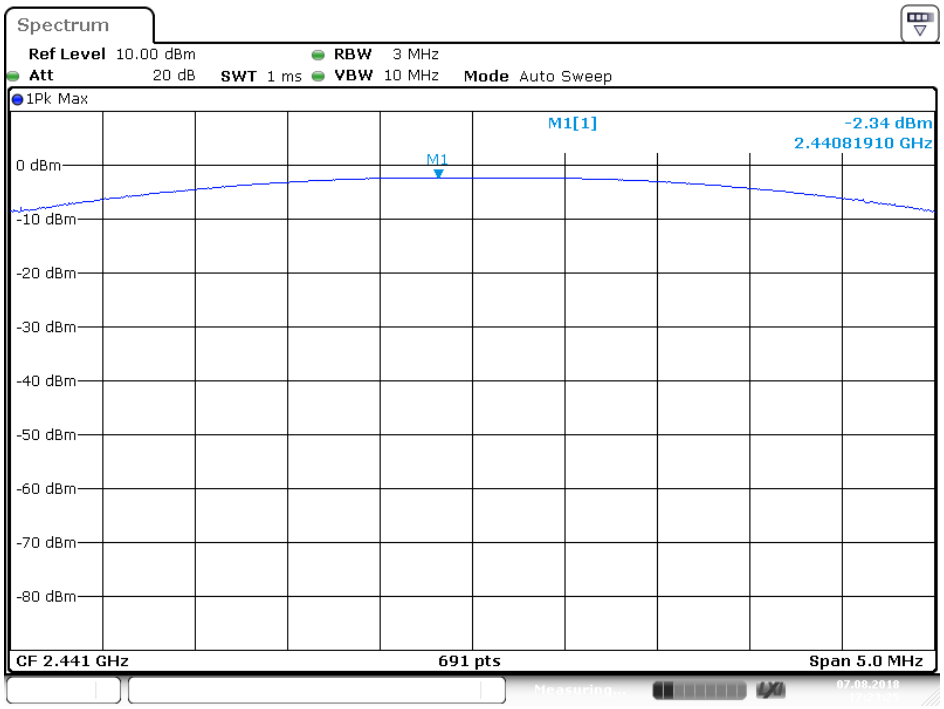
GFSK Mode

Low channel



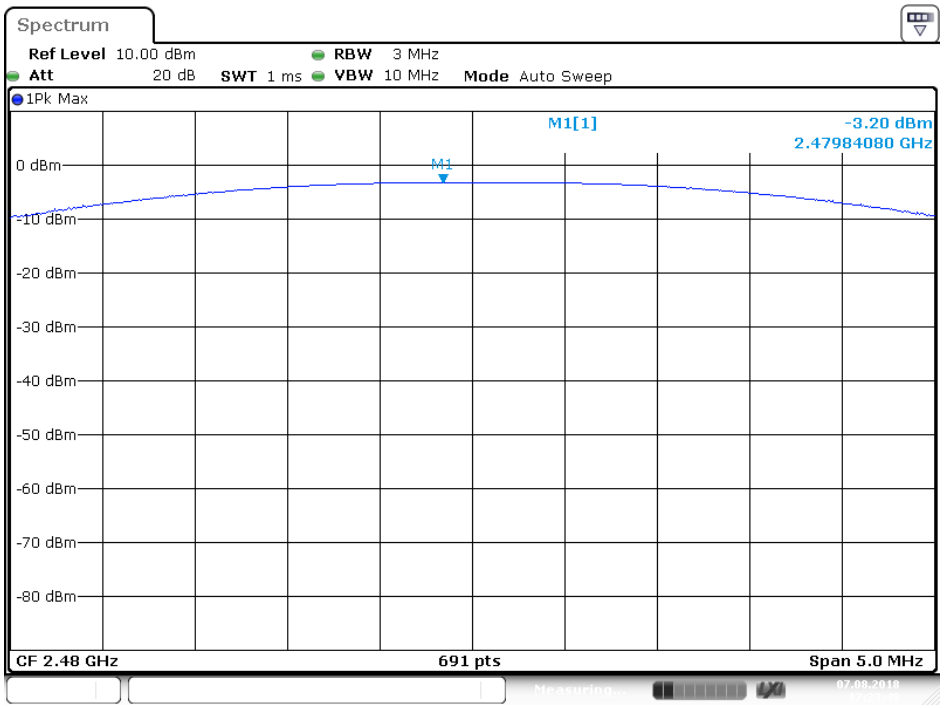
Date: 7.AUG.2018 17:23:02

Middle channel



Date: 7.AUG.2018 17:23:25

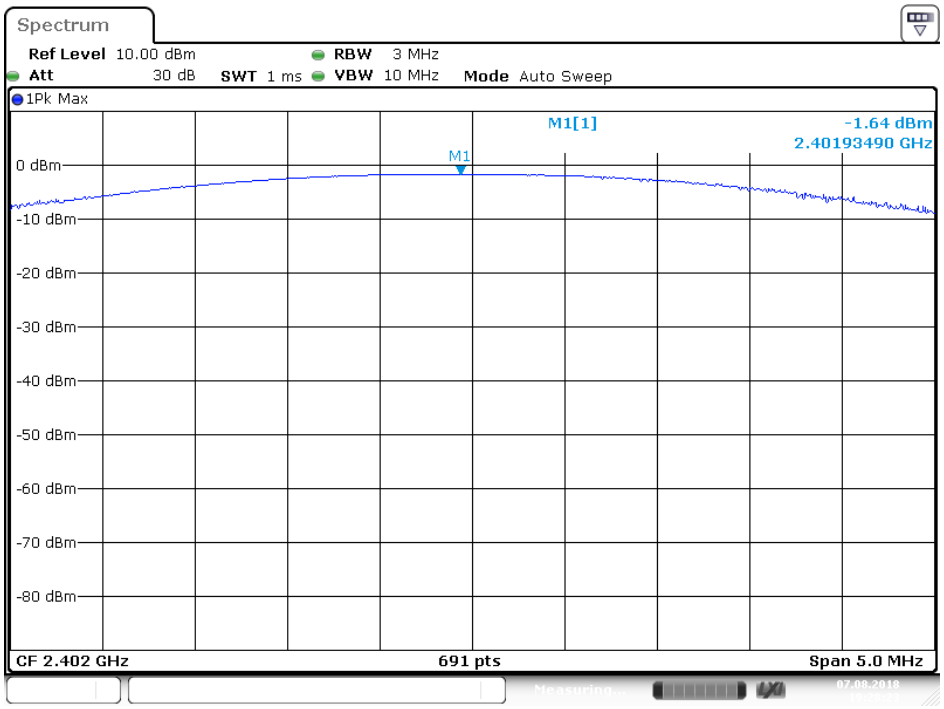
High channel



Date: 7.AUG.2018 17:23:48

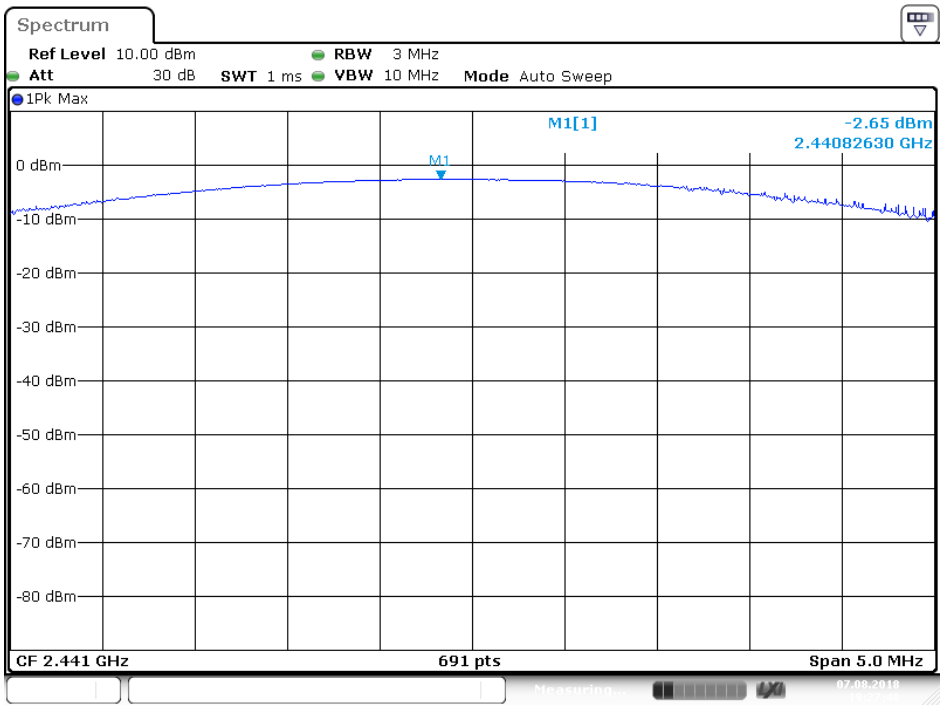
8DPSK Mode

Low channel



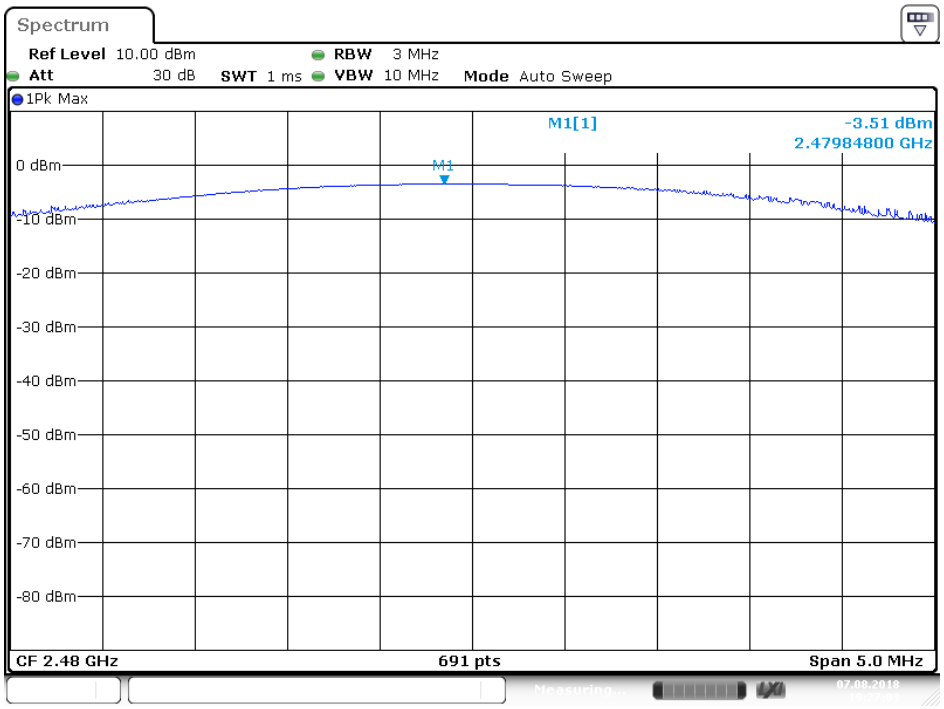
Date: 7.AUG.2018 19:28:23

Middle channel



Date: 7.AUG.2018 19:27:49

High channel



Date: 7.AUG.2018 19:27:03

10.RADIATED EMISSION TEST

10.1.Block Diagram of Test Setup

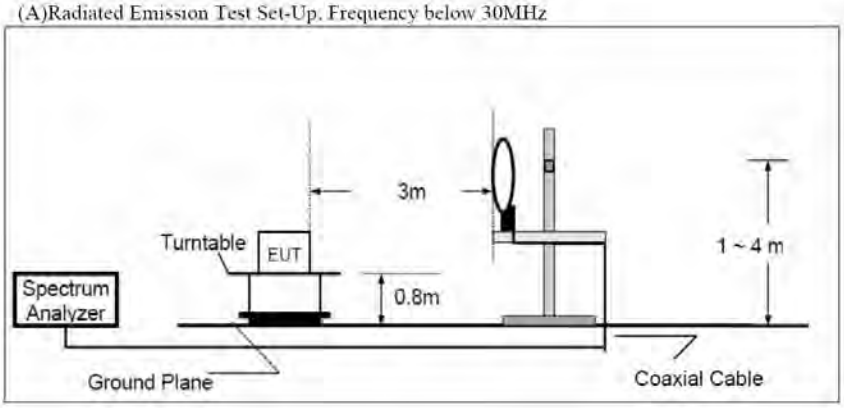
10.1.1.Block diagram of connection between the EUT and peripherals

EUT

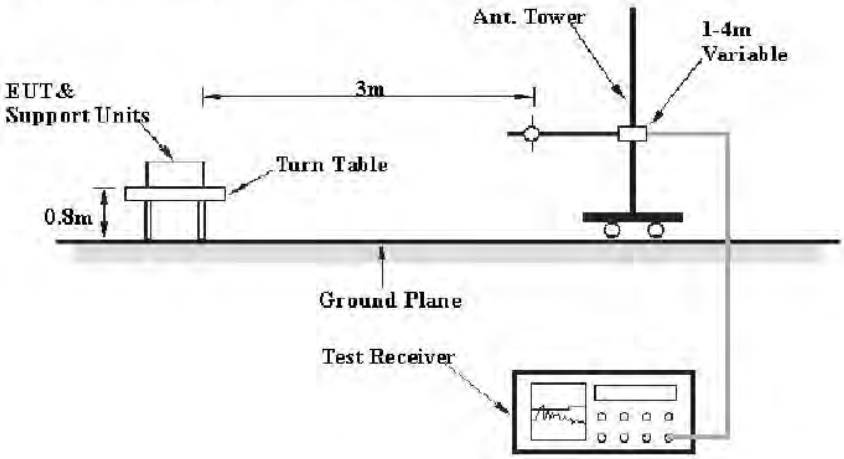
Figure 1 Setup: Transmitting mode

10.1.2.Semi-Anechoic Chamber Test Setup Diagram

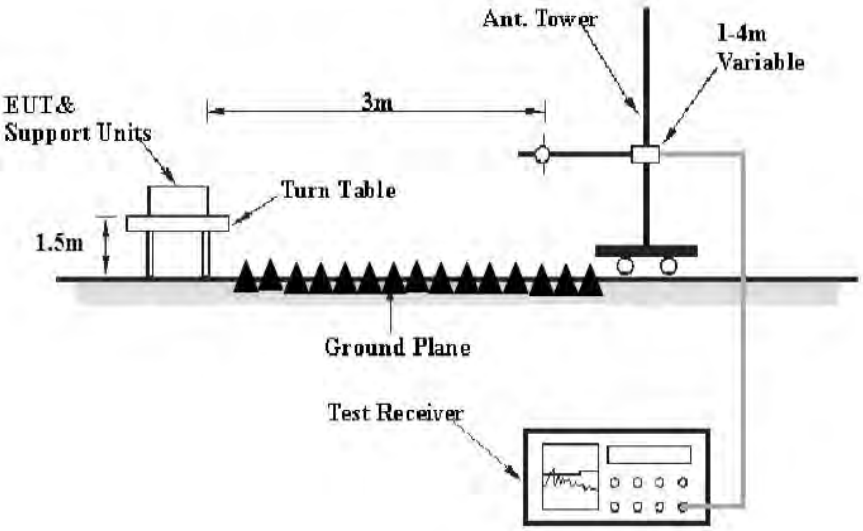
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



(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)

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.The Field Strength of Radiation Emission Measurement Results

Pass.

Note: 1.We tested GFSK mode, 8DPSK Mode and recorded the worst case data (GFSK mode) for all test mode.

The spectrum analyzer plots are attached as below.

9kHz-30MHz test data

ACCURATE TECHNOLOGY CO., LTD.

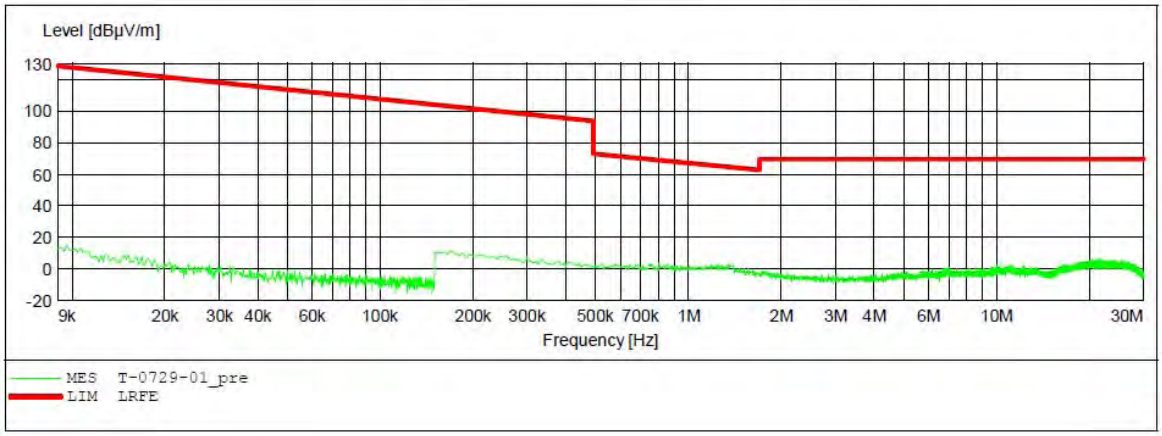
FCC Class B 3M Radiated

EUT:	Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:	THUMBS UP(UK)LTD
Operating Condition:	TX 2402MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	X
Start of Test:	2018-07-29 /

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.

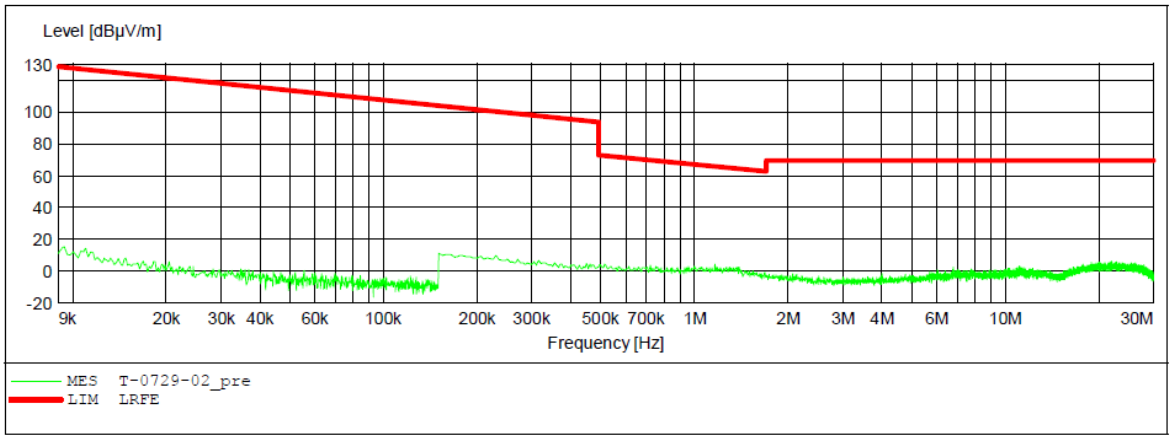
FCC Class B 3M Radiated

EUT:	Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:	THUMBS UP(UK)LTD
Operating Condition:	TX 2402MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Y
Start of Test:	2018-07-29 /

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.

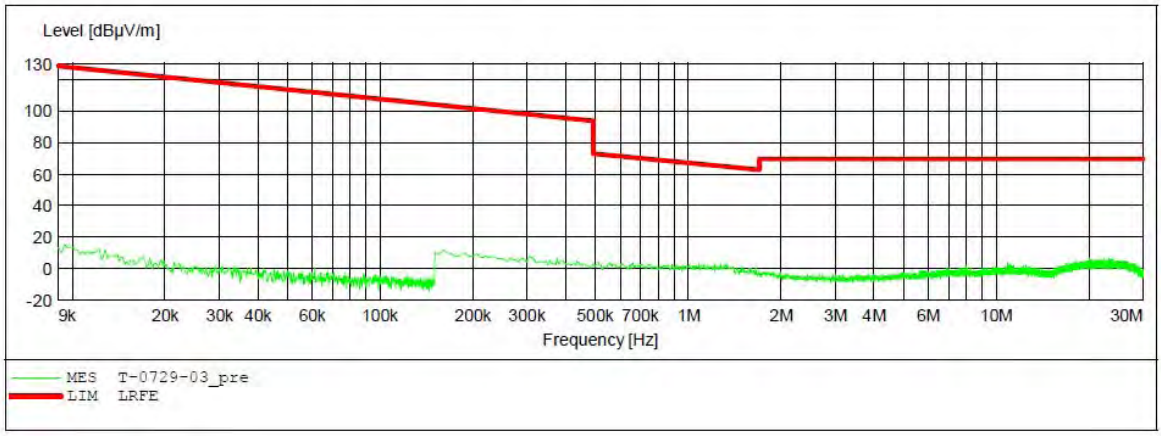
FCC Class B 3M Radiated

EUT: Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer: THUMBS UP(UK)LTD
Operating Condition: TX 2402MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Z
Start of Test: 2018-07-29 /

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.

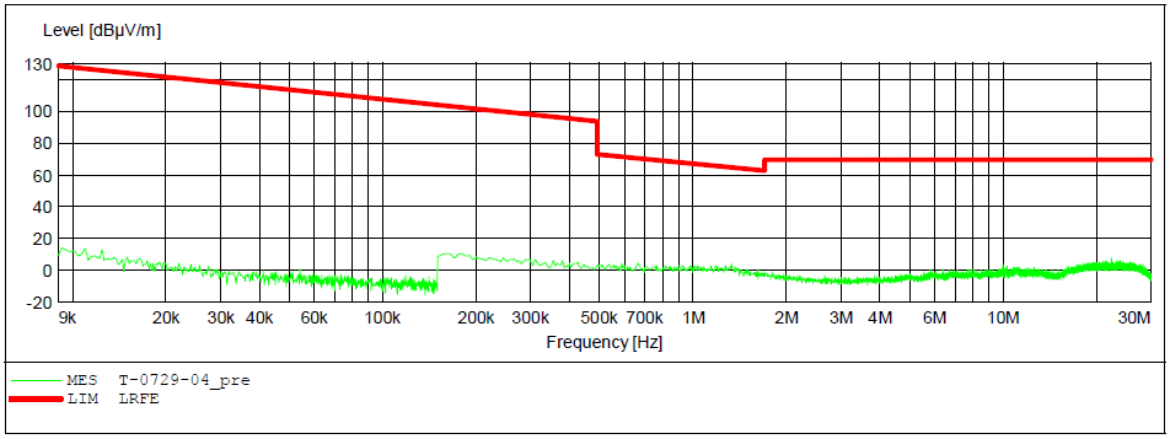
FCC Class B 3M Radiated

EUT:	Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:	THUMBS UP(UK)LTD
Operating Condition:	TX 2441MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	X
Start of Test:	2018-07-29 /

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.

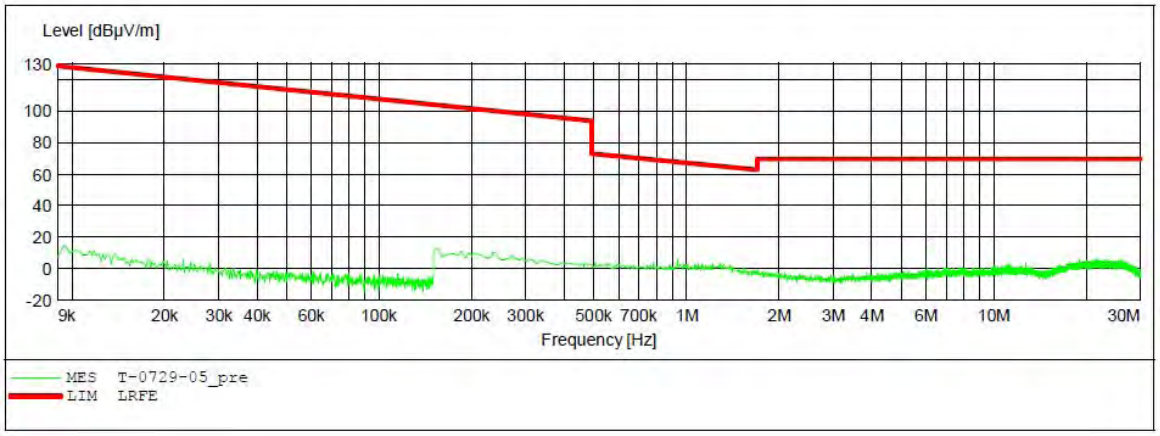
FCC Class B 3M Radiated

EUT:	Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:	THUMBS UP(UK)LTD
Operating Condition:	TX 2441MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Y
Start of Test:	2018-07-29 /

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.

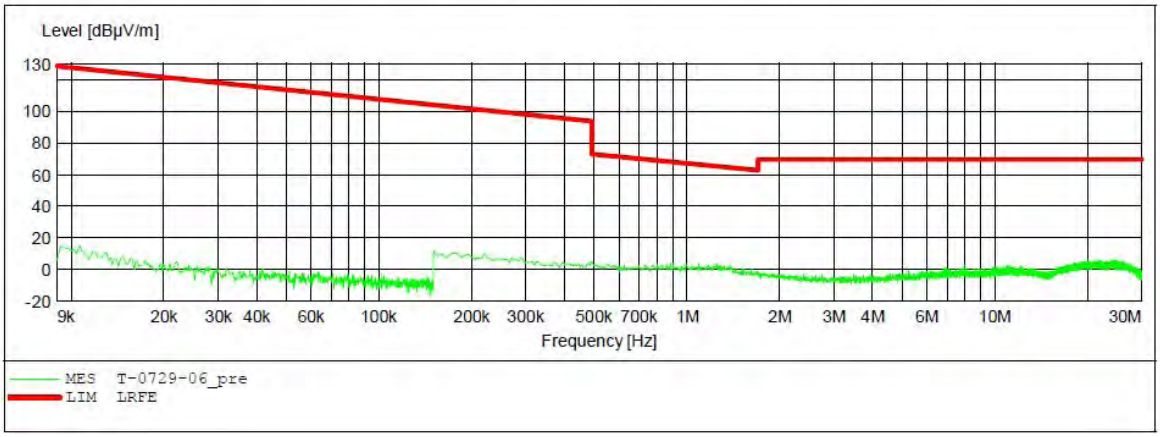
FCC Class B 3M Radiated

EUT:	Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:	THUMBS UP(UK)LTD
Operating Condition:	TX 2441MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Z
Start of Test:	2018-07-29 /

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.

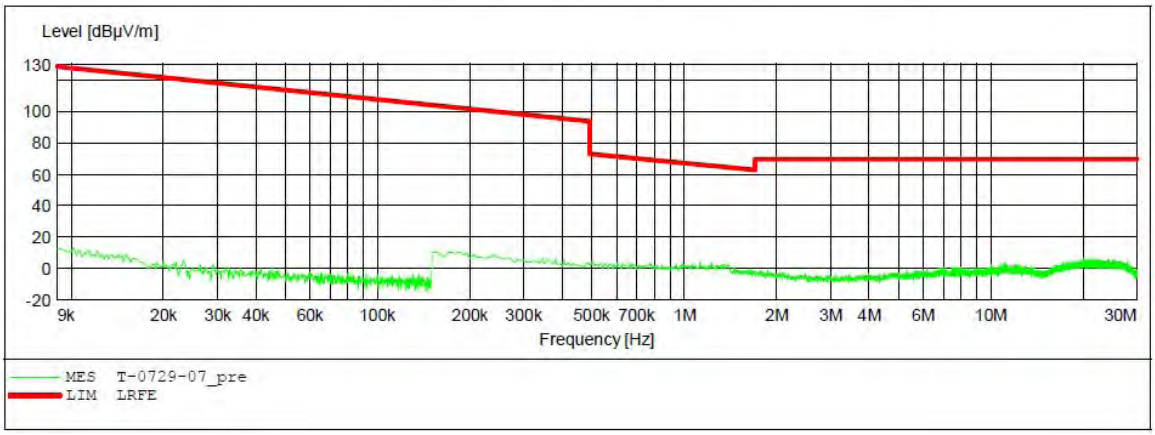
FCC Class B 3M Radiated

EUT: Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer: THUMBS UP(UK)LTD
Operating Condition: TX 2480MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: X
Start of Test: 2018-07-29 /

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.

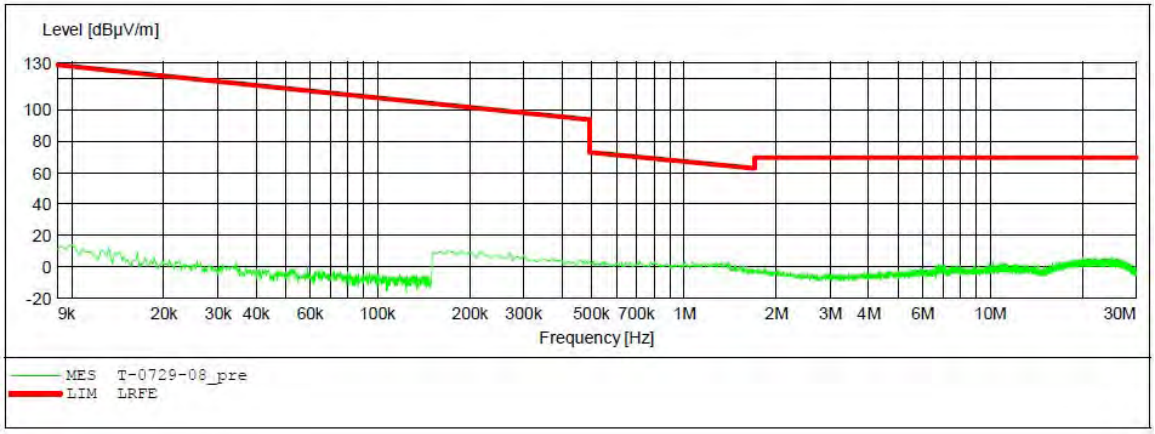
FCC Class B 3M Radiated

EUT:	Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:	THUMBS UP(UK)LTD
Operating Condition:	TX 2480MHz
Test Site:	2# Chamber
Operator:	WADE
Test Specification:	DC 3.7V
Comment:	Y
Start of Test:	2018-07-29 /

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.

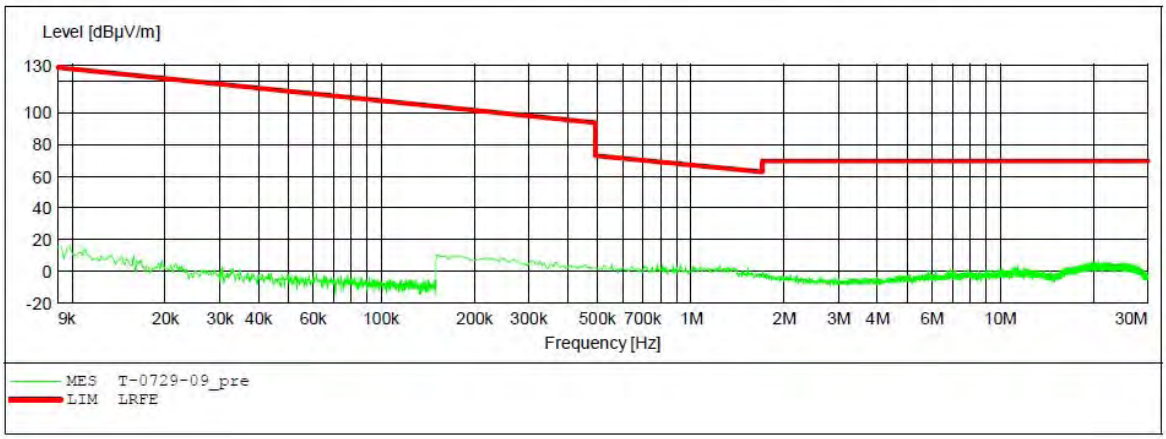
FCC Class B 3M Radiated

EUT: Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer: THUMBS UP(UK)LTD
Operating Condition: TX 2480MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 3.7V
Comment: Z
Start of Test: 2018-07-29 /

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

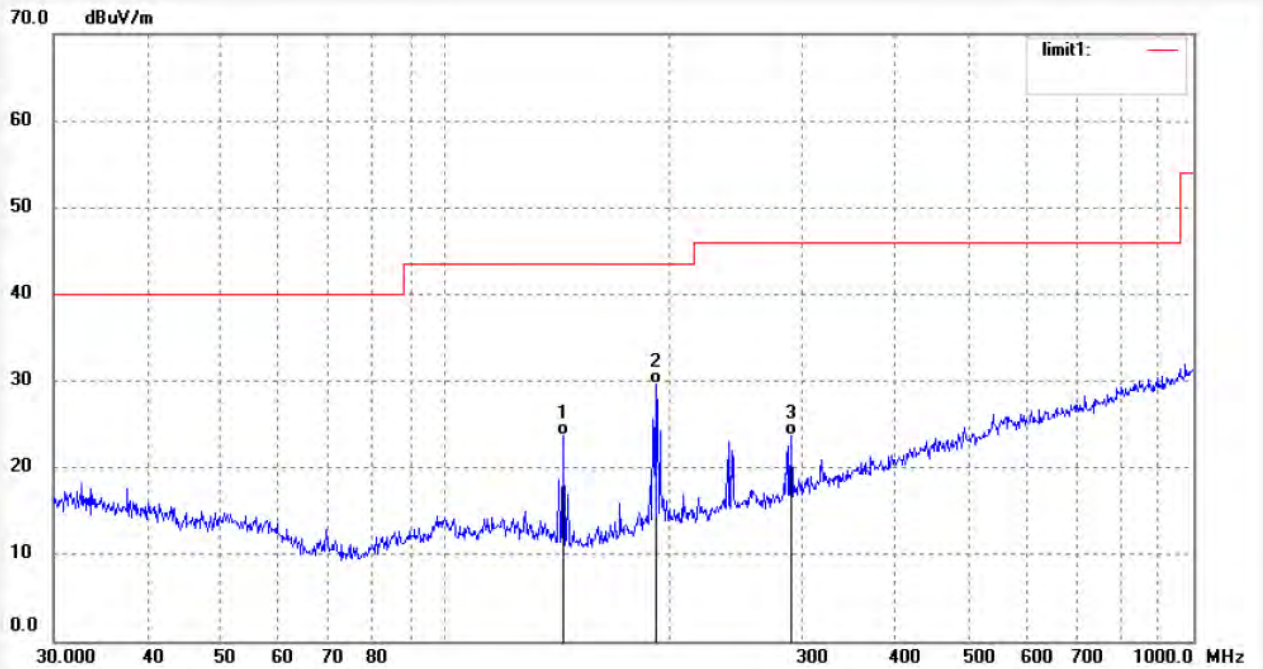


30MHz-1000MHz test data

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.: LGW2018 #1996	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



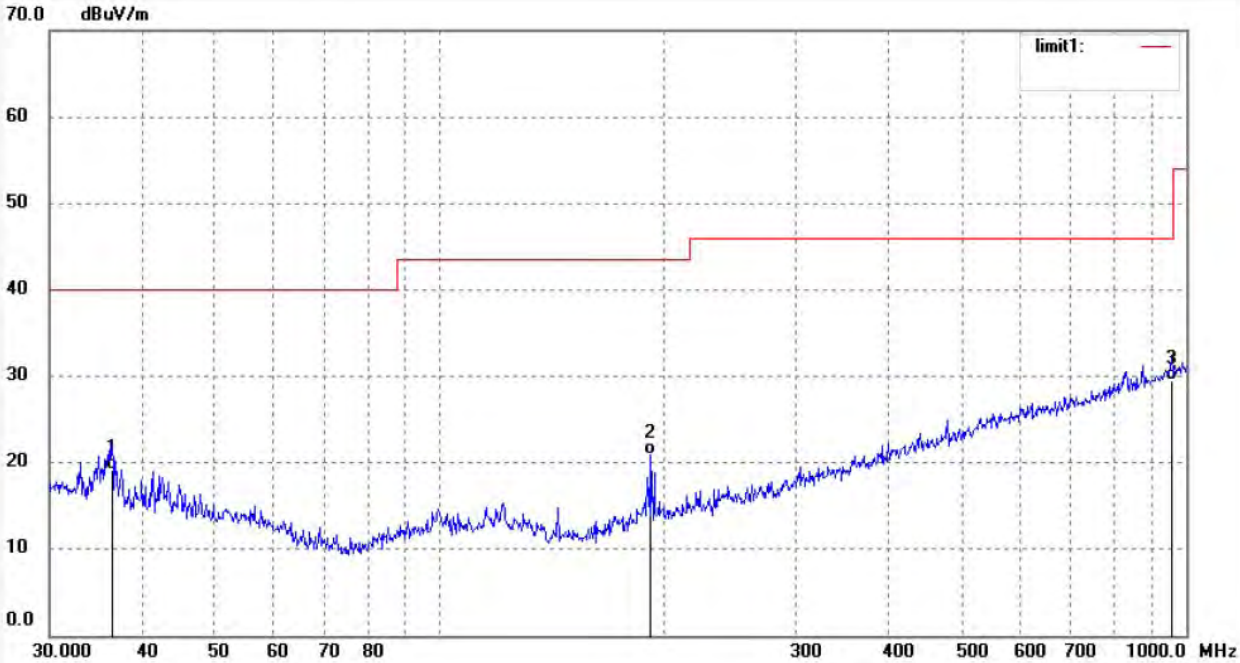
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	143.8294	38.77	-15.11	23.66	43.50	-19.84	QP			
2	191.7450	42.02	-12.42	29.60	43.50	-13.90	QP			
3	290.0172	33.08	-9.31	23.77	46.00	-22.23	QP			

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.: LGW2018 #1997	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



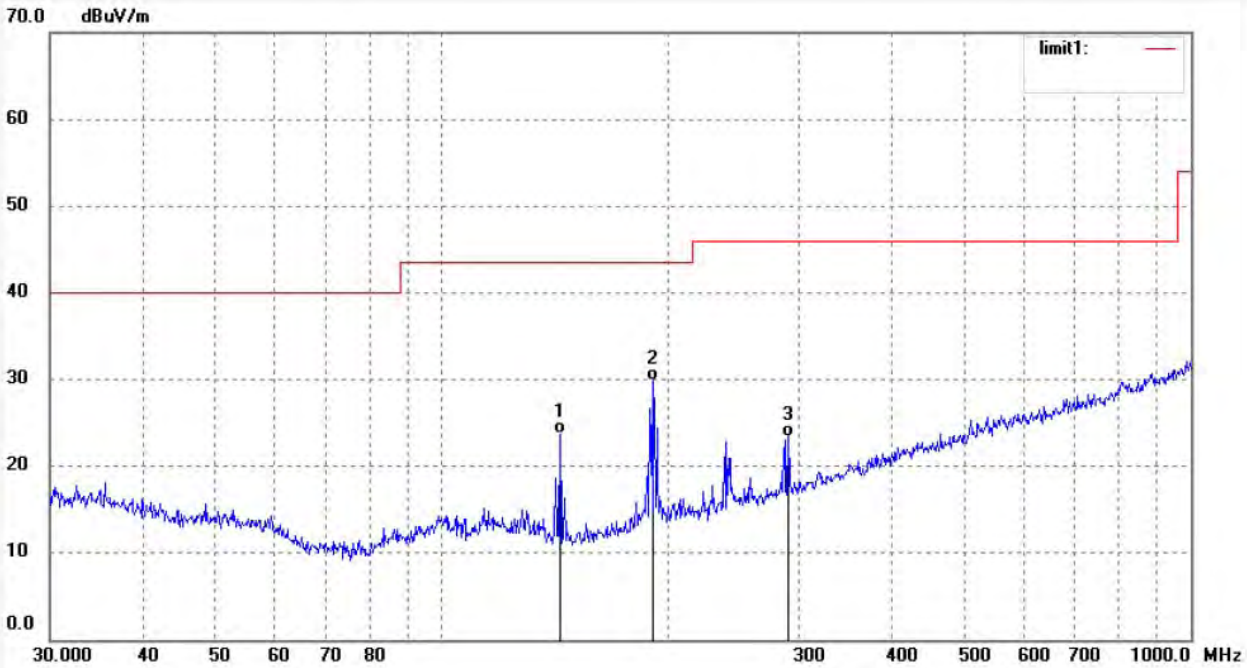
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	36.3813	29.96	-10.72	19.24	40.00	-20.76	QP			
2	191.7450	33.34	-12.42	20.92	43.50	-22.58	QP			
3	955.4380	26.30	3.24	29.54	46.00	-16.46	QP			

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.: LGW2018 #1999
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Speaker
Mode: TX 2441MHz
Model: SPKRWIRGRNPRM
Manufacturer: THUMBS UP(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/07/29/
Time:
Engineer Signature: WADE
Distance: 3m

Note:

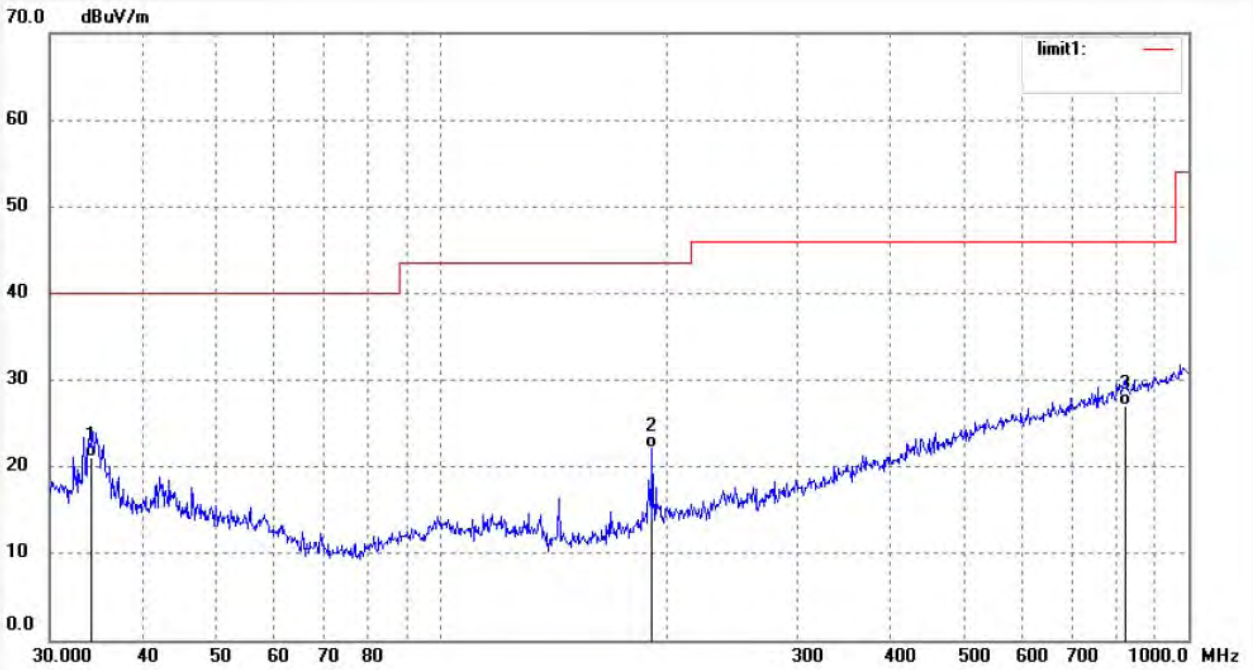


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	143.8294	38.84	-15.11	23.73	43.50	-19.77	QP			
2	191.7450	42.32	-12.42	29.90	43.50	-13.60	QP			
3	290.0172	32.76	-9.31	23.45	46.00	-22.55	QP			

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.: LGW2018 #1998	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2441MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



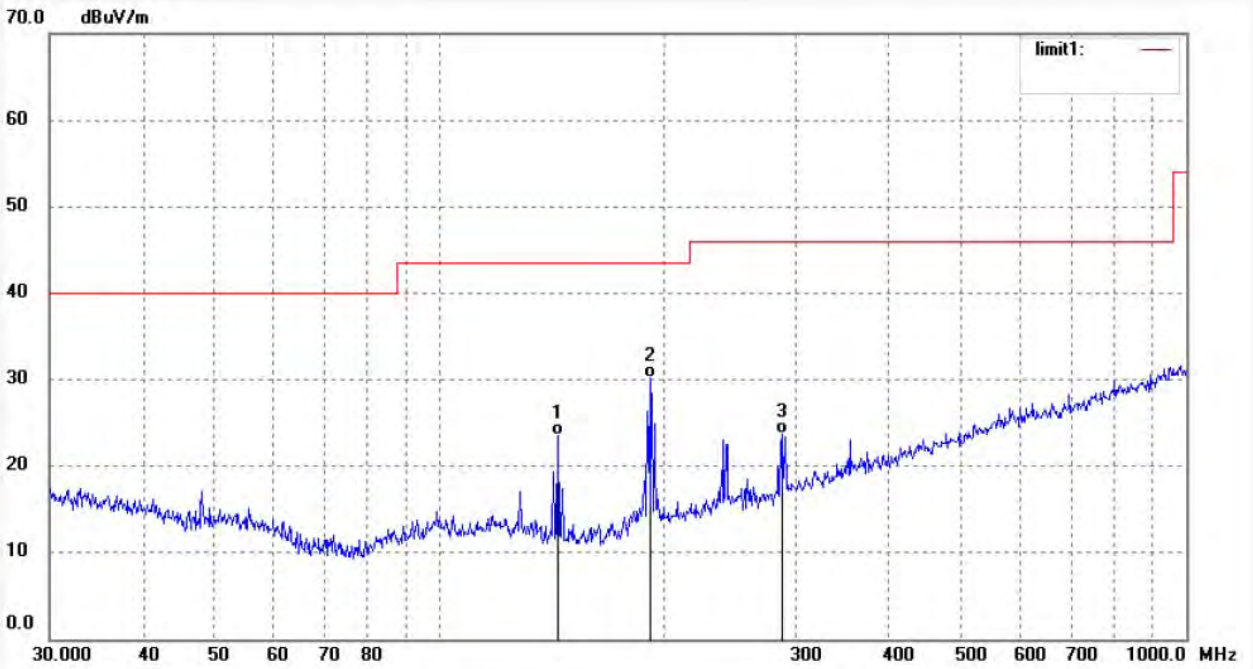
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	34.1561	31.30	-10.16	21.14	40.00	-18.86	QP			
2	191.7450	34.58	-12.42	22.16	43.50	-21.34	QP			
3	824.5968	25.78	1.24	27.02	46.00	-18.98	QP			

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.: LGW2018 #2000
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Speaker
Mode: TX 2480MHz
Model: SPKRWIRGRNPRM
Manufacturer: THUMBS UP(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/07/29/
Time:
Engineer Signature: WADE
Distance: 3m

Note:

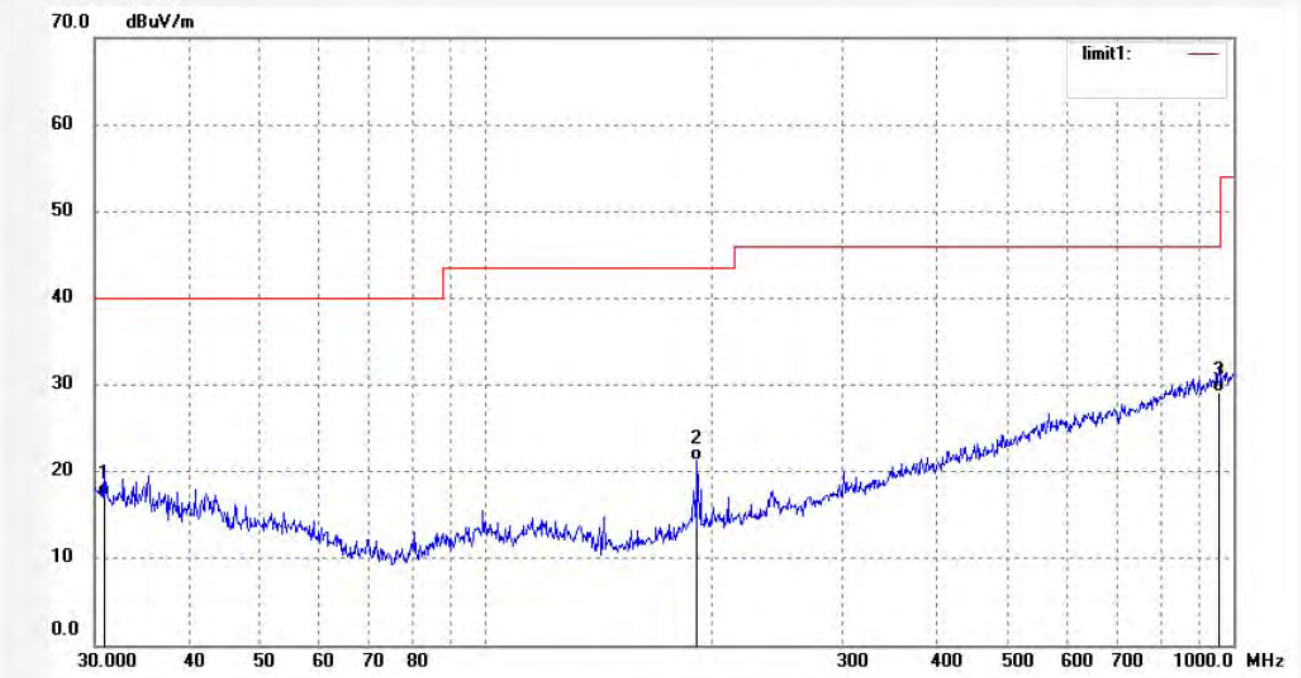


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	143.8294	38.58	-15.11	23.47	43.50	-20.03	QP			
2	191.7450	42.55	-12.42	30.13	43.50	-13.37	QP			
3	287.9904	33.00	-9.34	23.66	46.00	-22.34	QP			

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.: LGW2018 #2001	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



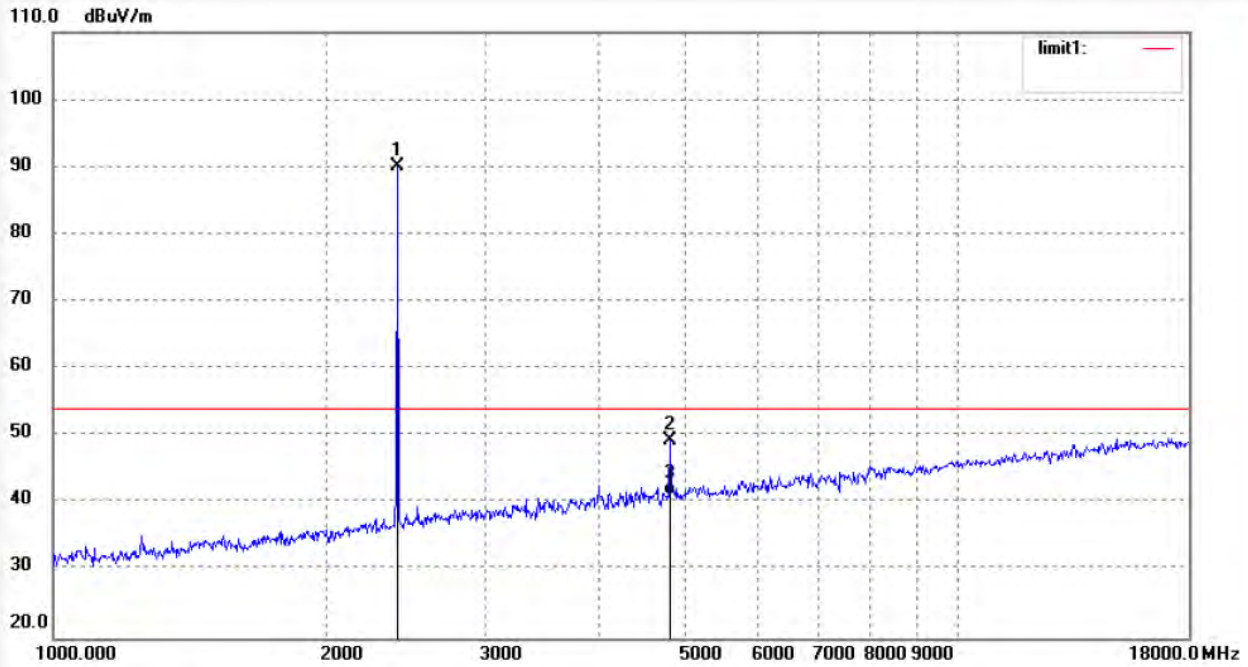
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	30.8535	26.43	-9.18	17.25	40.00	-22.75	QP			
2	191.7450	33.60	-12.42	21.18	43.50	-22.32	QP			
3	955.4380	25.88	3.24	29.12	46.00	-16.88	QP			

1GHz-18GHz 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.: LGW2018 #1964	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

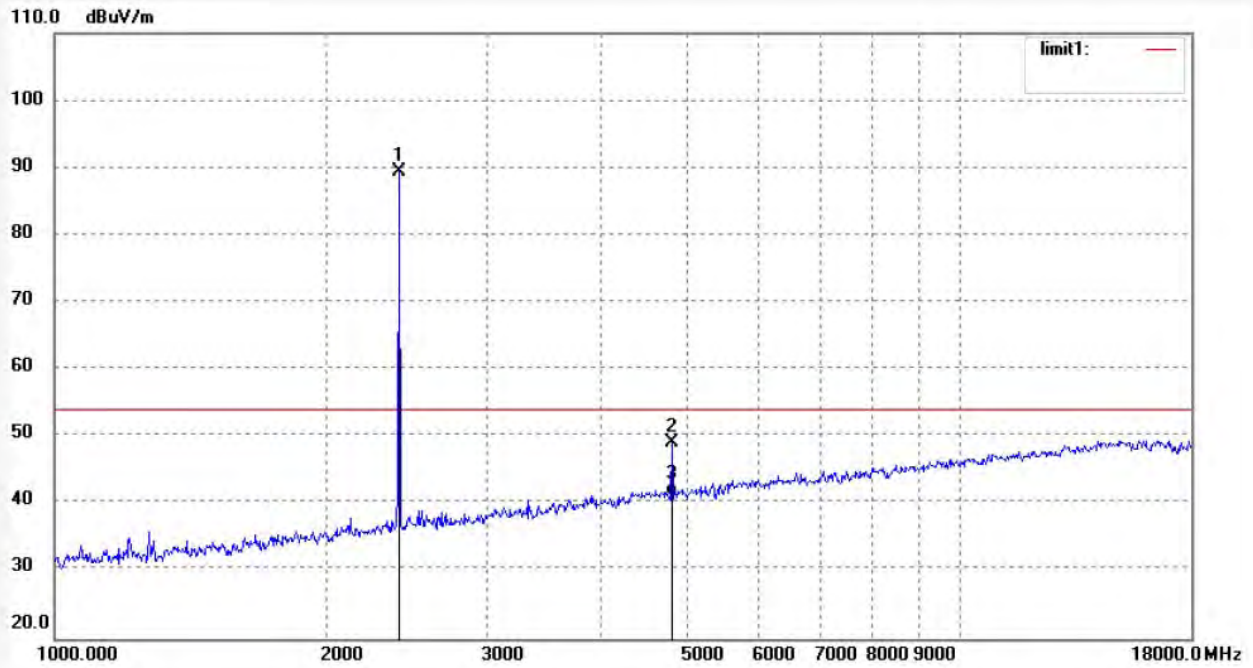


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	89.23	0.89	90.12	/	/	peak			
2	4804.025	41.94	7.40	49.34	74.00	-24.66	peak			
3	4804.025	33.83	7.40	41.23	54.00	-12.77	AVG			

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.: LGW2018 #1965	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



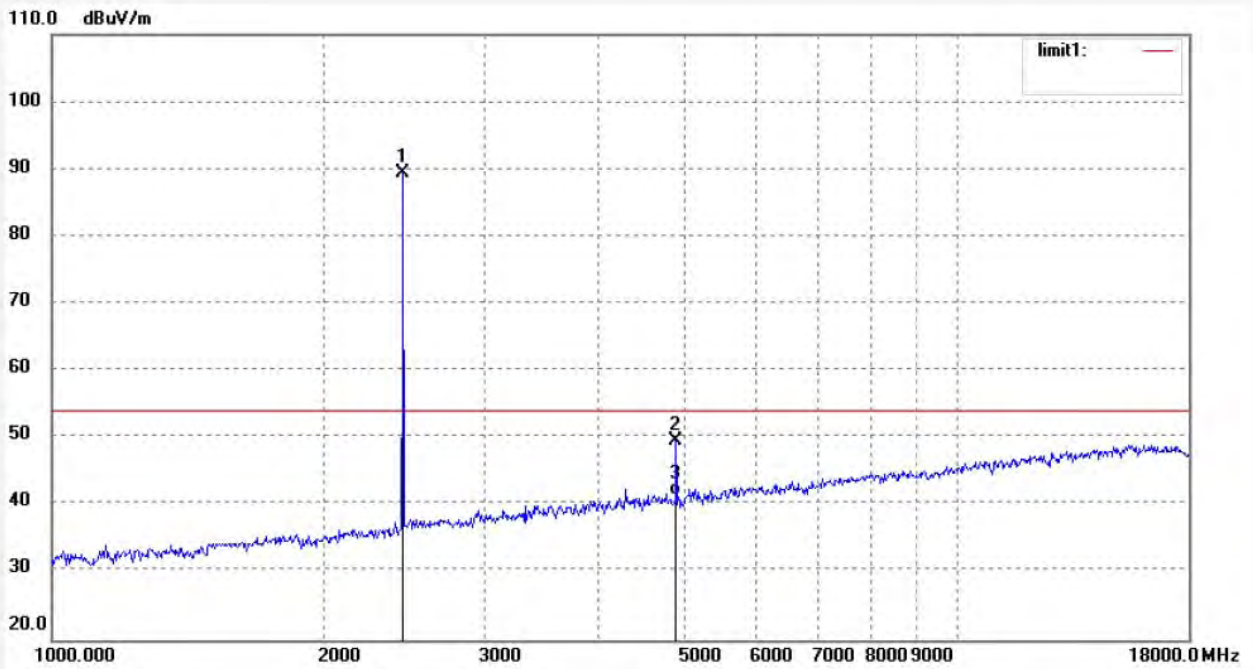
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	88.51	0.89	89.40	/	/	peak			
2	4804.026	41.67	7.40	49.07	74.00	-24.93	peak			
3	4804.026	33.85	7.40	41.25	54.00	-12.75	AVG			

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.: LGW2018 #1968
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Bluetooth Speaker
Mode: TX 2441MHz
Model: SPKRWIRGRNPRM
Manufacturer: THUMBS UP(UK)LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/07/29/
Time:
Engineer Signature: WADE
Distance: 3m

Note:



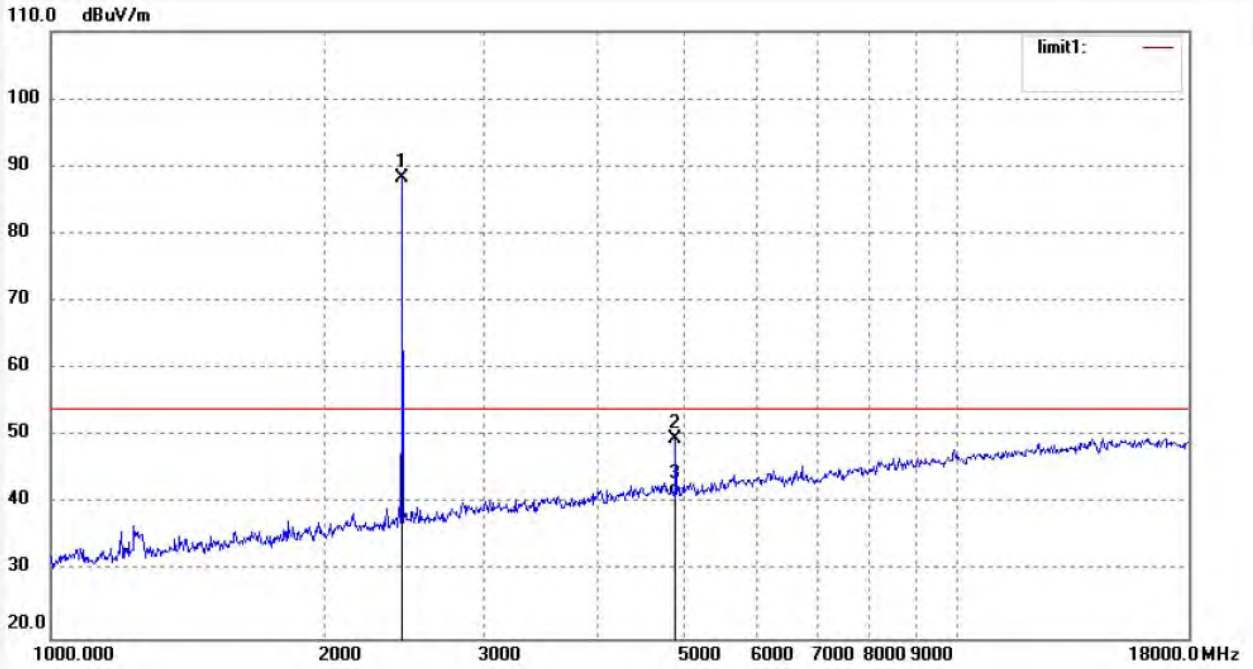
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	88.27	1.06	89.33	/	/	peak			
2	4882.027	41.38	8.11	49.49	74.00	-24.51	peak			
3	4882.027	33.46	8.11	41.57	54.00	-12.43	AVG			

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.: LGW2018 #1969	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2441MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

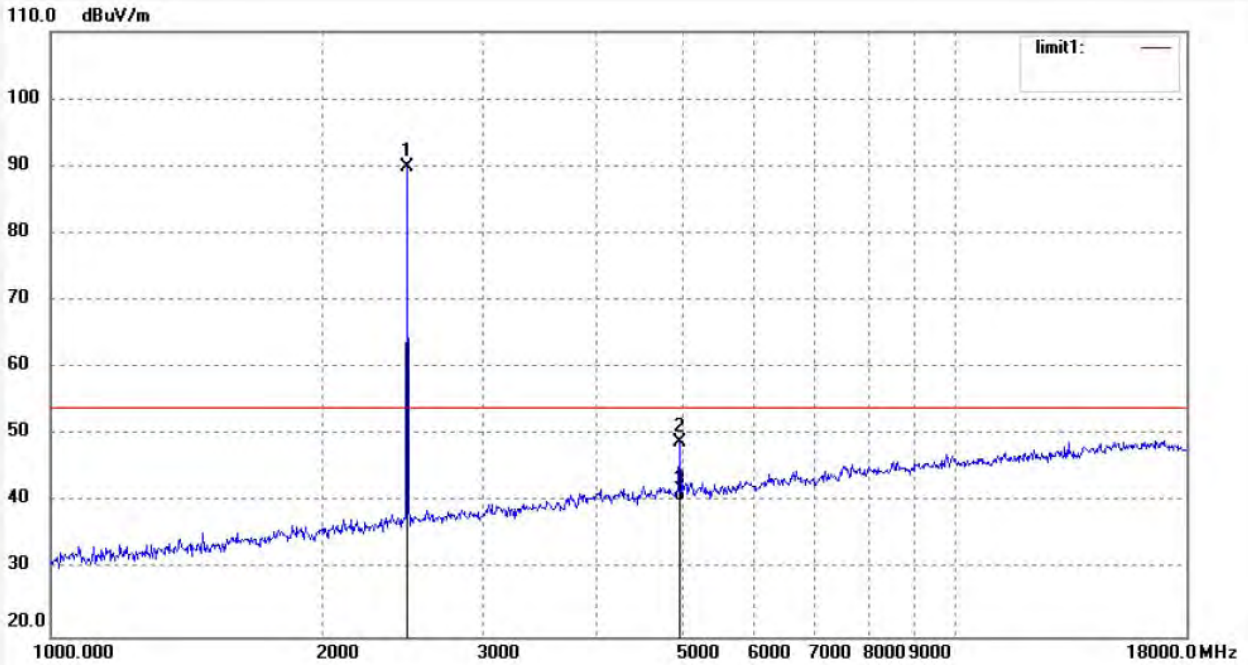


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	87.24	1.06	88.30	/	/	peak			
2	4882.026	41.47	8.11	49.58	74.00	-24.42	peak			
3	4882.026	33.12	8.11	41.23	54.00	-12.77	AVG			

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.: LGW2018 #1971	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

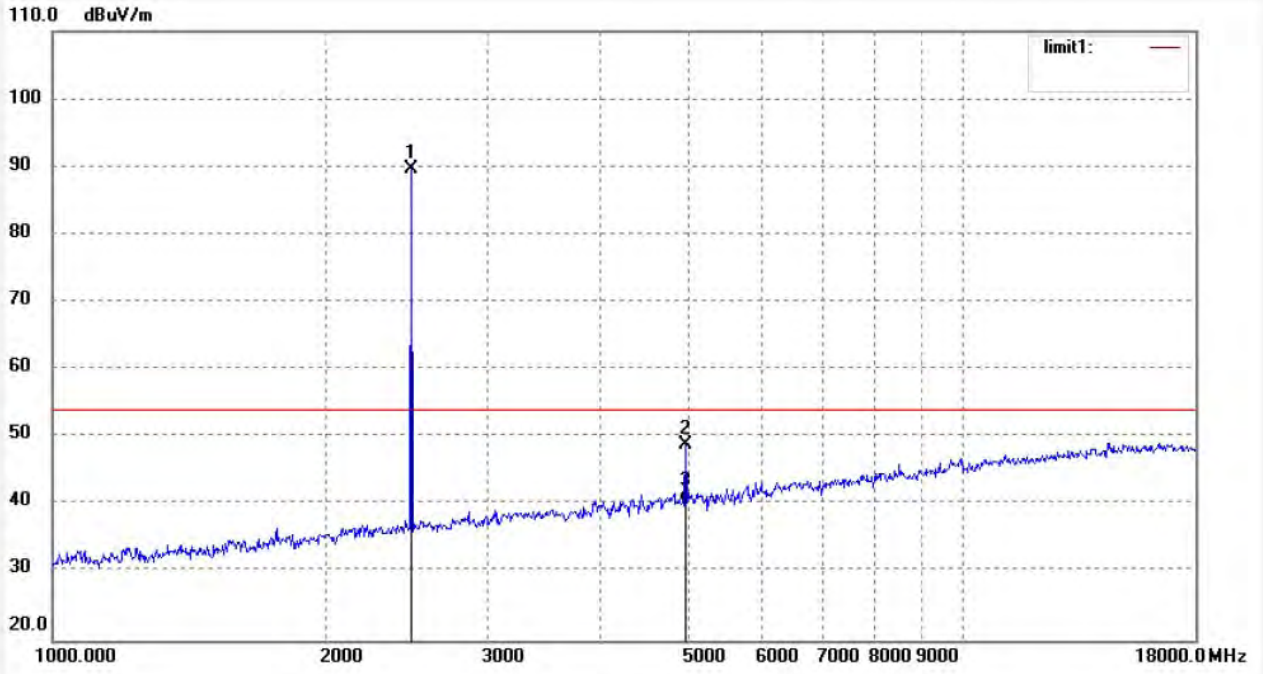


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	88.80	1.10	89.90	/	/	peak			
2	4960.029	40.29	8.60	48.89	74.00	-25.11	peak			
3	4960.029	31.63	8.60	40.23	54.00	-13.77	AVG			

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.: LGW2018 #1970	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



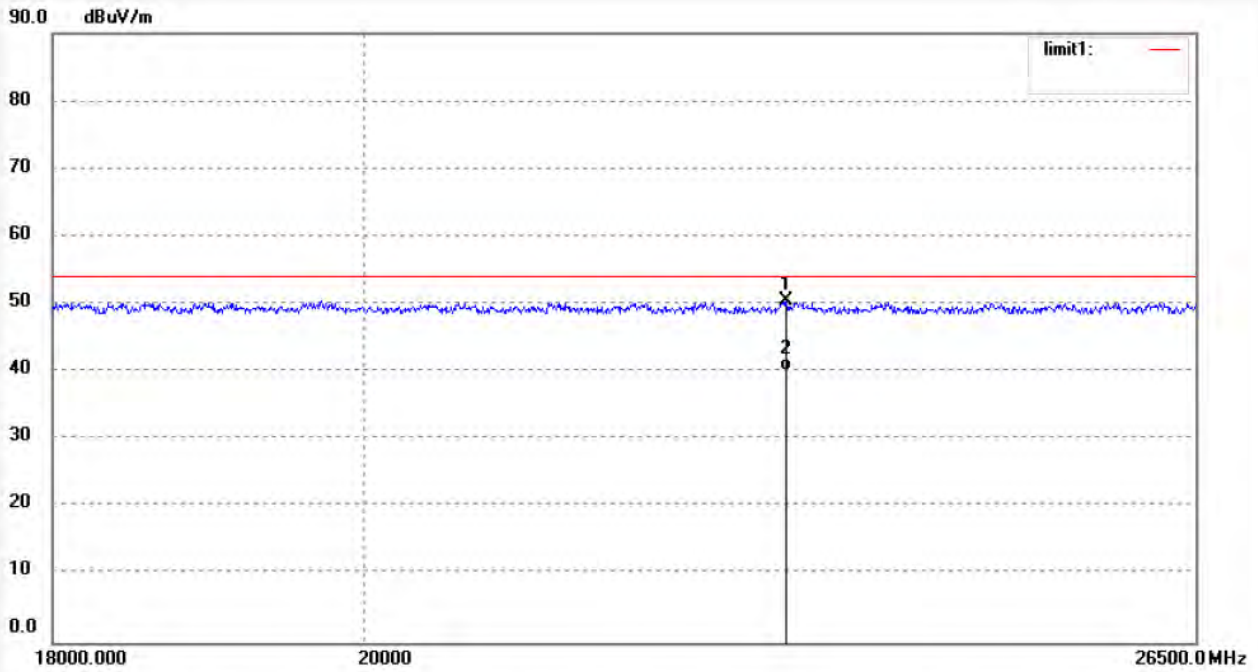
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	88.62	1.10	89.72	/	/	peak			
2	4960.028	40.26	8.60	48.86	74.00	-25.14	peak			
3	4960.028	31.71	8.60	40.31	54.00	-13.69	AVG			

18GHz-26.5GHz 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.: LGW2018 #1975	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

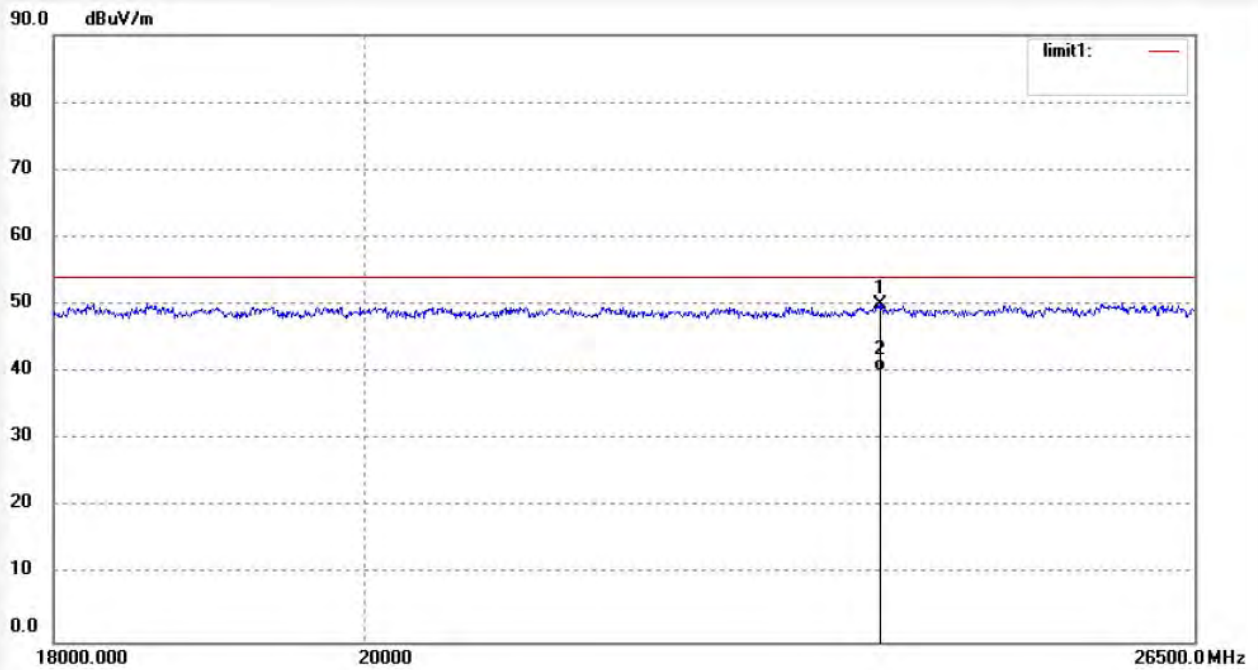


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	23073.390	10.94	39.64	50.58	74.00	-23.42	peak			
2	23073.390	0.57	39.64	40.21	54.00	-13.79	AVG			

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.: LGW2018 #1974	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

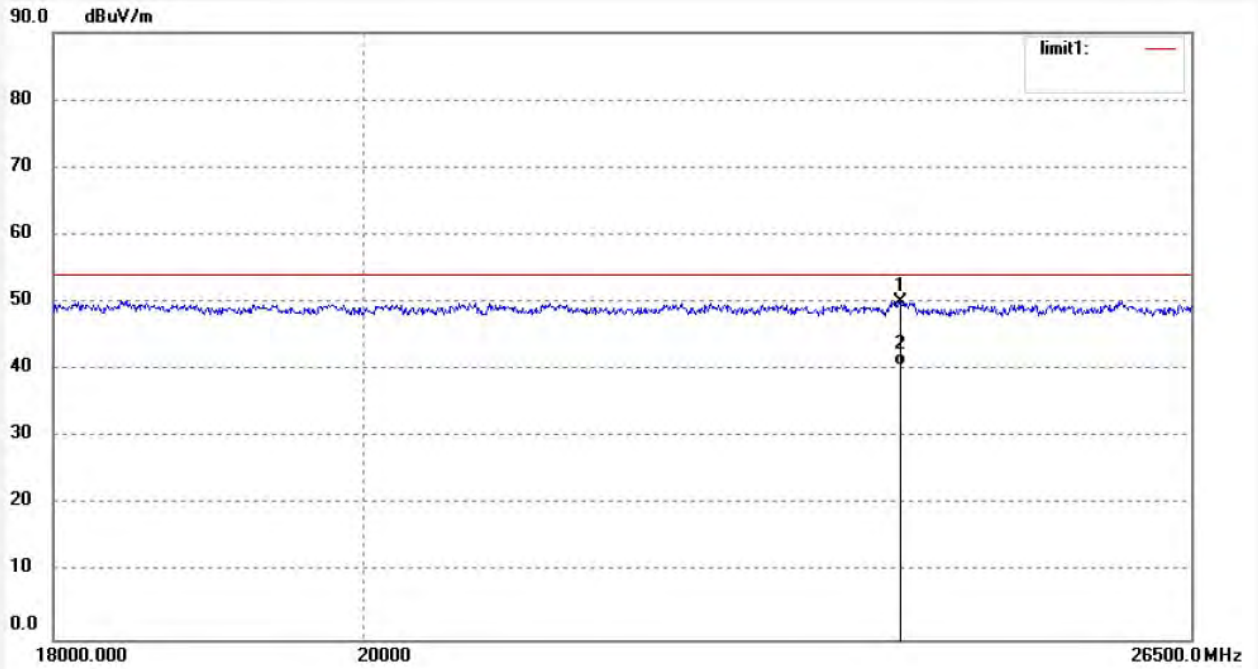


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	23826.113	10.35	39.72	50.07	74.00	-23.93	peak			
2	23826.113	0.52	39.72	40.24	54.00	-13.76	AVG			

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.: LGW2018 #1976	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2441MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

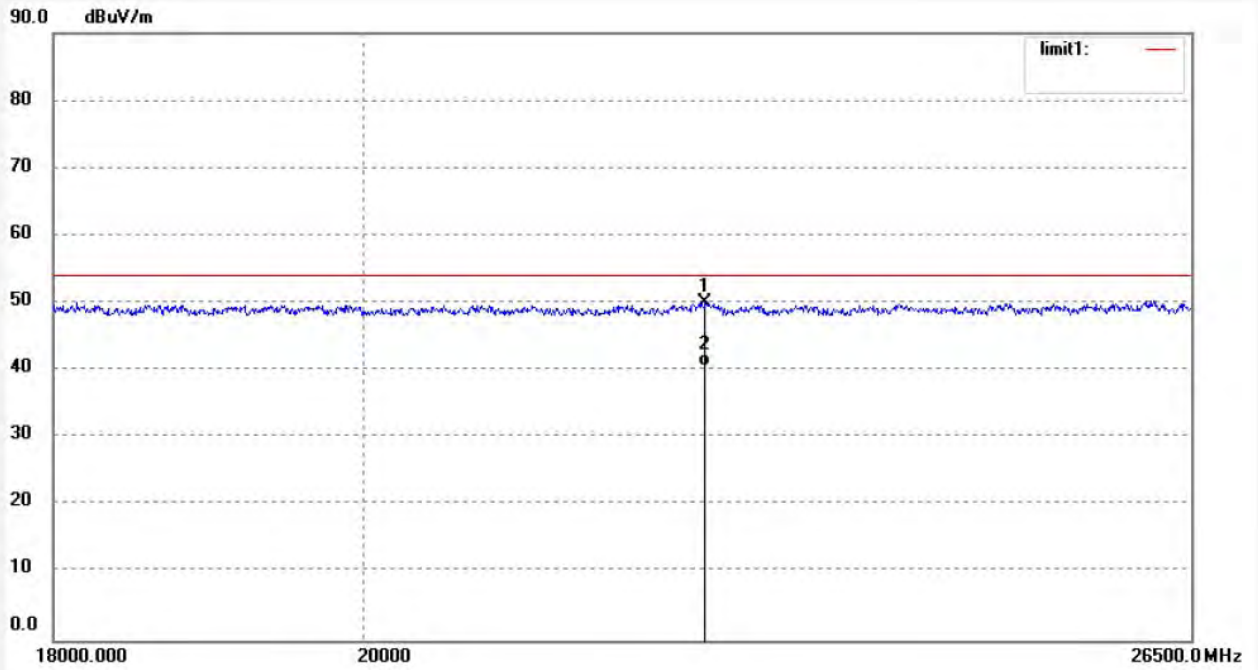


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	24011.134	9.67	40.41	50.08	74.00	-23.92	peak			
2	24011.134	0.14	40.41	40.55	54.00	-13.45	AVG			

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.: LGW2018 #1977	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2441MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:



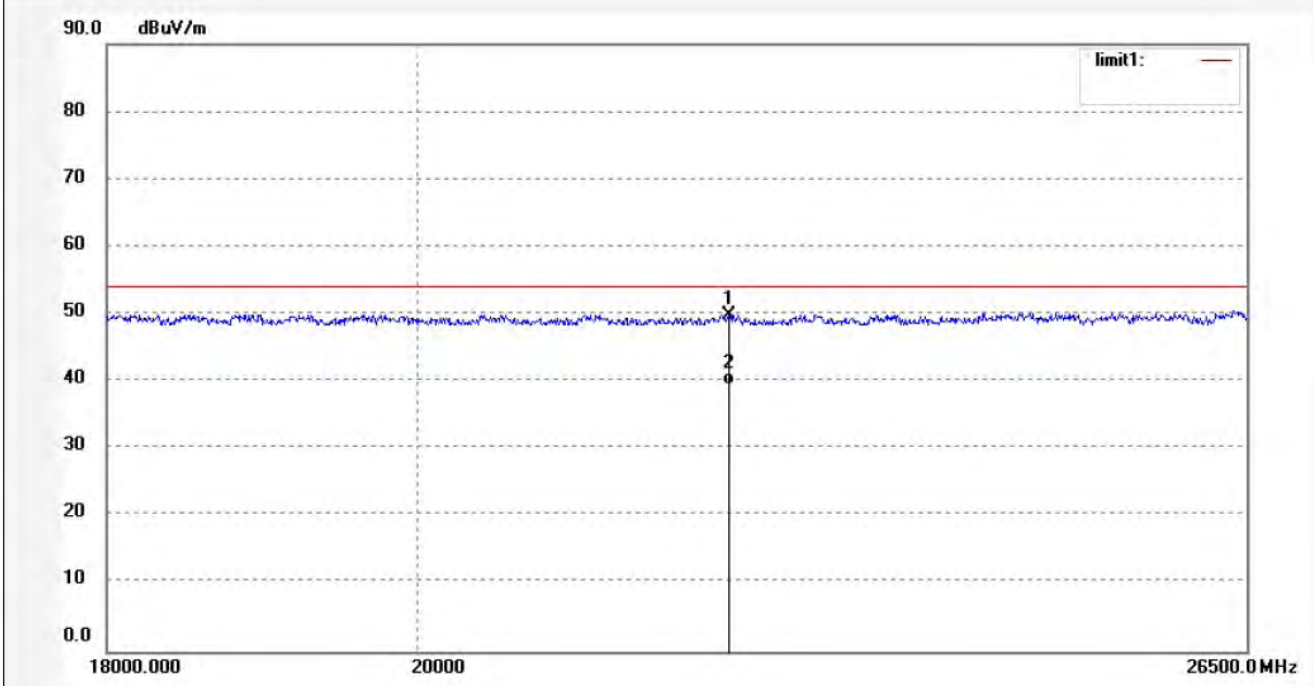
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22465.767	10.77	39.37	50.14	74.00	-23.86	peak			
2	22465.767	1.17	39.37	40.54	54.00	-13.46	AVG			

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.: LGW2018 #1979	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

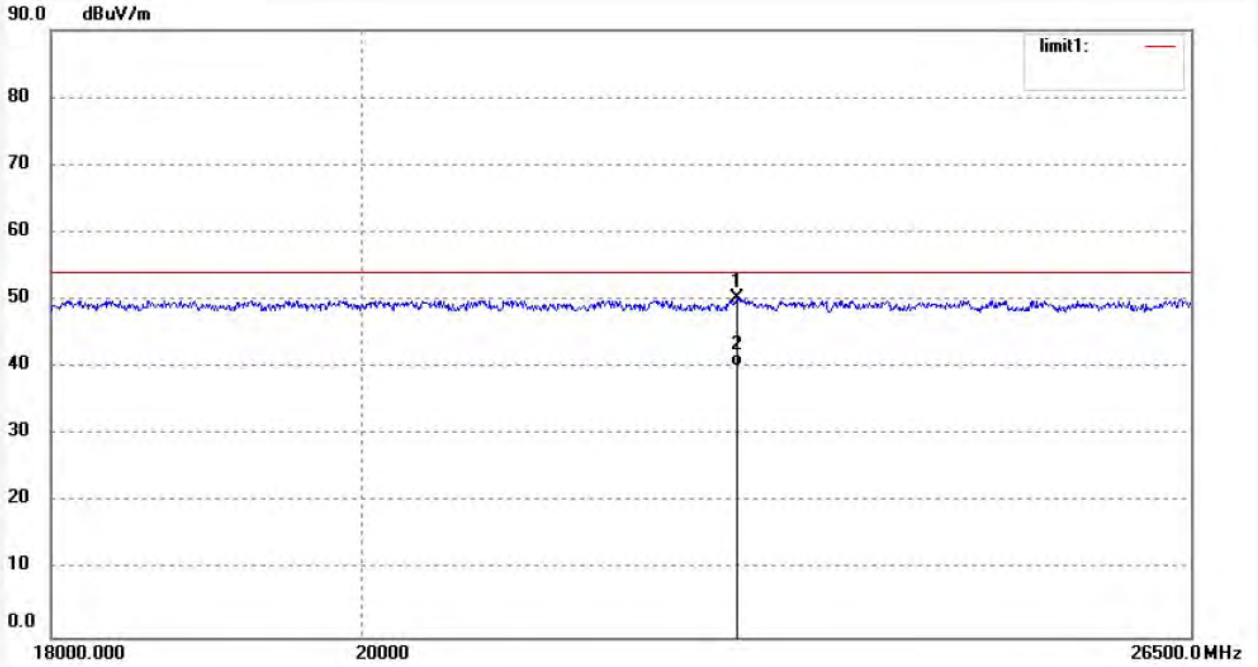


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22232.380	10.25	39.60	49.85	74.00	-24.15	peak			
2	22232.380	-0.15	39.60	39.45	54.00	-14.55	AVG			

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.: LGW2018 #1978	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

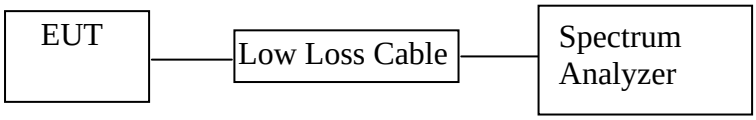
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22719.171	10.70	39.57	50.27	74.00	-23.73	peak			
2	22719.171	0.55	39.57	40.12	54.00	-13.88	AVG			

11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



11.2.The Requirement For Section 15.247(d)

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

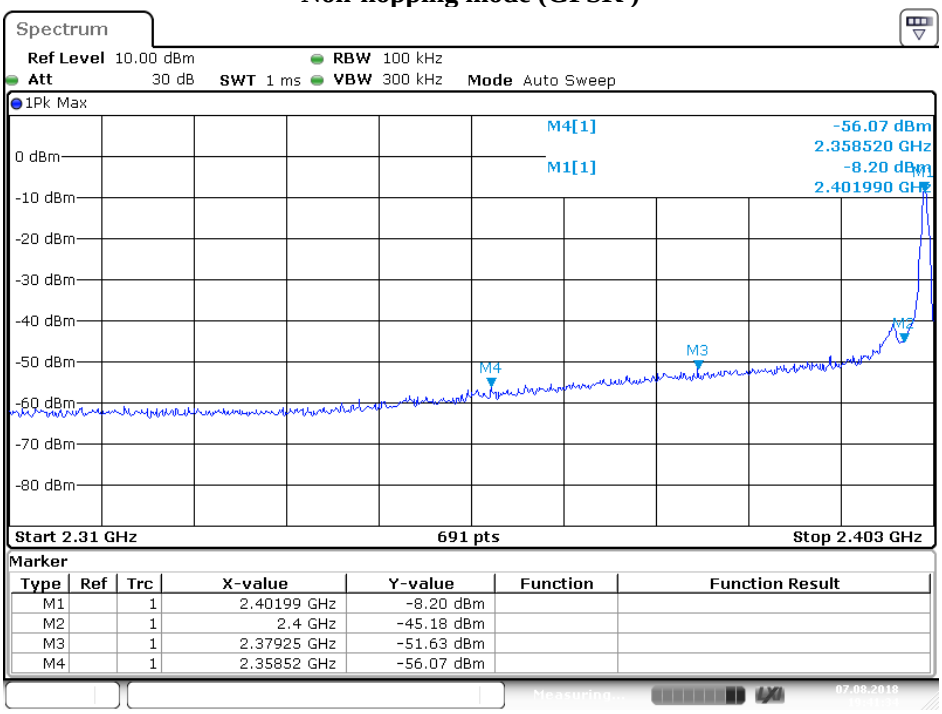
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)	Result
GFSK mode			
2400.00	36.98	> 20dBc	PASS
2483.50	35.17	> 20dBc	PASS
8DPSK mode			
2400.00	29.3	> 20dBc	PASS
2483.50	31.42	> 20dBc	PASS

Hopping mode

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)	Result
GFSK mode			
2400.00	35.94	> 20dBc	PASS
2483.50	42.78	> 20dBc	PASS
8DPSK mode			
2396.96	27.70	> 20dBc	PASS
2483.50	29.45	> 20dBc	PASS

The spectrum analyzer plots are attached as below.

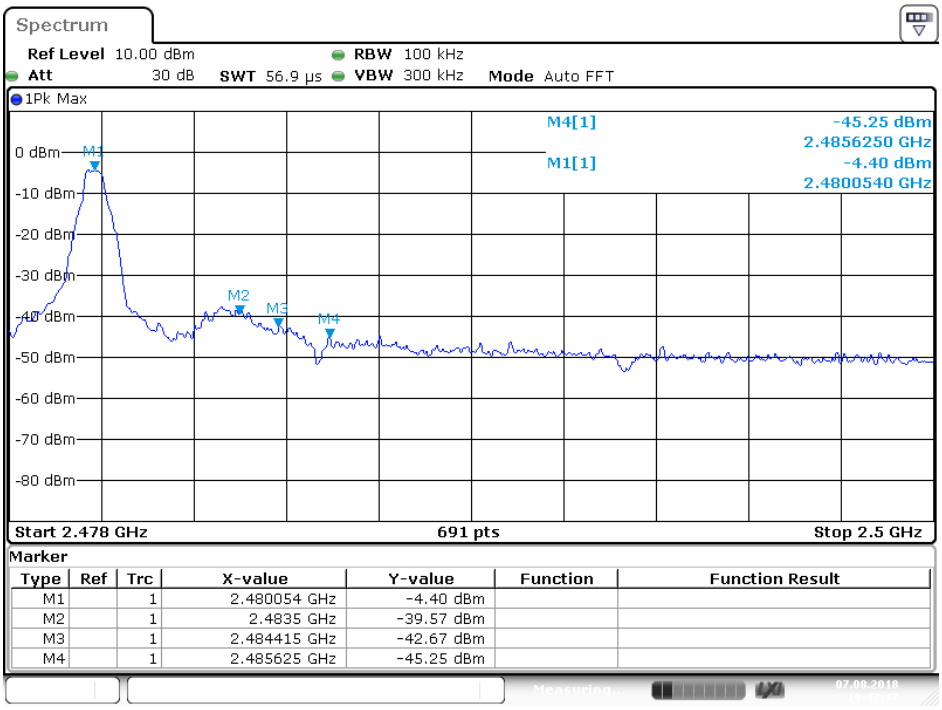
Non-hopping mode (GFSK)



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40199 GHz	-8.20 dBm		
M2		1	2.4 GHz	-45.18 dBm		
M3		1	2.37925 GHz	-51.63 dBm		
M4		1	2.35852 GHz	-56.07 dBm		

Date: 7.AUG.2018 19:41:34

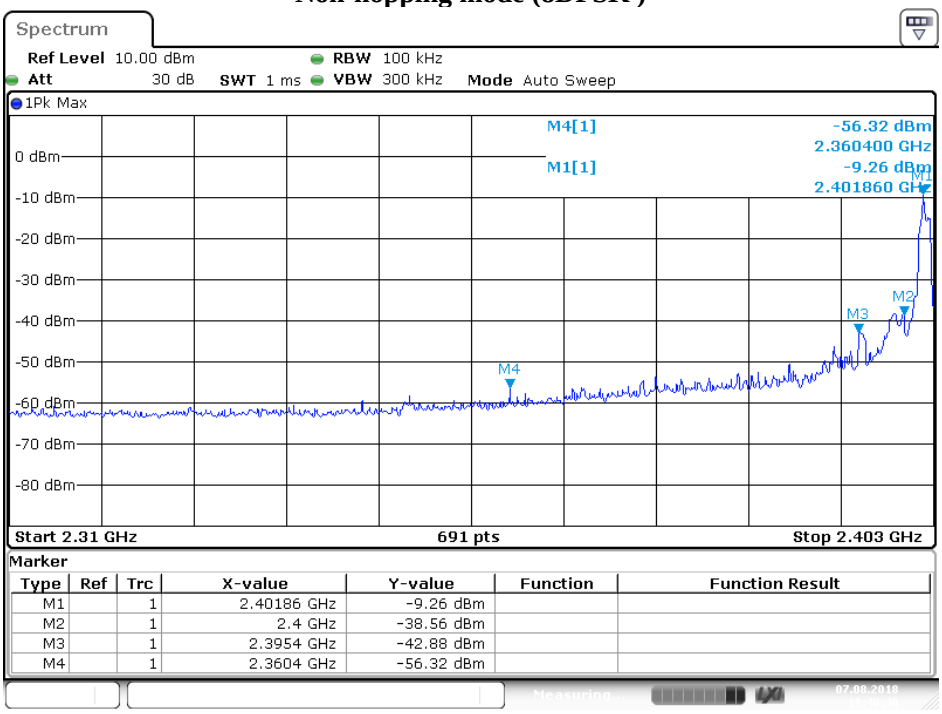


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.480054 GHz	-4.40 dBm		
M2		1	2.4835 GHz	-39.57 dBm		
M3		1	2.484415 GHz	-42.67 dBm		
M4		1	2.485625 GHz	-45.25 dBm		

Date: 7.AUG.2018 19:42:47

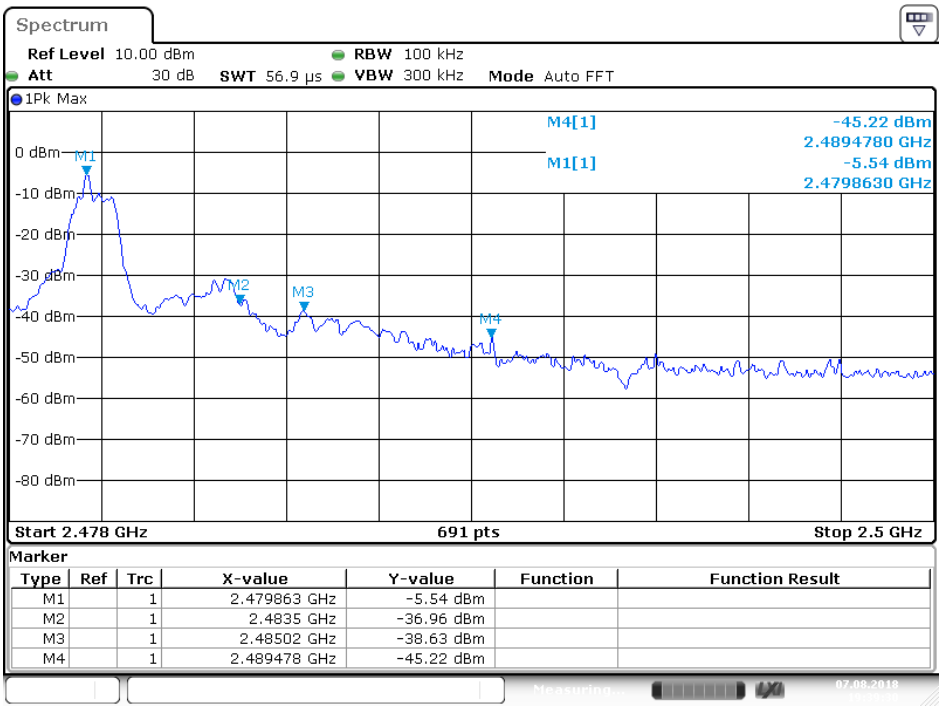
Non-hopping mode (8DPSK)



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40186 GHz	-9.26 dBm		
M2		1	2.4 GHz	-38.56 dBm		
M3		1	2.3954 GHz	-42.88 dBm		
M4		1	2.3604 GHz	-56.32 dBm		

Date: 7.AUG.2018 19:40:40

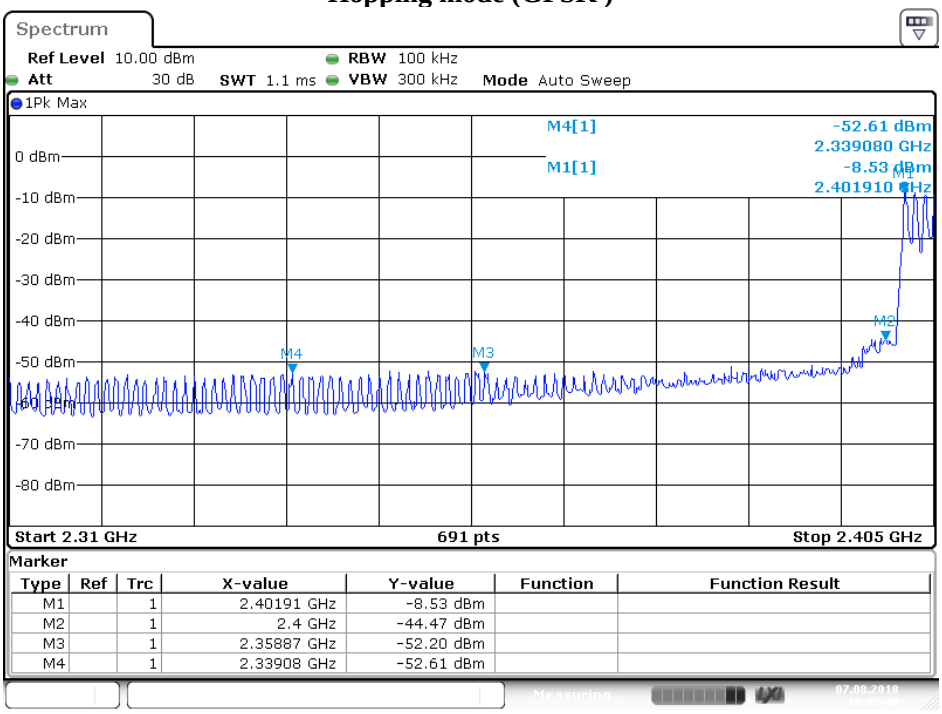


Marker

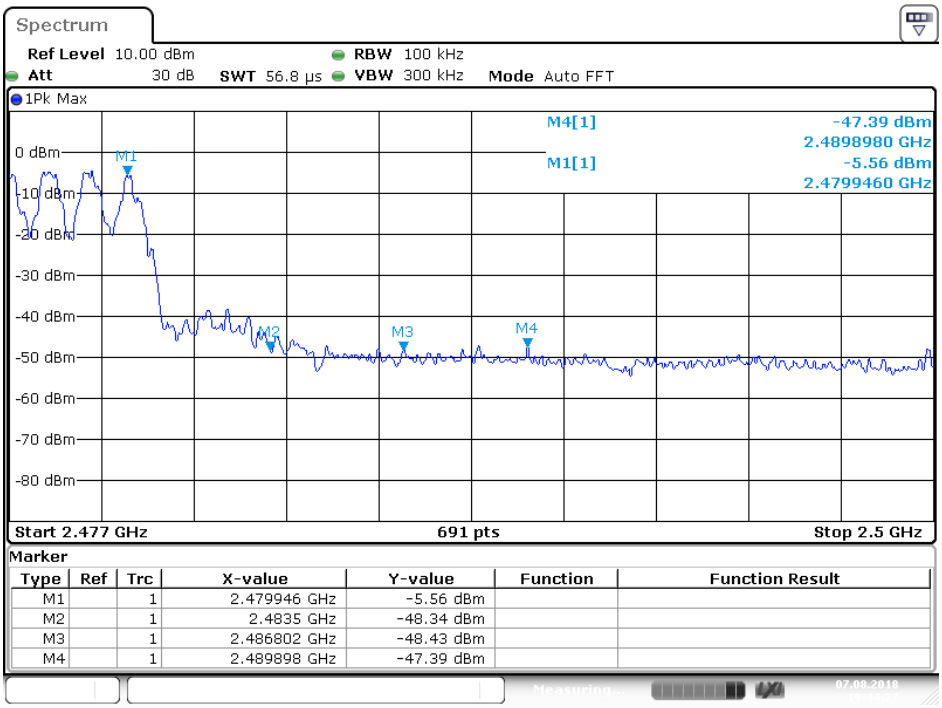
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479863 GHz	-5.54 dBm		
M2		1	2.4835 GHz	-36.96 dBm		
M3		1	2.48502 GHz	-38.63 dBm		
M4		1	2.489478 GHz	-45.22 dBm		

Date: 7.AUG.2018 19:39:31

Hopping mode (GFSK)

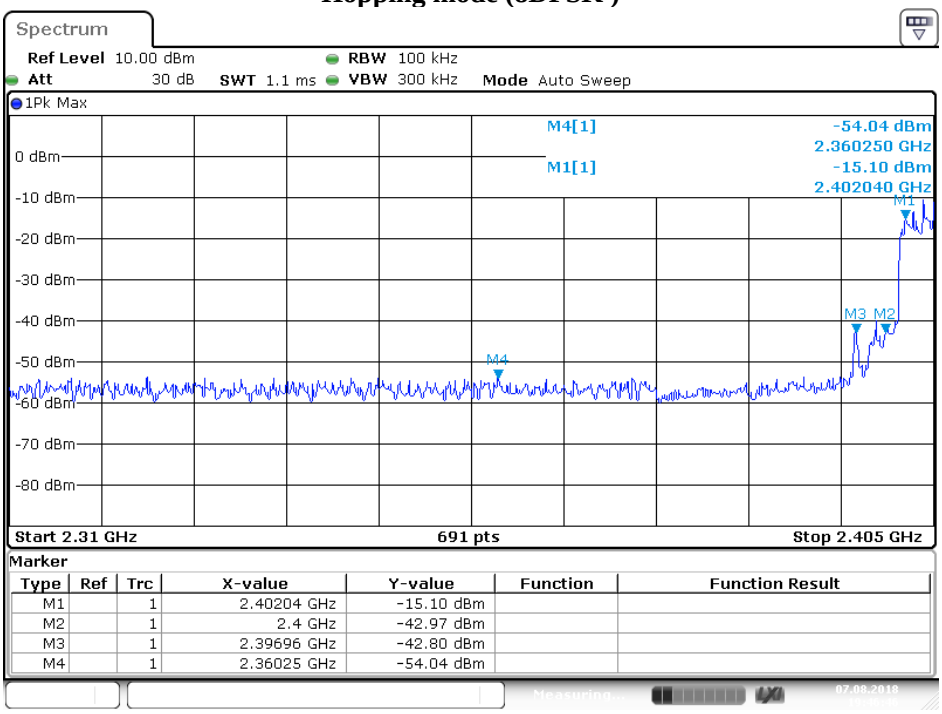


Date: 7.AUG.2018 19:45:40

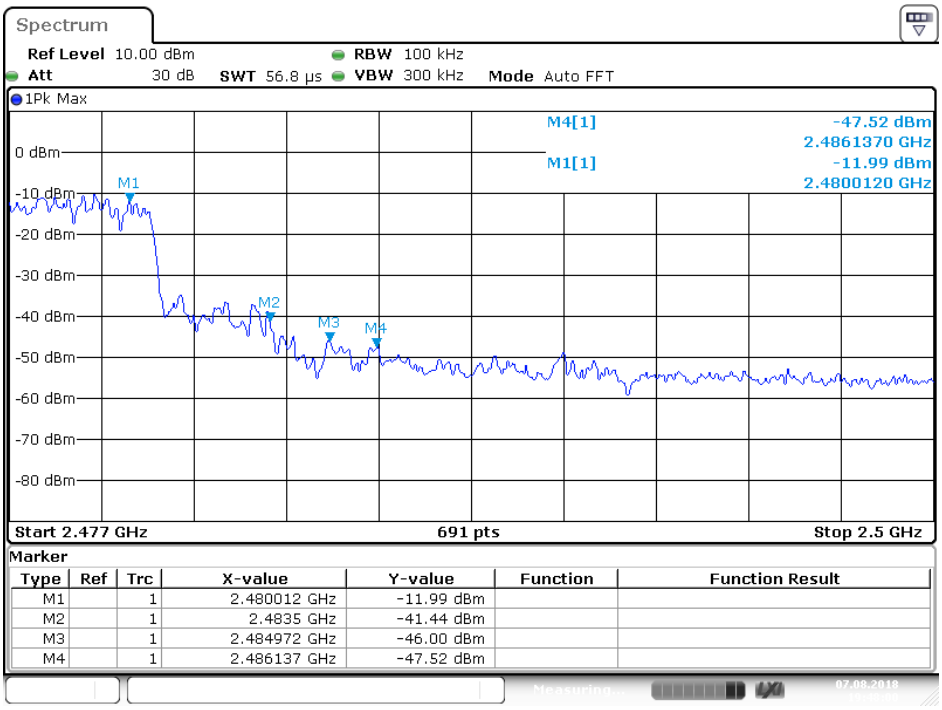


Date: 7.AUG.2018 19:44:27

Hopping mode (8DPSK)



Date: 7.AUG.2018 19:46:47



Date: 7.AUG.2018 19:48:01

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).

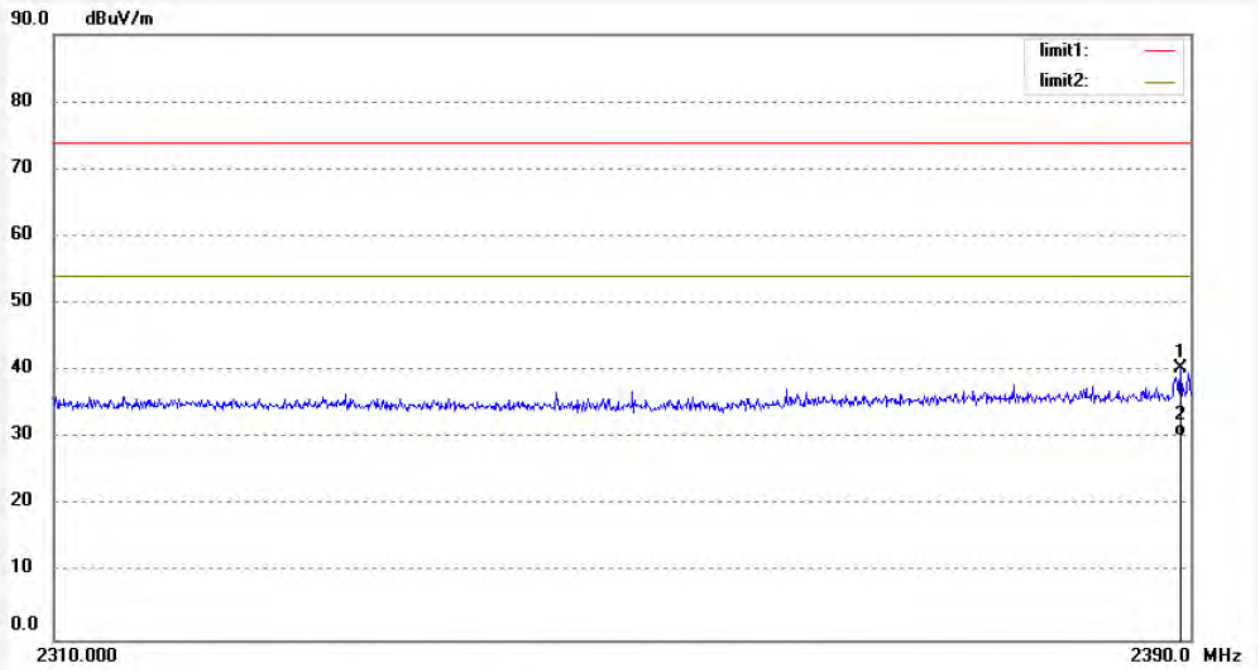
During the radiated emission test, the spectrum analyzer was set with the following configurations:
1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
2.The resolution bandwidth of test receiver/spectrum 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 worst-case(GFSK) emissions are reported.

Non-hopping mode

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.: LGW2018 #1967	Polarization: Horizontal
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

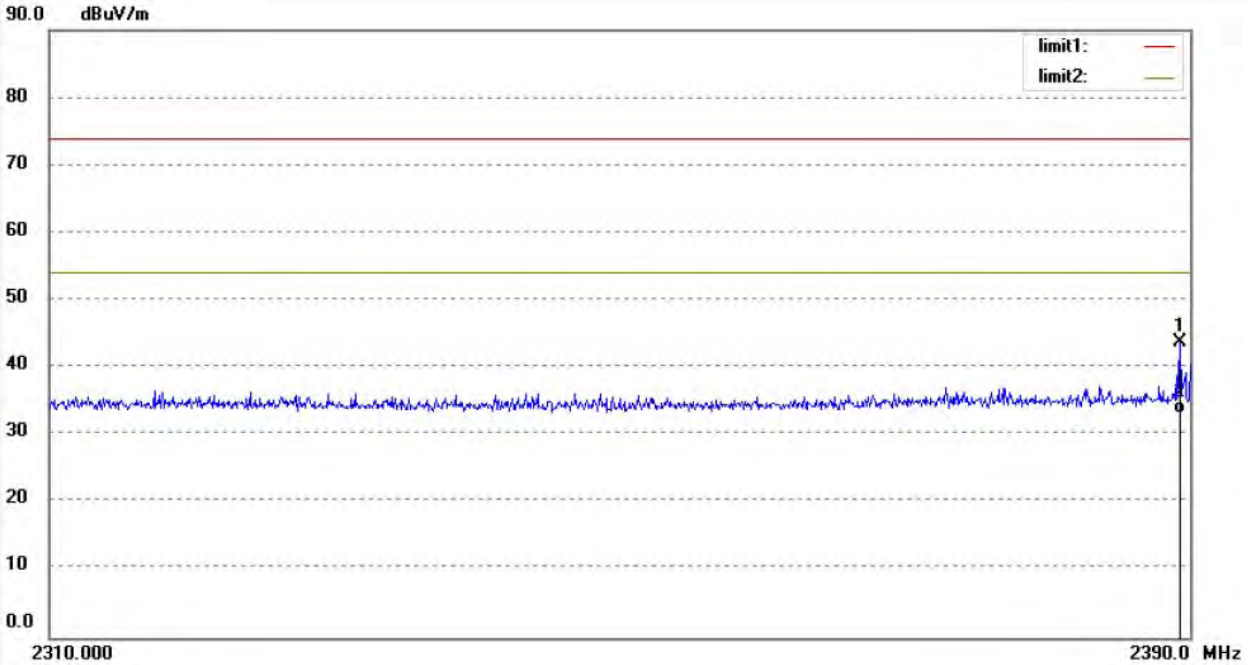


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2389.280	39.63	0.79	40.42	74.00	-33.58	peak			
2	2389.280	29.48	0.79	30.27	54.00	-23.73	AVG			

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.: LGW2018 #1966	Polarization: Vertical
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

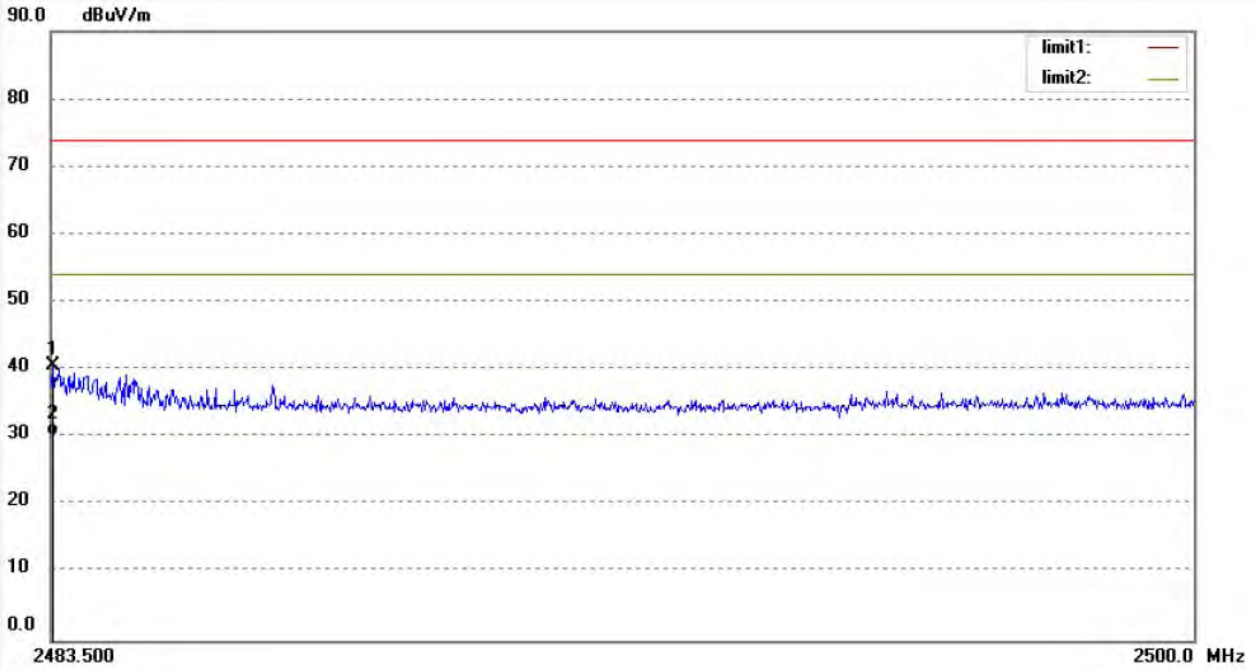


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2389.280	43.04	0.79	43.83	74.00	-30.17	peak			
2	2389.280	32.46	0.79	33.25	54.00	-20.75	AVG			

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.: LGW2018 #1972	Polarization: Horizontal
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

Note:

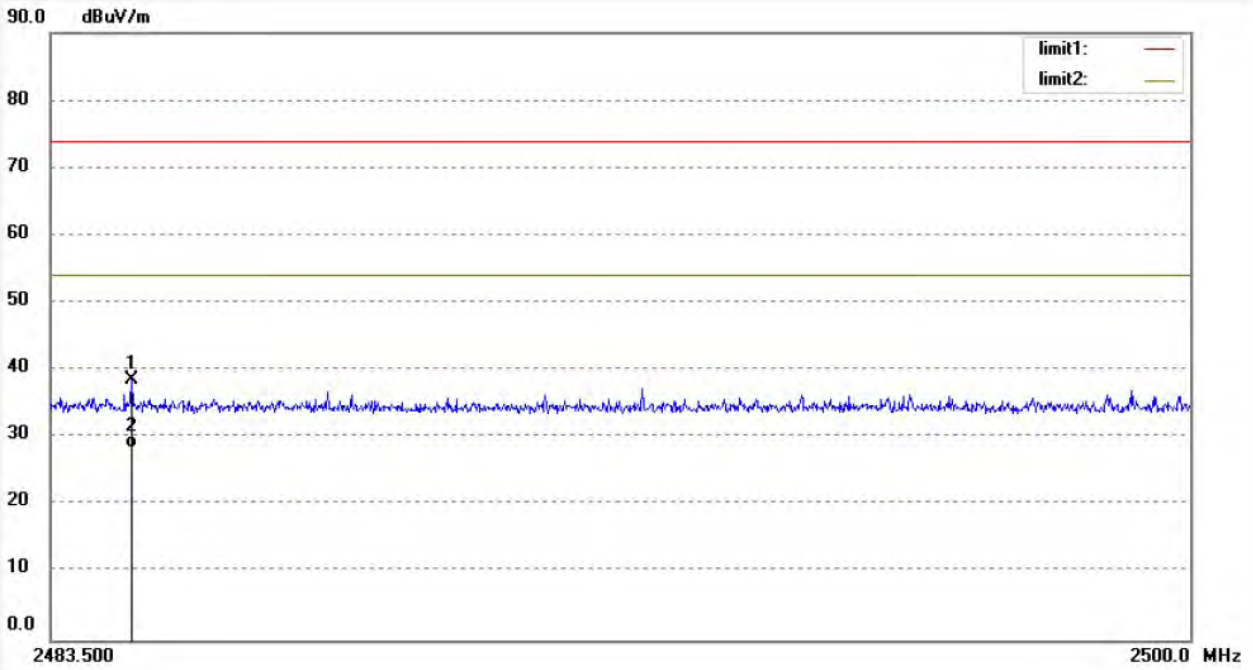


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.533	39.52	1.10	40.62	74.00	-33.38	peak			
2	2483.533	29.14	1.10	30.24	54.00	-23.76	AVG			

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.: LGW2018 #1973	Polarization: Vertical
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/07/29/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2480MHz	Distance: 3m
Model: SPKRWIRGRNPRM	
Manufacturer: THUMBS UP(UK)LTD	

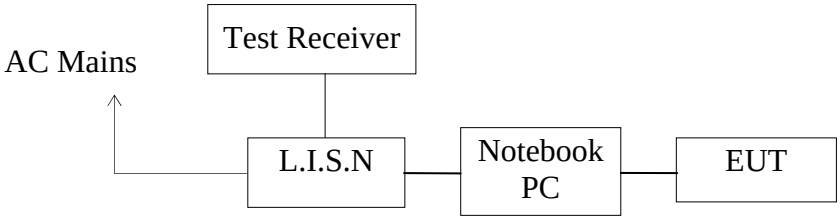
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2484.671	37.50	1.10	38.60	74.00	-35.40	peak			
2	2484.671	27.27	1.10	28.37	54.00	-25.63	AVG			

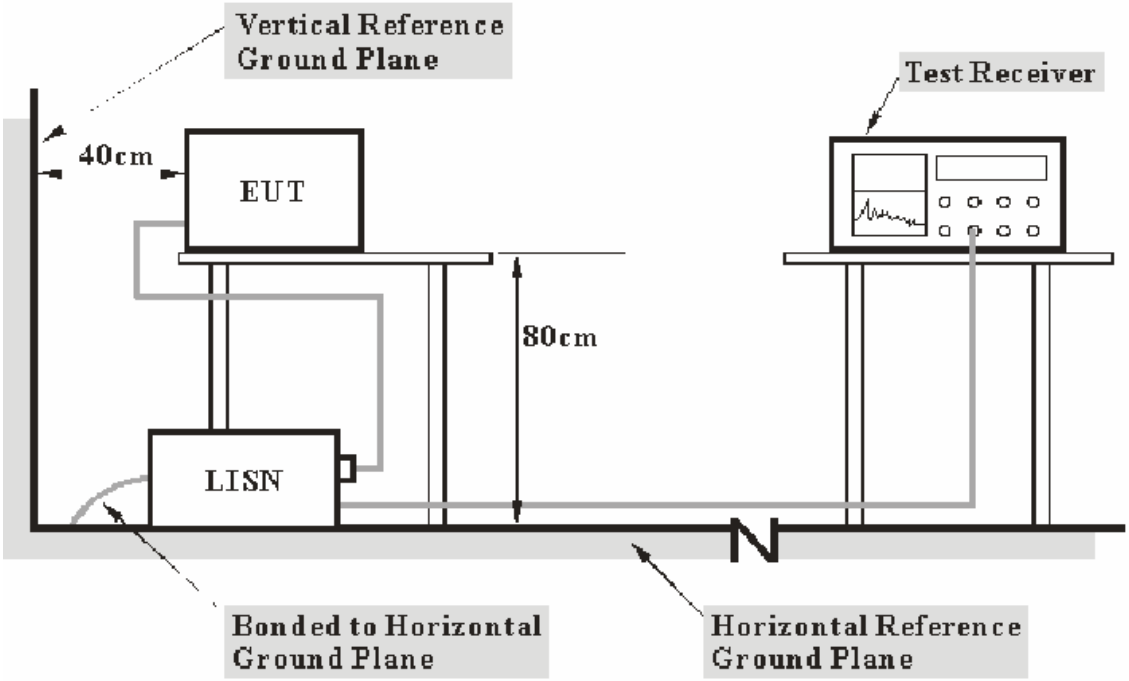
12. AC POWER LINE CONDUCTED EMISSION FOR FCC PART 15 SECTION 15.207(A)

12.1. Block Diagram of Test Setup



(EUT: Bluetooth Speaker)

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.Power Line Conducted Emission Measurement 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.Power Line Conducted Emission Measurement Results

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.

ACCURATE TECHNOLOGY CO.,LTD

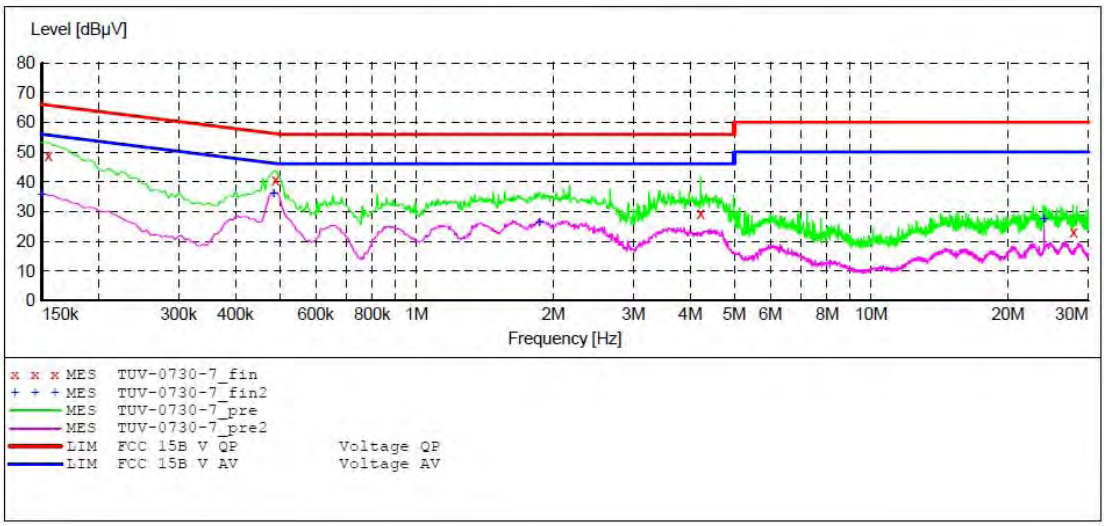
CONDUCTED EMISSION STANDARD FCC PART 15C

```
EUT:                  Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:         THUMBS UP(UK)LTD
Operating Condition:  BT Communication
Test Site:            1#Shielding Room
Operator:             WADE
Test Specification:   L 120V/60Hz
Comment:              Mains port
Start of Test:        7/30/2018 /
```

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: "TUV-0730-7_fin"

7/30/2018

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.155000	48.80	10.5	66	16.9	QP	L1	GND
0.490000	40.60	10.7	56	15.6	QP	L1	GND
4.220000	29.40	11.1	56	26.6	QP	L1	GND
27.835000	22.90	11.5	60	37.1	QP	L1	GND

MEASUREMENT RESULT: "TUV-0730-7_fin2"

7/30/2018

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	35.40	10.5	56	20.6	AV	L1	GND
0.485000	36.00	10.7	46	10.3	AV	L1	GND
1.865000	26.30	11.0	46	19.7	AV	L1	GND
23.995000	27.20	11.5	50	22.8	AV	L1	GND

ACCURATE TECHNOLOGY CO.,LTD

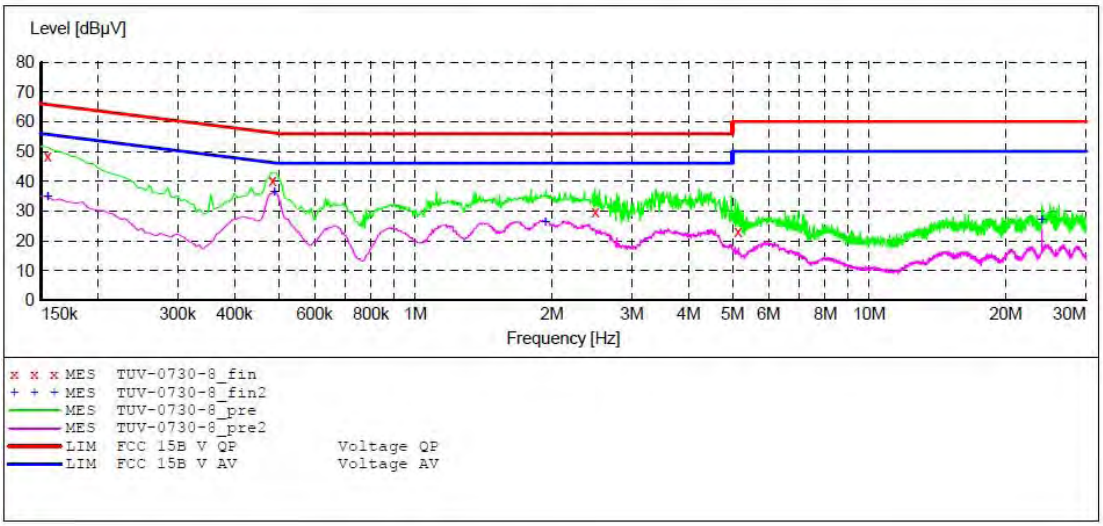
CONDUCTED EMISSION STANDARD FCC PART 15C

```
EUT:                  Bluetooth Speaker M/N:SPKRWIRGRNPRM
Manufacturer:         THUMBS UP(UK)LTD
Operating Condition:  BT Communication
Test Site:            1#Shielding Room
Operator:             WADE
Test Specification:   N 120V/60Hz
Comment:              Mains port
Start of Test:        7/30/2018 /
```

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: "TUV-0730-8_fin"

7/30/2018

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.155000	48.60	10.5	66	17.1	QP	N	GND
0.485000	40.20	10.7	56	16.1	QP	N	GND
2.490000	29.60	11.0	56	26.4	QP	N	GND
5.140000	23.10	11.2	60	36.9	QP	N	GND

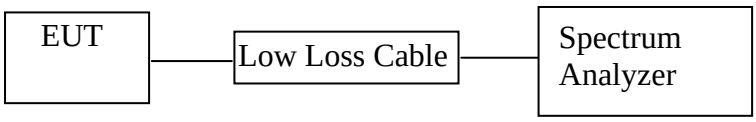
MEASUREMENT RESULT: "TUV-0730-8_fin2"

7/30/2018

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.155000	34.80	10.5	56	20.9	AV	N	GND
0.490000	36.30	10.7	46	9.9	AV	N	GND
1.935000	26.10	11.0	46	19.9	AV	N	GND
23.995000	26.80	11.5	50	23.2	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)

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 14.1.

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.

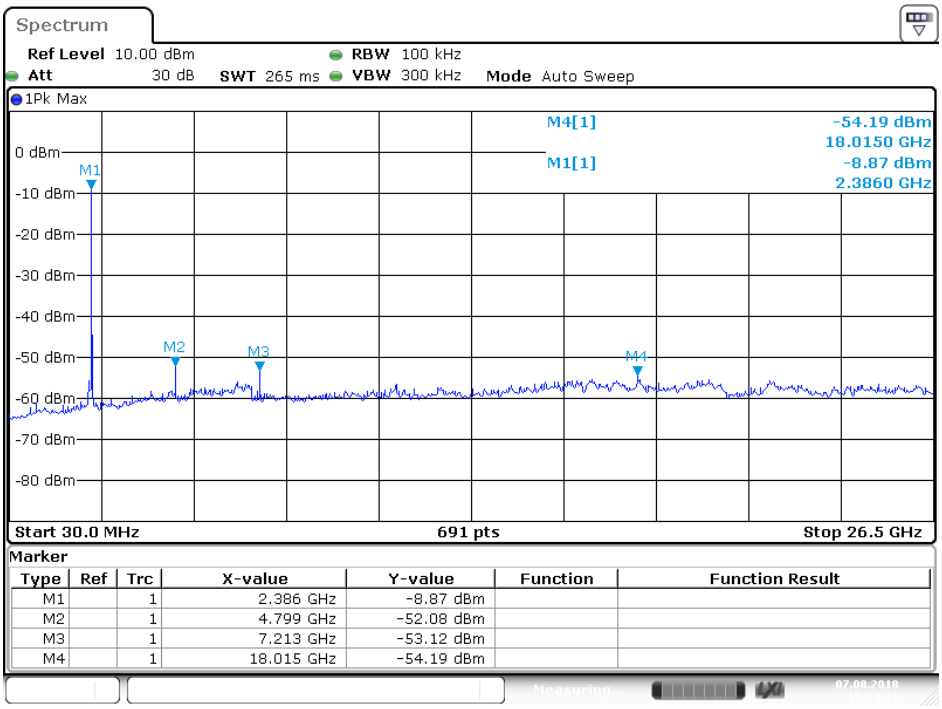
13.6.Test Result

Pass.

The spectrum analyzer plots are attached as below.

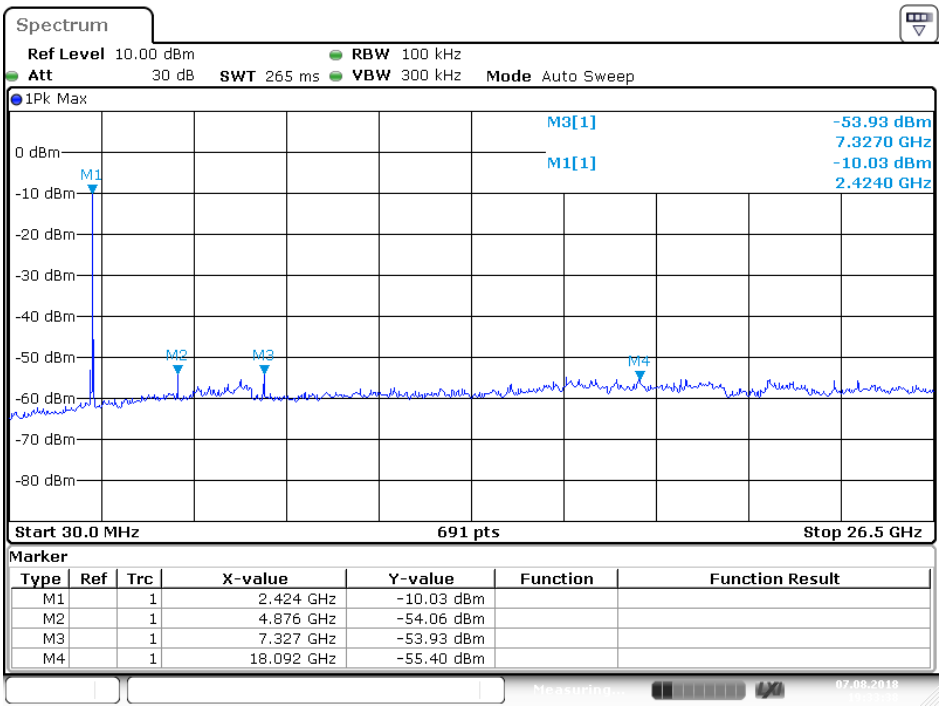
GFSK mode

Low Channel



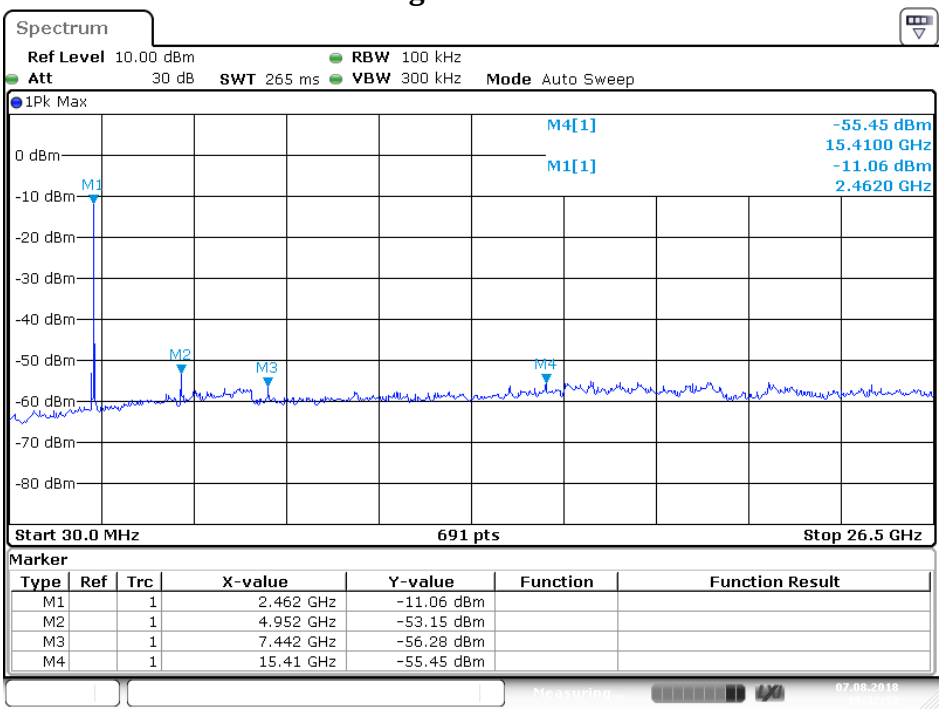
Date: 7.AUG.2018 19:34:32

Middle Channel



Date: 7.AUG.2018 19:33:38

High Channel



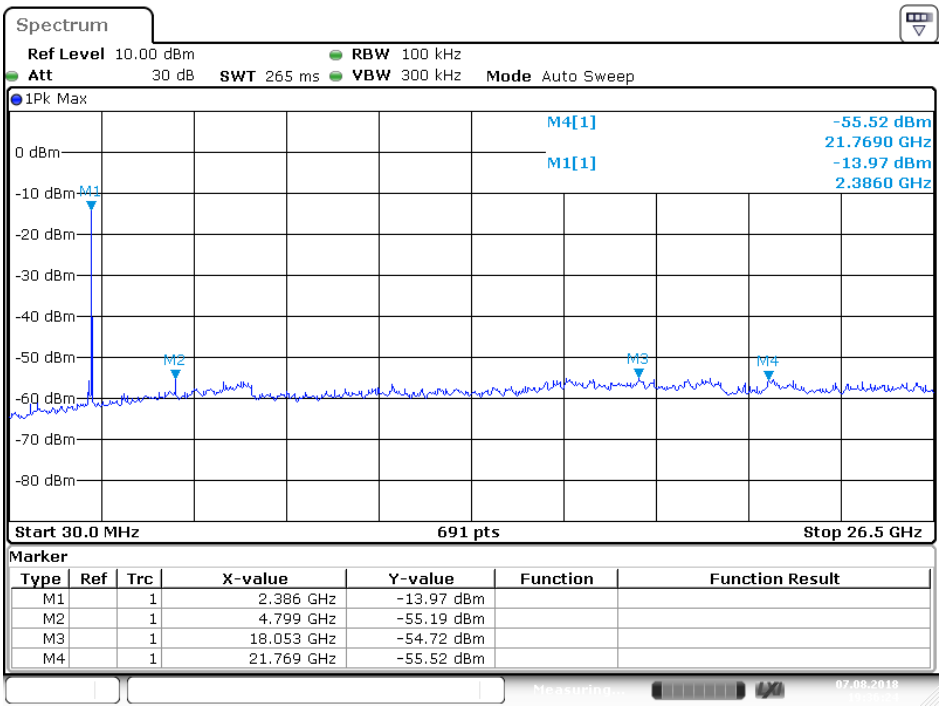
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.462 GHz	-11.06 dBm		
M2		1	4.952 GHz	-53.15 dBm		
M3		1	7.442 GHz	-56.28 dBm		
M4		1	15.41 GHz	-55.45 dBm		

Date: 7.AUG.2018 19:32:32

8DPSK mode

Low Channel

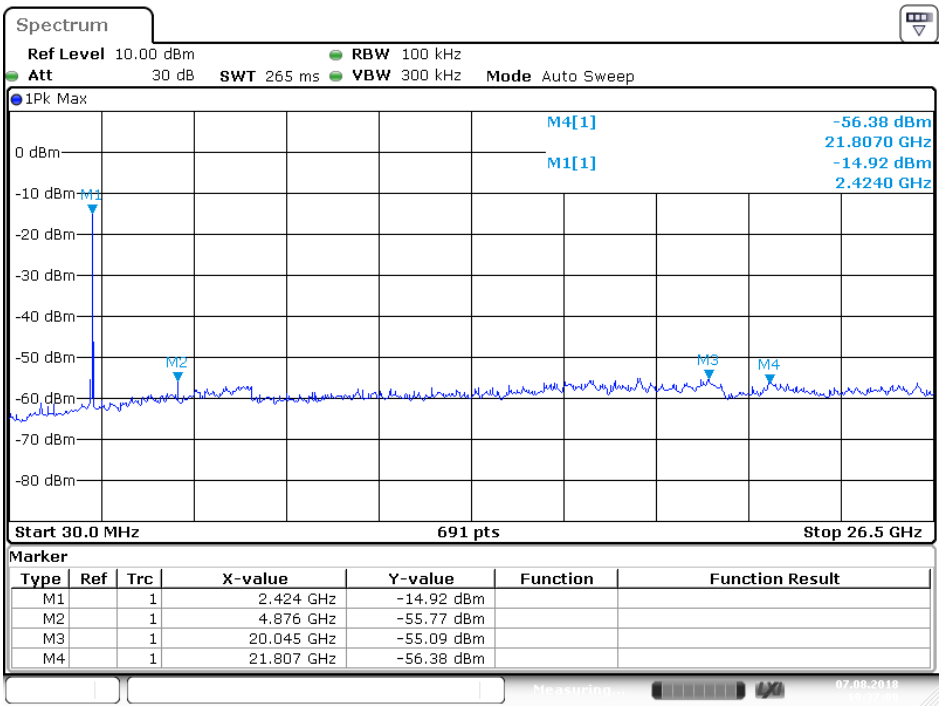


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.386 GHz	-13.97 dBm		
M2		1	4.799 GHz	-55.19 dBm		
M3		1	18.053 GHz	-54.72 dBm		
M4		1	21.769 GHz	-55.52 dBm		

Date: 7.AUG.2018 19:36:24

Middle Channel

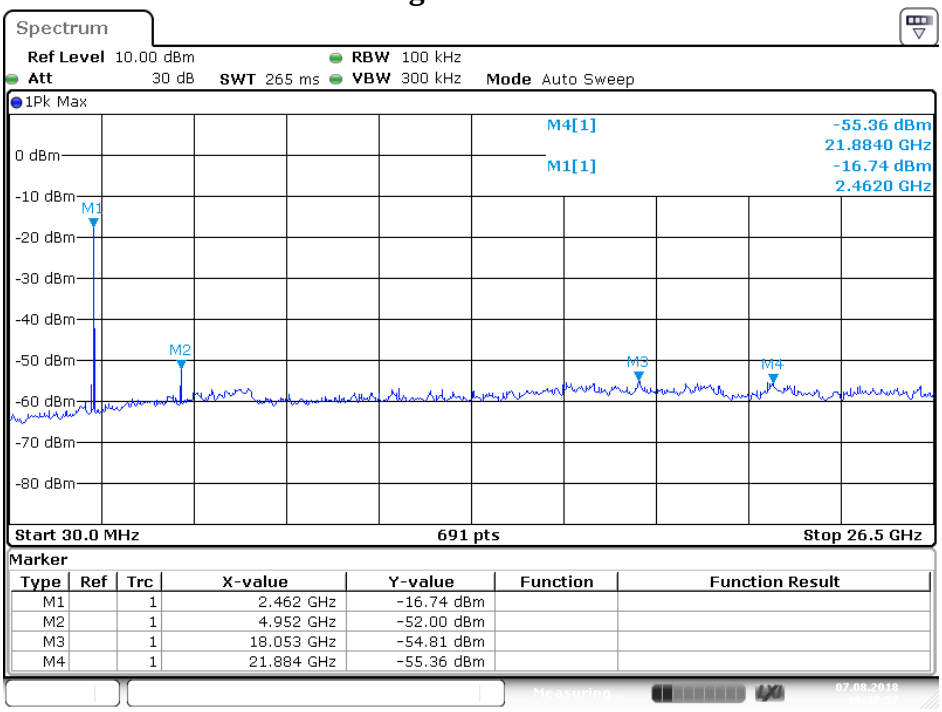


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.424 GHz	-14.92 dBm		
M2		1	4.876 GHz	-55.77 dBm		
M3		1	20.045 GHz	-55.09 dBm		
M4		1	21.807 GHz	-56.38 dBm		

Date: 7.AUG.2018 19:37:09

High Channel



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.462 GHz	-16.74 dBm		
M2		1	4.952 GHz	-52.00 dBm		
M3		1	18.053 GHz	-54.81 dBm		
M4		1	21.884 GHz	-55.36 dBm		

Date: 7.AUG.2018 19:37:58

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 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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