

APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Braven LC.

Braven 2300 Portable Bluetooth Speaker
Model No.: 2300

FCC ID: Z7RB23

Prepared for : Braven LC.
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Report No. : ATE20151700
Date of Test : Jan 28, 2016--Feb 06, 2016
Date of Report : Feb 17, 2016

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Test Report Certification

Applicant : Braven LC
 Manufacturer : Braven LC
 Factory : Zhao Yang Electronic(Shenzhen) Co., Ltd
 EUT Description : Braven 2300 Portable Bluetooth Speaker
 (A) MODEL NO.: 2300
 (B) TRADE NAME.: Braven
 (C) Test Voltage: AC 100--240V/60Hz

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 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 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 ACCURATE TECHNOLOGY CO. LTD.

Date of Test : Jan 28, 2016--Feb 06, 2016
 Date of Report: Feb 17, 2016

Prepared by : Tim Zhang
 (Tim.zhang, Engineer)

Approved & Authorized Signer : Sean Liu
 (Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Braven 2300 Portable Bluetooth Speaker
Model Number	:	2300
Bluetooth version	:	BT V4.0 Dual Mode This report is for BT classic mode
Frequency Range	:	2402MHz-2480MHz
Number of Channels	:	40 for BT V4.0 LE 79 for BT classic mode
Antenna Gain	:	0dBi
Antenna type	:	PCB Antenna
Trade Name	:	Braven
Test Voltage	:	AC 100--240V/60Hz
Adapter	:	Model: DYS902-250300W Input: AC100-240V; 50/60Hz 1.5A MAX Output: DC 25.0V; 3.0A
Modulation mode	:	GFSK for BT V4.0 LE GFSK, $\pi/4$ DQPSK, 8DPSK for BT classic mode
Applicant	:	Braven LC
Address	:	6001 Oak Canyon, Irvine, CA, USA 92618.
Manufacturer	:	Braven LC
Address	:	6001 Oak Canyon, Irvine, CA, USA 92618.
Factory	:	Zhao Yang Electronic(Shenzhen) Co., Ltd.
Address	:	Building 2, De Yong Jia Industrial Park, Guang Qiao Road, Yu Lv Community, Gong Ming Street, Guang Ming New District, Shenzhen ,518132, China
Date of sample received	:	Jan 27, 2016
Date of Test	:	Jan 28, 2016--Feb 06, 2016

1.2. Accessory and Auxiliary Equipment

PC
Manufacturer: LENOVO
M/N: 4290-RT8
S/N: R9-FW93G 11/08

1.3. Description of Test Facility

EMC Lab : Accredited by TUV Rheinland Shenzhen

Listed by FCC
The Registration Number is 752051

Listed by Industry Canada
The Registration Number is 5077A-2

Accredited by China National Accreditation Committee
for Laboratories
The Certificate Registration Number is L3193

Name of Firm : ACCURATE TECHNOLOGY CO. LTD
Site Location : F1, Bldg. A, Changyuan New Material Port, Keyuan Rd.
Science & Industry Park, Nanshan, Shenzhen, Guangdong
P.R. China

1.4. Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty = 3.08dB, k=2
(9kHz-30MHz)

Radiated emission expanded uncertainty = 4.42dB, k=2
(30MHz-1000MHz)

Radiated emission expanded uncertainty = 4.06dB, k=2
(Above 1GHz)

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. 10, 2016	Jan. 09, 2017
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 10, 2016	Jan. 09, 2017
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 10, 2016	Jan. 09, 2017
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 10, 2016	Jan. 09, 2017
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 14, 2016	Jan. 13, 2017
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 14, 2016	Jan. 13, 2017
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 14, 2016	Jan. 12, 2017
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 14, 2016	Jan. 13, 2017
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 10, 2016	Jan. 09, 2017
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 10, 2016	Jan. 09, 2017
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan. 10, 2016	Jan. 09, 2017
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan. 10, 2016	Jan. 09, 2017

3. OPERATION OF EUT DURING TESTING

3.1. Operating Mode

The mode is used: Transmitting mode

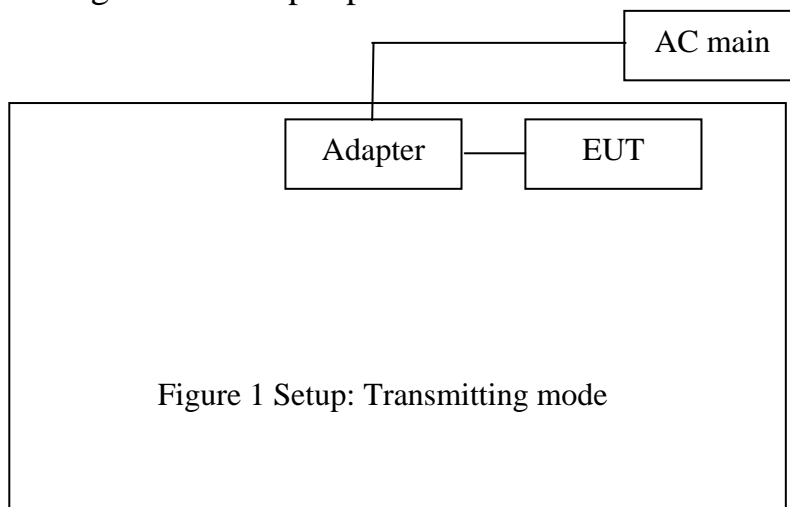
Low Channel: 2402MHz

Middle Channel: 2441MHz

High Channel: 2480MHz

Hopping

3.2. Configuration and peripherals

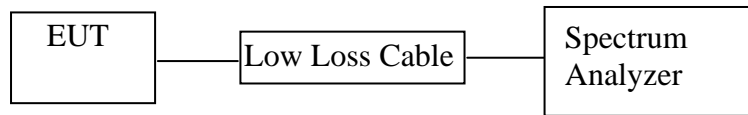


4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	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 15.203	Antenna Requirement	Compliant

5. 20DB BANDWIDTH TEST

5.1. Block Diagram of Test Setup



(EUT: Braven 2300 Portable Bluetooth Speaker)

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. Set RBW of spectrum analyzer to 30 kHz and VBW to 100 kHz.

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

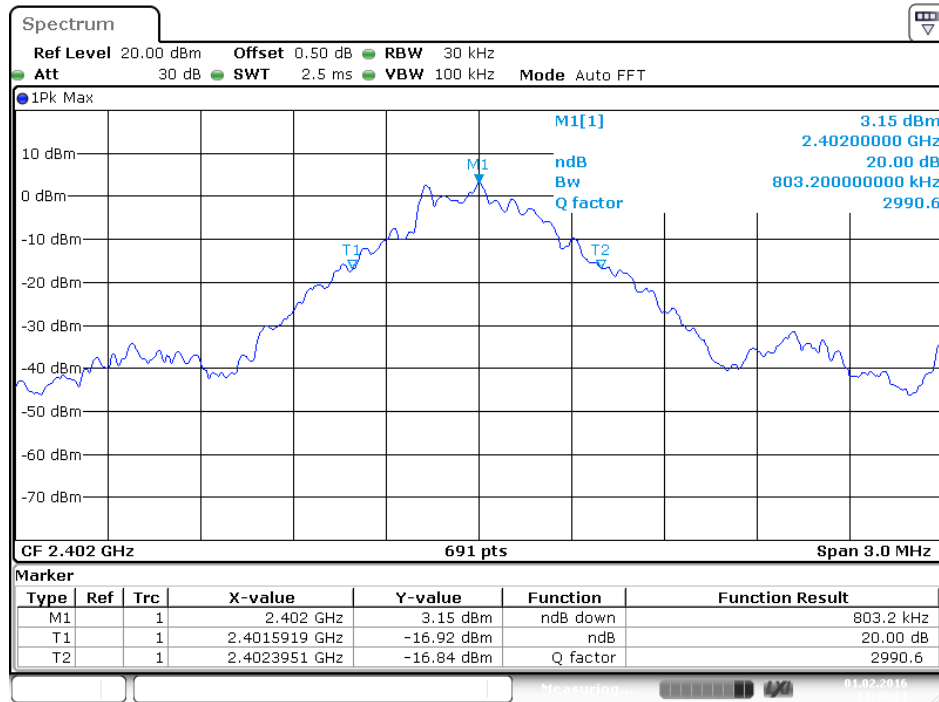
5.6. Test Result

Channel	Frequency (MHz)	GFSK 20dB Bandwidth (MHz)	$\Pi/4$ -DQPSK 20dB Bandwidth (MHz)	8DPSK 20dB Bandwidth (MHz)	Result
Low	2402	0.803	1.220	1.207	Pass
Middle	2441	0.803	1.220	1.207	Pass
High	2480	0.803	1.224	1.211	Pass

The spectrum analyzer plots are attached as below.

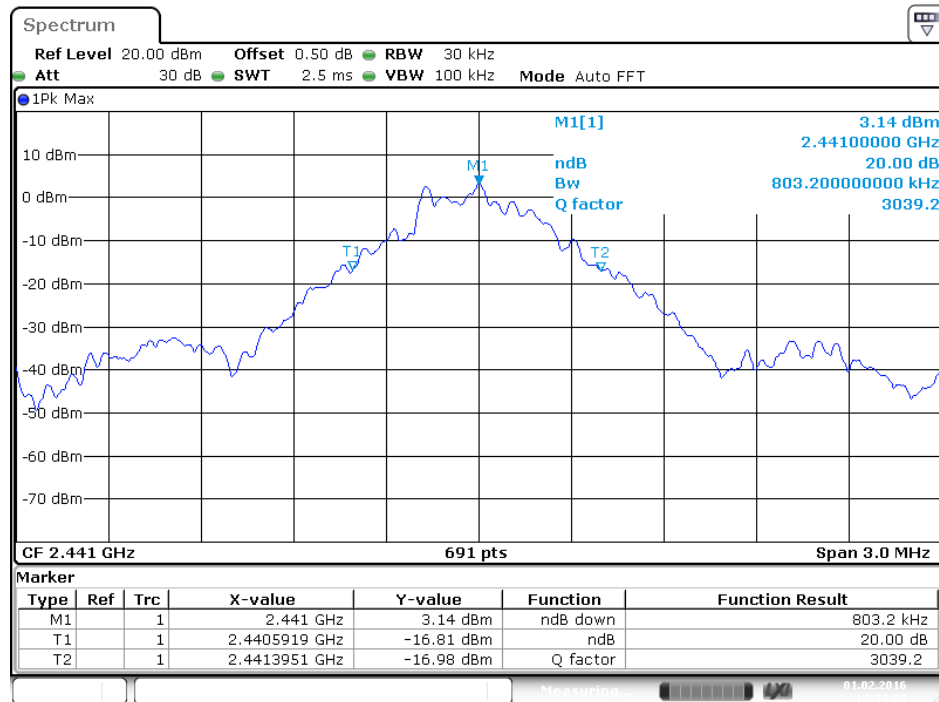
GFSK Mode

Low channel



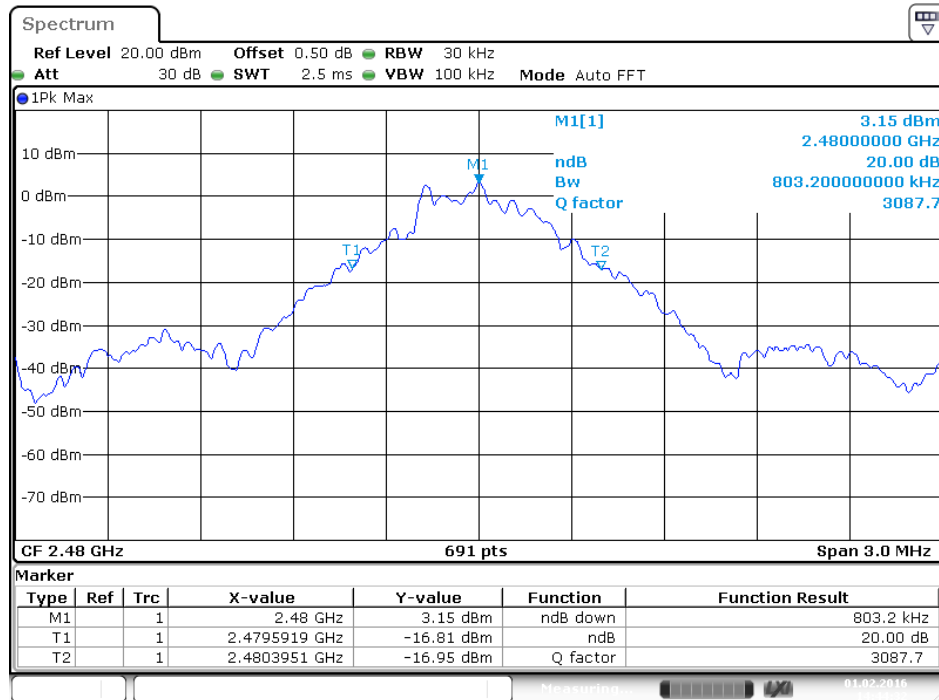
Date: 1.FEB.2016 14:43:11

Middle channel



Date: 1.FEB.2016 14:44:10

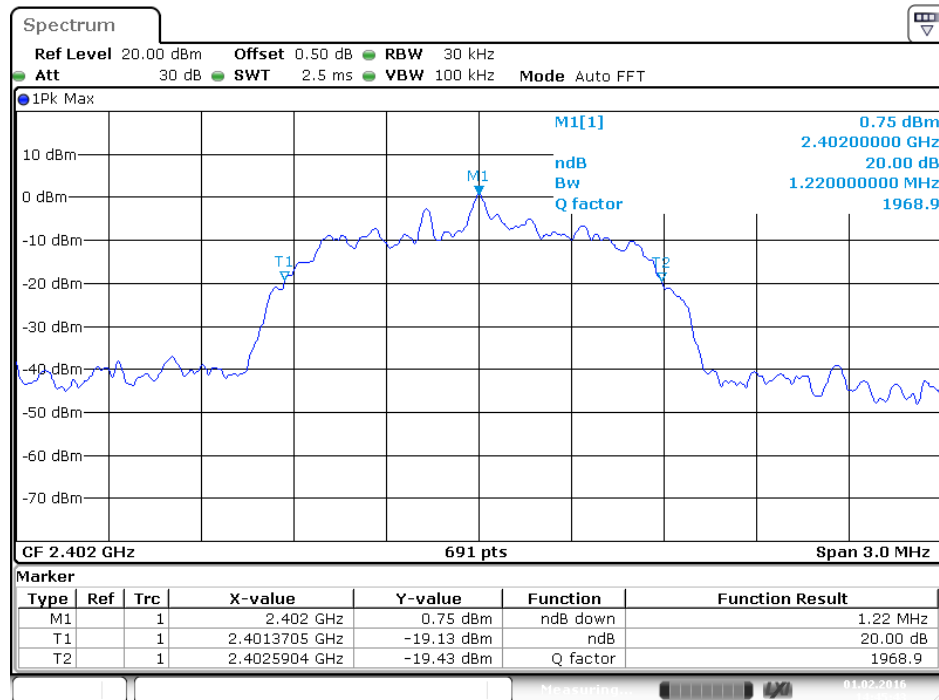
High channel



Date: 1.FEB.2016 14:44:32

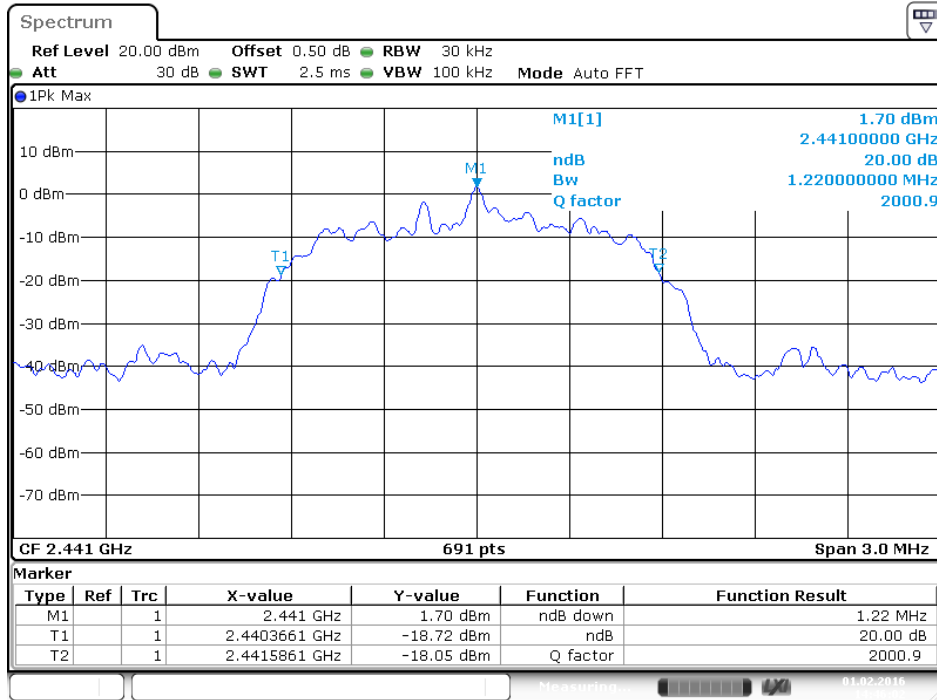
Π/4-DQPSK Mode

Low channel



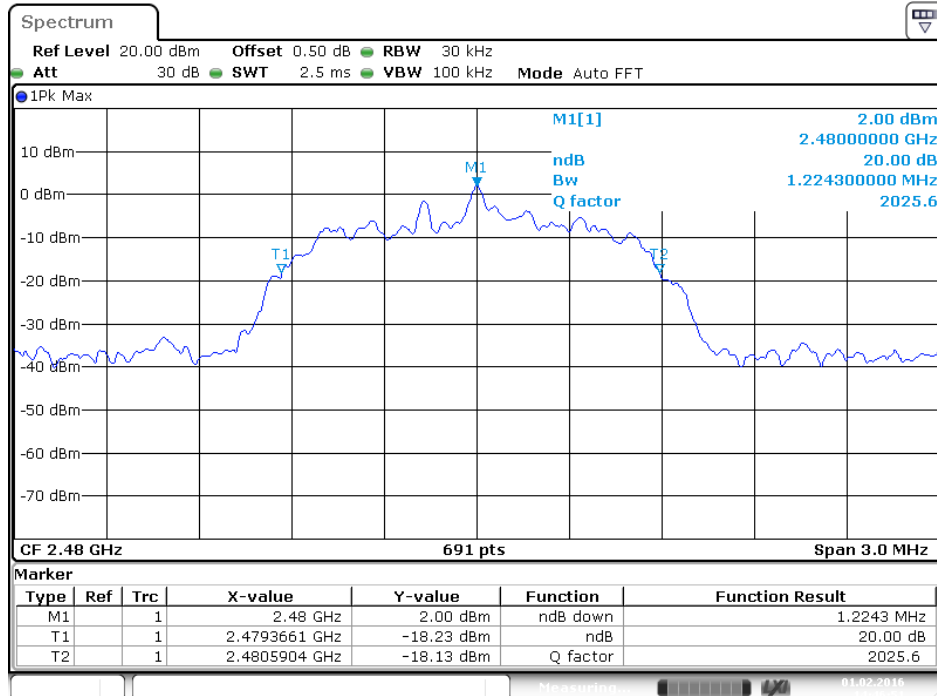
Date: 1.FEB.2016 14:45:43

Middle channel



Date: 1.FEB.2016 14:46:02

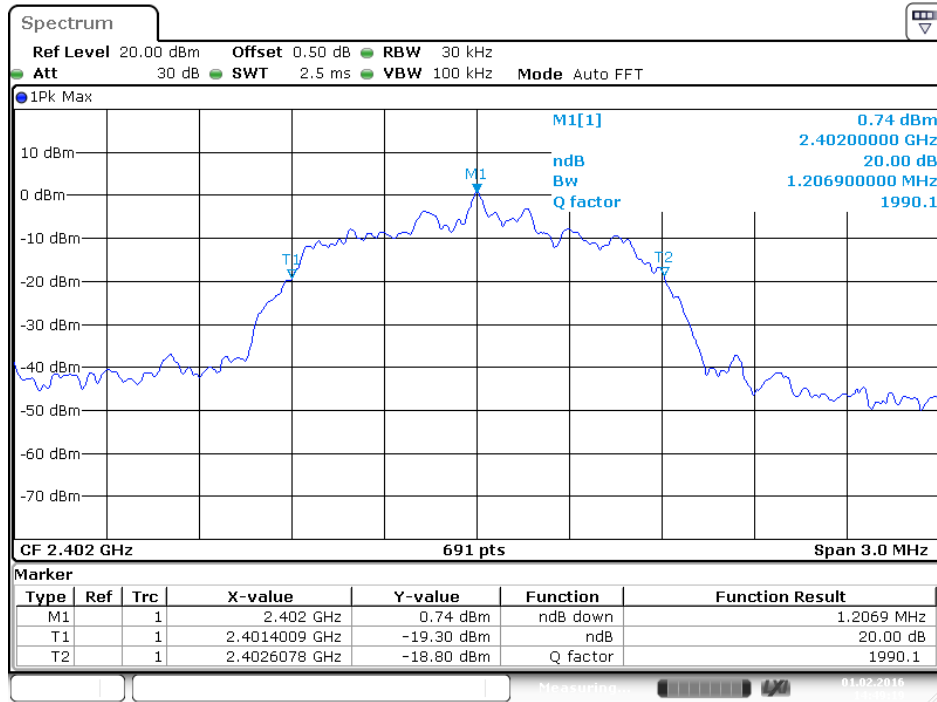
High channel



Date: 1.FEB.2016 14:46:51

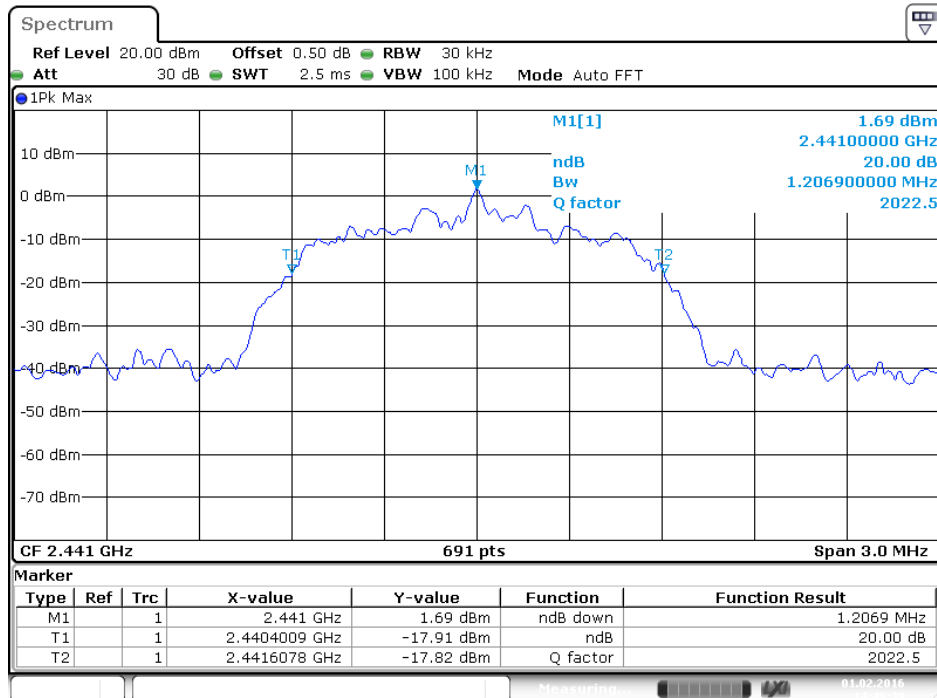
8DPSK Mode

Low channel



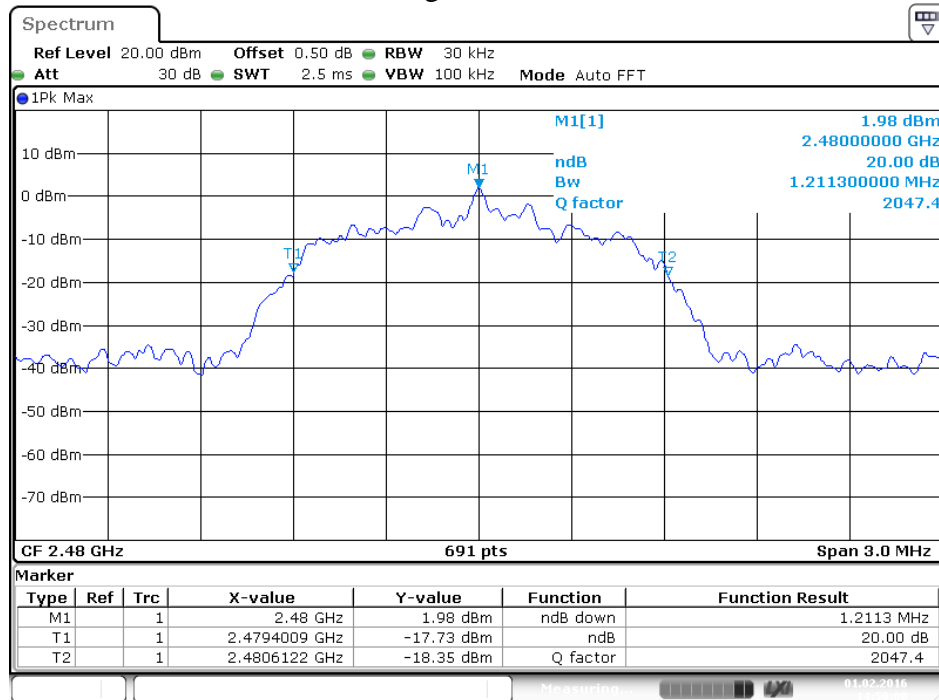
Date: 1.FEB.2016 14:49:19

Middle channel



Date: 1.FEB.2016 14:49:39

High channel



Date: 1.FEB.2016 14:50:00

6. CARRIER FREQUENCY SEPARATION TEST

6.1. Block Diagram of Test Setup



(EUT: Braven 2300 Portable Bluetooth Speaker)

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 pseudorandomly 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 30 kHz and VBW to 100 kHz. Adjust Span to 2MHz.

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

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.0014	25KHz or 20dB bandwidth	PASS
	2403			
Middle	2440	1.0014	25KHz or 20dB bandwidth	PASS
	2441			
High	2479	1.0014	25KHz or 20dB bandwidth	PASS
	2480			

Π/4-DQPSK

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			

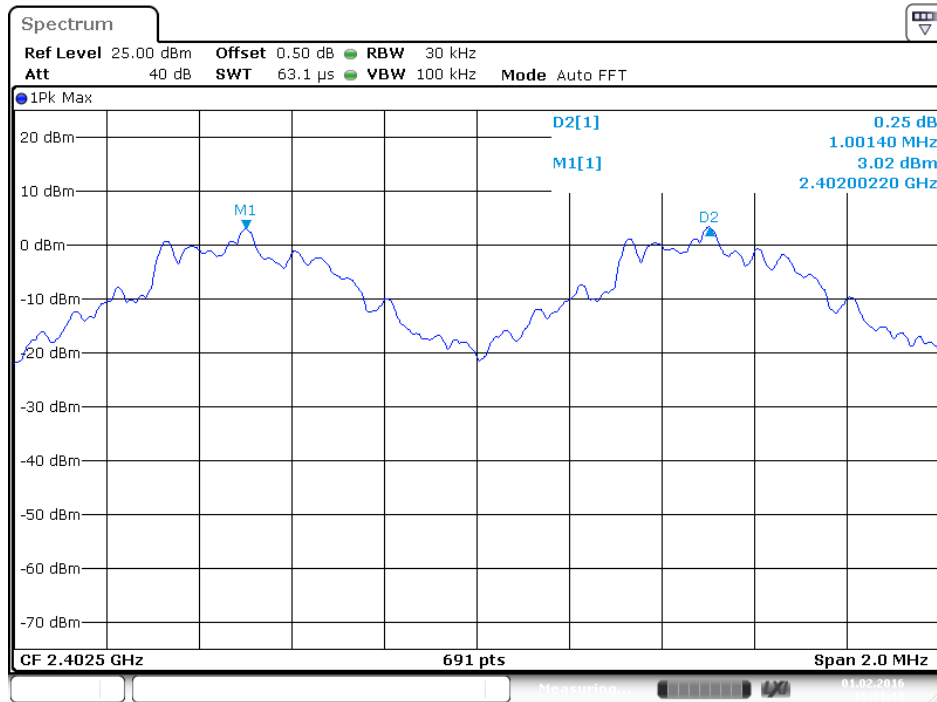
8DPSK

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.

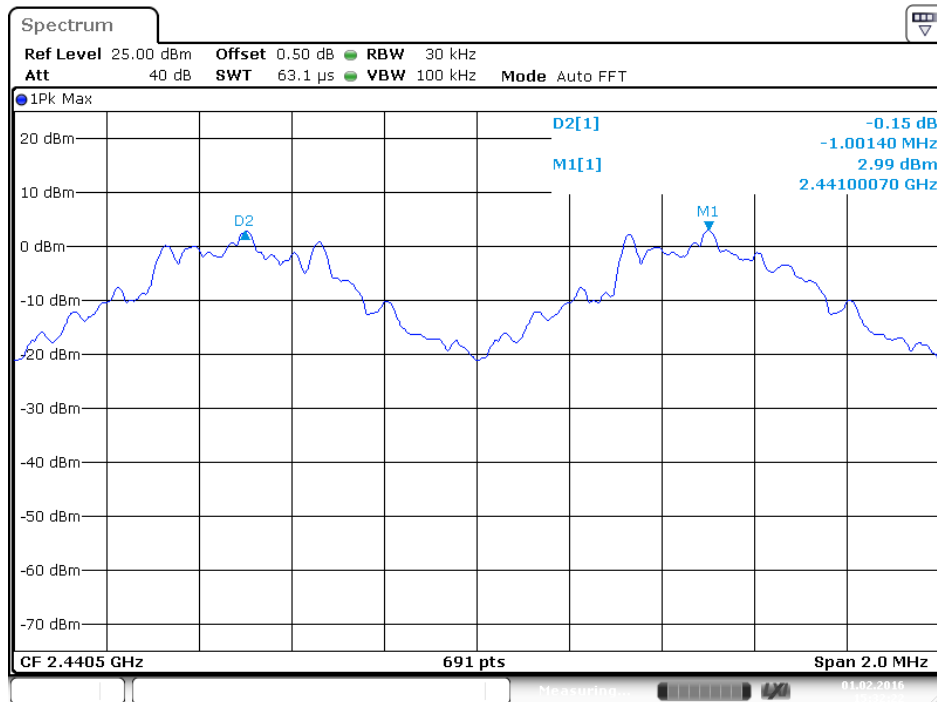
GFSK Mode

Low channel



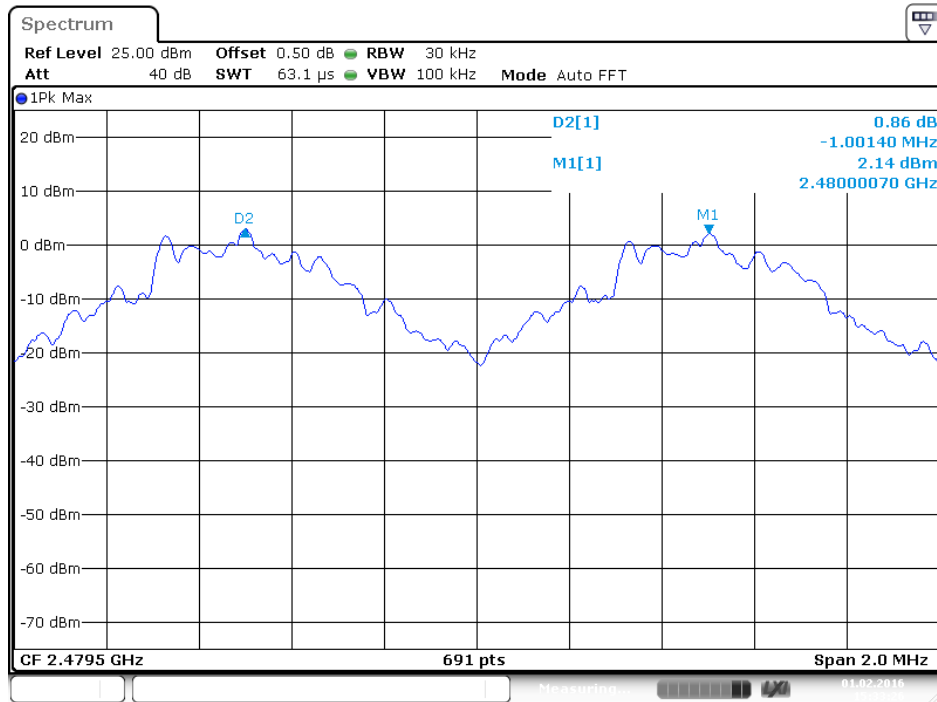
Date: 1.FEB.2016 15:31:11

Middle channel



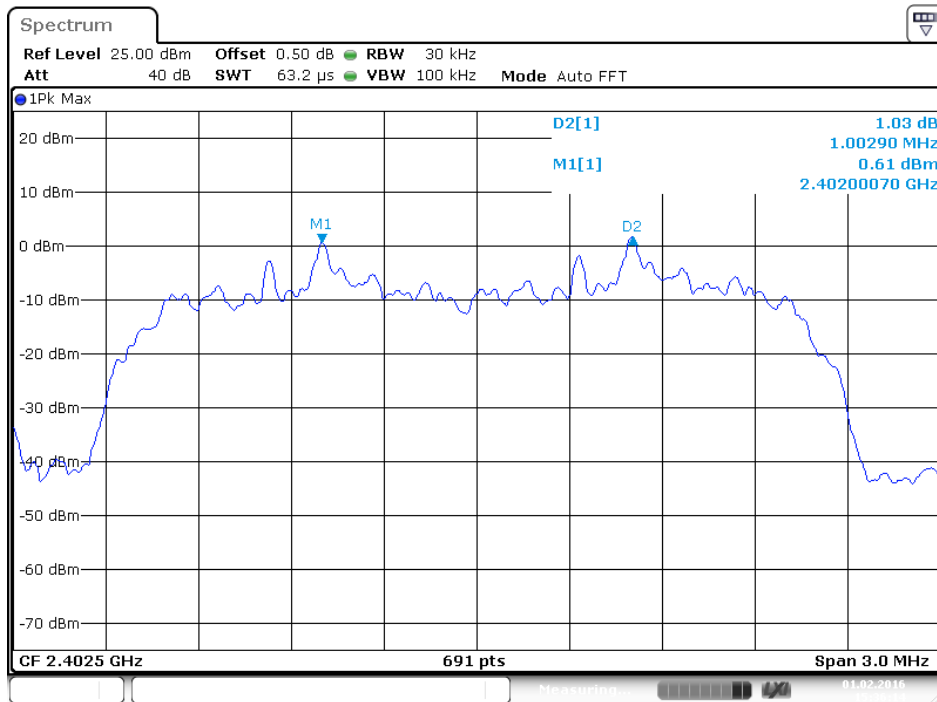
Date: 1.FEB.2016 15:32:22

High channel

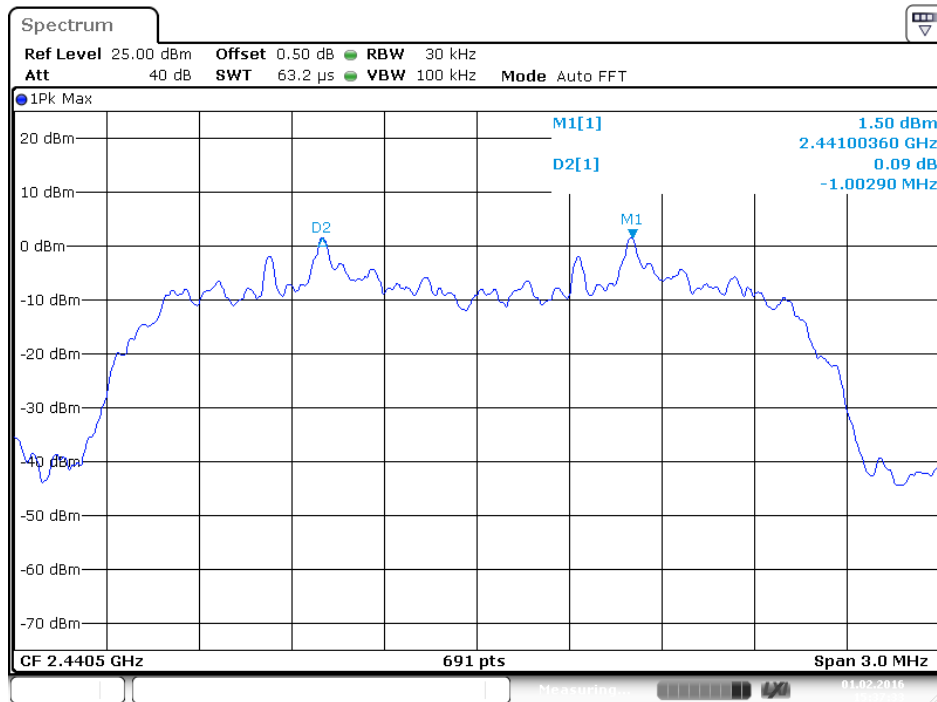


Π/4-DQPSK Mode

Low channel

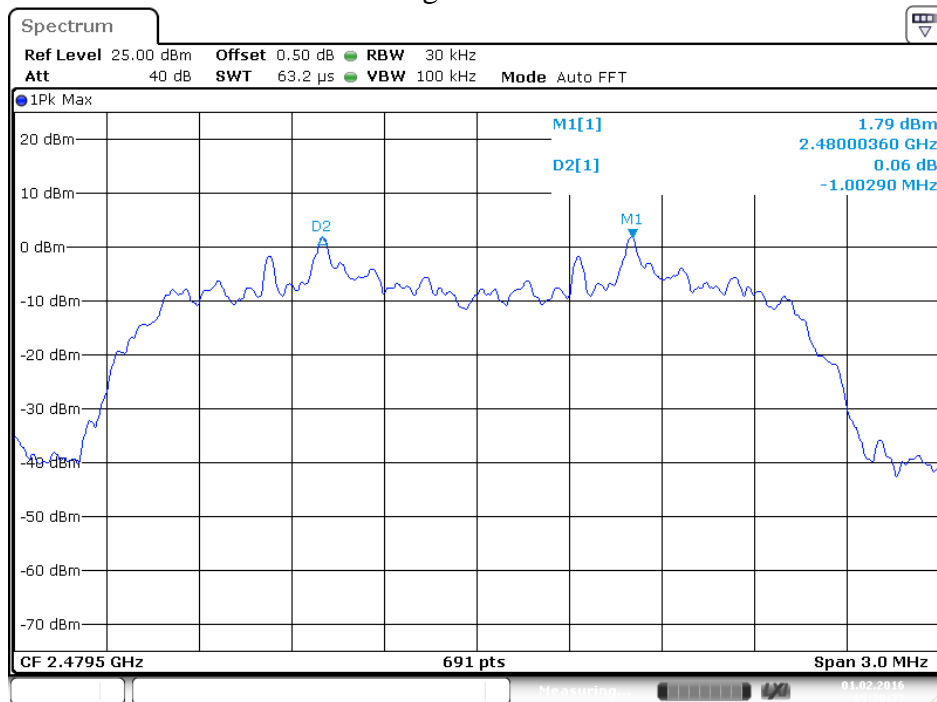


Middle channel



Date: 1.FEB.2016 15:37:34

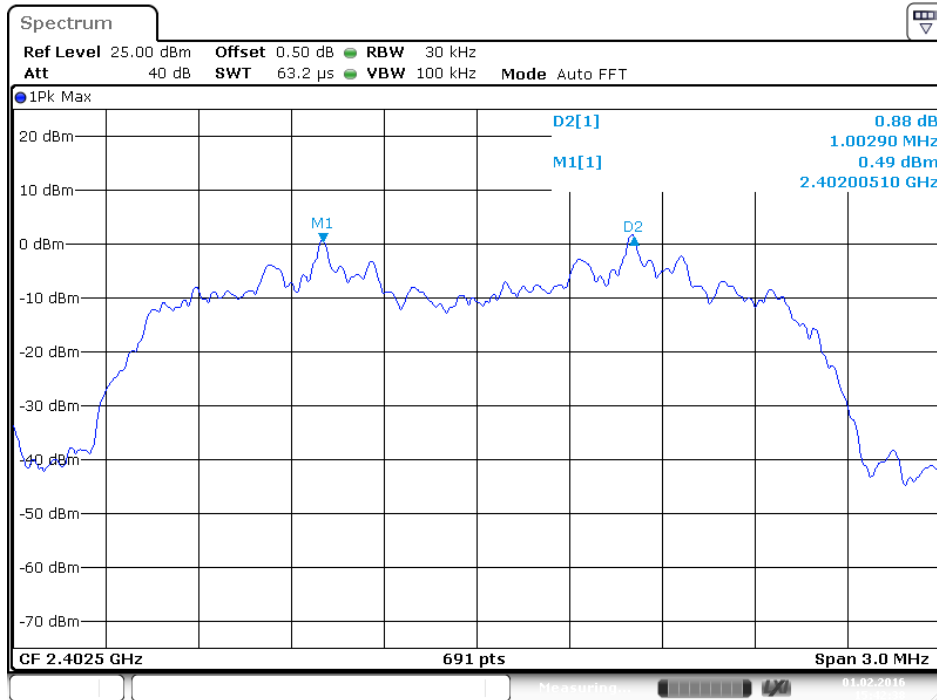
High channel



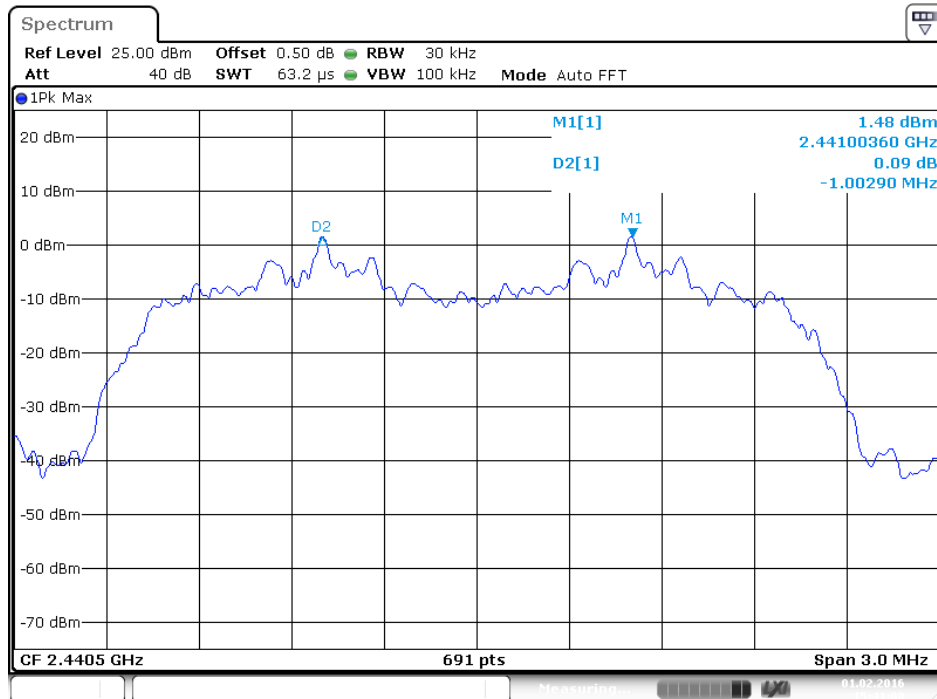
Date: 1.FEB.2016 15:38:33

8DPSK Mode

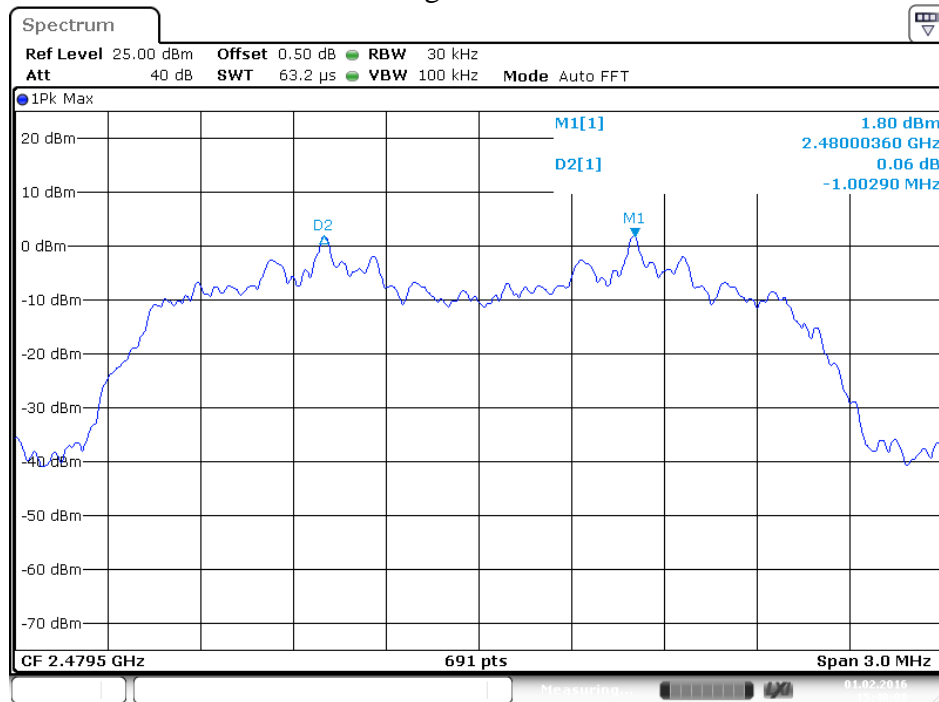
Low channel



Middle channel



High channel



Date: 1.FEB.2016 15:40:08

7. NUMBER OF HOPPING FREQUENCY TEST

7.1. Block Diagram of Test Setup



(EUT: Braven 2300 Portable Bluetooth Speaker)

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=83.5MHz, RBW=100 kHz, VBW=300 kHz.

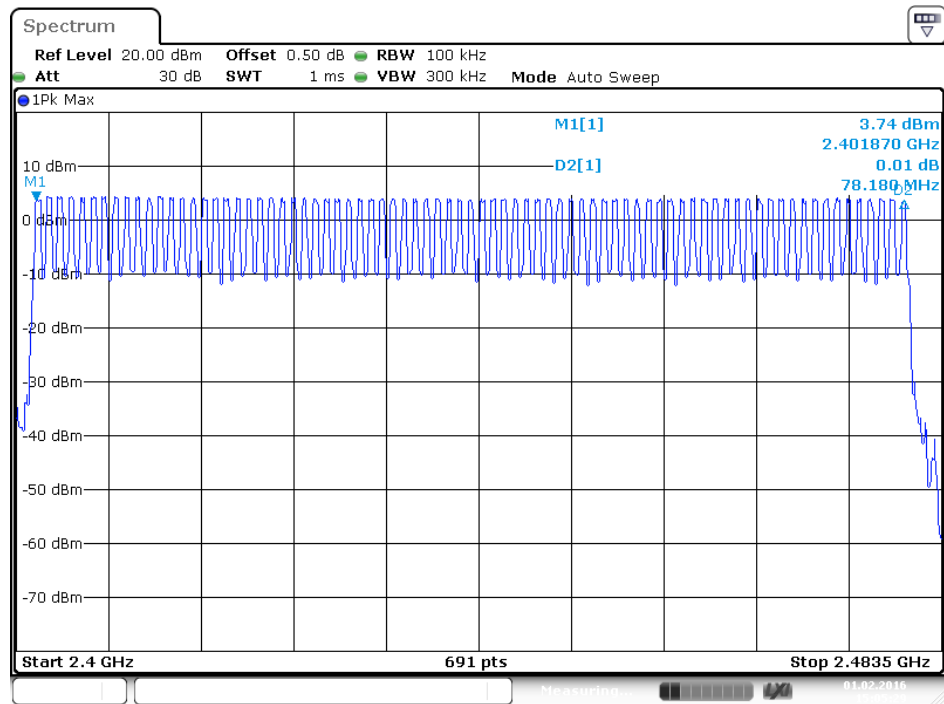
7.5.3. Max hold, view and count how many channel in the band.

7.6. Test Result

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

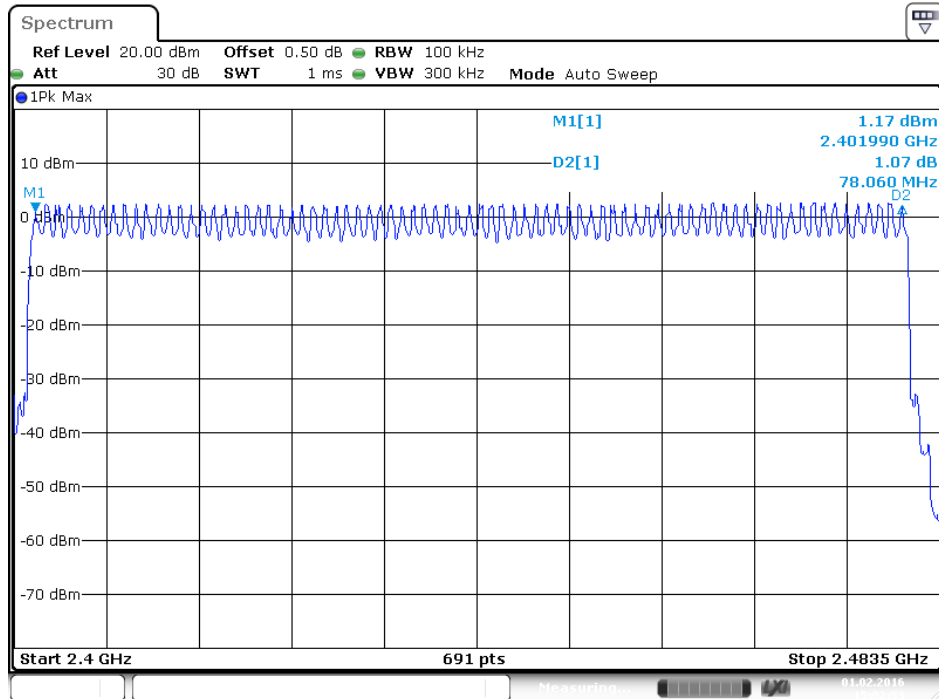
The spectrum analyzer plots are attached as below.

Number of hopping channels(GFSK)



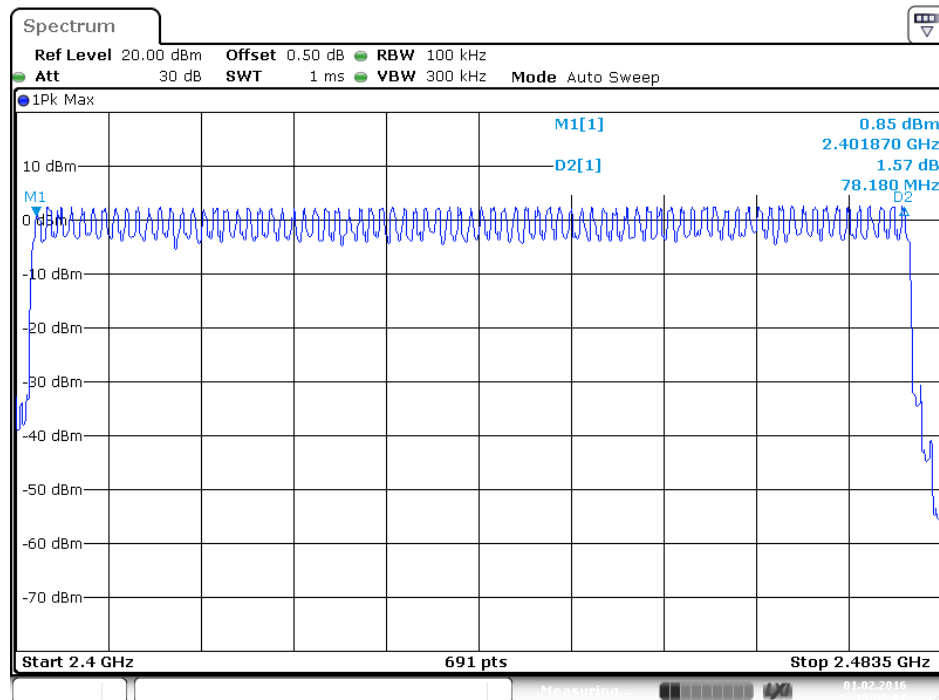
Date: 1.FEB.2016 15:05:29

Number of hopping channels($\Pi/4$ -DQPSK)



Date: 1.FEB.2016 15:02:53

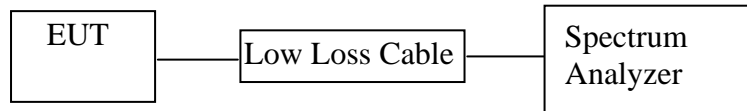
Number of hopping channels(8DPSK)



Date: 1.FEB.2016 15:08:02

8. DWELL TIME TEST

8.1. Block Diagram of Test Setup



(EUT: Braven 2300 Portable Bluetooth Speaker)

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

GFSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.428	136.96	400
	2441	0.438	140.16	400
	2480	0.442	141.44	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2*79)) \times 31.6$				
DH3	2402	1.746	279.36	400
	2441	1.790	286.40	400
	2480	1.761	281.76	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4*79)) \times 31.6$				
DH5	2402	2.978	317.65	400
	2441	2.978	317.65	400
	2480	3.000	320.00	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6*79)) \times 31.6$				

$\Pi/4$ -DQPSK

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.446	142.72	400
	2441	0.442	141.44	400
	2480	0.438	140.16	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2*79)) \times 31.6$				
DH3	2402	1.714	274.24	400
	2441	1.714	274.24	400
	2480	1.728	276.48	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4*79)) \times 31.6$				
DH5	2402	3.000	320.00	400
	2441	3.022	322.35	400
	2480	2.978	317.65	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6*79)) \times 31.6$				

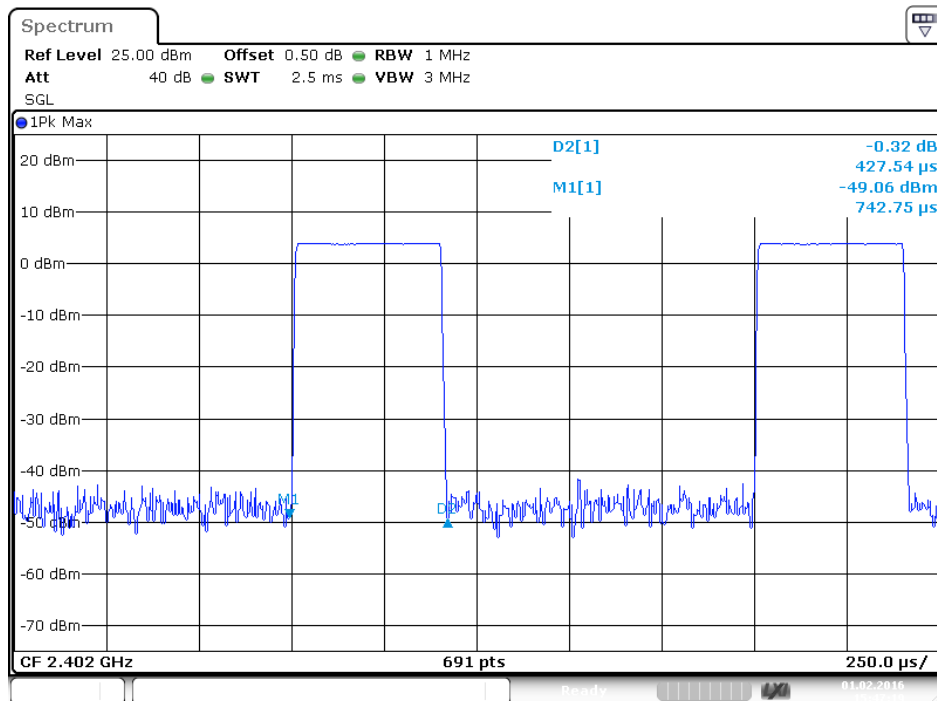
8DPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.449	143.68	400
	2441	0.446	142.72	400
	2480	0.446	142.72	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2*79)) \times 31.6$				
DH3	2402	1.736	277.76	400
	2441	1.721	275.36	400
	2480	1.736	277.76	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4*79)) \times 31.6$				
DH5	2402	3.040	324.27	400
	2441	2.975	317.33	400
	2480	3.062	326.61	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6*79)) \times 31.6$				

The spectrum analyzer plots are attached as below.

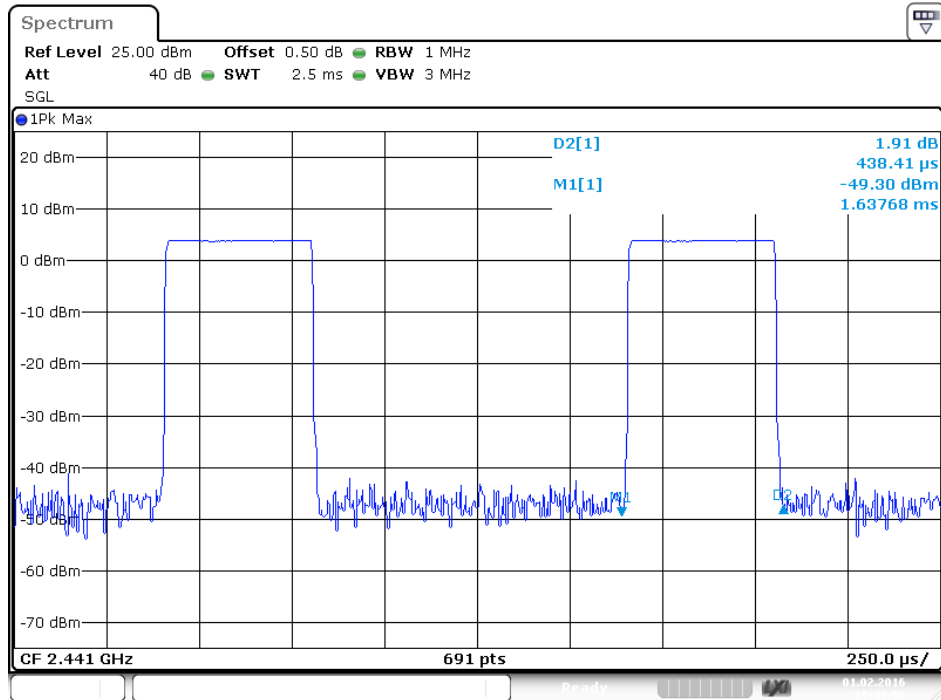
GFSK Mode

DH1 Low channel



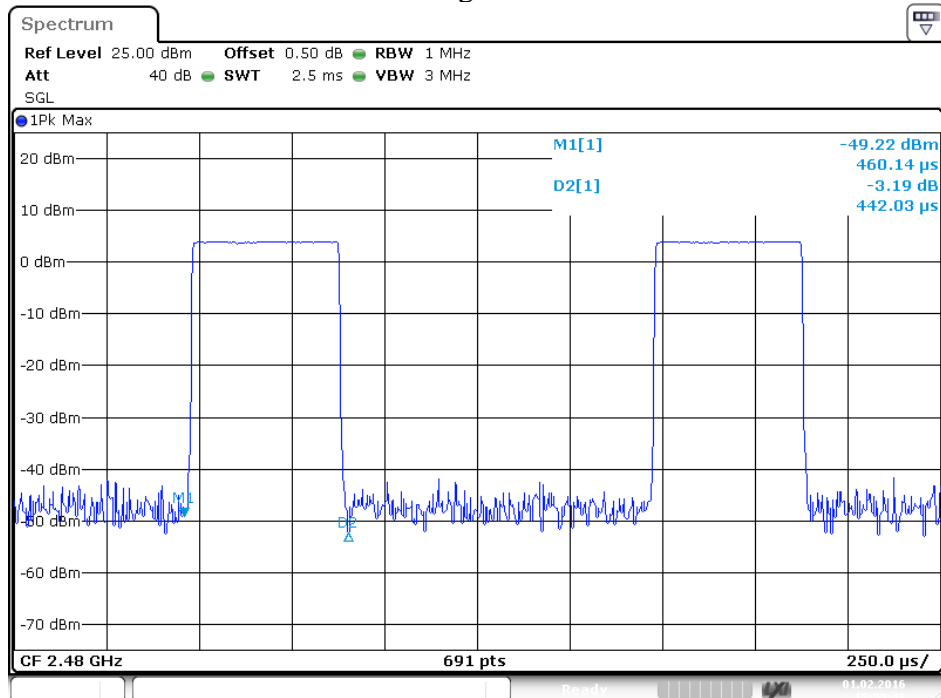
Date: 1.FEB.2016 15:47:20

DH1 Middle channel



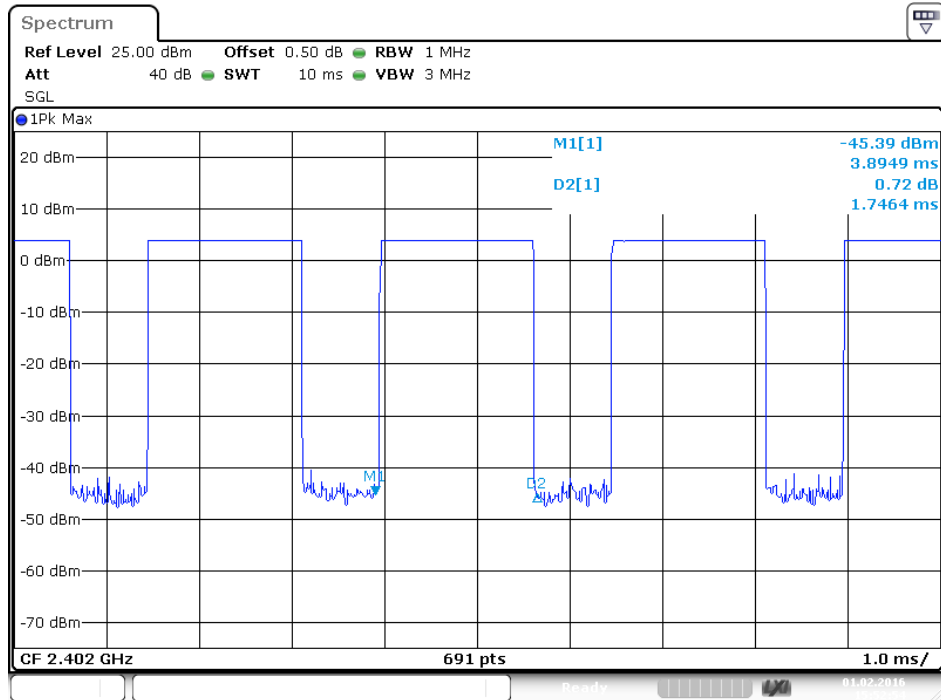
Date: 1.FEB.2016 15:49:50

DH1 High channel



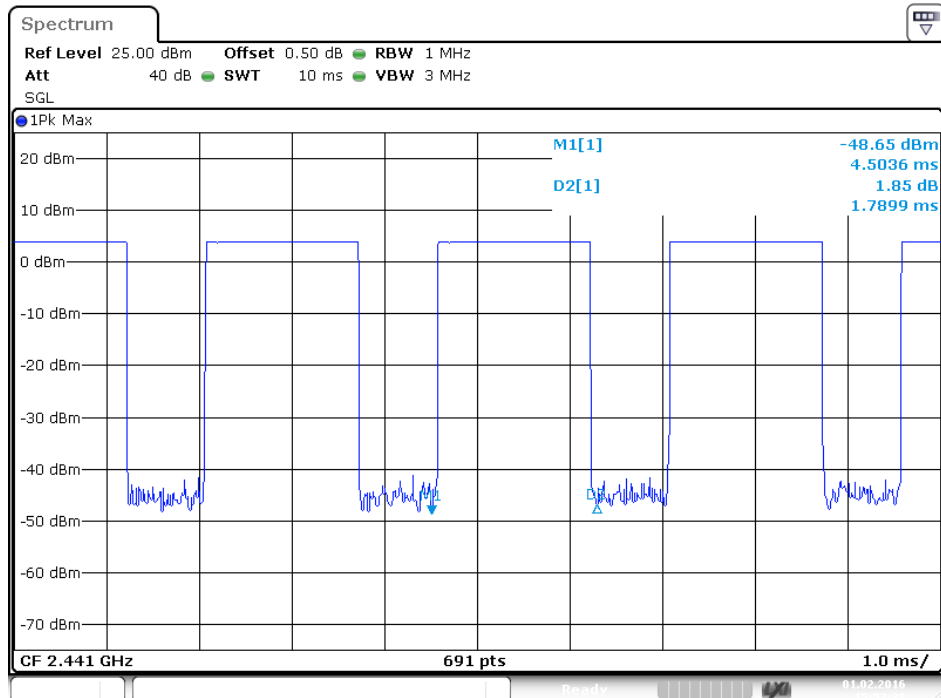
Date: 1.FEB.2016 15:50:48

DH3 Low channel



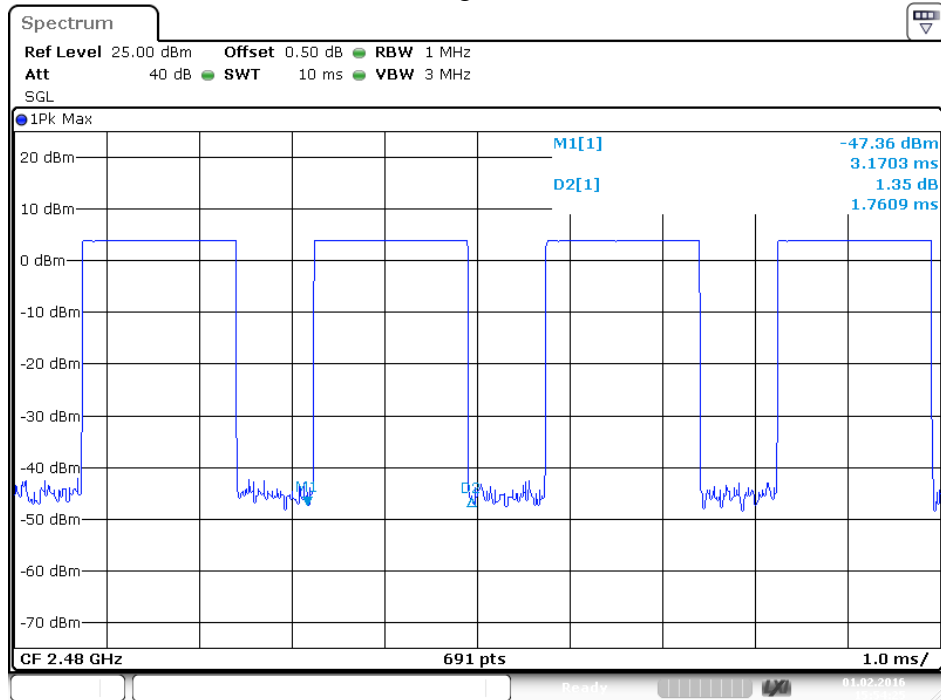
Date: 1.FEB.2016 15:52:54

DH3 Middle channel



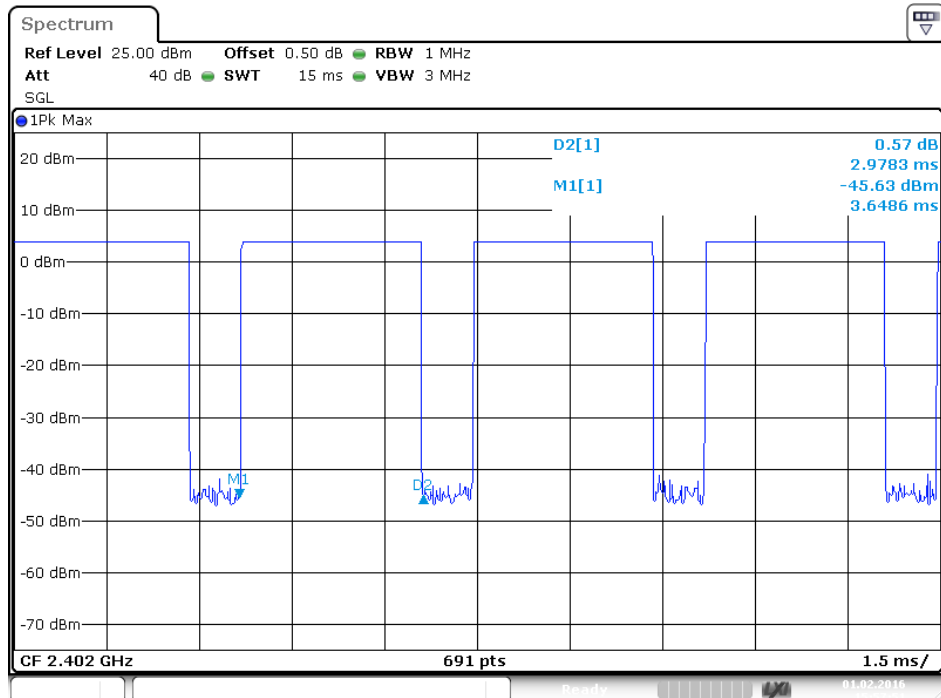
Date: 1.FEB.2016 15:53:38

DH3 High channel



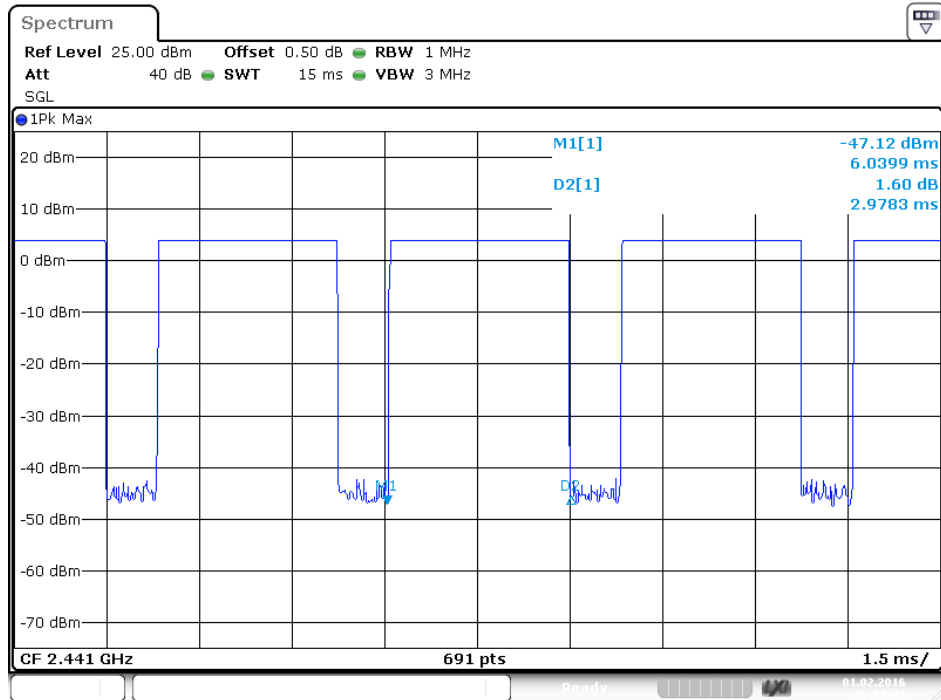
Date: 1.FEB.2016 15:54:25

DH5 Low channel



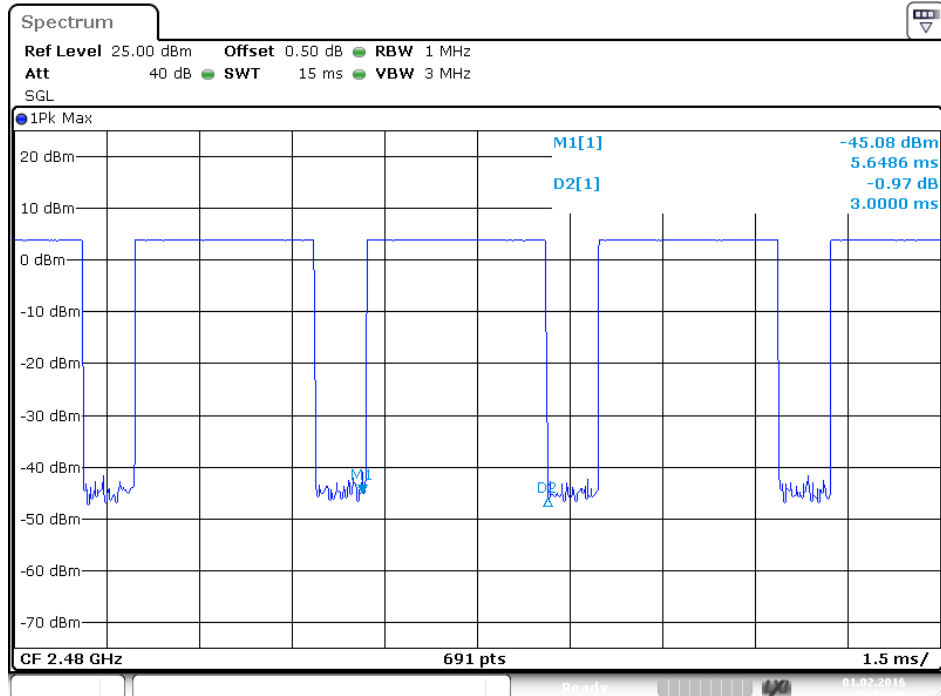
Date: 1.FEB.2016 15:57:51

DH5 Middle channel



Date: 1.FEB.2016 15:57:03

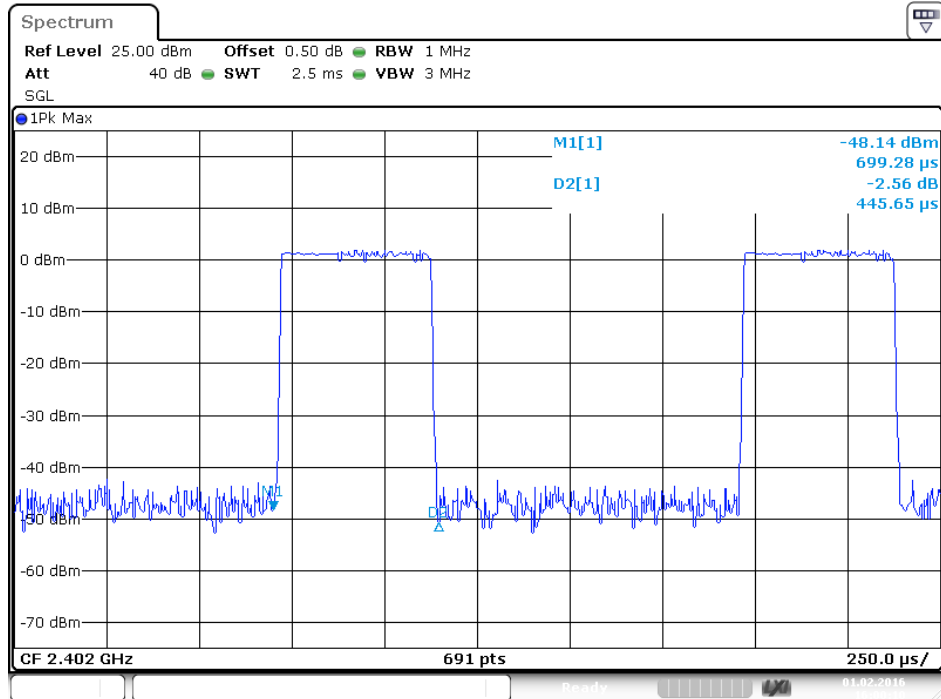
DH5 High channel



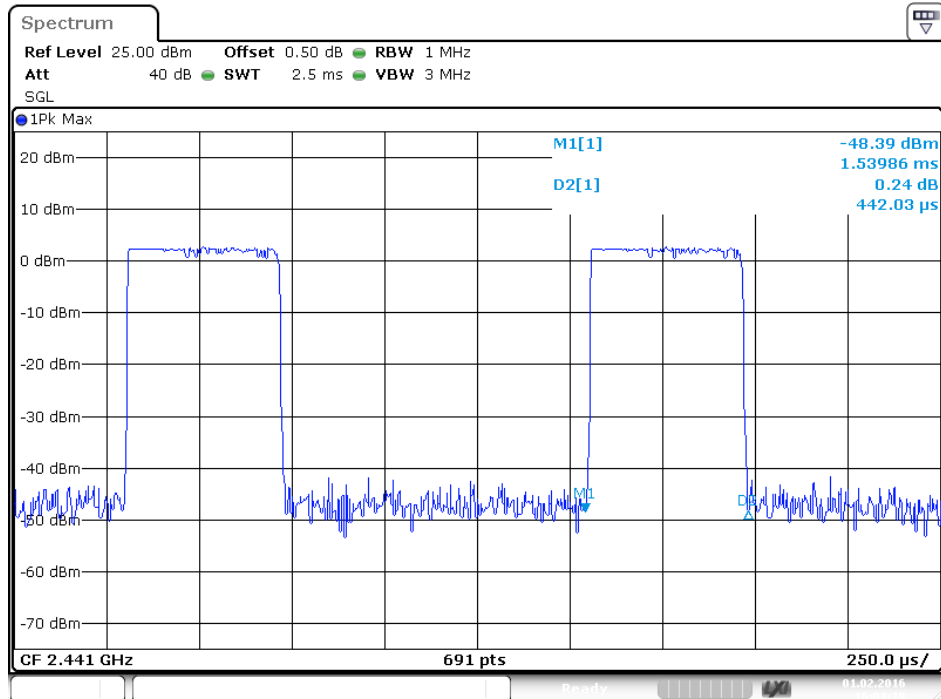
Date: 1.FEB.2016 15:56:09

Π/4-DQPSK

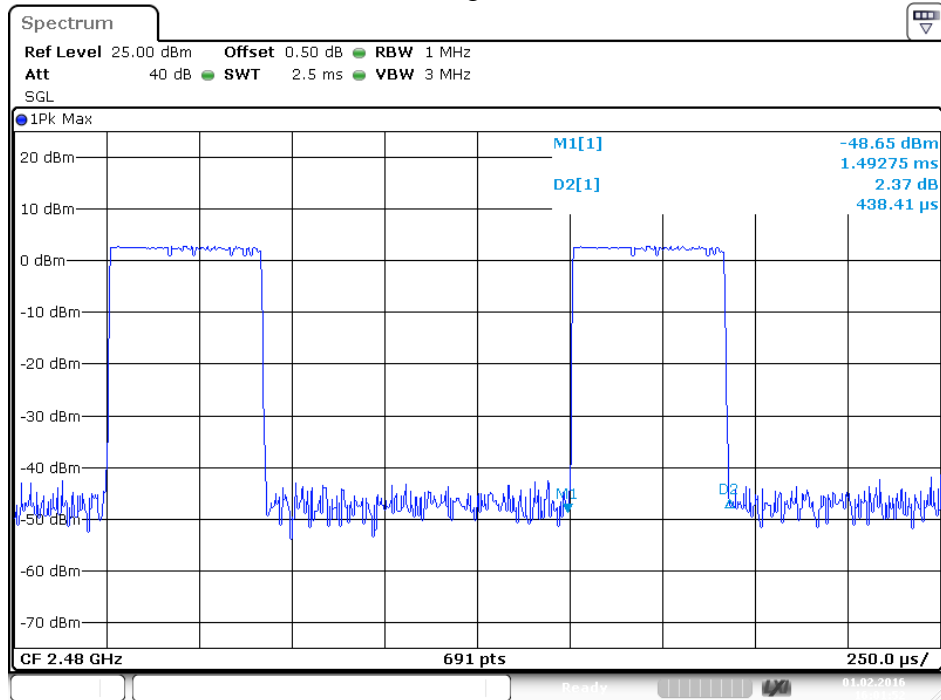
2DH1 Low channel



2DH1 Middle channel

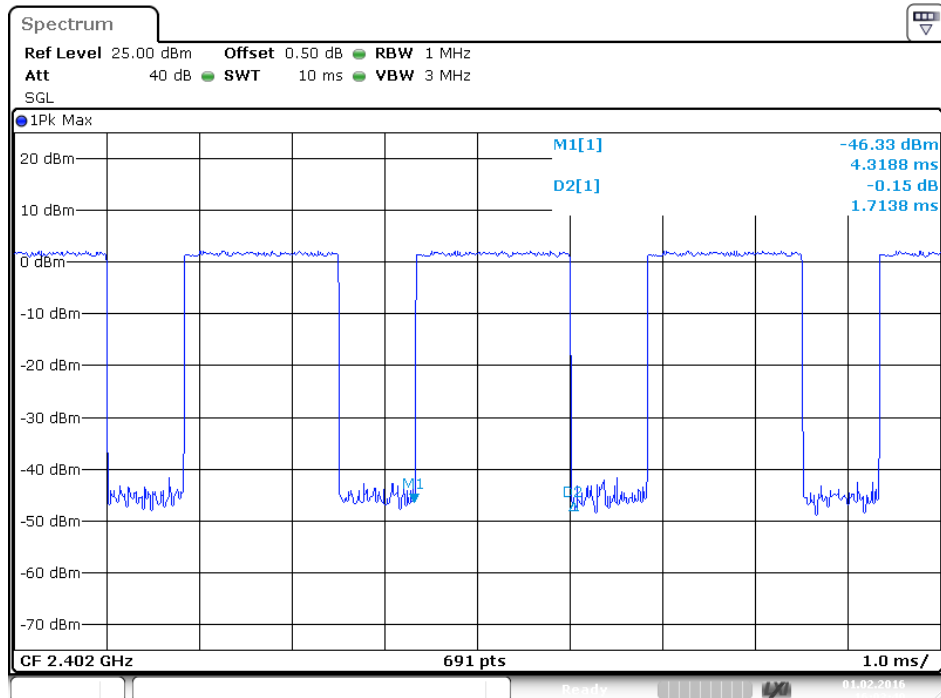


2DH1 High channel



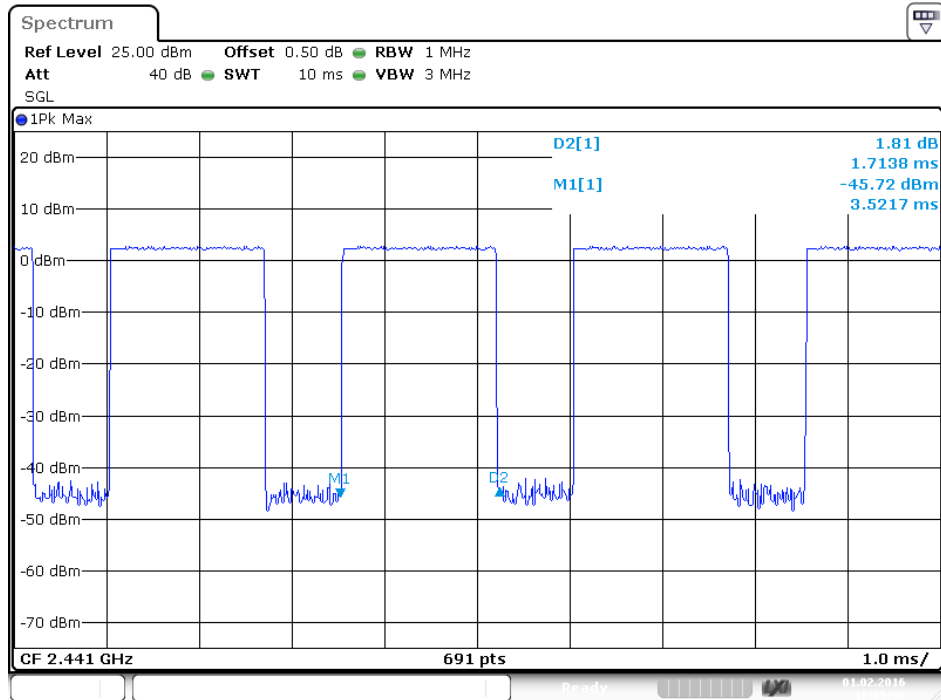
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2DH3 Low channel



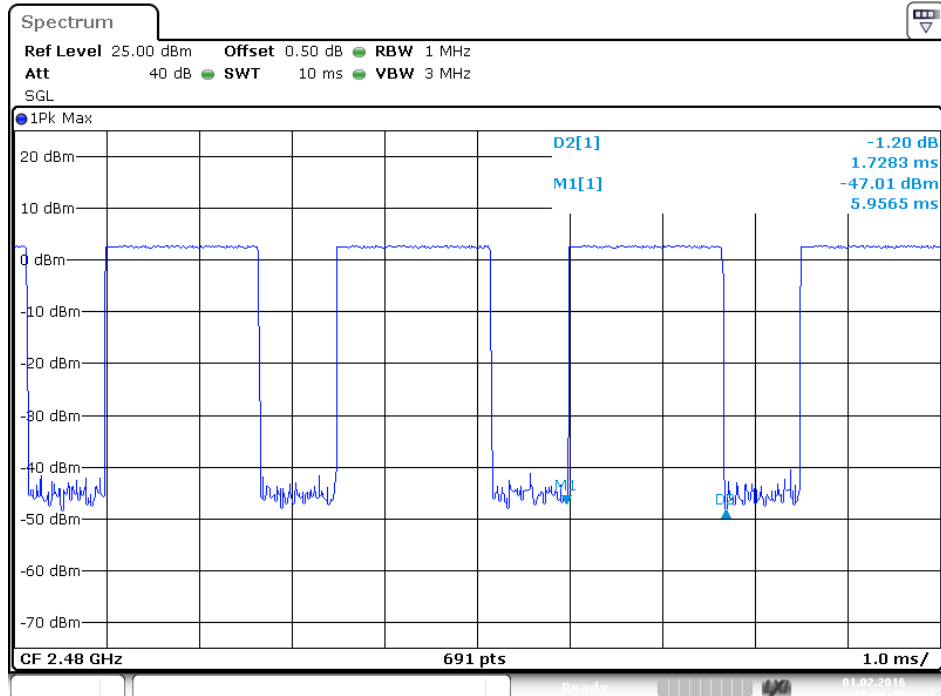
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2DH3 Middle channel



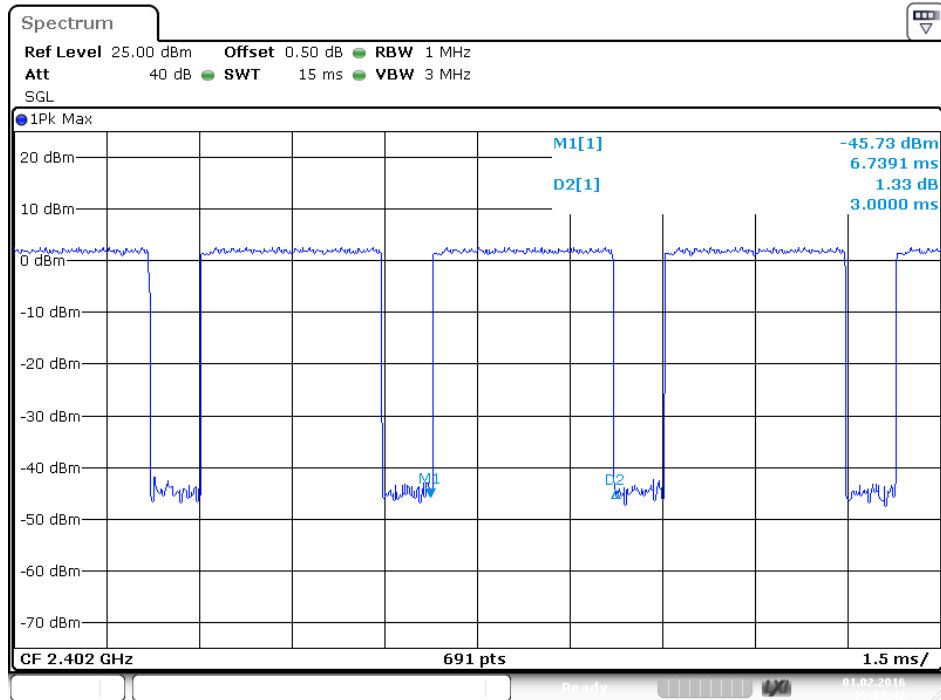
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2DH3 High channel



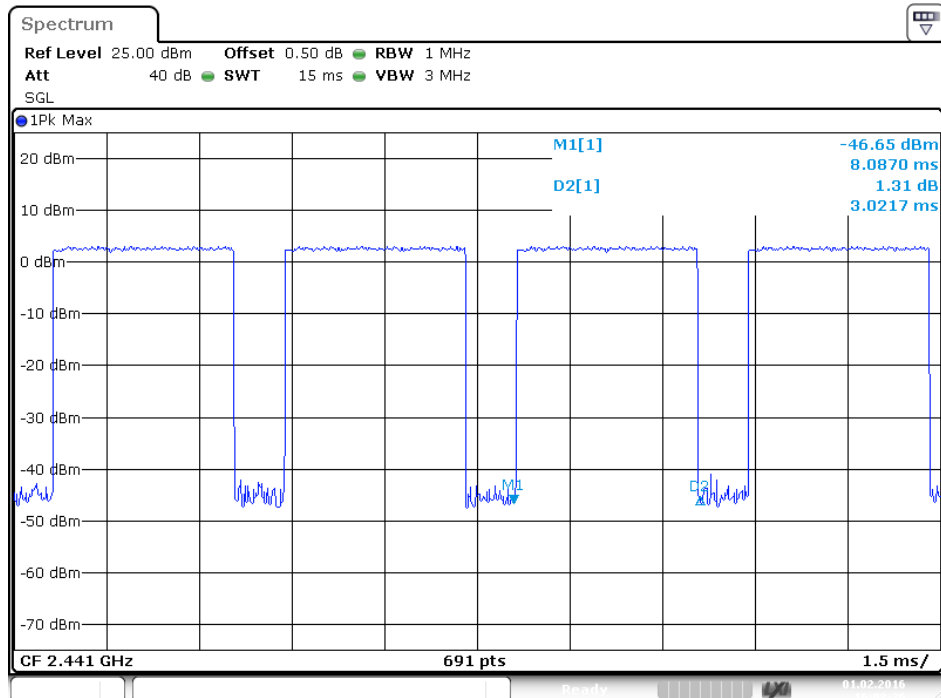
Date: 1.FEB.2016 16:06:26

2DH5 Low channel



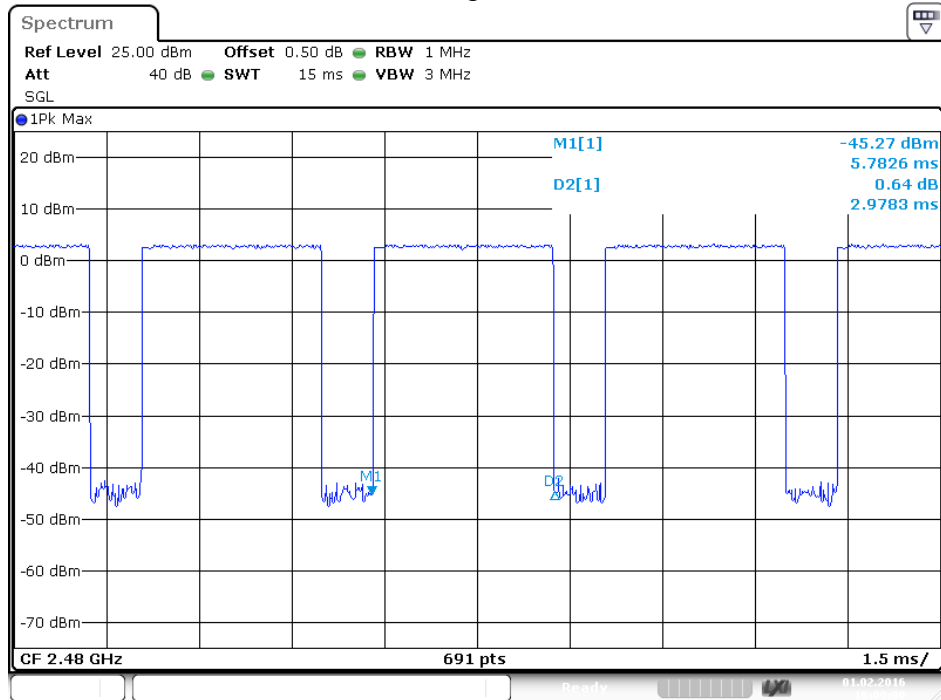
Date: 1.FEB.2016 16:07:43

2DH5 Middle channel



Date: 1.FEB.2016 16:08:26

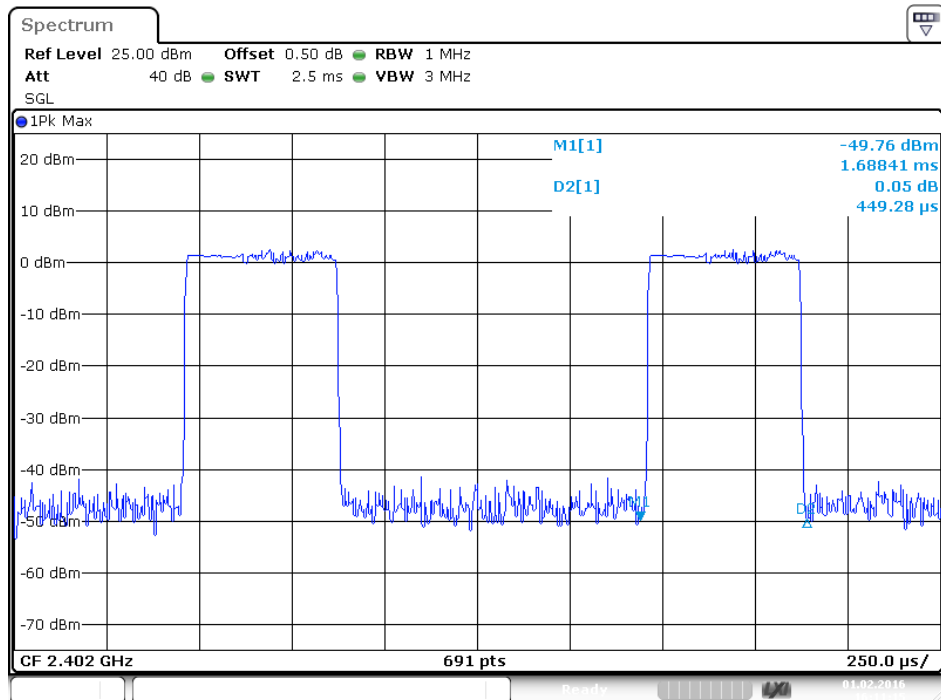
2DH5 High channel



Date: 1.FEB.2016 16:09:00

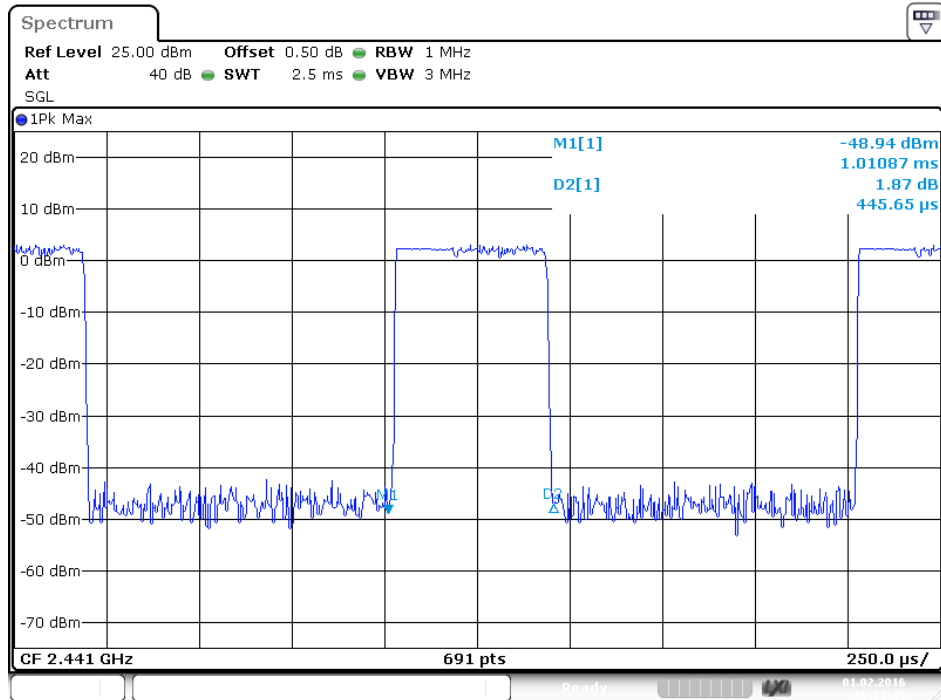
8DPSK Mode

3DH1 Low channel



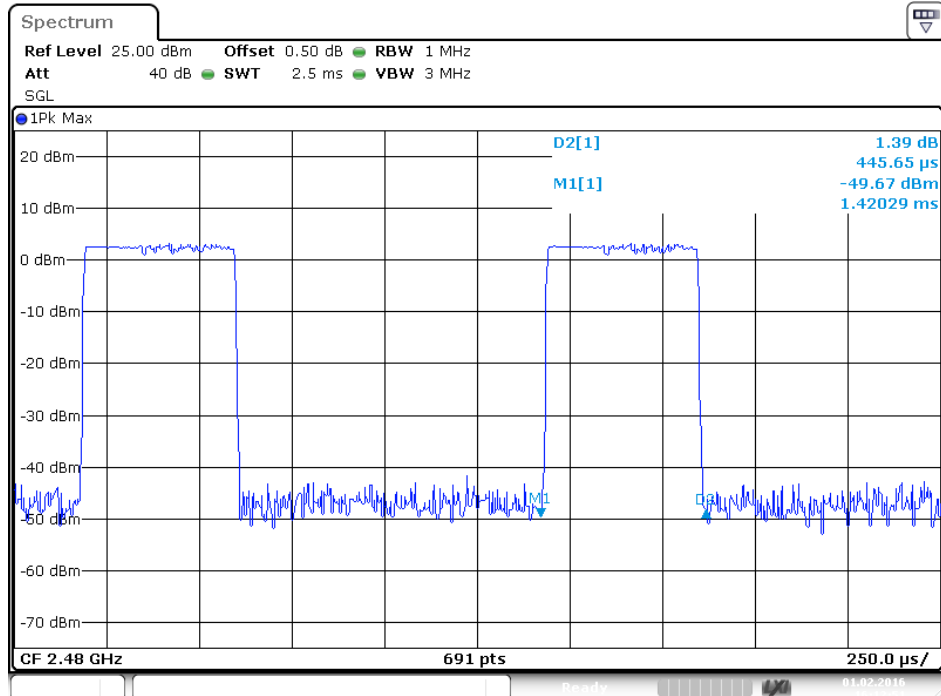
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3DH1 Middle channel



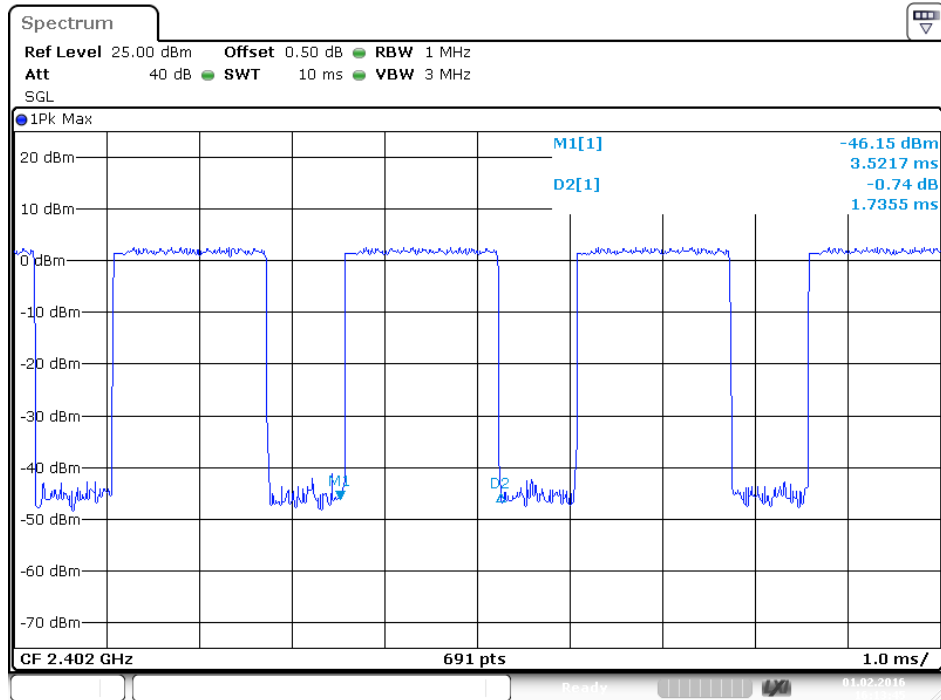
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3DH1 High channel



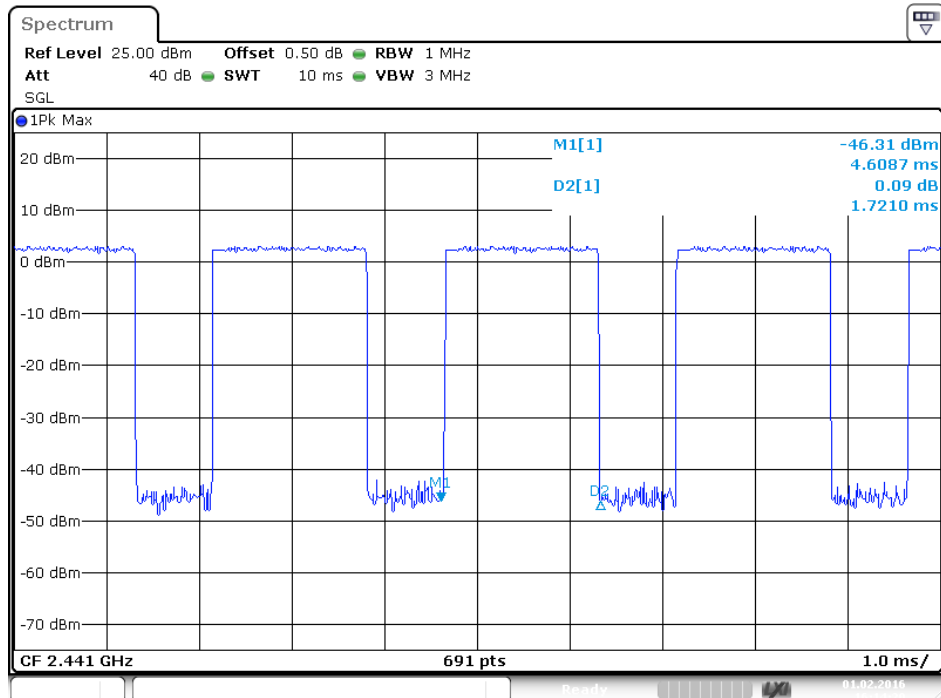
Date: 1.FEB.2016 16:12:52

3DH3 Low channel



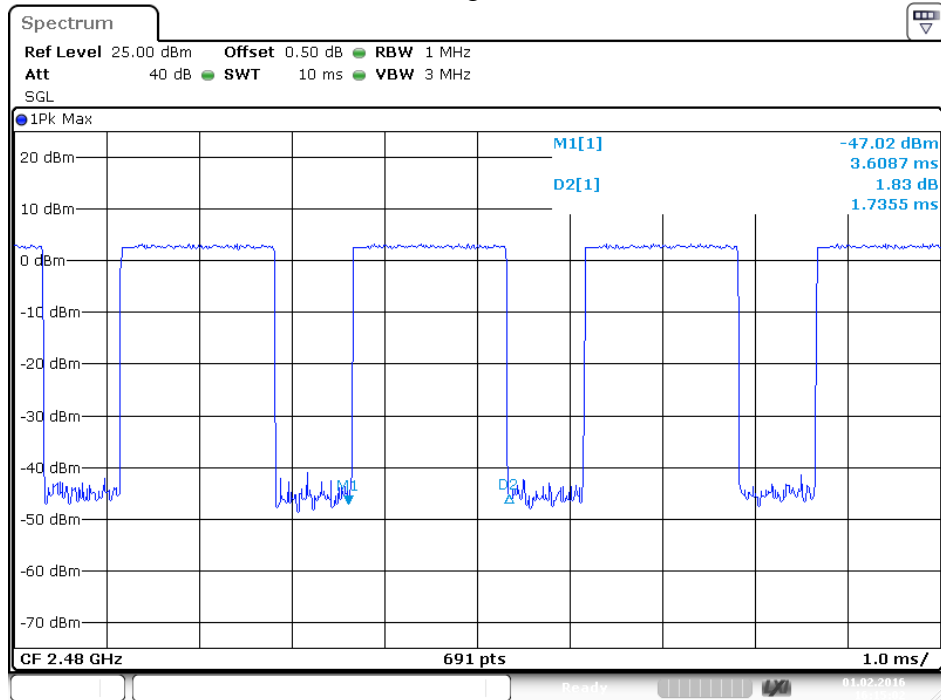
Date: 1.FEB.2016 16:13:45

3DH3 Middle channel



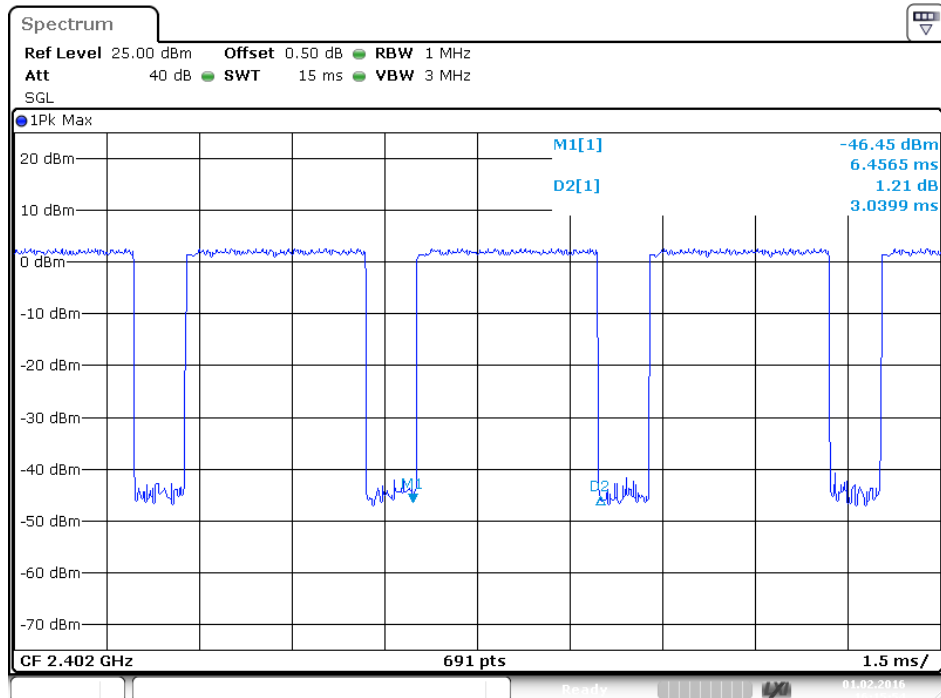
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3DH3 High channel



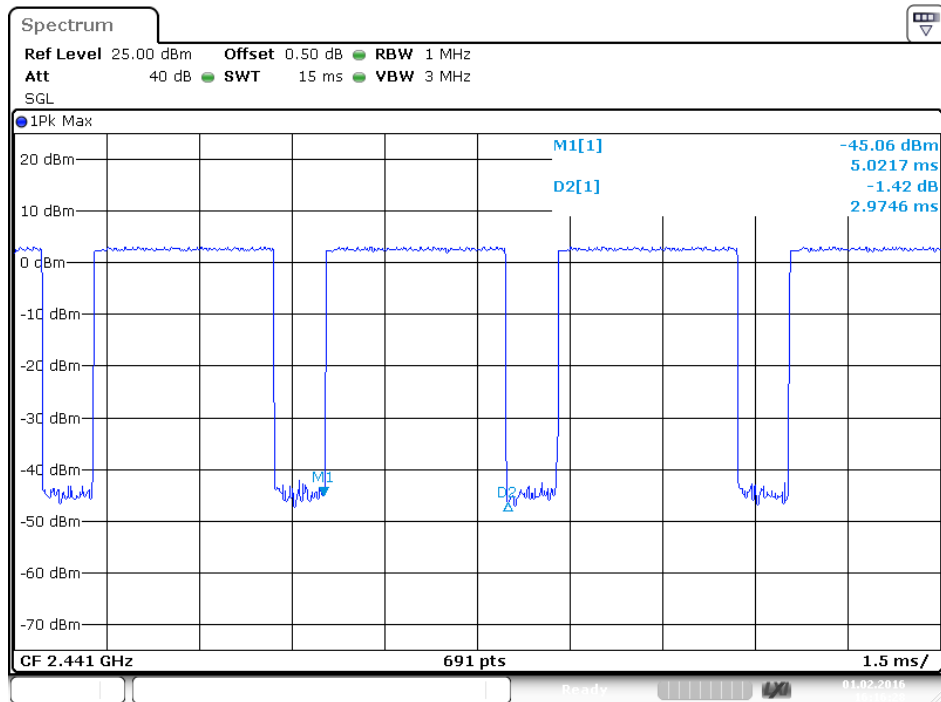
Date: 1.FEB.2016 16:15:02

3DH5 Low channel



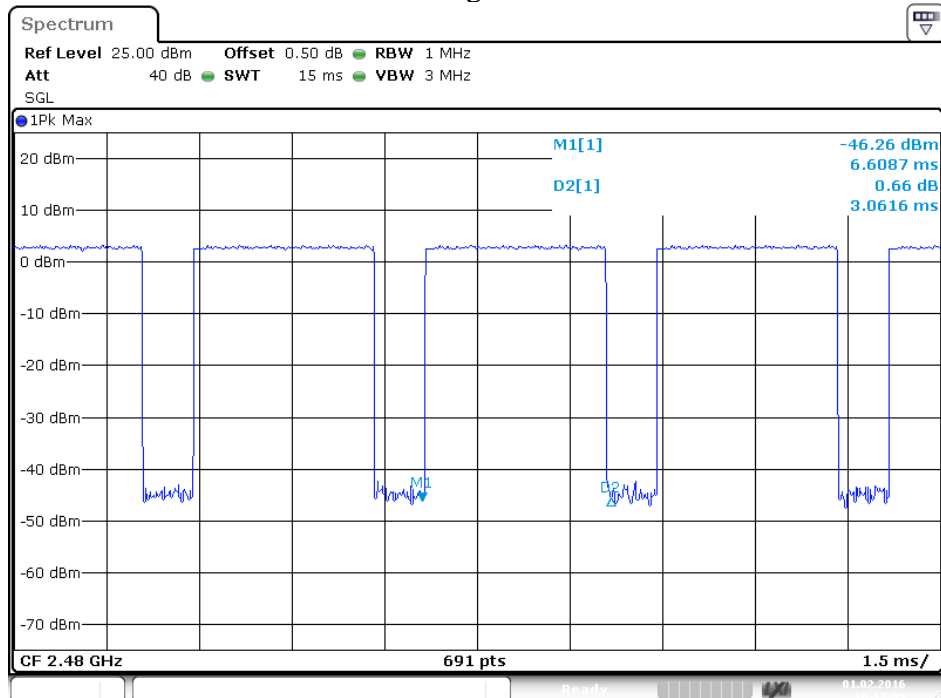
Date: 1.FEB.2016 16:15:54

3DH5 Middle channel



Date: 1.FEB.2016 16:16:28

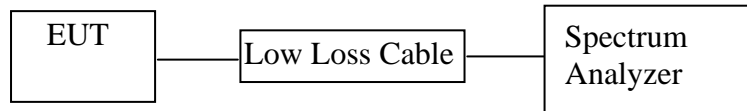
3DH5 High channel



Date: 1.FEB.2016 16:17:05

9. MAXIMUM PEAK OUTPUT POWER TEST

9.1. Block Diagram of Test Setup



(EUT: Braven 2300 Portable Bluetooth Speaker)

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 3MHz for other mode

9.5.4. Measurement the maximum peak output power.

9.6. Test Result

GFSK Mode

Channel	Frequency (MHz)	Peak Output Power (dBm/W)	Limits dBm / W
Low	2402	4.18/0.0026	30 / 1.0
Middle	2441	4.10/0.0026	30 / 1.0
High	2480	4.04/0.0025	30 / 1.0

Π/4-DQPSK Mode

Channel	Frequency (MHz)	Peak Output Power (dBm/W)	Limits dBm / W
Low	2402	2.42/0.0017	21 / 0.125
Middle	2441	3.07/0.0020	21 / 0.125
High	2480	3.14/0.0021	21 / 0.125

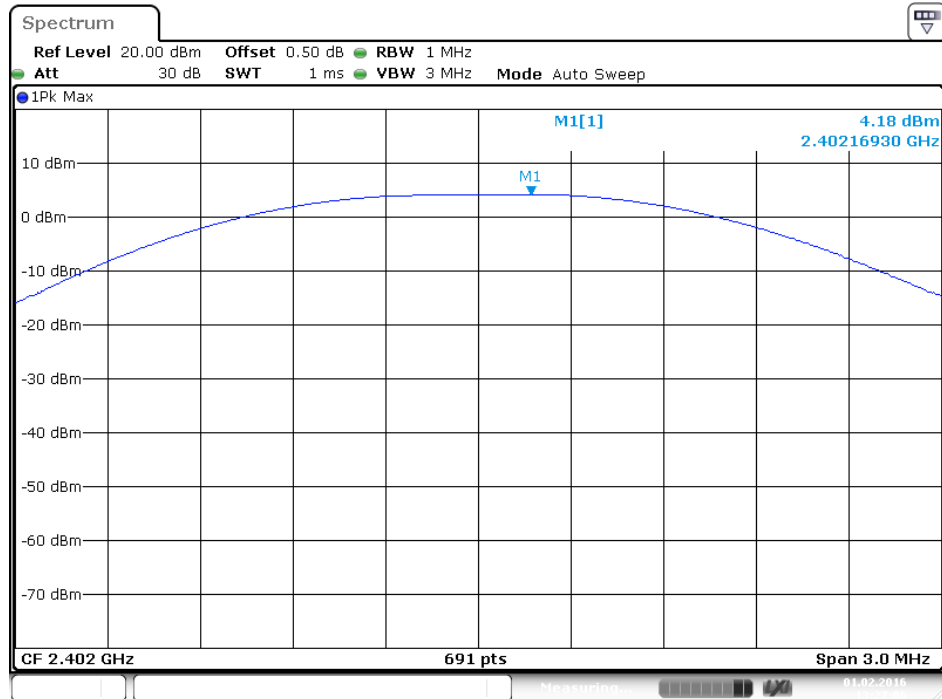
8DPSK Mode

Channel	Frequency (MHz)	Peak Output Power (dBm/W)	Limits dBm / W
Low	2402	2.62/0.0018	21 / 0.125
Middle	2441	3.18/0.0021	21 / 0.125
High	2480	3.25/0.0021	21 / 0.125

The spectrum analyzer plots are attached as below.

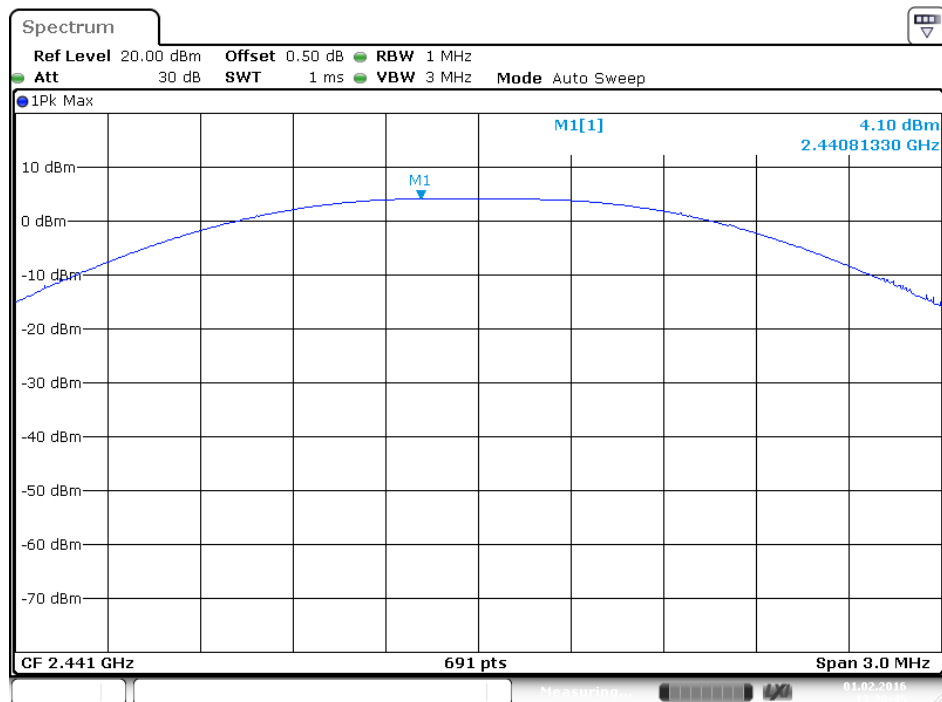
GFSK Mode

Low channel



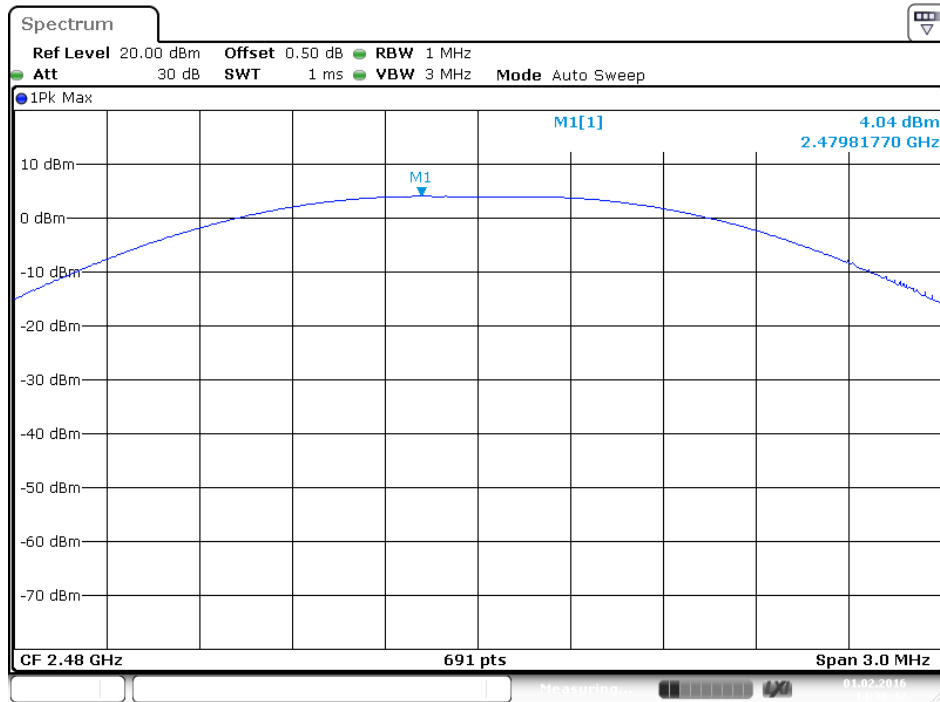
Date: 1.FEB.2016 13:27:05

Middle channel



Date: 1.FEB.2016 13:28:44

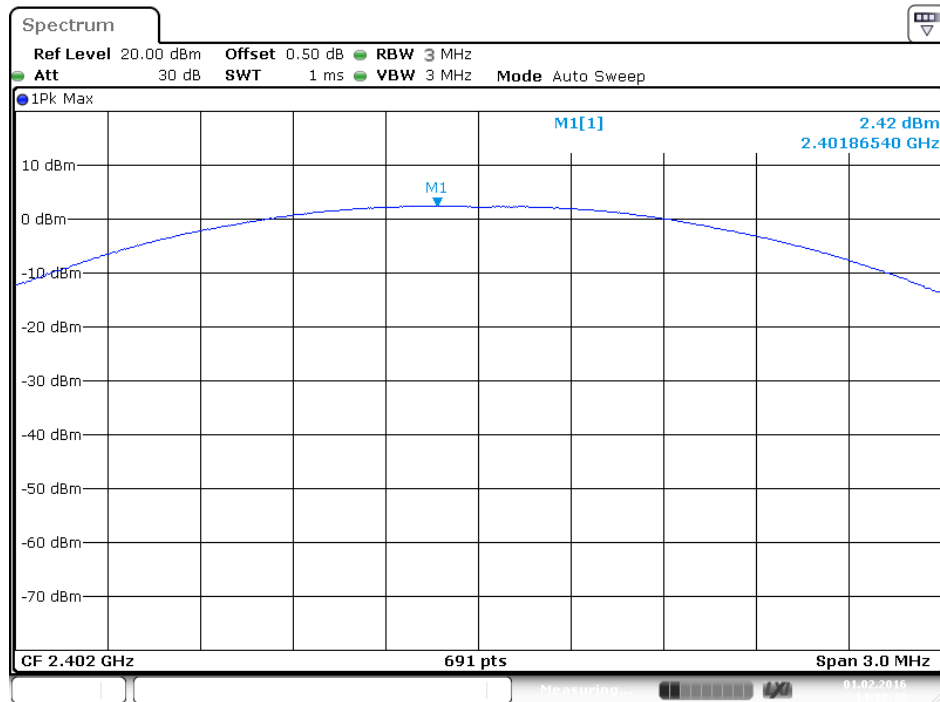
High channel



Date: 1.FEB.2016 14:30:42

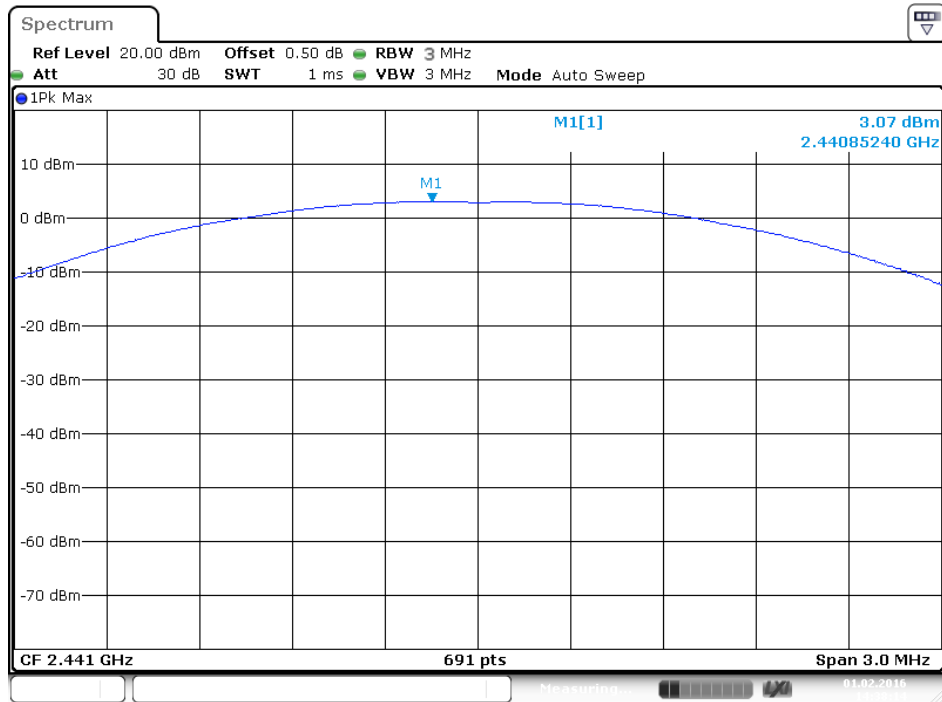
Π/4-DQPSK Mode

Low channel



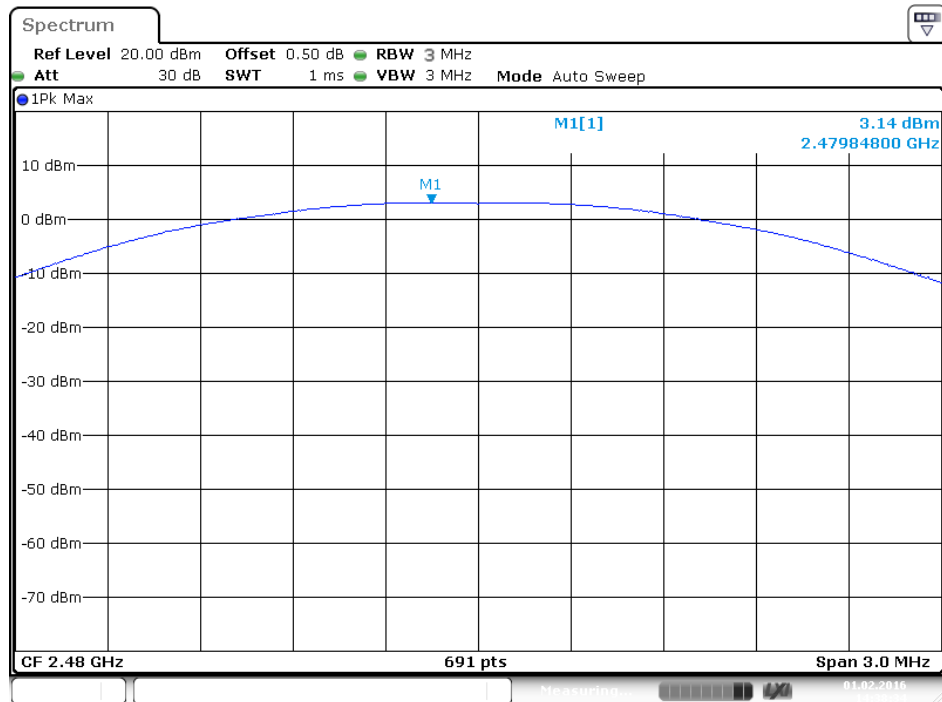
Date: 1.FEB.2016 14:32:42

Middle channel



Date: 1.FEB.2016 14:38:15

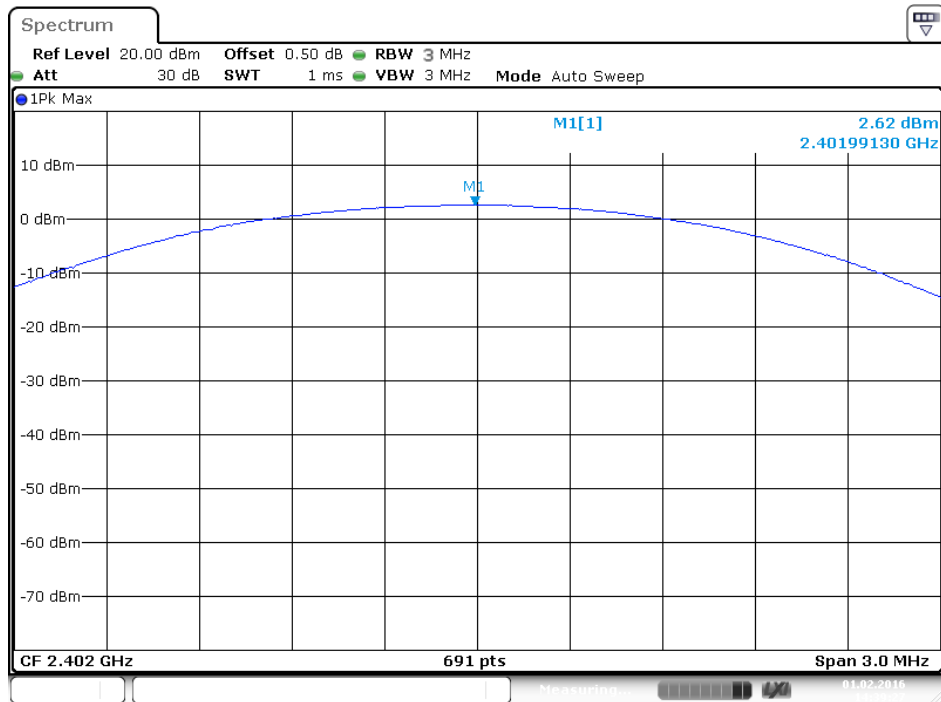
High channel



Date: 1.FEB.2016 14:38:34

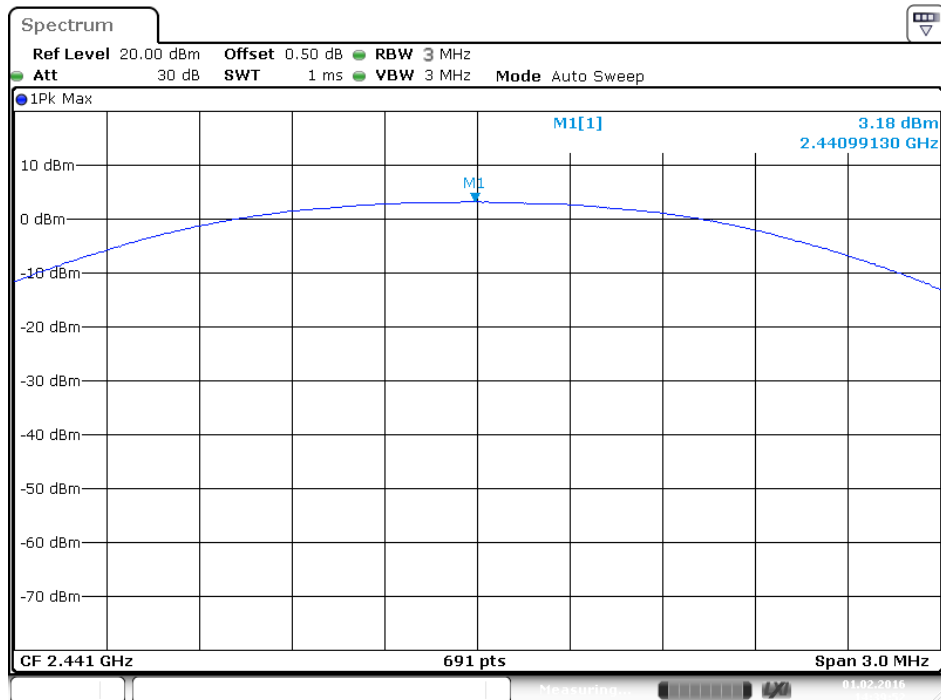
8DPSK Mode

Low channel



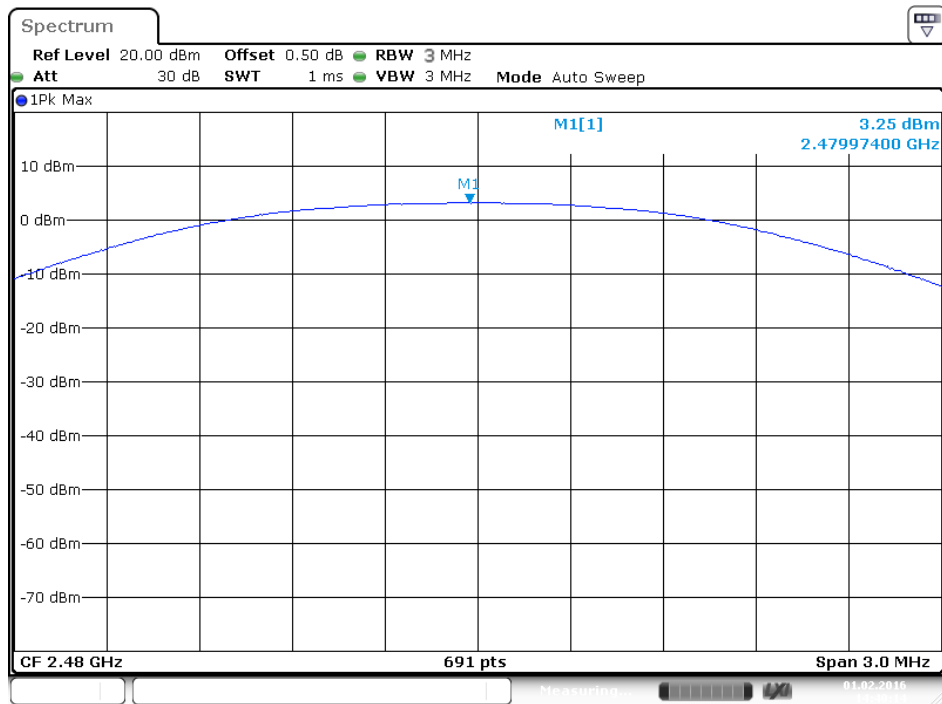
Date: 1.FEB.2016 14:39:28

Middle channel



Date: 1.FEB.2016 14:39:53

High channel

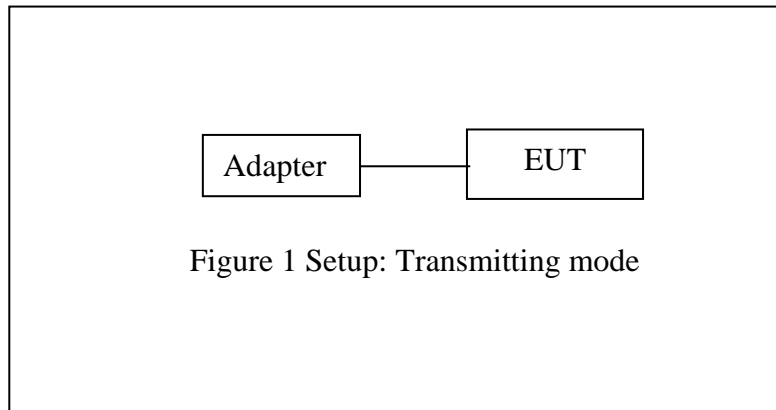


Date: 1. FEB. 2016 14:40:14

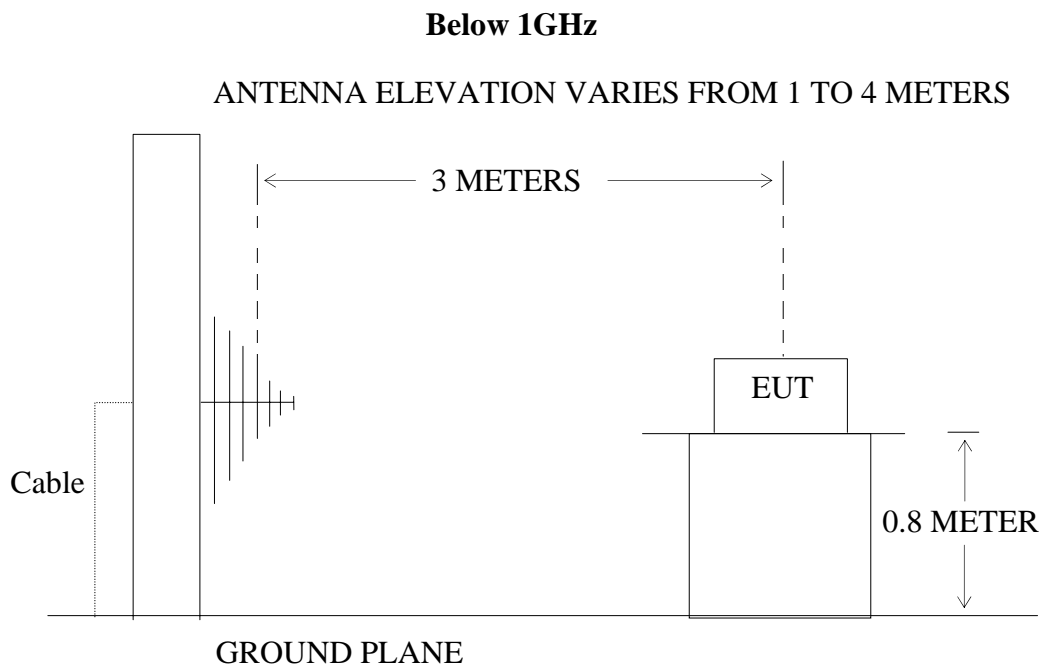
10. RADIATED EMISSION TEST

10.1. Block Diagram of Test Setup

10.1.1. Block diagram of connection between the EUT and peripherals

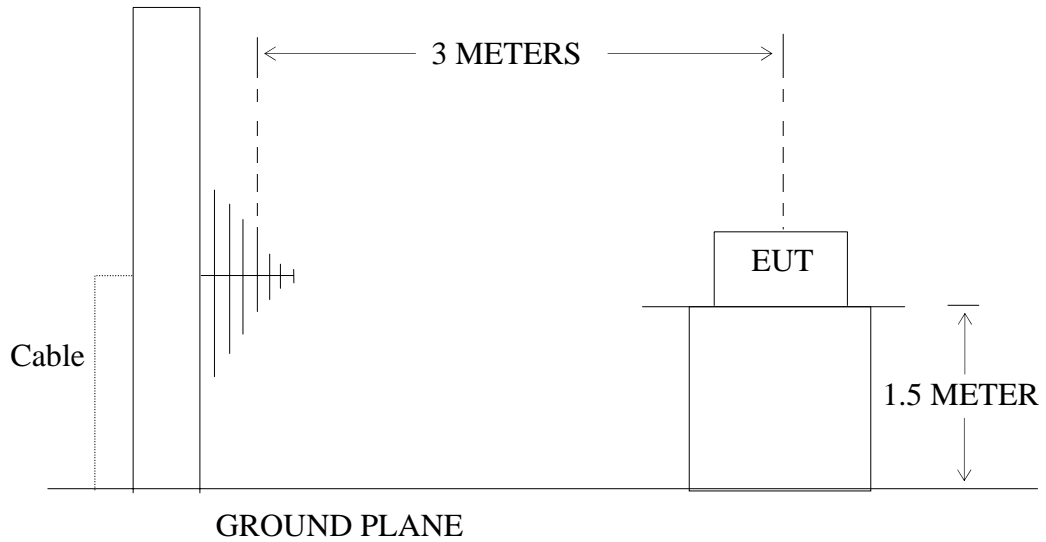


10.1.2. Semi-Anechoic Chamber Test Setup Diagram



Above 1GHz

ANTENNA ELEVATION VARIES FROM 1 TO 4 METERS



10.2.The Limit 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.Restricted bands of operation

10.3.1.FCC Part 15.205 Restricted bands of operation

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

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

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

²Above 38.6

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

10.4.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.

10.5. 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. The EUT was tested in 3 orthogonal planes.

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.

10.6. The Field Strength of Radiation Emission Measurement Results

Note: 1. We tested GFSK mode, $\pi/4$ -DQPSK Mode & 8QPSK mode and recorded the worst case data (GFSK mode) for all test mode.

2. The test frequency is from 30MHz to 25GHz, The 18-25GHz emissions are not reported, because the levels are too low against the limit.

Below 1GHz



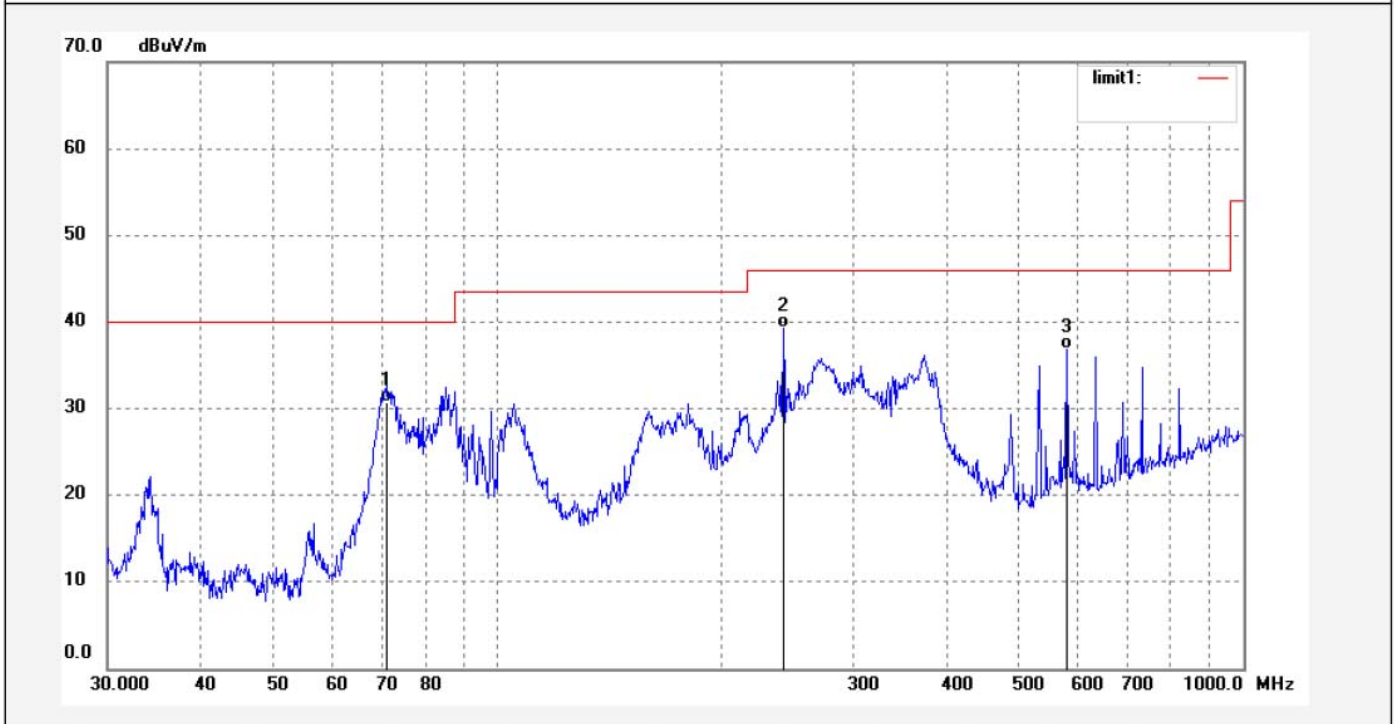
ACCURATE TECHNOLOGY CO., LTD.

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

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1421	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13:59:46
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2402MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	70.9536	53.69	-22.90	30.79	40.00	-9.21	QP			
2	241.8377	57.46	-18.23	39.23	46.00	-6.77	QP			
3	580.0705	47.29	-10.37	36.92	46.00	-9.08	QP			



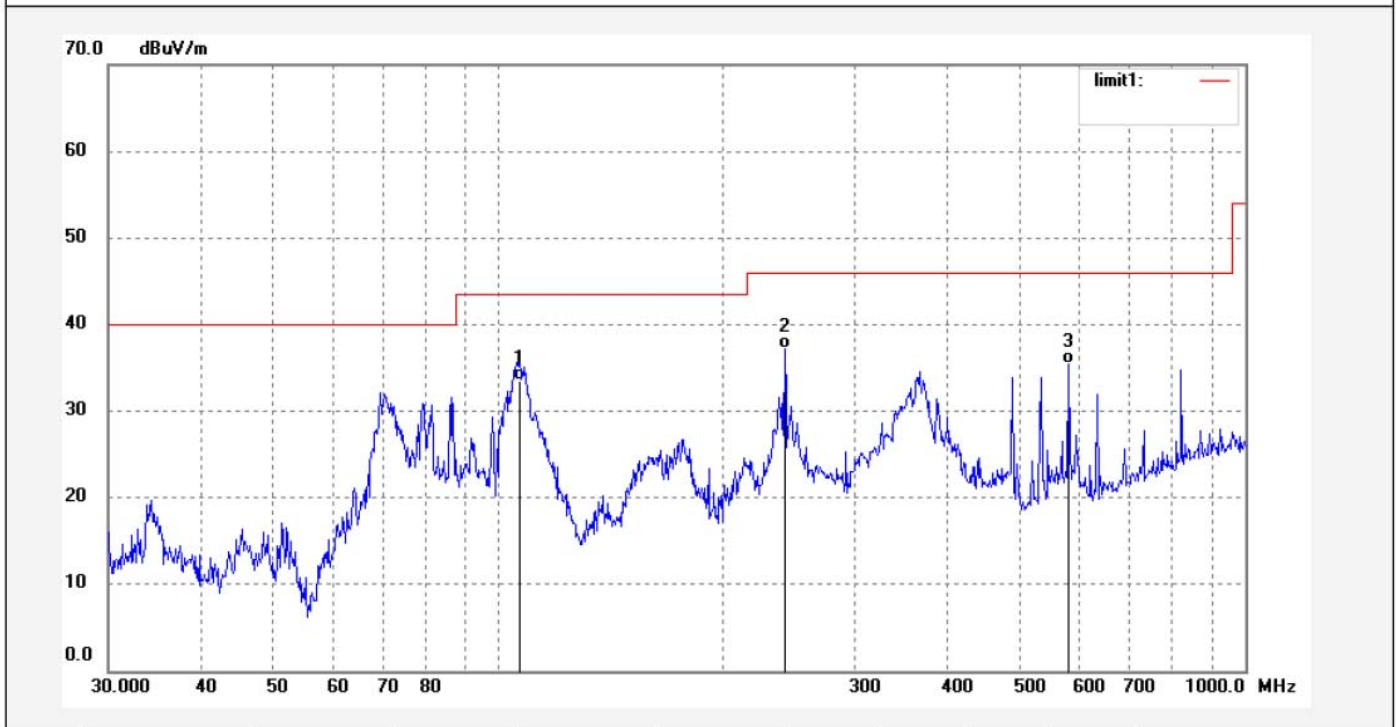
ACCURATE TECHNOLOGY CO., LTD.

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

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1422	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:00:29
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2402MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	106.6551	55.20	-21.61	33.59	43.50	-9.91	QP			
2	241.8377	55.36	-18.23	37.13	46.00	-8.87	QP			
3	580.0705	45.84	-10.37	35.47	46.00	-10.53	QP			



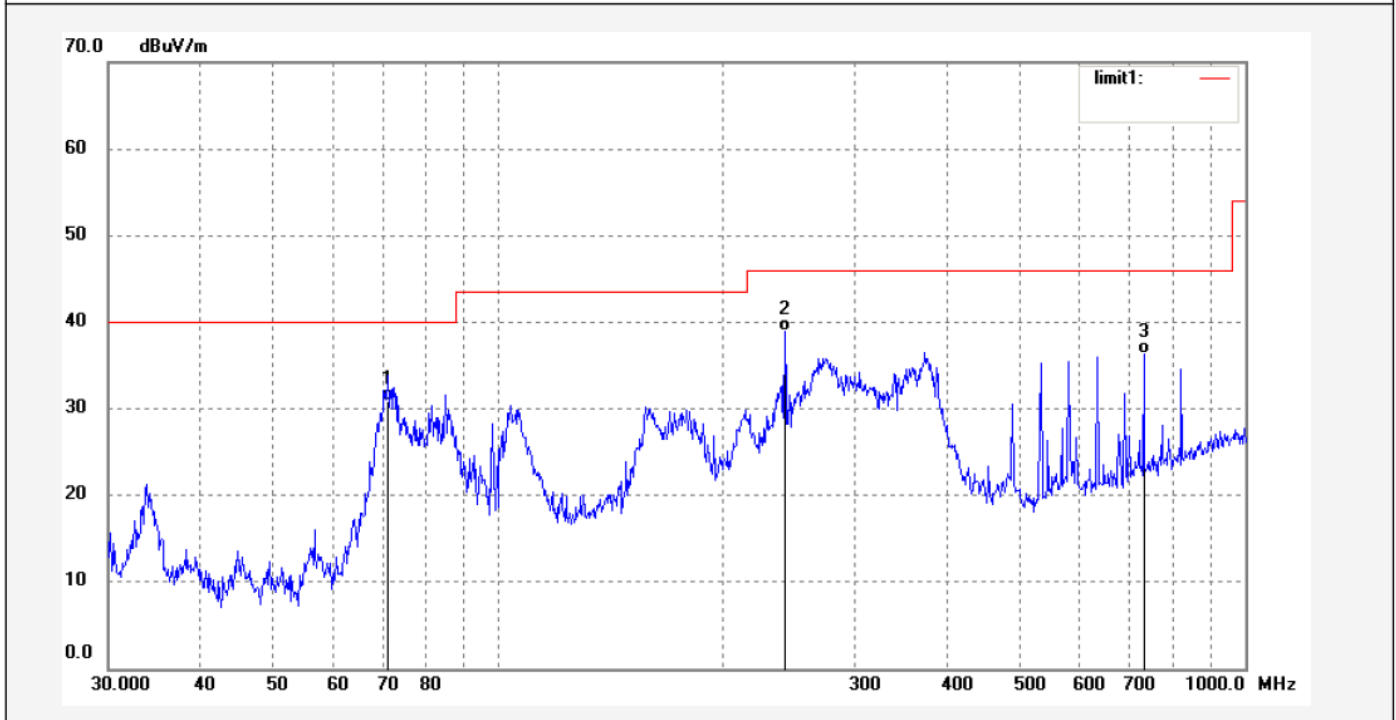
ACCURATE TECHNOLOGY CO., LTD.

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

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1424	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:02:24
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2441MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	71.2032	53.80	-22.92	30.88	40.00	-9.12	QP			
2	241.8377	57.24	-18.23	39.01	46.00	-6.99	QP			
3	731.4627	43.44	-7.20	36.24	46.00	-9.76	QP			



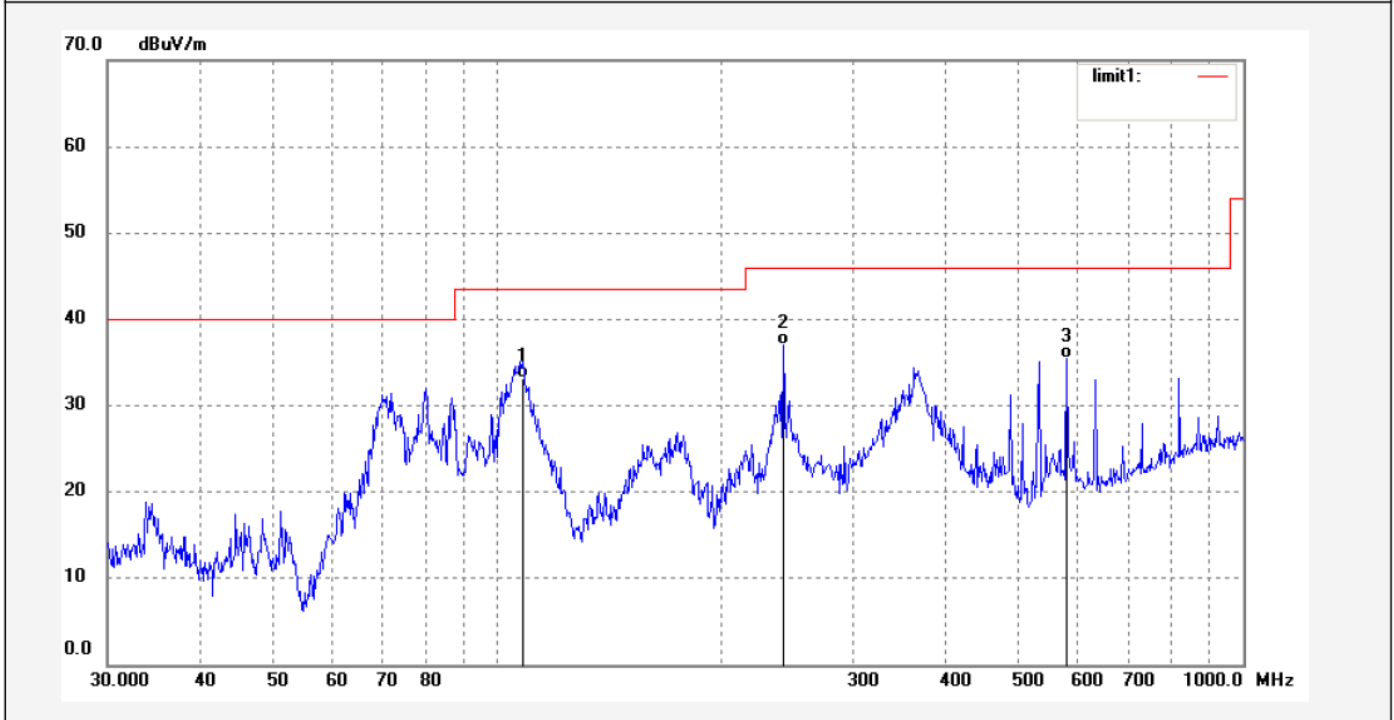
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Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1423	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:01:06
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2441MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	108.1648	54.44	-21.36	33.08	43.50	-10.42	QP			
2	241.8377	55.24	-18.23	37.01	46.00	-8.99	QP			
3	580.0705	45.84	-10.37	35.47	46.00	-10.53	QP			



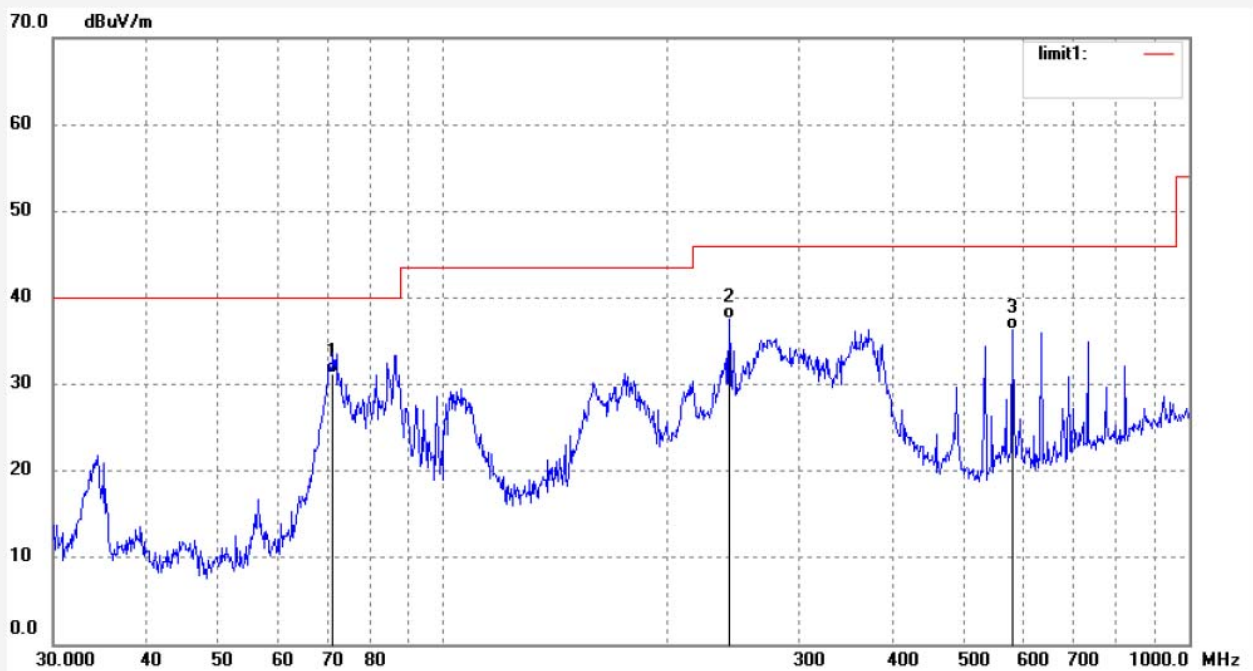
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Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1425	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:03:55
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2480MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	71.2032	54.09	-22.92	31.17	40.00	-8.83	QP			
2	241.8377	55.81	-18.23	37.58	46.00	-8.42	QP			
3	580.0705	46.70	-10.37	36.33	46.00	-9.67	QP			



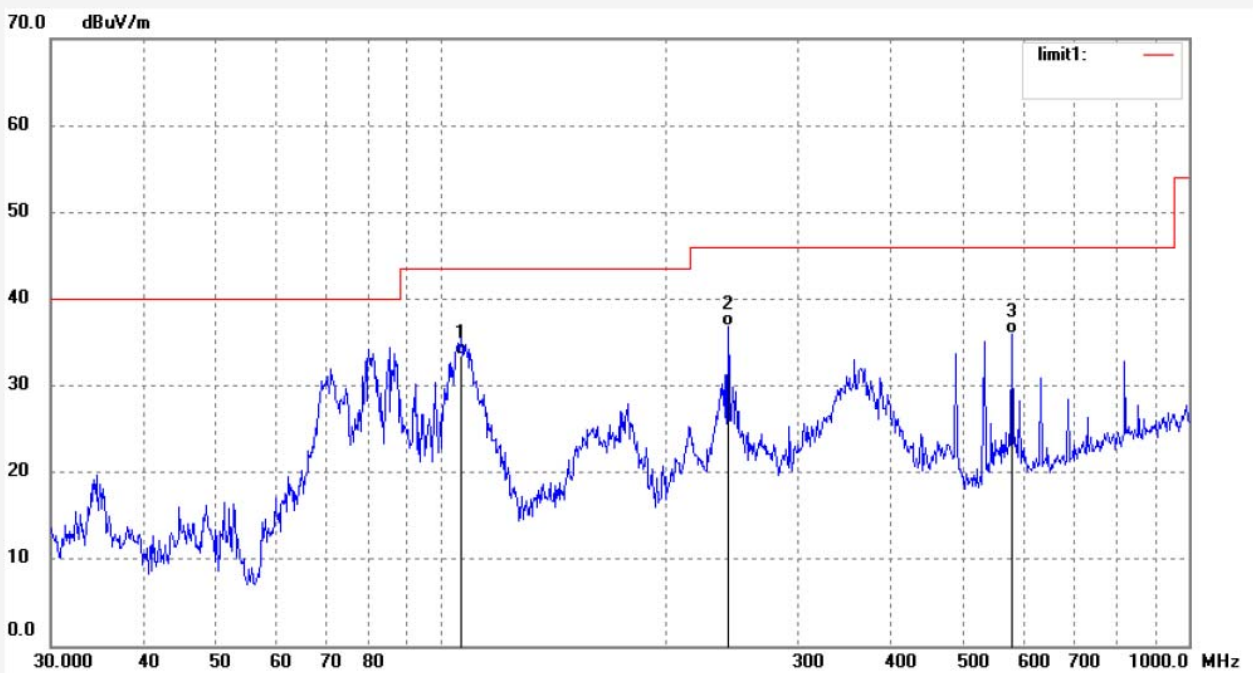
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Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1426	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:04:31
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2480MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	106.2811	55.26	-21.68	33.58	43.50	-9.92	QP			
2	241.8377	55.14	-18.23	36.91	46.00	-9.09	QP			
3	580.0705	46.39	-10.37	36.02	46.00	-9.98	QP			

Above 1GHz



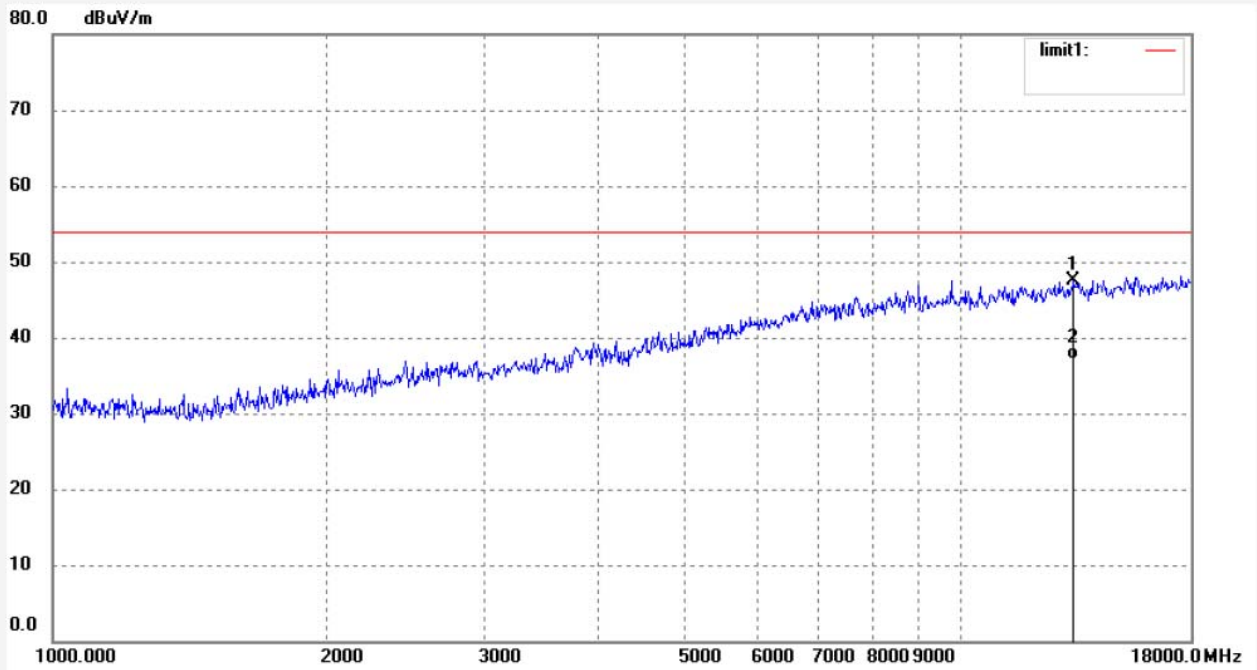
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Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1428	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:06:17
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2402MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	13376.181	37.46	10.13	47.59	74.00	-26.41	peak			
2	13376.181	26.90	10.13	37.03	54.00	-16.97	peak			

Note: Average measurement with peak detection at No.2



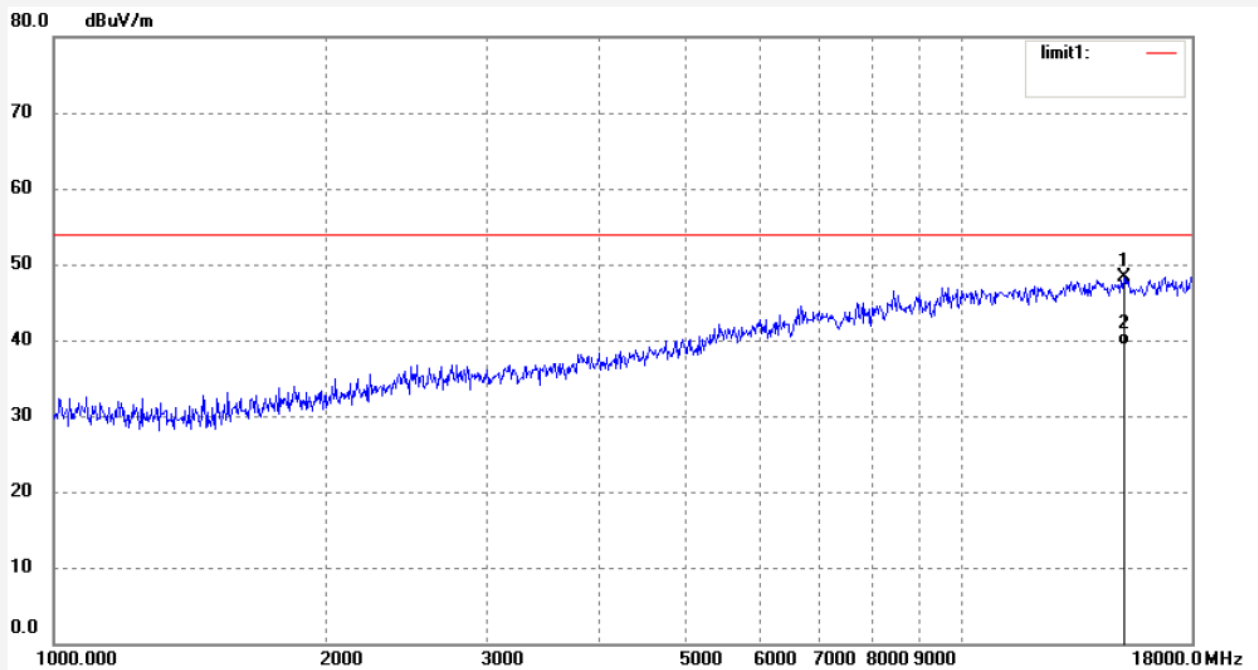
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Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1427	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:05:32
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2402MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	15159.656	35.27	13.06	48.33	74.00	-25.67	peak			
2	15159.656	26.22	13.06	39.28	54.00	-14.72	peak			

Note: Average measurement with peak detection at No.2



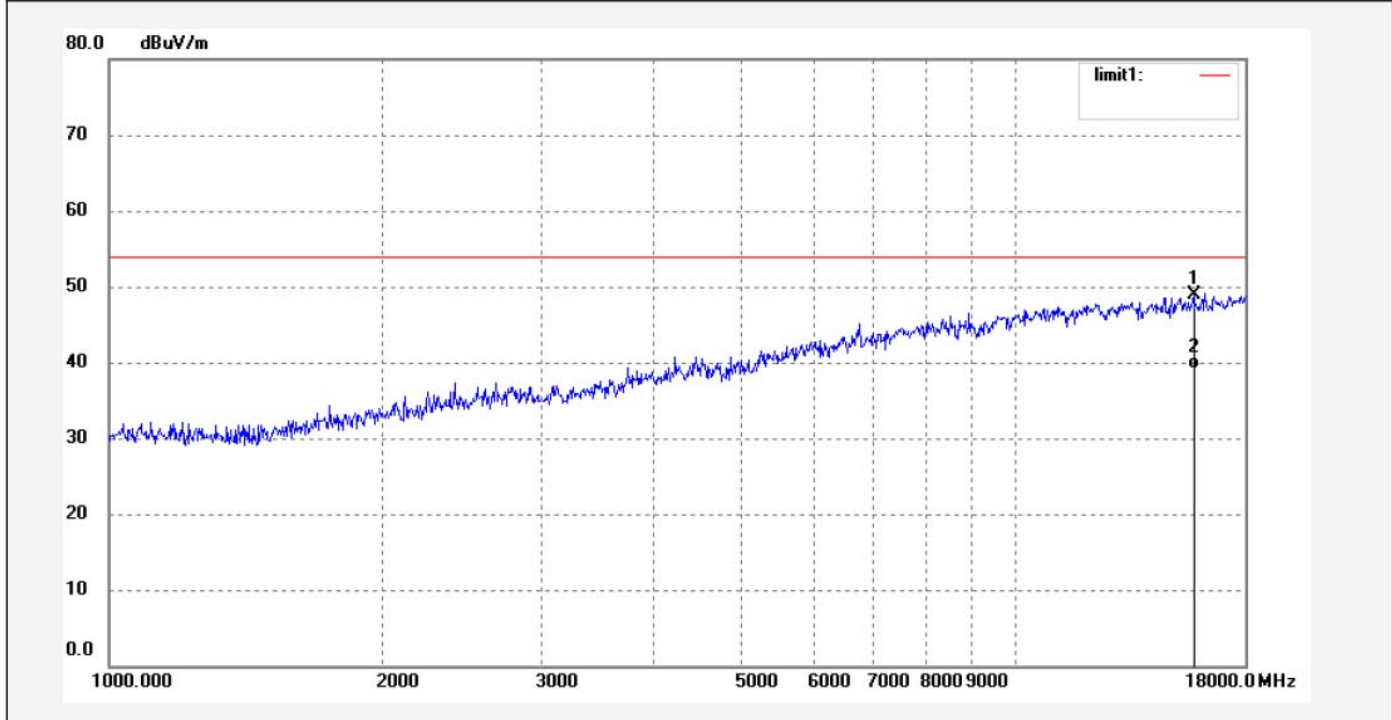
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Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: STAR2015 #1429	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:07:03
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2441MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	15790.179	36.25	12.72	48.97	74.00	-25.03	peak			
2	15790.179	26.44	12.72	39.16	54.00	-14.84	peak			

Note: Average measurement with peak detection at No.2


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Job No.: STAR2015 #1430

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Braven 2300 Portable Bluetooth Speaker

Mode: TX 2441MHz

Model: 2300

Manufacturer: Braven LC

Polarization: Vertical

Power Source: AC 120V/60Hz

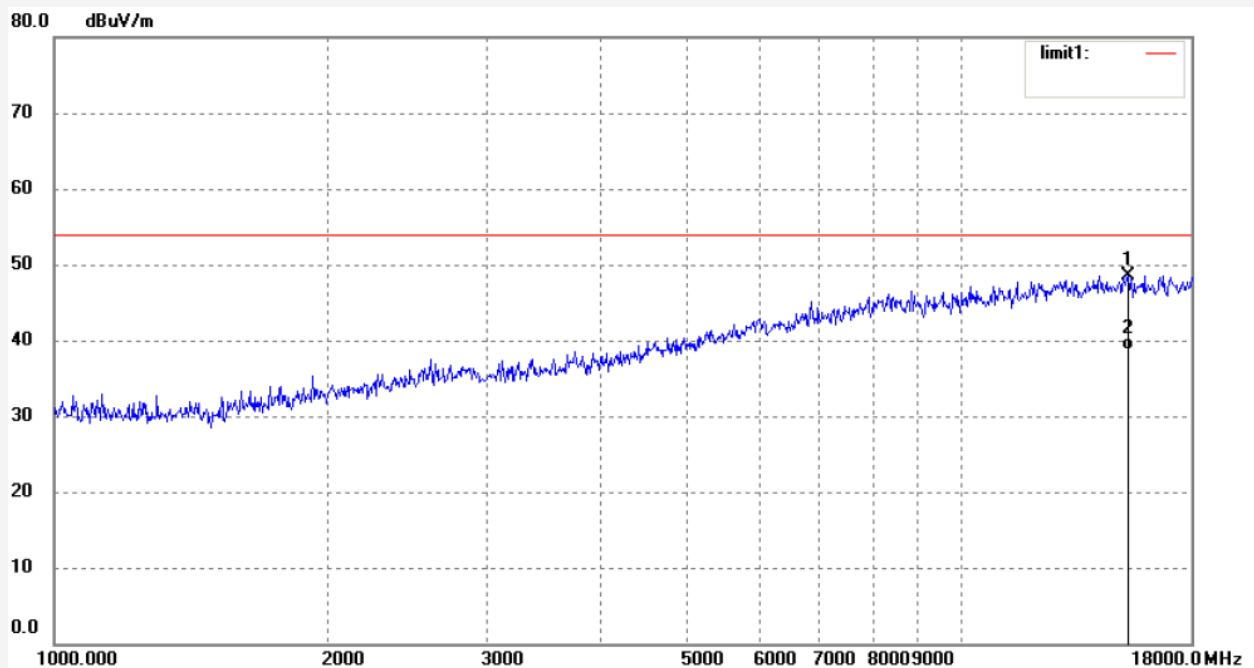
Date: 2016/01/30

Time: 14:07:44

Engineer Signature:

Distance: 3m

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	15337.191	35.72	12.82	48.54	74.00	-25.46	peak			
2	15337.191	25.97	12.82	38.79	54.00	-15.21	peak			

Note: Average measurement with peak detection at No.2



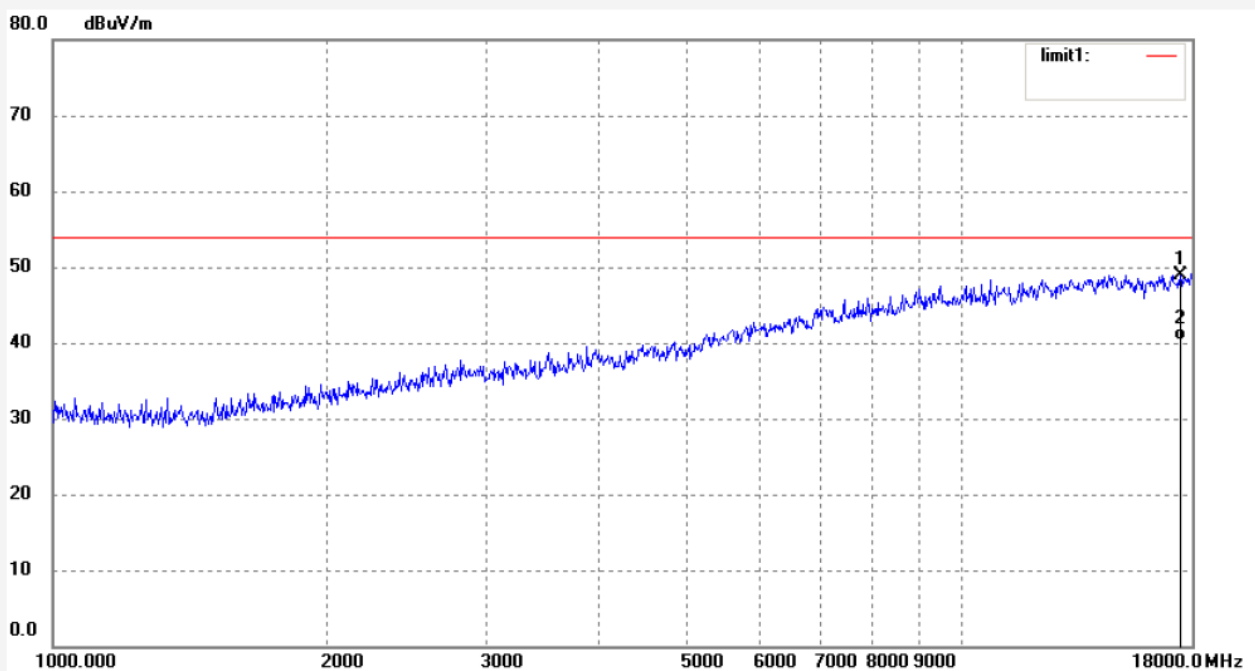
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Site: 1# Chamber
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Fax:+86-0755-26503396

Job No.: STAR2015 #1432	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:09:15
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2480MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	17483.617	32.02	16.98	49.00	74.00	-25.00	peak			
2	17483.617	23.42	16.98	40.40	54.00	-13.60	peak			

Note: Average measurement with peak detection at No.2



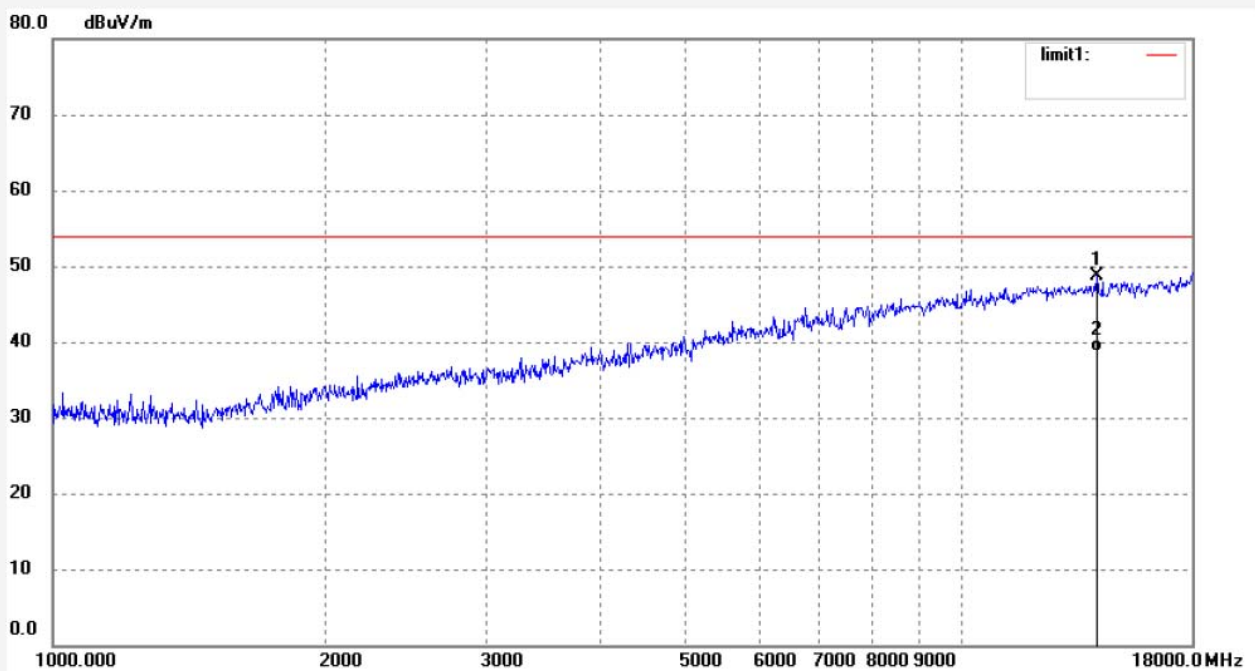
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Site: 1# Chamber
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Job No.: STAR2015 #1431	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2016/01/30
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14:08:31
EUT: Braven 2300 Portable Bluetooth Speaker	Engineer Signature:
Mode: TX 2480MHz	Distance: 3m
Model: 2300	
Manufacturer: Braven LC	

Note: Report No.:ATE20151700

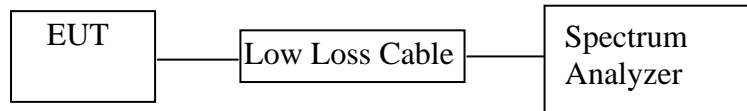


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	14136.778	36.21	12.41	48.62	74.00	-25.38	peak			
2	14136.778	26.22	12.41	38.63	54.00	-15.37	peak			

Note: Average measurement with peak detection at No.2

11. BAND EDGE COMPLIANCE TEST

11.1. Block Diagram of Test Setup



(EUT: Braven 2300 Portable Bluetooth Speaker)

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.

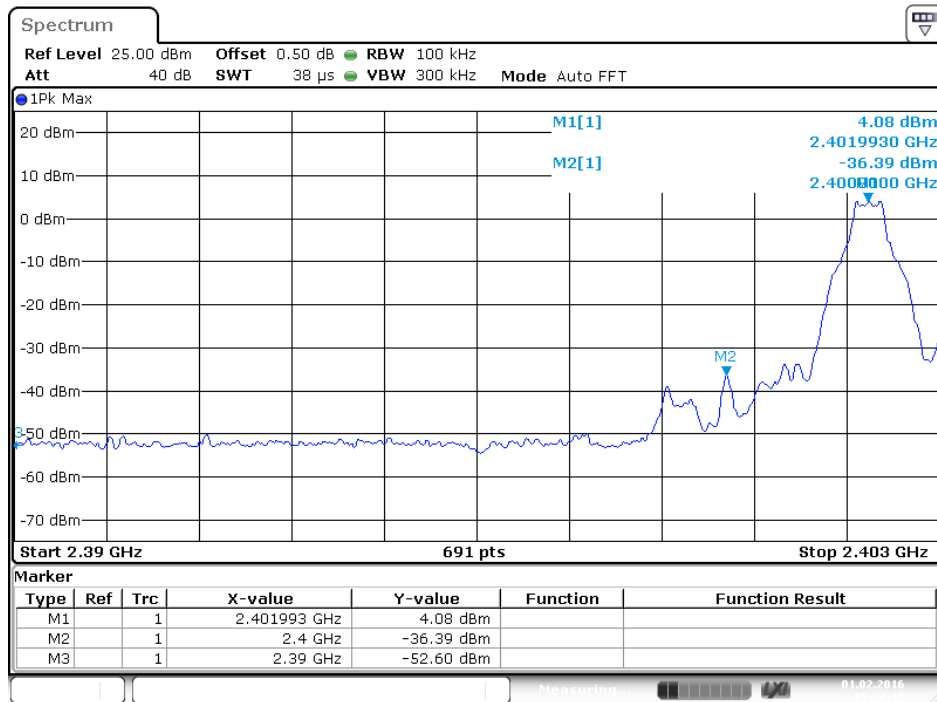
11.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with convenient frequency span including 100 kHz bandwidth from band edge.

11.5.3. The band edges was measured and recorded.

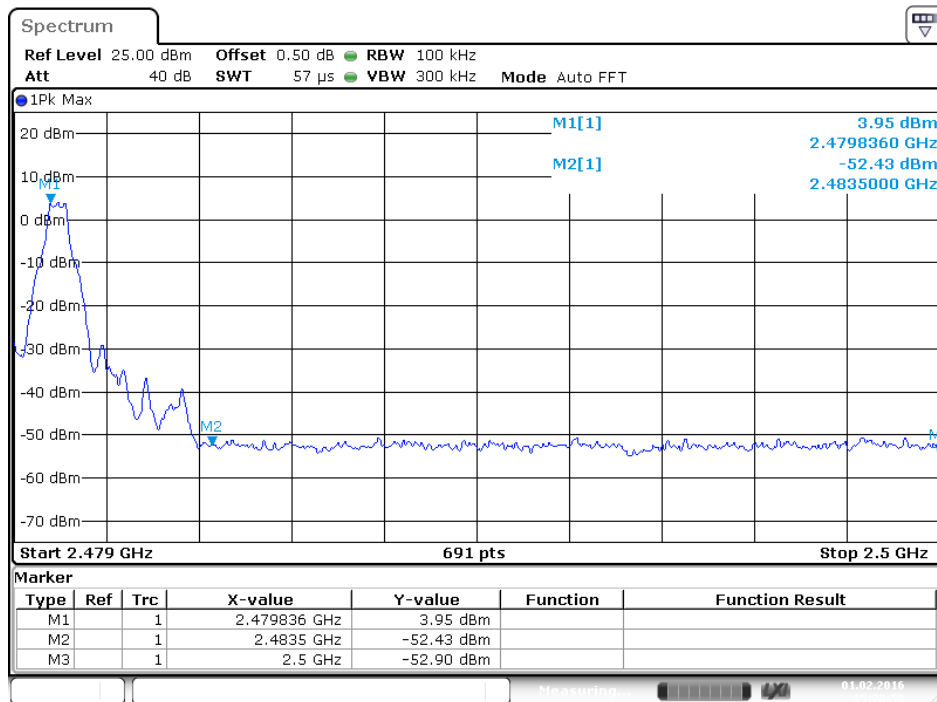
11.6. Test Result

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
GFSK		
2400.00	40.47	> 20dBc
2483.50	56.38	> 20dBc
Π/4-DQPSK Mode		
2400.00	33.86	> 20dBc
2483.50	53.11	> 20dBc
8DPSK		
2400.00	34.13	> 20dBc
2483.50	51.72	> 20dBc

GFSK

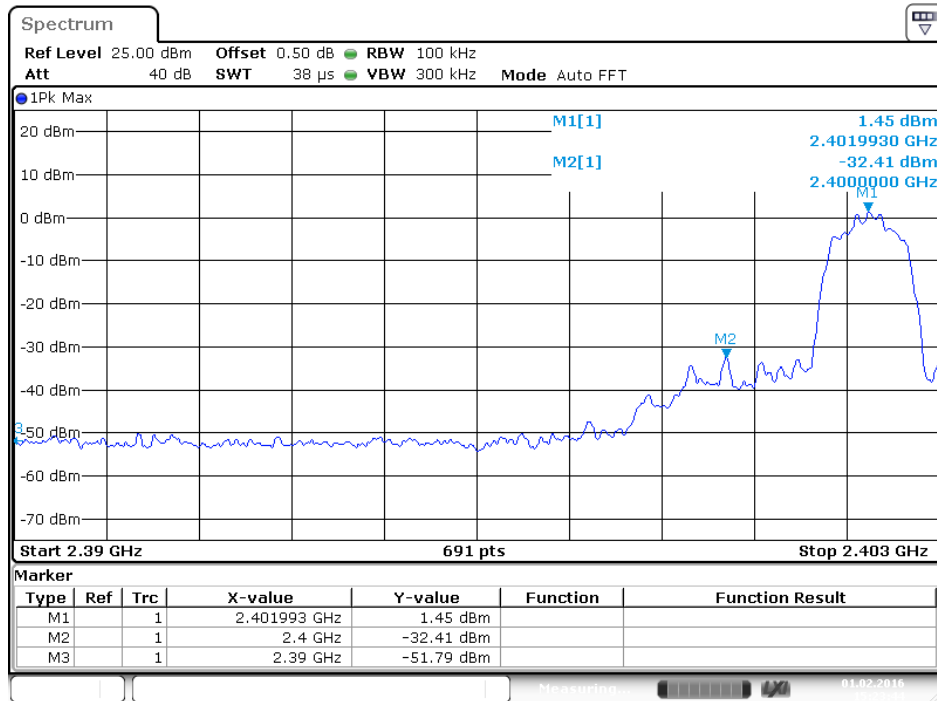


Date: 1.FEB.2016 15:22:10

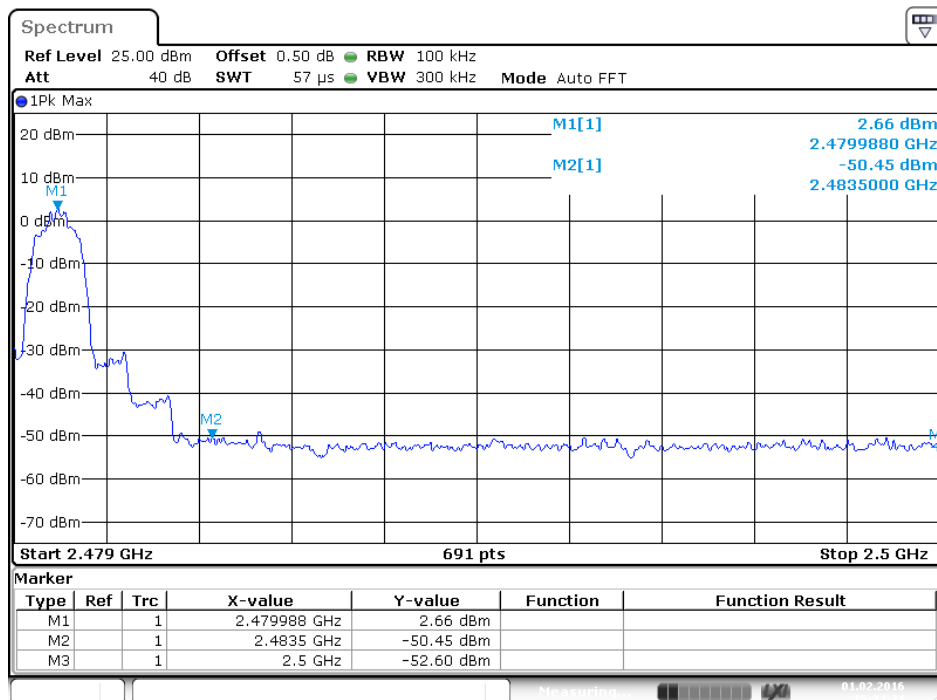


Date: 1.FEB.2016 15:20:58

Π/4-DQPSK Mode

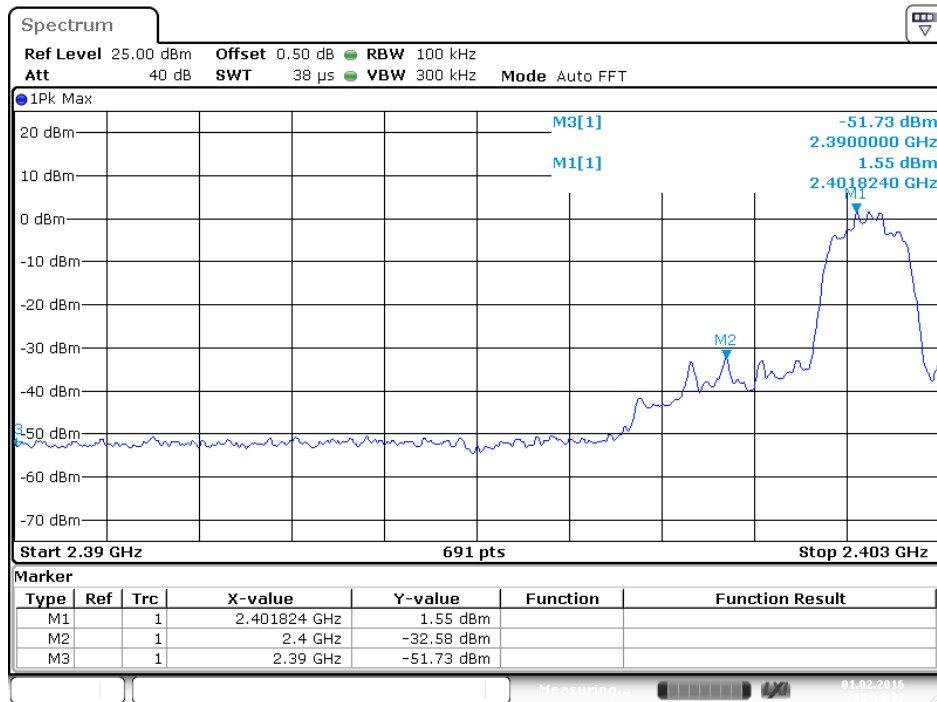


Date: 1.FEB.2016 15:23:44

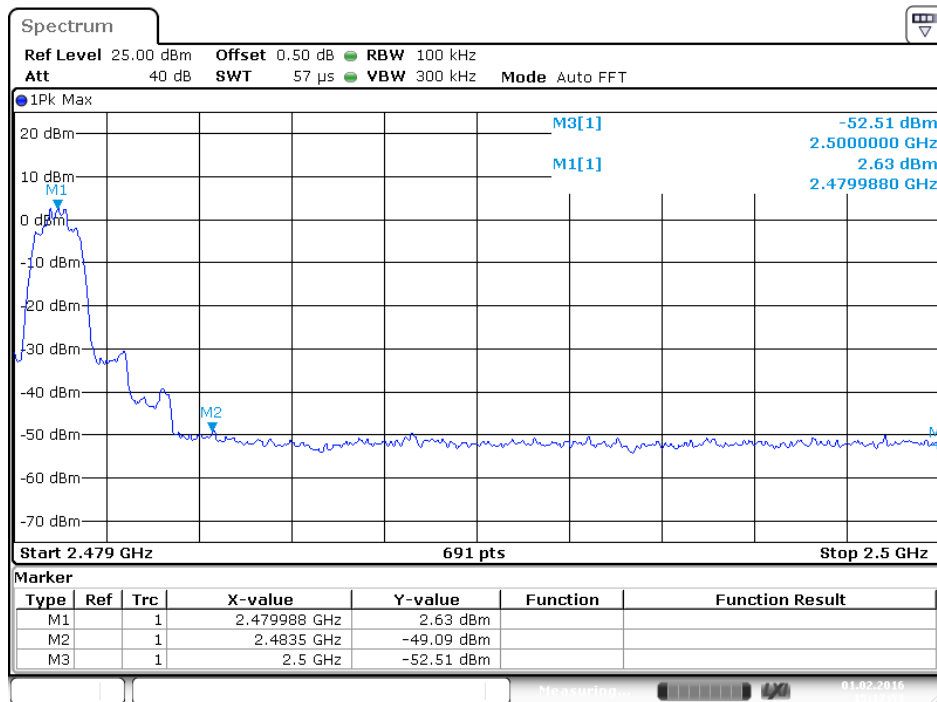


Date: 1.FEB.2016 15:24:34

8DPSK



Date: 1.FEB.2016 15:14:32



Date: 1.FEB.2016 15:17:54