PRECISE TESTING

FCC RADIO TEST REPORT
FCC ID: 2AB9SM53

Product： Bluetooth speaker
Trade Name：Jonter, BooM&Tech
Model Name：M53
Serial Model：XC5219, Roar

Prepared for

Shenzhen Jonter Digital Co.,Ltd

Building4, Jinfo Industrial Park, Hezhou Village, Xixiang Town, Baoan District, Shenzhen, China

Prepared by

DongGuan Precise Testing Service Co.,Ltd.

Room 203-204, 2F, Xinye Building, No.67 Shijing, Guanzhang Road, Dongguan, China

TEST RESULT CERTIFICATION

Applicant's name ..... Shenzhen Jonter Digital Co.,Ltd
Address ..... Building4, Jinfo Industrial Park, Hezhou Village, Xixiang Town, Baoan District, Shenzhen, China

Manufacture's Name... Shenzhen Jonter Digital Co.,Ltd
Address ..... Building4, Jinfo Industrial Park, Hezhou Village, Xixiang Town, Baoan District, Shenzhen, China

Product description

Product name ..... Bluetooth speaker

Model and/or type reference M53

Serial Model ..... XC5219, Roar

In all, the original product and the alternative product are the same.

Standards ..... FCC Part15.247

Test procedure ..... ANSI C63.10-2003

This device described above has been tested by PTS, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test .....

Date (s) of performance of tests ..... 25, Sep. 2014 ~ 17,Oct. 2014

Date of Issue ..... 17, Oct. 2014

Test Result ..... **Pass**

Testing Engineer : Jonas Song
Assistant

Technical Manager : David Liu
Supervisor

Authorized Signatory : Jacky Ou
Jacky Ou / Manager

2 Test Summary

Test Items	Test Requirement	Result
Spurious Radiated Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge Emissions	15.247(d)	PASS
Conducted Emissions	15.207	PASS
20dB Bandwidth	15.215c 15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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3 General Information

3.1 General Description of E.U.T.

Product Name : Bluetooth speaker

Model No. : M53

Brand Name : Jonter, BooM&Tech

Model Description : Series Production

Operation Frequency : 2400MHz ~ 2483MHz,79 channels in total, separated by 1MHz

Type of Modulation : GFSK, Pi/4DQPSK, 8DPSK

Oscillator : 26MHz for RF module

Antenna installation : PCB Printed Antenna

Antenna Gain : 0dBi

3.2 Details of E.U.T.

Technical Data : (1)DC 3.7V from battery
(2)AC 100-240V, 0.5A

3.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2403	3	2404	4	2405
5	2406	6	2407	7	2408	8	2409
9	2410	10	2411	11	2412	12	2413
13	2414	14	2415	15	2416	16	2417
17	2418	18	2419	19	2420	20	2421
21	2422	22	2423	23	2424	24	2425
25	2426	26	2427	27	2428	28	2429
29	2430	30	2431	31	2432	32	2433
33	2434	34	2435	35	2436	36	2437
37	2438	38	2439	39	2440	40	2441
41	2442	42	2443	43	2444	44	2445
45	2446	46	2447	47	2448	48	2449
49	2450	50	2451	51	2452	52	2453
53	2454	54	2455	55	2456	56	2457
57	2458	58	2459	59	2460	60	2461
61	2462	62	2463	63	2464	64	2465
65	2466	66	2467	67	2468	68	2469
69	2470	70	2471	71	2472	72	2473
73	2474	74	2475	75	2476	76	2477
77	2478	78	2479	79	2480	-	-

3.4 Description of Support Units

No.	Equipment	Manufacturer	Model No.	Serial No.
1.	N/A	N/A	N/A	N/A

3.5 Test Facility

The test facility has a test site registered with the following organizations:

NTEK Testing Technology Co., Ltd
Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.
FCC Registration No.:238937; IC Registration No.:9270A-1
CNAS Registration No.:L5516

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3.6 Test Location

All the tests were performed at:
1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.

4 Equipment Used during Test

4.1 Equipments List

Mains Terminal Disturbance Voltage (Conducted Emission)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Interval**
1.	EMI Test Receiver	R&S	ESCI	101155	Sep.17,2014	1 Year
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.17,2014	1 Year
3.	Cable	LARGE	RF300	-	Sep.17,2014	1 Year
3m Semi-anechoic Chamber for Radiation						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Interval**
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.17,2014	1 Year
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.17,2014	1 Year
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.19,2014	1 Year
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.17,2014	1 Year
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.19,2014	1 Year
6	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.06,2014	1 Year
7	Coaxial Cable (above 1GHz)	Top	25MHz-18GHz	EW02014-7	Apr.19,2014	1 Year

4.2 Measurement Uncertainty

Parameter	**Uncertainty**
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Temperature	± 1 °C
DC Source	±0.05%
Radiated Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 4.74 dB (Horn antenna 1000M~25000MHz)
Conducted Emissions test	3.64dB (150kHz~30MHz)

4.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

5 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz 56 dBμV between 0.5MHz & 5MHz 60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

EUT Operation:

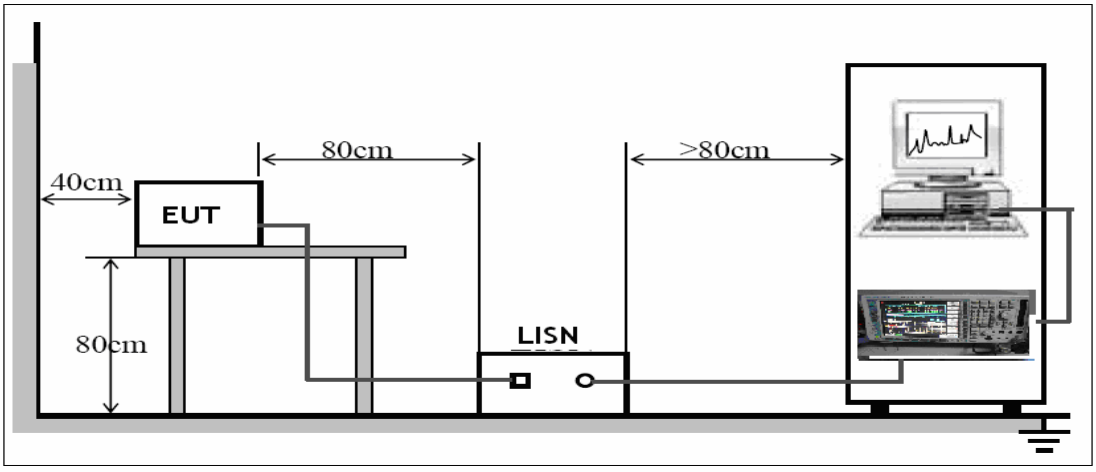
The pre-test was performed in Bluetooth linking, and the data were shown as follow.

The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.2 EUT Setup

The EUT was placed on the test table in shielding room.

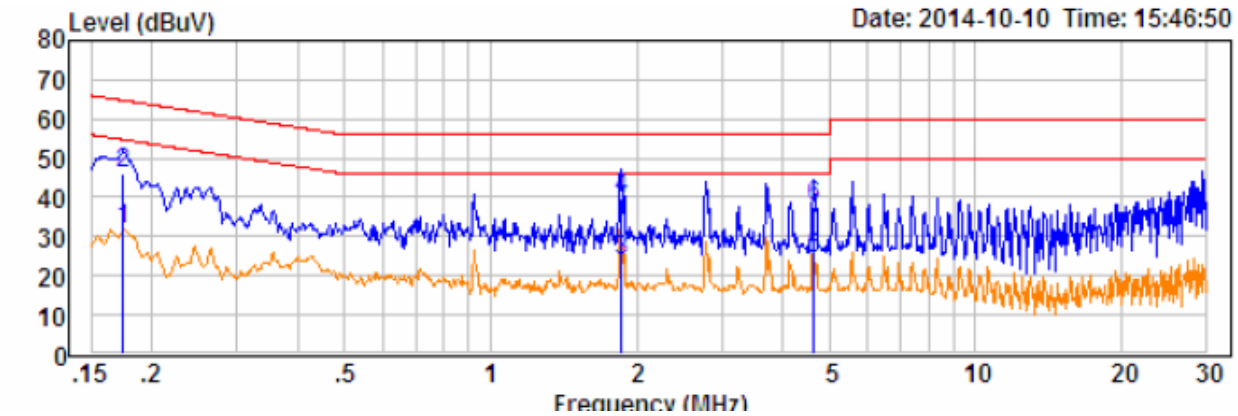


5.3 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

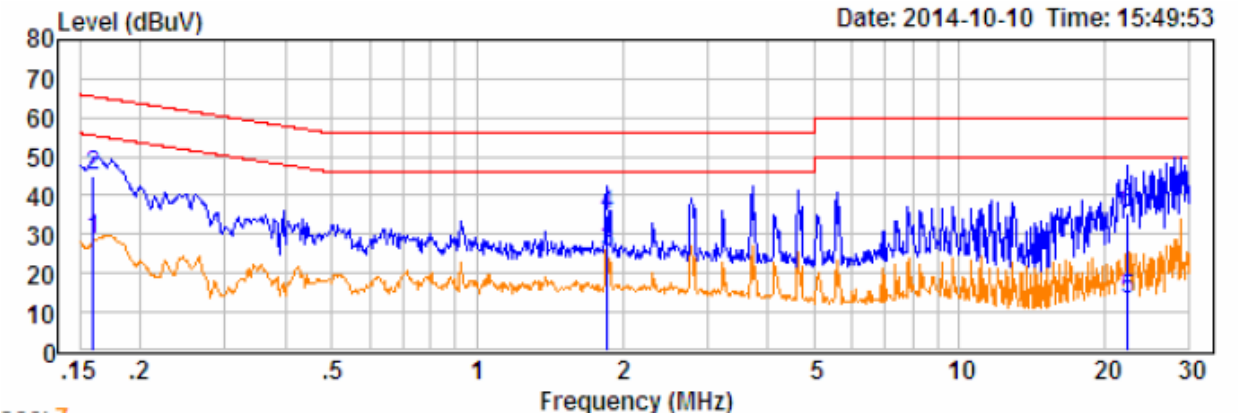
Test Mode: Running

Live line:



Freq MHz	Reading dBuV	Result dBuV/m	Limit	Over dBuV/m	Limit dB	Remark
0.17	20.54	31.74	54.72	-22.98	Average	LINE
0.17	34.89	46.09	64.72	-18.63	QP	LINE
1.86	12.71	24.01	46.00	-21.99	Average	LINE
1.86	28.49	39.79	56.00	-16.21	QP	LINE
4.65	12.94	24.27	46.00	-21.73	Average	LINE
4.65	26.37	37.70	56.00	-18.30	QP	LINE

Neutral line:



Freq MHz	Reading dBuV	Result dBuV/m	Limit	Over dBuV/m	Limit dB	Remark
0.16	17.24	28.44	55.47	-27.03	Average	NEUTRAL
0.16	33.95	45.15	65.47	-20.32	QP	NEUTRAL
1.86	14.12	25.42	46.00	-20.58	Average	NEUTRAL
1.86	23.70	35.00	56.00	-21.00	QP	NEUTRAL
22.30	1.63	13.02	50.00	-36.98	Average	NEUTRAL
22.30	24.12	35.51	60.00	-24.49	QP	NEUTRAL

6 Spurious Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

6.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

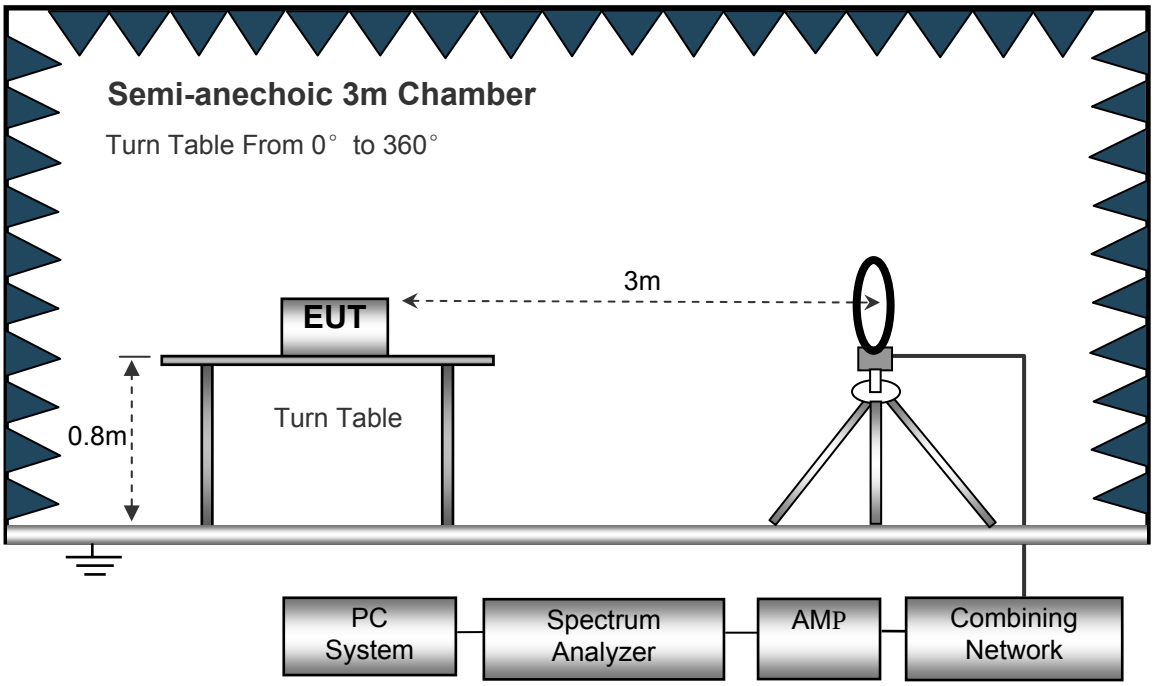
Atmospheric Pressure:1010 mbar

Operation Mode:

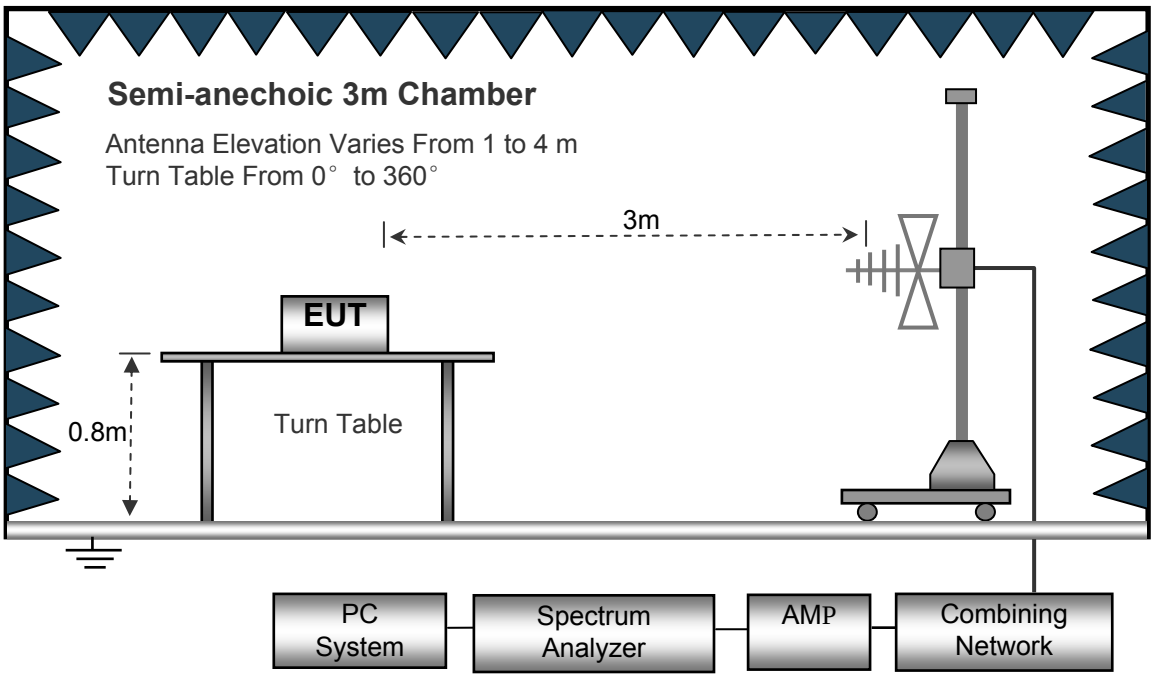
The EUT was tested in transmitting mode, and the data were shown as follow.

6.2 Test Setup

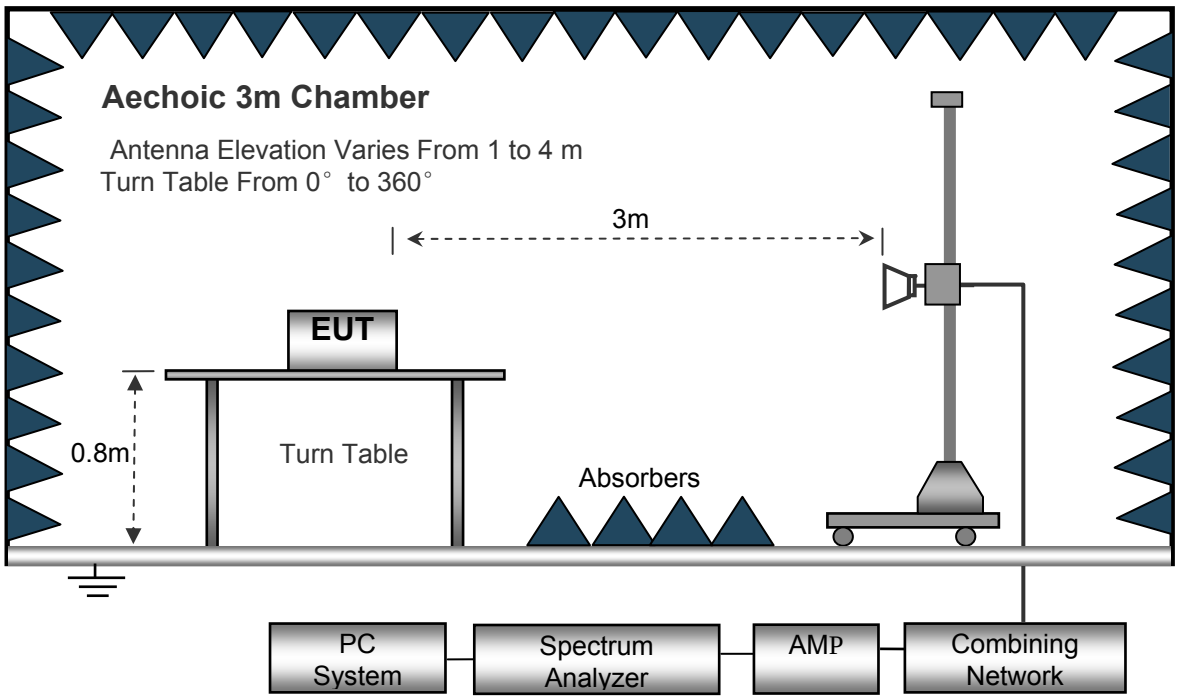
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



6.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested 9kHz to 25000MHz.

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz

Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

6.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

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 maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

6.6 Summary of Test Results

Test Frequency :Below 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 18GHz

Test mode: transmitting

All the modulation modes were tested, the data of the worst mode (GFSK) were recorded in the following pages.

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Lower Channel 2402MHz									
183.20	22.17	PK	356	1.8	H	11.13	33.30	40.00	-6.70
183.20	24.73	PK	91	1.3	V	11.13	35.86	40.00	-4.14
4804.00	52.30	PK	17	1.4	H	-1.06	51.24	74.00	-22.76
4804.00	44.17	Ave	17	1.4	V	-1.06	43.11	54.00	-10.89
7206.00	42.05	PK	231	1.7	H	1.33	43.38	74.00	-30.62
7206.00	40.20	Ave	231	1.7	V	1.33	41.53	54.00	-12.47
2343.54	46.46	PK	91	1.2	H	-13.19	33.27	74.00	-40.73
2343.54	38.67	Ave	91	1.2	V	-13.19	25.48	54.00	-28.52
2366.84	44.86	PK	323	1.5	H	-13.14	31.72	74.00	-42.28
2366.84	37.58	Ave	323	1.5	V	-13.14	24.44	54.00	-29.56
2489.91	44.41	PK	100	1.2	H	-13.08	31.33	74.00	-42.67
2489.91	36.45	Ave	100	1.2	V	-13.08	23.37	54.00	-30.63

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Center Channel 2441MHz									
183.20	22.94	PK	133	1.7	H	11.13	34.07	40.00	-5.93
183.20	23.69	PK	98	1.9	V	11.13	34.82	40.00	-5.18
4882.00	49.87	PK	164	1.5	H	-0.62	49.25	74.00	-24.75
4882.00	41.92	Ave	164	1.5	V	-0.62	41.30	54.00	-12.70
7323.00	46.96	PK	63	1.4	H	2.21	49.17	74.00	-24.83
7323.00	38.31	Ave	63	1.4	V	2.21	40.52	54.00	-13.48
2340.63	45.98	PK	134	1.9	H	-13.19	32.79	74.00	-41.21
2340.63	39.75	Ave	134	1.9	V	-13.19	26.56	54.00	-27.44
2363.54	44.29	PK	271	1.1	H	-13.14	31.15	74.00	-42.85
2363.54	36.65	Ave	271	1.1	V	-13.14	23.51	54.00	-30.49
2486.61	43.94	PK	171	1.9	H	-13.08	30.86	74.00	-43.14
2486.61	37.24	Ave	171	1.9	V	-13.08	24.16	54.00	-29.84

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Upper Channel 2480MHz									
183.20	20.91	PK	343	1.5	H	11.13	32.04	40.00	-7.96
183.20	24.82	PK	316	2.0	V	11.13	35.95	40.00	-4.05
4960.00	52.77	PK	299	1.7	H	-0.24	52.53	74.00	-21.47
4960.00	44.73	Ave	299	1.7	V	-0.24	44.49	54.00	-9.51
7440.00	46.81	PK	205	1.8	H	2.84	49.65	74.00	-24.35
7440.00	39.03	Ave	205	1.8	V	2.84	41.87	54.00	-12.13
2315.09	45.39	PK	314	1.7	H	-13.19	32.20	74.00	-41.80
2315.09	37.08	Ave	314	1.7	V	-13.19	23.89	54.00	-30.11
2389.64	44.16	PK	269	1.2	H	-13.14	31.02	74.00	-42.98
2389.64	36.82	Ave	269	1.2	V	-13.14	23.68	54.00	-30.32
2490.41	44.66	PK	354	1.8	H	-13.08	31.58	74.00	-42.42
2490.41	38.17	Ave	354	1.8	V	-13.08	25.09	54.00	-28.91

Test Frequency :Above 18GHz
The measurements were more than 20 dB below the limit and not reported.

7 Band Edge Measurement

Test Requirement:	Section 15.247(d) 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) (see Section 15.205(c)).
Test Method:	DA 00-705
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz

7.1 Test Procedure

1. The EUT was placed on a turntable which is 0.8m above ground plane

2. Measurement Distance is 3m

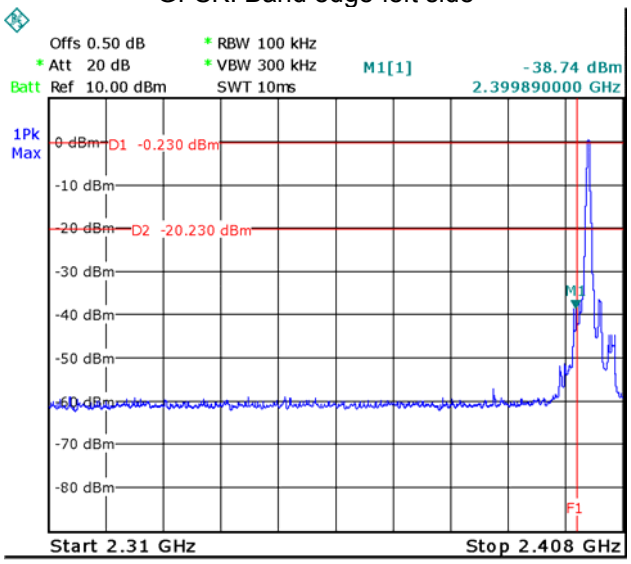
3. Detector: For Peak value:
RBW = 1 MHz for f ≥ 1 GHz
VBW ≥ RBW; Sweep = auto
Detector function = peak
Trace = max hold
For AVG value:
RBW = 1 MHz for f ≥ 1 GHz
VBW = 10Hz; Sweep = auto
Detector function = AVG
Trace = max hold

4.continuous transmitting

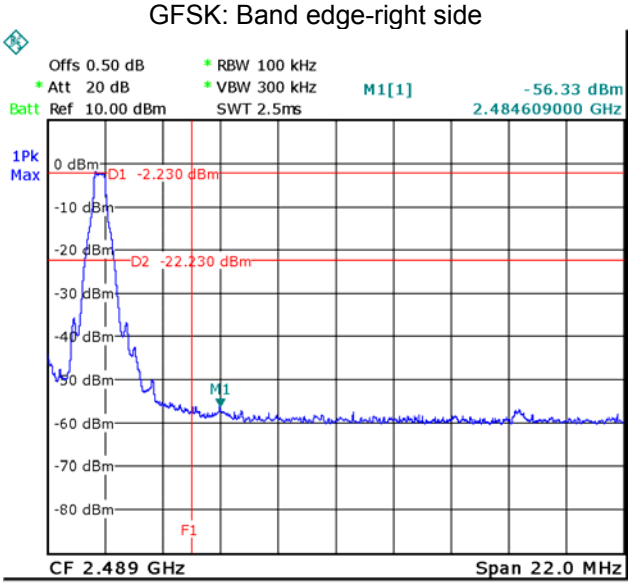
7.2 Test Result:

Test result plots shown as follows:

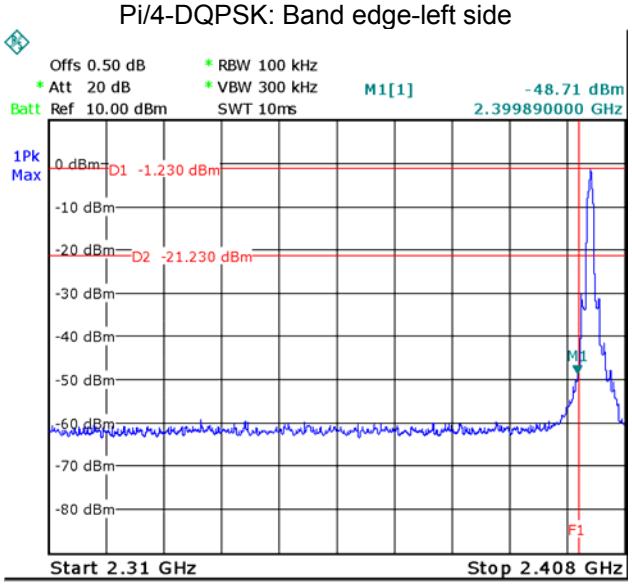
GFSK: Band edge-left side



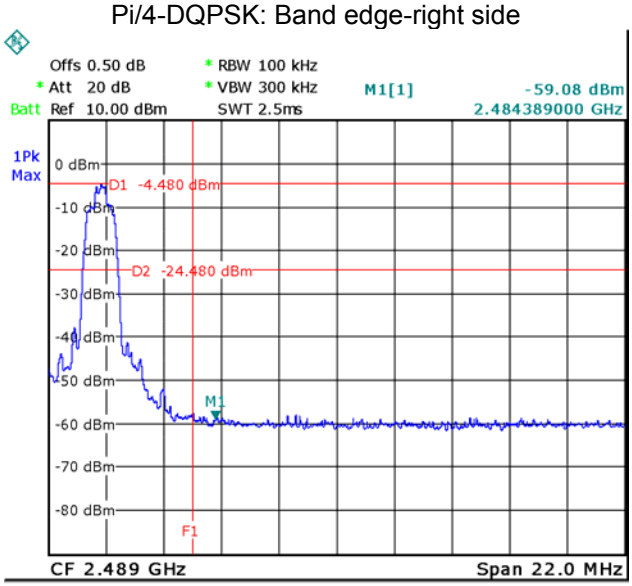
GFSK: Band edge-right side



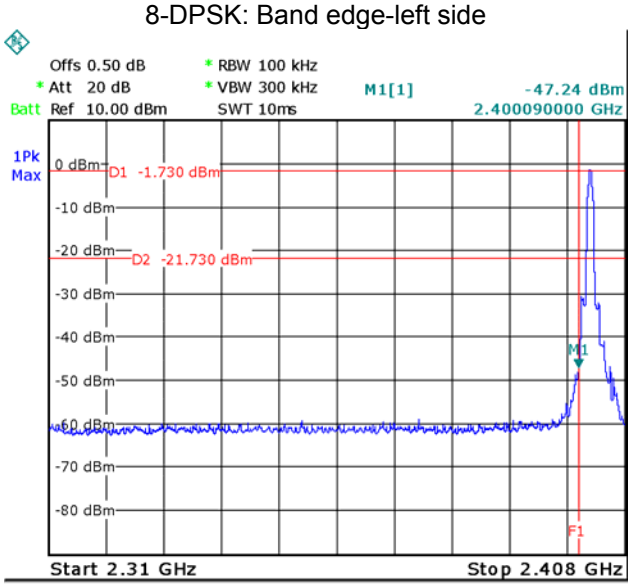
Pi/4-DQPSK: Band edge-left side



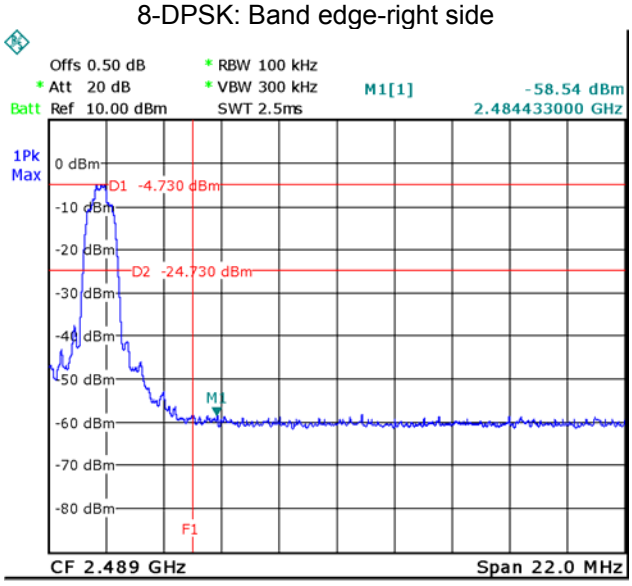
Pi/4-DQPSK: Band edge-right side



8-DPSK: Band edge-left side



8-DPSK: Band edge-right side



8 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

8.1 Test Procedure:

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

2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

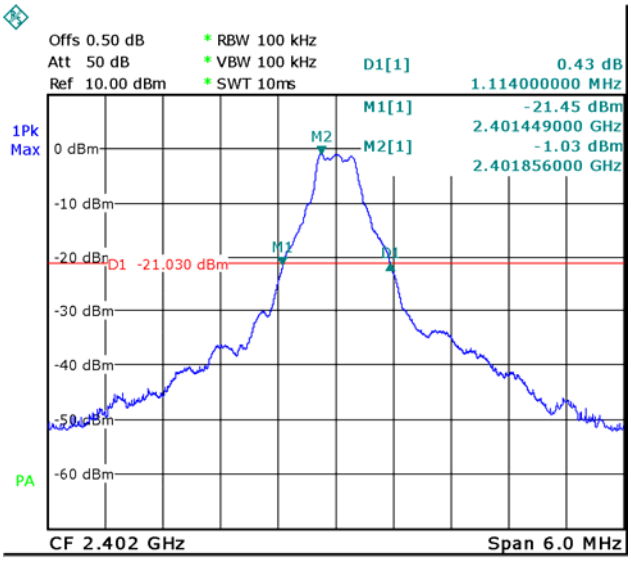
8.2 Test Result:

Modulation	Test Channel	Bandwidth(MHz)
GFSK	Lower	1.114
	Middle	1.138
	Upper	1.114
Pi/4DQPSK	Lower	1.353
	Middle	1.365
	Upper	1.377
8DPSK	Lower	1.341
	Middle	1.353
	Upper	1.365

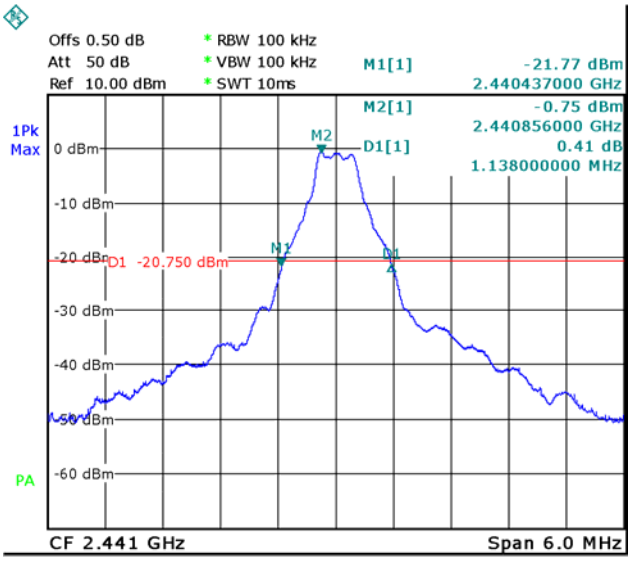
Test result plot as follows:

Modulation:GFSK

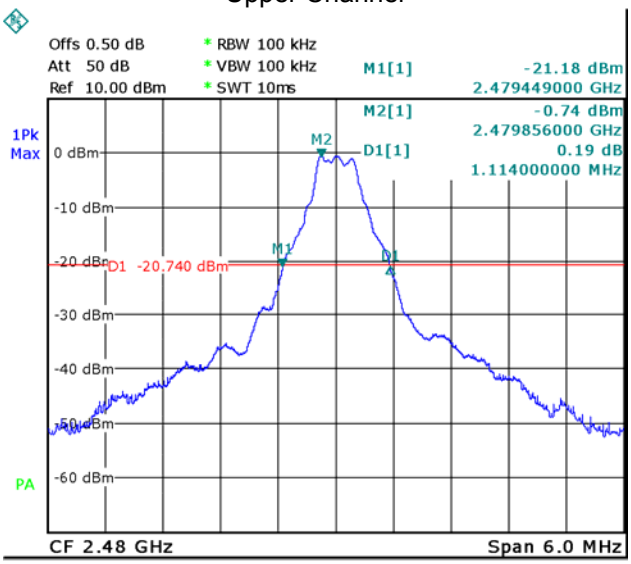
Lower Channel



Middle Channel

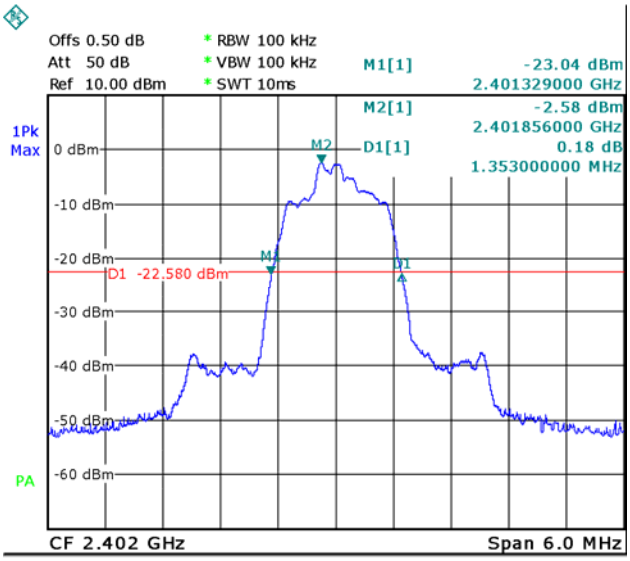


Upper Channel

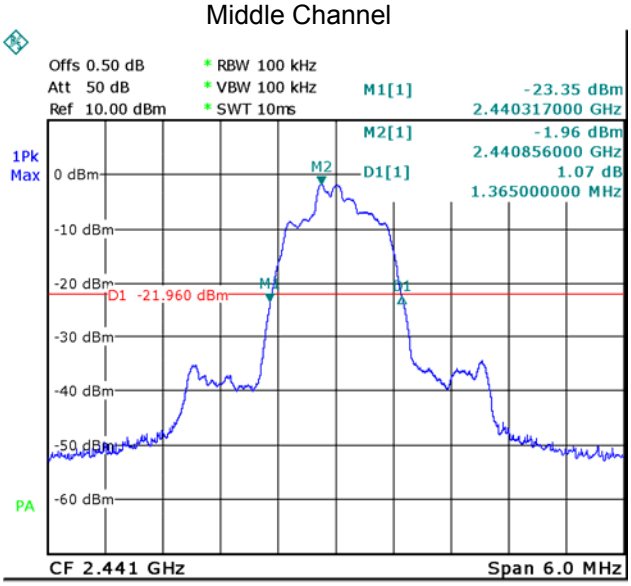


Modulation: Pi/4DQPSK

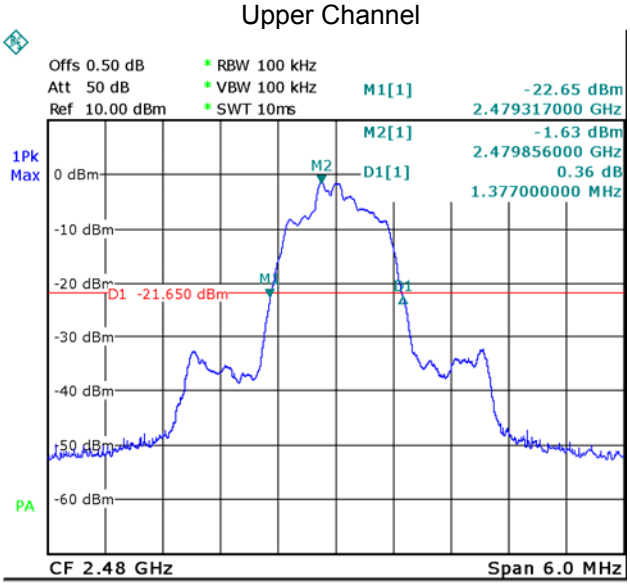
Lower Channel



Middle Channel

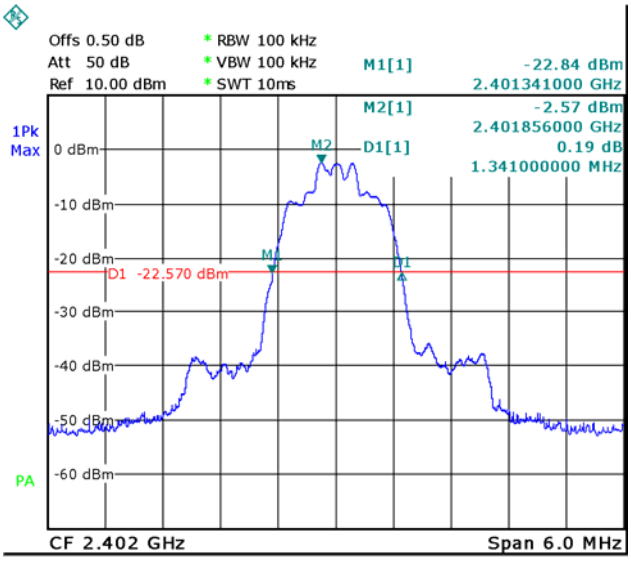


Upper Channel

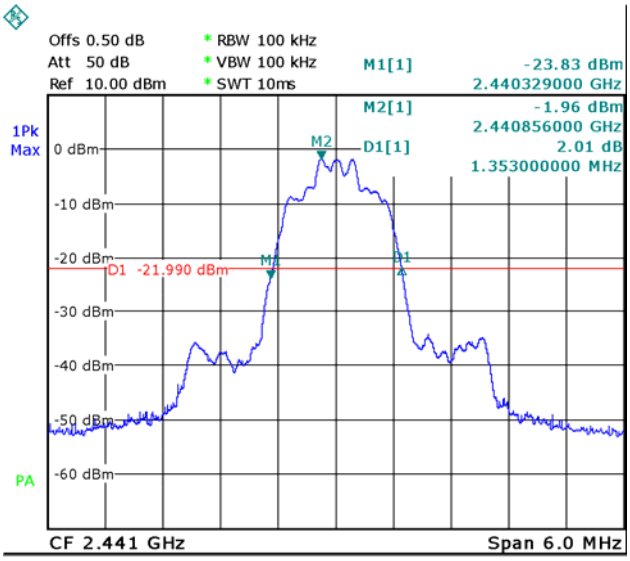


Modulation: 8DPSK

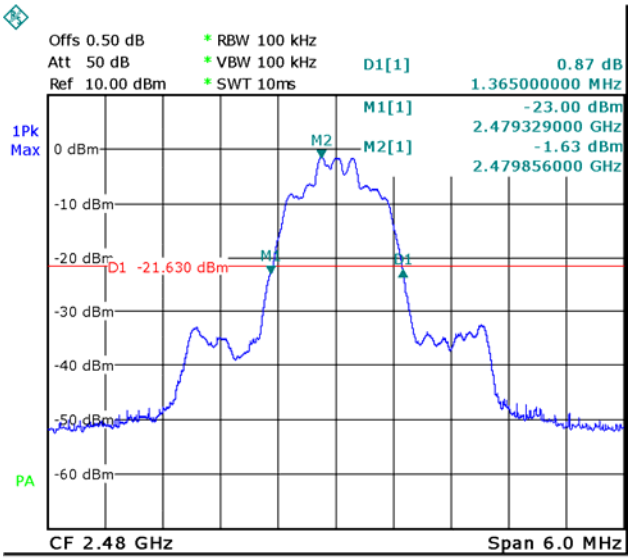
Lower Channel



Middle Channel



Upper Channel



9 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483 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 MHz band: 0.125 watts. Refer to the result "Number of Hopping Frequency" of this document. The 1watts (30 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

9.1 Test Procedure:

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

2. Set the spectrum analyzer: RBW = 3 MHz. VBW =3 MHz. Sweep = auto; Detector Function = Peak.

3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

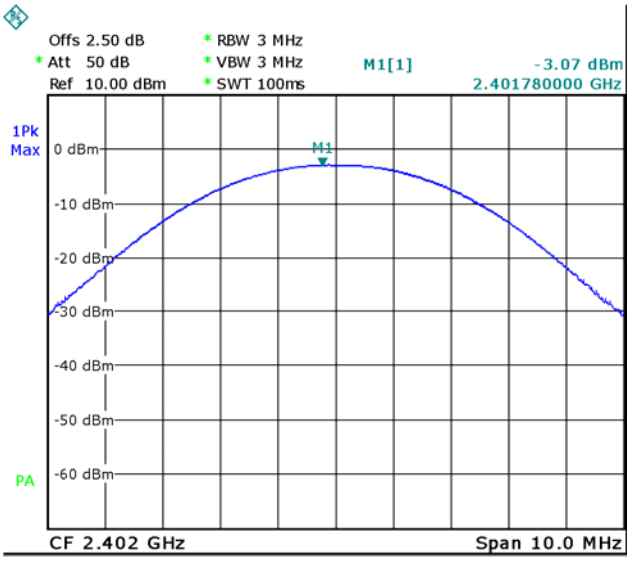
9.2 Test Result:

Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Lower	--3.07	30
	Middle	-4.48	30
	Upper	-6.88	30
Pi/4DQPSK	Lower	-4.33	30
	Middle	-5.72	30
	Upper	-7.76	30
8DPSK	Lower	-4.09	30
	Middle	-5.56	30
	Upper	-7.76	30

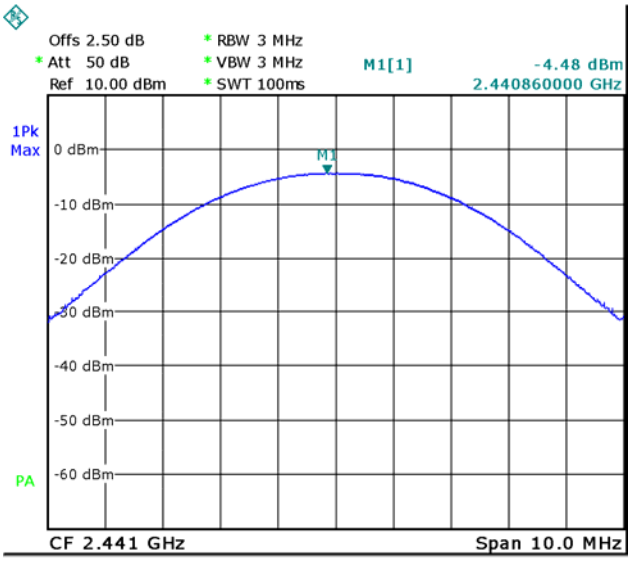
Test result plot as follows:

Modulation:GFSK

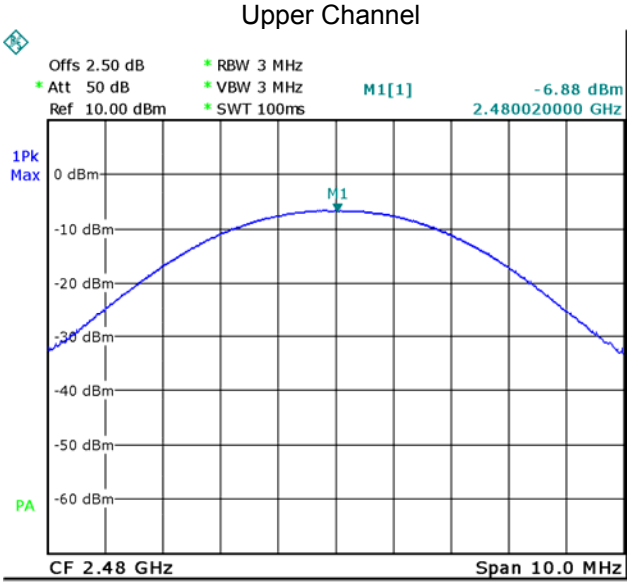
Lower Channel



Middle Channel

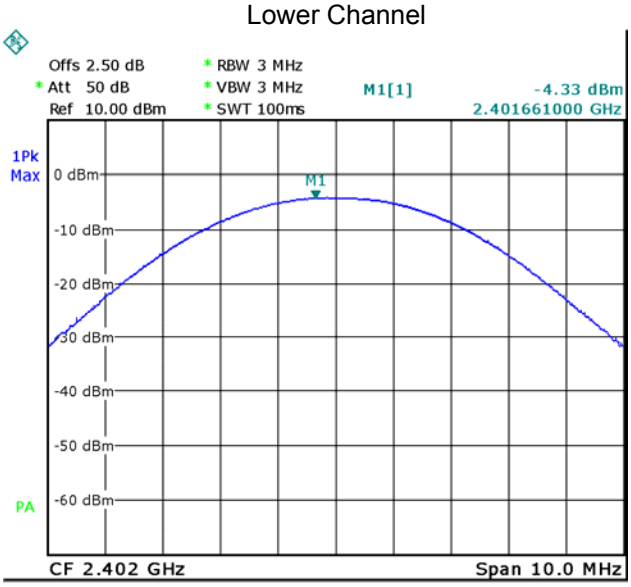


Upper Channel

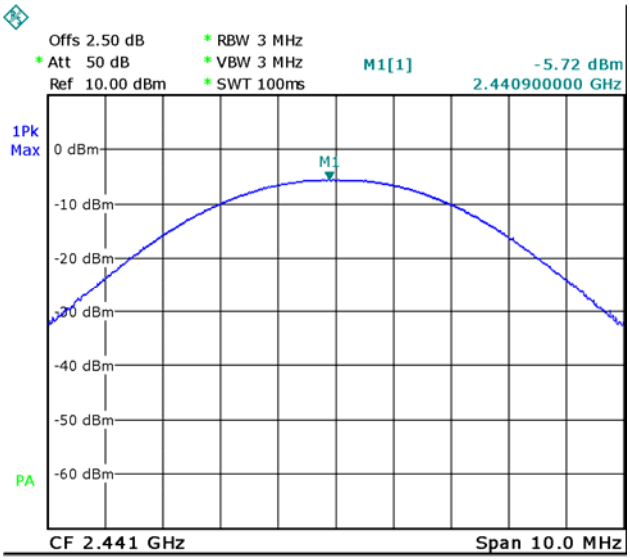


Modulation: Pi/4DQPSK

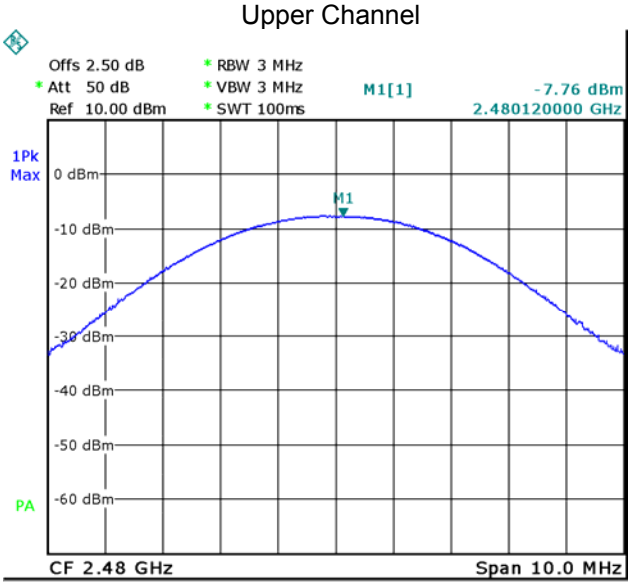
Lower Channel



Middle Channel

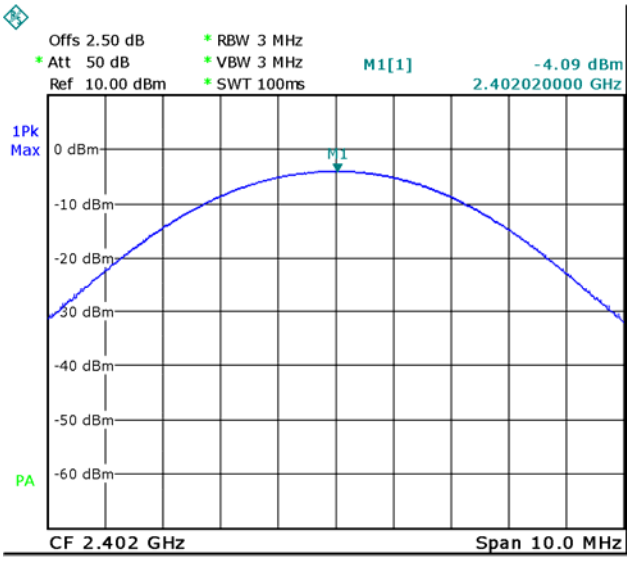


Upper Channel

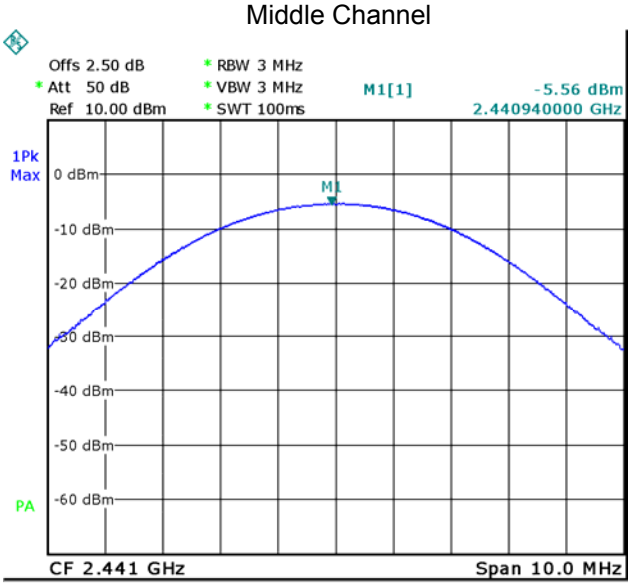


Modulation: 8DPSK

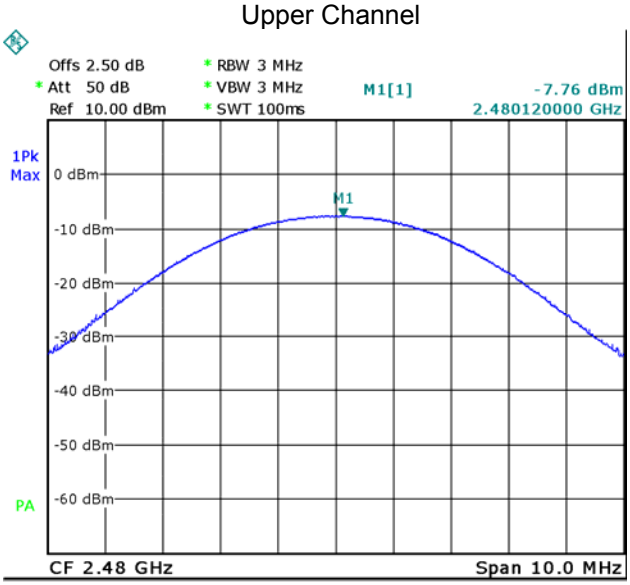
Lower Channel



Middle Channel



Upper Channel



10 Hopping Channel Separation

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Limit: Regulation 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 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 1W.

Test Mode: Test in hopping transmitting operating mode.

10.1 Test Procedure:

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

2. Set the spectrum analyzer: RBW = 100KHz. VBW = 100KHz , Span = 6MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

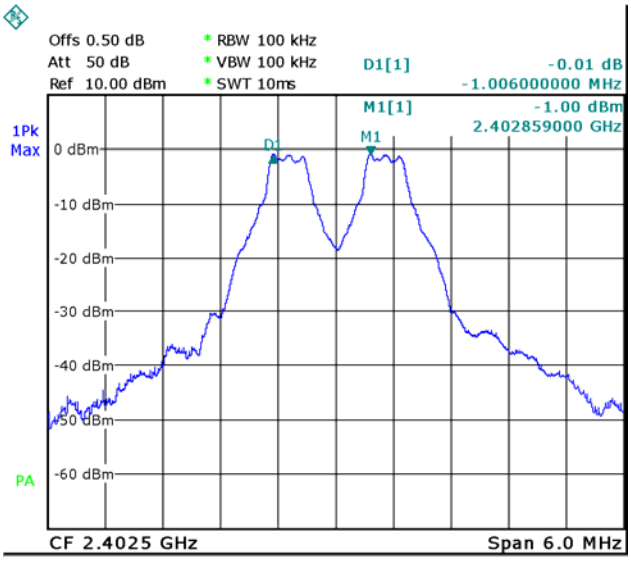
10.2 Test Result:

Modulation	Test Channel	Separation (MHz)
GFSK	Lower	1.006
	Middle	1.006
	Upper	1.006
Pi/4DQPSK	Lower	1.006
	Middle	1.006
	Upper	1.006
8DPSK	Lower	1.006
	Middle	1.006
	Upper	1.006

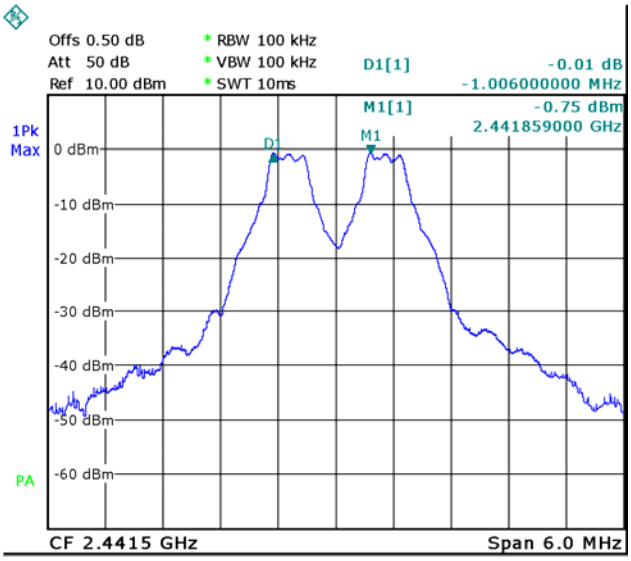
Test result plot as follows:

Modulation:GFSK

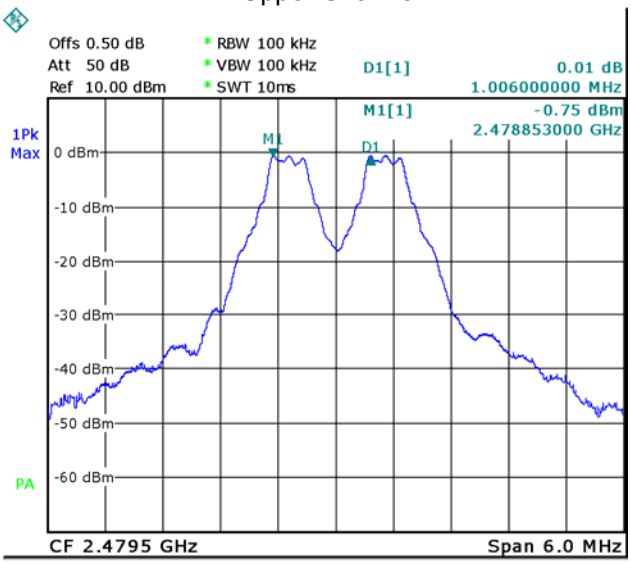
Lower Channel



Middle Channel

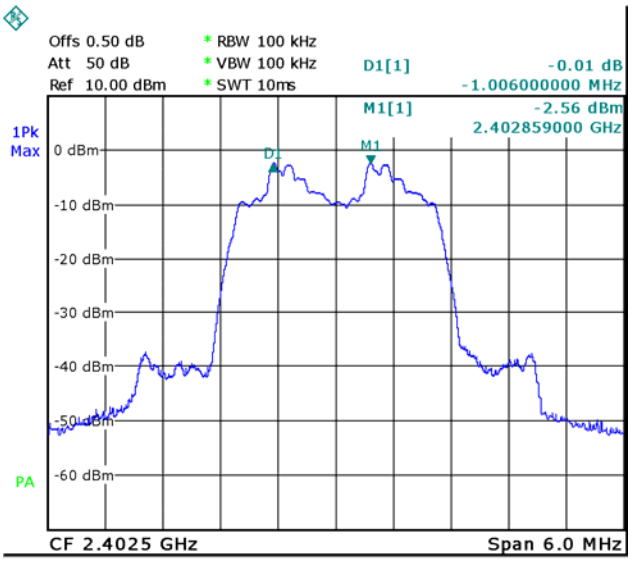


Upper Channel

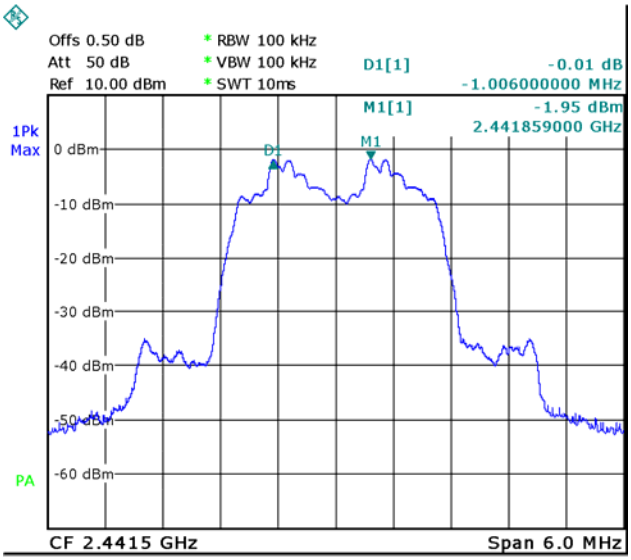


Modulation: Pi/4DQPSK

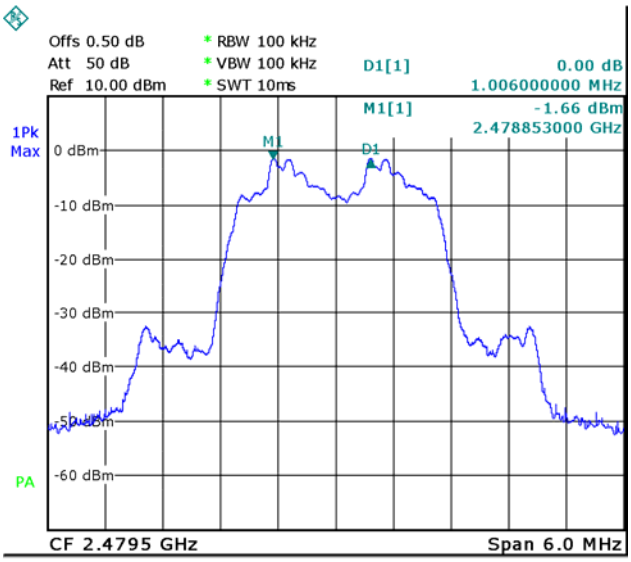
Lower Channel



Middle Channel

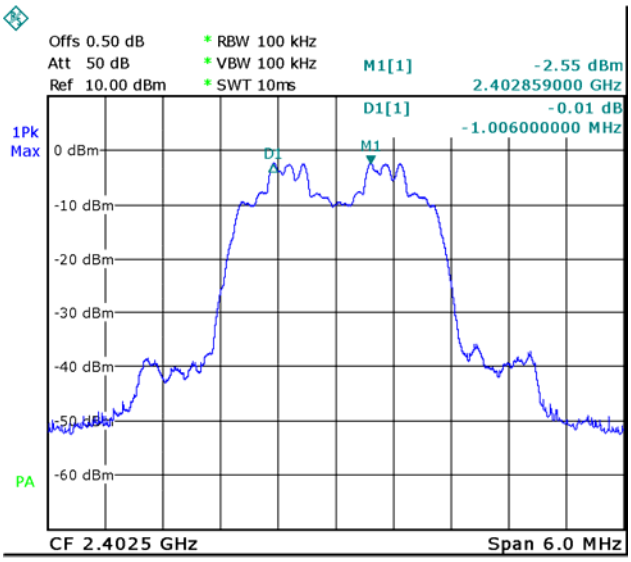


Upper Channel

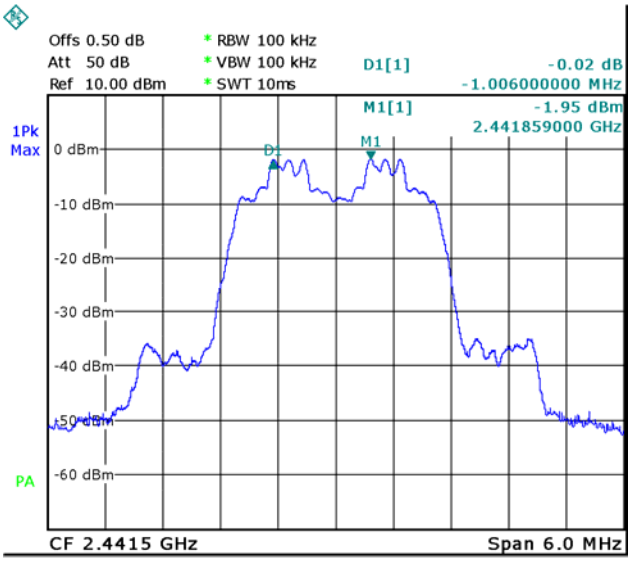


Modulation: 8DPSK

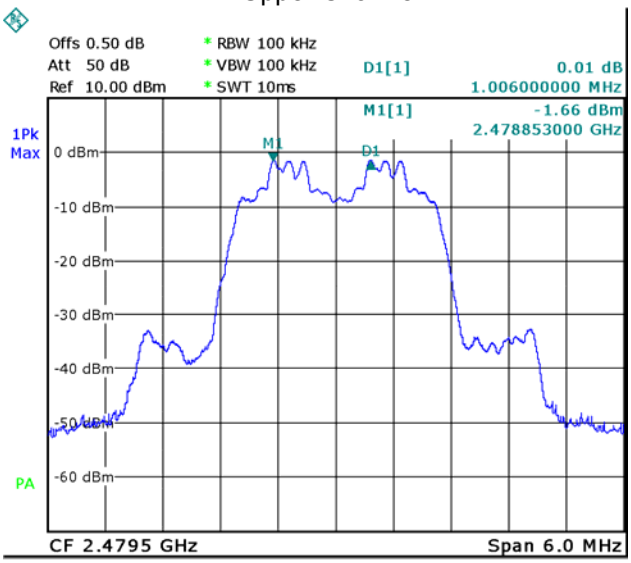
Lower Channel



Middle Channel



Upper Channel



11 Number of Hopping Frequency

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Limit: Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483

MHz band shall use at least 15 channels.

Test Mode: Test in hopping transmitting operating mode.

11.1 Test Procedure:

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

2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

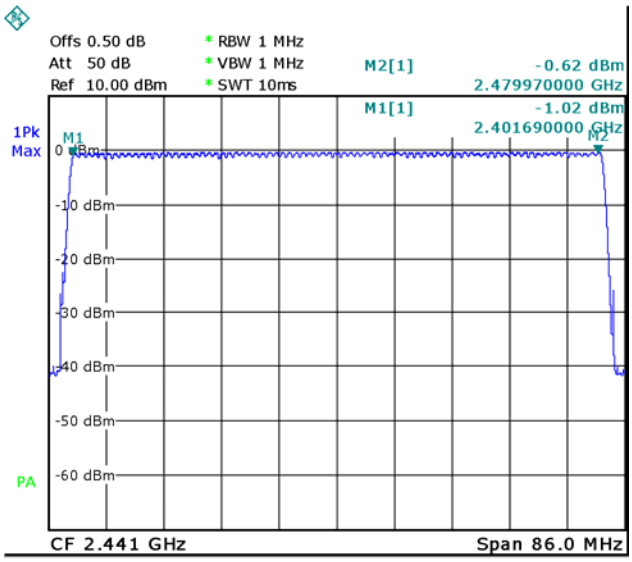
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Centre Frequency = 2.441GHz, Span = 86MHz. Sweep=auto;

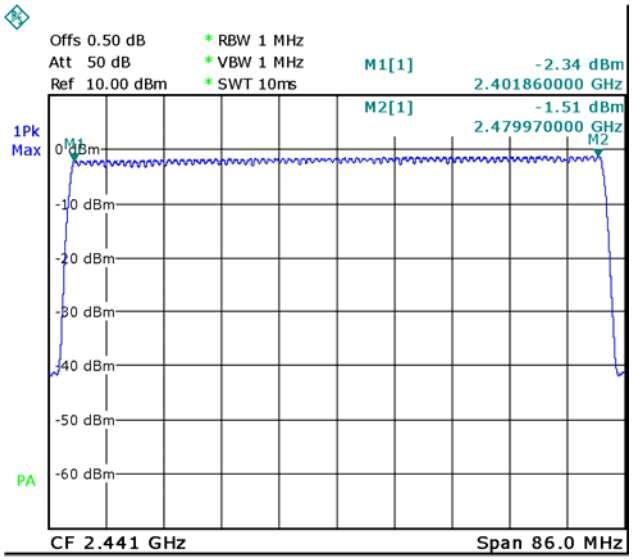
11.2 Test Result:

Total Channels are 79 Channels.

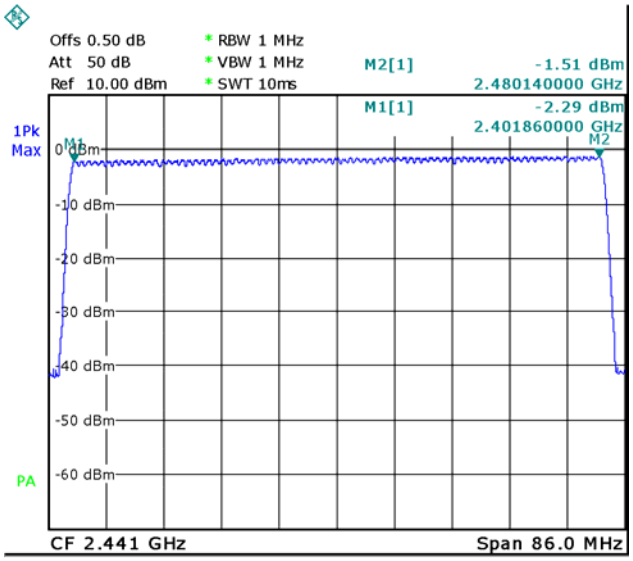
Modulation: GFSK



Modulation: Pi/4DQPSK



Modulation: 8DPSK



12 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483 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.
Test Mode:	Test in hopping transmitting operating mode.

12.1 Test Procedure:

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

2.Set spectrum analyzer span = 0. centred on a hopping channel;

3.Set RBW = 1MHz and VBW = 1MHz. Sweep = as necessary to capture the entire dwell time per hopping channel.

4.Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

12.2 Test Result:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period
The test period: T= 0.4(s) * 79 = 31.6 (s)
DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).
DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

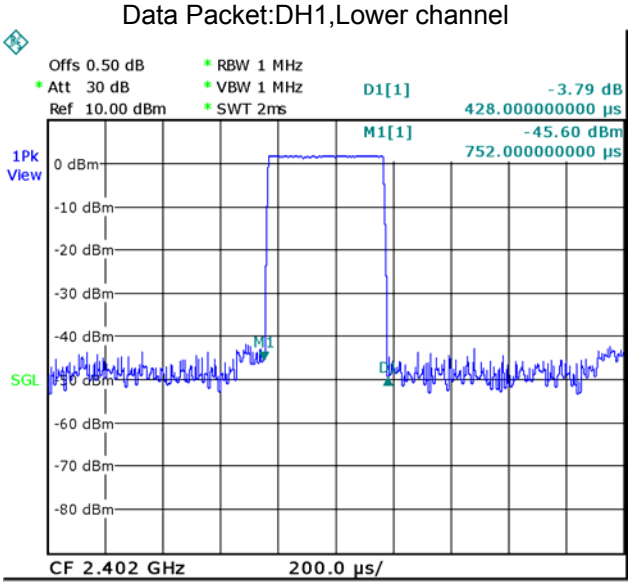
DH1 Packet permit maximum 1600 / 79 / 2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

Data Packet	Dwell Time(s)
DH5	1600/79/6*31.6*(MkrDelta)/1000
DH3	1600/79/4*31.6*(MkrDelta)/1000
DH1	1600/79/2*31.6*(MkrDelta)/1000
Remark	Mkr Delta is single pulse time.

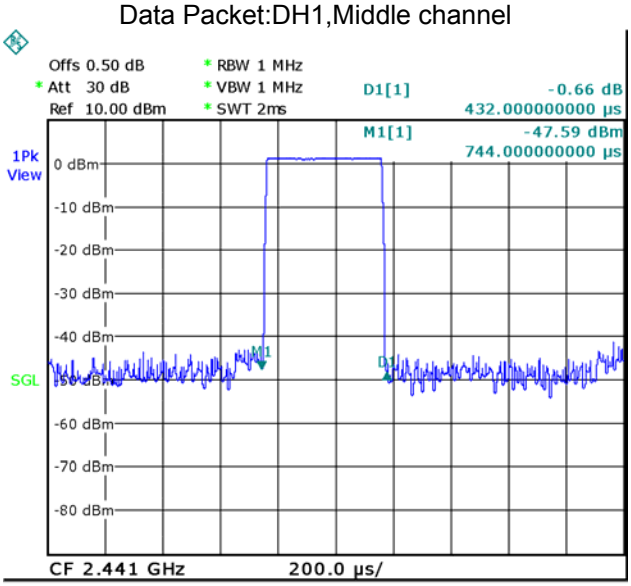
Modulation	Frequency	Data Packet	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
GFSK	Lower channel	DH1	0.428	0.137	0.400
	Middle channel		0.432	0.138	0.400
	Upper channel		0.436	0.140	0.400
	Lower channel	DH3	1.704	0.273	0.400
	Middle channel		1.686	0.270	0.400
	Upper channel		1.692	0.271	0.400
	Lower channel	DH5	2.950	0.315	0.400
	Middle channel		2.958	0.316	0.400
	Upper channel		2.982	0.318	0.400
Pi/4DQPSK	Lower channel	DH1	0.444	0.142	0.400
	Middle channel		0.440	0.141	0.400
	Upper channel		0.440	0.141	0.400
	Lower channel	DH3	1.696	0.271	0.400
	Middle channel		1.684	0.269	0.400
	Upper channel		1.696	0.271	0.400
	Lower channel	DH5	2.970	0.317	0.400
	Middle channel		2.930	0.313	0.400
	Upper channel		2.938	0.313	0.400
8DPSK	Lower channel	DH1	0.440	0.141	0.400
	Middle channel		0.440	0.141	0.400
	Upper channel		0.444	0.142	0.400
	Lower channel	DH3	1.698	0.272	0.400
	Middle channel		1.716	0.275	0.400
	Upper channel		1.710	0.274	0.400
	Lower channel	DH5	2.966	0.316	0.400
	Middle channel		2.998	0.320	0.400
	Upper channel		2.982	0.318	0.400

Modulation:GFSK

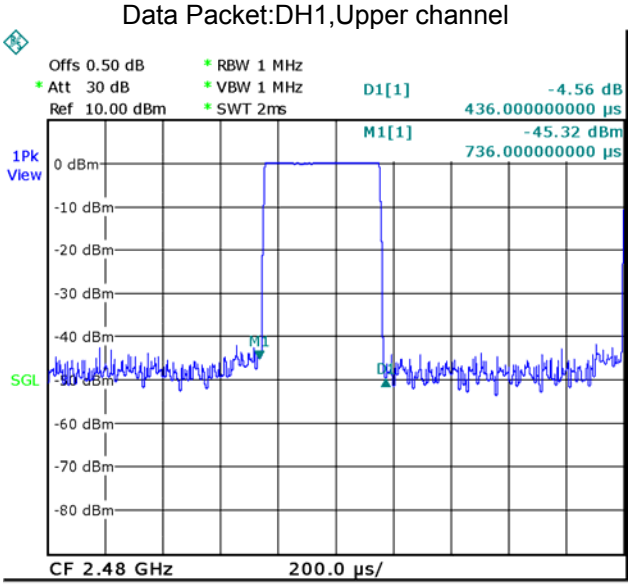
Data Packet:DH1,Lower channel



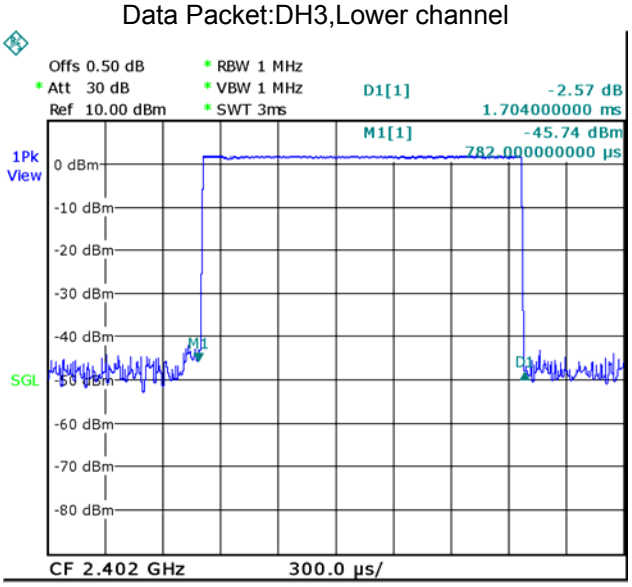
Data Packet:DH1,Middle channel



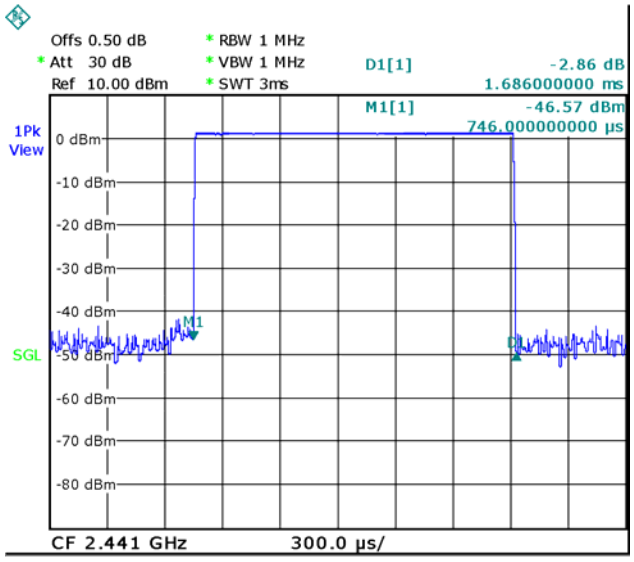
Data Packet:DH1,Upper channel



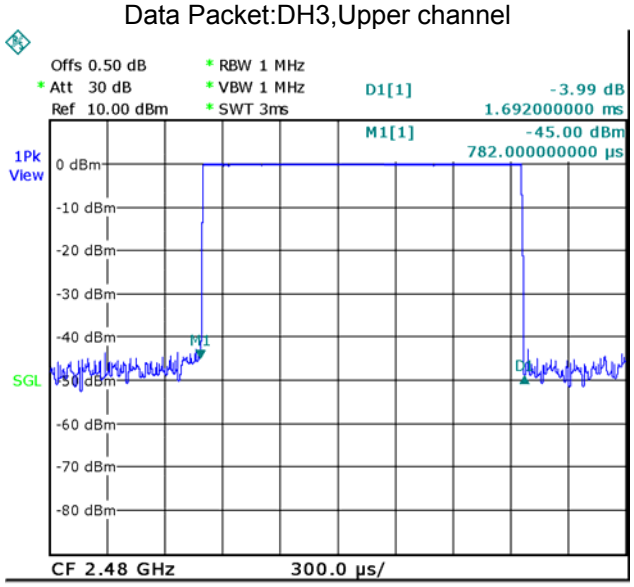
Data Packet:DH3,Lower channel



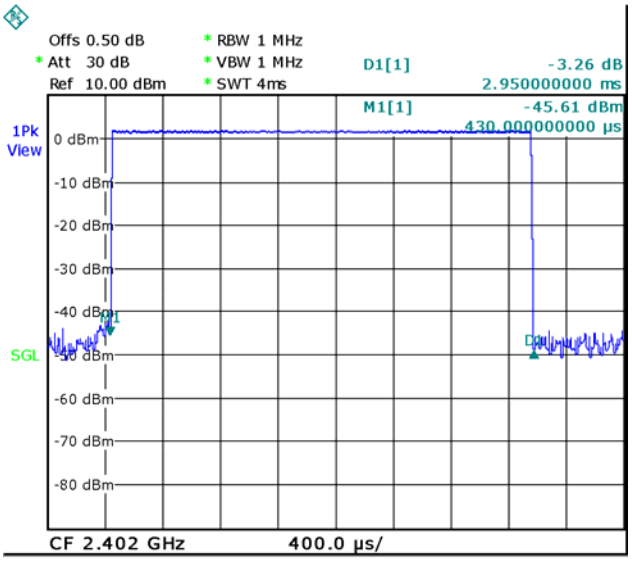
Data Packet:DH3,Middle channel



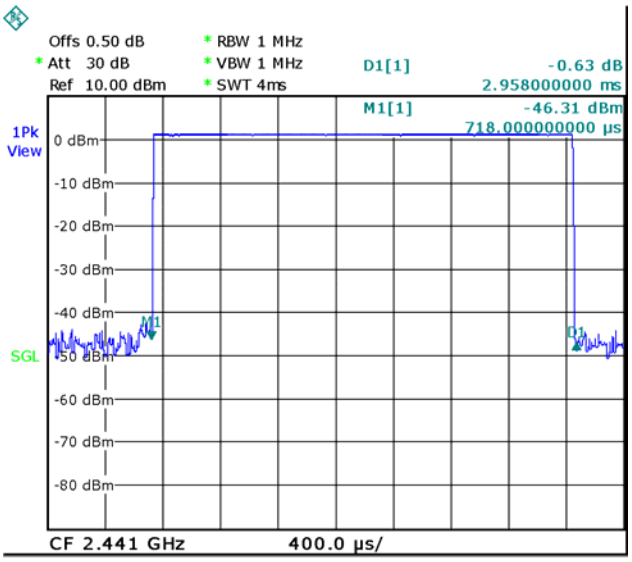
Data Packet:DH3,Upper channel



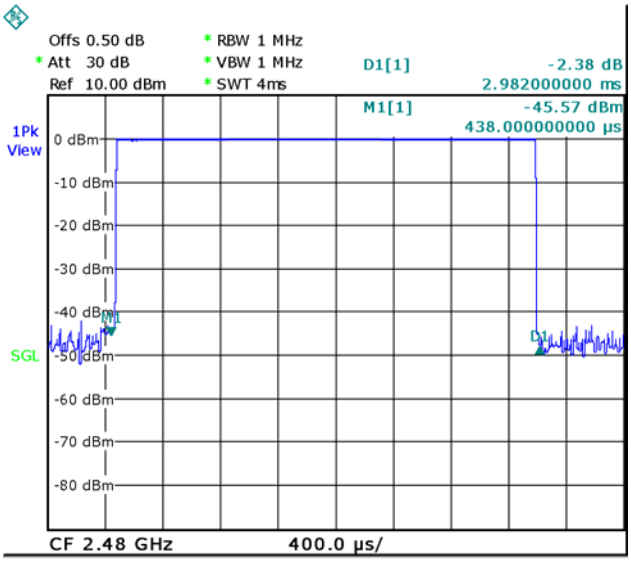
Data Packet:DH5,Lower channel



Data Packet:DH5,Middle channel

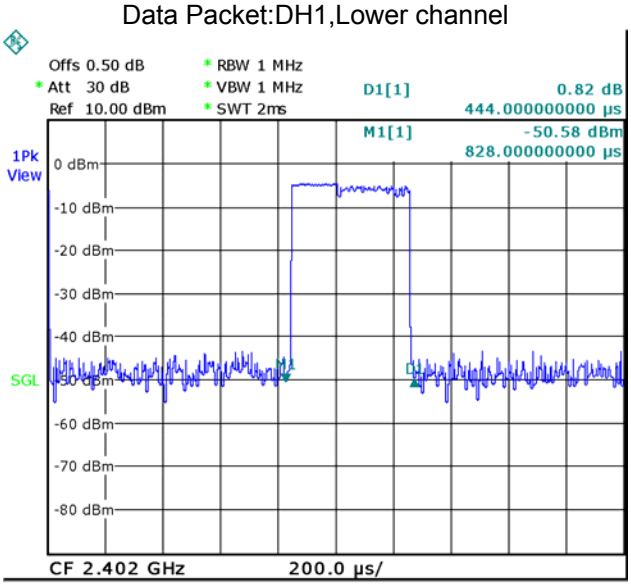


Data Packet:DH5,Upper channel

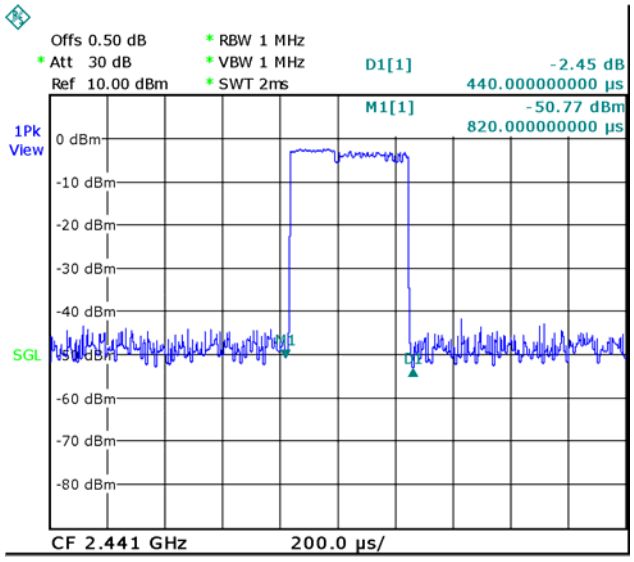


Modulation: Pi/4DQPSK

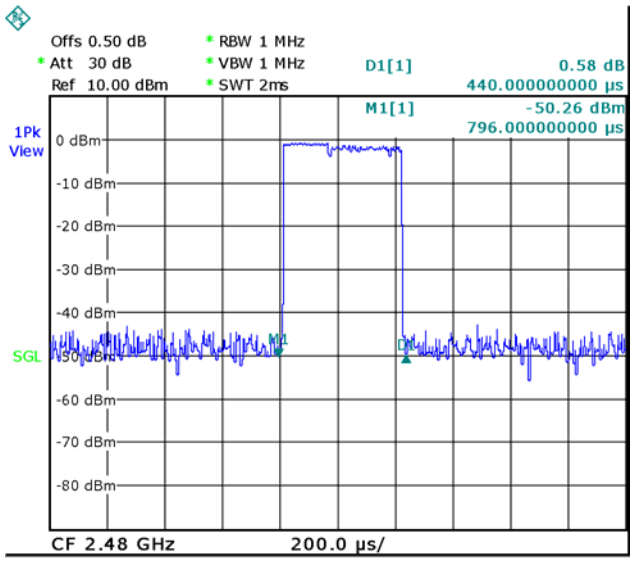
Data Packet:DH1,Lower channel



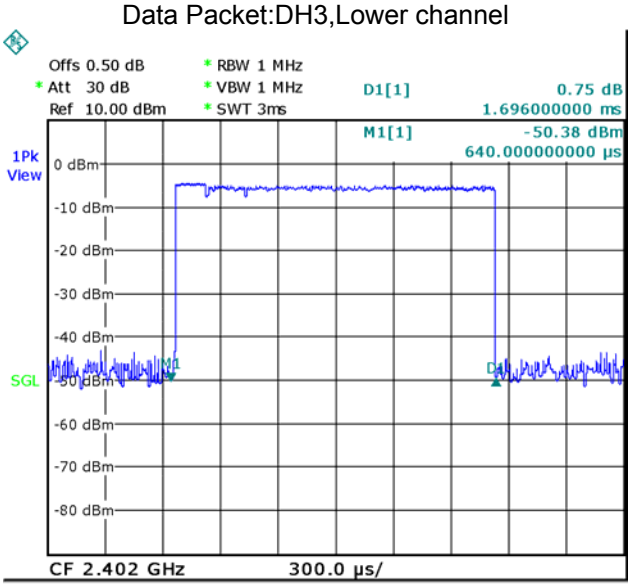
Data Packet:DH1,Middle channel



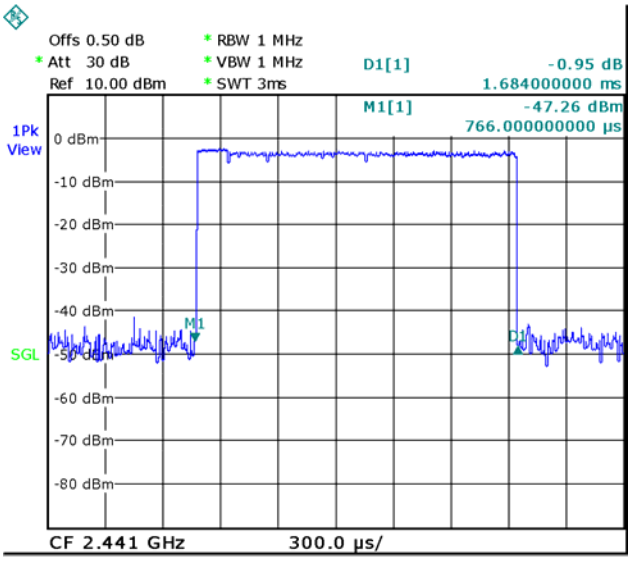
Data Packet:DH1,Upper channel



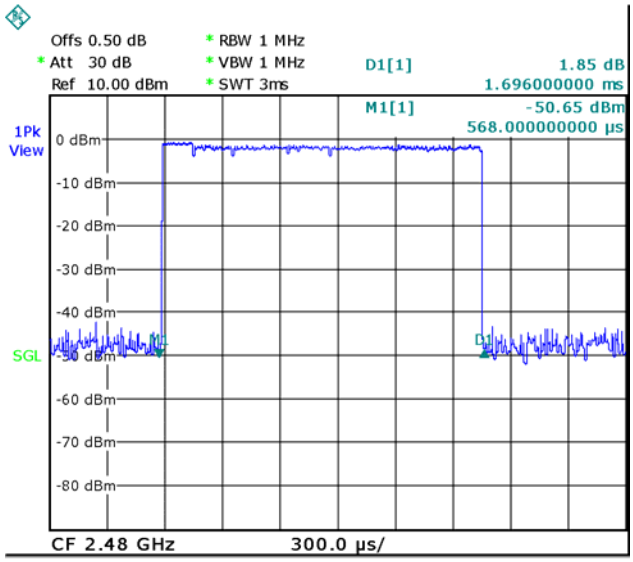
Data Packet:DH3,Lower channel



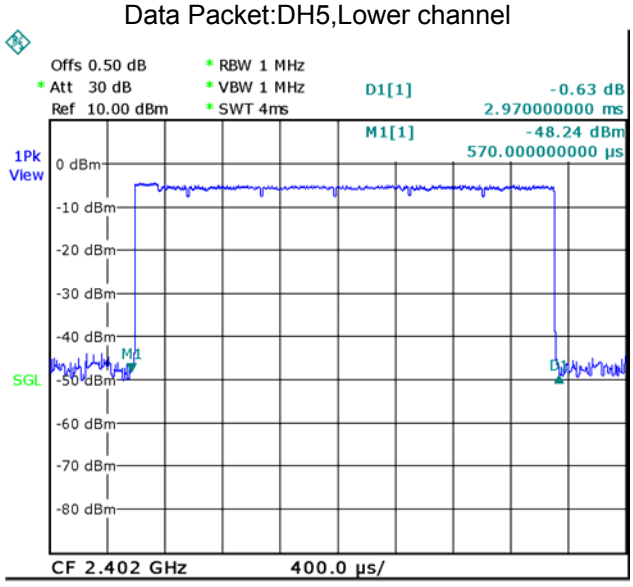
Data Packet:DH3,Middle channel



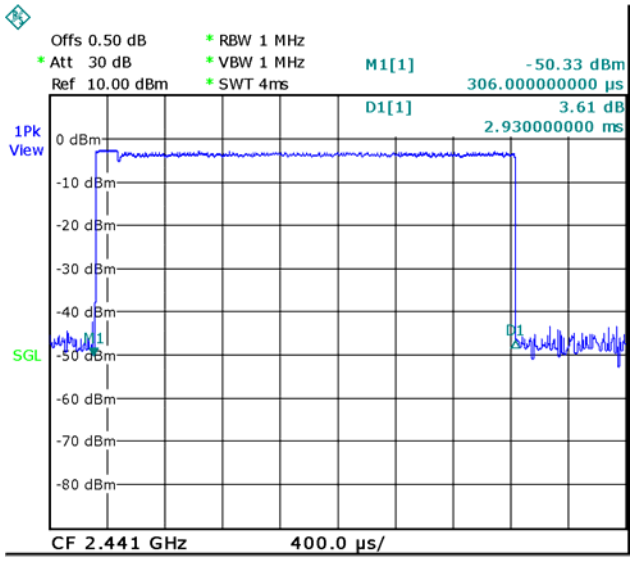
Data Packet:DH3,Upper channel



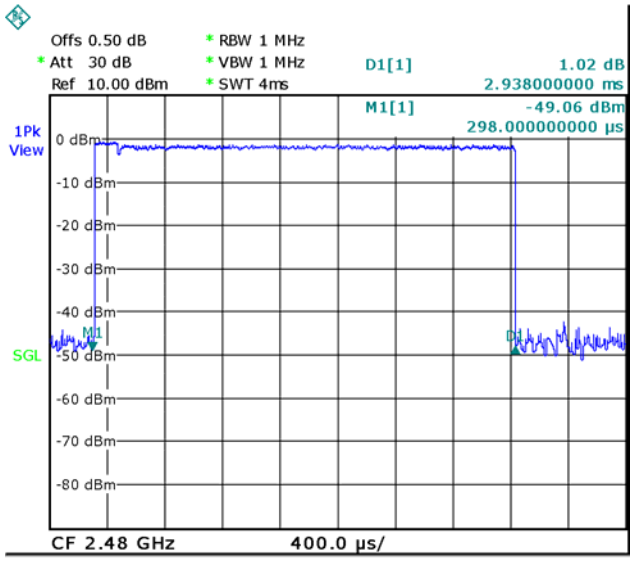
Data Packet:DH5,Lower channel



Data Packet:DH5,Middle channel

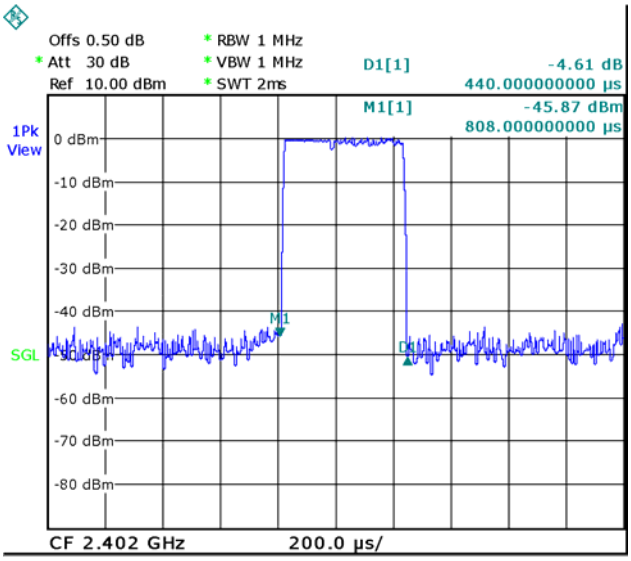


Data Packet:DH5,Upper channel

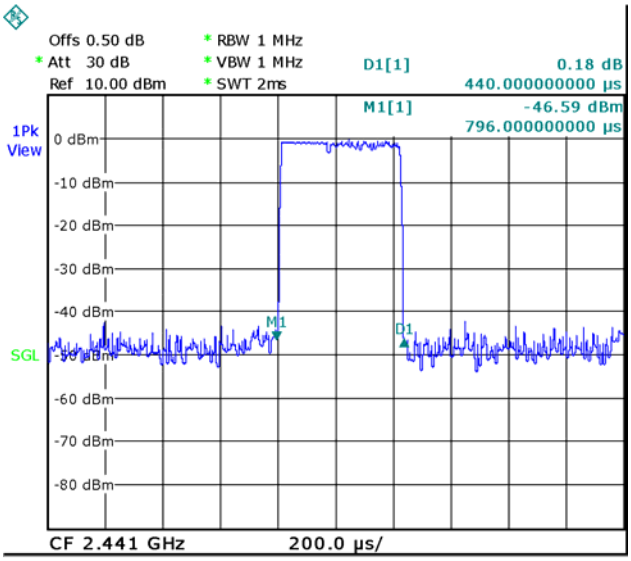


Modulation: 8DPSK

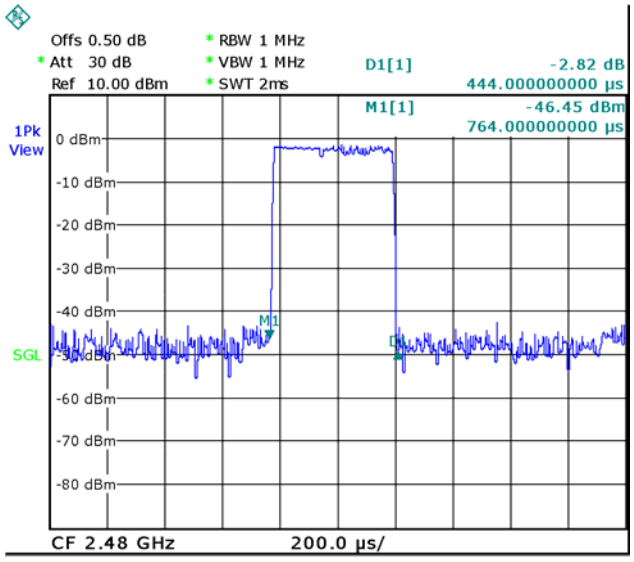
Data Packet:DH1,Lower channel



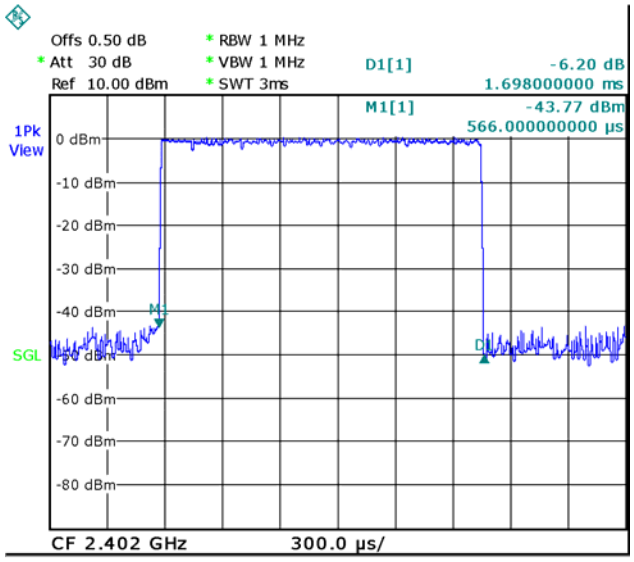
Data Packet:DH1,Middle channel



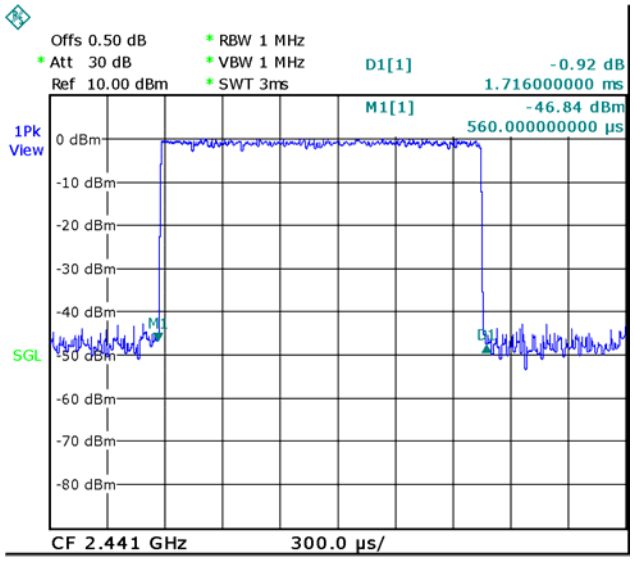
Data Packet:DH1,Upper channel



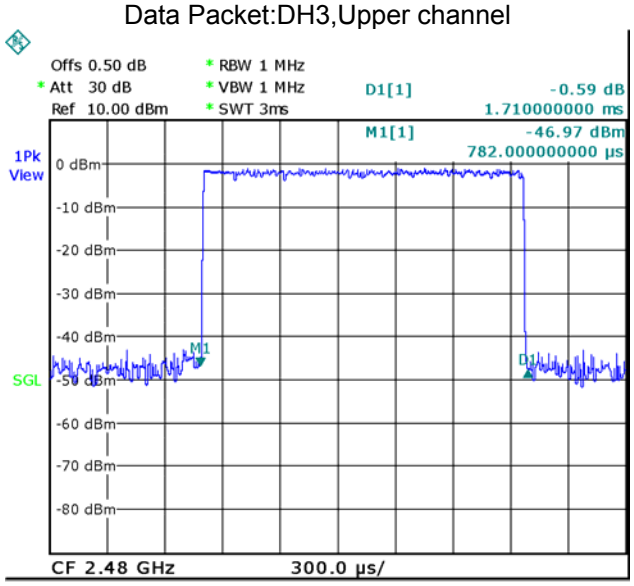
Data Packet:DH3,Lower channel



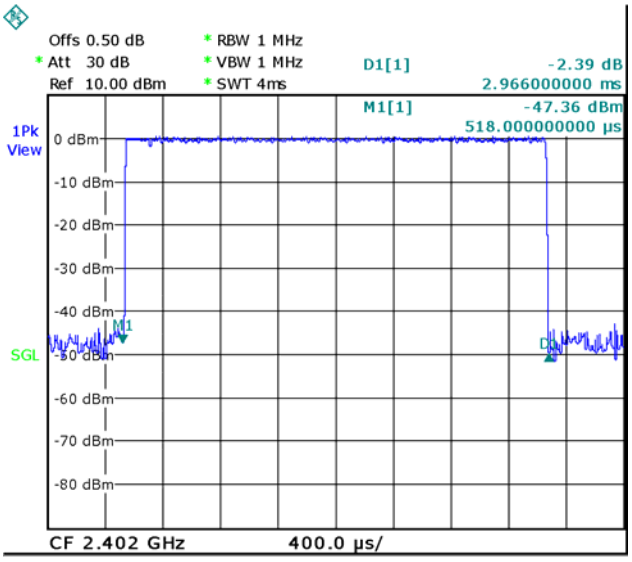
Data Packet:DH3,Middle channel



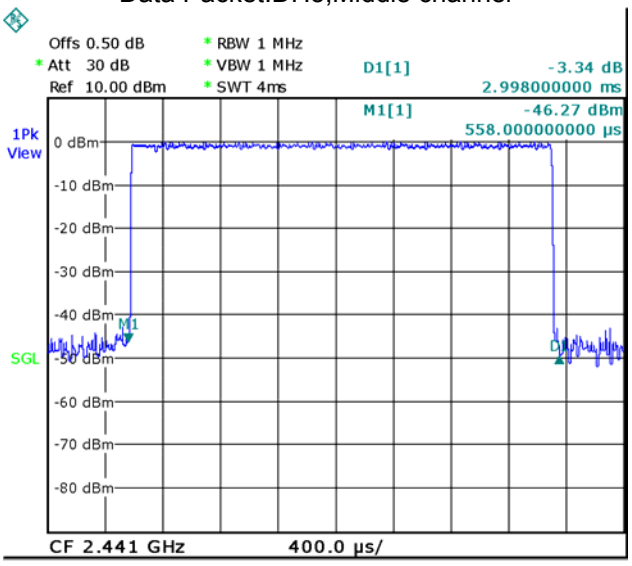
Data Packet:DH3,Upper channel



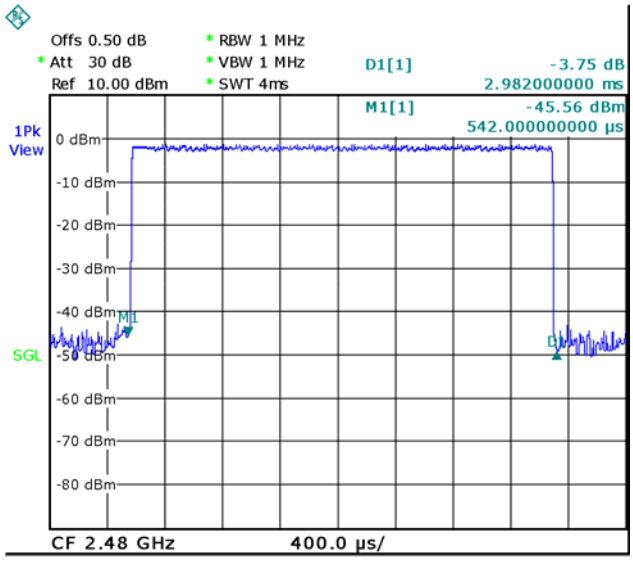
Data Packet:DH5,Lower channel



Data Packet:DH5,Middle channel



Data Packet:DH5,Upper channel



13 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a PCB printed antenna, fulfill the requirement of this section.

========== End of Test Report ==========