

FCC TEST REPORT

FCC ID : SW7ISB03W
Applicant : SUPERTIC ELECTRONICS FACTORY
Address : Dingshan plaza road,Houjie town,Dongguan city,Guangdong,China
Manufacturer : The same as above
Address : The same as above
Equipment Under Test (EUT) :
Product Name : Bluetooth speaker
Model No. : ISB03W

Standards : FCC CFR47 Part 15 Section 15.247:2011

Date of Test : April 1~23, 2013
Date of Issue : April 26, 2013

Test Result : **PASS**

Remark:

* The sample described above has been tested to be in compliance with the requirements of ANSI C63.4:2003. The test results have been reviewed and comply with the rules listed above and found to meet their essential requirements.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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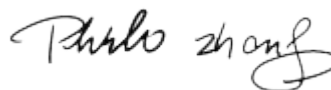
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Compiled by:



Zero Zhou / Project Engineer

Approved by:



Philo Zhong / 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
Spurious RF Conducted Emissions from out of band	15.247(d)	PASS
Duty Cycle	15.35	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
Radiofrequency radiation exposure evaluation	2.1093	PASS

3 Contents

	Page
1 COVER PAGE	1
2 TEST SUMMARY	2
3 CONTENTS	3
4 GENERAL INFORMATION	5
4.1 GENERAL DESCRIPTION OF E.U.T.	5
4.2 DETAILS OF E.U.T.	5
4.3 TEST FACILITY	5
4.4 TEST LOCATION	5
5 EQUIPMENT USED DURING TEST	6
5.1 EQUIPMENTS LIST	6
5.2 MEASUREMENT UNCERTAINTY	7
5.3 TEST EQUIPMENT CALIBRATION	7
6 CONDUCTED EMISSION	8
6.1 E.U.T. OPERATION	8
6.2 EUT SETUP	8
6.3 CONDUCTED EMISSION TEST RESULT	9
7 SPURIOUS RADIATED EMISSIONS	11
7.1 EUT OPERATION :	11
7.2 TEST SETUP	12
7.3 SPECTRUM ANALYZER SETUP	13
7.4 TEST PROCEDURE	14
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION	14
7.6 SUMMARY OF TEST RESULTS	15
8 SPURIOUS RF CONDUCTED EMISSIONS FROM OUT OF BAND	23
8.1 TEST PROCEDURE	23
8.2 TEST RESULT	23
9 DUTY CYCLE	33
9.1 TEST PROCEDURE	33
9.2 TEST RESULT	33
10 BAND EDGE MEASUREMENT	35
10.1 TEST PROCEDURE	35
10.2 TEST RESULT:	36
11 20 DB BANDWIDTH MEASUREMENT	44
11.1 TEST PROCEDURE:	44
11.2 TEST RESULT:	44
12 MAXIMUM PEAK OUTPUT POWER	50
12.1 TEST PROCEDURE:	50
12.2 TEST RESULT:	50
13 HOPPING CHANNEL SEPARATION	56
13.1 TEST PROCEDURE:	56
13.2 TEST RESULT:	56
14 NUMBER OF HOPPING FREQUENCY	62
14.1 TEST PROCEDURE:	62

14.2	TEST RESULT:.....	62
15	DWELL TIME	64
15.1	TEST PROCEDURE:.....	64
15.2	TEST RESULT:.....	64
16	ANTENNA REQUIREMENT	80
17	RADIOFREQUENCY RADIATION EXPOSURE EVALUATION	81
17.1	REQUIREMENTS:	81
17.2	TEST RESULT	82
18	PHOTOGRAPHS – TEST SETUP	83
18.1	RADIATED EMISSIONS.....	83
18.2	CONDUCTED EMISSIONS	85
19	PHOTOGRAPHS - CONSTRUCTIONAL DETAILS	86
19.1	EUT – EXTERNAL VIEW.....	86
19.2	EUT – INTERNAL VIEW	89
19.3	EUT-RF MODULE VIEW	91

4 General Information

4.1 General Description of E.U.T.

Product Name	: Bluetooth speaker
Model No.	: ISB03W
Model Description	: N/A
Operation Frequency	: 2402MHz ~ 2480MHz, 79 channels in total, separated by 1MHz
Type of Modulation	: GFSK, Pi/4DQPSK, 8DPSK
Oscillator	: 16 MHz
Antenna installation	: PCB Printed Antenna
Antenna Gain	: 0dBi

4.2 Details of E.U.T.

Technical Data	: (1)DC 5V for USB (2)DC 3.7V, 600mAh for lithium battery
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4.3 Test Facility

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

- **IC – Registration No.: 7760A**

Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.
Registration 7760A, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

4.4 Test Location

All the tests were performed at:
Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen, China

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	Aug. 13,2012	Aug. 12,2013
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Aug. 13,2012	Aug. 12,2013
3.	Cable	LARGE	RF300	EW02014-3	Aug.14,2012	Aug. 13,2013
3m Semi-anechoic Chamber for Radiation(TDK) (Test Frequency: 16MHz ~ 1000MHz)						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	Aug.09,2012	Aug.08,2013
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Aug. 13,2012	Aug. 12,2013
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Aug.11,2012	Aug.10,2013
4	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Apr.07,2013	Apr.06,2014
5	Cable	HUBER+SUHNE R	CBL2	525178	Sep.15,2012	Sep.14,2013
3m Semi-anechoic Chamber for Radiation Emissions (Test Frequency: 1GHz ~ 26.5GHz)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer	Agilent	E7405A	MY45114943	Aug. 13,2012	Aug. 12,2013
2.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Aug. 13,2012	Aug. 12,2013
3.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	399	Aug. 13,2012	Aug. 12,2013
4.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.07,2013	Apr.06,2014
5.	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-148	Aug. 13,2012	Aug. 12,2013
6.	10m Coaxial Cable with N- plug	SCHWARZBECK	AK 9515 H	-	Aug. 13,2012	Aug. 12,2013
Associated Equipment						
1.	Notebook	IBM	2672-39C	99-8D3W4	-	-
2.	Computer	Lenovo	T4900V	0100640332	-	-
3.	LCD	View Sonic	VA521	922050101551	-	-
4.	Keyboard	Shuangfeiyan	KB-3	-	-	-
5.	Mouse	JEEJA	M-01	-	-	-
6.	IPOD	Apple	A1367	-	-	-

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Temperature	± 1 °C
DC Source	$\pm 0.05\%$
Radiated Emissions test	± 3.58 dB (9KH~30MHz)
	± 5.03 dB (30M~1000MHz)
	± 4.74 dB (1000M~25000MHz)
Conducted Spurious Emissions test	± 0.5 dB (9KHz~1000MHz)
	± 1 dB(1000M~26500MHz)
Conducted Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

5.3 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.

6 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 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

EUT Operation:

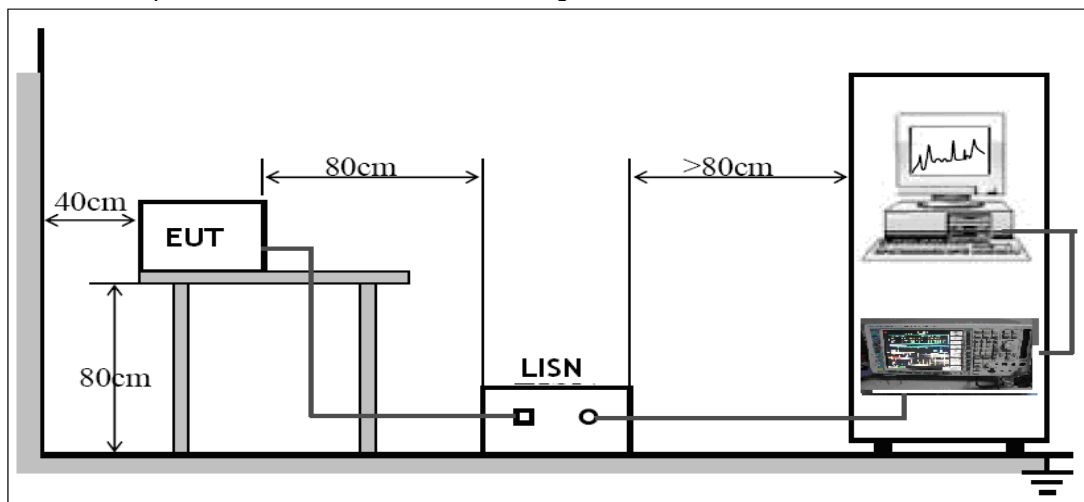
The EUT was tested in Charging mode. The test data were shown as follow.

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.

6.2 EUT Setup

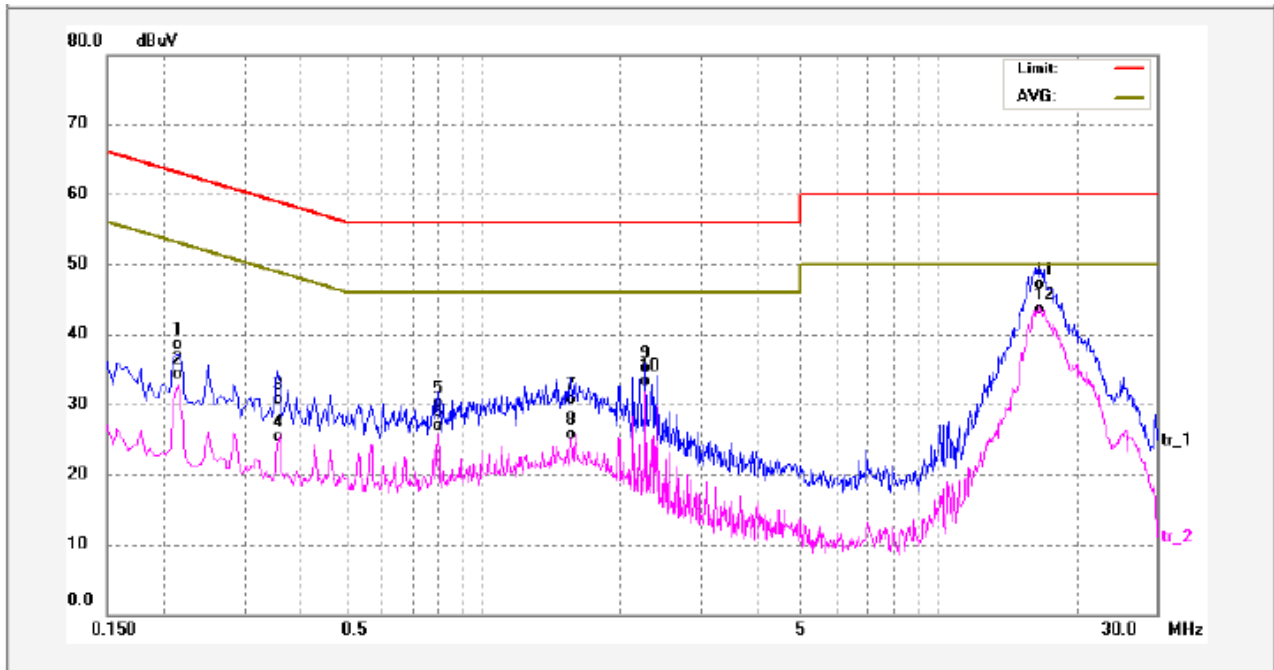
The EUT was placed on the test table in shielding room.



6.3 Conducted Emission Test Result

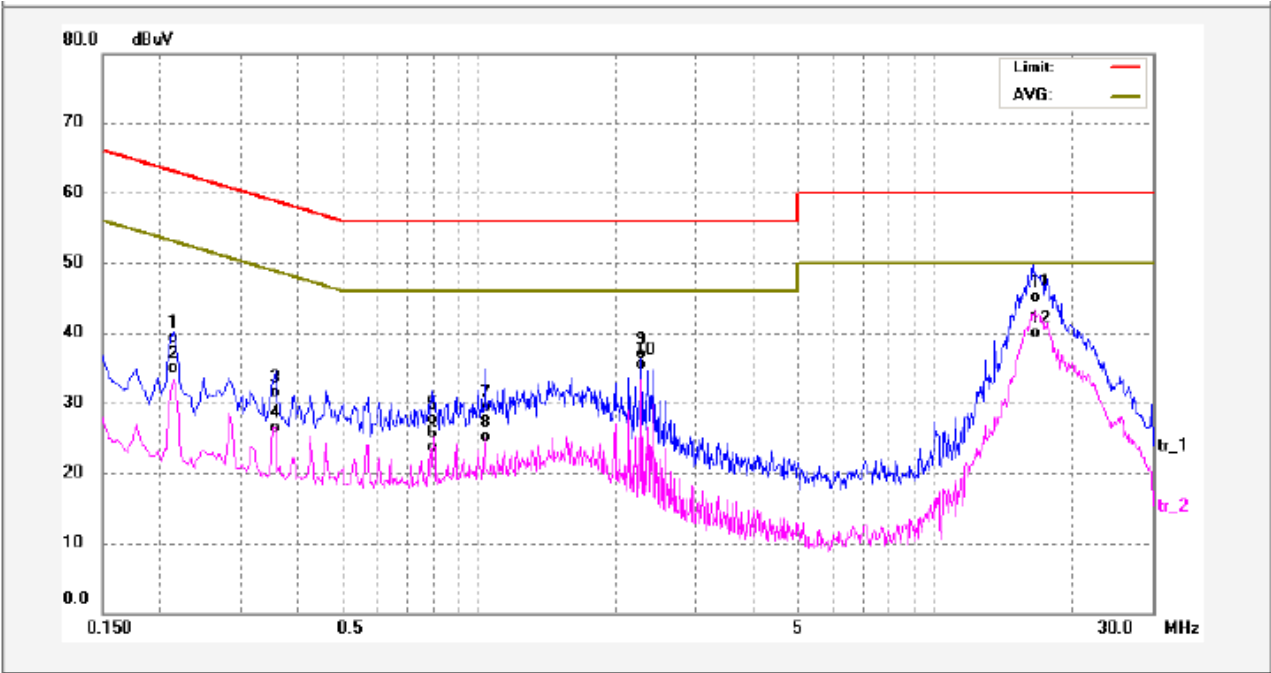
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2140	26.35	11.30	37.65	63.04	-25.39	QP	
2	0.2140	22.18	11.30	33.48	53.04	-19.56	AVG	
3	0.3540	18.59	11.31	29.90	58.87	-28.97	QP	
4	0.3540	13.14	11.31	24.45	48.87	-24.42	AVG	
5	0.7980	18.01	11.29	29.30	56.00	-26.70	QP	
6	0.7980	14.80	11.29	26.09	46.00	-19.91	AVG	
7	1.5660	18.74	11.19	29.93	56.00	-26.07	QP	
8	1.5660	13.72	11.19	24.91	46.00	-21.09	AVG	
9	2.2780	23.12	11.20	34.32	56.00	-21.68	QP	
10	2.2780	21.24	11.20	32.44	46.00	-13.56	AVG	
11	16.7180	34.74	11.47	46.21	60.00	-13.79	QP	
12	16.7180	31.22	11.47	42.69	50.00	-7.31	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2140	27.15	11.30	38.45	63.04	-24.59	QP	
2	0.2140	22.85	11.30	34.15	53.04	-18.89	AVG	
3	0.3580	19.32	11.31	30.63	58.77	-28.14	QP	
4	0.3580	14.30	11.31	25.61	48.77	-23.16	AVG	
5	0.7940	15.56	11.29	26.85	56.00	-29.15	QP	
6	0.7940	11.70	11.29	22.99	46.00	-23.01	AVG	
7	1.0339	17.33	11.18	28.51	56.00	-27.49	QP	
8	1.0339	13.05	11.18	24.23	46.00	-21.77	AVG	
9	2.2780	24.93	11.20	36.13	56.00	-19.87	QP	
10	2.2780	23.46	11.20	34.66	46.00	-11.34	AVG	
11	16.4380	32.79	11.47	44.26	60.00	-15.74	QP	
12	16.4380	27.57	11.47	39.04	50.00	-10.96	AVG	

7 Spurious Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Frequency Range: 16MHz to 25GHz

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	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
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	$20\log^{(500)}$

7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C

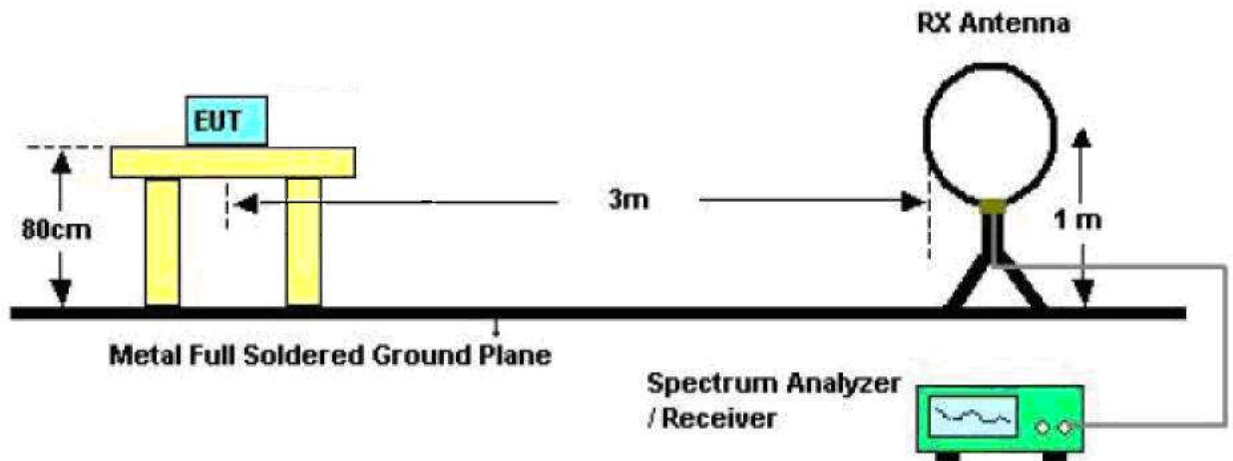
Humidity: 51 % RH

Atmospheric Pressure: 1010 mbar

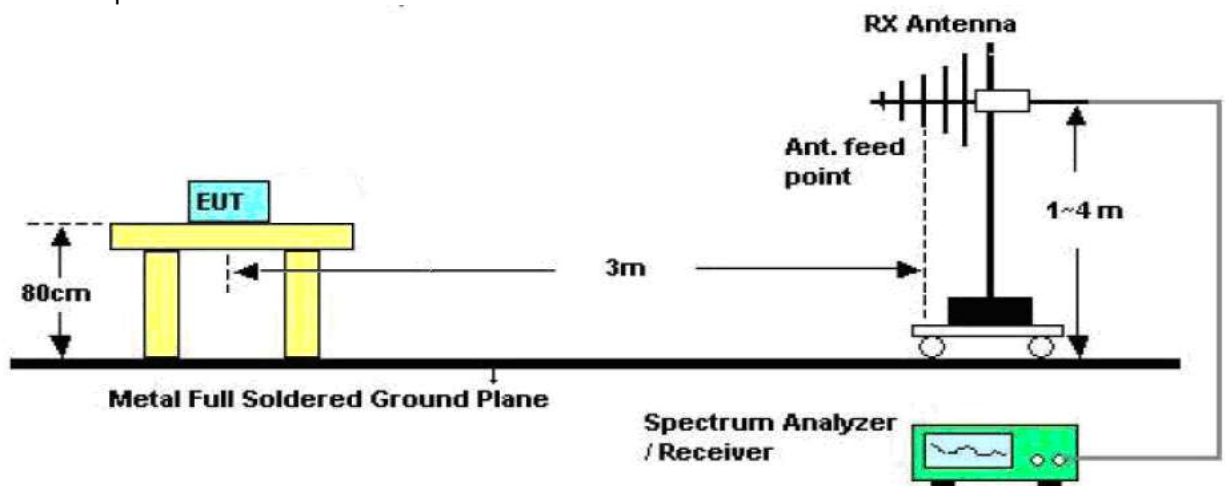
7.2 Test Setup

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

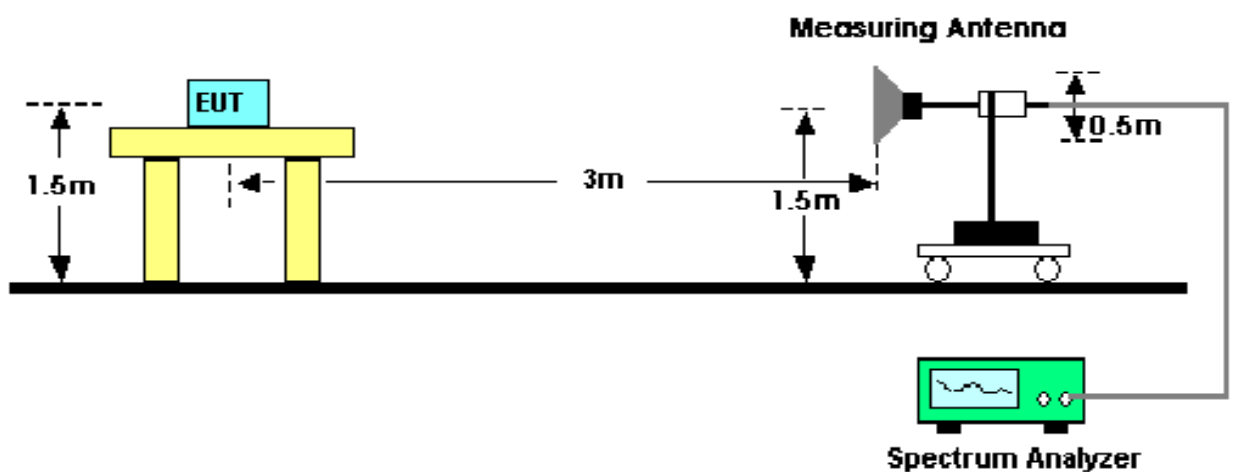
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested 16MHz to 25000MHz.

Below 30MHz

Sweep SpeedAuto
IF Bandwidth10KHz
Video Bandwidth10KHz
Resolution Bandwidth10KHz

30MHz ~ 1GHz

Sweep SpeedAuto
IF Bandwidth120 KHz
Video Bandwidth100KHz
Quasi-Peak Adapter Bandwidth120 KHz
Quasi-Peak Adapter ModeNormal
Resolution Bandwidth100KHz

Above 1GHz

Sweep SpeedAuto
IF Bandwidth120 KHz
Video Bandwidth3MHz
Quasi-Peak Adapter Bandwidth120 KHz
Quasi-Peak Adapter ModeNormal
Resolution Bandwidth1MHz

7.4 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.

7.5 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

7.6 Summary of Test Results

Test Frequency :Below 30MHz

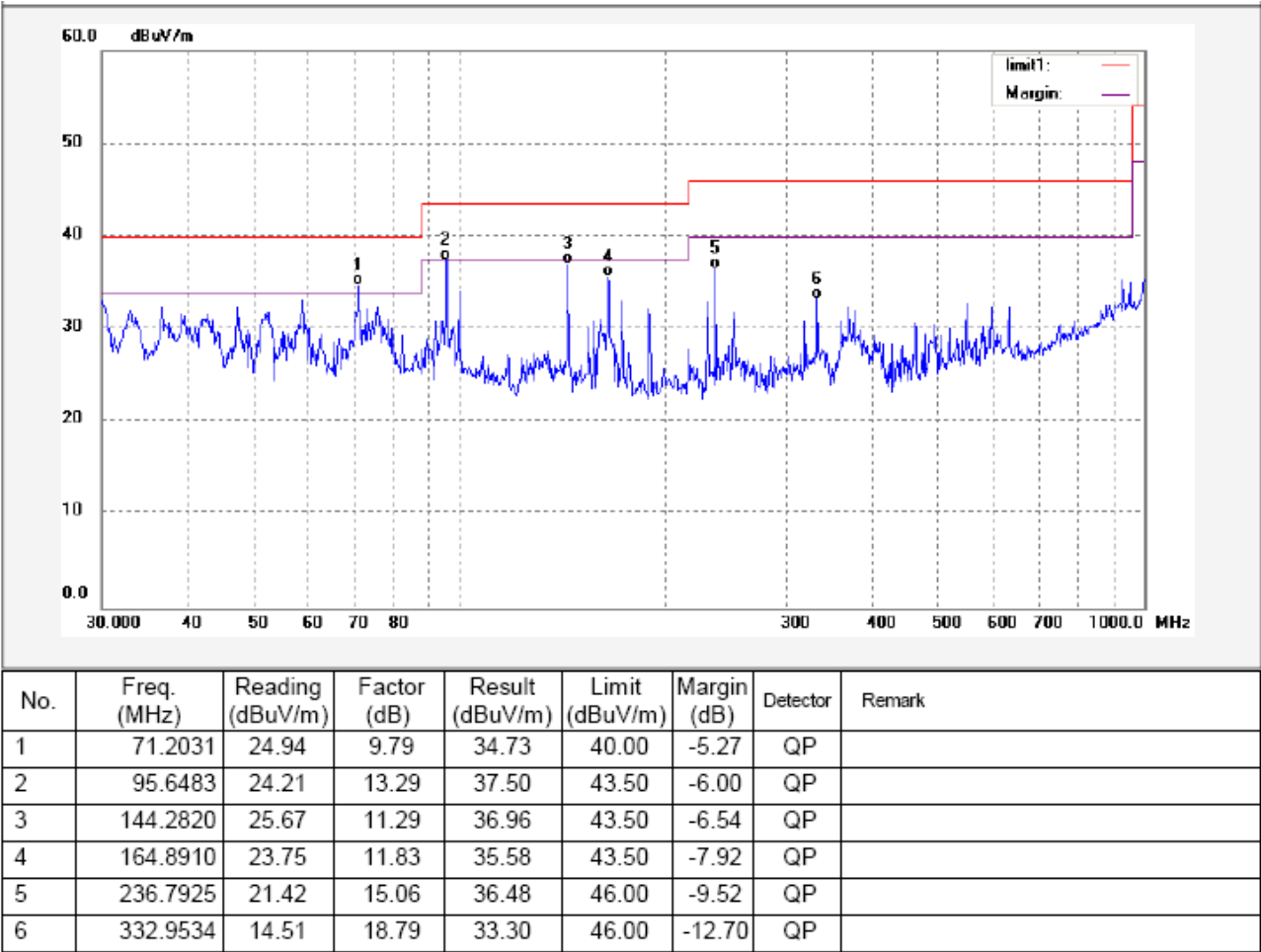
All emissions were more than 20 dB below the limit and therefore not reported

Test Frequency : 30MHz ~ 1000MHz

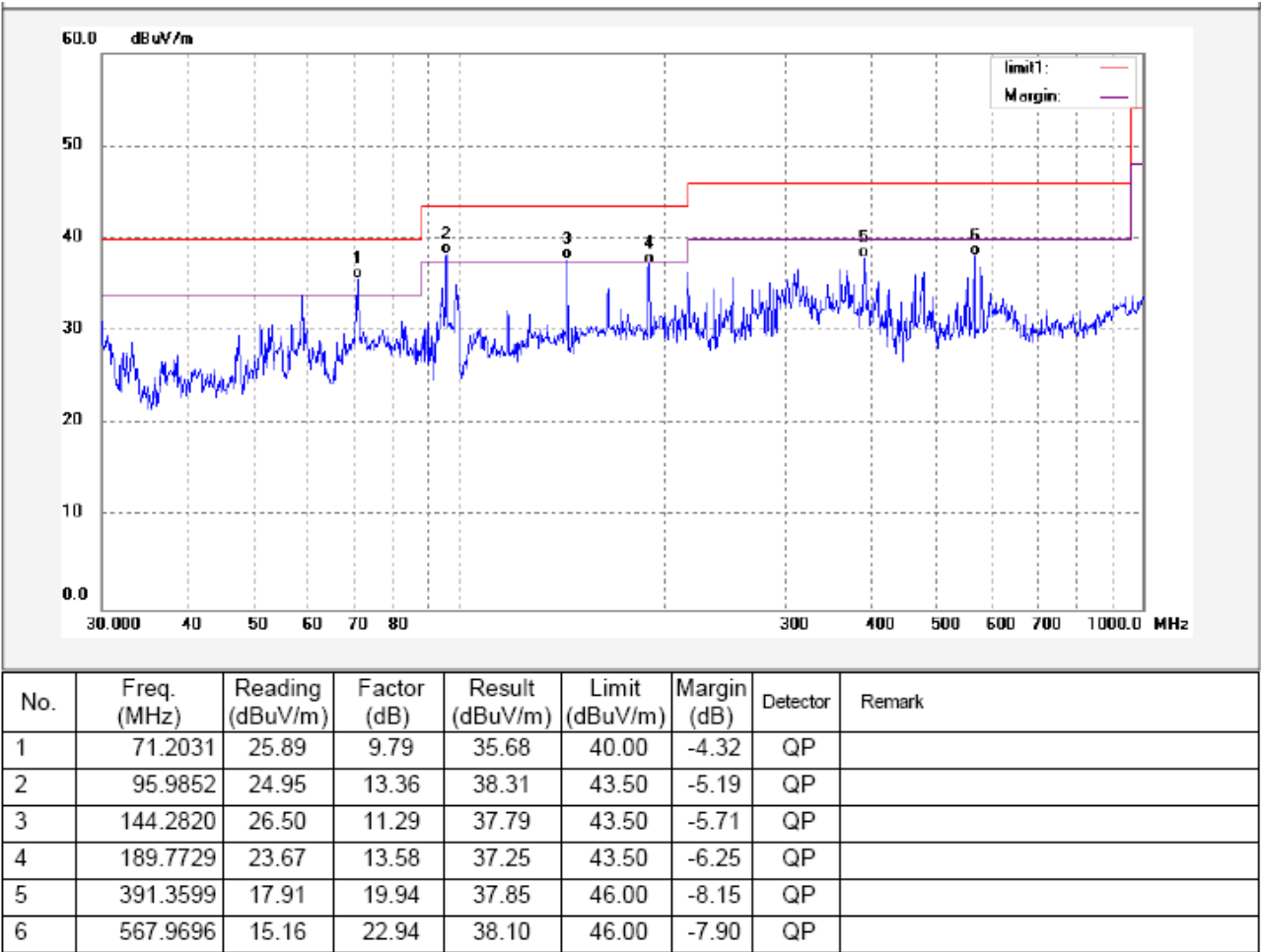
Test voltage: DC 3.7V, 400mAh for lithium battery

Test Mode: BT linking

Antenna polarization: Vertical



Antenna polarization: Horizontal



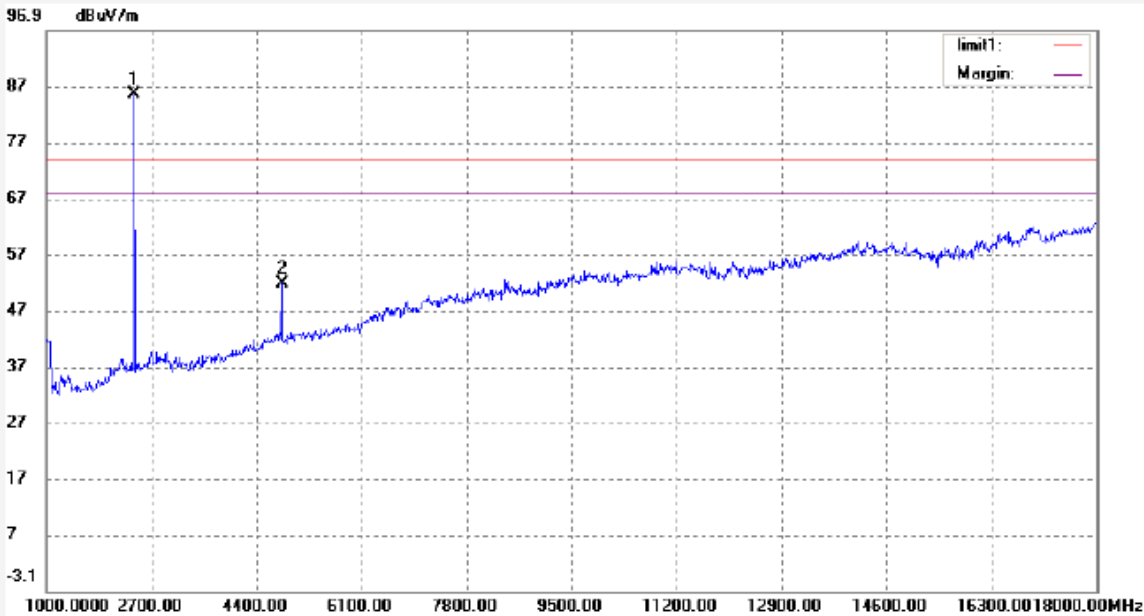
Test Frequency: 1GHz ~ 18GHz

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

$AV = \text{Peak} + 20\text{Log}_{10}(\text{duty cycle}) = \text{PK} + (-8) = \text{PK} - 8$ [refer to section 9 for more detail]

Test mode: transmitting at lower channel

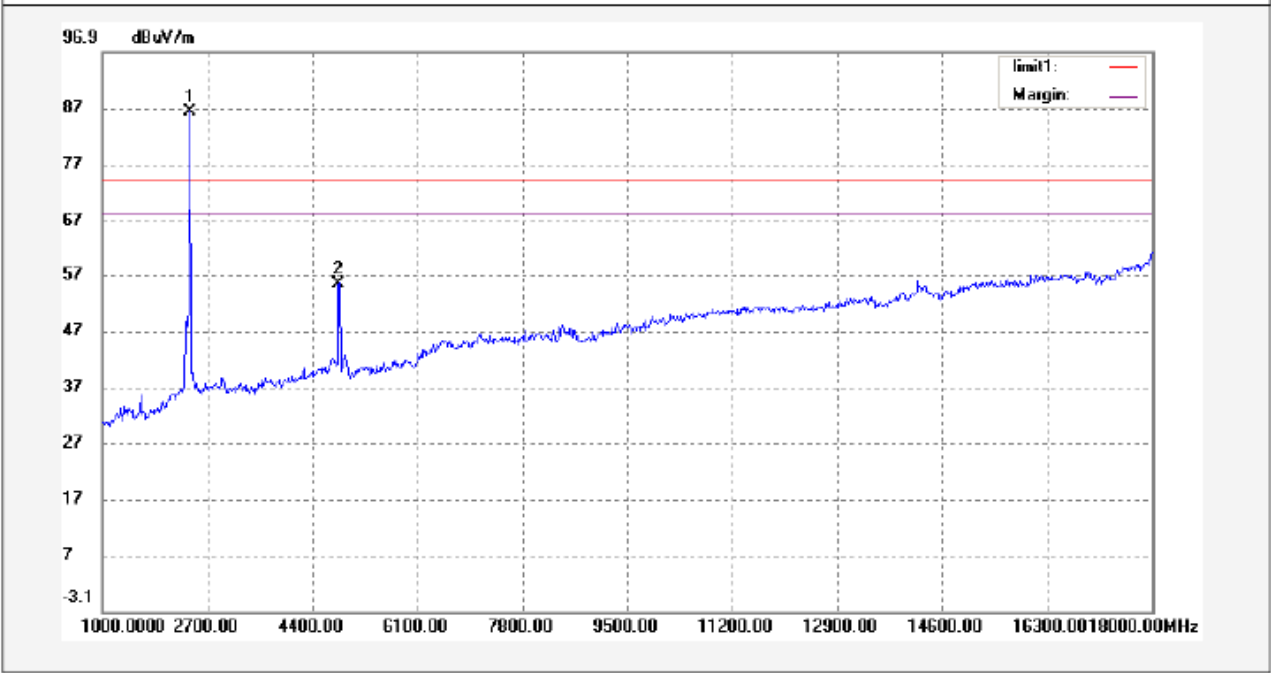
Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2402.000	94.75	-9.28	85.47	74.00	11.47	peak	
2	4804.000	55.03	-3.17	51.86	74.00	-22.14	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	4804.000	-8	43.86	54.00	-10.14	AV	

Antenna polarization: Horizontal

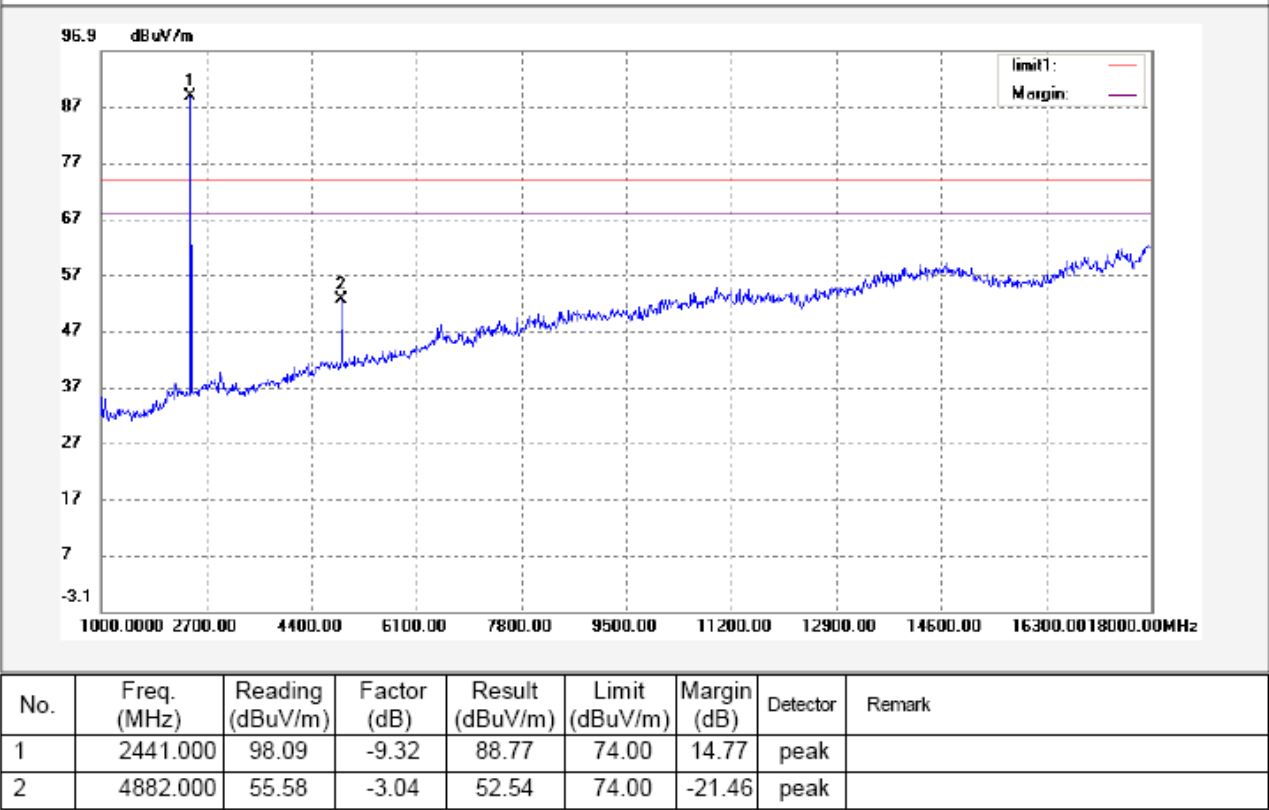


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2402.000	95.51	-9.29	86.22	74.00	12.22	peak	
2	4804.000	58.40	-3.17	55.23	74.00	-18.77	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	4804.000	-8	47.23	54.00	-6.77	AV	

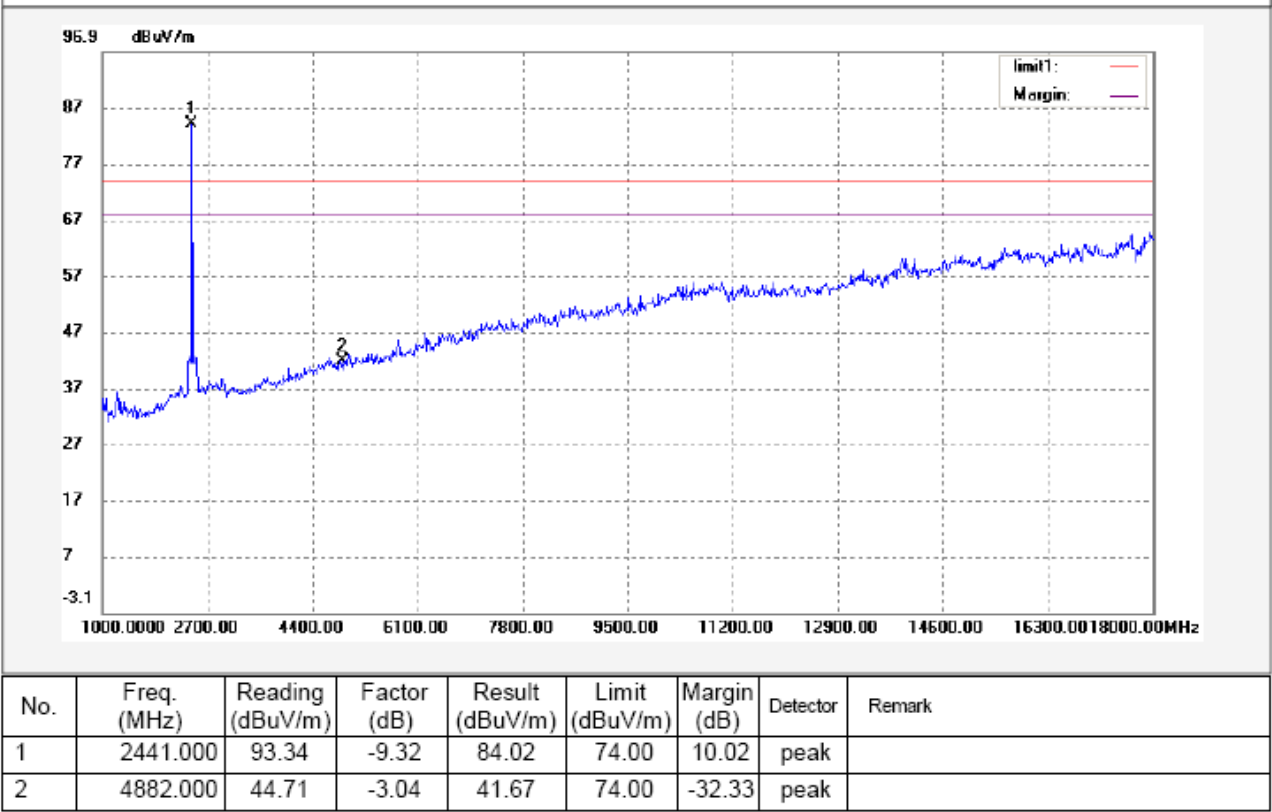
Test mode: transmitting at middle channel

Antenna polarization: Vertical



No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	4882.000	-8	44.54	54.00	-9.46	AV	

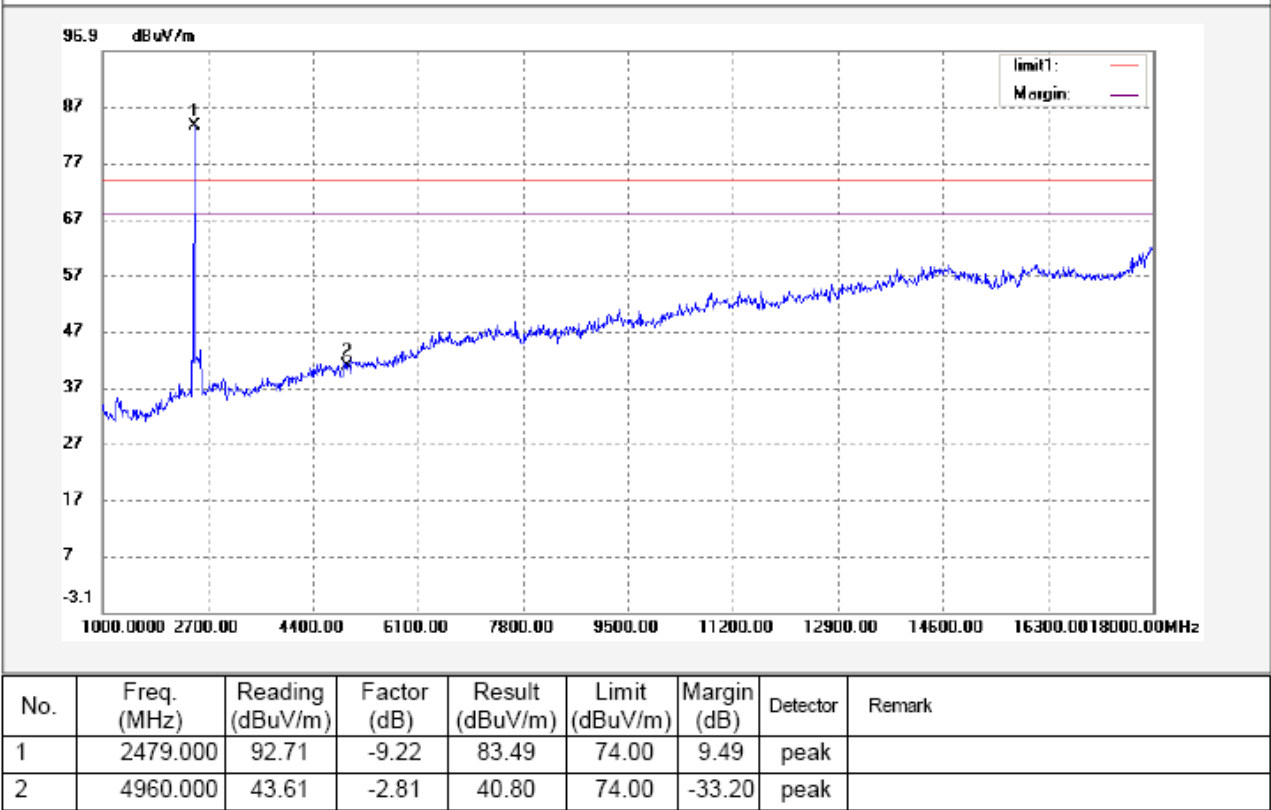
Antenna polarization: Horizontal



No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	4882.000	-8	33.67	54.00	-20.33	AV	

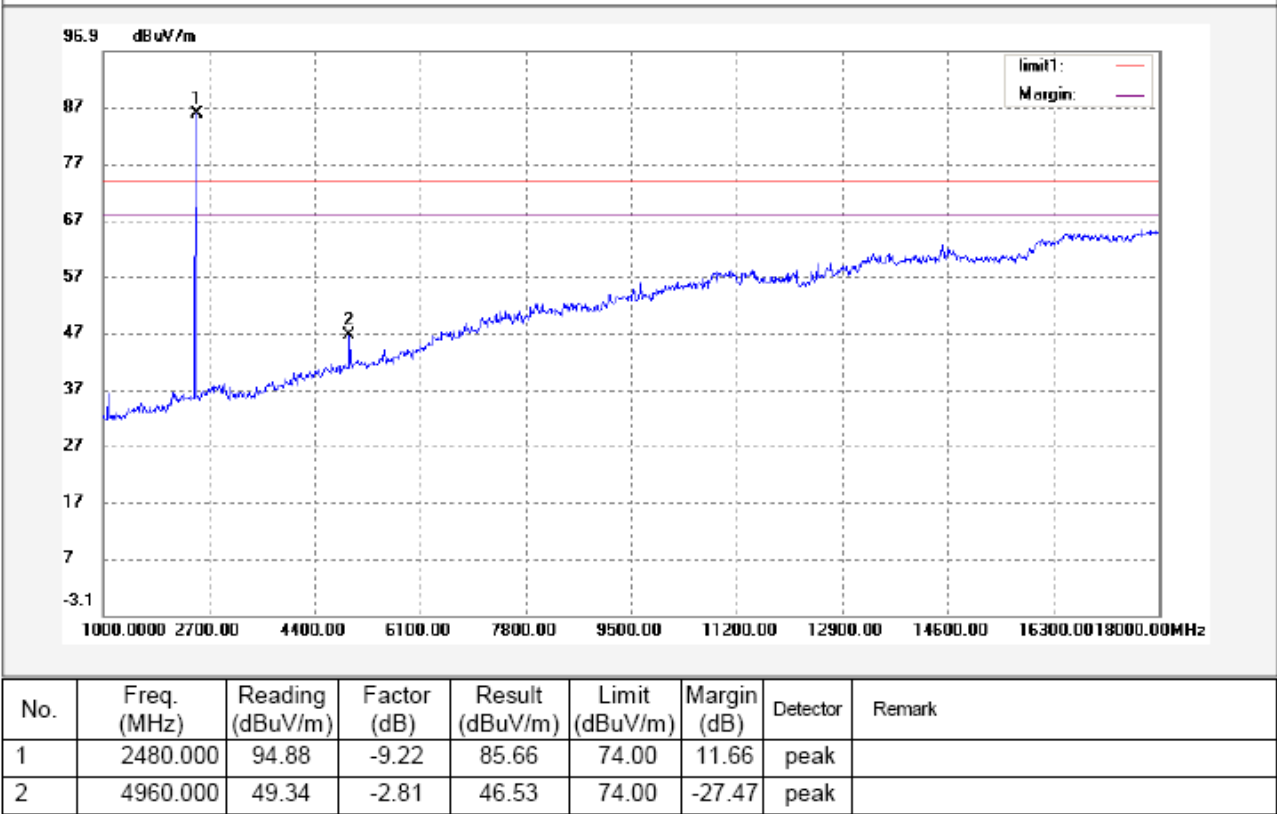
Test mode: transmitting at upper channel

Antenna polarization: Vertical



No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	4960.000	-8	32.8	54.00	-21.2	AV	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	4960.000	-8	38.53	54.00	-15.47	AV	

Test Frequency :Above 18GHz

The measurement is performed up to 25GHz, and all other emissions are more than 20dB below the limit, therefore the results above 18GHz is not recorded in this report.

8 Spurious RF Conducted Emissions from out of band

Test Requirement: FCC Part 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.

Test Method: DA 00-705

Test Status: TX mode

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 to span from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency.
3. Set RBW = 100kHz and VBW = 300kHz. Sweep = auto.
4. mark the worst point and record.

8.2 Test Result

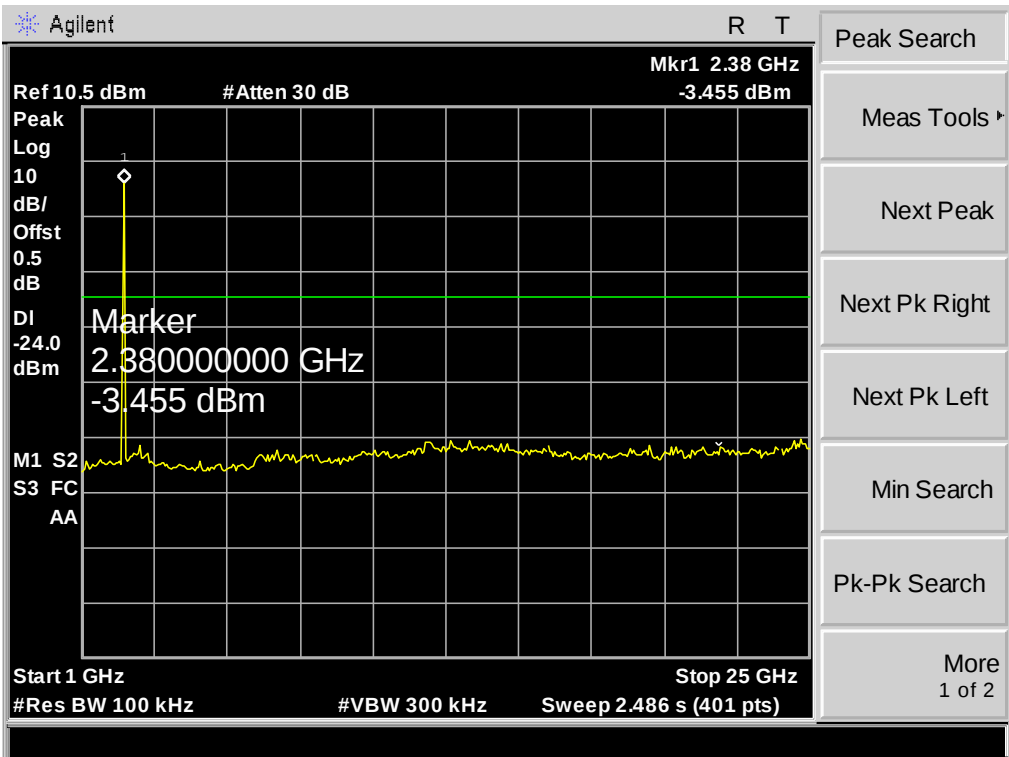
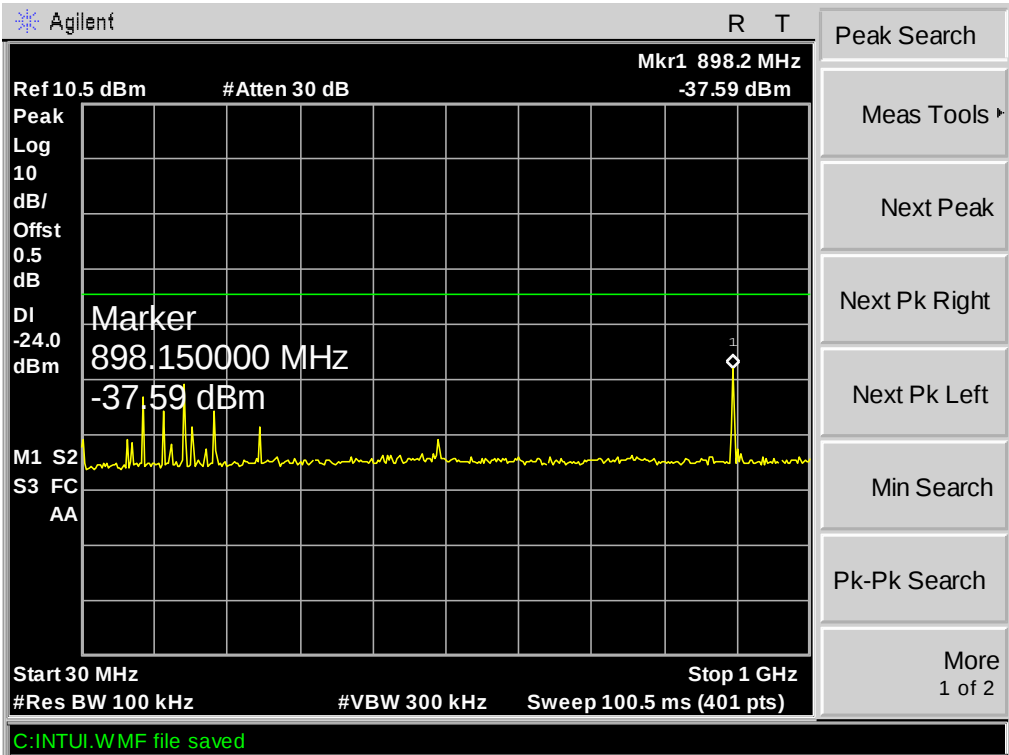
Test Frequency: Below 30MHz

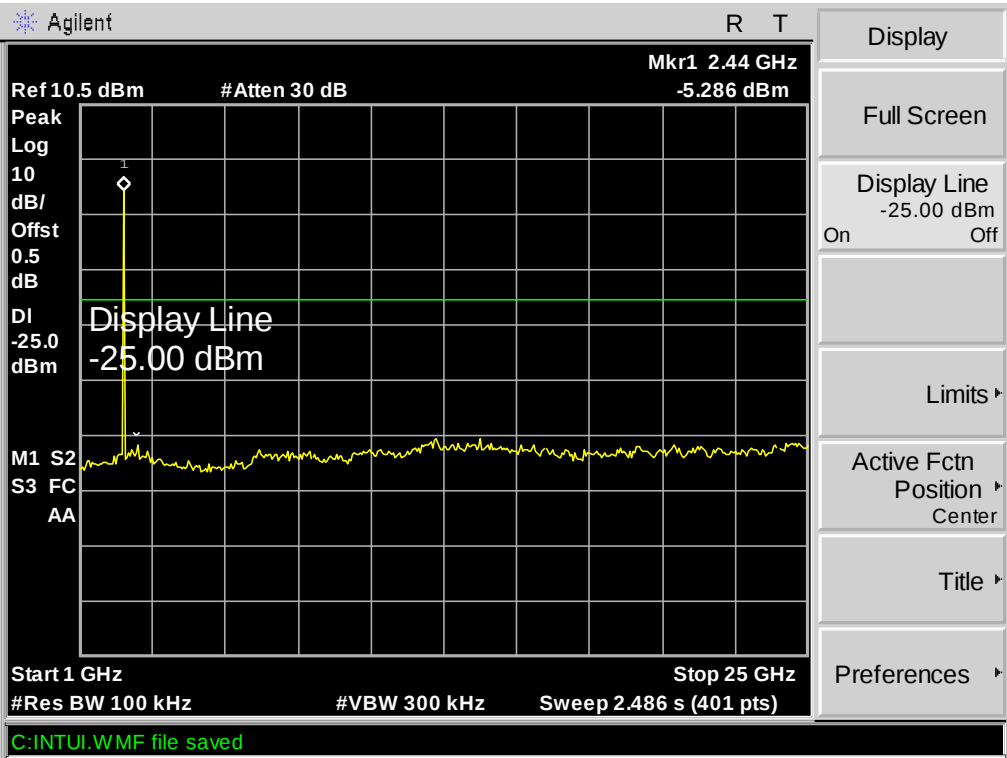
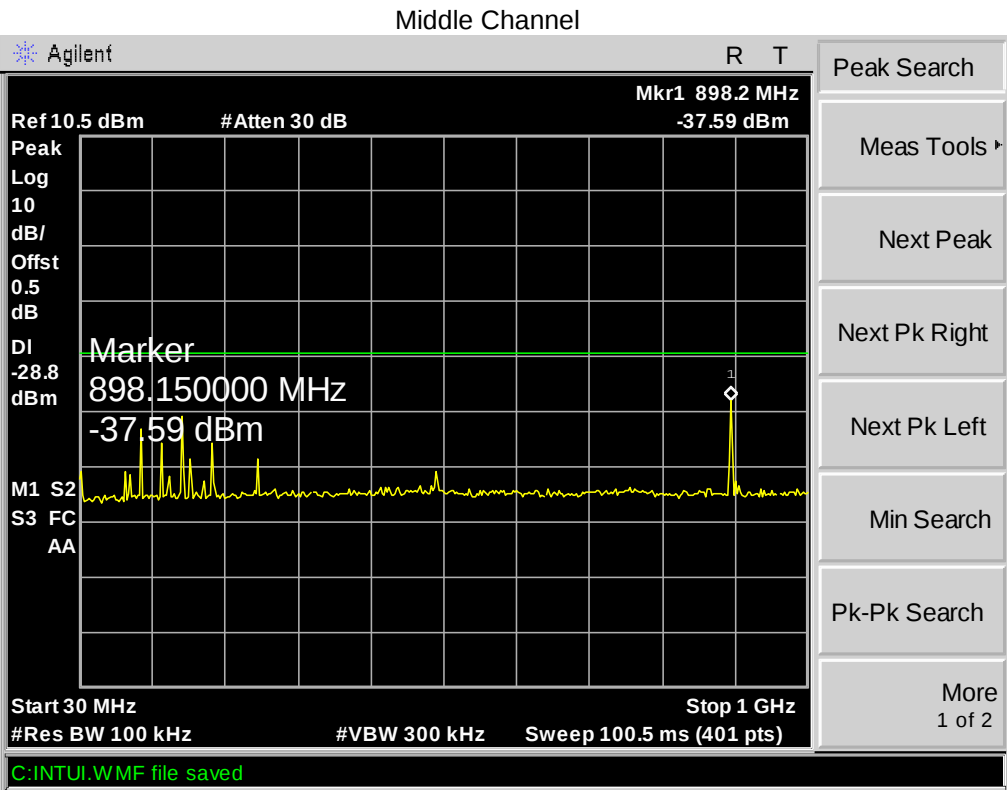
Remark: For emissions below 30MHz, no emission higher than background level, so the data does not show in the report.

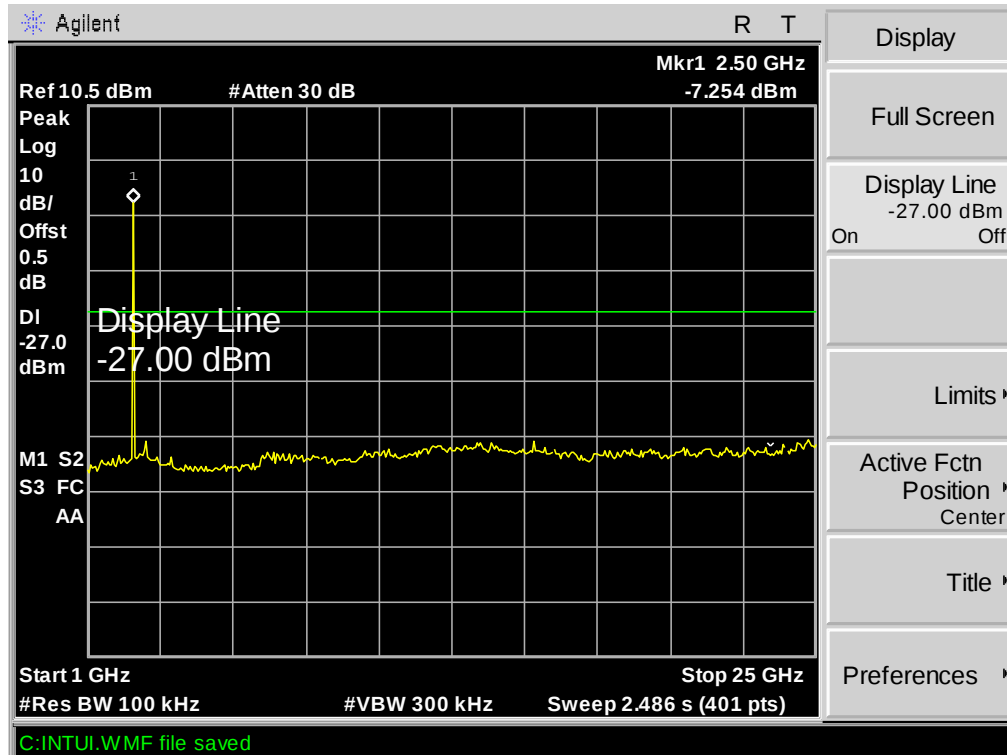
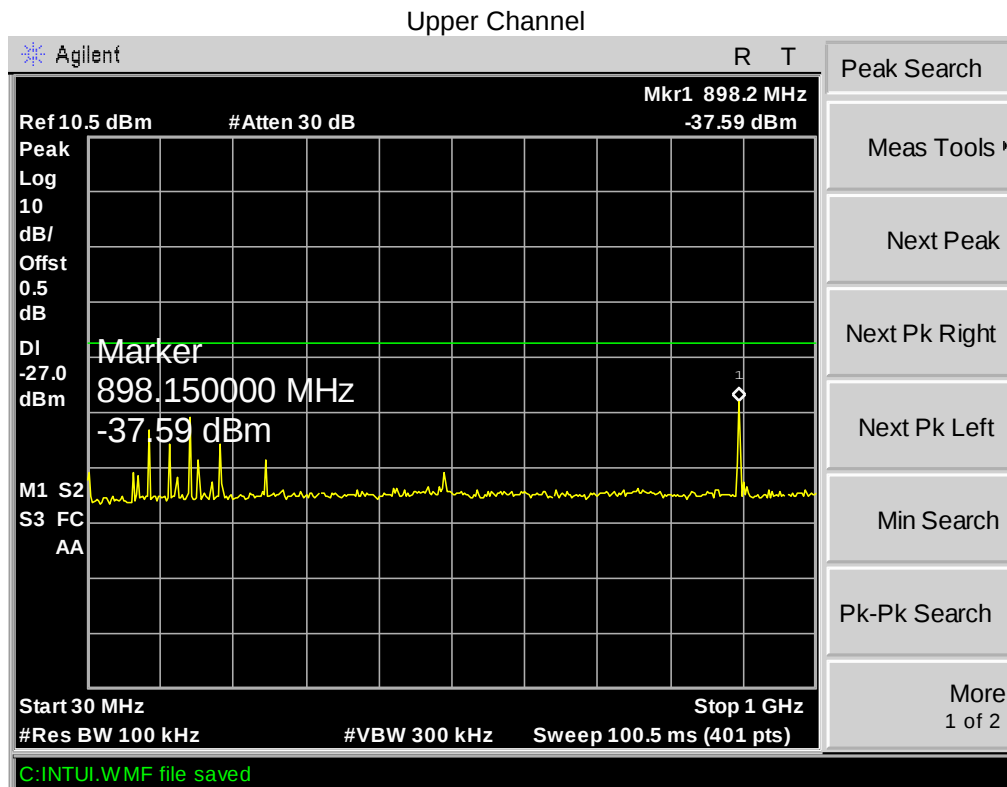
Test Frequency: 30MHz ~ 25GHz

Test result plots shown as follows:

Modulation:GFSK
Lower Channel

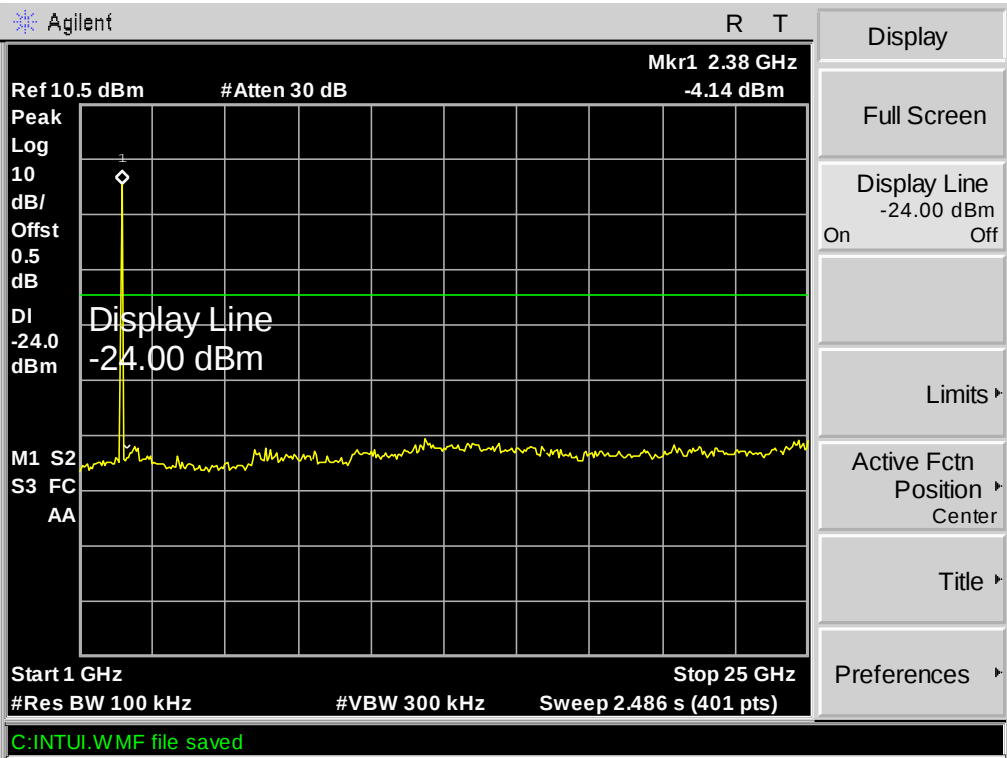
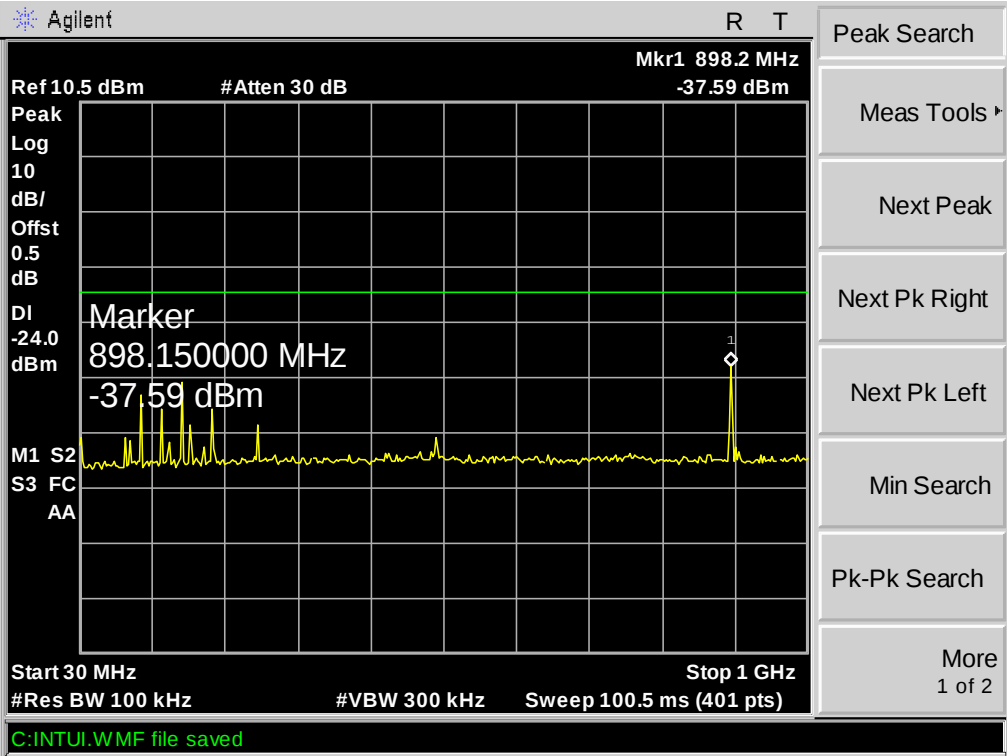


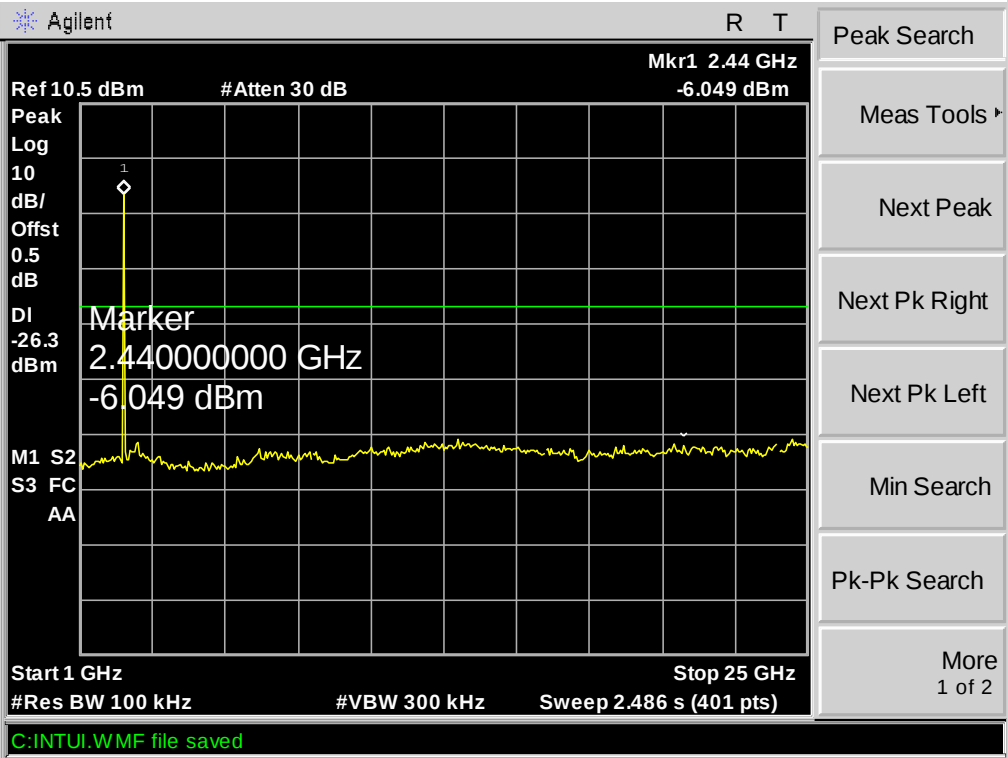
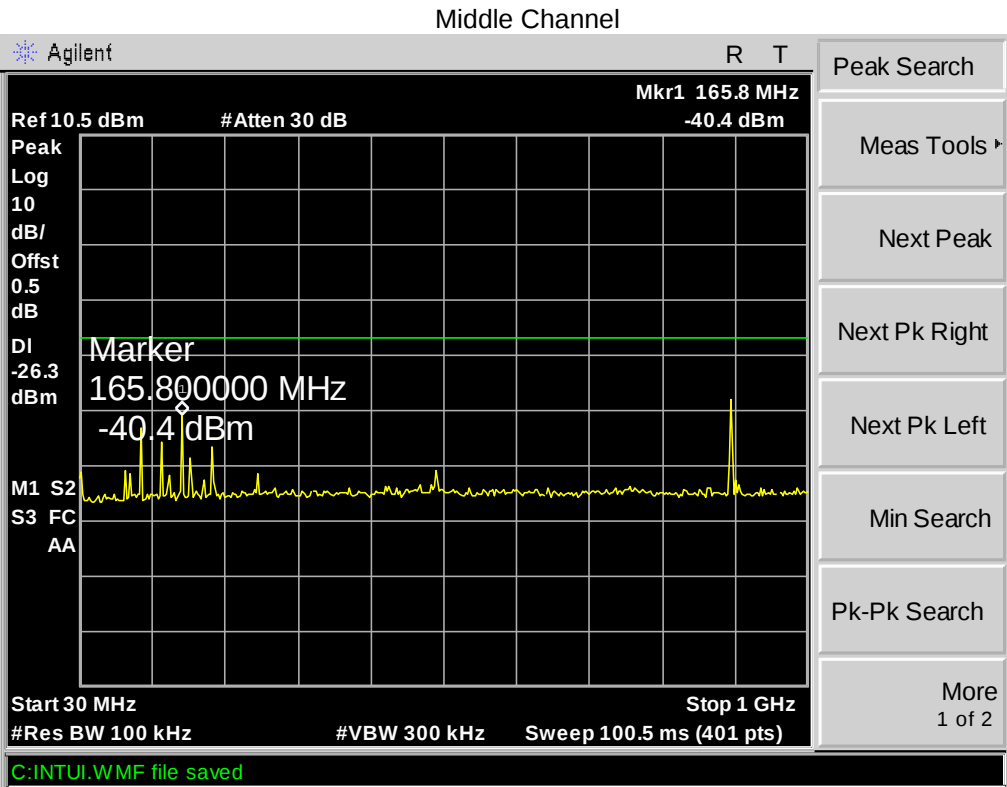


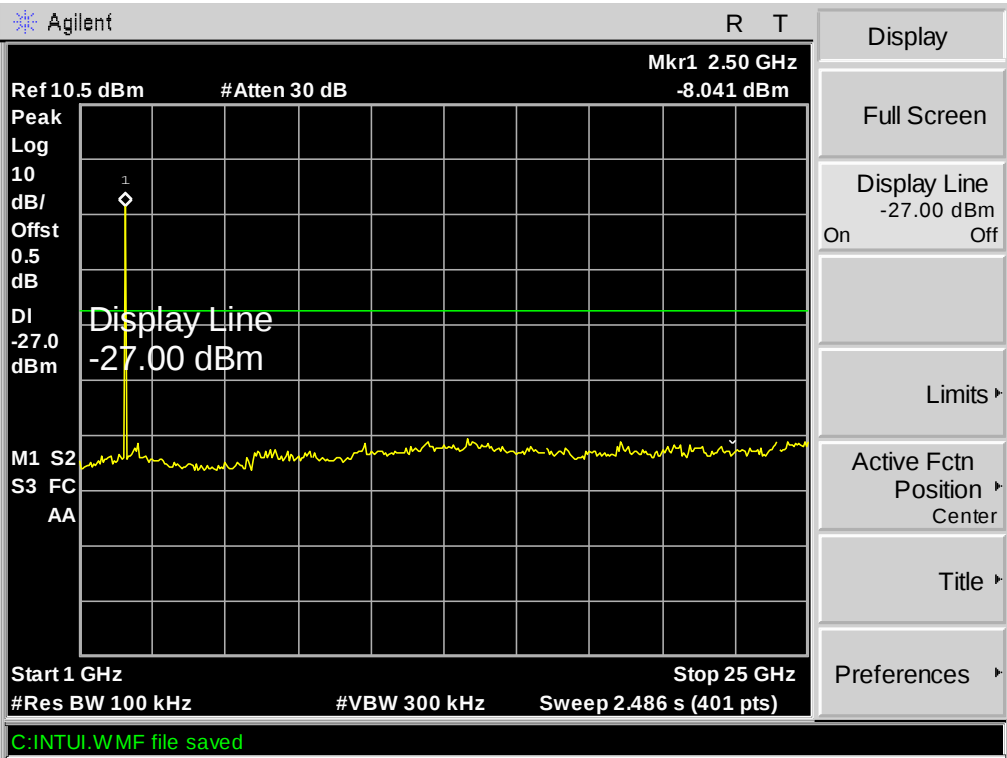
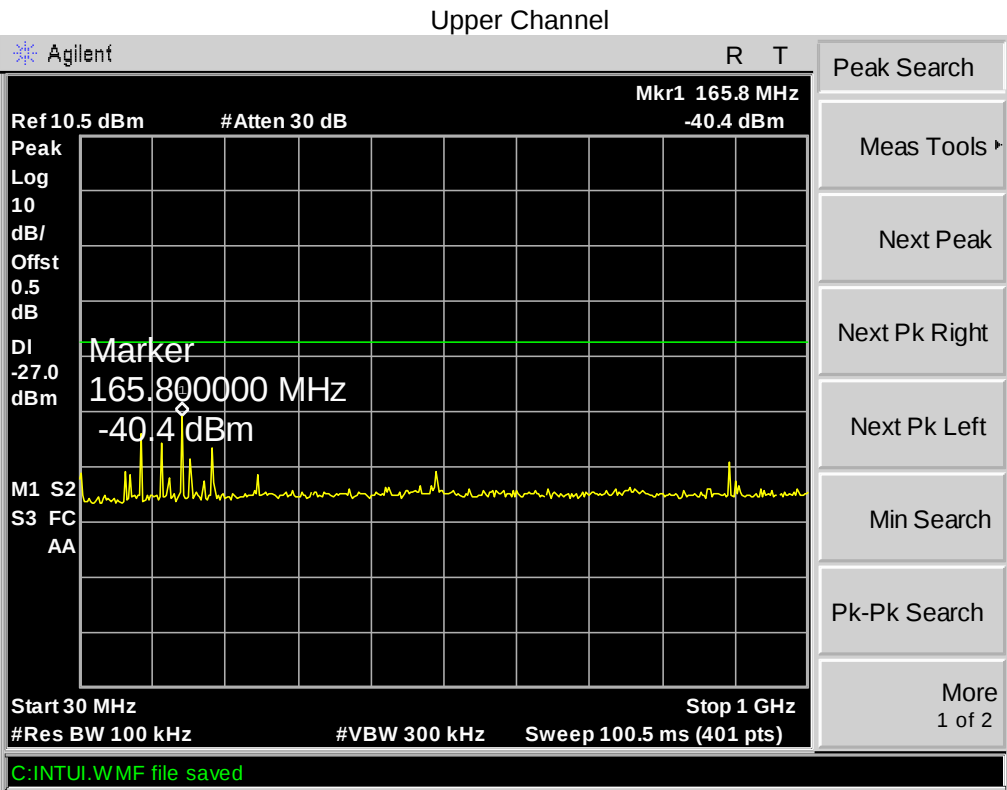


Modulation: Pi/4DQPSK

Lower Channel

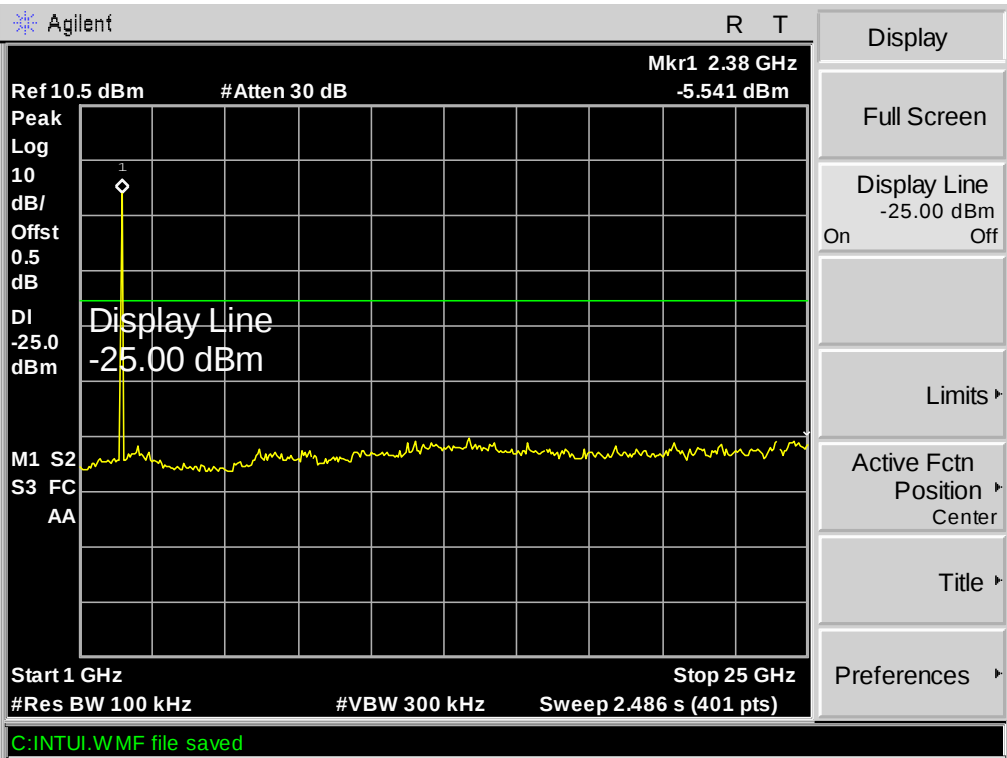
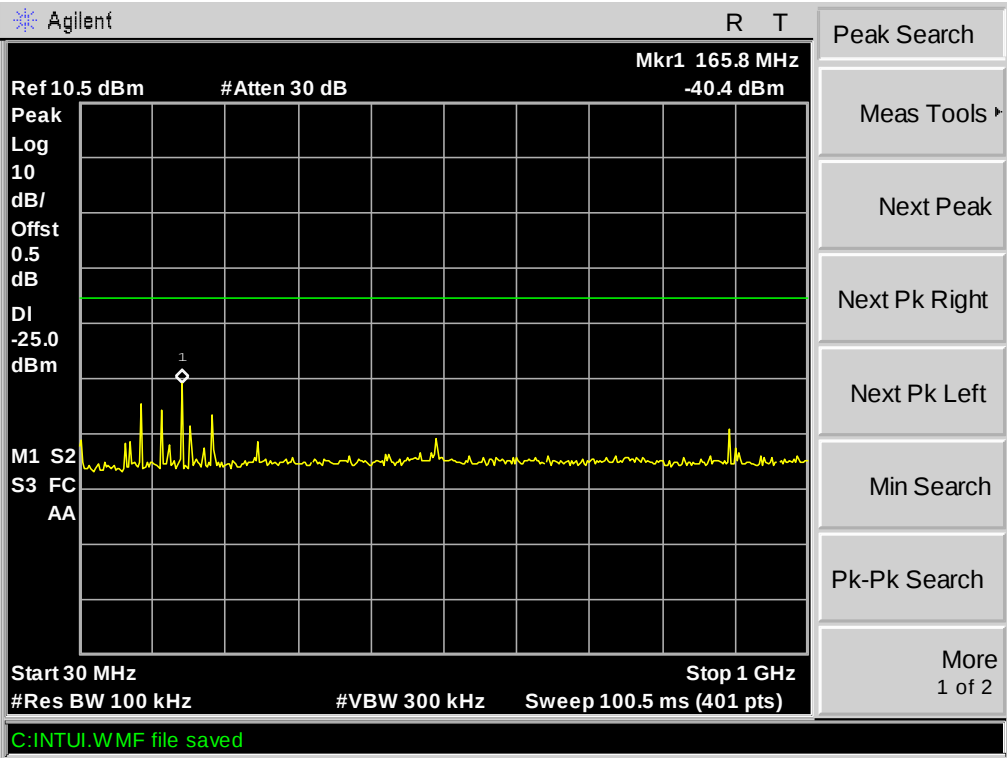


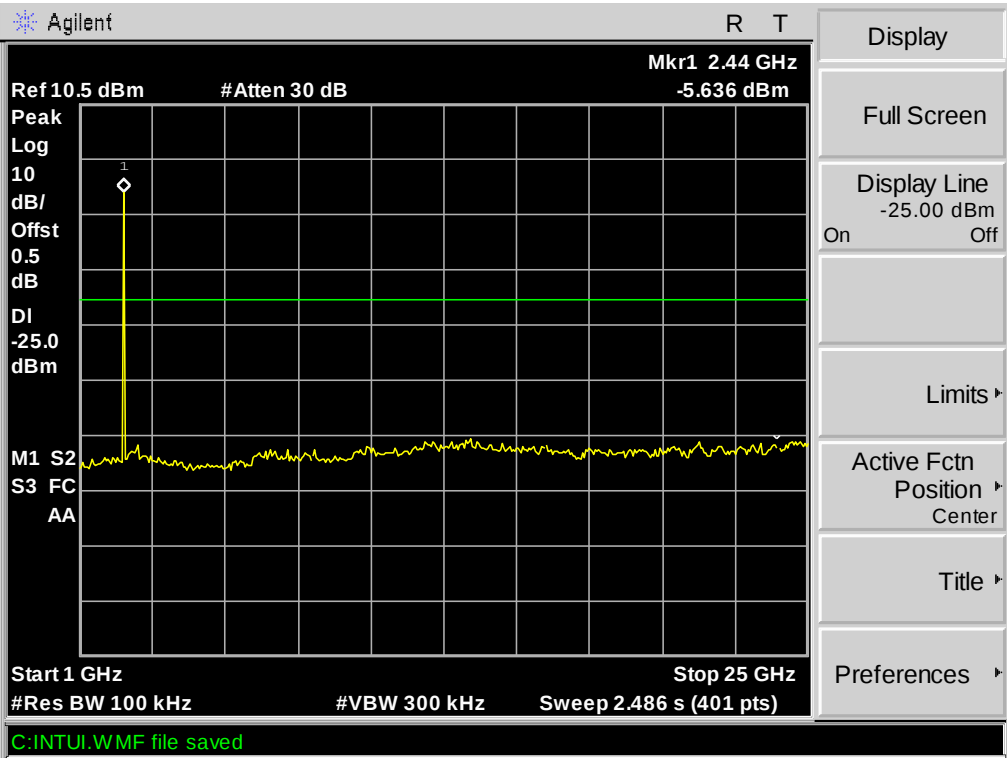
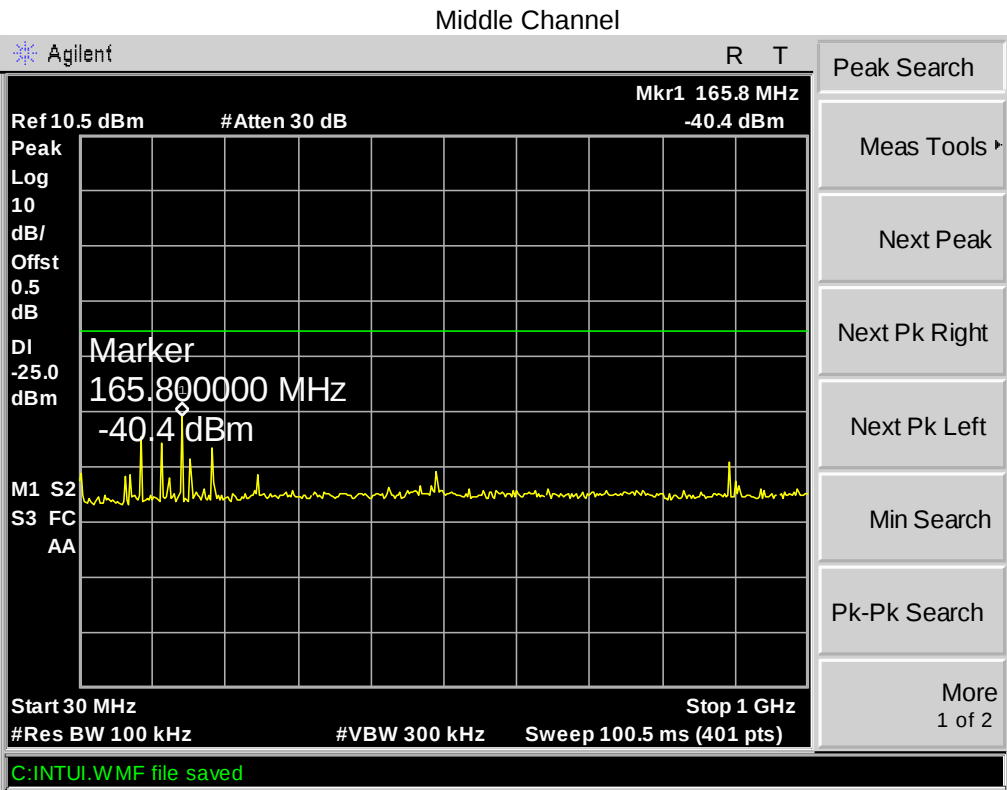


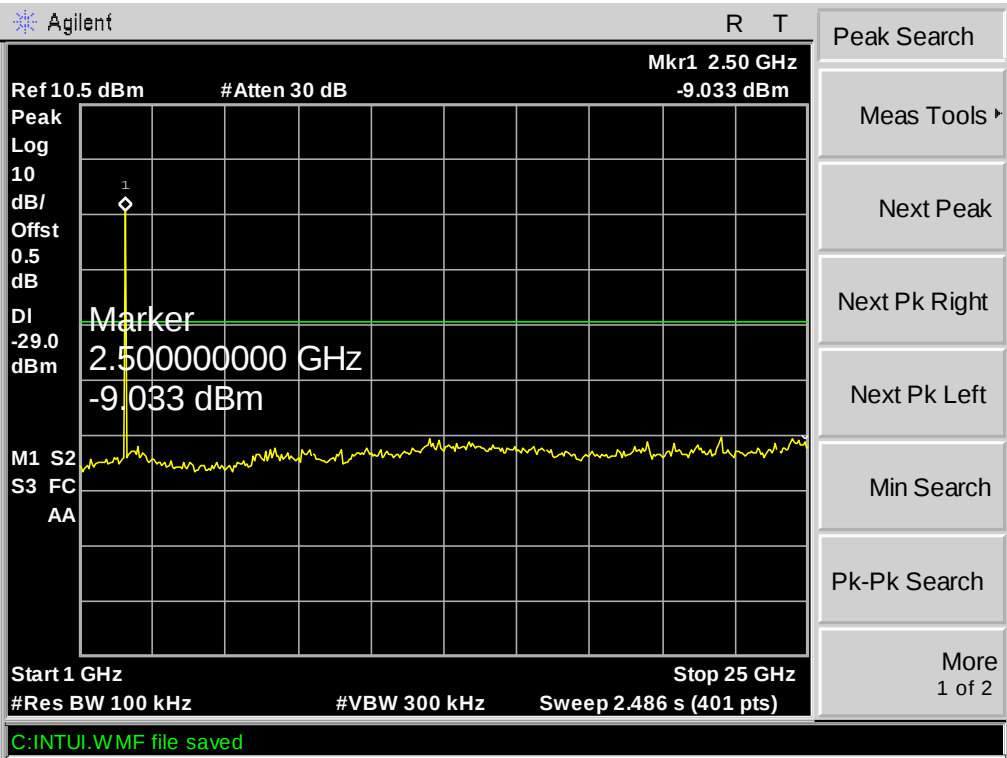
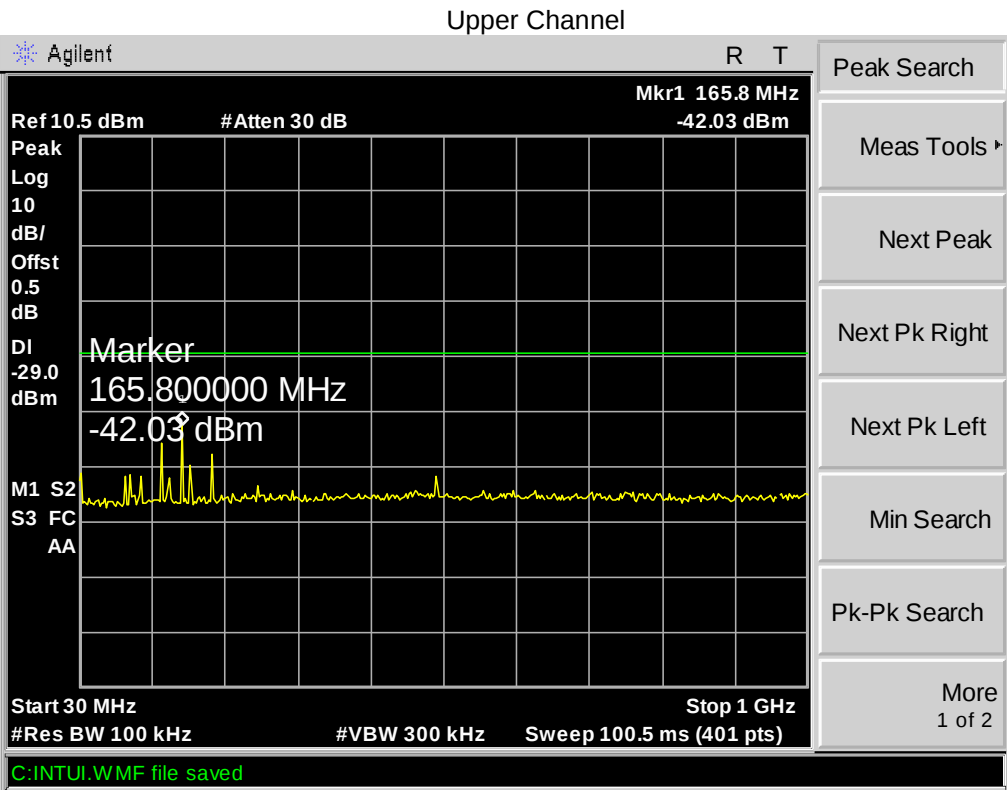


Modulation: 8DPSK

Lower Channel







9 Duty Cycle

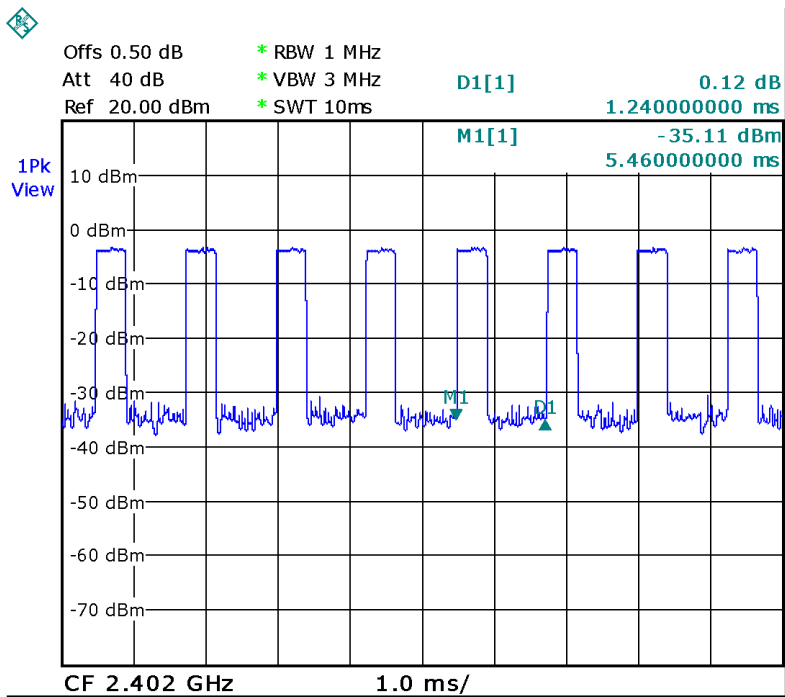
Test Requirement: FCC Part 15.35
Test Mothed: ANSI C63.4:2003
Test Status: TX mode.

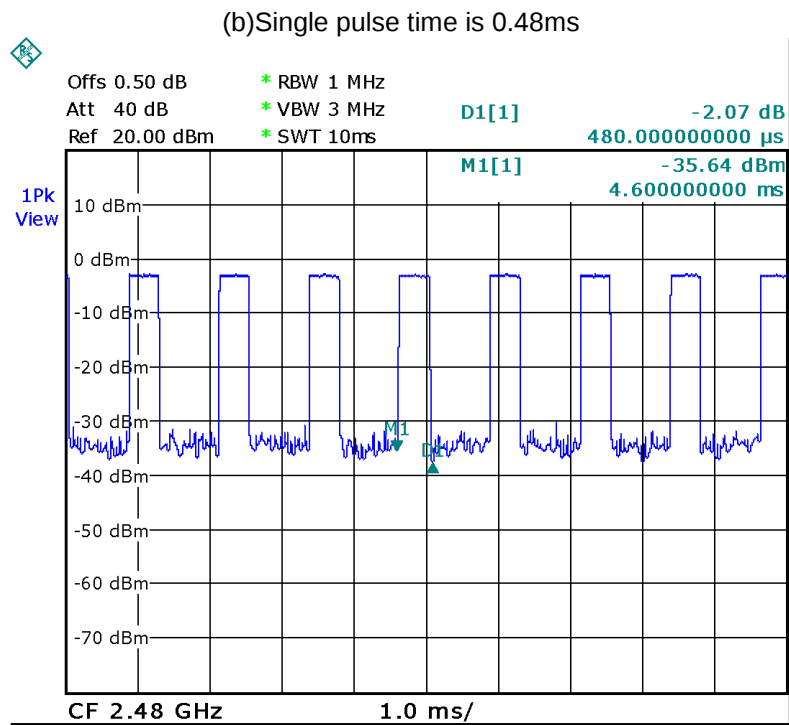
9.1 Test Procedure

- 1. The EUT was placed on a turntable which is 0.8m above ground plane
- 2. Set EUT as normal wrking mode
- 3. Set SPA center frequency = fundamental frequency, RBW = 1000 kHz, VBW = 3000 kHz, Span = 0 Hz, Adjacent sweep time.

9.2 Test Result

(a) transmission period is 1.24ms





The EUT is auto. operation for transmitter, it is declared by the manufacturer as a duty cycle ratio of less than 100%.

The EUT's work time : T_{on} = pulse time = 0.48 ms

The EUT's work period : $T = T_{ON} + T_{OFF}$ = transmission period = 1.24 ms

The EUT's duty cycle : $D = T_{on} / T = 0.48 / 1.24 * 100\% = 38.7\%$

Duty Cycle Correction Factor(dB) = $20 * \log_{10}(\text{Duty Cycle}) = 20 * \log_{10}(38.7\%)$

= -8dB

10 Band Edge Measurement

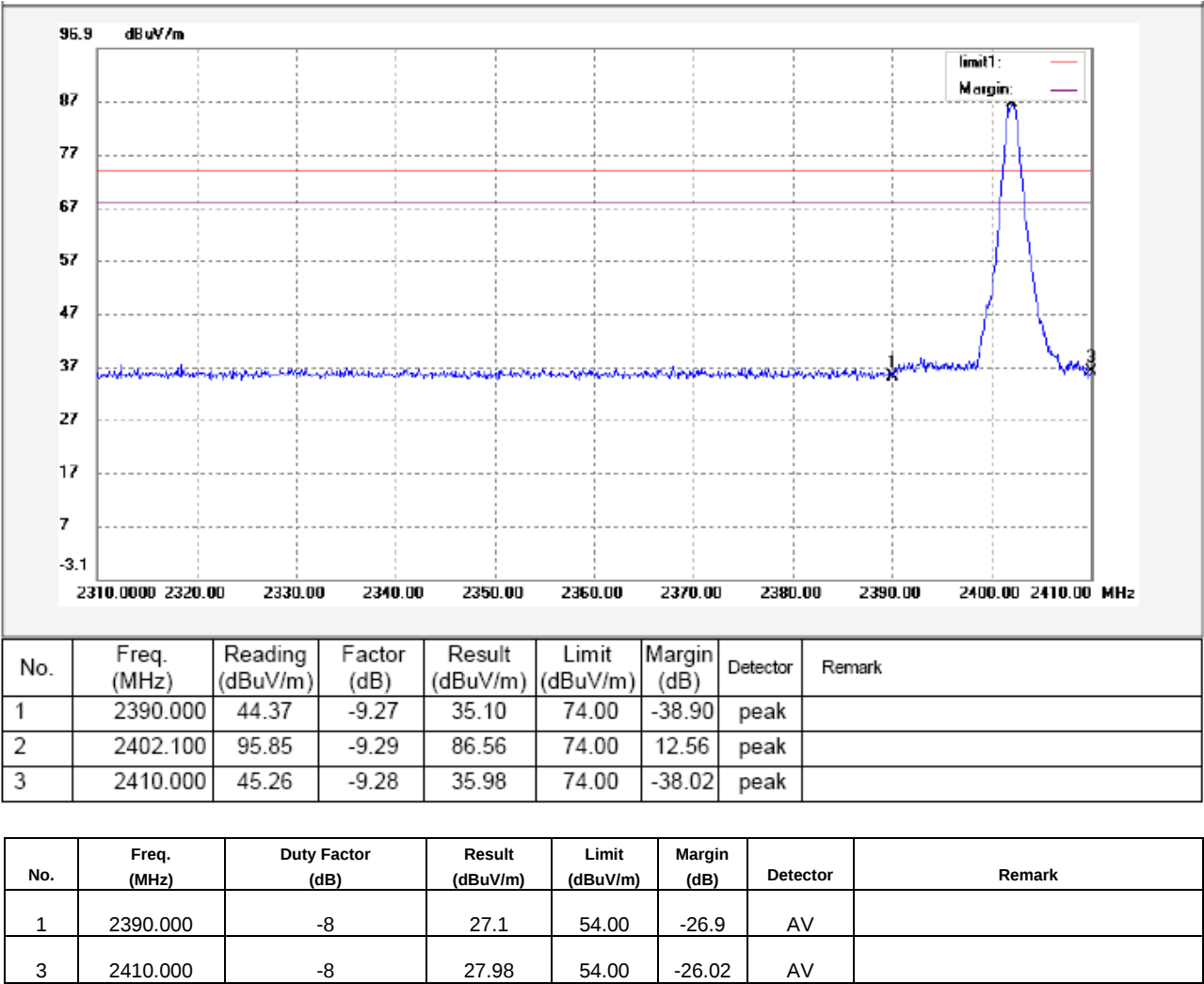
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Limit:	40.0 dBuV/m between 30MHz & 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

10.1 Test Procedure

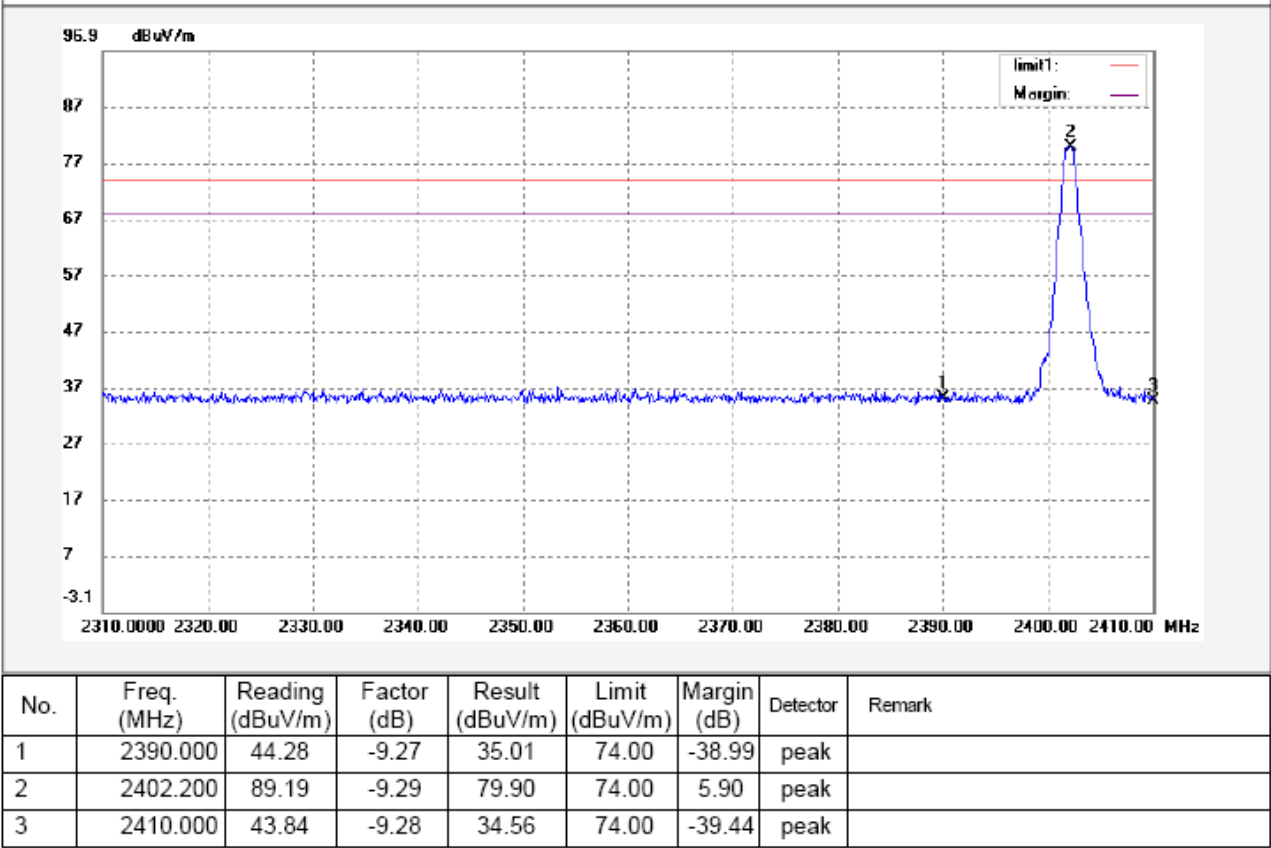
1. The EUT was placed on a turntable which is 0.8m above ground plane
2. Measurement Distance is 3m
3. Detector:
 - For Peak value:
RBW = 1 MHz for $f \geq 1$ GHz
VBW $\geq$ RBW; Sweep = auto
Detector function = peak
Trace = max hold
 - For AVG value:
RBW = 1 MHz for $f \geq 1$ GHz
VBW = 10Hz; Sweep = auto
Detector function = AVG
Trace = max hold
4. Hopping off and hopping on modes were tested, the worst data were shown as follow.

10.2 Test Result:

Hopping off
Lower Channel – Peak, Vertical

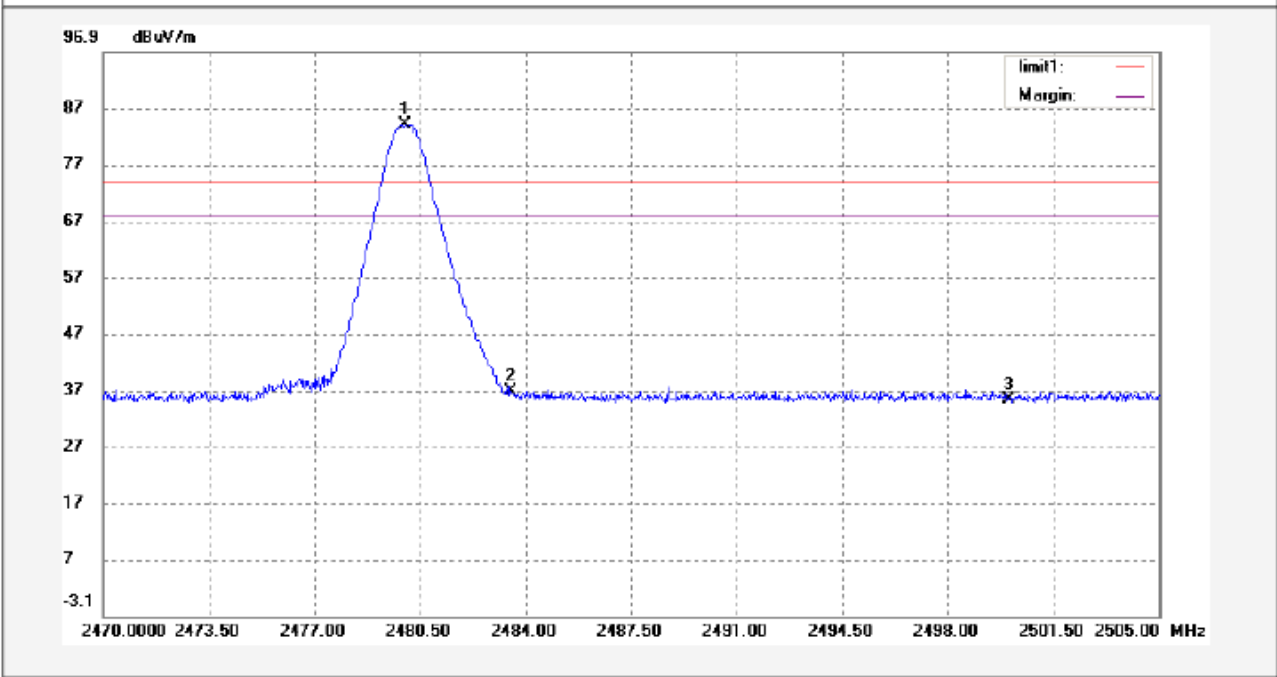


Lower Channel – Peak, Horizontal



No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2390.000	-8	27.01	54.00	-26.99	AV	
3	2410.000	-8	26.56	54.00	-27.44	AV	

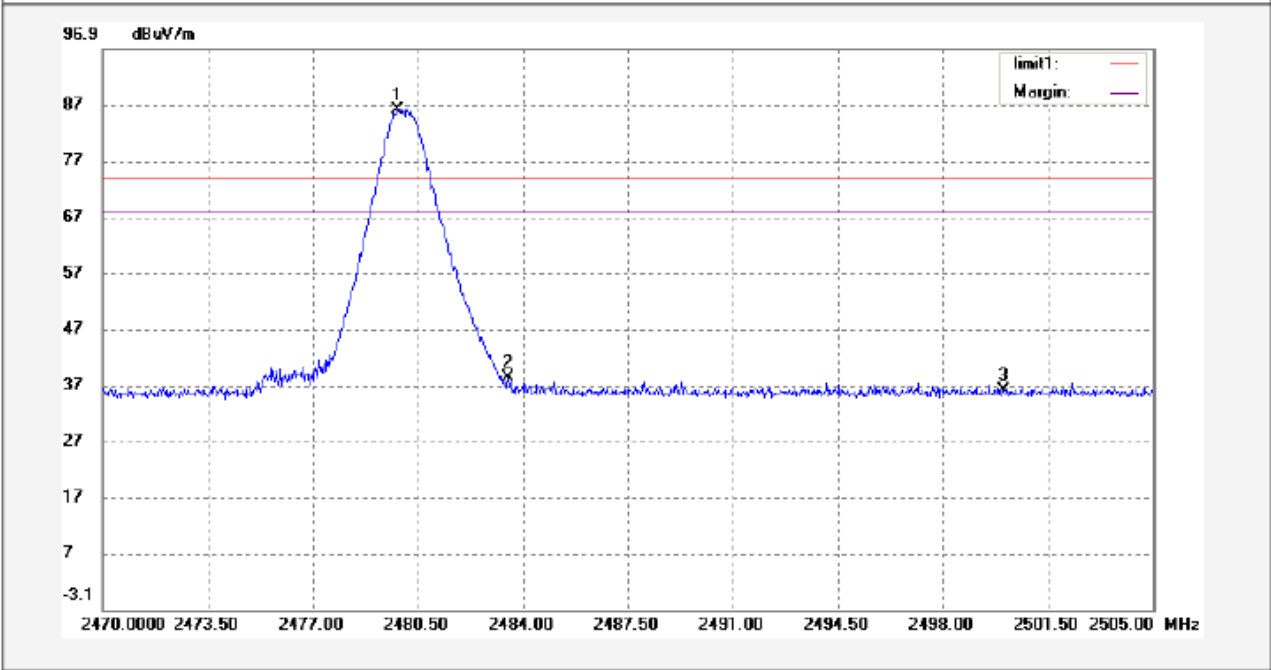
Upper Channel – Peak, Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2480.010	93.33	-9.22	84.11	74.00	10.11	peak	
2	2483.500	45.89	-9.20	36.69	74.00	-37.31	peak	
3	2500.000	44.54	-9.15	35.39	74.00	-38.61	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	2483.500	-8	28.69	54.00	-25.31	AV	
3	2500.00	-8	27.39	54.00	-26.61	AV	

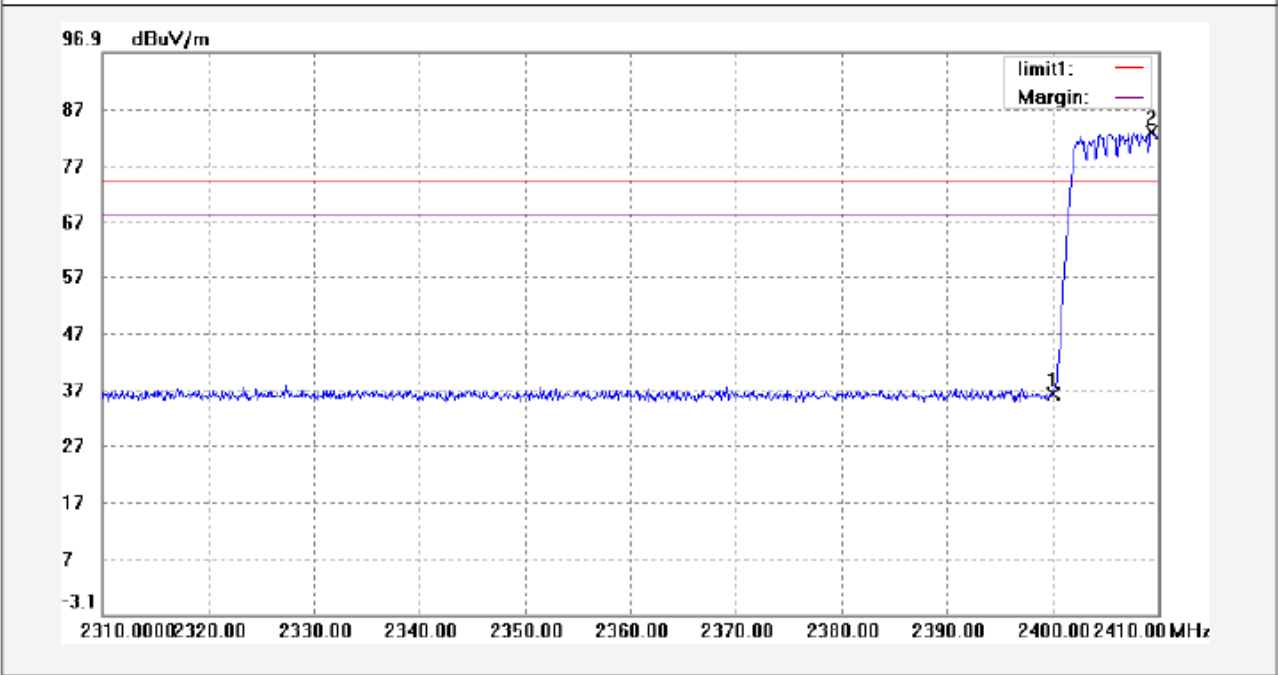
Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2479.835	95.23	-9.22	86.01	74.00	12.01	peak	
2	2483.500	47.42	-9.20	38.22	74.00	-35.78	peak	
3	2500.000	45.16	-9.15	36.01	74.00	-37.99	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
2	2483.500	-8	30.22	54.00	-23.78	AV	
3	2500.000	-8	28.01	54.00	-25.99	AV	

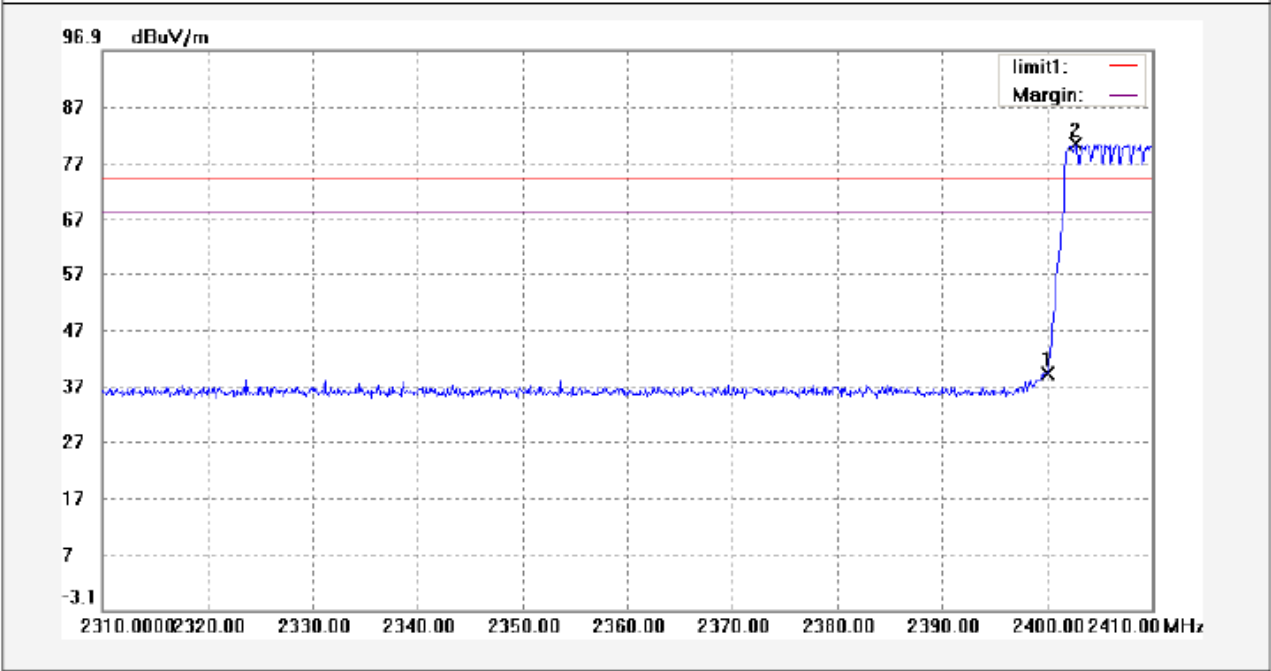
Test mode: Hopping on Modulation:8DPSK(the worst mode)
Lower Channel – Peak, Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	45.36	-9.28	36.08	74.00	-37.92	peak	
2	2409.400	91.98	-9.28	82.70	74.00	8.70	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-8	27.58	54.00	-26.42	AV	
2	2409.000	-8	74.2	54.00	20.2	AV	

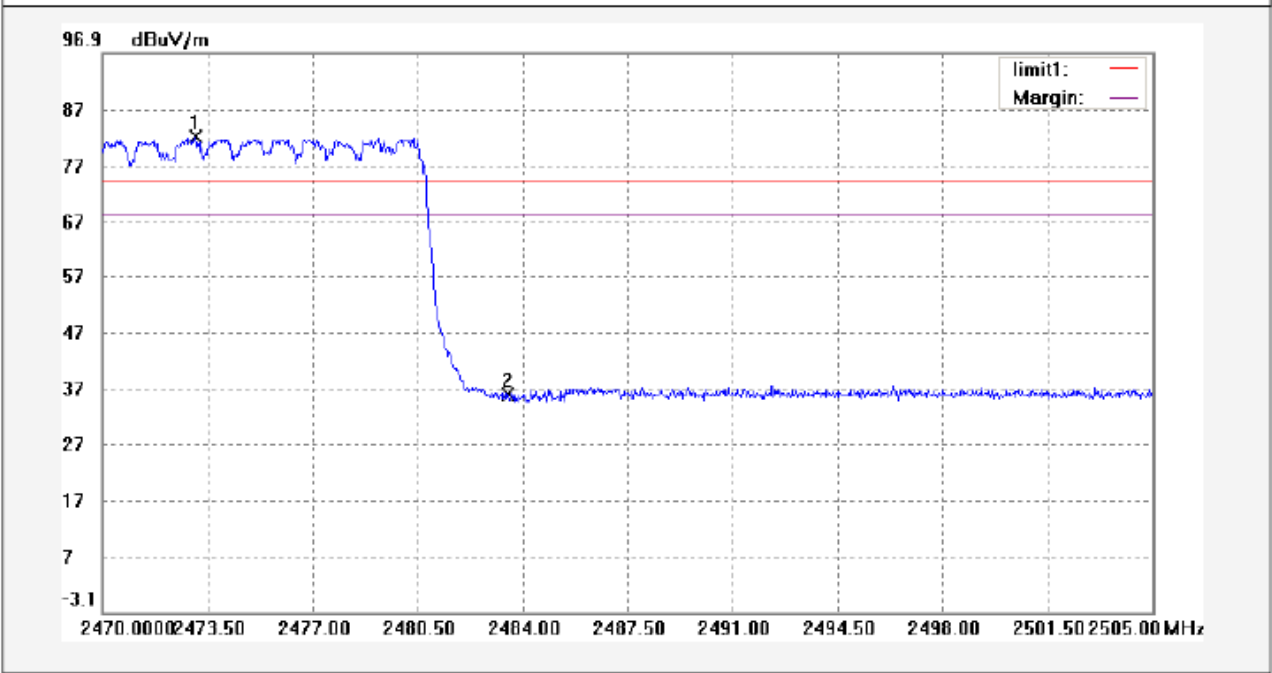
Lower Channel – Peak, Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	48.19	-9.28	38.91	74.00	-35.09	peak	
2	2402.700	89.60	-9.28	80.32	74.00	6.32	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2400.000	-8	30.41	54.00	-23.59	AV	
2	2402.700	-8	71.82	54.00	17.82	AV	

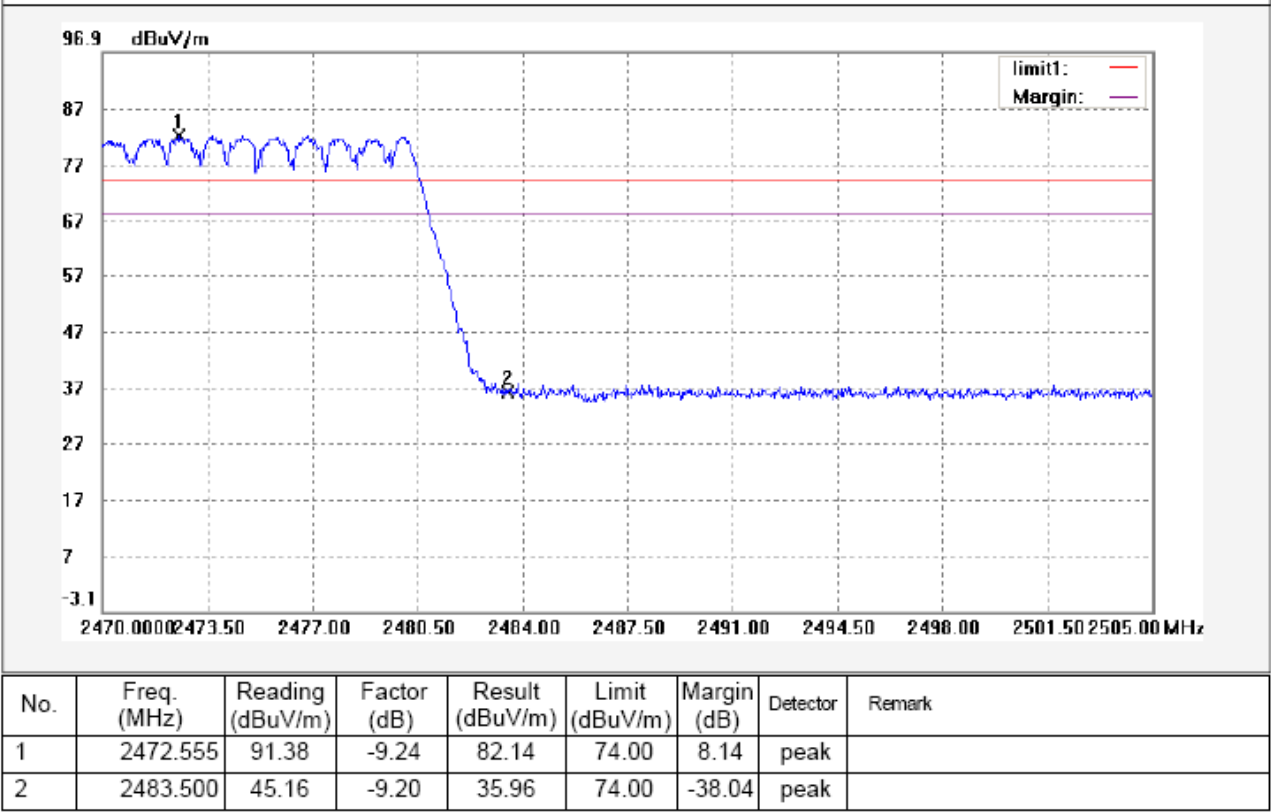
Upper Channel – Peak, Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2473.115	91.16	-9.24	81.92	74.00	7.92	peak	
2	2483.500	45.04	-9.20	35.84	74.00	-38.16	peak	

No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2473.115	-8	73.42	54.00	19.42	AV	
2	2483.500	-8	27.34	54.00	-26.66	AV	

Upper Channel – Peak, Horizontal



No.	Freq. (MHz)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.555	-8	73.64	54.00	19.64	AV	
2	2483.500	-8	27.46	54.00	-26.54	AV	

11 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.

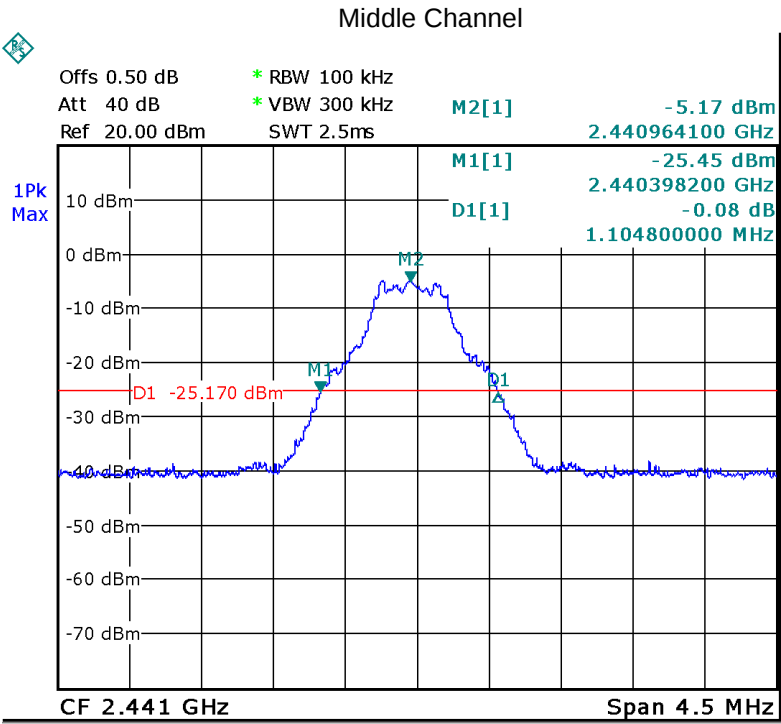
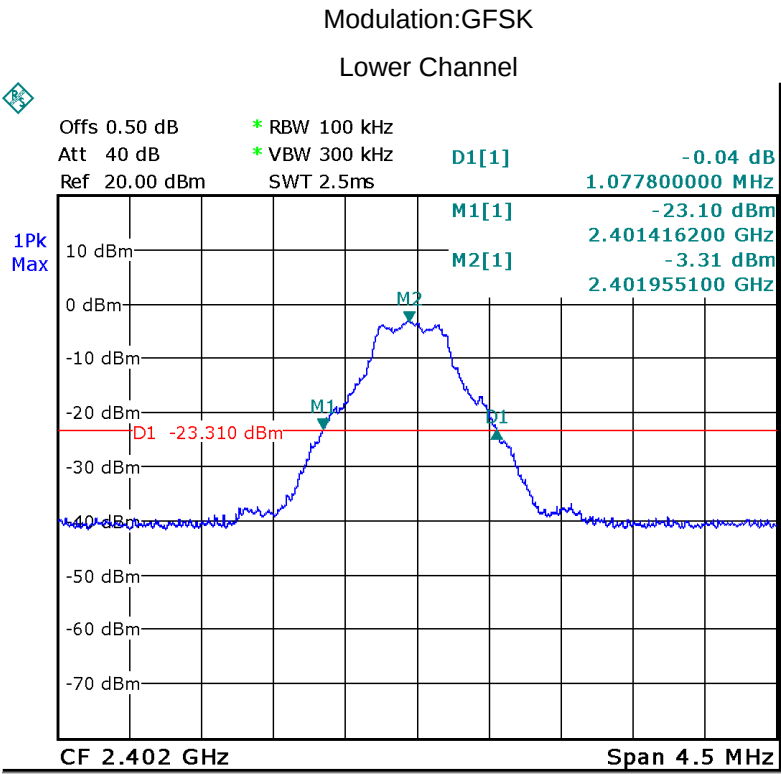
11.1 Test Procedure:

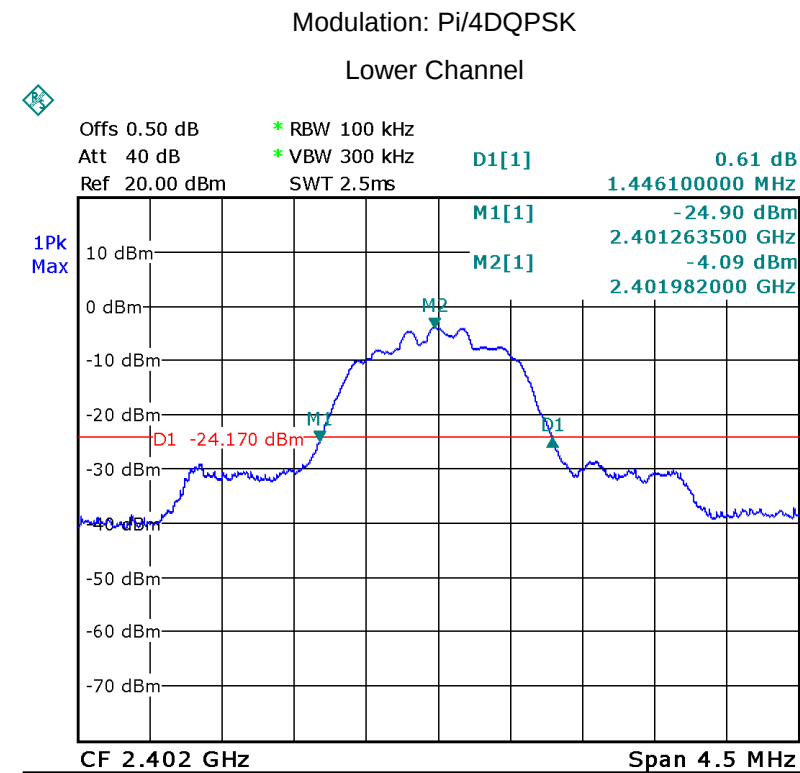
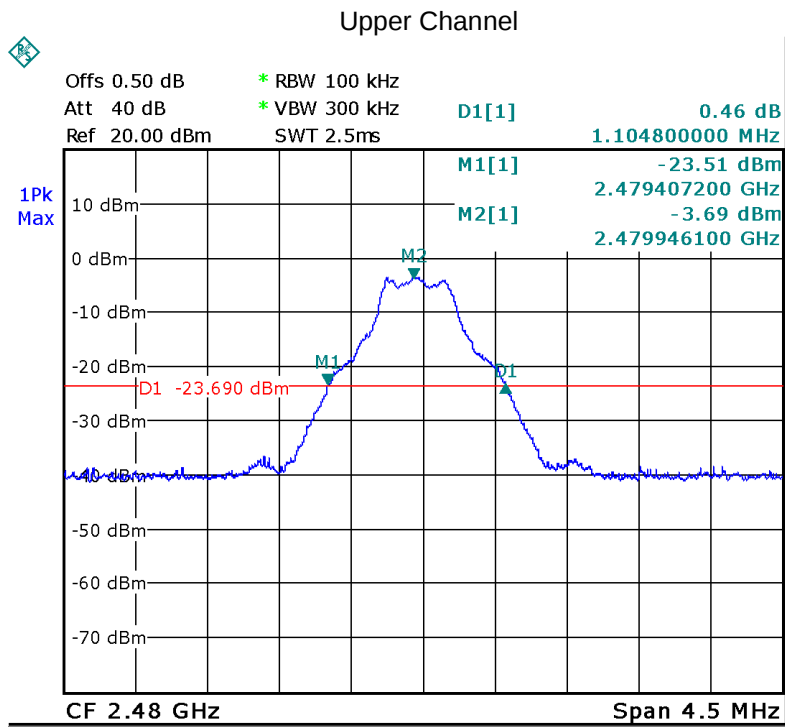
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

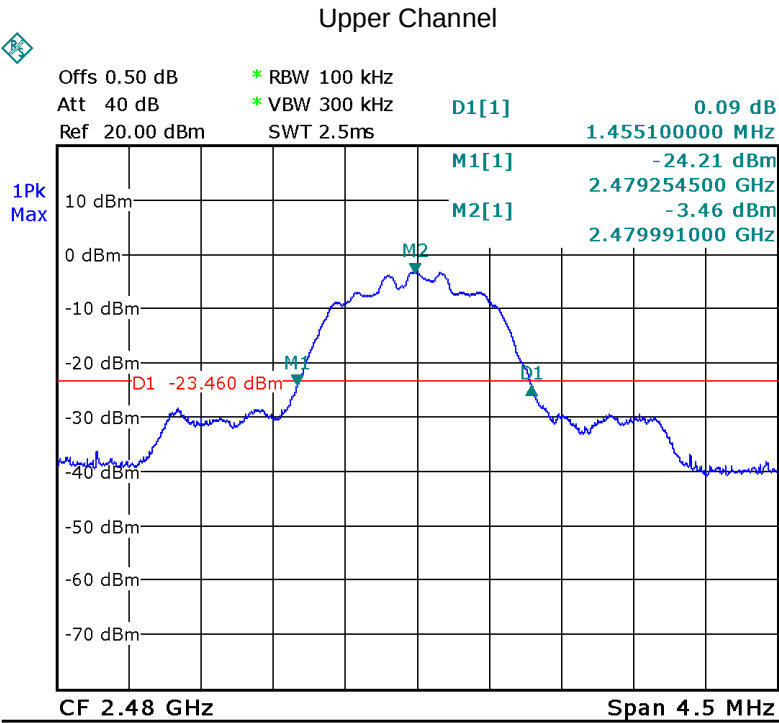
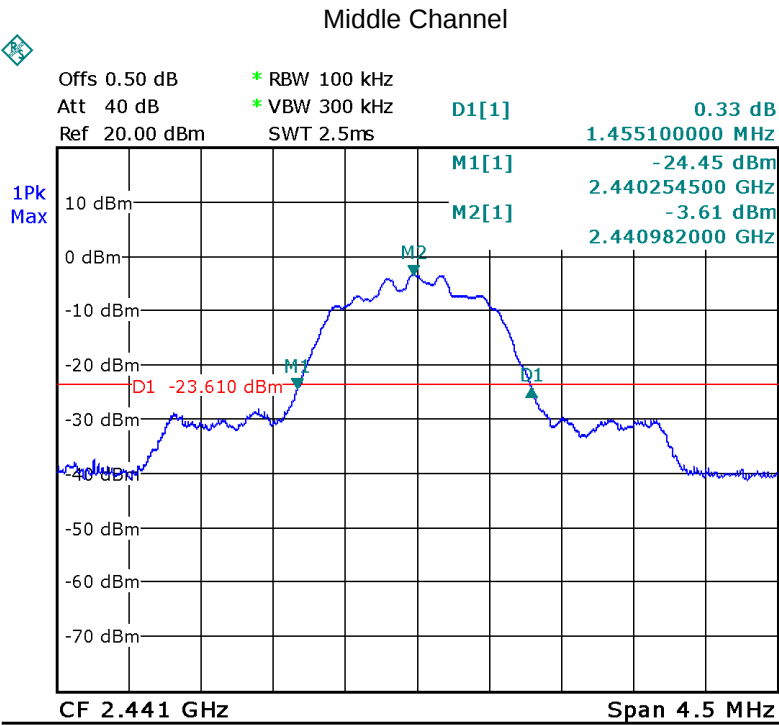
11.2 Test Result:

Modulation	Test Channel	Bandwidth(MHz)
GFSK	Lower	1.0778
	Middle	1.1048
	Upper	1.1048
Pi/4DQPSK	Lower	1.4461
	Middle	1.4551
	Upper	1.4551
8DPSK	Lower	1.4451
	Middle	1.4501
	Upper	1.4641

Test result plot as follows:

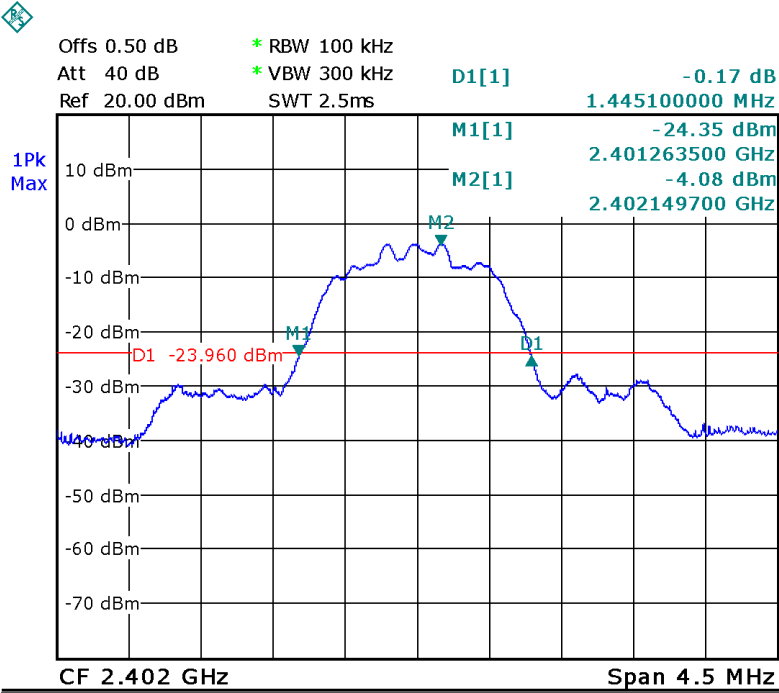




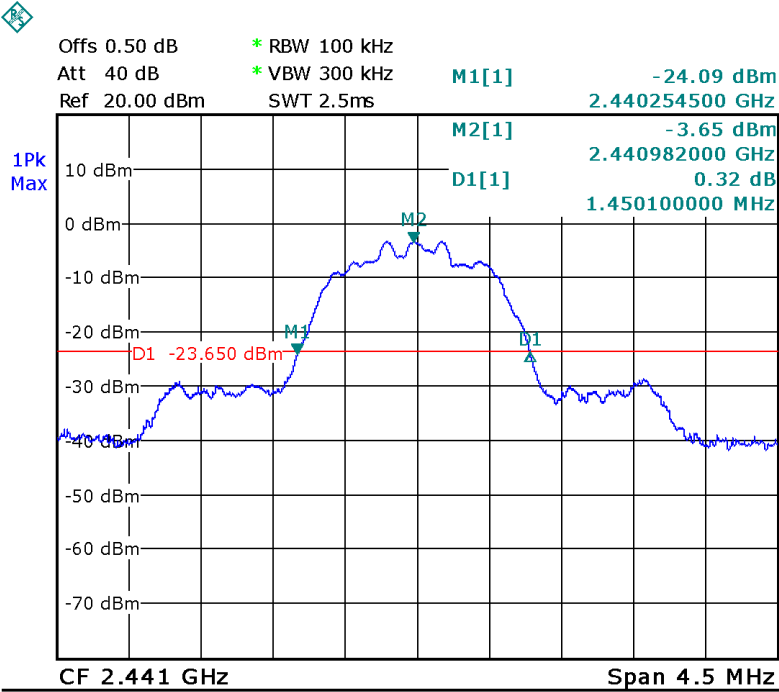


Modulation: 8DPSK

Lower Channel



Middle Channel





12 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 2400-2483.5 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. 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.

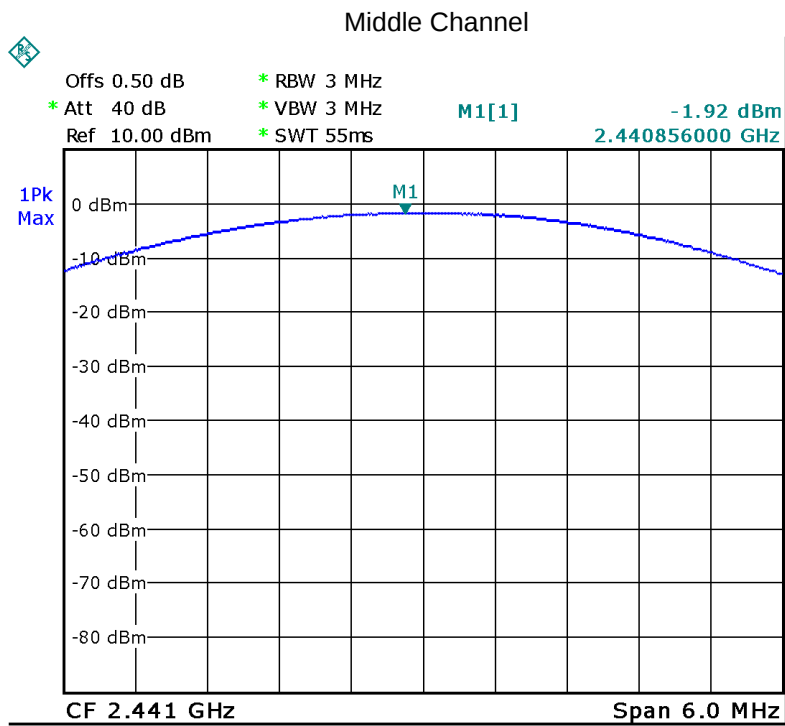
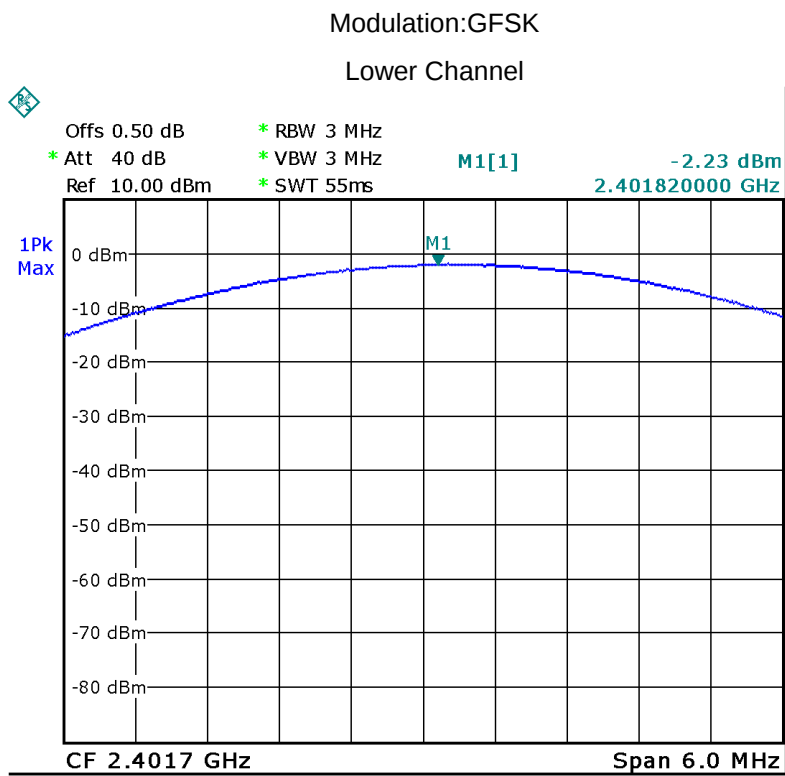
12.1 Test Procedure:

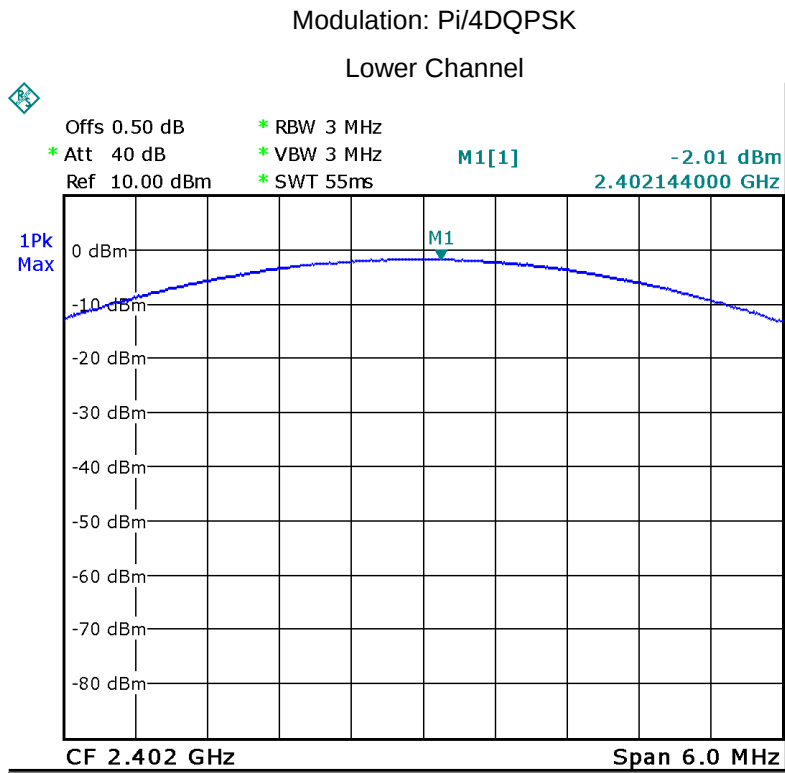
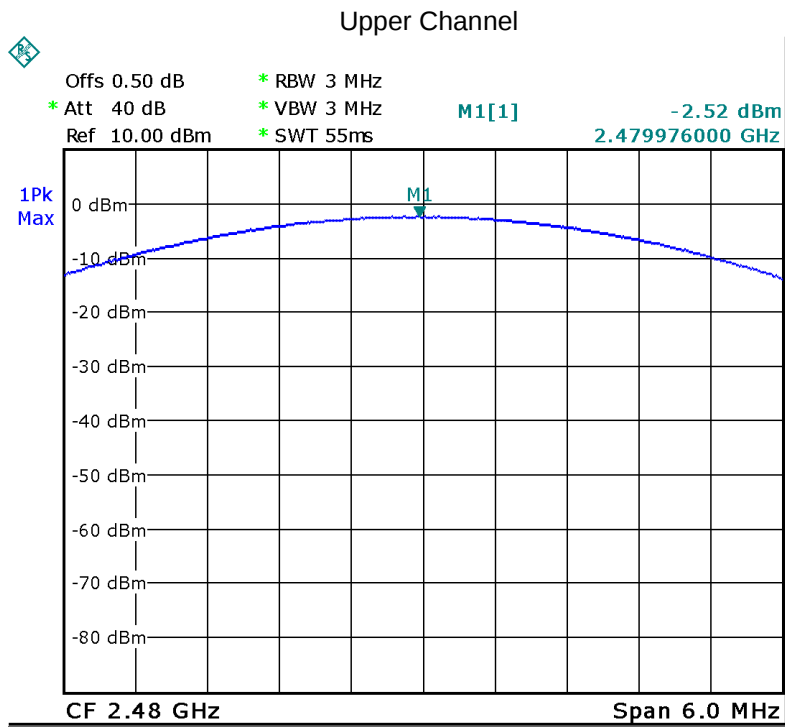
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

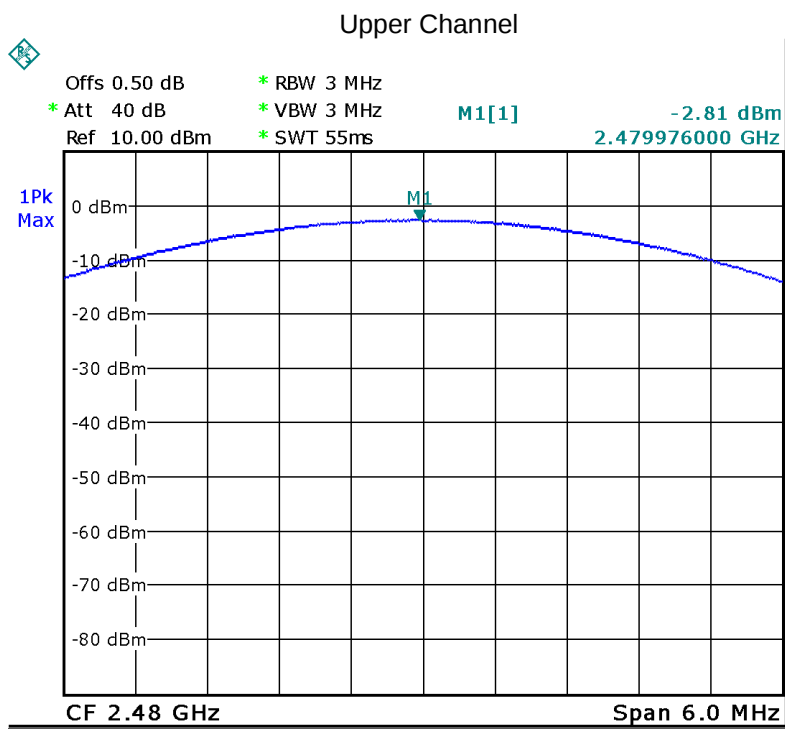
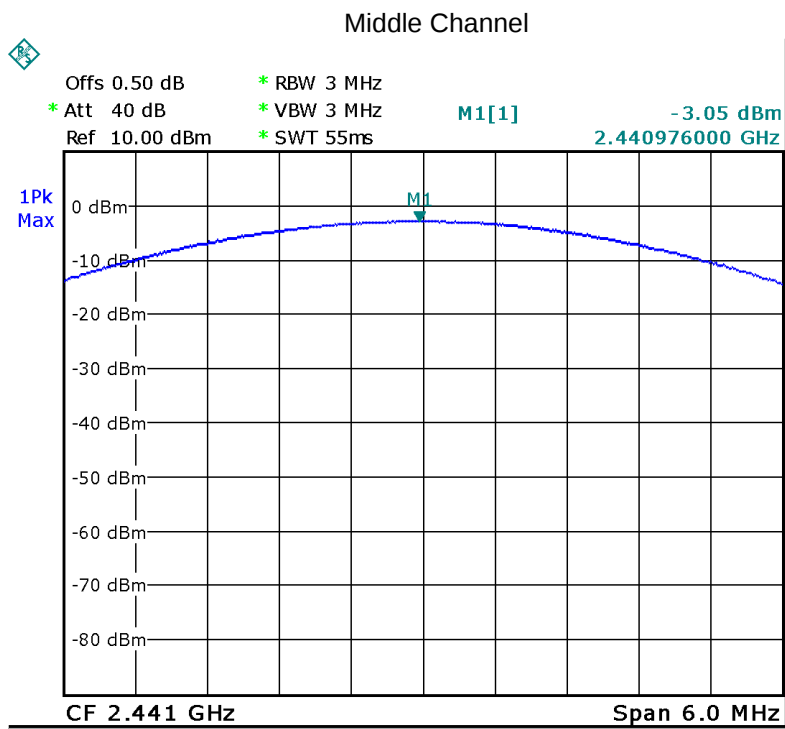
12.2 Test Result:

Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Lower	-2.23	20.97
	Middle	-1.92	20.97
	Upper	-2.52	20.97
Pi/4DQPSK	Lower	-2.01	20.97
	Middle	-3.05	20.97
	Upper	-2.81	20.97
8DPSK	Lower	-3.34	20.97
	Middle	-3.03	20.97
	Upper	-3.80	20.97

Test result plot as follows:

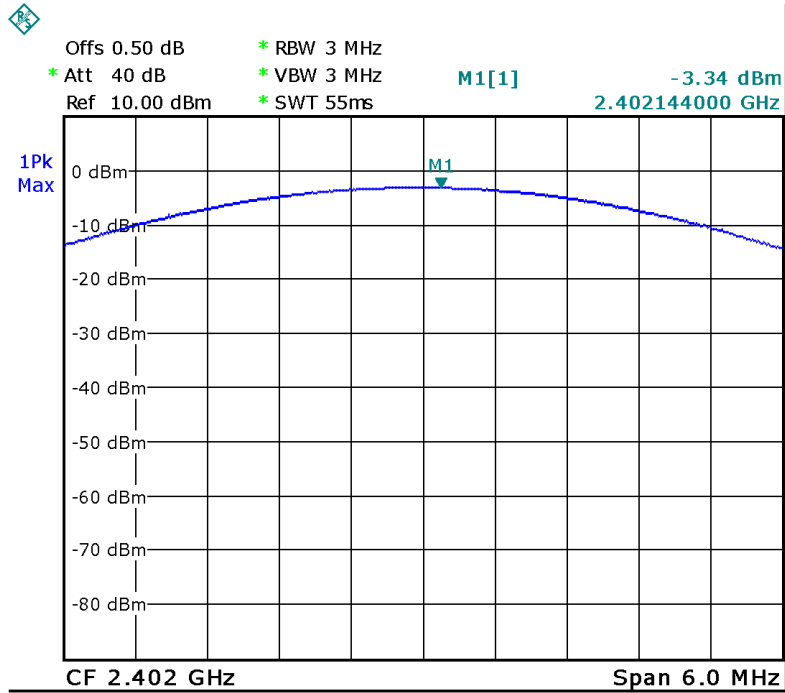




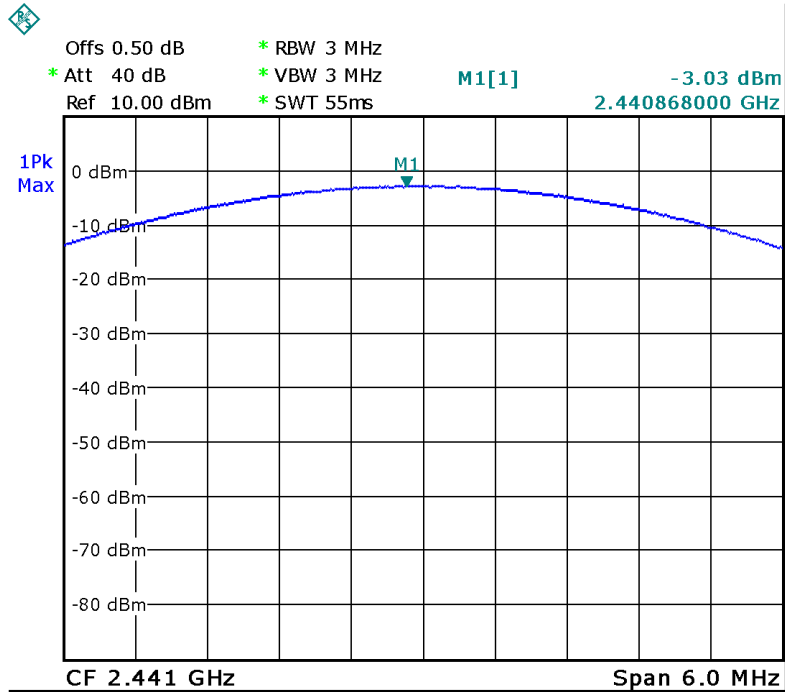


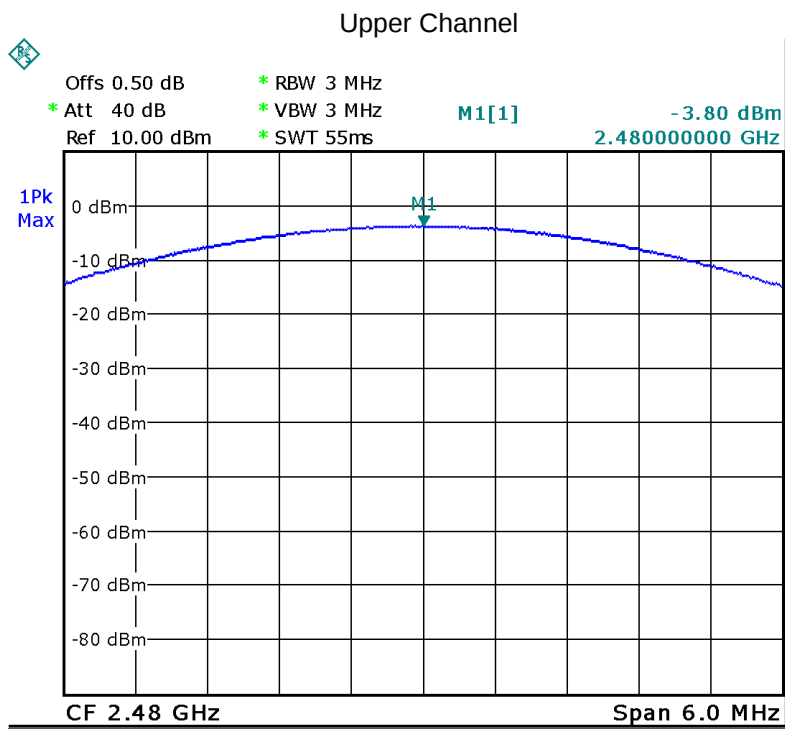
Modulation: 8DPSK

Lower Channel



Middle Channel





13 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 2400-2483.5 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 1W.

Test Mode: Test in hopping transmitting operating mode.

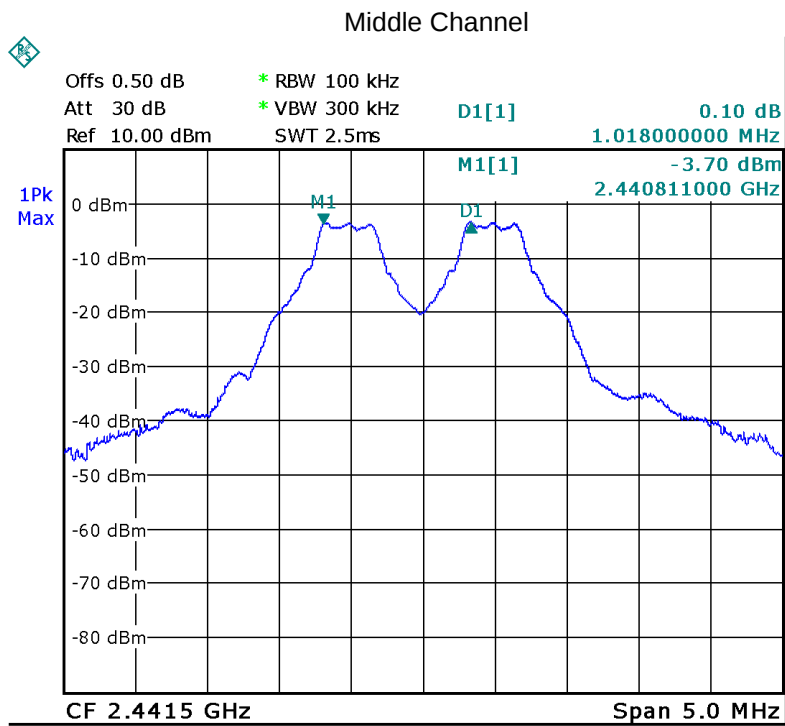
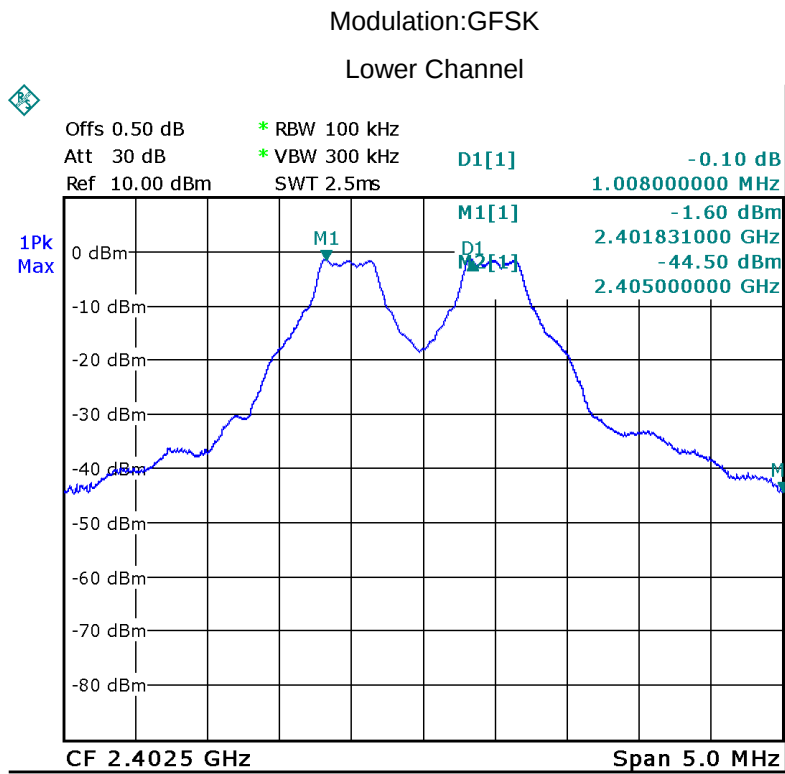
13.1 Test Procedure:

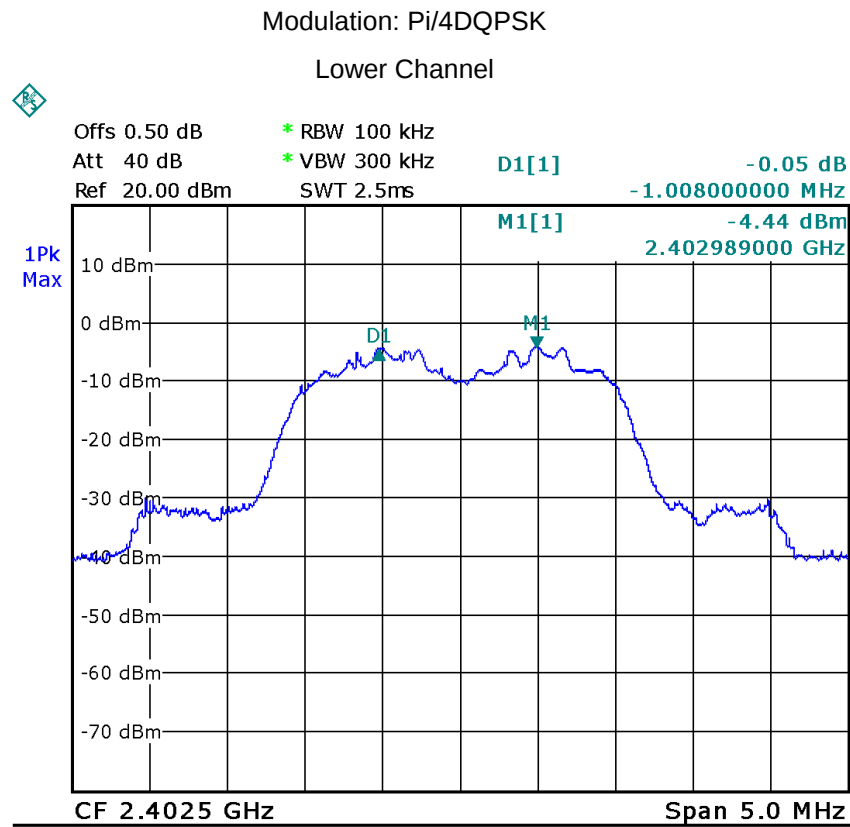
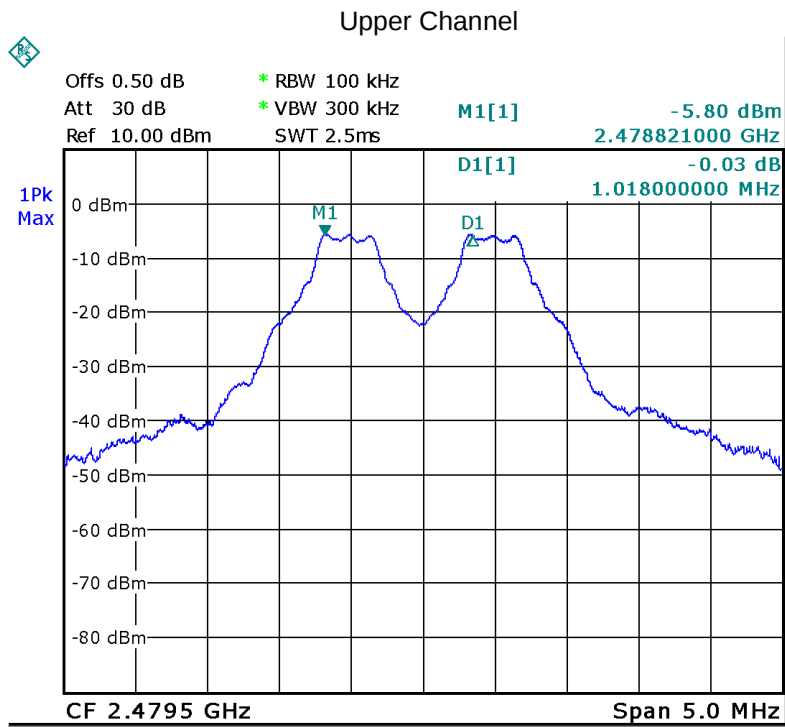
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW = 300KHz , Span = 5MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to 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.

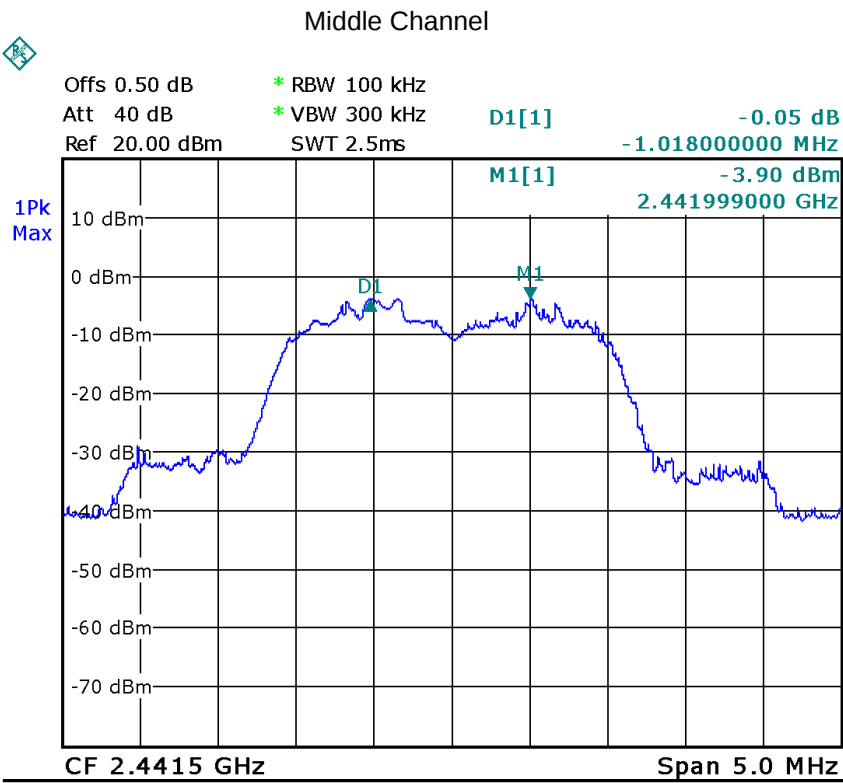
13.2 Test Result:

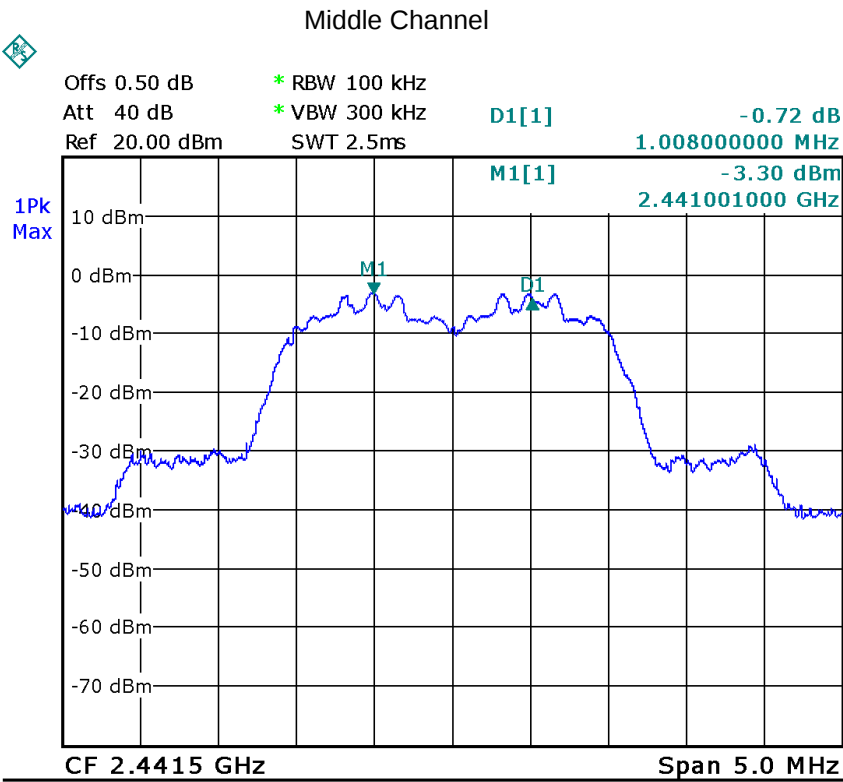
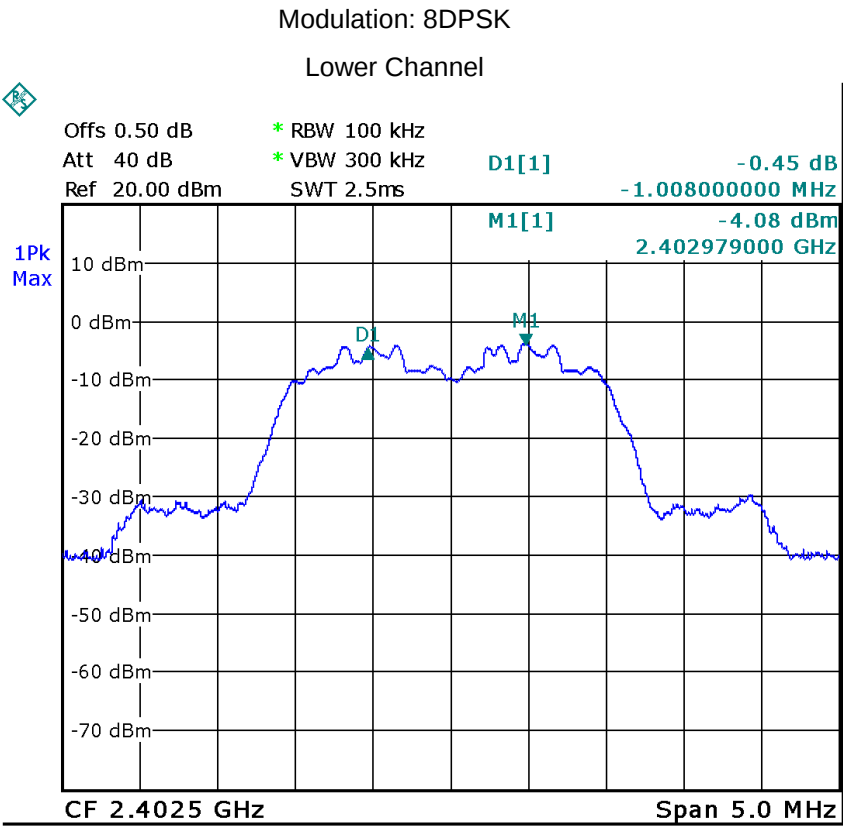
Modulation	Test Channel	Separation (MHz)
GFSK	Lower	1.008
	Middle	1.018
	Upper	1.018
Pi/4DQPSK	Lower	1.008
	Middle	1.018
	Upper	1.005
8DPSK	Lower	1.008
	Middle	1.008
	Upper	1.008

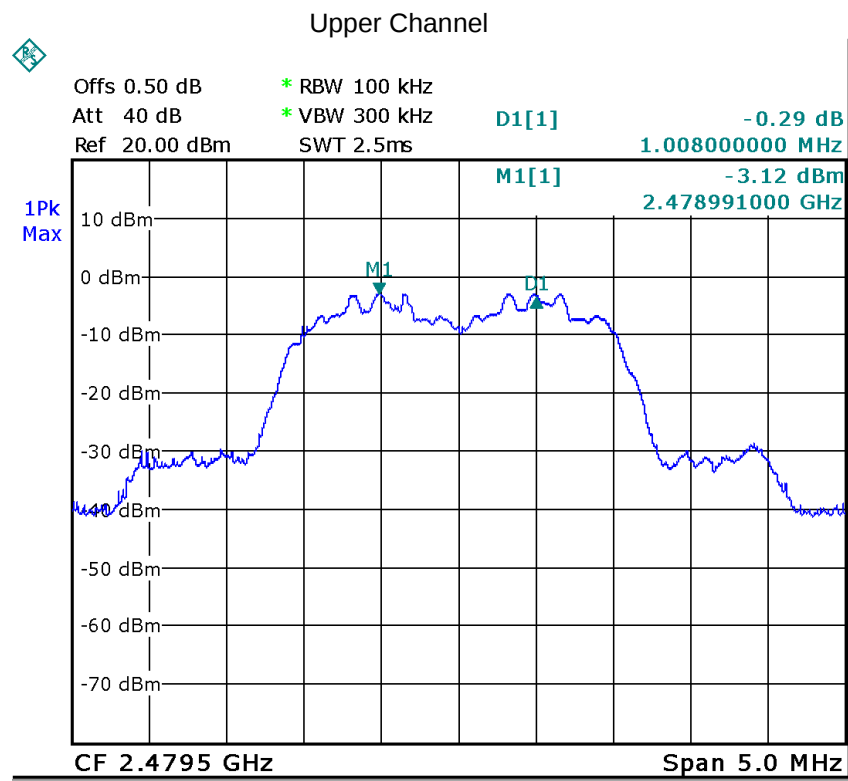
Test result plot as follows:











14 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 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

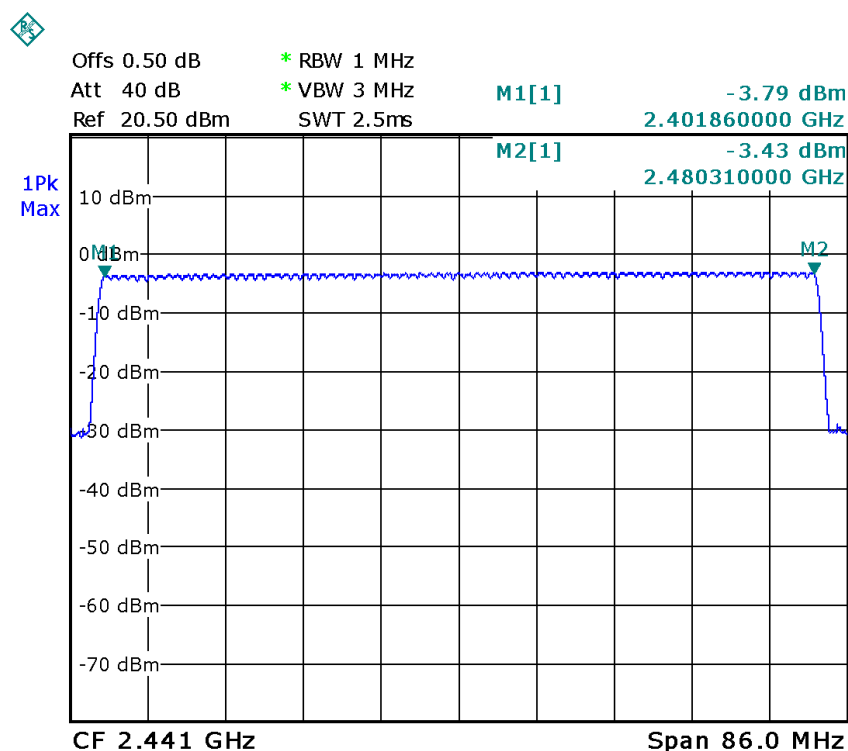
14.1 Test Procedure:

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 = 3MHz. 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;

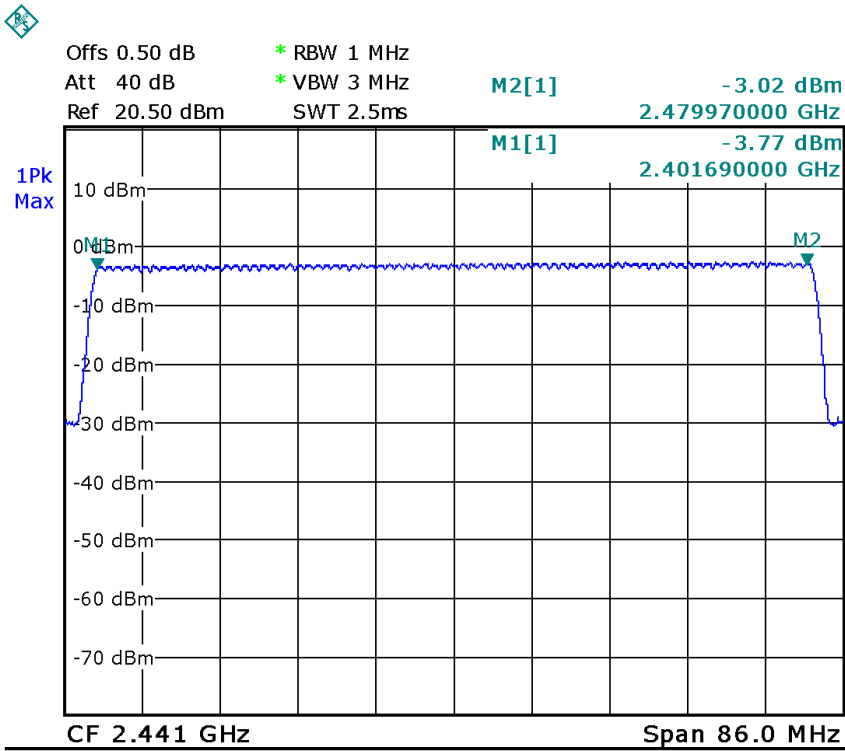
14.2 Test Result:

Total Channels are 79 Channels.

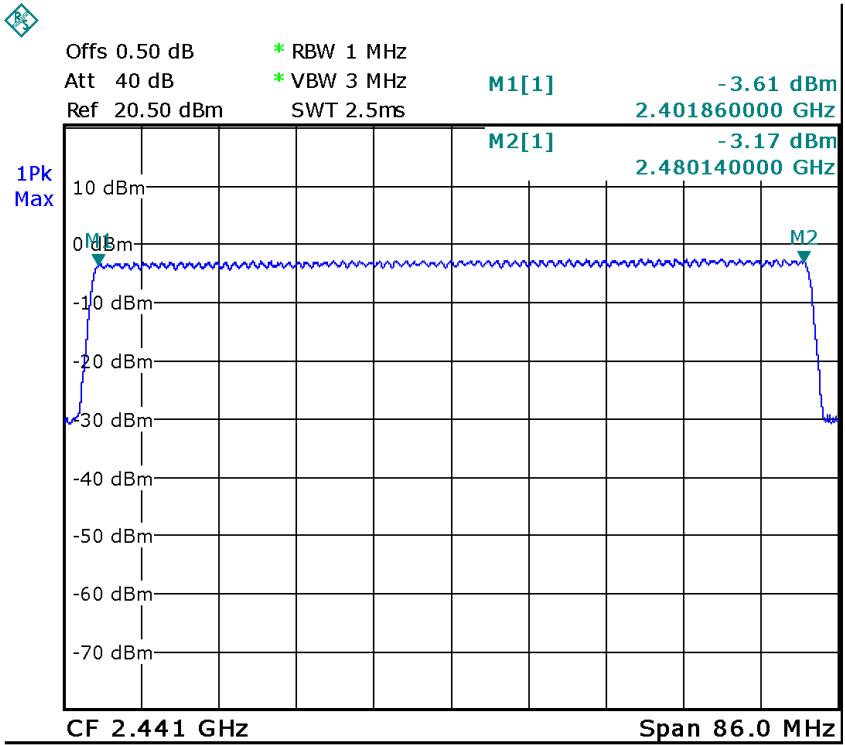
Modulation: GFSK



Modulation: Pi/4DQPSK



Modulation: 8DPSK



15 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 2400-2483.5 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.
Test Mode:	Test in hopping transmitting operating mode.

15.1 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. centered on a hopping channel;
- 3.Set RBW = 1MHz and VBW = 3MHz.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).

15.2 Test Result:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period

The test period: $T = 0.4(s) * 79 = 31.6 (s)$

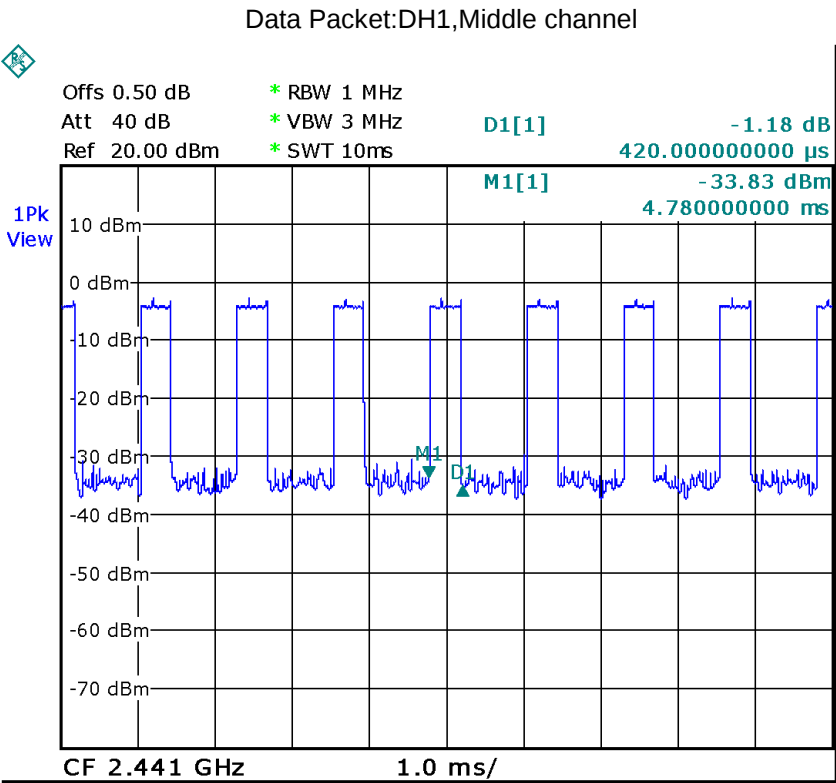
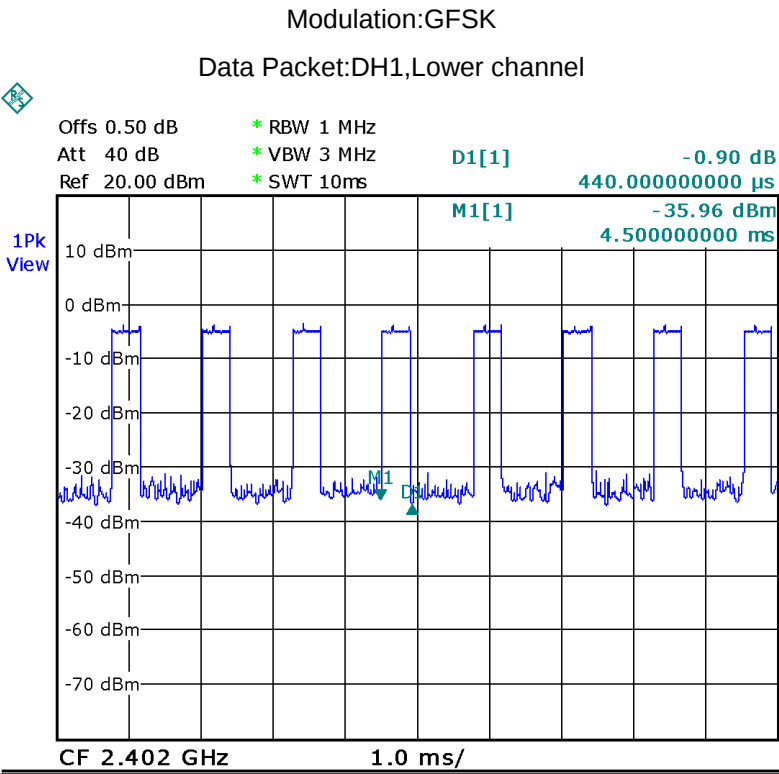
DH5 Packet permit maximum $1600 / 79 / 6$ hops per second in each channel (5 time slots RX, 1 time slot TX).

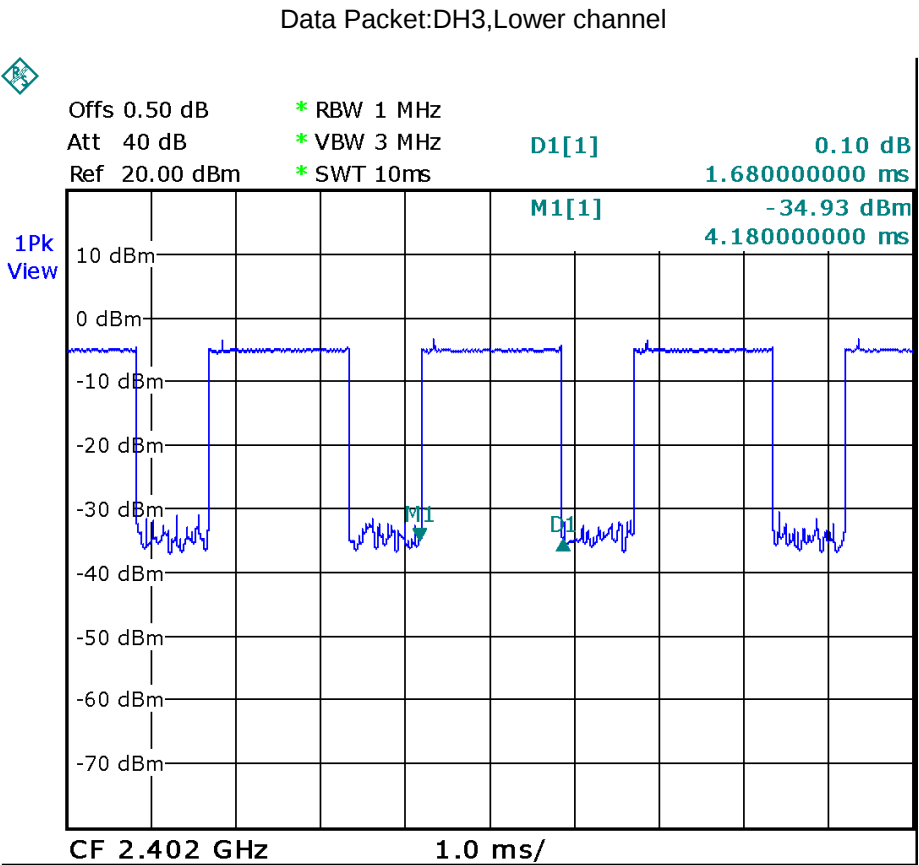
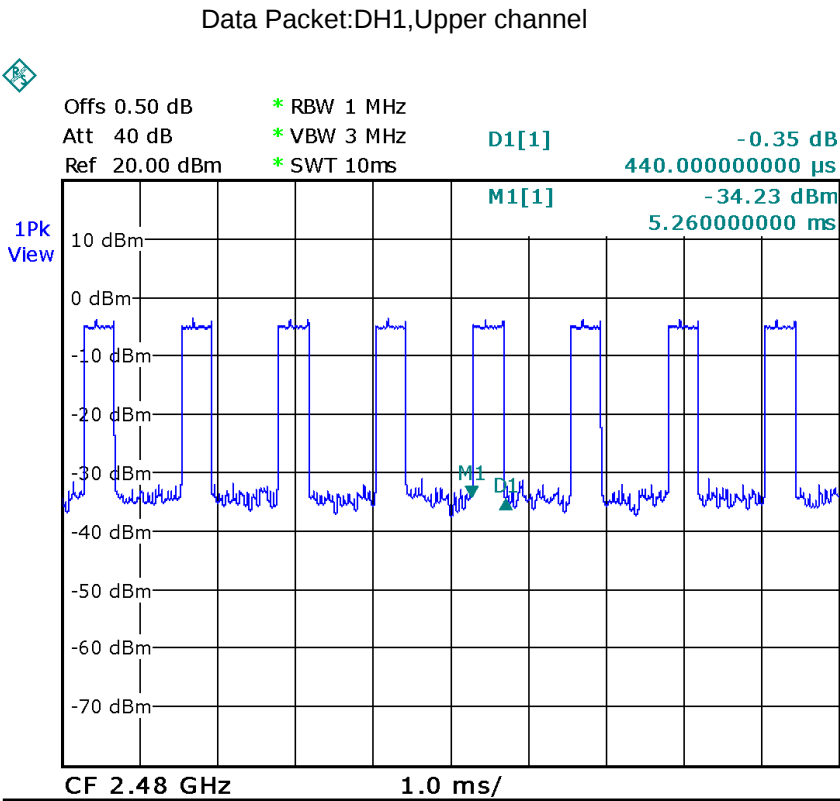
DH3 Packet permit maximum $1600 / 79 / 4$ hops per second in each channel (3 time slots RX, 1 time slot TX).

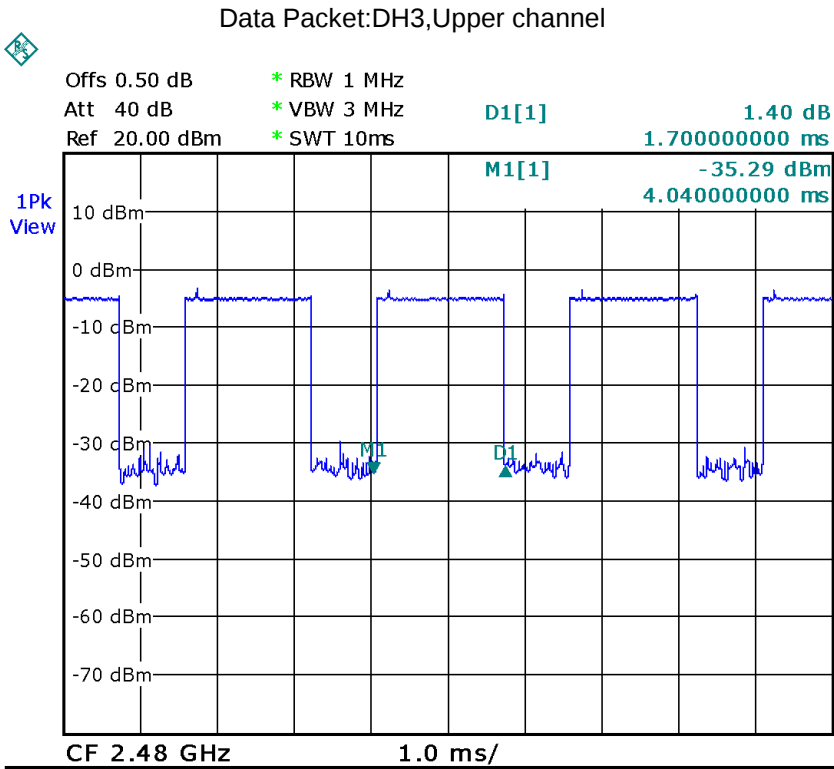
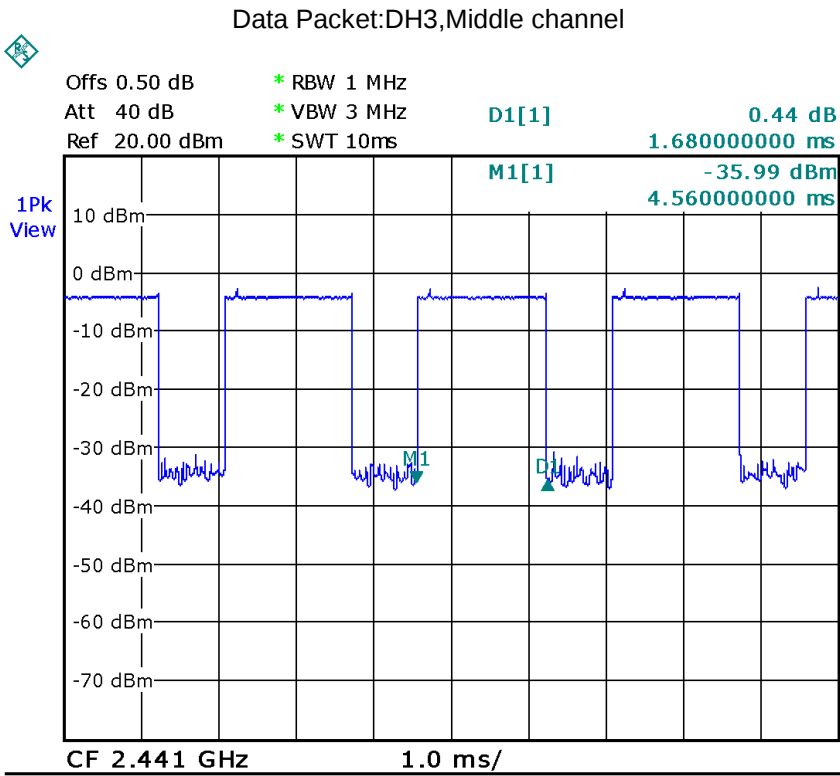
DH1 Packet permit maximum $1600 / 79 / 2$ hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

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.

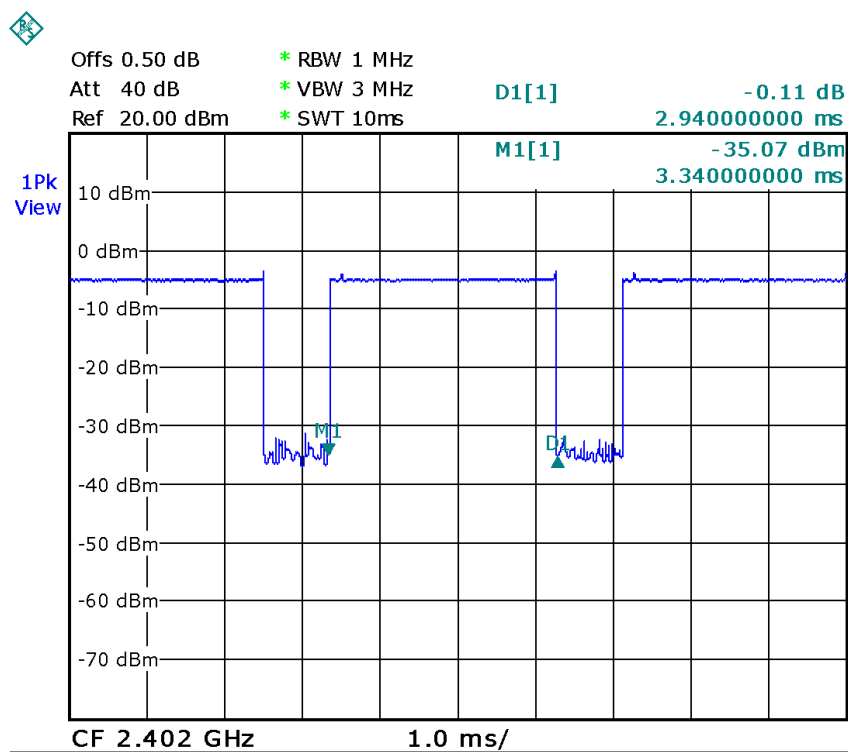
Modulation	Frequency	Data Packet	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
GFSK	Lower channel	DH1	0.440	0.1408	0.400
	Middle channel		0.420	0.1344	0.400
	Upper channel		0.440	0.1408	0.400
	Lower channel	DH3	1.680	0.2688	0.400
	Middle channel		1.680	0.2688	0.400
	Upper channel		1.700	0.2720	0.400
	Lower channel	DH5	2.940	0.3136	0.400
	Middle channel		2.980	0.3179	0.400
	Upper channel		2.940	0.3136	0.400
Pi/4DQPSK	Lower channel	DH1	0.480	0.1536	0.400
	Middle channel		0.520	0.1664	0.400
	Upper channel		0.480	0.1536	0.400
	Lower channel	DH3	1.720	0.2752	0.400
	Middle channel		1.740	0.2784	0.400
	Upper channel		1.740	0.2784	0.400
	Lower channel	DH5	2.960	0.3157	0.400
	Middle channel		3.020	0.3221	0.400
	Upper channel		3.000	0.3200	0.400
8DPSK	Lower channel	DH1	0.460	0.1472	0.400
	Middle channel		0.460	0.1472	0.400
	Upper channel		0.440	0.1408	0.400
	Lower channel	DH3	1.820	0.2912	0.400
	Middle channel		1.760	0.2816	0.400
	Upper channel		1.700	0.2720	0.400
	Lower channel	DH5	3.020	0.3221	0.400
	Middle channel		3.020	0.3221	0.400
	Upper channel		2.980	0.3179	0.400



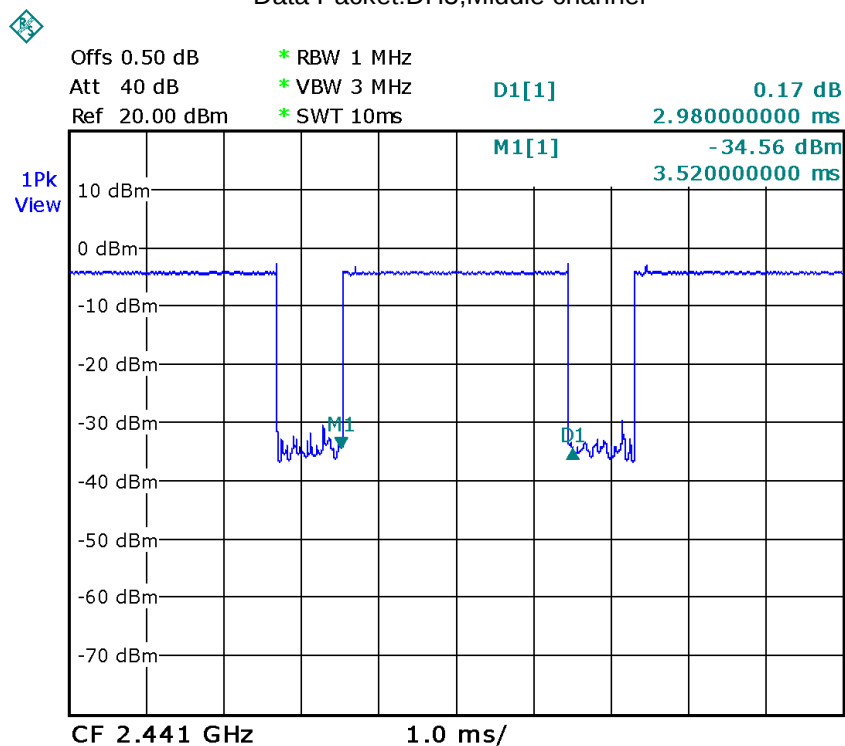


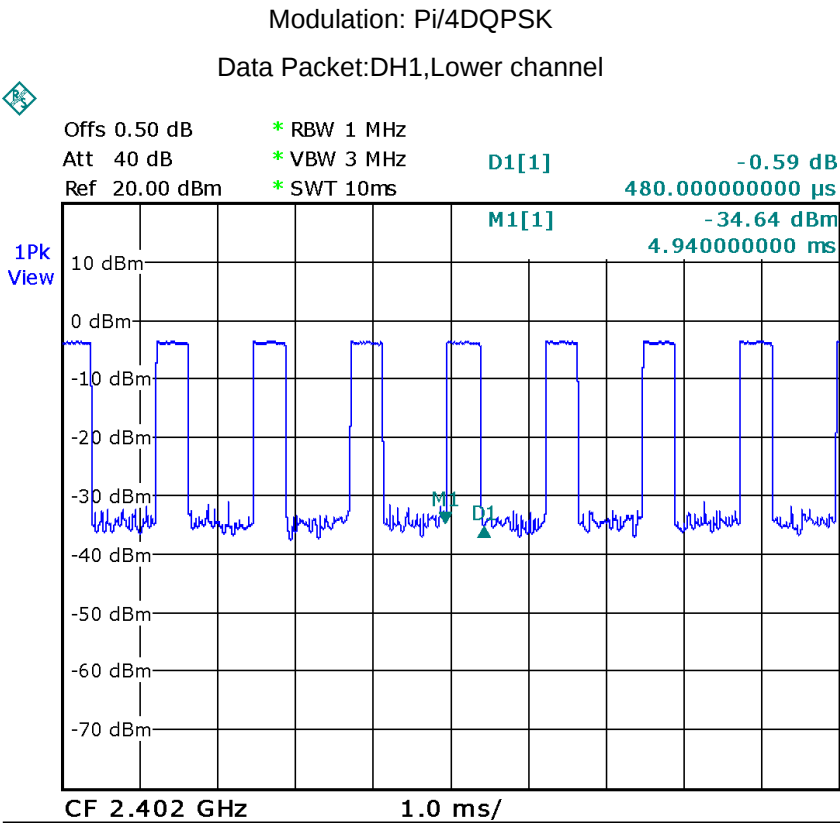
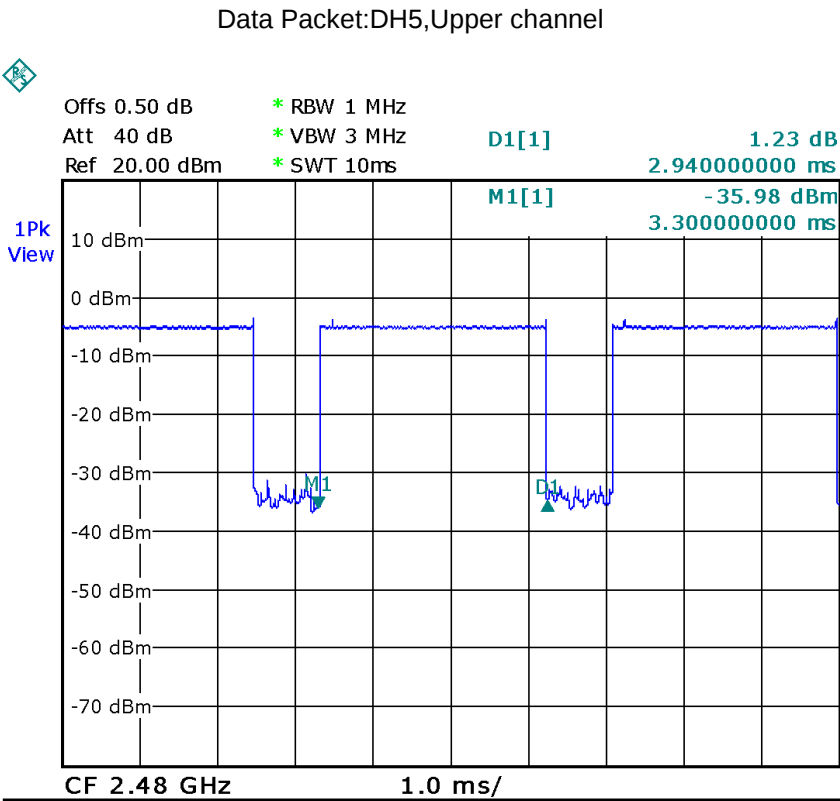


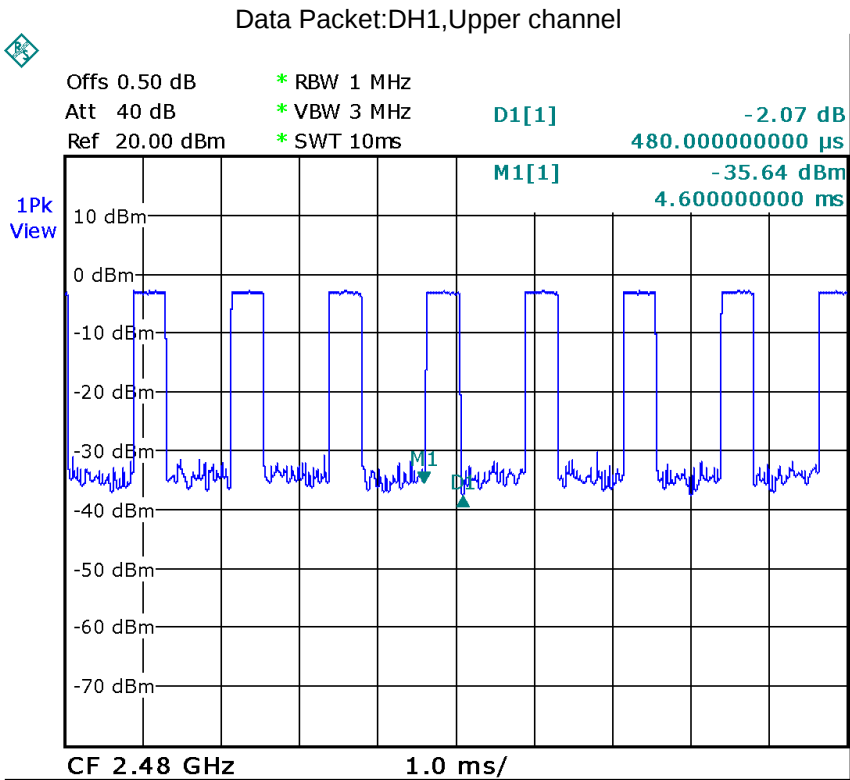
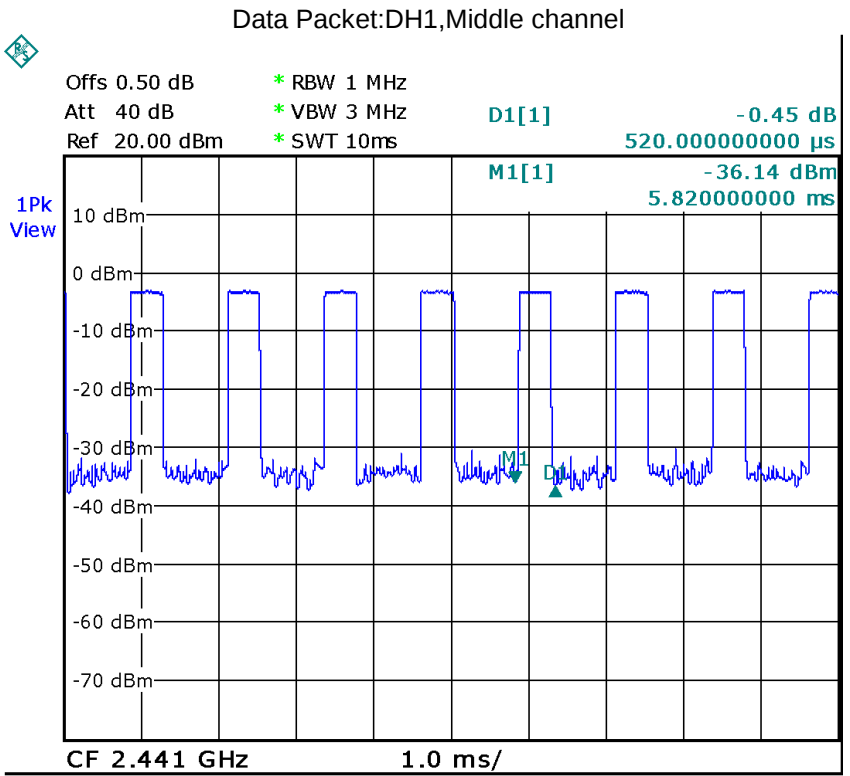
Data Packet:DH5,Lower channel

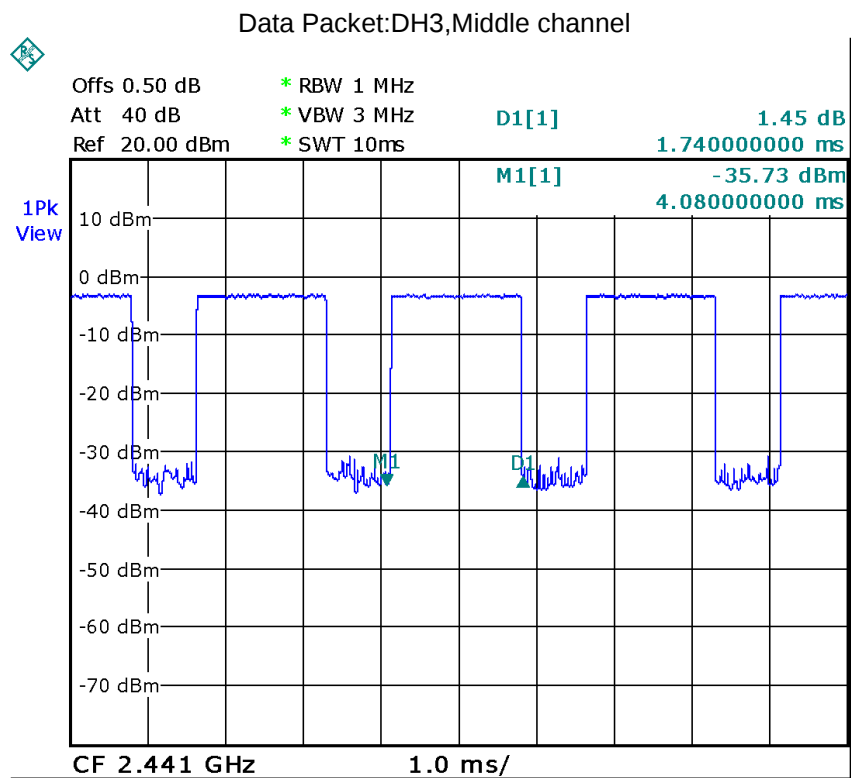
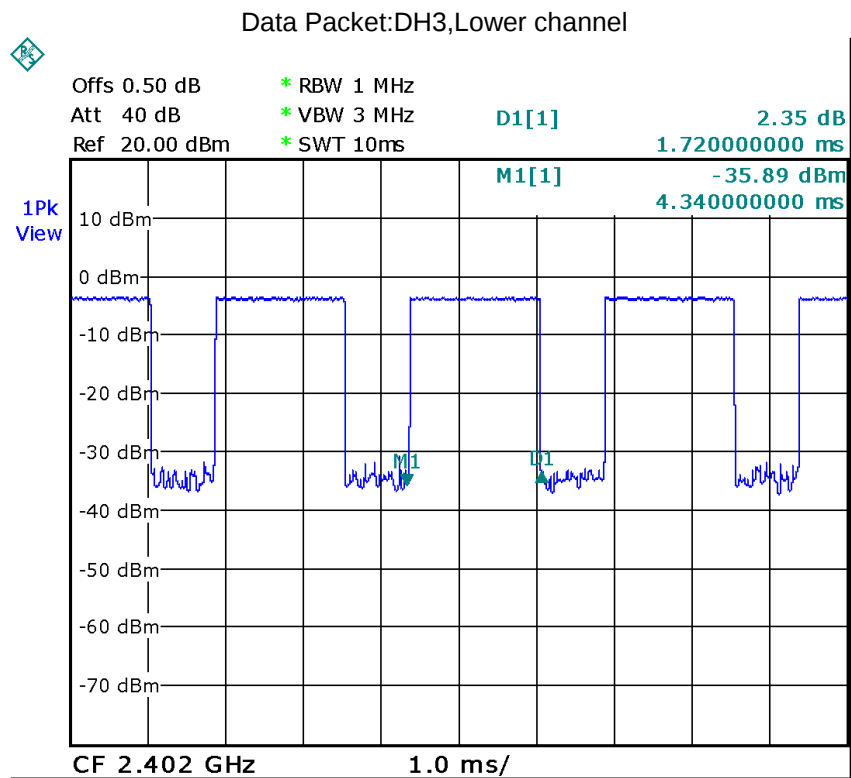


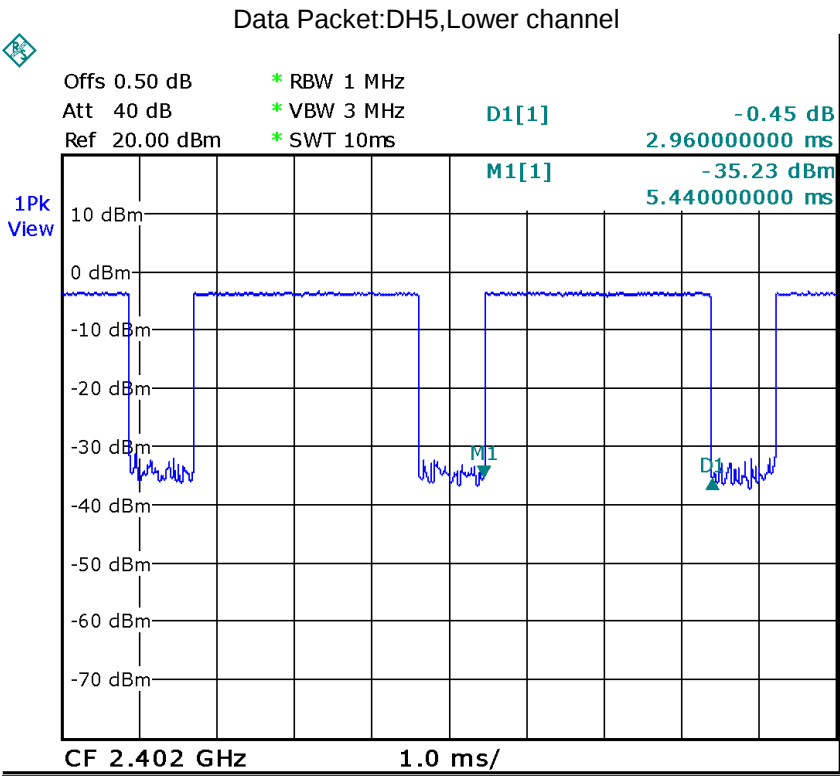
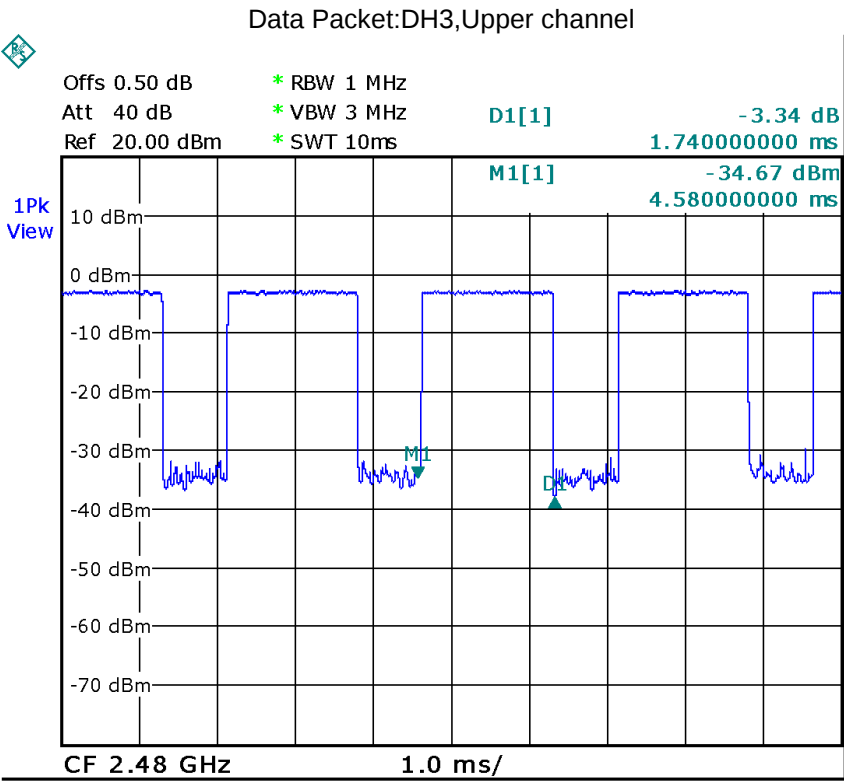
Data Packet:DH5,Middle channel



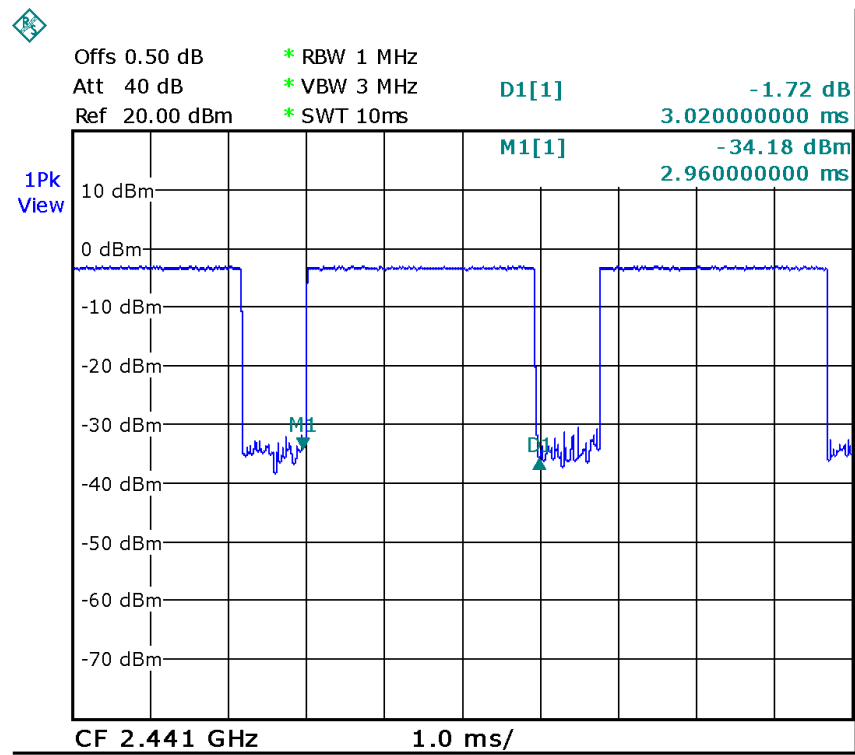




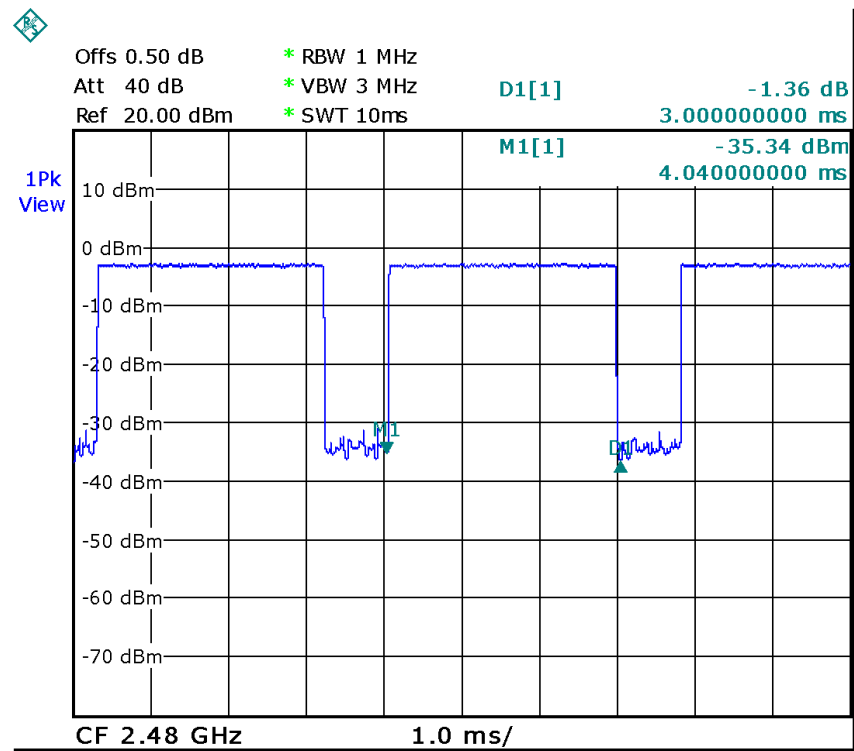




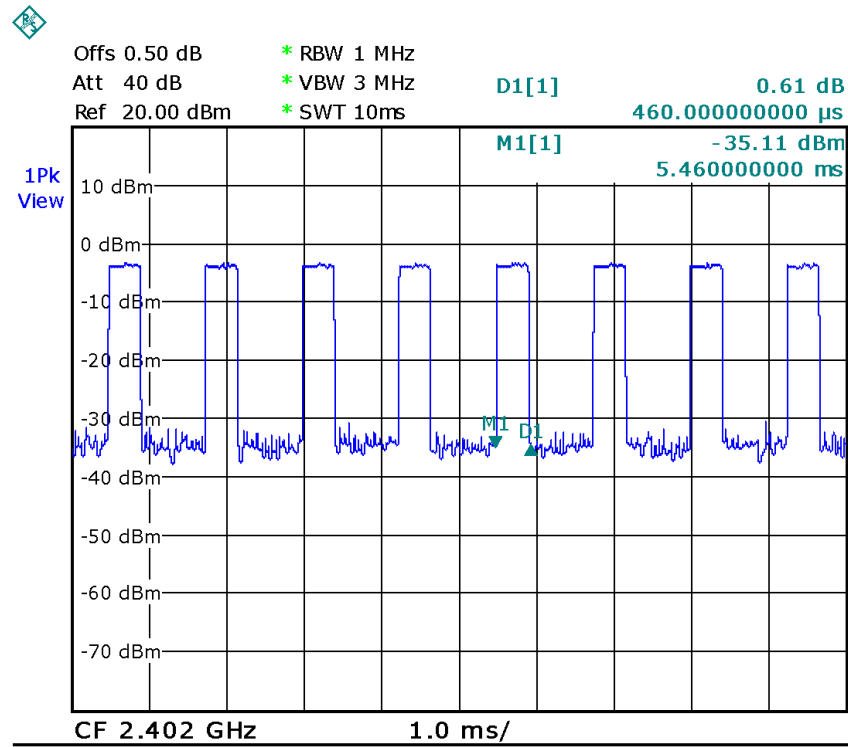
Data Packet:DH5,Middle channel



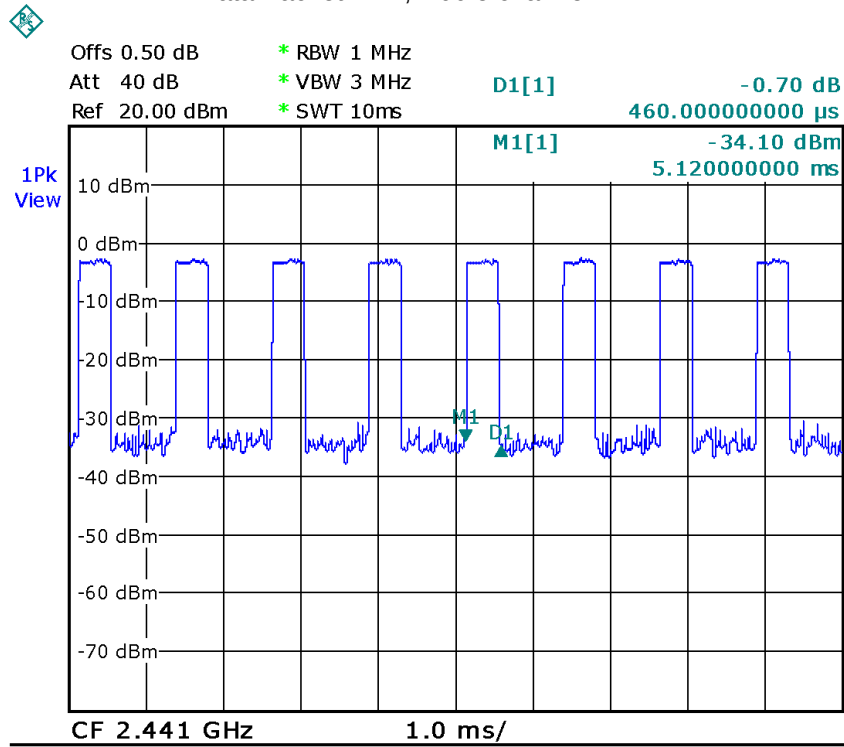
Data Packet:DH5,Upper channel

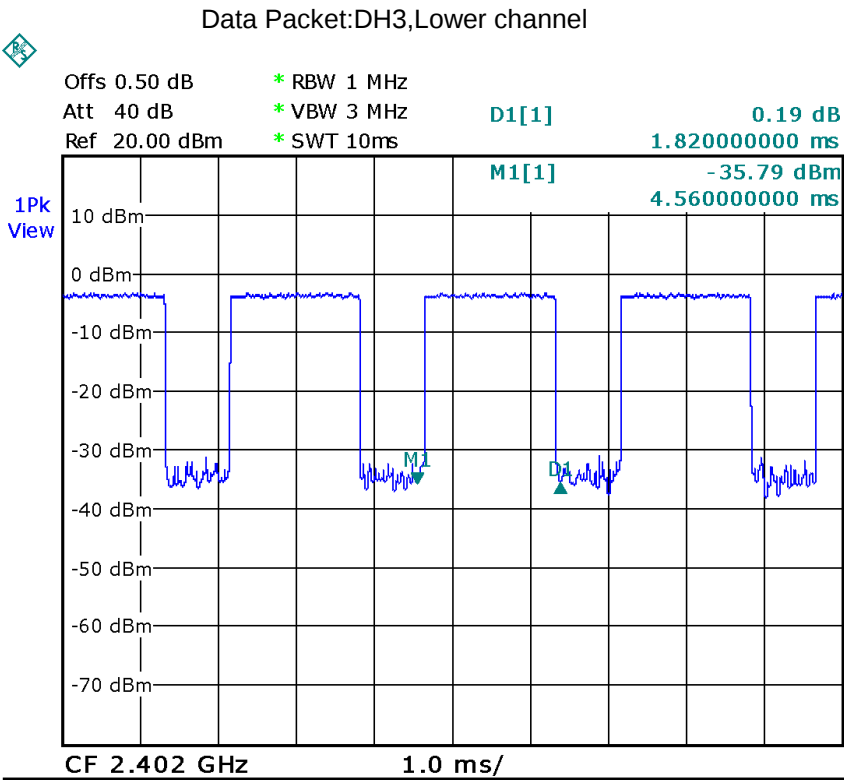
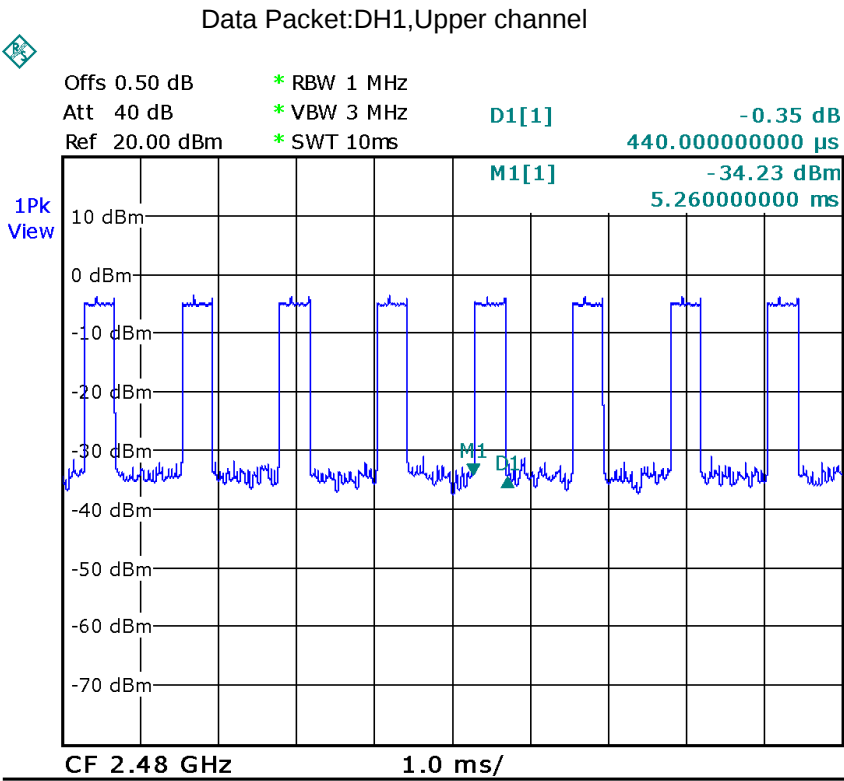


Modulation: 8DPSK
Data Packet:DH1,Lower channel

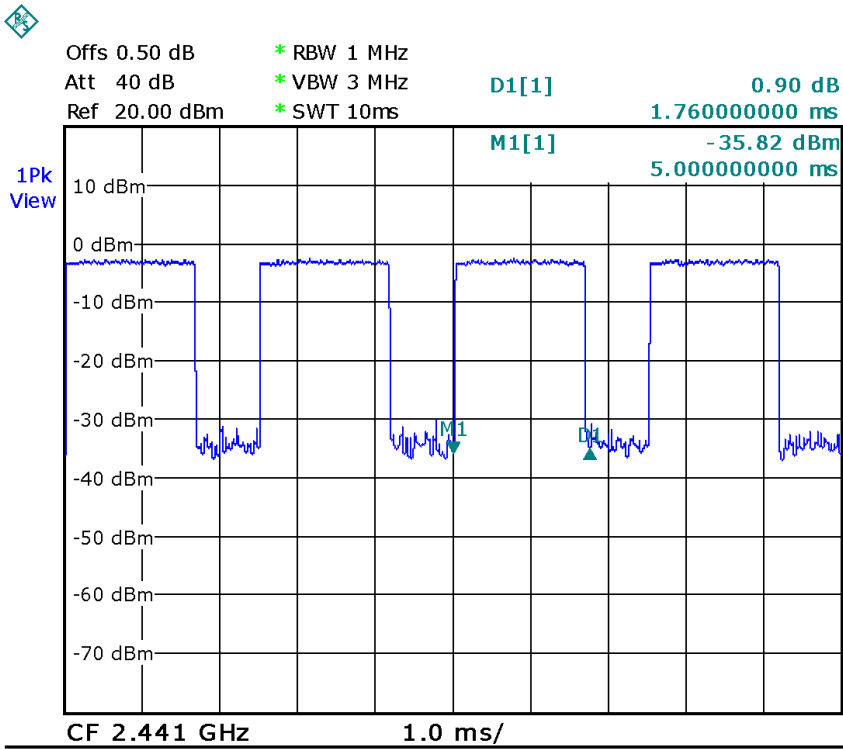


Data Packet:DH1,Middle channel

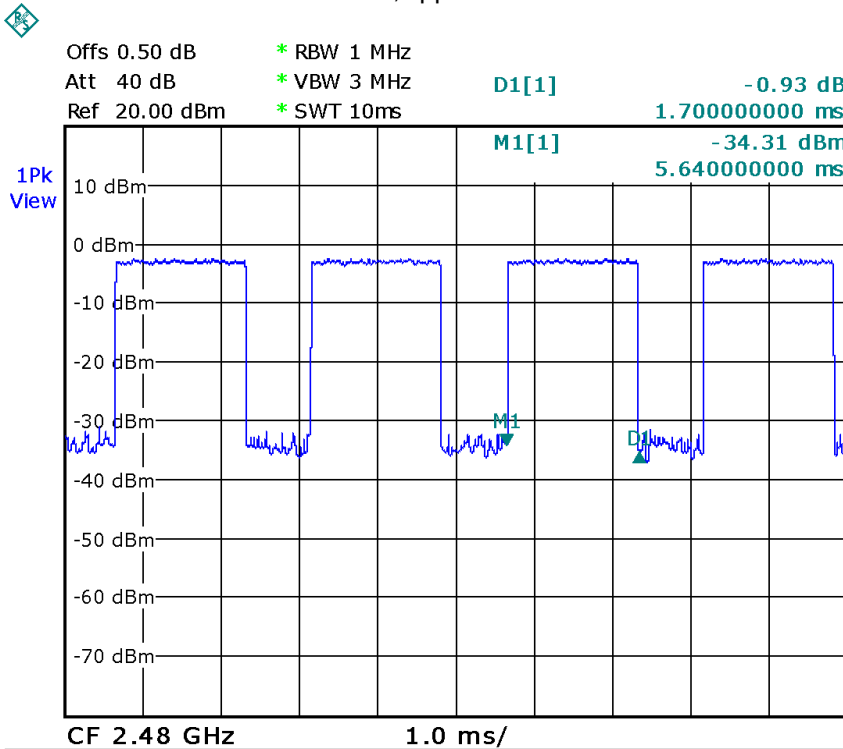


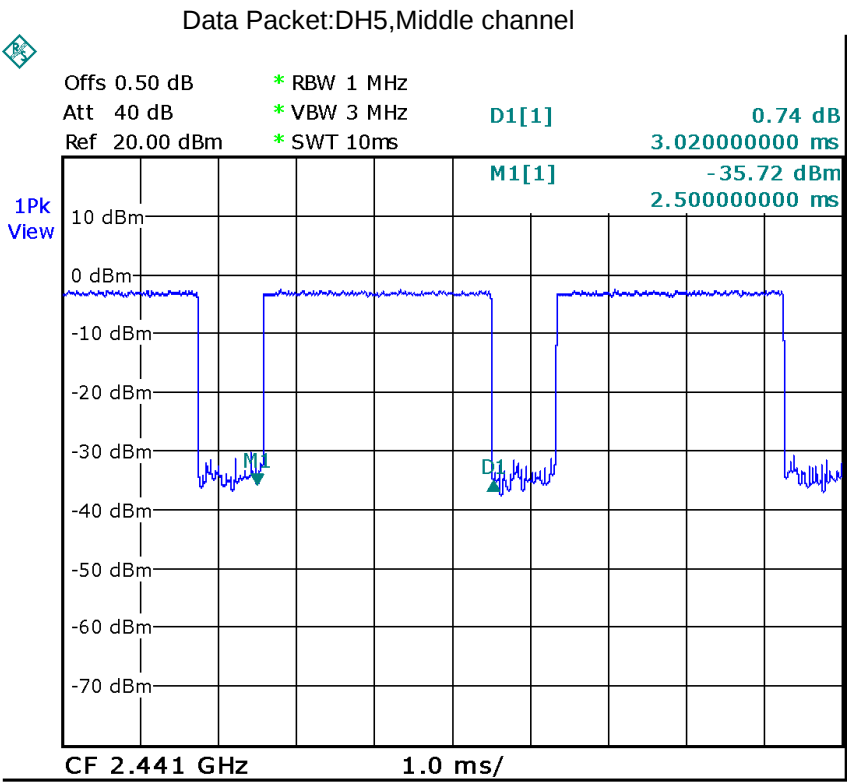
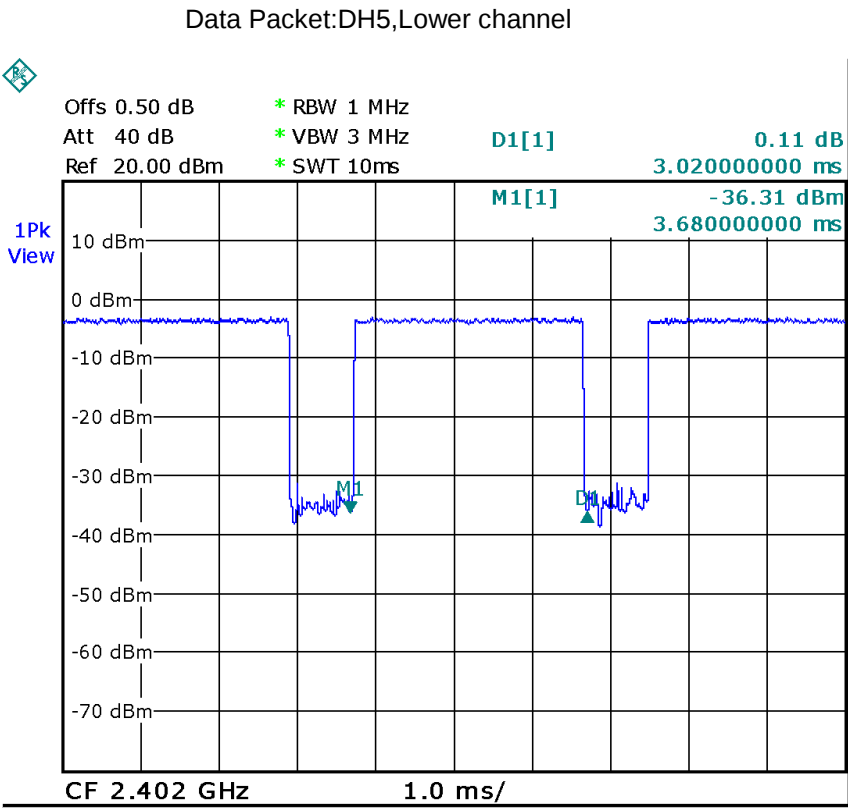


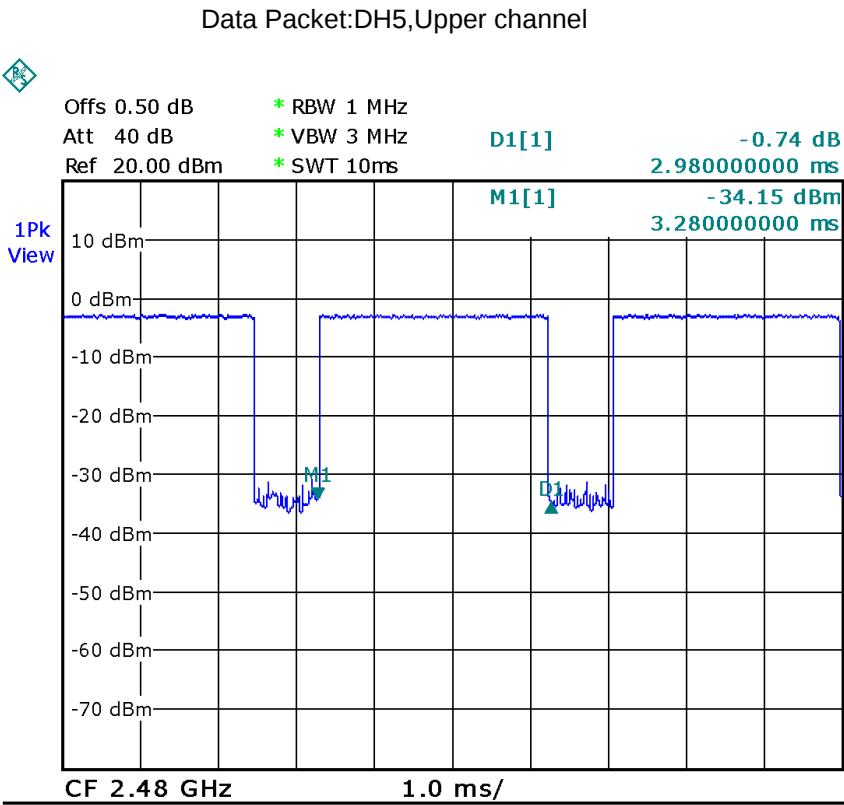
Data Packet:DH3,Middle channel



Data Packet:DH3,Upper channel







16 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.

17 Radiofrequency radiation exposure evaluation

Test Requirement:	FCC Part 2.1093
Test Method	KDB 447498 D01 General RF Exposure Guidance v05
Test Mode:	The EUT work in test mode(Tx).

17.1 Requirments:

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot \left[\sqrt{f(\text{GHz})} \right] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR where}$$

1. $f(\text{GHz})$ is the RF channel transmit frequency in GHz
2. Power and distance are rounded to the nearest mW and mm before calculation
3. The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

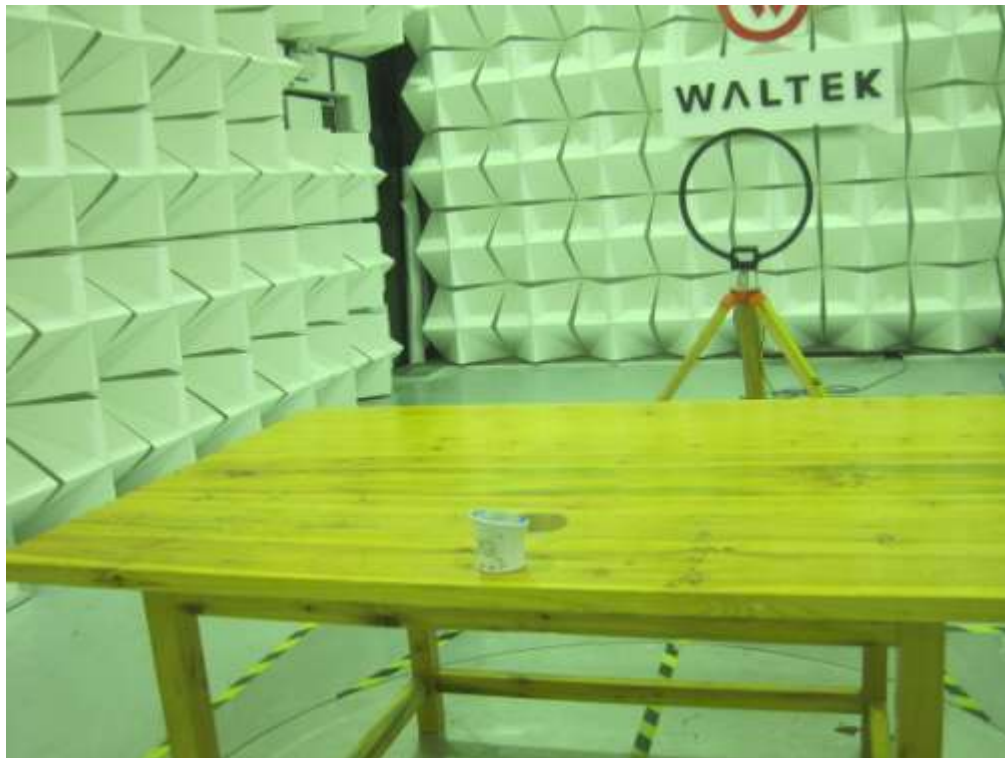
17.2 Test Result

Modulation	Conducted Peak power(dBm)	Conducted Peak power(mW)	Minimum test separation distance required for the exposure conditions (mm)	SAR Test Exclusion Thresholds(mW)
GFSK	-1.92	0.643	5	10
Pi/4DQPSK	-2.01	0.630	5	10
8DPSK	-3.03	0.498	5	10

18 Photographs – Test Setup

18.1 Radiated Emissions

Below 30MHz



From 30-1000MHz
BT Linking Mode:



Above 1GHz

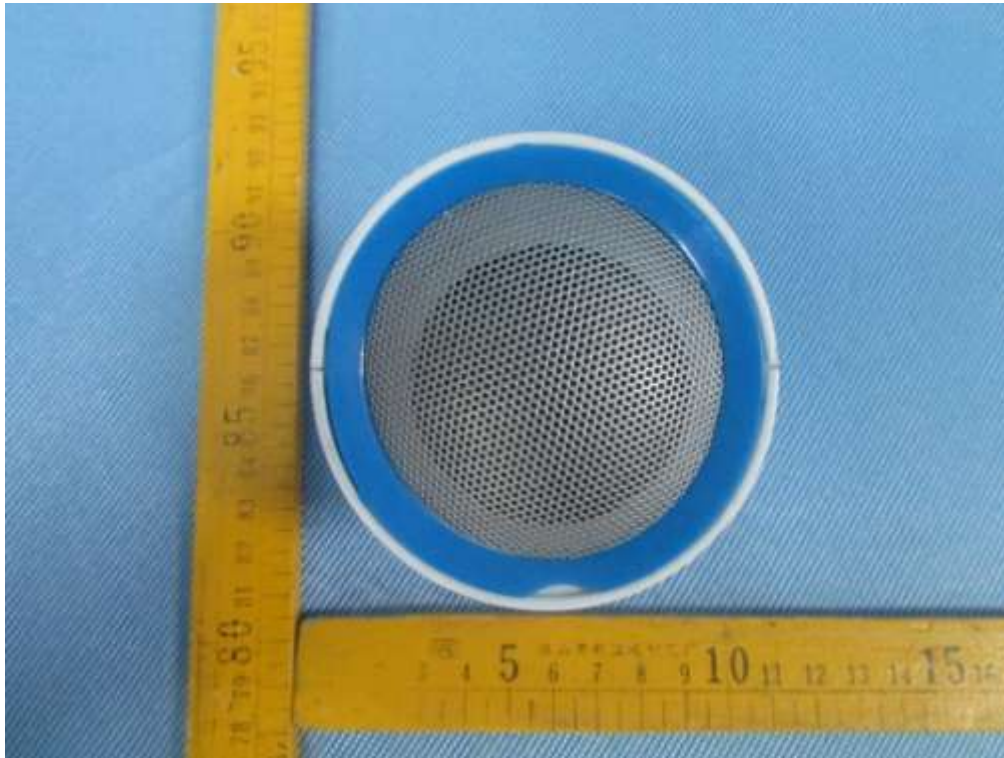


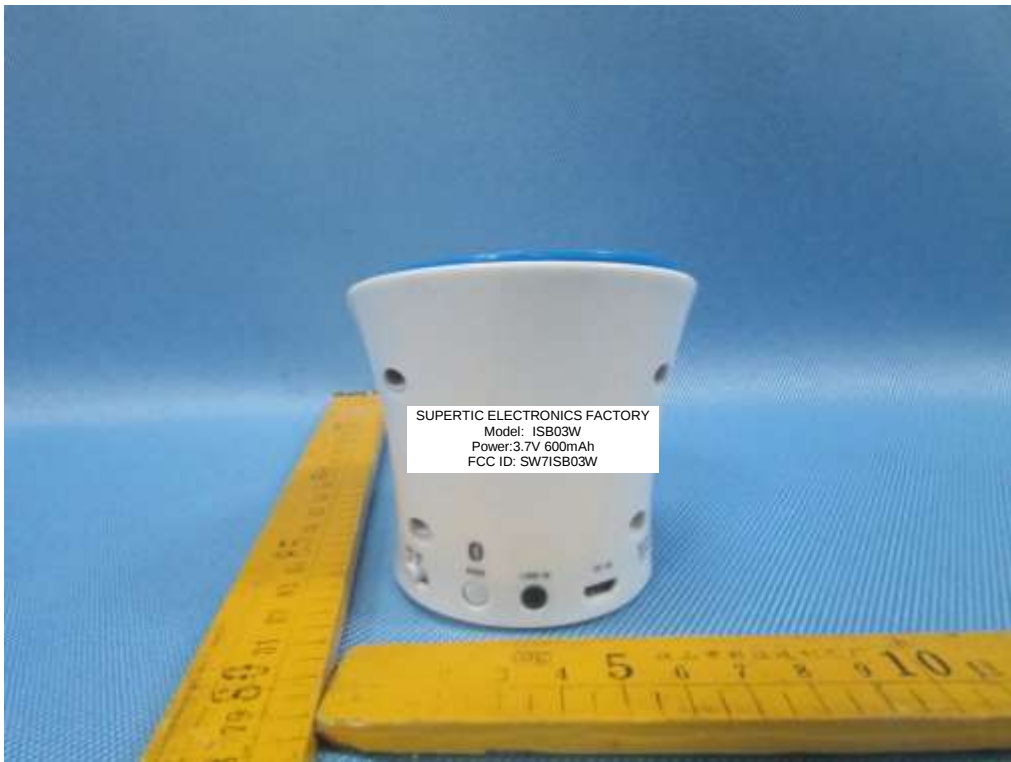
18.2 Conducted Emissions



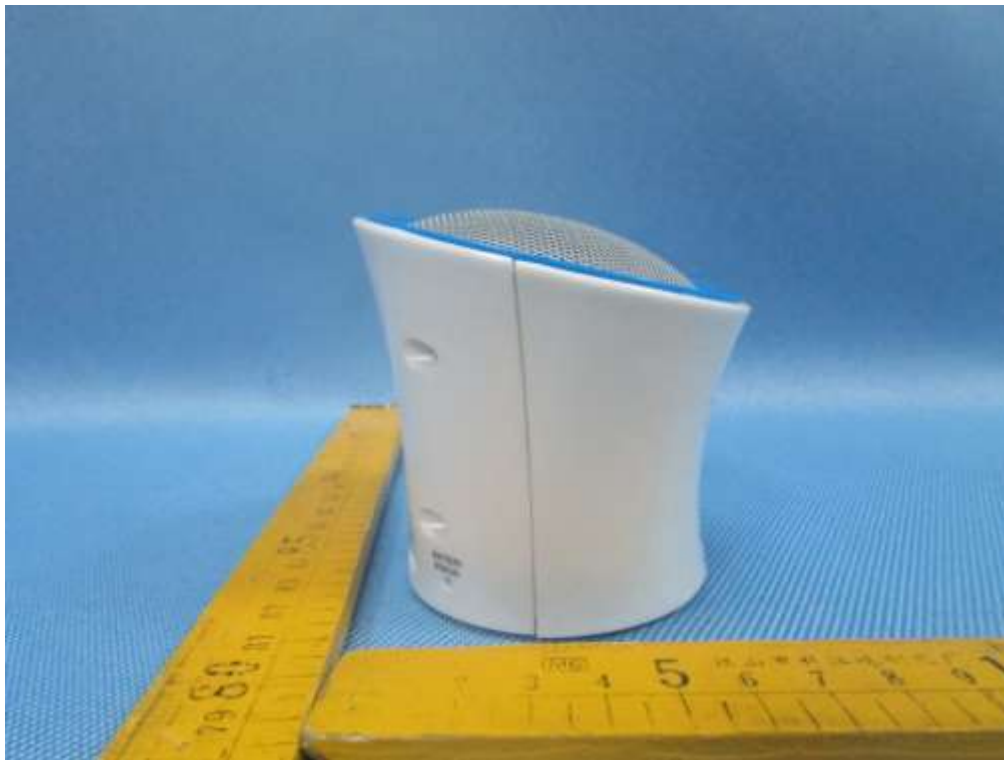
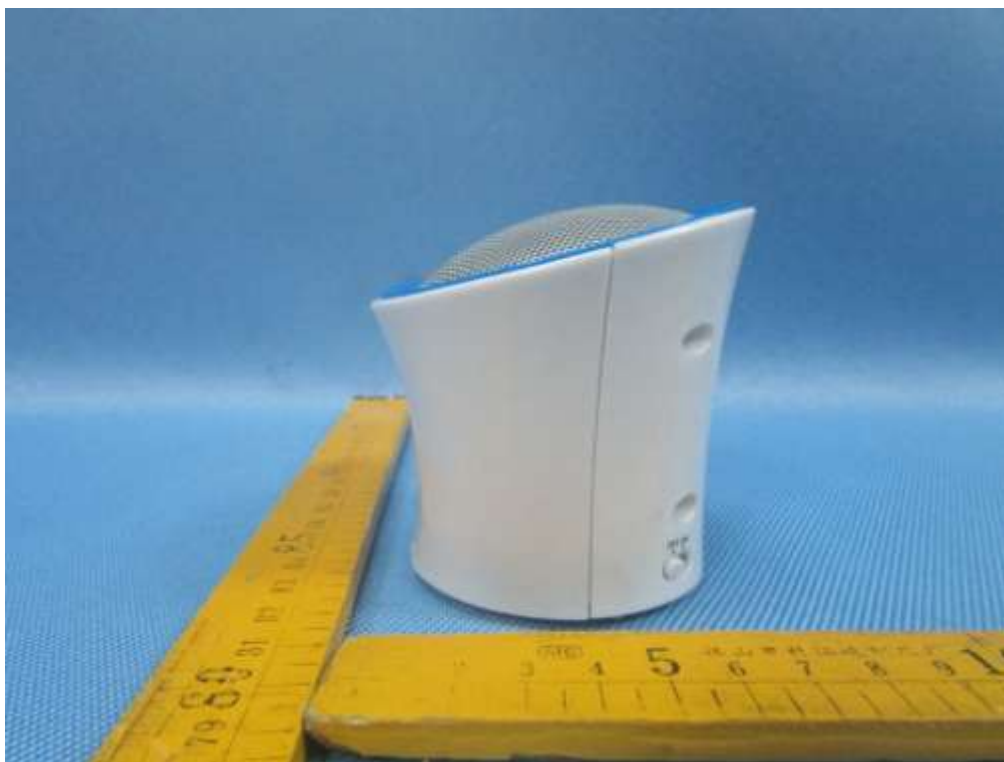
19 Photographs - Constructional Details

19.1 EUT – External View





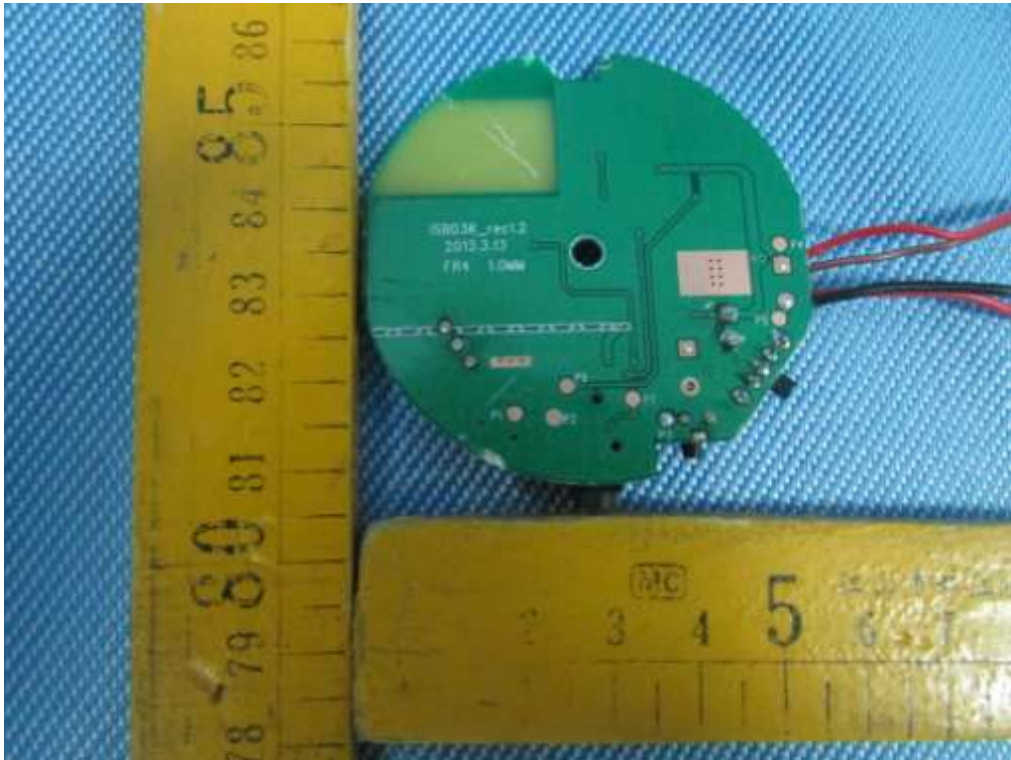
SUPERTIC ELECTRONICS FACTORY
Model: ISB03W
Power: 3.7V 600mAh
FCC ID: SW71SB03W



19.2 EUT – Internal View







19.3 EUT-RF Module View



==End of test report==