

TEST REPORT

Reference No...... : WTS15S0730010-1E
FCC ID : 2ADTE-Y100X
Applicant..... : Shenzhen KVD Communication Equipment
Address..... : 13C, Block C, Shenzhen Electronic Technology Building, Shennan Middle Road, Futian District, Shenzhen City.
Manufacturer : Shenzhen KVD Communication Equipment
Address..... : The second floor in A2 building, Silicon valley power new material industrial park, Zongyi Road, Dafu industrial park, Guanlan Guanguang Road, Baoan district, Shenzhen City
Product Name..... : Mobile Phone
Model No...... : Nova Y100X
Brand..... : DOOGEE
Standards..... : FCC CFR47 Part 15 Section 15.247:2014
Date of Receipt sample : Jan.13, 2015
Date of Test : Jan.15-Aug.12, 2015
Date of Issue..... : Aug. 12, 2015
Test Result..... : **Pass**
Remark..... : N/A

Remarks:

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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2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious emissions	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth	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
Antenna Requirement	15.203	Complies
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: Mobile Phone
Model No.	: Nova Y100X
Model Description	: N/A
GSM Band(s)	: GSM 850/900/1800/1900MHz
GPRS Class	: 12
WCDMA Band(s)	: FDD Band I/II/V
Wi-Fi Specification	: 802.11b/g/n HT20/n HT40
Bluetooth Version	: Bluetooth v4.0 with BLE
GPS	: Support
NFC	: N/A
Hardware Version	: G156MB-A2-BOM2
Software Version	: 14-12-31 g156f-daoge-a30-fwvga-850-1900-2100-kk-64g8g-DG280-4.4-R07

Note: This product Model No.: Nova Y100X is identical in interior structure, electrical circuits and components with the product LEO DG280 tested by Waltek Services (Shenzhen) Co., Ltd., and just model name, brand name, the screen size, antenna location and connect board are different, details pls refer to attached Declaration Letter..

And based on the letter these differences only affect Conducted Emission, Radiated Emission, and Radiated Spurious Emissions, the other test data were refer to report WTS15S0122182-1E, Grant Date: 01/30/2015.

4.2 Details of E.U.T.

Operation Frequency	: GSM/GPRS 850: 824~849MHz GSM/GPRS 900: 925-960MHz DCS 1800: 1805-1880MHz PCS 1900: 1850~1910MHz WCDMA Band I: 1920-1980MHz WCDMA Band II: 1850-1910MHz WCDMA Band V: 824~849MHz WiFi: 802.11b/g/n HT20: 2412-2462MHz 802.11n HT40: 2422-2452MHz Bluetooth: 2402-2480MHz
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	GPS: 1.57GHz
Max. RF output power	: GSM 850: 32.81dBm PCS1900: 29.69dBm WCDMA Band II: 20.95dBm WCDMA Band V: 22.86dBm WiFi: 9.24dBm Bluetooth: 0.86dBm
Type of Modulation	: GSM,GPRS: GMSK WCDMA: BPSK WiFi: CCK, OFDM Bluetooth: GFSK, Pi/4 DQPSK,8DPSK
Antenna installation	: GSM/WCDMA: Wire antenna WiFi/Bluetooth: Metal Dome
Antenna Gain	: GSM 850: -4.0dBi PCS1900: -4.0dBi WCDMA Band II: -4.0dBi WCDMA Band V: -4.0dBi WiFi: -1.0dBi Bluetooth: -1.0dBi
Technical Data	: Battery DC 3.8V 1800mAh DC 5V, 1.0A, charging from adapter (Adapter Input: 100-240V~50/60Hz, 0.15A)
Adapter	: Manufacture: Shenzhen KVD Communication Equipment Model No.: DG80

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	-	-

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests; the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting	2402MHz	2441MHz	2480MHz

4.5 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 number 7760A, July 12, 2012.

- **FCC Test Site 1#– 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, April 29, 2014.

- **FCC Test Site 2#– Registration No.: 328995**

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 328995, December 3, 2014.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions Test Site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	100947	Sep.15,2014	Sep.14,2015
2.	LISN	R&S	ENV216	101215	Sep.15,2014	Sep.14,2015
3.	Cable	Top	TYPE16(3.5M)	-	Sep.15,2014	Sep.14,2015
Conducted Emissions Test Site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	Sep.15,2014	Sep.14,2015
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.15,2014	Sep.14,2015
3.	Limiter	York	MTS-IMP-136	261115-001-0024	Sep.15,2014	Sep.14,2015
4.	Cable	LARGE	RF300	-	Sep.15,2014	Sep.14,2015
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.15,2014	Sep.14,2015
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.15,2014	Sep.14,2015
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.19,2015	Apr.18,2016
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.15,2014	Sep.14,2015
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.19,2015	Apr.18,2016
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.19,2015	Apr.18,2016
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Mar.17,2015	Mar.16,2016
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.10,2015	Apr.09,2016
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	Sep.15,2014	Sep.14,2015
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Sep.15,2014	Sep.14,2015
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Sep.15,2014	Sep.14,2015
4	Cable	HUBER+SUHNER	CBL2	525178	Sep.15,2014	Sep.14,2015

RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	Sep.15,2014	Sep.14,2015
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.15,2014	Sep.14,2015
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.15,2014	Sep.14,2015

5.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
Headphone	Qisheng	S-325	N/A

5.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

5.4 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 C63.4:2009
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	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)

6.1 E.U.T. Operation

Operating Environment :

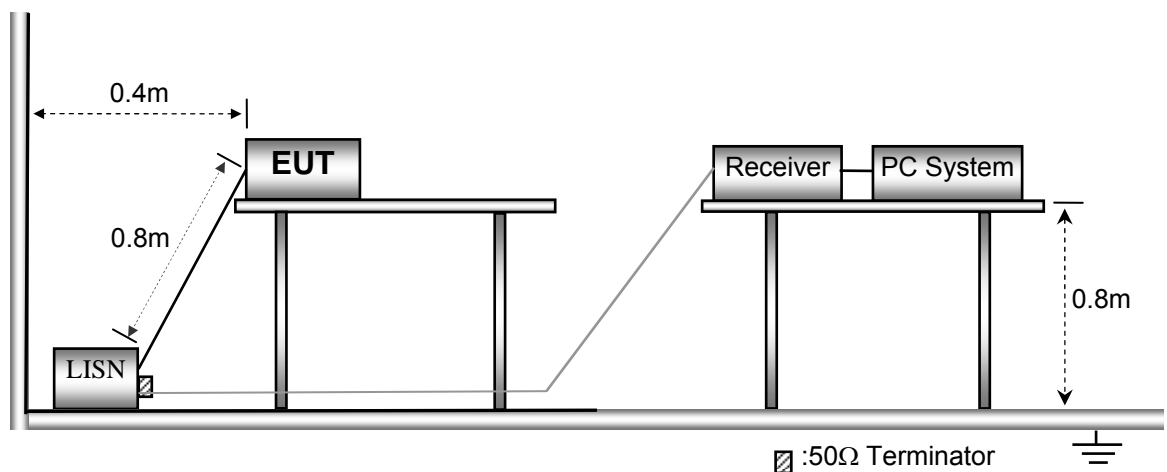
Temperature:	22.8 °C
Humidity:	52.6 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation :

The test was performed in communication mode, the test data were shown in the report.

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4.



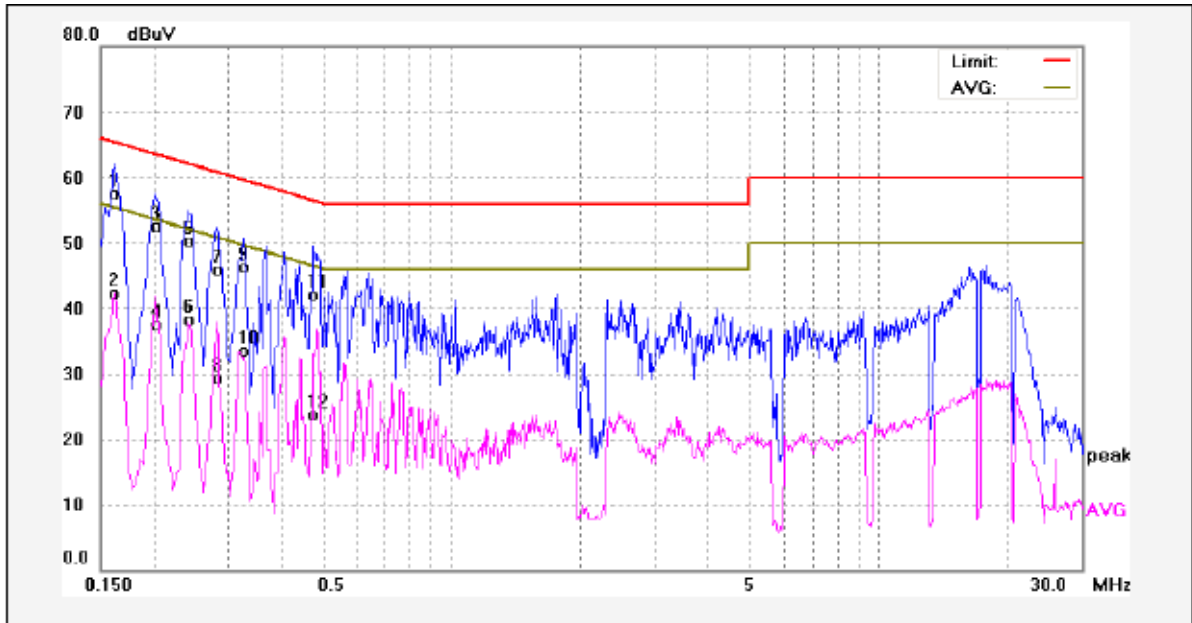
6.3 Measurement Description

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.

6.4 Conducted Emission Test Result

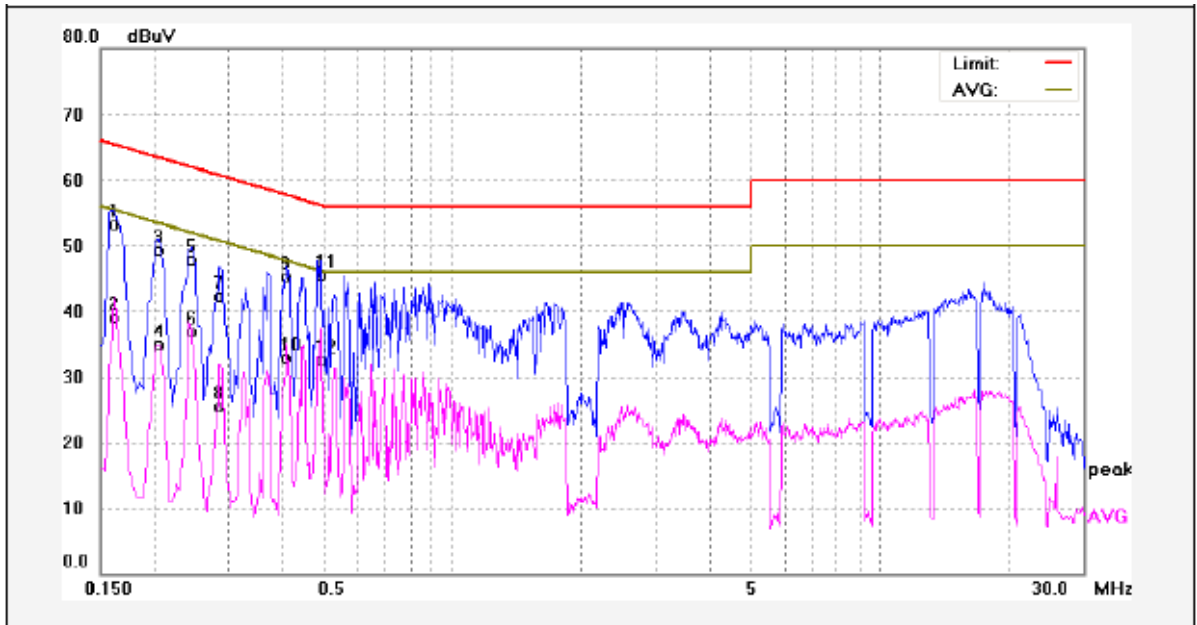
The worst mode: communication mode (Adapter Operation)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	47.44	10.13	57.57	65.36	-7.79	QP	
2	0.1620	32.10	10.13	42.23	55.36	-13.13	AVG	
3	0.2020	42.34	10.15	52.49	63.52	-11.03	QP	
4	0.2020	27.30	10.15	37.45	53.52	-16.07	AVG	
5	0.2420	40.21	10.16	50.37	62.02	-11.65	QP	
6	0.2420	28.09	10.16	38.25	52.02	-13.77	AVG	
7	0.2819	35.80	10.16	45.96	60.76	-14.80	QP	
8	0.2819	19.14	10.16	29.30	50.76	-21.46	AVG	
9	0.3260	36.09	10.17	46.26	59.55	-13.29	QP	
10	0.3260	23.33	10.17	33.50	49.55	-16.05	AVG	
11	0.4740	31.97	10.19	42.16	56.44	-14.28	QP	
12	0.4740	13.54	10.19	23.73	46.44	-22.71	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	43.25	10.13	53.38	65.36	-11.98	QP	
2	0.1620	28.89	10.13	39.02	55.36	-16.34	AVG	
3	0.2060	39.19	10.15	49.34	63.36	-14.02	QP	
4	0.2060	24.66	10.15	34.81	53.36	-18.55	AVG	
5	0.2460	37.65	10.16	47.81	61.89	-14.08	QP	
6	0.2460	26.77	10.16	36.93	51.89	-14.96	AVG	
7	0.2860	32.06	10.16	42.22	60.64	-18.42	QP	
8	0.2860	15.42	10.16	25.58	50.64	-25.06	AVG	
9	0.4100	35.05	10.18	45.23	57.65	-12.42	QP	
10	0.4100	22.79	10.18	32.97	47.65	-14.68	AVG	
11	0.4940	35.38	10.19	45.57	56.10	-10.53	QP	
12	0.4940	22.30	10.19	32.49	46.10	-13.61	AVG	

7 Radiated Spurious 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	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

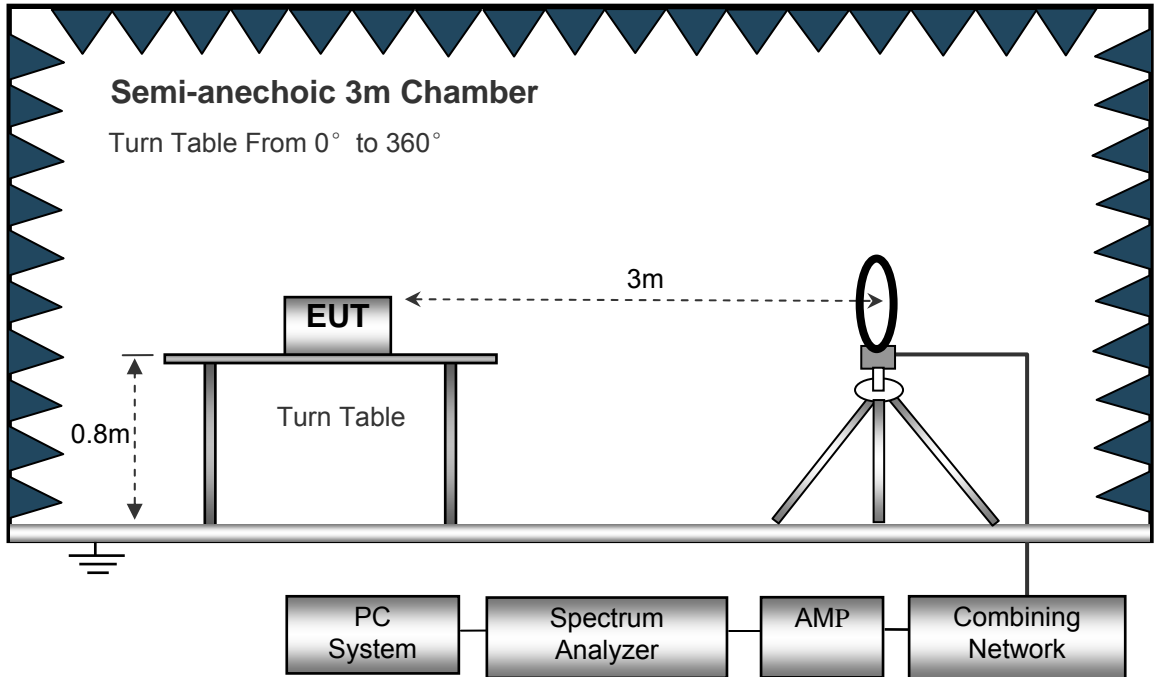
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

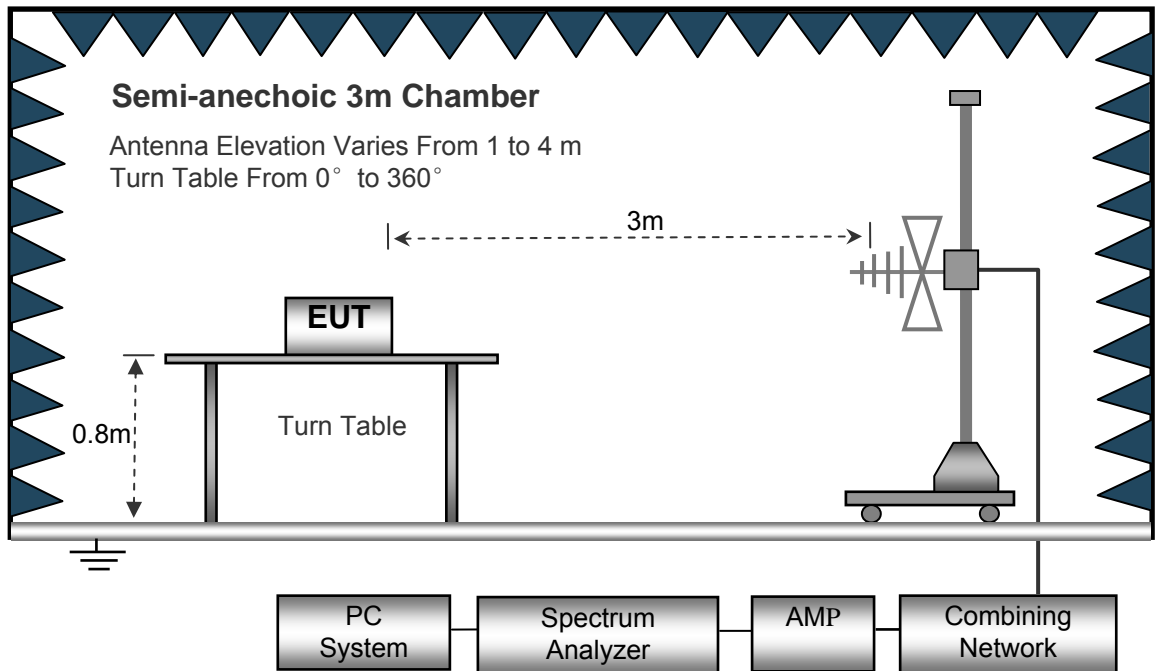
7.2 Test Setup

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

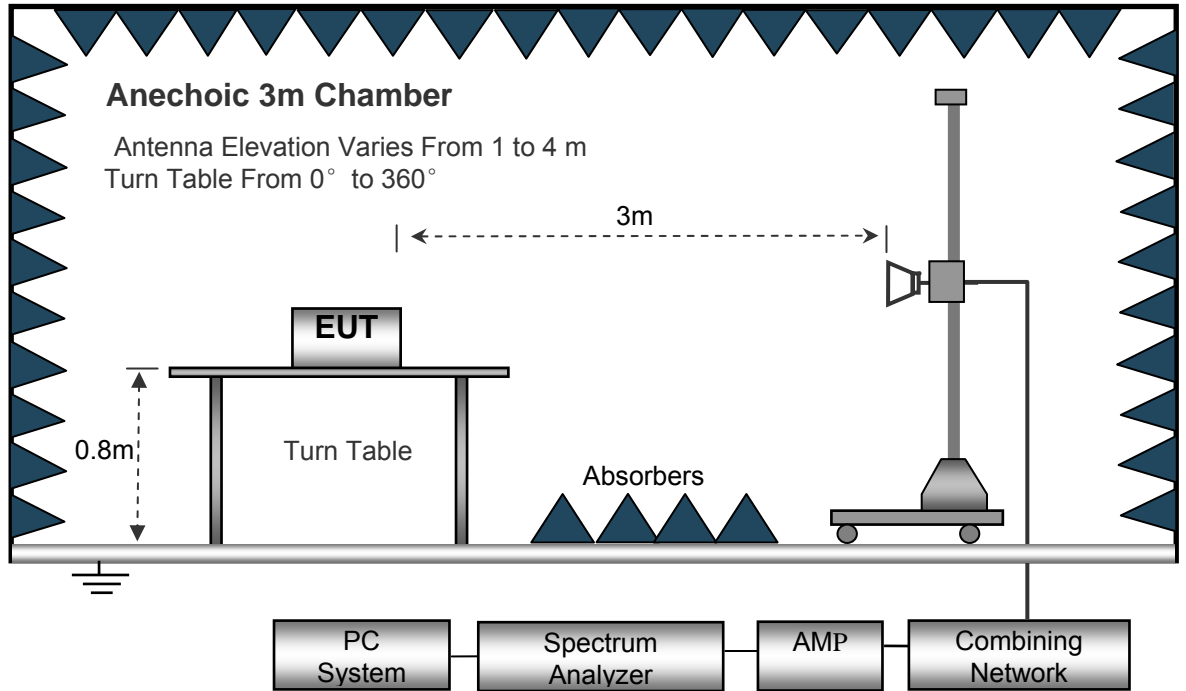
The test setup for emission measurement below 30MHz.



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

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

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. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
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: 32.768kHz~30MHz

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

Test Frequency: 30MHz ~ 18GHz

Remark: only the worst data (GFSK modulation mode) were reported.

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK Low Channel									
175.26	20.02	QP	217	1.3	H	10.59	30.61	43.52	-12.91
175.26	19.47	QP	107	1.5	V	10.59	30.06	43.52	-13.46
4804.00	54.37	PK	170	1.3	V	-1.08	53.29	74.00	-20.71
4804.00	43.65	Ave	170	1.3	V	-1.08	42.57	54.00	-11.43
7206.00	54.88	PK	30	1.2	H	1.34	56.22	74.00	-17.78
7206.00	42.10	Ave	30	1.2	H	1.34	43.44	54.00	-10.56
2321.76	45.13	PK	128	1.8	V	-13.20	31.93	74.00	-42.07
2321.76	39.41	Ave	128	1.8	V	-13.20	26.21	54.00	-27.79
2361.42	44.65	PK	49	2.0	H	-13.12	31.53	74.00	-42.47
2361.42	38.55	Ave	49	2.0	H	-13.12	25.43	54.00	-28.57
2487.75	44.24	PK	61	1.1	V	-13.02	31.22	74.00	-42.78
2487.75	38.89	Ave	61	1.1	V	-13.02	25.87	54.00	-28.13

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK Middle Channel									
175.26	21.24	QP	85	1.1	H	10.59	31.83	43.52	-11.71
175.26	18.29	QP	285	1.3	V	10.59	28.88	43.52	-14.64
4882.00	51.37	PK	74	1.6	V	-0.62	50.75	74.00	-23.25
4882.00	43.07	Ave	74	1.6	V	-0.62	42.45	54.00	-11.55
7323.00	53.77	PK	60	1.3	H	2.21	55.98	74.00	-18.02
7323.00	40.94	Ave	60	1.3	H	2.21	43.15	54.00	-10.85
2337.68	46.99	PK	353	1.8	V	-13.19	33.80	74.00	-40.20
2337.68	39.68	Ave	353	1.8	V	-13.19	26.49	54.00	-27.51
2381.63	44.83	PK	58	1.7	H	-13.14	31.69	74.00	-42.31
2381.63	36.30	Ave	58	1.7	H	-13.14	23.16	54.00	-30.84
2489.78	44.82	PK	169	1.9	V	-13.08	31.74	74.00	-42.26
2489.78	38.17	Ave	169	1.9	V	-13.08	25.09	54.00	-28.91

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK High Channel									
175.26	22.16	QP	153	1.1	H	10.59	32.75	43.52	-10.77
175.26	19.91	QP	329	1.7	V	10.59	30.50	43.52	-13.02
4960.00	54.92	PK	96	1.3	V	-0.24	54.68	74.00	-19.32
4960.00	44.36	Ave	96	1.3	V	-0.24	44.12	54.00	-9.88
7440.00	52.88	PK	231	1.4	H	2.84	55.72	74.00	-18.28
7440.00	41.41	Ave	231	1.4	H	2.84	44.25	54.00	-9.75
2322.99	45.95	PK	69	1.9	V	-13.19	32.76	74.00	-41.24
2322.99	39.46	Ave	69	1.9	V	-13.19	26.27	54.00	-27.73
2359.54	44.18	PK	8	1.1	H	-13.14	31.04	74.00	-42.96
2359.54	38.15	Ave	8	1.1	H	-13.14	25.01	54.00	-28.99
2489.08	42.01	PK	184	1.4	V	-13.08	28.93	74.00	-45.07
2489.08	37.39	Ave	184	1.4	V	-13.08	24.31	54.00	-29.69

Test Frequency: 18GHz~25GHz

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

8 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Result: PASS

Limit:

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) (see Section 15.205(c)).

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 = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

8.2 Test Result

GFSK Low Channel

Fundamental

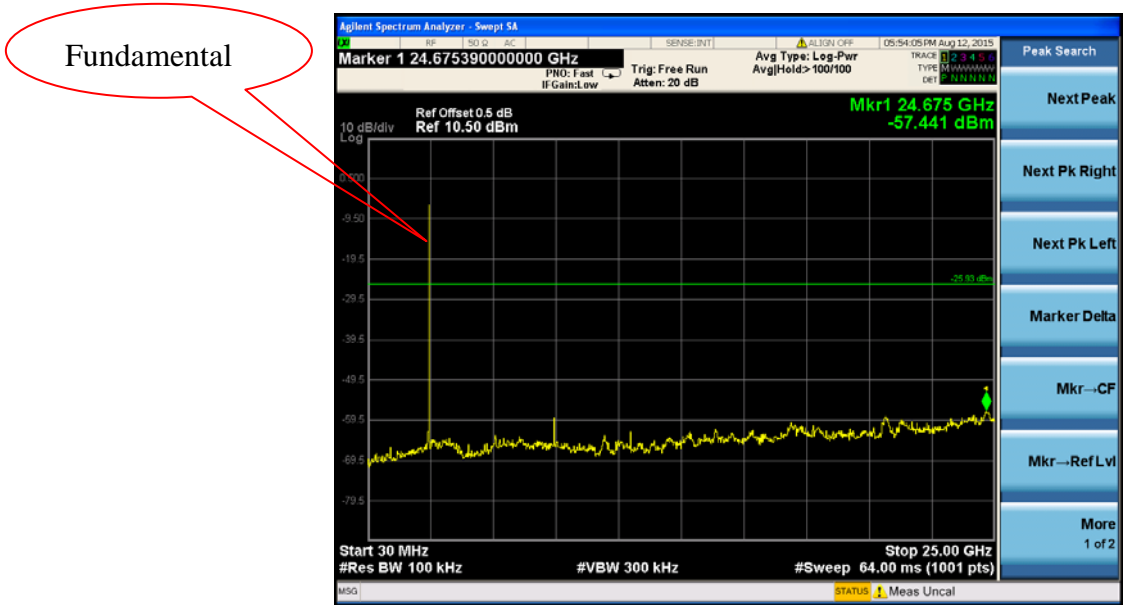


GFSK Middle Channel

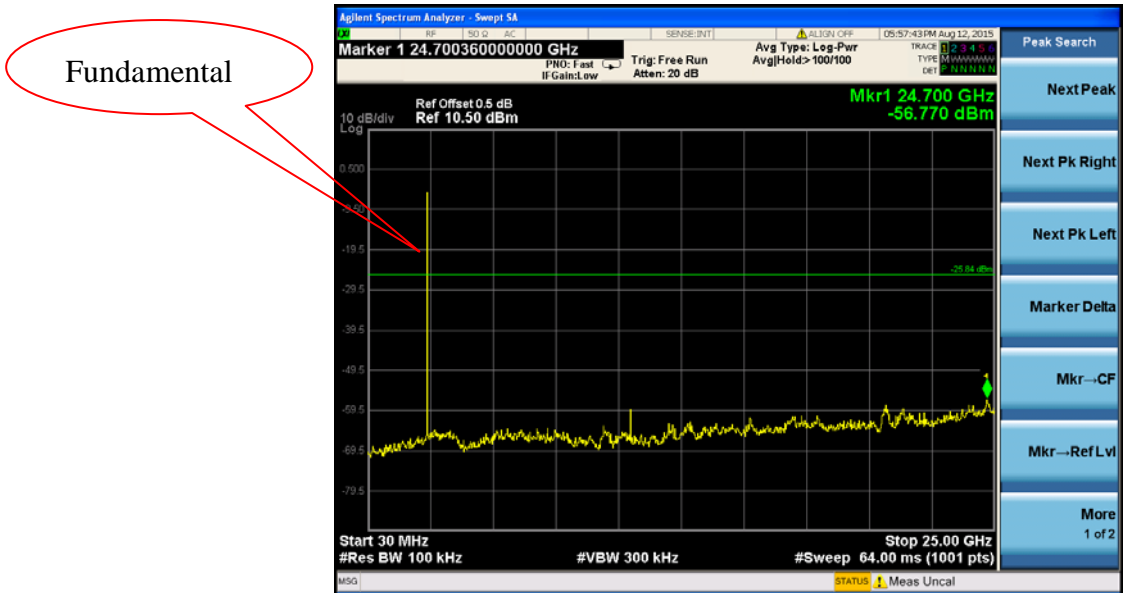
Fundamental



GFSK High Channel

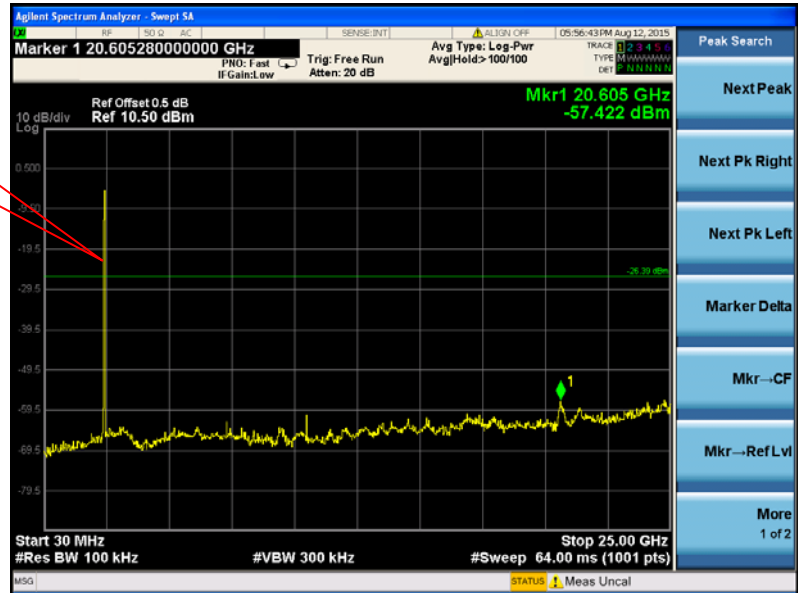


Pi/4 DQPSK Low Channel



Pi/4 DQPSK Middle Channel

Fundamental



Pi/4 DQPSK High Channel

Fundamental



8DPSK Low Channel

Fundamental



8DPSK Middle Channel

Fundamental



8DPSK High Channel

Fundamental



9 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
Test Limit:	Regulation 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

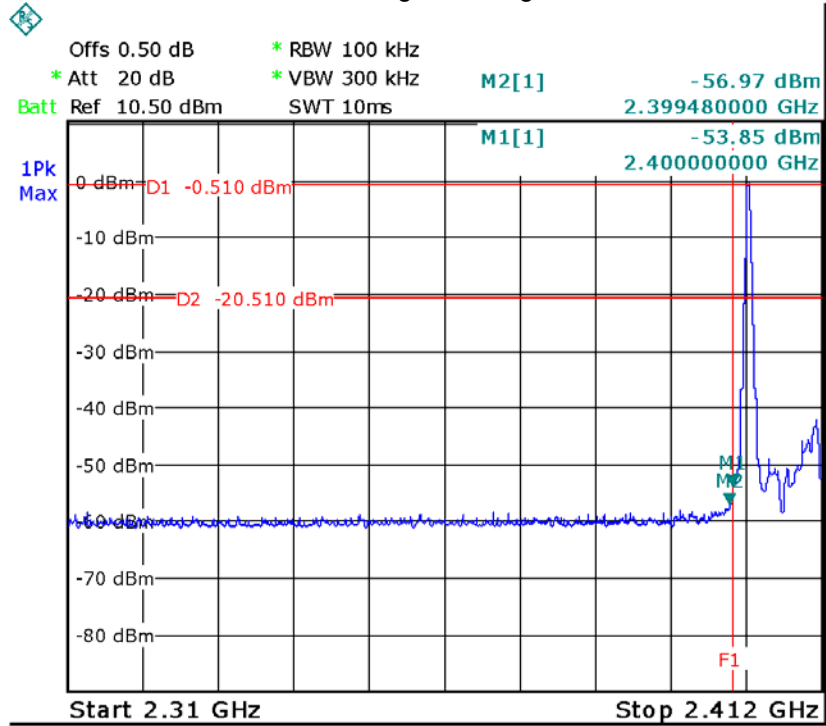
9.1 Test Procedure

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 = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

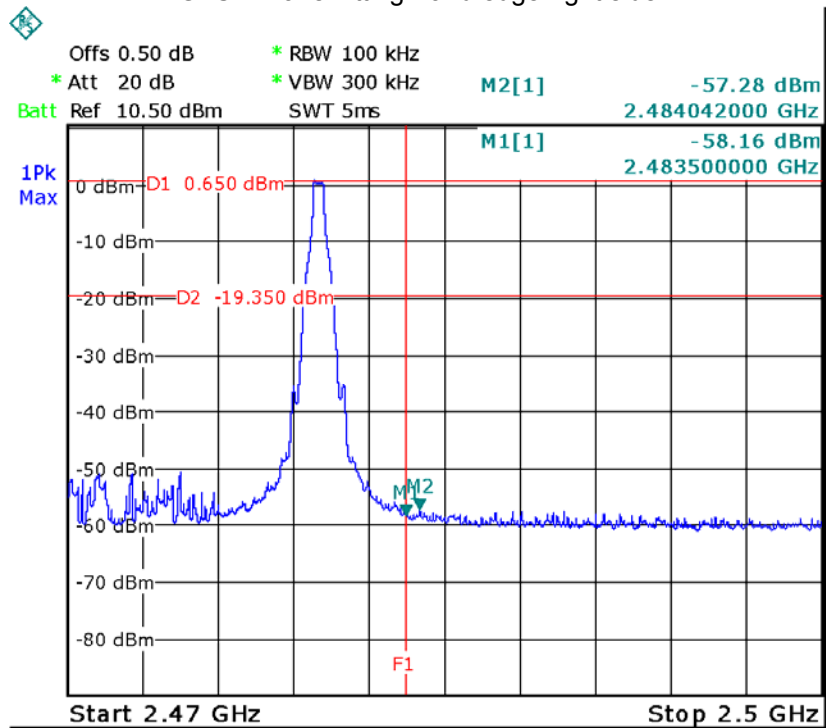
9.2 Test Result

Test plots

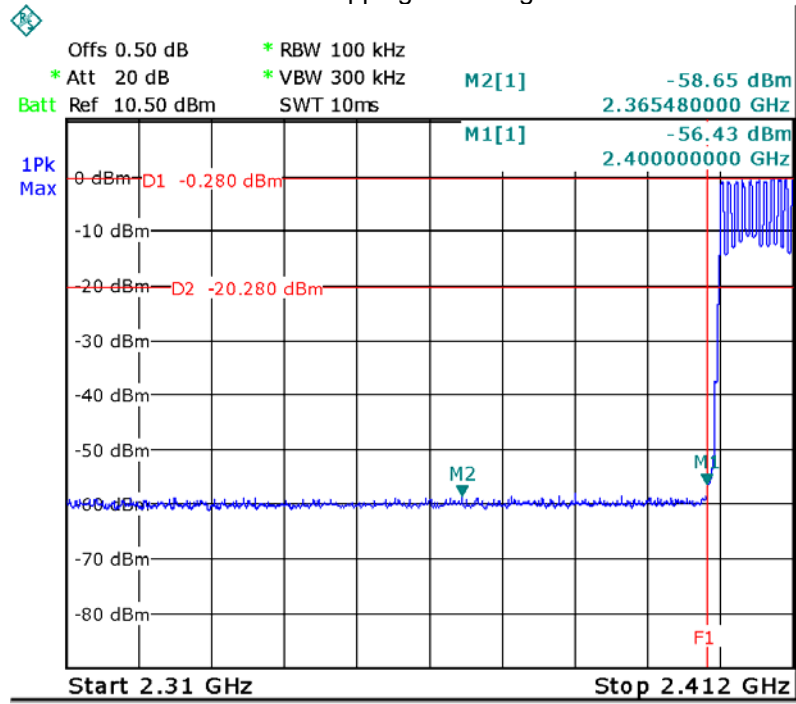
GFSK Transmitting Band edge-left side



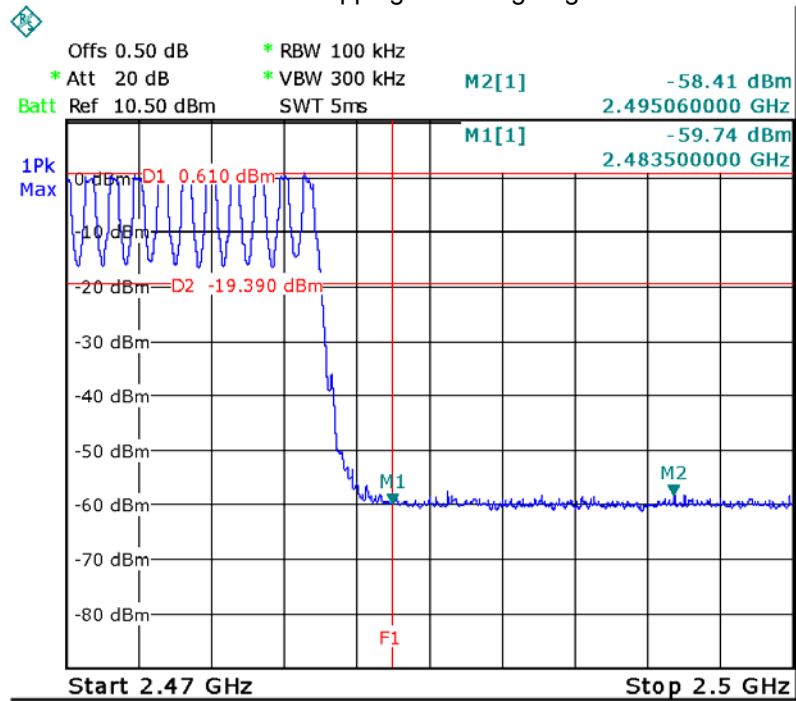
GFSK Transmitting Band edge-right side



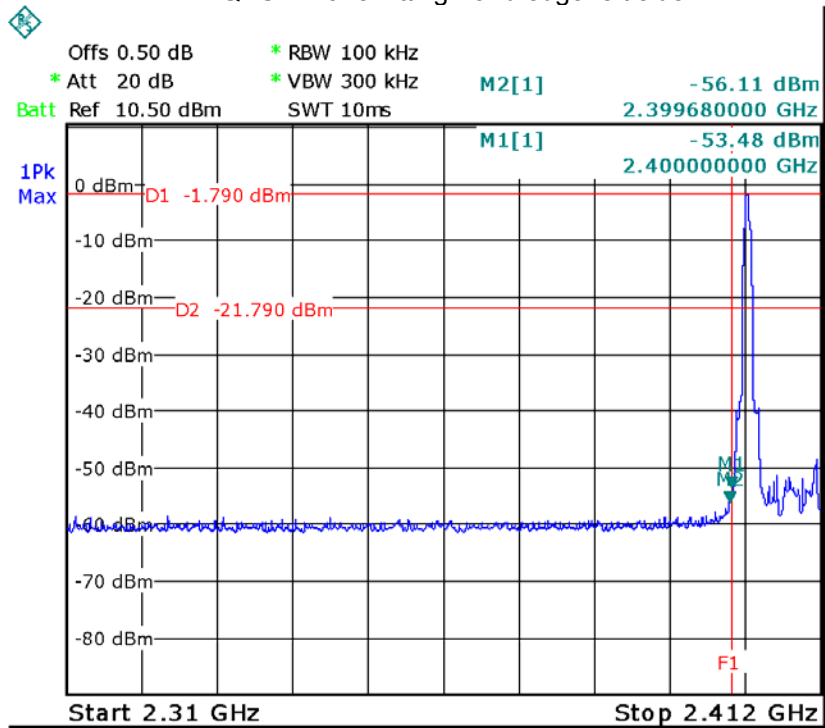
GFSK Hopping Band edge-left side



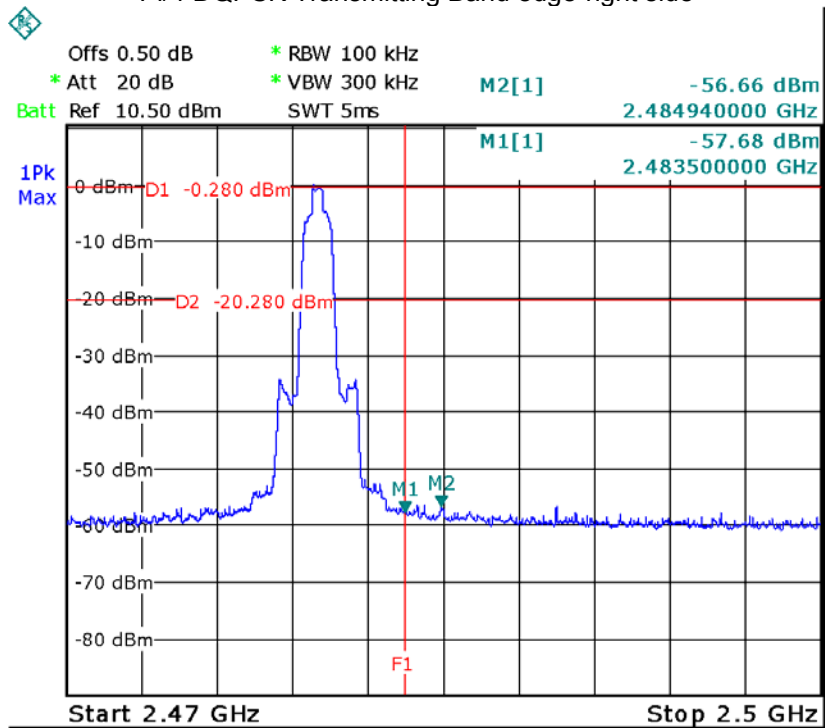
GFSK Hopping Band edge-right side



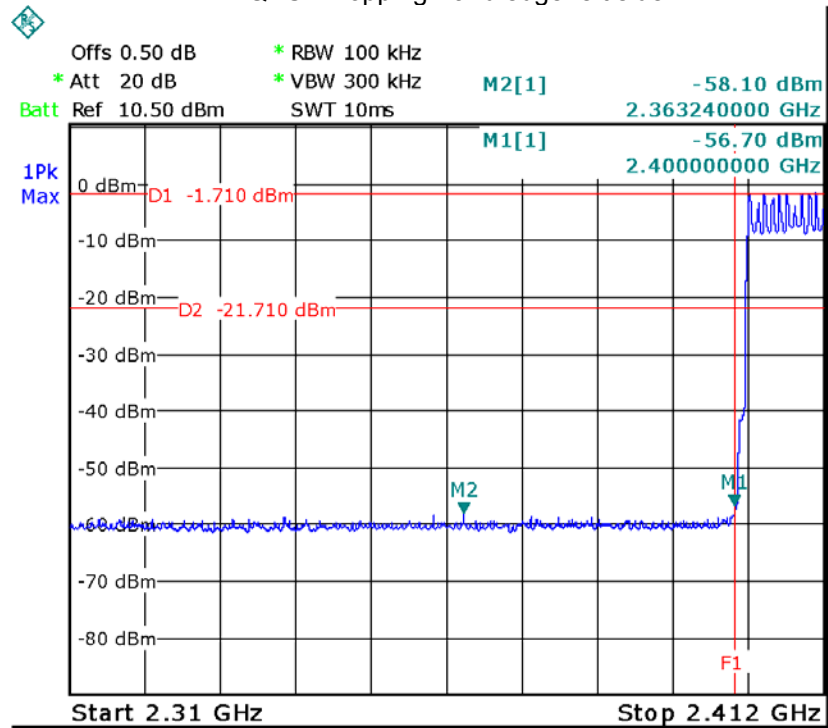
Pi/4 DQPSK Transmitting Band edge-left side



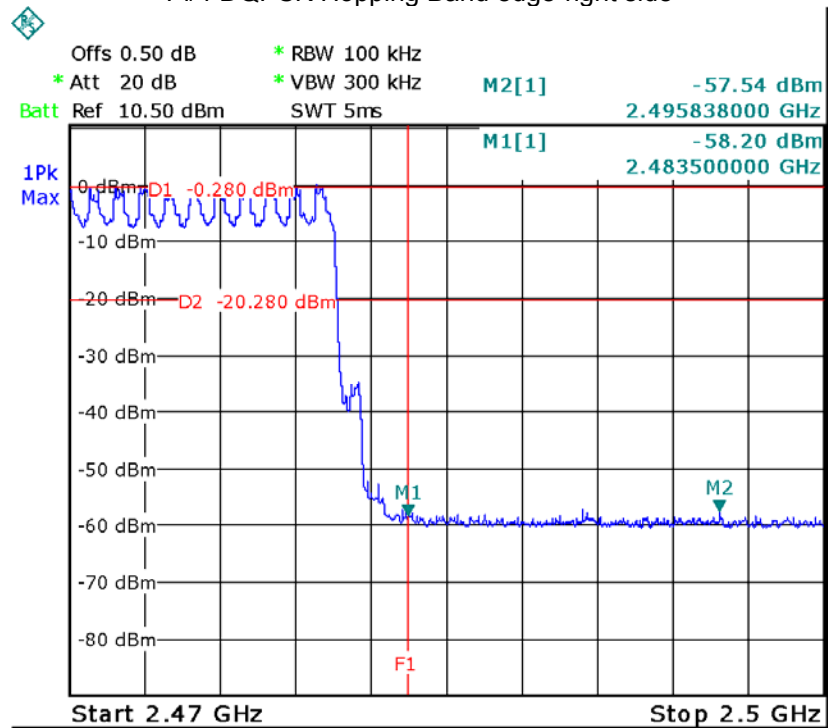
Pi/4 DQPSK Transmitting Band edge-right side



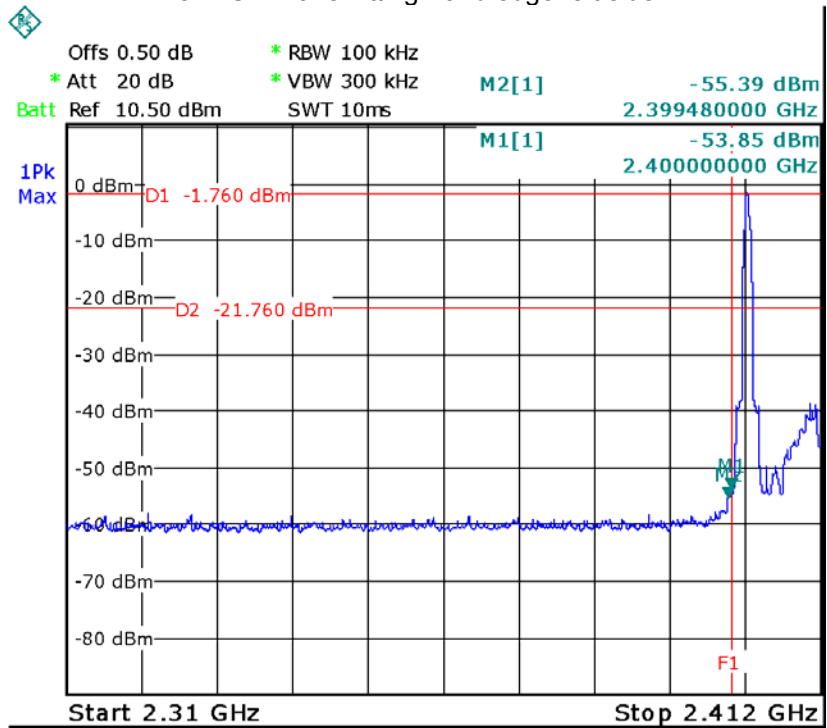
Pi/4 DQPSK Hopping Band edge-left side



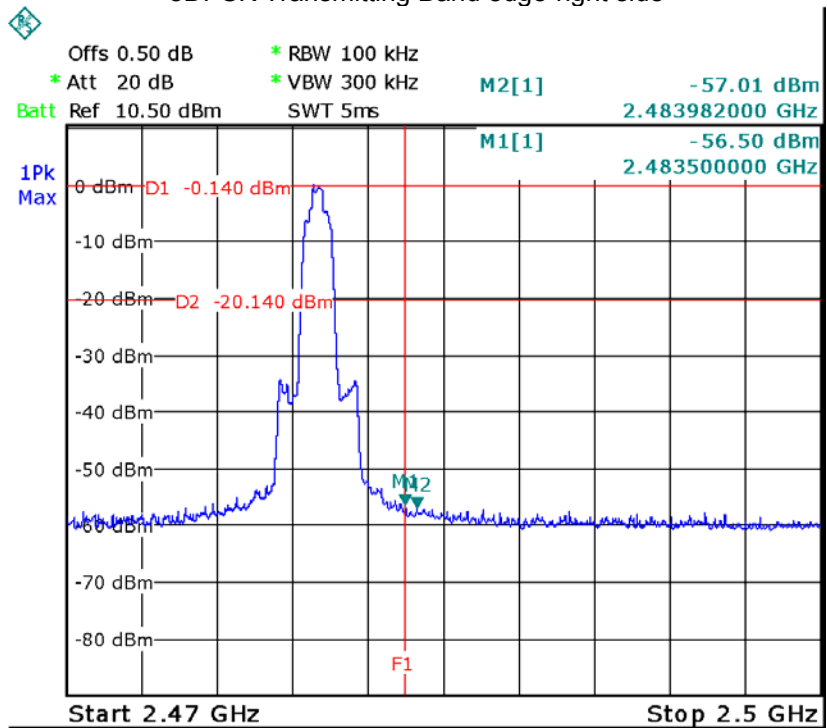
Pi/4 DQPSK Hopping Band edge-right side



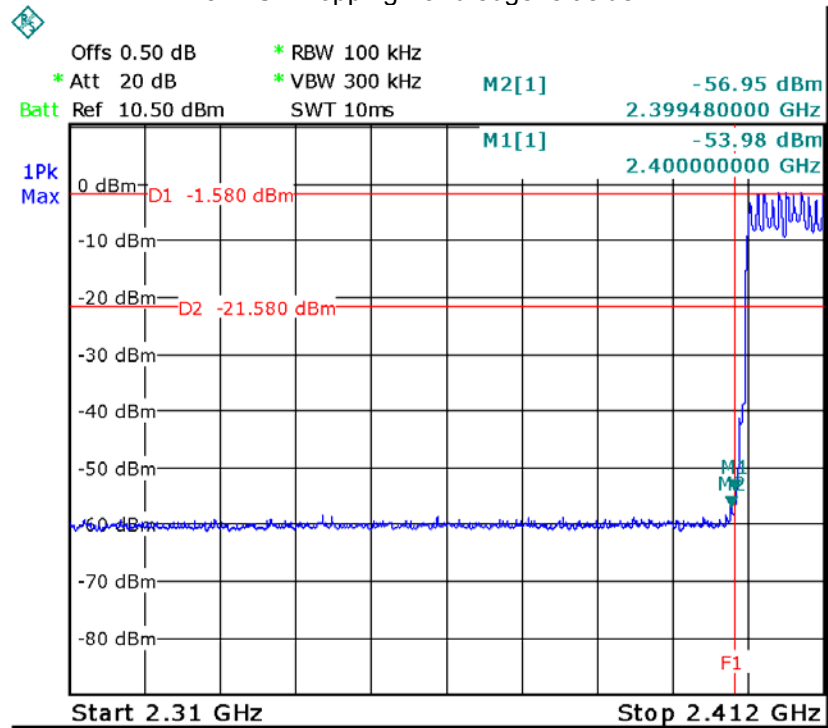
8DPSK Transmitting Band edge-left side



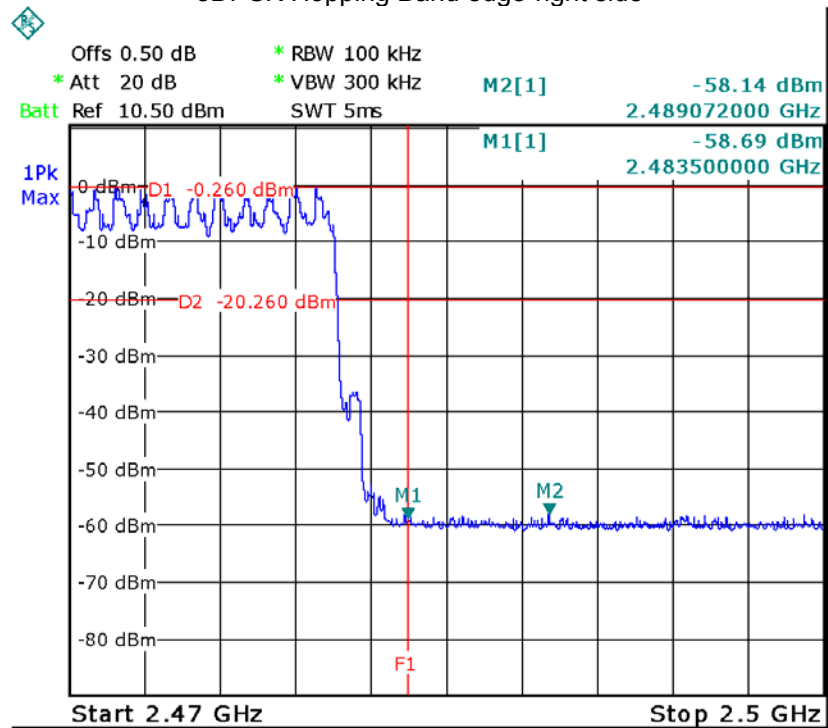
8DPSK Transmitting Band edge-right side



8DPSK Hopping Band edge-left side



8DPSK Hopping Band edge-right side



10 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.

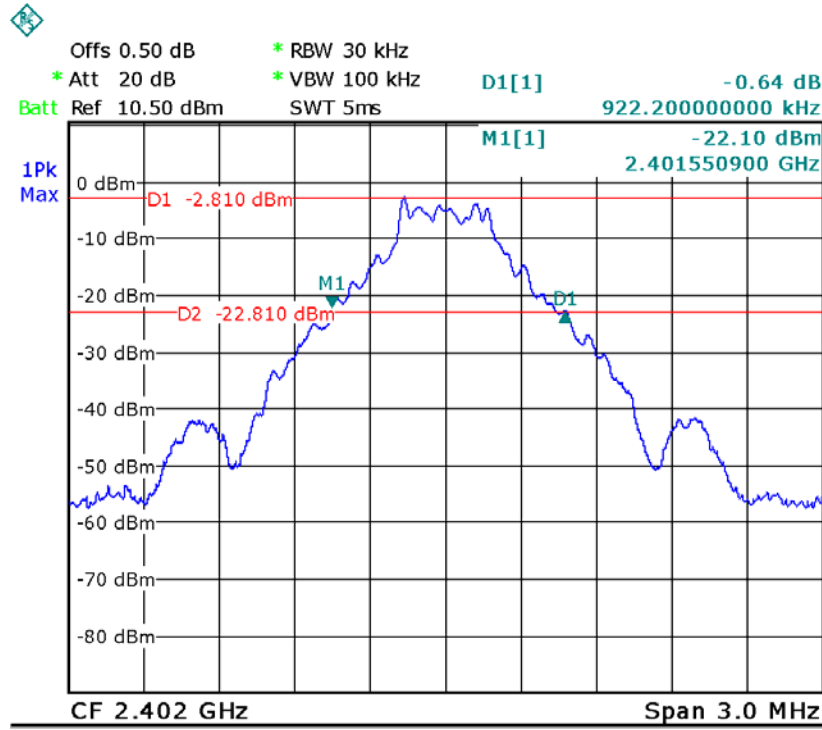
10.1 Test Procedure

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 = 30kHz, VBW = 100kHz

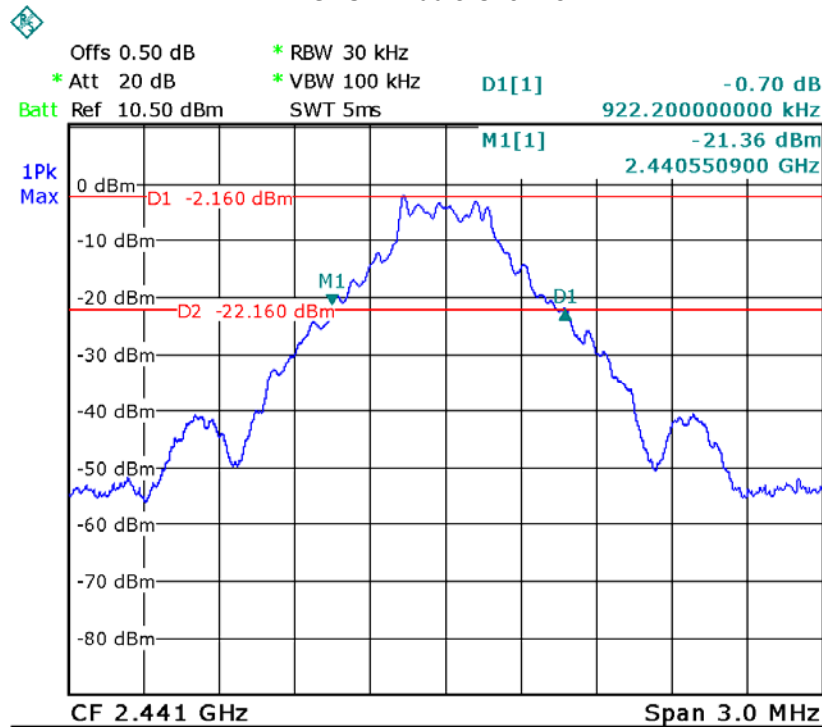
10.2 Test Result

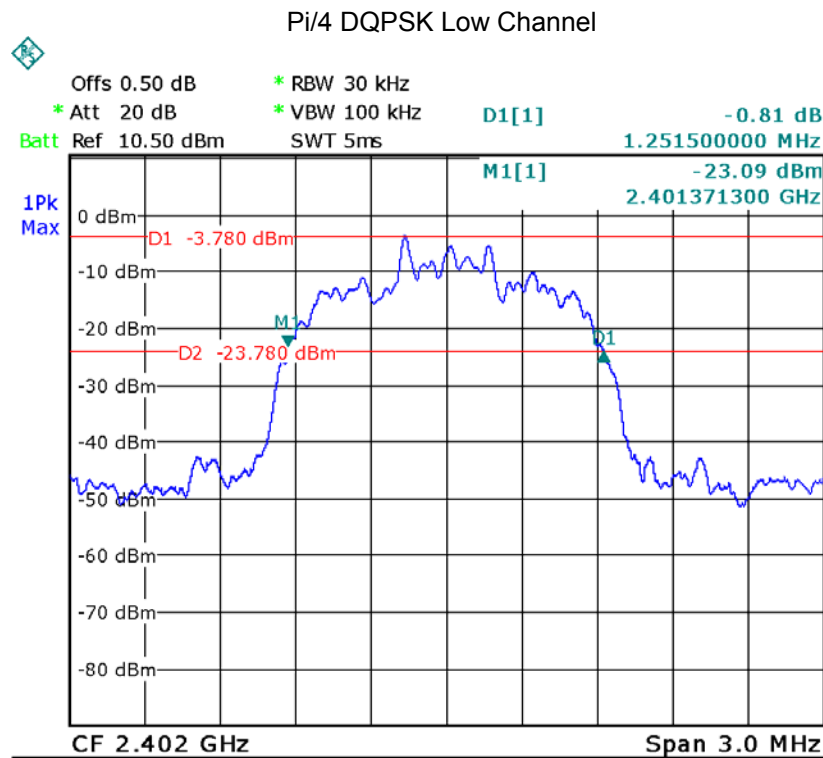
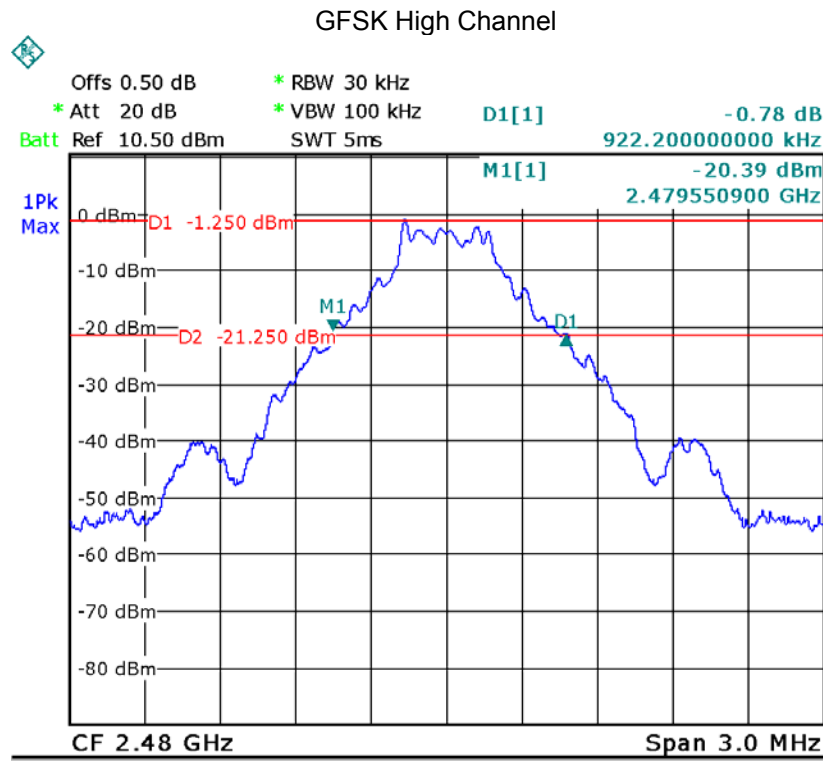
Modulation	Test Channel	Bandwidth(MHz)
GFSK	Low	0.922
GFSK	Middle	0.922
GFSK	High	0.922
Pi/4 DQPSK	Low	1.252
Pi/4 DQPSK	Middle	1.252
Pi/4 DQPSK	High	1.252
8DPSK	Low	1.258
8DPSK	Middle	1.258
8DPSK	High	1.258

Test plots
GFSK Low Channel

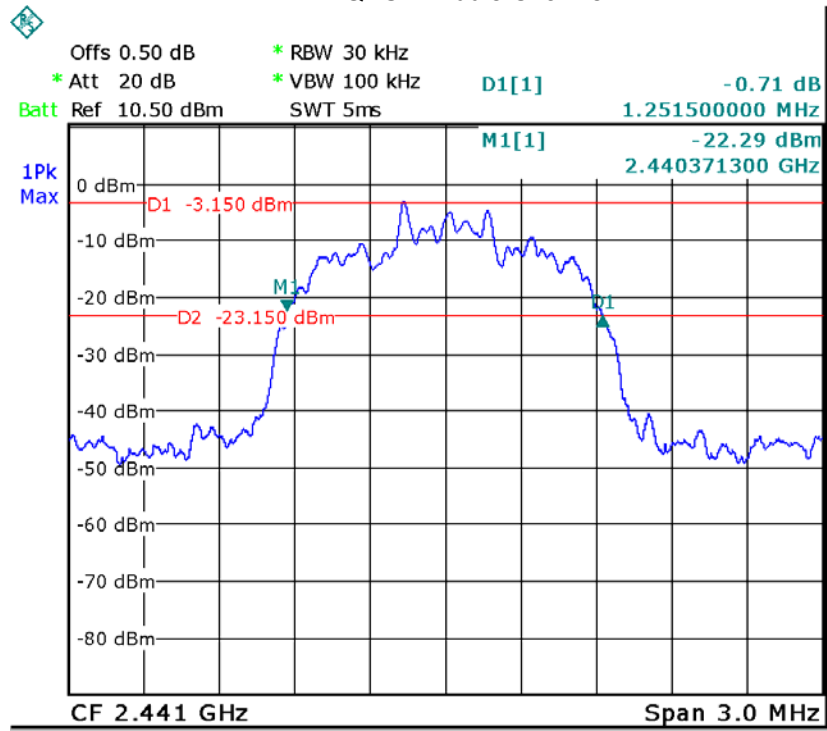


GFSK Middle Channel

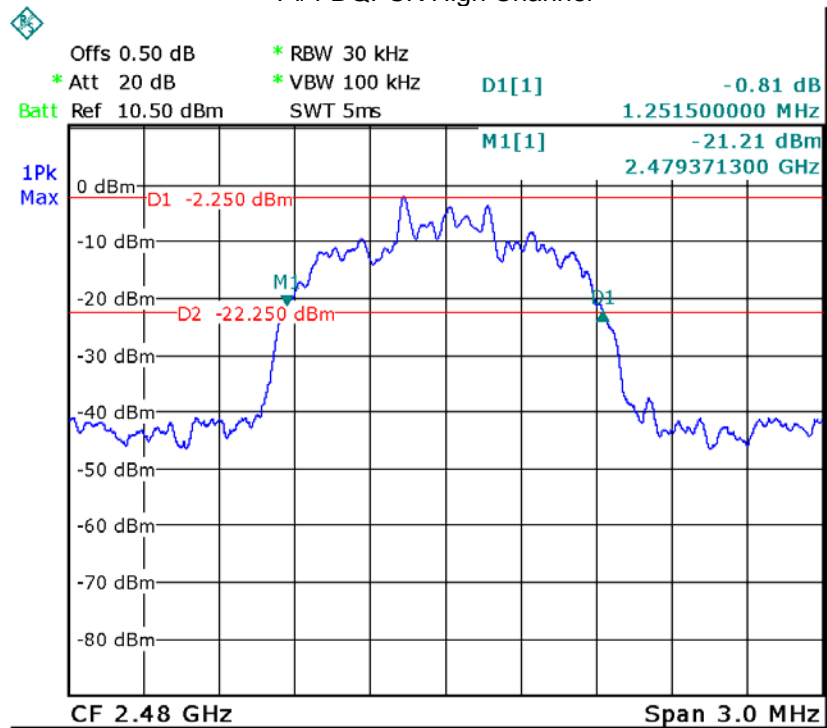




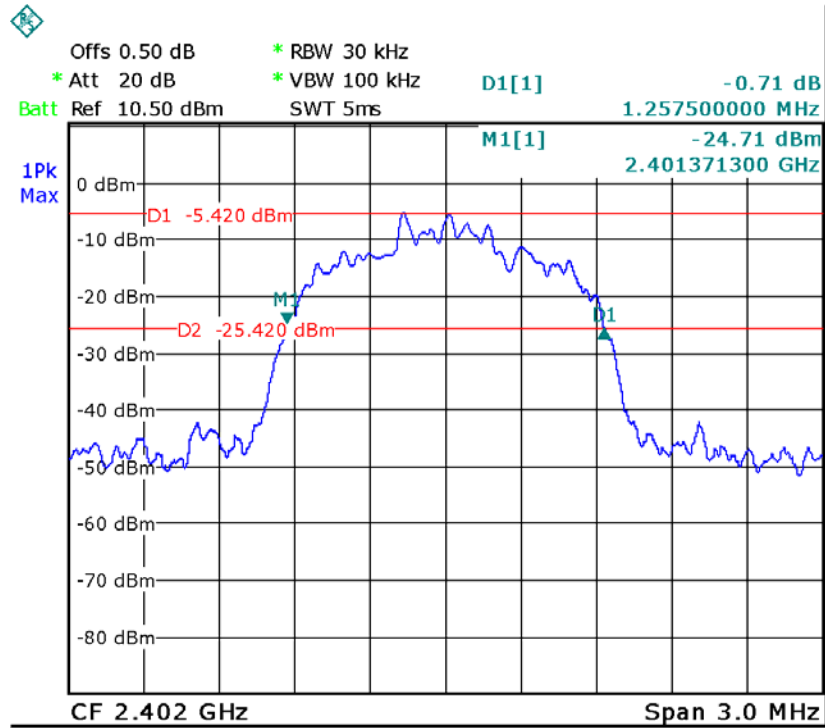
Pi/4 DQPSK Middle Channel



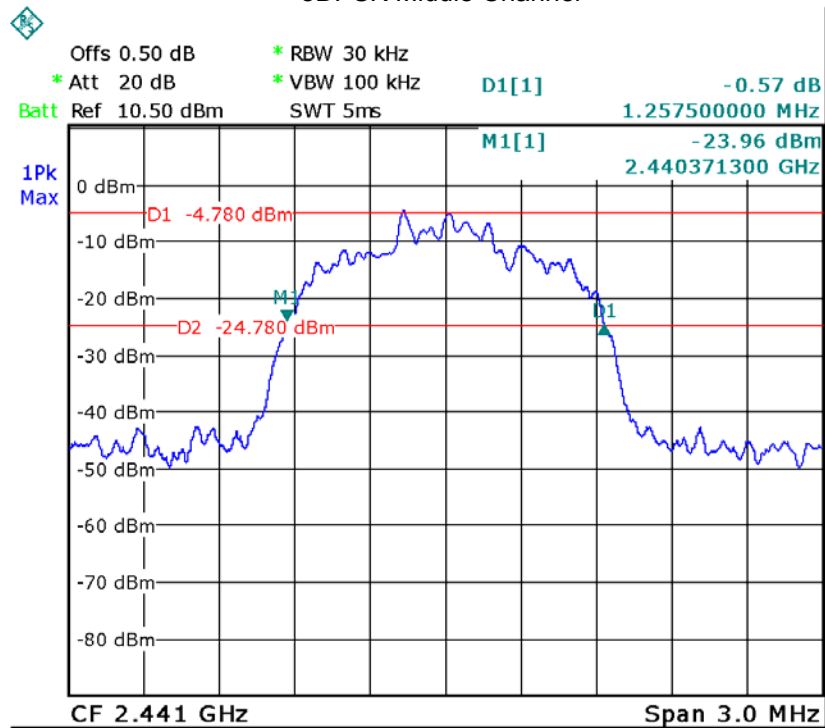
Pi/4 DQPSK High Channel

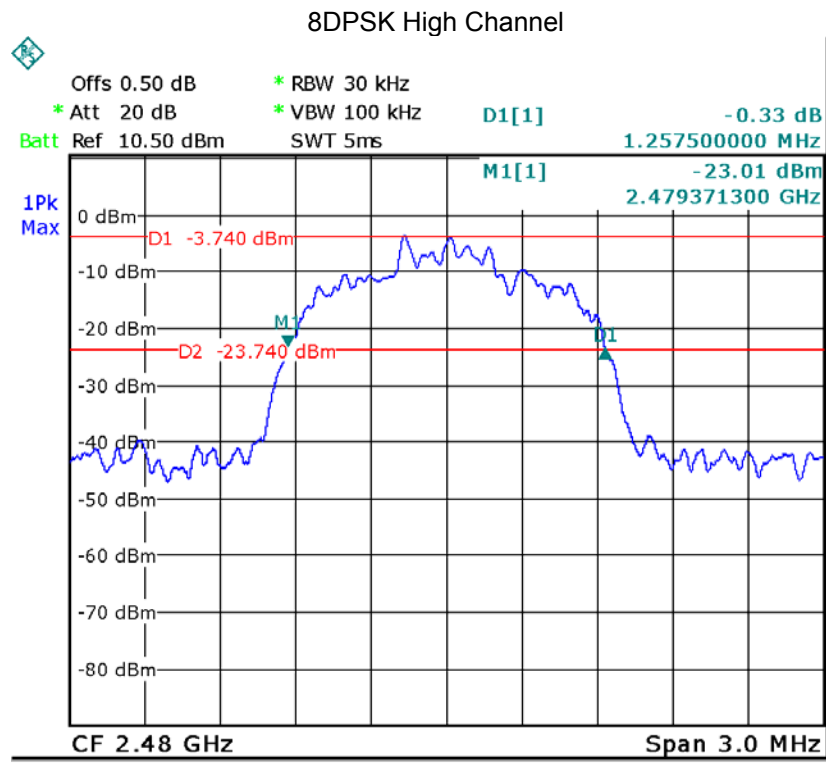


8DPSK Low Channel



8DPSK Middle Channel





11 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.
Test mode:	Test in fixing frequency transmitting mode.

11.1 Test Procedure

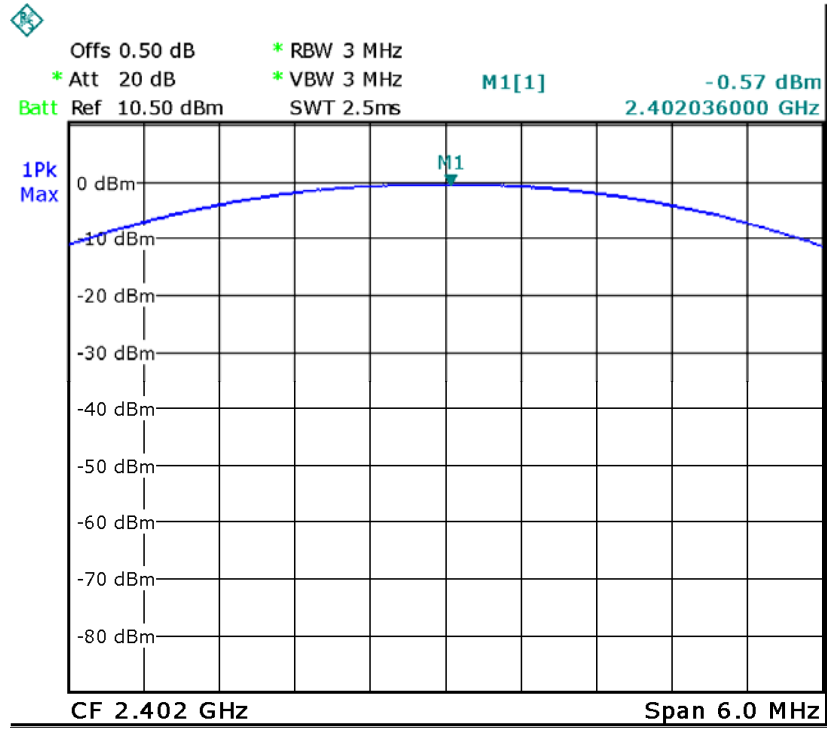
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3MHz. VBW = 3MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

11.2 Test Result

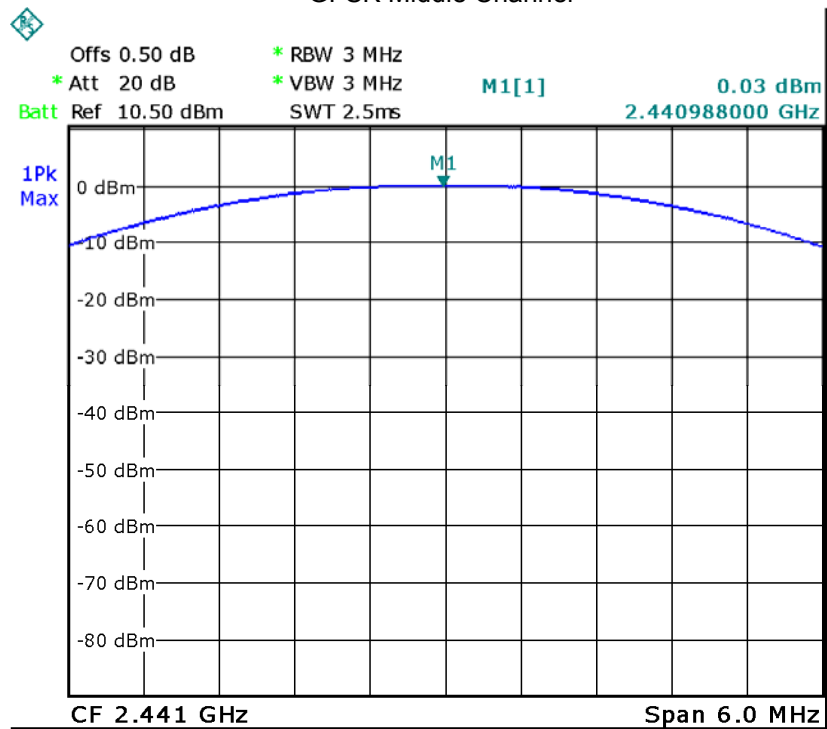
Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	-0.57	30
GFSK	Middle	0.03	30
GFSK	High	0.86	30
Pi/4 DQPSK	Low	-0.75	30
Pi/4 DQPSK	Middle	-0.47	30
Pi/4 DQPSK	High	0.51	30
8DPSK	Low	-0.83	30
8DPSK	Middle	-0.70	30
8DPSK	High	0.30	30

Test plots

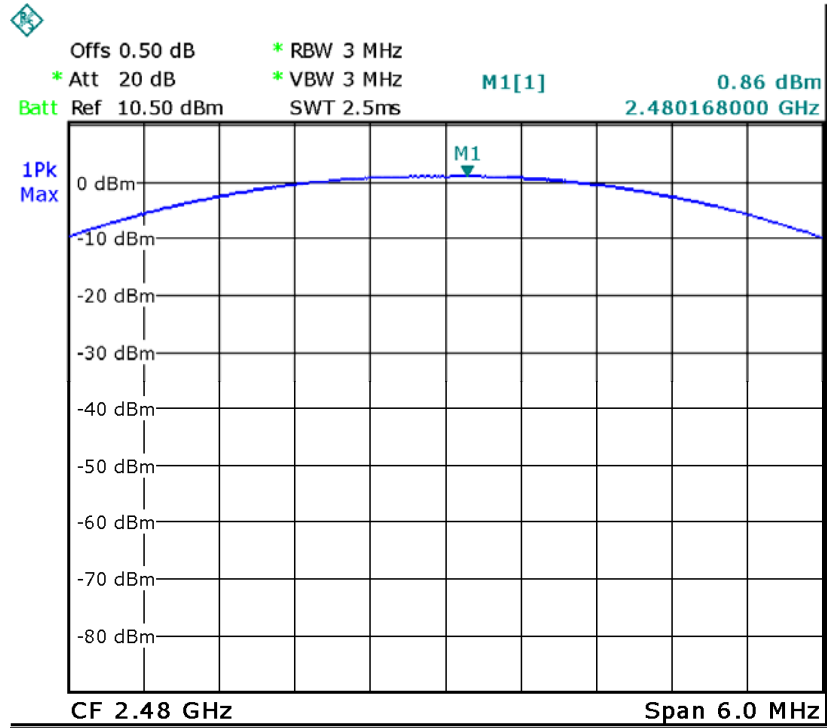
GFSK Low Channel



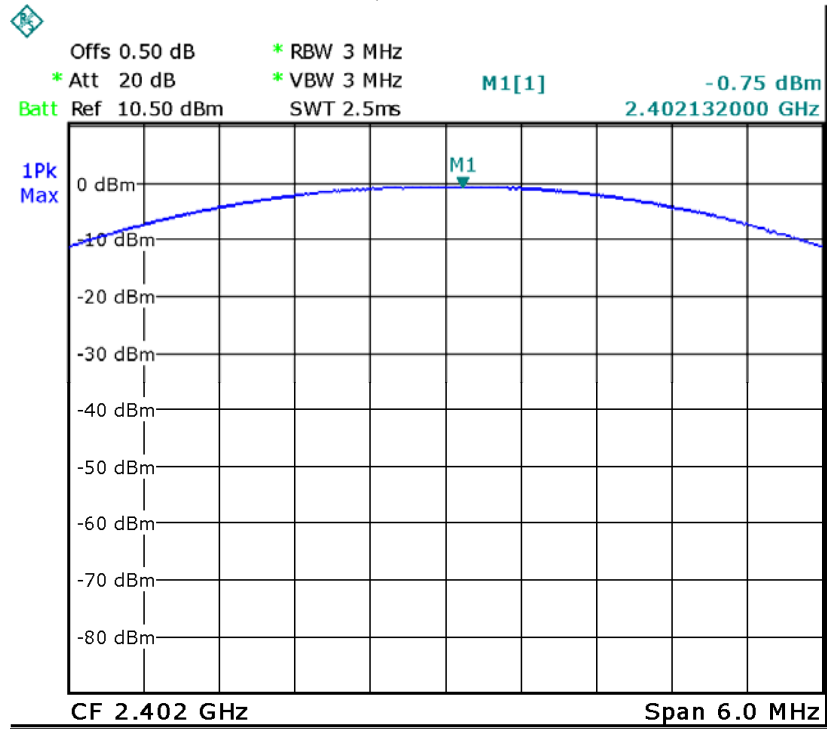
GFSK Middle Channel



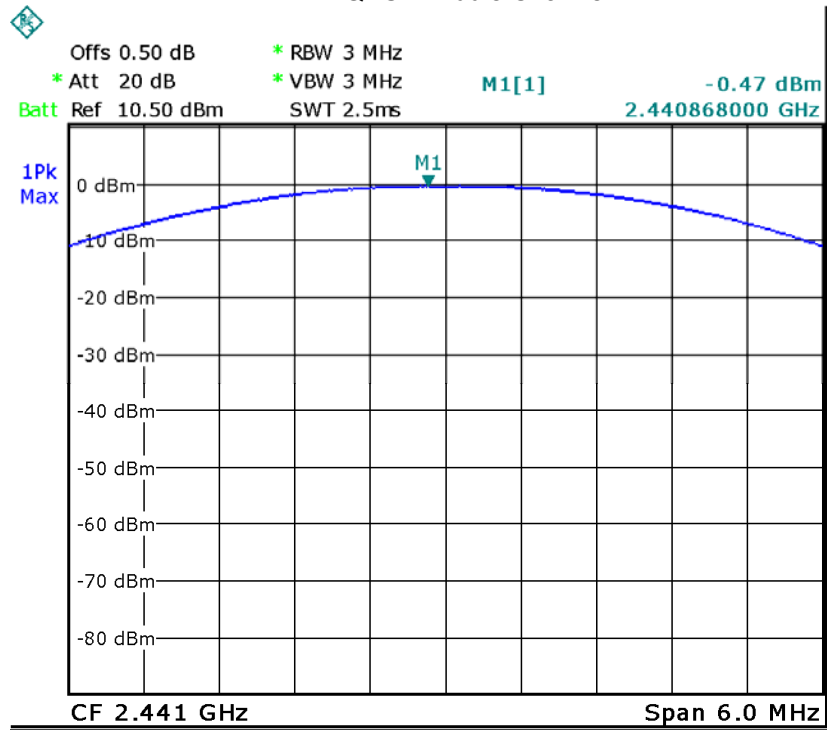
GFSK High Channel



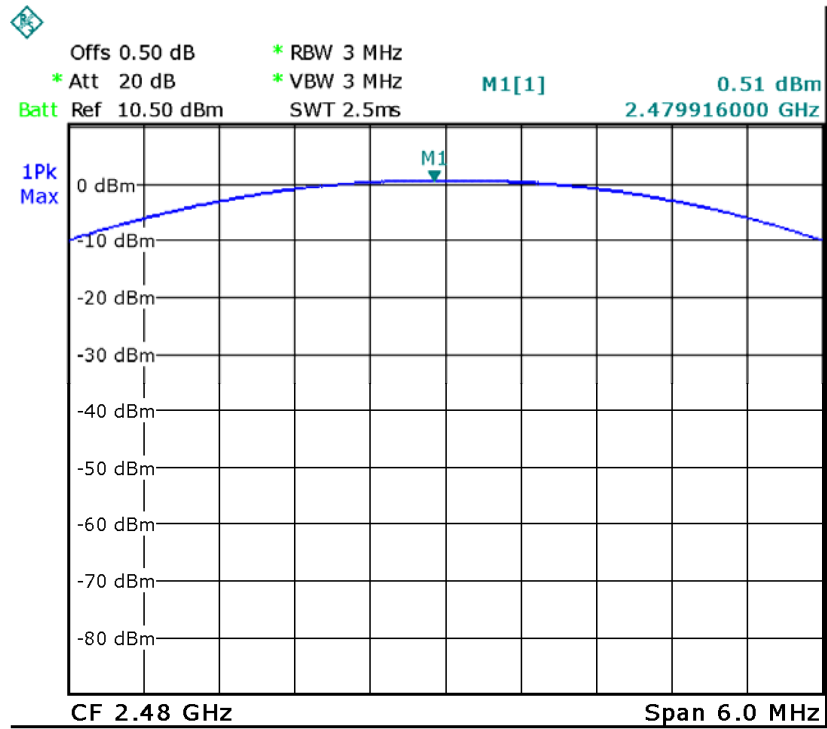
Pi/4 DQPSK Low Channel



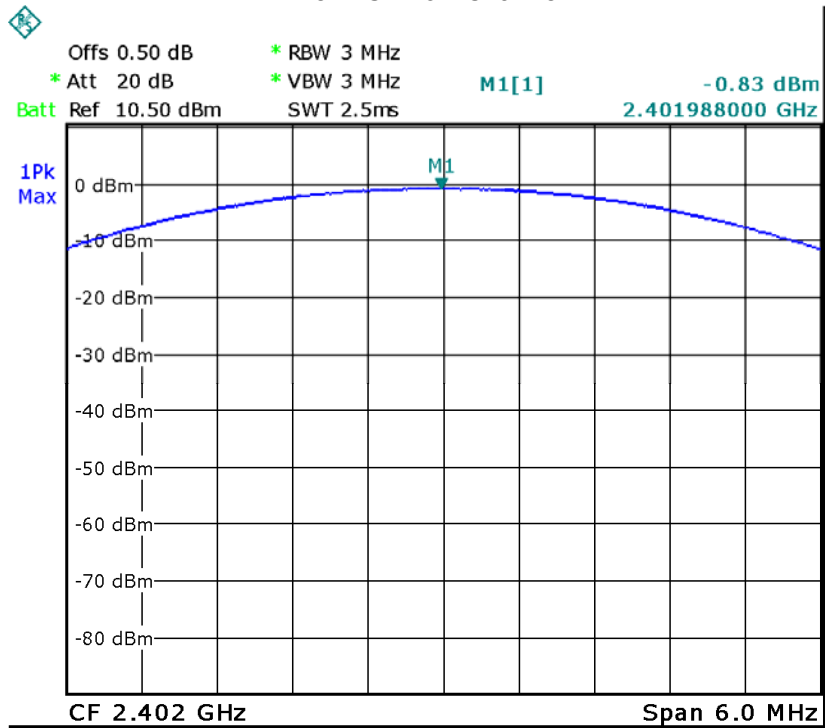
Pi/4 DQPSK Middle Channel



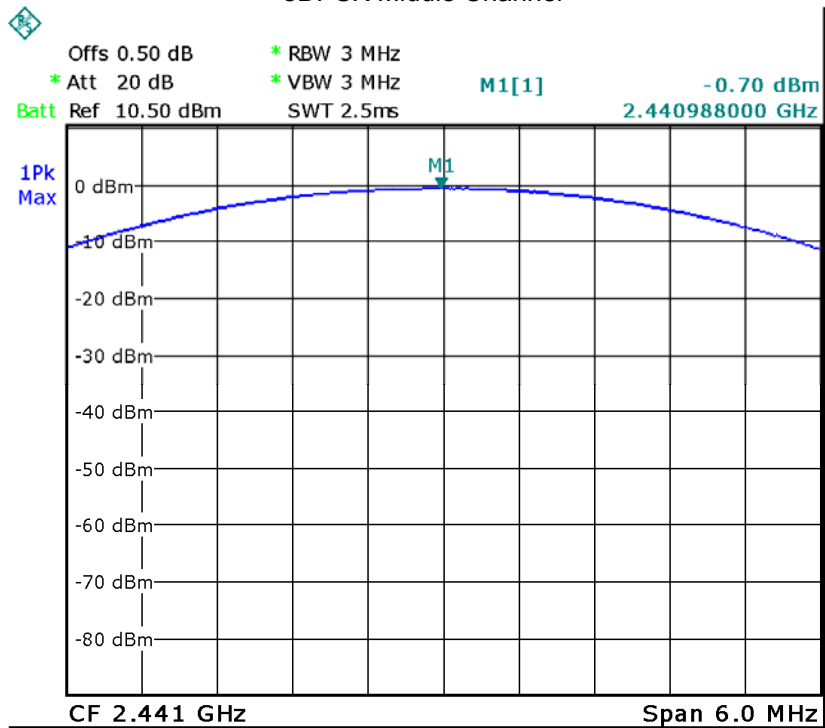
Pi/4 DQPSK High Channel



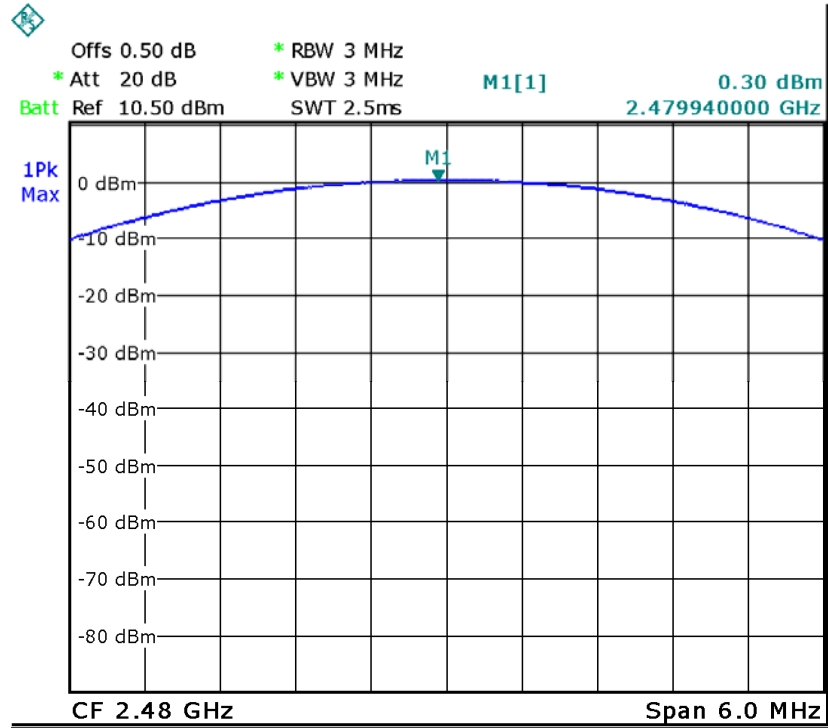
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



12 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.

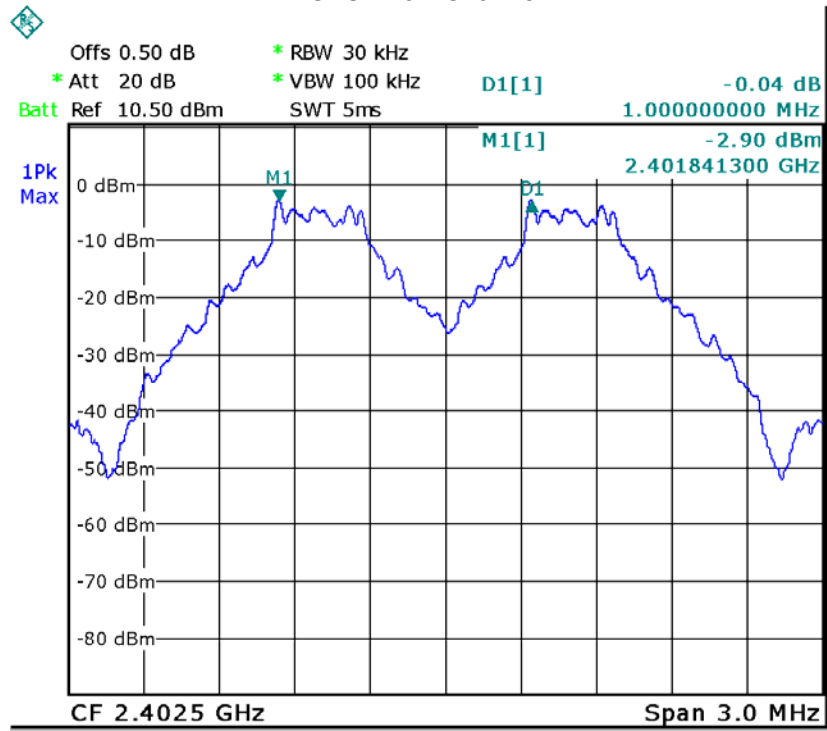
12.1 Test Procedure

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 = 30kHz. VBW = 100kHz , Span = 3.0MHz. 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.

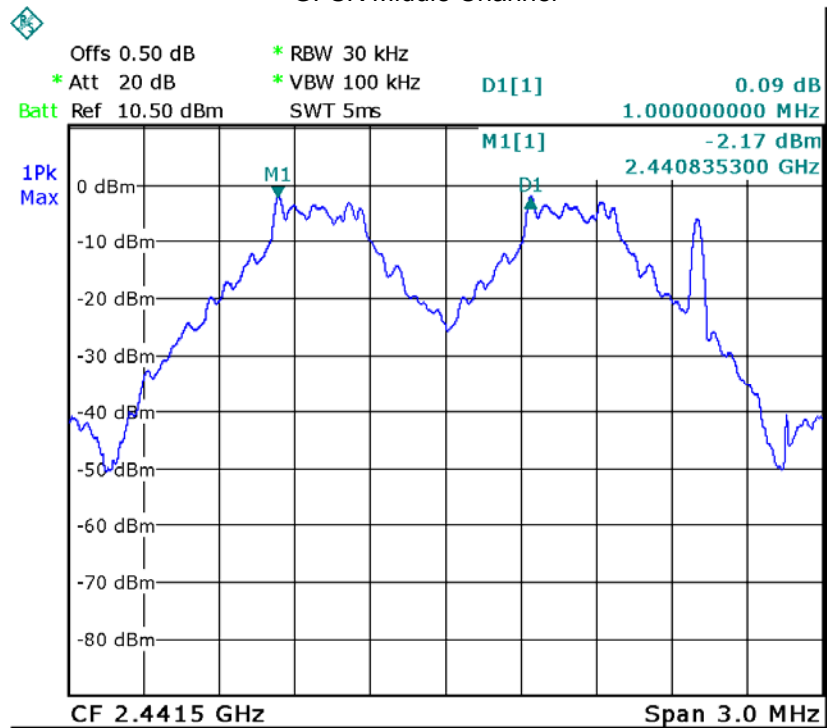
12.2 Test Result

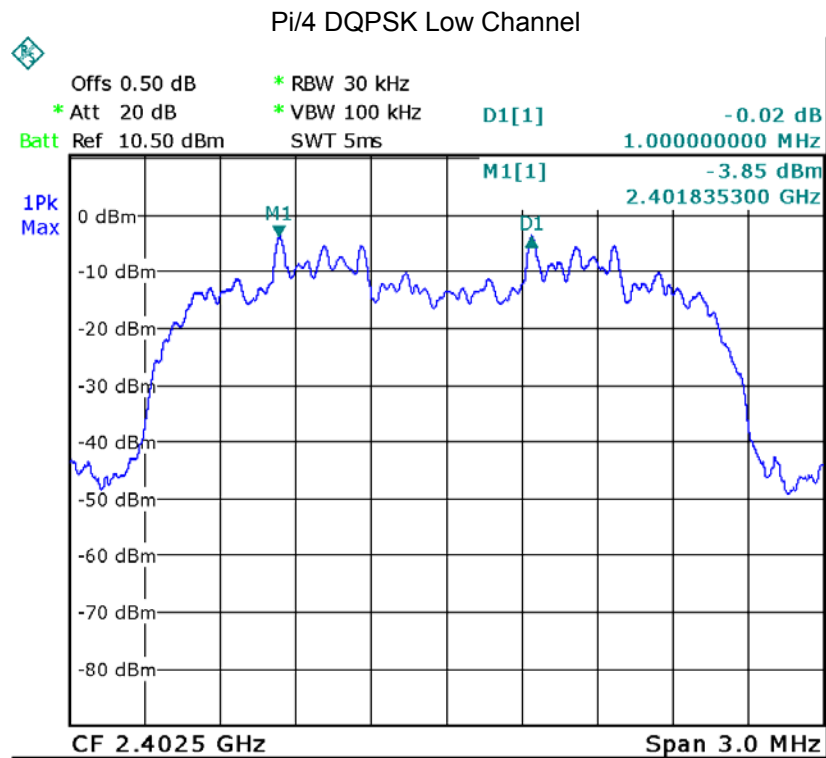
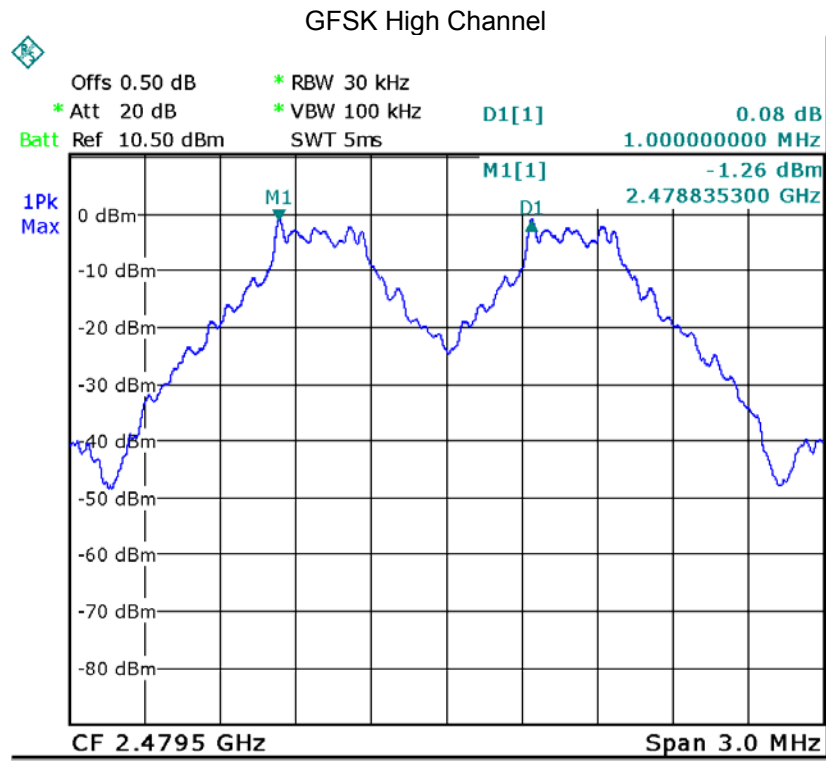
Modulation	Test Channel	Separation (MHz)	Result
GFSK	Low	1.00	PASS
GFSK	Middle	1.00	PASS
GFSK	High	1.00	PASS
Pi/4 DQPSK	Low	1.00	PASS
Pi/4 DQPSK	Middle	1.00	PASS
Pi/4 DQPSK	High	1.00	PASS
8DPSK	Low	1.00	PASS
8DPSK	Middle	1.00	PASS
8DPSK	High	1.00	PASS

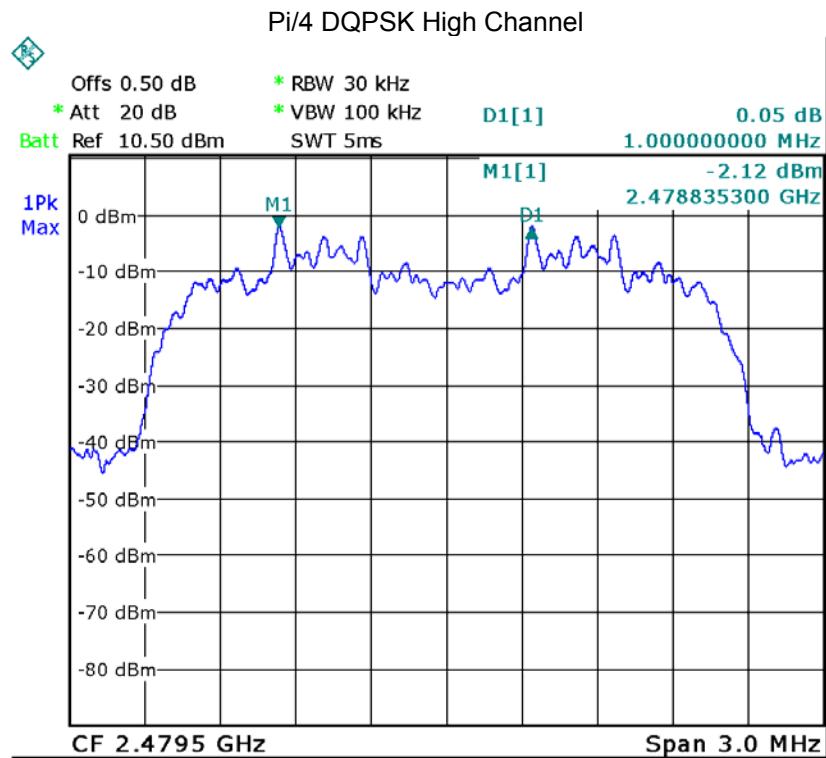
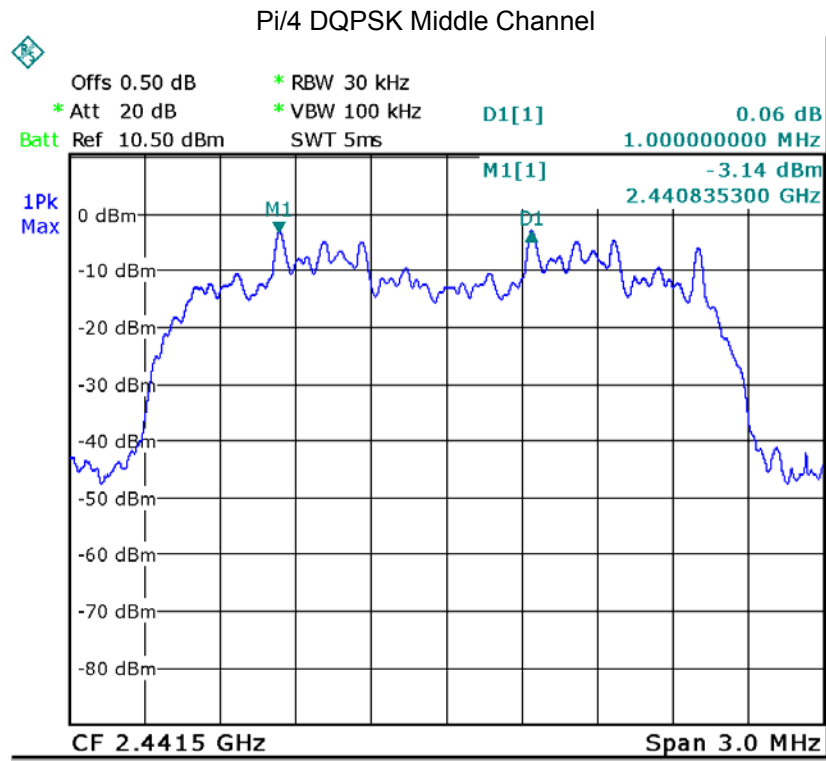
Test plots GFSK Low Channel



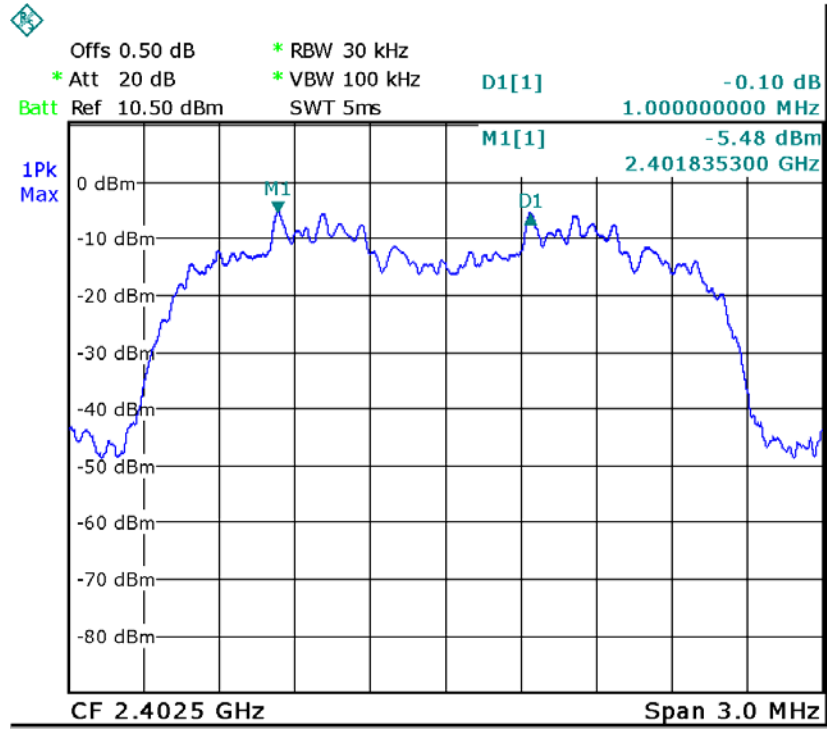
GFSK Middle Channel



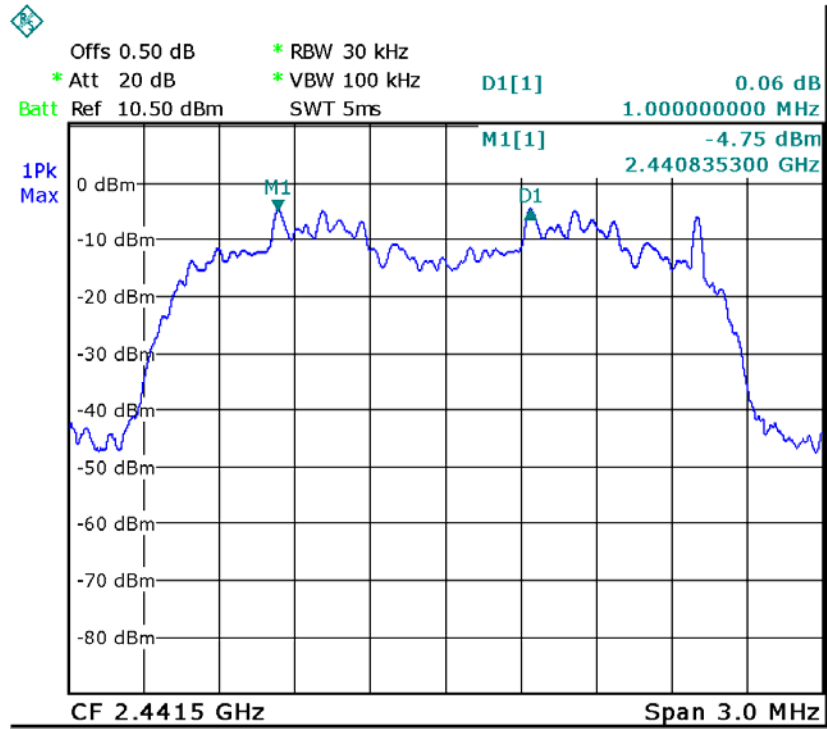


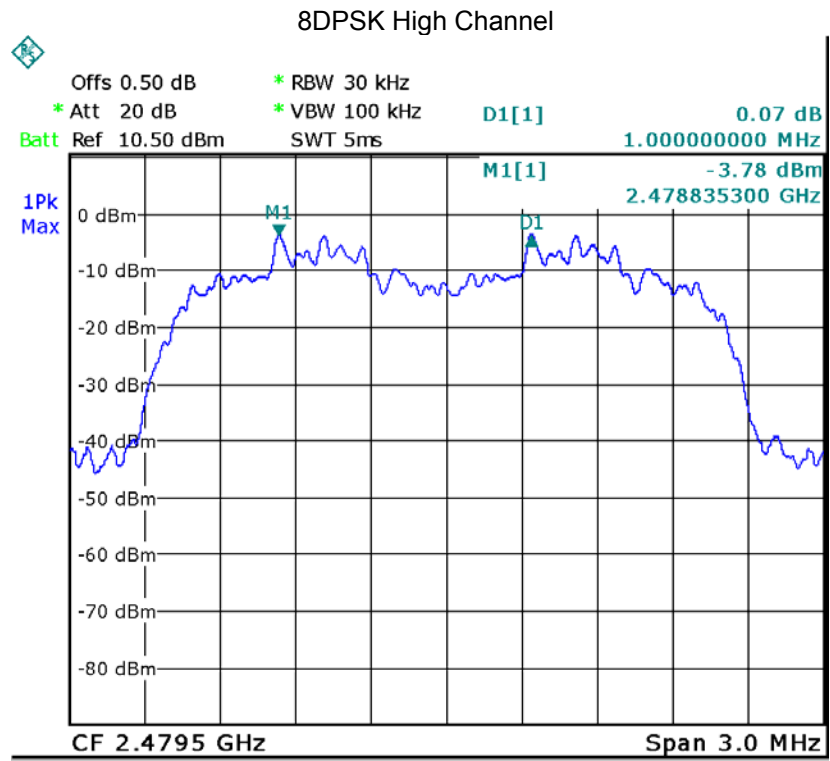


8DPSK Low Channel



8DPSK Middle Channel





13 Number of Hopping Frequency

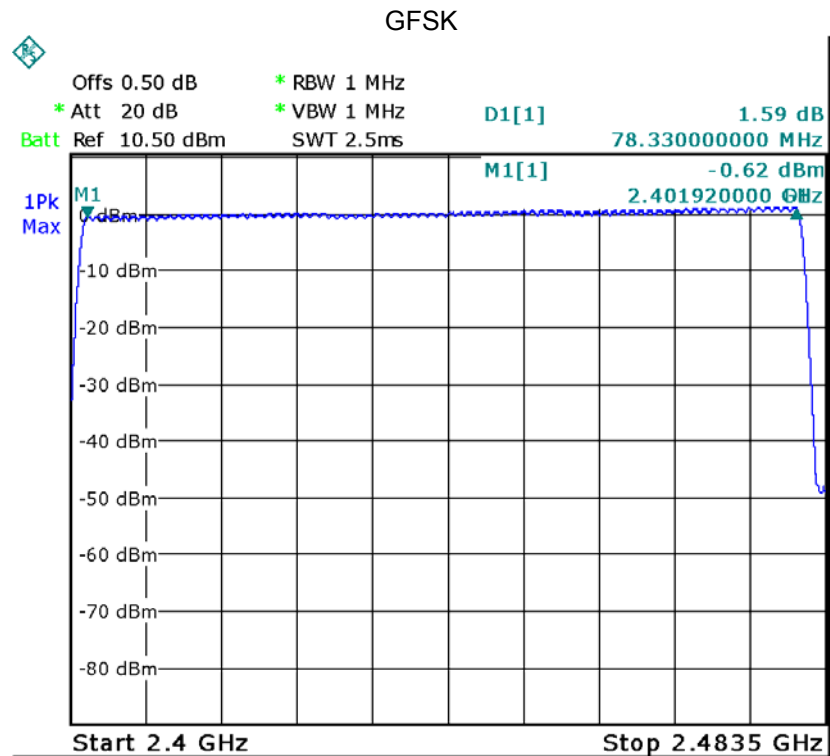
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

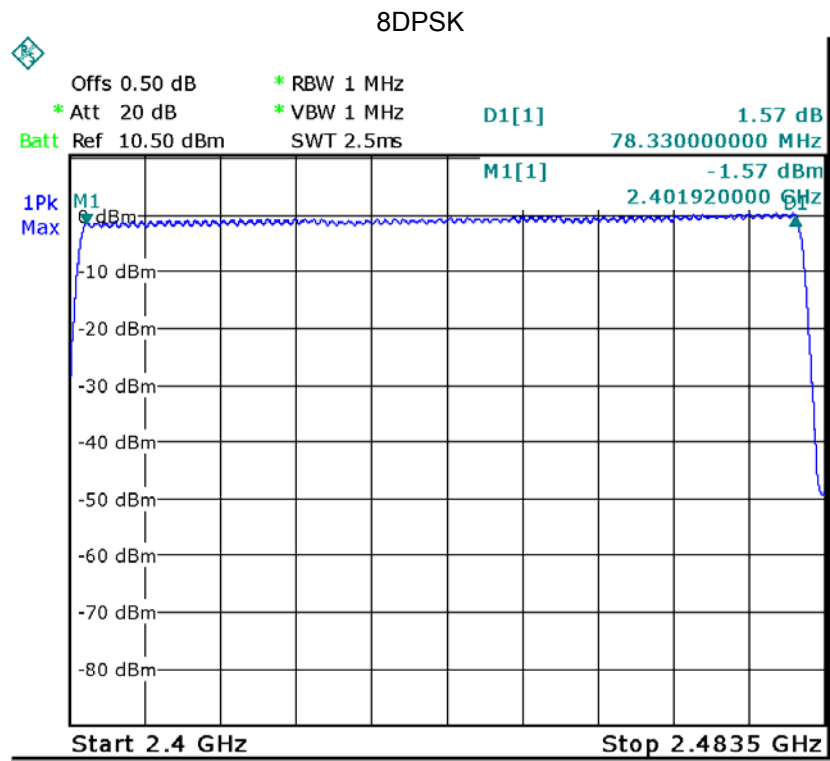
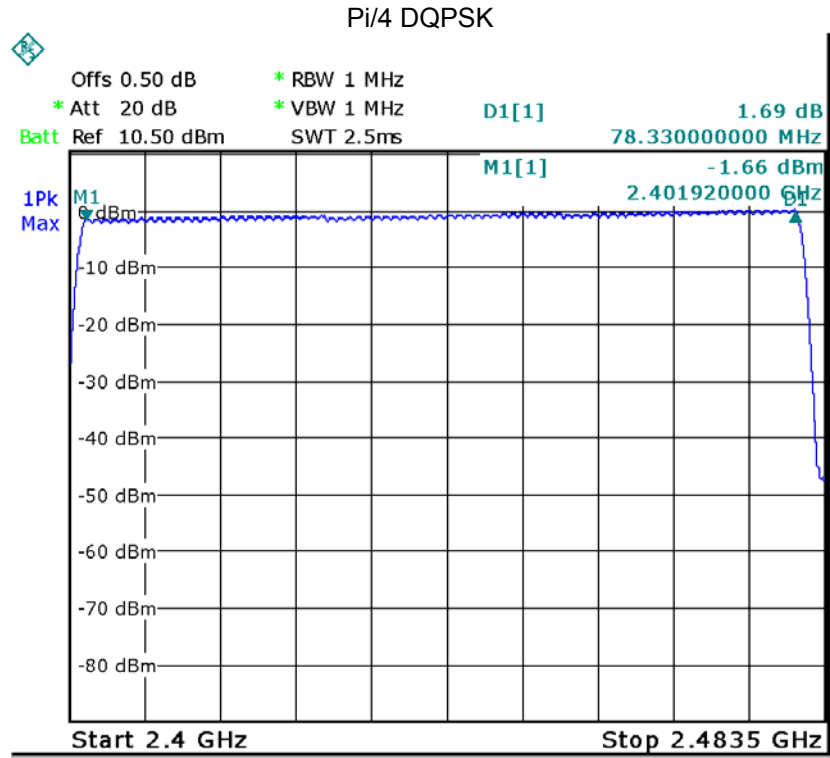
13.1 Test Procedure

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 = 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: Start Frequency = 2.4GHz, Stop Frequency = 2.483GHz. Sweep=auto;

13.2 Test Result

Test Plot: 79 Channels in total





14 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.

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 spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
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).

14.2 Test Result

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

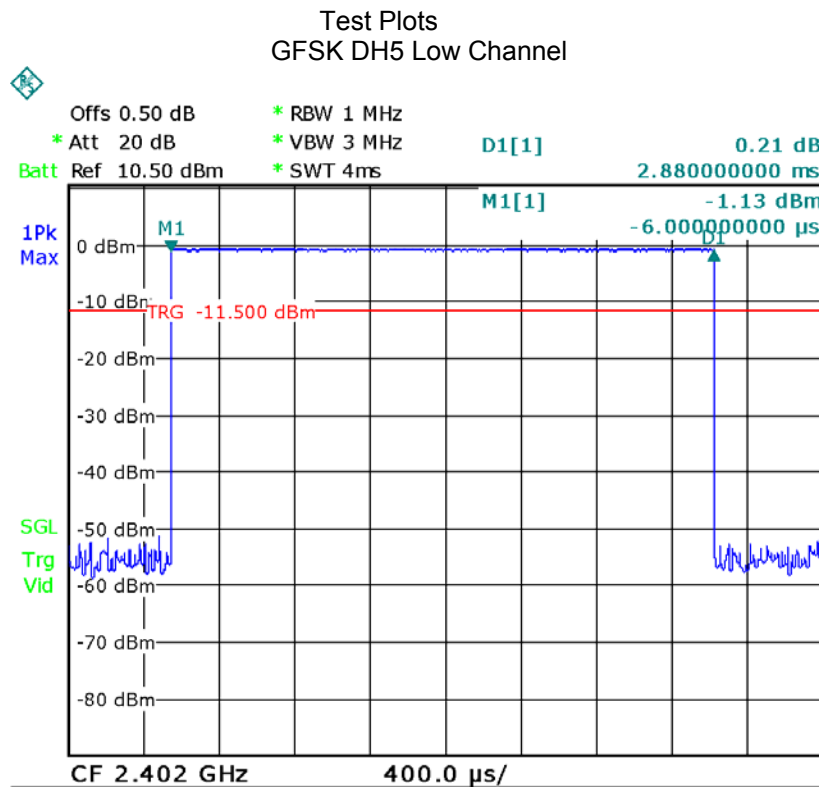
DH3 Packet permit maximum $1600 / 79 / 4$ hops per second in each channel (3 time slots RX, 1 time slot TX).

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:

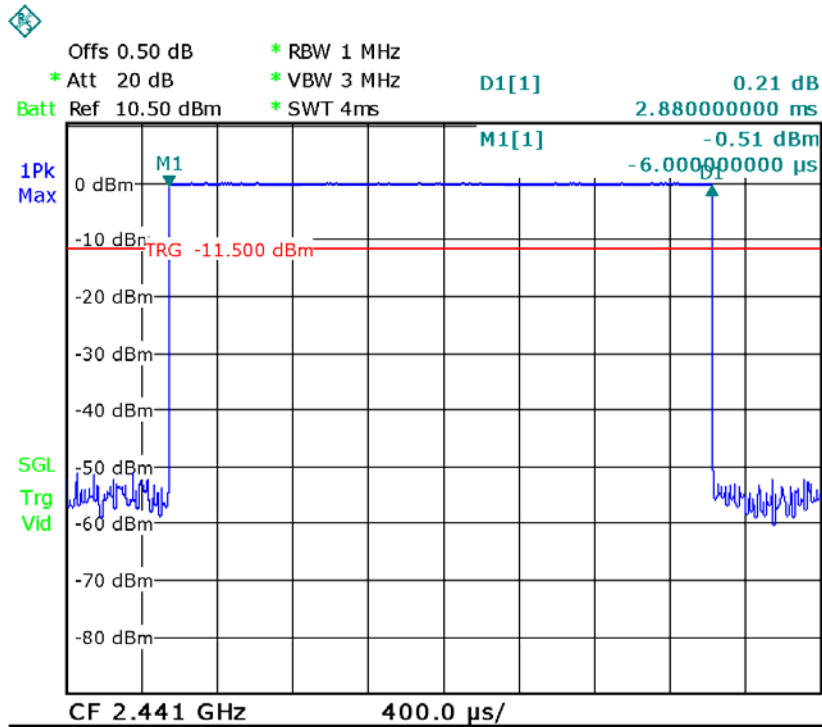
Data Packet	Dwell Time(s)
DH5	$1600/79/6*0.4*79*(MkrDelta)/1000$
DH3	$1600/79/4*0.4*79*(MkrDelta)/1000$
DH1	$1600/79/2*0.4*79*(MkrDelta)/1000$
Remark: Mkr Delta is once pulse time.	

Modulation	Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	DH5	Low	2.880	0.307	0.4
		middle	2.880	0.307	0.4
		High	2.880	0.307	0.4
Pi/4DQPSK	DH5	Low	2.880	0.307	0.4
		middle	2.880	0.307	0.4
		High	2.880	0.307	0.4
8DPSK	DH5	Low	2.888	0.308	0.4
		middle	2.888	0.308	0.4
		High	2.888	0.308	0.4

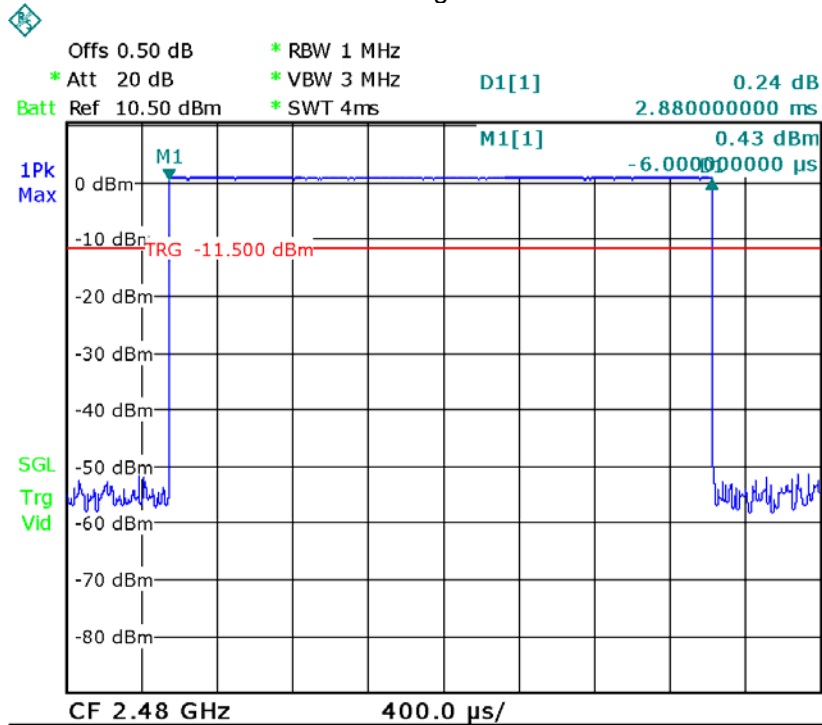
Remark: only the worst data were recorded.

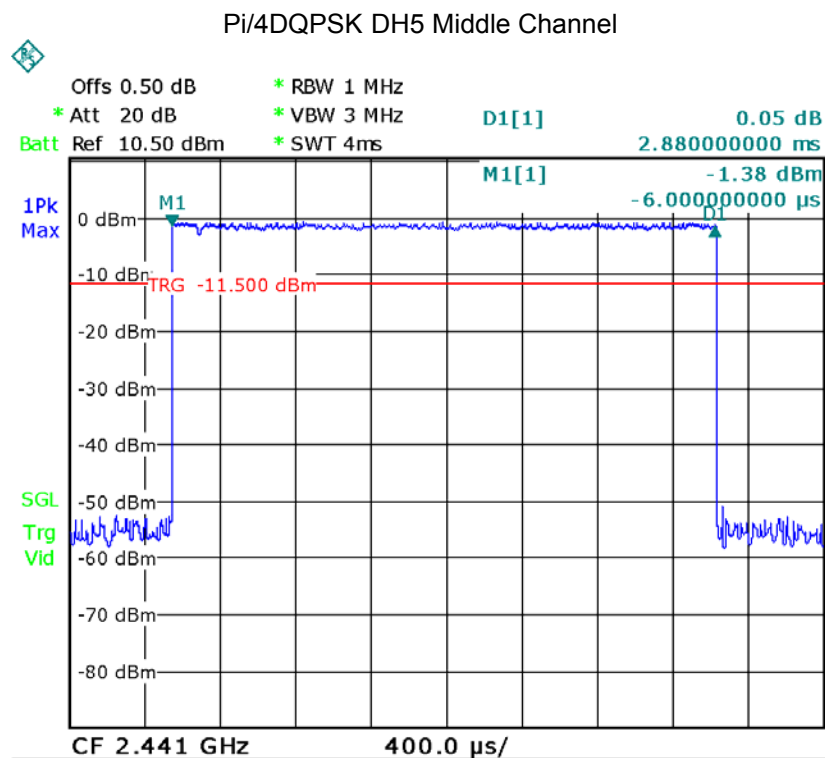
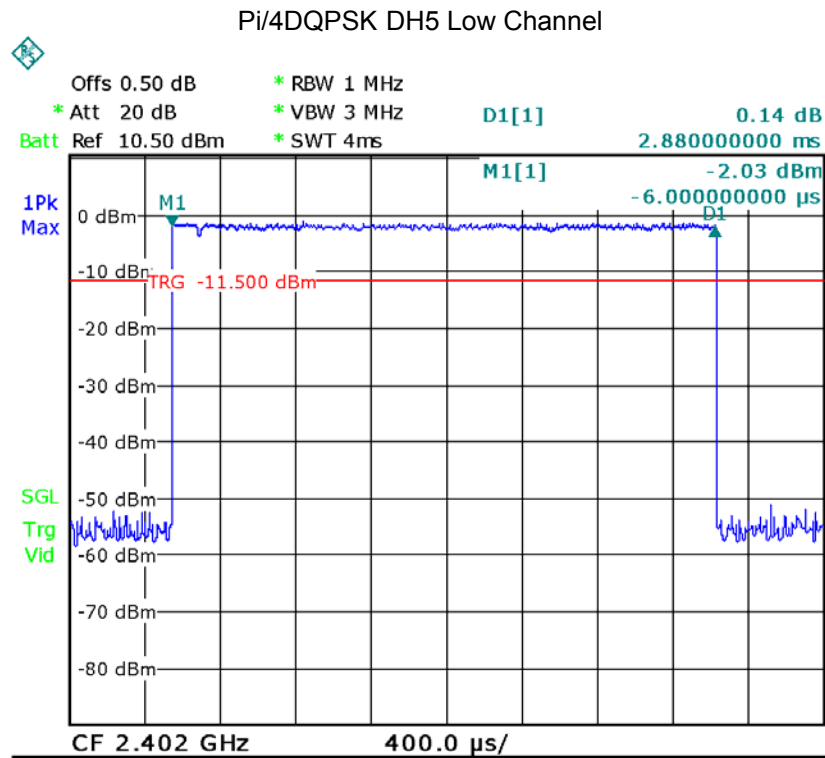


GFSK DH5 Middle Channel

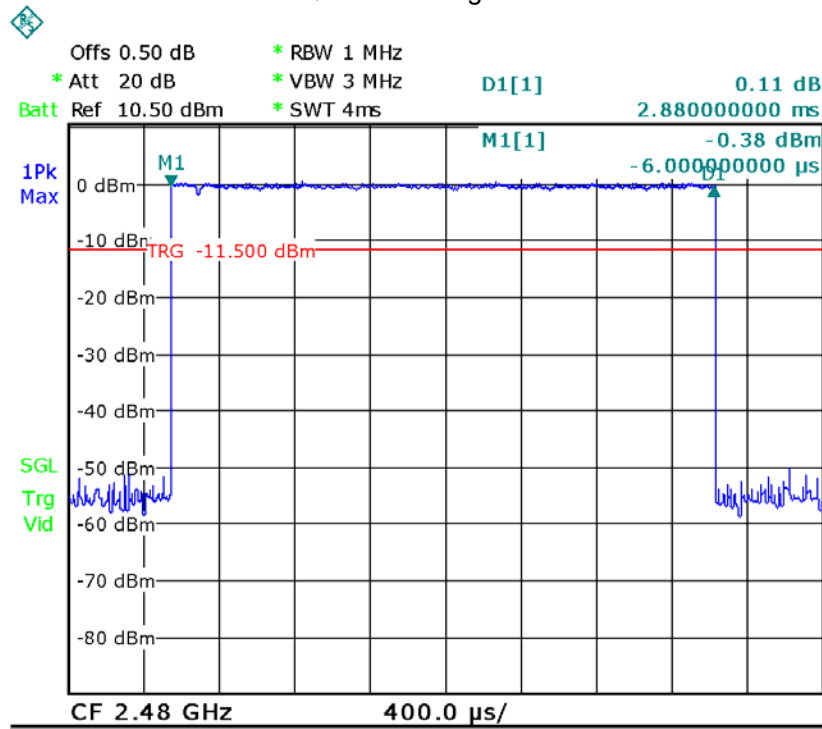


GFSK DH5 High Channel

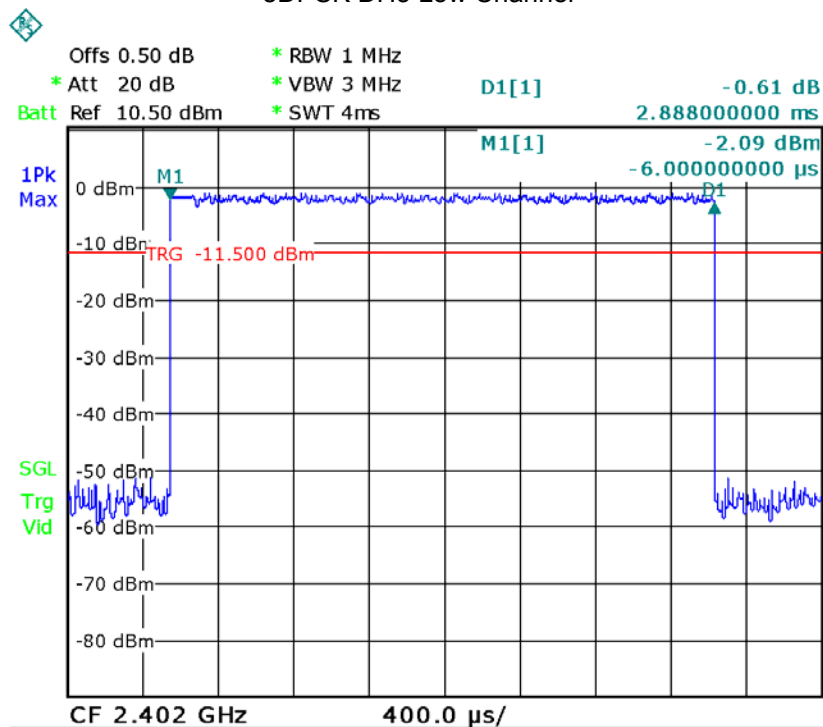




Pi/4DQPSK DH5 High Channel



8DPSK DH5 Low Channel



15 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 integrated antenna, fulfil the requirement of this section.

16 RF Exposure

Remark: refer to SAR test report: WTS15S0730009E.

=====**End of Report**=====