FCC TEST REPORT
FCC ID: 2ABKAP137

Product	:	BLUETOOTH SPEAKER
Model Name	:	P137L, P137LL, P137J, P126L, P178L, P179L
Brand	:	N/A
Report No.	:	PTS802048160809E-FC01

Prepared for

Leaderwave Electronics (H.K.) Ltd

RM811，HENG NGAI JEWELRY CENTER,4 HOK YUEN STREET EAST, ,

HUNGHOM, KOWLOON, HK

Prepared by

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Dongcheng District, Dongguan, Guangdong, China

TEST RESULT CERTIFICATION

Applicant's name	:	Leaderwave Electronics (H.K.) Ltd
Address	:	RM811，HENG NGAI JEWELRY CENTER,4 HOK YUEN STREET EAST,HUNGHOM, KOWLOON, HK
Manufacture's name	:	Dongguan QingXILeaderwave Electronics Technology Company Limited
Address	:	3RD INDUSTRIAL DISTRICT，QINGXI TOWN，DONGGUAN，GUANGDONG，CHINA
Product name	:	BLUETOOTH SPEAKER
Model name	:	P137L, P137LL, P137J, P126L, P178L, P179L
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10:2013, DA 00-705
Test Date	:	Aug. 20, 2016 ~Aug.24, 2016
Date of Issue	:	Aug.25, 2016
Test Result	:	Pass

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

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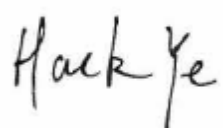
Testing Engineer

August Qiu

TechnicalManager

Hack Ye



AuthorizedSignatory

Contents

2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 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
MaximumPeak 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	PASS

Remark:

N/A: Not Applicable

3 General Information

3.1 IDescription of E.U.T.

Product Name	:	BLUETOOTH SPEAKER
Model Name	:	P137L, P137LL, P137J, P126L, P178L, P179L
Model Description	:	N/A
Bluetooth Version	:	V4.0(With BLE+EDR)
Operating frequency	:	For BT (EDR) 2402-2480MHz,79channels For BLE 2402-2480MHz,40channels
Antenna installation:	:	Integrated Antenna
Antenna Gain:	:	-0.61dBi
The lowest oscillator:	:	32.768kHz
Type of Modulation	:	GFSK, Pi/4DQPSK, 8DPSK
Power supply	:	Input: AC230/50MHz Output: DC 15V/3A

3.2 Channel List

BT							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	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
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	-	-

3.3 Test Mode

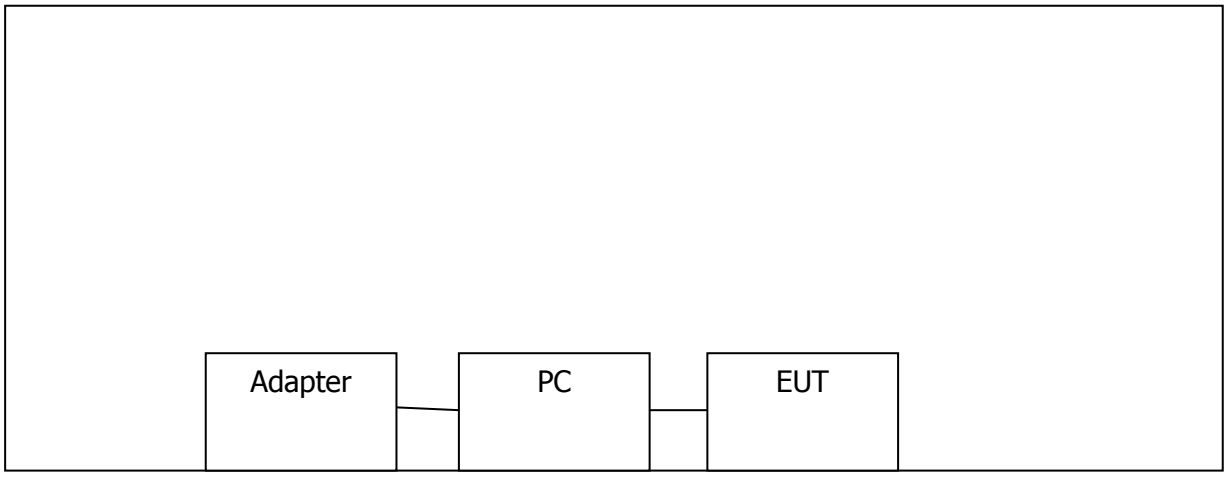
All test mode(s) and condition(s) mentioned were considered and evaluated respectivelyby performing full tests,the worst data were recorded and reported.

Test mode	**Low channel**	**Middle channel**	**High channel**
Transmitting	2402MHz	2441MHz	2480MHz
Hopping	2402-2480MHz		
Tests Carried Out Under FCC part 15.207& 15.209			
Test Item	Test Mode		
Conduction Emission, 0.15MHz to 30MHz	BT Communication		
Radiated Emission, 30M-1GHz	BT Communication		

3.4 Test Voltage

Normal Test Voltage	Item
120V 60Hz	Conducted Emission & Radiated Emission
240V 60Hz	Conducted Emission & Radiated Emission
Remark: Only the worst case (120V 60Hz) was recorded in the report.	

3.5 Configuration of System



4 Equipment During Test

4.1 Equipments List

RF Conducted Test							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMC Analyzer (9k~26.5GHz)	Agilent	E4407B	MY45109572	Aug.04, 2016	Aug.03, 2017	1 year
2	EXA Signal Analyzer	Keysight	N9010A	MY50520207 526B25MPB W7X	Aug.04, 2016	Aug.03, 2017	1 year
3	EMI Test Receiver	R&S	ESCI	101155	July 15, 2016	July 14, 2017	1 year
RadiatedEmissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	July 15, 2016	July 14, 2017	1 year
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3355	July 15, 2016	July 14, 2017	1 year
3	Amplifier	EM	EM-30180	060538	July 15, 2016	July 14, 2017	1 year
4	Horn Antenna	SCHWARZBECK	BBHA9120 D	9120D-1246	July 15, 2016	July 14, 2017	1 year
Conducted Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	R&S	ESCI	101155	July 15, 2016	July 14, 2017	1 year
2	LISN	SCHWARZBECK	NSLK 8128	8128-289	July 15, 2016	July 14, 2017	1 year
3	Cable	LARGE	RF300	-	July 15, 2016	July 14, 2017	1 year

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions(150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

5 Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method:	:	ANSI C63.10:2013
Test Result:	:	PASS
FrequencyRange:	:	150kHz to 30MHz
Class/Severity:	:	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)

5.1 E.U.T. Operation

Operating Environment:

Temperature:	:	25.5 °C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.2kPa
EUT Operation:	:	Refer to section 3.3

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.

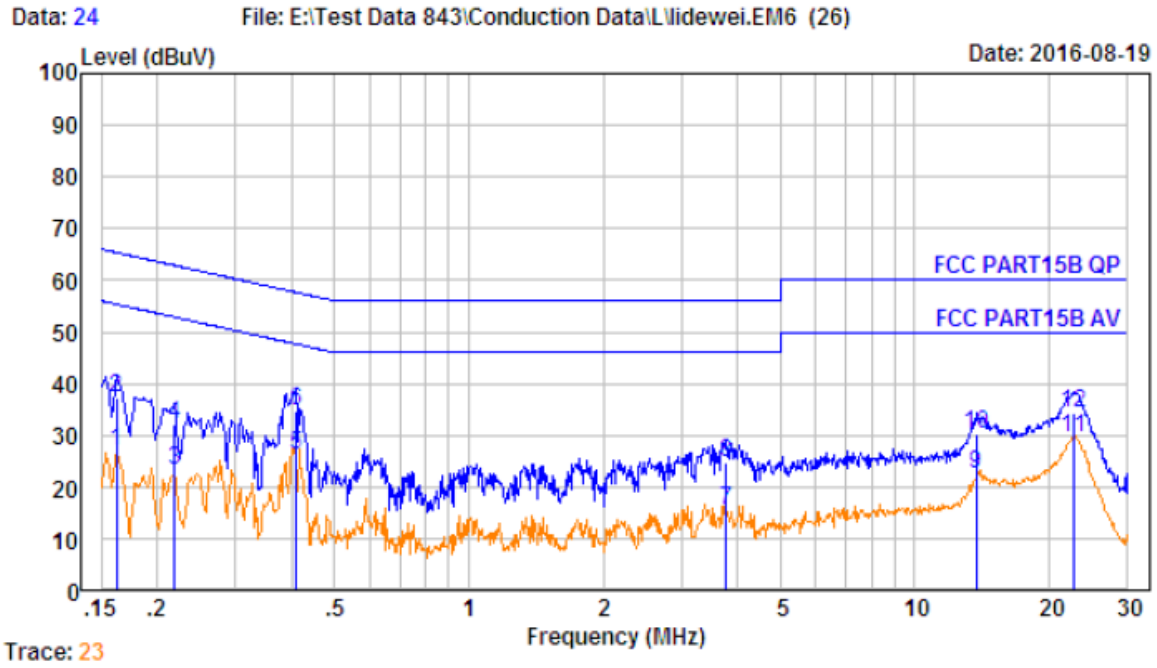
5.3 Measurement Description

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.

Note:In the worst test mode with GFSK 2402MHz

5.4 Conducted Emission Test Result

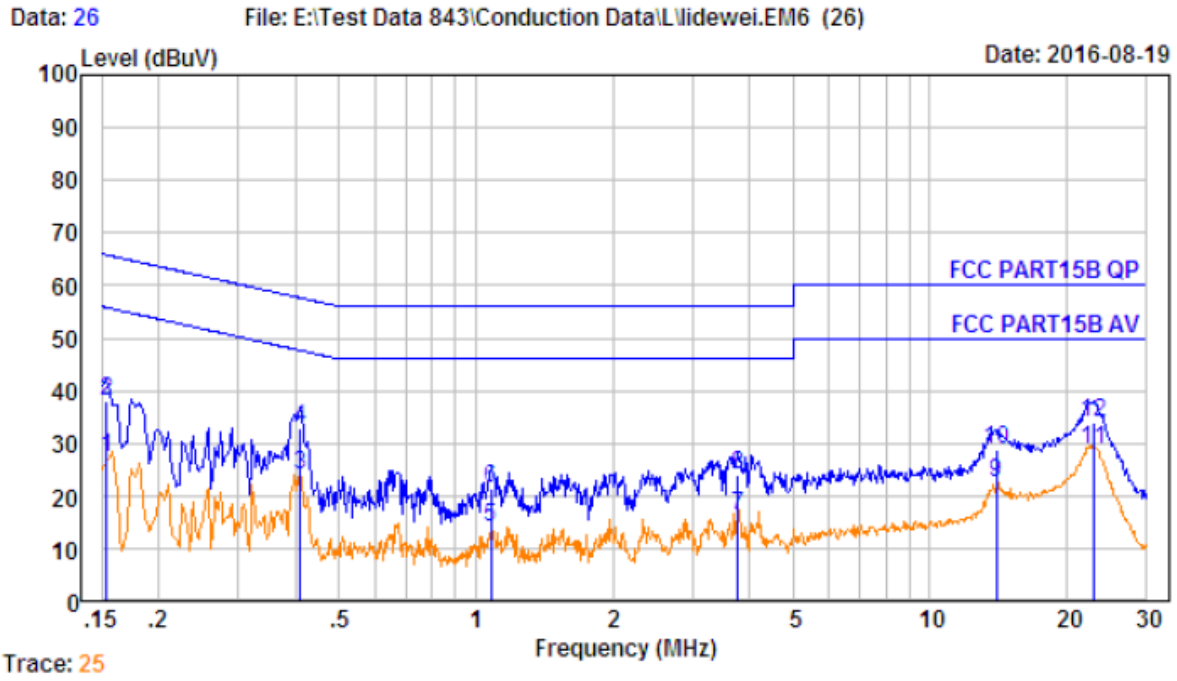
Live line:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.162	10.60	0.60	15.76	26.96	55.34	-28.38	Average
2.	0.162	10.60	0.60	26.10	37.30	65.34	-28.04	QP
3.	0.219	10.61	0.60	12.10	23.31	52.88	-29.57	Average
4.	0.219	10.61	0.60	20.82	32.03	62.88	-30.85	QP
5.	0.410	10.64	0.60	15.11	26.35	47.64	-21.29	Average
6.	0.410	10.64	0.60	23.39	34.63	57.64	-23.01	QP
7.	3.779	10.72	0.60	4.18	15.50	46.00	-30.50	Average
8.	3.779	10.72	0.60	13.33	24.65	56.00	-31.35	QP
9.	13.768	10.77	0.60	11.13	22.50	50.00	-27.50	Average
10.	13.768	10.77	0.60	18.78	30.15	60.00	-29.85	QP
11.	22.775	10.79	0.60	18.06	29.45	50.00	-20.55	Average
12.	22.775	10.79	0.60	23.06	34.45	60.00	-25.55	QP

Note: Emission Level=Cable Loss+AMNFactor+Receiver Reading

Neutral line:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.154	10.60	0.60	15.94	27.14	55.78	-28.64	Average
2.	0.154	10.60	0.60	26.81	38.01	65.78	-27.77	QP
3.	0.410	10.64	0.60	12.68	23.92	47.64	-23.72	Average
4.	0.410	10.64	0.60	21.75	32.99	57.64	-24.65	QP
5.	1.082	10.68	0.60	2.65	13.93	46.00	-32.07	Average
6.	1.082	10.68	0.60	10.21	21.49	56.00	-34.51	QP
7.	3.779	10.72	0.60	5.10	16.42	46.00	-29.58	Average
8.	3.779	10.72	0.60	12.82	24.14	56.00	-31.86	QP
9.	13.989	10.77	0.60	11.00	22.37	50.00	-27.63	Average
10.	13.989	10.77	0.60	17.27	28.64	60.00	-31.36	QP
11.	22.896	10.79	0.60	17.55	28.94	50.00	-21.06	Average
12.	22.896	10.79	0.60	22.60	33.99	60.00	-26.01	QP

Note: Emission Level=Cable Loss+AMNFactor+Receiver Reading

6 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: : ANSI C63.10:2013,DA 00-705

Test Result: : PASS

Measurement Distance: : 3m

Limit: : See the follow table

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: : 23.5 °C

Humidity: : 51.1 % RH

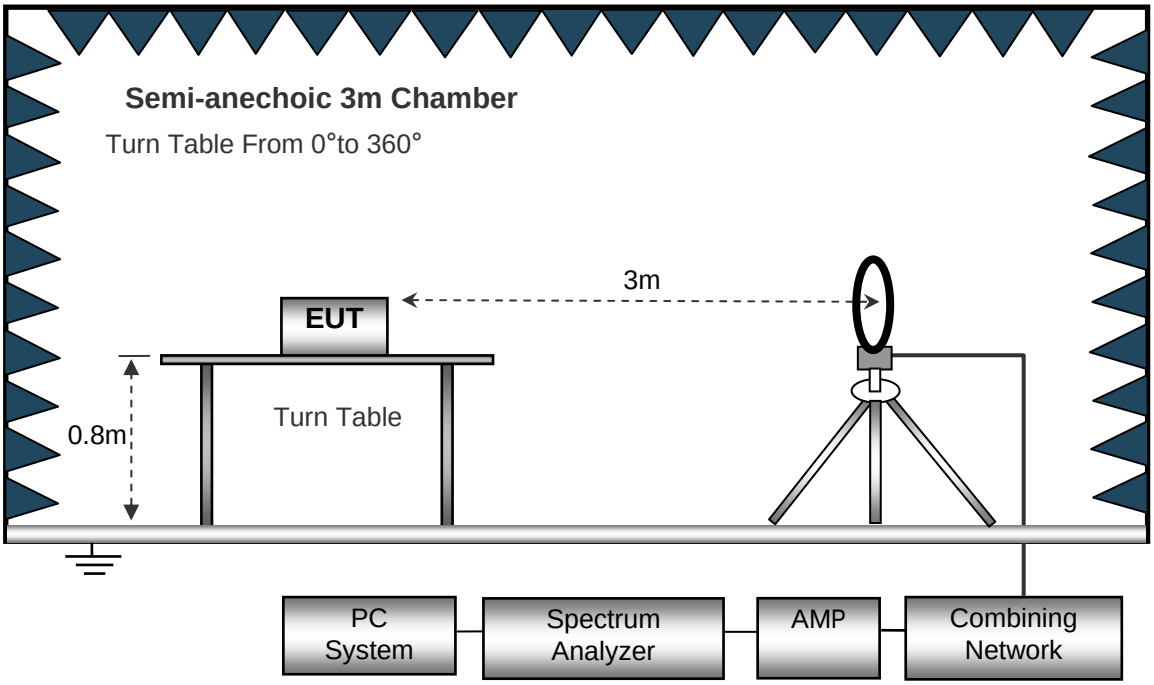
Atmospheric Pressure: : 101.2kPa

EUT Operation : : Refer to section 3.3

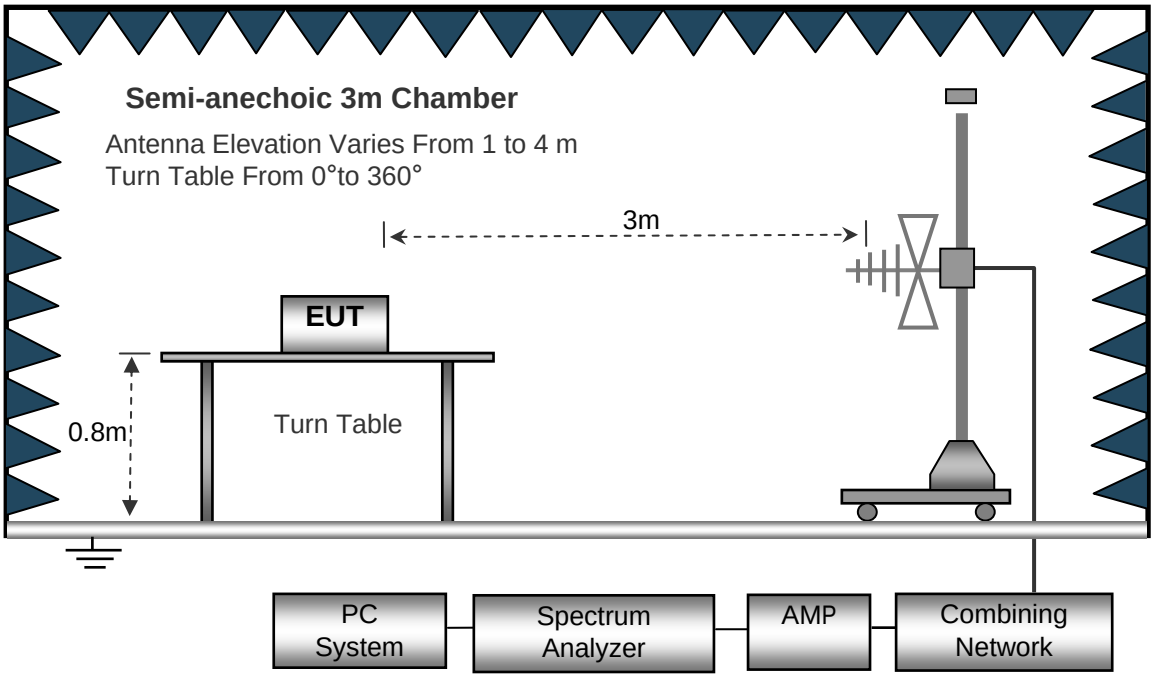
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber testsite

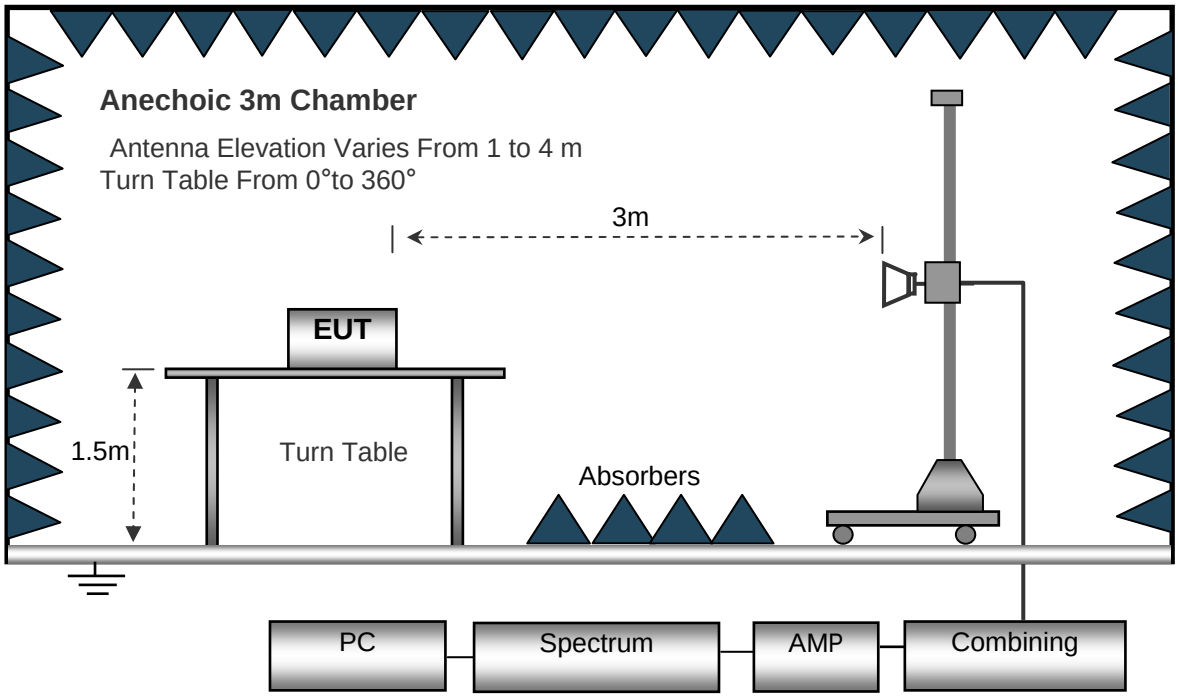
The test setup for emission measurement below 30MHz.



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

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 for below 1GHz and 1.5m for above 1GHz.

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 tothe 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.

6.5 Summary of Test Results

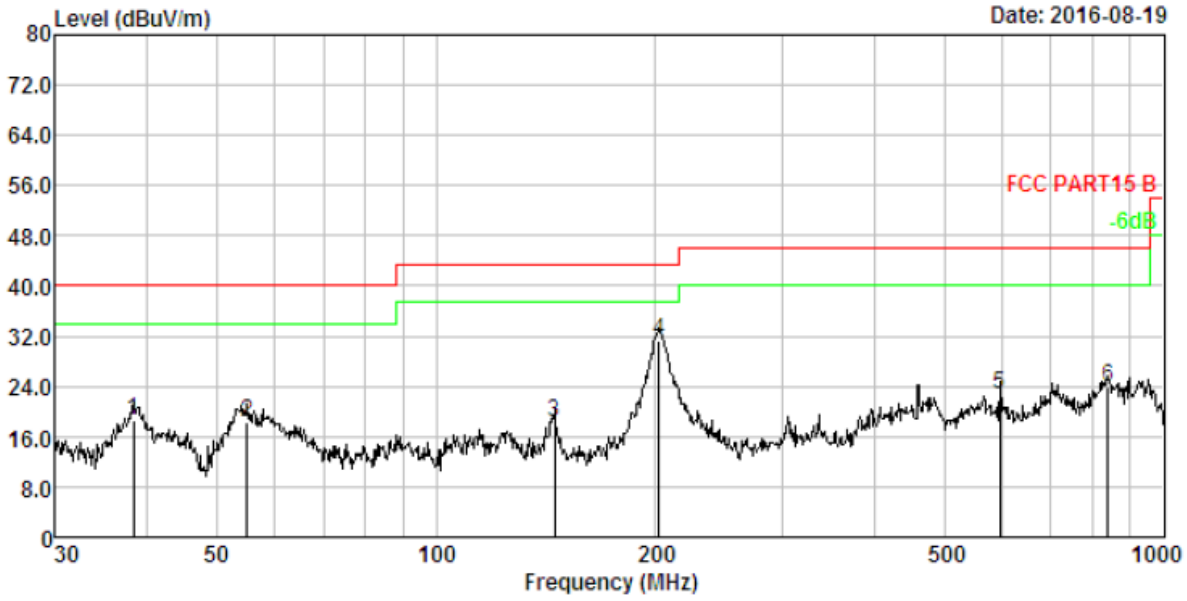
Test Frequency: Below 30MHz

The measurements were more than 30 dB below the limit and not reported.

Test Frequency: 30MHz ~ 1GHz

In the worst test mode with GFSK 2402MHz

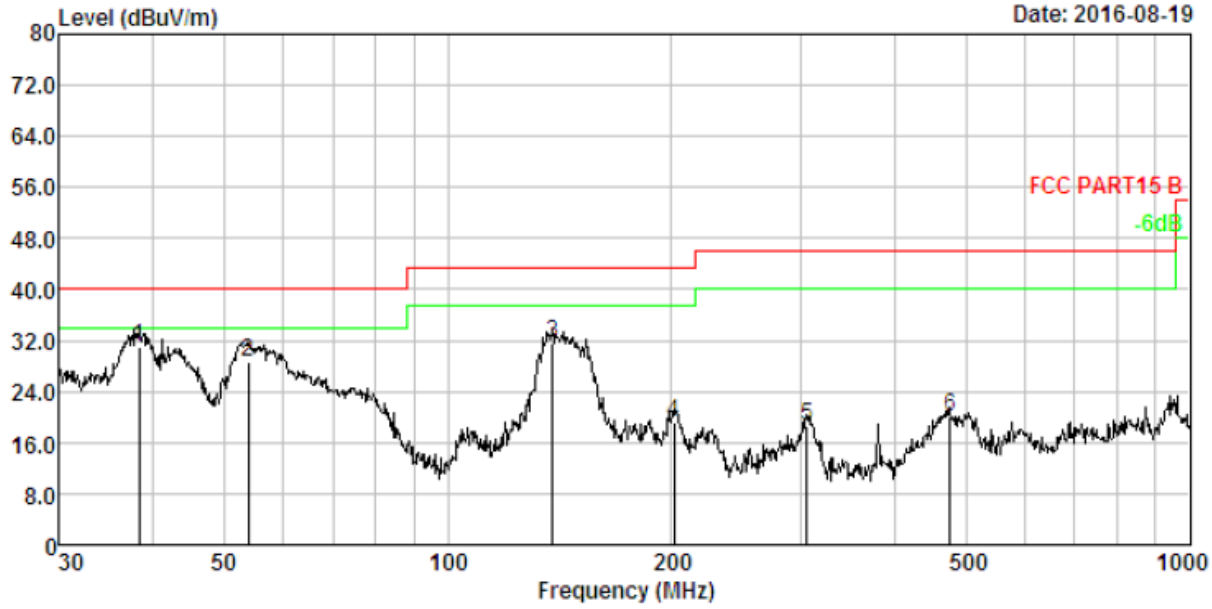
Antenna Polarization: Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	38.346	1.28	13.58	33.77	30.06	18.57	40.00	-21.43	QP
2.	55.027	1.60	11.90	34.84	30.18	18.16	40.00	-21.84	QP
3.	145.351	2.48	13.65	32.74	30.52	18.35	43.50	-25.15	QP
4.	202.810	2.79	10.44	48.68	30.63	31.28	43.50	-12.22	QP
5.	595.133	3.76	19.03	30.92	31.01	22.70	46.00	-23.30	QP
6.	839.182	4.07	22.00	28.83	31.13	23.77	46.00	-22.23	QP

Note: Emission Level=Cable Loss+AMNFactor+Receiver Reading-Preamp Factor

Antenna Polarization: Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	38.346	1.28	13.58	46.24	30.06	31.04	40.00	-8.96	QP
2.	53.882	1.59	11.98	45.23	30.17	28.63	40.00	-11.37	QP
3.	138.387	2.44	13.25	46.49	30.50	31.68	43.50	-11.82	QP
4.	202.100	2.78	10.42	36.70	30.63	19.27	43.50	-24.23	QP
5.	304.610	3.15	13.30	32.80	30.78	18.47	46.00	-27.53	QP
6.	475.499	3.56	16.81	30.60	30.93	20.04	46.00	-25.96	QP

Note: Emission Level=Cable Loss+AMNFactor+Receiver Reading-Preamp Factor

Test Frequency: 1GHz ~ 18GHz

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel						
Harmonic& Spurious Emission						
1200.58	56.36	PK	-19.07	37.29	74	-36.71
1200.58	45.26	Ave	-19.07	26.19	54	-27.81
4804.00	55.82	PK	-1.06	54.76	74	-19.24
4804.00	43.11	Ave	-1.06	42.05	54	-11.95
7206.00	54.74	PK	1.33	56.07	74	-17.93
7206.00	40.89	Ave	1.33	42.22	54	-11.78
Restricted bands Emission						
2305.32	57.26	PK	-13.14	44.12	74	-29.88
2305.32	41.59	Ave	-13.14	28.45	54	-25.55
2390.00	57.65	PK	-13.08	44.57	74	-29.43
2390.00	42.22	Ave	-13.08	29.14	54	-24.86
2495.42	53.69	PK	-13.01	40.68	74	-33.32
2495.42	43.68	Ave	-13.01	30.67	54	-23.33
Remark:						
1.Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2.the dispaly data are worst case with horizontal direction						

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel						
Harmonic& Spurious Emission						
1135.35	52.36	PK	-19.42	32.94	74	-41.06
1135.35	41.11	Ave	-19.42	21.69	54	-32.31
4882.00	55.49	PK	-0.93	54.56	74	-19.44
4882.00	42.62	Ave	-0.93	41.69	54	-12.31
7323.00	54.69	PK	1.67	56.36	74	-17.64
7323.00	41.85	Ave	1.67	43.52	54	-10.48
Restricted bands Emission						
2310.56	54.11	PK	-13.14	40.97	74	-33.03
2310.56	43.09	Ave	-13.14	29.95	54	-24.05
2332.41	53.26	PK	-13.11	40.15	74	-33.85
2332.41	40.52	Ave	-13.11	27.41	54	-26.59
2488.12	55.69	PK	-13.06	42.63	74	-31.37
2488.12	43.25	Ave	-13.06	30.19	54	-23.81
Remark:						
1.Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2.the dispaly data are worst case with horizontal direction						

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel						
Harmonic& Spurious Emission						
1220.51	54.58	PK	-18.89	35.69	74	-38.31
1220.51	42.47	Ave	-18.89	23.58	54	-30.42
4960.00	54.11	PK	-0.87	53.24	74	-20.76
4960.00	41.52	Ave	-0.87	40.65	54	-13.35
7440.00	54.41	PK	1.84	56.25	74	-17.75
7440.00	41.22	Ave	1.84	43.06	54	-10.94
Restricted bands Emission						
2331.61	55.25	PK	-13.18	42.07	74	-31.93
2331.61	43.05	Ave	-13.18	29.87	54	-24.13
2374.54	49.67	PK	-13.12	36.55	74	-37.45
2374.54	42.34	Ave	-13.12	29.22	54	-24.78
2483.50	58.35	PK	-13.09	45.26	74	-28.74
2483.50	42.28	Ave	-13.09	29.19	54	-24.81
Remark:						
1.Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2.the dispaly data are worst case with horizontal direction						

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
8DPSK Low Channel						
Harmonic& Spurious Emission						
1170.42	55.68	PK	-19.52	36.16	74	-37.84
1170.42	41.35	Ave	-19.52	21.83	54	-32.17
4804.00	55.28	PK	-1.06	54.22	74	-19.78
4804.00	41.97	Ave	-1.06	40.91	54	-13.09
7206.00	54.67	PK	1.33	56	74	-18
7206.00	40.35	Ave	1.33	41.68	54	-12.32
Restricted bands Emission						
2320.51	54.17	PK	-13.19	40.98	74	-33.02
2320.51	42.61	Ave	-13.19	29.42	54	-24.58
2390.00	56.38	PK	-13.14	43.24	74	-30.76
2390.00	42.51	Ave	-13.14	29.37	54	-24.63
2494.18	48.96	PK	-13.07	35.89	74	-38.11
2494.18	41.00	Ave	-13.07	27.93	54	-26.07
Remark:						
1.Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2.the dispaly data are worst case with horizontal direction						

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
8DPSK Middle Channel						
Harmonic& Spurious Emission						
1161.51	56.28	PK	-19.5	36.78	74	-37.22
1161.51	43.87	Ave	-19.5	24.37	54	-29.63
4882.00	55.11	PK	-0.93	54.18	74	-19.82
4882.00	41.59	Ave	-0.93	40.66	54	-13.34
7323.00	54.42	PK	1.67	56.09	74	-17.91
7323.00	42.04	Ave	1.67	43.71	54	-10.29
Restricted bands Emission						
2320.11	55.11	PK	-13.18	41.93	74	-32.07
2320.11	43.04	Ave	-13.18	29.86	54	-24.14
2382.54	54.06	PK	-13.13	40.93	74	-33.07
2382.54	42.98	Ave	-13.13	29.85	54	-24.15
2490.25	50.11	PK	-13.08	37.03	74	-36.97
2490.25	40.16	Ave	-13.08	27.08	54	-26.92
Remark:						
1.Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2.the dispaly data are worst case with horizontal direction						

Frequency	Receiver Reading	Detector	Corrected Factor	Corrected Amplitude	Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
8DPSK High Channel						
Harmonic& Spurious Emission						
1155.63	53.28	PK	-19.5	33.78	74	-40.22
1155.63	42.05	Ave	-19.5	22.55	54	-31.45
4960.00	54.77	PK	-0.87	53.9	74	-20.1
4960.00	44.52	Ave	-0.87	43.65	54	-10.35
7440.00	53.56	PK	1.84	55.4	74	-18.6
7440.00	42.01	Ave	1.84	43.85	54	-10.15
Restricted bands Emission						
2324.81	55.07	PK	-13.18	41.89	74	-32.11
2324.81	41.33	Ave	-13.18	28.15	54	-25.85
2381.52	53.32	PK	-13.13	40.19	74	-33.81
2381.52	41.15	Ave	-13.13	28.02	54	-25.98
2483.50	57.69	PK	-13.08	44.61	74	-29.39
2483.50	44.06	Ave	-13.08	30.98	54	-23.02
Remark:						
1.Corrected Factor=ANT Factor + Cable Loss – Amp Gain						
2.the dispaly data are worst case with horizontal direction						

Test Frequency: 18-25GHz

The measurements were more than 30 dB below the limit and not reported

Remark : 1. The testing has been conformed to 10*2480 =24800MHz.
2. All other emissions more than 30dB below the limit
3: Only the worst data (GFSK/8DPSK modulation mode) were reported.

7 Conducted Spurious Emissions

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	DA 00-705
Test 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)).
Test Result	:	PASS

7.1 Test Procedure

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

2. Set the spect m analyzer:

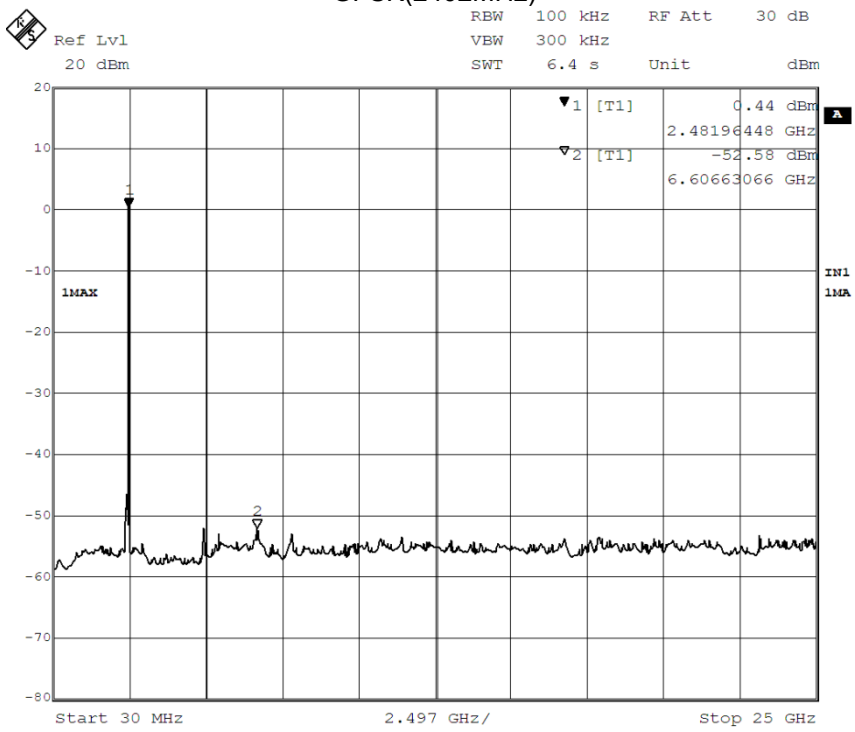
RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

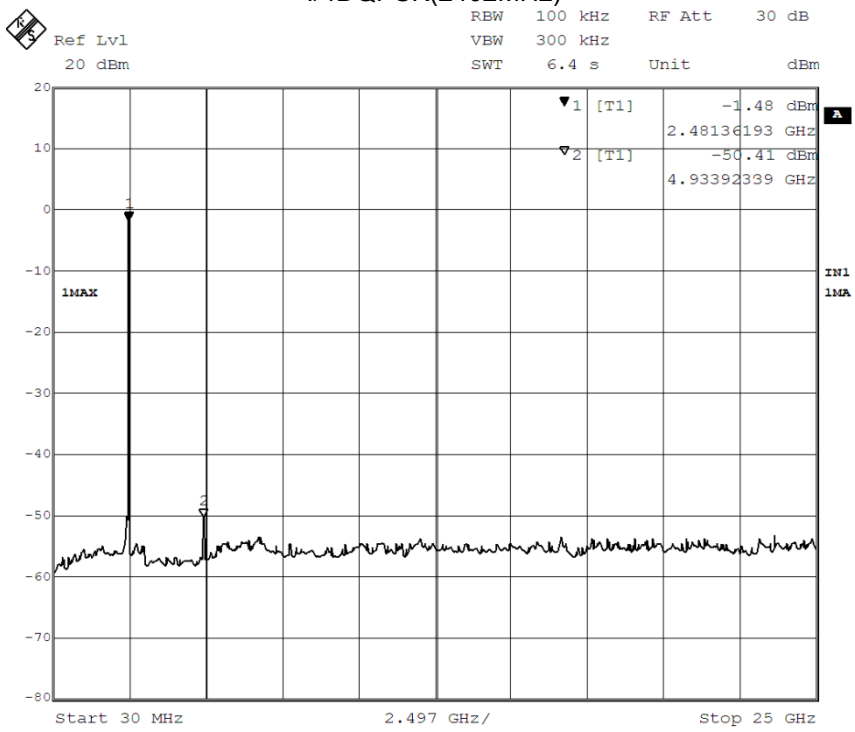
7.2 Test Result

Remark: only the worst data(2402MHz) were reported.

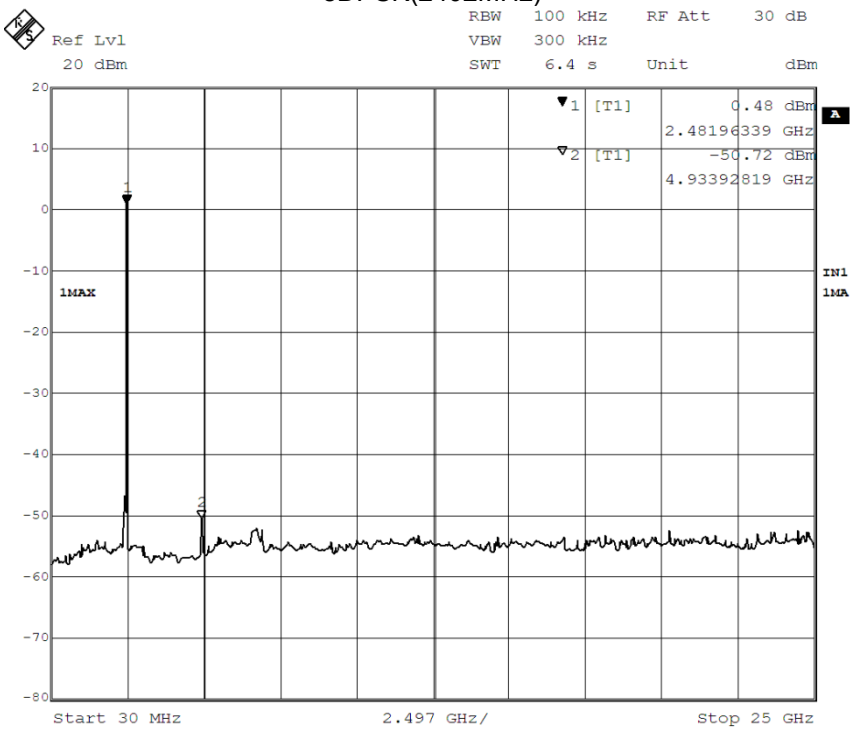
GFSK(2402MHz)



I/4DQPSK(2402MHz)



8DPSK(2402MHz)



8 Band Edge Measurement

TestRequirement	:	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	:	ANSI C63.10:2013,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 & Hopping
Remark	:	The worst case was recorded.

8.1 Test Procedure

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

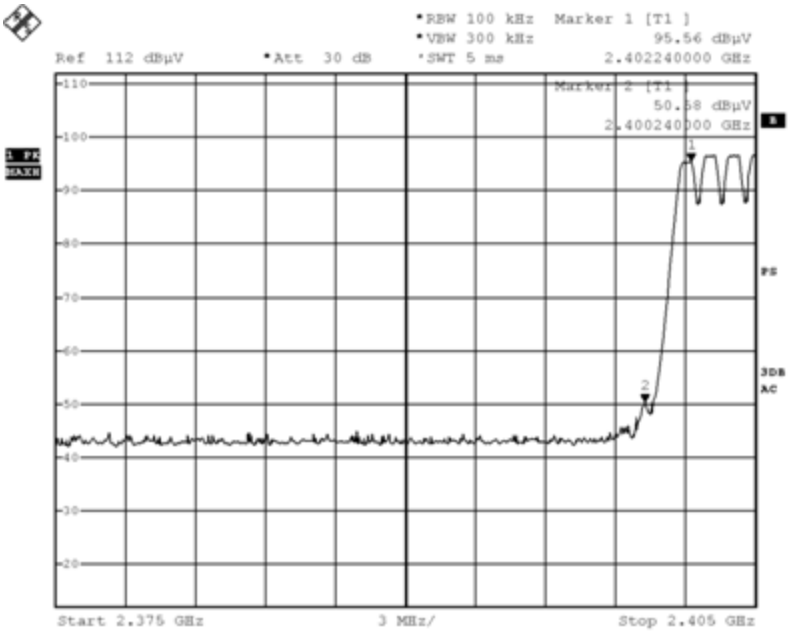
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

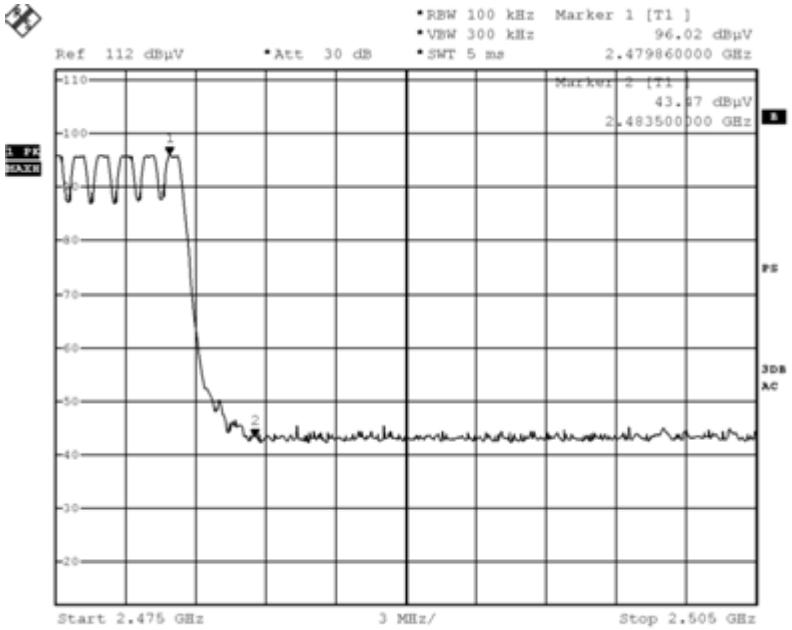
8.2 Test Result

Modulation	Mode	Band edge	Value	Limit	Result
GFSK	Hopping	Left	50.58	75.56	Pass
		Right	43.47	76.02	Pass
Pi/4 DQPSK	Hopping	Left	47.63	71.92	Pass
		Right	45.21	72.89	Pass
8DPSK	Hopping	Left	47.74	72.33	Pass
		Right	44.45	73.07	Pass
The limit is 20dB below the maximum peak level, please refer to the display line of the follow plot					

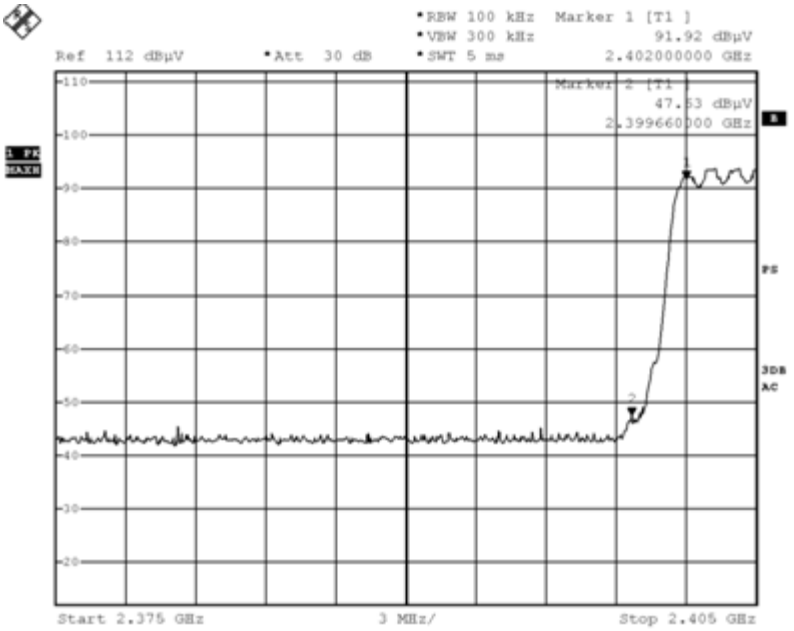
Hopping in GFSK Band edge-left side



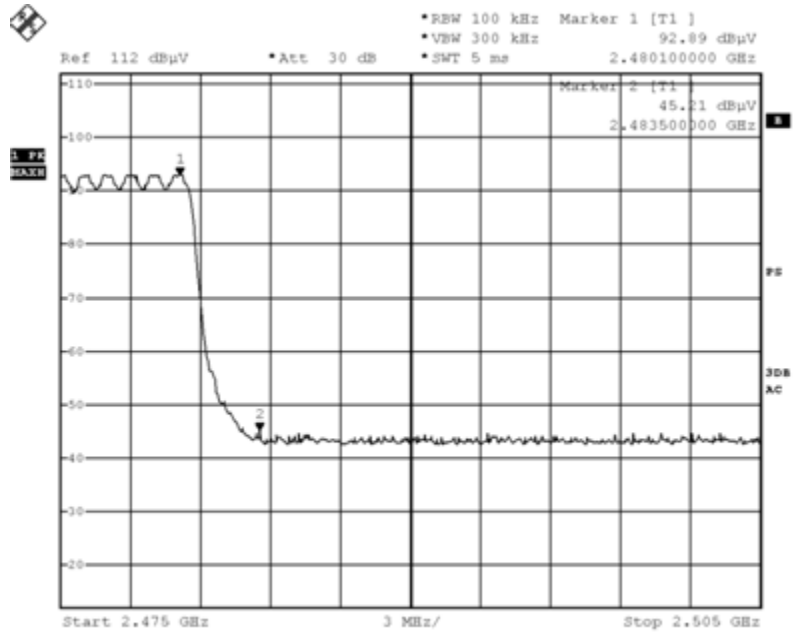
Hopping in GFSK Band edge-right side



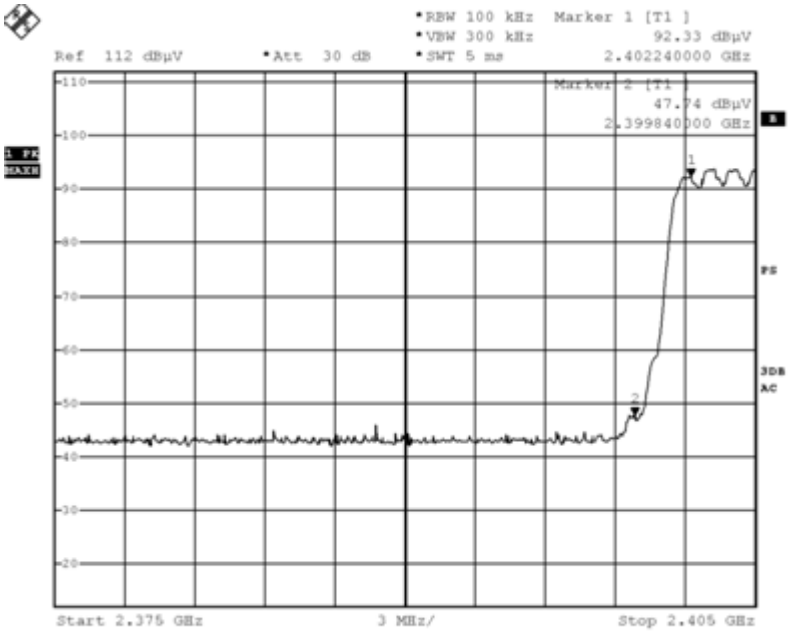
Hopping in Pi/4 DQPSK Band edge-left side



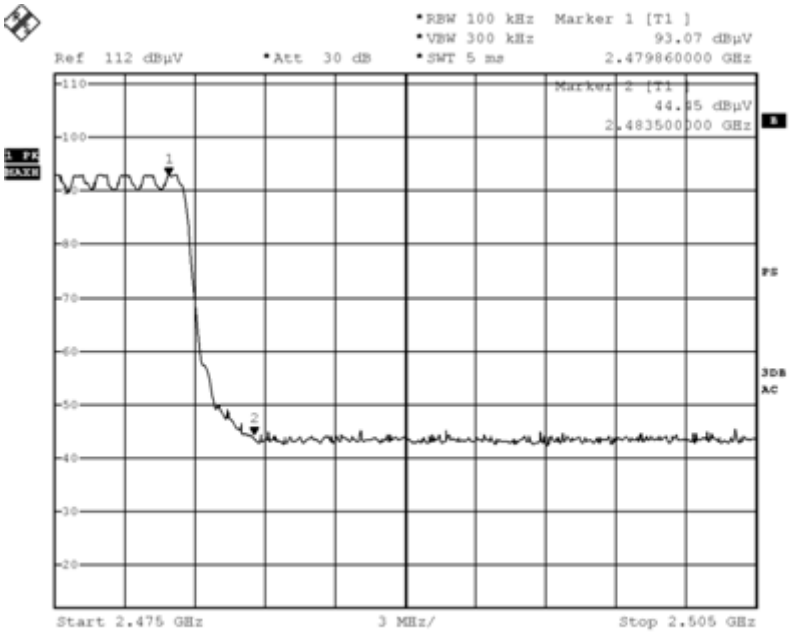
Hopping in Pi/4 DQPSK Band edge-right side



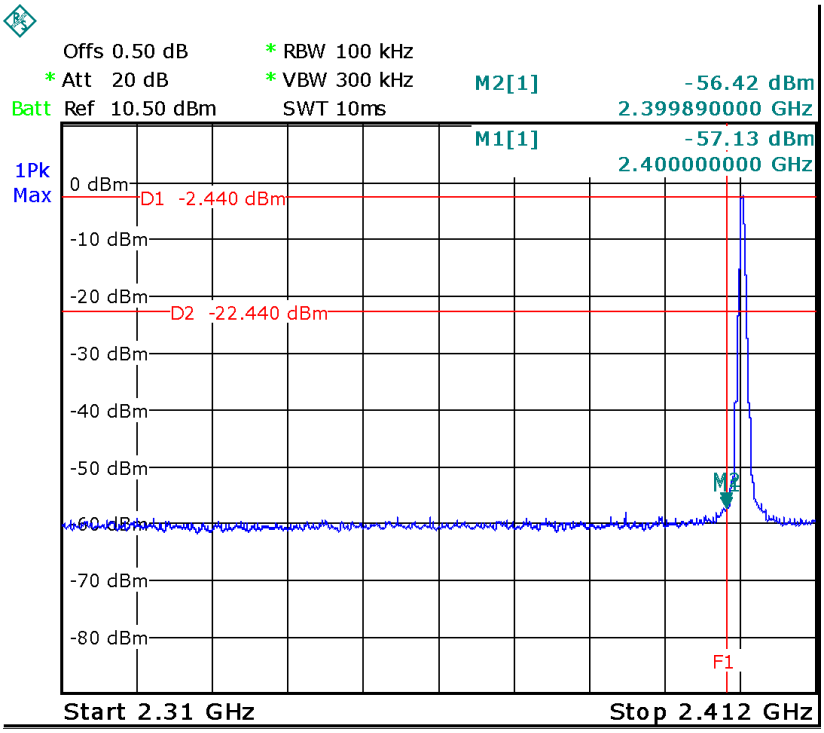
Hopping in 8DPSK Band edge-left side



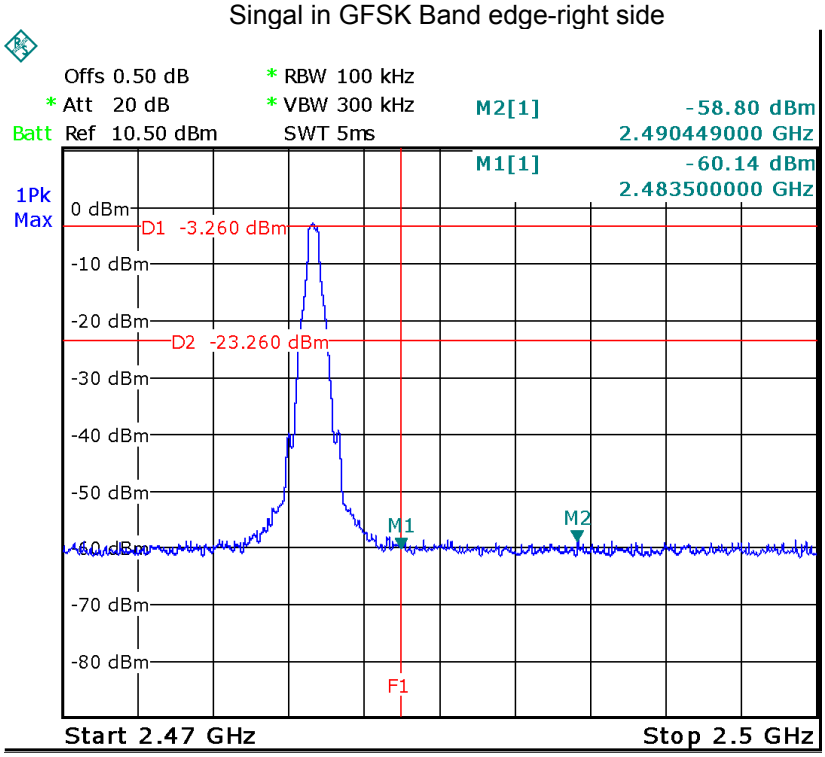
Hopping in 8DPSK Band edge-right side



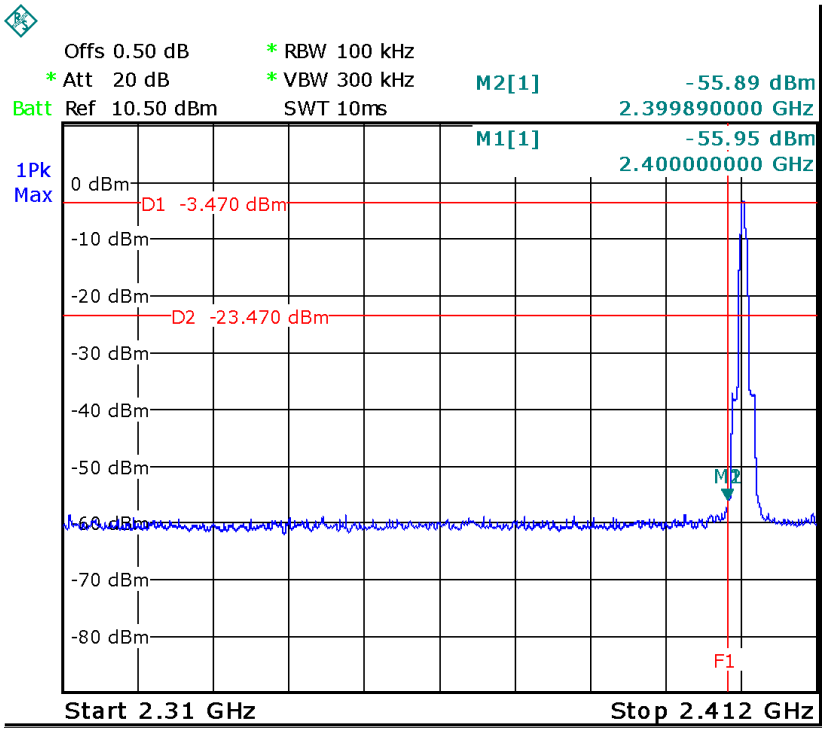
Singal in GFSK Band edge-left side



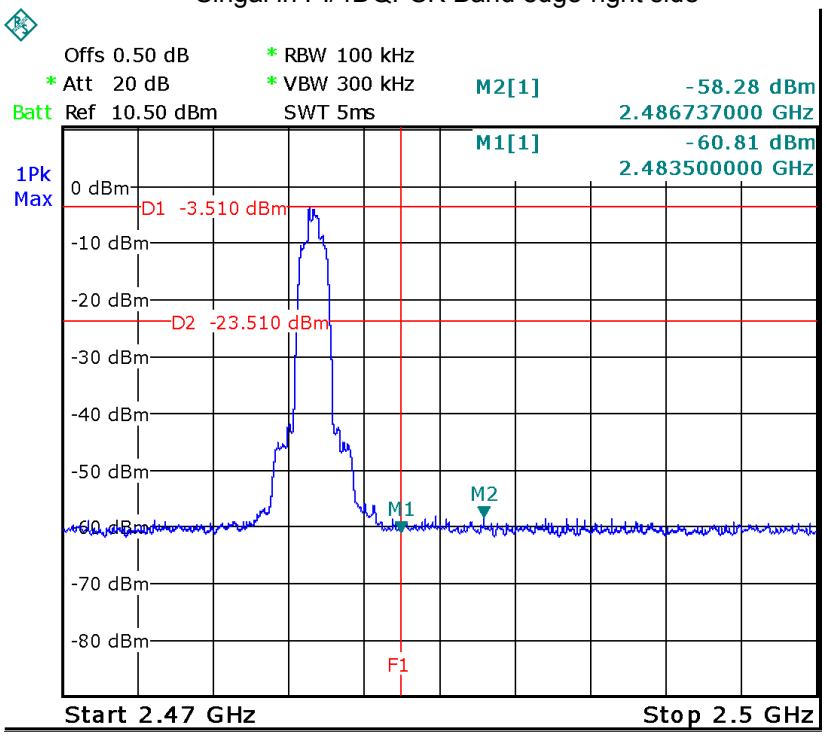
Singal in GFSK Band edge-right side



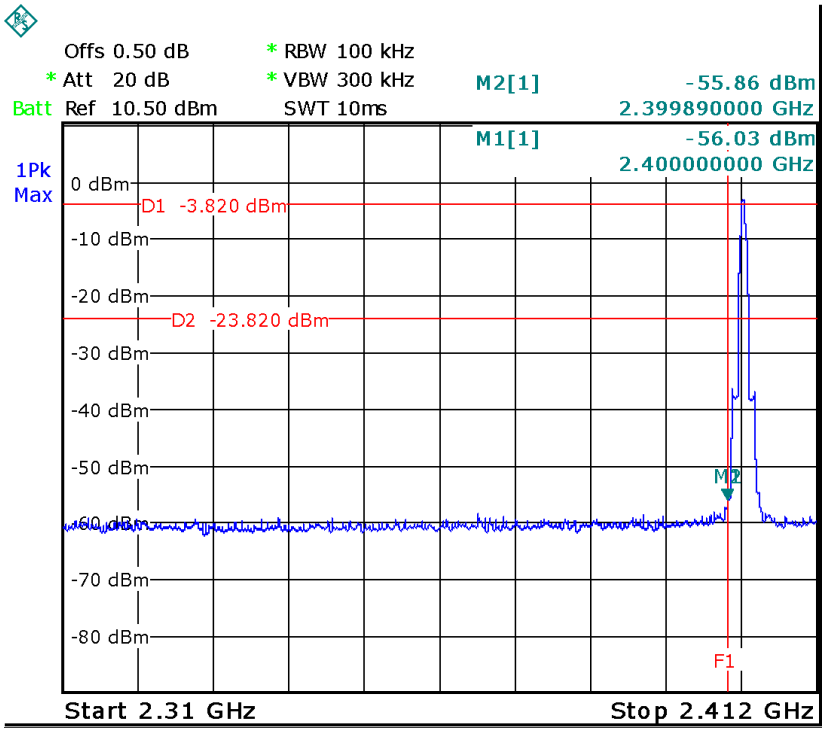
Singal in PI/4DQPSK Band edge-left side



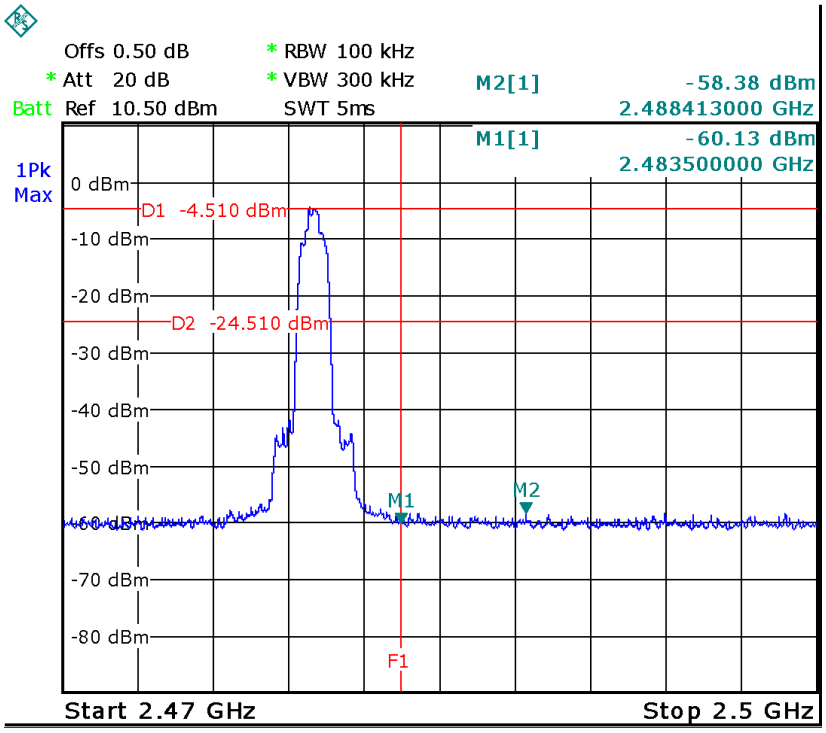
Singal in PI/4DQPSK Band edge-right side



Singal in 8DPSK Band edge-left side



Singal in 8DPSK Band edge-right side



9 20 dB Bandwidth Measurement

TestRequirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013,DA 00-705
Test Mode	:	Refer to section 3.3

9.1 Test Procedure

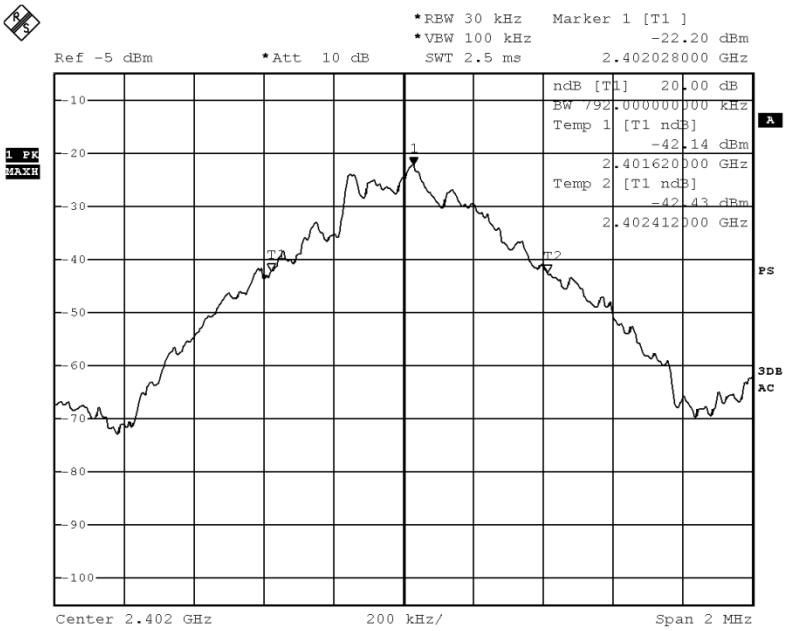
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2. Set the spectrum analyzer: RBW = 30kHz, VBW = 100kHz

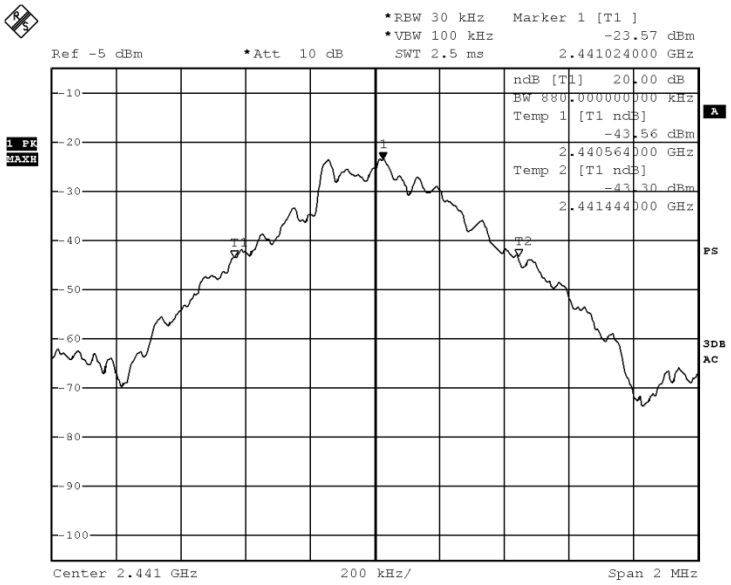
9.2 Test Result

Modulation	Test Channel	Bandwidth(MHz)
GFSK	Low	0.792
GFSK	Middle	0.880
GFSK	High	0.864
Pi/4 DQPSK	Low	1.205
Pi/4 DQPSK	Middle	1.220
Pi/4 DQPSK	High	1.210
8DPSK	Low	1.210
8DPSK	Middle	1.210
8DPSK	High	1.205

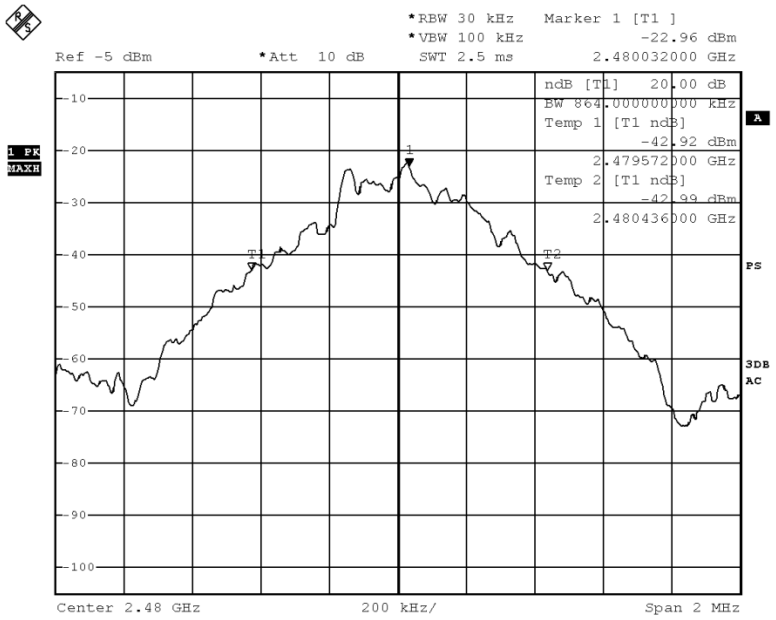
GFSK Low Channel



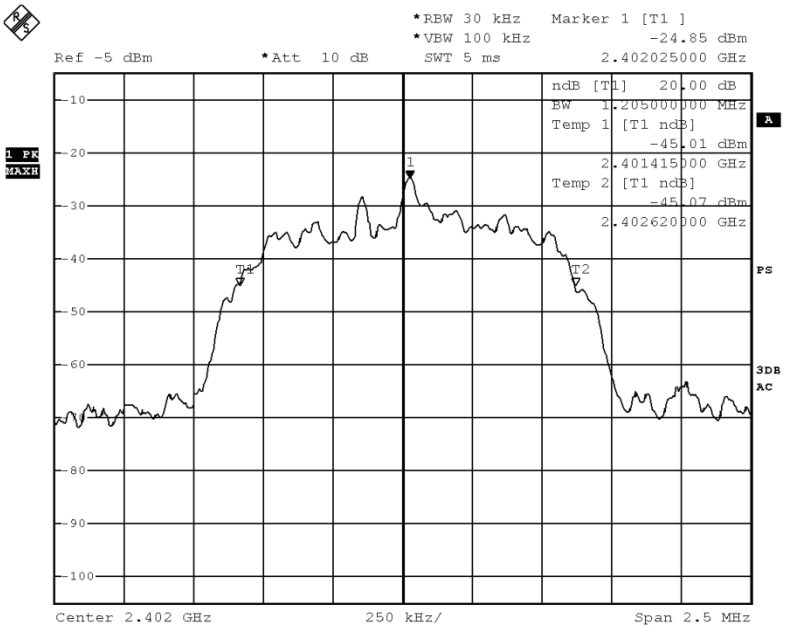
GFSK Middle Channel



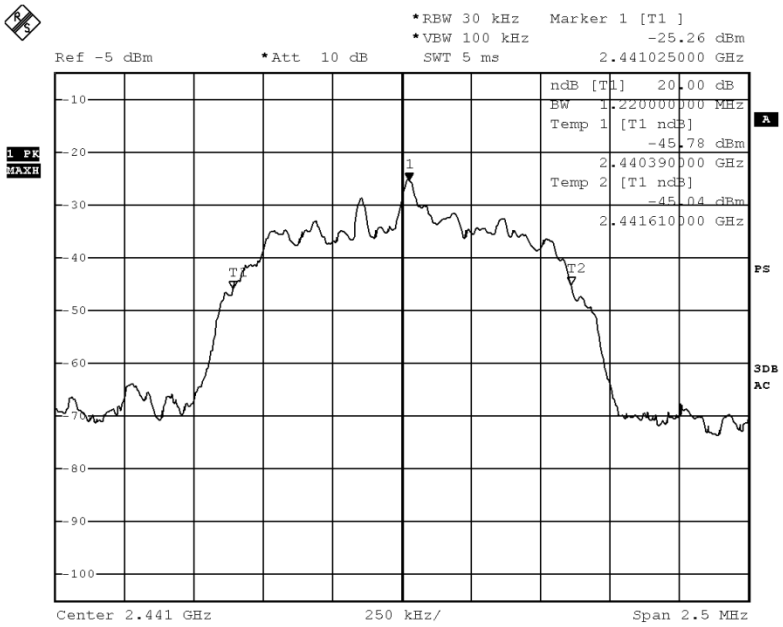
GFSKHigh Channel



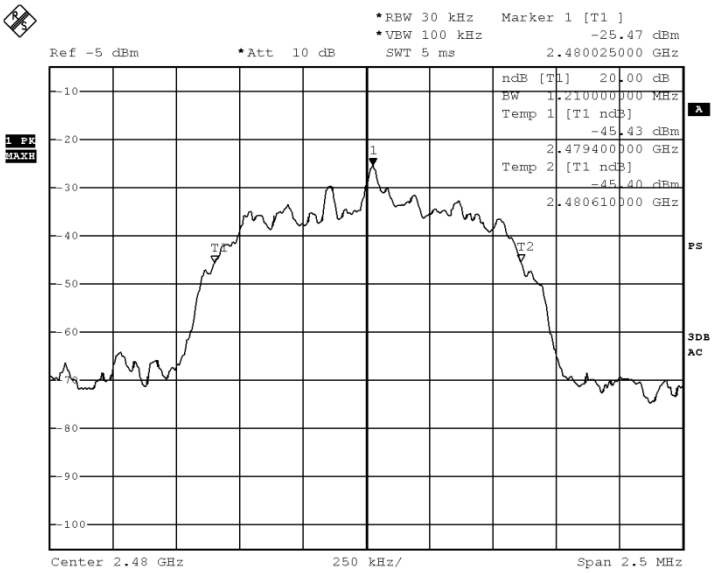
Pi/4DQPSK LowChannel



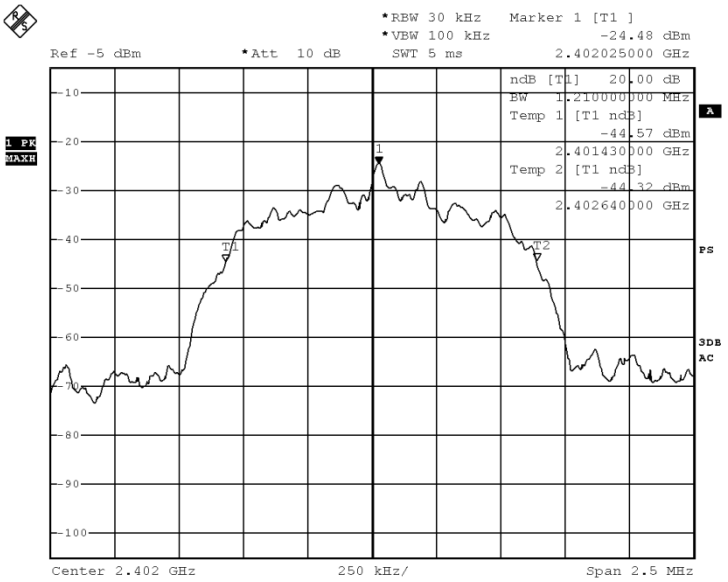
Pi/4DQPSK Middle Channel



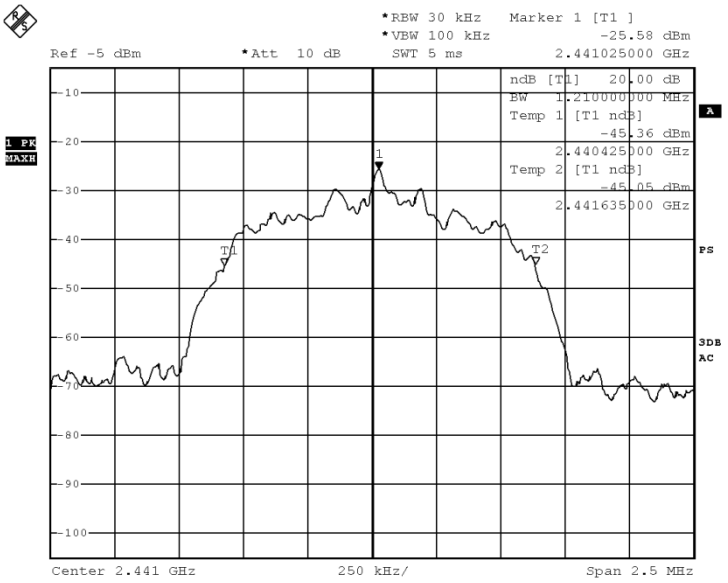
Pi/4DQPSK High Channel



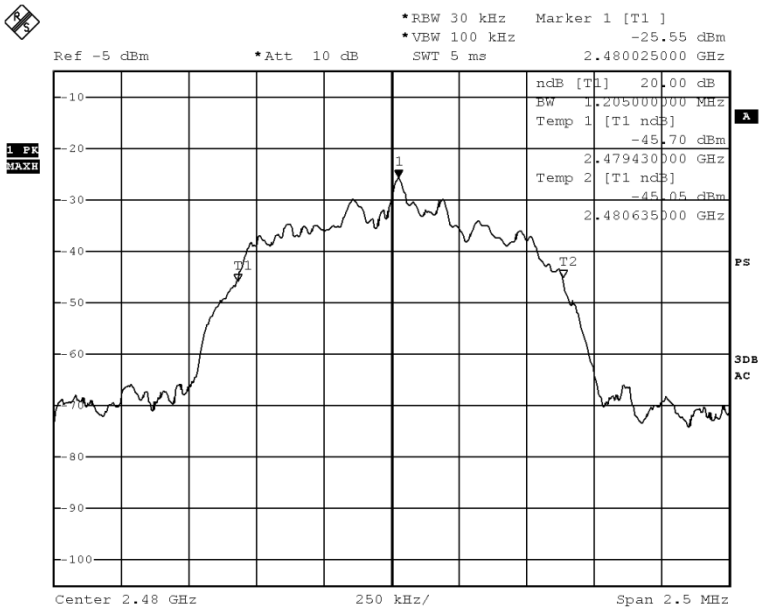
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



10 MaximumPeak Output Power

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013,DA 00-705
Test Limit	:	
		0.125W (frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.)
Test Mode	:	Refer to section 3.3

10.1Test Procedure

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

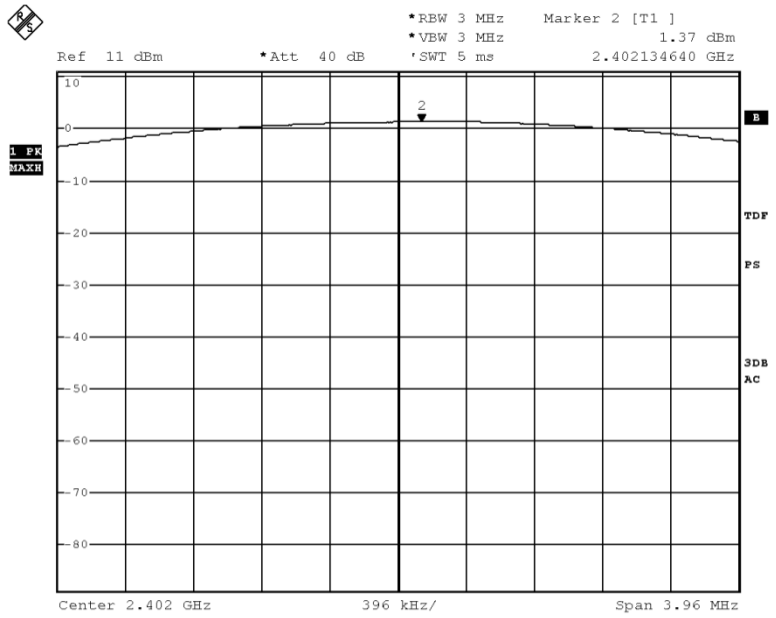
2. Set the spectrum analyser: RBW = 3MHz. VBW =3MHz. Sweep = auto; Detector Function = Peak.

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

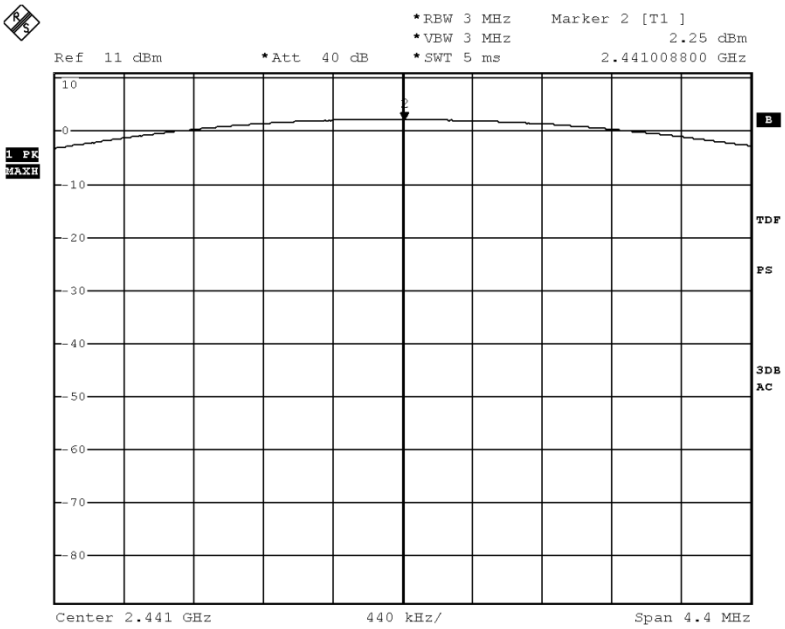
10.2Test Result

Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	1.37	20.97
GFSK	Middle	2.25	20.97
GFSK	High	2.10	20.97
Pi/4 DQPSK	Low	-0.92	20.97
Pi/4 DQPSK	Middle	0.34	20.97
Pi/4 DQPSK	High	0.14	20.97
8DPSK	Low	-0.25	20.97
8DPSK	Middle	0.86	20.97
8DPSK	High	0.67	20.97

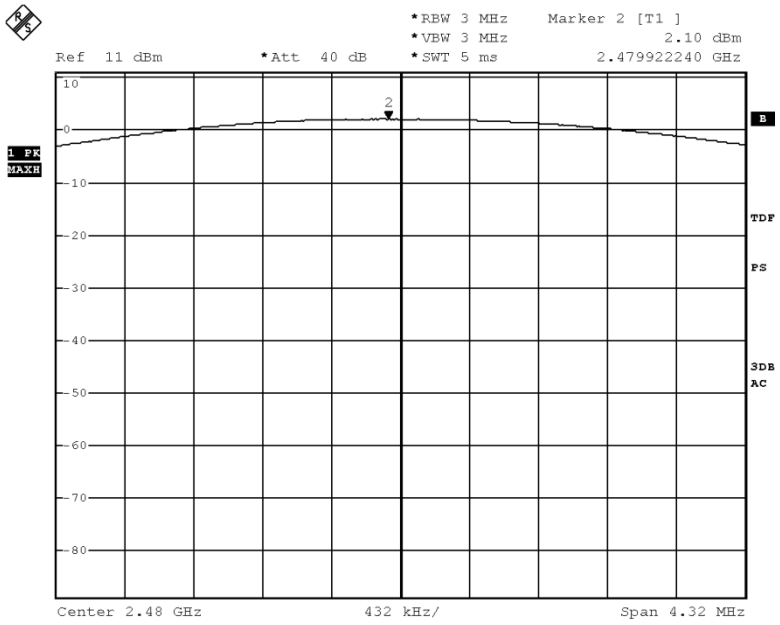
GFSK Low Channel



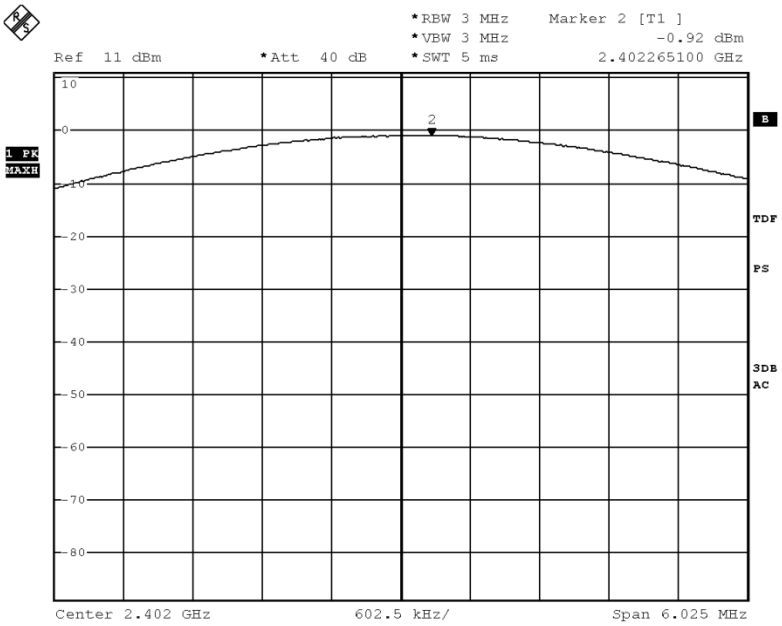
GFSK Middle Channel



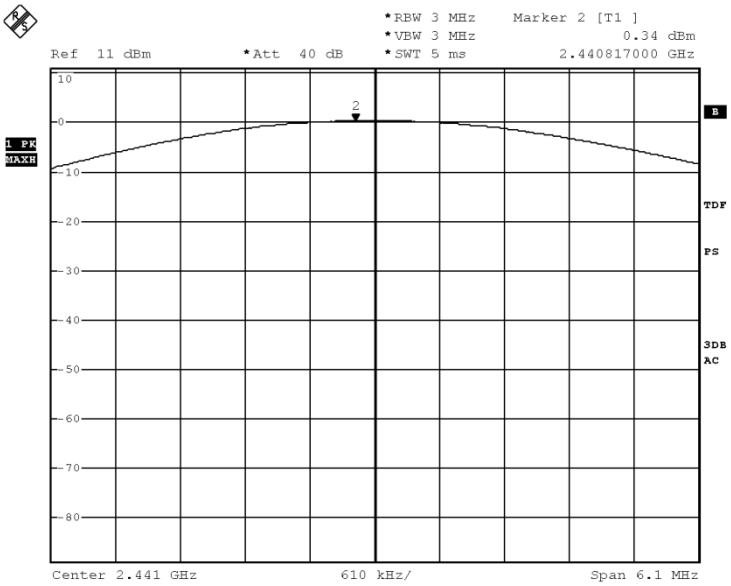
GFSKHigh Channel



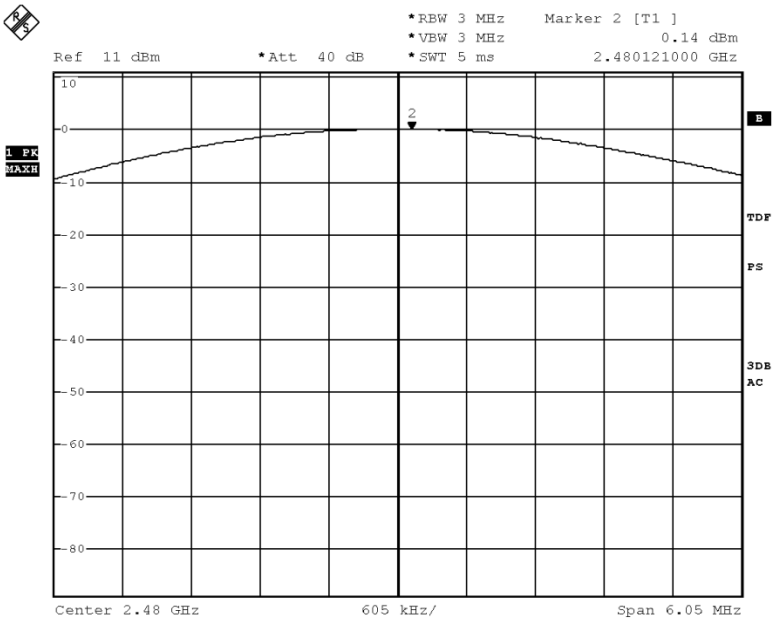
Pi/4DQPSK LowChannel



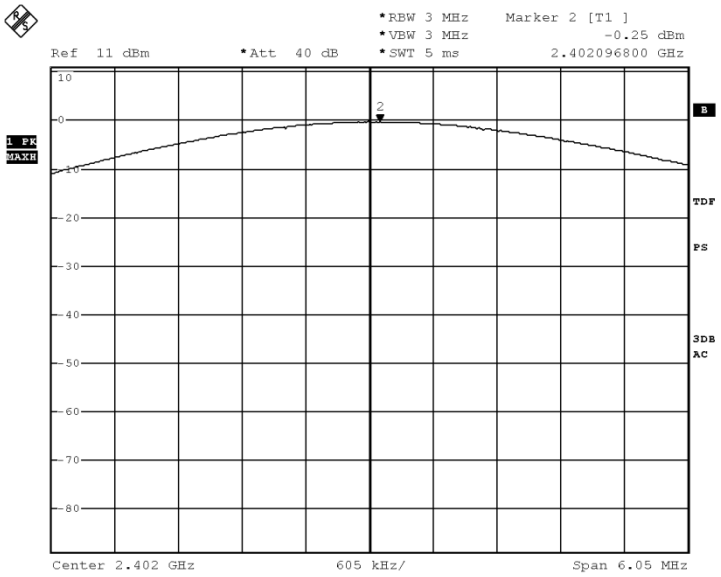
Pi/4DQPSK Middle Channel



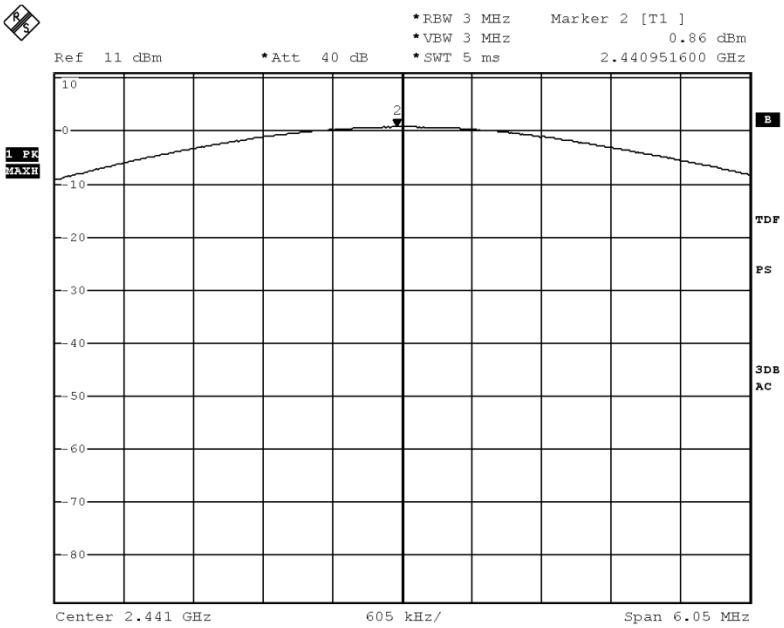
Pi/4DQPSK High Channel



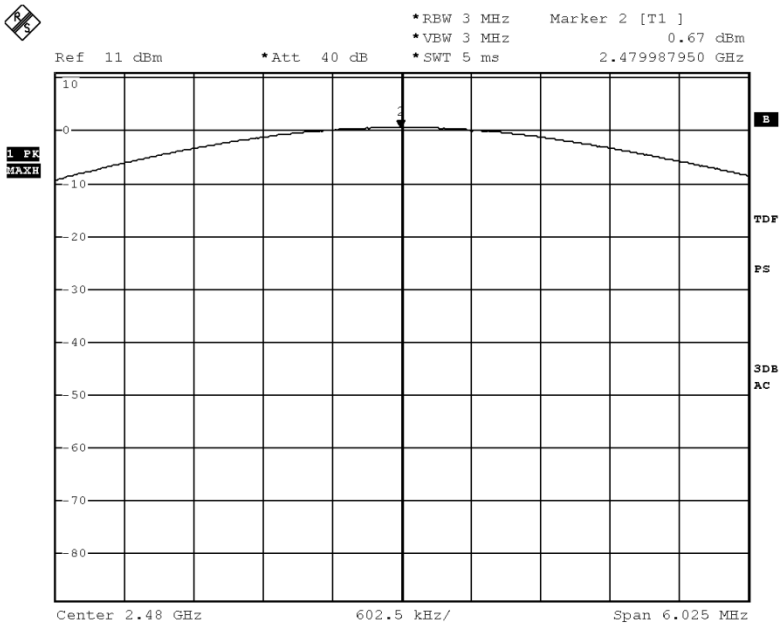
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



11 Hopping Channel Separation

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013,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 2400-2483.5MHz 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 0.125W.
Test Mode	:	Hopping

11.1 Test Procedure

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

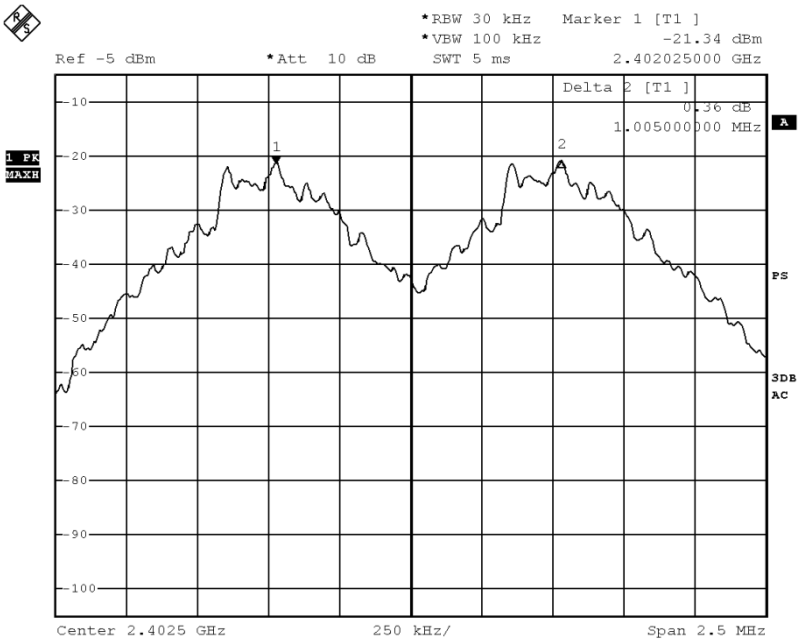
2. Set the spectrum analyzer: RBW = 30KHz. VBW = 100KHz , Span = 2.5MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

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.

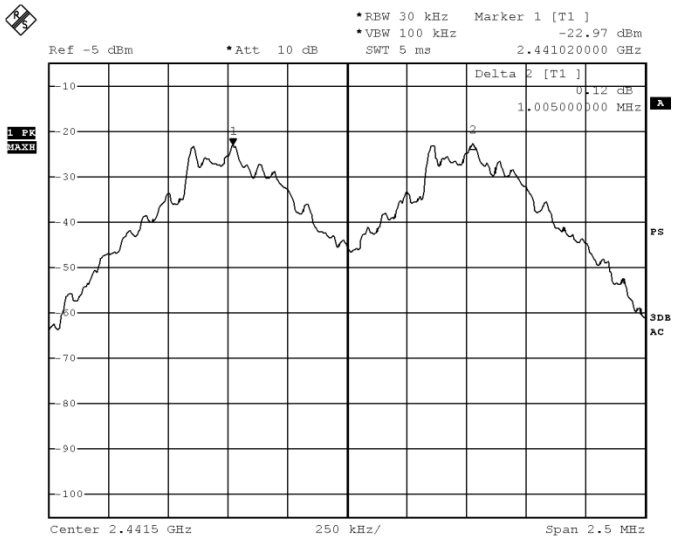
11.2 Test Result

Modulation	Test Channel	Separation (MHz)	Limit (MHz)	Result
GFSK	Low	1.005	0.528	PASS
GFSK	Middle	1.005	0.587	PASS
GFSK	High	1.000	0.576	PASS
Pi/4 DQPSK	Low	1.005	0.803	PASS
Pi/4 DQPSK	Middle	1.005	0.813	PASS
Pi/4 DQPSK	High	1.005	0.807	PASS
8DPSK	Low	1.005	0.807	PASS
8DPSK	Middle	1.005	0.807	PASS
8DPSK	High	1.005	0.803	PASS

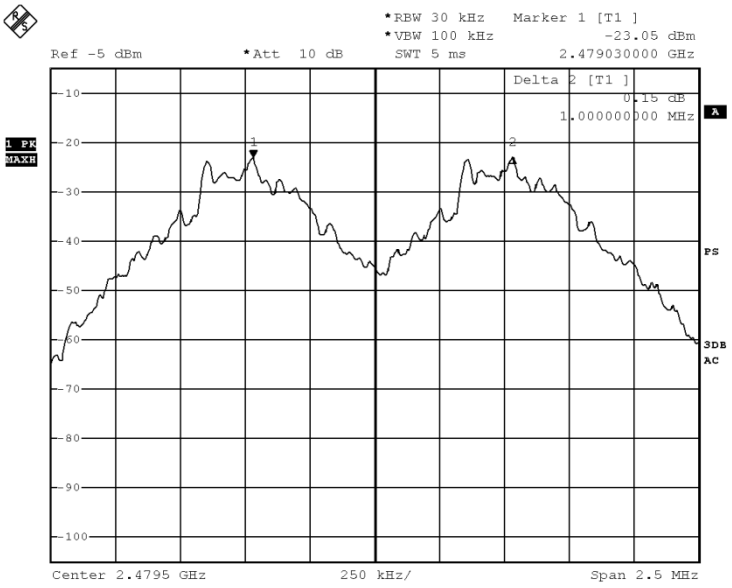
GFSK Low Channel



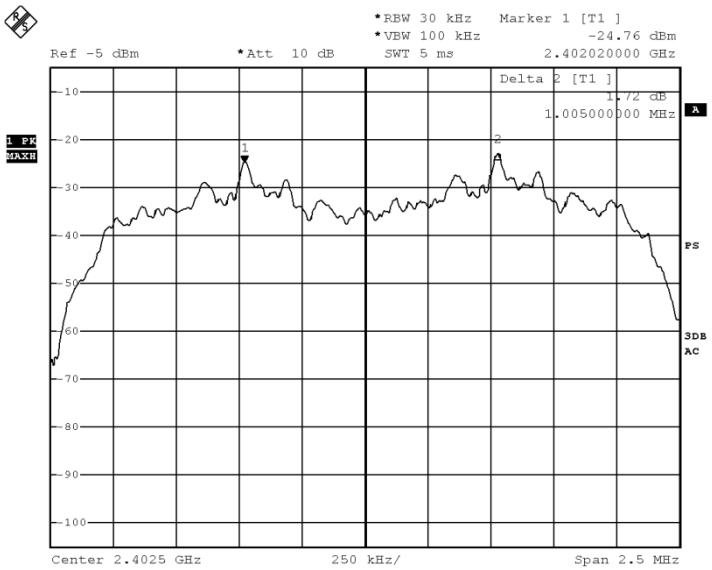
GFSK Middle Channel



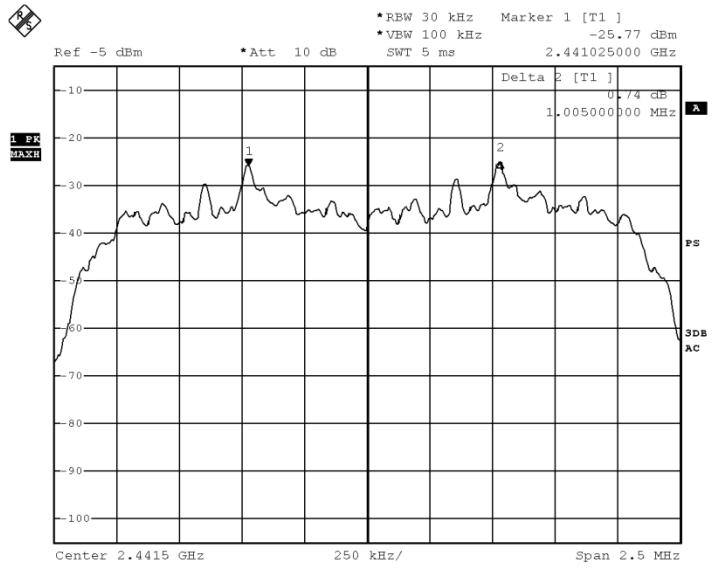
GFSKHigh Channel



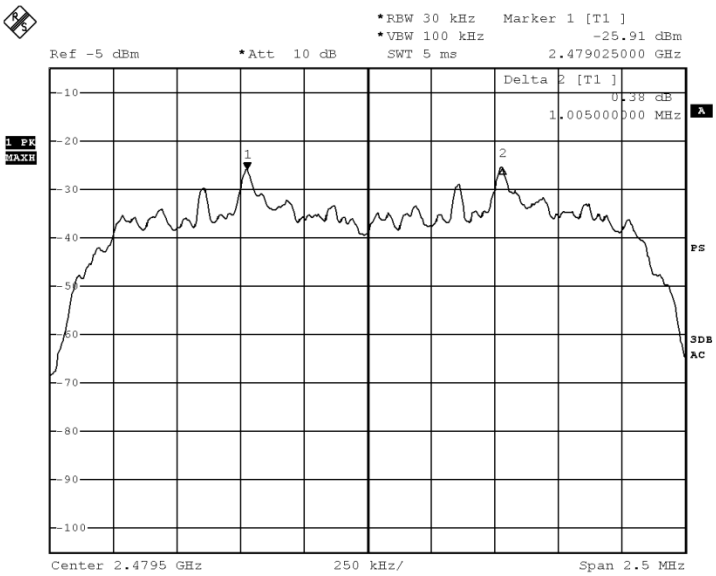
Pi/4DQPSK LowChannel



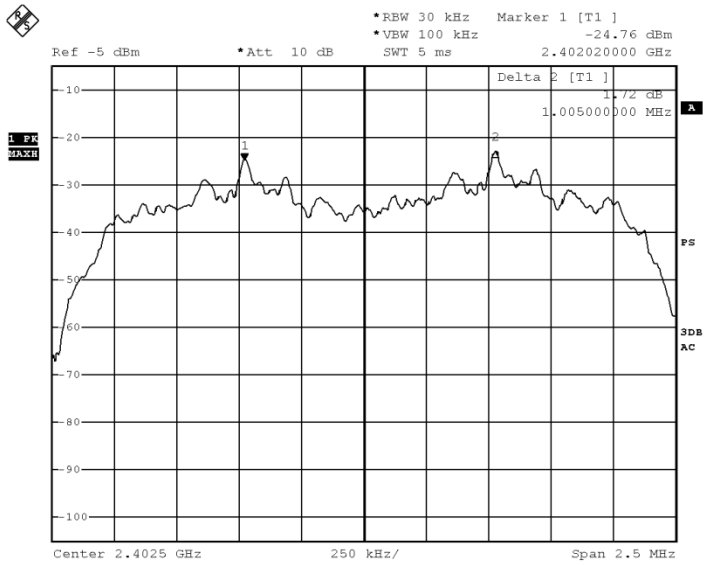
Pi/4DQPSK Middle Channel



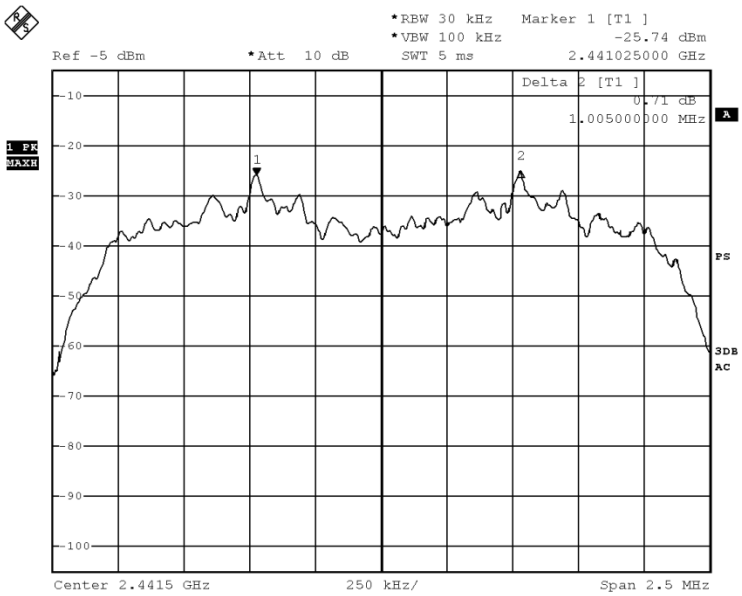
Pi/4DQPSK High Channel



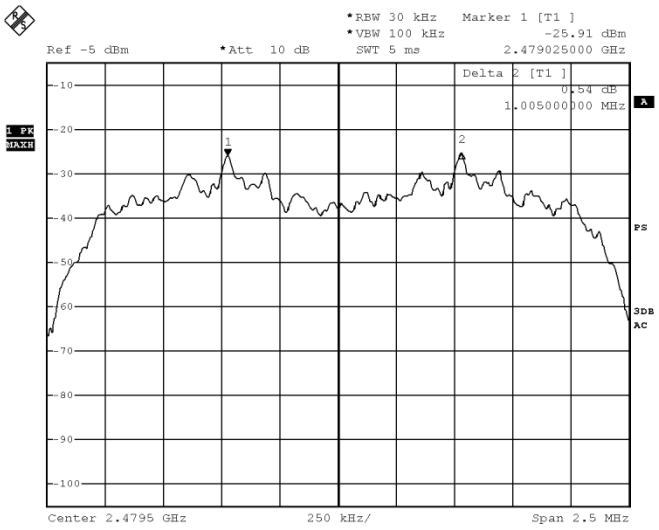
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



12 Number of Hopping Frequency

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013,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	:	Hopping(GFSK)

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.

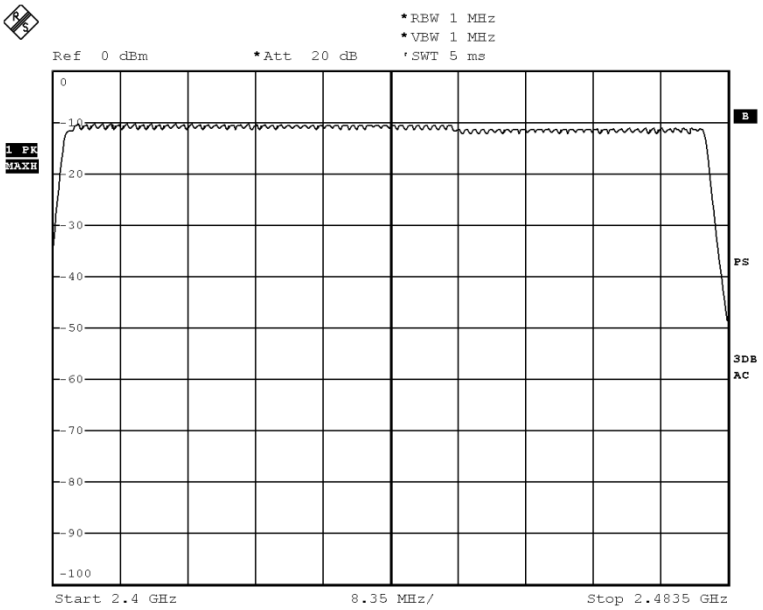
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

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;

12.2 Test Result

Channel Number	Limit
79	⩾15



13 Dwell Time

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013,DA 00-705
Test Limit	:	Regulation 15.247(a)(1)(iii) Frequency hopping systems inthe 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.
Test Mode	:	Hopping
Remark	:	The worst case(8DPSK,3DH5) was recorded

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 spectrum analyzer span = 0. Centredon a hopping channel;

3. Set RBW = 1MHz and VBW = 1MHz.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).

13.2 Test Result

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

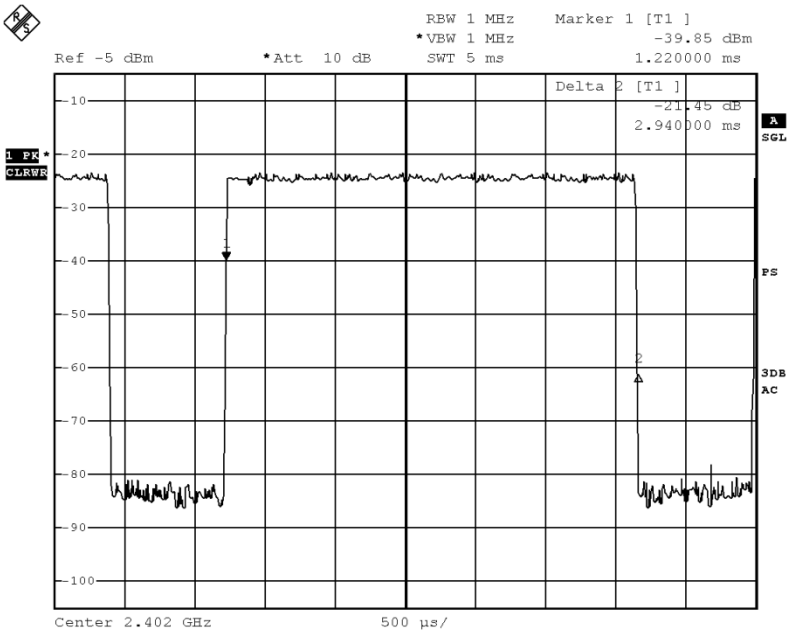
DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

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:

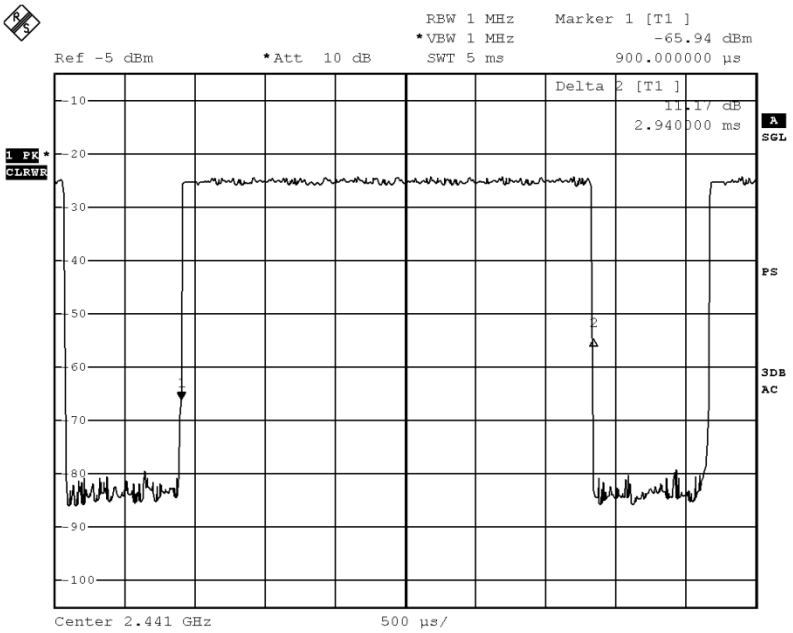
Data Packet	Dwell Time(s)
DH5/2DH5/3DH5	1600/79/6*0.4*79*(MkrDelta)/1000
DH3/2DH3/3DH3	1600/79/4*0.4*79*(MkrDelta)/1000
DH1/2DH1/3DH1	1600/79/2*0.4*79*(MkrDelta)/1000
Remark:MkrDeltaisonce pulse time. Only the worst data(DH5) were show as follow.	

Modulation	Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	3DH5	Low	2.940	0.314	0.4
		middle	2.940	0.314	0.4
		High	2.940	0.314	0.4
PI/4DQPSK	3DH5	Low	2.940	0.314	0.4
		middle	2.940	0.314	0.4
		High	2.940	0.314	0.4
8DPSK	3DH5	Low	2.940	0.314	0.4
		middle	2.940	0.314	0.4
		High	2.940	0.314	0.4

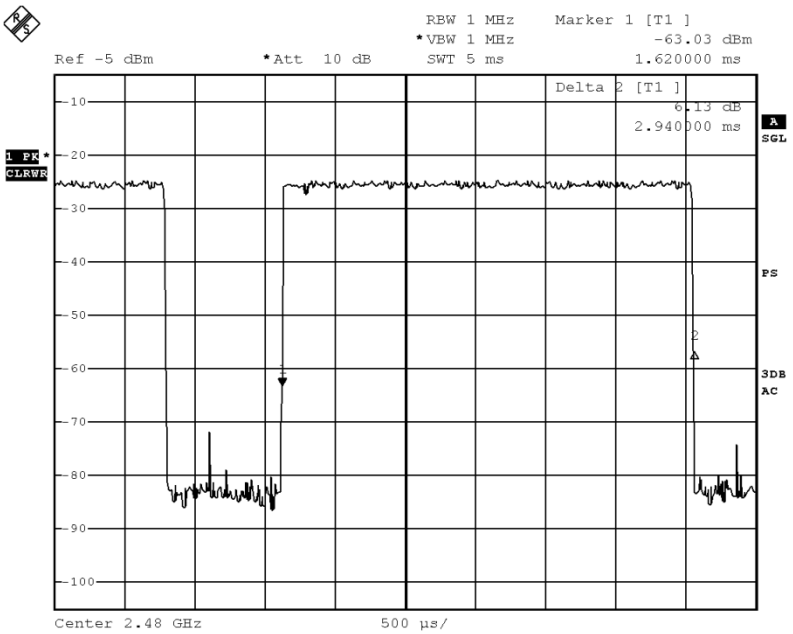
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



14 Antenna Requirement

According to the FCC part15.203, a transmitter can only be sold or operated with antennas with which it was approved. This product has ainternal permanent antenna, it meet the requirement of this section.

*******THE END REPORT********