

FCC TEST REPORT

FCC ID: 2ALS7IQ4408DJ

Product Name : Trolley Speaker
Model Name : IQ-4408DJBT, V15, V16, V6, 0818B-BPLS
Brand Name : IQ Sound, EARISE, iBastek
Report No. : PTC-DQ-01170111801-FC01

Prepared for

Dongguan City MeiZhiZun Electronics Technology Co.,Ltd
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Prepared by

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1TEST RESULT CERTIFICATION

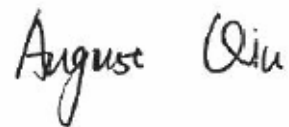
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Manufacture's name : Dongguan City MeiZhiZun Electronics Technology Co.,Ltd
Address : No. 33, Hehe Road, Xiangxi Village, Liaobu Town, Dongguan, Guangdong, China
Product name : Trolley Speaker
Model name : IQ-4408DJBT, V15, V16, V6, 0818B-BPLS
Brand Name : IQ Sound, EARISE, iBastek
Standards : FCC CFR47 Part 15 Section 15.247
Test procedure : ANSI C63.10:2013
Test Date : June 27, 2017 to June 30, 2017
Date of Issue : July 03, 2017
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 only to the tested sample identified in the report.

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Testing Engineer

August Qiu



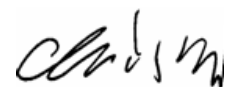
Technical Manager

Hack Ye



Authorized Signatory

Chris Du



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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
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	PASS

Remark:

N/A: Not Applicable

3 General Information

3.1 General Description of E.U.T.

Product Name	: Trolley Speaker
Model Name	: IQ-4408DJBT, V15, V16, V6, 0818B-BPLS
Model Description	: Except for decorative parts in front panels, color of enclosure, are the trade mark and model no. for trading purpose.
Bluetooth Version	: BT2.1+EDR
Operating frequency	: 2402-2480MHz
Numbers of Channel	: 79 channels
Antenna Type:	: Internal PCB Antenna
Antenna Gain:	: 0dBi
Type of Modulation	: GFSK, Pi/4DQPSK, 8DPSK
Power supply for Test	: Power Supply: DC7.4V by Battery DC 9V, 1300mA for Adapter
Adapter	: Model: XH-UL0913-A2 Input: AC100-240V, 50-60Hz, 300mA Output: DC 9V, 1300mA

Note: The USB port only read data from U-disk and can't be used to transfer data with PC.



3.2 Channel List

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 respectively by 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			
Test Item	Test Mode		
Conduction Emission, 0.15MHz to 30MHz	BT Communication		

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	Sep.15, 2016	Sep.14, 2017	1 year
4	Humidity Chamber	GF	GTH-225-40-1P	IAA061225	Sep.15, 2016	Sep.14, 2017	1 year
5	USB RF power sensor	DARE	RPR3006W	15I00041SN 001	Sep.15, 2016	Sep.14, 2017	1 year
Radiated Emissions							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Sep.15, 2016	Sep.14, 2017	1 year
2	Loop Antenna	SCHWARZBECK	FMZB 1519	012	Sep.15, 2016	Sep.14, 2017	1 year
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3355	Sep.15, 2016	Sep.14, 2017	1 year
4	Amplifier	EM	EM-30180	060538	Sep.15, 2016	Sep.14, 2017	1 year
5	Horn Antenna	SCHWARZBECK	BBHA9120D	1246	Sep.15, 2016	Sep.14, 2017	1 year
6	Horn Antenna	SCHWARZBECK	BBHA9170D	1412	Sep.15, 2016	Sep.14, 2017	1 year
7	Coaxial Cable(below 1GHz)	LARGE	CALB1	-	Sep.15, 2016	Sep.14, 2017	1 year
8	Coaxial Cable(above 1GHz)	LARGE	CALB2	-	Sep.15, 2016	Sep.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	Sep.15, 2016	Sep.14, 2017	1 year
2	LISN	SCHWARZB ECK	NSLK 8128	8128-289	Sep.15, 2016	Sep.14, 2017	1 year
3	Cable	LARGE	RF300	-	Sep.15, 2016	Sep.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

Frequency Range: : 150kHz to 30MHz

Class/Severity: : Class B

Detector: : Peak for pre-scan (9kHz Resolution Bandwidth)

5.1 E.U.T. Operation

Operating Environment :

Temperature: : 25.5 °C

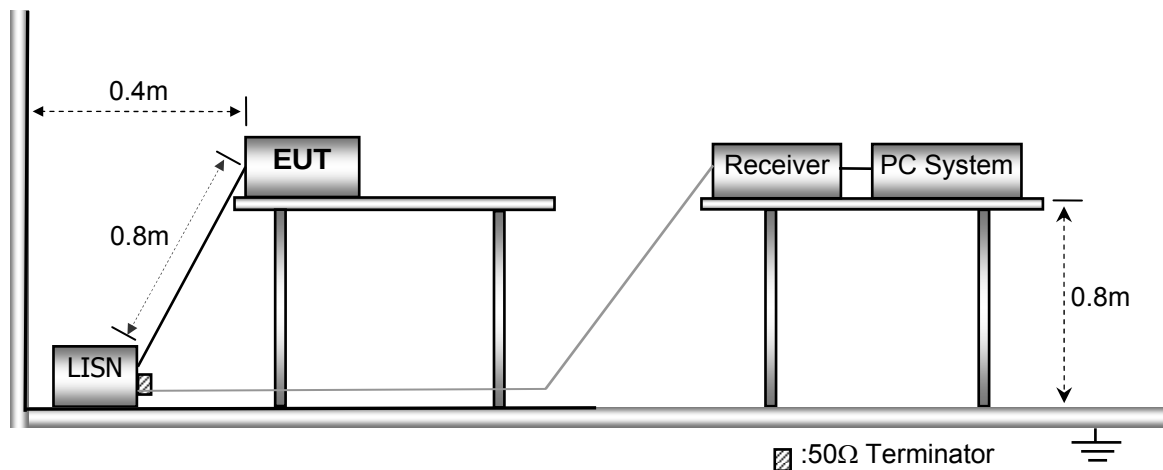
Humidity: : 51 % RH

Atmospheric Pressure: : 101.2kPa

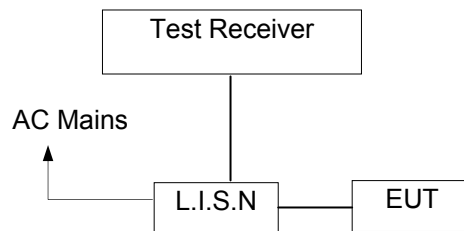
EUT Operation : : Refer to section 3.3

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2014.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.6 Measurement Description

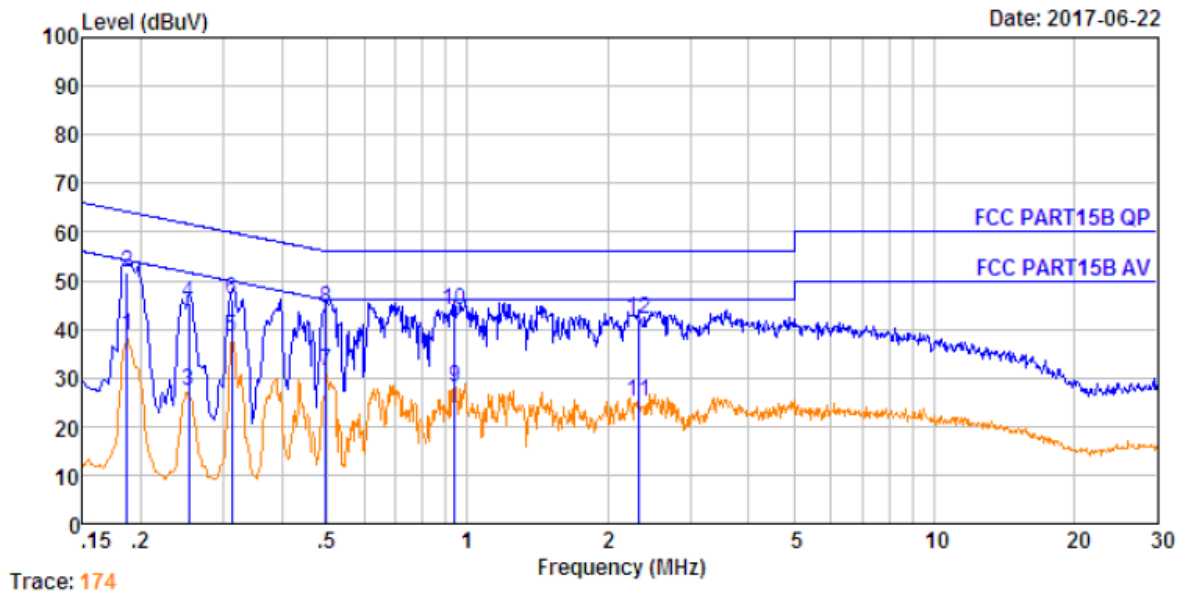
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

Pass
Please find the following pages.



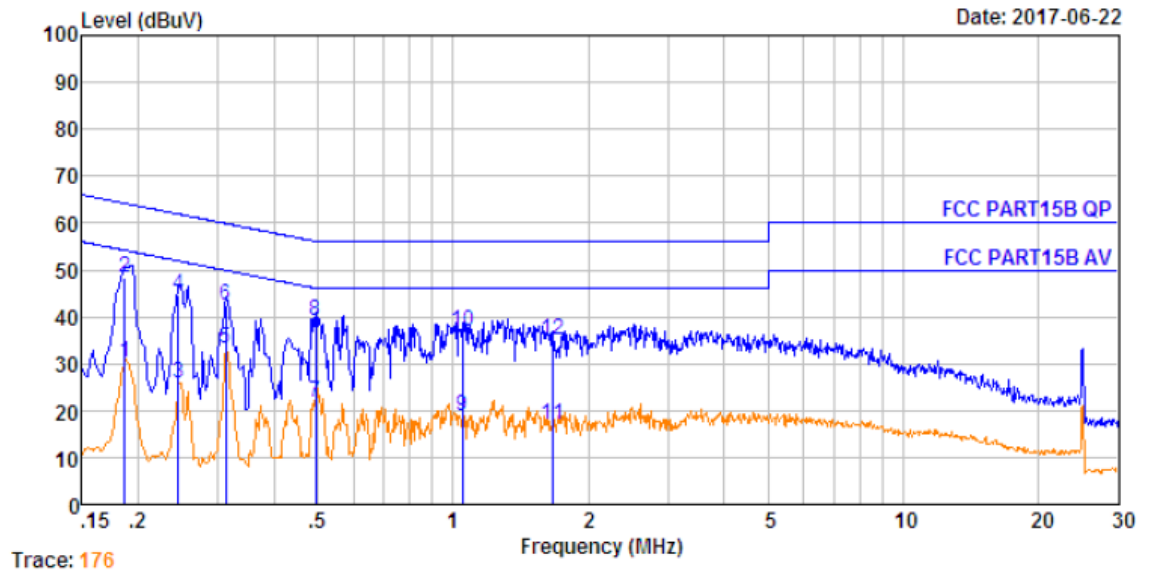
Line-120V:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.186	10.61	0.60	27.40	38.61	54.20	-15.59	Average
2.	0.186	10.61	0.60	40.40	51.61	64.20	-12.59	QP
3.	0.253	10.62	0.60	16.07	27.29	51.64	-24.35	Average
4.	0.253	10.62	0.60	34.07	45.29	61.64	-16.35	QP
5.	0.313	10.63	0.60	26.99	38.22	49.88	-11.66	Average
6.	0.313	10.63	0.60	34.99	46.22	59.88	-13.66	QP
7.	0.497	10.65	0.60	20.03	31.28	46.05	-14.77	Average
8.	0.497	10.65	0.60	33.03	44.28	56.05	-11.77	QP
9.	0.938	10.67	0.60	16.68	27.95	46.00	-18.05	Average
10.	0.938	10.67	0.60	32.68	43.95	56.00	-12.05	QP
11.	2.321	10.70	0.60	13.66	24.96	46.00	-21.04	Average
12.	2.321	10.70	0.60	30.66	41.96	56.00	-14.04	QP

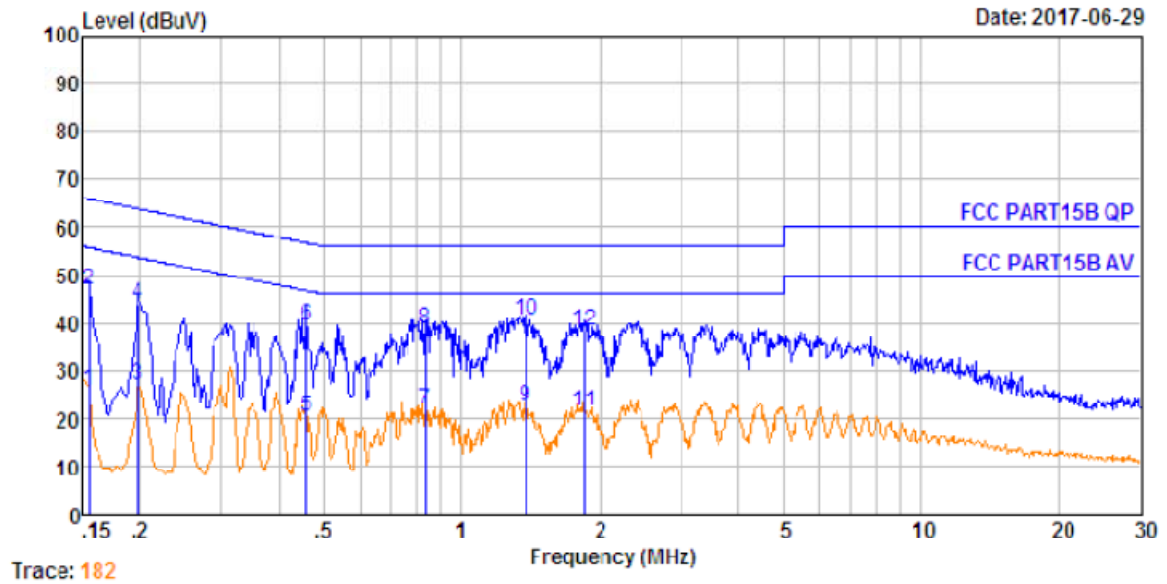


Neutral-120V:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.186	10.61	0.60	19.21	30.42	54.20	-23.78	Average
2.	0.186	10.61	0.60	37.21	48.42	64.20	-15.78	QP
3.	0.246	10.62	0.60	14.54	25.76	51.91	-26.15	Average
4.	0.246	10.62	0.60	33.54	44.76	61.91	-17.15	QP
5.	0.313	10.63	0.60	22.12	33.35	49.88	-16.53	Average
6.	0.313	10.63	0.60	31.12	42.35	59.88	-17.53	QP
7.	0.494	10.64	0.60	10.69	21.93	46.10	-24.17	Average
8.	0.494	10.64	0.60	27.69	38.93	56.10	-17.17	QP
9.	1.049	10.67	0.60	7.51	18.78	46.00	-27.22	Average
10.	1.049	10.67	0.60	25.51	36.78	56.00	-19.22	QP
11.	1.662	10.69	0.60	5.75	17.04	46.00	-28.96	Average
12.	1.662	10.69	0.60	23.75	35.04	56.00	-20.96	QP

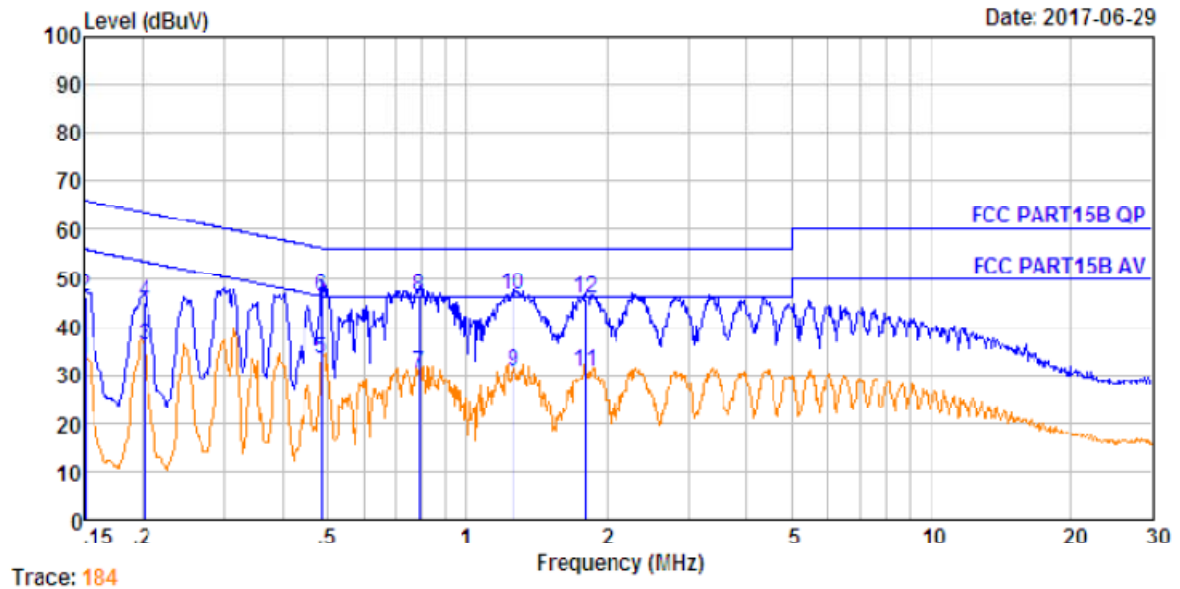
Live line-240V:



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	14.61	25.81	55.78	-29.97	Average
2.	0.154	10.60	0.60	35.61	46.81	65.78	-18.97	QP
3.	0.198	10.61	0.60	15.64	26.85	53.71	-26.86	Average
4.	0.198	10.61	0.60	32.64	43.85	63.71	-19.86	QP
5.	0.459	10.64	0.60	9.24	20.48	46.71	-26.23	Average
6.	0.459	10.64	0.60	28.24	39.48	56.71	-17.23	QP
7.	0.835	10.66	0.60	10.48	21.74	46.00	-24.26	Average
8.	0.835	10.66	0.60	27.48	38.74	56.00	-17.26	QP
9.	1.381	10.68	0.60	11.24	22.52	46.00	-23.48	Average
10.	1.381	10.68	0.60	29.24	40.52	56.00	-15.48	QP
11.	1.848	10.69	0.60	10.26	21.55	46.00	-24.45	Average
12.	1.848	10.69	0.60	27.26	38.55	56.00	-17.45	QP



Neutral line-240V



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.150	10.60	0.60	21.88	33.08	56.00	-22.92	Average
2.	0.150	10.60	0.60	34.88	46.08	66.00	-19.92	QP
3.	0.202	10.61	0.60	24.91	36.12	53.54	-17.42	Average
4.	0.202	10.61	0.60	33.91	45.12	63.54	-18.42	QP
5.	0.486	10.64	0.60	21.88	33.12	46.23	-13.11	Average
6.	0.486	10.64	0.60	34.88	46.12	56.23	-10.11	QP
7.	0.792	10.66	0.60	18.94	30.20	46.00	-15.80	Average
8.	0.792	10.66	0.60	34.94	46.20	56.00	-9.80	QP
9.	1.255	10.68	0.60	19.28	30.56	46.00	-15.44	Average
10.	1.255	10.68	0.60	35.28	46.56	56.00	-9.44	QP
11.	1.800	10.69	0.60	19.40	30.69	46.00	-15.31	Average
12.	1.800	10.69	0.60	34.40	45.69	56.00	-10.31	QP

6 Radiated Spurious Emissions

Test Requirement: : FCC CFR47 Part 15 Section 15.209 & 15.247
 Test Method: : ANSI C63.10:2013
 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	$2400/F(\text{kHz})$	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	$20\log^{(500)}$

6.1 EUT Operation

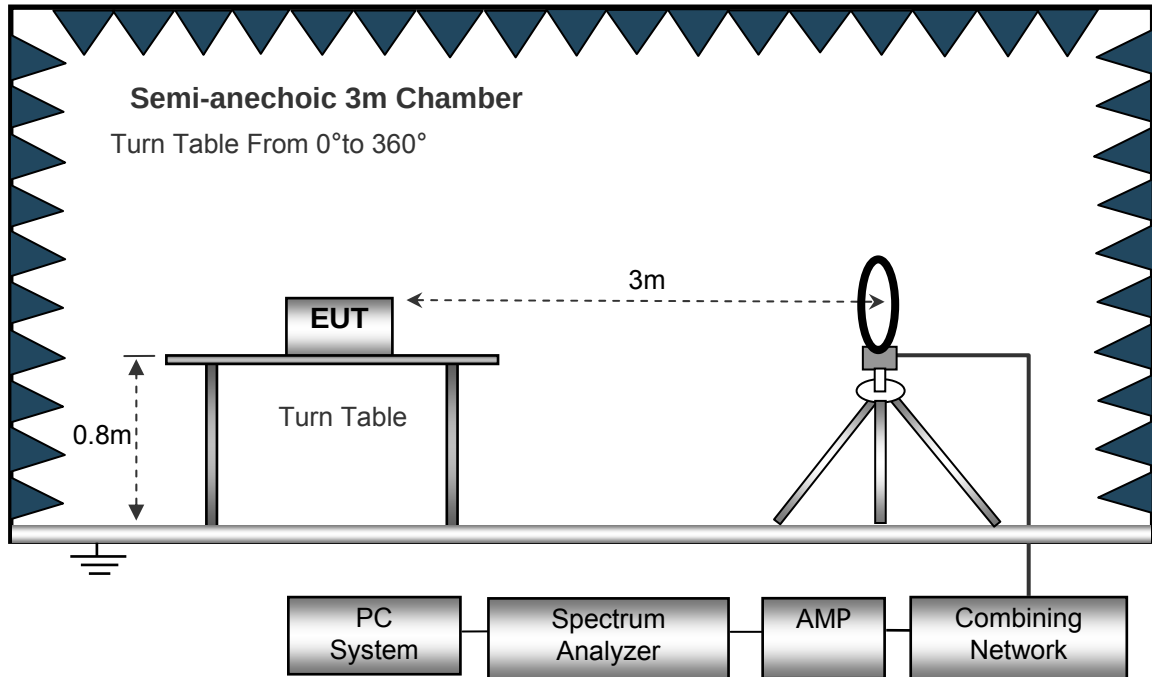
Operating Environment :

Temperature: : 23.5 °C
 Humidity: : 51.1 % RH
 Atmospheric Pressure: : 101.2kPa
 EUT Operation : : Refer to section 3.3

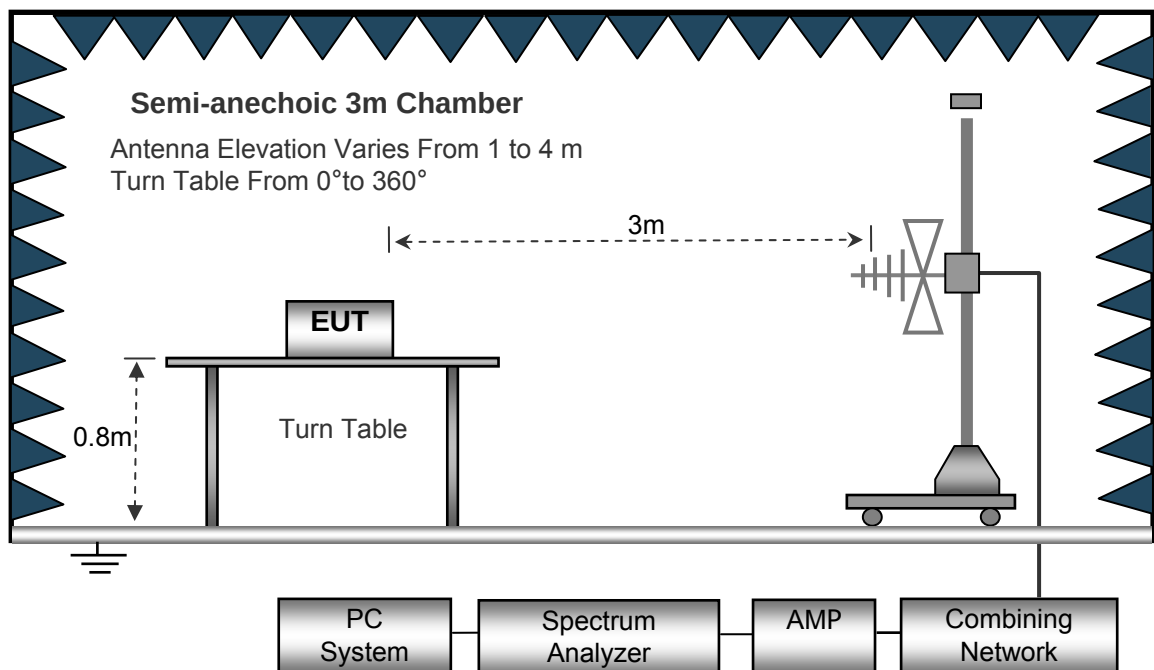
6.2 Test Setup

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

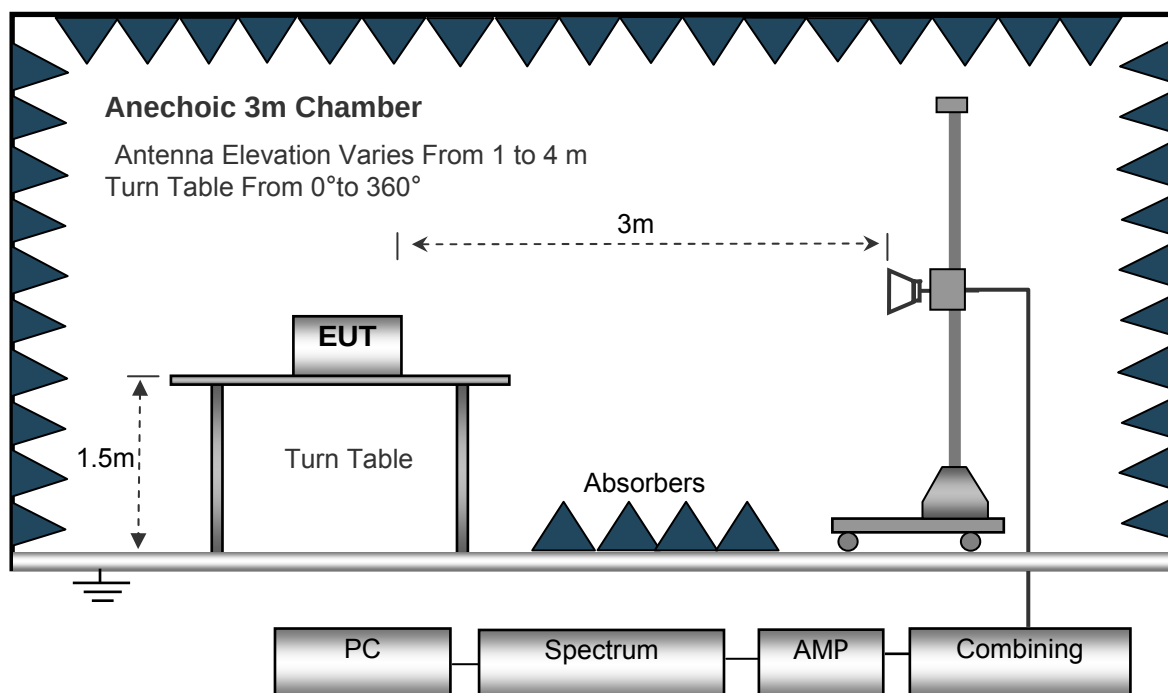
The test setup for emission measurement below 30MHz.



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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

6.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. 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. In the frequency above 1GHz, Place the measurement antenna 3m away from the EUT for each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
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

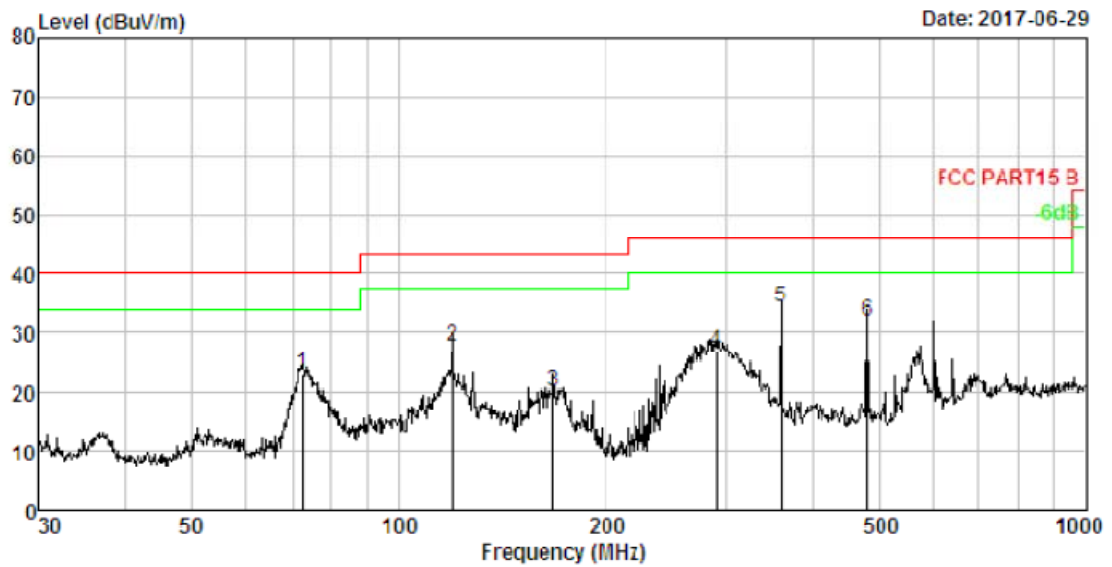
The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 1GHz

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



Test plot for Horizontal:

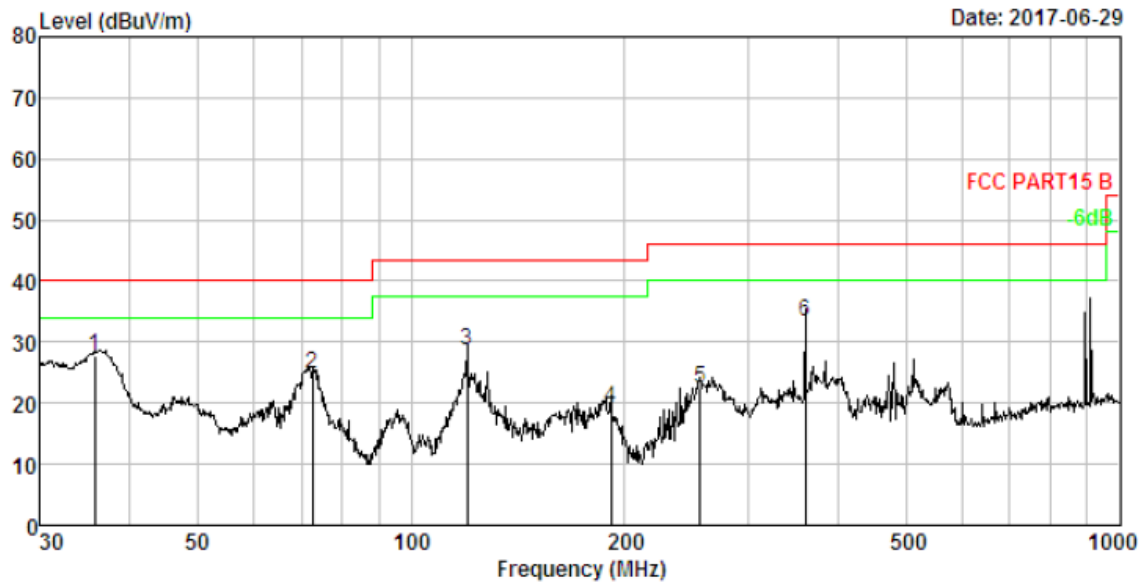


Remark: Absolute Level= Reading Level+ Factor, Margin= Limit- Absolute Level

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.	72.592	1.86	9.93	41.42	30.28	22.93	40.00	-17.07	QP
2.	119.856	2.31	12.02	43.96	30.45	27.84	43.50	-15.66	QP
3.	167.824	2.61	13.45	34.63	30.57	20.12	43.50	-23.38	QP
4.	290.017	3.11	13.00	41.55	30.76	26.90	46.00	-19.10	QP
5.	360.448	3.31	14.40	47.39	30.83	34.27	46.00	-11.73	QP
6.	480.528	3.57	16.89	42.43	30.94	31.95	46.00	-14.05	QP



Test plot for Vertical:



Remark:

Absolute Level= Reading Level+ Factor, Margin= Limit- Absolute Level

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.	35.749	1.21	13.43	43.14	30.03	27.75	40.00	-12.25	QP
2.	72.592	1.86	9.93	43.33	30.28	24.84	40.00	-15.16	QP
3.	119.856	2.31	12.02	44.69	30.45	28.57	43.50	-14.93	QP
4.	191.745	2.73	10.97	36.04	30.62	19.12	43.50	-24.38	QP
5.	255.623	2.99	12.04	37.99	30.72	22.30	46.00	-23.70	QP
6.	360.448	3.31	14.40	46.49	30.83	33.37	46.00	-12.63	QP

Test Frequency: Above 1000MHz~10th Harmonics:

GFSK Low Channel (2402MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4804	33.62	AV	V	29.34	4.68	30.14	37.5	54	-16.5
4804	32.15	AV	H	29.34	4.68	30.14	36.03	54	-17.97
4804	38.05	PK	V	29.34	4.68	30.14	41.93	74	-32.07
4804	39.46	PK	H	29.34	4.68	30.14	43.34	74	-30.66
17805	25.14	AV	V	37.26	6.83	27.69	41.54	54	-12.46
17805	26.06	AV	H	37.26	6.83	27.69	42.46	54	-11.54
17805	36.69	PK	V	37.26	6.83	27.69	53.09	74	-20.91
17805	35.74	PK	H	37.26	6.83	27.69	52.14	74	-21.86

GFSK Low Channel (2441MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882	35.22	AV	V	27.66	7.42	27.46	42.84	54	-11.16
4882	32.15	AV	H	27.66	7.42	27.46	39.77	54	-14.23
4882	39.45	PK	V	27.66	7.42	27.46	47.07	74	-26.93
4882	37.06	PK	H	27.66	7.42	27.46	44.68	74	-29.32
17802	25.14	AV	V	34.26	8.36	35.66	32.1	54	-21.9
17802	24.66	AV	H	34.26	8.36	35.66	31.62	54	-22.38
17802	36.06	PK	V	34.26	8.36	35.66	43.02	74	-30.98
17802	34.25	PK	H	34.26	8.36	35.66	41.21	74	-32.79

GFSK High Channel (2480MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4960	30.36	AV	V	27.63	5.63	25.49	38.13	54	-15.87
4960	34.05	AV	H	27.63	5.63	25.49	41.82	54	-12.18
4960	40.66	PK	V	27.63	5.63	25.49	48.43	74	-25.57
4960	41.25	PK	H	27.63	5.63	25.49	49.02	74	-24.98
17821	27.62	AV	V	38.26	6.24	29.65	42.47	54	-11.53
17821	26.35	AV	H	38.26	6.24	29.65	41.2	54	-12.8
17821	37.45	PK	V	38.26	6.24	29.65	52.3	74	-21.7
17821	33.06	PK	H	38.26	6.24	29.65	47.91	74	-26.09

π /4-DQPSK Low Channel (2402MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4804	32.04	AV	V	30.22	5.06	29.35	37.97	54	-16.03
4804	31.26	AV	H	30.22	5.06	29.35	37.19	54	-16.81
4804	38.42	PK	V	30.22	5.06	29.35	44.35	74	-29.65
4804	36.26	PK	H	30.22	5.06	29.35	42.19	74	-31.81
17806	24.05	AV	V	35.72	5.83	30.46	35.14	54	-18.86
17806	25.85	AV	H	35.72	5.83	30.46	36.94	54	-17.06
17806	35.16	PK	V	35.72	5.83	30.46	46.25	74	-27.75
17806	34.06	PK	H	35.72	5.83	30.46	45.15	74	-28.85

π /4-DQPSK Low Channel (2441MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882	34.26	AV	V	29.35	7.16	28.43	42.34	54	-11.66
4882	33.14	AV	H	29.35	7.16	28.43	41.22	54	-12.78
4882	38.26	PK	V	29.35	7.16	28.43	46.34	74	-27.66
4882	36.26	PK	H	29.35	7.16	28.43	44.34	74	-29.66
17806	25.04	AV	V	33.24	7.69	34.16	31.81	54	-22.19
17806	25.69	AV	H	33.24	7.69	34.16	32.46	54	-21.54
17806	34.15	PK	V	33.24	7.69	34.16	40.92	74	-33.08
17806	35.09	PK	H	33.24	7.69	34.16	41.86	74	-32.14

π /4-DQPSK High Channel (2480MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4960	29.33	AV	V	26.58	4.36	24.72	35.55	54	-18.45
4960	32.14	AV	H	26.58	4.36	24.72	38.36	54	-15.64
4960	38.26	PK	V	26.58	4.36	24.72	44.48	74	-29.52
4960	40.22	PK	H	26.58	4.36	24.72	46.44	74	-27.56
17811	26.36	AV	V	37.15	5.96	28.53	40.94	54	-13.06
17811	28.46	AV	H	37.15	5.96	28.53	43.04	54	-10.96
17811	37.16	PK	V	37.15	5.96	28.53	51.74	74	-22.26
17811	32.05	PK	H	37.15	5.96	28.53	46.63	74	-27.37

8DPSK Low Channel (2402MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4804	31.05	AV	V	29.72	4.72	28.72	36.77	54	-17.23
4804	30.54	AV	H	29.72	4.72	28.72	36.26	54	-17.74
4804	37.26	PK	V	29.72	4.72	28.72	42.98	74	-31.02
4804	35.06	PK	H	29.72	4.72	28.72	40.78	74	-33.22
17803	25.47	AV	V	33.66	6.29	29.43	35.99	54	-18.01
17803	26.36	AV	H	33.66	6.29	29.43	36.88	54	-17.12
17803	34.22	PK	V	33.66	6.29	29.43	44.74	74	-29.26
17803	33.19	PK	H	33.66	6.29	29.43	43.71	74	-30.29

8DPSK Low Channel (2441MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882	33.02	AV	V	28.72	6.38	27.43	40.69	54	-13.31
4882	31.24	AV	H	28.72	6.38	27.43	38.91	54	-15.09
4882	35.2	PK	V	28.72	6.38	27.43	42.87	74	-31.13
4882	35.62	PK	H	28.72	6.38	27.43	43.29	74	-30.71
17804	24.72	AV	V	32.04	7.11	33.26	30.61	54	-23.39
17804	25.06	AV	H	32.04	7.11	33.26	30.95	54	-23.05
17804	33.18	PK	V	32.04	7.11	33.26	39.07	74	-34.93
17804	32.67	PK	H	32.04	7.11	33.26	38.56	74	-35.44

8DPSK High Channel (2480MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4960	30.33	AV	V	25.72	3.72	23.69	36.08	54	-17.92
4960	31.24	AV	H	25.72	3.72	23.69	36.99	54	-17.01
4960	34.29	PK	V	25.72	3.72	23.69	40.04	74	-33.96
4960	36.25	PK	H	25.72	3.72	23.69	42	74	-32
17812	26.37	AV	V	35.06	4.86	29.72	36.57	54	-17.43
17812	27.42	AV	H	35.06	4.86	29.72	37.62	54	-16.38
17812	33.16	PK	V	35.06	4.86	29.72	43.36	74	-30.64
17812	34.05	PK	H	35.06	4.86	29.72	44.25	74	-29.75

Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit

7 CONDUCTED BAND EDGE EMISSION

7.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

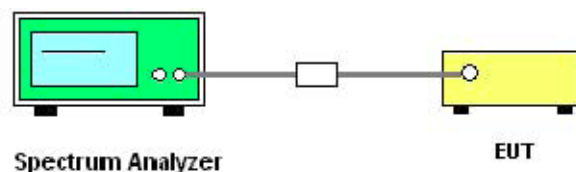
7.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 – 2403 MHz Upper Band Edge: 2479 – 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

7.3 TEST SETUP



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

7.4 EUT OPERATION CONDITIONS

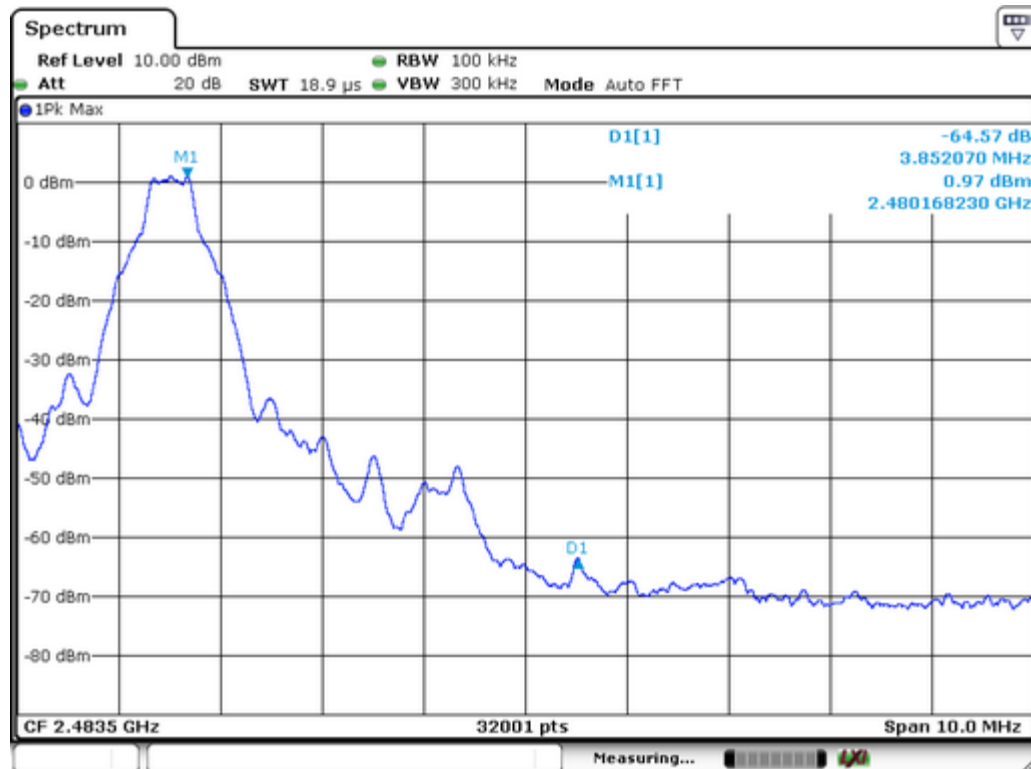
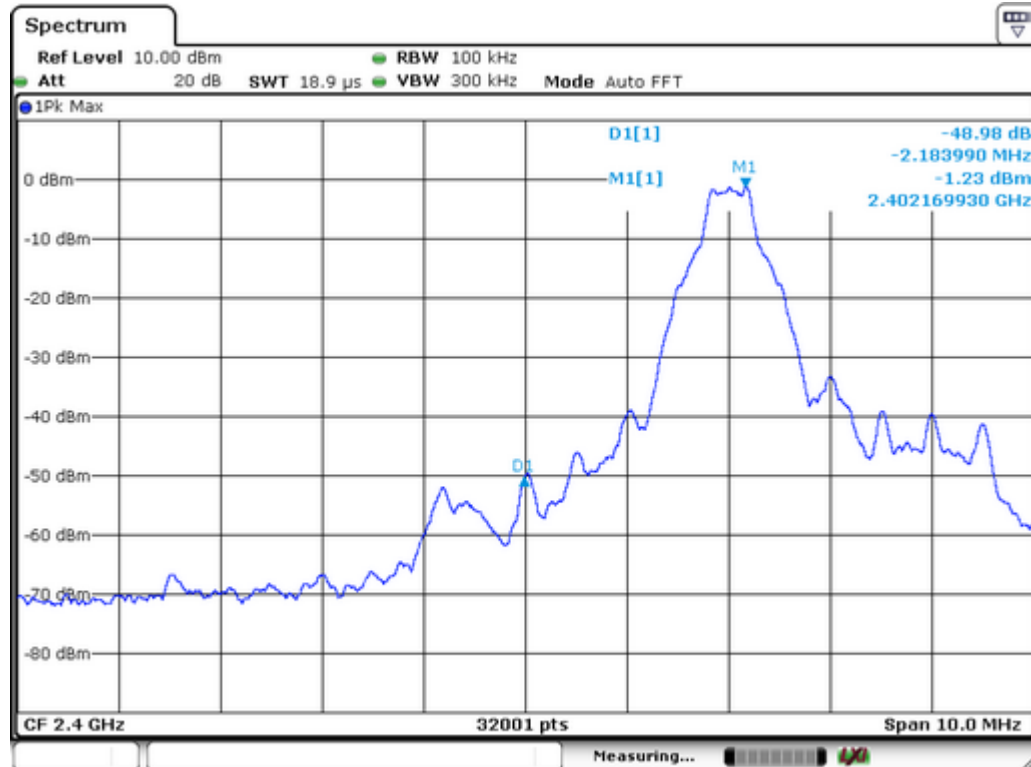
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

7.5 TEST RESULTS

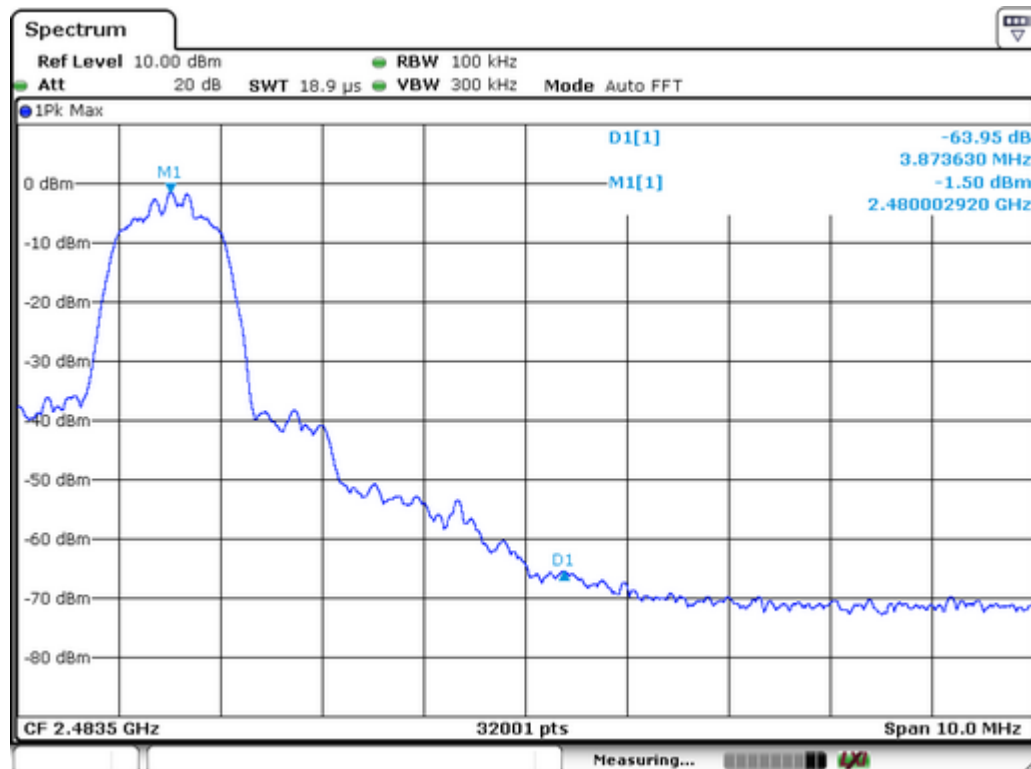
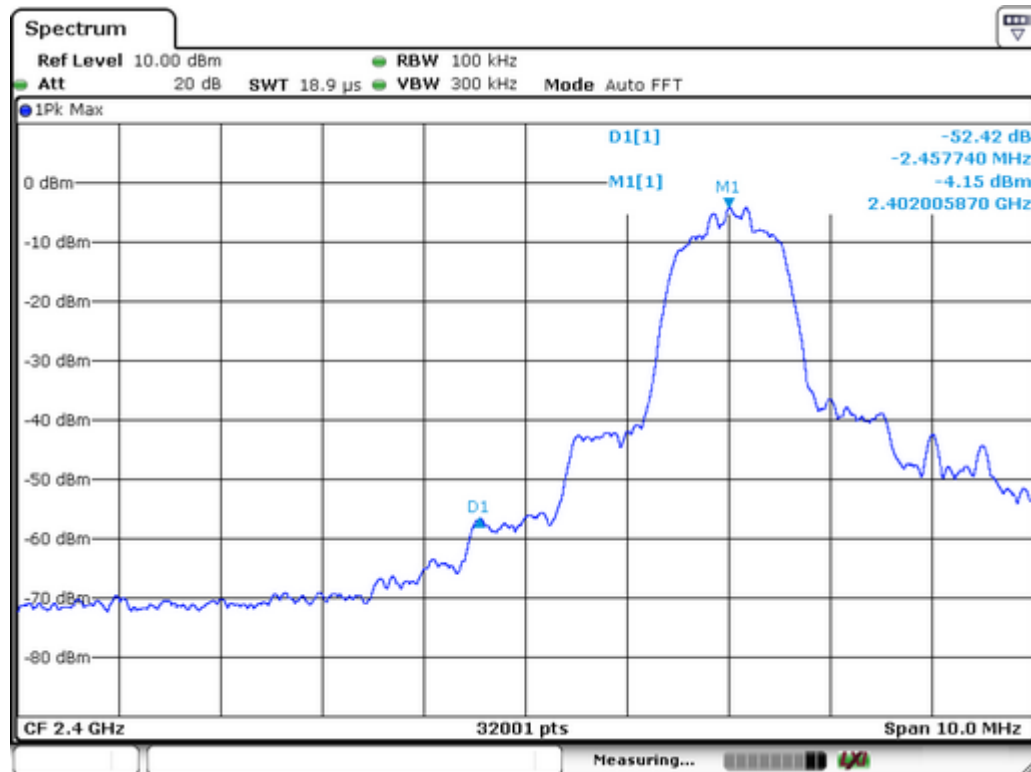
For Non-Hopping Mode:

Frequency(MHz)	Modulation	Peak Power Output (dBm)	Emission Read Value (dBm)	Result of Band edge (dBc)	Band Edge Limit (dBc)
2399.986	GFSK	-1.23	-50.21	48.98	>20dBc
2399.548	$\pi/4$ -DQPSK	-4.15	-56.57	52.42	>20dBc
2399.532	8DPSK	-4.14	-55.76	51.62	>20dBc
2484.02	GFSK	0.97	-63.60	64.57	>20dBc
2483.875	$\pi/4$ -DQPSK	-1.5	-65.45	63.95	>20dBc
2483.516	8DPSK	-1.38	-62.75	61.37	>20dBc

GFSK

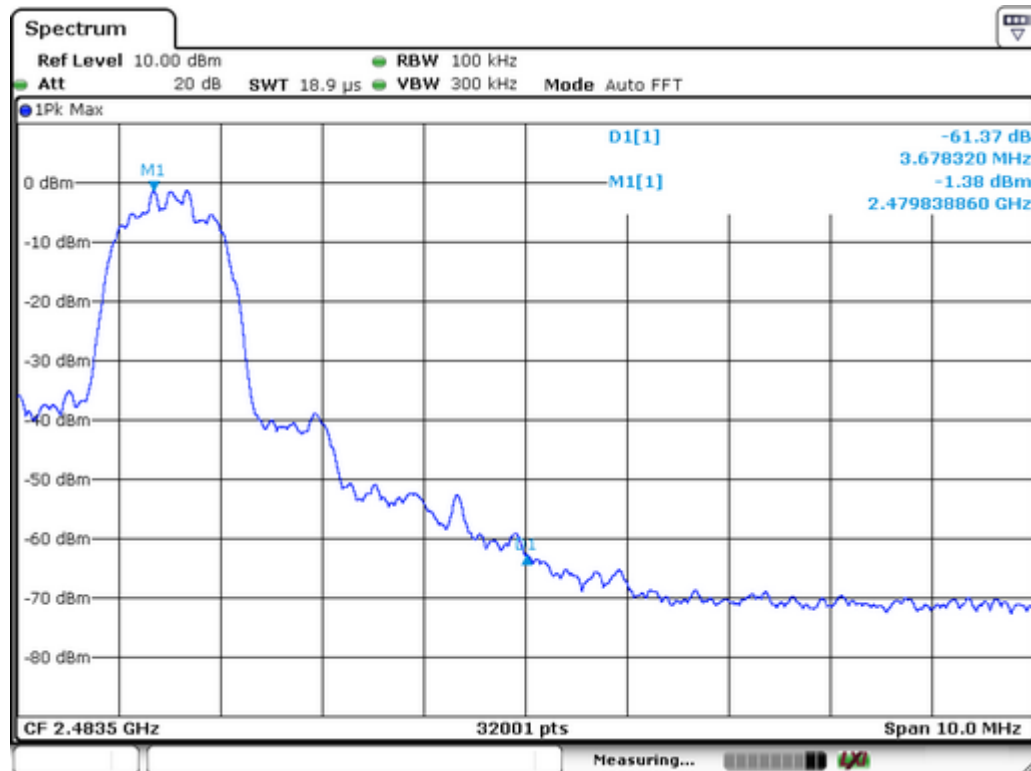
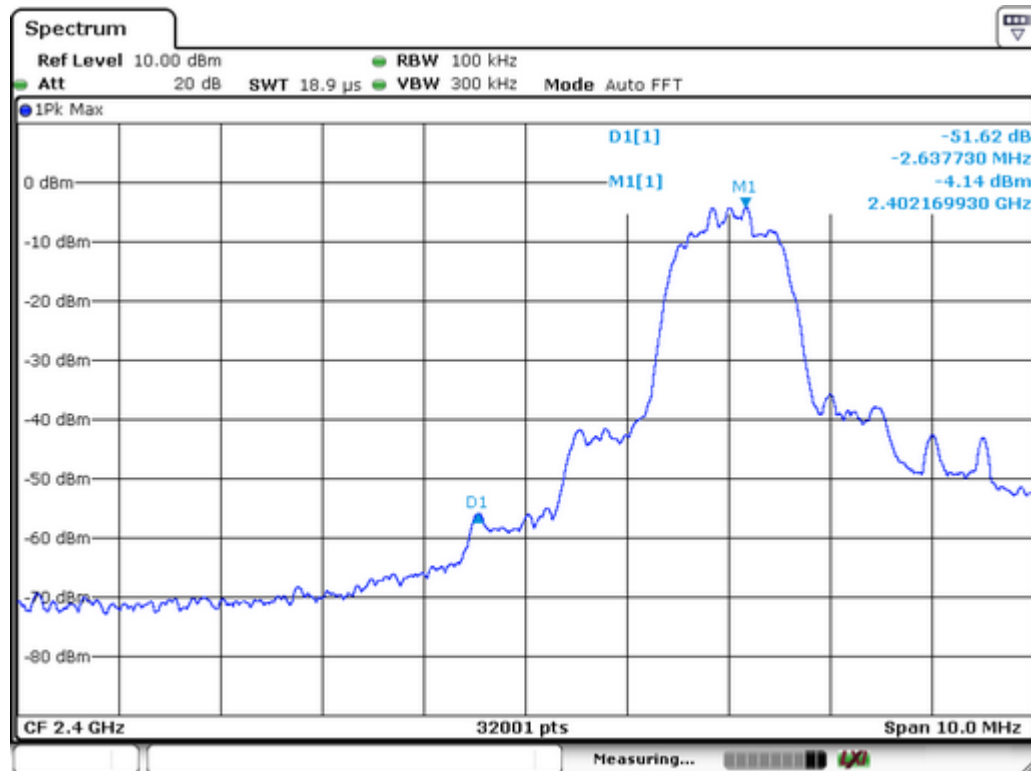


$\pi/4$ -DQPSK





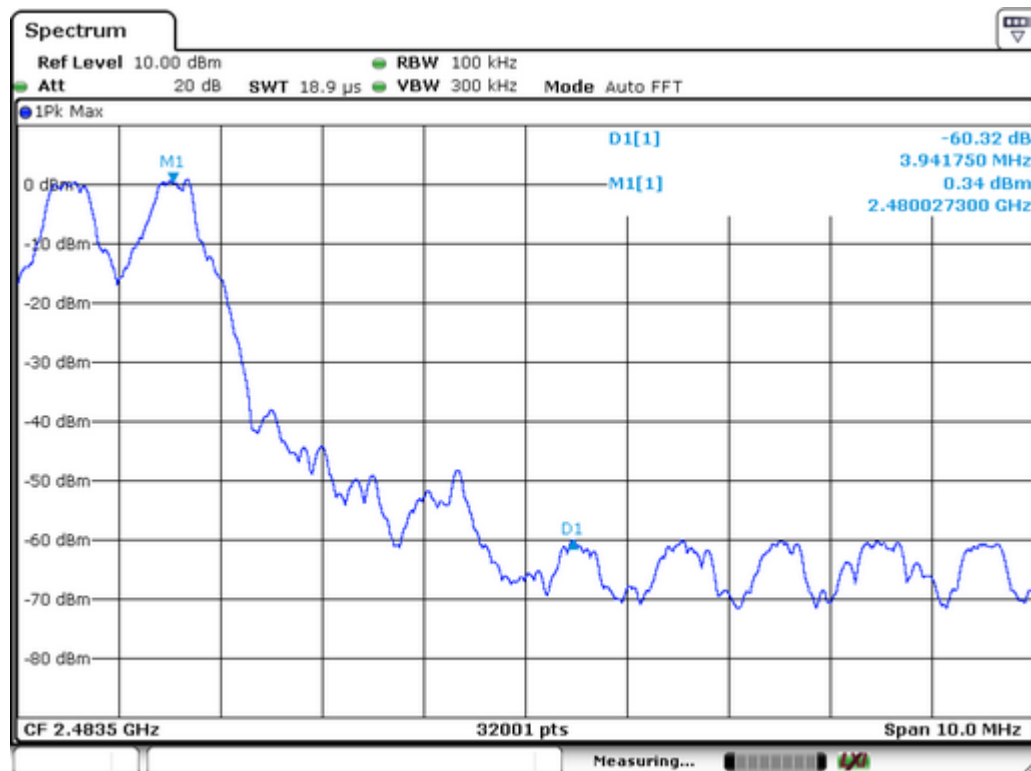
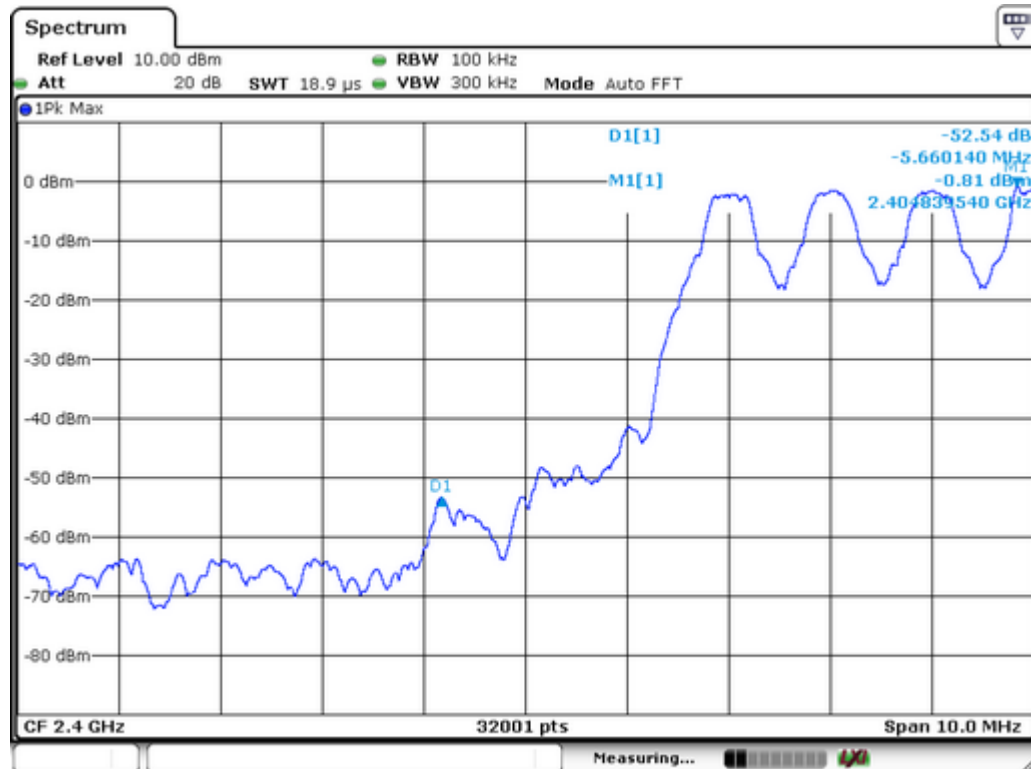
8DPSK

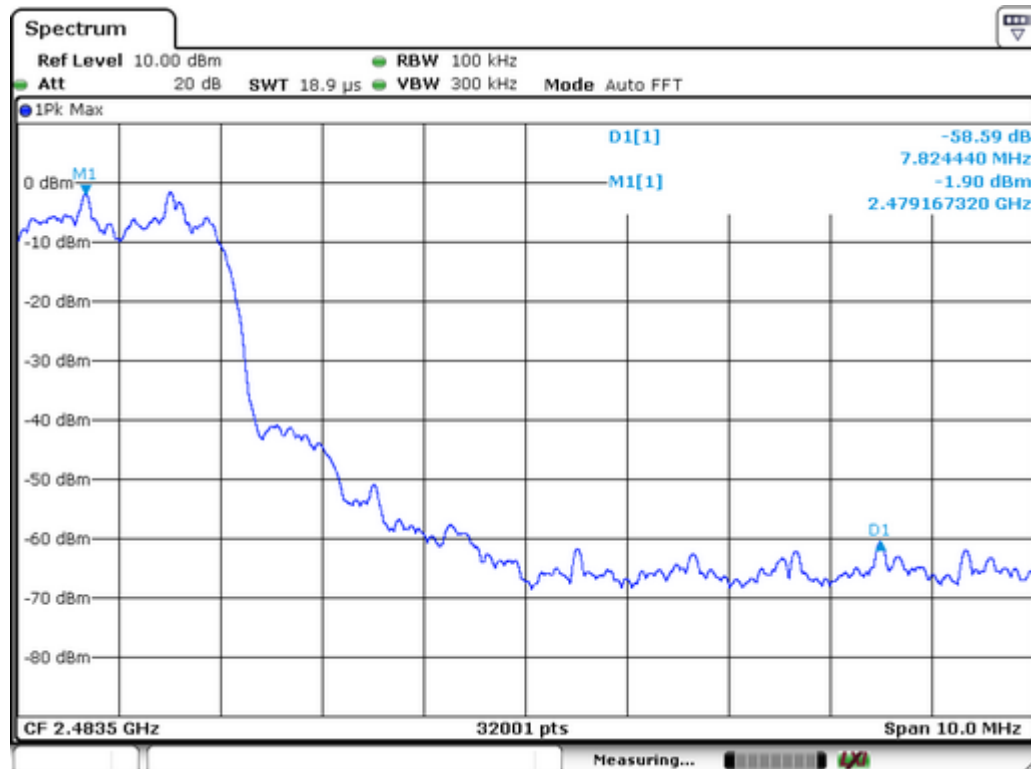
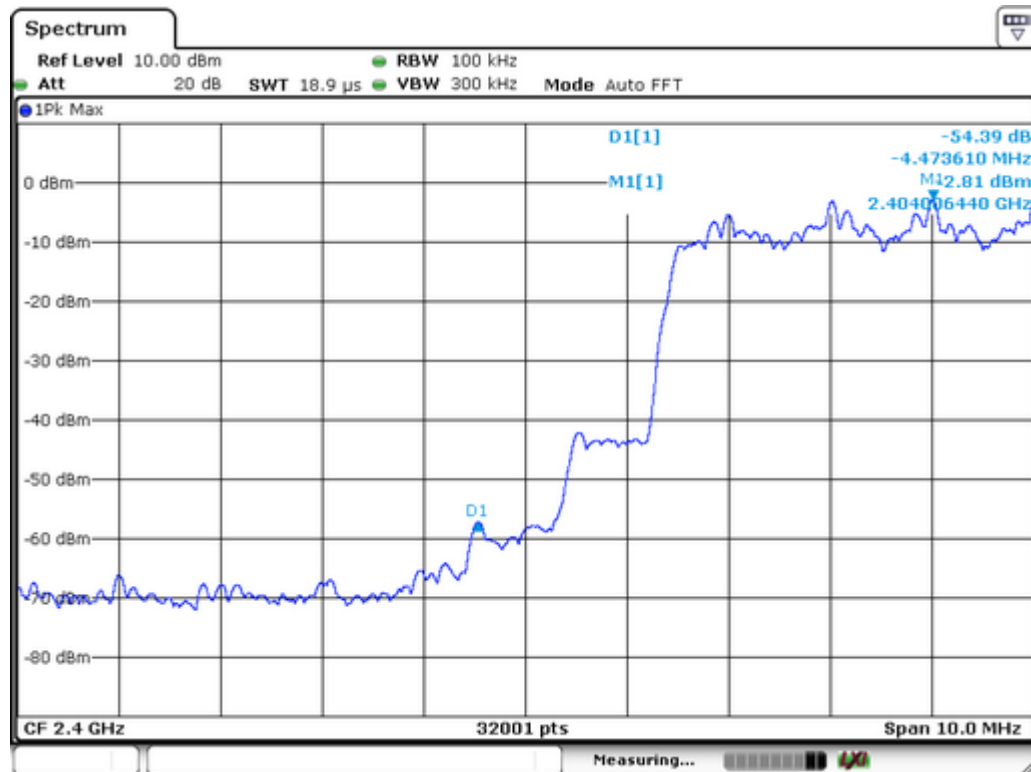


For Hopping Mode:

Frequency(MHz)	Modulation	Peak Power Output (dBm)	Emission Read Value (dBm)	Result of Band edge (dBc)	Band Edge Limit (dBc)
2399.179	GFSK	-0.81	-53.35	52.54	>20dBc
2399.533	$\pi/4$ -DQPSK	2.81	-51.58	54.39	>20dBc
2399.689	8DPSK	-3	-57.95	54.95	>20dBc
2483.968	GFSK	0.34	-59.98	60.32	>20dBc
2486.991	$\pi/4$ -DQPSK	-1.9	-60.49	58.59	>20dBc
2487.847	8DPSK	-1.52	-61.06	59.54	>20dBc

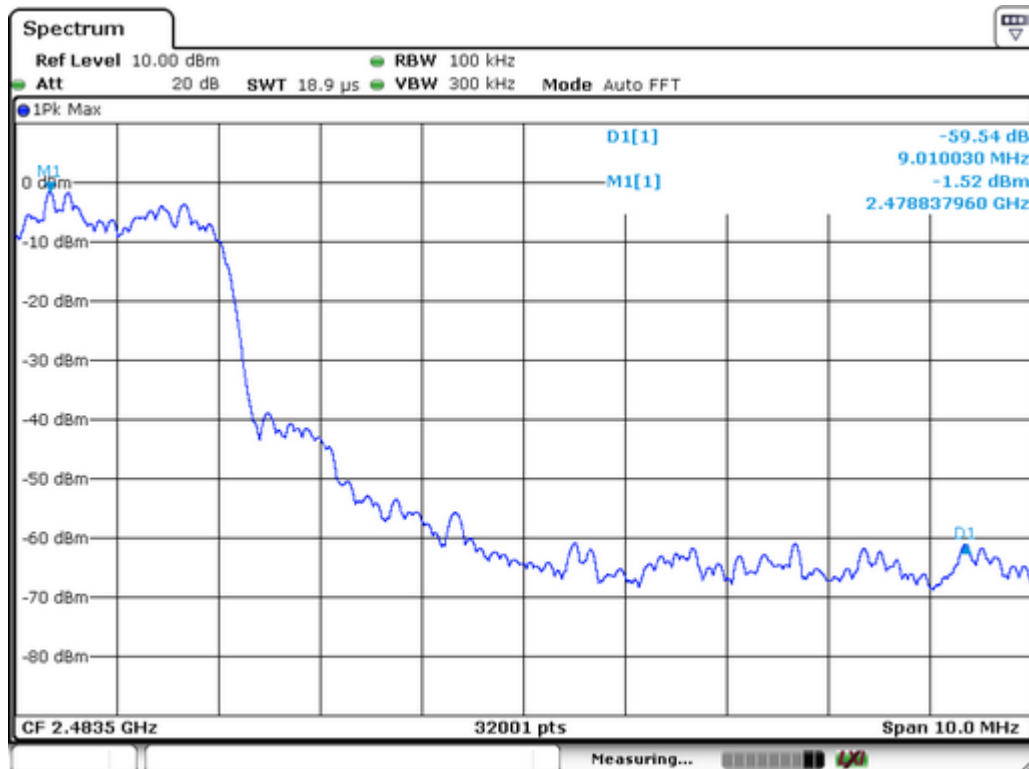
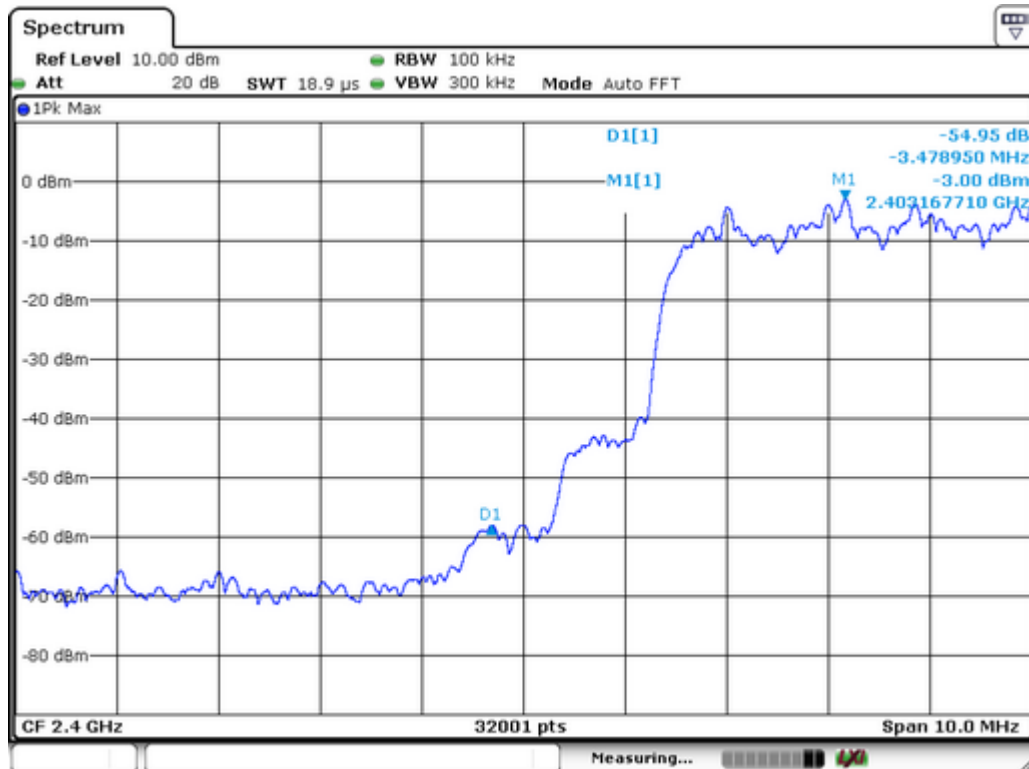
GFSK



 $\pi/4$ -DQPSK



8DPSK





8 20 dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247
Test Method : ANSI C63.10:2013
Test Mode : Refer to section 3.3

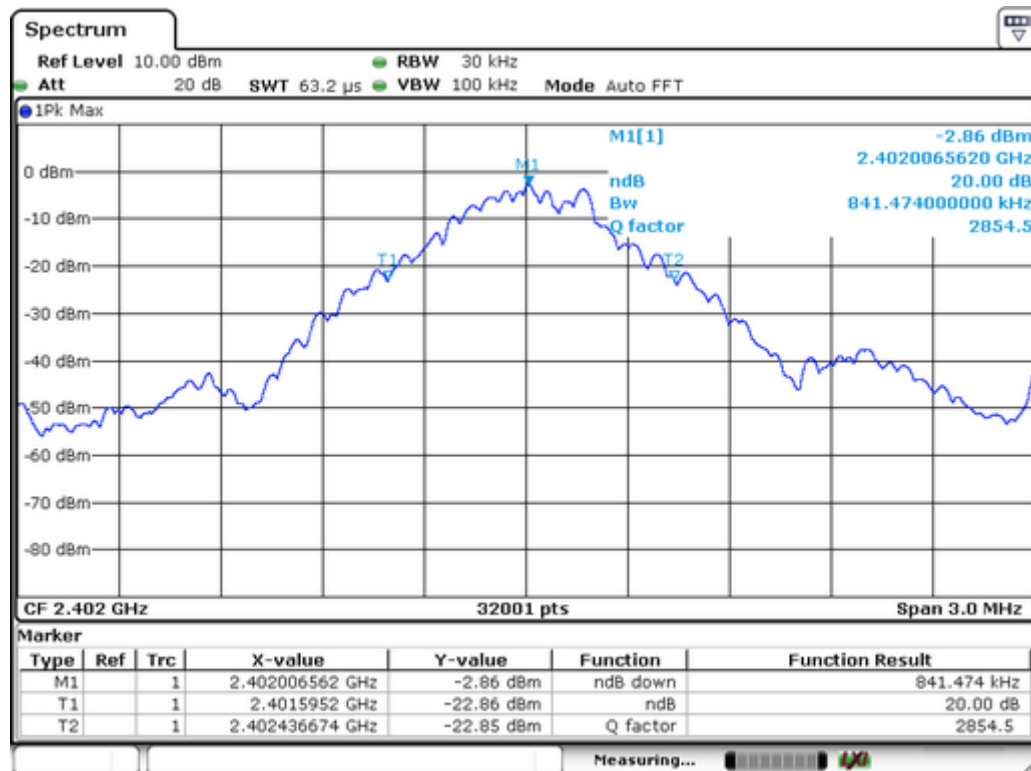
8.1 Test Procedure

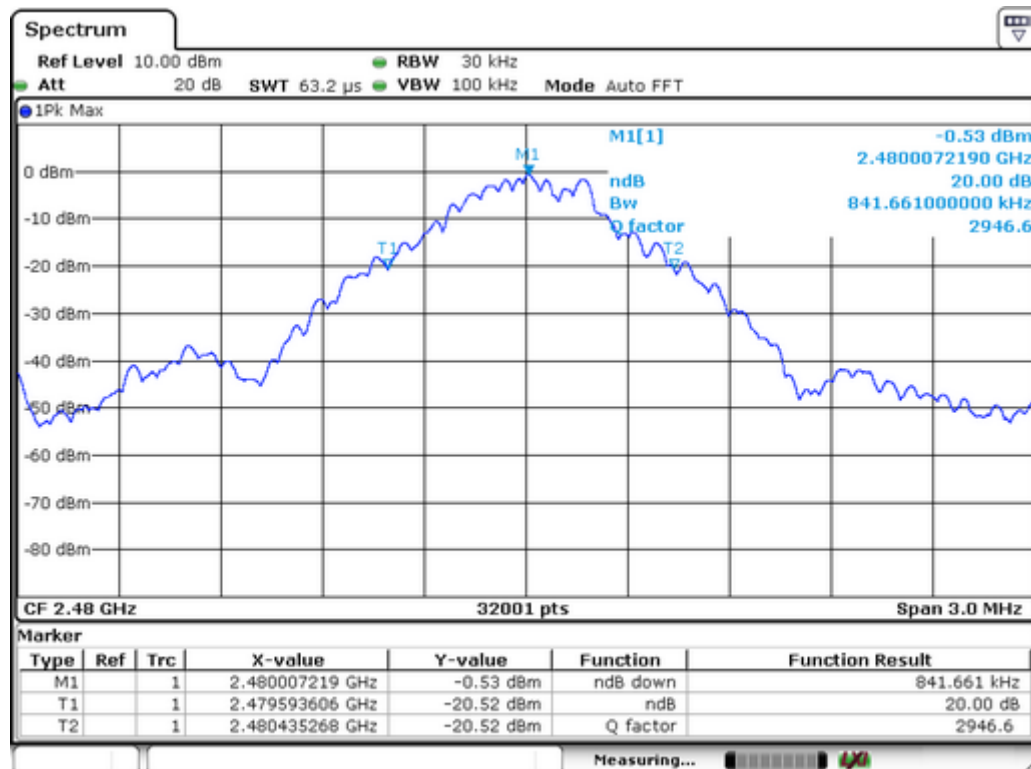
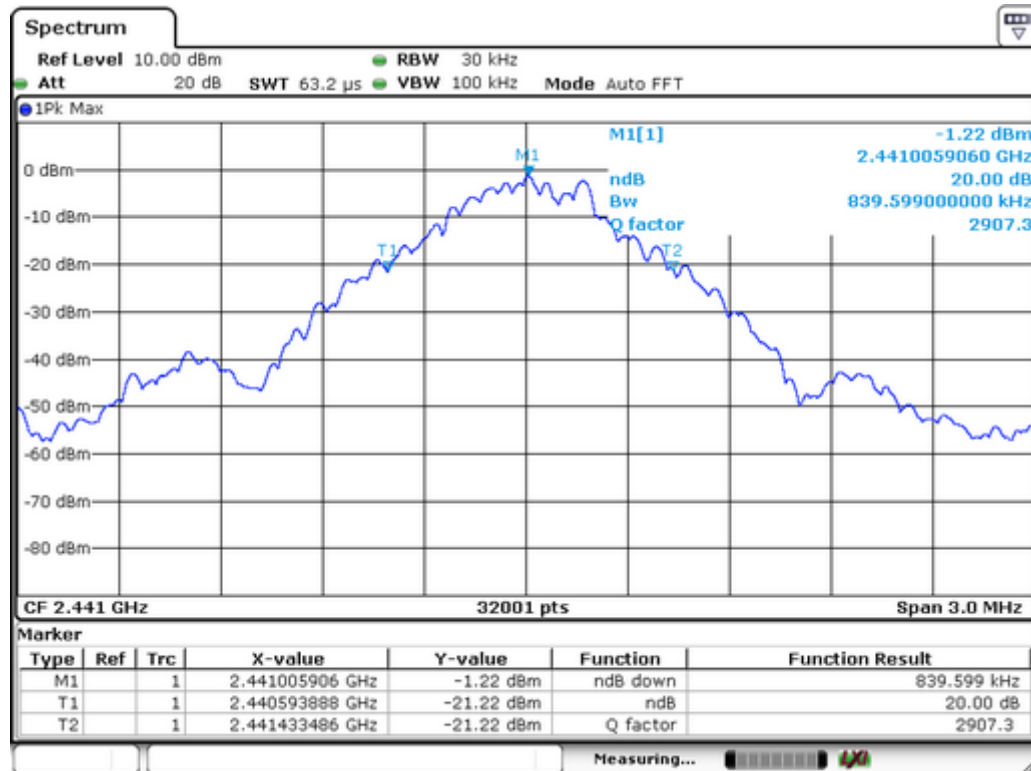
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 30kHz, VBW = 100kHz

8.2 Test Result

Test Mode: CH00 / CH39 / CH78 (GFSK/(1Mbps)Mode)

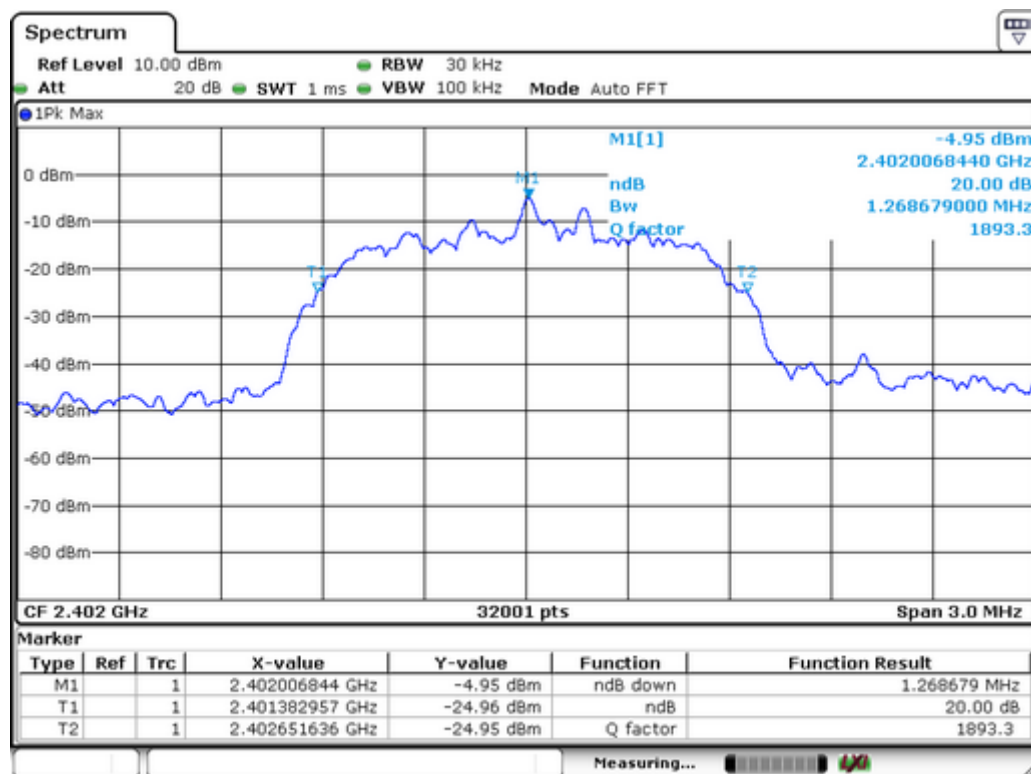
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	841
39	2441	840
78	2480	842

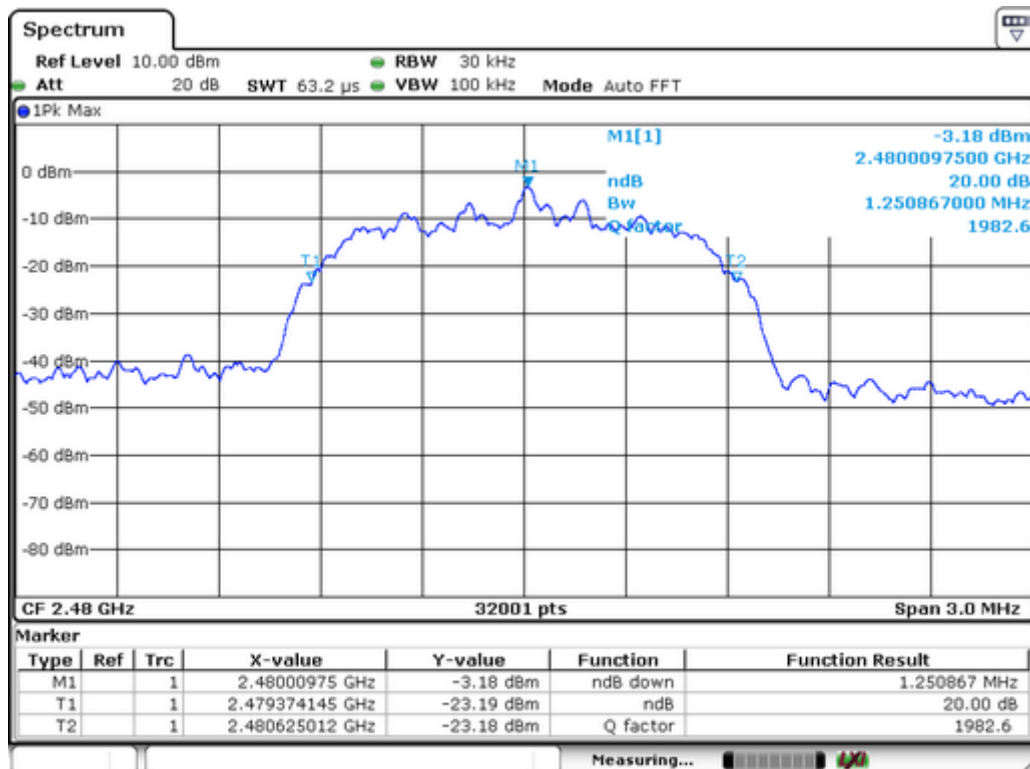
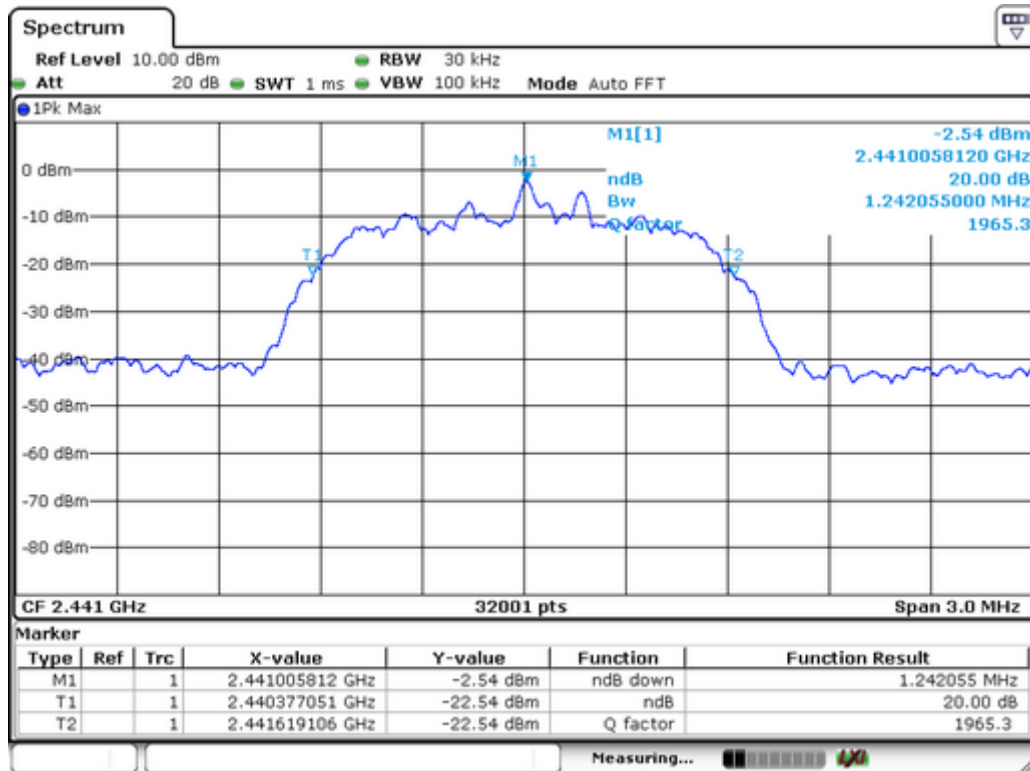




Test Mode: CH00 / CH39 / CH78 ($\pi/4$ -DQPSK / (2Mbps) Mode)

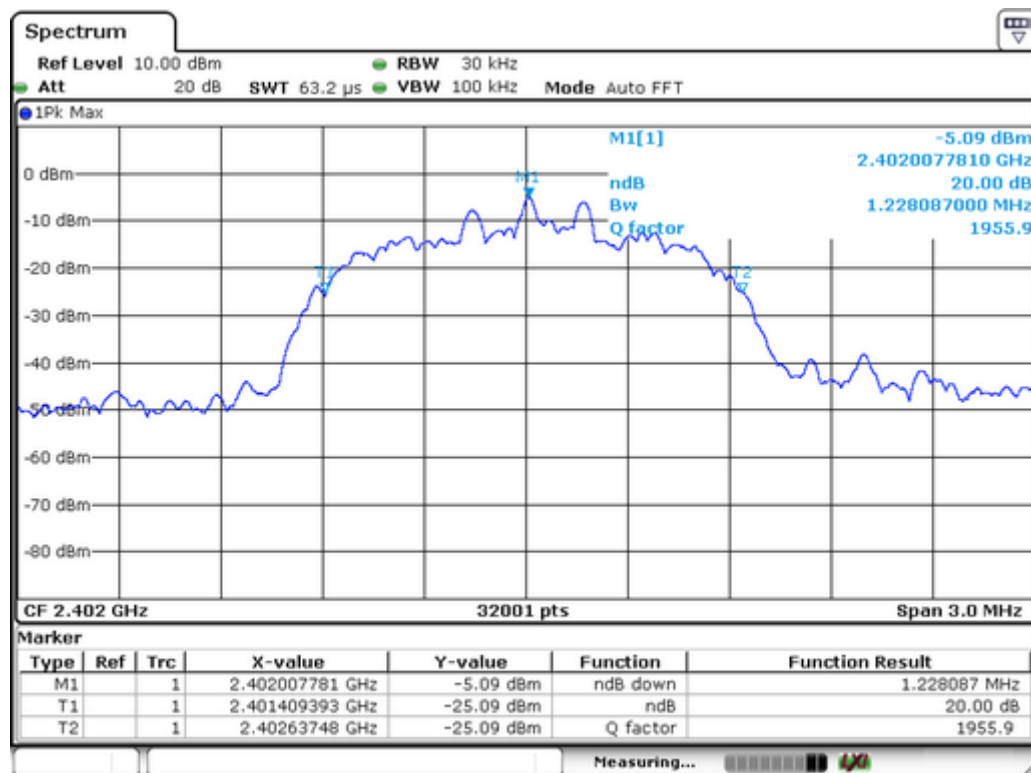
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1269
39	2441	1242
78	2480	1251

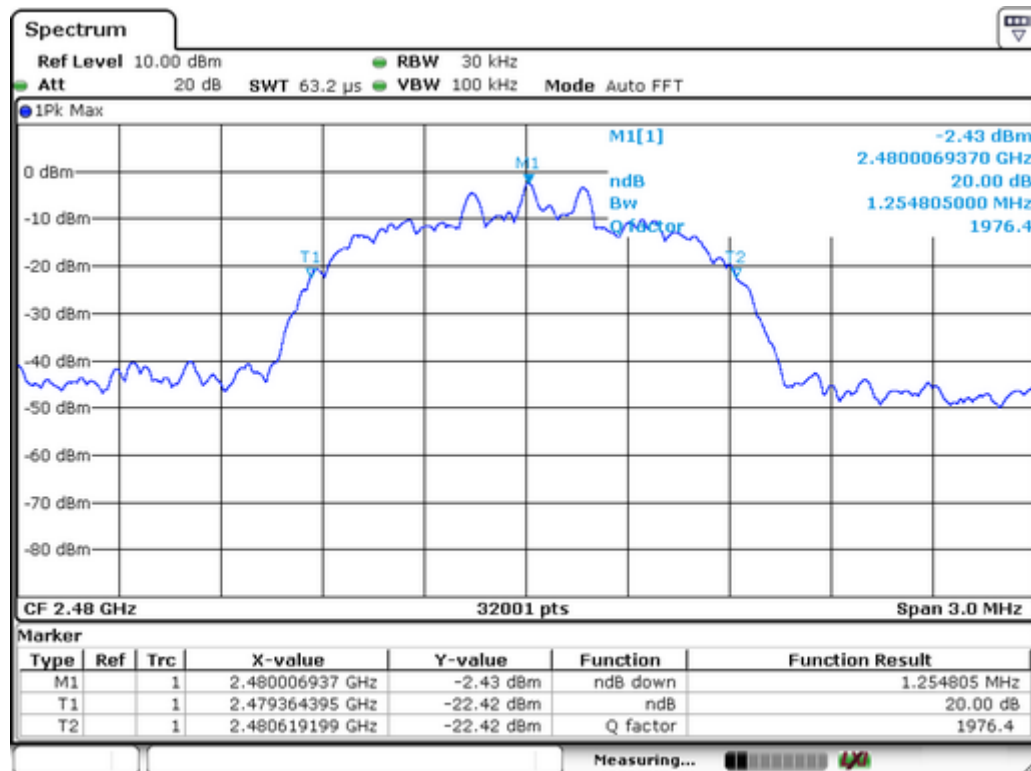
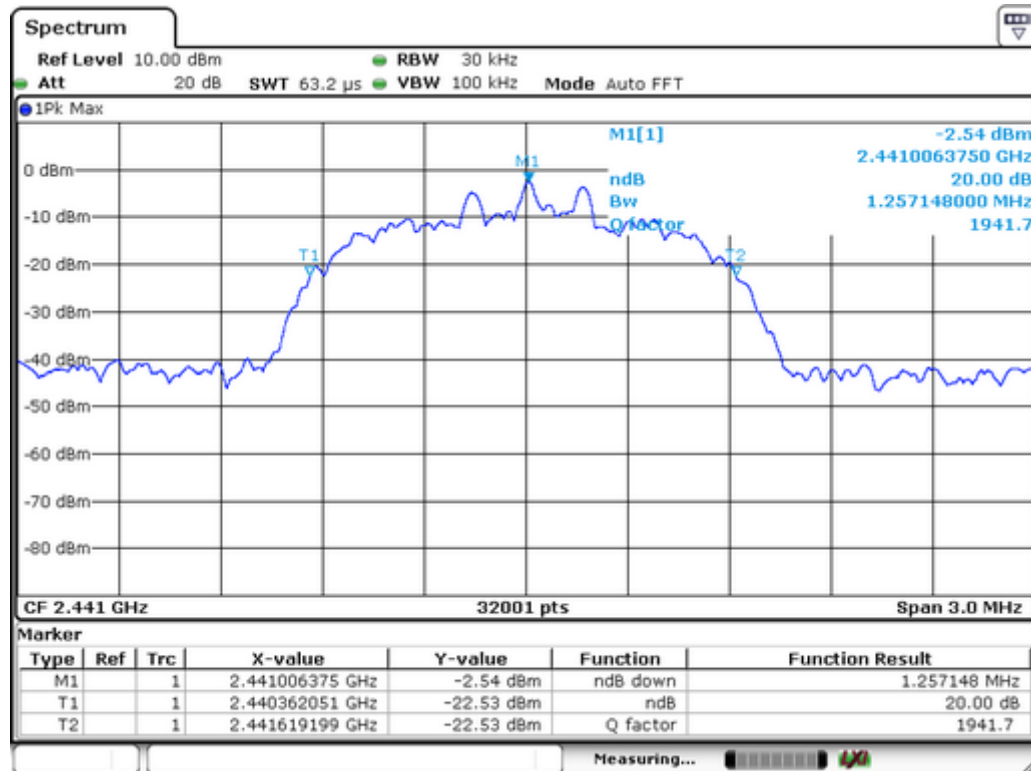




Test Mode: CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1228
39	2441	1257
78	2480	1255





9 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

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 (30dBm). 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 0.125watts (20.97 dBm) limit applies.

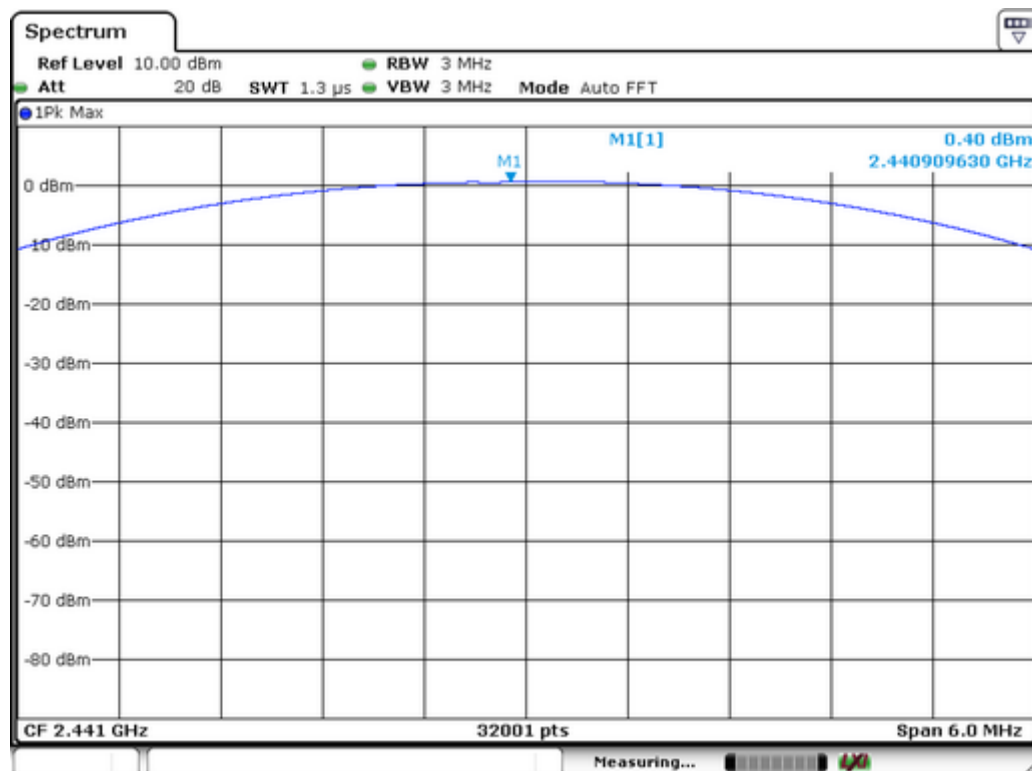
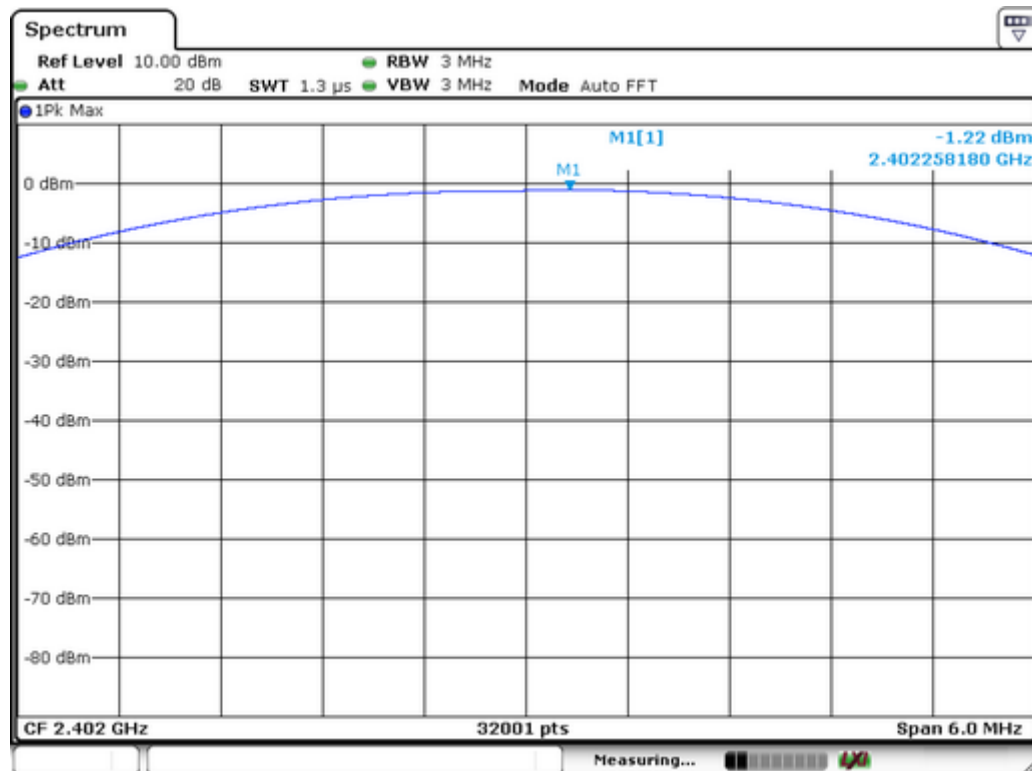
Test Mode : Refer to section 3.3

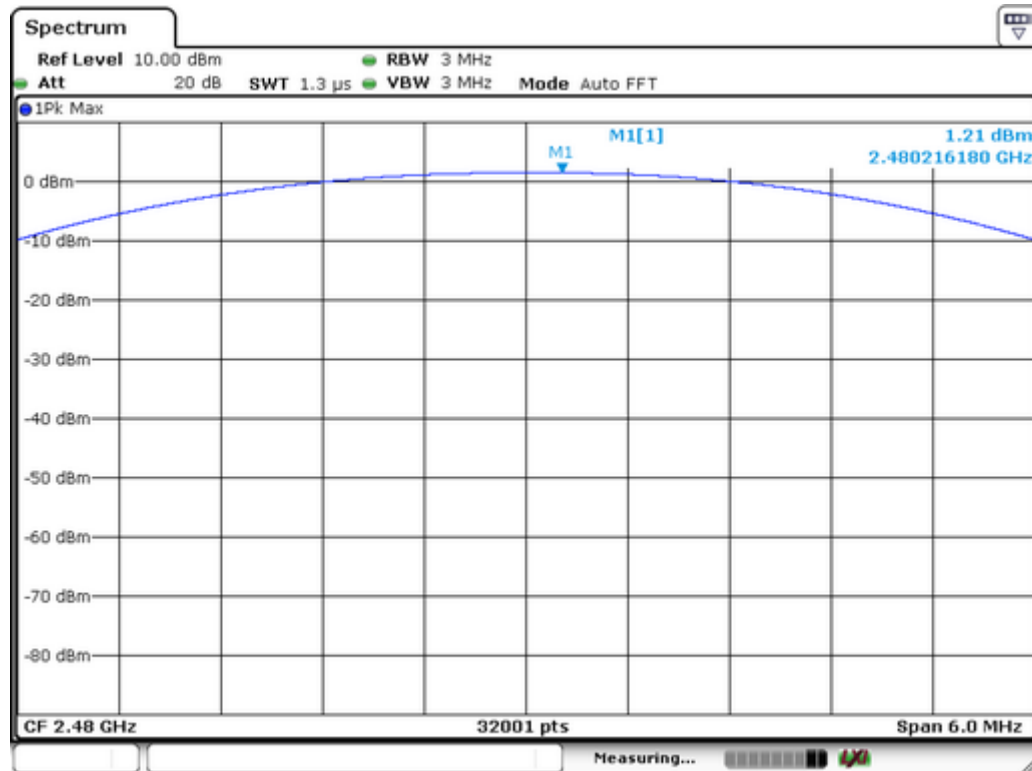
9.1 Test Procedure

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 analyser: RBW = 3 MHz. VBW =3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

9.2 Test Result

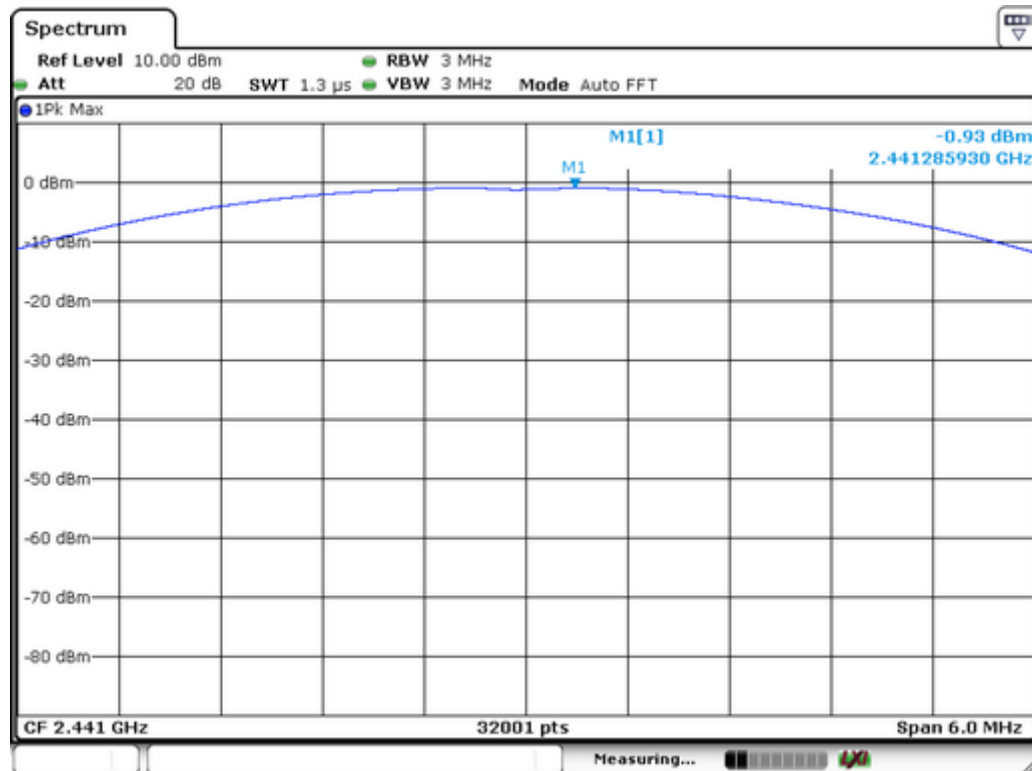
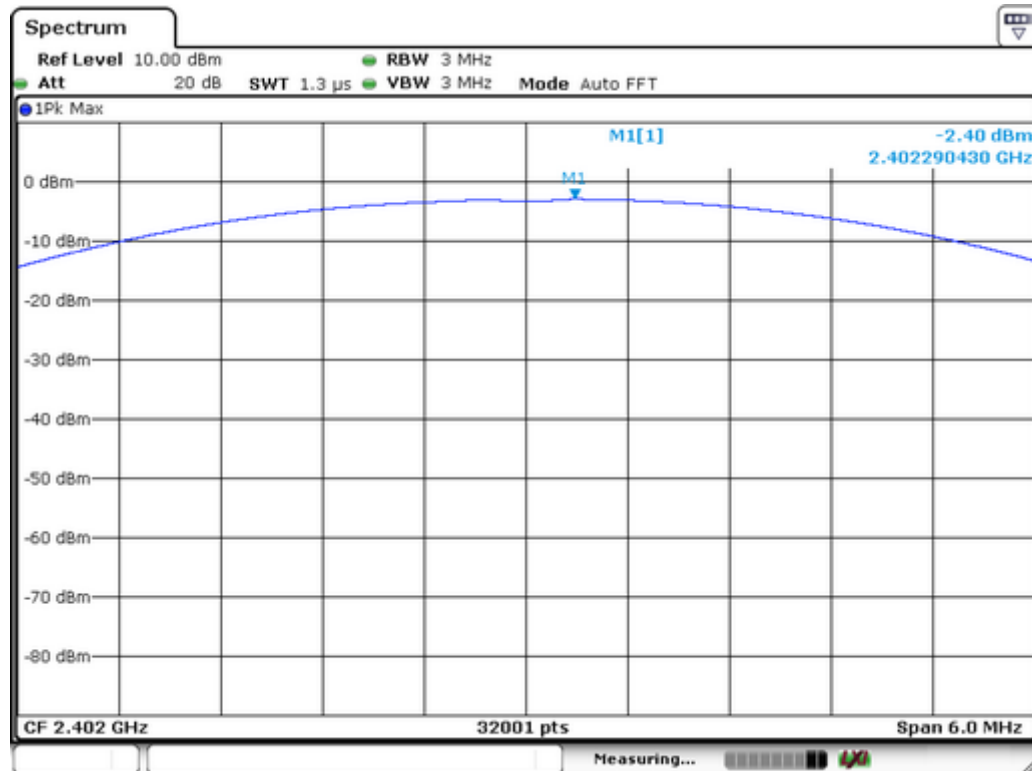
GFSK(1Mbps)					
Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(mW)	(mW)	
CH00	2402	-1.22	0.755	1000	Pass
CH39	2441	0.4	1.096	1000	Pass
CH78	2480	1.21	1.321	1000	Pass

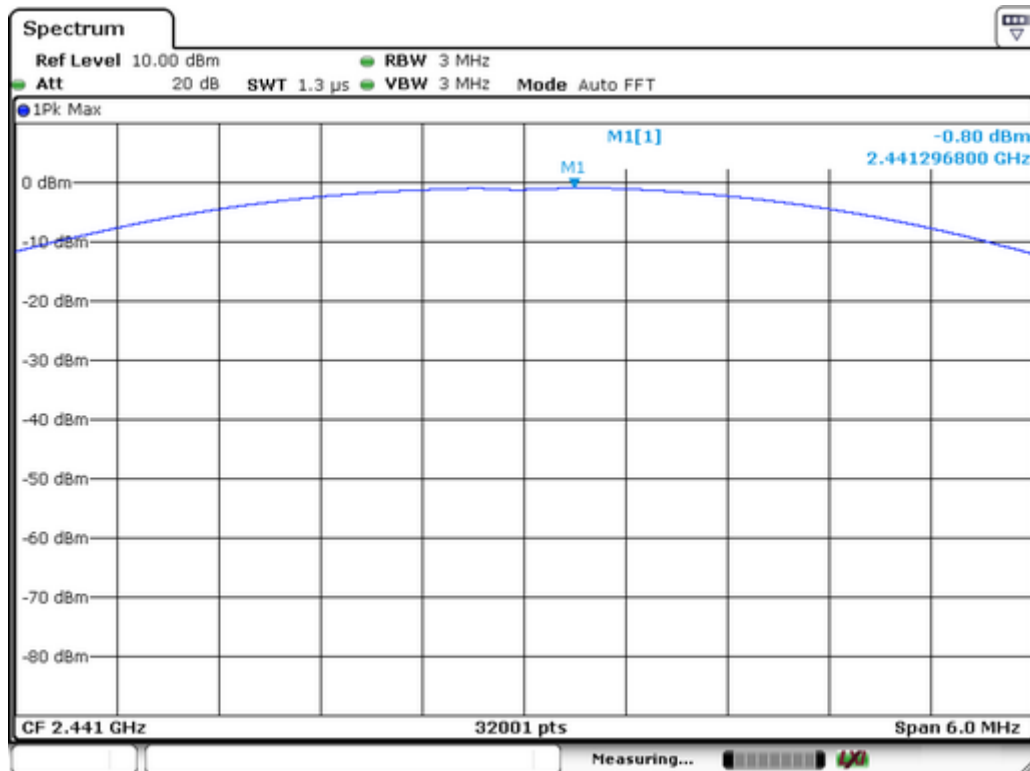
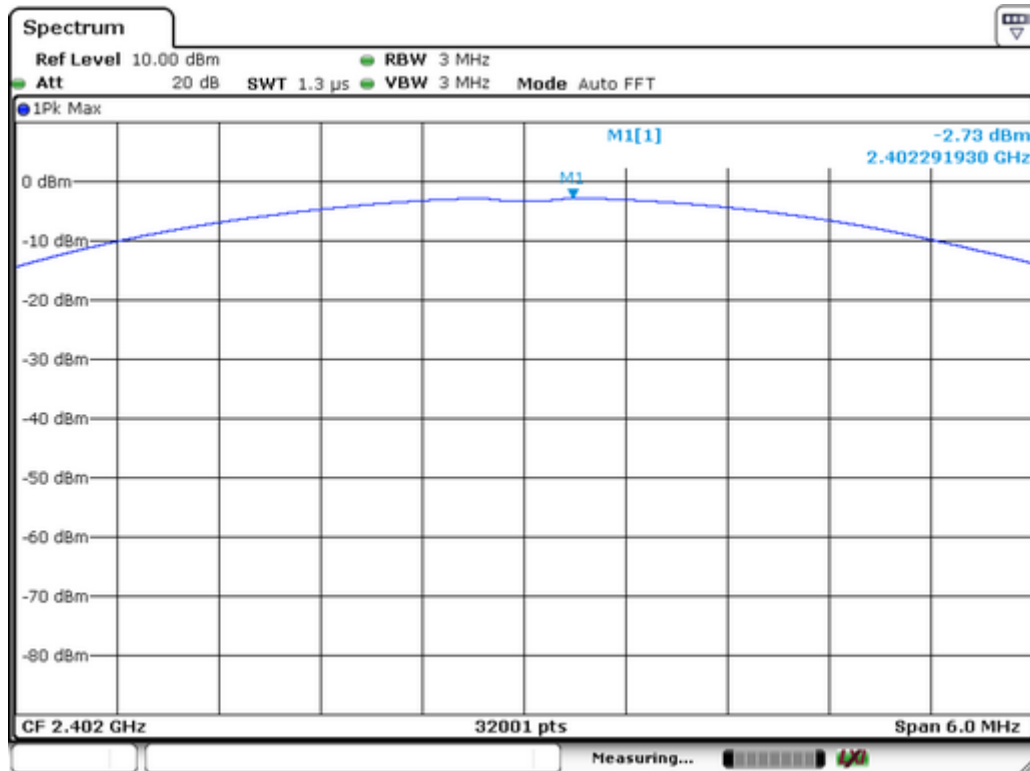


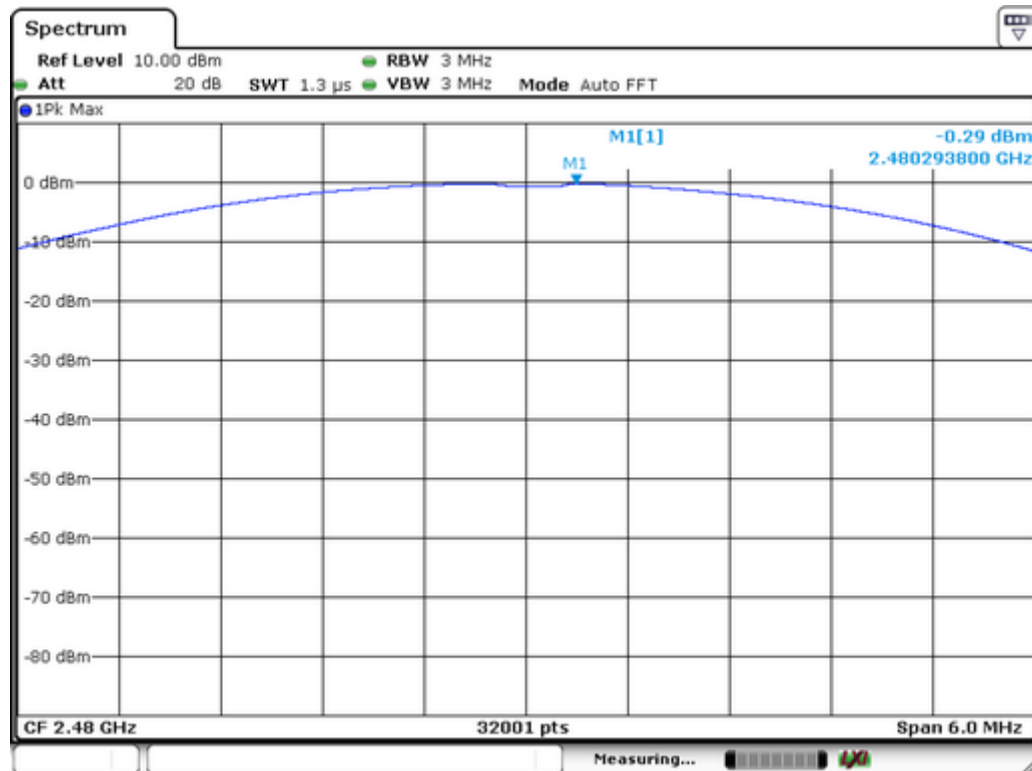


π /4QPSK(2Mbps)

Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(mW)	(mW)	
CH00	2402	-2.40	0.575	125	Pass
CH39	2441	-0.93	0.807	125	Pass
CH78	2480	-0.36	0.920	125	Pass







10 Hopping Channel Separation

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
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 1W.
Test Mode	: Hopping

10.1 Test Procedure

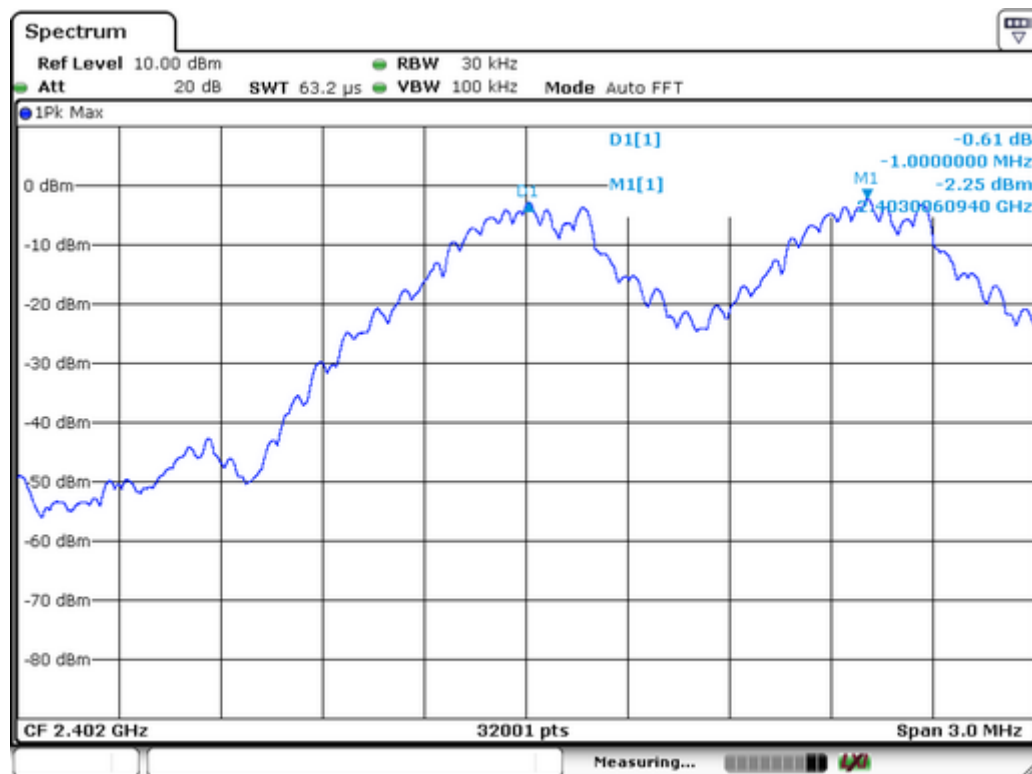
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30KHz. VBW = 100KHz , Span = 3MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

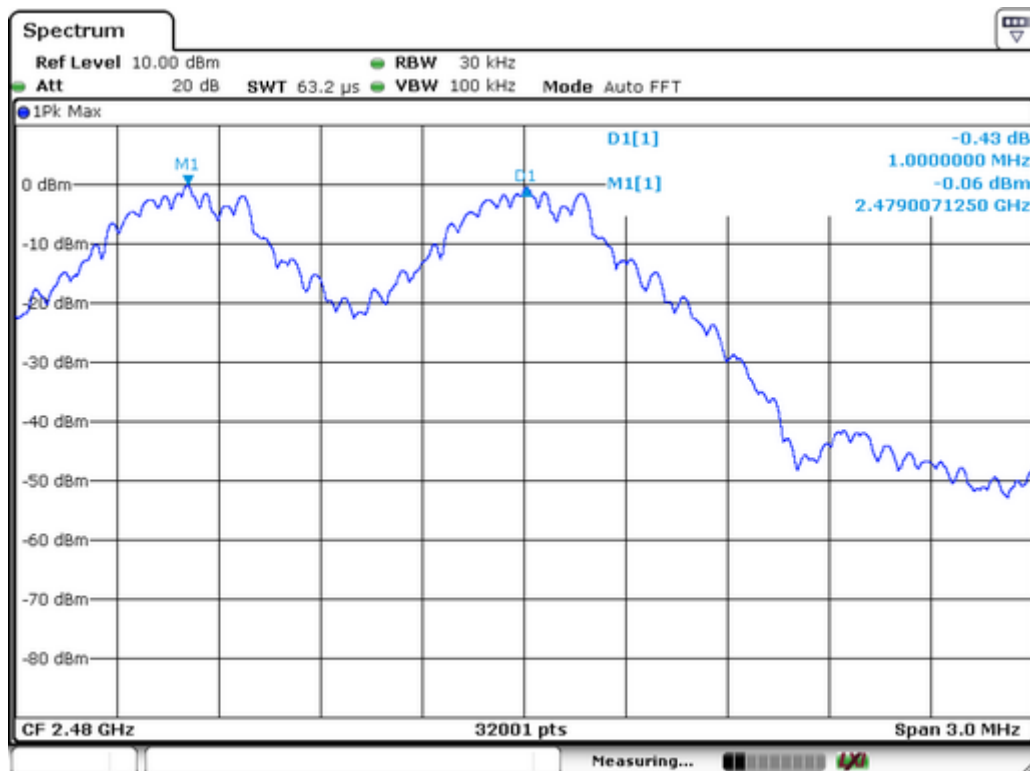
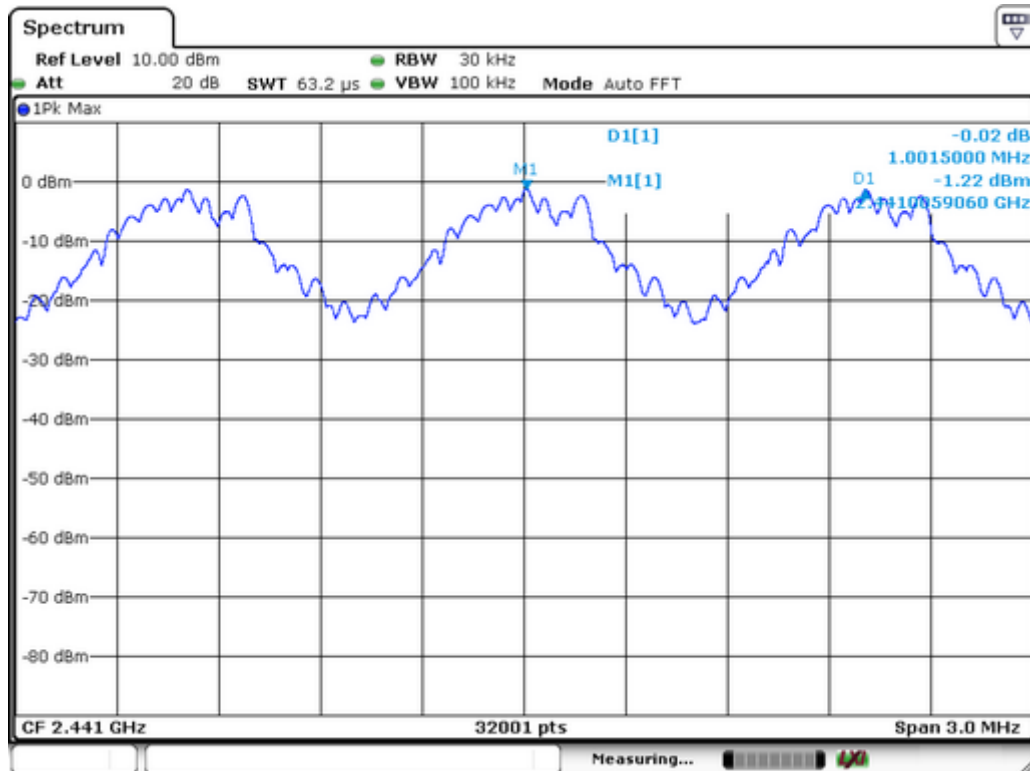


10.2 Test Result

Test Mode:	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)
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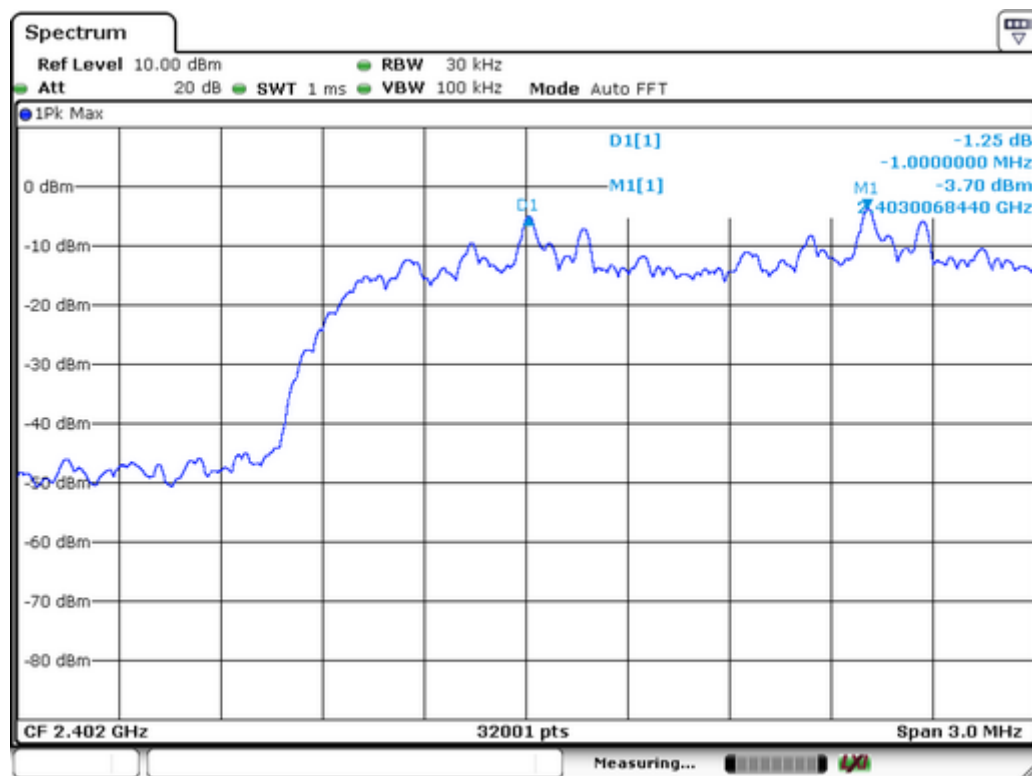
Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit (kHz)
1	2402	1000	>841
40	2441	1001	>840
79	2480	1000	>842

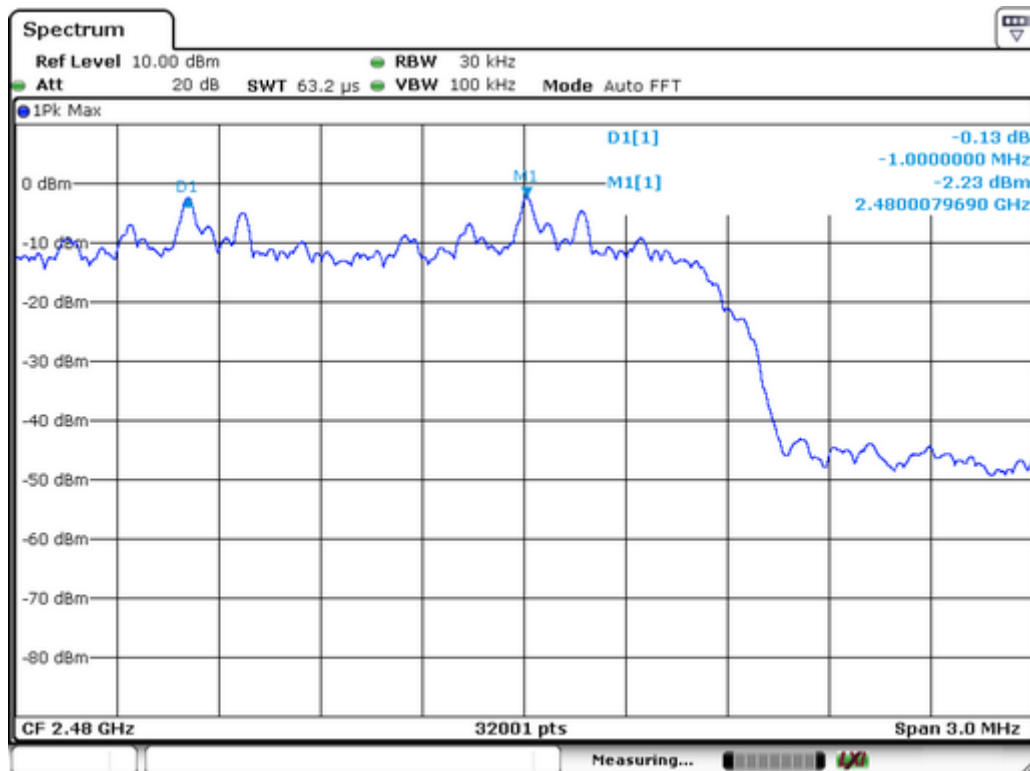
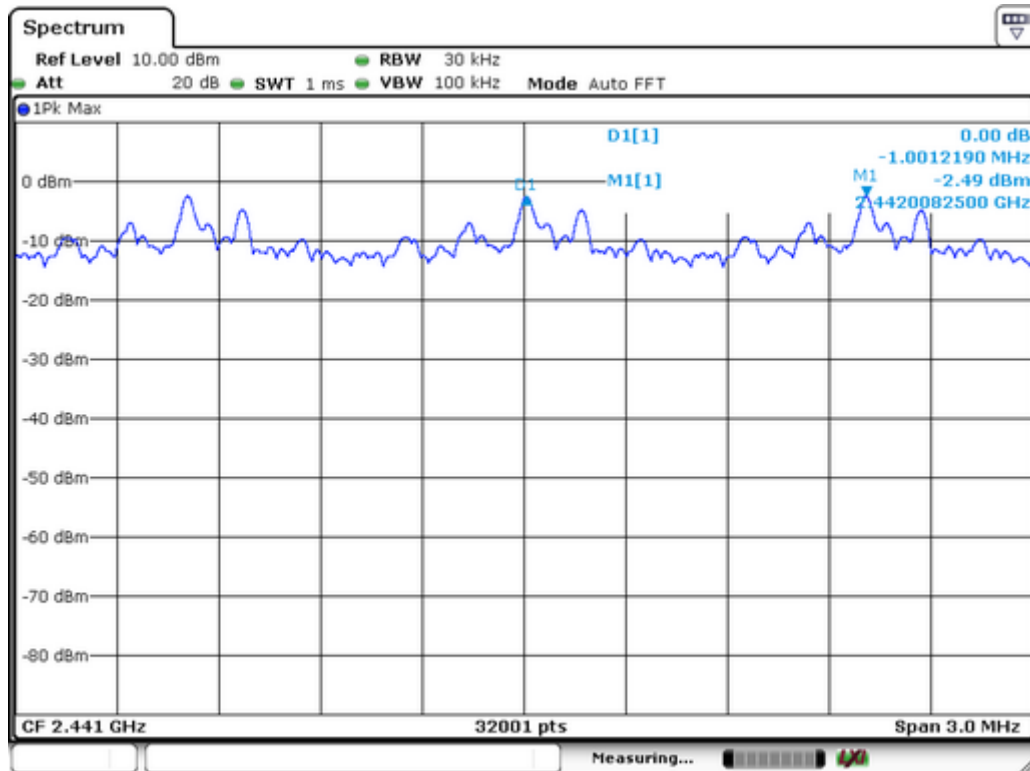




Test Mode:	CH00 / CH39 / CH78 ($\pi/4$ -DQPSK(2Mbps) Mode)
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Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1000	>846
40	2441	1001	>828
79	2480	1000	>834

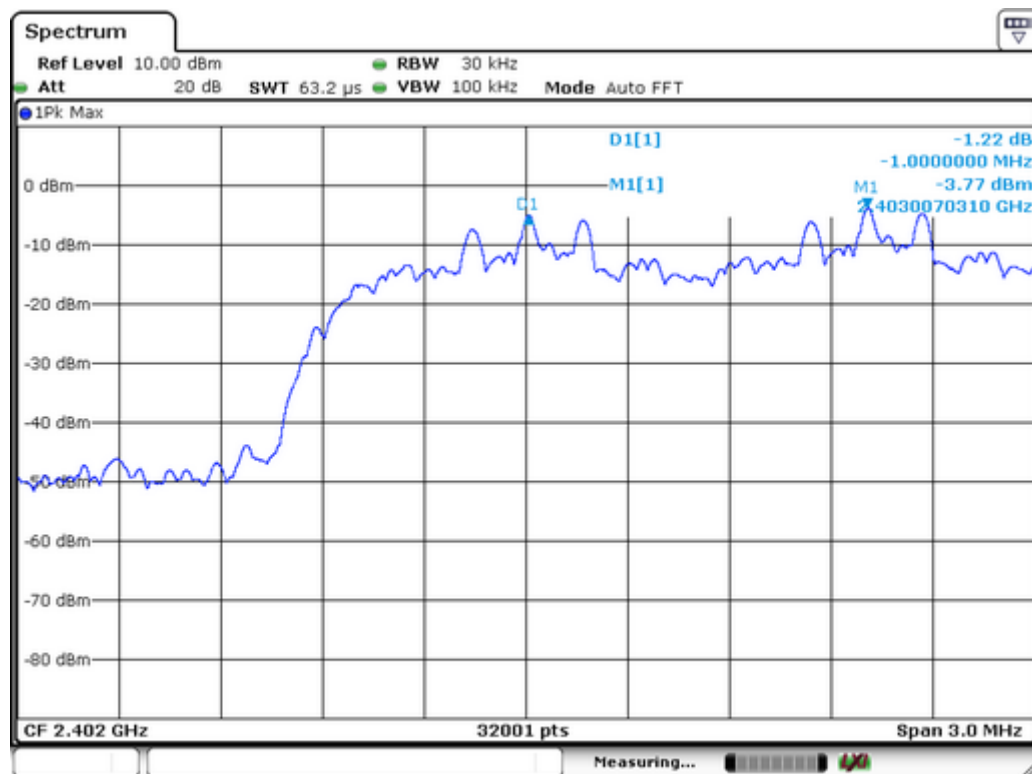


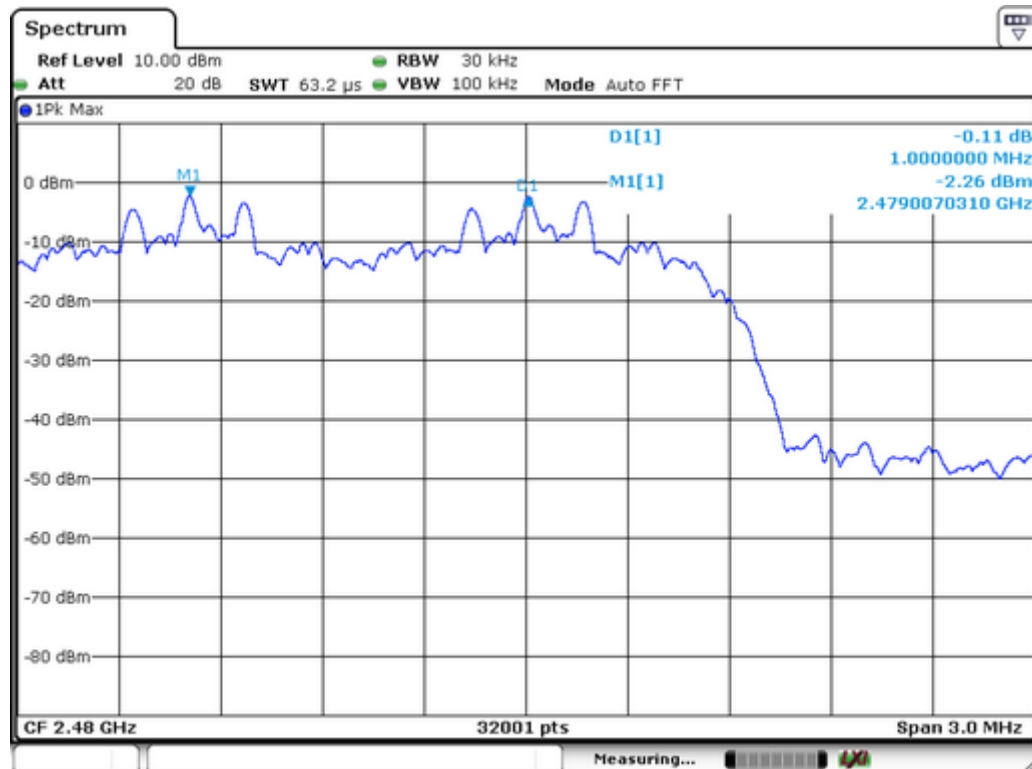
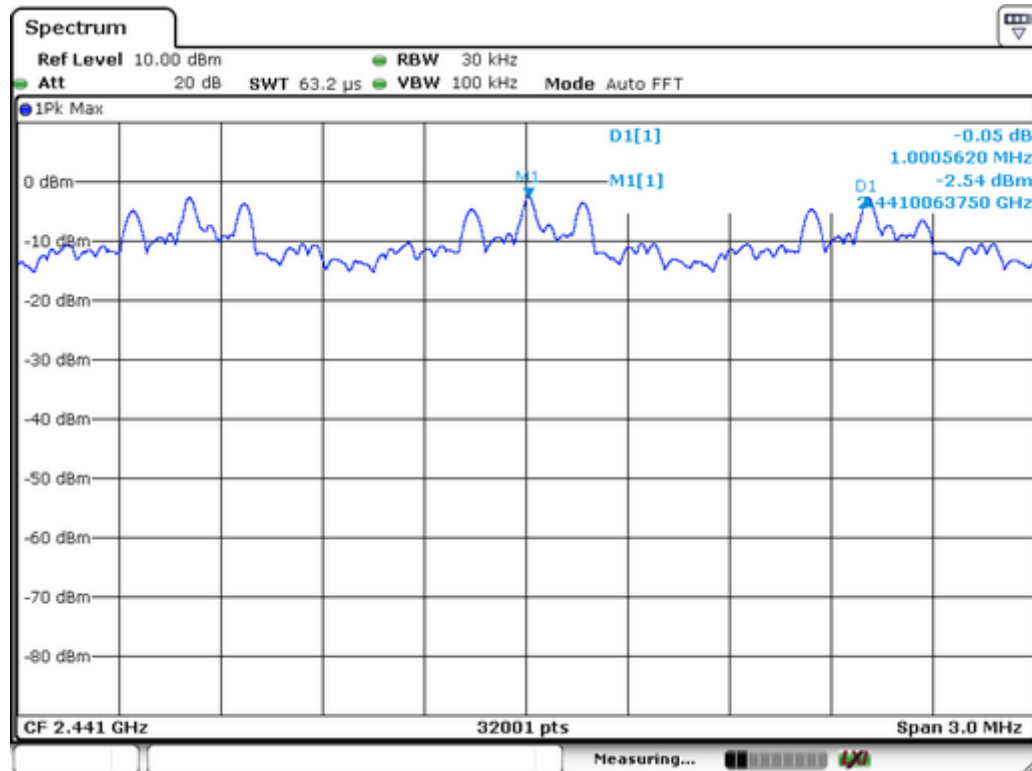




Test Mode:	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)
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Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1000	>819
40	2441	1001	>838
79	2480	1000	>837





11 Number of Hopping Frequency

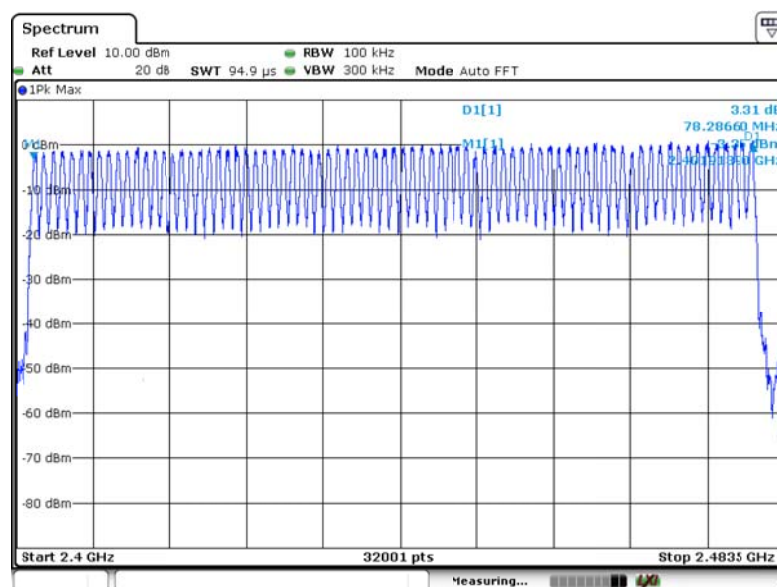
Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode	: Hopping(GFSK)

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. 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;

11.2 Test Result

Channel Number	Limit
79	≥15



12 Dwell Time

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
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.
Test Mode	: Hopping
Remark	: The worst case $\pi/4$ -DQPSK(2Mbps) was recorded

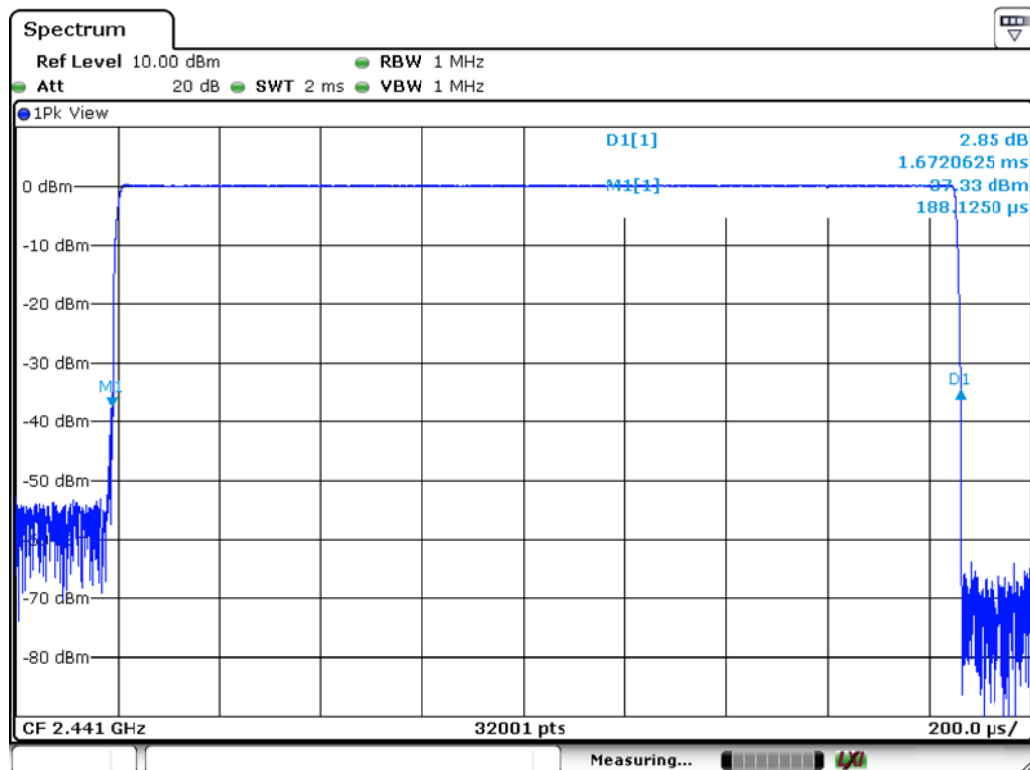
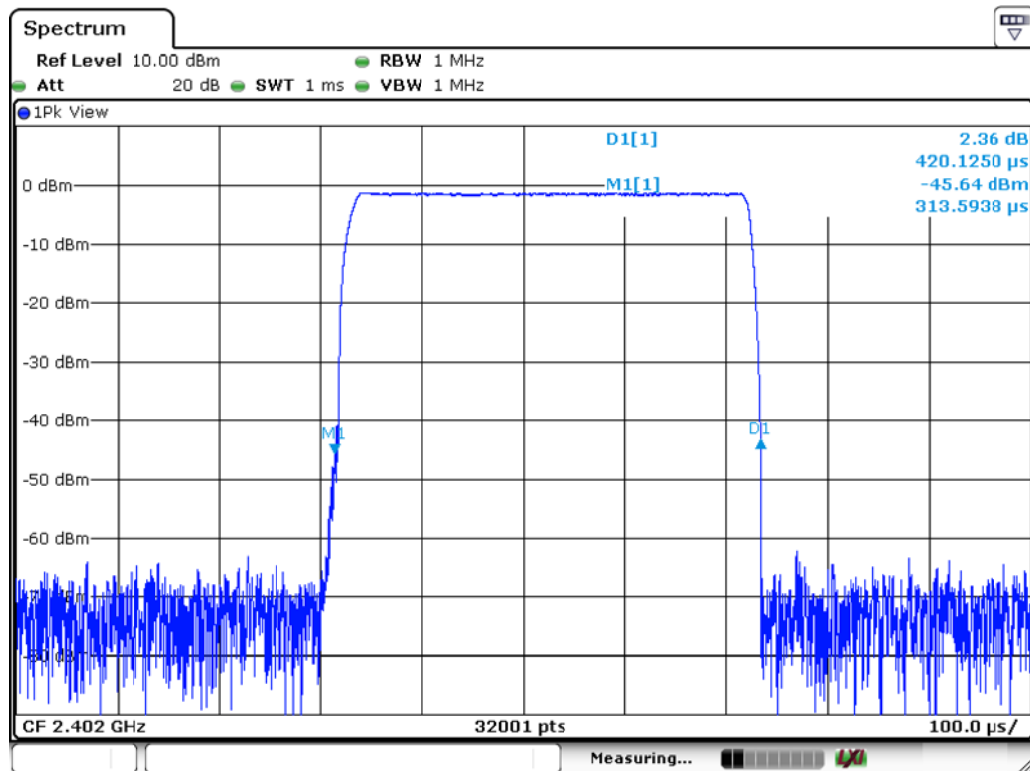
12.1 Test Procedure

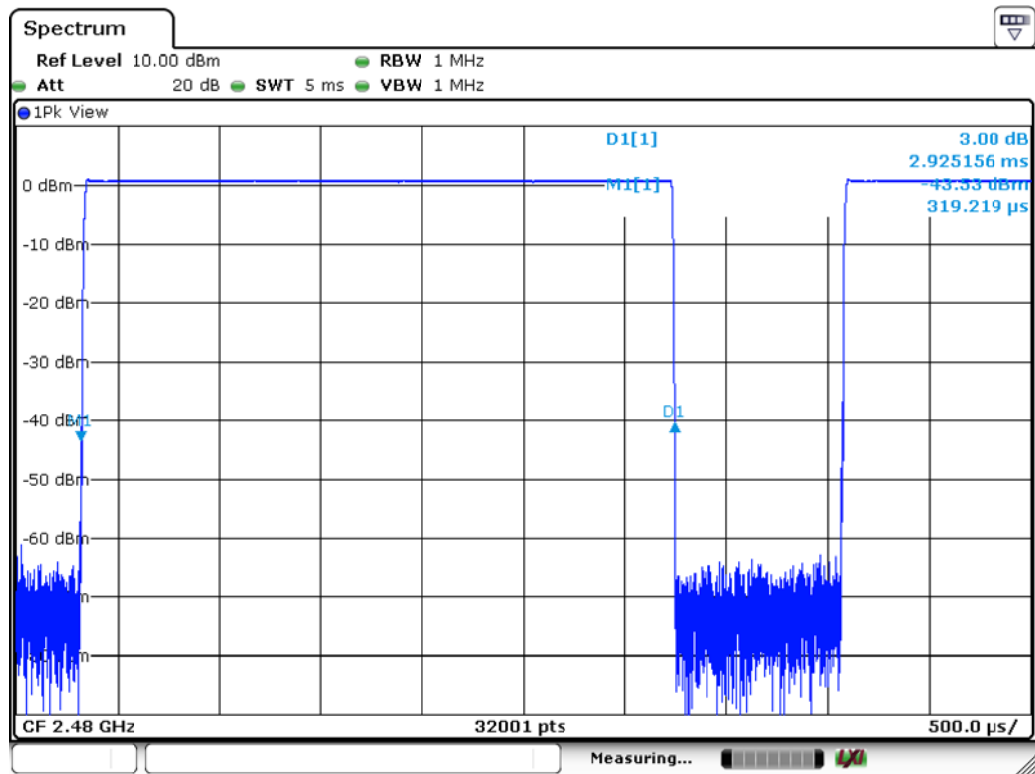
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 1MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, 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).

12.2 Test Result

Test Mode:	$\pi/4$ -DQPSK(2Mbps) –2DH1/2DH3/2DH5
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Mode	Number of transmission in a 31.6(79 Hopping*0.4)	Length of transmissions time(msec)	Result (msec)	Limit (msec)
2DH1	$1600/(2*79) \times 31.6 = 320$	0.420	134.4	400
2DH3	$1600/(4*79) \times 31.6 = 160$	1.672	267.5	400
2DH5	$1600/(6*79) \times 31.6 = 106.67$	2.925	312.0	400



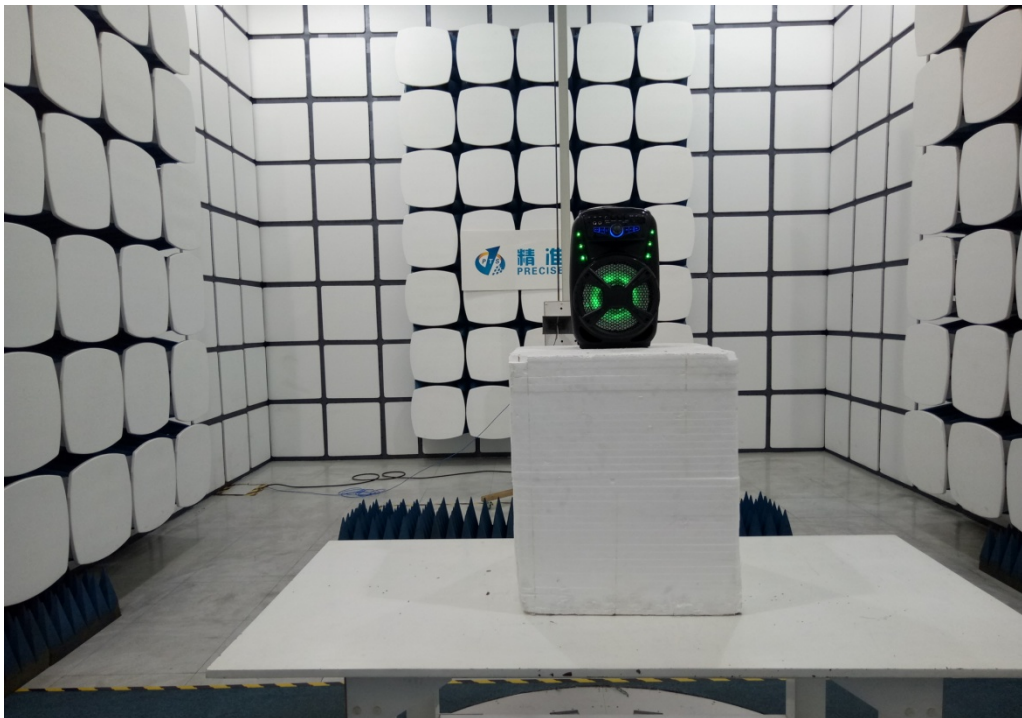


13 Antenna Requirement

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

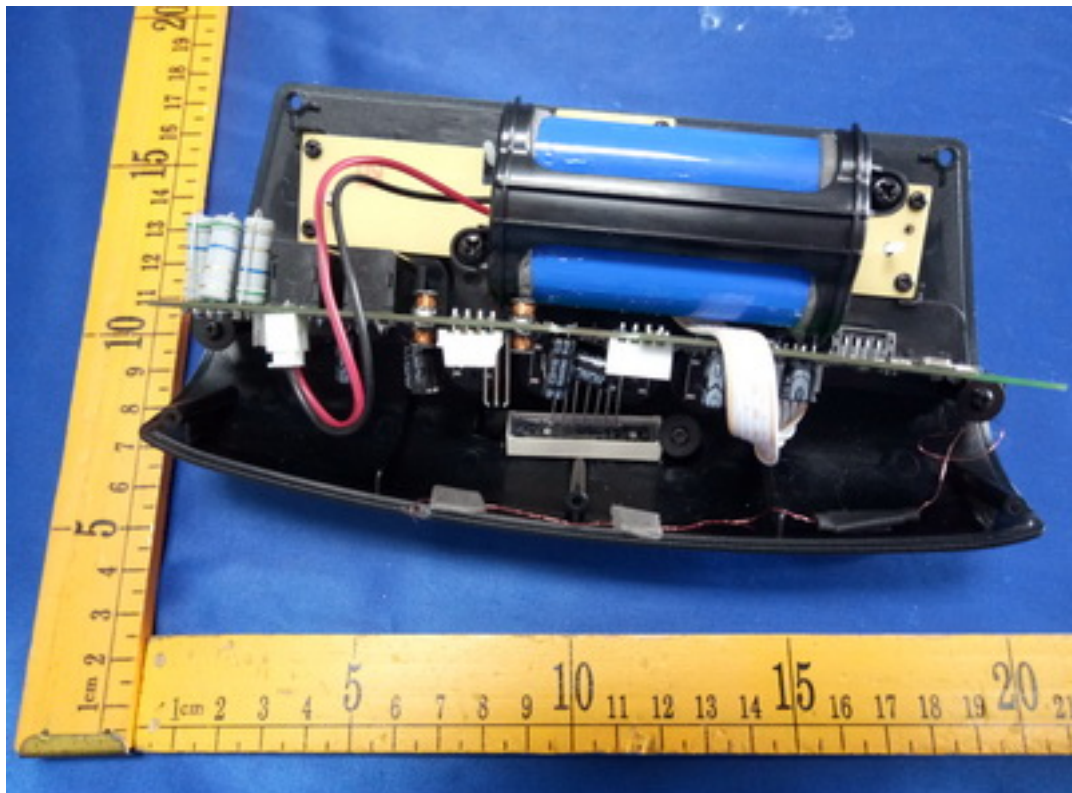
14 TEST PHOTOS

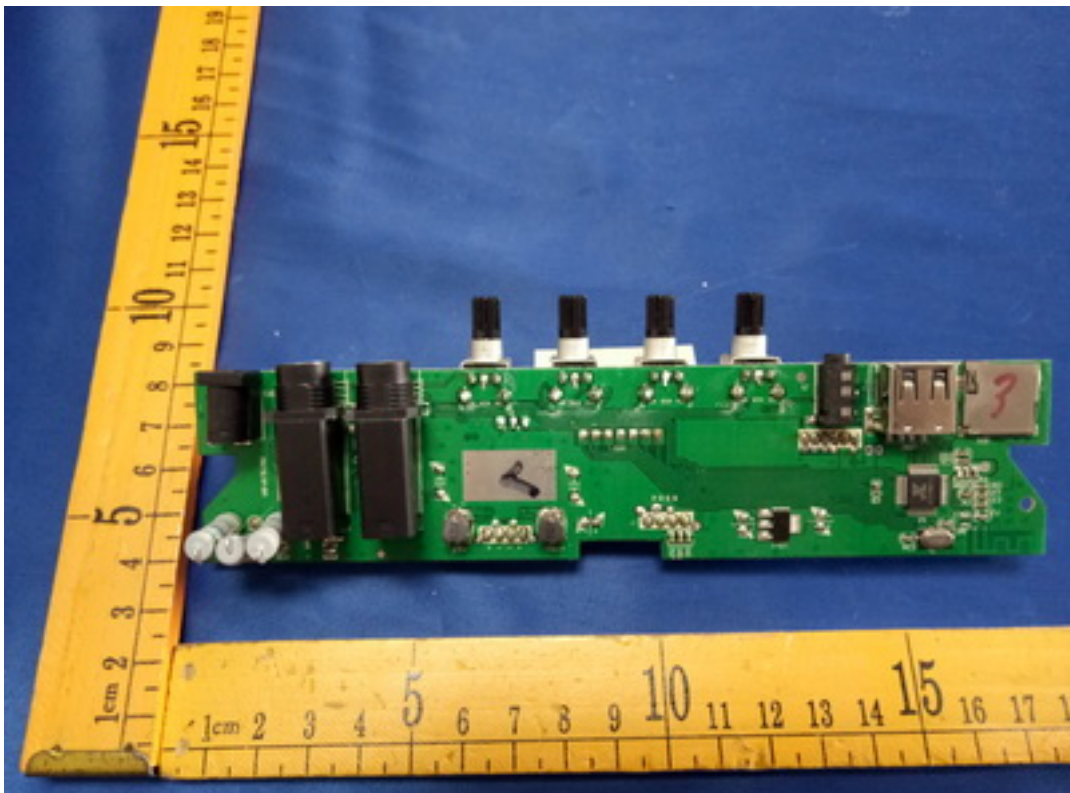
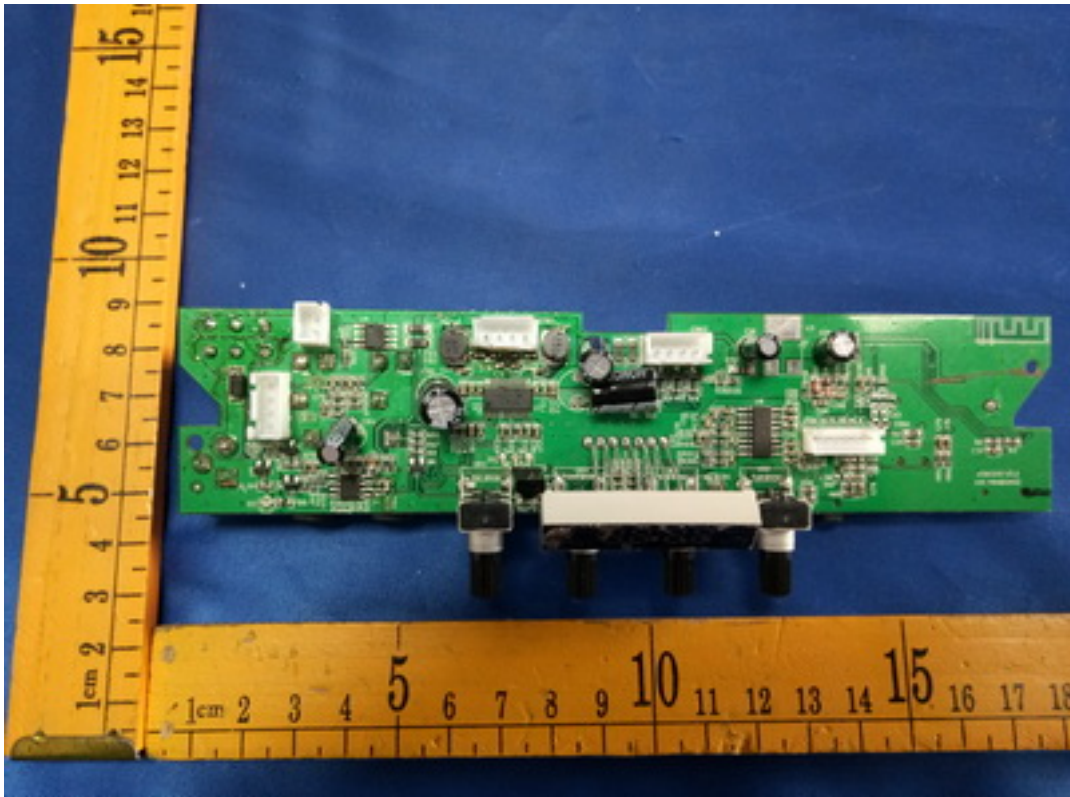


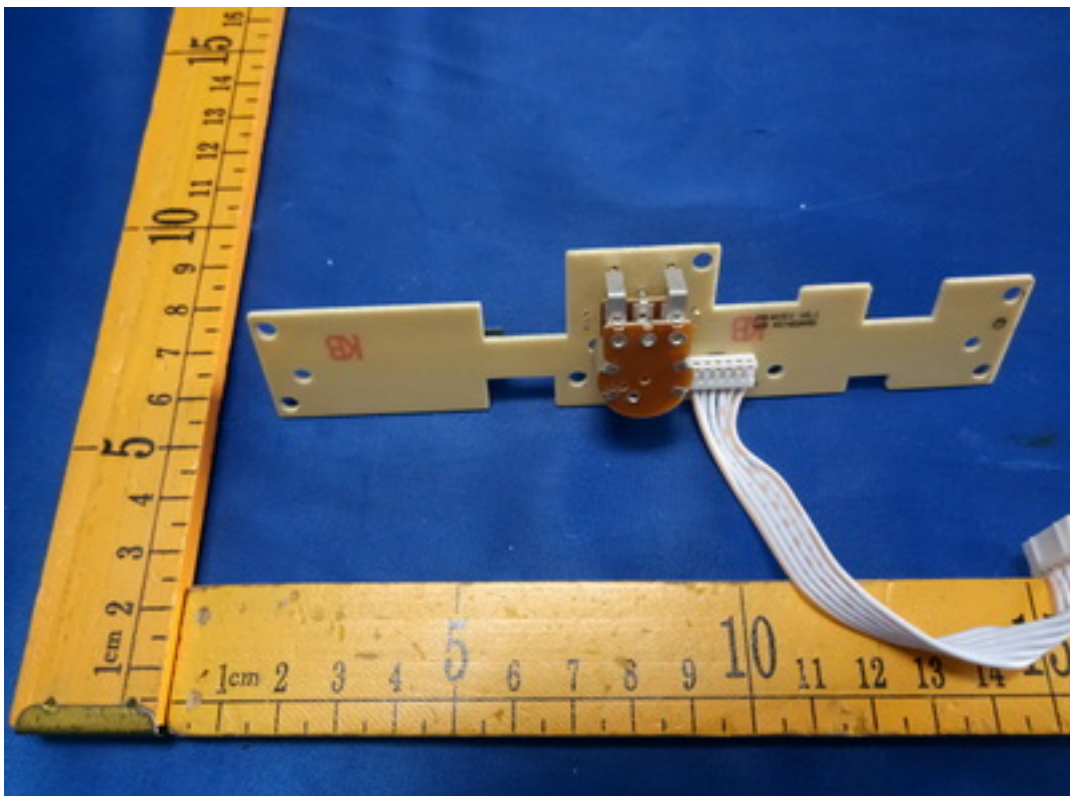
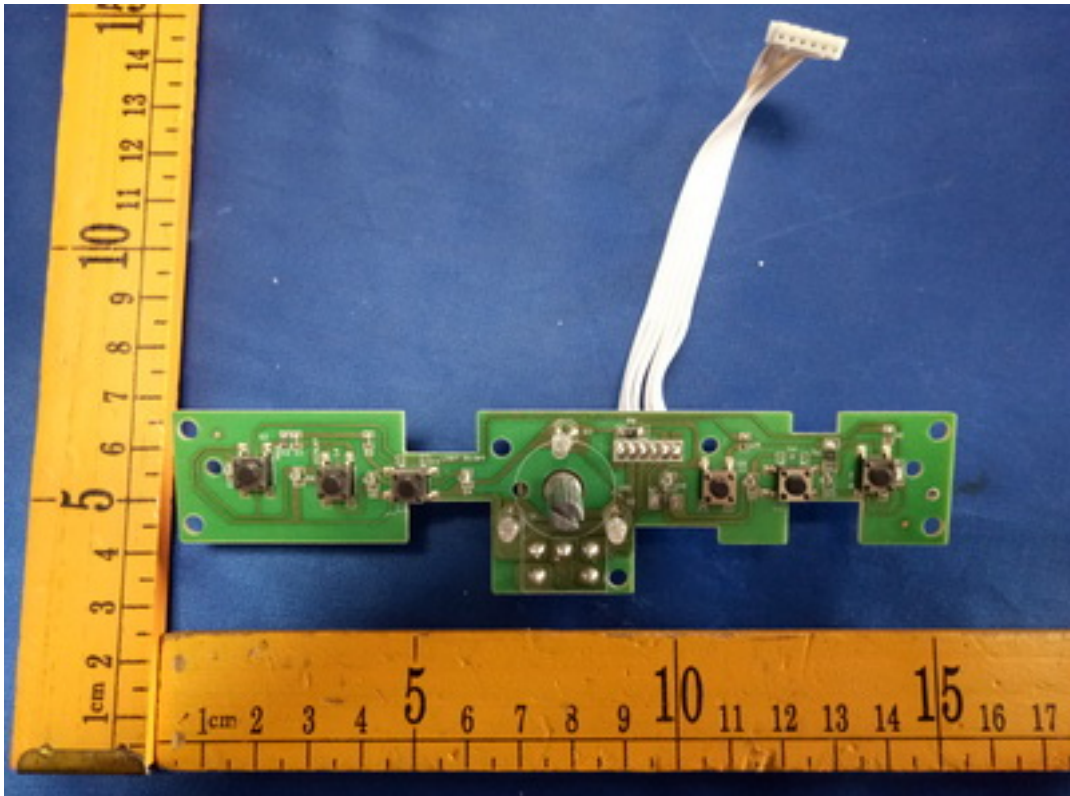


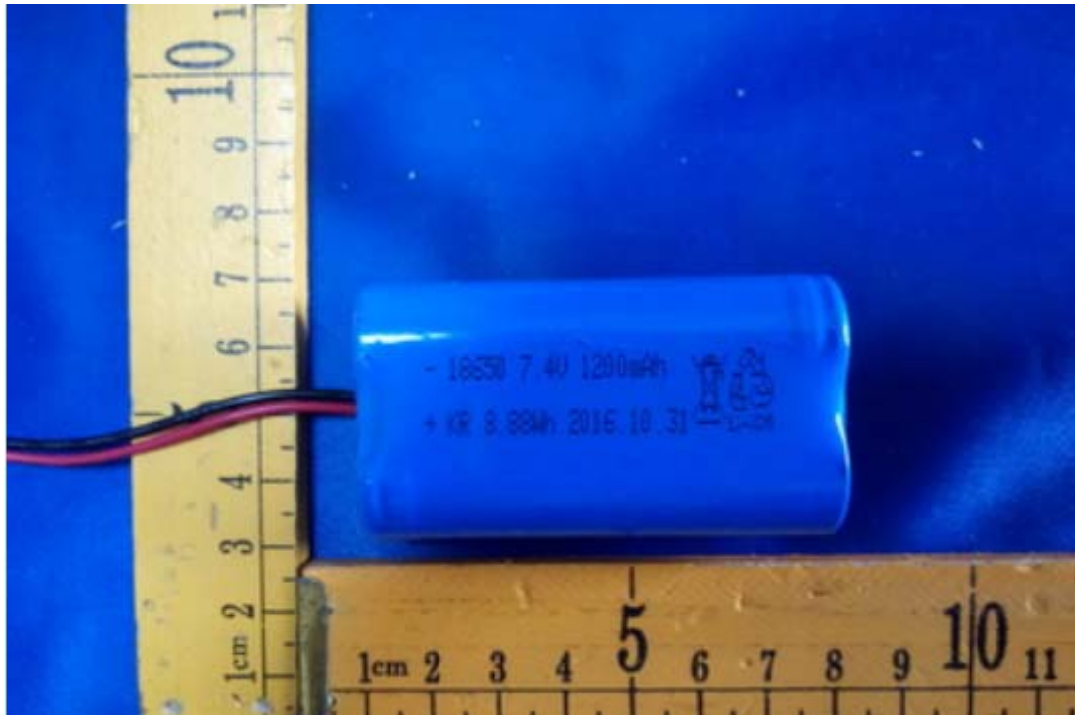
15 EUT PHOTOS













M/N: V6



M/N: V15



M/N: V16

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