FCC TEST REPORT

FCC ID: 2AOSW-VISTAR-0001

Product Name	:	Portable Audio System
Model Name	:	SC-506, VT-811, VT-813, VT-812, VT-830, VT-832, VT-836, VT-844, VT-849, VT-851, SC-506****, SC-509**** (*can be 0-9 or A-Z or blank)
Brand Name	:	SuperSonic
Report No.	:	PTCDQ03171210801E-FC01
Prepared for		
VISTAR ELECTRIC CO., LIMITED		
NO.368 Wushiling, Yangwu, dalang Town, Dongguan City, Guangdong Province, China		
Prepared by		
Dongguan Precise Testing & Certification Corp., Ltd.		
Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China		

1TEST RESULT CERTIFICATION

Applicant's name	:	VISTAR ELECTRIC CO., LIMITED
Address	:	NO.368 Wushiling, Yangwu, dalang Town, Dongguan City, Guangdong Province, China
Manufacture's name	:	VISTAR ELECTRIC CO., LIMITED
Address	:	NO.368 Wushiling, Yangwu, dalang Town, Dongguan City, Guangdong Province, China
Product name	:	Portable Audio System
Model name	:	SC-506, VT-811, VT-813, VT-812, VT-830, VT-832, VT-836, VT-844, VT-849, VT-851, SC-506****, SC-509**** (*can be 0-9 or A-Z or blank)
Brand Name	:	SuperSonic
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10:2013
Test Date	:	December 21, 2017 to January 15, 2018
Date of Issue	:	January 17, 2018
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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Test Engineer:

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

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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:

1. The EUT is powered by full-charged battery during the test.

3 TEST FACILITY

Dongguan Precise Testing & Certification Corp., Ltd.

Address: Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

Test Lab: Shenzhen BCTC Testing Co., Ltd.

Address: BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China

FCC Registered No.: 712850

Test items: Radiated Spurious Emission(18GHz to 25GHz)

4 General Information

4.1 General Description of E.U.T.

Product Name	:	Portable Audio System
Model Name	:	SC-506, VT-811, VT-813, VT-812, VT-830, VT-832, VT-836, VT-844, VT-849, VT-851, SC-506****, SC-509**** (*can be 0-9 or A-Z or blank)
Model Description	:	Only the model names and colors are different
Bluetooth Version	:	BT 4.2+EDR
Operating frequency	:	2402-2480MHz
Numbers of Channel	:	79 channels
Antenna Type:	:	PCB Print Antenna
Antenna Gain:	:	1.2 dBi
Type of Modulation	:	GFSK, Π/4-DQPSK, 8DPSK
Power supply	:	AC 100-240V, 50-60Hz, 13W DC 4*1.5V Battery

4.2 Test Mode

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes GFSK, Π/4-DQPSK, 8DPSK have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

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	-	-

Channel	**Frequency(MHz)**
0	2402
39	2441
78	2480

5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Apr 07, 2018
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Oct 09, 2018
Antenna Connector	Florida RF Labs	N/A	RF01#	N/A	Aug. 26, 2018

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions(Test Frequency from 9KHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug 31, 2018
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug 31, 2018
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 03, 2018
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 03, 2018
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Oct. 13, 2018
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 31, 2018
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 31, 2018
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 03, 2018

Radiated Emission (Test Frequency from 18GHz-25GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-26.5GHz	2018.08.26
Test Receiver	R&S	ESPI	101396	9KHz-7GHz	2018.08.26
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	2018.09.02
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	2018.08.26
RF Cable	R&S	R204	R21X	1GHz-40GHz	2018.08.26

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep. 03, 2018
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep. 03, 2018

5.2 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
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	

5.3 Description of Support Units

Equipment	Model No.	Series No.
N/A	N/A	N/A

6 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)

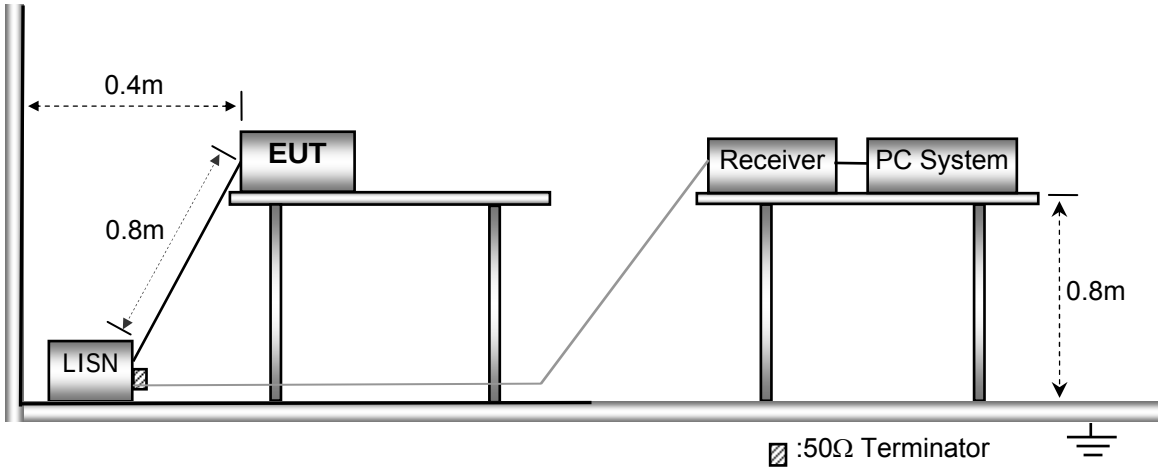
6.1 E.U.T. Operation

Operating Environment **:**

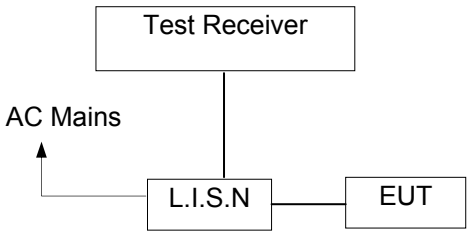
Temperature:	:	25.5 °C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.2kPa
Test Voltage	:	AC 120V/60Hz

6.2 EUT Setup

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



6.3 Test SET-UP (Block Diagram of Configuration)



6.4 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.

6.5 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.

6.6 Measurement Description

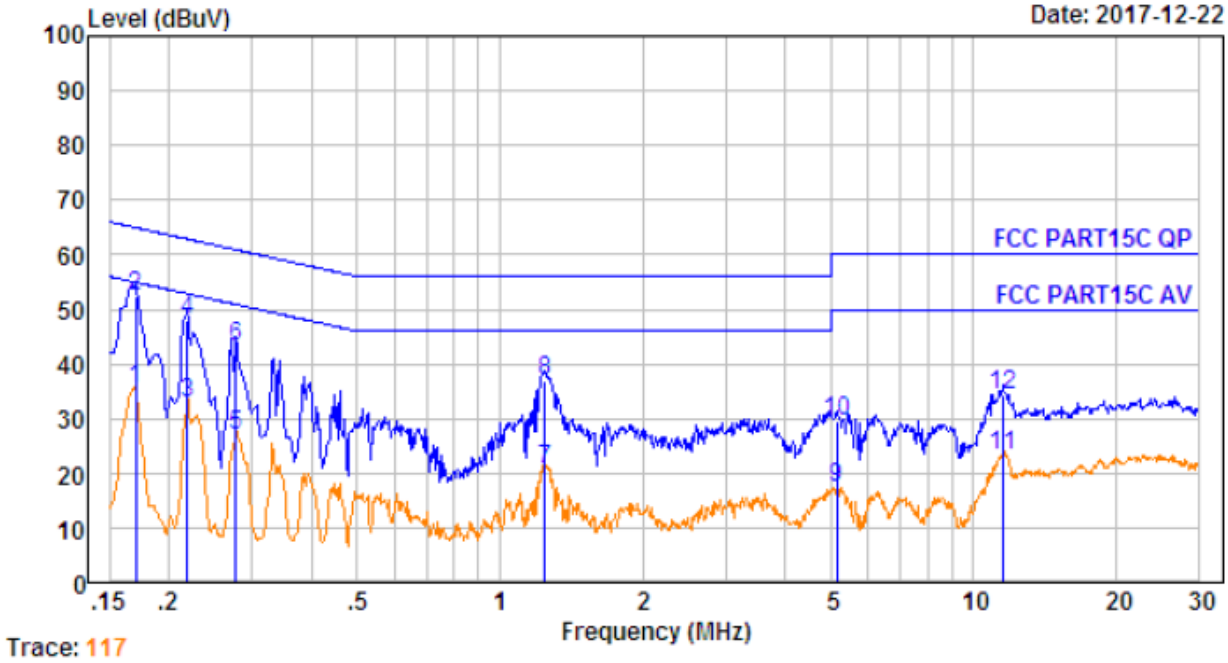
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass

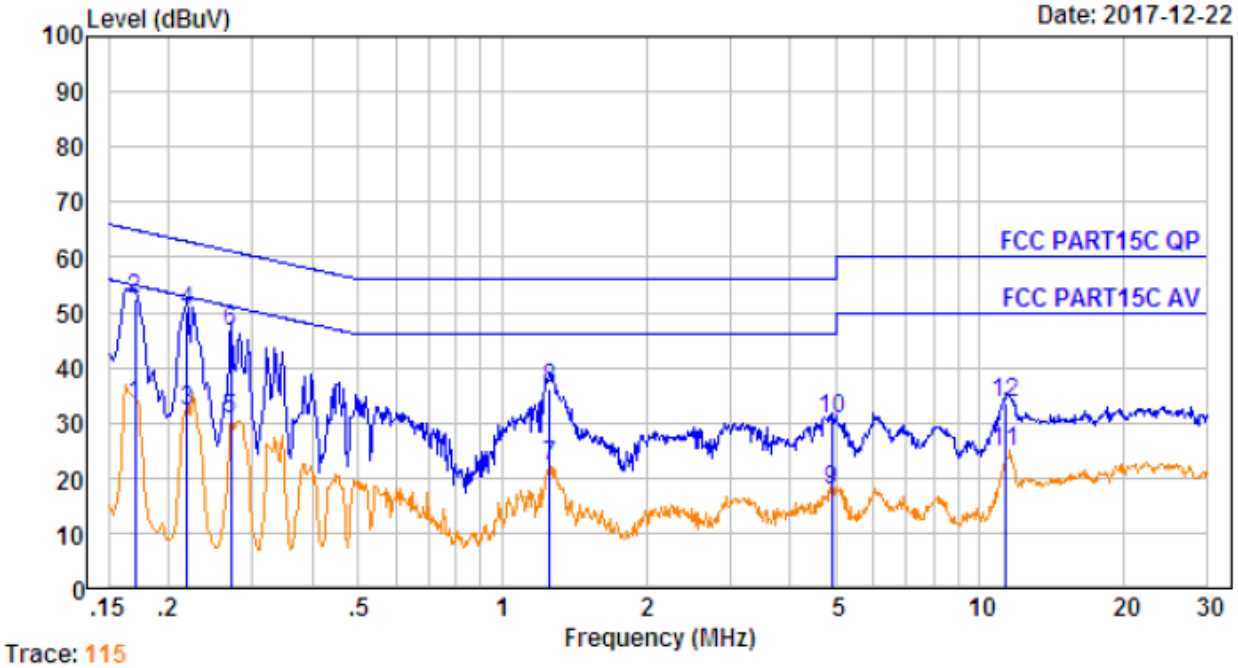
Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (GFSK) are recorded in the following pages and the others modulation methods do not exceed the limits.

Line -120V/60Hz:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.170	0.24	9.54	25.71	35.49	54.94	-19.45	Average
2.	0.170	0.24	9.54	42.71	52.49	64.94	-12.45	QP
3.	0.219	0.30	9.61	23.04	32.95	52.88	-19.93	Average
4.	0.219	0.30	9.61	38.04	47.95	62.88	-14.93	QP
5.	0.277	0.35	9.66	17.02	27.03	50.90	-23.87	Average
6.	0.277	0.35	9.66	33.02	43.03	60.90	-17.87	QP
7.	1.242	0.46	9.83	10.55	20.84	46.00	-25.16	Average
8.	1.242	0.46	9.83	26.55	36.84	56.00	-19.16	QP
9.	5.139	0.51	9.92	7.02	17.45	50.00	-32.55	Average
10.	5.139	0.51	9.92	19.02	29.45	60.00	-30.55	QP
11.	11.498	0.56	9.98	12.68	23.22	50.00	-26.78	Average
12.	11.498	0.56	9.98	23.68	34.22	60.00	-25.78	QP

Neutral -120V/60Hz:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.170	0.24	9.57	23.58	33.39	54.94	-21.55	Average
2.	0.170	0.24	9.57	42.58	52.39	64.94	-12.55	QP
3.	0.219	0.30	9.64	22.32	32.26	52.88	-20.62	Average
4.	0.219	0.30	9.64	40.32	50.26	62.88	-12.62	QP
5.	0.270	0.35	9.68	20.46	30.49	51.12	-20.63	Average
6.	0.270	0.35	9.68	36.46	46.49	61.12	-14.63	QP
7.	1.255	0.46	9.86	11.67	21.99	46.00	-24.01	Average
8.	1.255	0.46	9.86	25.67	35.99	56.00	-20.01	QP
9.	4.900	0.50	9.96	7.28	17.74	46.00	-28.26	Average
10.	4.900	0.50	9.96	20.28	30.74	56.00	-25.26	QP
11.	11.377	0.56	10.03	13.98	24.57	50.00	-25.43	Average
12.	11.377	0.56	10.03	22.98	33.57	60.00	-26.43	QP

7 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(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

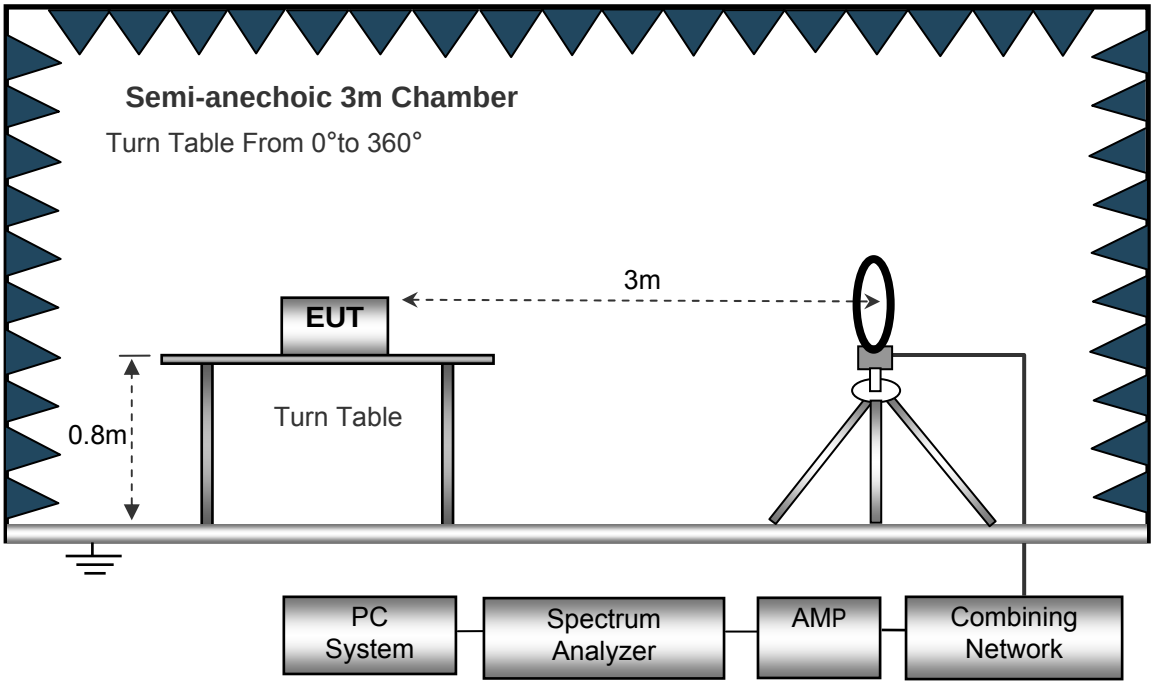
Atmospheric Pressure: : 101.2kPa

Test Voltage : DC 4*1.5V Battery

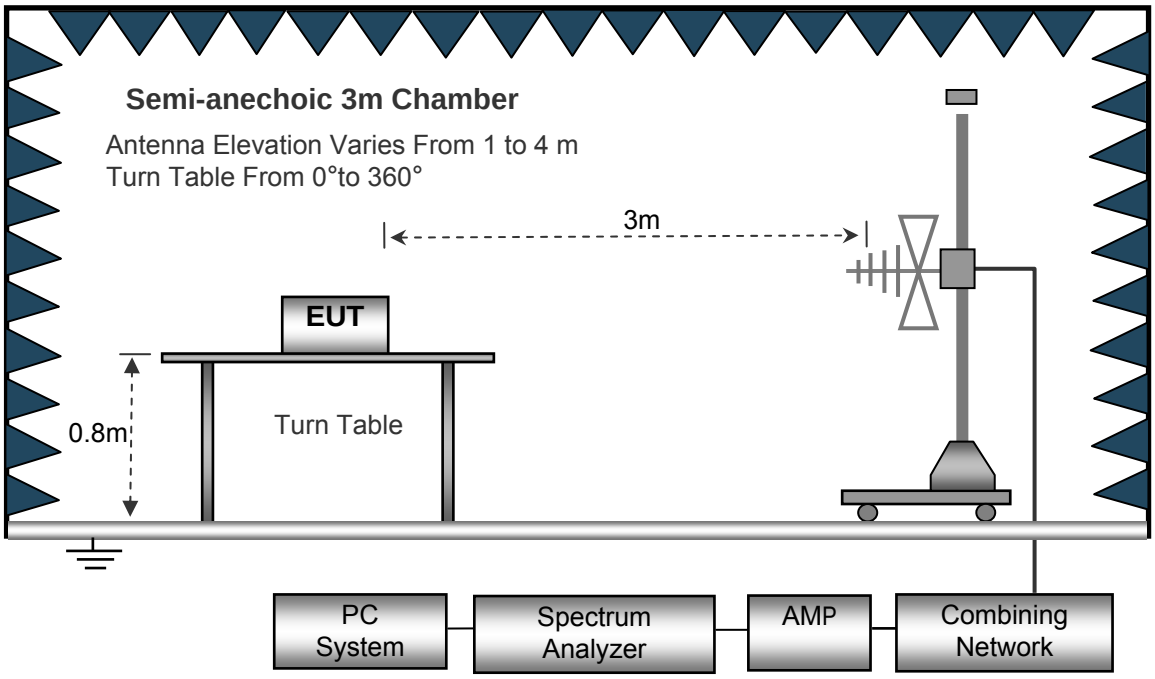
7.2 Test Setup

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

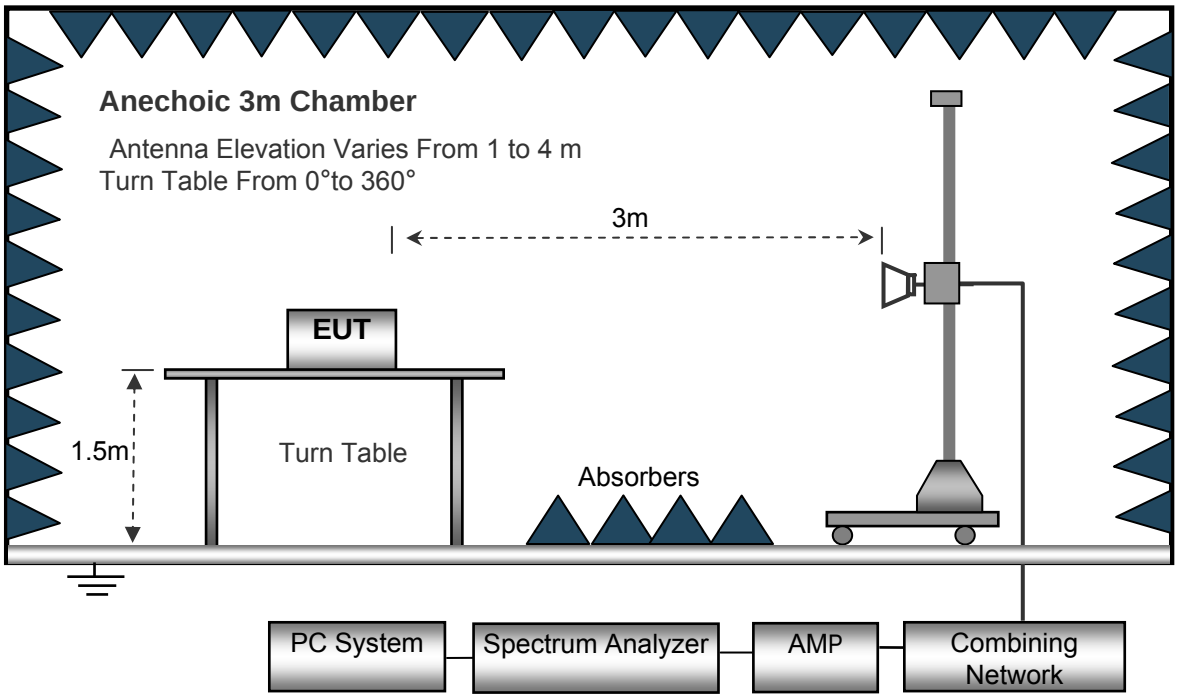
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 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

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

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 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

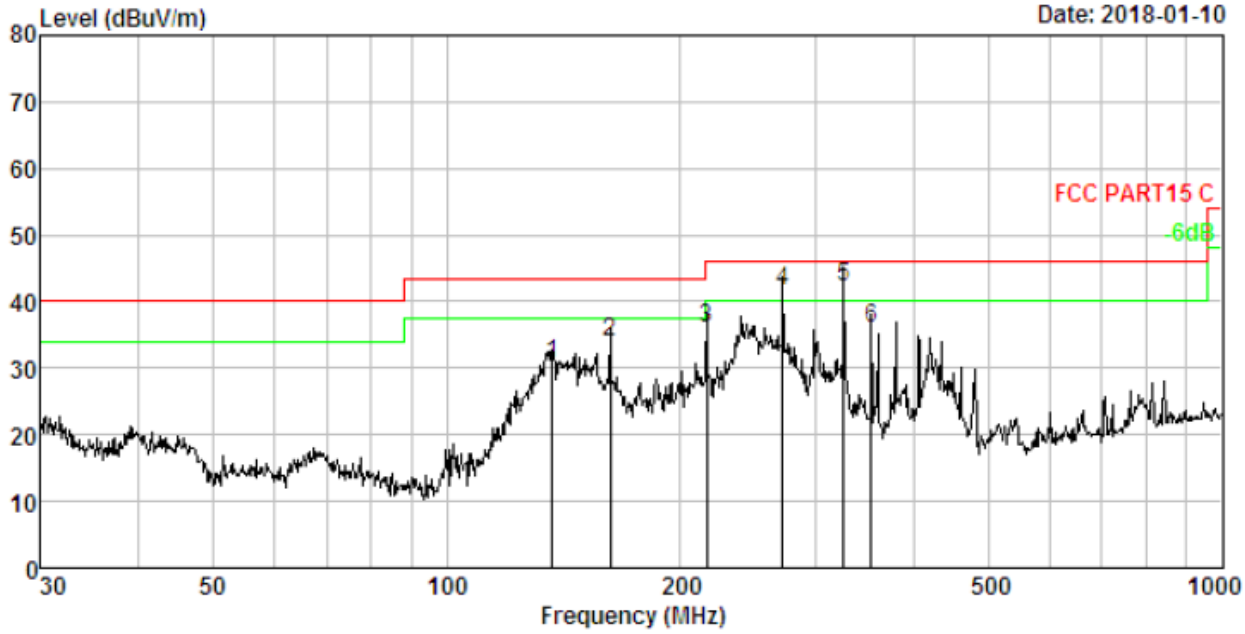
The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

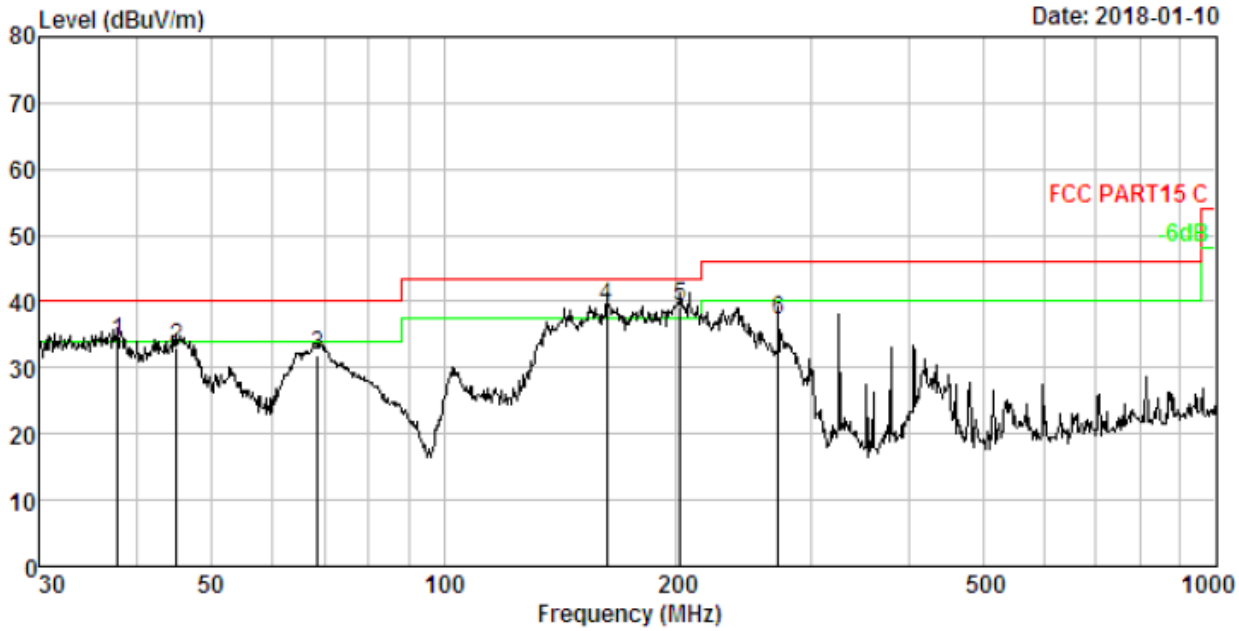
Please refer to the following test plots:

Test plot for Horizontal: GFSK(2402MHz)



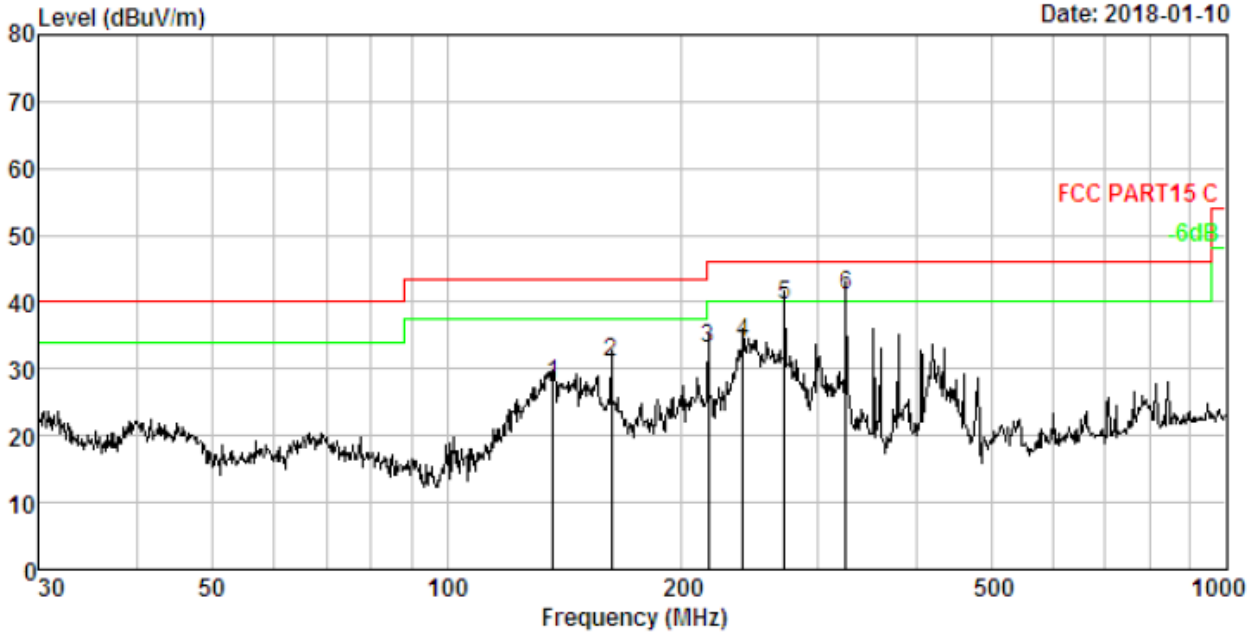
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	136.939	2.43	13.14	45.76	30.50	30.83	43.50	-12.67	QP
2.	162.611	2.59	13.73	48.13	30.56	33.89	43.50	-9.61	QP
3.	216.783	2.85	10.70	53.13	30.66	36.02	46.00	-9.98	QP
4.	271.325	3.05	12.52	56.80	30.74	41.63	46.00	-4.37	QP
5.	325.596	3.21	13.78	55.99	30.80	42.18	46.00	-3.82	QP
6.	352.943	3.29	14.29	49.40	30.83	36.15	46.00	-9.85	QP

Test plot for Vertical: GFSK(2402MHz)



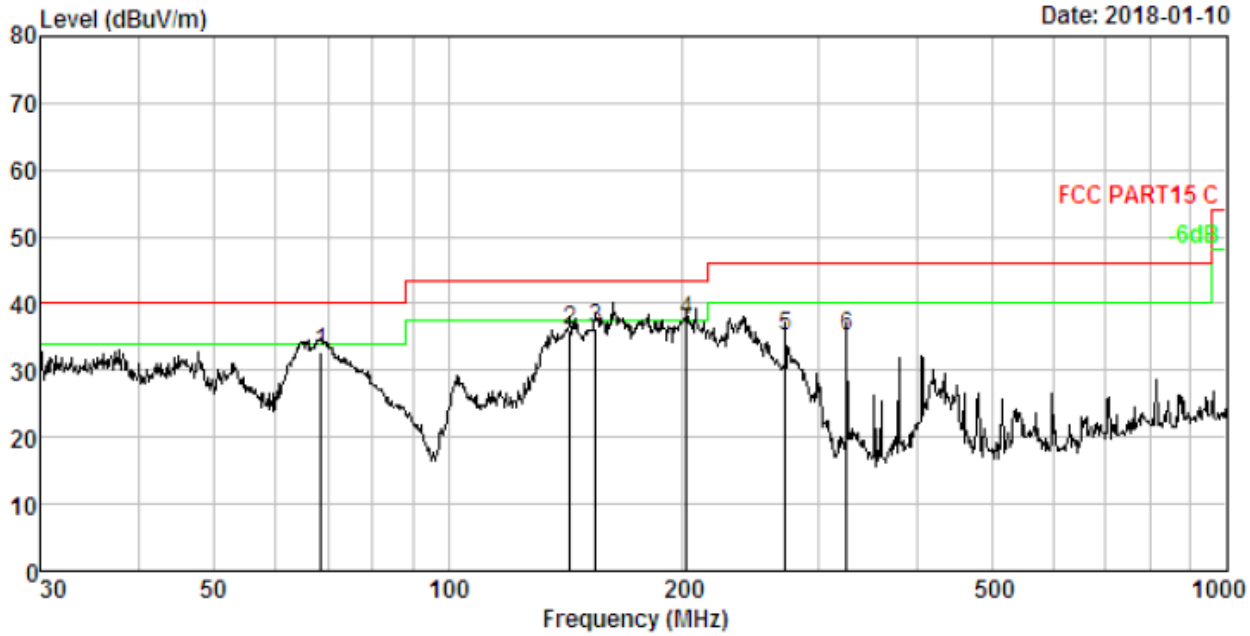
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	37.812	1.26	13.54	49.20	30.05	33.95	40.00	-6.05	QP
2.	45.058	1.42	13.24	48.66	30.11	33.21	40.00	-6.79	QP
3.	68.631	1.80	10.48	49.77	30.26	31.79	40.00	-8.21	QP
4.	162.611	2.59	13.73	53.45	30.56	39.21	43.50	-4.29	QP
5.	202.810	2.79	10.44	56.79	30.63	39.39	43.50	-4.11	QP
6.	271.325	3.05	12.52	52.38	30.74	37.21	46.00	-8.79	QP

Test plot for Horizontal: GFSK(2441MHz)



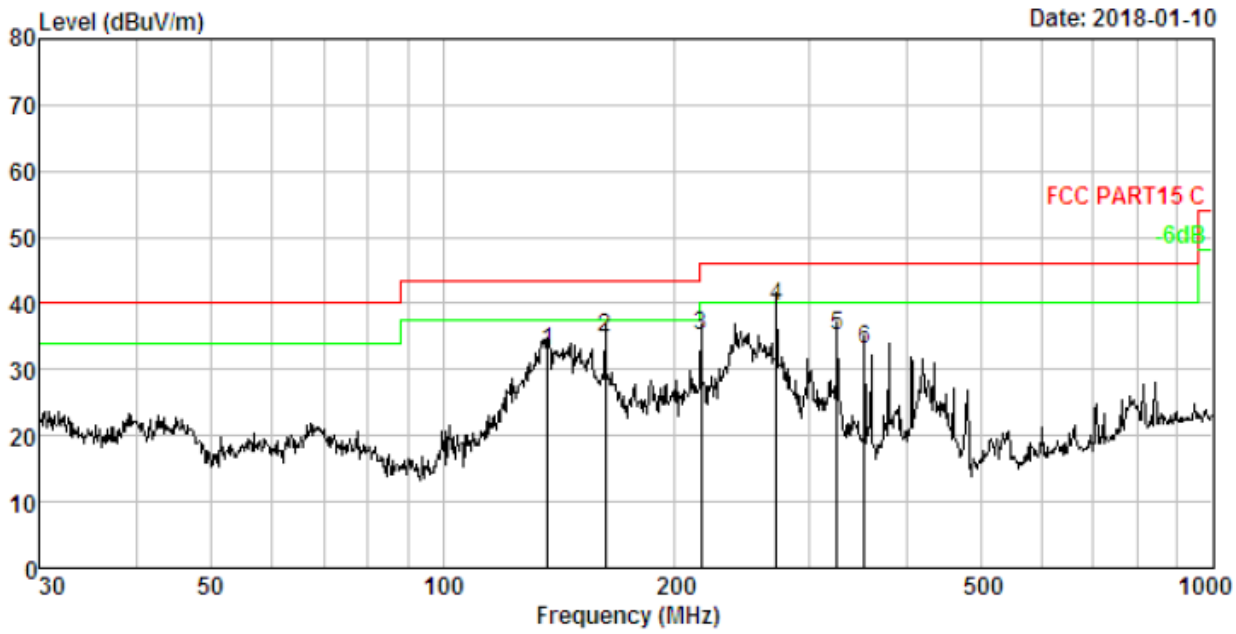
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	136.939	2.43	13.14	42.76	30.50	27.83	43.50	-15.67	QP
2.	162.611	2.59	13.73	45.13	30.56	30.89	43.50	-12.61	QP
3.	216.783	2.85	10.70	50.13	30.66	33.02	46.00	-12.98	QP
4.	239.987	2.94	11.71	49.91	30.69	33.87	46.00	-12.13	QP
5.	271.325	3.05	12.52	54.80	30.74	39.63	46.00	-6.37	QP
6.	325.596	3.21	13.78	54.99	30.80	41.18	46.00	-4.82	QP

Test plot for Vertical: GFSK(2441MHz)



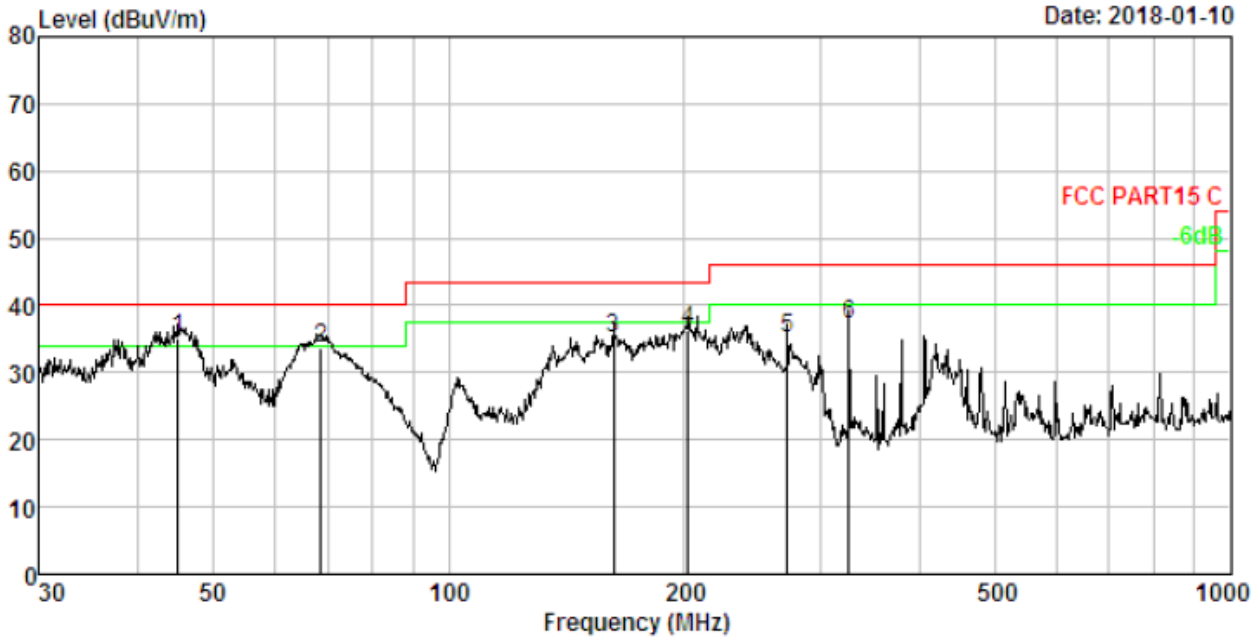
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	68.631	1.80	10.48	50.77	30.26	32.79	40.00	-7.21	QP
2.	143.326	2.47	13.54	50.52	30.51	36.02	43.50	-7.48	QP
3.	154.821	2.54	13.89	50.50	30.54	36.39	43.50	-7.11	QP
4.	202.810	2.79	10.44	54.79	30.63	37.39	43.50	-6.11	QP
5.	271.325	3.05	12.52	50.38	30.74	35.21	46.00	-10.79	QP
6.	325.596	3.21	13.78	49.01	30.80	35.20	46.00	-10.80	QP

Test plot for Horizontal: GFSK(2480MHz)



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.	136.939	2.43	13.14	47.76	30.50	32.83	43.50	-10.67	QP
2.	162.611	2.59	13.73	49.13	30.56	34.89	43.50	-8.61	QP
3.	216.783	2.85	10.70	52.13	30.66	35.02	46.00	-10.98	QP
4.	271.325	3.05	12.52	54.80	30.74	39.63	46.00	-6.37	QP
5.	325.596	3.21	13.78	48.99	30.80	35.18	46.00	-10.82	QP
6.	352.943	3.29	14.29	46.40	30.83	33.15	46.00	-12.85	QP

Test plot for Vertical: GFSK(2480MHz)



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.	45.058	1.42	13.24	50.66	30.11	35.21	40.00	-4.79	QP
2.	68.631	1.80	10.48	51.77	30.26	33.79	40.00	-6.21	QP
3.	162.611	2.59	13.73	49.45	30.56	35.21	43.50	-8.29	QP
4.	202.810	2.79	10.44	53.79	30.63	36.39	43.50	-7.11	QP
5.	271.325	3.05	12.52	50.38	30.74	35.21	46.00	-10.79	QP
6.	325.596	3.21	13.78	51.01	30.80	37.20	46.00	-8.80	QP

Test Frequency 1GHz-18GHz

Low Channel (2402MHz) Worst case GFSK

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	34.66	AV	V	30.35	5.69	29.75	40.95	54	-13.05
4804	33.15	AV	H	30.35	5.69	29.75	39.44	54	-14.56
4804	39.2	PK	V	30.35	5.69	29.75	45.49	74	-28.51
4804	40.35	PK	H	30.35	5.69	29.75	46.64	74	-27.36
17809	24.59	AV	V	38.72	7.36	30.11	40.56	54	-13.44
17809	25.36	AV	H	38.72	7.36	30.11	41.33	54	-12.67
17809	38.04	PK	V	38.72	7.36	30.11	54.01	74	-19.99
17809	37.46	PK	H	38.72	7.36	30.11	53.43	74	-20.57

Low Channel (2441MHz) Worst caseπ/4-DQPSK

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	34.21	AV	V	29.66	6.69	26.49	44.07	54	-9.93
4882	31.05	AV	H	29.66	6.69	26.49	40.91	54	-13.09
4882	40.15	PK	V	29.66	6.69	26.49	50.01	74	-23.99
4882	38.06	PK	H	29.66	6.69	26.49	47.92	74	-26.08
17806	25.74	AV	V	38.25	9.43	37.69	35.73	54	-18.27
17806	23.69	AV	H	38.25	9.43	37.69	33.68	54	-20.32
17806	36.25	PK	V	38.25	9.43	37.69	46.24	74	-27.76
17806	35.75	PK	H	38.25	9.43	37.69	45.74	74	-28.26

High Channel (2480MHz) Worst case GFSK

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	31.36	AV	V	28.75	6.99	26.72	40.38	54	-13.62
4960	32.05	AV	H	28.75	6.99	26.72	41.07	54	-12.93
4960	41.25	PK	V	28.75	6.99	26.72	50.27	74	-23.73
4960	42.69	PK	H	28.75	6.99	26.72	51.71	74	-22.29
17811	25.14	AV	V	39.67	7.14	30.33	41.62	54	-12.38
17811	23.68	AV	H	39.67	7.14	30.33	40.16	54	-13.84
17811	38.42	PK	V	39.67	7.14	30.33	54.9	74	-19.1
17811	34.69	PK	H	39.67	7.14	30.33	51.17	74	-22.83

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

Test Frequency: From 18GHz to 25GHz

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

8 CONDUCTED BAND EDGE EMISSION

8.1 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.

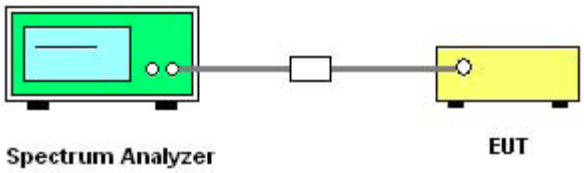
8.2 TEST PROCEDURE

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

8.3 TEST SETUP



1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.

2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

8.4 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.

8.5 TEST RESULTS

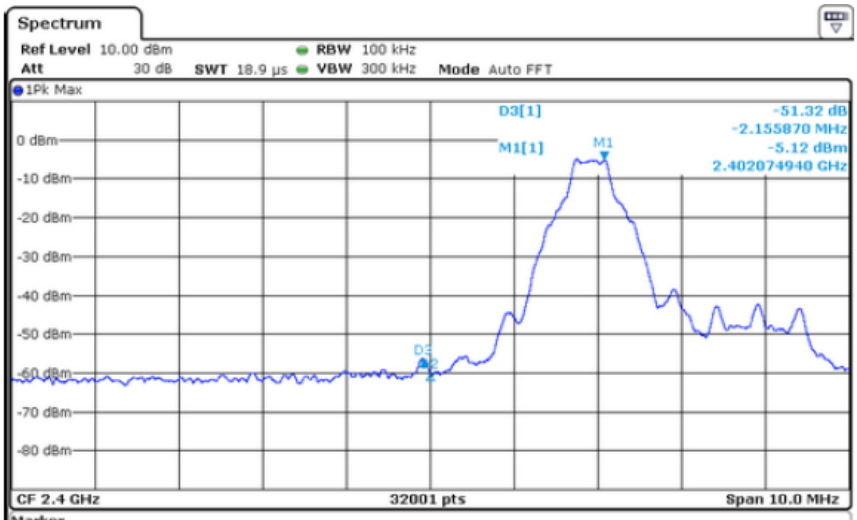
For Non-Hopping Mode:

Frequency(MHz)	Modulation	Peak Power Output (dBm)	Emission Read Value (dBm)	Result of Band edge (dBc)	Band Edge Limit (dBc)
2399.84	GFSK	-5.12	-51.32	46.2	>20dBc
2399.55	π/4-DQPSK	-4.90	-49.81	44.91	>20dBc
2400.05	8DPSK	-3.99	-49.03	45.04	>20dBc
2484.35	GFSK	-3.72	-56.61	52.89	>20dBc
2483.76	π/4-DQPSK	-6.45	-54.49	48.04	>20dBc
2483.59	8DPSK	-6.51	-55.54	49.03	>20dBc

Test Plot:

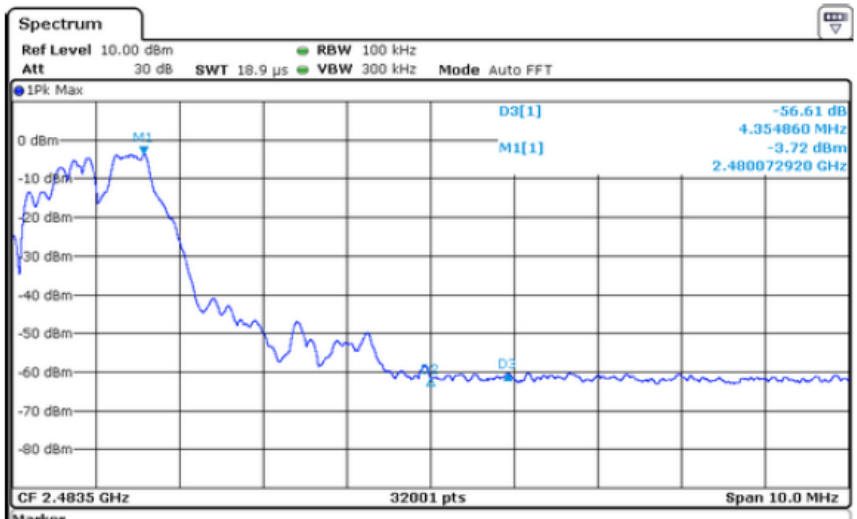
Please refer to the following pages.

GFSK



Marker

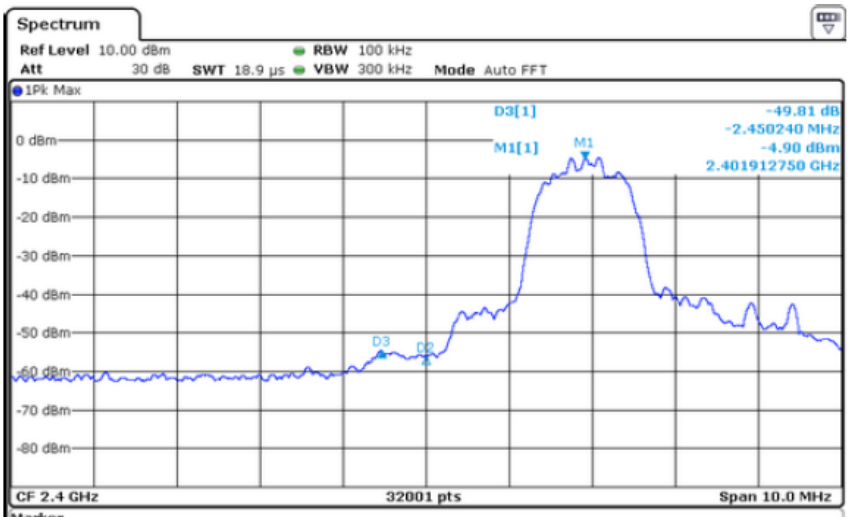
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207494 GHz	-5.12 dBm		
D2	M1	1	-2.07494 MHz	-54.96 dB		
D3	M1	1	-2.15587 MHz	-51.32 dB		

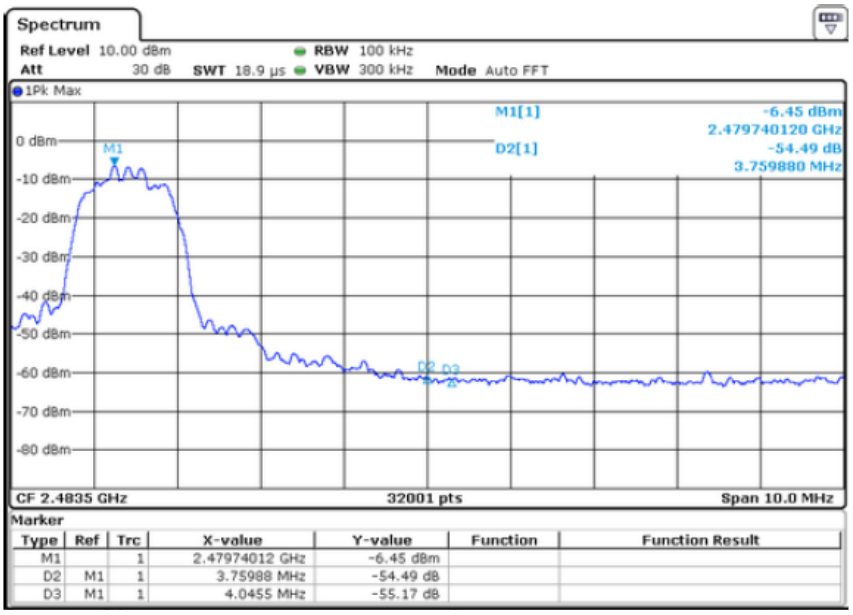


Marker

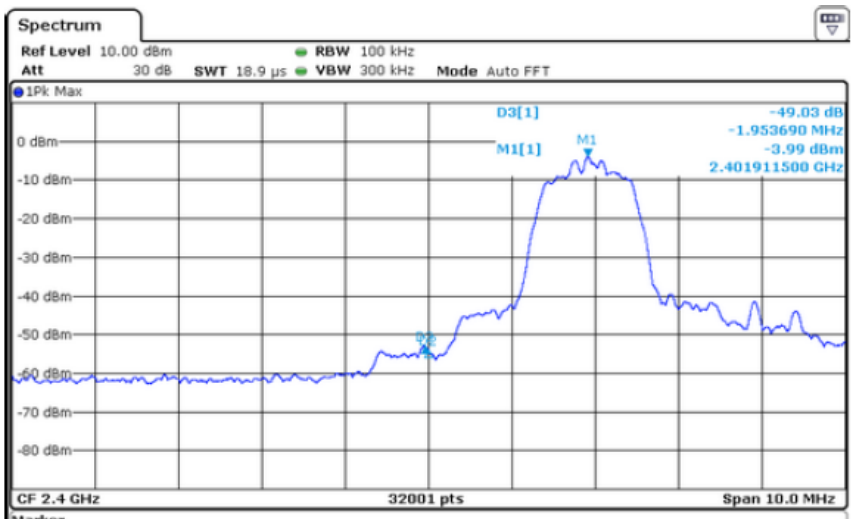
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48007292 GHz	-3.72 dBm		
D2	M1	1	3.42708 MHz	-57.97 dB		
D3	M1	1	4.35486 MHz	-56.61 dB		

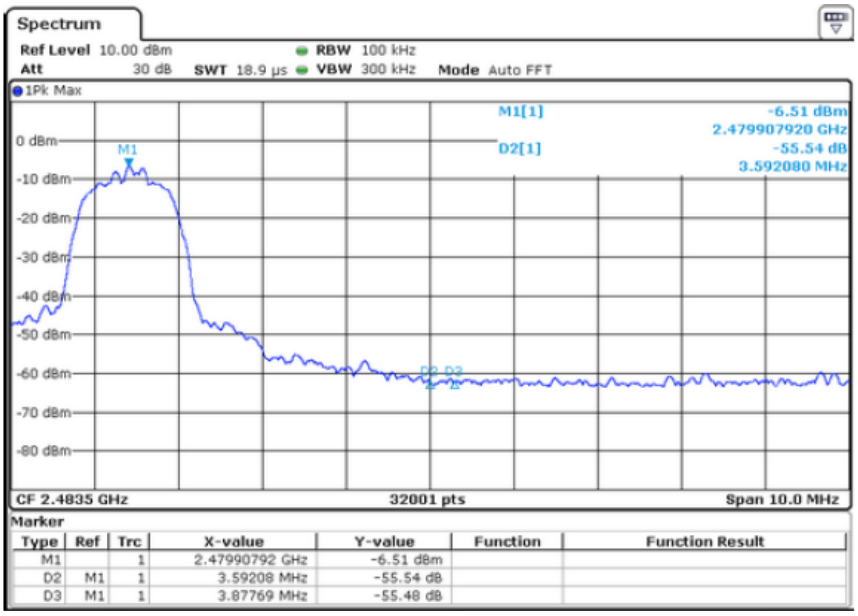
π/4-DQPSK


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D3[1]
-49.81 dB
-2.450240 MHz
M1[1]
M1
-4.90 dBm
2.401912750 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D3
D2
CF 2.4 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.40191275 GHz -4.90 dBm
D2 M1 1 -1.91275 MHz -51.32 dB
D3 M1 1 -2.45024 MHz -49.81 dB


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
M1[1]
-6.45 dBm
2.479740120 GHz
D2[1]
-54.49 dB
3.759880 MHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D2 D3
CF 2.4835 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47974012 GHz -6.45 dBm
D2 M1 1 3.75988 MHz -54.49 dB
D3 M1 1 4.0455 MHz -55.17 dB

8DPSK


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D3[1]
-49.03 dB
-1.953690 MHz
M1[1]
-3.99 dBm
2.401911500 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.4 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4019115 GHz -3.99 dBm
D2 M1 1 -1.9115 MHz -50.13 dB
D3 M1 1 -1.95369 MHz -49.03 dB


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
M1[1]
-6.51 dBm
2.479907920 GHz
D2[1]
-55.54 dB
3.592080 MHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.4835 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47990792 GHz -6.51 dBm
D2 M1 1 3.59208 MHz -55.54 dB
D3 M1 1 3.87769 MHz -55.48 dB

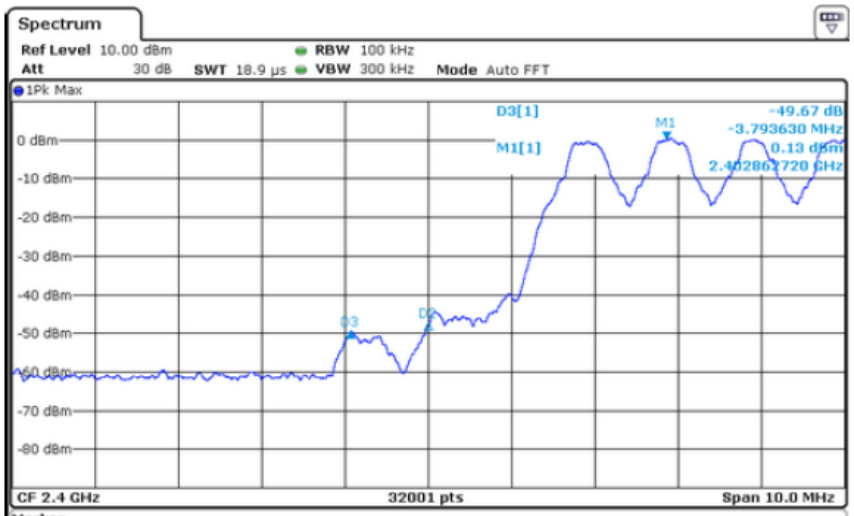
For Hopping Mode:

Frequency(MHz)	Modulation	Peak Power Output (dBm)	Emission Read Value (dBm)	Result of Band edge (dBc)	Band Edge Limit (dBc)
2399.21	GFSK	0.13	-49.67	49.80	>20dBc
2399.36	π/4-DQPSK	-4.55	-49.69	45.14	>20dBc
2400.10	8DPSK	0.36	-50.81	51.17	>20dBc
2485.38	GFSK	-2.48	-57.32	54.84	>20dBc
2484.04	π/4-DQPSK	-4.95	-55.32	50.39	>20dBc
2483.59	8DPSK	-5.05	-57.54	52.49	>20dBc

Test Plot:

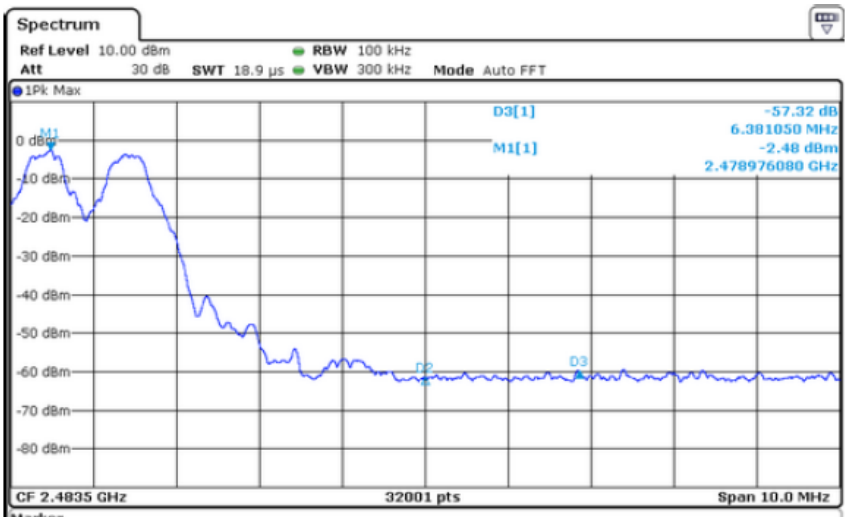
Please refer to the following pages.

GFSK



Marker

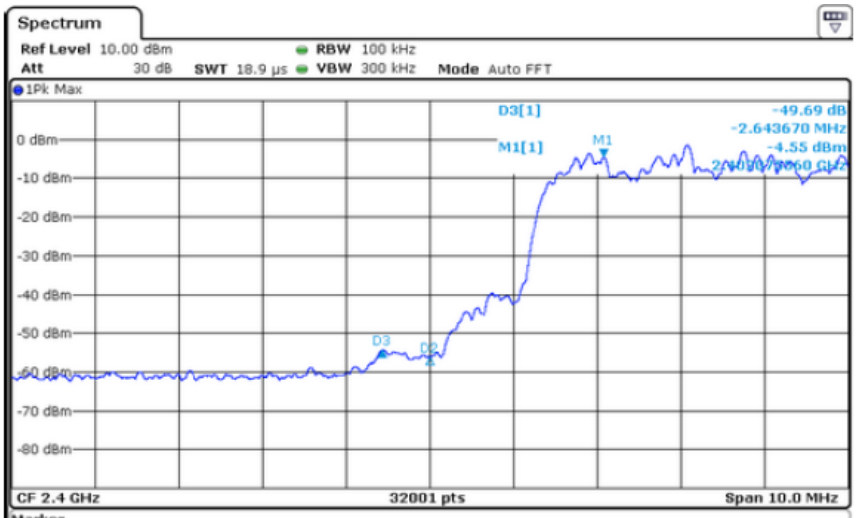
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40286272 GHz	0.13 dBm		
D2	M1	1	-2.86272 MHz	-47.40 dB		
D3	M1	1	-3.79363 MHz	-49.67 dB		

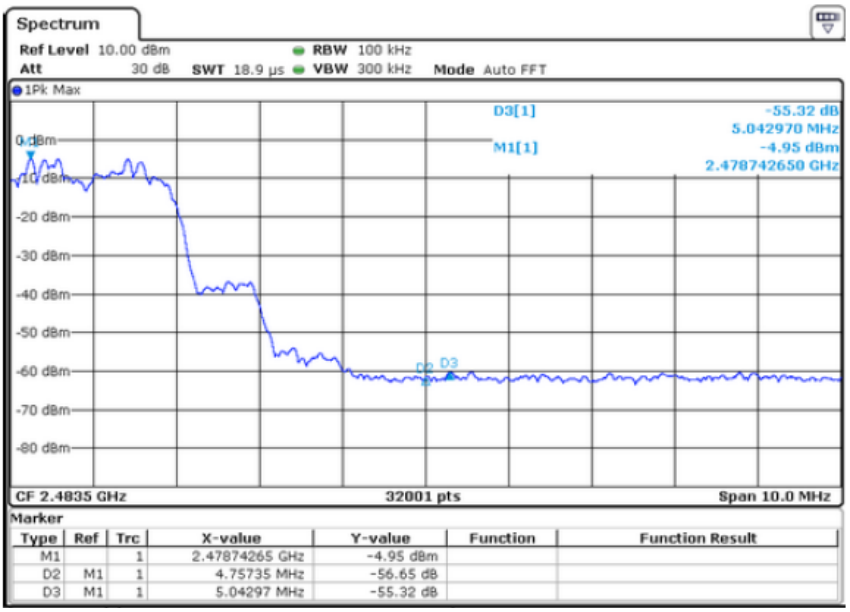


Marker

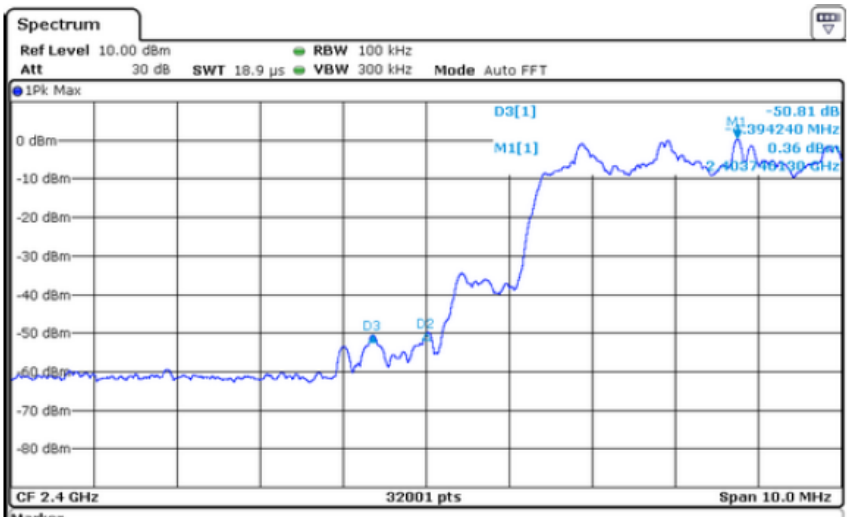
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47897608 GHz	-2.48 dBm		
D2	M1	1	4.52392 MHz	-58.84 dB		
D3	M1	1	6.38105 MHz	-57.32 dB		

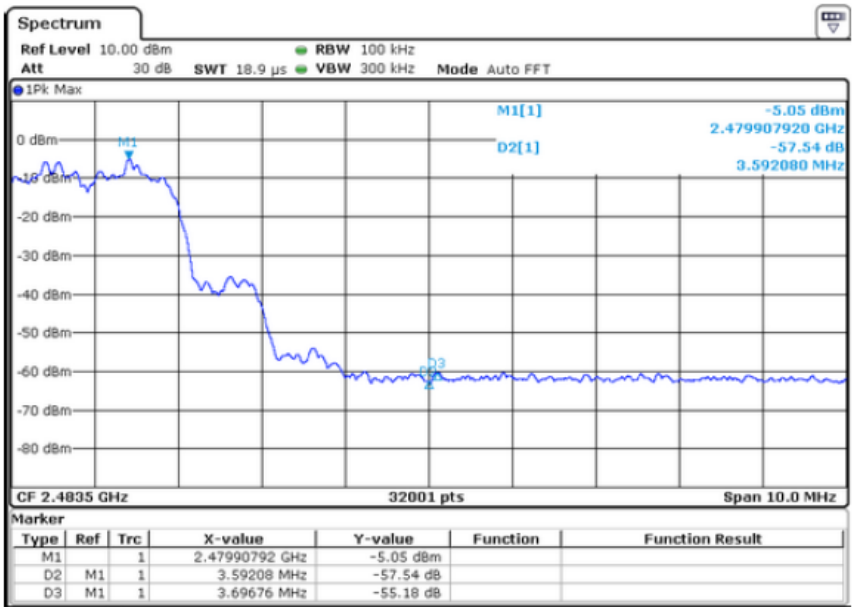
π/4-DQPSK


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D3[1]
-49.69 dB
-2.643670 MHz
M1[1]
M1
-4.55 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D3
D2
CF 2.4 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.40207556 GHz -4.55 dBm
D2 M1 1 -2.07556 MHz -51.65 dB
D3 M1 1 -2.64367 MHz -49.69 dB


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D3[1]
-55.32 dB
5.042970 MHz
M1[1]
-4.95 dBm
2.478742650 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D2
D3
CF 2.4835 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47874265 GHz -4.95 dBm
D2 M1 1 4.75735 MHz -56.65 dB
D3 M1 1 5.04297 MHz -55.32 dB

8DPSK


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D3[1]
-50.81 dB
M1[1]
0.36 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D3
D2
CF 2.4 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.40374613 GHz 0.36 dBm
D2 M1 1 -3.74613 MHz -50.36 dB
D3 M1 1 -4.39424 MHz -50.81 dB


Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 18.9 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
M1[1]
-5.05 dBm
2.479907920 GHz
D2[1]
-57.54 dB
3.592080 MHz
0 dBm
M1
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D3
CF 2.4835 GHz
32001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47990792 GHz -5.05 dBm
D2 M1 1 3.59208 MHz -57.54 dB
D3 M1 1 3.69676 MHz -55.18 dB

9 20 dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

9.1 Test Procedure

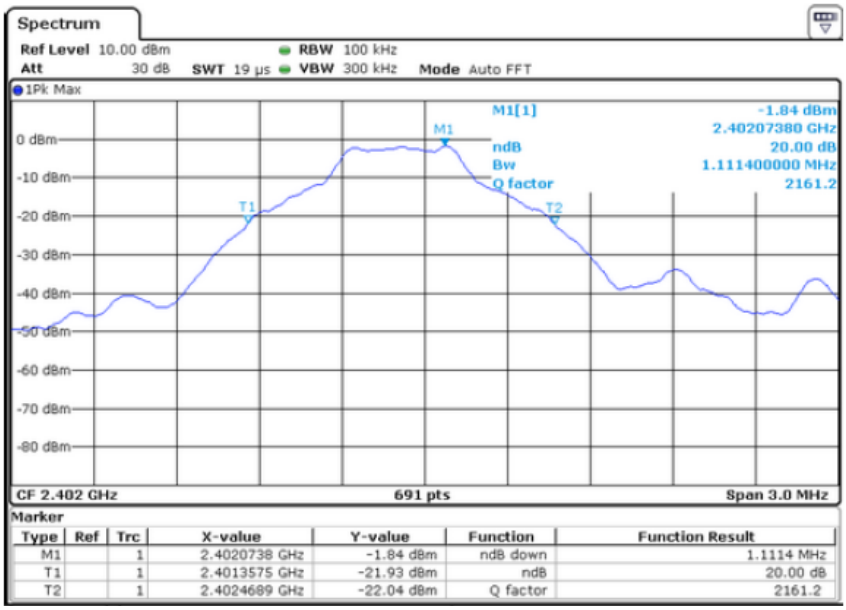
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

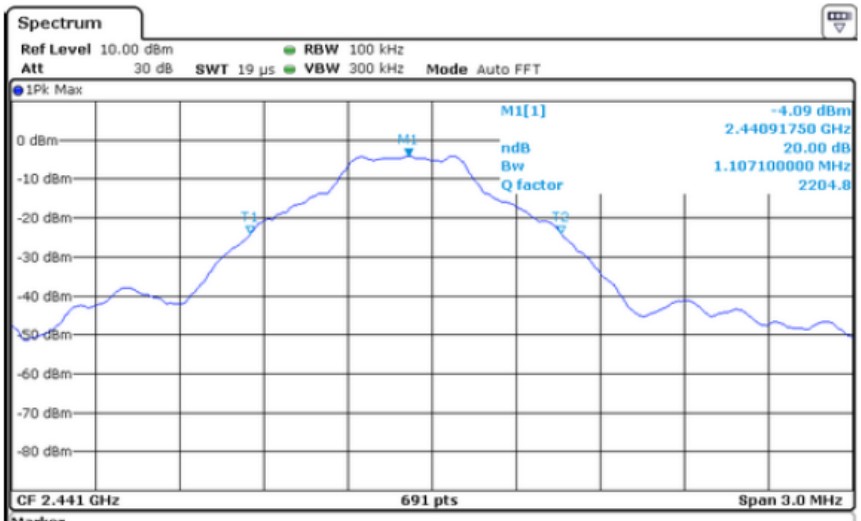
2. Set the spectrum analyzer: RBW =100kHz, VBW = 300kHz

9.2 Test Result

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

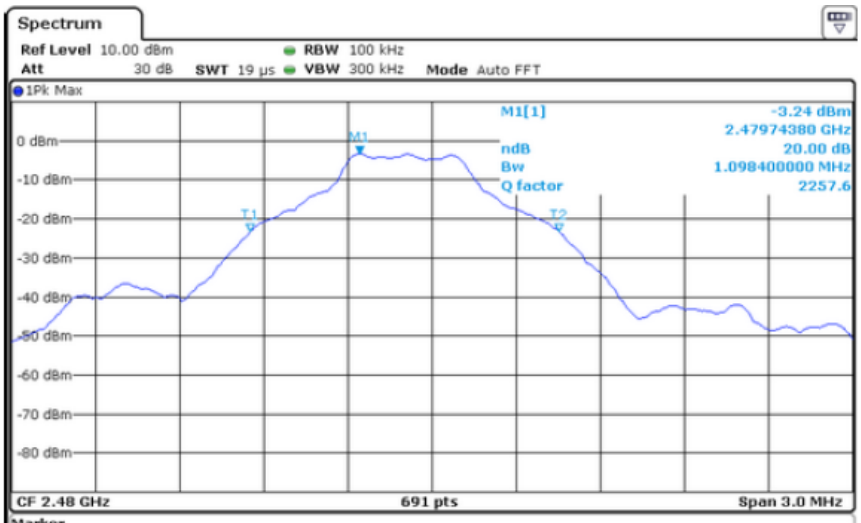
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1111
39	2441	1107
78	2480	1098





Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4409175 GHz	-4.09 dBm	ndB down	1.1071 MHz
T1		1	2.4403531 GHz	-24.00 dBm	ndB	20.00 dB
T2		1	2.4414602 GHz	-24.07 dBm	Q factor	2204.8

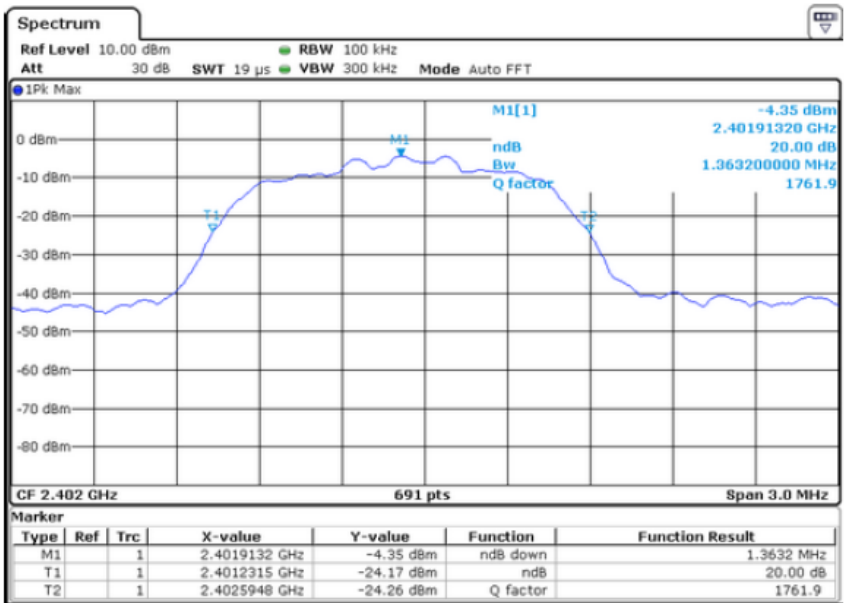


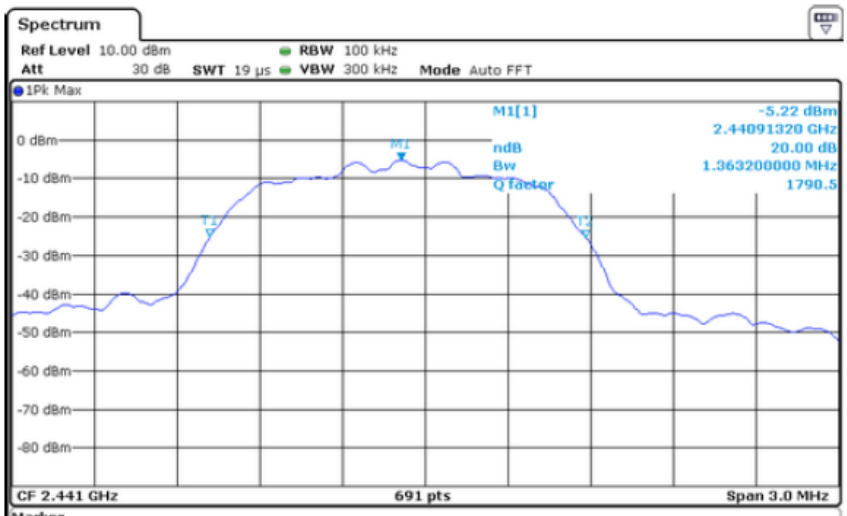
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4797438 GHz	-3.24 dBm	ndB down	1.0984 MHz
T1		1	2.4793531 GHz	-23.21 dBm	ndB	20.00 dB
T2		1	2.4804515 GHz	-23.24 dBm	Q factor	2257.6

Test Mode: CH00 / CH39 / CH78 (Π/4-DQPSK /(2Mbps)Mode)

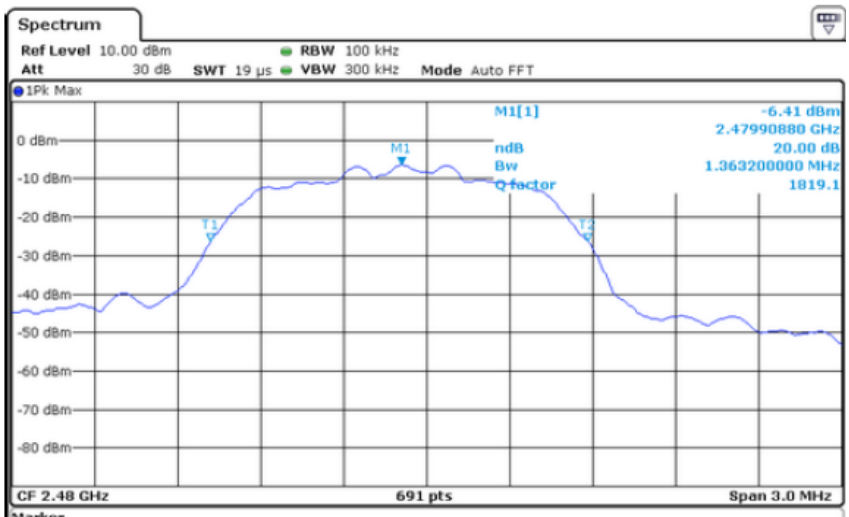
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1363
39	2441	1363
78	2480	1363





Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4409132 GHz	-5.22 dBm	ndB down	1.3632 MHz
T1		1	2.4402185 GHz	-25.17 dBm	ndB	20.00 dB
T2		1	2.4415818 GHz	-25.30 dBm	Q factor	1790.5

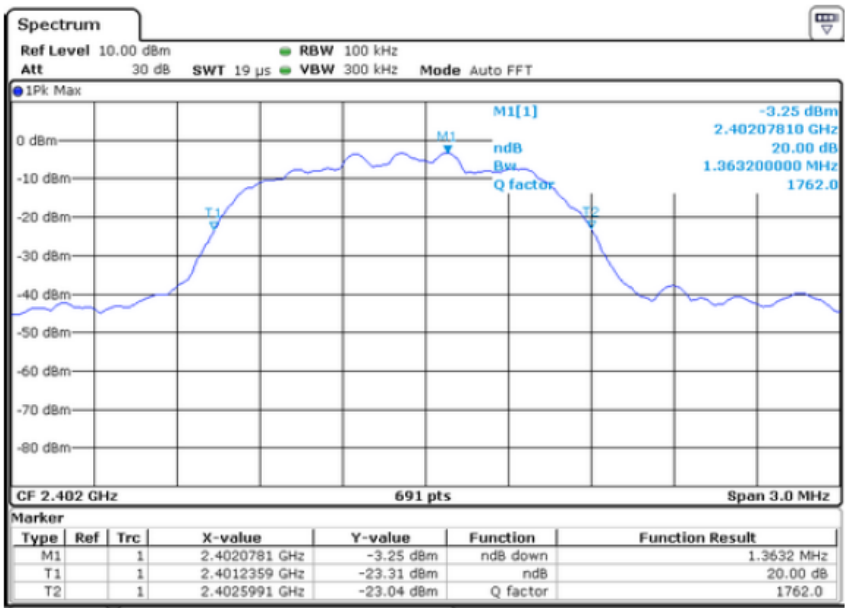


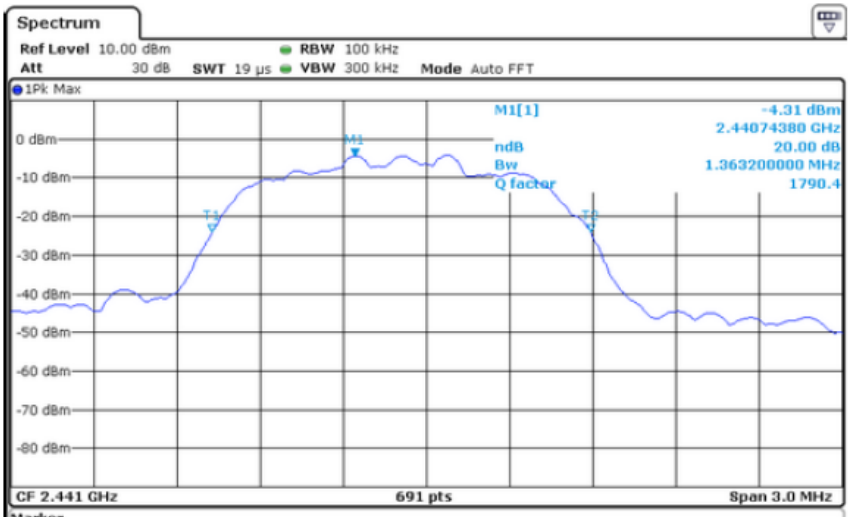
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4799088 GHz	-6.41 dBm	ndB down	1.3632 MHz
T1		1	2.4792185 GHz	-26.25 dBm	ndB	20.00 dB
T2		1	2.4805818 GHz	-26.37 dBm	Q factor	1819.1

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

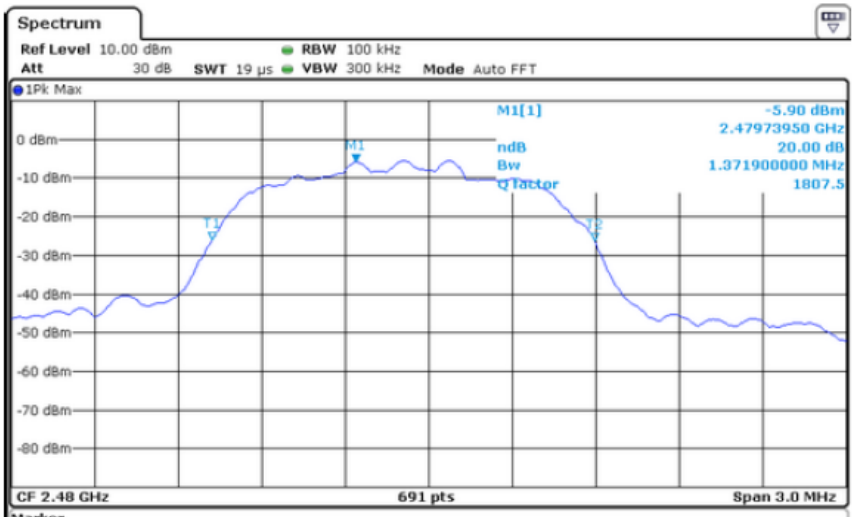
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1363
39	2441	1363
78	2480	1372





Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4407438 GHz	-4.31 dBm	ndB down	1.3632 MHz
T1		1	2.4402272 GHz	-24.11 dBm	ndB	20.00 dB
T2		1	2.4415904 GHz	-24.06 dBm	Q factor	1790.4



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4797395 GHz	-5.90 dBm	ndB down	1.3719 MHz
T1		1	2.4792229 GHz	-25.91 dBm	ndB	20.00 dB
T2		1	2.4805948 GHz	-26.21 dBm	Q factor	1807.5

10 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.

10.1Test Procedure

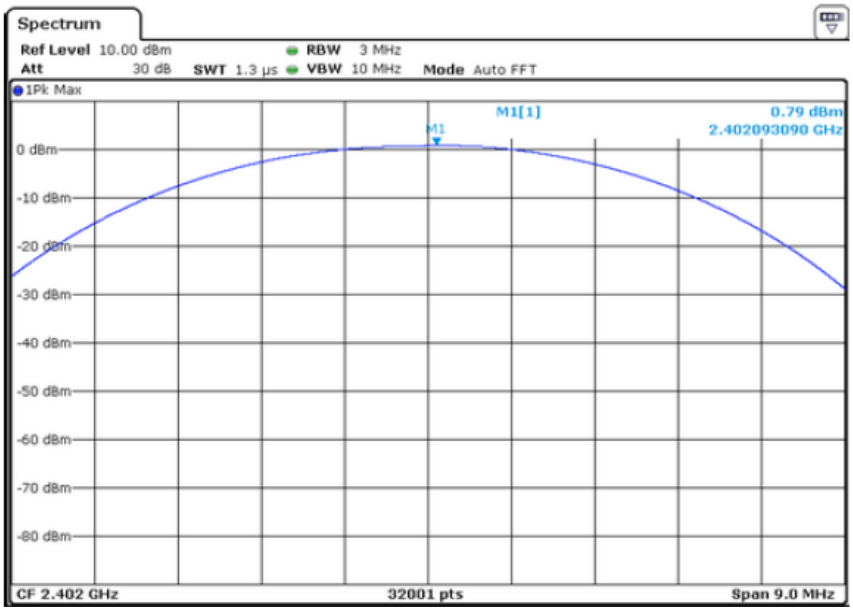
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

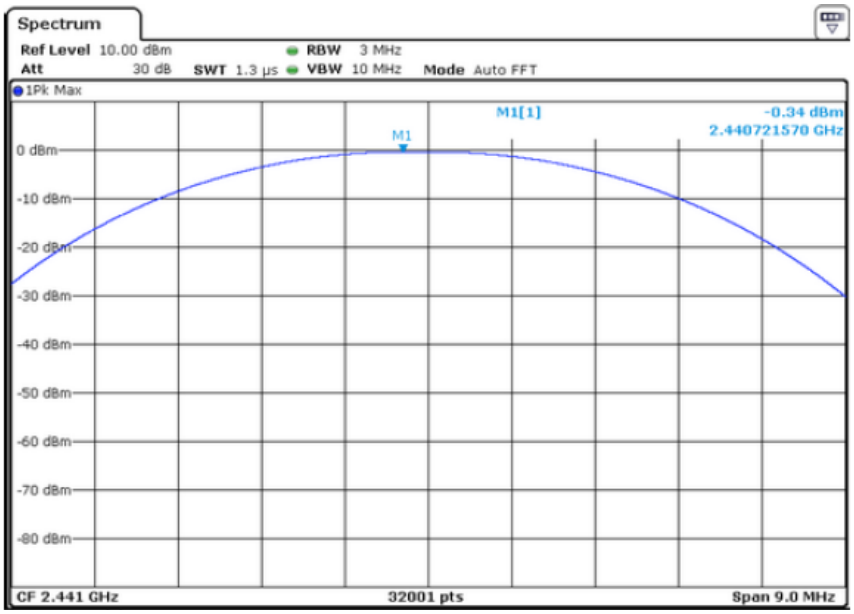
2. Set the spectrum analyser: RBW = 3 MHz. VBW =10 MHz. Sweep = auto; Detector Function = Peak.

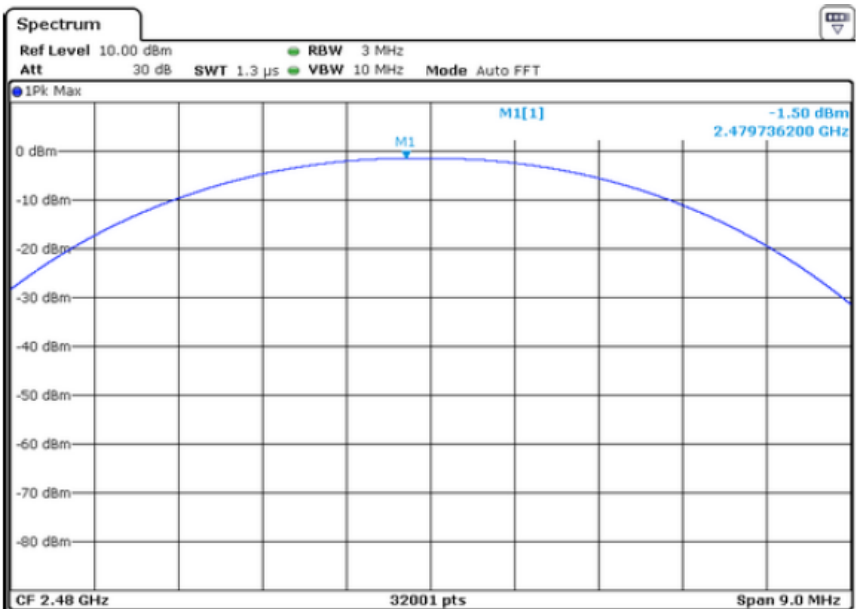
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2Test Result

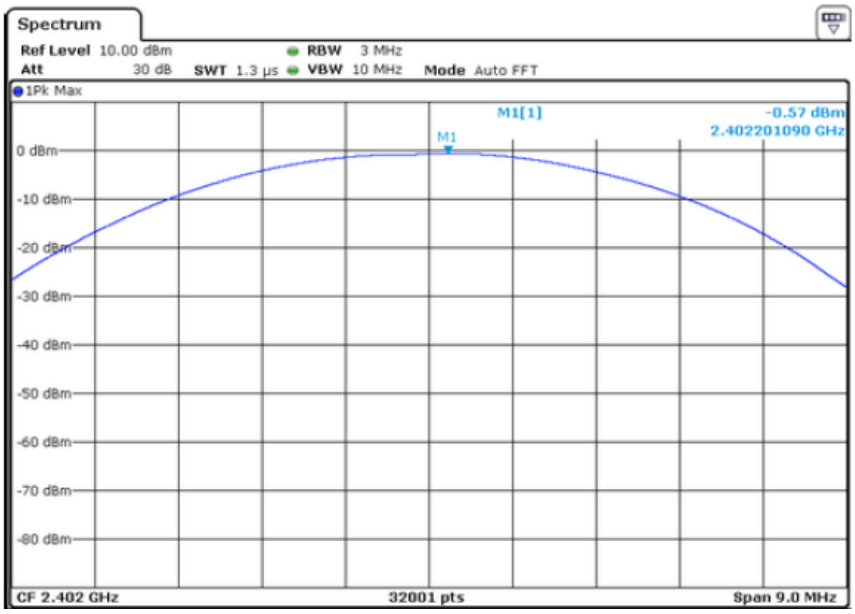
GFSK(1Mbps)					
Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(mW)	(mW)	
CH00	2402	0.79	1.199	1000	Pass
CH39	2441	-0.34	0.925	1000	Pass
CH78	2480	-1.5	0.708	1000	Pass

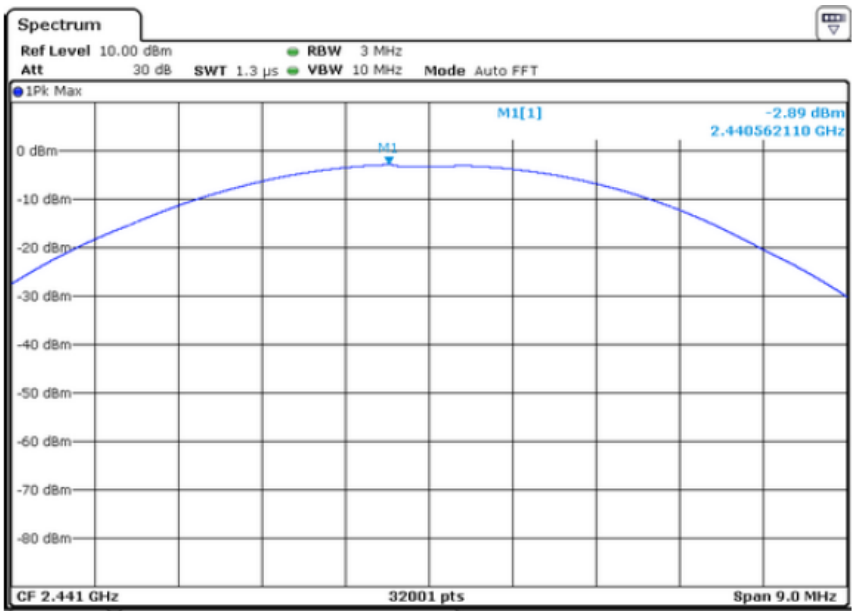

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
0.79 dBm
2.402093090 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
32001 pts
Span 9.0 MHz

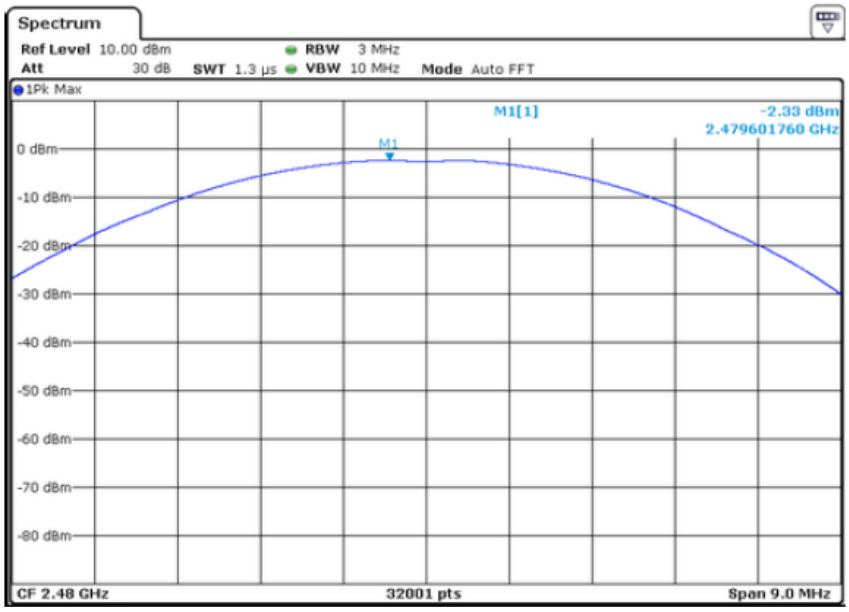

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
-0.34 dBm
2.440721570 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
32001 pts
Span 9.0 MHz



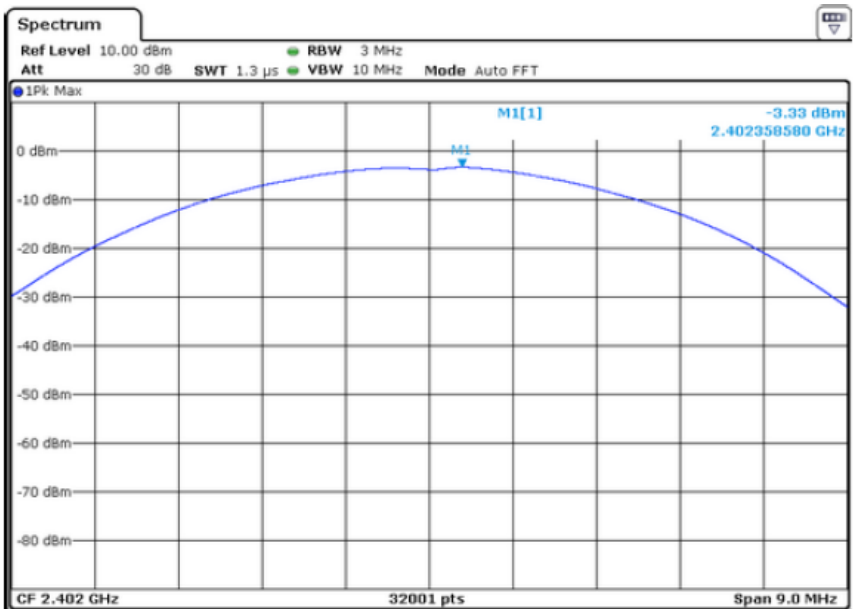
π/4QPSK(2Mbps)					
Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(mW)	(mW)	
CH00	2402	-0.57	0.877	125	Pass
CH39	2441	-2.89	0.514	125	Pass
CH78	2480	-2.33	0.585	125	Pass

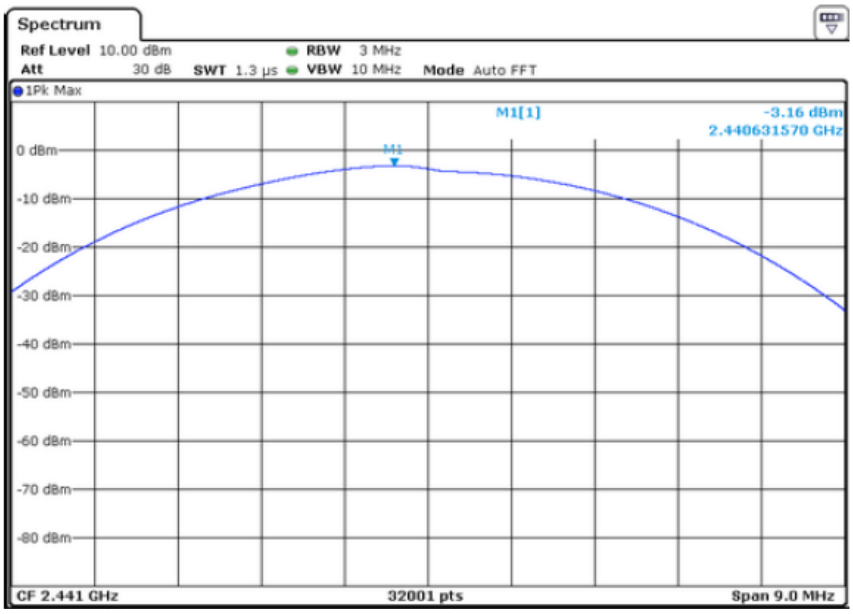

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
-0.57 dBm
2.402201090 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
32001 pts
Span 9.0 MHz

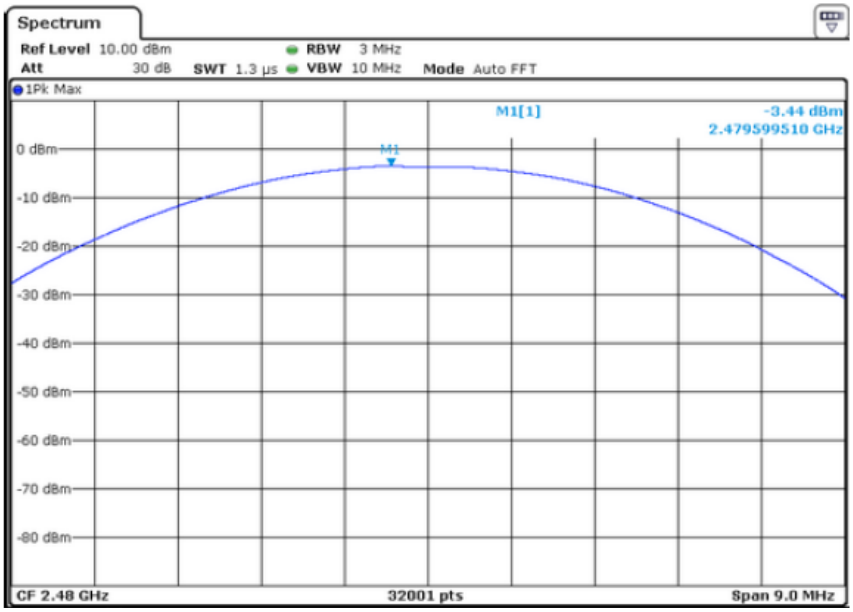

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
-2.89 dBm
2.440562110 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
32001 pts
Span 9.0 MHz



8DPSK(3Mbps)					
Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(mW)	(mW)	
CH00	2402	-3.33	0.465	125	Pass
CH39	2441	-3.16	0.483	125	Pass
CH78	2480	-3.44	0.453	125	Pass


Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
-3.33 dBm
2.402358580 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
32001 pts
Span 9.0 MHz


Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
-3.16 dBm
2.440631570 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
32001 pts
Span 9.0 MHz


Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 30 dB
SWT 1.3 µs
VBW 10 MHz
Mode Auto FFT
1Pk Max
M1[1]
-3.44 dBm
2.479599510 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
32001 pts
Span 9.0 MHz

11 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

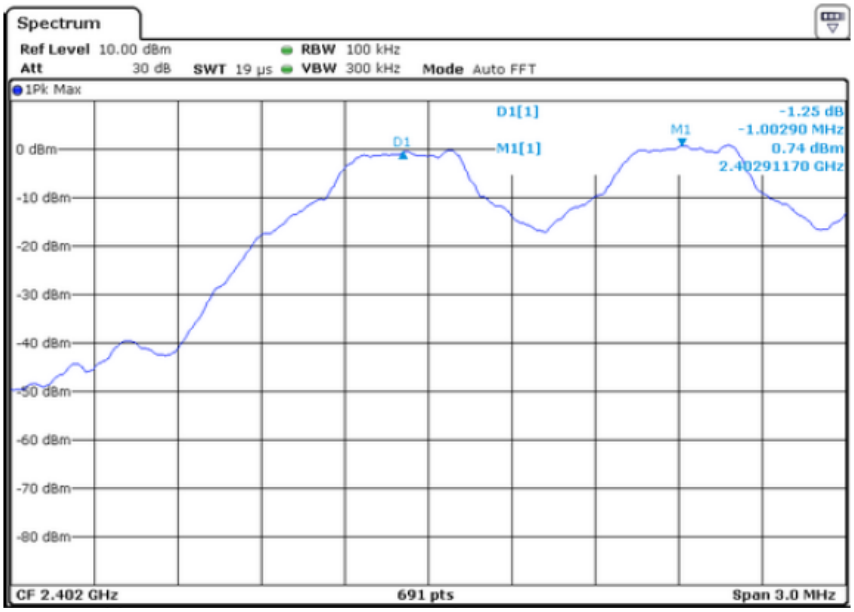
11.1 Test Procedure

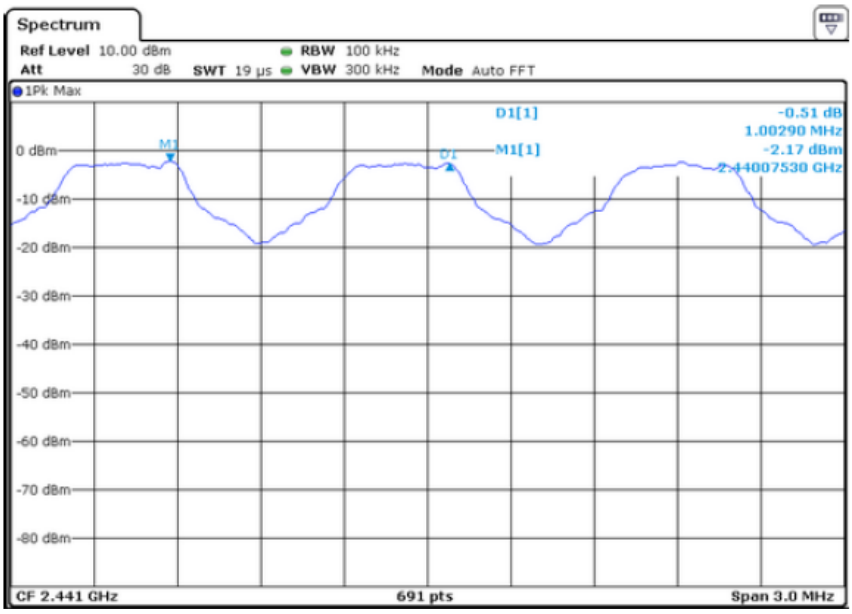
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW = 300KHz, Span = 3MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to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

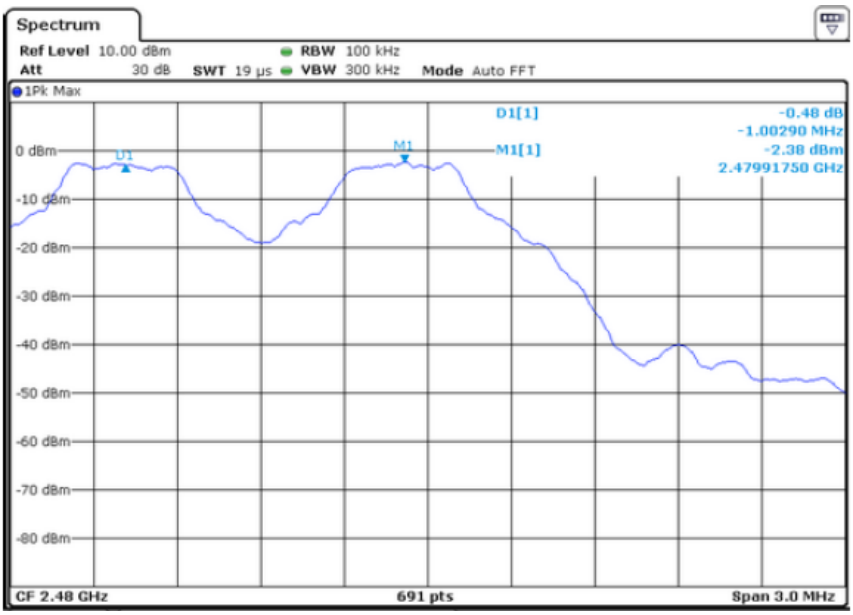
11.2 Test Result

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

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
00	2402	1003	>743
39	2441	1003	>738
78	2480	1003	>732

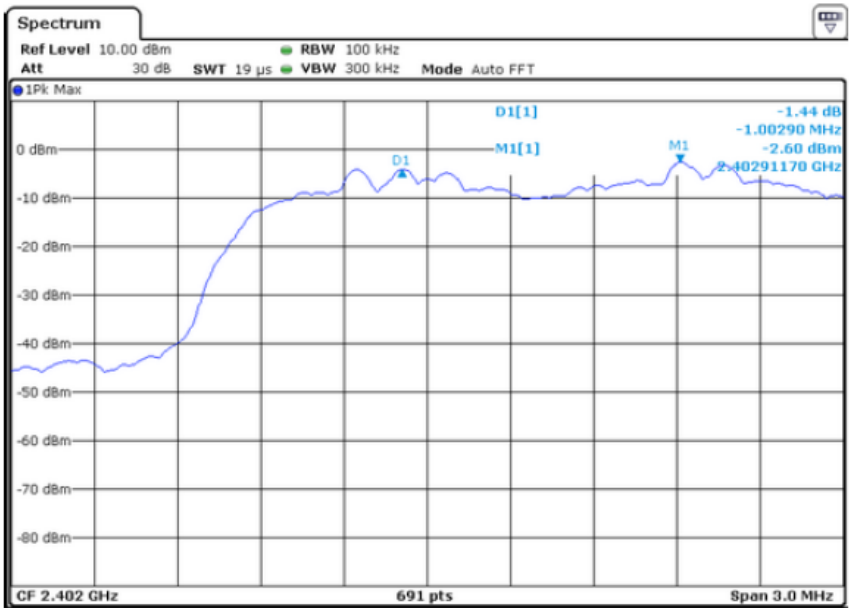


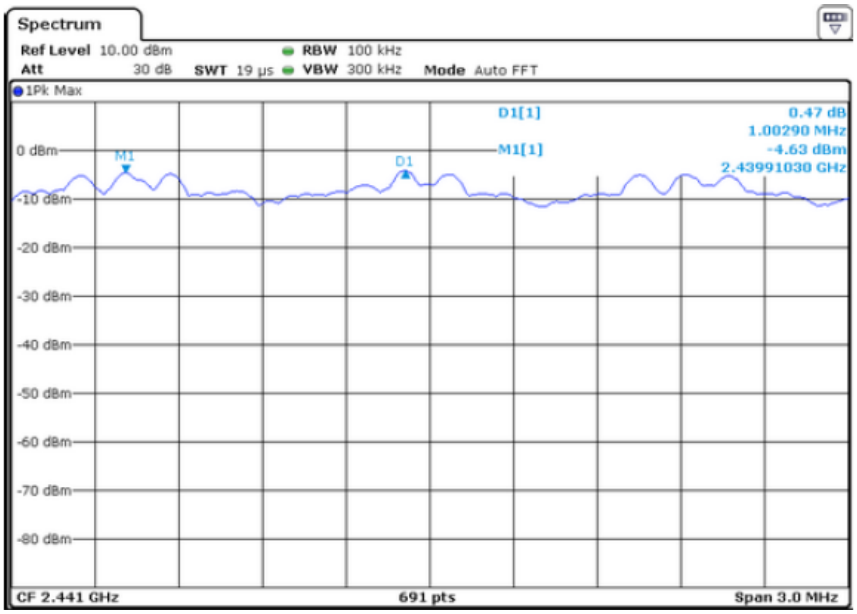

Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 19 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.51 dB
1.00290 MHz
M1[1]
-2.17 dBm
2.44007530 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
691 pts
Span 3.0 MHz

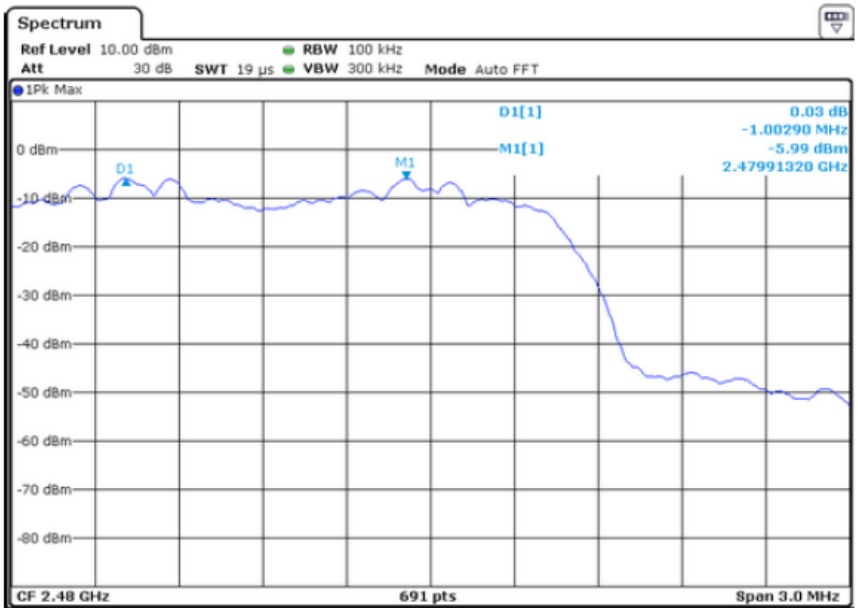

Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 19 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.48 dB
-1.00290 MHz
M1[1]
-2.38 dBm
2.47991750 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
691 pts
Span 3.0 MHz

Test Mode:	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
00	2402	1003	>909
39	2441	1003	>909
78	2480	1003	>909

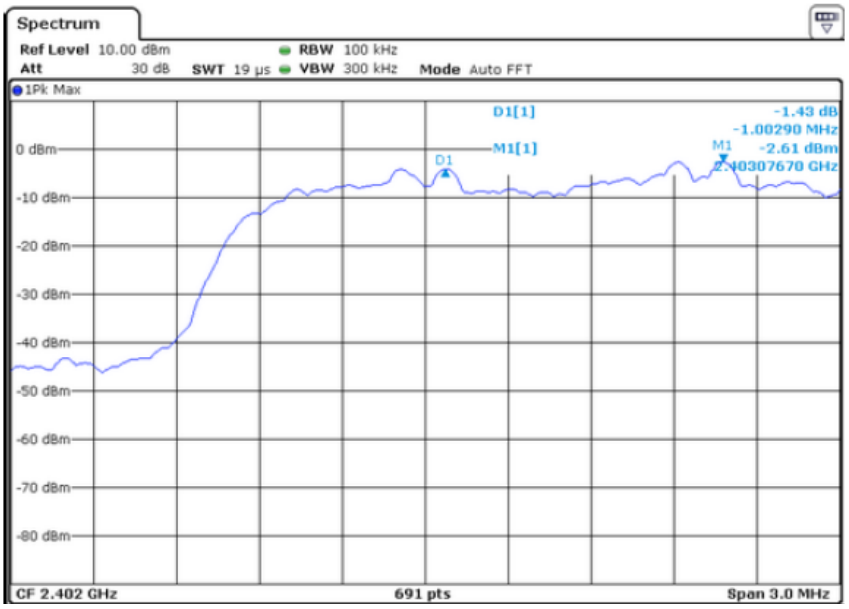


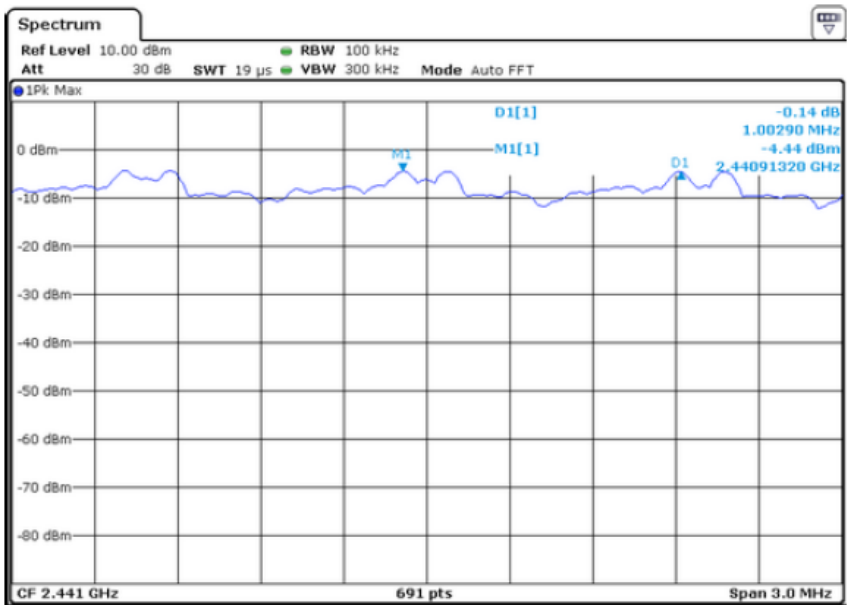

Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 19 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D1[1]
0.47 dB
1.00290 MHz
M1[1]
-4.63 dBm
2.43991030 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
D1
CF 2.441 GHz
691 pts
Span 3.0 MHz

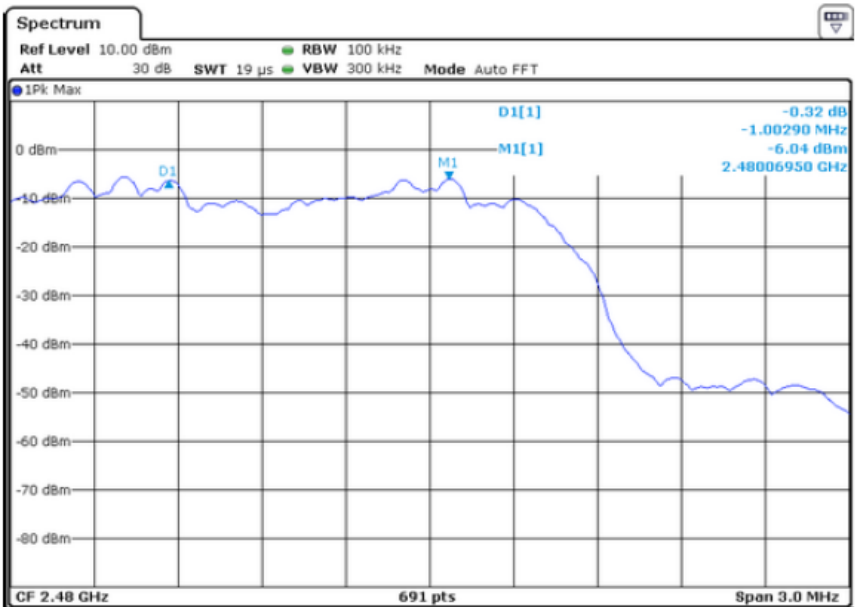

Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
Att 30 dB
SWT 19 µs
VBW 300 kHz
Mode Auto FFT
1Pk Max
D1[1]
0.03 dB
-1.00290 MHz
M1[1]
-5.99 dBm
2.47991320 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
D1
M1
CF 2.48 GHz
691 pts
Span 3.0 MHz

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

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
00	2402	1003	>909
39	2441	1003	>909
78	2480	1003	>915




Spectrum
Ref Level 10.00 dBm
Att 30 dB
SWT 19 µs
RBW 100 kHz
VBW 300 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.14 dB
1.00290 MHz
M1[1]
-4.44 dBm
2.44091320 GHz
M1
D1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
691 pts
Span 3.0 MHz


Spectrum
Ref Level 10.00 dBm
Att 30 dB
SWT 19 µs
RBW 100 kHz
VBW 300 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.32 dB
-1.00290 MHz
M1[1]
-6.04 dBm
2.48006950 GHz
D1
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
691 pts
Span 3.0 MHz

12 Number of Hopping Frequency

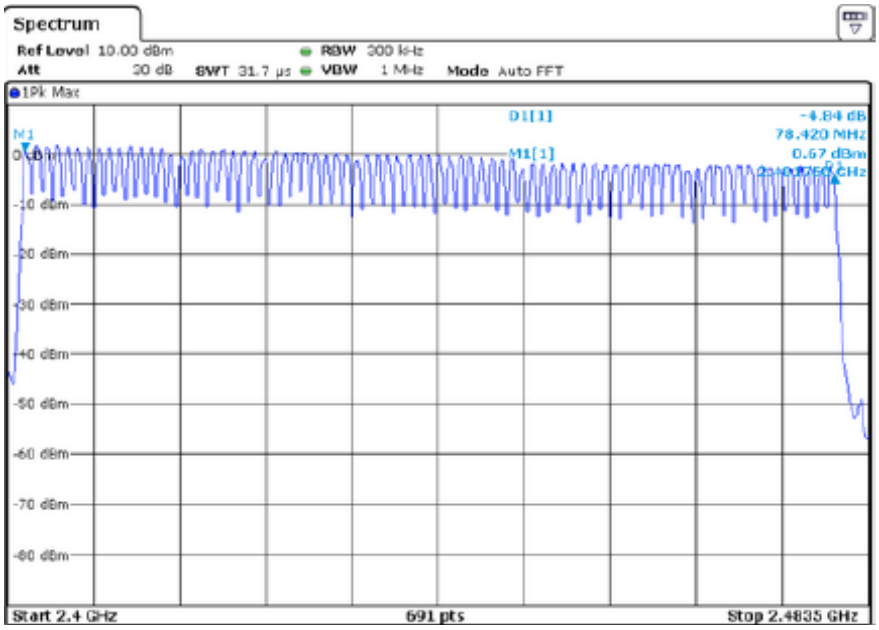
Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode	:	Hopping(GFSK)

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 = 300KHz. 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
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	:	The worst case(π/4-DQPSK) 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. Centred on a hopping channel;

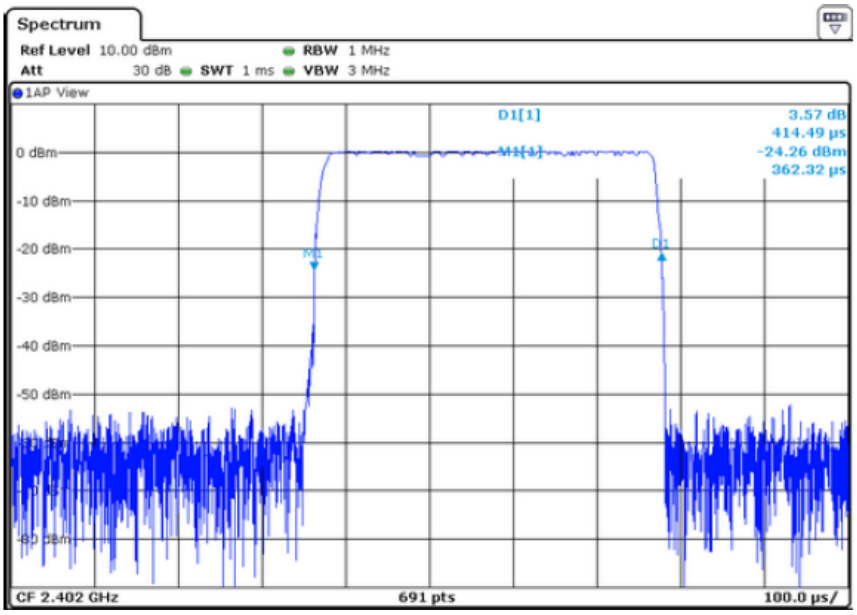
3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

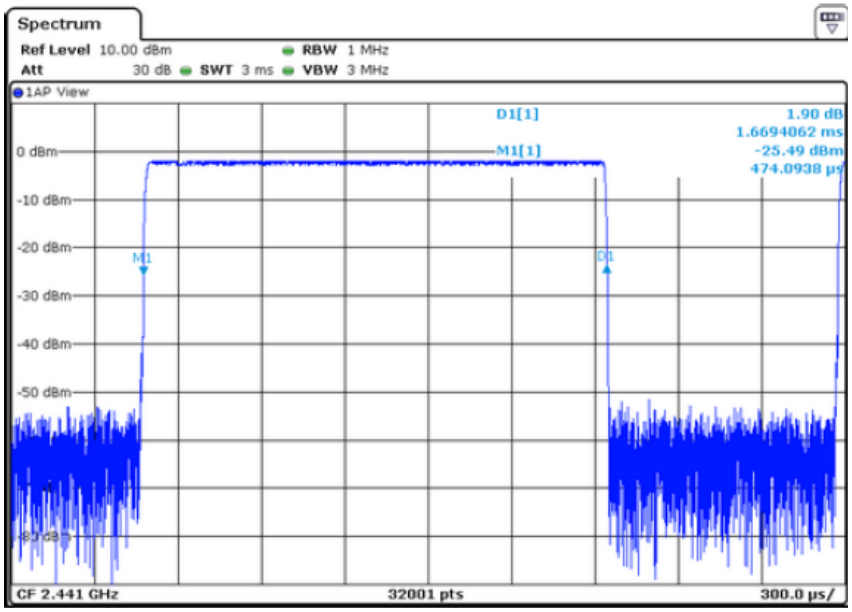
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

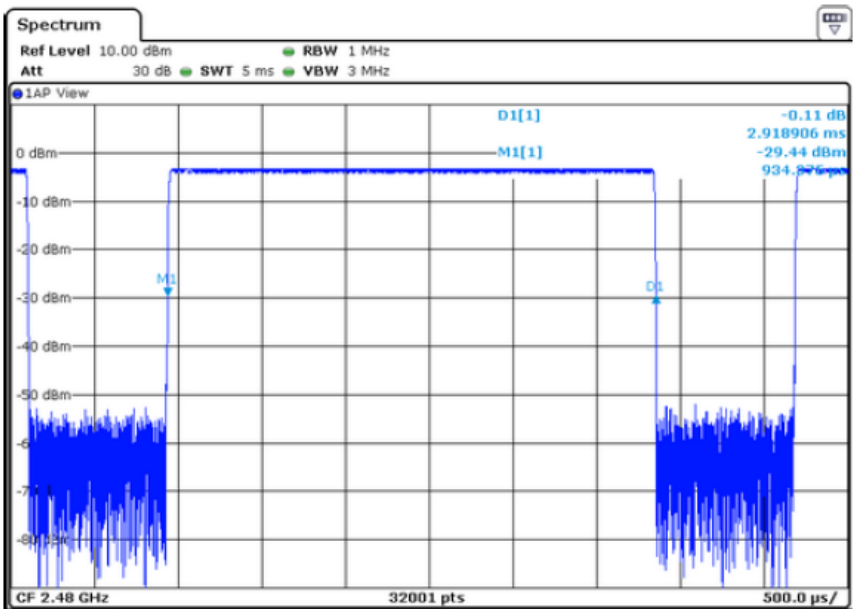
13.2 Test Result

Test Mode:	π/4-DQPSK(2Mbps) –2DH1/2DH3/2DH5

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) x 31.6 = 320	0.414	132.48	400
2DH3	1600/(4*79) x 31.6 =160	1.669	267.04	400
2DH5	1600/(6*79) x 31.6 =106.67	2.919	311.36	400


Spectrum
Ref Level 10.00 dBm
RBW 1 MHz
Att 30 dB
SWT 1 ms
VBW 3 MHz
1AP View
D1[1]
3.57 dB
414.49 µs
M1[1]
-24.26 dBm
362.32 µs
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
M1
D1
CF 2.402 GHz
691 pts
100.0 µs/


Spectrum
Ref Level 10.00 dBm
RBW 1 MHz
Att 30 dB
SWT 3 ms
VBW 3 MHz
1AP View
D1[1]
1.90 dB
1.6694062 ms
M1[1]
-25.49 dBm
474.0938 µs
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
M1
D1
CF 2.441 GHz
32001 pts
300.0 µs/


Spectrum
Ref Level 10.00 dBm
RBW 1 MHz
Att 30 dB
SWT 5 ms
VBW 3 MHz
1AP View
D1[1]
-0.11 dB
2.918906 ms
M1[1]
-29.44 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
M1
D1
CF 2.48 GHz
32001 pts
500.0 µs/

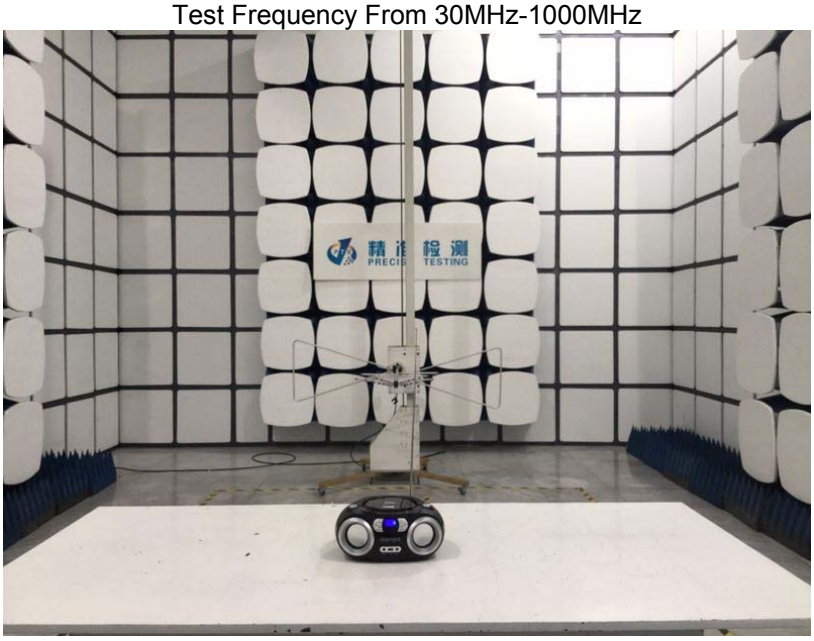
14 Antenna Requirement

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

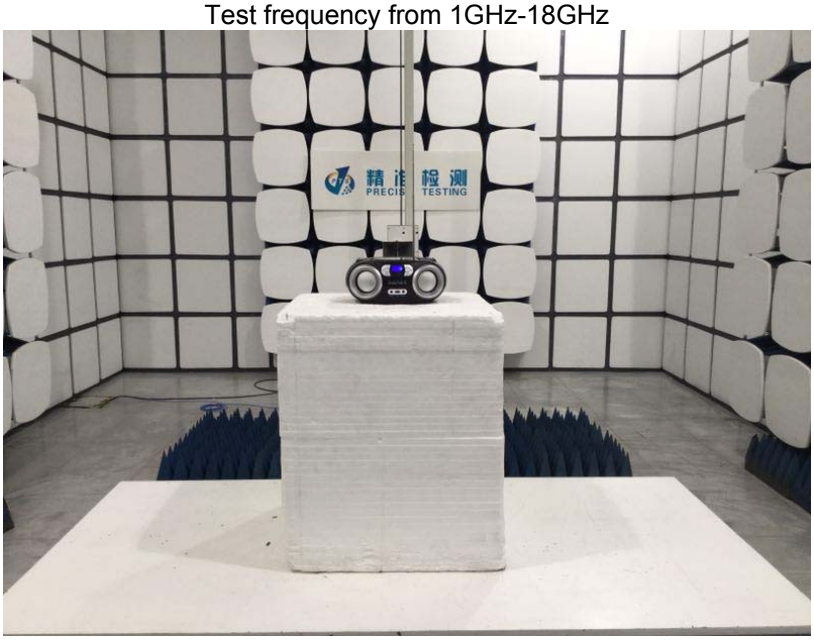
15 TEST PHOTOS

Conducted Emissions

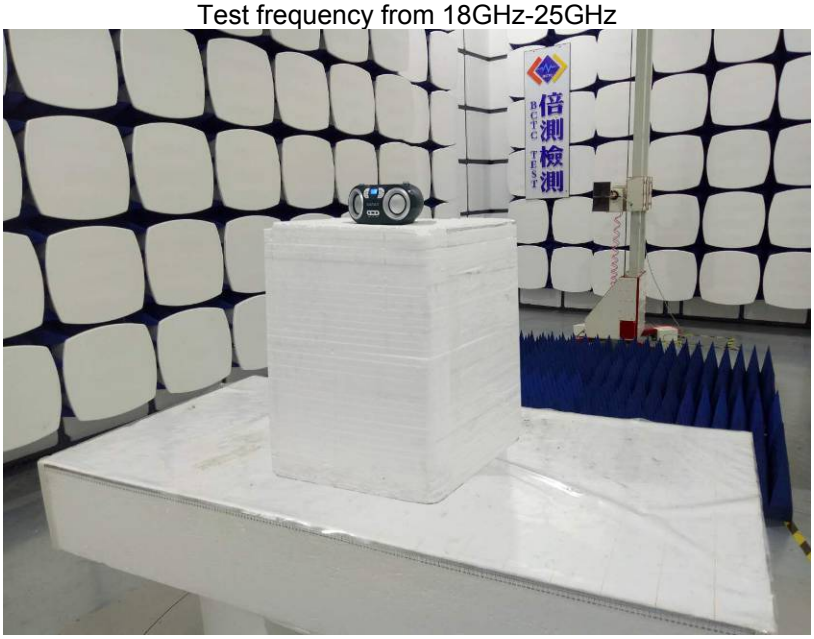
Radiated Spurious Emissions
Test Frequency From 30MHz-1000MHz



Test frequency from 1GHz-18GHz



Test frequency from 18GHz-25GHz

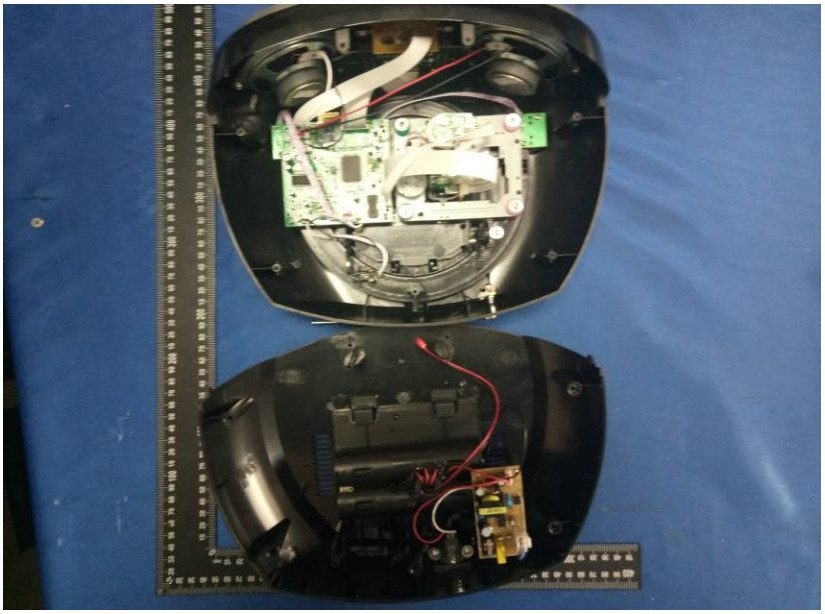


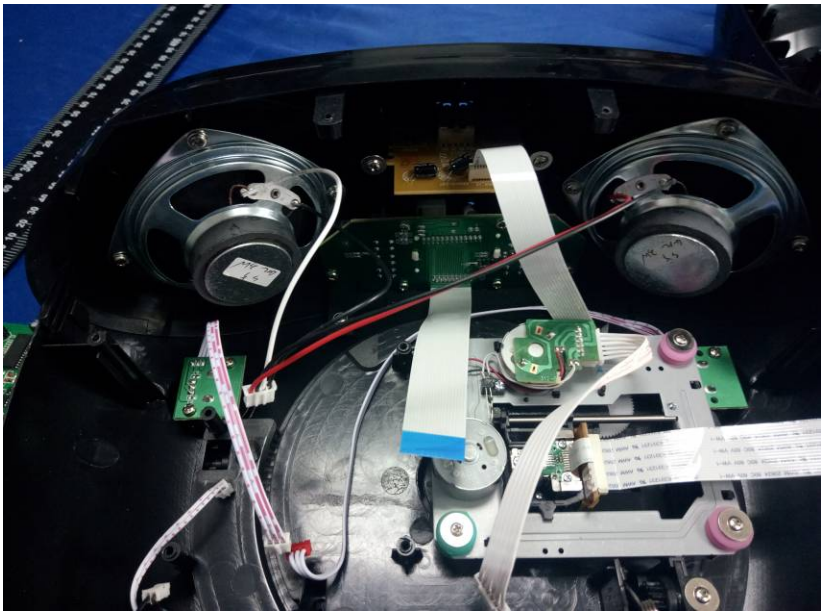
16 EUT PHOTOS

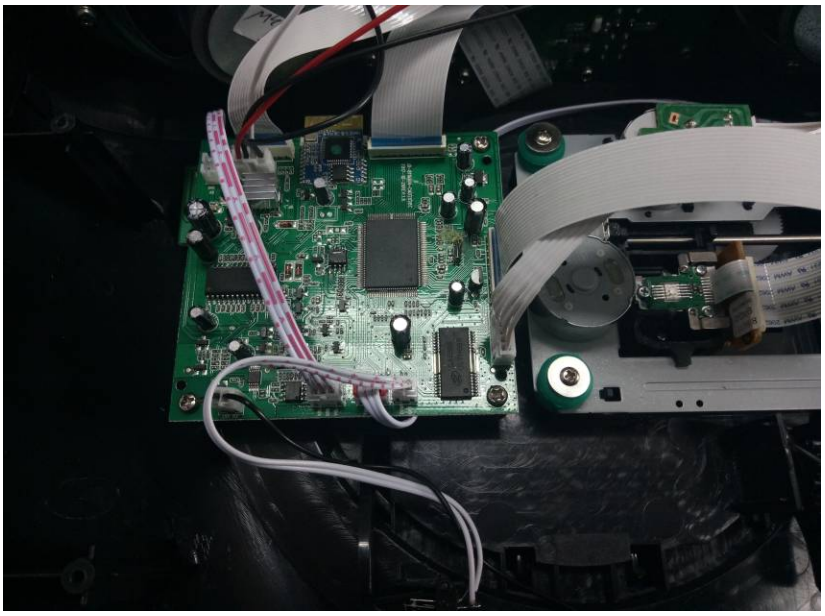
COMPACT
disc
DIGITAL AUDIO
COMPACT DISC PLAYER
VOLUME
TUNING
MODE
REPEAT
MAX

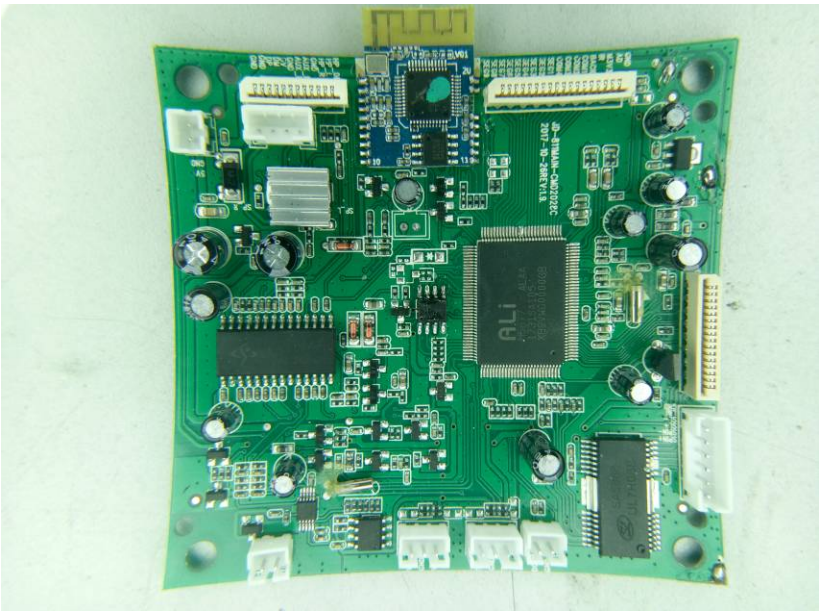
VOLUME

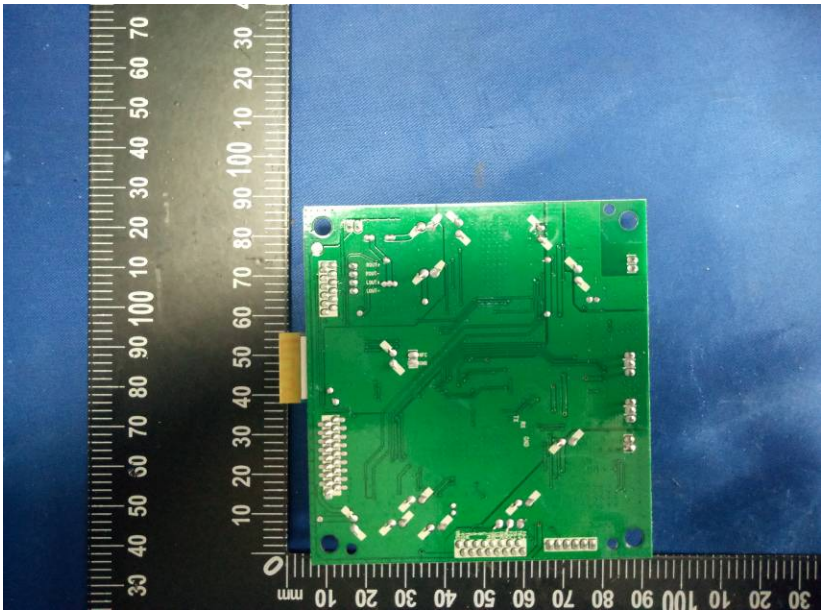
TUNING

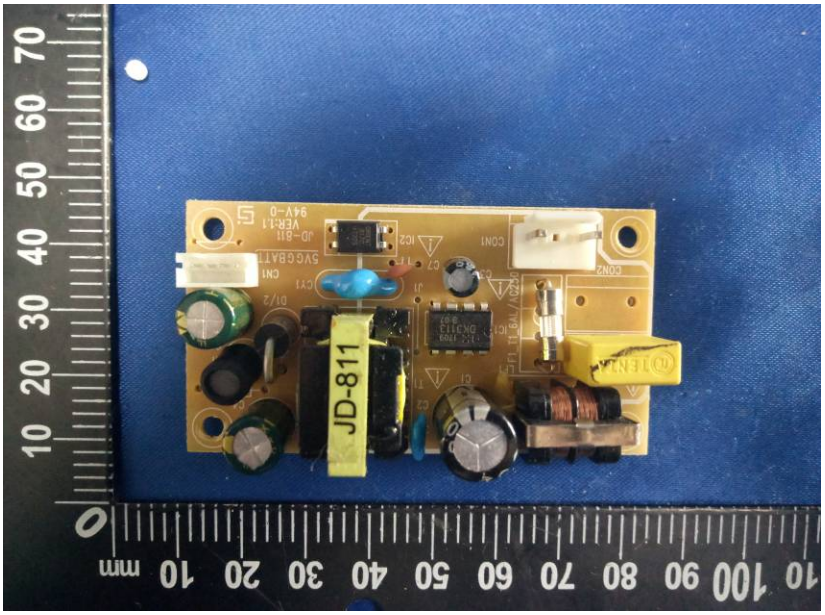


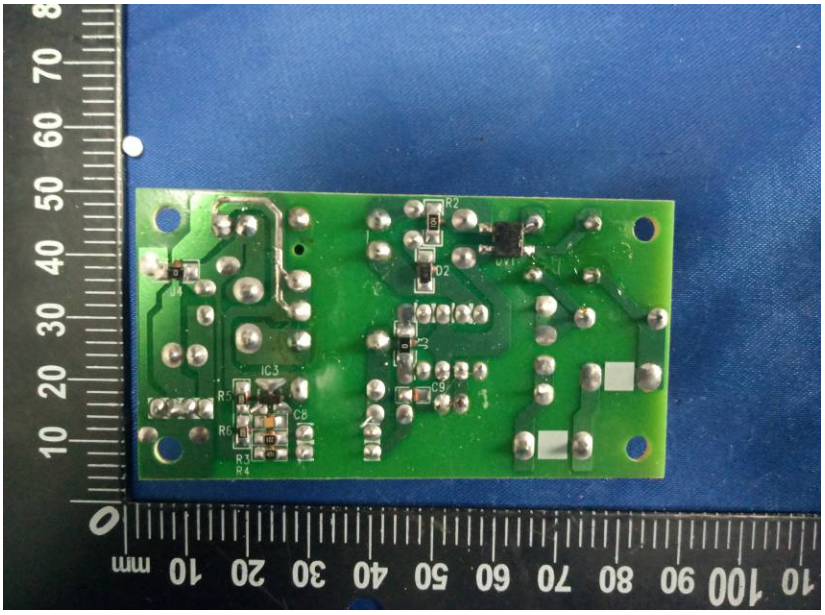


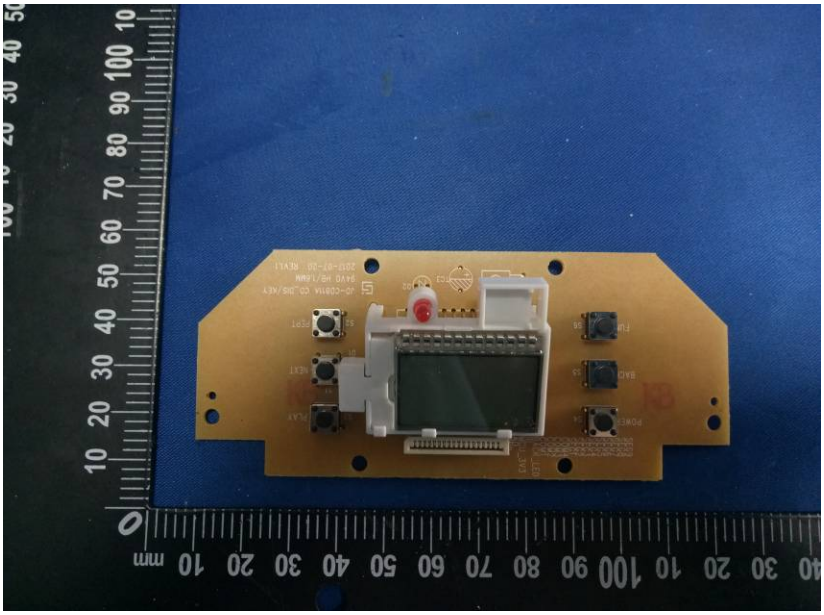


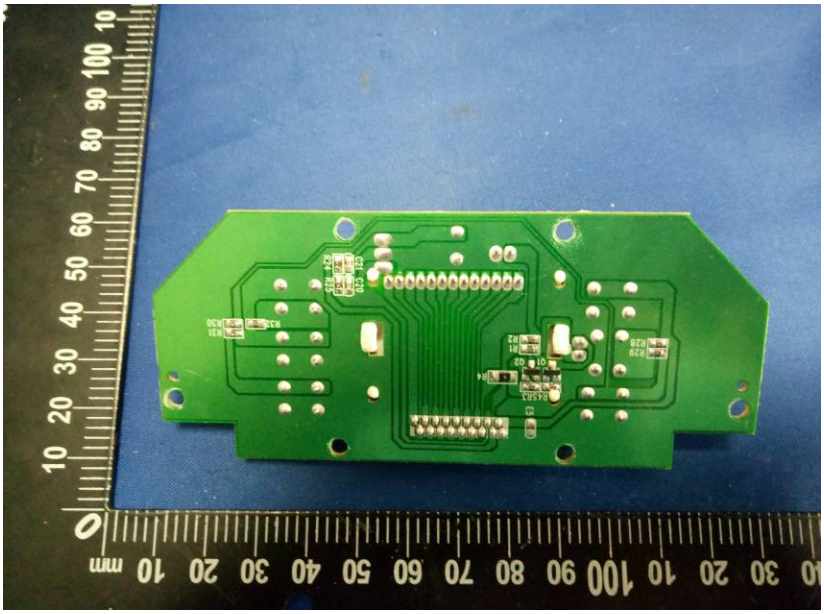


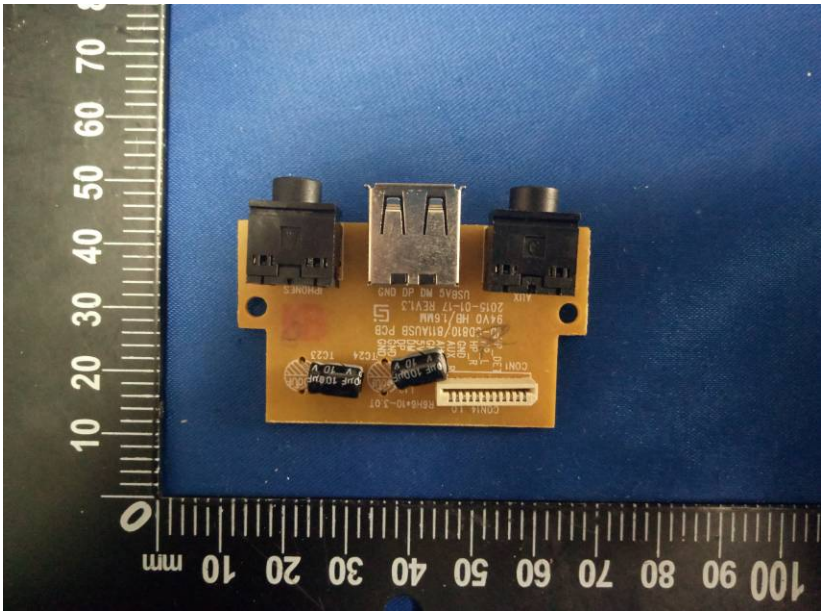


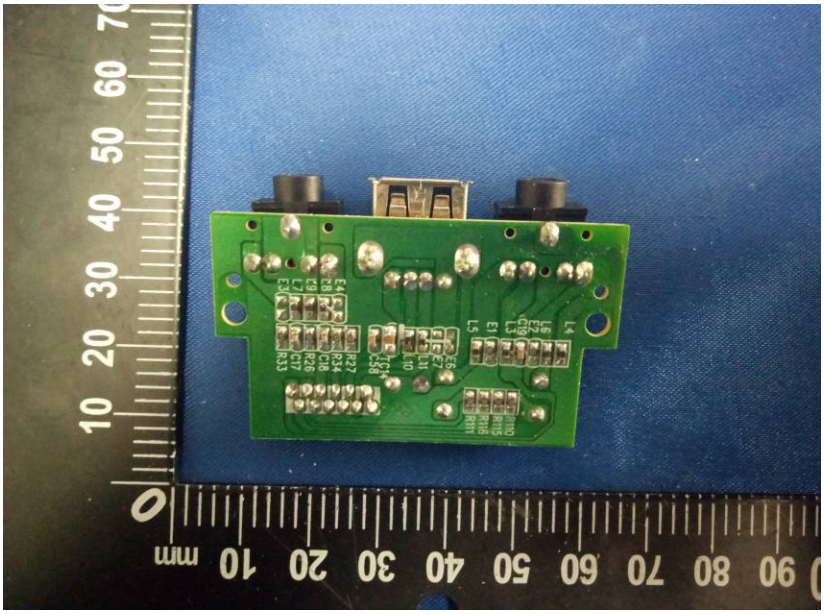

JD-811

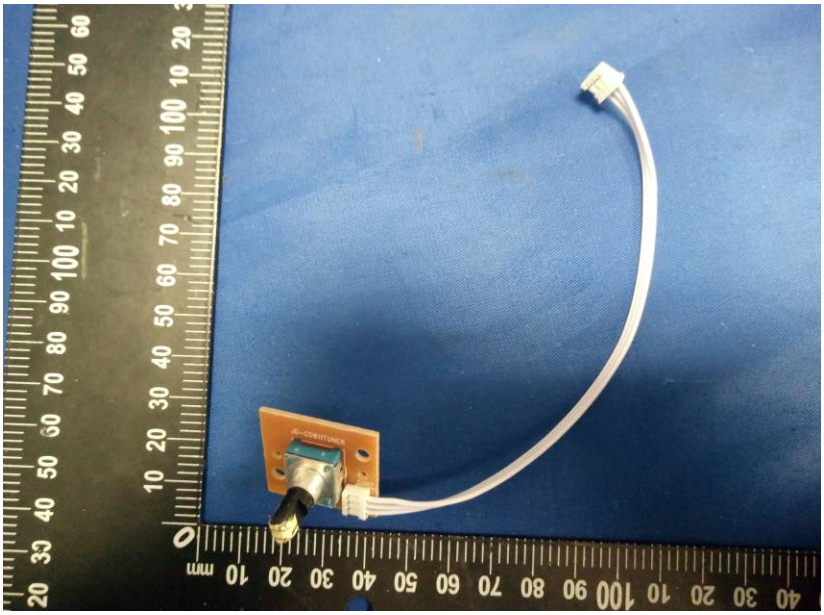


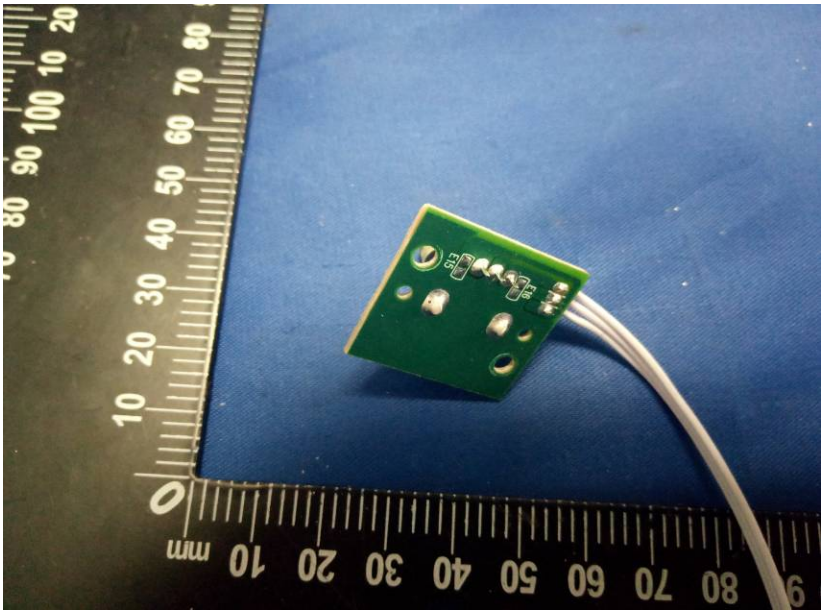


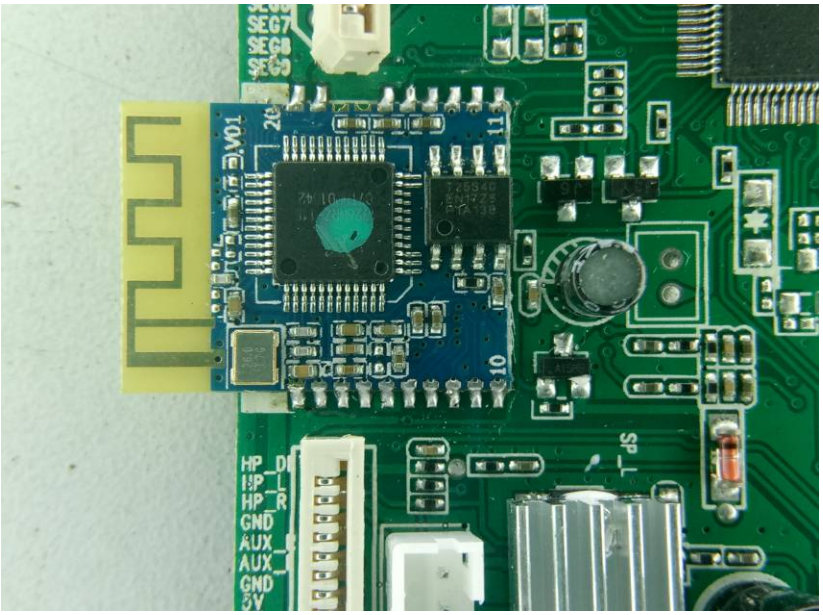












********THE END REPORT********