FCC TEST REPORT

FCC ID: 2ADFF-KSHIVEXBK

Product Name	:	Bluetooth Speaker(KS Hive X)
Model Name	:	KSHIVEXBK, KSHIVEXnn (nn = the colour code), BL-268
Brand Name	:	Kitsound / Uchoice
Report No.	:	PTCDQ01170715001E-FC01

Prepared for

KONDOR LIMITED

RADAR WAY CHRISTCHURCH BUSINESS PARK CHRISTCHURCH United Kingdom BH23 4FL

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	:	KONDOR LIMITED
Address	:	RADAR WAY CHRISTCHURCH BUSINESS PARK CHRISTCHURCH United Kingdom BH23 4FL
Manufacture's name	:	DONGGUAN CITY YUANYU ELECTRONIC TECHNOLOGY CO., LIMITED
Address	:	JINDUOGANG DEVELOPMENT ZONE, DATANG VILLAGE, DALINGSHAN TOWN, DONGGUAN CITY, GUANGDONG, CHINA
Product name	:	Bluetooth Speaker(KS Hive X)
Model name	:	KSHIVEXBK, KSHIVEXnn (nn = the colour code), BL-268
Brand Name	:	Kitsound / Uchoice
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10:2013
Test Date	:	December 12, 2017 to January 12, 2018
Date of Issue	:	January 15, 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:

(PTC) (BCTC)

Leo Yang / Engineer Eric Yang/Engineer

Technical Manager:

Chris Du / Manager

Contents

2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth	15.247(a)(1)	PASS
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	:	Bluetooth Speaker(KS Hive X)
Model Name	:	KSHIVEXBK, KSHIVEXnn (nn = the colour code); BL-268
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	:	0.5 dBi
Type of Modulation	:	GFSK, Π/4-DQPSK, 8DPSK
Power supply	:	DC 7.4V, 3300mAh Battery
Hardware Version	:	BL-268 MAINPCBV&3.0 2017.08.26
Software Version	:	US282A_BTBOX_DVB_ATS2825C-TWS-268-20170909

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.
Adapter	NSA12UH-050200 Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 5V, 2A	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)

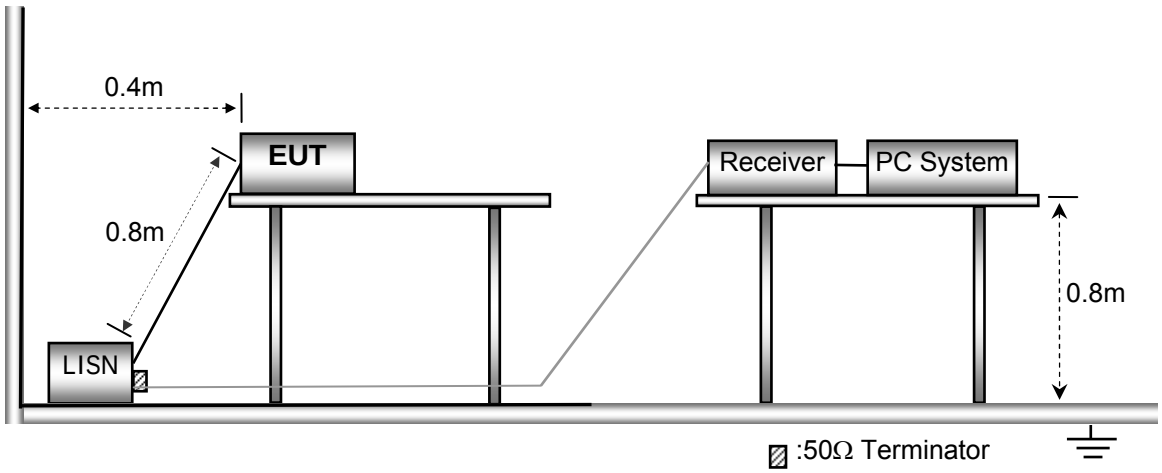
6.1 E.U.T. Operation

Operating Environment **:**

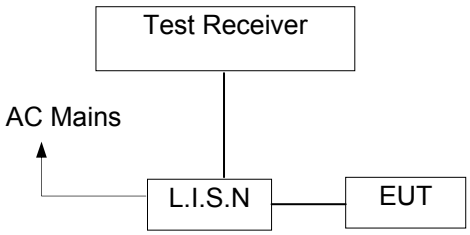
Temperature:	:	25.5 °C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.2kPa
Test Voltage	:	AC 120V/60Hz

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.

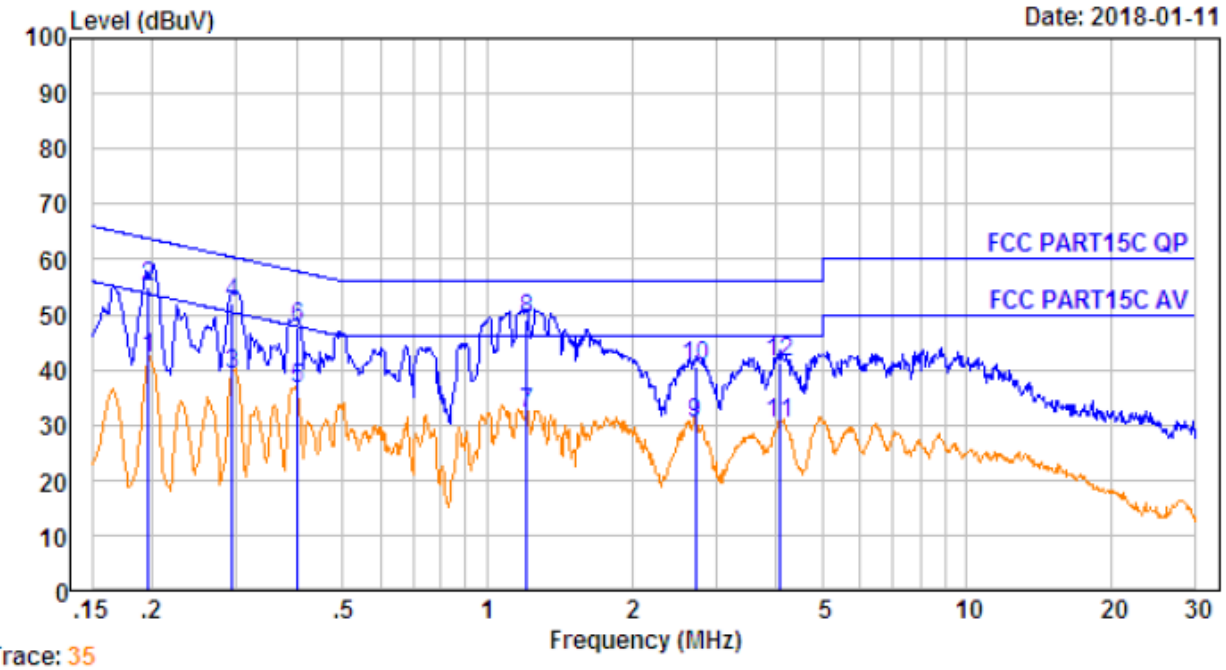
6.6 Measurement Description

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

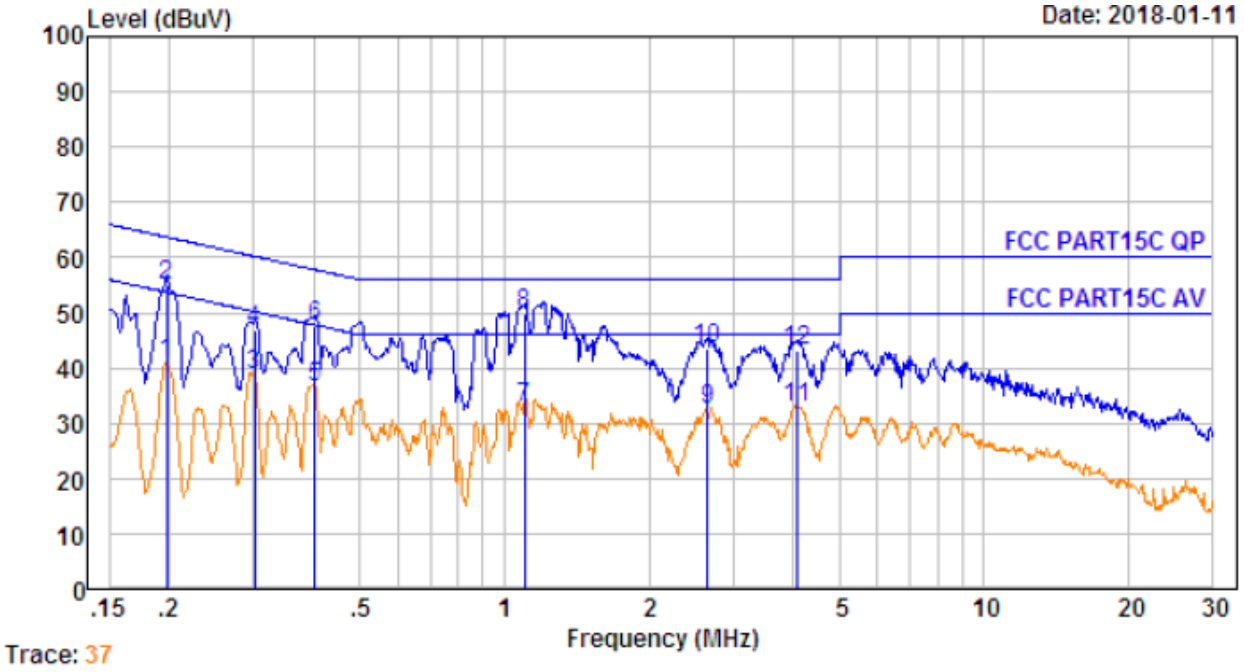
Pass
Please find the following pages for the worst mode(GFSK TX 2402MHz).

Line -120V/60Hz:



No.	Freq MHz	Cable Loss dB	Clamp Factor dB	Receiver Reading dBpW	Emission Level dBpW	Limit dBpW	Over Limit dB	Remark
1.	0.197	0.28	9.61	32.11	42.00	53.76	-11.76	Average
2.	0.197	0.28	9.61	45.11	55.00	63.76	-8.76	QP
3.	0.294	0.37	9.70	29.10	39.17	50.41	-11.24	Average
4.	0.294	0.37	9.70	42.10	52.17	60.41	-8.24	QP
5.	0.402	0.40	9.76	26.35	36.51	47.81	-11.30	Average
6.	0.402	0.40	9.76	37.35	47.51	57.81	-10.30	QP
7.	1.210	0.46	9.86	21.76	32.08	46.00	-13.92	Average
8.	1.210	0.46	9.86	38.76	49.08	56.00	-6.92	QP
9.	2.721	0.47	9.91	20.06	30.44	46.00	-15.56	Average
10.	2.721	0.47	9.91	30.06	40.44	56.00	-15.56	QP
11.	4.070	0.47	9.94	19.96	30.37	46.00	-15.63	Average
12.	4.070	0.47	9.94	30.96	41.37	56.00	-14.63	QP

Neutral -120V/60Hz:



No.	Freq MHz	Cable Loss dB	Clamp Factor dB	Receiver Reading dBpW	Emission Level dBpW	Limit dBpW	Over Limit dB	Remark
1.	0.198	0.28	9.59	31.11	40.98	53.71	-12.73	Average
2.	0.198	0.28	9.59	45.11	54.98	63.71	-8.73	QP
3.	0.302	0.37	9.68	28.72	38.77	50.19	-11.42	Average
4.	0.302	0.37	9.68	36.72	46.77	60.19	-13.42	QP
5.	0.402	0.40	9.73	26.35	36.48	47.81	-11.33	Average
6.	0.402	0.40	9.73	37.35	47.48	57.81	-10.33	QP
7.	1.100	0.46	9.82	22.43	32.71	46.00	-13.29	Average
8.	1.100	0.46	9.82	39.43	49.71	56.00	-6.29	QP
9.	2.650	0.47	9.87	22.08	32.42	46.00	-13.58	Average
10.	2.650	0.47	9.87	33.08	43.42	56.00	-12.58	QP
11.	4.070	0.47	9.90	22.65	33.02	46.00	-12.98	Average
12.	4.070	0.47	9.90	32.65	43.02	56.00	-12.98	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

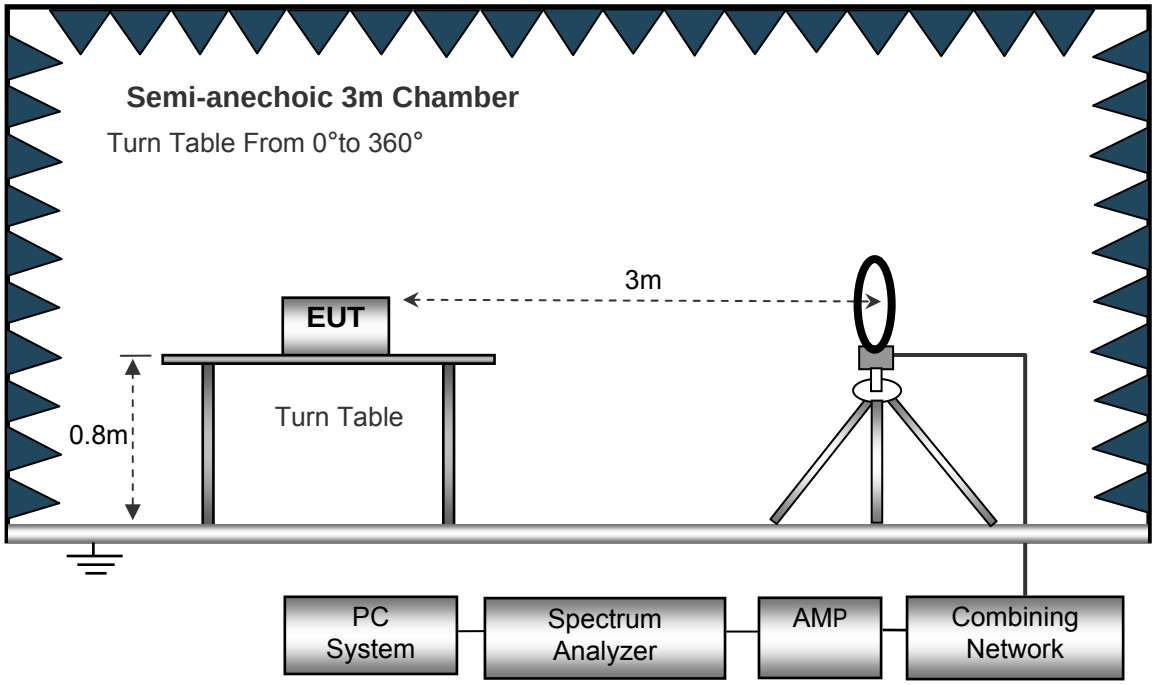
Atmospheric Pressure: : 101.2kPa

Test Voltage : DC 7.4V Battery

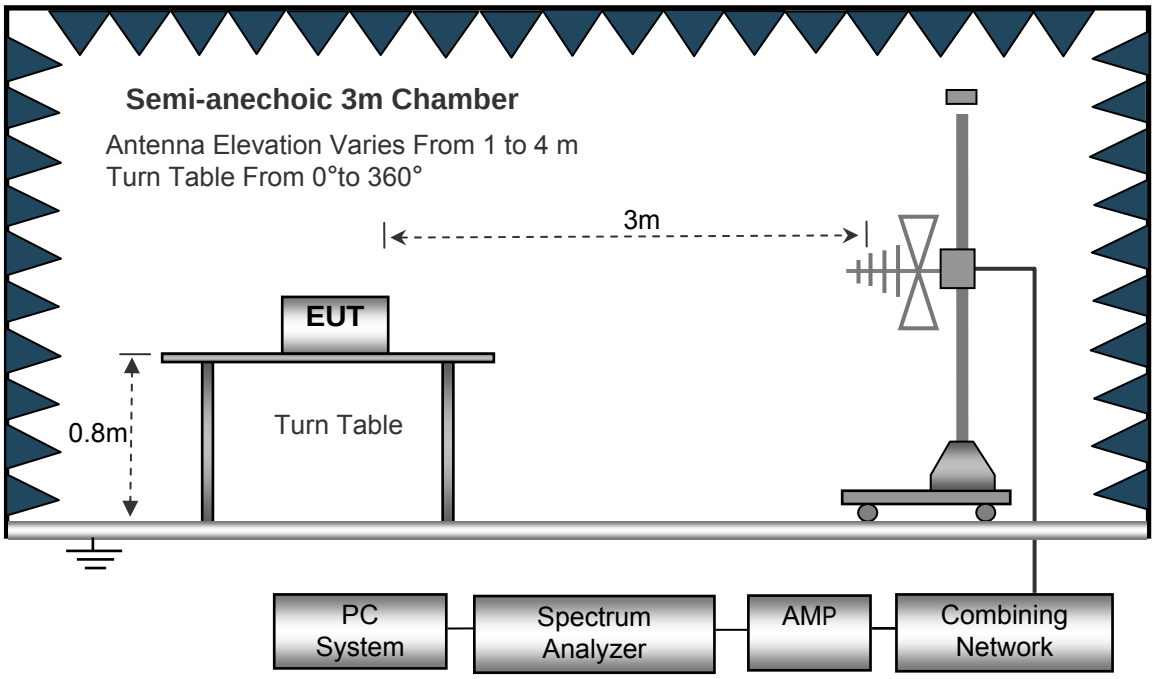
7.2 Test Setup

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

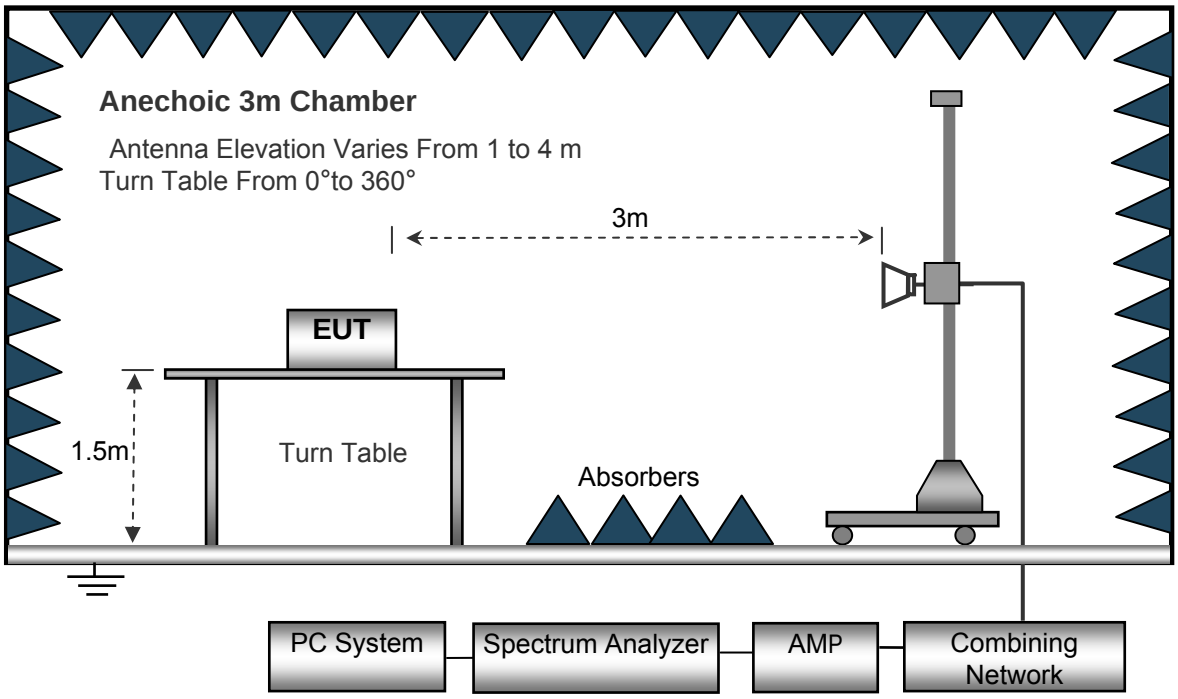
The test setup for emission measurement below 30MHz.



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

Operation Mode: TX Test Date : January 11, 2018

Test Result: PASS Test By: Leo Yang

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

Note:

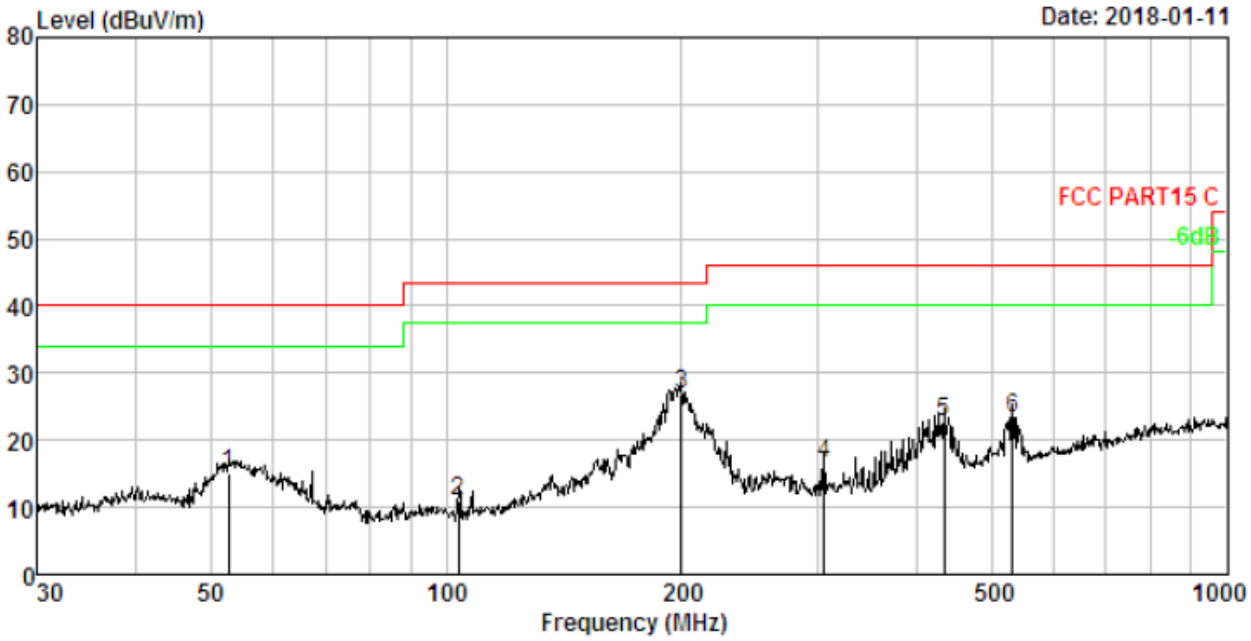
The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

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

Test Frequency: 30MHz ~ 1GHz

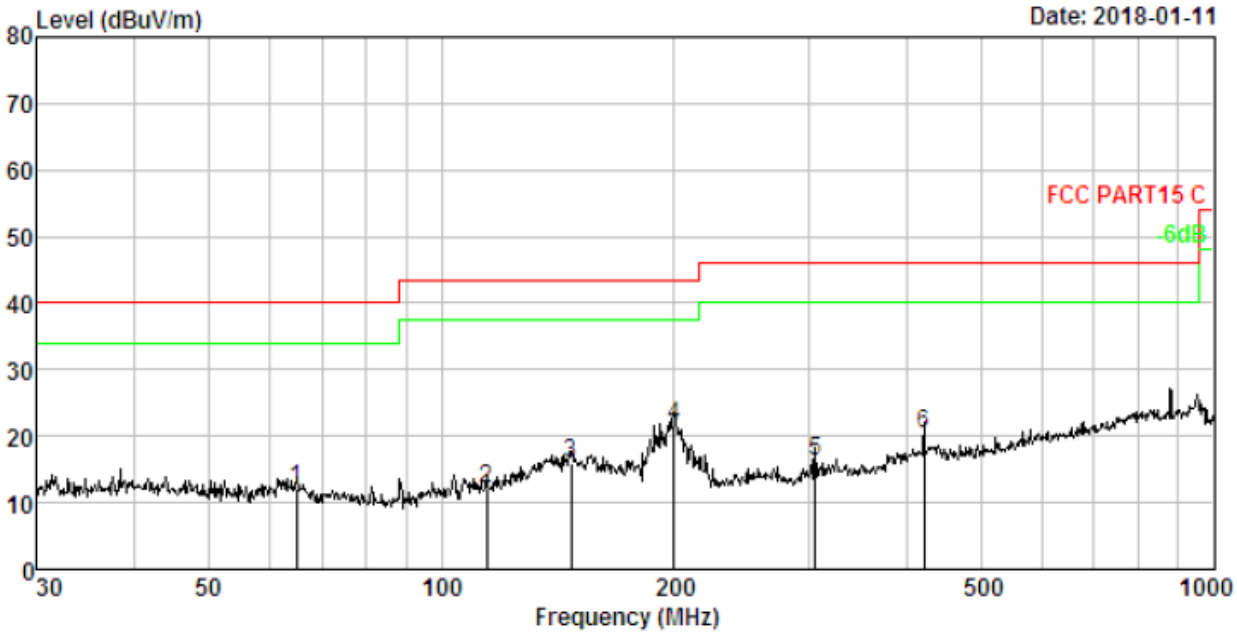
Please refer to the following test plots:

Test plot for Horizontal: GFSK(2402MHz)



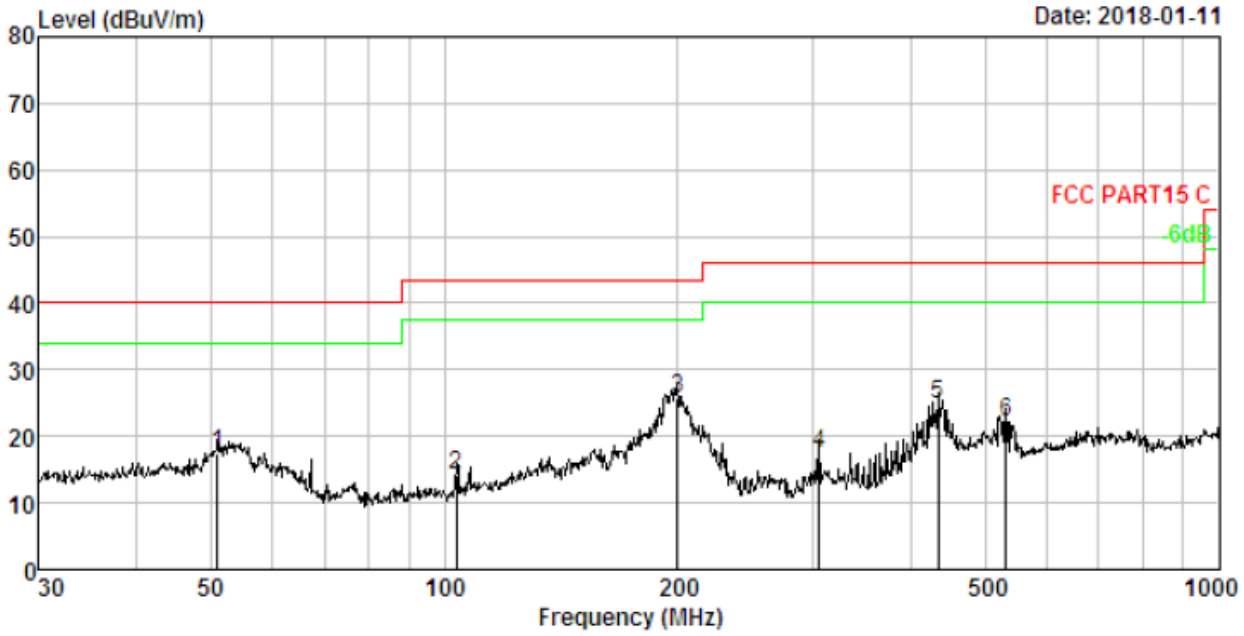
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	52.575	1.56	12.08	31.60	30.17	15.07	40.00	-24.93	QP
2.	103.806	2.18	10.57	28.72	30.40	11.07	43.50	-32.43	QP
3.	199.986	2.77	10.38	44.21	30.63	26.73	43.50	-16.77	QP
4.	304.610	3.15	13.30	30.75	30.78	16.42	46.00	-29.58	QP
5.	434.065	3.47	16.06	34.07	30.90	22.70	46.00	-23.30	QP
6.	531.964	3.66	17.54	33.05	30.97	23.28	46.00	-22.72	QP

Test plot for Vertical: GFSK(2402MHz)



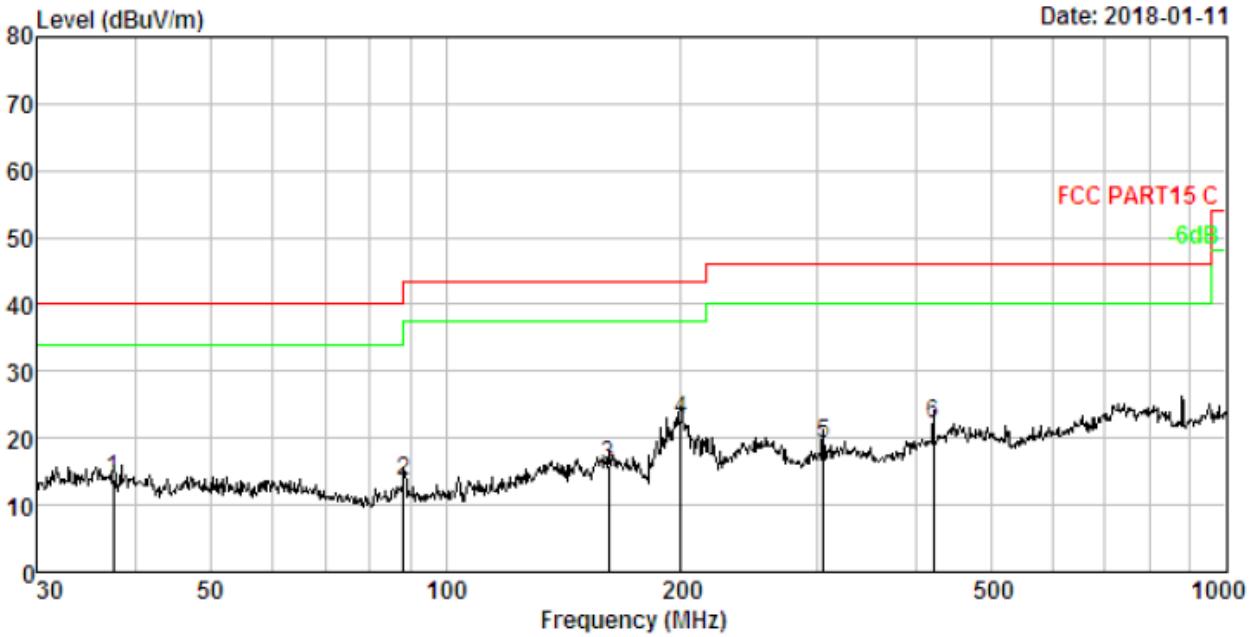
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	64.887	1.75	11.85	28.66	30.24	12.02	40.00	-27.98	QP
2.	114.515	2.27	11.51	28.88	30.44	12.22	43.50	-31.28	QP
3.	147.404	2.50	13.76	30.06	30.52	15.80	43.50	-27.70	QP
4.	199.986	2.77	10.38	39.17	30.63	21.69	43.50	-21.81	QP
5.	304.610	3.15	13.30	30.56	30.78	16.23	46.00	-29.77	QP
6.	422.058	3.45	15.75	31.97	30.89	20.28	46.00	-25.72	QP

Test plot for Horizontal: GFSK(2441MHz)



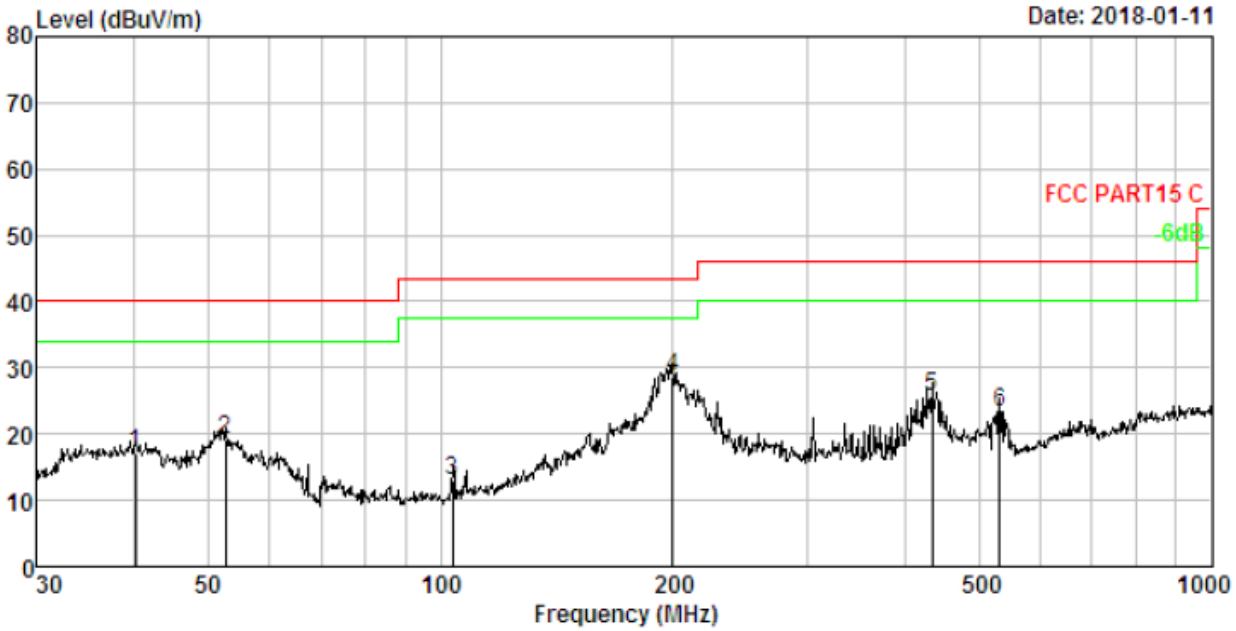
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	50.942	1.53	12.20	33.90	30.15	17.48	40.00	-22.52	QP
2.	103.806	2.18	10.57	31.72	30.40	14.07	43.50	-29.43	QP
3.	199.986	2.77	10.38	43.21	30.63	25.73	43.50	-17.77	QP
4.	304.610	3.15	13.30	31.75	30.78	17.42	46.00	-28.58	QP
5.	434.065	3.47	16.06	36.07	30.90	24.70	46.00	-21.30	QP
6.	531.964	3.66	17.54	32.05	30.97	22.28	46.00	-23.72	QP

Test plot for Vertical: GFSK(2441MHz)



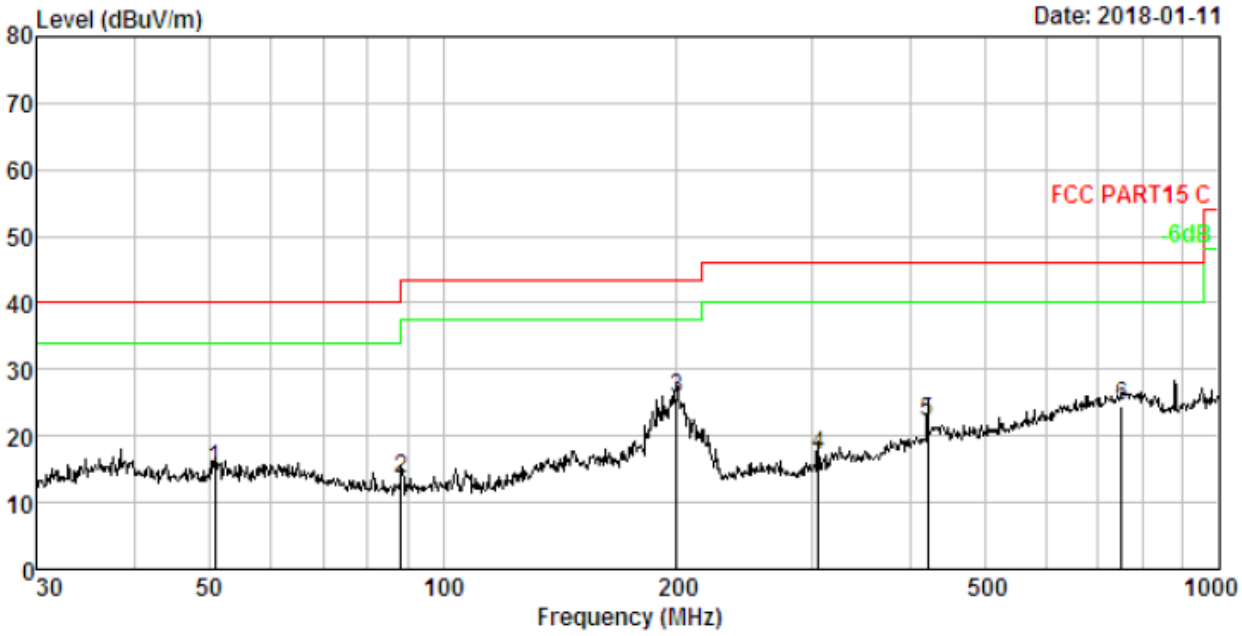
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	37.548	1.26	13.51	29.25	30.05	13.97	40.00	-26.03	QP
2.	88.342	2.03	9.10	32.86	30.35	13.64	43.50	-29.86	QP
3.	161.474	2.58	13.80	30.10	30.56	15.92	43.50	-27.58	QP
4.	199.986	2.77	10.38	40.17	30.63	22.69	43.50	-20.81	QP
5.	304.610	3.15	13.30	33.56	30.78	19.23	46.00	-26.77	QP
6.	422.058	3.45	15.75	33.97	30.89	22.28	46.00	-23.72	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.	40.276	1.32	13.68	32.06	30.07	16.99	40.00	-23.01	QP
2.	52.575	1.56	12.08	35.60	30.17	19.07	40.00	-20.93	QP
3.	103.806	2.18	10.57	30.72	30.40	13.07	43.50	-30.43	QP
4.	199.986	2.77	10.38	46.21	30.63	28.73	43.50	-14.77	QP
5.	434.065	3.47	16.06	37.07	30.90	25.70	46.00	-20.30	QP
6.	531.964	3.66	17.54	33.05	30.97	23.28	46.00	-22.72	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.	50.764	1.53	12.21	31.36	30.15	14.95	40.00	-25.05	QP
2.	88.342	2.03	9.10	32.86	30.35	13.64	43.50	-29.86	QP
3.	199.986	2.77	10.38	43.17	30.63	25.69	43.50	-17.81	QP
4.	304.610	3.15	13.30	31.56	30.78	17.23	46.00	-28.77	QP
5.	422.058	3.45	15.75	33.97	30.89	22.28	46.00	-23.72	QP
6.	750.108	3.97	21.35	30.41	31.09	24.64	46.00	-21.36	QP

Test Frequency 1GHz-18GHz:

Operation Mode:	GFSK (CH00: 2402MHz)	Test Date :	January 11, 2018
Test Result:	PASS	Test By:	Leo Yang

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4804	V	65.35	44.15	74	54	-8.65	-9.85
7206	V	64.21	43.25	74	54	-9.79	-10.75
9608	V	63.05	42.13	74	54	-10.95	-11.87
12010	V	62.48	41.59	74	54	-11.52	-12.41
14412	V	61.24	40.24	74	54	-12.76	-13.76
16814	V	60.35	39.25	74	54	-13.65	-14.75
4804	H	64.25	45.15	74	54	-9.75	-8.85
7206	H	63.15	44.62	74	54	-10.85	-9.38
9608	H	62.05	43.42	74	54	-11.95	-10.58
12010	H	61.58	42.15	74	54	-12.42	-11.85
14412	H	60.35	40.26	74	54	-13.65	-13.74
16814	H	59.28	38.54	74	54	-14.72	-15.46

Operation Mode:	GFSK (CH39: 2441MHz)	Test Date :	January 11, 2018
Test Result:	PASS	Test By:	Leo Yang

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4882	H	64.05	46.22	74	54	-9.95	-7.78
7323	H	63.15	45.35	74	54	-10.85	-8.65
9764	H	62.04	44.15	74	54	-11.96	-9.85
12205	H	61.59	43.62	74	54	-12.41	-10.38
14646	H	60.22	42.04	74	54	-13.78	-11.96
17087	H	59.84	41.95	74	54	-14.16	-12.05
4882	V	65.25	45.25	74	54	-8.75	-8.75
7323	V	64.39	44.35	74	54	-9.61	-9.65
9764	V	63.24	43.69	74	54	-10.76	-10.31
12205	V	62.05	42.15	74	54	-11.95	-11.85
14646	V	61.48	41.05	74	54	-12.52	-12.95
17087	V	60.26	40.24	74	54	-13.74	-13.76

Operation Mode:	GFSK (CH78: 2480MHz)	Test Date :	January 11, 2018
Test Result:	PASS	Test By:	Leo Yang

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4960	H	65.32	45.15	74	54	-8.68	-8.85
7440	H	64.15	44.35	74	54	-9.85	-9.65
9920	H	63.48	43.62	74	54	-10.52	-10.38
12400	H	62.25	42.08	74	54	-11.75	-11.92
14880	H	61.58	41.69	74	54	-12.42	-12.31
17360	H	60.35	40.25	74	54	-13.65	-13.75
4960	V	65.18	44.35	74	54	-8.82	-9.65
7440	V	64.25	43.61	74	54	-9.75	-10.39
9920	V	63.04	42.15	74	54	-10.96	-11.85
12400	V	62.15	41.08	74	54	-11.85	-12.92
14880	V	61.08	40.69	74	54	-12.92	-13.31
17360	V	60.48	39.27	74	54	-13.52	-14.73

Note:

1) Scan with GFSK, π/4-DQPSK,8DPSK,the worst case is GFSK Mode

2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

Test Frequency: From 18GHz to 25GHz

Operation Mode:	TX	Test Date :	December 14, 2017
Test Result:	PASS	Test By:	Eric Yang

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.

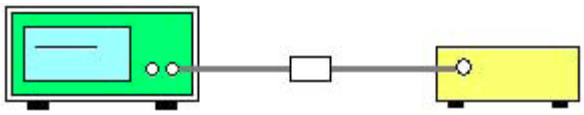
8.2 TEST PROCEDURE

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

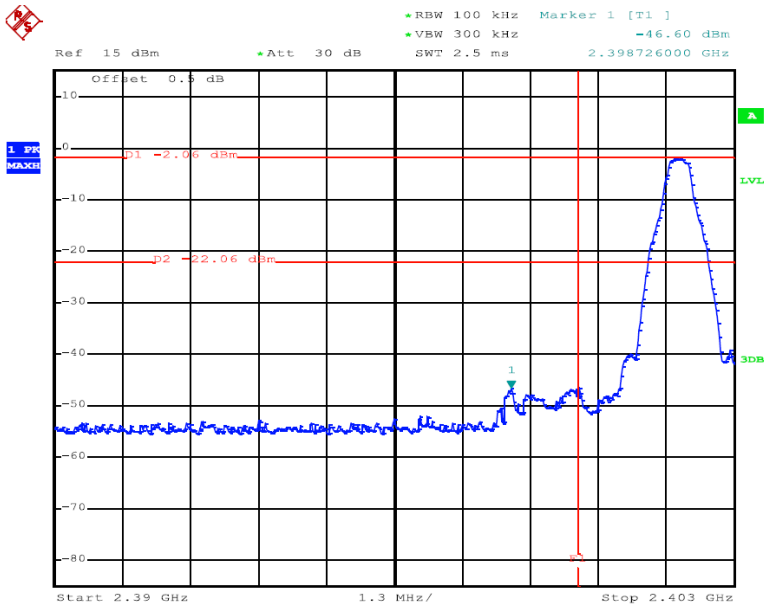
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

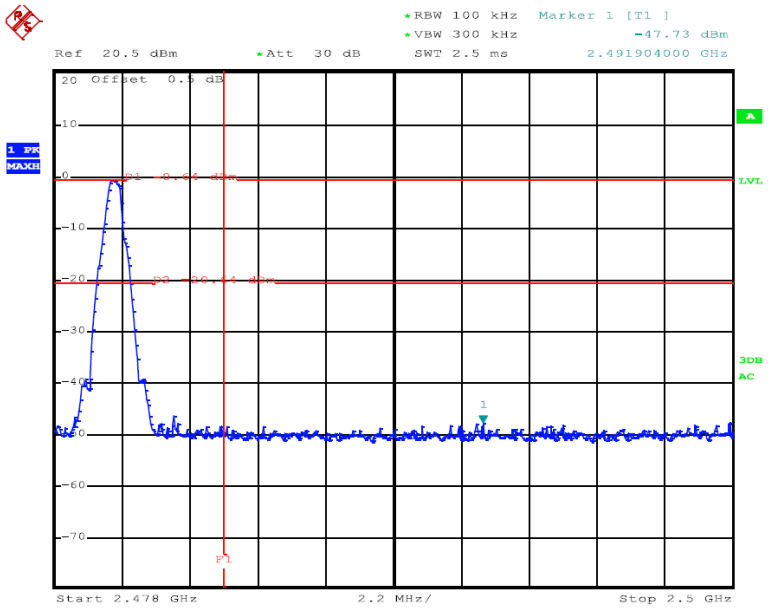
8.5 TEST RESULTS

Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS

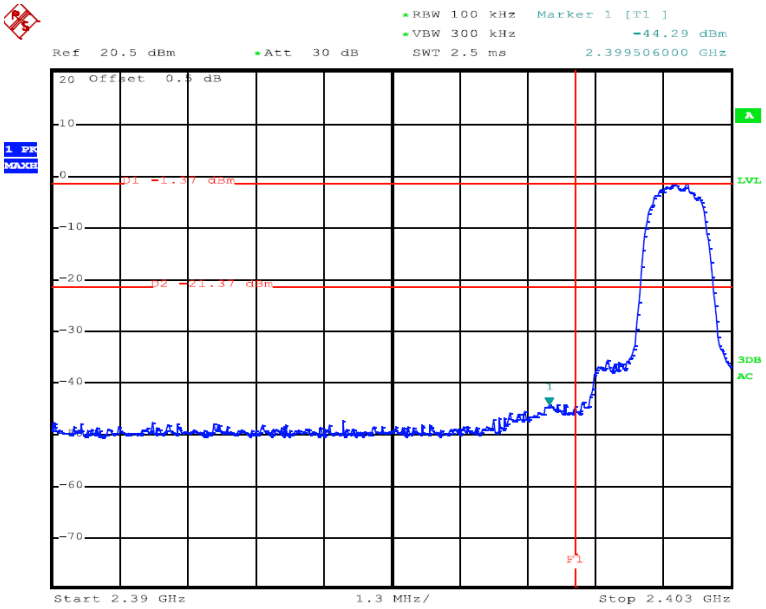
For Non-Hopping Mode:

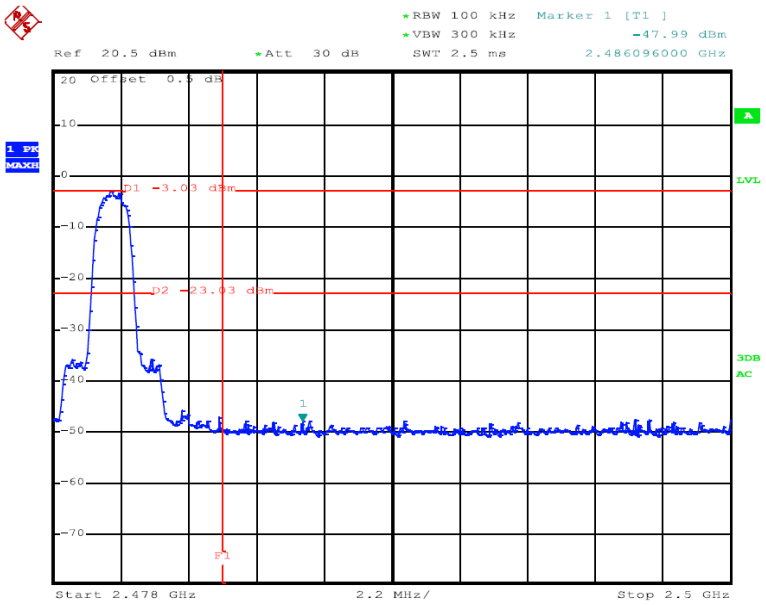
GFSK



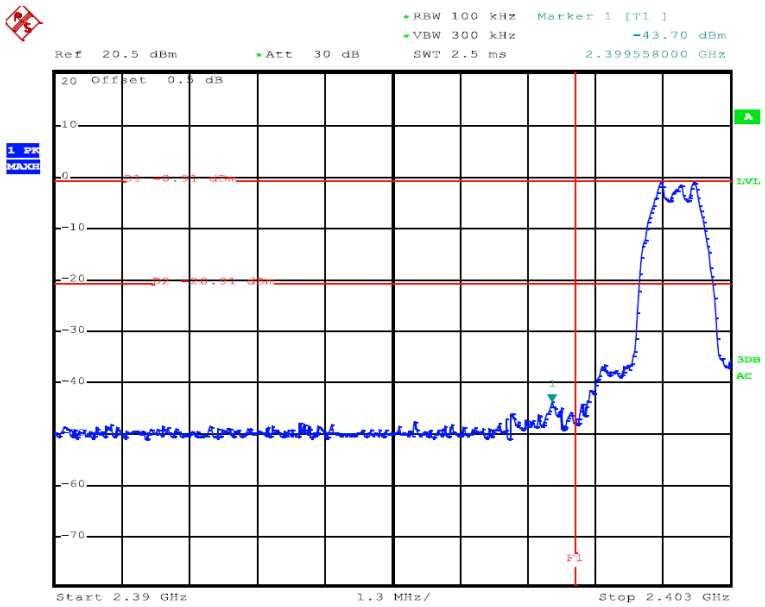

RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-47.73 dBm
Ref 20.5 dBm
Att 30 dB
SWT 2.5 ms
2.491904000 GHz
Offset 0.5 dB
1 PK MAXH
A
LVL
3DB AC
Start 2.478 GHz
2.2 MHz/
Stop 2.5 GHz

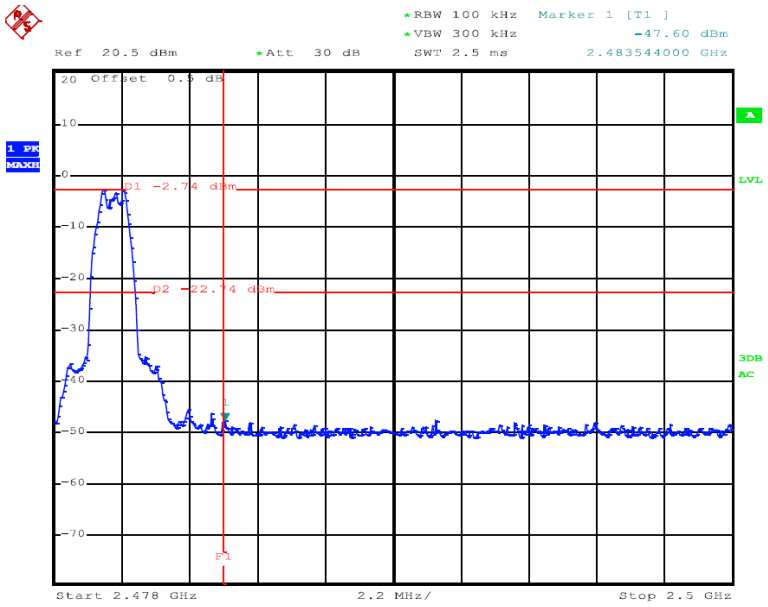
π/4-DQPSK


RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-44.29 dBm
Ref 20.5 dBm
Att 30 dB
SWT 2.5 ms
2.399506000 GHz
Offset 0.5 dB
1 PK MAXH
A
LVL
3DB AC
Start 2.39 GHz
1.3 MHz/
Stop 2.403 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-47.99 dBm
2.486096000 GHz
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
D1 -3.03 dBm
D2 -23.03 dBm
LVL
3DB
AC
Start 2.478 GHz
2.2 MHz/
Stop 2.5 GHz

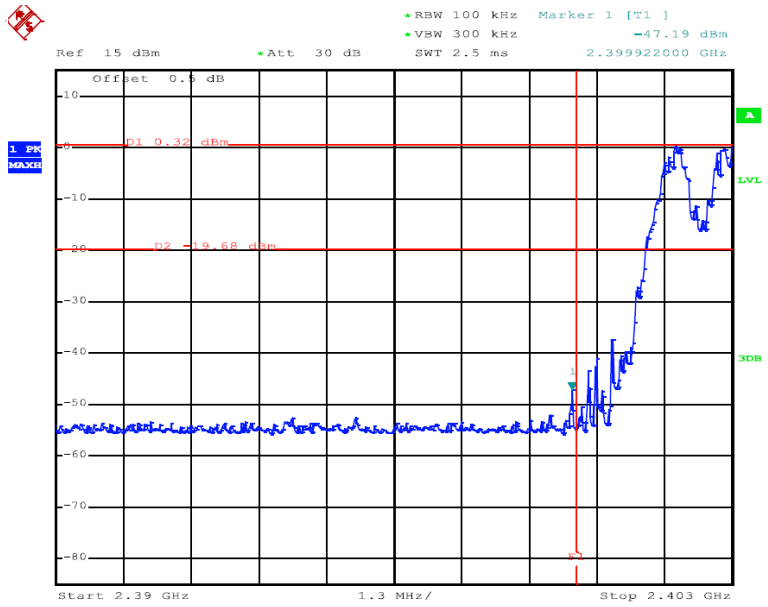
8DPSK

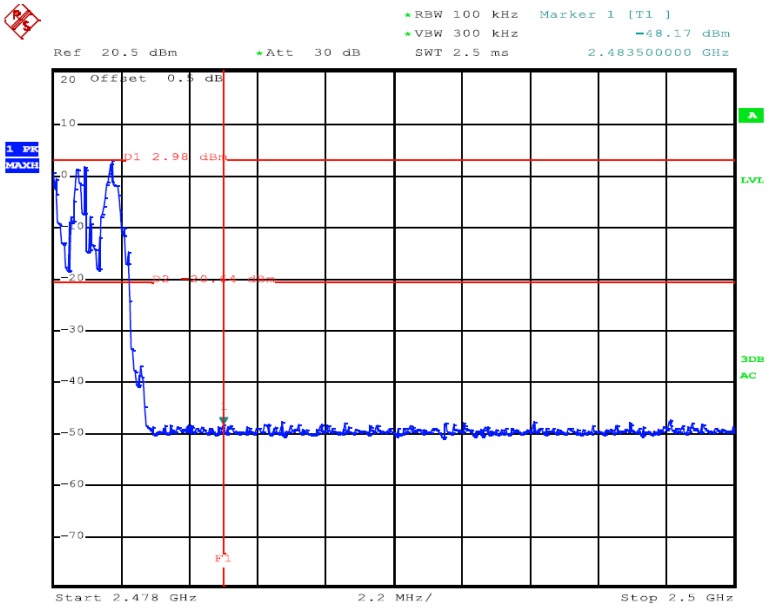

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-43.70 dBm
2.399558000 GHz
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
LVL
3DB
AC
Start 2.39 GHz
1.3 MHz/
Stop 2.403 GHz



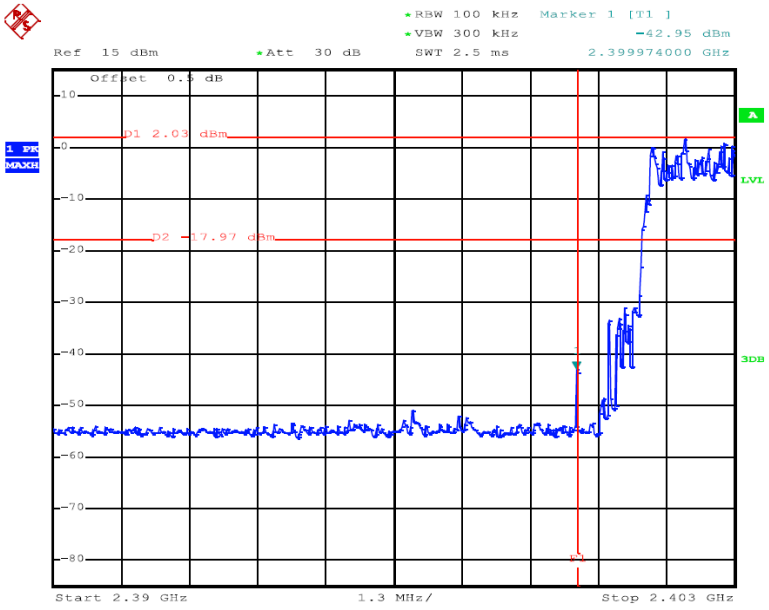
For Hopping Mode:

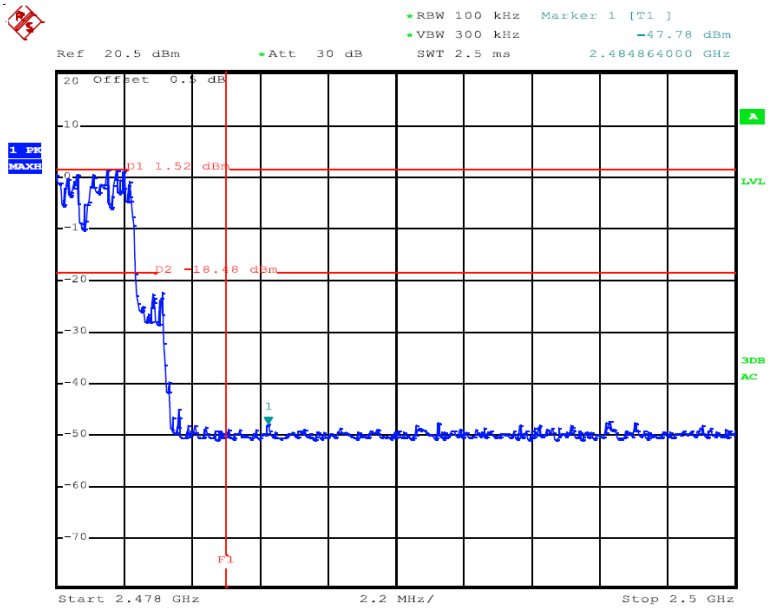
GFSK



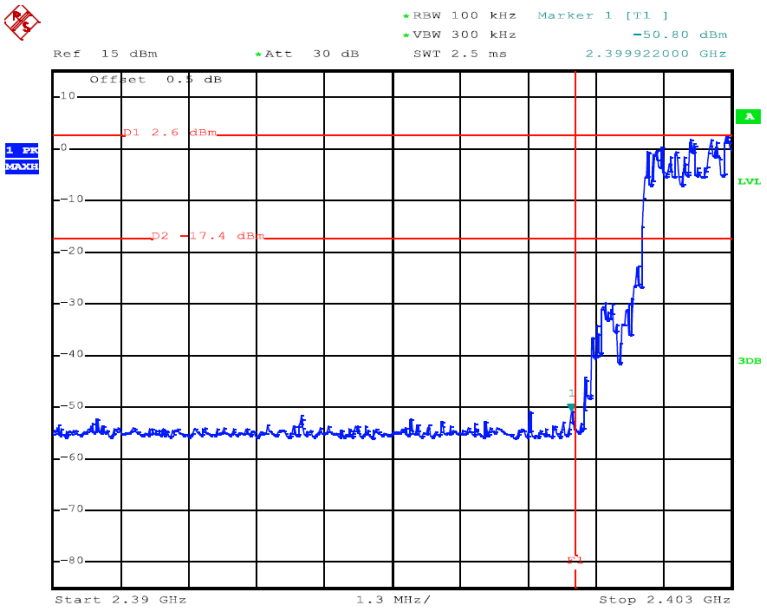

RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-48.17 dBm
Ref 20.5 dBm
Att 30 dB
SWT 2.5 ms
2.483500000 GHz
Offset 0.5 dB
D1 2.98 dBm
D2 -16.14 dBm
LVL
3DB
AC
Start 2.478 GHz
2.2 MHz/
Stop 2.5 GHz

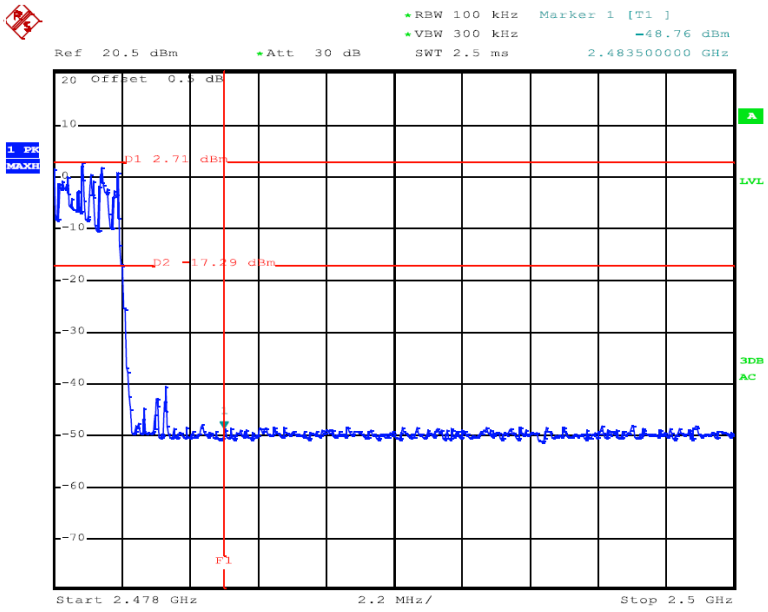
π/4-DQPSK


RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-42.95 dBm
Ref 15 dBm
Att 30 dB
SWT 2.5 ms
2.399974000 GHz
Offset 0.5 dB
D1 2.03 dBm
D2 -17.97 dBm
LVL
3DB
Start 2.39 GHz
1.3 MHz/
Stop 2.403 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-47.78 dBm
2.484864000 GHz
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
D1 1.52 dBm
D2 -18.48 dBm
LVL
3DB
AC
Start 2.478 GHz
2.2 MHz/
Stop 2.5 GHz

8DPSK


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-50.80 dBm
2.399922000 GHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
D1 2.6 dBm
D2 -17.4 dBm
LVL
3DB
Start 2.39 GHz
1.3 MHz/
Stop 2.403 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-48.76 dBm
2.483500000 GHz
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
D1 2.71 dBm
D2 -17.29 dBm
LVL
3DB
AC
Start 2.478 GHz
2.2 MHz/
Stop 2.5 GHz

9 20 dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

9.1 Test Procedure

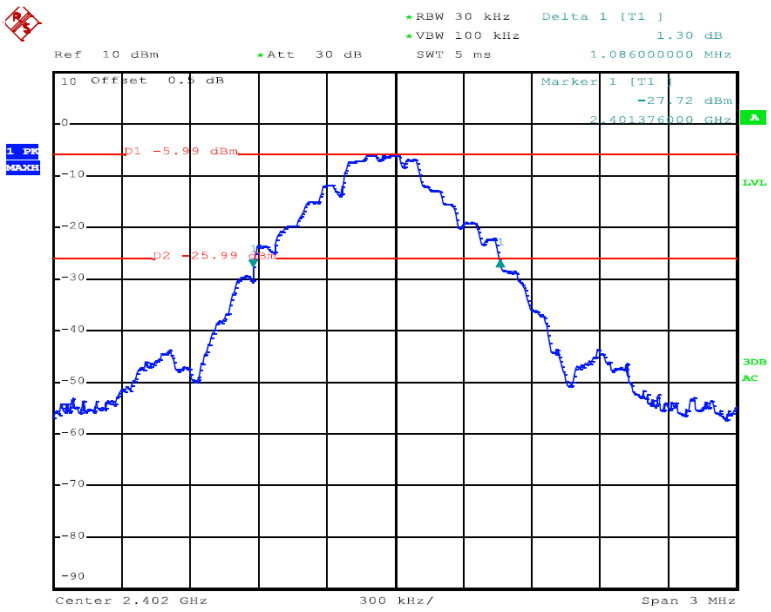
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

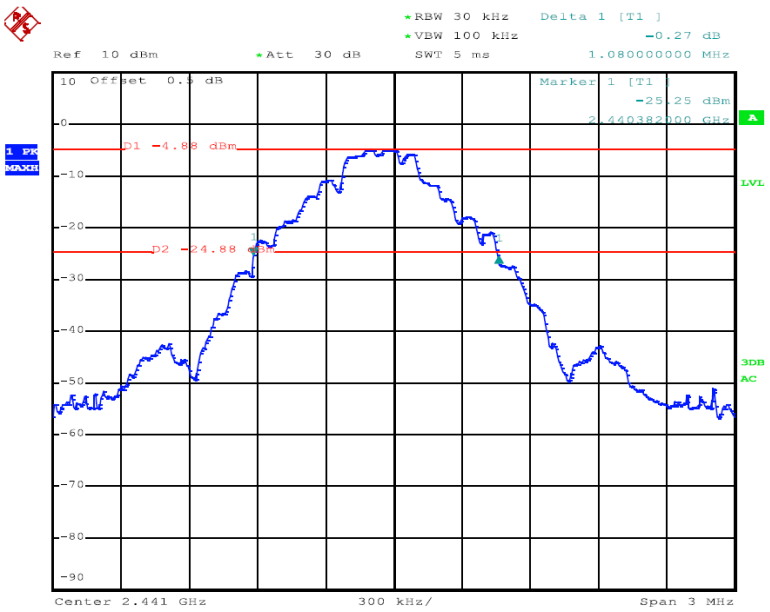
2. Set the spectrum analyzer: RBW =30kHz, VBW = 100kHz

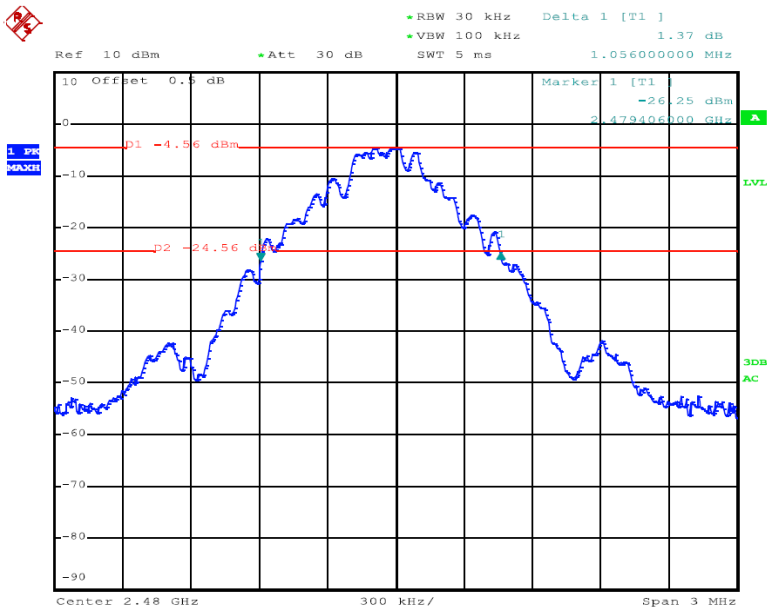
9.2 Test Result

Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1086
39	2441	1080
78	2480	1056

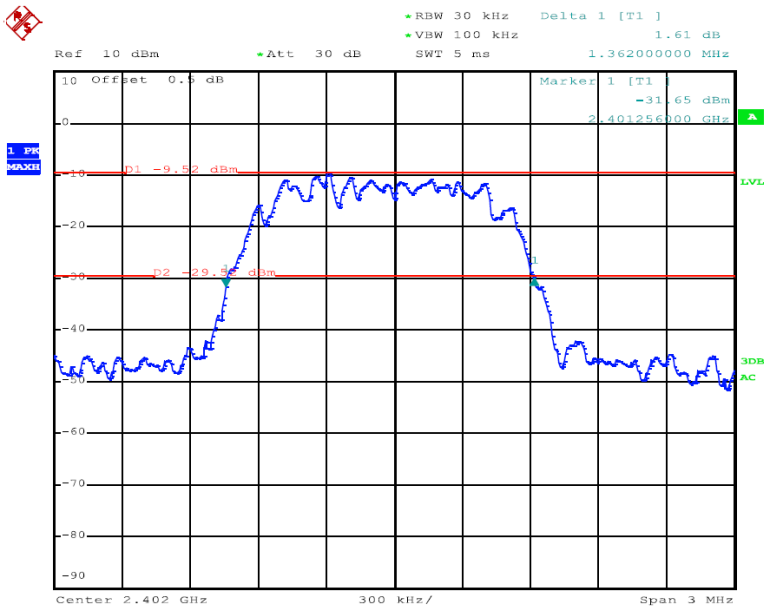

RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
1.30 dB
1.086000000 MHz
Ref 10 dBm
Att 30 dB
10 Offset 0.5 dB
Marker 1 [T1]
-27.72 dBm
2.401376000 GHz
D1 -5.99 dBm
D2 -25.99 dBm
1 PK MAXH
LVL
3DB AC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.402 GHz
300 kHz/
Span 3 MHz

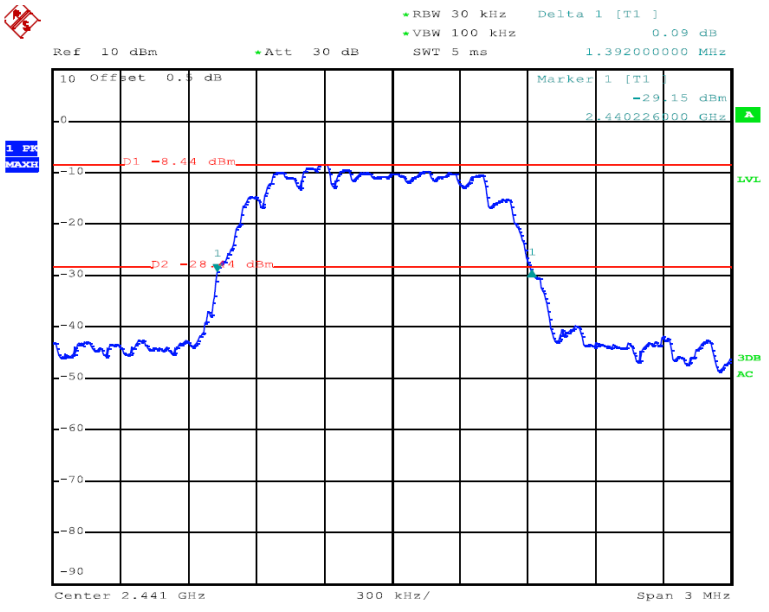

RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
-0.27 dB
1.080000000 MHz
Ref 10 dBm
Att 30 dB
10 Offset 0.5 dB
Marker 1 [T1]
-25.25 dBm
2.440382000 GHz
D1 -4.88 dBm
D2 -24.88 dBm
1 PK MAXH
LVL
3DB AC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.441 GHz
300 kHz/
Span 3 MHz

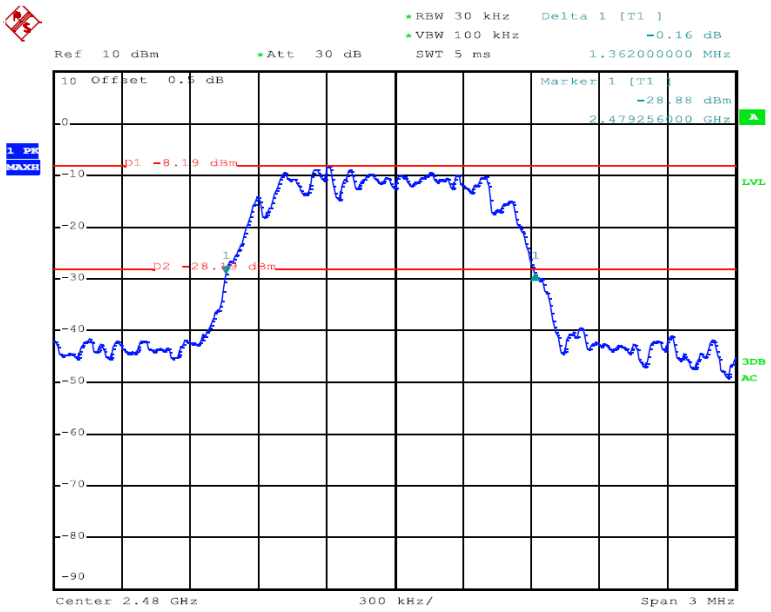


Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	Π/4-DQPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1362
39	2441	1392
78	2480	1362

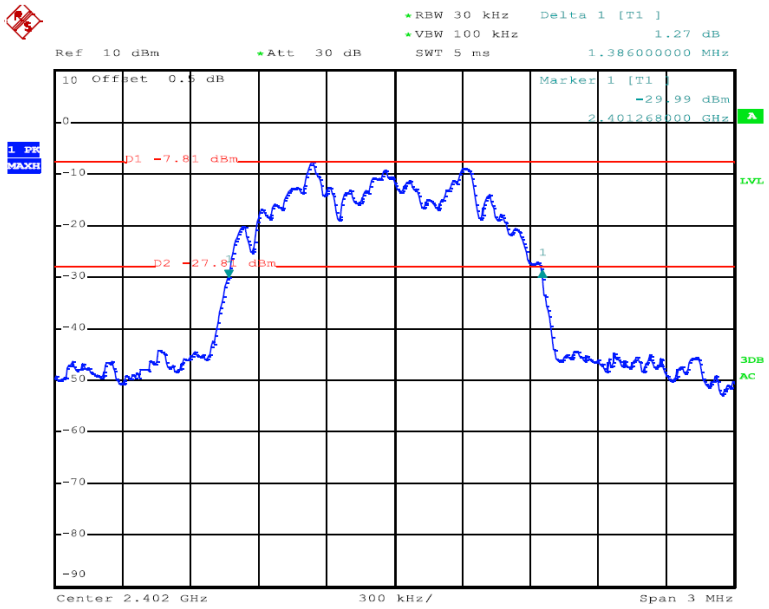

RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
1.61 dB
1.362000000 MHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-31.65 dBm
2.401256000 GHz
D1 -9.52 dBm
D2 -29.52 dBm
1 PK MAXH
LVL
3DB AC
Center 2.402 GHz
300 kHz/
Span 3 MHz

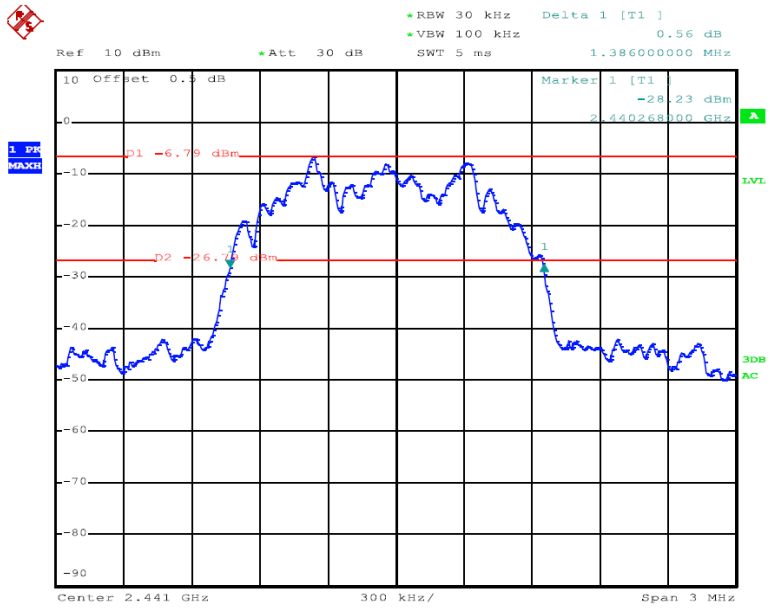

RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
0.09 dB
1.392000000 MHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-29.15 dBm
2.440226000 GHz
D1 -8.44 dBm
D2 -28.44 dBm
1 PK MAXH
LVL
3DB AC
Center 2.441 GHz
300 kHz/
Span 3 MHz

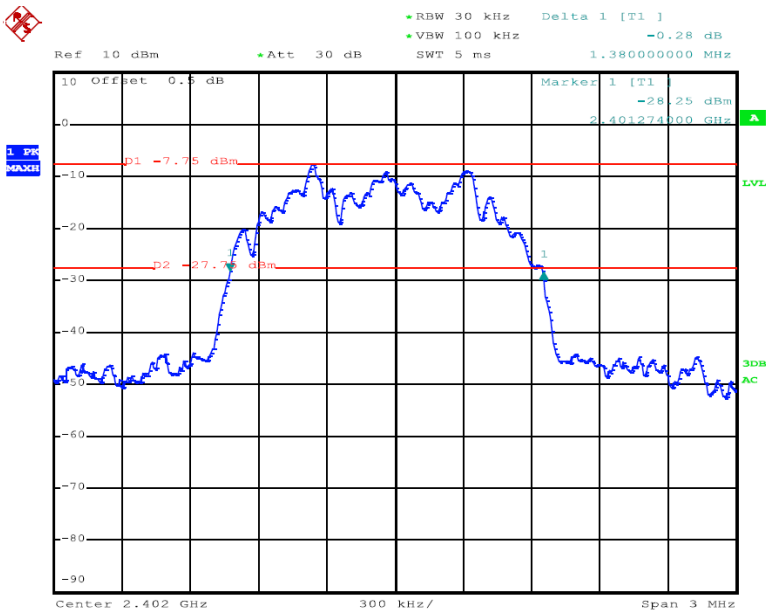


Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
00	2402	1386
39	2441	1386
78	2480	1380


RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
1.27 dB
1.386000000 MHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-29.99 dBm
2.401268000 GHz
D1 -7.81 dBm
D2 -27.81 dBm
LVL
3DB
AC
Center 2.402 GHz
300 kHz/
Span 3 MHz


RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
0.56 dB
1.386000000 MHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-28.23 dBm
2.440268000 GHz
D1 -6.79 dBm
D2 -26.79 dBm
LVL
3DB
AC
Center 2.441 GHz
300 kHz/
Span 3 MHz


RBW 30 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
-0.28 dB
1.380000000 MHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-28.25 dBm
2.401274000 GHz
D1 -7.75 dBm
D2 -27.75 dBm
LVL
3DB
AC
Center 2.402 GHz
300 kHz/
Span 3 MHz

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.

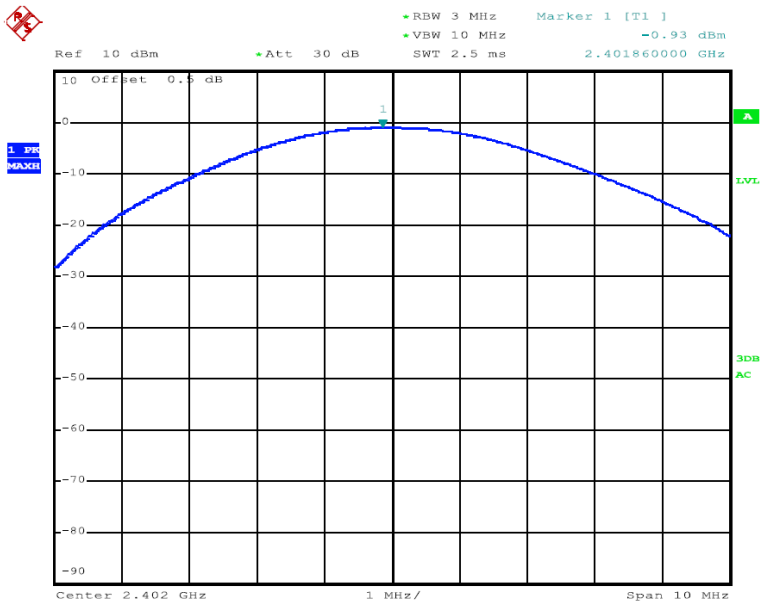
2. Set the spectrum analyser: RBW = 3 MHz. VBW =10 MHz. Sweep = auto; Detector Function = Peak.

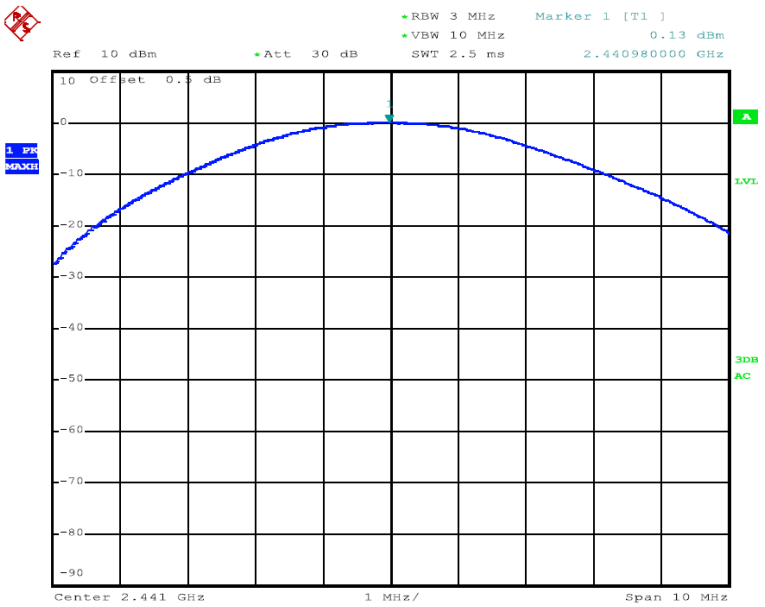
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

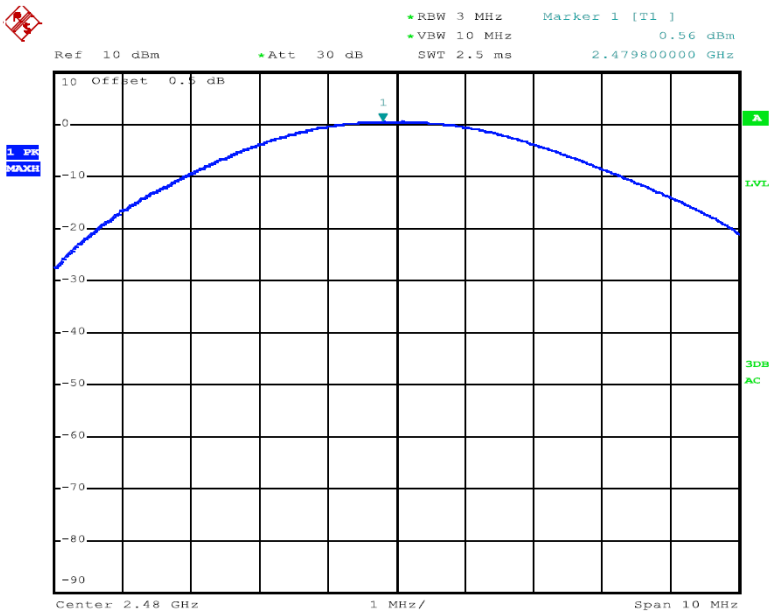
10.2Test Result

Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	GFSK		

Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT
	(MHz)	(dBm)	(mW)	(mW)
CH00	2402	-0.93	0.807	1000
CH39	2441	0.13	1.030	1000
CH78	2480	0.56	1.138	1000

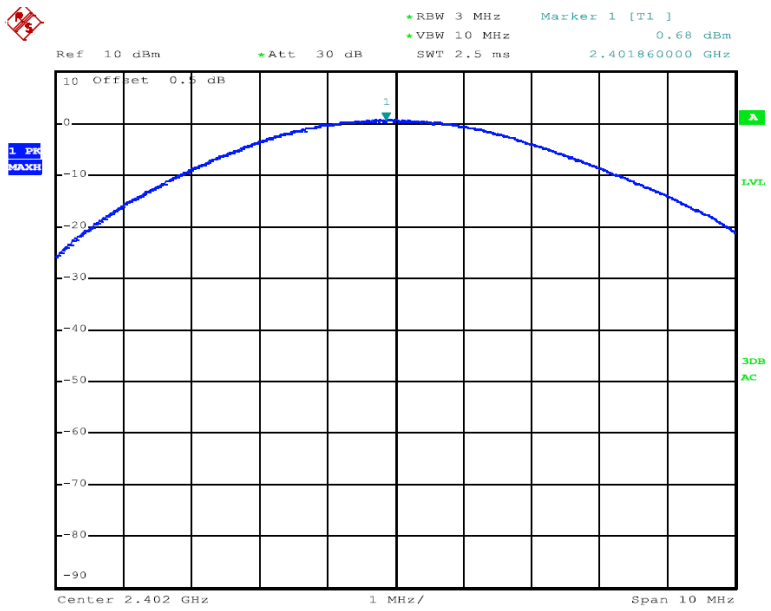

RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
-0.93 dBm
2.401860000 GHz
Ref 10 dBm
Att 30 dB
10 Offset 0.5 dB
1 PK MAXH
A
LVL
3DB AC
Center 2.402 GHz
1 MHz/
Span 10 MHz

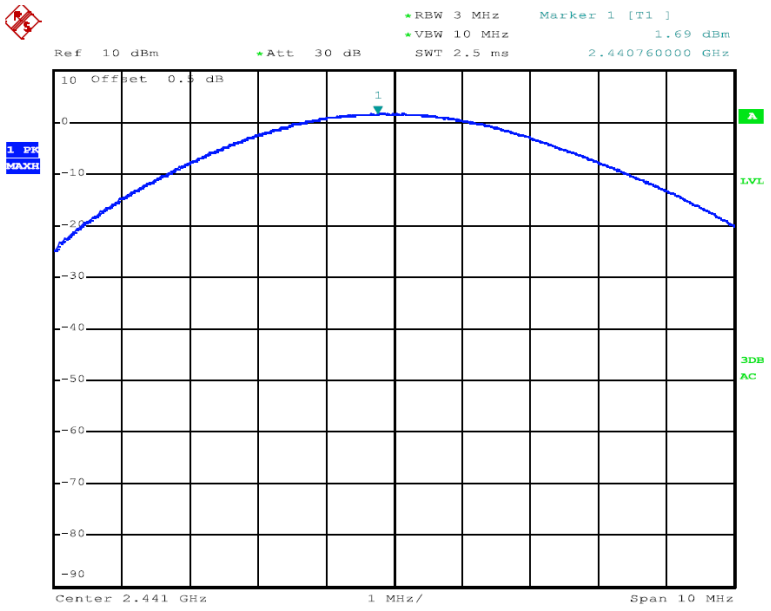

RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
0.13 dBm
2.440980000 GHz
Ref 10 dBm
Att 30 dB
10 Offset 0.5 dB
1 PK MAXH
A
LVL
3DB AC
Center 2.441 GHz
1 MHz/
Span 10 MHz

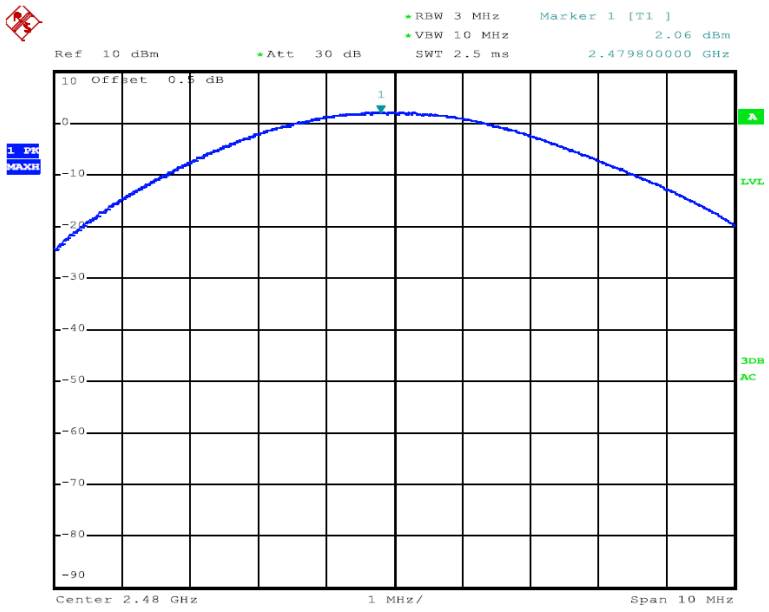


Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	π/4-QPSK		

Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT
	(MHz)	(dBm)	(mW)	(mW)
CH00	2402	0.68	1.169	125
CH39	2441	1.69	1.476	125
CH78	2480	2.06	1.607	125

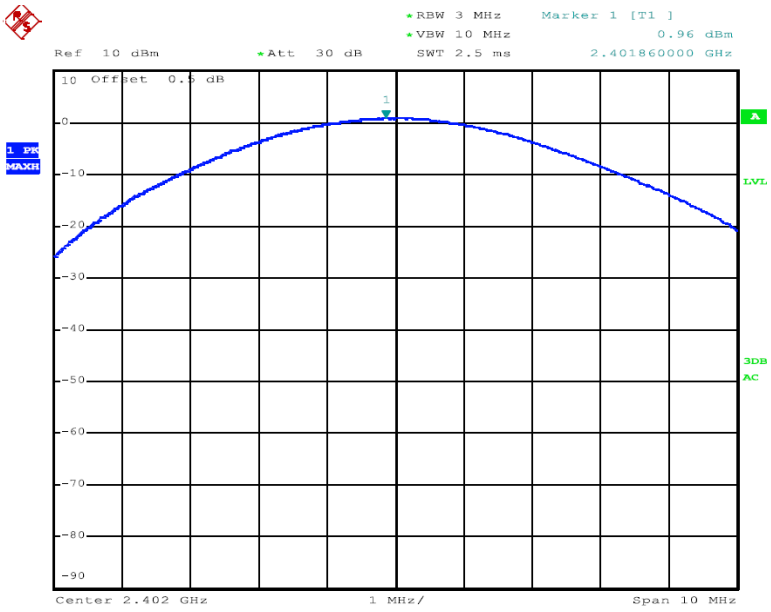

RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
0.68 dBm
2.401860000 GHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
1 PK MAXH
A
LVL
3DB AC
Center 2.402 GHz
1 MHz/
Span 10 MHz

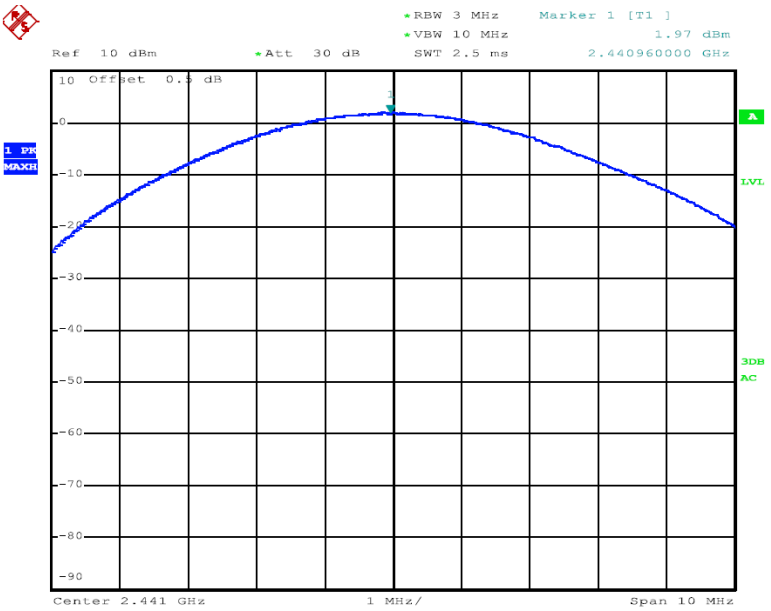

RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
1.69 dBm
2.440760000 GHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
1 PK MAXH
A
LVL
3DB AC
Center 2.441 GHz
1 MHz/
Span 10 MHz

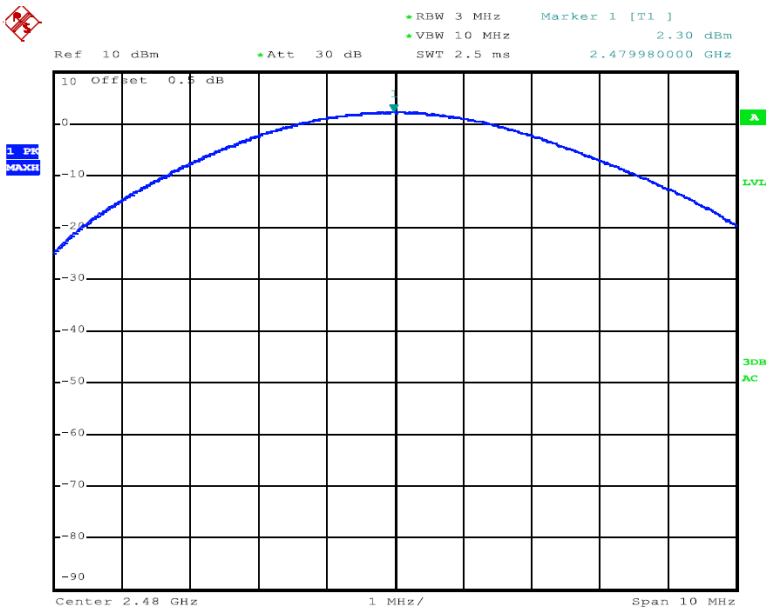


Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	8DPSK		

Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT
	(MHz)	(dBm)	(mW)	(mW)
CH00	2402	0.96	1.247	125
CH39	2441	1.97	1.574	125
CH78	2480	2.30	1.698	125


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
0.96 dBm
2.401860000 GHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
1 PK MAXH
LVL
3DB AC
Center 2.402 GHz
1 MHz/
Span 10 MHz


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
1.97 dBm
2.440960000 GHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
1 PK MAXH
LVL
3DB AC
Center 2.441 GHz
1 MHz/
Span 10 MHz


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
Marker 1 [T1]
2.30 dBm
2.479980000 GHz
Ref 10 dBm
Att 30 dB
Offset 0.5 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1 PK
MAXH
A
LVL
3DB
AC
Center 2.48 GHz
1 MHz/
Span 10 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.

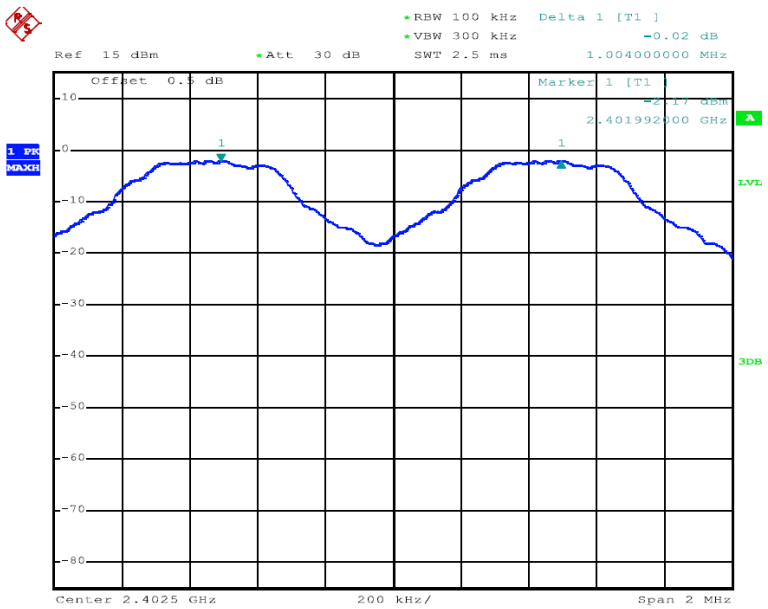
2. Set the spectrum analyzer: RBW = 100KHz, VBW = 300KHz, Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

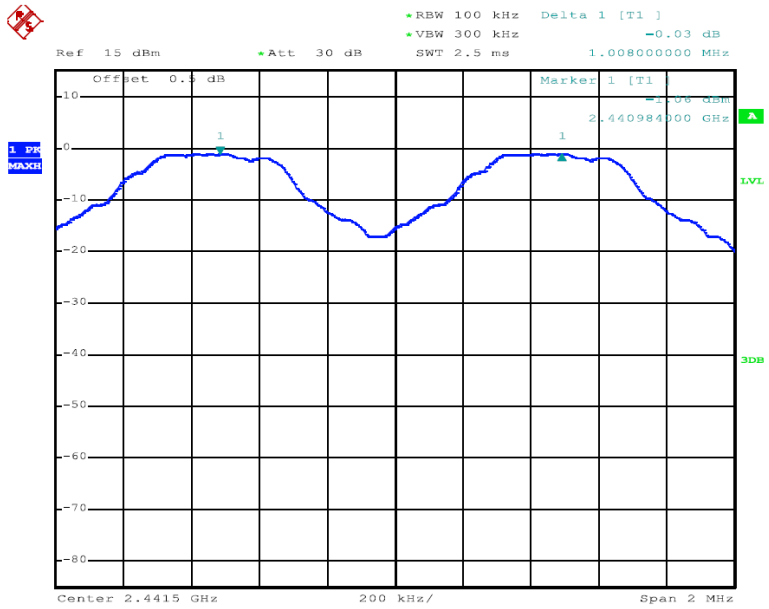
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

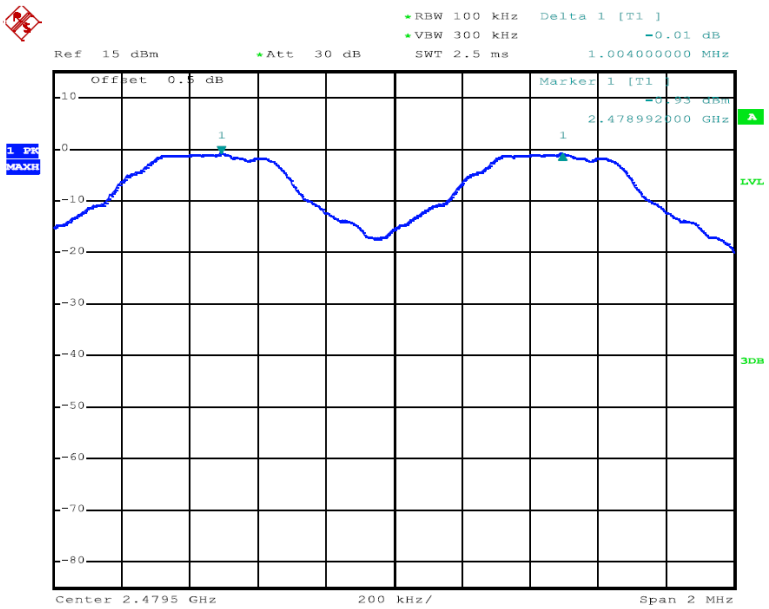
11.2 Test Result

Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
00	2402	1004	>724
39	2441	1008	>720
78	2480	1004	>704

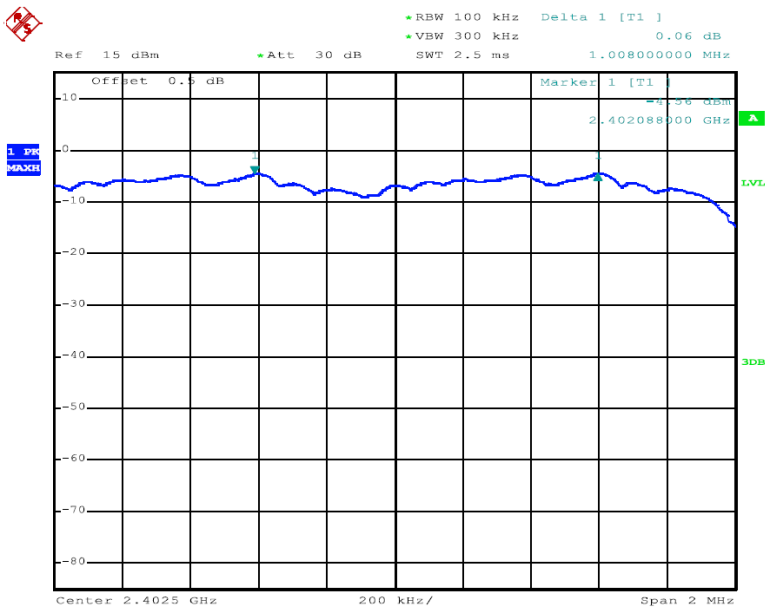


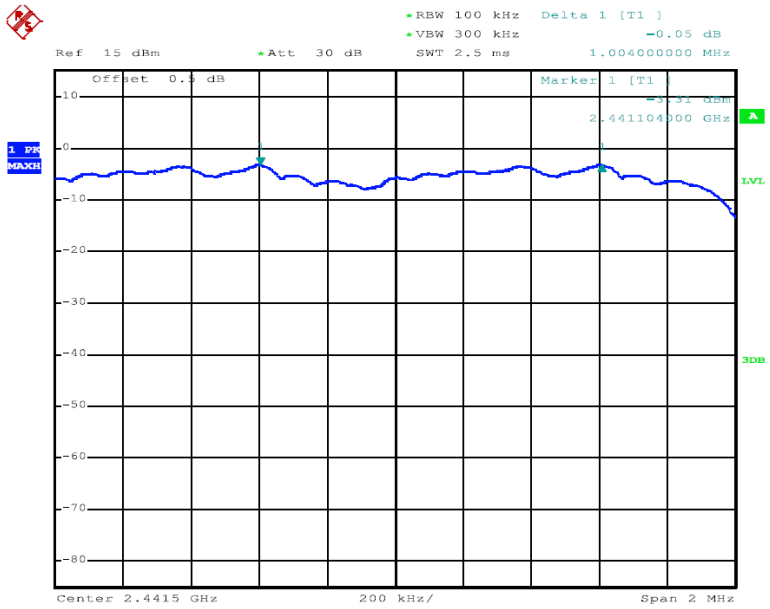

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.03 dB
1.008000000 MHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
2.440984000 GHz
1 PK MAXH
LVL
3DB
Center 2.4415 GHz
200 kHz/
Span 2 MHz

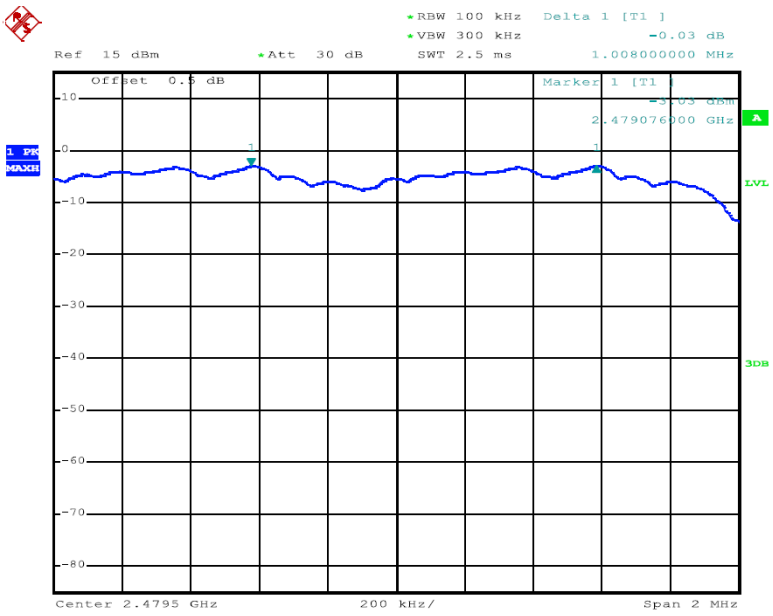

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.01 dB
1.004000000 MHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
2.478992000 GHz
1 PK MAXH
LVL
3DB
Center 2.4795 GHz
200 kHz/
Span 2 MHz

Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	π/4-DQPSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
00	2402	1008	>908
39	2441	1004	>928
78	2480	1008	>908

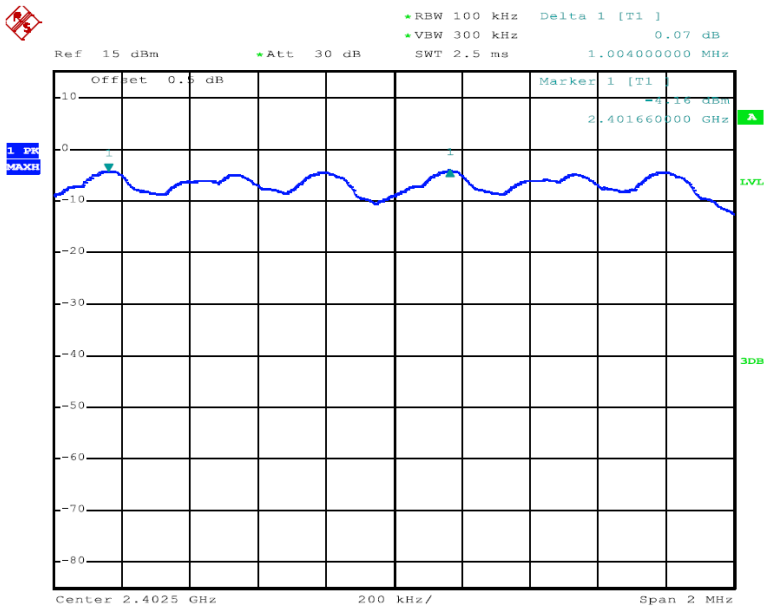


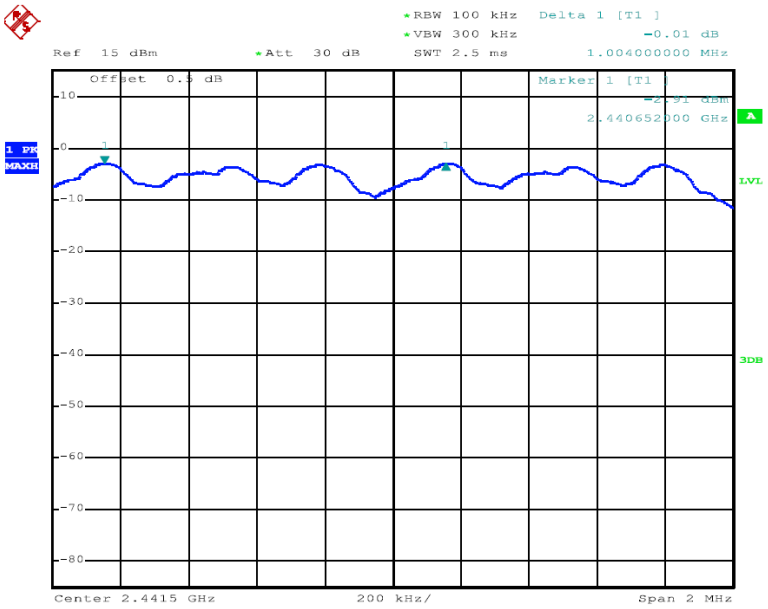

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.05 dB
1.004000000 MHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-3.31 dBm
2.441104000 GHz
1 PK MAXH
LVL
3DB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4415 GHz
200 kHz/
Span 2 MHz

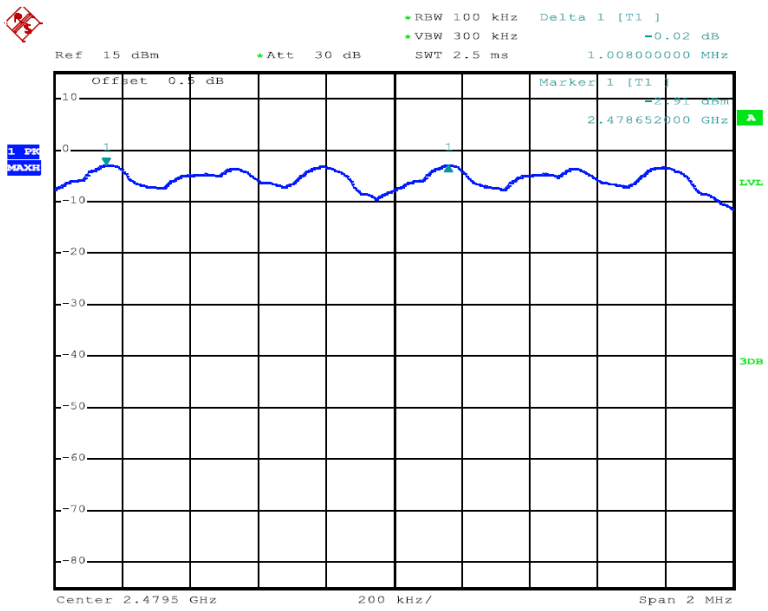

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.03 dB
1.008000000 MHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-3.03 dBm
2.479076000 GHz
1 PK MAXH
LVL
3DB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4795 GHz
200 kHz/
Span 2 MHz

Spectrum Detector:	PK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
00	2402	1004	>924
39	2441	1004	>924
78	2480	1008	>920




RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.01 dB
1.004000000 MHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-2.91 dBm
2.440652000 GHz
1 PK MAXH
LVL
3DB
Center 2.4415 GHz
200 kHz/
Span 2 MHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.02 dB
1.008000000 MHz
Ref 15 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-2.91 dBm
2.478652000 GHz
1 PK MAXH
LVL
3DB
Center 2.4795 GHz
200 kHz/
Span 2 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.

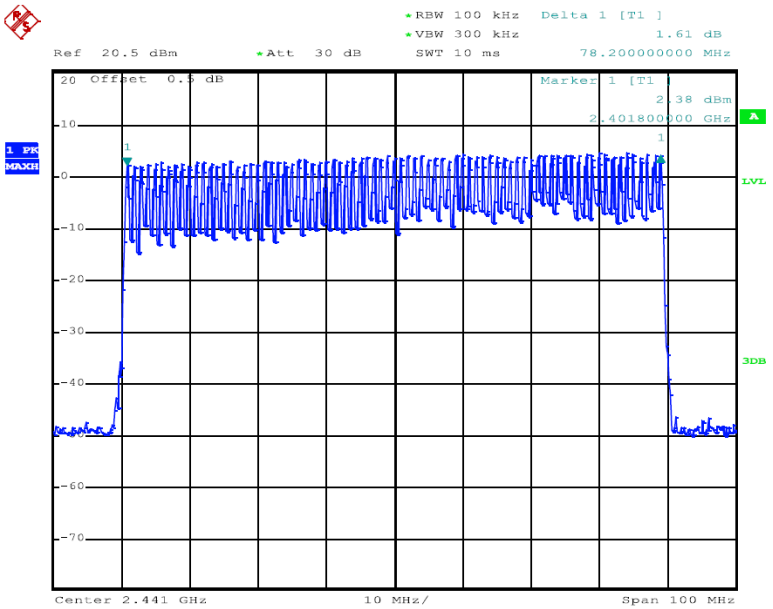
12.1 Test Procedure

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 = 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;

12.2 Test Result

Worst Test Mode	GFSK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS

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.

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;

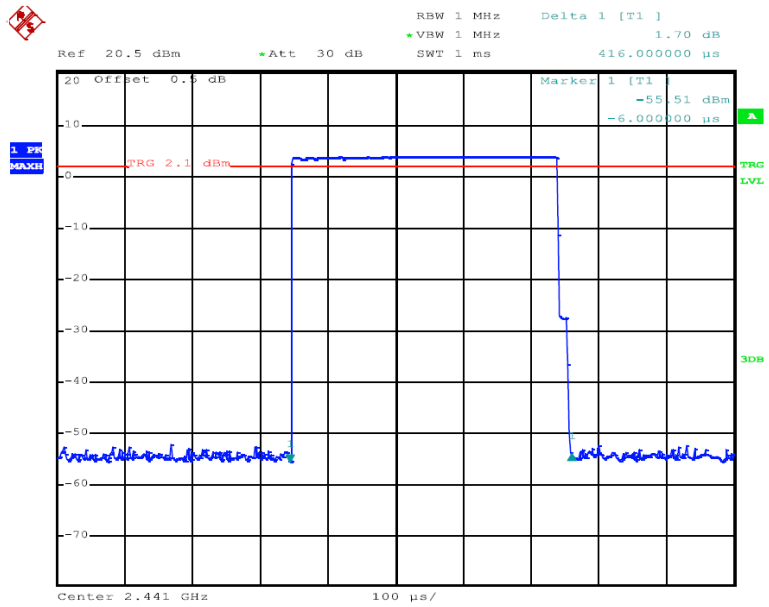
3. Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

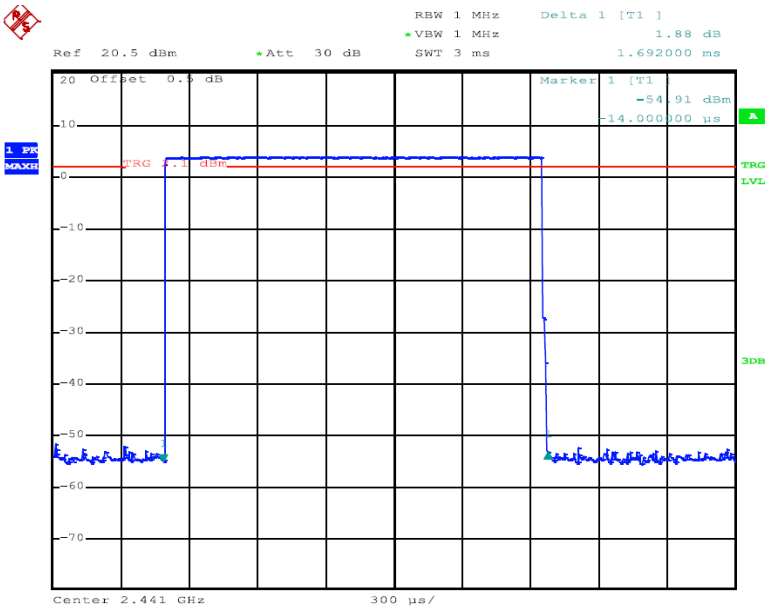
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

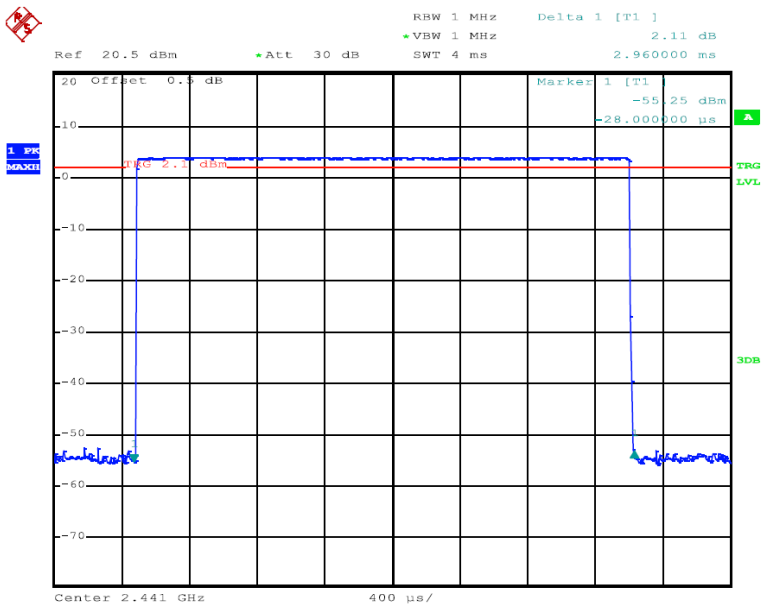
13.2 Test Result

Worst Test Mode	π/4-DQPSK	Test Date :	January 12, 2018
Test By:	Leo Yang	Test Result:	PASS

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	0.416	133.12	400
2DH3	1600/(4*79) x 31.6 =160	1.692	270.72	400
2DH5	1600/(6*79) x 31.6 =106.67	2.960	315.74	400


RBW 1 MHz
VBW 1 MHz
SWT 1 ms
Delta 1 [T1]
1.70 dB
416.000000 µs
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-55.51 dBm
-6.000000 µs
TRG 2.1 dBm
TRG LVL
3DB
Center 2.441 GHz
100 µs/


RBW 1 MHz
VBW 1 MHz
SWT 3 ms
Delta 1 [T1]
1.88 dB
1.692000 ms
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-54.91 dBm
-14.000000 µs
TRG 2.1 dBm
TRG LVL
3DB
Center 2.441 GHz
300 µs/


RBW 1 MHz
VBW 1 MHz
SWT 4 ms
Delta 1 [T1]
2.11 dB
2.960000 ms
Ref 20.5 dBm
Att 30 dB
Offset 0.5 dB
Marker 1 [T1]
-55.25 dBm
28.000000 µs
1 PK MAXH
TRG LVL
3DB
Center 2.441 GHz
400 µs/

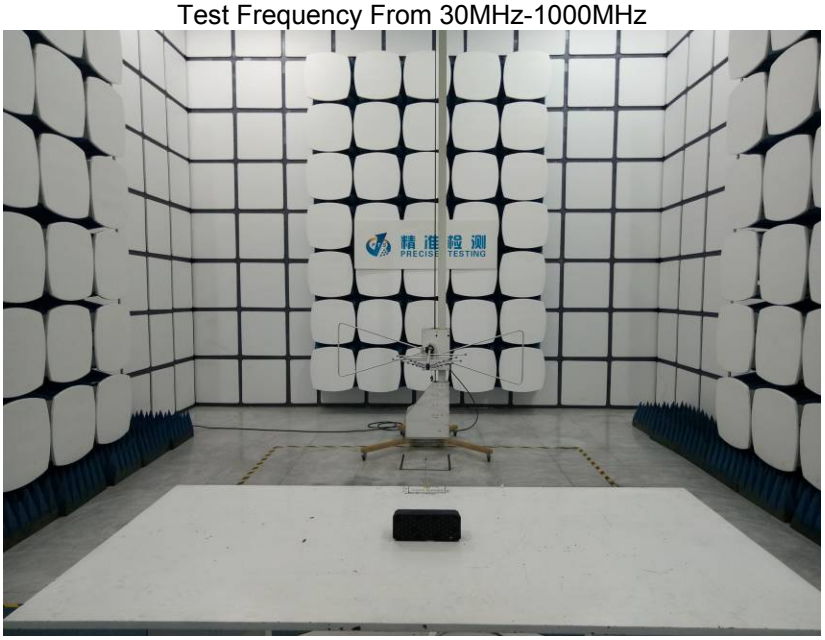
14 Antenna Requirement

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.

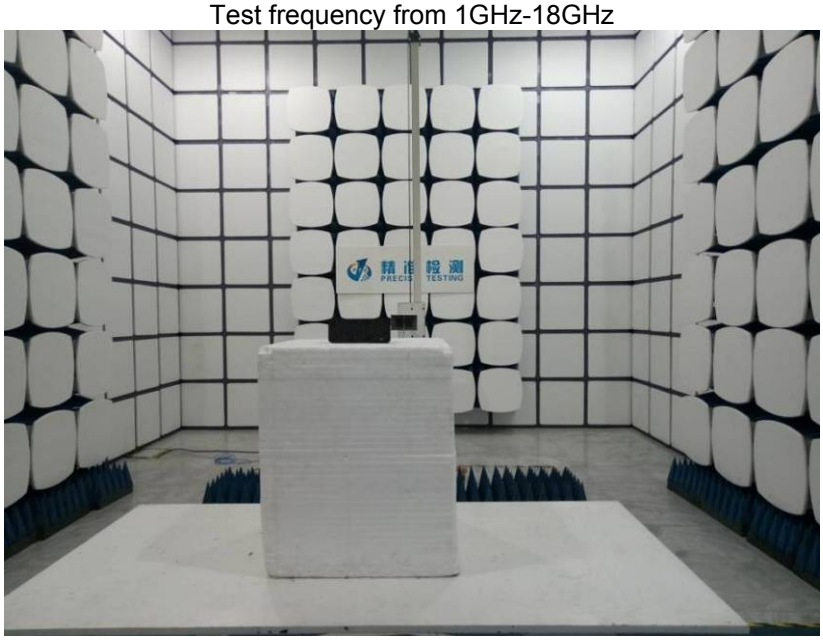
15 TEST PHOTOS

Conducted Emissions

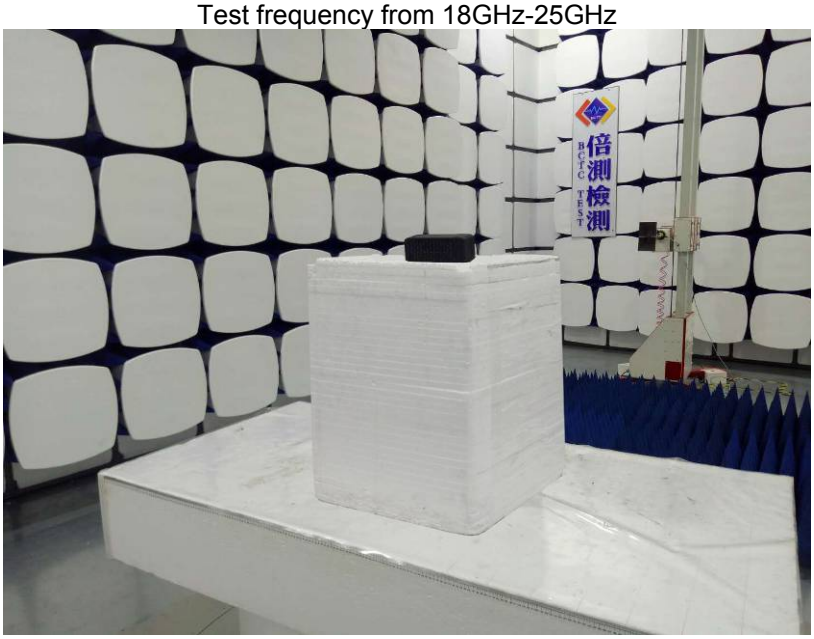
Radiated Spurious Emissions
Test Frequency From 30MHz-1000MHz



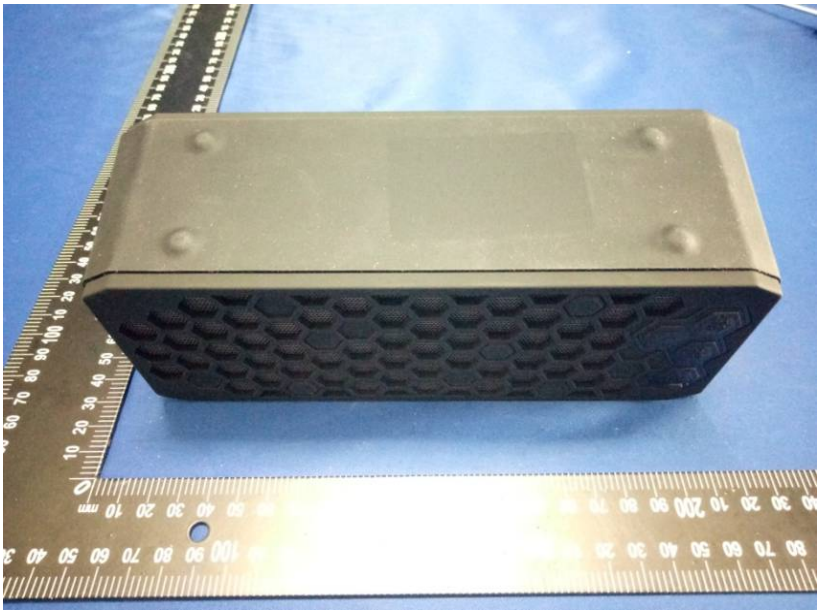
Test frequency from 1GHz-18GHz

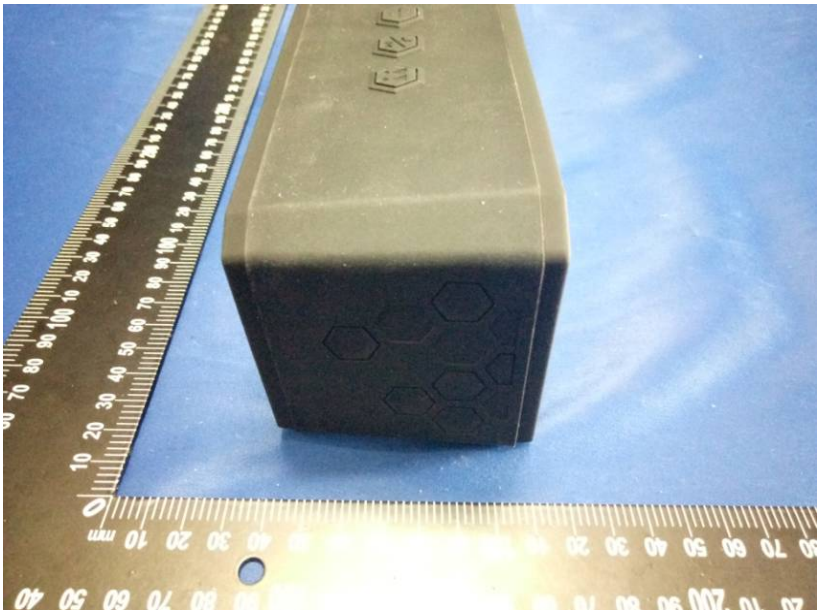


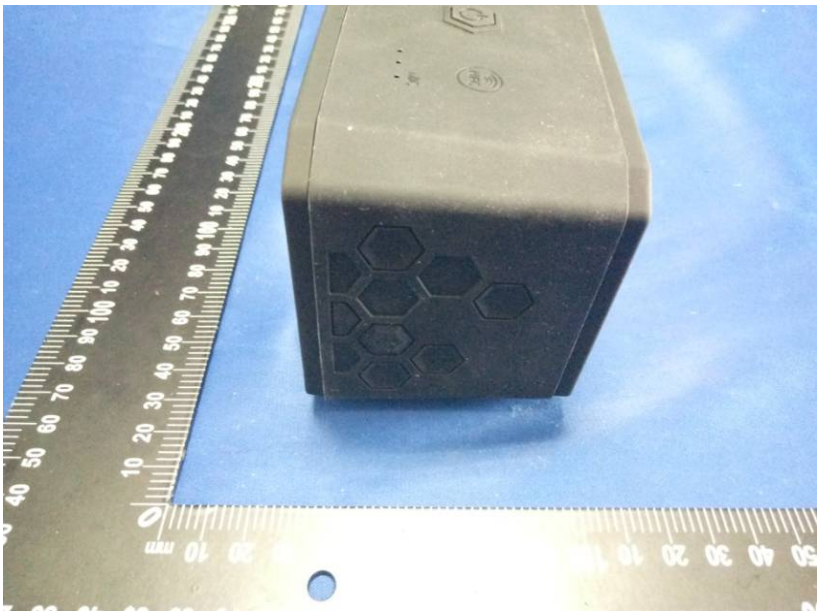
Test frequency from 18GHz-25GHz

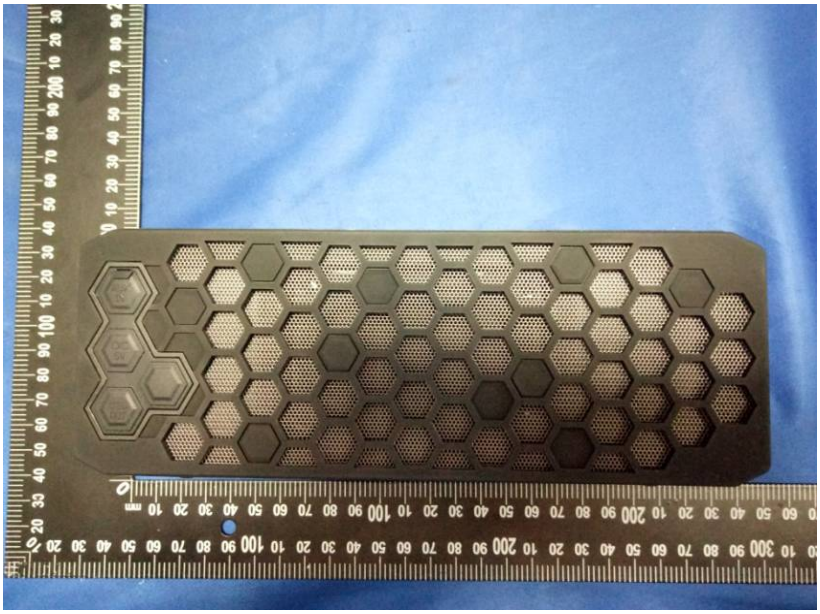


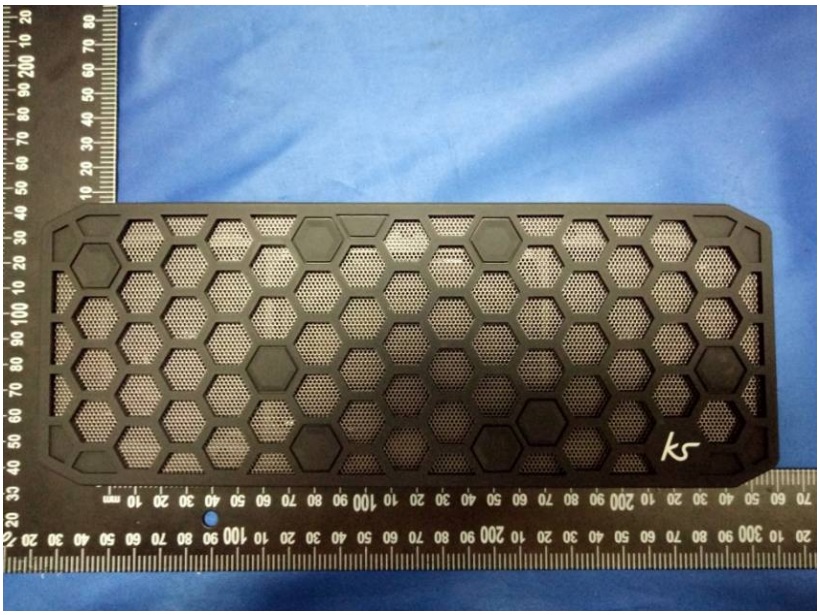
16 EUT PHOTOS







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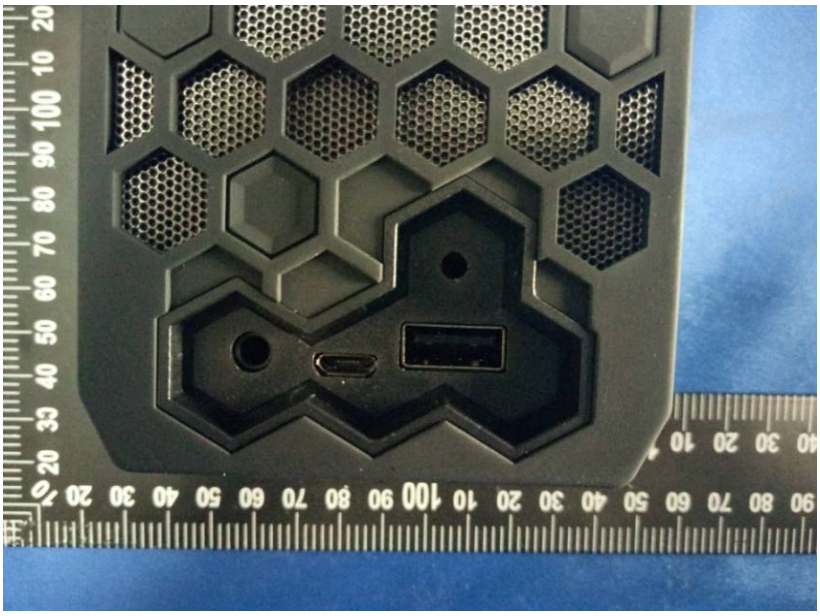

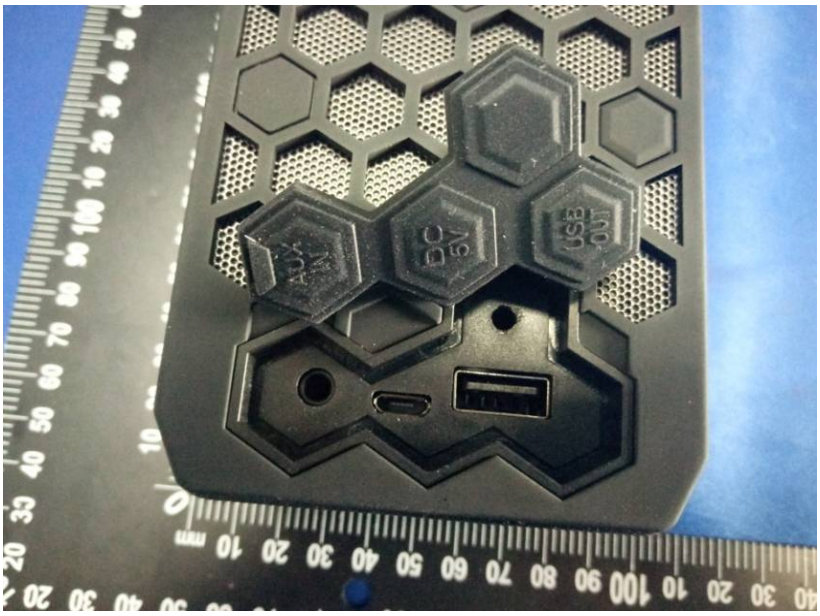
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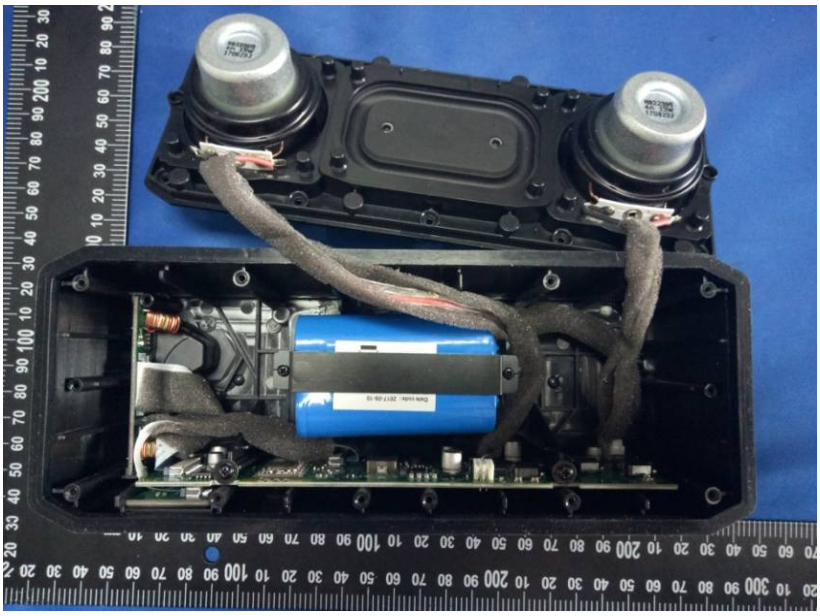
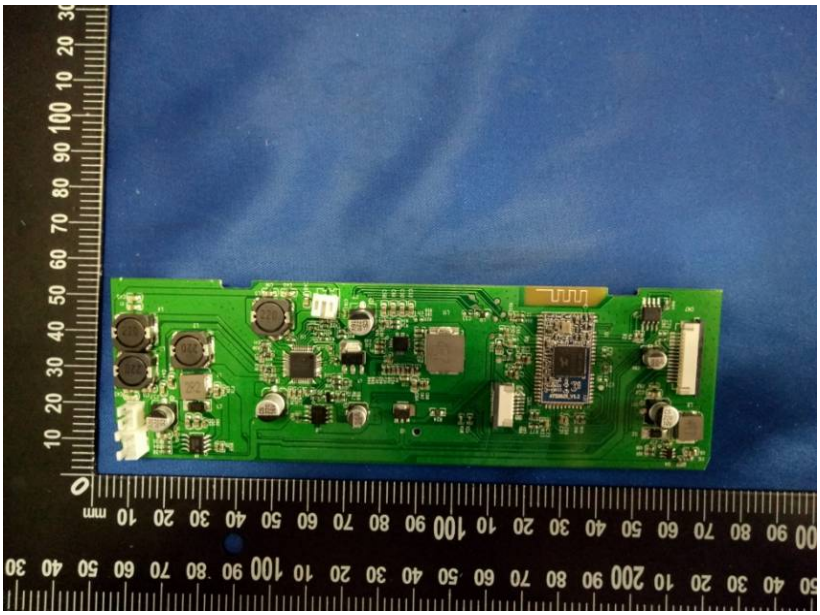
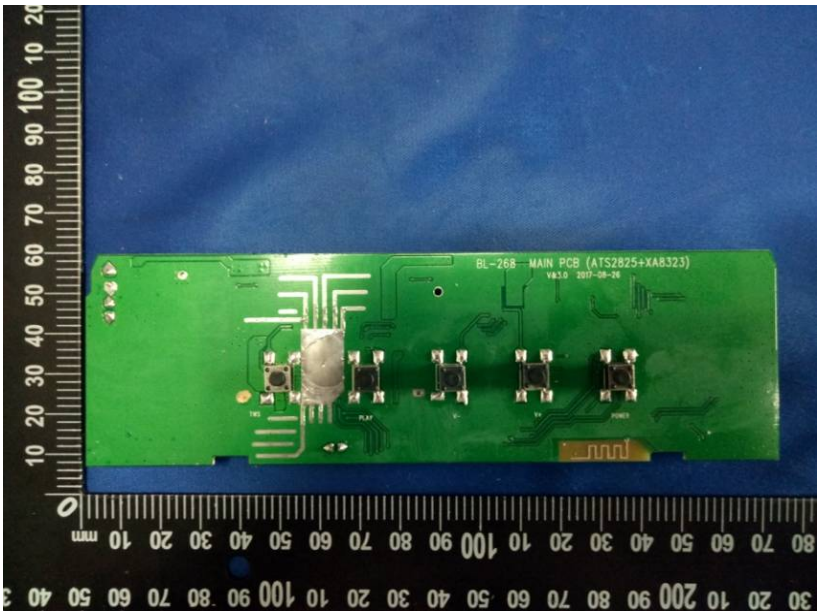
DC 5V
USB OUT



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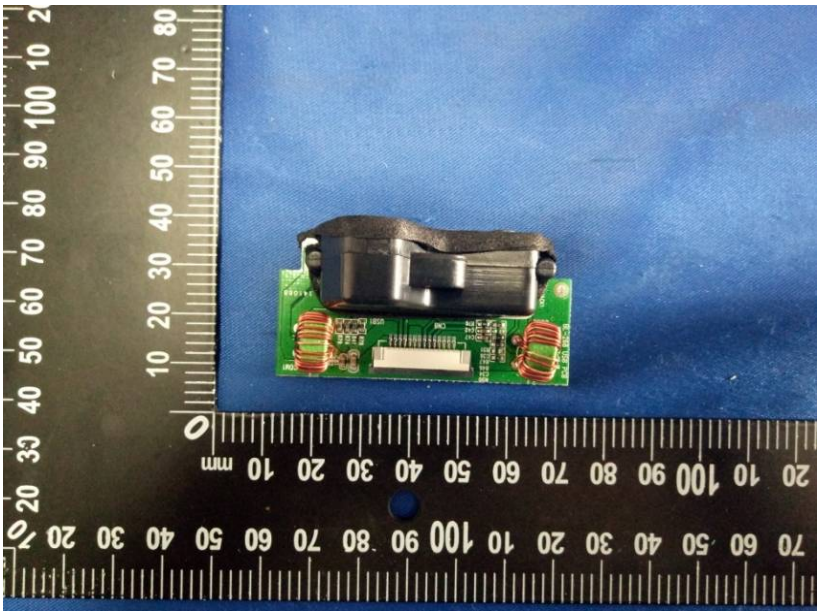

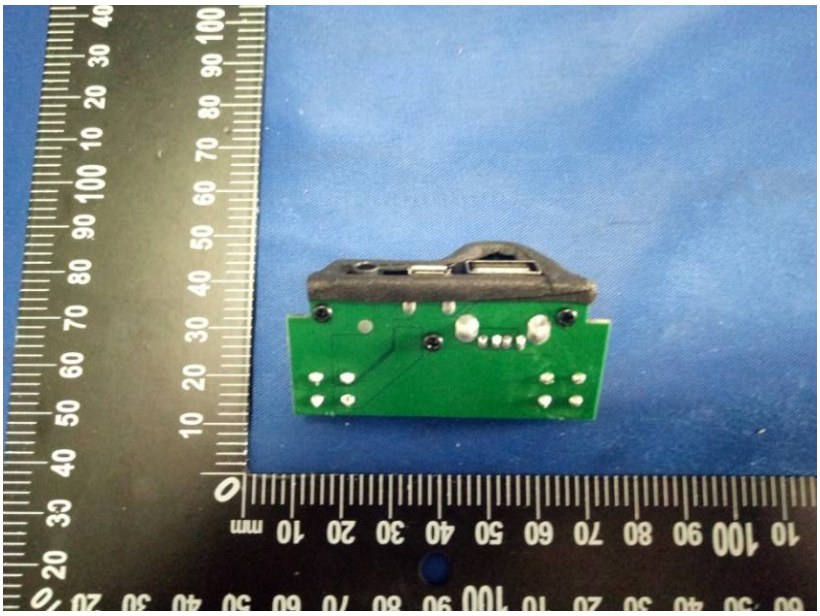

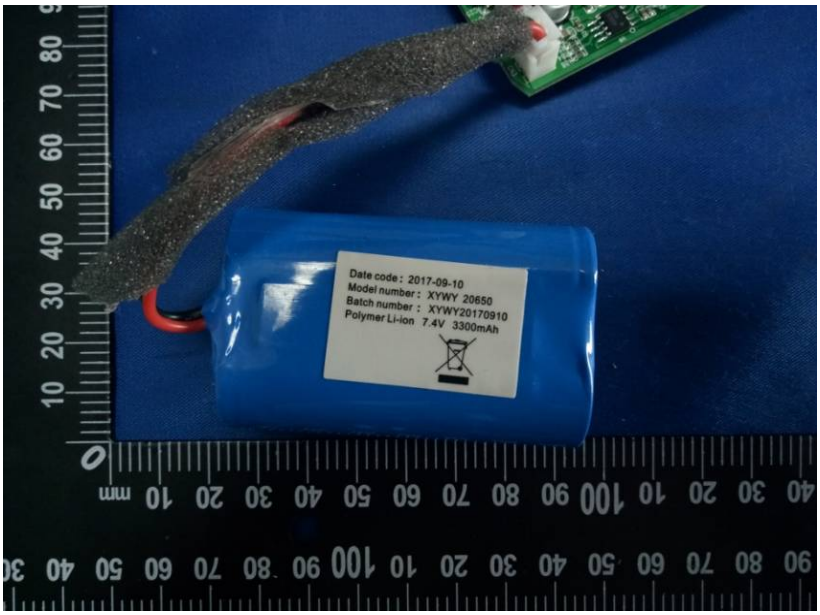
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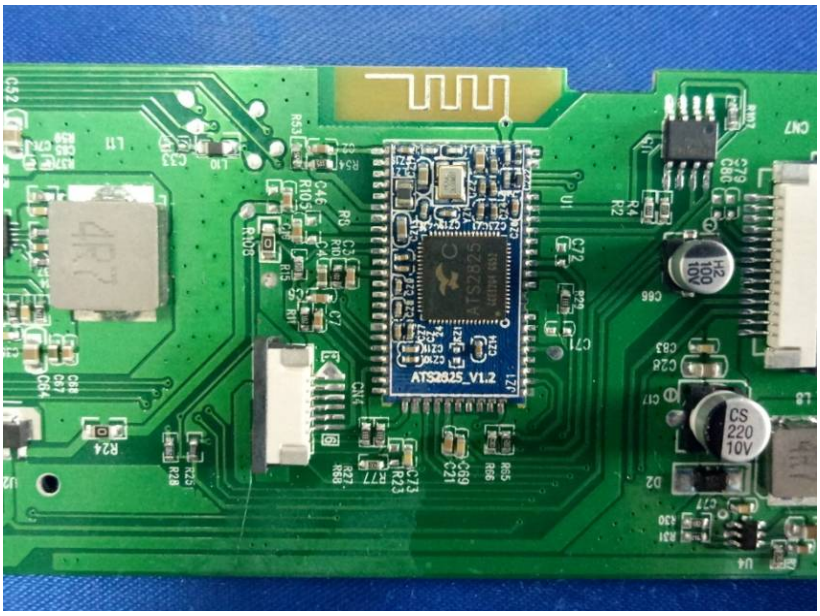

******THE END REPORT******