FCC TEST REPORT

FCC ID: 2ASRB-P1000

Product Name	:	Label Printer
Model Name	:	P1000、P3100，P110
Brand Name	:	N/A
Report No.	:	PTC19092603001E-FC02

Prepared for

Zhuhai Quyin Technology Co., Ltd.

Office 105 - 38942, No. 6 Baohua Road, Hengqin New District, Zhuhai City (Centralized Office Area)

Prepared by

Dongguan Precise Testing & Certification Co., Ltd.

Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China

1TEST RESULT CERTIFICATION

Applicant's name	:	Zhuhai Quyin Technology Co., Ltd.
Address	:	Office 105 - 38942, No. 6 Baohua Road, Hengqin New District, Zhuhai City (Centralized Office Area)
Manufacture's name	:	Zhuhai Quyin Technology Co., Ltd.
Address	:	Office 105 - 38942, No. 6 Baohua Road, Hengqin New District, Zhuhai City (Centralized Office Area)
Product name	:	Label Printer
Model name	:	P1000、P3100，P110
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10:2013
Test Date	:	Oct. 24, 2019 to Nov. 12, 2019
Date of Issue	:	Nov. 13, 2019
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

4 General Information

4.1 General Description of E.U.T.

Product Name	:	Label Printer
Model Name	:	P1000、P3100，P110 (Note: The samples are the same except appearance and model number. So P1000 was selected for full tested.)
Bluetooth Version	:	BT 4.0
Operating frequency	:	2402-2480MHz
Numbers of Channel	:	79 channels
Antenna Type	:	Internal PCB Antenna
Antenna Gain	:	0 dBi
Type of Modulation	:	GFSK, Π/4-DQPSK, 8DPSK
Power supply	:	DC 7.4V 1500mAh Battery
Hardware Version	:	V1.2
Software Version	:	V0.1

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	-	-

EUT was tested with channel 0, 39, 78.

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	Sep. 18, 2020
Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	20Hz-26.5GHz	Sep. 18, 2020
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Sep. 18, 2020
Antenna Connector	Florida RF Labs	N/A	RF01#	N/A	Sep. 18, 2020
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Sep. 18, 2020
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Sep. 18, 2020

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. 18, 2020
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Sep. 18, 2020
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Sep. 18, 2020
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 18, 2020
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 18, 2020
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Sep. 18, 2020
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Sep. 18, 2020
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Sep. 18, 2020
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 18, 2020
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Sep. 18, 2020
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Sep. 18, 2020
RF Cable	R&S	R204	R21X	1GHz-40GHz	Sep. 18, 2020

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 18, 2020
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep. 18, 2020
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep. 18, 2020

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	Model: BI-18-090200AdC/P24C090200 Input: AC120V, 60Hz Output: DC 9V, 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)

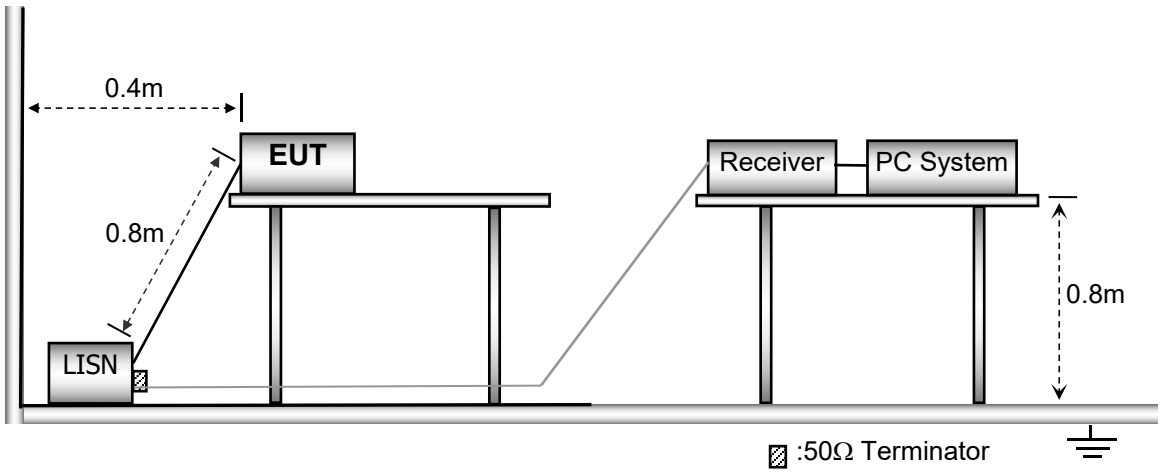
6.1 E.U.T. Operation

Operating Environment **:**

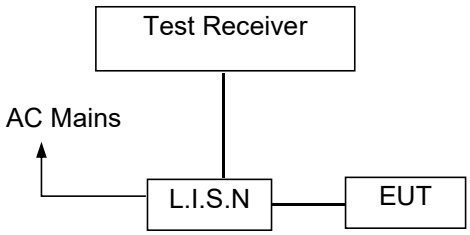
Temperature:	:	25.5 °C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.2kPa
Test Voltage	:	AC 120V/60Hz

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

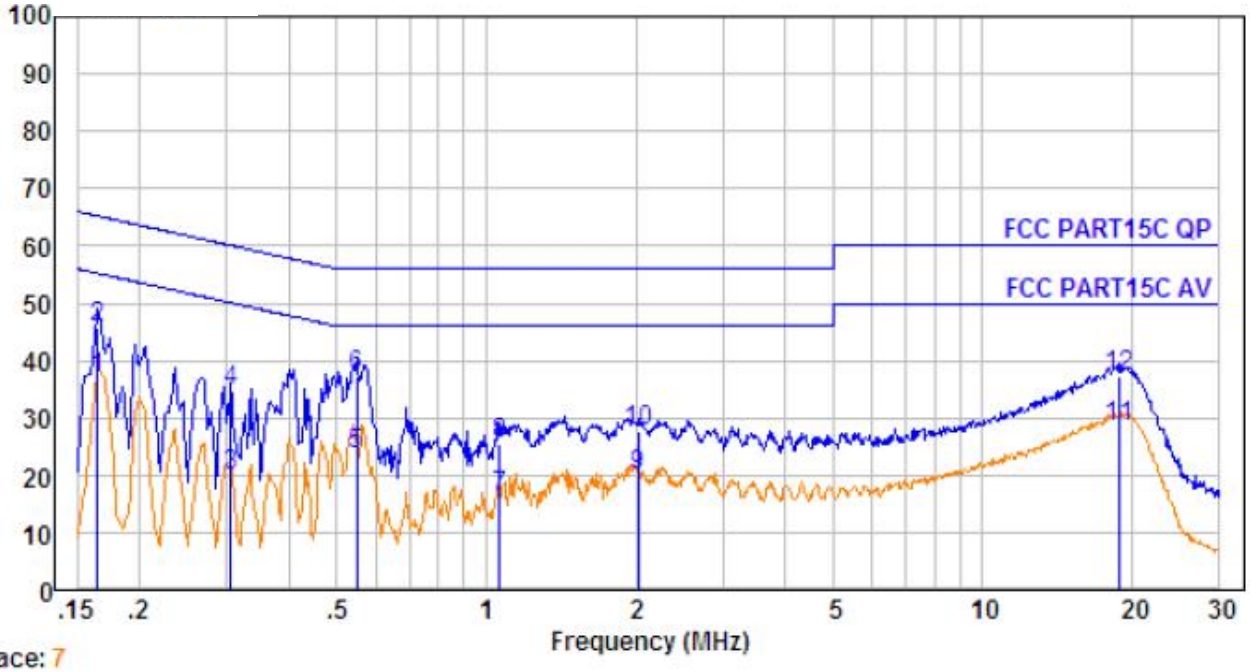
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass.

All the modulation modes were tested the data of the worst mode (AC 120V/60Hz, GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

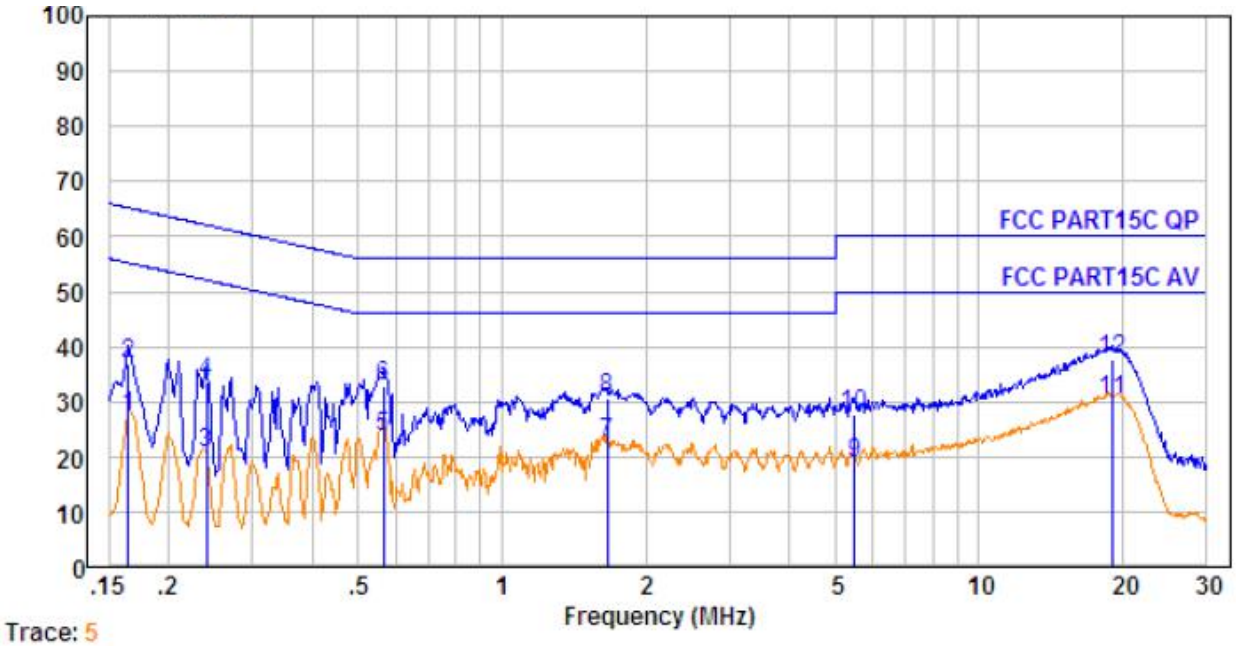
Line -120V/60Hz:



Trace: 7

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.165	0.23	9.53	27.31	37.07	55.21	-18.14	Average
2.	0.165	0.23	9.53	36.14	45.90	65.21	-19.31	QP
3.	0.305	0.37	9.68	10.04	20.09	50.10	-30.01	Average
4.	0.305	0.37	9.68	24.68	34.73	60.10	-25.37	QP
5.	0.549	0.43	9.79	13.55	23.77	46.00	-22.23	Average
6.	0.549	0.43	9.79	27.12	37.34	56.00	-18.66	QP
7.	1.065	0.46	9.82	5.98	16.26	46.00	-29.74	Average
8.	1.065	0.46	9.82	15.32	25.60	56.00	-30.40	QP
9.	2.023	0.47	9.85	9.54	19.86	46.00	-26.14	Average
10.	2.023	0.47	9.85	17.35	27.67	56.00	-28.33	QP
11.	18.820	0.43	9.88	18.28	28.59	50.00	-21.41	Average
12.	18.820	0.43	9.88	26.94	37.25	60.00	-22.75	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.	0.165	0.23	9.56	17.36	27.15	55.21	-28.06	Average
2.	0.165	0.23	9.56	27.14	36.93	65.21	-28.28	QP
3.	0.240	0.32	9.66	10.83	20.81	52.08	-31.27	Average
4.	0.240	0.32	9.66	23.65	33.63	62.08	-28.45	QP
5.	0.564	0.43	9.82	13.53	23.78	46.00	-22.22	Average
6.	0.564	0.43	9.82	22.65	32.90	56.00	-23.10	QP
7.	1.662	0.47	9.87	12.24	22.58	46.00	-23.42	Average
8.	1.662	0.47	9.87	20.35	30.69	56.00	-25.31	QP
9.	5.476	0.51	9.97	8.22	18.70	50.00	-31.30	Average
10.	5.476	0.51	9.97	17.35	27.83	60.00	-32.17	QP
11.	19.021	0.42	9.98	19.79	30.19	50.00	-19.81	Average
12.	19.021	0.42	9.98	27.37	37.77	60.00	-22.23	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

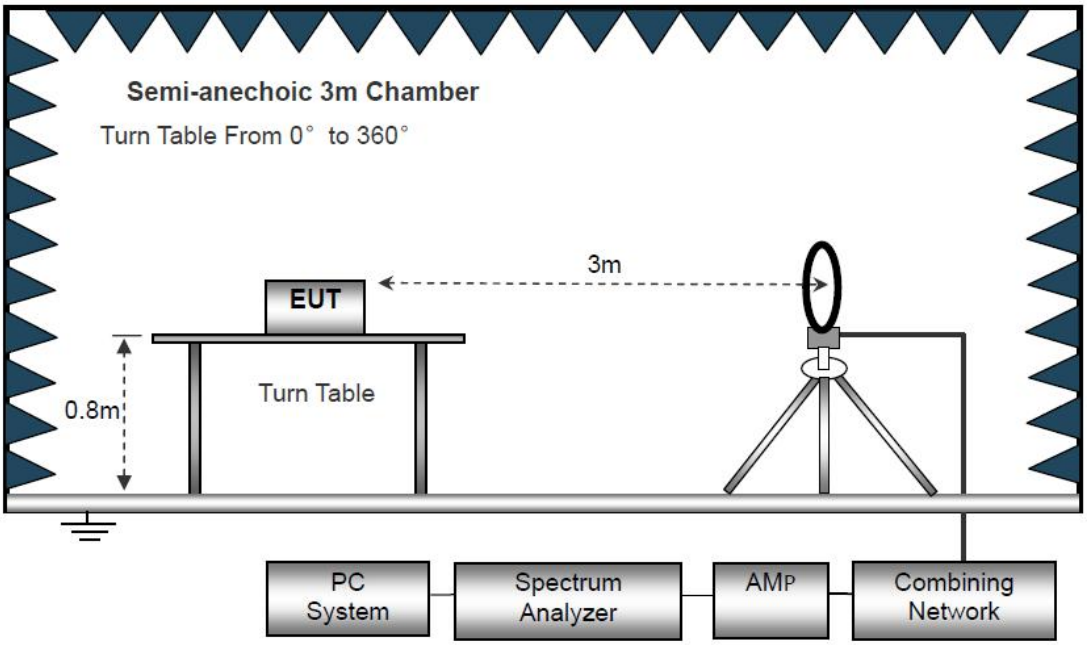
Atmospheric Pressure : 101.2kPa

Test Voltage : AC 120V 60Hz

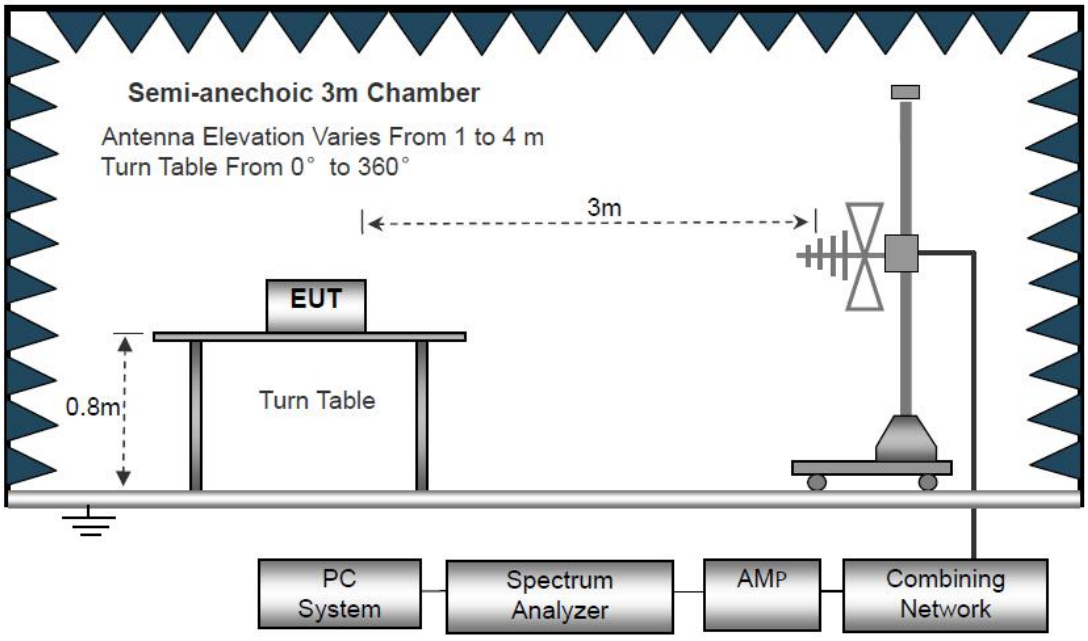
7.2 Test Setup

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

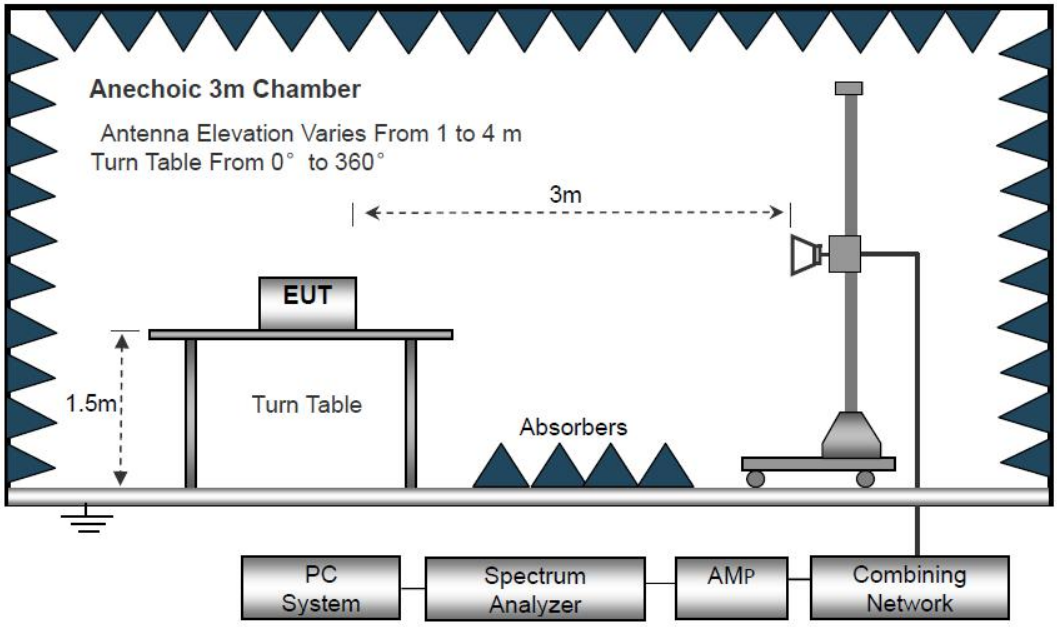
The test setup for emission measurement below 30MHz.



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.

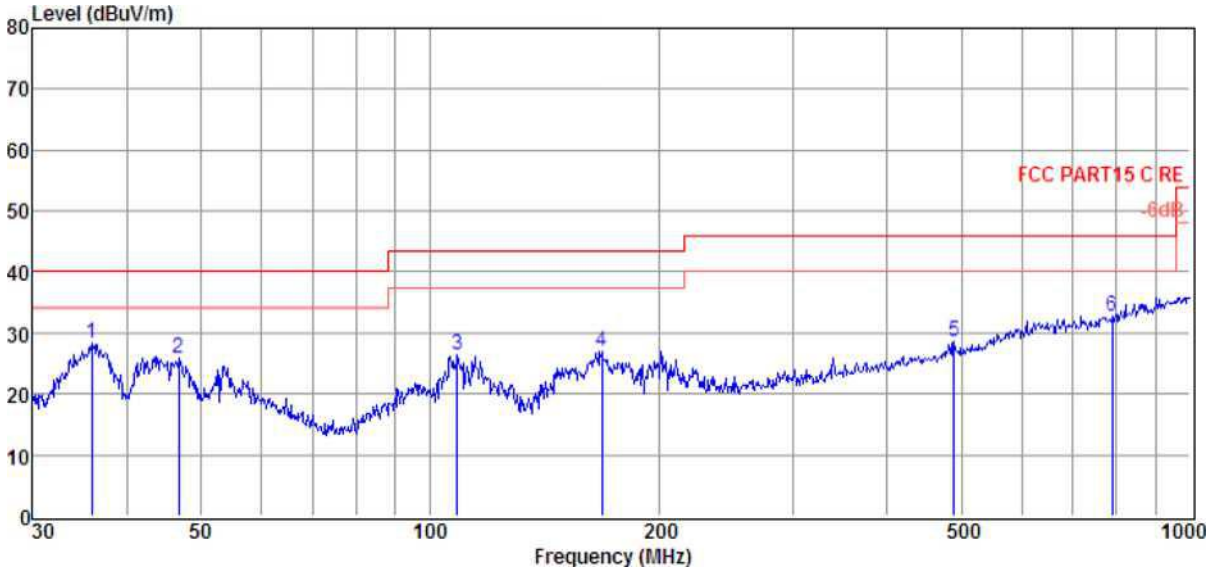
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots:

All the modulation modes were tested the data of the worst mode (GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Test plot for Vertical: GFSK(2402MHz)

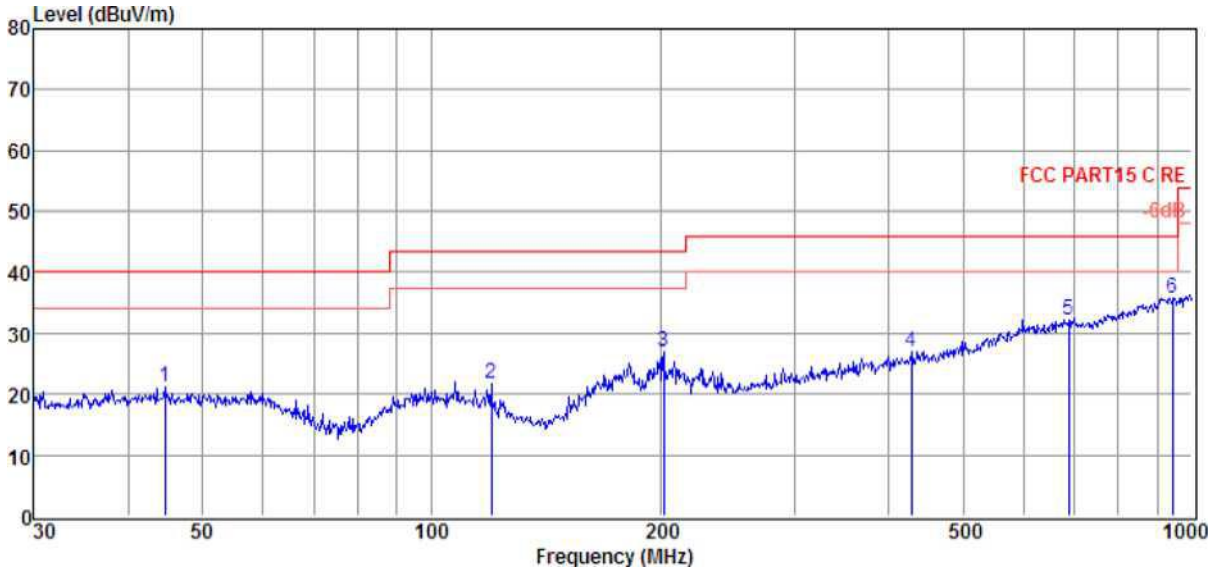


Item	Freq.	Read Level	Antenna Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector	Polarization
(Mark)	(MHz)	(dBnV)	(dB/m)	dB	(dBnV/m)	(dB^iV/m)	(dB)		
1	35.88	12.50	11.98	3.74	28.22	40.00	-11.78	QP	VERTICAL
2	46.67	9.72	12.23	3.86	25.81	40.00	-14.19	QP	VERTICAL
3	108.65	10.81	11.16	4.35	26.32	43.50	-17.18	QP	VERTICAL
4	168.41	13.98	8.34	4.71	27.03	43.50	-16.47	QP	VERTICAL
5	489.03	5.43	17.10	6.13	28.66	46.00	-17.34	QP	VERTICAL
6	790.62	4.71	20.92	7.09	32.72	46.00	-13.28	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

Test plot for Horizontal: GFSK(2402MHz)



Item (Mark)	Freq. (MHz)	Read Level (dBnV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBnV/m)	Limit Line (dBnV/m)	Over Limit _	Detector	Polarization
1	44.59	5.12	12.34	3.84	21.30	40.00	-18.70	QP	HORIZONTAL
2	119.86	7.98	9.33	4.42	21.73	43.50	-21.77	QP	HORIZONTAL
3	202.10	11.60	10.43	4.91	26.94	43.50	-16.56	QP	HORIZONTAL
4	428.02	4.73	16.22	5.90	26.85	46.00	-19.15	QP	HORIZONTAL
5	689.56	5.53	19.80	6.80	32.13	46.00	-13.87	QP	HORIZONTAL
6	942.13	5.31	22.96	7.53	35.80	46.00	-10.20	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

3. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

Test Frequency 1GHz-18GHz

TX-Low Channel (2402MHz) Worst case GFSK

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Limit dBuv/m	Margin dB	Remark	Pol.
4804.14	45.89	33.06	35.04	3.94	74	-26.15	Peak	Horizontal
4804.24	37.64	33.06	35.04	3.94	54	-14.40	Average	Horizontal
4804.15	46.13	33.06	35.04	3.94	74	-25.91	Peak	Vertical
4804.26	37.75	33.06	35.04	3.94	54	-14.29	Average	Vertical

TX-Middle Channel (2441MHz) Worst case GFSK

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Limit dBuv/m	Margin dB	Remark	Pol.
4882.17	45.57	33.16	35.15	3.96	74	-26.46	Peak	Horizontal
4882.21	37.44	33.16	35.15	3.96	54	-14.59	Average	Horizontal
4882.19	45.97	33.16	35.15	3.96	74	-26.06	Peak	Vertical
4882.21	37.69	33.16	35.15	3.96	54	-14.34	Average	Vertical

TX-High Channel (2480MHz) Worst case GFSK

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab . Los	Limit dBuv/m	Margin dB	Remark	Pol.

				s dB				
4960.16	44.46	33.26	35.14	3.98	74	-27.44	Peak	Horizontal
4960.17	36.52	33.26	35.14	3.98	54	-15.38	Average	Horizontal
4960.19	45.36	33.26	35.14	3.98	74	-26.54	Peak	Vertical
4960.21	37.11	33.26	35.14	3.98	54	-14.79	Average	Vertical

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

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Bluetooth (GFSK, Pi/4-DQPSK, 8DPSK, Hopping)mode have been tested, and the worst result(GFSK, no-Hopping) was report as below

Tx-2402, GFSK, Non-hopping

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Limit dBuV/m	Margin dB	Remark	Pol.
2387.67	42.35	32.89	35.16	3.51	74	-30.41	Peak	Horizontal
2387.65	34.41	32.90	35.16	3.51	54	-18.34	Average	Horizontal
2400.00	43.78	32.92	35.16	3.54	74	-28.92	Peak	Horizontal
2399.97	34.77	32.92	35.16	3.54	54	-17.93	Average	Horizontal
2386.58	44.17	32.89	35.16	3.51	74	-28.59	Peak	Vertical
2386.59	35.16	32.90	35.16	3.51	54	-17.59	Average	Vertical
2400.00	44.53	32.92	35.16	3.54	74	-28.17	Peak	Vertical
2399.96	35.47	32.92	35.16	3.54	54	-17.23	Average	Vertical

Tx-2480, GFSK, Non-hopping

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Limit dBuV/m	Margin dB	Remark	Pol.
2483.50	43.76	33.06	35.18	3.60	74	-28.76	Peak	Horizontal
2483.53	34.63	33.08	35.18	3.60	54	-17.87	Average	Horizontal
2491.87	44.85	33.08	35.18	3.62	74	-27.63	Peak	Horizontal
2491.85	34.87	33.08	35.18	3.62	54	-17.61	Average	Horizontal
2483.50	45.21	33.06	35.18	3.60	74	-27.31	Peak	Vertical
2483.51	35.13	33.08	35.18	3.60	54	-17.37	Average	Vertical
2487.68	45.43	33.08	35.18	3.62	74	-27.05	Peak	Vertical
2487.70	35.84	33.08	35.18	3.62	54	-16.64	Average	Vertical

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

For Conducted Test

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.

EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	100KHz
Detector	Peak
Trace	Max hold

For Radiated emission Test

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the ban edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were be encompassed by the span. After trace stabilization, the maximum peak was be determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

The measurements were performed at the lower end of the 2.4GHz band.

Use the following spectrum analyzer settings:

For Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RBW	1MHz
VBW	3MHz
Detector	Peak
Trace	Max hold

For Non-Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 100KHz, video bandwidth 300KHz:

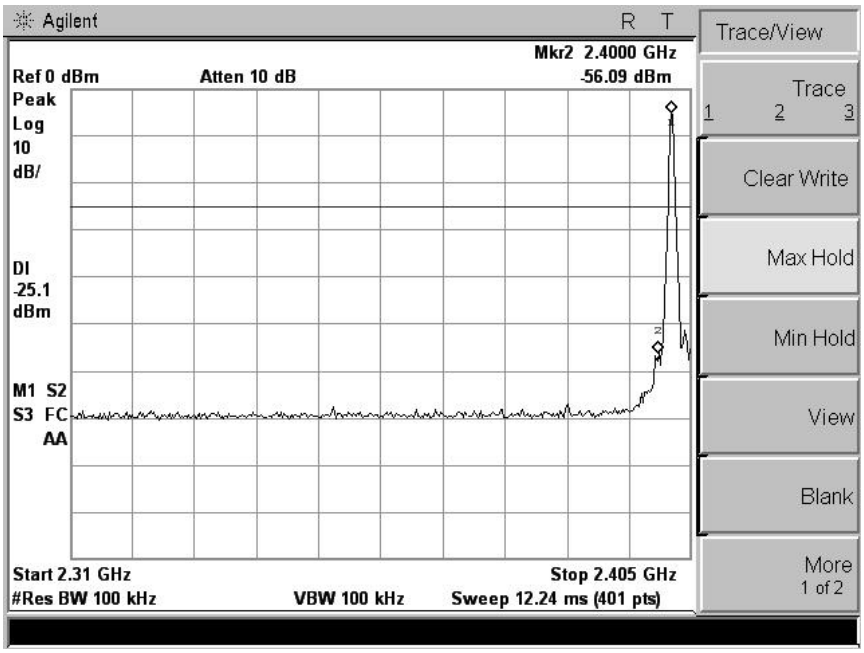
EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	100KHz
Detector	Peak
Trace	Max hold

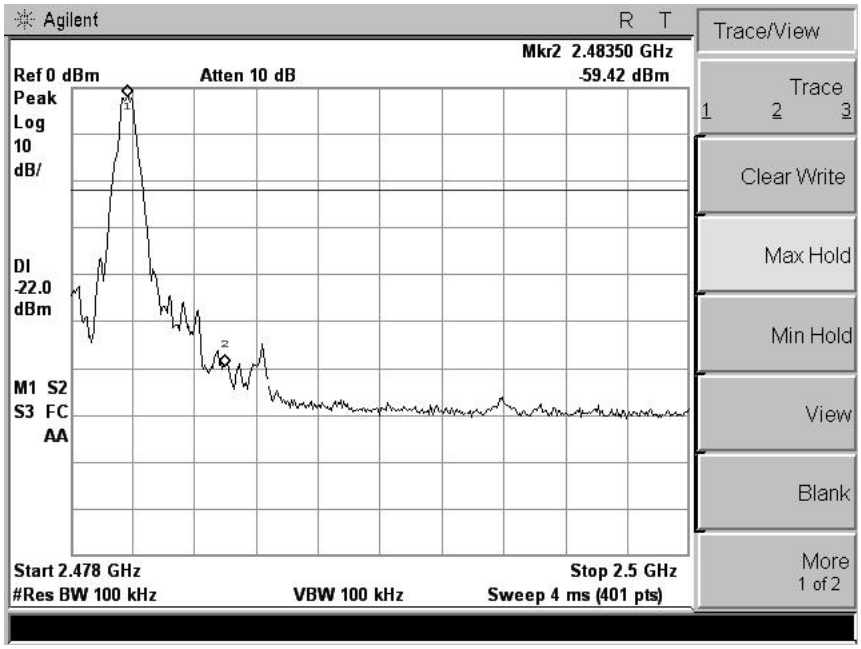
8.3 TEST RESULTS

For Conducted Test (only record the worst test result in this report)

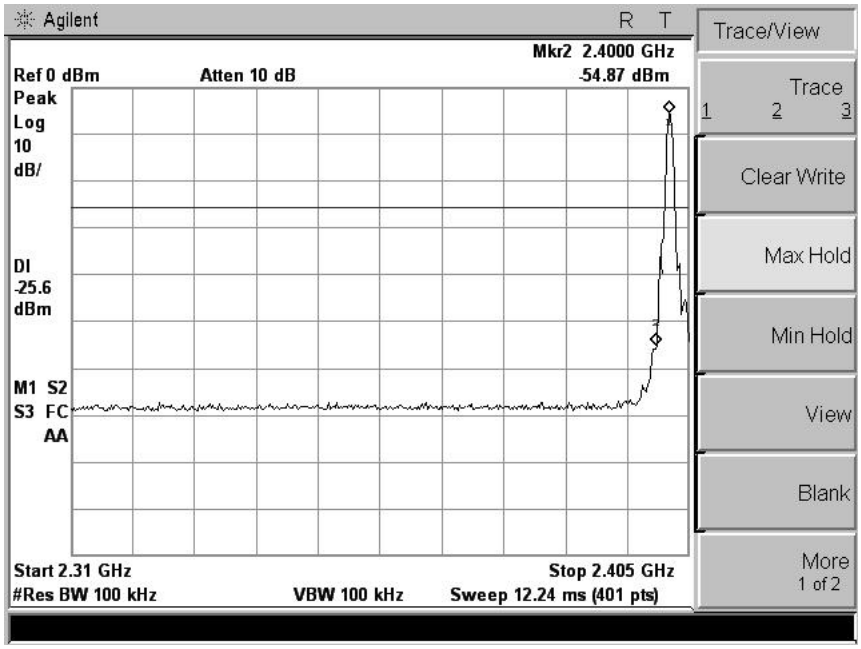
For Non-Hopping Mode

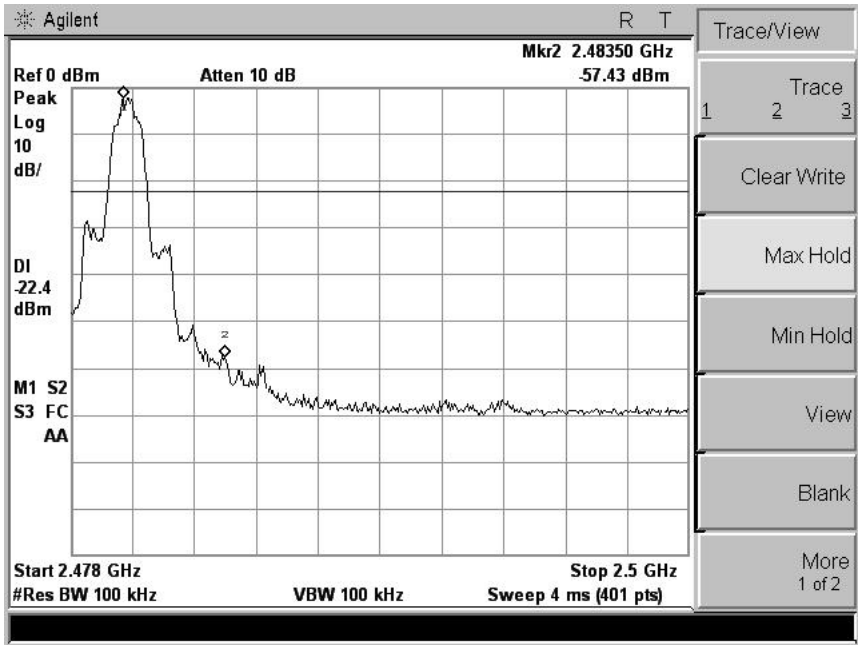
GFSK





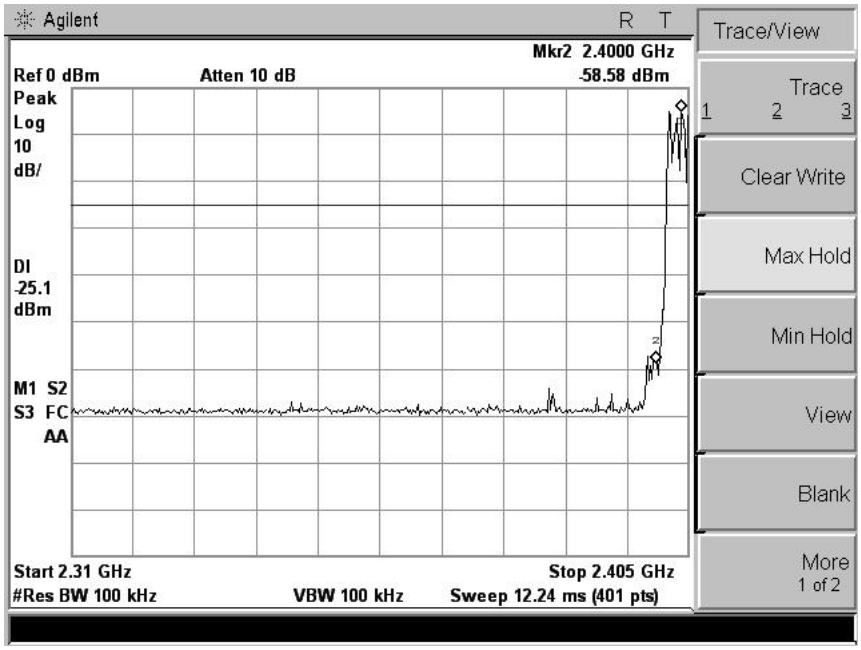
8DPSK

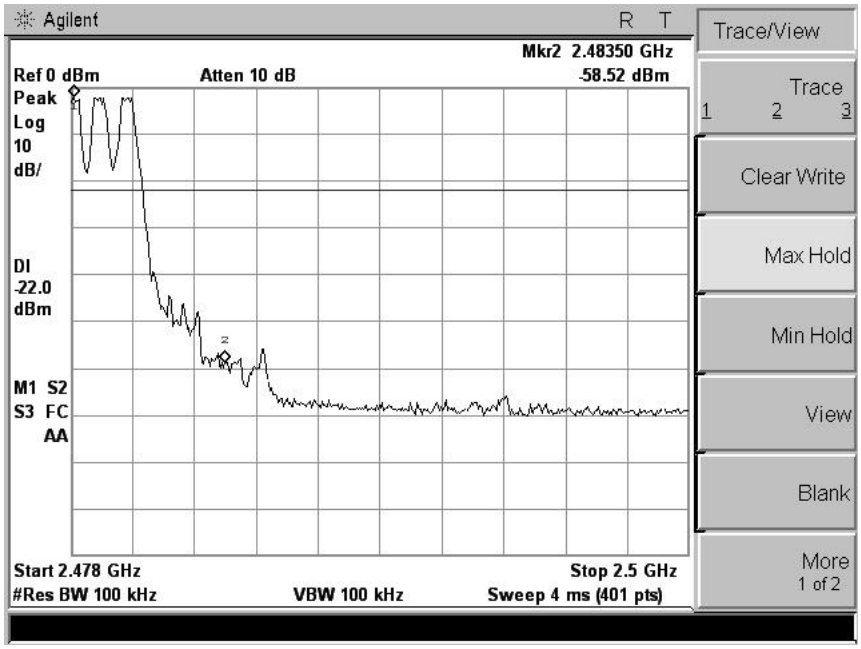

Agilent
R T
Mkr2 2.4000 GHz
Ref 0 dBm
Atten 10 dB
-54.87 dBm
Peak
Log
10
dB/
DI
-25.6
dBm
M1 S2
S3 FC
AA
Start 2.31 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 2.405 GHz
Sweep 12.24 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2


Agilent
R T
Mkr2 2.48350 GHz
Ref 0 dBm
Atten 10 dB
-57.43 dBm
Peak
Log
10
dB/
DI
-22.4
dBm
M1 S2
S3 FC
AA
Start 2.478 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 2.5 GHz
Sweep 4 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

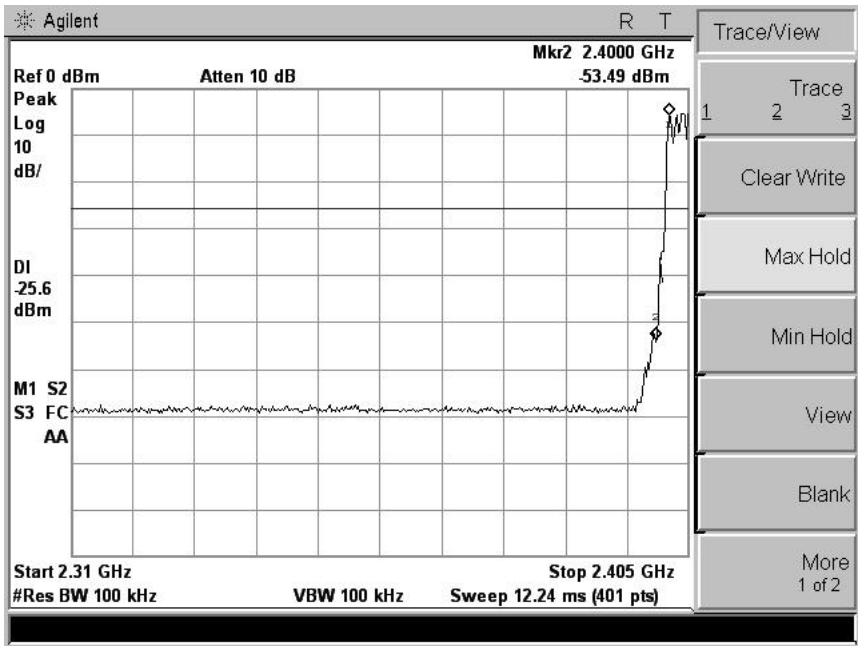
For Hopping Mode

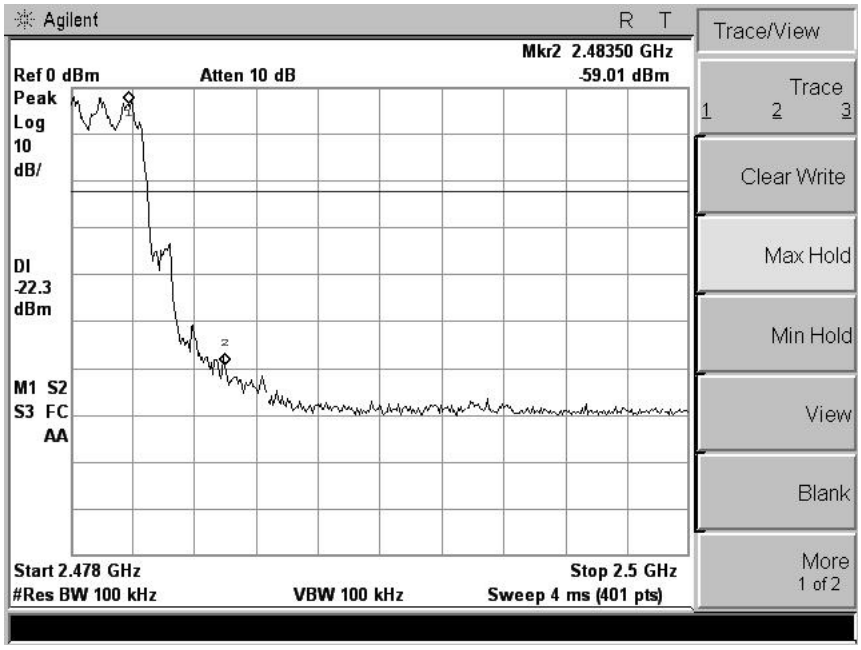
GFSK





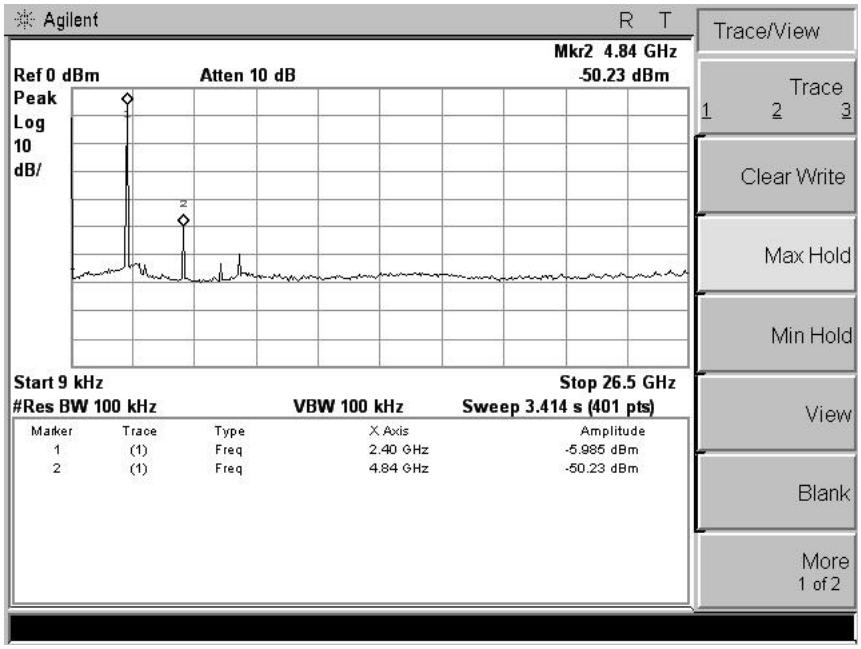
8DPSK

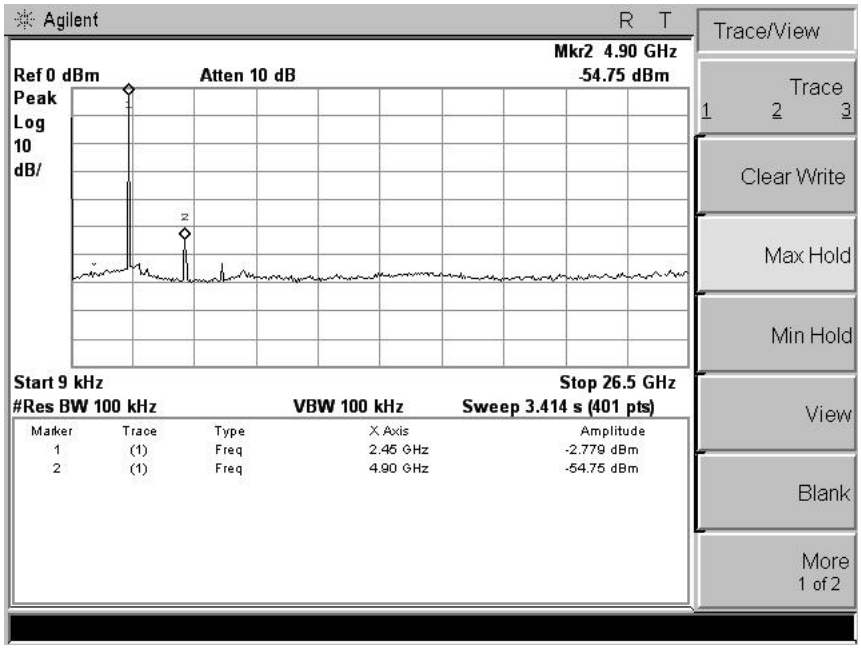

Agilent
R T
Mkr2 2.4000 GHz
Ref 0 dBm
Atten 10 dB
-53.49 dBm
Peak
Log
10
dB/
DI
-25.6
dBm
M1 S2
S3 FC
AA
Start 2.31 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 2.405 GHz
Sweep 12.24 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

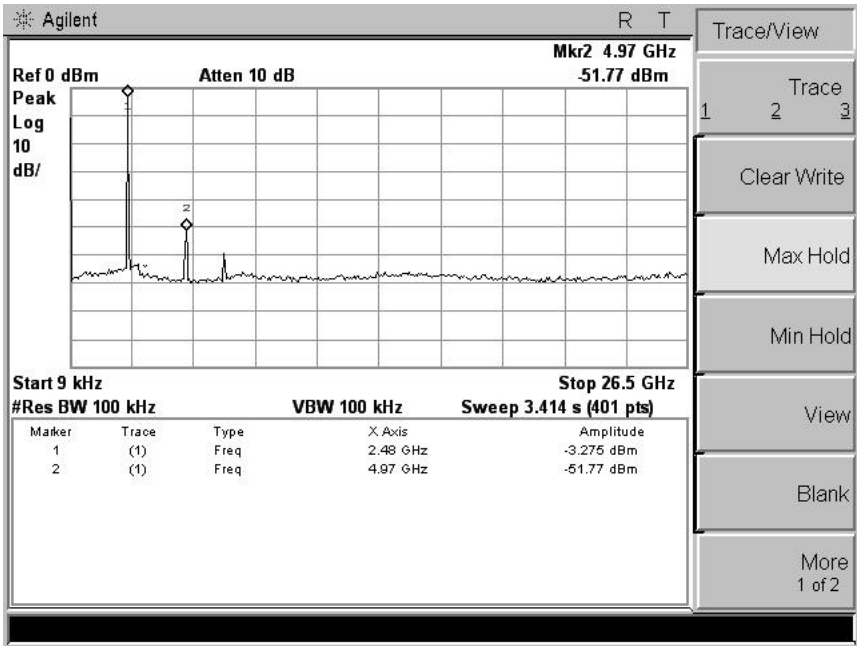

Agilent
R T
Mkr2 2.48350 GHz
Ref 0 dBm
Atten 10 dB
-59.01 dBm
Peak
Log
10
dB/
DI
-22.3
dBm
M1 S2
S3 FC
AA
Start 2.478 GHz
#Res BW 100 kHz
VBW 100 kHz
Stop 2.5 GHz
Sweep 4 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

For Conduct spurious emissions (only record the worst test result in this report)

GFSK






Agilent
R T
Mkr2 4.97 GHz
Ref 0 dBm
Atten 10 dB
-51.77 dBm
Peak
Log
10
dB/
Start 9 kHz
Stop 26.5 GHz
#Res BW 100 kHz
VBW 100 kHz
Sweep 3.414 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.48 GHz -3.275 dBm
2 (1) Freq 4.97 GHz -51.77 dBm
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

9 Frequency Separation And 20 dB Bandwidth Measurement

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Limit	:	According to §15.247(c) or A8.1(a), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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, In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in15.209(a).

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 = 100kHz

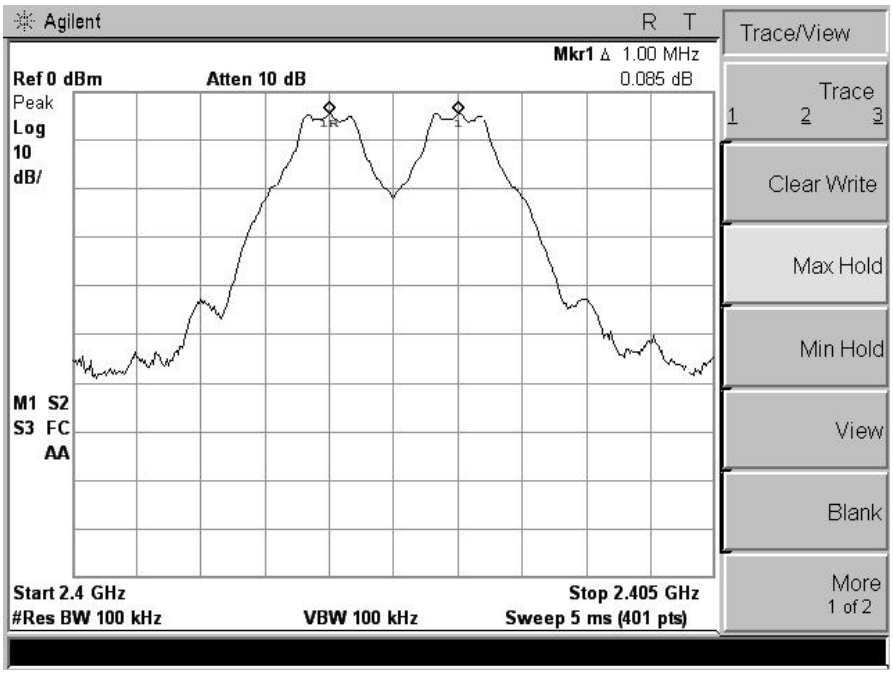
9.2 Test Result

The Measurement Result With 1Mbps For GFSK Modulation				
Channel	**20dB Bandwidth (KHz)**	**Channel Separation (MHz)**	**Limit (MHz)**	**Result**
Low	846.79	1.000	>=25 KHz or 2/3 20 dB BW	Pass
Middle	844.948		>=25 KHz or 2/3 20 dB BW	Pass
High	850.637		>=25 KHz or 2/3 20 dB BW	Pass

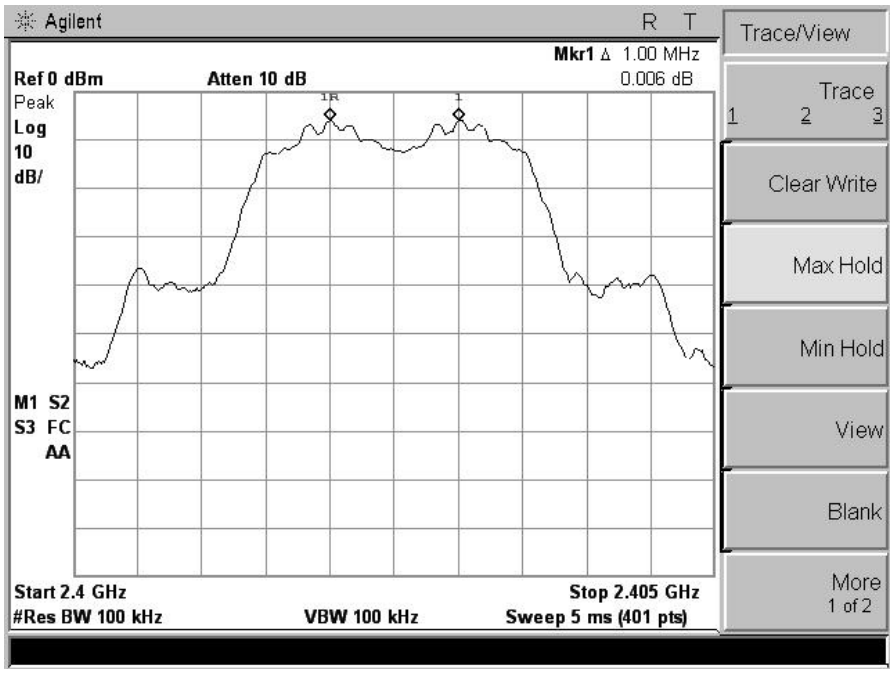
The Measurement Result With 2Mbps For π /4 DQPSK Modulation				
Channel	**20dB Bandwidth (MHz)**	**Channel Separation (MHz)**	**Limit (MHz)**	**Result**
Low	1.202	1.000	>=25 KHz or 2/3 20 dB BW	Pass
Middle	1.209		>=25 KHz or 2/3 20 dB BW	Pass
High	1.212		>=25 KHz or 2/3 20 dB BW	Pass

The Measurement Result With 3Mbps For 8-DPSK Modulation				
Channel	**20dB Bandwidth (MHz)**	**Channel Separation (MHz)**	**Limit (MHz)**	**Result**
Low	1.208	1.000	>=25 KHz or 2/3 20 dB BW	Pass
Middle	1.211		>=25 KHz or 2/3 20 dB BW	Pass
High	1.211		>=25 KHz or 2/3 20 dB BW	Pass

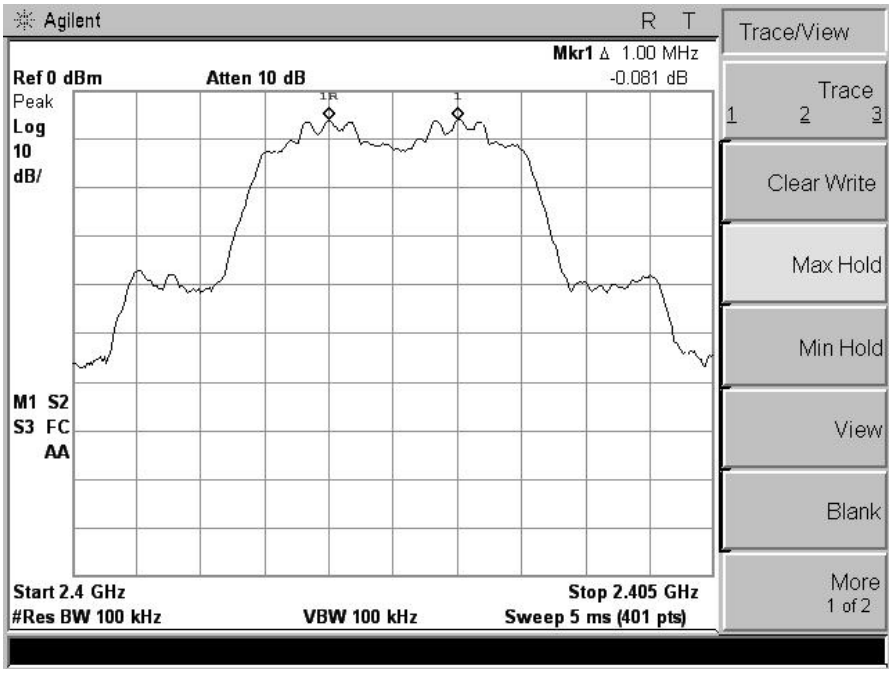
Plot Of Frequency Separation (1Mbps)



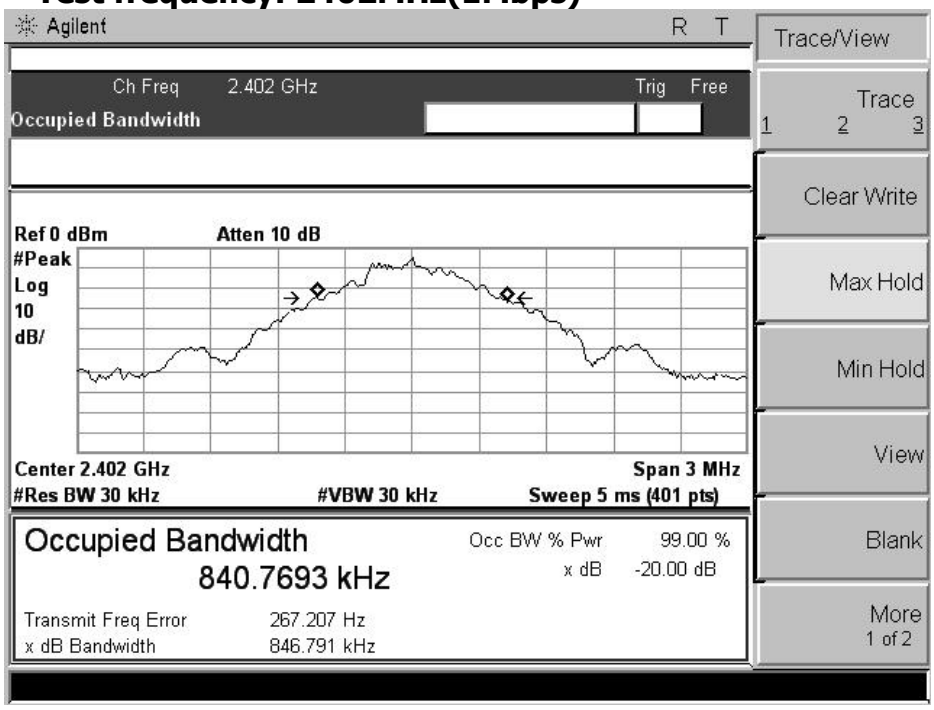
Plot Of Frequency Separation (2Mbps)



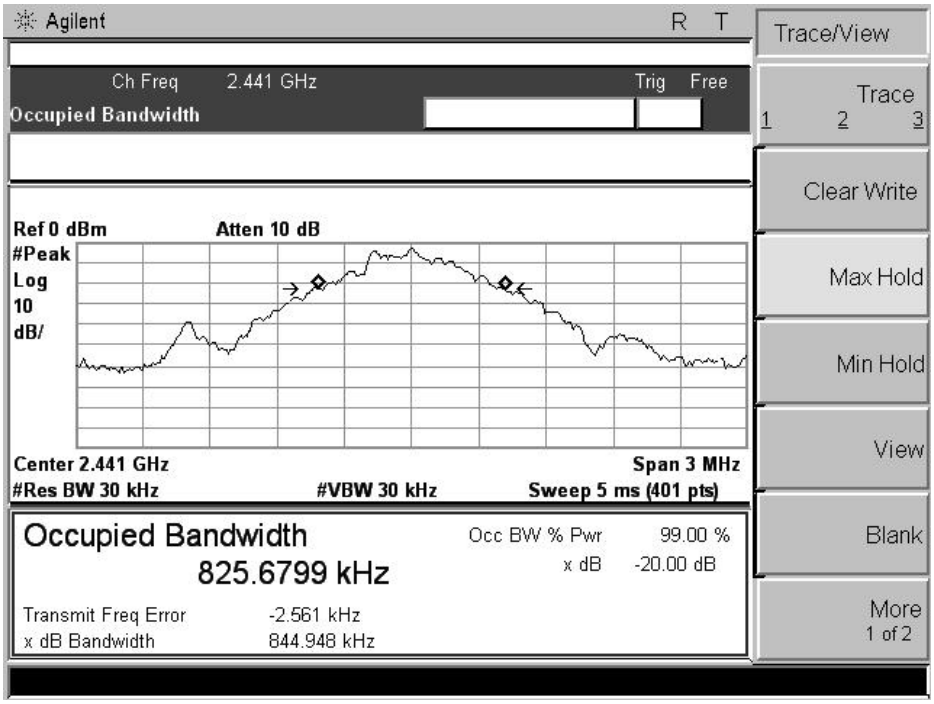
Plot Of Frequency Separation (3Mbps)



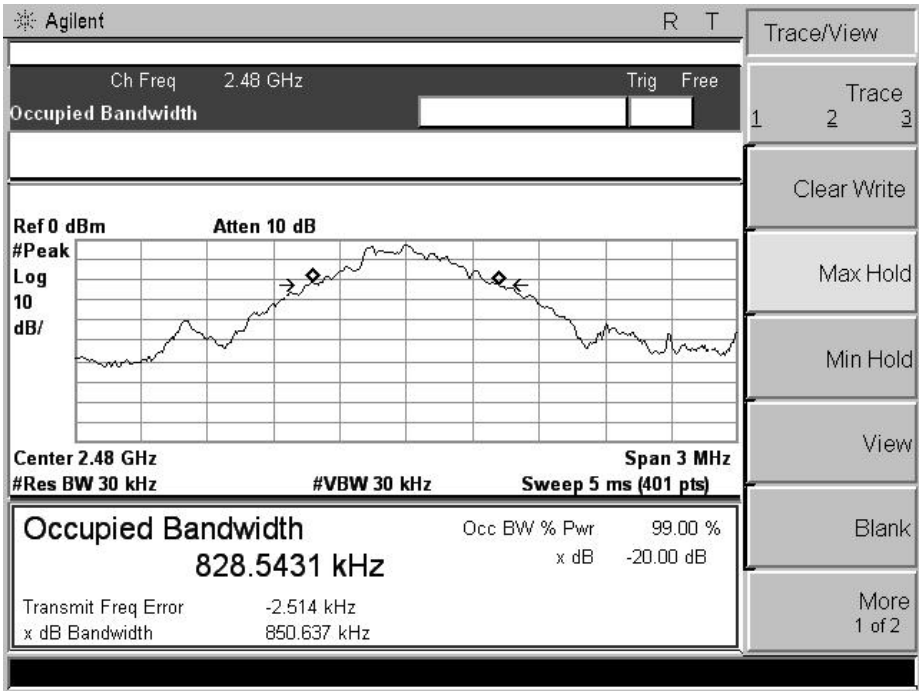
Test frequency: 2402MHz(1Mbps)



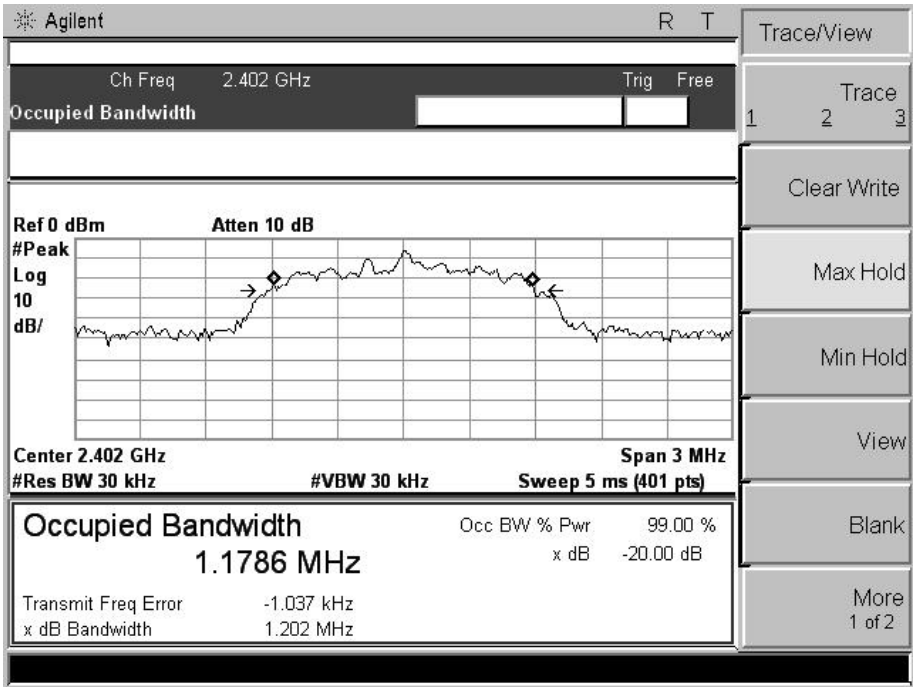
Test frequency: 2441MHz(1Mbps)



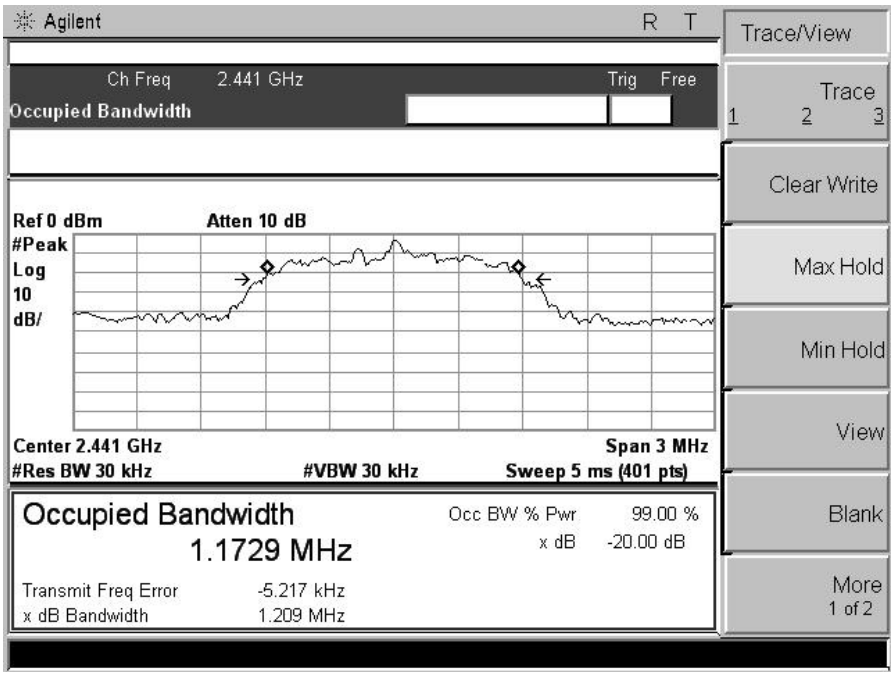
Test frequency: 2480MHz(1Mbps)



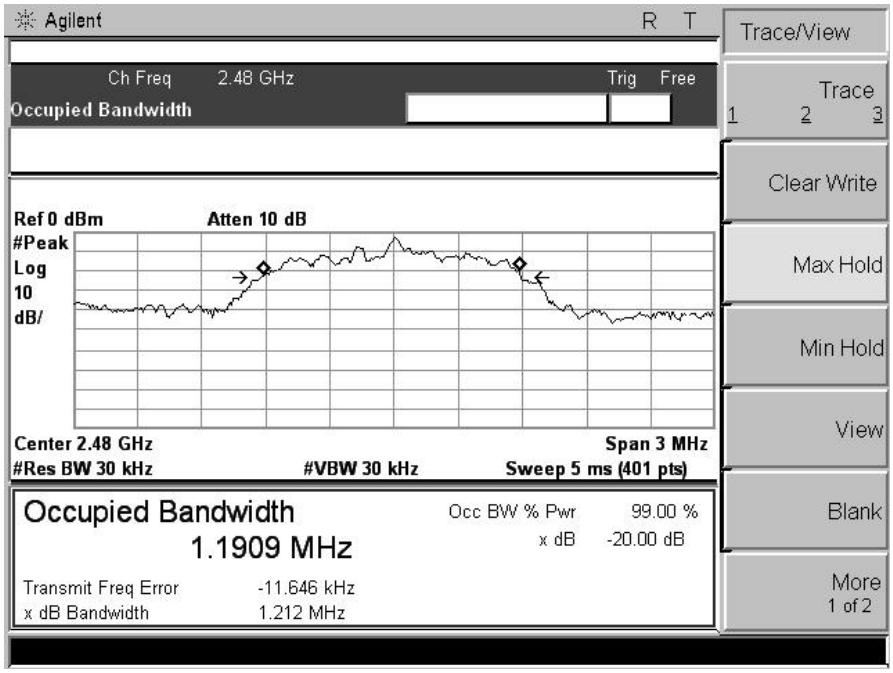
Test frequency: 2402MHz(2Mbps)



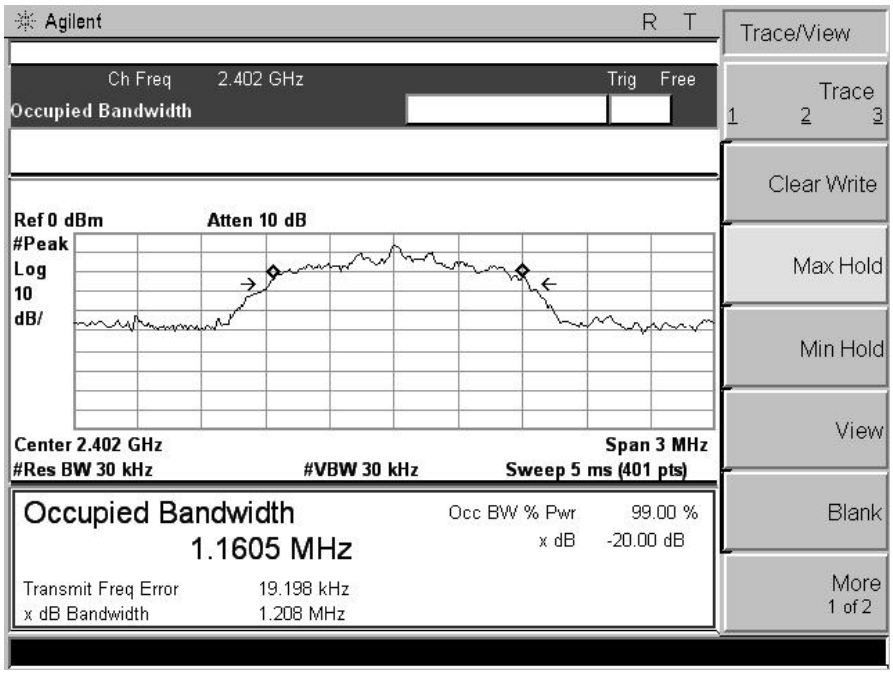
Test frequency: 2441MHz(2Mbps)



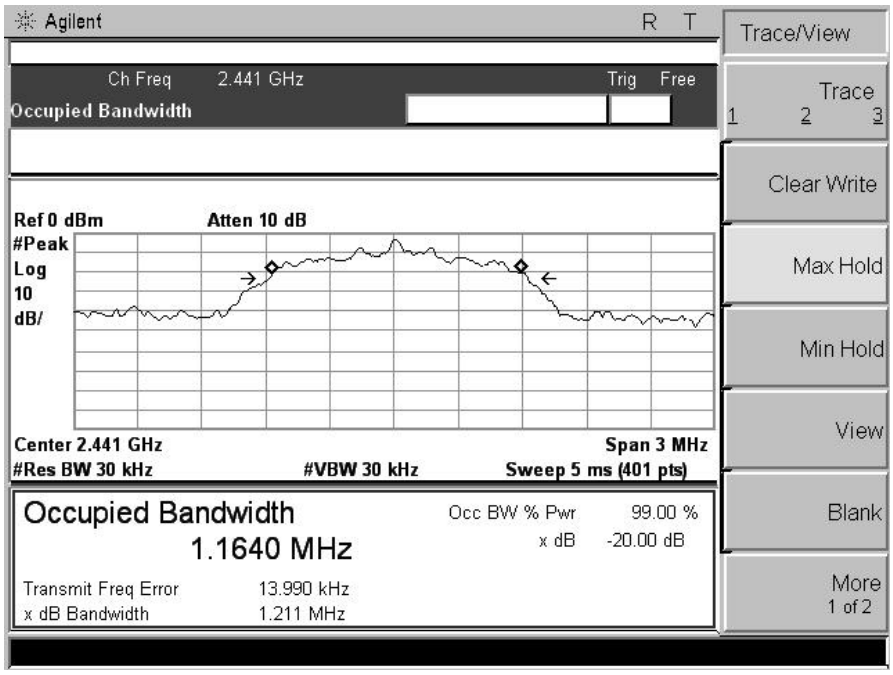
Test frequency: 2480MHz(2Mbps)



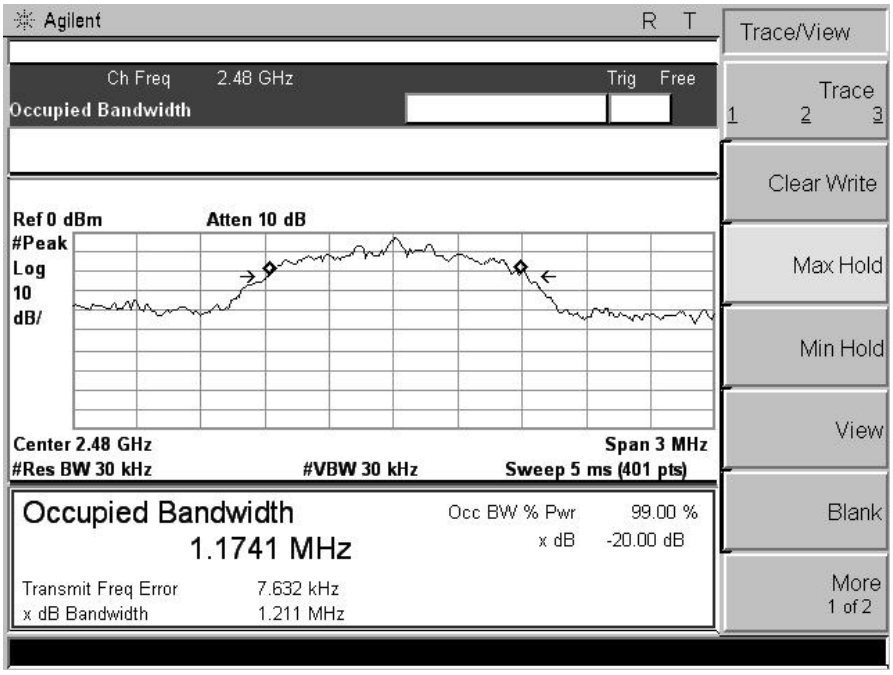
Test frequency: 2402MHz(3Mbps)



Test frequency: 2441MHz(3Mbps)



Test frequency: 2480MHz(3Mbps)



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 eploying 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 power meter.

2. Set the spectrum analyser: RBW = 3MHz. VBW =10MHz. 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)	(W)	(W)	
CH00	2402	3.62	0.0023	1	Pass
CH39	2441	4.92	0.0031	1	Pass
CH78	2480	5.49	0.0035	1	Pass

π /4-DQPSK(2Mbps)					
Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(W)	(W)	
CH00	2402	3.49	0.0022	1	Pass
CH39	2441	4.81	0.003	1	Pass
CH78	2480	5.26	0.0034	1	Pass

8DPSK(3Mbps)					
Test Channel	Frequency	Conducted Output Peak Power	Conducted Output Peak Power	LIMIT	Pass/Fail
	(MHz)	(dBm)	(W)	(W)	
CH00	2402	3.33	0.0022	1	Pass
CH39	2441	4.65	0.0029	1	Pass
CH78	2480	5.14	0.0033	1	Pass

11 Number of Hopping Frequency

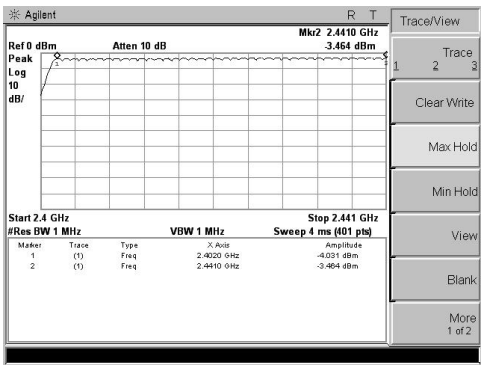
Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode	:	Hopping(GFSK)

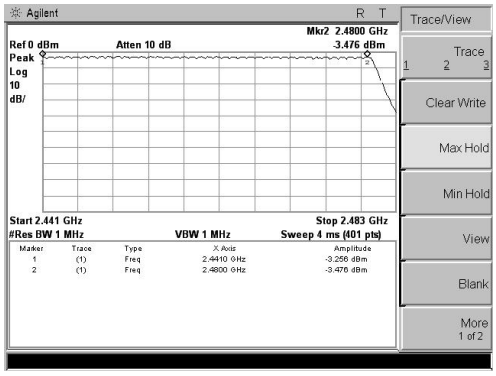
11.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.483GHz. Sweep=auto;

11.2 Test Result

Channel Number	Limit
79	≥15





12 Dwell Time

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
Test Mode	:	The worst case 8-DPSK was recorded

12.1 Test Procedure

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

2. Set spectrum analyzer span = 0. Centred on a hopping channel;

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

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

12.2 Test Result

The Measurement Result With The Worst Case of 3Mbps For 8-DPSK Modulation				
Channel	**Time of Pulse for DH5 (ms)**	**Period Time (s)**	**Sweep Time (ms)**	**Limit (ms)**
Low	2.91	31.6	310.4	400
Middle	2.91	31.6	310.4	400
High	2.91	31.6	310.4	400

Calculate:

Low Channel :

2.91*(1600/6)/79*31.6=310.4ms

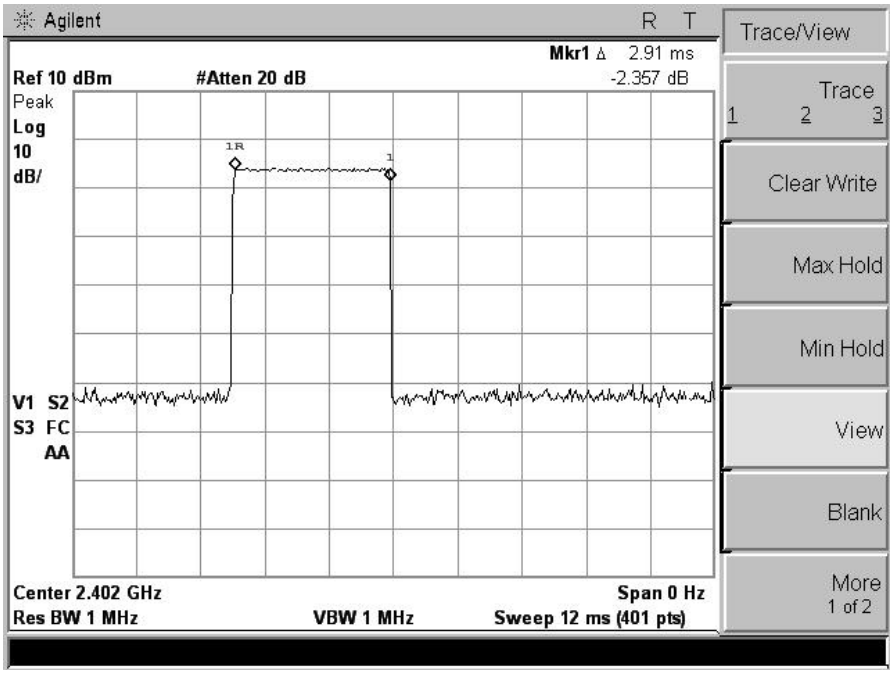
Middle Channel

2.91*(1600/6)/79*31.6=310.4ms

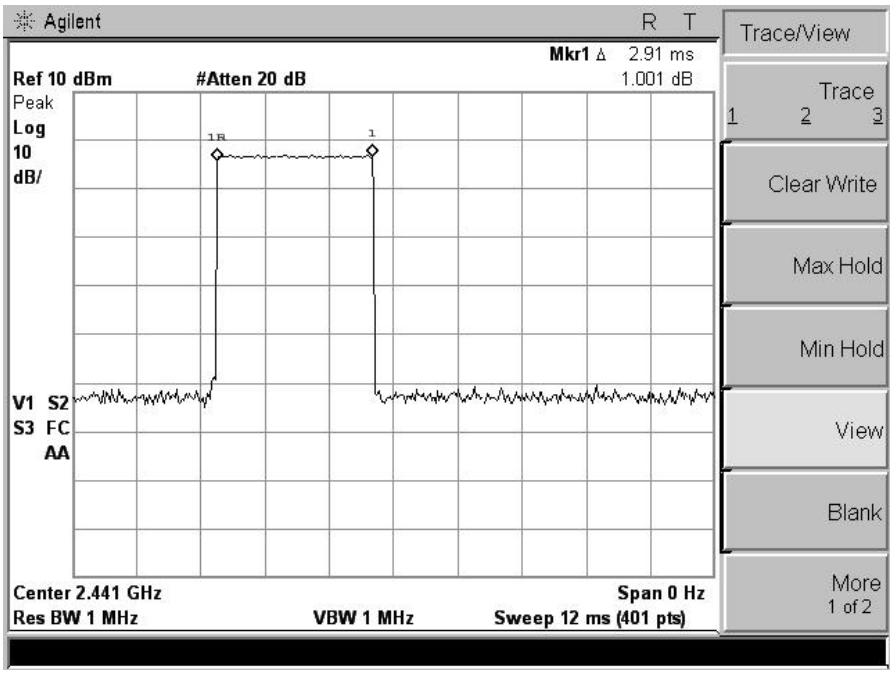
High Channel

2.91*(1600/6)/79*31.6=310.4ms

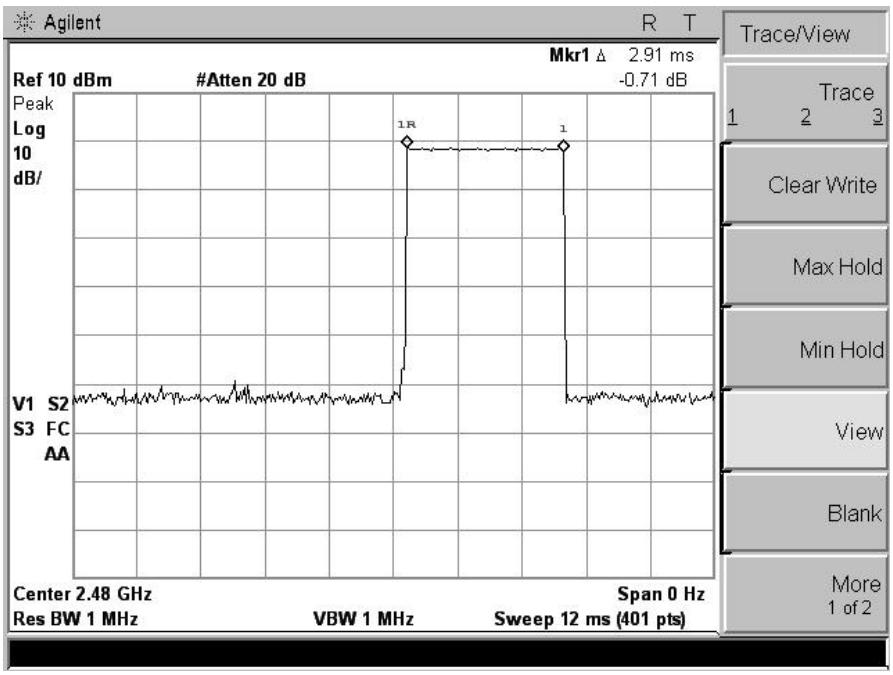
Low Channel



Middle Channel



High Channel



13 Antenna Requirement

13.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

13.2 Result

The EUT'S antenna, permanent attached antenna, is Internal Antenna. The antenna's gain is 0dBi and meets the requirement.

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