TEST REPORT

Report No. :	**HST201605-2476-FCC**
Product description:	**Speaker**
Model/Type :	**ACE210, FLASH212, YHT-10, YHT-12, YHT-15, C4D, V6L, V8L, T10S, FLASH16, FLASH18, FLASH110, FLASH112, FLASH115, FLASH28, FLASH210, FLASH215, K6-5R, K6-5RC, K10-6PZ, K10-6PZT, T8L, T10L, V11L, K6-8E, K6-5K, K6-5C, K6-5CD, K6-6PB, K6-6PB2, K6-6PB3**
Applicant's name:	**GUANGZHOU QIYUN ELECTRONIC CO., LTD.**

TEST REPORT

FCC Part 15.247: 2014

FCCID: 2AIG6ACE210

Report Reference No. .....:	HST201605-2476-FCC	
Tested by (+ signature) .....:	Lemon Fu	Lemon Fu
Review by (+ signature) .....:	Sandy Yu	Sandy Yu
Approved by (+ signature).....	Zeng	Robin Peng
Date of Sample Receive ..... …..:	May 10, 2016	
Date of Test.....:	May 10, 2016 to May 25, 2016	
Date of issue .....:	May 28, 2016	
Total number of pages .....:	110 Pages	
Testing Laboratory……..:	Guangdong Environment Radiation Monitoring Center (Accredited by CNAS, Accredited Number: L5539) FCC- Registration No: 667318 Renewal on Sep. 12, 2012	
Address .....:	No. 860, South Guangzhou Avenue, Guangzhou, 510300 China	
Applicant's name .....:	GUANGZHOU QIYUN ELECTRONIC CO., LTD.	
Address .....:	NO.11 HUAXING INDUSTRY AREA, DONGGUAN VILLAGE, HUADU DIST. GUANGZHOU P.R. CHINA.	
Manufacturer's name .....:	GUANGZHOU QIYUN ELECTRONIC CO., LTD.	
Address .....:	NO.11 HUAXING INDUSTRY AREA, DONGGUAN VILLAGE, HUADU DIST. GUANGZHOU P.R. CHINA.	
Test specification……:	Entrusted testing	
Standard.....:	FCC Part 15.247: 2014	
Non-standard test method……..:	N/A	
Test item description.....:	Speaker	
Trade Mark.....:	N/A	
Model/Type reference .....:	ACE210	
Ratings .....:	120Vac, 60Hz or 220Vac, 50Hz	

TABLE OF CONTENT

1 TEST SUMMARY

Test Item	Standard Section	Test method	Result
Conducted Emission	15.207	ANSI C63.10: Clause 6.2 & DA 00-705	PASS
Hopping Channel Separation	15.247(a)(1)	DA 00-705	PASS
Output Power	15.247(a)(1)&(b)(1)	ANSI C63.10: Clause 6.10 & DA 00-705	PASS
Radiated Spurious Emission	15.247(c)	ANSI C63.10: Clause 6.4, 6.5 and 6.6 & DA 00-705	PASS
Conducted Spurious	15.247(d)	ANSI C63.10: Clause 6.7 & DA 00-705	PASS
Band Edge			PASS
Number of Hopping Frequency	15.247(a)(iii)	DA 00-705	PASS
Dwell Time	15.247(a)(iii)	DA 00-705	PASS
Bandwidth	15.247(a)(1)	ANSI C63.10: Clause 6.9 & DA 00-705	PASS
Band Edge Emission	15.247(d) & 15.205	ANSI C63.10: Clause 6.9 & DA 00-705	PASS
Antenna Requirement	15.247(c) & 15.203	15.247 (c) & Section 15.203	PASS

Remark:

N/A: not applicable. Refer to the relative section for the details.
EUT: In this whole report EUT means Equipment Under Test.
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radio Frequency.
ANSI C63.10: the detail version is ANSI C63.10:2013 in the whole report.
DA 00-705: “Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems”

Model No.: ACE210, FLASH212, YHT-10, YHT-12, YHT-15, C4D, V6L, V8L, T10S, FLASH16, FLASH18, FLASH110, FLASH112, FLASH115, FLASH28, FLASH210, FLASH215, K6-5R, K6-5RC, K10-6PZ, K10-6PZT, T8L, T10L, V11L, K6-8E, K6-5K, K6-5C, K6-5CD, K6-6PB, K6-6PB2, K6-6PB3

According to the confirmation from the applicant, all models are totally the same in and electrical and mechanical construction, except model No., appearance (speaker’s size).

Therefore only one model ACE210 was tested in this report.

2 GENERAL INFORMATION

2.1 Client Information

Applicant:	GUANGZHOU QIYUN ELECTRONIC CO., LTD.
Address of Applicant:	NO.11 HUAXING INDUSTRY AREA, DONGGUAN VILLAGE, HUADU DIST. GUANGZHOU P.R. CHINA.

2.2 General Description of E.U.T.

Name:	Speaker
Model No.:	ACE210, FLASH212, YHT-10, YHT-12, YHT-15, C4D, V6L, V8L, T10S, FLASH16, FLASH18, FLASH110, FLASH112, FLASH115, FLASH28, FLASH210, FLASH215, K6-5R, K6-5RC, K10-6PZ, K10-6PZT, T8L, T10L, V11L, K6-8E, K6-5K, K6-5C, K6-5CD, K6-6PB, K6-6PB2, K6-6PB3
Trade Mark:	/
Operating Frequency:	2402 MHz to 2480 MHz
Channels:	79 channels with 1MHz step
Type of Modulation	GFSK(1Mbps), π/4-DQPSK(2Mbps), 8-DPSK(3Mbps)
Antenna Type	FM antenna: One simple retractable rod antenna without any connectors, 350mm, 3/25 wave Internal BT Antenna, Fixed in the PCB, 23mm, 1/5 wave
Antenna gain:	FM antenna: 2 dBi, BT antenna: 1 dBi.
Function:	Mixer with BT function to receive audio signal.

2.3 Details of E.U.T.

EUT Power Supply:	120Vac, 60Hz or 220Vac, 50Hz
Rated power:	50W
Power cord/ signal cord:	N/A, the USB port is only used for U-disk.
Test mode:	The program used to control the EUT for staying in continuous transmitting mode is programmed. Channel lowest (2402MHz), middle (2441MHz) and highest (2480MHz) are chosen for full testing. Normal mode: the Bluetooth has been tested on the Modulation of GFSK; EDR mode: the Bluetooth has been tested on the Modulation of (π/4)DQPSK and 8DPSK, compliance test and record the worst case on 8DPSK.

Pretest Mode	Description	Data Rate/Modulation
Mode 1	TX CH00	1Mbps/GFSK
Mode 2	TX CH39	1Mbps/GFSK
Mode 3	TX CH78	1Mbps/GFSK
Mode 4	TX CH00	2 Mbps/π/4-DQPSK
Mode 5	TX CH39	2 Mbps/π/4-DQPSK
Mode 6	TX CH78	2 Mbps/π/4-DQPSK
Mode 7	TX CH00	3 Mbps/8-DPSK

Mode 8	TX CH39	3 Mbps/8-DPSK
Mode 9	TX CH78	3 Mbps/8-DPSK
Mode 10	For AC Conducted Emission	Keeping BT TX

2.4 Description of Support Units

The EUT has been tested as an independent unit for fixed frequency by testing lab.

2.5 Test Location

Guangdong Environment Radiation Monitoring Center

Address: No. 860, South Guangzhou Avenue, Guangzhou, 510300 China

Accredited by CNAS, Accredited Number: L5539

FCC- Registration No: 667318 Renewal on Sep. 12, 2012

2.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

2.7 Abnormalities from Standard Conditions

None.

2.8 Other Information Requested by the Customer

None.

2.9 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission (9KHz-150KHz)	±2.88dB
Conducted Emission (150KHz-30MHz)	±2.67dB
RF power,conducted	±0.70dB
Spurious emissions,conducted	±1.19dB
All emissions,radiated (<30M) (9KHz-30MHz)	±2.45dB
All emissions,radiated(<1G) 30MHz-200MHz	±2.83dB
All emissions,radiated(<1G) 200MHz-1000MHz	±2.94dB
All emissions,radiated(>1G)	±3.03dB
Temperature	±0.5°C
Humidity	±2%

3 TEST RESULTS

3.1 E.U.T. test conditions

Test Voltage:	Input: AC 120V, 60 Hz
Temperature:	20.0 -25.0 °C
Humidity:	38-50 % RH
Atmospheric Pressure:	1000 -1010 mbar
Test frequencies and frequency range:	According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table: According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	11	2413	22	2424
1	2403	12	2414	23	2425
2	2404	13	2415	24	2426
3	2405	14	2416	25	2427
4	2406	15	2417	26	2428
5	2407	16	2418	27	2429
6	2408	17	2419	28	2430
7	2409	18	2420	29	2431
8	2410	19	2421	30	2432
9	2411	20	2422	31	2433
10	2412	21	2423	32	2434
33	2435	49	2451	65	2467
34	2436	50	2452	66	2468
35	2437	51	2453	67	2469
36	2438	52	2454	68	2470
37	2439	53	2455	69	2471
38	2440	54	2456	70	2472
39	2441	55	2457	71	2473
40	2442	56	2458	72	2474
41	2443	57	2459	73	2475
42	2444	58	2460	74	2476
43	2445	59	2461	75	2477
44	2446	60	2462	76	2478
45	2447	61	2463	77	2479
46	2448	62	2464	78	2480
47	2449	63	2465		
48	2450	64	2466		

Test frequencies are the lowest channel: 0 channel(2402 MHz), middle channel: 39 channel(2441 MHz) and highest channel: 78 channel(2480 MHz)

3.2 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz

Test Requirement: FCC Part 15 C section 15.207

Test Method: ANSI C63.10: Clause 6.2 & DA 00-705

Frequency Range: 150 kHz to 30 MHz

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

Test Limit

Limits for conducted disturbance at the mains ports of class B

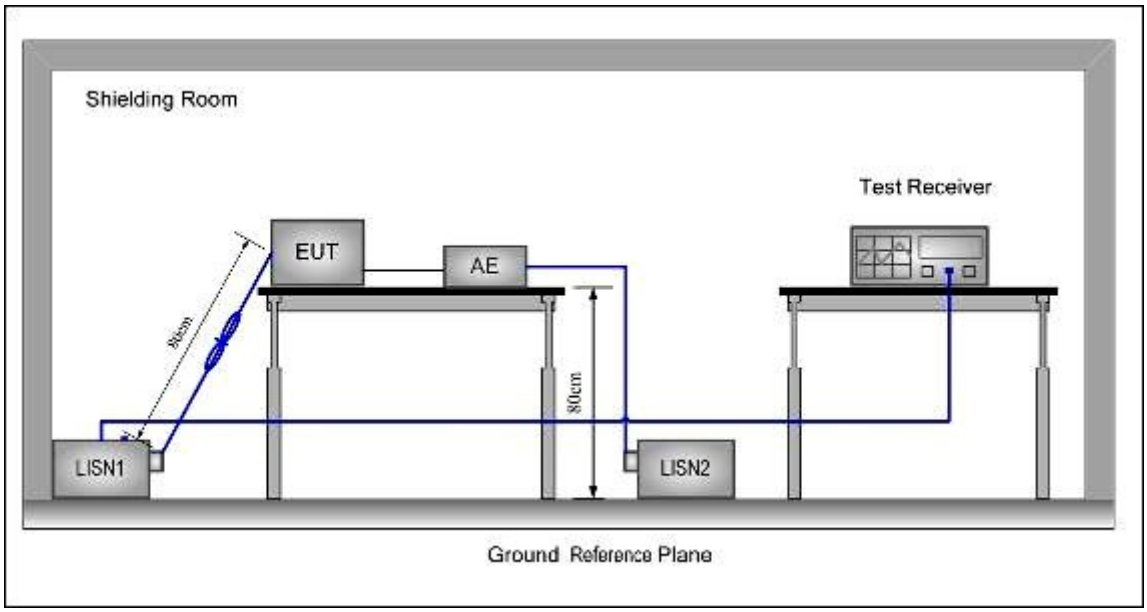
Frequency Range	**Class B Limit dB(μV)**	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

EUT Operation:

Test in normal operating mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Configuration:



Test procedure:

1. The mains terminal disturbance voltage test was conducted in a shielded room.

2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

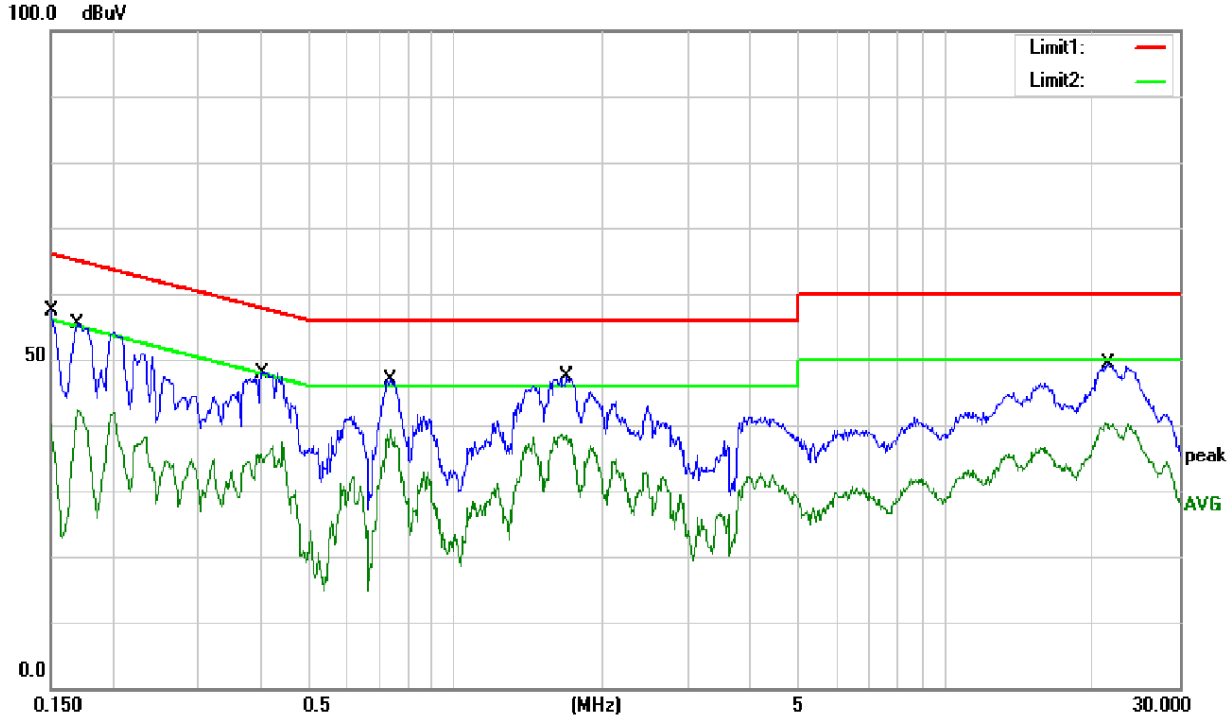
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

The following Quasi-Peak and Average measurements were performed on the EUT:

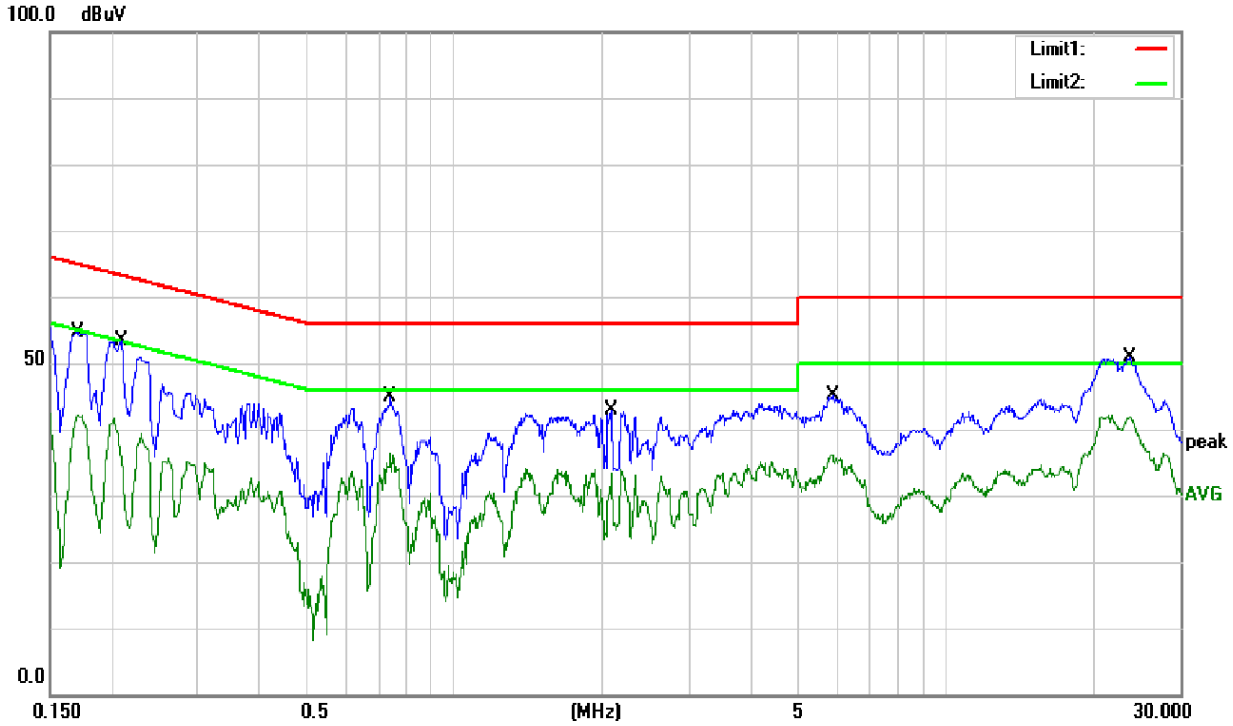
Live line



Quasi-peak and Average measurement

Freq. (MHz)	Line	QP (dBµV)	Transducer (dB)	QP limit (dBµV)	Margin (dB)	AV (dBµV)	Transducer (dB)	AV limit (dBµV)	Margin (dB)
0.150	Live	57.4	11.2	66.0	-8.6	40.1	11.2	56.0	-15.9
0.170	Live	55.5	10.0	65.0	-9.5	42.3	10.0	55.0	-12.7
0.406	Live	48.0	10.2	57.7	-9.7	35.6	10.2	47.7	-12.1
0.742	Live	46.9	10.0	56	-9.1	39.3	10.0	46	-6.7
1.690	Live	47.3	10.0	56	-8.7	38.5	10.0	46	-7.5
21.41	Live	49.3	10.7	60	-10.7	40.3	10.7	50	-9.7

Neutral Line:



Quasi-peak and Average measurement

Freq. (MHz)	Line	QP (dBµV)	Transducer（dB）	QP limit (dBµV)	Margin (dB)	AV (dBµV)	Transducer（dB）	AV limit (dBµV)	Margin (dB)
0.171	Neutral	54.7	10.0	64.9	-10.2	42.2	10.0	54.9	-12.7
0.210	Neutral	53.3	10.0	63.2	-9.9	41.7	10.0	53.2	-11.5
0.742	Neutral	44.8	10.0	56	-11.2	36.4	10.0	46	-9.6
2.082	Neutral	43.0	10.0	56	-13.0	33.9	10.0	46	-12.1
5.894	Neutral	45.1	10.2	60	-14.9	36.2	10.2	50	-13.8
23.71	Neutral	50.8	10.7	60	-9.2	41.9	10.7	50	-8.1

3.3 Radiated Spurious Emissions

Test Requirement: FCC Part15 C section 15.247, 15.205

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that Contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, and provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method: ANSI C63.10: Clause 6.4, 6.5 and 6.6 & DA 00-705

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting mode with normal mode (DH5) as the worst case was found.

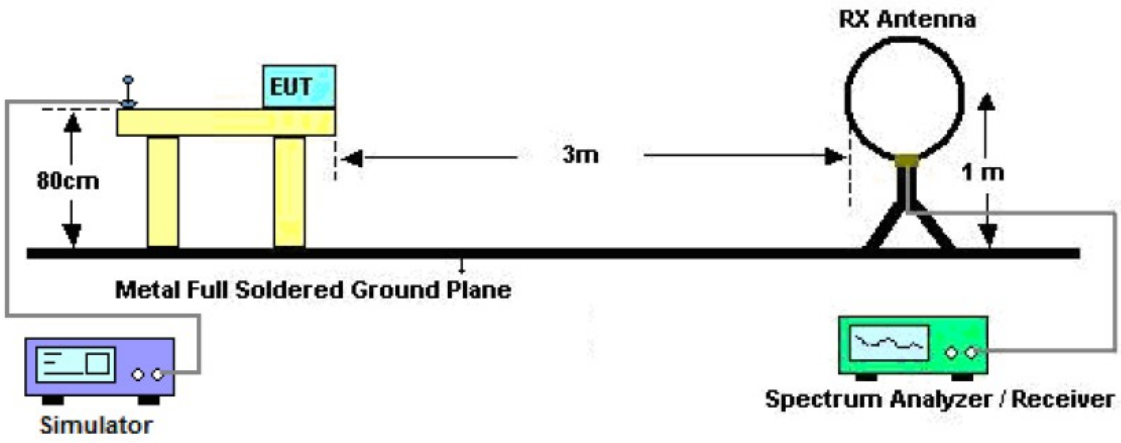
Detector: For PK value:
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, 9kHz for <30MHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
For AV value:
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, 9kHz for <30MHz
VBW =10 Hz
Sweep = auto
Detector function = peak
Trace = max hold

15.209 Limit: 40.0 dBμV/m between 30MHz & 88MHz
43.5 dBμV/m between 88MHz & 216MHz
46.0 dBμV/m between 216MHz & 960MHz
54.0 dBμV/m above 960MHz

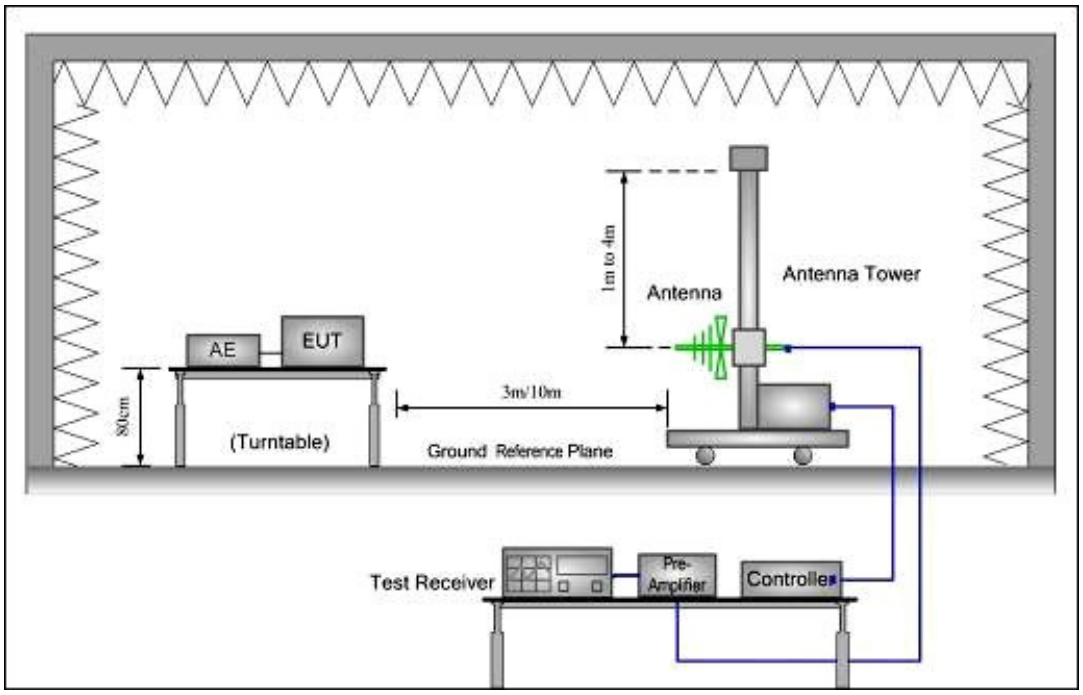
For Band edge: Detector: Peak
Start/Stop Frequency: Lower Band Edge: 2300 to 2430 MHz
Upper Band Edge: 2450 to 2500 MHz
RB/ VB (emission in restricted band): 1MHz/ 1MHz,
AV= 1MHz/ 10Hz

Test Configuration 1 for tabletop EUTs:

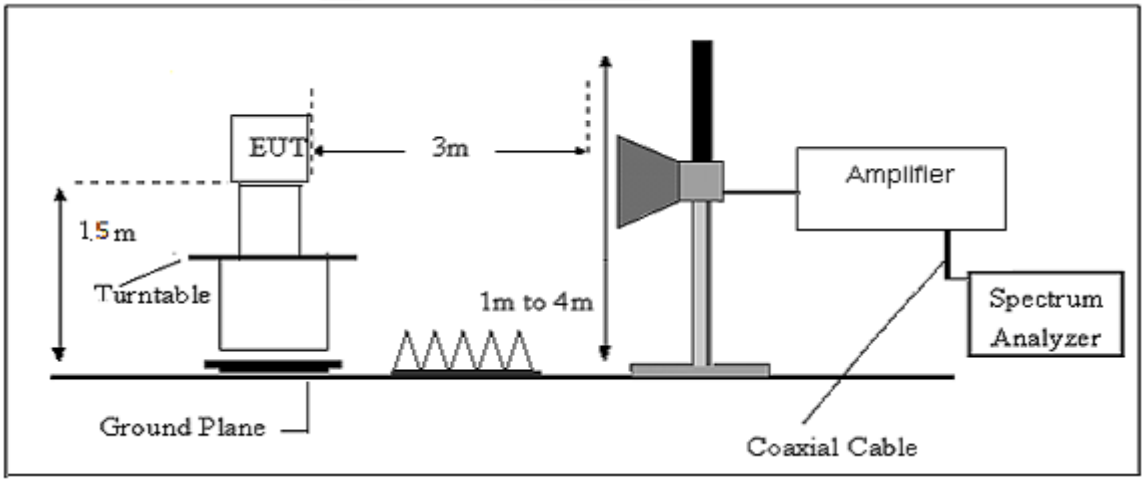
1) 9kHz to 30MHz emissions:



2) 30 MHz to 1 GHz emissions:

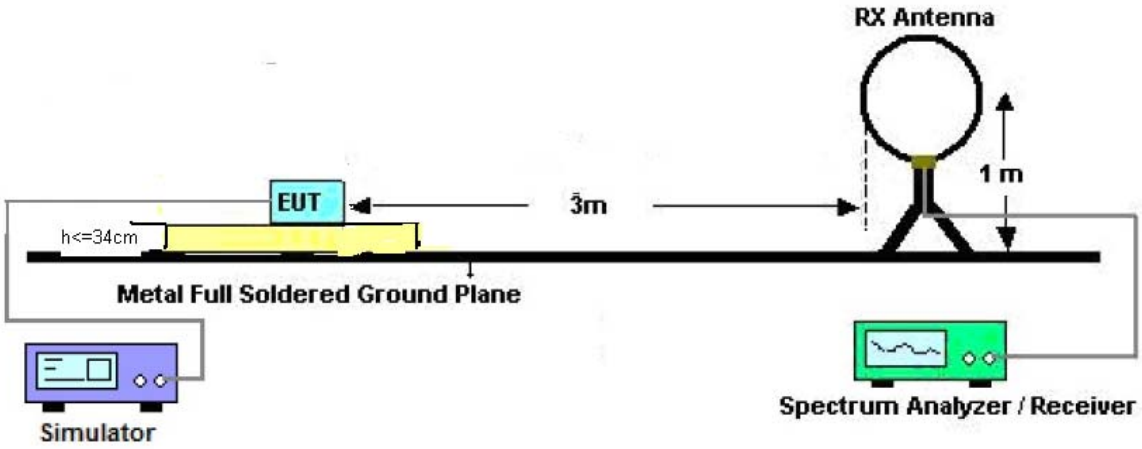


3) 1 GHz to 40 GHz emissions:

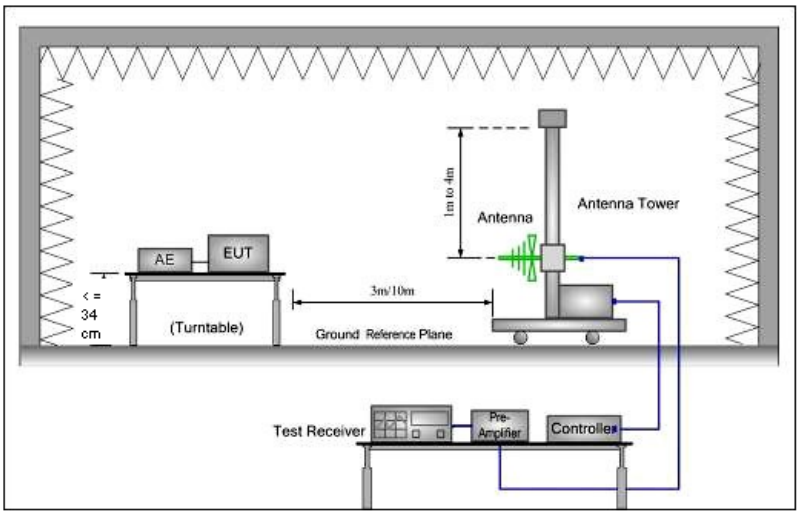


Test Configuration 2 to represent typical raised/ false floor installation:

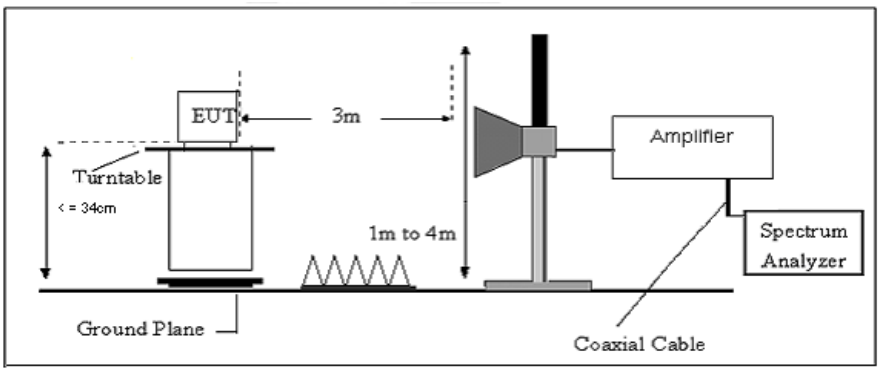
4) 9kHz to 30MHz emissions:



5) 30 MHz to 1 GHz emissions:



6) 1 GHz to 40 GHz emissions:



Test Procedure: The procedure used was ANSI Standard C63.4:2014. The receiver was scanned from 30MHz to 25GHz.When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from
20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

For floor-standing EUT is typically installed with its base in direct electrical contanct with, or connected to, a grounded metal floor or grid, the EUT shall be connected to, or placed directly on, the test site (or turntable) reference ground plane in a manner representative of this contact or connection.

Where floor-standing equipment is not typically installed with its base in direct electrical contact with, or connected to, a metal floor or grid, the EUT shall not be placed in direct electrical contact with the test site (or turntable) reference ground plane. If necessary to prevent direct metallic contact of the EUT and the reference ground plane, insulating material (up to 12 mm thick) shall be placed under the EUT.

To represent typical raised/ false floor installation of EUTs more explicitly, the base of the EUT may be raised but in no case exceed 34 cm above the

reference ground plane. If the EUT elevation that is not representative of a typical installation is used for testing, the reason for the variation shall be explained in the test report. However, the preferred method shall be measurements made at elevations that are representative of actual applications.

Note:

The manufactory stated that the EUT's typical installation should be raised 10 cm above the ground, and the EMI emission tests set-up is set the EUT 10cm above the reference ground plane. More details of the set-up photos please refer to clause 4 in this report.

Harmonic and other spurious emissions

Test at low Channel in transmitting status

9kHz~30MHz Test result

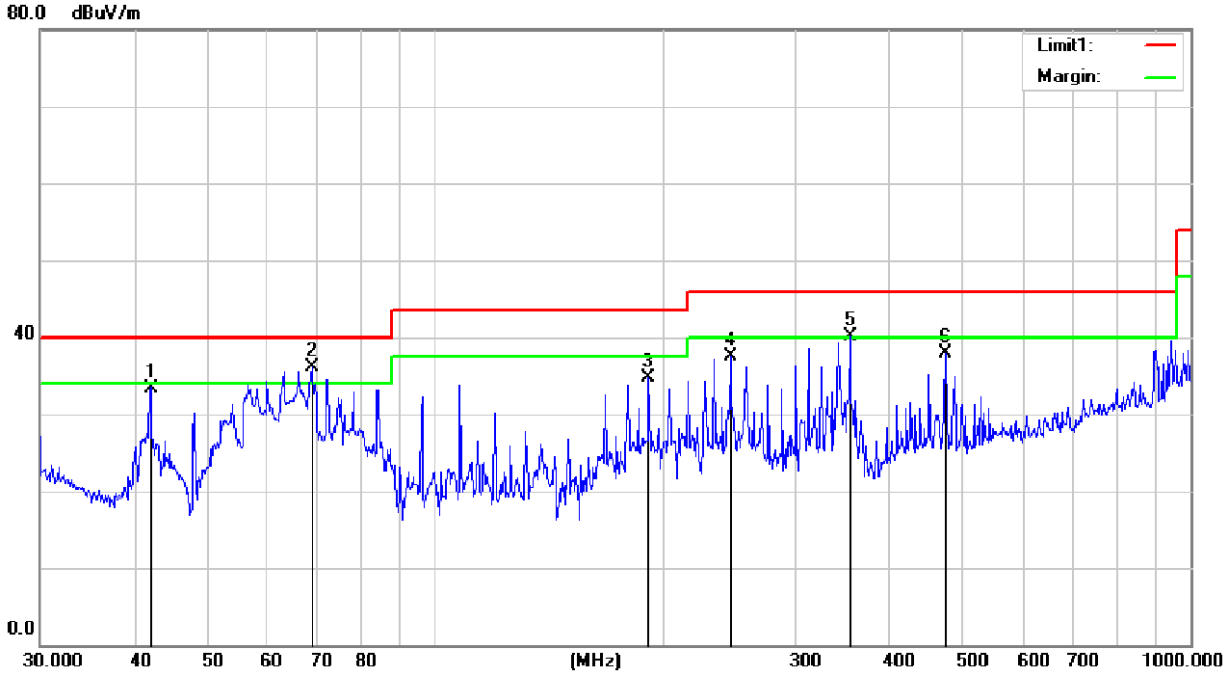
The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Pre-test in mode 1/2/3/4/5/6/7/8/9, and choose the worst mode 1-1M as the final measurement.

Peak scan



Frequency	Reading	Correct	Result	Limit	Margin	Remark
MHz	dBuV	Factor (dB)	dBuV/m	dBuV/m	dB	
42.0	21.1	12.3	33.4	40	-6.6	QP
68.6	30.1	6.1	36.2	40	-3.8	QP
191.7	25.5	9.2	34.7	43.5	-8.8	QP
246.0	24.5	13.0	37.5	46	-8.5	QP
354.2	23.7	16.4	40.1	46	-5.9	QP
473.8	18.2	19.8	38.0	46	-8.0	QP

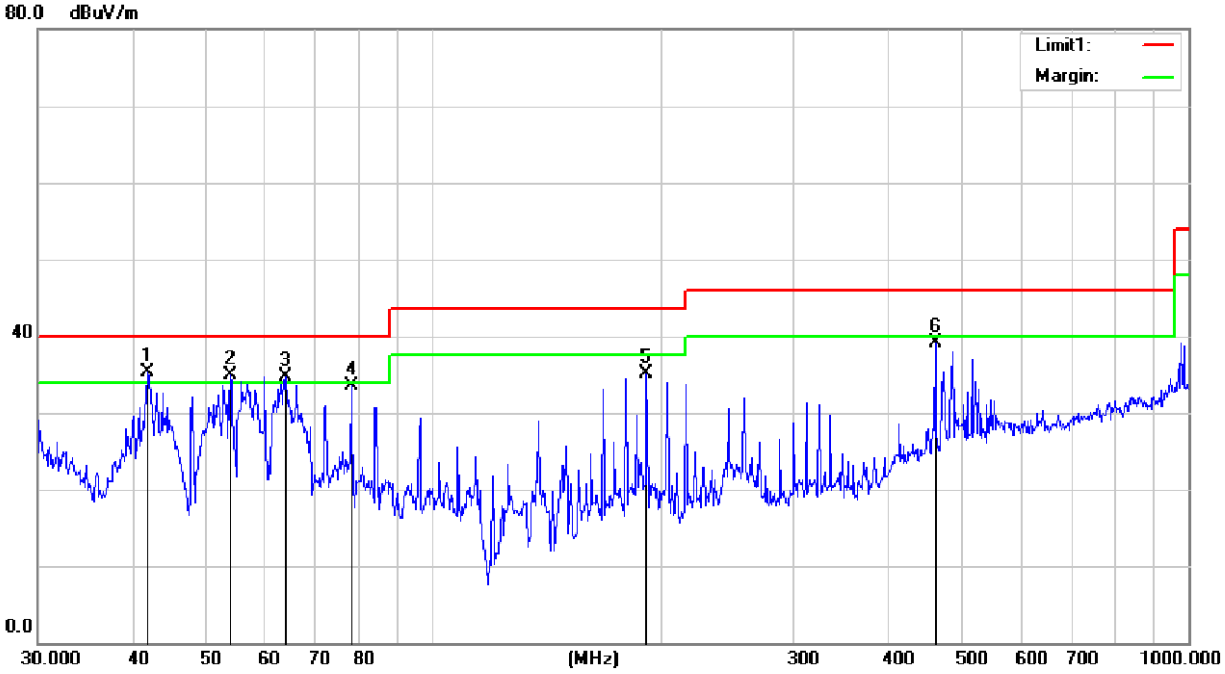
Remark:

1. Factor = Antenna Factor + Cable loss – Pre-amplifier.

Vertical:

Pre-test in mode 1/2/3/4/5/6/7/8/9, and choose the worst mode 1-1M as the final measurement.

Peak scan



Frequency	Reading	Correct	Result	Limit	Margin	Remark
MHz	dBuV	Factor (dB)	dBuV/m	dBuV/m	dB	
41.9	22.9	12.4	35.3	40	-4.7	QP
53.9	28.3	6.6	34.9	40	-5.1	QP
63.8	29.2	5.6	34.8	40	-5.2	QP
77.9	25.8	7.6	33.4	40	-6.6	QP
191.7	26.0	9.2	35.2	43.5	-8.3	QP
462.3	19.6	19.4	39.0	46	-7.0	QP

Remark:

1. Factor = Antenna Factor + Cable loss – Pre-amplifier.

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Frequency (MHz)	Meter Reading (dBuV/m)	Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna polarization
Low Channel: 2402 MHz							
4804.2	67.3	-3.6	63.7	74	-10.3	PK	V (Vertical)
4804.2	47.3	-3.6	43.7	54	-10.3	AV	V
7206.1	62.8	-0.9	61.9	74	-12.1	PK	V
7206.1	42.2	-0.9	41.3	54	-12.7	AV	V
4804.0	62.7	-3.6	59.1	74	-14.9	PK	H (Horizontal)
4804.0	45.3	-3.6	41.7	54	-12.3	AV	H
Mid Channel: 2441 MHz							
4882.1	65.5	-3.7	61.8	74	-12.2	PK	V
4882.1	50.2	-3.7	46.5	54	-7.5	AV	V
7323.2	61.4	-0.8	60.6	74	-13.4	PK	V
7323.2	45.0	-0.8	44.2	54	-9.8	AV	V
4882.2	62.1	-3.7	58.4	74	-15.6	PK	H
4882.2	45.7	-3.7	42.0	54	-12.0	AV	H
High Channel: 2480 MHz							
4960.3	61.8	-3.6	58.2	74	-15.8	PK	V
4960.3	46.3	-3.6	42.7	54	-11.3	AV	V
7440.3	61.8	-0.8	61.0	74	-13.0	PK	V
7440.3	46.1	-0.8	45.3	54	-8.7	AV	V
4960.3	61.7	-3.6	58.1	74	-15.9	PK	H
4960.3	46.1	-3.6	42.5	54	-11.5	AV	H

Note:

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

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

Emission Level = Meter Reading + Factor

Margin = Limit – Emission Level.

Band edge

Frequency (MHz)	Meter Reading (dBuV/m)	Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna polarization
GFSK							
2400.0	69.5	-13.0	56.5	74	-17.5	PK	V
2400.0	55.2	-13.0	42.2	54	-11.8	AV	V
2400.0	70.2	-13.0	57.2	74	-16.8	PK	H
2400.0	54.1	-13.0	41.1	54	-12.9	AV	H
2483.5	71.1	-12.8	58.3	74	-15.7	PK	V
2483.5	54.1	-12.8	41.3	54	-12.7	AV	V
2483.5	71.3	-12.8	58.5	74	-15.5	PK	H
2483.5	54.3	-12.8	41.5	54	-12.5	AV	H
π/4-DQPSK							
2400.0	71.5	-13.0	58.5	74	-15.5	PK	V
2400.0	54.4	-13.0	41.4	54	-12.6	AV	V
2400.0	70.1	-13.0	57.1	74	-16.9	PK	H
2400.0	55.0	-13.0	42.0	54	-12.0	AV	H
2483.5	71.5	-12.8	58.7	74	-15.3	PK	V
2483.5	56.2	-12.8	43.4	54	-10.6	AV	V
2483.5	71.2	-12.8	58.4	74	-15.6	PK	H
2483.5	54.5	-12.8	41.7	54	-12.3	AV	H
8DPSK							
2400.0	71.5	-13.0	58.5	74	-15.5	PK	V
2400.0	54.4	-13.0	41.4	54	-12.6	AV	V
2400.0	70.2	-13.0	57.2	74	-16.8	PK	H
2400.0	55.0	-13.0	42.0	54	-12.0	AV	H
2483.5	71.4	-12.8	58.7	74	-15.3	PK	V
2483.5	56.2	-12.8	43.4	54	-10.6	AV	V
2483.5	71.2	-12.8	58.4	74	-15.6	PK	H
2483.5	54.5	-12.8	41.7	54	-12.3	AV	H

Low measurement frequencies is range from 2310 to 2400 MHz, high measurement frequencies is range from 2483.5 to 2500 MHz.

Only show the worst point data of the emissions in the frequency 2310-2400 MHz and 2483.5-2500 MHz.

Hopping (Band edge)

Frequency (MHz)	Meter Reading (dBuV/m)	Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna polarization
GFSK							
2400.0	69.1	-13.0	56.1	74	-17.9	PK	V
2400.0	55.1	-13.0	42.1	54	-11.9	AV	V
2400.0	68.5	-13.0	55.5	74	-18.5	PK	H
2400.0	54.1	-13.0	41.1	54	-12.9	AV	H
2483.5	67.2	-12.8	54.4	74	-19.6	PK	V
2483.5	55.2	-12.8	42.4	54	-11.6	AV	V
2483.5	68.1	-12.8	55.3	74	-18.7	PK	H
2483.5	55.1	-12.8	42.3	54	-11.7	AV	H
π/4-DQPSK							
2400.0	69.1	-13.0	56.1	74	-17.9	PK	V
2400.0	56.2	-13.0	43.2	54.0	-10.8	AV	V
2400.0	68.0	-13.0	55.0	74.0	-19.0	PK	H
2400.0	54.1	-13.0	41.1	54.0	-12.9	AV	H
2483.5	68.1	-12.8	55.3	74.0	-18.7	PK	V
2483.5	54.1	-12.8	41.3	54.0	-12.7	AV	V
2483.5	69.1	-12.8	56.3	74.0	-17.7	PK	H
2483.5	55.2	-12.8	42.4	54.0	-11.6	AV	H
8DPSK							
2400.0	69.1	-13.0	56.1	74.0	-17.9	PK	V
2400.0	55.0	-13.0	42.0	54.0	-12.0	AV	V
2400.0	68.0	-13.0	55.0	74.0	-19.0	PK	H
2400.0	55.1	-13.0	42.1	54.0	-11.9	AV	H
2483.5	69.1	-12.8	56.3	74.0	-17.7	PK	V
2483.5	55.2	-12.8	42.4	54.0	-11.6	AV	V
2483.5	68.0	-12.8	55.2	74.0	-18.8	PK	H
2483.5	55.1	-12.8	42.3	54.0	-11.7	AV	H

Low measurement frequencies is range from 2310 to 2400 MHz, high measurement frequencies is range from 2483.5 to 2500 MHz.

Only show the worst point data of the emissions in the frequency 2310-2400 MHz and 2483.5-2500 MHz.

3.4 Conducted Spurious

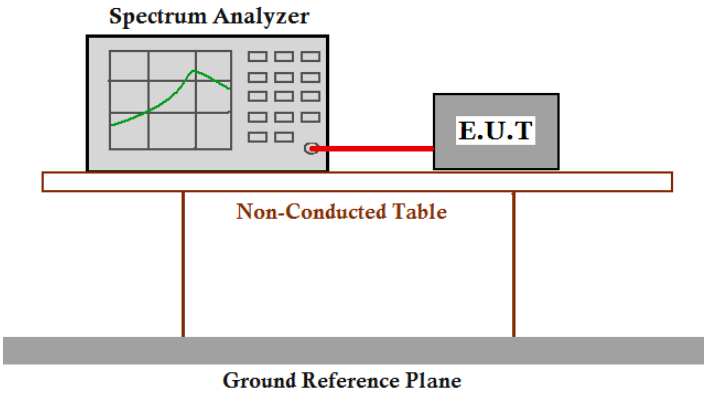
Test Requirement: FCC Part15 C section 15.247

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method: ANSI C63.10: Clause 6.7 & DA 00-705

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting mode with normal mode (DH5) as the worst case was found.

Test Configuration:



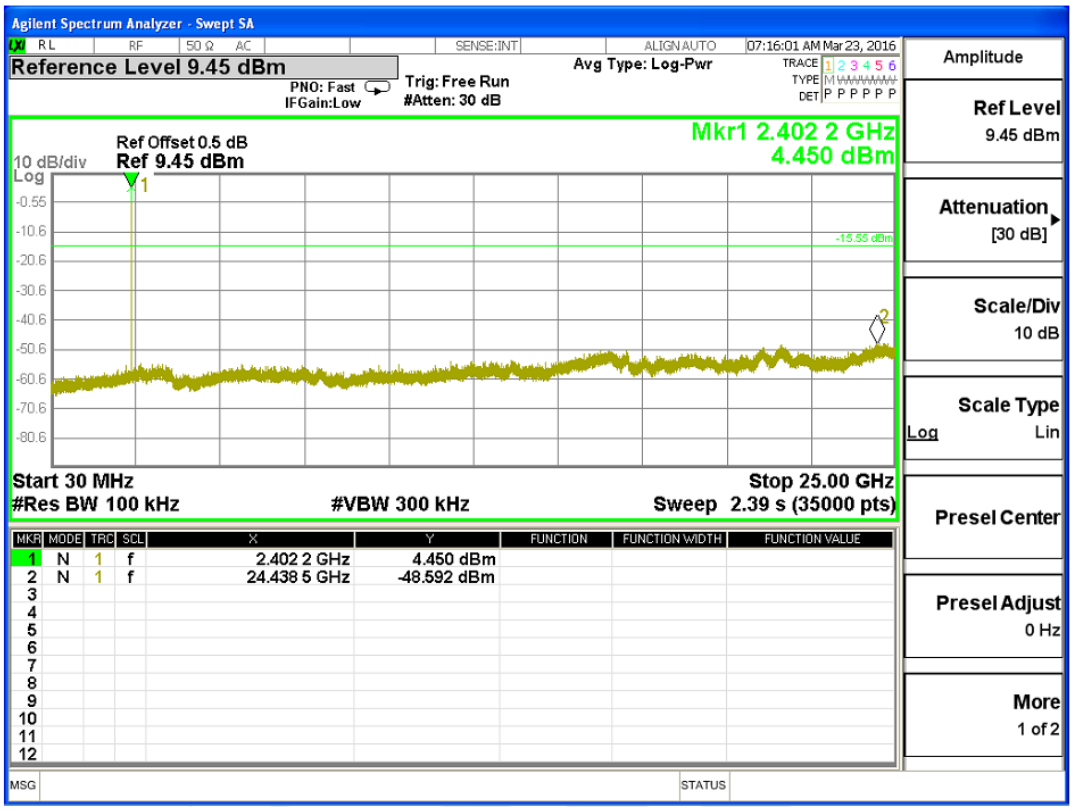
Test Procedure:

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

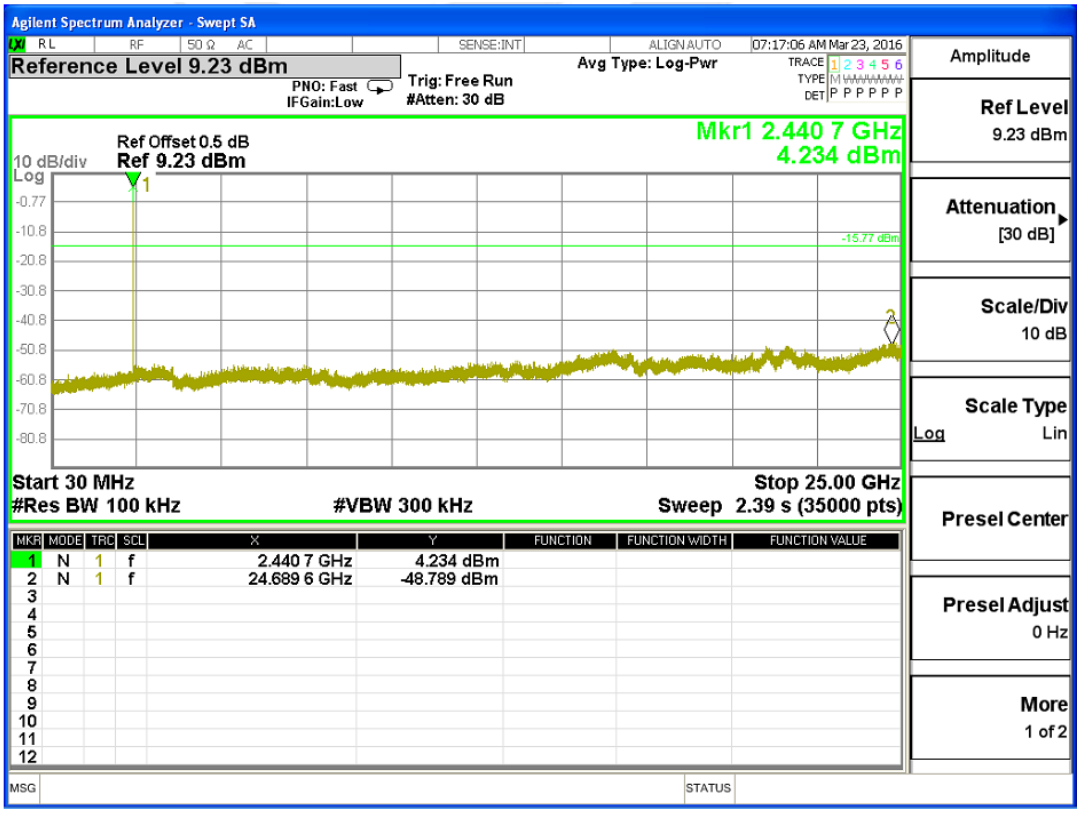
2. Set the spectrum analyzer: RBW = 100 kHz. VBW >= RBW. Sweep = auto; Detector Function = Peak (Max. hold).

Test result plot as follows: GFSK(1Mbps)-00/39/78 CH

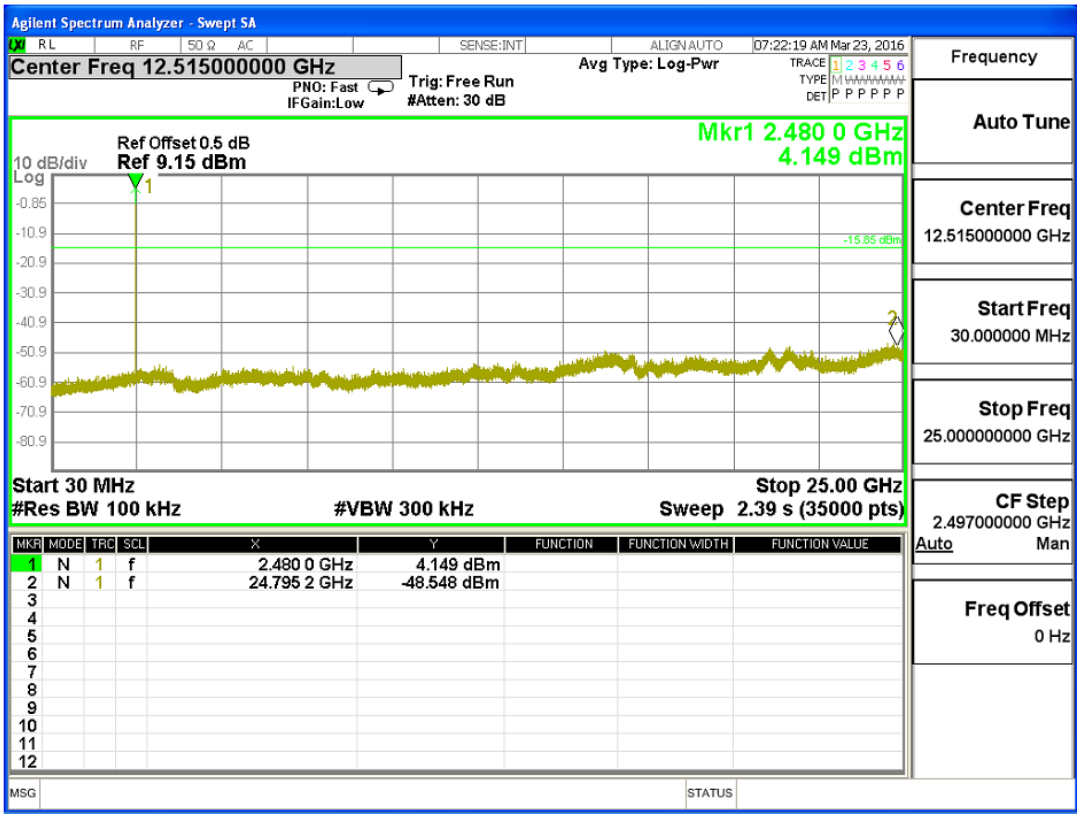
00 CH:



39 CH:

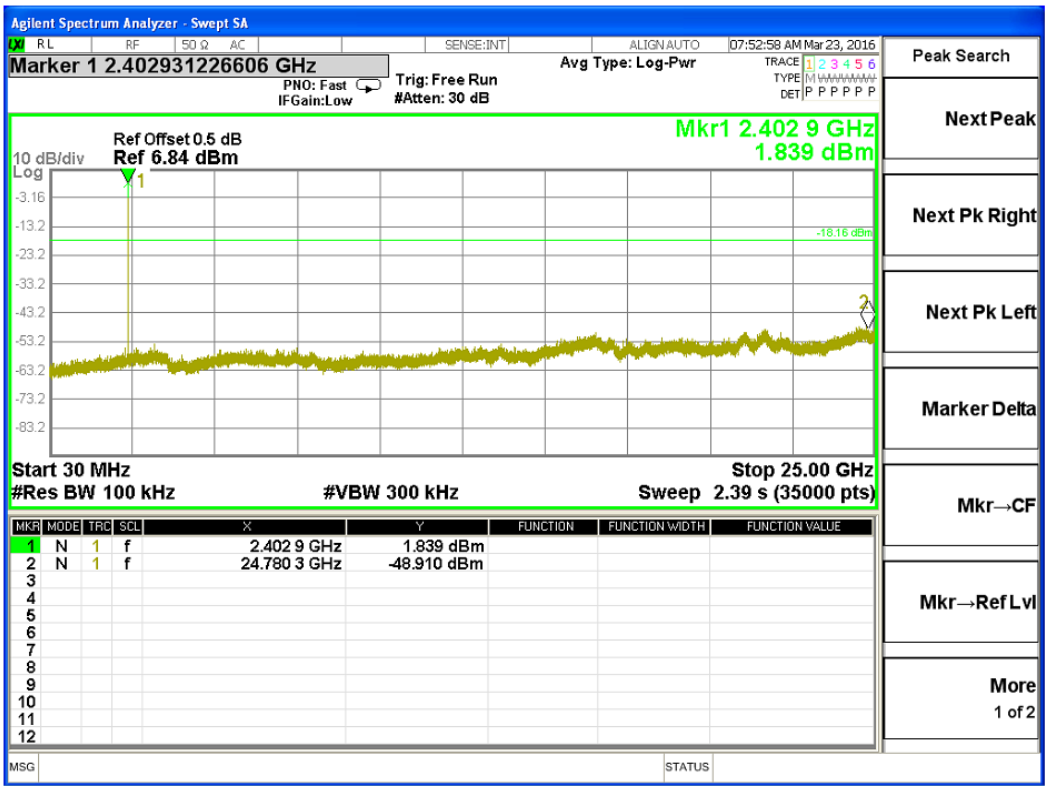


78 CH:

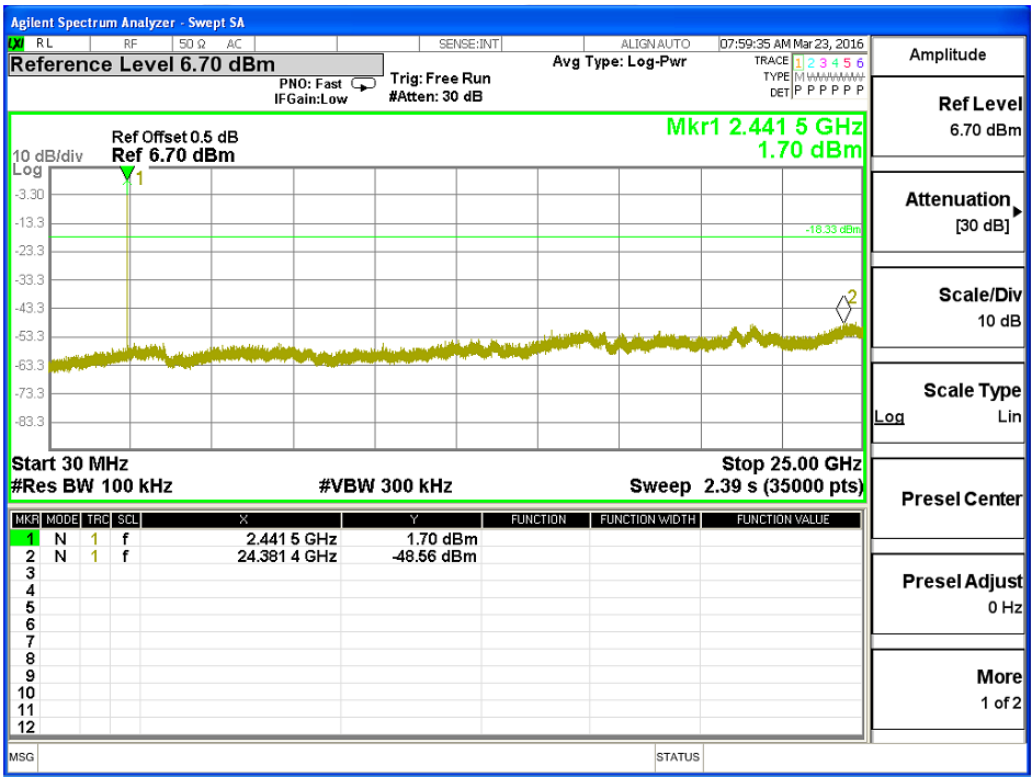


π/4 - DQPSK(2Mbps)-00/39/78 CH

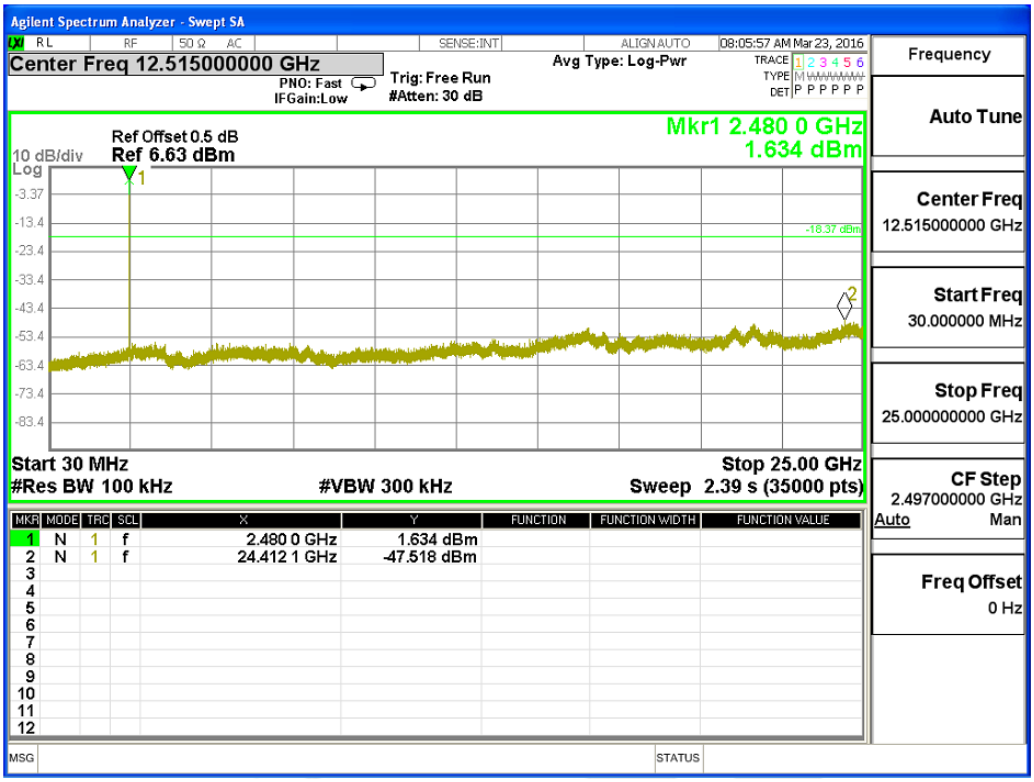
00 CH:



39 CH:

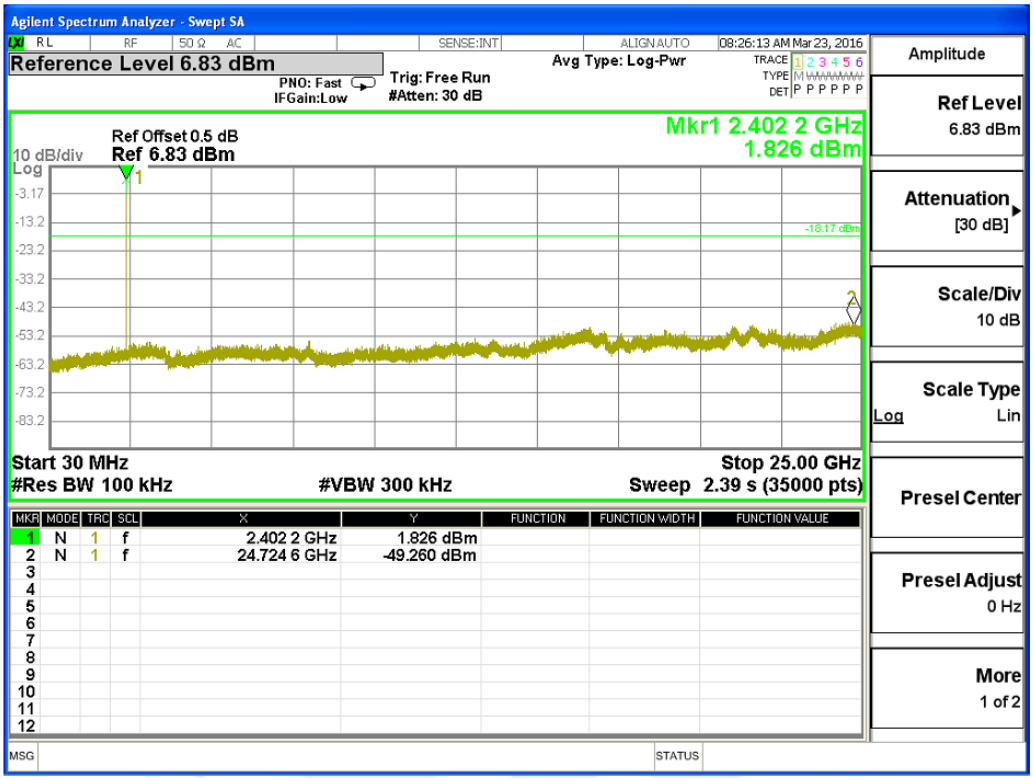

Agilent Spectrum Analyzer - Swept SA
Reference Level 6.70 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
07:59:35 AM Mar 23, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 6.70 dBm
Log
Mkr1 2.441 5 GHz
1.70 dBm
-18.33 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (35000 pts)
1 N 1 f 2.441 5 GHz 1.70 dBm
2 N 1 f 24.381 4 GHz -48.56 dBm
Amplitude
Ref Level 6.70 dBm
Attenuation [30 dB]
Scale/Div 10 dB
Scale Type Log Lin
Presel Center
Presel Adjust 0 Hz
More 1 of 2

78 CH:

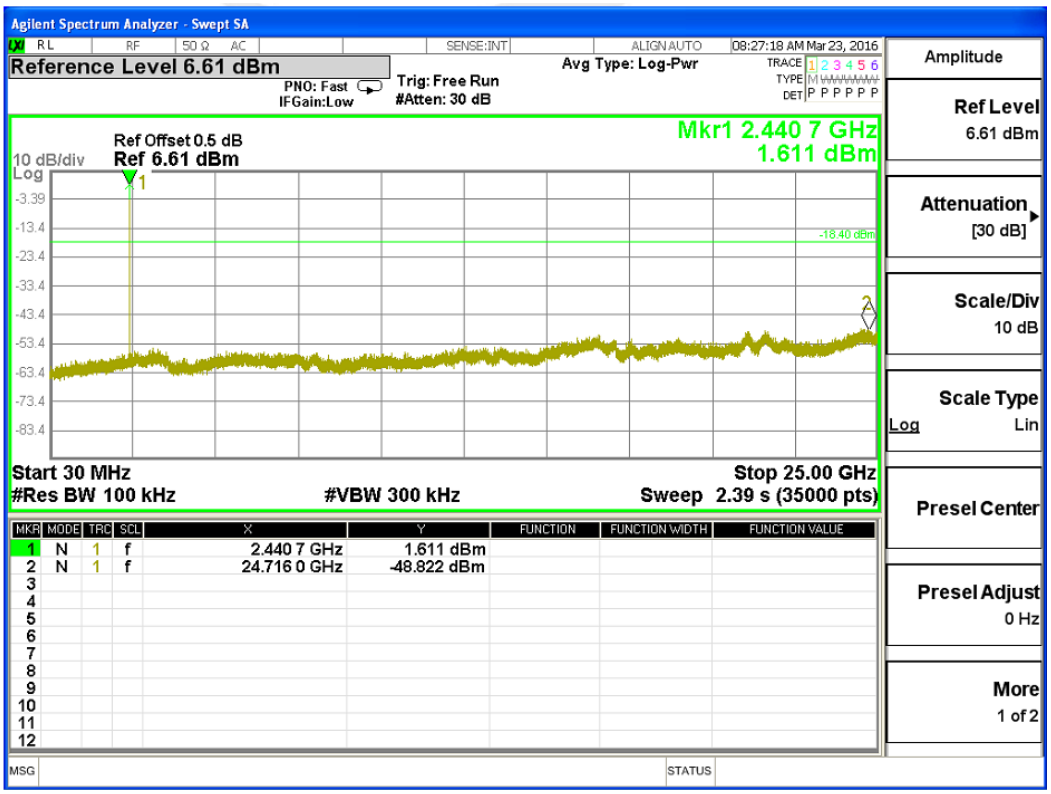

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
08:05:57 AM Mar 23, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 6.63 dBm
Log
Mkr1 2.480 0 GHz
1.634 dBm
-18.37 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (35000 pts)
1 N 1 f 2.480 0 GHz 1.634 dBm
2 N 1 f 24.412 1 GHz -47.518 dBm
Frequency
Auto Tune
Center Freq 12.515000000 GHz
Start Freq 30.000000 MHz
Stop Freq 25.000000000 GHz
CF Step 2.497000000 GHz Auto Man
Freq Offset 0 Hz

8DPSK(3Mbps)-00/39/78 CH

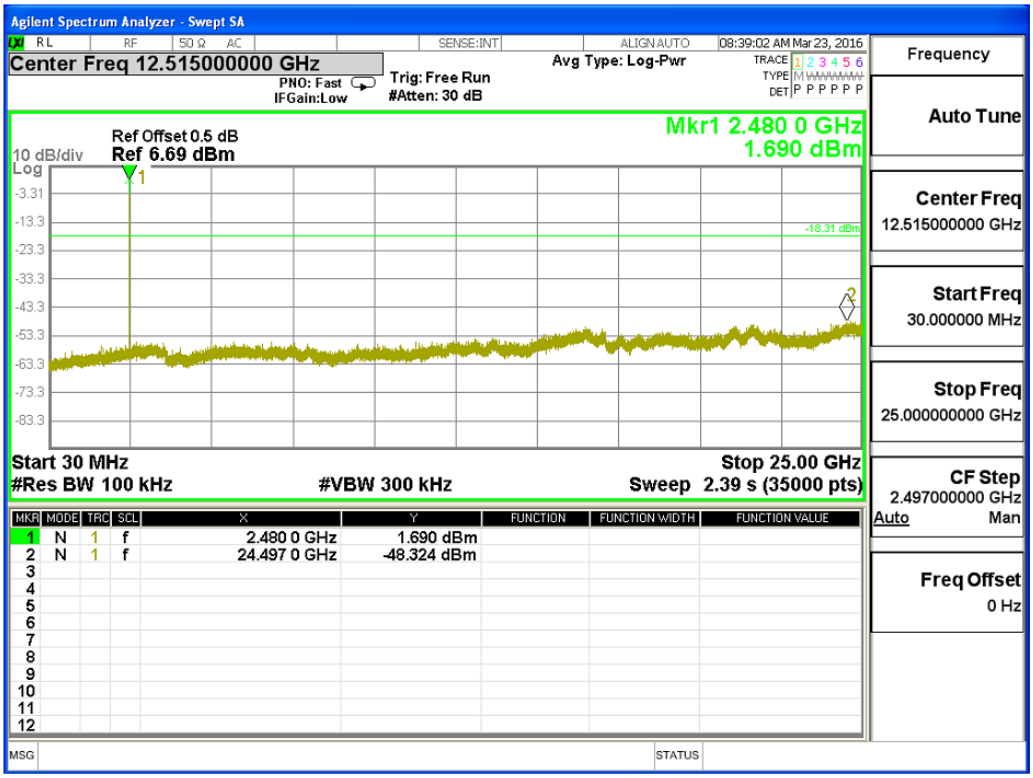
00 CH:



39CH:



78 CH:


Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
08:39:02 AM Mar 23, 2016
Ref Offset 0.5 dB
10 dB/div
Log
Ref 6.69 dBm
Mkr1 2.480 0 GHz
1.690 dBm
-18.31 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (35000 pts)
1 N 1 f 2.480 0 GHz 1.690 dBm
2 N 1 f 24.497 0 GHz -48.324 dBm
Frequency
Auto Tune
Center Freq
12.515000000 GHz
Start Freq
30.000000 MHz
Stop Freq
25.000000000 GHz
CF Step
2.497000000 GHz
Auto
Man
Freq Offset
0 Hz

3.5 Band Edges

Test Requirement: FCC Part15 C section 15.247

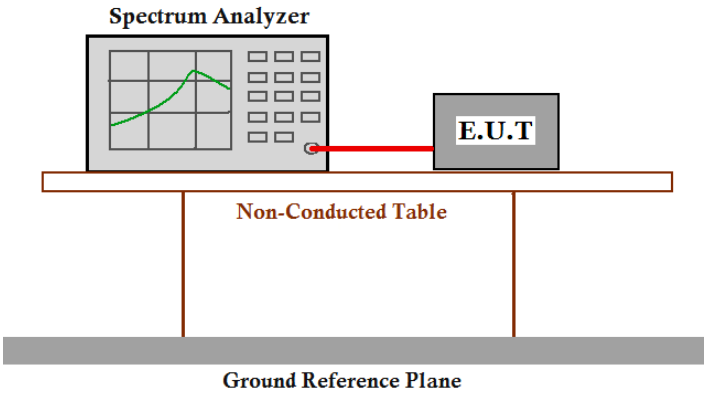
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency Band: 2400 MHz to 2483.5 MHz

Test Method: ANSI C63.10: Clause 6.9 & DA 00-705

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), and highest (2480 MHz) channel and hopping mode with different data packet. Compliance test in continuous transmitting mode with normal (DH5) and EDR mode (3DH5) as the worst case was found.

Test Configuration:



Test Procedure: Set RBW of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 kHz bandwidth from band edge.

The band edges was measured and recorded Result:

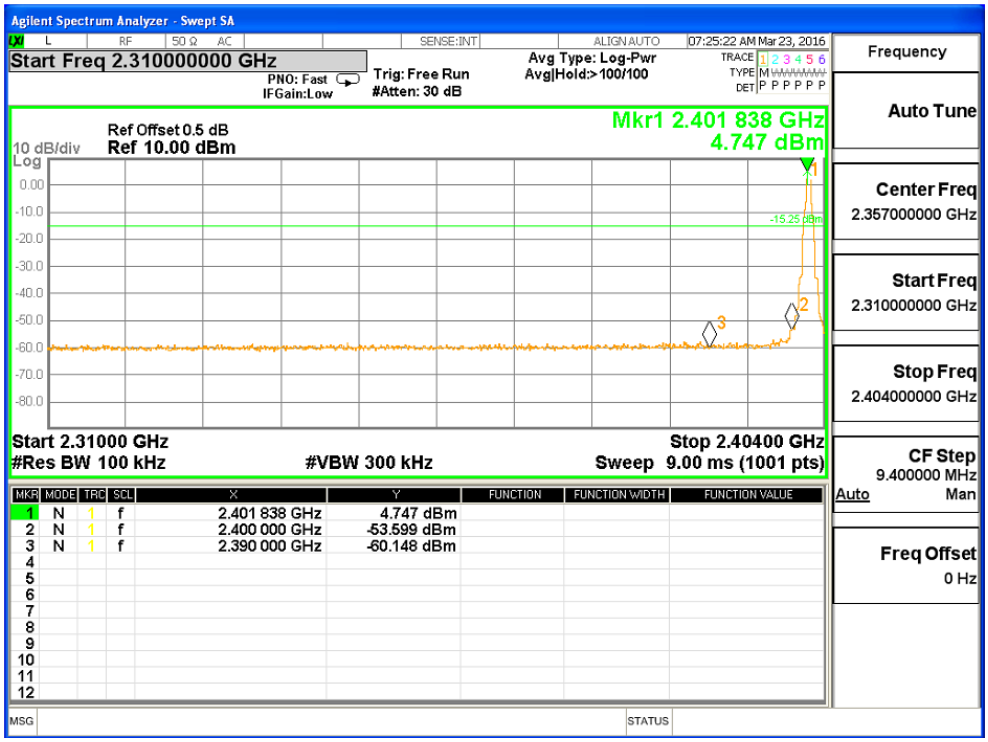
The Lower Edges attenuated more than 20dB.

The Upper Edges attenuated more than 20dB.

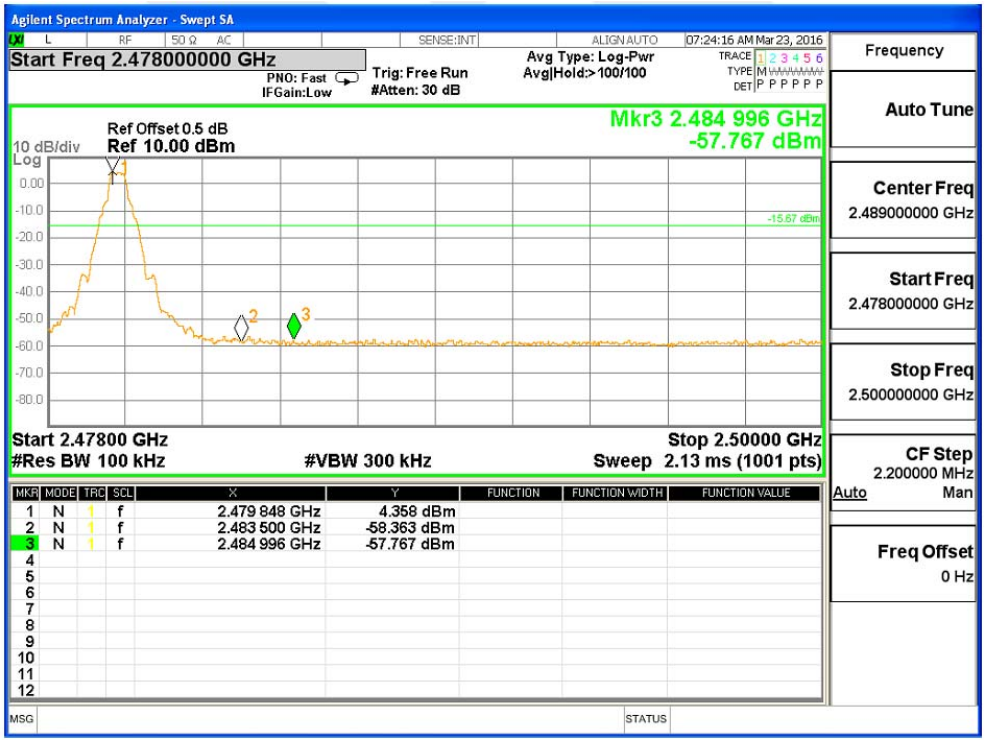
The graph as below. Represents the emissions take for this device. **GFSK(1Mbps)-00/78 CH**

For band edge:

00 CH:

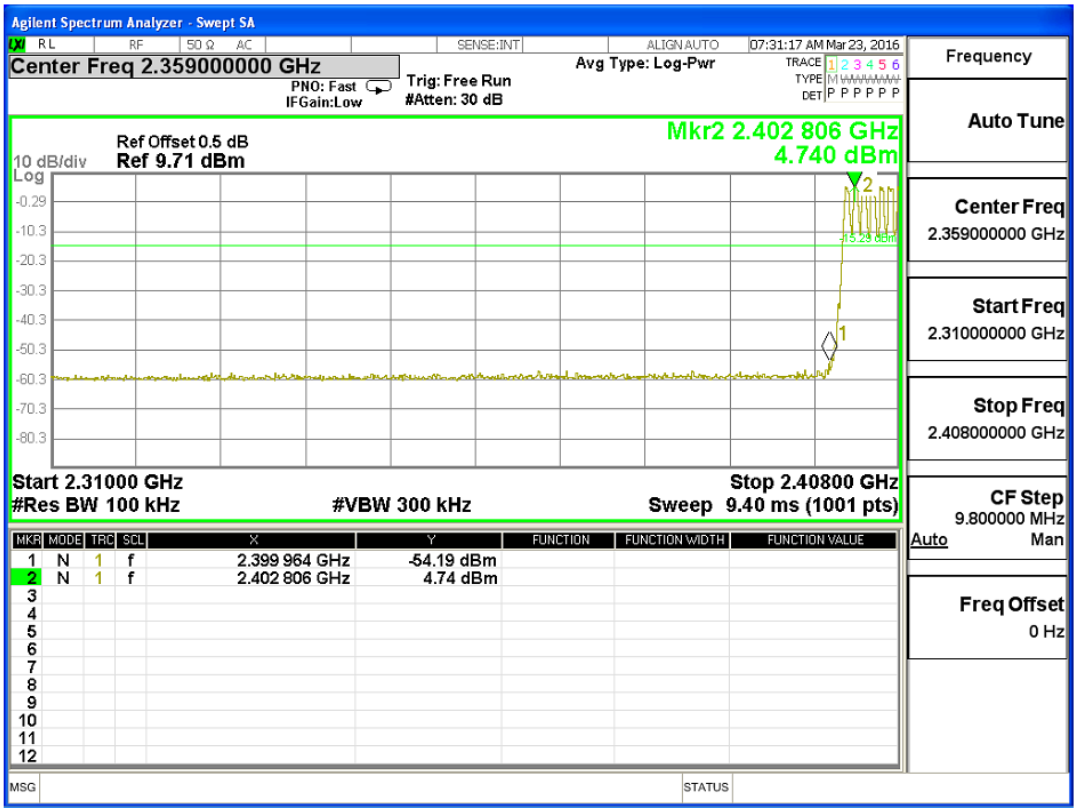


78 CH:

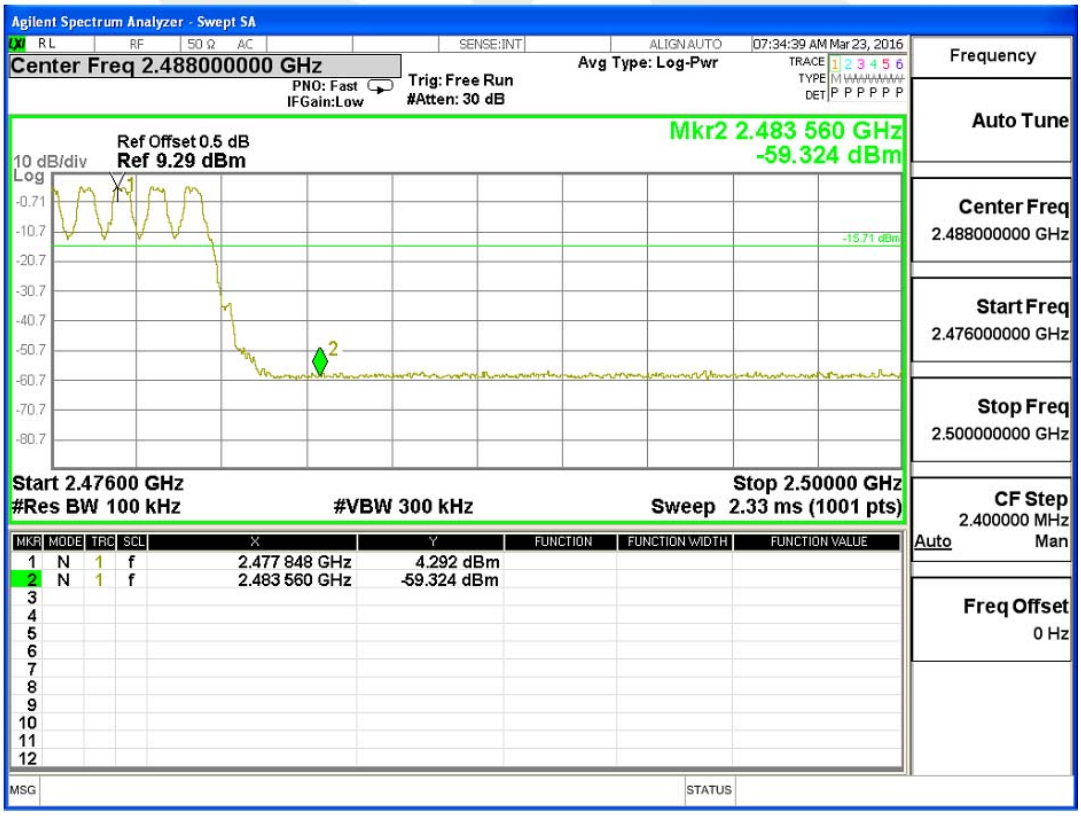


For Hopping band edge:

00 CH:



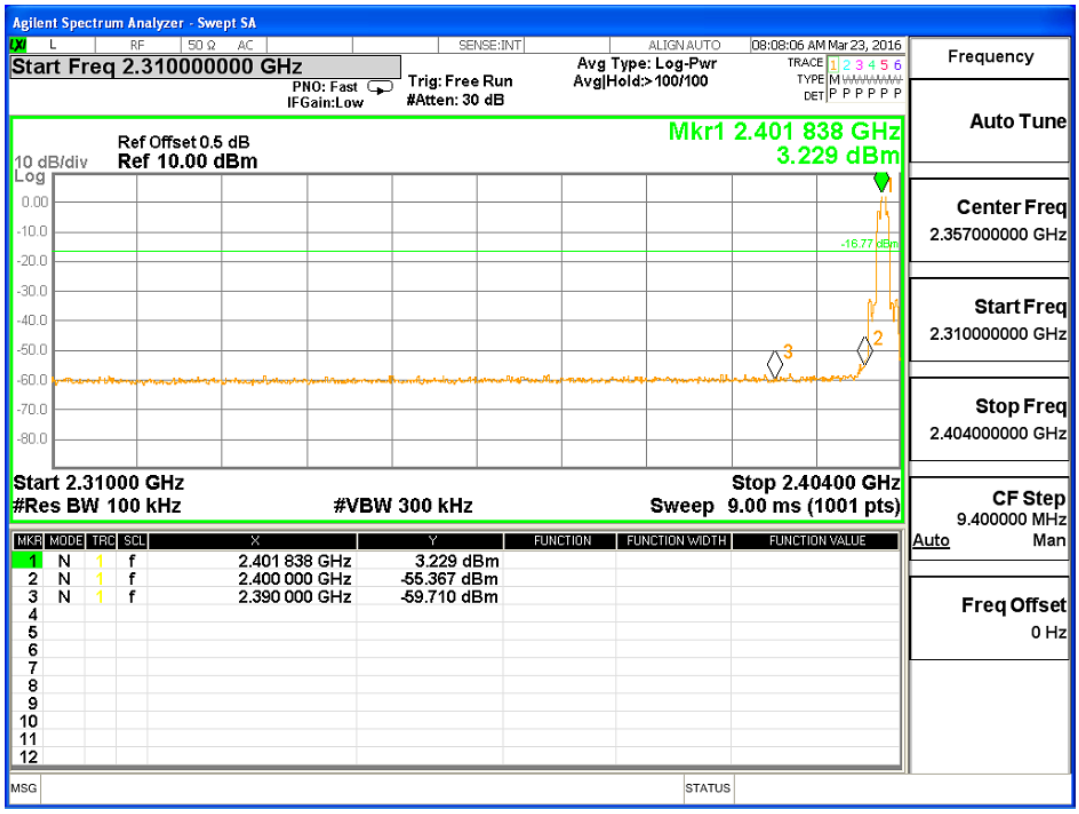
78 CH



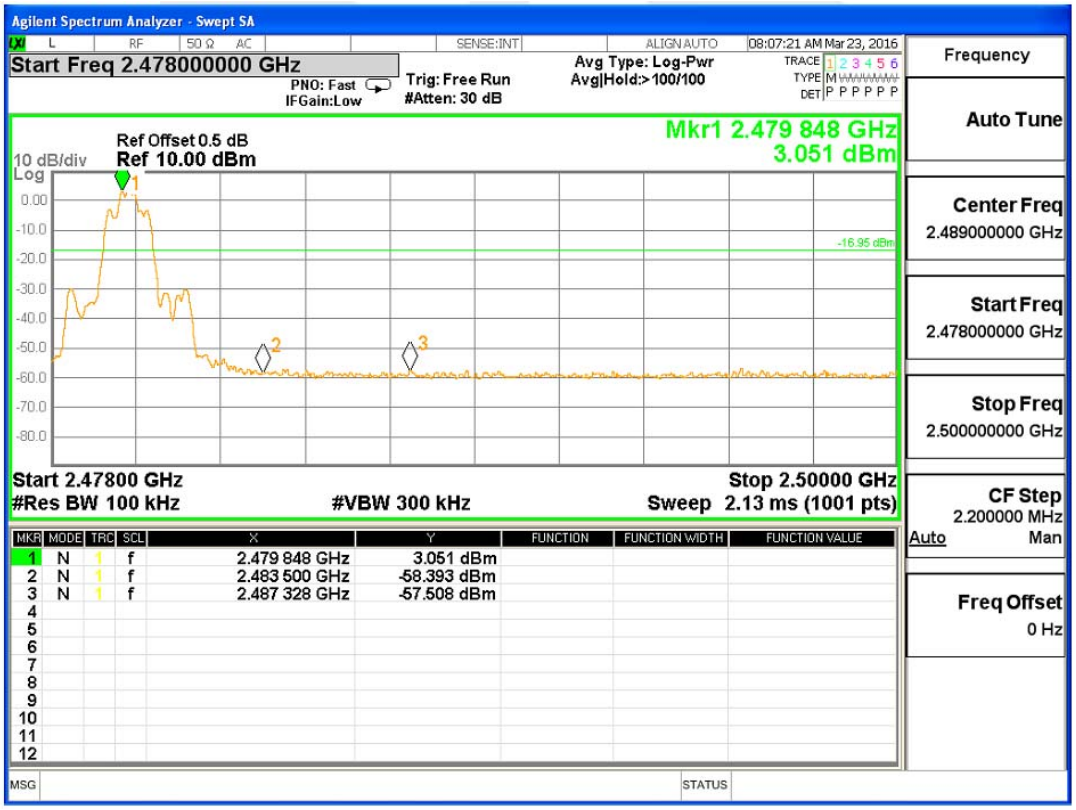
π/4 - DQPSK(2Mbps)-00/78 CH

For band edge:

00 CH:

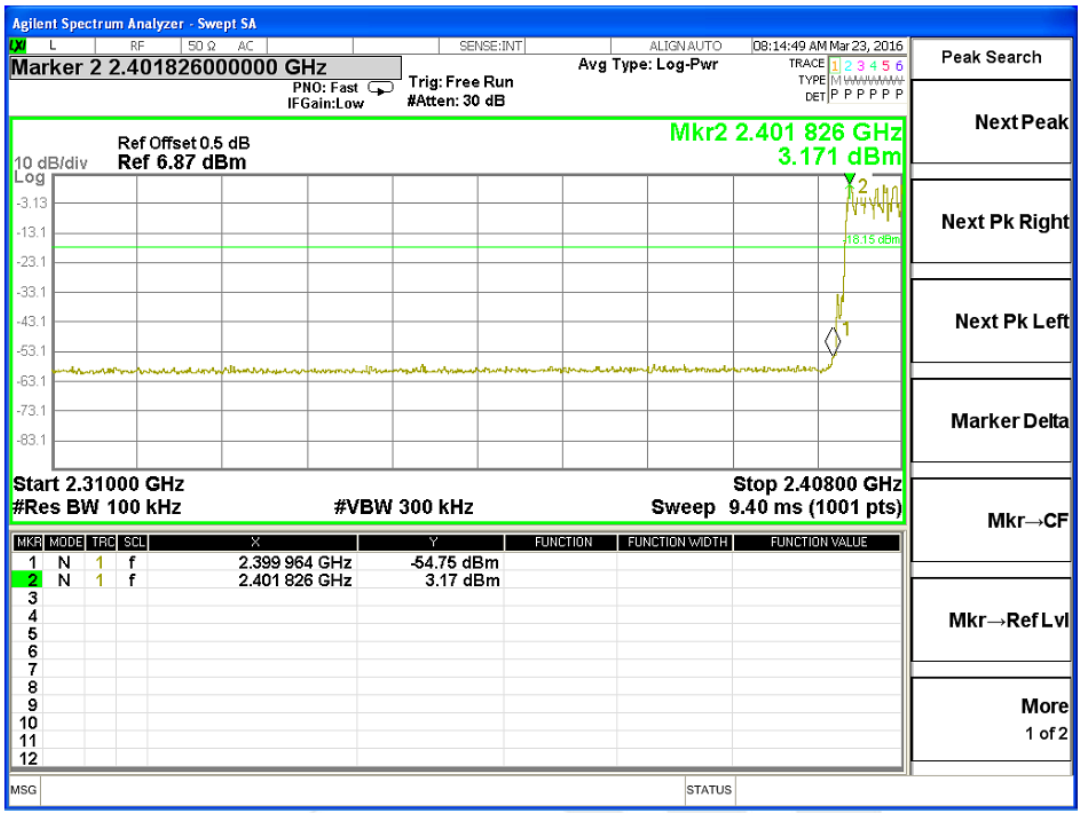


78 CH:

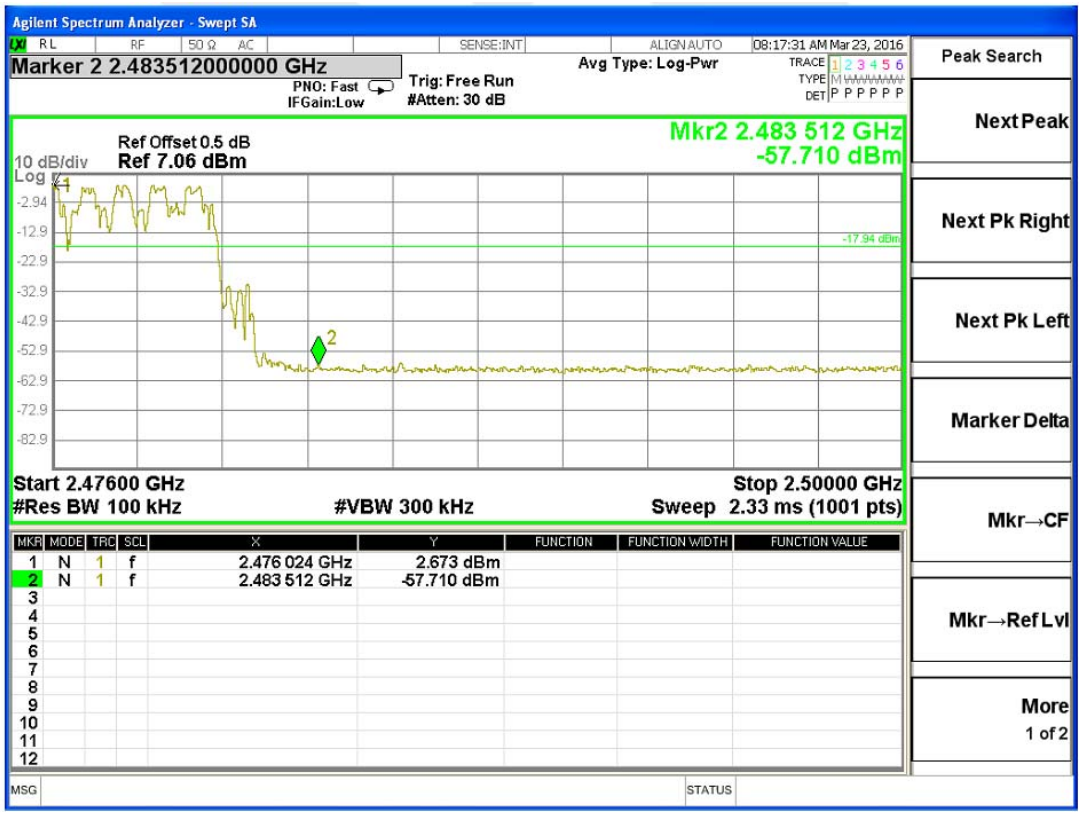


For hopping band edge:

00 CH:



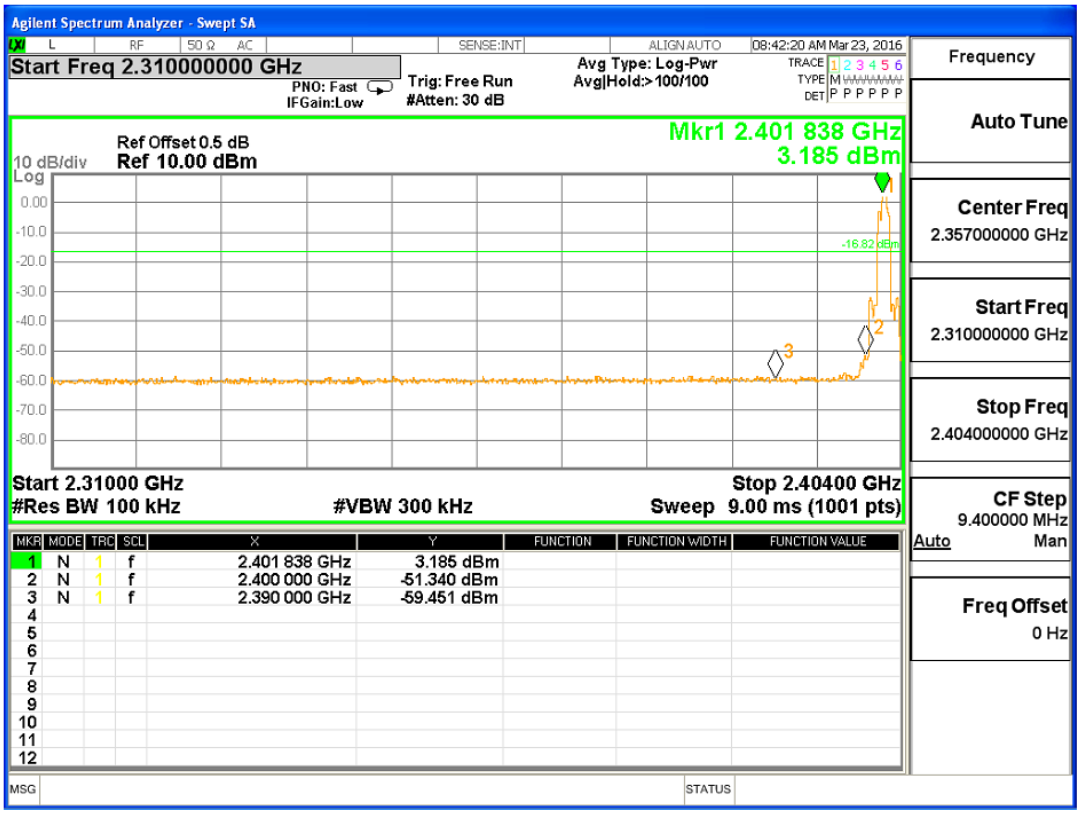
78 CH:



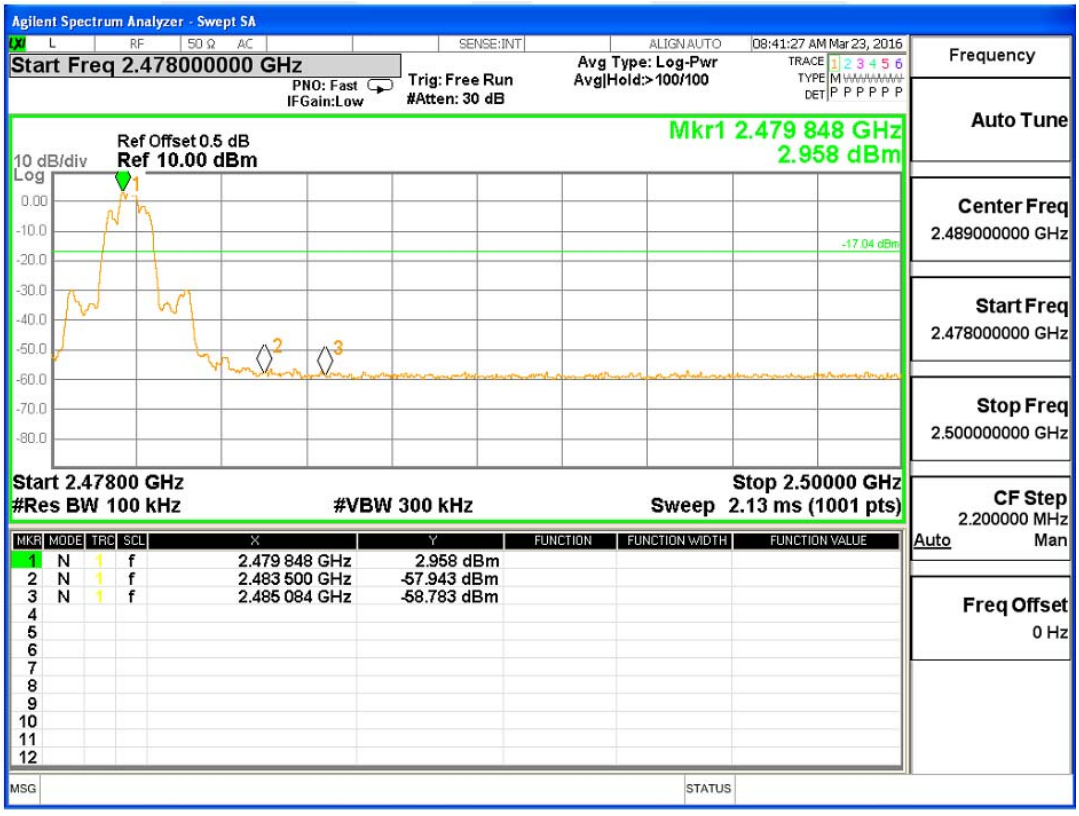
8DPSK(3Mbps)-00/78 CH

For band edge:

00 CH:

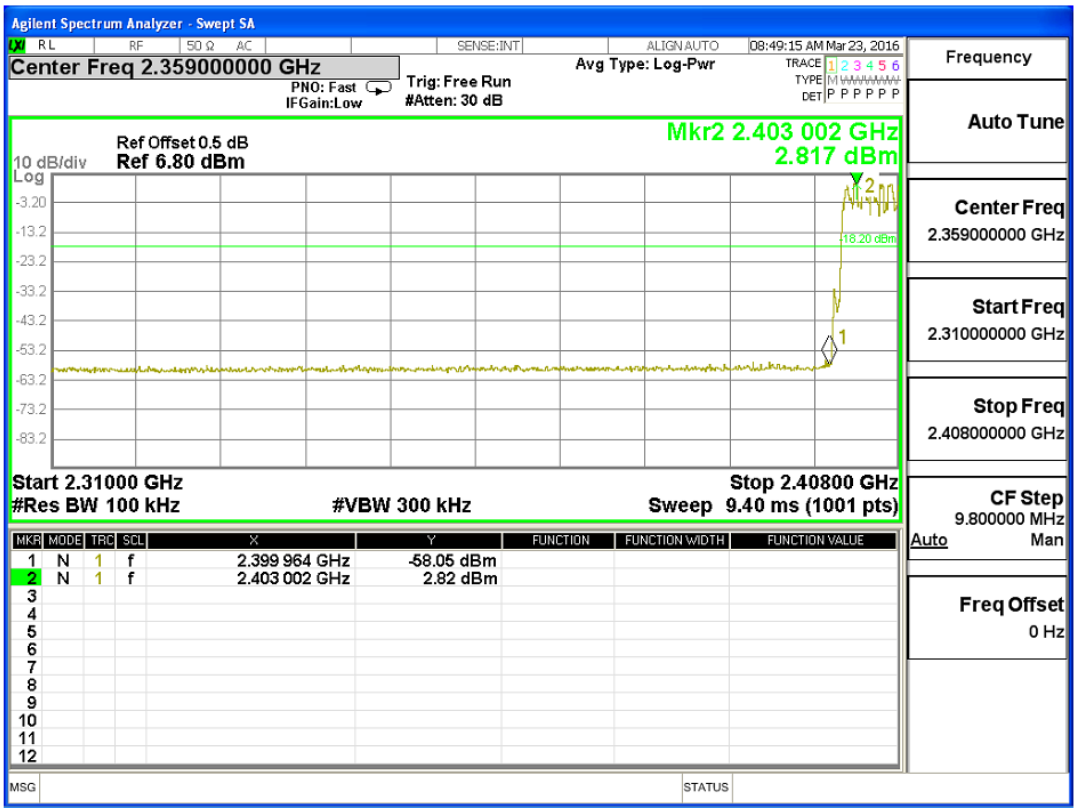


78 CH:

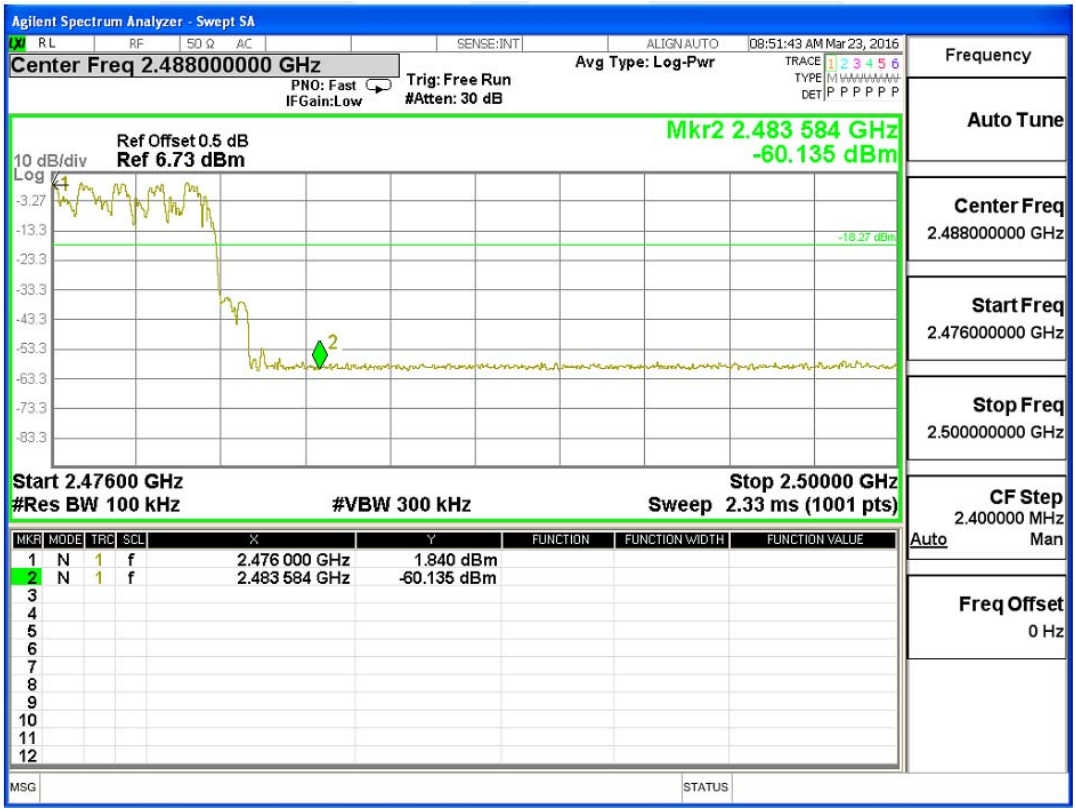


For hopping band edge:

00 CH:



78 CH:



Test result: The unit does meet the FCC requirements.

3.6 Hopping Channel Number

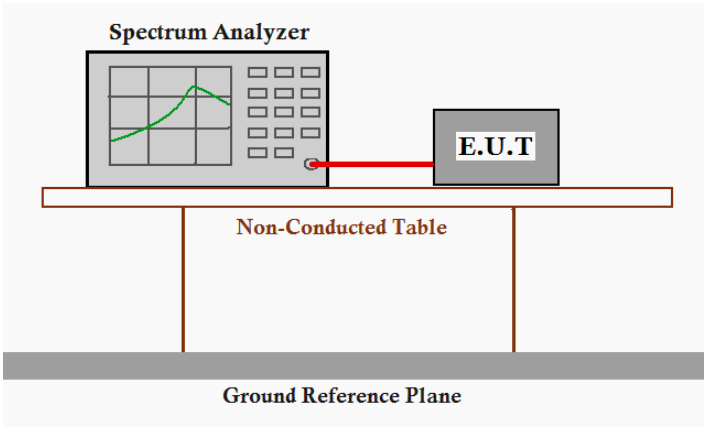
Test Requirement: FCC Part15 C section 15.247

(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

Test Method: DA 00-705

Test Status: Pre-test the EUT in hopping mode with different data packet. Compliance test in hopping with normal mode (DH5) as the worst case was found.

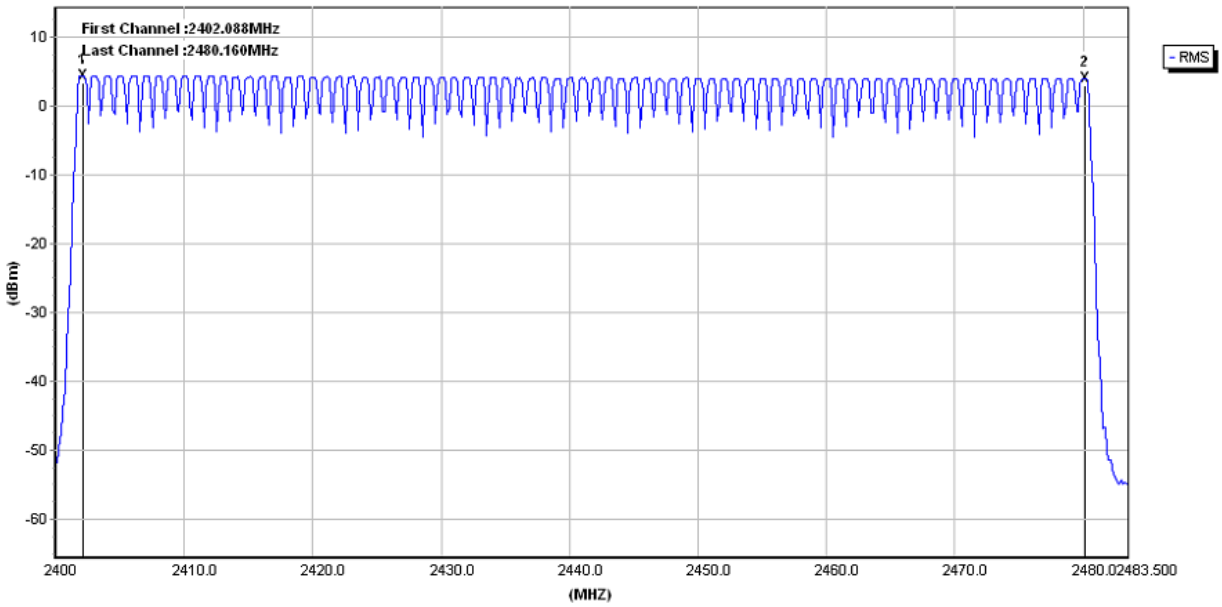
Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 300 kHz. 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 = 2400 MHz. stop frequency = 2483.5 MHz. Submit the test result graph.

Test result: Total channels are 79 channels.



Test result: The unit does meet the FCC requirements.

3.7 Dwell Time

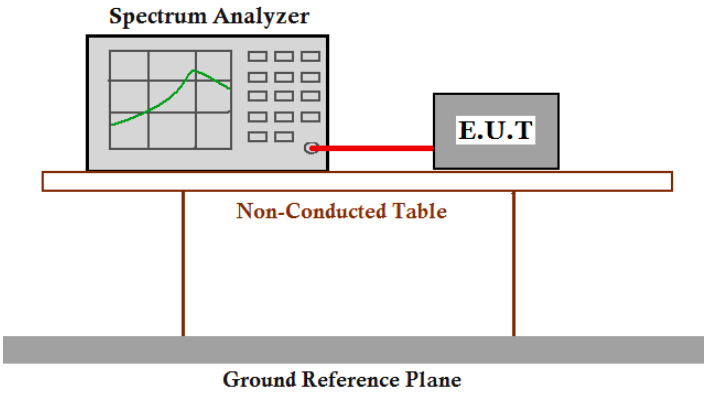
Test Requirement: FCC Part 15 C section 15.247

(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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Method: DA 00-705

1） **Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (00CH: 2402 MHz), middle (39CH: 2441 MHz) and highest (78CH: 2480 MHz) channel with different data packet: GFSK（1Mbps）,π/4-DQPSK（2Mbps）, 8DPSK（3Mbps）. Compliance test in hopping with EDR mode (3DH1, 3DH3 and as the worst case was middle (39CH: 2441 MHz) found.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. centered on a hopping channel;
3. Set RBW = 1 MHz and VBW = 1 MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = View;
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). An oscilloscope may be used instead of a spectrum analyzer.

Test Result:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

39 CH: 2.441GHz

1）GFSK（1Mbps）-DH1/DH3/DH5

DH1 time slot = 0.37 (ms) * (1600/(2*79)) * 31.6 = 118 ms

DH3 time slot = 1.63 (ms) * (1600/(4*79)) * 31.6 = 261 ms

DH5 time slot = 2.88 (ms) * (1600/(6*79)) * 31.6 = 307 ms

2） π/4-DQPSK（2Mbps）-2DH1/2DH3/2DH5

2DH1 time slot = 0.38 (ms) * (1600/(2*79)) * 31.6 = 122 ms

2DH3 time slot = 1.63 (ms) * (1600/(4*79)) * 31.6 = 261 ms

2DH5 time slot = 2.88 (ms) * (1600/(6*79)) * 31.6 = 307 ms

3） 8DPSK（3Mbps）-3DH1/3DH3/3DH5

3DH1 time slot = 0.38 (ms) * (1600/(2*79)) * 31.6 = 122 ms

3DH3 time slot = 1.64 (ms) * (1600/(4*79)) * 31.6 = 262 ms

3DH5 time slot = 2.89 (ms) * (1600/(6*79)) * 31.6 = 308 ms

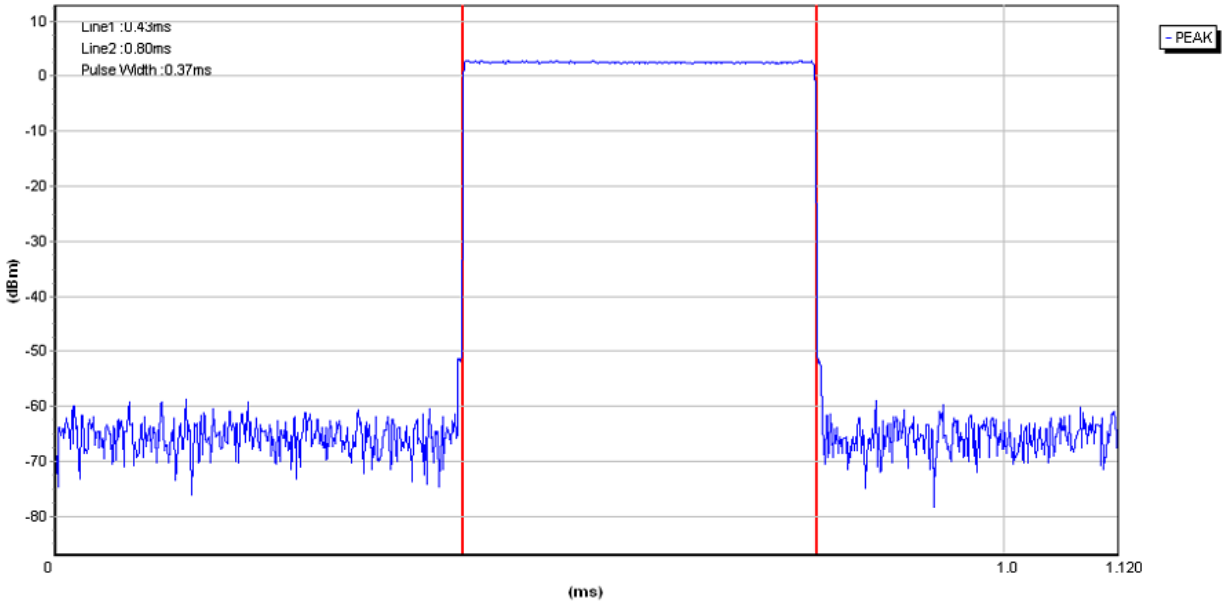
The unit does meet the FCC requirements.

Please refer the graph as below:

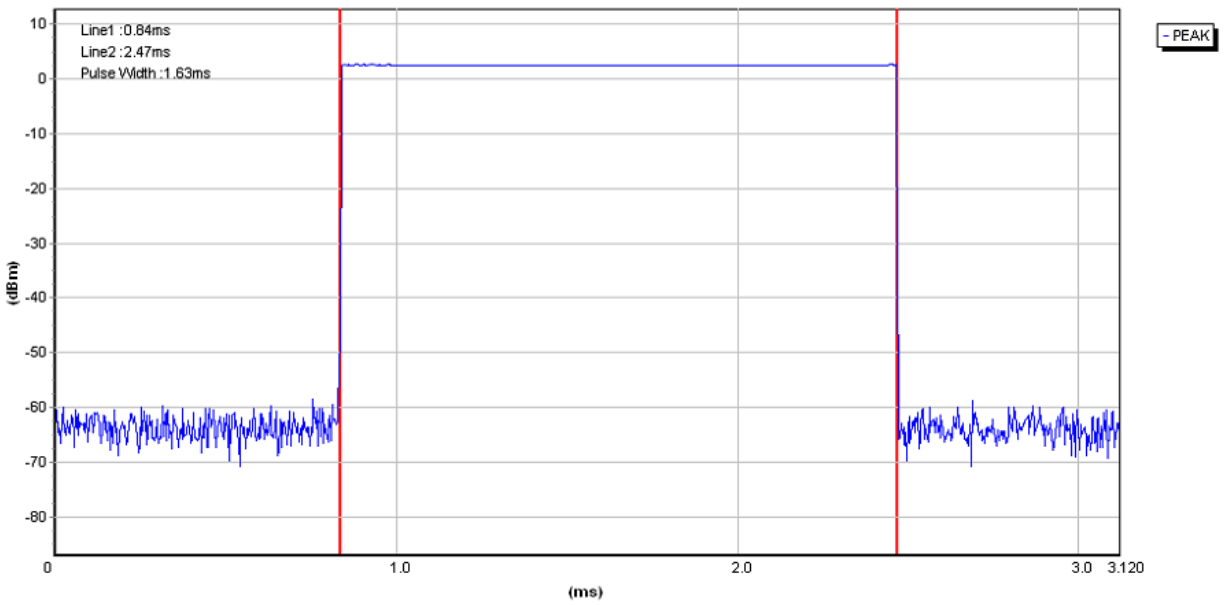
39 CH

1）GFSK（1Mbps）-DH1/DH3/DH5

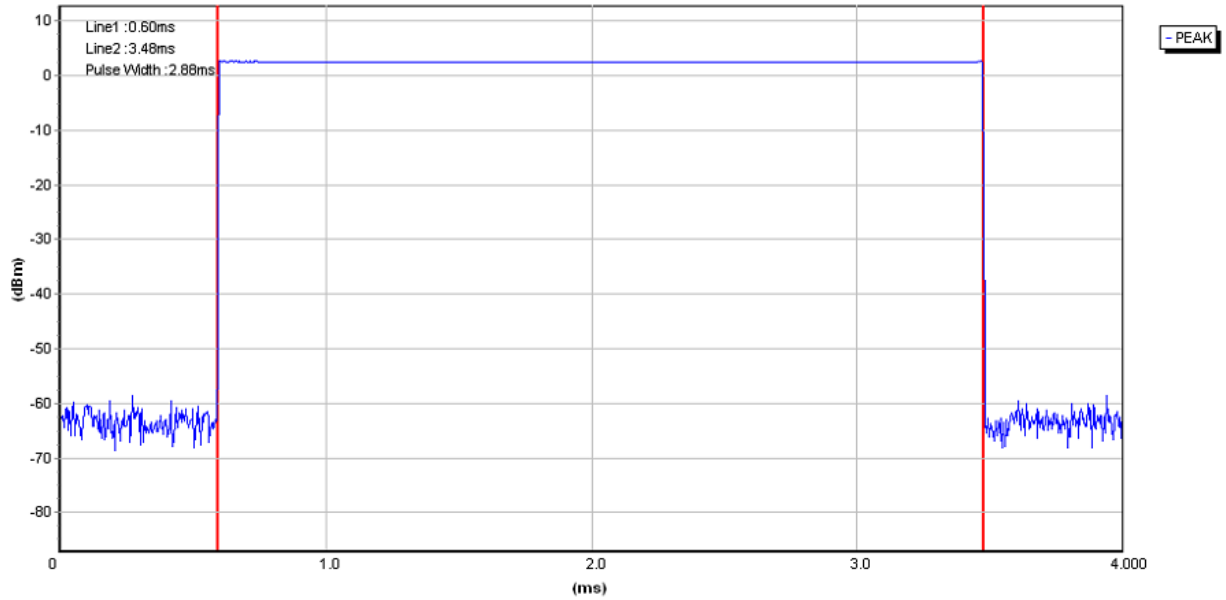
DH1



DH3

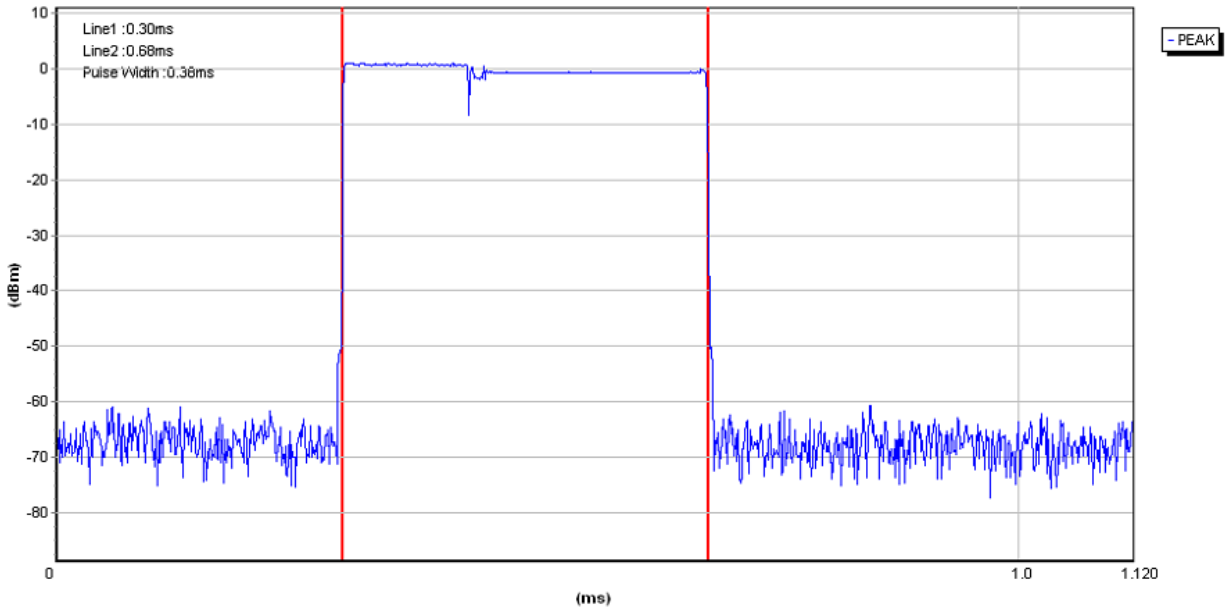


DH5

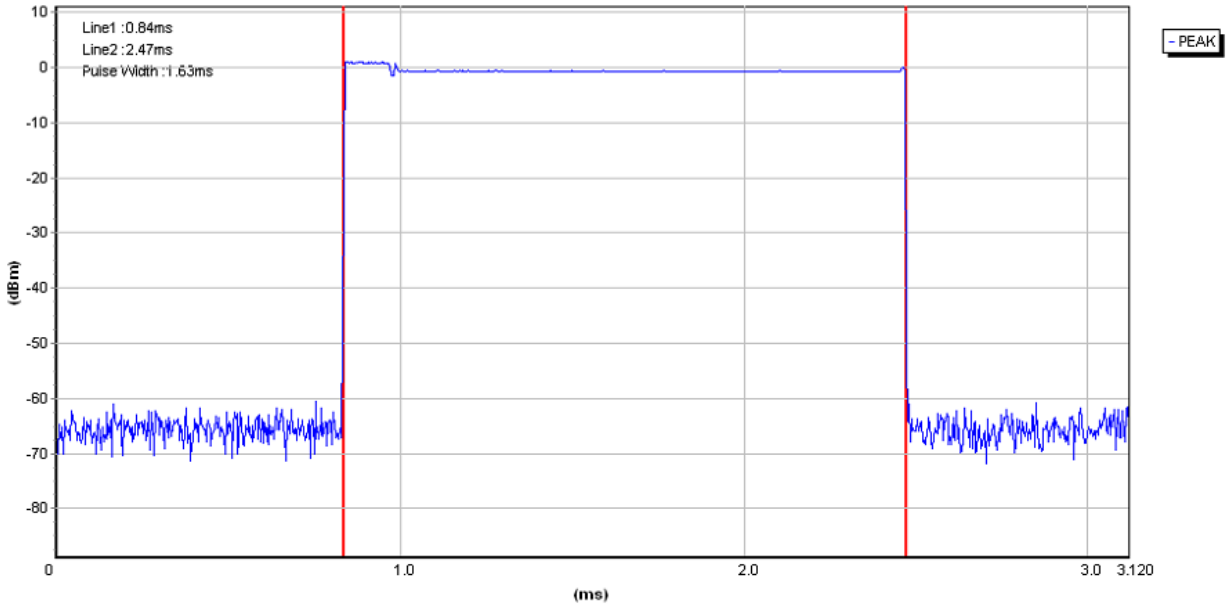


2）π/4-DQPSK（2Mbps）-2DH1/2DH3/2DH5

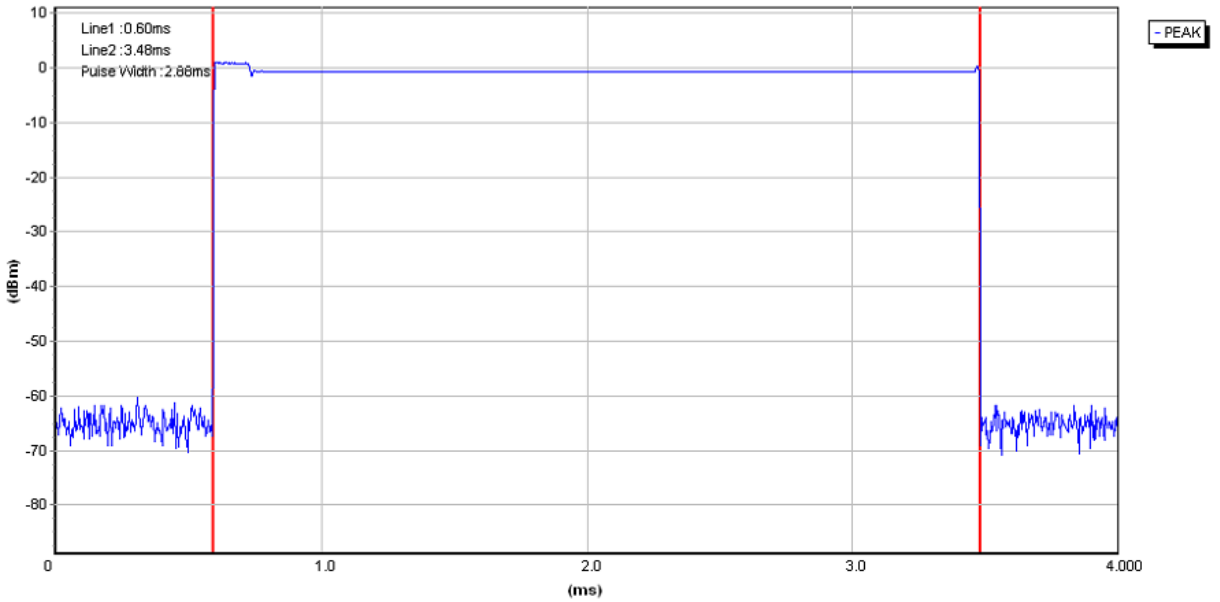
2DH1



2DH3

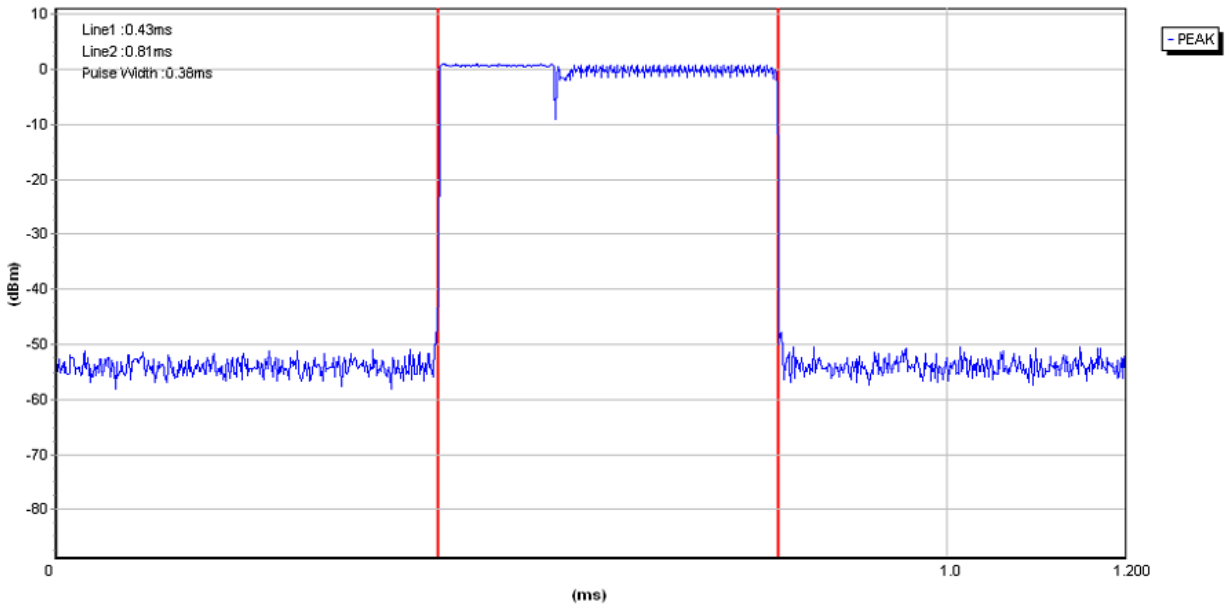

Line1 :0.84ms
Line2 :2.47ms
Pulse Width :1.63ms
PEAK
10
0
-10
-20
-30
-40
-50
-60
-70
-80
(dBm)
0
1.0
2.0
3.0
3.120
(ms)

2DH5

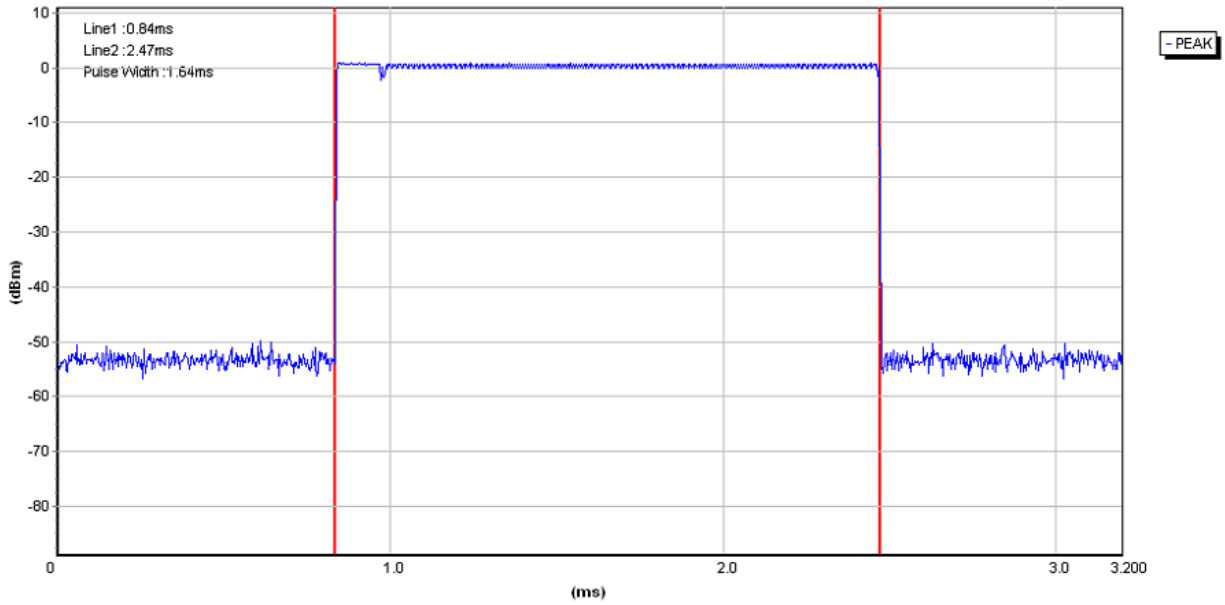

Line1 :0.60ms
Line2 :3.48ms
Pulse Width :2.88ms
PEAK
10
0
-10
-20
-30
-40
-50
-60
-70
-80
(dBm)
0
1.0
2.0
3.0
4.000
(ms)

3）8DPSK（3Mbps）-3DH1/3DH3/3DH5

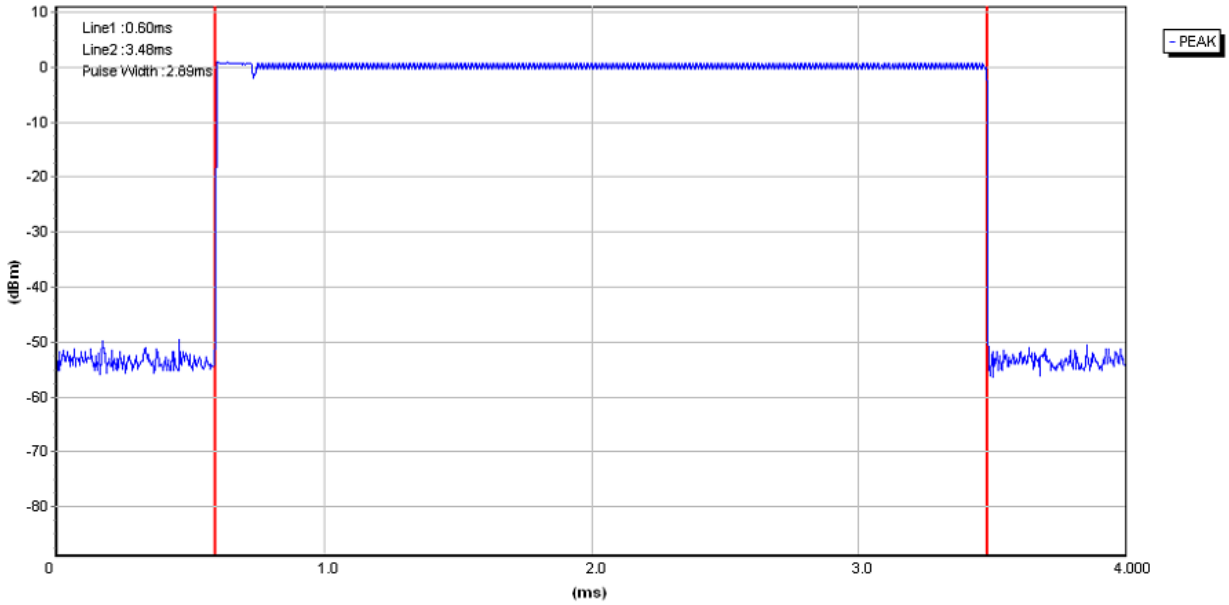
3DH1



3DH3



3DH5


Line1 :0.60ms
Line2 :3.48ms
Pulse Width :2.88ms
PEAK
10
0
-10
-20
-30
-40
-50
-60
-70
-80
(dBm)
0
1.0
2.0
3.0
4.000
(ms)

3.8 Carrier Frequencies Separated

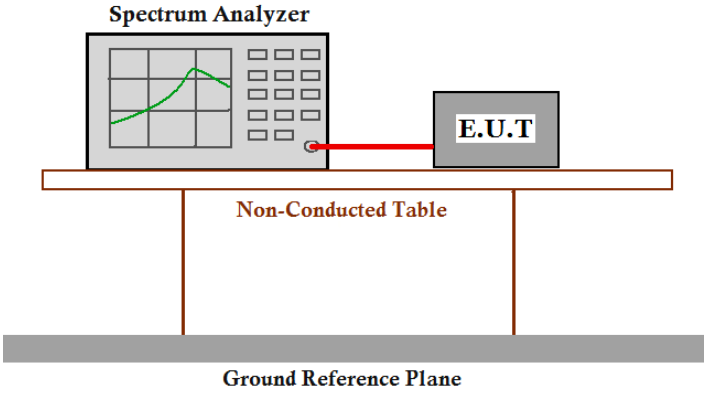
Test Requirement: FCC Part 15 C section 15.247

(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 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Method: DA 00-705

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel and hopping mode with different data packet. Compliance test in hopping GFSK(1Mbps), π/4-DQPSK(2Mbps), 8-DPSK(3Mbps) modes.

Test Configuration:



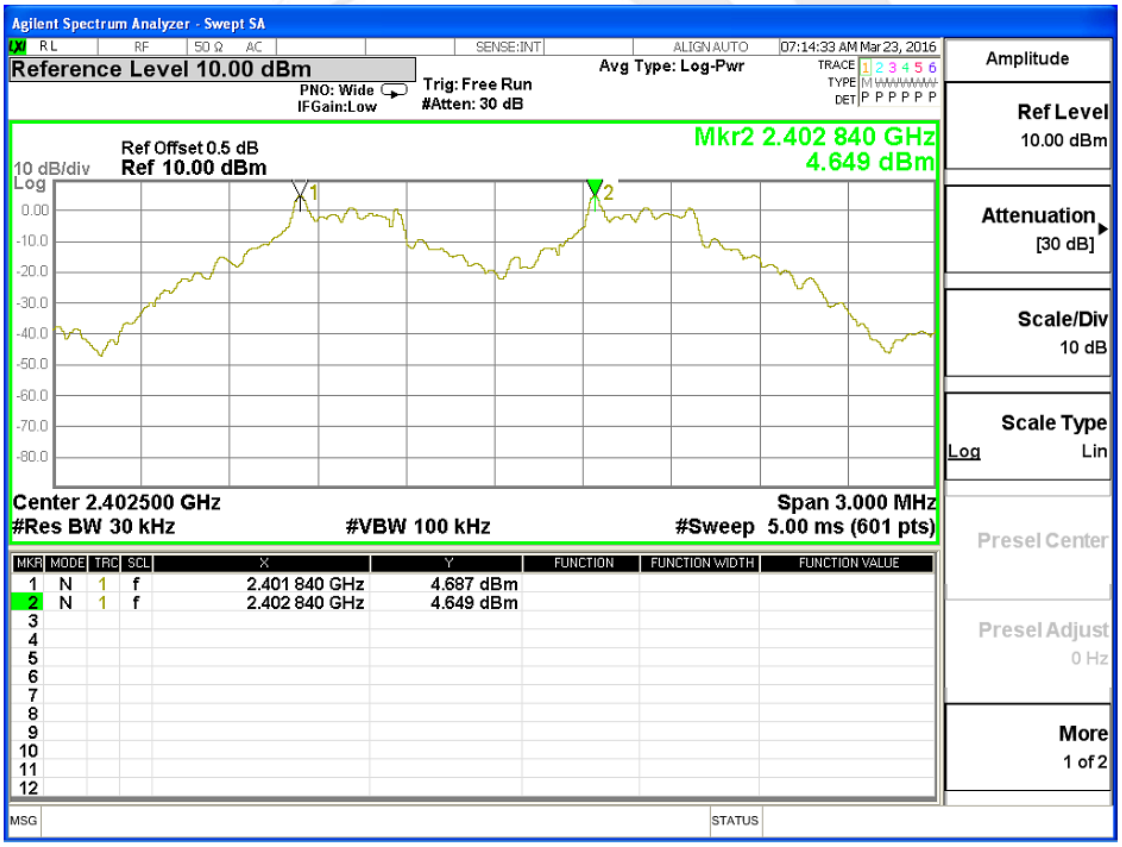
Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW >= 1% of the span, VBW >= RBW,. 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.

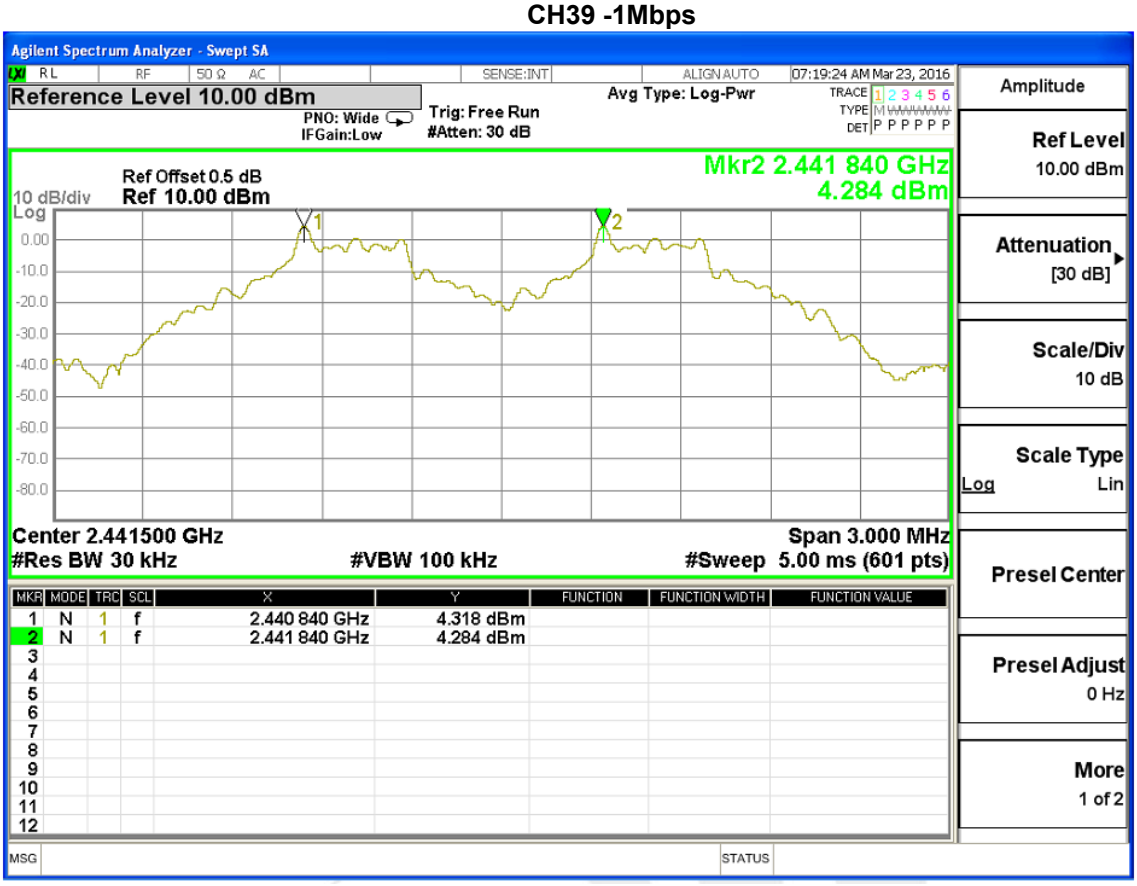
Test result:
CH00 / CH39 /CH78 (GFSK(1Mbps) Mode)

Frequency (MHz)	Ch. Separation (MHz)	20 dB BW (MHz)	2/3 20 dB BW (MHz)
2402	1.000	0.830	/
2441	1.000	0.834	/
2480	1.000	0.835	/
Note: Pass, for GFSK: Ch. Separation Limits: >20dB bandwidth.			

CH00 -1Mbps



CH39 -1Mbps



CH78 -1Mbps