REPORT No.: SZ16020003W02

FCC RF TEST REPORT

APPLICANT	:	Shanghai Mobvoi Information Technology Company Limited
PRODUCT NAME	:	Smart Watch
MODEL NAME	:	WE12016
TRADE NAME	:	ticwatch
BRAND NAME	:	ticwatch
FCC ID	:	2AHEA-WE12016
STANDARD(S)	:	47 CFR Part 15 Subpart C
ISSUE DATE	:	2016-05-19

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DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2016-05-19	First edition

TEST REPORT DECLARATION

Applicant	Shanghai Mobvoi Information Technology Company Limited
Applicant Address	Building 2-106, 1690 Cailun Road, China (Shanghai) free trade area, China
Manufacturer	Shanghai Mobvoi Information Technology Company Limited
Manufacturer Address	Building 2-106, 1690 Cailun Road, China (Shanghai) free trade area, China
Product Name	Smart Watch
Model Name	WE12016
Brand Name	ticwatch
HW Version	2.0
SW Version	5.1
Test Standards	47 CFR Part 15 Subpart C
Test Date	2016-04-11 to 2016-04-25
Test Result	PASS

Tested by : Zou Jian
Zou Jian

Reviewed by : Qiu Xiaojun
Qiu Xiaojun

Approved by : Peng Huarui
Peng Huarui

1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	Shanghai Mobvoi Information Technology Company Limited
Address:	Building 2-106, 1690 Cailun Road, China (Shanghai) free trade area, China

1.2 Equipment under Test (EUT) Description

Brand Name:	ticwatch
Trade Name:	ticwatch
Model Name:	WE12016
Frequency Range:	The frequency range used is 2402MHz – 2480MHz (79 channels, at intervals of 1MHz); The frequency block is 2400MHz to 2483.5MHz.
Modulation Type:	Bluetooth: FHSS (GFSK(1Mbps), π/4-DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))
Bluetooth Version:	BT4.1(BR+EDR)
Antenna Type:	Dedicated Antenna
Antenna Gain:	-6.3 dBi

NOTE:

1. The EUT is a Smart Watch, it contains Bluetooth 4.1(BR+EDR) operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is F(MHz)=2402+1*n (0<=n<=78). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).
2. The EUT powered by battery. During the test, the EUT powered by a new battery.
3. The EUT connected to the serial port of the computer with a serial communication cable, and then use the dedicated software to control the EUT into the test mode
5. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2.1 Identification of all used EUTs

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
01	2.0	5.1

1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-15 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Test Date	Result
1	15.203	Antenna Requirement	N.A	**PASS**
2	15.247(a)	Number of Hopping Frequency	Apr 14, 2016	**PASS**
3	15.247(b)	Peak Output Power	Apr 14, 2016	**PASS**
4	15.247(a)	20dB Bandwidth	Apr 14, 2016	**PASS**
5	15.247(a)	Carrier Frequency Separation	Apr 14, 2016	**PASS**
6	15.247(a)	Time of Occupancy (Dwell time)	Apr 14, 2016	**PASS**
7	15.247(d)	Conducted Spurious Emission	Apr 14, 2016	**PASS**
8	15.247(d)	Restricted Frequency Bands	Apr 23, 2016	**PASS**
9	15.209 15.247(d)	Radiated Emission	Apr 23, 2016	**PASS**
10	15.207	Conducted Emission	Apr 23, 2016	**PASS**

NOTE: The tests were performed according to the method of measurements prescribed in DA-00-705 and ANSI C63.10-2013.

1.3.1 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR PART 15C REQUIREMENTS

2.1 Antenna requirement

2.1.1 Applicable Standard

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

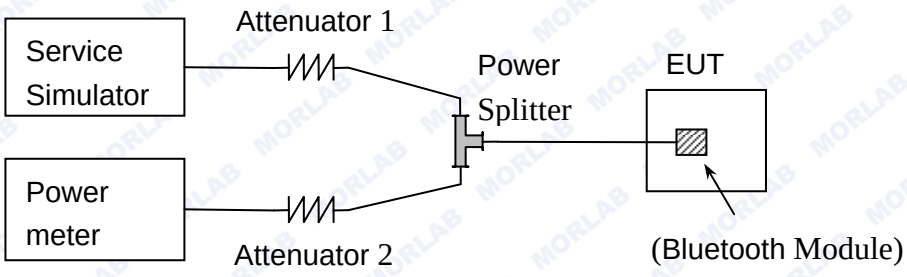
2.2 Number of Hopping Frequency

2.2.1 Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

2.2.2 Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

2.2.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

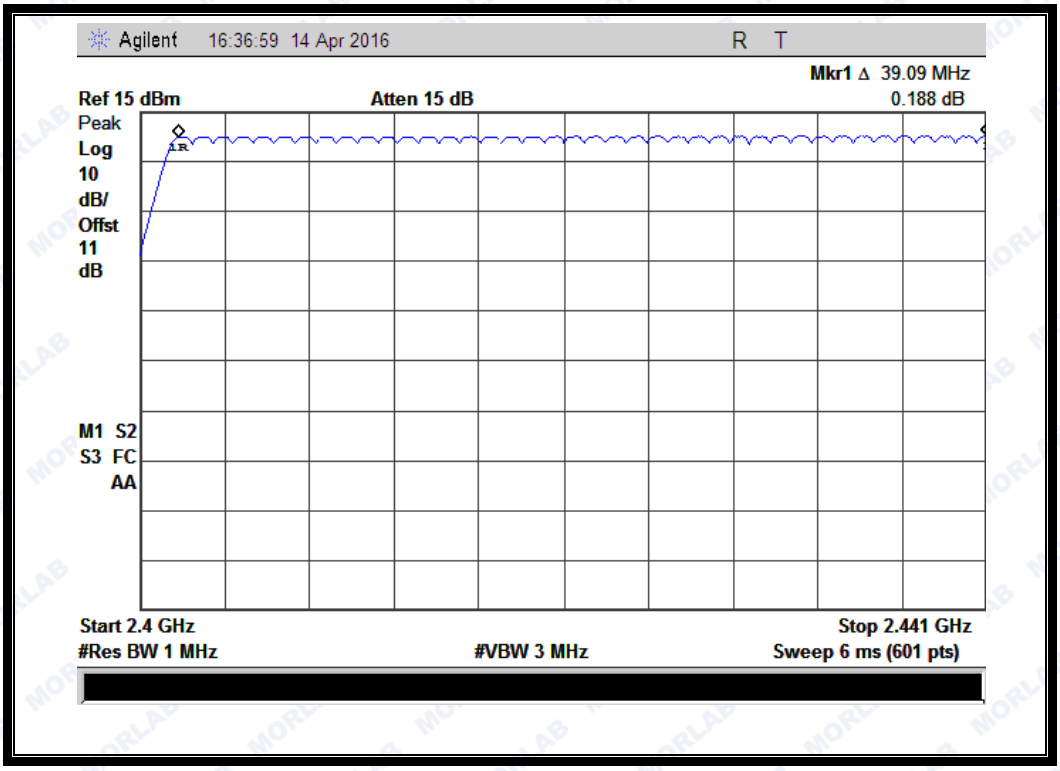
2.2.4 Test Result

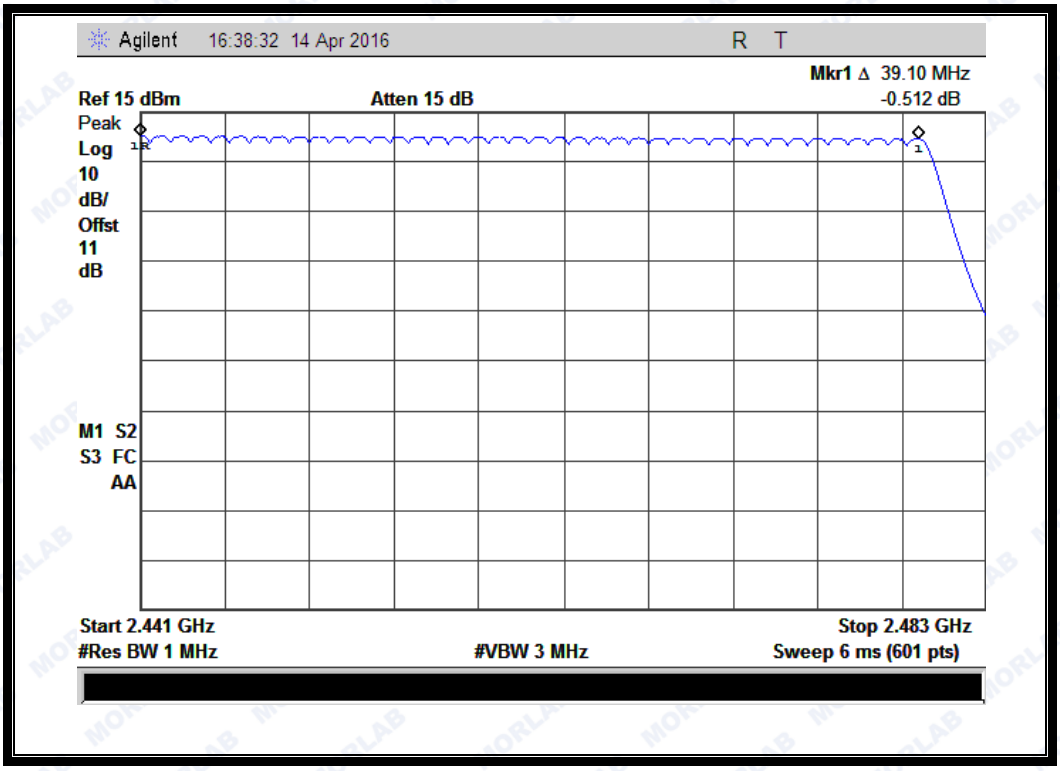
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

A. Test Verdict:

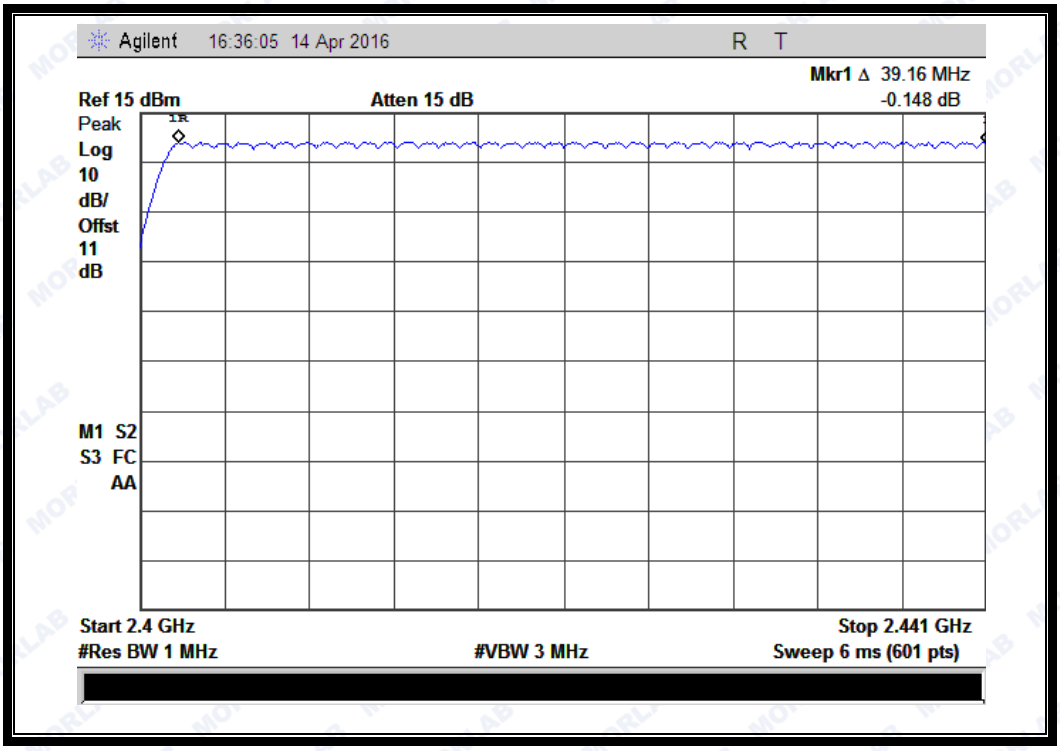
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
π/4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

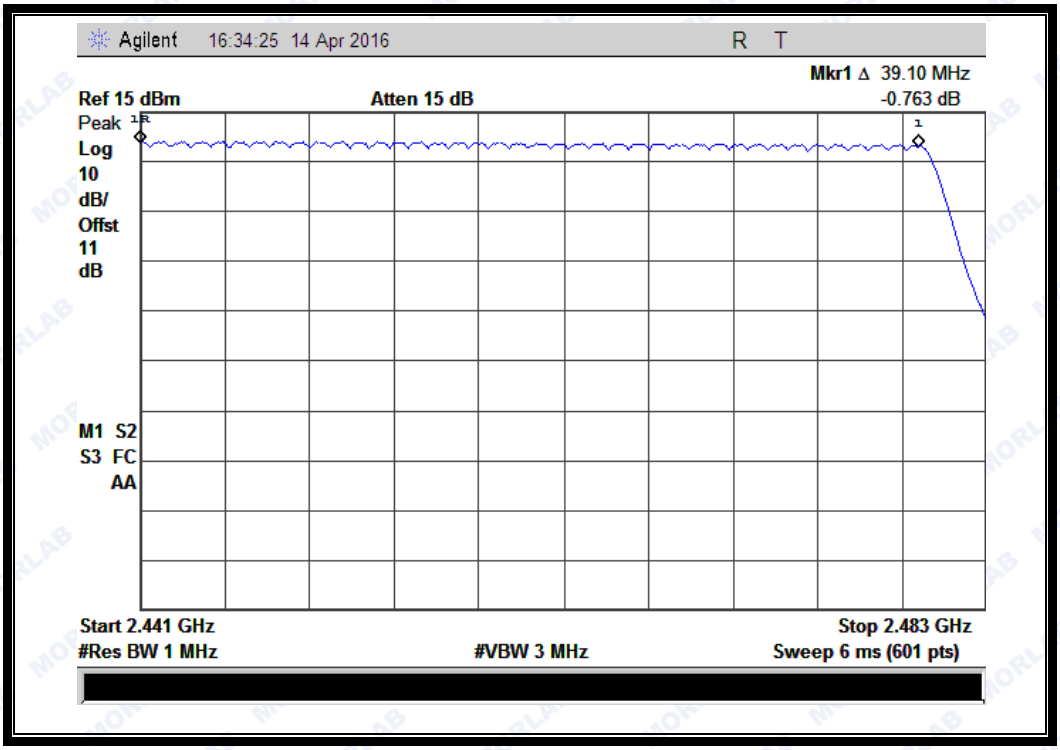
B. Test Plots:



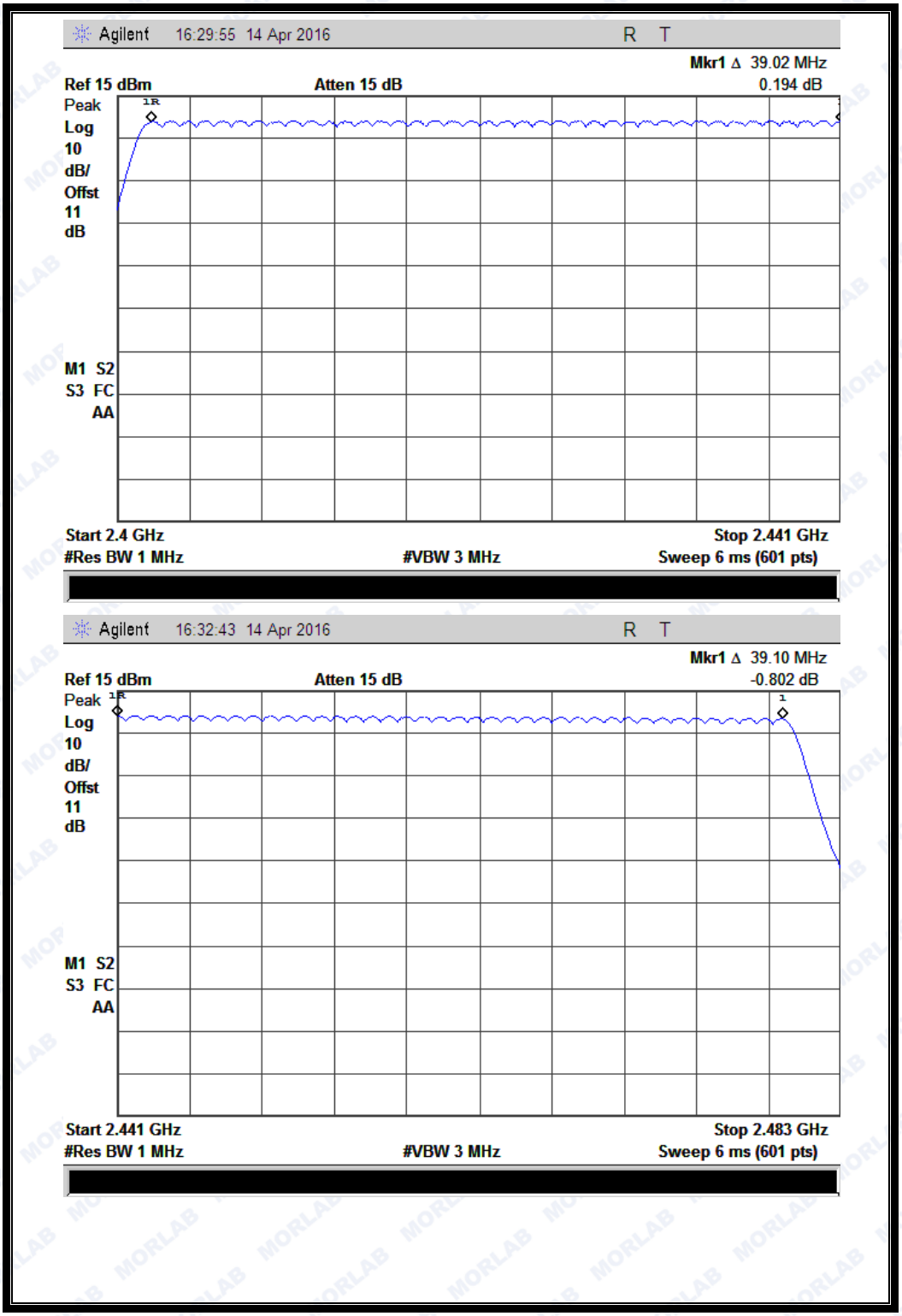

Agilent 16:38:32 14 Apr 2016
R T
Mkr1 Δ 39.10 MHz
-0.512 dB
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
M1 S2
S3 FC
AA
Start 2.441 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 2.483 GHz
Sweep 6 ms (601 pts)

(Plot A: GFSK)


Agilent 16:36:05 14 Apr 2016
R T
Mkr1 Δ 39.16 MHz
-0.148 dB
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
M1 S2
S3 FC
AA
Start 2.4 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 2.441 GHz
Sweep 6 ms (601 pts)



(Plot B: π/4-DQPSK)


Agilent 16:29:55 14 Apr 2016
R T
Mkr1 Δ 39.02 MHz
0.194 dB
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
M1 S2
S3 FC
AA
Start 2.4 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 2.441 GHz
Sweep 6 ms (601 pts)
Agilent 16:32:43 14 Apr 2016
R T
Mkr1 Δ 39.10 MHz
-0.802 dB
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
M1 S2
S3 FC
AA
Start 2.441 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 2.483 GHz
Sweep 6 ms (601 pts)

(Plot C: 8- DPSK)

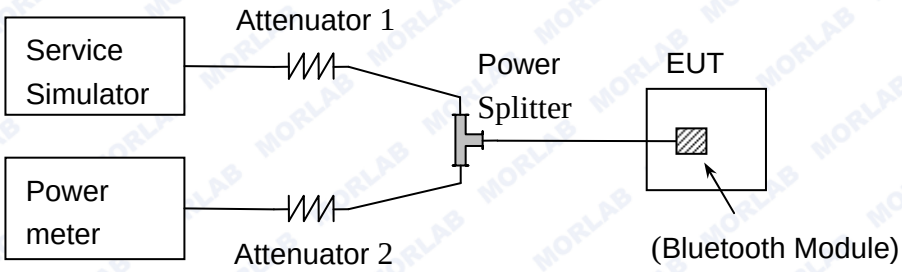
2.3 Peak Output Power

2.3.1 Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

2.3.2 Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Power meter and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

2.3.3 Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the module. The lowest, middle and highest channel were tested by power meter.

2.3.3.1 GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	10.04	0.010	20.97	0.125	PASS
39	2441	10.21	0.010			PASS
78	2480	9.65	0.009			PASS

2.3.3.2 π/4-DQPSK Mode

B. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	9.11	0.008	20.97	0.125	PASS
39	2441	9.15	0.008			PASS
78	2480	8.47	0.007			PASS

2.3.3.3 8-DPSK Mode

C. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	9.19	0.008	20.97	0.125	PASS
39	2441	9.25	0.008			PASS
78	2480	8.55	0.007			PASS

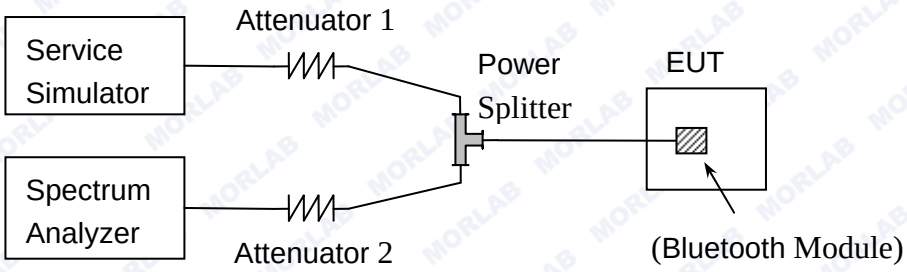
2.4 20dB Bandwidth

2.4.1 Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1% = 20dB) taking the total RF output power.

2.4.2 Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

2.4.3 Test Procedure

Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥ 1% of the 20 dB bandwidth
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

2.4.4 Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

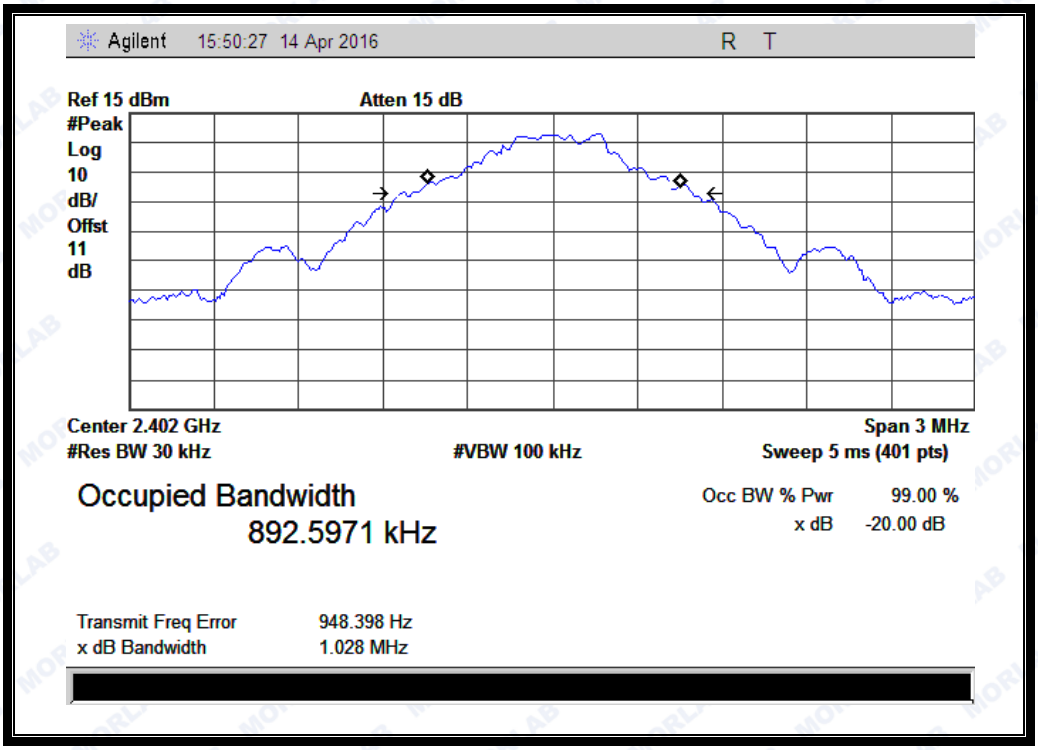
2.4.4.1 GFSK Mode

A. Test Verdict:

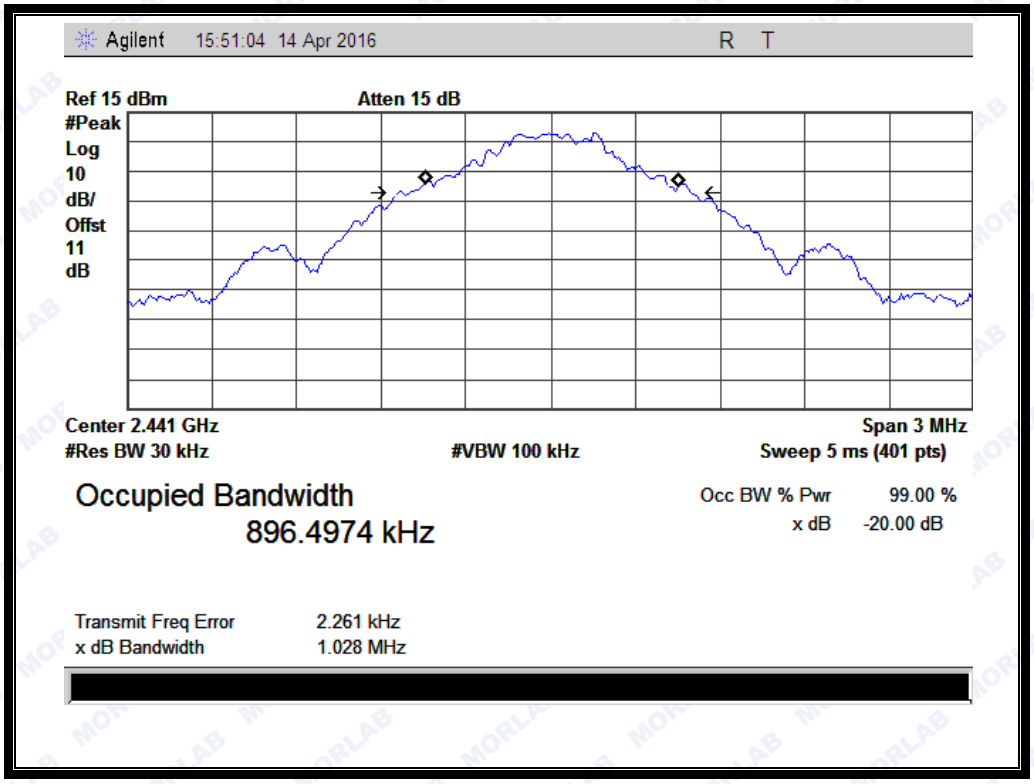
The maximum 20dB bandwidth measured is 1.028MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.028	Plot A
39	2441	1.028	Plot B
78	2480	0.9855	Plot C

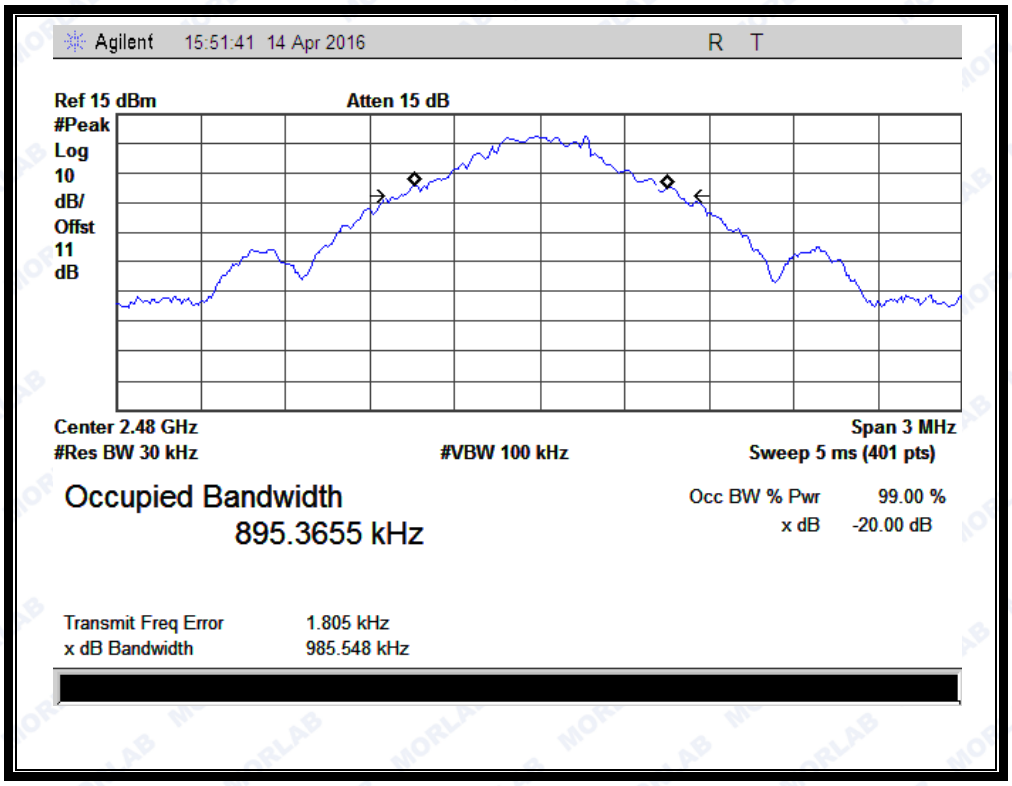
B. Test Plots:



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

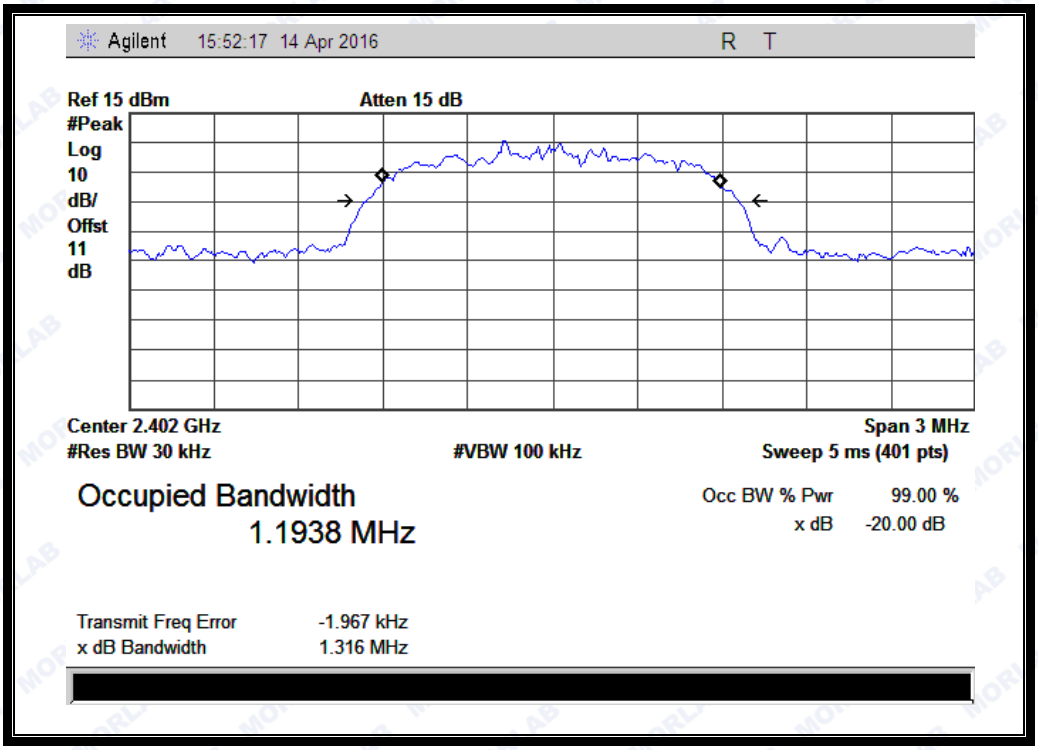
2.4.4.2 π/4-DQPSK Mode

A. Test Verdict:

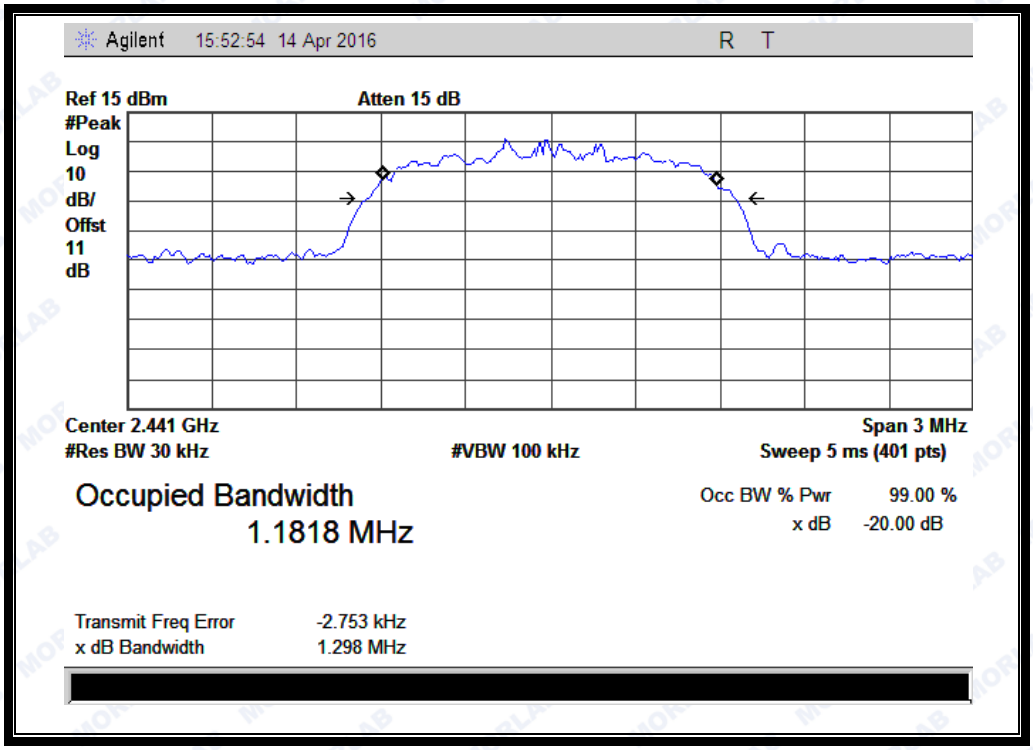
The maximum 20dB bandwidth measured is 1.316MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.316	Plot D
39	2441	1.298	Plot E
78	2480	1.295	Plot F

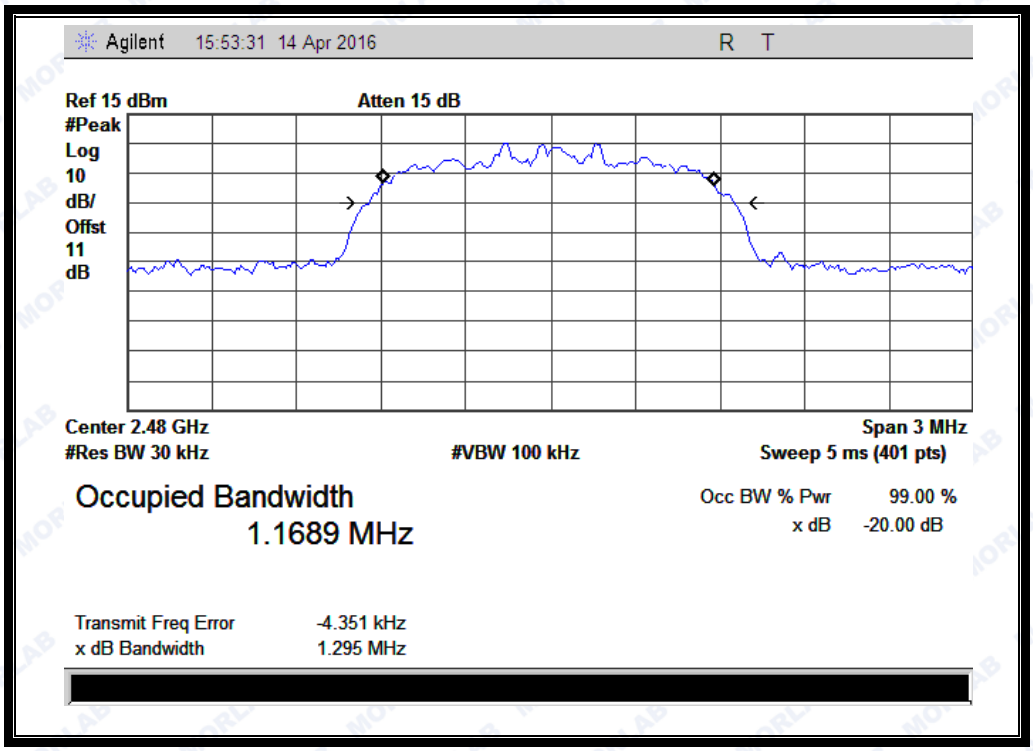
B. Test Plots:



(Plot D: Channel = 2402 @ π/4-DQPSK)



(Plot E: Channel = 2441 @ π/4-DQPSK)



(Plot F: Channel = 2480 @ π/4-DQPSK)

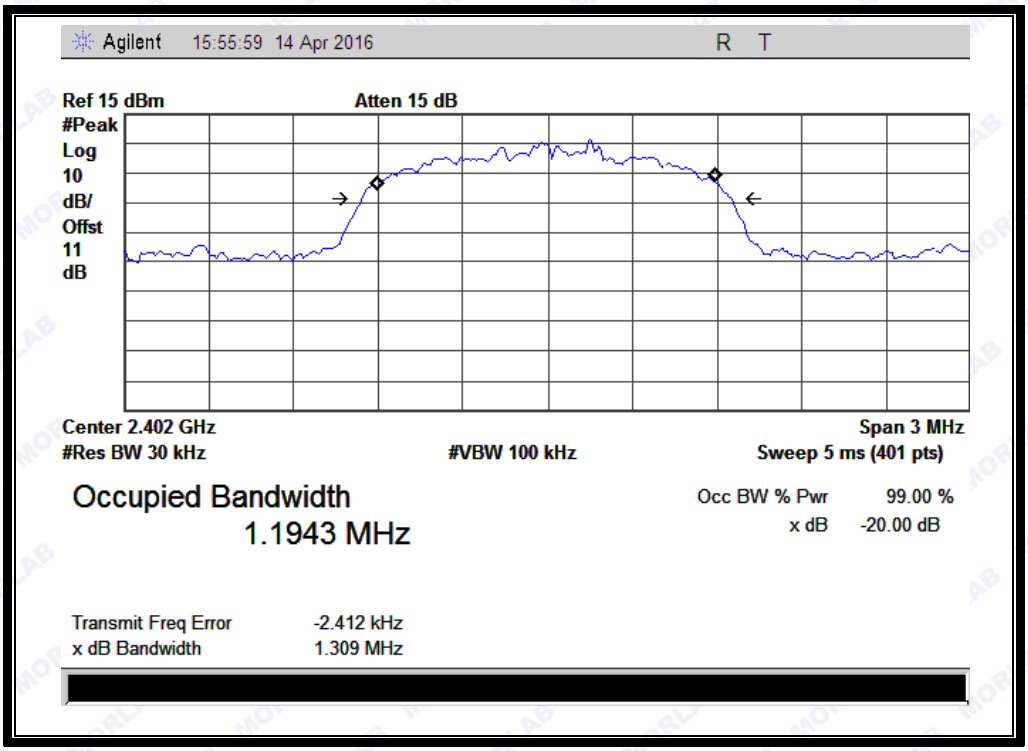
2.4.4.3 8-DPSK Mode

A. Test Verdict:

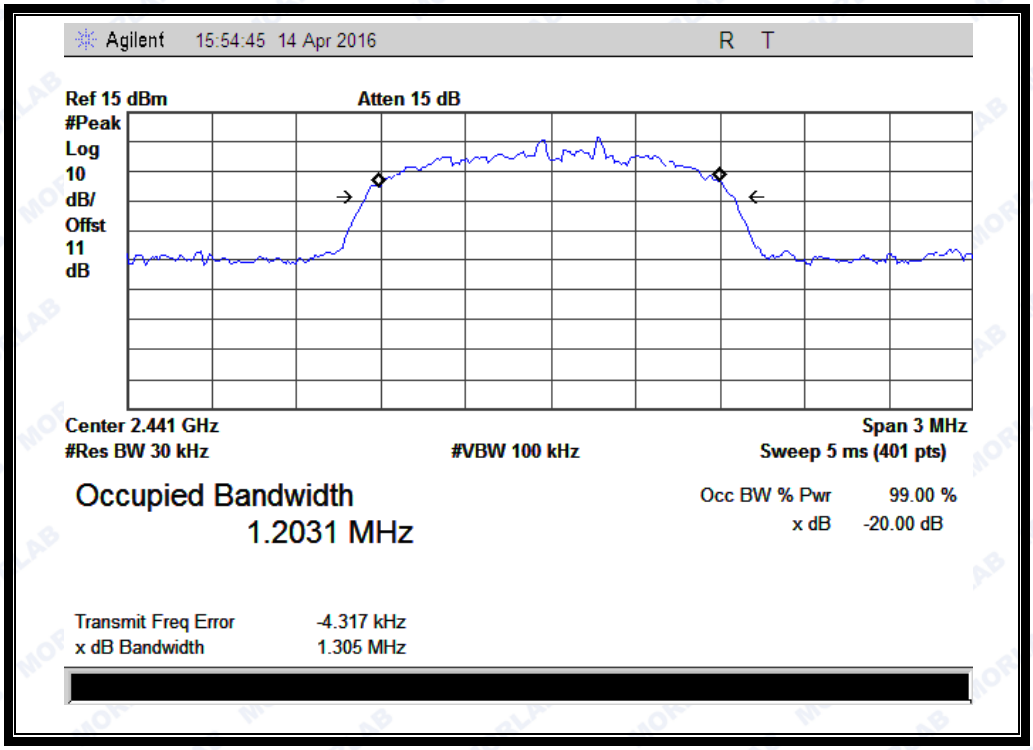
The maximum 20dB bandwidth measured is 1.309MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.309	Plot G
39	2441	1.305	Plot H
78	2480	1.305	Plot I

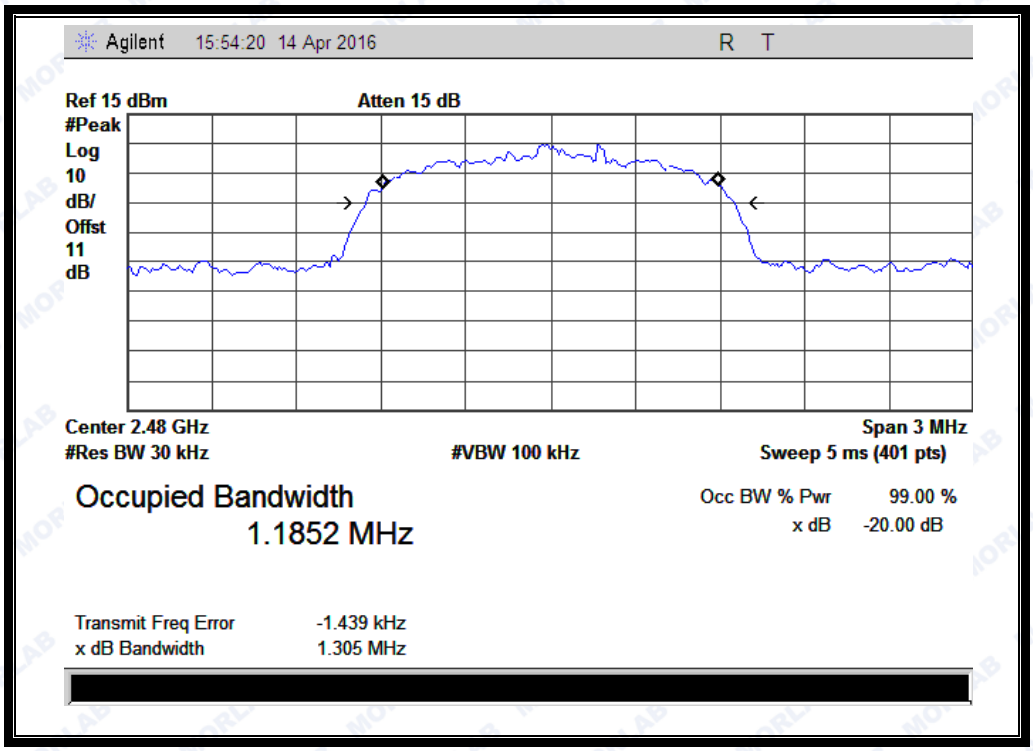
B. Test Plots:



(Plot G: Channel = 2402 @ 8-DPSK)



(Plot H: Channel = 2441 @ 8-DPSK)



(Plot I: Channel = 2480 @ 8-DPSK)

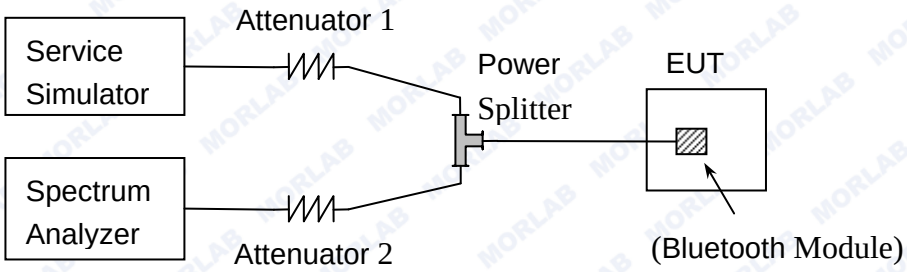
2.5 Carried Frequency Separation

2.5.1 Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

2.5.2 Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm;the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

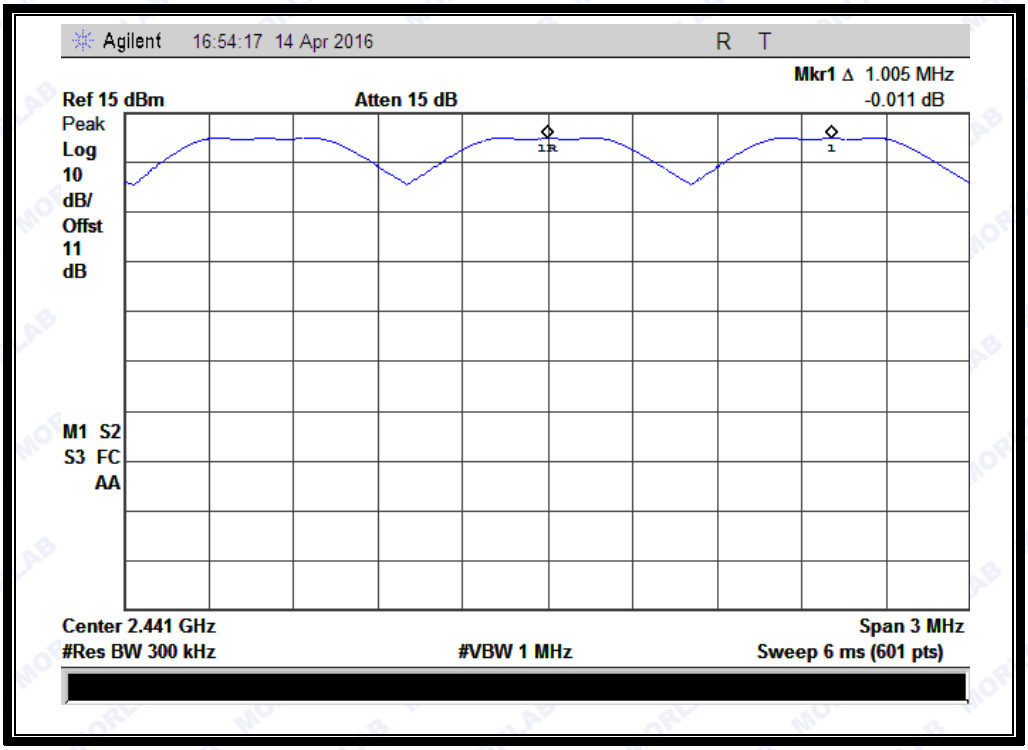
Please reference ANNEX A(1.5).

2.5.3 Test Procedure

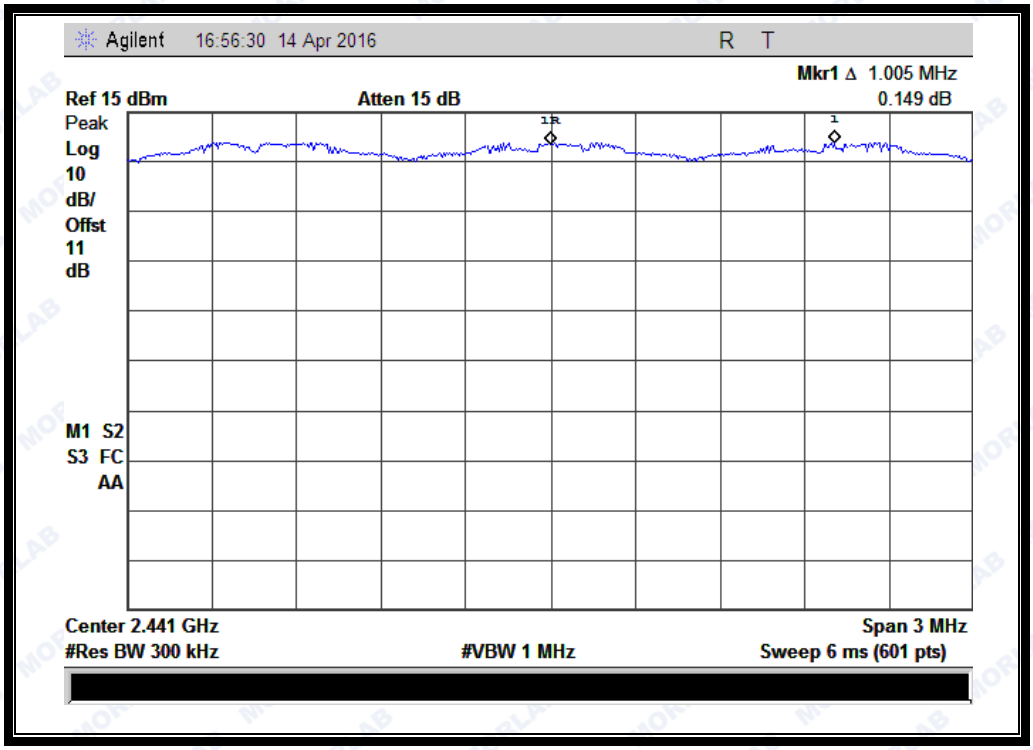
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

2.5.4 Test Result

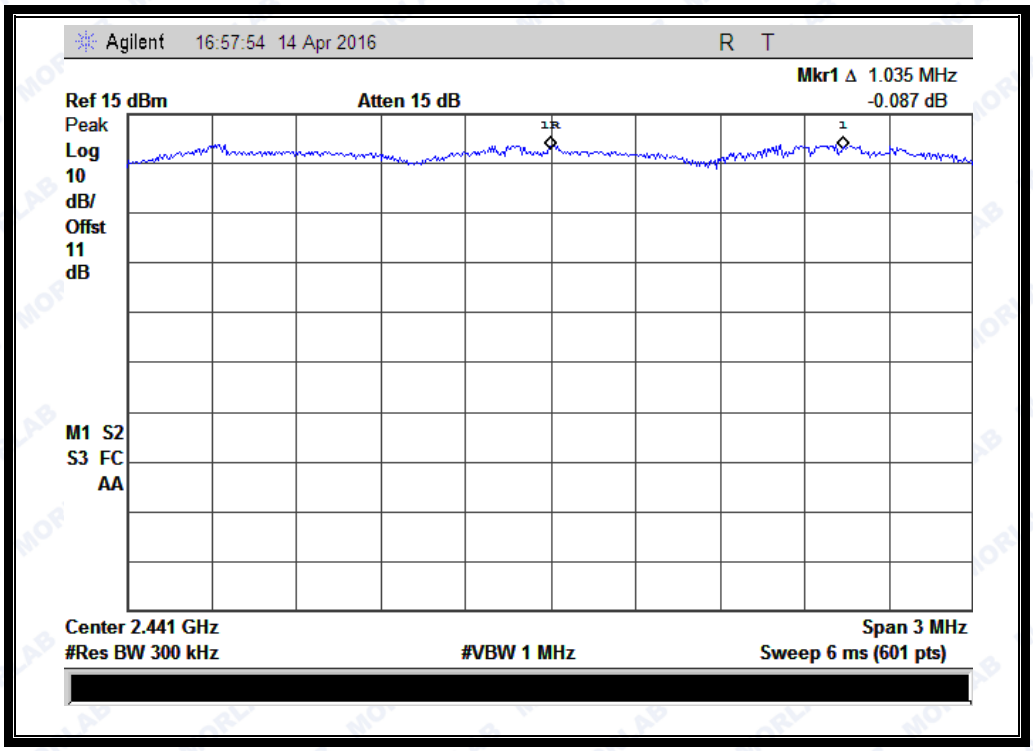
The Bluetooth Module operates at hopping-on test mode. For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section 0), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)



(Plot B: π/4-DQPSK)



(Plot C: 8-DPSK)

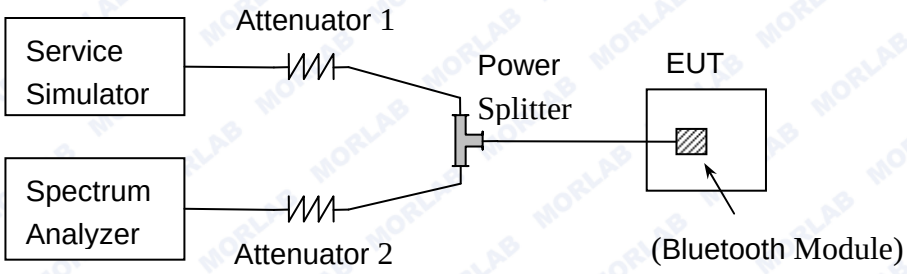
2.6 Time of Occupancy (Dwell time)

2.6.1 Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping 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.

2.6.2 Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

2.6.3 Test Procedure

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channel * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

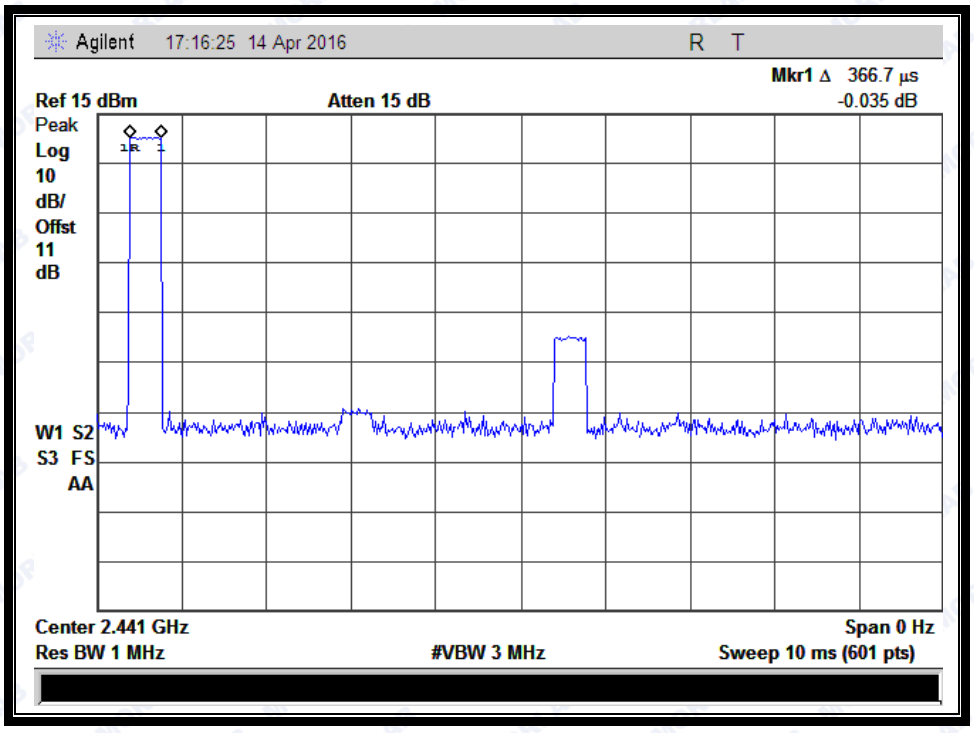
2.6.4 Test Result

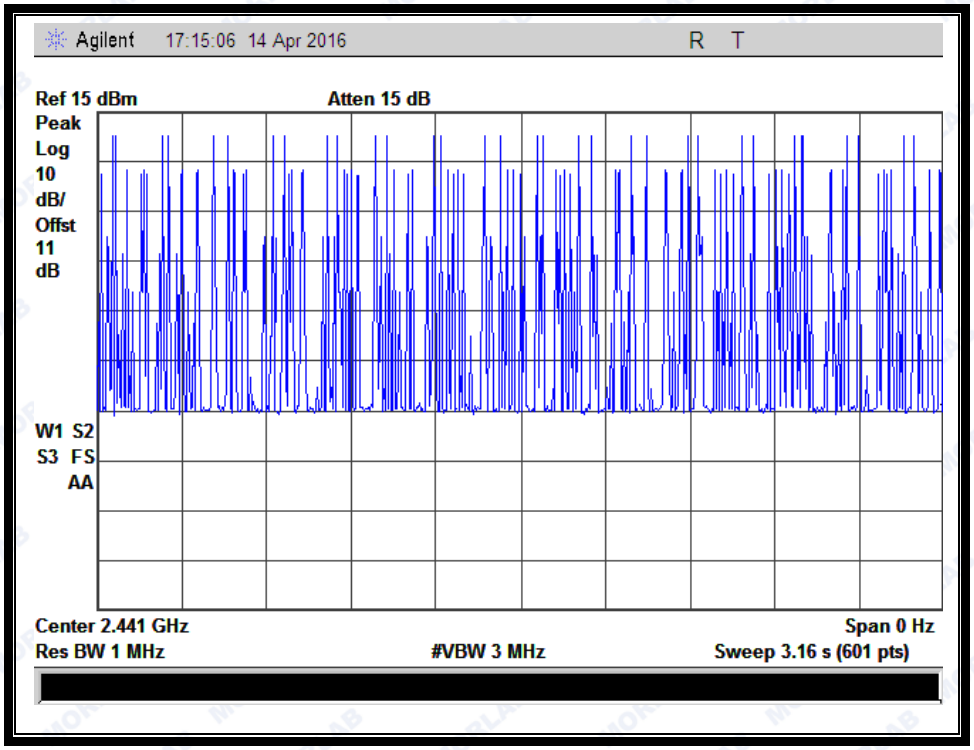
2.6.4.1 GFSK Mode

A. Test Verdict:

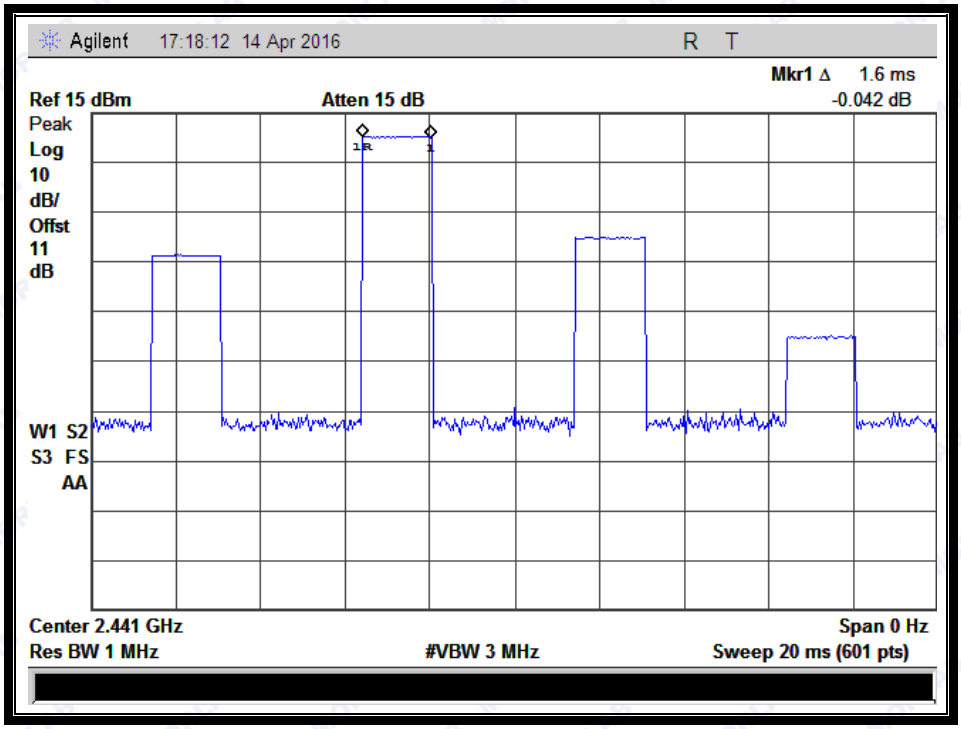
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.37	32	0.01184	0.1184	0.4	PASS
DH3	1.6	20	0.03200	0.3200		PASS
DH5	2.87	13	0.03731	0.3731		PASS

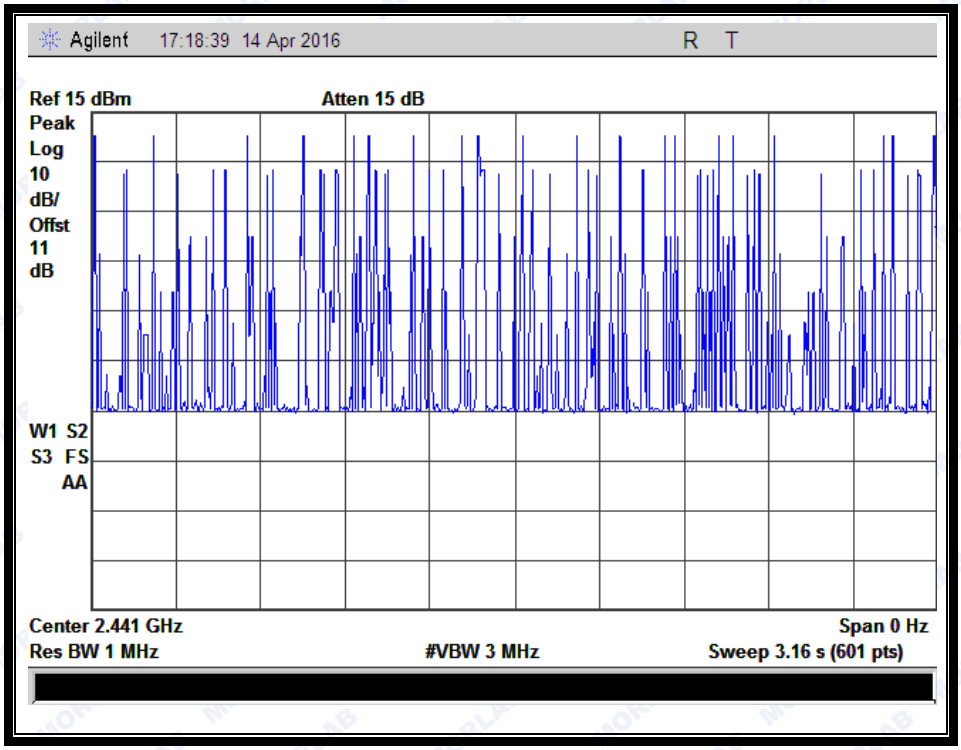
B. Test Plots:



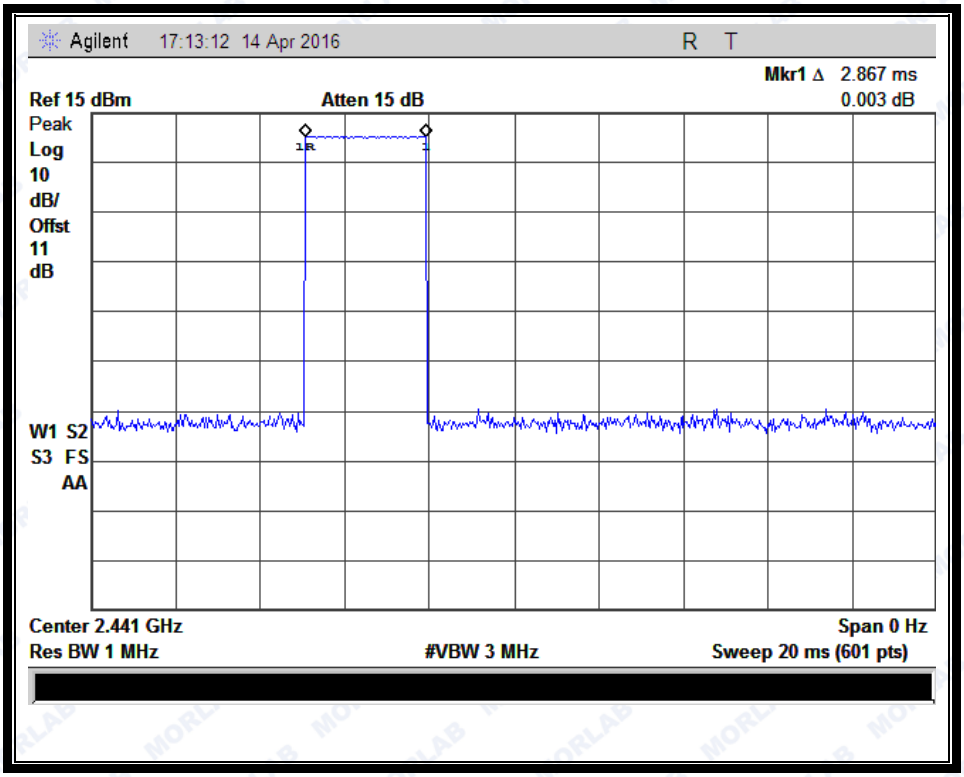


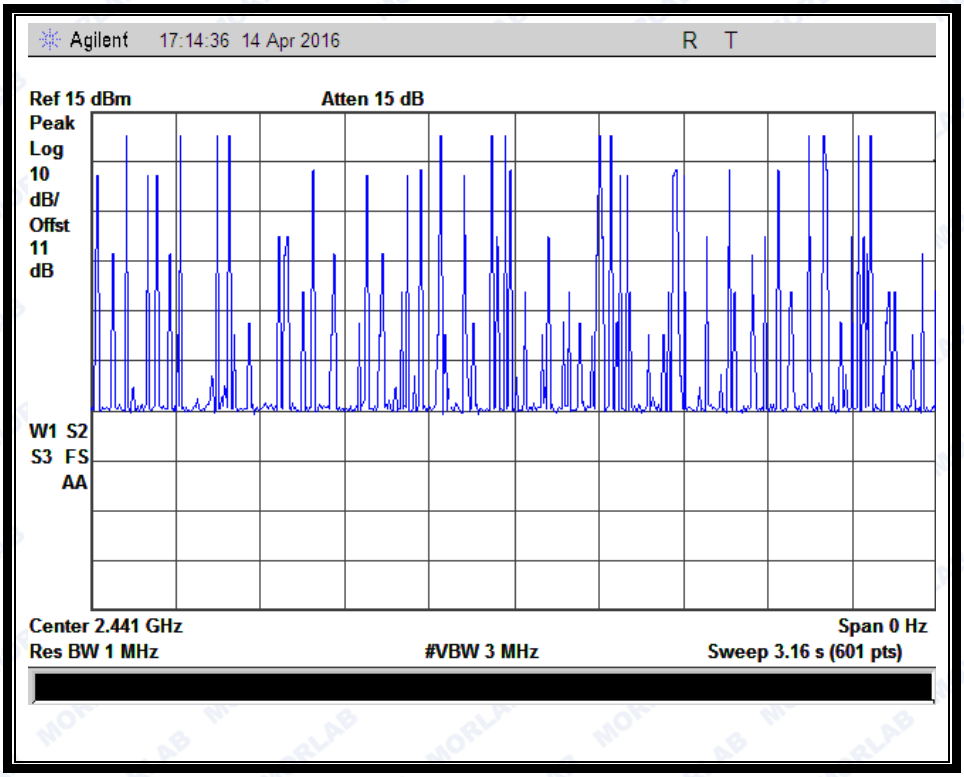
(Plot A: DH1 @ GFSK)





(Plot B: DH3 @ GFSK)





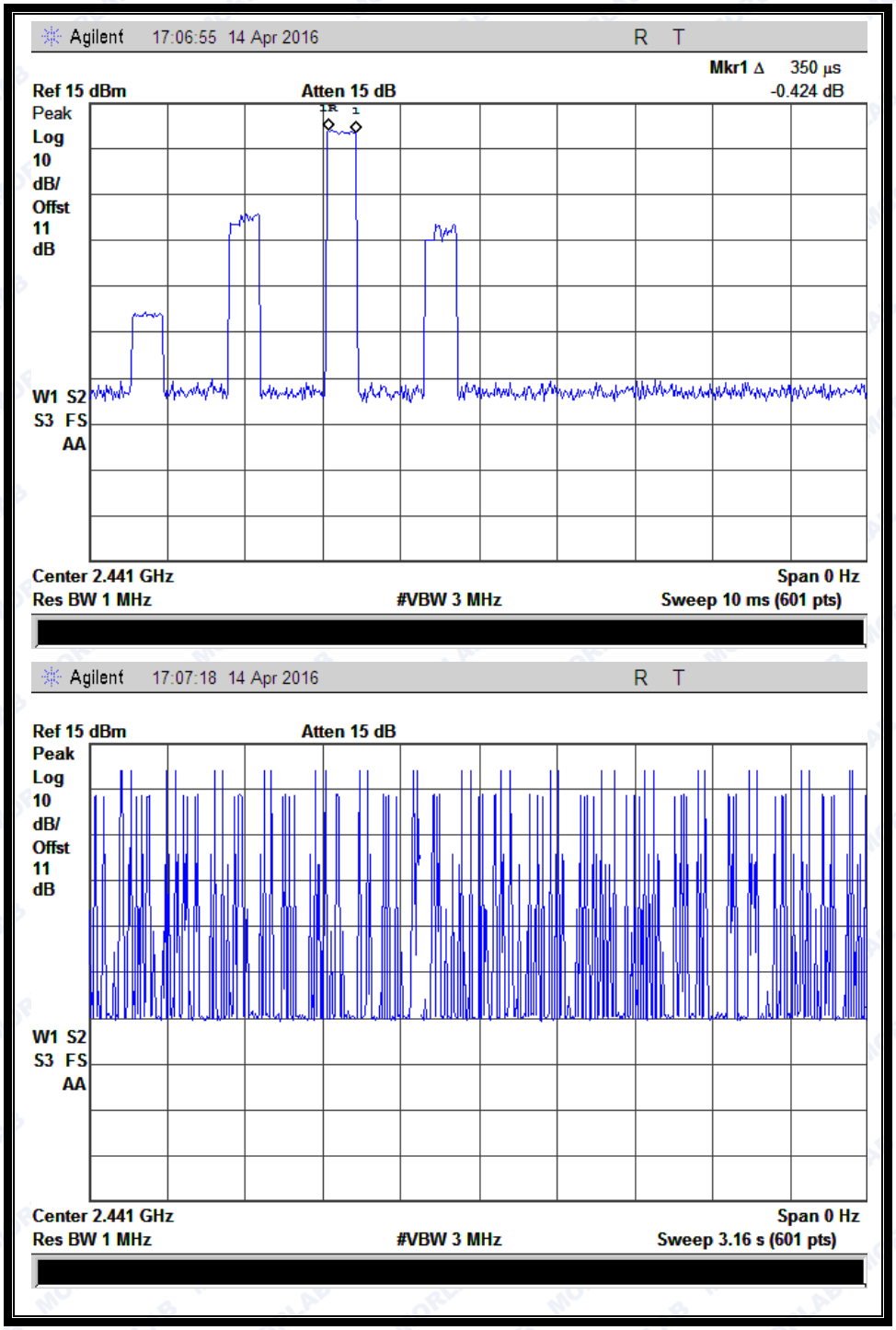
(Plot C: DH5 @ GFSK)

2.6.4.2 π/4-DQPSK Mode

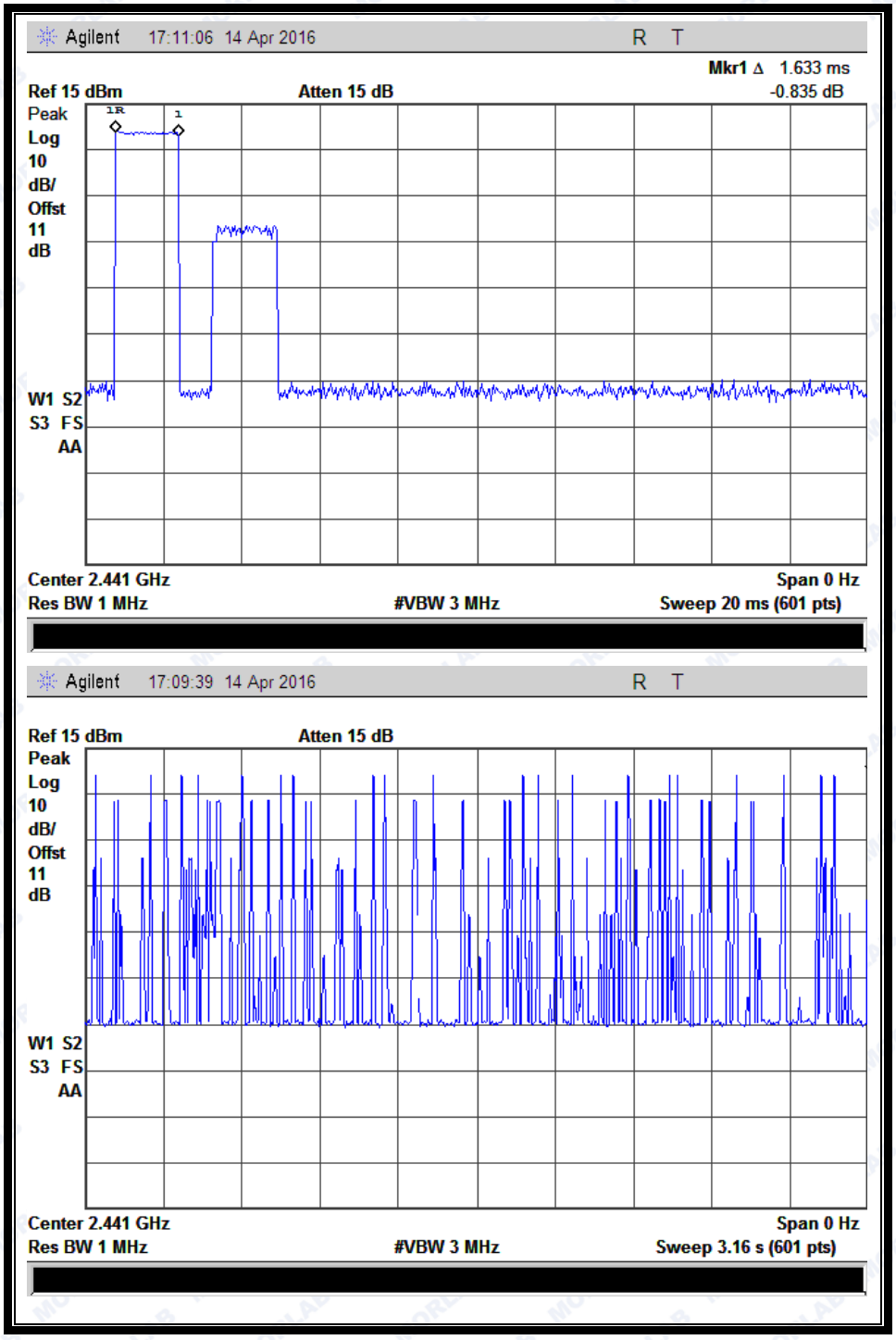
A. Test Verdict:

DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.35	32	0.01120	0.1120	0.4	PASS
DH3	1.63	20	0.03260	0.3260		PASS
DH5	2.87	10	0.02870	0.2870		PASS

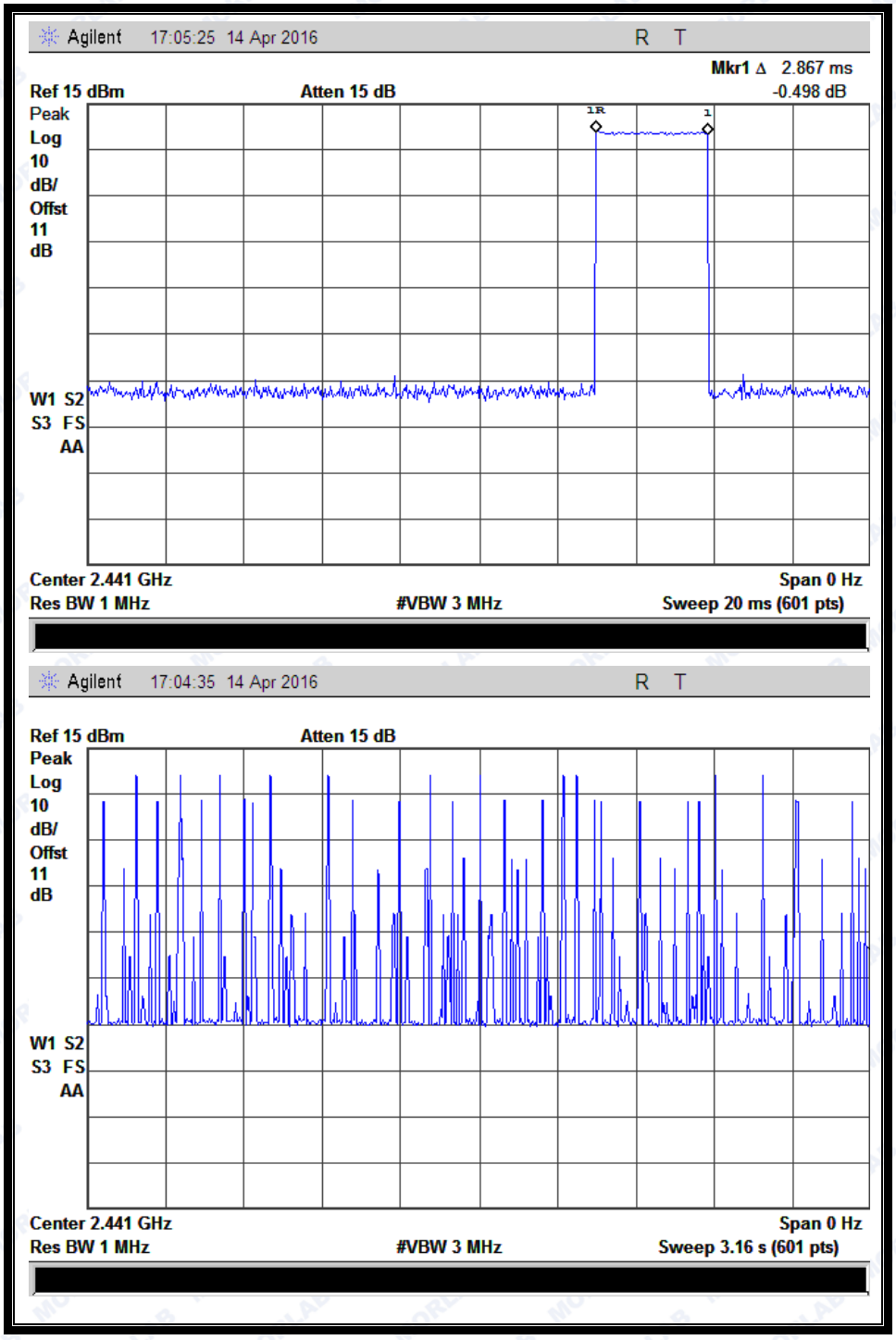
B. Test Plots:



(Plot D: DH1 @ π/4-DQPSK)



(Plot E: DH3 @ π/4-DQPSK)



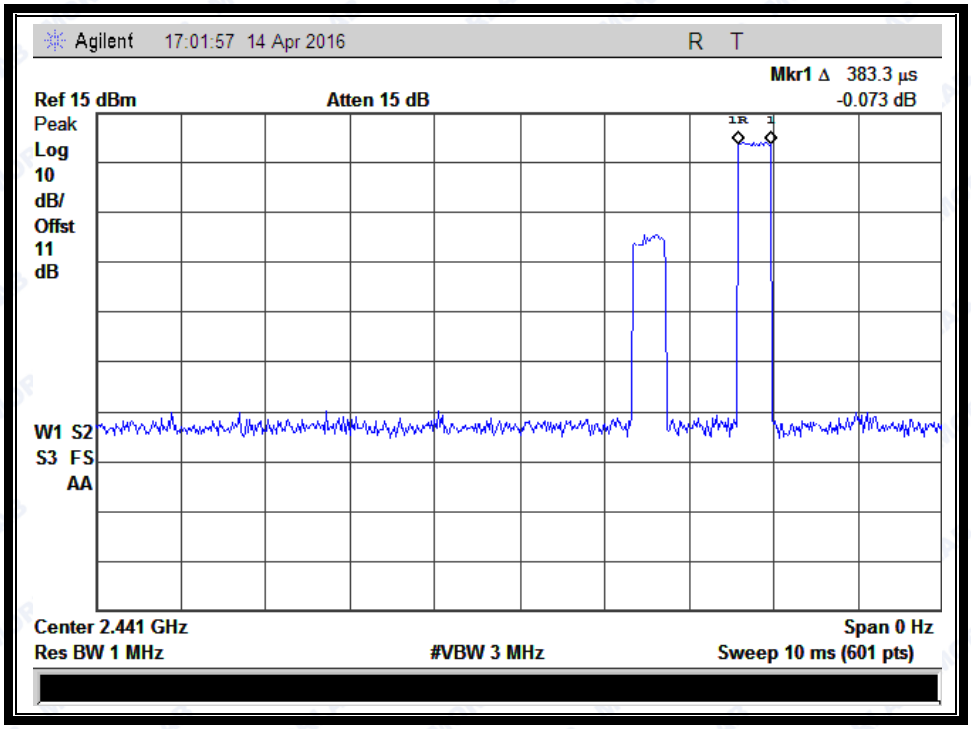
(Plot F: DH5 @ π/4-DQPSK)

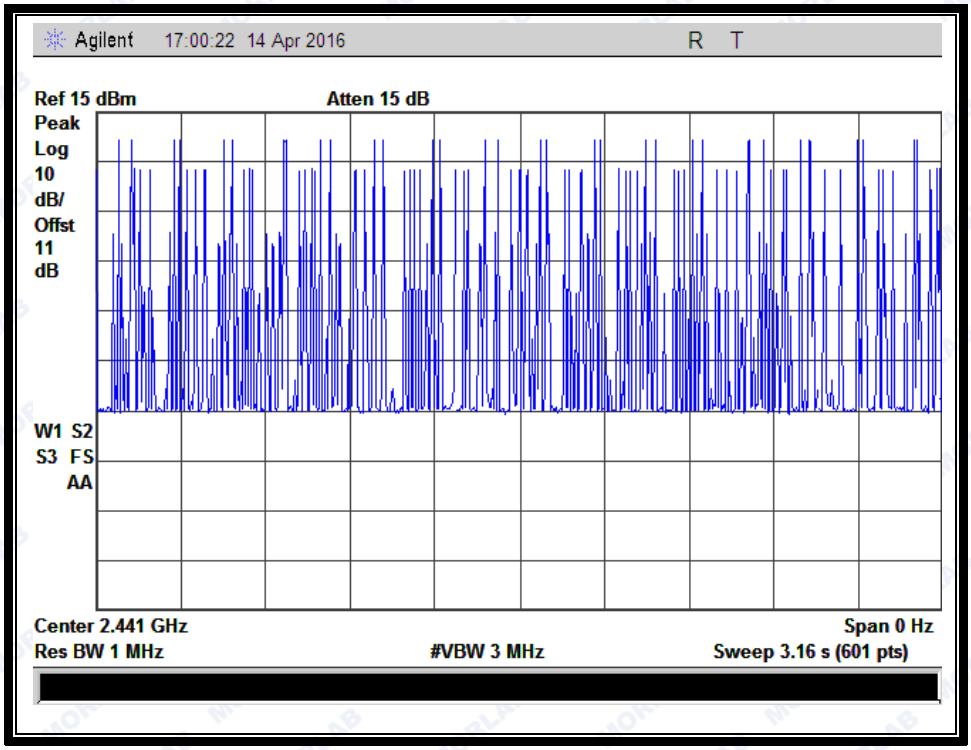
2.6.4.3 8-DPSK mode

A. Test Verdict:

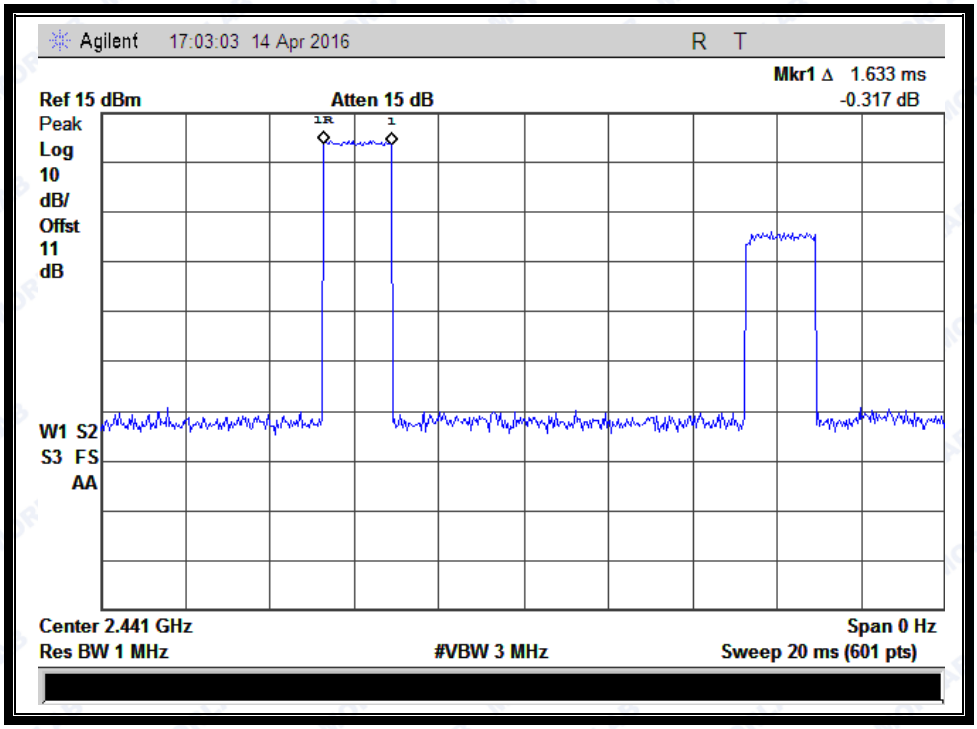
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.38	31	0.01178	0.1178	0.4	PASS
DH3	1.63	14	0.02282	0.2282		PASS
DH5	2.9	10	0.02900	0.2900		PASS

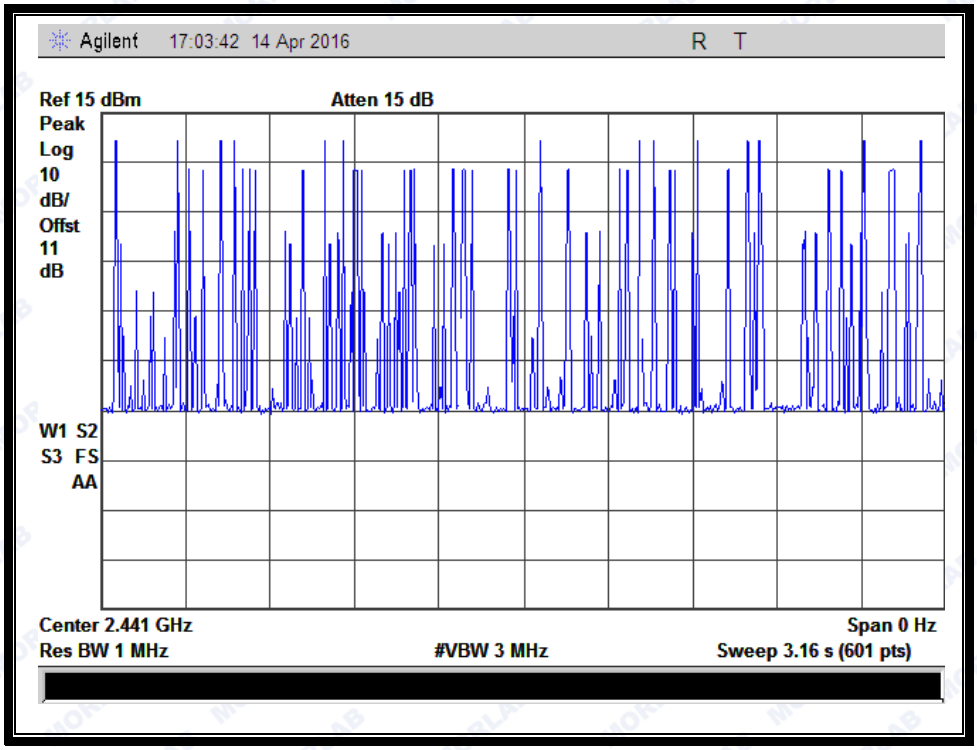
B. Test Plots:



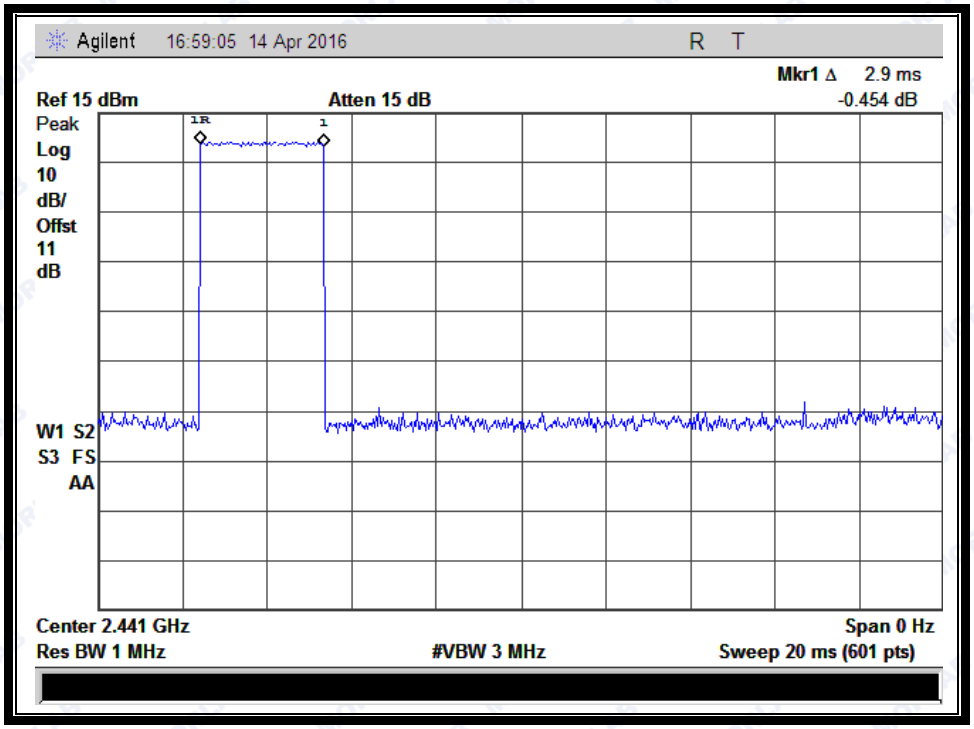


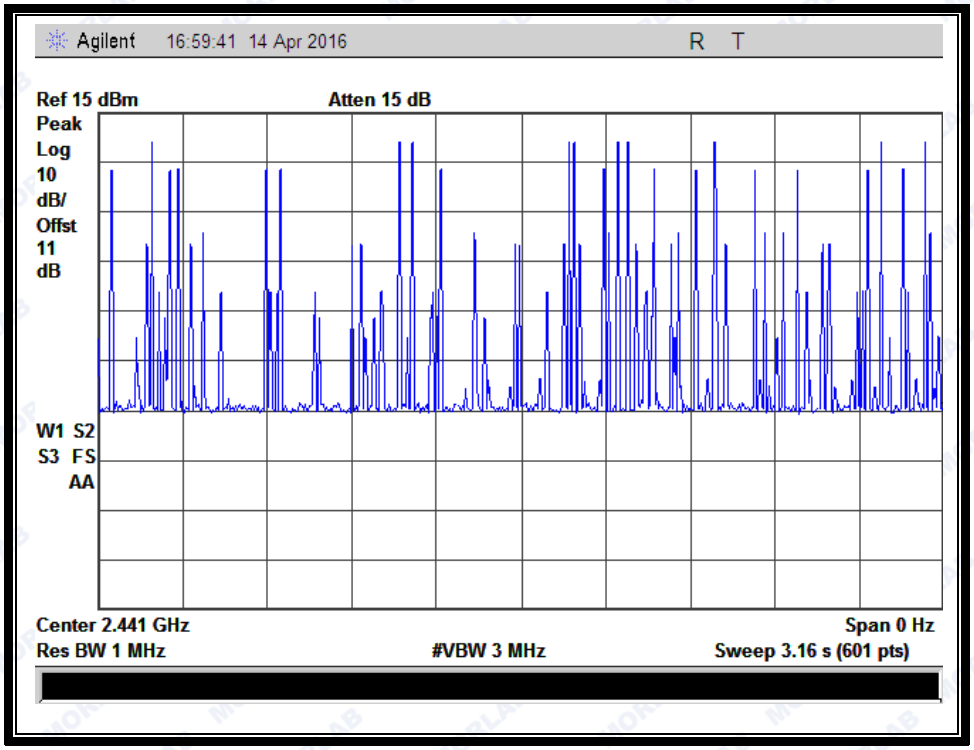
(Plot G: DH1 @ 8-DPSK)





(Plot H: DH3 @ 8-DPSK)





(Plot I: DH5 @ 8-DPSK)

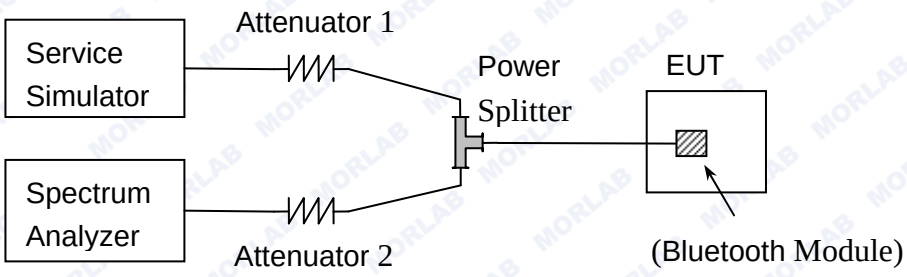
2.7 Conducted Spurious Emissions

2.7.1 Requirement

According to FCC §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.

2.7.2 Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm;the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

2.7.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.7.4 Test Result

The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

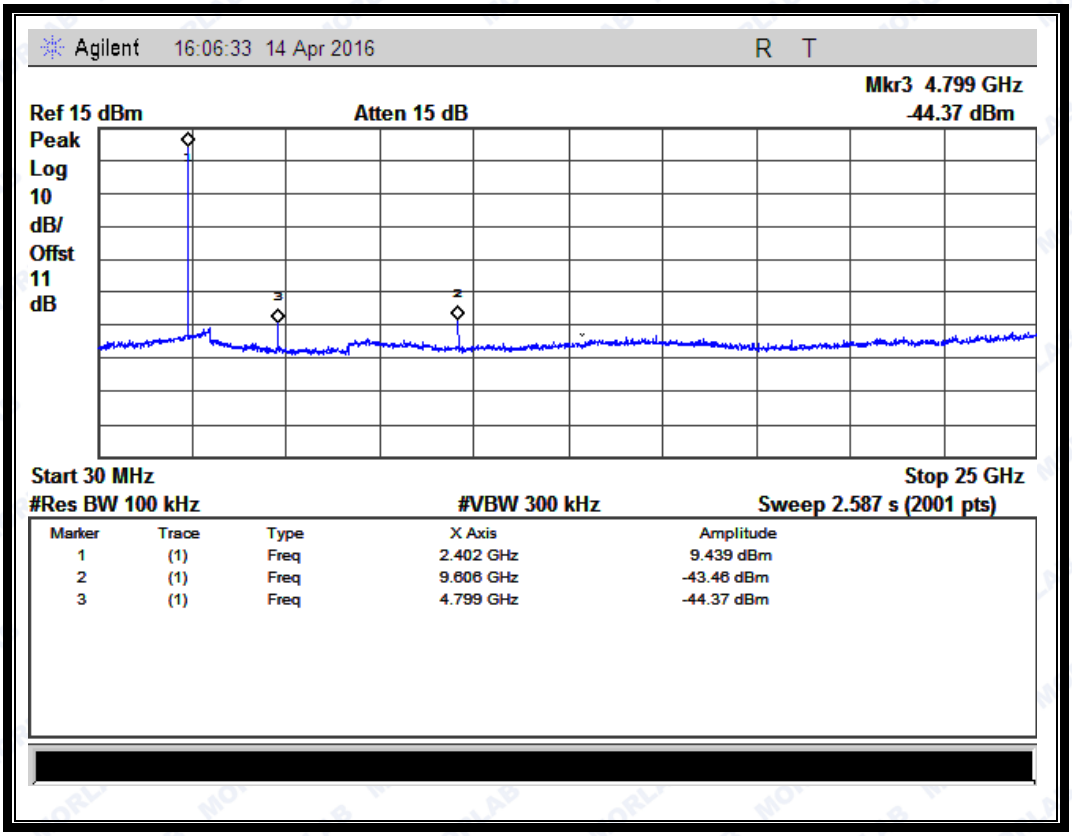
2.7.4.1 GFSK Mode

A. Test Verdict:

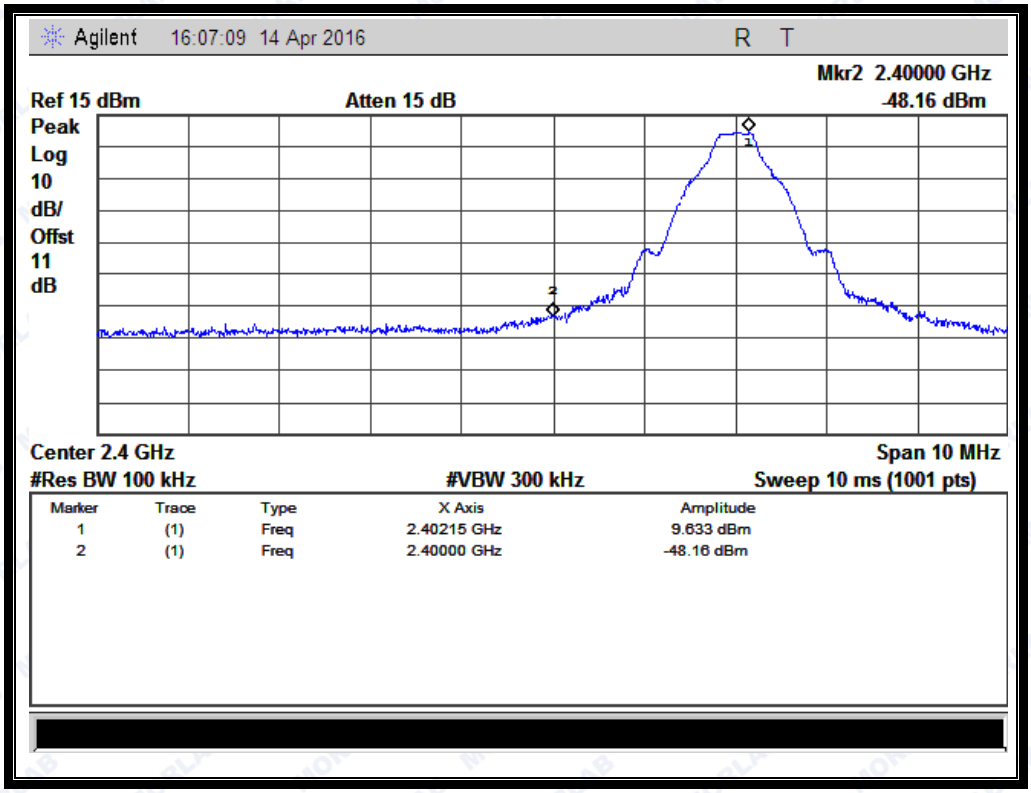
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-43.46	Plot A.1	9.44	-10.56	PASS
39	2441	-42.51	Plot B.1	9.49	-10.51	PASS
78	2480	-44.81	Plot C.1	9.13	-10.87	PASS

B. Test Plots:

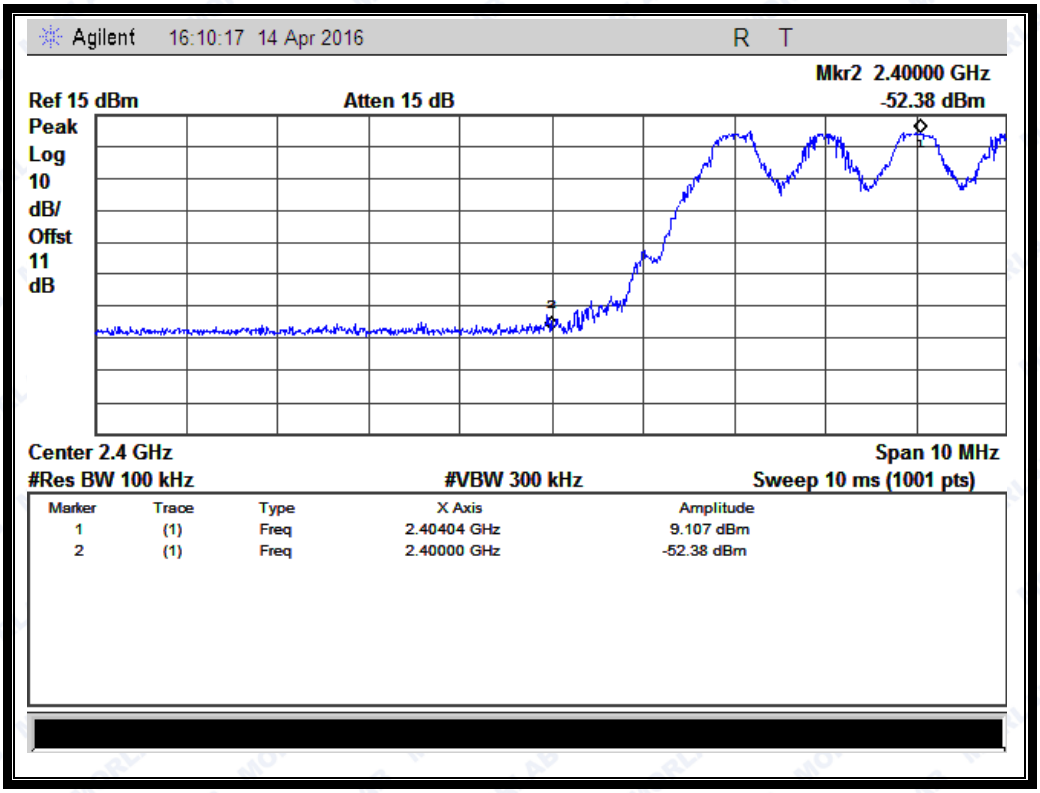
Note: the power of the Module transmitting frequency should be ignored.



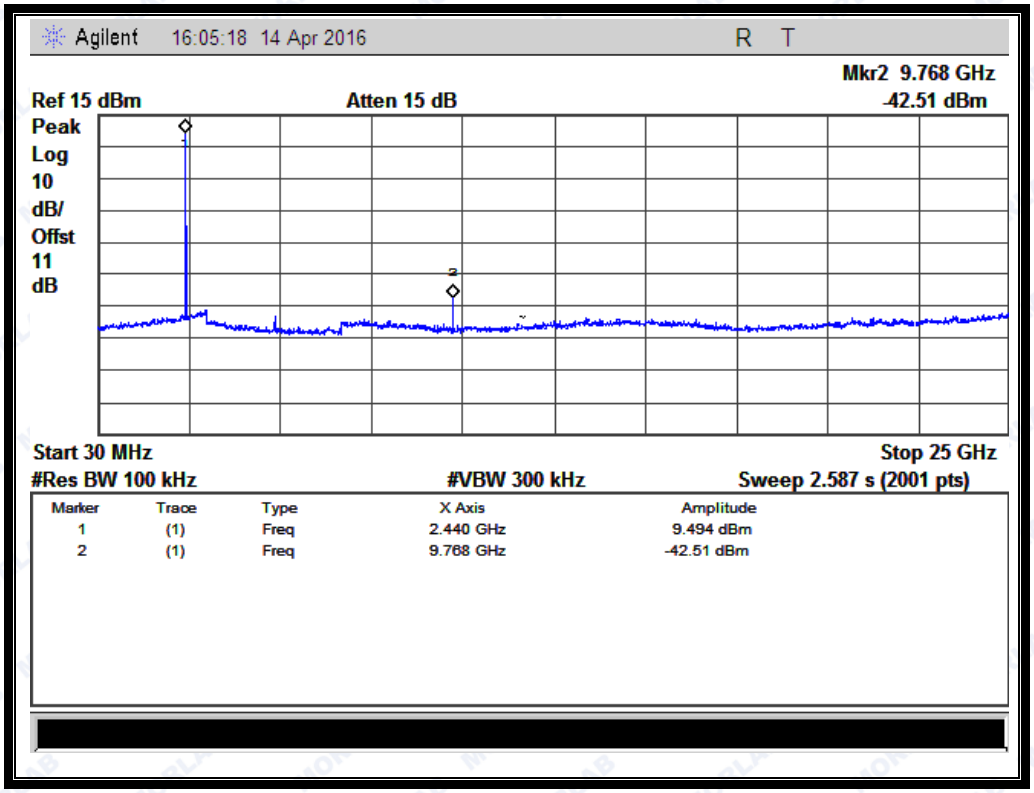
(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



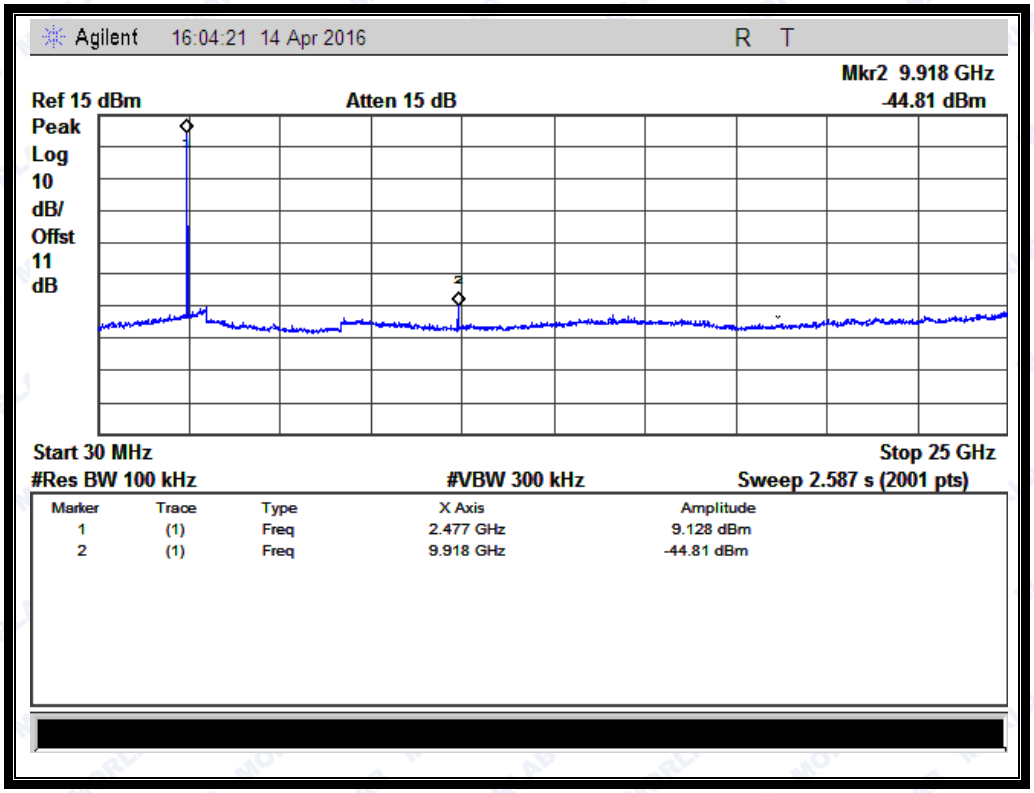
(Channel = 0, Band edge @ GFSK Mode)



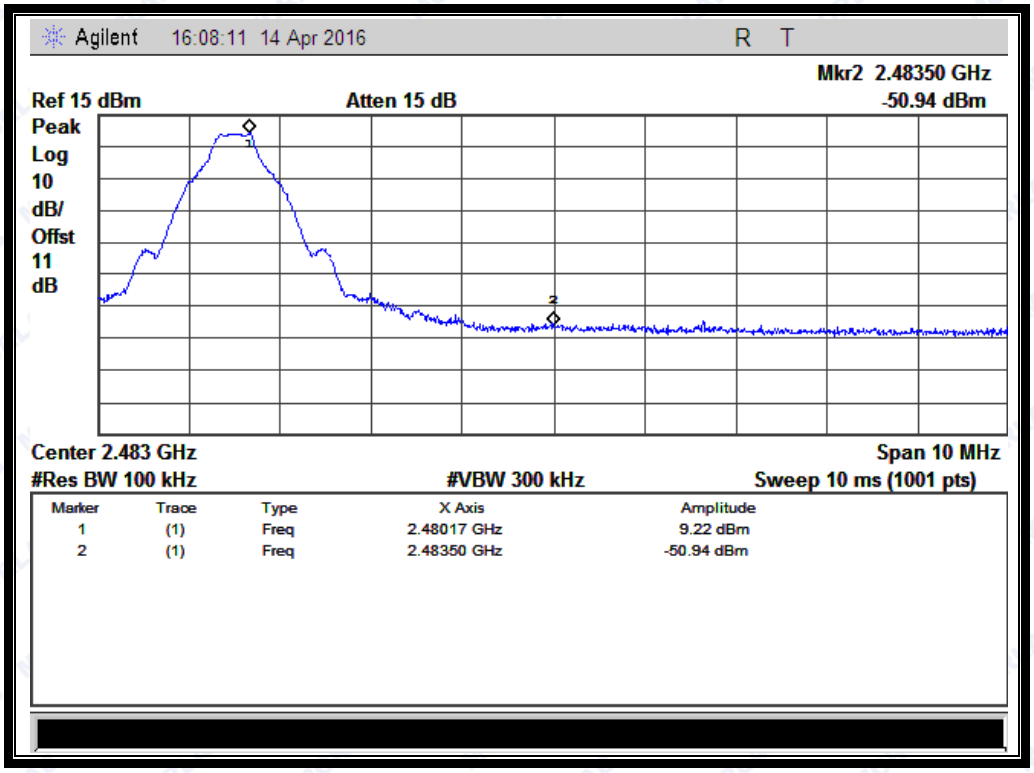
(Channel = 0, Band edge with hopping on @ GFSK Mode)



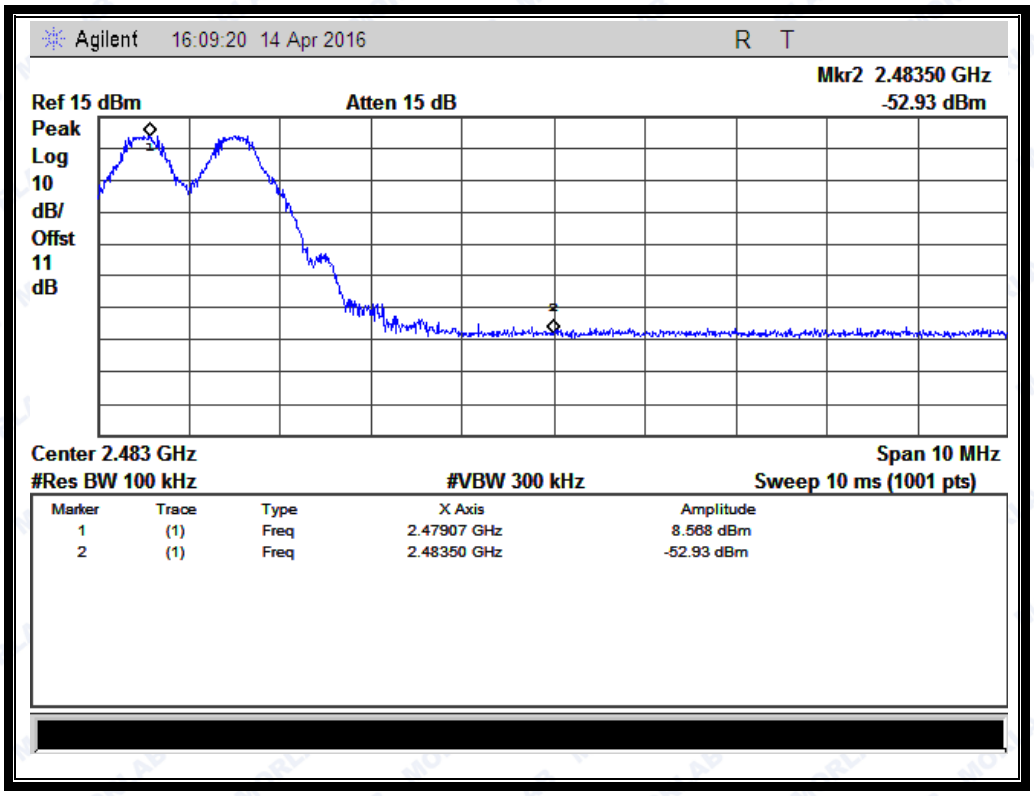
(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



(Plot C.1: Channel = 78, 30MHz to 25GHz @ GFSK Mode)



(Channel = 78, Band edge @ GFSK Mode)



(Channel = 78, Band edge with hopping on @ GFSK Mode)

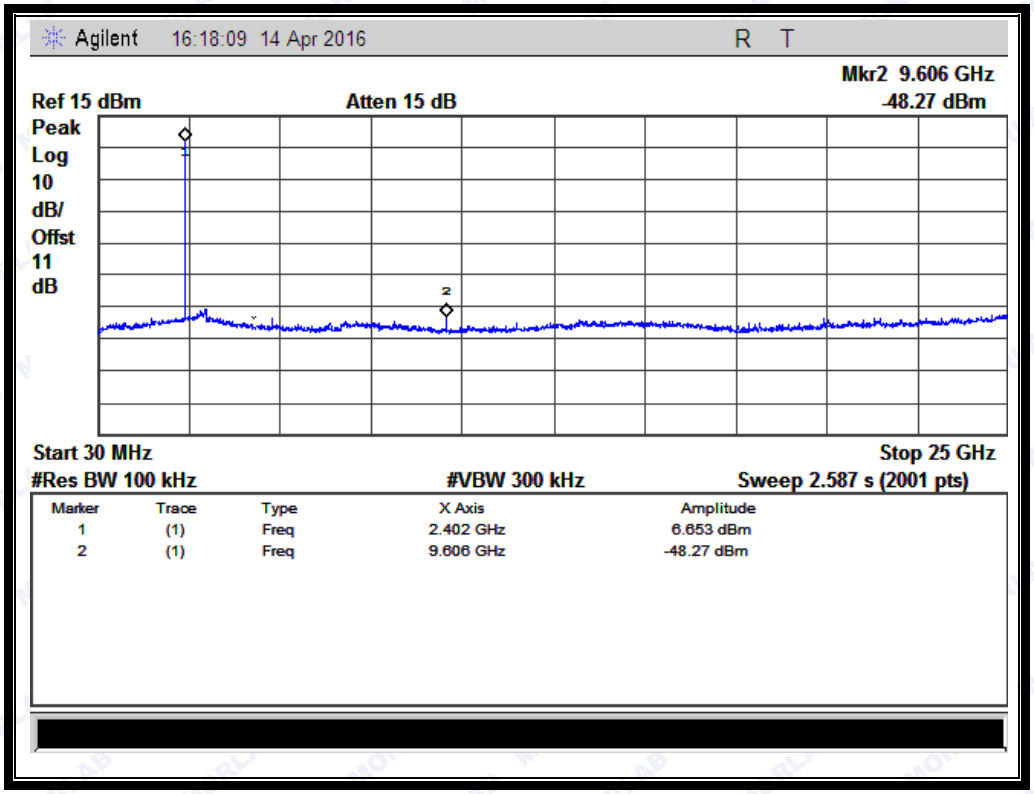
2.7.4.2 π/4-DQPSK Mode

A. Test Verdict:

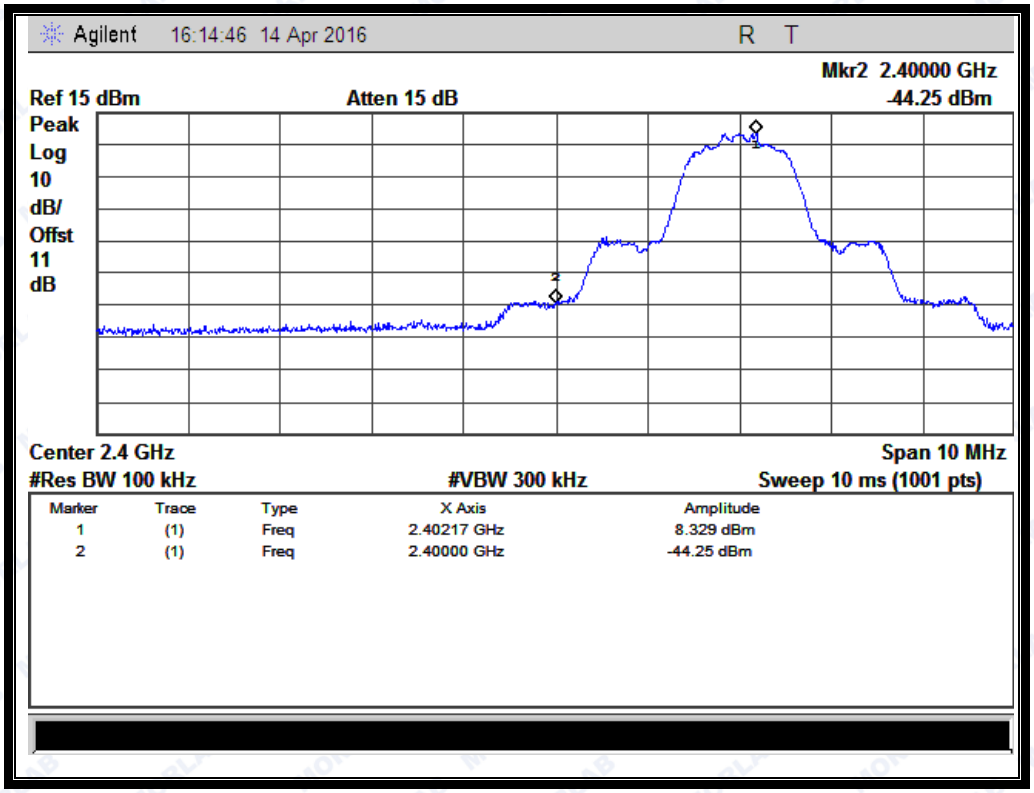
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-48.27	Plot D.1	6.65	-13.35	PASS
39	2441	-48.86	Plot E.1	5.24	-14.76	PASS
78	2480	-46.96	Plot F.1	4.05	-15.95	PASS

B. Test Plots:

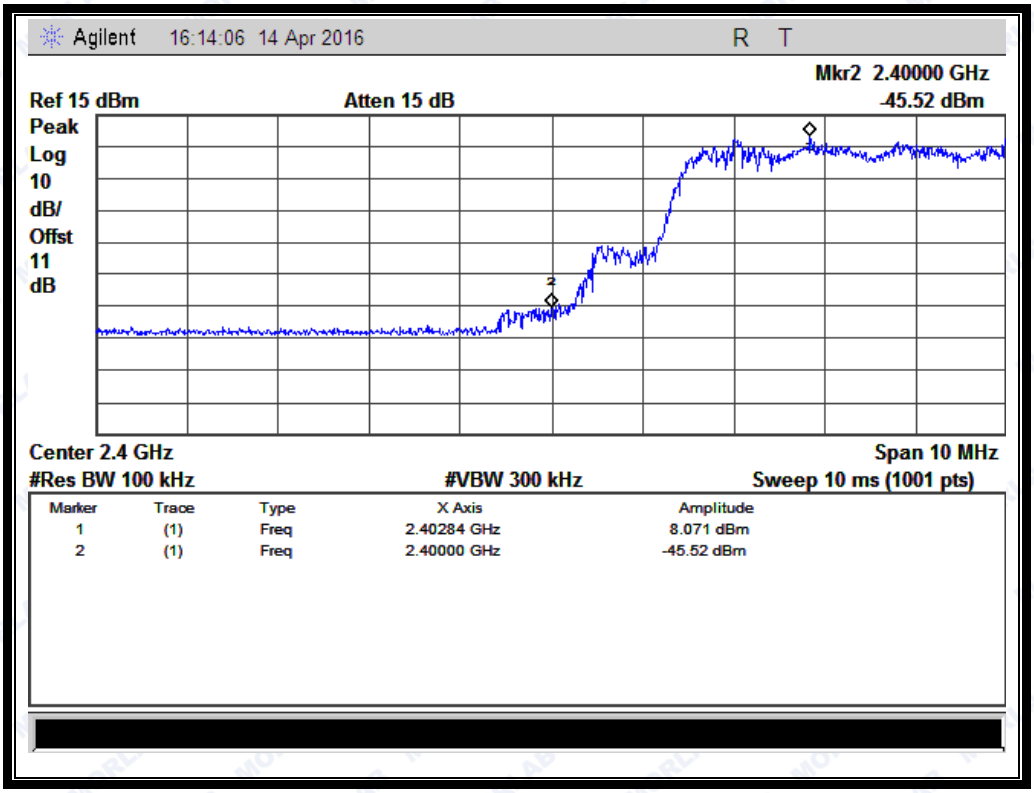
Note: the power of the Module transmitting frequency should be ignored.



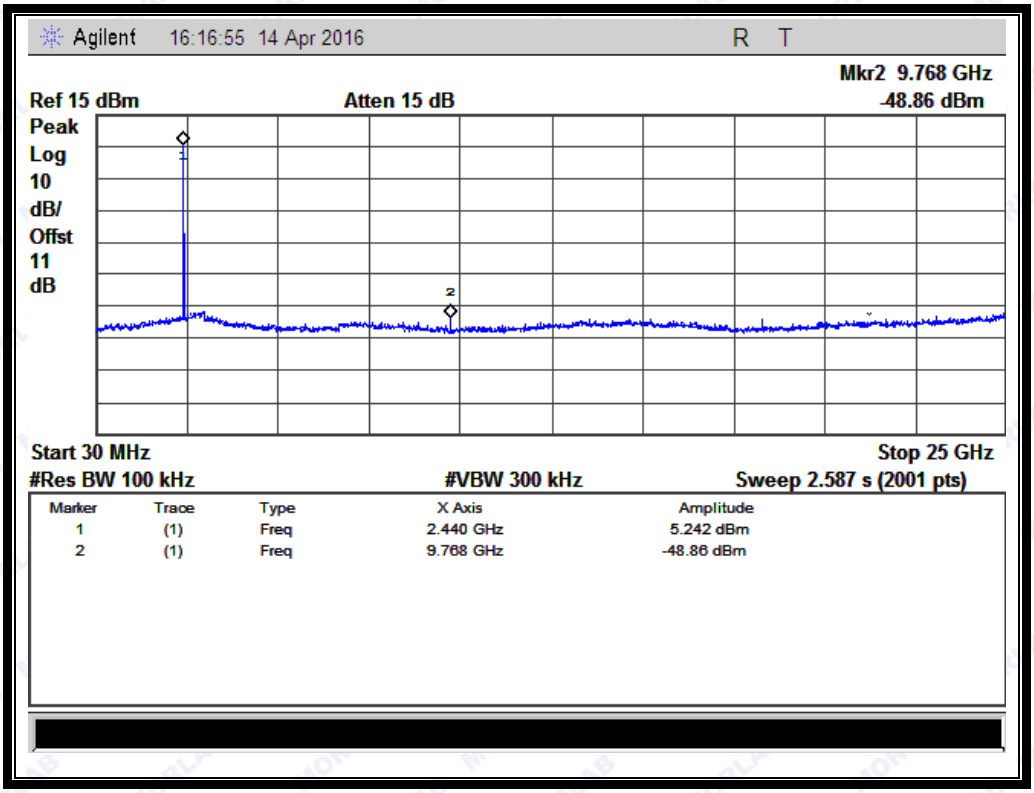
(Plot D.1: Channel = 0, 30MHz to 25GHz @π/4-DQPSK)



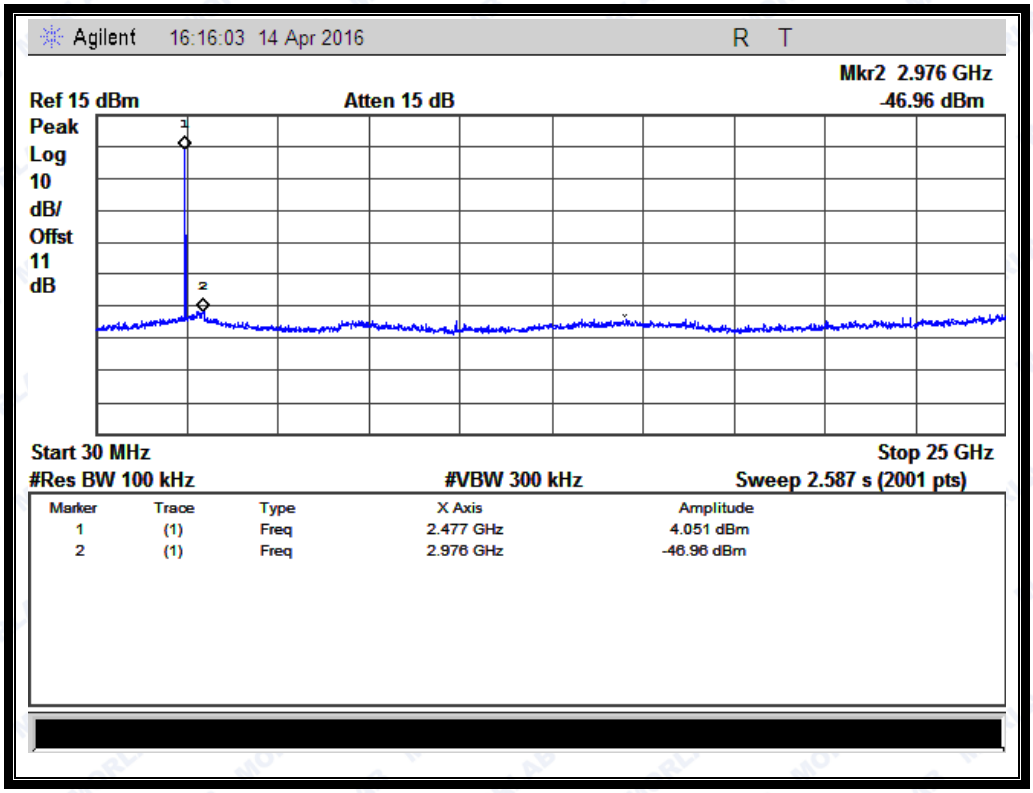
(Channel = 0, Band edge @π/4-DQPSK)



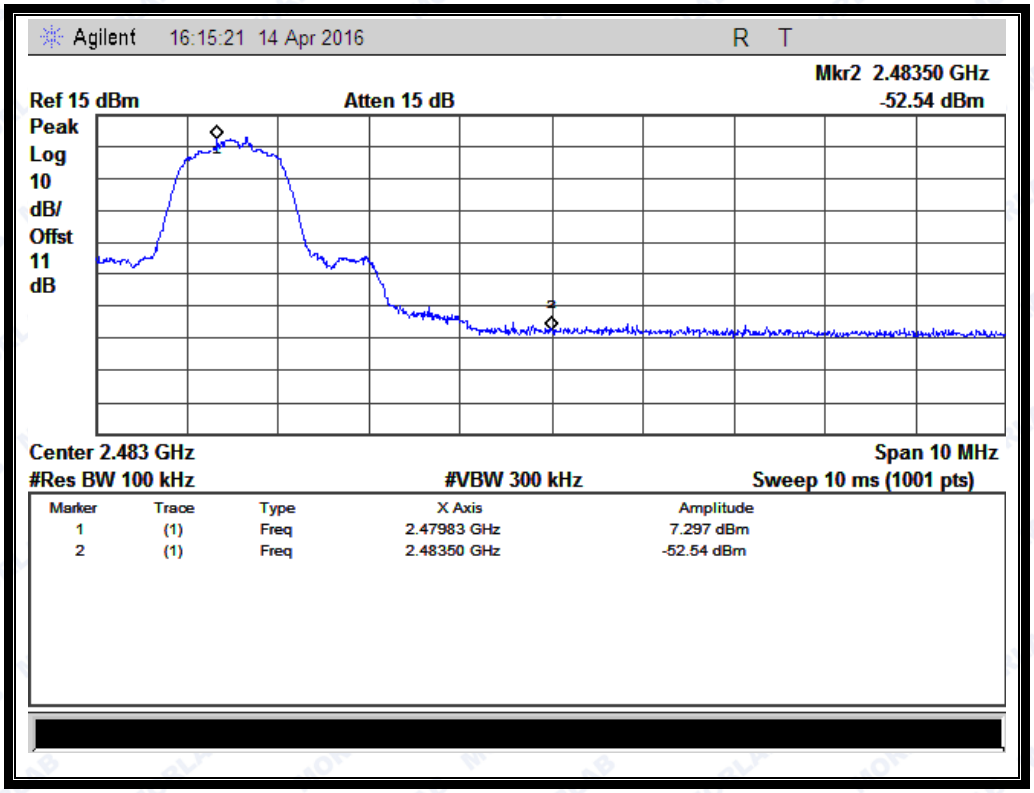
(Channel = 0, Band edge with hopping on @π/4-DQPSK)



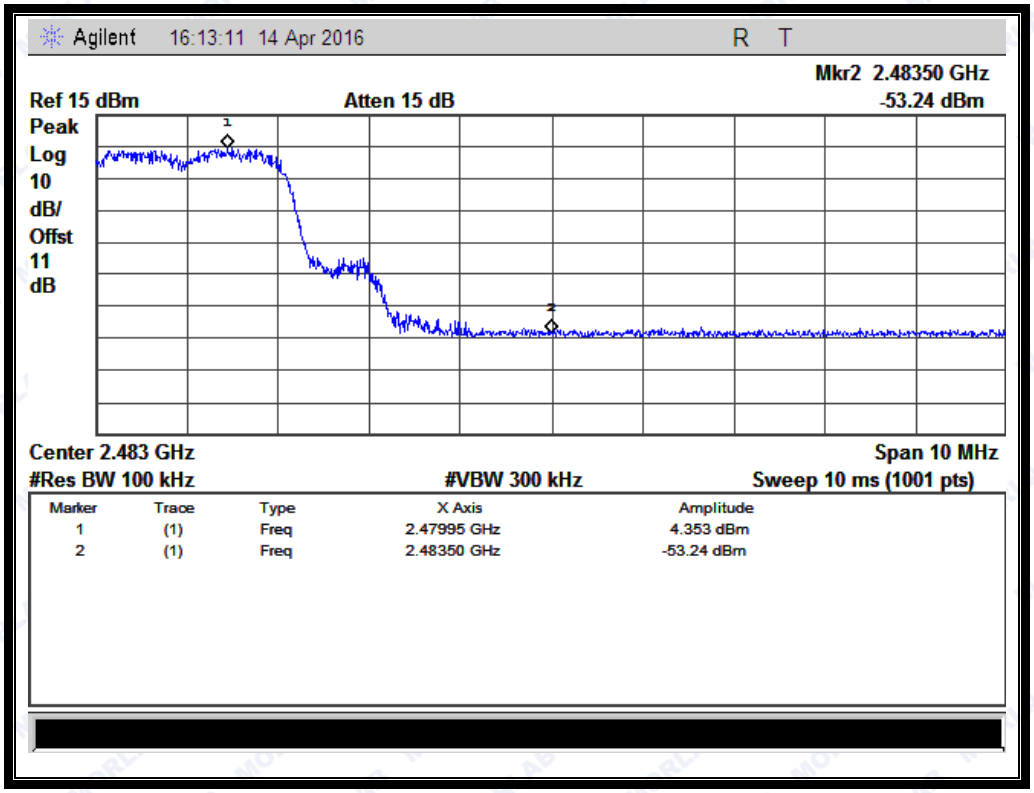
(Plot E.1: Channel = 39, 30MHz to 25GHz @ π/4-DQPSK)



(Plot F.1: Channel = 78, 30MHz to 25GHz @π/4-DQPSK)



(Channel = 78, Band edge @π/4-DQPSK)



(Channel = 78, Band edge with hopping on @ π/4-DQPSK)

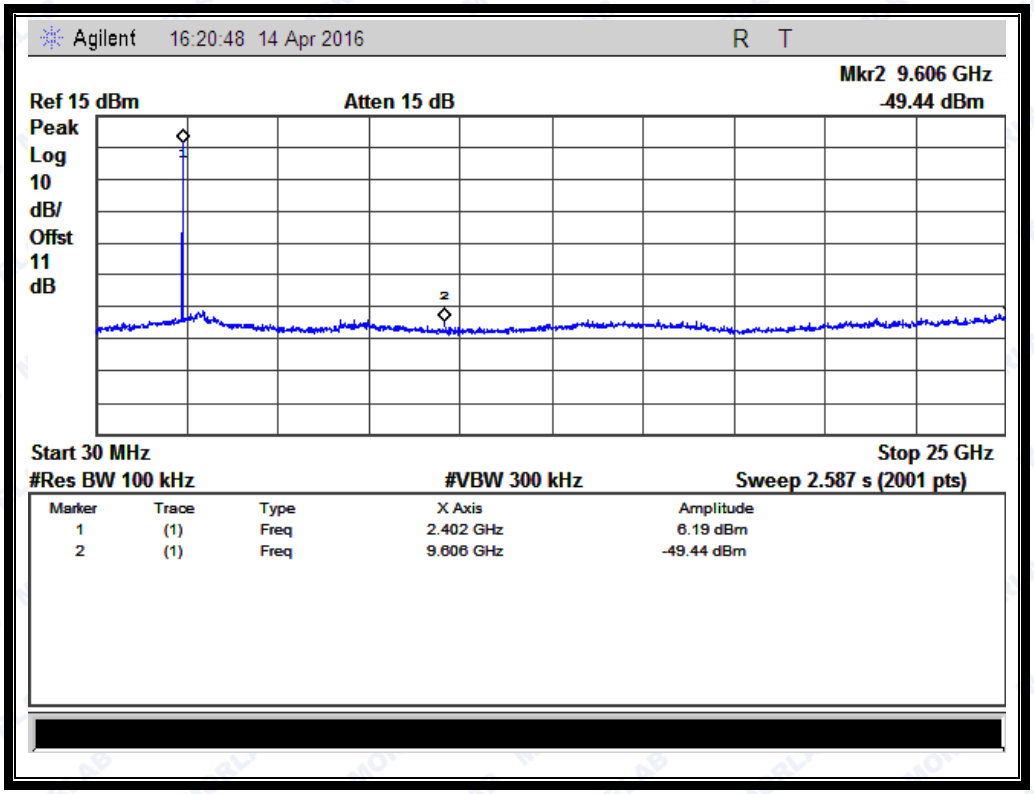
2.7.4.3 8-DPSK Mode

A. Test Verdict:

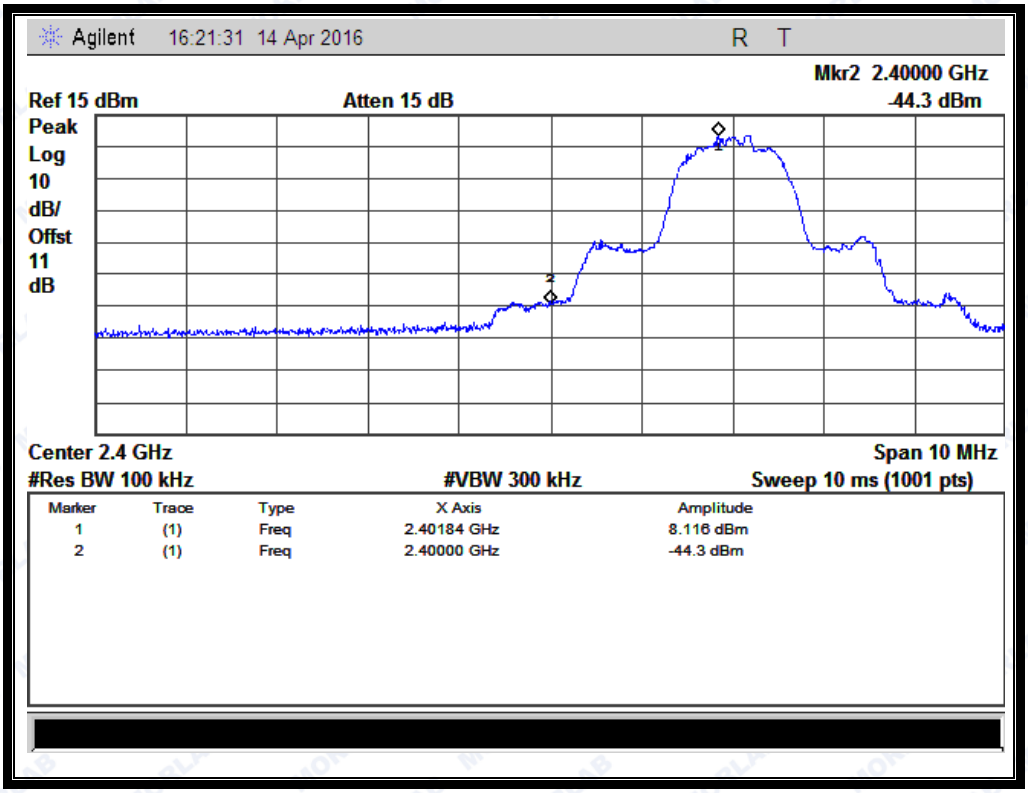
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-49.44	Plot G.1	6.19	-13.81	PASS
39	2441	-48.11	Plot H.1	2.82	-17.18	PASS
78	2480	-48.25	Plot I.1	4.51	-15.49	PASS

B. Test Plots:

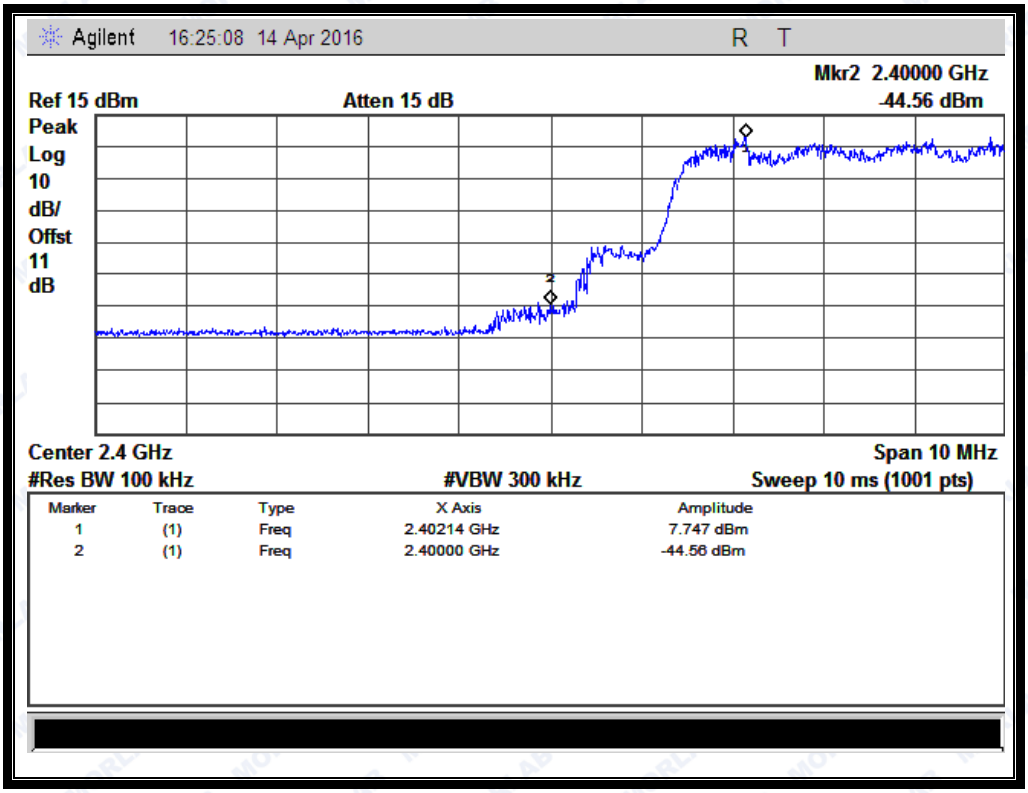
Note: the power of the Module transmitting frequency should be ignored.



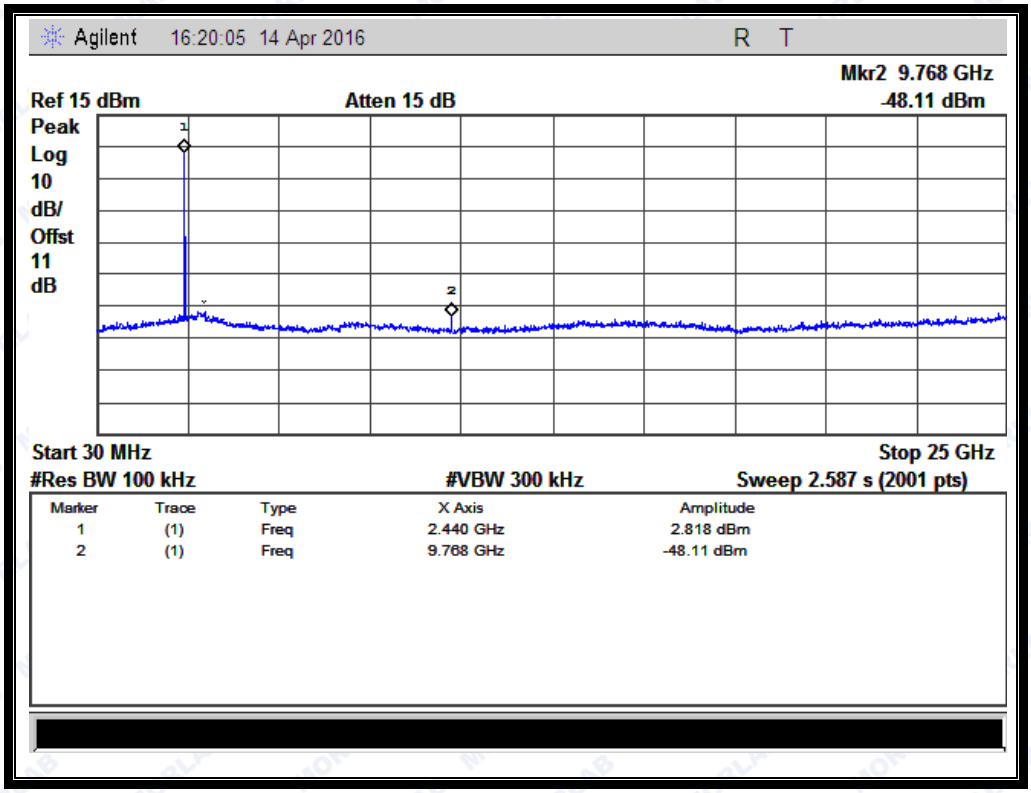
(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)



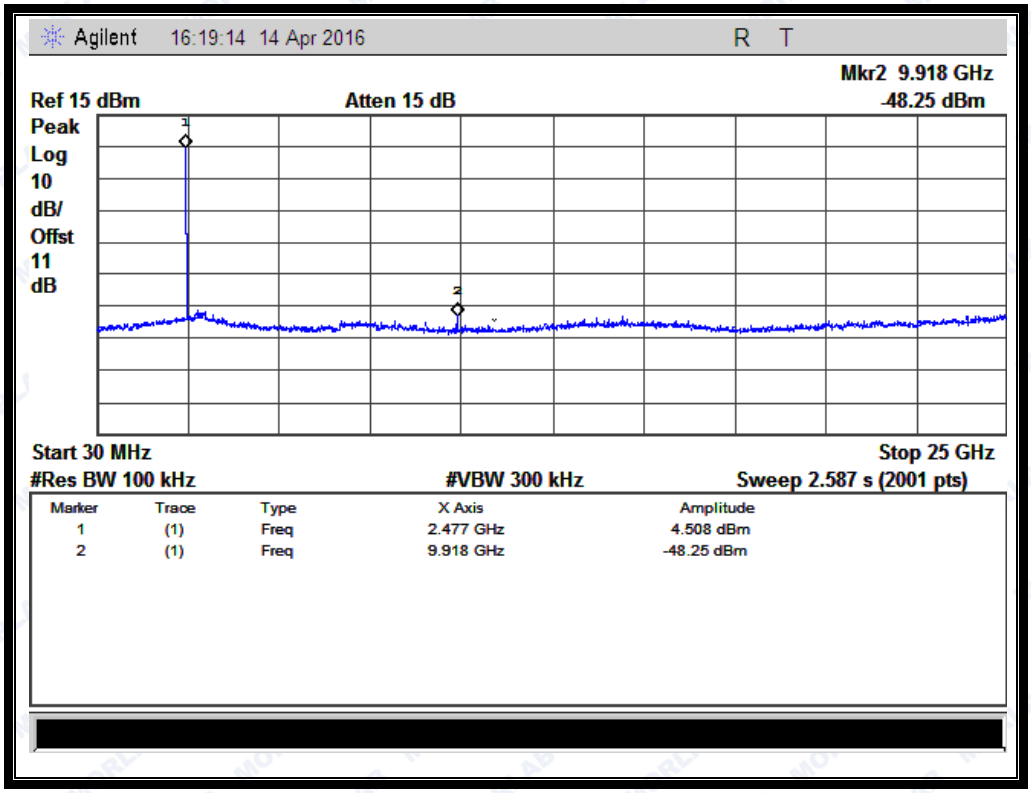
(Channel = 0, Band edge @ 8-DPSK)



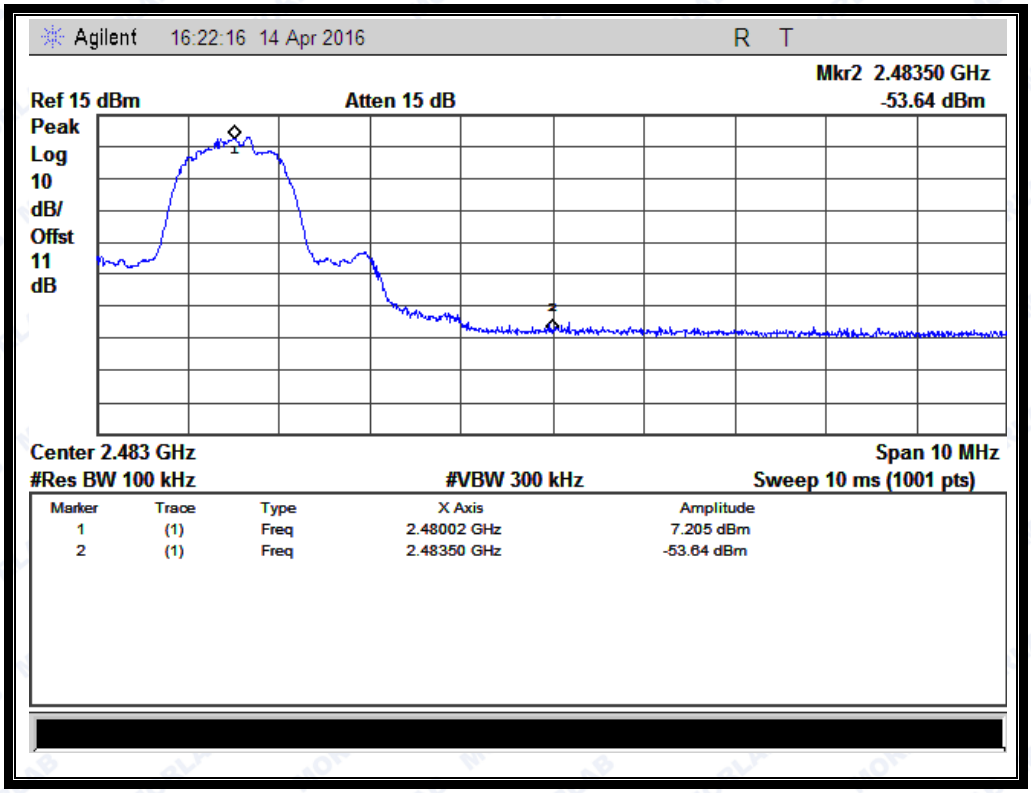
(Channel = 0, Band edge with hopping on @ 8-DPSK)



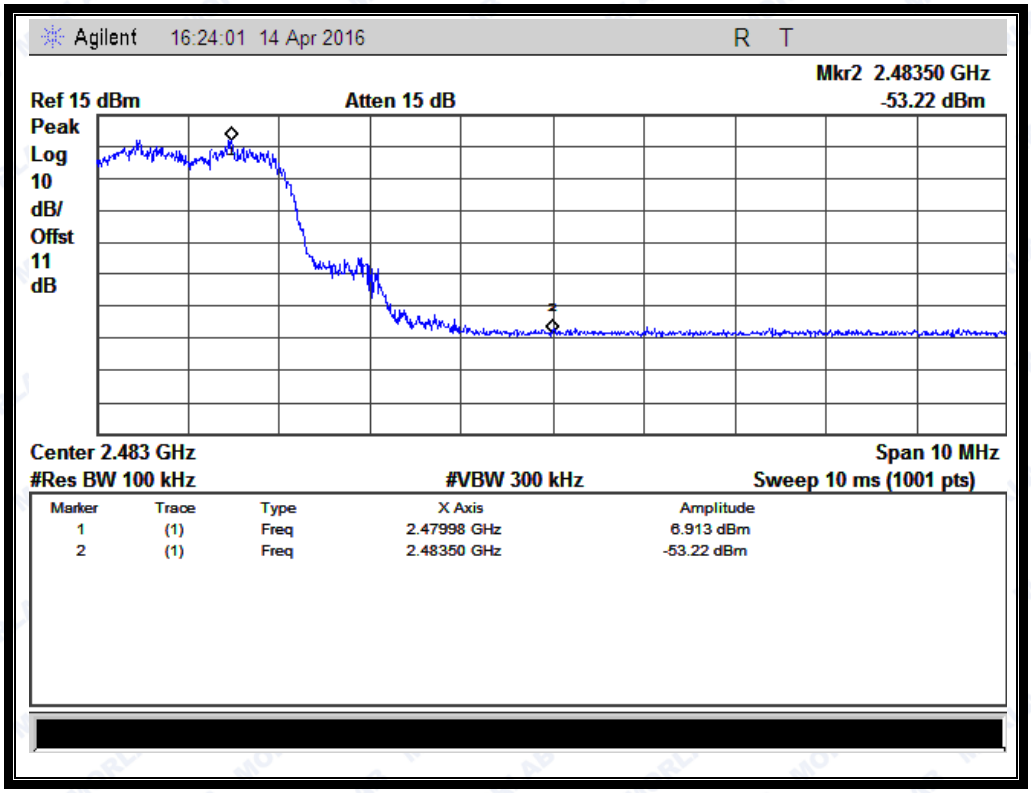
(Plot H.1: Channel = 39, 30MHz to 25GHz @ 8-DPSK)



(Plot I.1: Channel = 78, 30MHz to 25GHz @ 8-DPSK)



(Plot I.1: Channel = 78, Band edge @ 8-DPSK)



(Plot I.1: Channel = 78, Band edge with hopping on @ 8-DPSK)

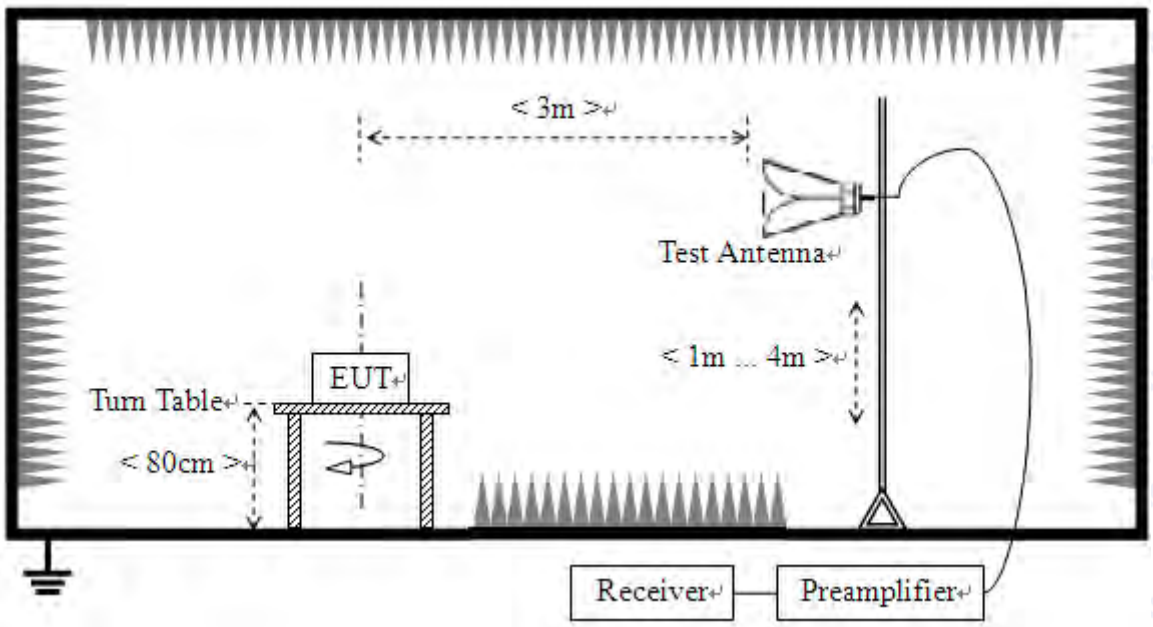
2.8 Restricted Frequency Bands

2.8.1 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, 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 in 15.209(a).

2.8.2 Test Description

A. Test Setup:



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

B. Equipments List:

Please reference ANNEX A(1.5).

2.8.3 Test Procedure

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1GHz, 100 KHz for f < 1GHz
VBW = 3 MHz for peak and 10Hz for average
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize.

2.8.4 Test Result

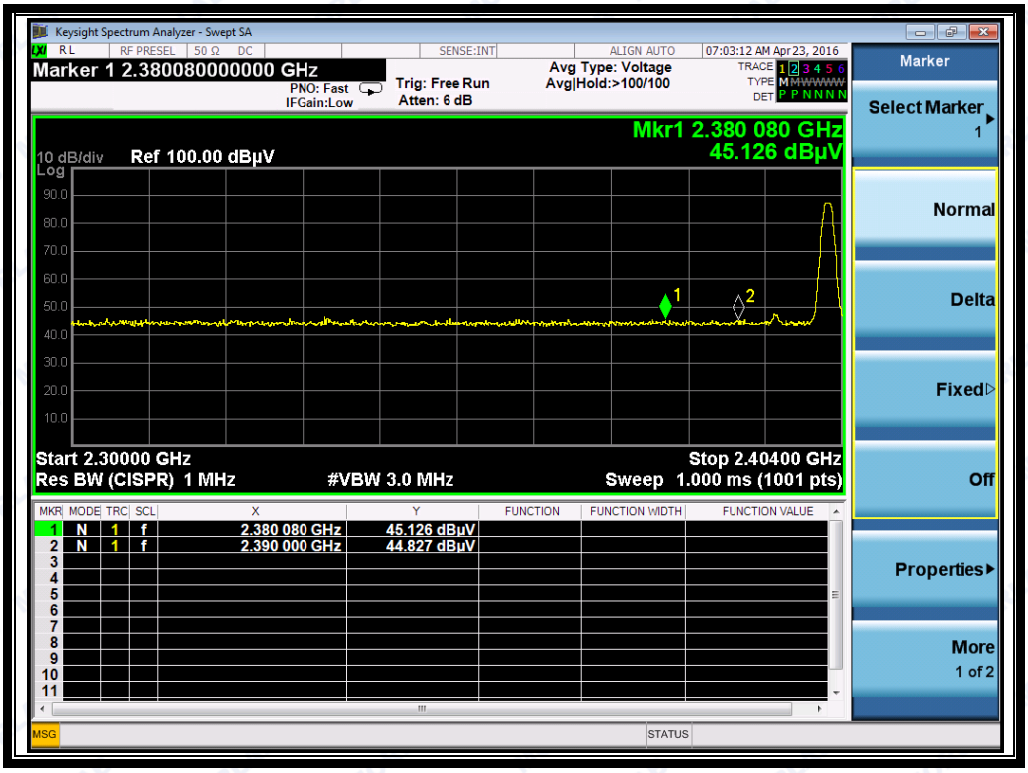
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; AT =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
AT: Total correction Factor except Antenna
UR: Receiver Reading
Gpreamp: Preamplifier Gain
AFactor: Antenna Factor at 3m
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

2.8.4.1 GFSK Mode

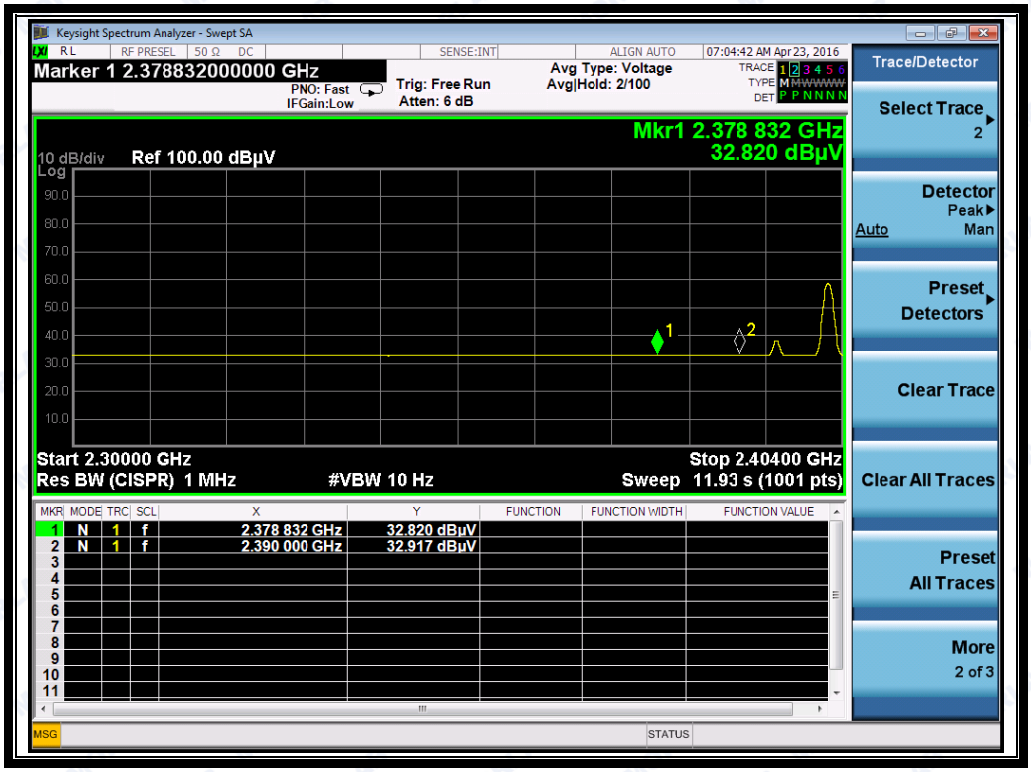
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2380.08	PK	45.13	-33.63	32.56	44.06	74	Pass
0	2378.83	AV	32.82	-33.63	32.56	31.75	54	Pass
78	2484.30	PK	44.94	-33.18	32.50	44.26	74	Pass
78	2484.85	AV	32.94	-33.18	32.50	32.26	54	Pass

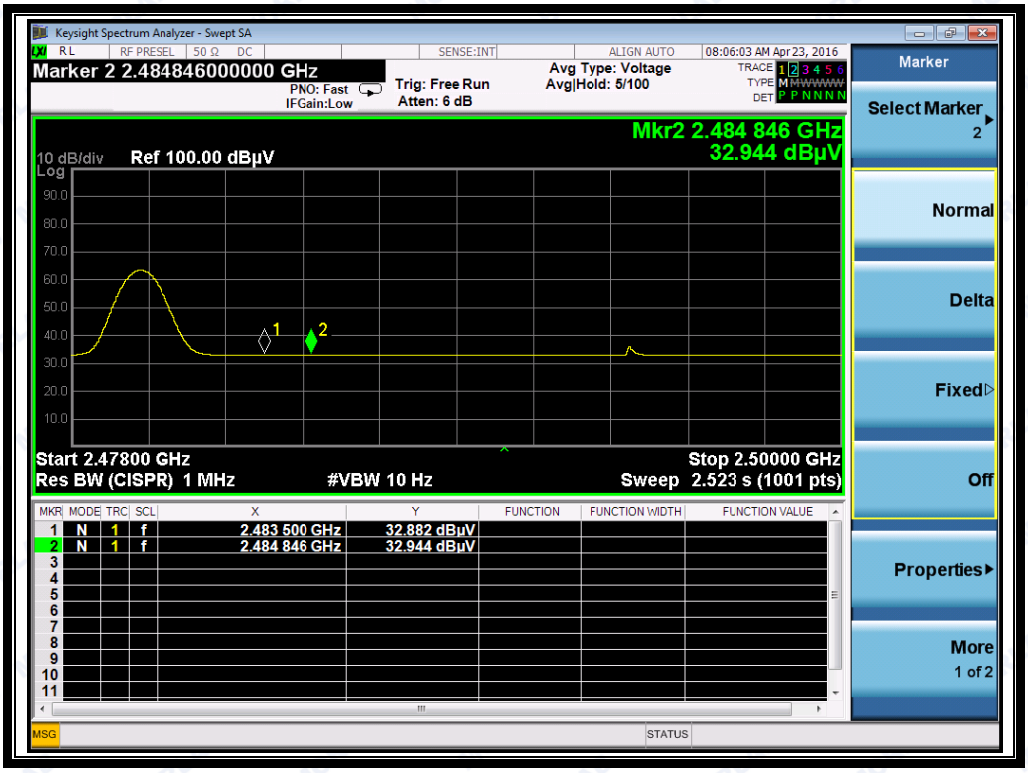
B. Test Plots:



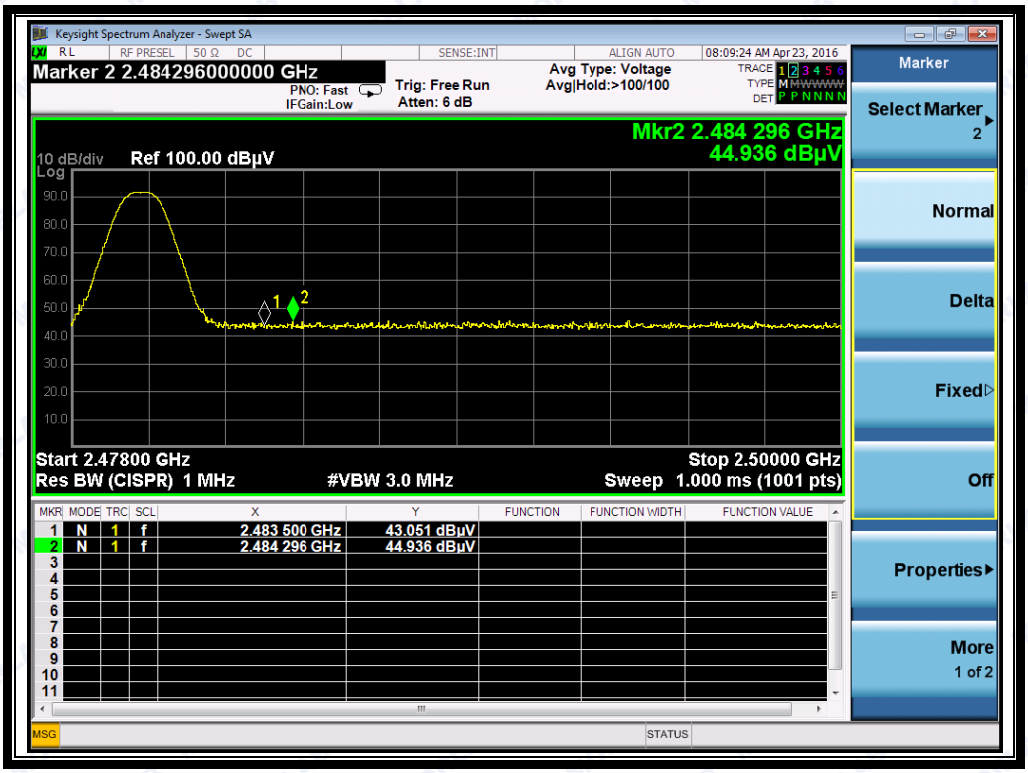
(Plot A1:Channel = 0 PEAK @ GFSK)



(Plot A2:Channel = 0 AVERAGE @ GFSK)



(Plot B1: Channel = 78 PEAK @ GFSK)



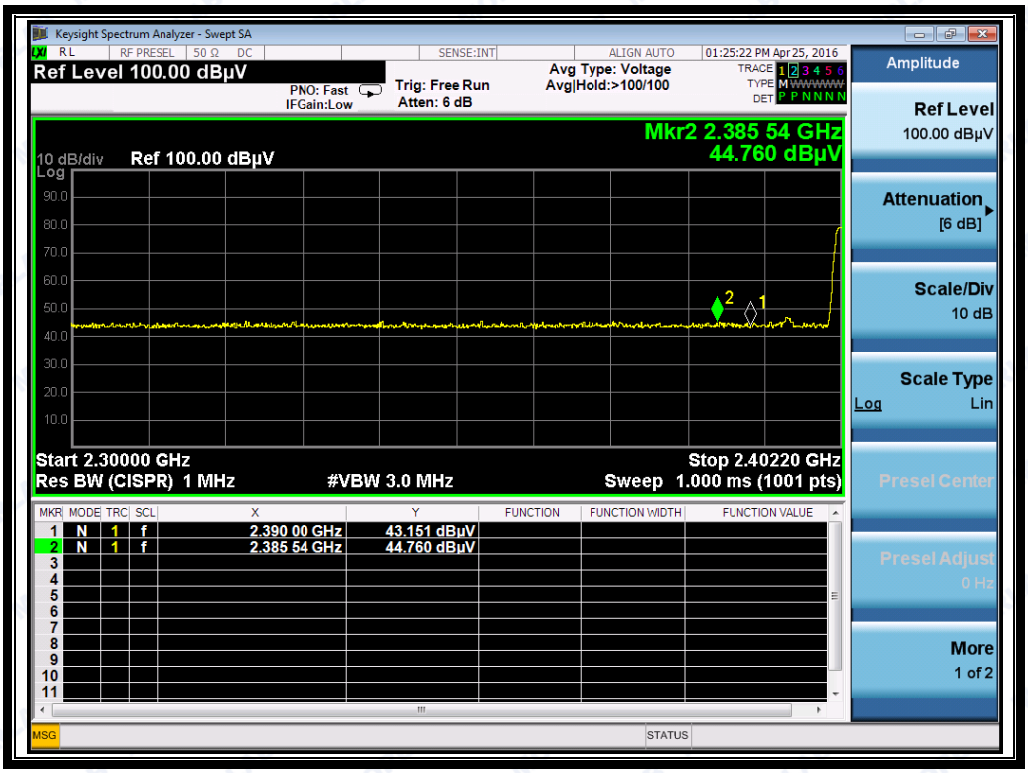
(Plot B2: Channel = 78 AVERAGE @ GFSK)

2.8.4.2 π/4-DQPSK Mode

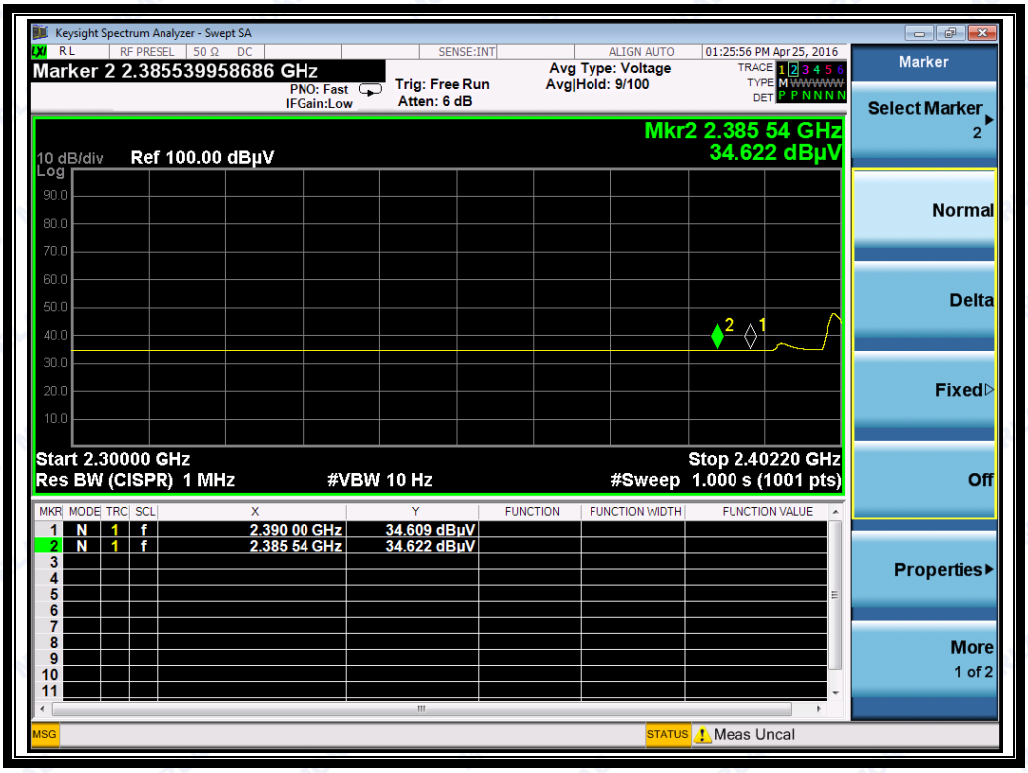
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2385.54	PK	44.76	-33.63	32.56	43.69	74	Pass
0	2385.54	AV	34.62	-33.63	32.56	33.55	54	Pass
78	2484.30	PK	44.64	-33.18	32.5	43.96	74	Pass
78	2484.67	AV	33.22	-33.18	32.5	32.54	54	Pass

B. Test Plots:

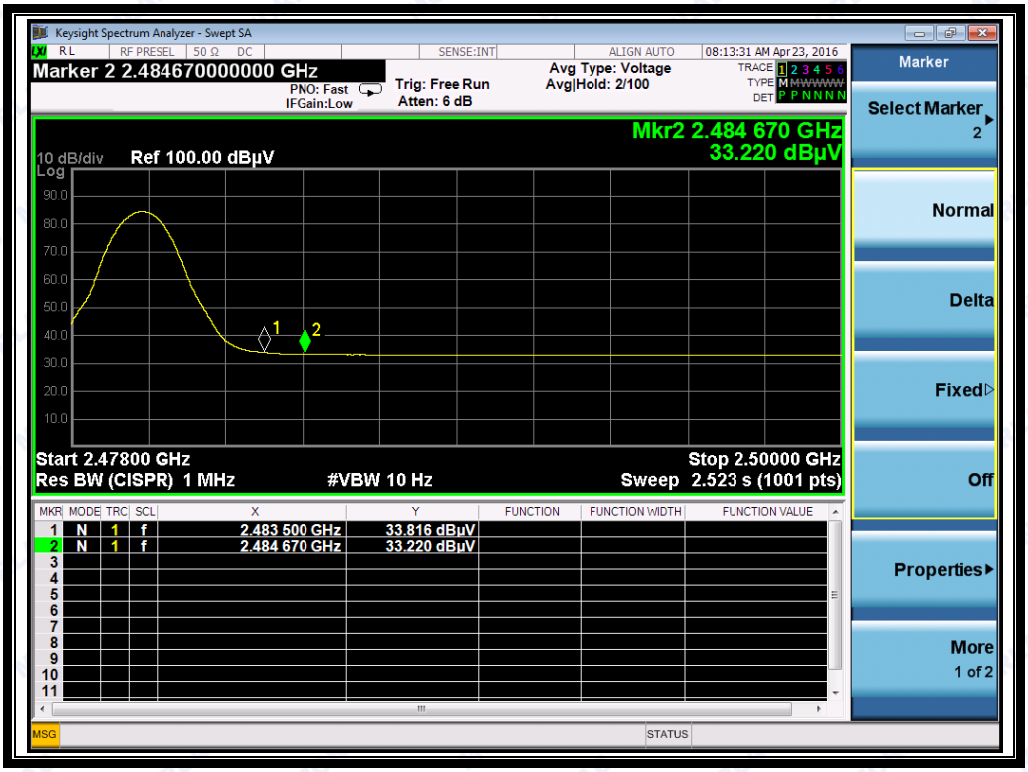


(Plot C1: Channel = 0 PEAK @ π/4-DQPSK)



(Plot C2: Channel = 0 AVERAGE @ π/4-DQPSK)

(Plot D1: Channel = 78 PEAK @ π/4-DQPSK)



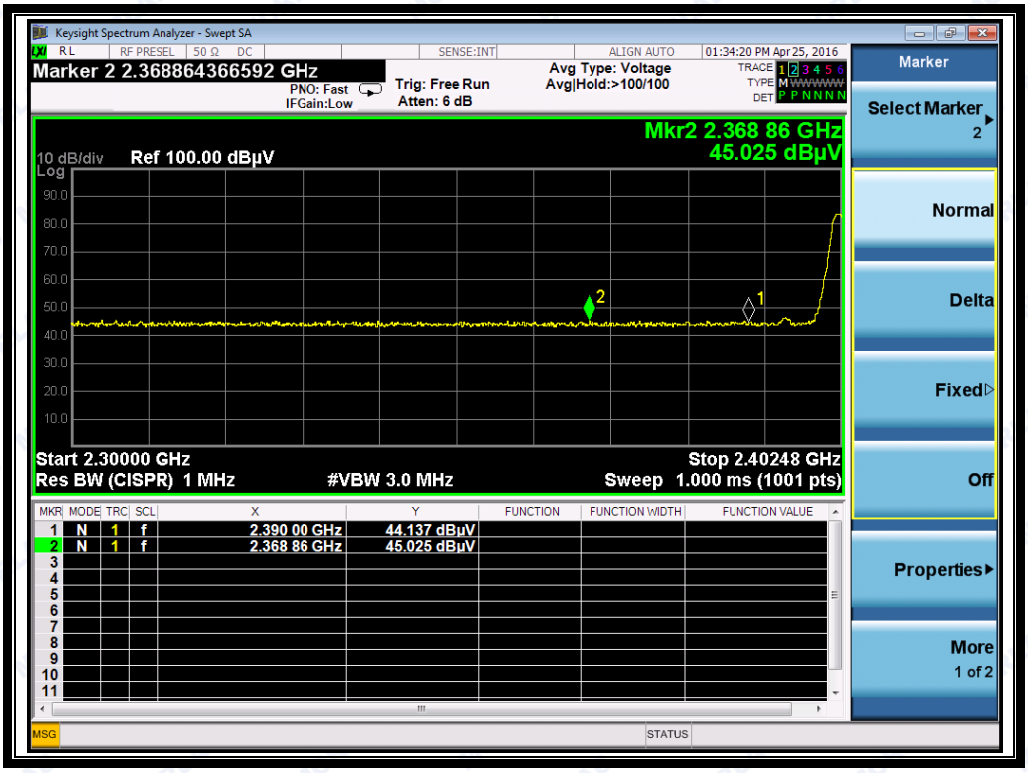
(Plot D2: Channel = 78 AVERAGE@ π/4-DQPSK)

2.8.4.3 8-DPSK Mode

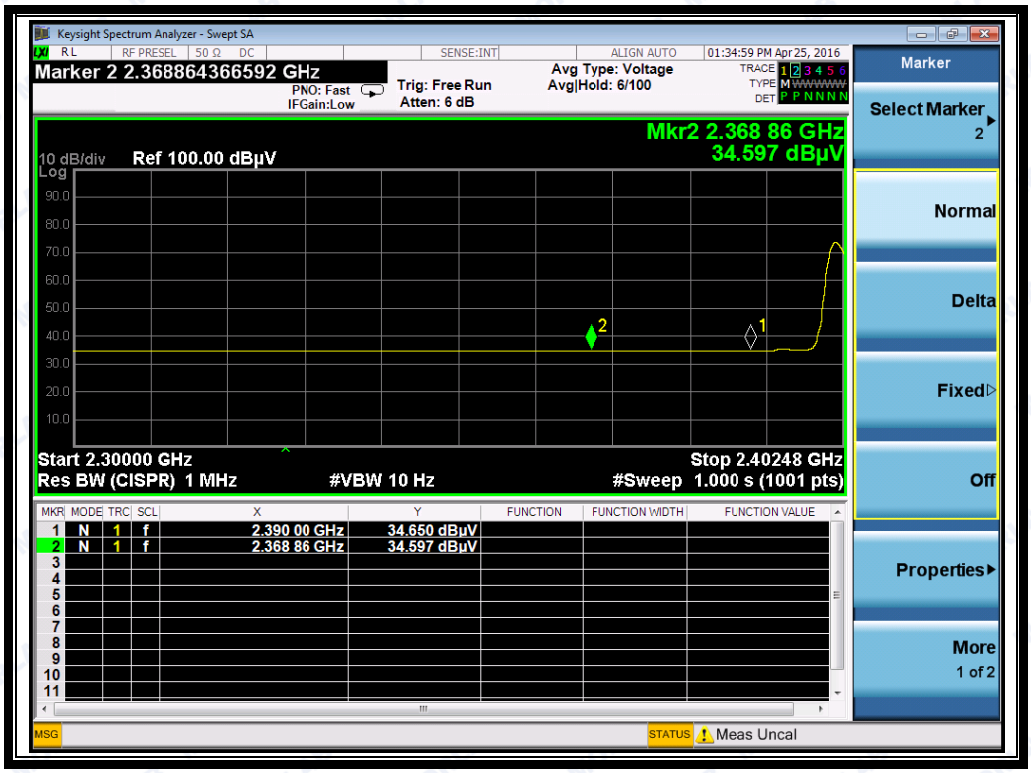
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2368.86	PK	45.03	-33.63	32.56	43.96	74	Pass
0	2368.86	AV	34.60	-33.63	32.56	33.53	54	Pass
78	2484.41	PK	43.44	-33.18	32.5	42.76	74	Pass
78	2484.58	AV	33.28	-33.18	32.5	32.60	54	Pass

B. Test Plots:

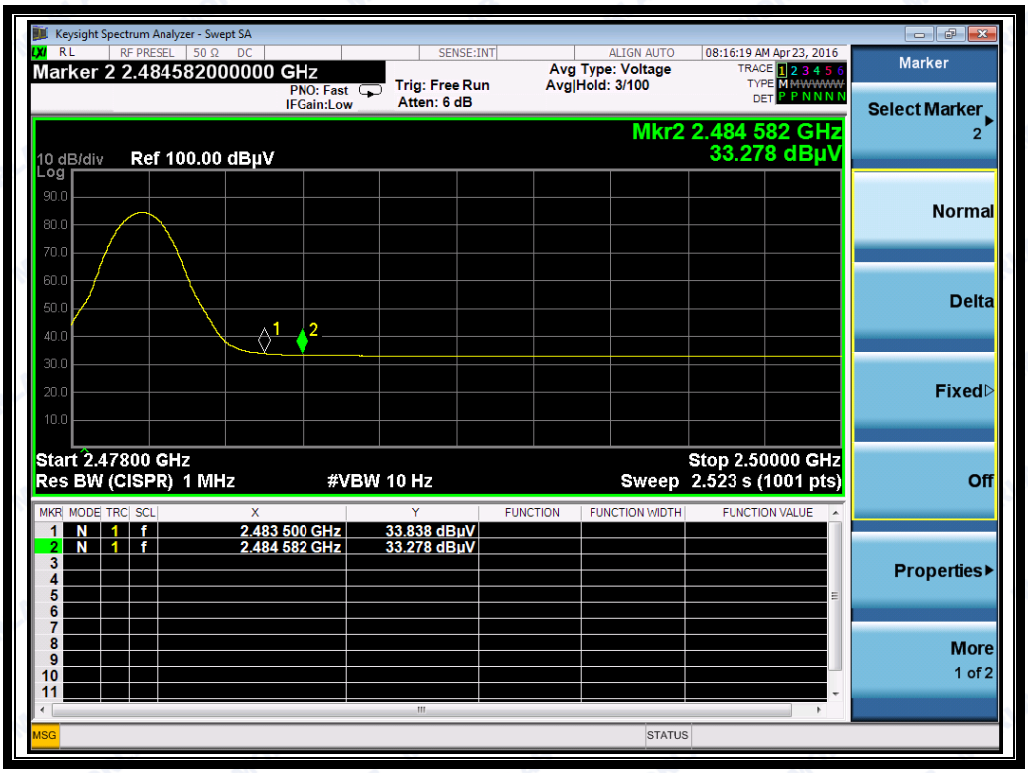


(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



(Plot E2: Channel = 0 AVERAGE @ 8-DPSK Mode)

(Plot F1:Channel = 78 PEAK @ 8-DPSK Mode)



(Plot F2:Channel = 78 AVERAGE @ 8-DPSK Mode)

2.9 Conducted Emission

2.9.1 Requirement

According FCC 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

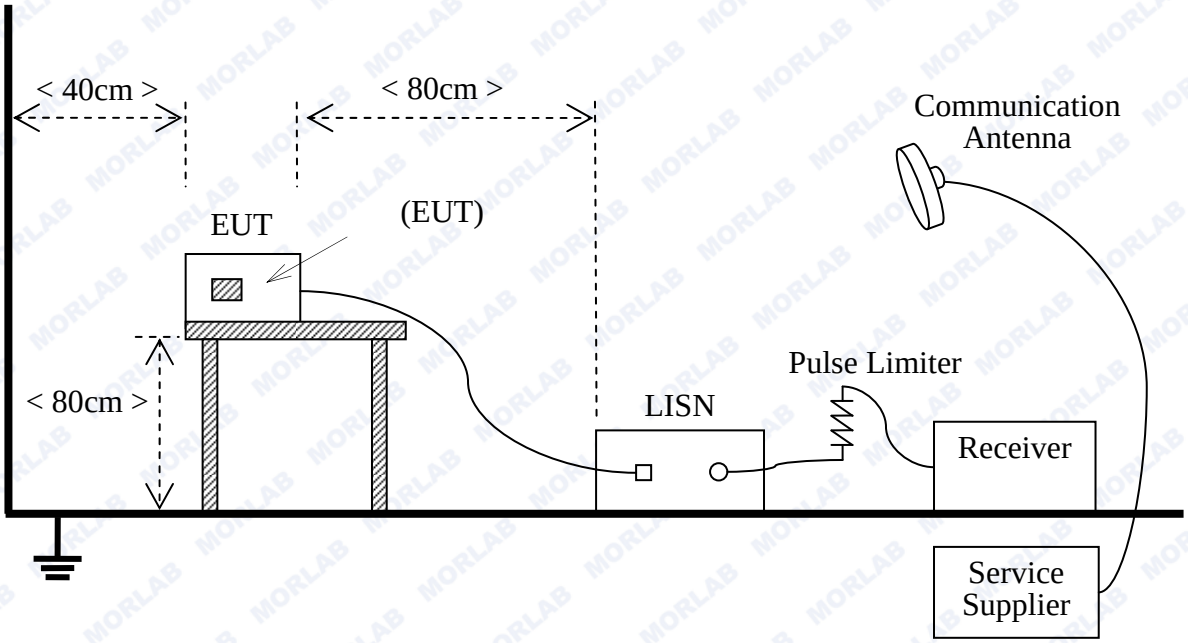
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.9.2 Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2014

The factors of the site are calibrated to correct the reading. During the measurement, the Bluetooth EUT is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at

maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

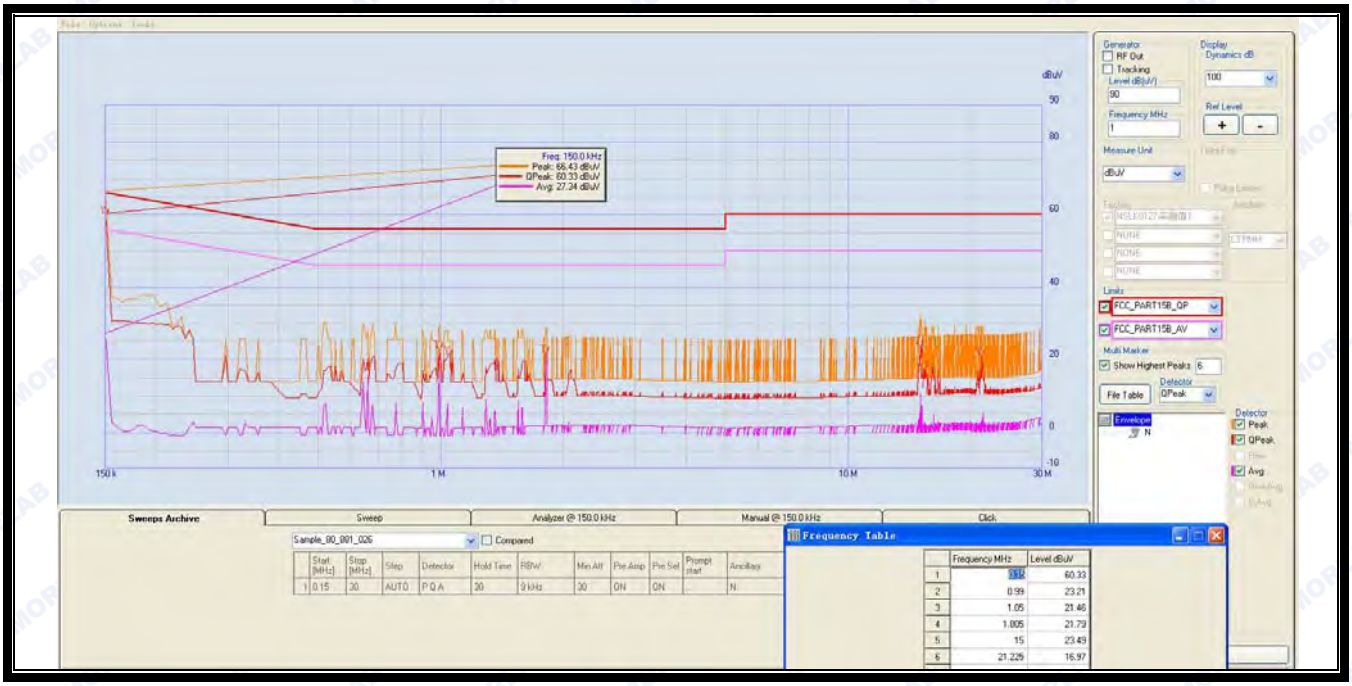
2.9.3 Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

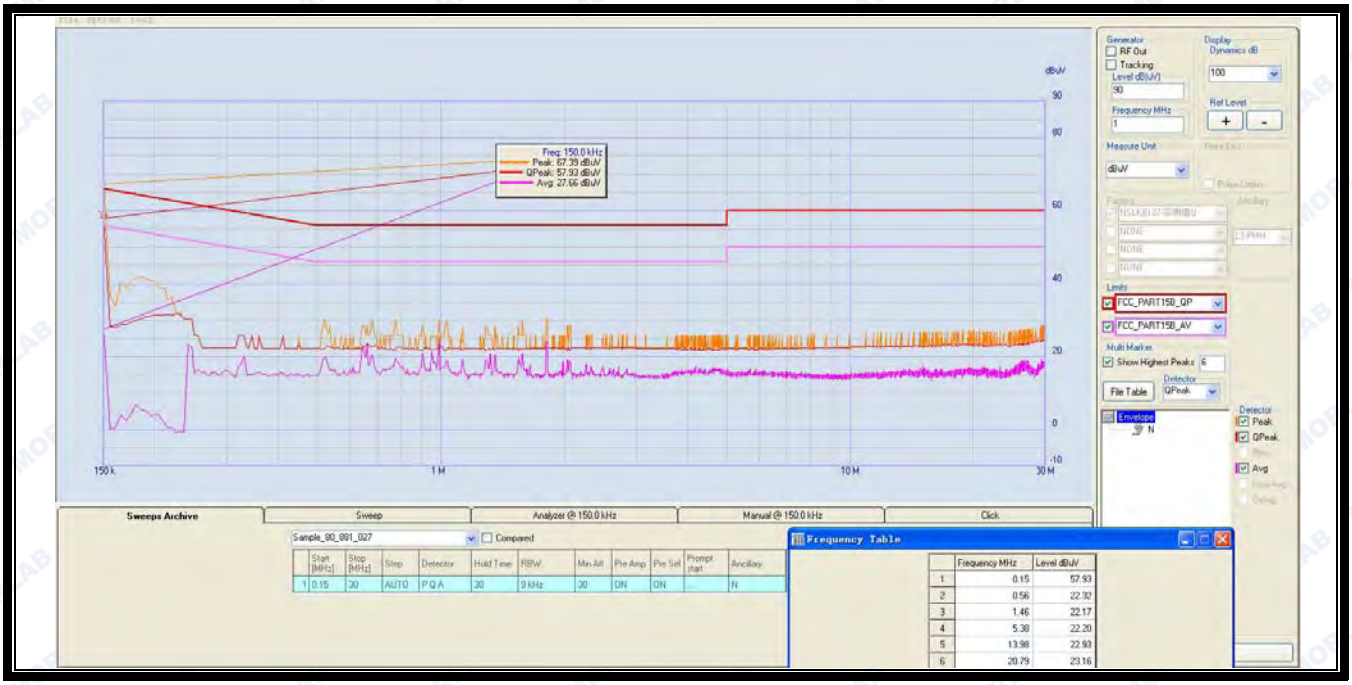
A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

2.10 Radiated Emission

2.10.1 Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

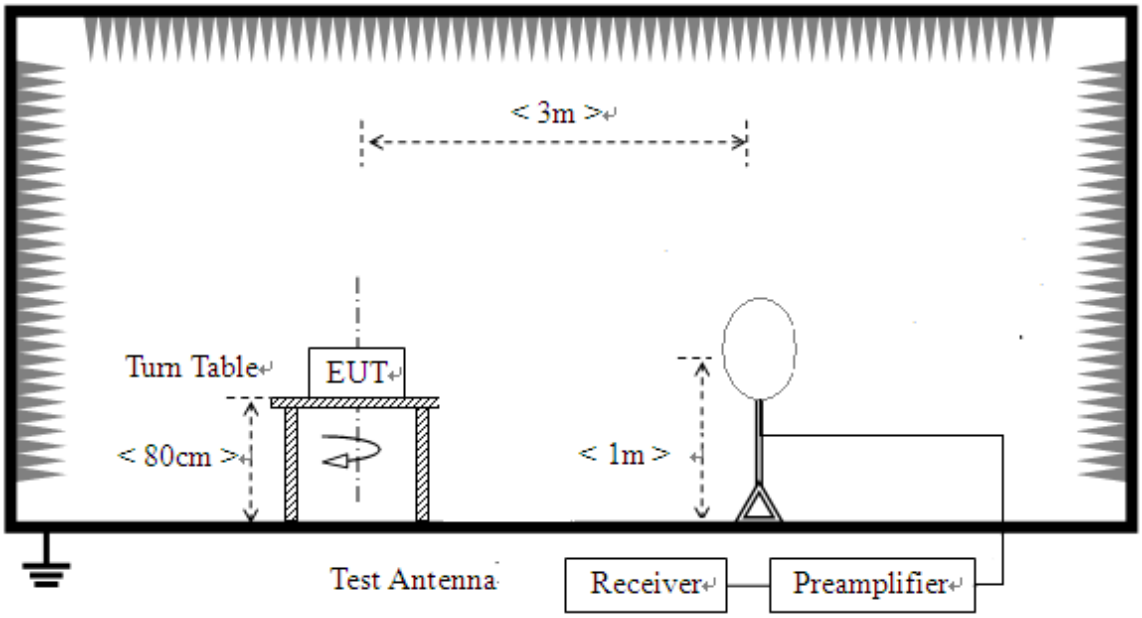
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

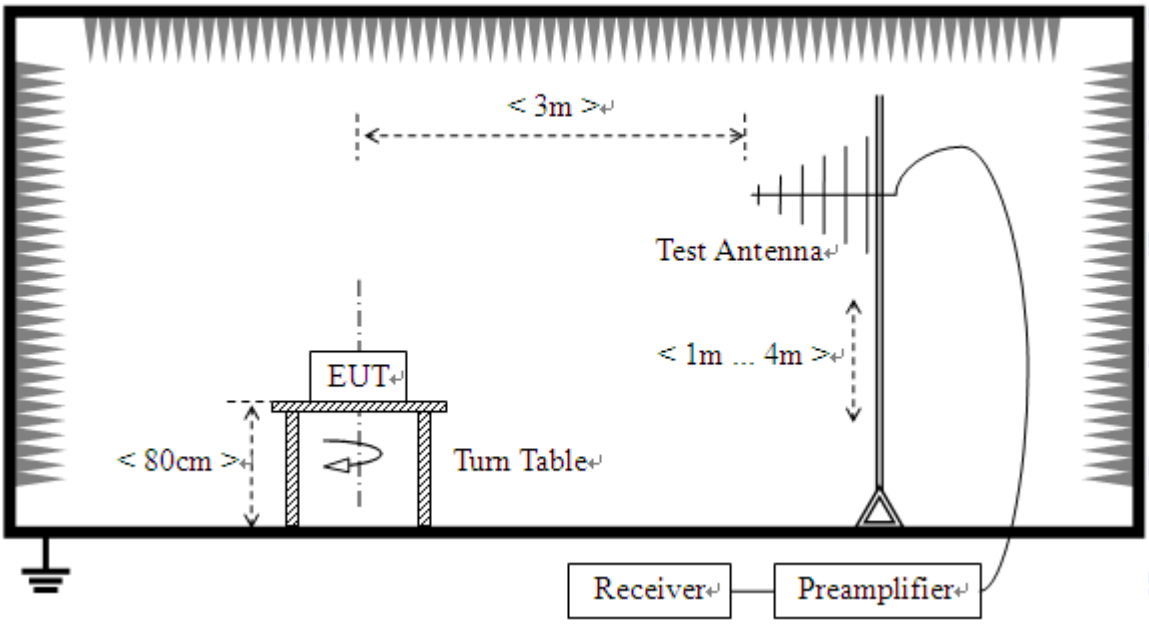
2.10.2 Test Description

A. Test Setup:

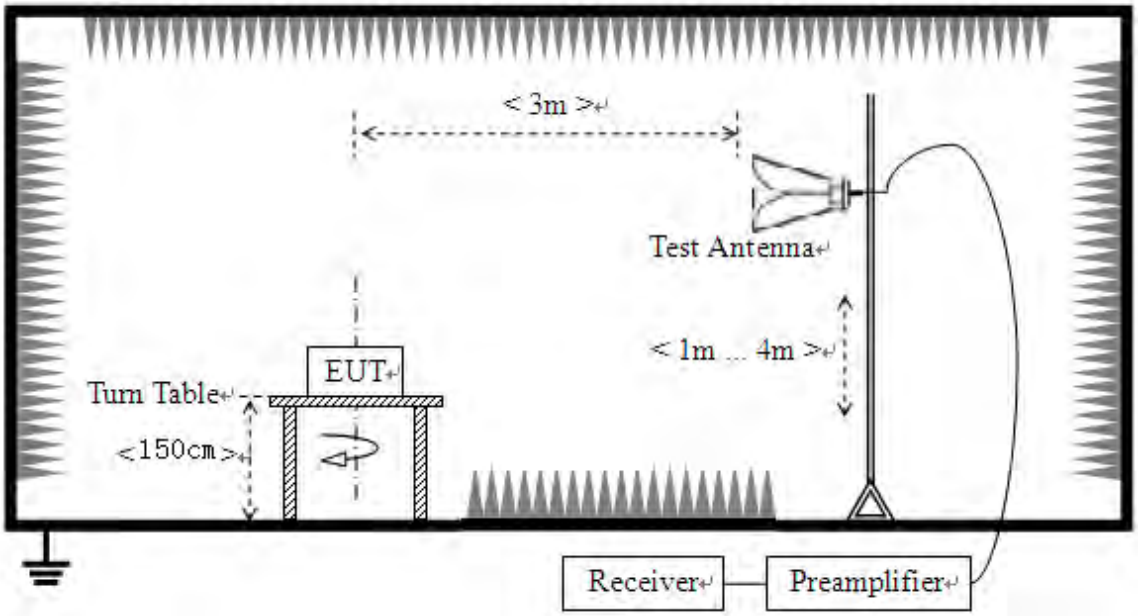
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz,The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Please reference ANNEX A(1.5).

2.10.3 Test Procedure

Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

2.10.4 Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

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 reported.

2.10.4.1 GFSK Mode：

A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0

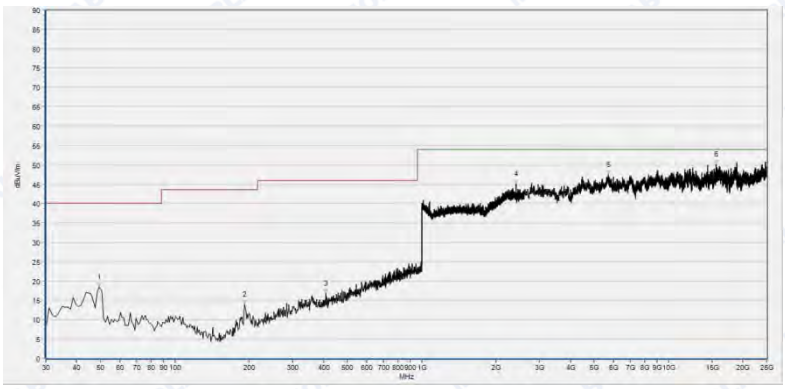
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.446	19.71	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
189.080	20.32	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
268.620	31.50	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2450.180	44.46	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
6970.831	48.55	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15688.052	50.19	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)

Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
84.320	23.39	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
174.530	19.76	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
288.994	18.74	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2160.144	45.14	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
4575.632	46.69	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
9056.447	49.09	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

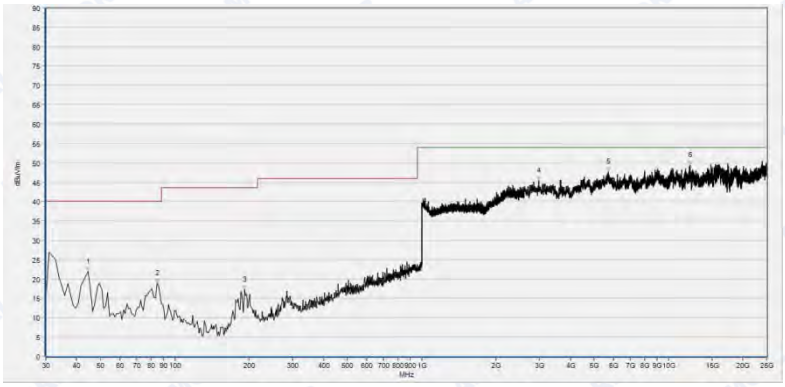
(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 0)

Plot for Channel = 39



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	18.39	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
191.990	13.92	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
409.270	16.75	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2414.966	45.14	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5708.056	47.43	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15606.583	50.05	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

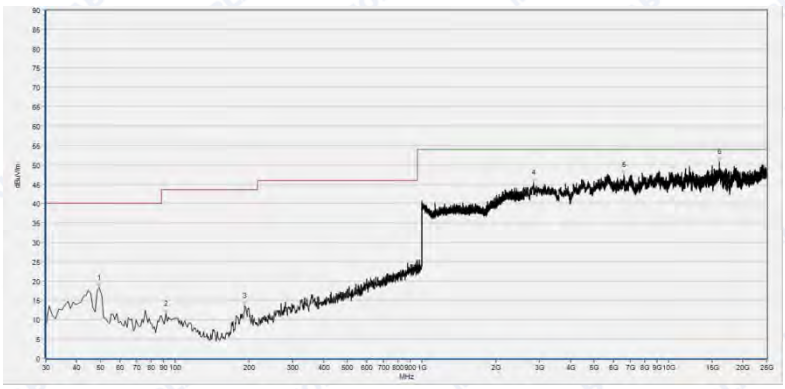
(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 39)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	21.94	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
85.290	19.00	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
191.990	17.18	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2982.906	45.34	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5699.909	47.70	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12197.090	49.37	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

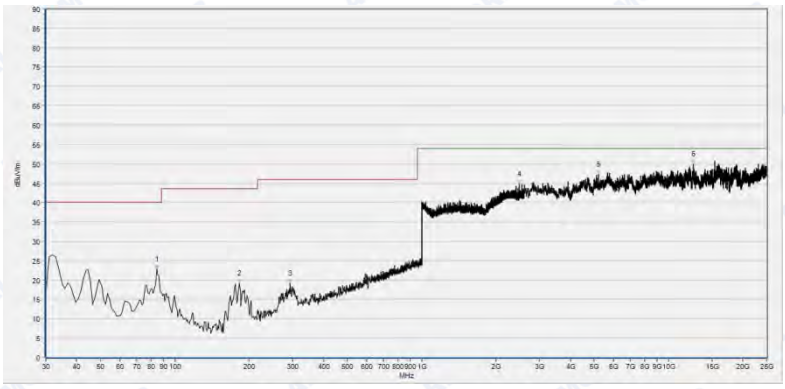
(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 39)

Plot for Channel = 78



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	18.32	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
92.080	11.51	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
191.990	13.50	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
2832.188	45.37	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
6583.852	47.39	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16034.297	50.72	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 78)



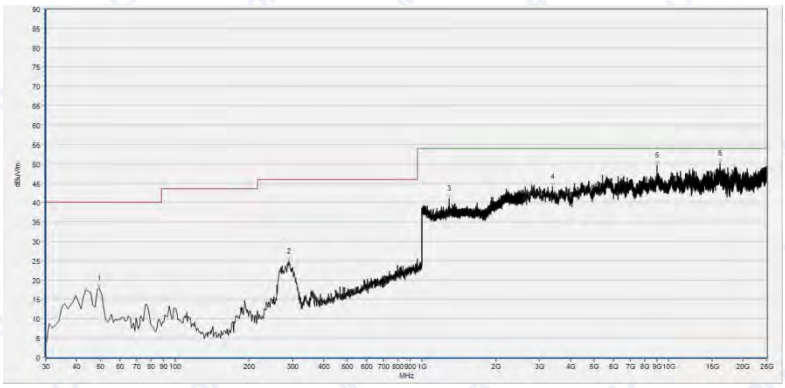
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
84.320	22.82	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
182.290	19.12	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
292.870	19.03	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2487.955	44.70	N.A	N.A	74.0	N.A	54.00	Vertical	PASS
5194.799	47.18	N.A	N.A	74.0	N.A	54.00	Vertical	PASS
12579.996	49.93	N.A	N.A	74.0	N.A	54.00	Vertical	PASS

(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 78)

2.10.4.2 π/4-DQPSK Mode：

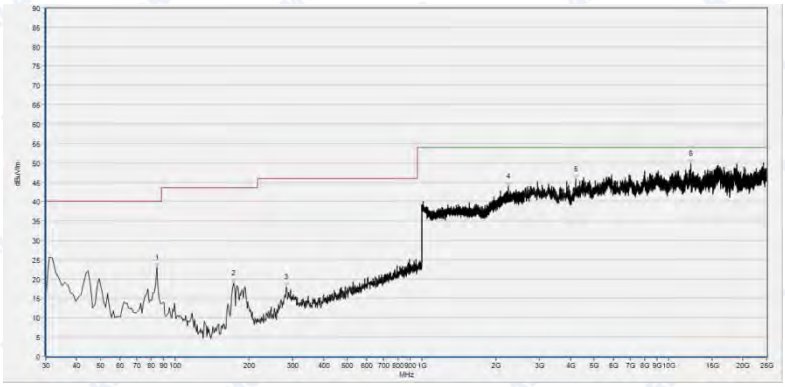
B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.404	17.92	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
288.990	24.87	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1293.237	40.99	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
3394.326	44.05	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
8999.418	49.67	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16189.089	50.18	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

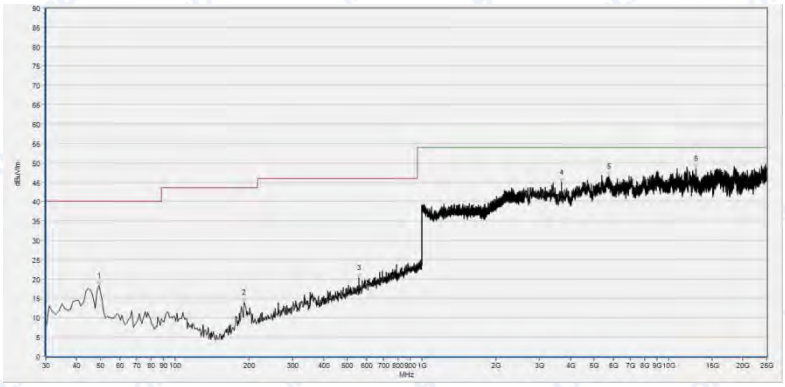
(30MHz to 25GHz, Antenna Horizontal @ π/4-DQPSK, channel 0)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
84.320	22.97	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
172.590	19.00	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
282.200	17.96	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2235.694	43.83	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
4200.873	45.68	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12311.147	49.82	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

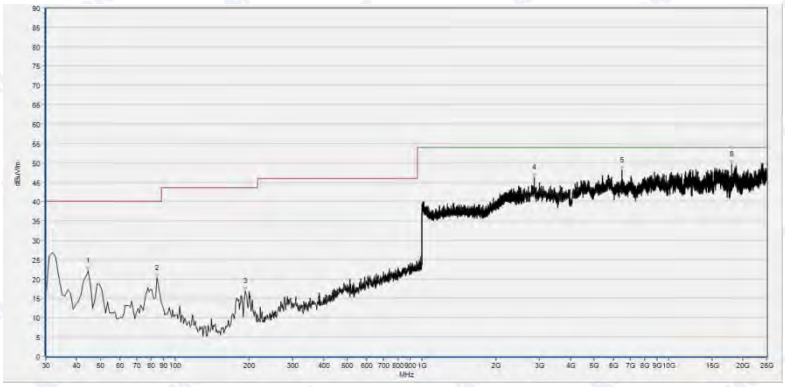
(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 0)

Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	18.26	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
190.056	13.95	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
556.710	20.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3691.689	44.92	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS
5744.717	46.48	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS
12889.580	48.48	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS

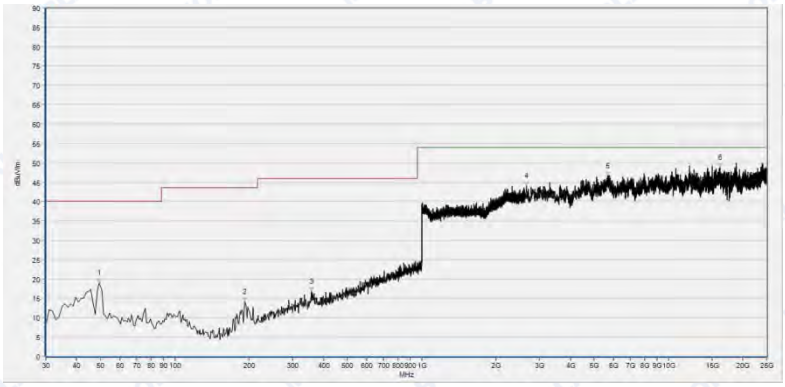
(30MHz to 25GHz, Antenna Horizontal @ π/4-DQPSK, channel 39)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	22.18	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
84.320	20.23	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
192.960	16.87	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2856.628	46.27	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
6477.941	48.11	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
17977.341	49.65	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

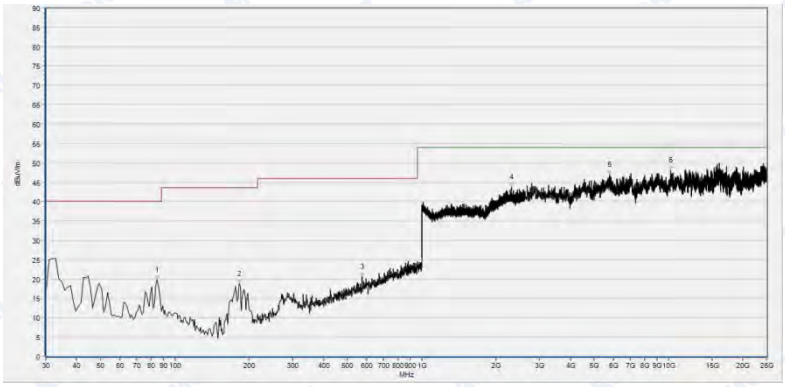
(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 39)

Plot for Channel = 78



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	18.90	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
191.990	14.13	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
356.890	16.84	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2648.882	44.10	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5667.321	46.63	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16189.089	48.81	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal @ π/4-DQPSK, channel 78)



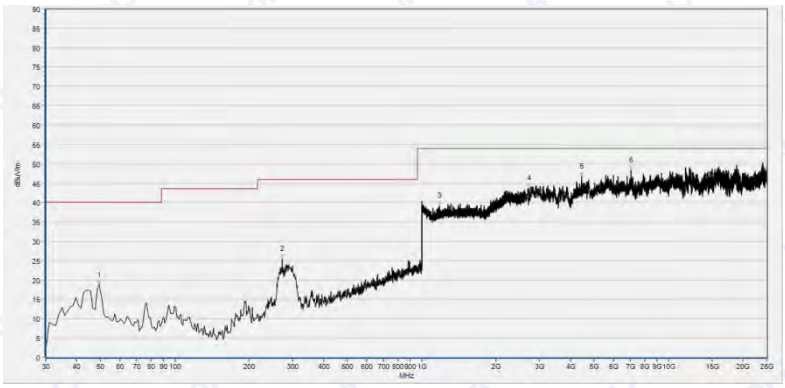
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
84.320	19.77	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
182.290	18.81	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
572.230	20.57	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2308.043	43.82	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5769.158	46.96	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
10201.091	48.05	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 78)

2.10.4.3 8-DPSK Mode：

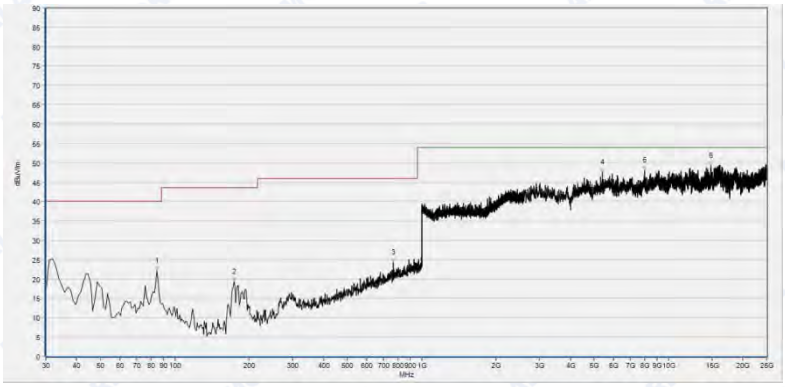
C. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	18.76	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
271.530	25.43	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
1179.912	39.25	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS
2722.204	43.68	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS
4437.134	46.81	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS
7027.860	48.19	N.A	N.A	74.0	N.A	54.00	Horizontal	PASS

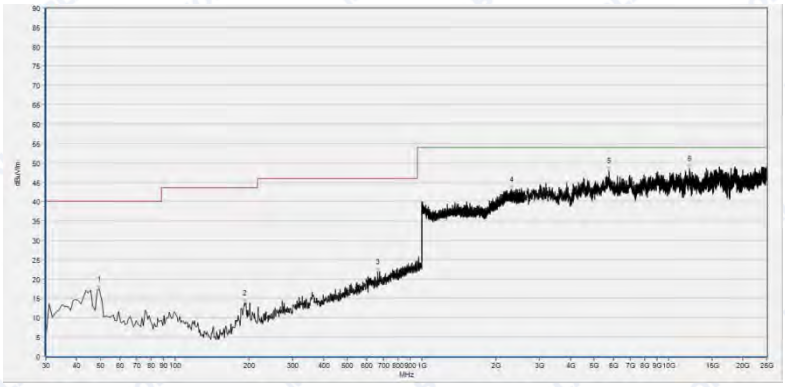
(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 0)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
84.320	22.20	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
173.560	19.36	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
768.170	24.26	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
5382.179	47.55	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
8005.492	48.10	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
14873.359	49.31	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

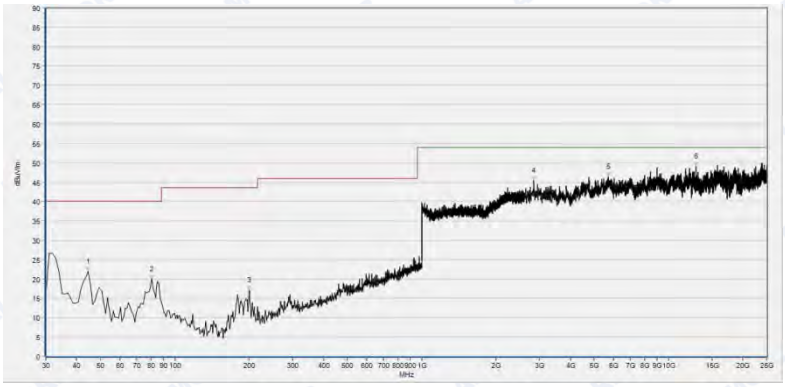
(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 0)

Plot for Channel = 39



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	17.42	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
191.020	13.80	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
665.350	21.72	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2304.842	43.11	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5748.791	47.85	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12140.062	48.51	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

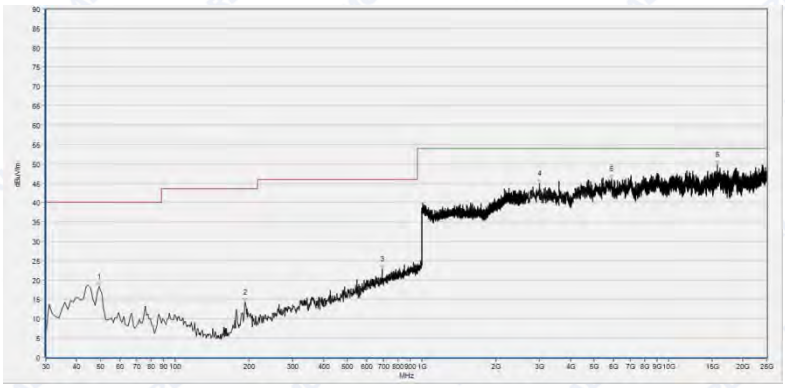
(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 39)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	21.97	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
80.440	19.88	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
199.750	17.02	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2844.408	45.40	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5699.909	46.45	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12901.800	49.08	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

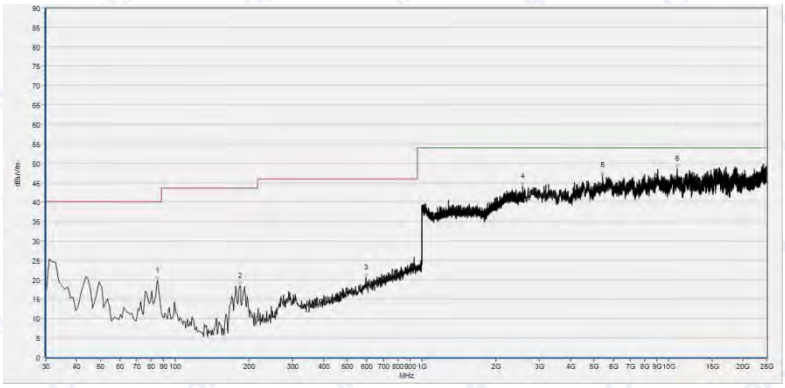
(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 39)

Plot for Channel = 78



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	18.34	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
192.960	14.18	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
690.570	22.72	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3003.273	44.94	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5891.362	46.04	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15757.301	49.80	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 78)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
85.290	19.76	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
183.260	18.36	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
593.570	20.66	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2567.987	44.02	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5410.693	46.89	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
10865.066	48.54	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 78)

ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

1.2 Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

1.3 Facilities and Accreditations

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2013 and CISPR Publication 22; the FCC registration number is 695796.

1.4 Maximum measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Measurements	**Frequency**	**Uncertainty**
Conducted emissions	9KHz~30MHz	2.44dB
Radiated emissions	30MHz~200MHz	2.93
	200MHz~1000MHz	2.95
	1GHz~18GHz	2.26
	18GHz~40GHz	1.94

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

1.5 Test Equipments Utilized

1.5.1 Conducted Test Equipments

Conducted Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Spectrum Analyzer	MY45101810	E4407B	Agilent	2016.03.02	2017.03.01
2	USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2016.03.02	2017.03.01
3	EXA Signal Analzyer	MY53470838	N9010A	Agilent	2015.08.26	2016.08.25
4	RF cable	CB01	RF01	Morlab	N/A	N/A
5	Attenuator	(n.a.)	10dB	Resnet	N/A	N/A
6	SMA connector Note	CN01	RF03	HUBER-SUHNER	N/A	N/A
Note： The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.						

1.5.2 Radiated Test Equipments

Radiated Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal.Due Date**
1	System Simulator	GB45360846	8960-E5515C	Agilent	2015.05.07	2016.05.06
2	Receiver	MY54130016	N9038A	Agilent	2015.05.07	2016.05.06
3	Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2015.05.14	2016.05.13
4	Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2016.03.02	2017.03.01
5	Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2016.03.02	2017.03.01
6	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2016.03.02	2017.03.01
7	Coaxial cable(N male)	CB02	EMC02	Morlab	N/A	N/A
8	Coaxial cable(N male)	CB03	EMC03	Morlab	N/A	N/A
9	1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde&Schwarz	2016.03.02	2017.03.01
10	18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde&Schwarz	2016.03.02	2017.03.01

1.5.3 Climate Chamber

Climate Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Climate Chamber	2004012	HL4003T	Yinhe	2016.03.02	2017.03.01

1.5.4 Vibration Table

Vibration Table						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Vibration Table	N/A	ACT2000-S015L	CMI-COM	2016.03.02	2017.03.01

1.5.5 Anechoic Chamber

Anechoic Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Anechoic Chamber	N/A	9m*6m*6m	Changning	2015.05.14	2016.05.13

1.5.6 Auxiliary Test Equipment

Auxiliary Test Equipment						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Computer	N.A	PU500C	Asus	N.A	N.A

***** END OF REPORT *****