REPORT No.: SZ17080255W02

FCC RF TEST REPORT

APPLICANT	**:**	Cleer Limited
PRODUCT NAME	**:**	Bluetooth wireless earphone
MODEL NAME	**:**	EDGE Pulse
TRADE NAME	**:**	Cleer
BRAND NAME	**:**	Cleer
FCC ID	**:**	2AETW-1246
STANDARD(S)	**:**	47 CFR Part 15 Subpart C
ISSUE DATE	**:**	2017-09-18

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DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2017-09-18	First edition

TEST REPORT DECLARATION

Applicant	Cleer Limited
Applicant Address	Unit518, Lakeside 1, Science Park West Ave. HK Science Park, Hong Kong.
Manufacturer	Cleer Limited
Manufacturer Address	Unit518, Lakeside 1, Science Park West Ave. HK Science Park, Hong Kong.
Product Name	Bluetooth wireless earphone
Model Name	EDGE Pulse
Brand Name	Cleer
HW Version	0.5
SW Version	09
Test Standards	47 CFR Part 15 Subpart C
Test Date	2017-09-08 to 2017-09-11
Test Result	PASS

Tested by : Li Jingzong (Test Engineer)

Approved by : Andy Yeh (Technical Director)

1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	Cleer Limited
Address:	Unit518, Lakeside 1, Science Park West Ave. HK Science Park, Hong Kong.

1.2 Equipment under Test (EUT) Description

Model Name:	EDGE Pulse
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:	Bluetooth 4.2(BR/ EDR)
Antenna Type:	Dielectric Chip Antenna
Antenna Gain:	1 dBi

NOTE 1: The EUT is a Bluetooth wireless earphone. It contains Bluetooth Module 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).

NOTE 2: The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT into the test mode, and then use MT8852B base station to control the EUT continuous transmission.

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

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	Sep 08, 2017	**PASS**
3	15.247(b)	Peak Output Power	Sep 08, 2017	**PASS**
4	15.247(a)	20dB Bandwidth	Sep 08, 2017	**PASS**
5	15.247(a)	Carrier Frequency Separation	Sep 08, 2017	**PASS**
6	15.247(a)	Time of Occupancy (Dwell time)	Sep 08, 2017	**PASS**
7	15.247(d)	Conducted Spurious Emission	Sep 08, 2017	**PASS**
8	15.247(d)	Restricted Frequency Bands	Sep 11, 2017	**PASS**
9	15.209 15.247(d)	Radiated Emission	Sep 11, 2017	**PASS**
10	15.207	Conducted Emission	Sep 11, 2017	**PASS**

NOTE: The tests were performed according to the method of measurements prescribed in 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.

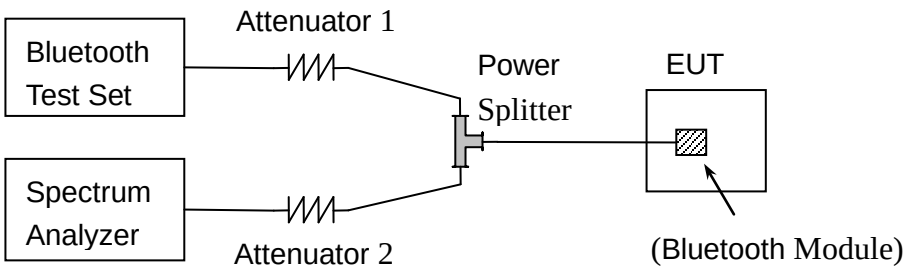
2.2 Number of Hopping Frequency

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 Test Set 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

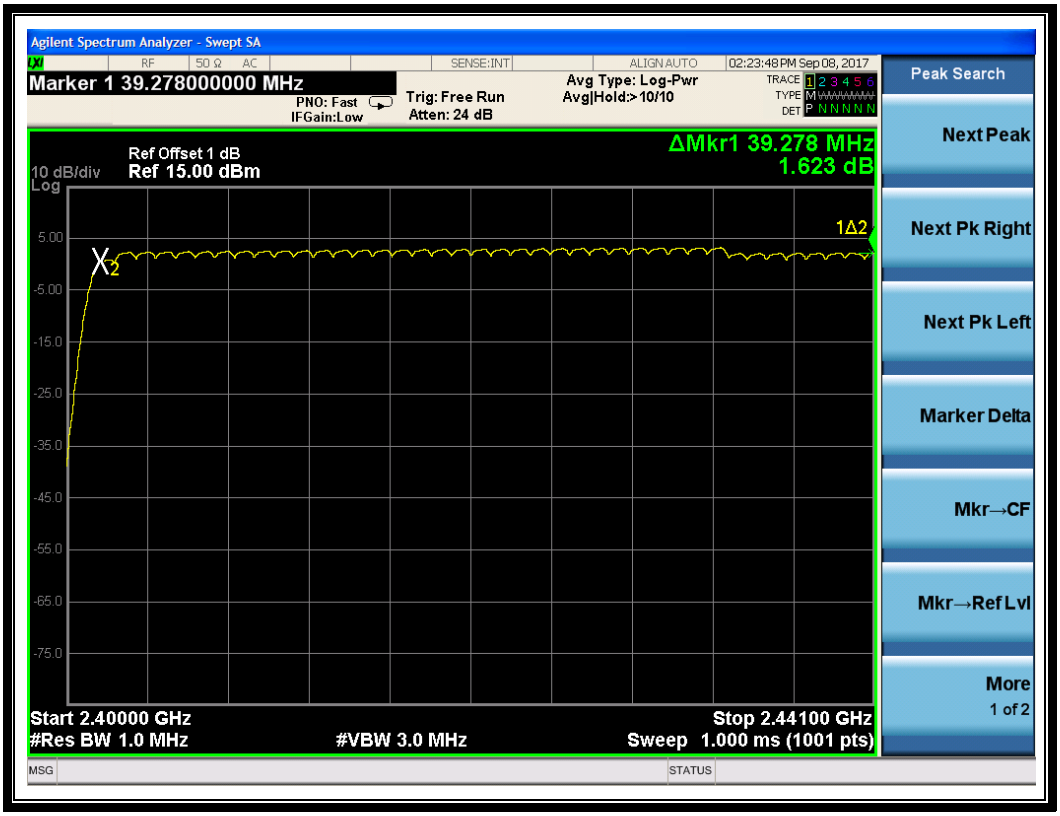
2.2.4 Test Result

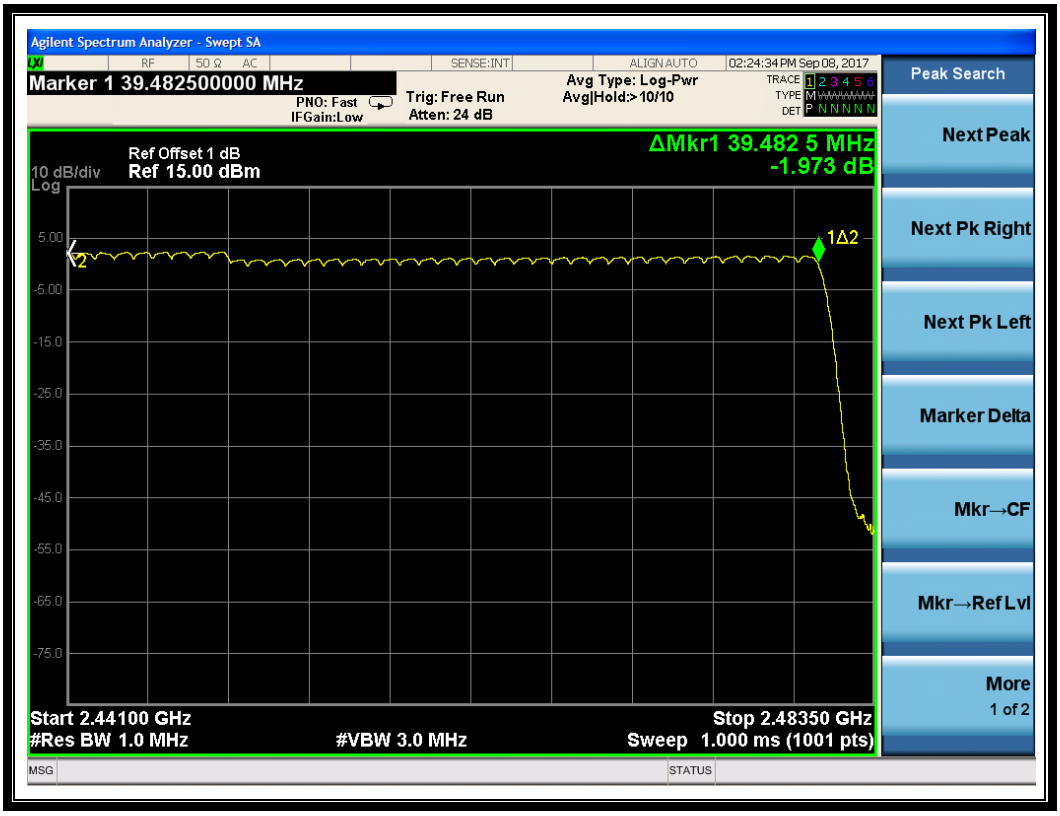
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

A. Test Verdict:

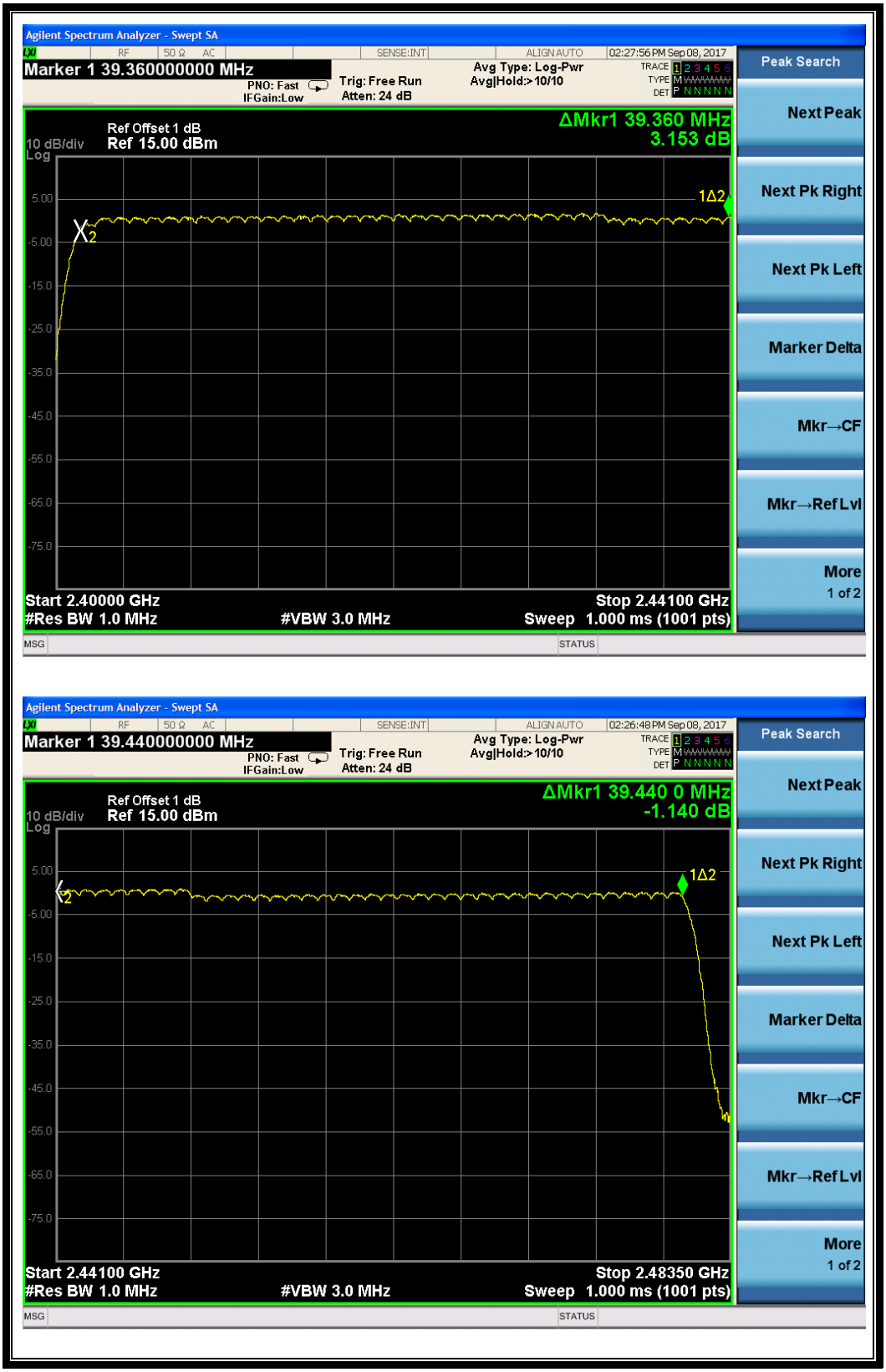
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
π/4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

B. Test Plots:

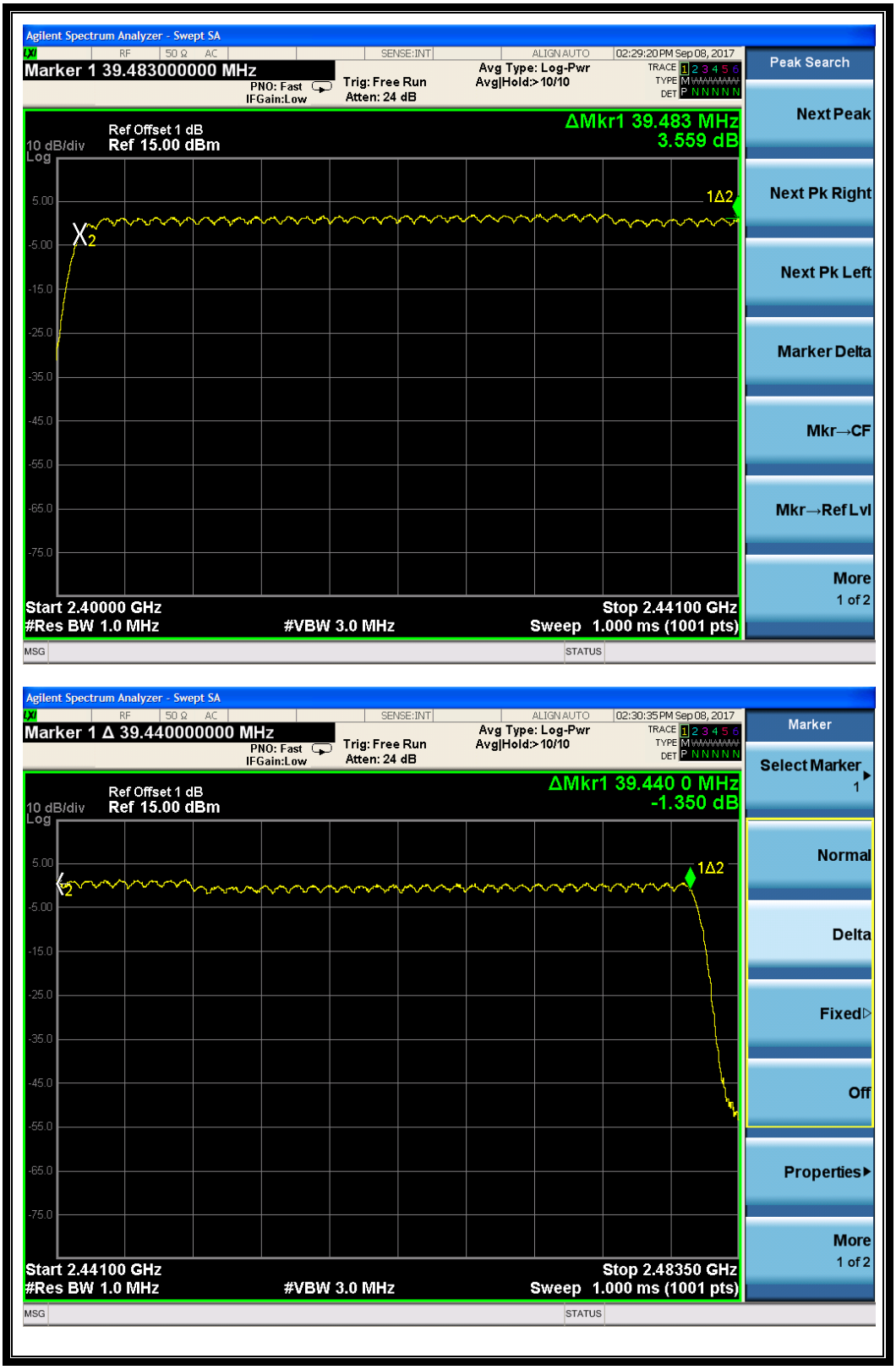



Agilent Spectrum Analyzer - Swept SA
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
02:24:34 PM Sep 08, 2017
Marker 1 39.482500000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 24 dB
Avg Type: Log-Pwr
Avg|Hold:>10/10
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 15.00 dBm
ΔMkr1 39.482 5 MHz
-1.973 dB
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
-65.0
-75.0
1Δ2
2
Start 2.44100 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.48350 GHz
Sweep 1.000 ms (1001 pts)
MSG
STATUS
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

(Plot A: GFSK)



(Plot B: π/4-DQPSK)


Agilent Spectrum Analyzer - Swept SA
Marker 1 39.483000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 24 dB
Avg Type: Log-Pwr
Avg|Hold:>10/10
02:29:20 PM Sep 08, 2017
Ref Offset 1 dB
10 dB/div
Ref 15.00 dBm
ΔMkr1 39.483 MHz
3.559 dB
Start 2.40000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.44100 GHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 39.440000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 24 dB
Avg Type: Log-Pwr
Avg|Hold:>10/10
02:30:35 PM Sep 08, 2017
Ref Offset 1 dB
10 dB/div
Ref 15.00 dBm
ΔMkr1 39.440 0 MHz
-1.350 dB
Start 2.44100 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.48350 GHz
Sweep 1.000 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

(Plot C: 8- DPSK)

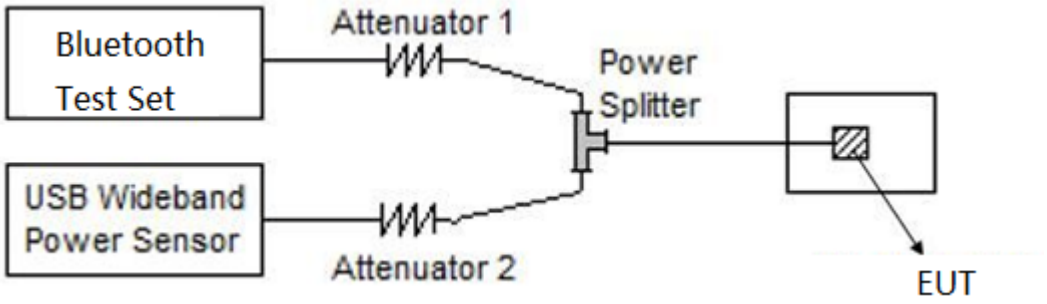
2.3 Peak Output Power

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 USB Wideband Power Sensor and the Bluetooth Test Set 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 USB Wideband Power Sensor.

2.3.3.1 GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	1.02	0.00126	30	1	PASS
39	2441	2.42	0.00175			PASS
78	2480	2.76	0.00189			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	0.07	0.00102	20.97	0.125	PASS
39	2441	1.53	0.00142			PASS
78	2480	1.23	0.00133			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	0.44	0.00111	20.97	0.125	PASS
39	2441	1.87	0.00154			PASS
78	2480	1.53	0.00142			PASS

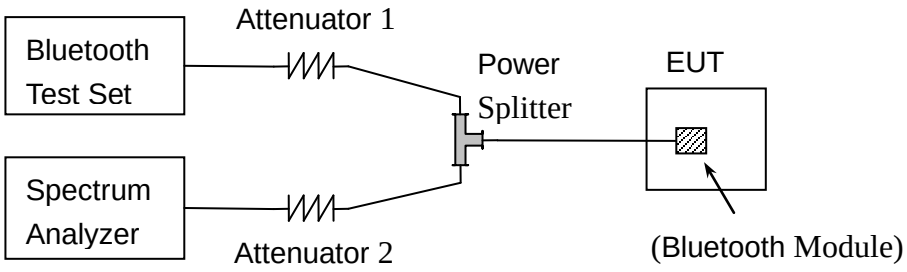
2.4 20dB Bandwidth

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 Test Set 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.

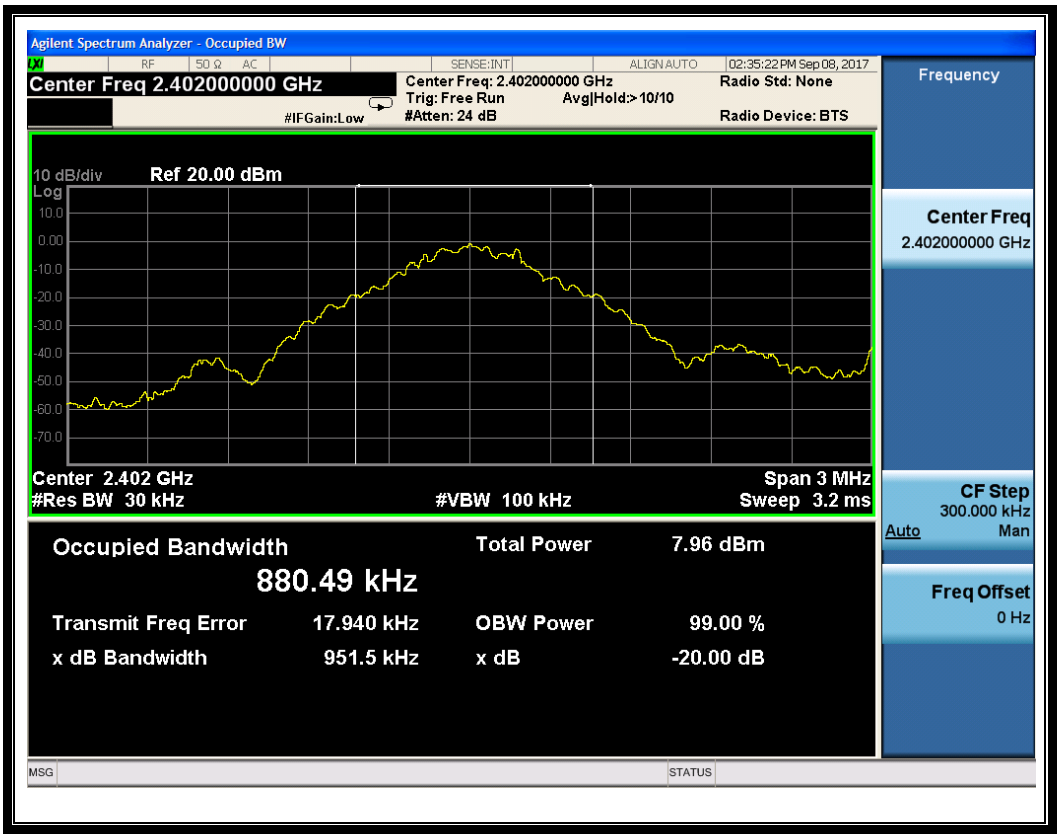
2.4.4.1 GFSK Mode

A. Test Verdict:

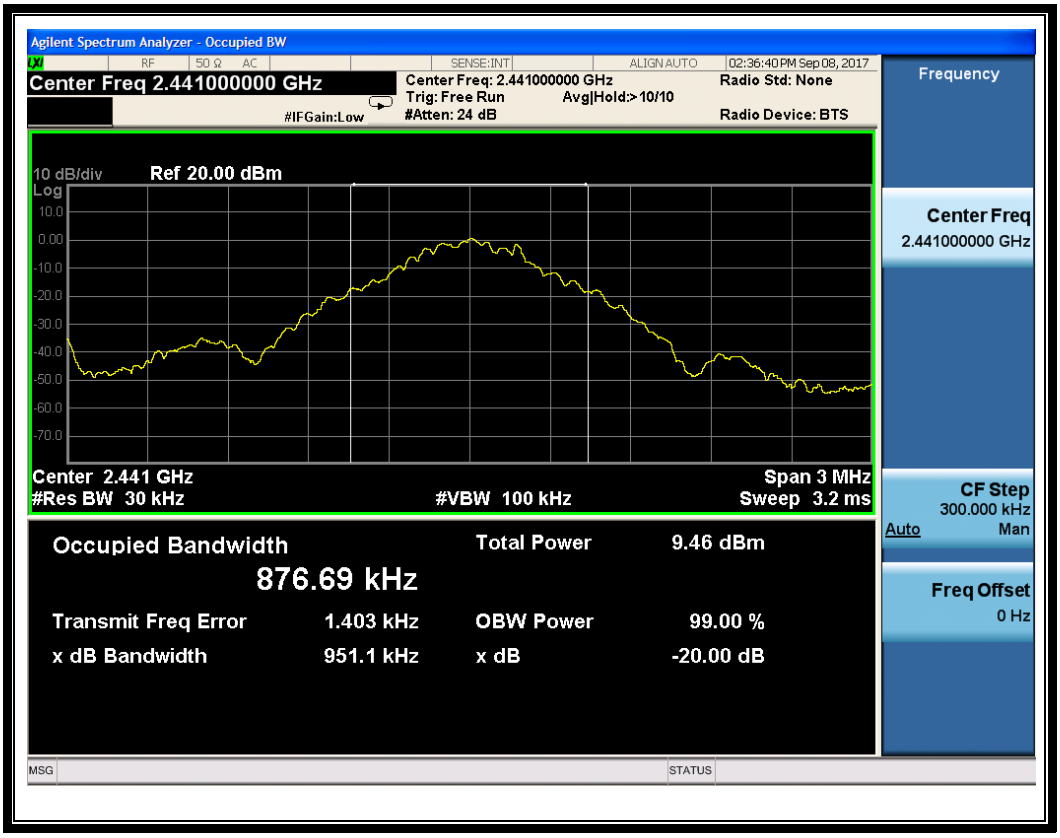
The maximum 20dB bandwidth measured is 0.9515 MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	0.9515	Plot A
39	2441	0.9511	Plot B
78	2480	0.9484	Plot C

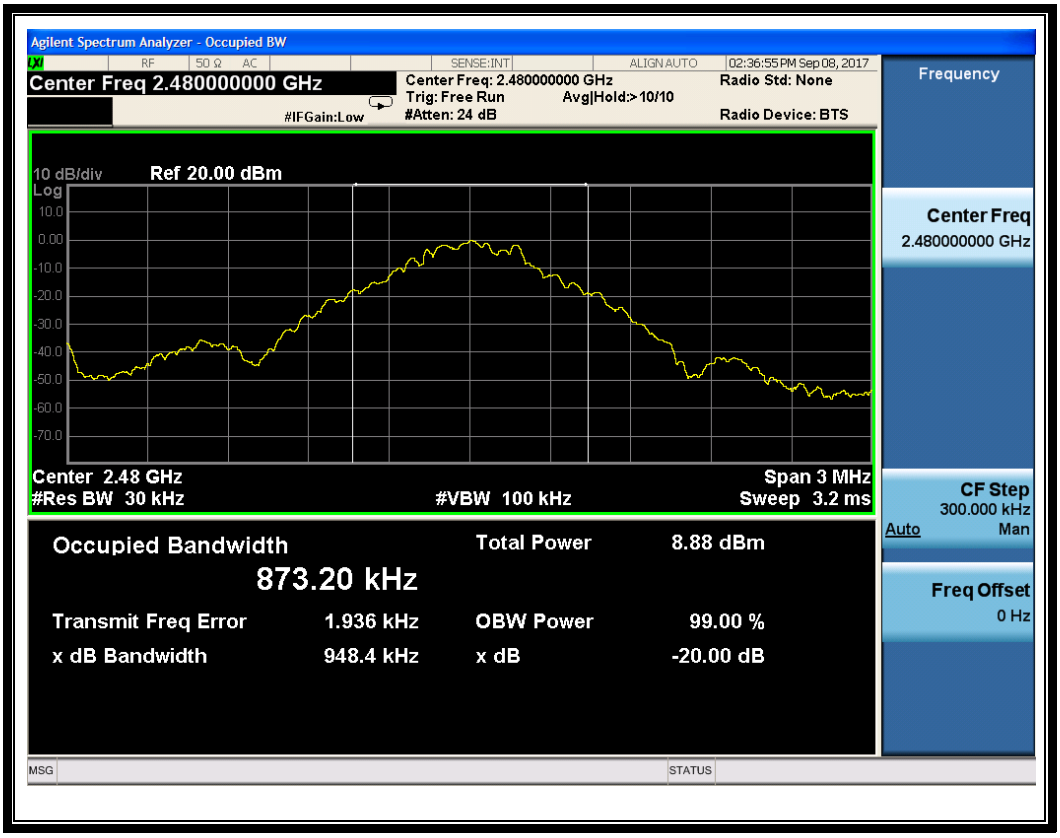
B. Test Plots:



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

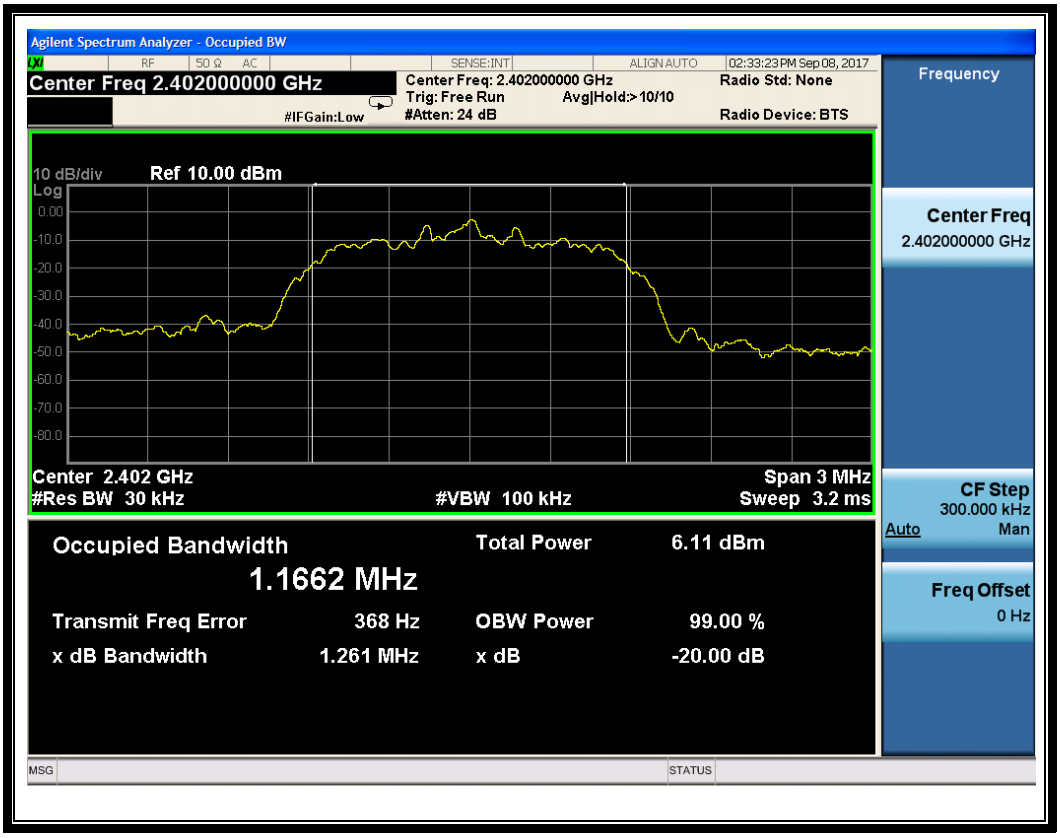
2.4.4.2 π/4-DQPSK Mode

A. Test Verdict:

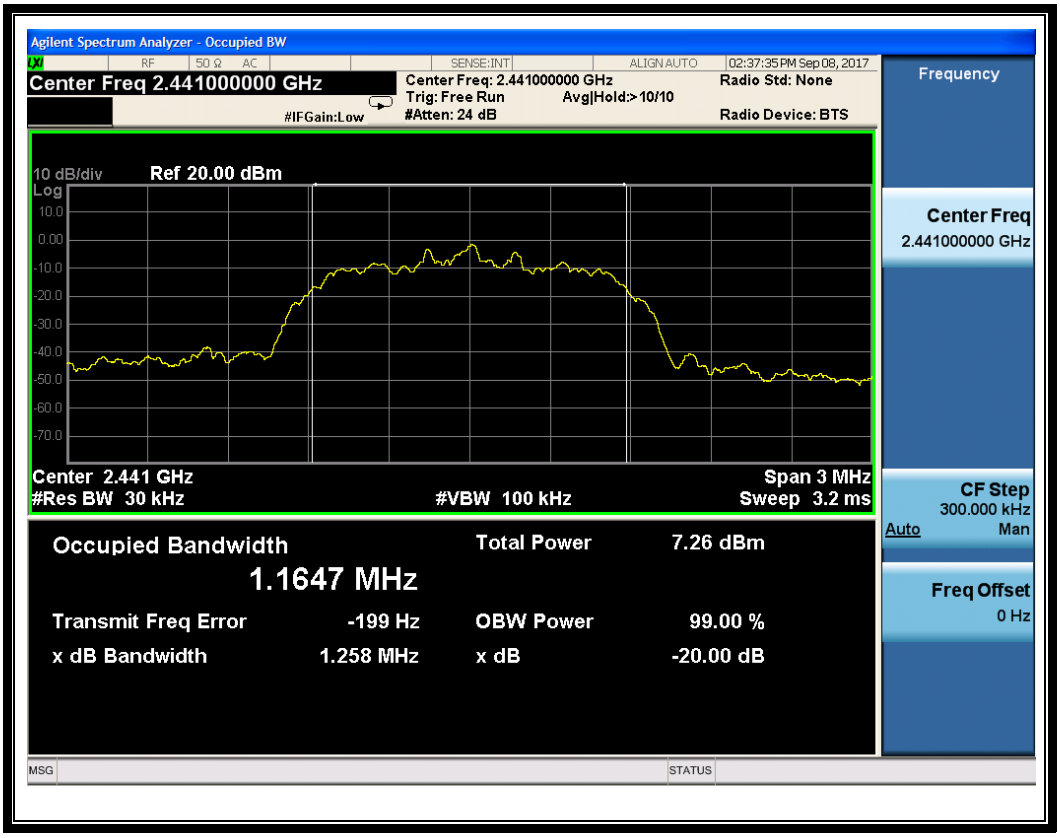
The maximum 20dB bandwidth measured is 1.265 MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.261	Plot D
39	2441	1.258	Plot E
78	2480	1.265	Plot F

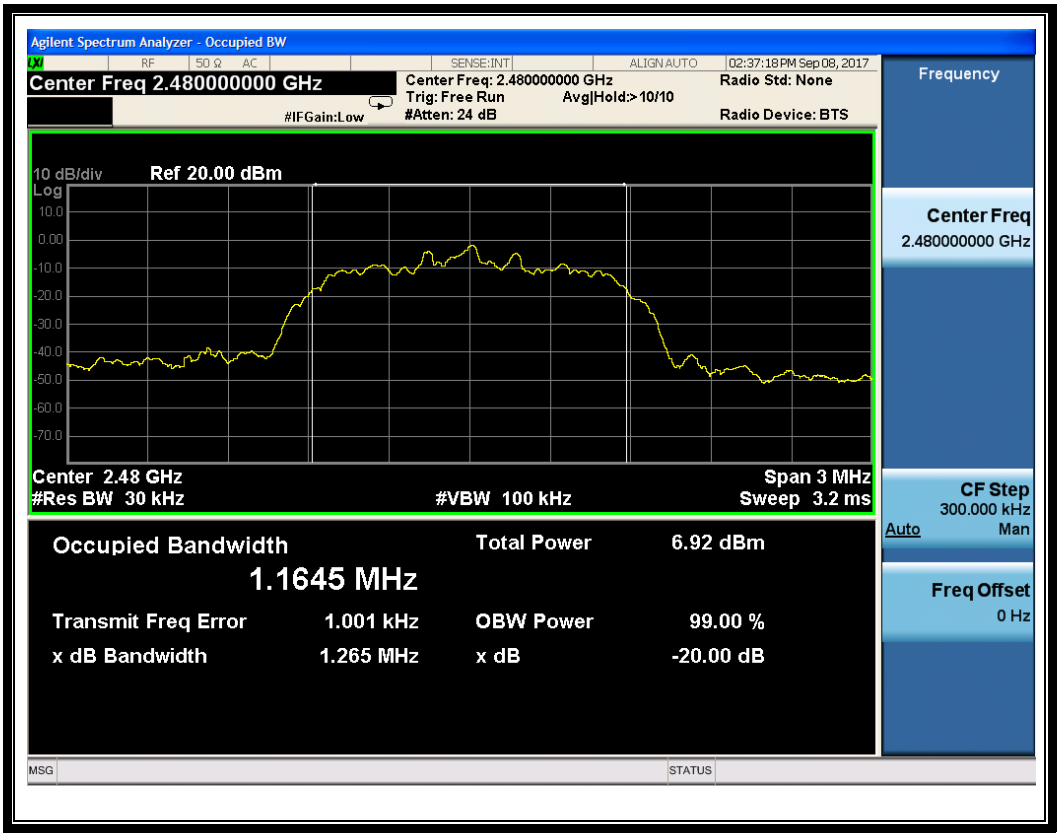
B. Test Plots:



(Plot D: Channel = 2402 @ π/4-DQPSK)



(Plot E: Channel = 2441 @ π/4-DQPSK)



(Plot F: Channel = 2480 @ π/4-DQPSK)

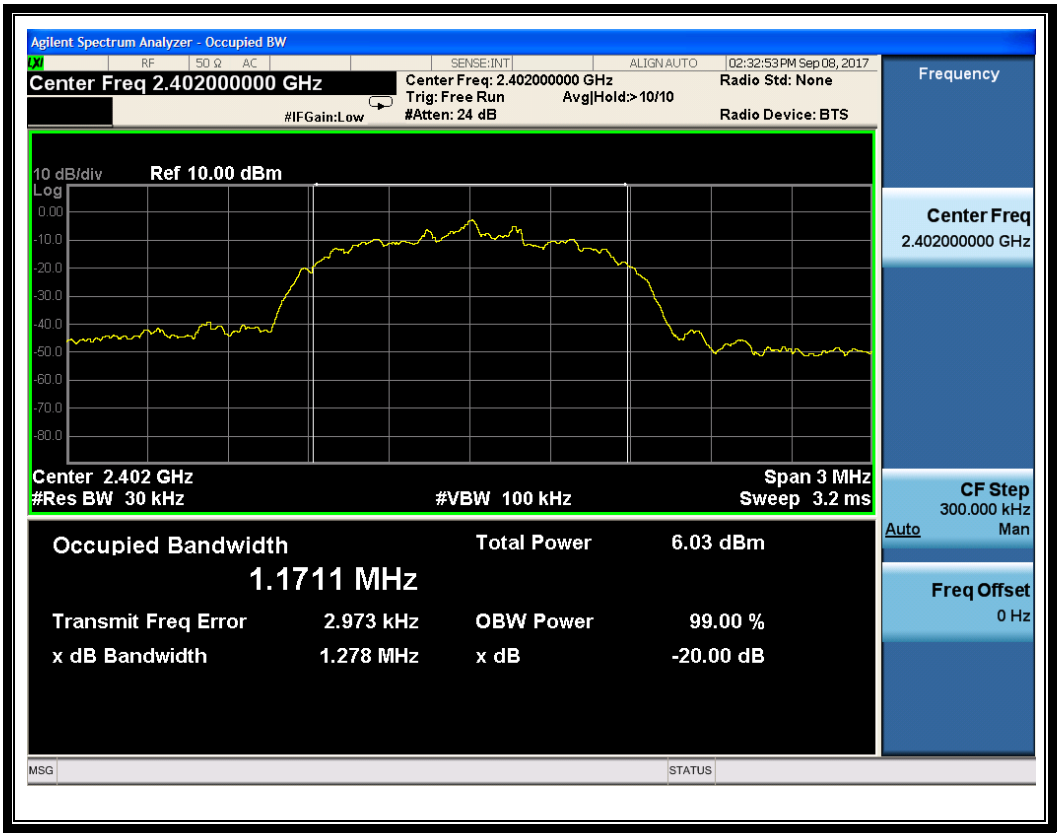
2.4.4.3 8-DPSK Mode

A. Test Verdict:

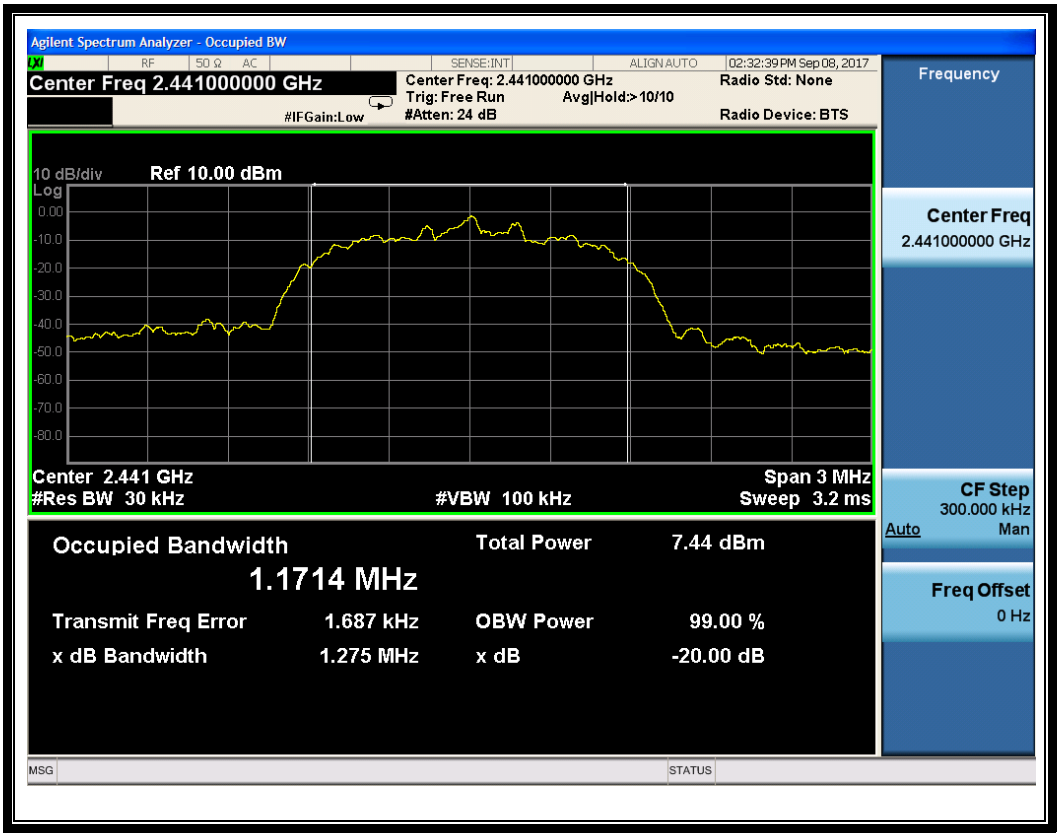
The maximum 20dB bandwidth measured is 1.282 MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.278	Plot G
39	2441	1.275	Plot H
78	2480	1.282	Plot I

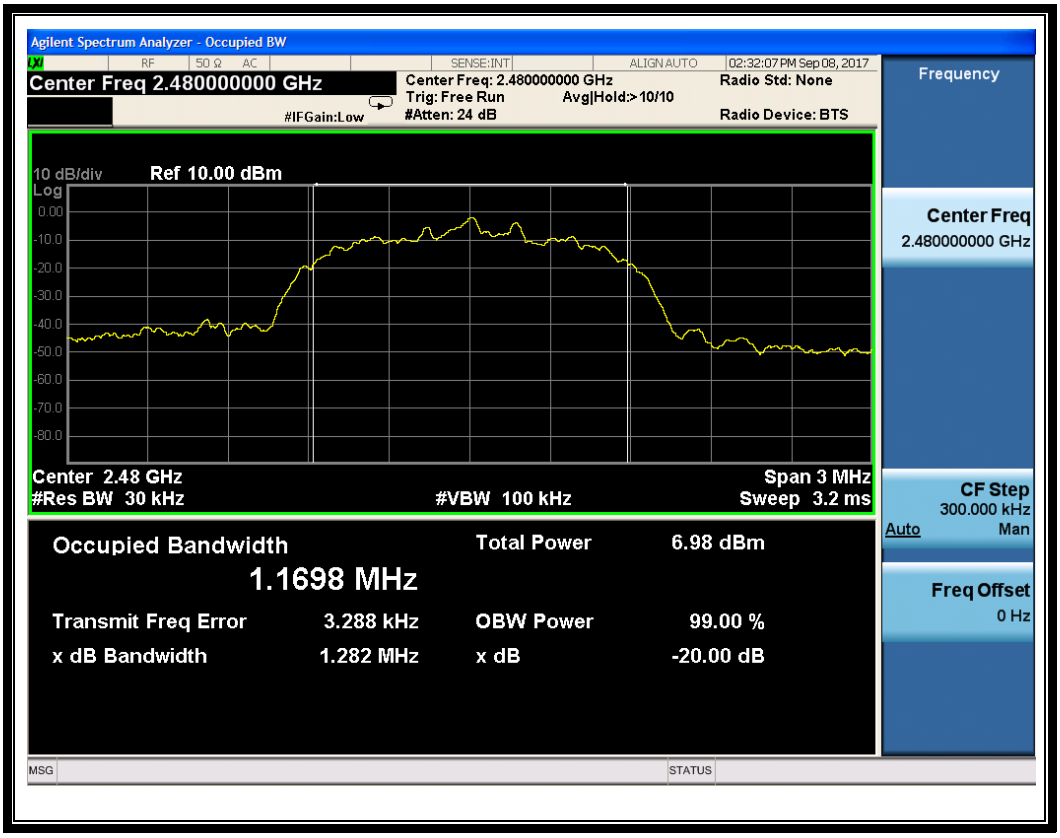
B. Test Plots:



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



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



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

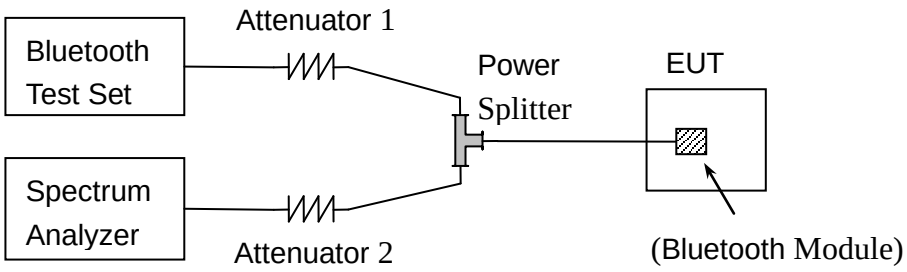
2.5 Carried Frequency Separation

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 Test Set 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).

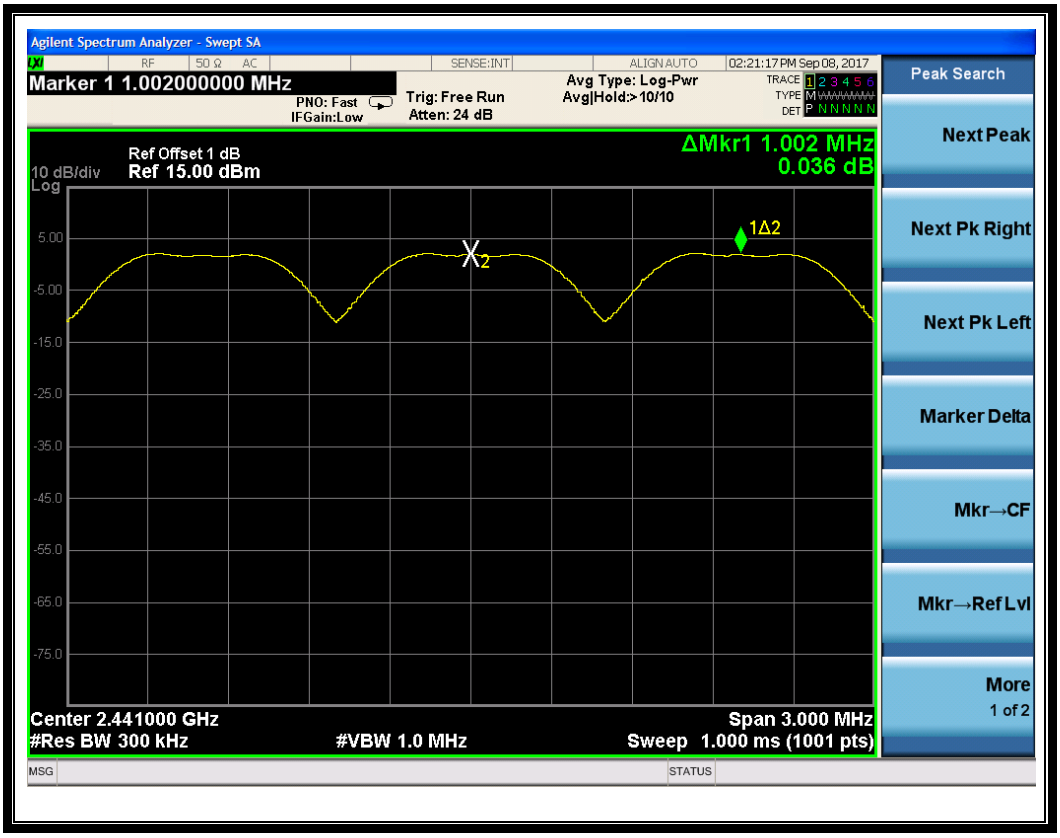
2.5.3 Test Procedure

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.

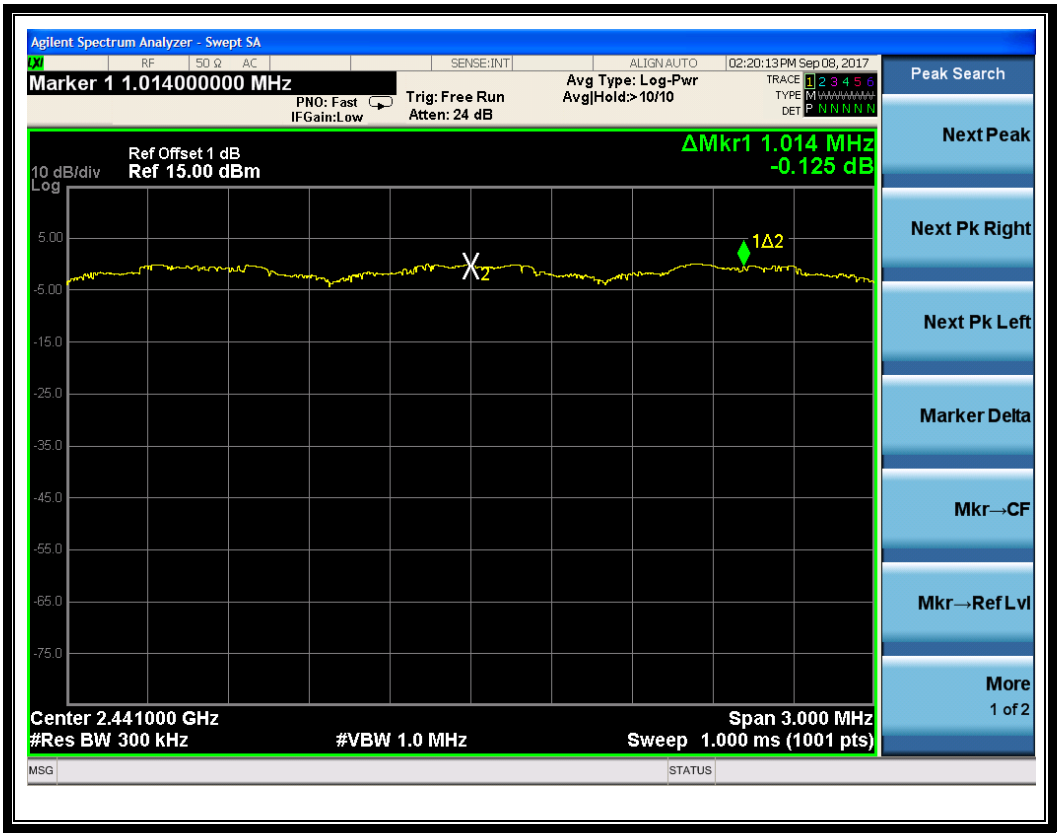
2.5.4 Test Result

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 2.4.4), whichever is greater. So, the verdict is PASSING

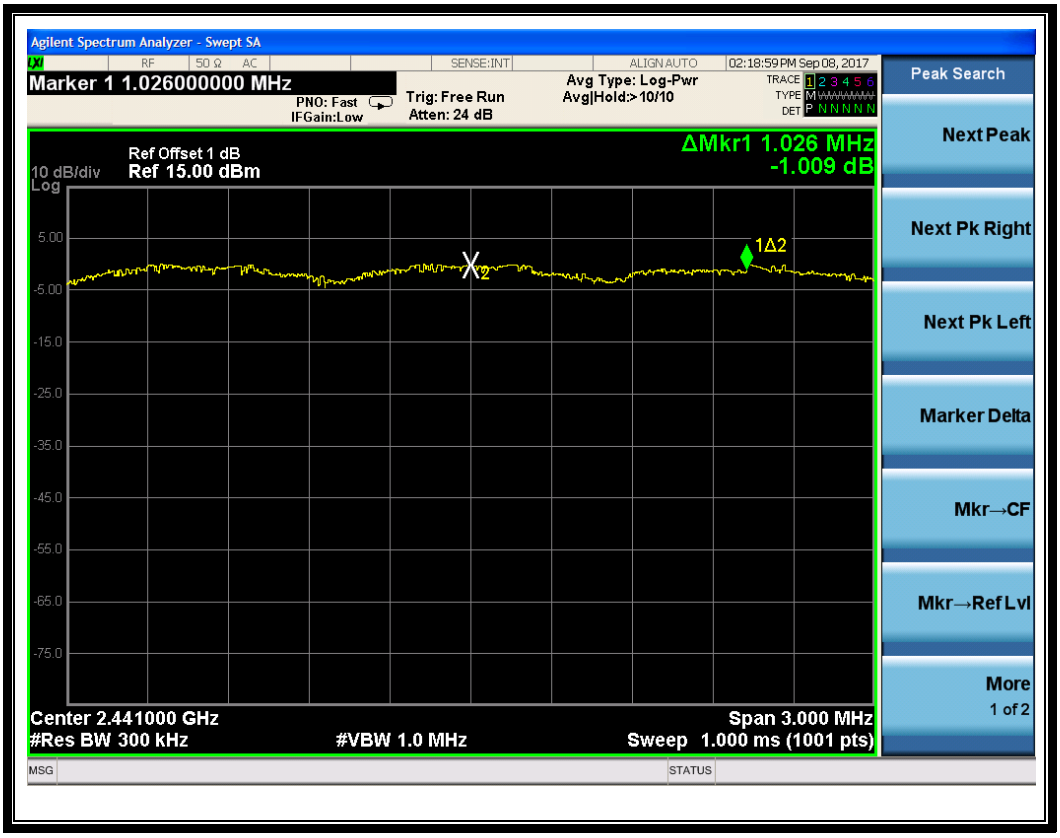
Test Mode	Measured Channel Numbers	Carried Frequency Separation	Refer to Plot	20dB bandwidth (MHz)	Min. Limit	Verdict
GFSK	39 and 40	1.002	Plot A	0.9515	20dB bandwidth	PASS
π/4-DQPSK	39 and 40	1.014	Plot B	1.265	two-thirds of the	PASS
8-DPSK	39 and 40	1.026	Plot C	1.282	20dB bandwidth	PASS



(Plot A: GFSK)



(Plot B: π/4-DQPSK)


Agilent Spectrum Analyzer - Swept SA
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
02:18:59 PM Sep 08, 2017
Marker 1 1.026000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 24 dB
Avg Type: Log-Pwr
Avg|Hold:>10/10
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 15.00 dBm
ΔMkr1 1.026 MHz
-1.009 dB
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
-65.0
-75.0
1Δ2
Center 2.441000 GHz
#Res BW 300 kHz
#VBW 1.0 MHz
Span 3.000 MHz
Sweep 1.000 ms (1001 pts)
MSG
STATUS
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

(Plot C: 8-DPSK)

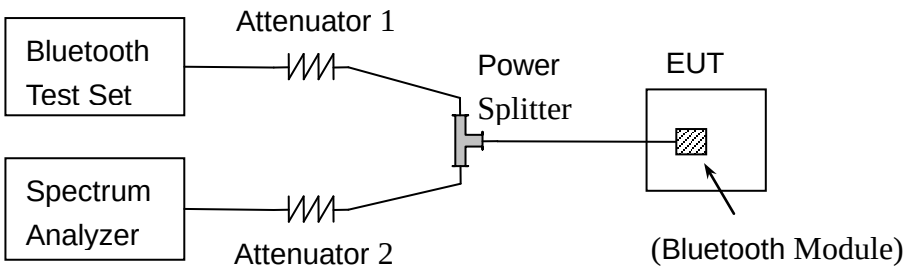
2.6 Time of Occupancy (Dwell time)

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 Test Set 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.

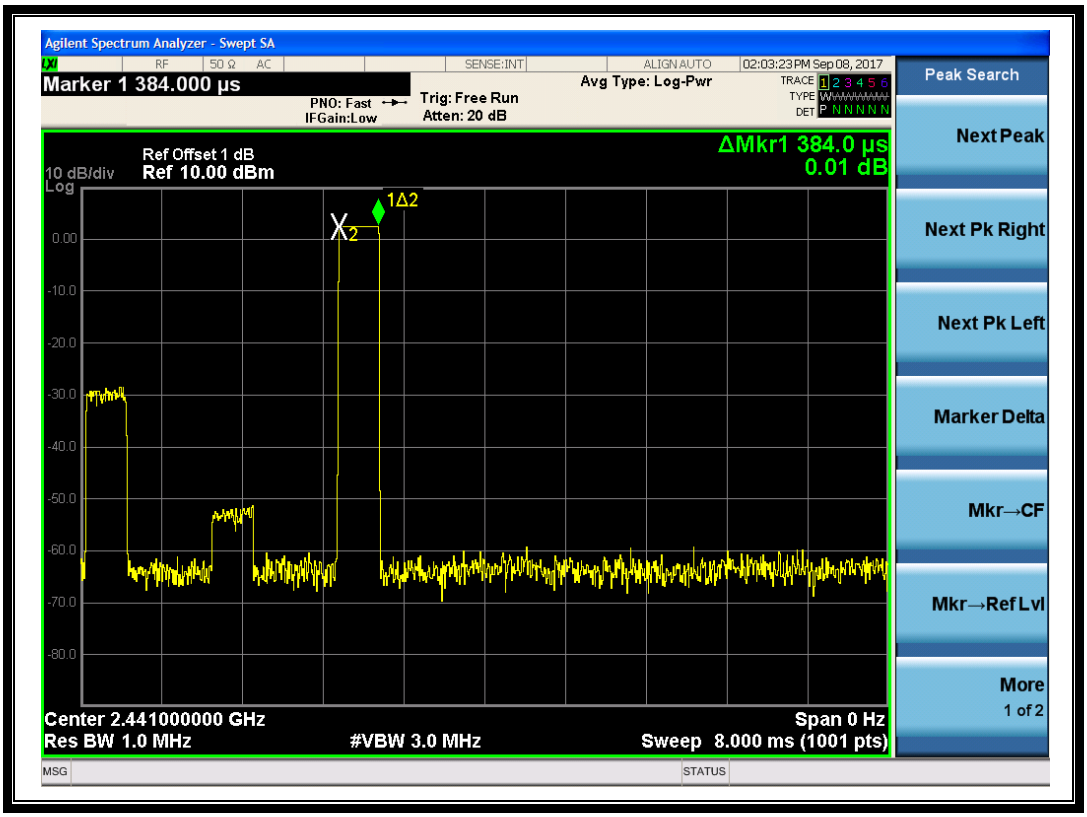
2.6.4 Test Result

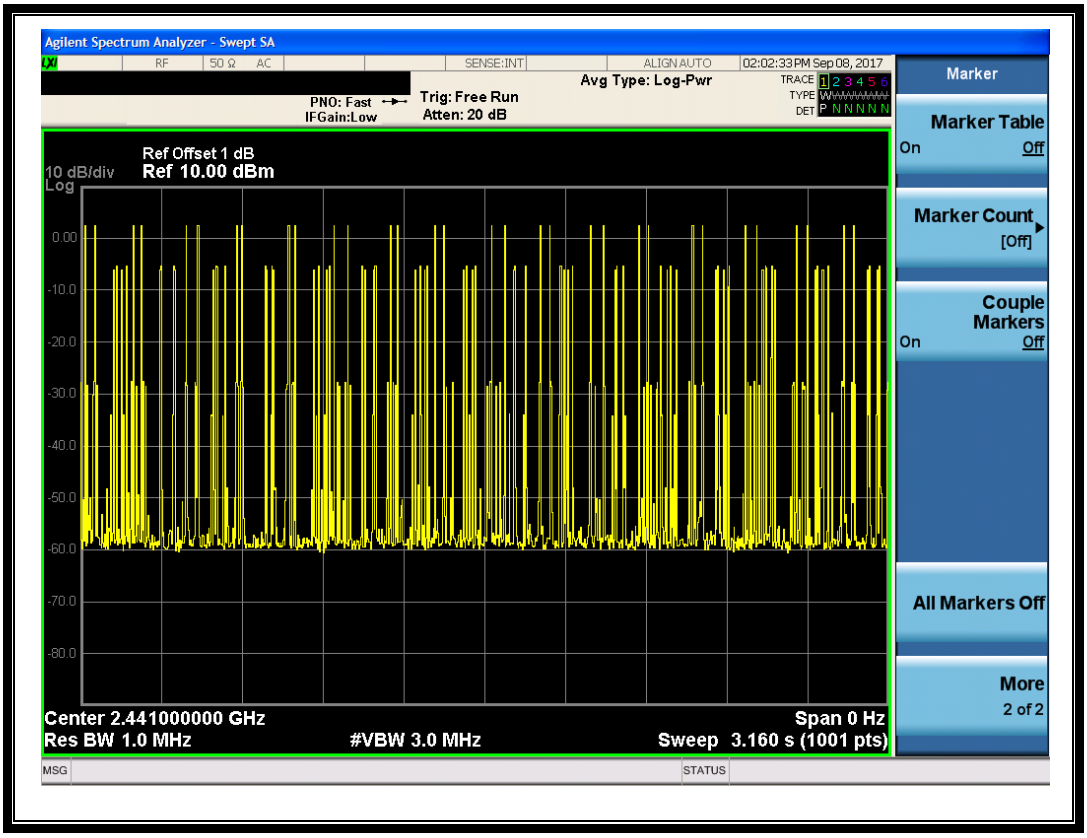
2.6.4.1 GFSK Mode

A. Test Verdict:

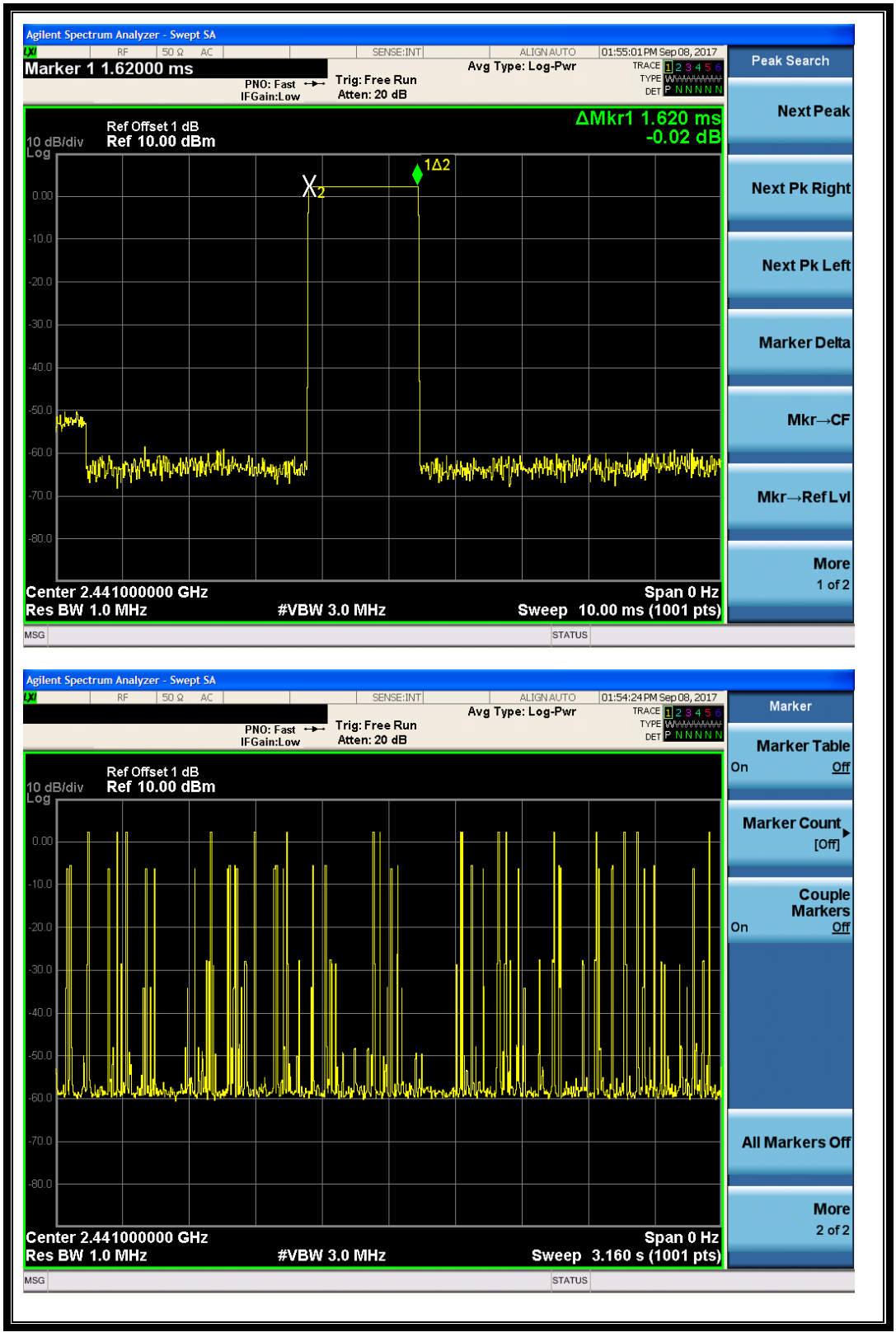
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.38	32	0.01216	0.1216	0.4	PASS
DH3	1.62	16	0.02592	0.2592		PASS
DH5	2.89	11	0.03179	0.3179		PASS

B. Test Plots:

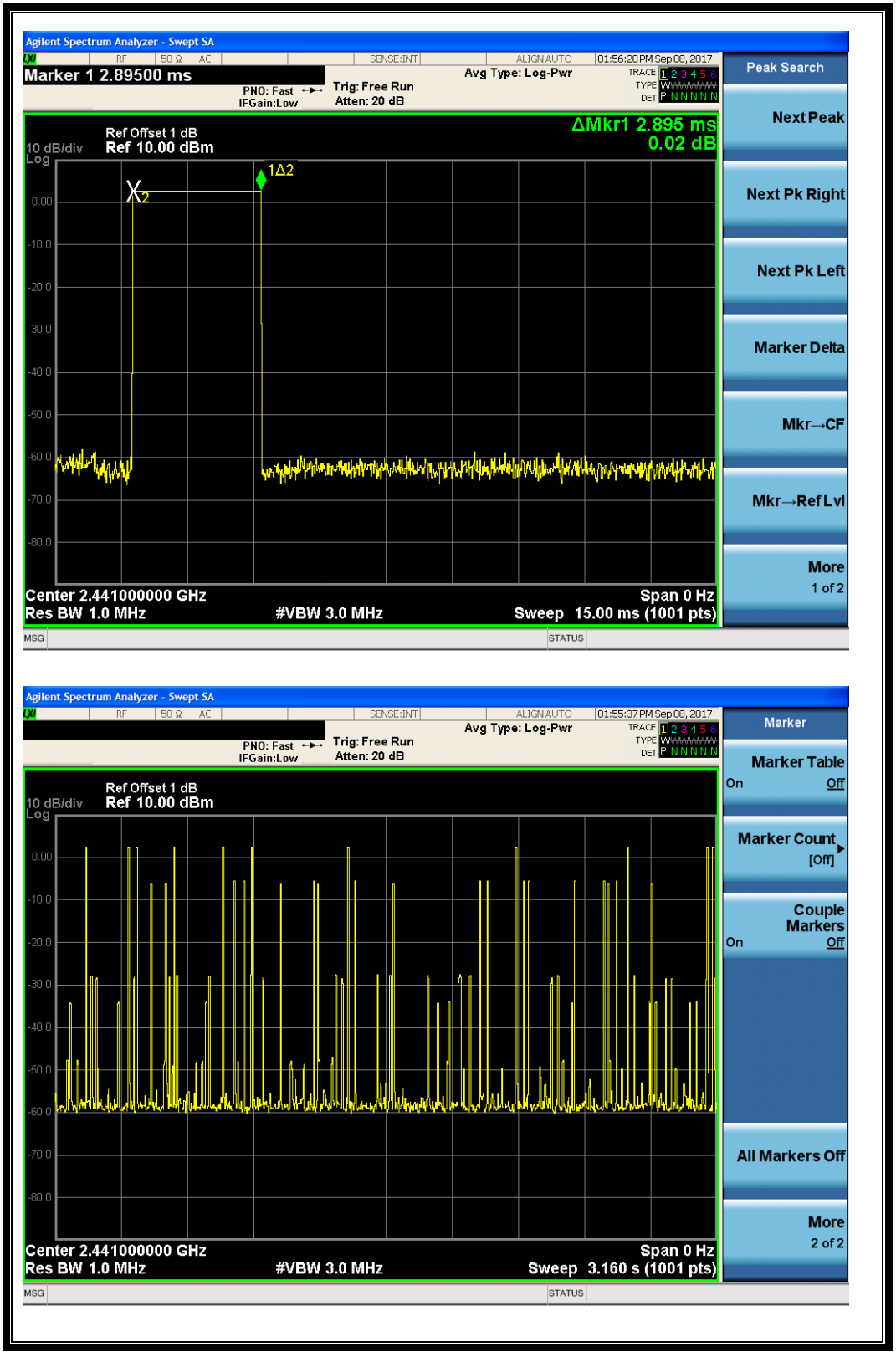




(Plot A: DH1 @ GFSK)



(Plot B: DH3 @ GFSK)



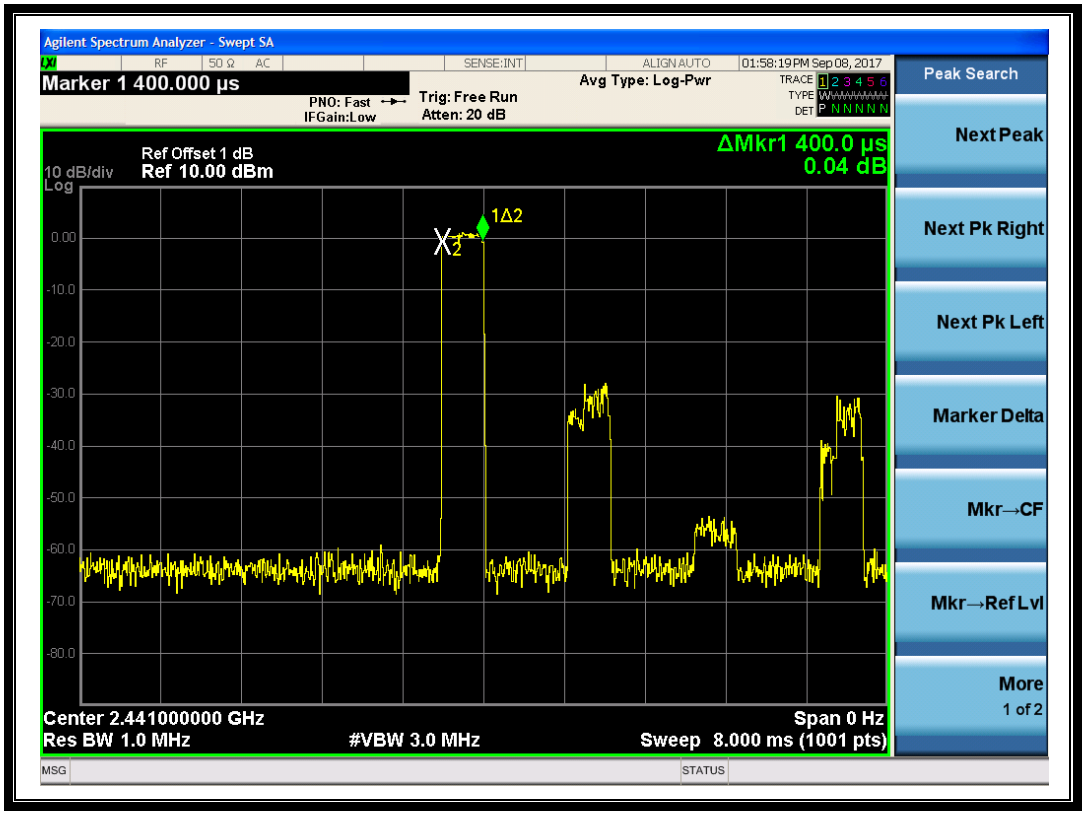
(Plot C: DH5 @ GFSK)

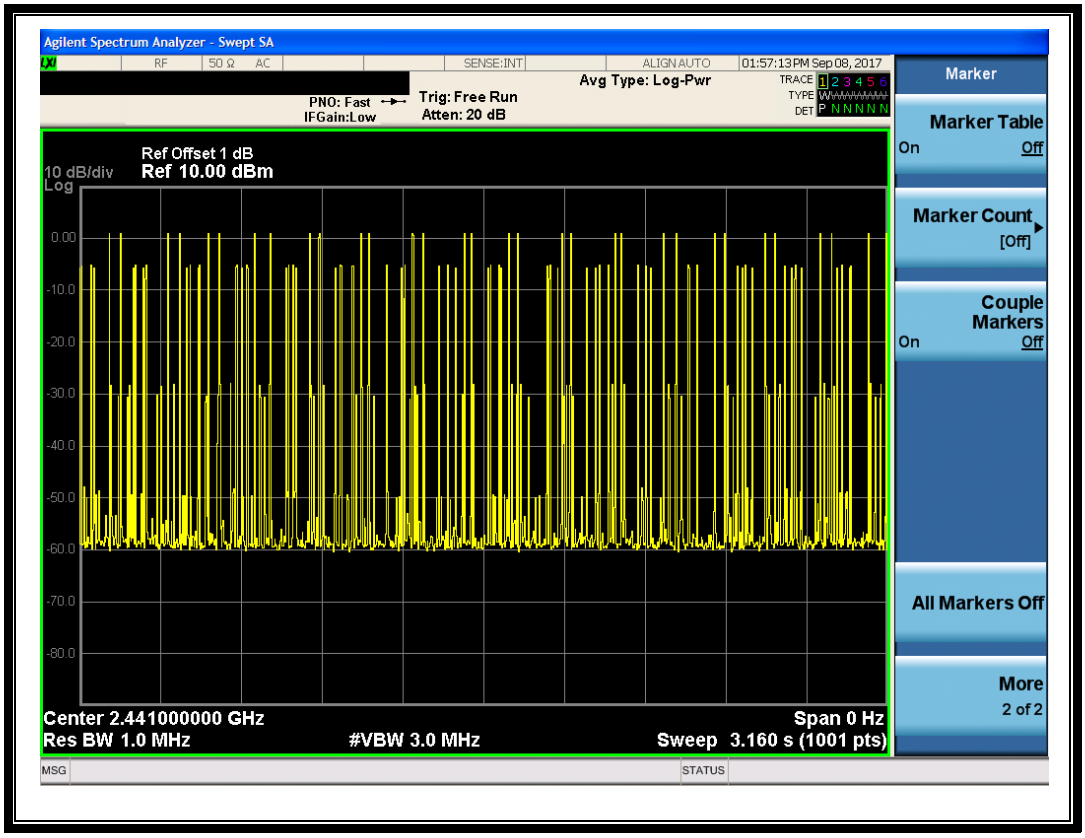
2.6.4.2 π/4-DQPSK Mode

A. Test Verdict:

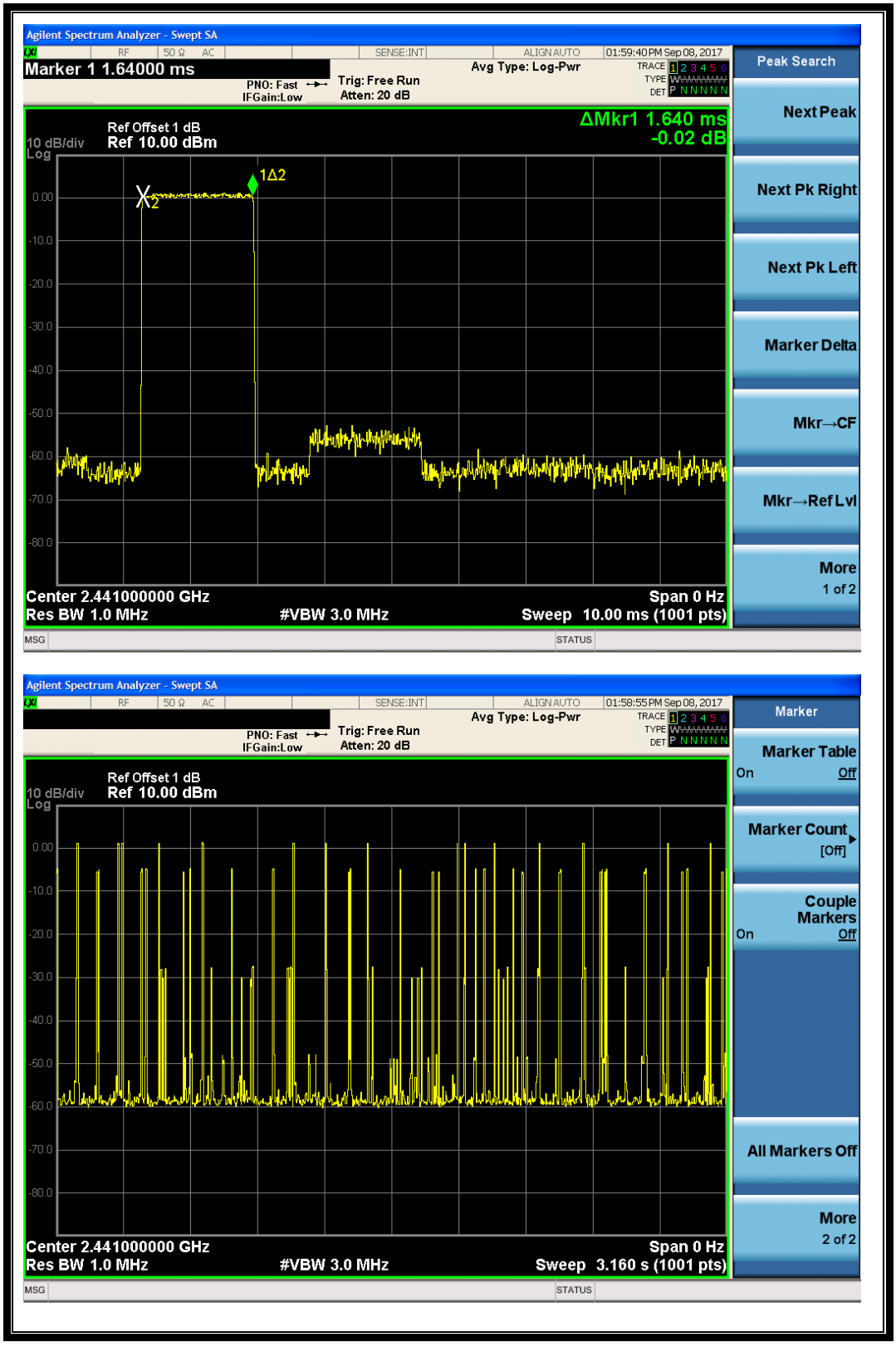
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.40	32	0.01280	0.1280	0.4	PASS
DH3	1.64	15	0.02460	0.2460		PASS
DH5	2.89	9	0.02601	0.2601		PASS

B. Test Plots:

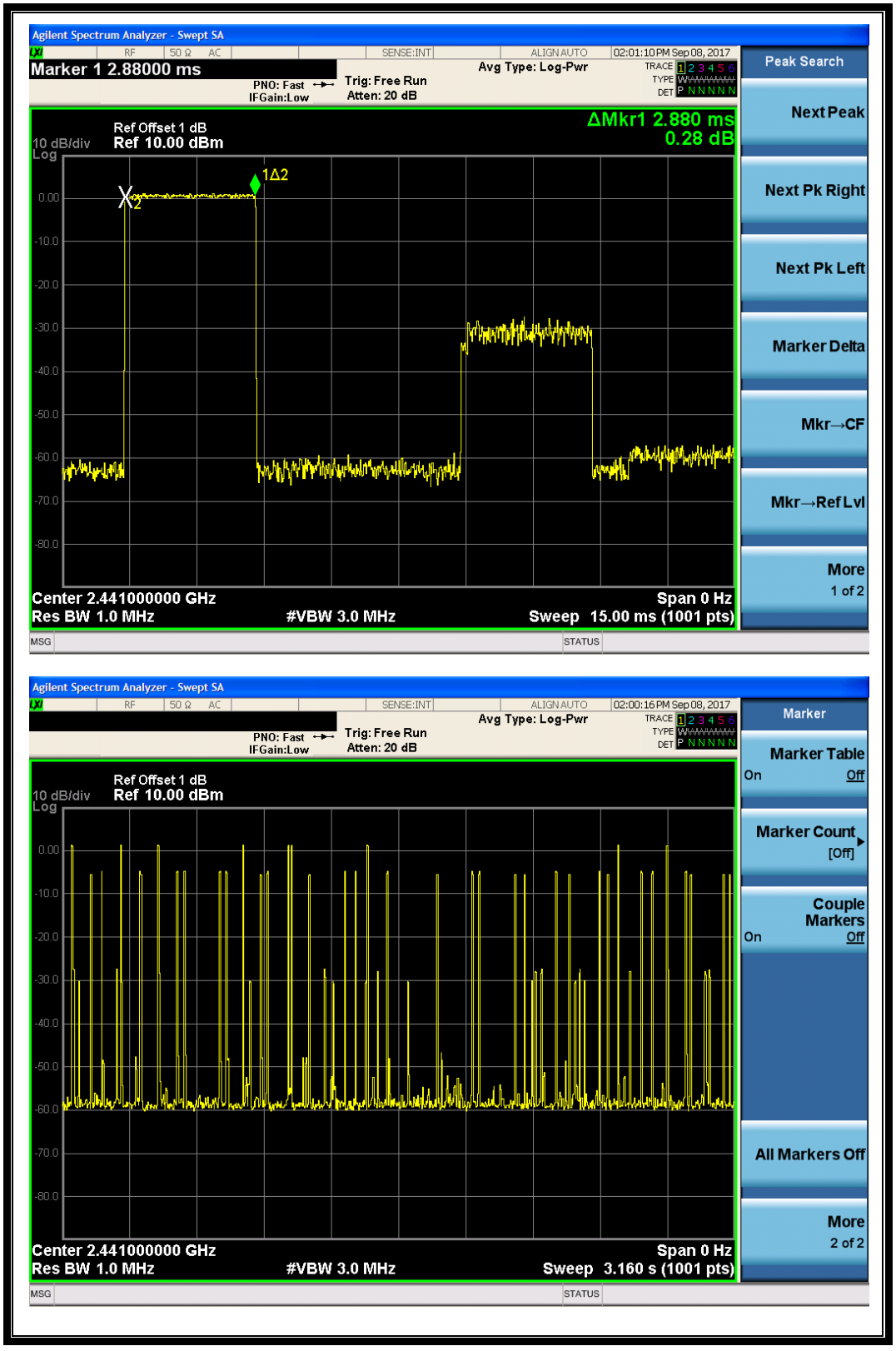




(Plot D: DH1 @ π/4-DQPSK)



(Plot E: DH3 @ π/4-DQPSK)



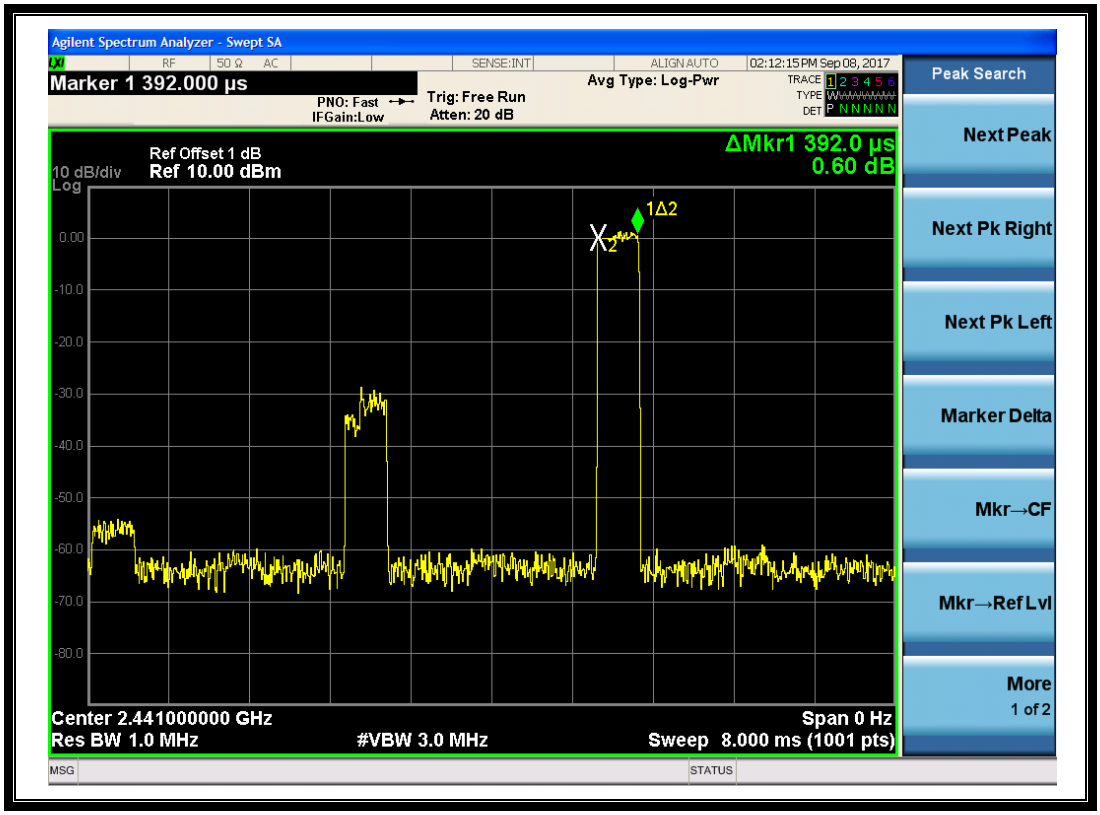
(Plot F: DH5 @ π/4-DQPSK)

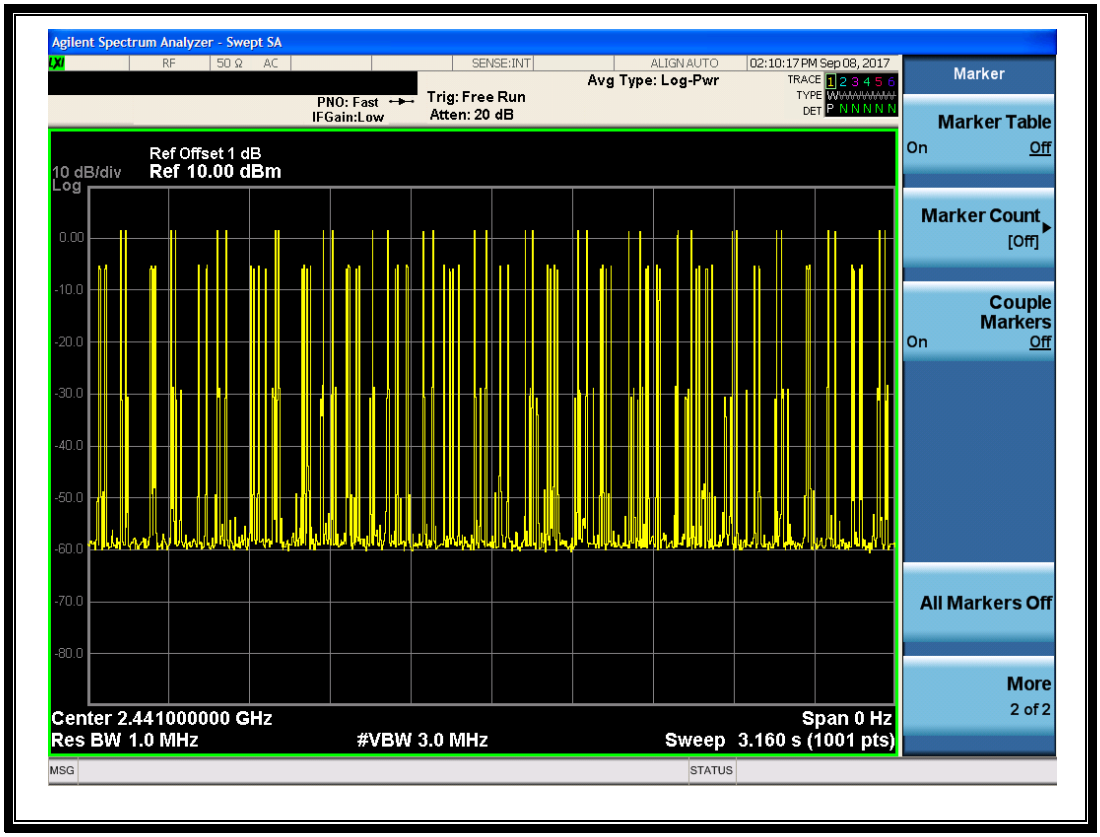
2.6.4.3 8-DPSK mode

A. Test Verdict:

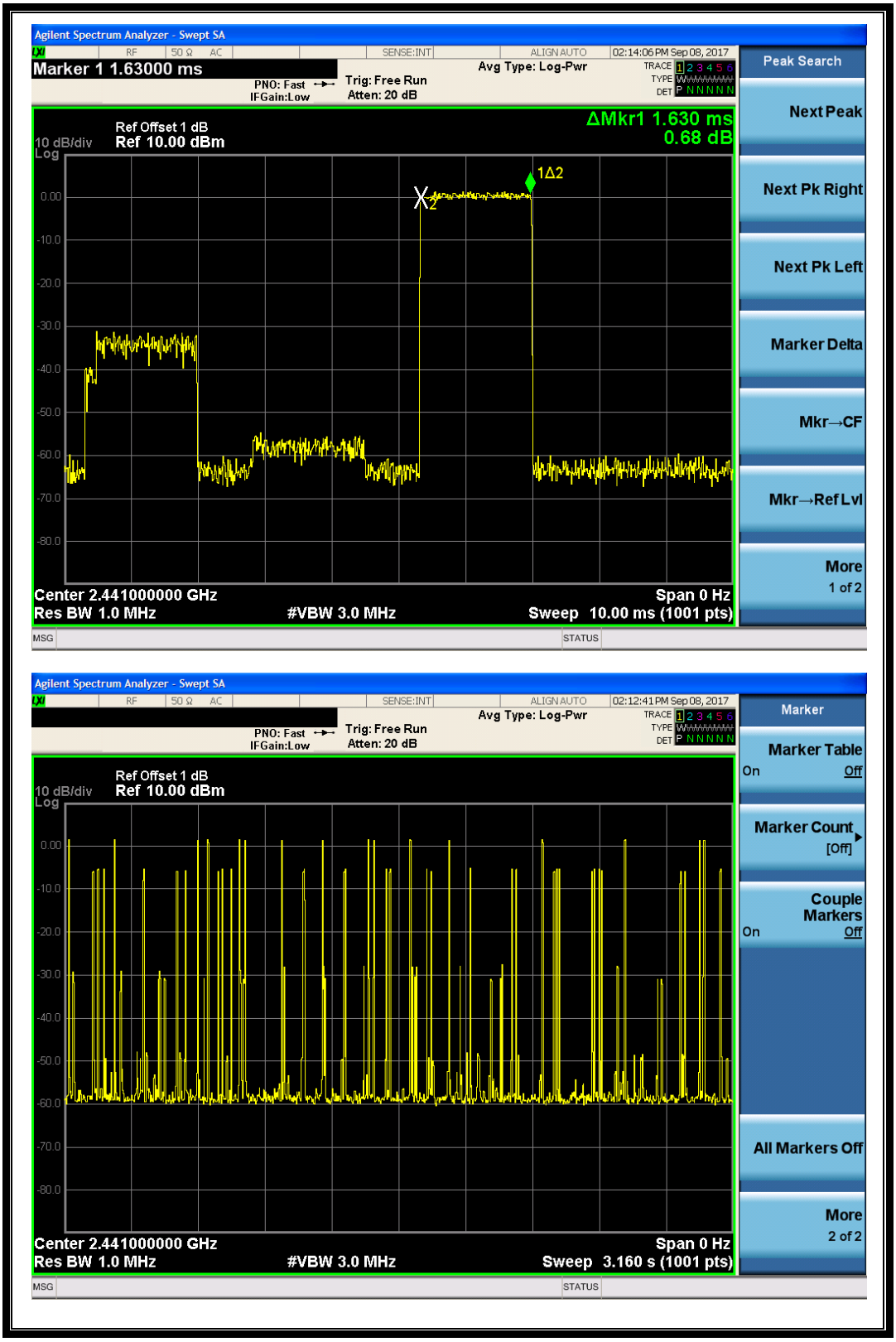
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.39	32	0.01248	0.1248	0.4	PASS
DH3	1.63	16	0.02608	0.2608		PASS
DH5	2.89	13	0.03757	0.3757		PASS

B. Test Plots:

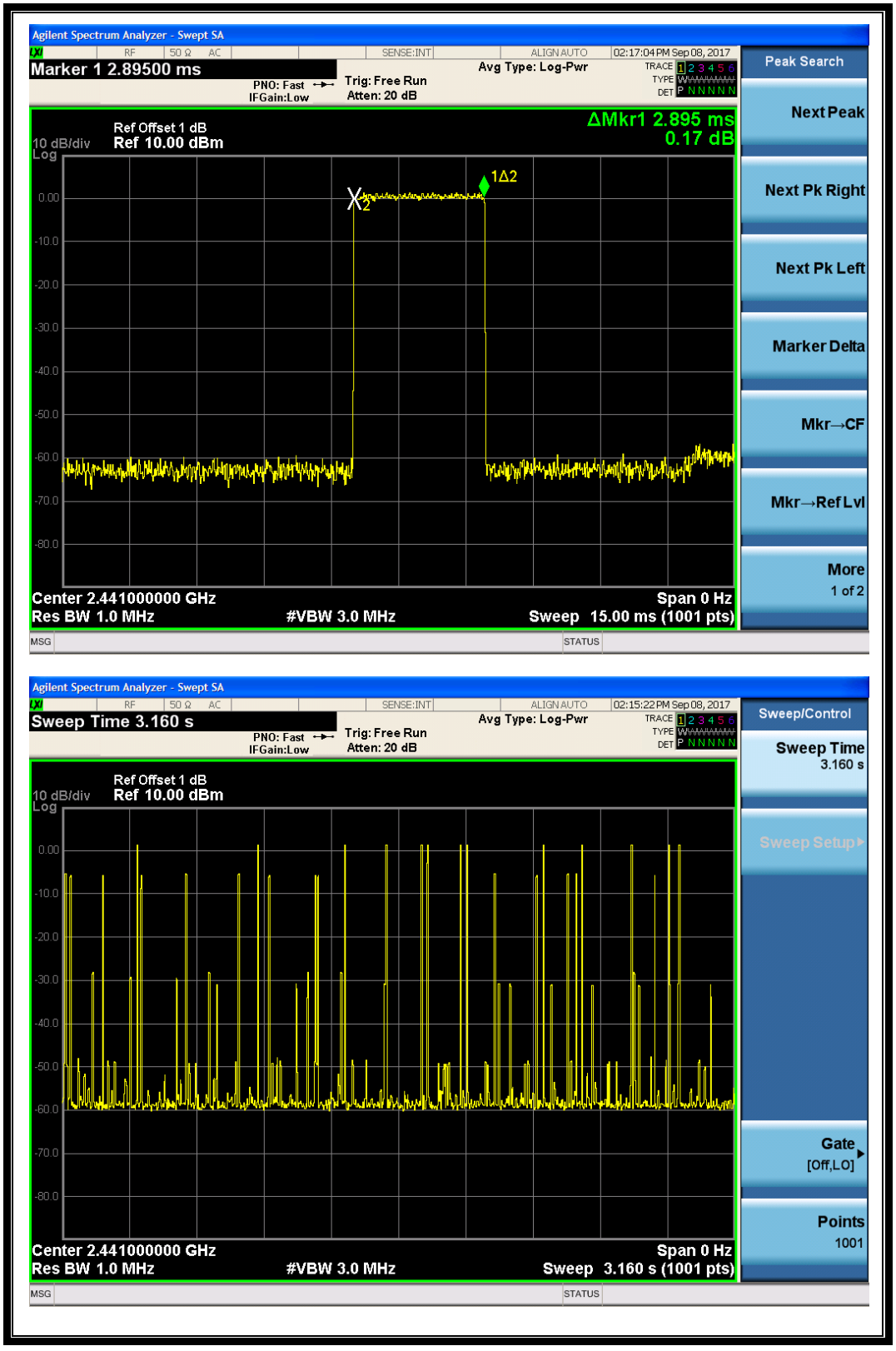




(Plot G: DH1 @ 8-DPSK)



(Plot H: DH3 @ 8-DPSK)



(Plot I: DH5 @ 8-DPSK)

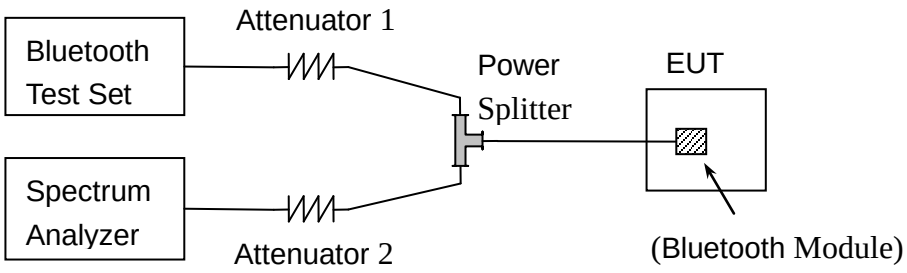
2.7 Conducted Spurious Emissions

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 Test Set 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.

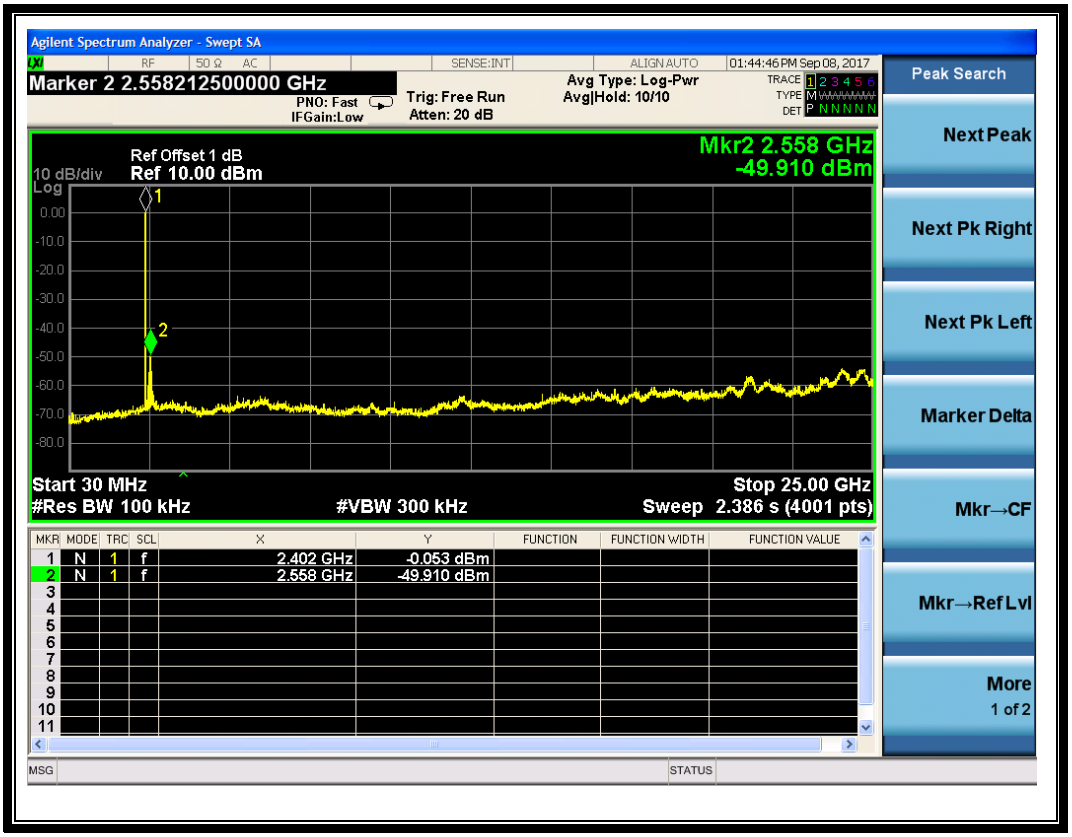
2.7.4.1 GFSK Mode

A. Test Verdict:

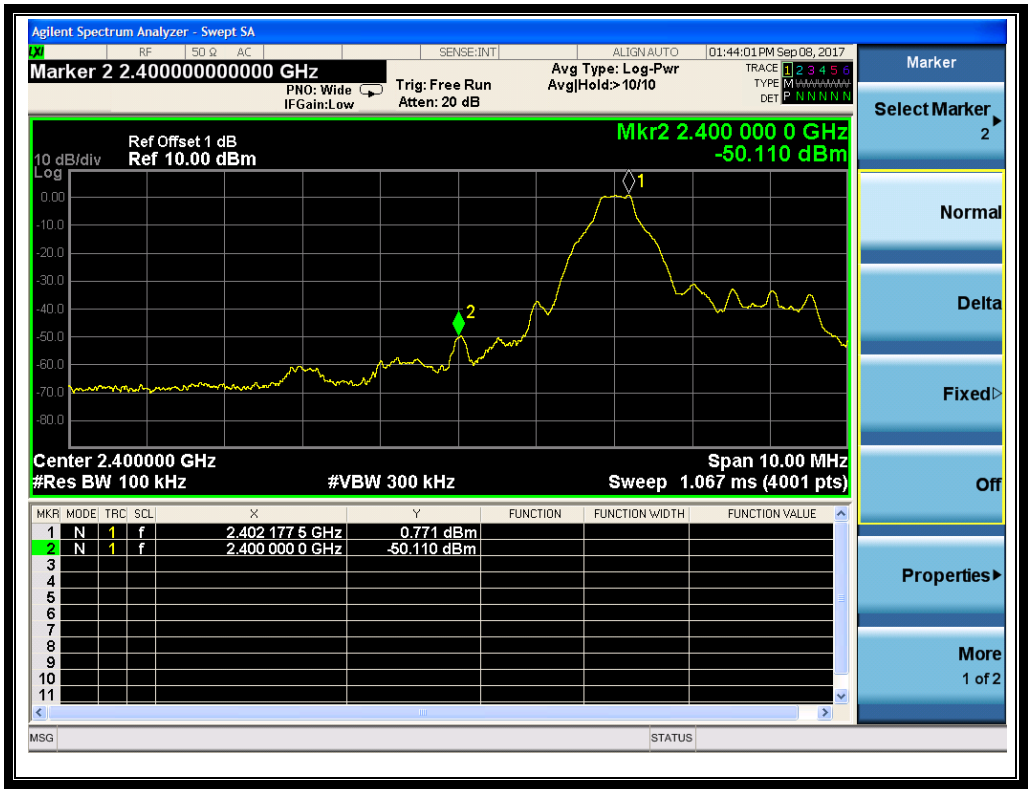
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-49.91	Plot A	-0.05	-20.05	PASS
39	2441	-50.41	Plot B	1.66	-18.34	PASS
78	2480	-50.03	Plot C	0.79	-19.21	PASS

B. Test Plots:

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

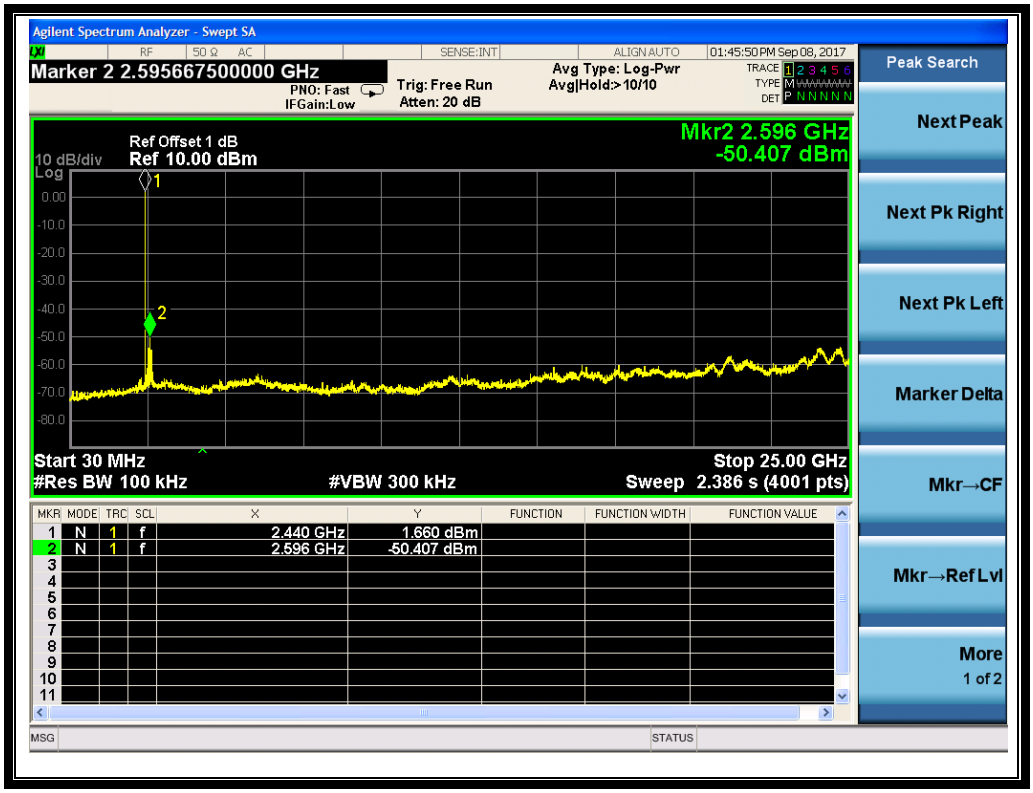


(Plot A: Channel = 0, 30MHz to 25GHz @ GFSK Mode)

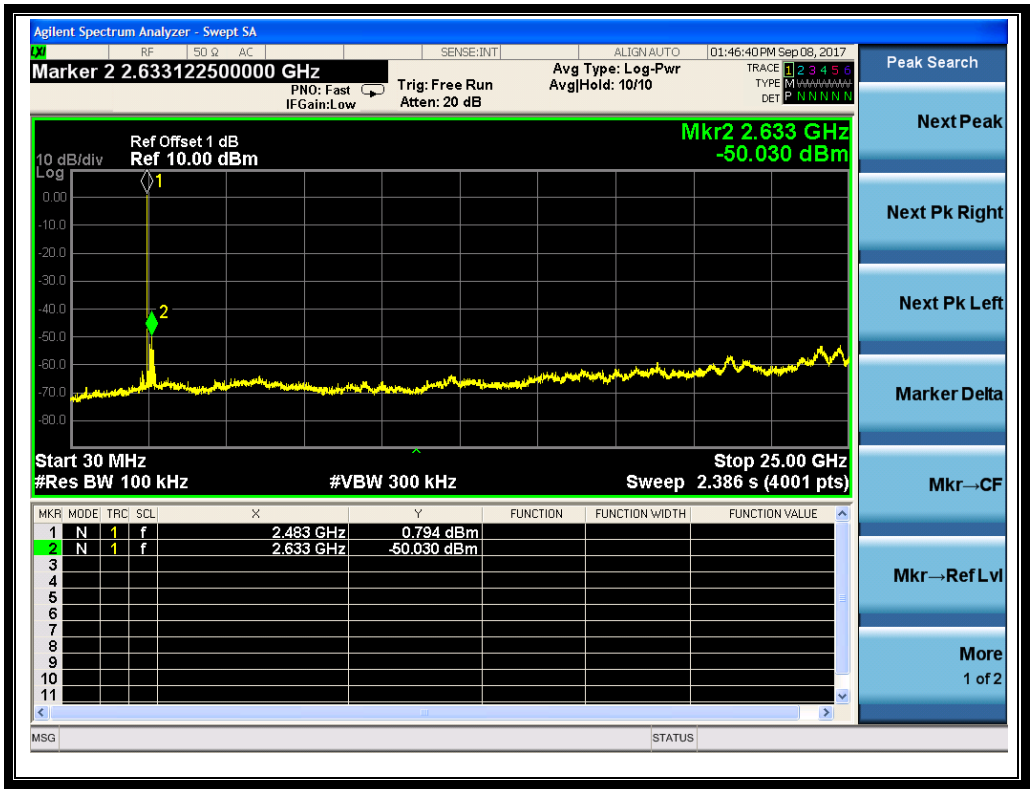


(Channel = 0, Band edge @ GFSK Mode)

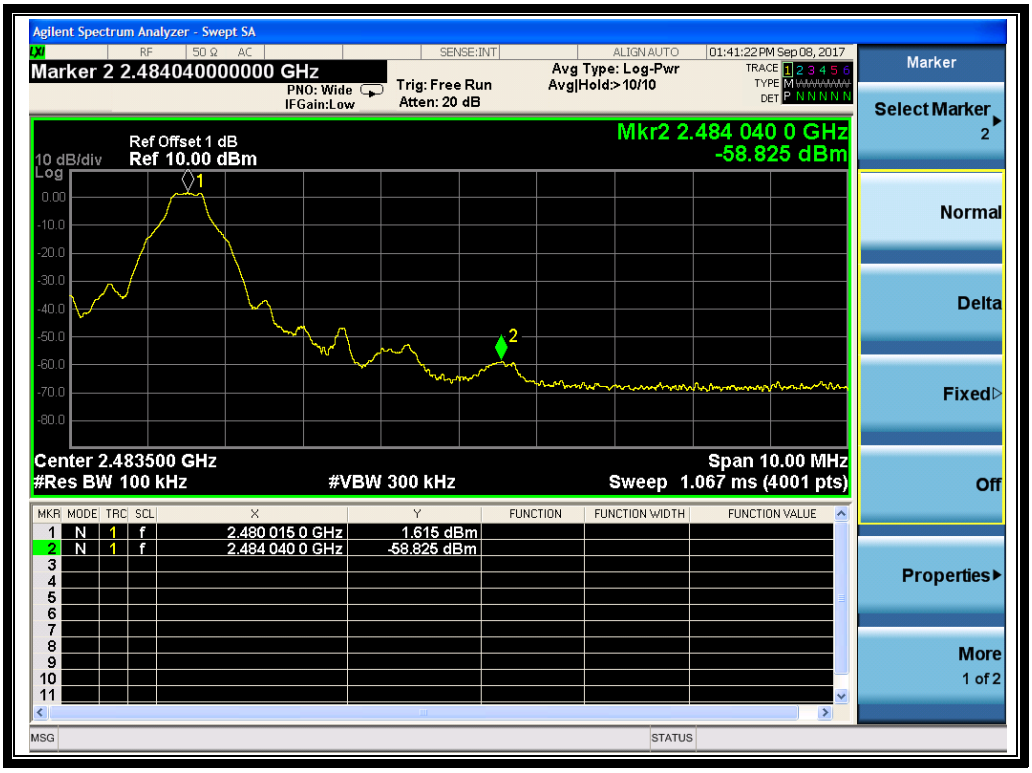
(Channel = 0, Band edge with hopping on @ GFSK Mode)



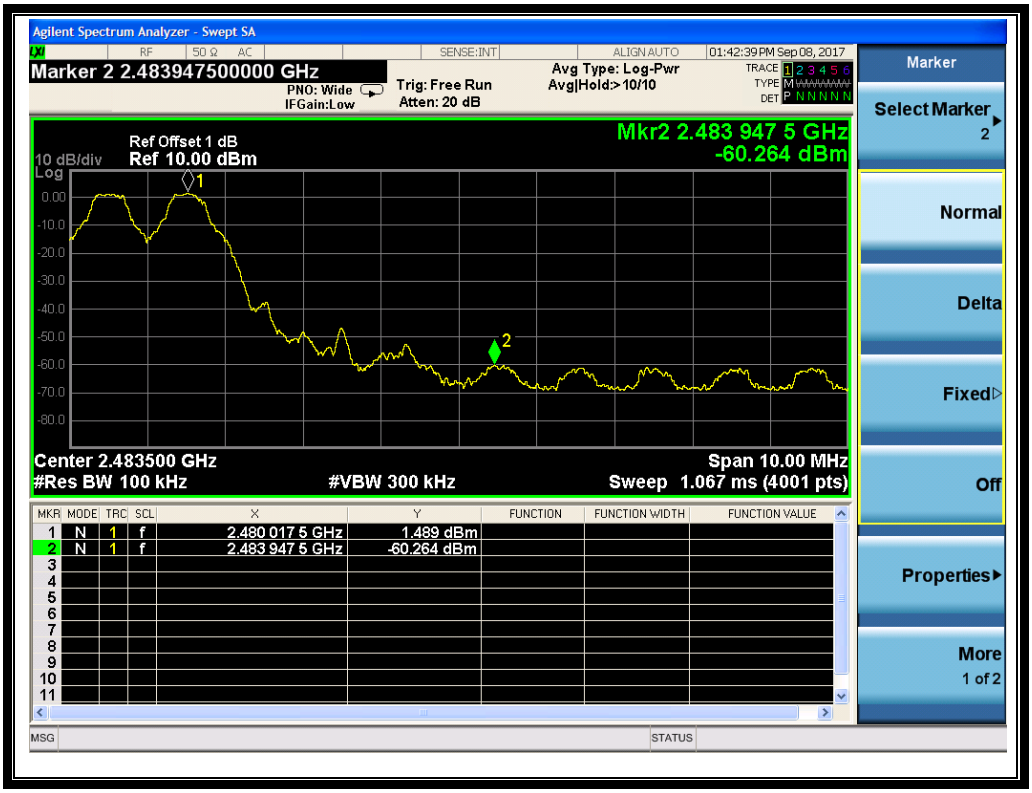
(Plot B: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



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



(Channel = 78, Band edge @ GFSK Mode)



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

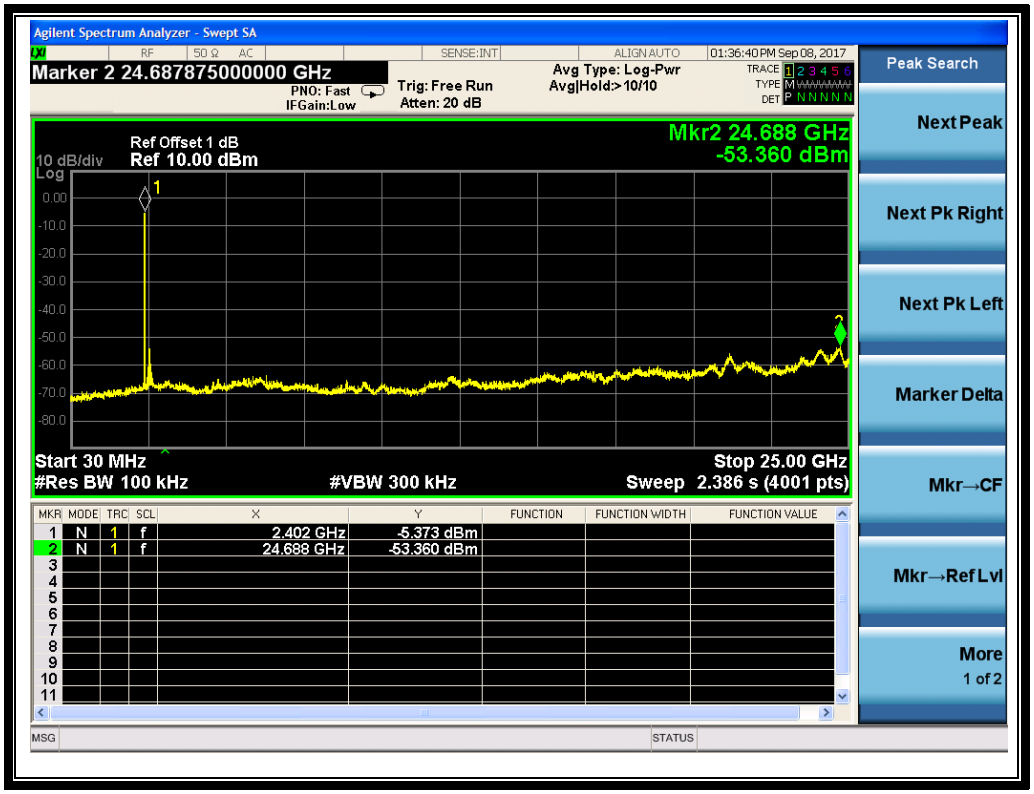
2.7.4.2 π/4-DQPSK Mode

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	-53.36	Plot D	-5.37	-25.37	PASS
39	2441	-51.83	Plot E	-2.72	-22.72	PASS
78	2480	-51.92	Plot F	-2.45	-22.45	PASS

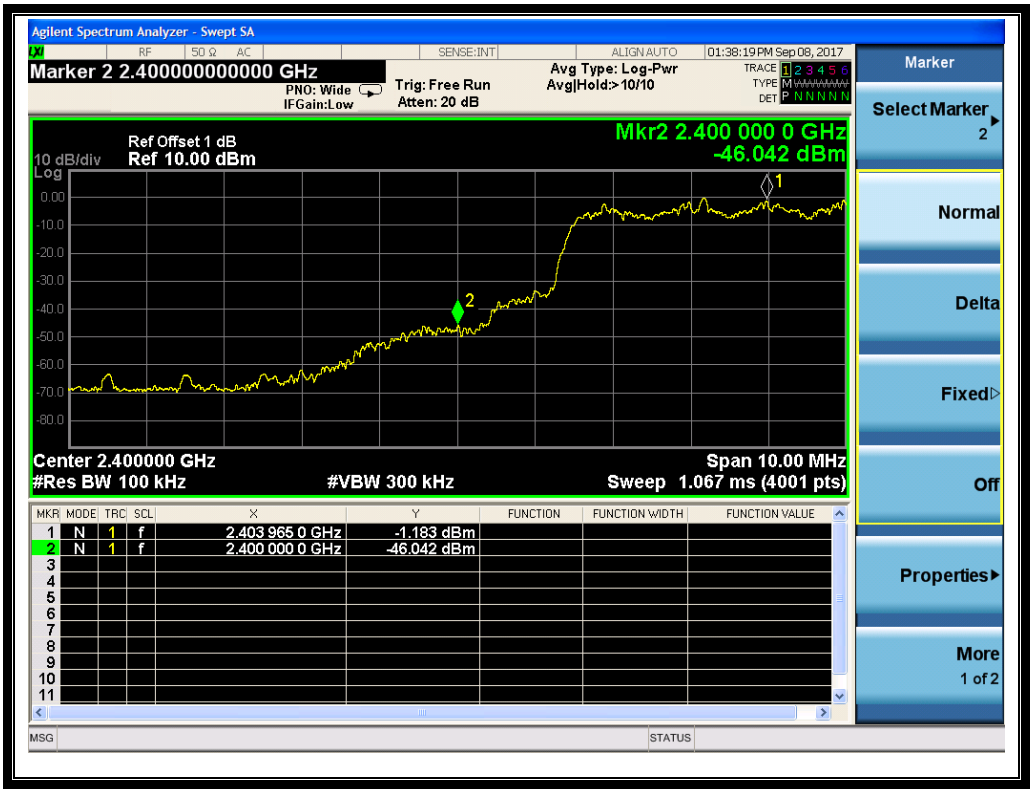
B. Test Plots:

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

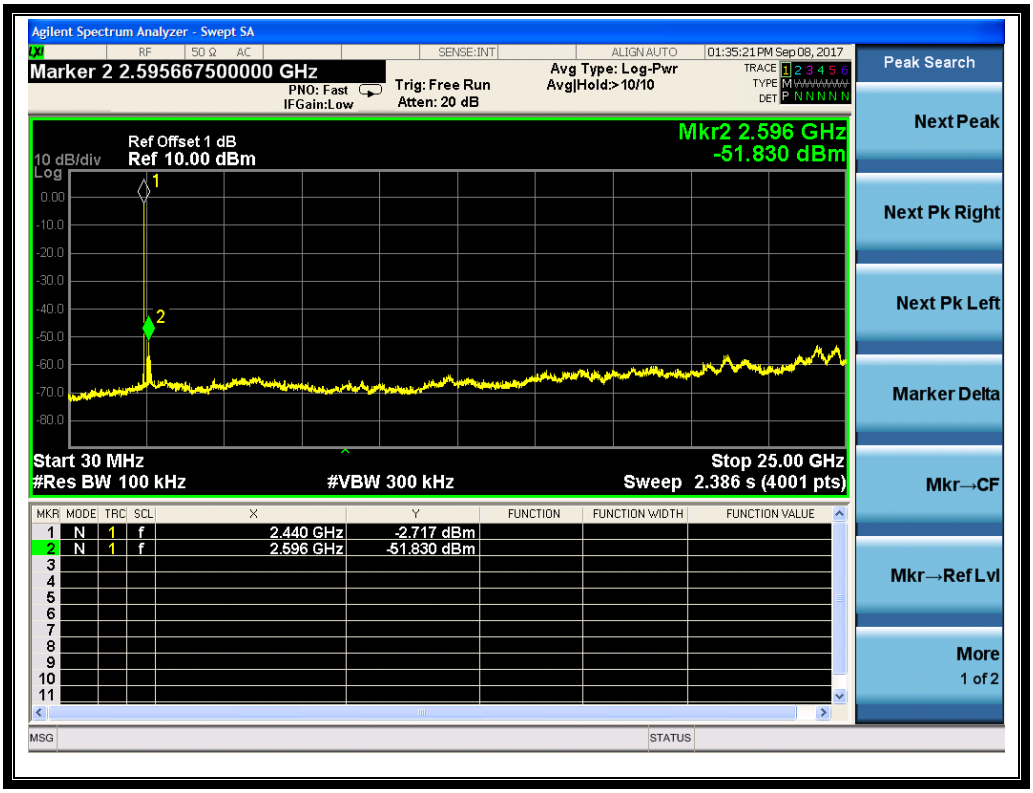


(Plot D: Channel = 0, 30MHz to 25GHz @π/4-DQPSK)

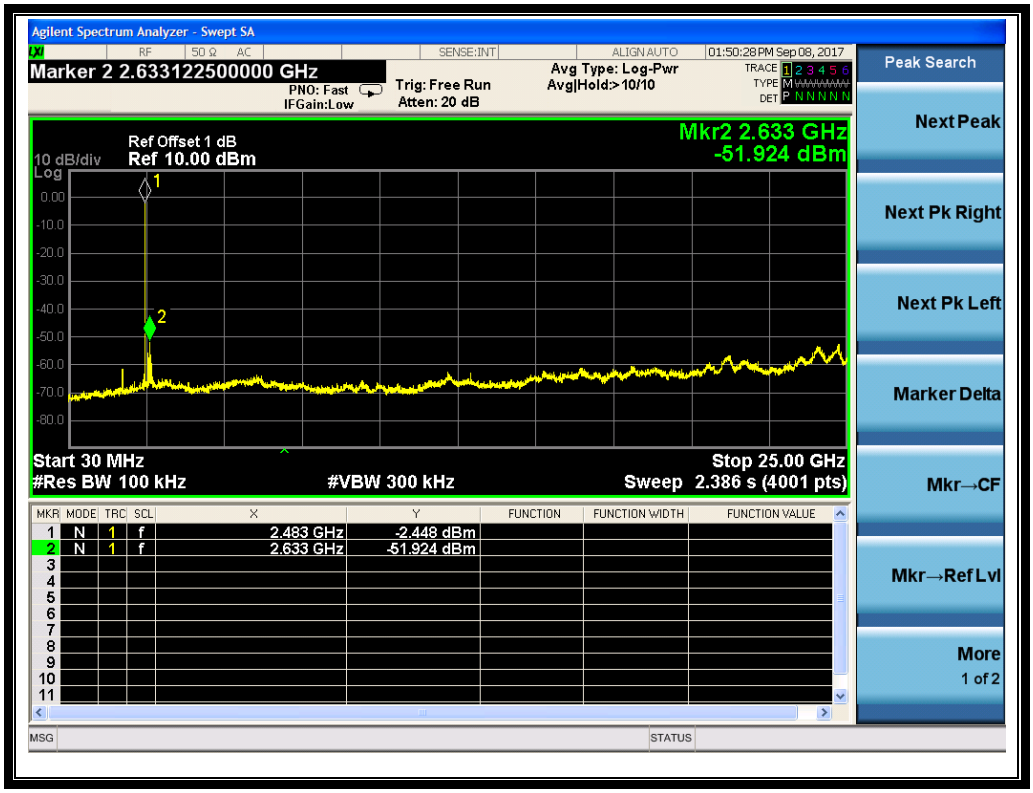
(Channel = 0, Band edge @π/4-DQPSK)



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



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



(Plot F: 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)

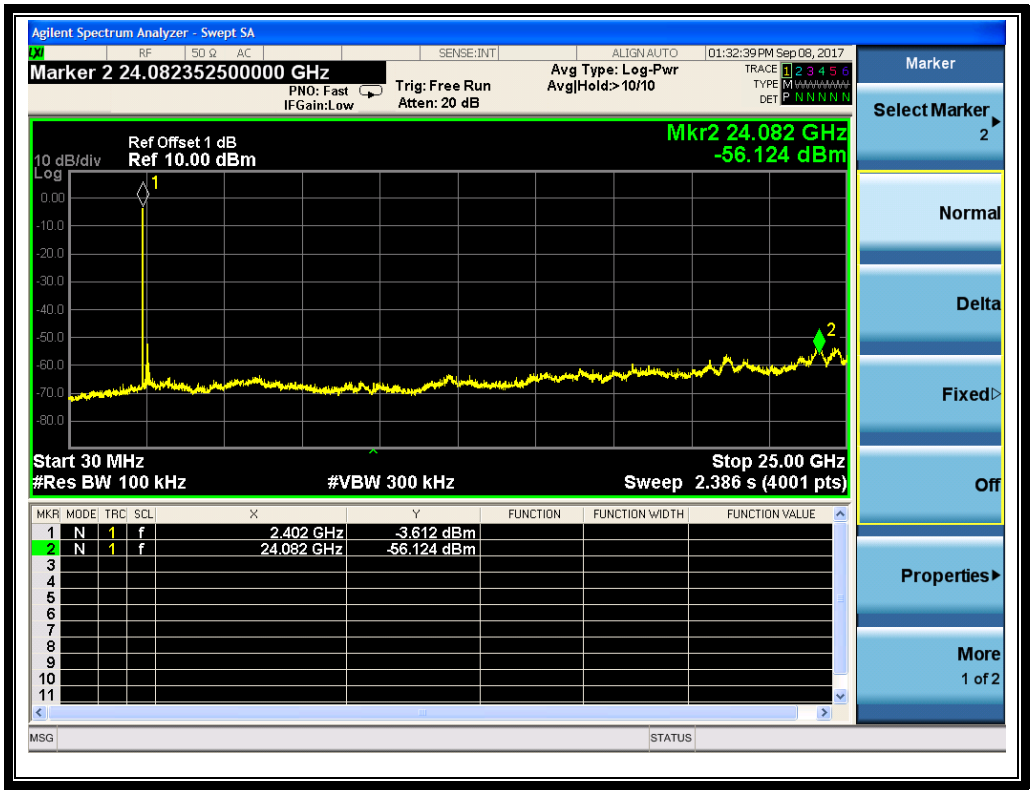
2.7.4.3 8-DPSK Mode

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	-56.12	Plot G	-3.61	-23.61	PASS
39	2441	-52.85	Plot H	-3.03	-23.03	PASS
78	2480	-53.80	Plot I	-1.49	-21.49	PASS

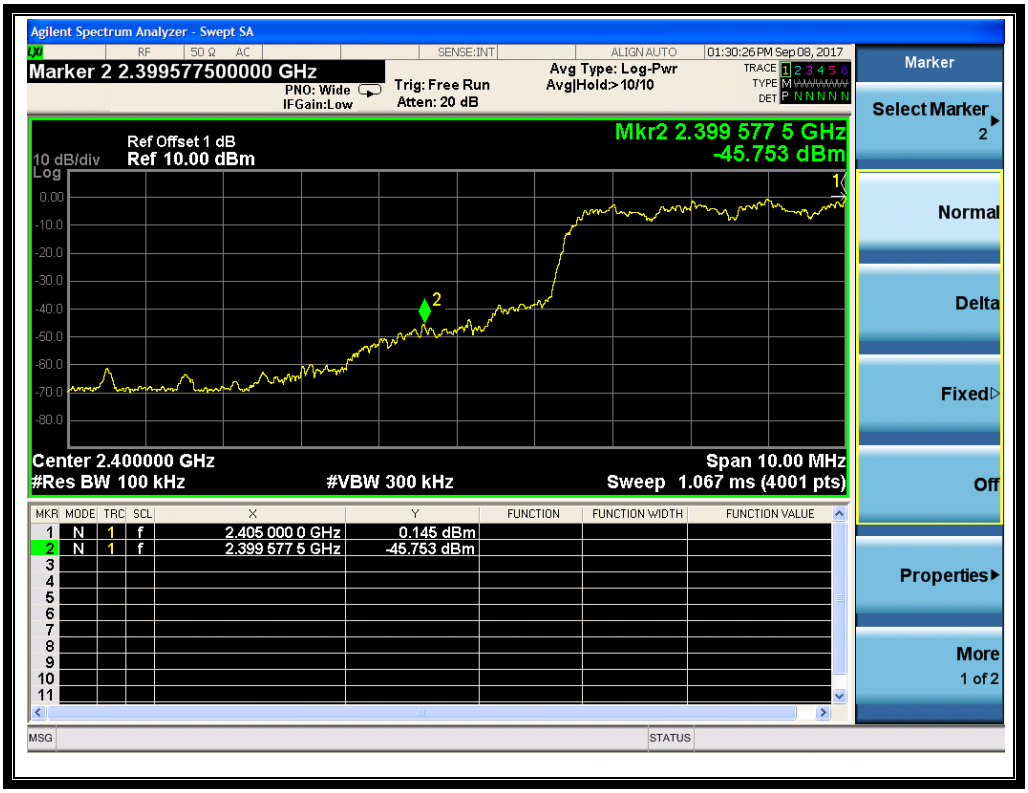
B. Test Plots:

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

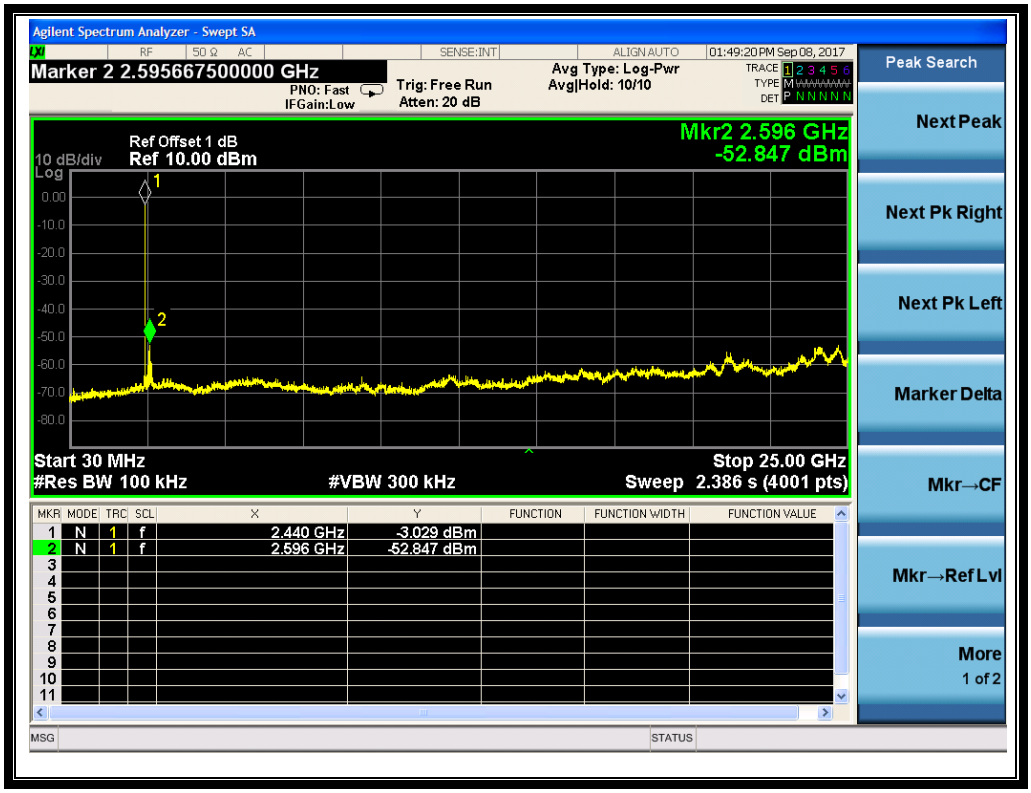


(Plot G: Channel = 0, 30MHz to 25GHz @ 8-DPSK)

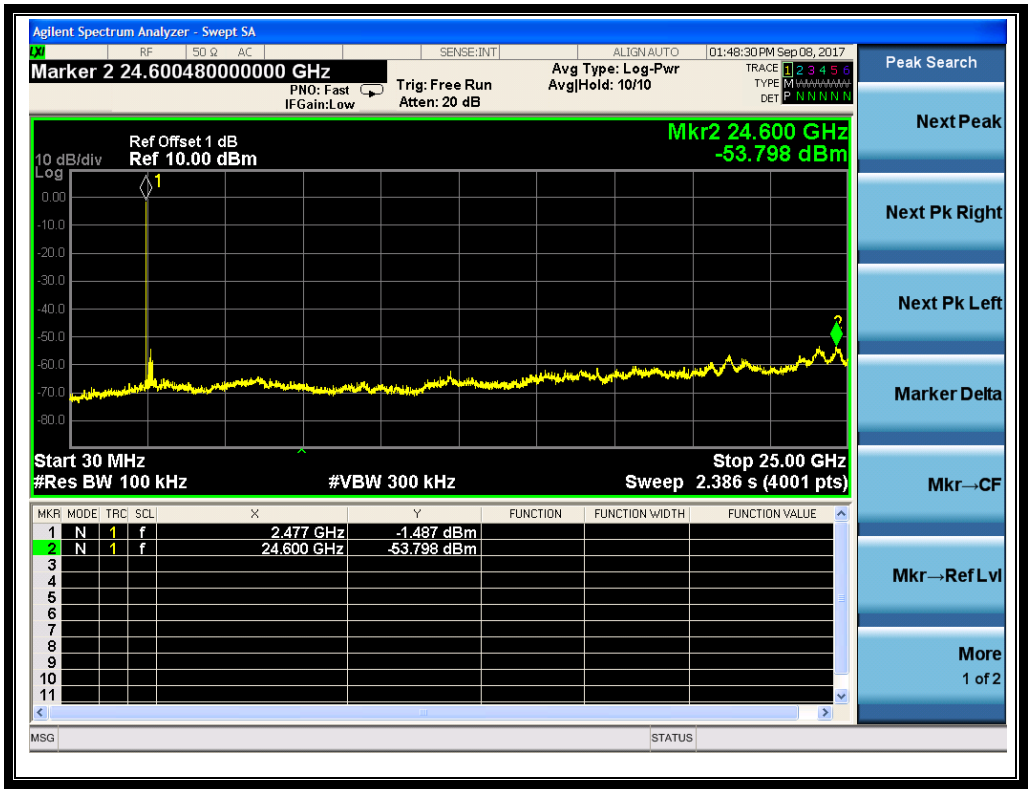
(Channel = 0, Band edge @ 8-DPSK)



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



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



(Plot I: 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)

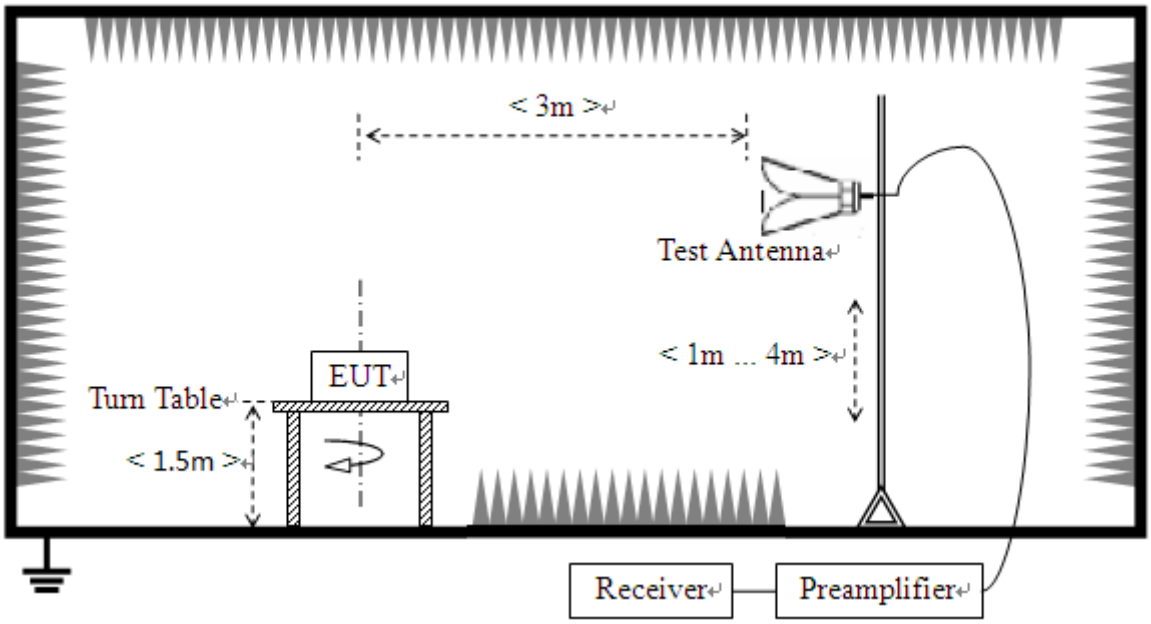
2.8 Restricted Frequency Bands

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 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. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under non hopping-on test mode transmitting 339 bytes DH5, 679 bytes 2DH5 and 1021 bytes 3DH5 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

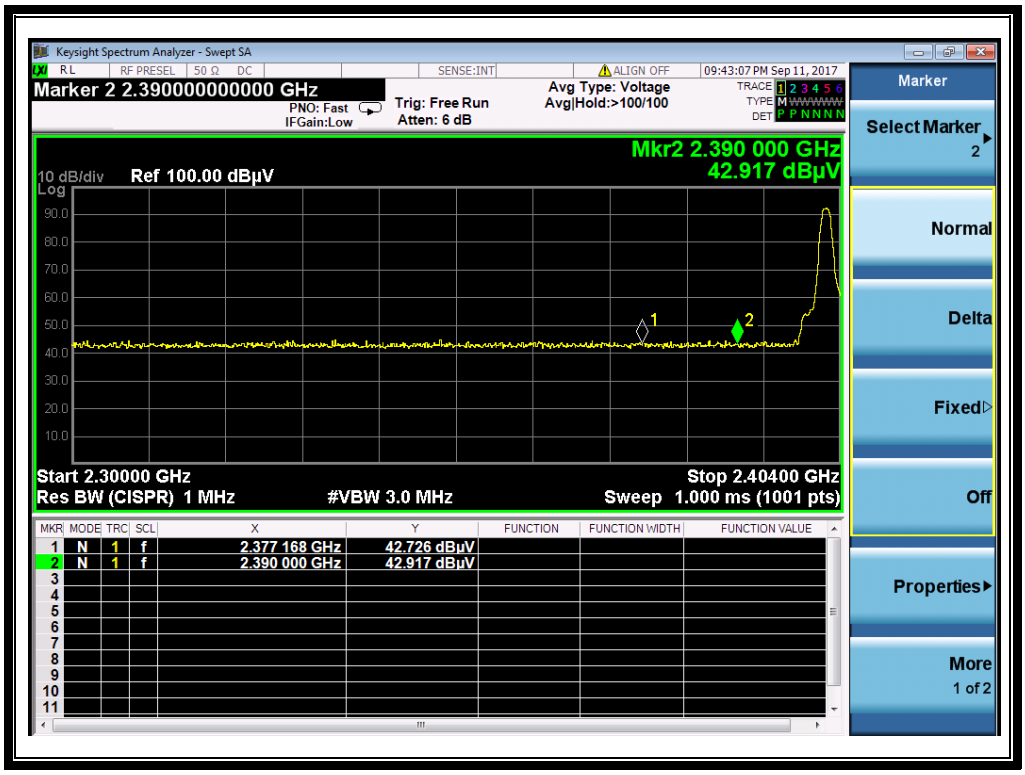
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; AT =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
AT: Total correction Factor except Antenna
UR: Receiver Reading
Gpreamp: Preamplifier Gain
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

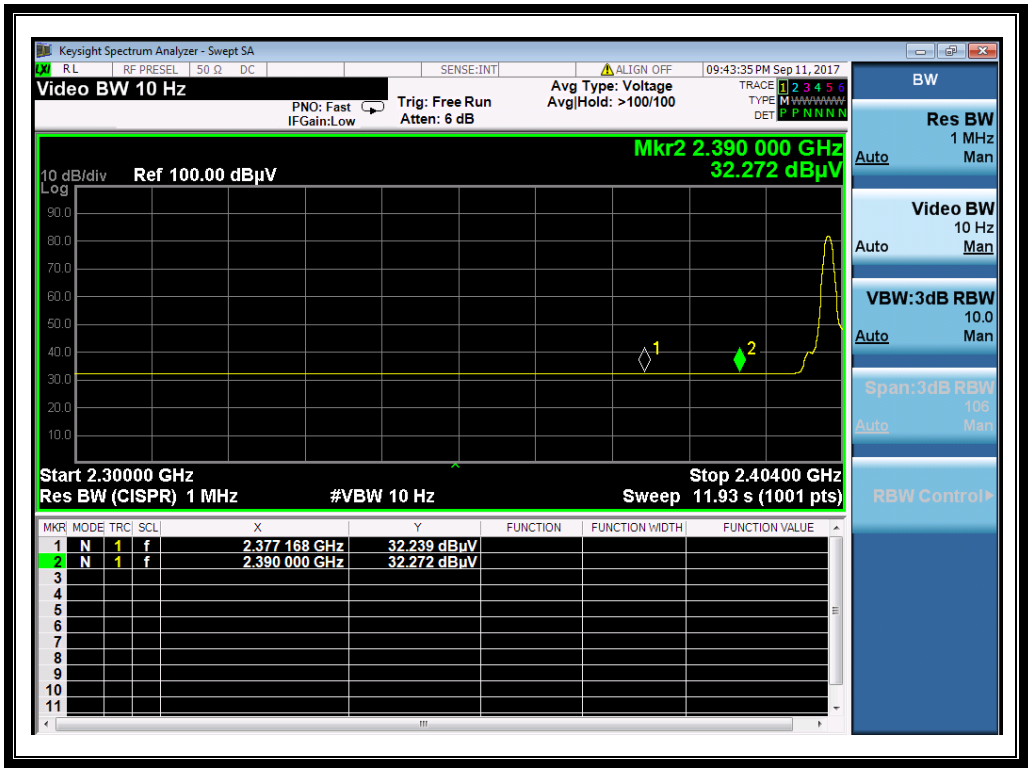
A. Test Verdict:

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	2377.17	PK	42.73	-33.63	32.56	41.66	74	Pass
0	2377.17	AV	32.24	-33.63	32.56	31.17	54	Pass
78	2484.40	PK	45.15	-33.18	32.50	44.47	74	Pass
78	2484.40	AV	32.28	-33.18	32.50	31.60	54	Pass

B. Test Plots:

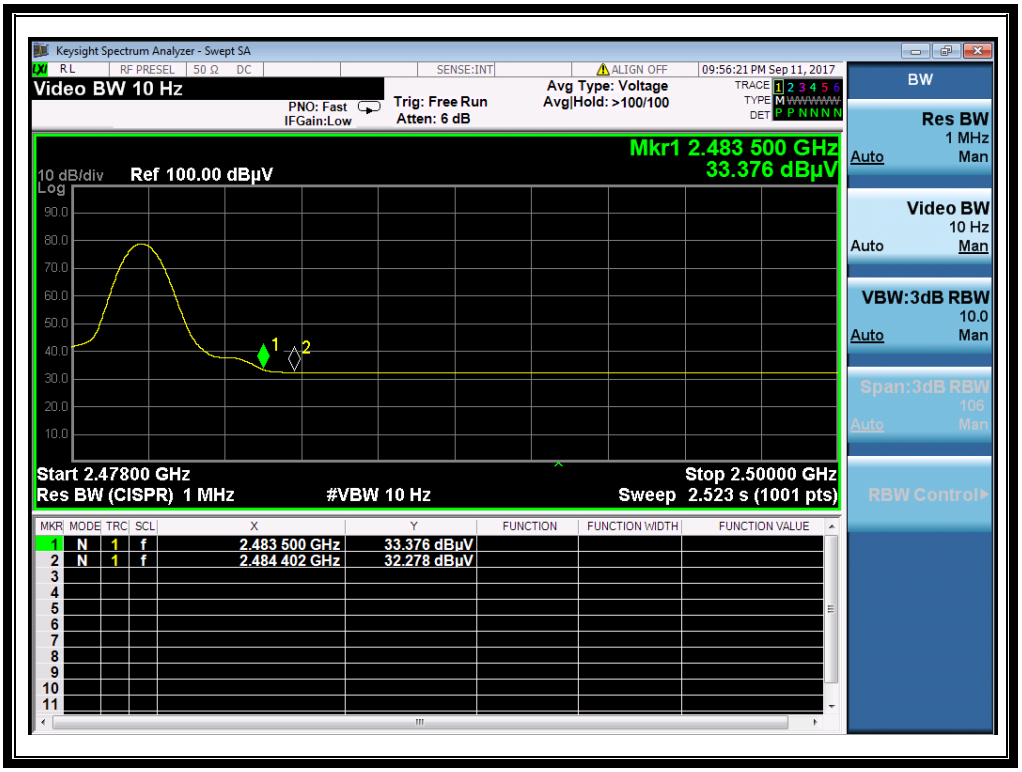


(Plot A1:Channel = 0 PEAK @ GFSK)



(Plot A2:Channel = 0 AVERAGE @ GFSK)

(Plot B1: Channel = 78 PEAK @ GFSK)



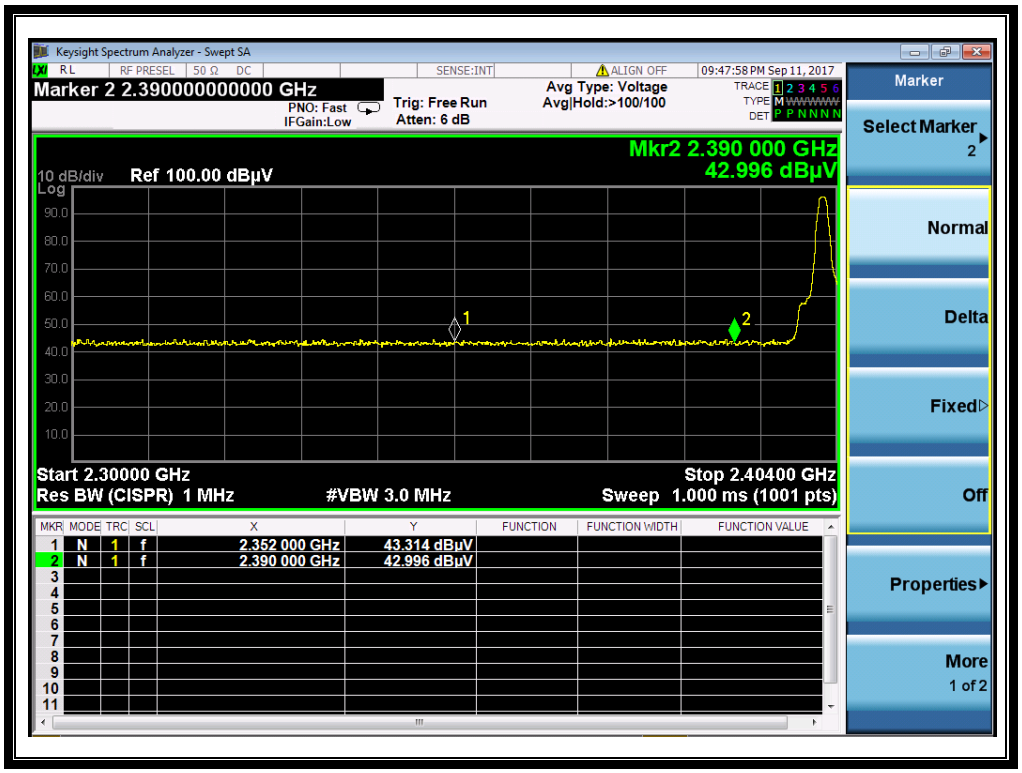
(Plot B2: Channel = 78 AVERAGE @ GFSK)

2.8.4.2 π/4-DQPSK Mode

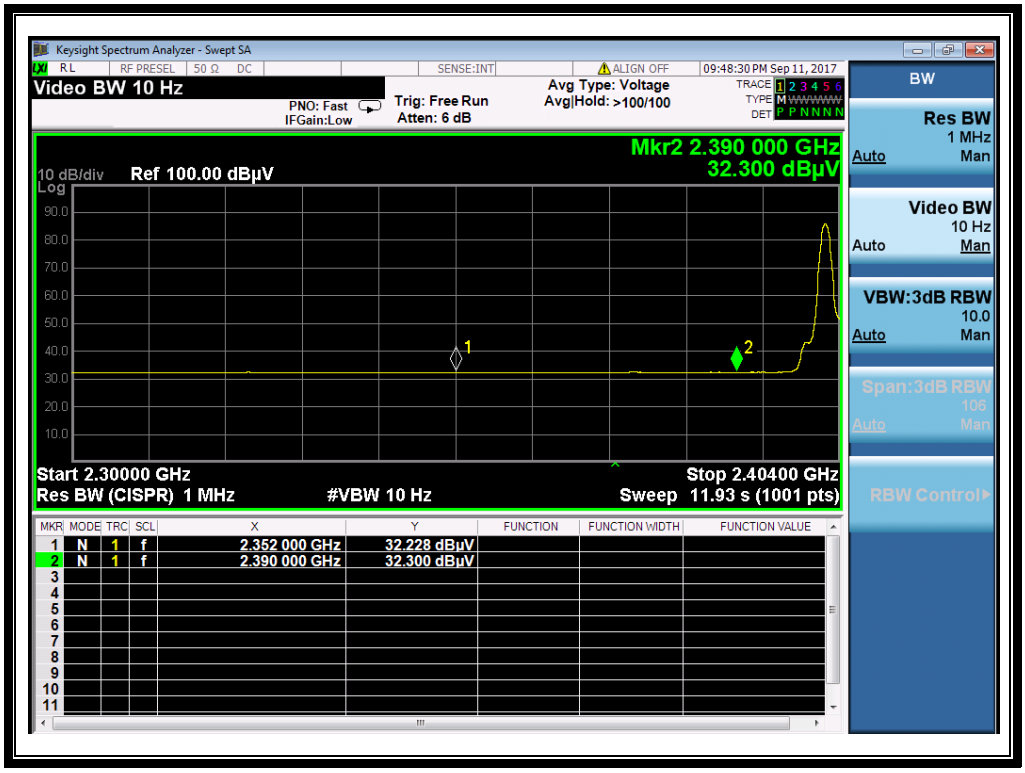
A. Test Verdict:

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	2352.00	PK	43.31	-33.63	32.56	42.24	74	Pass
0	2352.00	AV	32.23	-33.63	32.56	31.16	54	Pass
78	2485.28	PK	43.17	-33.18	32.5	42.49	74	Pass
78	2485.28	AV	32.23	-33.18	32.5	31.55	54	Pass

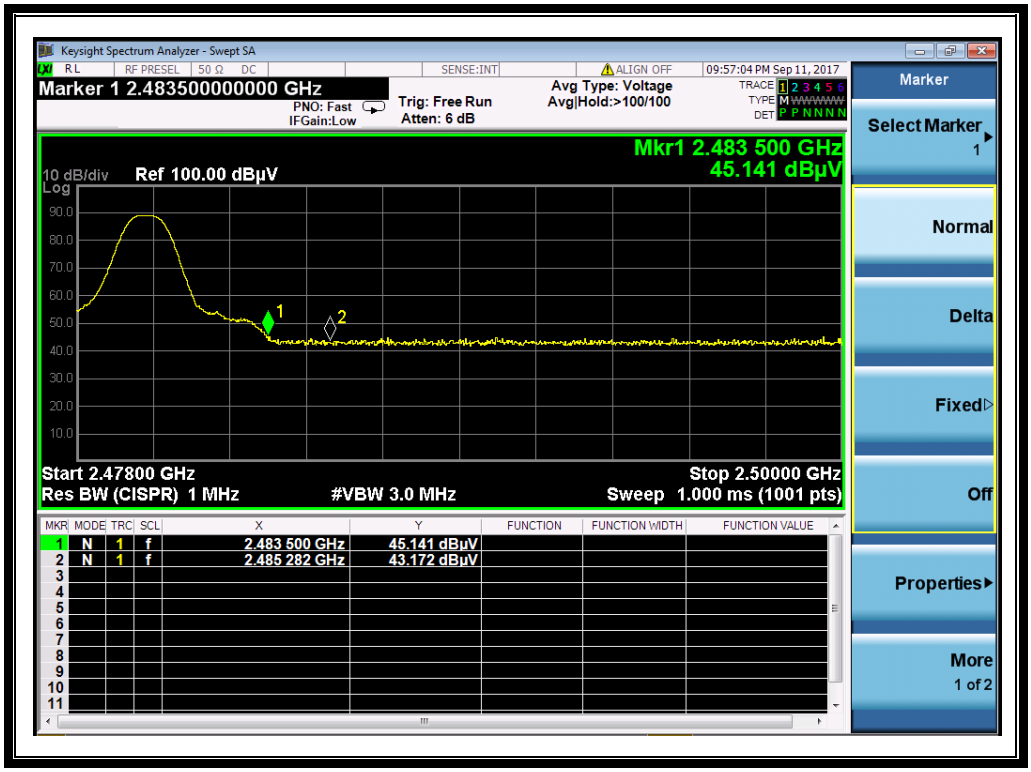
B. Test Plots:



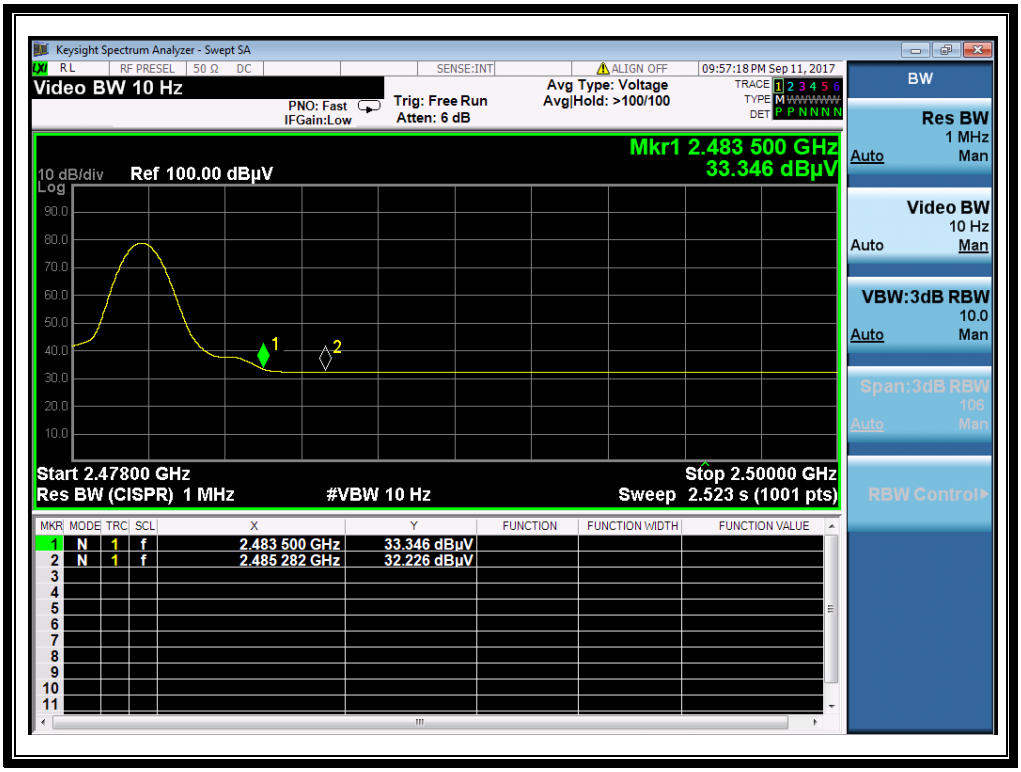
(Plot C1: Channel = 0 PEAK @ π/4-DQPSK)



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



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



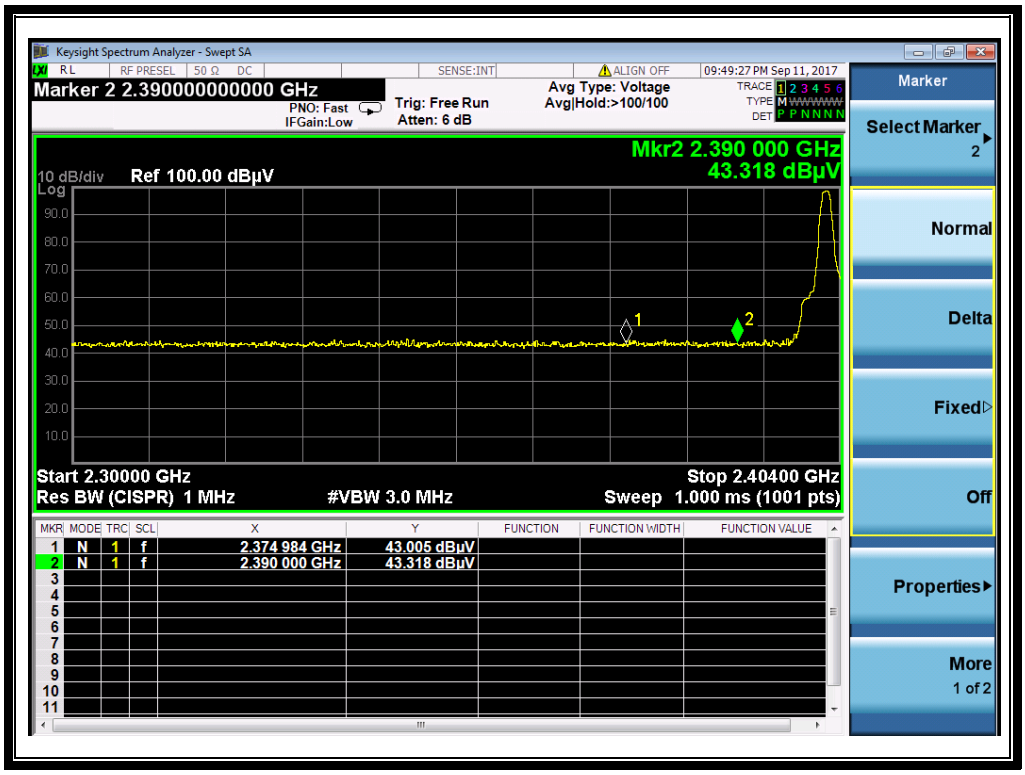
(Plot D2: Channel = 78 AVERAGE@ π/4-DQPSK)

2.8.4.3 8-DPSK Mode

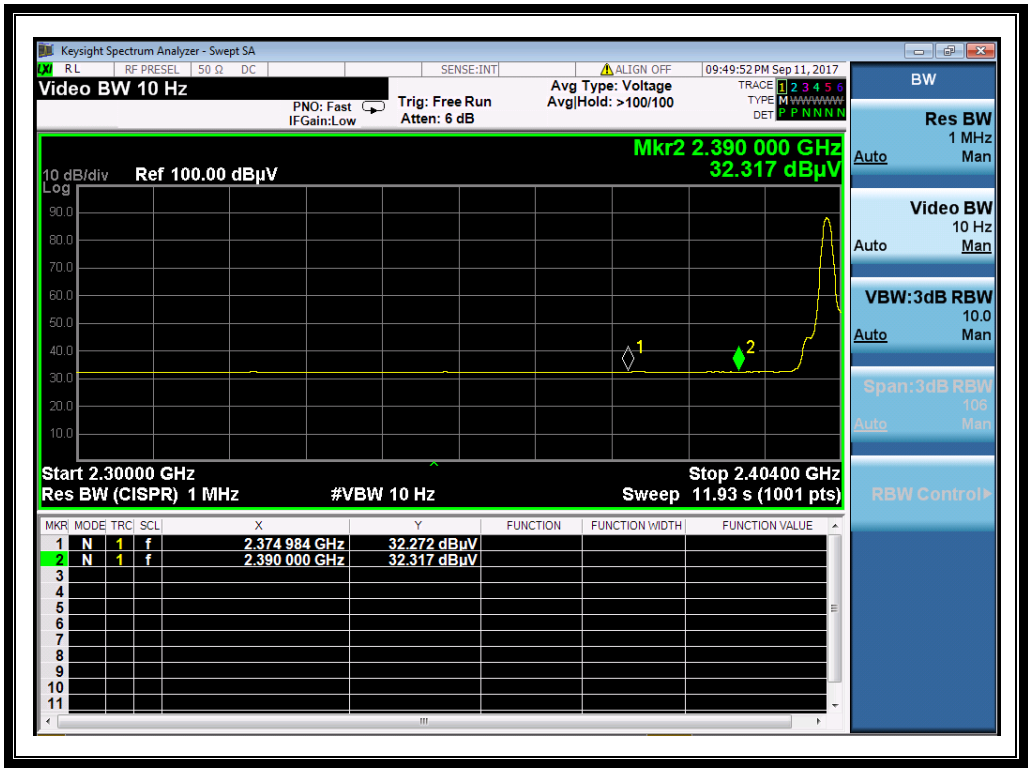
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
0	2374.98	PK	43.01	-33.63	32.56	41.94	74	Pass
0	2374.98	AV	32.27	-33.63	32.56	31.20	54	Pass
78	2484.45	PK	43.08	-33.18	32.5	42.40	74	Pass
78	2484.45	AV	32.29	-33.18	32.5	31.61	54	Pass

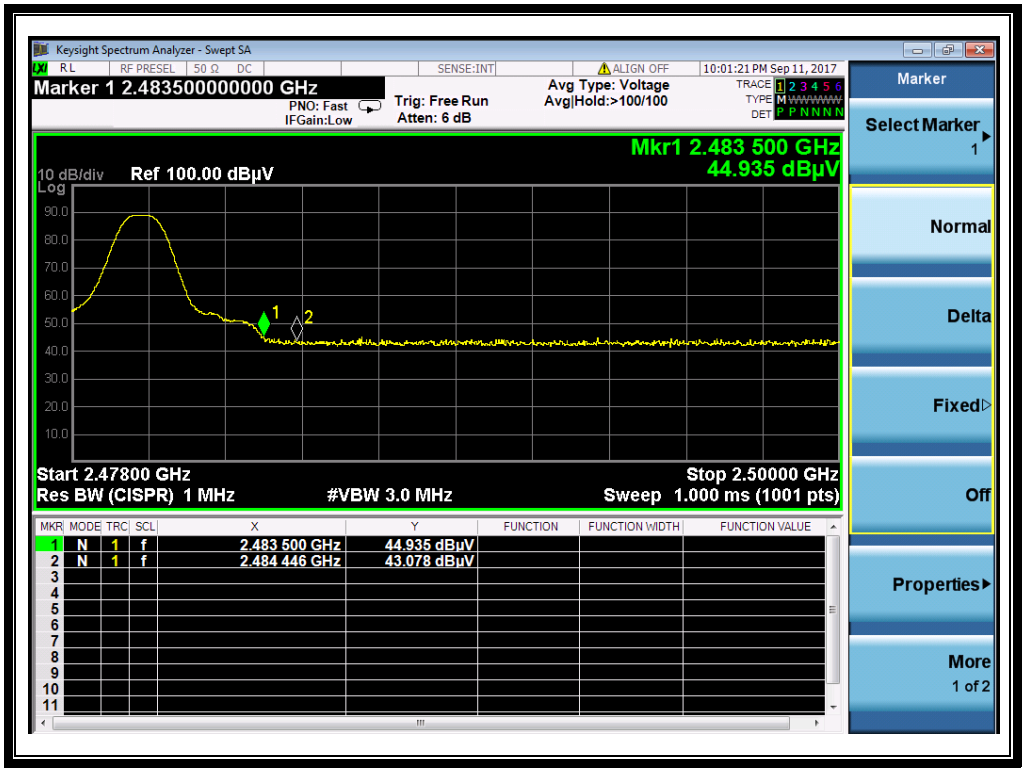
B. Test Plots:



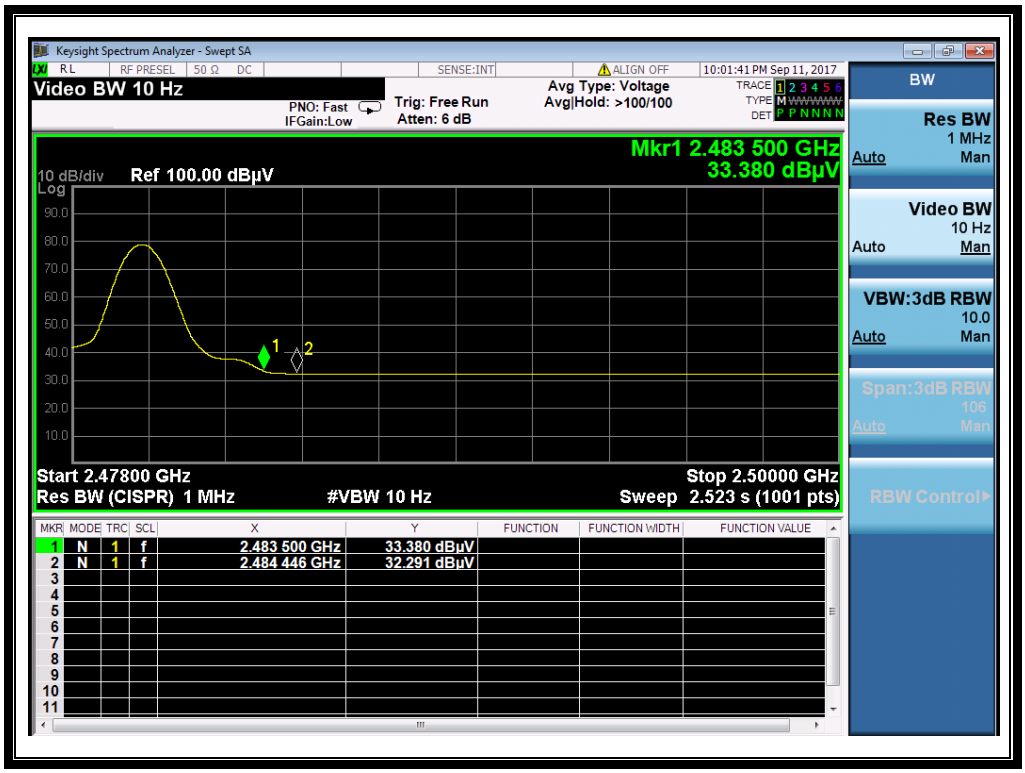
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



(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 to RSS-GEN section 8.8, 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

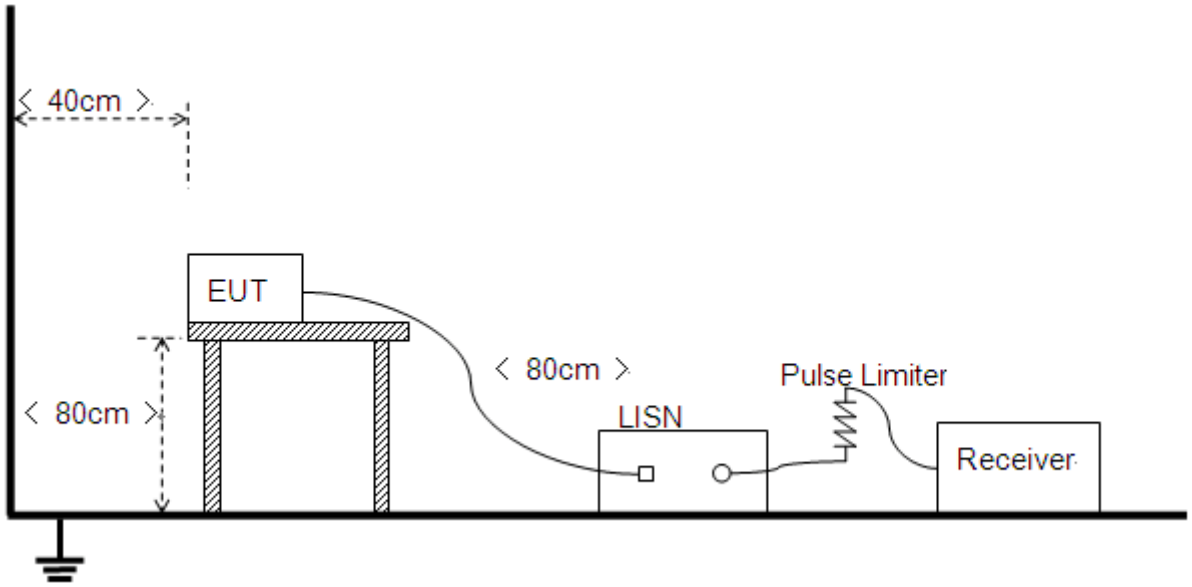
NOTE:

(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 C63.10: 2013.

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

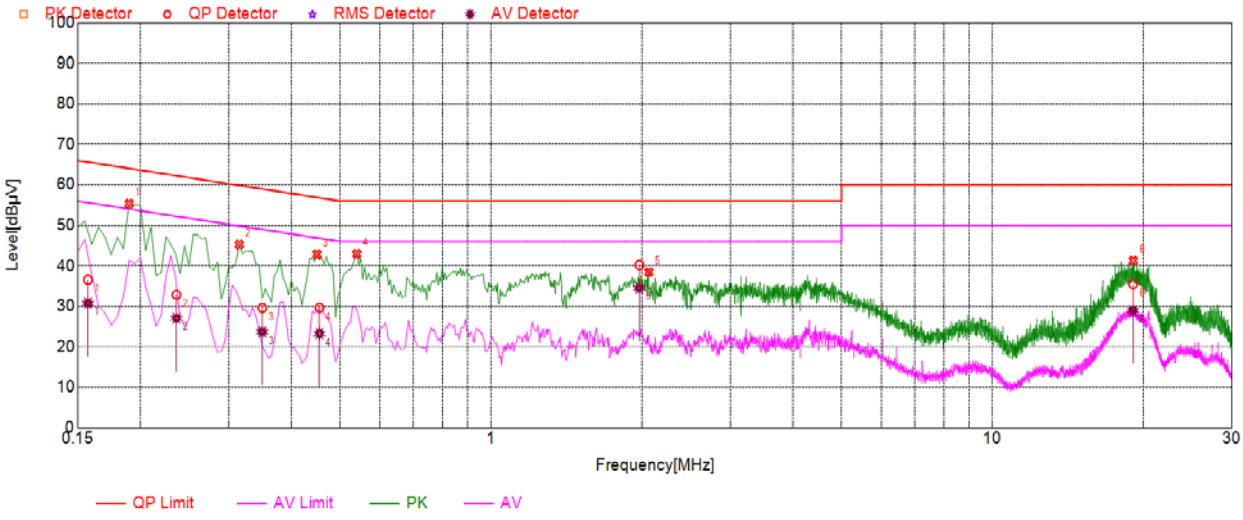
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT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

A. Test setup:

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

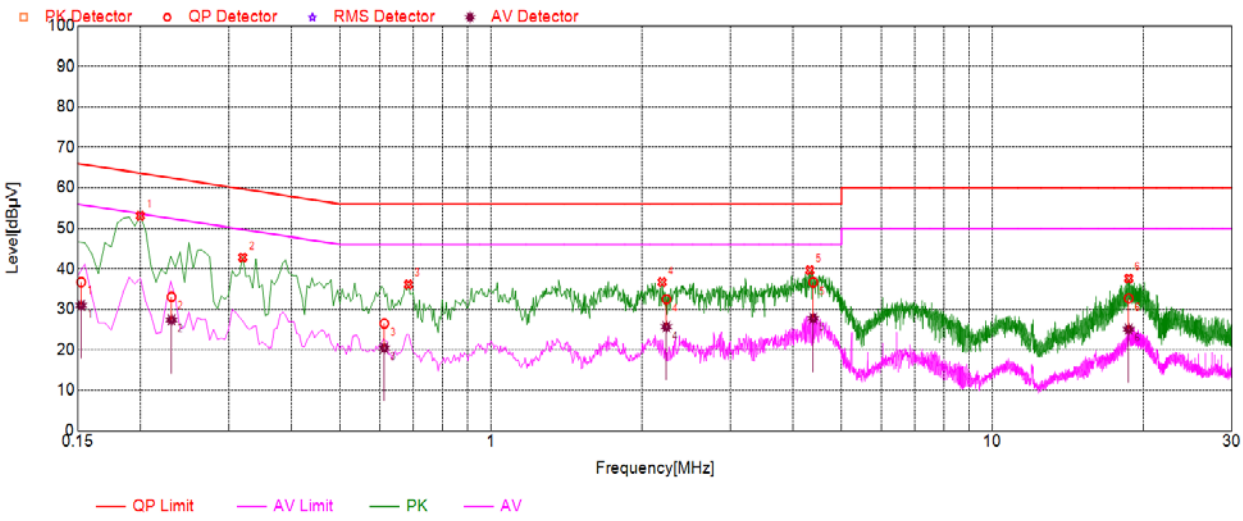
Note: The test voltage is AC 120V/60Hz.

B. Test Plots:



(Plot A: L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1572	36.56	30.78	65.79	55.79	Line	PASS
2	0.236	32.85	27.07	63.54	53.54		PASS
3	0.35	29.62	23.74	60.29	50.29		PASS
4	0.4552	29.67	23.28	57.28	47.28		PASS
5	1.977	40.26	34.54	56	46		PASS
6	19.073	35.48	28.98	60	50		PASS



(Plot B: N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1524	36.73	29.14	65.93	55.93	Line	PASS
2	0.2308	33.08	29.34	63.69	53.69		PASS
3	0.613	26.50	29.50	56	46		PASS
4	2.2382	32.50	23.50	56	46		PASS
5	4.393	36.68	19.32	56	46		PASS
6	18.694	32.72	27.28	60	50		PASS

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:

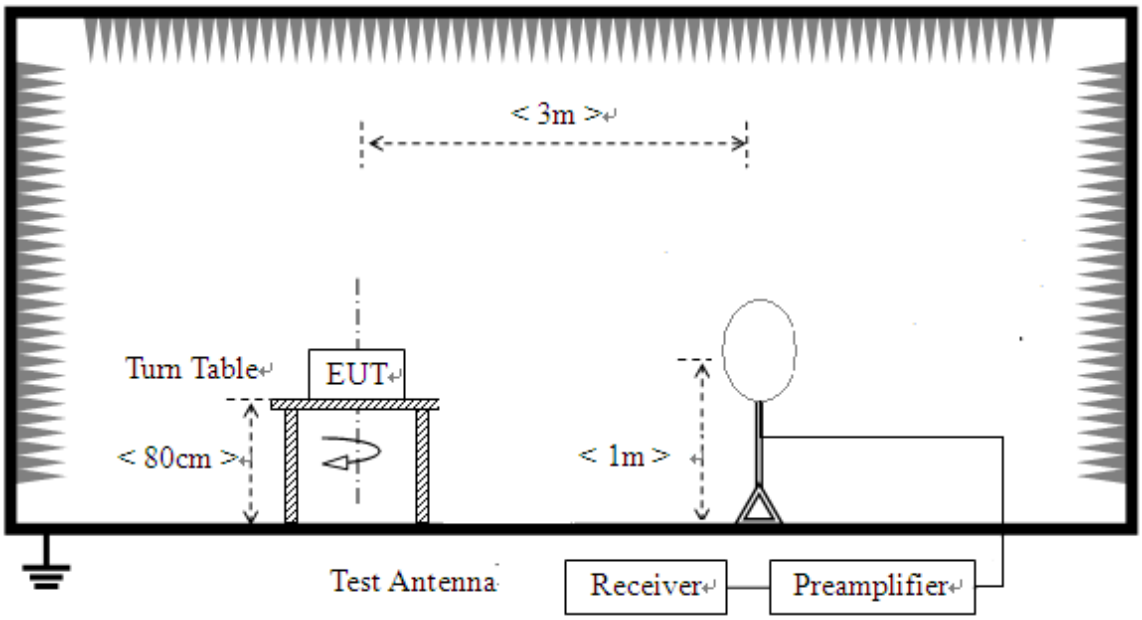
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength 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)

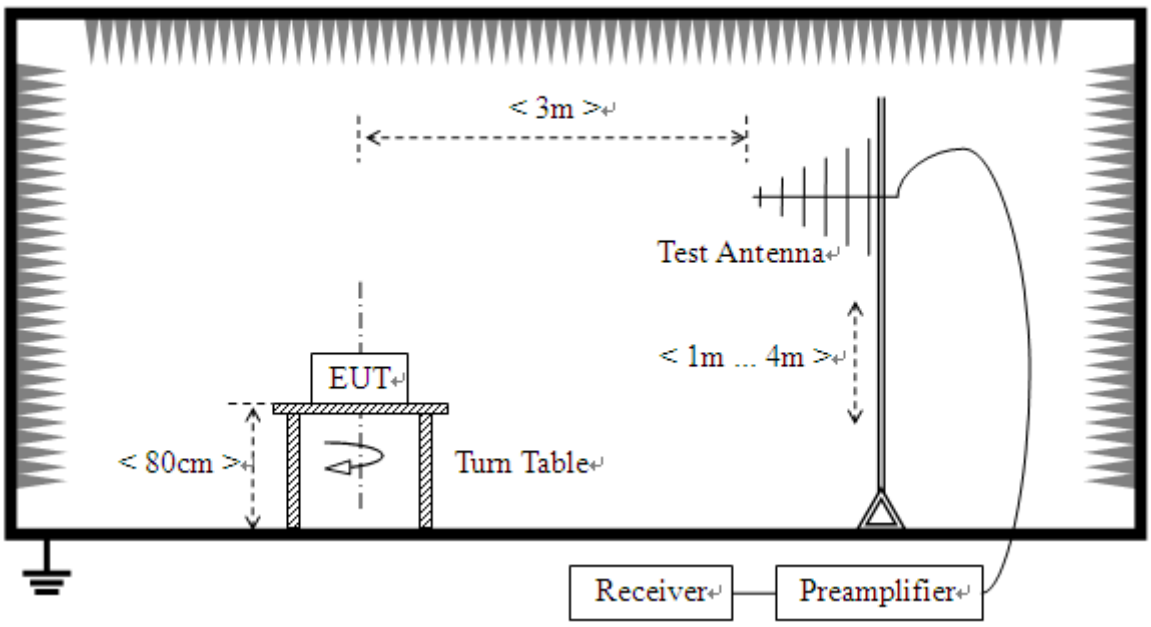
2.10.2 Test Description

A. Test Setup:

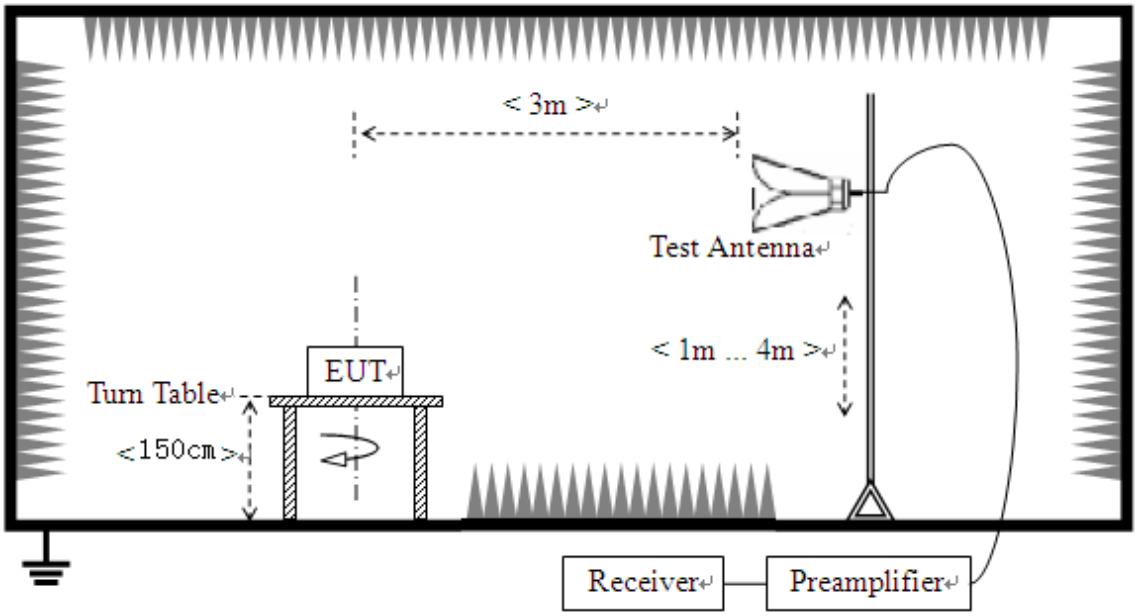
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz. Test site have a minimum area of the ground plane covered with RF absorbing material as specified in Figure 6 of ANSI C63.4: 2014.

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. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant

emissions, with polarization oriented for maximum response. The test antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 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.

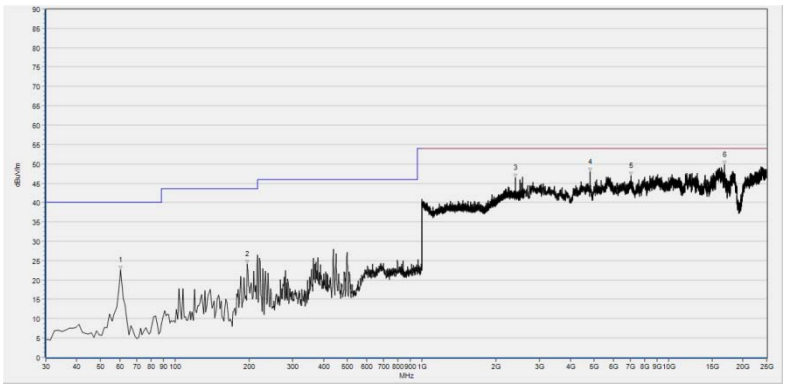
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

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：

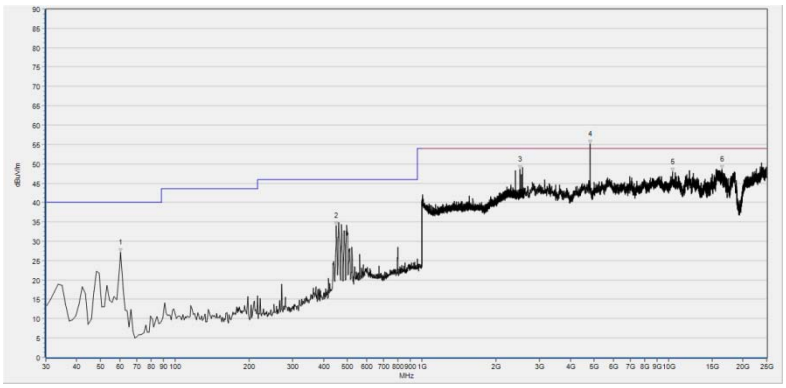
A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	22.60	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
196.320	24.20	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2401.521	46.41	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
4803.746	48.63	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
7040.080	46.85	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
16812.330	49.80	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

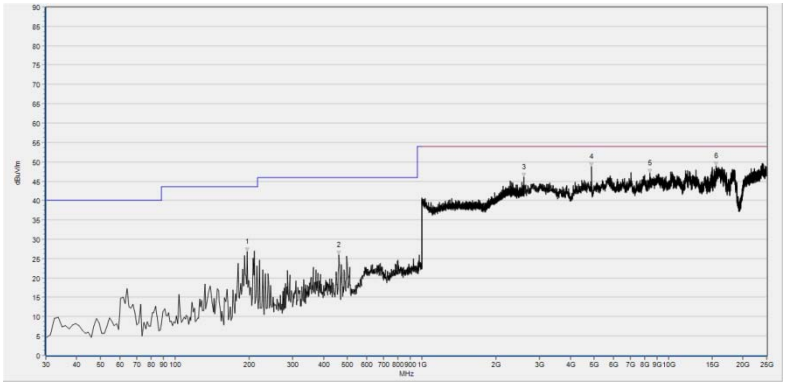
(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	27.11	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
450.050	34.10	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2505.882	48.64	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
4803.600	55.02	N/A	43.59	74.0	N/A	54.00	Vertical	PASS
10355.883	47.90	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
16441.644	48.69	N/A	N/A	74.0	N/A	54.00	Vertical	PASS

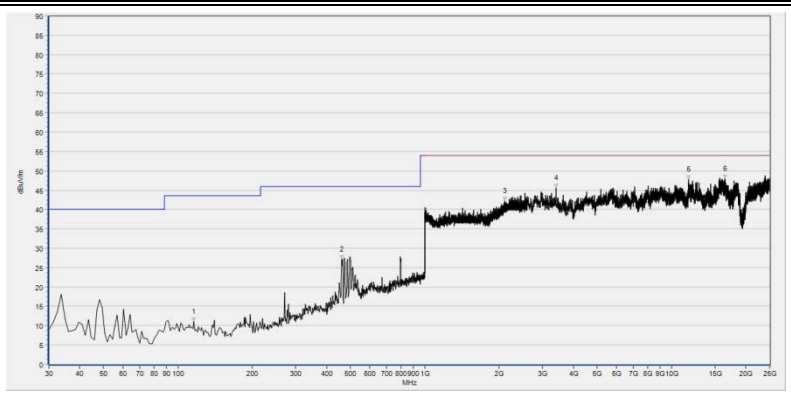
(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 0)

Plot for Channel = 39



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
196.320	26.78	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
462.190	25.95	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2596.158	46.15	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
4881.142	48.76	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
8420.986	47.12	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
15578.069	48.96	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

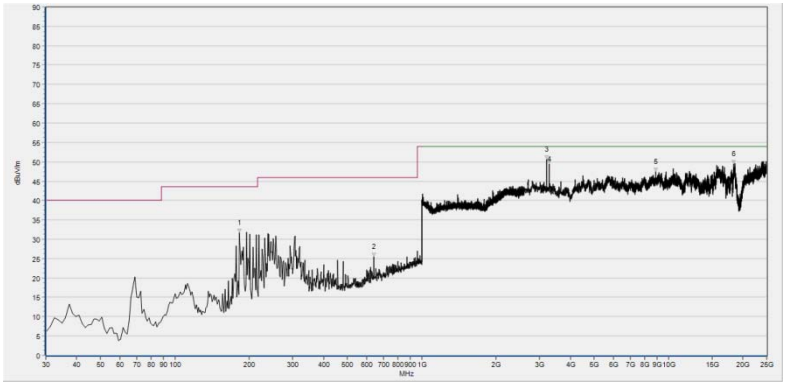
(30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 39)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
116.195	11.00	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
460.976	27.21	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2110.844	42.15	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
3402.473	45.52	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
11749.009	47.73	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
16445.717	48.01	N/A	N/A	74.0	N/A	54.00	Vertical	PASS

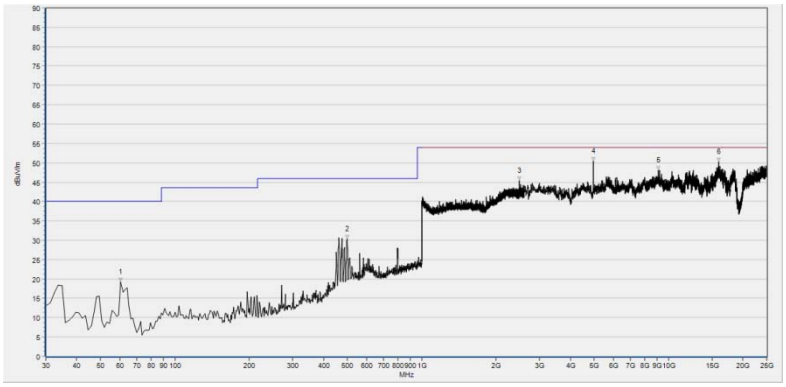
(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 39)

Plot for Channel = 78



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
196.320	24.40	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
462.190	26.24	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2479.632	46.05	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
4669.322	44.33	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
10404.765	47.50	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
15582.142	48.08	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

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



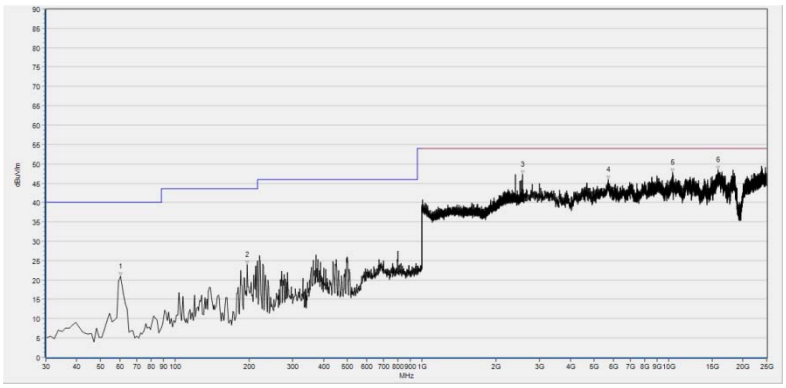
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	19.20	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
498.611	30.37	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2479.632	45.45	N/A	N/A	74.0	N/A	N/A	Vertical	PASS
4958.538	50.51	N/A	25.69	74.0	N/A	54.00	Vertical	PASS
9072.740	48.04	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
15993.562	50.22	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：

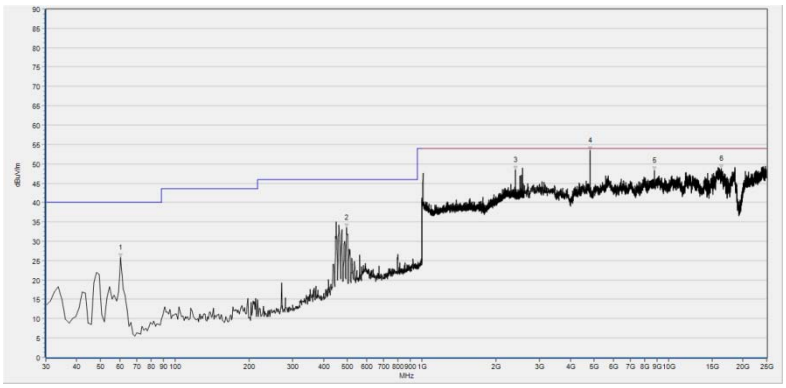
B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	21.03	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
196.320	23.96	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2557.743	47.27	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
5712.129	45.84	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
10359.956	47.75	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
15891.726	48.41	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

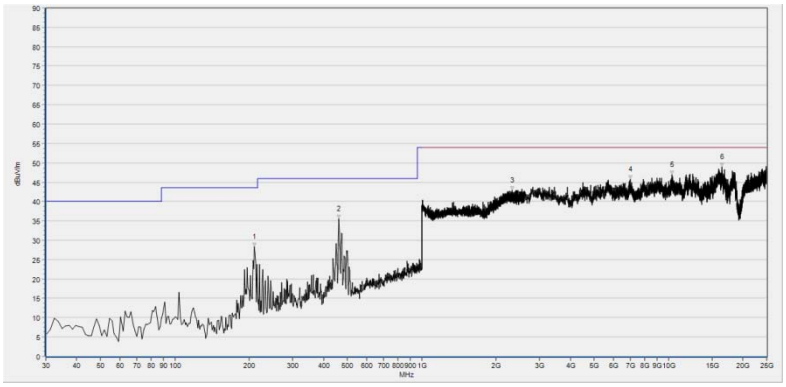
(30MHz to 25GHz, Antenna Horizontal @ π/4-DQPSK, channel 0)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	25.77	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
496.183	33.52	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2402.161	48.42	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
4803.746	53.74	N/A	31.58	74.0	N/A	54.00	Vertical	PASS
8742.790	48.25	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
16392.762	48.81	N/A	N/A	74.0	N/A	54.00	Vertical	PASS

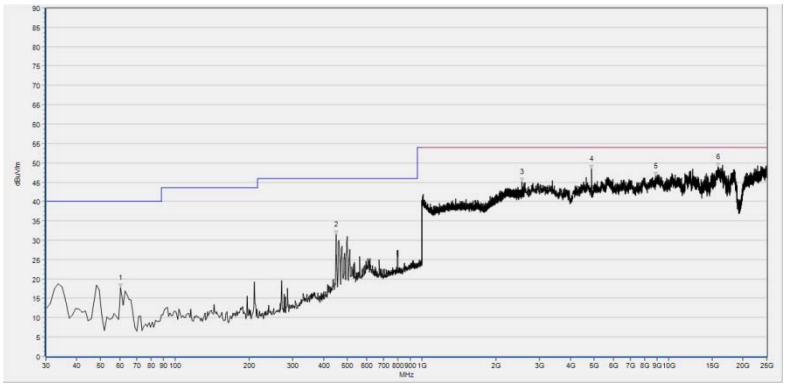
(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 0)

Plot for Channel = 39



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
209.675	28.40	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
460.976	35.46	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2321.489	42.93	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
7003.419	45.73	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
10315.148	46.84	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
16409.056	49.02	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

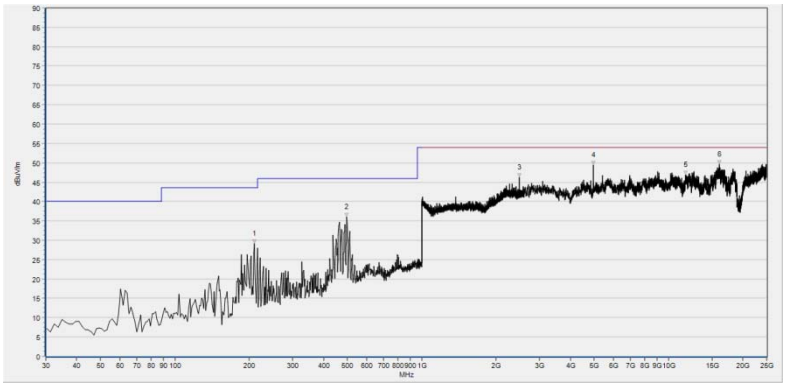
(30MHz to 25GHz, Antenna Horizontal @ π/4-DQPSK, channel 39)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	17.80	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
448.836	31.45	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2543.657	45.04	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
4881.142	48.46	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
8873.141	46.52	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
15875.432	48.96	N/A	N/A	74.0	N/A	54.00	Vertical	PASS

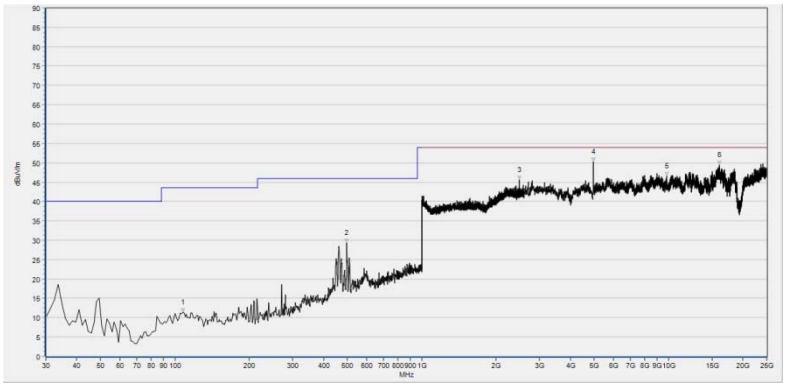
(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 39)

Plot for Channel = 78



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
209.675	29.23	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
497.397	35.98	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2479.632	46.28	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
4958.538	49.43	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
11753.082	46.86	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
16107.620	49.59	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

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



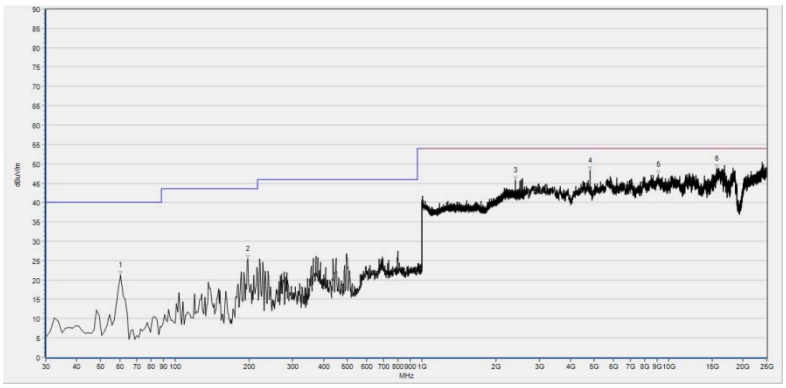
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
107.697	11.33	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
497.397	29.27	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2479.632	45.57	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
4960.300	50.04	N/A	24.76	74.0	N/A	54.00	Vertical	PASS
9805.965	46.61	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
16062.811	49.44	N/A	N/A	74.0	N/A	54.00	Vertical	PASS

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

2.10.4.3 8-DPSK Mode：

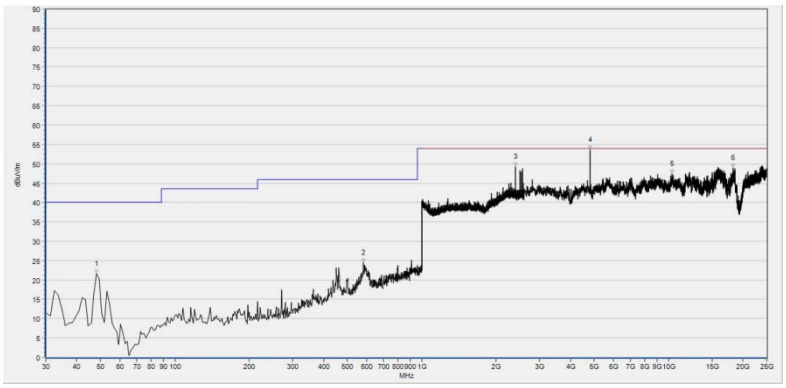
C. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
60.350	21.25	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
197.534	25.49	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2402.161	45.75	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
4803.746	48.29	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
9089.034	47.22	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
15635.097	48.70	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

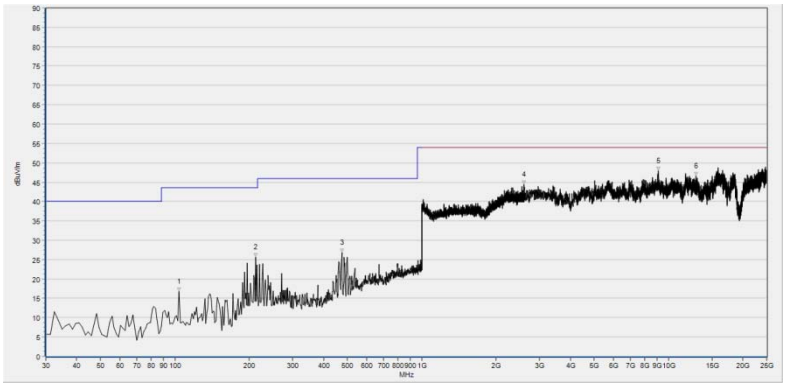
(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 0)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
48.210	21.69	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
579.950	24.39	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2402.161	49.26	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
4803.746	53.60	N/A	31.58	74.0	N/A	54.00	Vertical	PASS
10339.589	47.35	N/A	N/A	74.0	N/A	54.00	Vertical	PASS
18233.970	48.86	N/A	N/A	74.0	N/A	54.00	Vertical	PASS

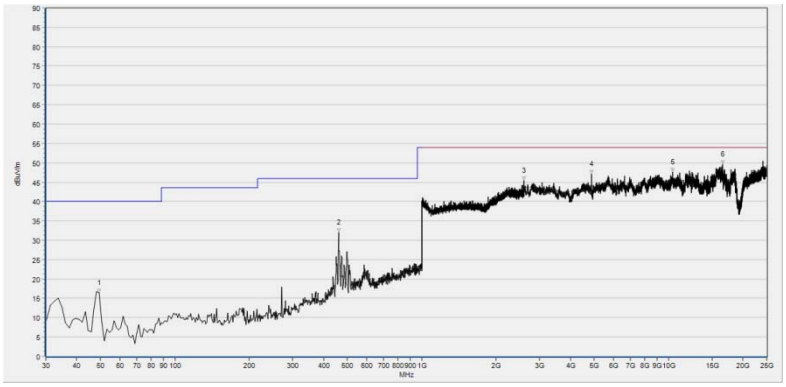
(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 0)

Plot for Channel = 39



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
104.055	16.76	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
212.103	25.69	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
474.330	26.86	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2596.158	44.45	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
9113.475	47.86	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS
12889.580	46.67	N/A	N/A	74.0	N/A	54.0	Horizontal	PASS

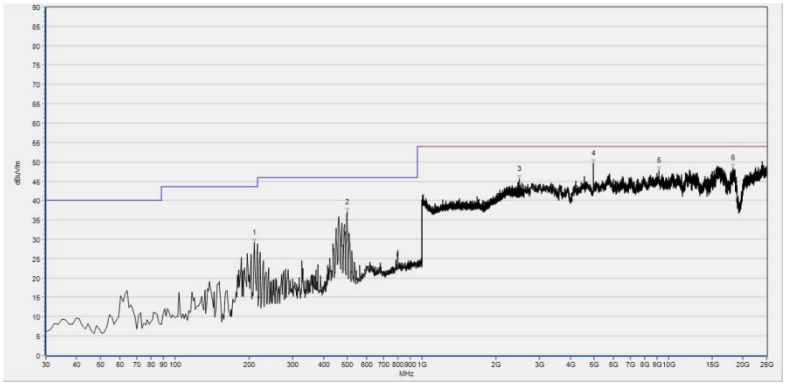
(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 39)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
49.424	16.45	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
460.976	32.03	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2596.158	45.37	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
4881.142	47.04	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
10364.030	47.64	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
16519.040	49.58	N/A	N/A	74.0	N/A	54.0	Vertical	PASS

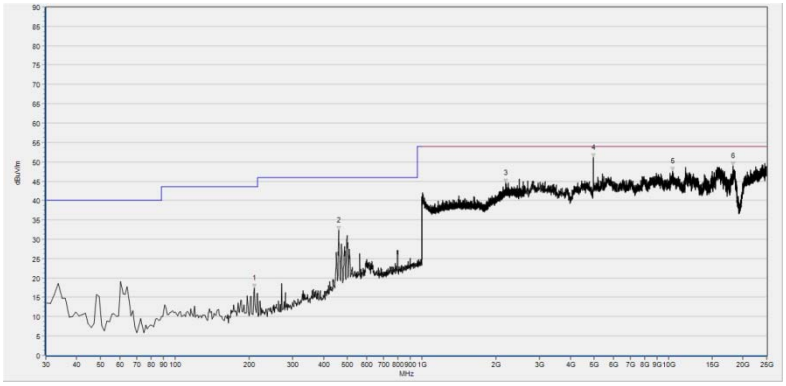
(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 39)

Plot for Channel = 78



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
209.675	29.11	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
498.611	36.97	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2479.632	45.59	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
4958.538	49.56	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
9141.989	47.76	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS
18233.970	48.47	N/A	N/A	74.0	N/A	54.00	Horizontal	PASS

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



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
209.675	17.36	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
460.976	32.33	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2190.876	44.65	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
4959.900	50.88	N/A	25.53	74.0	N/A	54.0	Vertical	PASS
10372.177	47.58	N/A	N/A	74.0	N/A	54.0	Vertical	PASS
18274.704	48.91	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.3, 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 designation number is CN1192.

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:

Test items	Uncertainty
Number of Hopping Frequency	±5%
Peak Output Power	±2.22dB
20dB Bandwidth	±5%
Carrier Frequency Separation	±5%
Time of Occupancy (Dwell time)	±5%
Conducted Spurious Emission	±2.77 dB
Restricted Frequency Bands	±5%

Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

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	2017.05.24	2018.05.23
2	Power Splitter	NW521	1506A	Weinschel	2017.05.24	2018.05.23
3	Attenuator 1	(N/A.)	10dB	Resnet	2017.05.24	2018.05.23
4	Attenuator 2	(N/A.)	3dB	Resnet	2017.05.24	2018.05.23
5	EXA Signal Analzyer	MY53470836	N9010A	Agilent	2016.12.07	2017.12.06
6	Bluetooth Test Set	6K00006210	MT8852B	Anritsu	2017.05.24	2018.05.23
7	USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2017.05.24	2018.05.23
8	RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
9	Coaxial cable	CB02	RF02	Morlab	N/A	N/A
10	SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.5.2 Conducted Emission Test Equipments

Conducted Emission Test Equipments						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal. Date**	**Cal. Due**
1	Receiver	US44210471	E7405A	Agilent	2017.05.24	2018.05.23
2	LISN	812744	NSLK 8127	Schwarzbeck	2017.05.24	2018.05.23
3	Service Supplier	100448	CMU200	R&S	2017.05.24	2018.05.23
4	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2017.05.24	2018.05.23
5	Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

1.5.3 Auxiliary Test Equipment

Auxiliary Test Equipment						
No.	**Equipment Name**	**Model No.**	**Brand Name**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Computer	T430i	Think Pad	Lenovo	N/A	N/A

1.5.4 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	2017.05.17	2018.05.16
2	Receiver	MY54130016	N9038A	Agilent	2017.05.17	2018.05.16
3	Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2016.12.09	2017.12.08
4	Test Antenna - Horn	9120C-384	BBHA 9120C	Schwarzbeck	2017.03.30	2018.03.29
5	Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2017.03.30	2018.03.29
6	Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
7	Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
8	Coaxial cable(N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
9	1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16
10	18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16

1.5.5 Climate Chamber

Climate Chamber						
No.	**Equipment Name**	**Serial No.**	**Type**	**Manufacturer**	**Cal.Date**	**Cal.Due Date**
1	Climate Chamber	2004012	HL4003T	Yinhe	2017.01.11	2018.01.10

1.5.6 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	2017.01.11	2018.01.10

1.5.7 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	2017.01.11	2018.01.10

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