



REPORT No. : SZ15030076W01

FCC RF TEST REPORT

APPLICANT : Zhongshan Huaxing Lighting Co. ,Ltd
PRODUCT NAME : Bluetooth Module
MODEL NAME : HX-3960
TRADE NAME : N/A
BRAND NAME : OV
FCC ID : 2AEEB-HX3960BT
STANDARD(S) : 47 CFR Part 15 Subpart C
ISSUE DATE : 2015-04-01



SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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MORLAB GROUP

FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , Guangdong Province, P. R. China

Tel: 86-755-36698555
Http://www.morlab.com

Fax: 86-755-36698525
E-mail: service@morlab.cn



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Change History

Issue	Date	Reason for change
1.0	2015-04-01	First edition



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Test Report Declaration

Applicant	Zhongshan Huaxing Lighting Co. ,Ltd
Applicant Address	No. 1 Dong Fang Dong Road, Gu Er Shuncheng Industrial Park, Guzhen Town, Zhongshan City, Guangdong Province.
Manufacturer	Shenzhen Rui Rong Da Electronic Co. Ltd
Manufacturer Address	3F,No.64 Longguan West Road, LongHua New District, Shenzhen, China
Product Name	Bluetooth Module
Model Name	HX-3960
Brand Name	OV
HW Version	V1.2
SW Version	V1.0
Test Standards	47 CFR Part 15 Subpart C
Test Date	2015-03-20 to 2015-04-01
Test Result	PASS

Tested by : Shen Senping
Shen Senping

Reviewed by : Qiu Xiaojun
Qiu Xiaojun

Approved by : Zeng Dexin
Zeng Dexin



1. Technical Information

Note: Provide by applicant.

1.1. Equipment under Test (EUT) Description

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), $\pi/4$ -DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))
Bluetooth Version:	3.0
Antenna Type:	PCB Antenna
Antenna Gain:	-4.4dBi

NOTE:

The EUT is a Bluetooth Module, it operate at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is $F(\text{MHz})=2402+1*n$ ($0 \leq n \leq 78$). 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).

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



1.2. 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 (10-1-13 Edition)	Radio Frequency Devices

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

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	<u>PASS</u>
2	15.247(a)	Number of Hopping Frequency	<u>PASS</u>
3	15.247(b)	Peak Output Power	<u>PASS</u>
4	15.247(a)	20dB Bandwidth	<u>PASS</u>
5	15.247(a)	Carrier Frequency Separation	<u>PASS</u>
6	15.247(a)	Time of Occupancy (Dwell time)	<u>PASS</u>
7	15.247(d)	Conducted Spurious Emission	<u>PASS</u>
8	15.247(d)	Restricted Frequency Bands	<u>PASS</u>
9	15.207	Conducted Emission	<u>PASS</u>
10	15.209 15.247(d)	Radiated Emission	<u>PASS</u>
11	15.247(i), 1.1307& 2.1093	RF exposure evaluation	<u>PASS</u>

NOTE: The tests were performed according to the method of measurements prescribed in DA-00-705, ANSI C63.4-2003 and ANSI C63.10-2009.

1.2.1. 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.

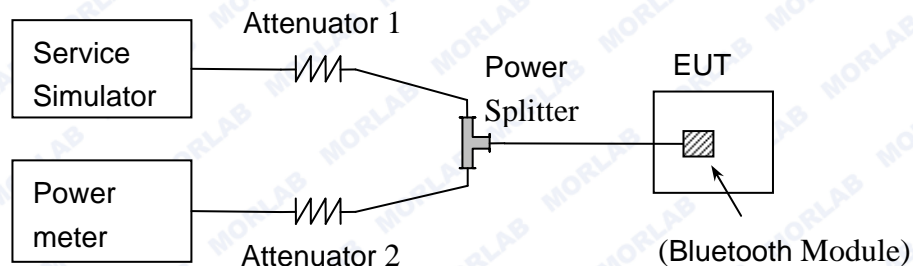
2.2. Number of Hopping Frequency

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(1.4).

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 \geq 1% of the span

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

2.2.4. Test Result

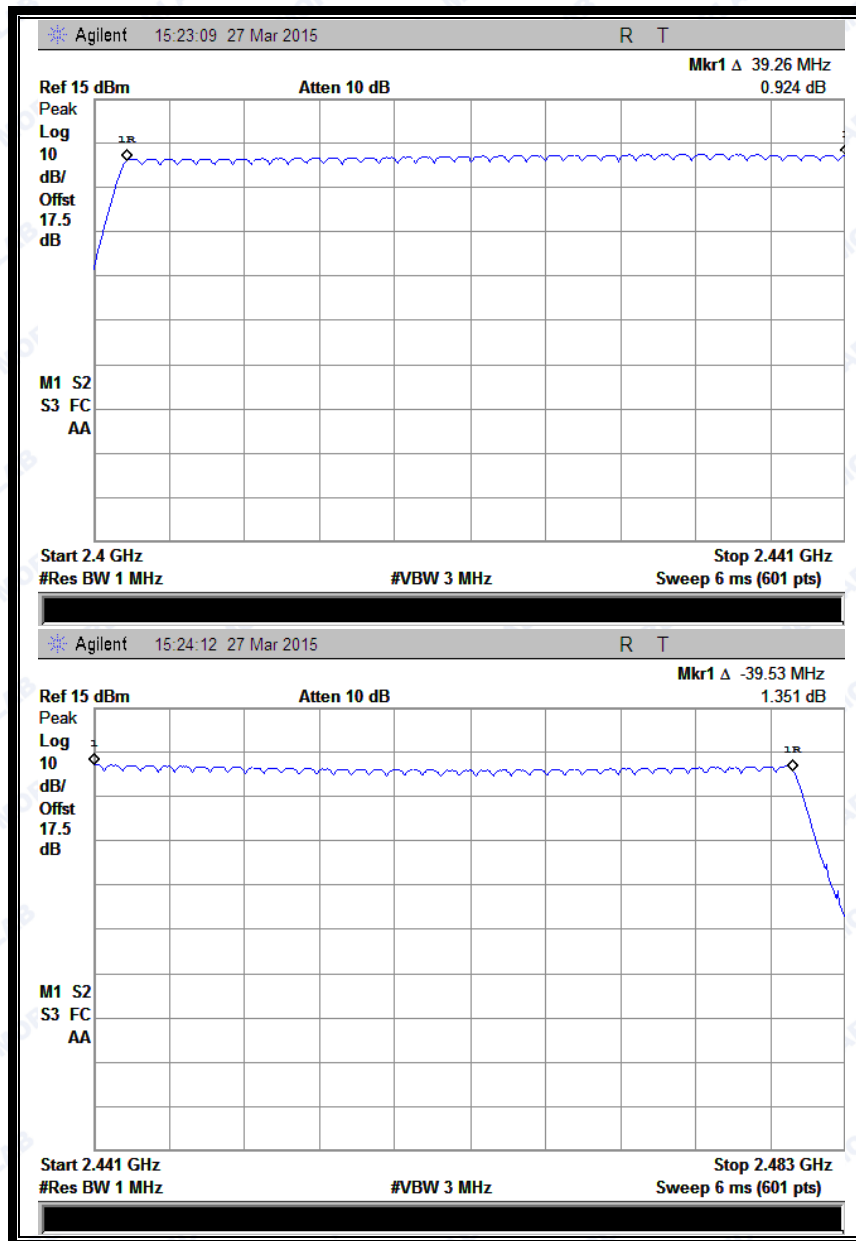
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.



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A. Test Verdict:

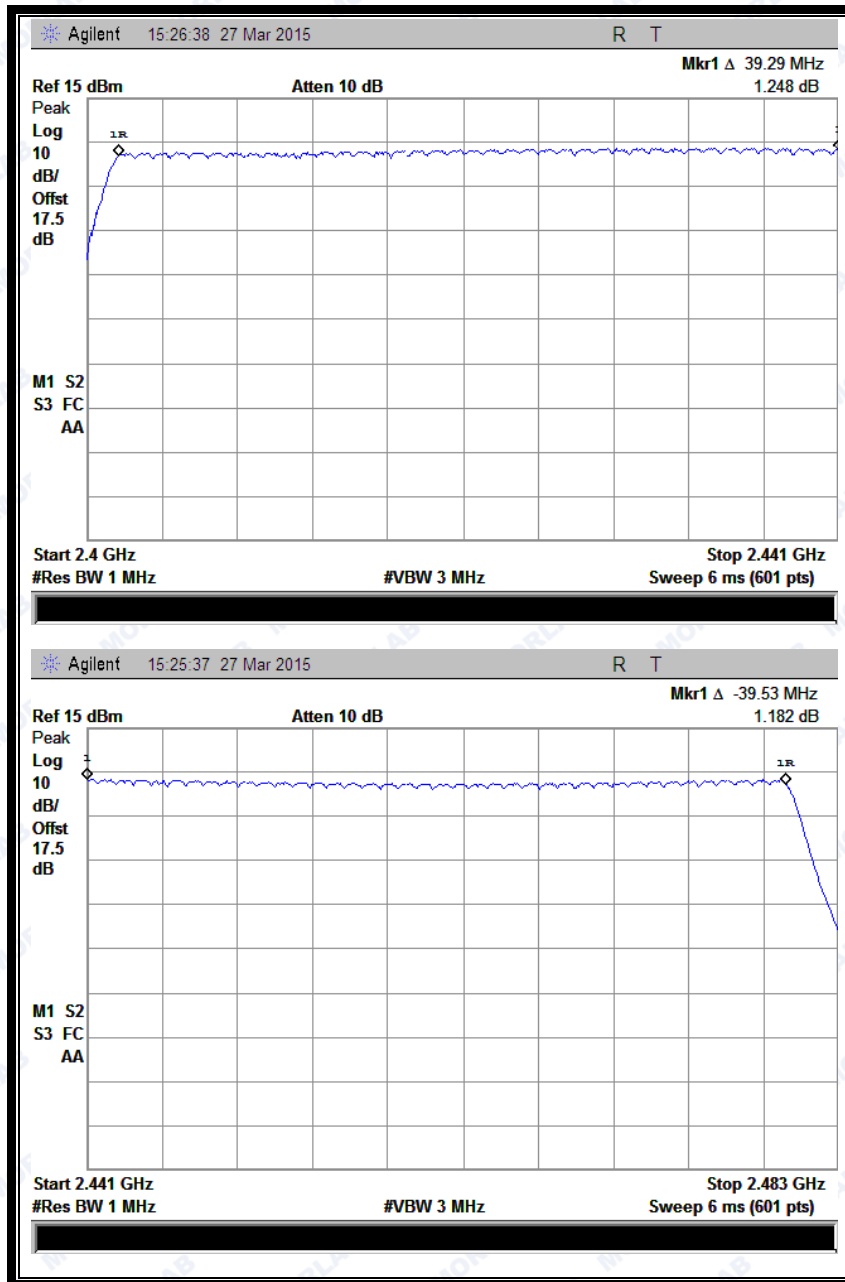
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
□/4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

B. Test Plots:

(Plot A: GFSK)



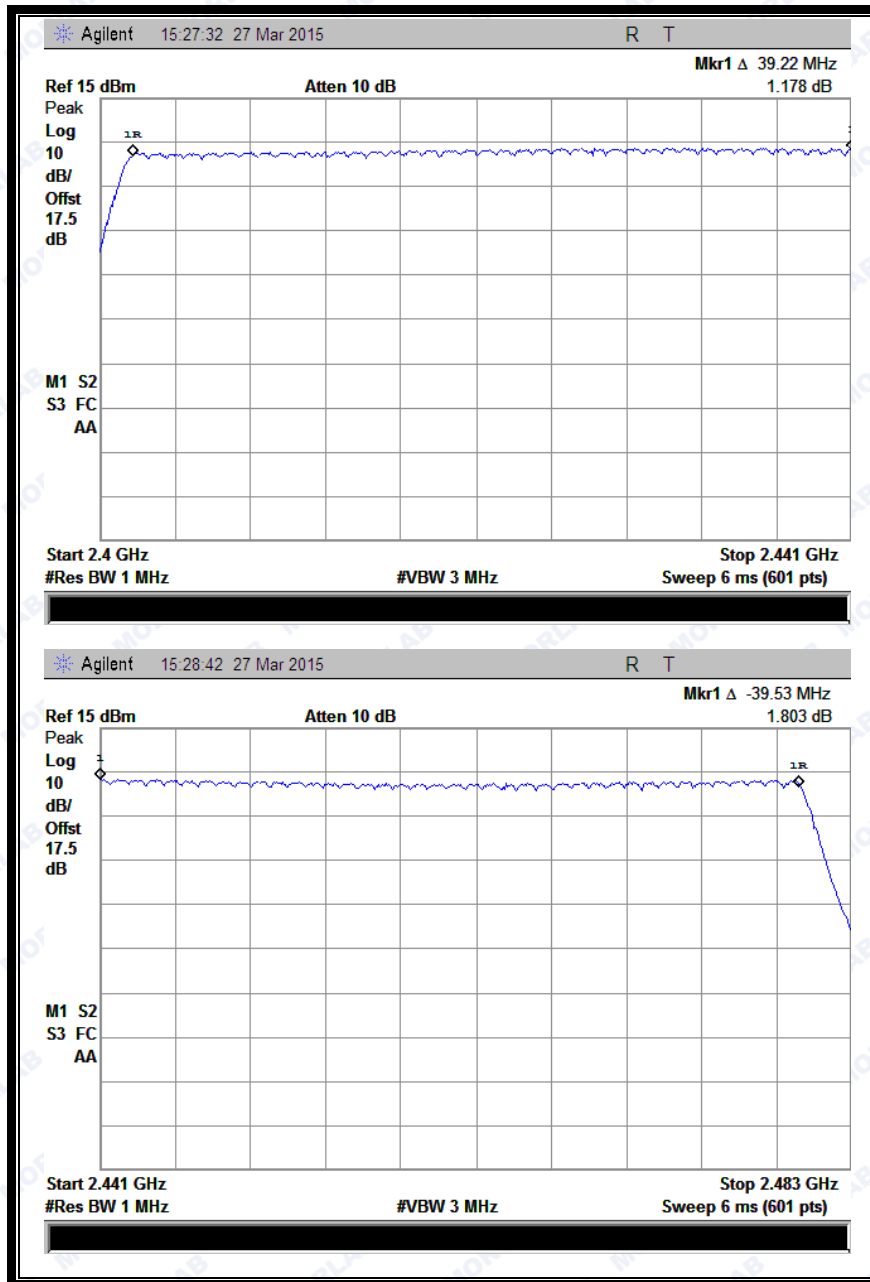
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(Plot B: $\pi/4$ -DQPSK)



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(Plot C: 8- DPSK)

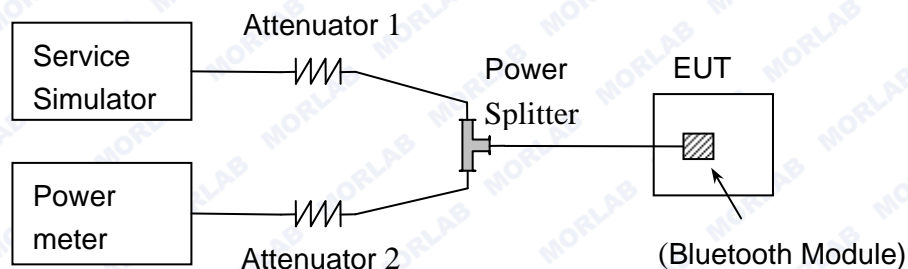
2.3. Peak Output Power

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(1.4).

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	1.741	0.001493	30	1	PASS
39	2441	2.436	0.001752			PASS
78	2480	2.137	0.001640			PASS

2.3.3.2. $\pi/4$ -DQPSK Mode**A. Test Verdict:**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	2.725	0.001873	30	1	PASS
39	2441	3.568	0.002274			PASS
78	2480	3.599	0.002290			PASS

2.3.3.3. 8-DPSK Mode**A. Test Verdict:**

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	2.741	0.001880	30	1	PASS
39	2441	3.527	0.002253			PASS
78	2480	3.390	0.002180			PASS

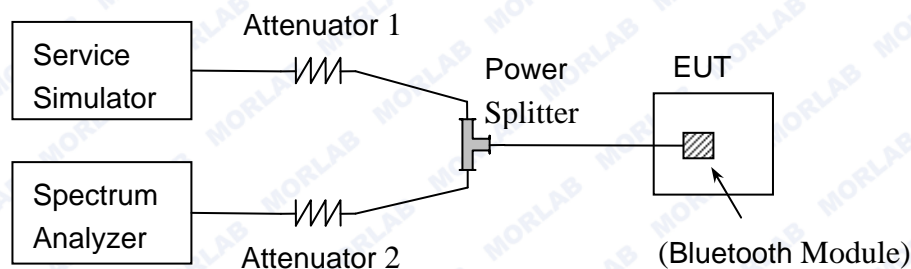
2.4. 20dB Bandwidth

2.4.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) 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(1.4).

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 \geq 1% of the 20 dB bandwidth



VBW \geq RBW
Sweep = auto
Detector function = peak
Trace = max hold

2.4.4. Test Result

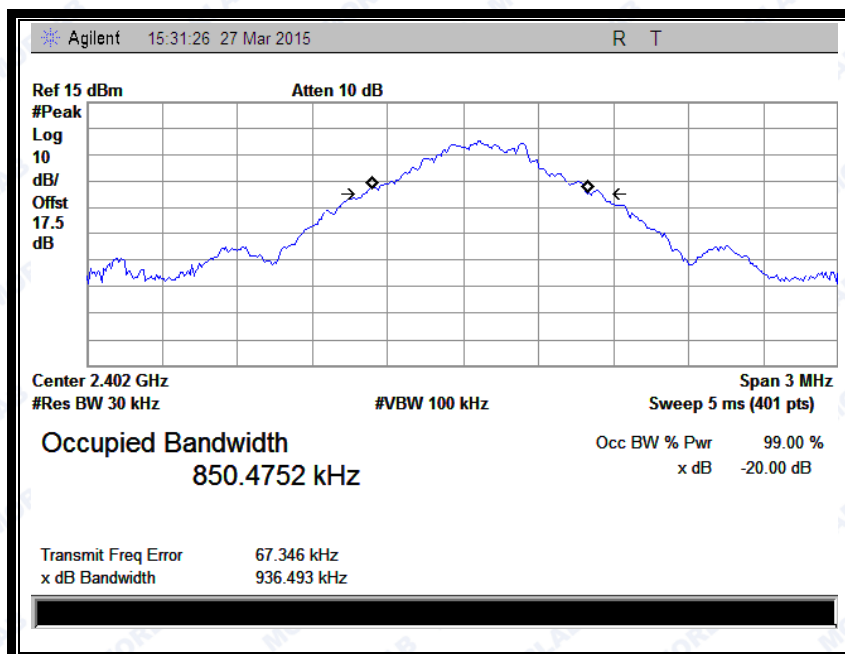
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

2.4.4.1. GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	0.936	Plot A
39	2441	0.950	Plot B
78	2480	0.945	Plot C

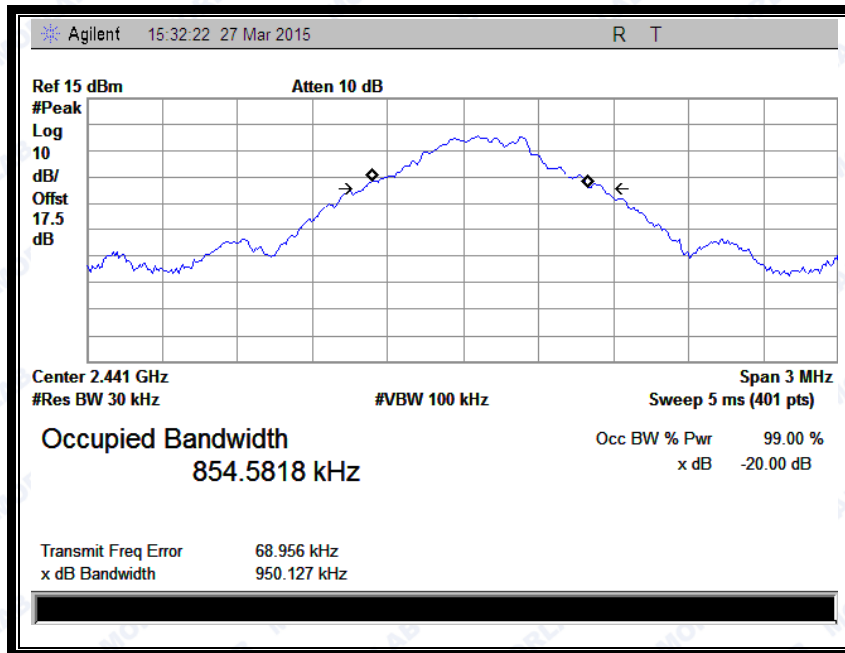
B. Test Plots:



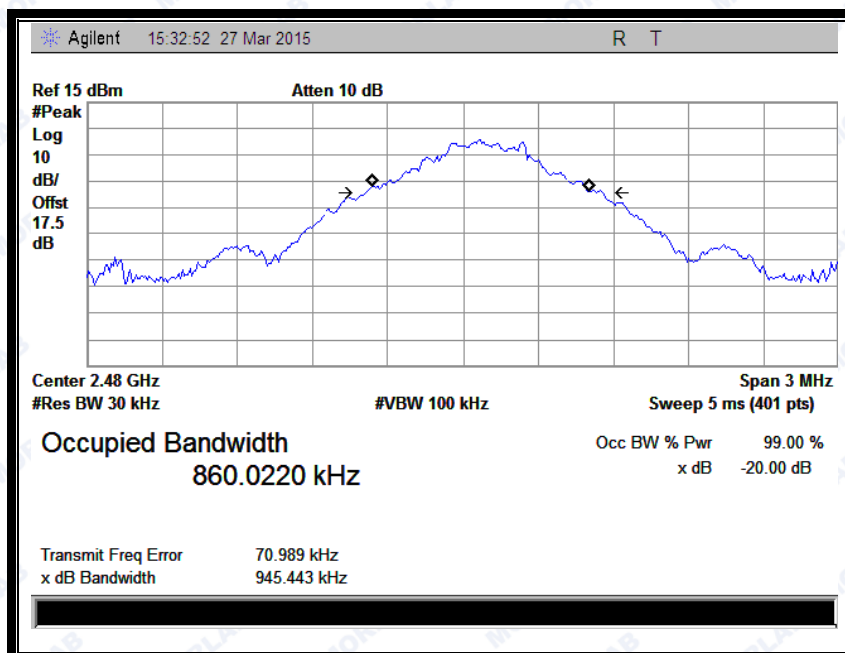
(Plot A: Channel = 2402 @ GFSK)



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(Plot B: Channel = 2441 @ GFSK)



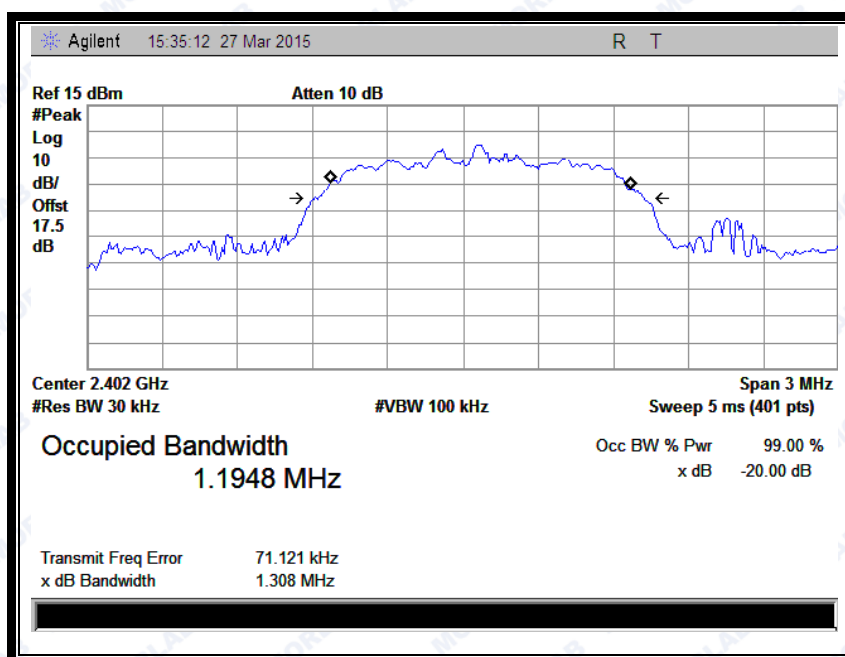
(Plot C: Channel = 2480 @ GFSK)

2.4.4.2. $\pi/4$ -DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.308	Plot D
39	2441	1.291	Plot E
78	2480	1.294	Plot F

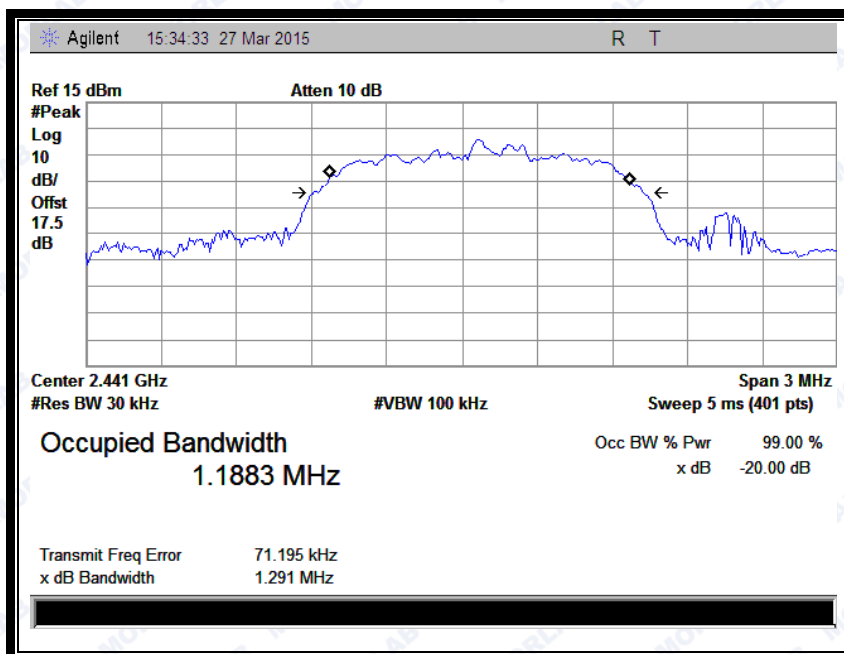
B. Test Plots:



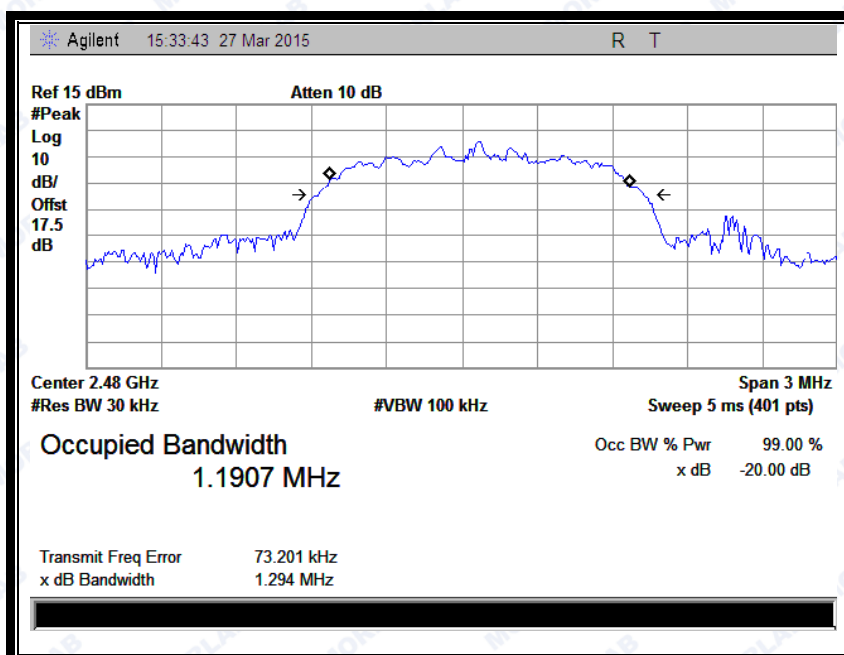
(Plot D: Channel = 2402 @ $\pi/4$ -DQPSK)



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(Plot E: Channel = 2441 @ $\pi/4$ -DQPSK)



(Plot F: Channel = 2480 @ $\pi/4$ -DQPSK)

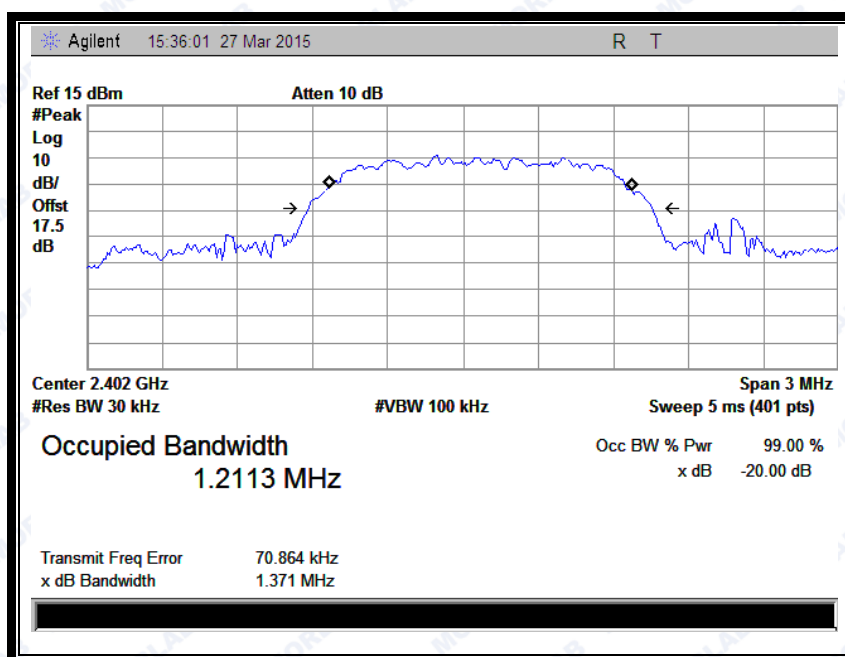


2.4.4.3. 8-DPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.371	Plot G
39	2441	1.292	Plot H
78	2480	1.299	Plot I

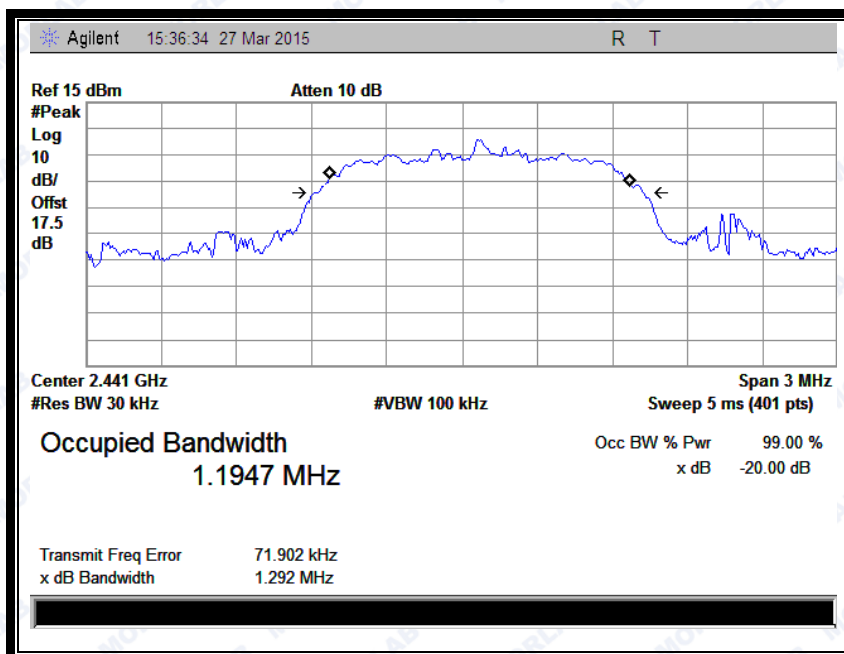
B. Test Plots:



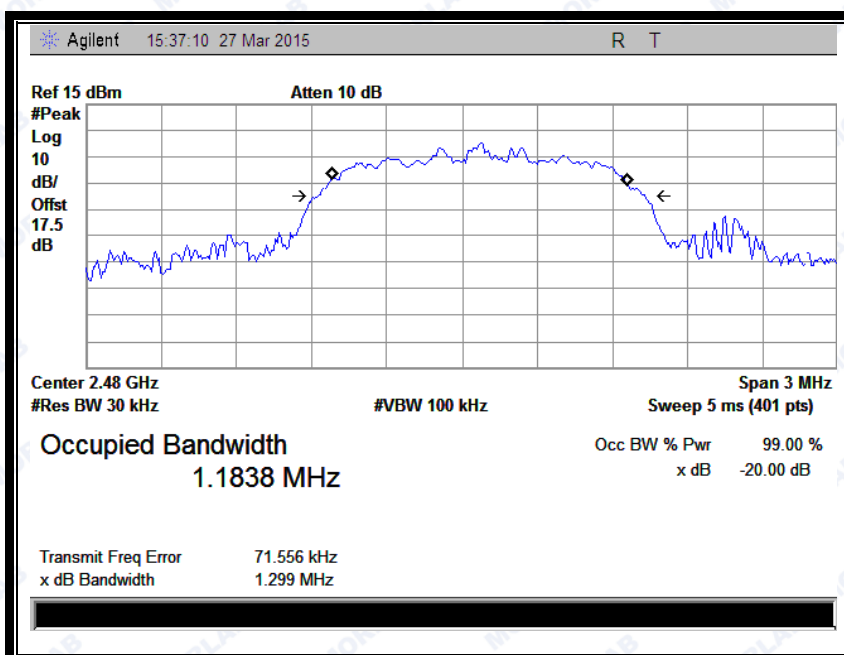
(Plot G: Channel = 2402 @ 8-DPSK)



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



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

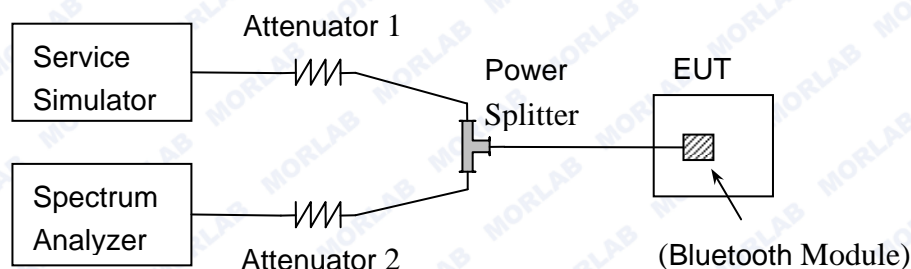
2.5. Carried Frequency Separation

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(1.4).

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) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) \geq RBW



Sweep = auto

Detector function = peak

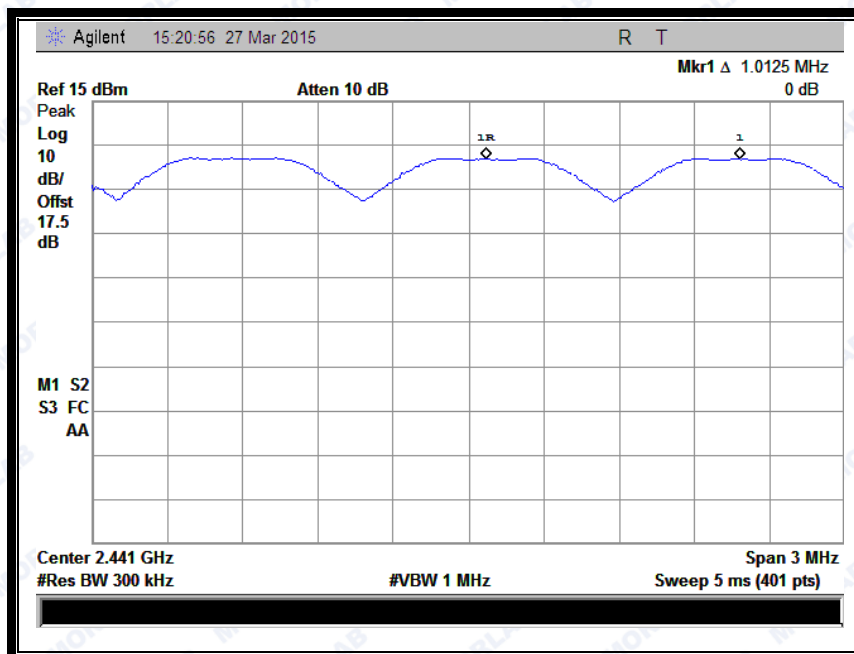
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

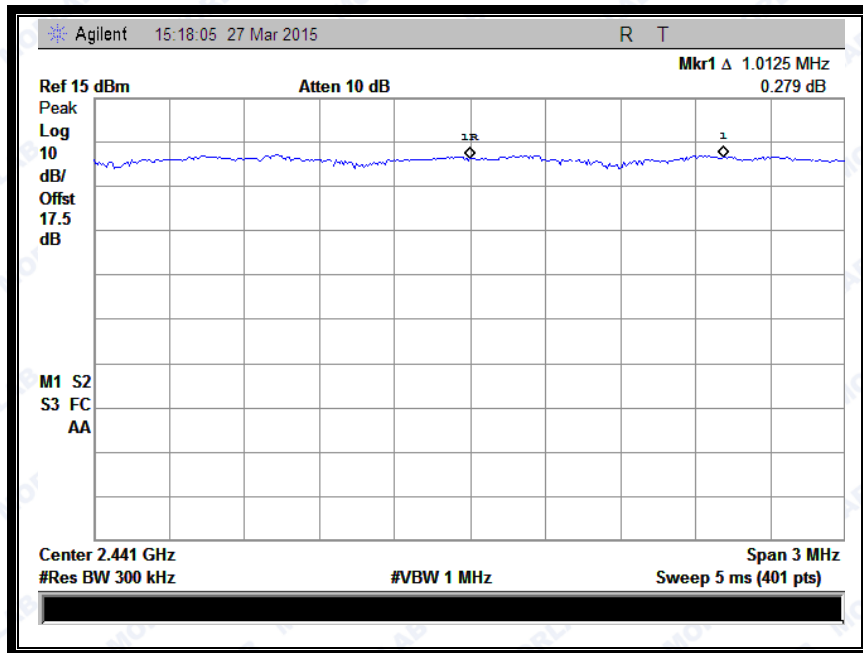
2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode.

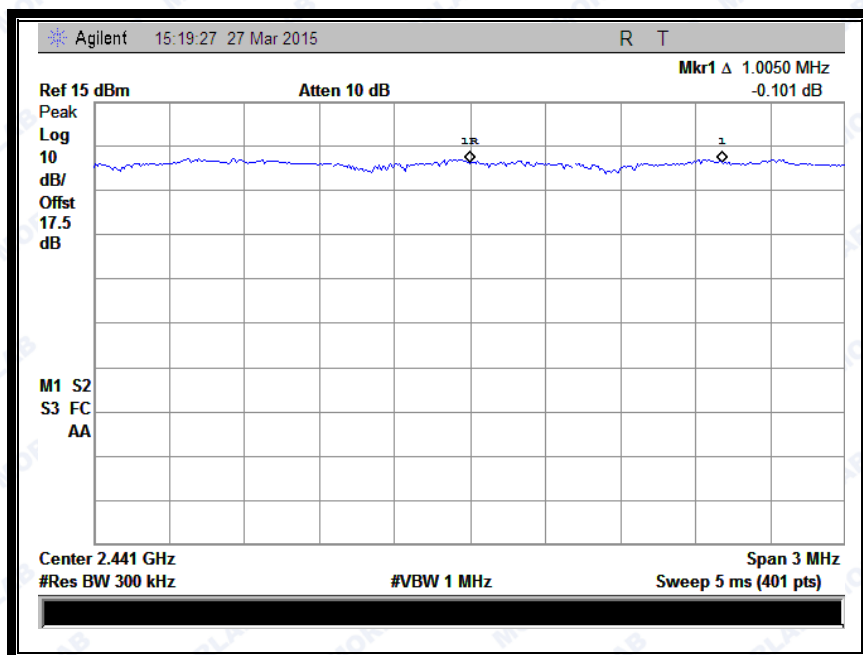
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section 0), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)



(Plot B: 1/4-DQPSK)



(Plot C: 8-DPSK)

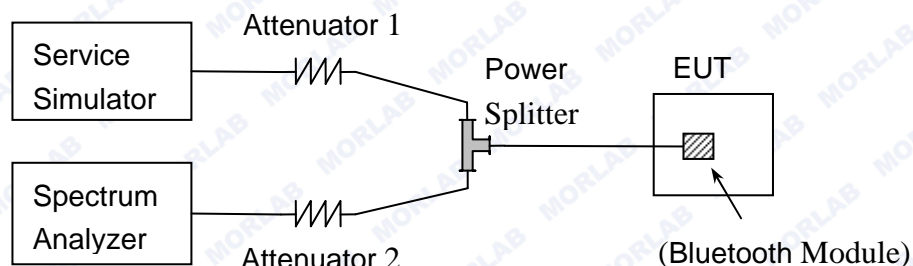
2.6. Time of Occupancy (Dwell time)

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(1.4).

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 $10 * (\# \text{ of pulses in 3.16 s}) * \text{pulse width}$.

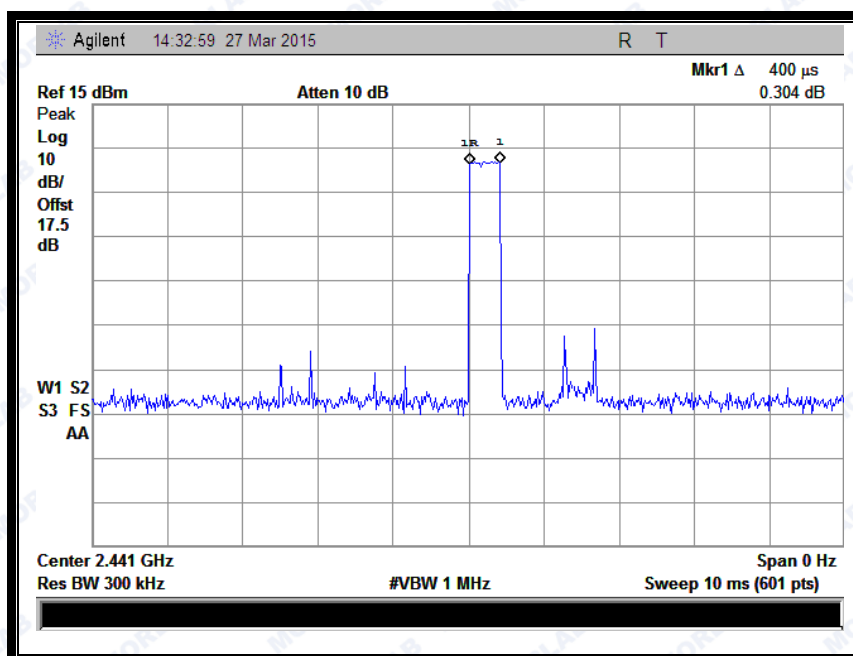
2.6.4. Test Result

2.6.4.1. GFSK Mode

A. Test Verdict:

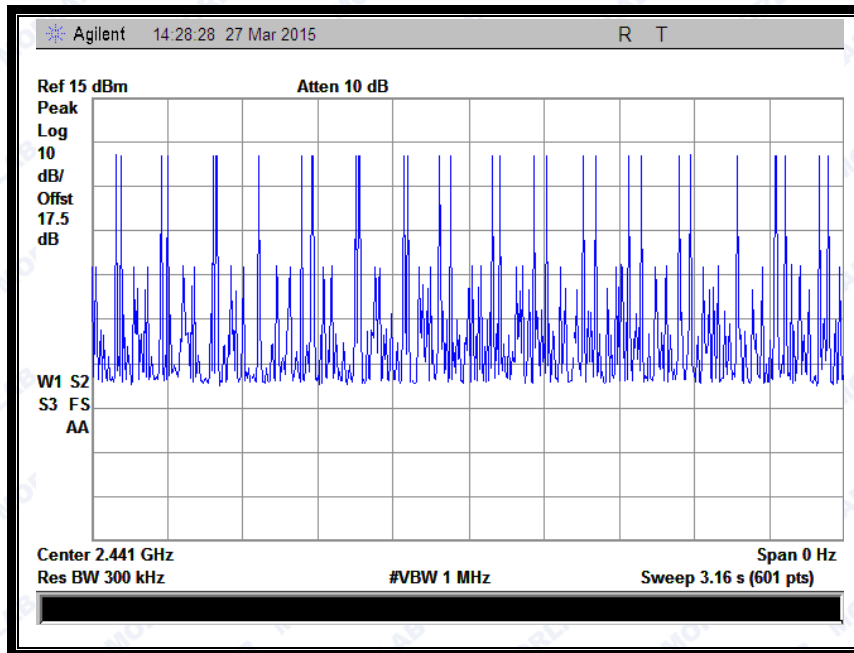
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Refer to Plot	Average Time of Occupancy (sec)	Limit (sec)	Verdict
DH1	0.400	30	Plot A	0.120	0.4	PASS
DH3	1.600	14	Plot B	0.224		PASS
DH5	2.833	10	Plot C	0.283		PASS

B. Test Plots:

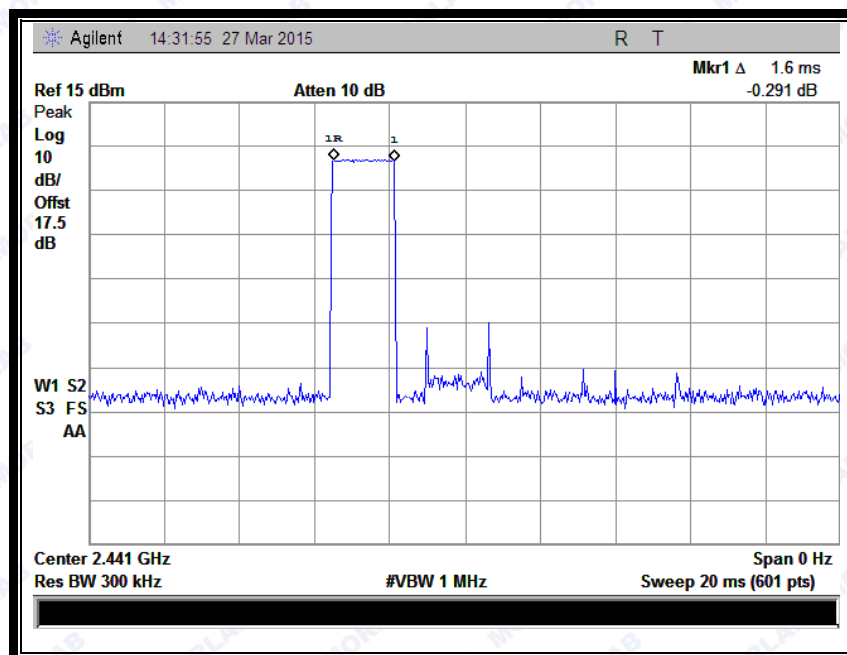




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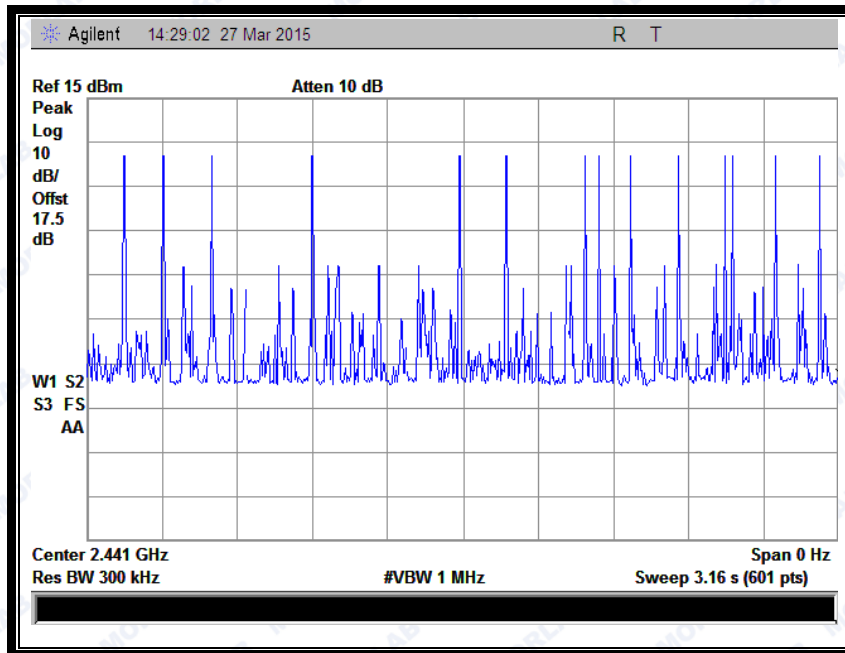


(Plot A: DH1 @ GFSK)

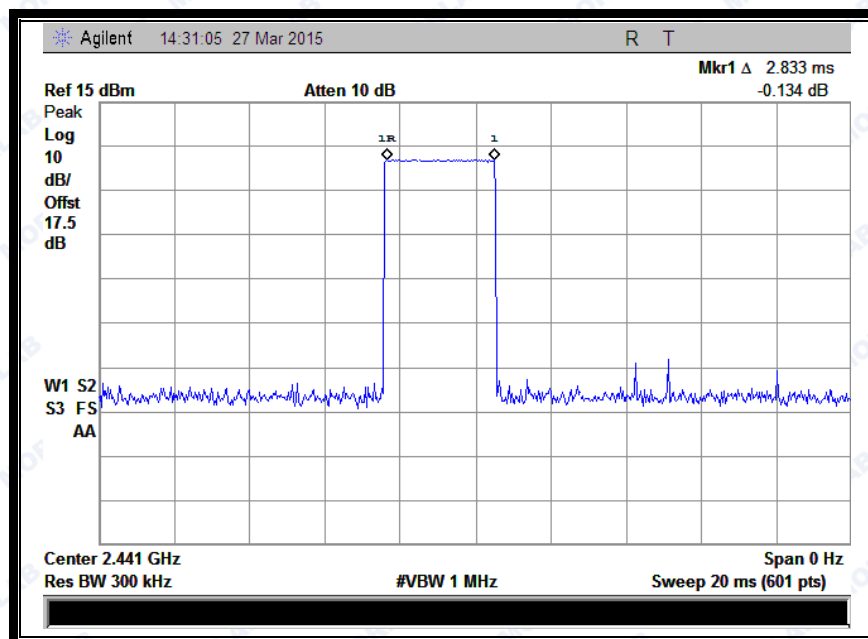


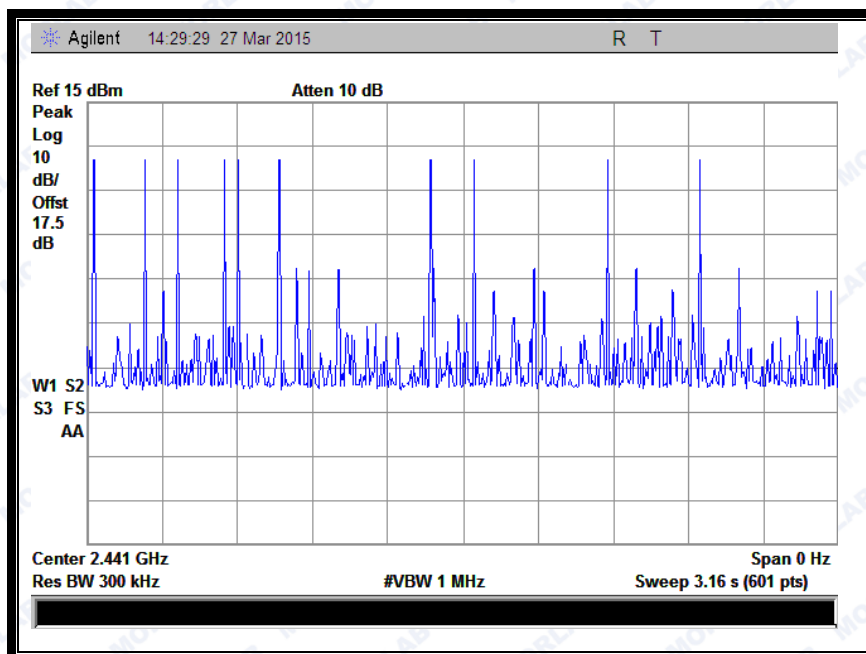


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(Plot B: DH3 @ GFSK)





(Plot C: DH5 @ GFSK)

2.6.4.2. $\pi/4$ -DQPSK Mode

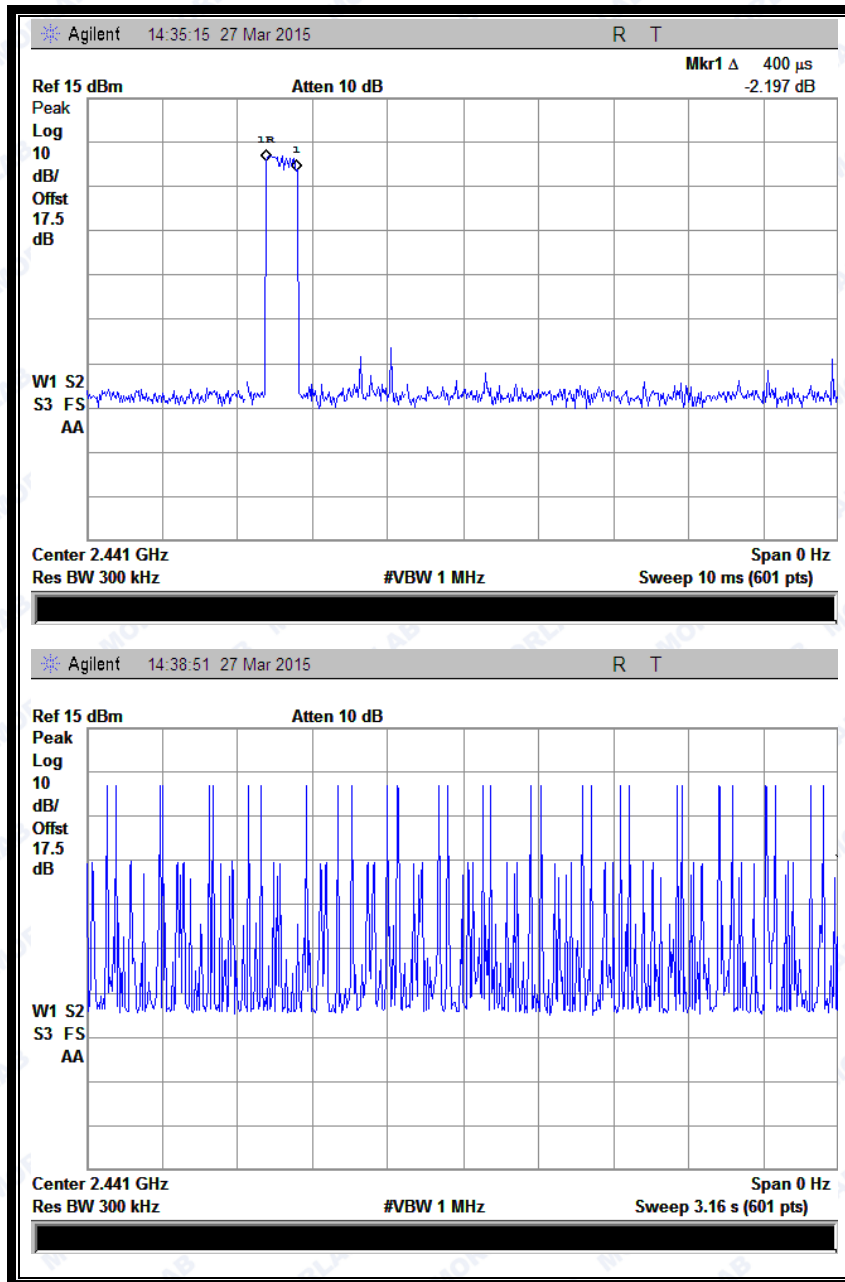
A. Test Verdict:

DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Refer to Plot	Average Time of Occupancy (sec)	Limit (sec)	Verdict
DH1	0.400	31	Plot A	0.124	0.4	PASS
DH3	1.633	20	Plot B	0.327		PASS
DH5	2.833	11	Plot C	0.312		PASS

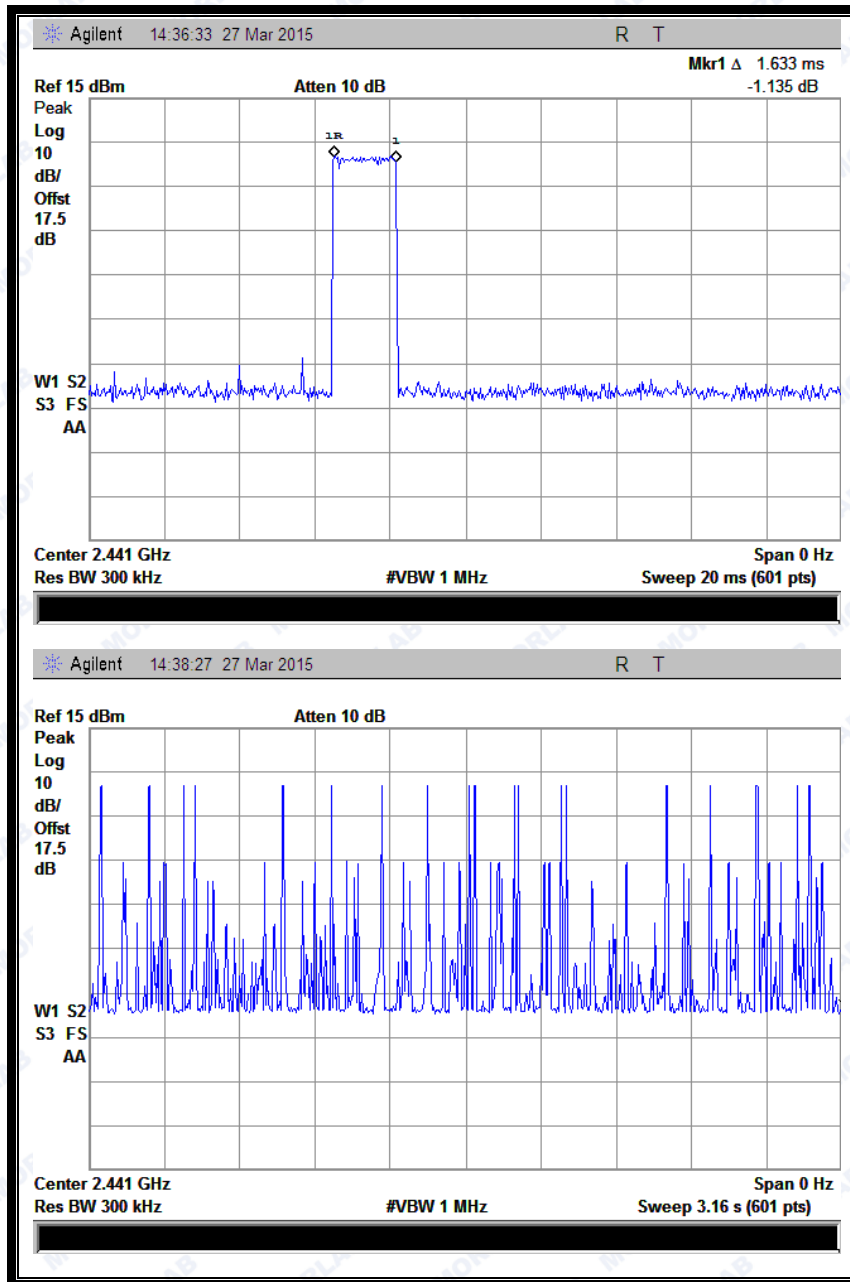
B. Test Plots:



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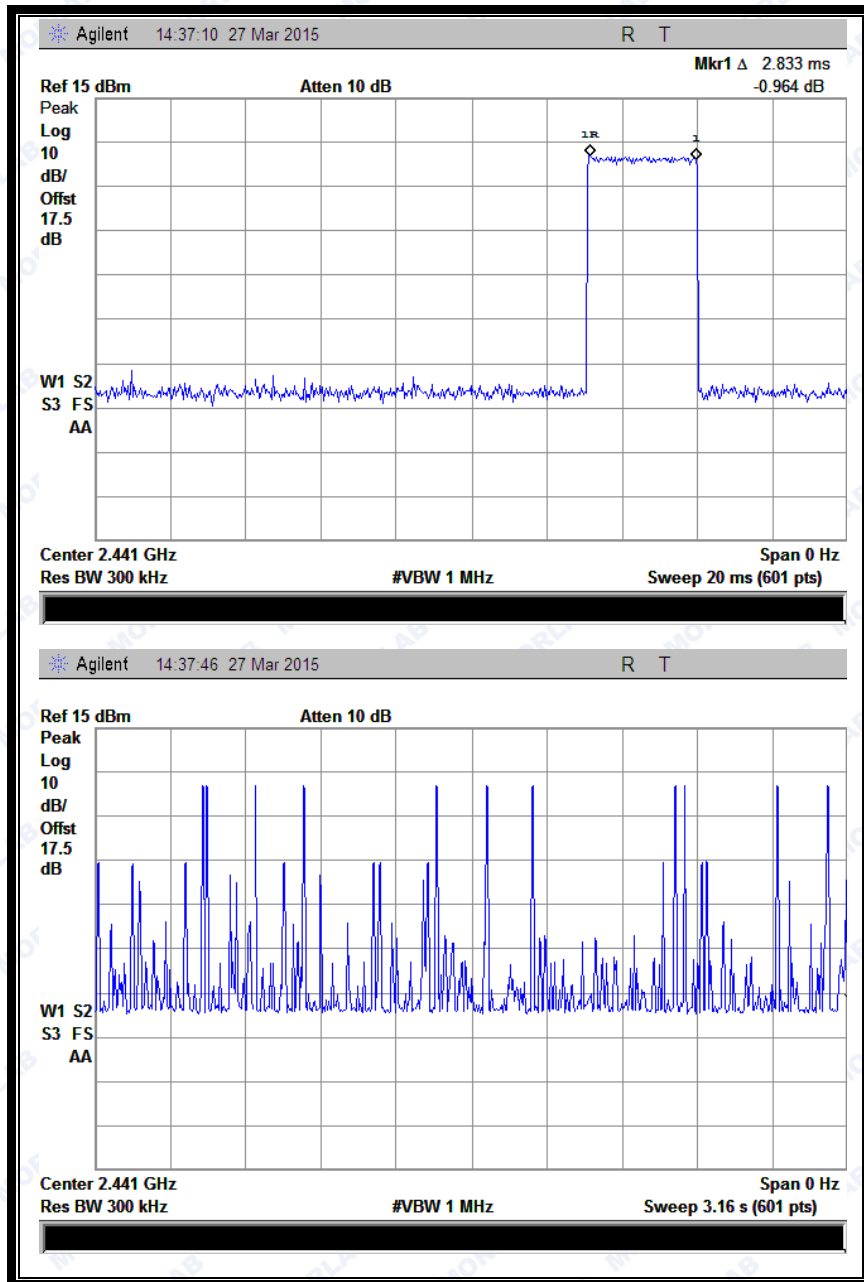


(Plot D: DH1 @ $\pi/4$ -DQPSK)

(Plot E: DH3 @ $\pi/4$ -DQPSK)



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(Plot F: DH5 @ $\pi/4$ -DQPSK)

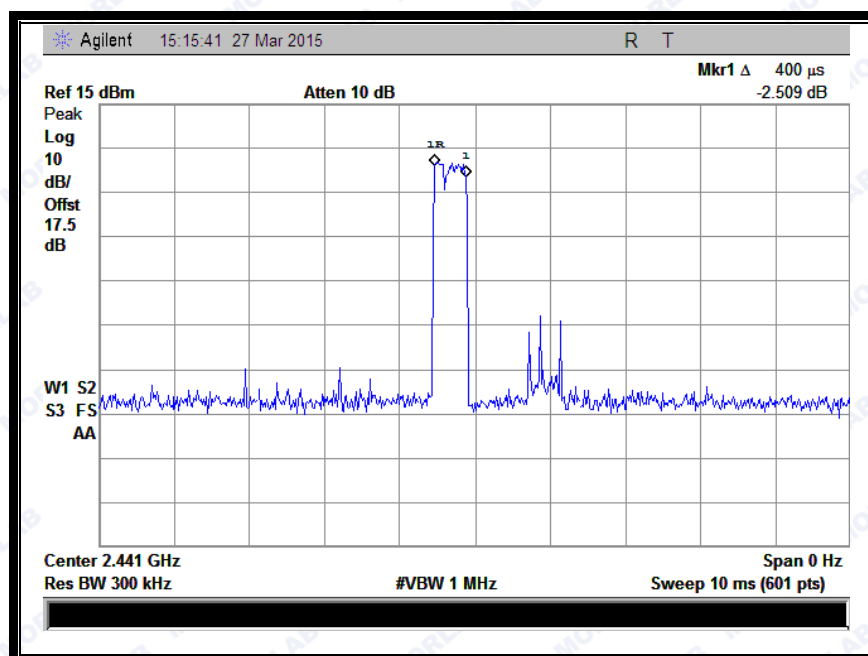


2.6.4.3. 8-DPSK mode

A. Test Verdict:

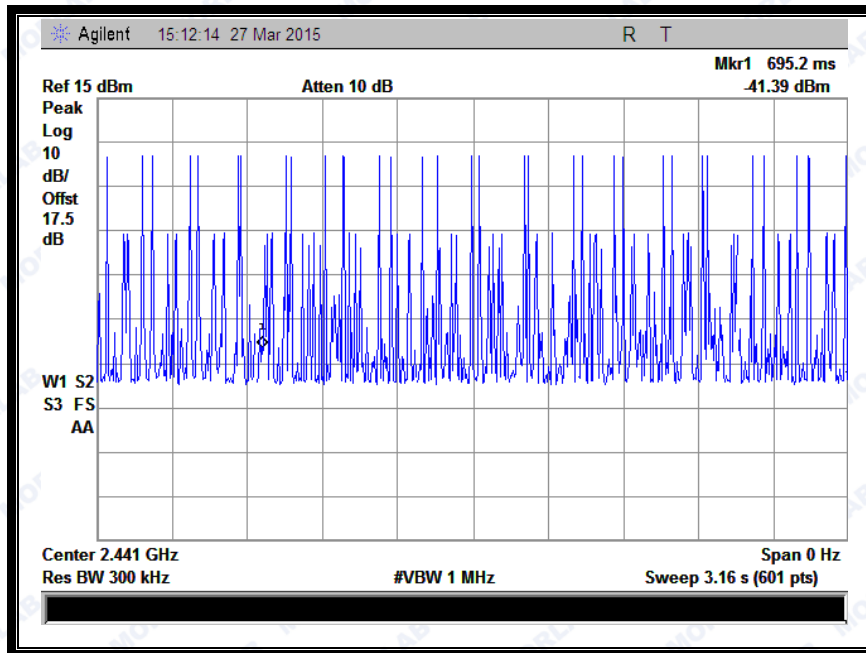
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Refer to Plot	Average Time of Occupancy (sec)	Limit (sec)	Verdict
DH1	0.400	31	Plot A	0.124	0.4	PASS
DH3	1.633	17	Plot B	0.278		PASS
DH5	2.800	7	Plot C	0.196		PASS

B. Test Plots:

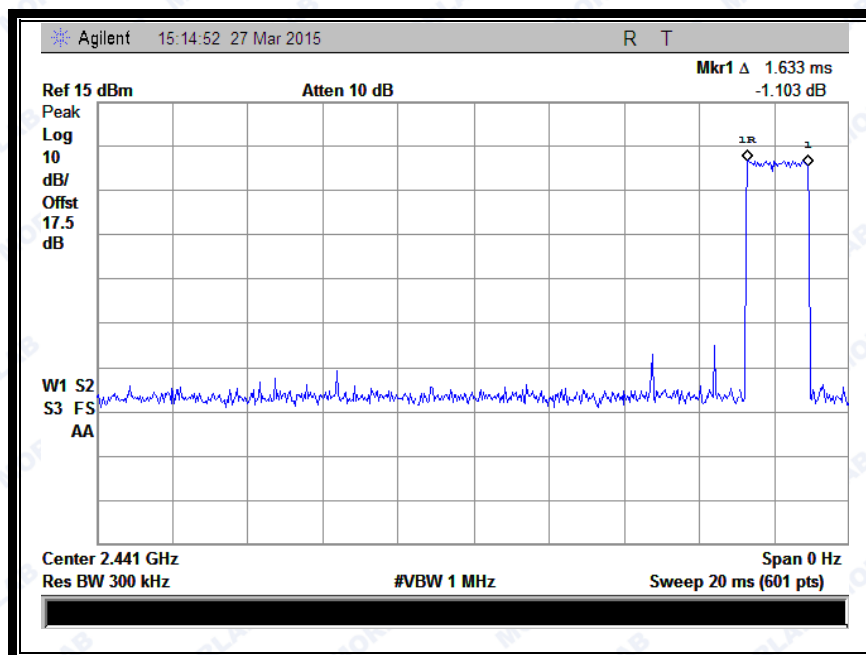




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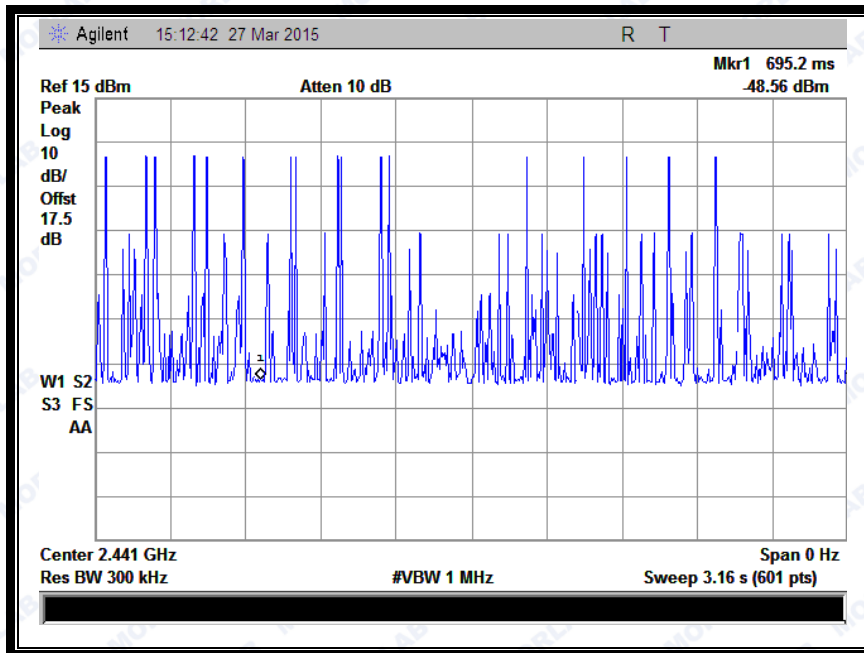


(Plot G: DH1 @ 8-DPSK)

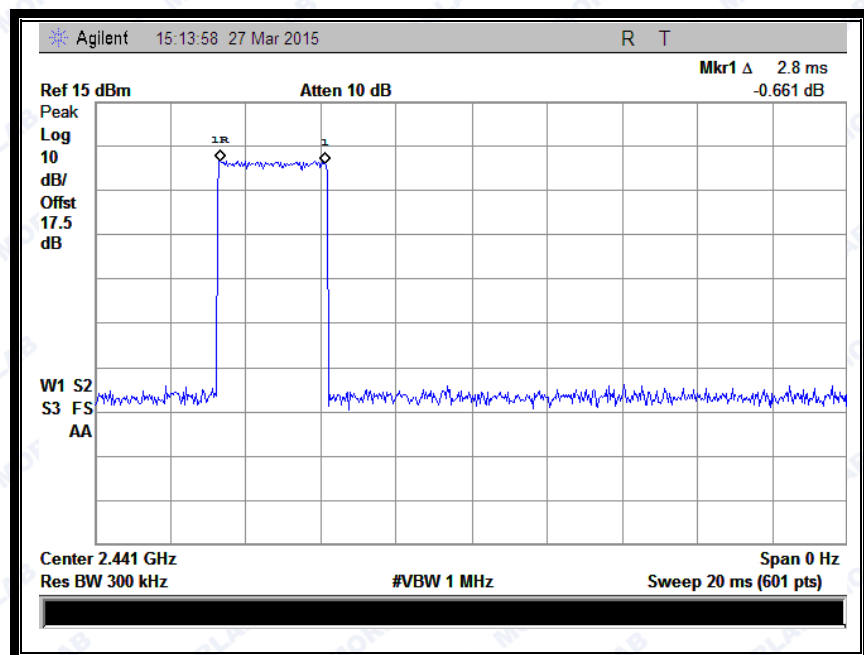




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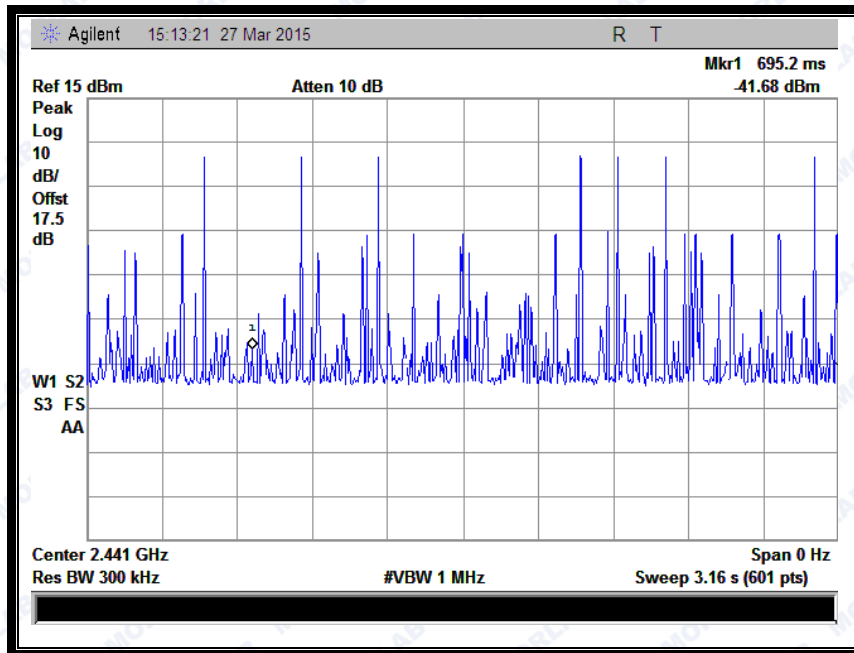


(Plot H: DH3 @ 8-DPSK)





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(Plot I: DH5 @ 8-DPSK)

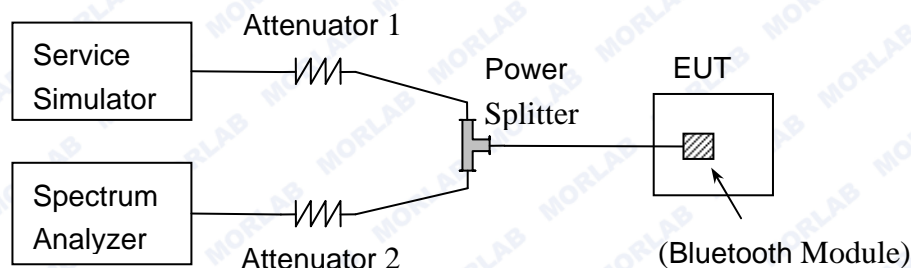
2.7. Conducted Spurious Emissions

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(1.4).

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 \geq 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.

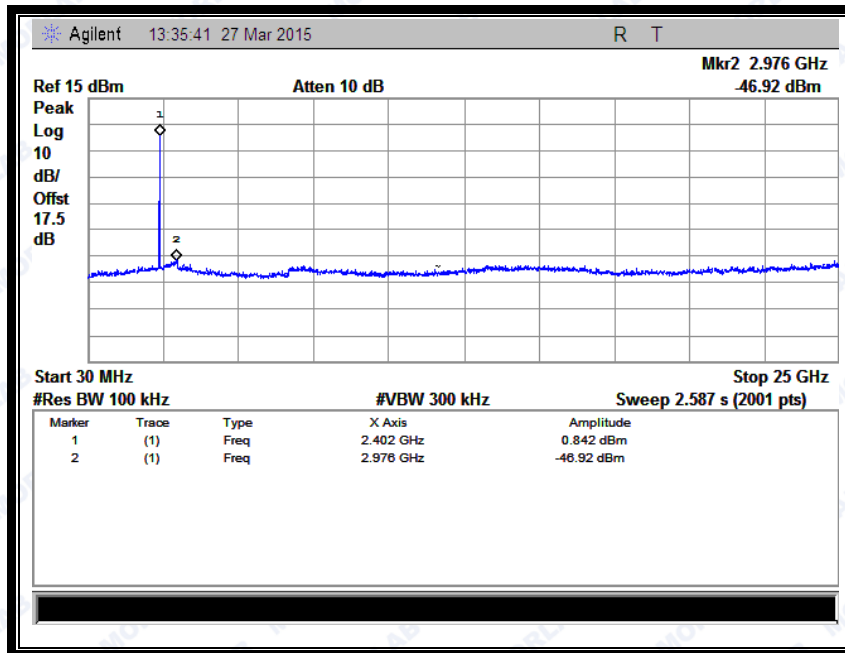
2.7.4.1. GFSK Mode

A. Test Verdict:

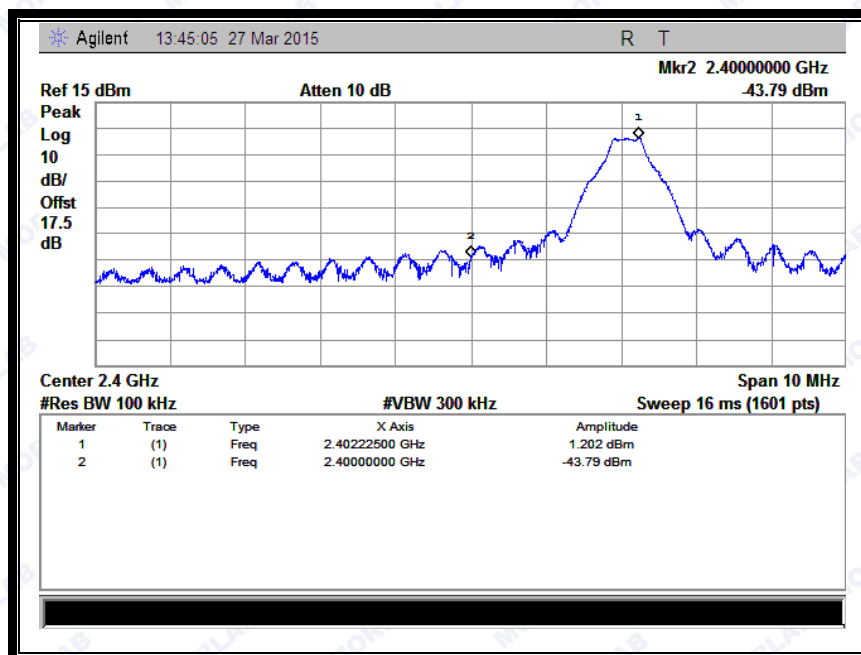
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-46.92	Plot A.1	0.842	-19.158	PASS
39	2441	-48.28	Plot B.1	1.679	-18.321	PASS
78	2480	-48.81	Plot C.1	1.487	-18.513	PASS

B. Test Plots:

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



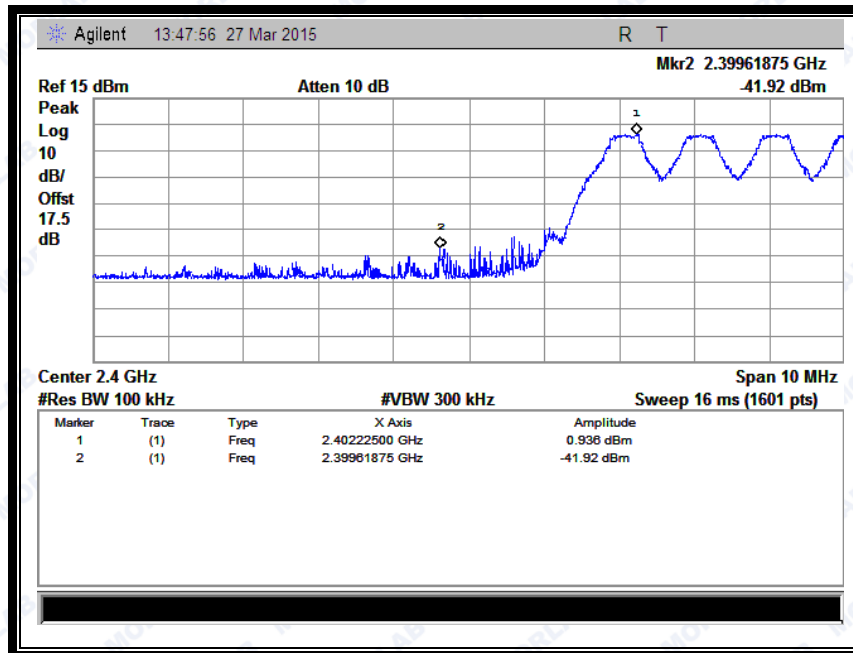
(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



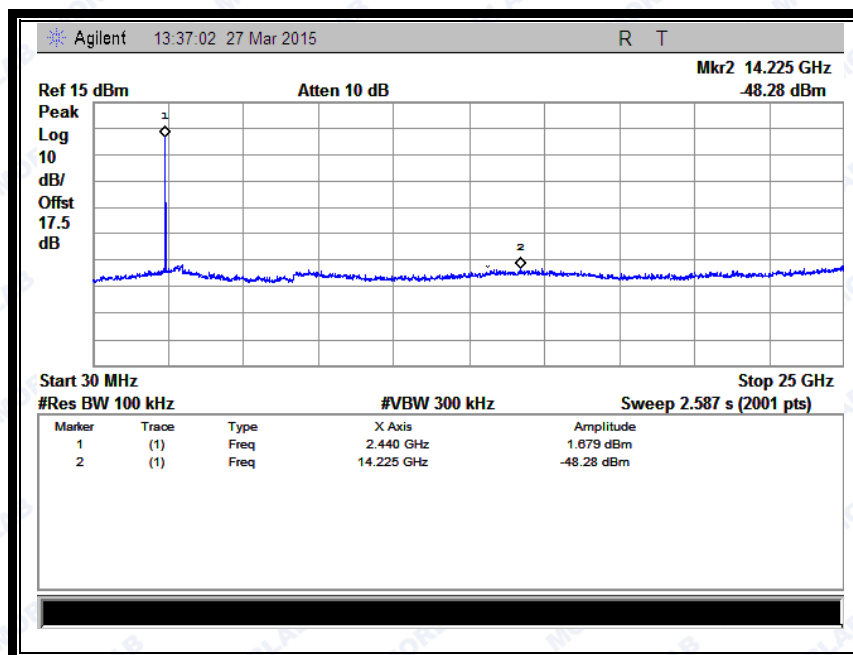
(Channel = 0, Band edge @ GFSK Mode)



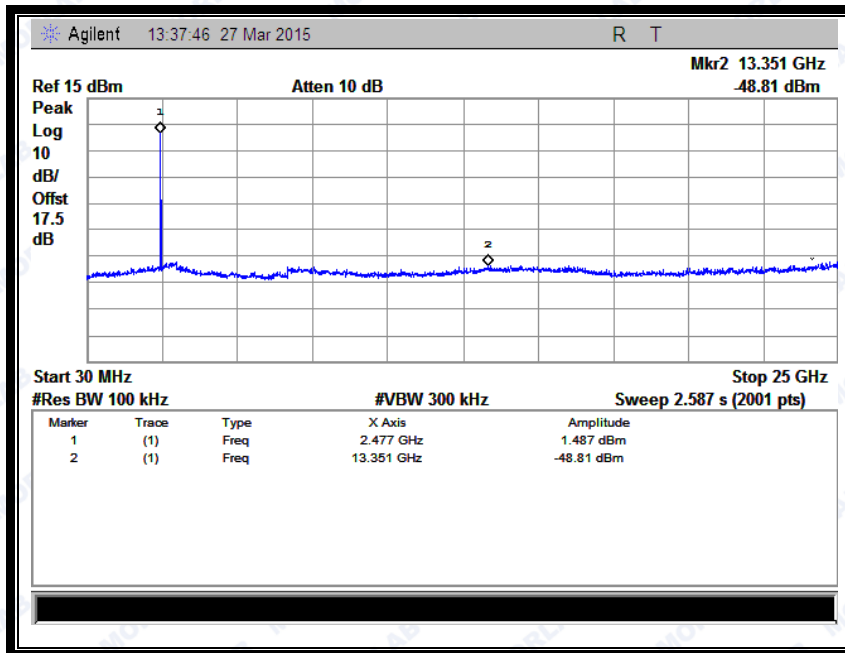
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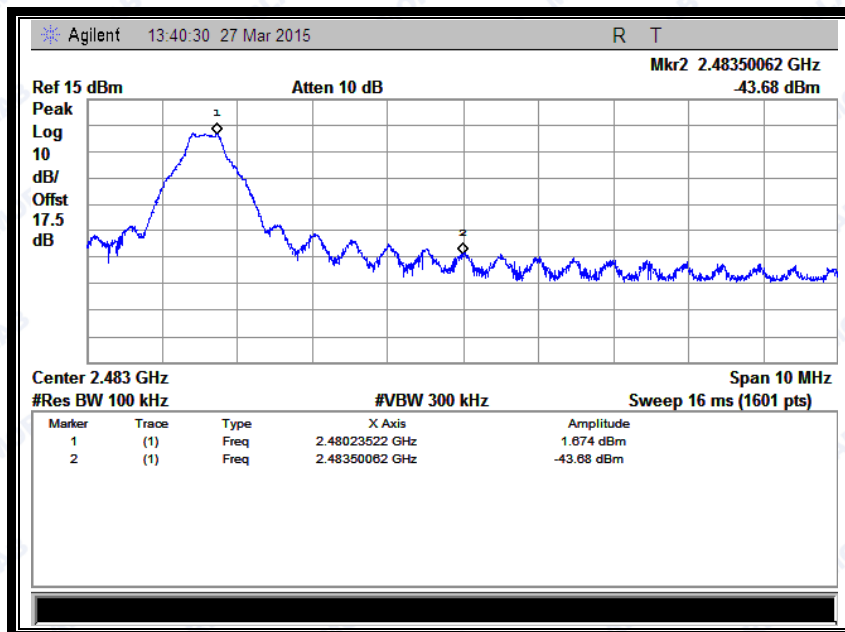
(Channel = 0, Band edge with hopping on @ GFSK Mode)



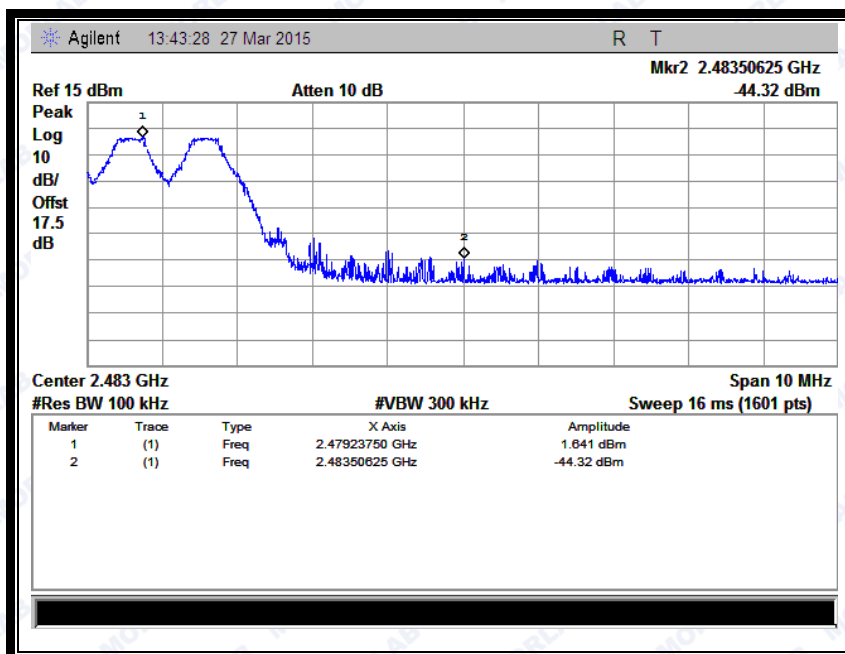
(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



(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)

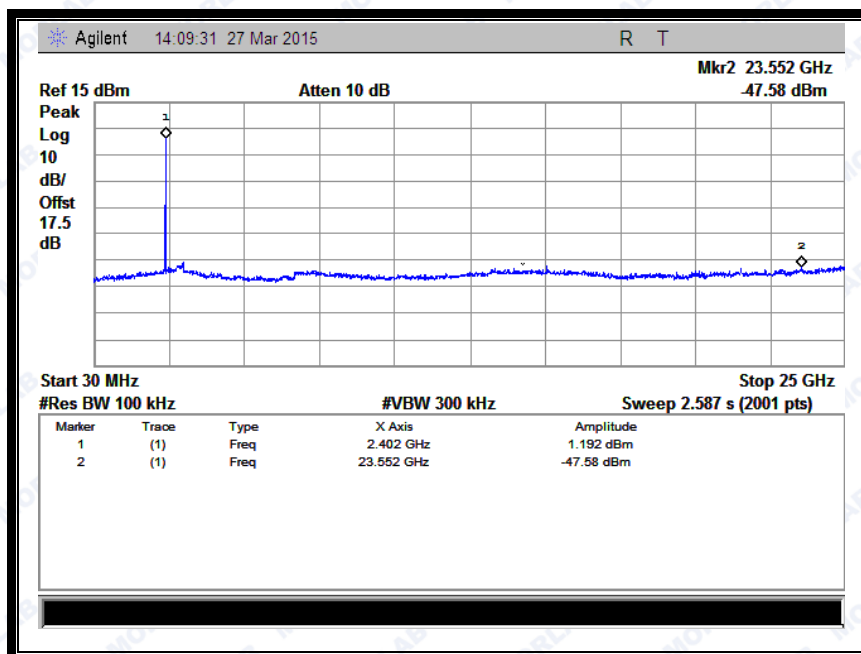
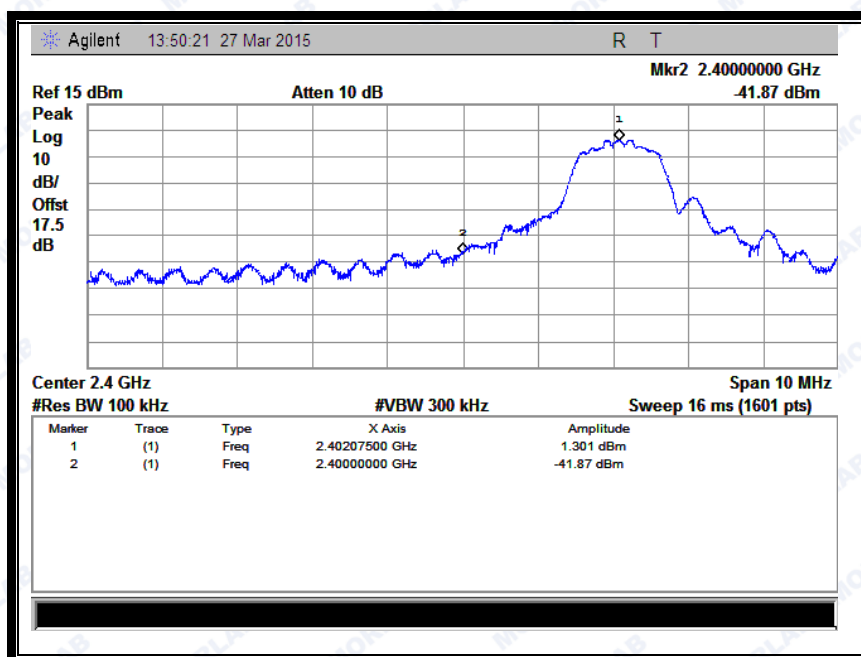
2.7.4.2. $\pi/4$ -DQPSK Mode

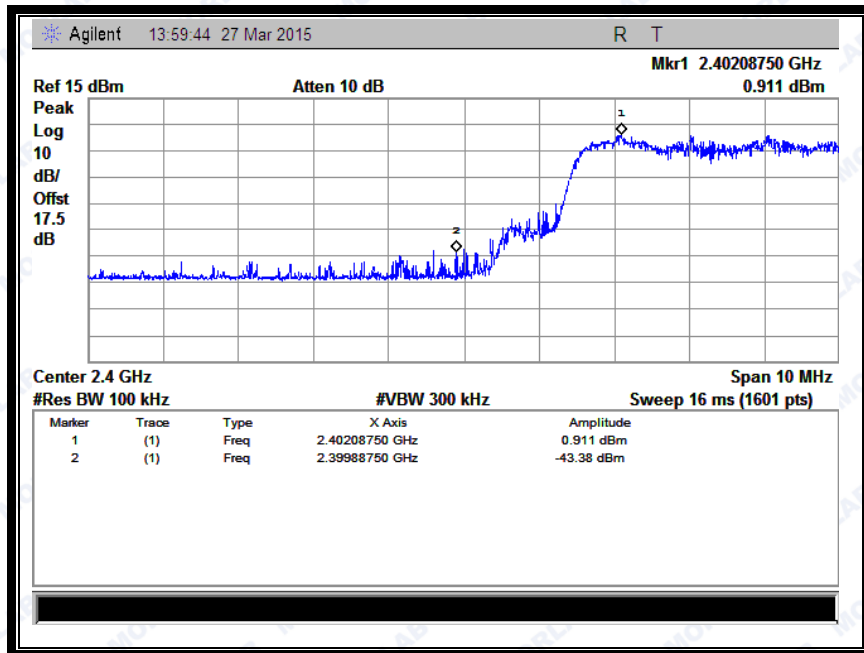
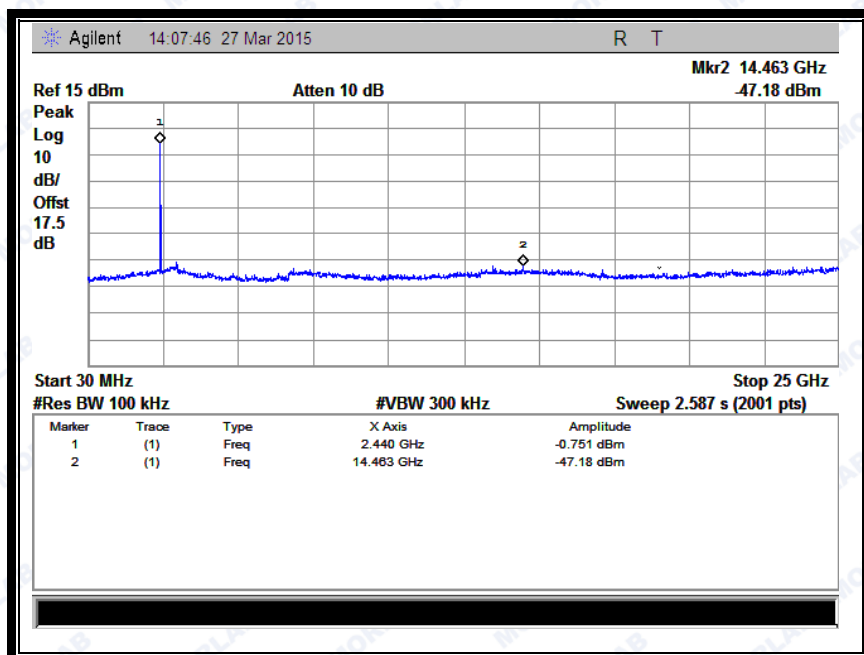
A. Test Verdict:

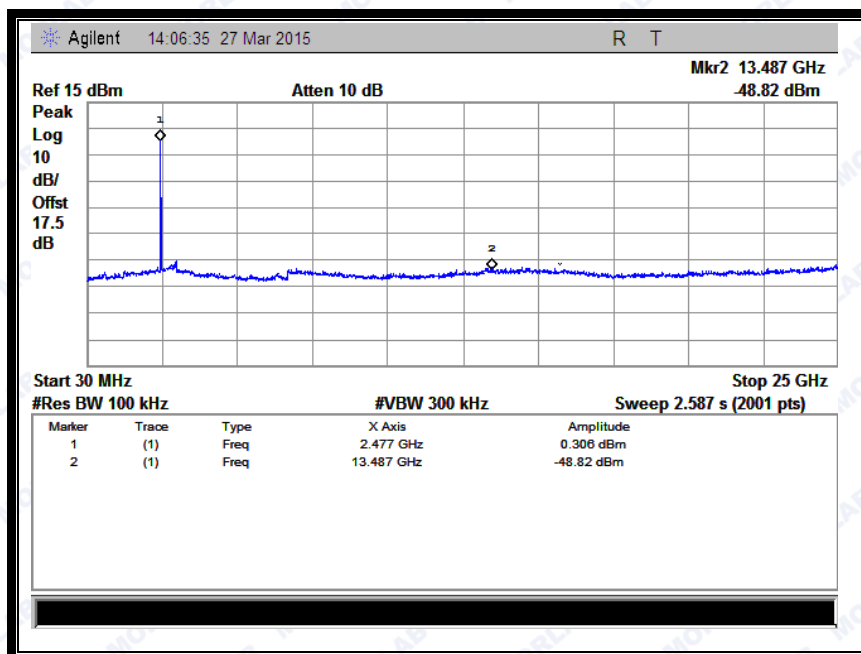
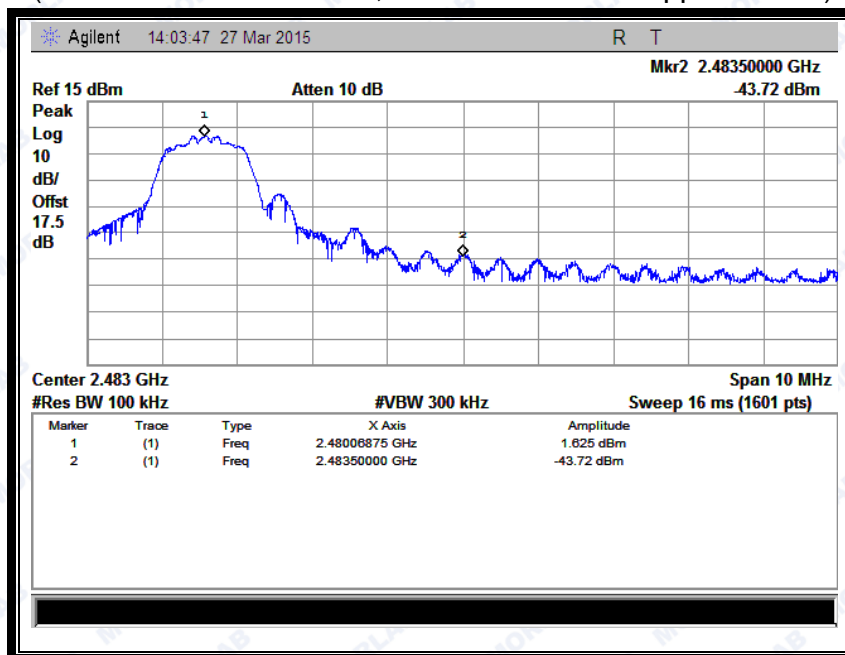
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-47.58	Plot D.1	1.192	-18.808	PASS
39	2441	-47.18	Plot E.1	-0.751	-20.751	PASS
78	2480	-48.82	Plot F.1	0.306	-19.694	PASS

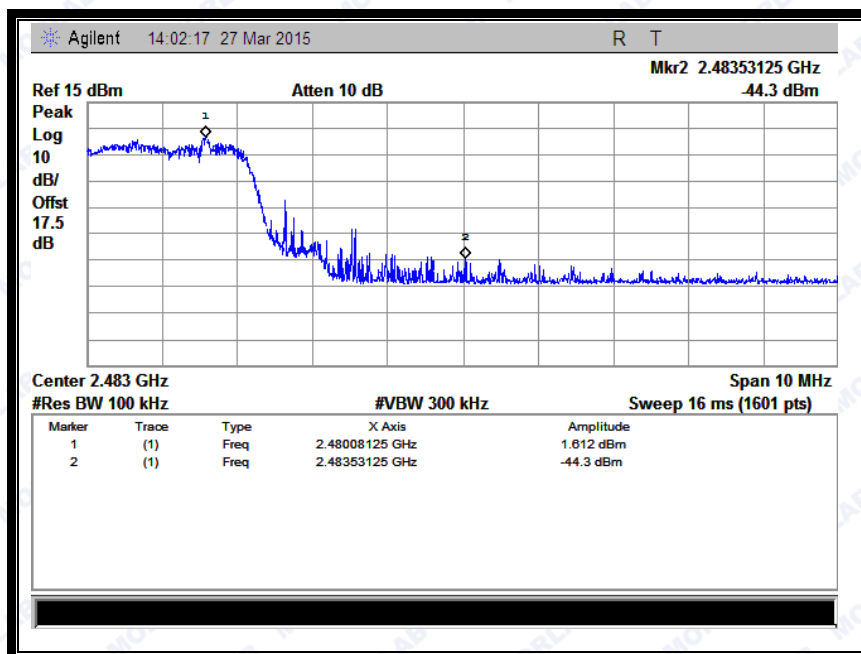
B. Test Plots:

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

(Plot D.1: Channel = 0, 30MHz to 25GHz @ $\pi/4$ -DQPSK)(Channel = 0, Band edge @ $\pi/4$ -DQPSK)

(Channel = 0, Band edge with hopping on @ $\pi/4$ -DQPSK)(Plot E.1: Channel = 39, 30MHz to 25GHz @ $\pi/4$ -DQPSK)

(Plot F.1: Channel = 78, 30MHz to 25GHz @ $\pi/4$ -DQPSK)(Channel = 78, Band edge @ $\pi/4$ -DQPSK)



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

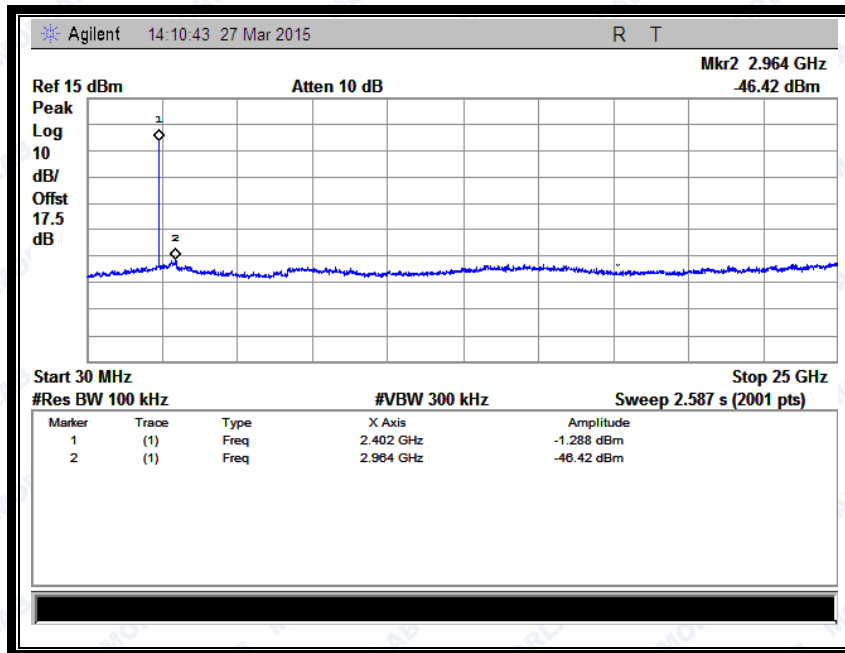
2.7.4.3. 8-DPSK Mode

A. Test Verdict:

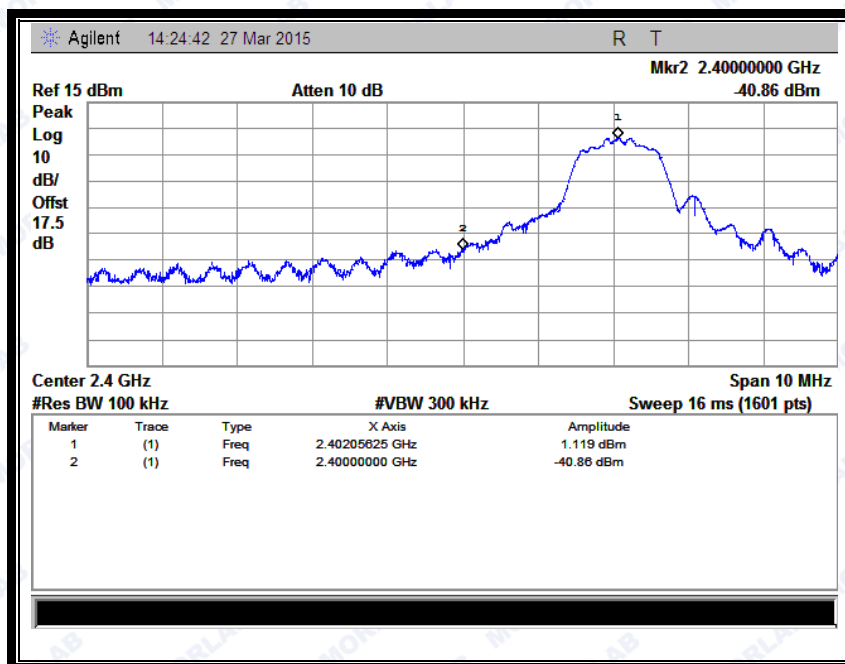
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-46.42	Plot G.1	-1.288	-21.288	PASS
39	2441	-48.78	Plot H.1	-0.673	-20.673	PASS
78	2480	-48.61	Plot I.1	-0.874	-20.874	PASS

B. Test Plots:

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



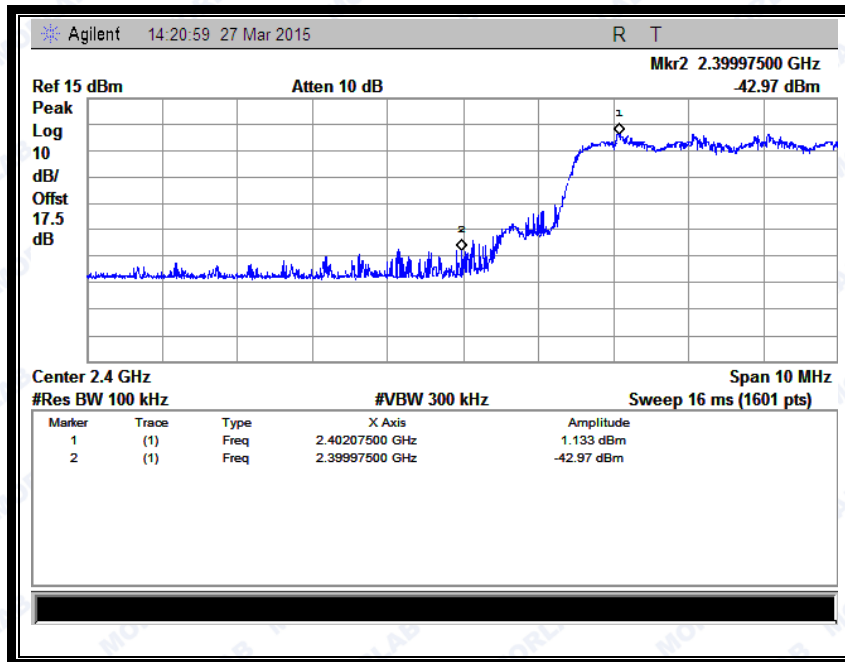
(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)



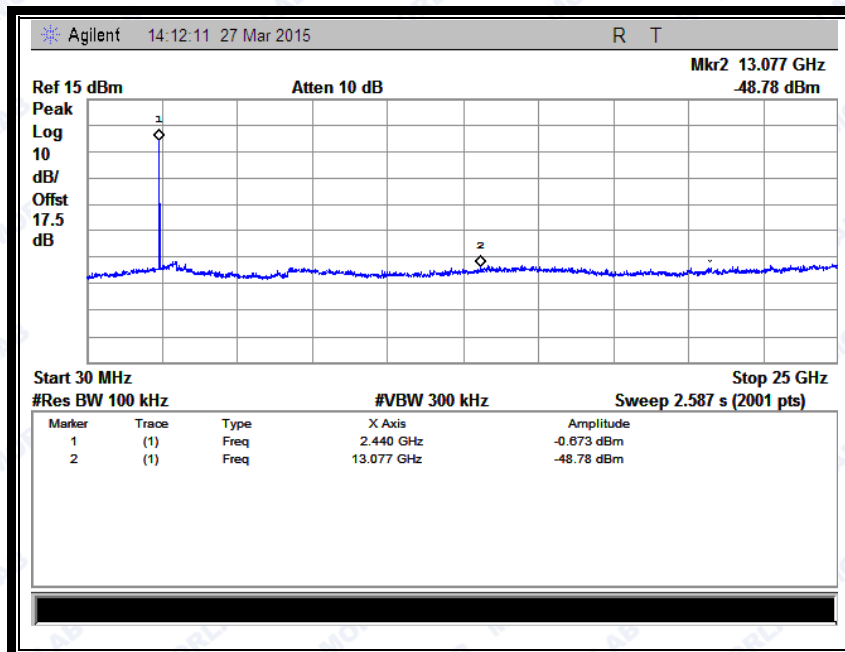
(Channel = 0, Band edge @ 8-DPSK)



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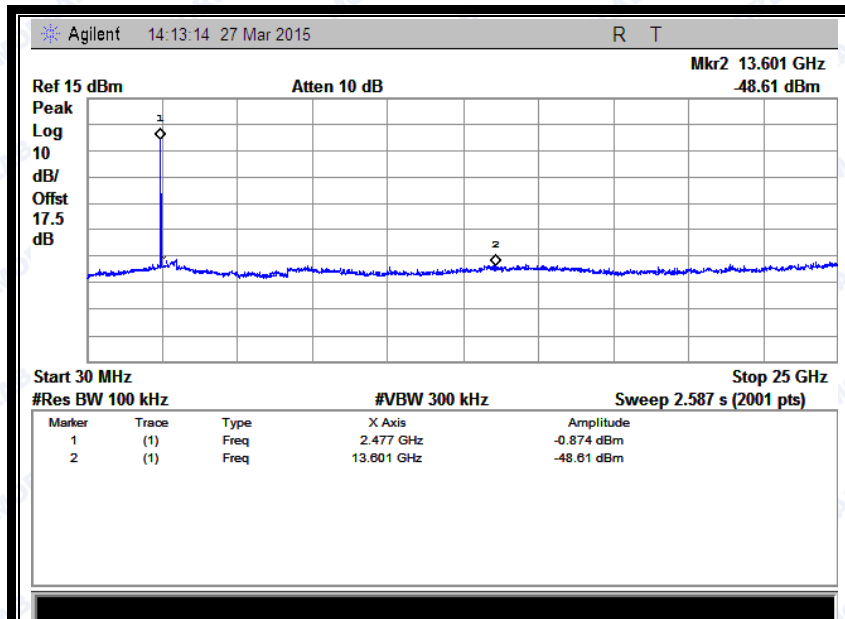
(Channel = 0, Band edge with hopping on @ 8-DPSK)



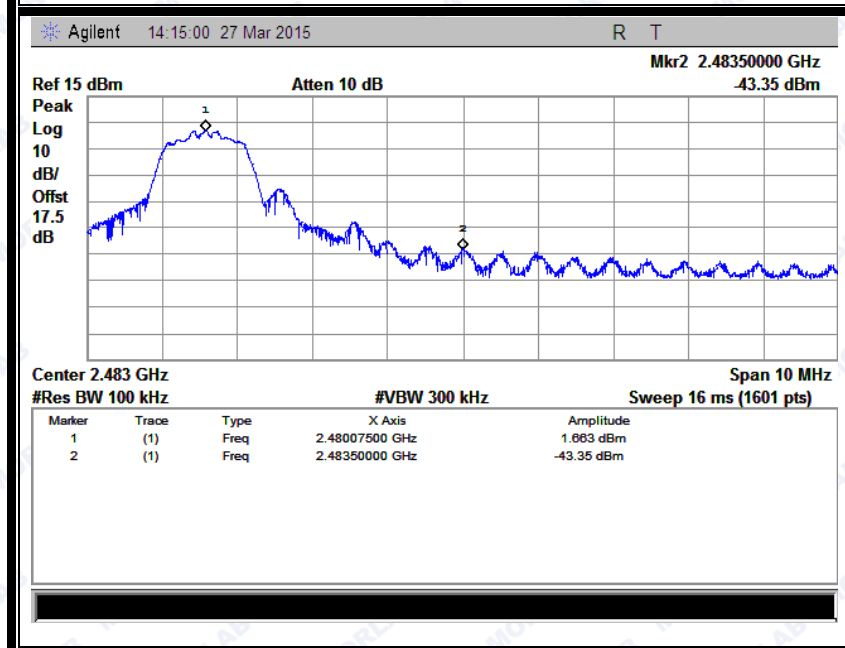
(Plot H.1: Channel = 39, 30MHz to 25GHz @ 8-DPSK)



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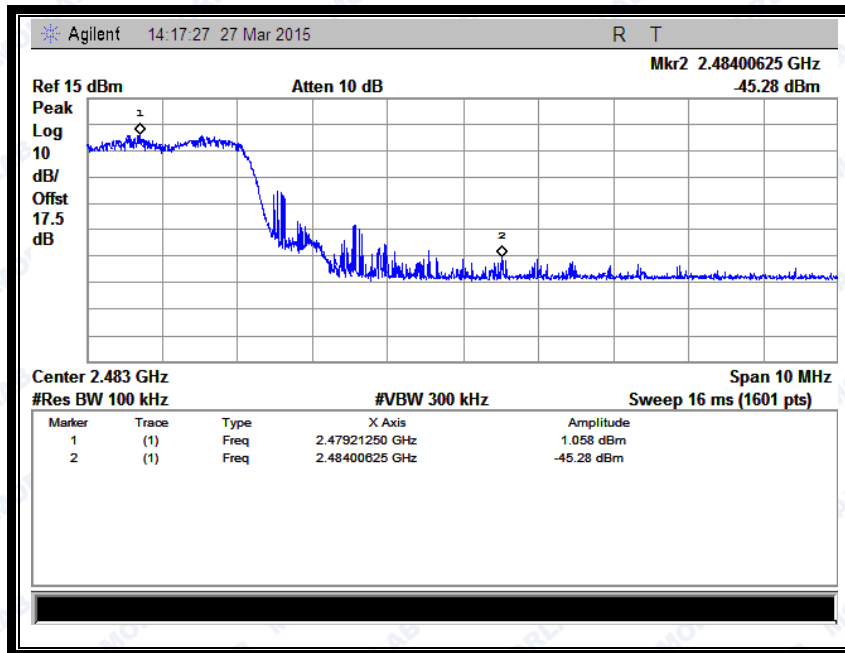
(Plot I.1:Channel = 78, 30MHz to 25GHz @ 8-DPSK)



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



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

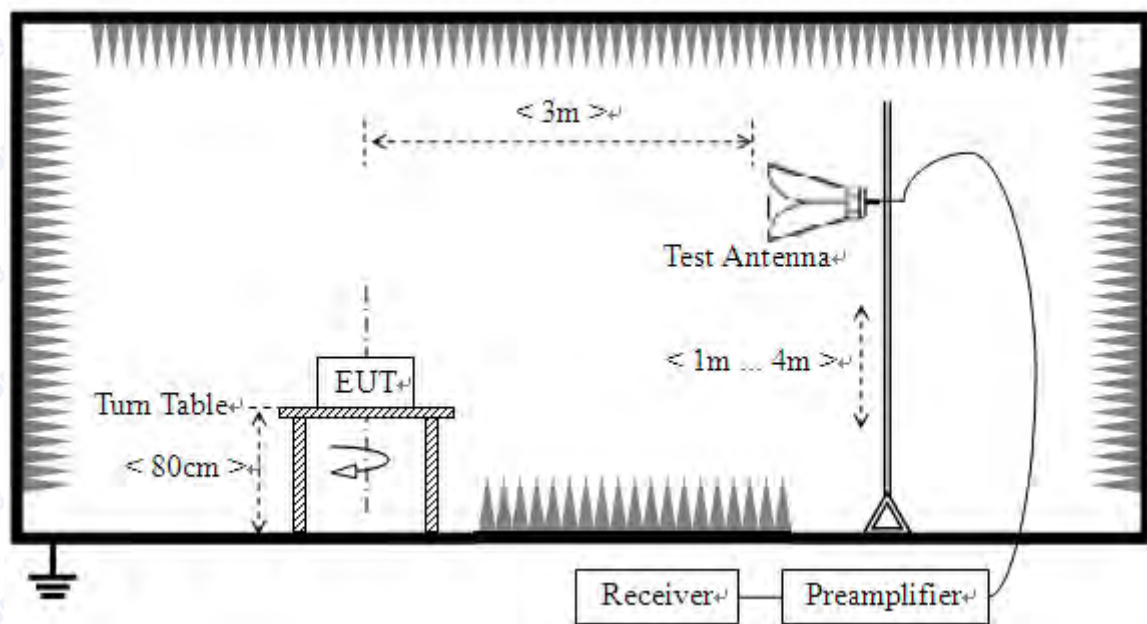
2.8. Restricted Frequency Bands

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(1.4).

2.8.3. Test Procedure

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 KHz for $f < 1\text{GHz}$

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:

$E [\text{dB}\mu\text{V/m}] = \text{UR} + \text{AT} + \text{AFactor} [\text{dB}]$; $\text{AT} = \text{LCable loss} [\text{dB}] - \text{Gpreamp} [\text{dB}]$

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.



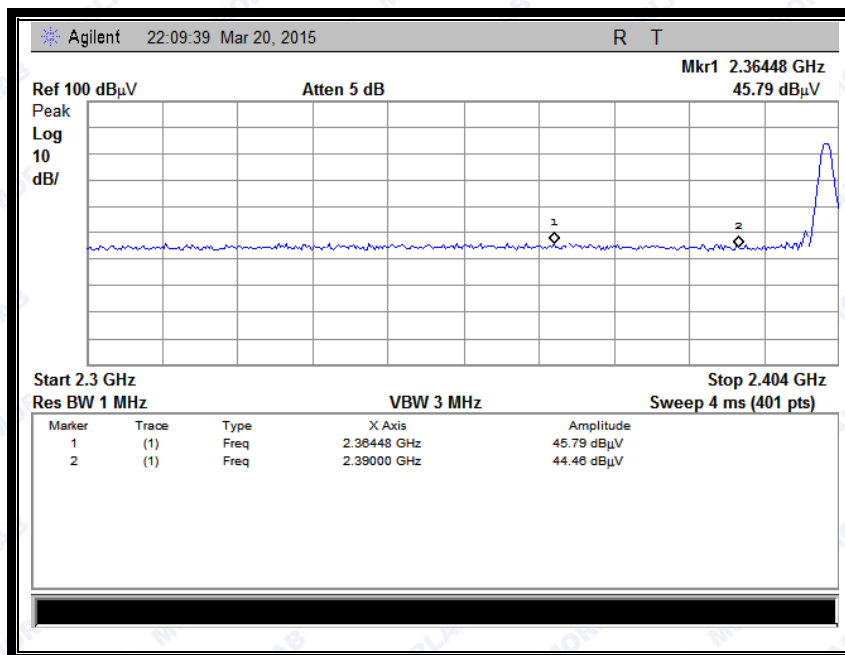
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2.8.4.1. GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2364.48	PK	45.79	-33.63	32.56	44.72	74	Pass
0	2370.72	AV	24.42	-33.63	32.56	23.35	54	Pass
78	2484.44	PK	45.68	-33.18	32.5	45.00	74	Pass
78	2483.50	AV	35.08	-33.18	32.5	34.40	54	Pass

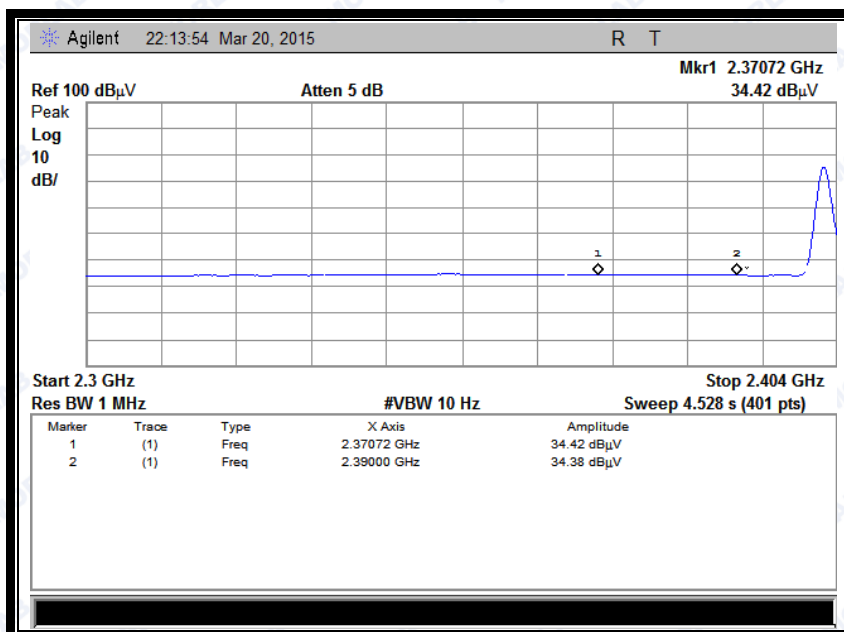
B. Test Plots:



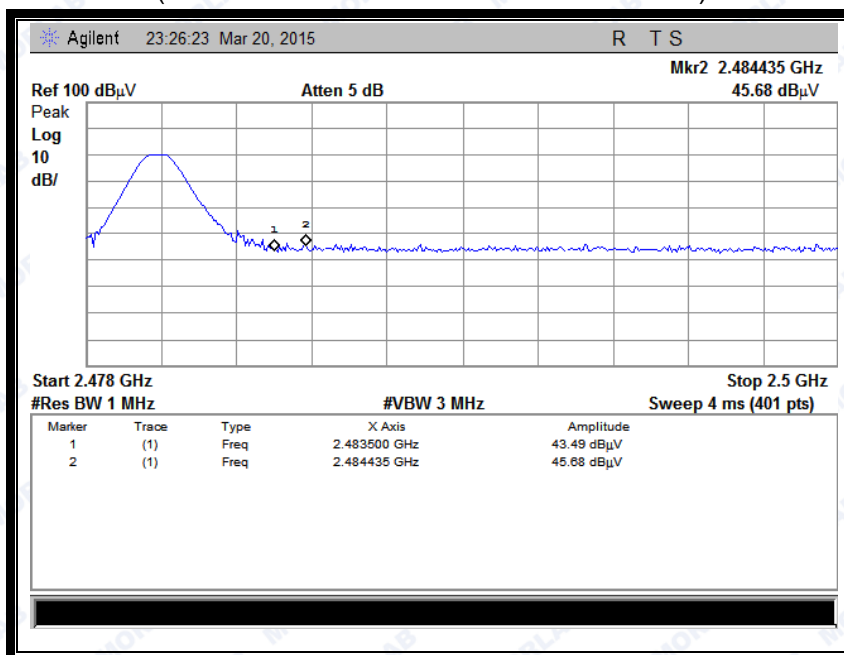
(Plot A1:Channel = 0 PEAK @ GFSK)



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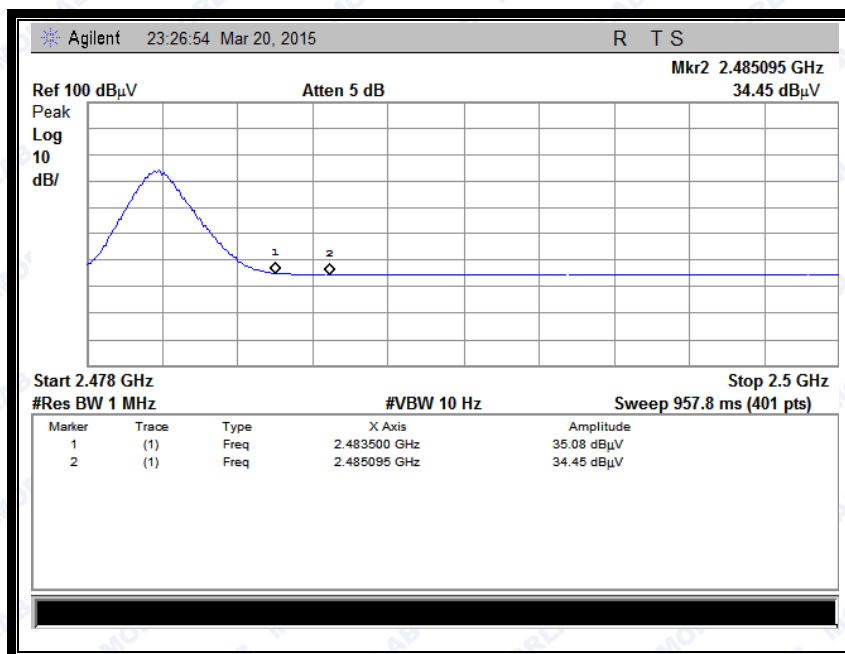
(Plot A2:Channel = 0 AVERAGE @ GFSK)



(Plot B1:Channel = 78 PEAK @ GFSK)



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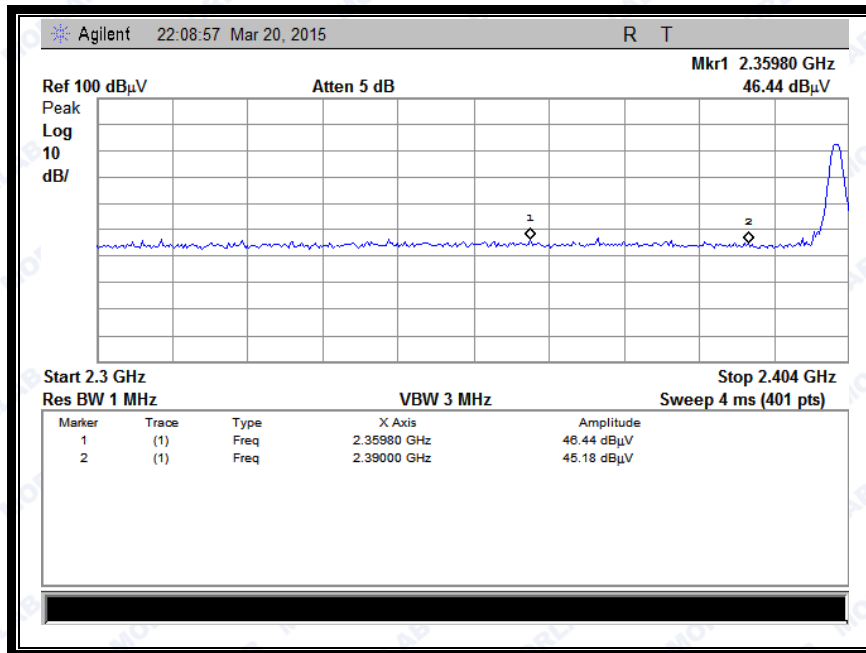
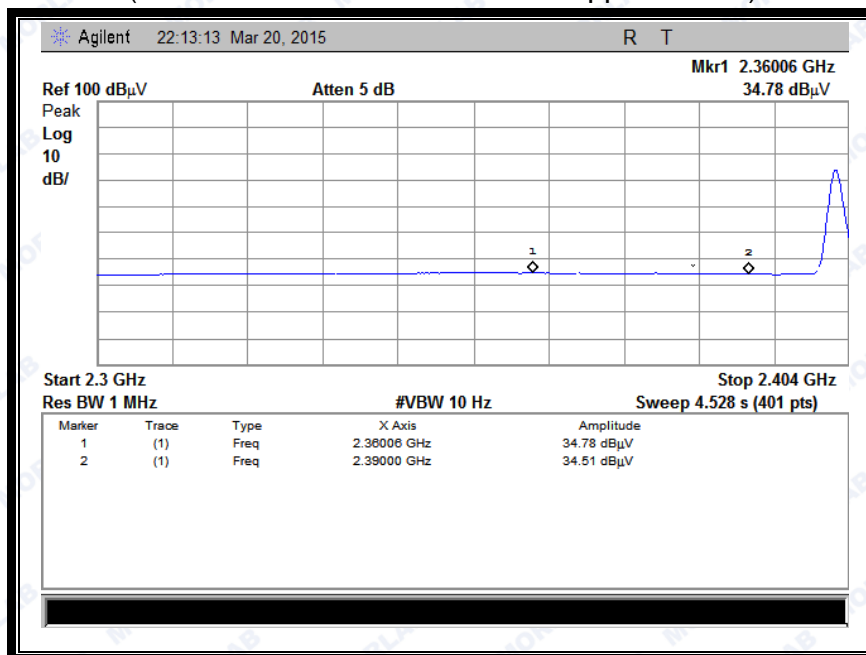
(Plot B2: Channel = 78 AVERAGE @ GFSK)

2.8.4.2. $\pi/4$ -DQPSK Mode

A. Test Verdict:

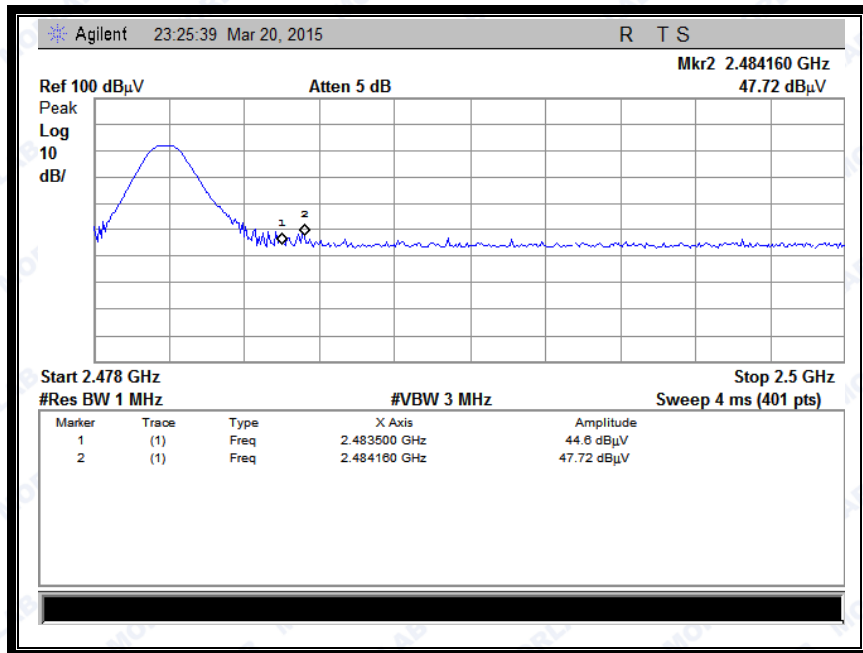
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dB μ V)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
0	2359.80	PK	46.44	-33.63	32.56	45.37	74	Pass
0	2360.06	AV	34.78	-33.63	32.56	33.71	54	Pass
78	2484.16	PK	47.72	-33.18	32.5	47.04	74	Pass
78	2483.50	AV	34.89	-33.18	32.5	34.21	54	Pass

B. Test Plots:

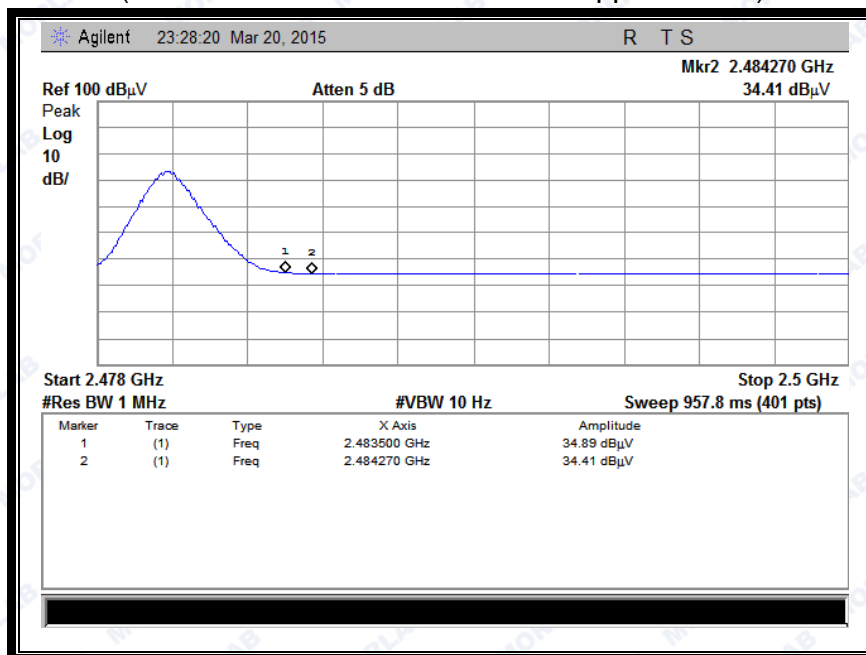
(Plot C1: Channel = 0 PEAK @ $\pi/4$ -DQPSK)(Plot C2: Channel = 0 AVERAGE @ $\pi/4$ -DQPSK)



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(Plot D1: Channel = 78 PEAK @ $\pi/4$ -DQPSK)



(Plot D2: Channel = 78 AVERAGE @ $\pi/4$ -DQPSK)



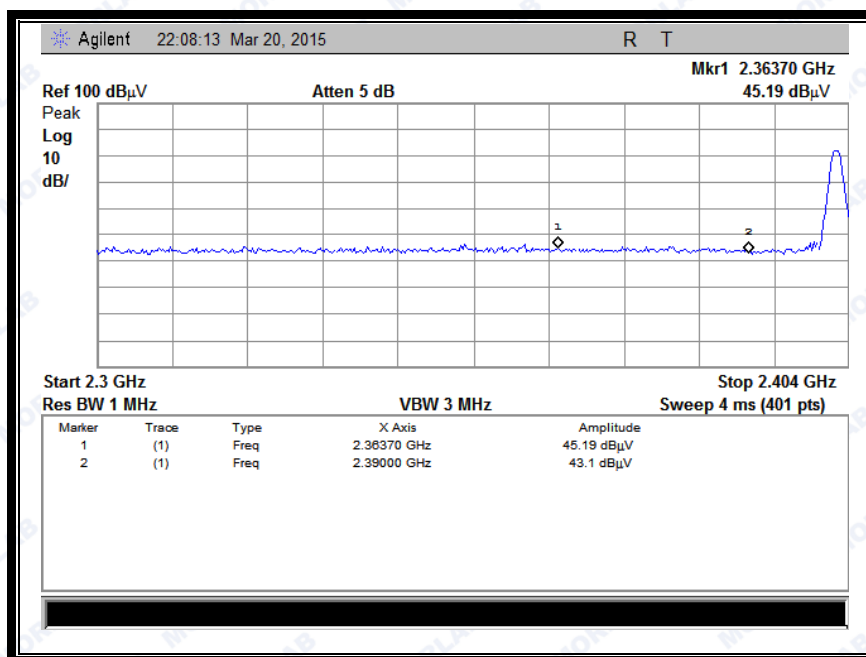
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2.8.4.3. 8-DPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
0	2363.70	PK	45.19	-33.63	32.56	44.12	74	Pass
0	2350.96	AV	34.77	-33.63	32.56	33.70	54	Pass
78	2483.50	PK	48.51	-33.18	32.5	47.83	74	Pass
78	2483.50	AV	35.13	-33.18	32.5	34.45	54	Pass

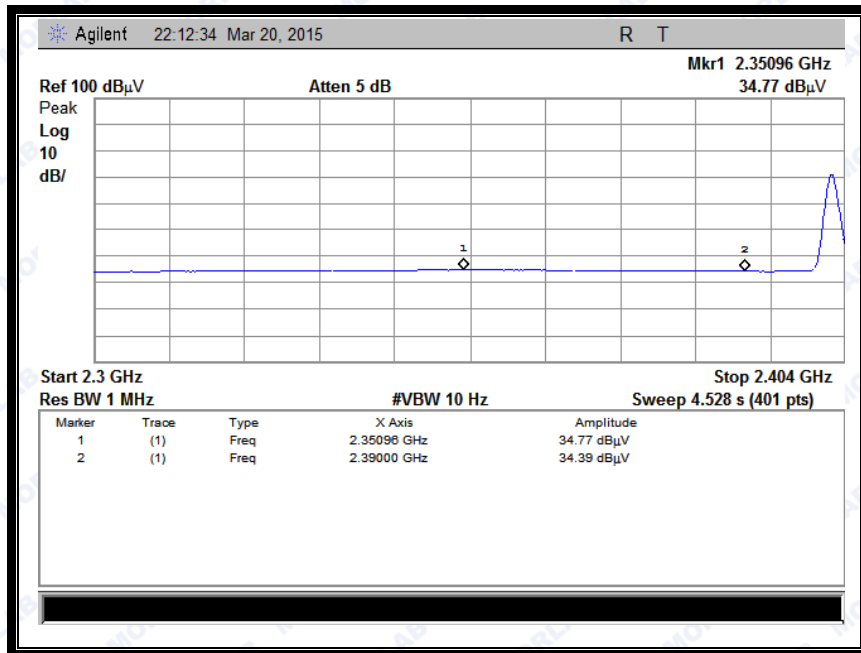
B. Test Plots:



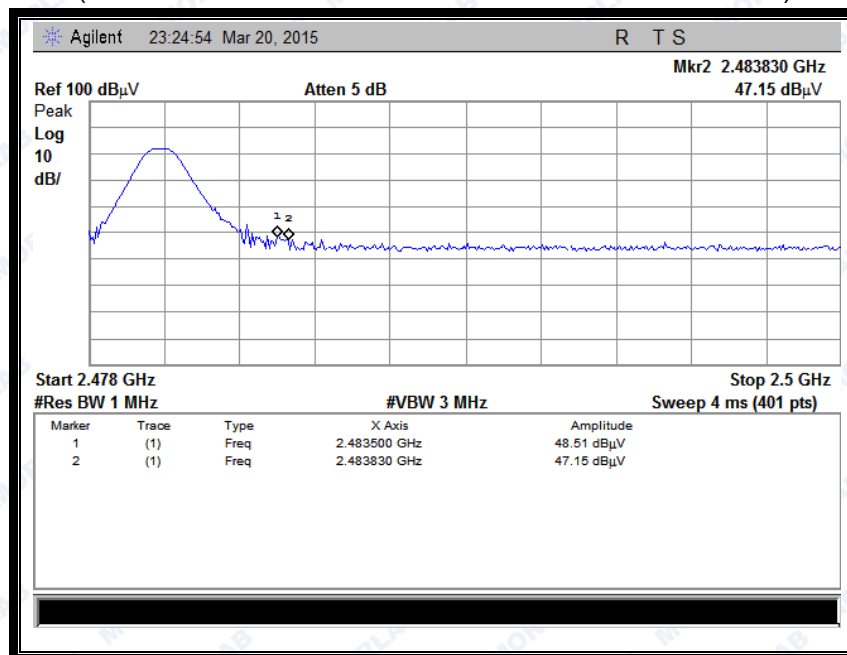
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



REPORT No. : SZ15030076W01



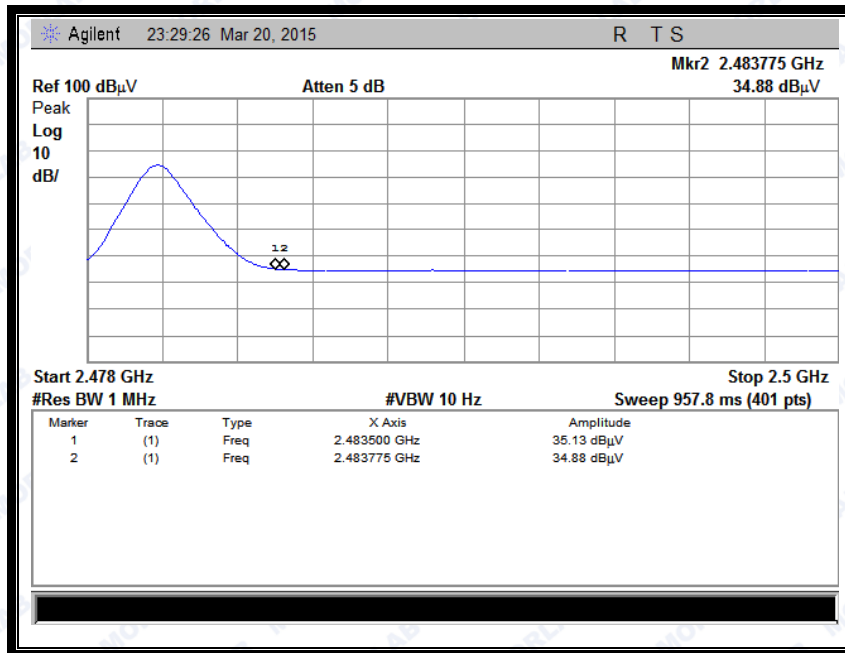
(Plot E2: Channel = 0 AVERAGE @ 8-DPSK Mode)



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



REPORT No. : SZ15030076W01



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

2.9. Conducted Emission

2.9.1. Requirement

According to FCC section 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 50 μ H/50 Ω line impedance stabilization network (LISN).

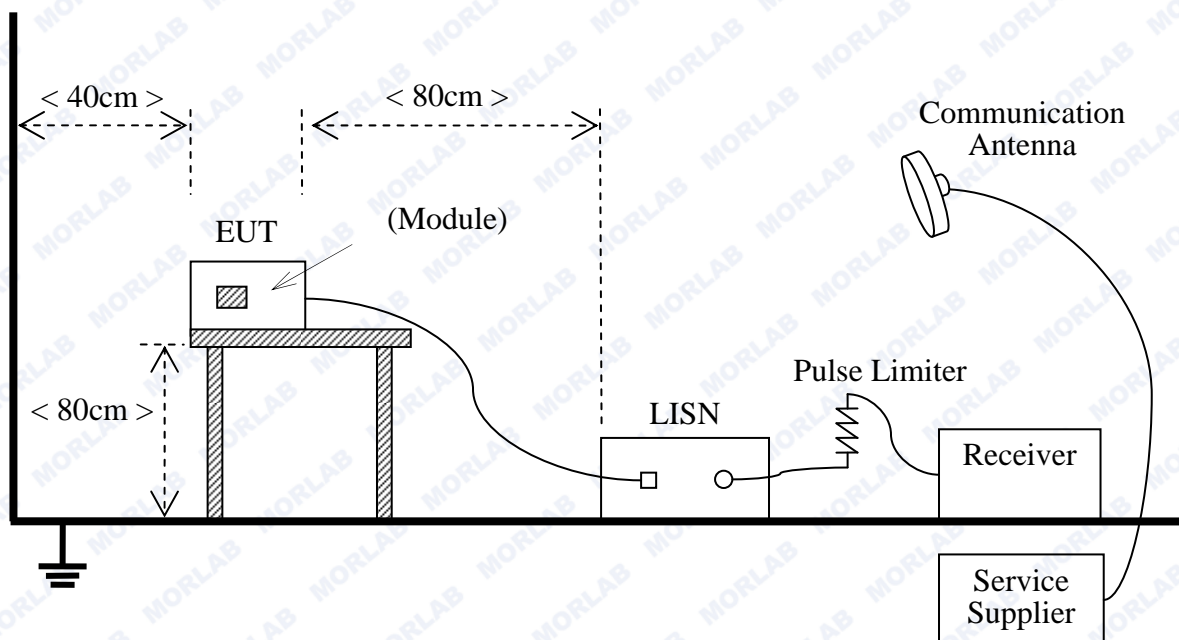
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

NOTE:

- The lower limit shall apply at the band edges.
- 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 C63.4:2009

The factors of the site are calibrated 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.

B. Equipments List:

Please reference ANNEX A(1.4).

2.9.3. Test Result

This test is not applicable to the EUT.



2.10. Radiated Emission

2.10.1. Requirement

According to FCC section 15.247(d) and RSS-A8.5, 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 ($\mu\text{V}/\text{m}$)	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:

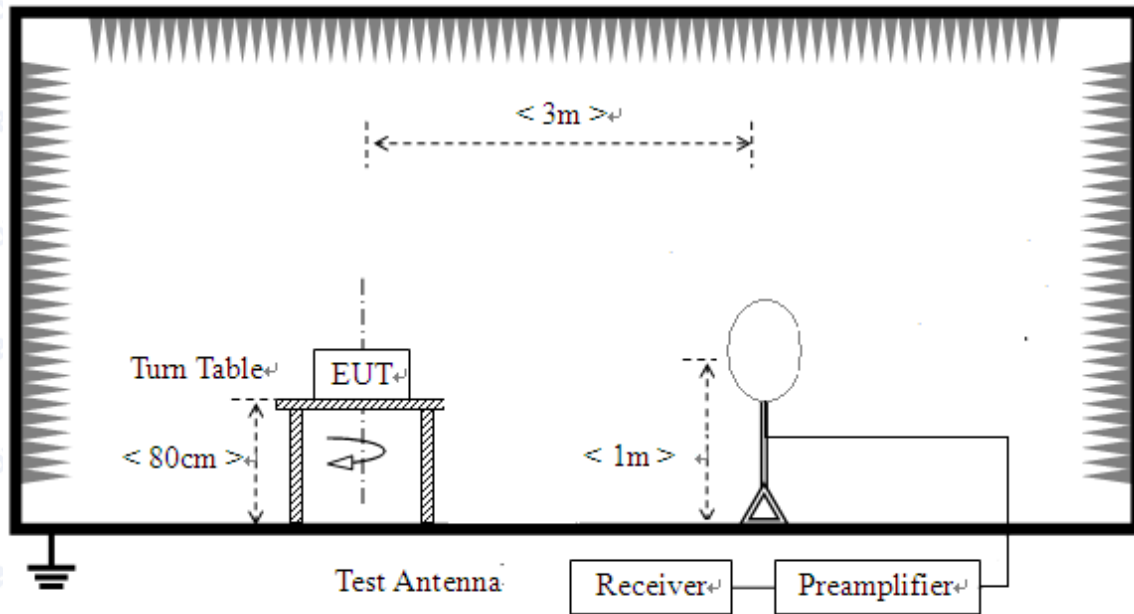
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength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

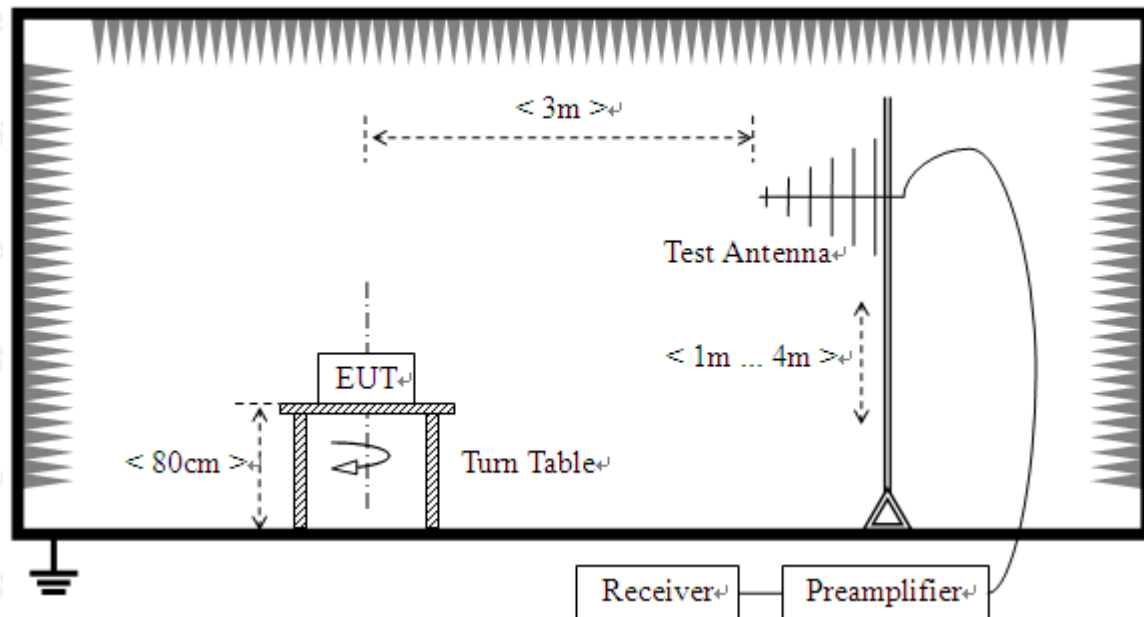
2.10.2. Test Description

A. Test Setup:

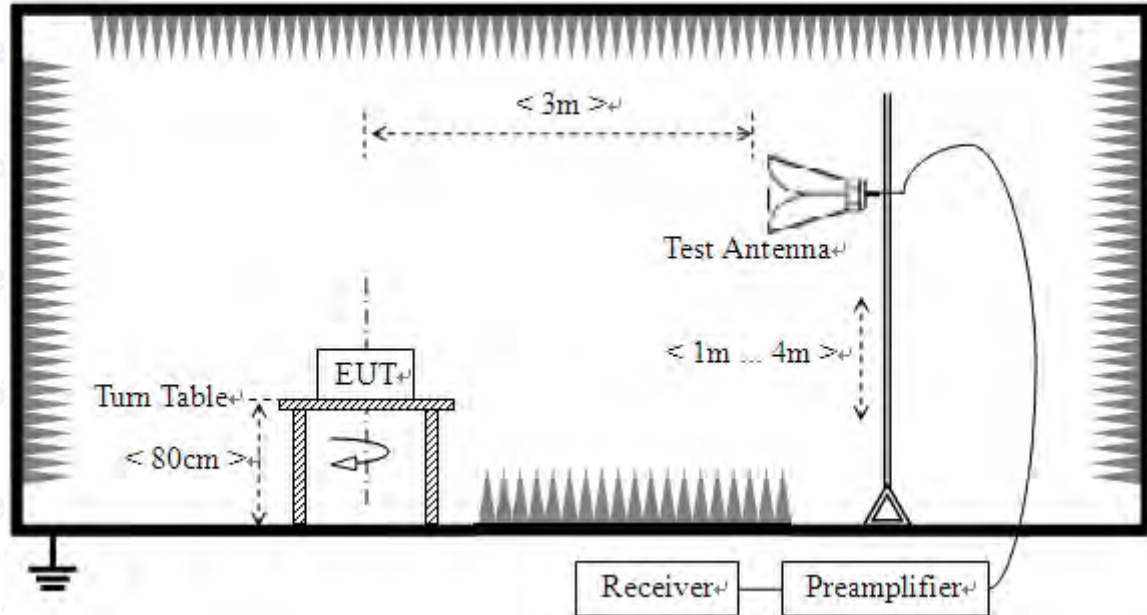
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to 1GHz



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 C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

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 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:

- 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.
- 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(1.4).

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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.10.4. Test Result

According to ANSI C63.4 selection 4.2.2, 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:

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

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

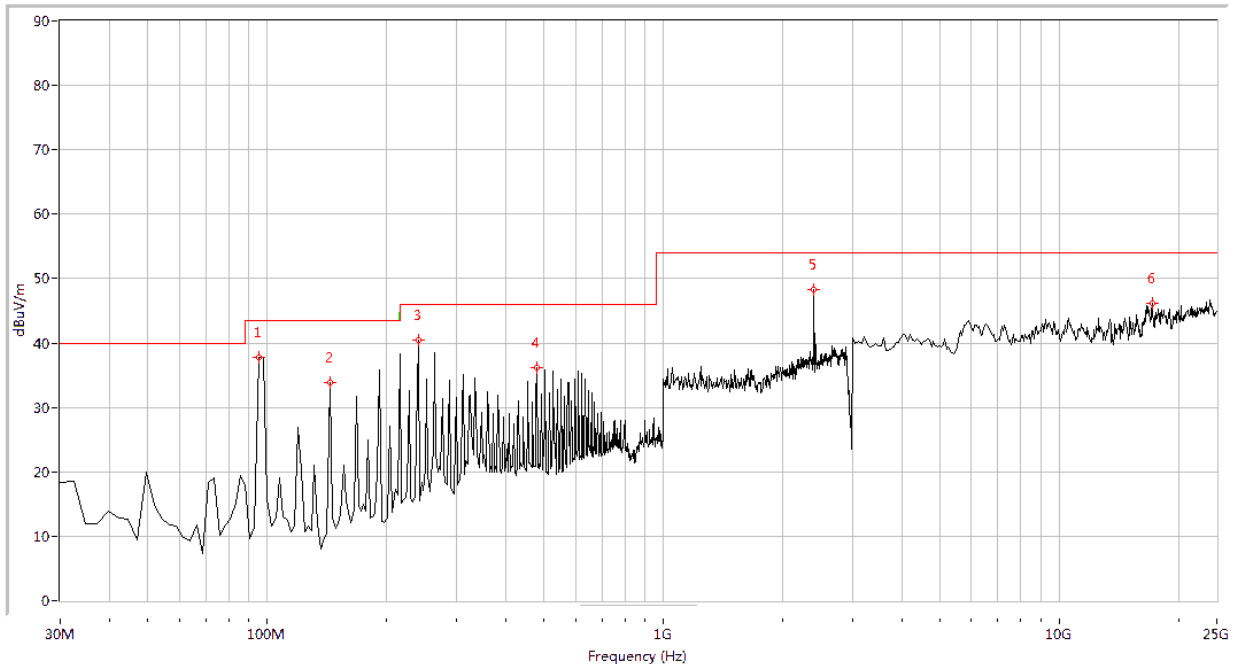
During the test, the total correction Factor A_T and A_{Factor} were built in test software.

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.

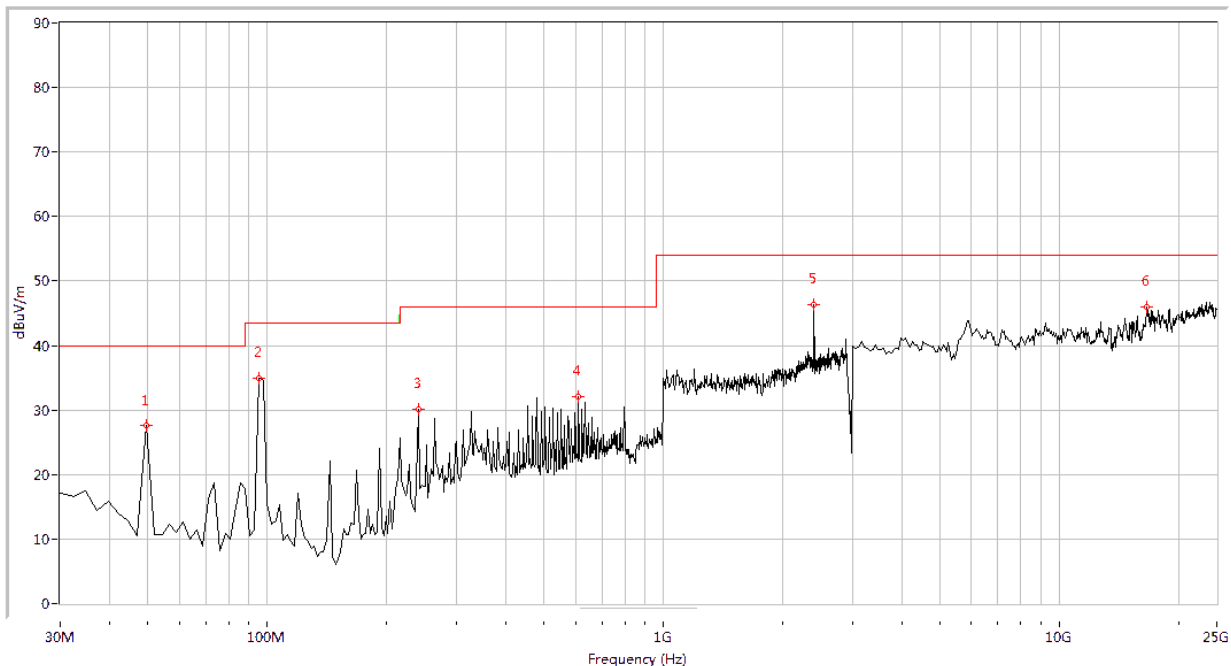
**2.10.4.1. GFSK Mode:****A. Test Plots for the Whole Measurement Frequency Range:**

Plots for Channel = 0



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
95.312	37.73	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	33.94	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	40.50	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	36.23	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2402.000	48.35	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
17154.613	46.11	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

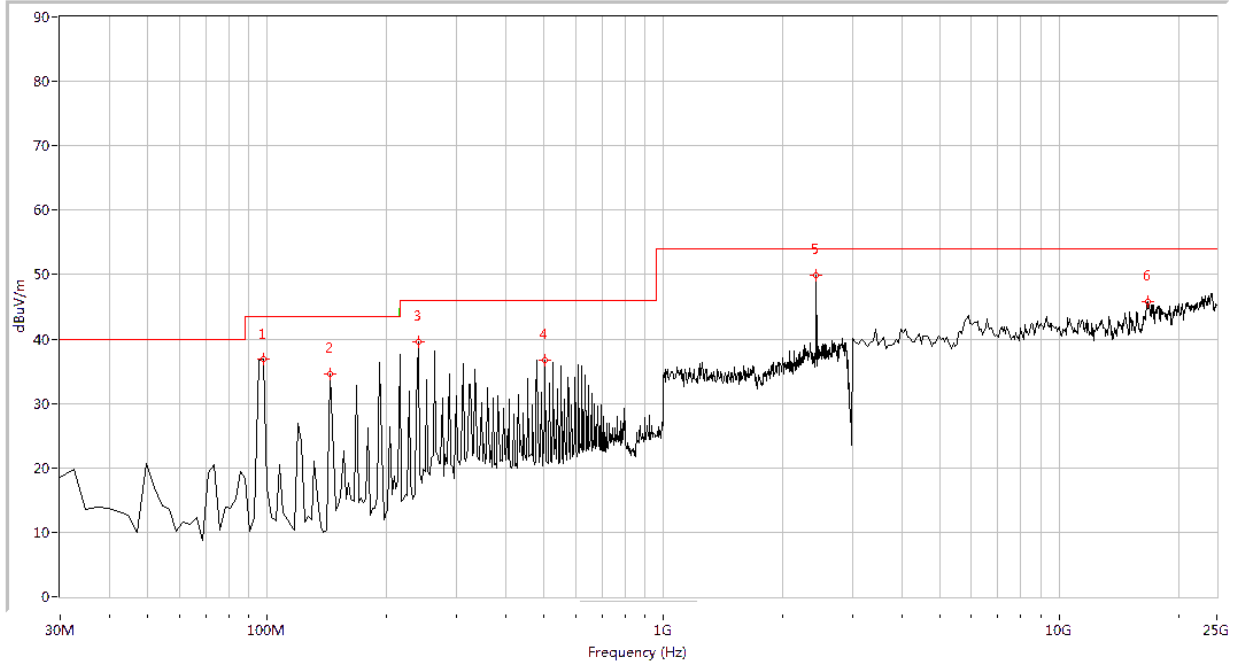


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	27.62	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
95.312	34.98	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	30.03	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
610.549	32.07	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2402.000	46.39	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
16660.848	46.00	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

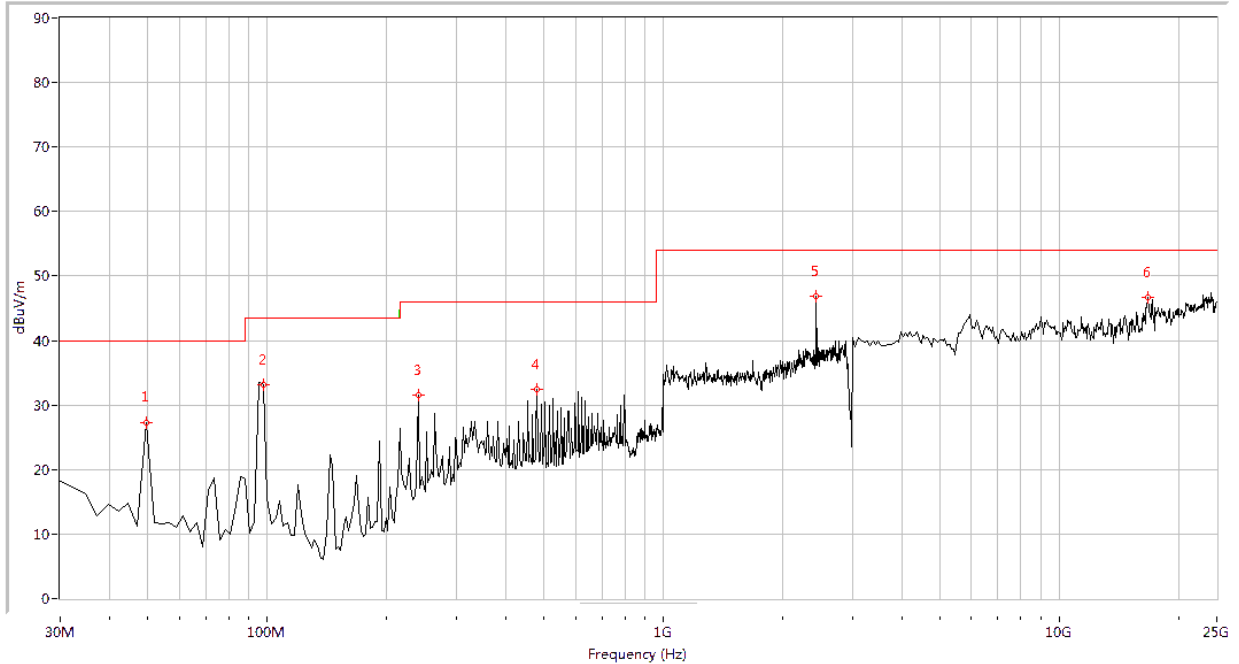


Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
97.731	36.83	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.66	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	39.54	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
504.115	36.79	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2441.000	49.88	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
16715.711	45.73	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

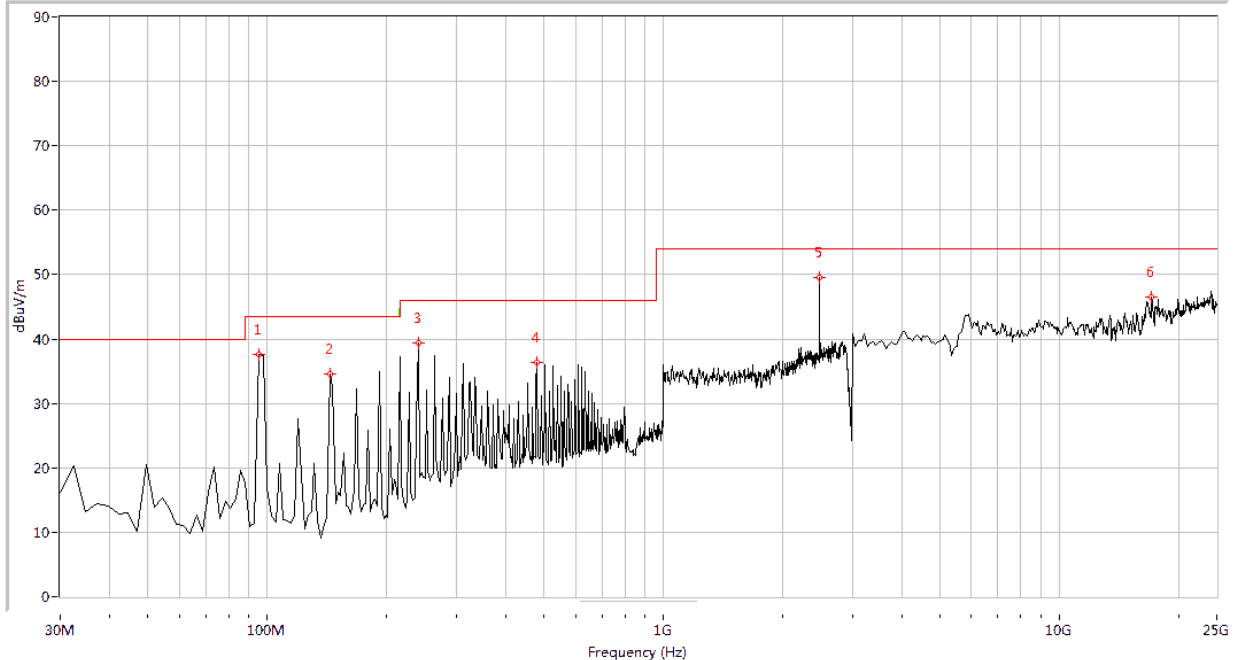


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	27.26	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	33.19	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	31.63	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	32.47	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2441.000	46.88	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
16770.574	46.70	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

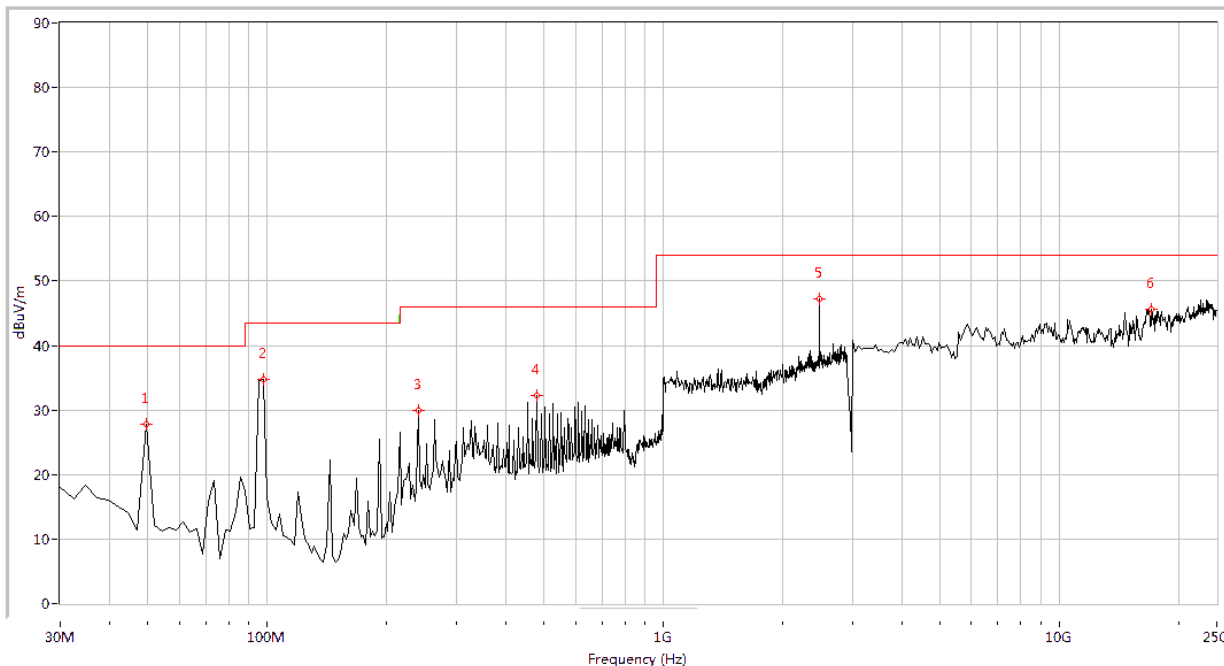


Plot for Channel = 78



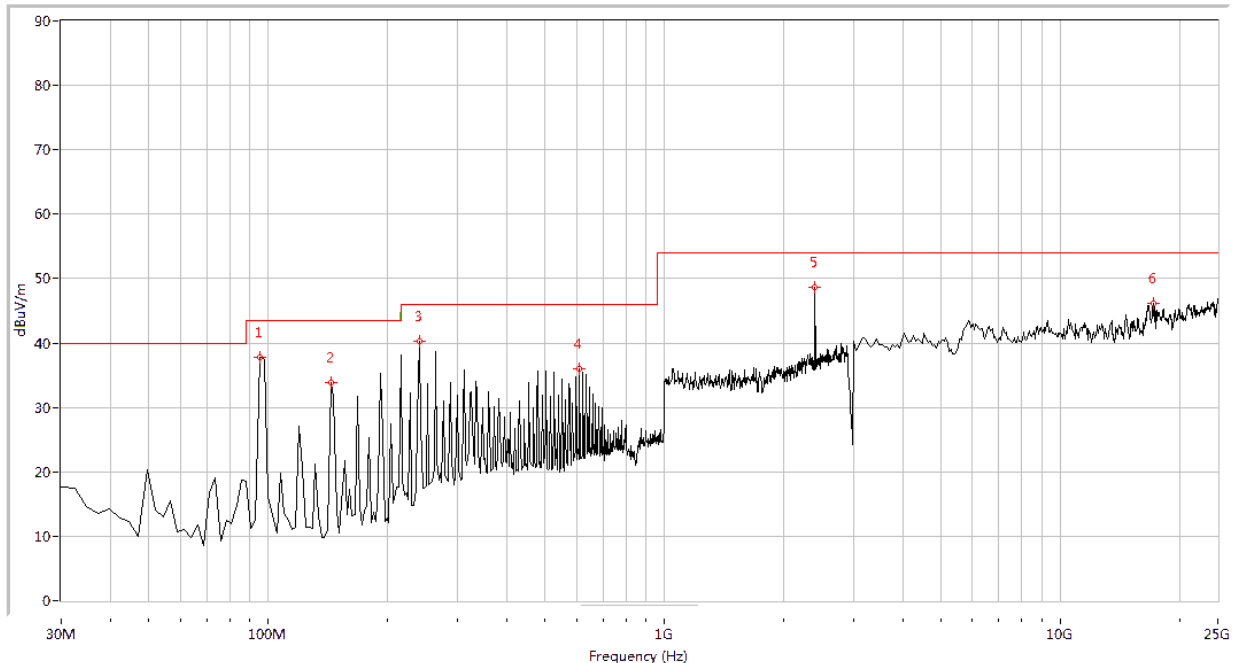
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
95.312	37.54	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.65	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	39.34	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	36.32	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2480.000	49.46	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
17099.751	46.50	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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



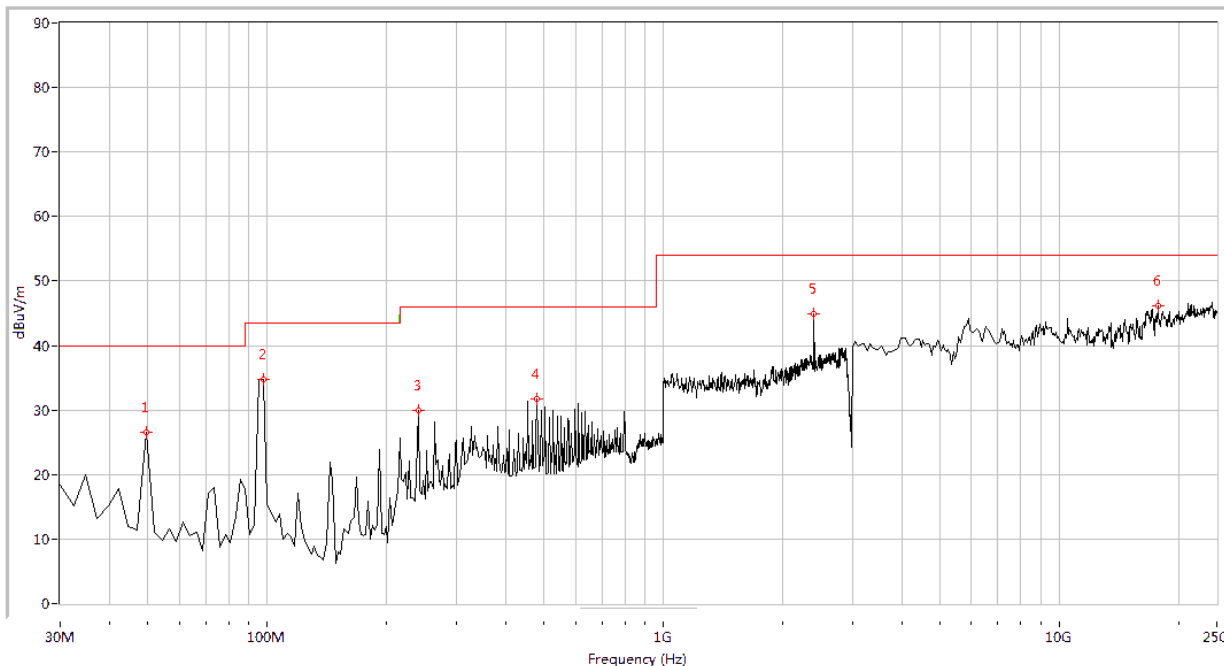
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	27.73	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	34.68	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	29.88	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	32.18	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2480.000	47.22	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
17099.751	45.56	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

**2.10.4.2. $\pi/4$ -DQPSK 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
95.312	37.81	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	33.92	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	40.20	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
610.549	36.02	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2402.000	48.71	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
17154.613	46.13	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

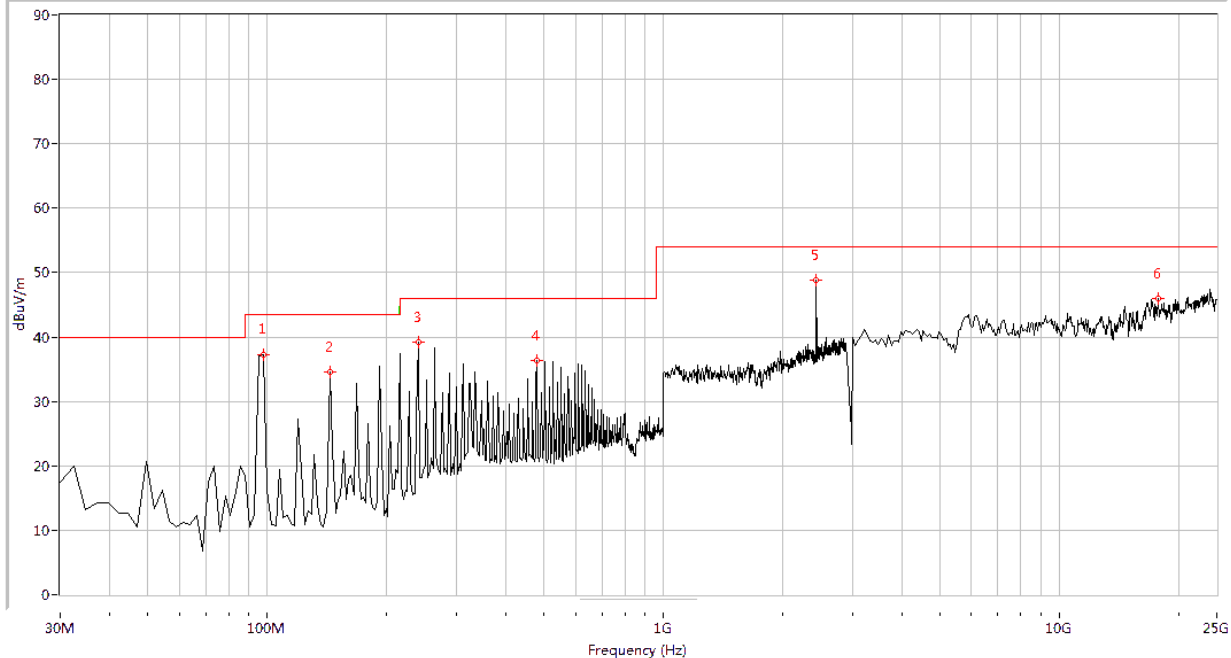


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	26.60	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	34.75	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	30.02	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	31.77	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2402.000	44.85	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
17758.105	46.15	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

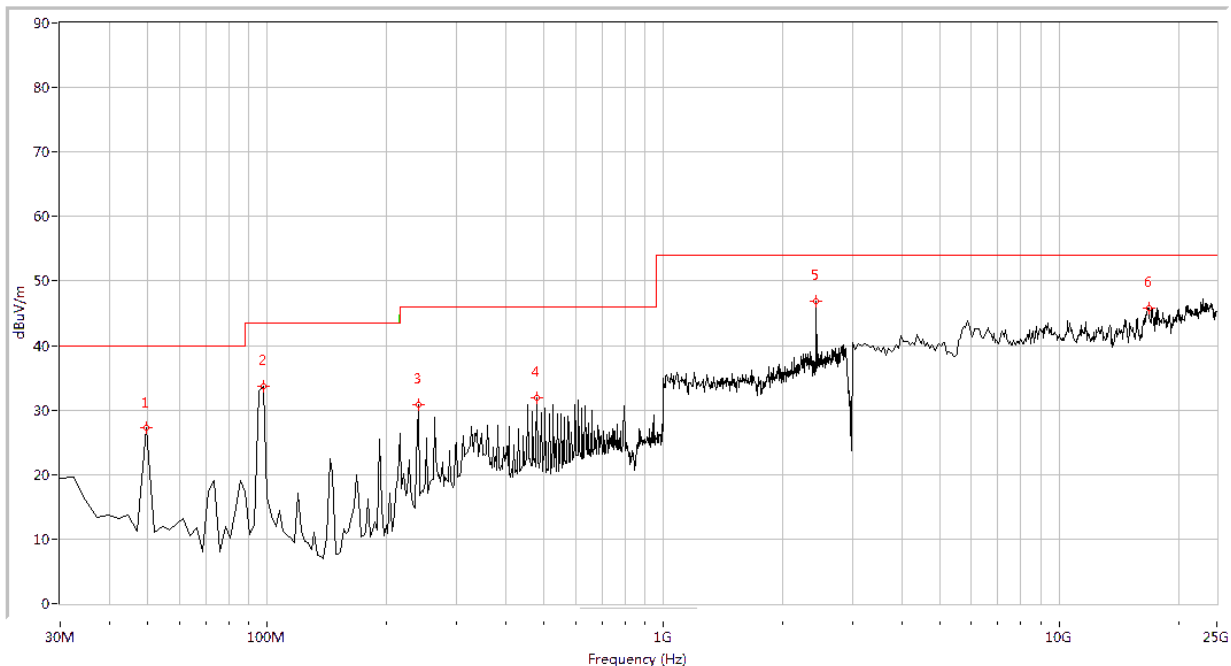


Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
97.731	37.16	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.66	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	39.24	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	36.30	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2441.000	48.79	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
17758.105	45.92	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

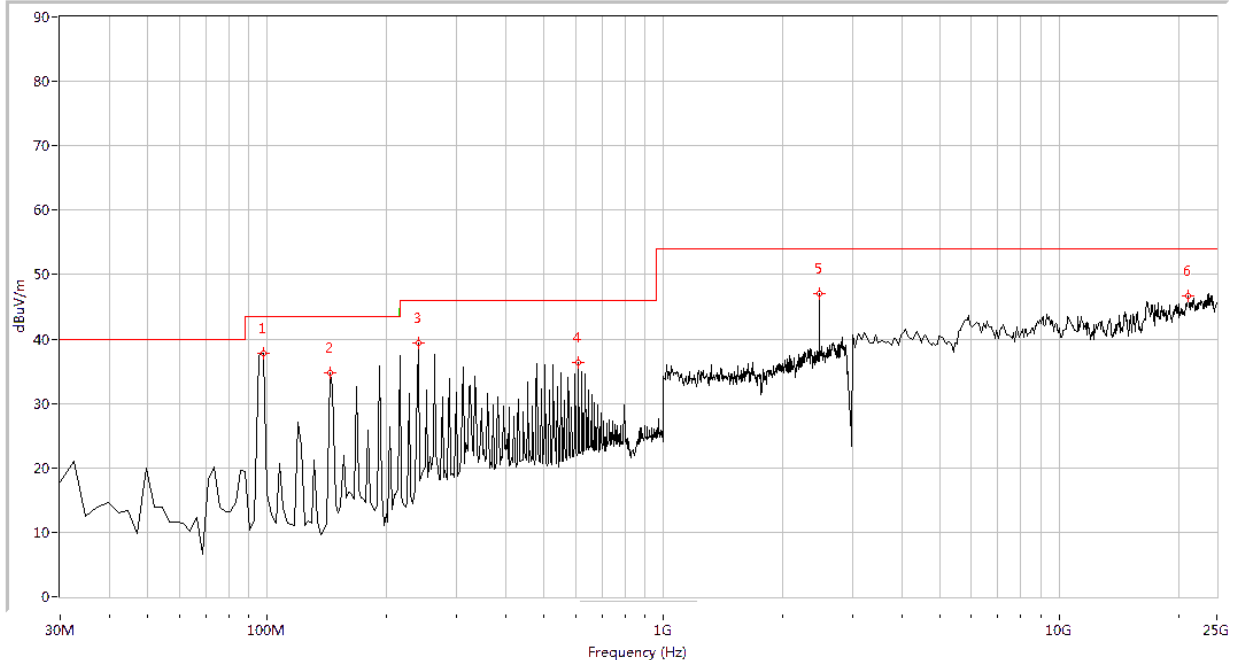


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	27.18	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	33.60	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	30.84	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	31.93	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2441.000	46.88	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
16825.436	45.82	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

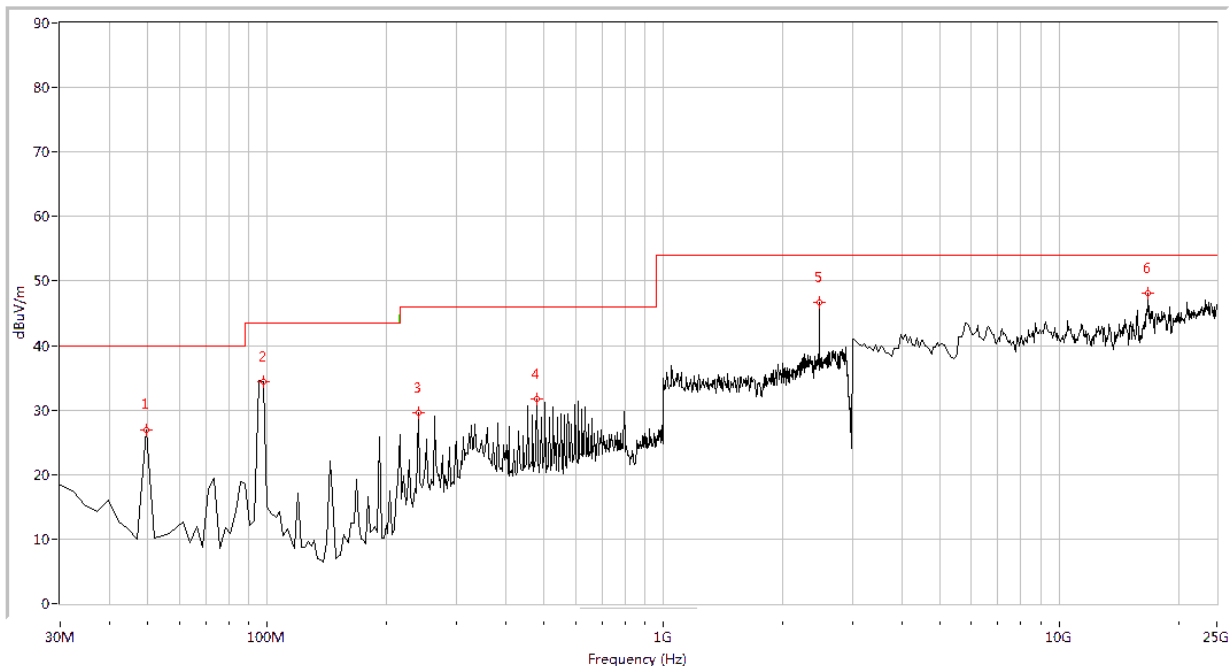


Plot for Channel = 78



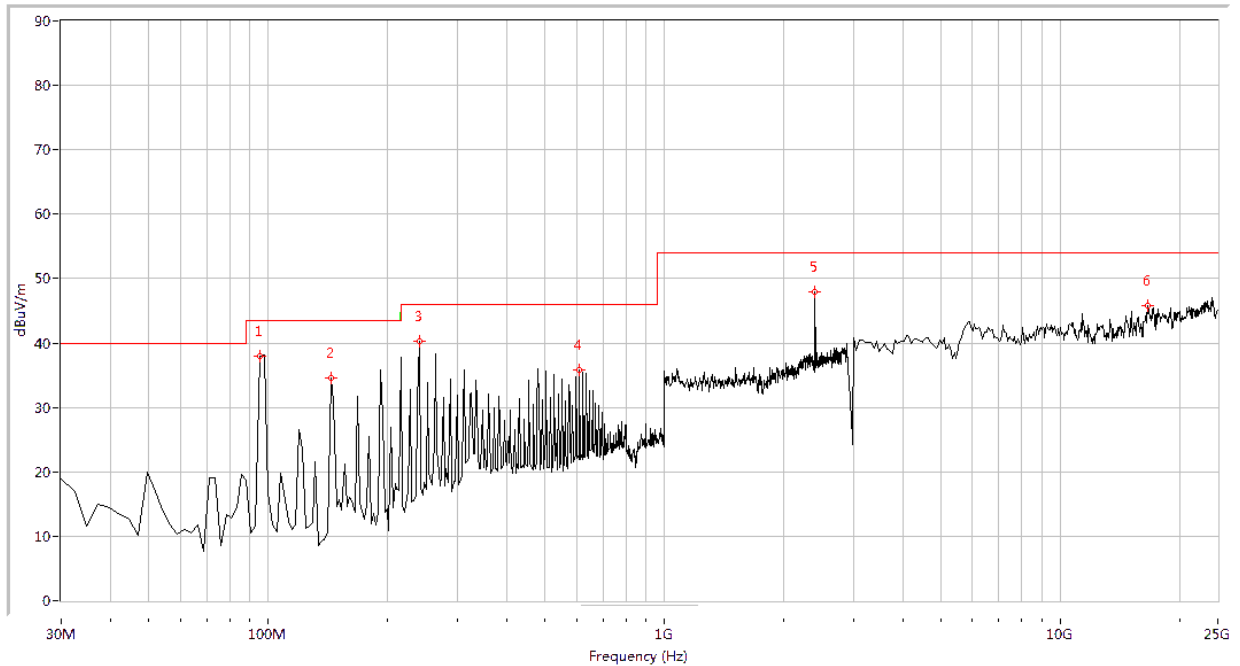
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
97.731	37.84	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.81	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	39.41	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
610.549	36.44	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2480.000	47.01	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
21214.464	46.68	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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



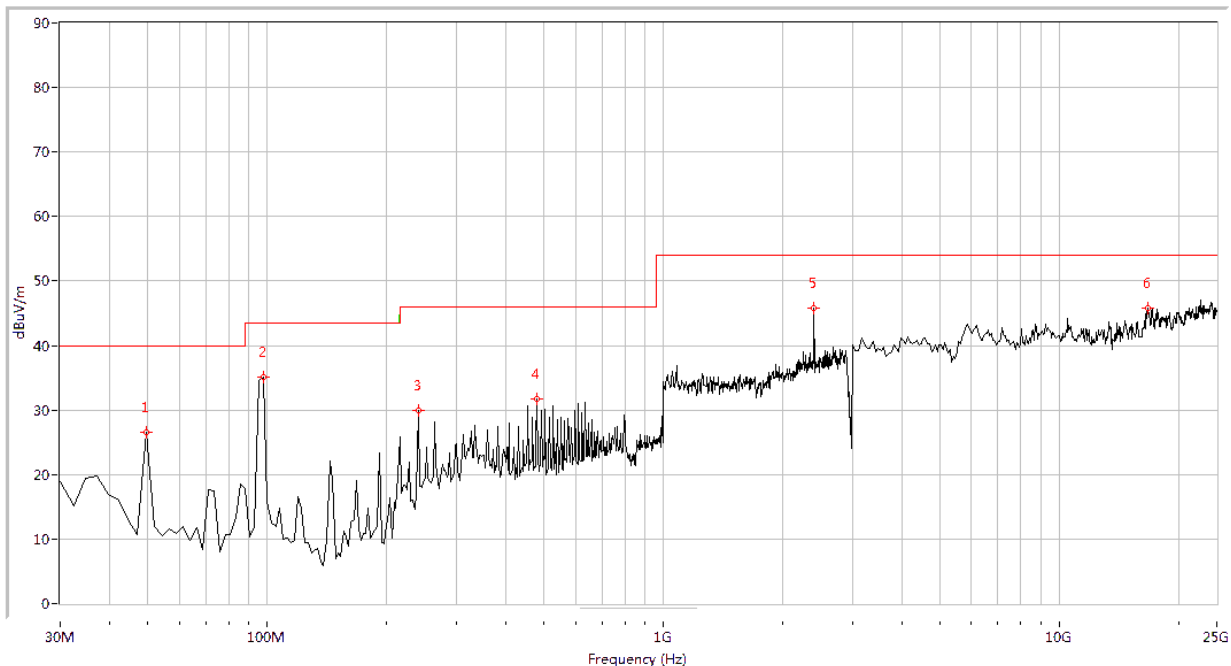
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	26.99	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	34.33	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	29.51	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	31.66	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2480.000	46.67	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
16770.574	48.04	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

**2.10.4.3. 8-DPSK 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
95.312	37.92	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.56	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	40.22	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
610.549	35.79	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2402.000	47.88	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
16605.985	45.76	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

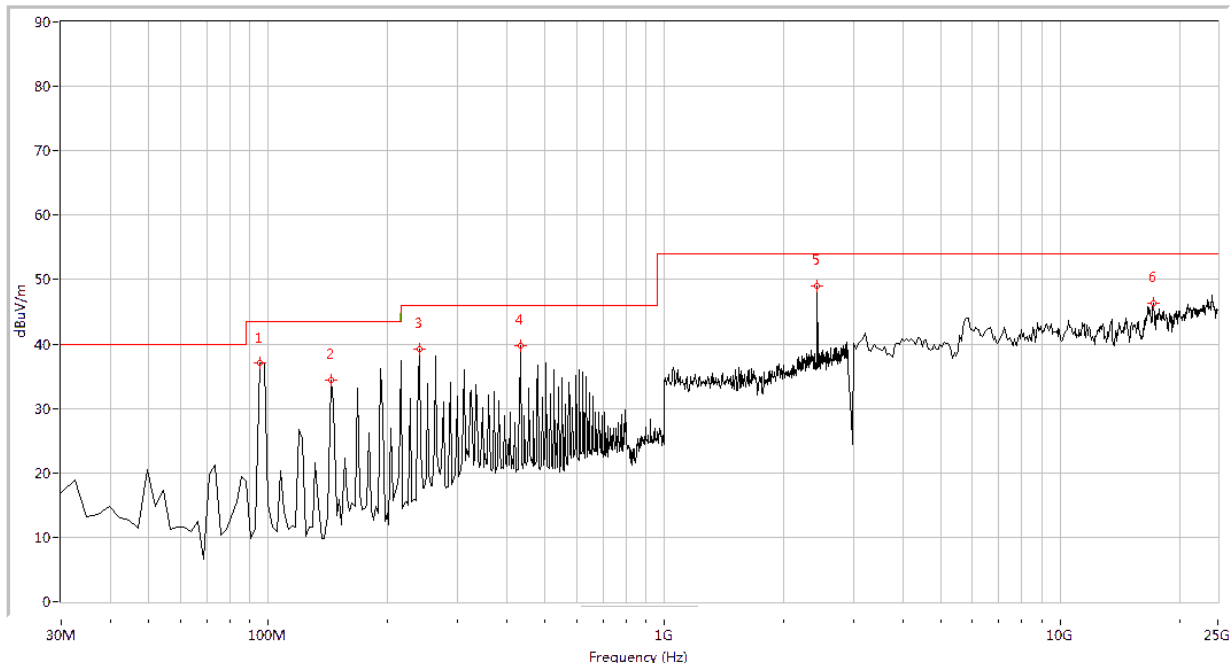


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	26.53	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	35.03	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	29.94	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	31.75	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2402.000	45.78	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
16715.711	45.74	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

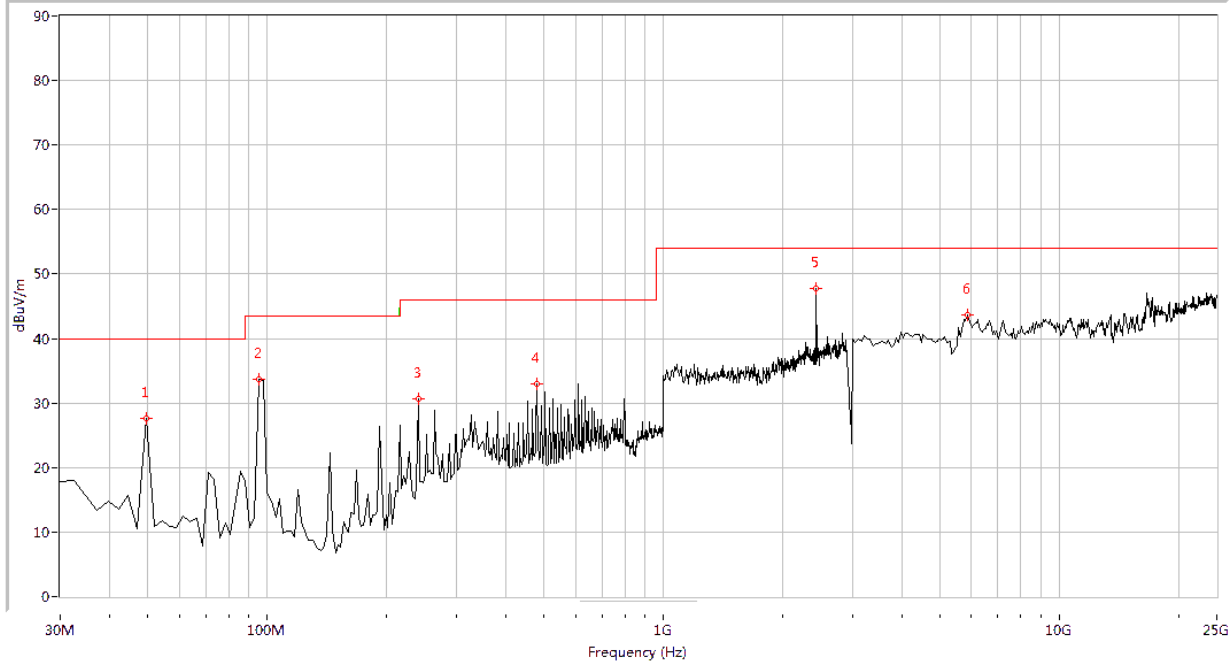


Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
95.312	37.10	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.37	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	39.24	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
433.965	39.69	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2441.000	48.96	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
17154.613	46.28	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

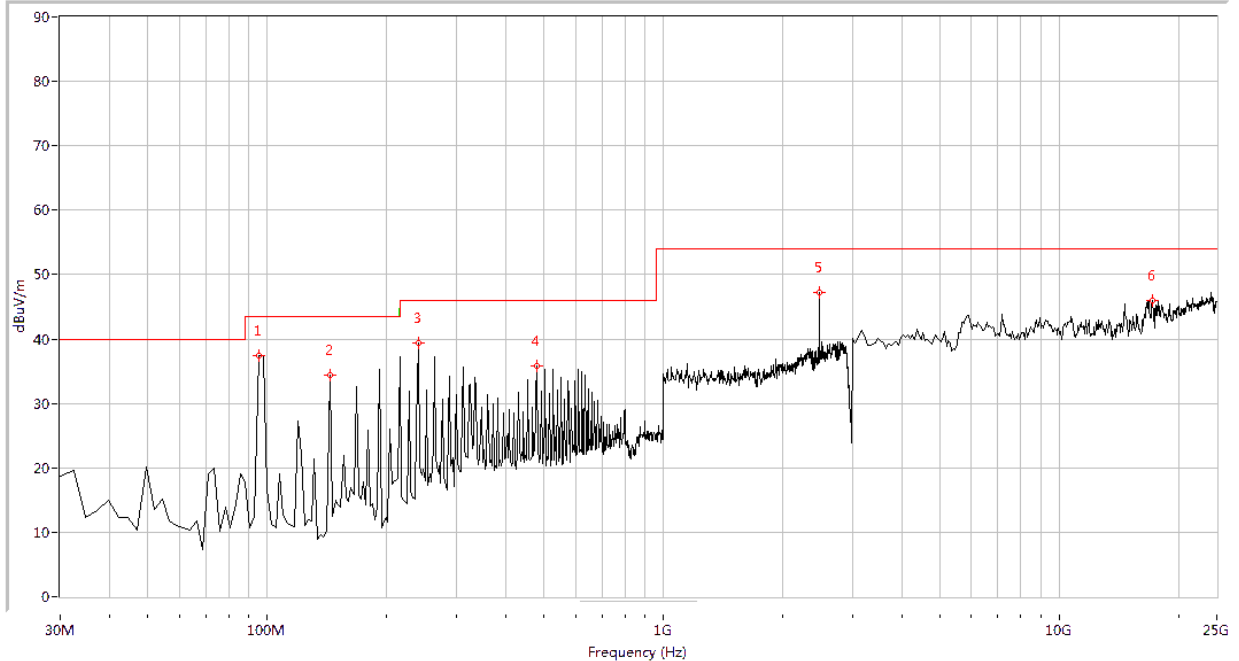


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.352	27.66	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
95.312	33.71	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	30.67	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	32.97	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2441.000	47.75	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
5852.868	43.62	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

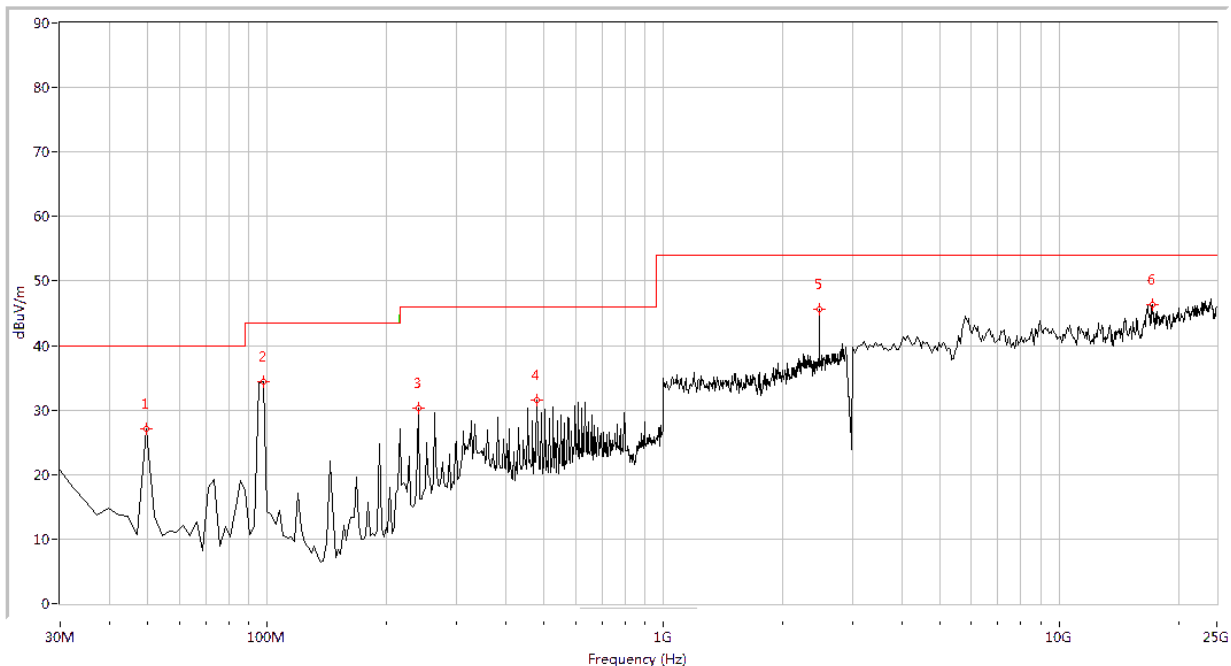


Plot for Channel = 78



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
95.312	37.34	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
143.691	34.31	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
240.449	39.42	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
479.925	35.84	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2480.000	47.14	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
17154.613	46.04	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
49.352	27.13	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
97.731	34.41	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
240.449	30.26	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
479.925	31.59	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2480.000	45.54	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
17209.476	46.25	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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



2.11. RF exposure evaluation

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4 \pi R^2}$$

Where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

2.1.1 Limits for Maximum Permissible Exposure

According to FCC Part 1.1307, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the commission's guidelines.

According to FCC Part 1.1310 RF exposure is calculated.

Limits for General Population/ Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength (H)(A/m)	Power Density (S)(mW/cm ²)
0.3-1.34	614	1.63	(100)*
1.34-30	824/f	2.19/f	(180/f2)*
30-300	27.5	0.073	0.2
300-1500			f/1500
1500-100,000			1.0



2.1.2 Test result

Maximum peak output power at antenna input terminal(dBm):	3.599
Maximum peak output power at antenna input terminal(mW):	2.29034
Source-based time-averaged output power:	--
Prediction distance(cm):	20
Predication frequency(MHz):	2480
Antenna Gain (typical) (dBi):	-4.4
Power density at predication frequency at <u>20</u> cm(mW/cm ²):	0.000165
MPE limit for RF exposure at prediction frequency(mW/cm ²):	1.0

2.1.3 Conclusion

Since the test result is passed, the SAR measurement is not required.



3. 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

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 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

The IC registration number is 7183A-2.



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1.4 Test Equipments Utilized

1.4.1 Conducted Test Equipments

Conducted Test Equipment						
No.	Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
1	System Simulator	6K00006210	MT8852B	Anritsu	2015.02.26	2016.02.25
2	Spectrum Analyzer	MY45101810	E4407B	Agilent	2015.02.26	2016.02.25
3	Power Splitter	NW521	1506A	Weinschel	2015.02.26	2016.02.25
4	Attenuator 1	(n.a.)	10dB	Resnet	2015.02.26	2016.02.25
5	Attenuator 2	(n.a.)	3dB	Resnet	2015.02.26	2016.02.25
6	EXA Signal Analyzer	MY51440152	N9010A	Agilent	2015.02.26	2016.02.25
7	RF cable	CB01	RF01	Morlab	N/A	N/A
8	Coaxial cable	CB02	RF02	Morlab	N/A	N/A
9	SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.4.2 Conducted Emission Test Equipments

Conducted Emission Test Equipments						
No.	Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
1	Receiver	US44210471	E7405A	Agilent	2015.02.26	2016.02.25
2	LISN	812744	NSLK 8127	Schwarzbeck	2015.02.26	2016.02.25
3	Service Supplier	100448	CMU200	R&S	2015.02.26	2016.02.25
4	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2015.02.26	2016.02.25
5	Coaxial cable(BNC)	CB01	EMC01	Morlab	N/A	N/A



1.4.3 Radiated Test Equipments

Radiated Test Equipments						
No.	Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal.Due Date
1	System Simulator	100448	CMU200	R&S	2015.02.26	2016.02.25
2	Receiver	US44210471	E7405A	Agilent	2015.02.26	2016.02.25
3	Test Antenna - Bi-Log	9163-274	9m*6m*6m	Albatross	2015.02.26	2016.02.25
4	Test Antenna - Horn	9120D-963	VULB 9163	Schwarzbeck	2015.02.26	2016.02.25
5	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2015.02.26	2016.02.25
6	Test Antenna - Loop	1519-022	HL050S7	R&S	2015.02.26	2016.02.25
7	Reject Filter	(n.a.)	BRM50702	Micro-Tronics	2015.02.26	2016.02.25
8	Coaxial cable (N male)	CB02	EMC02	Morlab	N/A	N/A
9	Coaxial cable (N male)	CB03	EMC03	Morlab	N/A	N/A

1.4.4 Climate Chamber

Climate Chamber						
No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	Climate Chamber	2004012	HL4003T	Yinhe	2015.02.26	2016.02.25

1.4.5 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	2015.02.26	2016.02.25



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1.4.6 Anechoic Chamber

Anechoic Chamber						
No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	Anechoic Chamber	N/A	9m*6m*6m	Albatross	2015.02.26	2016.02.25

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