



REPORT No.: SZ15080164W02

FCC RF TEST REPORT

APPLICANT : Solnik S.A.
PRODUCT NAME : TBW9613A8
MODEL NAME : HY2-3169BL
TRADE NAME : N.A
BRAND NAME : HYUNDAI
FCC ID : 2AFRUKY23169NE
STANDARD(S) : 47 CFR Part 15 Subpart C
ISSUE DATE : 2015-10-12



SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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Change History		
Issue	Date	Reason for change
1.0	2015-10-12	First edition



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TEST REPORT DECLARATION

Applicant	Solnik S.A.
Applicant Address	Dr Emilio Ravignani 1724 - C.A.B.A. - República Argentina
Manufacturer	Beijing Benywave Wireless Communication Co. Ltd.,
Manufacturer Address	No 55, Jiachuang second road, Zhongguancun science Park OPTO—Mechatronics Industrial Park, Tongzhou District, Beijing, China 101111
Product Name	TBW9613A8
Model Name	HY2-3169BL
Brand Name	HYUNDAI
HW Version	TBW9613_P2.2_001
SW Version	961315_9783_VXXXX
Test Standards	47 CFR Part 15 Subpart C
Test Date	2015-8-20 to 2015-9-20
Test Result	PASS

Tested by : Zou Jian
Zou Jian(Test Engineer)

Reviewed by : Qiu Xiaojun
Qiu Xiaojun(RF Manager)

Approved by : Zeng Dexin
Zeng Dexin(Chief Engineer)



1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	Solnik S.A.
Address:	Dr Emilio Ravignani 1724 - C.A.B.A. - República Argentina

1.2 Equipment under Test (EUT) Description

Brand Name:	HYUNDAI
Trade Name:	N.A
Model Name:	HY2-3169BL
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:	2.1+EDR
Antenna Type:	PIFAAntenna
Antenna Gain:	1.55dbi

NOTE:

The EUT is a TBW9613A8, it contains Bluetooth Module operating 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.

1.2.1 Identification of all used EUTs

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

EUT Identity	Hardware Version	Software Version
A01	TBW9613_P2.2_001	961315_9783_VXXXX



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 (10-1-13 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	<u>PASS</u>
2	15.247(a)	Number of Hopping Frequency	Sep 01, 2015	<u>PASS</u>
3	15.247(b)	Peak Output Power	Sep 01, 2015	<u>PASS</u>
4	15.247(a)	20dB Bandwidth	Aug 31, 2015	<u>PASS</u>
5	15.247(a)	Carrier Frequency Separation	Sep 01, 2015	<u>PASS</u>
6	15.247(a)	Time of Occupancy (Dwell time)	Sep 01, 2015	<u>PASS</u>
7	15.247(d)	Conducted Spurious Emission	Aug31,2015& Sep 01, 2015	<u>PASS</u>
8	15.247(d)	Restricted Frequency Bands	Sep 16, 2015	<u>PASS</u>
9	15.207	Conducted Emission	Sep 07, 2015	<u>PASS</u>
10	15.209 15.247(d)	Radiated Emission	Sep 10,2015	<u>PASS</u>
11	15.247(i),1.1307& 2.1093	RF exposure evaluation	NA	<u>PASS</u>

NOTE: The tests were performed according to the method of measurements prescribed in DA-00-705, ANSI C63.4-2009 and ANSI C63.10-2013.

1.3.1 Test Environment Conditions

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

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

2. 47 CFR PART 15C REQUIREMENTS

2.1 Antenna requirement

2.1.1 Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2 Result: Compliant

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

2.2 Number of Hopping Frequency

2.2.1 Requirement

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

2.2.2 Test Description

A. Test Setup:



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

B. Equipments List:

Please reference ANNEX A(1.4).



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

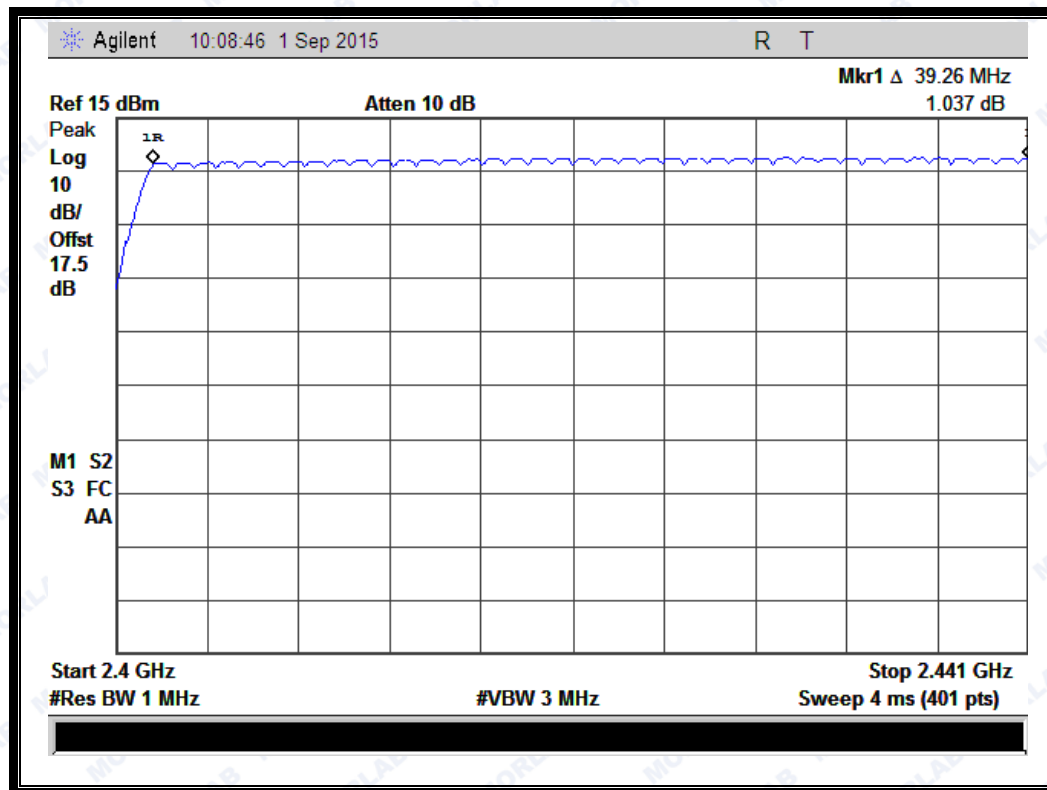
2.2.4 Test Result

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.

A. Test Verdict:

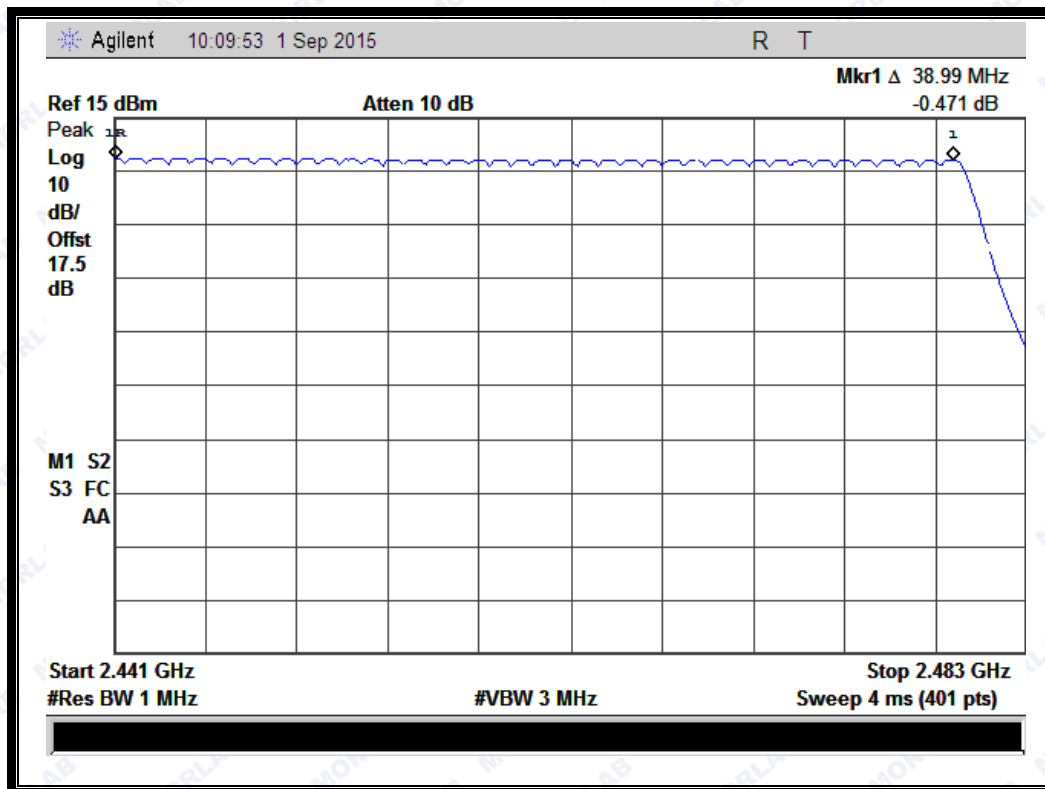
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
$\pi/4$ -DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

B. Test Plots:

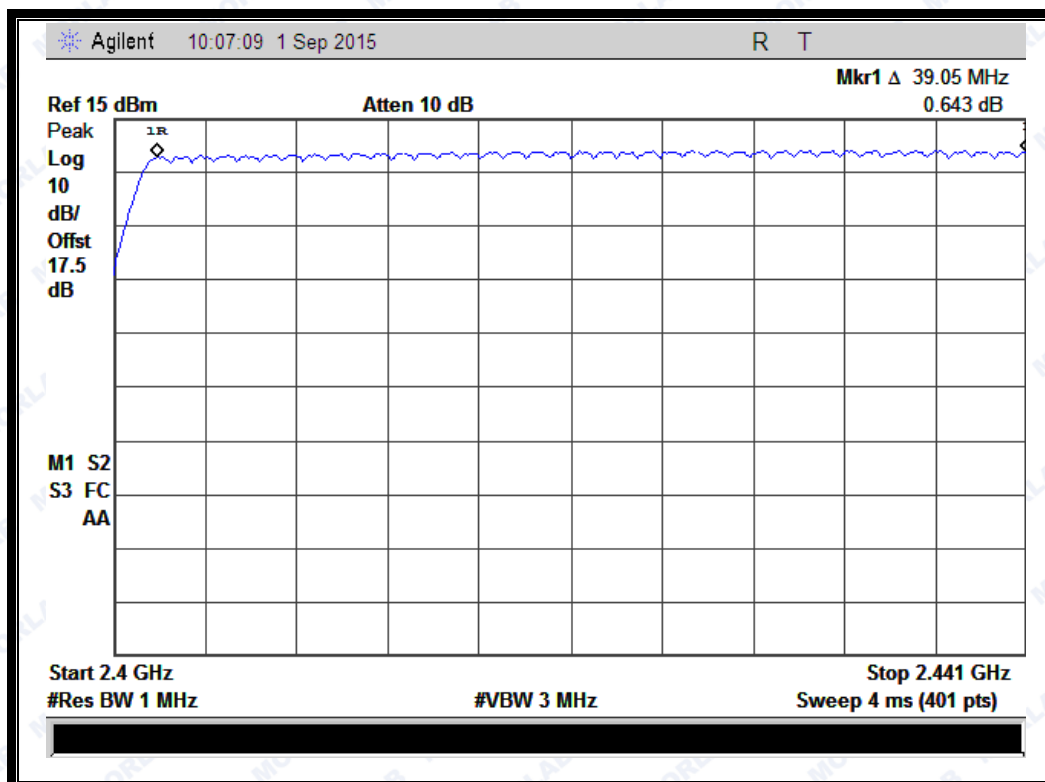




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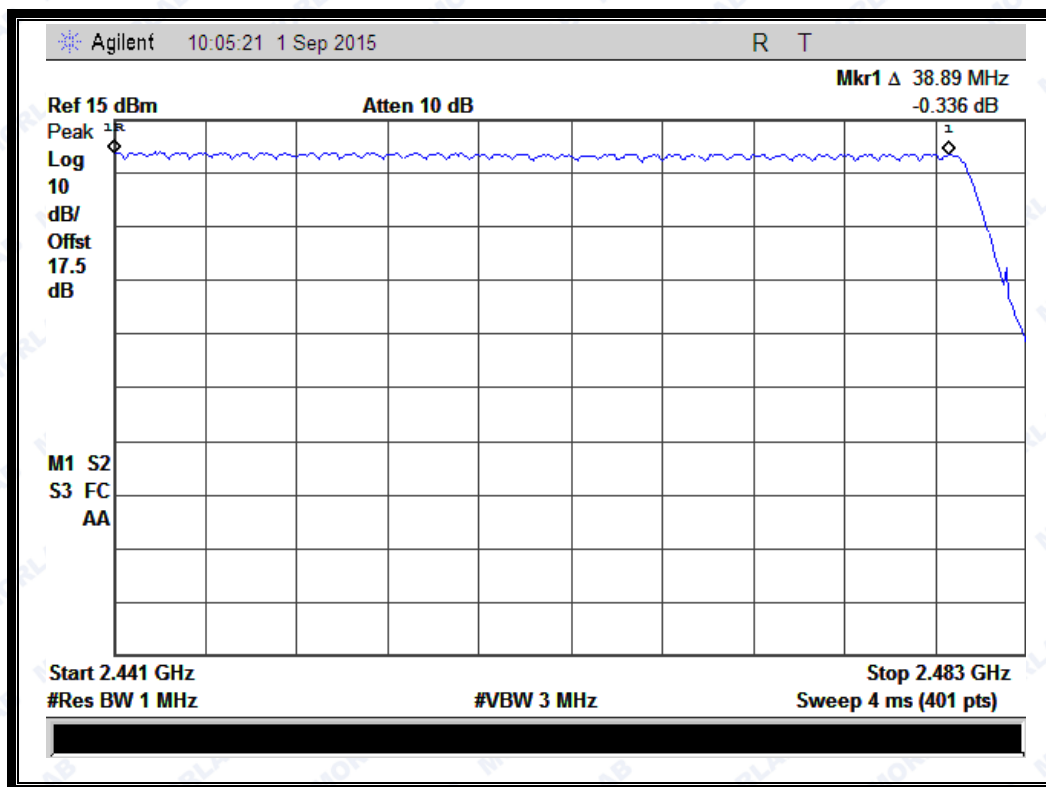


(Plot A: GFSK)





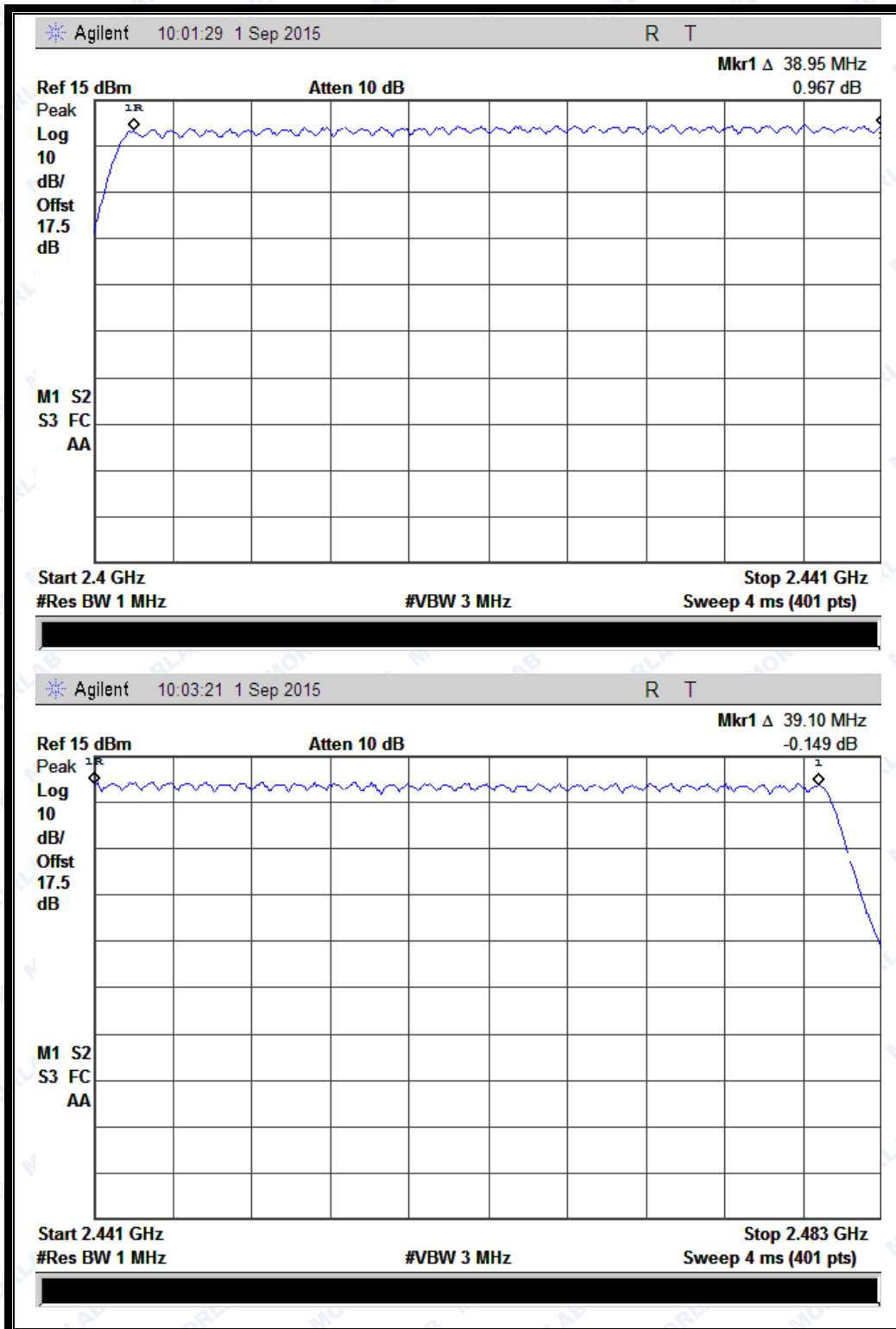
REPORT No.: SZ15080164W02



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



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(Plot C: 8- DPSK)

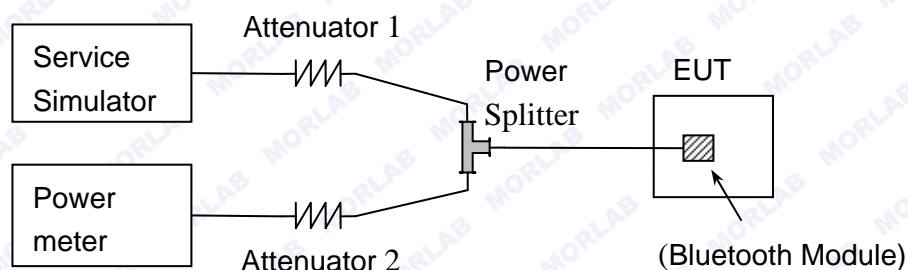
2.3 Peak Output Power

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	6.588	0.00456	20.97	0.125	PASS
39	2441	7.900	0.00617			PASS
78	2480	6.398	0.00436			PASS

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

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	7.722	0.00592	20.97	0.125	PASS
39	2441	9.145	0.00821			PASS
78	2480	8.313	0.00678			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	8.281	0.00673	20.97	0.125	PASS
39	2441	9.747	0.00943			PASS
78	2480	8.323	0.00680			PASS

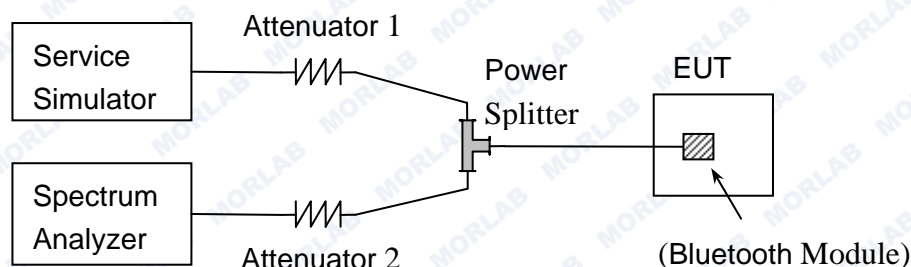
2.4 20dB Bandwidth

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.



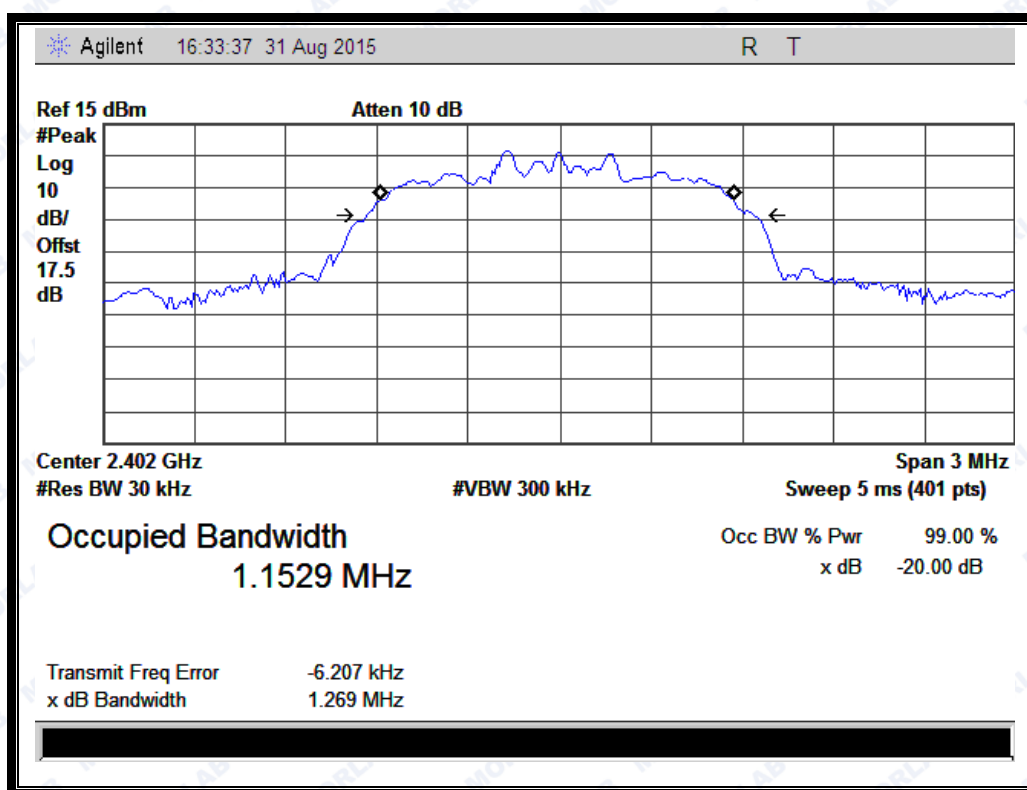
2.4.4.1 GFSK Mode

A. Test Verdict:

The maximum 20dB bandwidth measured is 1.274MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.269	Plot A
39	2441	1.271	Plot B
78	2480	1.274	Plot C

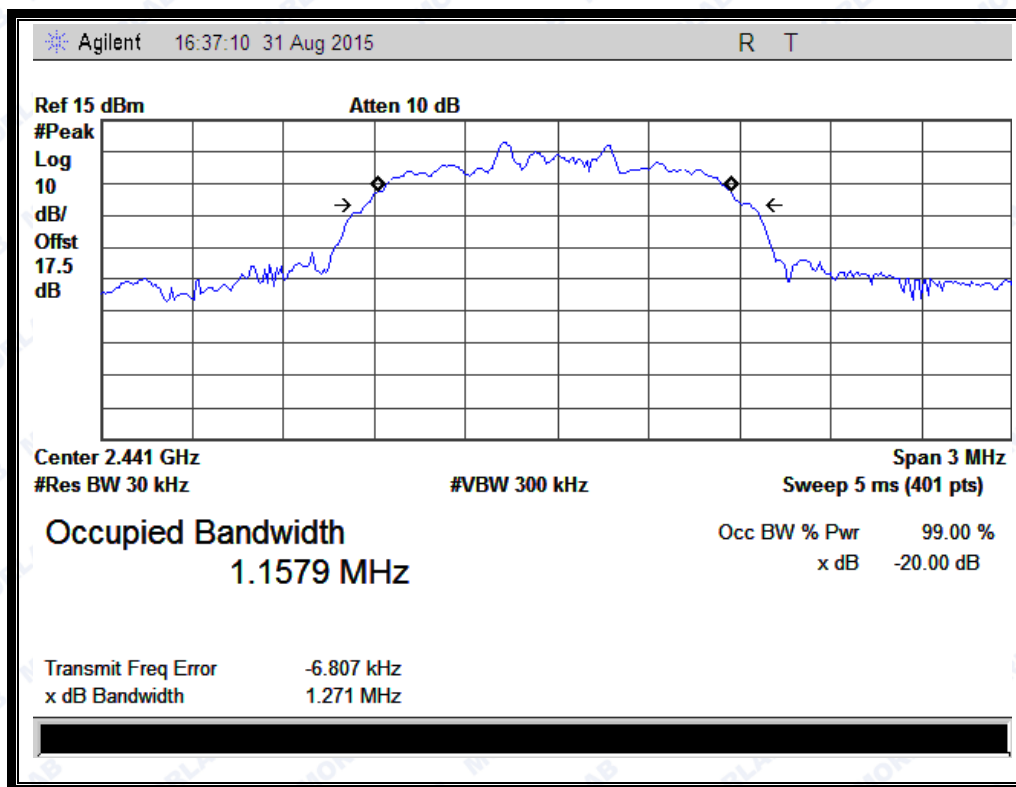
B. Test Plots:



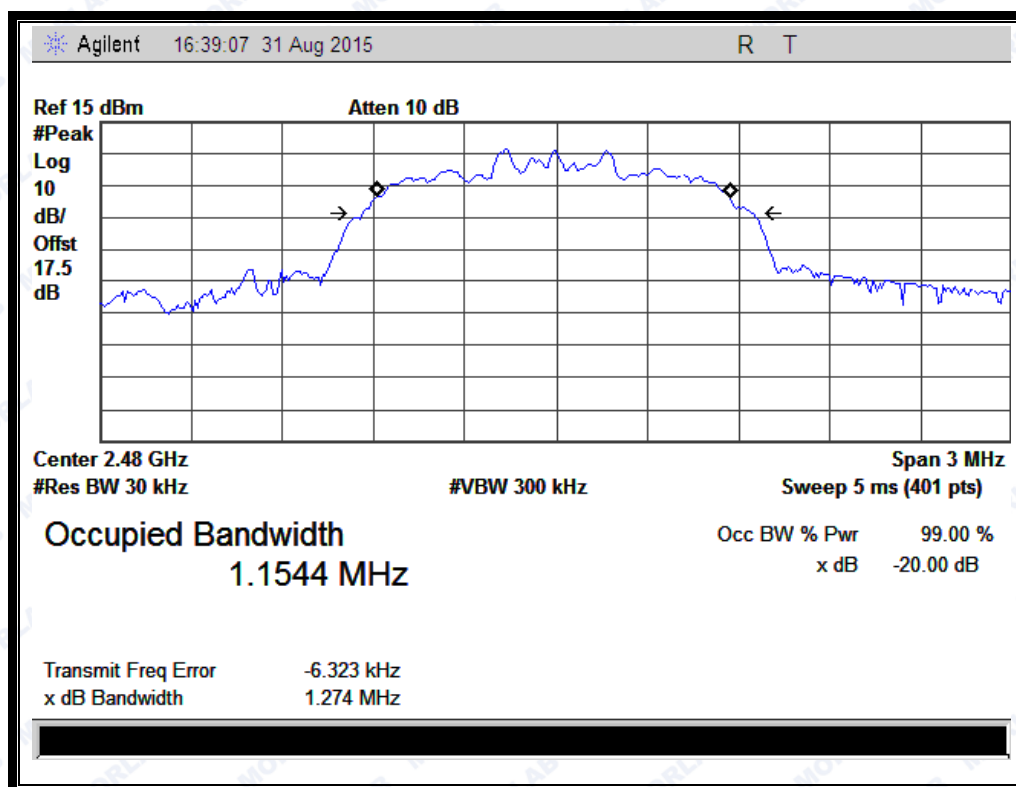
(Plot A: Channel = 2402 @ GFSK)



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(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)



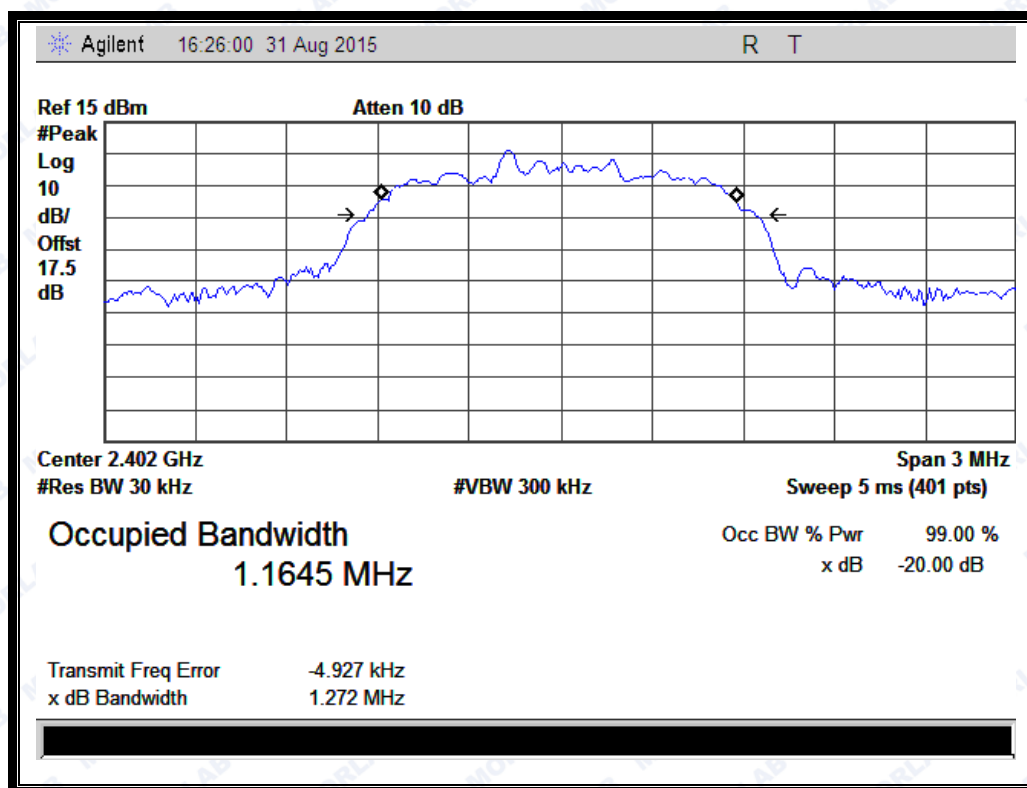
2.4.4.2 $\pi/4$ -DQPSK Mode

A. Test Verdict:

The maximum 20dB bandwidth measured is 1.272MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.272	Plot D
39	2441	1.268	Plot E
78	2480	1.268	Plot F

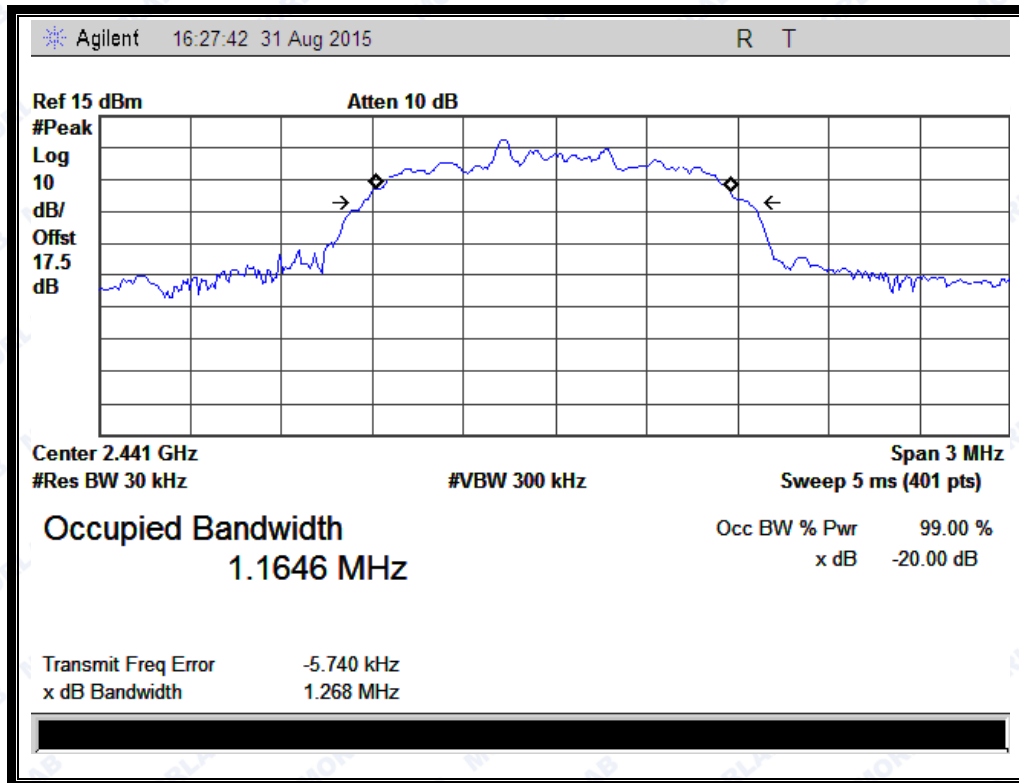
B. Test Plots:



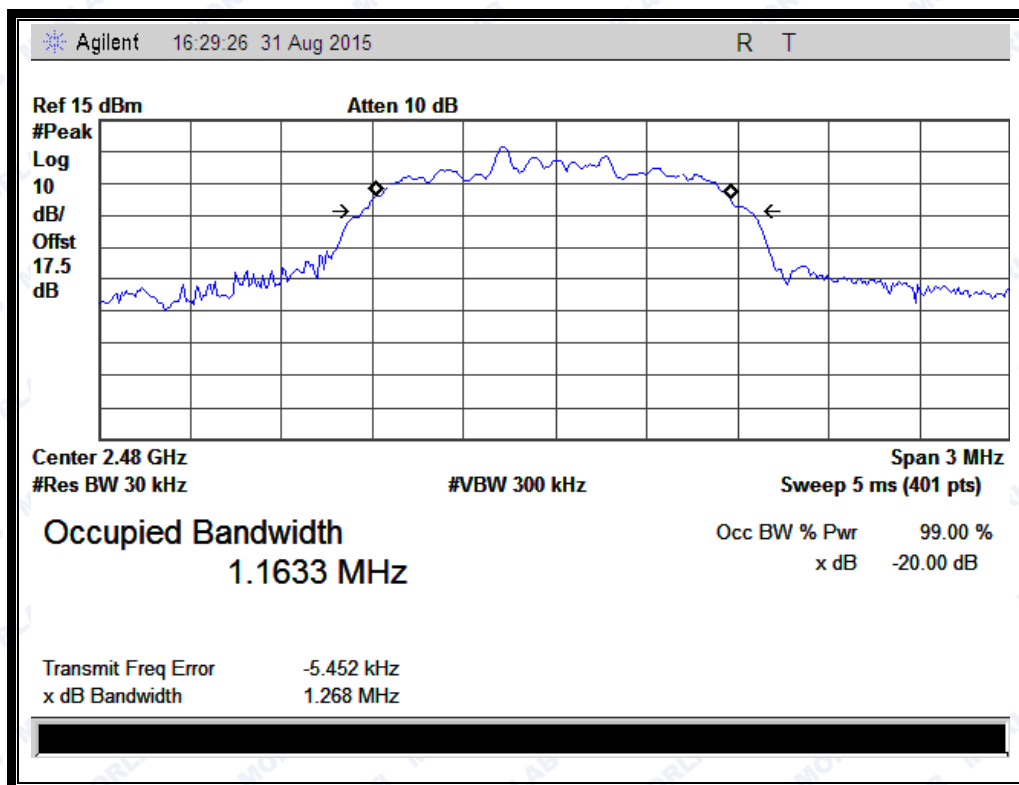
(Plot D: Channel = 2402 @ $\pi/4$ -DQPSK)



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



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



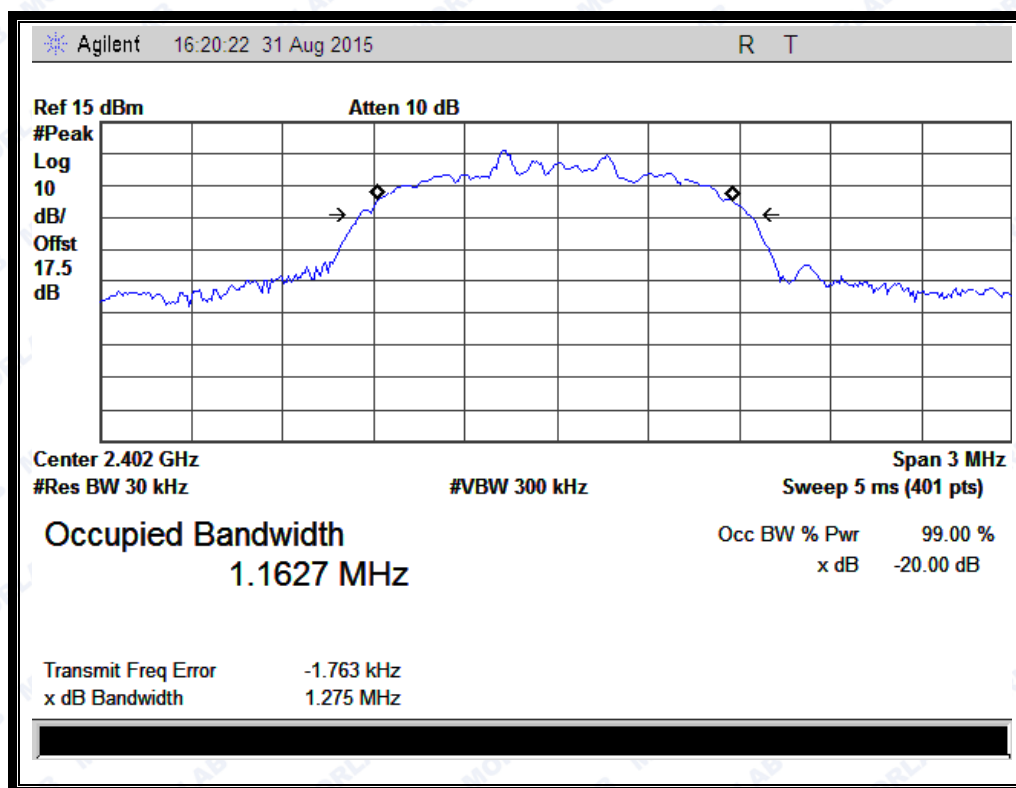
2.4.4.3 8-DPSK Mode

A. Test Verdict:

The maximum 20dB bandwidth measured is 1.279MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.275	Plot G
39	2441	1.277	Plot H
78	2480	1.279	Plot I

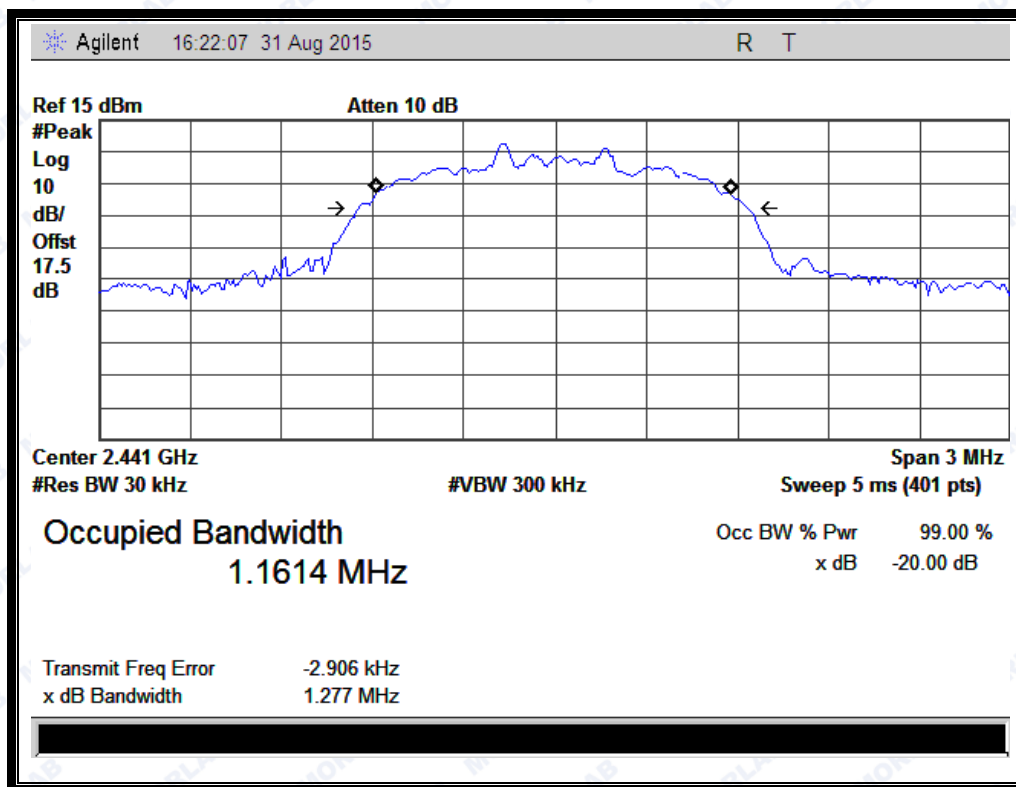
B. Test Plots:



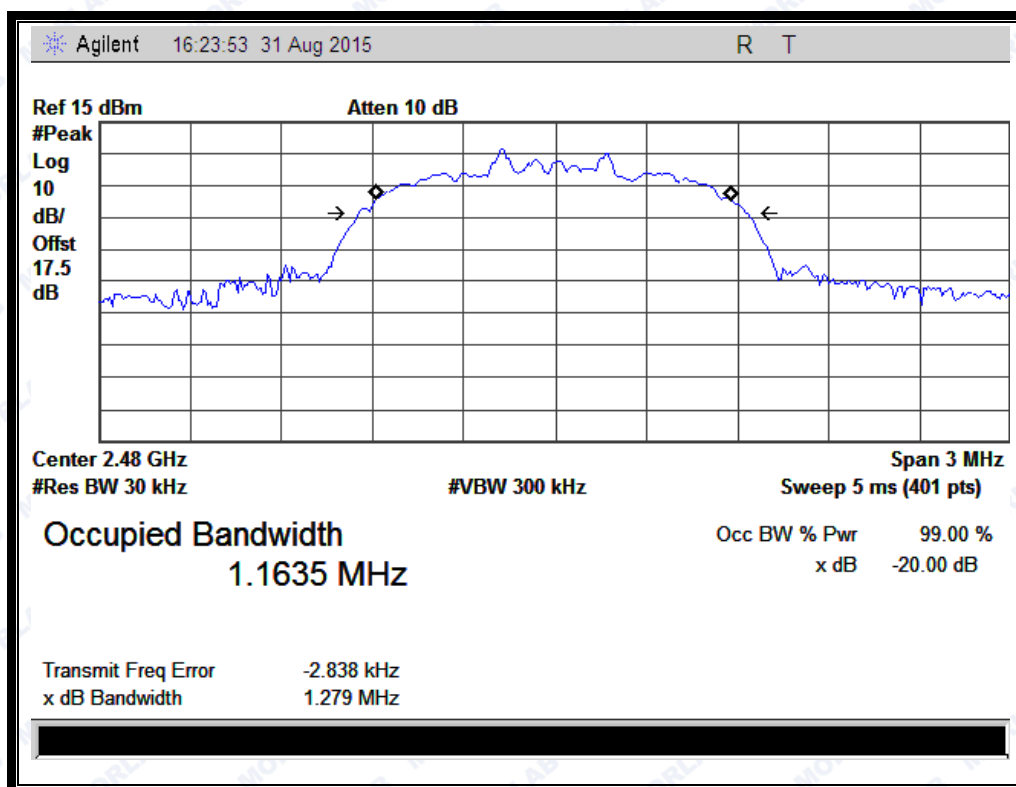
(Plot G: Channel = 2402 @ 8-DPSK)



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



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

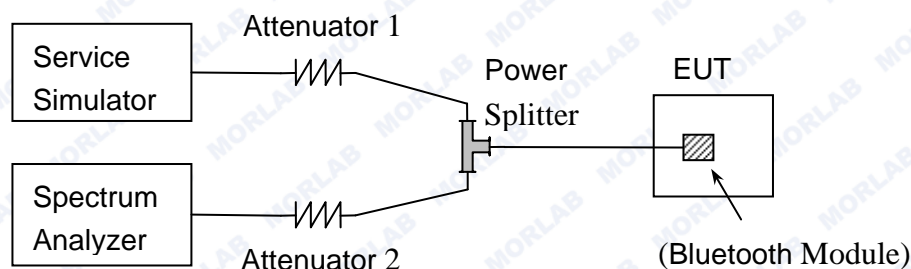
2.5 Carried Frequency Separation

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

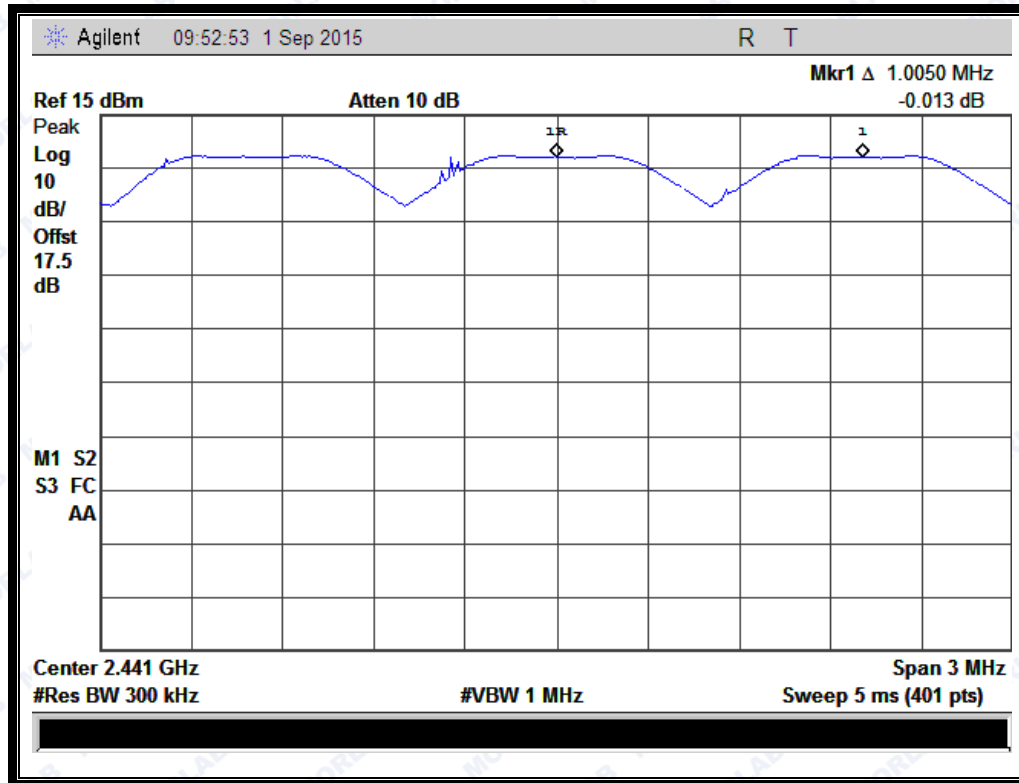
Trace = max hold

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

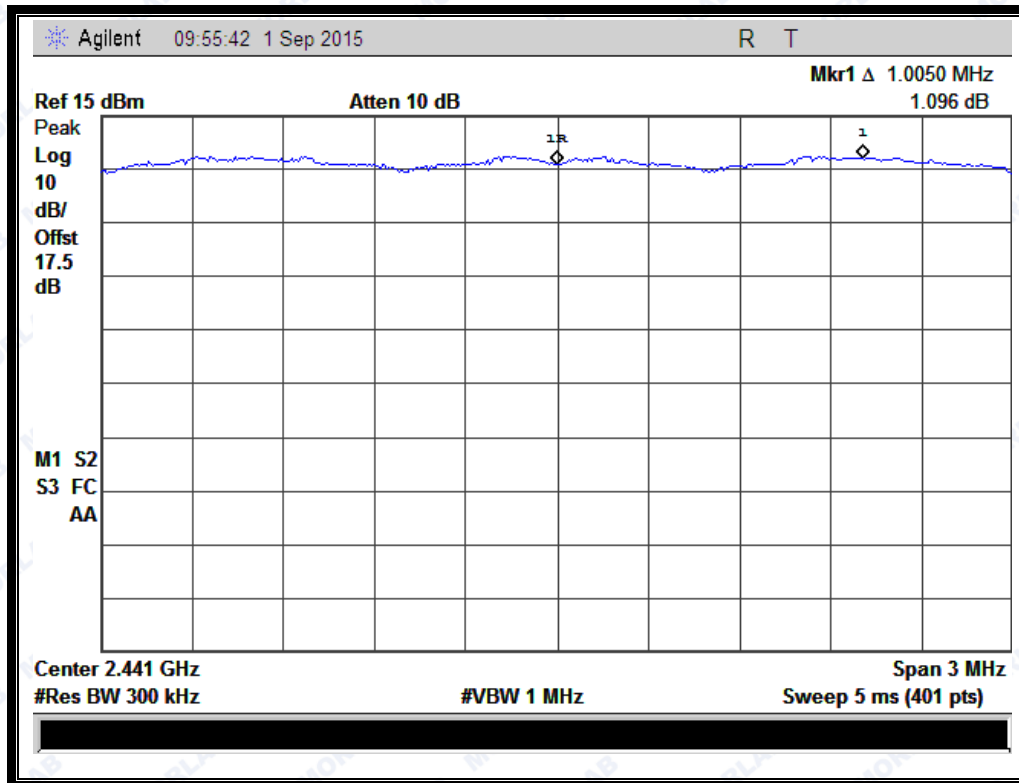
The Bluetooth Module operates at hopping-on test mode. For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section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



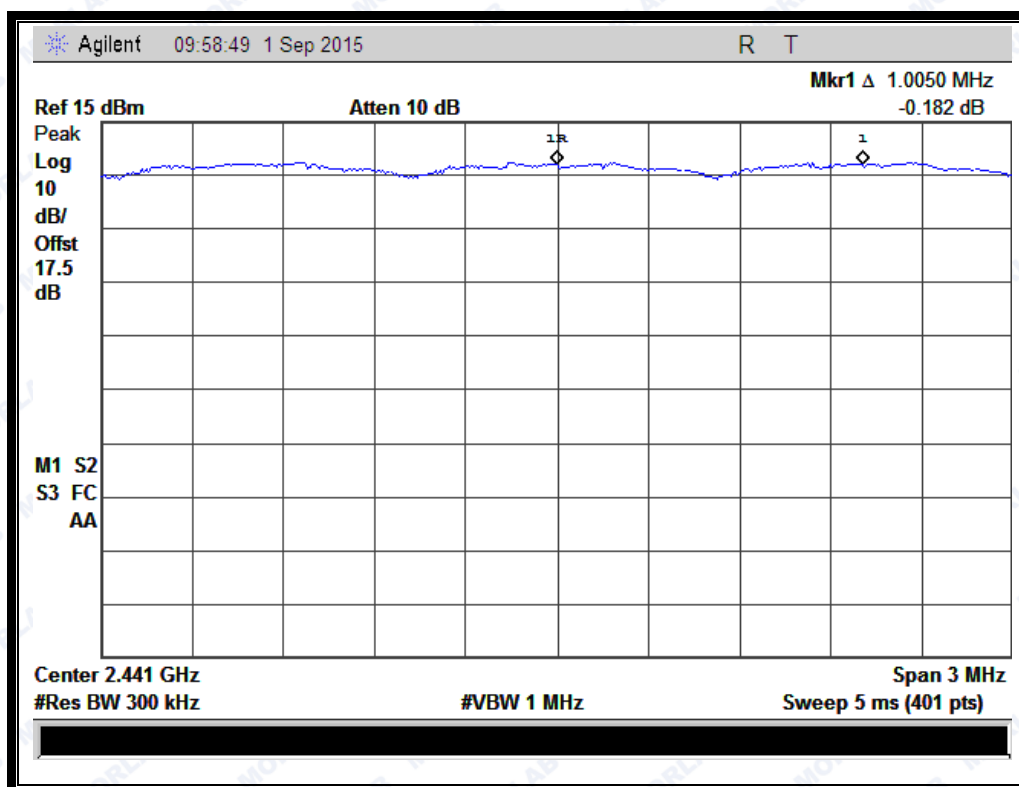
(Plot A: GFSK)



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



(Plot C: 8-DPSK)

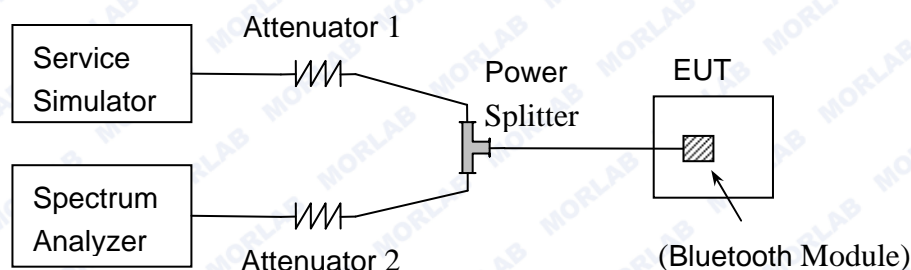
2.6 Time of Occupancy (Dwell time)

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



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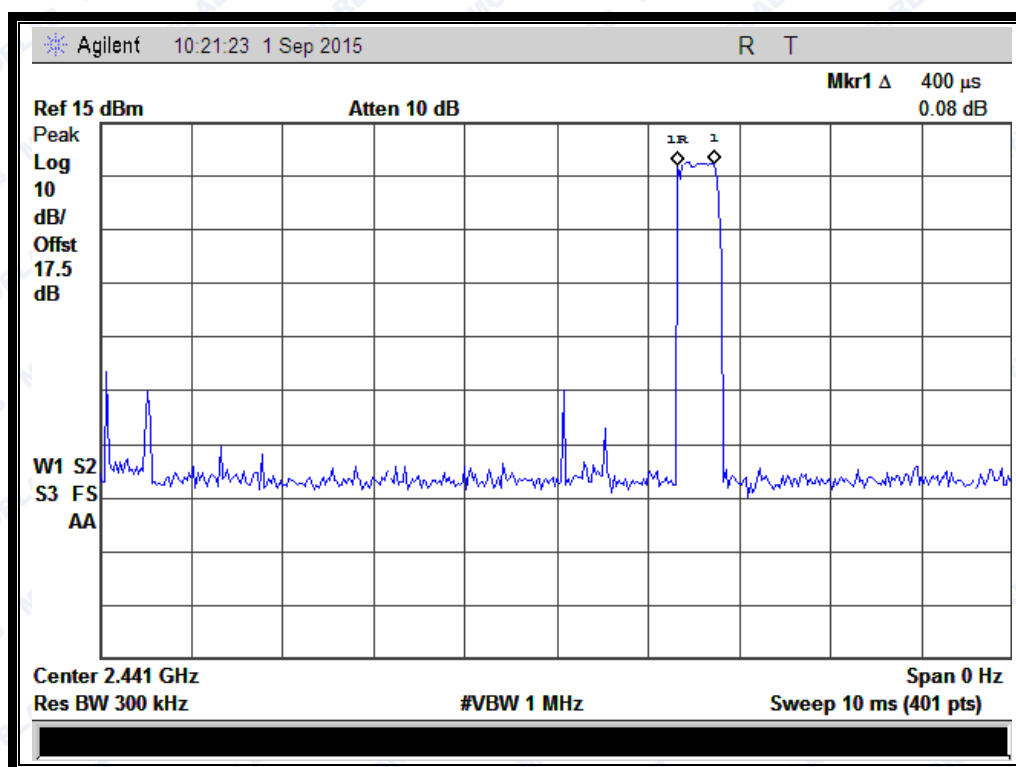
2.6.4 Test Result

2.6.4.1 GFSK Mode

A. Test Verdict:

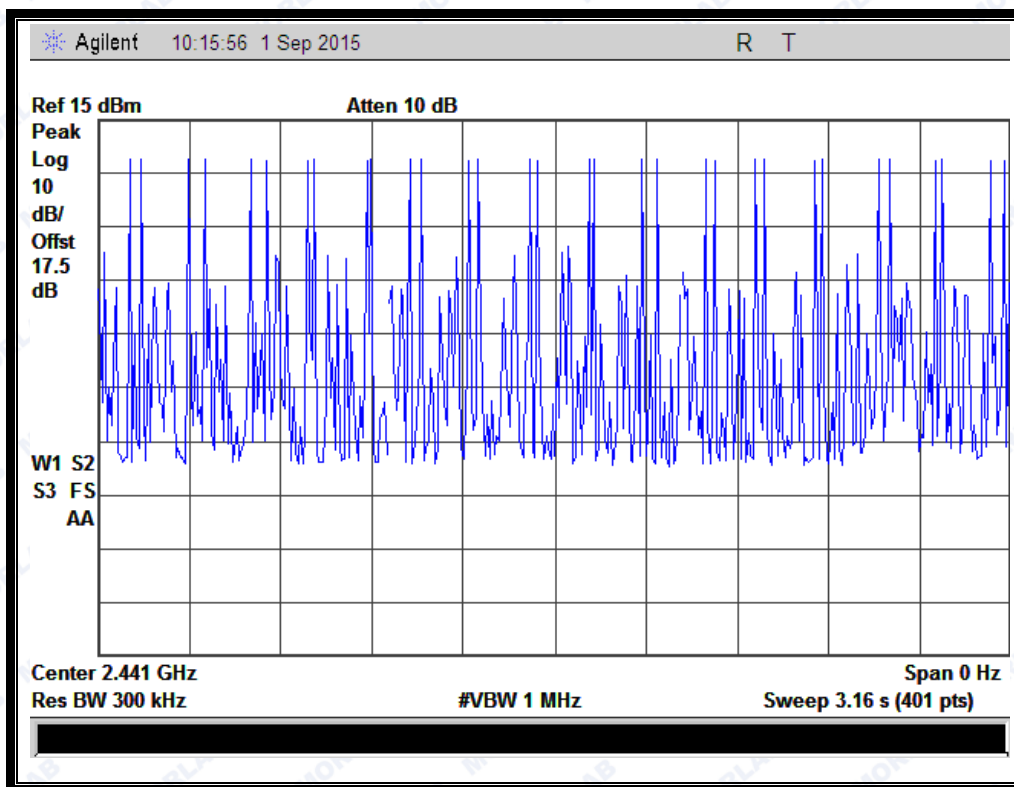
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.40	32	0.01280	0.1280	0.4	PASS
DH3	1.60	15	0.02400	0.2400		PASS
DH5	2.83	11	0.03113	0.3113		PASS

B. Test Plots:

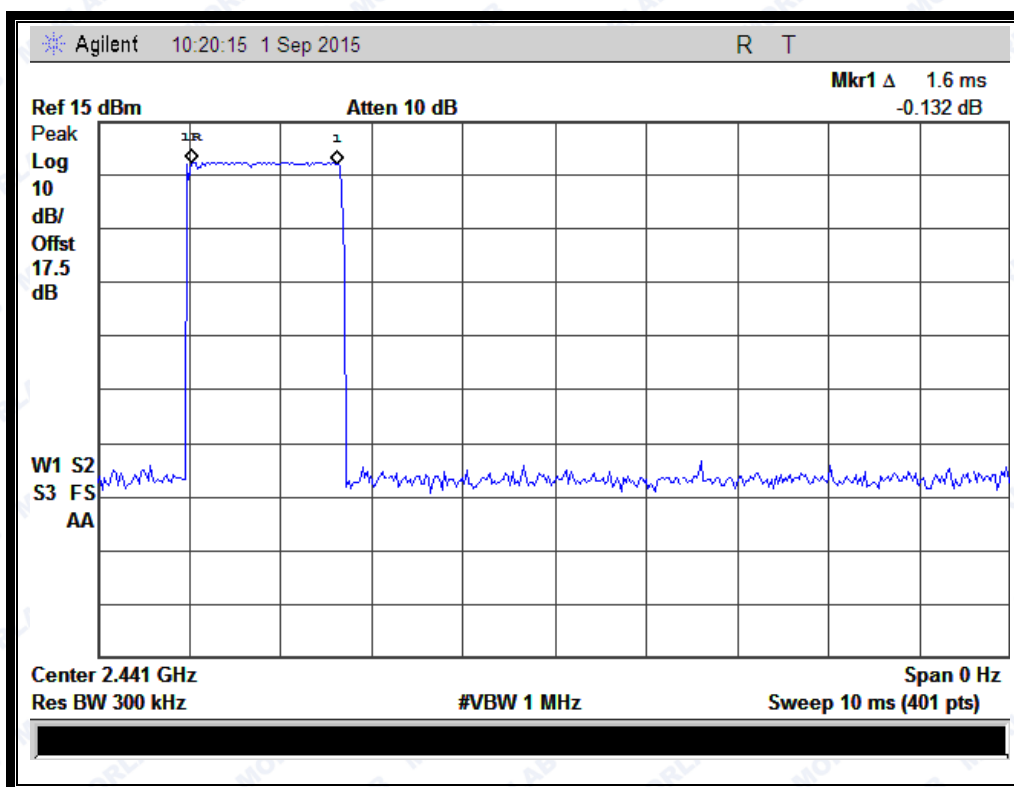




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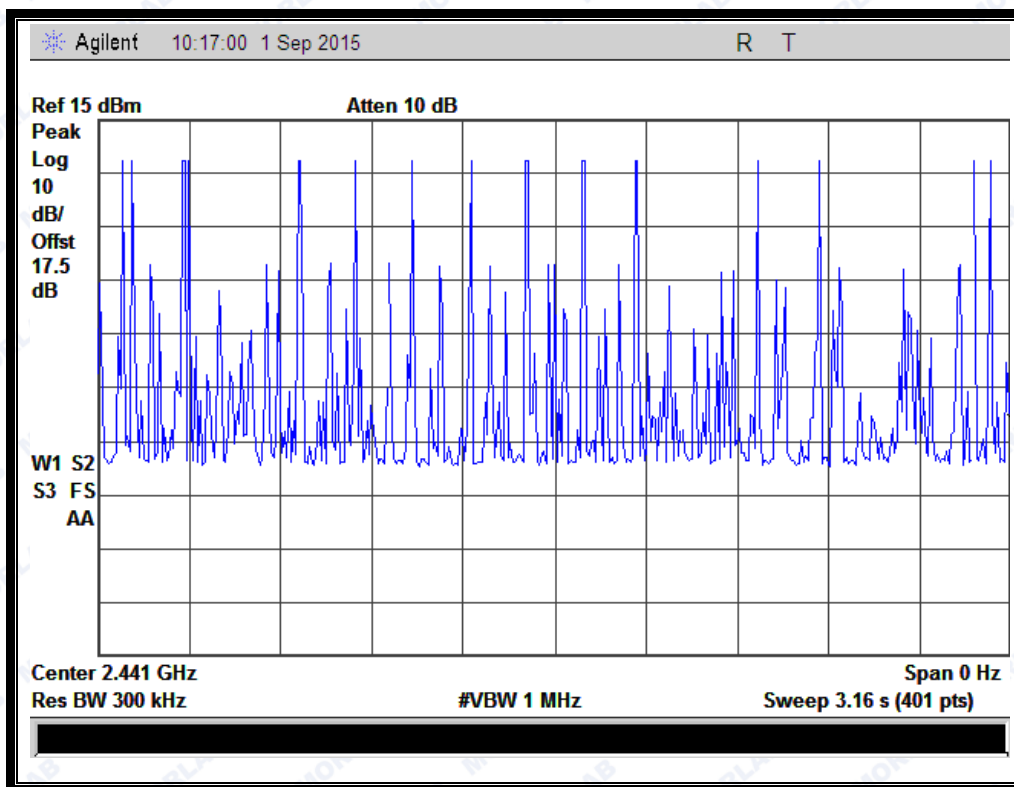


(Plot A: DH1 @ GFSK)

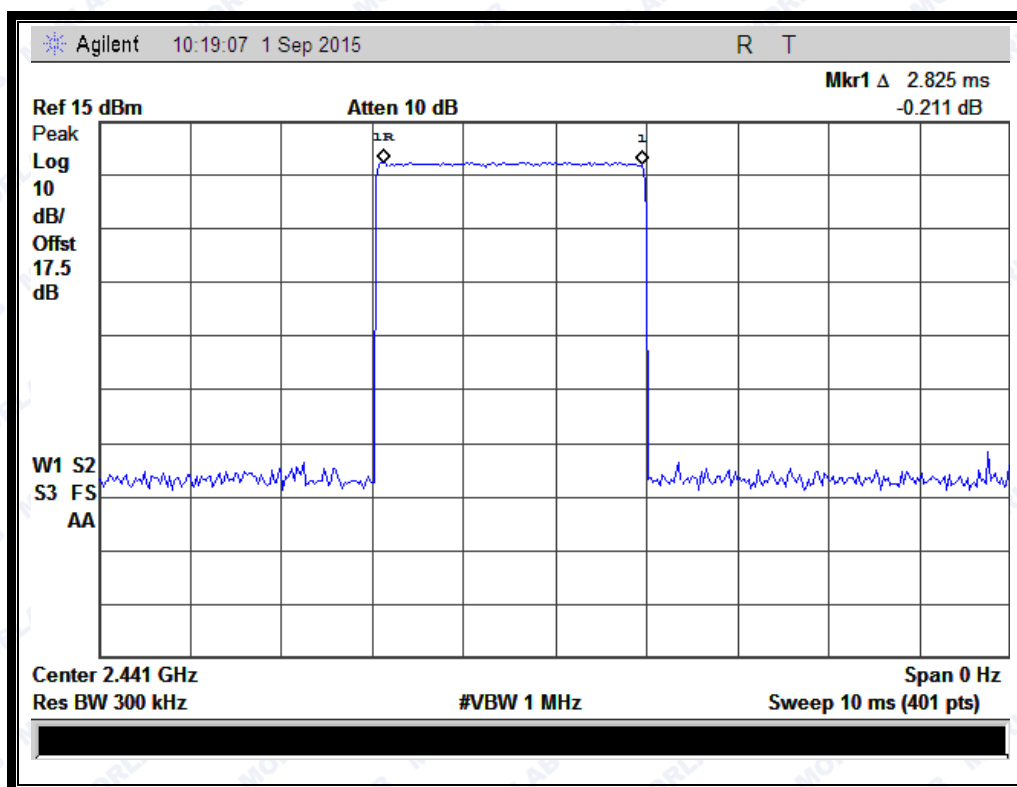


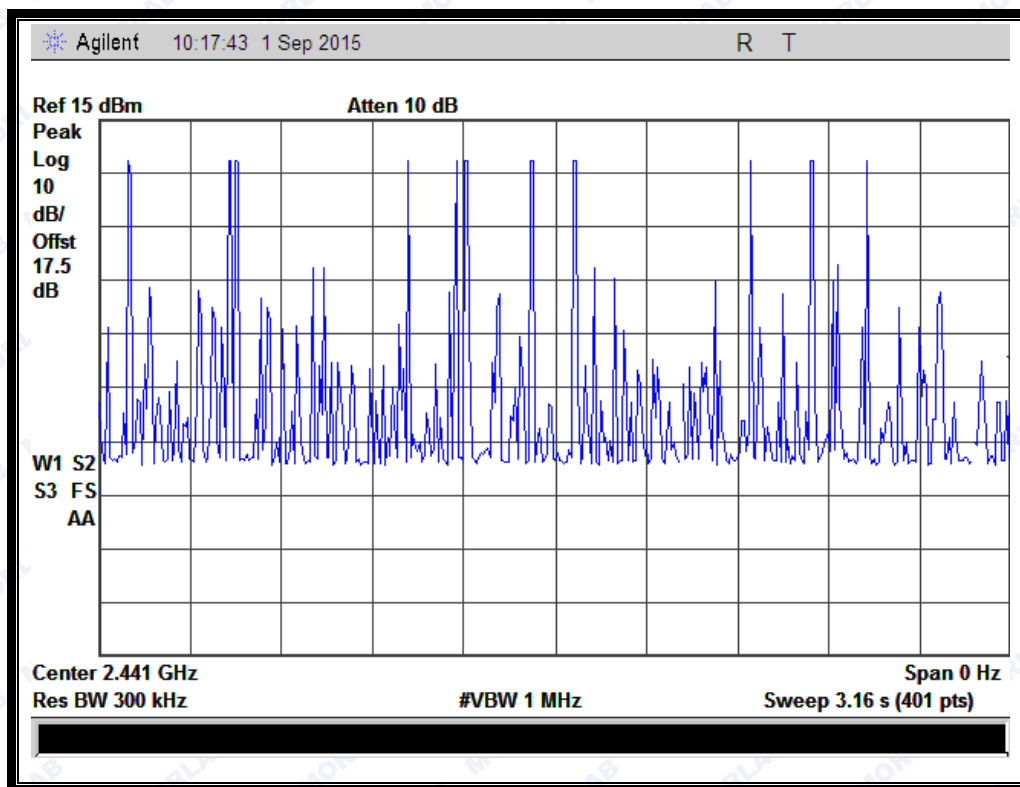


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(Plot B: DH3 @ GFSK)





(Plot C: DH5 @ GFSK)

2.6.4.2 $\pi/4$ -DQPSK Mode

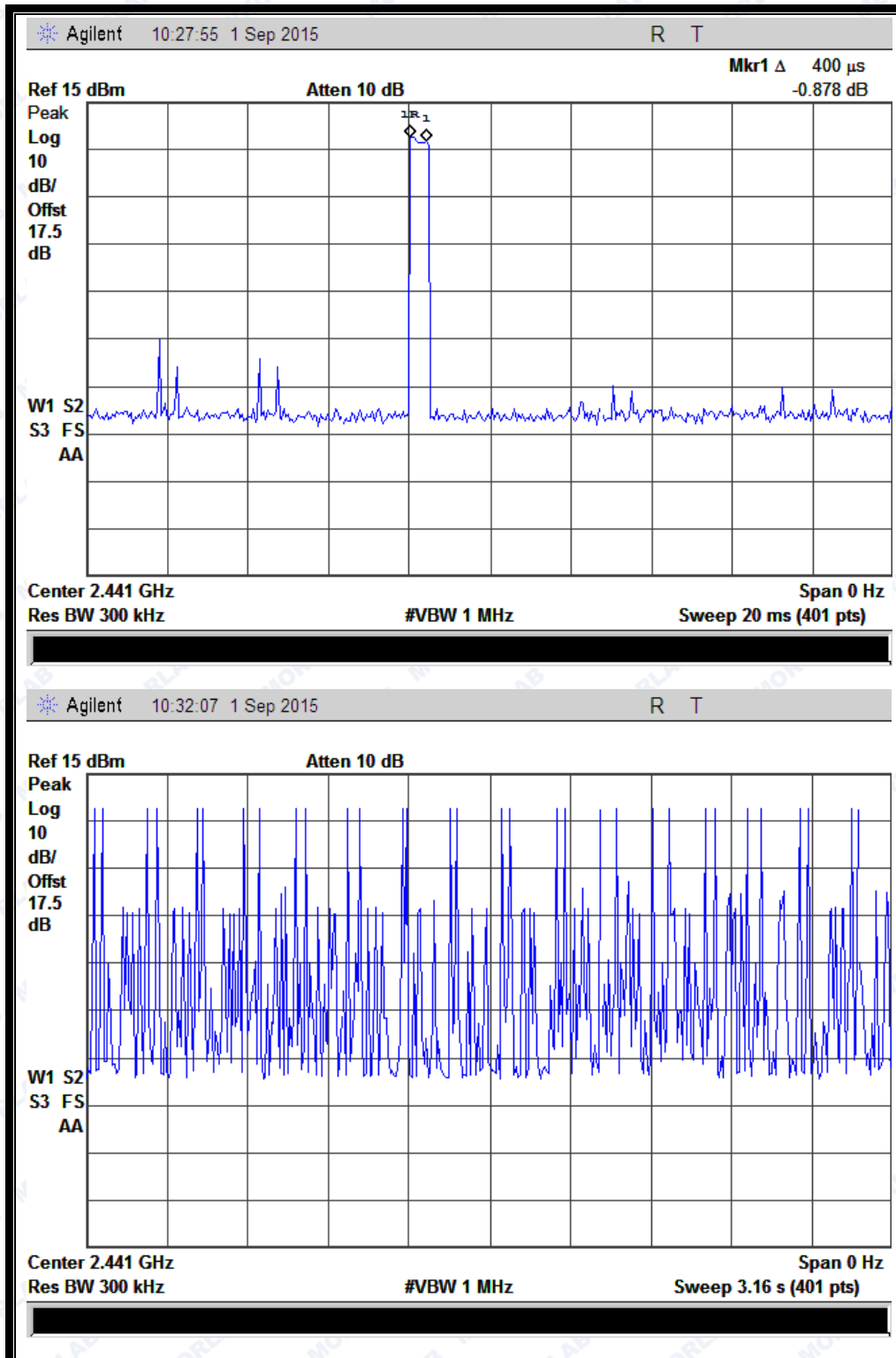
A. Test Verdict:

DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	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	1.60	16	0.02560	0.2560		PASS
DH5	2.85	16	0.04528	0.4528		PASS

B. Test Plots:



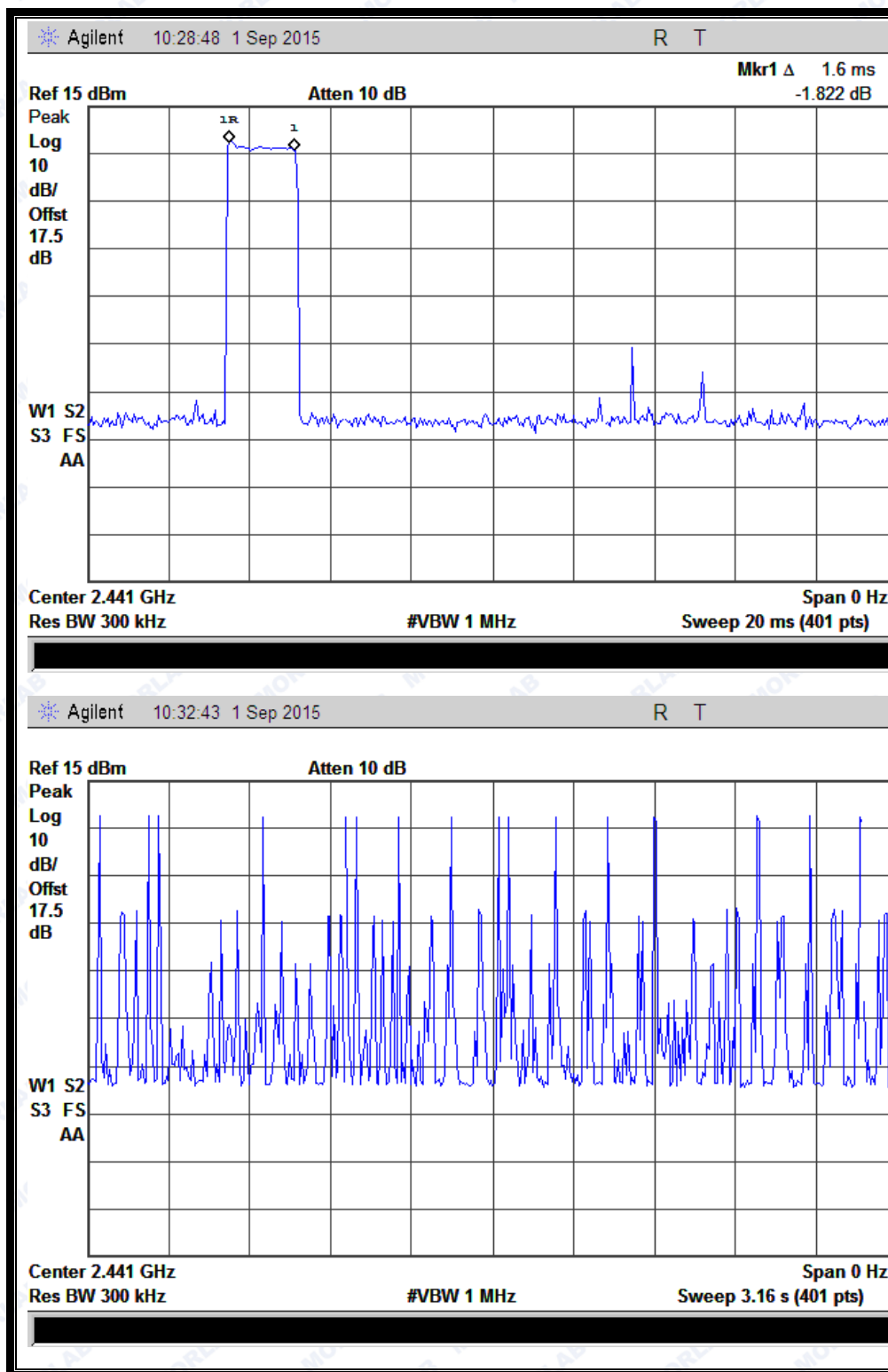
REPORT No.: SZ15080164W02



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

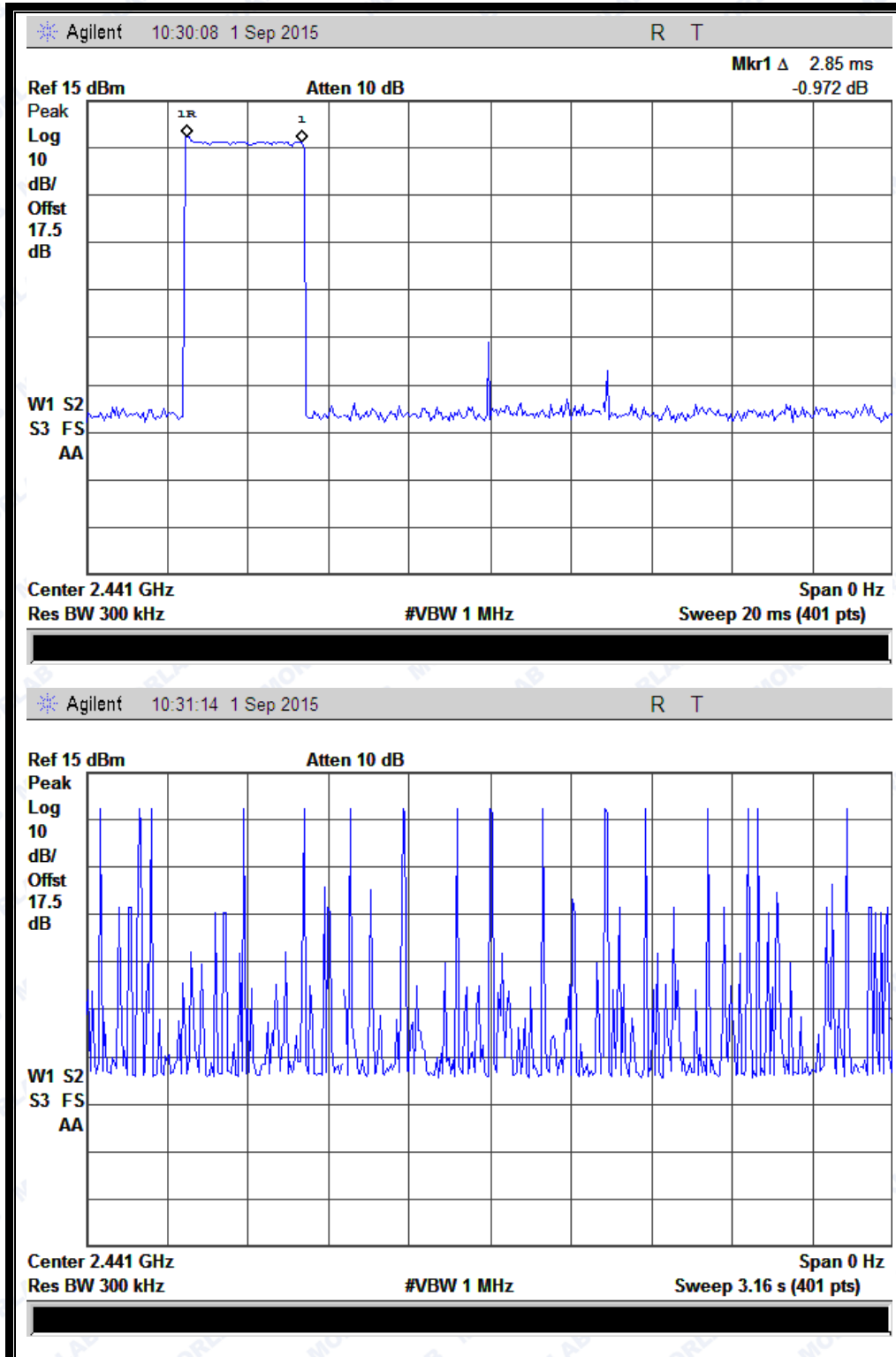


REPORT No.: SZ15080164W02

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



REPORT No.: SZ15080164W02



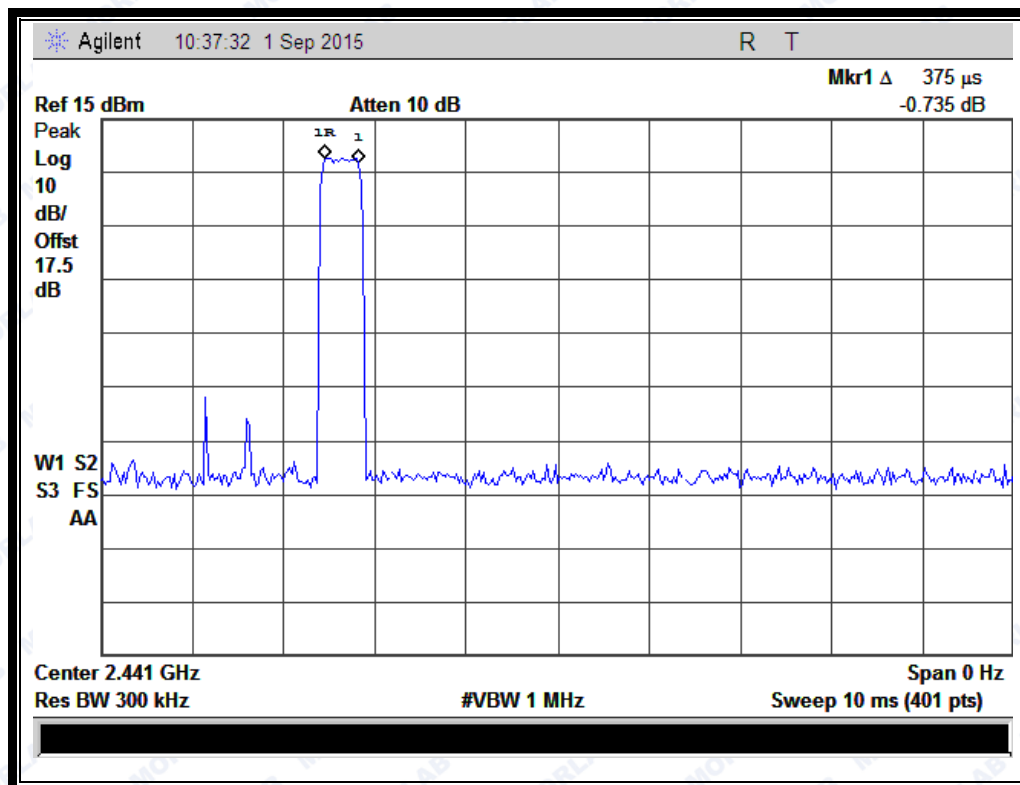
(Plot F: DH5 @ $\pi/4$ -DQPSK)



REPORT No.: SZ15080164W02

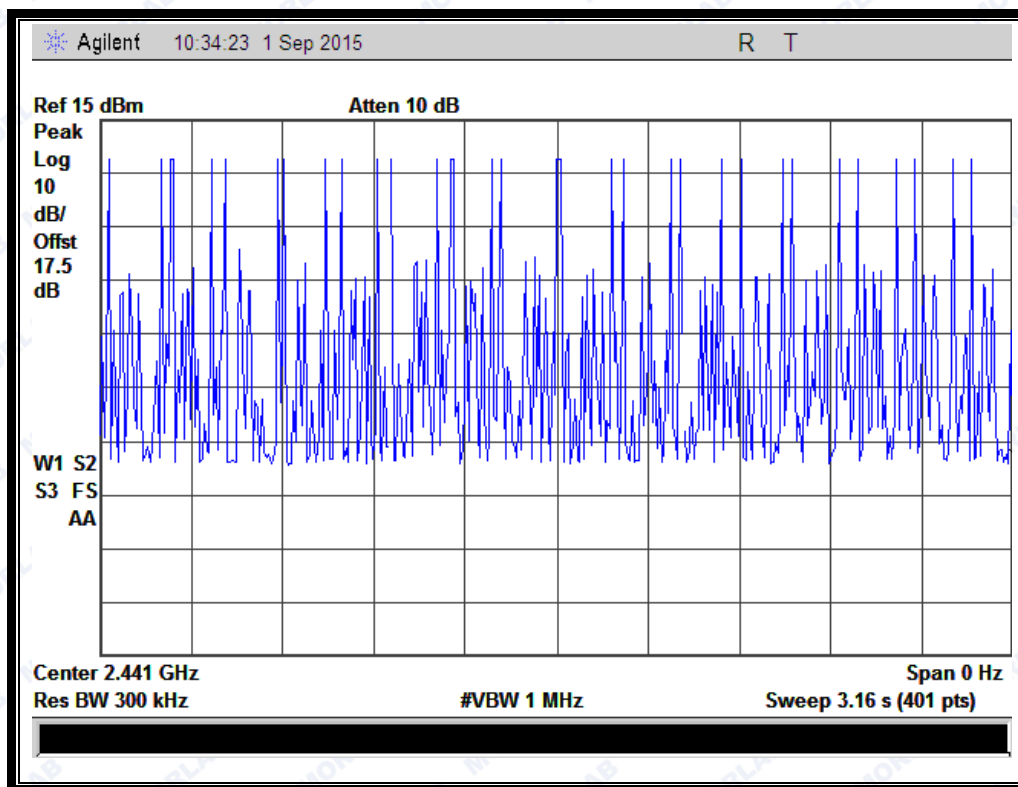
2.6.4.3 8-DPSK mode**A. Test Verdict:**

DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Average Time of Occupancy in 3.16 seconds (sec)	Average Time of Occupancy in 31.6 seconds (sec)	Limit (sec)	Verdict
DH1	0.38	30	0.01140	0.1140	0.4	PASS
DH3	1.60	15	0.02400	0.2400		PASS
DH5	2.80	13	0.03640	0.3640		PASS

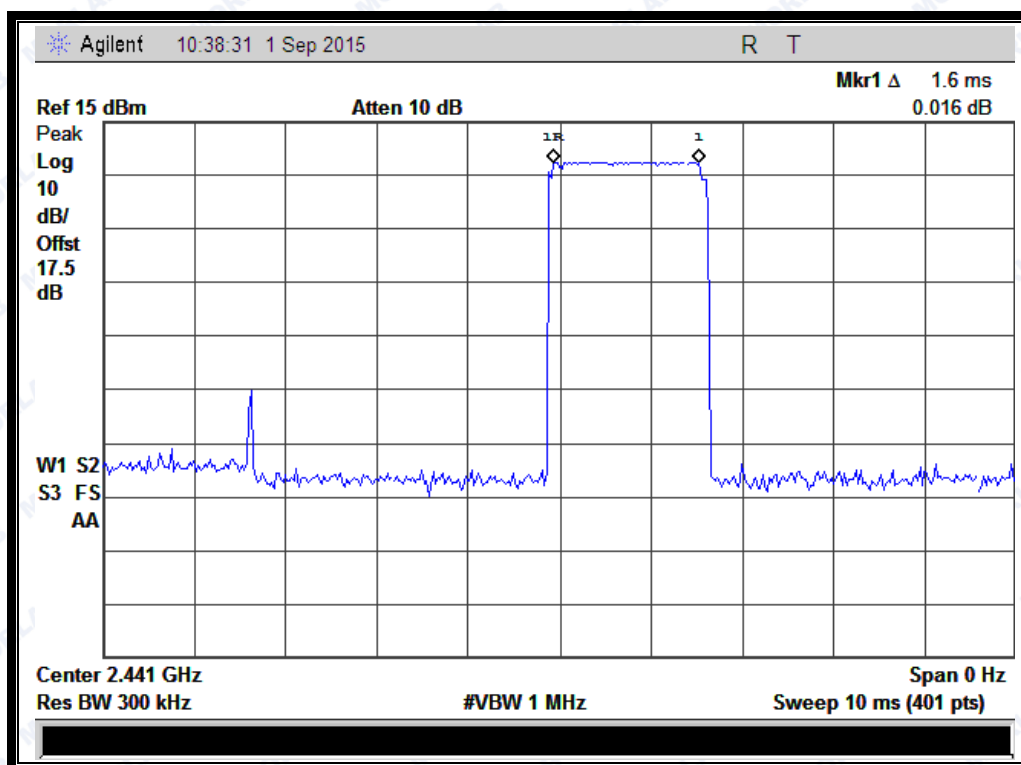
B. Test Plots:



REPORT No.: SZ15080164W02

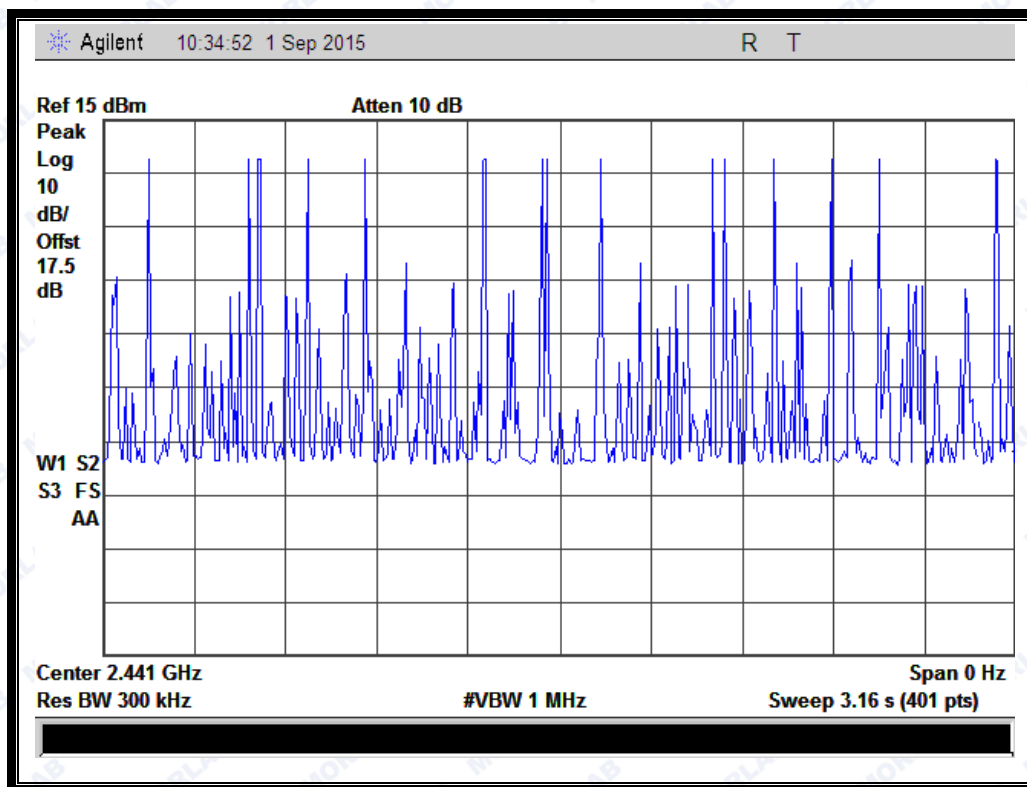


(Plot G: DH1 @ 8-DPSK)

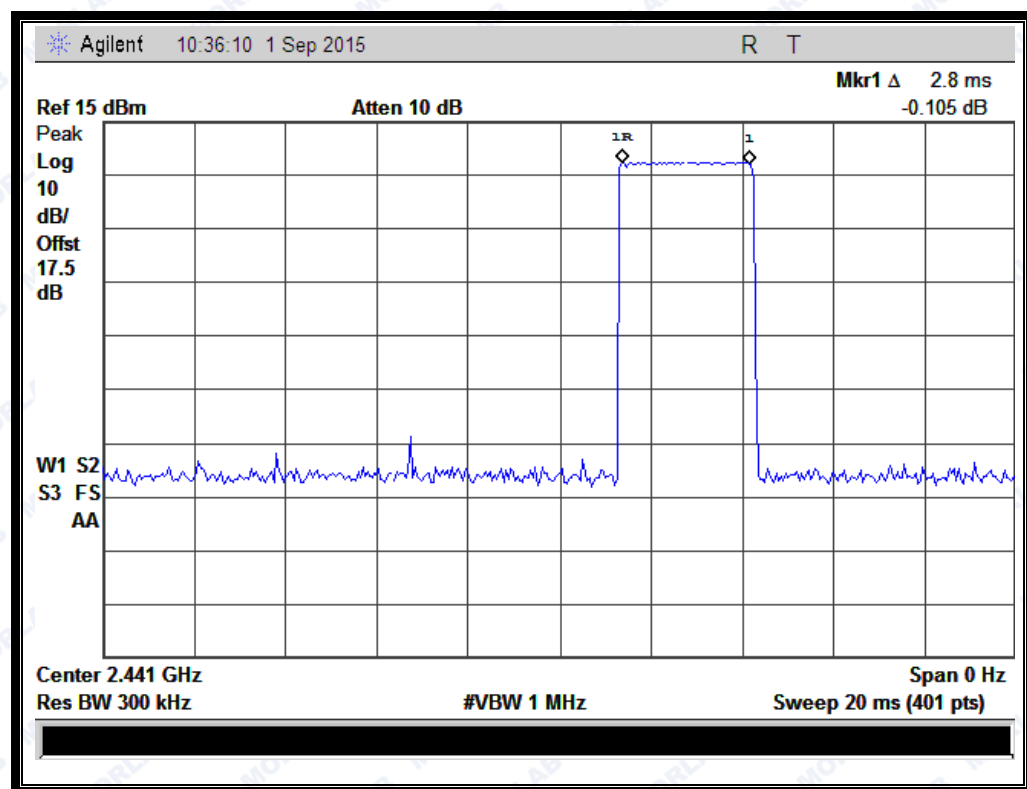




REPORT No.: SZ15080164W02

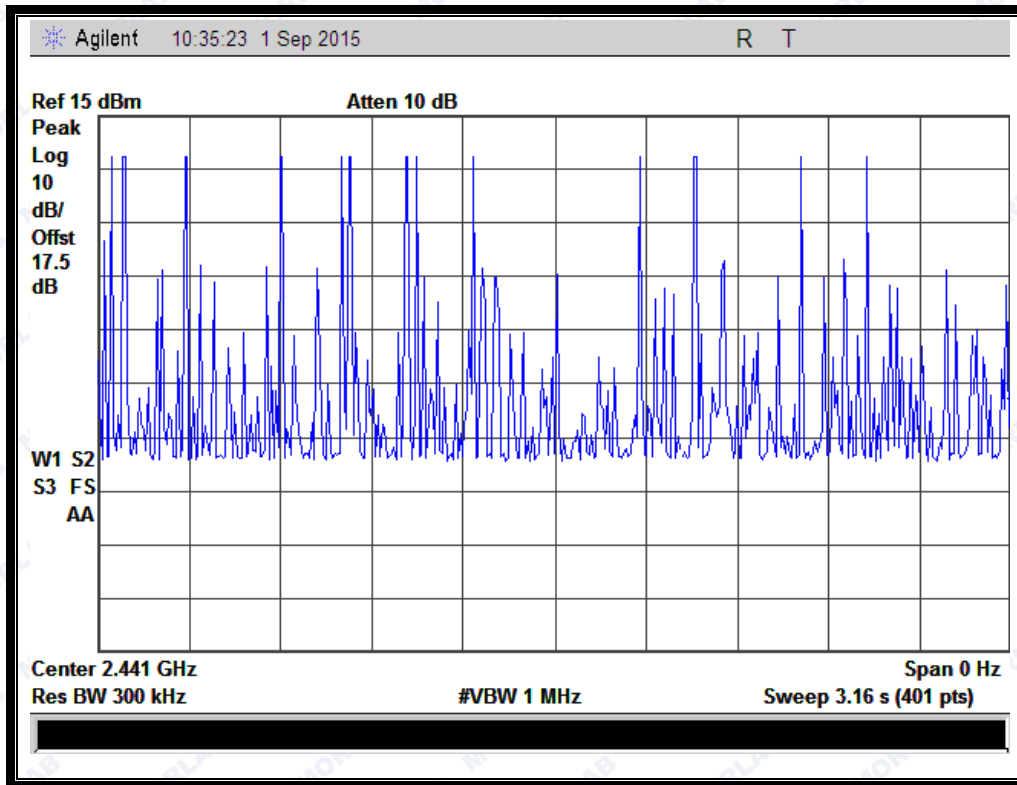


(Plot H: DH3 @ 8-DPSK)





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(Plot I: DH5 @ 8-DPSK)

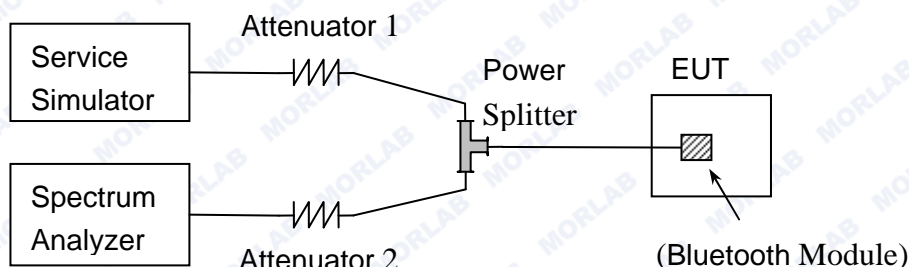
2.7 Conducted Spurious Emissions

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.

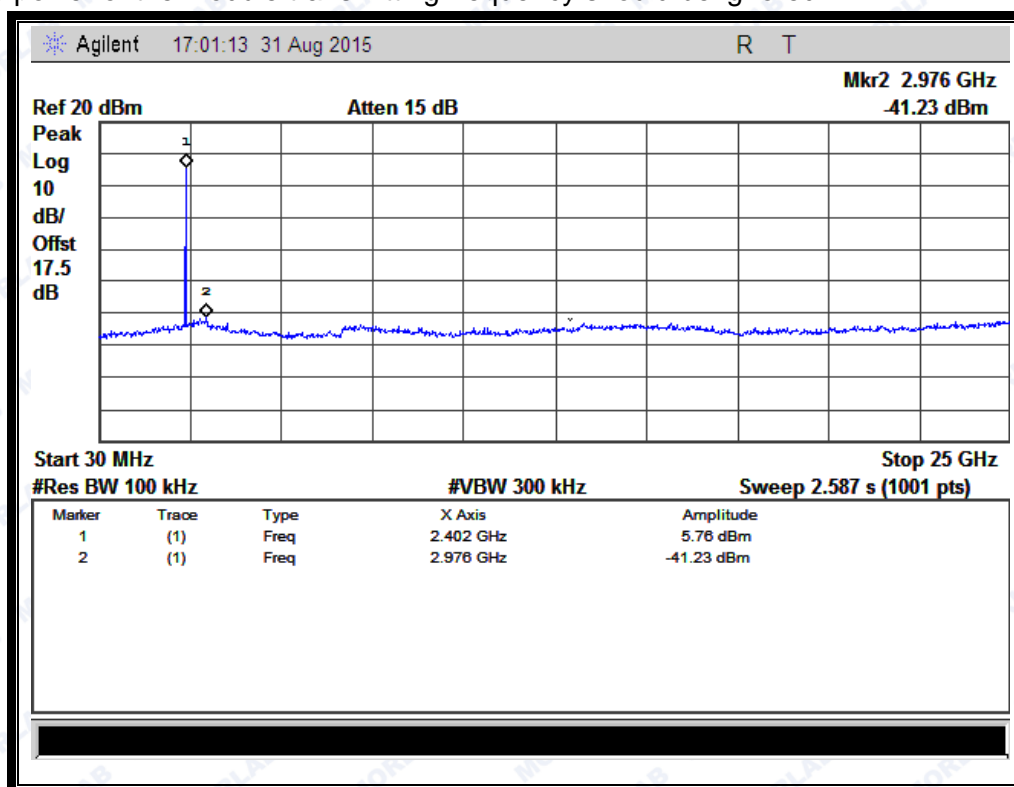
2.7.4.1 GFSK Mode

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	-41.23	Plot A.1	5.760	-14.240	PASS
39	2441	-42.00	Plot B.1	6.982	-13.018	PASS
78	2480	-42.77	Plot C.1	4.728	-15.272	PASS

B. Test Plots:

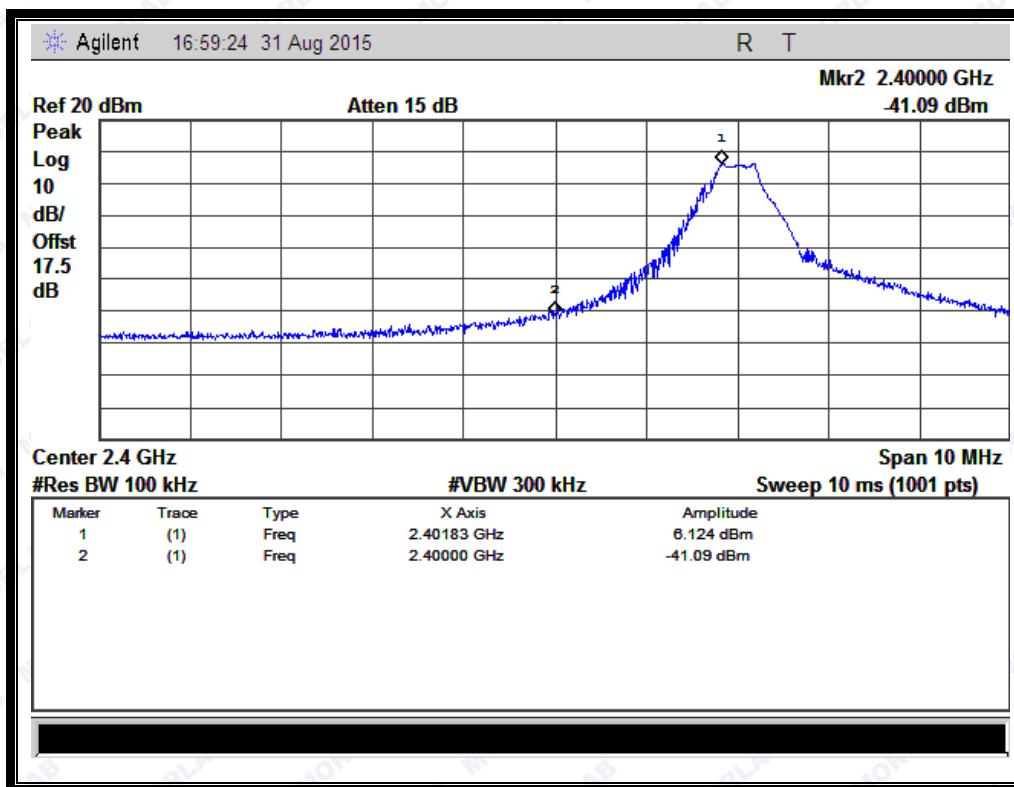
Note: the power of the Module transmitting frequency should be ignored.



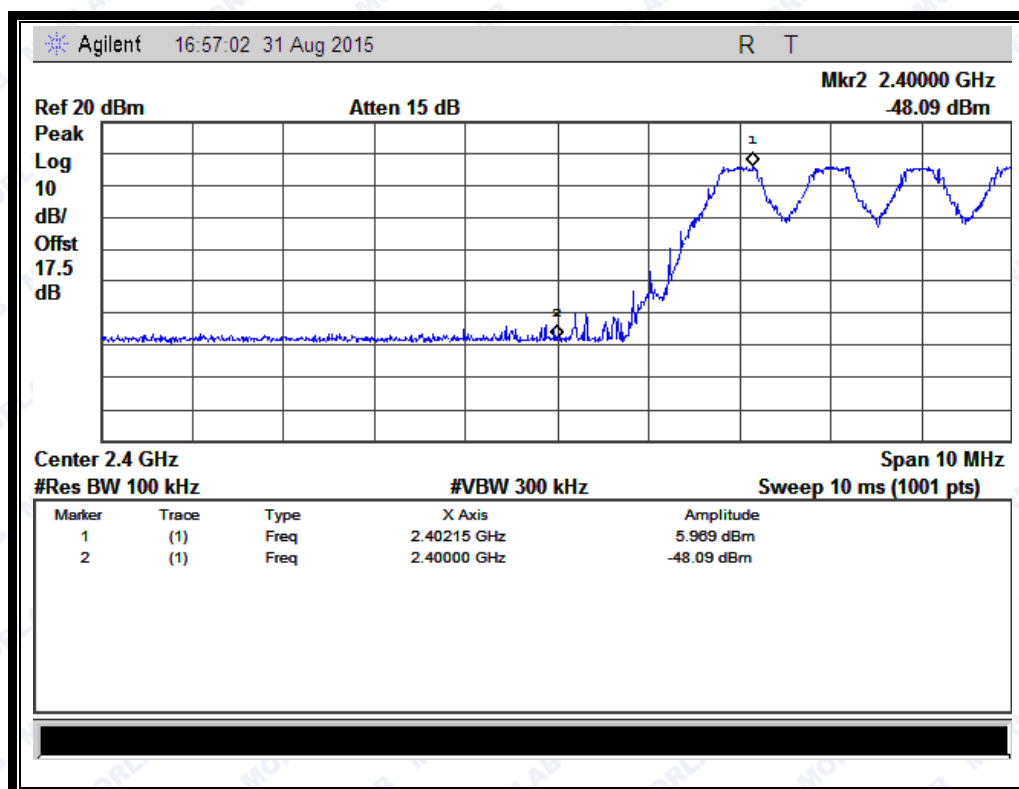
(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



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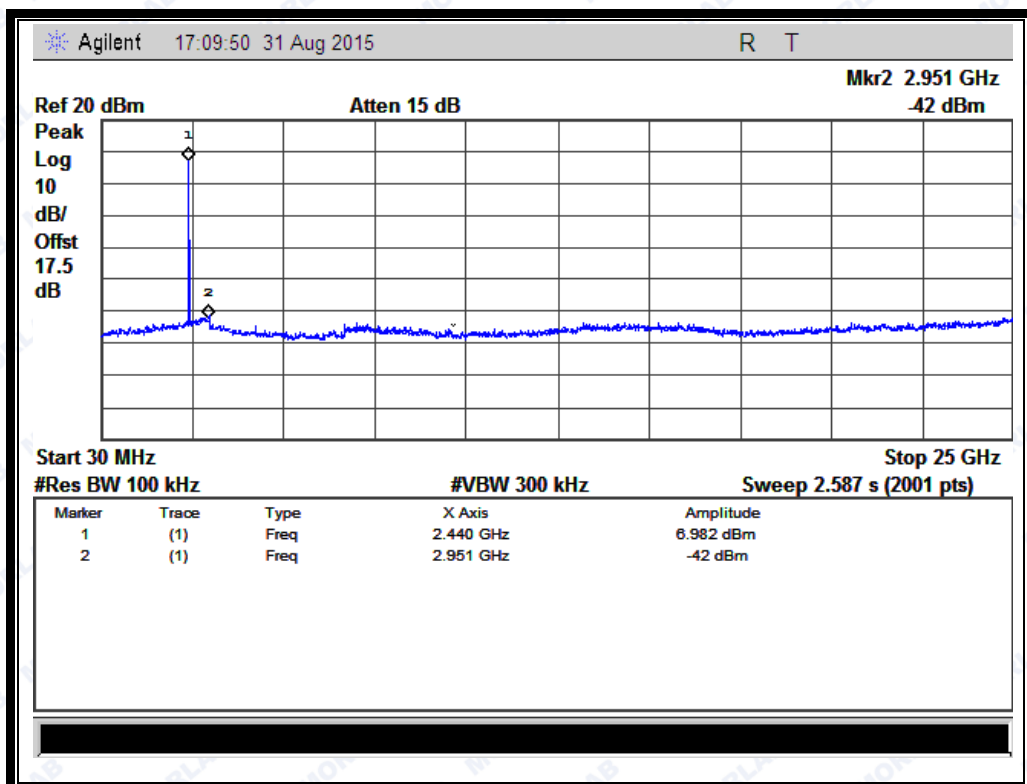
(Channel = 0, Band edge @ GFSK Mode)



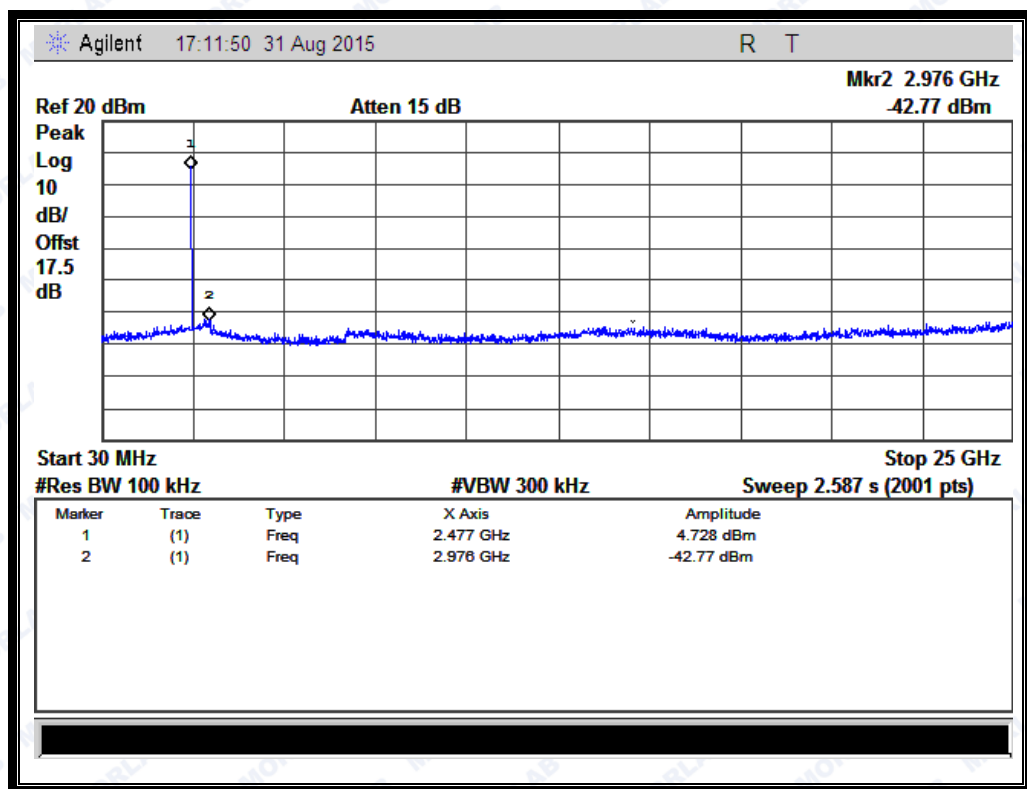
(Channel = 0, Band edge with hopping on @ GFSK Mode)



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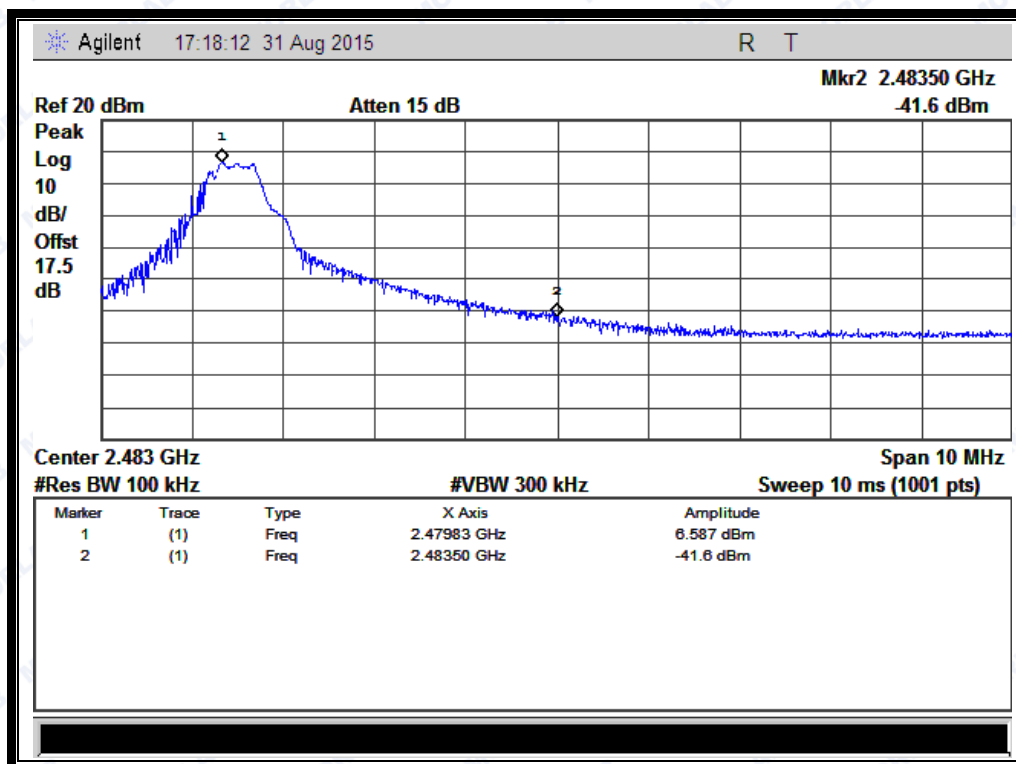
(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



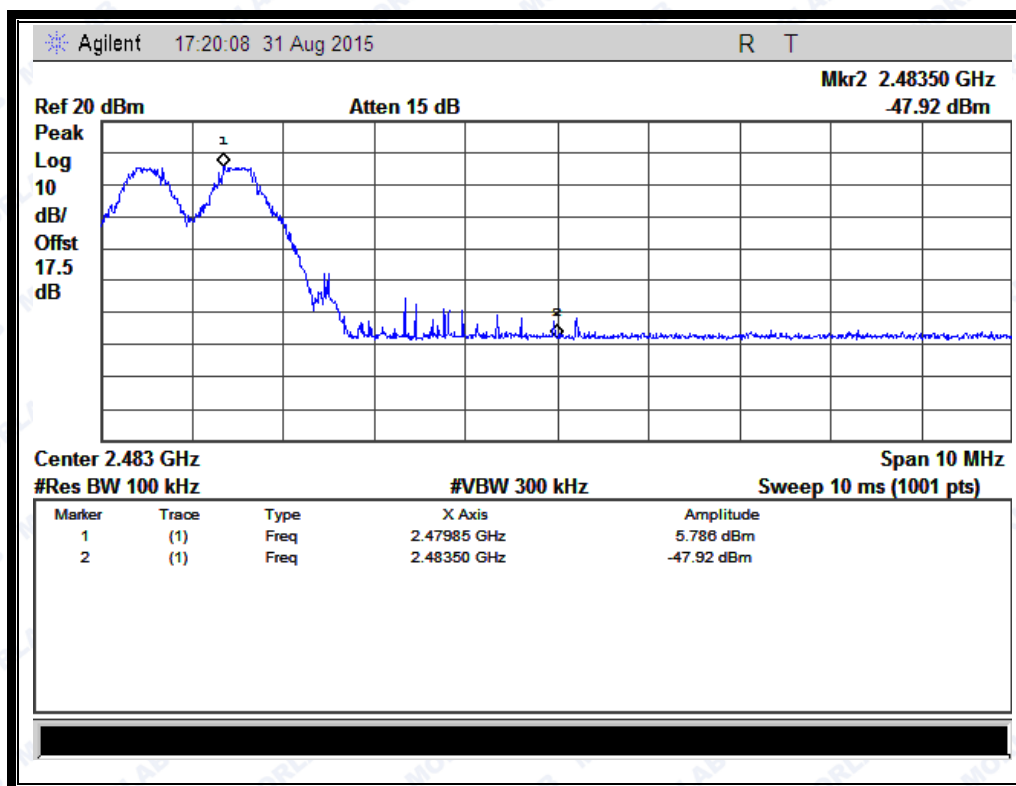
(Plot C.1: Channel = 78, 30MHz to 25GHz @ GFSK Mode)



REPORT No.: SZ15080164W02



(Channel = 78, Band edge @ GFSK Mode)



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

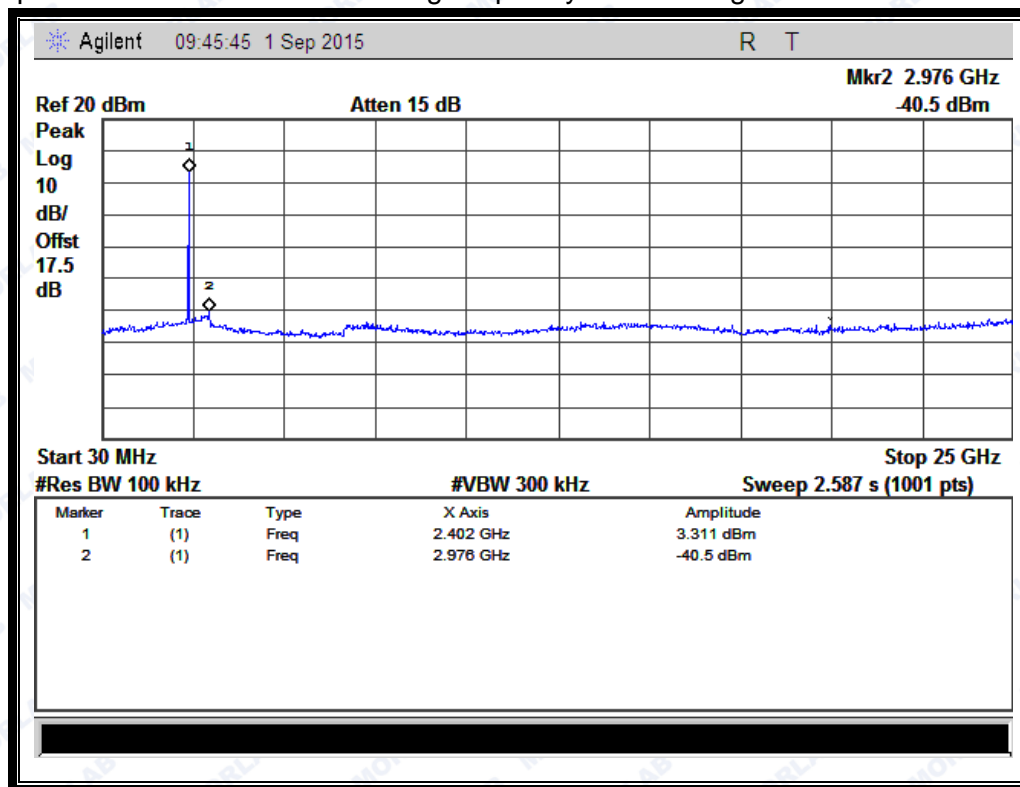
2.7.4.2 $\pi/4$ -DQPSK Mode

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	-40.50	Plot D.1	3.311	-16.689	PASS
39	2441	-40.61	Plot E.1	7.515	-12.485	PASS
78	2480	-40.41	Plot F.1	2.982	-17.018	PASS

B. Test Plots:

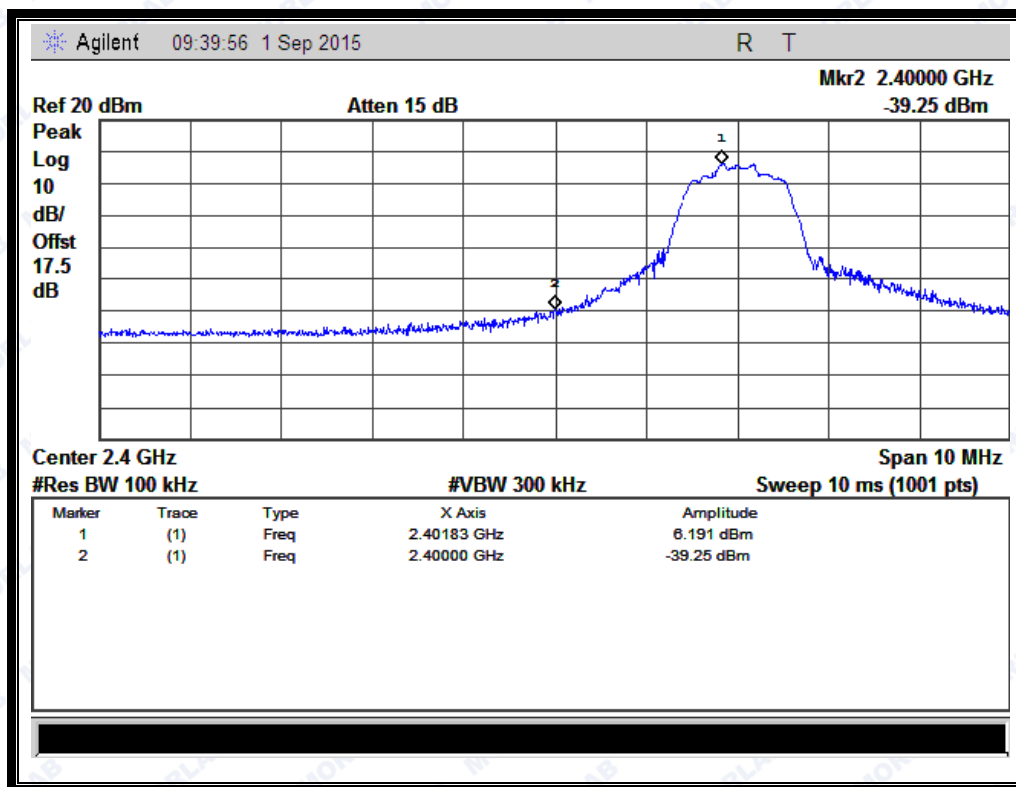
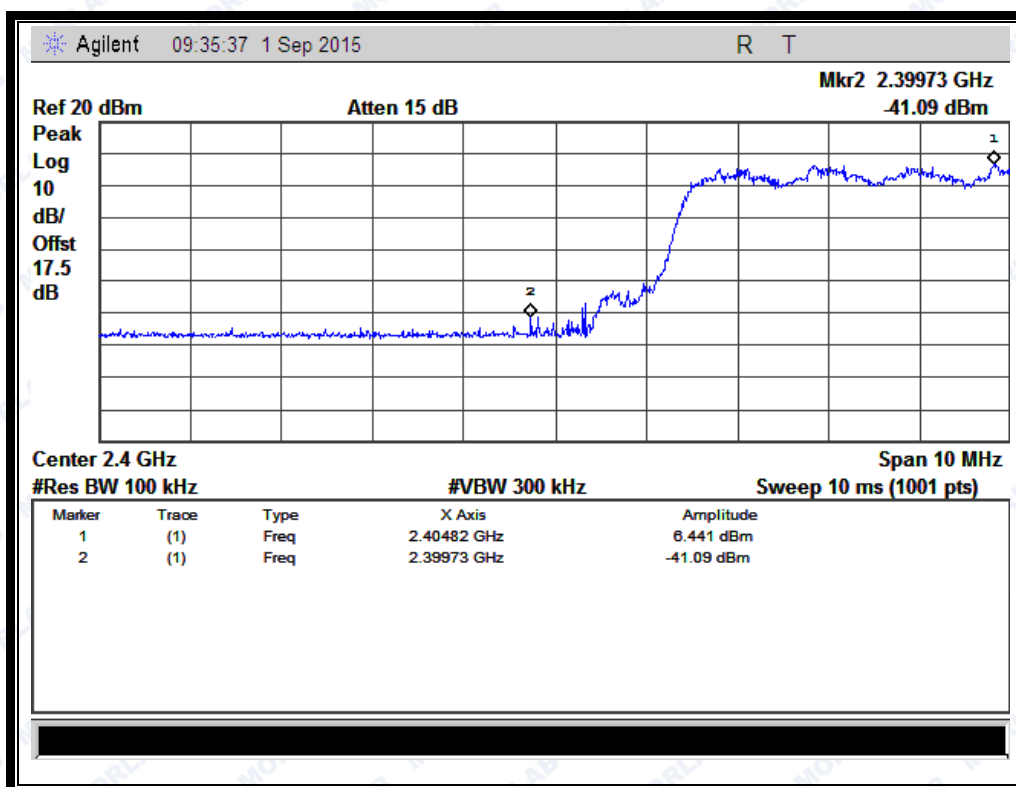
Note: the power of the Module transmitting frequency should be ignored.

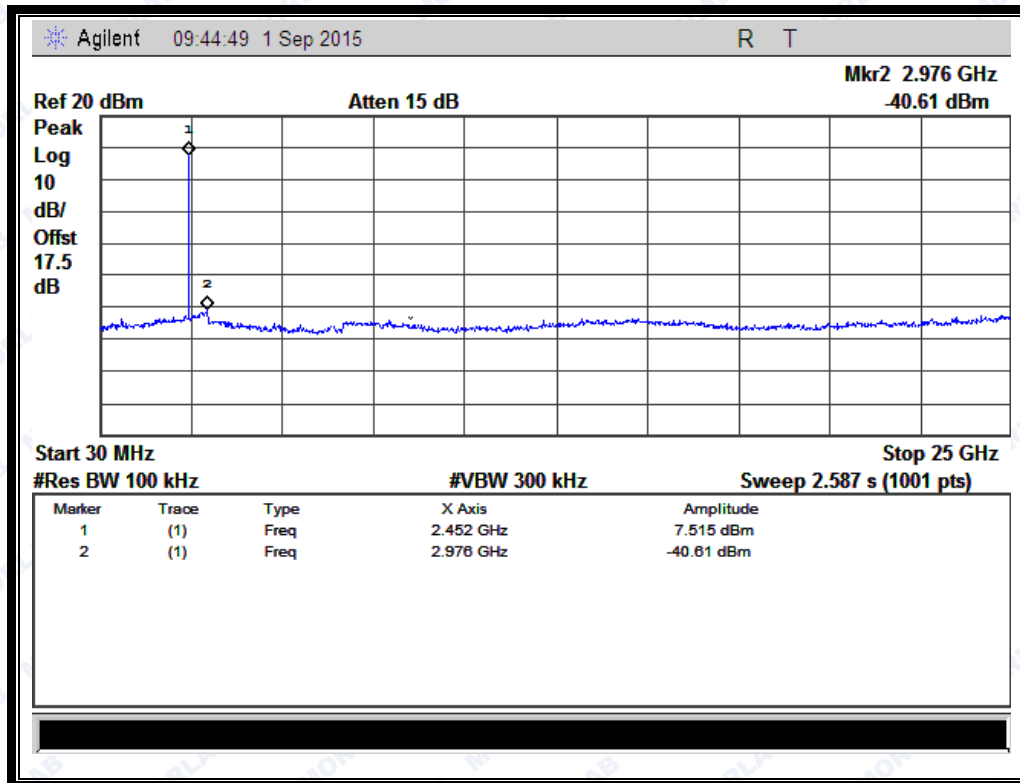
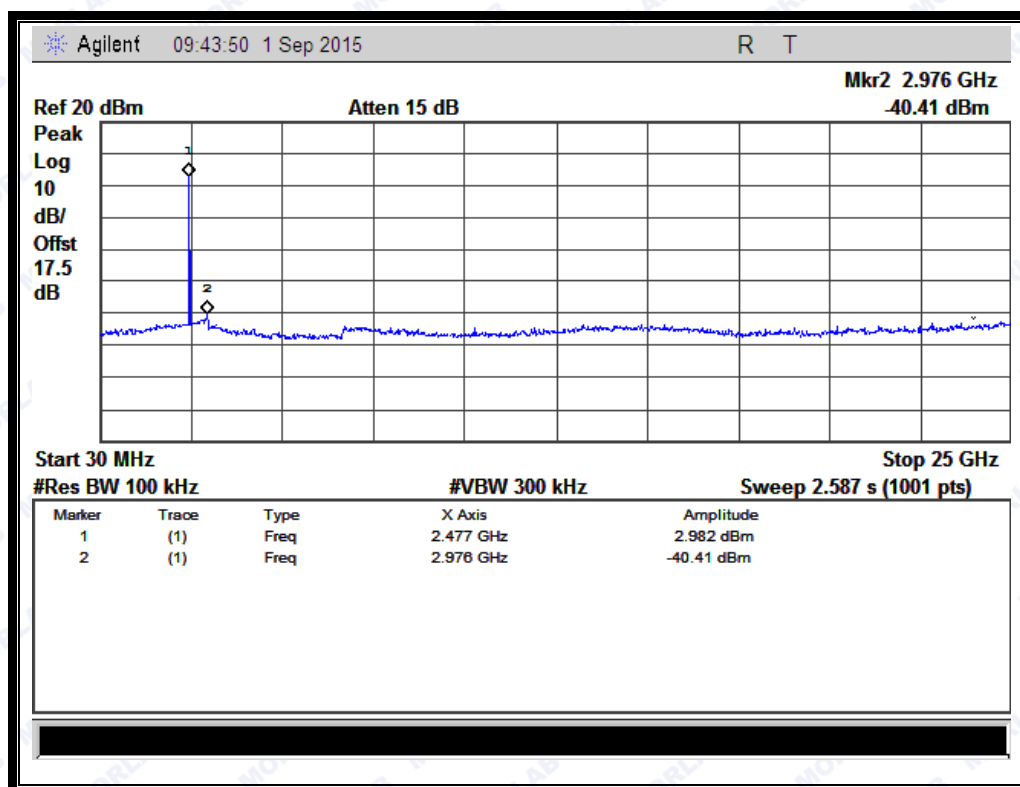


(Plot D.1: Channel = 0, 30MHz to 25GHz @ $\pi/4$ -DQPSK)



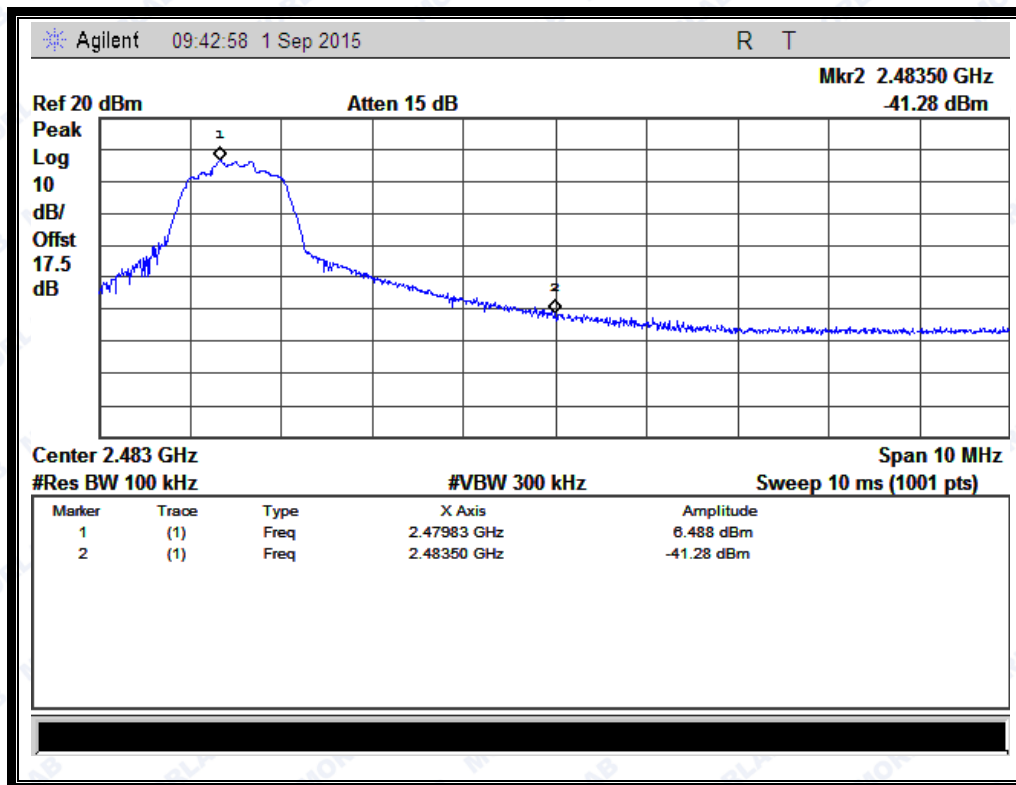
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(Channel = 0, Band edge @ $\pi/4$ -DQPSK)(Channel = 0, Band edge with hopping on @ $\pi/4$ -DQPSK)

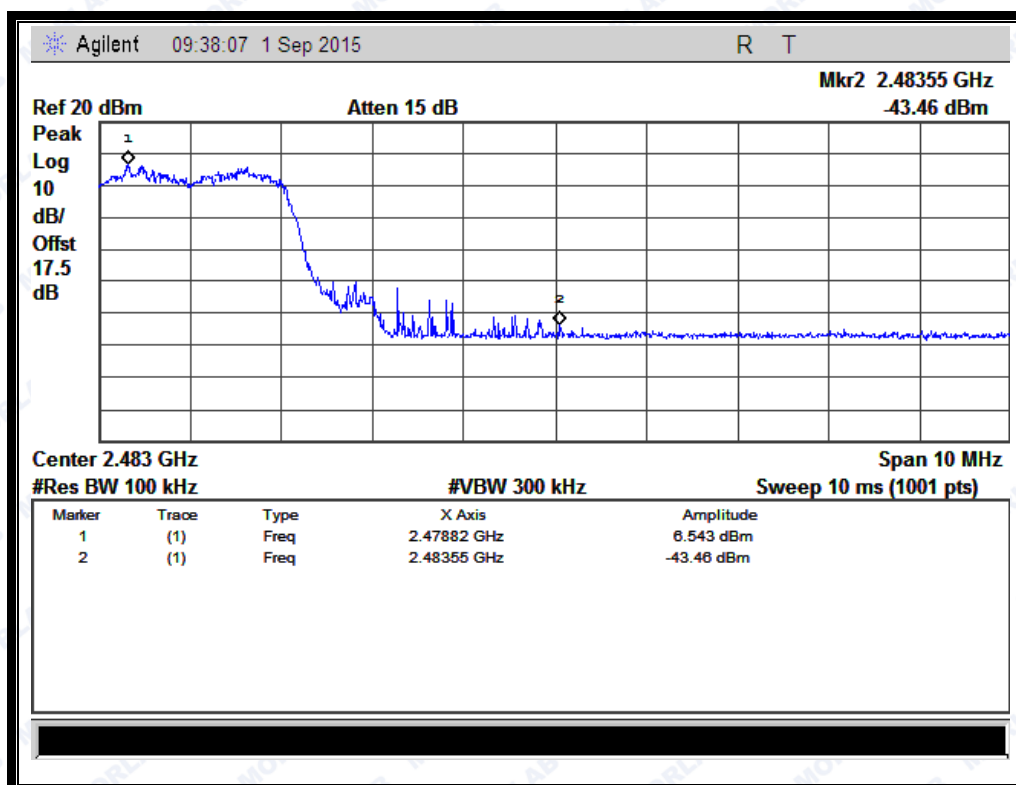
(Plot E.1: Channel = 39, 30MHz to 25GHz @ $\pi/4$ -DQPSK)(Plot F.1: Channel = 78, 30MHz to 25GHz @ $\pi/4$ -DQPSK)



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



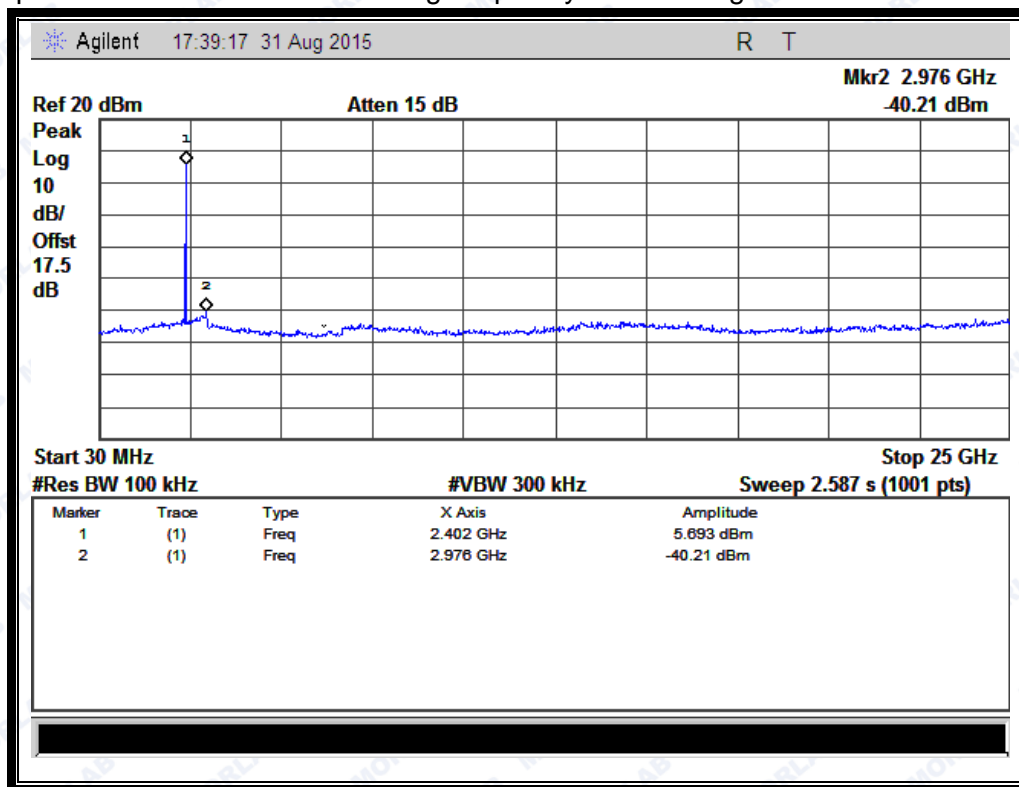
(Channel = 78, Band edge with hopping on @ $\pi/4$ -DQPSK)

**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	-40.21	Plot G.1	5.693	-14.307	PASS
39	2441	-40.87	Plot H.1	4.466	-15.534	PASS
78	2480	-41.25	Plot I.1	3.614	-16.386	PASS

B. Test Plots:

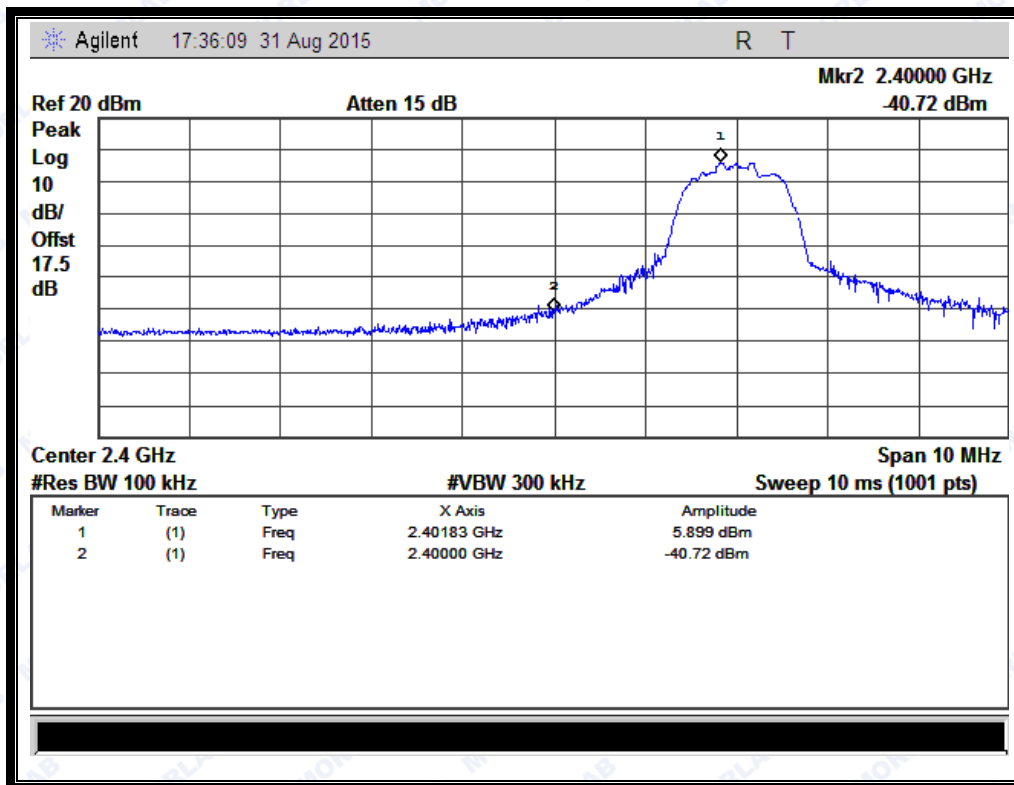
Note: the power of the Module transmitting frequency should be ignored.



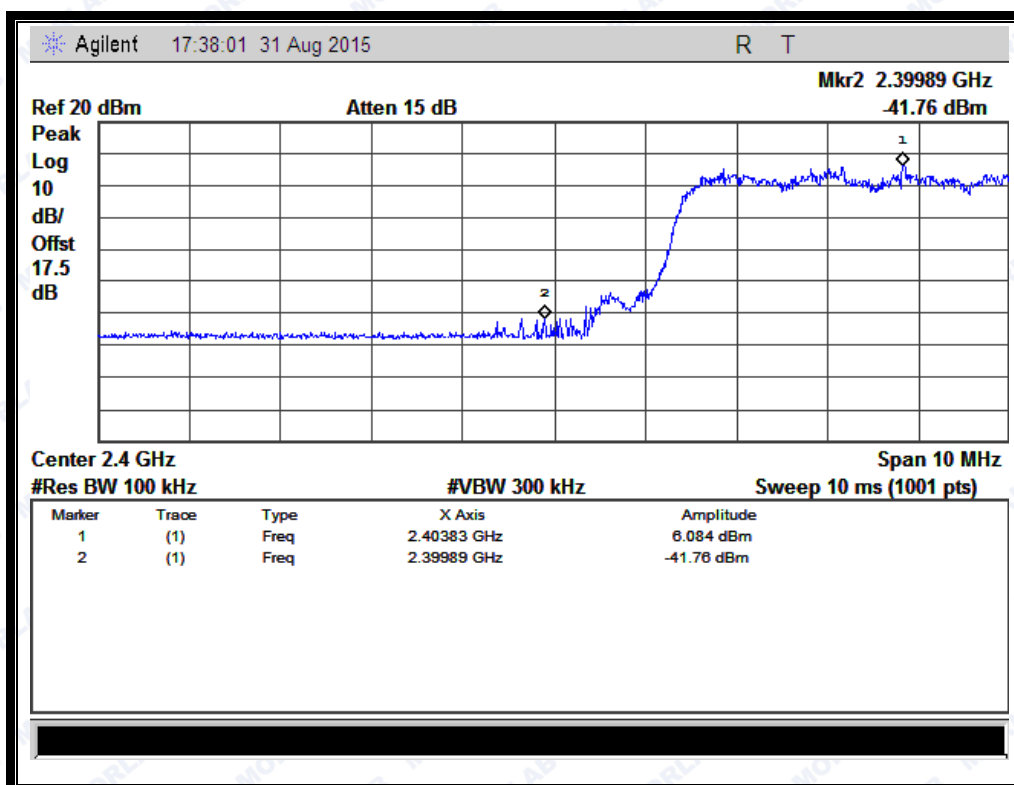
(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)



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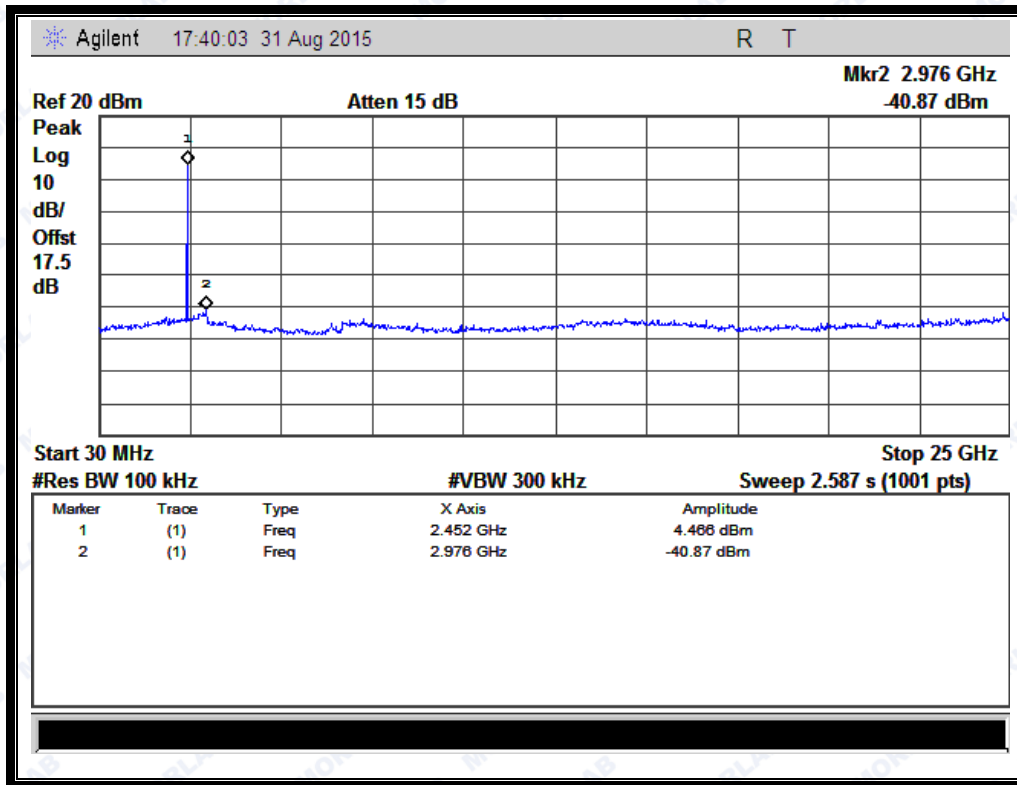
(Channel = 0, Band edge @ 8-DPSK)



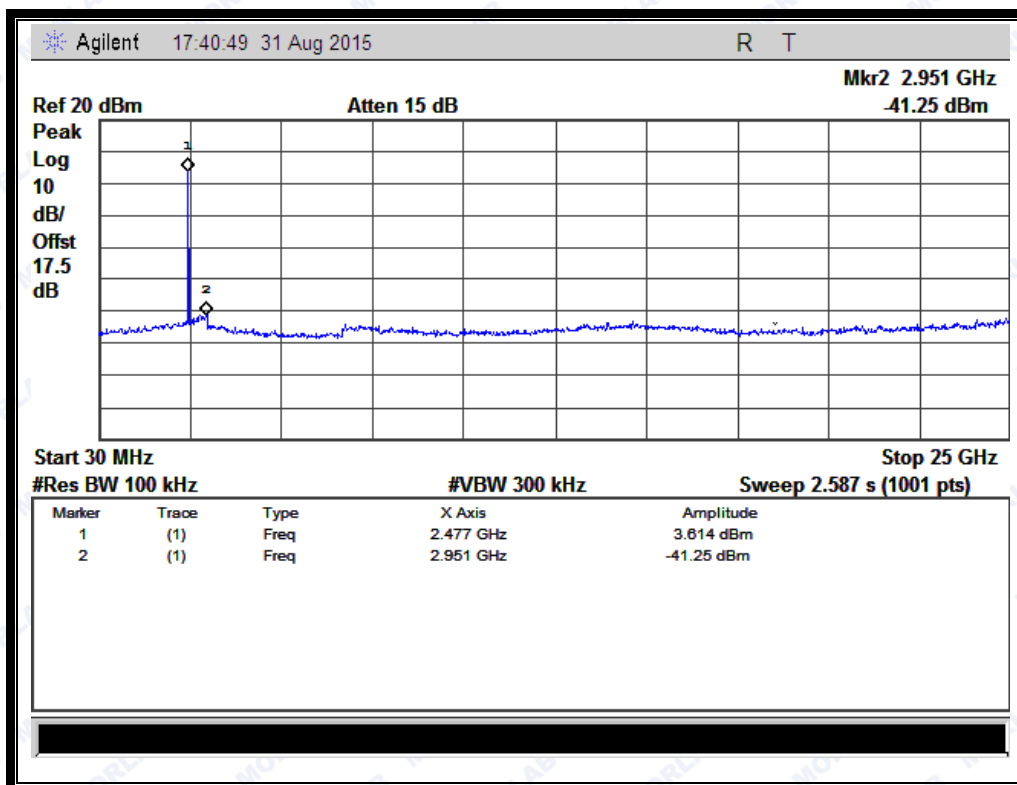
(Channel = 0, Band edge with hopping on @ 8-DPSK)



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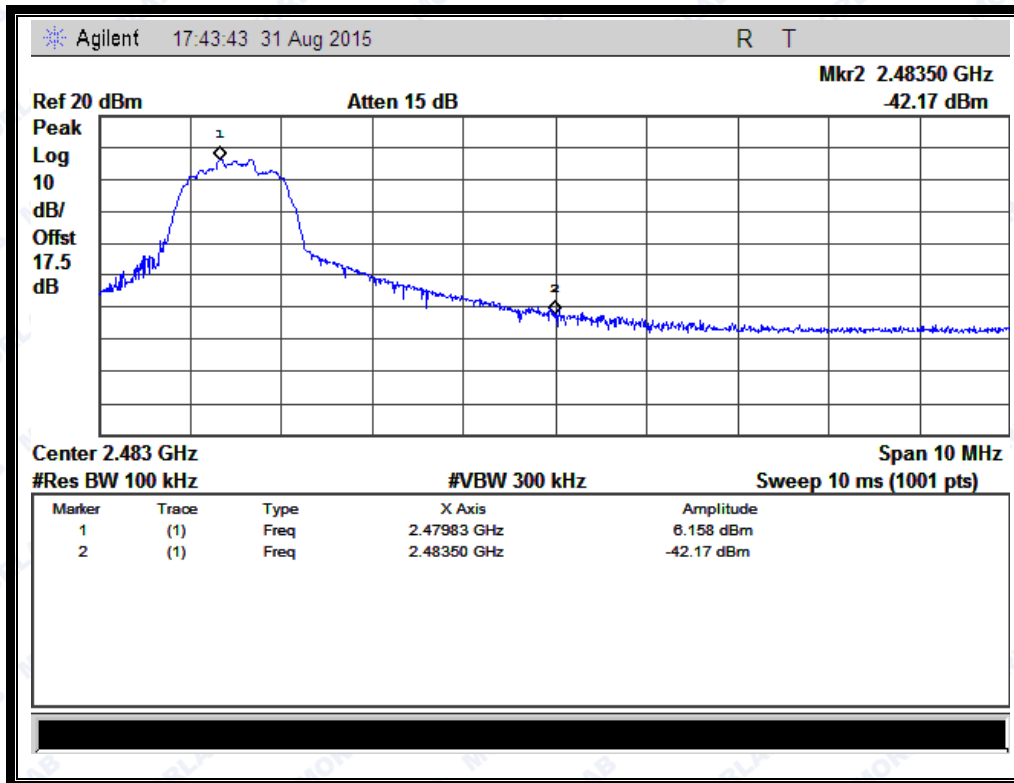
(Plot H.1: Channel = 39, 30MHz to 25GHz @ 8-DPSK)



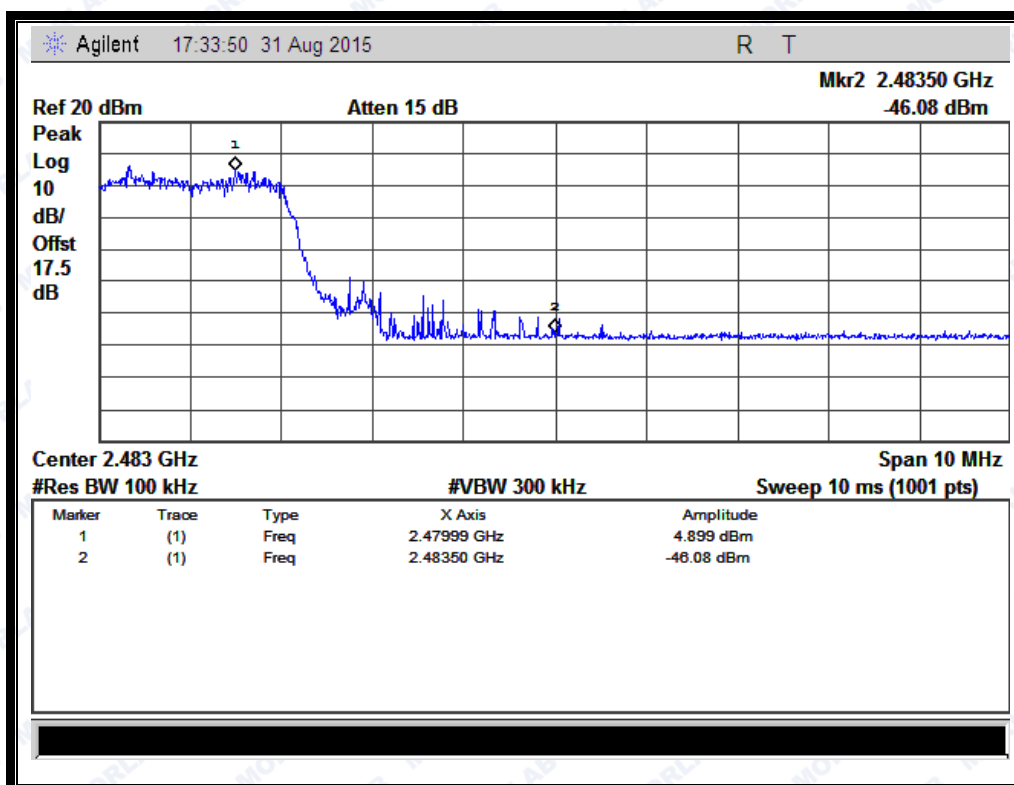
(Plot I.1: Channel = 78, 30MHz to 25GHz @ 8-DPSK)



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



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

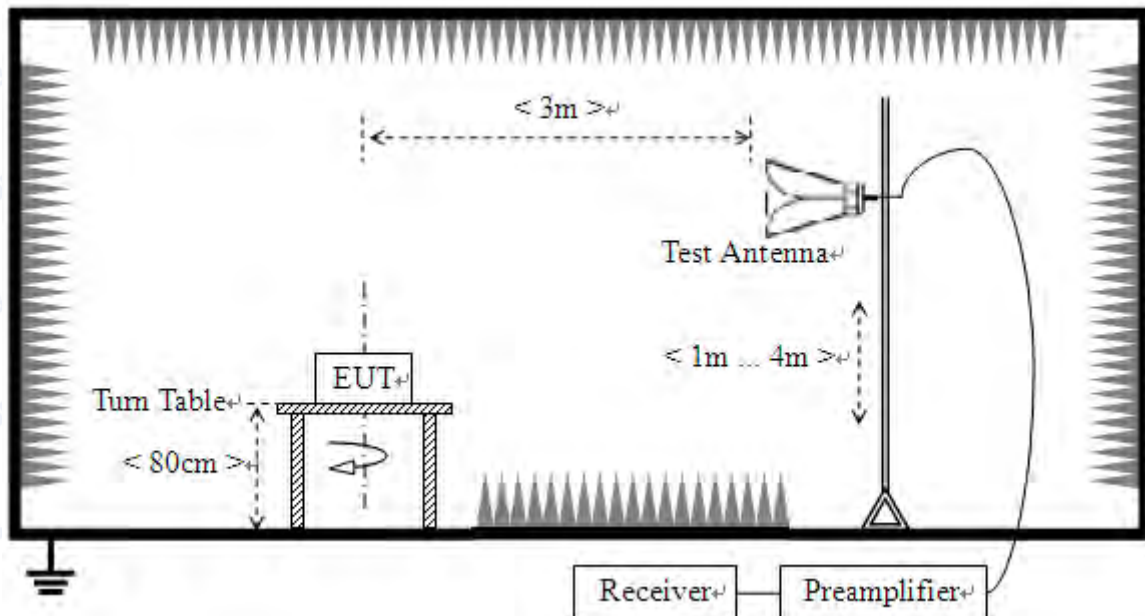
2.8 Restricted Frequency Bands

2.8.1 Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.8.2 Test Description

A. Test Setup:



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

For the Test Antenna:

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

**B. Equipments List:**

Please reference ANNEX A(1.4).

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:

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

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

AFactor: Antenna Factor at 3m

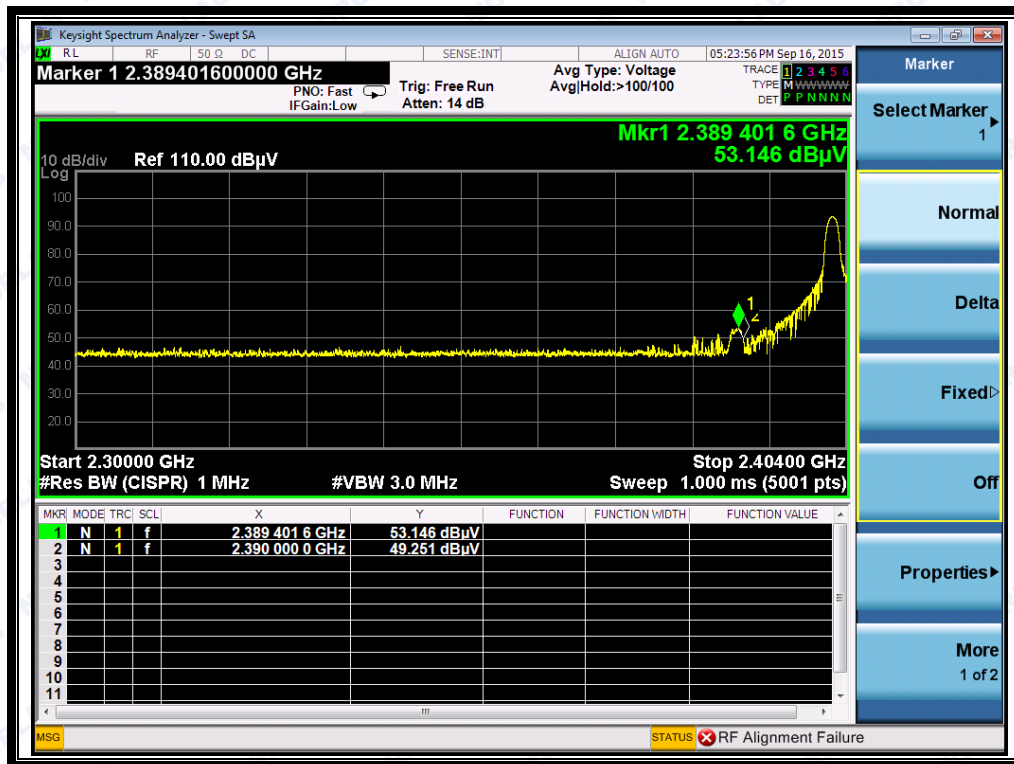
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

2.8.4.1 GFSK Mode**A. Test Verdict:**

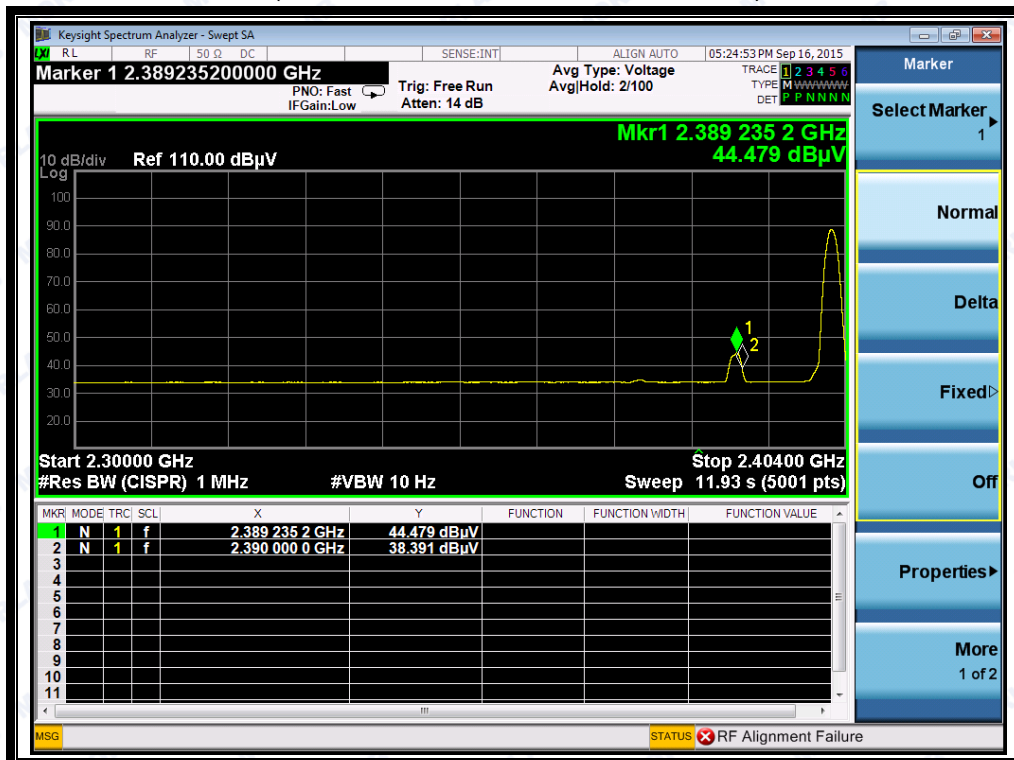
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
0	2389.40	PK	53.15	-33.63	32.56	52.08	74	Pass
0	2389.24	AV	44.48	-33.63	32.56	43.41	54	Pass
78	2483.80	PK	65.46	-33.18	32.5	64.78	74	Pass
78	2492.99	AV	44.88	-33.18	32.5	44.20	54	Pass



B. Test Plots:



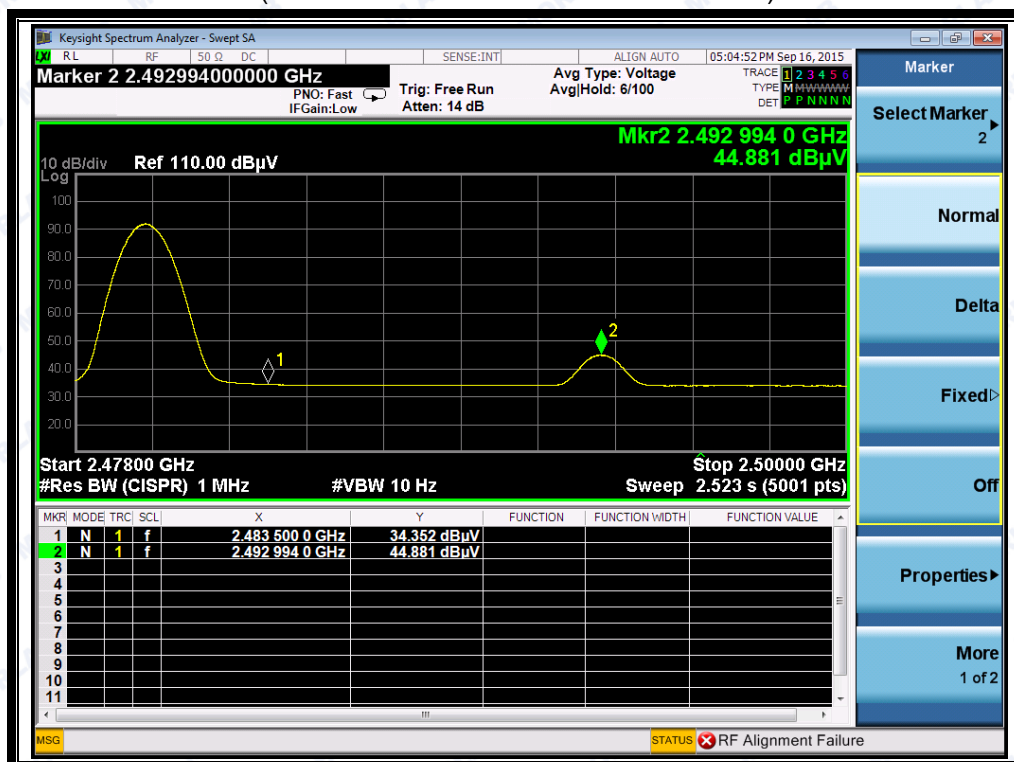
(Plot A1:Channel = 0 PEAK @ GFSK)



(Plot A2:Channel = 0 AVERAGE @ GFSK)



(Plot B1: Channel = 78 PEAK @ GFSK)



(Plot B2: Channel = 78 AVERAGE @ GFSK)

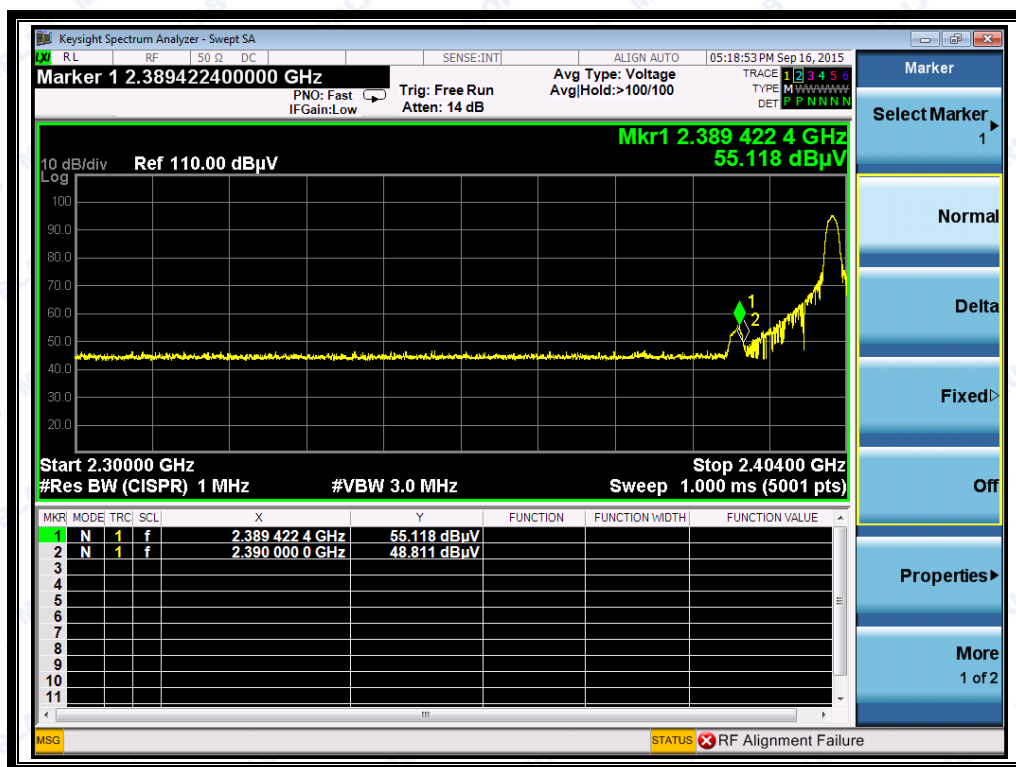


2.8.4.2 $\pi/4$ -DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
0	2389.42	PK	55.12	-33.63	32.56	54.05	74	Pass
0	2389.13	AV	45.82	-33.63	32.56	44.75	54	Pass
78	2483.63	PK	66.80	-33.18	32.5	66.12	74	Pass
78	2492.58	AV	47.36	-33.18	32.5	46.68	54	Pass

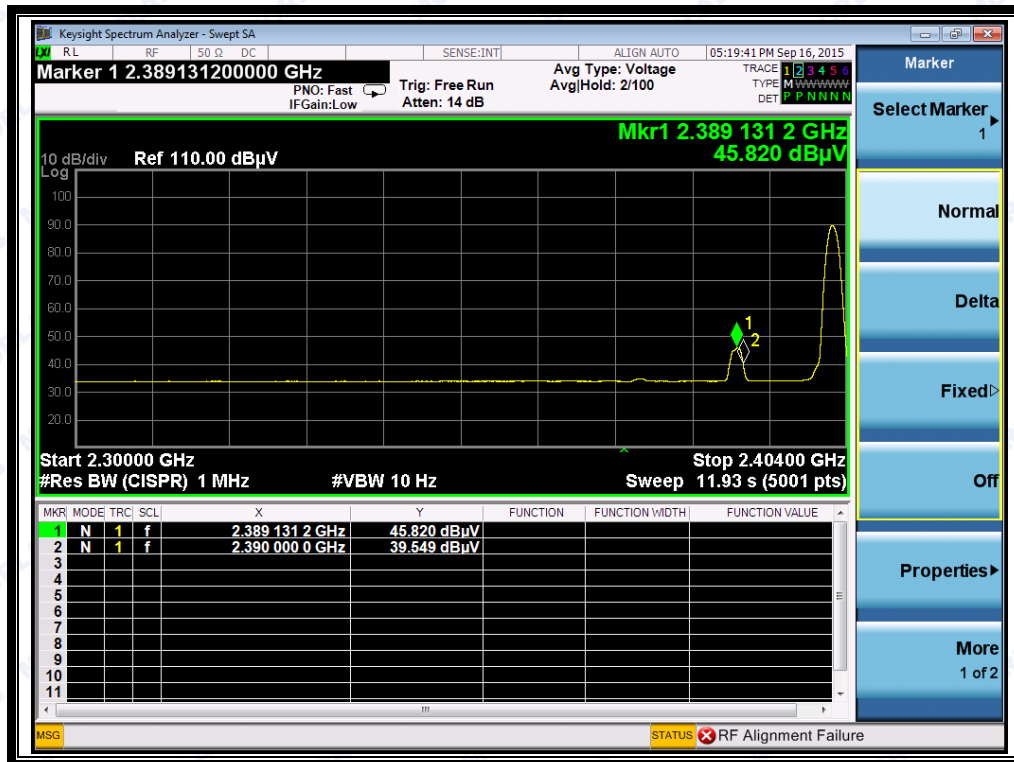
B. Test Plots:



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



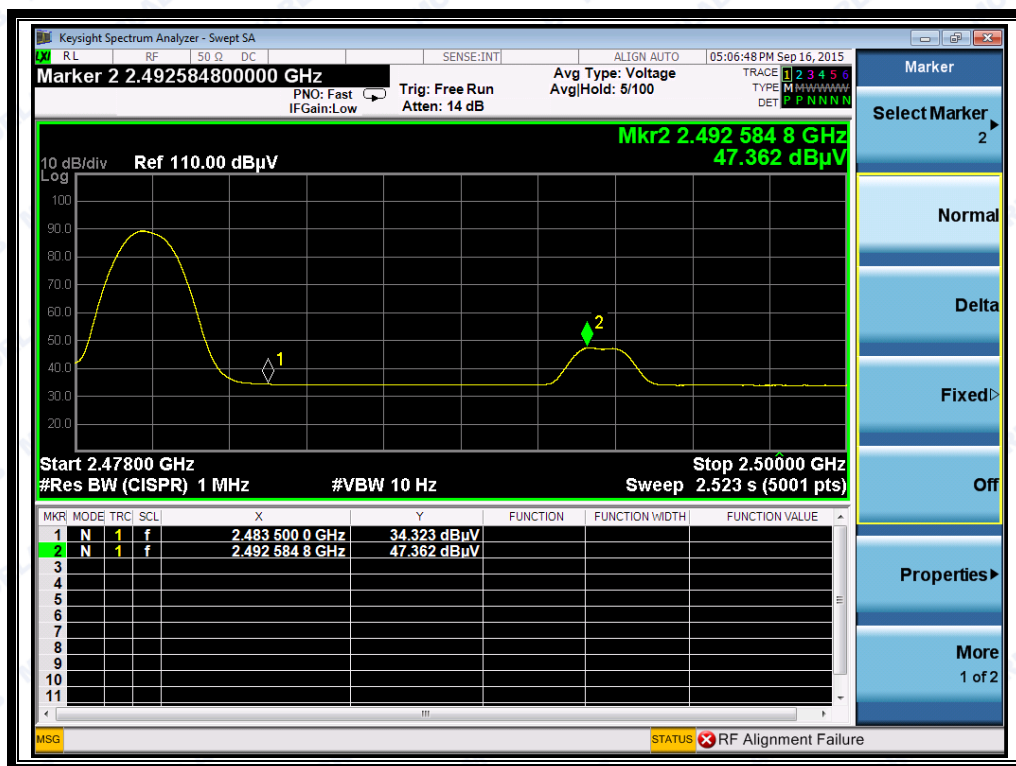
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(Plot C2: Channel = 0 AVERAGE @ $\pi/4$ -DQPSK)



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



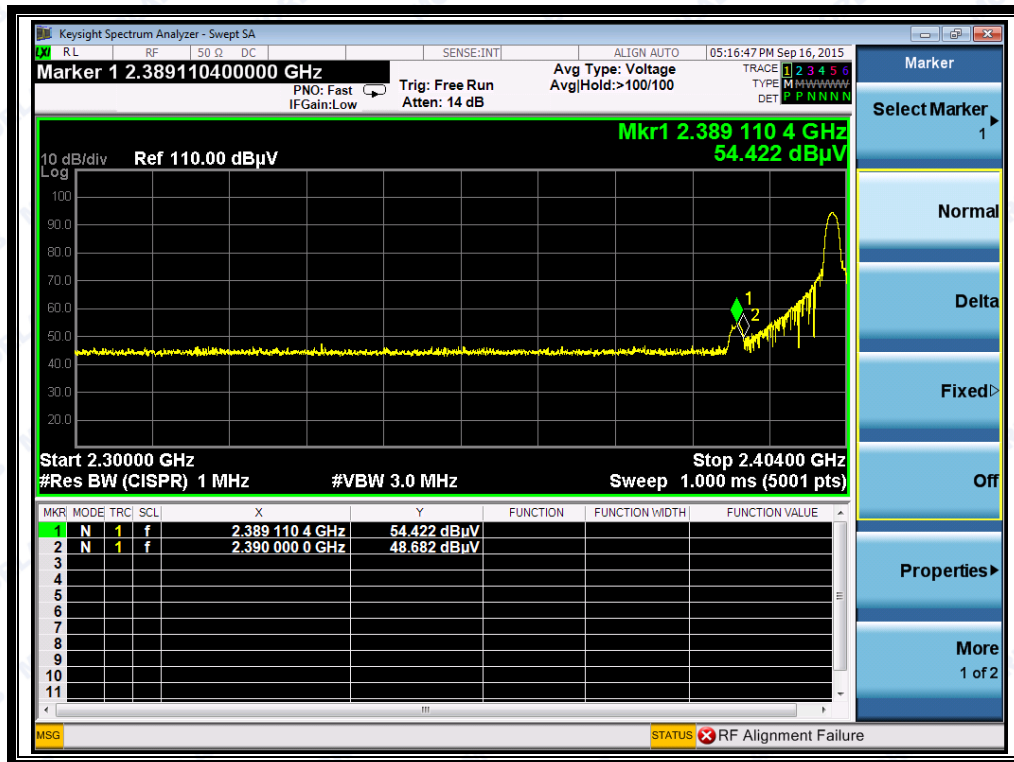
(Plot D2: Channel = 78 AVERAGE @ $\pi/4$ -DQPSK)

2.8.4.3 8-DPSK Mode

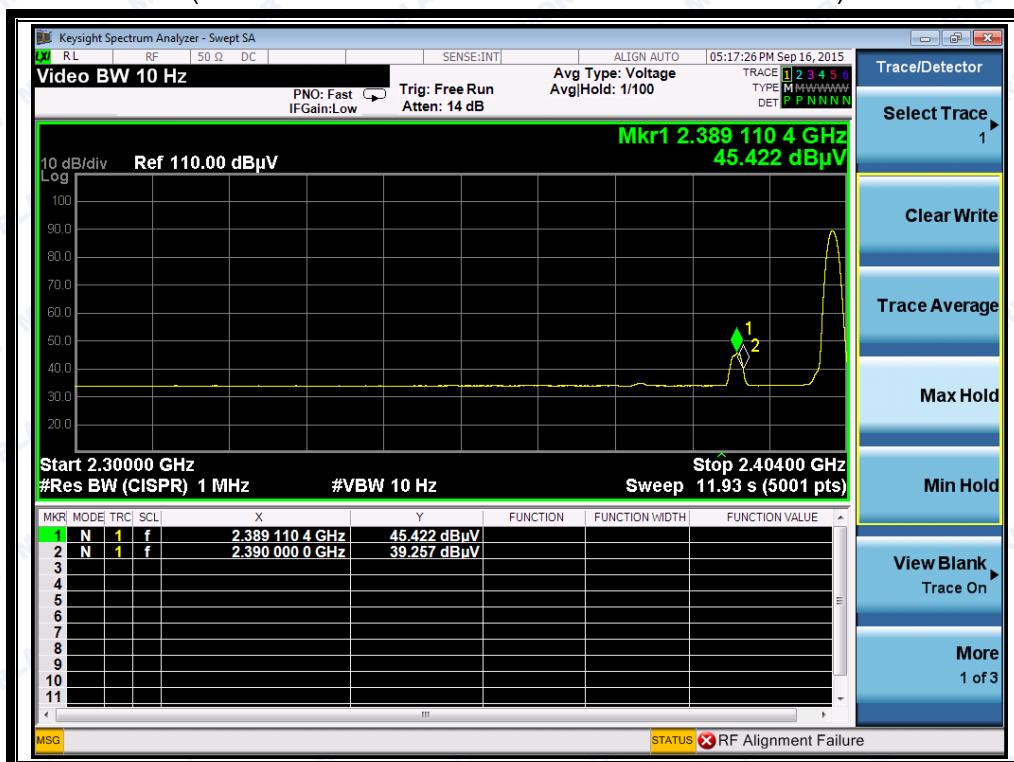
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2389.11	PK	54.42	-33.63	32.56	53.35	74	Pass
0	2389.11	AV	45.42	-33.63	32.56	44.35	54	Pass
78	2483.92	PK	64.78	-33.18	32.5	64.10	74	Pass
78	2492.70	AV	46.50	-33.18	32.5	45.82	54	Pass

B. Test Plots:



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



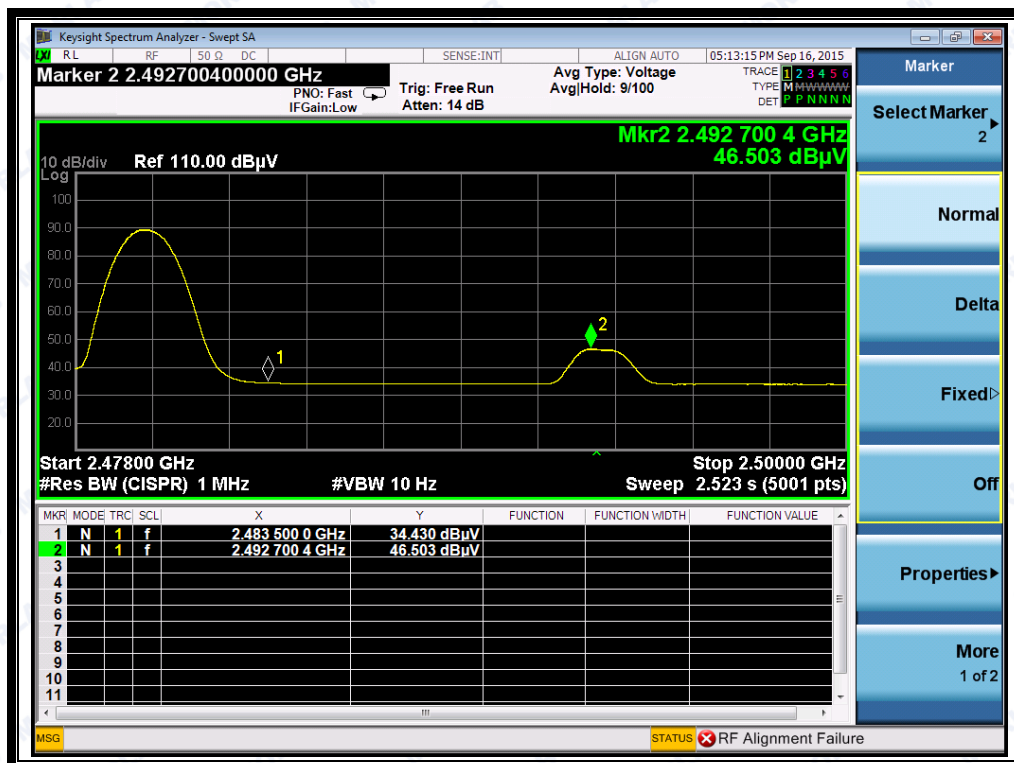
(Plot E2: Channel = 0 AVERAGE @ 8-DPSK Mode)



REPORT No.: SZ15080164W02



(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 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).

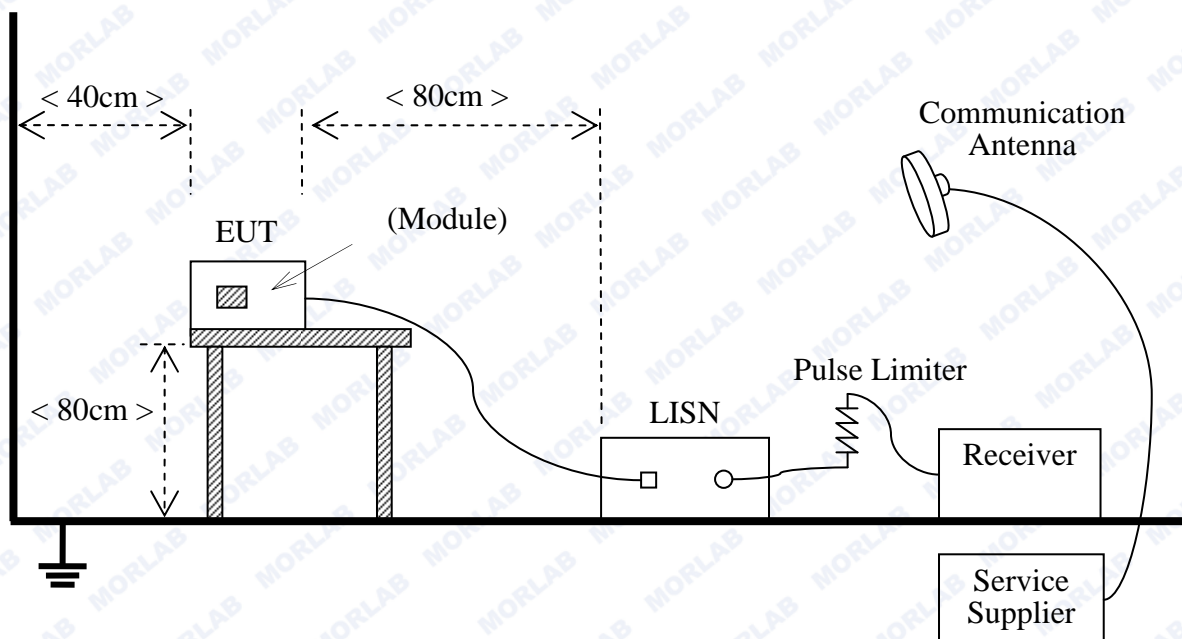
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

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).

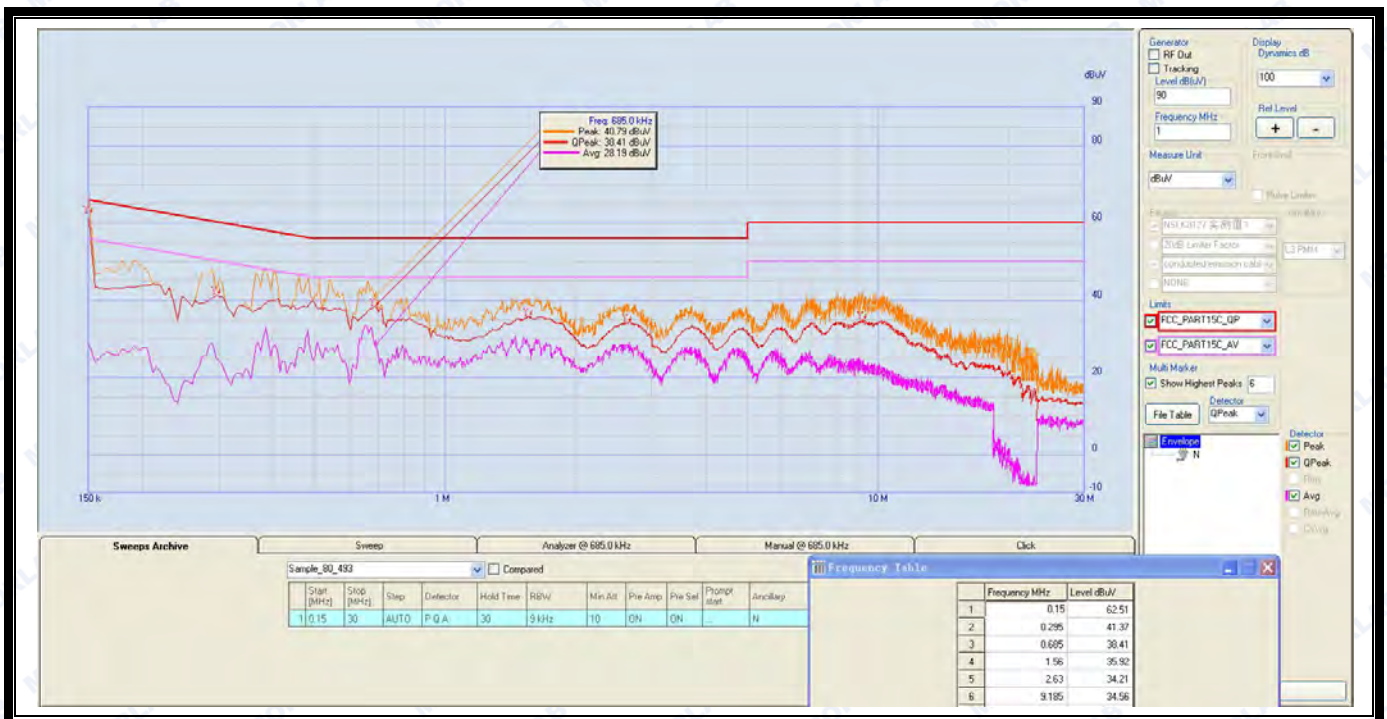
2.9.3 Test Result

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

A. Test setup:

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

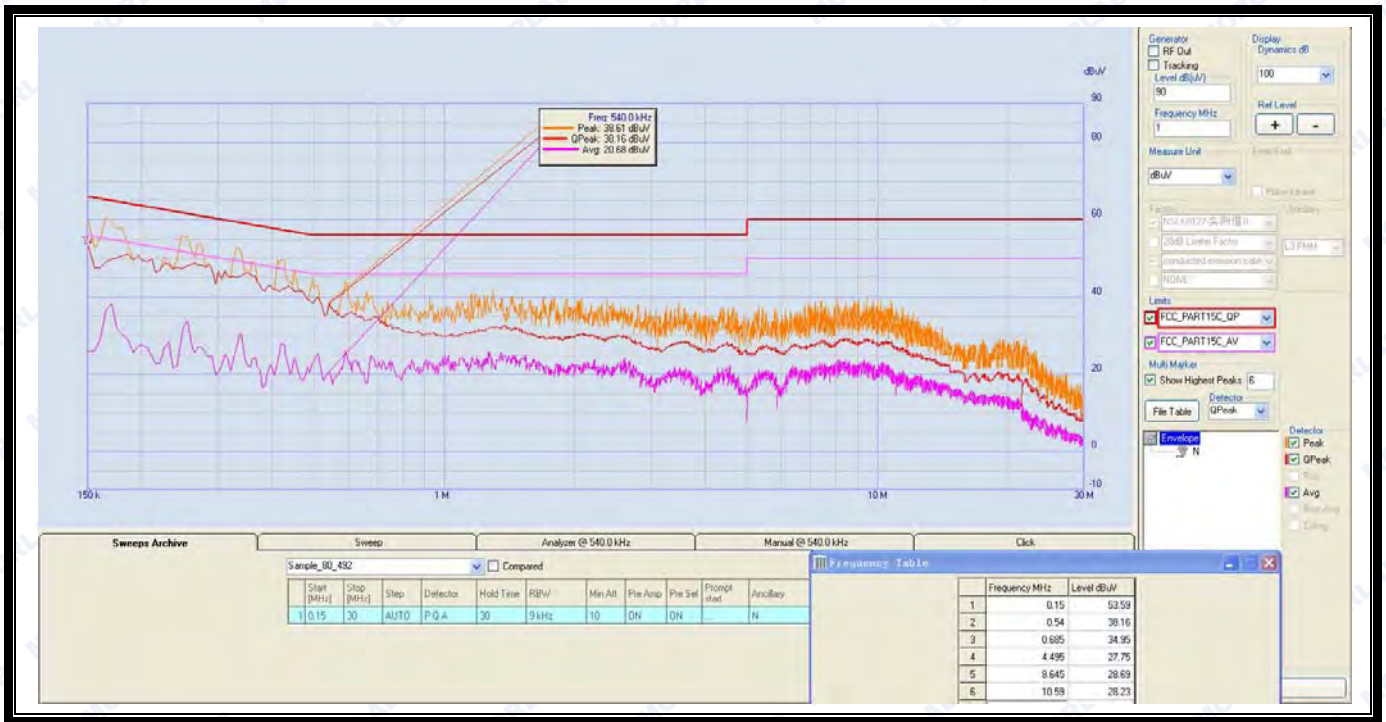
B. Test Plots:



(Plot A: L Phase)



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(Plot B: N Phase)



2.10 Radiated Emission

2.10.1 Requirement

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

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

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	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:

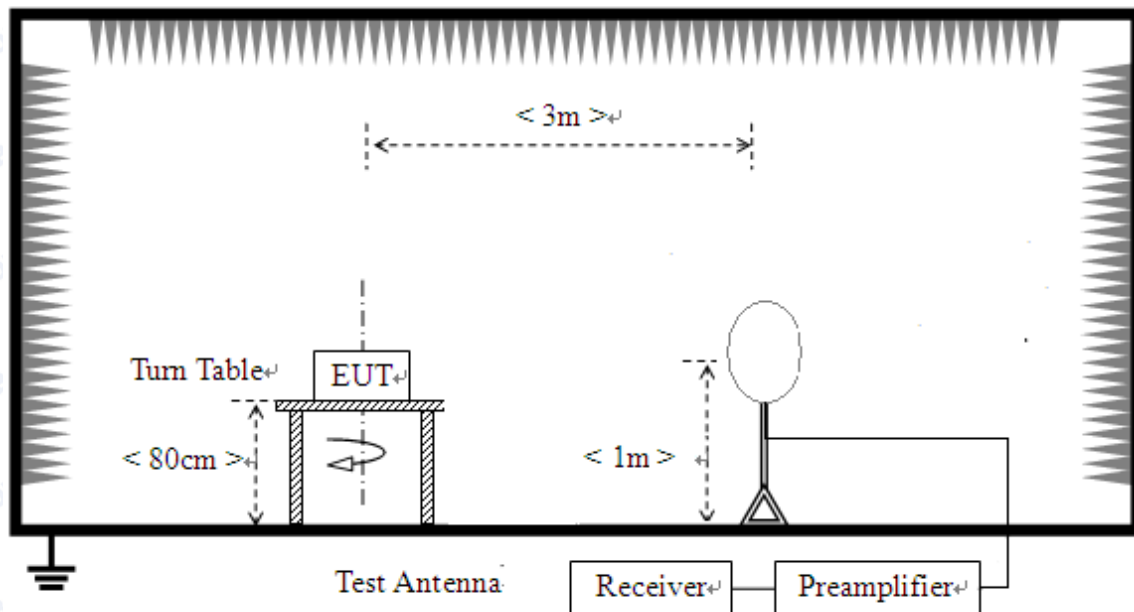
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength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

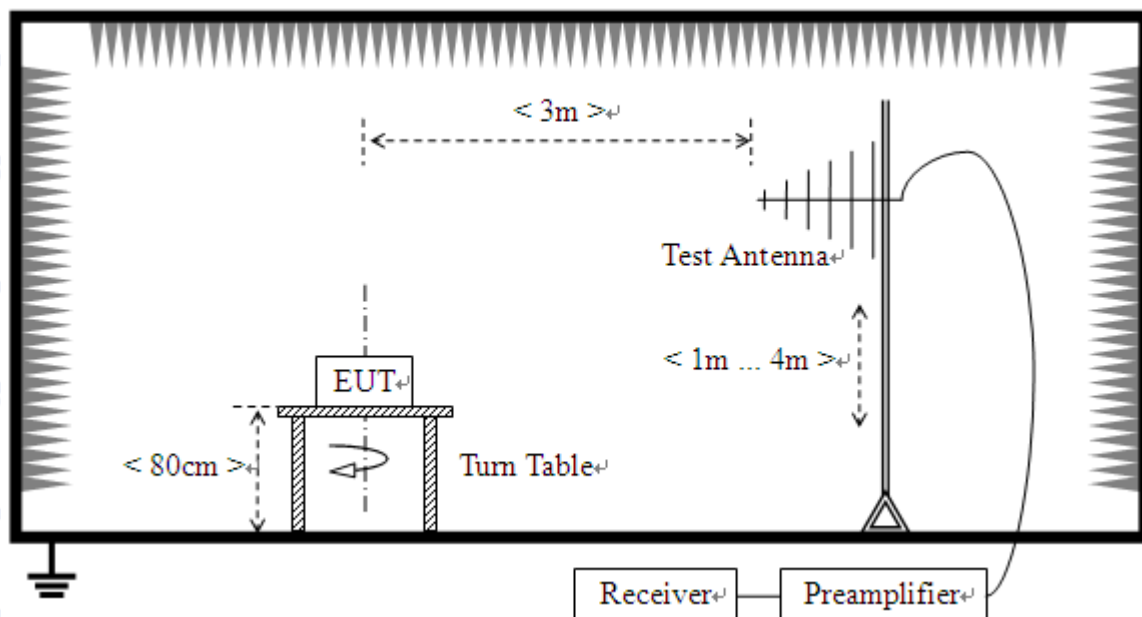
2.10.2 Test Description

A. Test Setup:

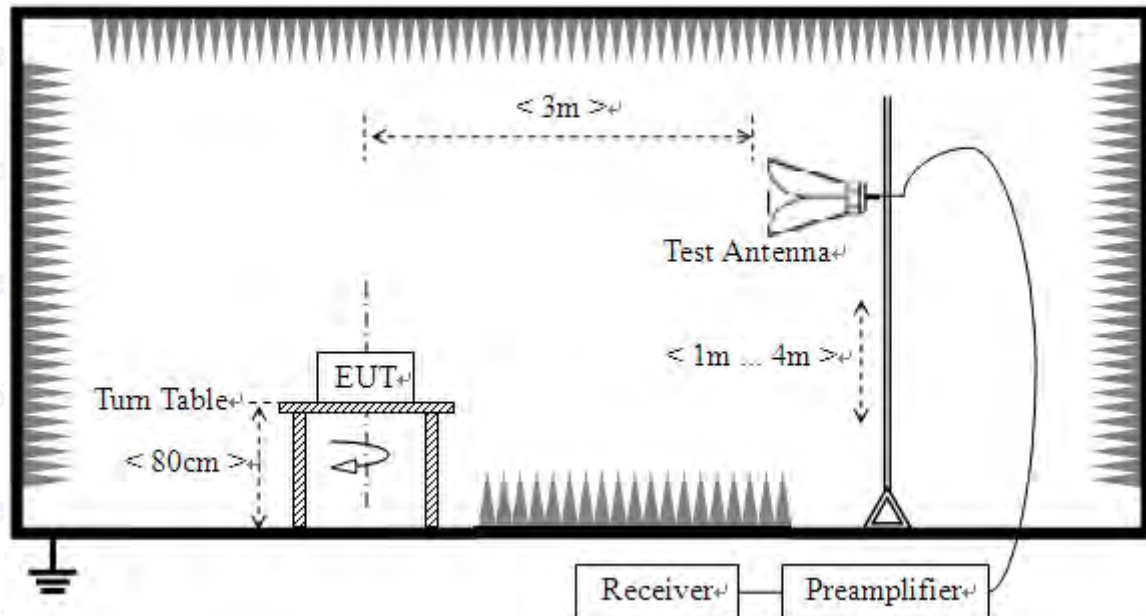
- 1) For radiated emissions from 9kHz to 30MHz



- 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.

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

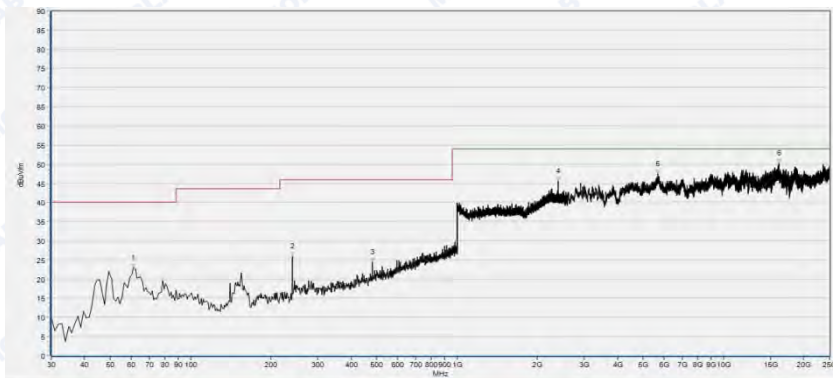
G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

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

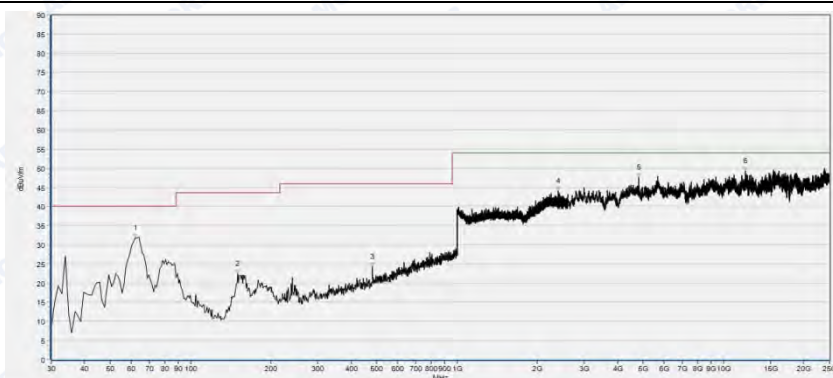
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

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
61.040	22.90	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	25.96	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	24.52	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2402.161	45.59	N.A	N.A	74.0	N.A	54.0	Horizontal	N.A
5679.542	47.37	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16132.060	50.21	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
62.010	31.85	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
150.280	22.44	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
481.050	24.24	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2401.521	44.04	N.A	N.A	74.0	N.A	54.0	Vertical	N.A
4803.746	47.55	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12107.474	49.23	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
62.010	22.30	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	21.43	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	27.26	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2271.549	47.68	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4616.367	46.06	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12193.017	48.84	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

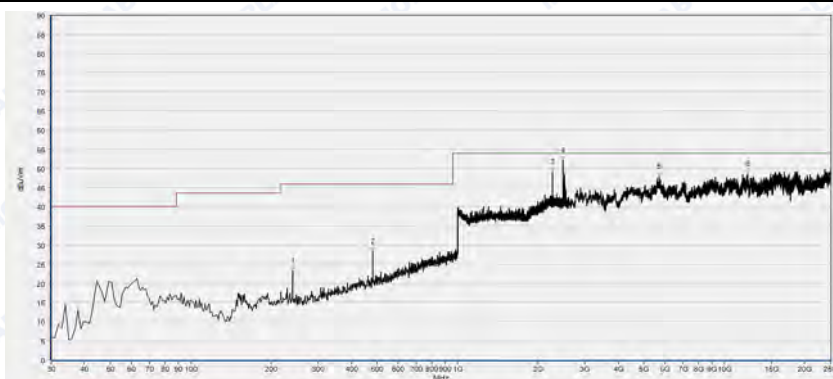


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
64.920	33.24	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
151.250	26.29	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
684.750	26.79	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2448.900	43.60	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5606.219	47.26	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12144.135	48.57	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

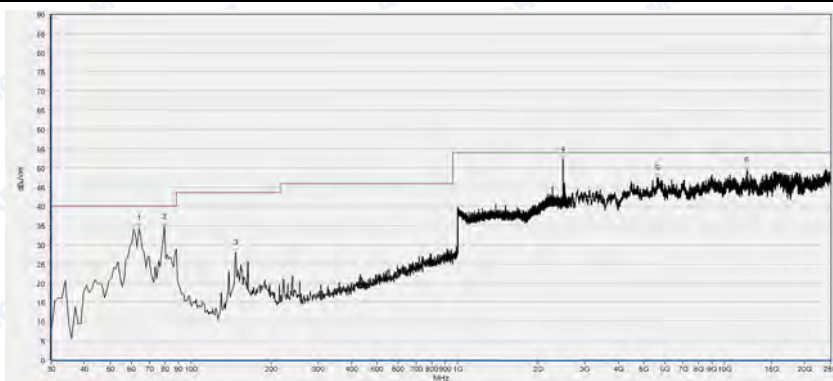


Plot for Channel = 78



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
240.490	23.35	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	28.36	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2272.189	49.14	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2479.632	52.13	N.A	N.A	74.0	N.A	54.0	Horizontal	N.A
5687.689	47.94	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12201.164	48.63	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

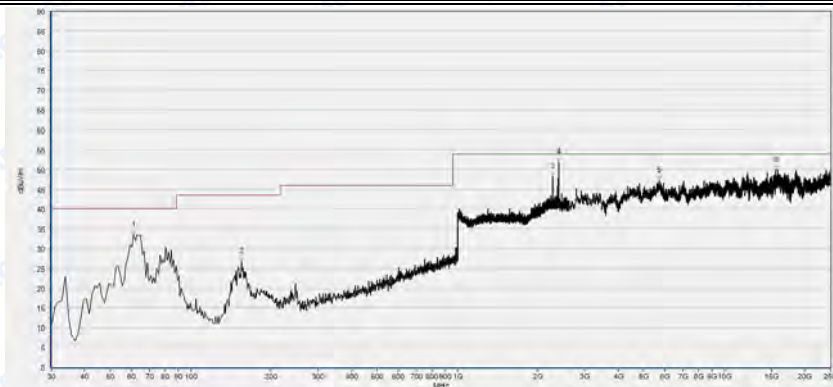


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
63.950	34.34	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
79.470	34.68	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
147.370	27.98	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2479.632	52.31	N.A	N.A	74.0	N.A	54.0	Vertical	N.A
5602.146	47.47	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12180.797	49.39	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:****B. Test Plots for the Whole Measurement Frequency Range:**Plots for Channel = 0

Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
62.010	21.65	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	26.14	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2276.030	49.60	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2402.161	44.87	N.A	N.A	74.0	N.A	54.0	Horizontal	N.A
5646.954	47.65	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11740.862	48.57	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

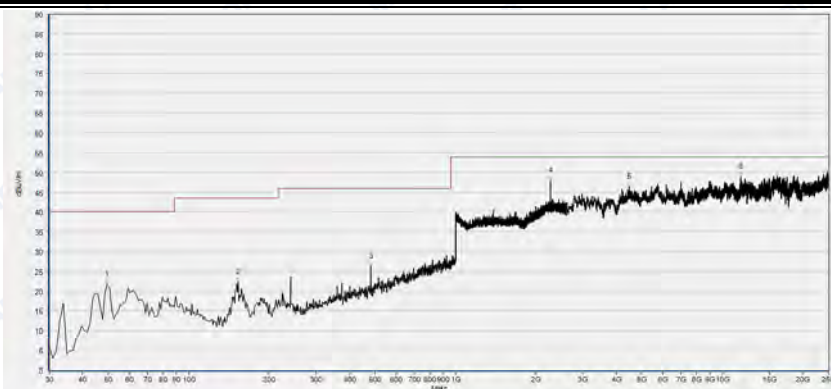
(30MHz to 25GHz, Antenna Horizontal @ $\pi/4$ -DQPSK, channel 0)

Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
61.040	33.48	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
155.130	26.80	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2276.030	48.26	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2401.521	51.92	N.A	N.A	74.0	N.A	54.0	Vertical	N.A
5683.615	47.35	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15602.510	49.87	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
49.400	21.58	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
153.190	22.28	N.A	N.A	N.A	43.50	N.A	Horizontal	PASS
481.050	26.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2275.390	47.92	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
4469.722	46.50	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11740.862	48.99	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

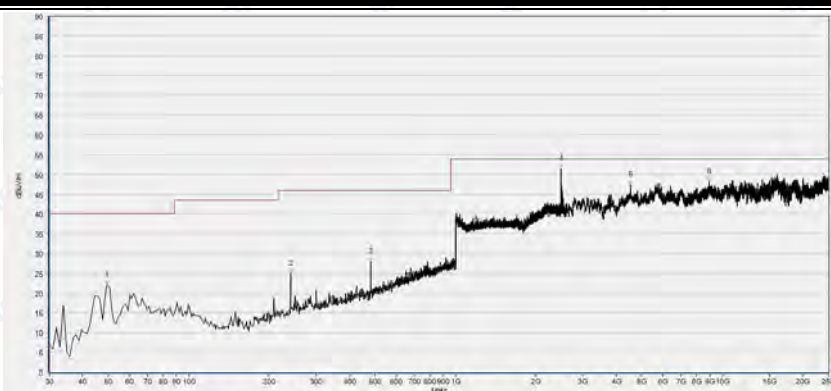


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
64.920	34.79	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
84.320	29.65	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
154.160	25.13	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2276.671	45.05	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5614.366	47.42	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
18535.406	50.13	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

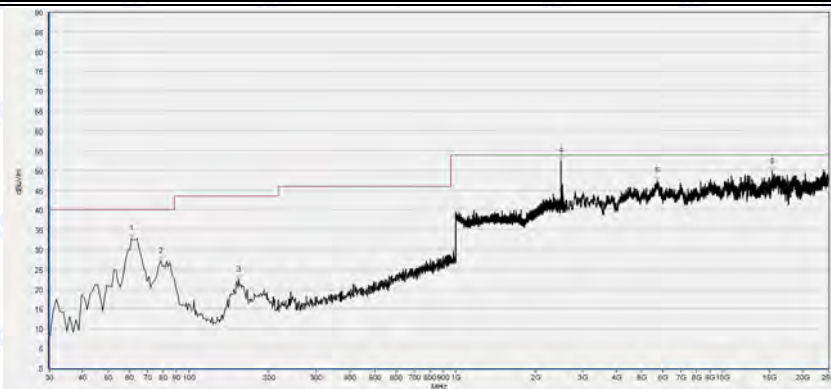
(30MHz to 25GHz, Antenna Vertical @ $\pi/4$ -DQPSK, channel 39)



Plot for Channel = 78

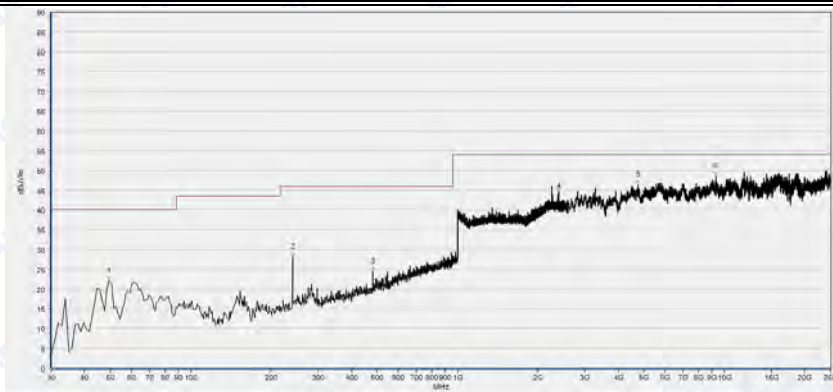


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	22.04	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	25.01	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	27.92	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2479.632	51.48	N.A	N.A	74.0	N.A	54.0	Horizontal	N.A
4534.897	47.44	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
8905.728	48.27	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

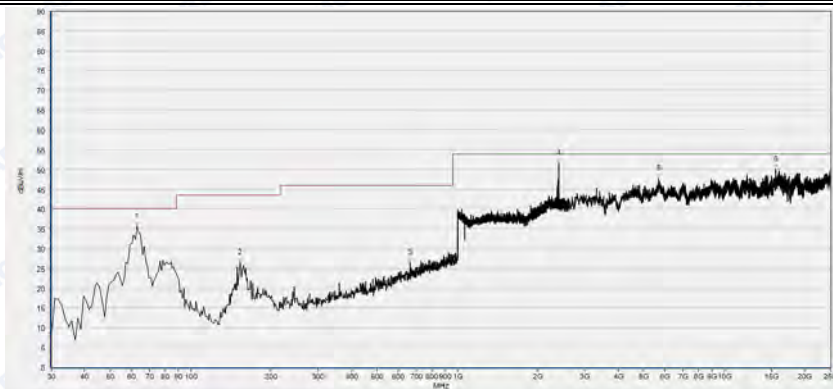
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
61.040	32.87	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
78.500	27.13	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
154.160	22.41	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
2479.632	52.47	N.A	N.A	74.0	N.A	54.0	Vertical	N.A
5703.983	47.38	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15431.424	49.84	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:****C. Test Plots for the Whole Measurement Frequency Range:**Plots for Channel = 0

Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	22.11	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	28.10	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	24.48	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2402.161	44.82	N.A	N.A	74.0	N.A	54.0	Horizontal	N.A
4763.011	46.42	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
9325.296	48.52	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

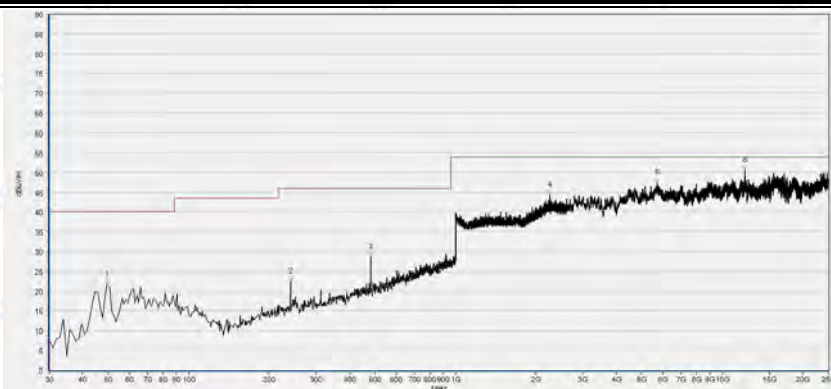


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
62.980	35.78	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
153.190	26.52	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
665.350	26.55	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2401.521	51.55	N.A	N.A	74.0	N.A	54.0	Vertical	N.A
5671.395	47.74	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15614.730	50.19	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

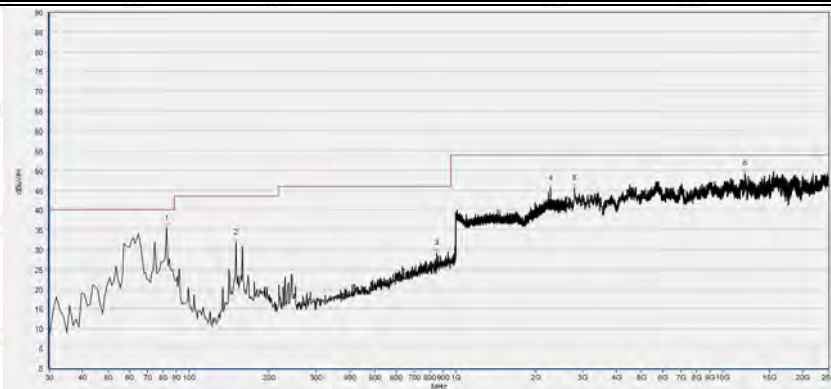


Plot for Channel = 39



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	21.59	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	22.48	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	28.71	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2261.945	44.45	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5708.056	47.51	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12140.062	50.53	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

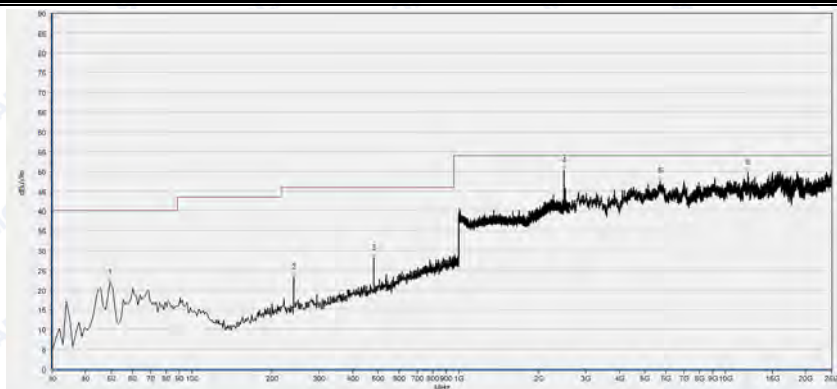


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
82.380	35.49	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
150.280	31.76	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
849.650	29.19	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2270.268	45.52	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2795.526	45.60	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12184.870	49.23	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

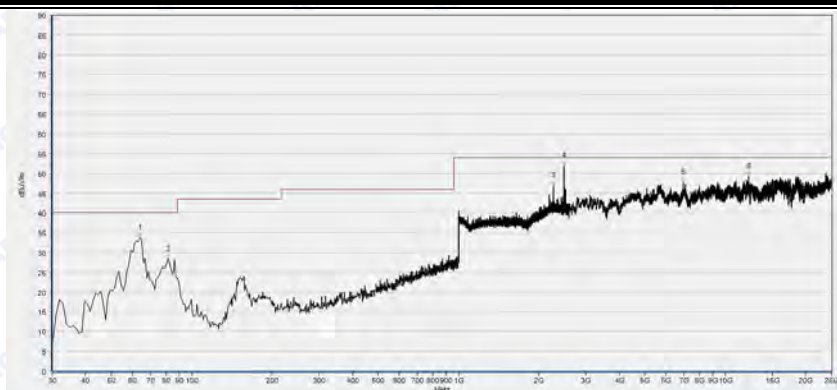


Plot for Channel = 78



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
49.400	22.02	N.A	N.A	N.A	40.00	N.A	Horizontal	PASS
240.490	23.34	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
481.050	28.15	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2479.632	50.23	N.A	N.A	74.0	N.A	54.0	Horizontal	N.A
5687.689	47.58	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12131.915	49.83	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
63.950	33.62	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
81.410	28.35	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
2270.908	46.94	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2479.632	51.92	N.A	N.A	74.0	N.A	54.0	Vertical	N.A
6966.758	47.83	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12201.164	49.31	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

2.11.1 Requirement

According to § 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of Commission's guideline.

2.11.2 Result

Please refer to SAR report.



ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

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

1.2 Identification of the Responsible Testing Location

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

1.3 Facilities and Accreditations

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

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10: 2013, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.



REPORT No.: SZ15080164W02

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



REPORT No.: SZ15080164W02

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

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 *****