



REPORT No. : SZ14090081W01

# FCC RF TEST REPORT

**APPLICANT** : Mediabridge Products, LLC

**PRODUCT NAME** : Portable Bluetooth Speaker

**MODEL NAME** : BTS-1B

**TRADE NAME** : N/A

**BRAND NAME** : MEDIABRIDGE

**FCC ID** : 2AC32BTS-1B

**STANDARD(S)** : 47 CFR Part 15 Subpart C

**ISSUE DATE** : 2014-10-22



**SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.**

NOTE: This document is issued by MORLAB, the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.

**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



## DIRECTORY

<b>TEST REPORT DECLARATION</b>	<b>5</b>
<b>1. TECHNICAL INFORMATION</b>	<b>6</b>
1.1. APPLICANT INFORMATION	6
1.2. EQUIPMENT UNDER TEST (EUT) DESCRIPTION	6
1.2.1. IDENTIFICATION OF ALL USED EUTS	6
1.3. TEST STANDARDS AND RESULTS	7
1.3.1. TEST ENVIRONMENT CONDITIONS	7
<b>2. 47 CFR PART 15C REQUIREMENTS</b>	<b>8</b>
2.1. ANTENNA REQUIREMENT	8
2.1.1. APPLICABLE STANDARD	8
2.1.2. RESULT: COMPLIANT	8
2.2. NUMBER OF HOPPING FREQUENCY	8
2.2.1. REQUIREMENT	8
2.2.2. TEST DESCRIPTION	8
2.2.3. TEST PROCEDURE	9
2.2.4. TEST RESULT	9
2.3. PEAK OUTPUT POWER	14
2.3.1. REQUIREMENT	14
2.3.2. TEST DESCRIPTION	14
2.3.3. TEST RESULT	14
2.3.3.1. GFSK MODE	15
2.3.3.2. $\Pi/4$ -DQPSK MODE	15
2.3.3.3. 8-DPSK MODE	15
2.4. 20dB BANDWIDTH	16
2.4.1. DEFINITION	16
2.4.2. TEST DESCRIPTION	16
2.4.3. TEST PROCEDURE	16
2.4.4. TEST RESULT	17
2.4.4.1. GFSK MODE	17
2.4.4.2. $\Pi/4$ -DQPSK MODE	19
2.4.4.3. 8-DPSK MODE	21



<b>2.5. CARRIED FREQUENCY SEPARATION .....</b>	<b>23</b>
2.5.1. DEFINITION .....	23
2.5.2. TEST DESCRIPTION .....	23
2.5.3. TEST PROCEDURE .....	23
2.5.4. TEST RESULT .....	24
<b>2.6. TIME OF OCCUPANCY (DWELL TIME).....</b>	<b>26</b>
2.6.1. REQUIREMENT .....	26
2.6.2. TEST DESCRIPTION .....	26
2.6.3. TEST PROCEDURE .....	26
2.6.4. TEST RESULT .....	27
2.6.4.1. GFSK MODE .....	27
2.6.4.2. $\Pi/4$ -DQPSK MODE .....	31
2.6.4.3. 8-DPSK MODE .....	34
<b>2.7. CONDUCTED SPURIOUS EMISSIONS .....</b>	<b>38</b>
2.7.1. REQUIREMENT .....	38
2.7.2. TEST DESCRIPTION .....	38
2.7.3. TEST PROCEDURE .....	38
2.7.4. TEST RESULT .....	39
2.7.4.1. GFSK MODE .....	39
2.7.4.2. $\Pi/4$ -DQPSK MODE .....	43
2.7.4.3. 8-DPSK MODE .....	47
<b>2.8. RESTRICTED FREQUENCY BANDS .....</b>	<b>52</b>
2.8.1. REQUIREMENT .....	52
2.8.2. TEST DESCRIPTION .....	52
2.8.3. TEST PROCEDURE .....	53
2.8.4. TEST RESULT .....	53
2.8.4.1. GFSK MODE .....	53
2.8.4.2. $\Pi/4$ -DQPSK MODE .....	56
2.8.4.3. 8-DPSK MODE .....	59
<b>2.9. CONDUCTED EMISSION.....</b>	<b>62</b>
2.9.1. REQUIREMENT .....	62
2.9.2. TEST DESCRIPTION .....	62
2.9.3. TEST RESULT .....	63
<b>2.10. RADIATED EMISSION.....</b>	<b>65</b>
2.10.1. REQUIREMENT .....	65
2.10.2. TEST DESCRIPTION .....	65
2.10.3. TEST PROCEDURE .....	68
2.10.4. TEST RESULT .....	68





2.10.4.1. GFSK MODE: .....	69
2.10.4.2. $\Pi/4$ -DQPSK MODE: .....	72
2.10.4.3. 8-DPSK MODE: .....	75
<b>2.11. RF EXPOSURE EVALUATION .....</b>	<b>78</b>
2.11.1. LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE .....	78
2.11.1.1. TEST RESULT .....	79
2.11.2. CONCLUSION .....	79

**ANNEX A    GENERAL INFORMATION .....80**

<b>1.1 IDENTIFICATION OF THE RESPONSIBLE TESTING LABORATORY .....</b>	<b>80</b>
<b>1.2 IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION.....</b>	<b>80</b>
<b>1.3 FACILITIES AND ACCREDITATIONS.....</b>	<b>80</b>
<b>1.4 TEST EQUIPMENTS UTILIZED .....</b>	<b>81</b>
1.4.1 CONDUCTED TEST EQUIPMENTS .....	81
1.4.2 CONDUCTED EMISSION TEST EQUIPMENTS.....	81
1.4.3 RADIATED TEST EQUIPMENTS.....	81
1.4.4 CLIMATE CHAMBER.....	82
1.4.5 VIBRATION TABLE.....	82
1.4.6 ANECHOIC CHAMBER .....	82

Change History		
Issue	Date	Reason for change
1.0	2014-10-22	First edition



REPORT No. : SZ14090081W01

### Test Report Declaration

Applicant	Mediabridge Products, LLC
Applicant Address	1951 Old Cuthbert Rd, Suite 301 Cherry Hill, NJ, USA 08034
Manufacturer	Mediabridge Products, LLC
Manufacturer Address	1951 Old Cuthbert Rd, Suite 301 Cherry Hill, NJ, USA 08034
Product Name	Portable Bluetooth Speaker
Model Name	BTS-1B
Brand Name	MEDIABRIDGE
HW Version	N/A
SW Version	N/A
Test Standards	47 CFR Part 15 Subpart C
Test Date	2014-09-22 to 2014-10-14
Test Result	PASS

Tested by : Nie Quan  
Nie Quan

Reviewed by : Qiu Xiaojun  
Qiu Xiaojun

Approved by : Zeng Dexin  
Zeng Dexin





# 1. Technical Information

Note: Provide by applicant.

## 1.1. Applicant Information

Company:	Mediabridge Products, LLC
Address:	1951 Old Cuthbert Rd, Suite 301 Cherry Hill, NJ, USA 08034

## 1.2. Equipment under Test (EUT) Description

Brand Name:	MEDIABRIDGE
Trade Name:	N/A
Model Name:	BTS-1B
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+EDR
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi

### NOTE:

The EUT is Portable Bluetooth Speaker, 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	N/A	N/A

### 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	Result
1	15.203	Antenna Requirement	<b><u>PASS</u></b>
2	15.247(a)	Number of Hopping Frequency	<b><u>PASS</u></b>
3	15.247(b)	Peak Output Power	<b><u>PASS</u></b>
4	15.247(a)	20dB Bandwidth	<b><u>PASS</u></b>
5	15.247(a)	Carrier Frequency Separation	<b><u>PASS</u></b>
6	15.247(a)	Time of Occupancy (Dwell time)	<b><u>PASS</u></b>
7	15.247(d)	Conducted Spurious Emission	<b><u>PASS</u></b>
8	15.247(d)	Restricted Frequency Bands	<b><u>PASS</u></b>
9	15.207	Conducted Emission	<b><u>PASS</u></b>
10	15.209 15.247(d)	Radiated Emission	<b><u>PASS</u></b>
11	15.247(i), 1.1307& 2.1091	RF exposure evaluation	<b><u>PASS</u></b>

**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.

#### 1.3.1. 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**

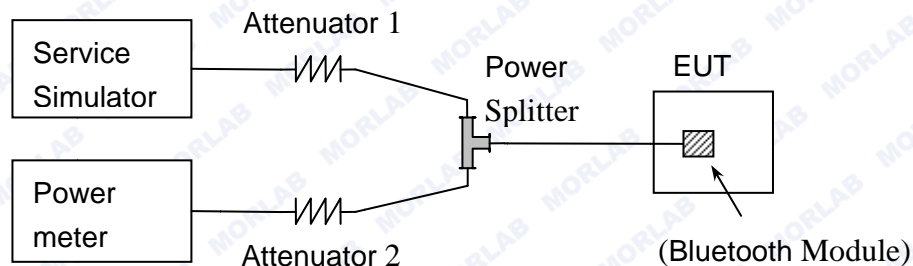
#### **2.2.1. Requirement**

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, which is powered by the Battery, 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.

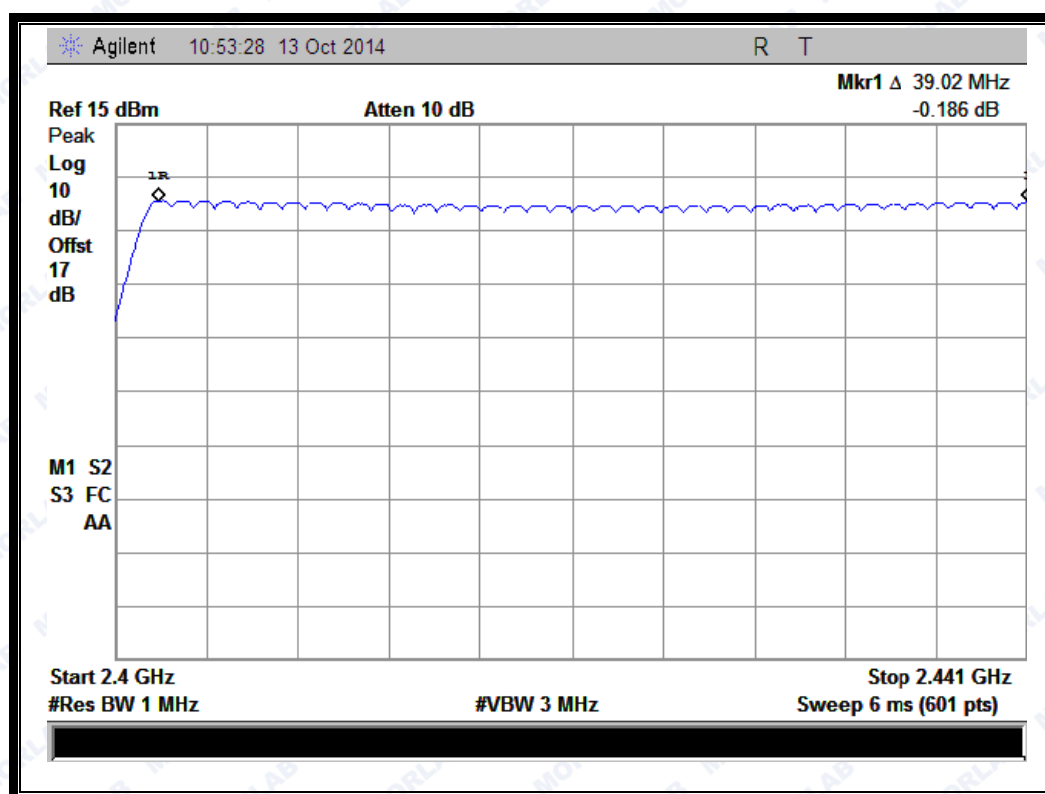


REPORT No. : SZ14090081W01

**A. Test Verdict:**

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

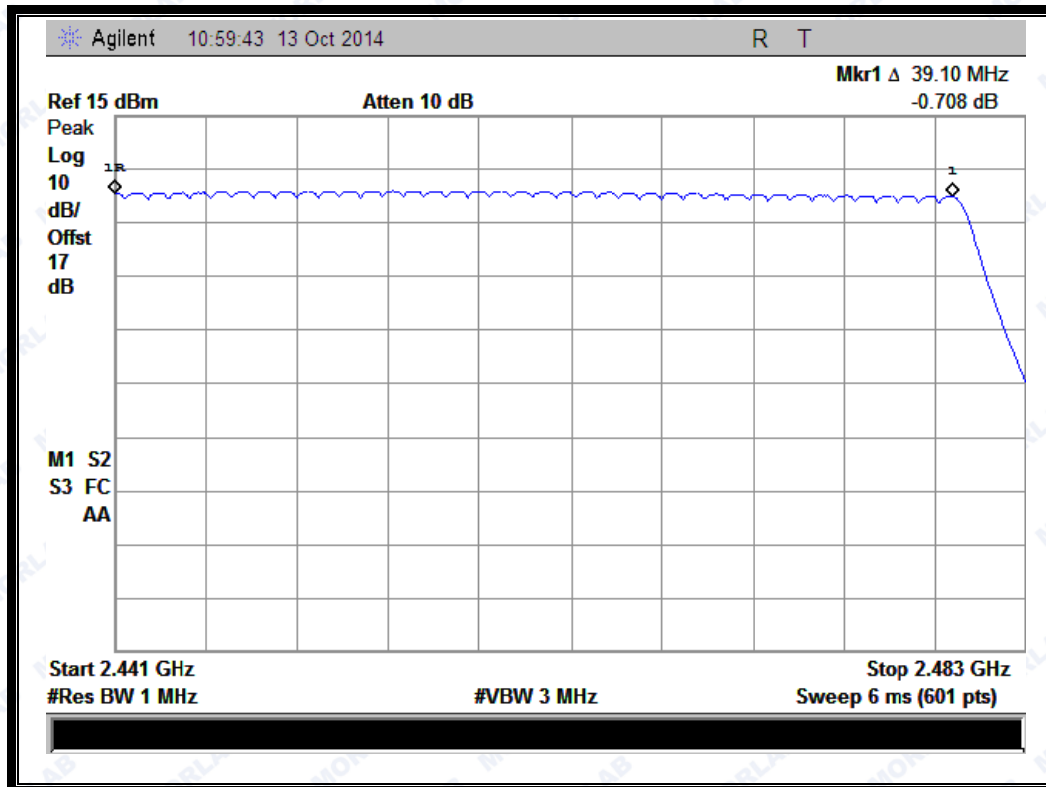
**B. Test Plots:**



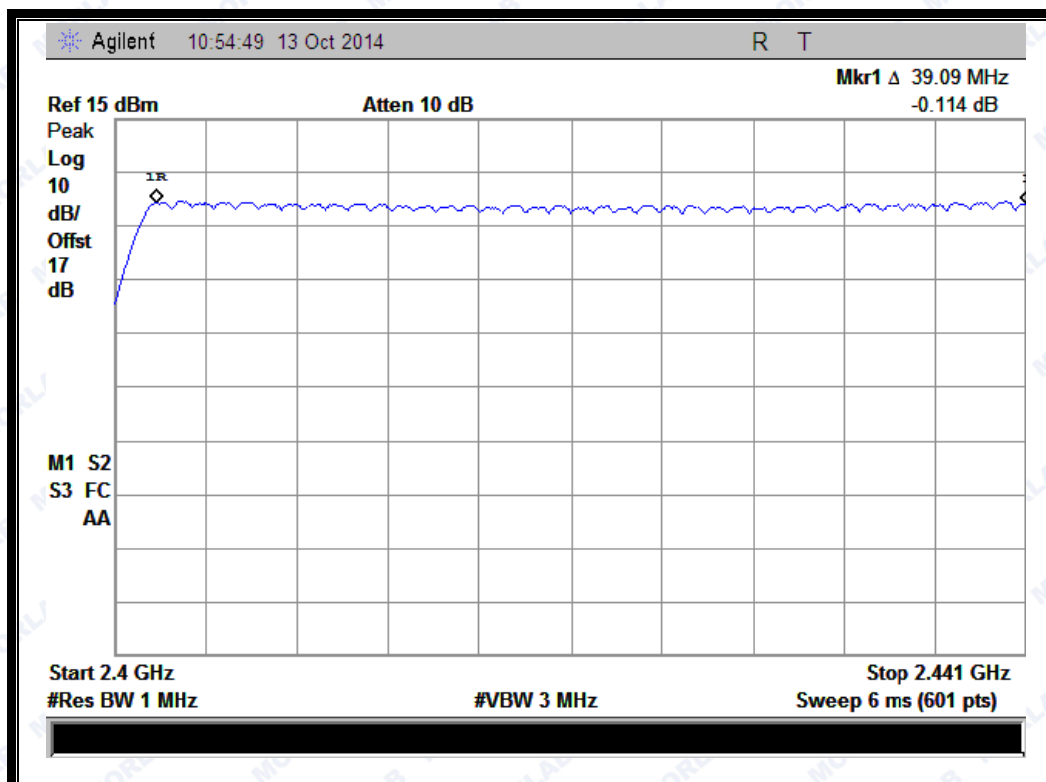




REPORT No. : SZ14090081W01

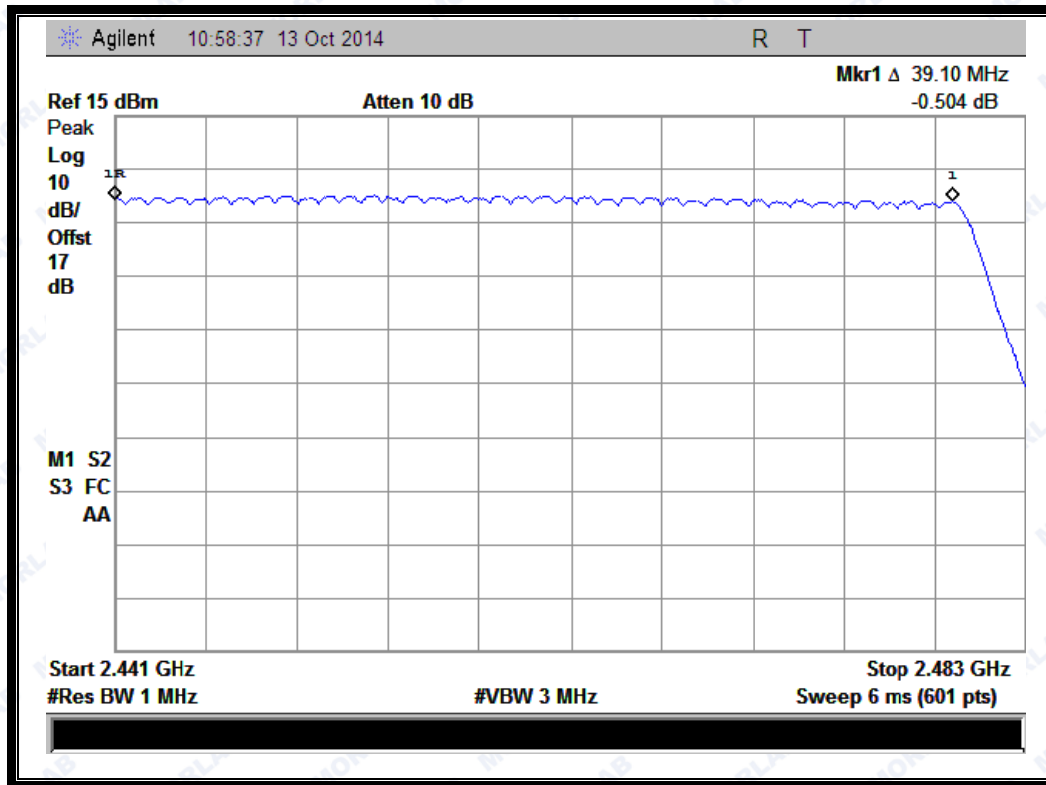


(Plot A: GFSK)





REPORT No. : SZ14090081W01

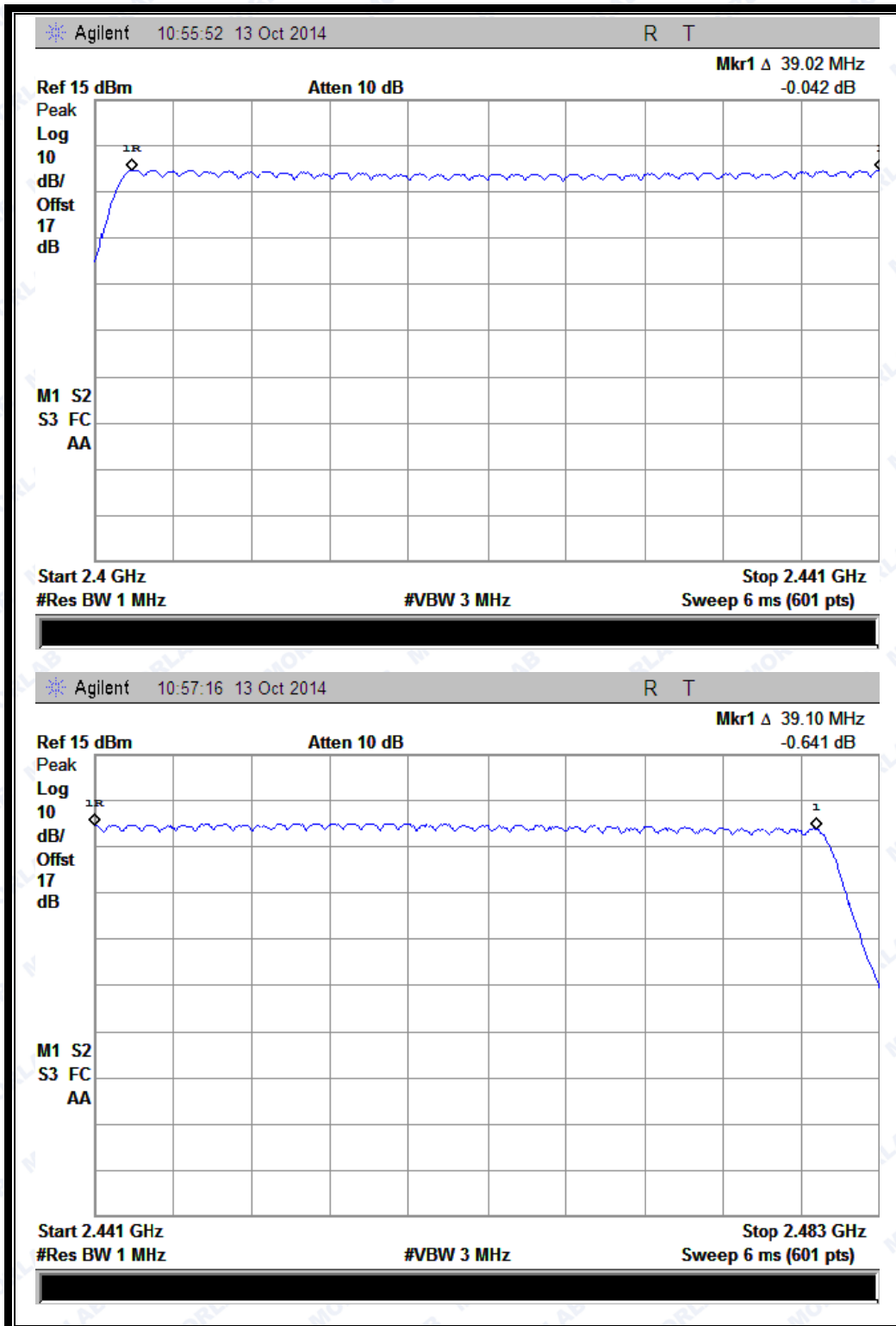


(Plot B: 1/4-DQPSK)





REPORT No. : SZ14090081W01



(Plot C: 8- DPSK)

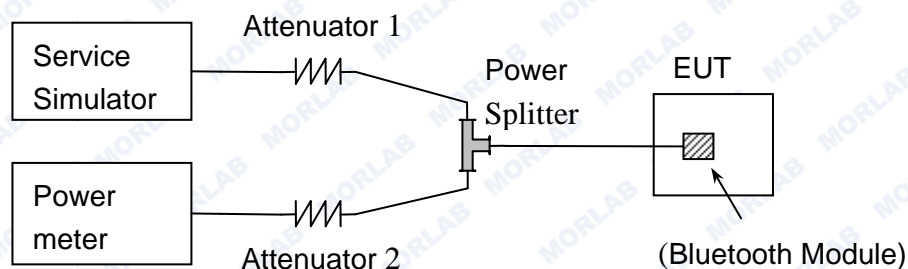
## 2.3. Peak Output Power

### 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, which is powered by the Battery, 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	0.839	0.001213	20.97	0.125	PASS
39	2441	0.693	0.001173			PASS
78	2480	-0.18	0.000960			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	-0.079	0.000982	20.97	0.125	PASS
39	2441	-0.123	0.000972			PASS
78	2480	-0.906	0.000810			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	0.145	0.001034	20.97	0.125	PASS
39	2441	0.023	0.001005			PASS
78	2480	-0.744	0.000840			PASS

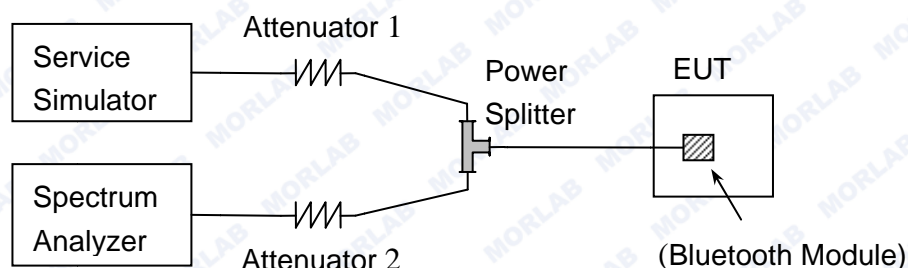
## 2.4. 20dB Bandwidth

### 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, which is powered by the Battery, 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

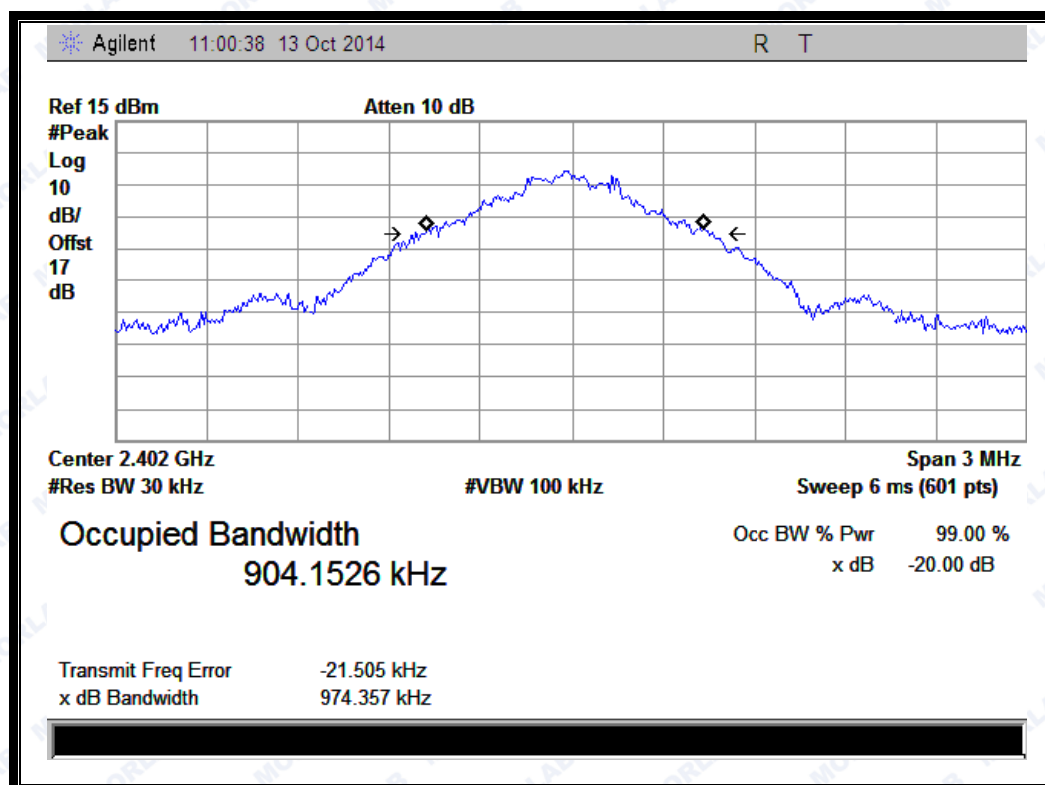
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

### 2.4.4.1. GFSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	0.9744	Plot A
39	2441	0.9858	Plot B
78	2480	0.9757	Plot C

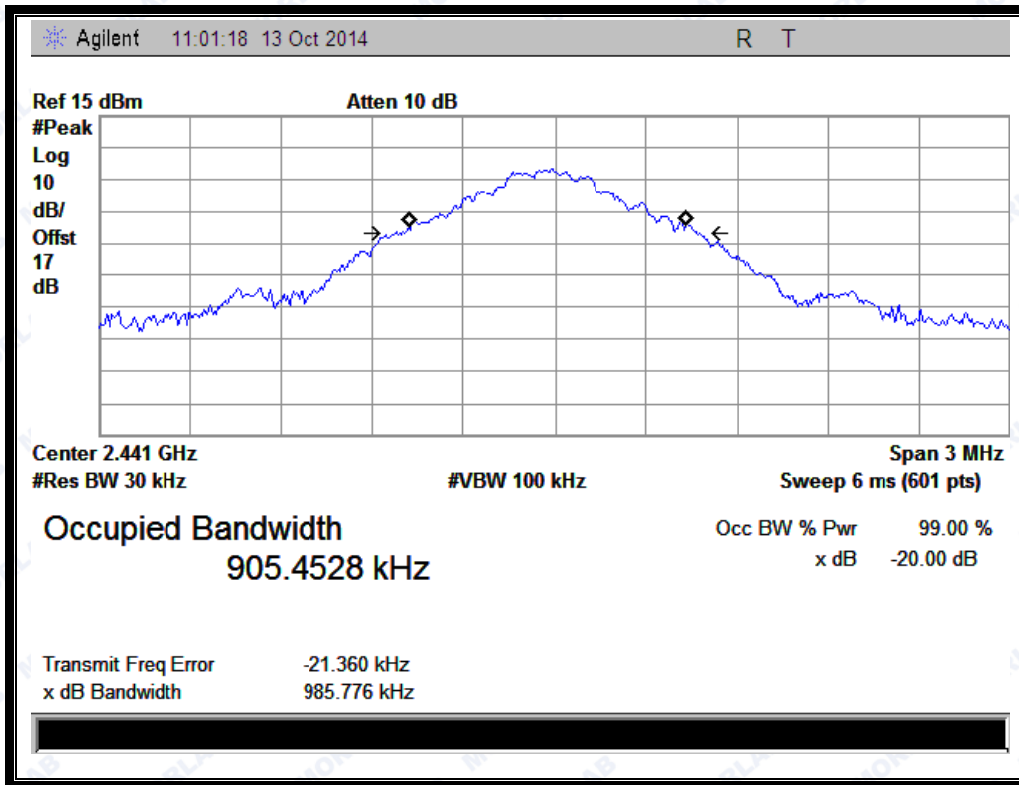
#### B. Test Plots:



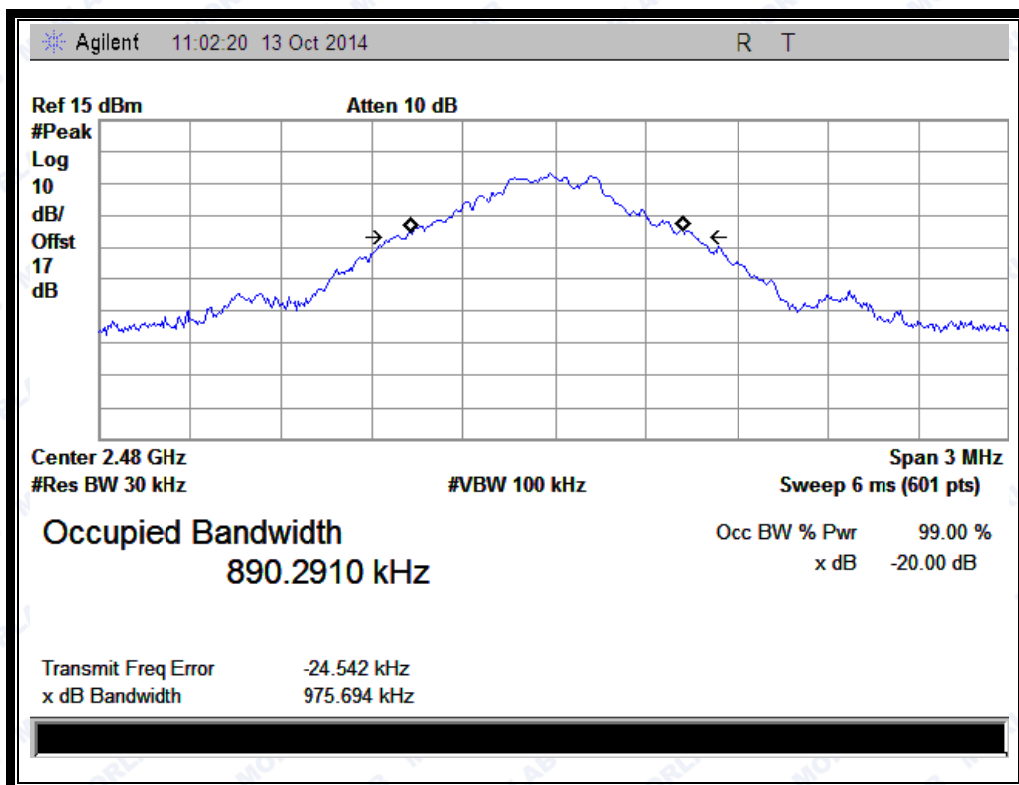
(Plot A: Channel = 2402 @ GFSK)



REPORT No. : SZ14090081W01



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

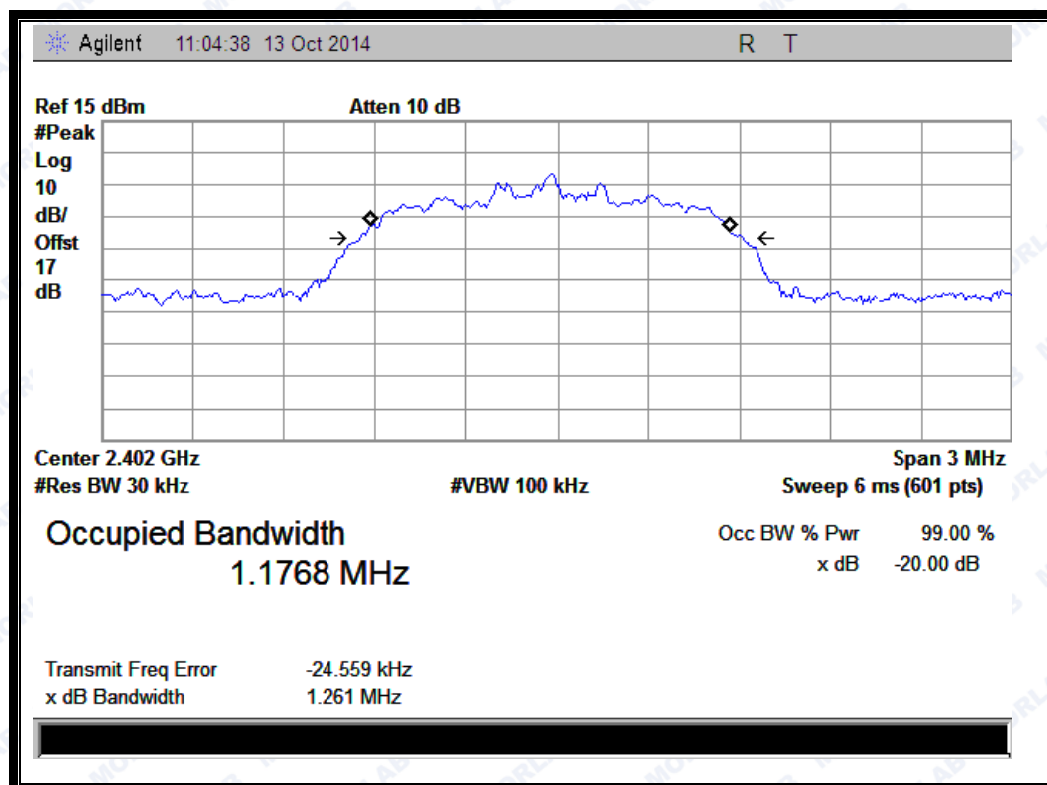


#### 2.4.4.2. $\pi/4$ -DQPSK Mode

##### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.2610	Plot D
39	2441	1.2590	Plot E
78	2480	1.2640	Plot F

##### B. Test Plots:

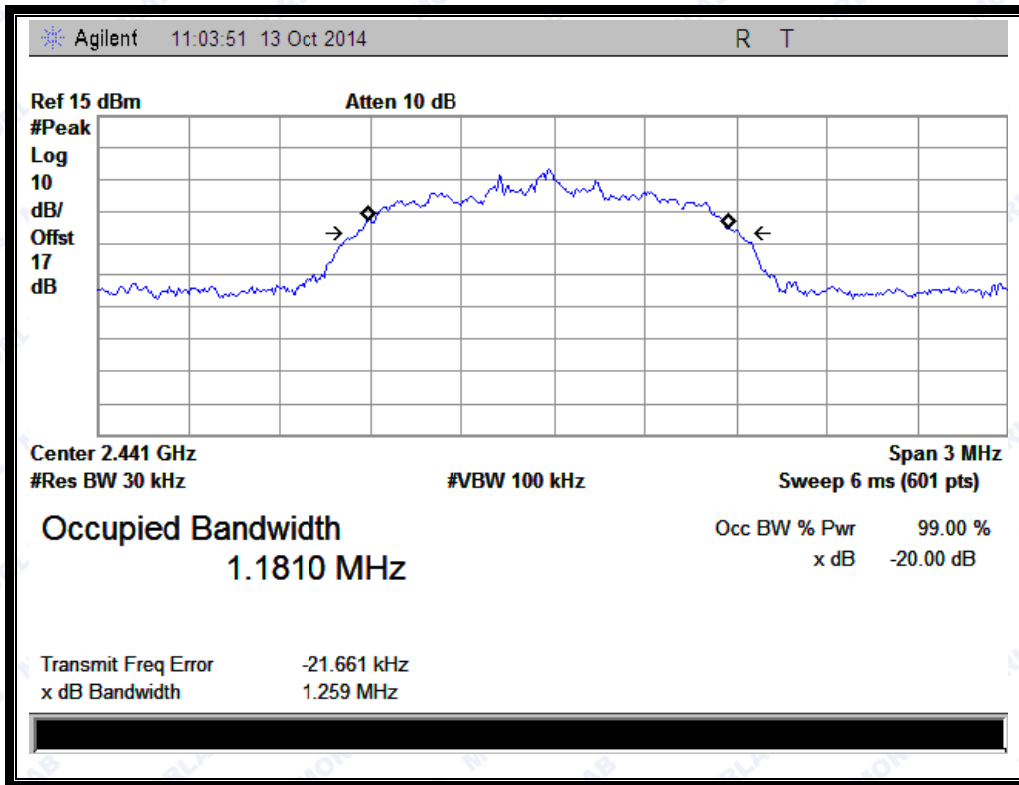


(Plot D: Channel = 2402 @  $\pi/4$ -DQPSK)

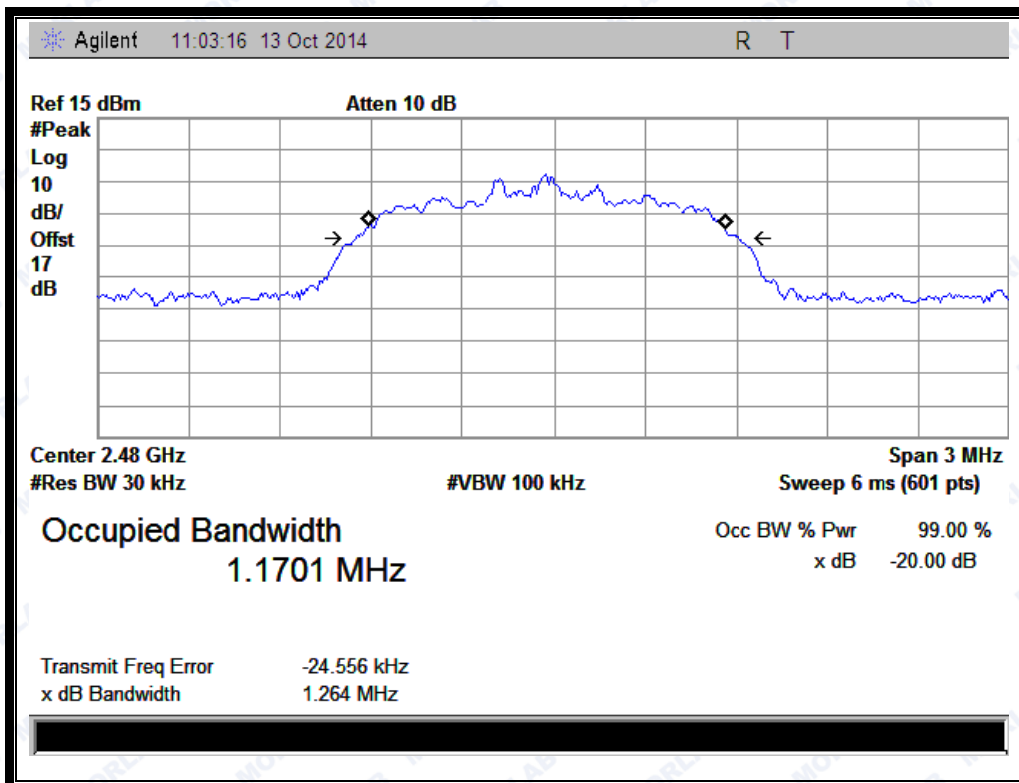




REPORT No. : SZ14090081W01



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



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

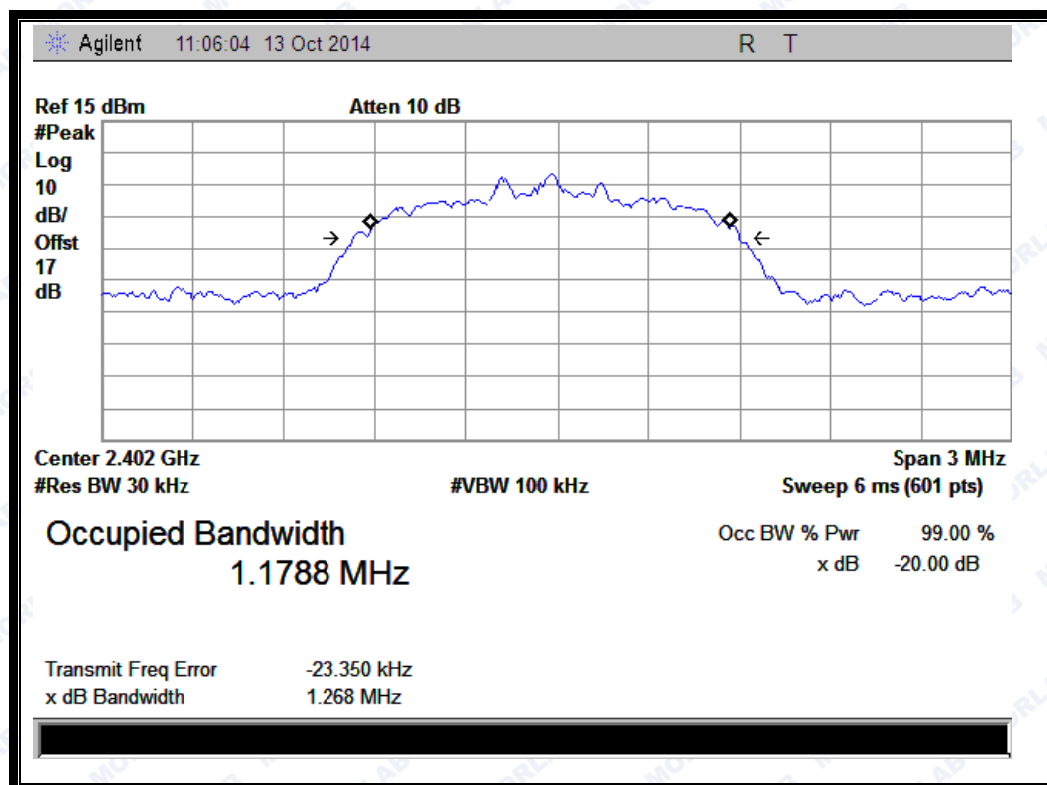


### 2.4.4.3. 8-DPSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.2680	Plot G
39	2441	1.2680	Plot H
78	2480	1.2680	Plot I

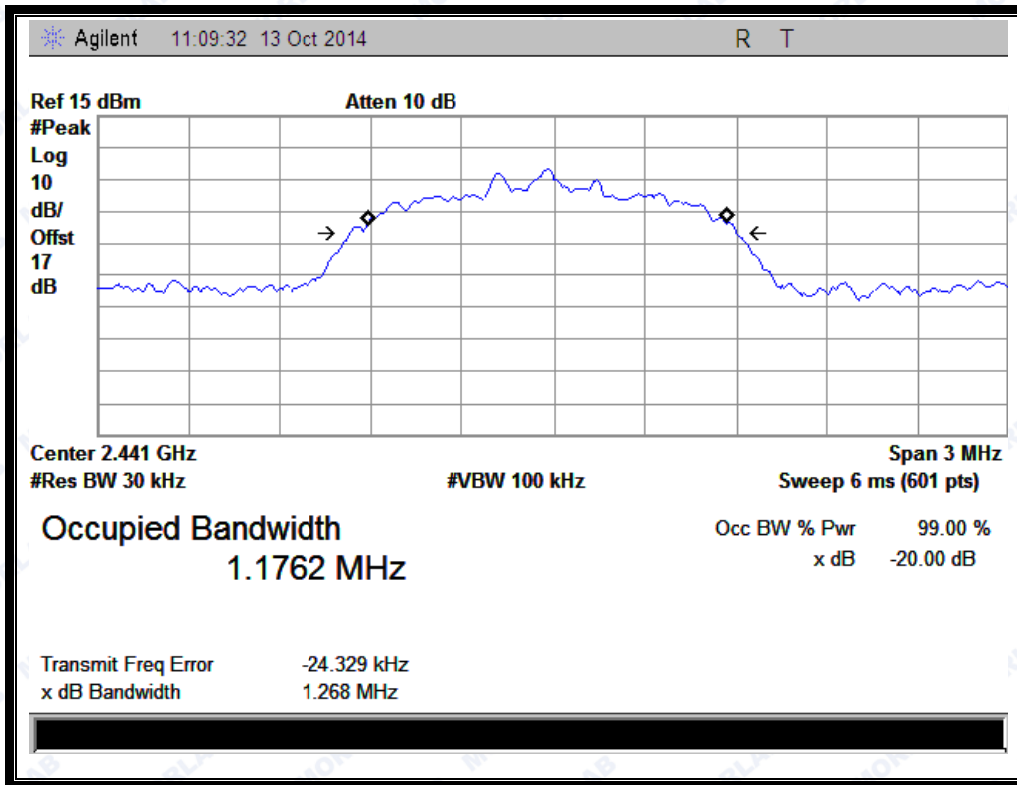
#### B. Test Plots:



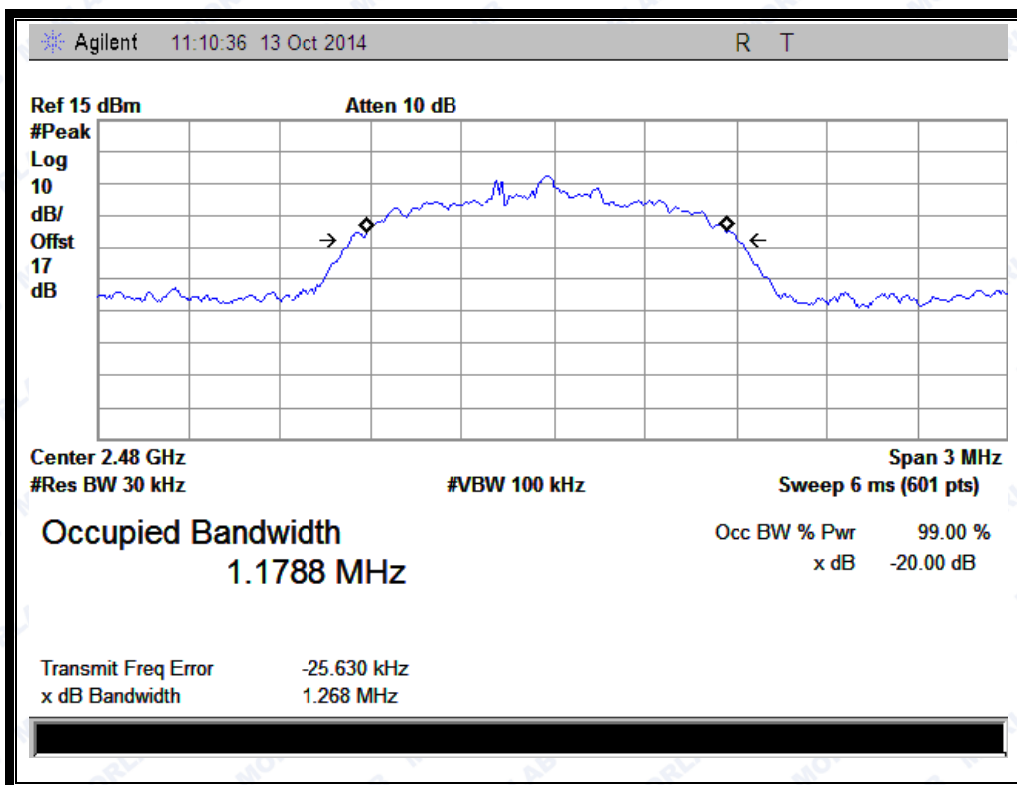
(Plot G: Channel = 2402 @ 8-DPSK)



REPORT No. : SZ14090081W01



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



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



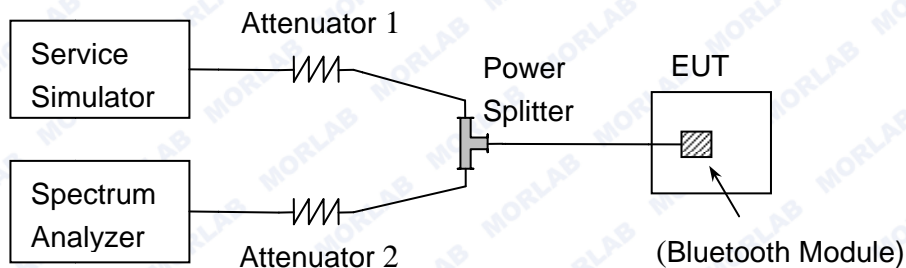
## 2.5. Carried Frequency Separation

### 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, which is powered by the Battery, 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

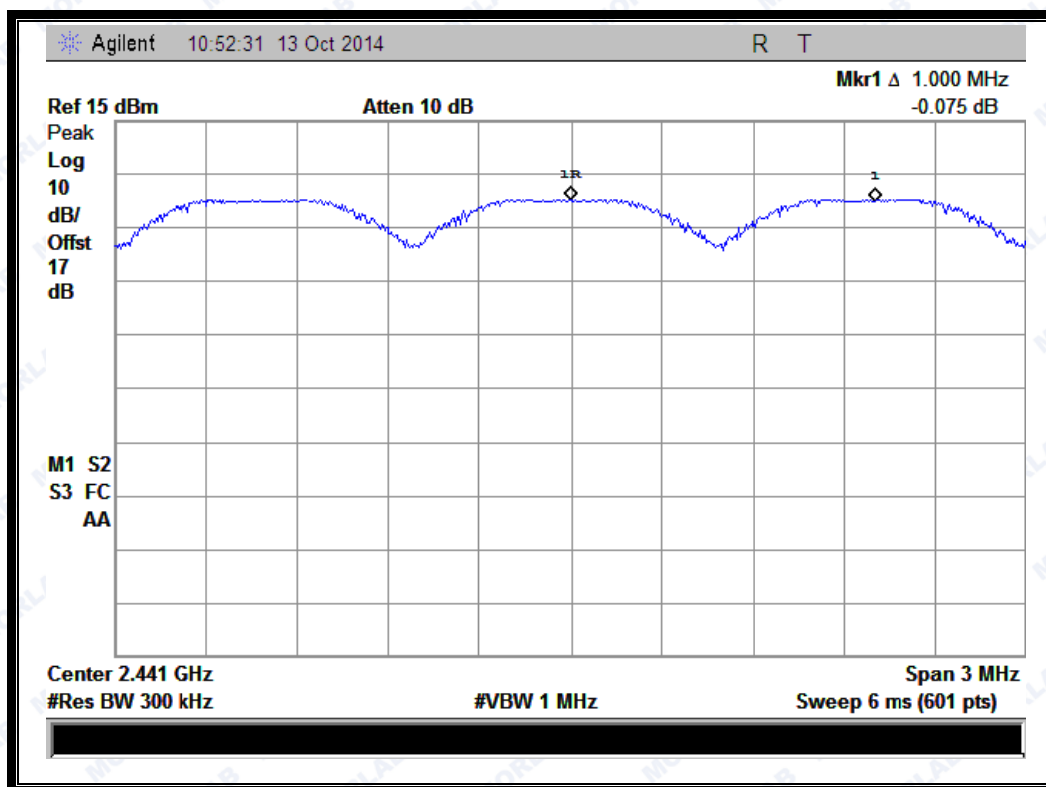
Trace = max hold

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.

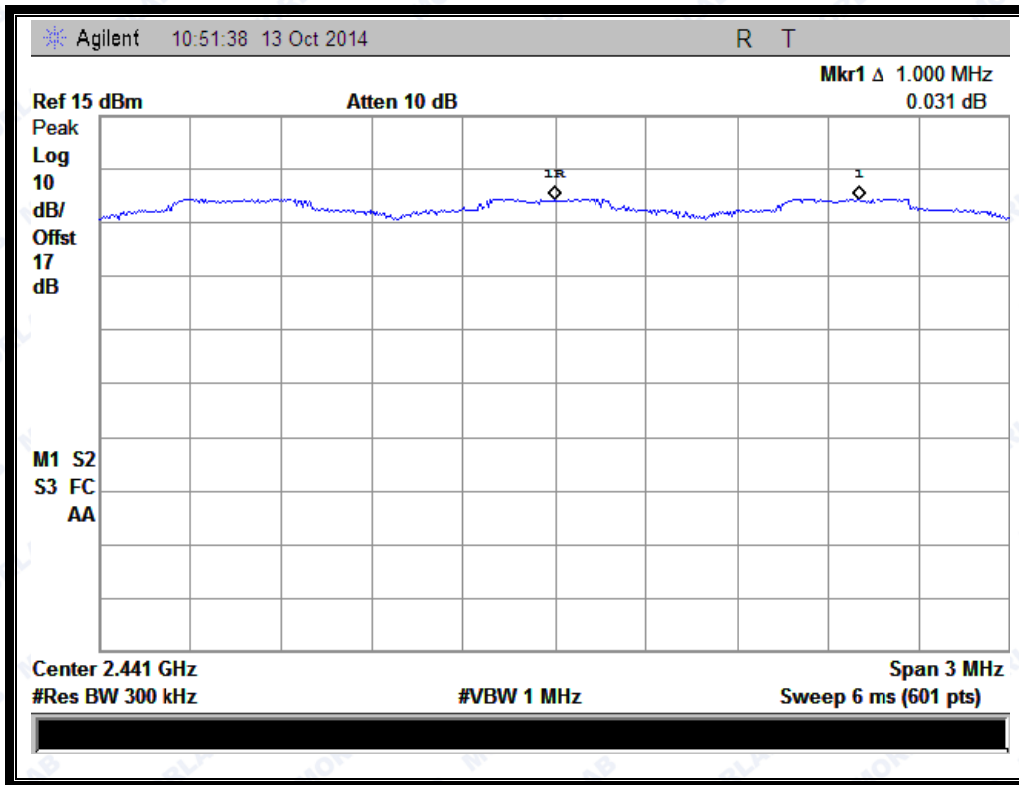
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section 0), whichever is greater. So, the verdict is PASSING



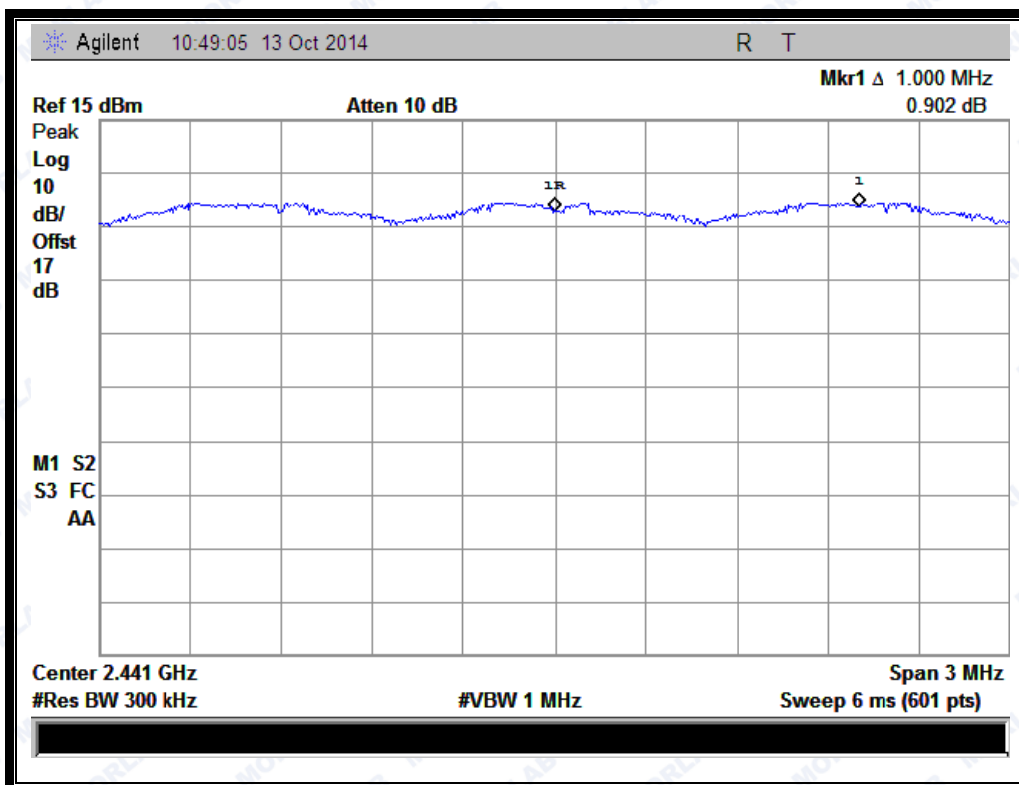
(Plot A: GFSK)



REPORT No. : SZ14090081W01



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



(Plot C: 8-DPSK)



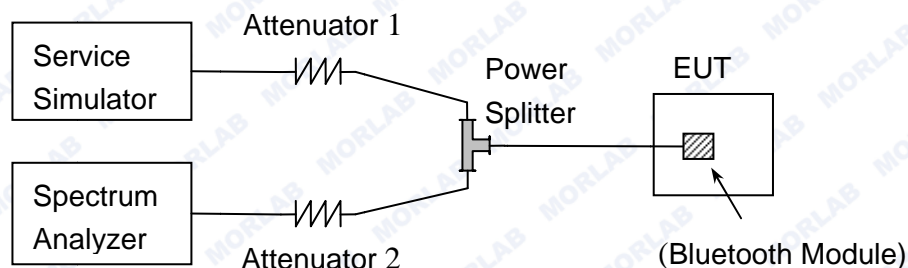
## 2.6. Time of Occupancy (Dwell time)

### 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, which is powered by the Battery, 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

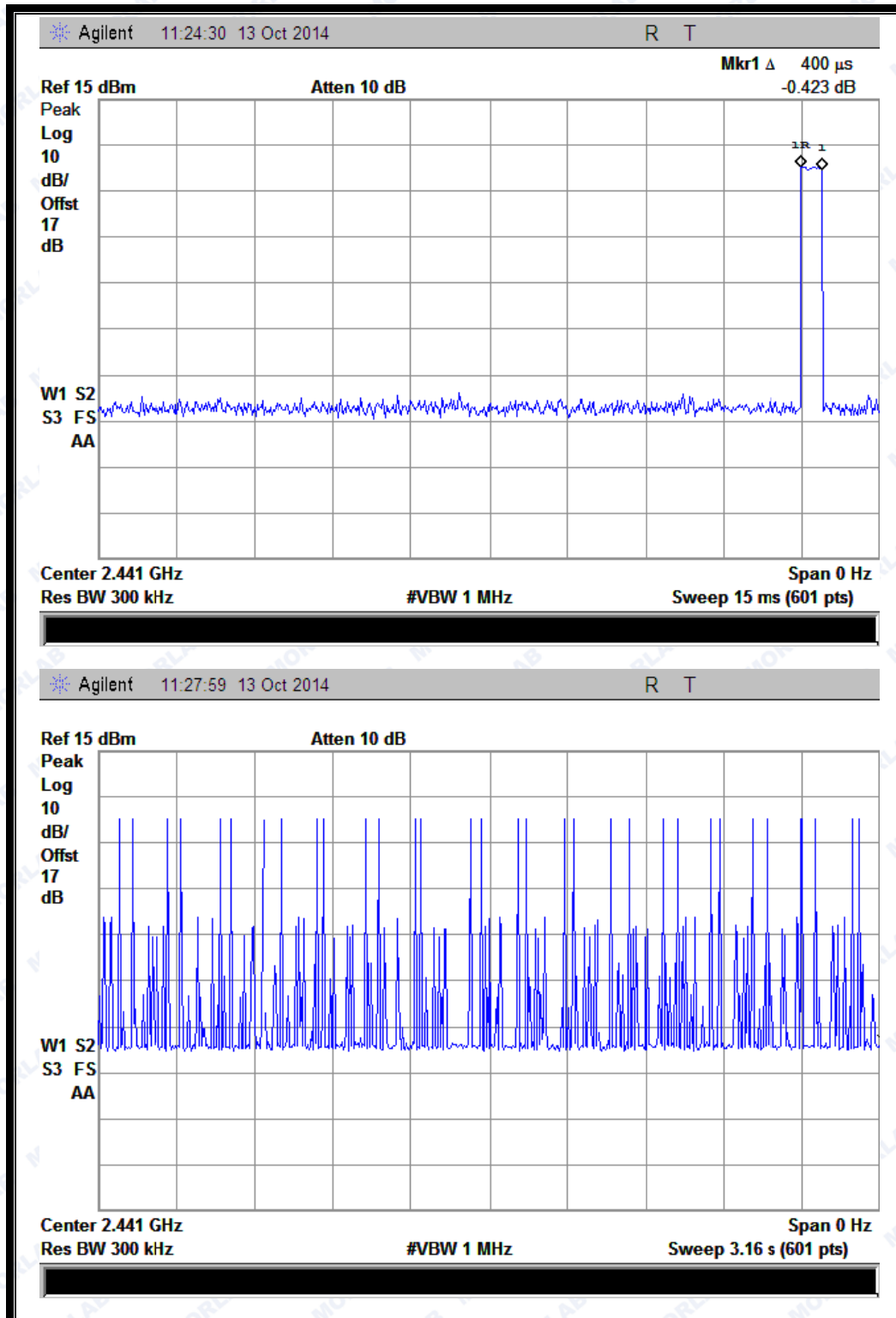
#### A. Test Verdict:

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	32	Plot A	0.128	0.4	PASS
DH3	1.650	16	Plot B	0.264		PASS
DH5	2.900	11	Plot C	0.319		PASS

#### B. Test Plots:



REPORT No. : SZ14090081W01

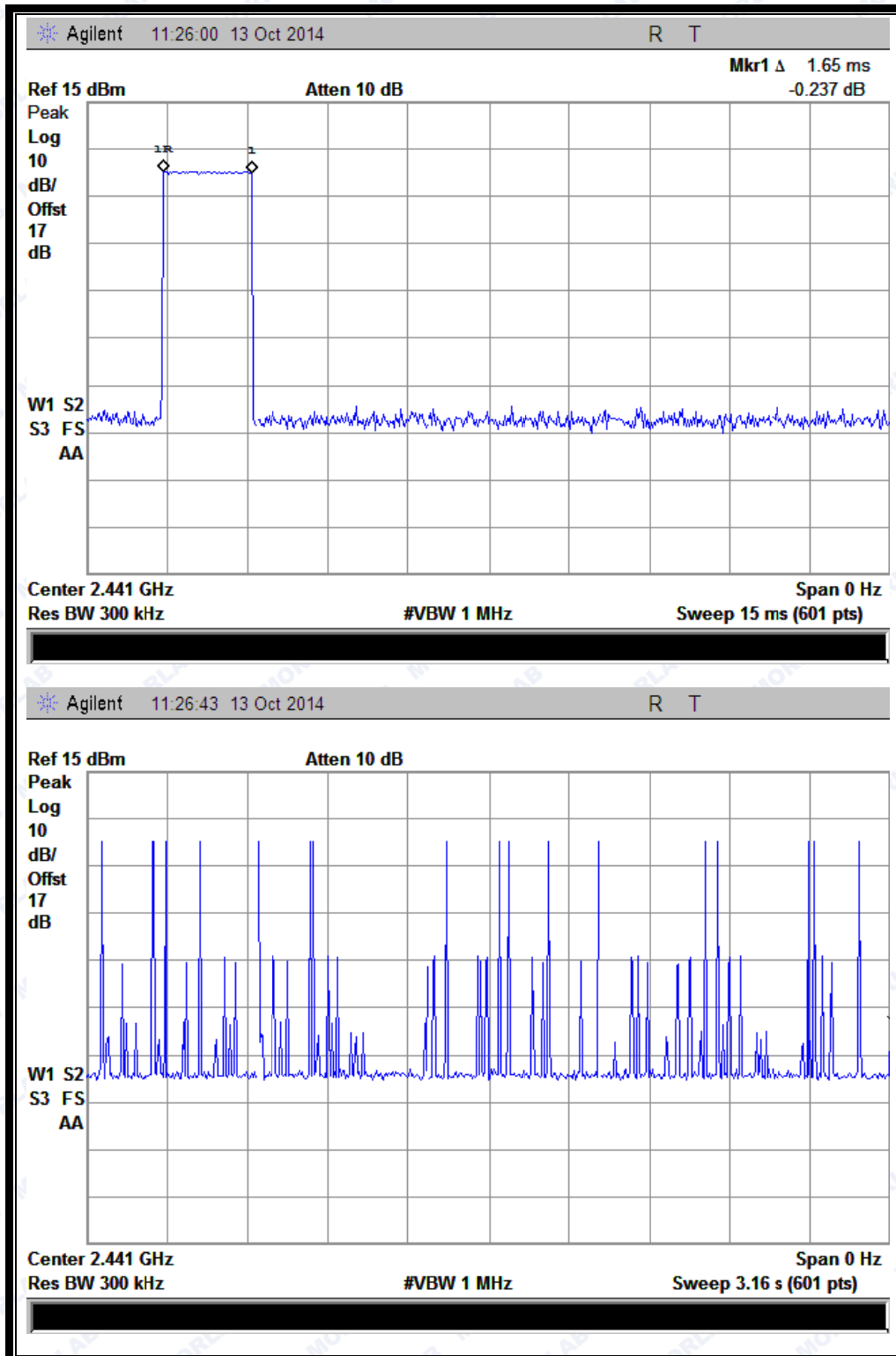


(Plot A: DH1 @ GFSK)





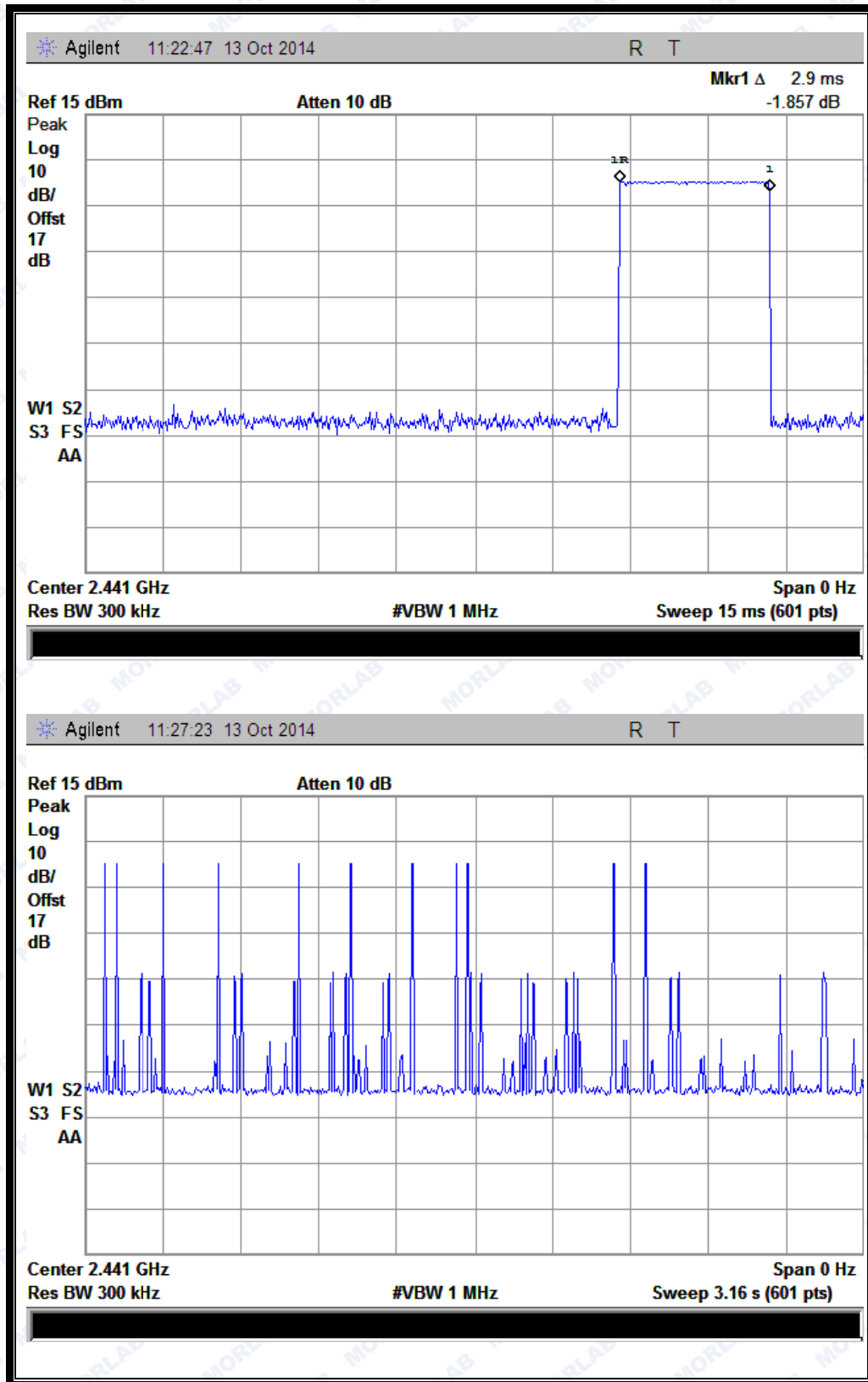
REPORT No. : SZ14090081W01



(Plot B: DH3 @ GFSK)



REPORT No. : SZ14090081W01



(Plot C: DH5 @ GFSK)



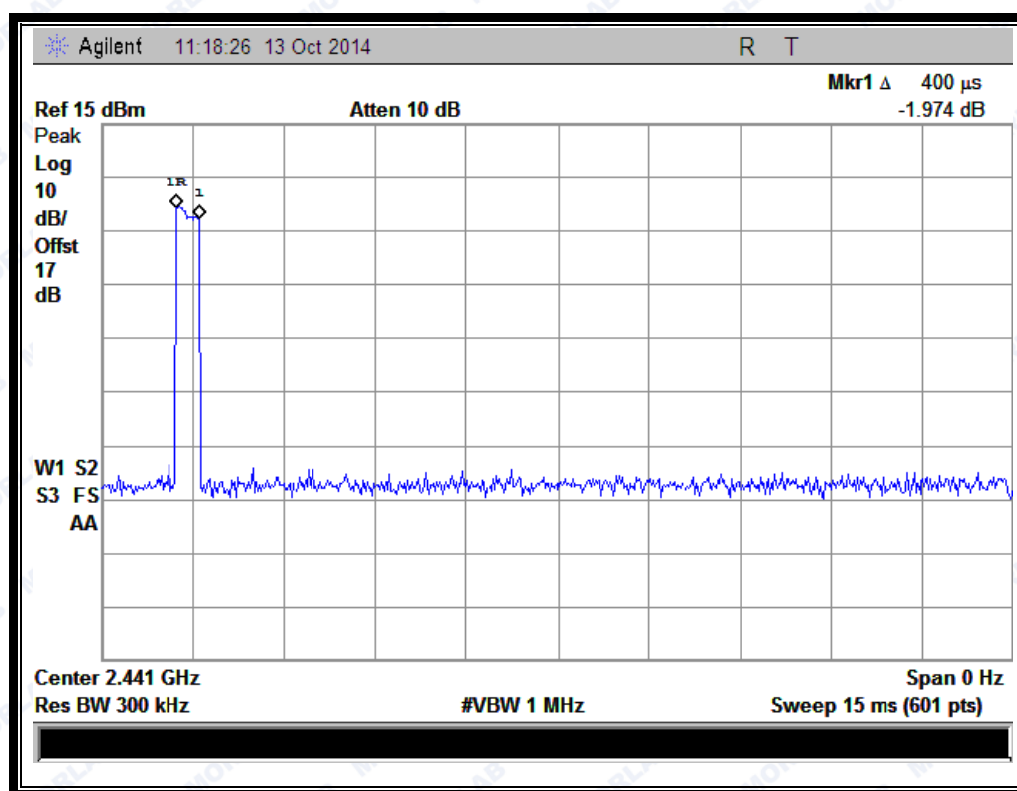
REPORT No. : SZ14090081W01

## 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	32	Plot A	0.128	0.4	PASS
DH3	1.650	14	Plot B	0.231		PASS
DH5	2.900	10	Plot C	0.290		PASS

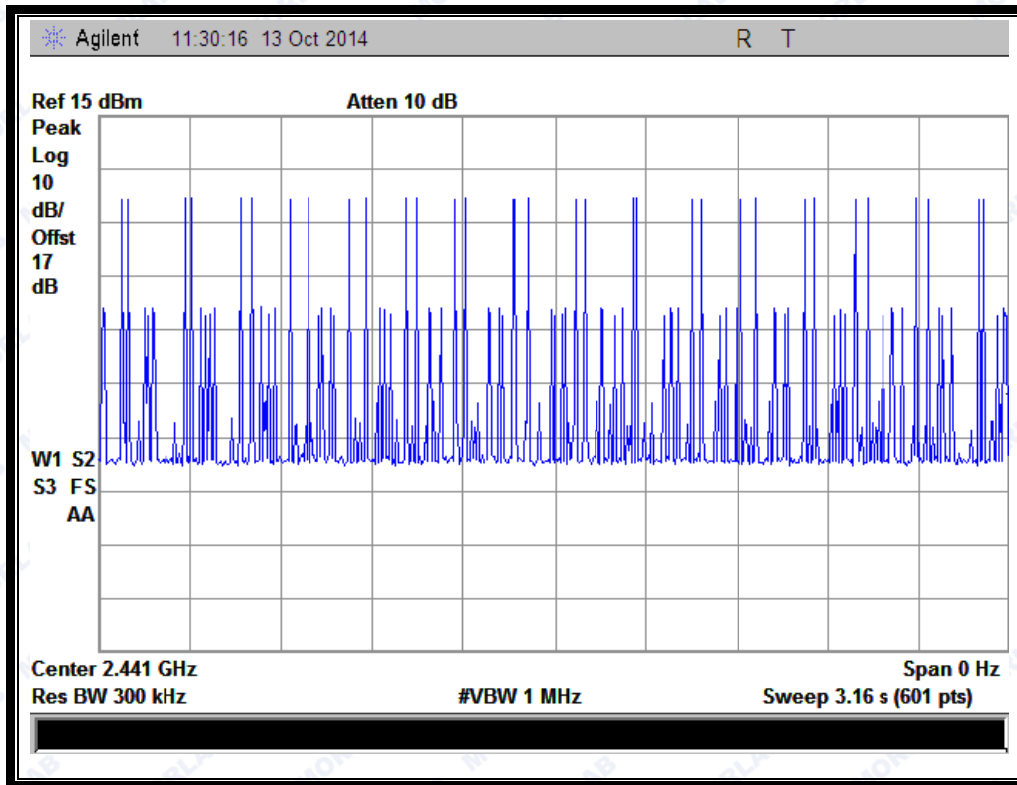
### B. Test Plots:



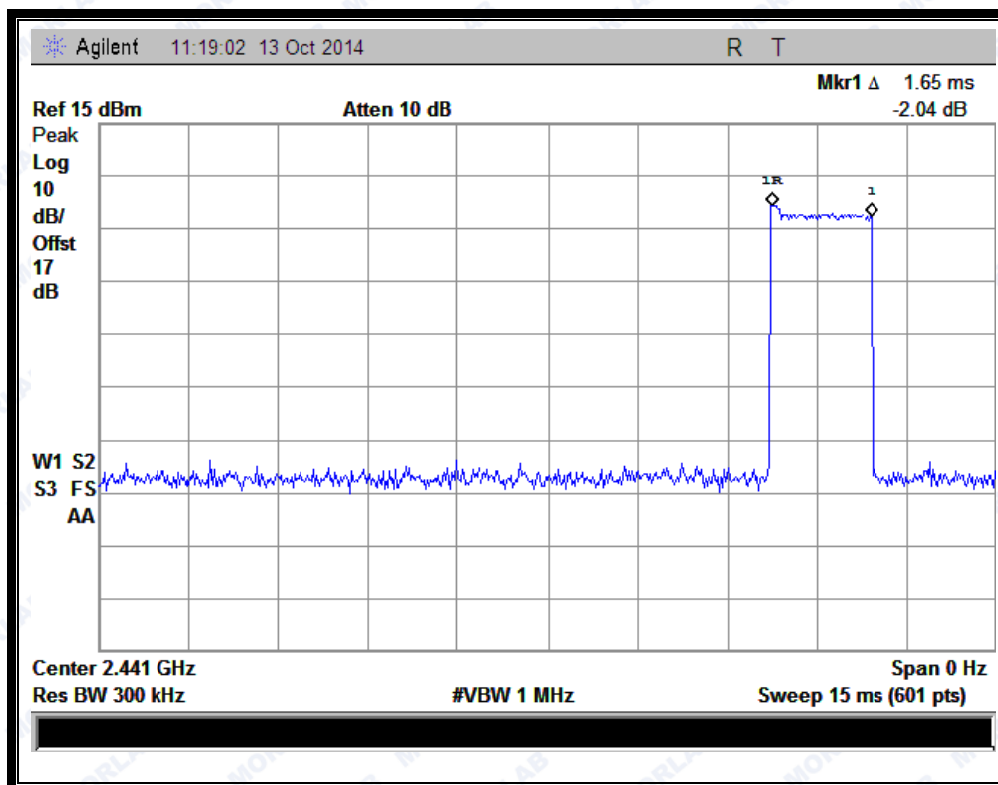




REPORT No. : SZ14090081W01

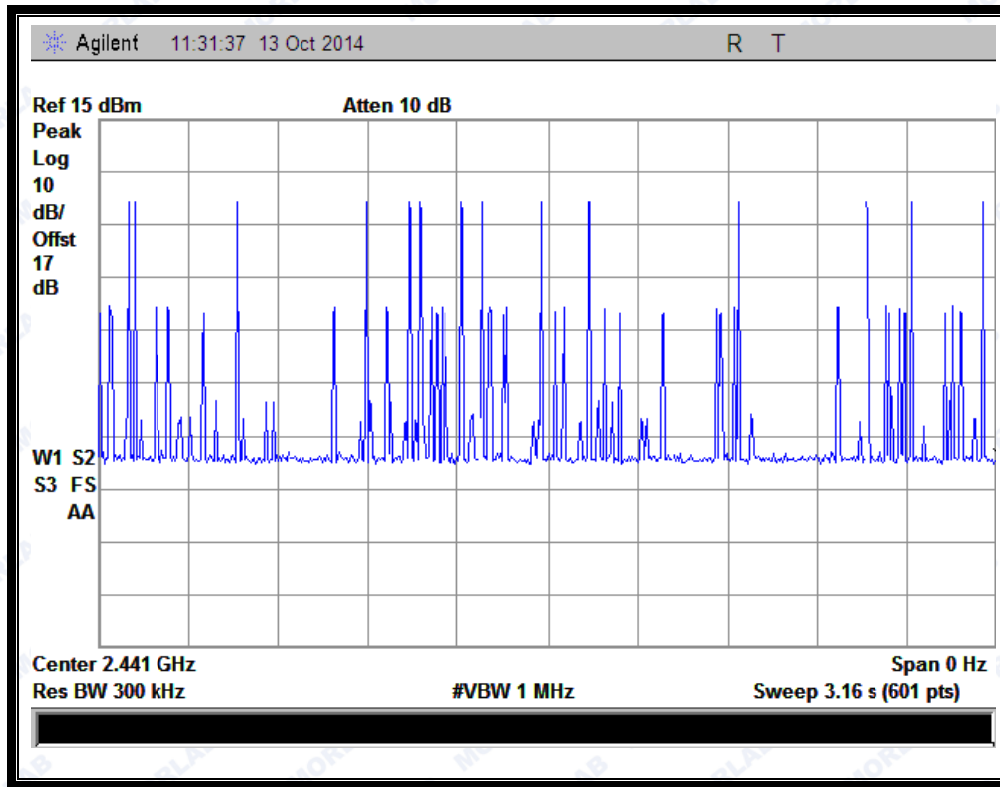


(Plot D: DH1 @  $\pi/4$ -DQPSK)

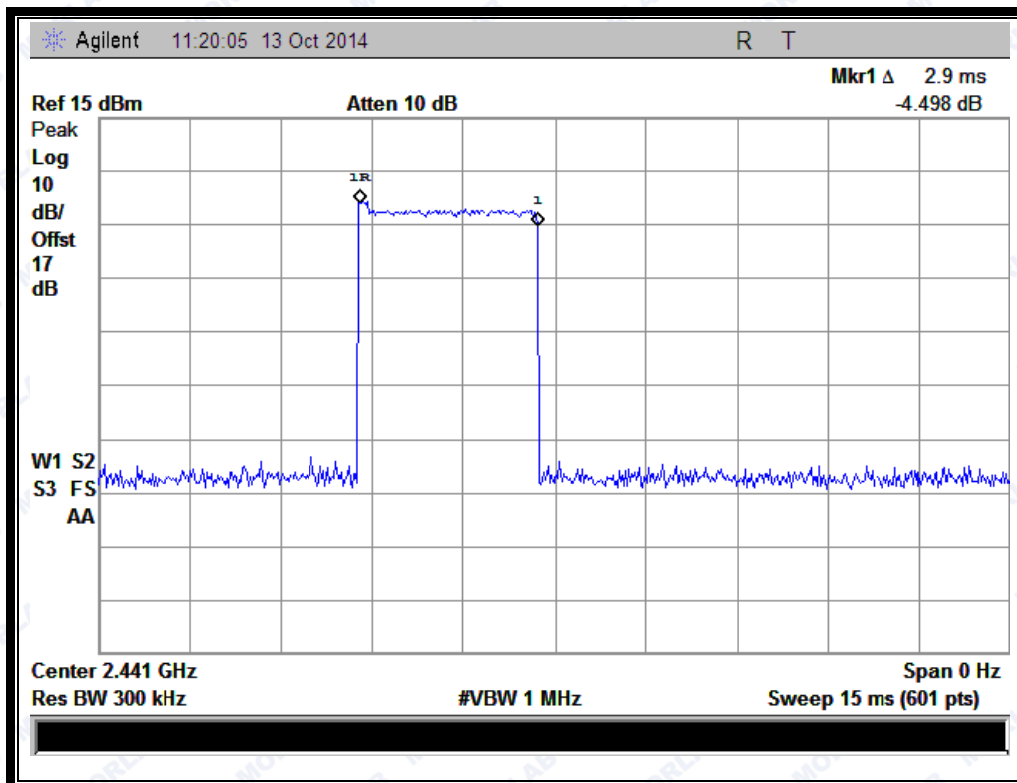


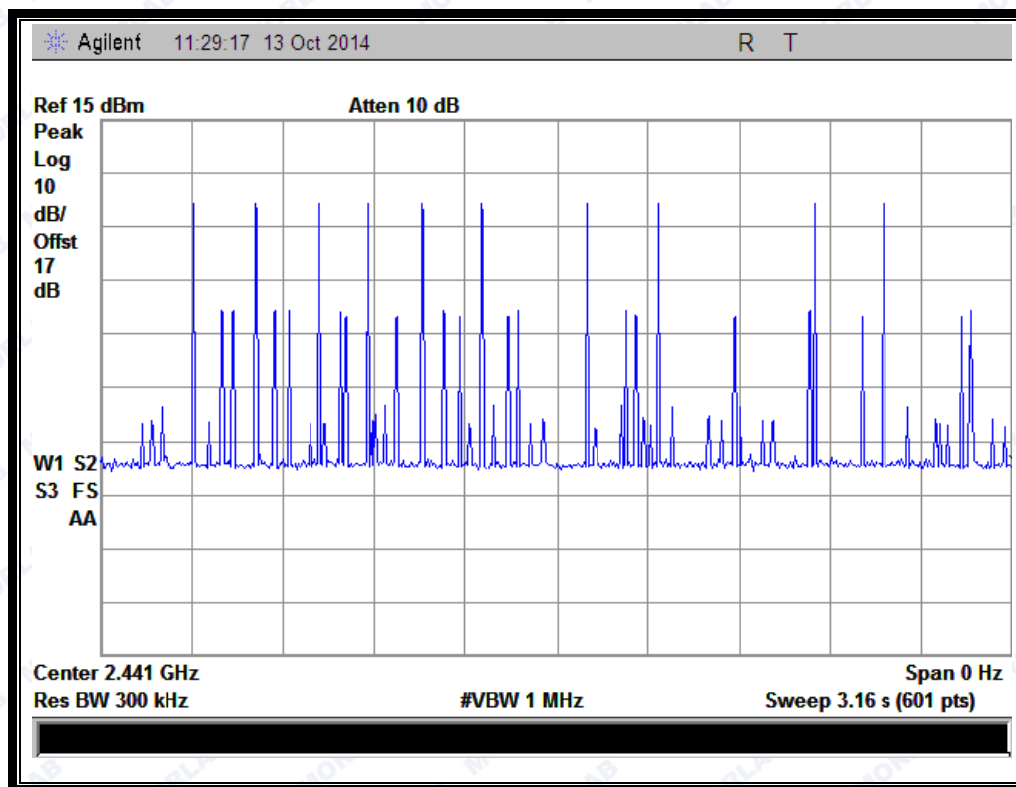


REPORT No. : SZ14090081W01



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



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

### 2.6.4.3. 8-DPSK mode

#### A. Test Verdict:

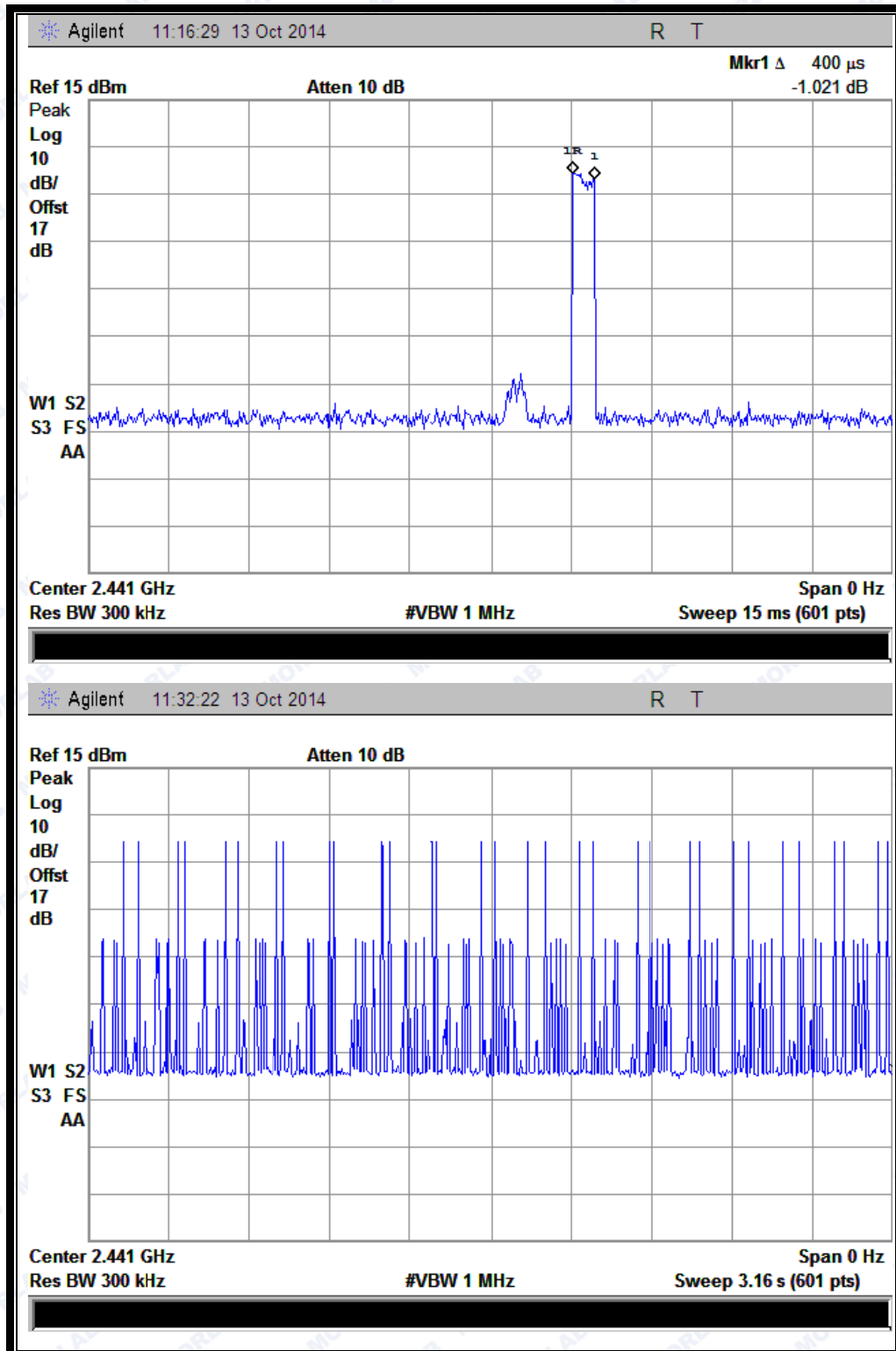
DH Packet	Pulse Width (msec)	Number of pulse in 3.16 seconds	Refer to Plot	Average Time of Occupancy (sec)	Limit (sec)	Verdict
DH1	0.400	32	Plot A	0.128	0.4	PASS
DH3	1.625	16	Plot B	0.260		PASS
DH5	2.900	9	Plot C	0.261		PASS

#### B. Test Plots:





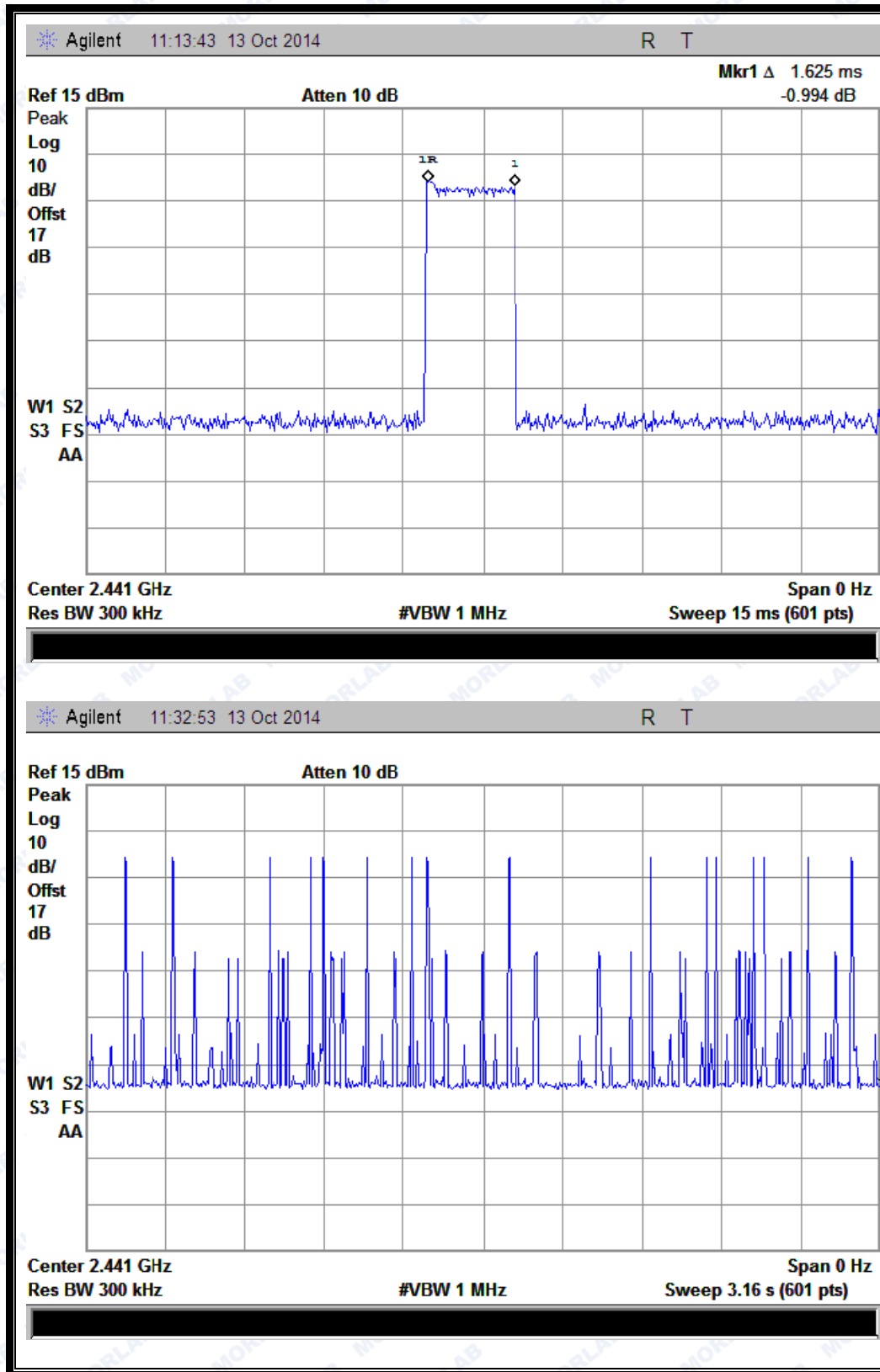
REPORT No. : SZ14090081W01



(Plot G: DH1 @ 8-DPSK)



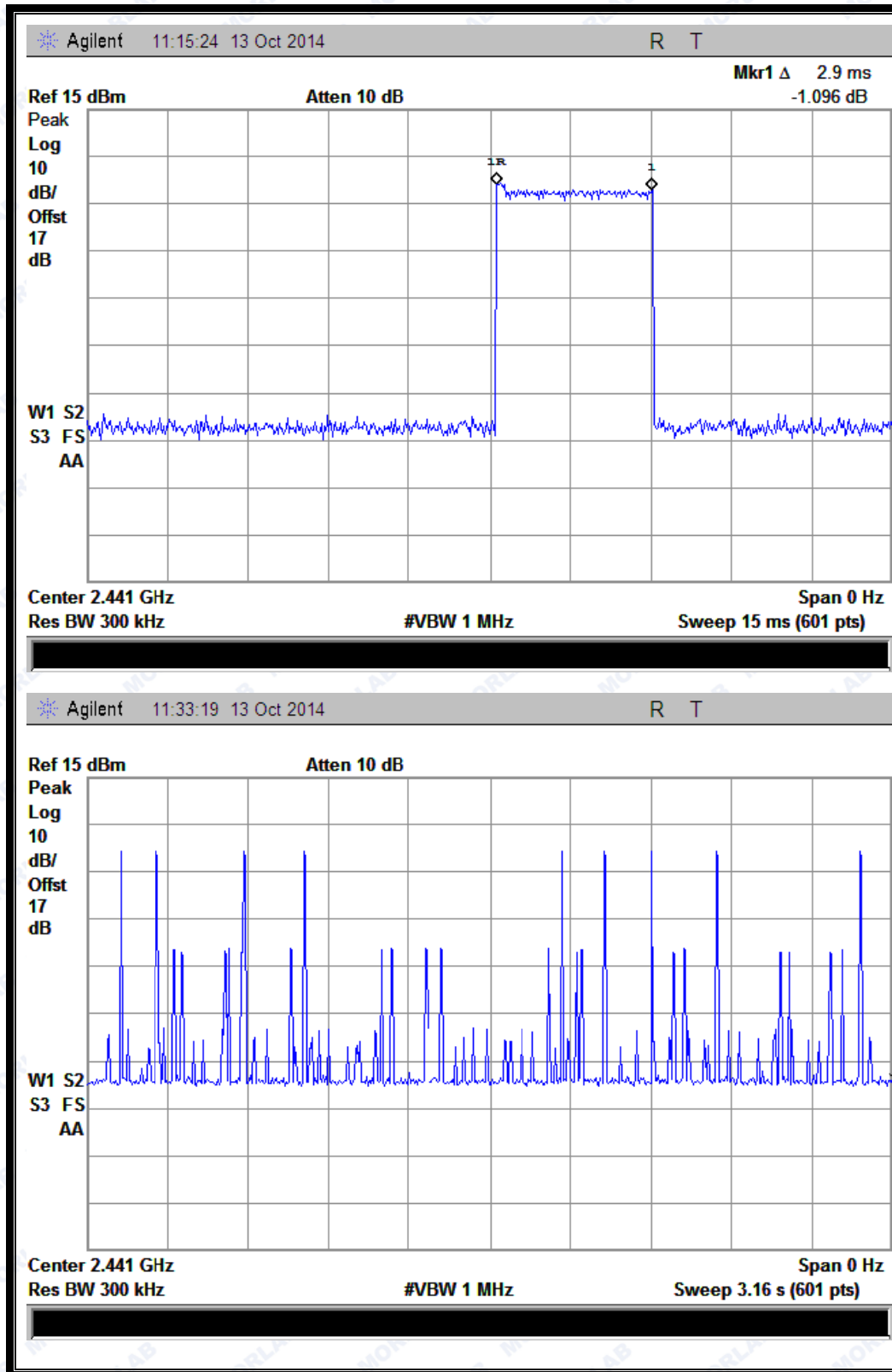
REPORT No. : SZ14090081W01



(Plot H: DH3 @ 8-DPSK)



REPORT No. : SZ14090081W01



(Plot I: DH5 @ 8-DPSK)



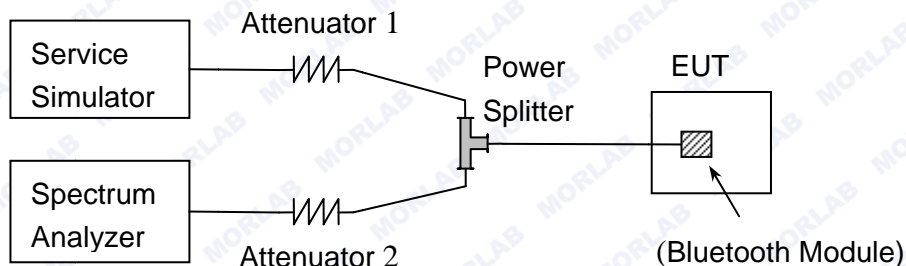
## 2.7. Conducted Spurious Emissions

### 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, which is powered by the Battery, 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:

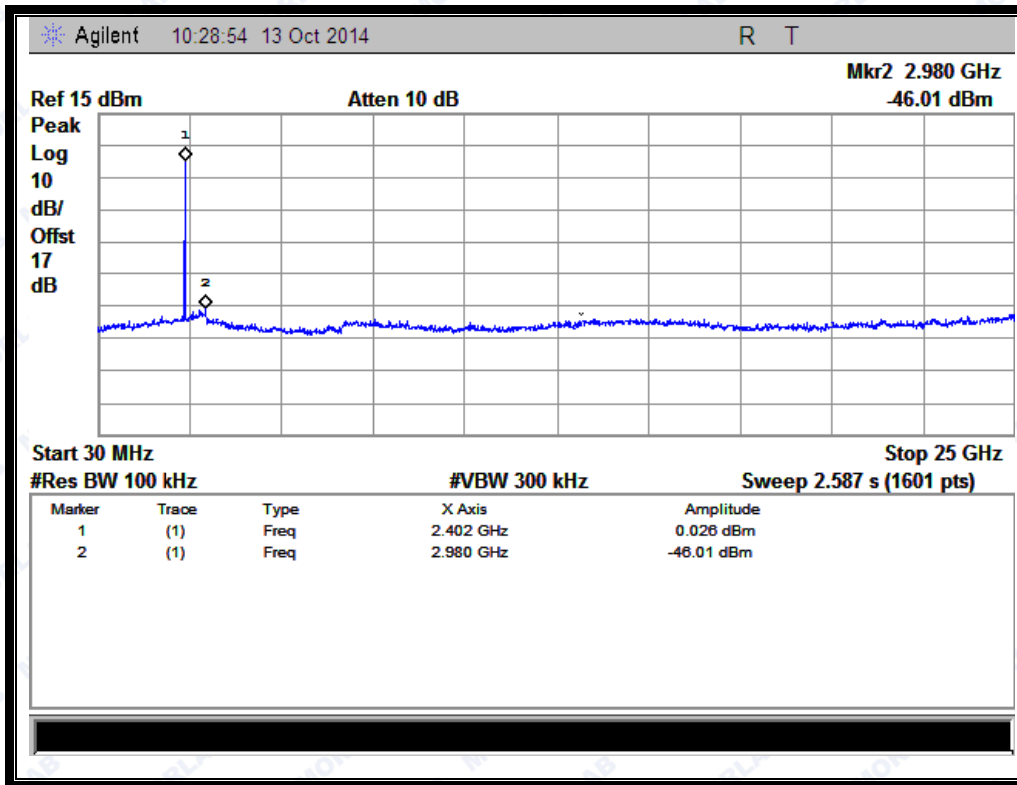
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-46.01	Plot A.1	0.026	-20.0	PASS
39	2441	-47.47	Plot B.1	-0.351	-20.4	PASS
78	2480	-46.23	Plot C.1	-0.775	-20.8	PASS

#### B. Test Plots:

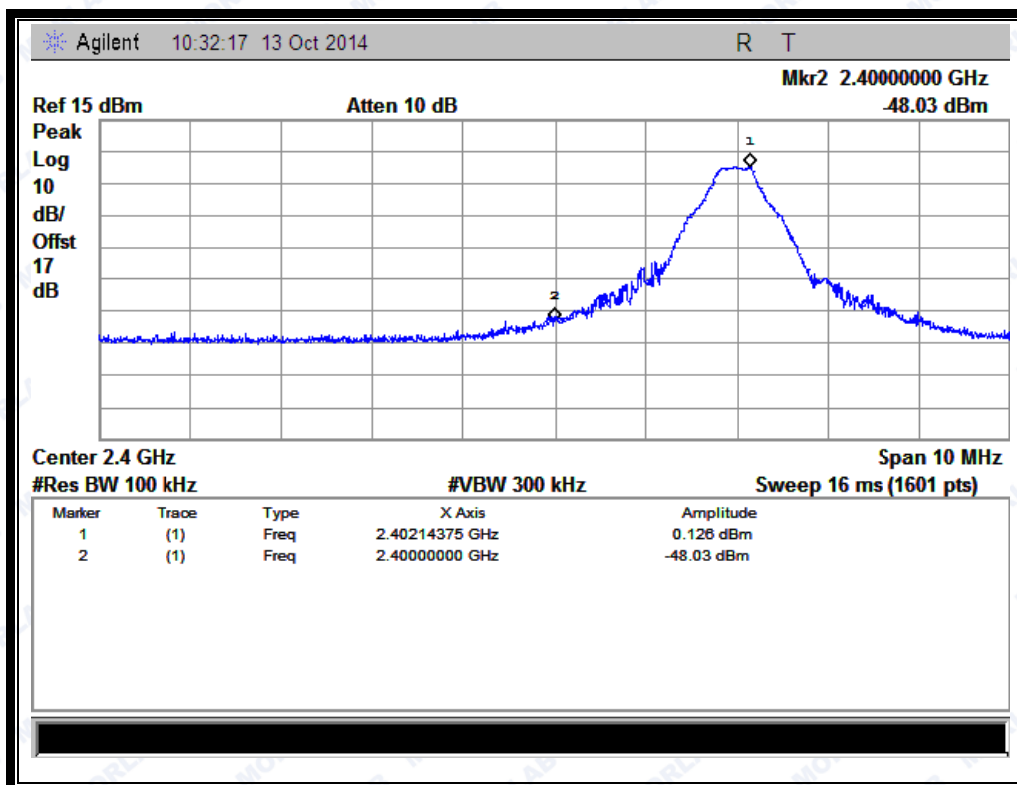
**Note:** the power of the Module transmitting frequency should be ignored.



REPORT No. : SZ14090081W01



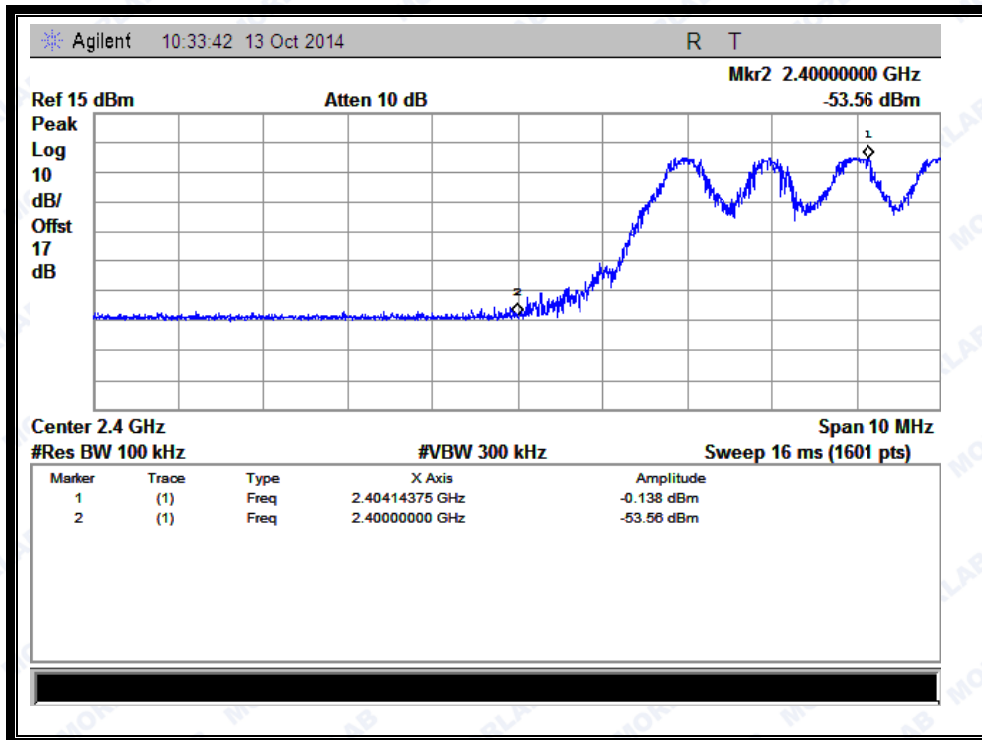
(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



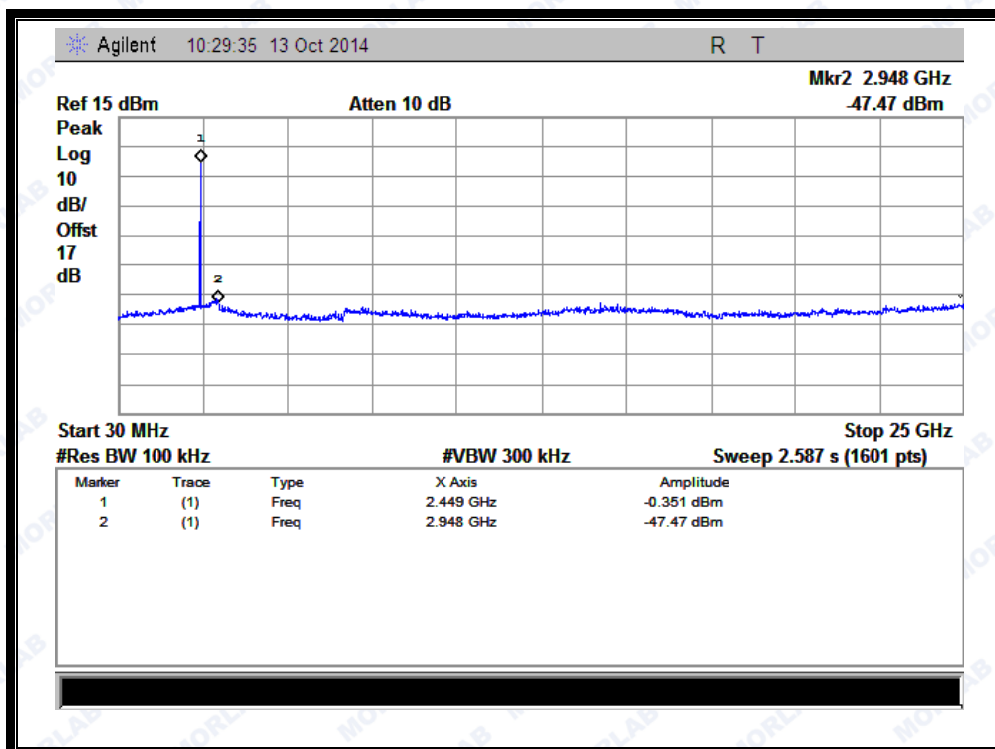
(Channel = 0, Band edge @ GFSK Mode)



REPORT No. : SZ14090081W01



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

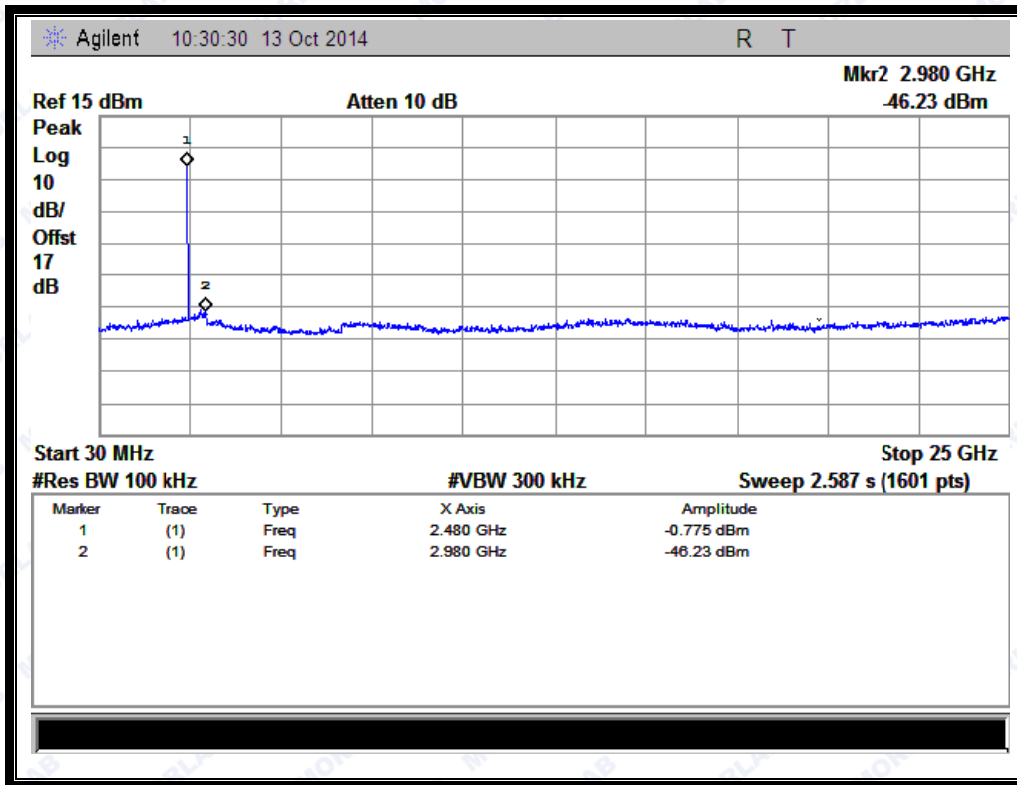


(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)

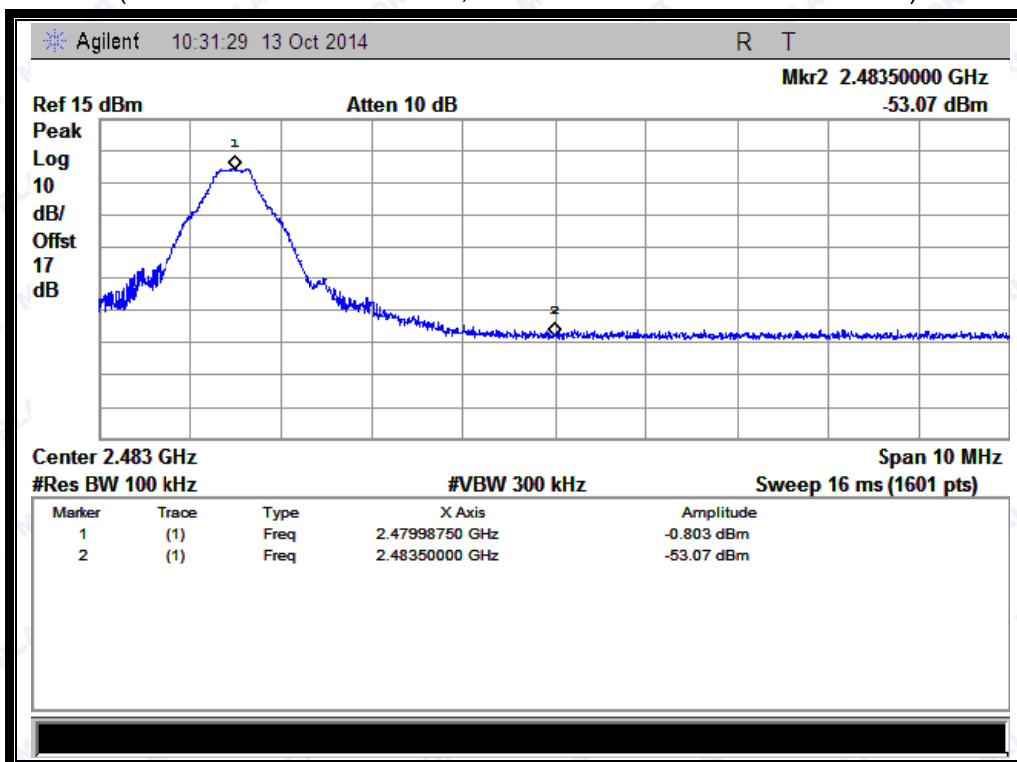




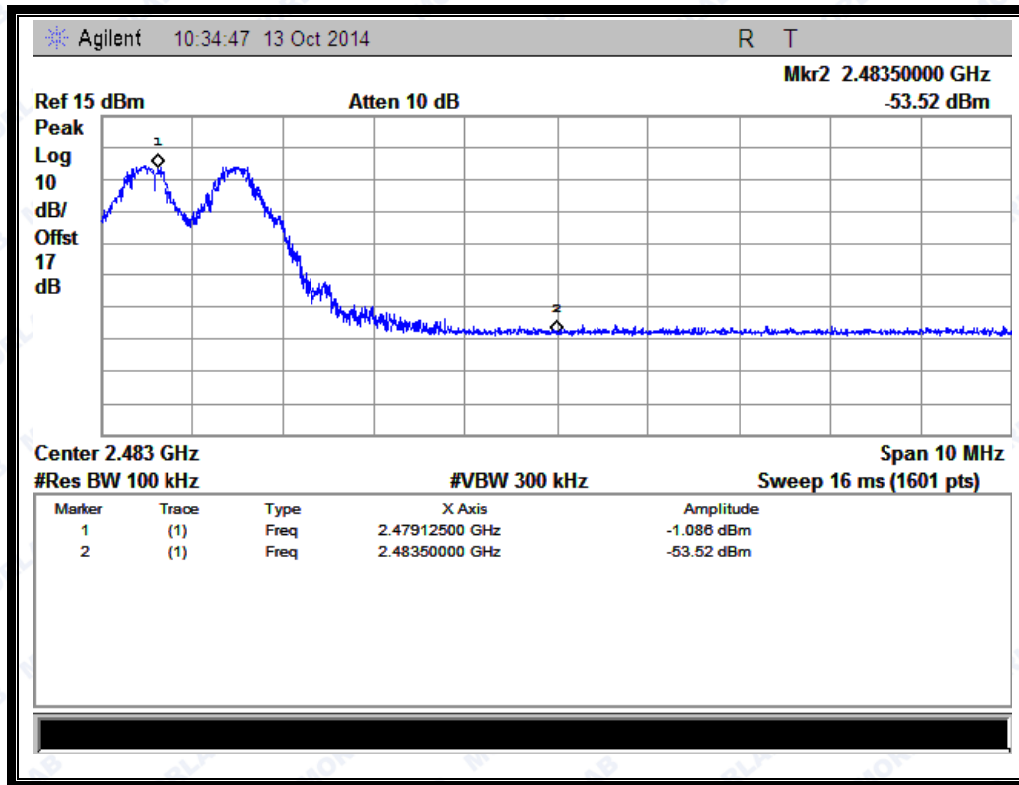
REPORT No. : SZ14090081W01



(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:

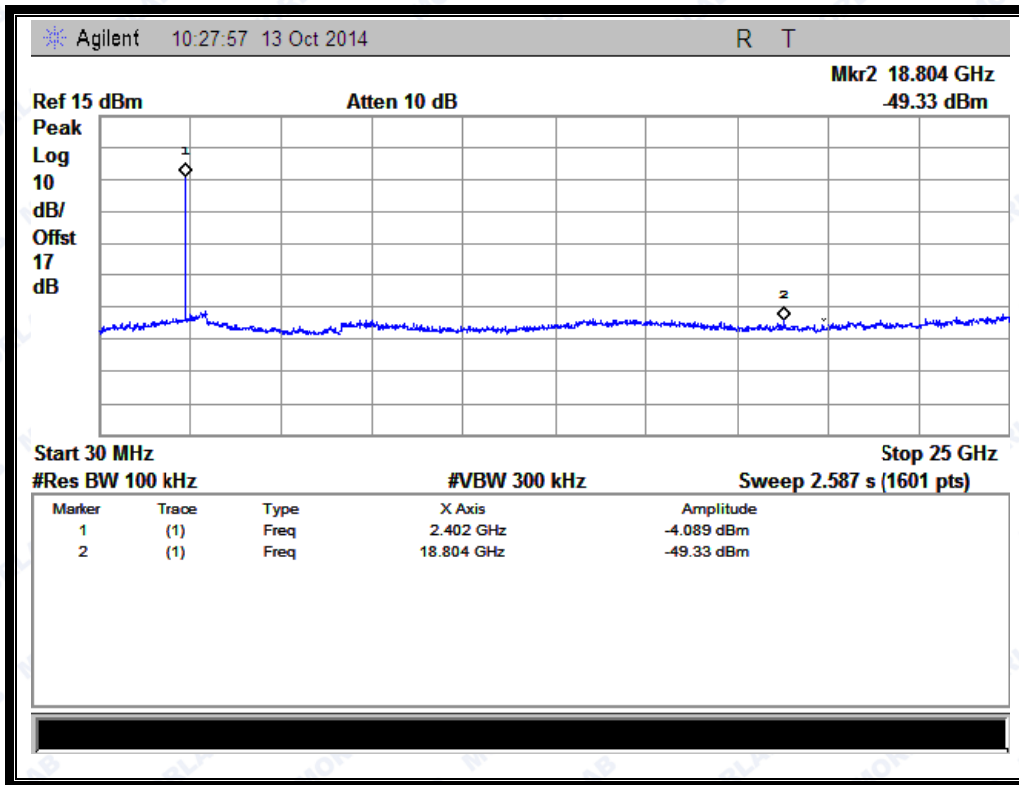
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-49.33	Plot D.1	-4.089	-24.1	PASS
39	2441	-47.67	Plot E.1	-4.501	-24.5	PASS
78	2480	-47.05	Plot F.1	-4.570	-24.6	PASS

### B. Test Plots:

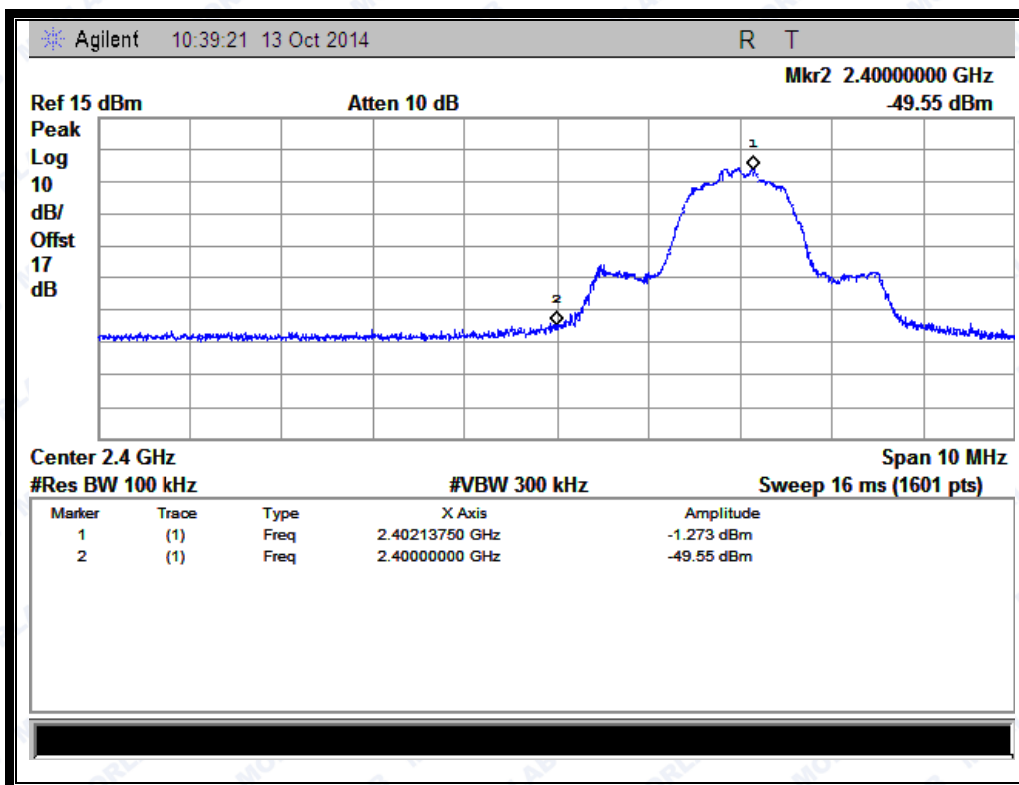
**Note:** the power of the Module transmitting frequency should be ignored.



REPORT No. : SZ14090081W01



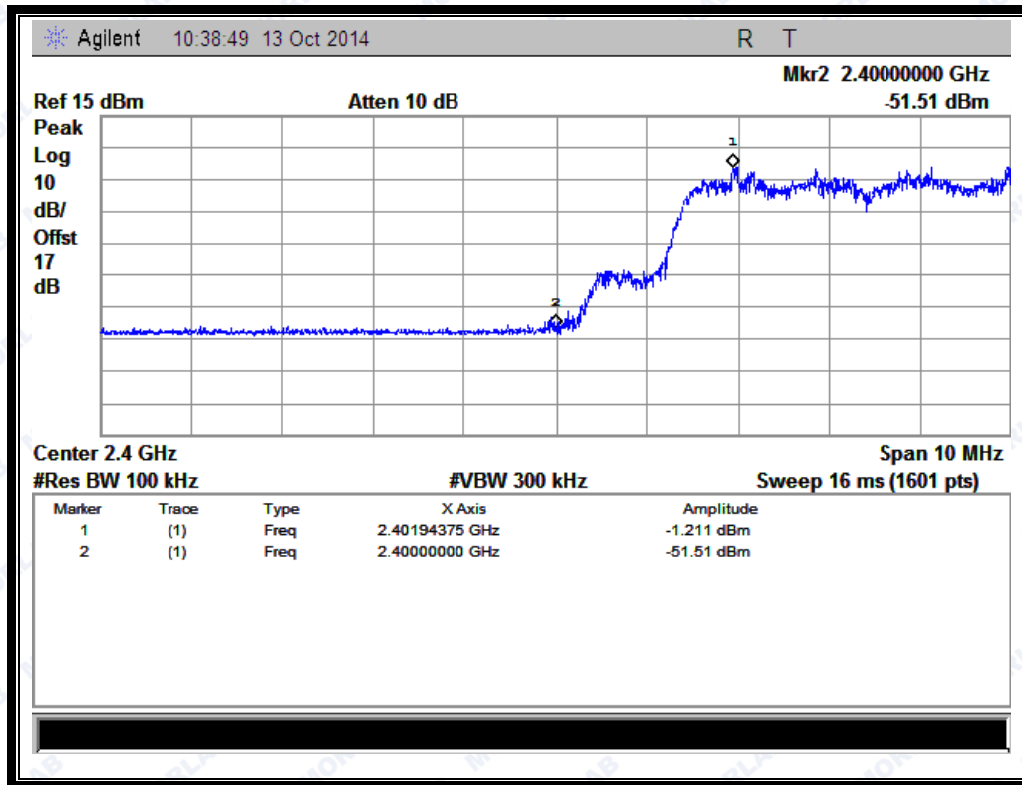
(Plot D.1: Channel = 0, 30MHz to 25GHz @  $\pi/4$ -DQPSK)



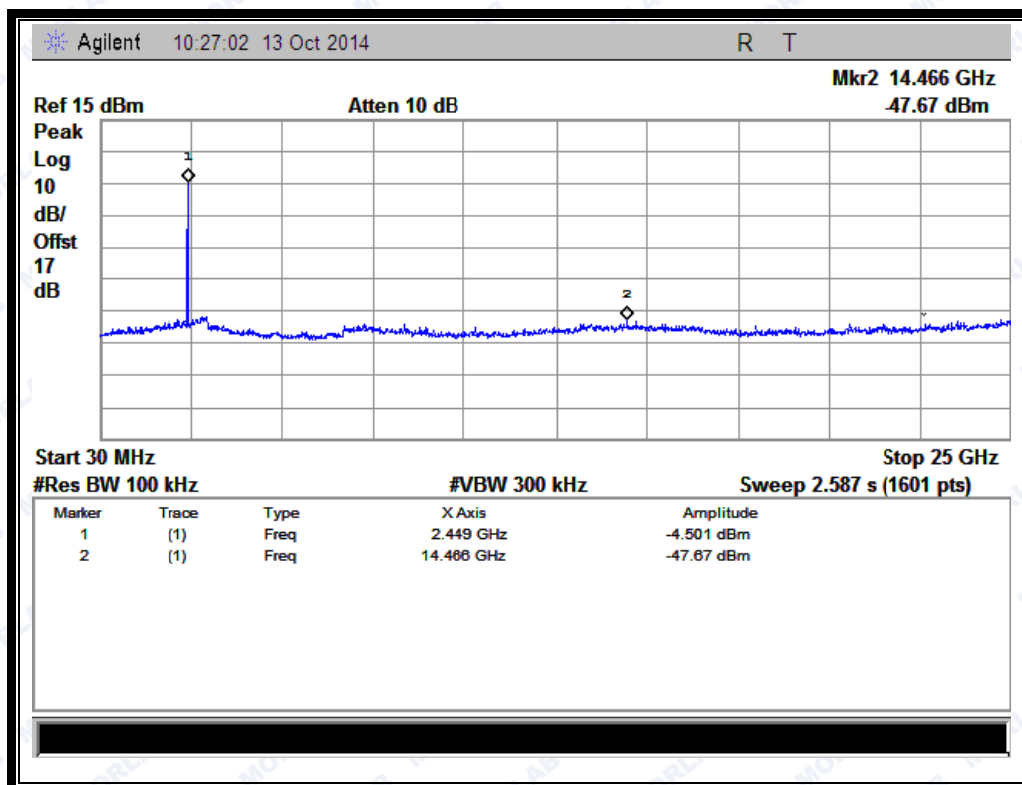
(Channel = 0, Band edge @  $\pi/4$ -DQPSK)



REPORT No. : SZ14090081W01



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

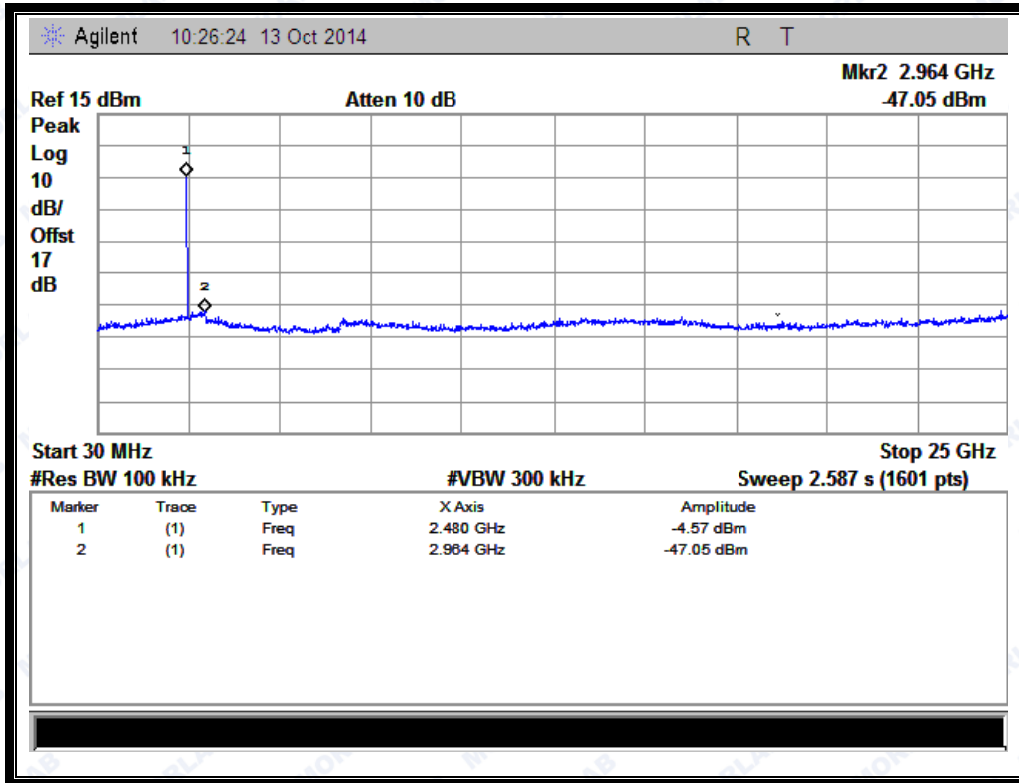


(Plot E.1: Channel = 39, 30MHz to 25GHz @  $\pi/4$ -DQPSK)

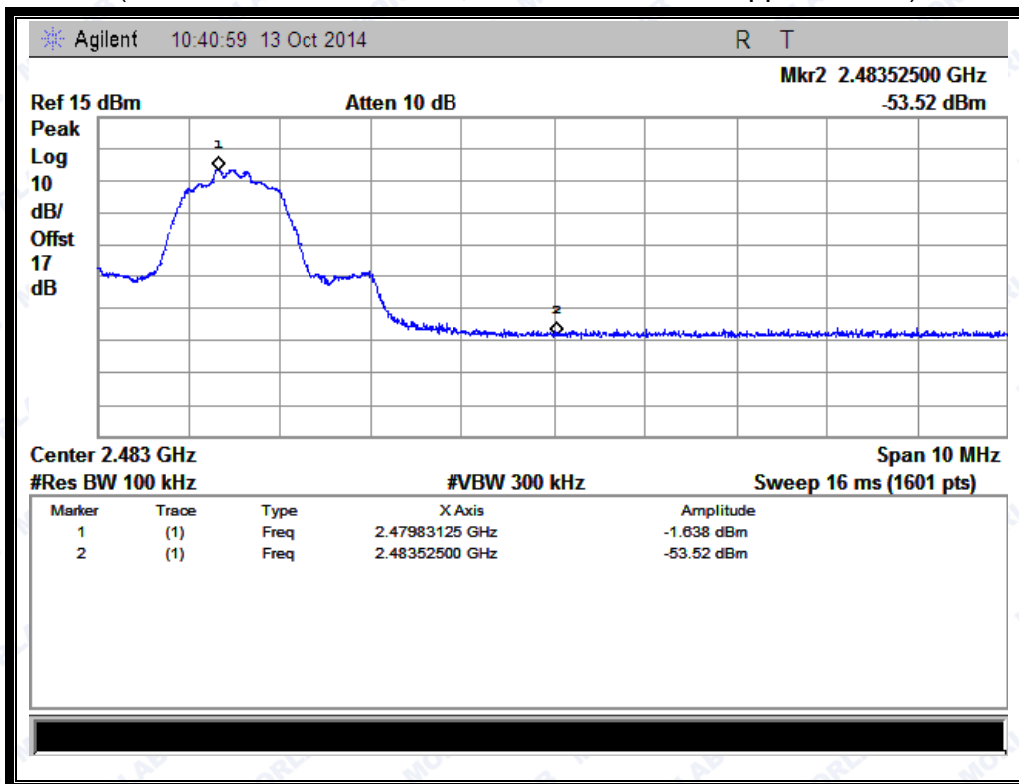




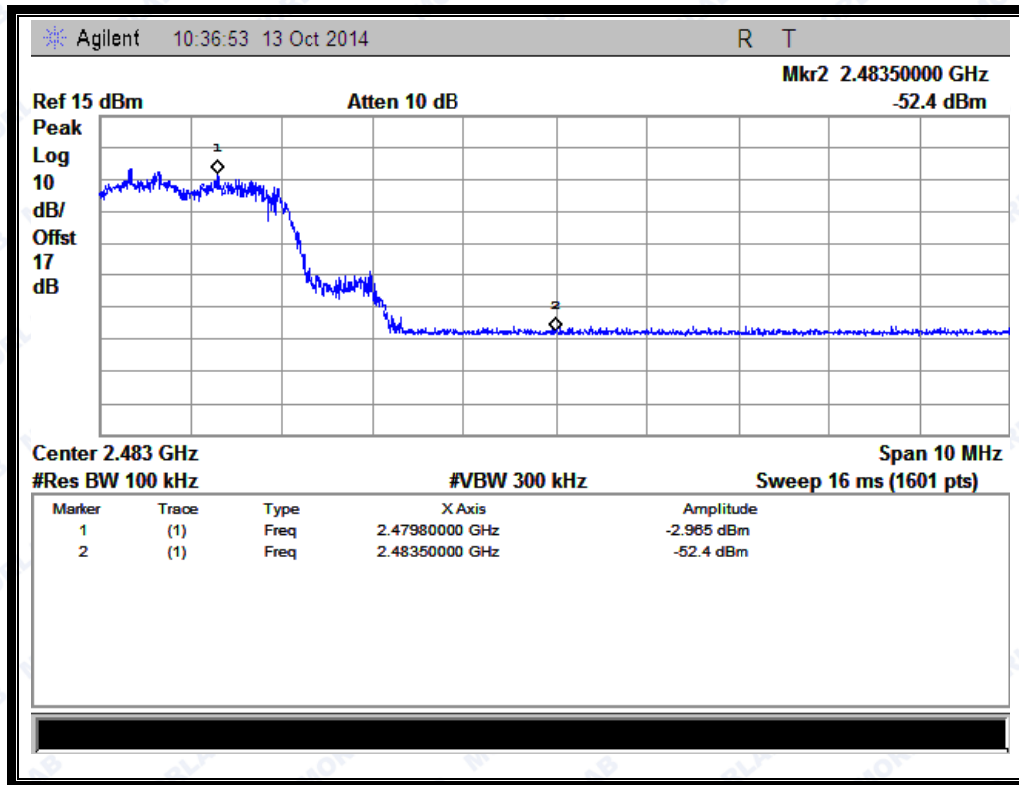
REPORT No. : SZ14090081W01



(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:

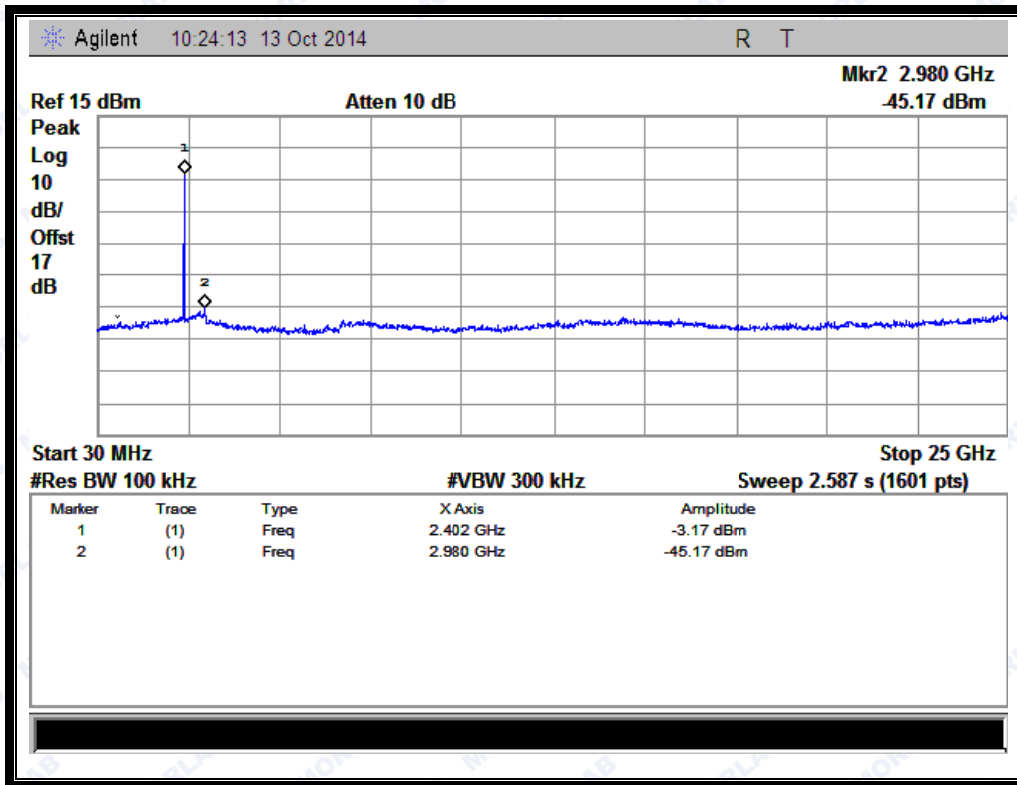
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-45.17	Plot G.1	-3.17	-23.2	PASS
39	2441	-47.74	Plot H.1	-4.373	-24.4	PASS
78	2480	-46.66	Plot I.1	-5.366	-25.4	PASS

#### B. Test Plots:

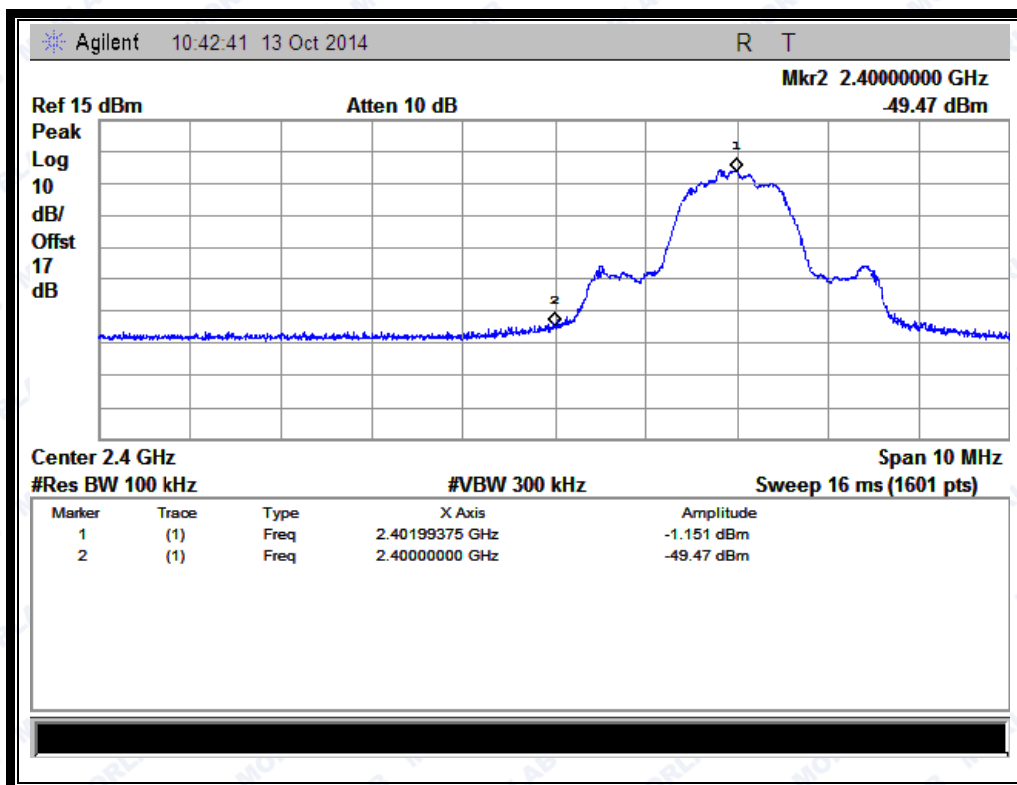
**Note:** the power of the Module transmitting frequency should be ignored.



REPORT No. : SZ14090081W01



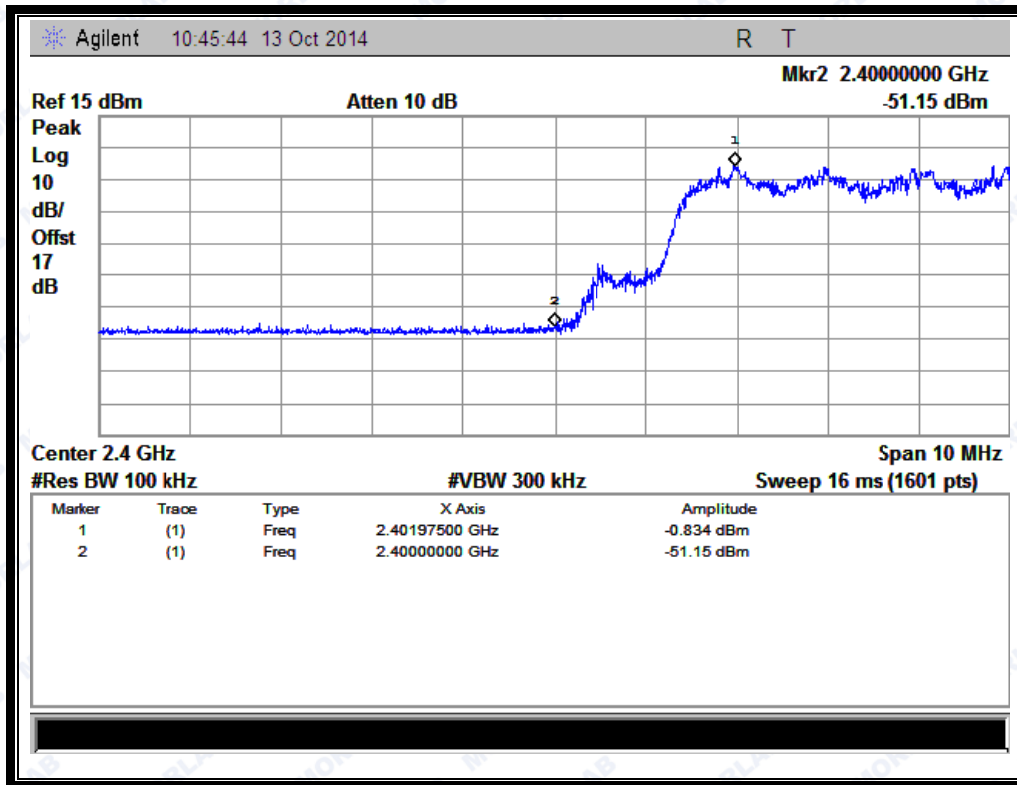
(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)



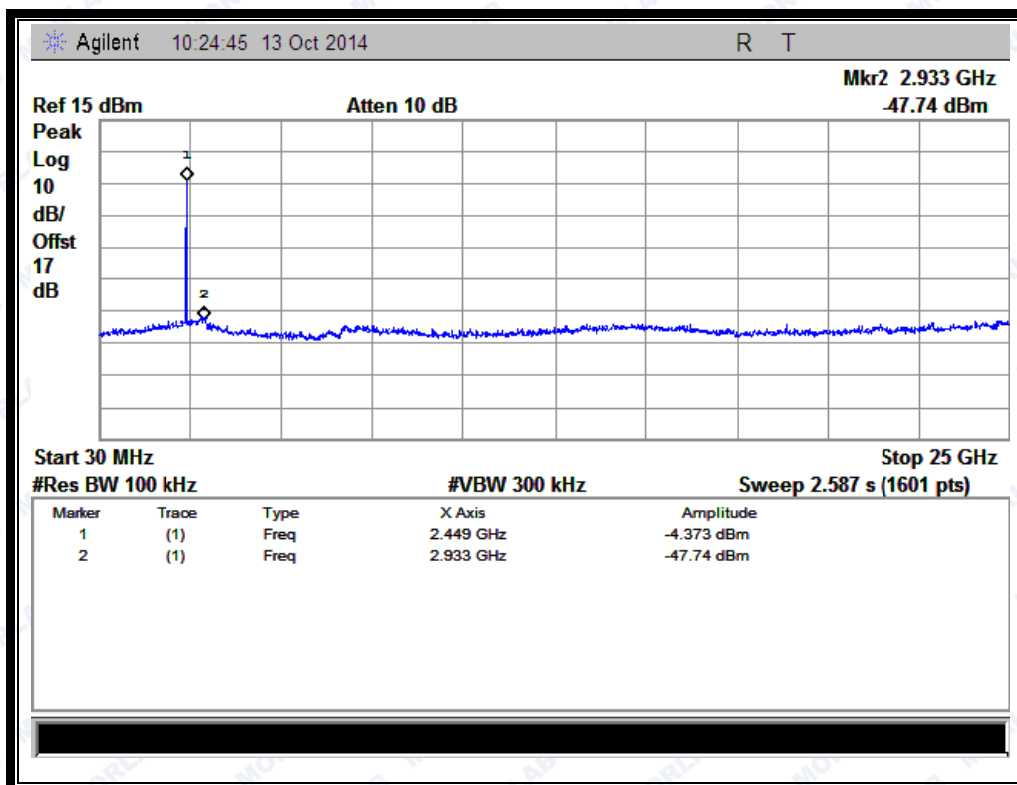
(Channel = 0, Band edge @ 8-DPSK)



REPORT No. : SZ14090081W01



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

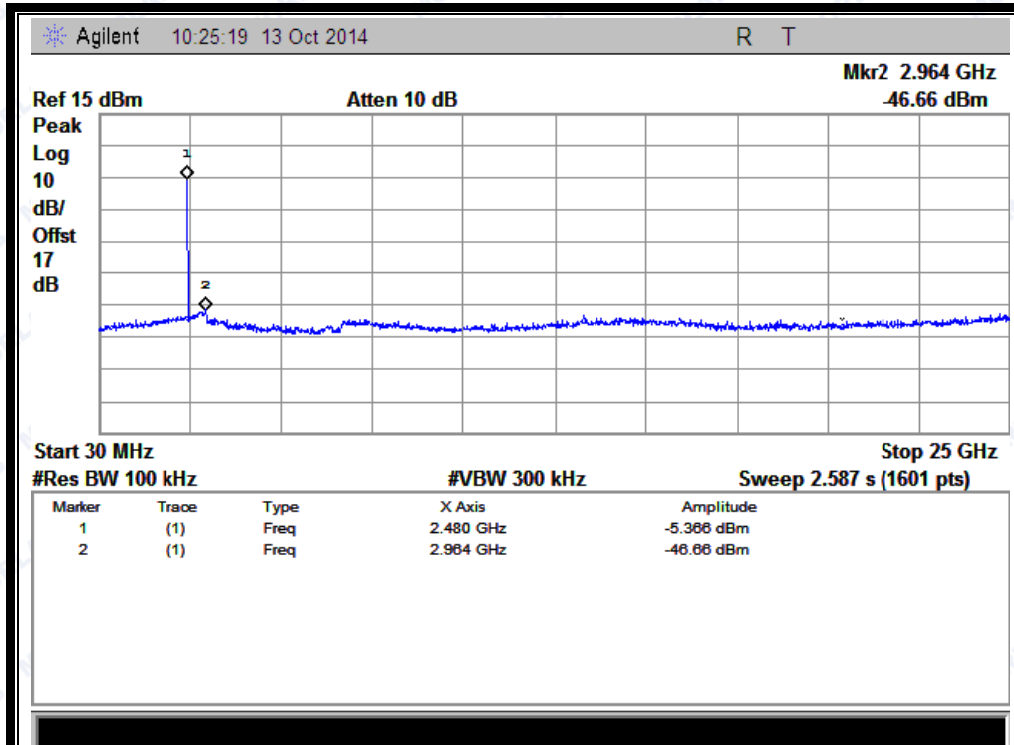


(Plot H.1: Channel = 39, 30MHz to 25GHz @ 8-DPSK)

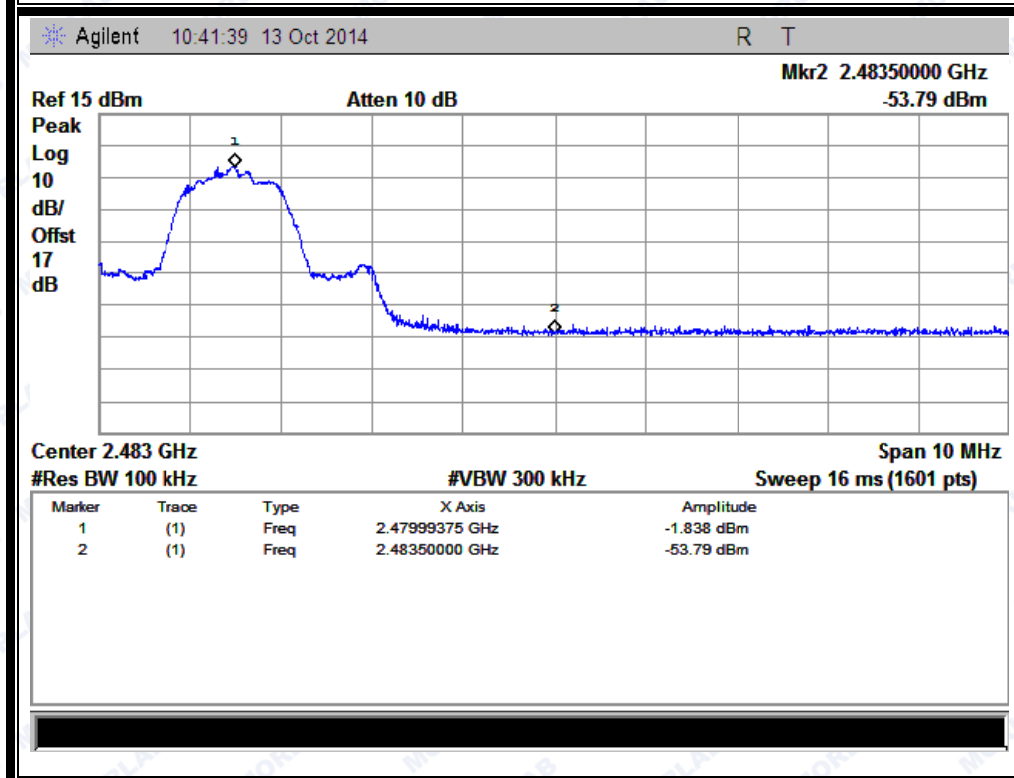




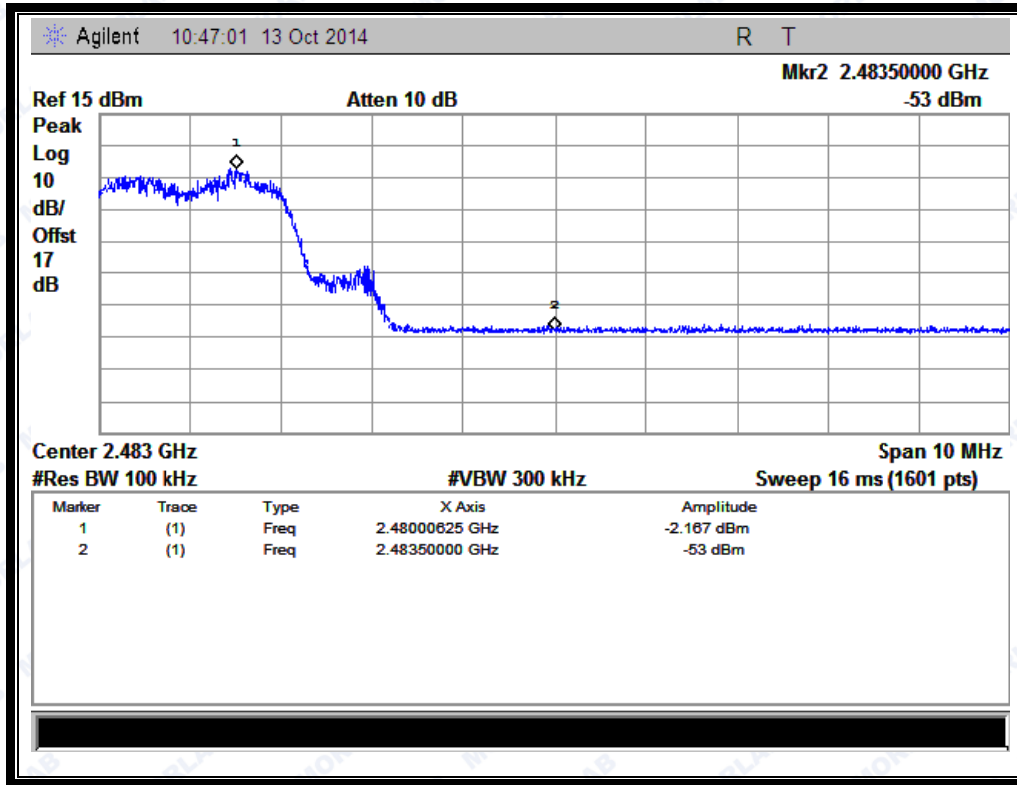
REPORT No. : SZ14090081W01



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



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



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

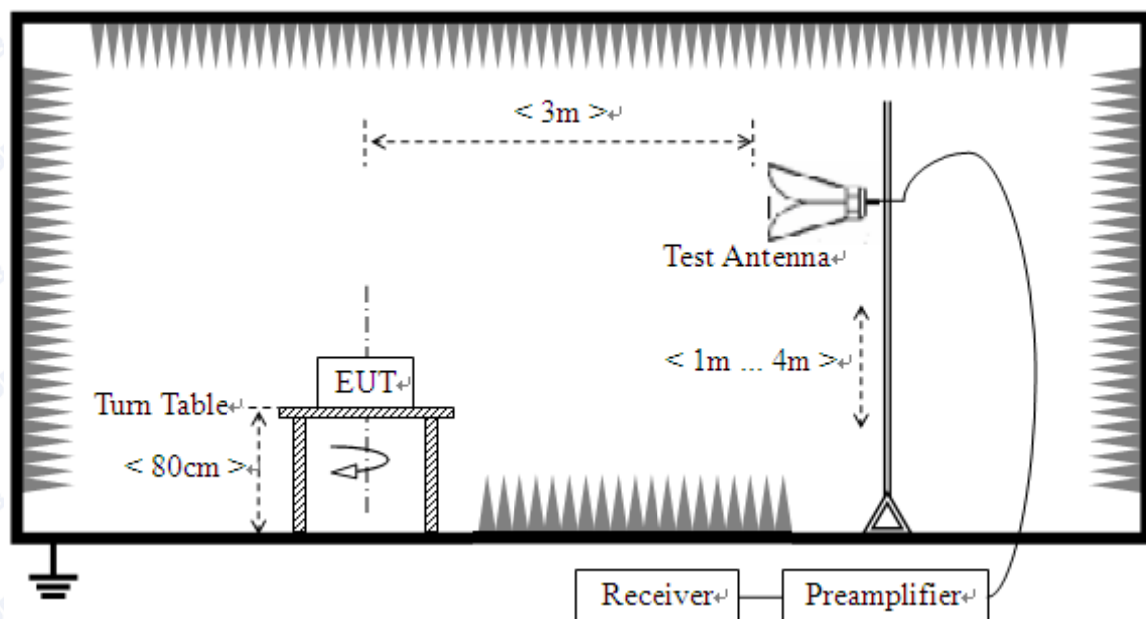
## 2.8. Restricted Frequency Bands

### 2.8.1. Requirement

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

### 2.8.2. Test Description

#### A. Test Setup:



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



For the Test Antenna:

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

#### **B. Equipments List:**

Please reference ANNEX A(1.4).

### **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.

#### **2.8.4.1. GFSK Mode**



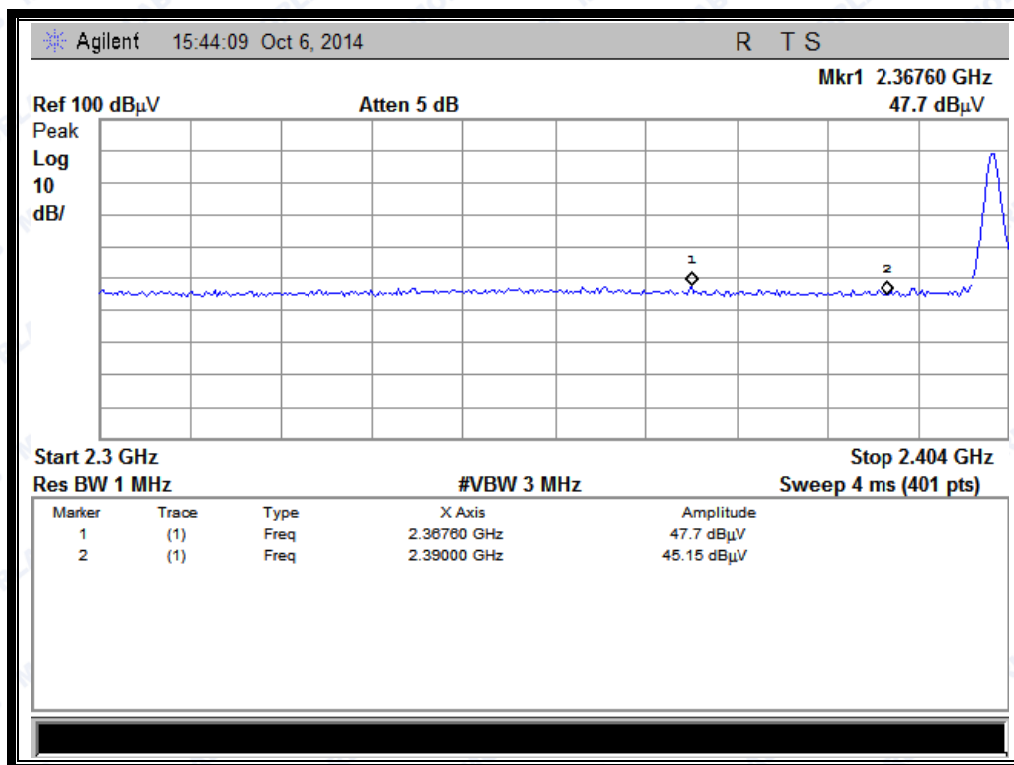


REPORT No. : SZ14090081W01

### 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	2367.60	PK	47.70	-33.63	32.56	46.63	74	Pass
0	2357.46	AV	35.18	-33.63	32.56	34.11	54	Pass
78	2484.17	PK	46.51	-33.18	32.5	45.83	74	Pass
78	2483.50	AV	36.76	-33.18	32.5	36.08	54	Pass

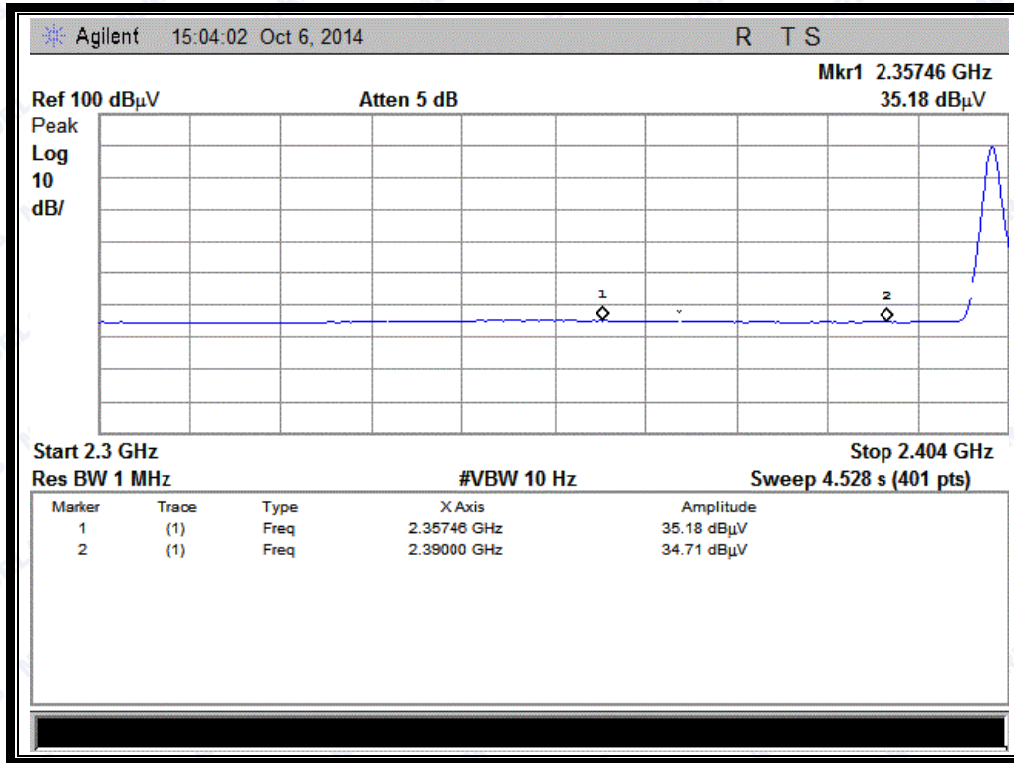
### B. Test Plots:



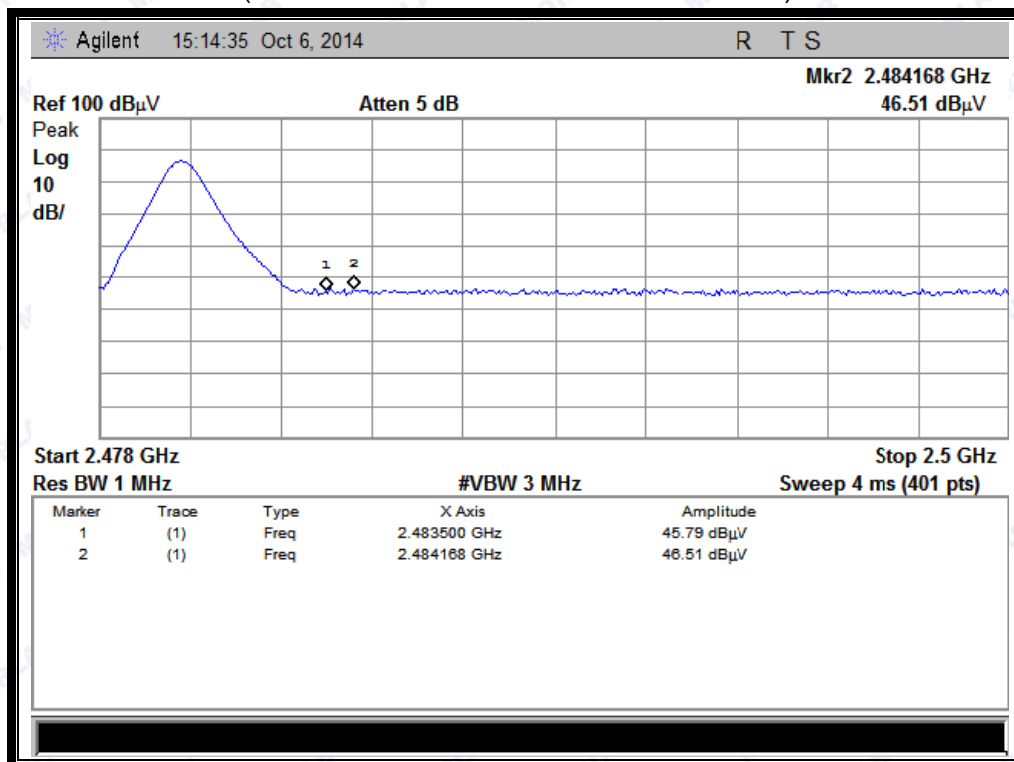
(Plot A1:Channel = 0 PEAK @ GFSK)



REPORT No. : SZ14090081W01



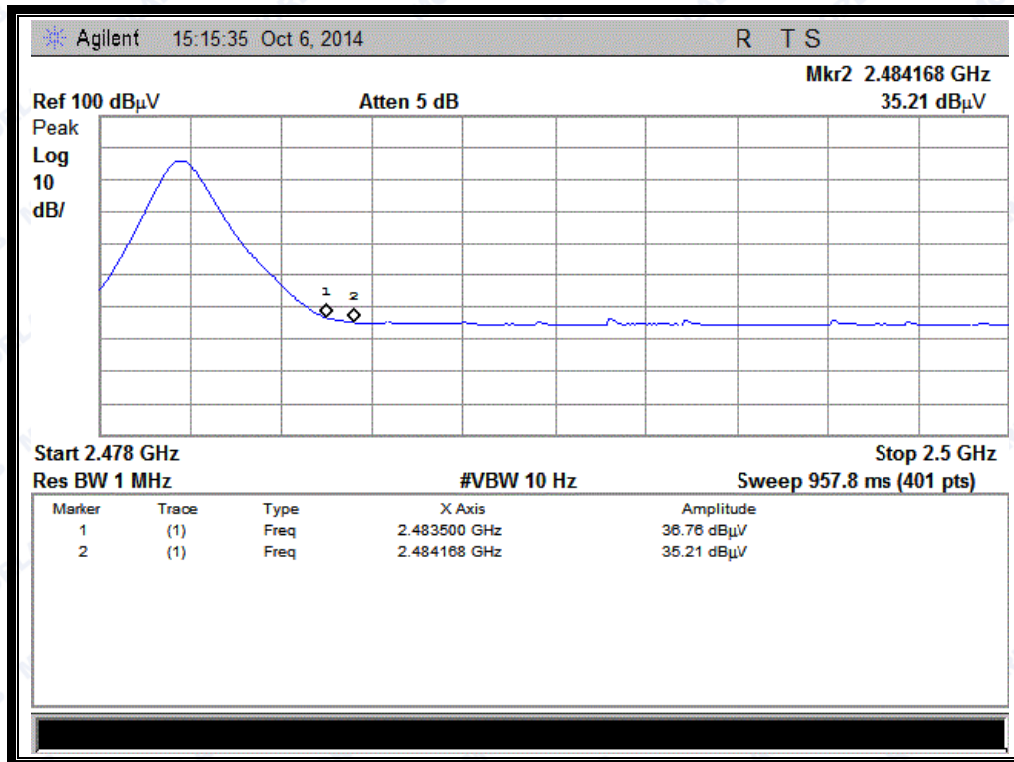
(Plot A2:Channel = 0 AVERAGE @ GFSK)



(Plot B1:Channel = 78 PEAK @ GFSK)



REPORT No. : SZ14090081W01



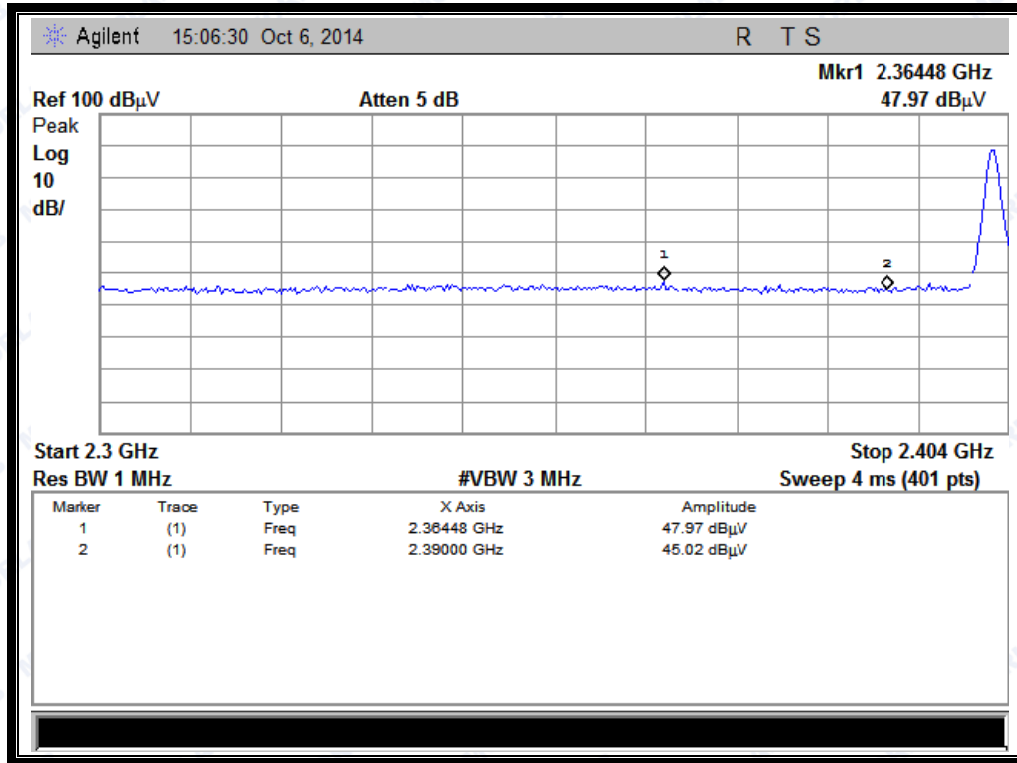
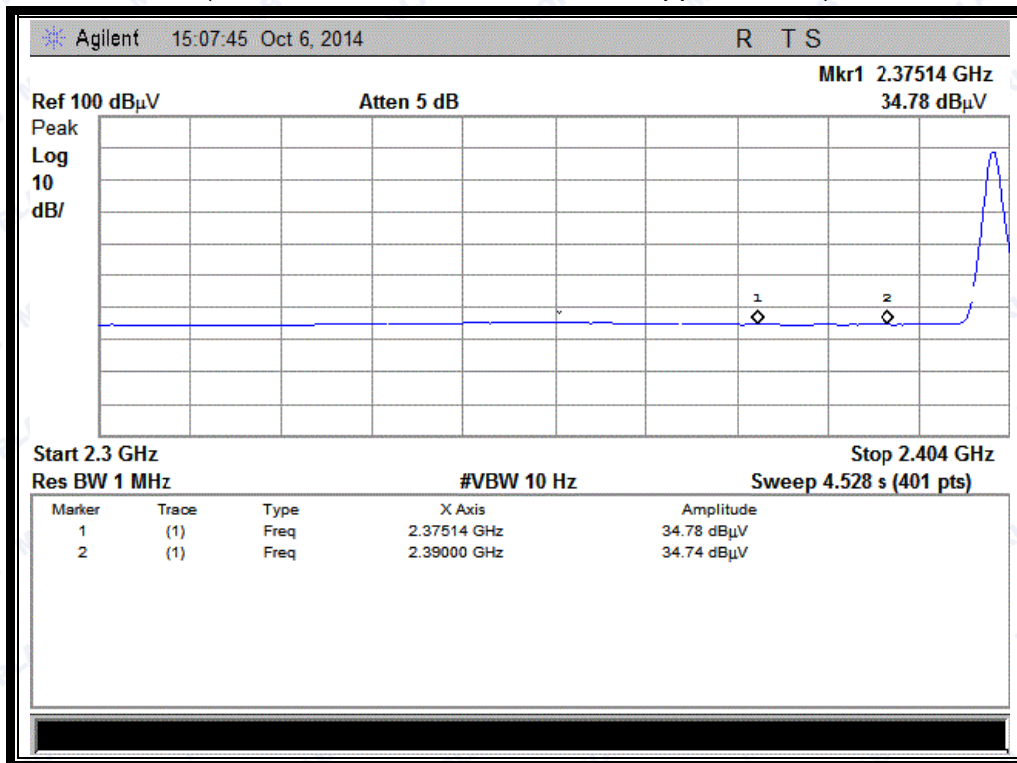
(Plot B2: Channel = 78 AVERAGE @ GFSK)

## 2.8.4.2. □/4-DQPSK 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	47.97	-33.63	32.56	46.9	74	Pass
0	2375.14	AV	34.78	-33.63	32.56	33.71	54	Pass
78	2484.66	PK	46.21	-33.18	32.5	45.53	74	Pass
78	2483.50	AV	35.97	-33.18	32.5	35.29	54	Pass

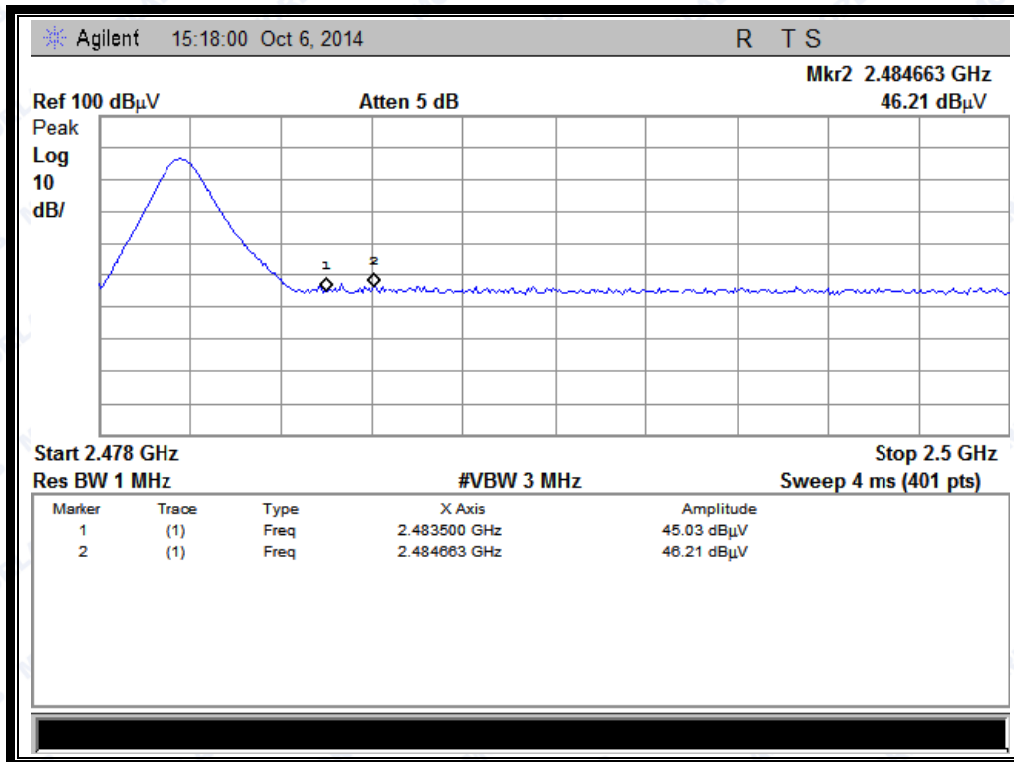
### B. Test Plots:

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

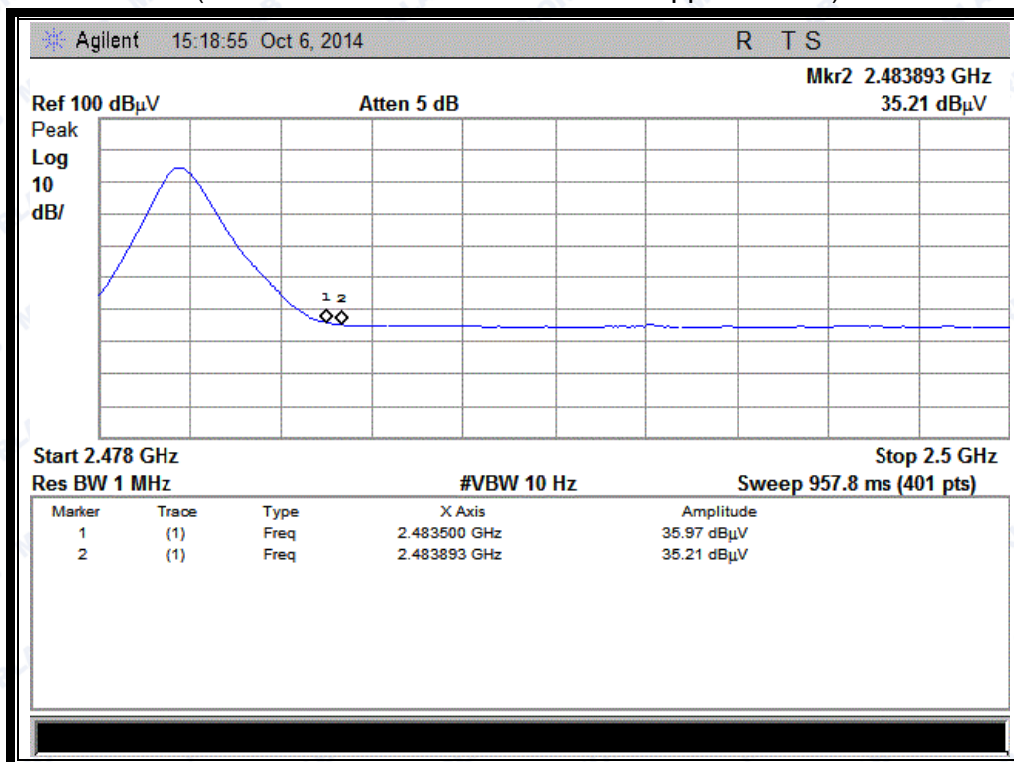




REPORT No. : SZ14090081W01



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



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

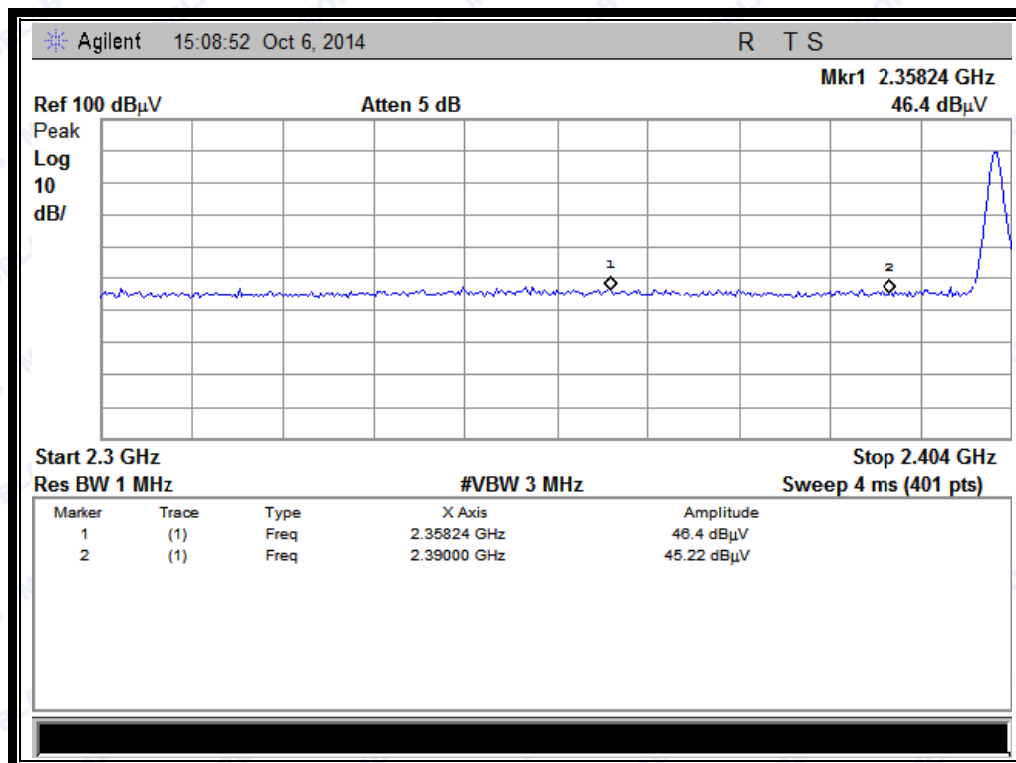


### 2.8.4.3. 8-DPSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
0	2358.24	PK	46.40	-33.63	32.56	45.33	74	Pass
0	2375.92	AV	34.84	-33.63	32.56	33.77	54	Pass
78	2484.72	PK	46.30	-33.18	32.5	45.62	74	Pass
78	2483.50	AV	36.81	-33.18	32.5	36.13	54	Pass

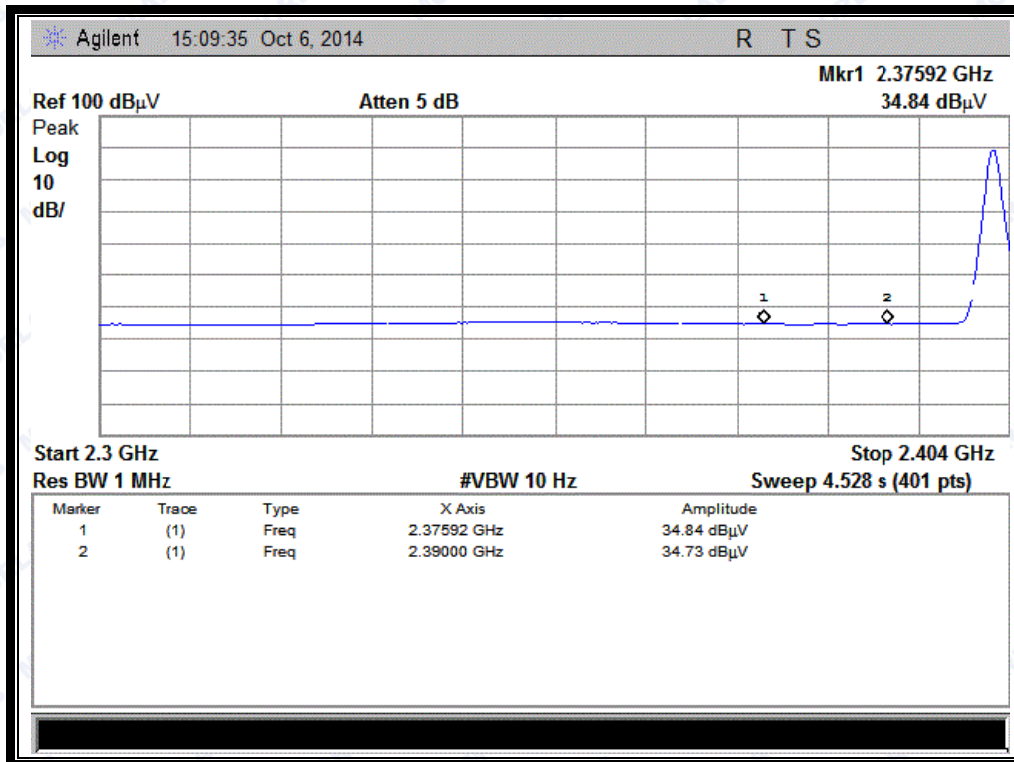
#### B. Test Plots:



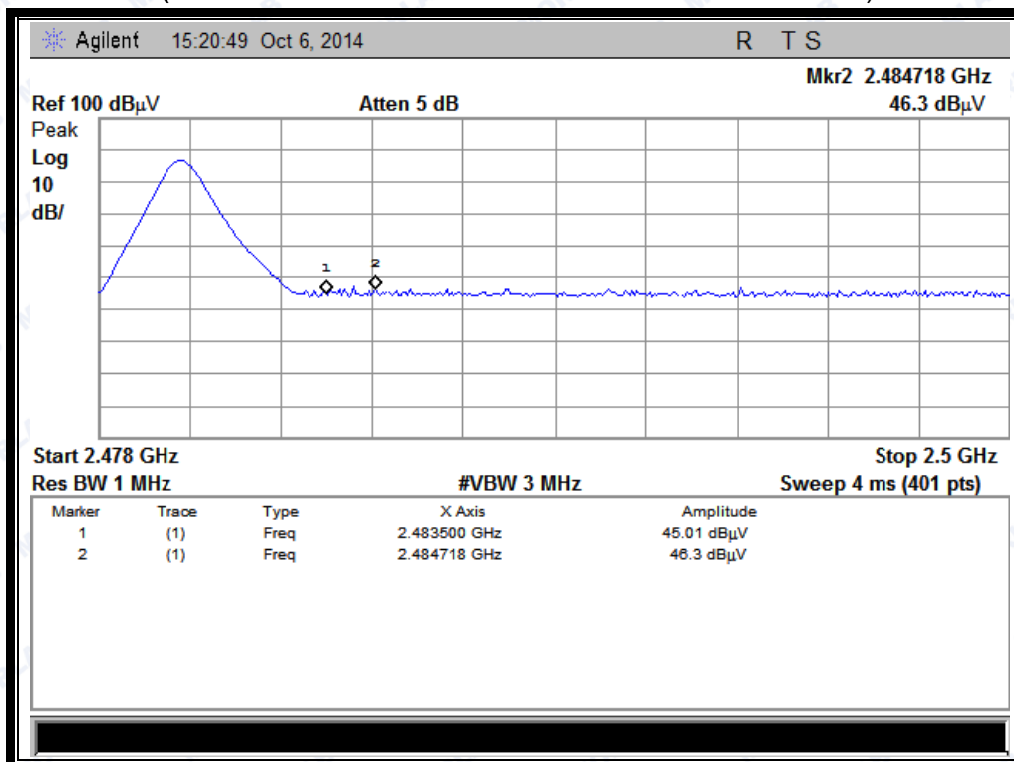
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



REPORT No. : SZ14090081W01



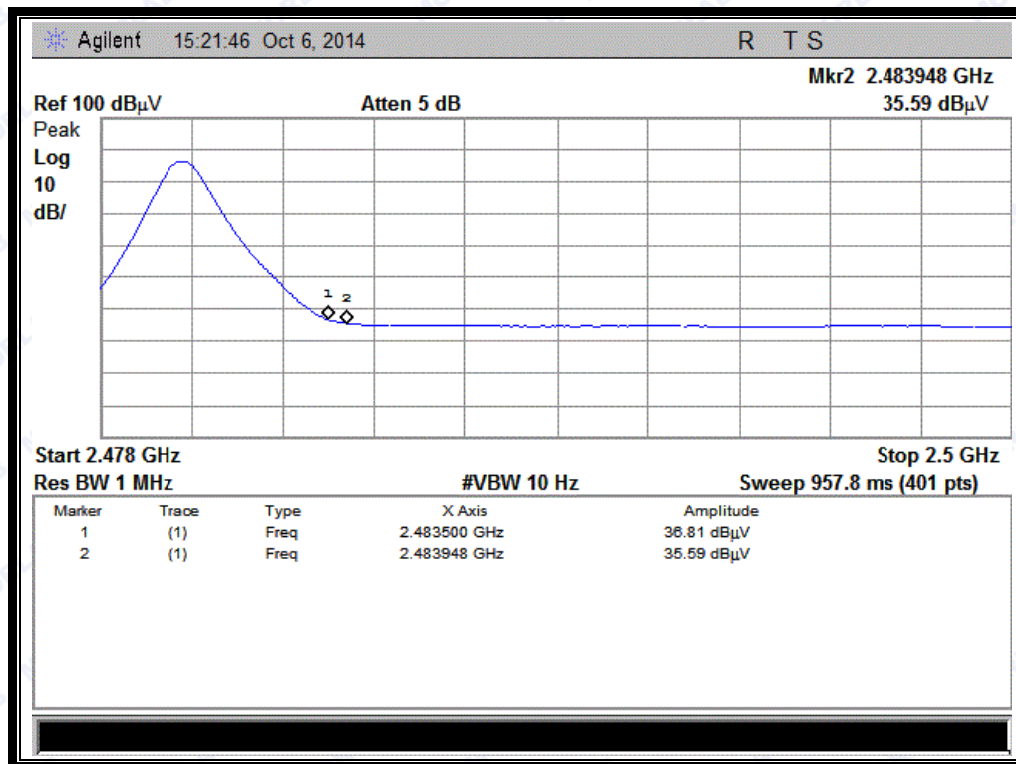
(Plot E2: Channel = 0 AVERAGE @ 8-DPSK Mode)



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



REPORT No. : SZ14090081W01



(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 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

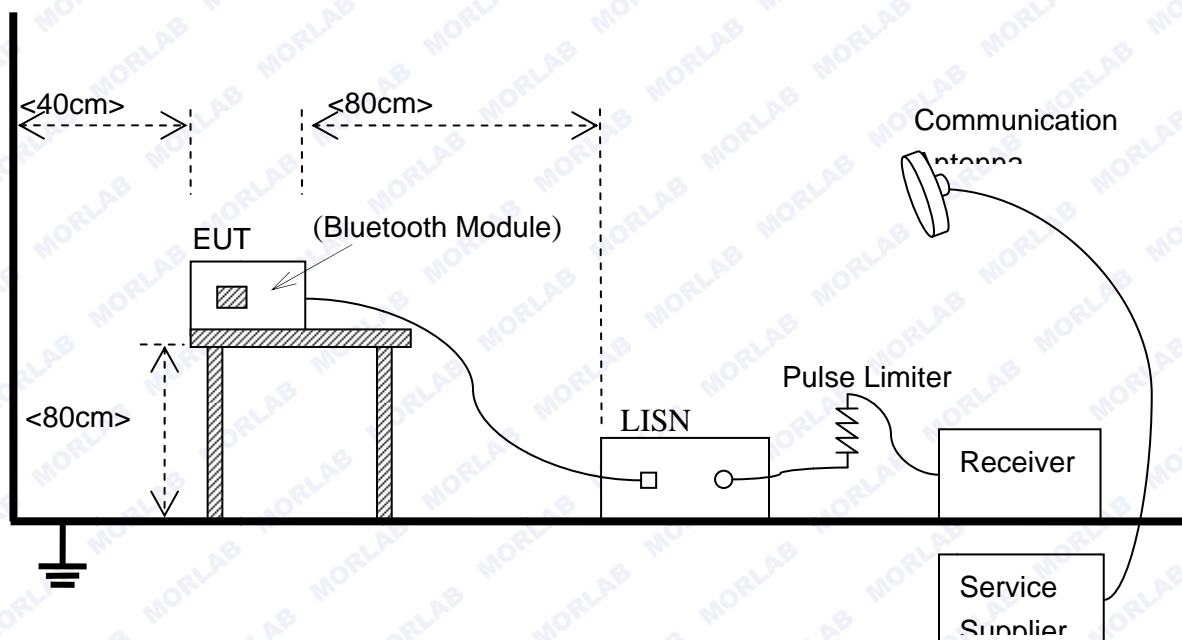
Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

#### 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).

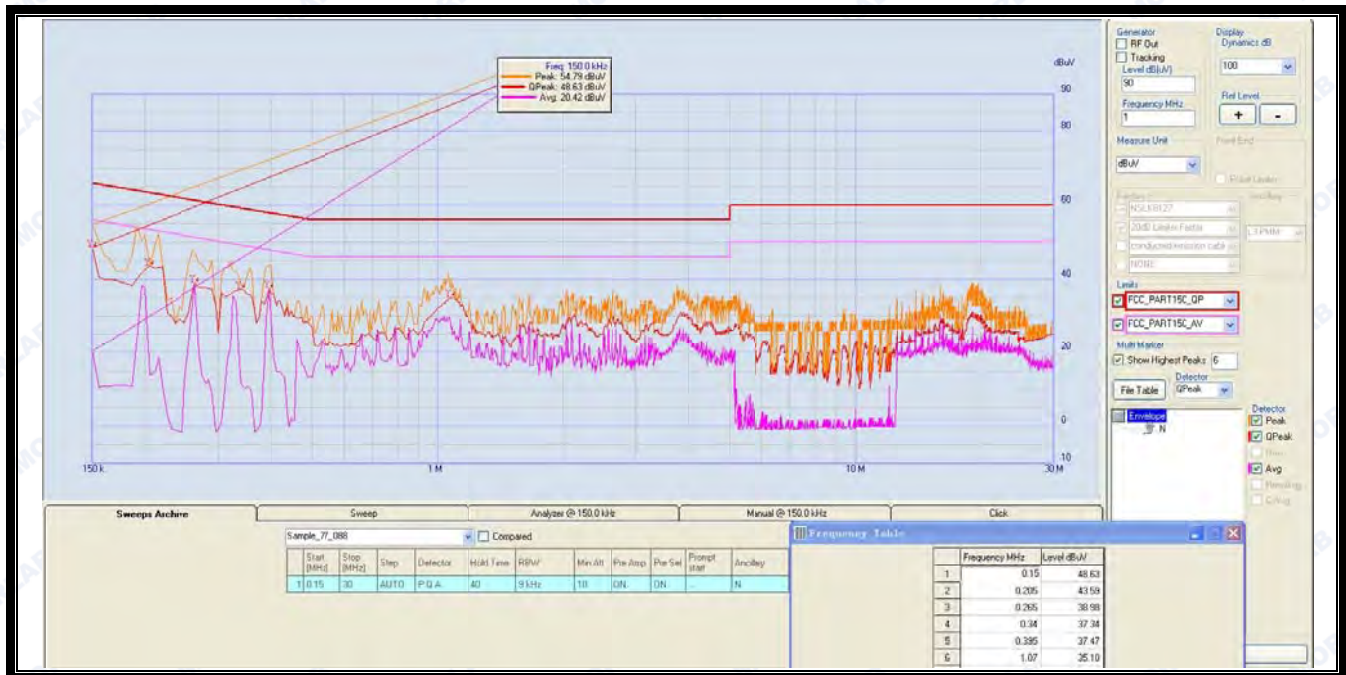
### **2.9.3. Test Result**

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.

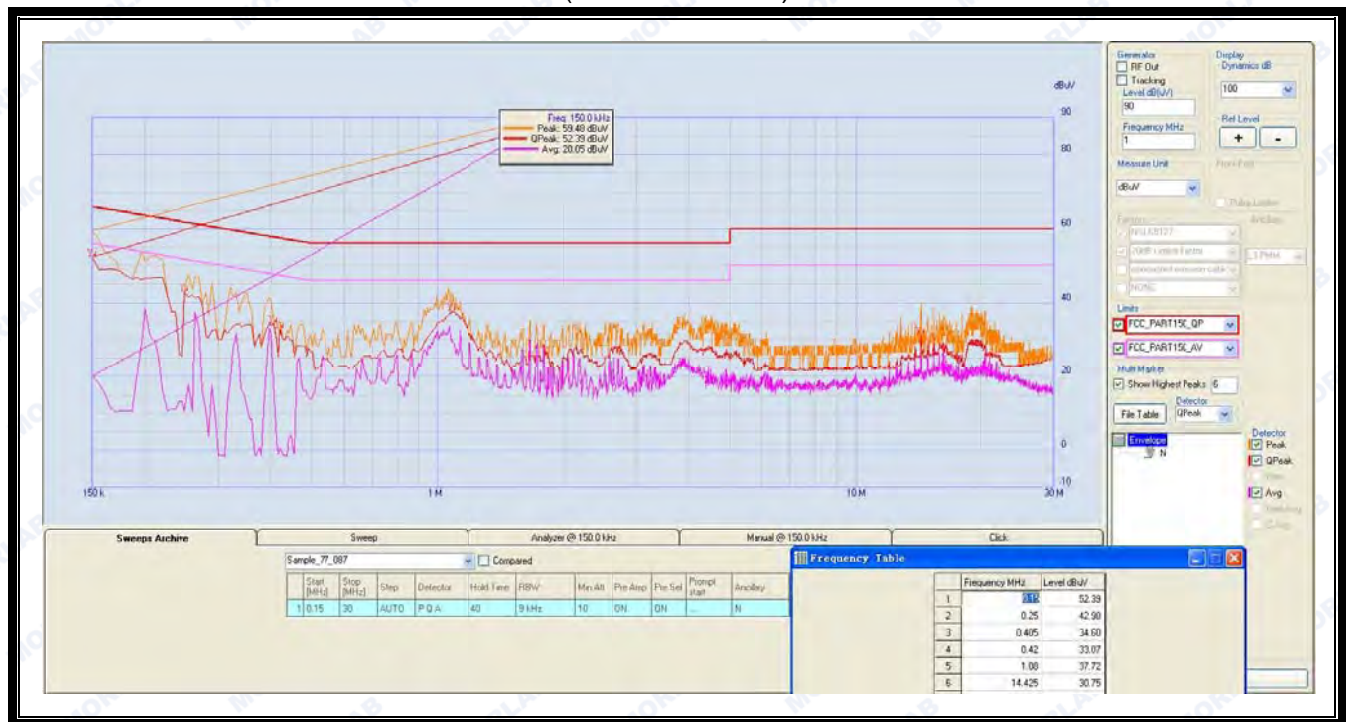
#### **A. Test setup:**

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

#### **B. Test Plots:**



(Plot A: L Phase)



(Plot B: N Phase)





## 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 ( $\mu\text{V/m}$ )	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)

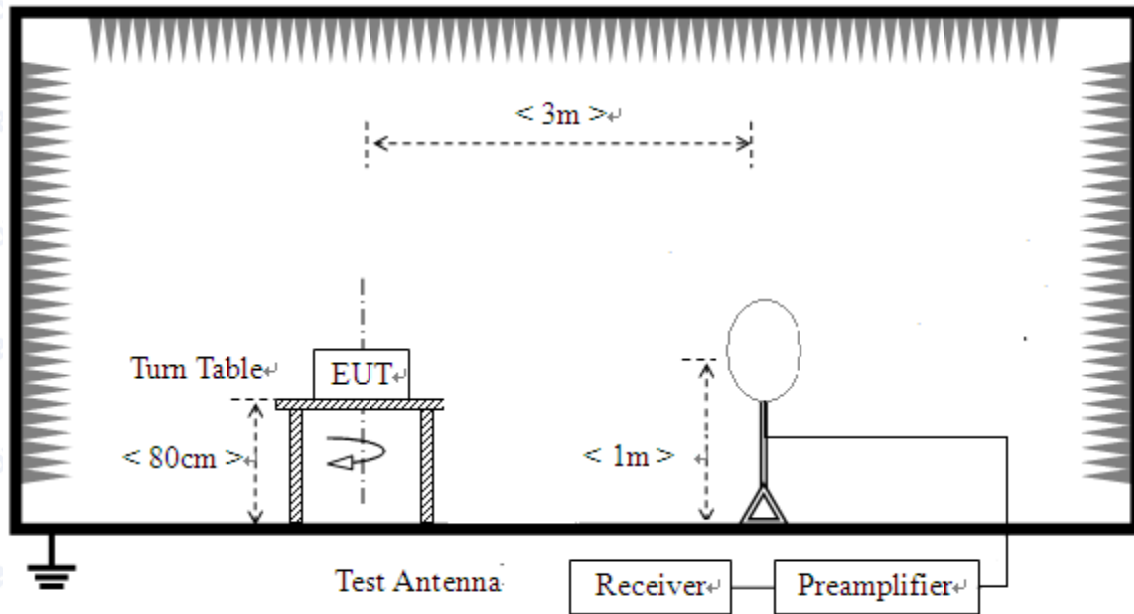
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

### 2.10.2. Test Description

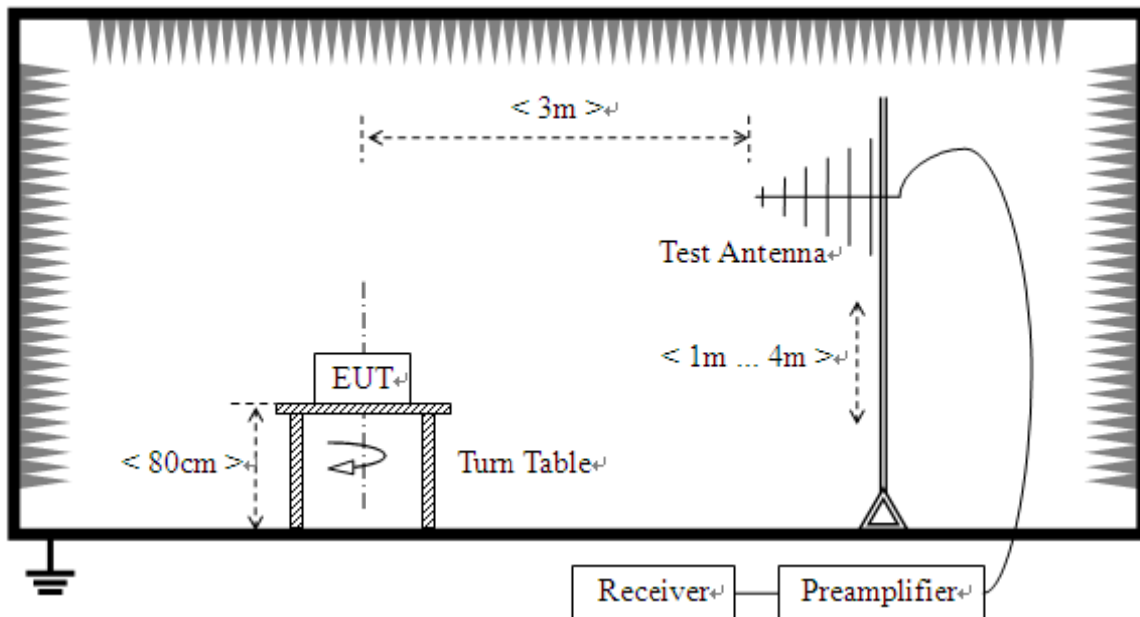
**A. Test Setup:**

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

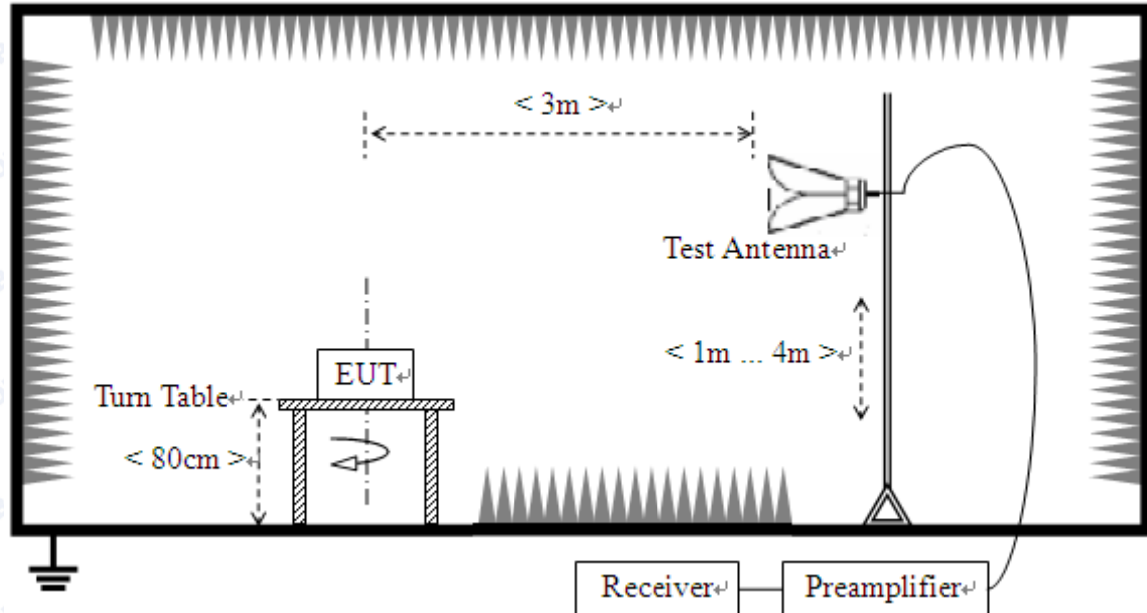




2) For radiated emissions from 30MHz to 1GHz



### 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 Bluetooth Module of the EUT is powered by the Battery. 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:

- 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

$G_{\text{preamp}}$ : Preamplifier Gain

$A_{\text{Factor}}$ : Antenna Factor at 3m

During the test, the total correction Factor  $A_T$  and  $A_{\text{Factor}}$  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.

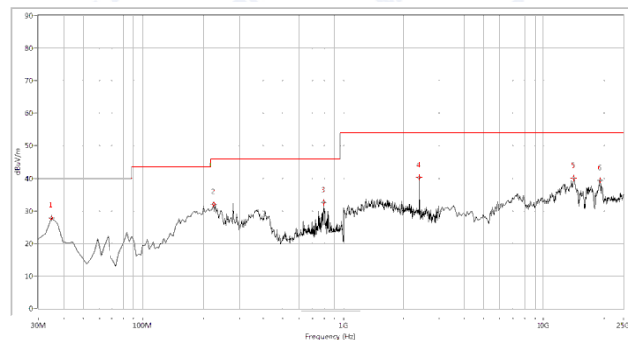
The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.



## 2.10.4.1. GFSK Mode:

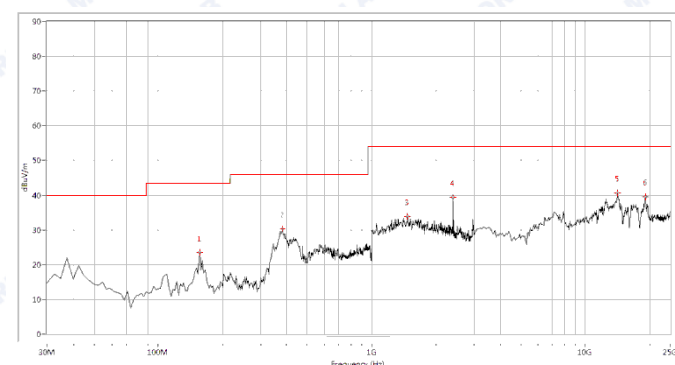
### A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	27.76	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
223.516	32.10	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	32.65	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2402.000	40.29	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	40.17	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19129.676	39.44	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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



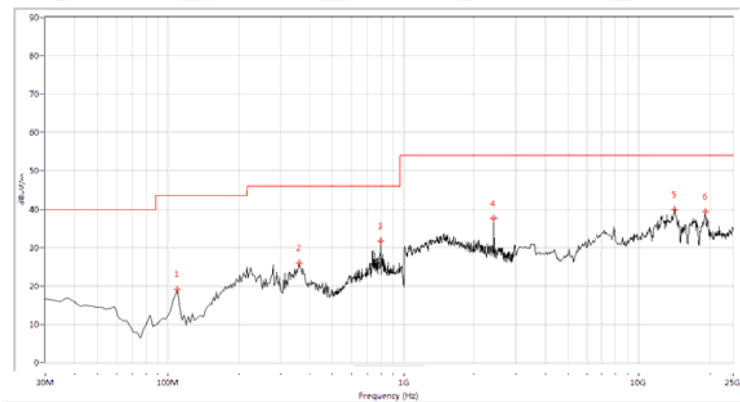
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
155.786	23.50	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
383.167	30.22	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
1463.840	33.82	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2402.000	39.43	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14192.020	40.57	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19129.676	39.64	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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



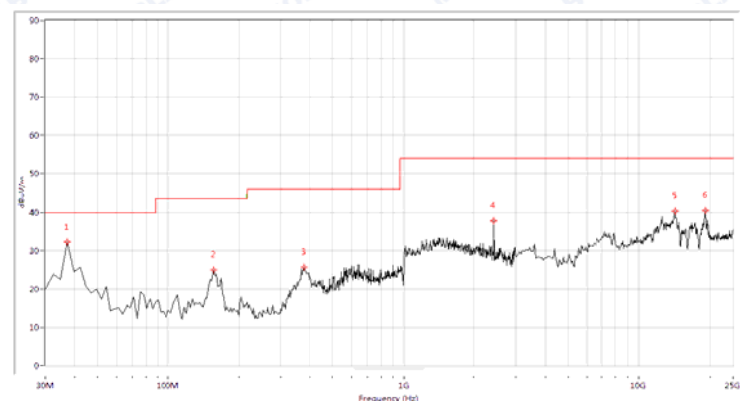


Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
109.825	19.01	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
358.978	26.05	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	31.67	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2441.000	37.60	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	39.96	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19129.676	39.39	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

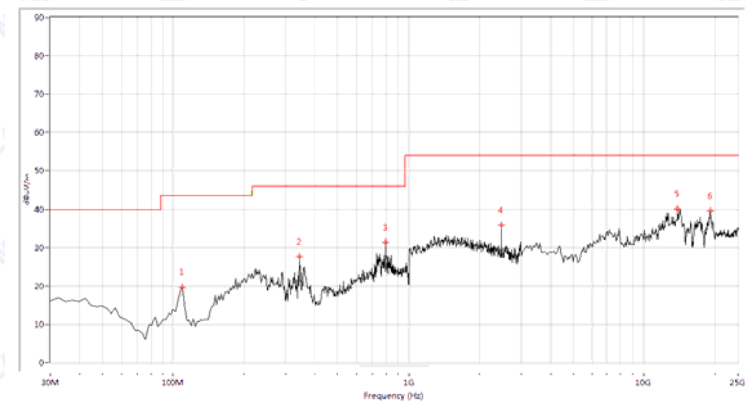


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
37.257	32.32	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
155.786	24.97	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
375.910	25.65	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2441.000	37.75	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14246.883	40.29	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19129.676	40.37	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

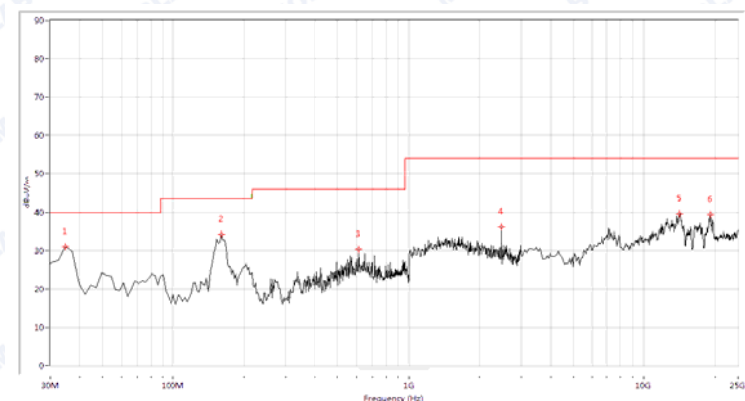


Plot for Channel = 78



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
109.825	19.58	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
344.464	27.68	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
799.227	31.45	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
248.000	35.79	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
13917.706	40.07	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19129.676	39.55	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
34.838	31.02	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
160.623	34.22	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
615.387	30.36	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2480.000	36.21	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	39.63	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19129.676	39.41	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

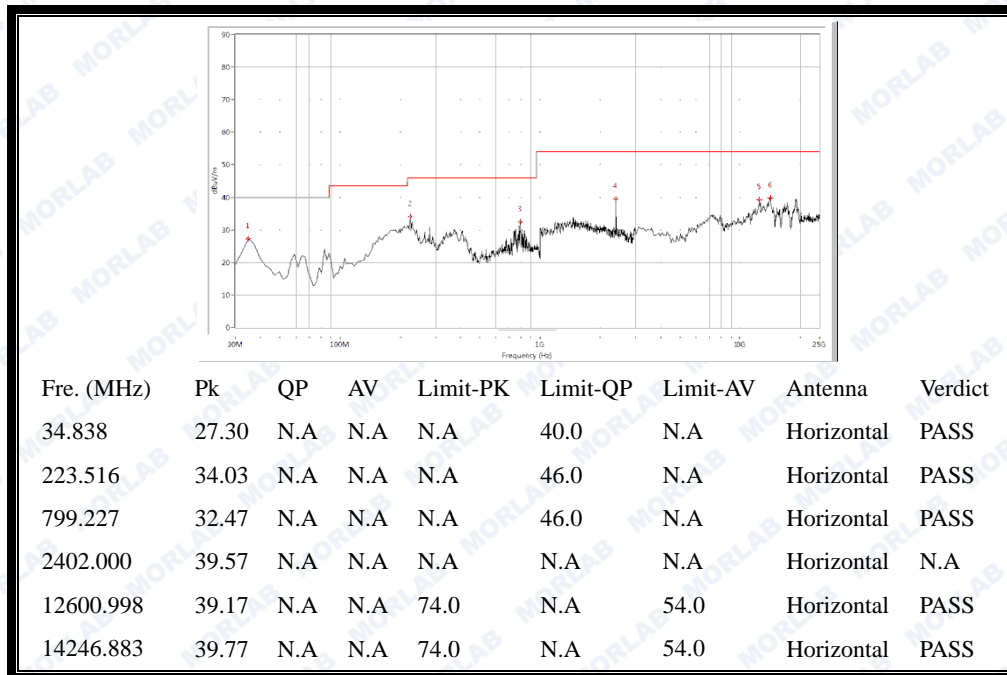
(30MHz to 25GHz, Antenna Vertical @ GFSK, channel 78)



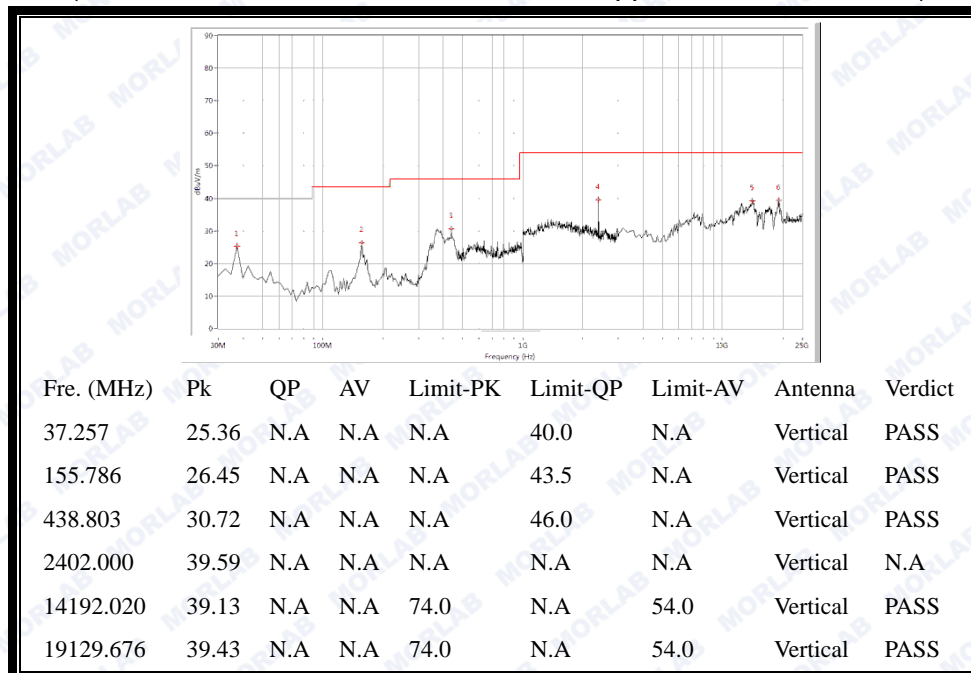
## 2.10.4.2. $\pi/4$ -DQPSK Mode:

### A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0



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

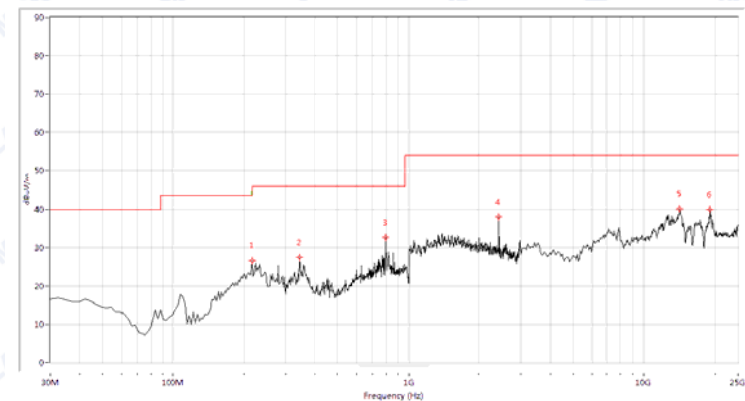


(30MHz to 25GHz, Antenna Vertical @  $\pi/4$ -DQPSK, channel 0)



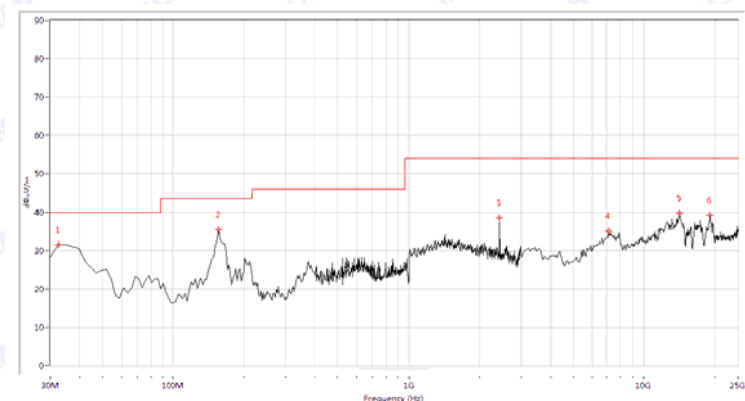
REPORT No. : SZ14090081W01

Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
216.259	26.47	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
344.464	27.46	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
799.227	32.57	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2441.000	37.94	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	40.15	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19074.813	39.98	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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



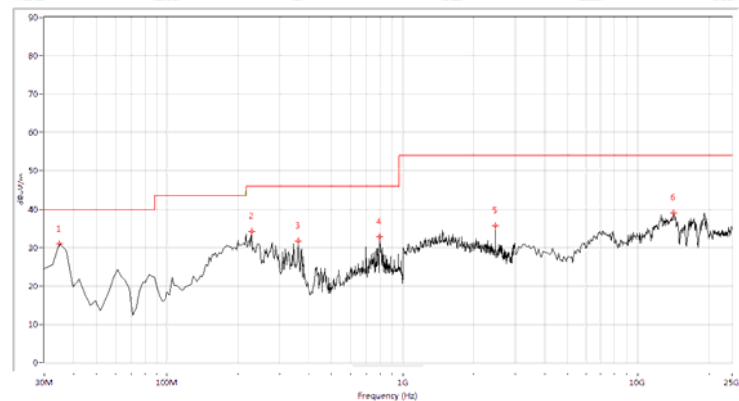
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
32.419	31.62	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
155.786	35.38	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
2441.000	38.54	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
7114.713	35.05	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
14137.157	39.76	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19019.950	39.16	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

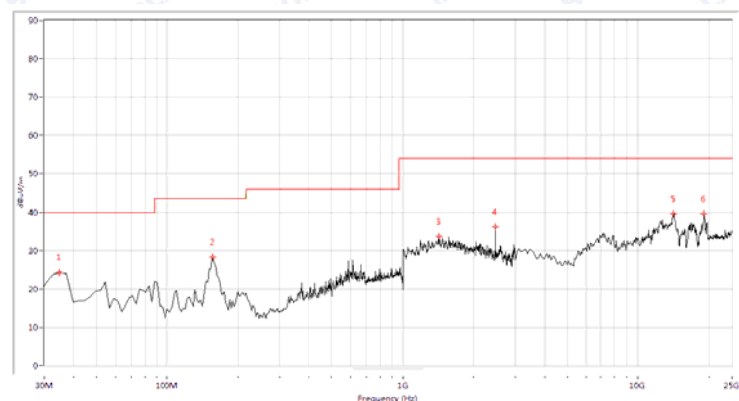




## Plot for Channel = 78

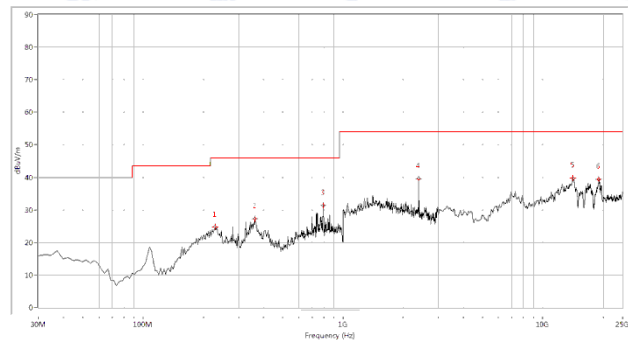


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	31.02	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
228.354	34.13	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
358.978	31.67	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	32.79	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2480.000	35.68	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	38.96	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

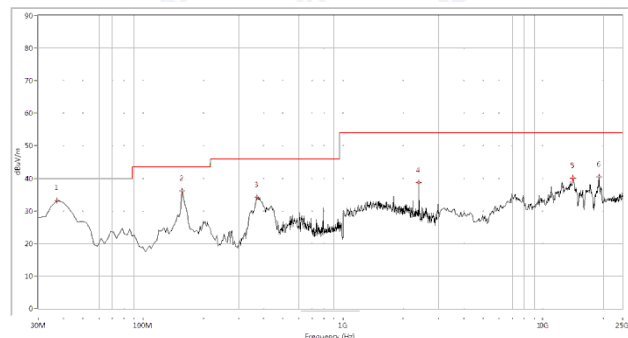
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	24.21	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
155.786	28.34	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
1413.965	33.67	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2480.000	36.17	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	39.53	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19074.813	39.64	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
228.354	24.80	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
361.397	27.24	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	31.37	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2402.000	39.48	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14137.157	39.67	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19074.813	39.33	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

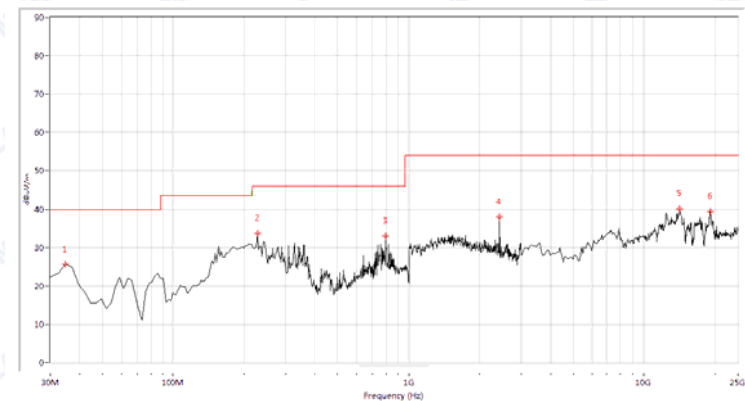


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
37.257	33.08	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
155.786	36.15	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
371.072	34.17	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2402.000	38.60	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14137.157	40.13	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19129.676	40.42	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

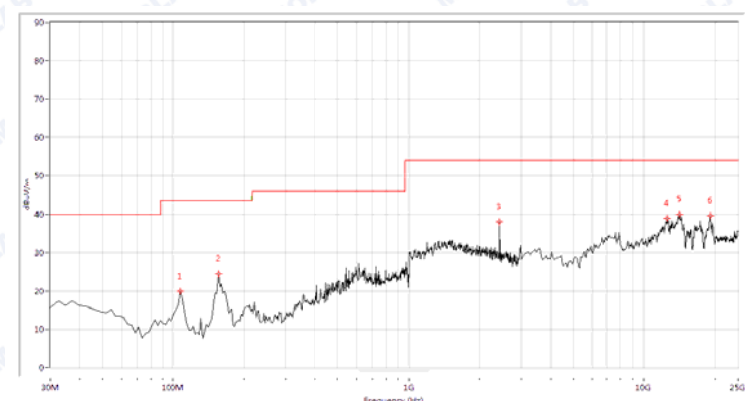


Plot for Channel = 39



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
34.838	25.64	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
228.354	33.68	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	33.03	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2441.000	37.94	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	40.05	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19129.676	39.46	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

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

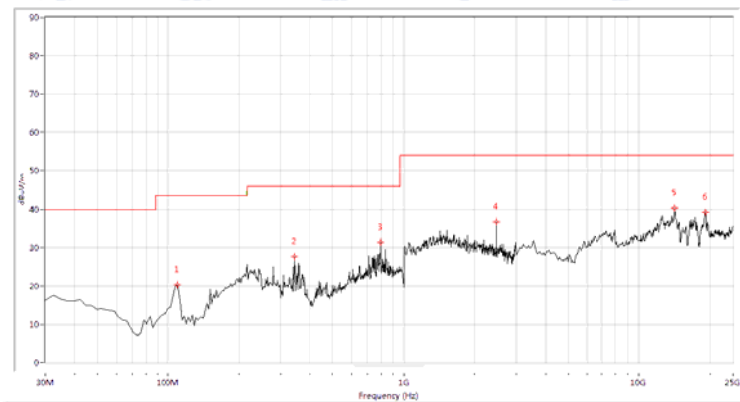


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
107.406	19.89	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
155.786	24.49	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
2441.000	37.93	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
12600.998	38.80	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
14192.020	39.94	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19129.676	39.50	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

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

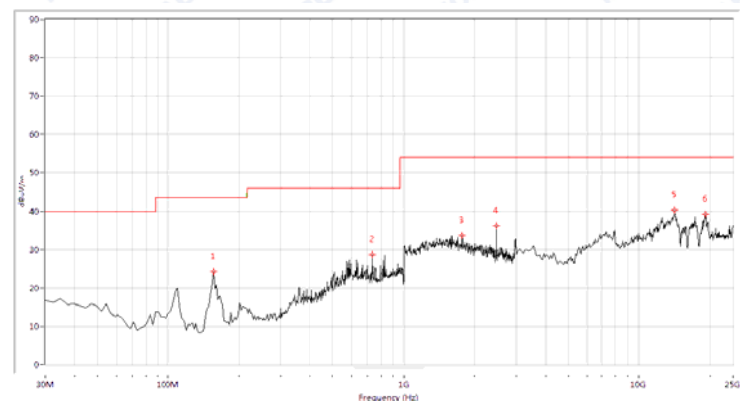


Plot for Channel = 78



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
109.825	20.30	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
344.464	27.68	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
794.389	31.30	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2480.000	36.64	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
14192.020	40.30	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
19129.676	39.28	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
155.786	24.25	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
736.334	28.75	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
1778.055	33.65	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2480.000	36.14	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
14192.020	40.19	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
19129.676	39.21	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

### 2.11.1. 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 <sup>2</sup> )
0.3-1.34	614	1.63	(100)*
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*
30-300	27.5	0.073	0.2
300-1500			f/1500
1500-100,000			1.0



### 2.11.1.1. Test result

Maximum peak output power at antenna input terminal(dBm):	0.836
Maximum peak output power at antenna input terminal(mW):	1.212
Source-based time-averaged output power:	--
Prediction distance(cm):	20
Predication frequency(MHz):	
Antenna Gain (typical) (dBi):	0
Power density at predication frequency at <u>20</u> cm(mW/cm <sup>2</sup> ):	0.000241
MPE limit for RF exposure at prediction frequency(mW/cm <sup>2</sup> ):	1.0

### 2.11.2. Conclusion

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



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

The IC registration number is 7183A-2.





REPORT No. : SZ14090081W01

## 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	2014.02.26	2015.02.25
2	Spectrum Analyzer	US44210471	E7405A	Agilent	2014.02.26	2015.02.25
3	Power Splitter	NW521	1506A	Weinschel	2014.02.26	2015.02.25
4	Attenuator 1	(n.a.)	10dB	Resnet	2014.02.26	2015.02.25
5	Attenuator 2	(n.a.)	3dB	Resnet	2014.02.26	2015.02.25
6	EXA Signal Analyzer	MY51440152	N9010A	Agilent	2014.02.26	2015.02.25
5	USB Wideband Power Sensor	MY52280010	U2021XA	Agilent	2014.02.26	2015.02.25
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	2014.02.26	2015.02.25
2	LISN	812744	NSLK 8127	Schwarzbeck	2014.02.26	2015.02.25
3	Service Supplier	100448	CMU200	R&S	2014.02.26	2015.02.25
4	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2014.02.26	2015.02.25
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





REPORT No. : SZ14090081W01

1	System Simulator	100448	CMU200	R&S	2014.02.26	2015.02.25
2	Receiver	US44210471	E7405A	Agilent	2014.02.26	2015.02.25
3	Test Antenna - Bi-Log	9163-274	9m*6m*6m	Albatross	2014.02.26	2015.02.25
4	Test Antenna - Horn	9120D-963	VULB 9163	Schwarzbeck	2014.02.26	2015.02.25
5	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2014.02.26	2015.02.25
6	Test Antenna - Loop	1519-022	HL050S7	R&S	2014.02.26	2015.02.25
7	Reject Filter	(n.a.)	BRM50702	Micro-Tronics	2014.02.26	2015.02.25
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	2014.02.26	2015.02.25

#### 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	2014.02.26	2015.02.25

#### 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	2014.02.26	2015.02.25

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