

# RF TEST REPORT



Report No.: 16070264-FCC-R

Supersede Report No.: N/A

Applicant	Xiamen PRT Technology Co.,Ltd	
Product Name	Bluetooth Module	
Model No.	SCBM4A	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2015, ANSI C63.10: 2013	
Test Date	March 30 to April 14, 2016	
Issue Date	April 14, 2016	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification <input checked="" type="checkbox"/>		
Equipment did not comply with the specification <input type="checkbox"/>		
<i>Winnie Zhang</i>	<i>David Huang</i>	
Winnie Zhang Test Engineer	David Huang Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

**SIEMIC (SHENZHEN-CHINA) LABORATORIES**

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: [China@siemic.com.cn](mailto:China@siemic.com.cn)

## Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

Test Report	16070264-FCC-R
Page	3 of 55

This page has been left blank intentionally.

## CONTENTS

1. REPORT REVISION HISTORY .....	5
2. CUSTOMER INFORMATION .....	5
3. TEST SITE INFORMATION .....	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION .....	6
5. TEST SUMMARY .....	7
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS .....	8
6.1 ANTENNA REQUIREMENT .....	8
6.2 CHANNEL SEPARATION .....	9
6.3 20DB BANDWIDTH .....	13
6.4 PEAK OUTPUT POWER .....	17
6.5 NUMBER OF HOPPING CHANNEL .....	21
6.6 TIME OF OCCUPANCY (DWEIL TIME) .....	23
6.7 BAND EDGE .....	27
6.8 AC POWER LINE CONDUCTED EMISSIONS .....	35
6.9 RADIATED SPURIOUS EMISSIONS .....	41
ANNEX A. TEST INSTRUMENT .....	46
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS .....	47
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT .....	50
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST .....	54
ANNEX E. DECLARATION OF SIMILARITY .....	55

## 1. Report Revision History

Report No.	Report Version	Description	Issue Date
16070264-FCC-R	NONE	Original	April 14, 2016

## 2. Customer information

Applicant Name	Xiamen PRT Technology Co.,Ltd
Applicant Add	1-303H Unit,1# Zengcuoan North Rd,Torch High-Tech Software park,Siming District Xiamen,Fujian
Manufacturer	CHUANGSHENG(XIAMEN) ELECTRONIC SCIENCE CO.,LTD
Manufacturer Add	ROOM 701-30 , NO.89 ANLING TWO ROAD, HULI DISTRICT, XIAMEN

## 3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

#### 4. Equipment under Test (EUT) Information

Description of EUT:	Bluetooth Module
Main Model:	SCBM4A
Serial Model:	N/A
Date EUT received:	March 29, 2016
Test Date(s):	March 30 to April 14, 2016
Equipment Category :	DSS
Antenna Gain:	1dBi
Type of Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
RF Operating Frequency (ies):	2402-2480 MHz
Max. Output Power:	3.816 dBm
Number of Channels:	Bluetooth: 79CH
Port:	N/A
Input Power:	Spec: DC 3.3V
Trade Name :	N/A
FCC ID:	Z5GSCBM4A

## 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247(a)(1)	Channel Separation	Compliance
§15.247(a)(1)	20 dB Bandwidth	Compliance
§15.247(b)(1)	Peak Output Power	Compliance
§15.247(a)(1)(iii)	Number of Hopping Channel	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(d)	Band Edge	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions	Compliance

### Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

## 6. Measurements, Examination And Derived Results

### 6.1 Antenna Requirement

#### **Applicable Standard**

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- Antenna must be permanently attached to the unit.
- Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **Antenna Connector Construction**

The EUT has 1 antenna:

A permanently attached PCB antenna for Bluetooth, the gain is 1dBi for Bluetooth

**The antenna meets up with the ANTENNA REQUIREMENT.**


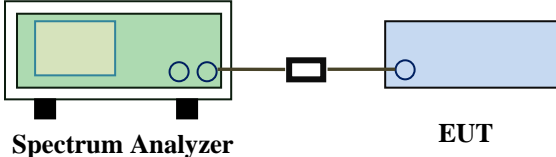
**Result:** Compliance.



## 6.2 Channel Separation

Temperature	25°C
Relative Humidity	54%
Atmospheric Pressure	1012mbar
Test date :	April 12, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(a)(1)	a)	Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW	
Test Setup	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> <li>- The EUT must have its hopping function enabled</li> <li>- Span = wide enough to capture the peaks of two adjacent channels</li> <li>- Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span</li> <li>- Video (or Average) Bandwidth (VBW) ≥ RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.</li> </ul>		

Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

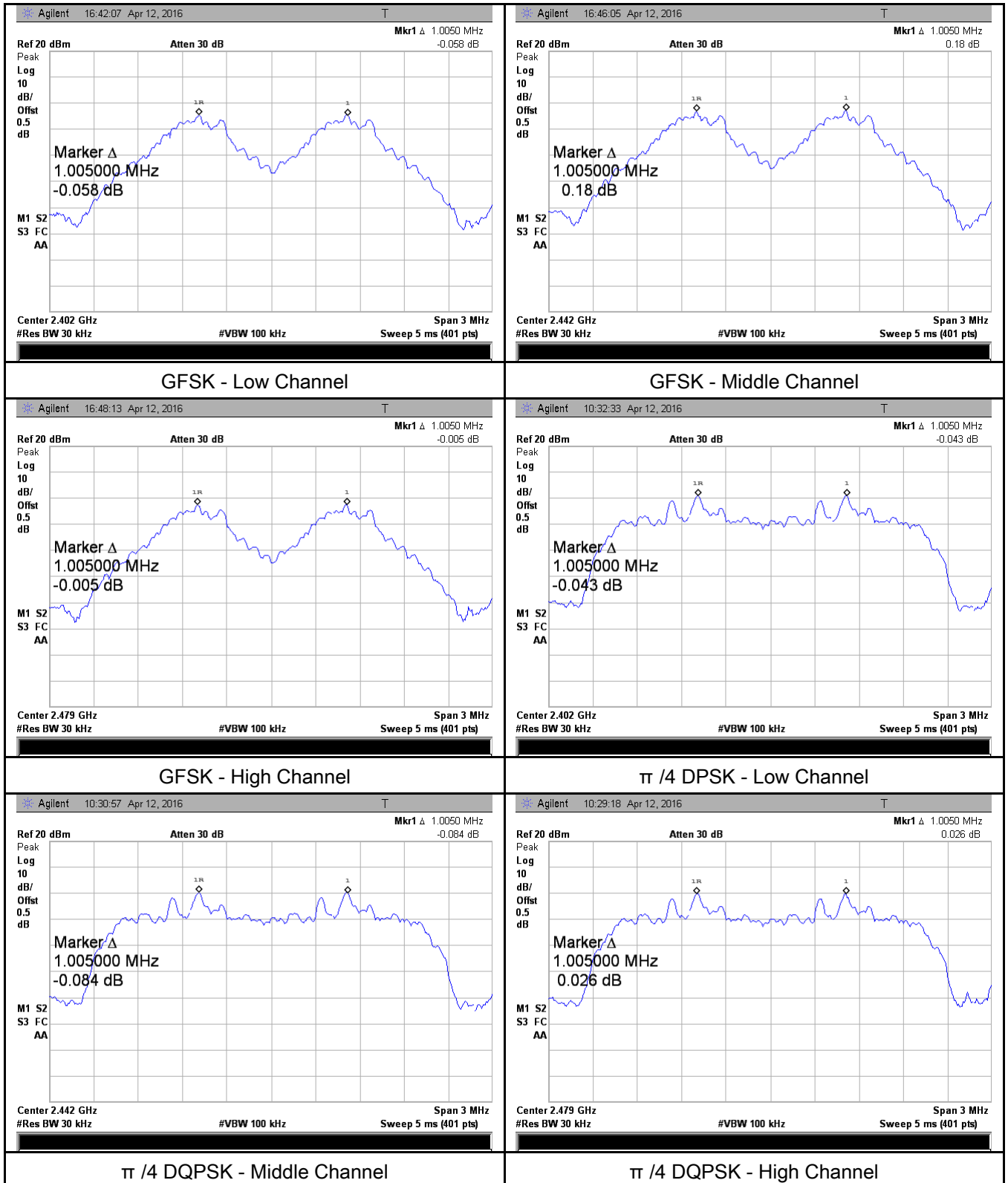
Test Data ☒ Yes ☐ N/A  
 Test Plot ☒ Yes (See below) ☐ N/A

### Channel Separation measurement result

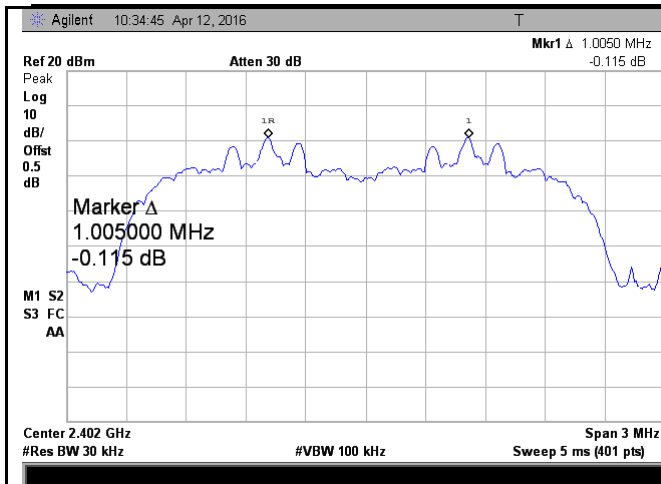
Type/ Modulation	CH	CH Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.005	0.954	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.939	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.005	0.939	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.005	0.838	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.820	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.005	0.819	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.005	0.847	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.845	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.005	0.843	Pass
	Adjacency Channel	2479			

## Test Plots

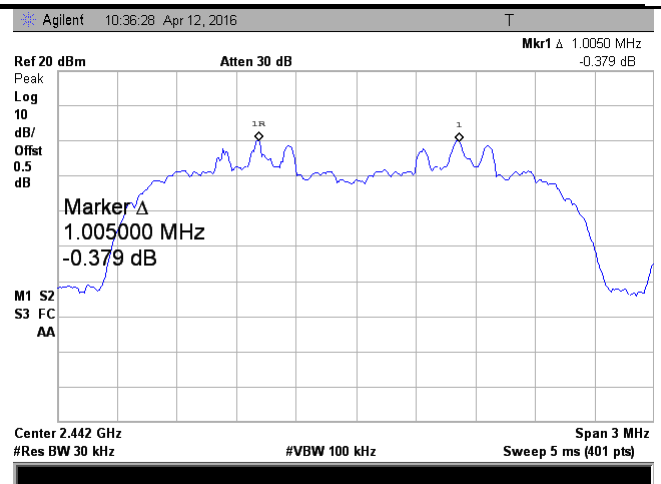
### Channel Separation measurement result



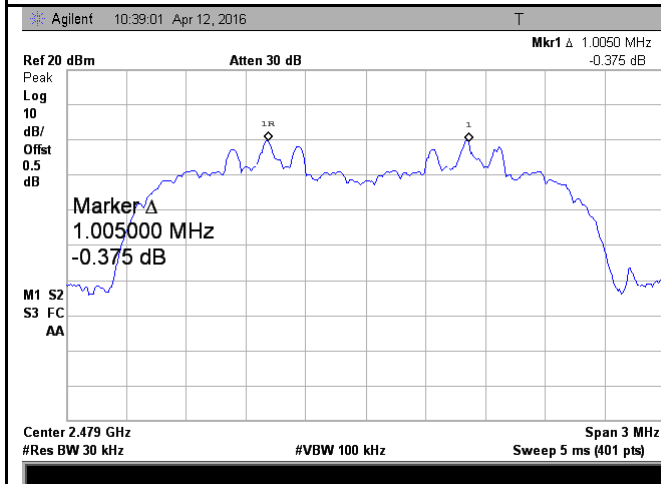
Test Report	16070264-FCC-R
Page	12 of 55



8DPSK - Low Channel



8DPSK - Middle Channel

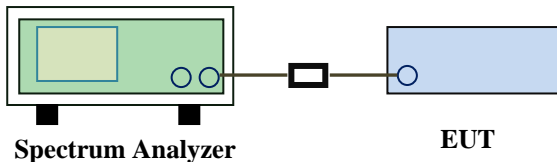


8DPSK - High Channel

### 6.3 20dB Bandwidth

Temperature	25°C
Relative Humidity	54%
Atmospheric Pressure	1012mbar
Test date :	April 12, 2016
Tested By :	Winnie Zhang

#### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)	a)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> <li>- Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel</li> <li>- RBW <math>\geq</math> 1% of the 20 dB bandwidth</li> <li>- VBW <math>\geq</math> RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold.</li> <li>- The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference</li> </ul>		

Test Report	16070264-FCC-R
Page	14 of 55

	marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

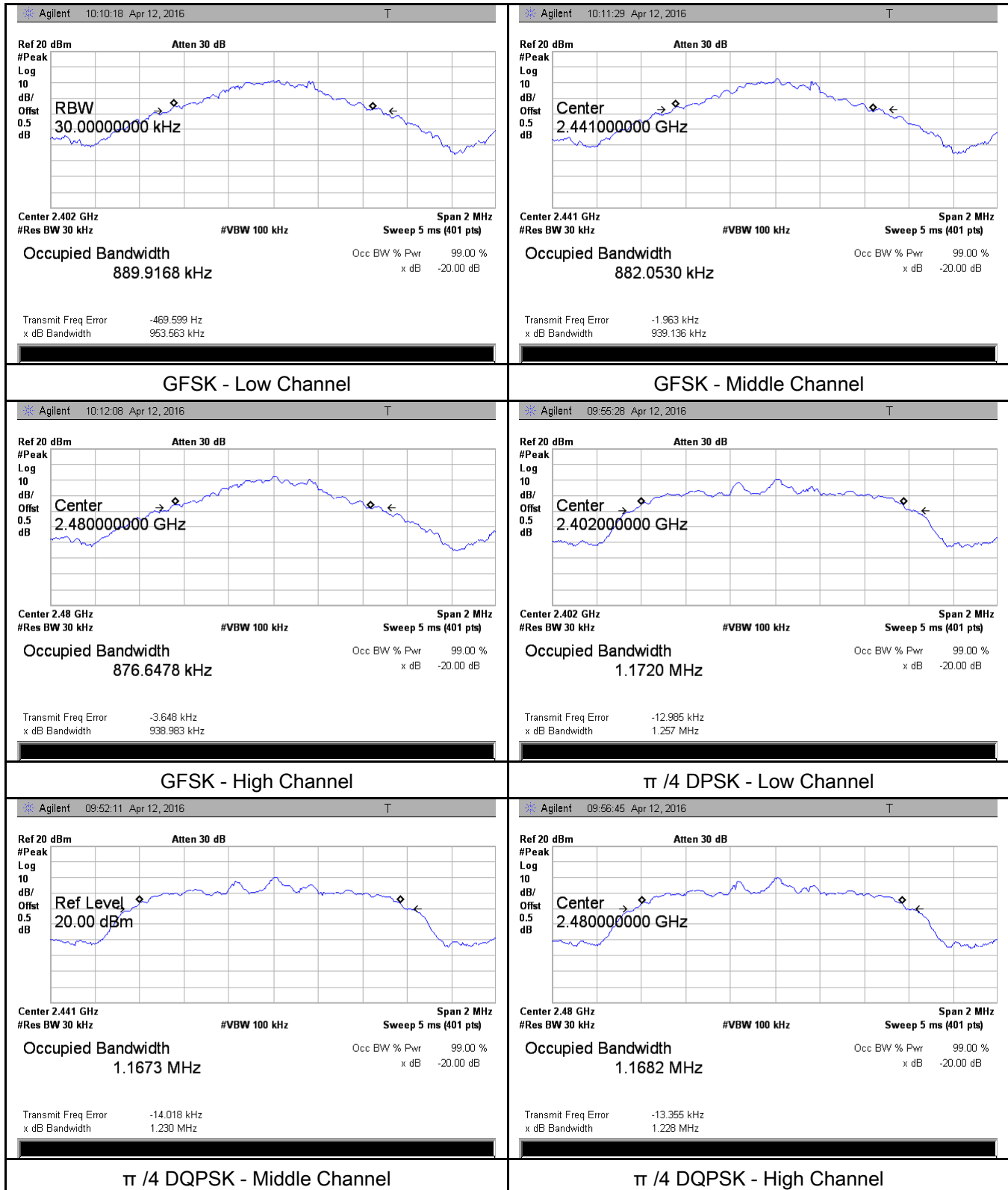
Test Plot ☒ Yes (See below) ☐ N/A

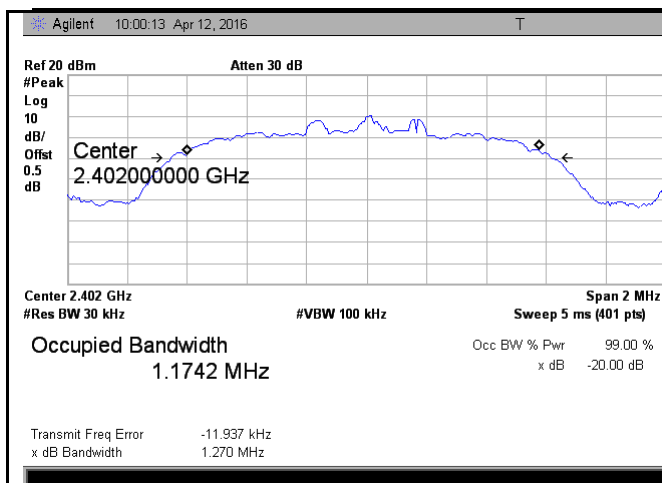
#### Measurement result

Modulation	CH	CH Freq (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.954	0.8899
	Mid	2441	0.939	0.8821
	High	2480	0.939	0.8766
$\pi$ /4 DQPSK	Low	2402	1.257	1.1720
	Mid	2441	1.230	1.1673
	High	2480	1.228	1.1682
8DPSK	Low	2402	1.270	1.1742
	Mid	2441	1.267	1.1728
	High	2480	1.265	1.1751

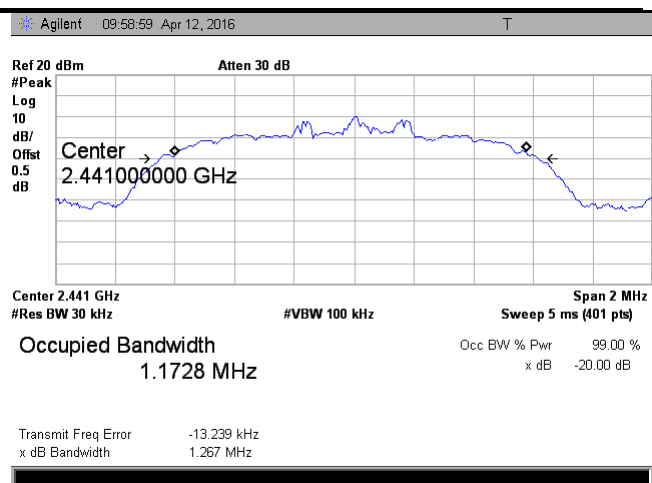
## Test Plots

### 20dB Bandwidth measurement result

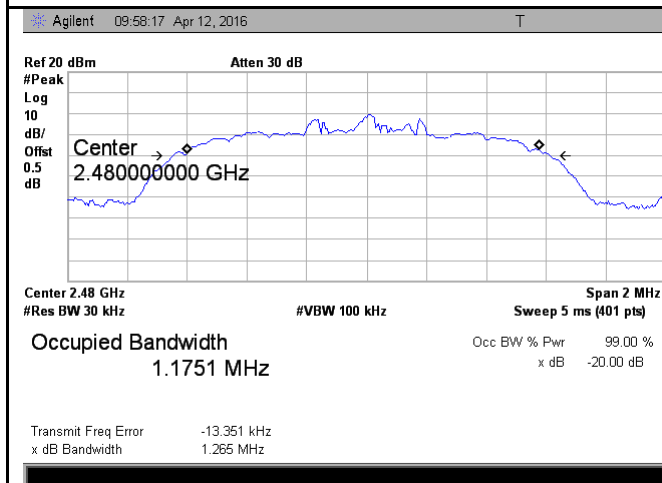




8DPSK - Low Channel



8DPSK - Middle Channel



8DPSK - High Channel

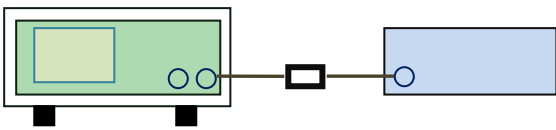


## 6.4 Peak Output Power

Temperature	25°C
Relative Humidity	54%
Atmospheric Pressure	1012mbar
Test date :	April 12, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3)	a)	FHSS in 2400-2483.5MHz with $\geq 75$ channels: $\leq 1$ Watt	<input checked="" type="checkbox"/>
	b)	FHSS in 5725-5850MHz: $\leq 1$ Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: $\leq 0.125$ Watt.	<input checked="" type="checkbox"/>
	d)	FHSS in 902-928MHz with $\geq 50$ channels: $\leq 1$ Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with $\geq 25$ & $<50$ channels: $\leq 0.25$ Watt	<input type="checkbox"/>
	f)	DTS in 902-928MHz, 2400-2483.5MHz: $\leq 1$ Watt	<input type="checkbox"/>

Test Setup	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>
------------	--

Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> <li>- Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel</li> <li>- RBW <math>&gt;</math> the 20 dB bandwidth of the emission being measured</li> <li>- VBW <math>\geq</math> RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- Allow the trace to stabilize.</li> </ul>
----------------	---

Test Report	16070264-FCC-R
Page	18 of 55

	<p>- Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer.</p>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

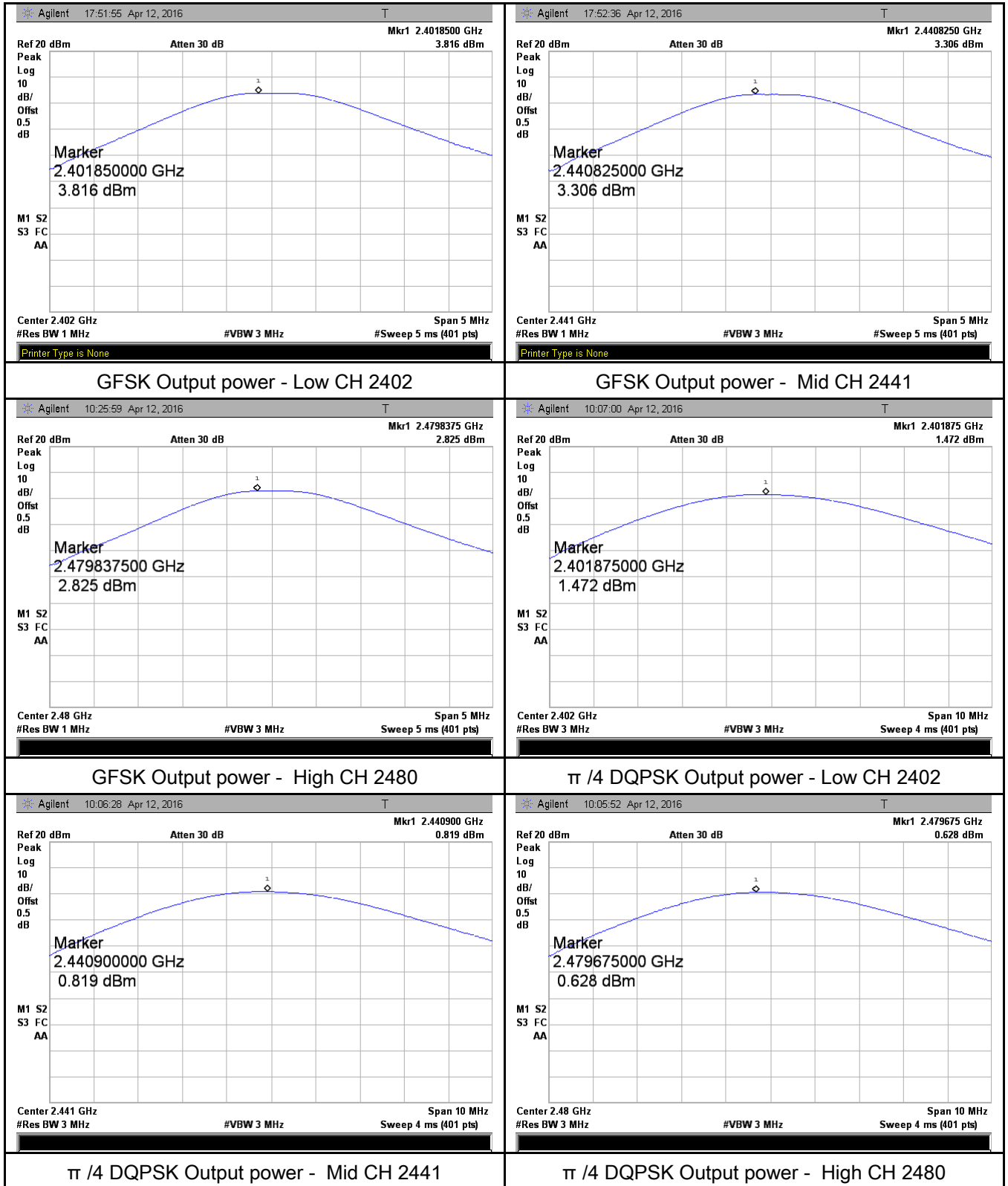
Test Plot ☒ Yes (See below) ☐ N/A

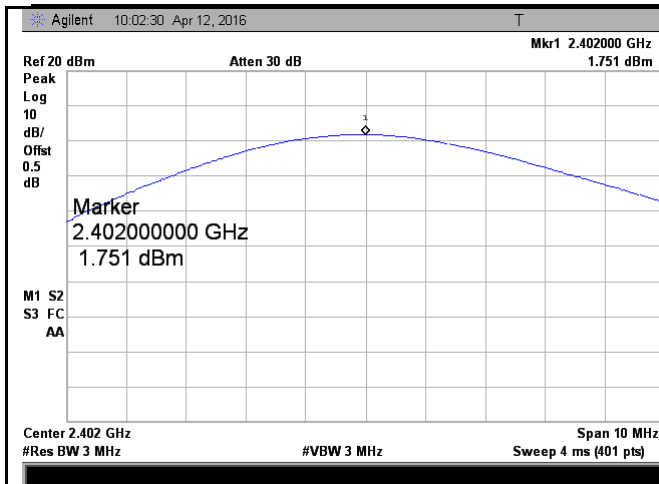
#### Peak Output Power measurement result

Type	Modulation	CH	Freq (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	3.816	1000	Pass
		Mid	2441	3.306	1000	Pass
		High	2480	2.825	1000	Pass
	$\pi$ /4 DQPSK	Low	2402	1.472	125	Pass
		Mid	2441	0.819	125	Pass
		High	2480	0.628	125	Pass
	8DPSK	Low	2402	1.751	125	Pass
		Mid	2441	3.126	125	Pass
		High	2480	2.927	125	Pass

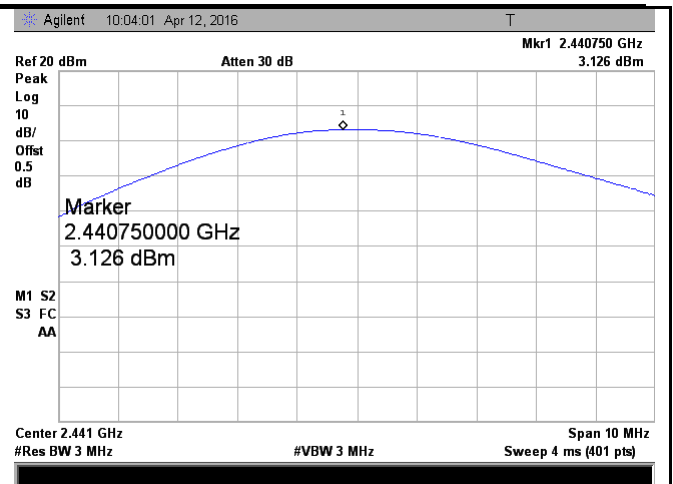
## Test Plots

### Output Power measurement result

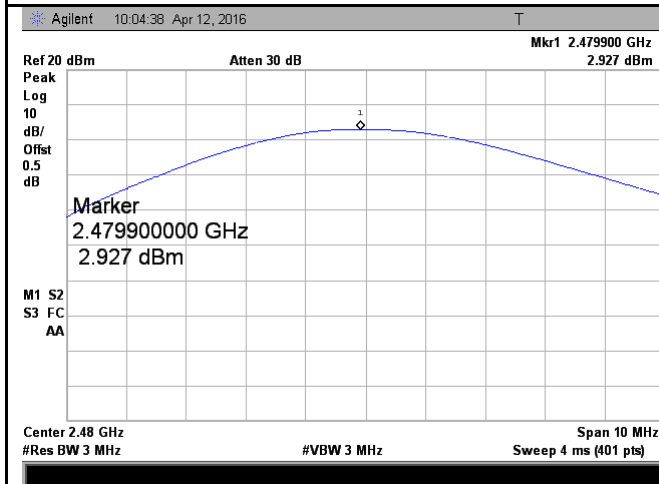




8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

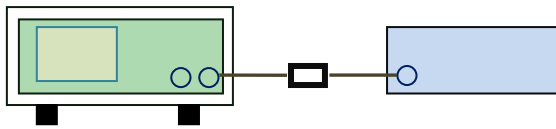


8DPSK Output power - High CH 2480

## 6.5 Number of Hopping Channel

Temperature	25°C
Relative Humidity	54%
Atmospheric Pressure	1012mbar
Test date :	April 12, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	FHSS in 2400-2483.5MHz $\geq$ 15 channels	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.  <u>Use the following spectrum analyzer settings:</u>          The EUT must have its hopping function enabled.</p> <ul style="list-style-type: none"> <li>- Span = the frequency band of operation</li> <li>- RBW <math>\geq</math> 1% of the span</li> <li>- VBW <math>\geq</math> RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- Allow trace to fully stabilize.</li> <li>- It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).</li> </ul>		
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data    ☒ Yes                      ☐ N/A

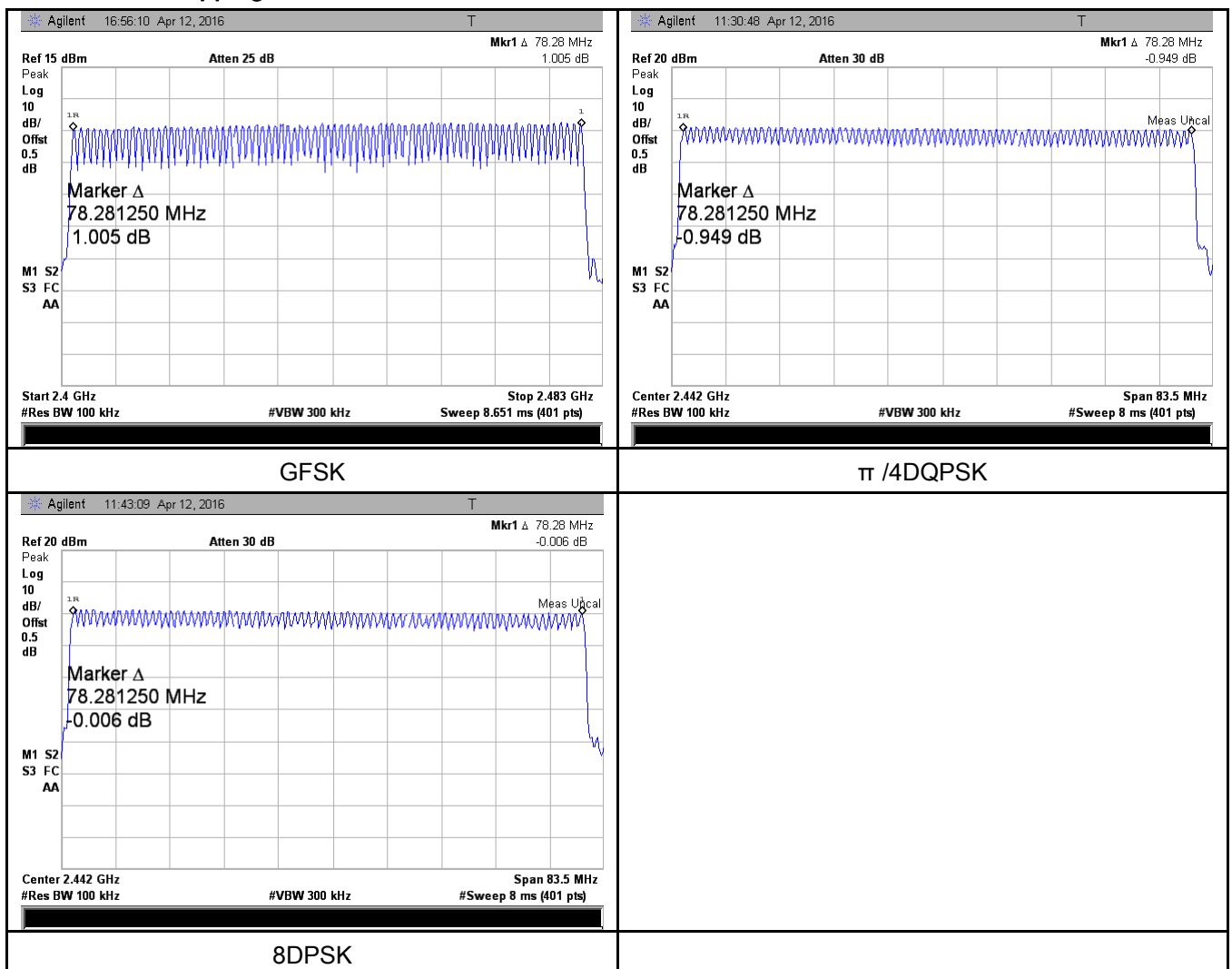
Test Plot    ☒ Yes (See below)                      ☐ N/A

### Number of Hopping Channel measurement result

Type	Modulation	Frequency Range	Number of Hopping Channel	Limit
Number of Hopping Channel	GFSK	2400-2483.5	79	15
	$\pi/4$ DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

### Test Plots

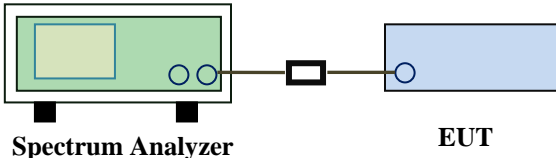
#### Number of Hopping Channels measurement result



## 6.6 Time of Occupancy (Dwell Time)

Temperature	25°C
Relative Humidity	54%
Atmospheric Pressure	1012mbar
Test date :	April 12, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	Dwell Time < 0.4s	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer</u></p> <ul style="list-style-type: none"> <li>- Span = zero span, centered on a hopping channel</li> <li>- RBW = 1 MHz</li> <li>- VBW ≥ RBW</li> <li>- Sweep = as necessary to capture the entire dwell time per hopping channel</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- use the marker-delta function to determine the dwell time</li> </ul>		
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data    ☒ Yes                      ☐ N/A

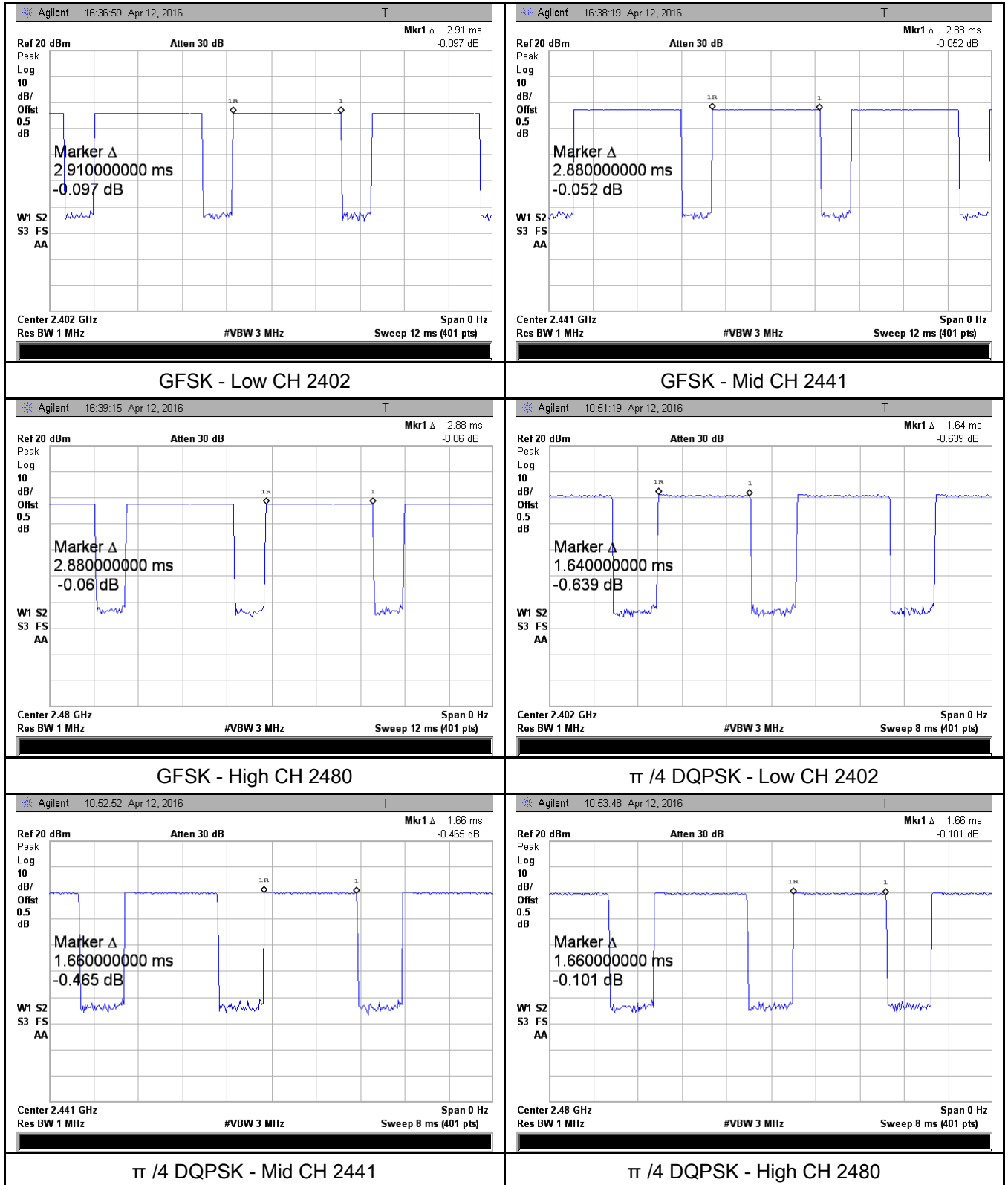
Test Plot    ☒ Yes (See below)                      ☐ N/A

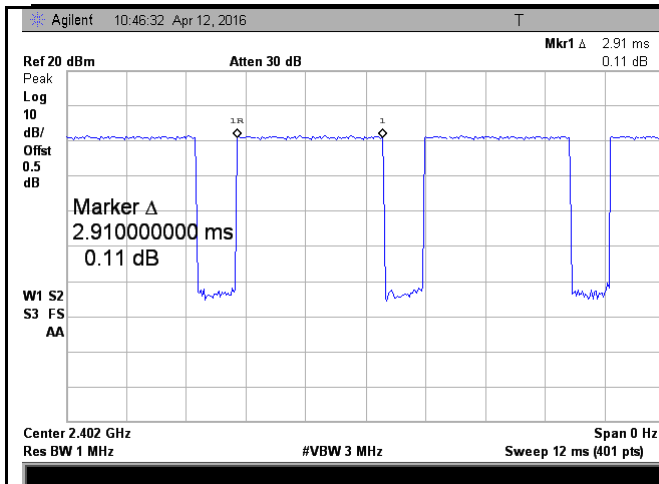
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.910	310.400	400	Pass
		Mid	2.880	307.200	400	Pass
		High	2.880	307.200	400	Pass
	$\pi$ /4 DQPSK	Low	1.640	174.933	400	Pass
		Mid	1.660	177.067	400	Pass
		High	1.660	177.067	400	Pass
	8DPSK	Low	2.910	310.400	400	Pass
		Mid	2.910	310.400	400	Pass
		High	2.850	304.000	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						



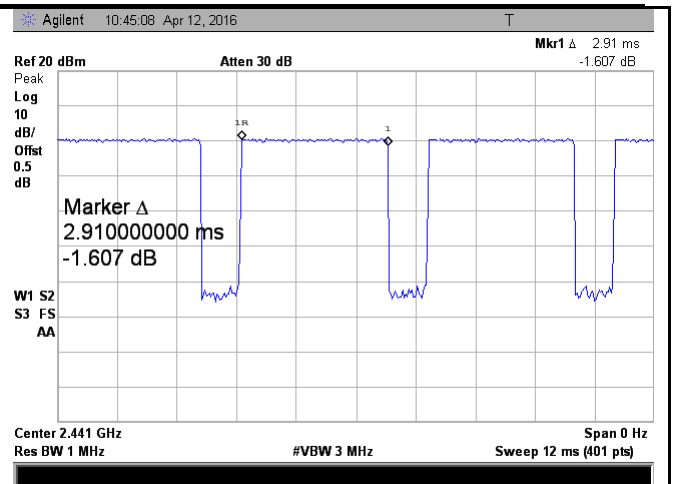
## Test Plots

### Dwell Time measurement result

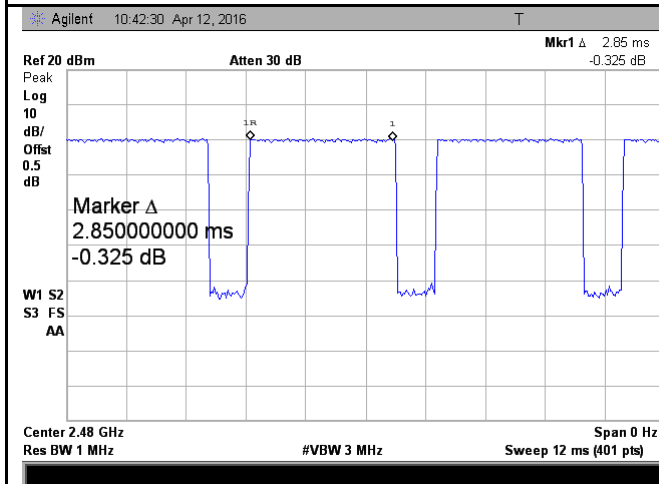




8DPSK - Low CH 2402



8DPSK - Mid CH 2441



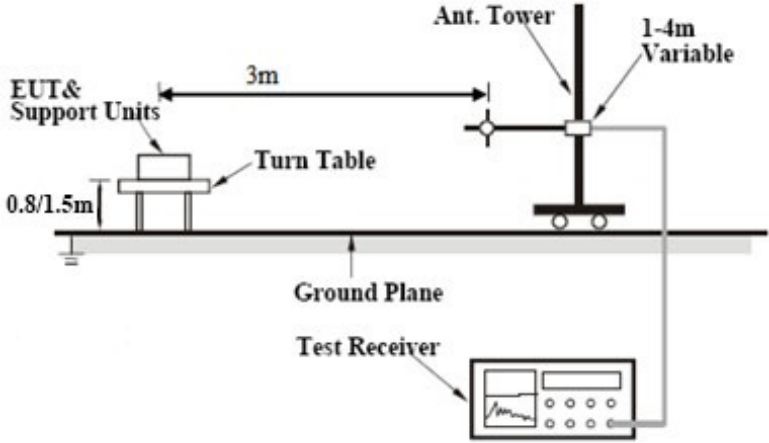
8DPSK - High CH 2480

## 6.7 Band Edge

Temperature	23°C
Relative Humidity	56%
Atmospheric Pressure	1014mbar
Test date :	April 14, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.	<input checked="" type="checkbox"/>

Test Setup	
------------	--

Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only</p> <ul style="list-style-type: none"> <li>1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.</li> <li>2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range,</li> </ul>
----------------	--

Test Report	16070264-FCC-R
Page	28 of 55

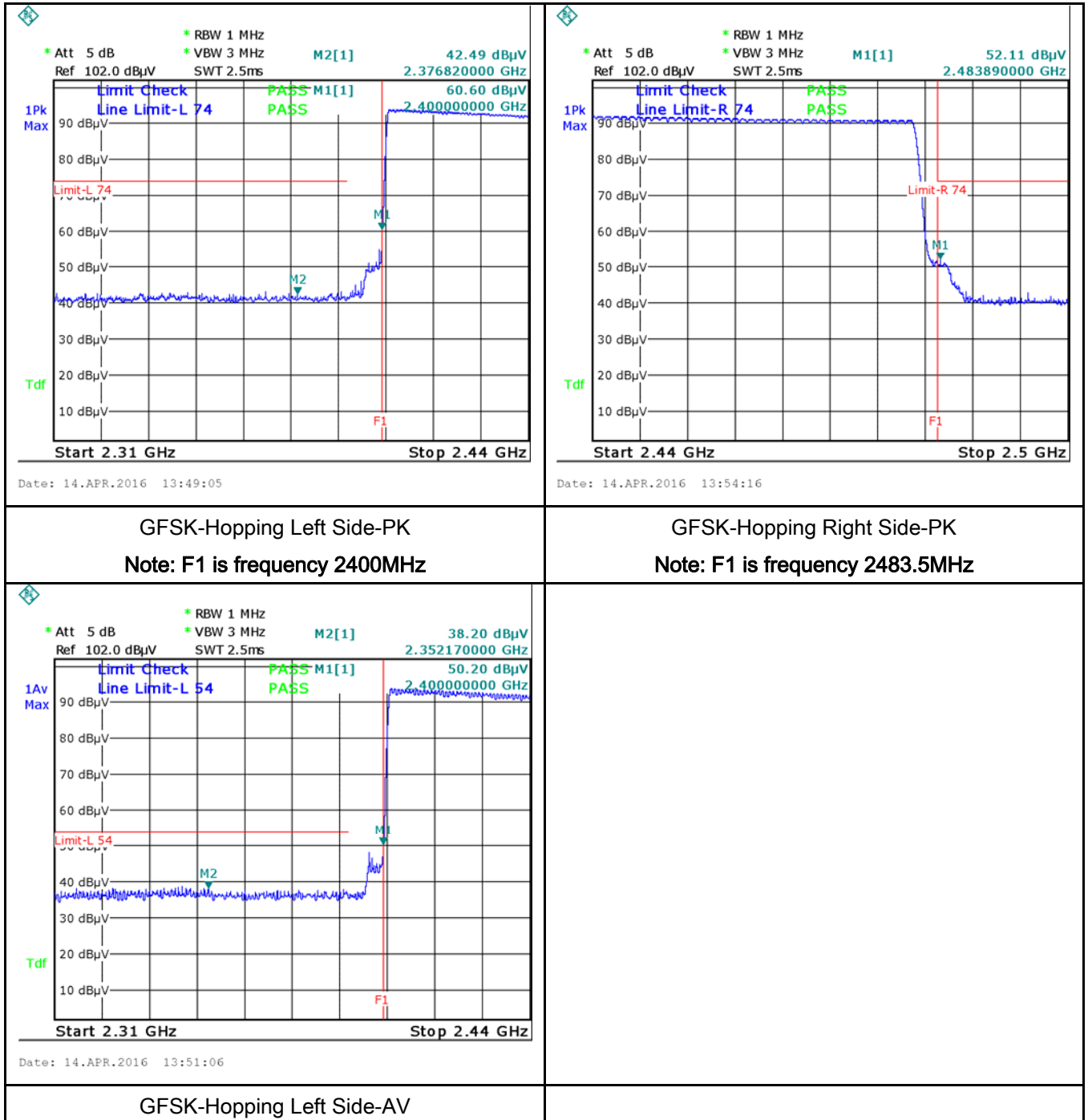
	<p>and make sure the instrument is operated in its linear range.</p> <ul style="list-style-type: none"> <li>- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: <ul style="list-style-type: none"> <li>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</li> <li>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.</li> <li>c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</li> </ul> </li> <li>- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.</li> <li>- 5. Repeat above procedures until all measured frequencies were complete.</li> </ul>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

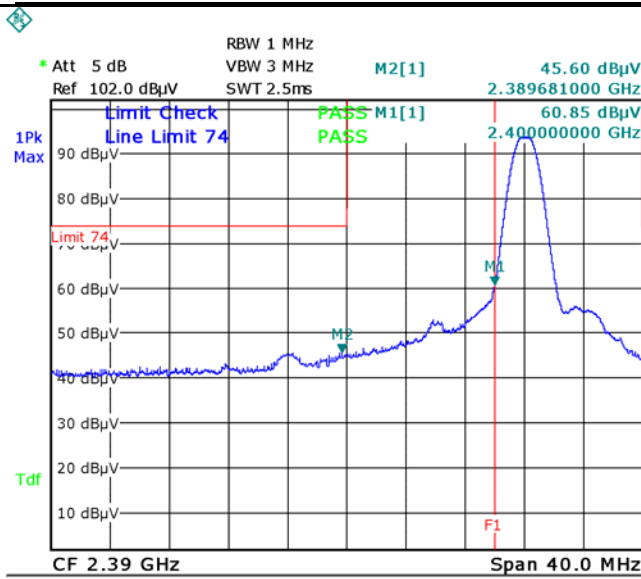
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

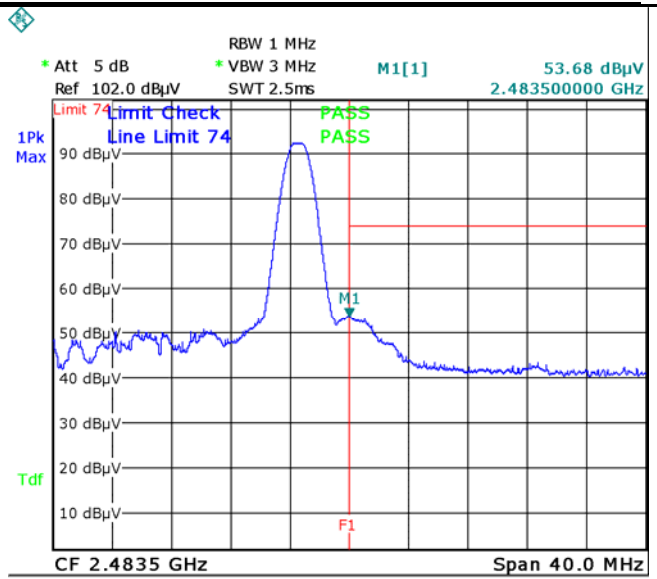
## Test Plots

### GFSK Mode:





Date: 14.APR.2016 11:49:13



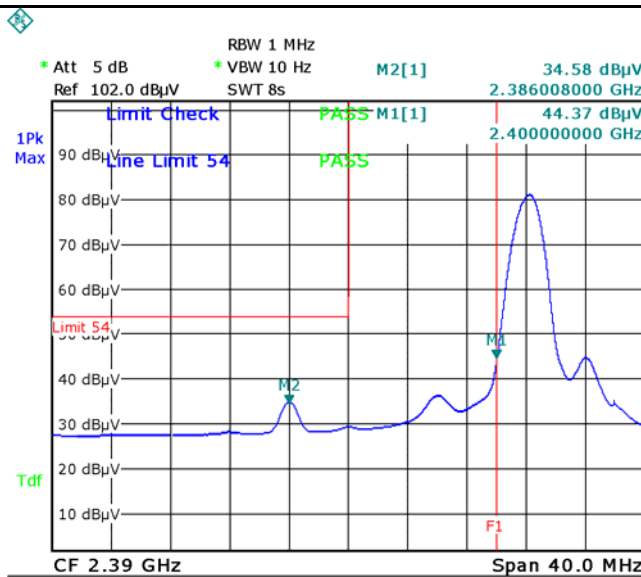
Date: 14.APR.2016 12:16:16

### GFSK-Left Side-PK

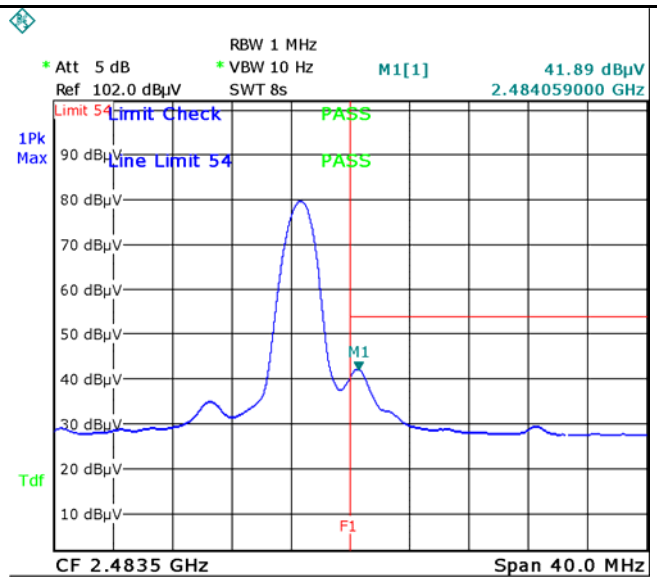
Note: F1 is frequency 2400MHz

### GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



Date: 14.APR.2016 11:51:51

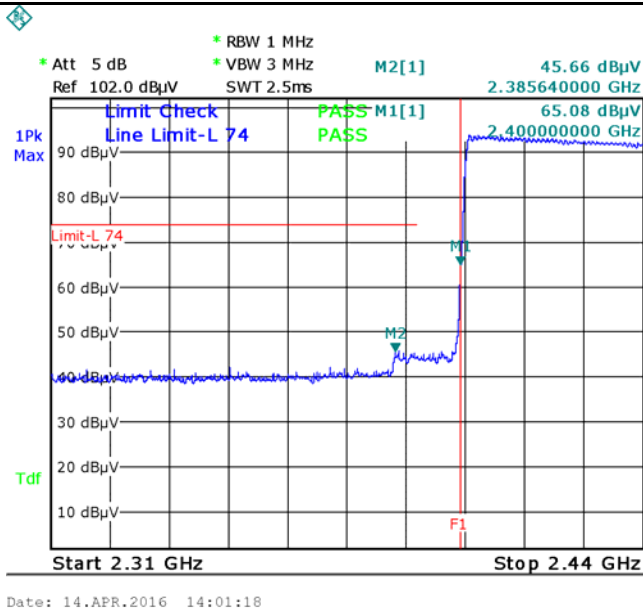


Date: 14.APR.2016 12:13:52

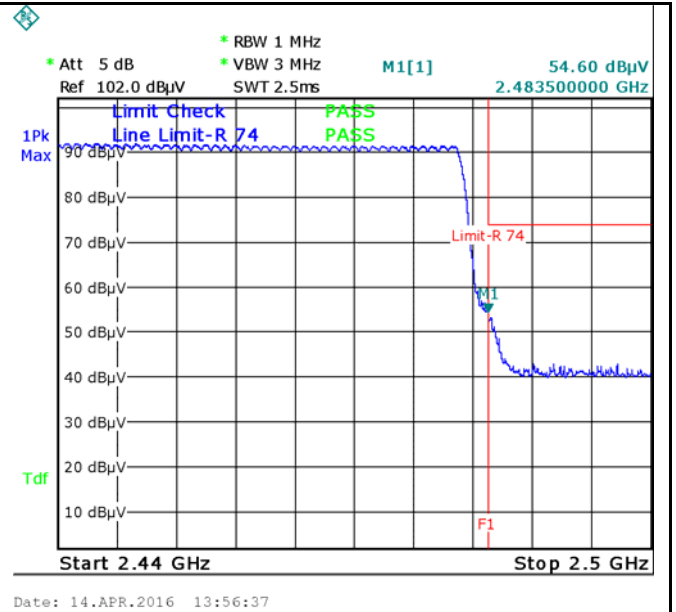
### GFSK-Left Side-AV

### GFSK-Right Side-AV

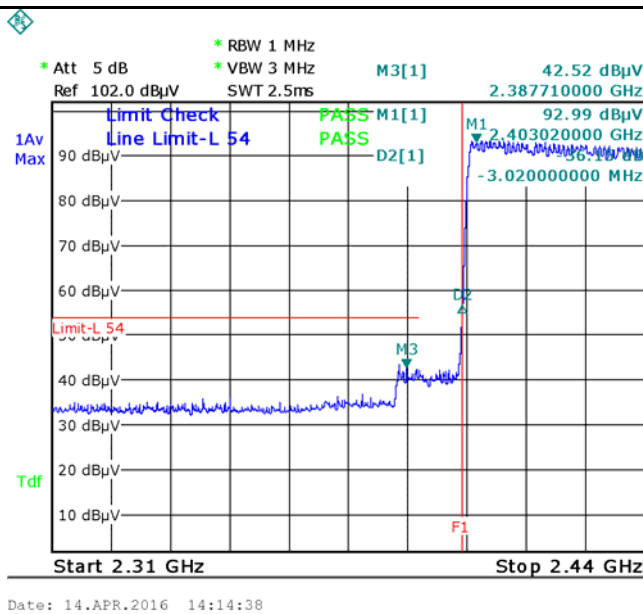
$\pi/4$  DQPSK Mode:



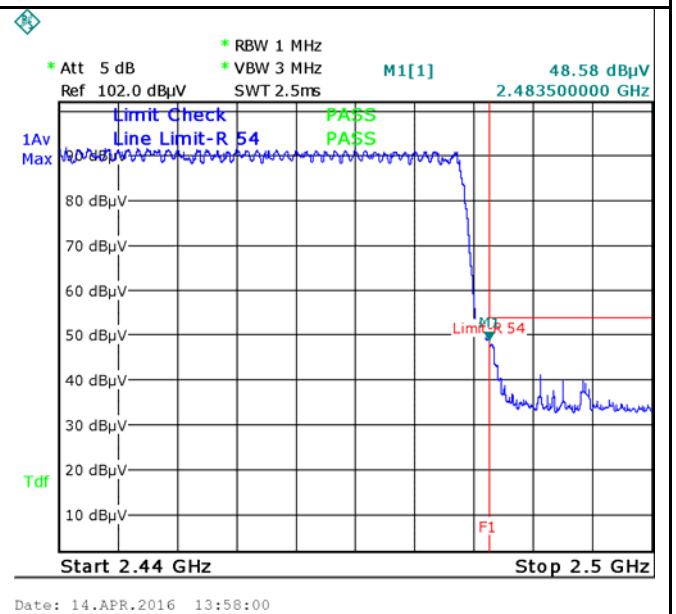
$\pi/4$  DQPSK-Hopping Left Side-PK  
Note: F1 is frequency 2400MHz



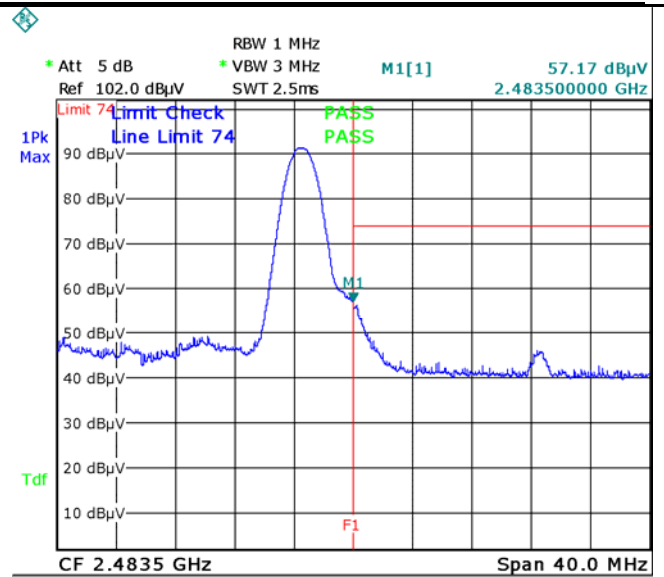
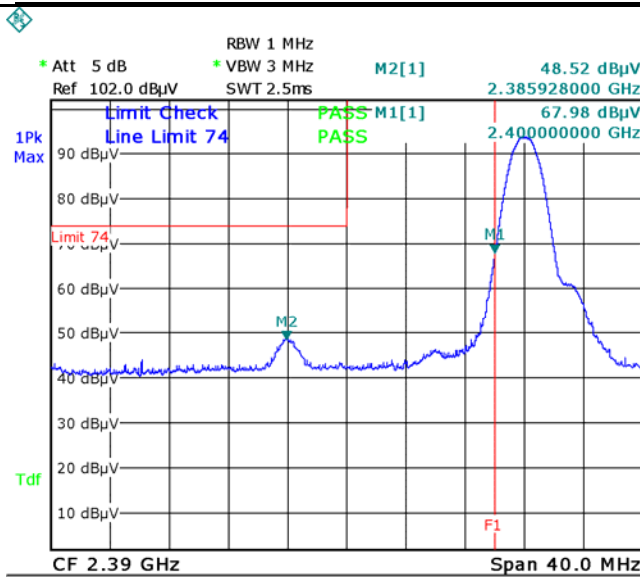
$\pi/4$  DQPSK-Hopping Right Side-PK  
Note: F1 is frequency 2483.5MHz



$\pi/4$  DQPSK-Hopping Left-AV



$\pi/4$  DQPSK-Hopping Right-AV

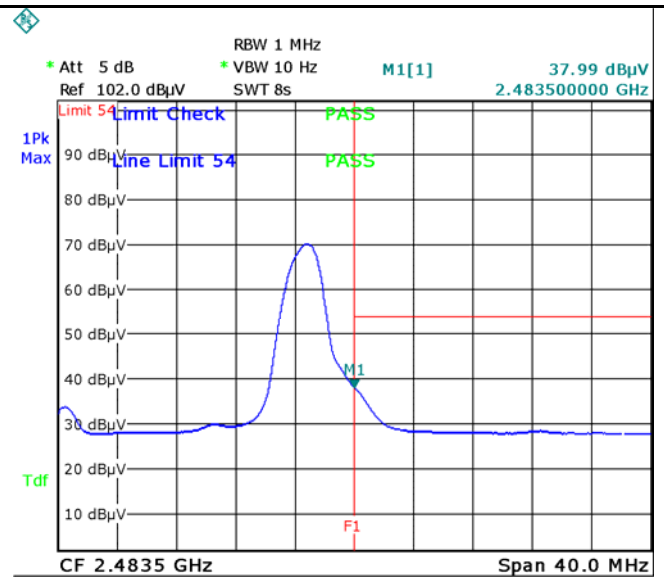
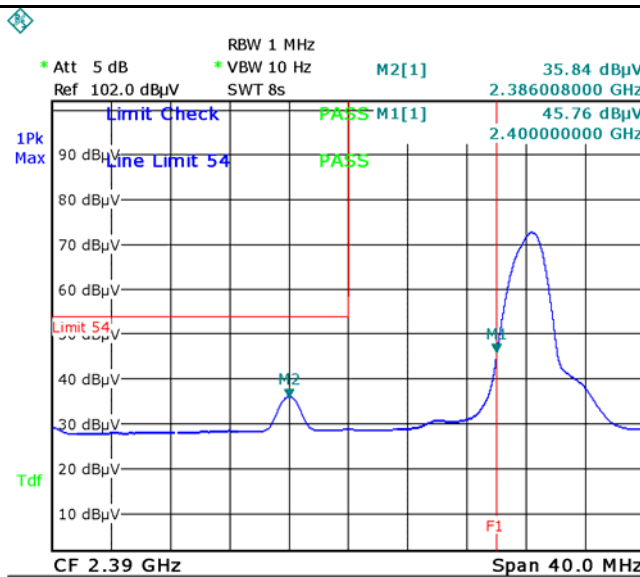


$\pi/4$  DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz

$\pi/4$  DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

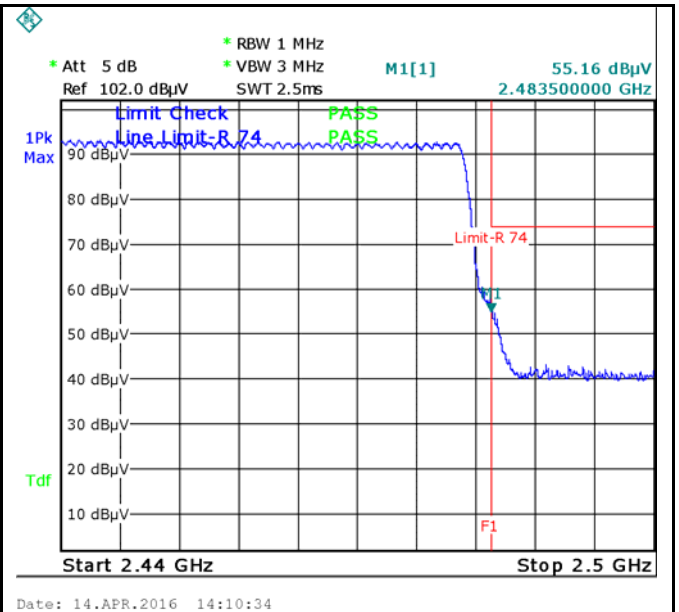
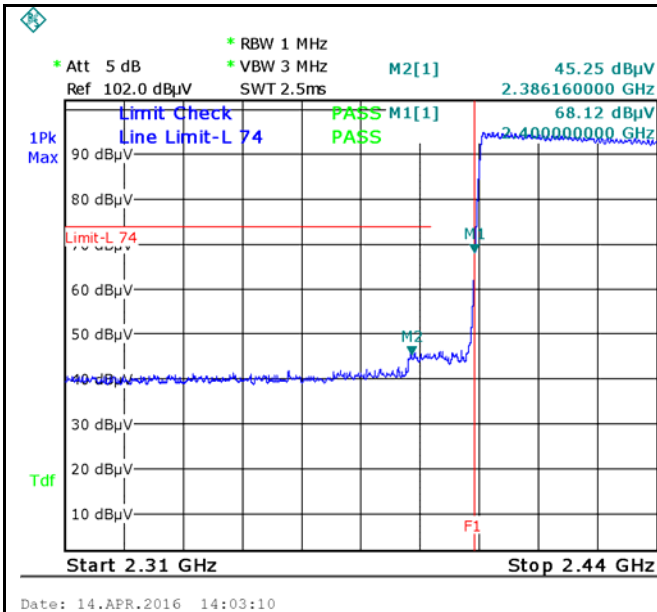


$\pi/4$  DQPSK-Left Side-AV

$\pi/4$  DQPSK-Right Side-AV

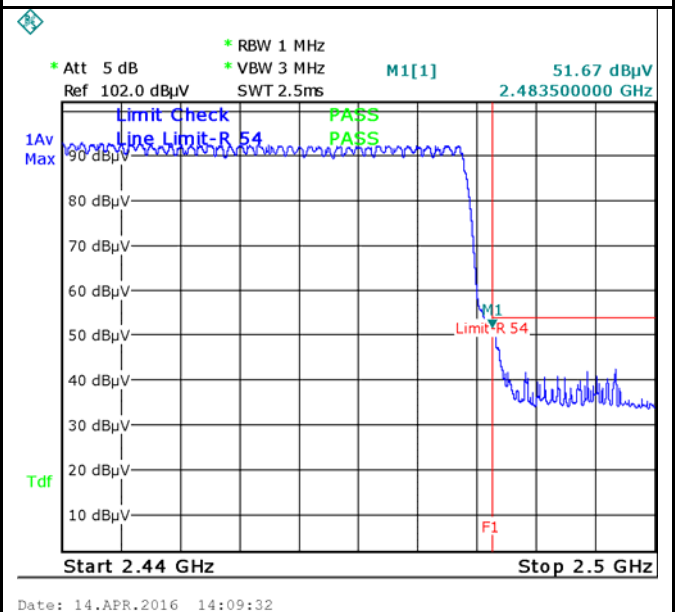
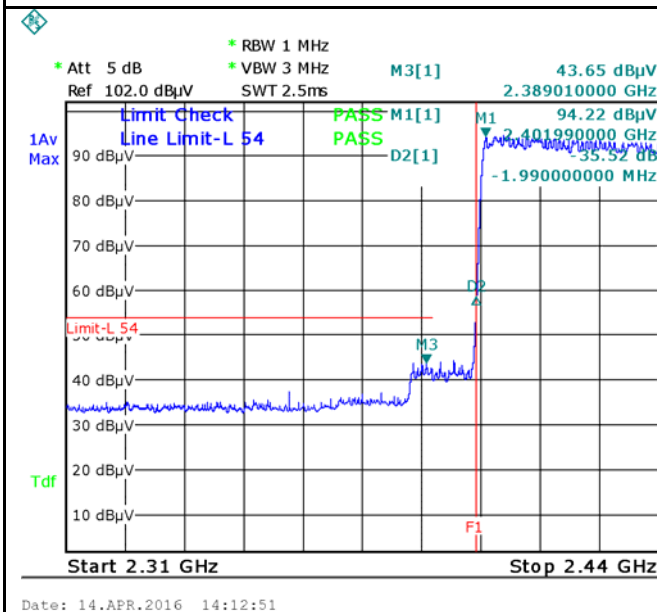


### 8DPSK Mode:



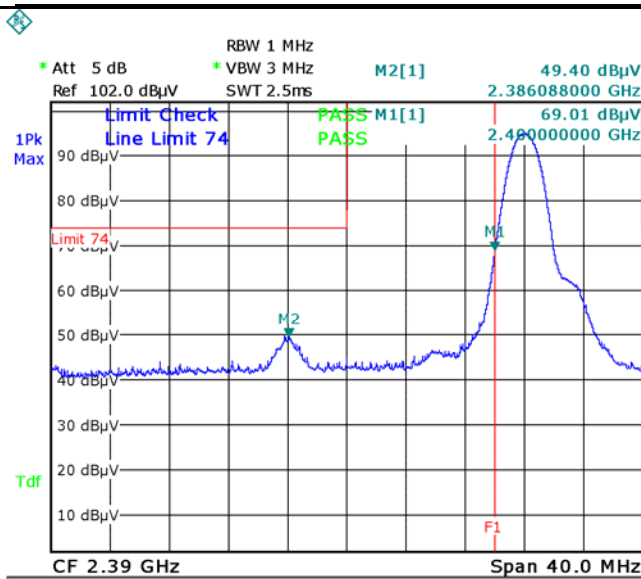
8DPSK-Hopping Left Side-PK  
Note: F1 is frequency 2400MHz

8DPSK--Hopping Right Side-PK  
Note: F1 is frequency 2483.5MHz

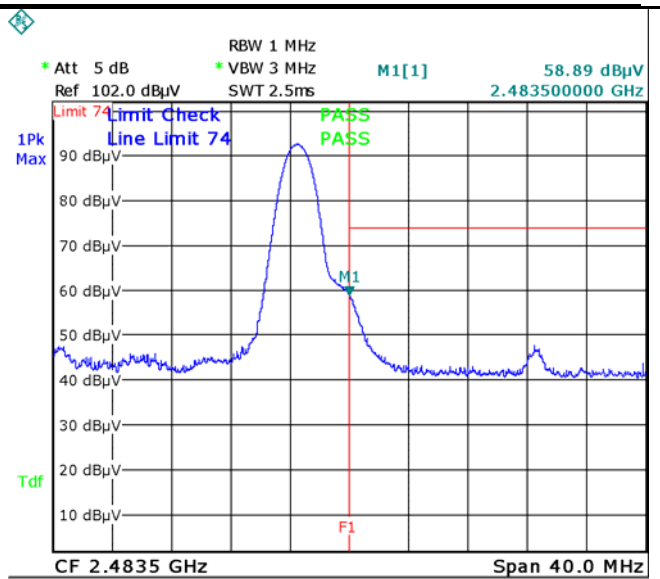


8DPSK--Hopping Left-AV

8DPSK--Hopping Right-AV



Date: 14.APR.2016 12:00:17



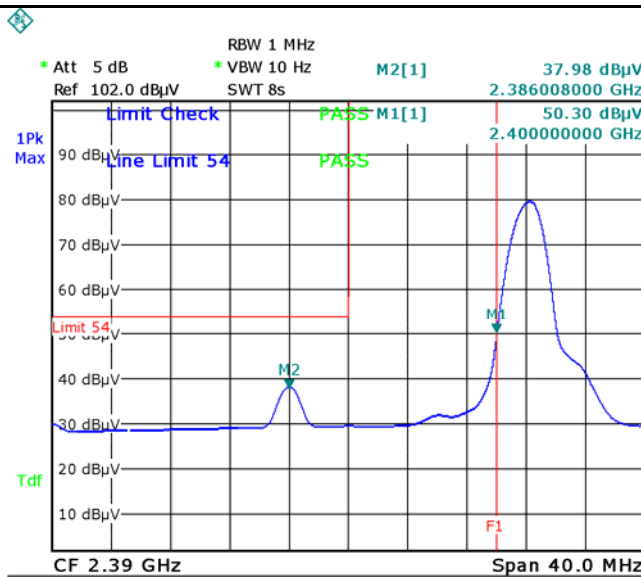
Date: 14.APR.2016 12:05:34

### 8DPSK--Left Side-PK

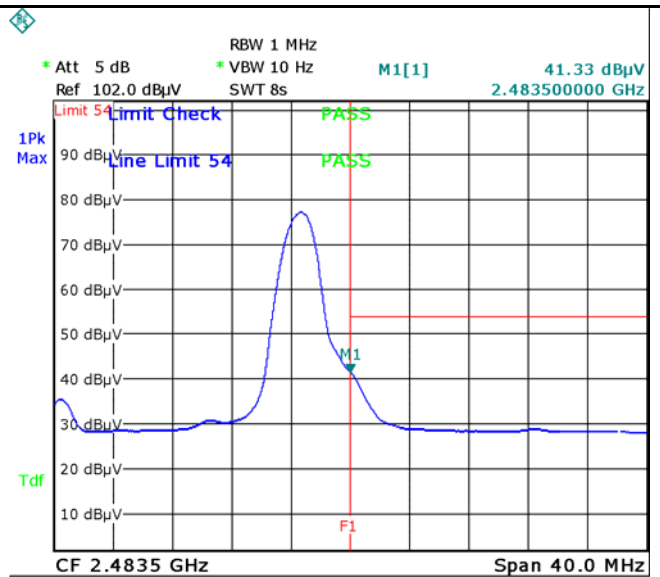
Note: F1 is frequency 2400MHz

### 8DPSK--Right Side-PK

Note: F1 is frequency 2483.5MHz



Date: 14.APR.2016 12:01:25



Date: 14.APR.2016 12:04:14

### 8DPSK--Left Side-AV

### 8DPSK--Right Side-AV

## 6.8 AC Power Line Conducted Emissions

Temperature	22°C
Relative Humidity	55%
Atmospheric Pressure	1013mbar
Test date :	April 13, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable		
47CFR§15.207, RSS210 (A8.1)	a)	For Low-power radio-frequency devices 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 or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	<div><input checked="" type="checkbox"/></div>		
		Frequency ranges (MHz)		Limit (dBµV)	
				QP	Average
		0.15 ~ 0.5		66 – 56	56 – 46
		0.5 ~ 5		56	46
5 ~ 30	60	50			

Test Setup	<p>Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p>
------------	--

Procedure	<ol style="list-style-type: none"> <li>The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.</li> <li>The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.</li> <li>The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</li> </ol>
-----------	---

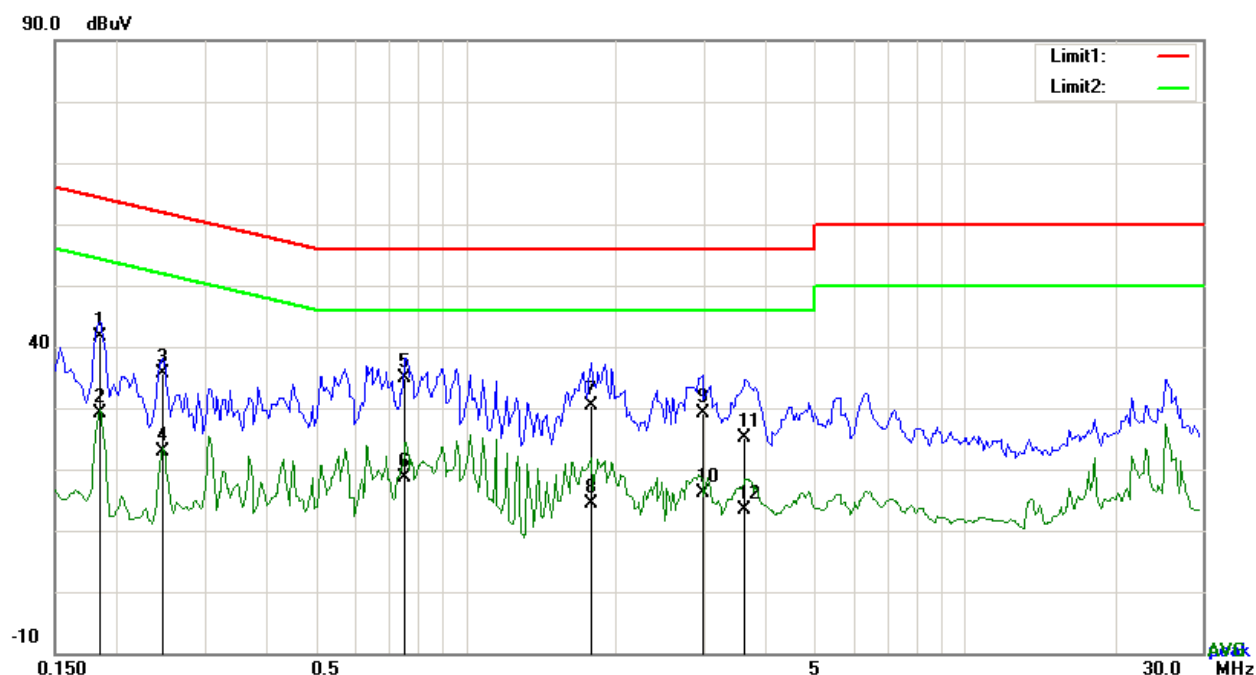
Test Report	16070264-FCC-R
Page	36 of 55

	<p>coaxial cable.</p> <ol style="list-style-type: none"> <li>4. All other supporting equipment were powered separately from another main supply.</li> <li>5. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.</li> <li>7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz.</li> <li>8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).</li> </ol>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

**Test Mode:** Bluetooth Mode

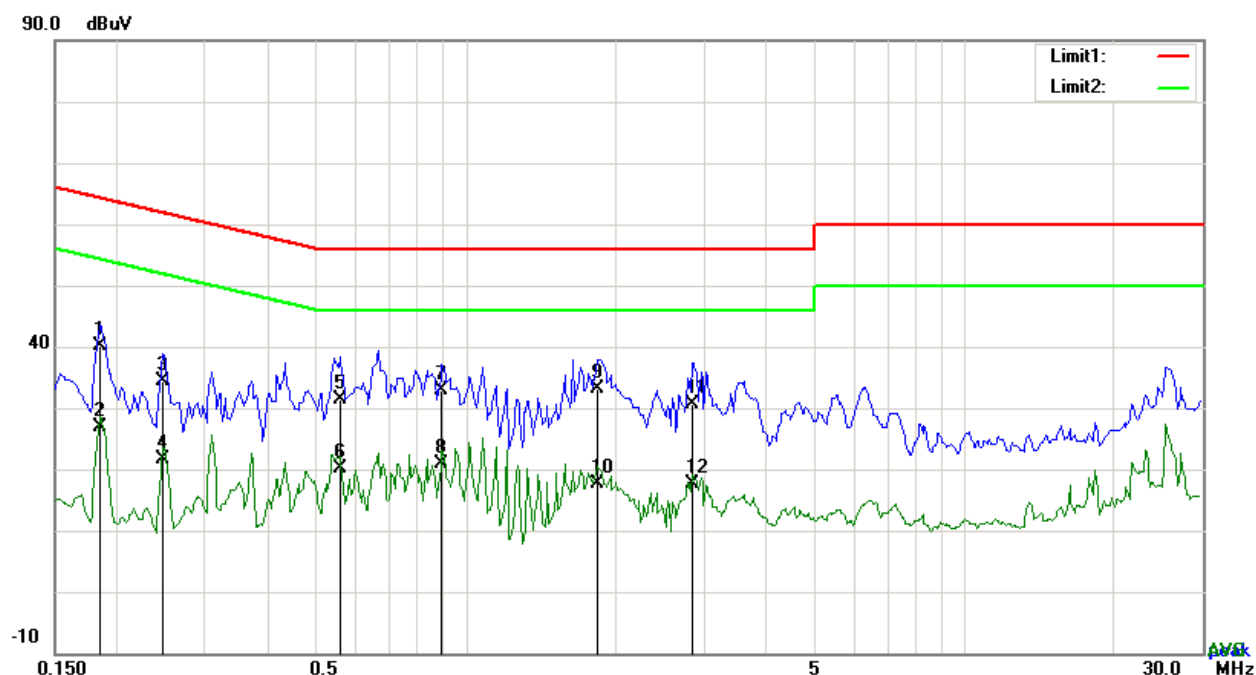


**Test Data**

**Phase Line Plot at 120Vac, 60Hz**

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1851	31.64	QP	10.03	41.67	64.25	-22.58
2	L1	0.1851	19.08	AVG	10.03	29.11	54.25	-25.14
3	L1	0.2475	25.50	QP	10.03	35.53	61.84	-26.31
4	L1	0.2475	12.84	AVG	10.03	22.87	51.84	-28.97
5	L1	0.7584	24.90	QP	10.03	34.93	56.00	-21.07
6	L1	0.7584	8.52	AVG	10.03	18.55	46.00	-27.45
7	L1	1.7841	20.30	QP	10.04	30.34	56.00	-25.66
8	L1	1.7841	4.34	AVG	10.04	14.38	46.00	-31.62
9	L1	2.9892	19.14	QP	10.05	29.19	56.00	-26.81
10	L1	2.9892	5.98	AVG	10.05	16.03	46.00	-29.97
11	L1	3.6279	15.07	QP	10.06	25.13	56.00	-30.87
12	L1	3.6279	3.38	AVG	10.06	13.44	46.00	-32.56

**Test Mode:** Bluetooth Mode

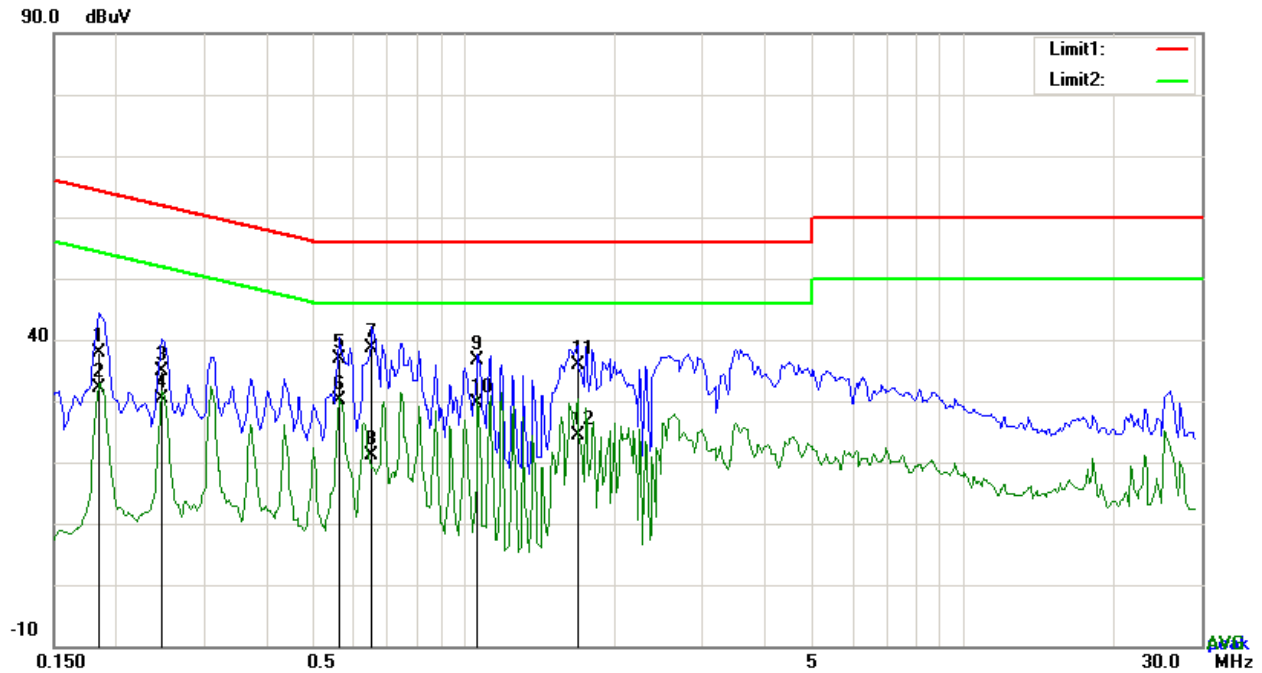


**Test Data**

### Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.1851	30.08	QP	10.02	40.10	64.25	-24.15
2	N	0.1851	16.78	AVG	10.02	26.80	54.25	-27.45
3	N	0.2475	24.30	QP	10.02	34.32	61.84	-27.52
4	N	0.2475	11.70	AVG	10.02	21.72	51.84	-30.12
5	N	0.5595	21.38	QP	10.02	31.40	56.00	-24.60
6	N	0.5595	10.14	AVG	10.02	20.16	46.00	-25.84
7	N	0.8988	22.96	QP	10.03	32.99	56.00	-23.01
8	N	0.8988	10.94	AVG	10.03	20.97	46.00	-25.03
9	N	1.8348	22.97	QP	10.04	33.01	56.00	-22.99
10	N	1.8348	7.58	AVG	10.04	17.62	46.00	-28.38
11	N	2.8488	20.67	QP	10.05	30.72	56.00	-25.28
12	N	2.8488	7.57	AVG	10.05	17.62	46.00	-28.38

**Test Mode:** Bluetooth Mode

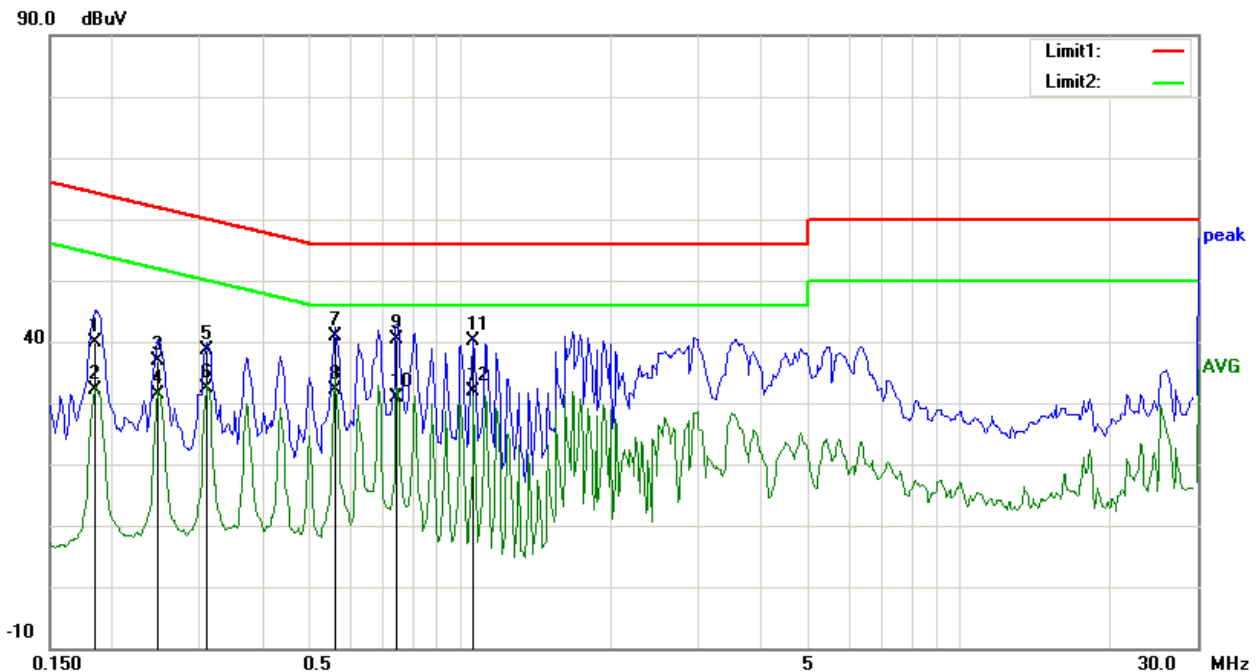


**Test Data**

**Phase Line Plot at 240Vac, 60Hz**

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1851	27.85	QP	10.03	37.88	64.25	-26.37
2	L1	0.1851	21.99	AVG	10.03	32.02	54.25	-22.23
3	L1	0.2475	24.91	QP	10.03	34.94	61.84	-26.90
4	L1	0.2475	20.38	AVG	10.03	30.41	51.84	-21.43
5	L1	0.5595	26.90	QP	10.03	36.93	56.00	-19.07
6	L1	0.5595	20.04	AVG	10.03	30.07	46.00	-15.93
7	L1	0.6531	28.70	QP	10.03	38.73	56.00	-17.27
8	L1	0.6531	10.99	AVG	10.03	21.02	46.00	-24.98
9	L1	1.0626	26.57	QP	10.03	36.60	56.00	-19.40
10	L1	1.0626	19.64	AVG	10.03	29.67	46.00	-16.33
11	L1	1.6827	25.90	QP	10.04	35.94	56.00	-20.06
12	L1	1.6827	14.35	AVG	10.04	24.39	46.00	-21.61

**Test Mode:** Bluetooth Mode



### Test Data

#### Phase Neutral Plot at 240Vac, 60Hz

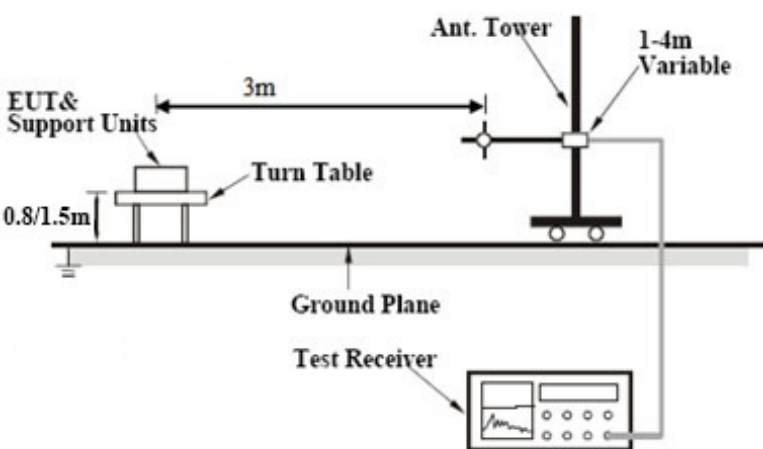
No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.1851	29.80	QP	10.02	39.82	64.25	-24.43
2	N	0.1851	22.22	AVG	10.02	32.24	54.25	-22.01
3	N	0.2475	26.92	QP	10.02	36.94	61.84	-24.90
4	N	0.2475	21.43	AVG	10.02	31.45	51.84	-20.39
5	N	0.3099	28.73	QP	10.02	38.75	59.97	-21.22
6	N	0.3099	22.42	AVG	10.02	32.44	49.97	-17.53
7	N	0.5595	30.86	QP	10.02	40.88	56.00	-15.12
8	N	0.5595	22.03	AVG	10.02	32.05	46.00	-13.95
9	N	0.7467	30.48	QP	10.02	40.50	56.00	-15.50
10	N	0.7467	20.75	AVG	10.02	30.77	46.00	-15.23
11	N	1.0626	30.05	QP	10.03	40.08	56.00	-15.92
12	N	1.0626	21.81	AVG	10.03	31.84	46.00	-14.16



## 6.9 Radiated Spurious Emissions

Temperature	23°C
Relative Humidity	56%
Atmospheric Pressure	1014mbar
Test date :	April 14, 2016
Tested By :	Winnie Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable											
47CFR§15.205, §15.209, §15.247(d)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	<div><input checked="" type="checkbox"/></div>											
		<table><tr><th>Frequency range (MHz)</th><th>Field Strength (µV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>		Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	
		Frequency range (MHz)		Field Strength (µV/m)										
		30 – 88		100										
		88 – 216		150										
		216 960		200										
Above 960	500													
Test Setup	<div></div>													
Procedure	1.	The EUT was switched on and allowed to warm up to its normal operating condition.												
	2.	The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:												

Test Report	16070264-FCC-R
Page	42 of 55

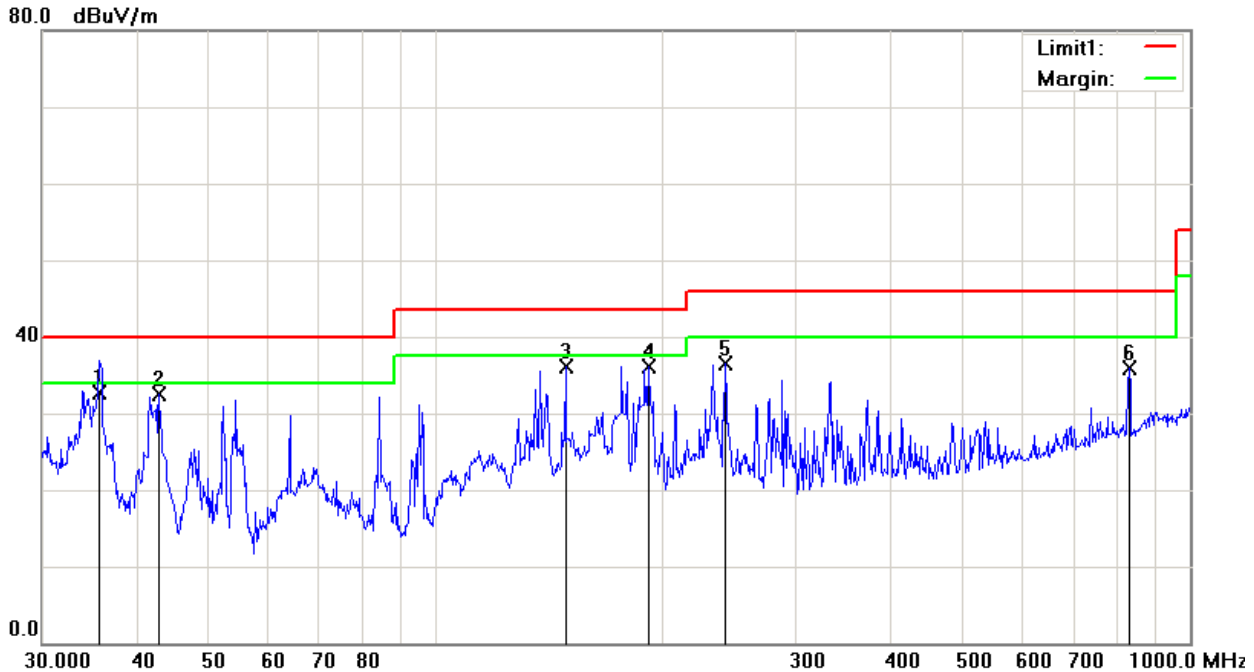
	<p>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</p> <p>b. The EUT was then rotated to the direction that gave the maximum emission.</p> <p>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</p> <p>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</p> <p>4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</p> <p>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</p>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

**Test Mode:** Bluetooth Mode

**Below 1GHz**

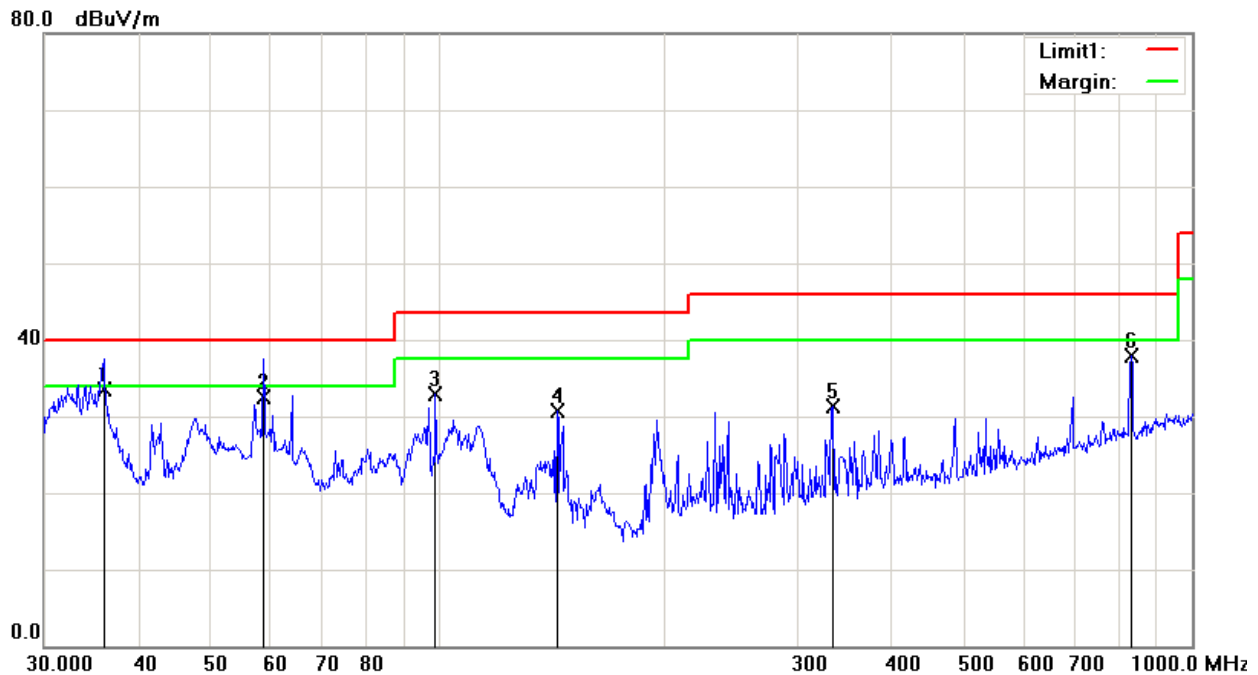


**Test Data**

**Horizontal Polarity Plot @3m**

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	H	35.7491	37.29	QP	-4.49	32.80	40.00	-7.20	100	195
2	H	42.8998	41.99	peak	-9.53	32.46	40.00	-7.54	100	105
3	H	148.4410	44.60	peak	-8.42	36.18	43.50	-7.32	100	0
4	H	191.0738	45.19	peak	-9.17	36.02	43.50	-7.48	100	311
5	H	241.6763	45.56	peak	-9.11	36.45	46.00	-9.55	100	277
6	H	830.4002	32.38	peak	3.57	35.95	46.00	-10.05	100	55

### Below 1GHz



### Test Data

#### Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	V	36.0007	38.20	QP	-4.67	33.53	40.00	-6.47	100	184
2	V	58.6126	46.67	QP	-14.20	32.47	40.00	-7.53	100	210
3	V	99.1797	43.85	peak	-11.02	32.83	43.50	-10.67	100	82
4	V	143.8295	39.14	peak	-8.48	30.66	43.50	-12.84	100	237
5	V	333.6867	37.16	peak	-5.93	31.23	46.00	-14.77	100	37
6	V	830.4002	34.39	peak	3.57	37.96	46.00	-8.04	100	45

<b>Test Mode:</b>	<b>Transmitting Mode</b>
-------------------	--------------------------

**GFSK Mode (Worst Case) : Low Channel (2402 MHz)**

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4804	33.87	AV	V	33.83	6.86	31.72	42.84	54	-11.16
4804	34.25	AV	H	33.83	6.86	31.72	43.22	54	-10.78
4804	47.35	PK	V	33.83	6.86	31.72	56.32	74	-17.68
4804	46.54	PK	H	33.83	6.86	31.72	55.51	74	-18.49

**GFSK Mode (Worst Case): Middle Channel (2441 MHz)**

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4882	32.16	AV	V	33.86	6.82	31.82	41.02	54	-12.98
4882	32.63	AV	H	33.86	6.82	31.82	41.49	54	-12.51
4882	46.37	PK	V	33.86	6.82	31.82	55.23	74	-18.77
4882	45.44	PK	H	33.86	6.82	31.82	54.3	74	-19.7

**8DPSK Mode (Worst Case): High Channel (2480 MHz)**

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	34.68	AV	V	33.9	6.76	31.92	43.42	54	-10.58
4960	35.27	AV	H	33.9	6.76	31.92	44.01	54	-9.99
4960	46.36	PK	V	33.9	6.76	31.92	55.1	74	-18.9
4960	45.89	PK	H	33.9	6.76	31.92	54.63	74	-19.37

**Note:**

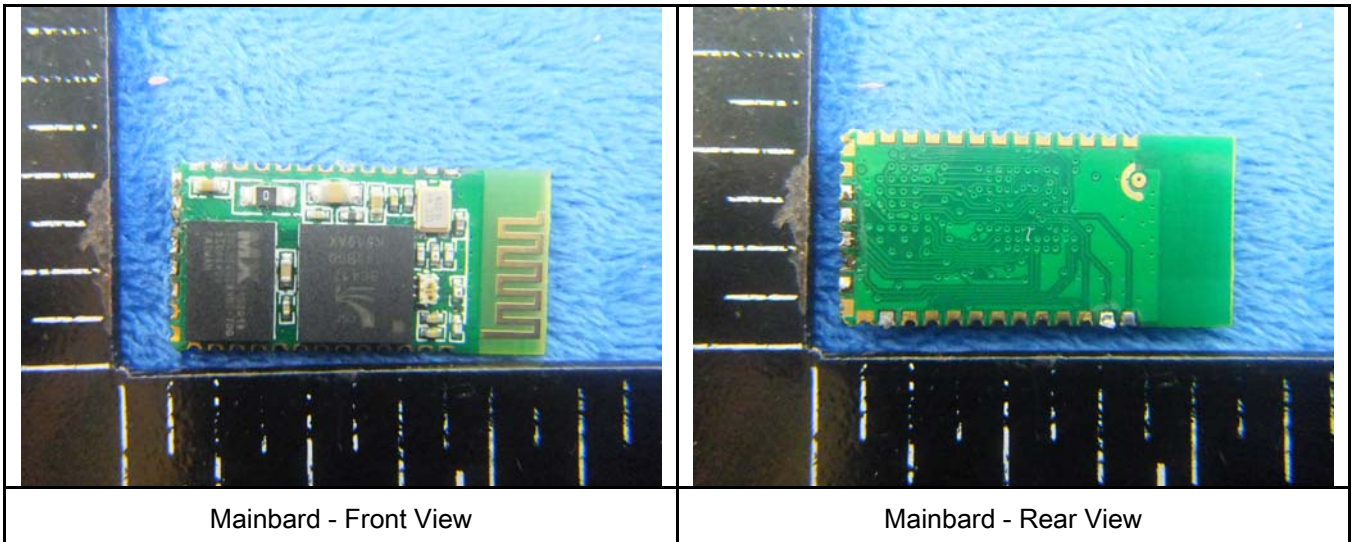
- 1, The testing has been conformed to  $10 \times 2480 \text{ MHz} = 24,800 \text{ MHz}$
- 2, All other emissions more than 30 dB below the limit

## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted</b>					
EMI test receiver	ESCS30	8471241027	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
LISN	ISN T800	34373	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/24/2015	09/23/2016	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
<b>RF conducted test</b>					
Agilent ESA-E SERIES	E4407B	MY45108319	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/19/2015	11/18/2016	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/24/2016	03/23/2017	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/21/2015	09/20/2016	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/24/2015	09/23/2016	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/25/2015	09/24/2016	<input checked="" type="checkbox"/>

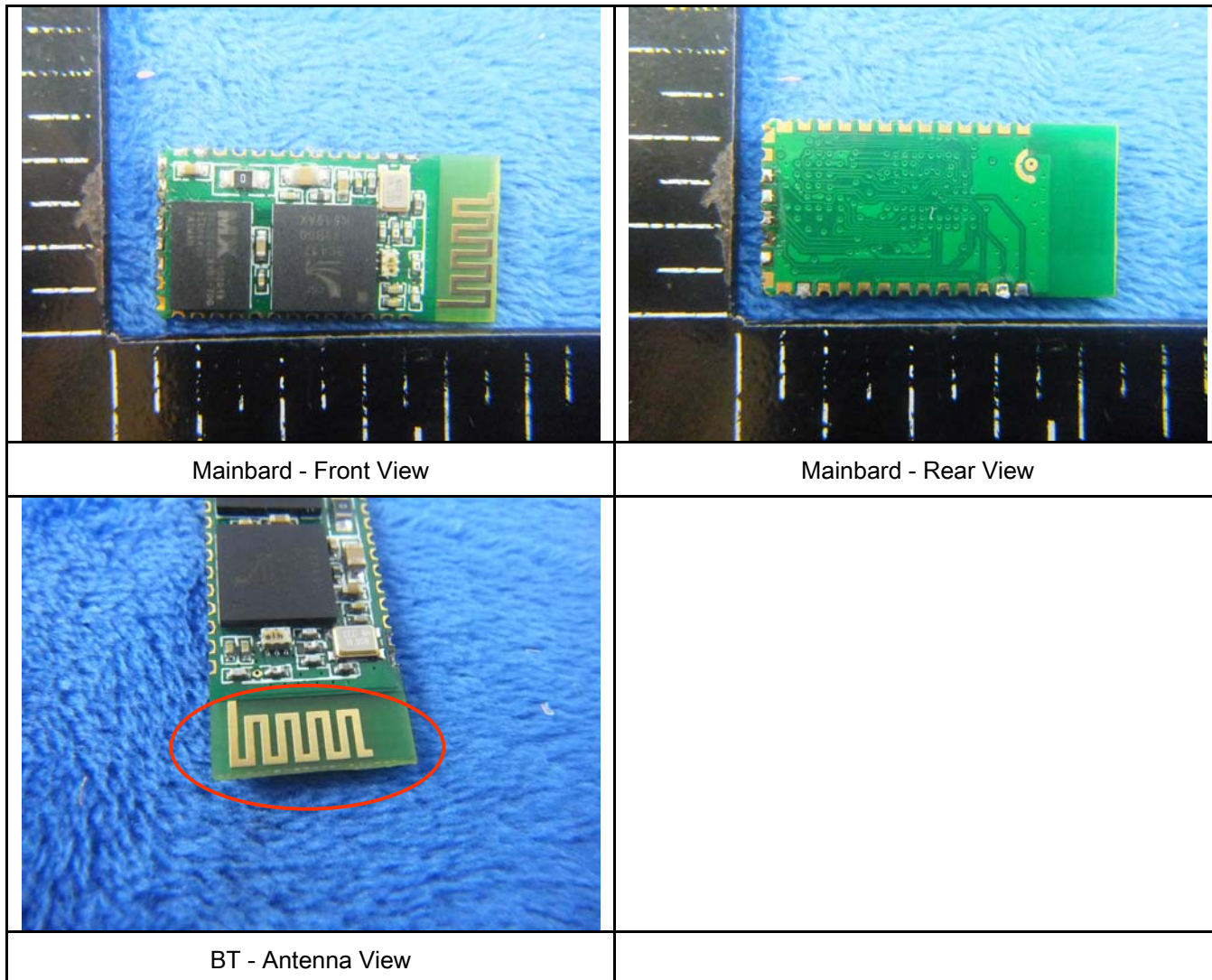
## Annex B. EUT And Test Setup Photographs

### Annex B.i. Photograph: EUT External Photo





**Annex B.ii. Photograph: EUT Internal Photo**

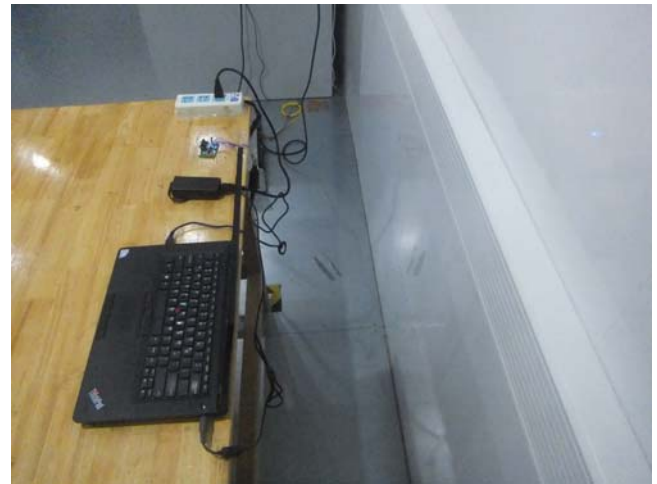




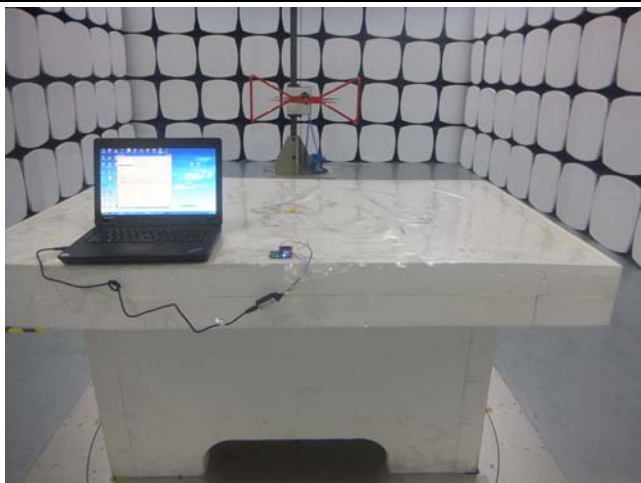
**Annex B.iii. Photograph: Test Setup Photo**



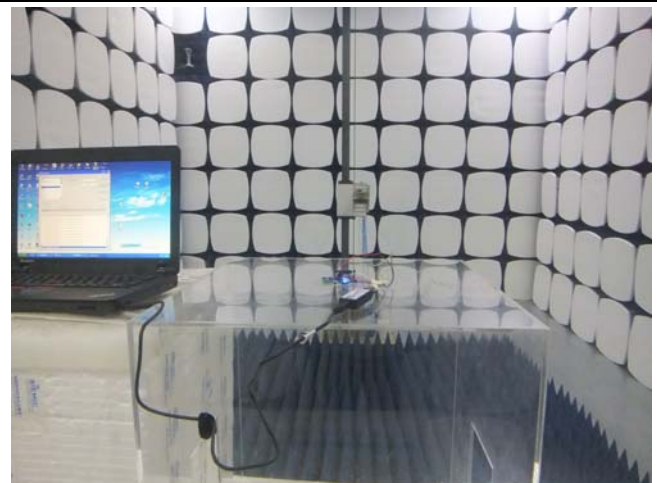
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below  
1GHz

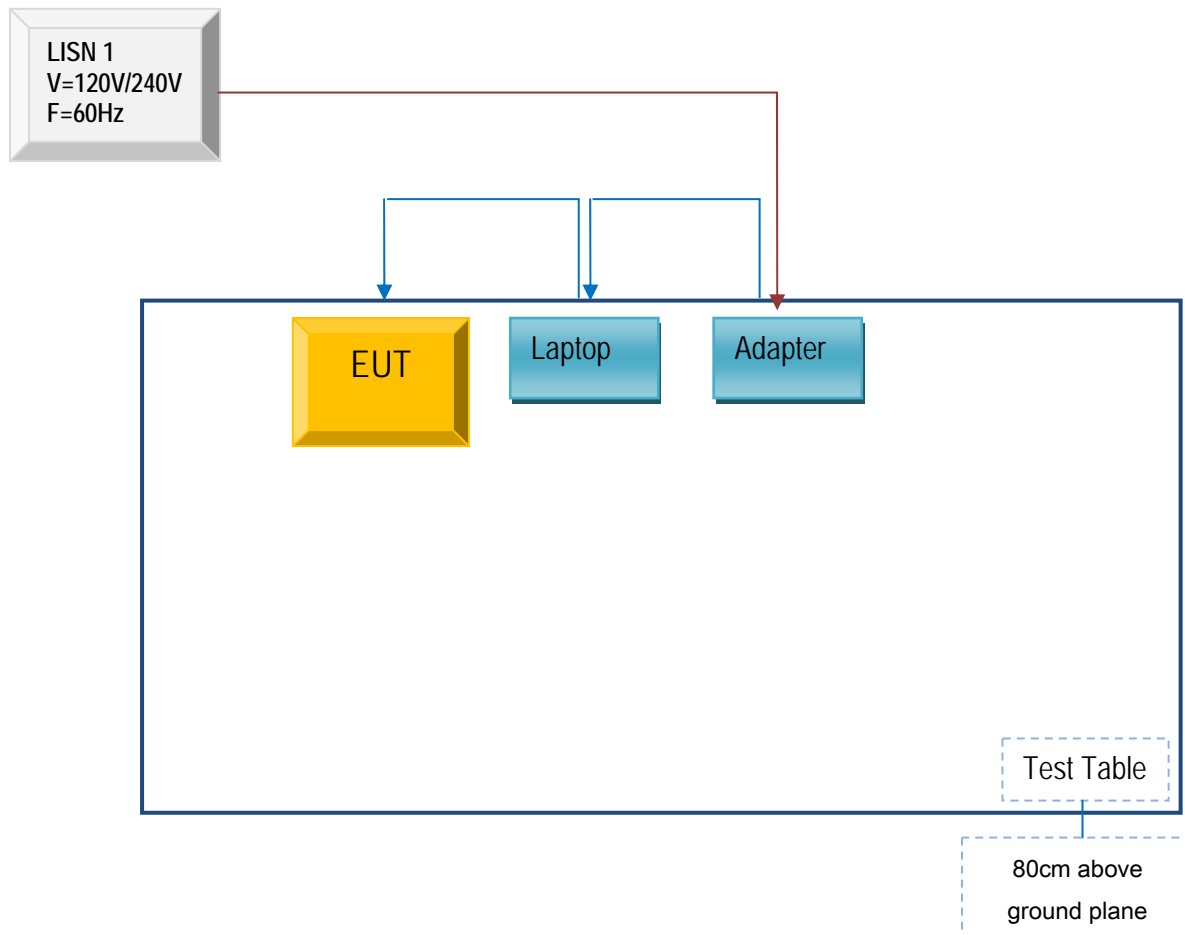


Radiated Spurious Emissions Test Setup Above  
1GHz

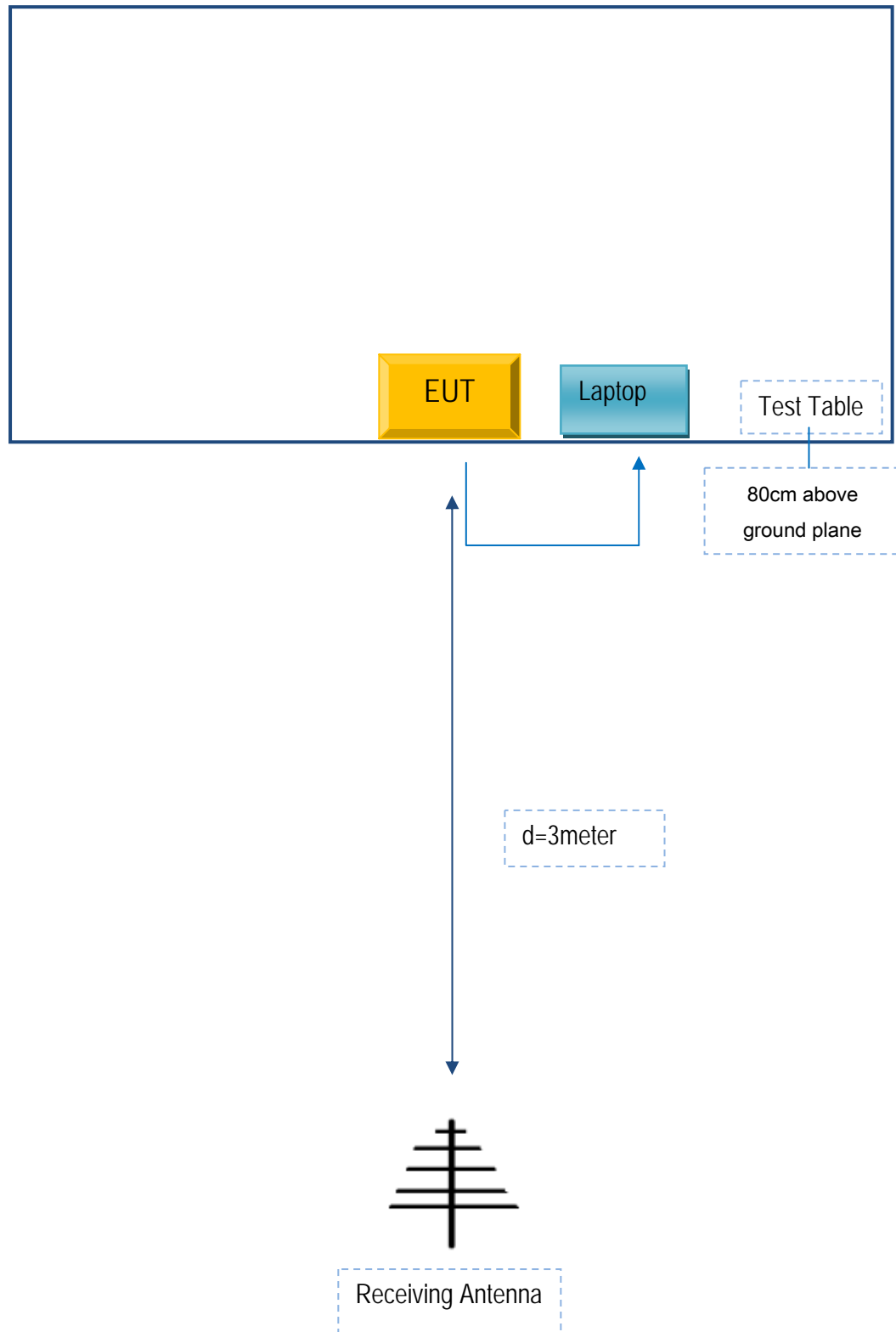
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### Annex C.ii. TEST SET UP BLOCK

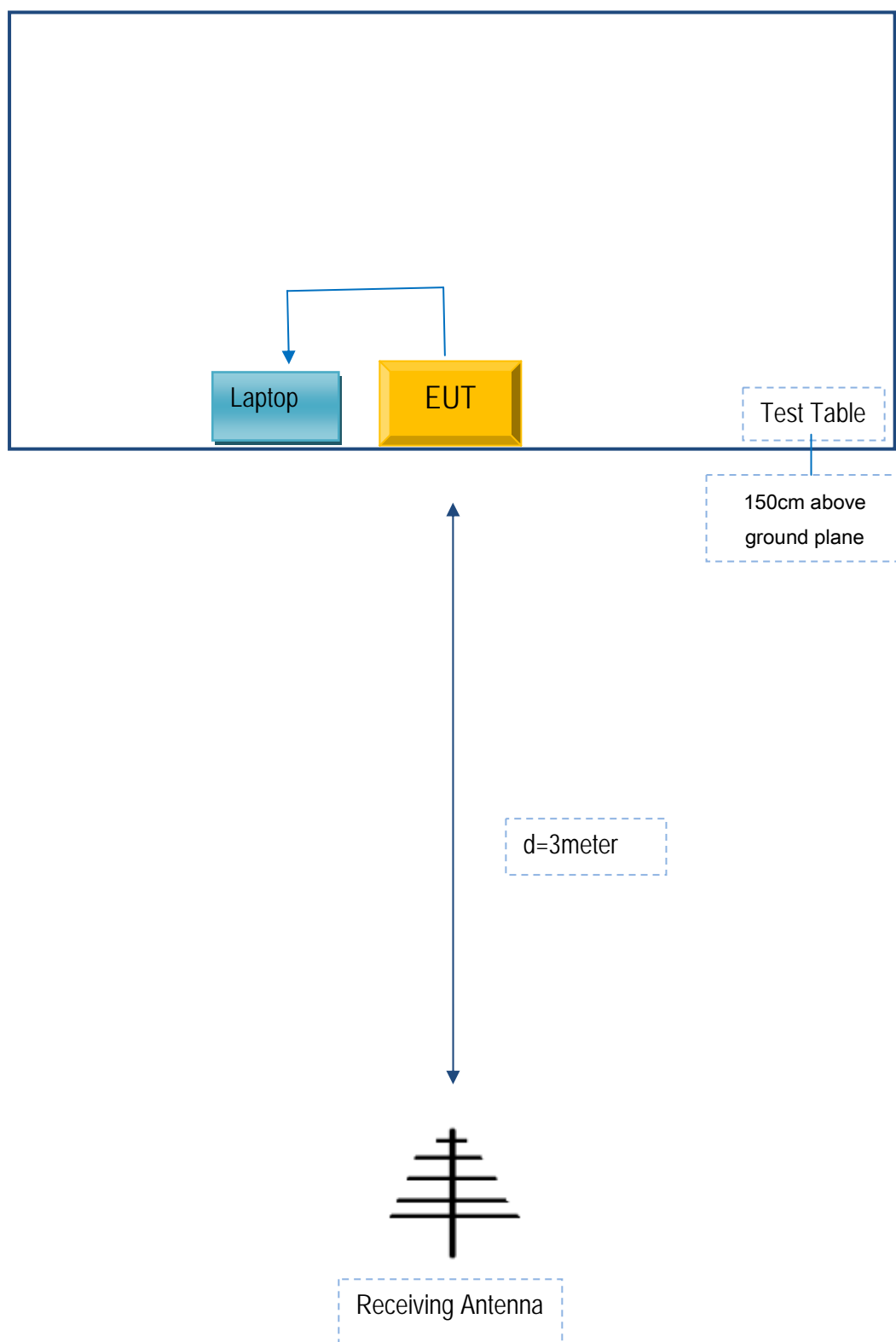
#### Block Configuration Diagram for Conducted Emissions



**Block Configuration Diagram for Radiated Emission ( Below 1GHz ) .**



**Block Configuration Diagram for Radiated Emission ( Above 1GHz ) .**



## **Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION**

The following is a description of supporting equipment and details of cables used with the EUT.

### **Supporting Equipment:**

Manufacturer	Equipment Description	Model	Serial No
Lenovo	Lenovo Laptop	E40	LR-1EHRX

### **Supporting Cable:**

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	ST22100

Test Report	16070264-FCC-R
Page	54 of 55

## Annex D. User Manual / Block Diagram / Schematics / Partlist

N/A

Test Report	16070264-FCC-R
Page	55 of 55

## Annex E. DECLARATION OF SIMILARITY

N/A