

# RF TEST REPORT



Report No.: 15050009-FCC-R2

Applicant	Collage Investments LLC.	
Product Name	Mobile Phone	
Model No.	LK700	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013	
Test Date	May 28 to June 12, 2015	
Issue Date	June 03, 2015	
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>Wiky.Jam</i>	<i>Chris You</i>	
Wiky.Jam Test Engineer	Chris You 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	15050009-FCC-R2
Page	3 of 56

This page has been left blank intentionally.

# CONTENTS

<b>1. REPORT REVISION HISTORY .....</b>	<b>5</b>
<b>2. CUSTOMER INFORMATION .....</b>	<b>5</b>
<b>3. TEST SITE INFORMATION.....</b>	<b>5</b>
<b>4. EQUIPMENT UNDER TEST (EUT) INFORMATION.....</b>	<b>6</b>
<b>5. TEST SUMMARY .....</b>	<b>8</b>
<b>6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS .....</b>	<b>9</b>
6.1 ANTENNA REQUIREMENT.....	9
6.2 CHANNEL SEPARATION .....	10
6.3 20DB BANDWIDTH .....	14
6.4 PEAK OUTPUT POWER.....	18
6.5 NUMBER OF HOPPING CHANNEL.....	22
6.6 TIME OF OCCUPANCY (DWEEL TIME) .....	24
6.7 BAND EDGE.....	28
6.8 AC POWER LINE CONDUCTED EMISSIONS.....	36
6.9 RADIATED SPURIOUS EMISSIONS .....	40
<b>ANNEX A. TEST INSTRUMENT.....</b>	<b>45</b>
<b>ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS.....</b>	<b>46</b>
<b>ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT.....</b>	<b>51</b>
<b>ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST .....</b>	<b>55</b>
<b>ANNEX E. DECLARATION OF SIMILARITY.....</b>	<b>56</b>

## 1. Report Revision History

Report No.	Report Version	Description	Issue Date
15050009-FCC-R2	NONE	Original	June 03, 2015

## 2. Customer information

Applicant Name	Collage Investments LLC.
Applicant Add	11437 NW 34 STREET Doral Florida United States 33178
Manufacturer	ZHENGZHOU SPEED COMMUNICATION EQUIPMEINT CO.,LTD
Manufacturer Add	6F, Tianzhan Building, Tairan 4th Rd, Chegongmiao, Futian District, Shenzhen, China

## 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:	Mobile Phone
Main Model:	LK700
Serial Model:	N/A
Date EUT received:	May 13, 2015
Test Date(s):	May 28 to June 12, 2015
Equipment Category :	DSS
Antenna Gain:	GSM850:1.24dBi PCS1900: -3.61dBi UMTS-FDD Band V: 0.65dBi Bluetooth: 0.5dBi
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK, 8PSK UMTS-FDD: QPSK, 16QAM Bluetooth: GFSK, $\pi$ /4DQPSK, 8DPSK
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz Bluetooth: 2402-2480 MHz
Max. Output Power:	GFSK: -3.51dBm
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band V : 102CH Bluetooth: 79CH
Port:	Earphone Port, USB Port



## 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:

- a. Antenna must be permanently attached to the unit.
- b. 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 2 antennas:

A permanently attached Line antenna for Bluetooth, the gain is 0.5dBi for Bluetooth

A permanently attached PIFA antenna for GSM and UMTS, the gain is 1.24dBi for GSM850, 0.65dBi for UMTS-FDD Band V, -3.61dBi for PCS1900, the gain is 1.8dBi for UMTS-FDD Band II

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

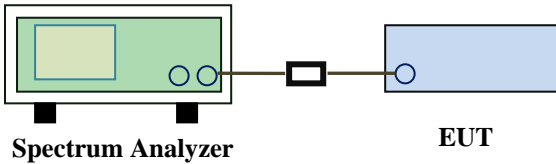
**Result:** Compliance.

## 6.2 Channel Separation

Temperature	21°C
Relative Humidity	55%
Atmospheric Pressure	1028mbar
Test date :	May 25, 2015
Tested By :	Wiky.Jam

### 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	<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>- 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

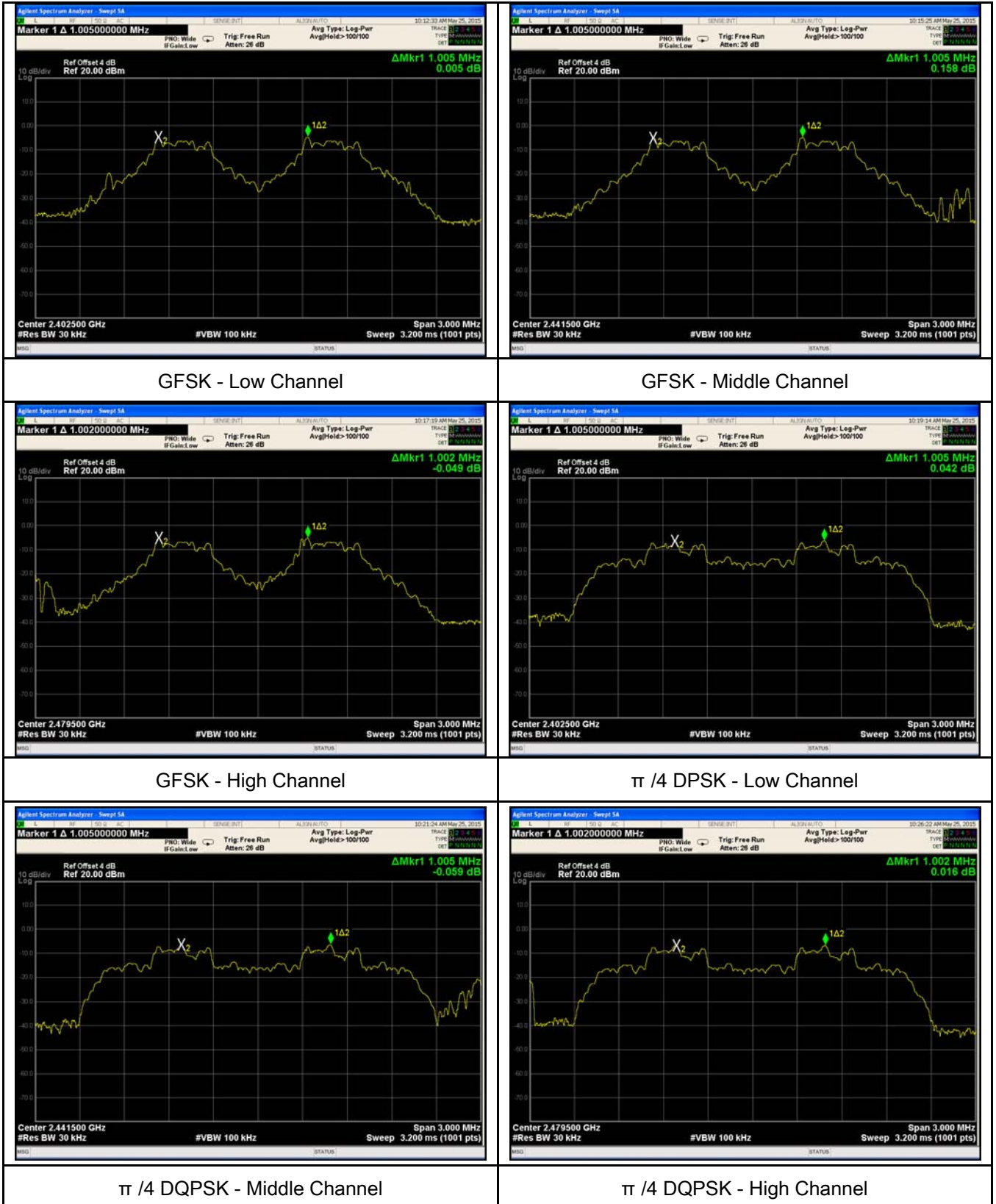
Test Plot  Yes (See below)  N/A

### Channel Separation measurement result

Type/ Modulation	CH	CH Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.005	0.947	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.947	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.929	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.005	0.933	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.823	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.821	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.008	0.849	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.837	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.833	Pass
	Adjacency Channel	2479			

## Test Plots

### Channel Separation measurement result





8DPSK - Low Channel



8DPSK - Middle Channel



8DPSK - High Channel

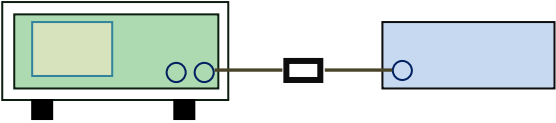


### 6.3 20dB Bandwidth

Temperature	21°C
Relative Humidity	55%
Atmospheric Pressure	1028mbar
Test date :	May 25, 2015
Tested By :	Wiky.Jam

**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>The diagram shows a green Spectrum Analyzer on the left connected by a black cable to a blue EUT on the right. The Spectrum Analyzer has two small circles on its front panel, and the EUT has one small circle on its front panel.</p>
------------	---

Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.  <u>Use the following spectrum analyzer settings:</u></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>
----------------	--

	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	0.947	0.887
	Mid	2441	0.947	0.892
	High	2480	0.929	0.888
$\pi/4$ DQPSK	Low	2402	0.933	0.893
	Mid	2441	1.234	1.139
	High	2480	1.231	1.133
8-DPSK	Low	2402	1.274	1.158
	Mid	2441	1.256	1.144
	High	2480	1.250	1.140

## Test Plots

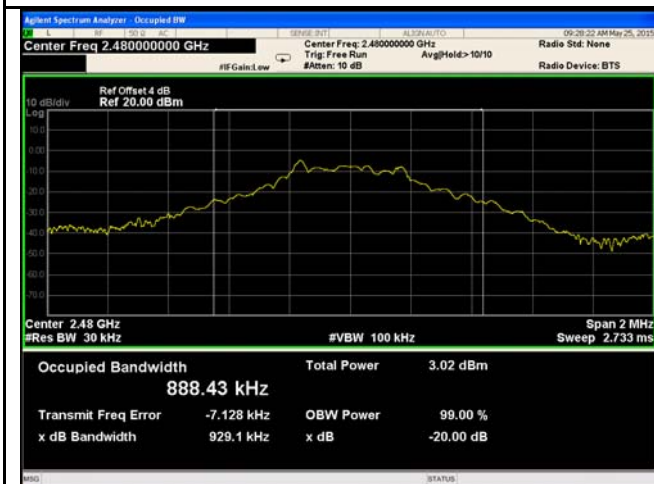
### 20dB Bandwidth measurement result



GFSK - Low Channel



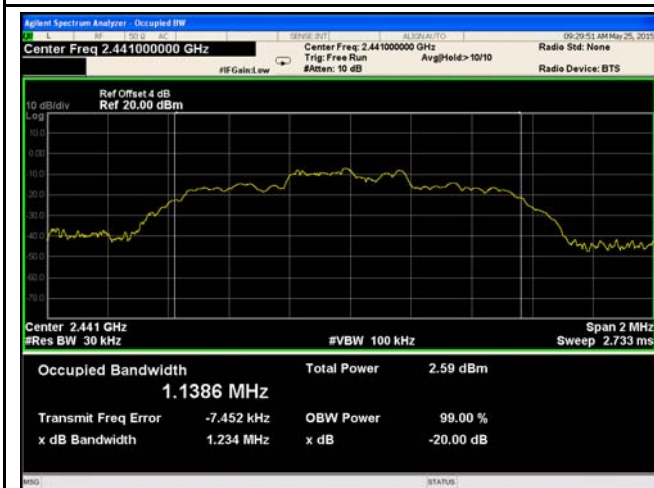
GFSK - Middle Channel



GFSK - High Channel



$\pi/4$  DPSK - Low Channel

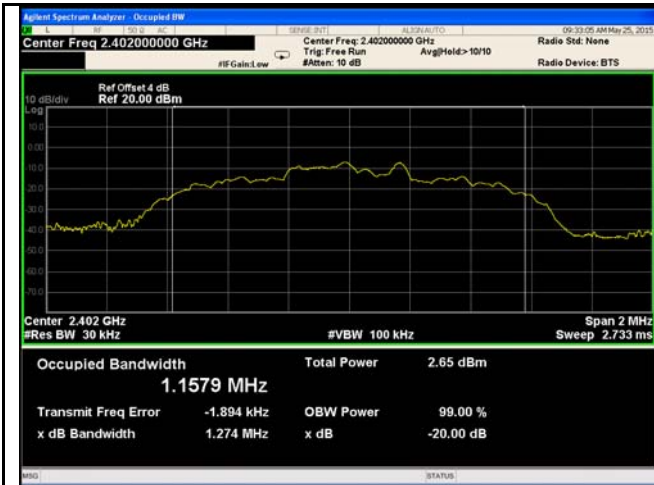


$\pi/4$  DQPSK - Middle Channel



$\pi/4$  DQPSK - High Channel

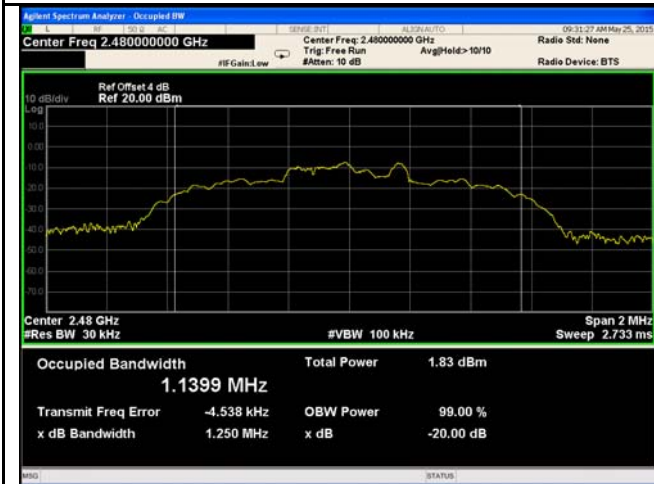




8DPSK - Low Channel



8DPSK - Middle Channel



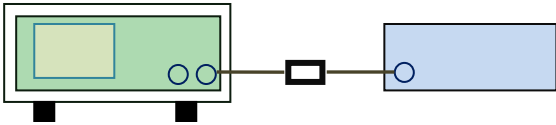
8DPSK - High Channel

## 6.4 Peak Output Power

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1029mbar
Test date :	May 25, 2015
Tested By :	Wiky.Jam

### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (2)	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)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: $\leq 1$ 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 &gt; 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> </ul>
----------------	---

	<ul style="list-style-type: none"> <li>- Allow the trace to stabilize.</li> <li>- 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.</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

**Peak Output Power measurement result**

Type	Modulation	CH	Freq (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	-3.784	1000	Pass
		Mid	2441	-3.751	1000	Pass
		High	2480	<b>-3.505</b>	1000	Pass
	$\pi/4$ DQPSK	Low	2402	-3.921	1000	Pass
		Mid	2441	-3.898	125	Pass
		High	2480	<b>-3.720</b>	125	Pass
	8-DPSK	Low	2402	-4.462	125	Pass
		Mid	2441	-4.355	125	Pass
		High	2480	<b>-3.954</b>	125	Pass

Test Plots

Output Power measurement result



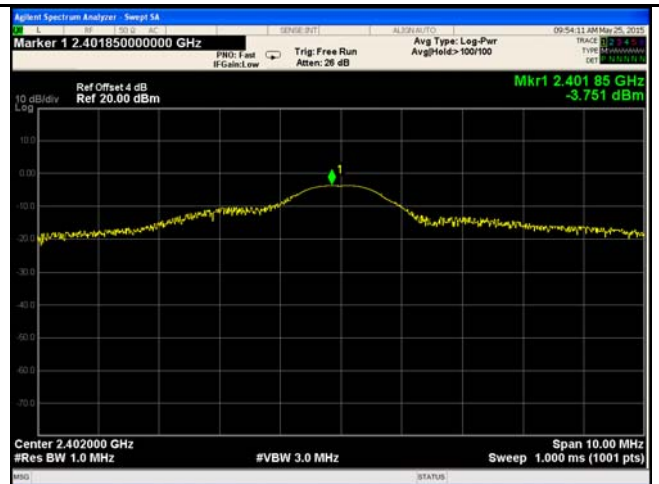
GFSK Output power - Low CH 2402



GFSK Output power - Mid CH 2441



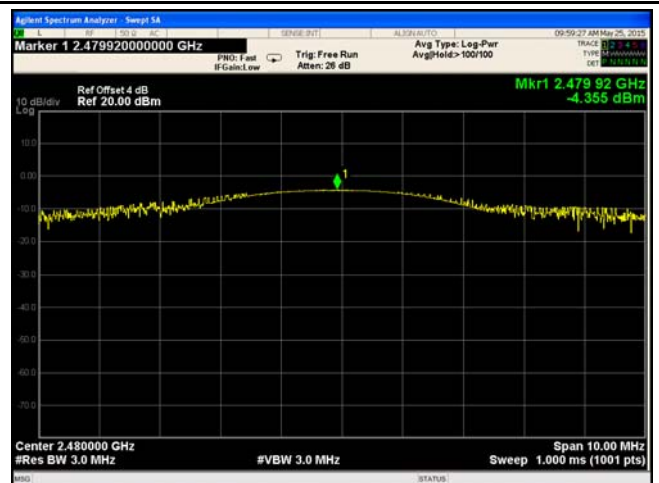
GFSK Output power - High CH 2480



$\pi/4$  DQPSK Output power - Low CH 2402



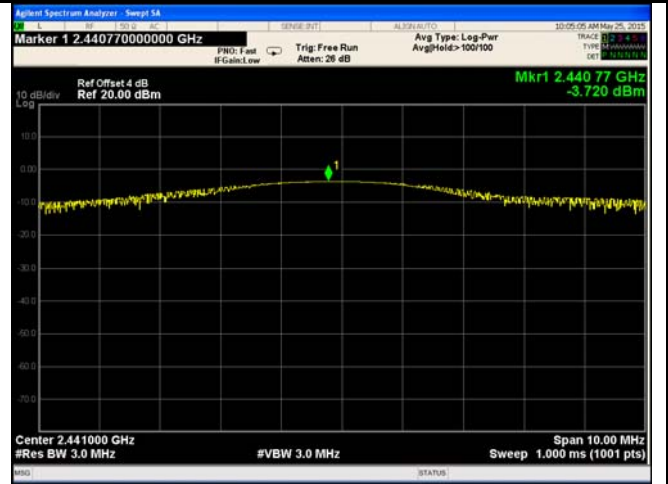
$\pi/4$  DQPSK Output power - Mid CH 2441



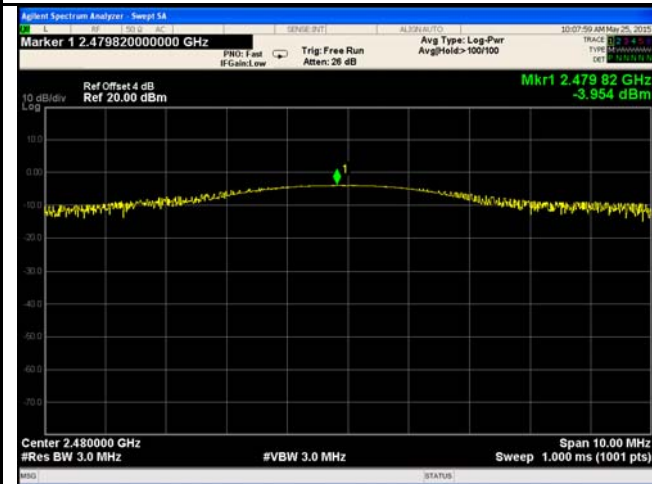
$\pi/4$  DQPSK Output power - High CH 2480



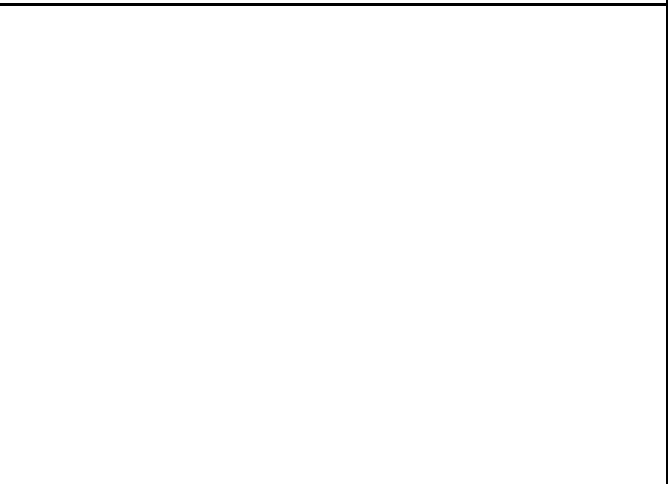
8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441



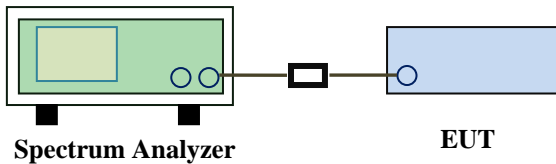
8DPSK Output power - High CH 2480



### 6.5 Number of Hopping Channel

Temperature	22C
Relative Humidity	57%
Atmospheric Pressure	1029mbar
Test date :	May 25, 2015
Tested By :	Wiky.Jam

**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		

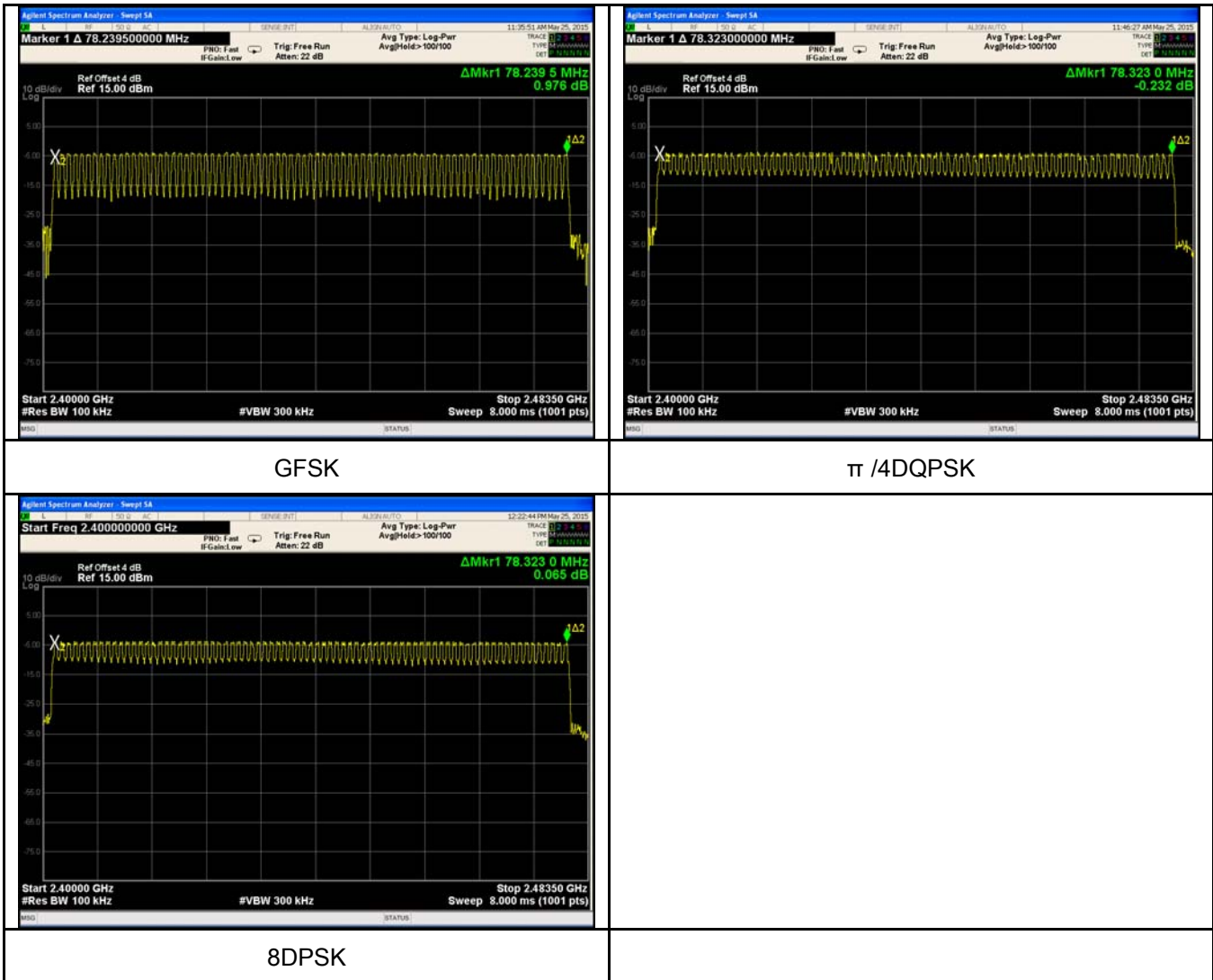
Test Data     Yes                       N/A  
 Test Plot     Yes (See below)                       N/A

**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**

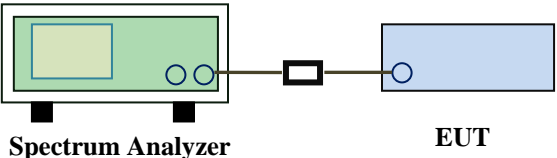
**Number of Hopping Channels measurement result**



## 6.6 Time of Occupancy (Dwell Time)

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1029mbar
Test date :	May 25, 2015
Tested By :	Wiky.Jam

### 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



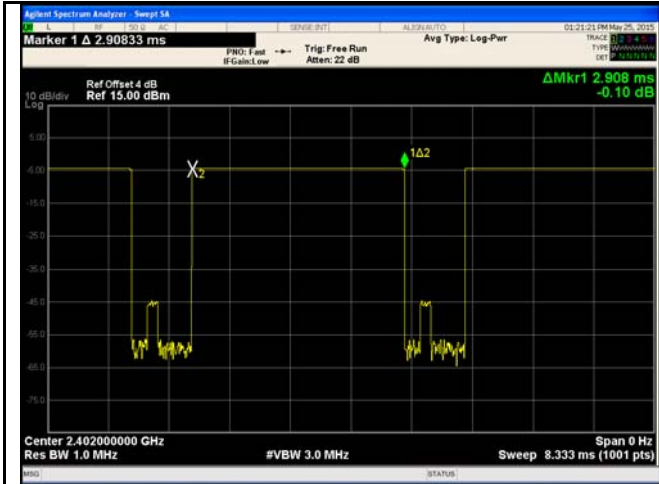
**Dwell Time measurement result**

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.908	310.187	400	Pass
		Mid	2.900	309.333	400	Pass
		High	2.900	309.333	400	Pass
	π /4 DQPSK	Low	2.900	309.333	400	Pass
		Mid	2.900	309.333	400	Pass
		High	2.900	309.333	400	Pass
	8-DPSK	Low	2.900	309.333	400	Pass
		Mid	2.900	309.333	400	Pass
		High	2.900	309.333	400	Pass

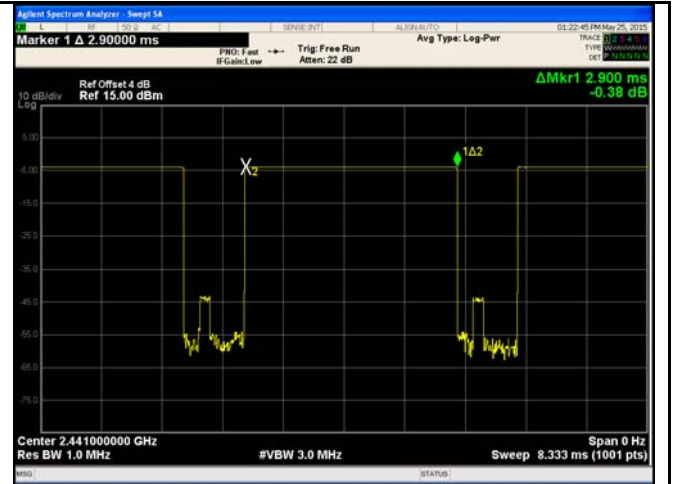
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6

Test Plots

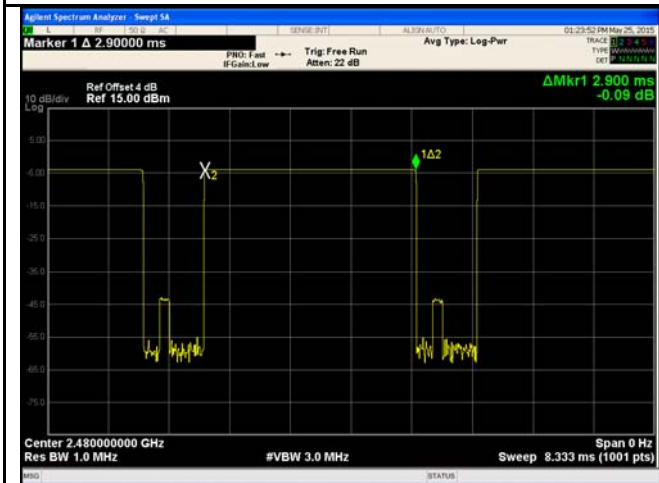
Dwell Time measurement result



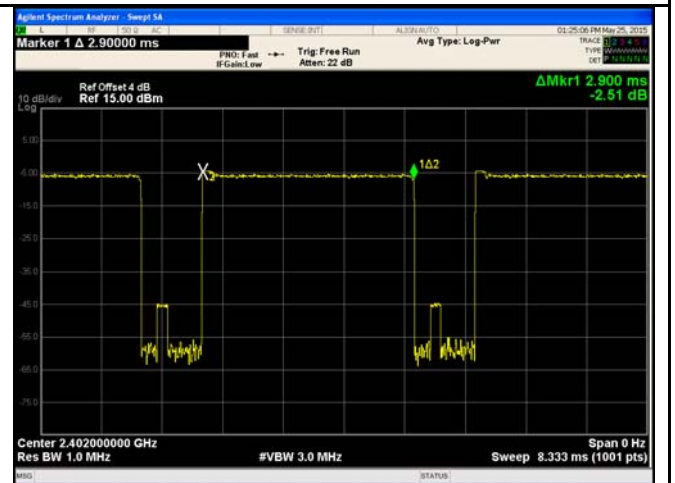
GFSK - Low CH 2402



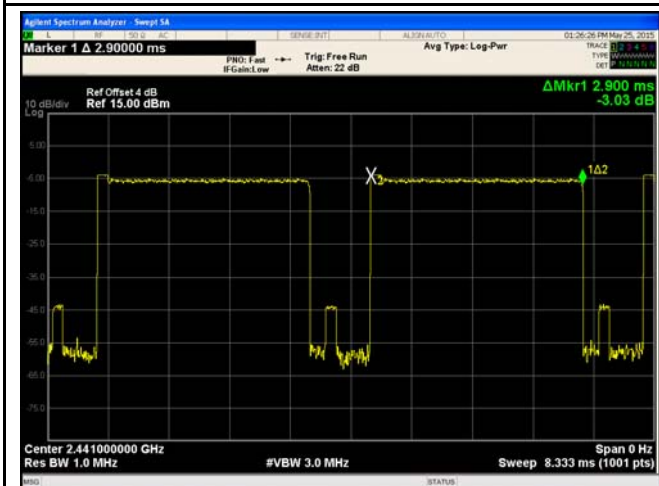
GFSK - Mid CH 2441



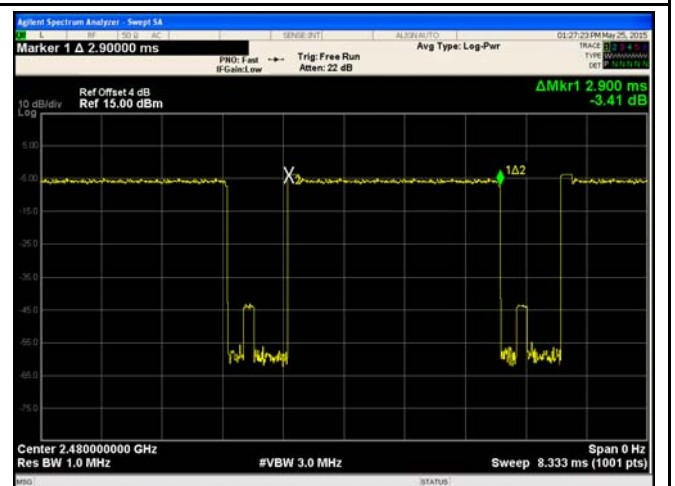
GFDK - High CH 2480



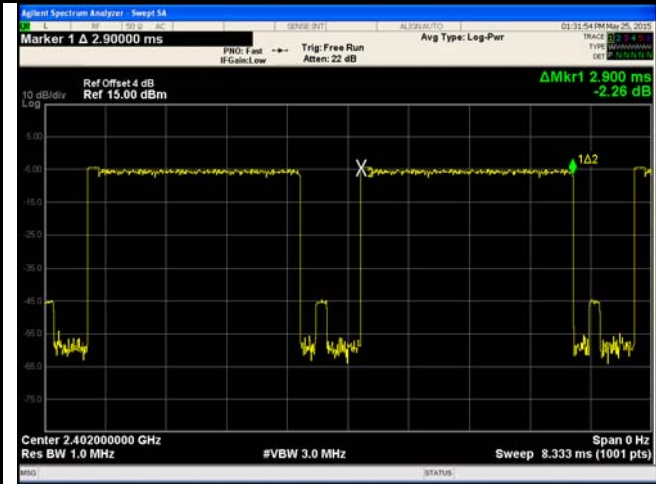
$\pi/4$  DQPSK - Low CH 2402



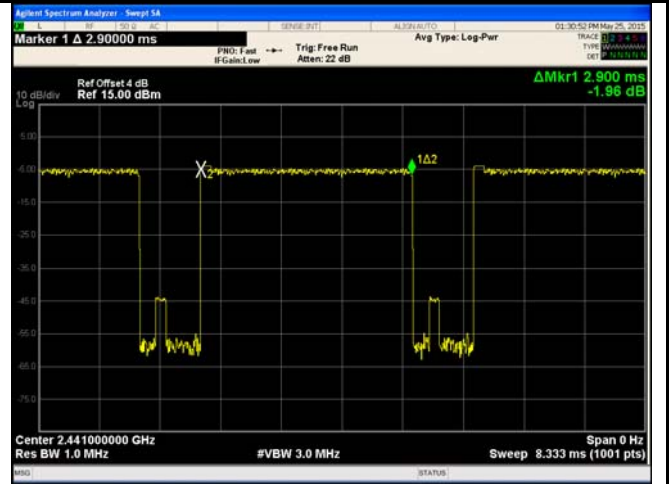
$\pi/4$  DQPSK - Mid CH 2441



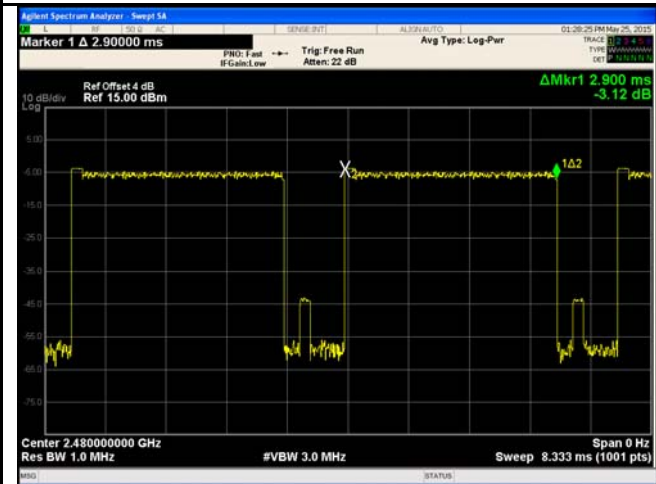
$\pi/4$  DQPSK - High CH 2480



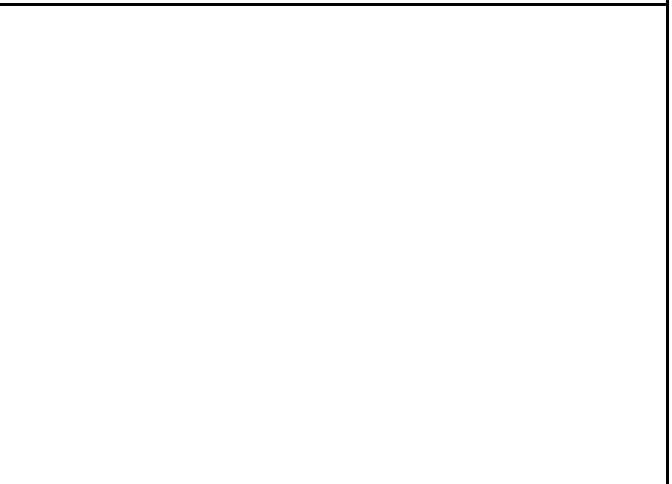
8DPSK - Low CH 2402



8DPSK - Mid CH 2441



8DPSK - High CH 2480



## 6.7 Band Edge

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1029mbar
Test date :	May 25, 2015; May 26, 2015;;May 27, 2015; Jun 12, 2015;
Tested By :	Wiky.Jam

### 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</li> </ul>		

Test Report	15050009-FCC-R2
Page	29 of 56

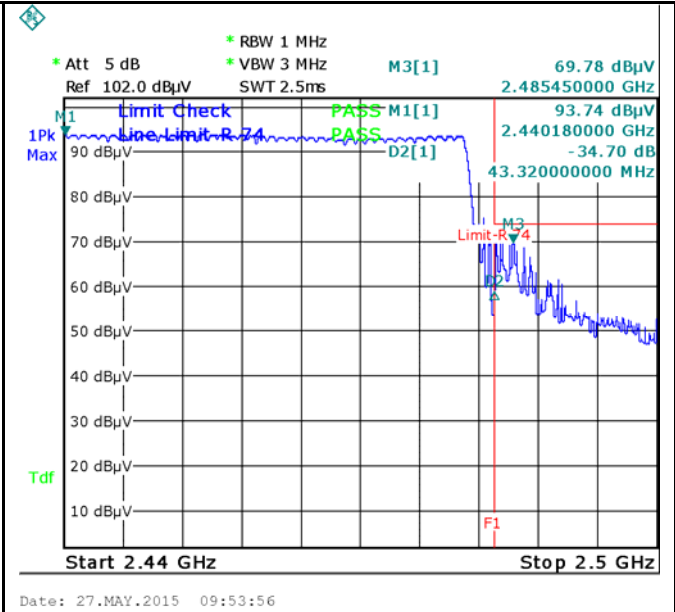
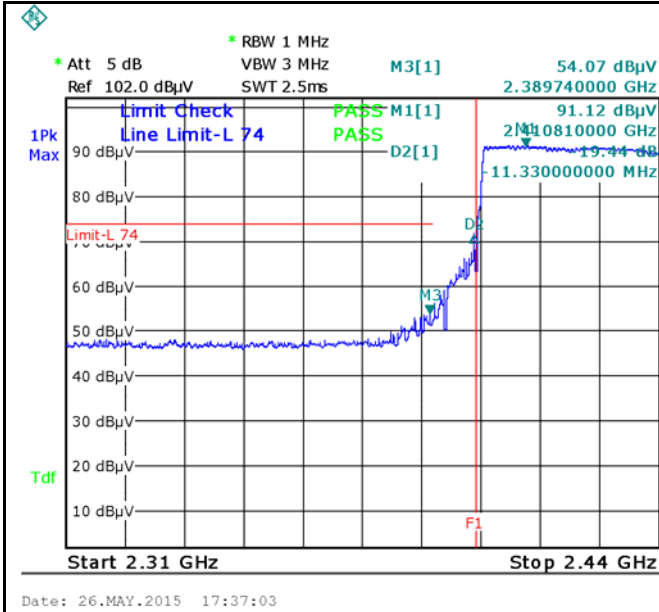
	<p>mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.</p> <ul style="list-style-type: none"> <li>- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz 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:**

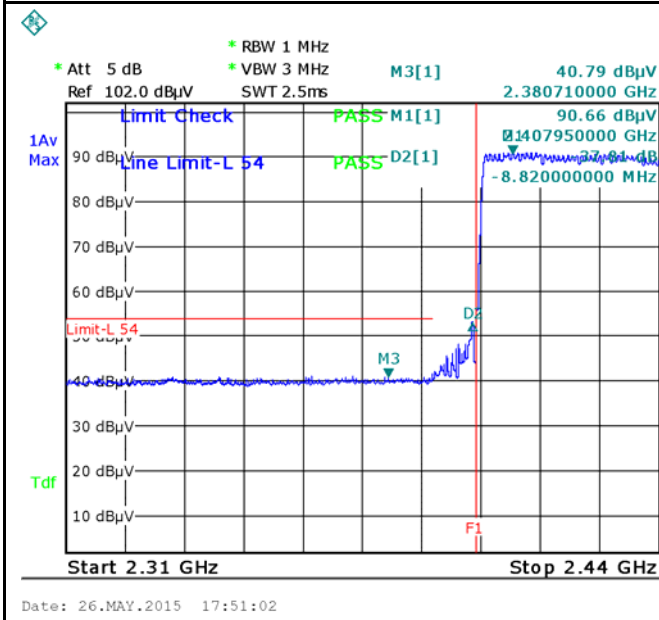


GFSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

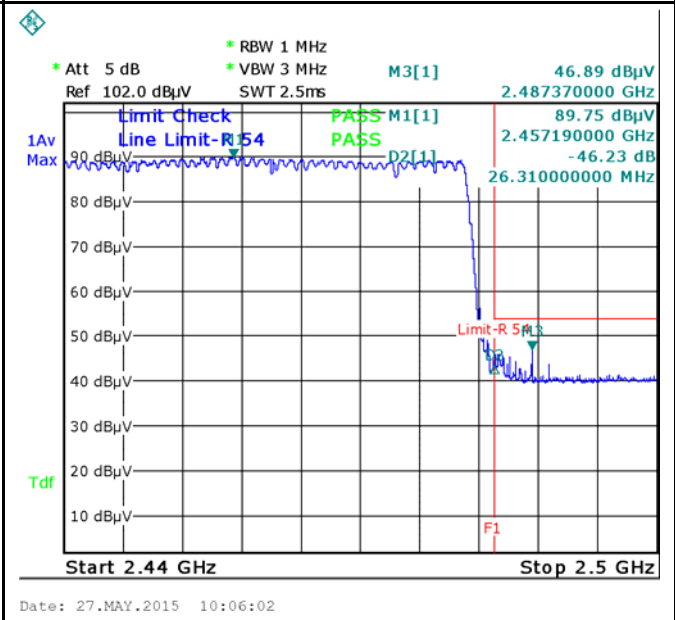
GFSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz



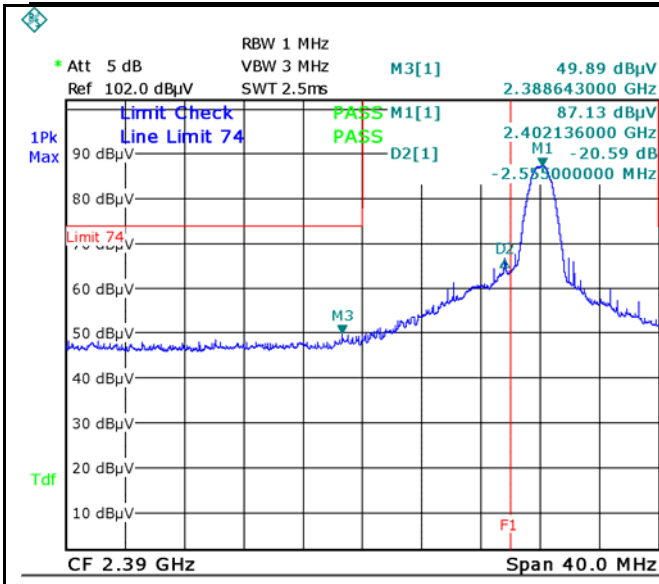
GFSK-Hopping Left Side-AV

Note: F1 is frequency 2400MHz

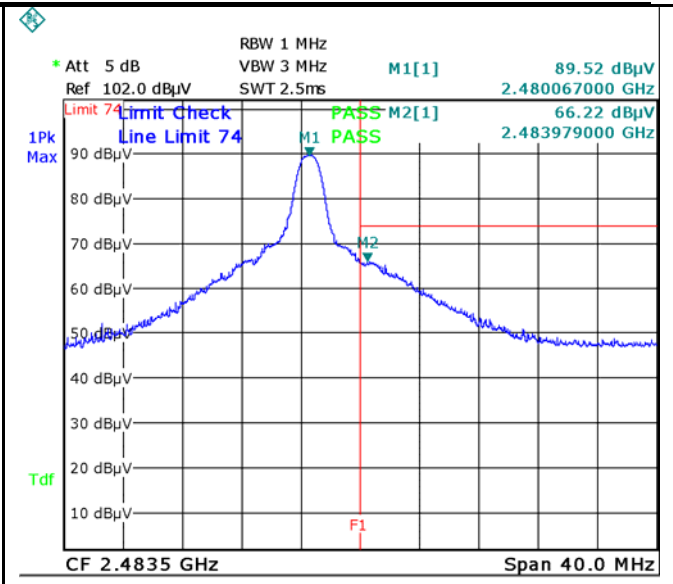


GFSK-Hopping Right Side-AV

Note: F1 is frequency 2483.5MHz



Date: 12.JUN.2015 10:33:57



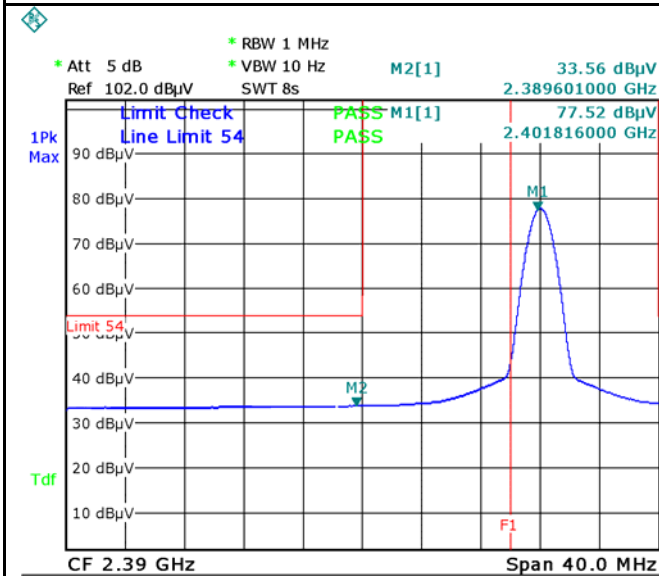
Date: 12.JUN.2015 13:36:47

GFSK-Left Side-PK

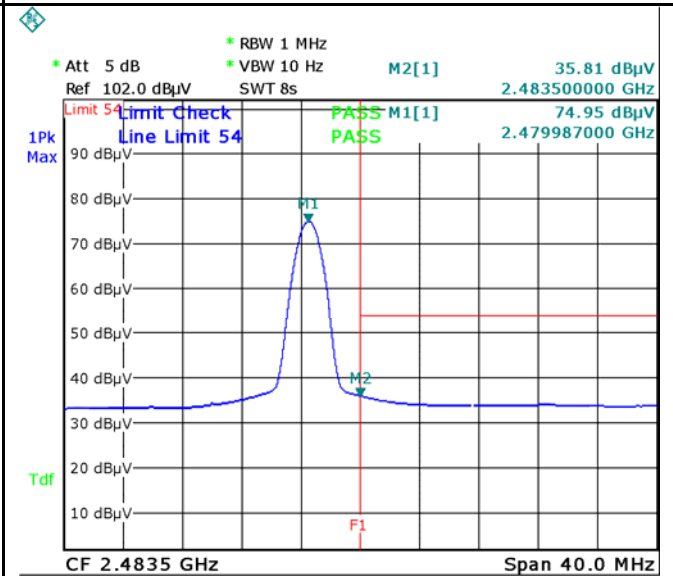
Note: F1 is frequency 2400MHz

GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



Date: 25.MAY.2015 17:08:21



Date: 26.MAY.2015 10:00:05

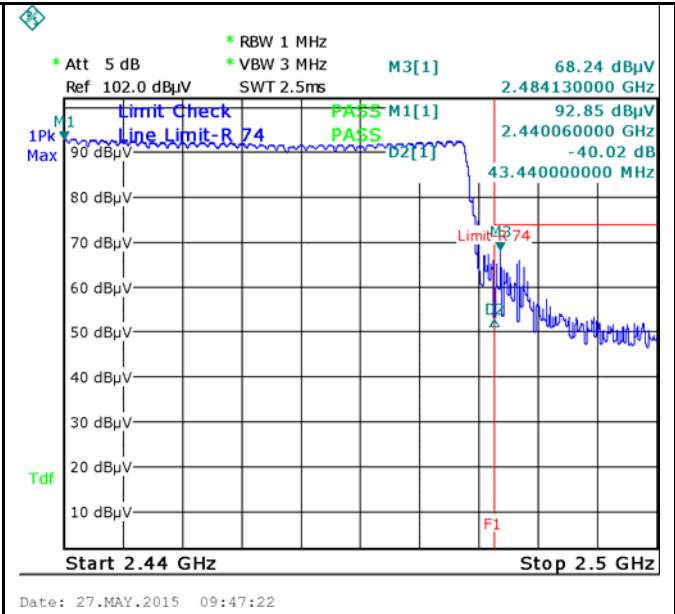
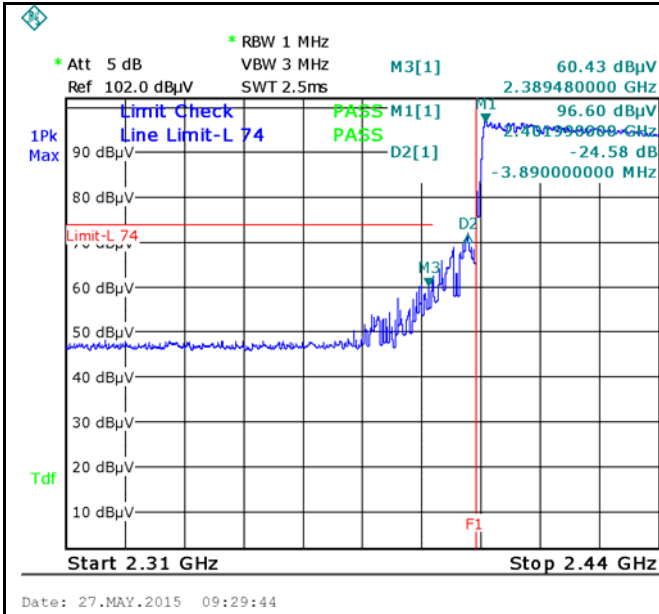
GFSK-Left Side-AV

Note: F1 is frequency 2400MHz

GFSK-Right Side-AV

Note: F1 is frequency 2483.5MHz

**$\pi/4$  DQPSK Mode:**

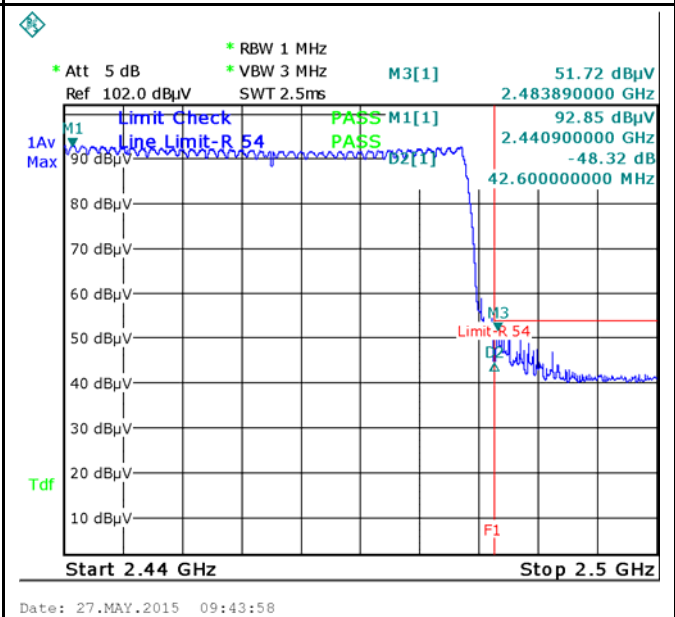
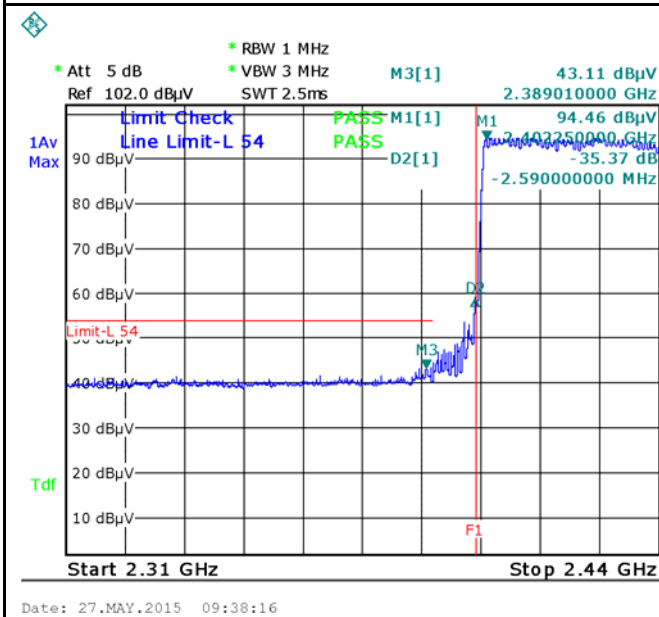


**$\pi/4$  DQPSK-Hopping Left Side-PK**

**Note: F1 is frequency 2400MHz**

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

**Note: F1 is frequency 2483.5MHz**



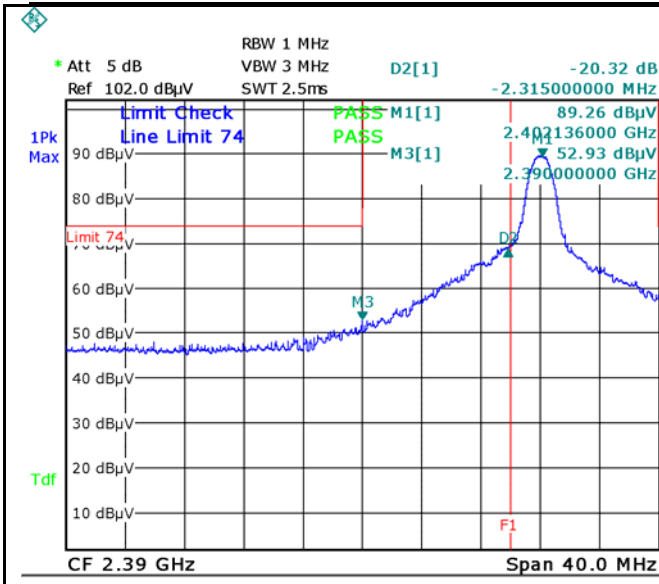
**$\pi/4$  DQPSK-Hopping Left-AV**

**Note: F1 is frequency 2400MHz**

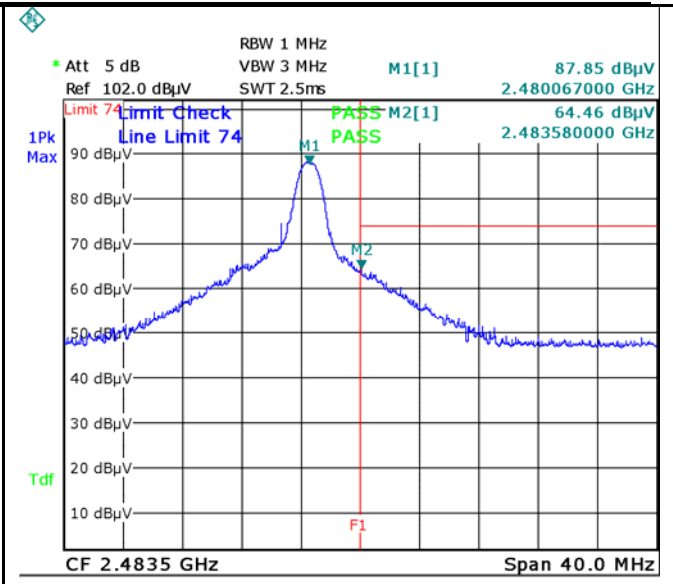
**$\pi/4$  DQPSK-Hopping Right-AV**

**Note: F1 is frequency 2483.5MHz**





Date: 12.JUN.2015 10:40:25



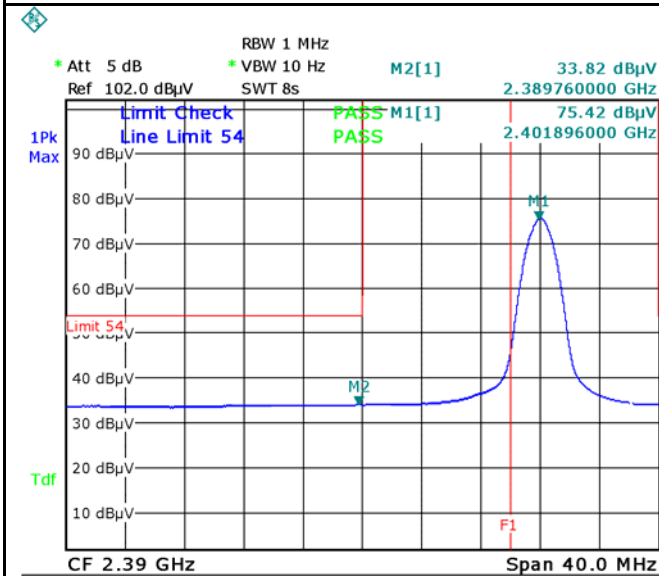
Date: 12.JUN.2015 13:38:28

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

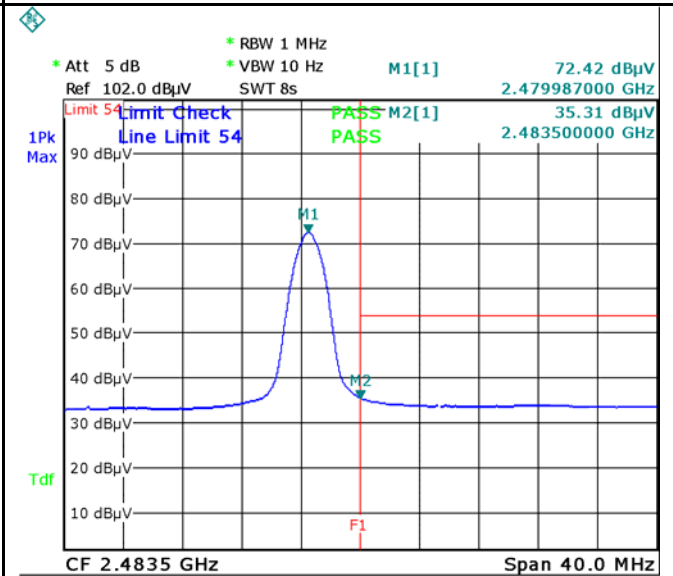
Note: F1 is frequency 2400MHz

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

Note: F1 is frequency 2483.5MHz



Date: 25.MAY.2015 17:52:18



Date: 26.MAY.2015 10:19:38

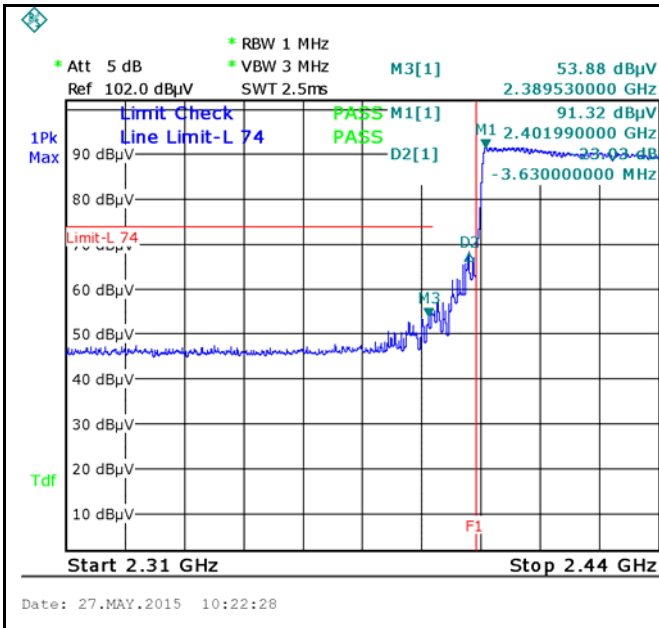
$\pi/4$  DQPSK-Left Side-AV

Note: F1 is frequency 2400MHz

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

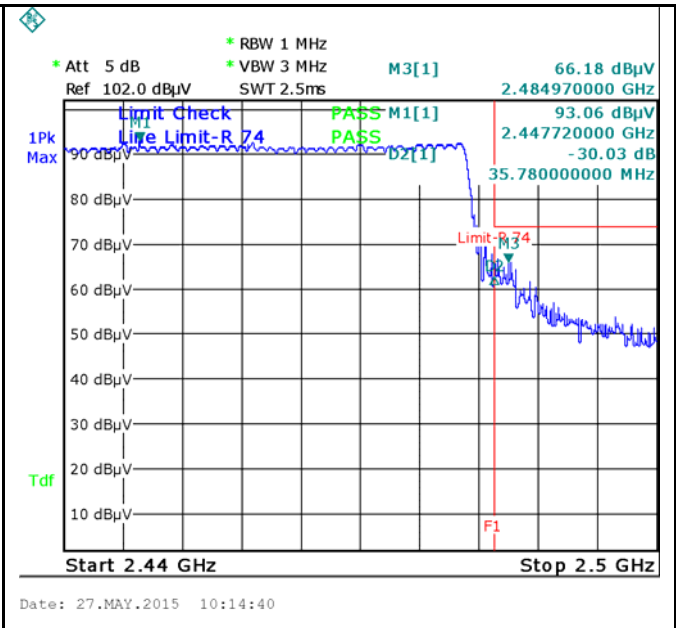
Note: F1 is frequency 2483.5MHz

**8-DPSK Mode:**



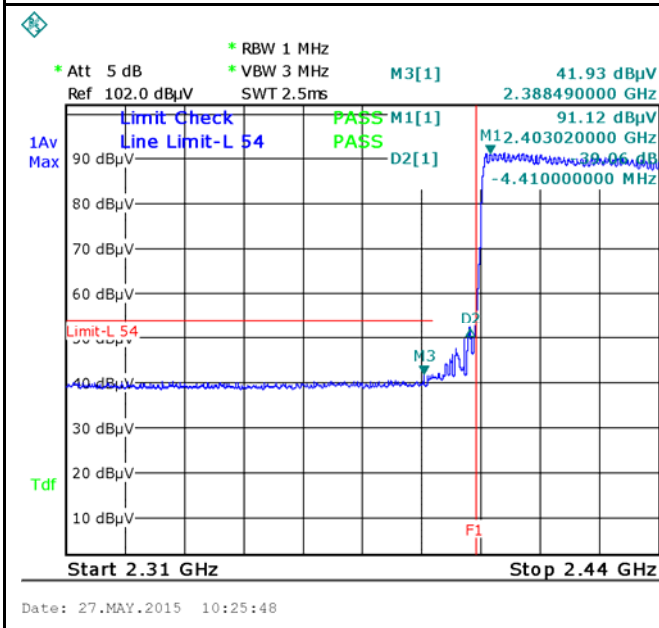
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



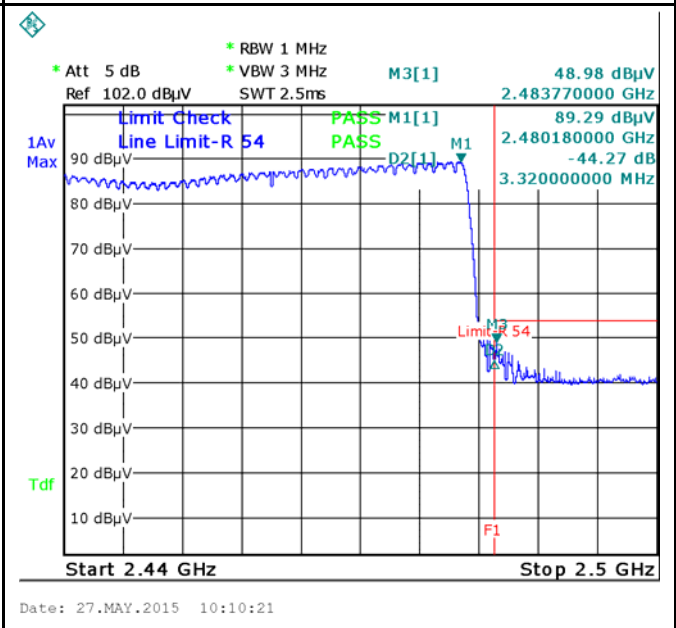
8DPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz



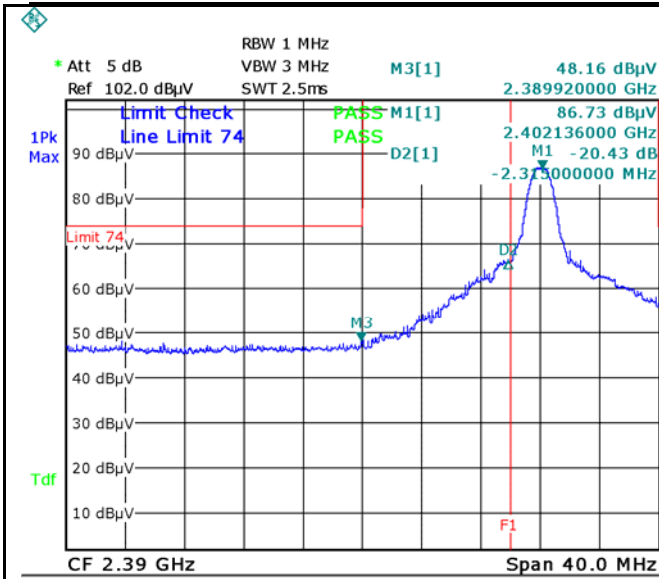
8DPSK-Hopping Left-AV

Note: F1 is frequency 2400MHz

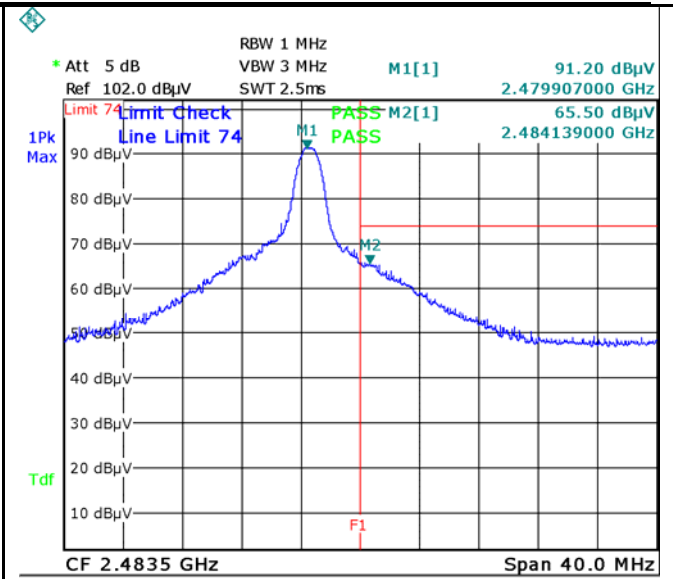


8DPSK-Hopping Right-AV

Note: F1 is frequency 2483.5MHz



Date: 12.JUN.2015 10:43:31



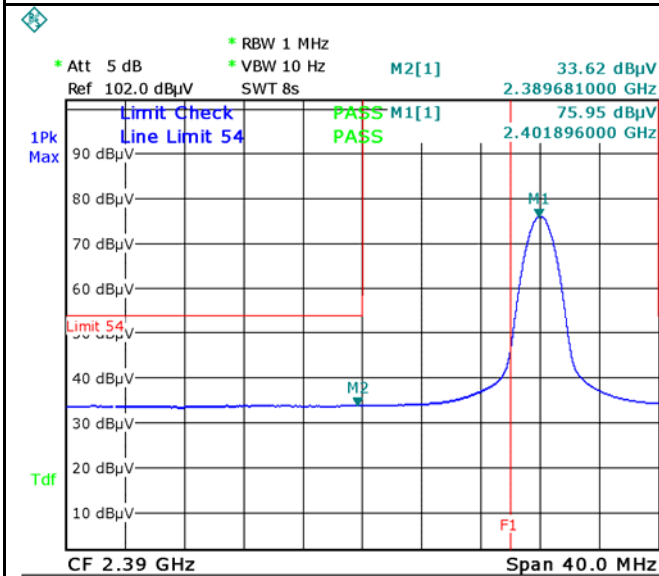
Date: 12.JUN.2015 13:40:00

8DPSK-Left Side-PK

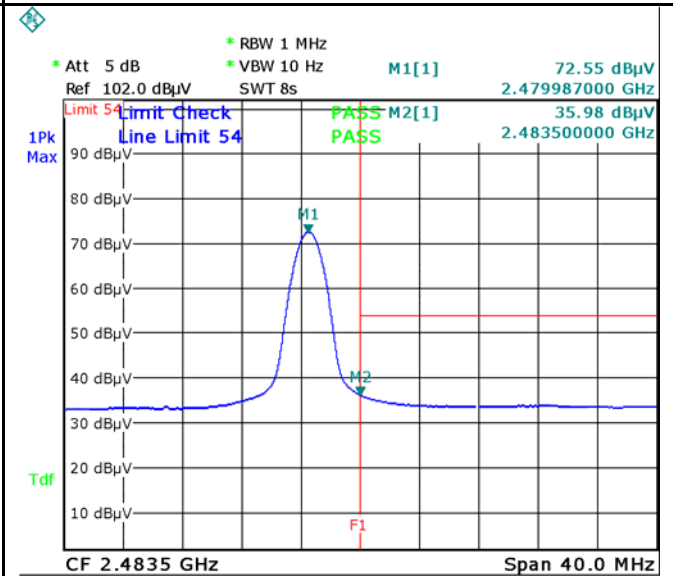
Note: F1 is frequency 2400MHz

8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



Date: 26.MAY.2015 09:53:33



Date: 26.MAY.2015 10:23:08

8DPSK-Left Side-AV

Note: F1 is frequency 2400MHz

8DPSK-Right Side-AV

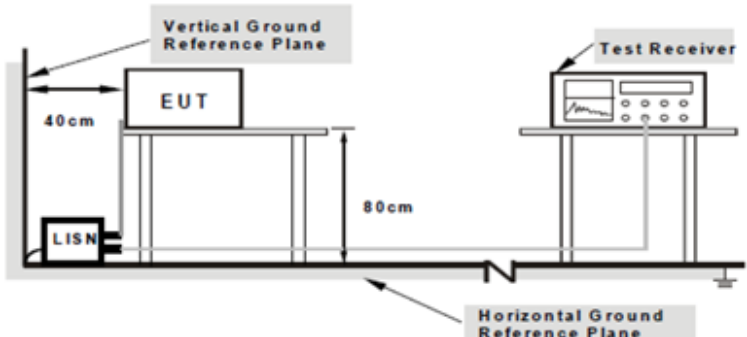
Note: F1 is frequency 2483.5MHz

## 6.8 AC Power Line Conducted Emissions

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1029mbar
Test date :	May 29, 2015
Tested By :	Wiky.Jam

### Requirement(s):

Spec	Item	Requirement	Applicable														
47CFR§15.207,	a)	<p>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 [μ]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 – 56</td> <td>56 – 46</td> </tr> <tr> <td>0.5 ~ 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 ~ 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency ranges (MHz)	Limit (dBμV)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50	<input checked="" type="checkbox"/>
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>
-----------	---

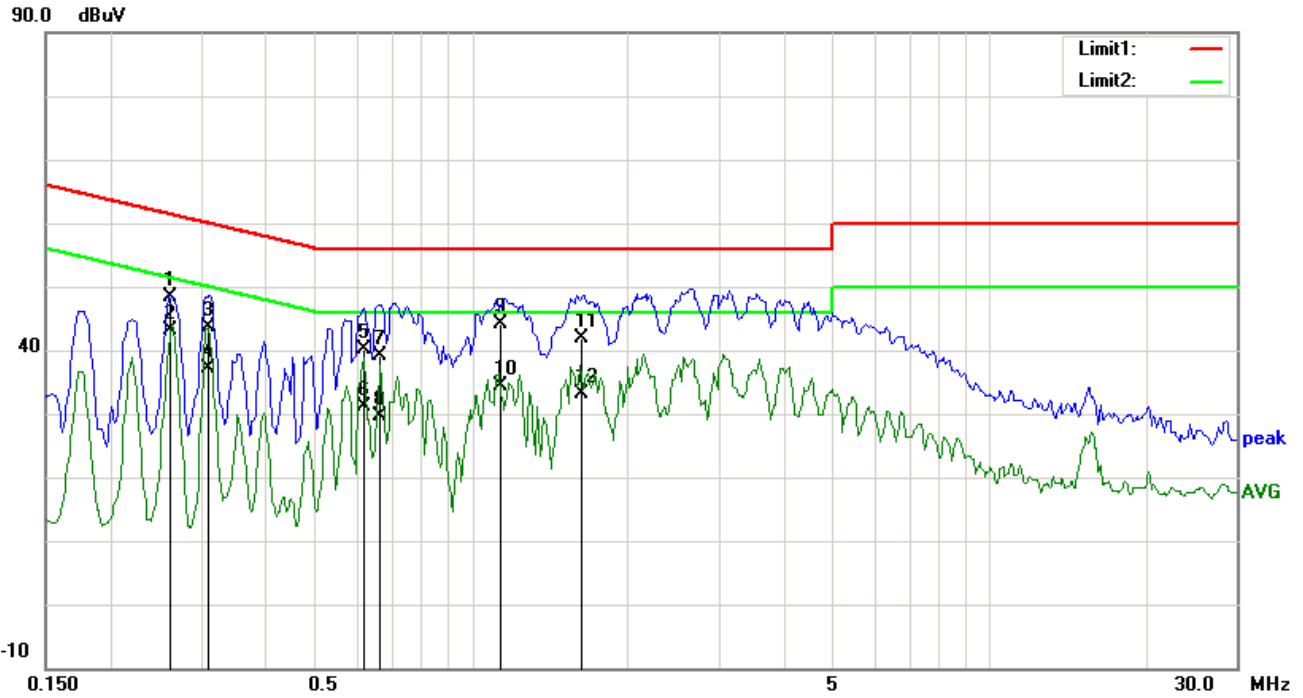
Test Report	15050009-FCC-R2
Page	37 of 56

	<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

Test Data     Yes                       N/A

Test Plot     Yes (See below)             N/A

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

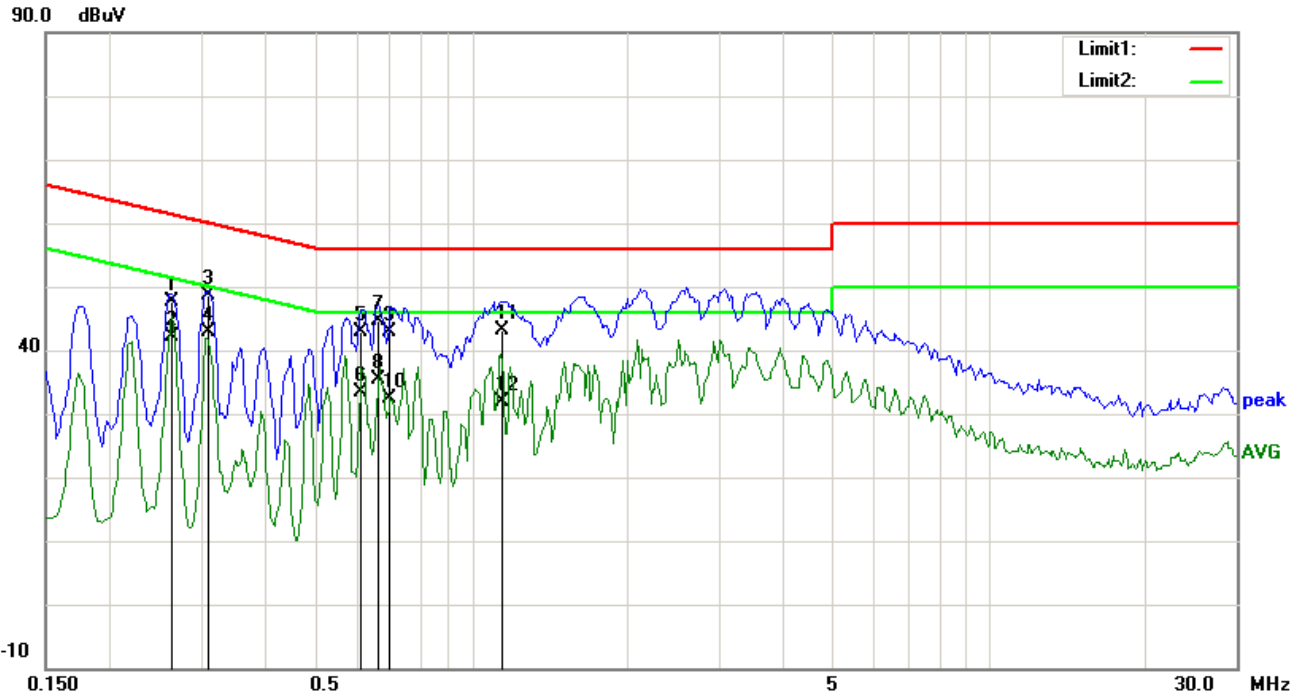


**Test Data**

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)	
1	L1	0.2616	35.57	QP	12.79	48.36	61.38	-13.02	
2	L1	0.2616	30.38	AVG	12.79	43.17	51.38	-8.21	
3	L1	0.3102	30.91	QP	12.60	43.51	59.97	-16.46	
4	L1	0.3102	24.64	AVG	12.60	37.24	49.97	-12.73	
5	L1	0.6188	28.27	QP	11.78	40.05	56.00	-15.95	
6	L1	0.6188	19.44	AVG	11.78	31.22	46.00	-14.78	
7	L1	0.6656	27.40	QP	11.73	39.13	56.00	-16.87	
8	L1	0.6656	17.88	AVG	11.73	29.61	46.00	-16.39	
9	L1	1.1305	32.83	QP	11.40	44.23	56.00	-11.77	
10	L1	1.1305	22.91	AVG	11.40	34.31	46.00	-11.69	
11	L1	1.6276	30.44	QP	11.40	41.84	56.00	-14.16	
12	L1	1.6276	21.75	AVG	11.40	33.15	46.00	-12.85	

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



**Test Data**

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

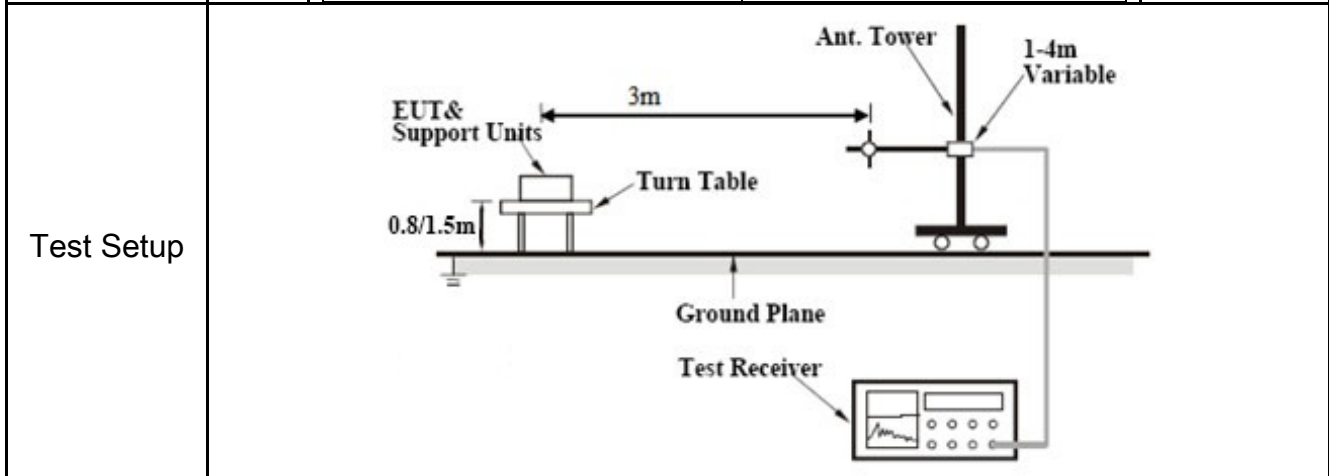
No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)	
1	N	0.2633	34.93	QP	12.78	47.71	61.33	-13.62	
2	N	0.2633	29.41	AVG	12.78	42.19	51.33	-9.14	
3	N	0.3102	35.97	QP	12.60	48.57	59.97	-11.40	
4	N	0.3102	30.31	AVG	12.60	42.91	49.97	-7.06	
5	N	0.6109	31.21	QP	11.79	43.00	56.00	-13.00	
6	N	0.6109	21.67	AVG	11.79	33.46	46.00	-12.54	
7	N	0.6578	32.79	QP	11.74	44.53	56.00	-11.47	
8	N	0.6578	23.54	AVG	11.74	35.28	46.00	-10.72	
9	N	0.6969	31.11	QP	11.70	42.81	56.00	-13.19	
10	N	0.6969	20.61	AVG	11.70	32.31	46.00	-13.69	
11	N	1.1413	31.80	QP	11.42	43.22	56.00	-12.78	
12	N	1.1413	20.51	AVG	11.42	31.93	46.00	-14.07	

## 6.9 Radiated Spurious Emissions

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1029mbar
Test date :	May 29, 2015
Tested By :	Wiky.Jam

### Requirement(s):

Spec	Item	Requirement	Applicable										
47CFR§15.205, §15.209, §15.247(d)	a)	<p>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</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (µV/m)</th> </tr> </thead> <tbody> <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> </tbody> </table>	Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength (µV/m)												
30 – 88	100												
88 – 216	150												
216 960	200												
Above 960	500												



Procedure	<ol style="list-style-type: none"> <li>The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>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:</li> </ol>
-----------	---



Test Report	15050009-FCC-R2
Page	41 of 56

	<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

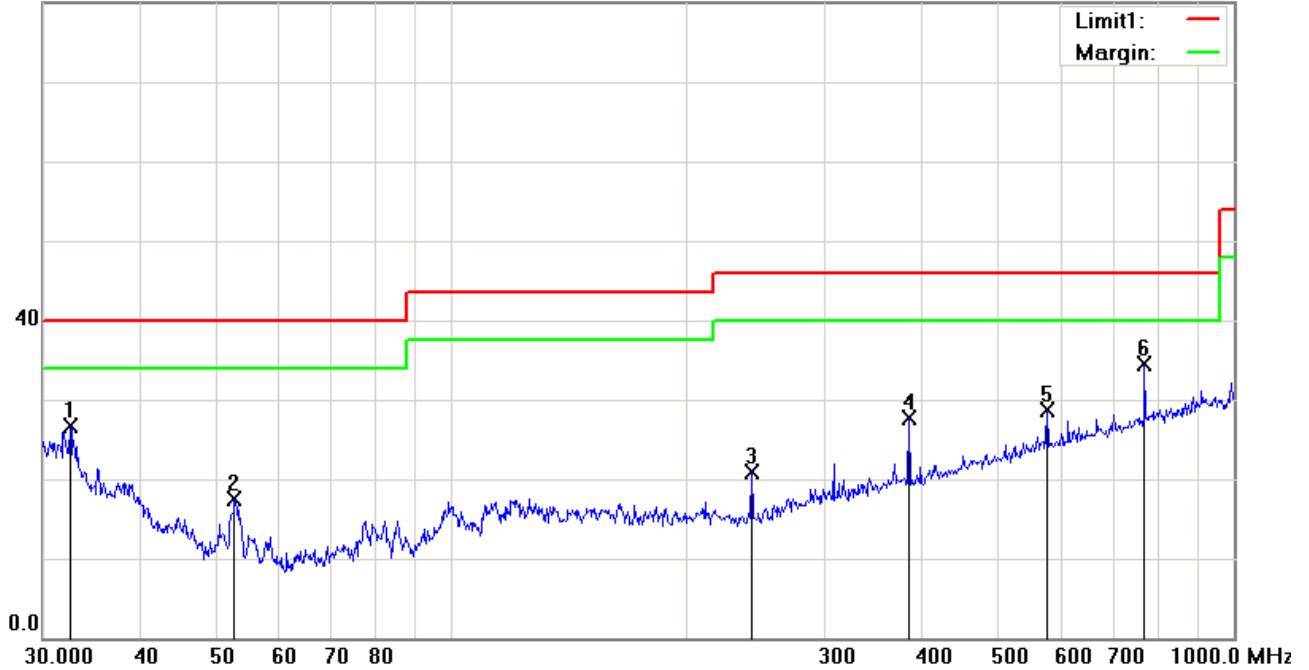
Test Data     Yes                       N/A

Test Plot     Yes (See below)             N/A

**Test Mode: Bluetooth Mode**

**Below 1GHz**

80.0 dBuV/m



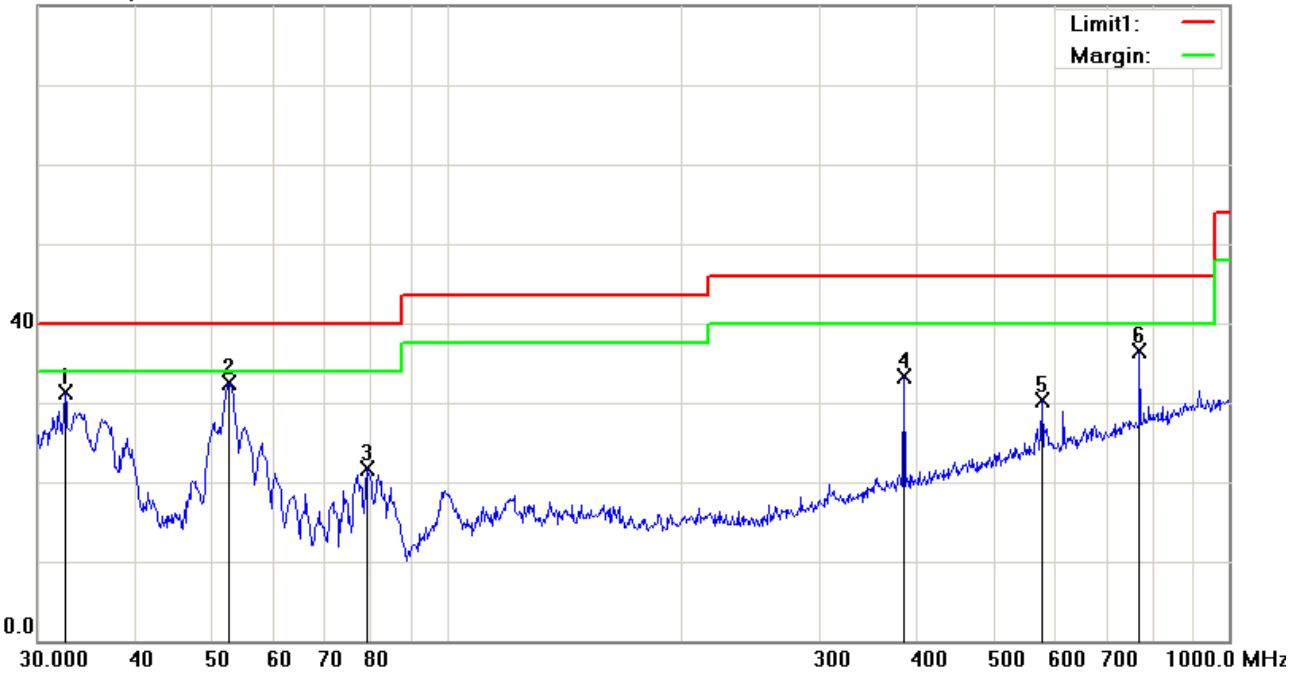
**Test Data**

**Horizontal Polarity Plot @3m**

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree ( )	Comment
1	H	32.5198	28.77	peak	-2.11	26.66	40.00	-13.34	200	51	
2	H	52.7600	31.08	peak	-13.50	17.58	40.00	-22.42	200	216	
3	H	241.6763	29.92	peak	-9.11	20.81	46.00	-25.19	200	227	
4	H	383.9318	32.37	peak	-4.67	27.70	46.00	-18.30	100	251	
5	H	576.6443	29.03	peak	-0.37	28.66	46.00	-17.34	200	216	
6	H	768.7482	31.74	peak	2.70	34.44	46.00	-11.56	100	79	

**Below 1GHz**

80.0 dBuV/m



**Test Data**

**Vertical Polarity Plot @3m**

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree ( )	Comment
1	V	32.5198	33.41	peak	-2.11	31.30	40.00	-8.70	200	330	
2	V	52.5753	46.04	peak	-13.48	32.56	40.00	-7.44	100	347	
3	V	78.9652	35.48	peak	-13.77	21.71	40.00	-18.29	100	347	
4	V	383.9318	38.06	peak	-4.67	33.39	46.00	-12.61	100	115	
5	V	576.6443	30.67	peak	-0.37	30.30	46.00	-15.70	100	17	
6	V	768.7482	33.82	peak	2.70	36.52	46.00	-9.48	200	225	

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

Mode: GFSK (Worst Case)

**Low Channel (2402 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4804	35.68	AV	V	33.83	6.86	31.72	44.65	54	-9.35
4804	35.12	AV	H	33.83	6.86	31.72	44.09	54	-9.91
4804	45.68	PK	V	33.83	6.86	31.72	54.65	74	-19.35
4804	45.13	PK	H	33.83	6.86	31.72	54.1	74	-19.9

**Middle Channel (2441 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4882	34.45	AV	V	33.86	6.82	31.82	43.31	54	-10.69
4882	33.89	AV	H	33.86	6.82	31.82	42.75	54	-11.25
4882	46.89	PK	V	33.86	6.82	31.82	55.75	74	-18.25
4882	45.79	PK	H	33.86	6.82	31.82	54.65	74	-19.35

**High Channel (2480 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4960	33.98	AV	V	33.9	6.76	31.92	42.72	54	-11.28
4960	32.59	AV	H	33.9	6.76	31.92	41.33	54	-12.67
4960	46.79	PK	V	33.9	6.76	31.92	55.53	74	-18.47
4960	45.67	PK	H	33.9	6.76	31.92	54.41	74	-19.59

## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted</b>					
EMI test receiver	ESCS30	8471241027	09/18/2014	09/17/2015	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>
LISN	ISN T800	34373	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
<b>RF conducted test</b>					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>

**Annex B. EUT And Test Setup Photographs**

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



Whole Package - Top View



Adapter - Front View



EUT - Front View



EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

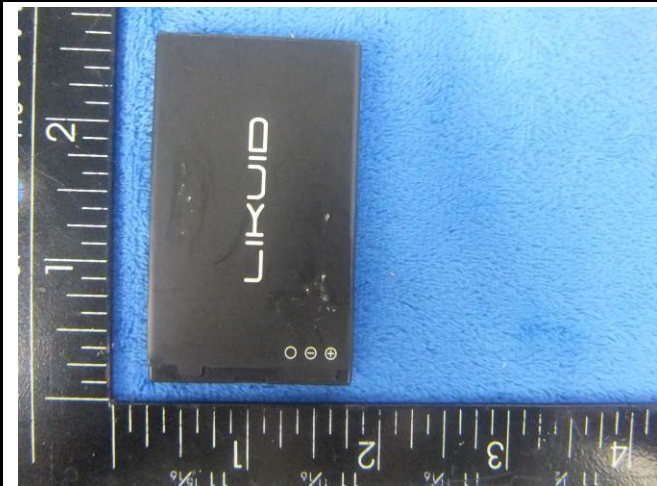
**Annex B.ii. Photograph: EUT Internal Photo**



Cover Off - Top View 1



Cover Off - Top View 2



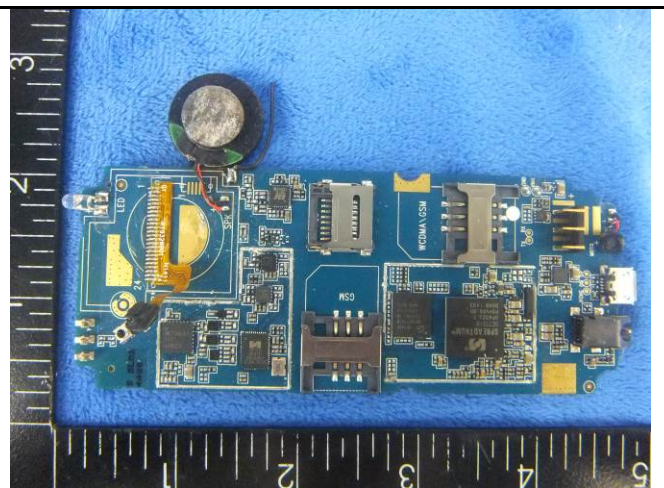
Battery - Top View



Battery - Bottom View

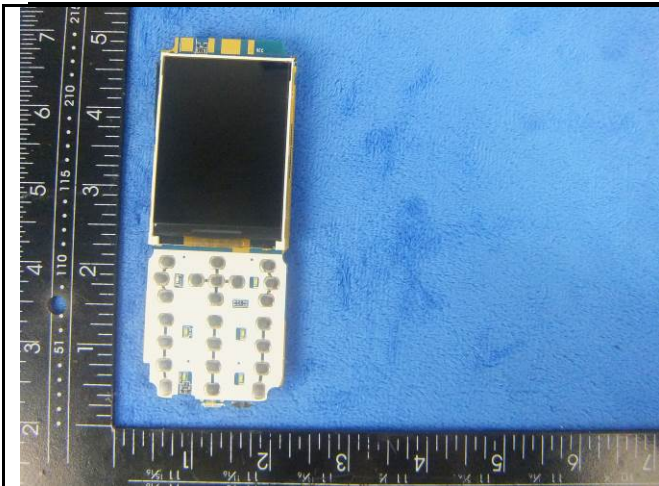


Mainboard With Shielding - Front View

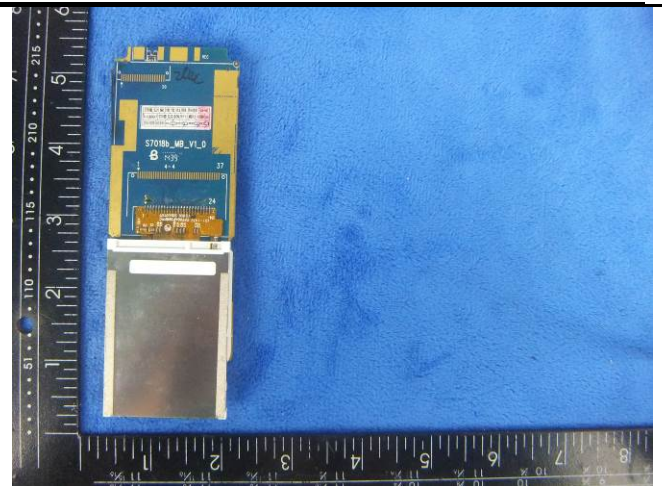


Mainboard Without Shielding - Front View

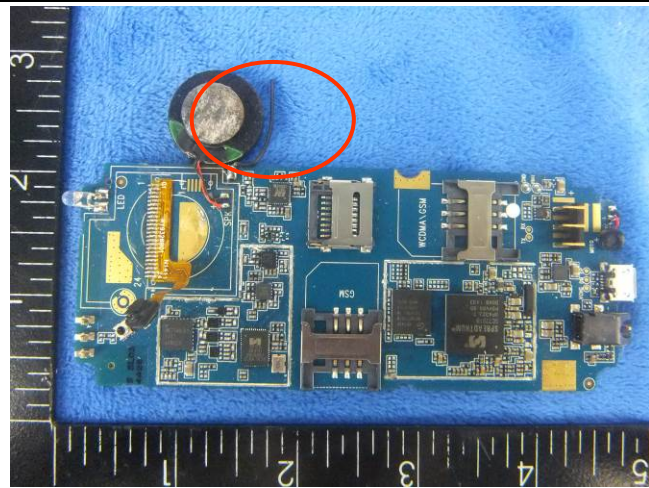




Mainboard With Shielding - rear View



Mainboard Without Shielding - rear View



BT - Antenna View



GSM/PCS/UMTS-FDD Antenna View

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



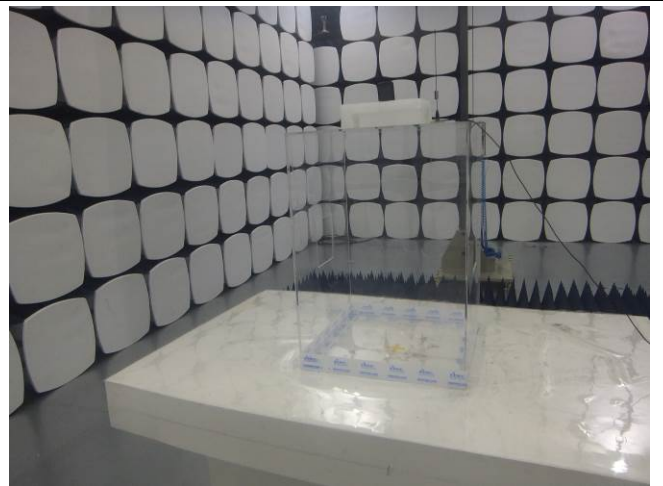
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

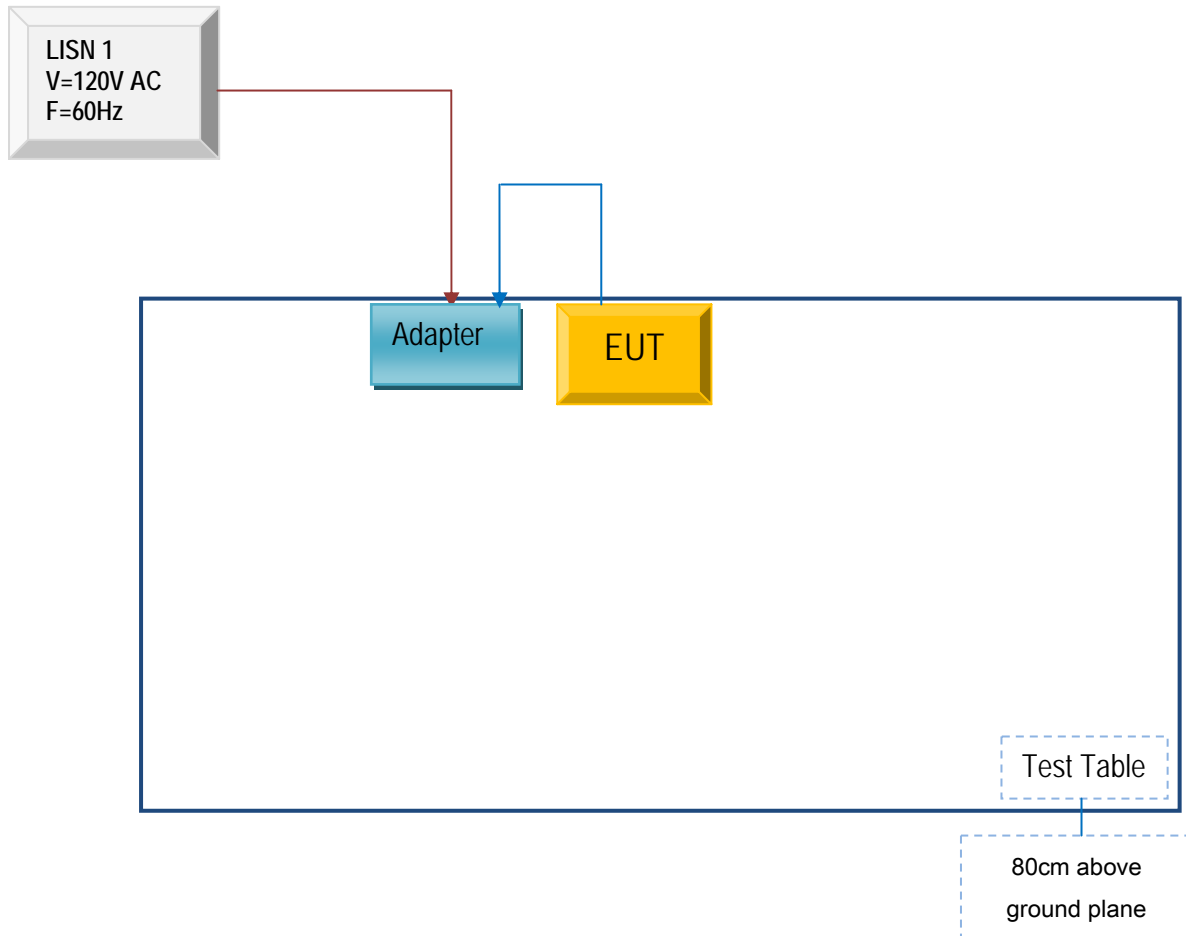


Radiated Spurious Emissions Test Setup Above  
1GHz

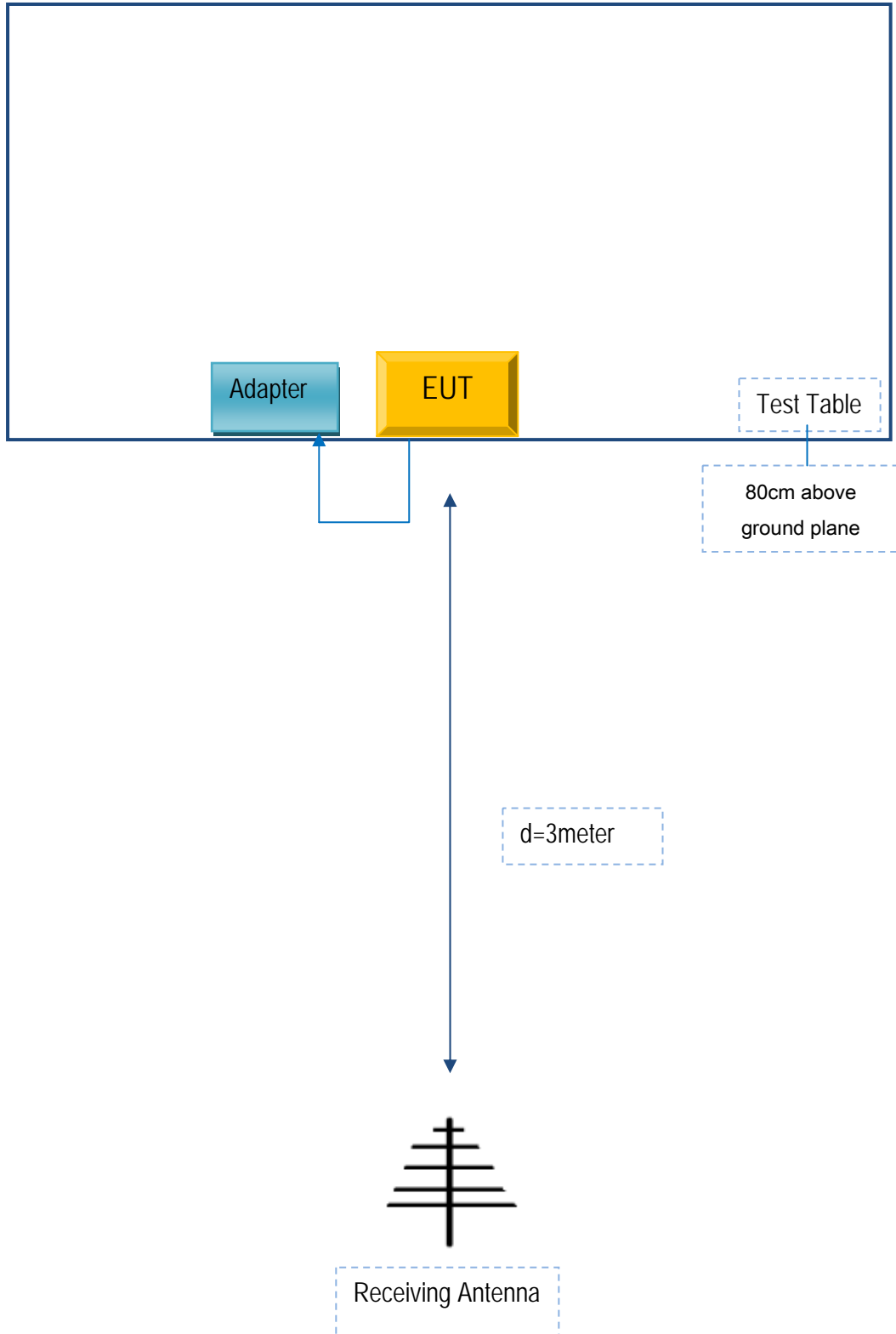
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

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

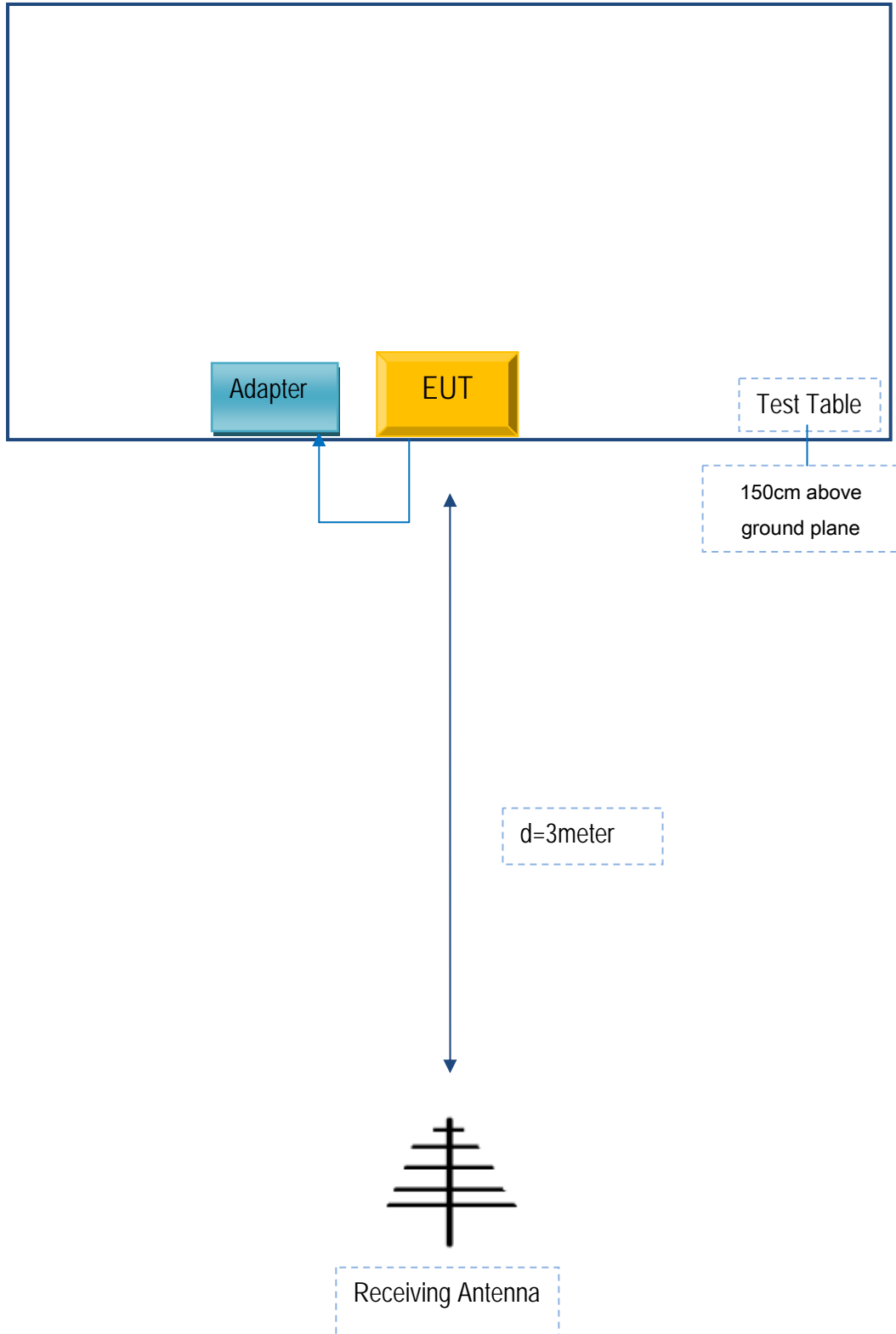
#### Block Configuration Diagram for AC Line Conducted Emissions



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



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



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

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

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

Test Report	15050009-FCC-R2
Page	55 of 56

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

Please see attachment

Test Report	15050009-FCC-R2
Page	56 of 56

## Annex E. DECLARATION OF SIMILARITY

N/A