

RF TEST REPORT



Report No.: 16070720-FCC-R2

Supersede Report No.: N/A

Applicant	SMT TELECOMM HK LIMITED	
Product Name	Mobile Phone	
Model No.	X444	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2015, ANSI C63.10: 2013	
Test Date	June 21 to July 11&22, 2016	
Issue Date	July 22, 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"/>
Loren Luo	David Huang	
Loren Luo 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

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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

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
16070720-FCC-R2	NONE	Original	July 12, 2016
16070720-FCC-R2	V1	Added the test data of the conducted method on P36	July 22, 2016

2. Customer information

Applicant Name	SMT TELECOMM HK LIMITED
Applicant Add	Unit C 8/F, CHARMHILL CTR 50 HILLWOOD RD TST KL
Manufacturer	SMT TELECOMM HK LIMITED
Manufacturer Add	Unit C 8/F, CHARMHILL CTR 50 HILLWOOD RD TST KL

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: X444

Serial Model: N/A

Date EUT received: June 20, 2016

Test Date(s): June 21 to July 11&22, 2016

Equipment Category : DSS

GSM850: -1.5dBi

PCS1900: -1.3dBi

Antenna Gain: UMTS-FDD Band V: -1.5dBi

UMTS-FDD Band II: -1.2dBi

Bluetooth/BLE/WIFI: -2.5dBi

Antenna Type: PIFA antenna

GSM / GPRS: GMSK

EGPRS: GMSK,8PSK

UMTS-FDD: QPSK

Type of Modulation: QPSK 16QAM 64QAM 256QAM

802.11b/g/n, 8033, OFDM

Bluetooth®. G

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

UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz:

RF Operating Frequency (ies): UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz;
RX: 1932.4 ~ 1987.6 MHz

WIFI: 802.11b/q/n(20M): 2412-2462 MHz

WIFI: 802.11n(40M): 2422-2452 MHz

Bluetooth & BLE: 2402-2480 MHz

Max. Output Power: 2.634dBm

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GSM 850: 124CH
PCS1900: 299CH
UMTS-FDD Band V : 102CH
UMTS-FDD Band II : 277CH
WIFI :802.11b/g/n(20M): 11CH
WIFI :802.11n(40M): 7CH
Bluetooth: 79CH
BLE: 40CH

Number of Channels:
Port: Earphone Port, USB Port

Adapter:
Model:PC444
Input: AC 100-240V~50/60Hz;0.15A
Output: DC 5.0V,500mA
Battery:
Model:BPX444
Spec: 3.7V,1300mAh(4.81Wh)
Charge limited voltage: 4.2V

Trade Name : N/A
GPRS/EGPRS Multi-slot class 8/10/12
FCC ID: 2AIMEX444

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& Restricted Band	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions& Restricted Band	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 PIFA antenna for Bluetooth/BLE/WIFI, the gain is -2.5dBi .

A permanently attached PIFA antenna for GSM/PCS/UMTS, the gain is -1.5dBi for GSM850, -1.3dBi for PCS1900, -1.5dBi for UMTS-FDD Band V, -1.2dBi for UMTS-FDD Band II.

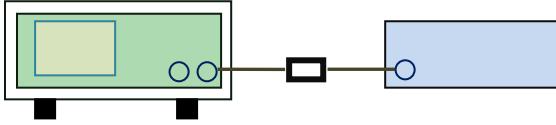
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2016
Tested By :	Loren Luo

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			
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <ul style="list-style-type: none"> - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) \geq 1% of the span - Video (or Average) Bandwidth (VBW) \geq RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot. 		

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

Test Data Yes N/A

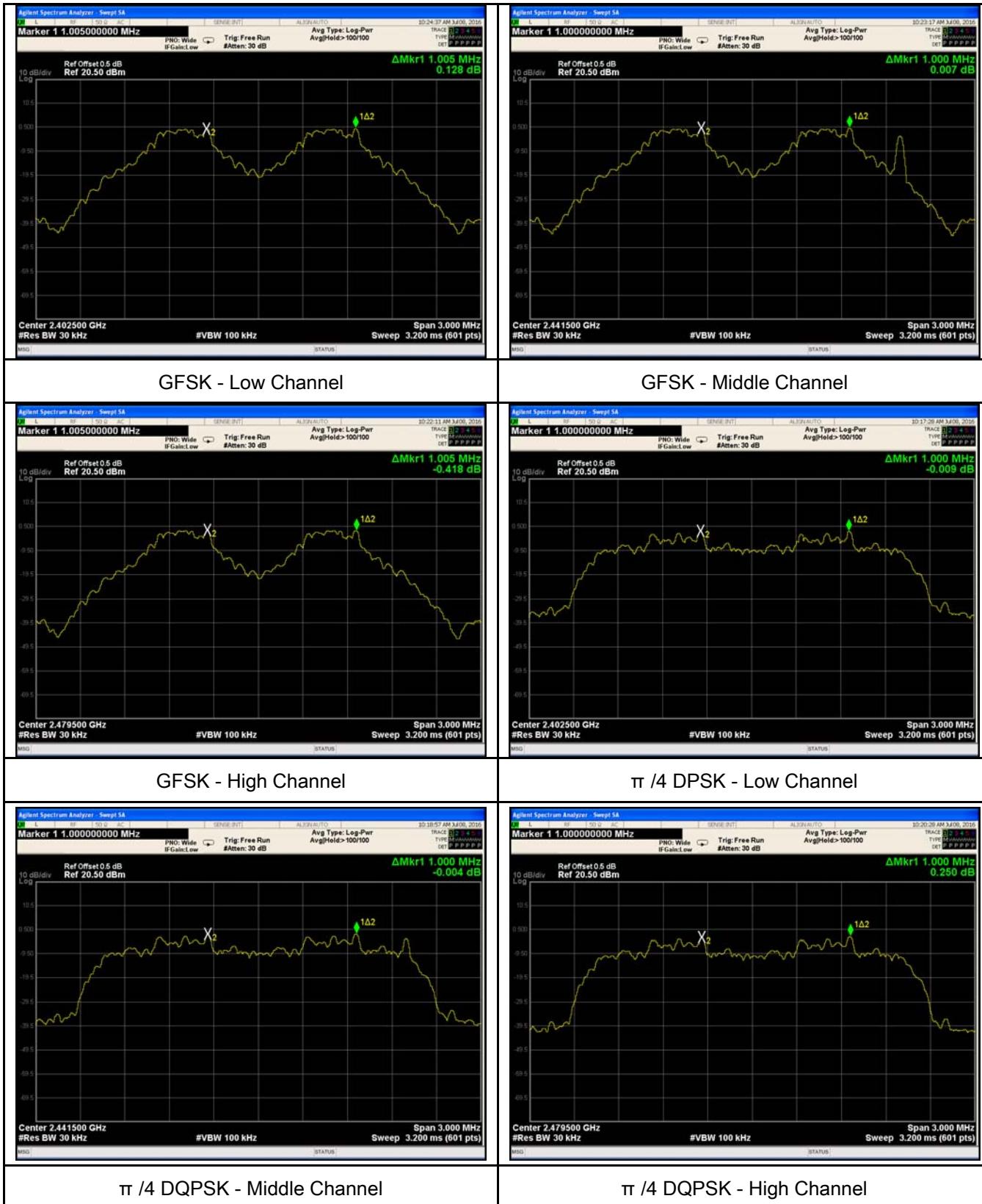
Test Plot Yes (See below) N/A

Channel Separation measurement result

Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.005	0.967	Pass
	Adjacency Channel	2403			
	Mid Channel	2440			
	Adjacency Channel	2441	1.000	0.912	Pass
	High Channel	2480			
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.000	0.863	Pass
	Adjacency Channel	2403			
	Mid Channel	2440			
	Adjacency Channel	2441	1.000	0.874	Pass
	High Channel	2480			
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.005	0.863	Pass
	Adjacency Channel	2403			
	Mid Channel	2440			
	Adjacency Channel	2441	1.000	0.864	Pass
	High Channel	2480			
	Adjacency Channel	2479			

Test Plots

Channel Separation measurement result





8DPSK - Low Channel

8DPSK - Middle Channel

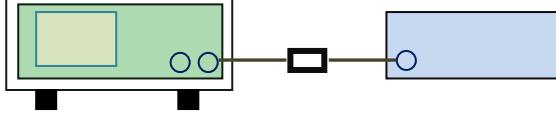


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2016
Tested By :	Loren Luo

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			
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <ul style="list-style-type: none"> - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW \geq 1% of the 20 dB bandwidth - VBW \geq RBW - Sweep = auto - Detector function = peak - Trace = max hold. - 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 		

	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

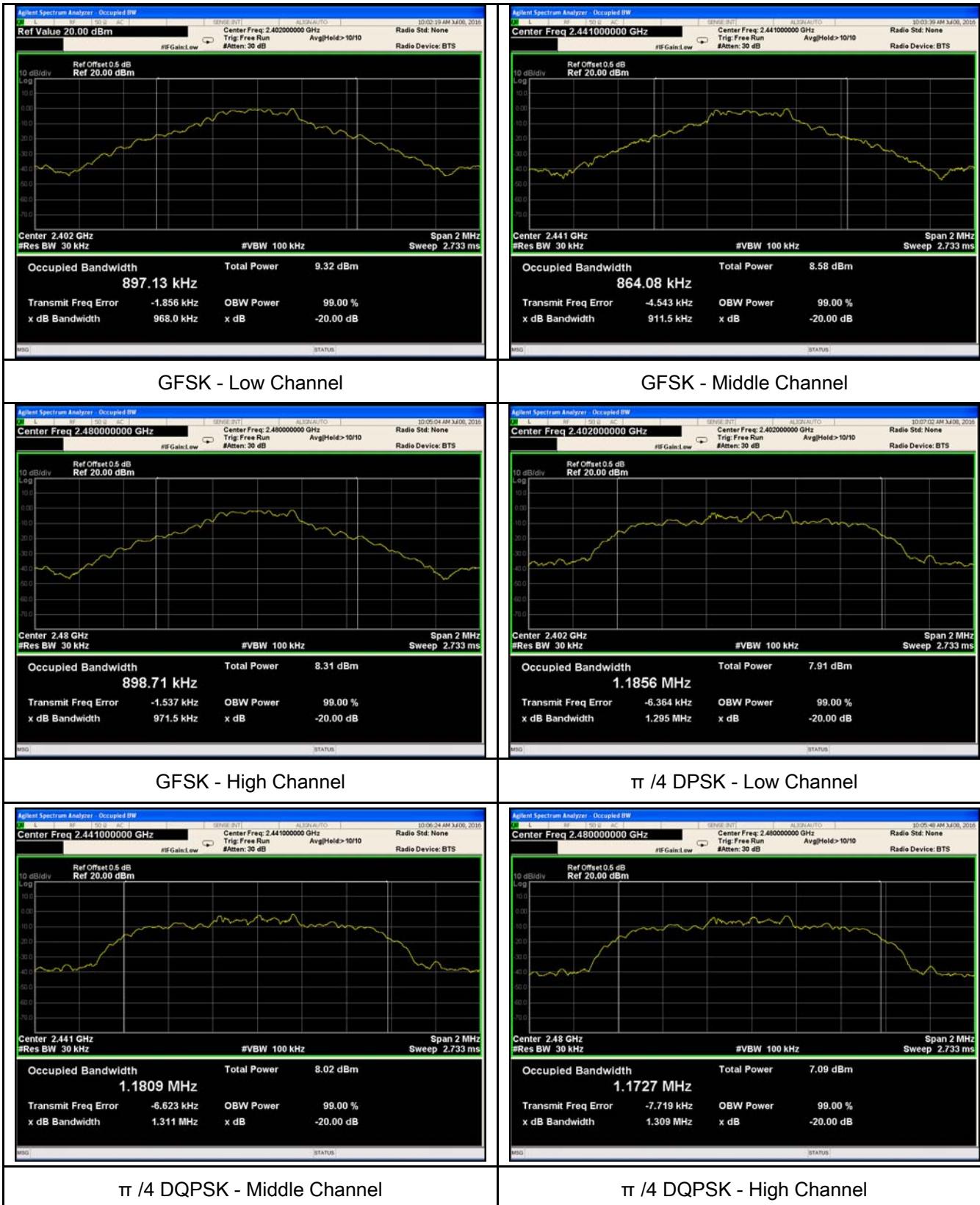
Test Plot Yes (See below) N/A

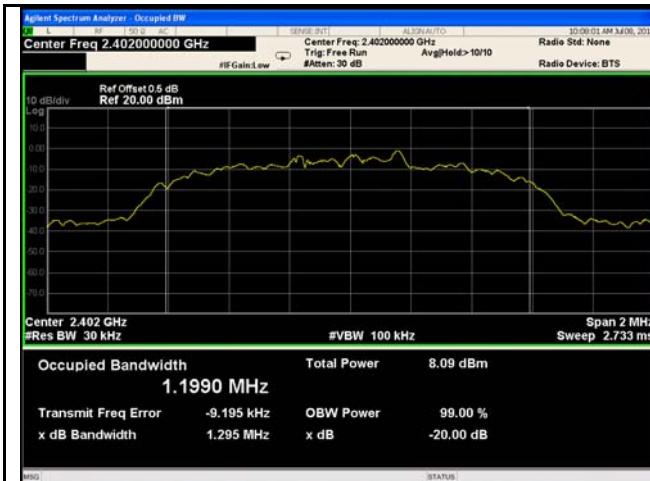
Measurement result

Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.9680	0.8971
	Mid	2441	0.9115	0.8641
	High	2480	0.9715	0.8987
$\pi/4$ DQPSK	Low	2402	1.295	1.1856
	Mid	2441	1.311	1.1809
	High	2480	1.309	1.1727
8-DPSK	Low	2402	1.295	1.1990
	Mid	2441	1.296	1.1908
	High	2480	1.297	1.1851

Test Plots

20dB Bandwidth measurement result





8DPSK - Low Channel

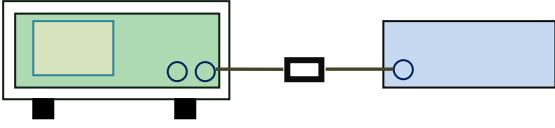
8DPSK - Middle Channel



6.4 Peak Output Power

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2016
Tested By :	Loren Luo

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

	<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

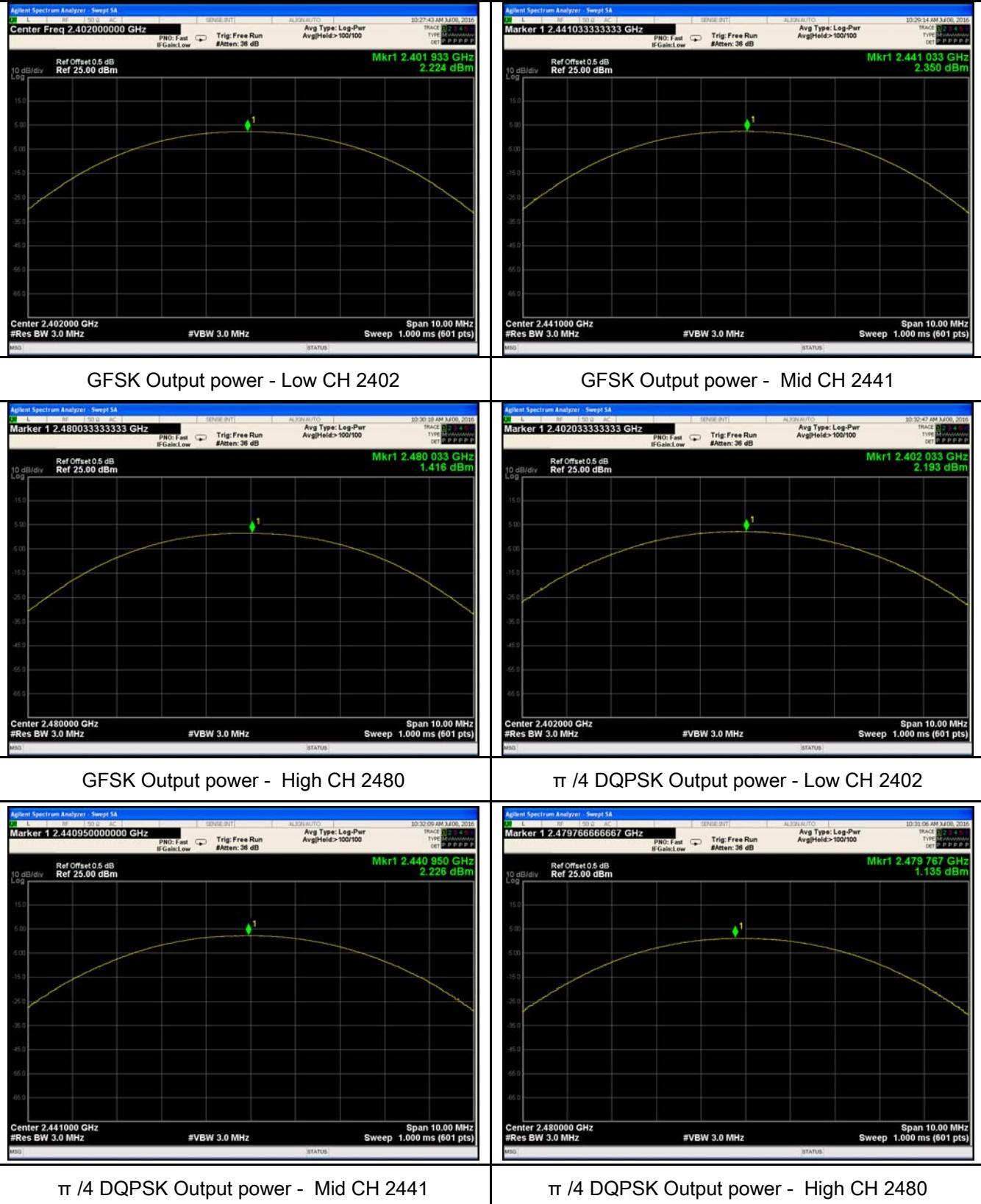
Test Plot Yes (See below) N/A

Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	2.224	1000	Pass
		Mid	2441	2.350	1000	Pass
		High	2480	1.416	1000	Pass
	$\pi/4$ DQPSK	Low	2402	2.193	125	Pass
		Mid	2441	2.226	125	Pass
		High	2480	1.135	125	Pass
	8-DPSK	Low	2402	2.634	125	Pass
		Mid	2441	2.534	125	Pass
		High	2480	1.234	125	Pass

Test Plots

Output Power measurement result





8DPSK Output power - Low CH 2402

8DPSK Output power - Mid CH 2441

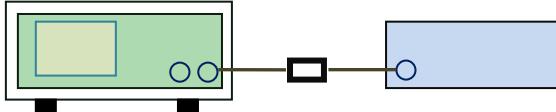


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2016
Tested By :	Loren Luo

Requirement(s):

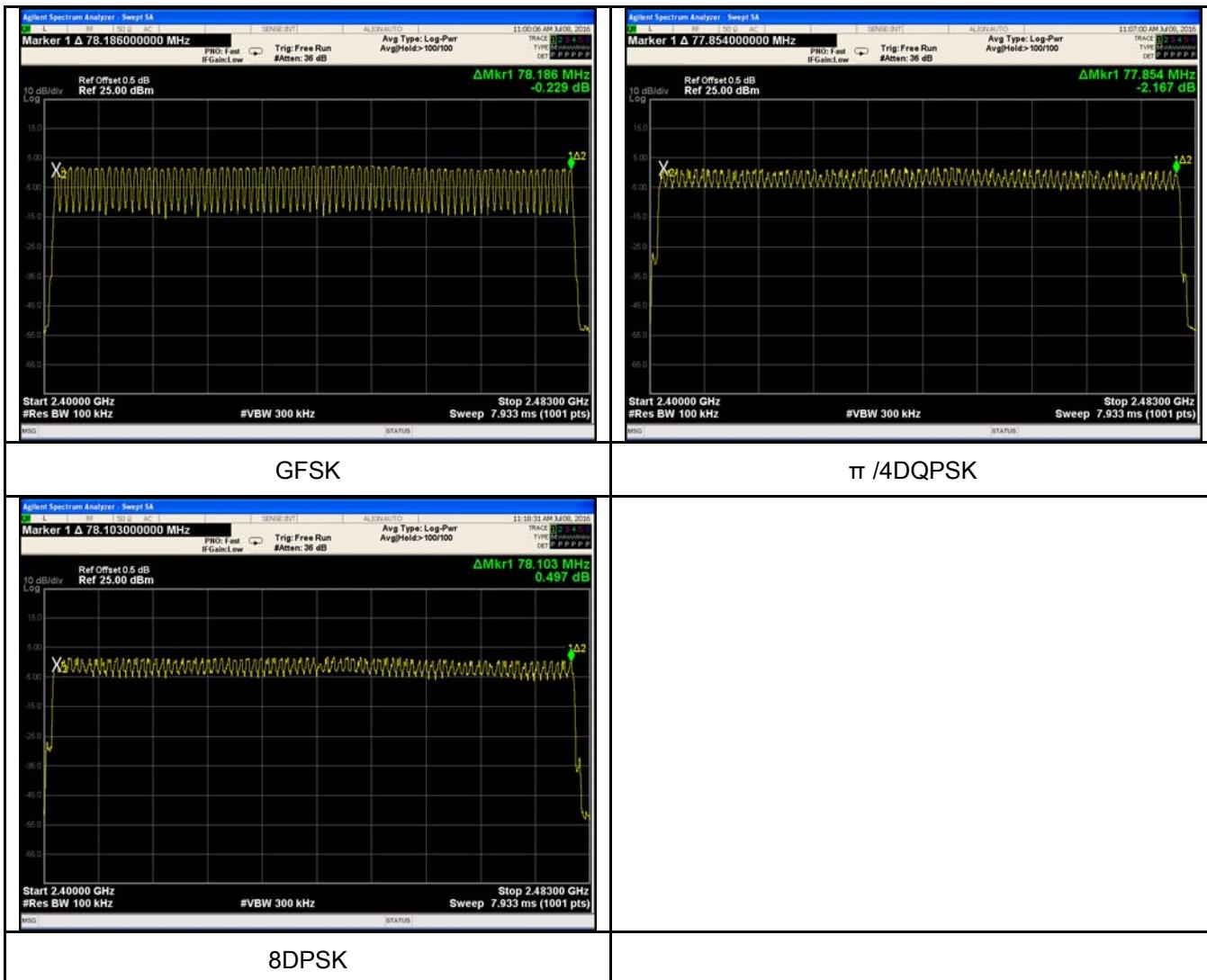
Spec	Item	Requirement	Applicable	
§15.247(a) (1)(iii)	a)	FHSS in 2400-2483.5MHz \geq 15 channels	<input checked="" type="checkbox"/>	
Test Setup				
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <p>The EUT must have its hopping function enabled.</p> <ul style="list-style-type: none"> - Span = the frequency band of operation - RBW \geq 1% of the span - VBW \geq RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow trace to fully stabilize. - 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). 			
Remark				
Result	<input checked="" type="checkbox"/>	Pass	<input type="checkbox"/>	Fail
Test Data	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	N/A
Test Plot	<input checked="" type="checkbox"/>	Yes (See below)	<input type="checkbox"/>	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

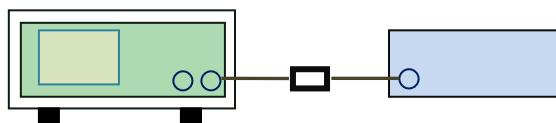
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2016
Tested By :	Loren Luo

Requirement(s):

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

Test Data Yes N/A

Test Plot Yes (See below) N/A

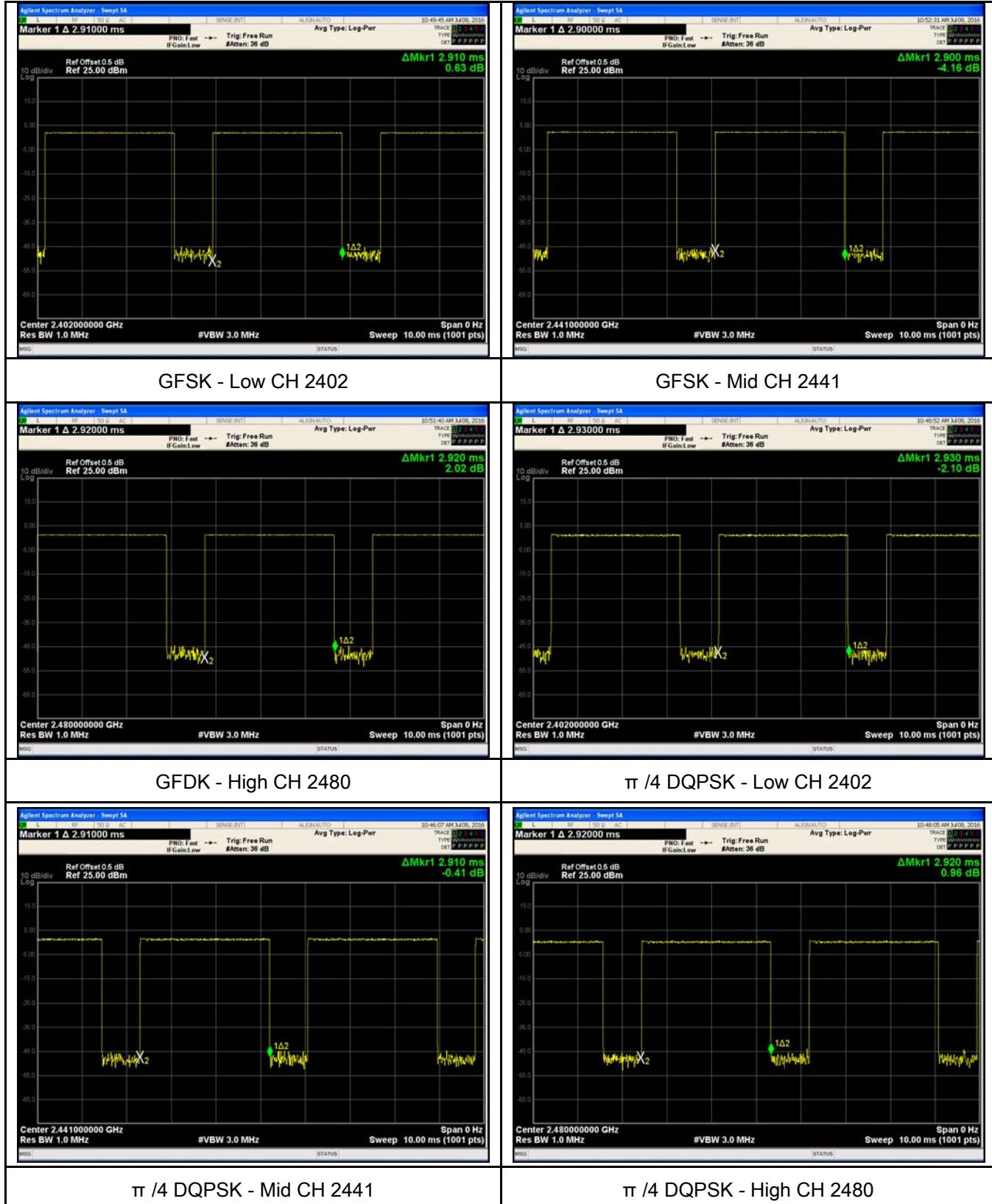
Dwell Time measurement result

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.910	310.400	400	Pass
		Mid	2.900	309.333	400	Pass
		High	2.920	311.467	400	Pass
	$\pi/4$ DQPSK	Low	2.930	312.533	400	Pass
		Mid	2.910	310.400	400	Pass
		High	2.920	311.467	400	Pass
	8-DPSK	Low	2.920	311.467	400	Pass
		Mid	2.920	311.467	400	Pass
		High	2.910	310.400	400	Pass

Note: Dwell time=Pulse Time (ms) $\times (1600 \div 6 \div 79) \times 31.6$

Test Plots

Dwell Time measurement result

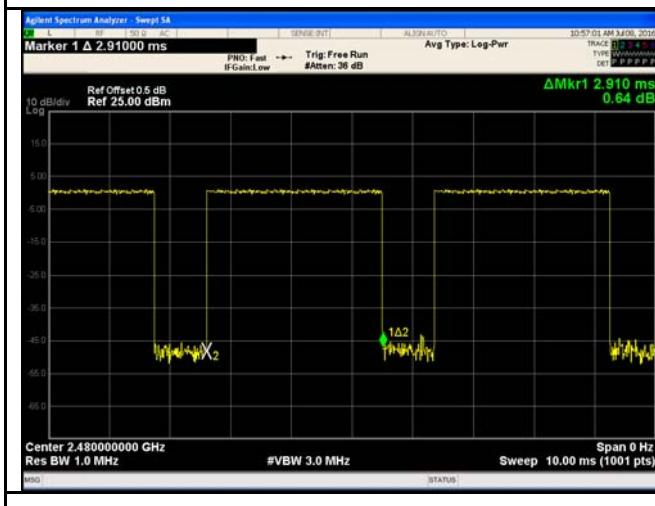




8DPSK - Low CH 2402



8DPSK - Mid CH 2441

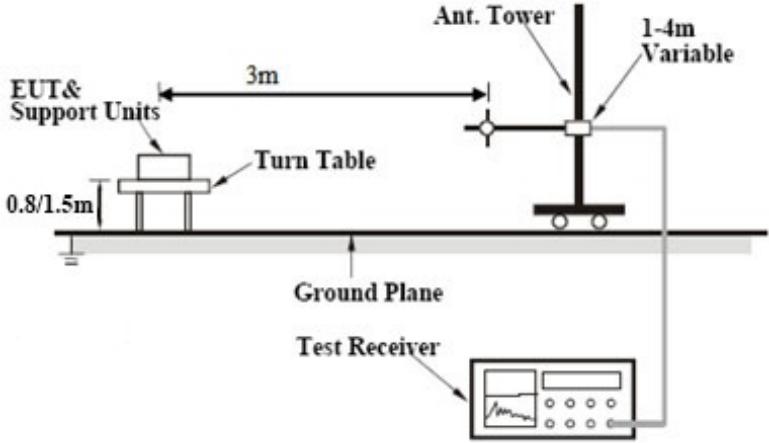


8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	22°C
Relative Humidity	57%
Atmospheric Pressure	1005mbar
Test date :	July 05, 2016&July 22, 2016
Tested By :	Loren Luo

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	 <p>The diagram illustrates the test setup. A Turn Table is positioned on a Ground Plane. An EUT & Support Units is placed on the turn table. A vertical Ant. Tower is mounted on the turn table, with a 3m horizontal distance to the EUT. The Ant. Tower has a 1-4m Variable height adjustment. A Test Receiver is connected to the Ant. Tower to measure the signal. </p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only</p> <ul style="list-style-type: none"> - 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 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, 		

	<p>and make sure the instrument is operated in its linear range.</p> <ul style="list-style-type: none"> - 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"> a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 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. 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. - 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. - 5. Repeat above procedures until all measured frequencies were complete.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

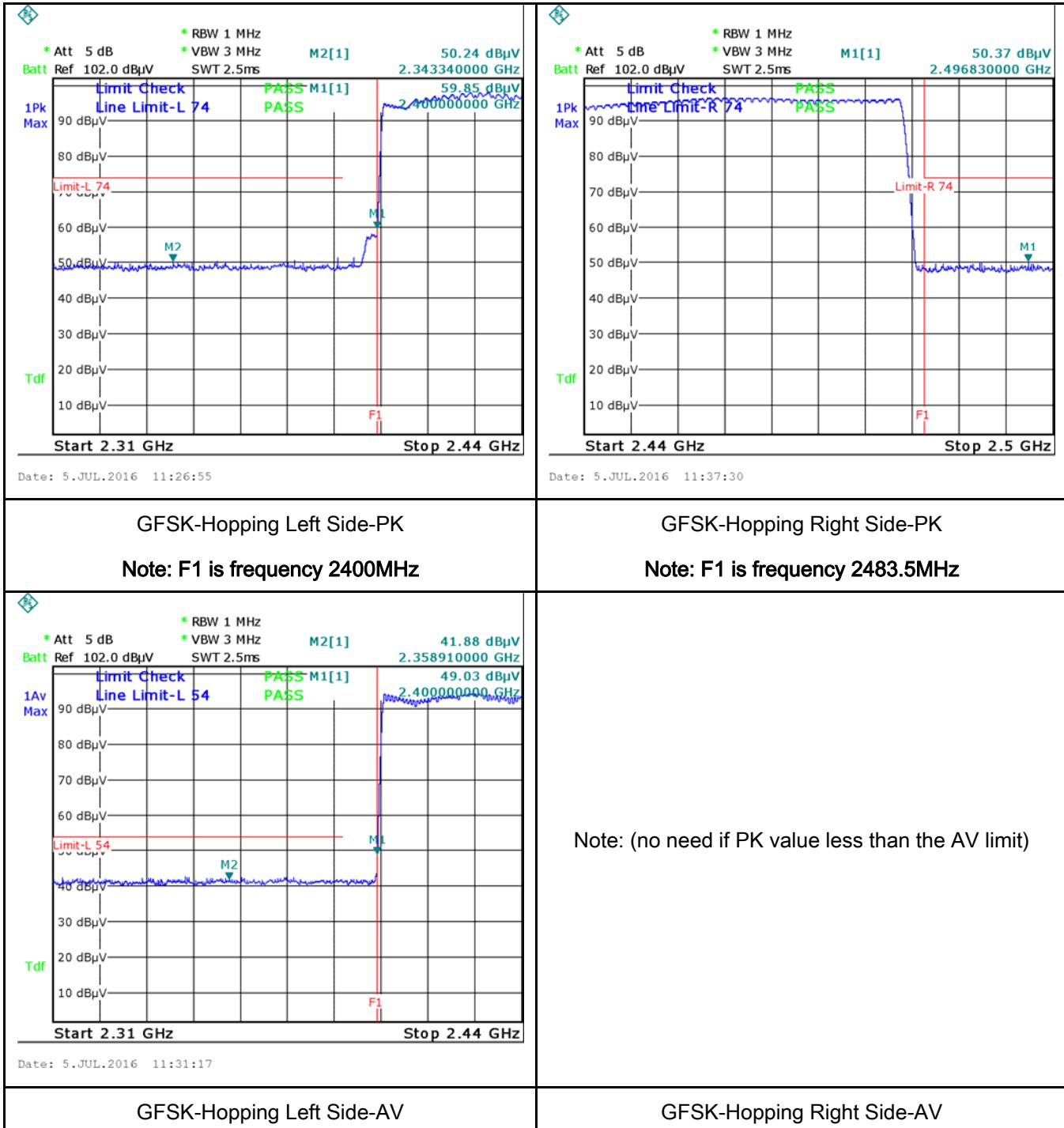
Test Data Yes N/A

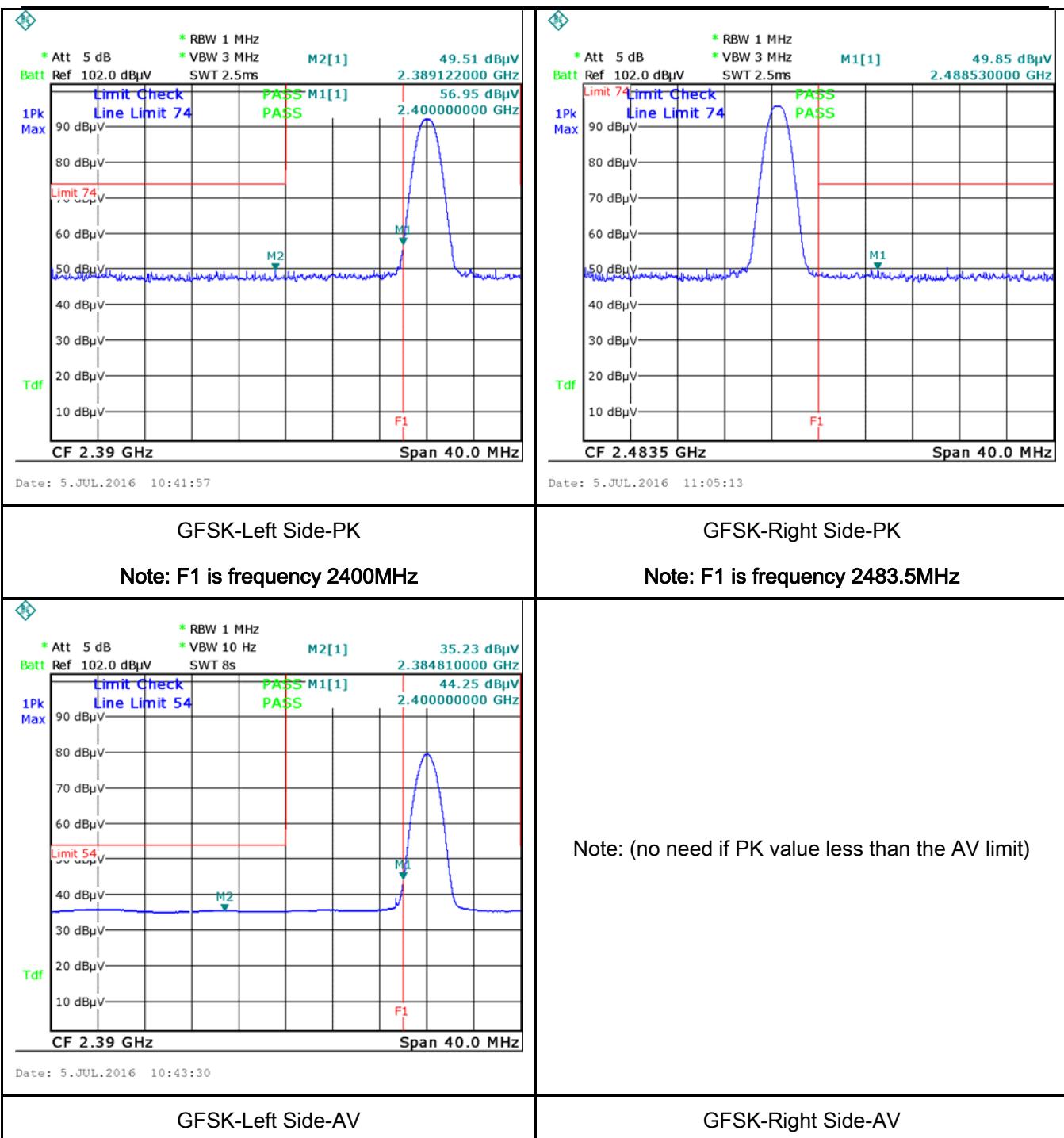
Test Plot Yes (See below) N/A

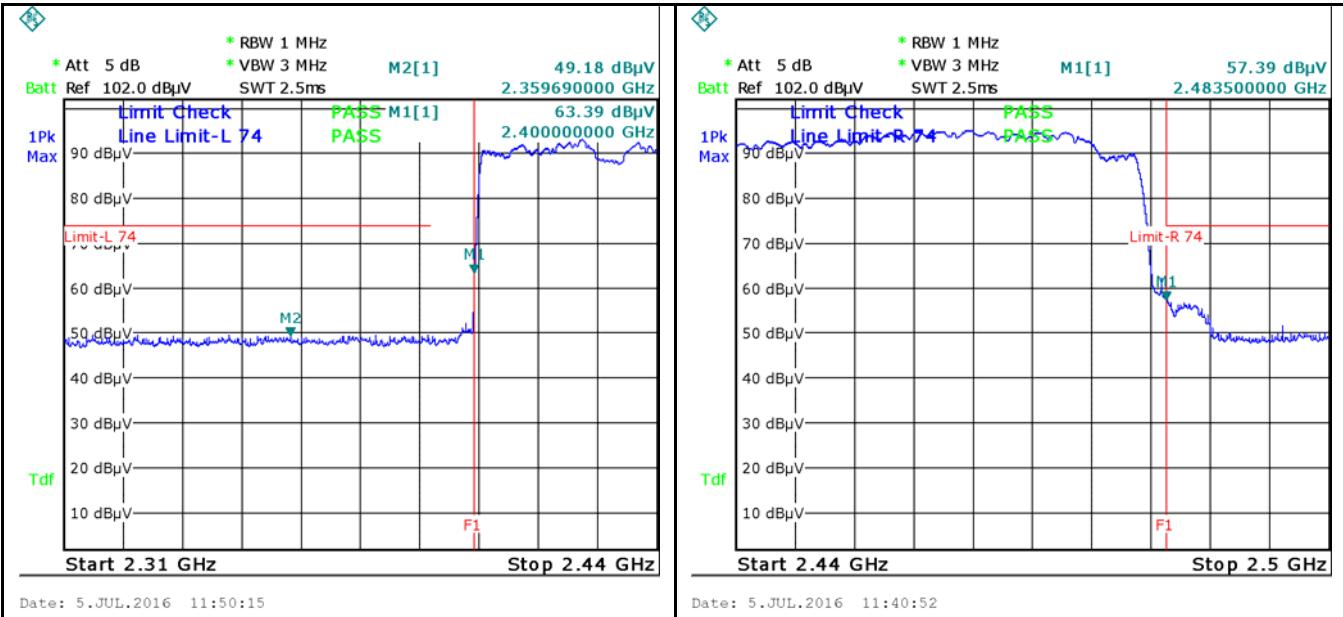
Radiated method:

Test Plots

GFSK Mode:



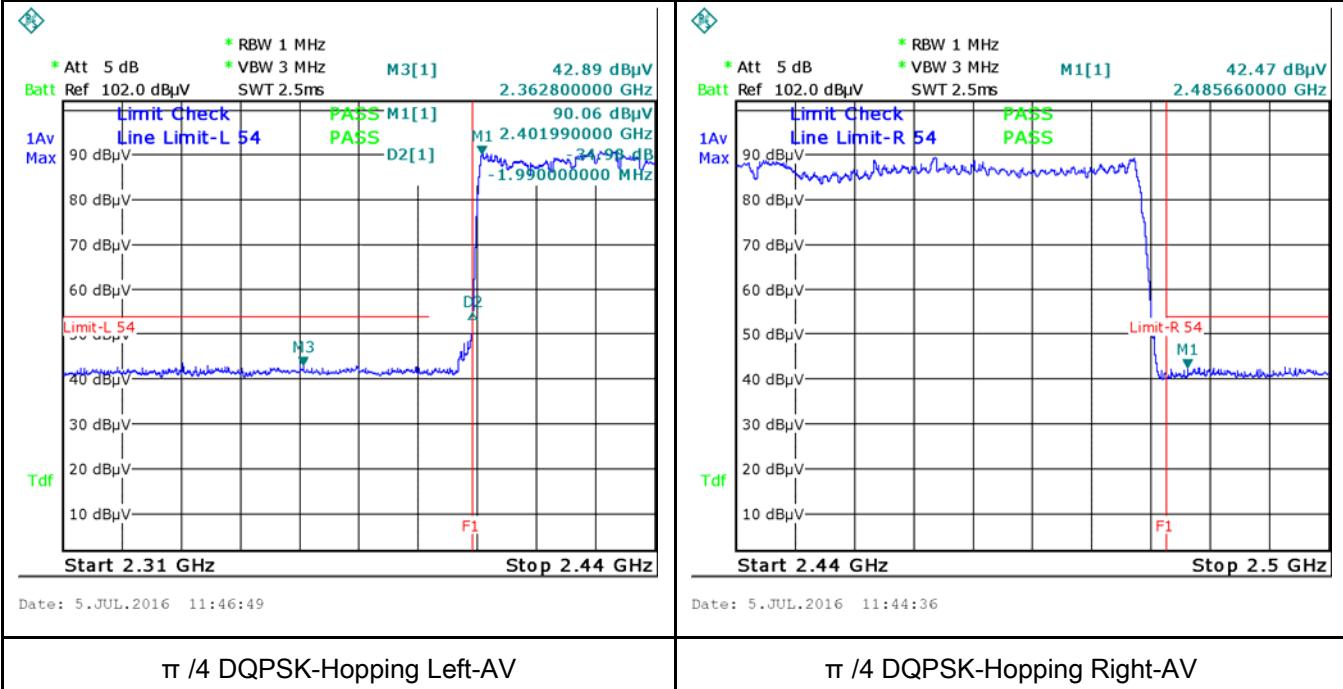


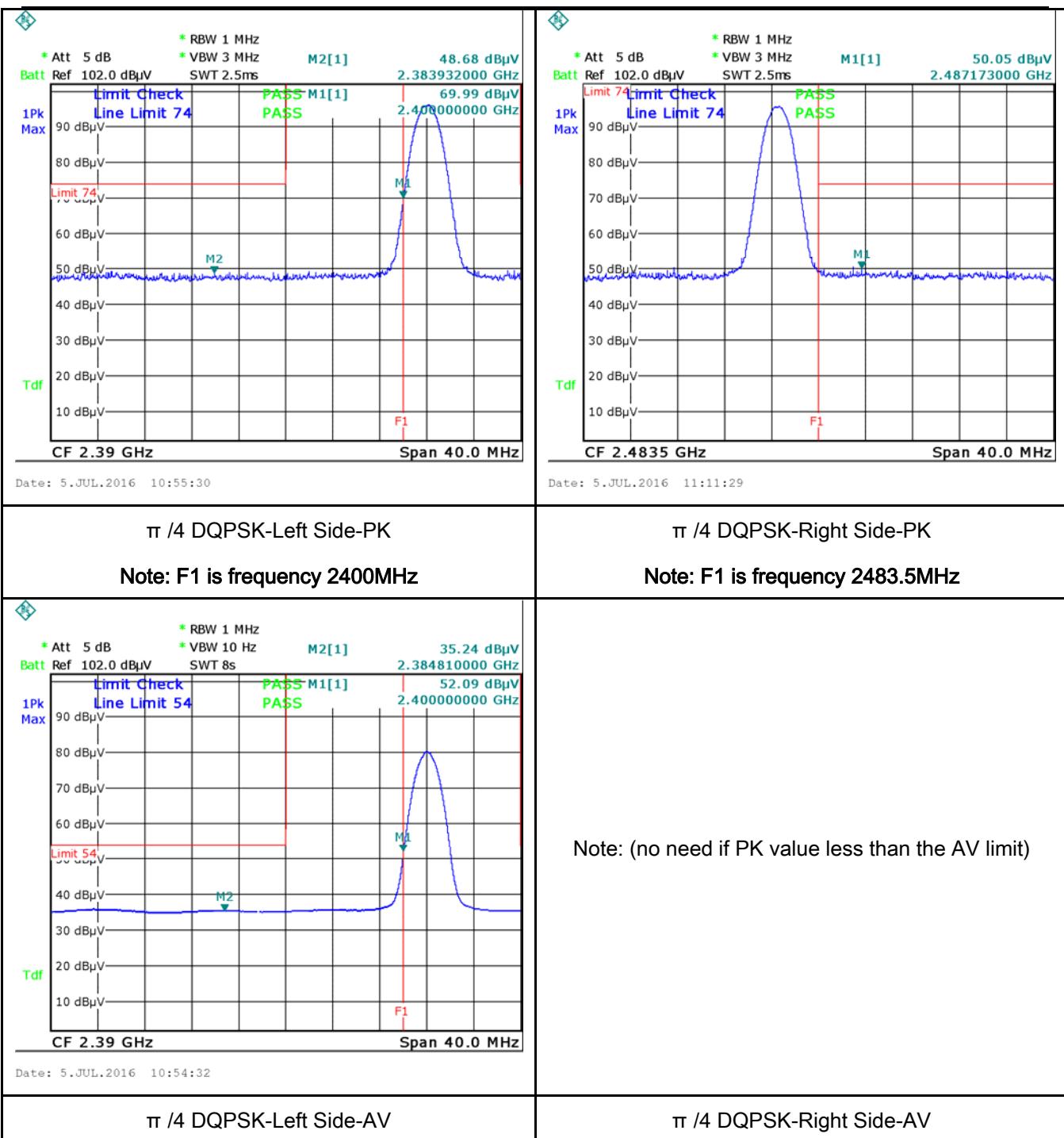
$\pi/4$ DQPSK Mode:

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

Note: F1 is frequency 2400MHz

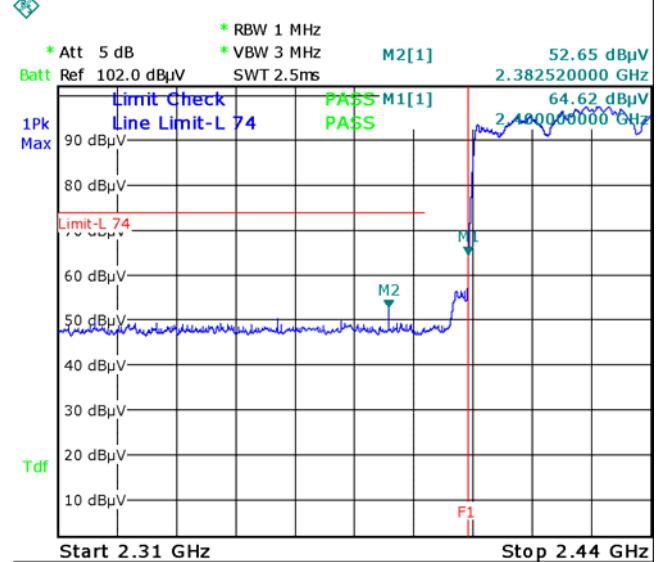
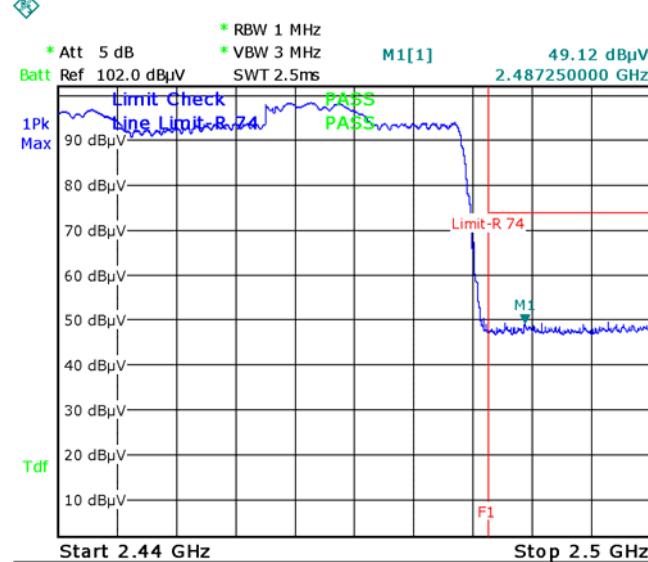
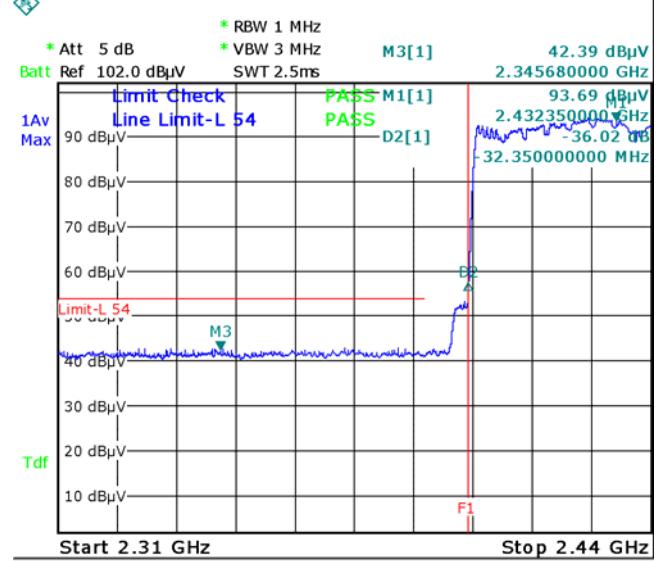
 $\pi/4$ DQPSK-Hopping Right Side-PK

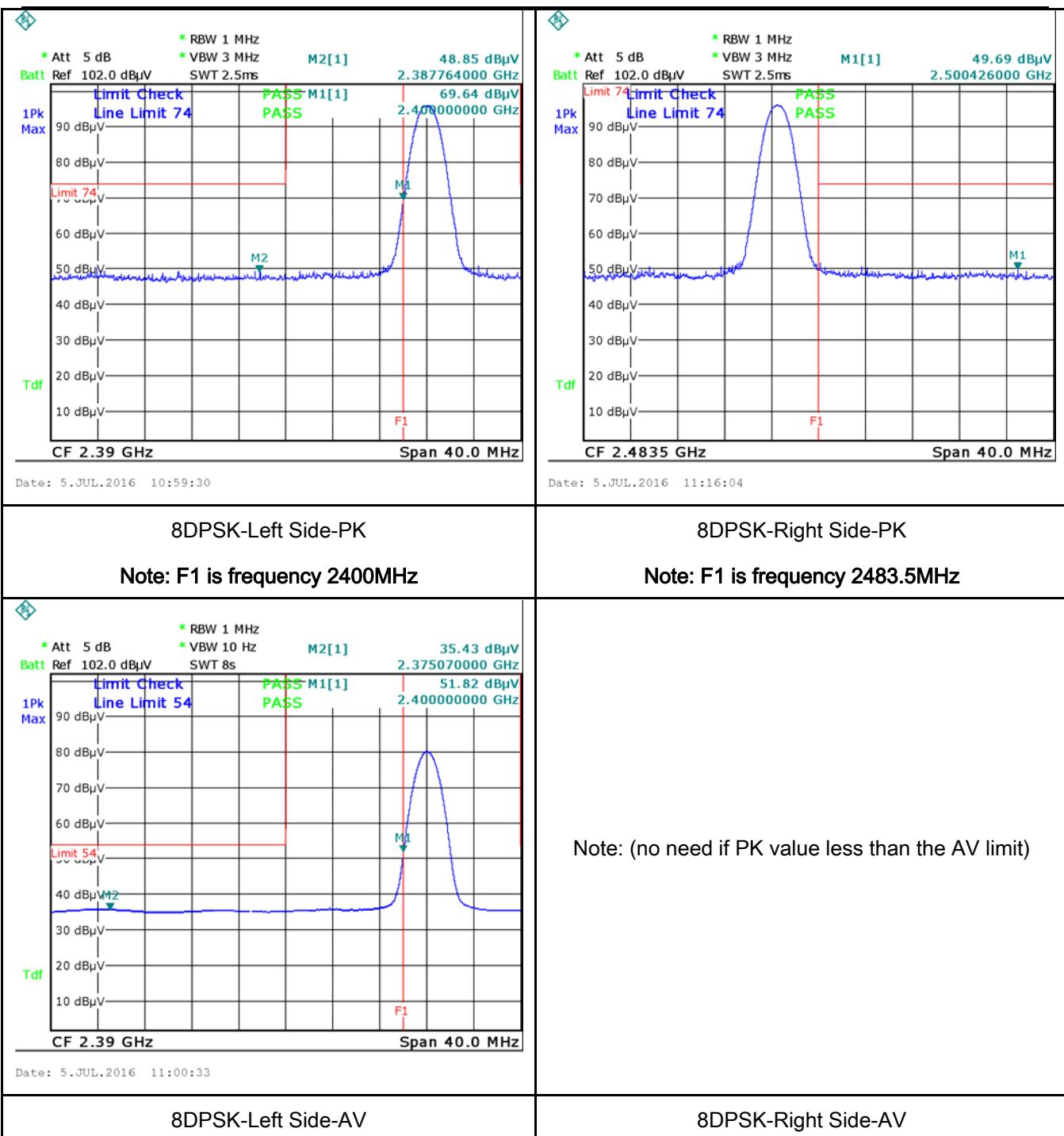
Note: F1 is frequency 2483.5MHz





8-DPSK Mode:

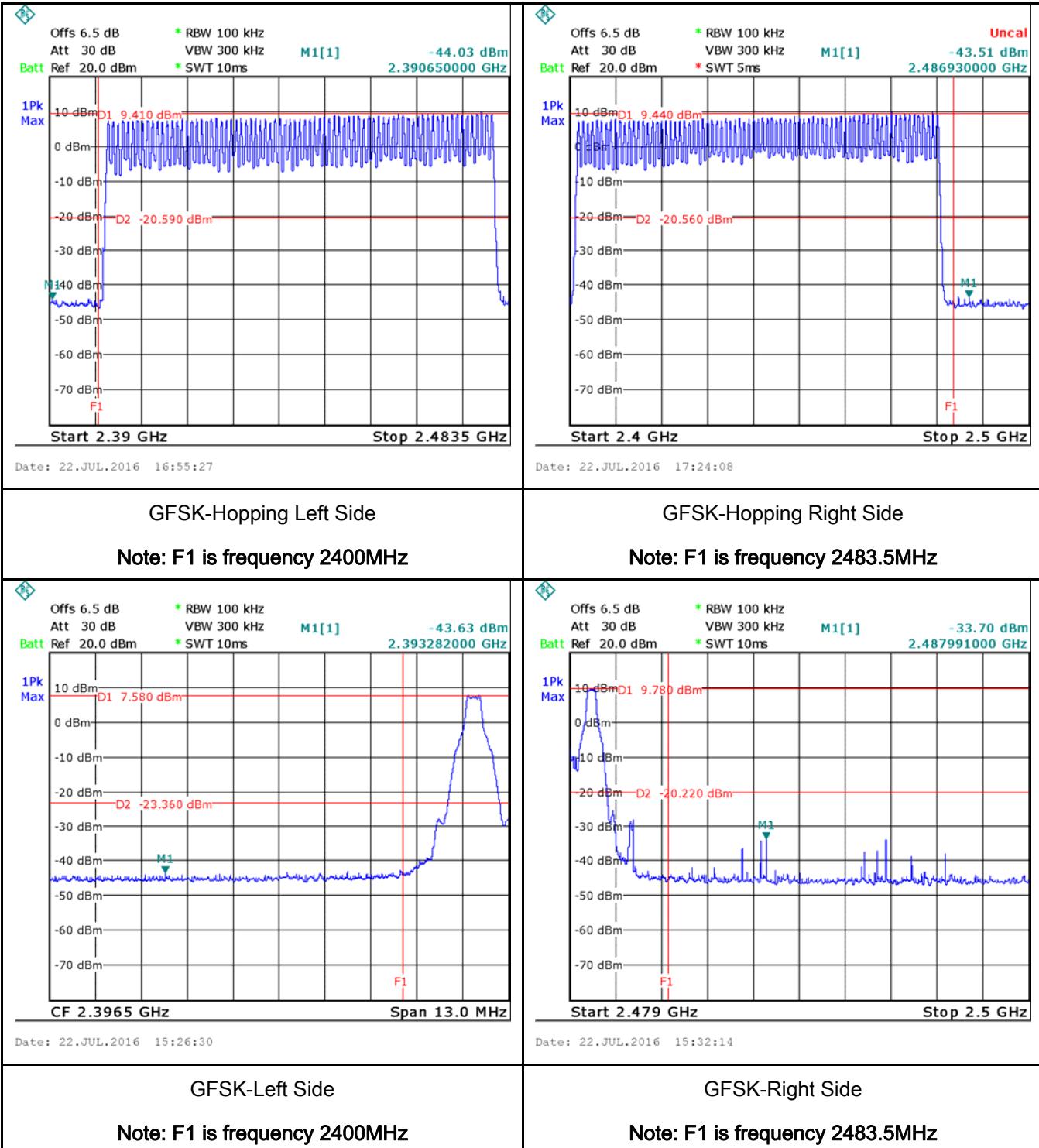
 <p>M2[1] 52.65 dBμV 2.382520000 GHz</p> <p>* Att 5 dB * RBW 1 MHz Batt Ref 102.0 dBμV * VBW 3 MHz SWT 2.5ms</p> <p>1Pk Max Tdf</p> <p>Limit Check Line Limit-L 74 PASS M1[1] PASS</p> <p>90 dBμV 80 dBμV 70 dBμV 60 dBμV 50 dBμV 40 dBμV 30 dBμV 20 dBμV 10 dBμV</p> <p>Start 2.31 GHz Stop 2.44 GHz</p> <p>Date: 5.JUL.2016 11:54:09</p>	 <p>M1[1] 49.12 dBμV 2.487250000 GHz</p> <p>* Att 5 dB * RBW 1 MHz Batt Ref 102.0 dBμV * VBW 3 MHz SWT 2.5ms</p> <p>1Pk Max Tdf</p> <p>Limit Check Line Limit-R 74 PASS M1[1] PASS</p> <p>90 dBμV 80 dBμV 70 dBμV 60 dBμV 50 dBμV 40 dBμV 30 dBμV 20 dBμV 10 dBμV</p> <p>Start 2.44 GHz Stop 2.5 GHz</p> <p>Date: 5.JUL.2016 12:03:18</p>
<p>8DPSK-Hopping Left Side-PK</p> <p>Note: F1 is frequency 2400MHz</p>	<p>8DPSK-Hopping Right Side-PK</p> <p>Note: F1 is frequency 2483.5MHz</p>
 <p>M3[1] 42.39 dBμV 2.345680000 GHz</p> <p>* Att 5 dB * RBW 1 MHz Batt Ref 102.0 dBμV * VBW 3 MHz SWT 2.5ms</p> <p>1Av Max Tdf</p> <p>Limit Check Line Limit-L 54 PASS M1[1] D2[1]</p> <p>90 dBμV 80 dBμV 70 dBμV 60 dBμV 50 dBμV 40 dBμV 30 dBμV 20 dBμV 10 dBμV</p> <p>Start 2.31 GHz Stop 2.44 GHz</p> <p>Date: 5.JUL.2016 11:56:25</p>	<p>Note: (no need if PK value less than the AV limit)</p>
<p>8DPSK-Hopping Left-AV</p>	<p>8DPSK-Hopping Right-AV</p>

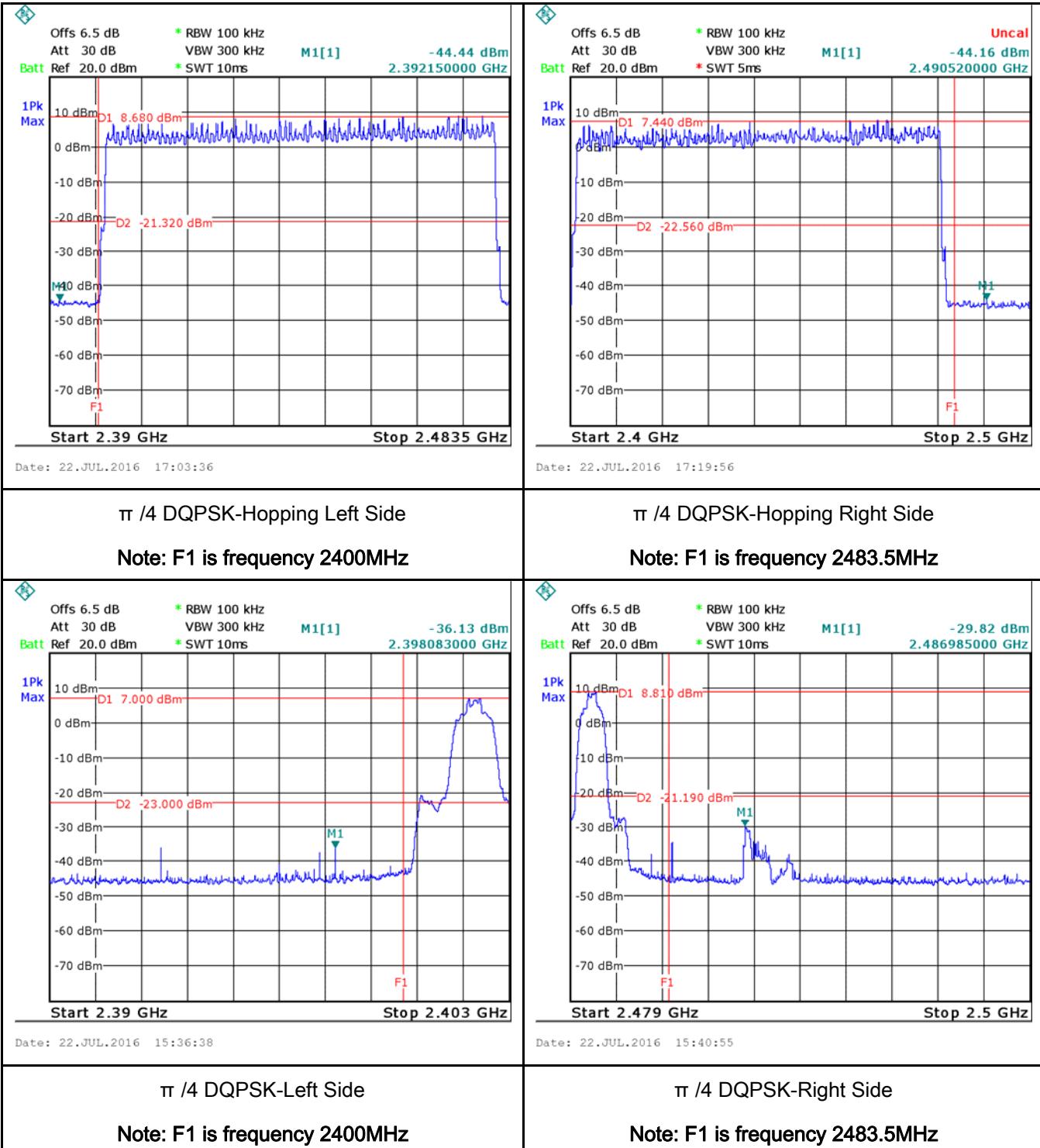


Conducted method:

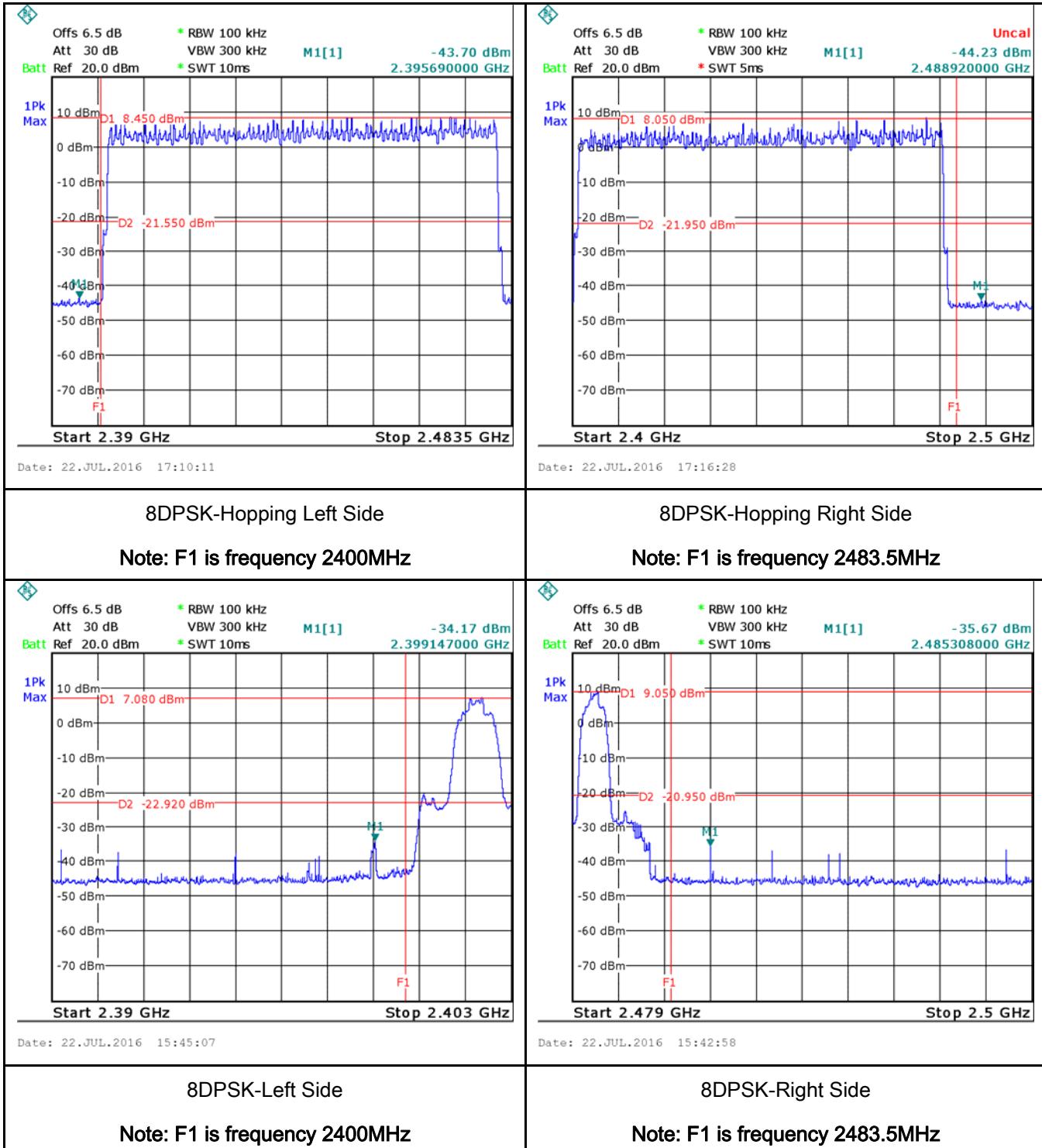
Test Plots

GFSK Mode:



$\pi/4$ DQPSK Mode:


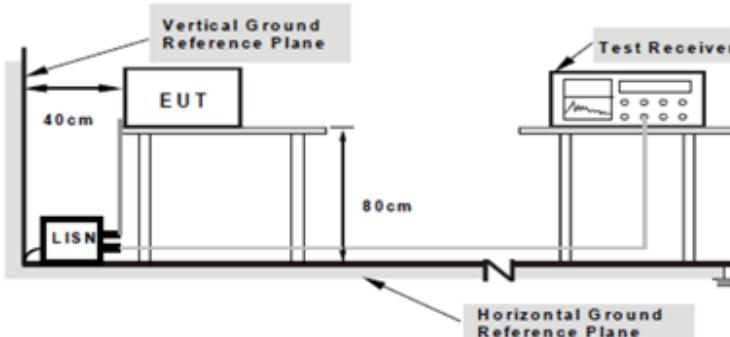
8-DPSK Mode:



6.8 AC Power Line Conducted Emissions

Temperature	24°C
Relative Humidity	57%
Atmospheric Pressure	1015mbar
Test date :	June 15, 2016
Tested By :	Loren Luo

Requirement(s):

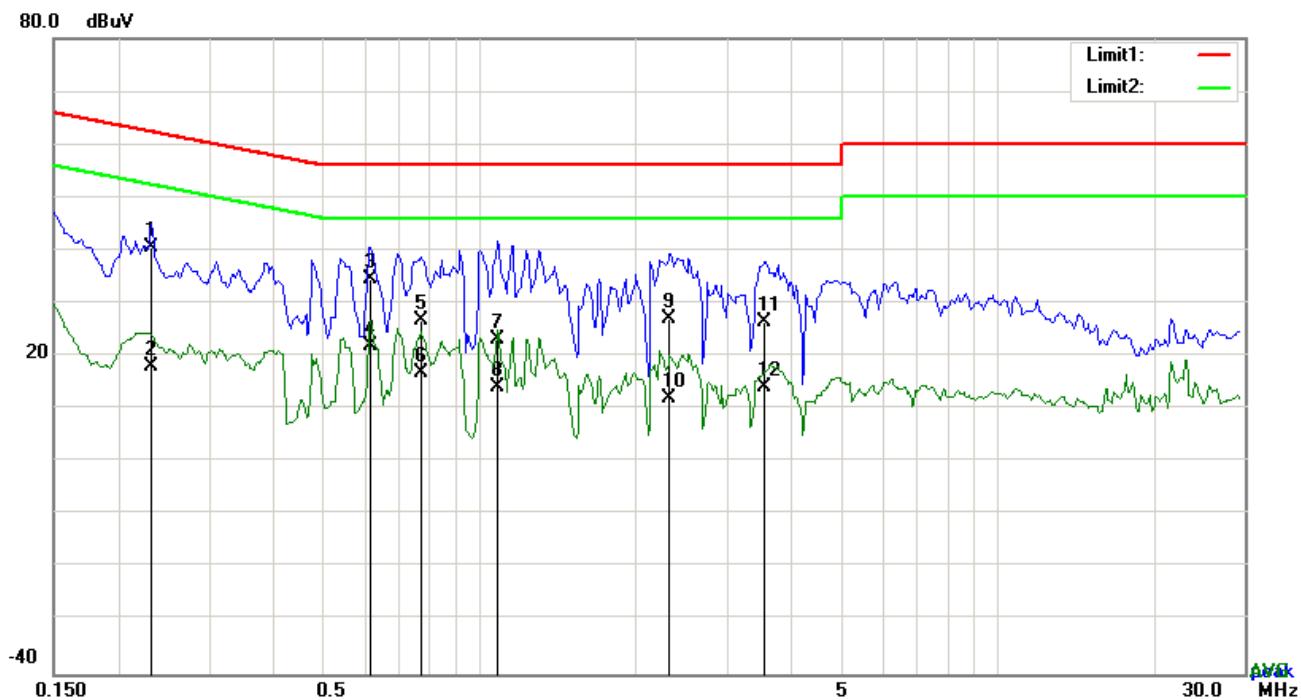
Spec	Item	Requirement	Applicable														
47CFR§15.207, RSS210 (A8.1)	a)	<p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]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 (dB μ V)		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 (dB μ V)																
	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"> 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. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss 																

	coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 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. 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. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
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

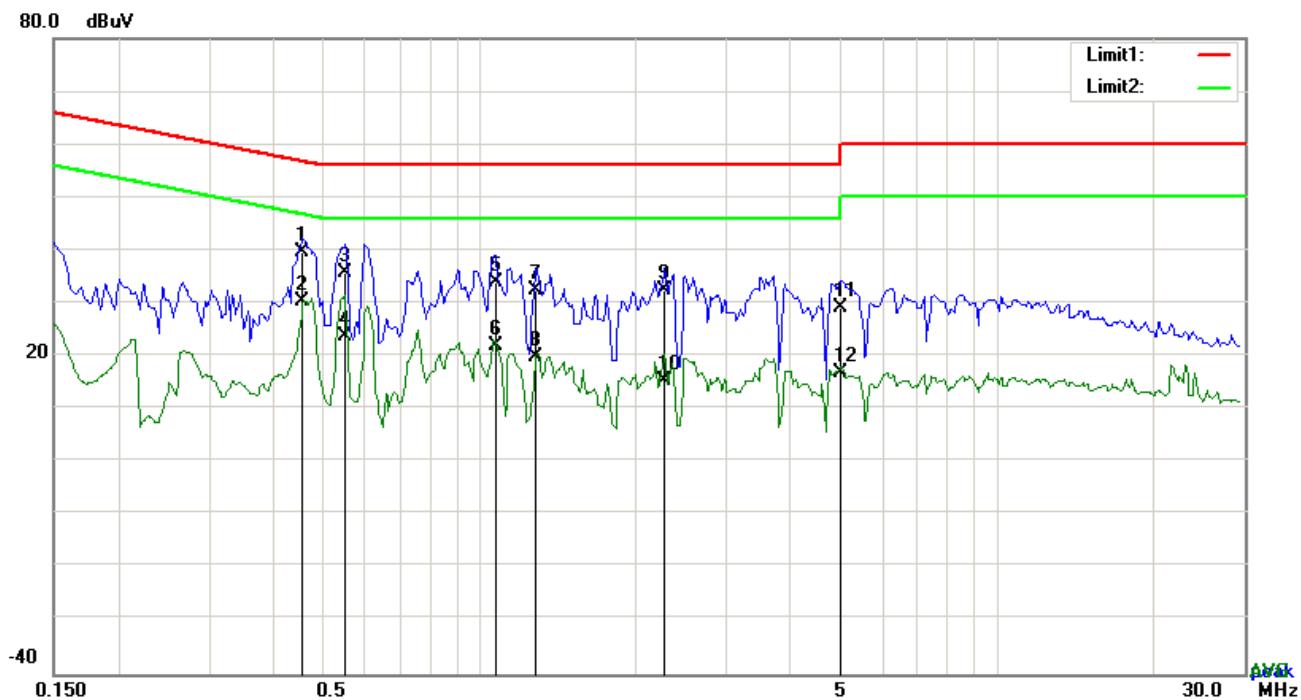


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	L1	0.2319	30.65	QP	10.03	40.68	62.38	-21.70
2	L1	0.2319	8.08	AVG	10.03	18.11	52.38	-34.27
3	L1	0.6141	24.54	QP	10.03	34.57	56.00	-21.43
4	L1	0.6141	12.05	AVG	10.03	22.08	46.00	-23.92
5	L1	0.7701	16.74	QP	10.03	26.77	56.00	-29.23
6	L1	0.7701	6.70	AVG	10.03	16.73	46.00	-29.27
7	L1	1.0860	13.26	QP	10.03	23.29	56.00	-32.71
8	L1	1.0860	4.25	AVG	10.03	14.28	46.00	-31.72
9	L1	2.3301	16.95	QP	10.05	27.00	56.00	-29.00
10	L1	2.3301	2.04	AVG	10.05	12.09	46.00	-33.91
11	L1	3.5616	16.50	QP	10.06	26.56	56.00	-29.44
12	L1	3.5616	4.16	AVG	10.06	14.22	46.00	-31.78

Test Mode: Bluetooth Mode

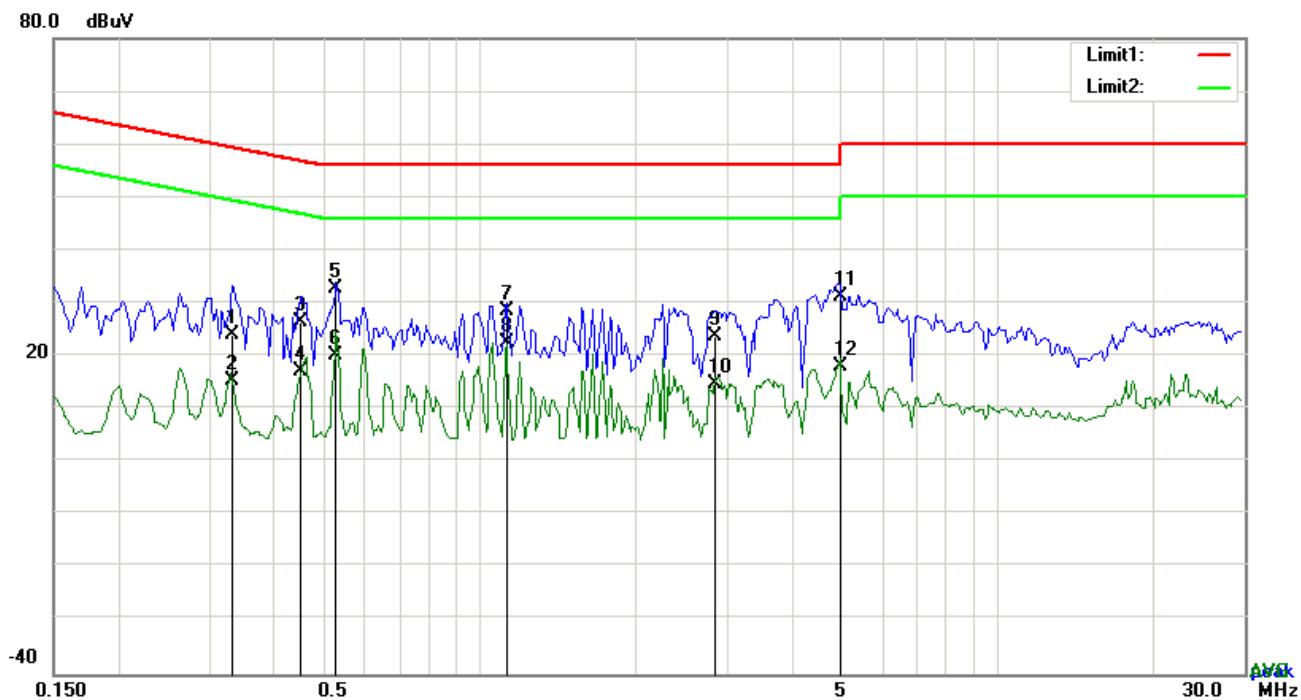


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	N	0.4542	29.65	QP	10.02	39.67	56.80	-17.13
2	N	0.4542	20.25	AVG	10.02	30.27	46.80	-16.53
3	N	0.5517	25.64	QP	10.02	35.66	56.00	-20.34
4	N	0.5517	13.65	AVG	10.02	23.67	46.00	-22.33
5	N	1.0743	23.88	QP	10.03	33.91	56.00	-22.09
6	N	1.0743	11.84	AVG	10.03	21.87	46.00	-24.13
7	N	1.2810	22.55	QP	10.03	32.58	56.00	-23.42
8	N	1.2810	9.91	AVG	10.03	19.94	46.00	-26.06
9	N	2.2794	22.34	QP	10.04	32.38	56.00	-23.62
10	N	2.2794	5.17	AVG	10.04	15.21	46.00	-30.79
11	N	5.0007	19.16	QP	10.07	29.23	60.00	-30.77
12	N	5.0007	6.93	AVG	10.07	17.00	50.00	-33.00

Test Mode: Bluetooth Mode

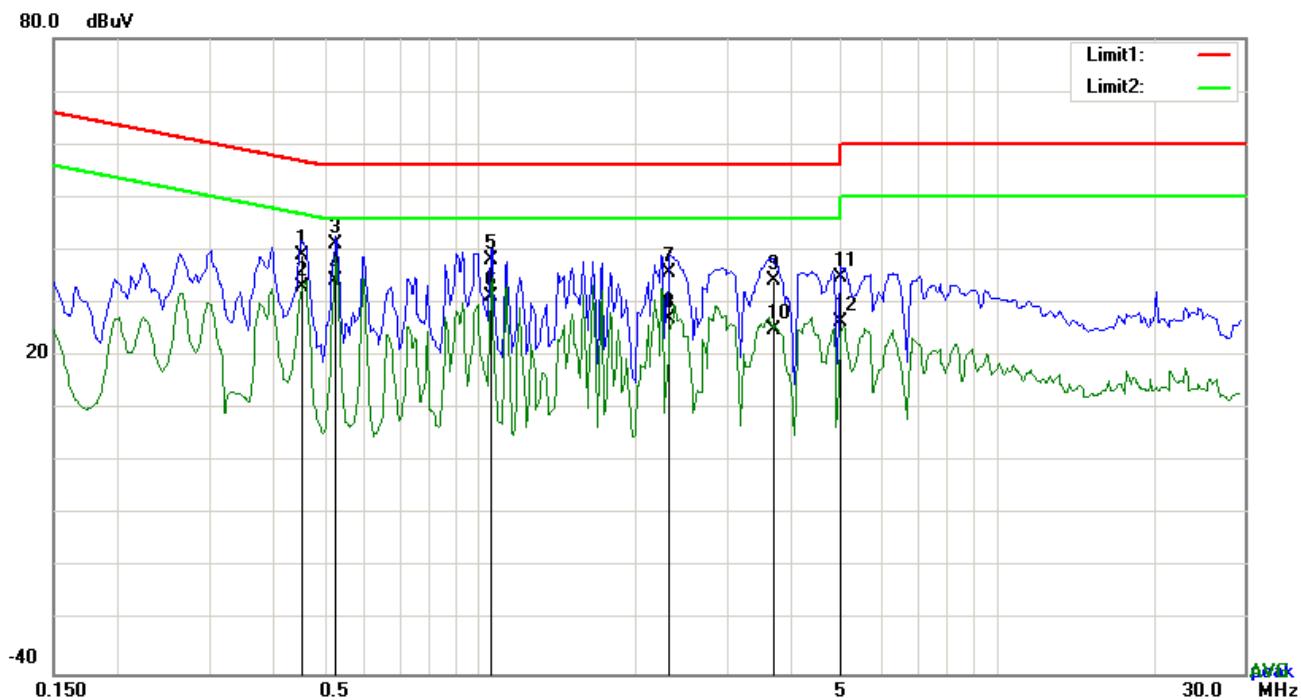


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	L1	0.3333	13.91	QP	10.03	23.94	59.37	-35.43
2	L1	0.3333	5.33	AVG	10.03	15.36	49.37	-34.01
3	L1	0.4503	16.35	QP	10.03	26.38	56.87	-30.49
4	L1	0.4503	7.09	AVG	10.03	17.12	46.87	-29.75
5	L1	0.5283	22.62	QP	10.03	32.65	56.00	-23.35
6	L1	0.5283	10.02	AVG	10.03	20.05	46.00	-25.95
7	L1	1.1250	18.51	QP	10.03	28.54	56.00	-27.46
8	L1	1.1250	12.44	AVG	10.03	22.47	46.00	-23.53
9	L1	2.8410	13.74	QP	10.05	23.79	56.00	-32.21
10	L1	2.8410	4.64	AVG	10.05	14.69	46.00	-31.31
11	L1	4.9617	21.07	QP	10.08	31.15	56.00	-24.85
12	L1	4.9617	8.02	AVG	10.08	18.10	46.00	-27.90

Test Mode: Bluetooth Mode



Test Data

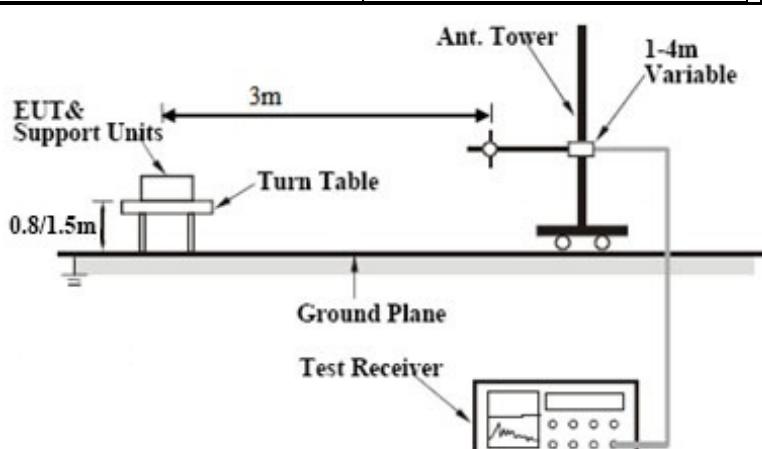
Phase Neutral Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	N	0.4542	29.02	QP	10.02	39.04	56.80	-17.76
2	N	0.4542	23.05	AVG	10.02	33.07	46.80	-13.73
3	N	0.5283	31.22	QP	10.02	41.24	56.00	-14.76
4	N	0.5283	24.17	AVG	10.02	34.19	46.00	-11.81
5	N	1.0509	28.05	QP	10.03	38.08	56.00	-17.92
6	N	1.0509	21.33	AVG	10.03	31.36	46.00	-14.64
7	N	2.3301	25.68	QP	10.04	35.72	56.00	-20.28
8	N	2.3301	16.94	AVG	10.04	26.98	46.00	-19.02
9	N	3.6825	24.17	QP	10.06	34.23	56.00	-21.77
10	N	3.6825	14.88	AVG	10.06	24.94	46.00	-21.06
11	N	4.9656	24.91	QP	10.07	34.98	56.00	-21.02
12	N	4.9656	16.40	AVG	10.07	26.47	46.00	-19.53

6.9 Radiated Spurious Emissions & Restricted Band

Temperature	22°C
Relative Humidity	58%
Atmospheric Pressure	1025mbar
Test date :	June 25, 2016
Tested By :	Loren Luo

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 (μ V/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength (μ V/m)												
30 – 88	100												
88 – 216	150												
216 960	200												
Above 960	500												
Test Setup		 <p>The diagram illustrates the test setup for radiated spurious emissions. A 'Turn Table' is positioned on a 'Ground Plane'. A 'EUT & Support Units' is mounted on the turn table. A 'Ant. Tower' is connected to the EUT and is height-adjustable, with a '1-4m Variable' height indicator. A 'Test Receiver' is connected to the tower and is shown with a waveform display. The distance between the EUT and the turn table is 0.8/1.5m, and the distance between the turn table and the antenna tower is 3m.</p>											
Procedure		<ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. 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: 											

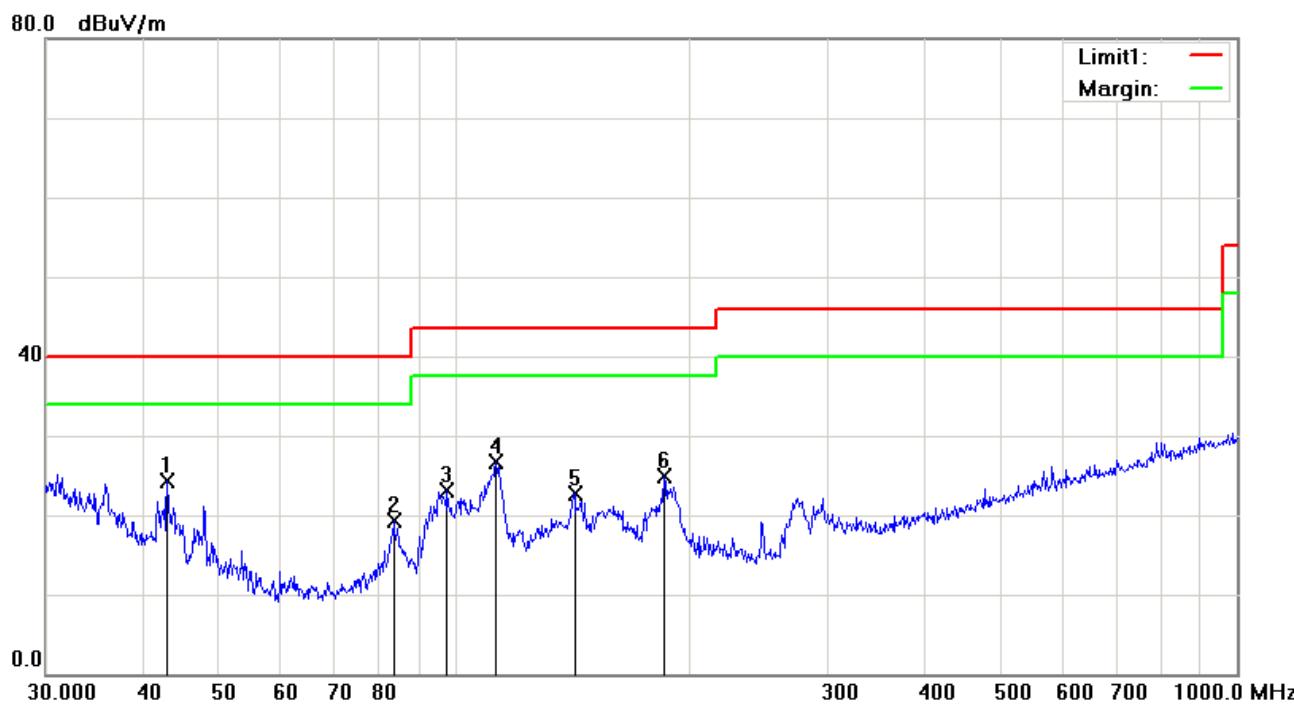
	<p>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</p> <p>b. The EUT was then rotated to the direction that gave the maximum emission.</p> <p>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</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.</p> <p>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

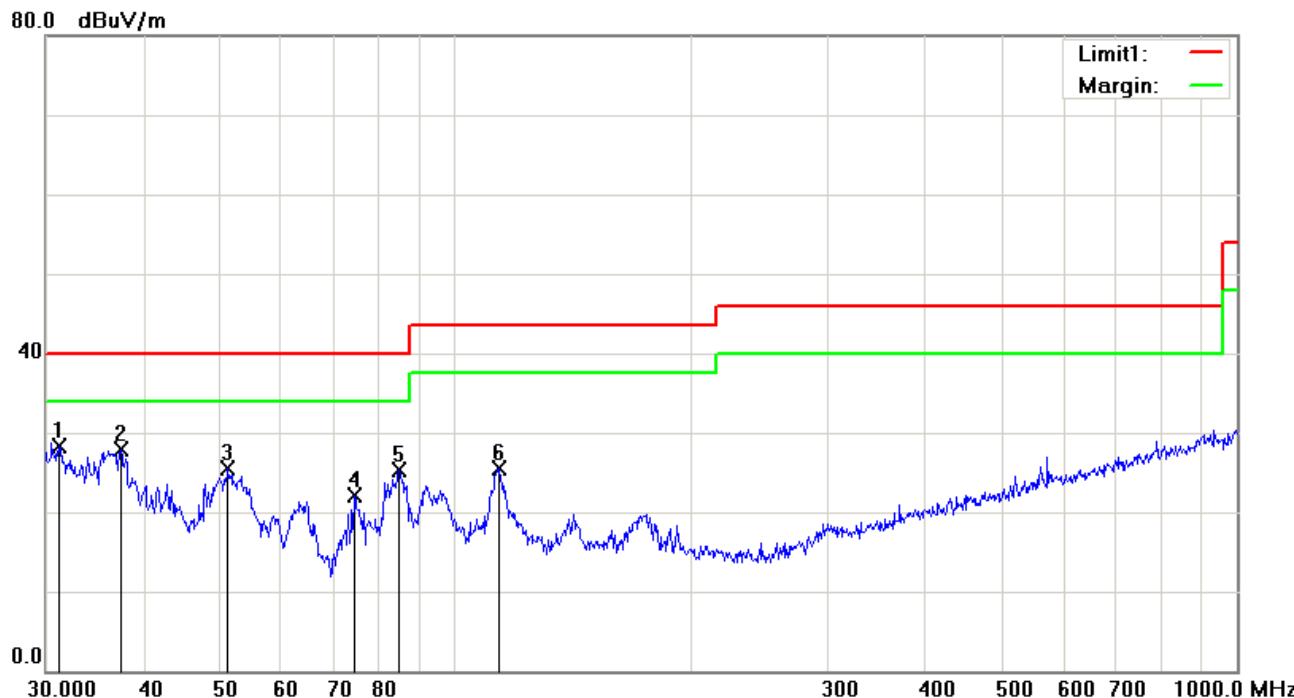


Test Data

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	42.8998	33.78	peak	-9.53	24.25	40.00	-15.75	100	319
2	H	83.5222	32.85	peak	-13.58	19.27	40.00	-20.73	100	192
3	H	97.7983	34.50	peak	-11.39	23.11	43.50	-20.39	100	233
4	H	112.9196	35.23	peak	-8.52	26.71	43.50	-16.79	100	83
5	H	142.3244	31.18	peak	-8.50	22.68	43.50	-20.82	100	45
6	H	185.1379	34.50	peak	-9.55	24.95	43.50	-18.55	100	68

Below 1GHz



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
1	V	31.1798	29.43	peak	-1.13	28.30	40.00	-11.70	100	141
2	V	37.4165	33.68	peak	-5.70	27.98	40.00	-12.02	100	261
3	V	51.3005	38.85	peak	-13.33	25.52	40.00	-14.48	100	265
4	V	74.3955	35.86	peak	-13.73	22.13	40.00	-17.87	100	81
5	V	84.7019	38.74	peak	-13.51	25.23	40.00	-14.77	100	134
6	V	113.7143	33.93	peak	-8.38	25.55	43.50	-17.95	100	167

Above 1GHz

Test Mode:	Transmitting Mode
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Mode: GFSK (Worst Case)
Low Channel (2402 MHz) (8DPSK Worst Case)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4804	38.66	AV	V	33.67	6.86	32.66	46.53	54	-7.47
4804	38.51	AV	H	33.67	6.86	32.66	46.38	54	-7.62
4804	47.95	PK	V	33.67	6.86	32.66	55.82	74	-18.18
4804	47.38	PK	H	33.67	6.86	32.66	55.25	74	-18.75
17793	24.53	AV	V	44.88	11.17	32.02	48.56	54	-5.44
17793	24.29	AV	H	44.88	11.17	32.02	48.32	54	-5.68
17793	40.91	PK	V	44.88	11.17	32.02	64.94	74	-9.06
17793	40.65	PK	H	44.88	11.17	32.02	64.68	74	-9.32

Middle Channel (2441 MHz) (8DPSK Worst Case)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4882	38.75	AV	V	33.71	6.95	32.74	46.67	54	-7.33
4882	38.63	AV	H	33.71	6.95	32.74	46.55	54	-7.45
4882	48.01	PK	V	33.71	6.95	32.74	55.93	74	-18.07
4882	47.67	PK	H	33.71	6.95	32.74	55.59	74	-18.41
17807	24.16	AV	V	44.95	11.23	32.09	48.25	54	-5.75
17807	24.02	AV	H	44.95	11.23	32.09	48.11	54	-5.89
17807	41.25	PK	V	44.95	11.23	32.09	65.34	74	-8.66
17807	40.79	PK	H	44.95	11.23	32.09	64.88	74	-9.12

High Channel (2480 MHz) (8DPSK Worst Case)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4960	38.59	AV	V	33.9	6.76	32.74	46.51	54	-7.49
4960	38.46	AV	H	33.9	6.76	32.74	46.38	54	-7.62
4960	48.12	PK	V	33.9	6.76	32.74	56.04	74	-17.96
4960	47.95	PK	H	33.9	6.76	32.74	55.87	74	-18.13
17795	24.72	AV	V	44.88	11.17	32.03	48.74	54	-5.26
17795	24.48	AV	H	44.88	11.17	32.03	48.5	54	-5.5
17795	41.35	PK	V	44.88	11.17	32.03	65.37	74	-8.63
17795	41.09	PK	H	44.88	11.17	32.03	65.11	74	-8.89

Note:

1, The testing has been conformed to $10*2480\text{MHz}=24,800\text{MHz}$

2, All other emissions more than 30 dB below the limit

3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

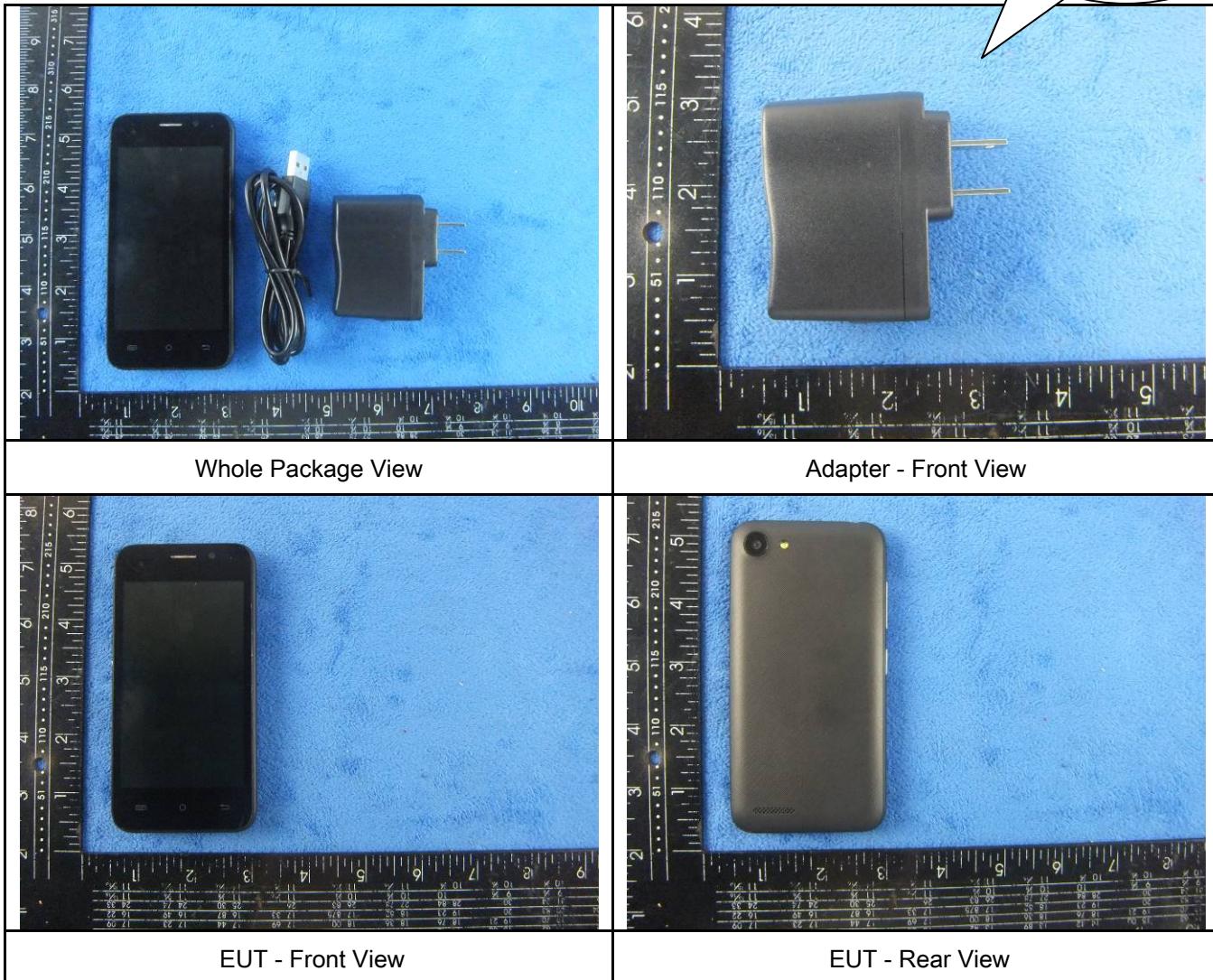
Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
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"/>
RF conducted test					
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"/>
Radiated Emissions					
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

Model: PC444
Input: AC100-240V
50/60HZ 0.15A
Output: DC 5.0V-500mA
Made in China

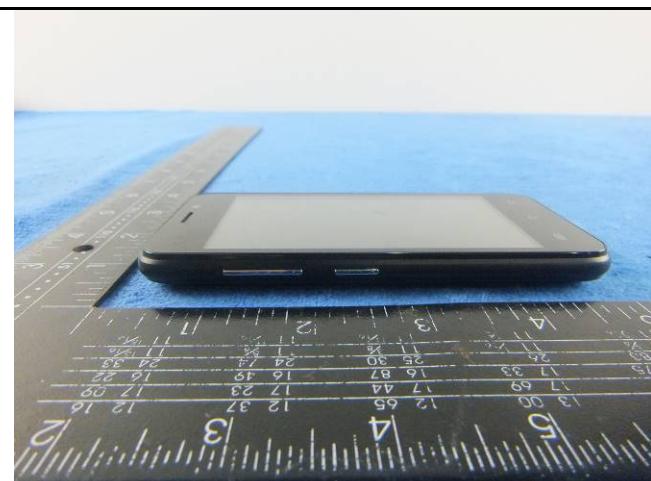




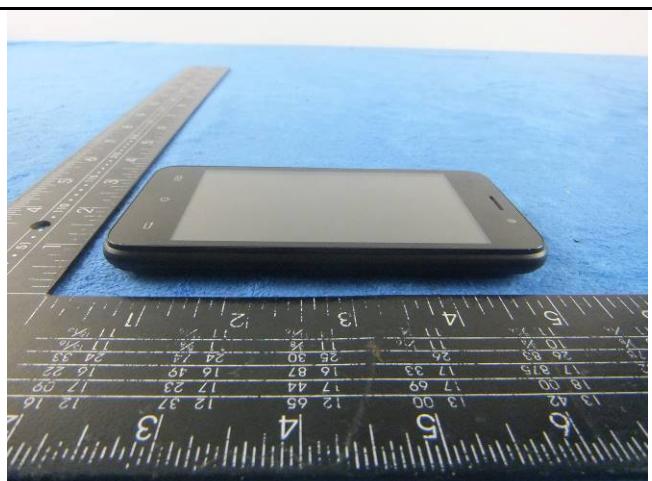
EUT - Top View



EUT - Bottom View

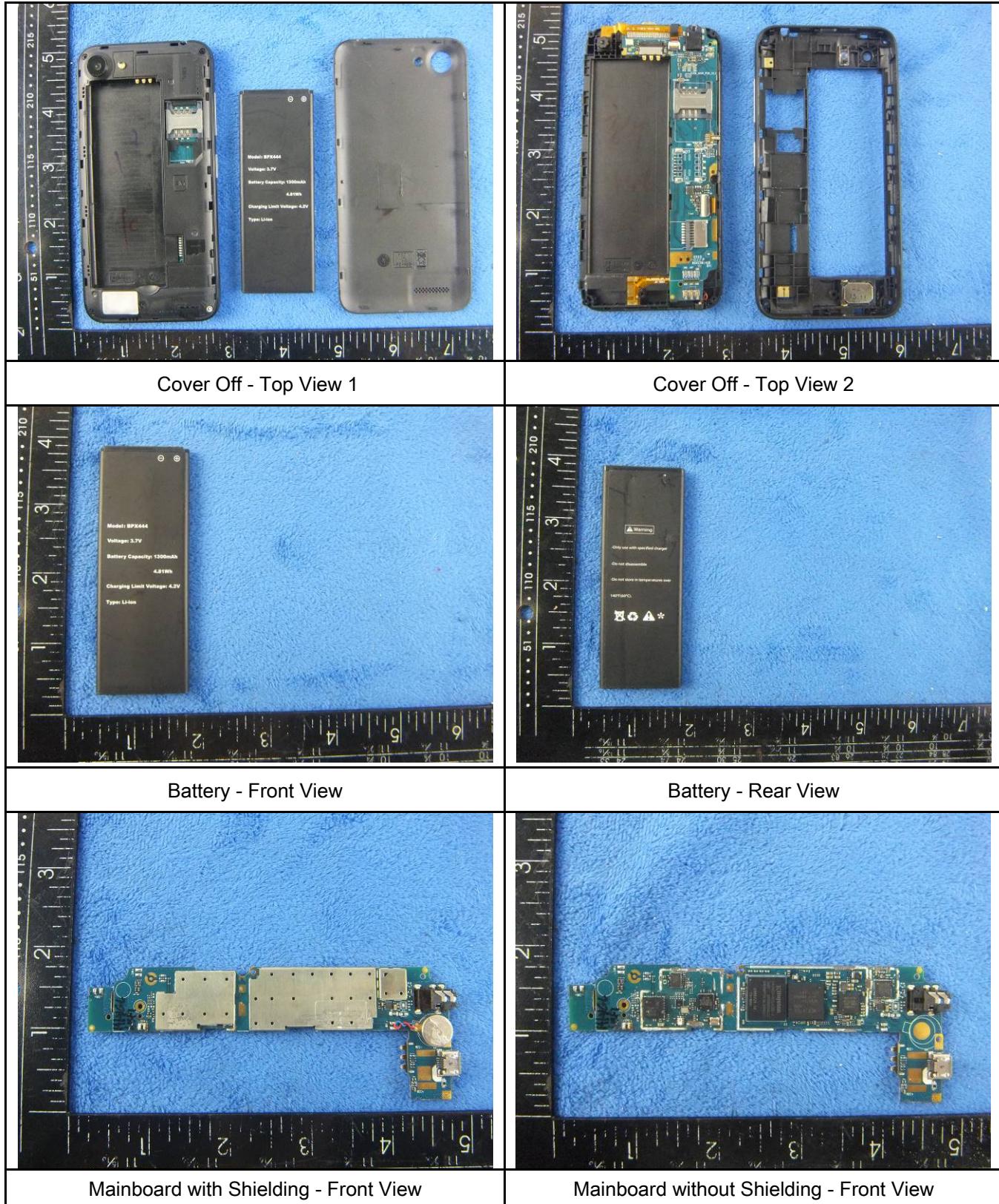


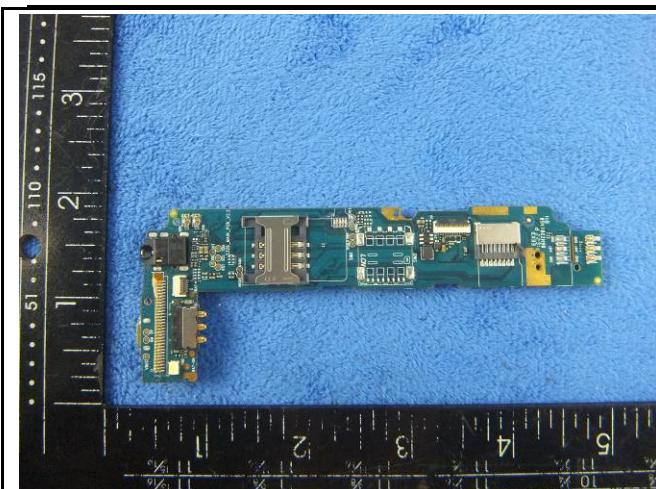
EUT - Left View



EUT - Right View

Annex B.ii. Photograph: EUT Internal Photo





Mainboard - Rear View



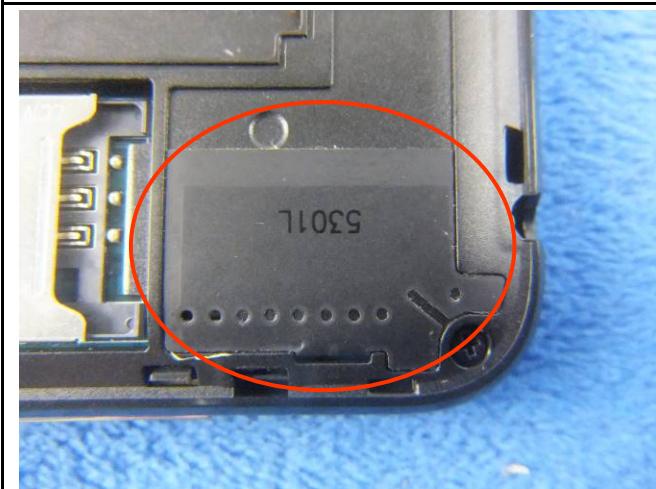
LCD – Front View



LCD – Rear View

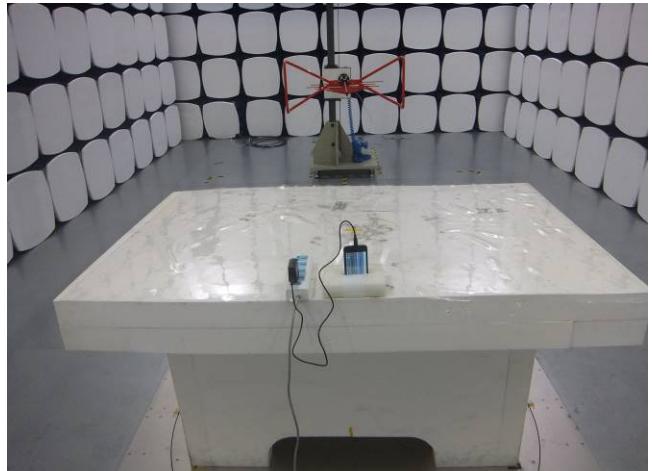
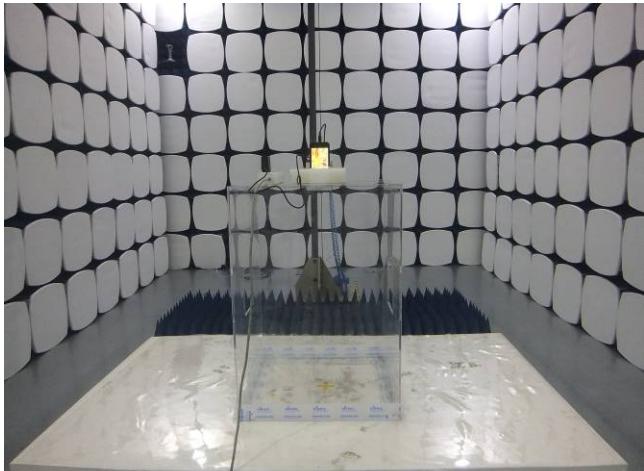


GSM/PCS/UMTS-FDD Antenna View



WIFI/BT/BLE - Antenna View

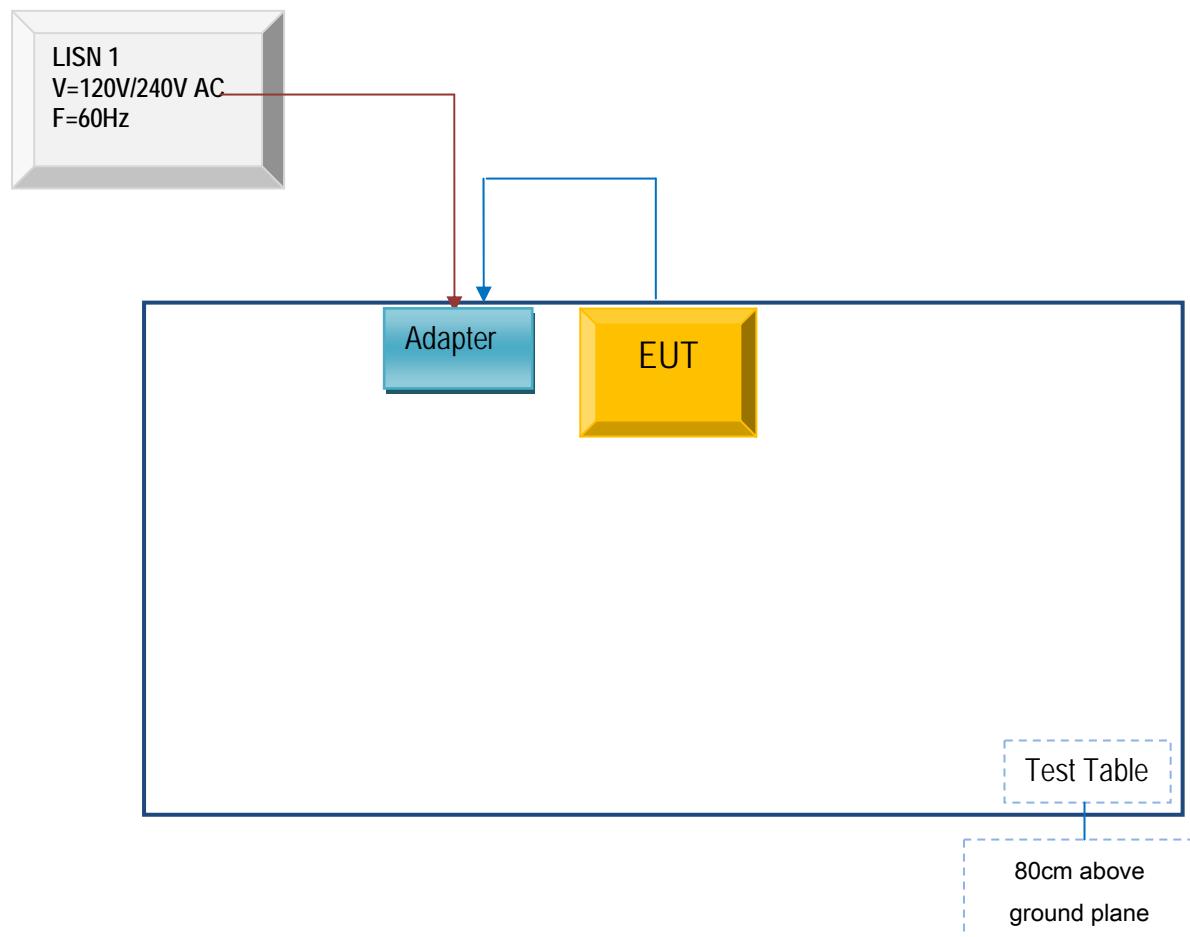
Annex B.iii. Photograph: Test Setup Photo

 A photograph showing a wooden table with a white electronic device and a blue power adapter on top. A black power cord is visible on the left side of the table. The background is a light-colored wall.	 A photograph showing the same wooden table from a side angle. The white electronic device is visible on the table. The background shows a white wall and a floor.
Conducted Emissions Test Setup Front View	Conducted Emissions Test Setup Side View
 A photograph of a white rectangular table with a white electronic device and a blue power adapter on top. The table is positioned in a room with white, curved, acoustical panels on the walls. A red tripod stand is visible in the background.	 A photograph of a white rectangular table with a white electronic device and a blue power adapter on top. The table is positioned in a room with white, curved, acoustical panels on the walls. A clear plastic enclosure is placed over the table, and a blue power adapter is visible inside.
Radiated Spurious Emissions Test Setup Below 1GHz	Radiated Spurious Emissions Test Setup Above 1GHz

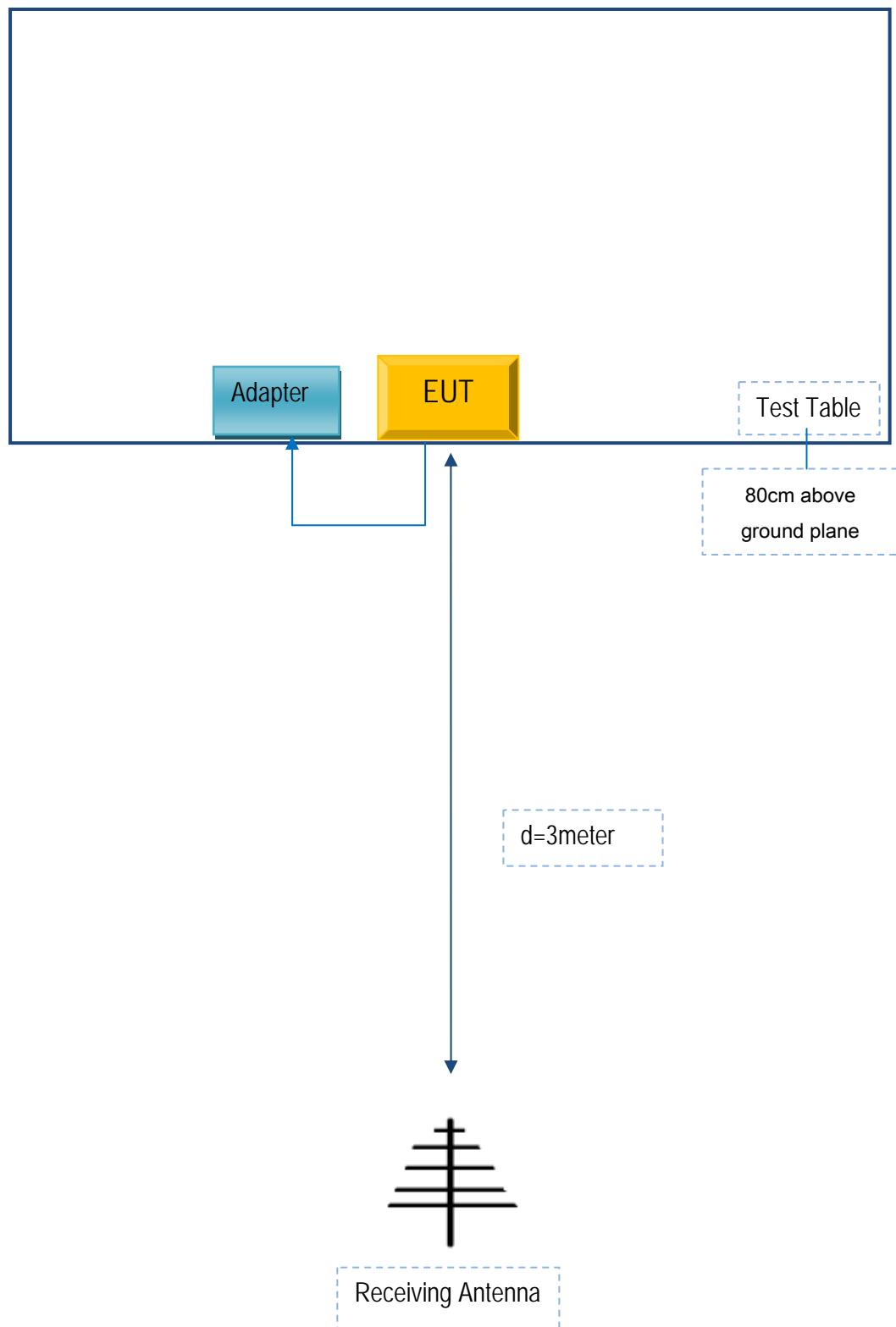
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

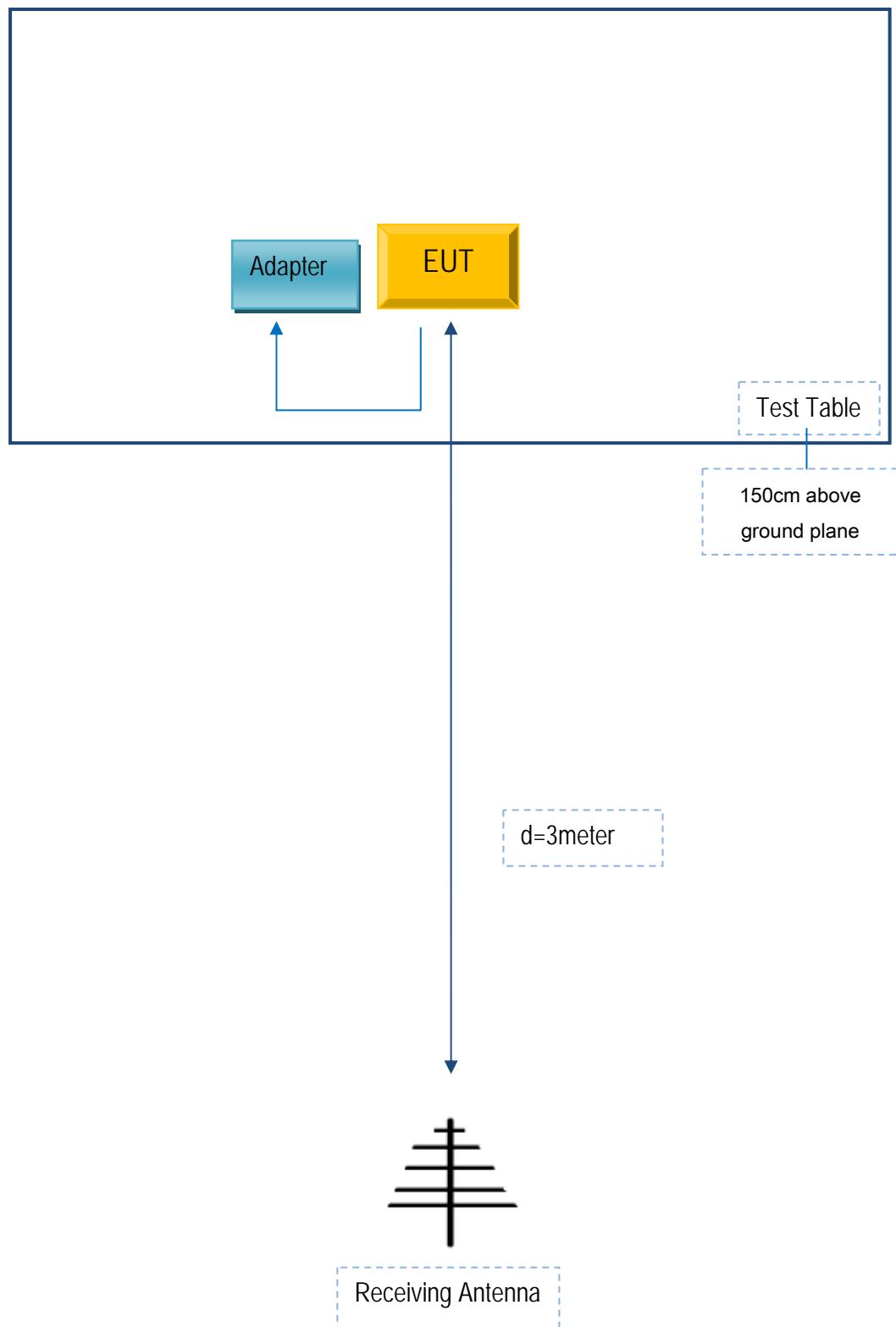
Block Configuration Diagram for AC Line Conducted Emissions



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.

Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
SMT TELECOMM HK LIMITED	Adapter	PC444	X444

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	X444

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

Please see attachment

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Annex E. DECLARATION OF SIMILARITY

N/A