RF TEST REPORT

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Report No.: 16070814-FCC-R2

Supersede Report No.: N/A

Applicant	Worldex International Ltd
Product Name	NEOS400
Model No.	400
Serial No.	N/A
Test Standard	FCC Part 15.247: 2015, ANSI C63.10: 2013
Test Date	July 08 to 21, 2016
Issue Date	July 22, 2016
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	

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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
16070814-FCC-R2	NONE	Original	July 22, 2016

2. Customer information

Applicant Name	Worldex International Ltd
Applicant Add	3A-8A, Mont Orchid Riverlet, Gongye 3rd Road, Nanshan, Shenzhen, China
Manufacturer	Shenzhen Fortuneship Technology Co., Ltd
Manufacturer Add	6/F, Kanghesheng Building, No.1 Chuangsheng Road, Nanshan District, Shenzhen,Guangdong, 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:	NEOS400
Main Model:	400
Serial Model:	N/A
Date EUT received:	July 07, 2016
Test Date(s):	July 08 to 21, 2016
Equipment Category :	DSS
Antenna Gain:	GSM850: 0.2dBi PCS1900: 0.5dBi UMTS-FDD Band V: 0.5dBi UMTS-FDD Band II: 0.5dBi Bluetooth/BLE/WIFI: 0dBi GPS: 0dBi
Antenna Type:	FPC antenna
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK UMTS-FDD: QPSK 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, π /4DQPSK, 8DPSK BLE: GFSK GPS:BPSK

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 UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz WIFI: 802.11b/g/n(20M): 2412-2462 MHz WIFI: 802.11n(40M): 2422-2452 MHz Bluetooth& BLE: 2402-2480 MHz GPS: 1575.42 MHz
Max. Output Power:	2.886dBm
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band 5: 102CH UMTS-FDD Band 2: 277CH WIFI :802.11b/g/n(20M): 11CH WIFI :802.11n(40M): 7CH Bluetooth: 79CH BLE: 40CH GPS:1CH
Port:	Power Port, Earphone Port, USB Port
Input Power:	Adapter: Model: TPA - 90C050050UU Input: AC100-240V~50/60Hz;0.2A Output: DC 5.0V,0.5A Battery: Model: 385258AR Spec: 3.7V,1300mAh(4.81Wh) Charge limited voltage: 4.2V
Trade Name :	NEOS
GPRS/EGPRS Multi-slot class	8/10/12
FCC ID:	2ACZ2-400

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 FPC antenna for Bluetooth/BLE/WIFI/GPS, the gain is 0dBi for Bluetooth/BLE/ WIFI/GPS.
A permanently attached FPC antenna for GSM/PCS/UMTS, the gain is0.2dBi for GSM850, 0.5dBi for PCS1900, 0.5dBi for UMTS-FDD Band V, 0.5dBi for UMTS-FDD Band II.

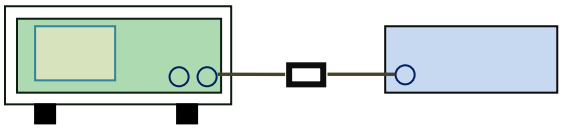
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	24℃
Relative Humidity	57%
Atmospheric Pressure	1015mbar
Test date :	July 15, 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	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span - Video (or Average) Bandwidth (VBW) ≥ 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	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Channel Separation measurement result

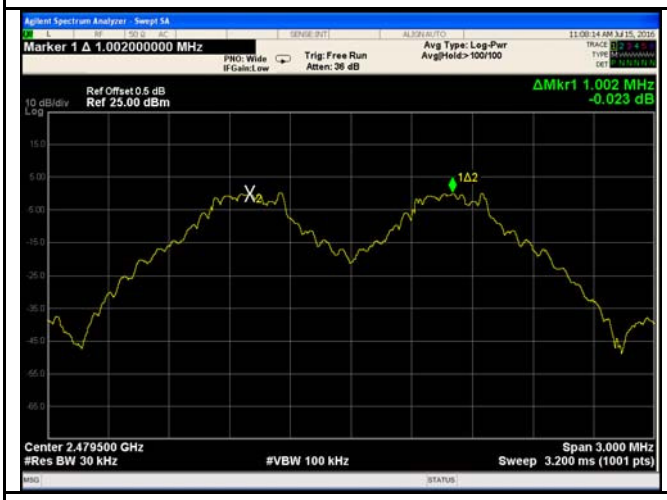
Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.964	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.969	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.965	Pass
	Adjacency Channel	2479			
CH Separation π /4 DQPSK	Low Channel	2402	1.002	0.855	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.855	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.855	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.856	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.868	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.861	Pass
	Adjacency Channel	2479			

Test Plots

Channel Separation measurement result

GFSK - Low Channel

GFSK - Middle Channel



GFSK - High Channel

π /4 DPSK - Low Channel

π /4 DQPSK - Middle Channel

π /4 DQPSK - High Channel

8DPSK - Low Channel

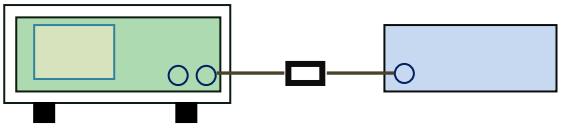
8DPSK - Middle Channel

8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	24℃
Relative Humidity	57%
Atmospheric Pressure	1015mbar
Test date :	July 15, 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.	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW ≥ 1% of the 20 dB bandwidth - VBW ≥ 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	☑ Pass ☐ 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	0.964	0.8855
	Mid	2441	0.969	0.8896
	High	2480	0.965	0.8893
π /4 DQPSK	Low	2402	1.282	1.1710
	Mid	2441	1.282	1.1715
	High	2480	1.282	1.1677
8-DPSK	Low	2402	1.284	1.1693
	Mid	2441	1.302	1.1825
	High	2480	1.291	1.1816

Test Plots

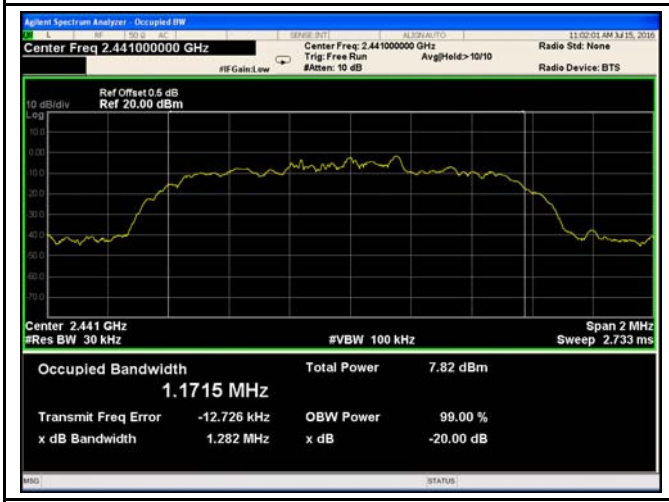
20dB Bandwidth measurement result

GFSK - Low Channel

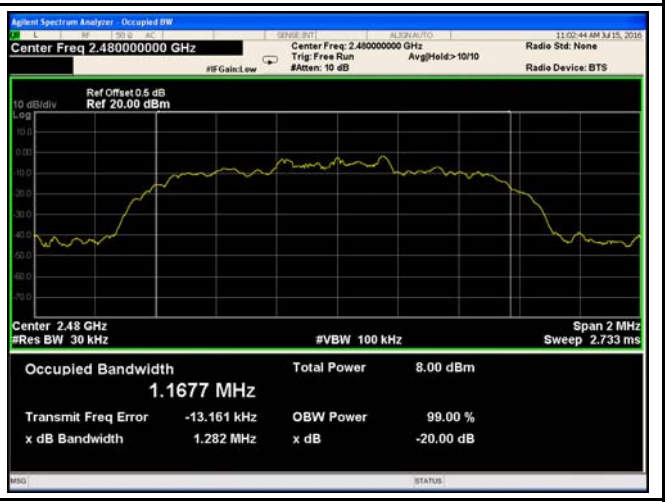
GFSK - Middle Channel

GFSK - High Channel

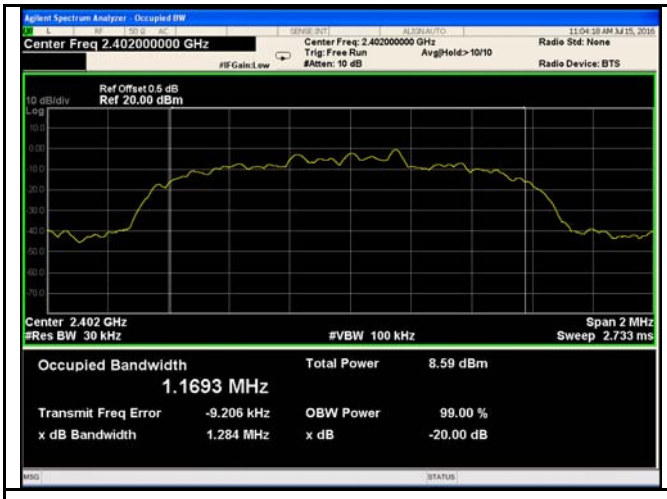
π /4 DPSK - Low Channel



π /4 DQPSK - Middle Channel

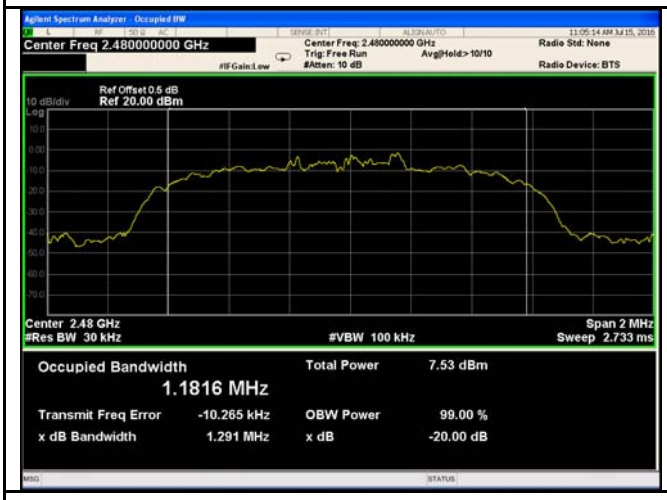


π /4 DQPSK - High Channel



8DPSK - Low Channel

8DPSK - Middle Channel

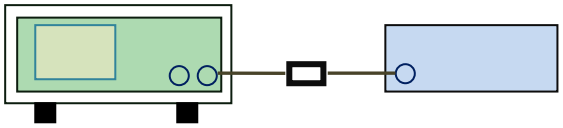


8DPSK - High Channel

6.4 Peak Output Power

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

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b)(3)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☑
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☑
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤ 0.25 Watt	☐
	f)	DTS in 902-928MHz, 2400-2483.5MHz: ≤ 1 Watt	☐
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel - RBW > the 20 dB bandwidth of the emission being measured - VBW ≥ RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize.		

	- 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.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

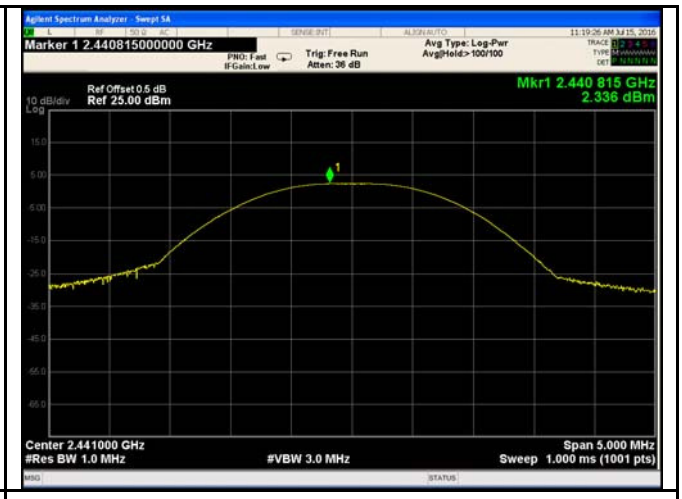
Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	2.837	1000	Pass
		Mid	2441	2.336	1000	Pass
		High	2480	2.486	1000	Pass
	π /4 DQPSK	Low	2402	2.756	125	Pass
		Mid	2441	2.240	125	Pass
		High	2480	2.365	125	Pass
	8-DPSK	Low	2402	**2.886**	125	Pass
		Mid	2441	2.367	125	Pass
		High	2480	2.475	125	Pass

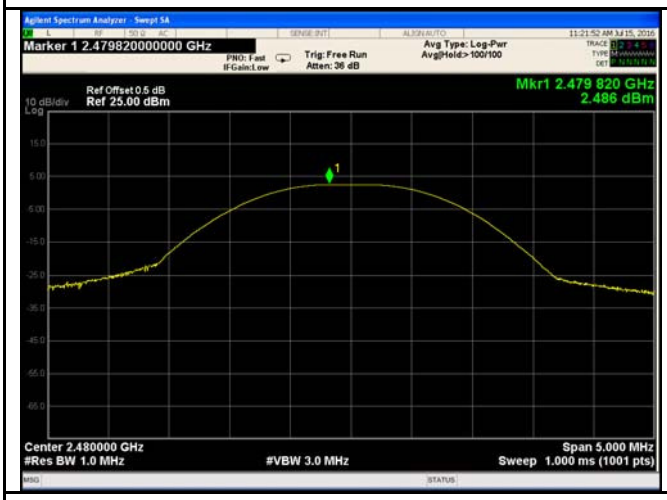
Test Plots

Output Power measurement result

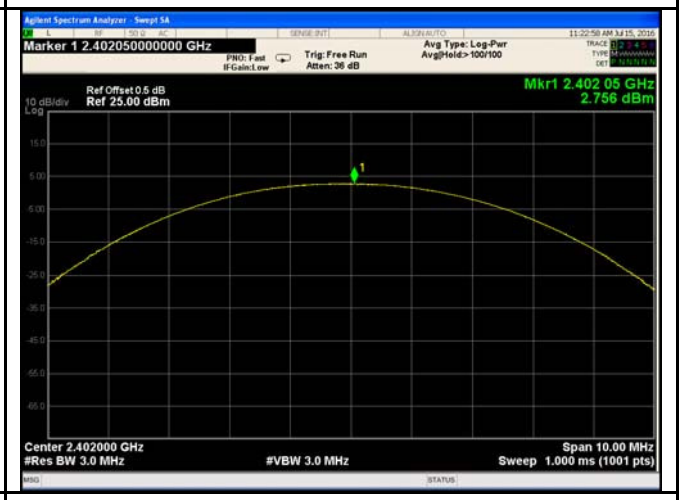
GFSK Output power - Low CH 2402



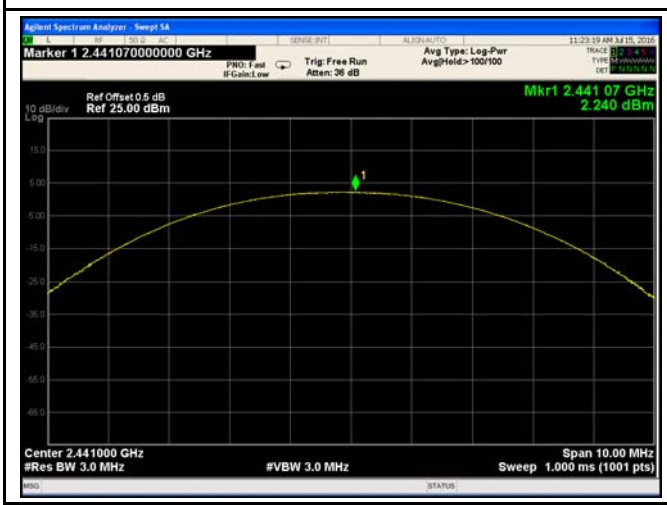
GFSK Output power - Mid CH 2441



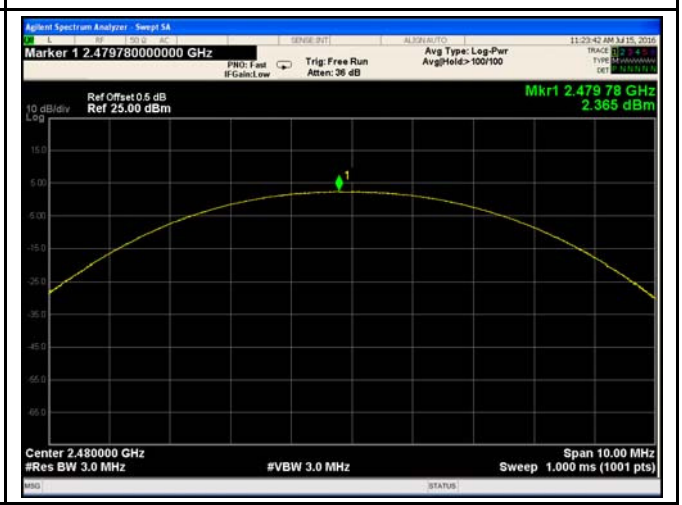
GFSK Output power - High CH 2480



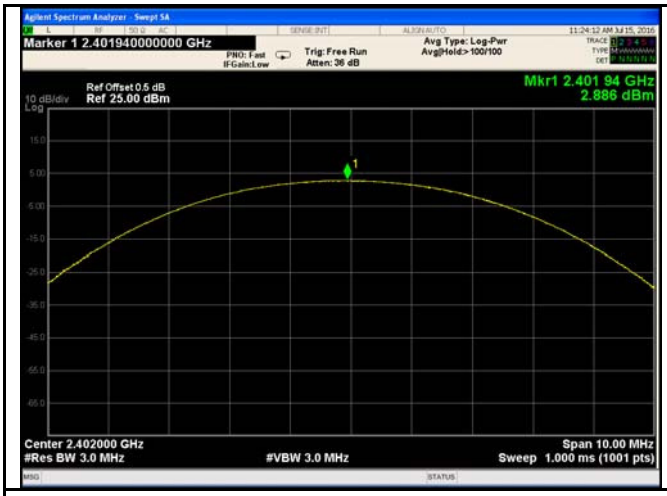
π /4 DQPSK Output power - Low CH 2402



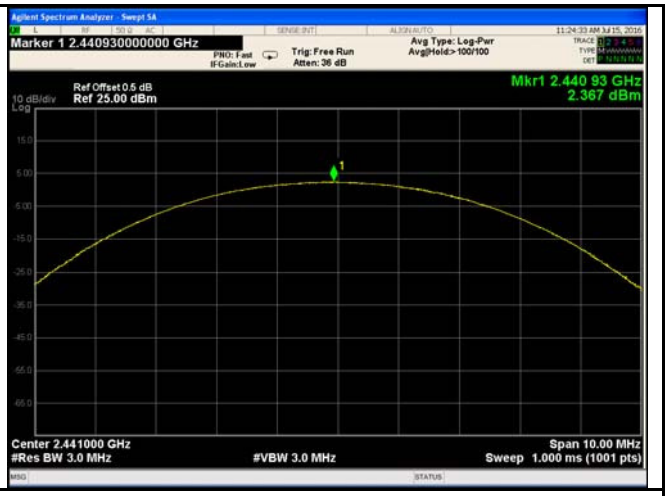
π /4 DQPSK Output power - Mid CH 2441



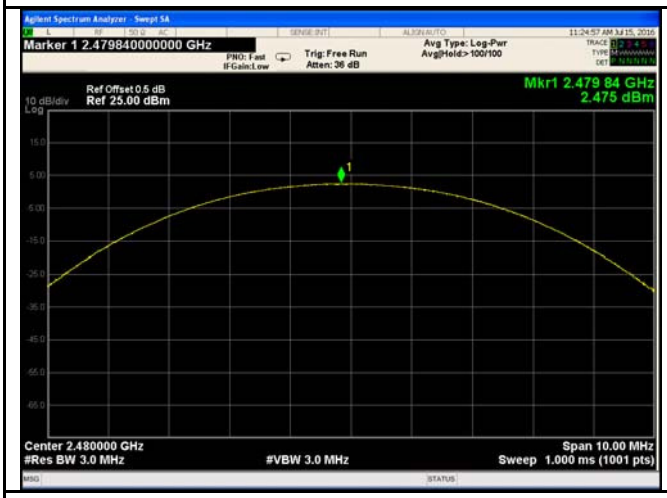
π /4 DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

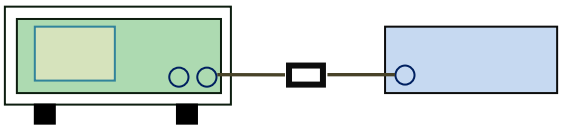


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

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

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	FHSS in 2400-2483.5MHz ≥ 15 channels	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: The EUT must have its hopping function enabled. - Span = the frequency band of operation - RBW ≥ 1% of the span - VBW ≥ 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	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

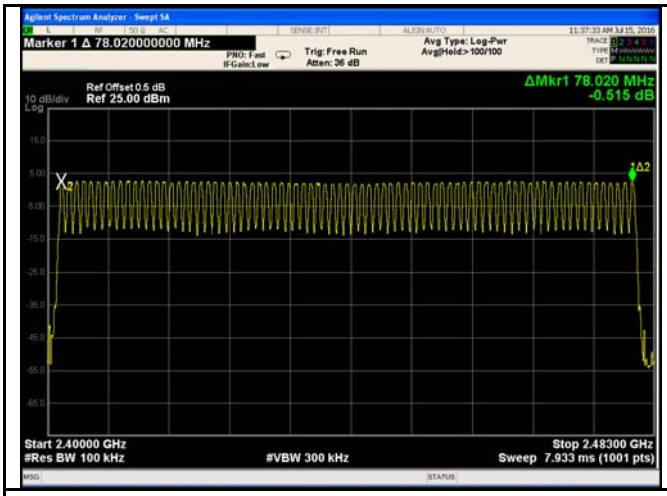
Test Plot ☑ Yes (See below) ☐ N/A

Number of Hopping Channel measurement result

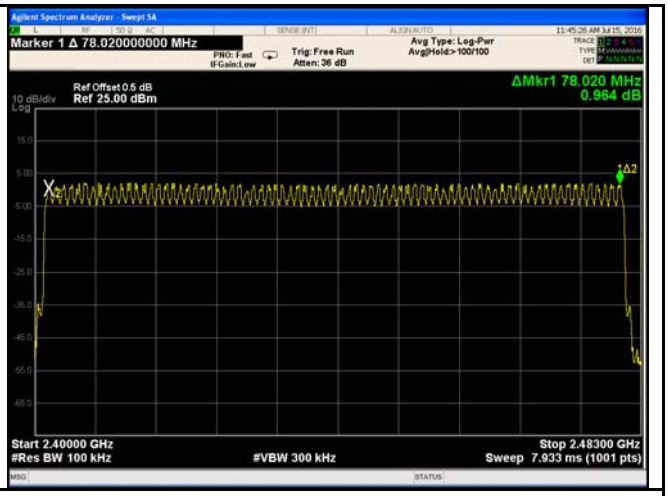
Type	Modulation	Frequency Range	Number of Hopping Channel	Limit
Number of Hopping Channel	GFSK	2400-2483.5	79	15
	π /4 DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

Test Plots

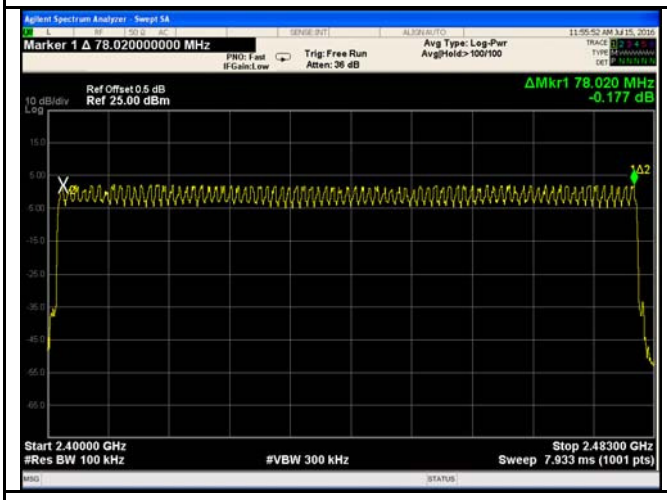
Number of Hopping Channels measurement result



GFSK



π /4DQPSK

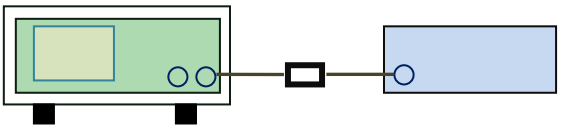


8DPSK

6.6 Time of Occupancy (Dwell Time)

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

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	Dwell Time < 0.4s	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥ 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	☑ Pass ☐ 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	2.940	313.600	400	Pass
		High	2.900	309.333	400	Pass
	π /4 DQPSK	Low	2.930	312.533	400	Pass
		Mid	2.910	310.400	400	Pass
		High	2.910	310.400	400	Pass
	8-DPSK	Low	2.910	310.400	400	Pass
		Mid	2.910	310.400	400	Pass
		High	2.910	310.400	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

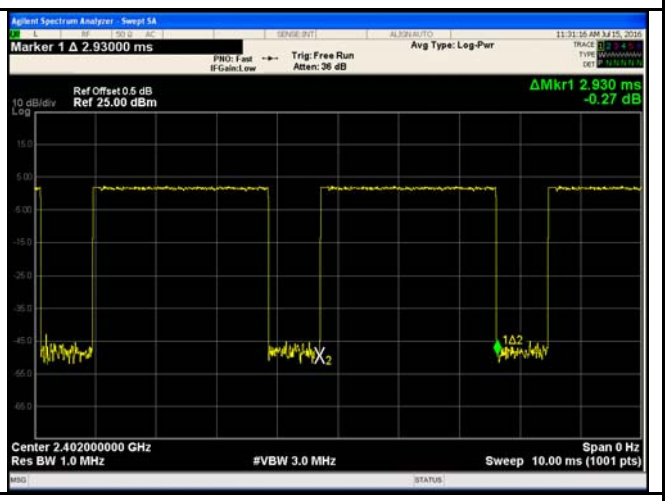
Test Plots

Dwell Time measurement result

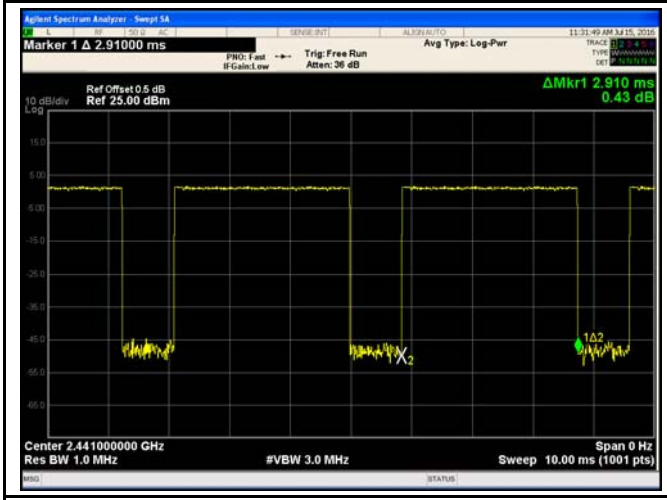
GFSK - Low CH 2402

GFSK - Mid CH 2441

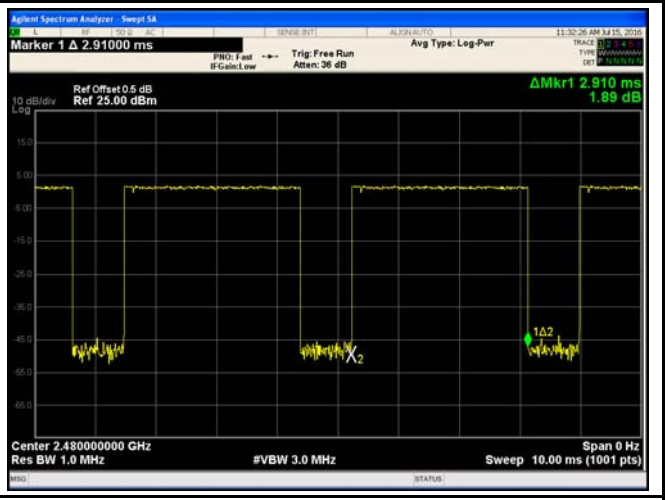
GFDK - High CH 2480



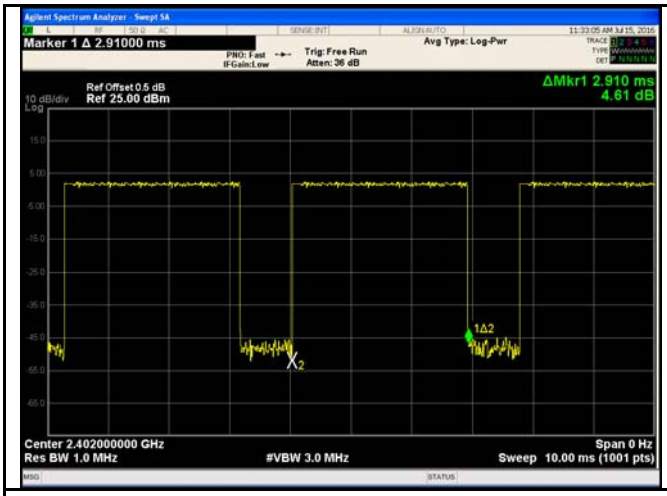
π /4 DQPSK - Low CH 2402



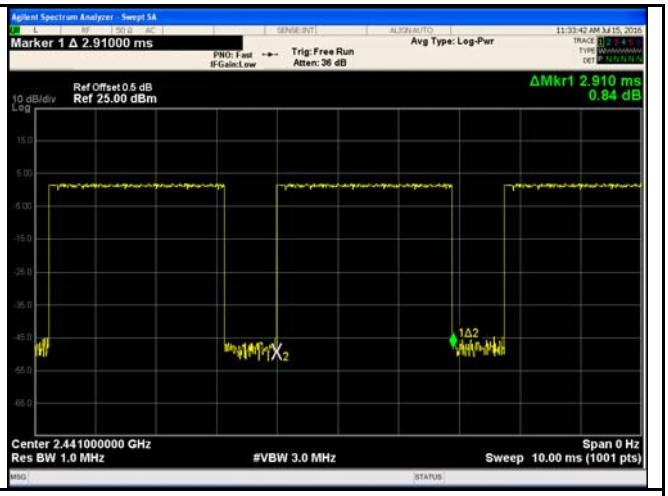
π /4 DQPSK - Mid CH 2441



π /4 DQPSK - High CH 2480



8DPSK - Low CH 2402



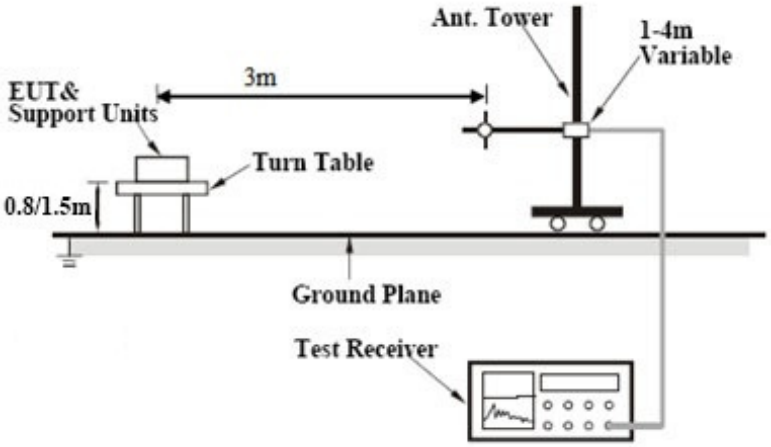
8DPSK - Mid CH 2441

8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	25℃
Relative Humidity	58%
Atmospheric Pressure	1016mbar
Test date :	July 16&18, 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.	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only - 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,		

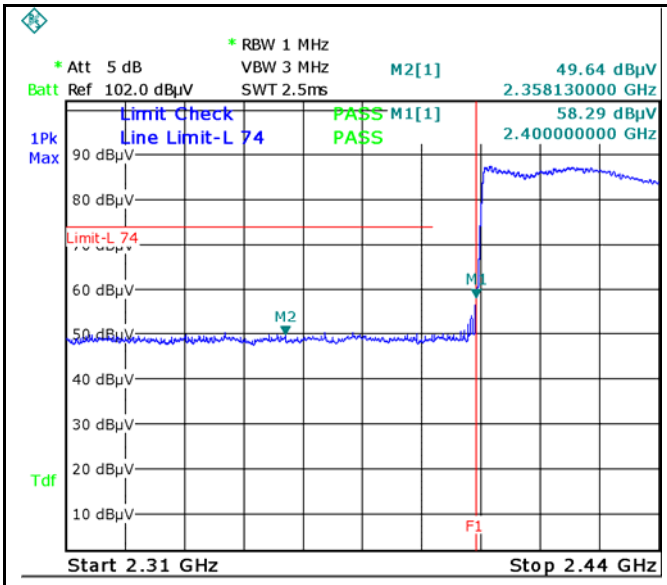
	and make sure the instrument is operated in its linear range. - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth 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	☑ Pass ☐ Fail

Test Data ☐ Yes ☑ N/A

Test Plot ☑ Yes (See below) ☐ N/A

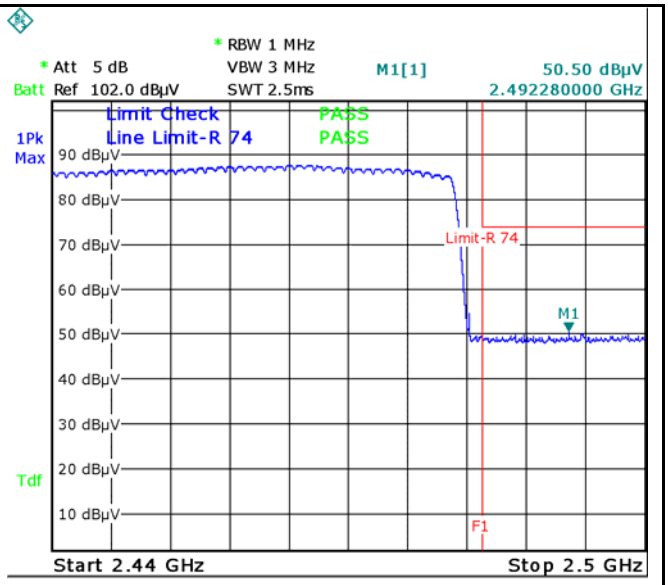
Test Plots

GFSK Mode:



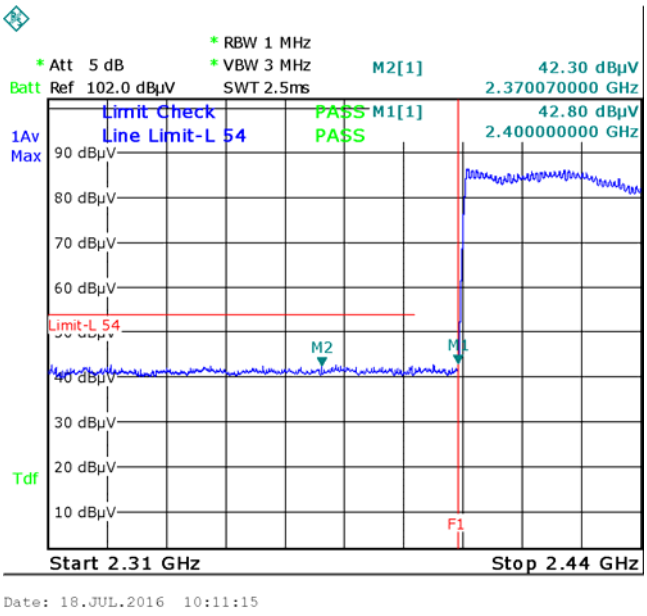
GFSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



GFSK-Hopping Right Side-PK

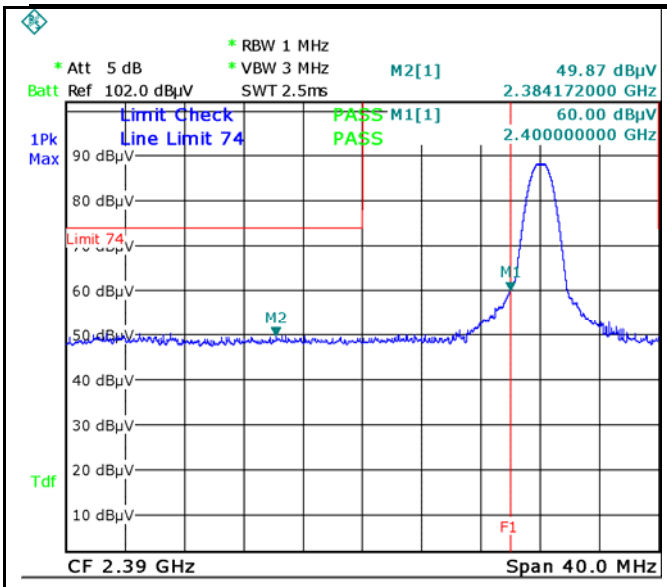
Note: F1 is frequency 2483.5MHz



GFSK-Hopping Left Side-AV

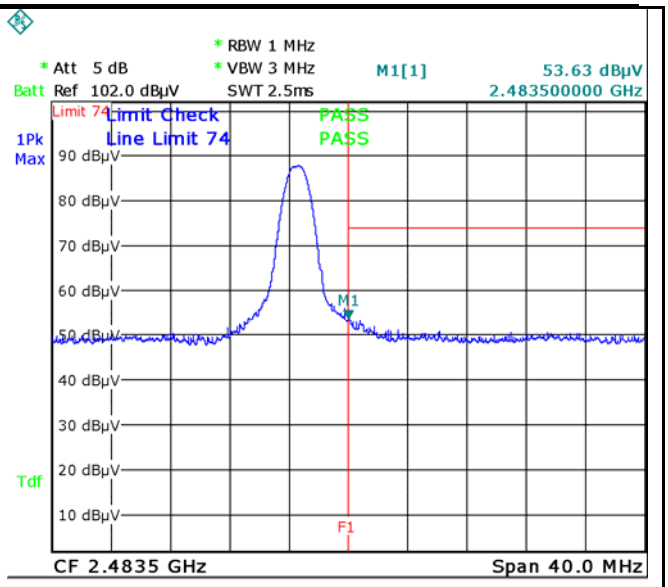
Note: (no need if PK value less than the AV limit)

GFSK-Hopping Right Side-AV



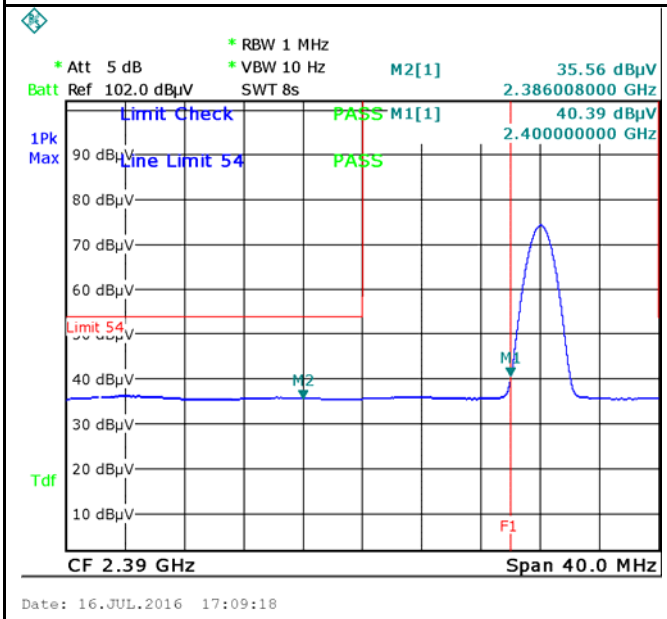
GFSK-Left Side-PK

Note: F1 is frequency 2400MHz



GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

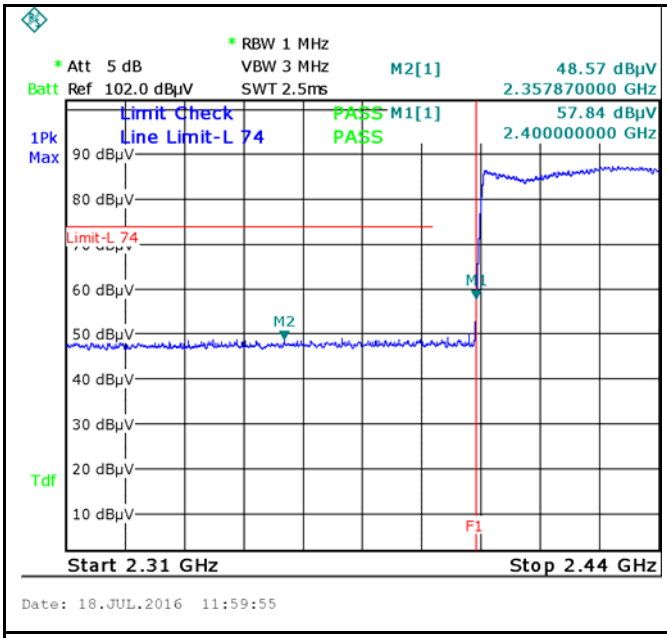


GFSK-Left Side-AV

Note: (no need if PK value less than the AV limit)

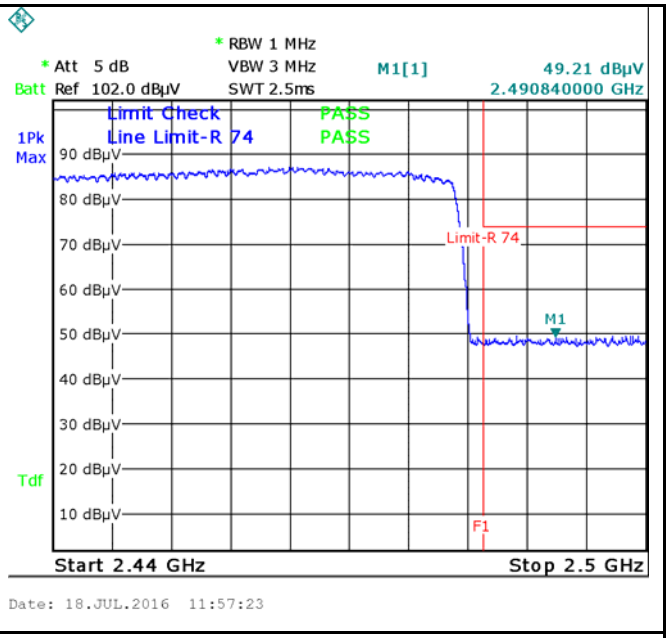
GFSK-Right Side-AV

π /4 DQPSK Mode:



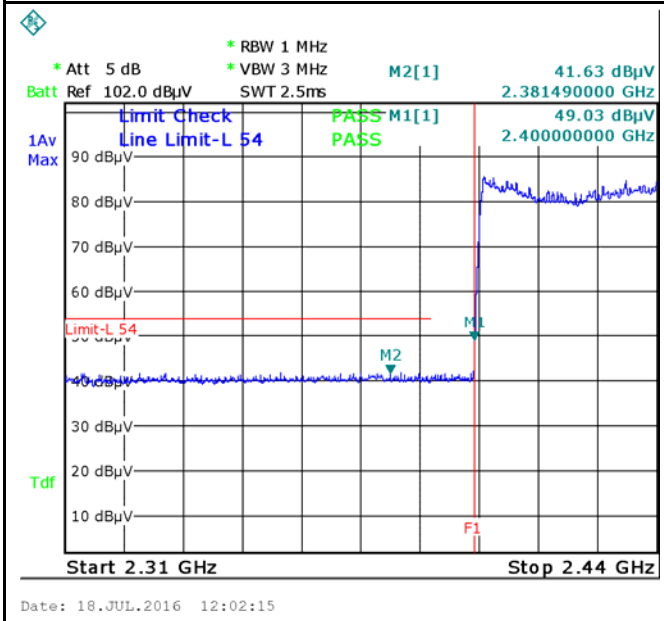
π /4 DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



π /4 DQPSK-Hopping Right Side-PK

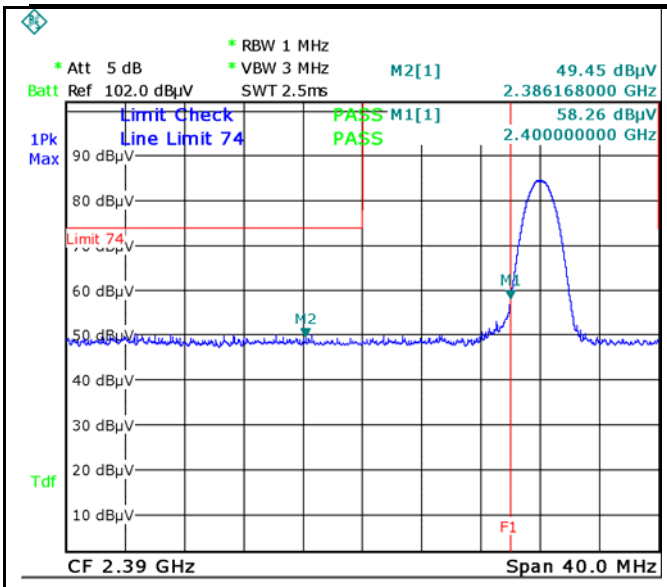
Note: F1 is frequency 2483.5MHz



π /4 DQPSK-Hopping Left-AV

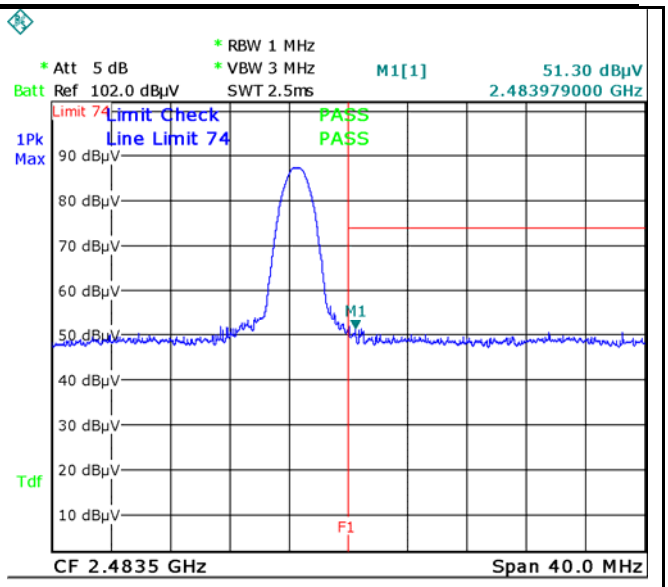
Note: (no need if PK value less than the AV limit)

π /4 DQPSK-Hopping Right-AV



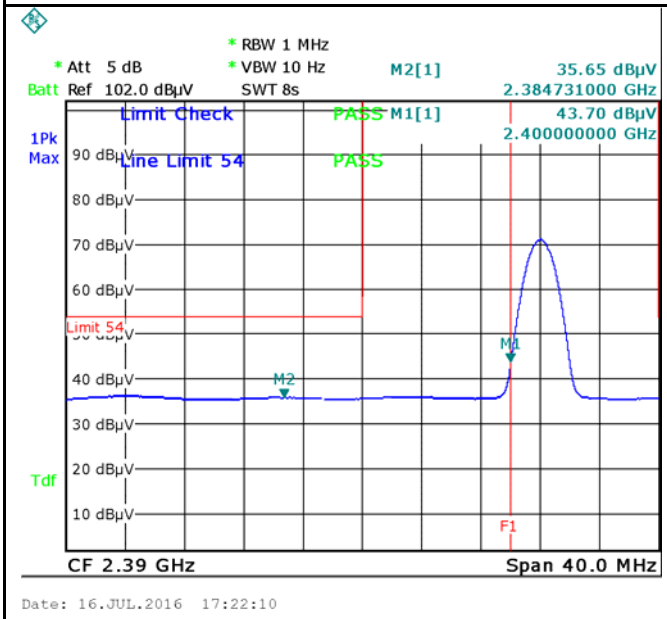
π /4 DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz



π /4 DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

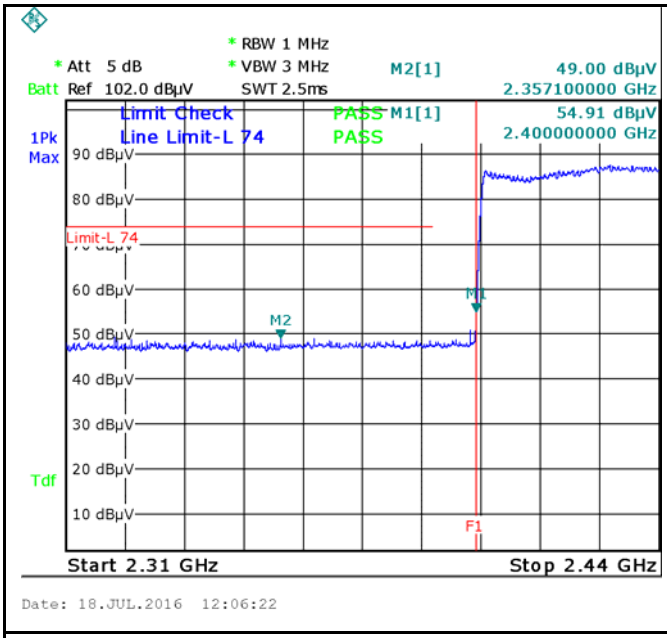


π /4 DQPSK-Left Side-AV

Note: (no need if PK value less than the AV limit)

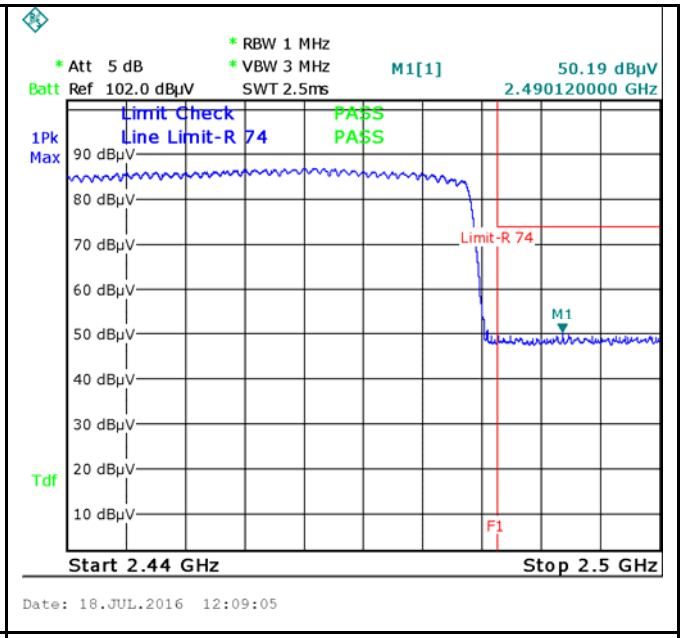
π /4 DQPSK-Right Side-AV

8-DPSK Mode:



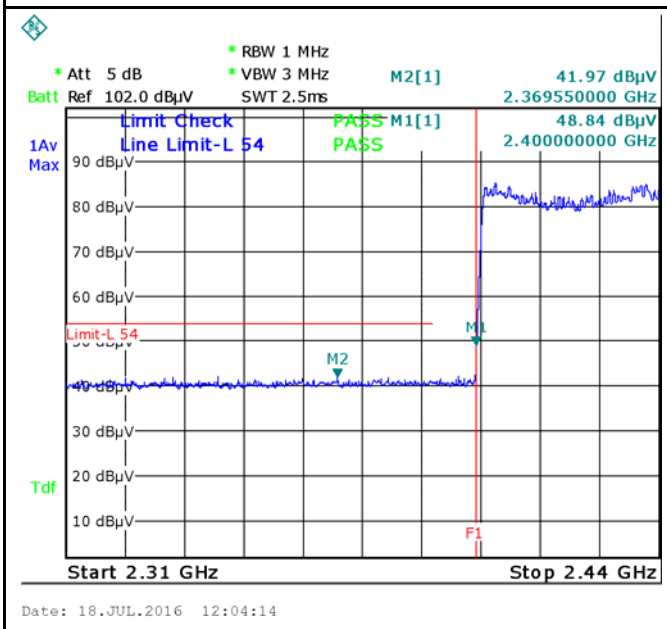
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

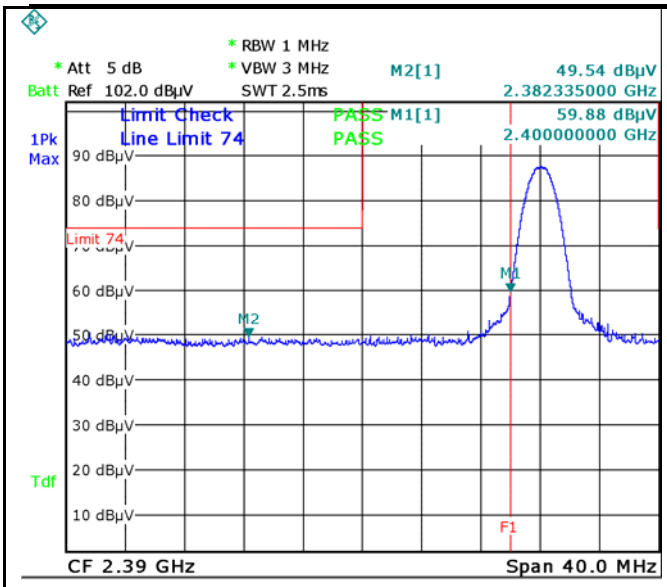
Note: F1 is frequency 2483.5MHz



8DPSK-Hopping Left-AV

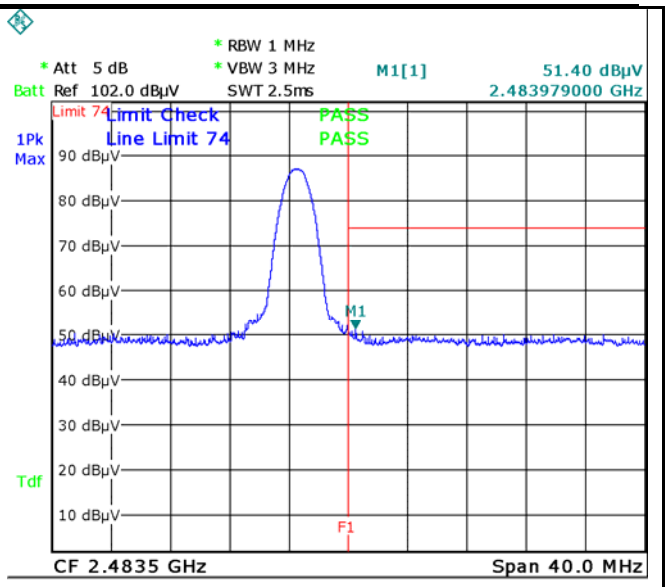
Note: (no need if PK value less than the AV limit)

8DPSK-Hopping Right-AV



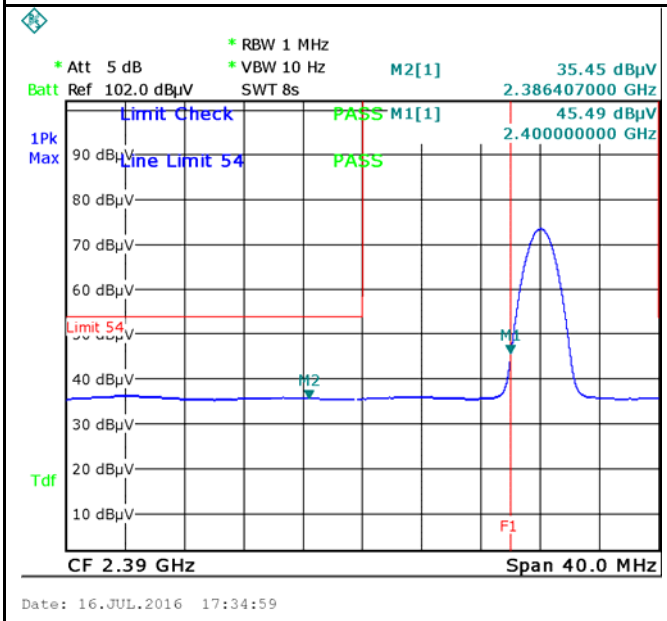
8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



8DPSK-Left Side-AV

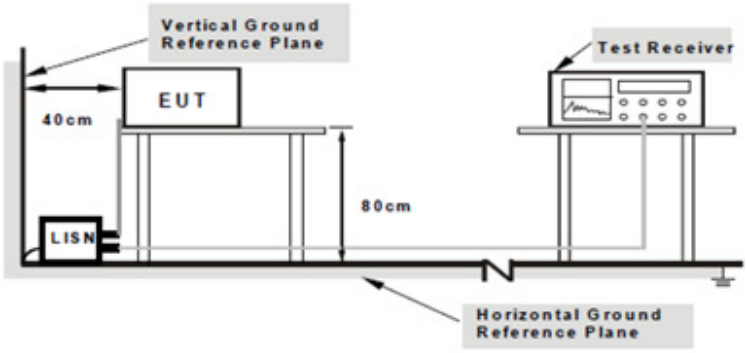
Note: (no need if PK value less than the AV limit)

8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

Temperature	23℃
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	July 18, 2016
Tested By :	Loren Luo

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207, RSS210 (A8.1)</td><td>a)</td><td>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.
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<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>
</table></td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

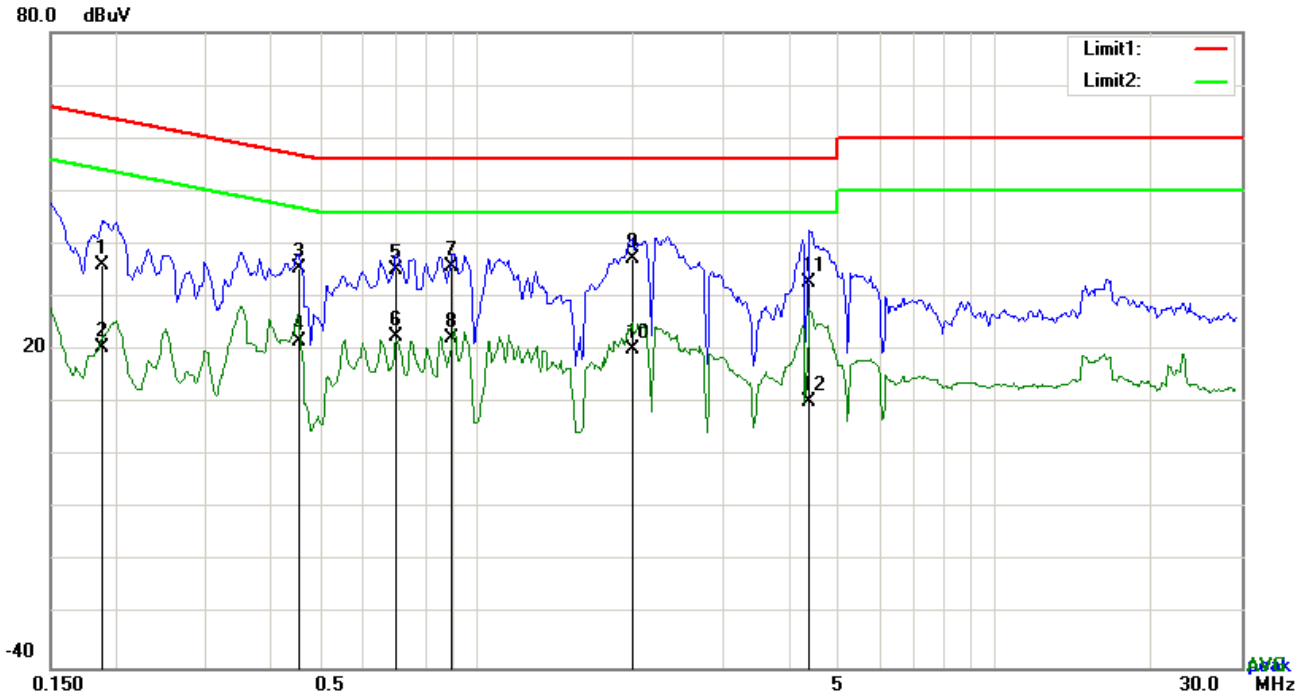
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</td></tr>
</table>

	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	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Bluetooth Mode

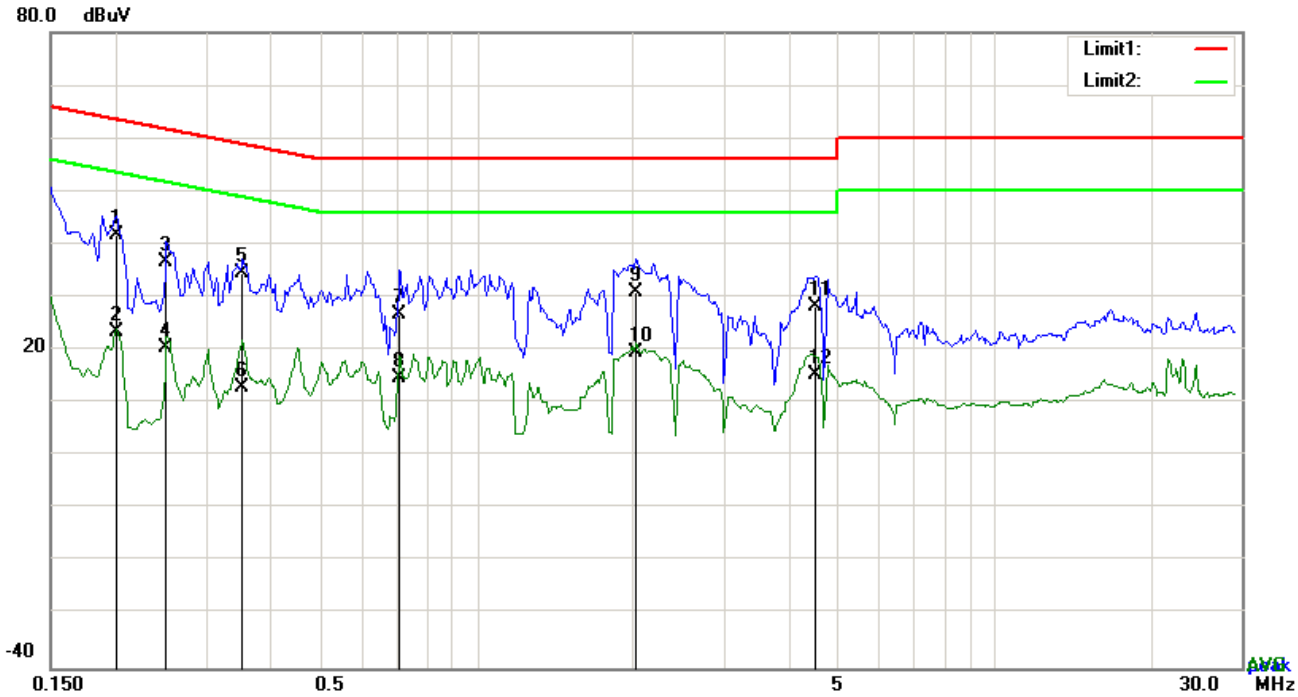


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1890	26.08	QP	10.03	36.11	64.08	-27.97
2	L1	0.1890	10.32	AVG	10.03	20.35	54.08	-33.73
3	L1	0.4542	25.30	QP	10.03	35.33	56.80	-21.47
4	L1	0.4542	11.65	AVG	10.03	21.68	46.80	-25.12
5	L1	0.6999	25.04	QP	10.03	35.07	56.00	-20.93
6	L1	0.6999	12.41	AVG	10.03	22.44	46.00	-23.56
7	L1	0.8949	25.71	QP	10.03	35.74	56.00	-20.26
8	L1	0.8949	12.09	AVG	10.03	22.12	46.00	-23.88
9	L1	1.9947	27.34	QP	10.04	37.38	56.00	-18.62
10	L1	1.9947	10.12	AVG	10.04	20.16	46.00	-25.84
11	L1	4.3884	22.76	QP	10.07	32.83	56.00	-23.17
12	L1	4.3884	0.32	AVG	10.07	10.39	46.00	-35.61

Test Mode:	Bluetooth Mode

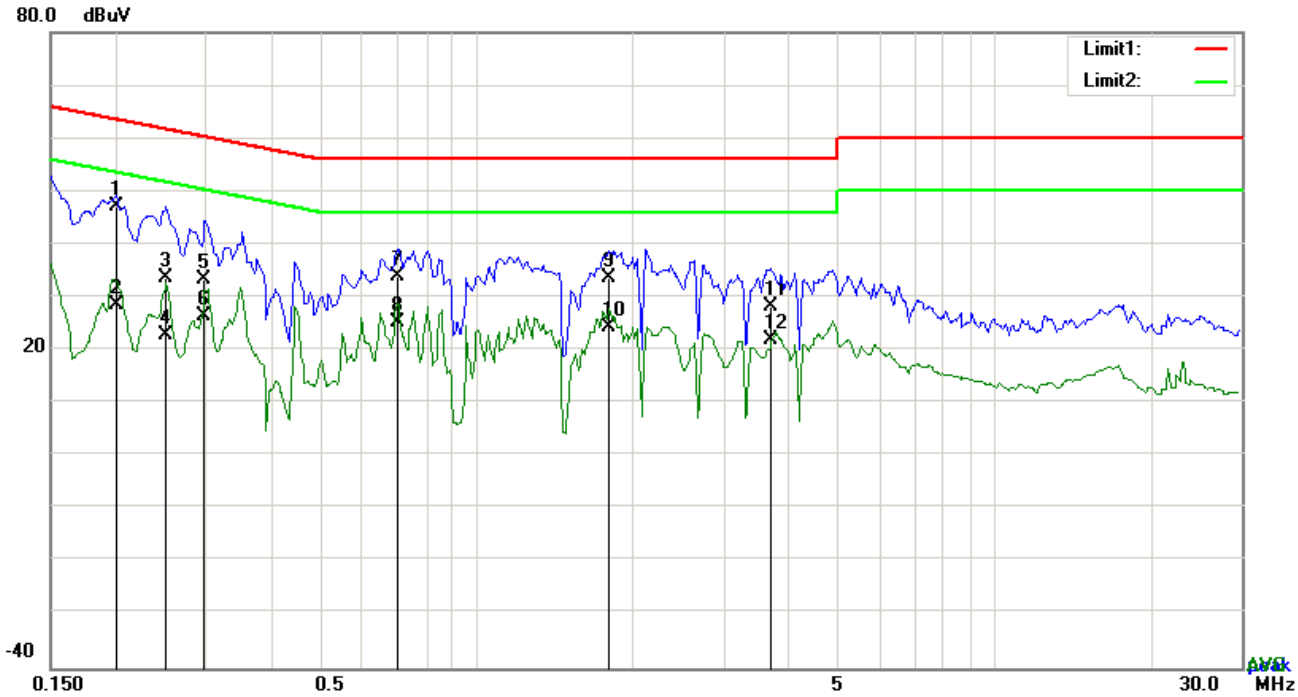


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.2007	31.82	QP	10.02	41.84	63.58	-21.74
2	N	0.2007	13.35	AVG	10.02	23.37	53.58	-30.21
3	N	0.2514	26.73	QP	10.02	36.75	61.71	-24.96
4	N	0.2514	10.52	AVG	10.02	20.54	51.71	-31.17
5	N	0.3528	24.60	QP	10.02	34.62	58.90	-24.28
6	N	0.3528	3.04	AVG	10.02	13.06	48.90	-35.84
7	N	0.7116	16.79	QP	10.02	26.81	56.00	-29.19
8	N	0.7116	4.70	AVG	10.02	14.72	46.00	-31.28
9	N	2.0298	20.78	QP	10.04	30.82	56.00	-25.18
10	N	2.0298	9.42	AVG	10.04	19.46	46.00	-26.54
11	N	4.5210	18.32	QP	10.07	28.39	56.00	-27.61
12	N	4.5210	5.19	AVG	10.07	15.26	46.00	-30.74

Test Mode:	Bluetooth Mode

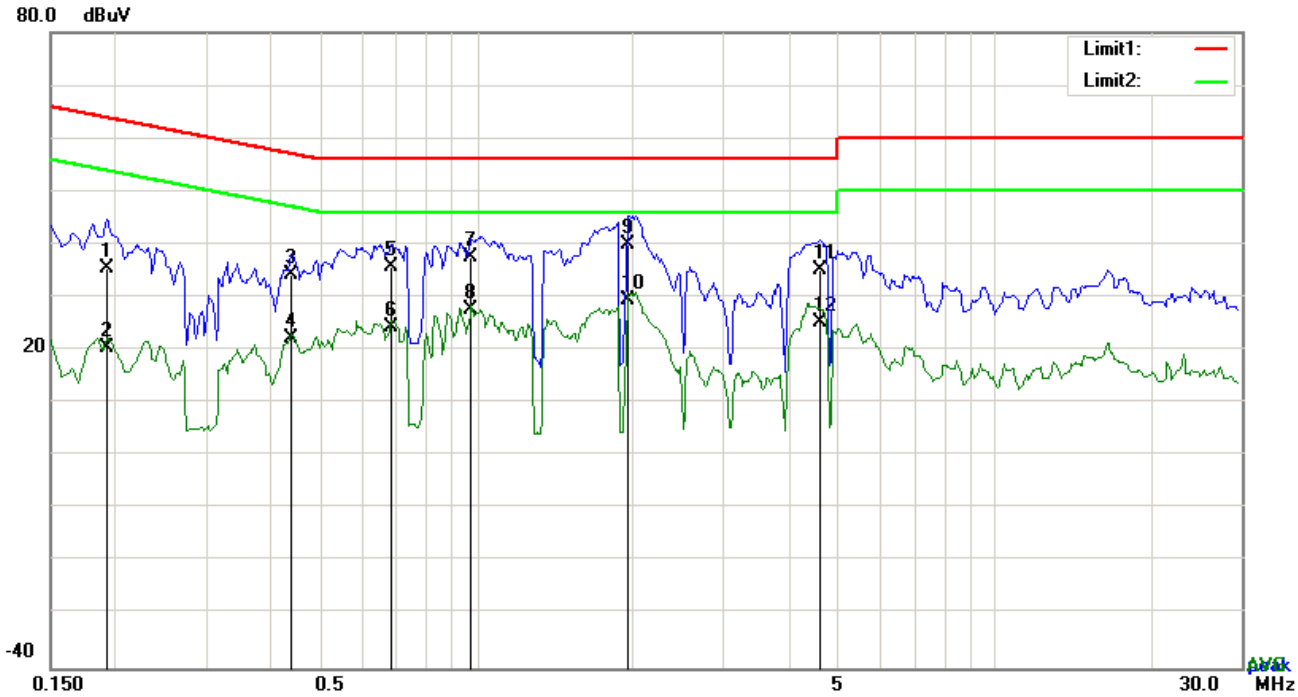


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.2007	37.18	QP	10.03	47.21	63.58	-16.37
2	L1	0.2007	18.67	AVG	10.03	28.70	53.58	-24.88
3	L1	0.2514	23.60	QP	10.03	33.63	61.71	-28.08
4	L1	0.2514	12.93	AVG	10.03	22.96	51.71	-28.75
5	L1	0.2982	23.19	QP	10.03	33.22	60.29	-27.07
6	L1	0.2982	16.36	AVG	10.03	26.39	50.29	-23.90
7	L1	0.7038	23.96	QP	10.03	33.99	56.00	-22.01
8	L1	0.7038	15.29	AVG	10.03	25.32	46.00	-20.68
9	L1	1.7997	23.76	QP	10.04	33.80	56.00	-22.20
10	L1	1.7997	14.30	AVG	10.04	24.34	46.00	-21.66
11	L1	3.6825	18.33	QP	10.06	28.39	56.00	-27.61
12	L1	3.6825	11.80	AVG	10.06	21.86	46.00	-24.14

Test Mode:	Bluetooth Mode



Test Data

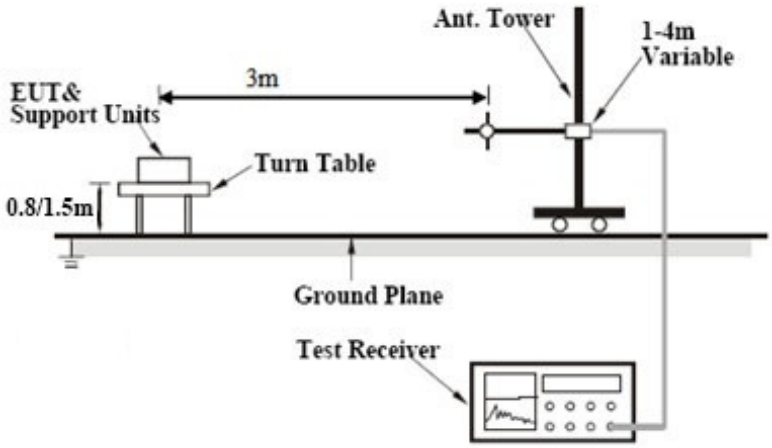
Phase Neutral Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.1929	25.33	QP	10.02	35.35	63.91	-28.56
2	N	0.1929	10.38	AVG	10.02	20.40	53.91	-33.51
3	N	0.4386	24.24	QP	10.02	34.26	57.09	-22.83
4	N	0.4386	12.26	AVG	10.02	22.28	47.09	-24.81
5	N	0.6843	25.88	QP	10.02	35.90	56.00	-20.10
6	N	0.6843	14.45	AVG	10.02	24.47	46.00	-21.53
7	N	0.9768	27.41	QP	10.03	37.44	56.00	-18.56
8	N	0.9768	17.48	AVG	10.03	27.51	46.00	-18.49
9	N	1.9518	29.91	QP	10.04	39.95	56.00	-16.05
10	N	1.9518	19.55	AVG	10.04	29.59	46.00	-16.41
11	N	4.6107	25.14	QP	10.07	35.21	56.00	-20.79
12	N	4.6107	15.17	AVG	10.07	25.24	46.00	-20.76

6.9 Radiated Spurious Emissions & Restricted Band

Temperature	23℃
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	July 18, 2016
Tested By :	Loren Luo

Requirement(s):

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

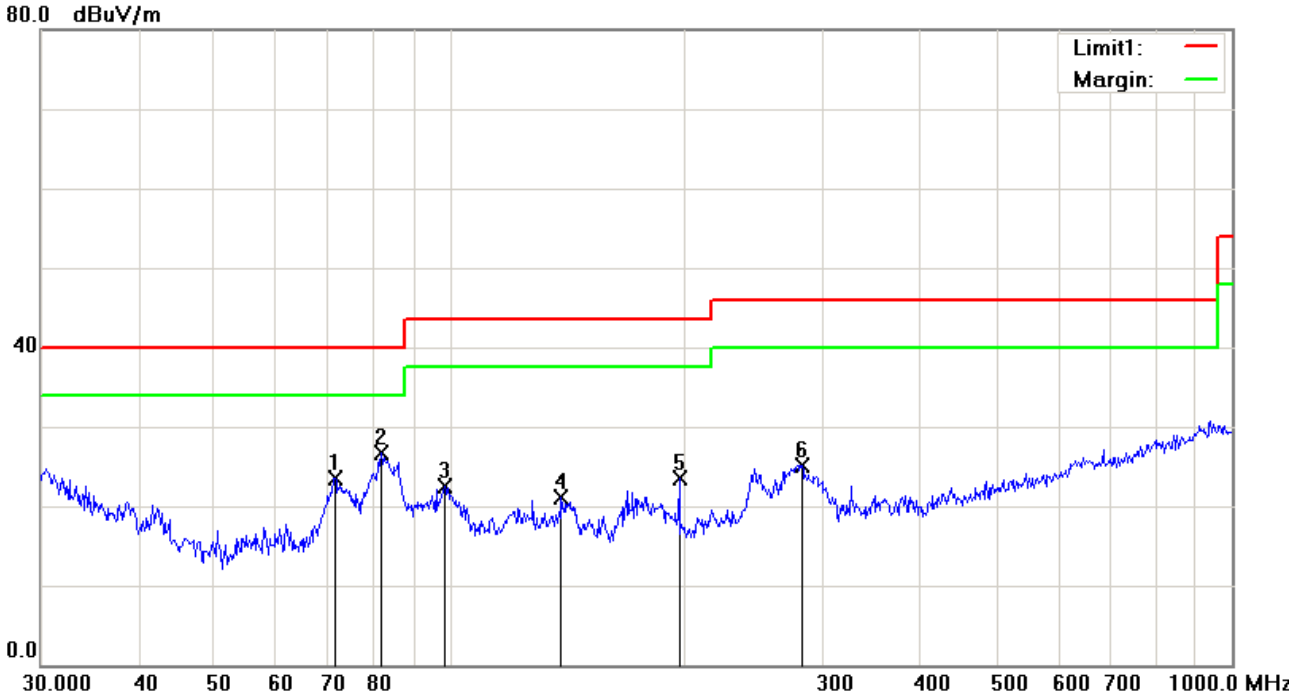
	a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 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. 5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Bluetooth Mode

Below 1GHz

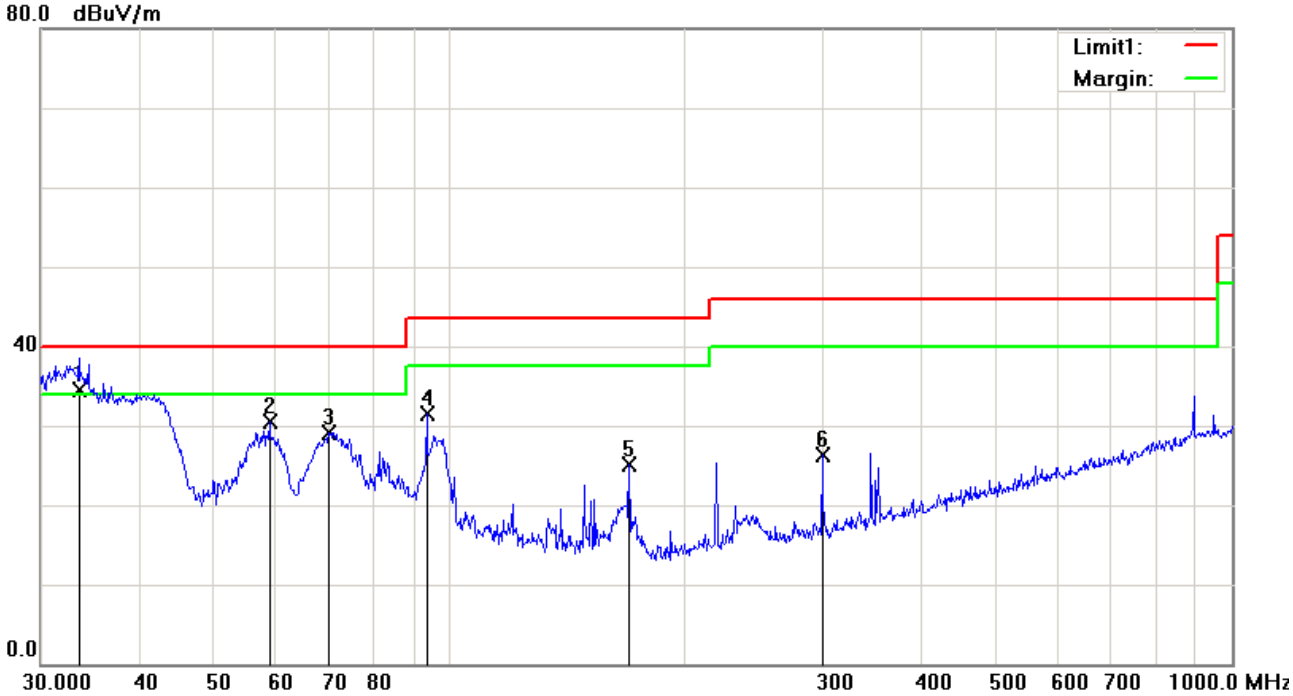


Test Data

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	71.3300	37.23	peak	-13.65	23.58	40.00	-16.42	100	192
2	H	81.7833	40.36	peak	-13.67	26.69	40.00	-13.31	100	218
3	H	98.4866	33.68	peak	-11.20	22.48	43.50	-21.02	100	214
4	H	138.8735	29.55	peak	-8.48	21.07	43.50	-22.43	100	68
5	H	196.5098	32.47	peak	-8.91	23.56	43.50	-19.94	100	128
6	H	281.9946	32.90	peak	-7.72	25.18	46.00	-20.82	100	271

Below 1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	V	33.5624	37.40	QP	-2.88	34.52	40.00	-5.48	100	55
2	V	58.8185	44.79	peak	-14.22	30.57	40.00	-9.43	100	59
3	V	70.0903	42.72	peak	-13.60	29.12	40.00	-10.88	100	18
4	V	93.4402	43.93	peak	-12.51	31.42	43.50	-12.08	100	157
5	V	169.5990	34.22	peak	-9.07	25.15	43.50	-18.35	100	145
6	V	299.3158	33.30	peak	-6.93	26.37	46.00	-19.63	100	63

Above 1GHz

Test Mode:	Transmitting Mode

Low Channel: 8-DPSK Mode (Worst Case) (2402 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4804	39.61	AV	V	33.67	6.86	32.66	47.48	54	-6.52
4804	39.34	AV	H	33.67	6.86	32.66	47.21	54	-6.79
4804	48.52	PK	V	33.67	6.86	32.66	56.39	74	-17.61
4804	48.79	PK	H	33.67	6.86	32.66	56.66	74	-17.34
17867	25.16	AV	V	45.03	11.21	32.38	49.02	54	-4.98
17867	24.91	AV	H	45.03	11.21	32.38	48.77	54	-5.23
17867	41.35	PK	V	45.03	11.21	32.38	65.21	74	-8.79
17867	41.08	PK	H	45.03	11.21	32.38	64.94	74	-9.06

Middle Channel: 8-DPSK Mode (Worst Case) (2441 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4882	39.58	AV	V	33.71	6.95	32.74	47.5	54	-6.5
4882	39.52	AV	H	33.71	6.95	32.74	47.44	54	-6.56
4882	48.37	PK	V	33.71	6.95	32.74	56.29	74	-17.71
4882	48.41	PK	H	33.71	6.95	32.74	56.33	74	-17.67
17855	25.03	AV	V	45.15	11.18	32.41	48.95	54	-5.05
17855	24.98	AV	H	45.15	11.18	32.41	48.9	54	-5.1
17855	41.22	PK	V	45.15	11.18	32.41	65.14	74	-8.86
17855	41.35	PK	H	45.15	11.18	32.41	65.27	74	-8.73

High Channel: GFSK Mode (Worst Case) (2480 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	39.84	AV	V	33.9	6.76	32.74	47.76	54	-6.24
4960	39.69	AV	H	33.9	6.76	32.74	47.61	54	-6.39
4960	48.51	PK	V	33.9	6.76	32.74	56.43	74	-17.57
4960	48.35	PK	H	33.9	6.76	32.74	56.27	74	-17.73
17862	25.17	AV	V	45.22	11.35	32.38	49.36	54	-4.64
17862	25.24	AV	H	45.22	11.35	32.38	49.43	54	-4.57
17862	41.39	PK	V	45.22	11.35	32.38	65.58	74	-8.42
17862	41.52	PK	H	45.22	11.35	32.38	65.71	74	-8.29

Note:

*1, The testing has been conformed to 10*2480MHz=24,800MHz*
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

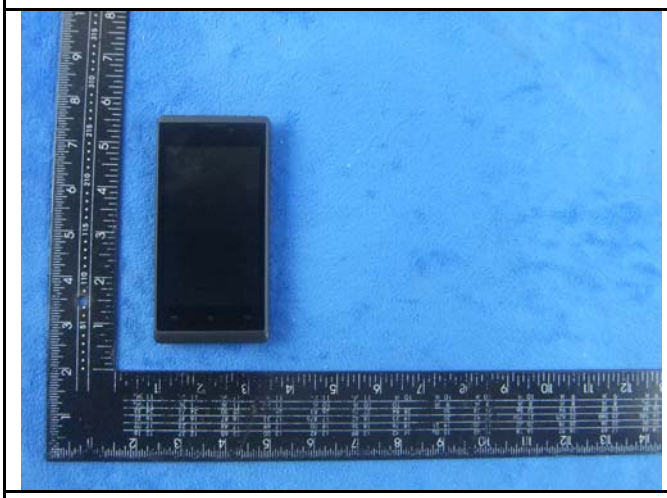
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/17/2015	09/16/2016	☑
Line Impedance	LI-125A	191106	09/25/2015	09/24/2016	☑
Line Impedance	LI-125A	191107	09/25/2015	09/24/2016	☑
LISN	ISN T800	34373	09/25/2015	09/24/2016	☑
Double Ridge Horn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

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

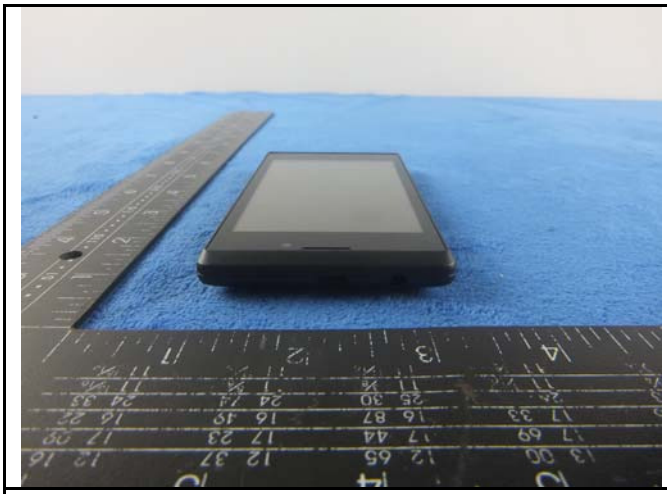
Whole Package View

Adapter - Front View

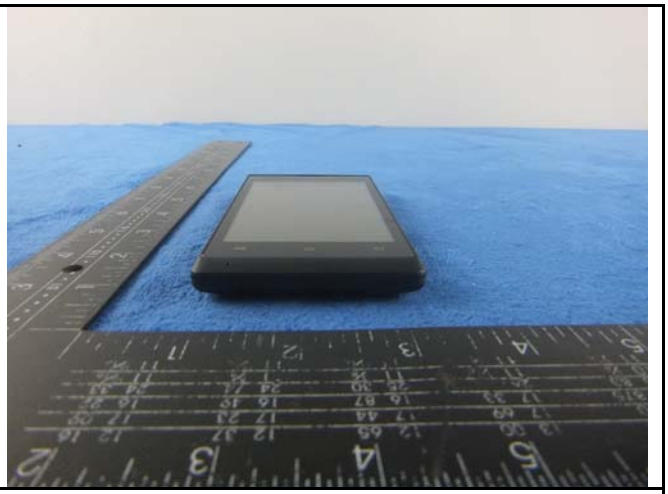


EUT - Front View

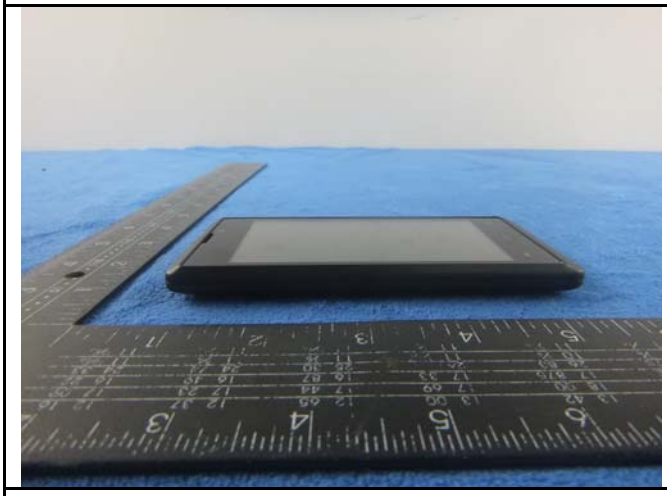
EUT - Rear View



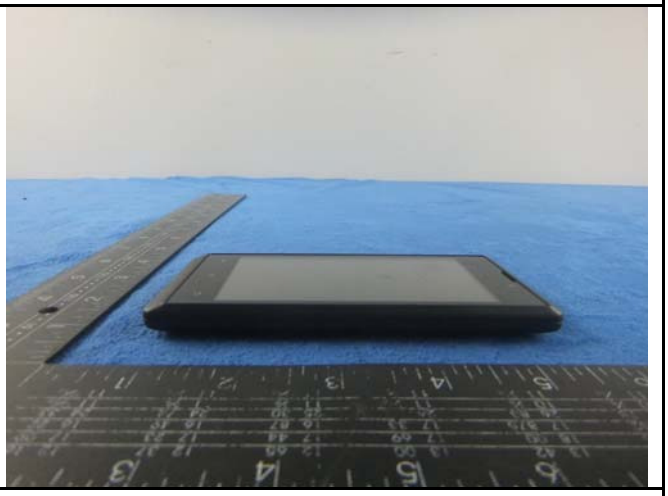
EUT - Top View



EUT - Bottom View



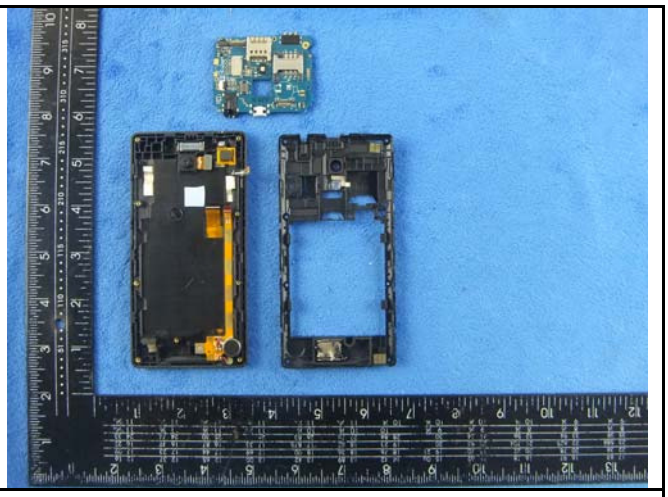
EUT - Left View



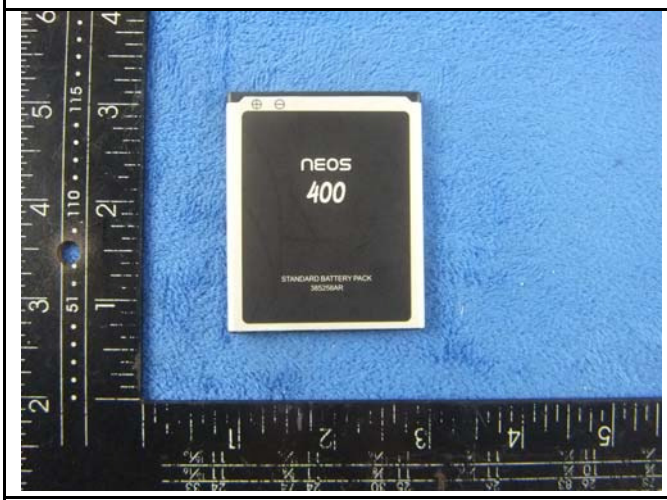
EUT - Right View

Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View 1

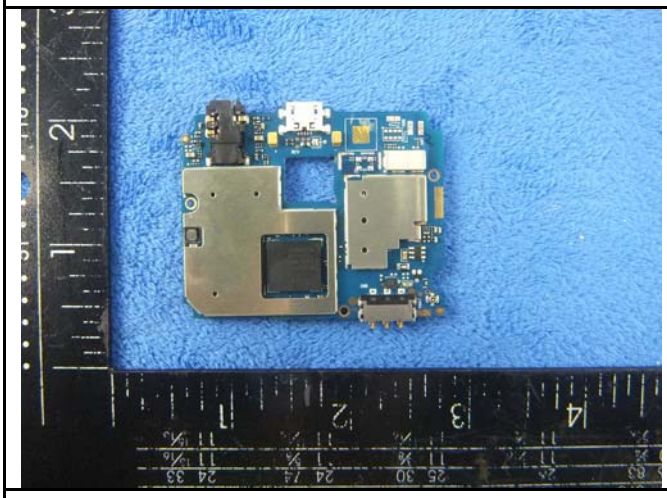


Cover Off - Top View 2

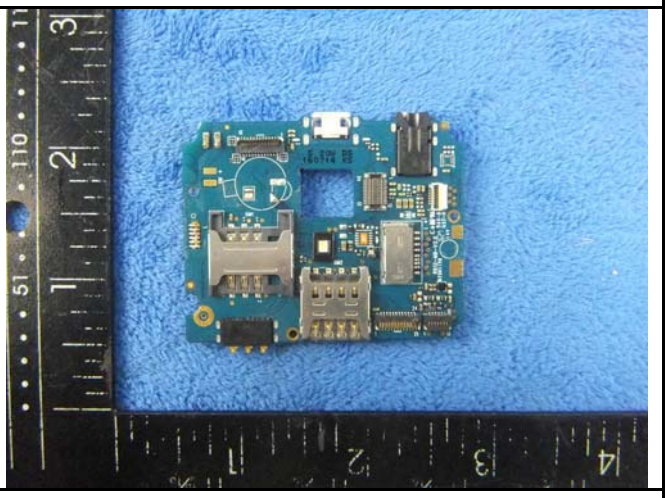


Battery - Front View

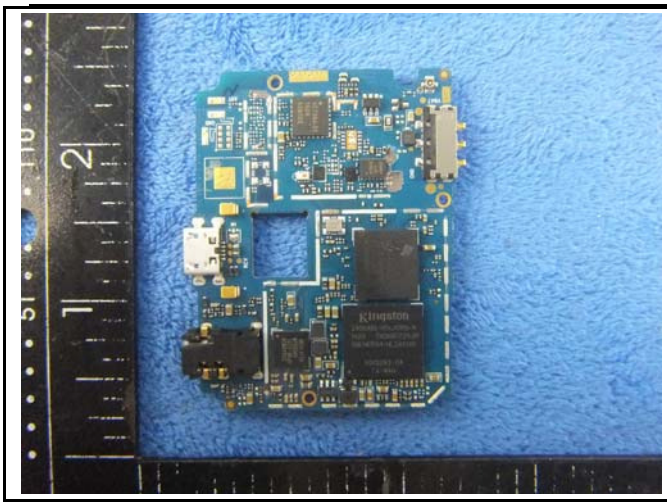
Battery - Rear View



Mainboard with Shielding - Front View

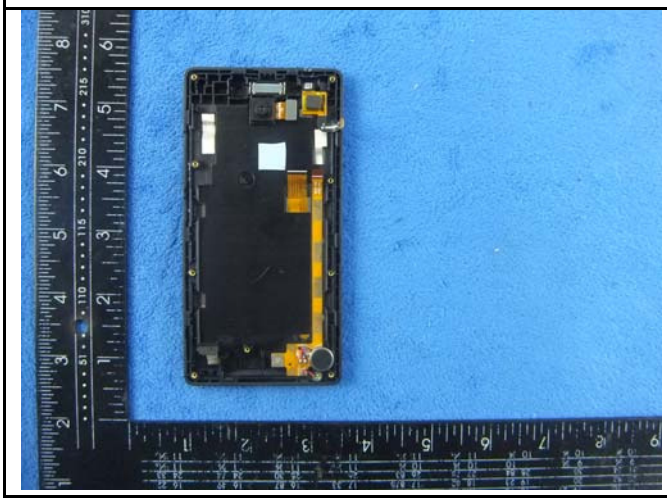


Mainboard without Shielding - Front View



Mainboard - Rear View

LCD – Front View



LCD – Rear View

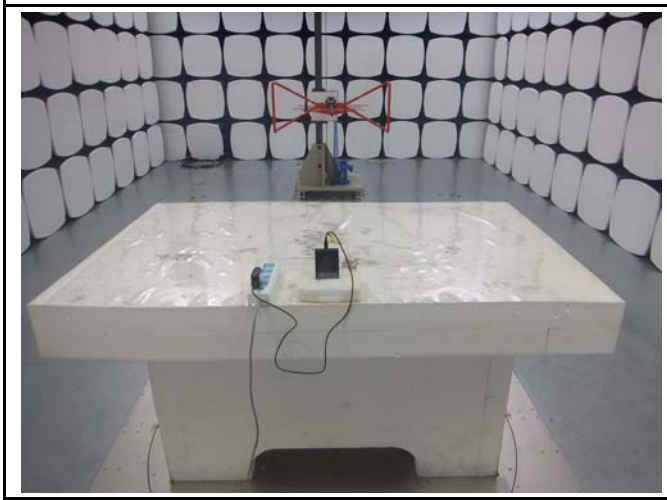
GSM/PCS/UMTS-FDD Antenna View

WIFI/BT/BLE/GPS - Antenna View

Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup Front View

Conducted Emissions Test Setup Side View



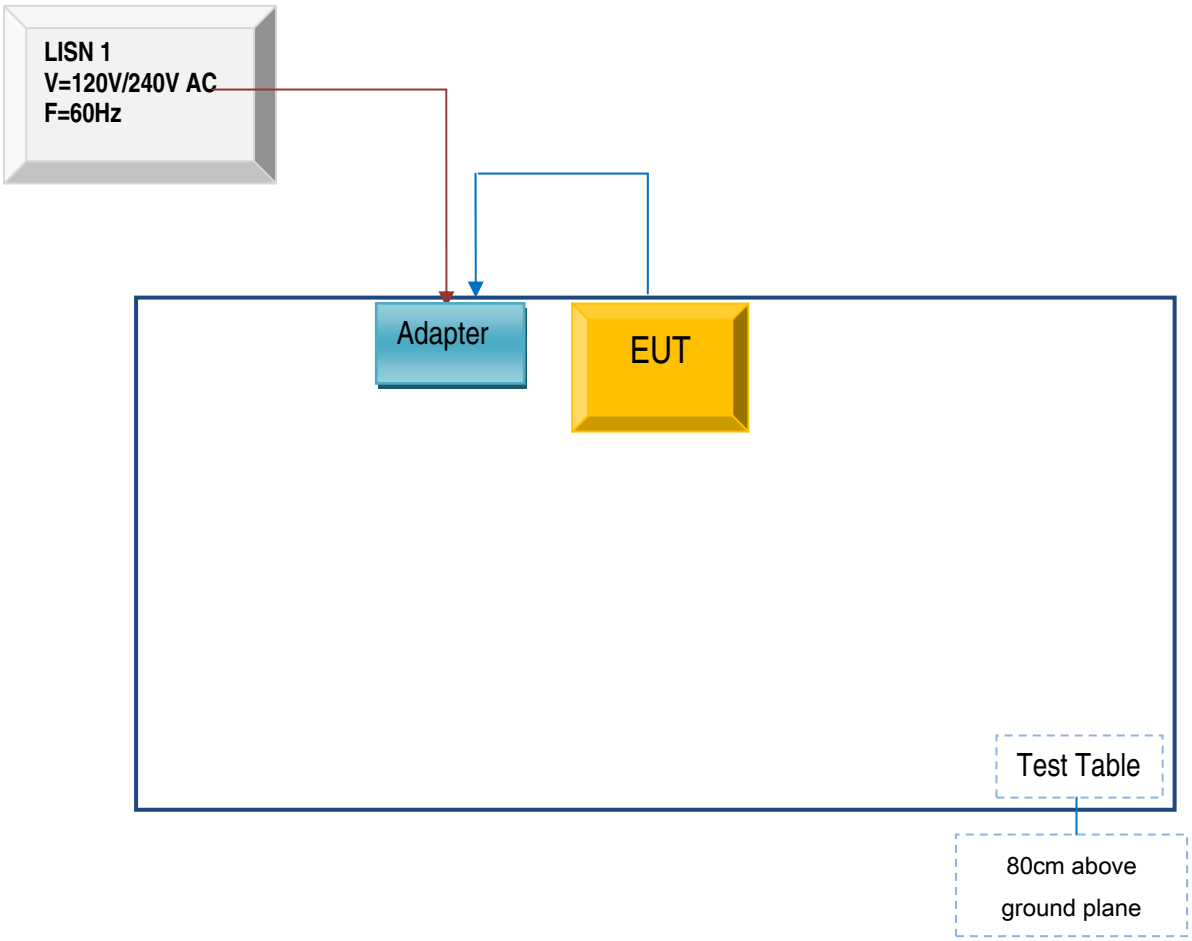
Radiated Spurious Emissions Test Setup Below 1GHz

Radiated Spurious Emissions Test Setup Above 1GHz

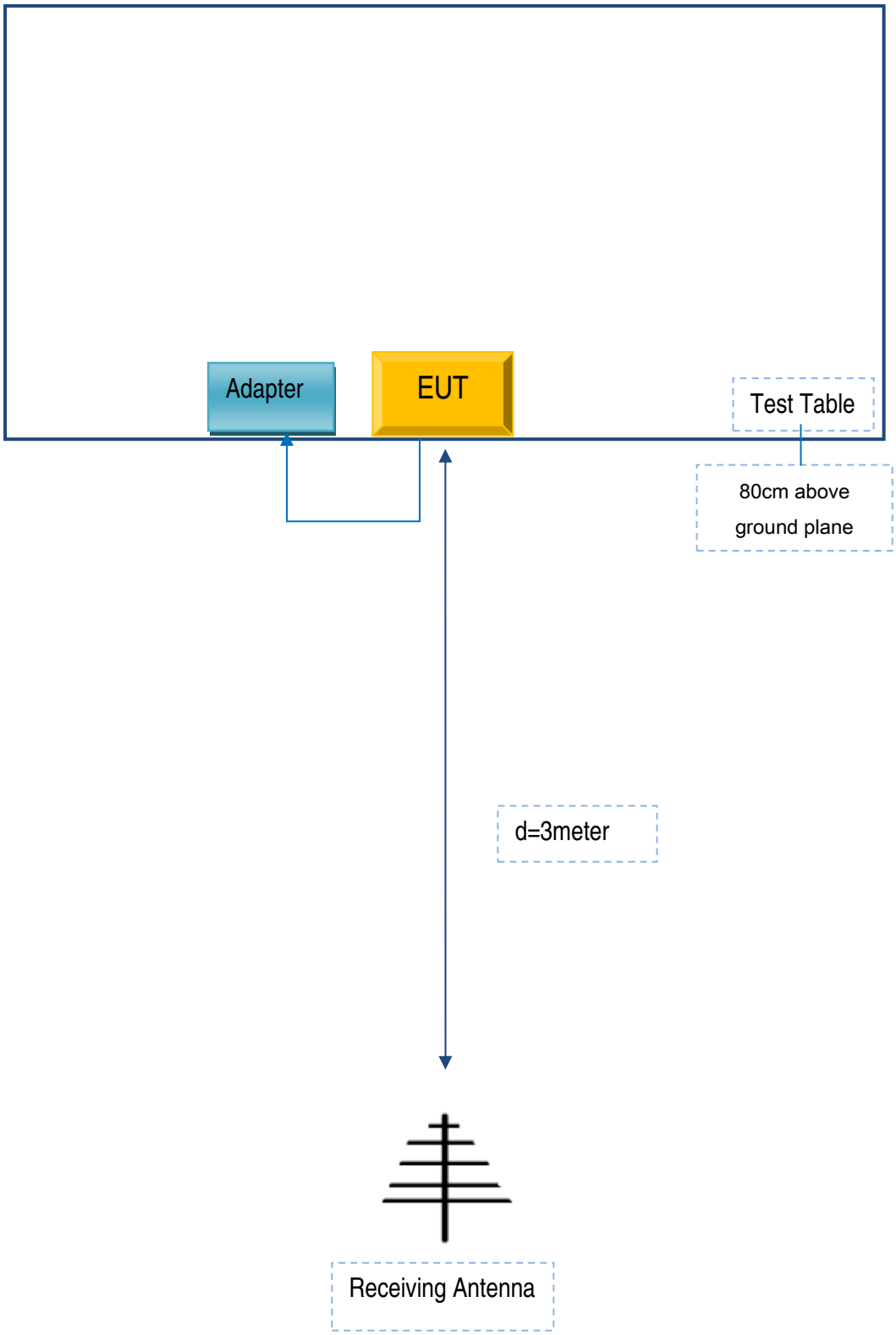
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

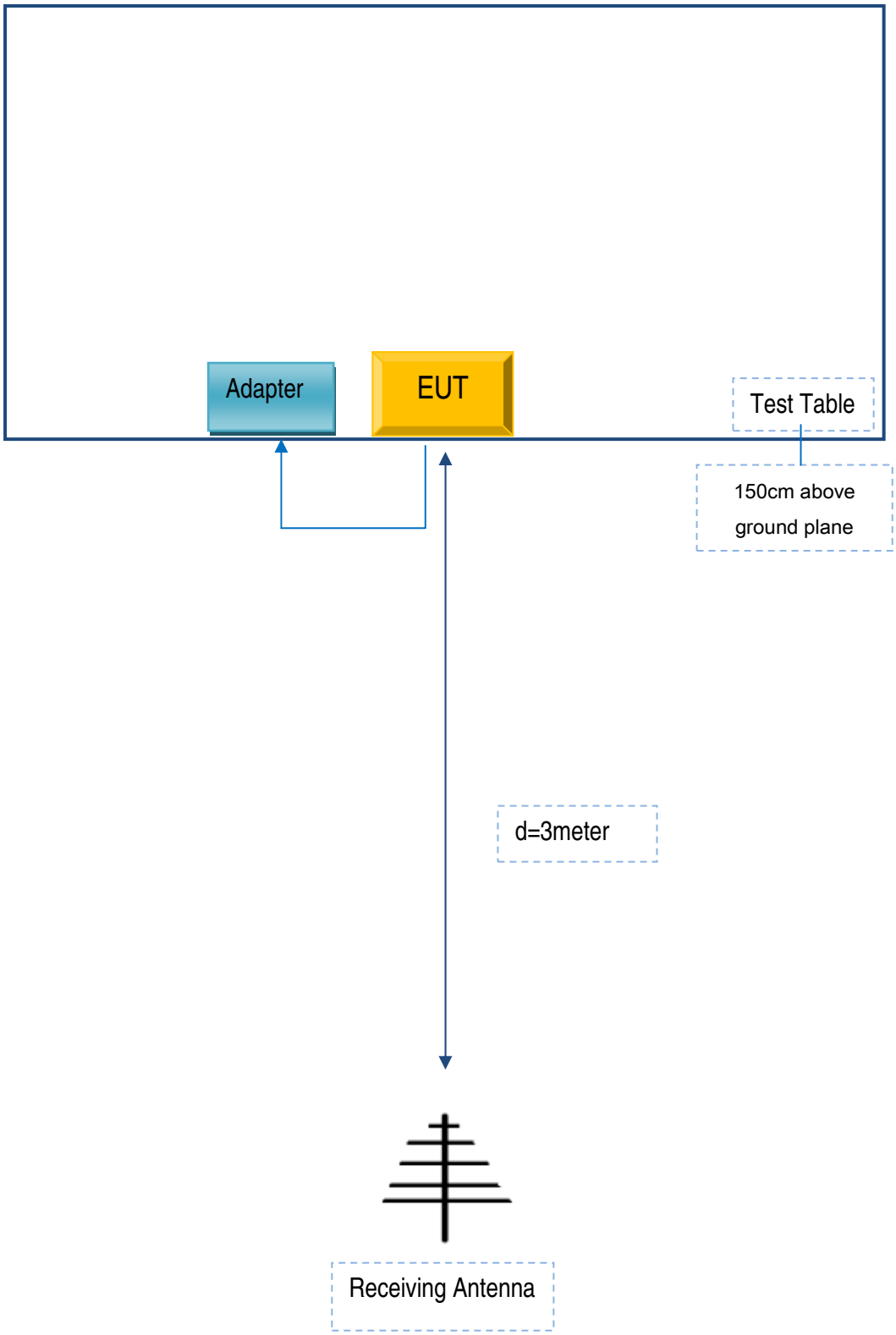
Block Configuration Diagram for AC Line Conducted Emissions



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



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



Annex C. il. 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
SHENZHEN TIANYIN ELECTRONICS CO., LTD.	Adapter	TPA - 90C050050UU	S201183

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	S201183

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

Please see the attachment

Annex E. DECLARATION OF SIMILARITY

N/A