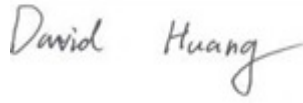


RF TEST REPORT



Report No.: 16071468-FCC-R2

Supersede Report No.: N/A

Applicant	Verykool USA Inc	
Product Name	Mobile Phone	
Model No.	s5035	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	December 23, 2016 to January 09, 2017	
Issue Date	January 10, 2017	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification	☒	
Equipment did not comply with the specification	☐	
		
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

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

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

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

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
16071468-FCC-R2	NONE	Original	January 10, 2017

2. Customer information

Applicant Name	Verykool USA Inc
Applicant Add	3636 Nobel Drive, Suite 325, San Diego, California 92122 United States
Manufacturer	HUAWO TECHNOLOGY LIMITED
Manufacturer Add	3 floor west, B building, New world shopping plaza, Gushu 2nd road, Xixiang street, Baoan District, Shenzhen , China

3. Test site information

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

4. Equipment under Test (EUT) Information

Description of EUT:	Mobile Phone
Main Model:	s5035
Serial Model:	N/A
Date EUT received:	December 22, 2016
Test Date(s):	December 23, 2016 to January 09, 2017
Equipment Category :	DSS
Antenna Gain:	GSM850: -0.6dBi PCS1900: -0.9dBi UMTS-FDD Band V: -0.6dBi UMTS-FDD Band IV: -1.2dBi UMTS-FDD Band II: -1.1dBi WIFI: -1.2dBi Bluetooth/BLE:-1.2dBi GPS: -1.1dBi
Antenna Type:	PIFA 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

	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 IV TX:1712.4 ~ 1752.6 MHz;
	RX : 2112.4 ~ 2152.6 MHz
RF Operating Frequency (ies):	UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz;
	RX: 1932.4 ~ 1987.6 MHz
	WIFI: 802.11b/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:	3.647dBm
	GSM 850: 124CH
	PCS1900: 299CH
	UMTS-FDD Band V: 102CH
	UMTS-FDD Band IV: 202CH
Number of Channels:	UMTS-FDD Band II: 277CH
	WIFI :802.11b/g/n(20M): 11CH
	WIFI :802.11n(40M): 7CH
	Bluetooth: 79CH
	BLE: 40CH
	GPS:1CH
Port:	USB Port, Earphone Port
	Adapter:
	Model: QU050100
	Input: AC100-240V~50/60Hz,0.2A
Input Power:	Output: DC 5.0V,1000mA
	Battery:
	Model:316083
	Spec: 3.8V,2050mAh,7.79Wh
	Limited charger voltage: 4.35V
Trade Name :	verykool
GPRS/EGPRS Multi-slot class	8/10/12

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FCC ID:

WA6S5035

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/GPS, the gain is -1.2dBi for Bluetooth/BLE, the gain is -1.2dBi for WIFI, the gain is -1.1dBi for GPS.

A permanently attached PIFA antenna for GSM/PCS/UMTS, the gain is -0.6dBi for GSM850, -0.9dBi for PCS1900, -0.6dBi for UMTS-FDD Band V, -1.2dBi for UMTS-FDD Band IV, -1.1dBi for UMTS-FDD Band II.

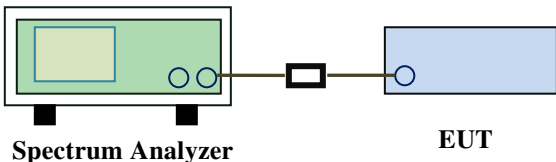
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	22°C
Relative Humidity	51%
Atmospheric Pressure	1001mbar
Test date :	December 26, 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	 Spectrum Analyzer EUT		
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

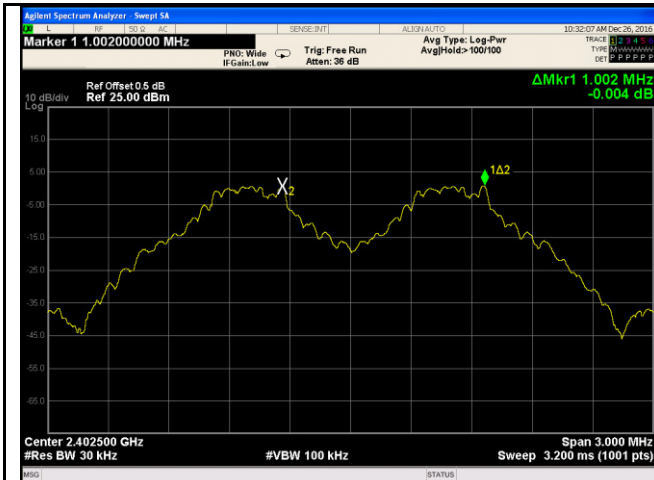
Test Plot ☒ Yes (See below) ☐ N/A

Channel Separation measurement result

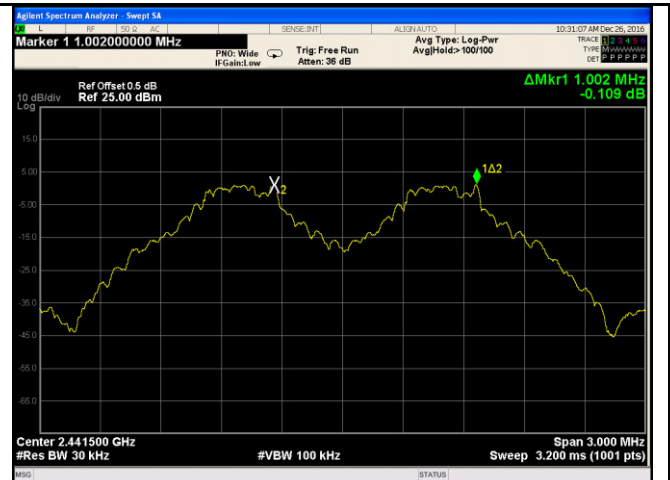
Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.694	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.689	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.694	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.002	0.857	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.857	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.857	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.855	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.856	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.857	Pass
	Adjacency Channel	2479			

Test Plots

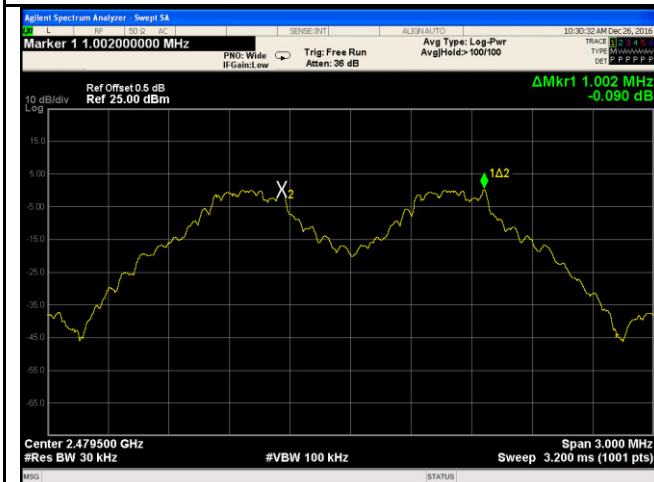
Channel Separation measurement result



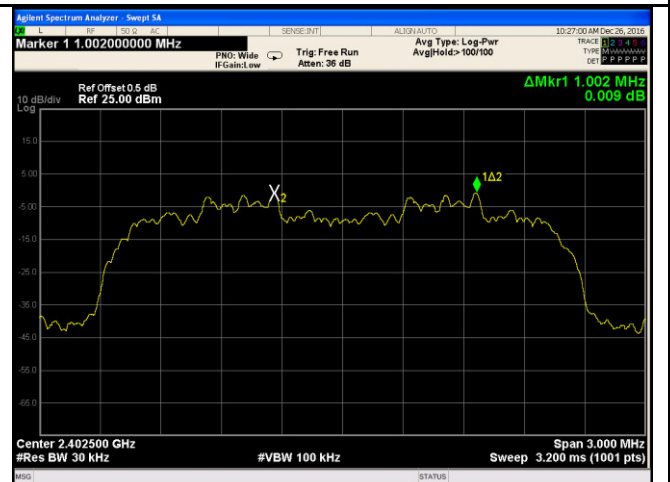
GFSK - Low Channel



GFSK - Middle Channel



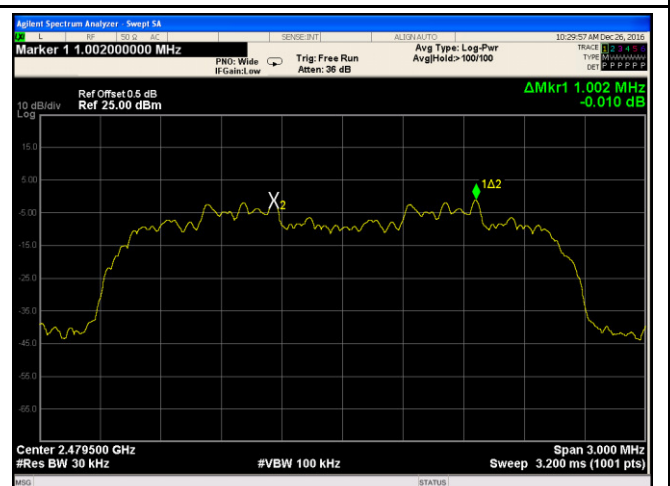
GFSK - High Channel



$\pi/4$ DPSK - Low Channel



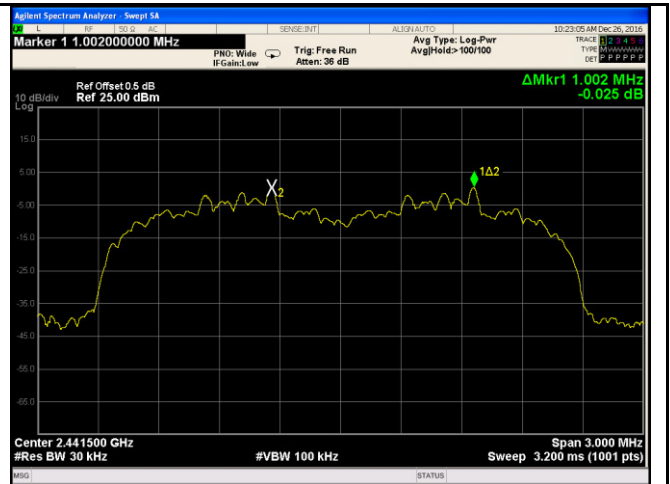
$\pi/4$ DQPSK - Middle Channel



$\pi/4$ DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel

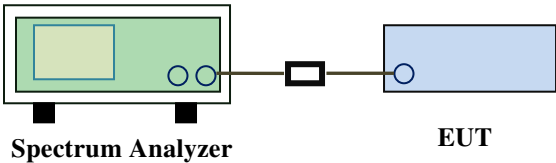


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	22°C
Relative Humidity	51%
Atmospheric Pressure	1001mbar
Test date :	December 26, 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	 Spectrum Analyzer EUT		
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 $\geq$ 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		

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	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

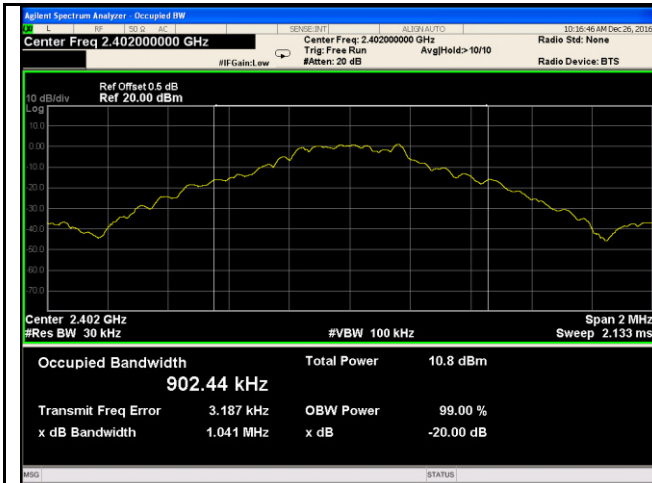
Test Plot ☒ Yes (See below) ☐ N/A

Measurement result

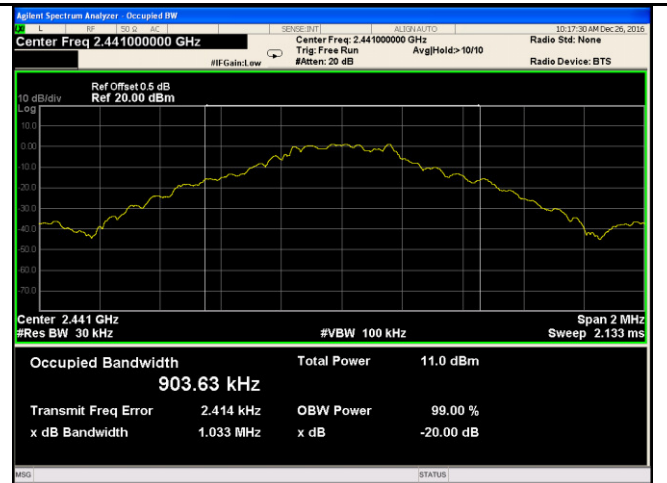
Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	1.041	0.9024
	Mid	2441	1.033	0.9036
	High	2480	1.041	0.9074
$\pi/4$ DQPSK	Low	2402	1.286	1.1673
	Mid	2441	1.286	1.1706
	High	2480	1.286	1.1666
8-DPSK	Low	2402	1.283	1.1672
	Mid	2441	1.284	1.1653
	High	2480	1.285	1.1662

Test Plots

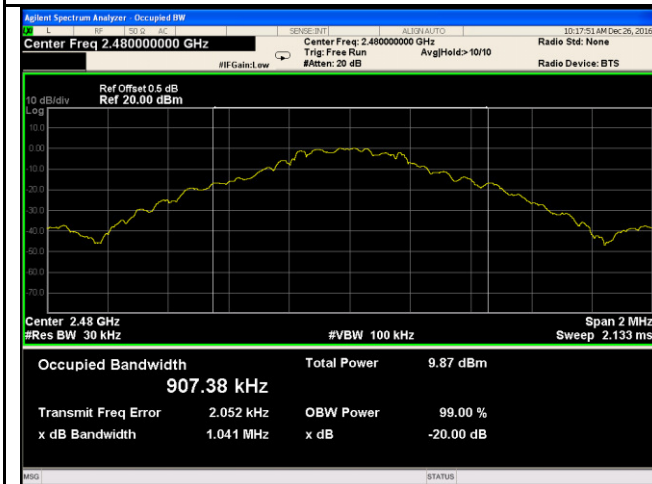
20dB Bandwidth measurement result



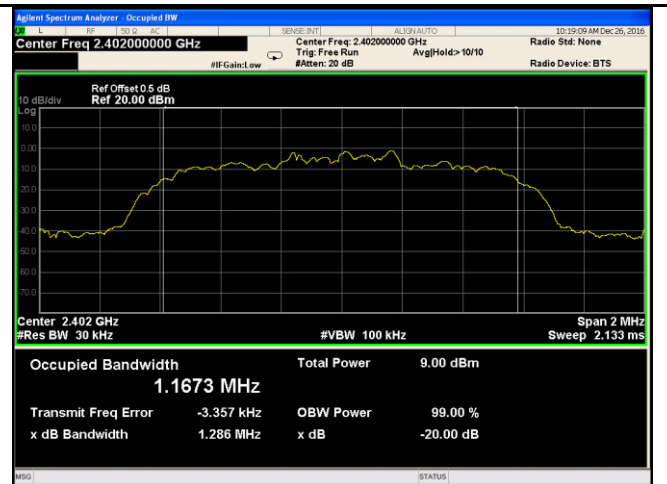
GFSK - Low Channel



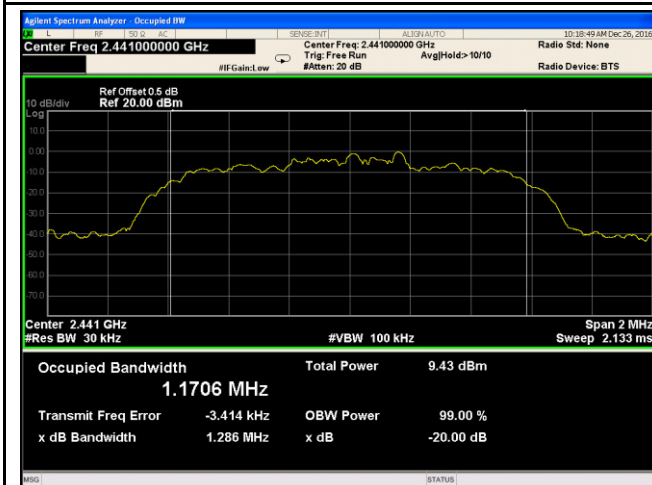
GFSK - Middle Channel



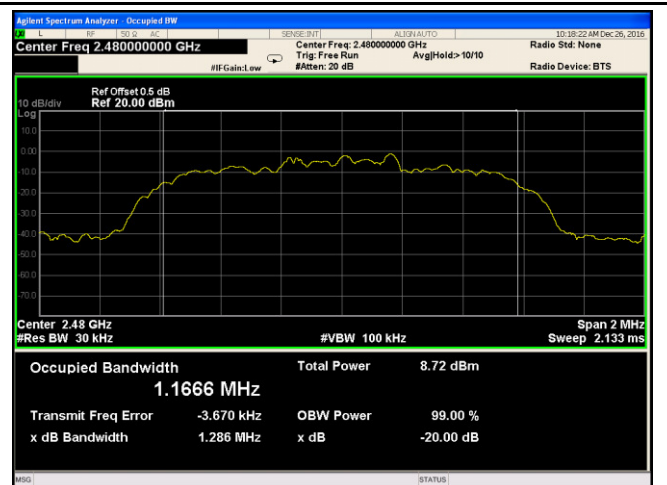
GFSK - High Channel



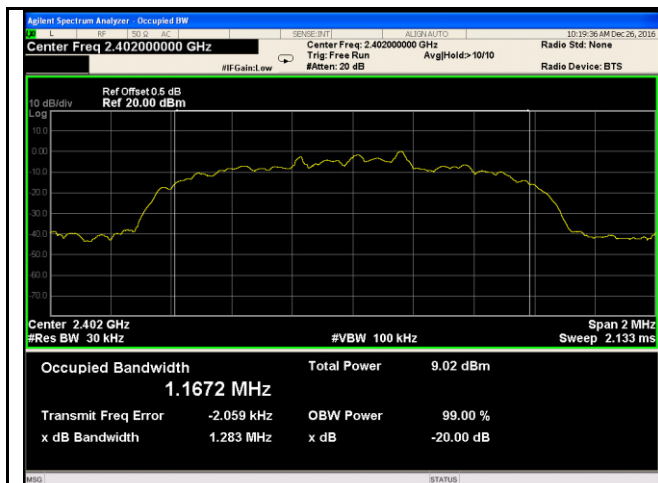
$\pi/4$ DPSK - Low Channel



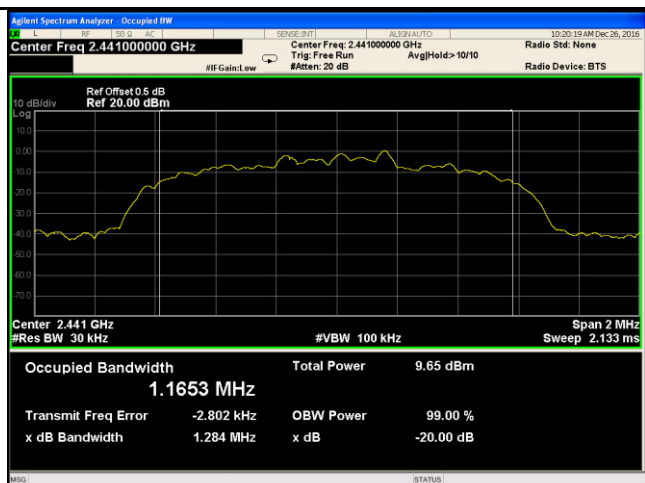
$\pi/4$ DQPSK - Middle Channel



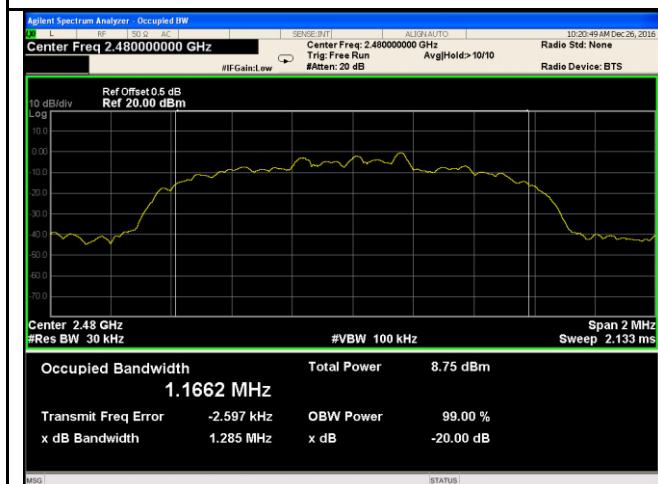
$\pi/4$ DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel



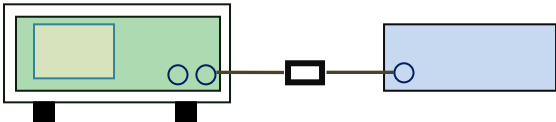
8DPSK - High Channel

6.4 Peak Output Power

Temperature	22°C
Relative Humidity	51%
Atmospheric Pressure	1001mbar
Test date :	December 26, 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	 Spectrum Analyzer EUT
------------	--

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 $\geq$ 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

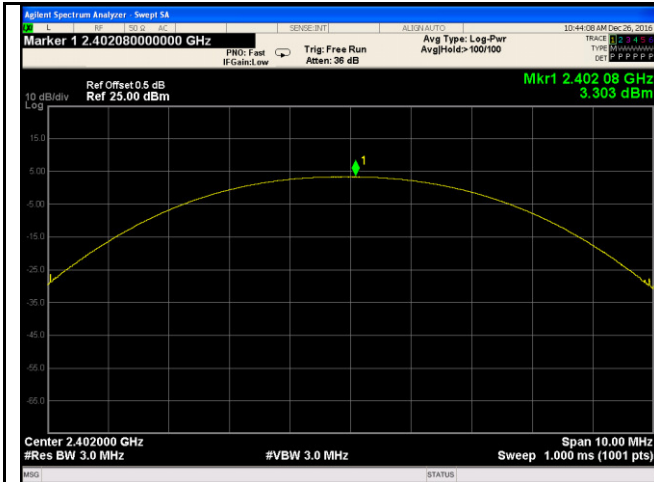
Test Plot ☒ Yes (See below) ☐ N/A

Peak Output Power measurement result

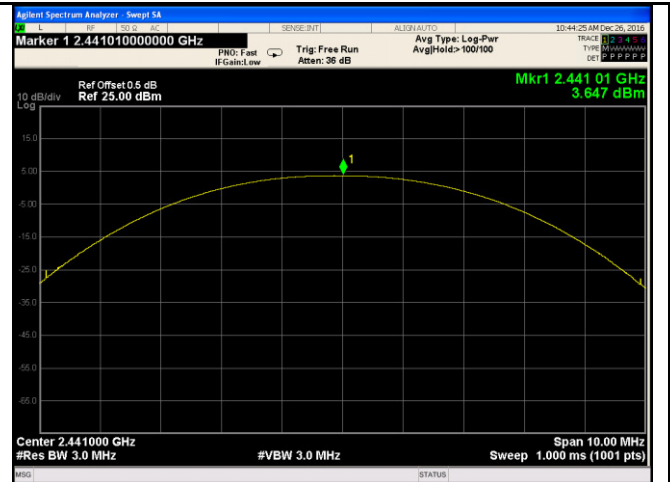
Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	3.303	125	Pass
		Mid	2441	3.647	125	Pass
		High	2480	2.779	125	Pass
	$\pi/4$ DQPSK	Low	2402	3.161	125	Pass
		Mid	2441	3.583	125	Pass
		High	2480	2.660	125	Pass
	8-DPSK	Low	2402	3.179	125	Pass
		Mid	2441	3.567	125	Pass
		High	2480	2.700	125	Pass

Test Plots

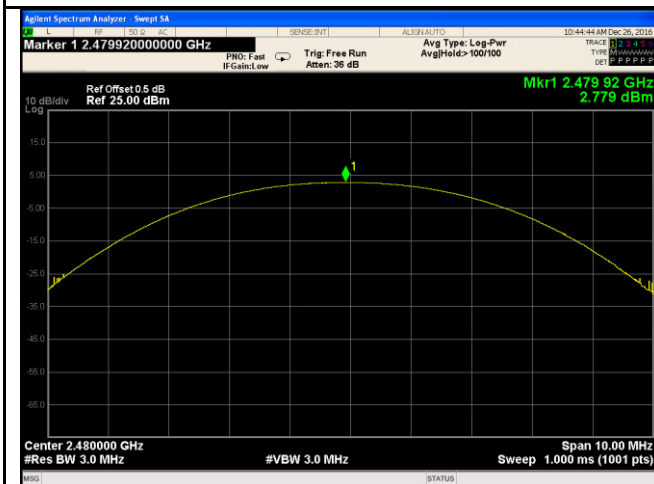
Output Power measurement result



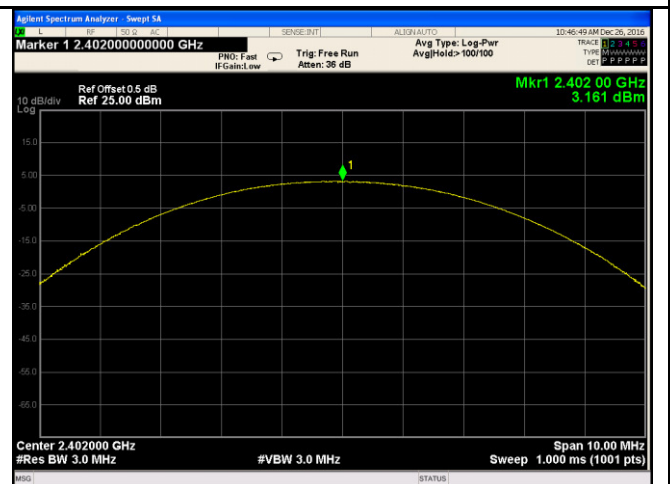
GFSK Output power - Low CH 2402



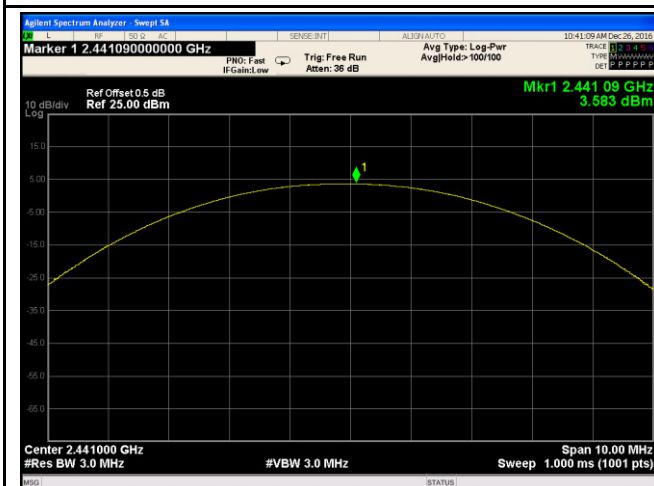
GFSK Output power - Mid CH 2441



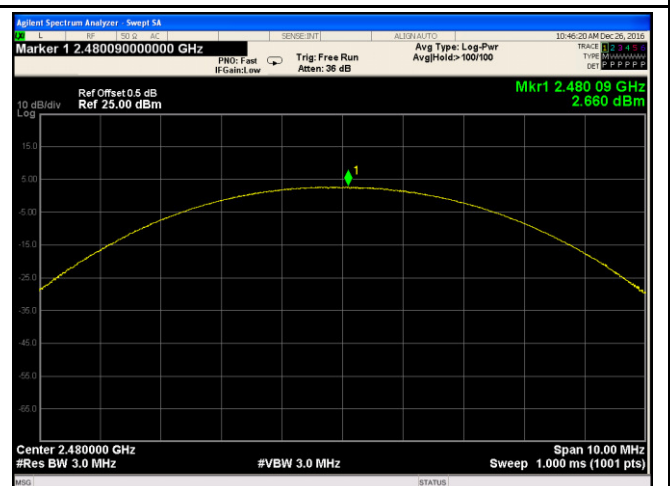
GFSK Output power - High CH 2480



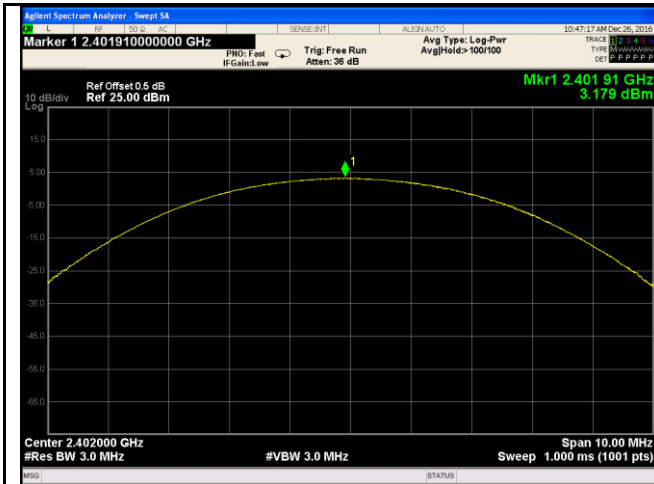
$\pi/4$ DQPSK Output power - Low CH 2402



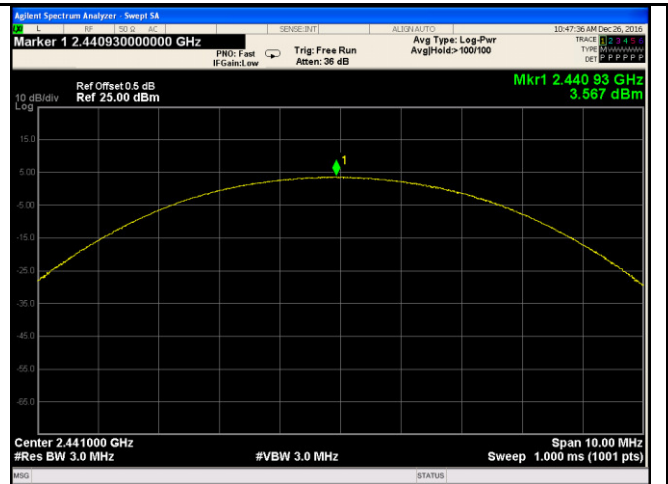
$\pi/4$ DQPSK Output power - Mid CH 2441



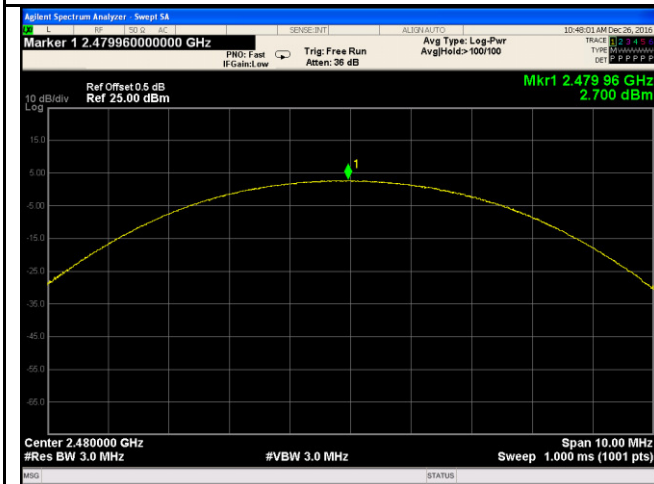
$\pi/4$ DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

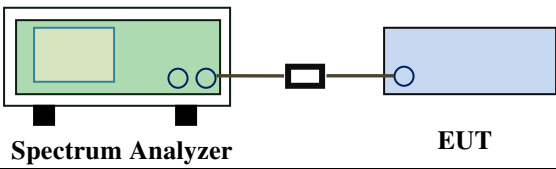


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	22°C
Relative Humidity	51%
Atmospheric Pressure	1001mbar
Test date :	December 26, 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	☒
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer settings:</u> The EUT must have its hopping function enabled. - 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	☒ Pass ☐ Fail		

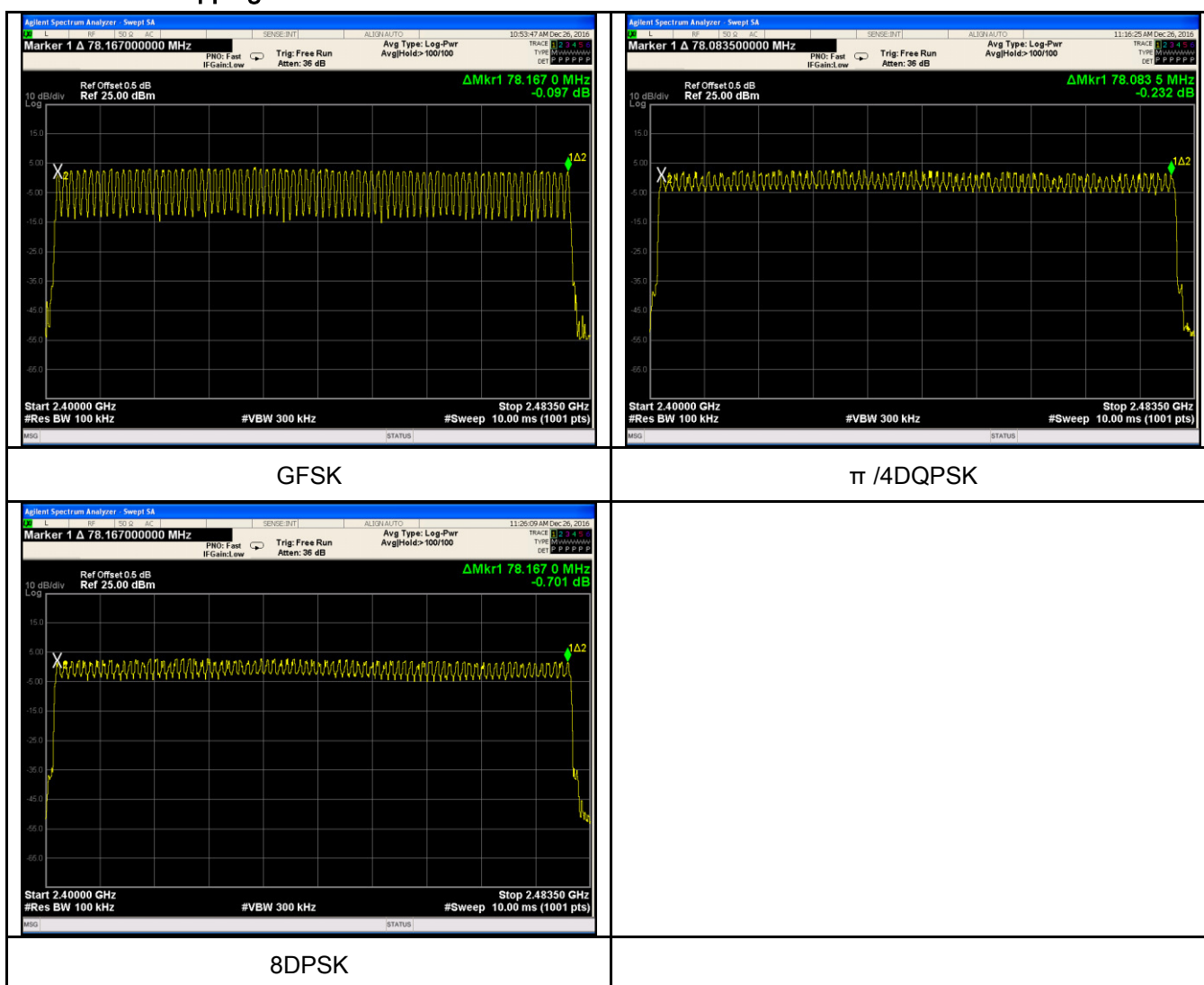
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

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
	$\pi/4$ DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

Test Plots

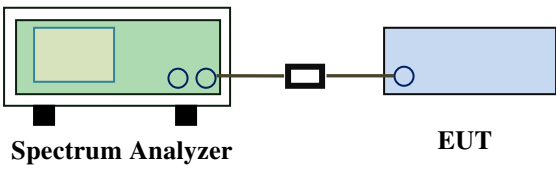
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	22°C
Relative Humidity	51%
Atmospheric Pressure	1001mbar
Test date :	December 26, 2016
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	Dwell Time < 0.4s	☒
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer</u> - 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 - use the marker-delta function to determine the dwell time		
Remark			
Result	☒ Pass ☐ Fail		

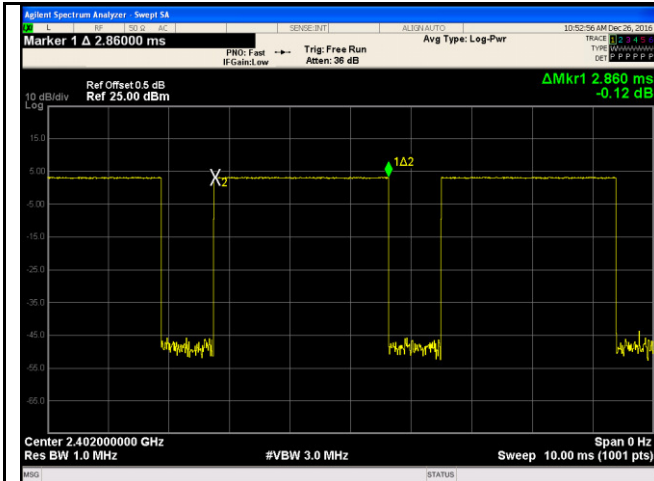
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

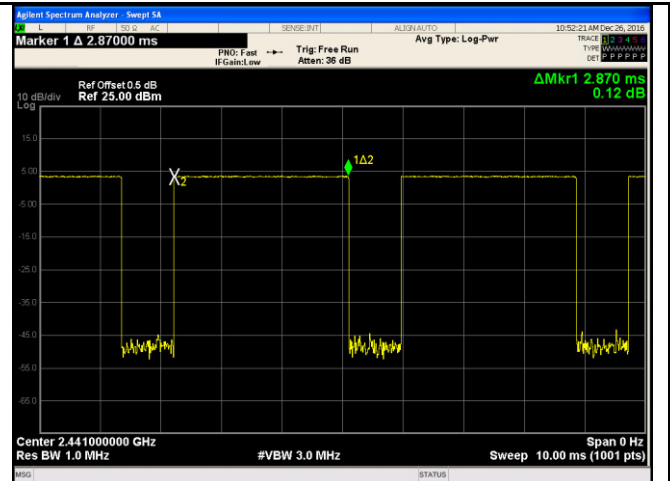
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.860	305.067	400	Pass
		Mid	2.870	306.133	400	Pass
		High	2.850	304.000	400	Pass
	π / 4 DQPSK	Low	2.880	307.200	400	Pass
		Mid	2.870	306.133	400	Pass
		High	2.870	306.133	400	Pass
	8-DPSK	Low	2.870	306.133	400	Pass
		Mid	2.870	306.133	400	Pass
		High	2.870	306.133	400	Pass
Note: Dwell time=Pulse Time (ms) $\times$ (1600 $\div$ 6 $\div$ 79) $\times$ 31.6						

Test Plots

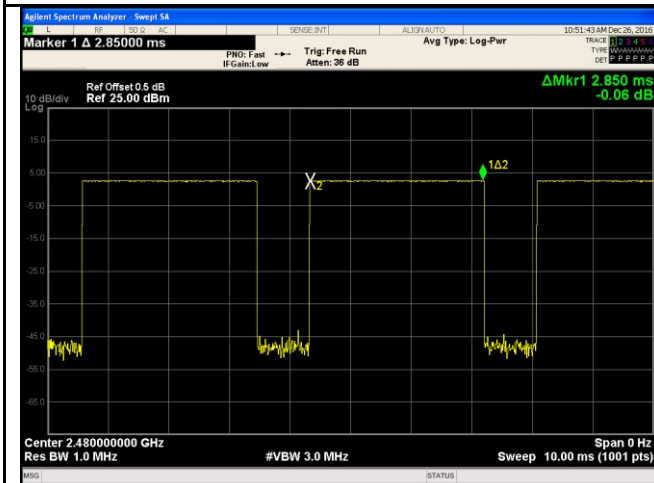
Dwell Time measurement result



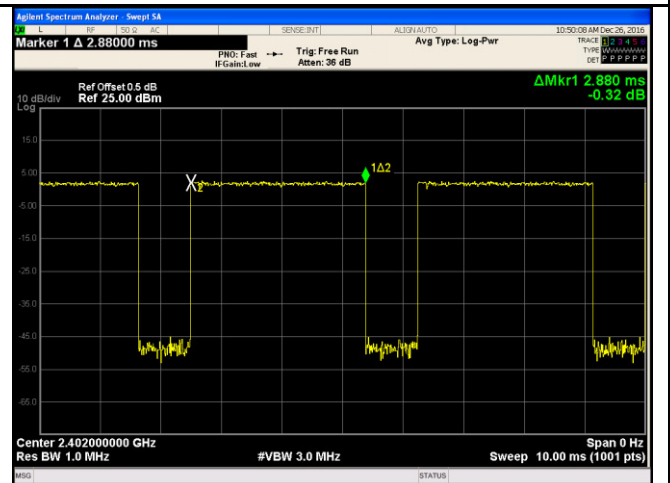
GFSK - Low CH 2402



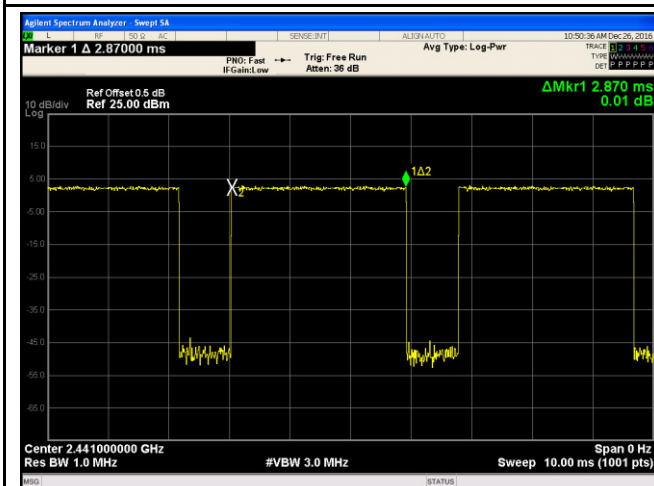
GFSK - Mid CH 2441



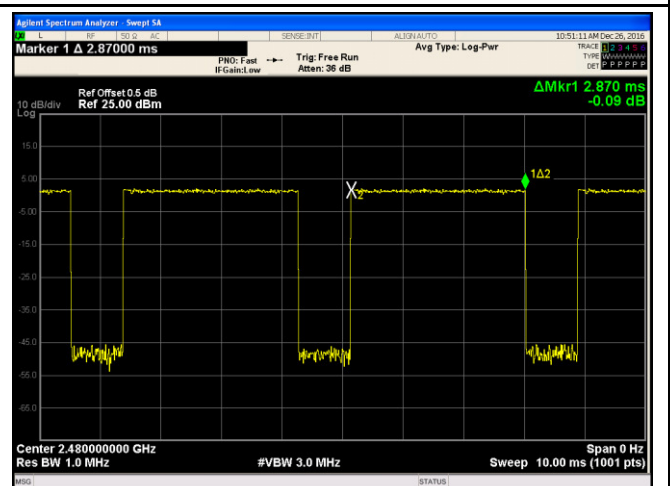
GFSK - High CH 2480



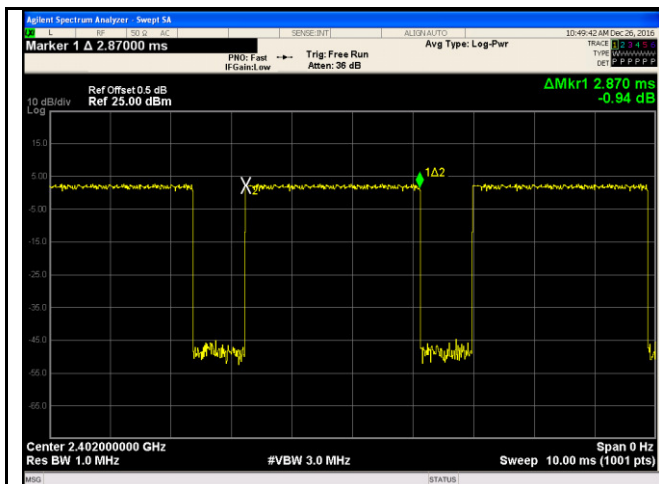
$\pi/4$ DQPSK - Low CH 2402



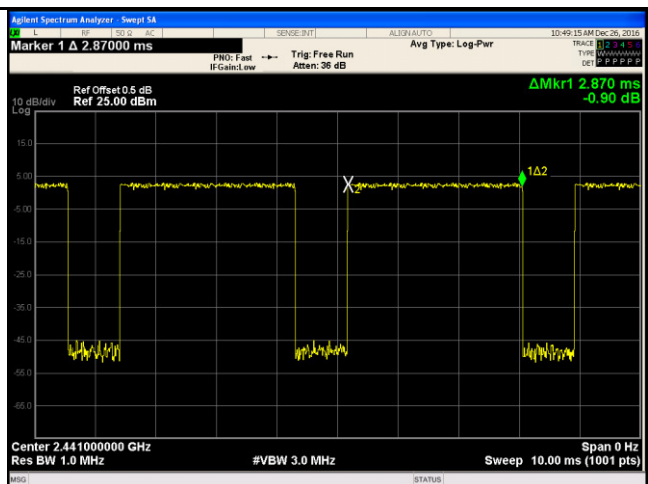
$\pi/4$ DQPSK - Mid CH 2441



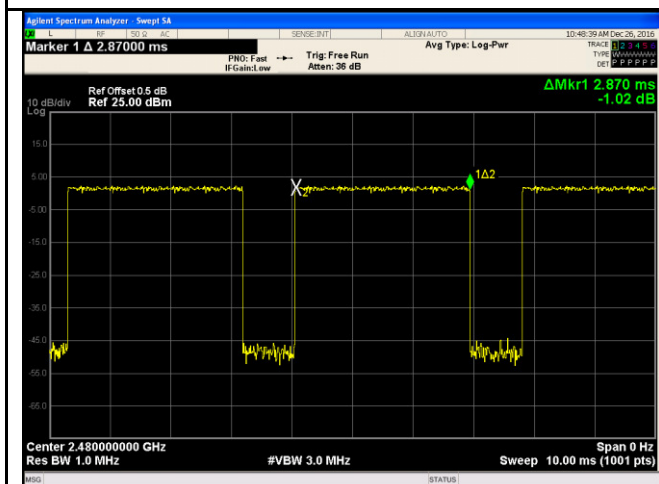
$\pi/4$ DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441



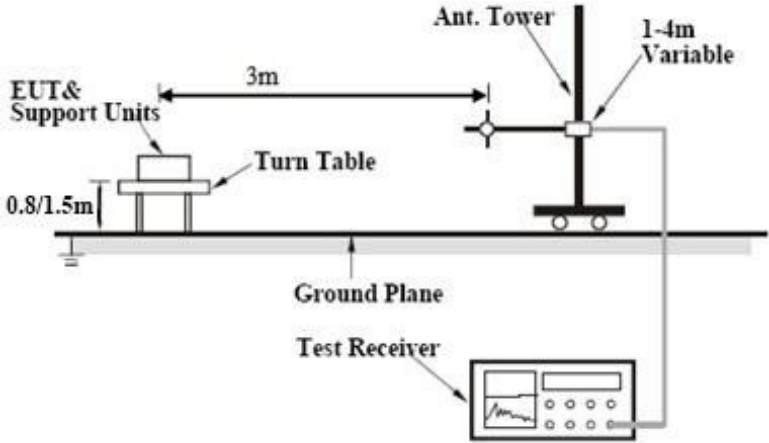
8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1008mbar
Test date :	December 30, 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	
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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,
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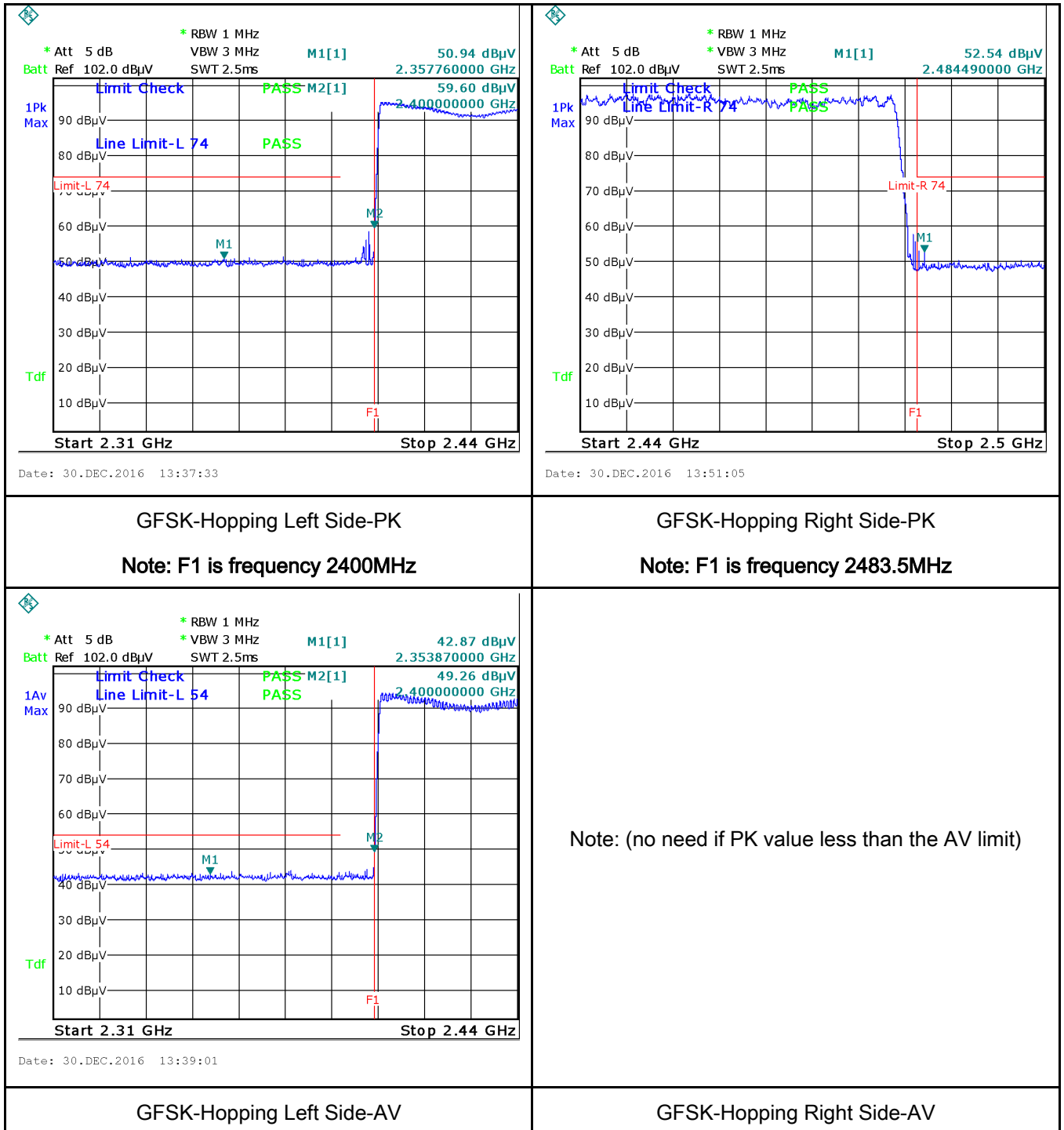
	and make sure the instrument is operated in its linear range. - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth 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

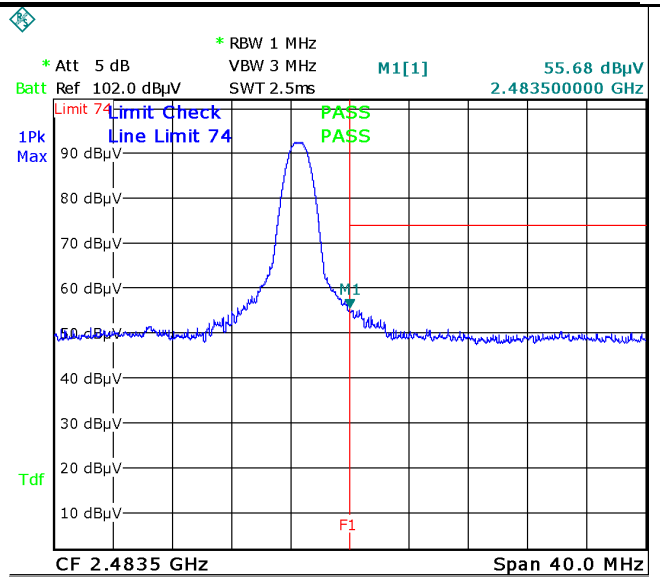
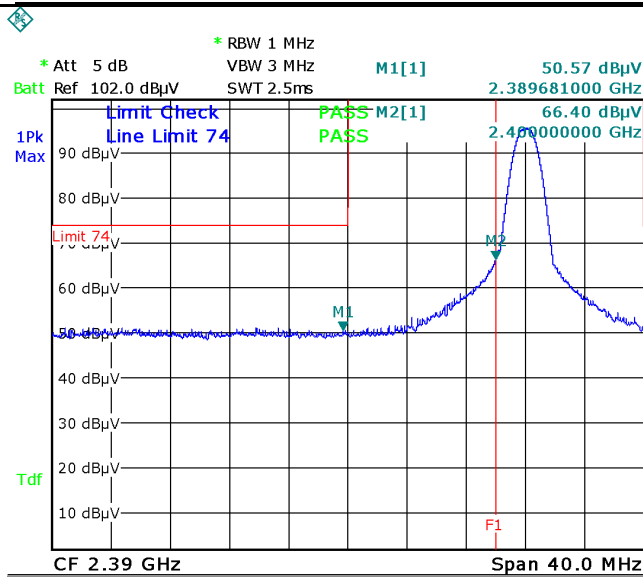
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

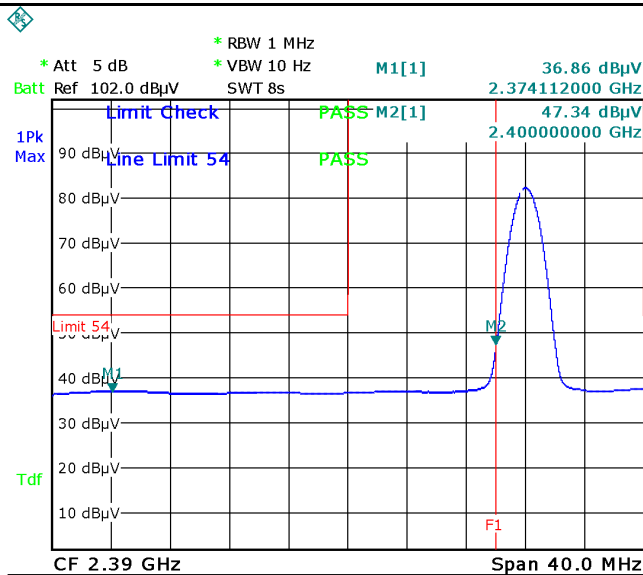
GFSK Mode:





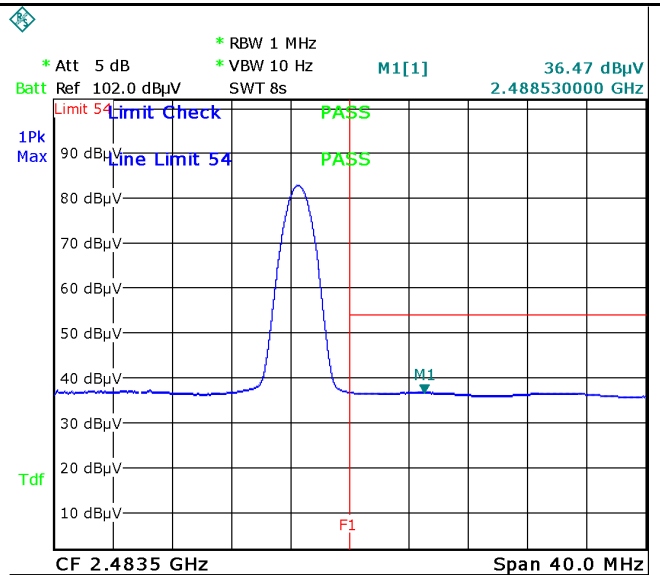
GFSK-Left Side-PK

Note: F1 is frequency 2400MHz



GFSK-Right Side-PK

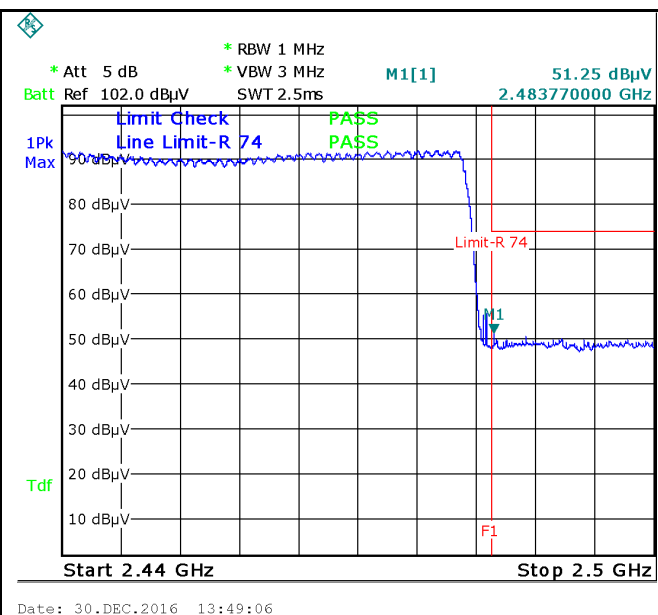
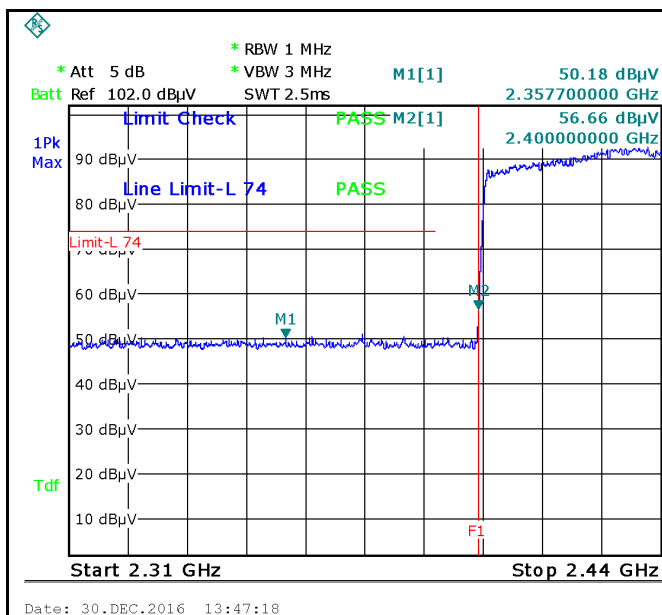
Note: F1 is frequency 2483.5MHz



GFSK-Left Side-AV

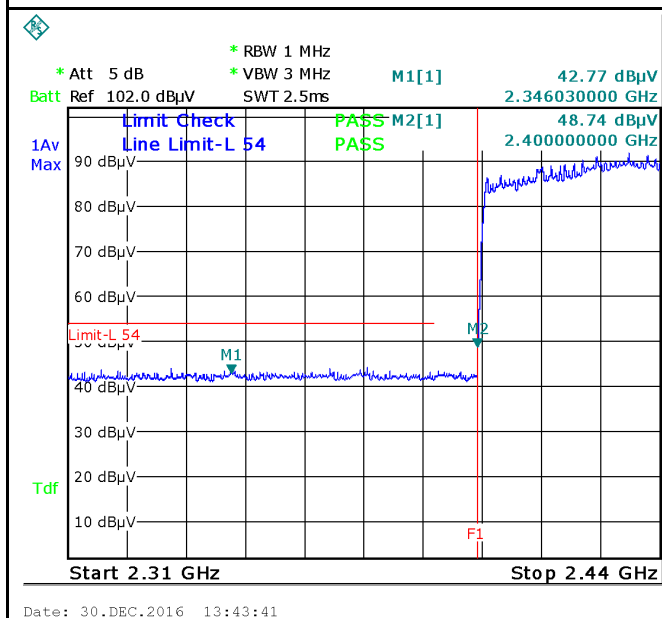
GFSK-Right Side-AV

$\pi/4$ DQPSK Mode:



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

Note: F1 is frequency 2400MHz



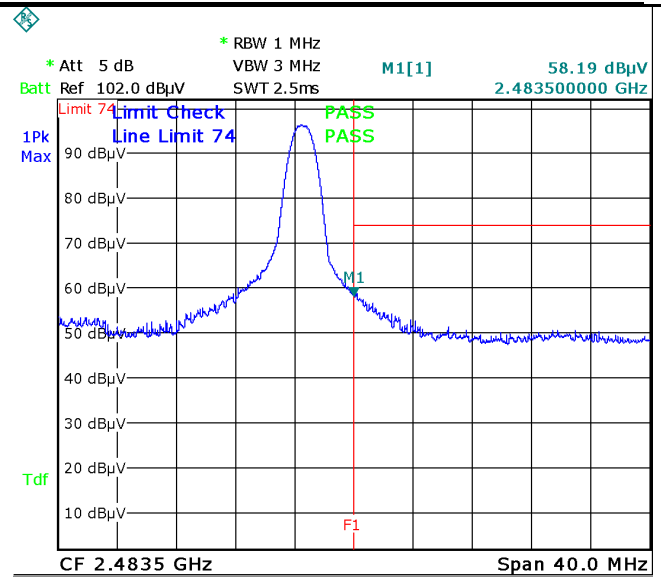
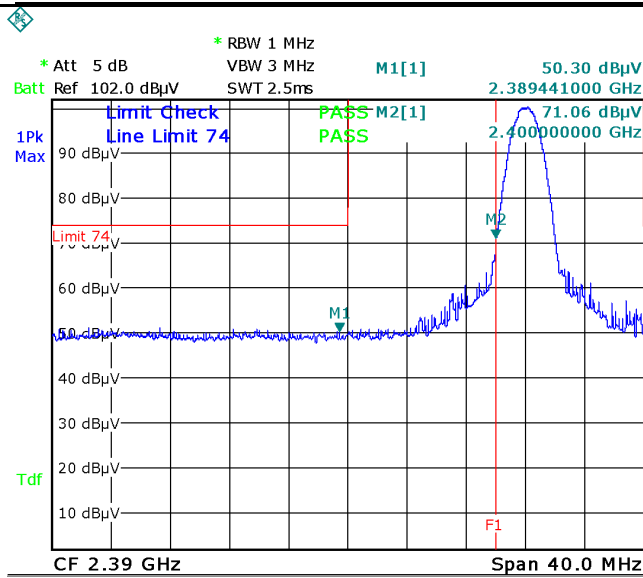
$\pi/4$ DQPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

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

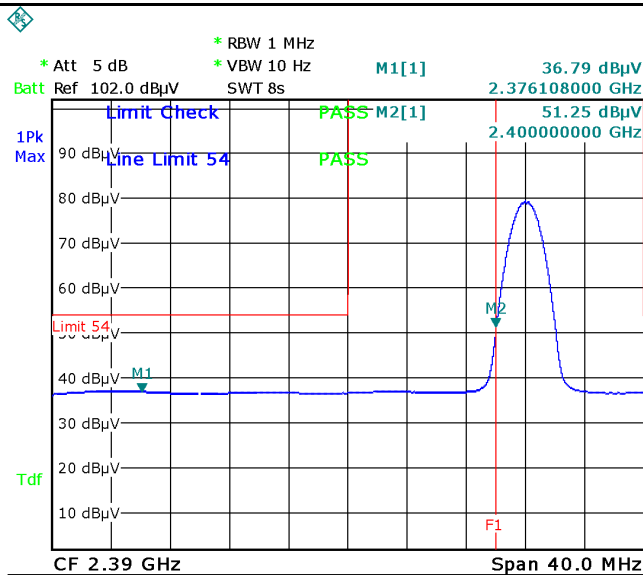
$\pi/4$ DQPSK-Hopping Left-AV

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



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

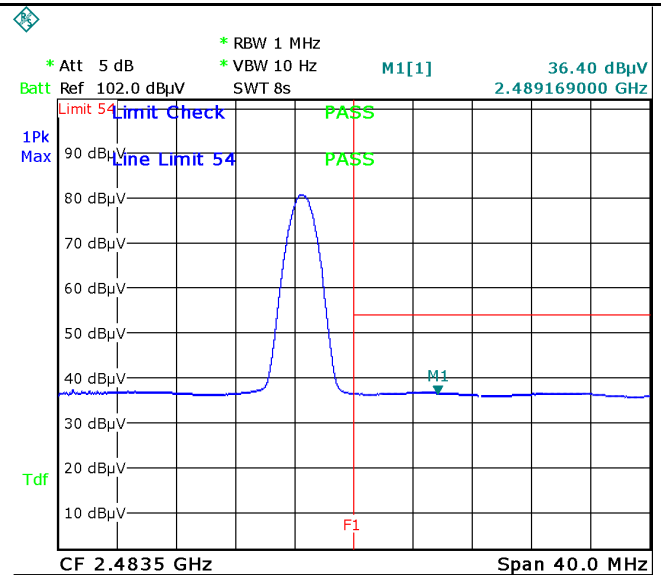
Note: F1 is frequency 2400MHz



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

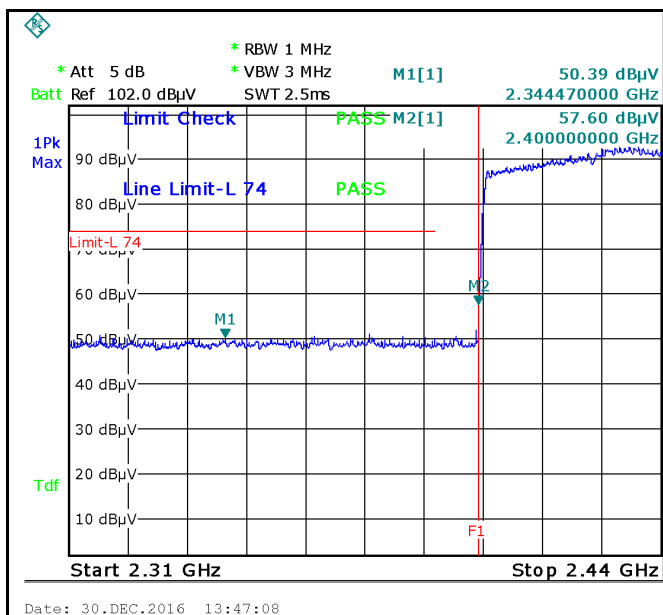
$\pi/4$ DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



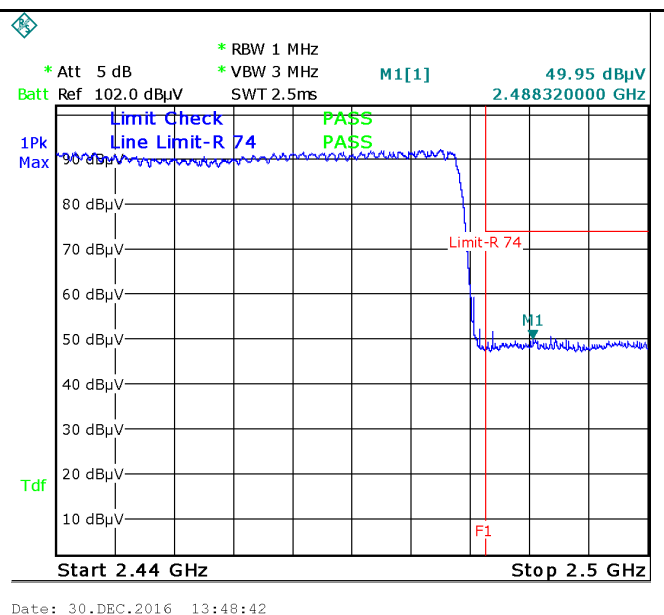
$\pi/4$ DQPSK-Right Side-AV

8-DPSK Mode:



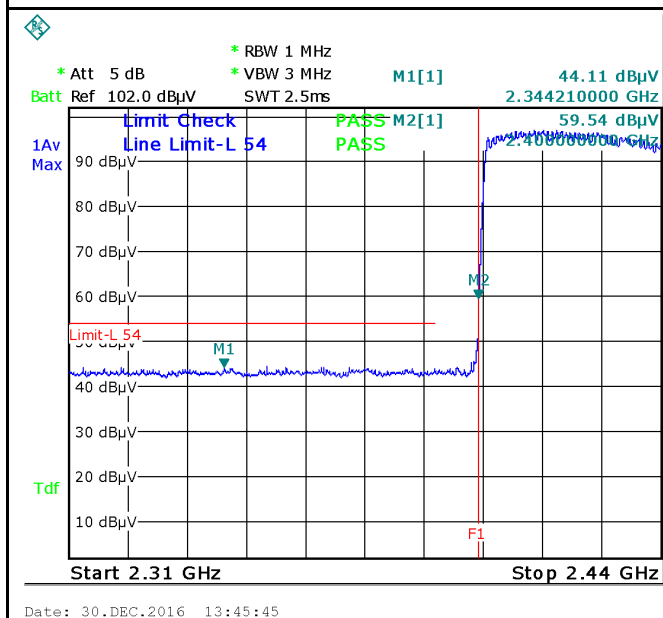
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

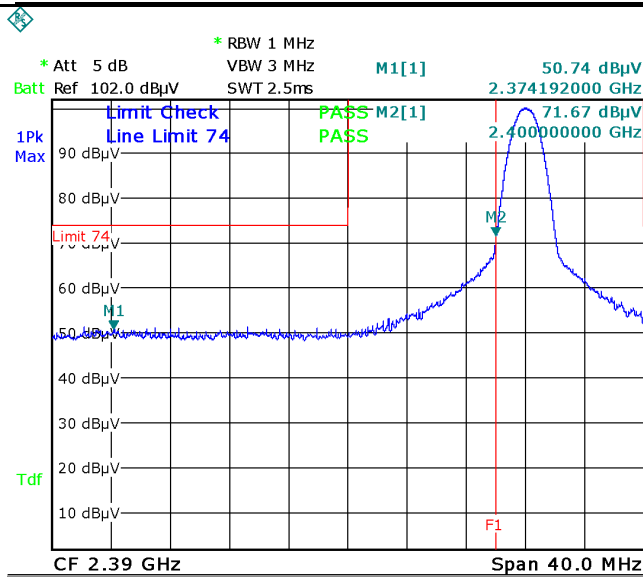
Note: F1 is frequency 2483.5MHz



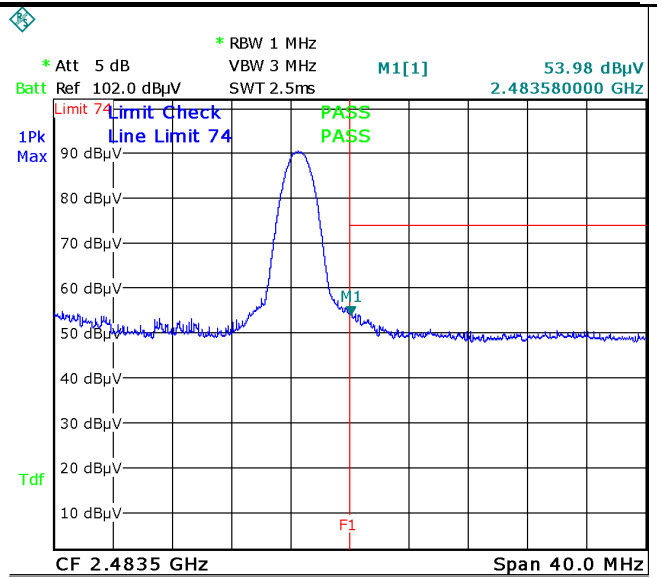
8DPSK-Hopping Left-AV

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

8DPSK-Hopping Right-AV



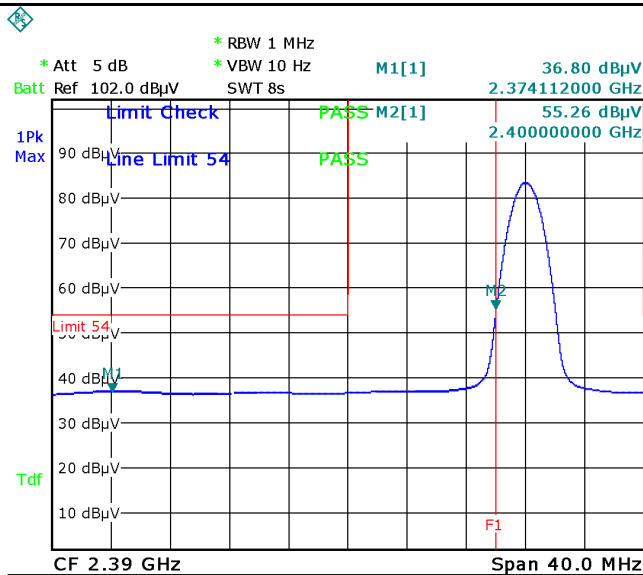
Date: 30.DEC.2016 12:53:16



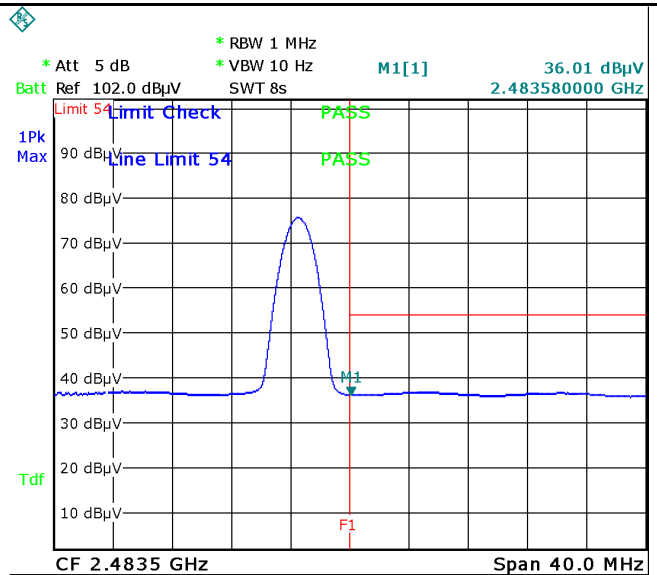
Date: 30.DEC.2016 13:01:37

8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



Date: 30.DEC.2016 12:52:30



Date: 30.DEC.2016 13:02:13

8DPSK-Left Side-AV

8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1008mbar
Test date :	December 30, 2016
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable		
47CFR§15.207, RSS210 (A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	☒		
		Frequency ranges (MHz)		Limit (dBµV)	
				QP	Average
		0.15 ~ 0.5		66 – 56	56 – 46
		0.5 ~ 5		56	46
5 ~ 30	60	50			

Test Setup	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.
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Procedure	- 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
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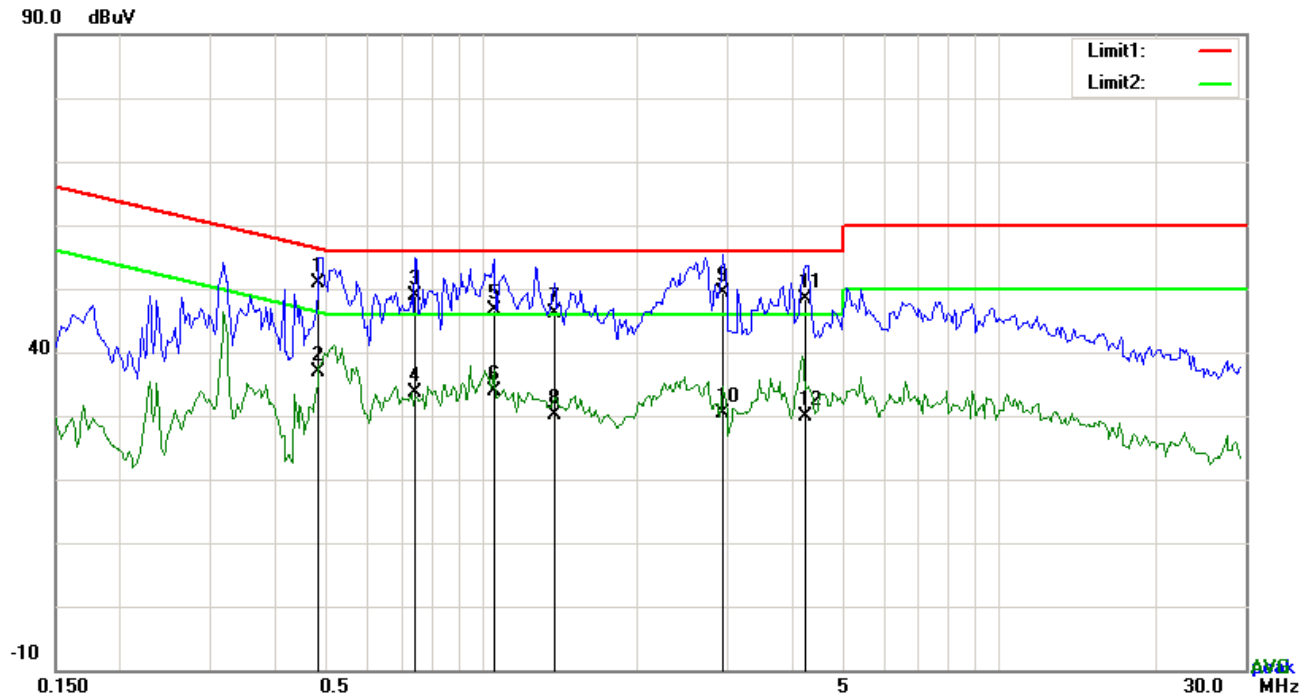
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	coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth 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

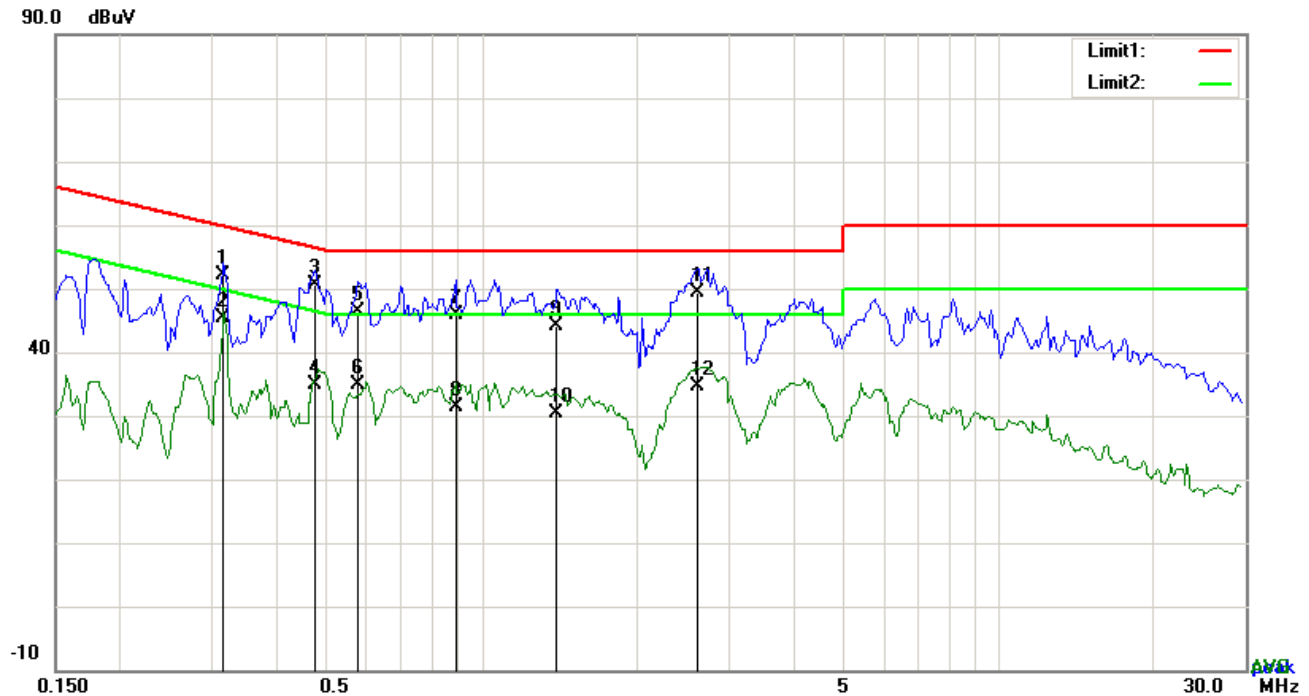


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.4854	40.88	QP	10.03	50.91	56.25	-5.34
2	L1	0.4854	26.90	AVG	10.03	36.93	46.25	-9.32
3	L1	0.7467	38.95	QP	10.03	48.98	56.00	-7.02
4	L1	0.7467	23.48	AVG	10.03	33.51	46.00	-12.49
5	L1	1.0548	36.61	QP	10.03	46.64	56.00	-9.36
6	L1	1.0548	23.97	AVG	10.03	34.00	46.00	-12.00
7	L1	1.3824	36.13	QP	10.03	46.16	56.00	-9.84
8	L1	1.3824	20.08	AVG	10.03	30.11	46.00	-15.89
9	L1	2.9190	39.28	QP	10.05	49.33	56.00	-6.67
10	L1	2.9190	20.22	AVG	10.05	30.27	46.00	-15.73
11	L1	4.2363	38.29	QP	10.07	48.36	56.00	-7.64
12	L1	4.2363	19.77	AVG	10.07	29.84	46.00	-16.16

Test Mode: Bluetooth Mode

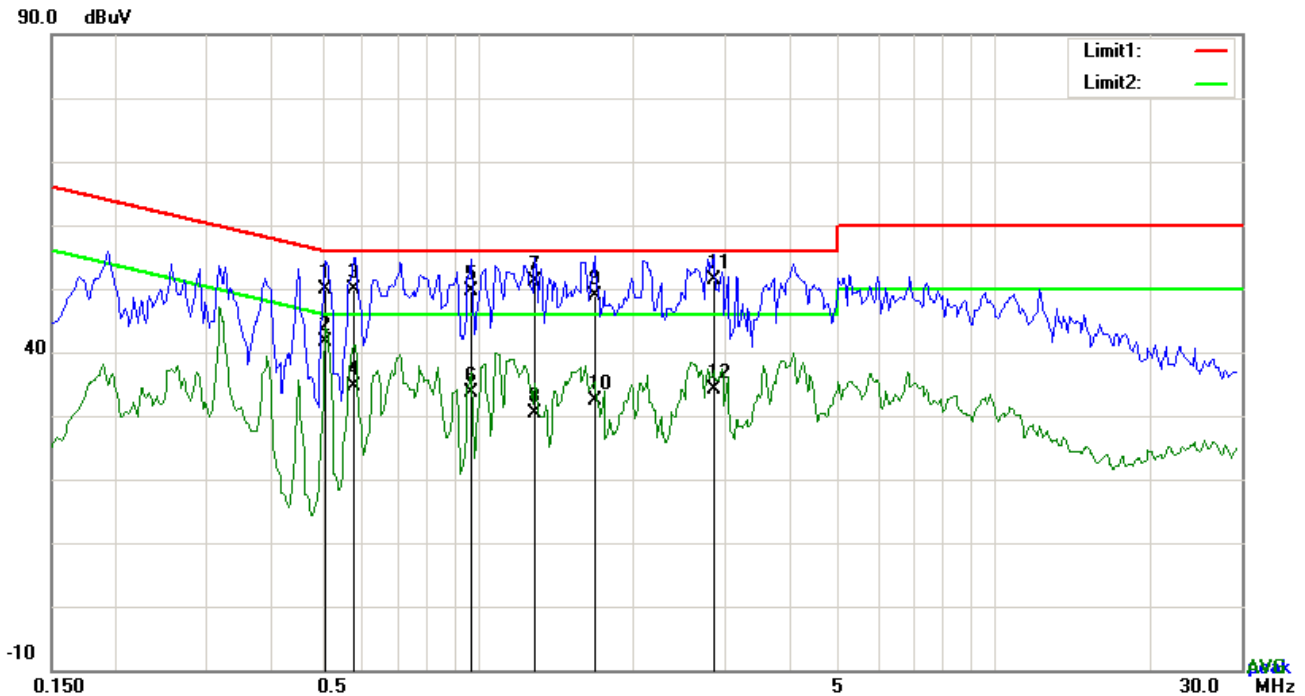


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.3177	42.12	QP	10.02	52.14	59.77	-7.63
2	N	0.3177	35.28	AVG	10.02	45.30	49.77	-4.47
3	N	0.4776	40.52	QP	10.02	50.54	56.38	-5.84
4	N	0.4776	24.79	AVG	10.02	34.81	46.38	-11.57
5	N	0.5790	36.30	QP	10.02	46.32	56.00	-9.68
6	N	0.5790	24.76	AVG	10.02	34.78	46.00	-11.22
7	N	0.8910	35.92	QP	10.03	45.95	56.00	-10.05
8	N	0.8910	21.23	AVG	10.03	31.26	46.00	-14.74
9	N	1.4019	34.22	QP	10.03	44.25	56.00	-11.75
10	N	1.4019	20.32	AVG	10.03	30.35	46.00	-15.65
11	N	2.6109	39.42	QP	10.05	49.47	56.00	-6.53
12	N	2.6109	24.63	AVG	10.05	34.68	46.00	-11.32

Test Mode: Bluetooth Mode

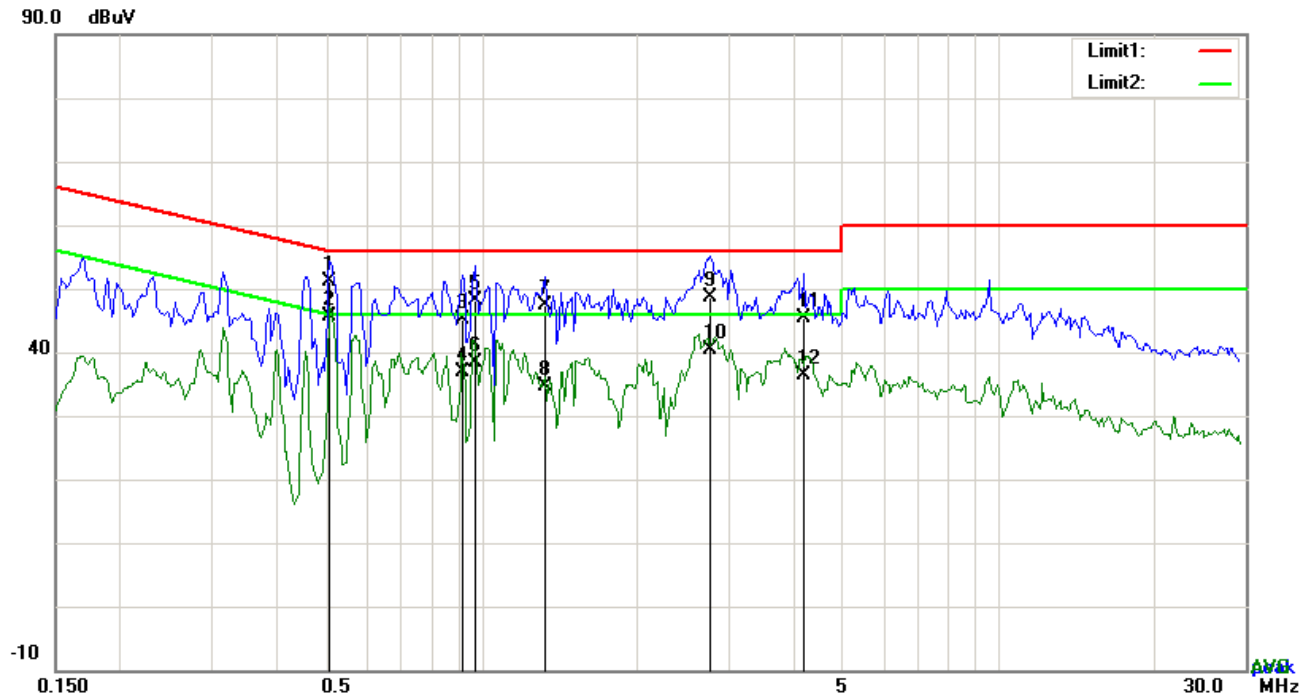


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.5088	39.97	QP	10.03	50.00	56.00	-6.00
2	L1	0.5088	31.54	AVG	10.03	41.57	46.00	-4.43
3	L1	0.5790	39.88	QP	10.03	49.91	56.00	-6.09
4	L1	0.5790	24.54	AVG	10.03	34.57	46.00	-11.43
5	L1	0.9729	39.59	QP	10.03	49.62	56.00	-6.38
6	L1	0.9729	23.64	AVG	10.03	33.67	46.00	-12.33
7	L1	1.2927	41.21	QP	10.03	51.24	56.00	-4.76
8	L1	1.2927	20.26	AVG	10.03	30.29	46.00	-15.71
9	L1	1.6827	38.92	QP	10.04	48.96	56.00	-7.04
10	L1	1.6827	22.33	AVG	10.04	32.37	46.00	-13.63
11	L1	2.8605	41.32	QP	10.05	51.37	56.00	-4.63
12	L1	2.8605	24.13	AVG	10.05	34.18	46.00	-11.82

Test Mode: Bluetooth Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

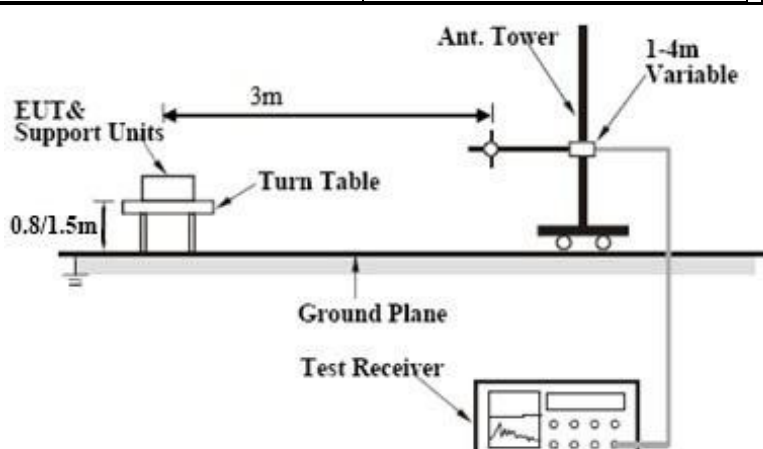
No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.5088	41.21	QP	10.02	51.23	56.00	-4.77
2	N	0.5088	35.58	AVG	10.02	45.60	46.00	-0.40
3	N	0.9222	35.07	QP	10.03	45.10	56.00	-10.90
4	N	0.9222	26.76	AVG	10.03	36.79	46.00	-9.21
5	N	0.9729	38.00	QP	10.03	48.03	56.00	-7.97
6	N	0.9729	28.24	AVG	10.03	38.27	46.00	-7.73
7	N	1.3278	37.29	QP	10.03	47.32	56.00	-8.68
8	N	1.3278	24.51	AVG	10.03	34.54	46.00	-11.46
9	N	2.7669	38.54	QP	10.05	48.59	56.00	-7.41
10	N	2.7669	30.45	AVG	10.05	40.50	46.00	-5.50
11	N	4.2129	35.25	QP	10.06	45.31	56.00	-10.69
12	N	4.2129	26.42	AVG	10.06	36.48	46.00	-9.52

6.9 Radiated Spurious Emissions & Restricted Band

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1008mbar
Test date :	December 30, 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	☒										
		<table><tr><th>Frequency range (MHz)</th><th>Field Strength (µV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>		Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500
		Frequency range (MHz)		Field Strength (µV/m)									
		30 – 88		100									
		88 – 216		150									
		216 960		200									
Above 960	500												

Test Setup	 The diagram illustrates the test setup for radiated spurious emissions. It features a Turn Table with EUT & Support Units on it, positioned 3m from an Ant. Tower. The Ant. Tower has a 1-4m Variable antenna. The setup is on a Ground Plane. A Test Receiver is connected to the antenna.
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Procedure	- 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:
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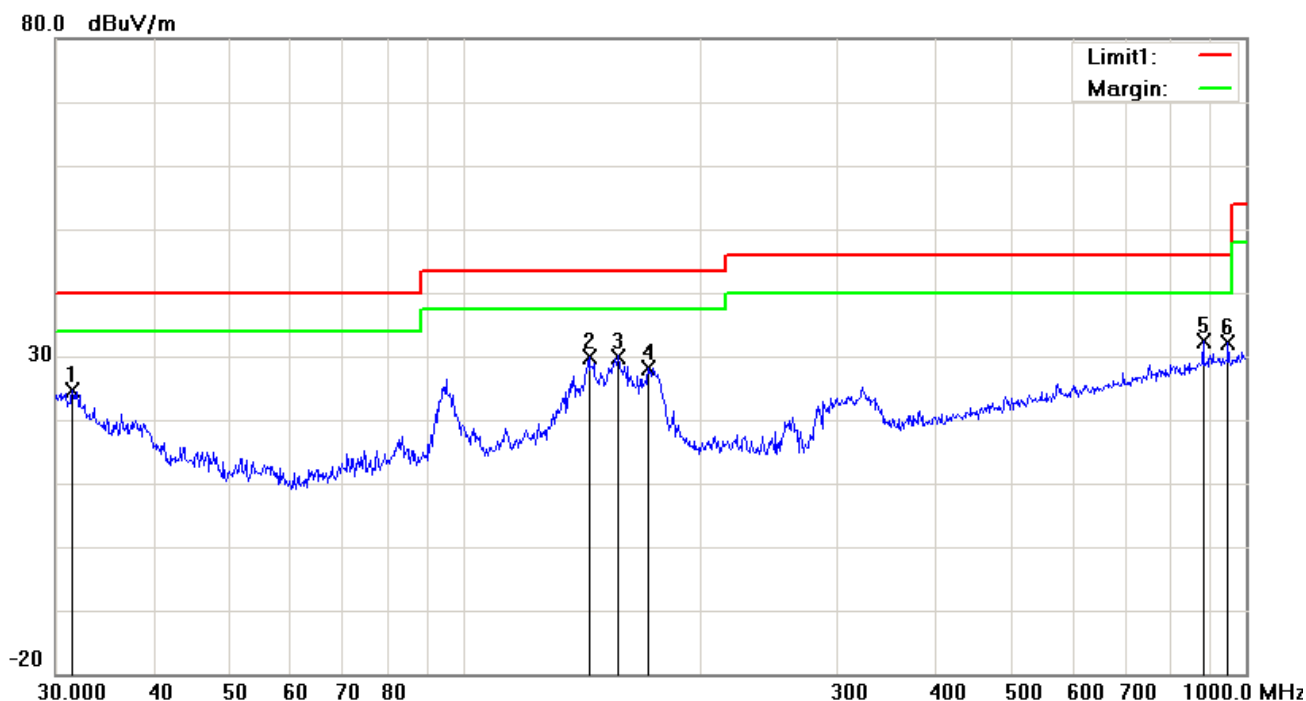
	a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution 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

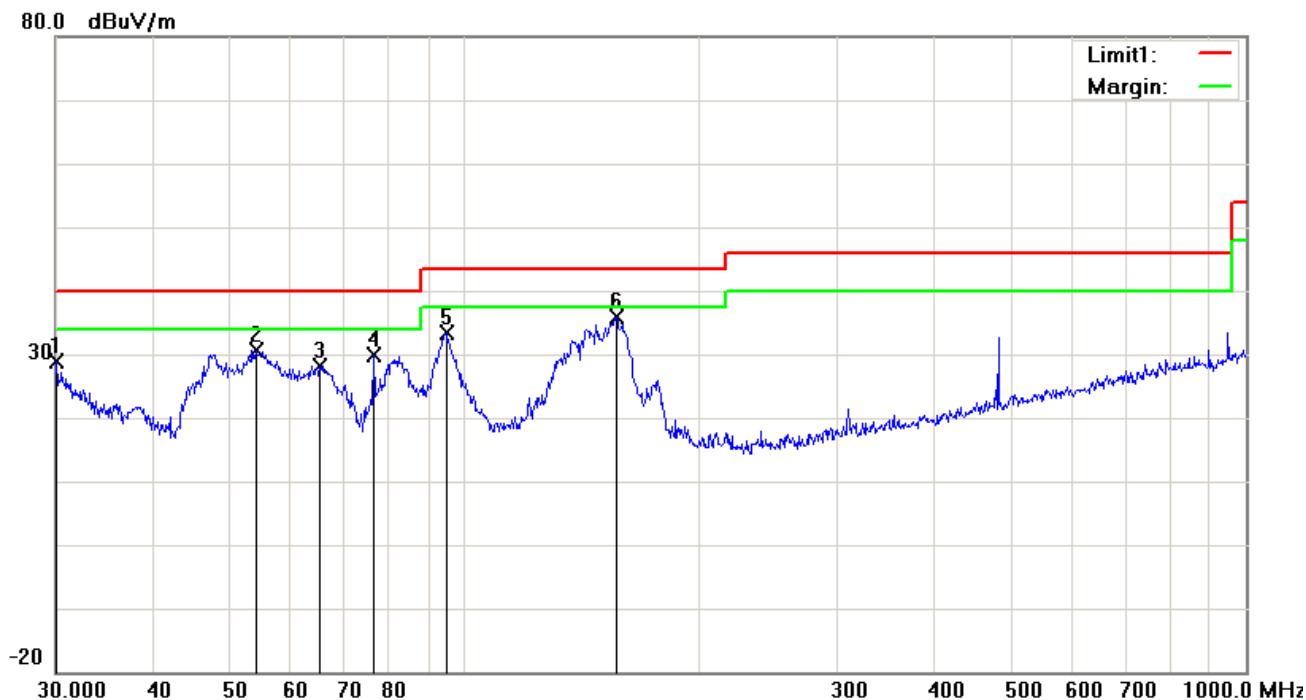


Test Data

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	31.5095	25.99	peak	-1.37	24.62	40.00	-15.38	157	100
2	H	144.3348	38.30	peak	-8.48	29.82	43.50	-13.68	222	78
3	H	157.5589	38.31	peak	-8.31	30.00	43.50	-13.50	157	239
4	H	171.9946	37.51	peak	-9.26	28.25	43.50	-15.25	236	142
5	H	881.4067	27.97	peak	4.37	32.34	46.00	-13.66	180	220
6	H	948.7610	26.89	peak	5.12	32.01	46.00	-13.99	127	177

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	30.1054	29.17	peak	-0.34	28.83	40.00	-11.17	204	84
2	V	54.0711	44.41	peak	-13.66	30.75	40.00	-9.25	138	235
3	V	65.3432	42.12	peak	-13.93	28.19	40.00	-11.81	155	335
4	V	76.5121	43.64	peak	-13.75	29.89	40.00	-10.11	175	310
5	V	94.7601	45.55	peak	-12.19	33.36	43.50	-10.14	109	123
6	V	156.4578	44.24	peak	-8.32	35.92	43.50	-7.58	209	318

Above 1GHz

Test Mode:	Transmitting Mode
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Low Channel: GFSK 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	38.76	AV	V	33.67	6.86	32.66	46.63	54	-7.37
4804	38.45	AV	H	33.67	6.86	32.66	46.32	54	-7.68
4804	48.64	PK	V	33.67	6.86	32.66	56.51	74	-17.49
4804	47.53	PK	H	33.67	6.86	32.66	55.4	74	-18.6
17811	24.31	AV	V	45.03	11.21	32.38	48.17	54	-5.83
17811	23.87	AV	H	45.03	11.21	32.38	47.73	54	-6.27
17811	40.65	PK	V	45.03	11.21	32.38	64.51	74	-9.49
17811	40.23	PK	H	45.03	11.21	32.38	64.09	74	-9.91

Middle Channel: GFSK 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	39.66	AV	V	33.71	6.95	32.74	47.58	54	-6.42
4882	38.25	AV	H	33.71	6.95	32.74	46.17	54	-7.83
4882	49.27	PK	V	33.71	6.95	32.74	57.19	74	-16.81
4882	48.16	PK	H	33.71	6.95	32.74	56.08	74	-17.92
17819	25.03	AV	V	45.15	11.18	32.41	48.95	54	-5.05
17819	24.61	AV	H	45.15	11.18	32.41	48.53	54	-5.47
17819	41.05	PK	V	45.15	11.18	32.41	64.97	74	-9.03
17819	40.39	PK	H	45.15	11.18	32.41	64.31	74	-9.69

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	38.59	AV	V	33.9	6.76	32.74	46.51	54	-7.49
4960	37.42	AV	H	33.9	6.76	32.74	45.34	54	-8.66
4960	48.51	PK	V	33.9	6.76	32.74	56.43	74	-17.57
4960	47.29	PK	H	33.9	6.76	32.74	55.21	74	-18.79
17823	24.33	AV	V	45.22	11.35	32.38	48.52	54	-5.48
17823	23.54	AV	H	45.22	11.35	32.38	47.73	54	-6.27
17823	41.19	PK	V	45.22	11.35	32.38	65.38	74	-8.62
17823	40.57	PK	H	45.22	11.35	32.38	64.76	74	-9.24

Note:

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

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

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

Annex A. TEST INSTRUMENT

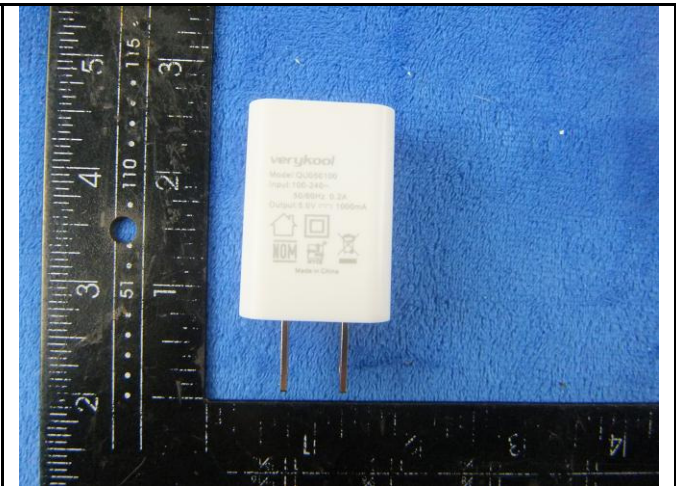
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/16/2016	09/15/2017	☒
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	☒
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	☒
LISN	ISN T800	34373	09/24/2016	09/23/2017	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	☒
Transient Limiter	LIT-153	531118	08/31/2016	08/30/2017	☒
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	☒
Power Splitter	1#	1#	08/31/2016	08/30/2017	☒
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	☒
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/31/2016	08/30/2017	☒
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/24/2016	03/23/2017	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	☒
Universal Radio Communication Tester	CMU200	121393	09/24/2016	09/23/2017	☒

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



Whole Package View



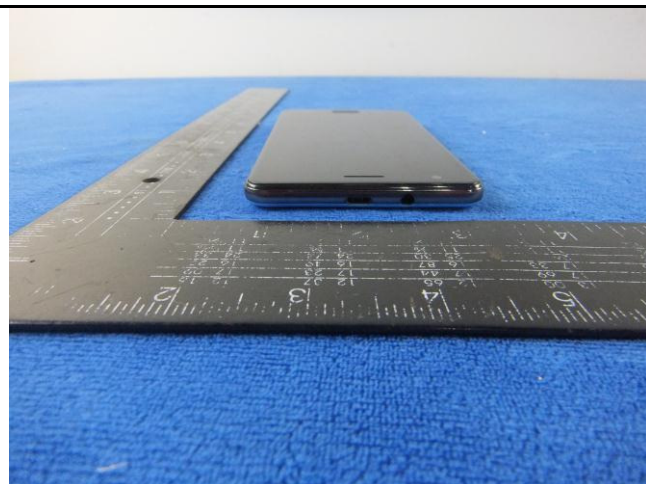
Adapter - Front View



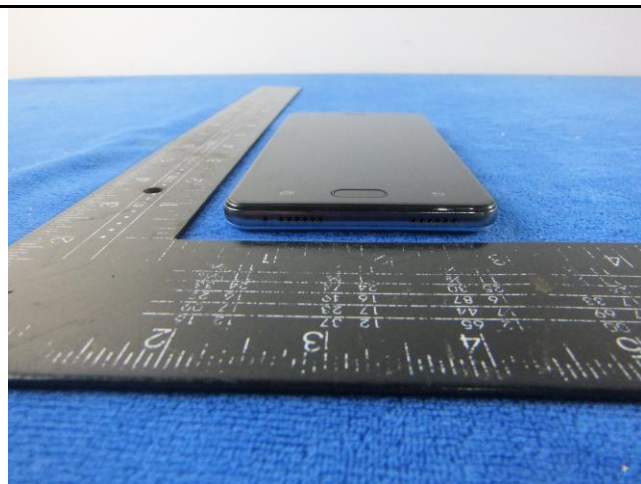
EUT - Front View



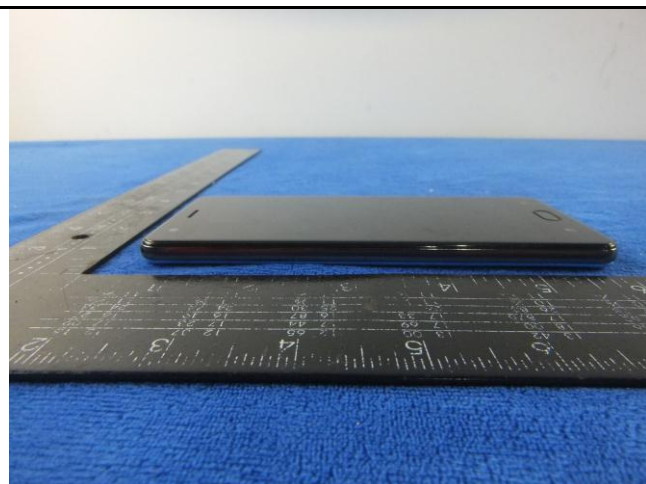
EUT - Rear View



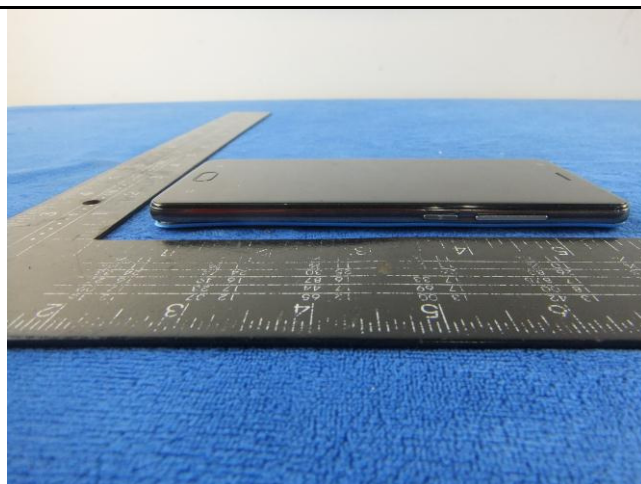
EUT - Top View



EUT - Bottom View

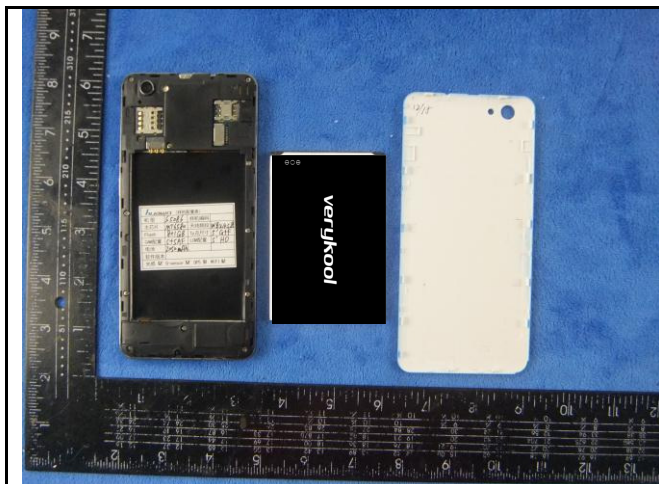


EUT - Left View



EUT - Right View

Annex B.ii. Photograph: EUT Internal Photo



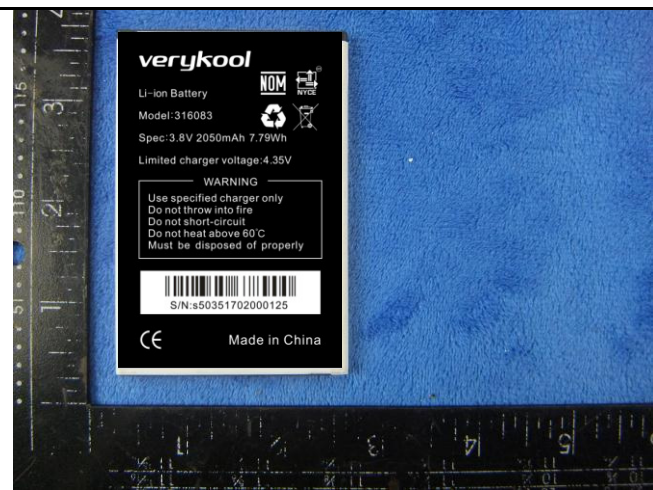
Cover Off - Top View 1



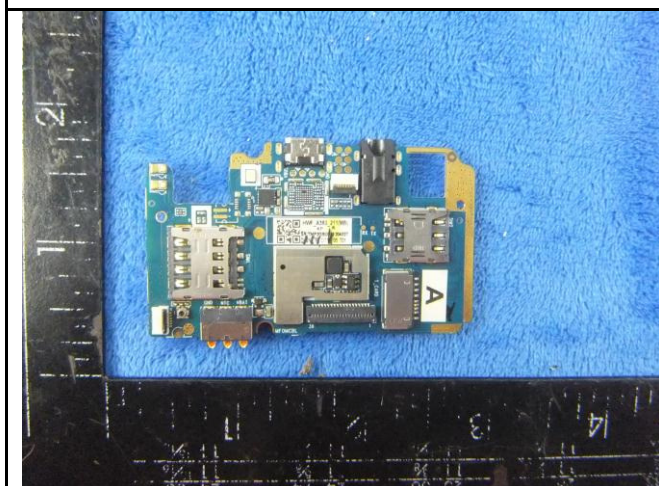
Cover Off - Top View 2



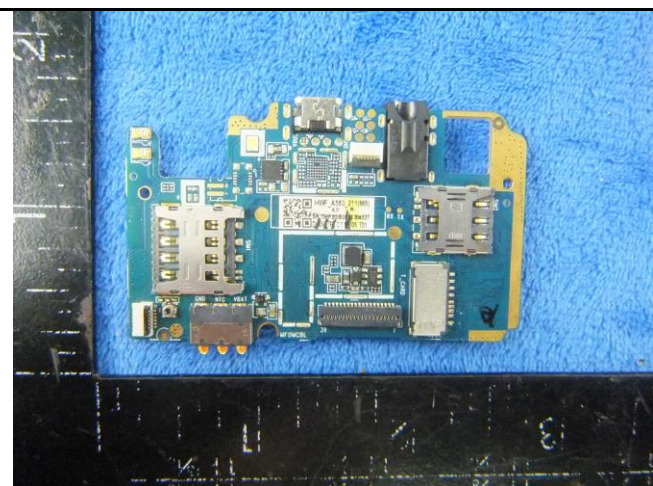
Battery - Front View



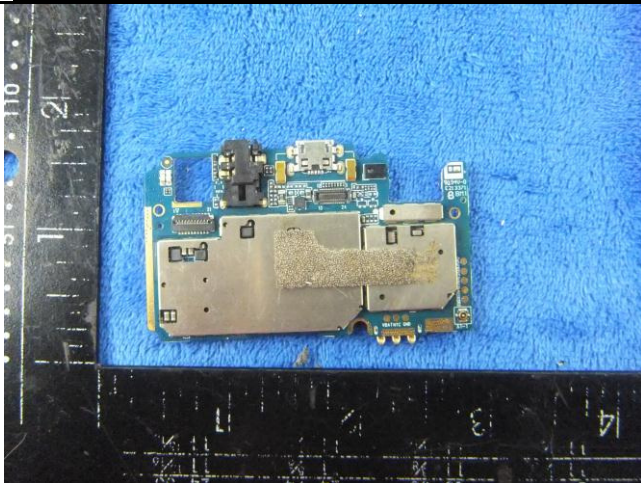
Battery - Rear View



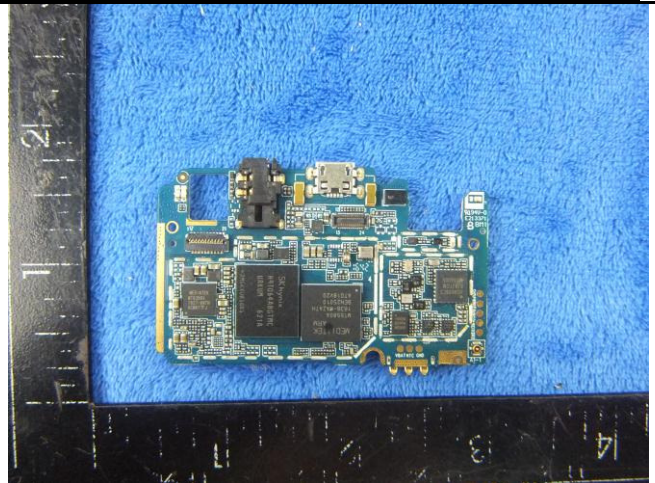
Mainboard with Shielding - Front View



Mainboard without Shielding - Front View



Mainboard with Shielding – Rear View



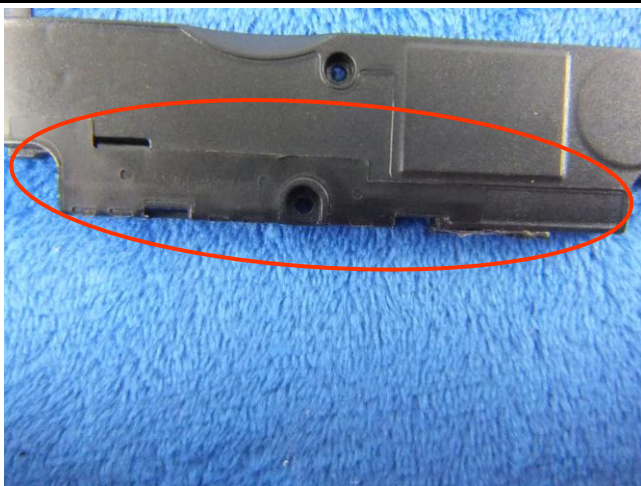
Mainboard without Shielding - Rear View



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



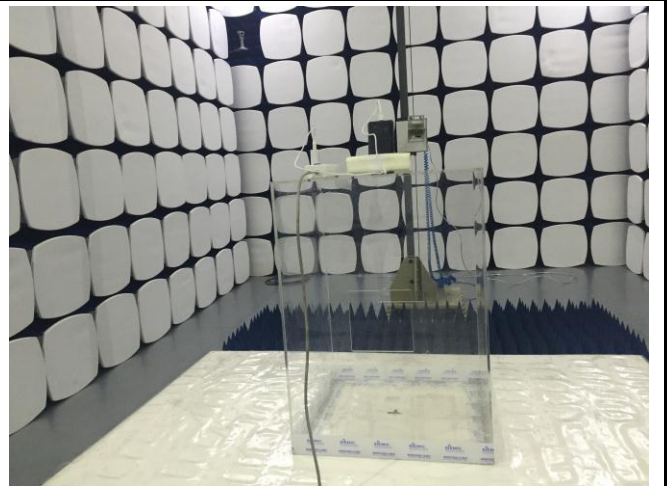
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

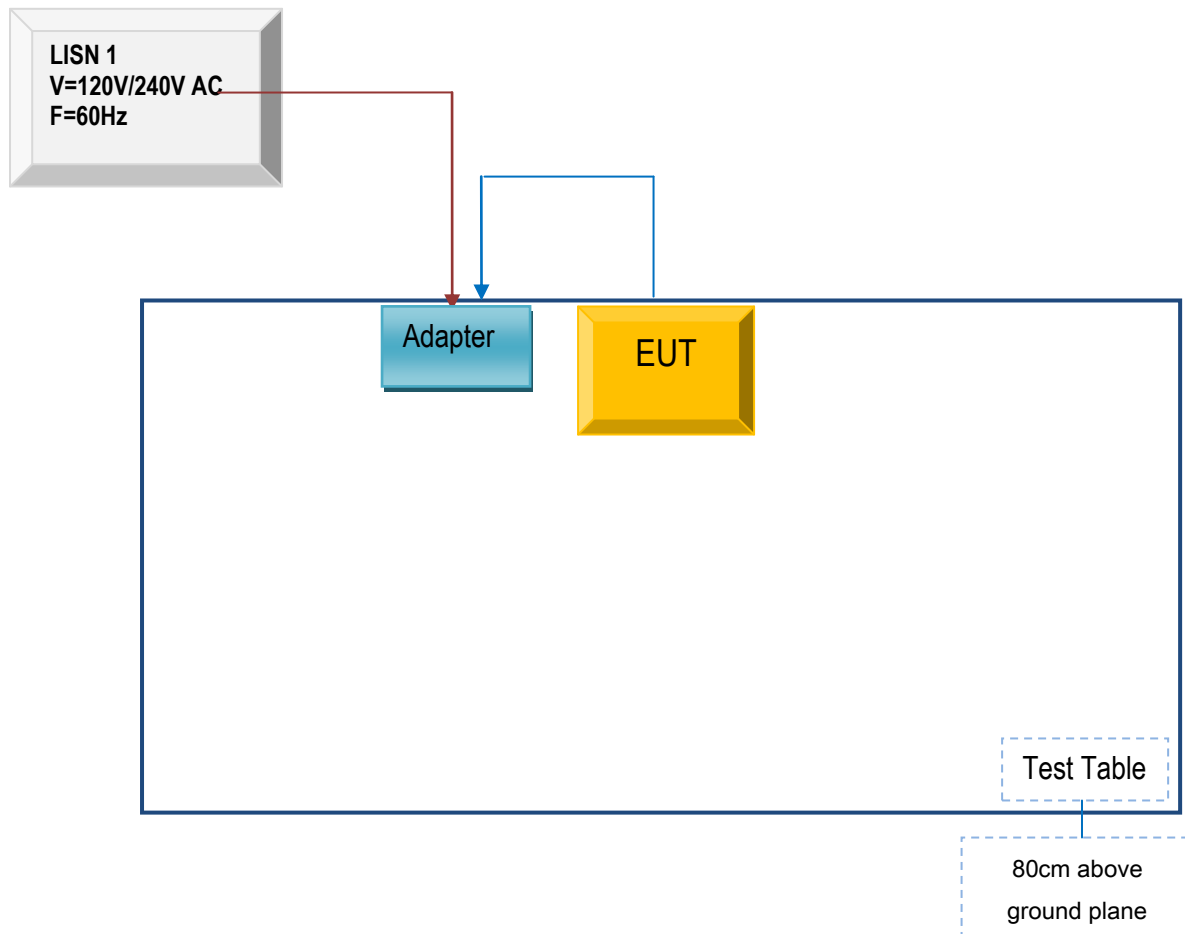


Radiated Spurious Emissions Test Setup Above
1GHz

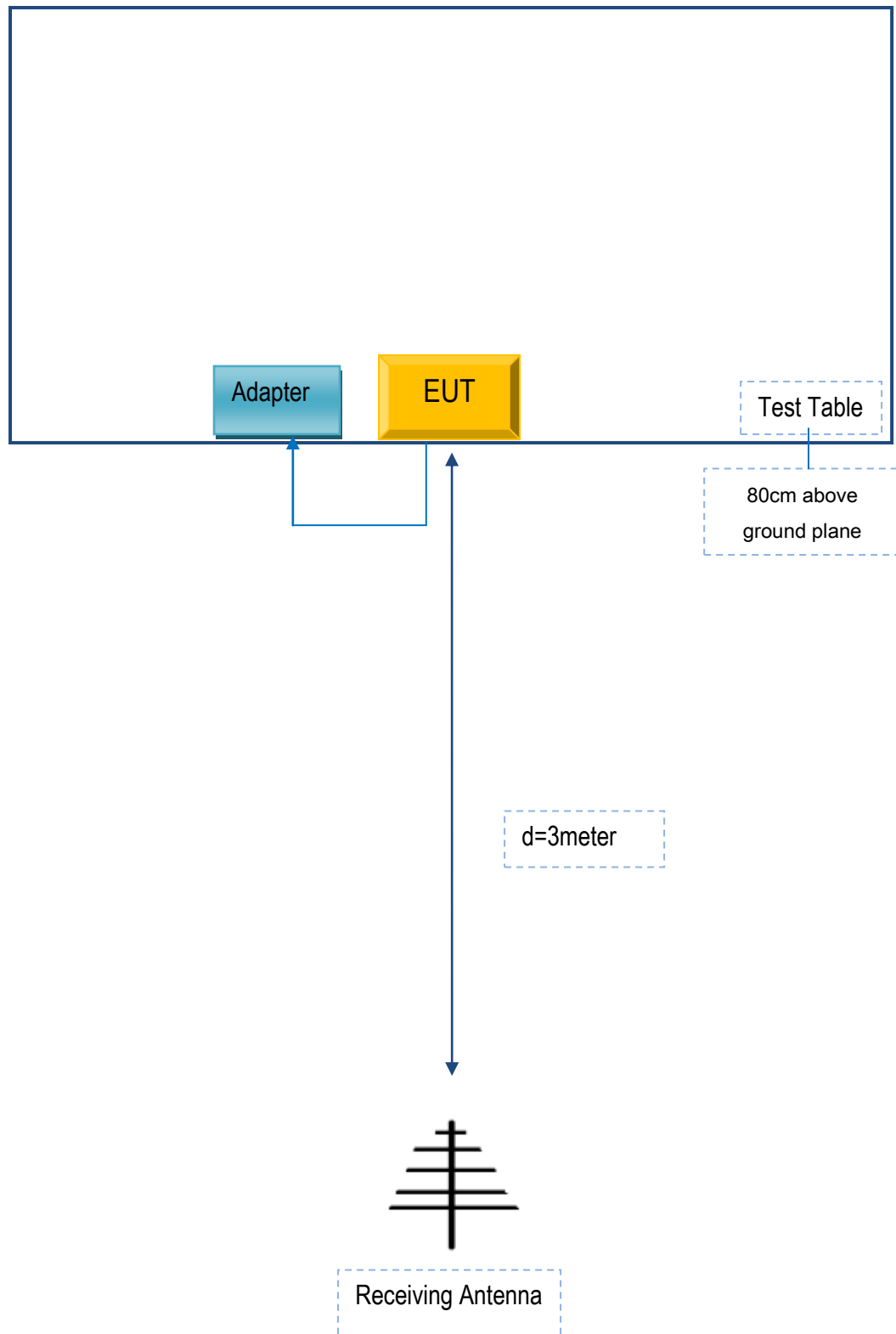
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

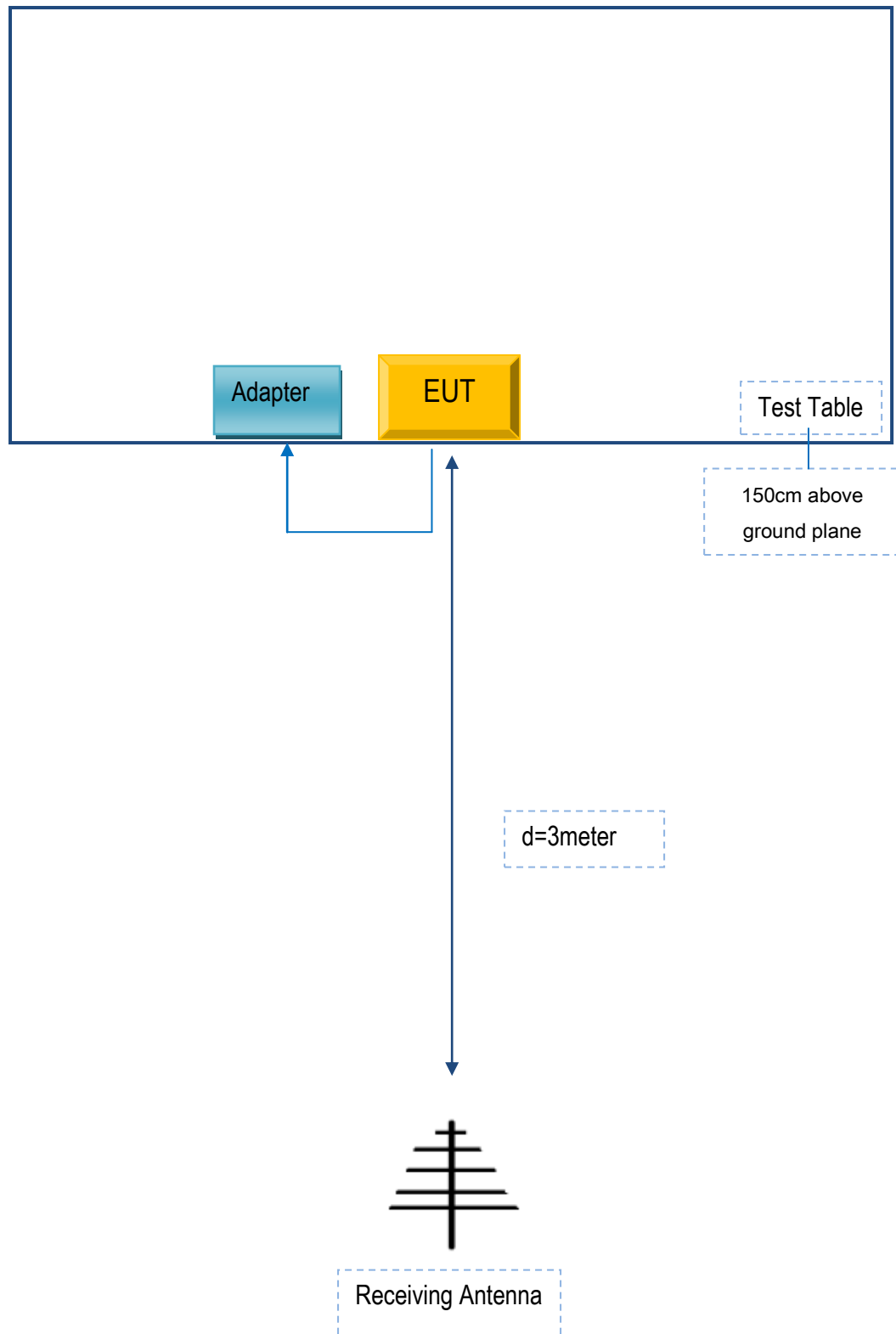
Block Configuration Diagram for AC Line Conducted Emissions



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



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



Annex C. 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
Verykool USA Inc	Adapter	QU050100	Y03346

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	Y03346

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

Please see the attachment

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Annex E. DECLARATION OF SIMILARITY

N/A