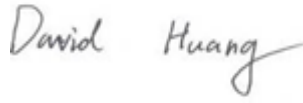


RF TEST REPORT



Report No.: 17070315-FCC-R2

Supersede Report No.: N/A

Applicant	Advantech Co Ltd	
Product Name	Mobile Data Terminal	
Model No.	PWS-472	
Serial No.	MICA-052, D300	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	April 22 to May 04, 2017	
Issue Date	May 05, 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

Test Report	17070315-FCC-R2
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1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070315-FCC-R2	NONE	Original	May 05, 2017

2. Customer information

Applicant Name	Advantech Co Ltd
Applicant Add	No. 1, Alley 20, Lane 26, Rueiguang Road , Neihu District, Taipei , Taiwan
Manufacturer	DOFUNTECH CO., LTD.
Manufacturer Add	A401, No.189 Xinjunhuan Rd., Pujiang Town, Minhang District, Shanghai, 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 of Radiated Emission	Radiated Emission Program-To Shenzhen v2.0
Test Software of Conducted Emission	EZ-EMC(ver.lcp-03A1)

4. Equipment under Test (EUT) Information

Description of EUT:	Mobile Data Terminal
Main Model:	PWS-472
Serial Model:	MICA-052, D300
Date EUT received:	April 21, 2017
Test Date(s):	April 22 to May 04, 2017
Equipment Category :	DSS
Antenna Gain:	BLE/Bluetooth(2.4G): 2.13dBi WIFI(2.4G): 2.13dBi WIFI(5150-5250MHz): 1.92dBi
Antenna Type:	PIFA antenna
Type of Modulation:	Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK 802.11b: DSSS 802.11a/g/n20/n40: OFDM BLE: GFSK
RF Operating Frequency (ies):	Bluetooth/BLE: 2402-2480 MHz 802.11b/g: 2412-2462 MHz (TX/RX) 802.11n20: 2412-2462MHz ; (TX/RX) 802.11n40: 2422-2452 MHz (TX/RX); 802.11 a: 5150-5250 MHz; (TX/RX)
Max. Output Power:	3.454dBm
Number of Channels:	Bluetooth: 79CH WIFI :802.11b/g: 11CH WIFI :802.11a: 24CH WIFI :802.11n20: 11CH(2.4GHz); 24CH(5GHz) WIFI :802.11n40: 9CH(2.4GHz); 12CH(5GHz) BLE: 40CH

Port: USB Port

Adapter:

Model: JHD-AP013U-050200BB-A

Input: AC100-240V~50/60Hz,0.35A

Output: DC 5.0V,2000mA

Input Power:

Battery:

Model: LBP300A

Spec : 3.7V,3200mAh,11.84Wh

Maximum chargeable voltage: 4.2V

Trade Name : ADVANTECH

FCC ID: M82-PWS472

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& Restricted Band and Radiated Emissions& Restricted Band	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/2.4G WIFI/BLE, the gain is 2.13dBi for Bluetooth/2.4G WIFI/BLE.

A permanently attached PIFA antenna for 5G WIFI, the gain is 1.92dBi for 5G WIFI (5150-5250MHz).

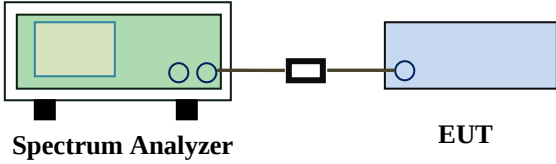
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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

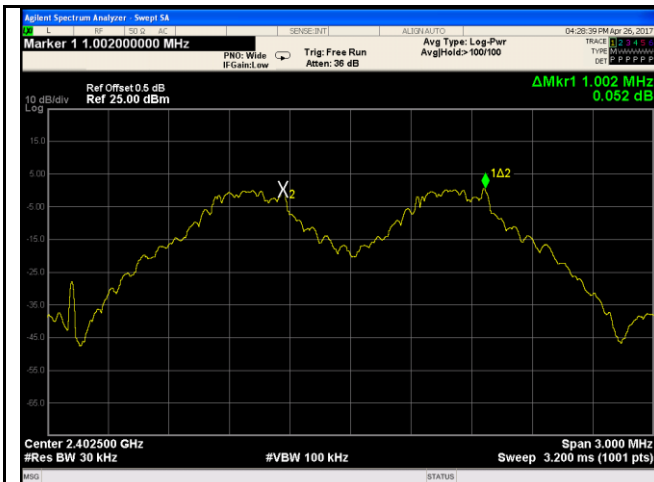
Test Plot ☒ Yes (See below) ☐ N/A

Channel Separation measurement result

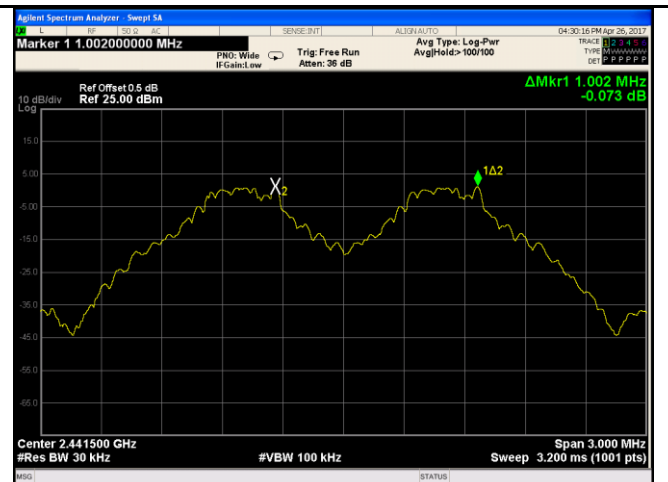
Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.685	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.686	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.689	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.002	0.857	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.859	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.859	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.861	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.863	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.873	Pass
	Adjacency Channel	2479			

Test Plots

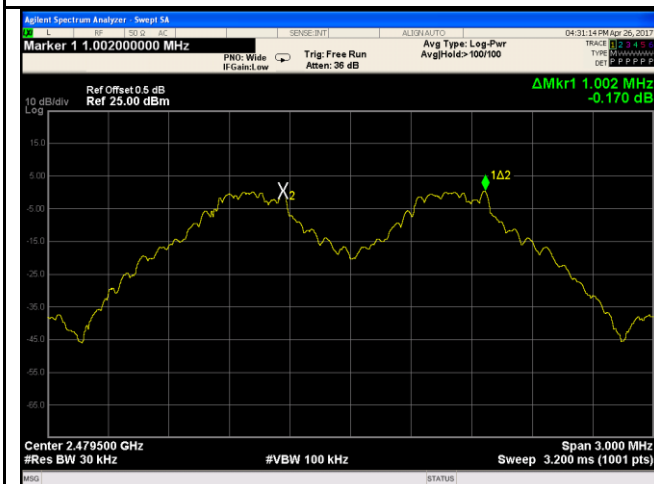
Channel Separation measurement result



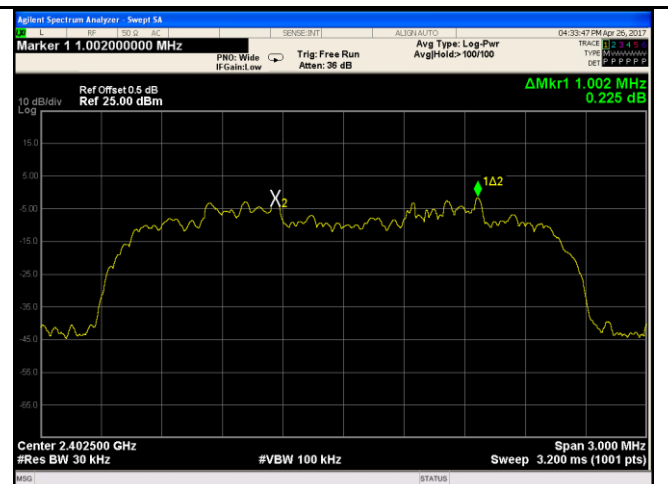
GFSK - Low Channel



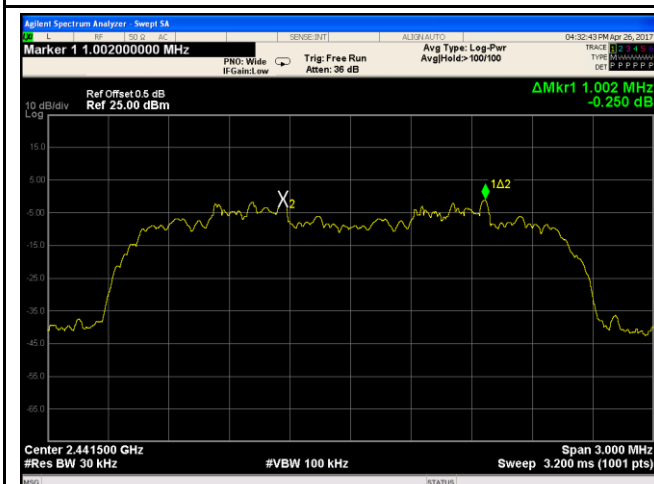
GFSK - Middle Channel



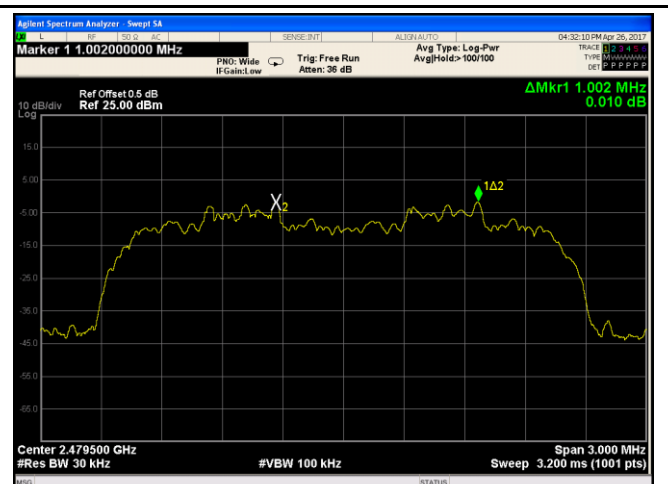
GFSK - High Channel



$\pi/4$ DPSK - Low Channel



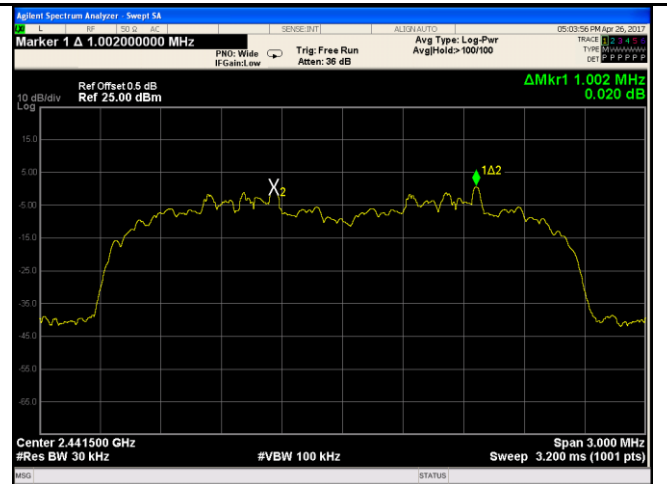
$\pi/4$ DQPSK - Middle Channel



$\pi/4$ DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel

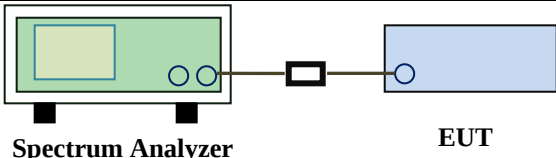


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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. <u>Use the following spectrum analyzer settings:</u> - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW $\geq$ 1% of the 20 dB bandwidth - VBW $\geq$ RBW - Sweep = auto - Detector function = peak - Trace = max hold. - The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference		

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

Test Data ☒ Yes ☐ N/A

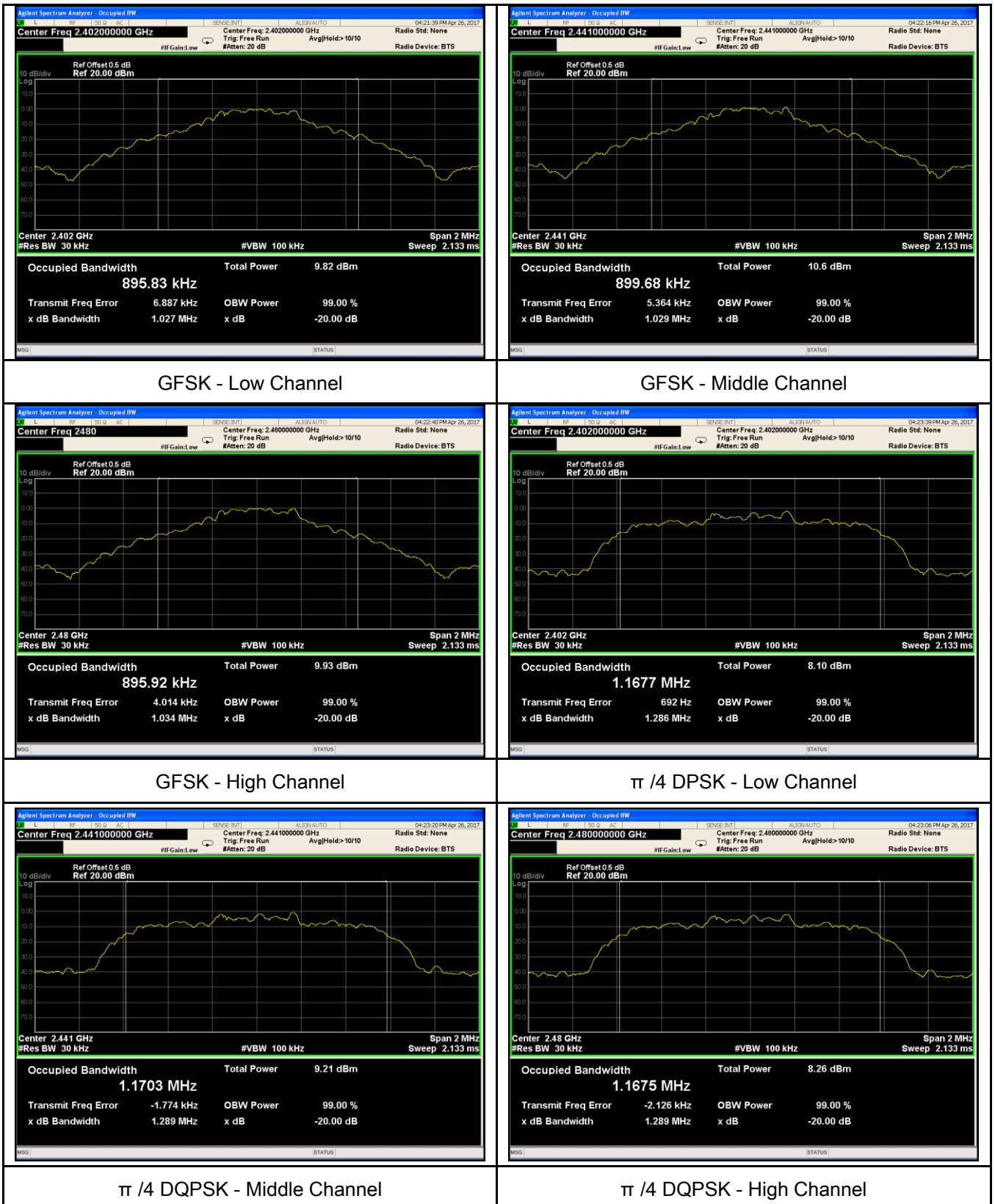
Test Plot ☒ Yes (See below) ☐ N/A

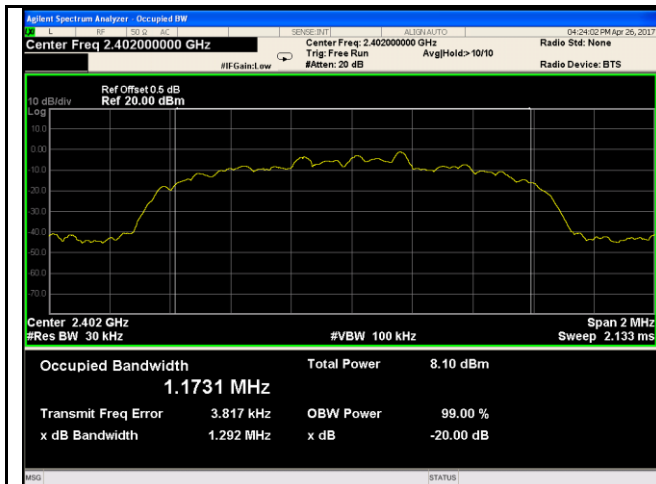
Measurement result

Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	1.027	0.8958
	Mid	2441	1.029	0.8997
	High	2480	1.034	0.8959
π /4 DQPSK	Low	2402	1.286	1.1677
	Mid	2441	1.289	1.1703
	High	2480	1.289	1.1675
8-DPSK	Low	2402	1.292	1.1731
	Mid	2441	1.295	1.1783
	High	2480	1.310	1.1837

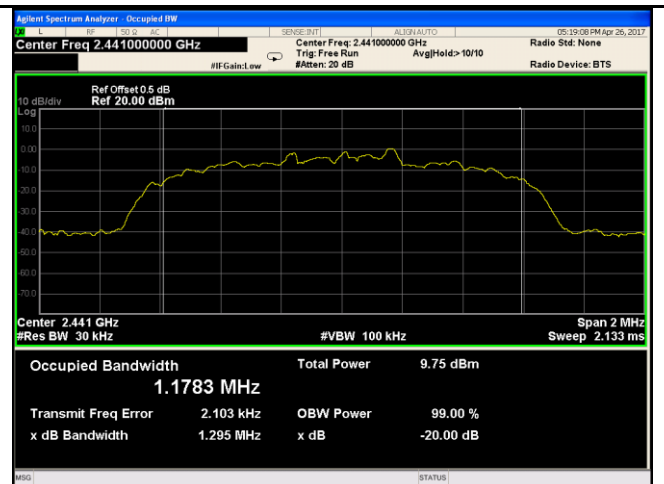
Test Plots

20dB Bandwidth measurement result

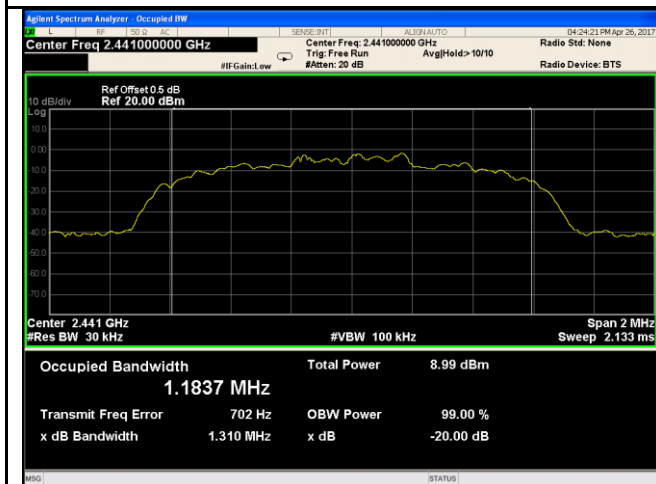




8DPSK - Low Channel



8DPSK - Middle Channel



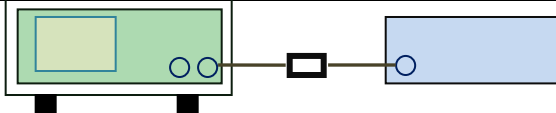
8DPSK - High Channel

6.4 Peak Output Power

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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. <u>Use the following spectrum analyzer settings:</u> - 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

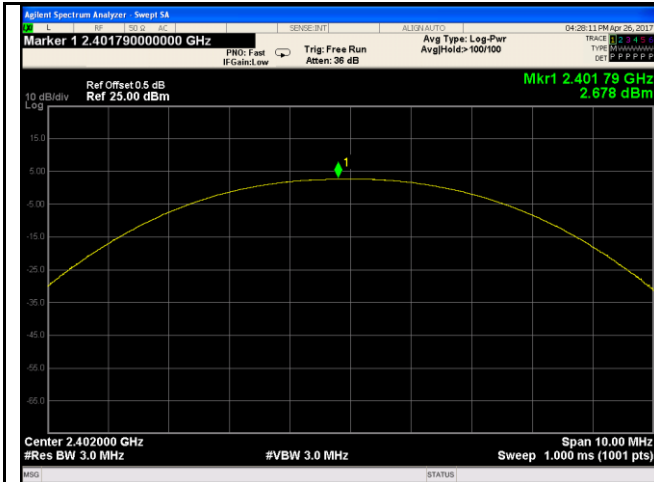
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

Peak Output Power measurement result

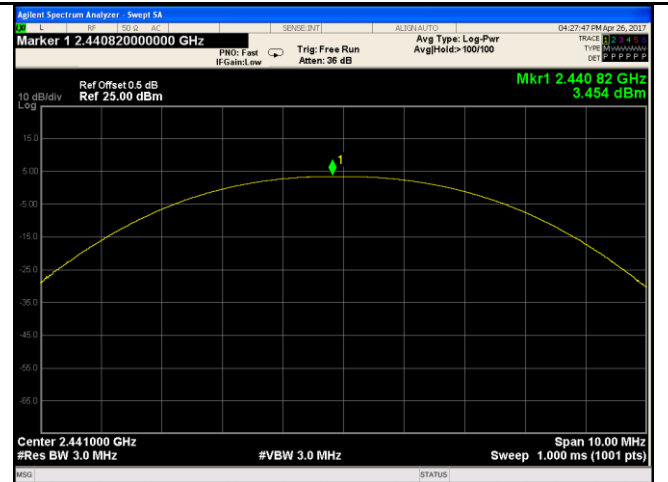
Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	2.678	125	Pass
		Mid	2441	3.454	125	Pass
		High	2480	2.754	125	Pass
	$\pi/4$ DQPSK	Low	2402	1.841	125	Pass
		Mid	2441	2.677	125	Pass
		High	2480	1.903	125	Pass
	8-DPSK	Low	2402	1.985	125	Pass
		Mid	2441	2.868	125	Pass
		High	2480	2.046	125	Pass

Test Plots

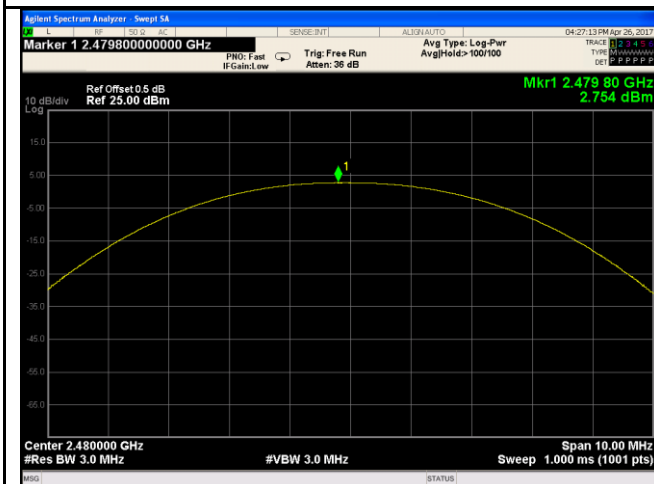
Output Power measurement result



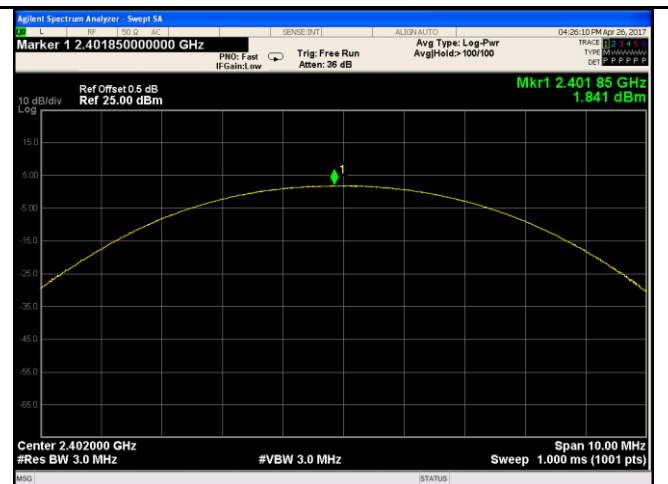
GFSK Output power - Low CH 2402



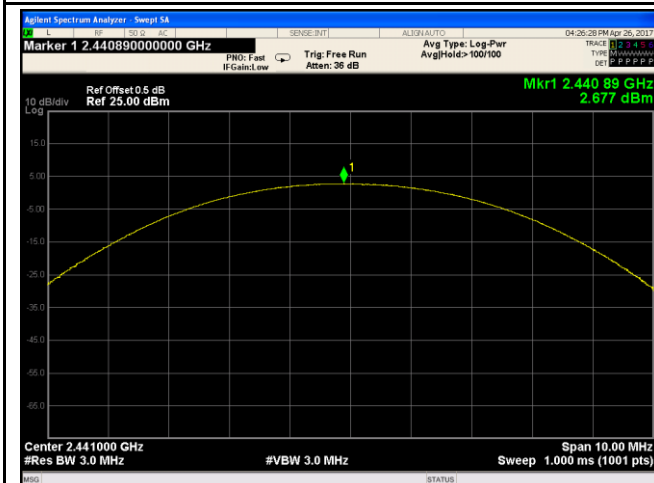
GFSK Output power - Mid CH 2441



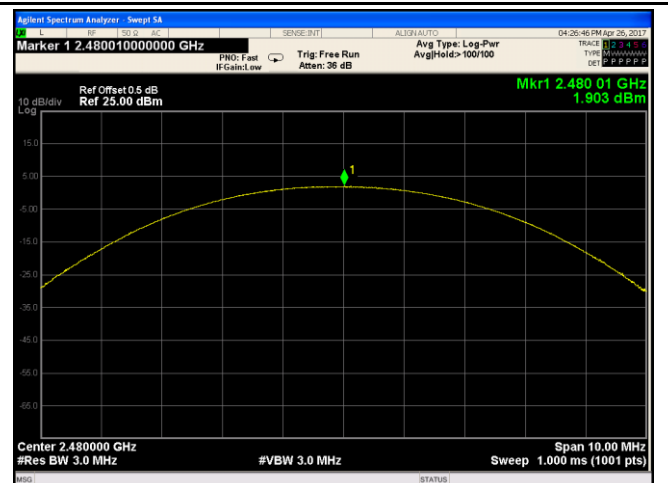
GFSK Output power - High CH 2480



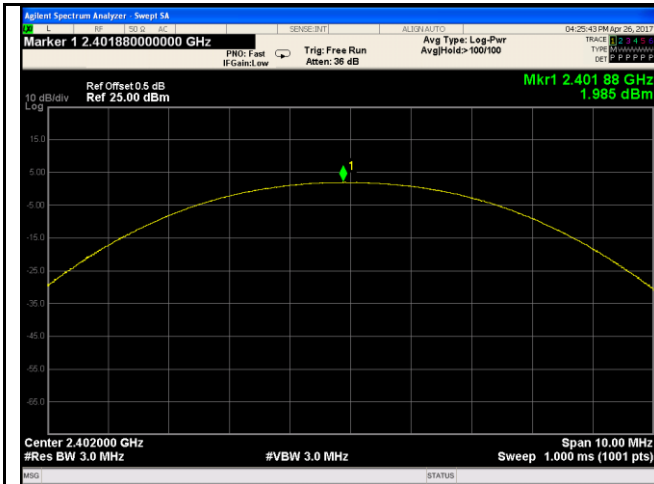
$\pi/4$ DQPSK Output power - Low CH 2402



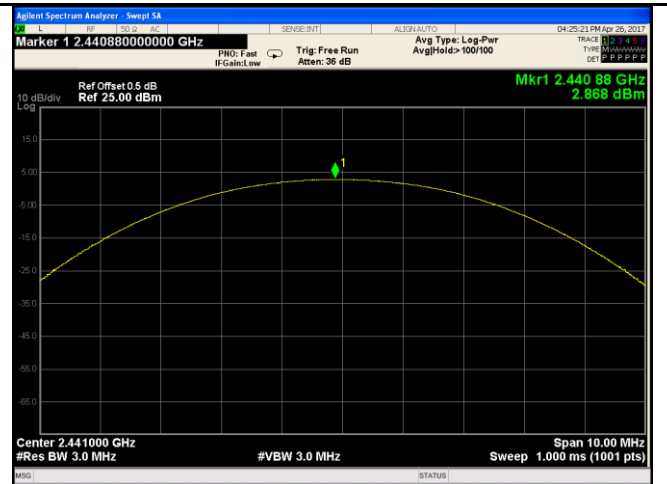
$\pi/4$ DQPSK Output power - Mid CH 2441



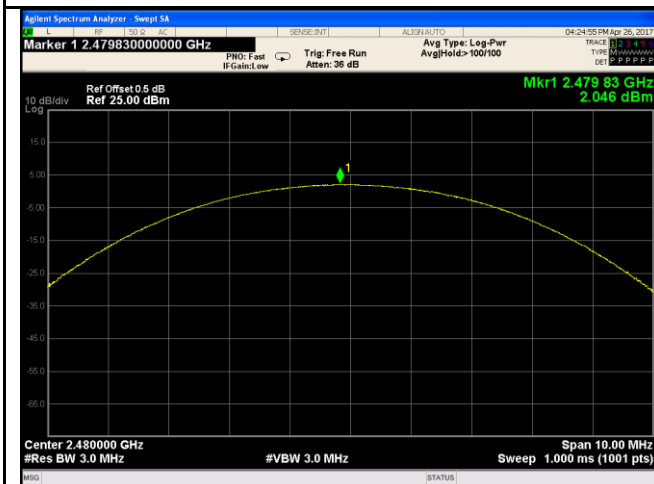
$\pi/4$ DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

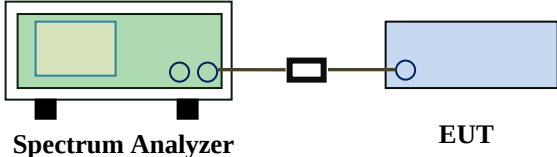


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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		

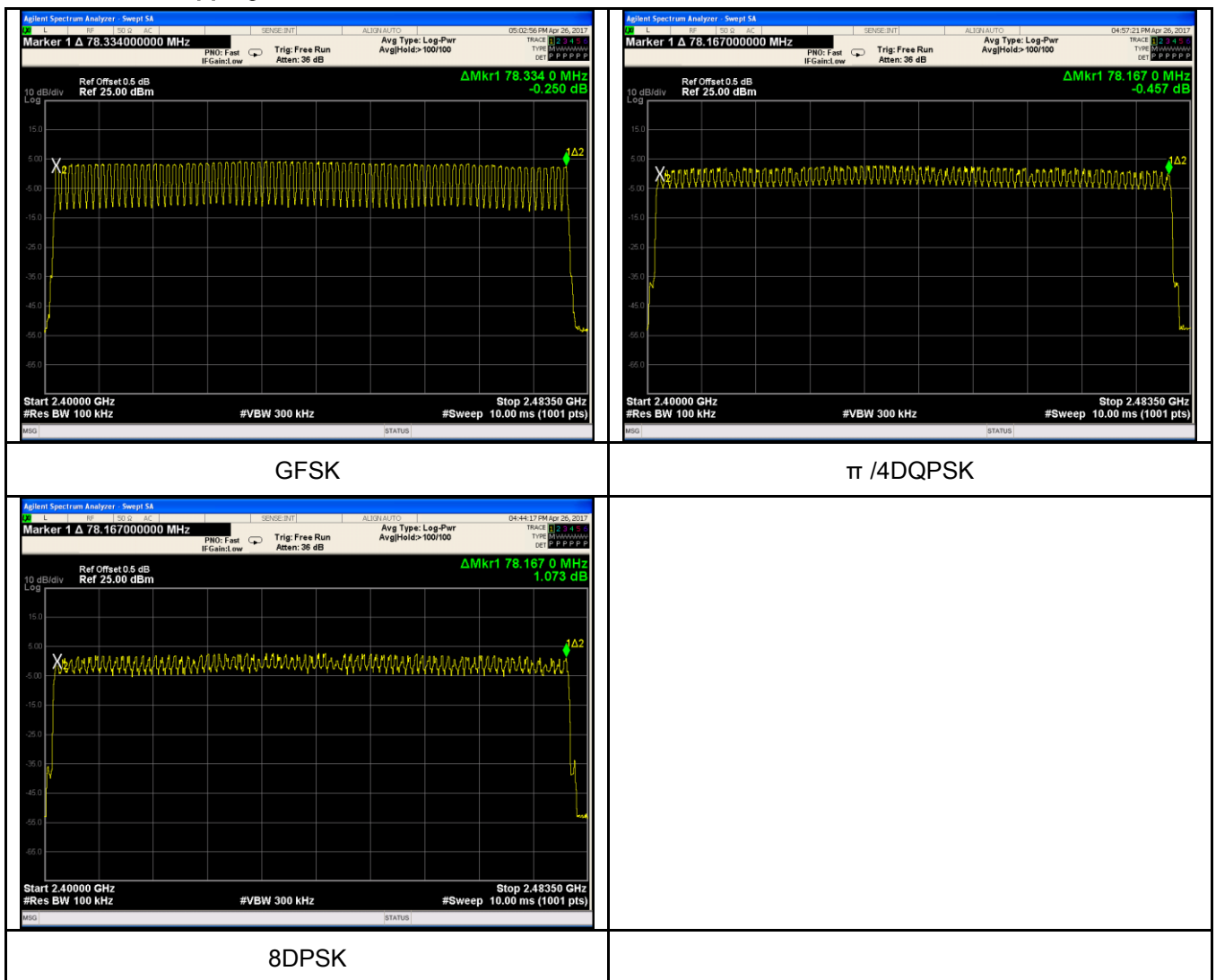
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

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

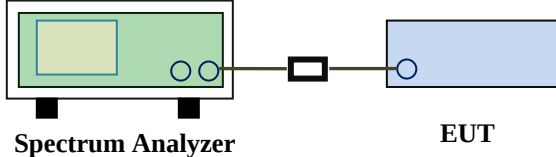
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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 - 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

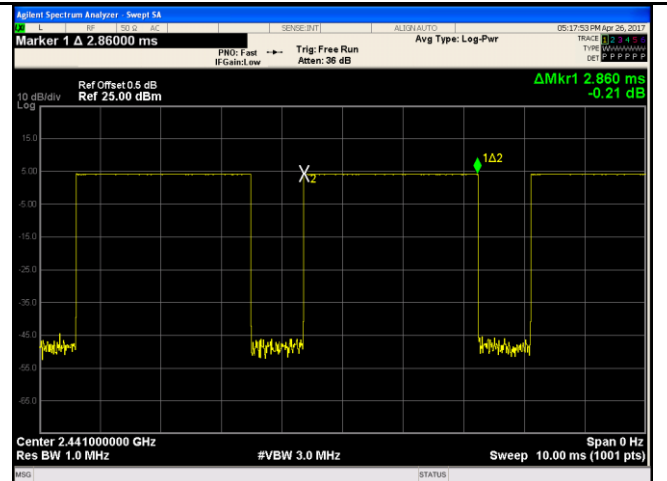
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.870	306.133	400	Pass
		Mid	2.860	305.067	400	Pass
		High	2.870	306.133	400	Pass
	π / 4 DQPSK	Low	2.880	307.200	400	Pass
		Mid	2.870	306.133	400	Pass
		High	2.880	307.200	400	Pass
	8-DPSK	Low	2.860	305.067	400	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

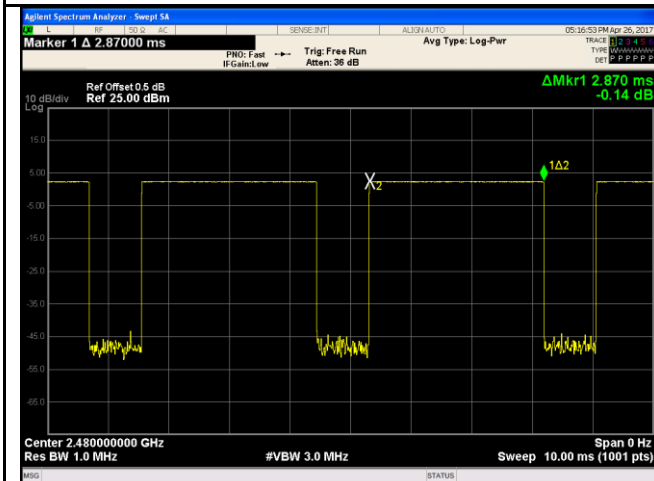
Dwell Time measurement result



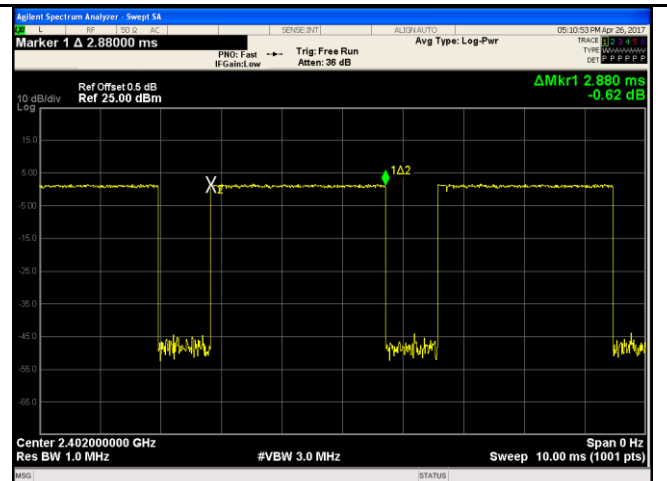
GFSK - Low CH 2402



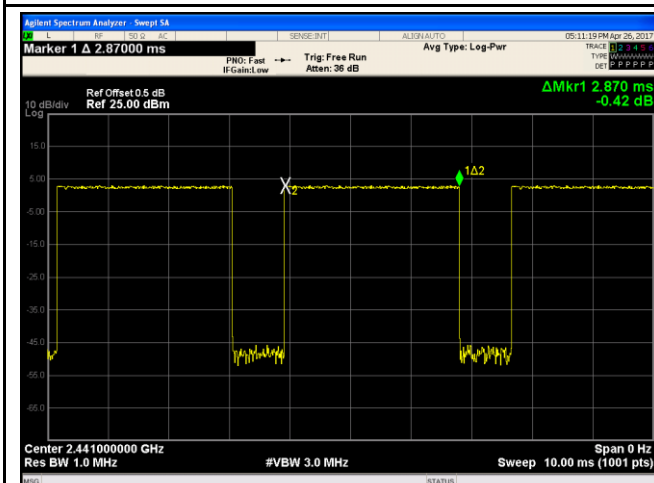
GFSK - Mid CH 2441



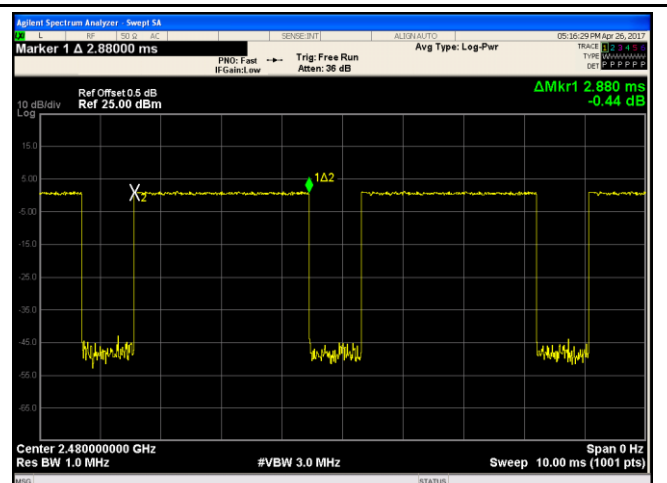
GFSK - High CH 2480



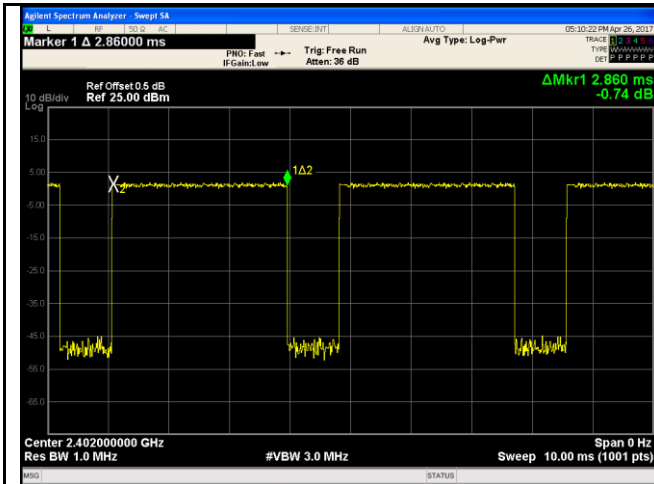
$\pi/4$ DQPSK - Low CH 2402



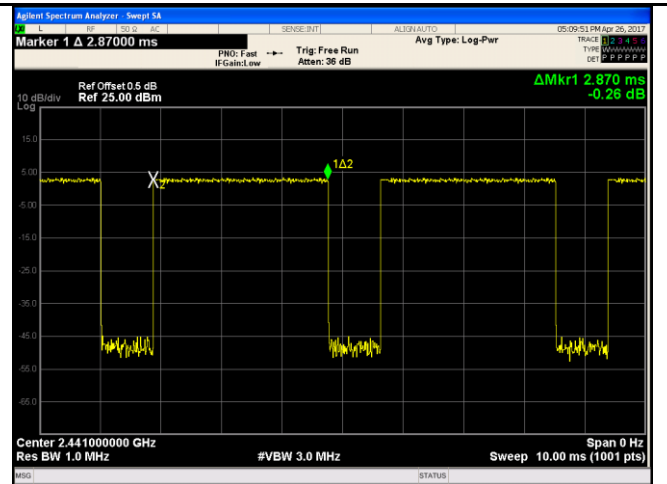
$\pi/4$ DQPSK - Mid CH 2441



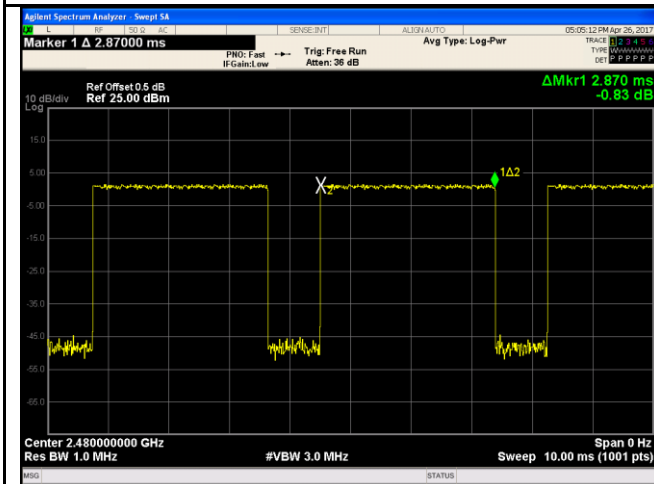
$\pi/4$ DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441



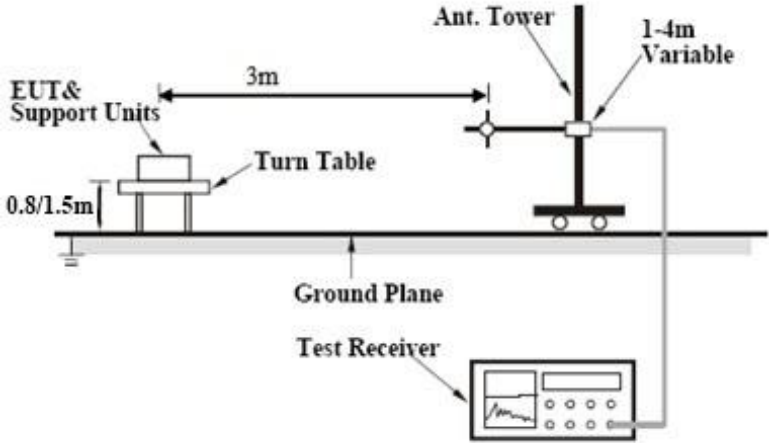
8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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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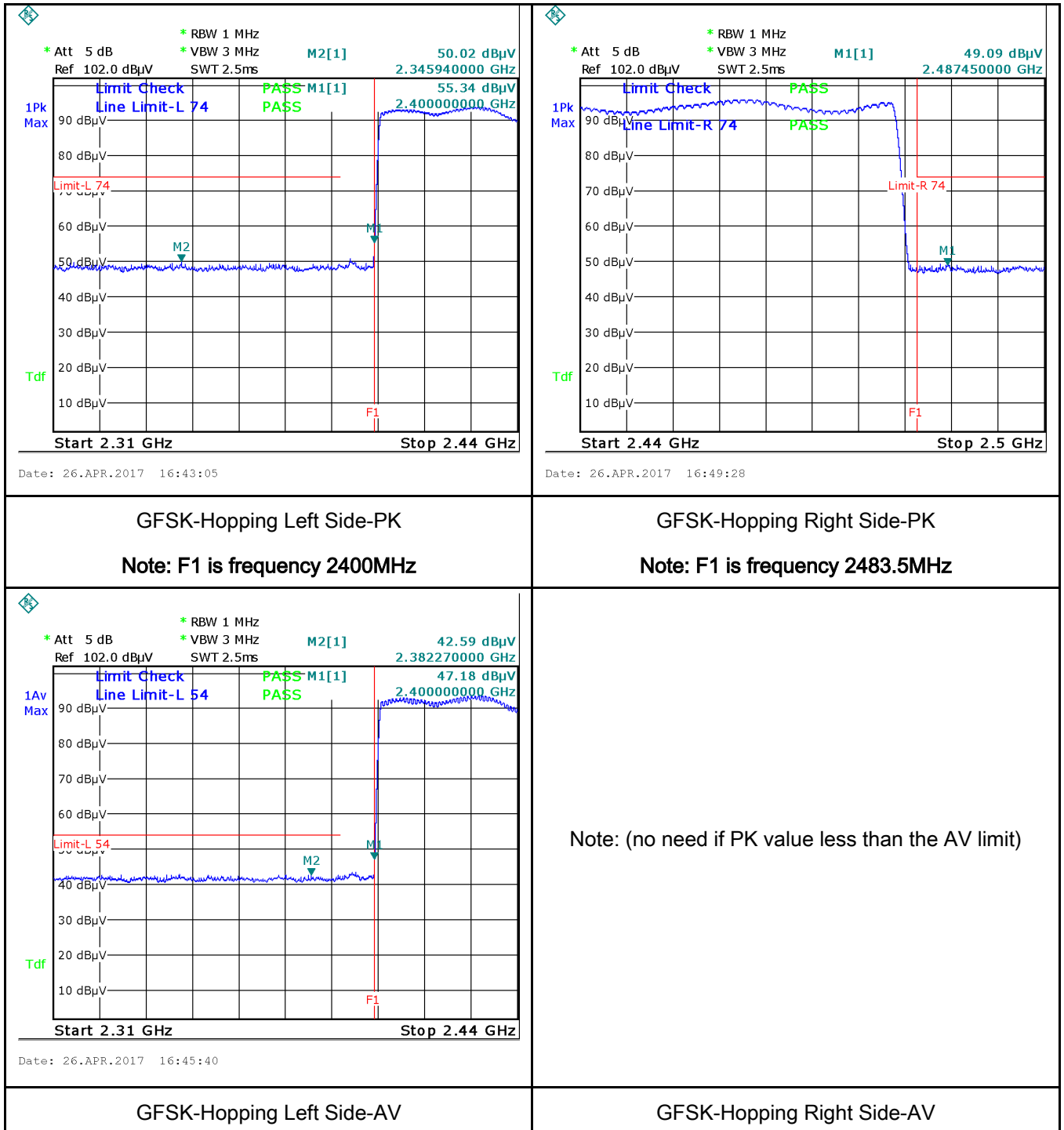
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. 2. Position the EUT without connection to measurement instrument. 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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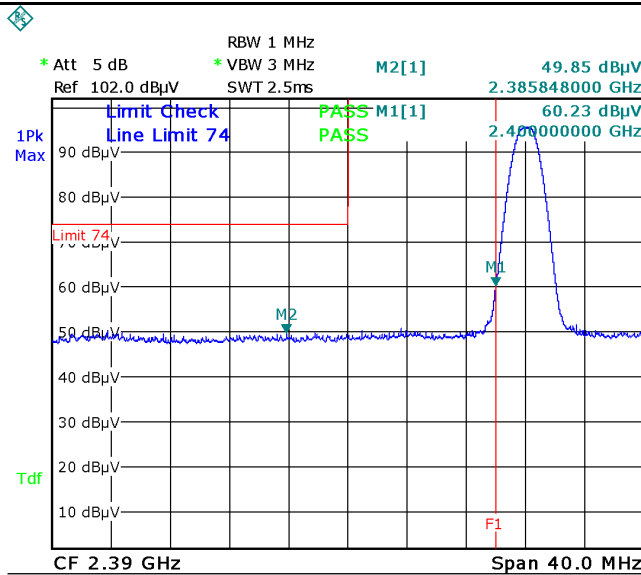
	and make sure the instrument is operated in its linear range. - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth 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

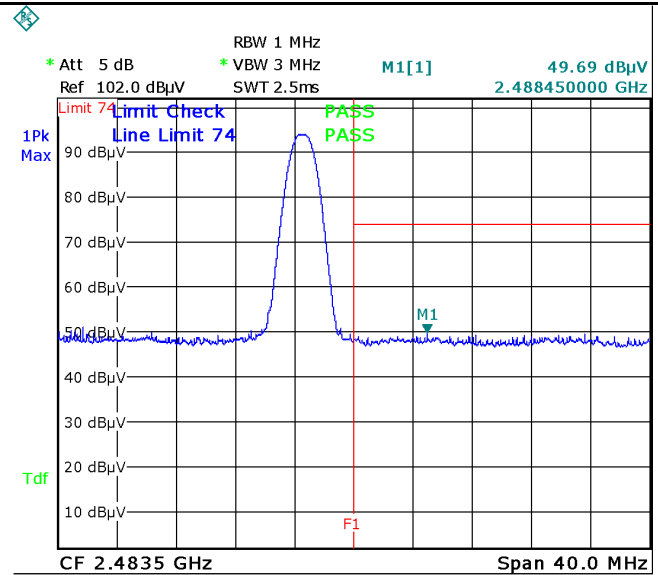
Test Plots

GFSK Mode:





Date: 26.APR.2017 16:10:02



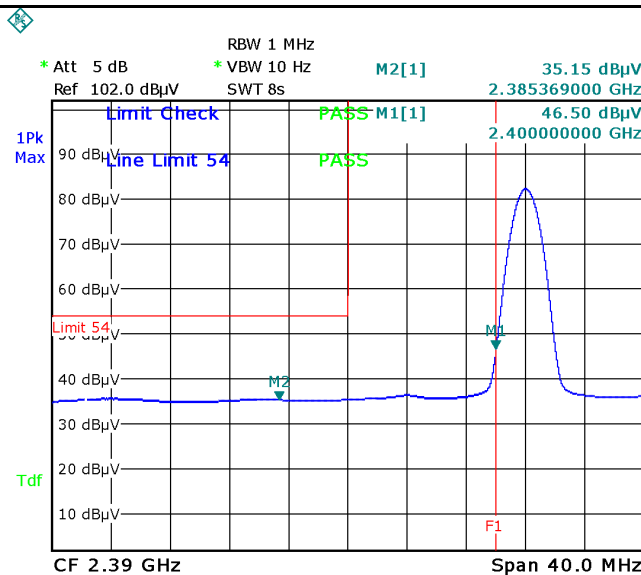
Date: 26.APR.2017 16:28:19

GFSK-Left Side-PK

Note: F1 is frequency 2400MHz

GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



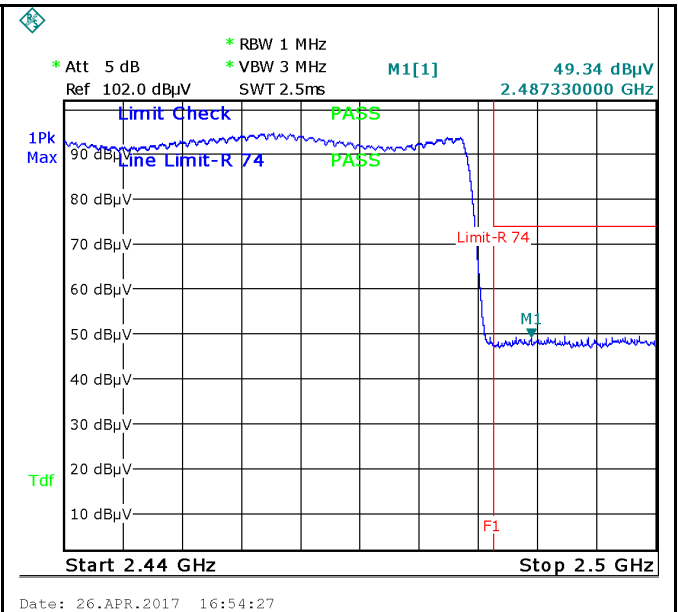
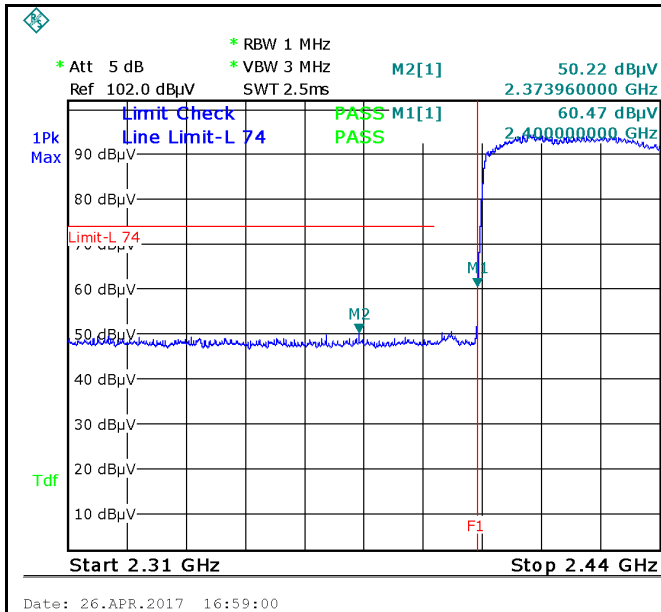
Date: 26.APR.2017 16:08:18

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

GFSK-Left Side-AV

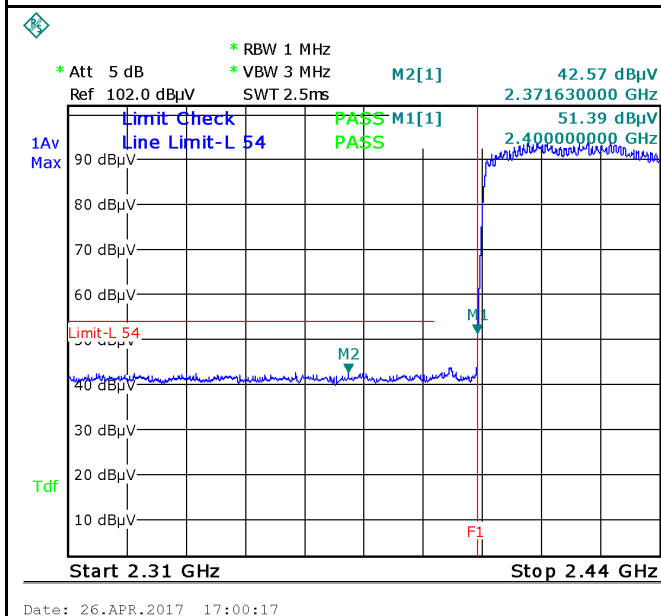
GFSK-Right Side-AV

$\pi/4$ DQPSK Mode:



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

Note: F1 is frequency 2400MHz



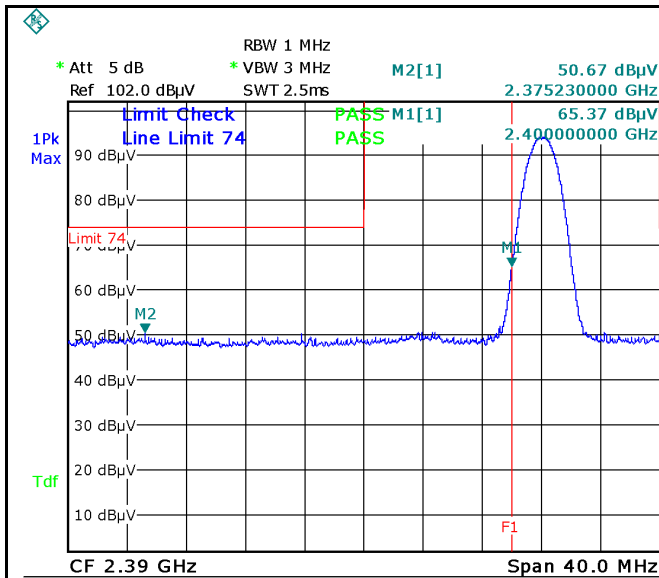
$\pi/4$ DQPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

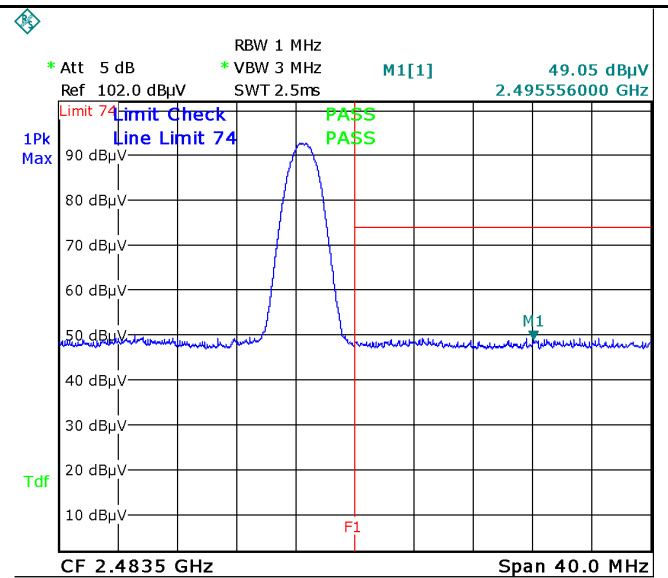
Note: (no need if PK value less than the AV limit)

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

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



Date: 26.APR.2017 16:16:15



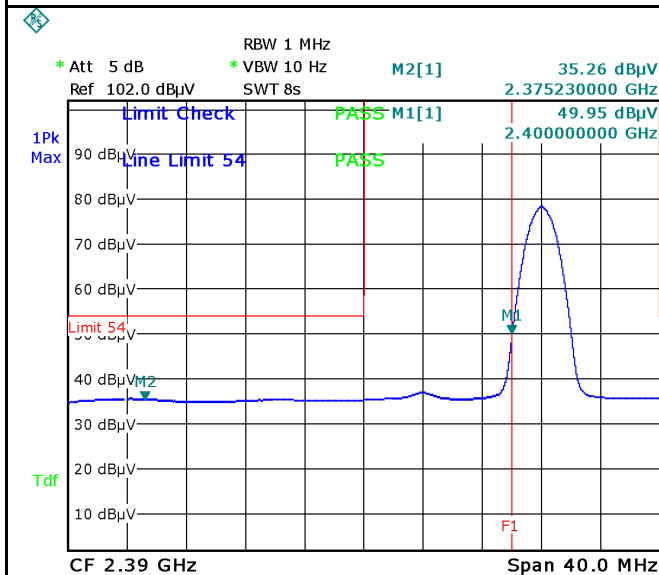
Date: 26.APR.2017 16:30:46

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

Note: F1 is frequency 2400MHz

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

Note: F1 is frequency 2483.5MHz



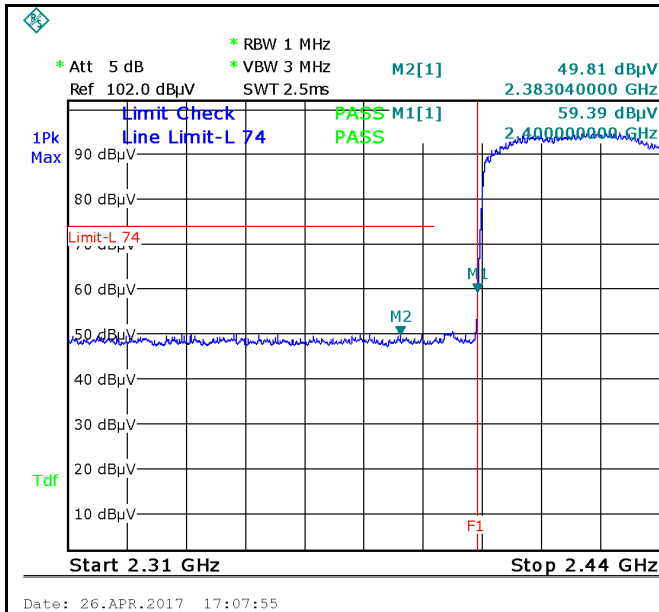
Date: 26.APR.2017 16:17:12

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

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

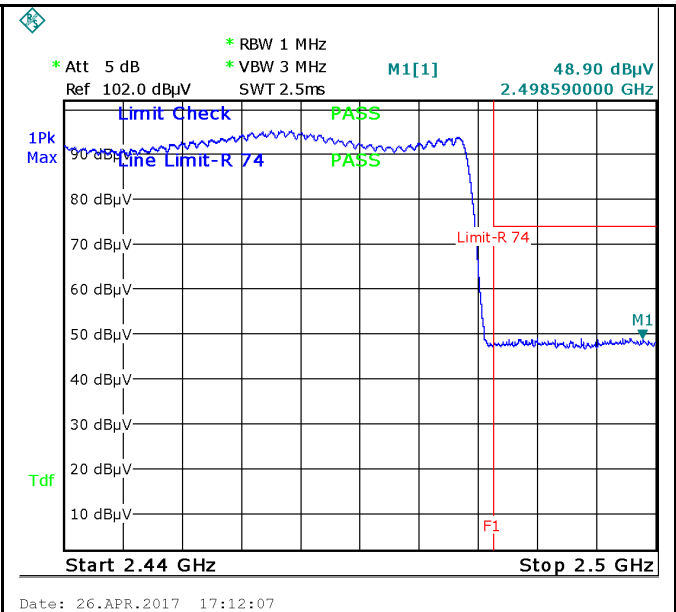
$\pi/4$ DQPSK-Right Side-AV

8-DPSK Mode:



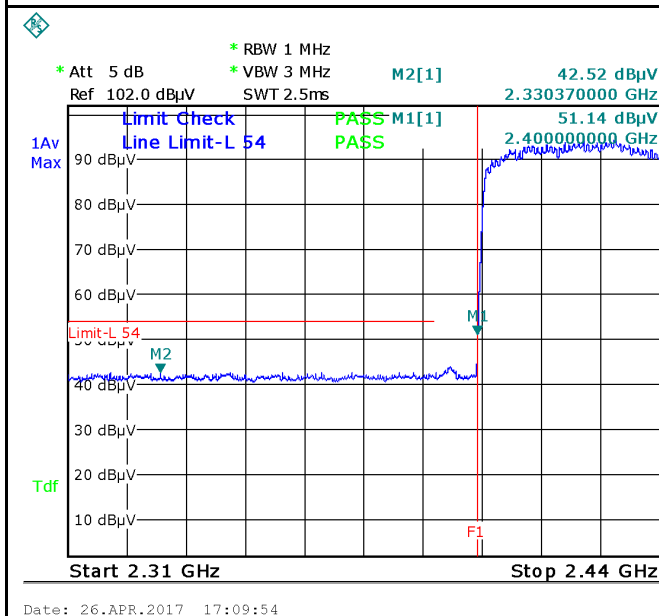
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

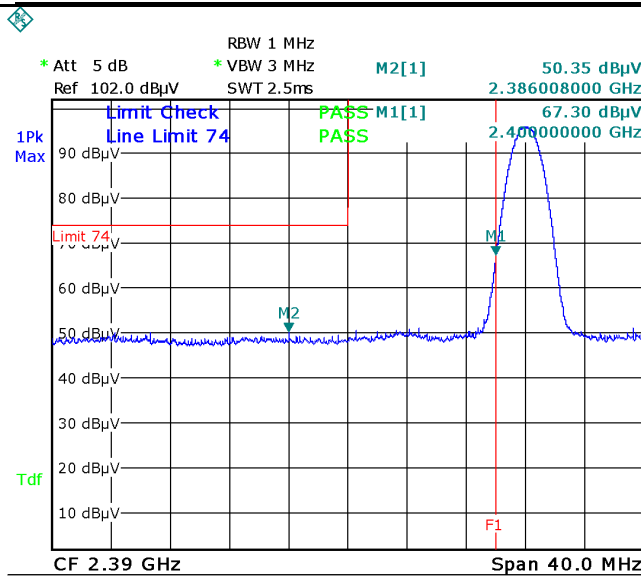
Note: F1 is frequency 2483.5MHz



8DPSK-Hopping Left-AV

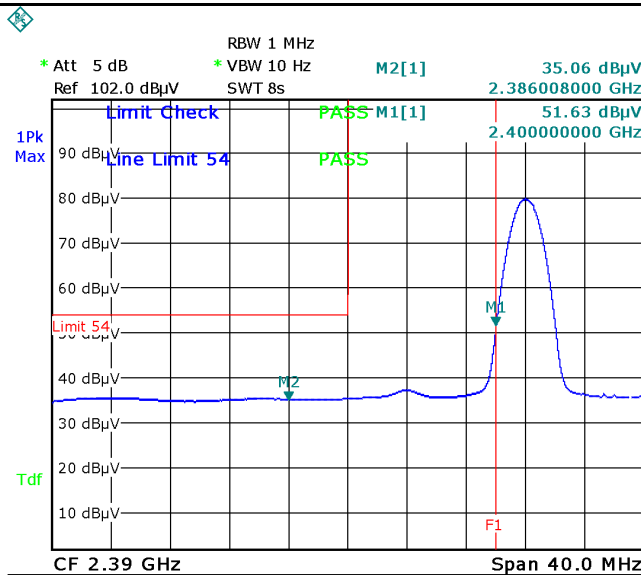
Note: (no need if PK value less than the AV limit)

8DPSK-Hopping Right-AV

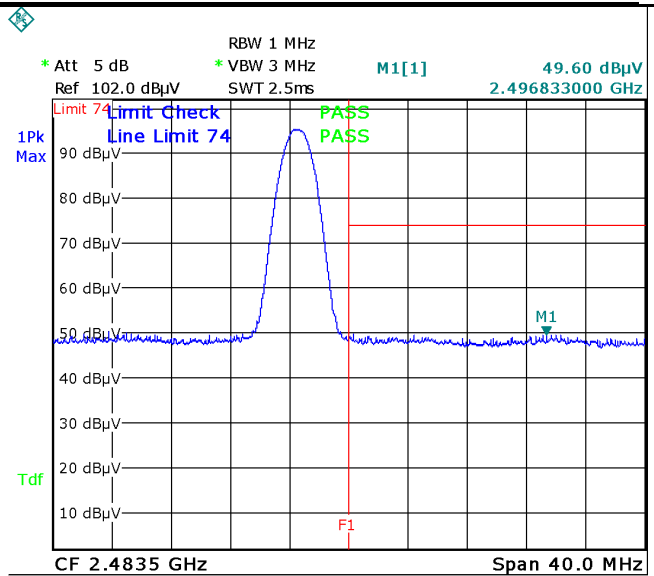


8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Left Side-AV



8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

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

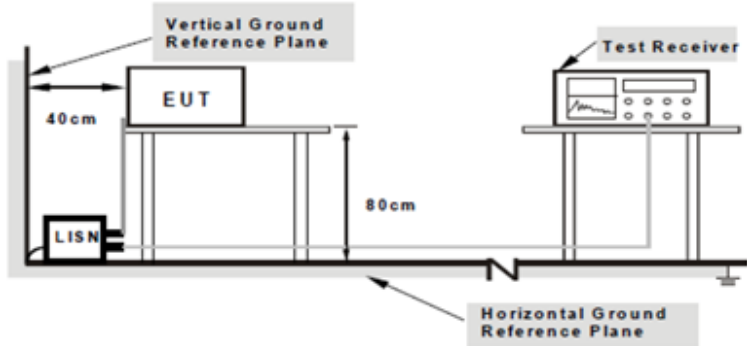
8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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			

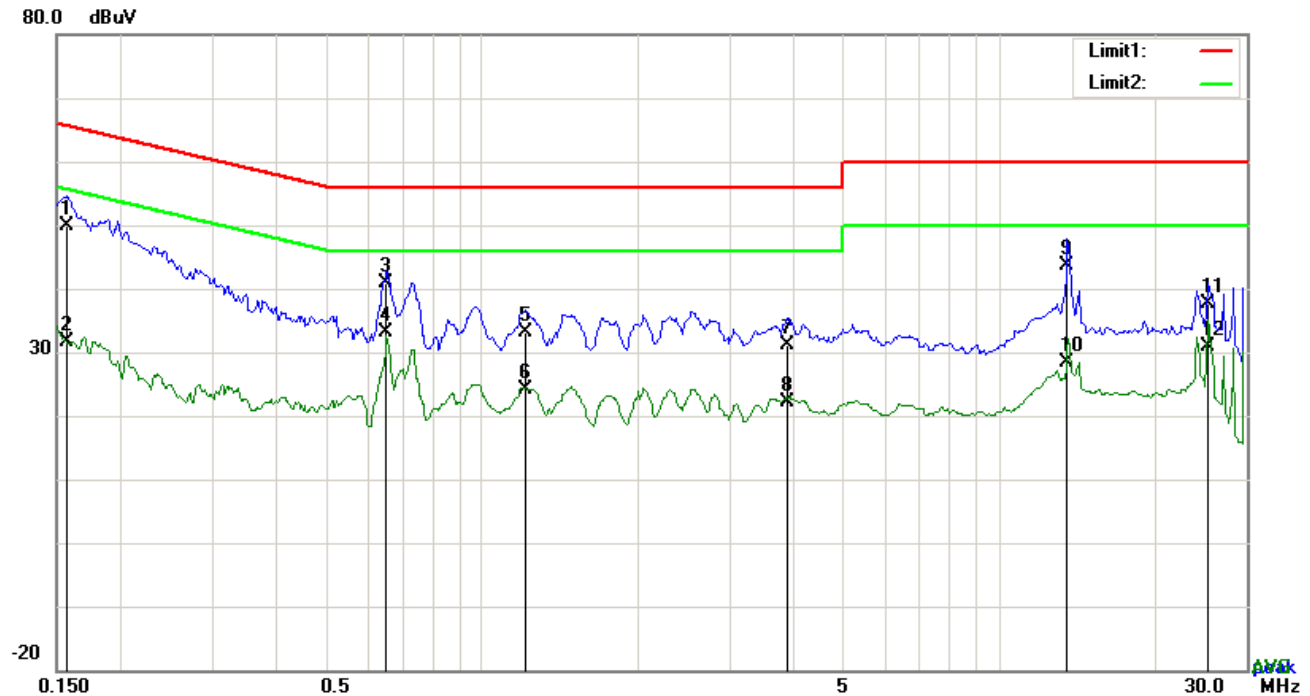
Test Setup	 Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.
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Procedure	- The EUT and supporting equipment were set up in accordance 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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	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

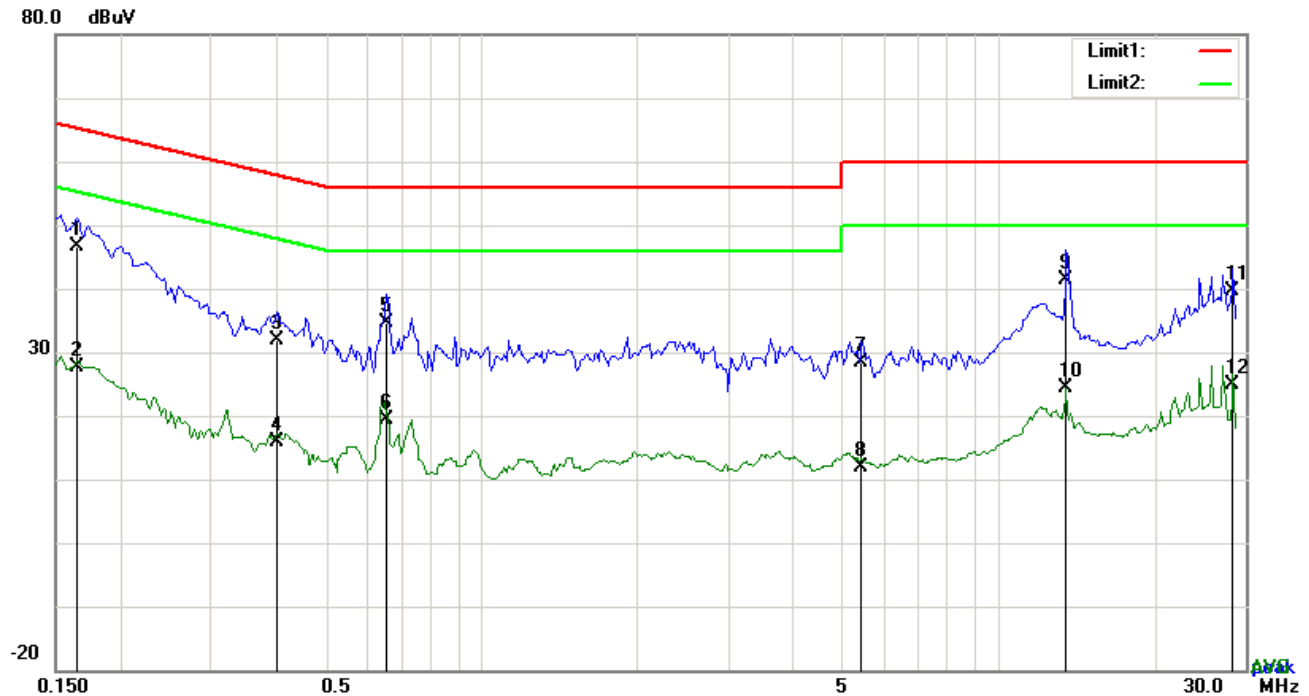


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.1578	39.87	QP	10.03	49.90	65.58	-15.68
2	L1	0.1578	21.60	AVG	10.03	31.63	55.58	-23.95
3	L1	0.6531	30.88	QP	10.03	40.91	56.00	-15.09
4	L1	0.6531	23.12	AVG	10.03	33.15	46.00	-12.85
5	L1	1.2147	23.07	QP	10.03	33.10	56.00	-22.90
6	L1	1.2147	14.17	AVG	10.03	24.20	46.00	-21.80
7	L1	3.9009	21.04	QP	10.07	31.11	56.00	-24.89
8	L1	3.9009	12.06	AVG	10.07	22.13	46.00	-23.87
9	L1	13.5222	33.53	QP	10.20	43.73	60.00	-16.27
10	L1	13.5222	18.14	AVG	10.20	28.34	50.00	-21.66
11	L1	25.2300	27.18	QP	10.40	37.58	60.00	-22.42
12	L1	25.2300	20.39	AVG	10.40	30.79	50.00	-19.21

Test Mode:	Bluetooth Mode
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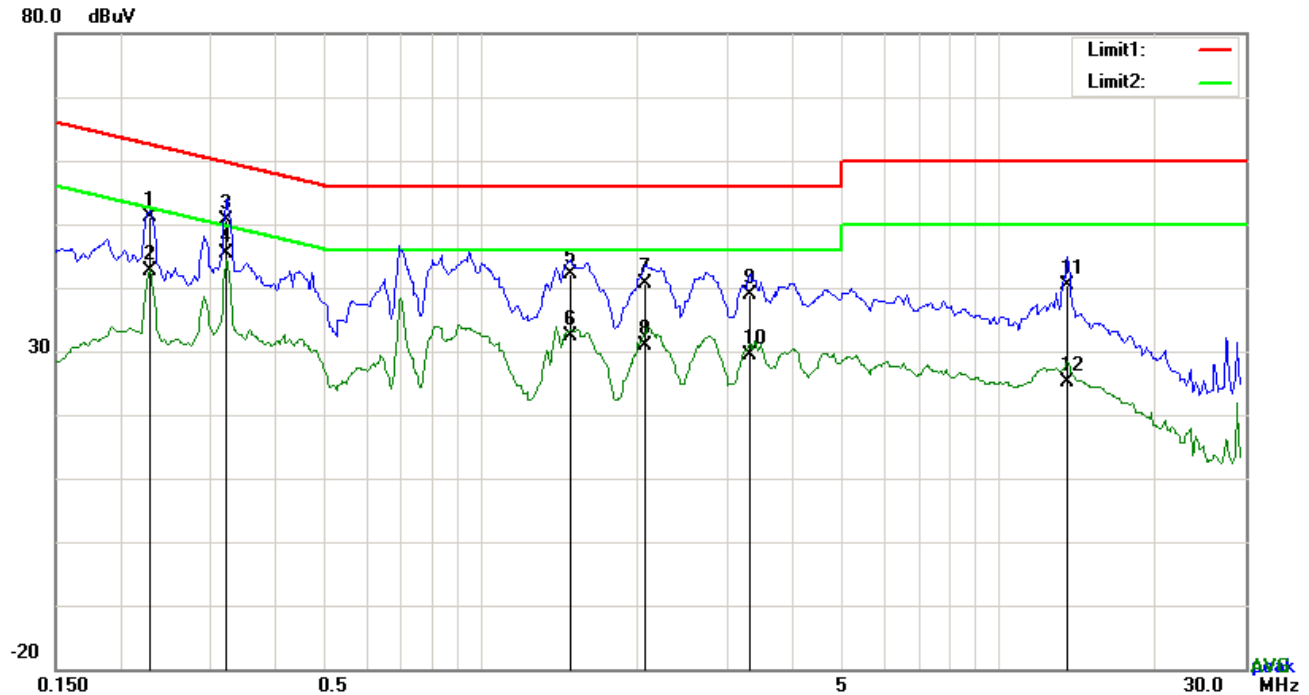


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.1656	36.73	QP	10.02	46.75	65.18	-18.43
2	N	0.1656	17.70	AVG	10.02	27.72	55.18	-27.46
3	N	0.4035	21.96	QP	10.02	31.98	57.78	-25.80
4	N	0.4035	5.82	AVG	10.02	15.84	47.78	-31.94
5	N	0.6570	24.57	QP	10.02	34.59	56.00	-21.41
6	N	0.6570	9.35	AVG	10.02	19.37	46.00	-26.63
7	N	5.4336	18.42	QP	10.08	28.50	60.00	-31.50
8	N	5.4336	1.86	AVG	10.08	11.94	50.00	-38.06
9	N	13.5261	31.27	QP	10.18	41.45	60.00	-18.55
10	N	13.5261	14.13	AVG	10.18	24.31	50.00	-25.69
11	N	28.3149	29.22	QP	10.39	39.61	60.00	-20.39
12	N	28.3149	14.38	AVG	10.39	24.77	50.00	-25.23

Test Mode: Bluetooth Mode

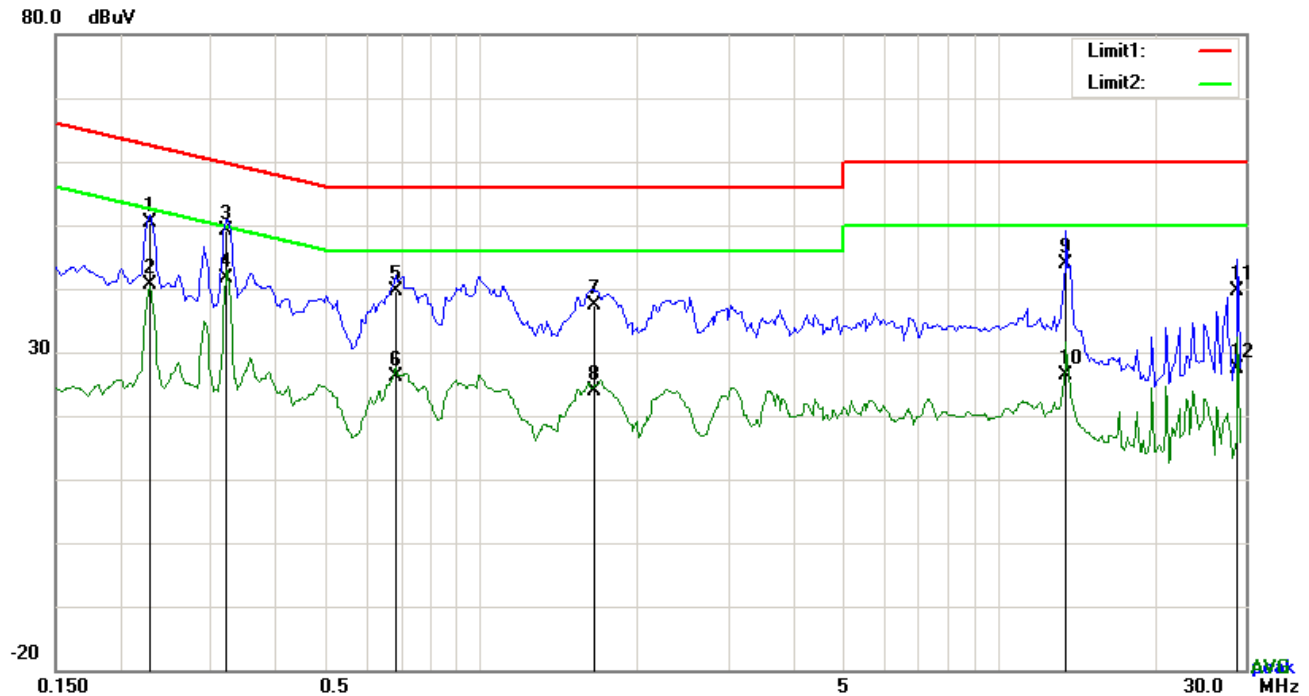


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.2280	40.98	QP	10.03	51.01	62.52	-11.51
2	L1	0.2280	32.55	AVG	10.03	42.58	52.52	-9.94
3	L1	0.3216	40.55	QP	10.03	50.58	59.67	-9.09
4	L1	0.3216	35.29	AVG	10.03	45.32	49.67	-4.35
5	L1	1.4838	32.03	QP	10.04	42.07	56.00	-13.93
6	L1	1.4838	22.34	AVG	10.04	32.38	46.00	-13.62
7	L1	2.0766	30.53	QP	10.04	40.57	56.00	-15.43
8	L1	2.0766	20.88	AVG	10.04	30.92	46.00	-15.08
9	L1	3.3081	28.91	QP	10.06	38.97	56.00	-17.03
10	L1	3.3081	19.36	AVG	10.06	29.42	46.00	-16.58
11	L1	13.5807	30.18	QP	10.20	40.38	60.00	-19.62
12	L1	13.5807	14.82	AVG	10.20	25.02	50.00	-24.98

Test Mode: Bluetooth Mode



Test Data

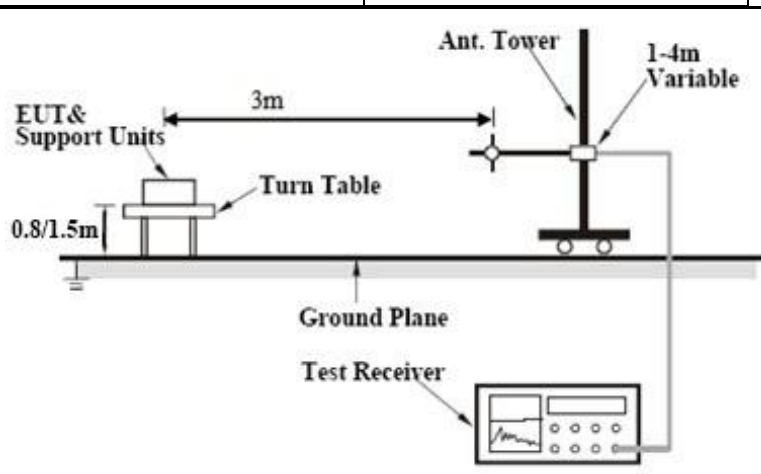
Phase Neutral Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.2280	40.47	QP	10.02	50.49	62.52	-12.03
2	N	0.2280	30.58	AVG	10.02	40.60	52.52	-11.92
3	N	0.3216	39.19	QP	10.02	49.21	59.67	-10.46
4	N	0.3216	31.63	AVG	10.02	41.65	49.67	-8.02
5	N	0.6843	29.66	QP	10.02	39.68	56.00	-16.32
6	N	0.6843	16.20	AVG	10.02	26.22	46.00	-19.78
7	N	1.6593	27.24	QP	10.04	37.28	56.00	-18.72
8	N	1.6593	13.96	AVG	10.04	24.00	46.00	-22.00
9	N	13.5495	33.70	QP	10.18	43.88	60.00	-16.12
10	N	13.5495	16.32	AVG	10.18	26.50	50.00	-23.50
11	N	28.9857	29.30	QP	10.40	39.70	60.00	-20.30
12	N	28.9857	17.08	AVG	10.40	27.48	50.00	-22.52

6.9 Radiated Emissions & Restricted Band

Temperature	23 °C
Relative Humidity	59%
Atmospheric Pressure	1026mbar
Test date :	April 26, 2017
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													
Procedure	1. 2.	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:											

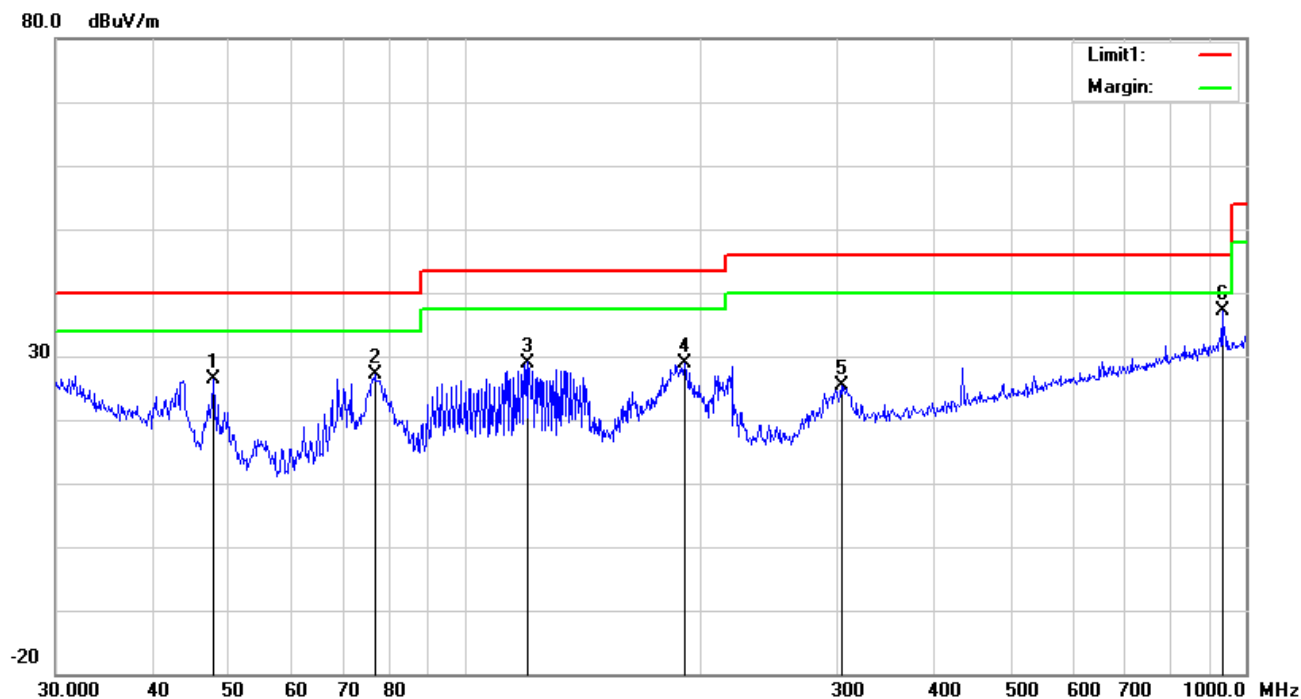
	a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution 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



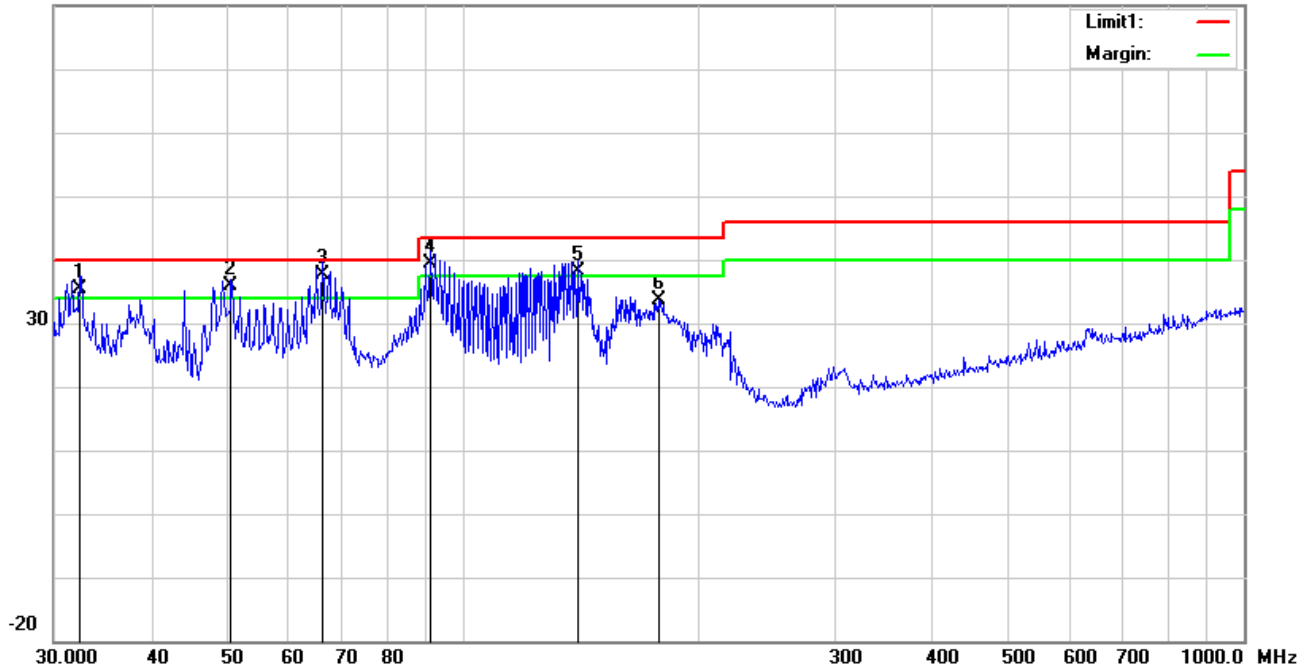
Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	H	47.8260	38.54	peak	9.36	22.34	0.78	26.34	40.00	-13.66	100	133
2	H	76.7808	40.92	peak	7.66	22.41	0.99	27.16	40.00	-12.84	100	110
3	H	120.6991	36.35	peak	13.85	22.36	1.16	29.00	43.50	-14.50	100	13
4	H	191.0738	37.97	peak	11.61	22.32	1.54	28.80	43.50	-14.70	100	153
5	H	303.5437	32.12	peak	13.67	22.28	1.81	25.32	46.00	-20.68	100	312
6	H	932.2715	32.12	peak	22.66	20.82	3.13	37.09	46.00	-8.91	100	240

Below 1GHz

80.0 dBuV/m



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()
1	V	32.4059	37.33	QP	19.55	22.27	0.69	35.30	40.00	-4.70	100	153
2	V	50.5860	49.04	QP	8.34	22.38	0.80	35.80	40.00	-4.20	100	57
3	V	66.2662	51.57	QP	7.61	22.39	0.91	37.70	40.00	-2.30	100	349
4	V	91.1746	52.58	QP	8.28	22.32	0.96	39.50	43.50	-4.00	100	286
5	V	140.3421	46.74	QP	12.60	22.41	1.27	38.20	43.50	-5.30	100	157
6	V	178.1327	43.48	peak	11.15	22.25	1.36	33.74	43.50	-9.76	100	211

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	39.46	AV	V	33.67	6.86	32.66	47.33	54	-6.67
4804	39.11	AV	H	33.67	6.86	32.66	46.98	54	-7.02
4804	48.28	PK	V	33.67	6.86	32.66	56.15	74	-17.85
4804	45.35	PK	H	33.67	6.86	32.66	53.22	74	-20.78
17801	23.97	AV	V	45.03	11.21	32.38	47.83	54	-6.17
17801	25.14	AV	H	45.03	11.21	32.38	49	54	-5
17801	40.62	PK	V	45.03	11.21	32.38	64.48	74	-9.52
17801	41.37	PK	H	45.03	11.21	32.38	65.23	74	-8.77

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	39.16	AV	V	33.71	6.95	32.74	47.08	54	-6.92
4882	38.95	AV	H	33.71	6.95	32.74	46.87	54	-7.13
4882	48.63	PK	V	33.71	6.95	32.74	56.55	74	-17.45
4882	47.49	PK	H	33.71	6.95	32.74	55.41	74	-18.59
17809	25.56	AV	V	45.15	11.18	32.41	49.48	54	-4.52
17809	23.88	AV	H	45.15	11.18	32.41	47.8	54	-6.2
17809	41.02	PK	V	45.15	11.18	32.41	64.94	74	-9.06
17809	40.86	PK	H	45.15	11.18	32.41	64.78	74	-9.22

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	37.45	AV	V	33.9	6.76	32.74	45.37	54	-8.63
4960	37.6	AV	H	33.9	6.76	32.74	45.52	54	-8.48
4960	47.41	PK	V	33.9	6.76	32.74	55.33	74	-18.67
4960	47.41	PK	H	33.9	6.76	32.74	55.33	74	-18.67
17822	23.23	AV	V	45.22	11.35	32.38	47.42	54	-6.58
17822	23.86	AV	H	45.22	11.35	32.38	48.05	54	-5.95
17822	42.15	PK	V	45.22	11.35	32.38	66.34	74	-7.66
17822	40.69	PK	H	45.22	11.35	32.38	64.88	74	-9.12

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	03/23/2017	03/22/2018	☒
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



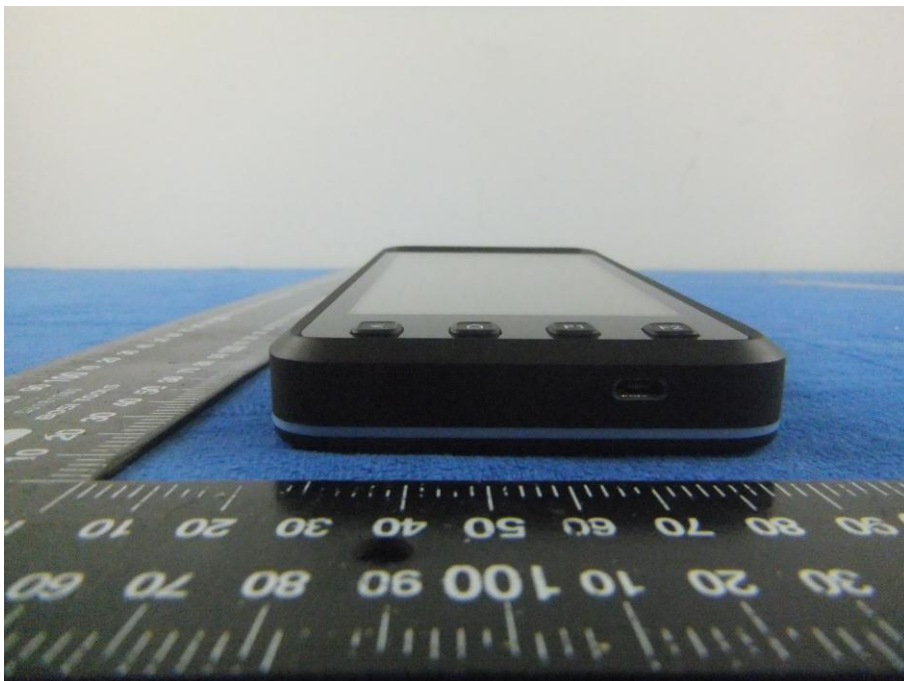
EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View



Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View 1



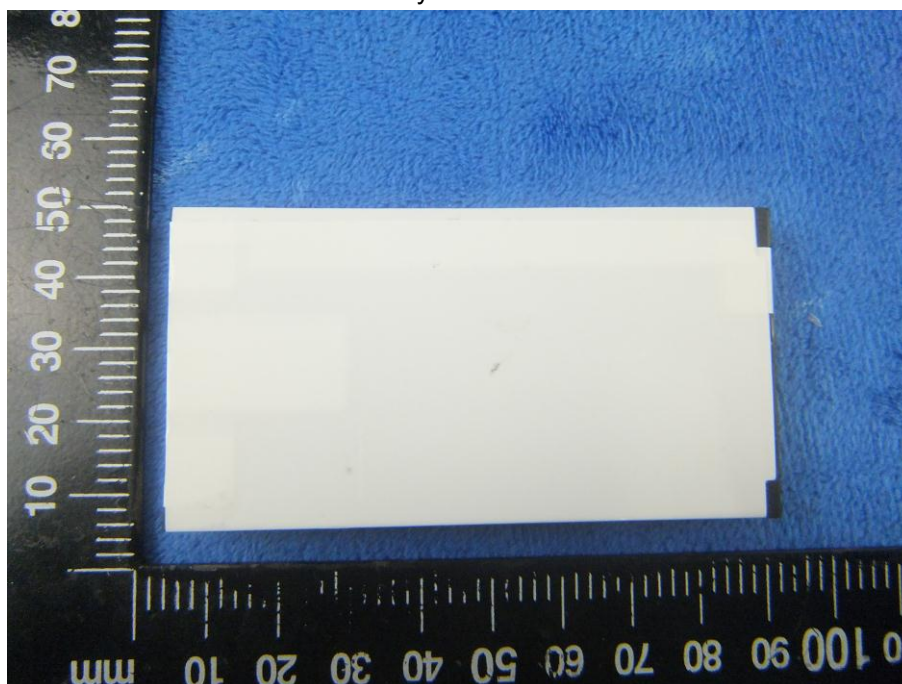
Cover Off - Top View 2



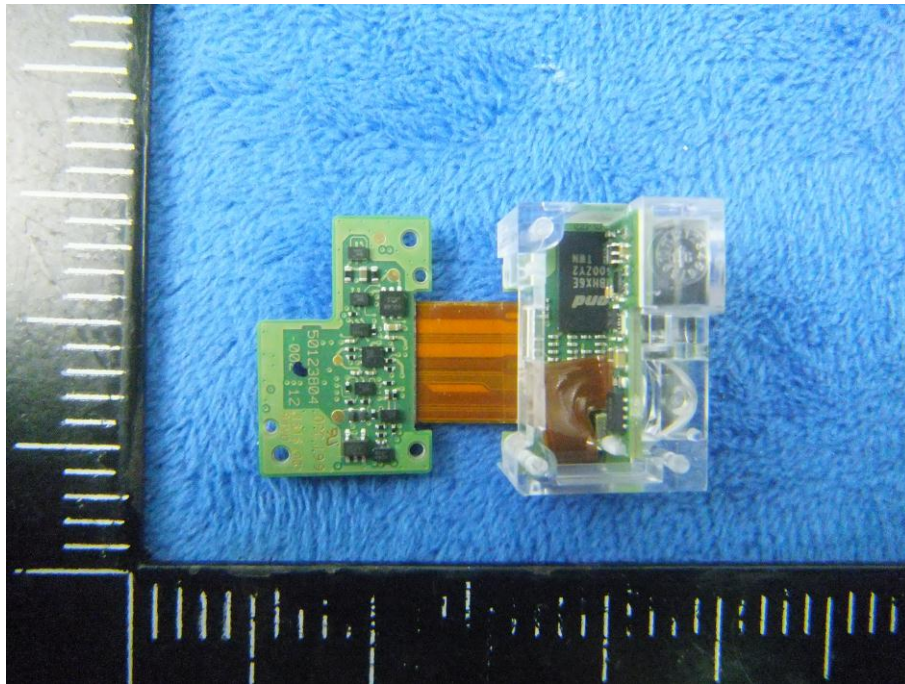
Battery - Front View



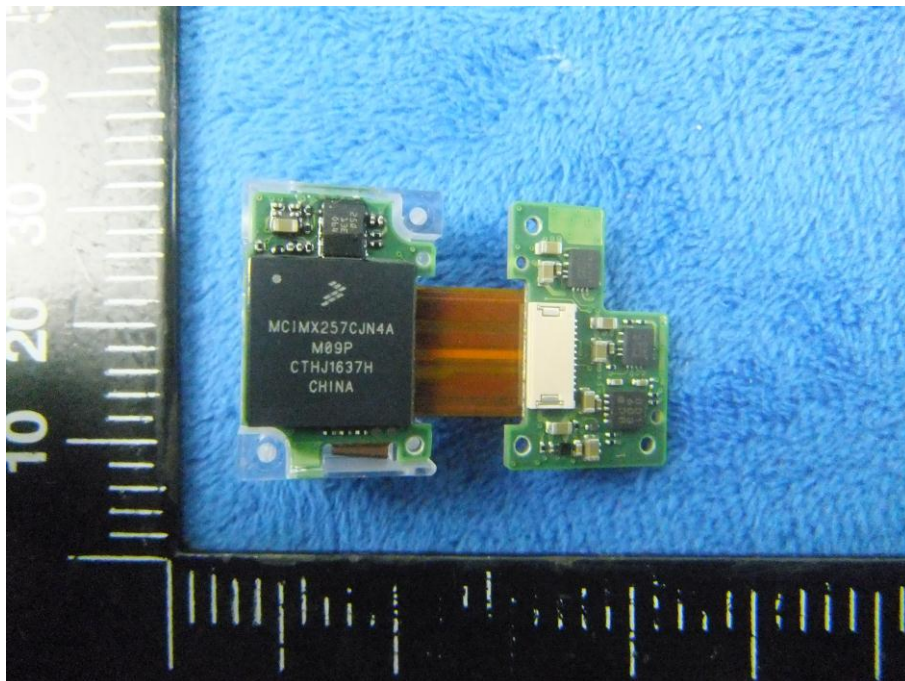
Battery - Rear View



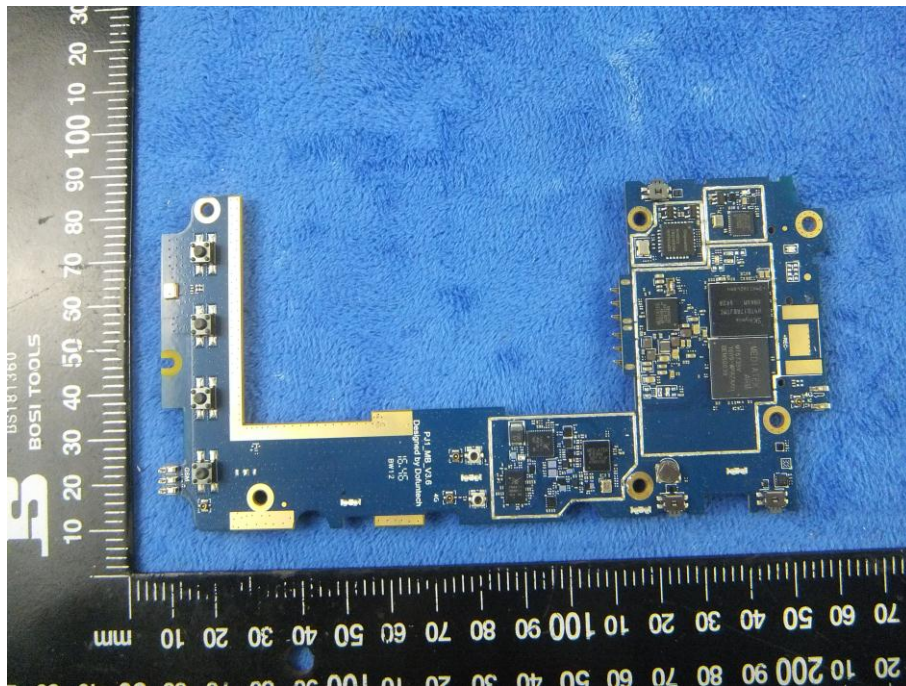
Barcode scanner engine board - Front View



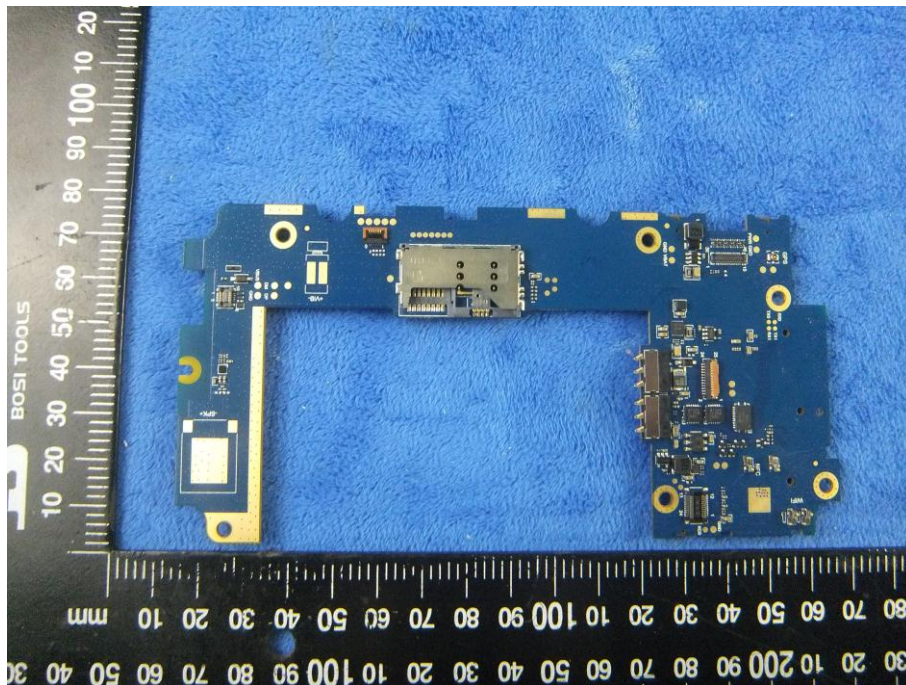
Barcode scanner engine board - Rear View



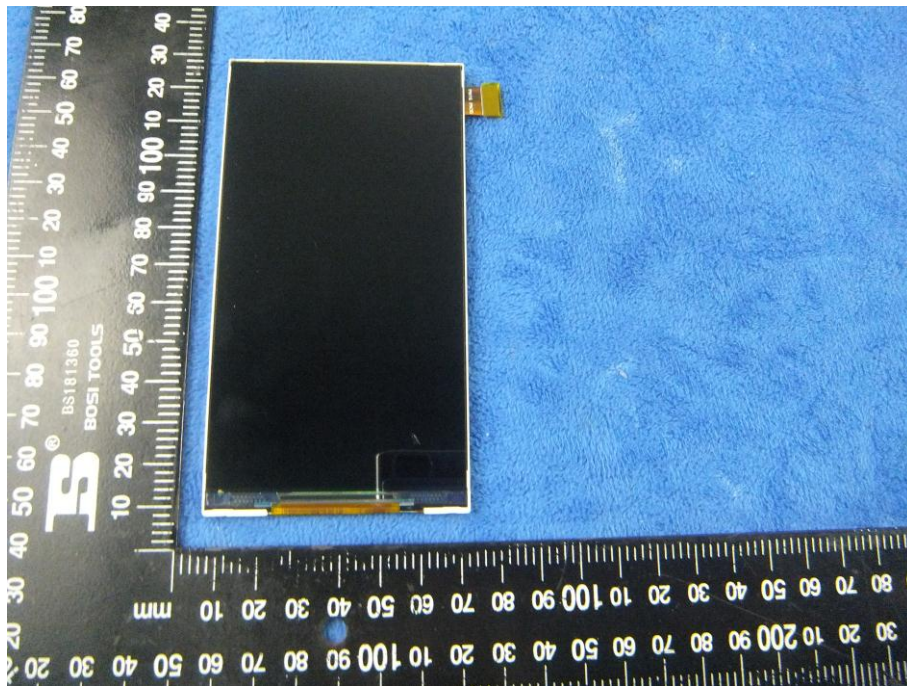
Mainboard – Front View



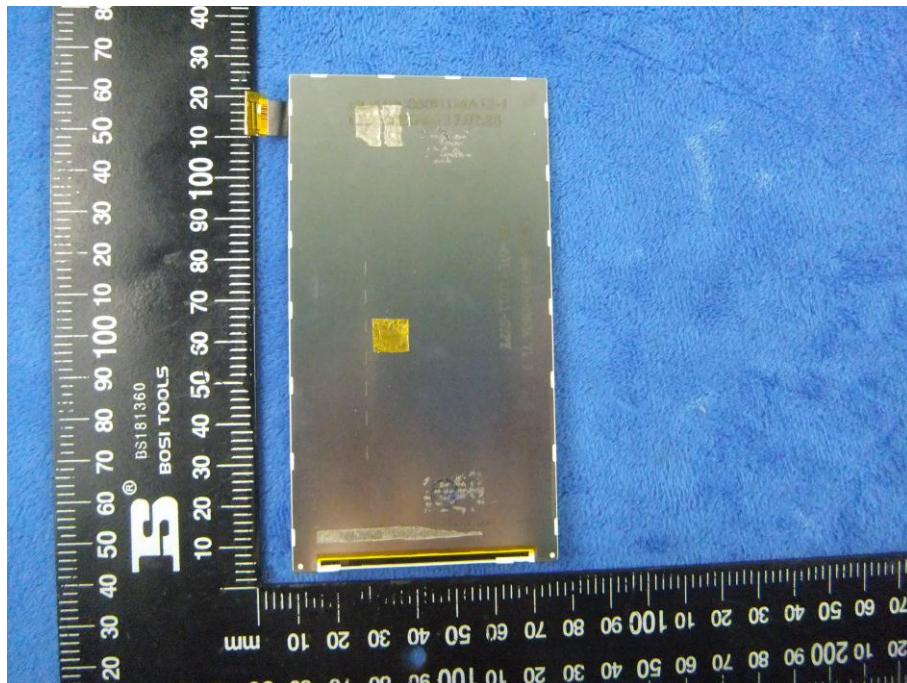
Mainboard - Rear View



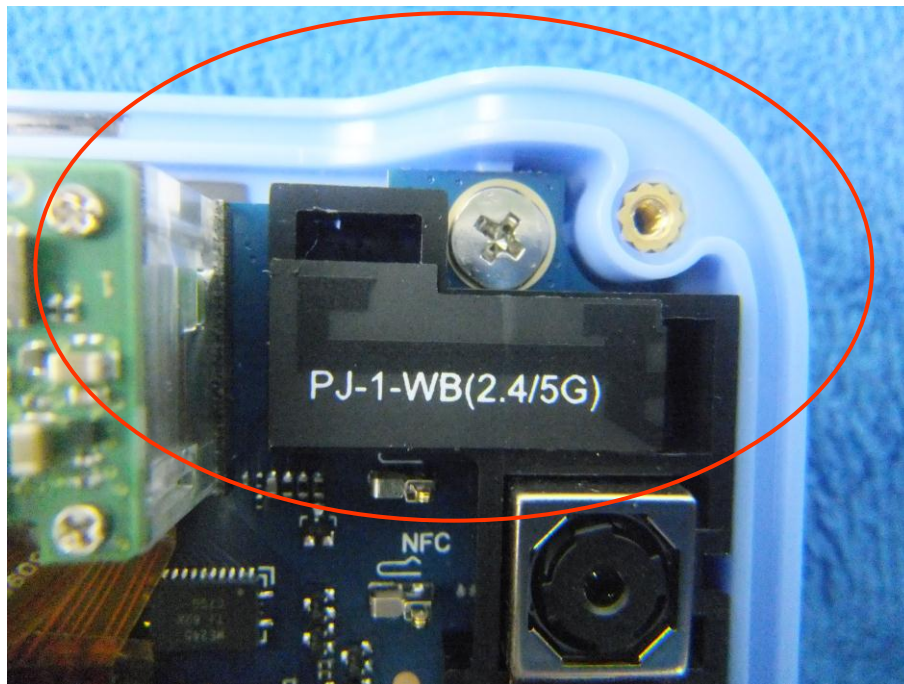
LCD – Front View



LCD – Rear View



BT/BLE/2.4 G WIFI/5G WIFI Antenna View



Annex B.iii. Photograph: Test Setup Photo



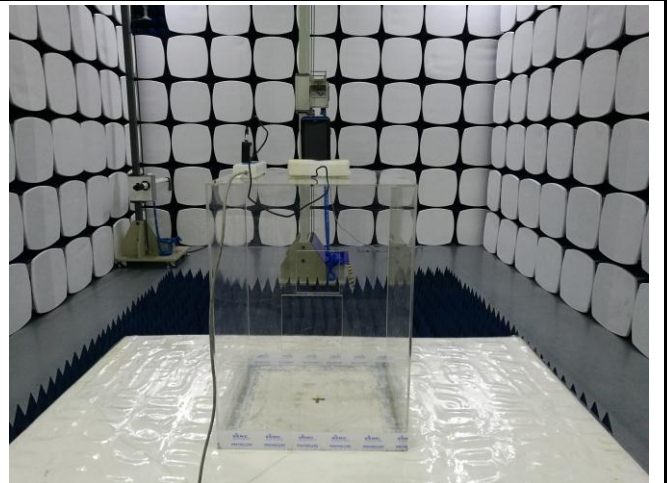
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

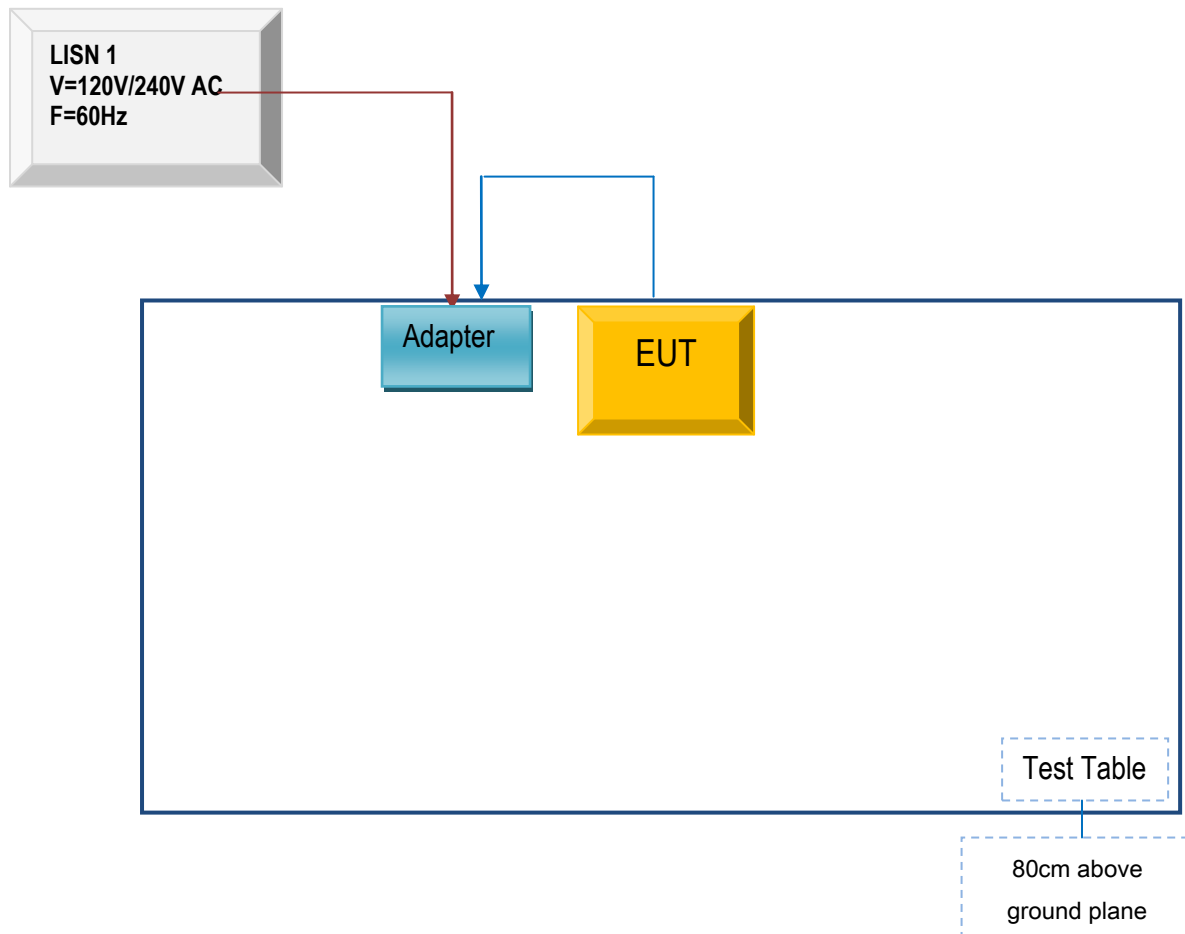


Radiated Spurious Emissions Test Setup Above
1GHz

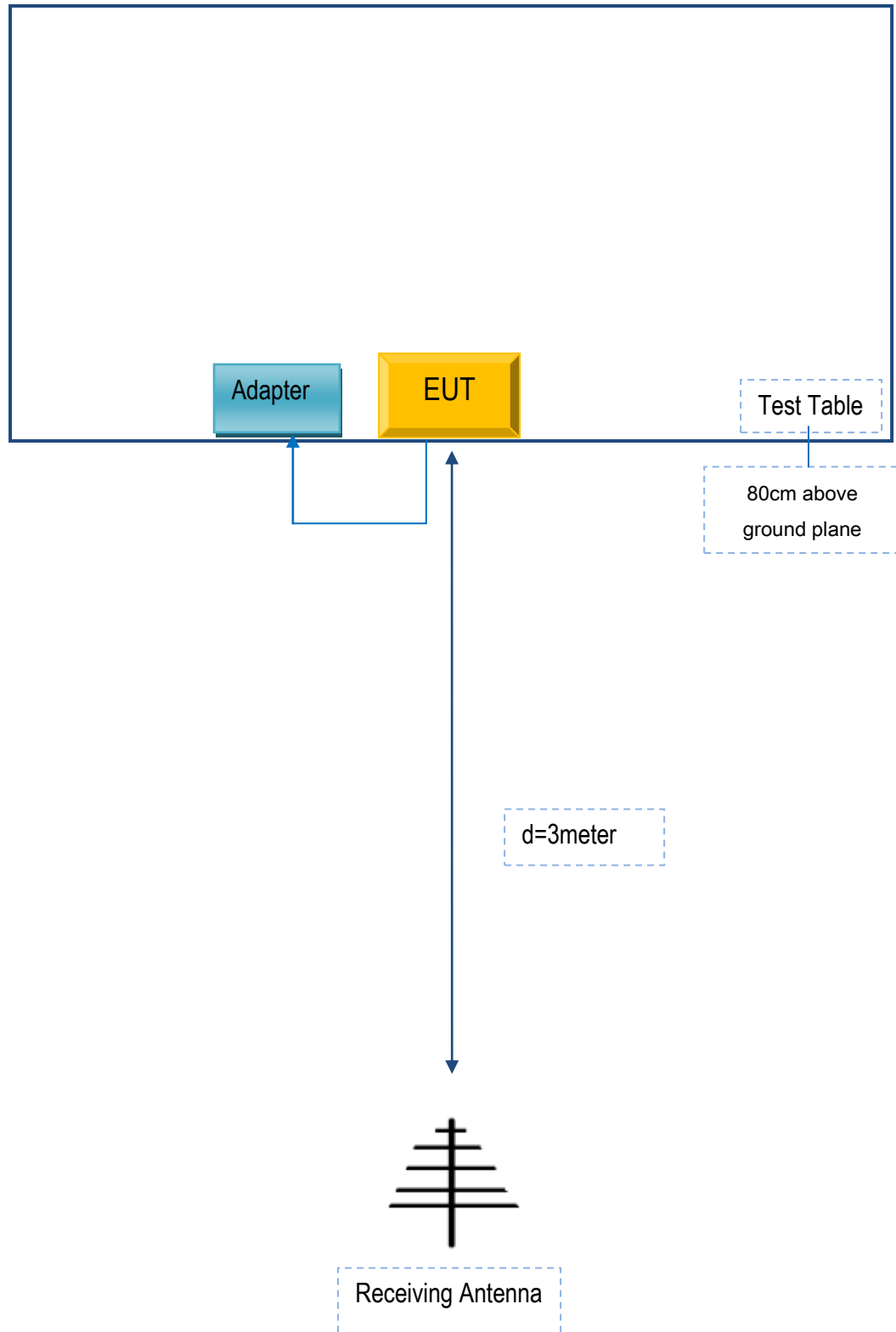
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

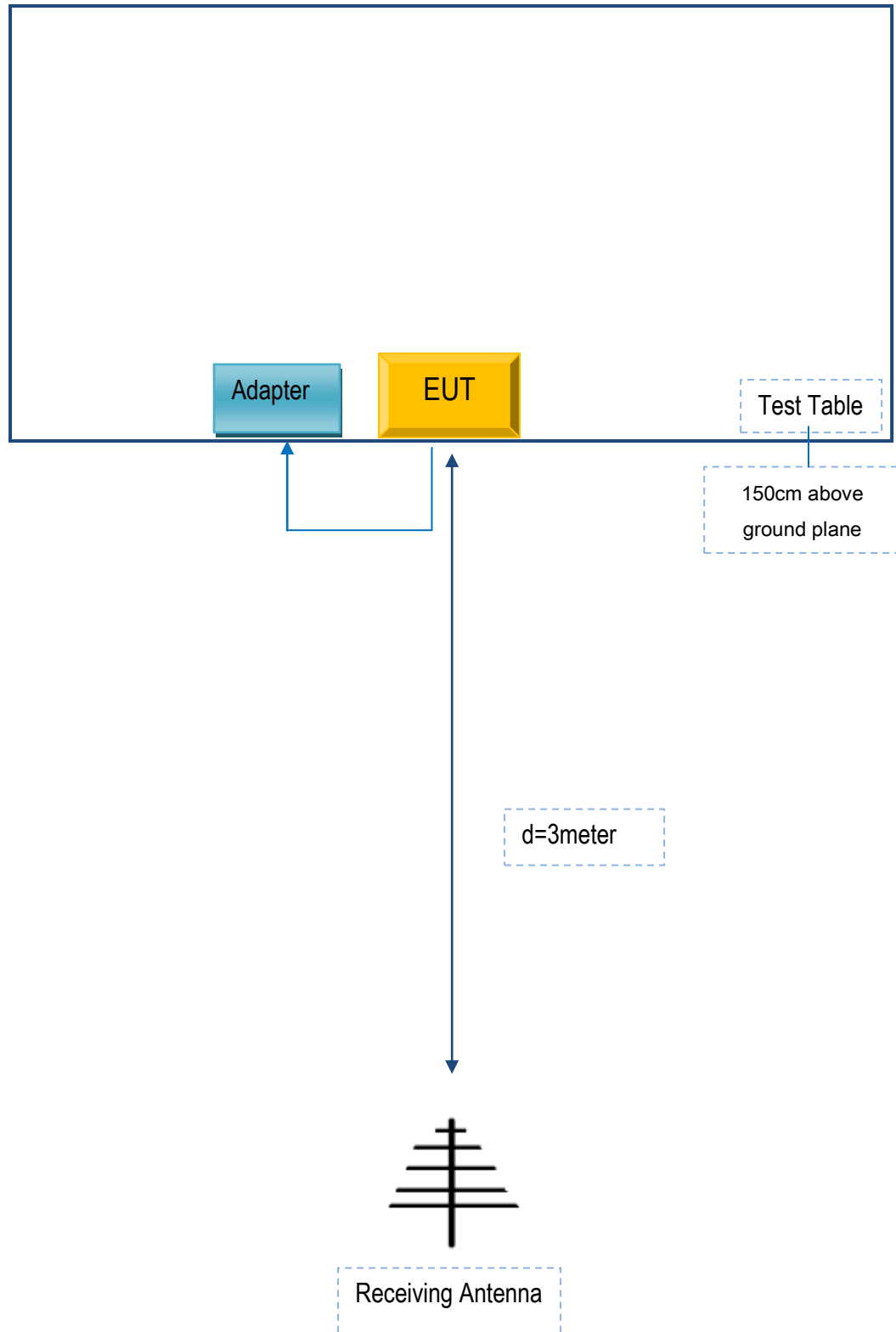
Block Configuration Diagram for AC Line Conducted Emissions



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
Advantech Co Ltd	Adapter	JHD-AP013U-050200BB-A	BE452

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	BE452

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

Please see the attachment

Annex E. DECLARATION OF SIMILARITY

Advantech Co Ltd

To: SIEMIC, 775 Montague Expressway, Milpitas, CA 95035, USA

Declaration Letter

Dear Sir,

For our business issue and marketing requirement, we would like to list (3) model numbers on the FCC certificates and reports, as following:

Model No.: PWS-472, MICA-052, D300

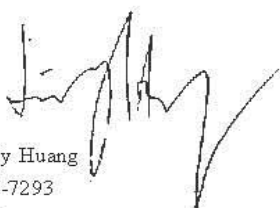
We declare that, all the model PCB, Antenna and Appearance shape, accessories are the same.

The difference of these is listed as below:

Main Model No	Serial Model No	Difference
PWS-472	MICA-052, D300	Different name and color

Thank you!

Signature:



Printed name/title: Lily Huang

Tel: 886-2-2218-4567-7293

Fax: 886-2-2794-7305

Address: No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei, Taiwan 114