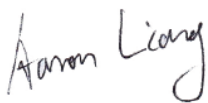
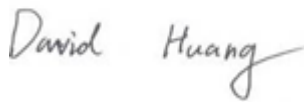


RF TEST REPORT



Report No.: 18070438-FCC-R1

Supersede Report No.: N/A

Applicant	Shinola Detroit LLC	
Product Name	POWERED BOOKSHELF SPEAKER	
Model No.	BSS002	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2017, ANSI C63.10: 2013	
Test Date	April 29 to May 10, 2018	
Issue Date	May 11, 2018	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		
		
Aaron Liang 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	18070438-FCC-R1
Page	3 of 60

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
18070438-FCC-R1	NONE	Original	May 11, 2018

2. Customer information

Applicant Name	Shinola Detroit LLC
Applicant Add	485 W Milwaukee St Ste 501, Detroit, MI 48202-3220, USA
Manufacturer	Barefoot Sound LLC
Manufacturer Add	1710 NW Upshur Street, Portland OR 97209, USA

3. Test site information

Test Lab A:

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.	535293
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

Test Lab B:

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	694825
IC Test Site No.	4842B-1
Test Software	EZ_EMG(ver.lcp-03A1)

Note: We just perform Radiated Spurious Emission above 18GHz in the test Lab. B.

4. Equipment under Test (EUT) Information

Description of EUT: POWERED BOOKSHELF SPEAKER

Main Model: BSS002

Serial Model: N/A

Date EUT received: April 28, 2018

Test Date(s): April 29 to May 10, 2018

Equipment Category : DSS

Antenna Gain: Bluetooth/BLE: 0dBi

Antenna Type: PCB antenna

Type of Modulation: Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK
BLE: GFSK

RF Operating Frequency (ies): Bluetooth& BLE: 2402-2480 MHz

Max. Output Power: 3.794dBm

Number of Channels: Bluetooth: 79CH
BLE: 40CH

Port: Please refer to the user' s manual

Input Power: Spec: AC 100-240V, 50/60Hz

Trade Name : **SHINOLA**
DETROIT

FCC ID: 2APOA-BSS002

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 1 antenna:

A permanently attached PCB antenna for Bluetooth, the gain is 0dBi for Bluetooth.

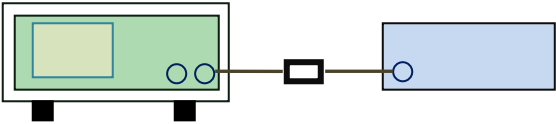
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1022mbar
Test date :	May 02, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(a)(1)	a)	Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW	
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) $\geq$ 1% of the span - Video (or Average) Bandwidth (VBW) $\geq$ RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.		

Remark	
Result	☒ Pass ☐ Fail

Test Data ☒ Yes ☐ N/A

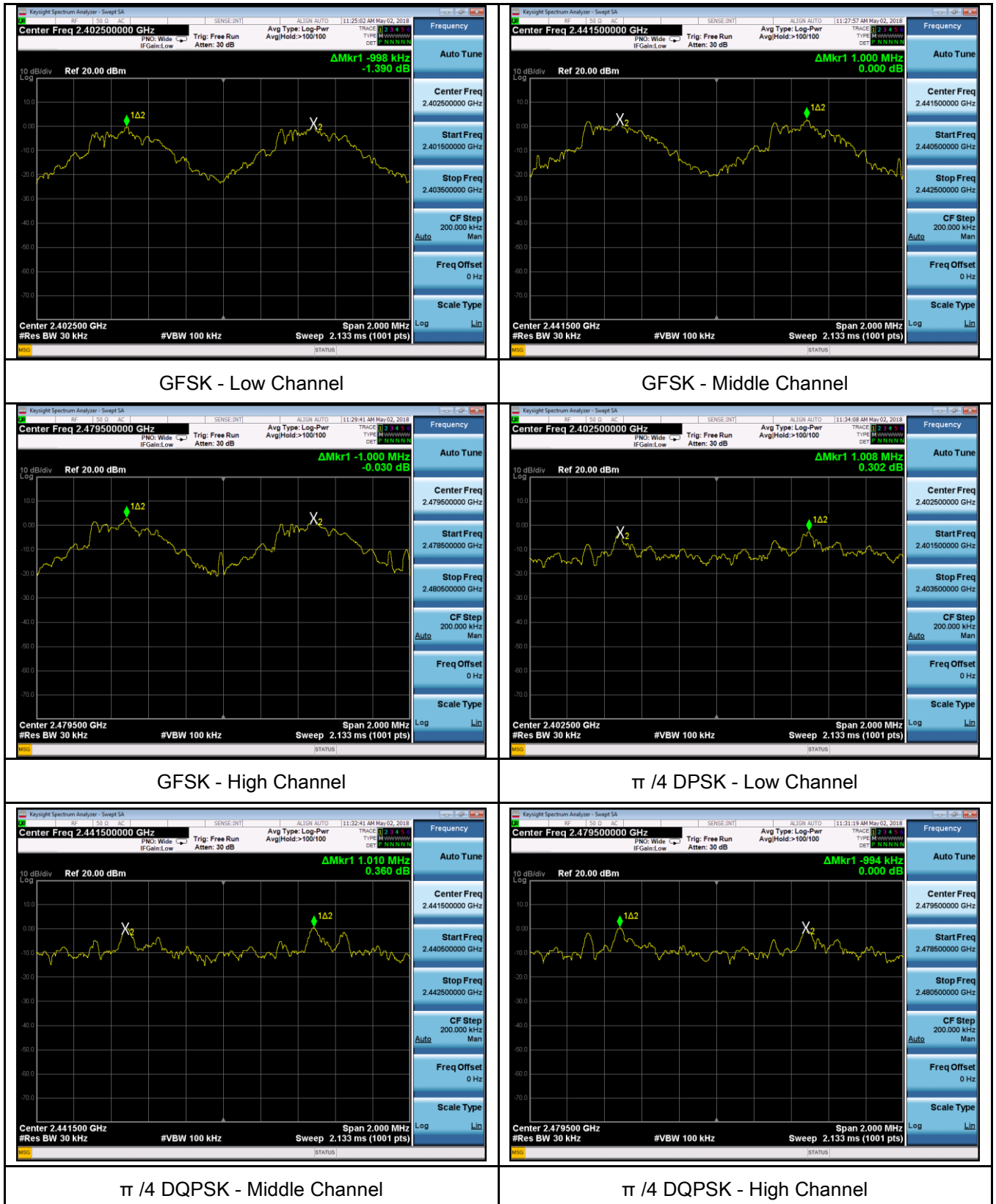
Test Plot ☒ Yes (See below) ☐ N/A

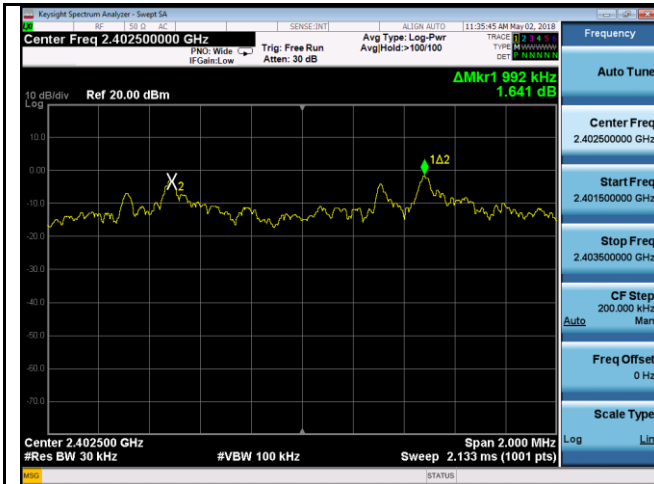
Channel Separation measurement result

Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	0.998	0.873	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.000	0.871	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.000	0.871	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.008	0.810	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.010	0.813	Pass
	Adjacency Channel	2441			
	High Channel	2480	0.994	0.813	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	0.992	0.805	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	0.986	0.805	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.805	Pass
	Adjacency Channel	2479			

Test Plots

Channel Separation measurement result

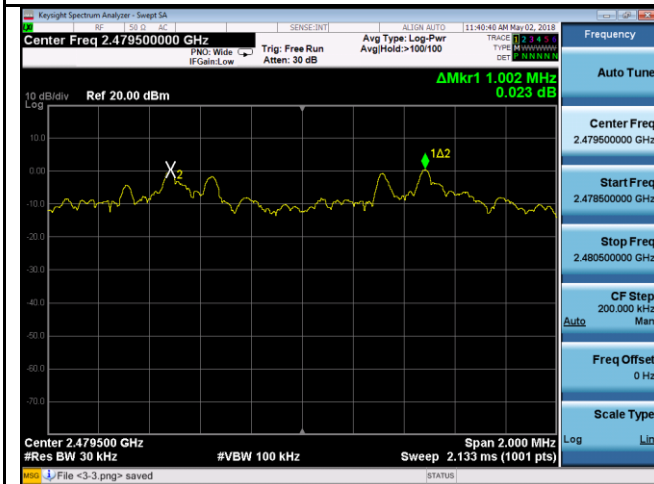




8DPSK - Low Channel



8DPSK - Middle Channel

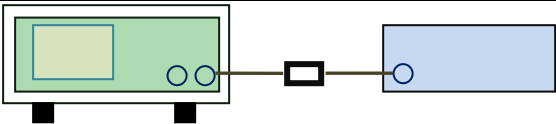


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1022mbar
Test date :	May 02, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)	a)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW $\geq$ 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

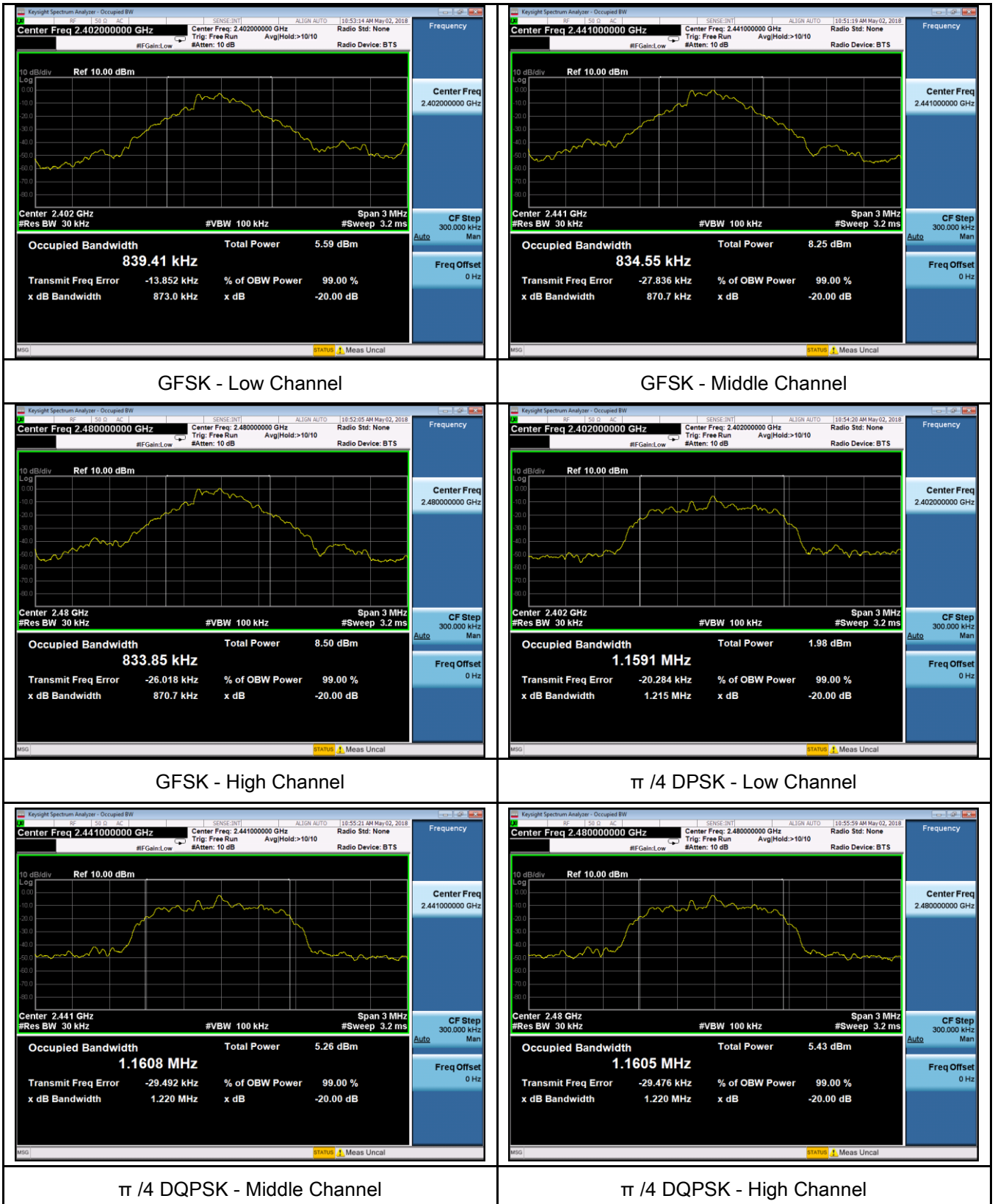
Test Plot ☒ Yes (See below) ☐ N/A

Measurement result

Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.8730	0.8394
	Mid	2441	0.8707	0.8346
	High	2480	0.8707	0.8339
$\pi/4$ DQPSK	Low	2402	1.215	1.159
	Mid	2441	1.220	1.161
	High	2480	1.220	1.161
8-DPSK	Low	2402	1.207	1.145
	Mid	2441	1.208	1.142
	High	2480	1.208	1.142

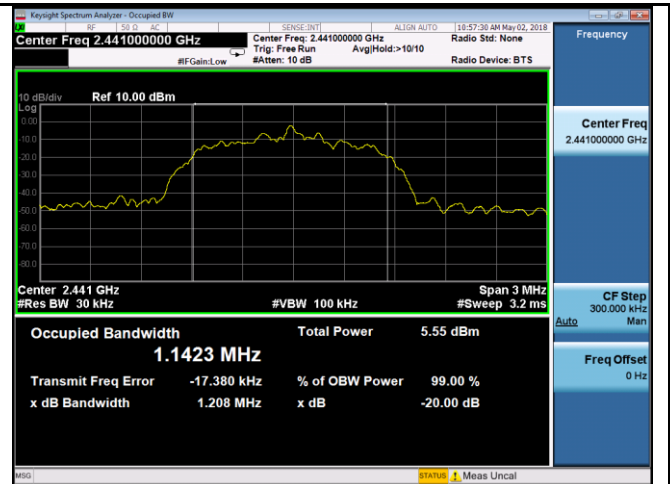
Test Plots

20dB Bandwidth measurement result

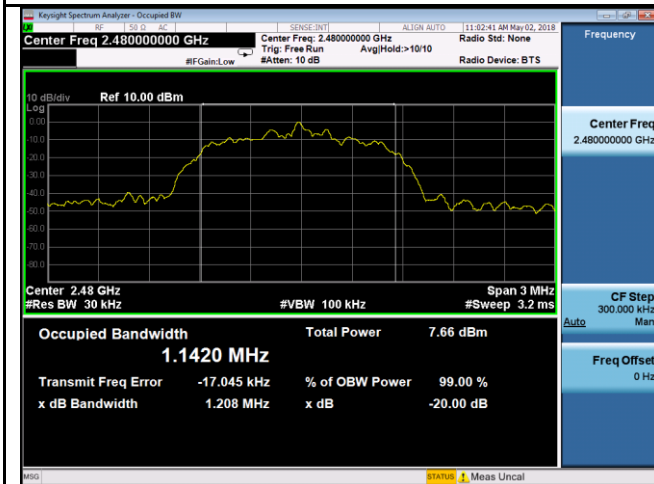




8DPSK - Low Channel



8DPSK - Middle Channel



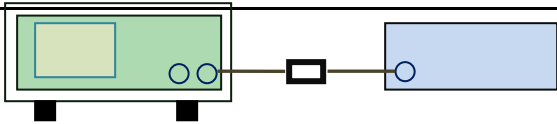
8DPSK - High Channel

6.4 Peak Output Power

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1022mbar
Test date :	May 02, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☒
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☒
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & < 50 channels: ≤ 0.25 Watt	☐
	f)	DTS in 902-928MHz, 2400-2483.5MHz: ≤ 1 Watt	☐

Test Setup	
------------	--

Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <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

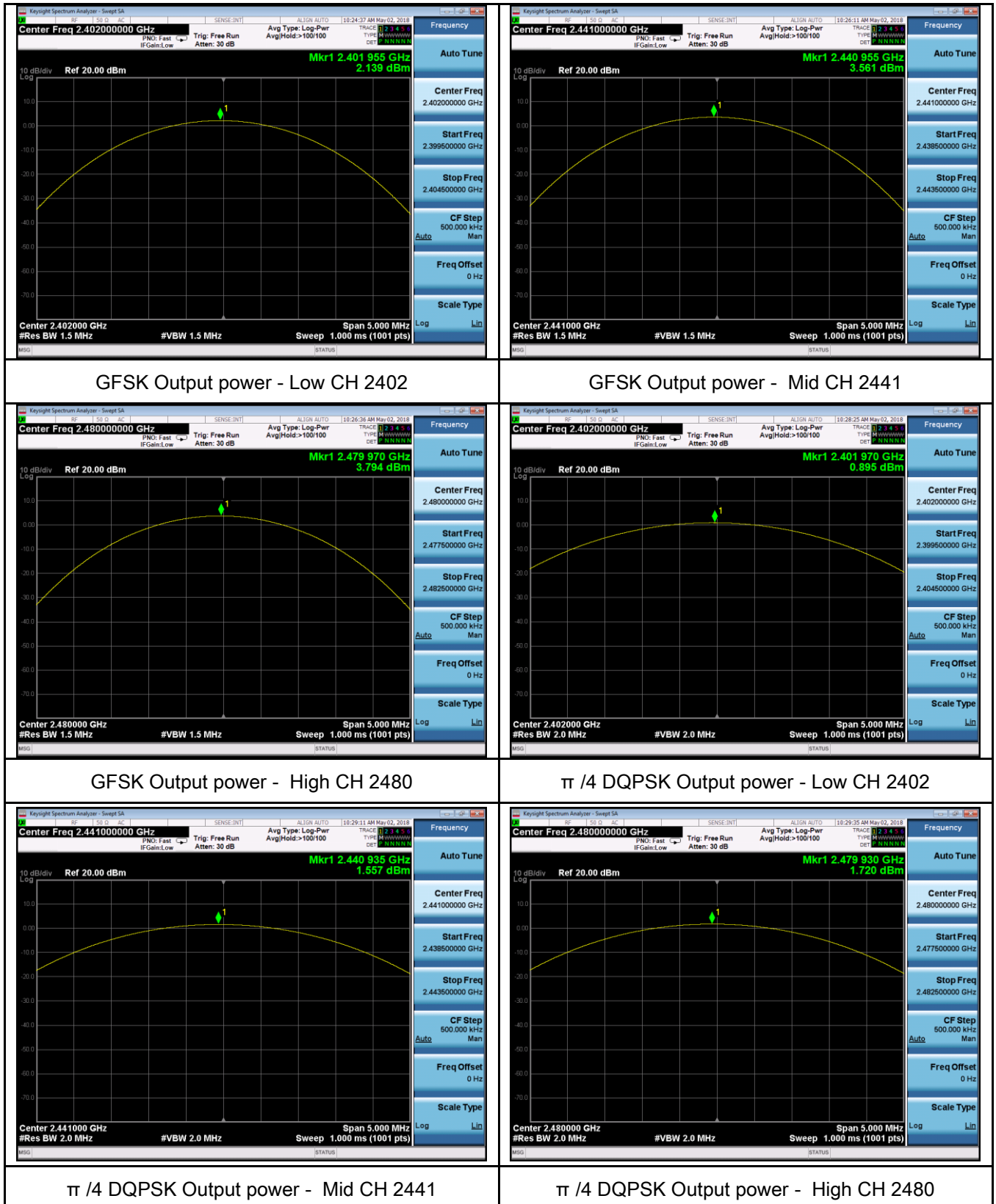
Test Plot ☒ Yes (See below) ☐ N/A

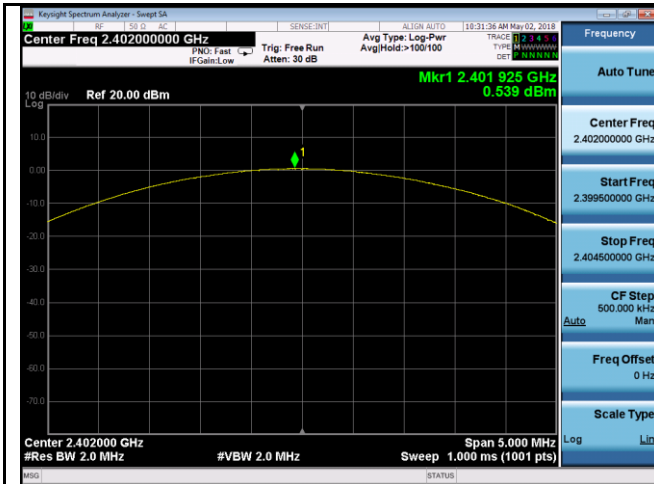
Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	2.139	1000	Pass
		Mid	2441	3.561	1000	Pass
		High	2480	3.794	1000	Pass
	$\pi/4$ DQPSK	Low	2402	0.895	125	Pass
		Mid	2441	1.557	125	Pass
		High	2480	1.720	125	Pass
	8-DPSK	Low	2402	0.539	125	Pass
		Mid	2441	1.290	125	Pass
		High	2480	1.589	125	Pass

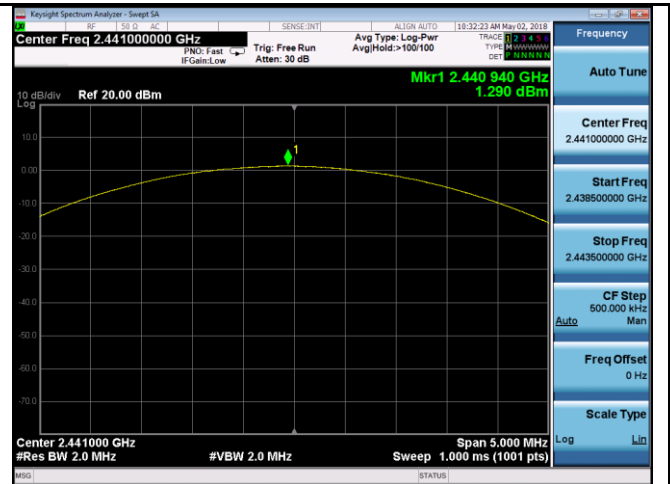
Test Plots

Output Power measurement result

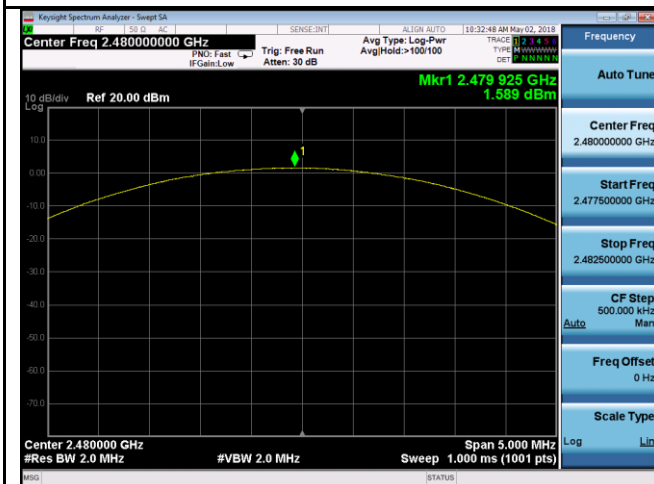




8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

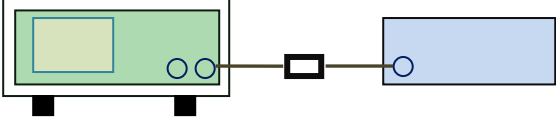


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1022mbar
Test date :	May 02, 2018
Tested By :	Aaron Liang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	FHSS in 2400-2483.5MHz ≥ 15 channels	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer settings:</u> The EUT must have its hopping function enabled. - Span = the frequency band of operation - RBW ≥ 1% of the span - VBW ≥ RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow trace to fully stabilize. - It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☒ Pass ☐ Fail		

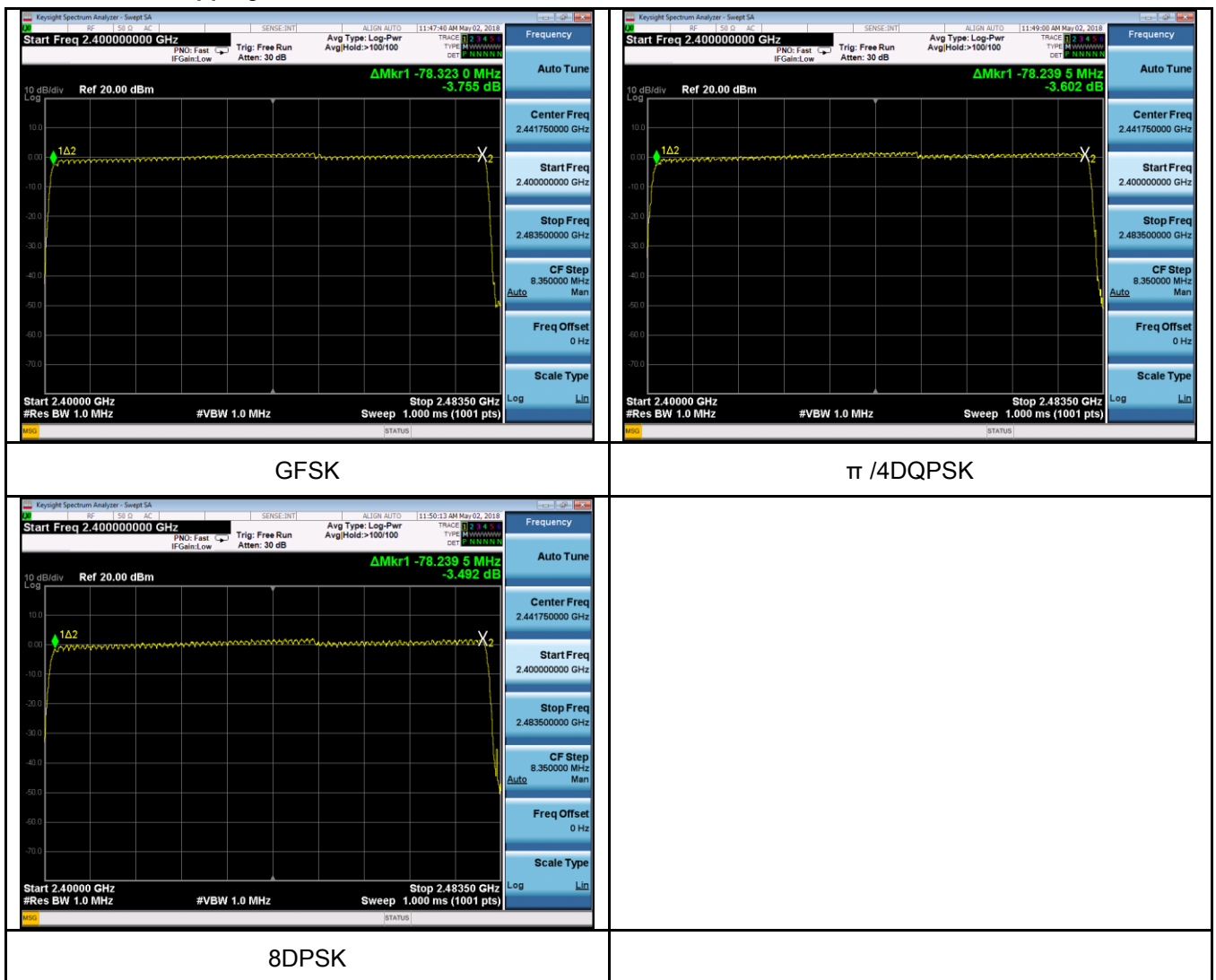
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

Number of Hopping Channel measurement result

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

Test Plots

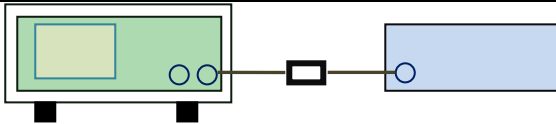
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1022mbar
Test date :	May 02, 2018
Tested By :	Aaron Liang

Requirement(s):

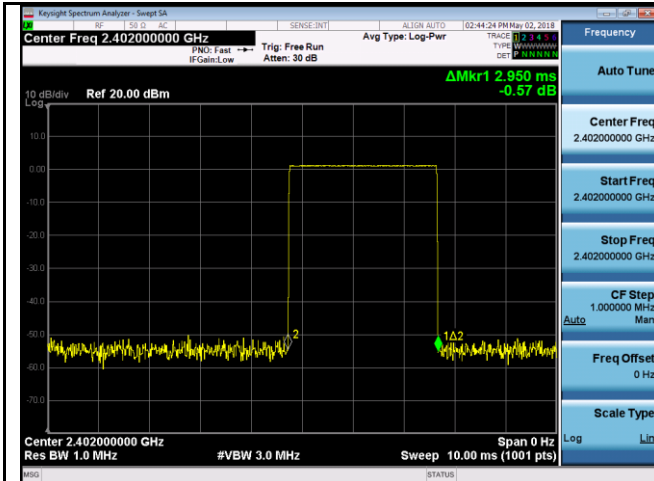
Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	Dwell Time < 0.4s	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer</u> - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥ RBW - Sweep = 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

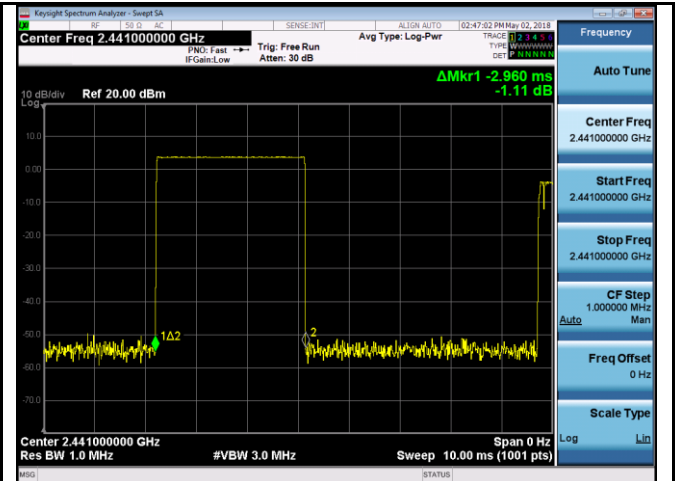
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.95	314.667	400	Pass
		Mid	2.96	315.733	400	Pass
		High	2.97	316.800	400	Pass
	π /4 DQPSK	Low	2.98	317.867	400	Pass
		Mid	2.97	316.800	400	Pass
		High	2.96	315.733	400	Pass
	8-DPSK	Low	2.97	316.800	400	Pass
		Mid	2.99	318.933	400	Pass
		High	2.98	317.867	400	Pass
Note: Dwell time=Pulse Time (ms) $\times$ (1600 $\div$ 6 $\div$ 79) $\times$ 31.6						

Test Plots

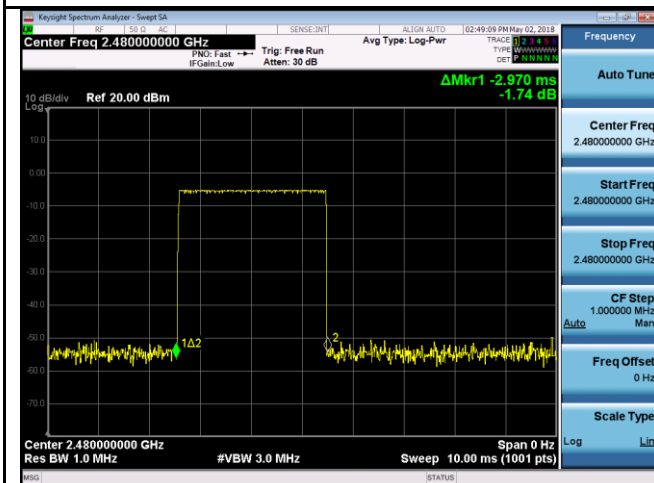
Dwell Time measurement result



GFSK - Low CH 2402



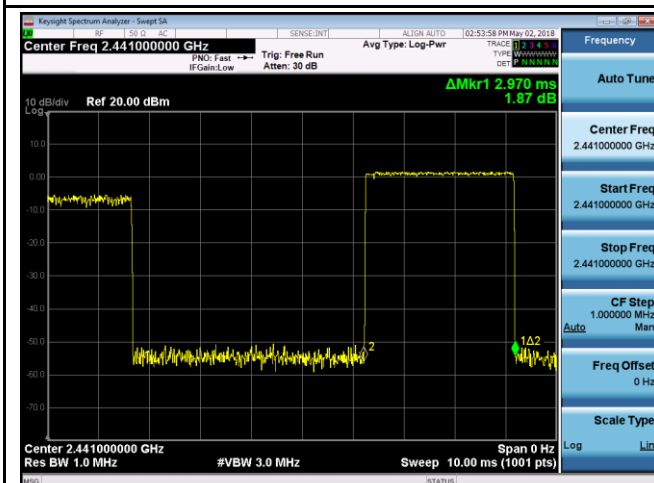
GFSK - Mid CH 2441



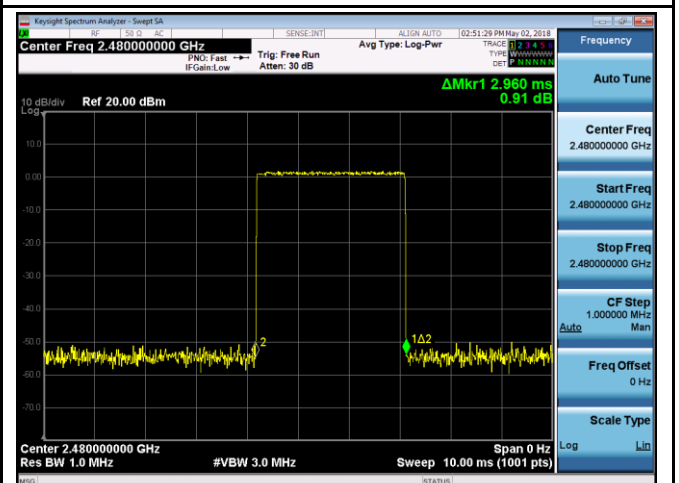
GFSK - High CH 2480



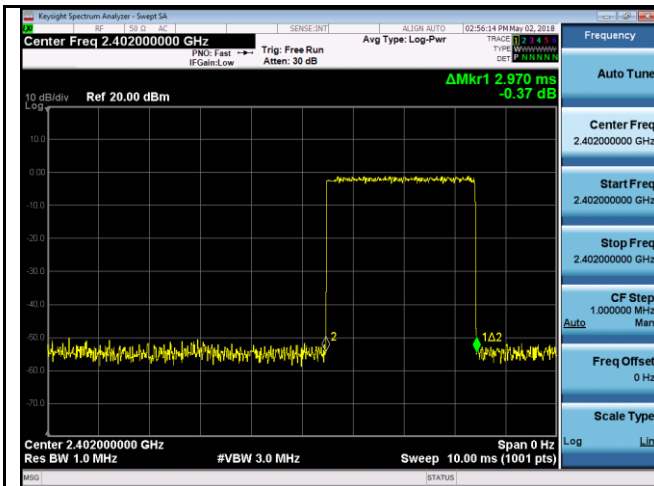
$\pi/4$ DQPSK - Low CH 2402



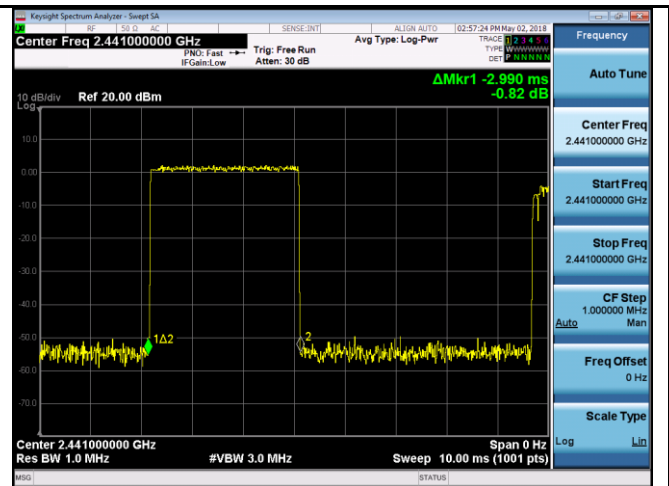
$\pi/4$ DQPSK - Mid CH 2441



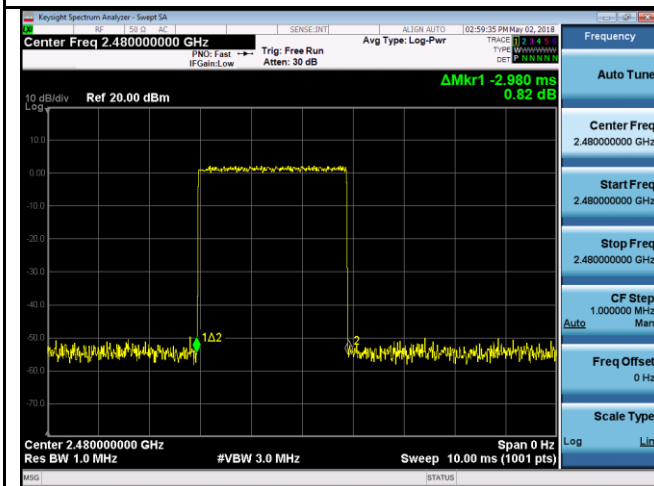
$\pi/4$ DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441



8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1022mbar
Test date :	May 02, 2018
Tested By :	Aaron Liang

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	The diagram illustrates the test setup for radiated emissions. A Turn Table is placed on a stand, with EUT & Support Units mounted on top. The height from the Ground Plane to the EUT is indicated as 0.8/1.5m. An Ant. Tower is positioned 3m away from the Turn Table. The Ant. Tower has a 1-4m Variable height adjustment. A Test Receiver is connected to the Ant. Tower.
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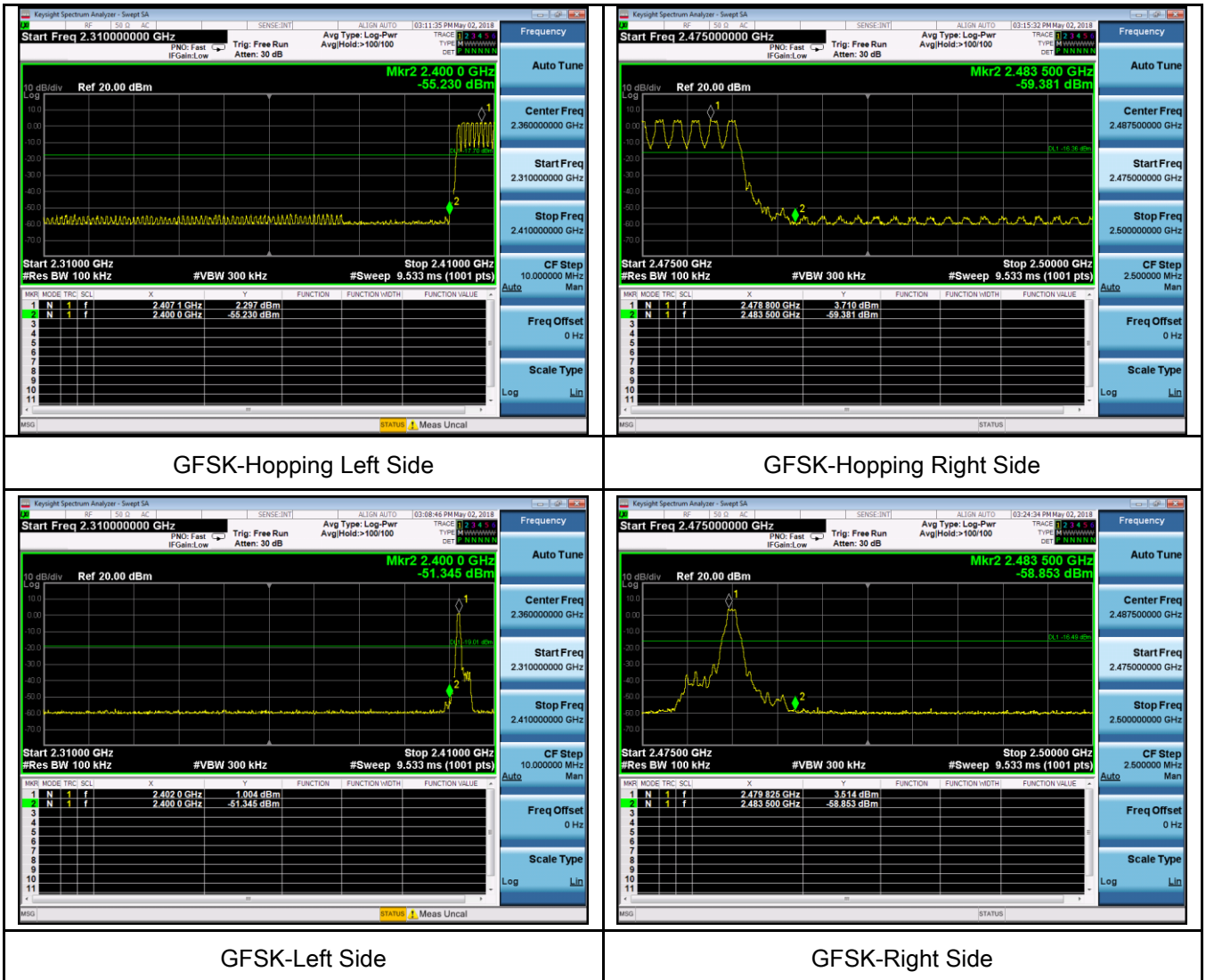
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. 2. Position the EUT without connection to measurement instrument. 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

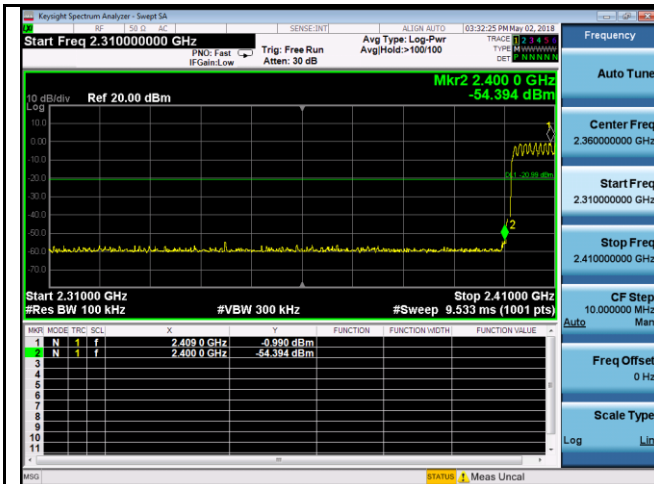
Test Data ☐ Yes ☒ N/A
Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

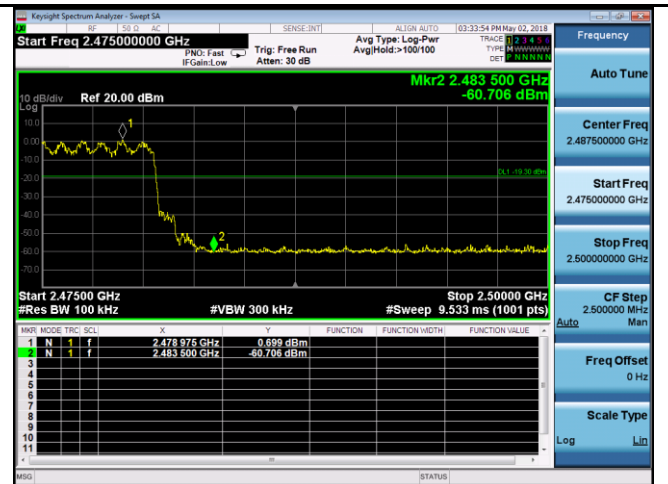
GFSK Mode:



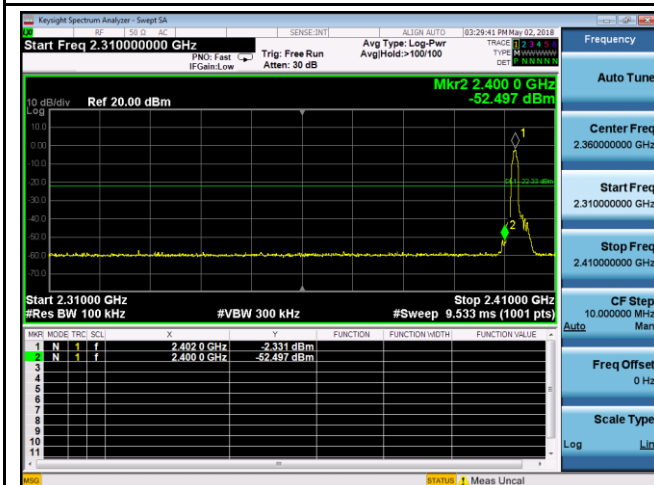
$\pi/4$ DQPSK Mode:



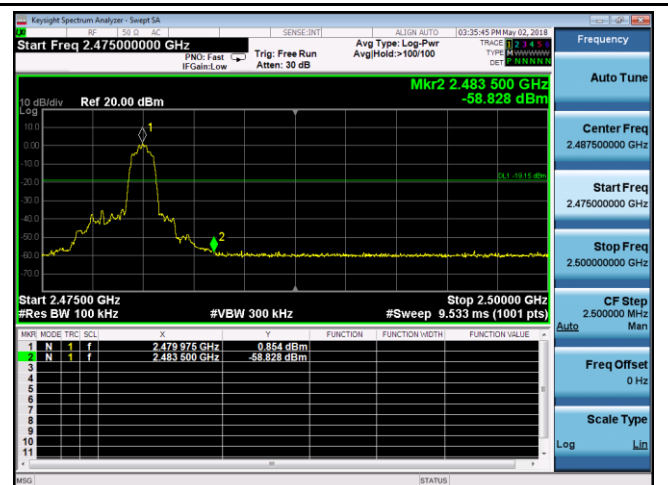
$\pi/4$ DQPSK-Hopping Left Side



$\pi/4$ DQPSK-Hopping Right Side

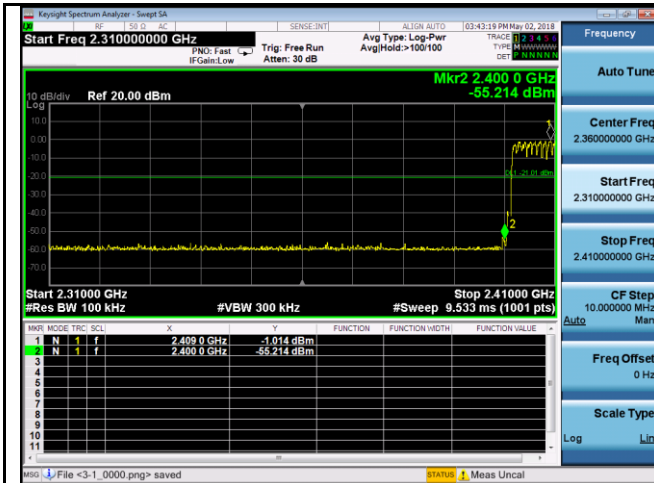


$\pi/4$ DQPSK-Left Side



$\pi/4$ DQPSK-Right Side

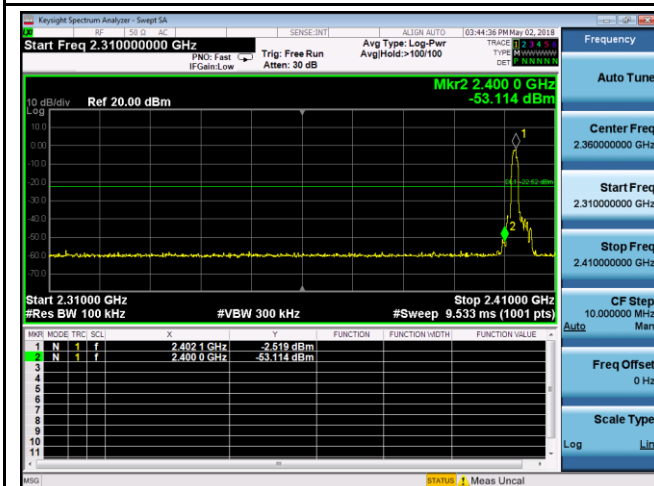
8-DPSK Mode:



8DPSK-Hopping Left Side



8DPSK-Hopping Right Side



8DPSK-Left Side



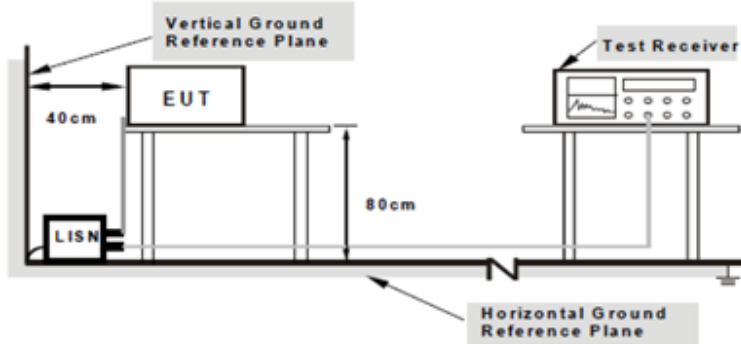
8DPSK-Right Side

6.8 AC Power Line Conducted Emissions

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	May 08, 2018
Tested By :	Aaron Liang

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.	☒														
		<table><tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBµV)</th></tr><tr><th>QP</th><th>Average</th></tr><tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr><tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr><tr><td>5 ~ 30</td><td>60</td><td>50</td></tr></table>		Frequency ranges (MHz)	Limit (dBµV)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50
		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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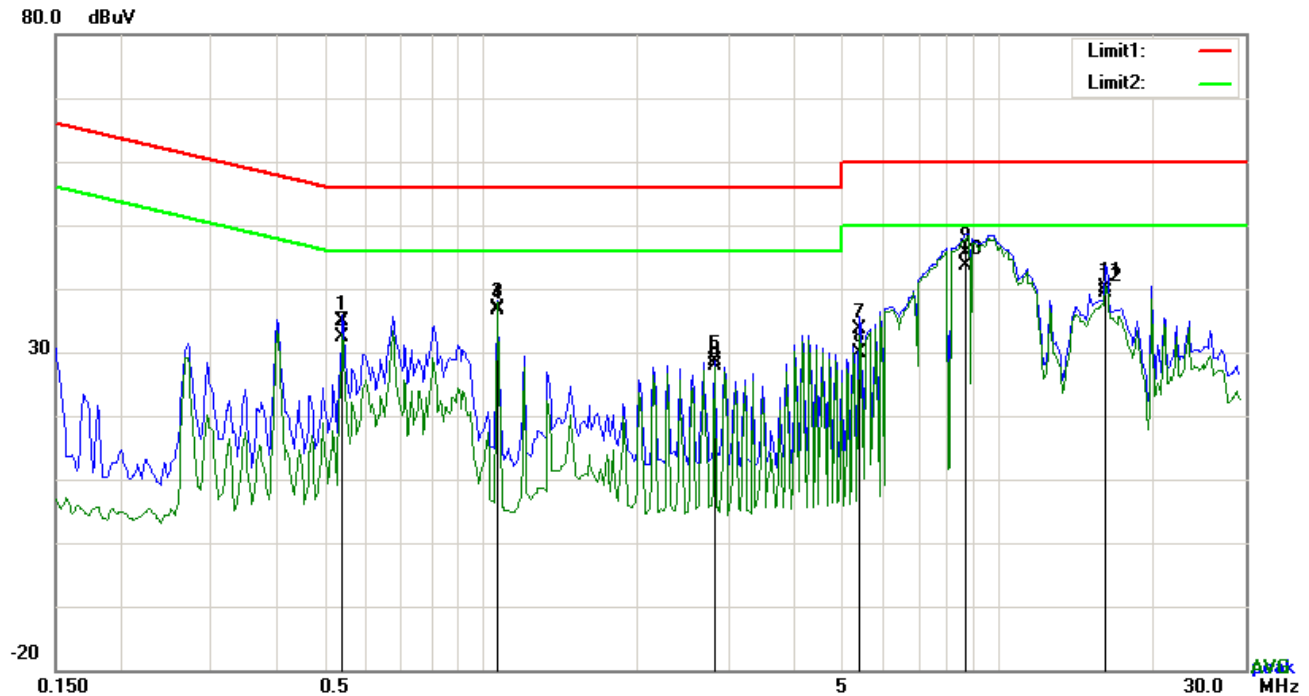
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	coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth 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

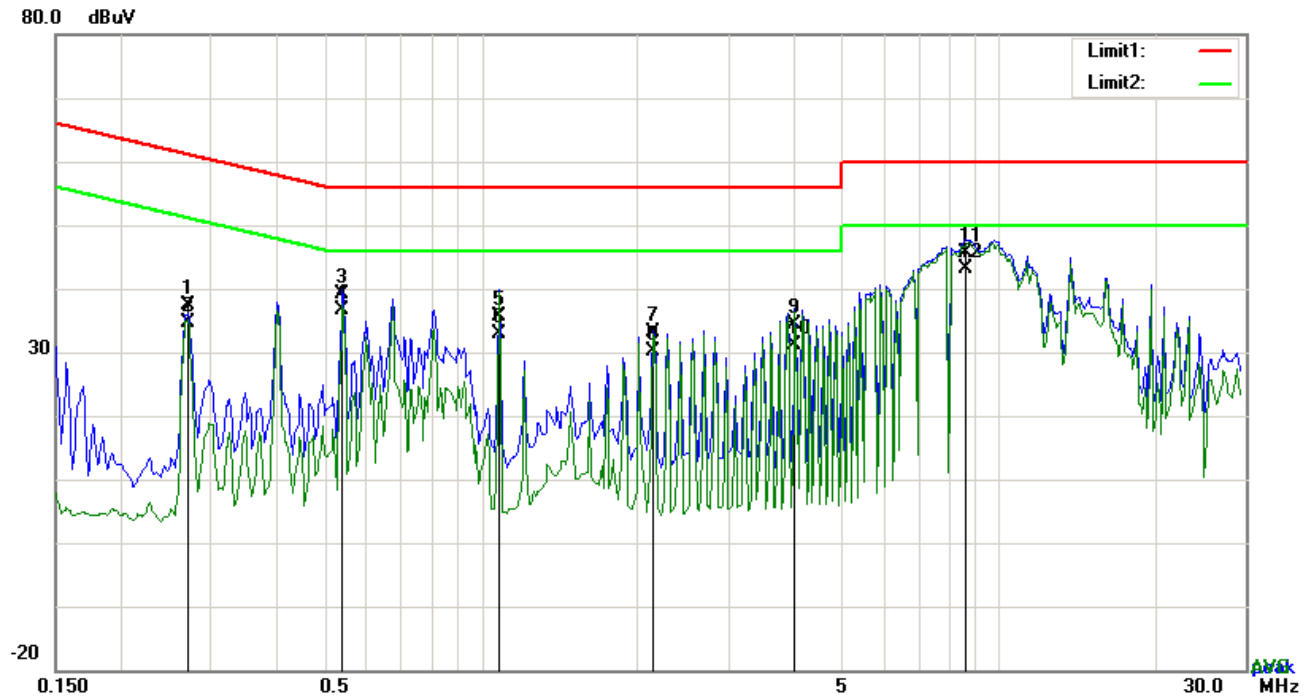


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.5400	24.83	QP	10.03	34.86	56.00	-21.14
2	L1	0.5400	22.37	AVG	10.03	32.40	46.00	-13.60
3	L1	1.0743	26.93	QP	10.03	36.96	56.00	-19.04
4	L1	1.0743	26.69	AVG	10.03	36.72	46.00	-9.28
5	L1	2.8254	18.52	QP	10.05	28.57	56.00	-27.43
6	L1	2.8254	17.91	AVG	10.05	27.96	46.00	-18.04
7	L1	5.3790	23.63	QP	10.09	33.72	60.00	-26.28
8	L1	5.3790	19.91	AVG	10.09	30.00	50.00	-20.00
9	L1	8.6082	35.46	QP	10.13	45.59	60.00	-14.41
10	L1	8.6082	33.53	AVG	10.13	43.66	50.00	-6.34
11	L1	16.1352	29.98	QP	10.24	40.22	60.00	-19.78
12	L1	16.1352	29.07	AVG	10.24	39.31	50.00	-10.69

Test Mode: Bluetooth Mode

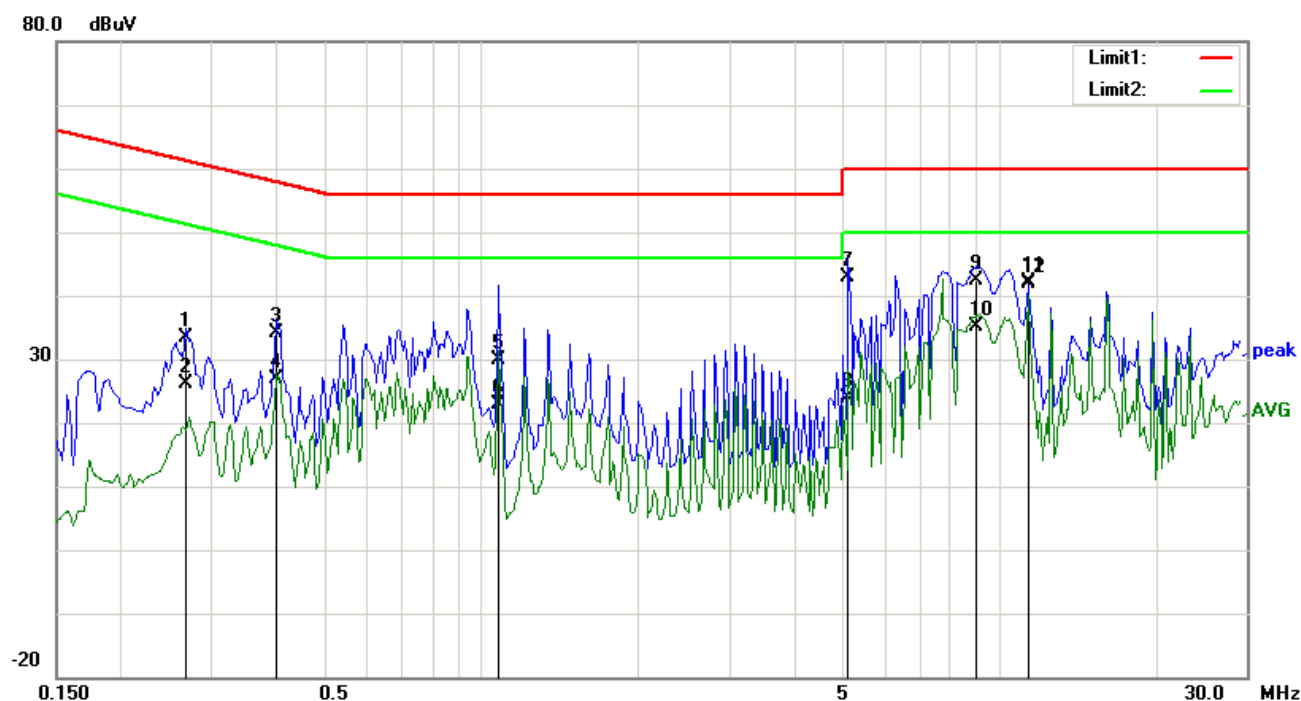


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.2709	27.24	QP	10.02	37.26	61.09	-23.83
2	N	0.2709	24.71	AVG	10.02	34.73	51.09	-16.36
3	N	0.5400	29.17	QP	10.02	39.19	56.00	-16.81
4	N	0.5400	26.50	AVG	10.02	36.52	46.00	-9.48
5	N	1.0821	25.58	QP	10.03	35.61	56.00	-20.39
6	N	1.0821	22.78	AVG	10.03	32.81	46.00	-13.19
7	N	2.1546	22.98	QP	10.04	33.02	56.00	-22.98
8	N	2.1546	20.12	AVG	10.04	30.16	46.00	-15.84
9	N	4.0374	24.33	QP	10.06	34.39	56.00	-21.61
10	N	4.0374	21.04	AVG	10.06	31.10	46.00	-14.90
11	N	8.6160	35.47	QP	10.12	45.59	60.00	-14.41
12	N	8.6160	32.89	AVG	10.12	43.01	50.00	-6.99

Test Mode: Bluetooth Mode

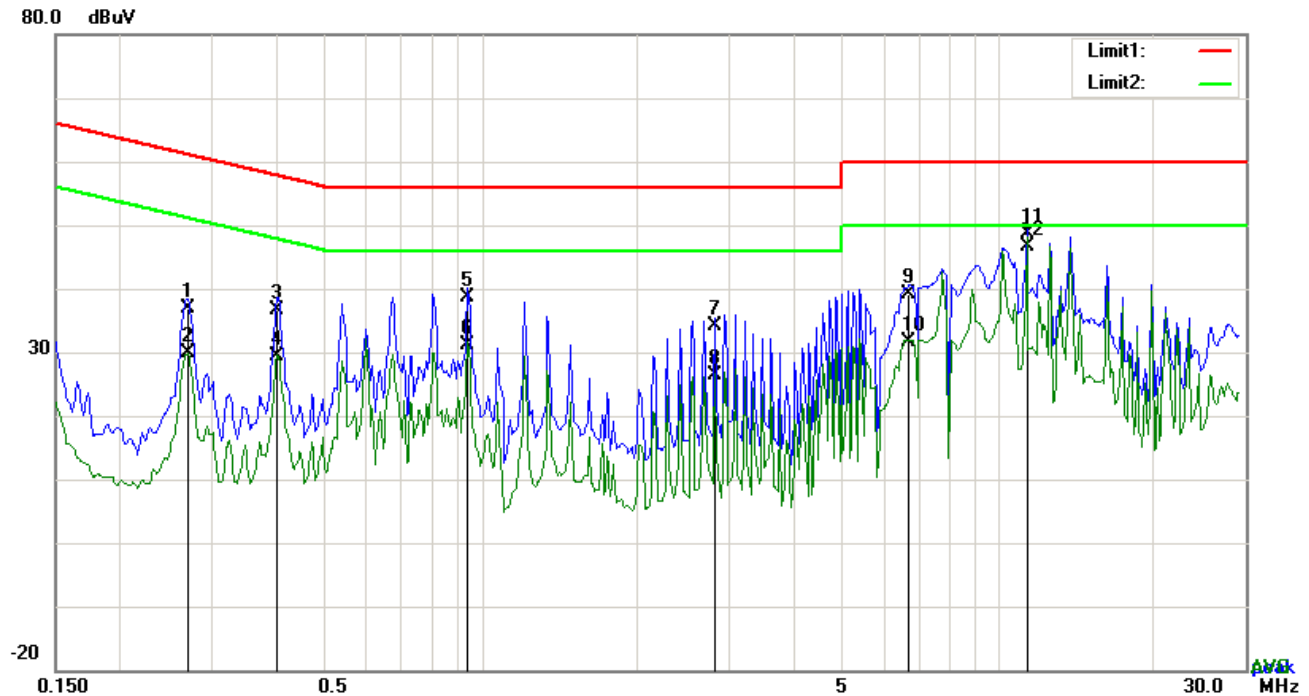


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.2670	23.38	QP	10.03	33.41	61.21	-27.80
2	L1	0.2670	16.11	AVG	10.03	26.14	51.21	-25.07
3	L1	0.3996	23.99	QP	10.03	34.02	57.86	-23.84
4	L1	0.3996	16.95	AVG	10.03	26.98	47.86	-20.88
5	L1	1.0743	19.89	QP	10.03	29.92	56.00	-26.08
6	L1	1.0743	12.86	AVG	10.03	22.89	46.00	-23.11
7	L1	5.0982	32.83	QP	10.08	42.91	60.00	-17.09
8	L1	5.0982	13.80	AVG	10.08	23.88	50.00	-26.12
9	L1	8.9904	32.27	QP	10.14	42.41	60.00	-17.59
10	L1	8.9904	25.11	AVG	10.14	35.25	50.00	-14.75
11	L1	11.3460	31.84	QP	10.17	42.01	60.00	-17.99
12	L1	11.3460	31.68	AVG	10.17	41.85	50.00	-8.15

Test Mode: Bluetooth Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

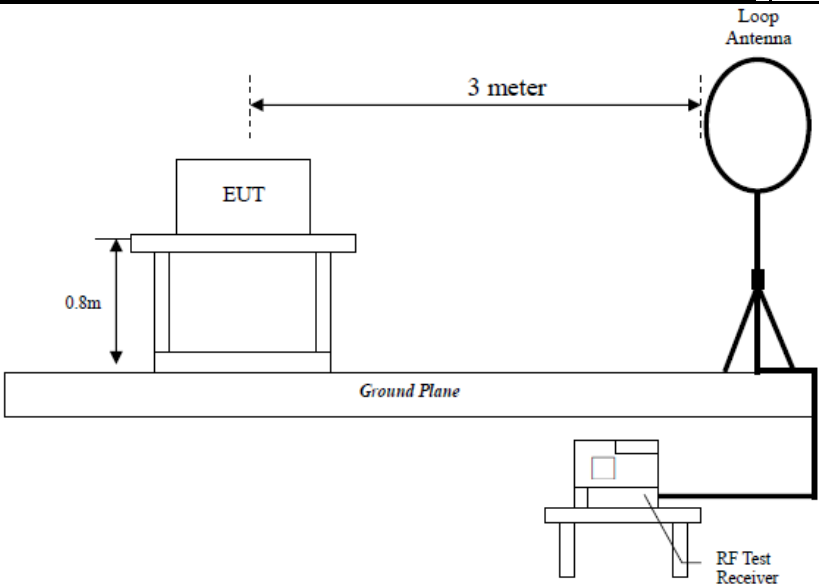
No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.2709	26.89	QP	10.02	36.91	61.09	-24.18
2	N	0.2709	19.74	AVG	10.02	29.76	51.09	-21.33
3	N	0.4035	26.70	QP	10.02	36.72	57.78	-21.06
4	N	0.4035	19.39	AVG	10.02	29.41	47.78	-18.37
5	N	0.9417	28.52	QP	10.03	38.55	56.00	-17.45
6	N	0.9417	21.14	AVG	10.03	31.17	46.00	-14.83
7	N	2.8254	24.01	QP	10.05	34.06	56.00	-21.94
8	N	2.8254	16.40	AVG	10.05	26.45	46.00	-19.55
9	N	6.7284	29.07	QP	10.09	39.16	60.00	-20.84
10	N	6.7284	21.54	AVG	10.09	31.63	50.00	-18.37
11	N	11.3616	38.51	QP	10.16	48.67	60.00	-11.33
12	N	11.3616	36.55	AVG	10.16	46.71	50.00	-3.29

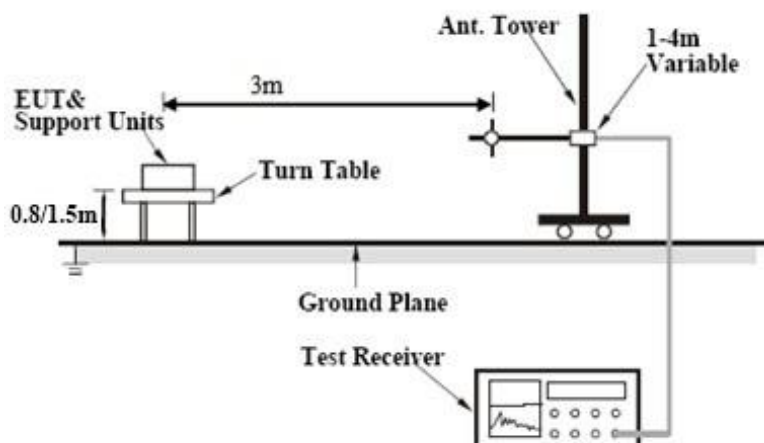
6.9 Radiated Emissions & Restricted Band

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	May 08, 2018
Tested By :	Aaron Liang

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>0.009~0.490</td><td>2400/F(KHz)</td></tr><tr><td>0.490~1.705</td><td>24000/F(KHz)</td></tr><tr><td>1.705~30.0</td><td>30</td></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)	0.009~0.490	2400/F(KHz)	0.490~1.705	24000/F(KHz)	1.705~30.0	30	30 – 88	100	88 – 216	150	216 960	200	Above 960	500
		Frequency range (MHz)		Field Strength (µV/m)															
		0.009~0.490		2400/F(KHz)															
		0.490~1.705		24000/F(KHz)															
		1.705~30.0		30															
		30 – 88		100															
		88 – 216		150															
		216 960		200															
		Above 960		500															

Test Setup	 The diagram illustrates the test setup for radiated emissions. It shows an Equipment Under Test (EUT) placed on a stand that is 0.8 meters high. A Loop Antenna is positioned 3 meters away from the EUT. The entire setup is on a Ground Plane. An RF Test Receiver is connected to the antenna.
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Procedure

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
 - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
 - b. The EUT was then rotated to the direction that gave the maximum emission.
 - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.
The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.
5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

Remark

Result

☒ Pass ☐ Fail

Test Data

☒ Yes ☐ N/A

Test Plot

☒ Yes (See below) ☐ N/A

Test Result:

Test Mode:	Transmitting Mode
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Frequency range: 9KHz - 30MHz

Freq.	Detection	Factor	Reading	Result	Limit@3m	Margin
(MHz)	value	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)
--	--	--	--	--	--	>20
--	--	--	--	--	--	>20

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.