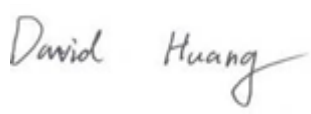


RF TEST REPORT



Report No.: 17070925-FCC-R3

Supersede Report No.: N/A

Applicant	SMT TELECOMM HK LIMITED	
Product Name	Mobile Phone	
Model No.	X422A	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	September 20 to October 09, 2017	
Issue Date	October 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

Test Report	17070925-FCC-R3
Page	3 of 58

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070925-FCC-R3	NONE	Original	October 10, 2017

2. Customer information

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

3. Test site information

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:	Mobile Phone
Main Model:	X422A
Serial Model:	N/A
Date EUT received:	September 20, 2017
Test Date(s):	September 20 to October 09, 2017
Equipment Category :	DSS
Antenna Gain:	GSM850: -1.86dBi PCS1900: -0.09dBi UMTS-FDD Band V: -1.86dBi UMTS-FDD Band IV: -0.16dBi UMTS-FDD Band II: -0.09dBi WIFI: 0.37dBi Bluetooth/BLE: 0.37dBi
Antenna Type:	PIFA antenna
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK, 8PSK UMTS-FDD: QPSK 802.11b: DSSS 802.11a/g/n20/n40: OFDM Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK BLE: GFSK

RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz
	PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz
	UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz
	UMTS-FDD Band IV TX:1712.4 ~ 1752.6 MHz;
	RX : 2112.4 ~ 2152.6 MHz
	UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz;
	RX: 1932.4 ~ 1987.6 MHz
	WIFI: 802.11b/g/n(20M): 2412-2462 MHz
	WIFI: 802.11n(40M): 2422-2452 MHz
	Bluetooth& BLE: 2402-2480 MHz
Max. Output Power:	3.292dBm
Number of Channels:	GSM 850: 124CH
	PCS1900: 299CH
	UMTS-FDD Band V: 102CH
	UMTS-FDD Band IV: 202CH
	UMTS-FDD Band II: 277CH
	WIFI :802.11b/g/n(20M): 11CH
	WIFI :802.11n(40M): 7CH
	Bluetooth: 79CH
Port:	BLE: 40CH
	USB Port, Earphone Port
	Adapter:
	Model: PCX422
	Input: AC100-240V~50/60Hz,0.15A
	Output: DC 5.0V~500mA
	Battery:
	Model: BPX422
	Battery Capacity: 3.7V, 1300mAh
	Battery Voltage Limit: 4.2V
Trade Name :	N/A
FCC ID:	2AIMEX422A

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/BLE/WIFI, the gain is 0.37dBi for Bluetooth/BLE, the gain is 0.37dBi for WIFI.

A permanently attached PIFA antenna for GSM/PCS/UMTS, the gain is -1.86dBi for GSM850, -0.09dBi for PCS1900, -1.86dBi for UMTS-FDD Band V, -0.09dBi for UMTS-FDD Band II, -0.16dBi for UMTS-FDD Band IV.

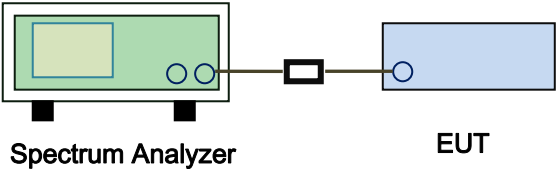
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	September 27, 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

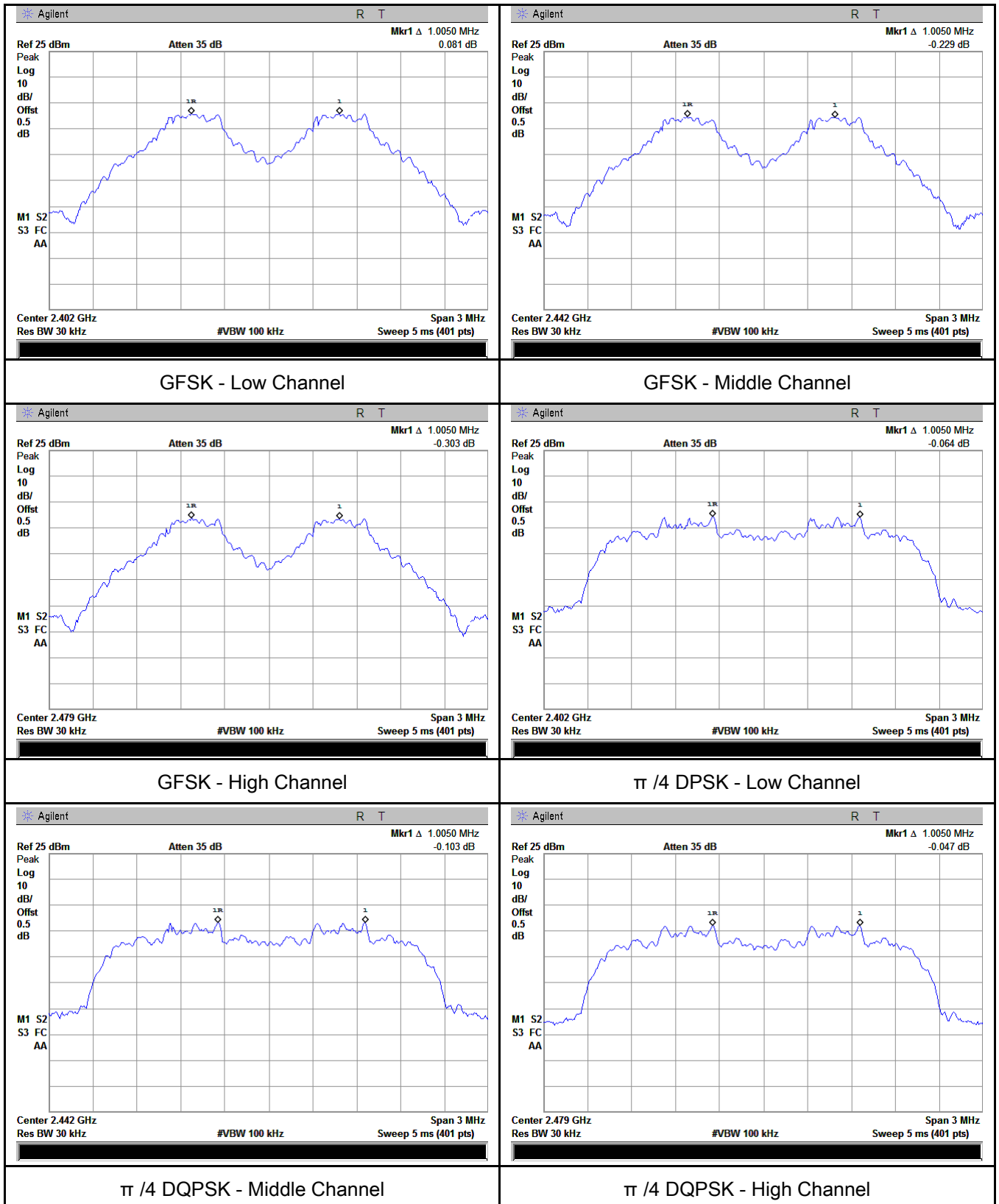
Test Plot ☒ Yes (See below) ☐ N/A

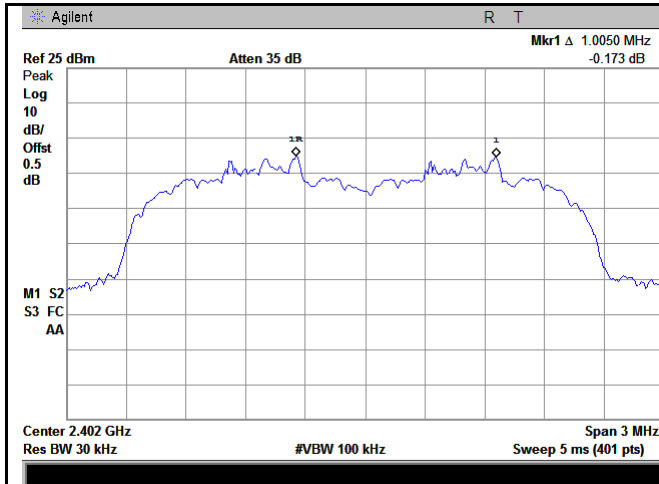
Channel Separation measurement result

Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.005	0.691	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.693	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.005	0.687	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.005	0.863	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.867	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.005	0.867	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.005	0.871	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.005	0.865	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.005	0.866	Pass
	Adjacency Channel	2479			

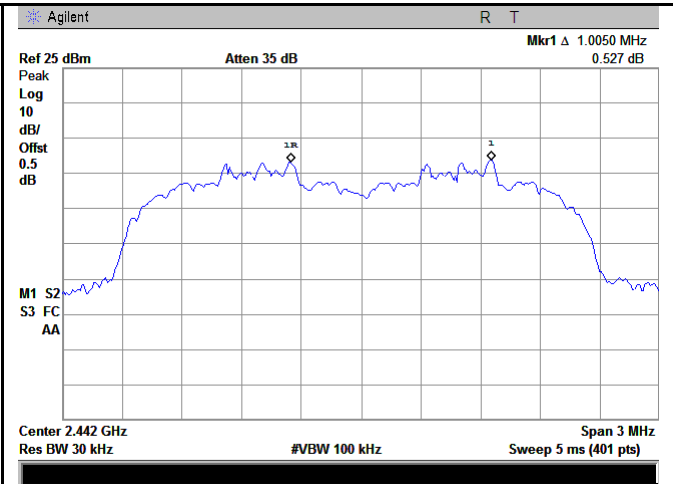
Test Plots

Channel Separation measurement result

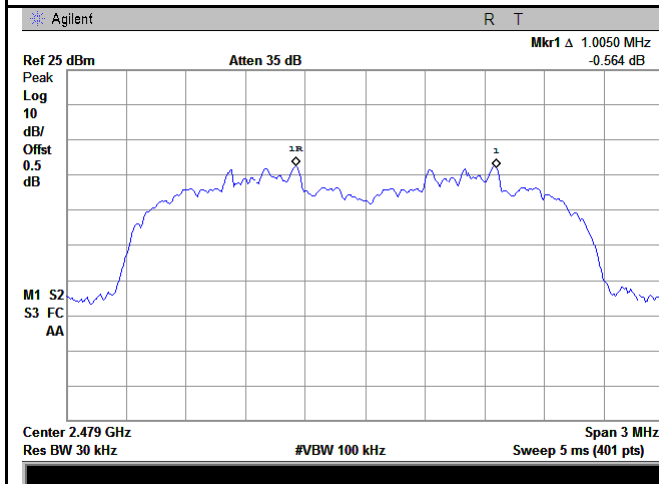




8DPSK - Low Channel



8DPSK - Middle Channel

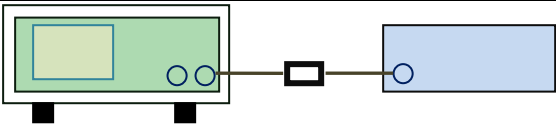


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	September 27, 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

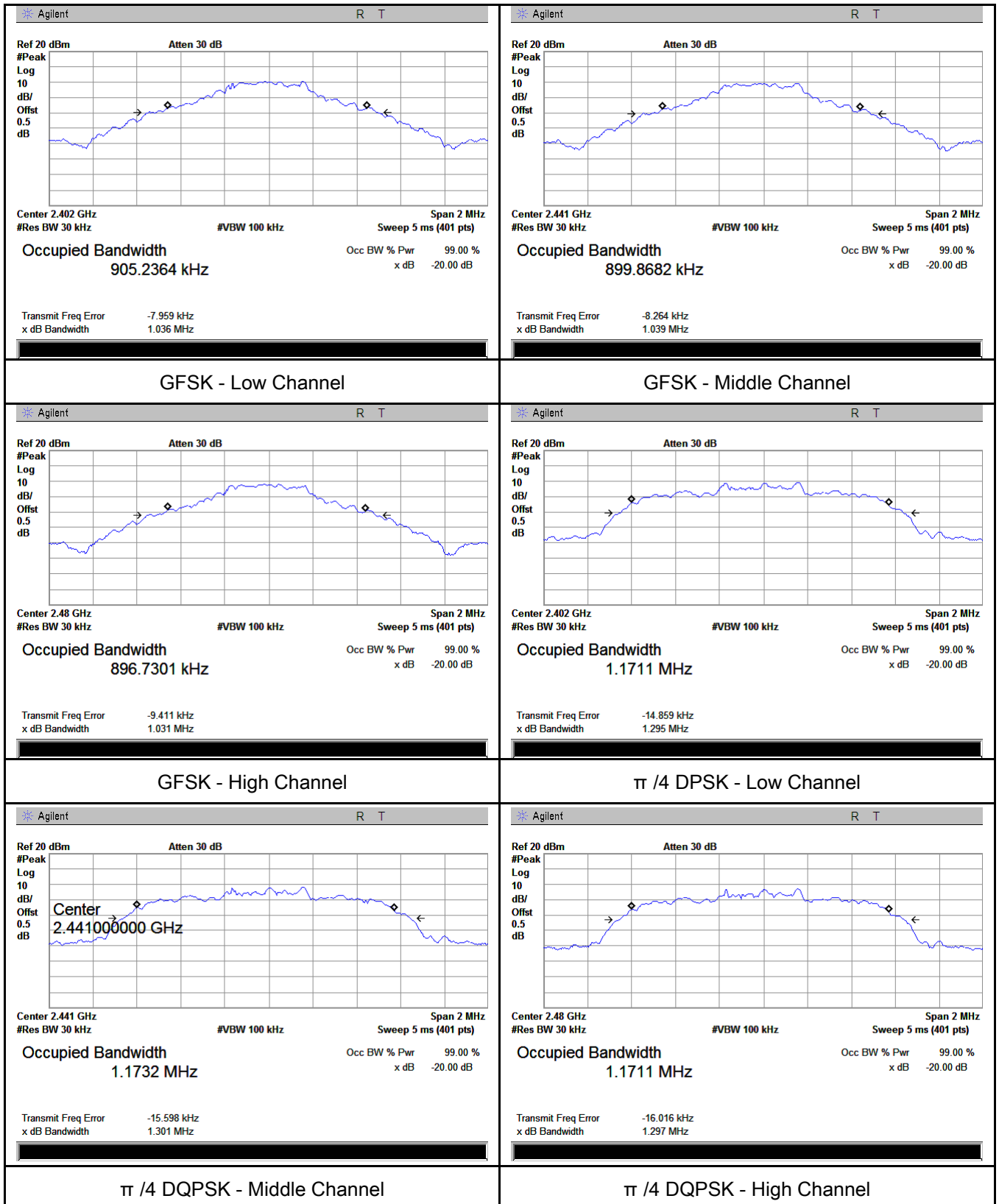
Test Plot ☒ Yes (See below) ☐ N/A

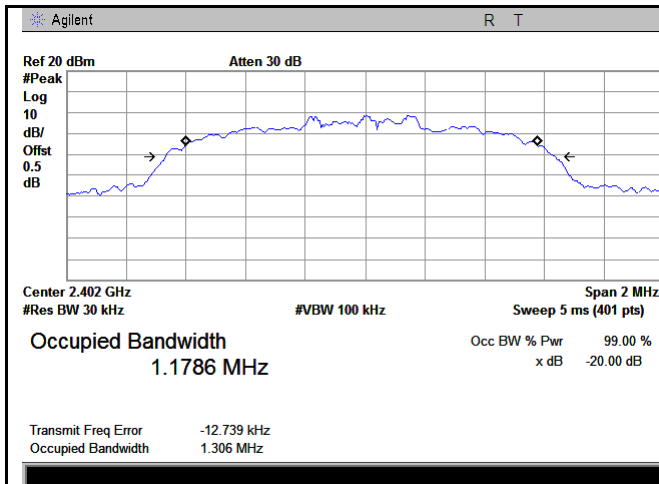
Measurement result

Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	1.036	0.9052
	Mid	2441	1.039	0.8999
	High	2480	1.031	0.8967
$\pi/4$ DQPSK	Low	2402	1.295	1.1711
	Mid	2441	1.301	1.1732
	High	2480	1.297	1.1711
8-DPSK	Low	2402	1.306	1.1786
	Mid	2441	1.298	1.1820
	High	2480	1.299	1.1771

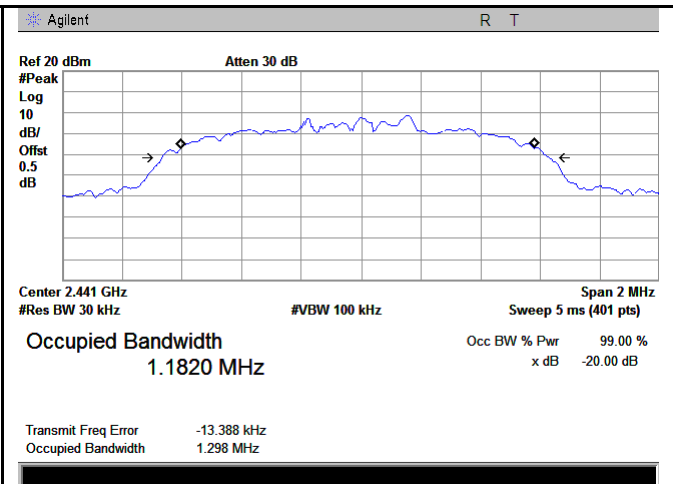
Test Plots

20dB Bandwidth measurement result

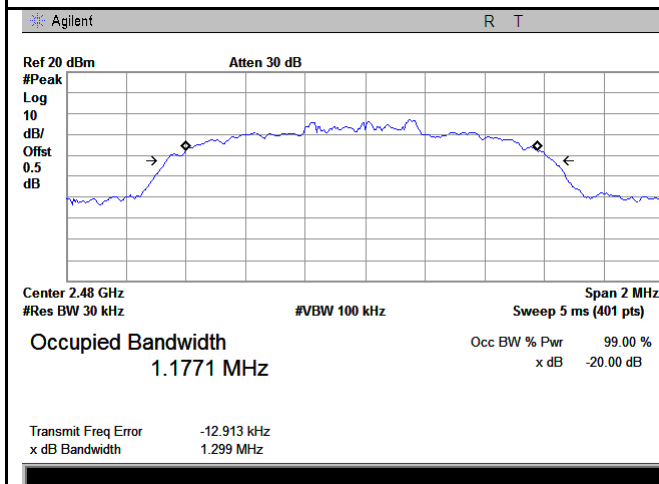




8DPSK - Low Channel



8DPSK - Middle Channel



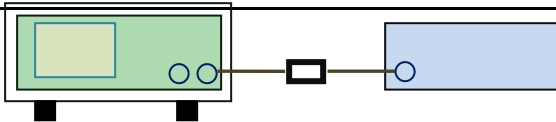
8DPSK - High Channel

6.4 Peak Output Power

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	September 27, 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. 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

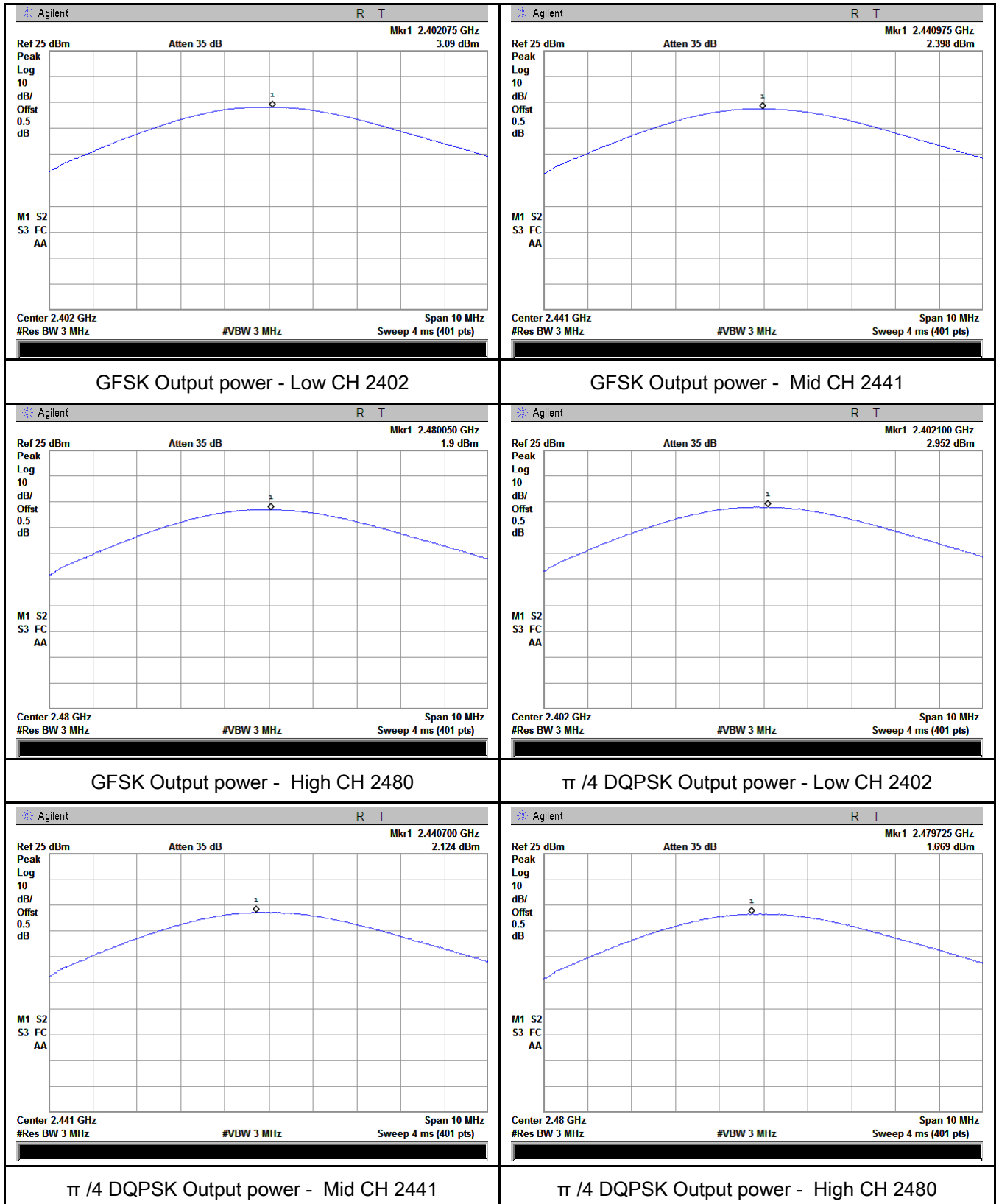
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

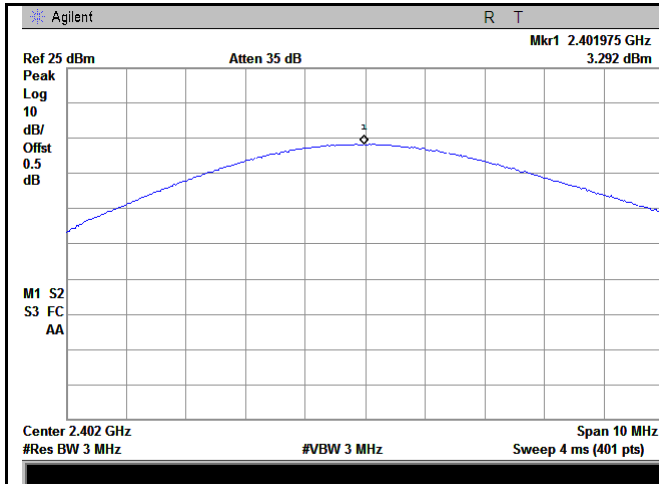
Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	3.090	125	Pass
		Mid	2441	2.398	125	Pass
		High	2480	1.900	125	Pass
	$\pi/4$ DQPSK	Low	2402	2.952	125	Pass
		Mid	2441	2.124	125	Pass
		High	2480	1.669	125	Pass
	8-DPSK	Low	2402	3.292	125	Pass
		Mid	2441	2.392	125	Pass
		High	2480	1.600	125	Pass

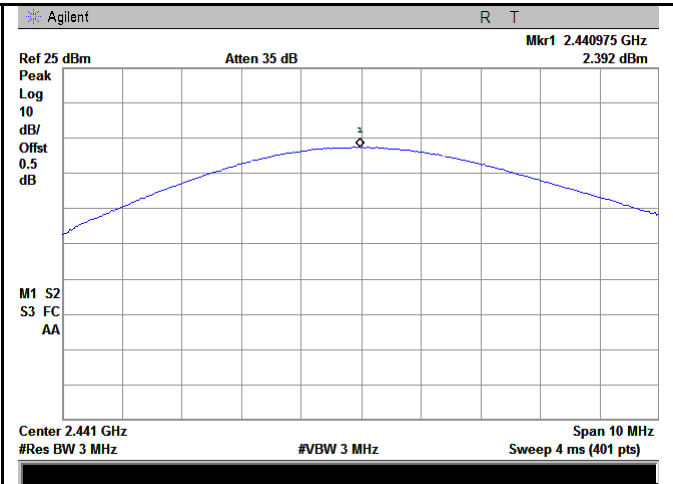
Test Plots

Output Power measurement result

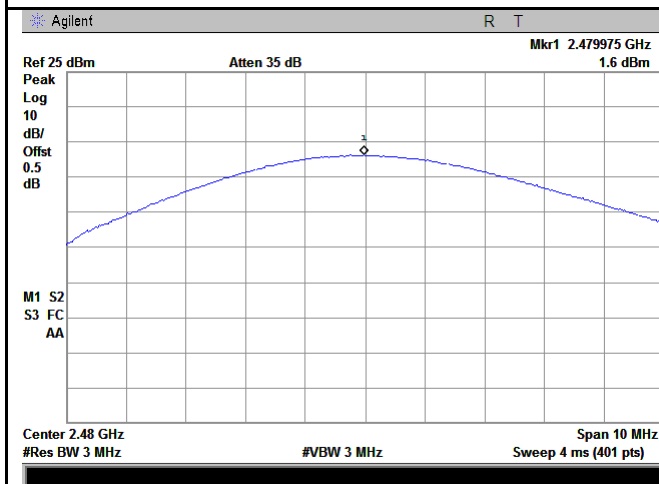




8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

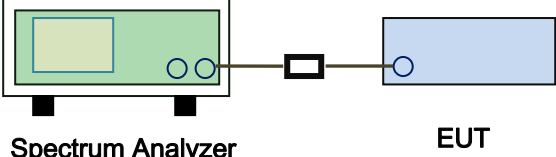


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	September 27, 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		

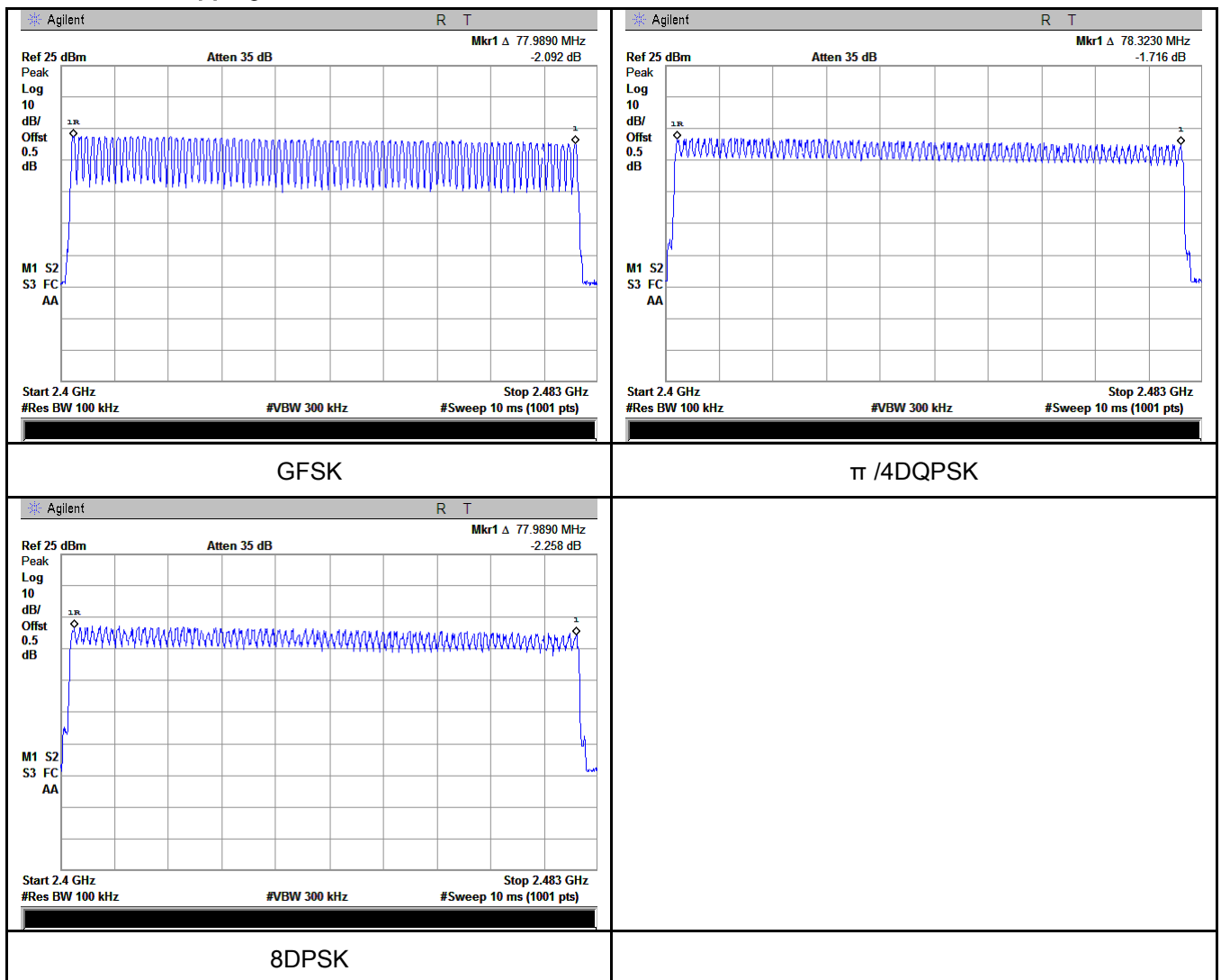
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

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
	π /4 DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

Test Plots

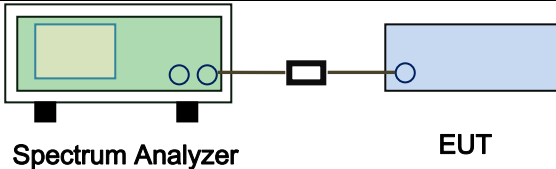
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	September 27, 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		

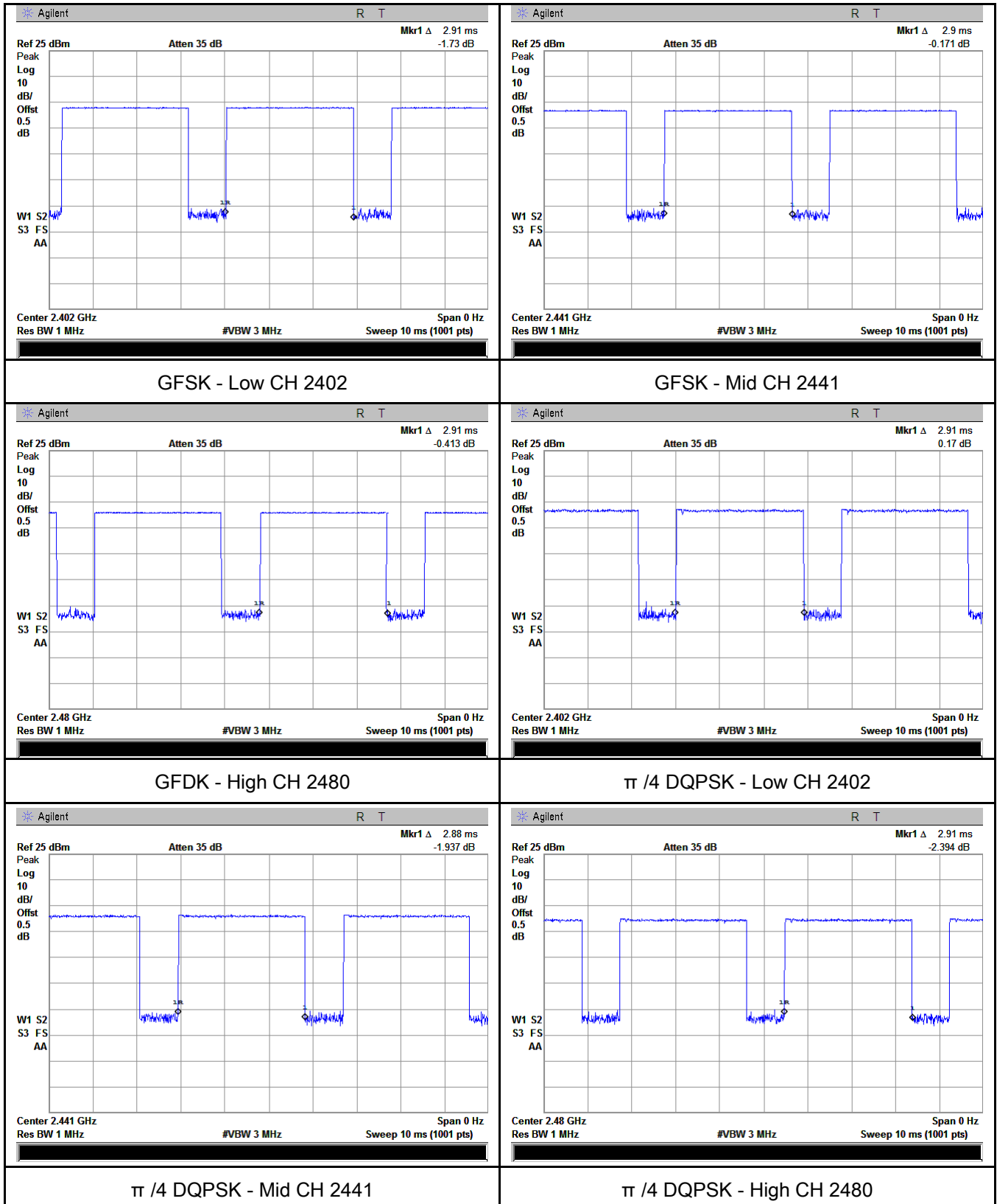
Test Data ☒ Yes ☐ N/A

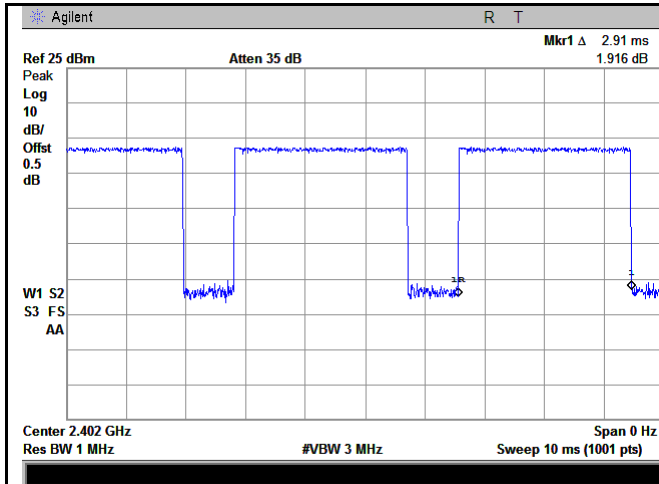
Test Plot ☒ Yes (See below) ☐ N/A

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.91	310.400	400	Pass
		Mid	2.90	309.333	400	Pass
		High	2.91	310.400	400	Pass
	$\pi/4$ DQPSK	Low	2.91	310.400	400	Pass
		Mid	2.88	307.200	400	Pass
		High	2.91	310.400	400	Pass
	8-DPSK	Low	2.91	310.400	400	Pass
		Mid	2.90	309.333	400	Pass
		High	2.91	310.400	400	Pass
Note: Dwell time=Pulse Time (ms) $\times$ (1600 $\div$ 6 $\div$ 79) $\times$ 31.6						

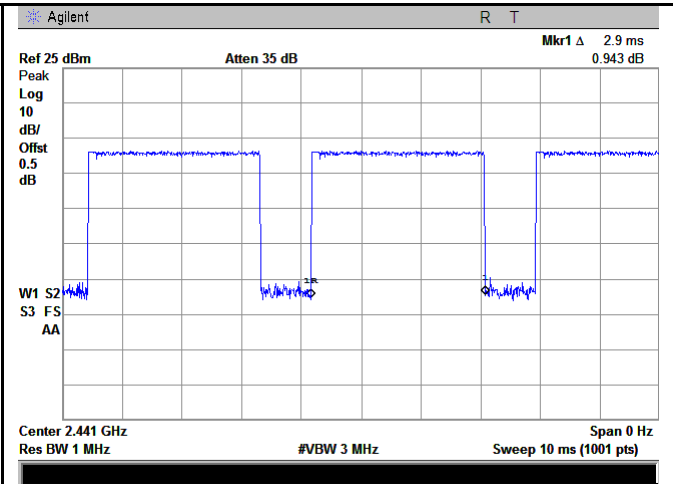
Test Plots

Dwell Time measurement result

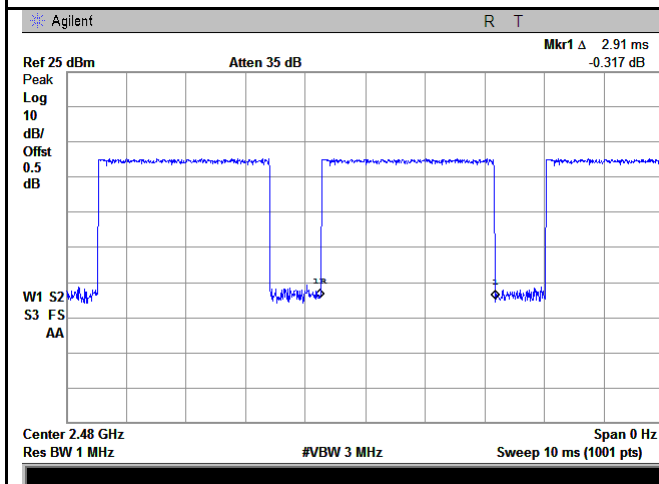




8DPSK - Low CH 2402



8DPSK - Mid CH 2441



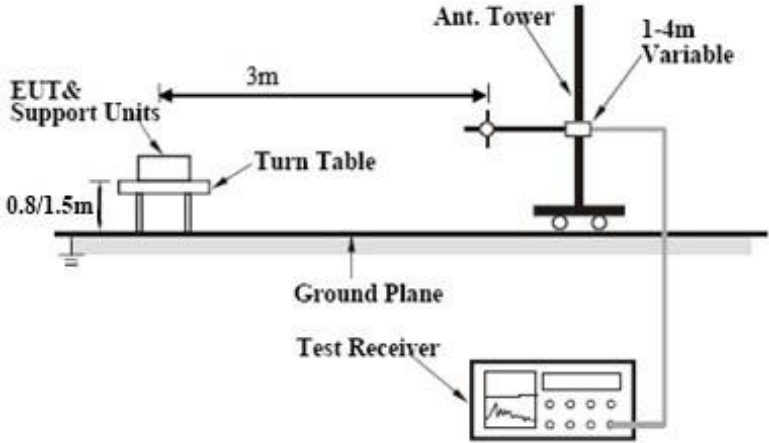
8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar
Test date :	September 23, 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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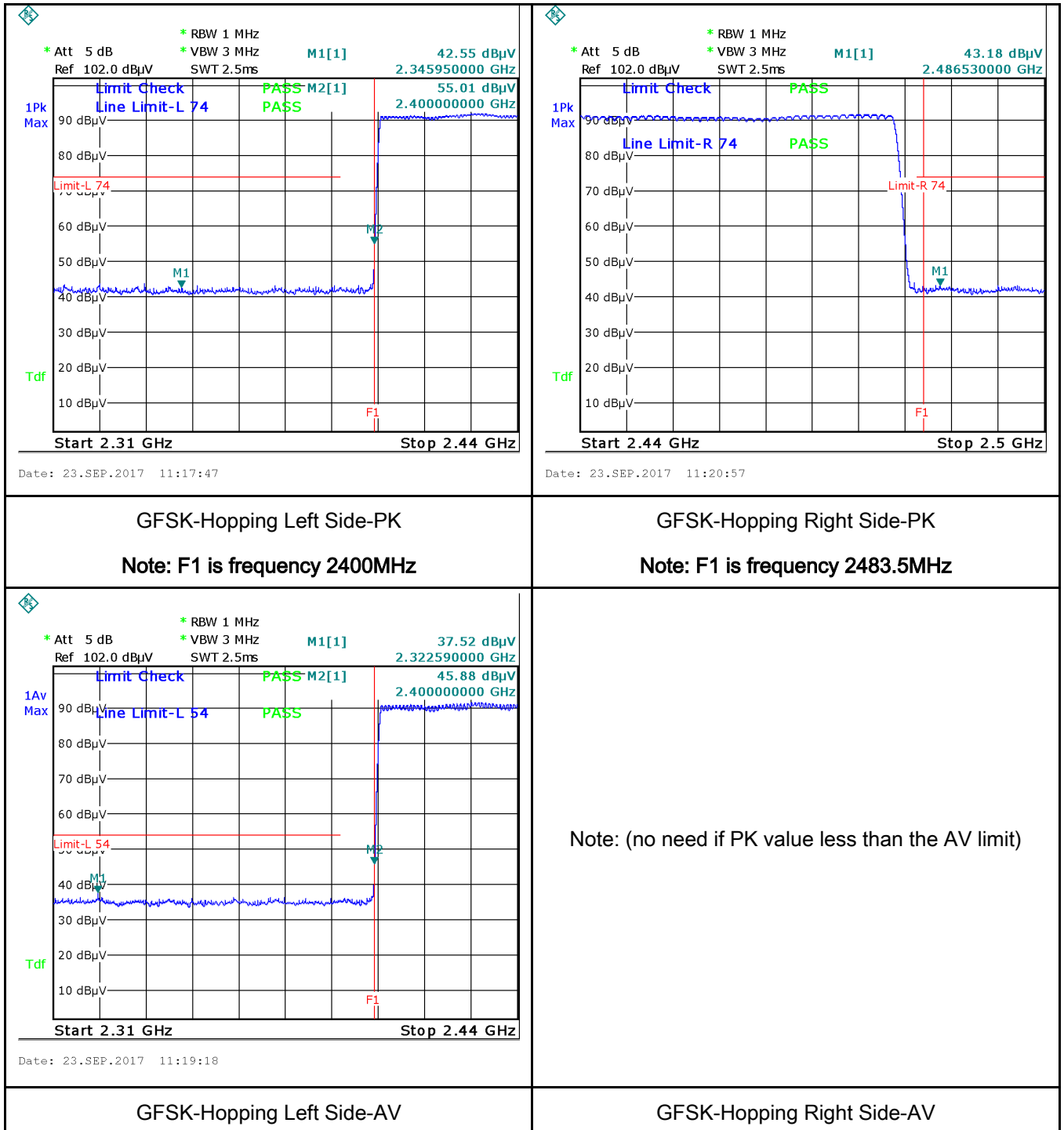
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. 2. Position the EUT without connection to measurement instrument. 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

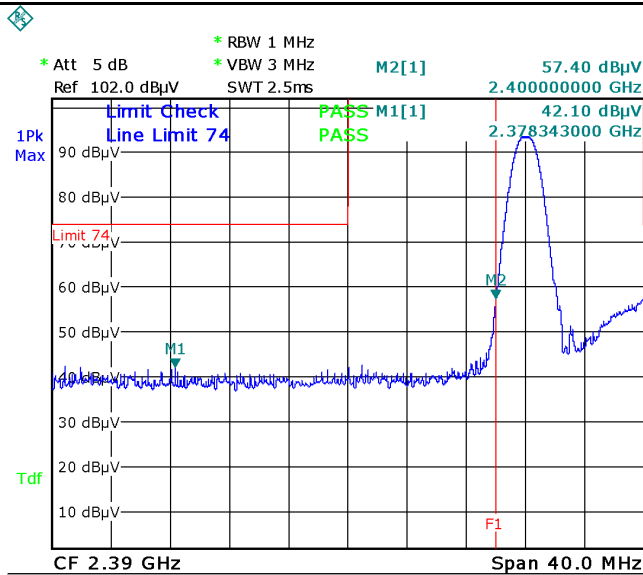
Test Data ☐ Yes ☒ N/A
Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

GFSK Mode:



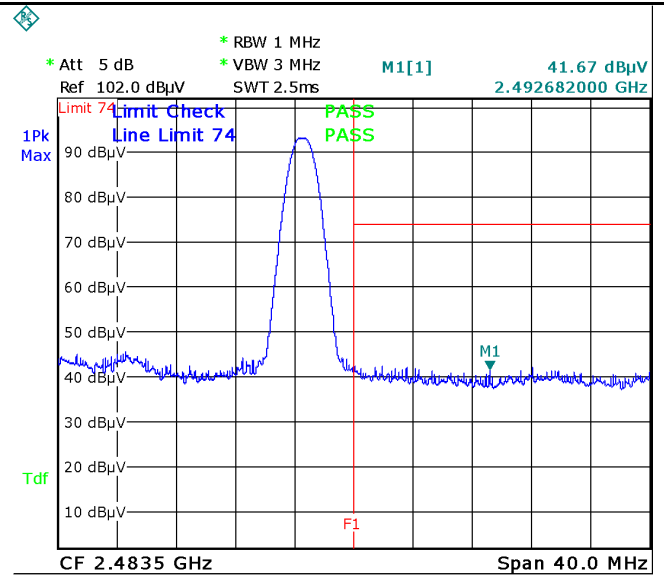
Note: Both Horizontal and vertical polarities were investigated.



Date: 23.SEP.2017 10:57:54

GFSK-Left Side-PK

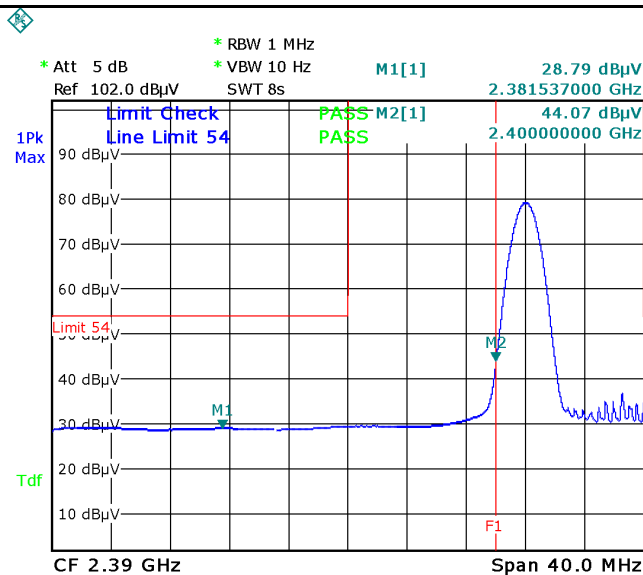
Note: F1 is frequency 2400MHz



Date: 23.SEP.2017 11:13:24

GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



Date: 23.SEP.2017 10:58:46

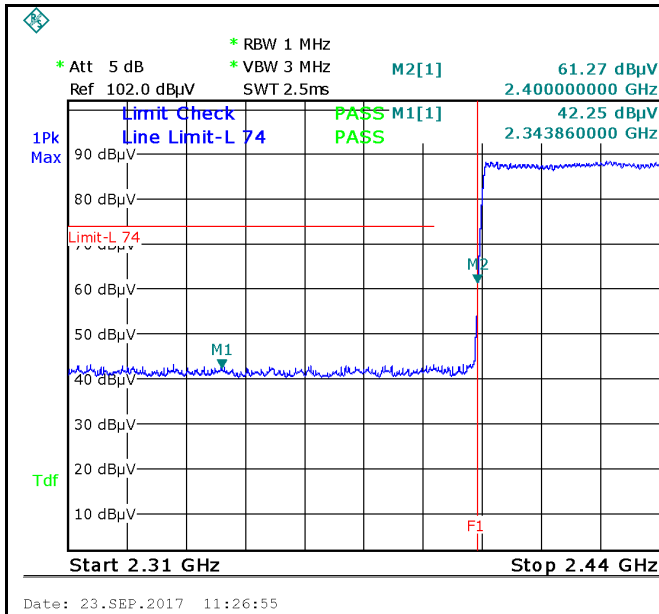
GFSK-Left Side-AV

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

GFSK-Right Side-AV

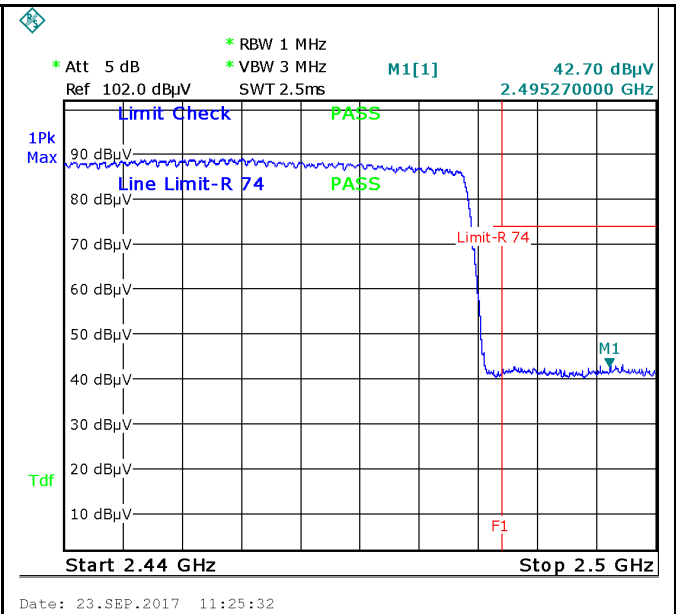
Note: Both Horizontal and vertical polarities were investigated.

$\pi/4$ DQPSK Mode:



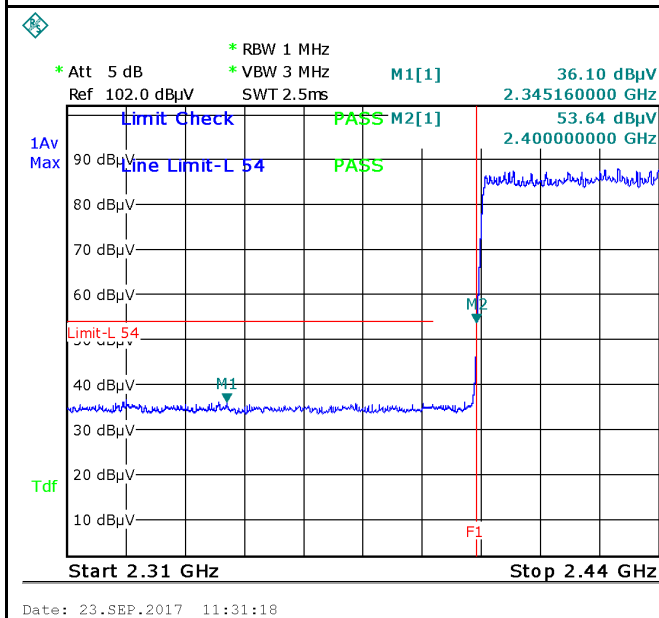
$\pi/4$ DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



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

Note: F1 is frequency 2483.5MHz

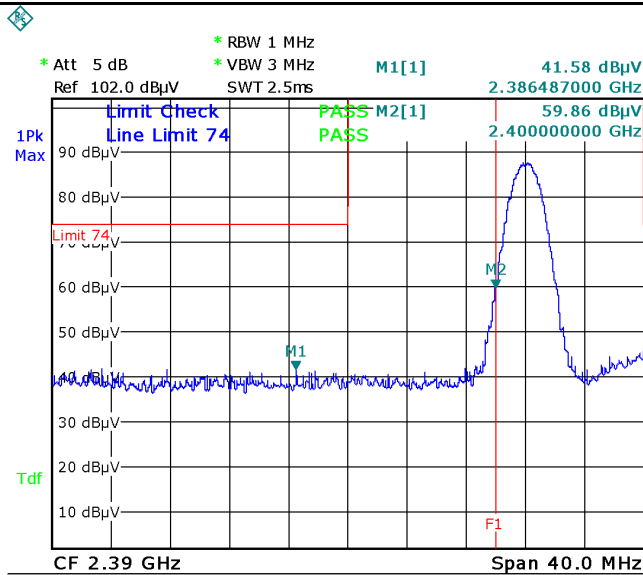


$\pi/4$ DQPSK-Hopping Left-AV

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

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

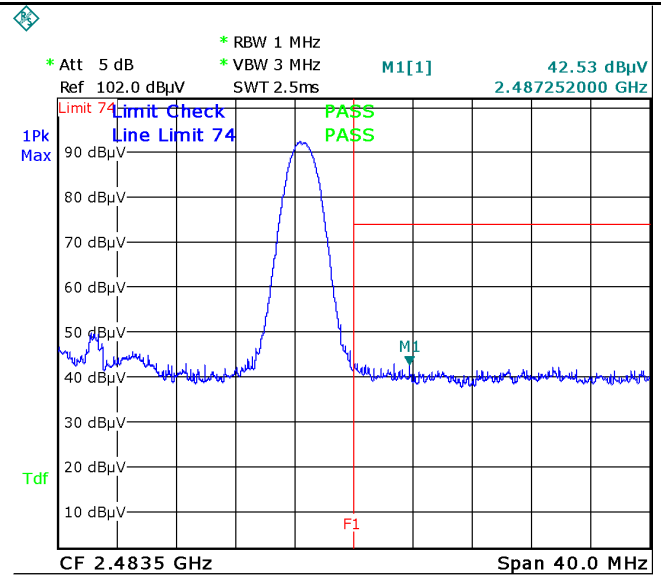
Note: Both Horizontal and vertical polarities were investigated.



Date: 23.SEP.2017 11:01:44

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

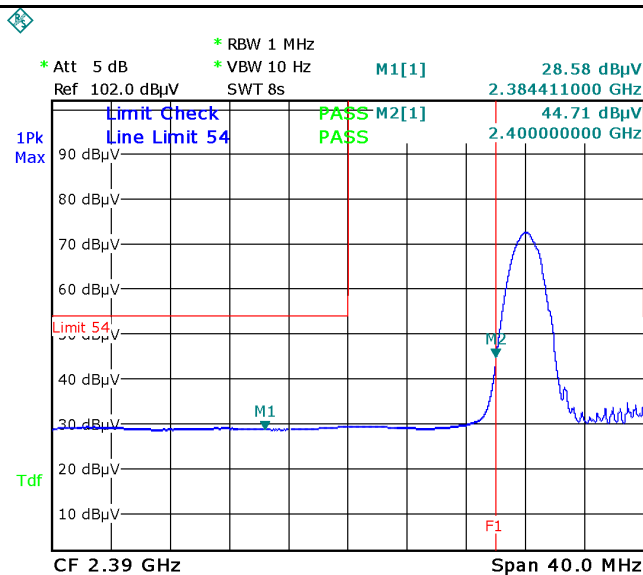
Note: F1 is frequency 2400MHz



Date: 23.SEP.2017 11:12:10

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

Note: F1 is frequency 2483.5MHz



Date: 23.SEP.2017 11:00:46

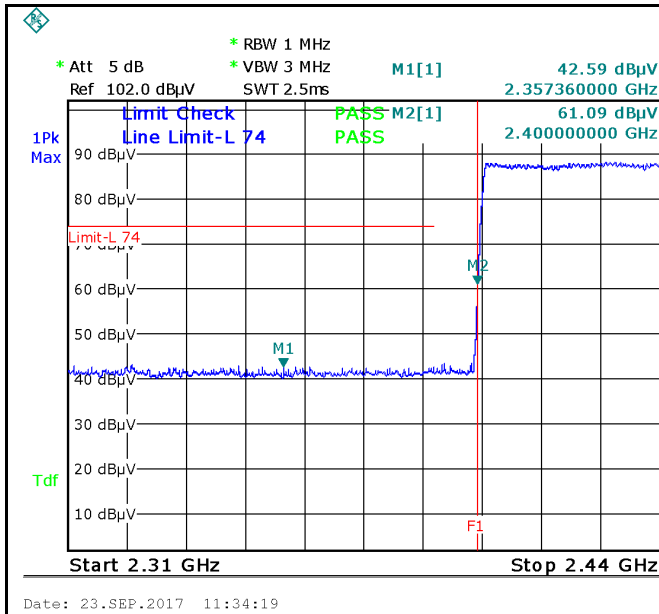
$\pi/4$ DQPSK-Left Side-AV

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

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

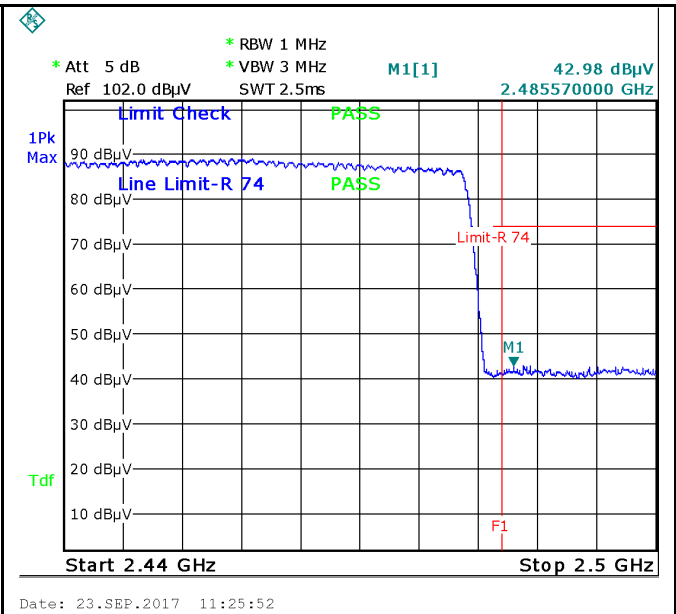
Note: Both Horizontal and vertical polarities were investigated.

8-DPSK Mode:



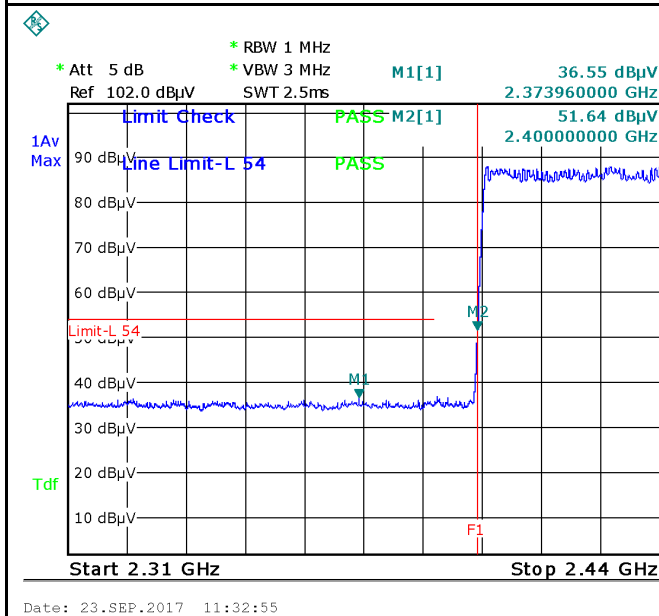
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

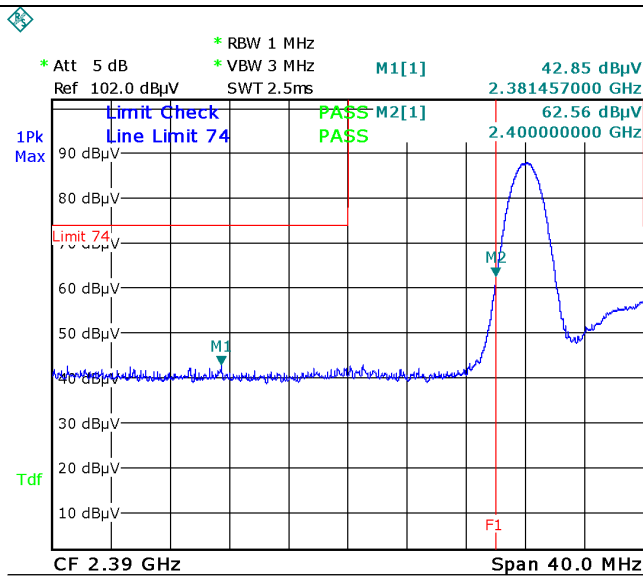


8DPSK-Hopping Left-AV

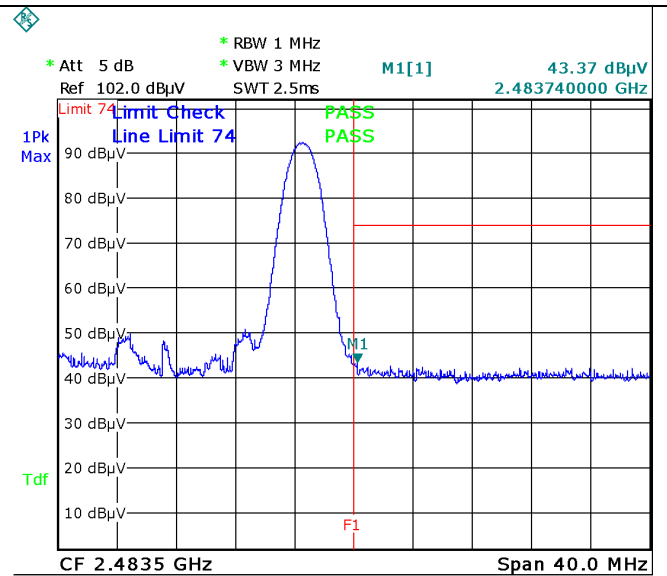
Note: (no need if PK value less than the AV limit)

8DPSK-Hopping Right-AV

Note: Both Horizontal and vertical polarities were investigated.



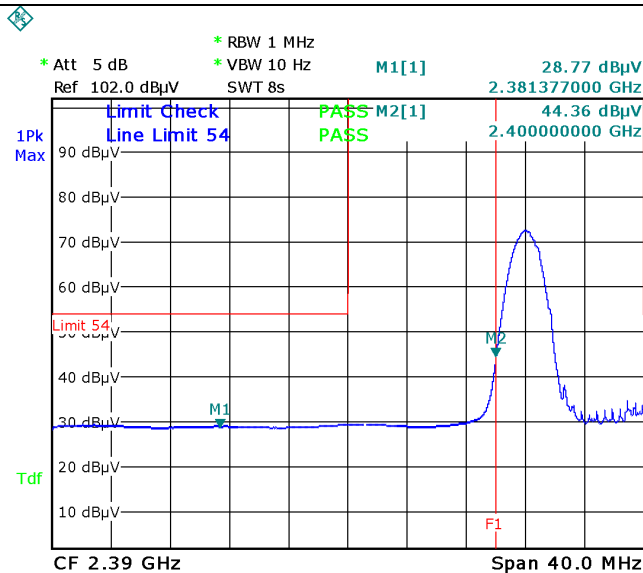
Date: 23.SEP.2017 11:06:04



Date: 23.SEP.2017 11:11:45

8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



Date: 23.SEP.2017 11:00:31

8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

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

8DPSK-Left Side-AV

8DPSK-Right Side-AV

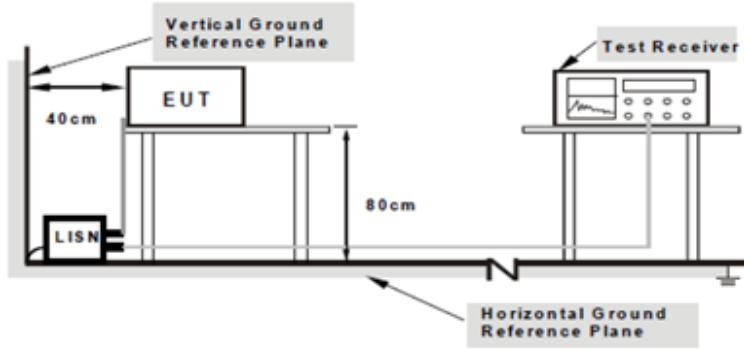
Note: Both Horizontal and vertical polarities were investigated.

6.8 AC Power Line Conducted Emissions

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar
Test date :	September 23, 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.	☒														
		<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															

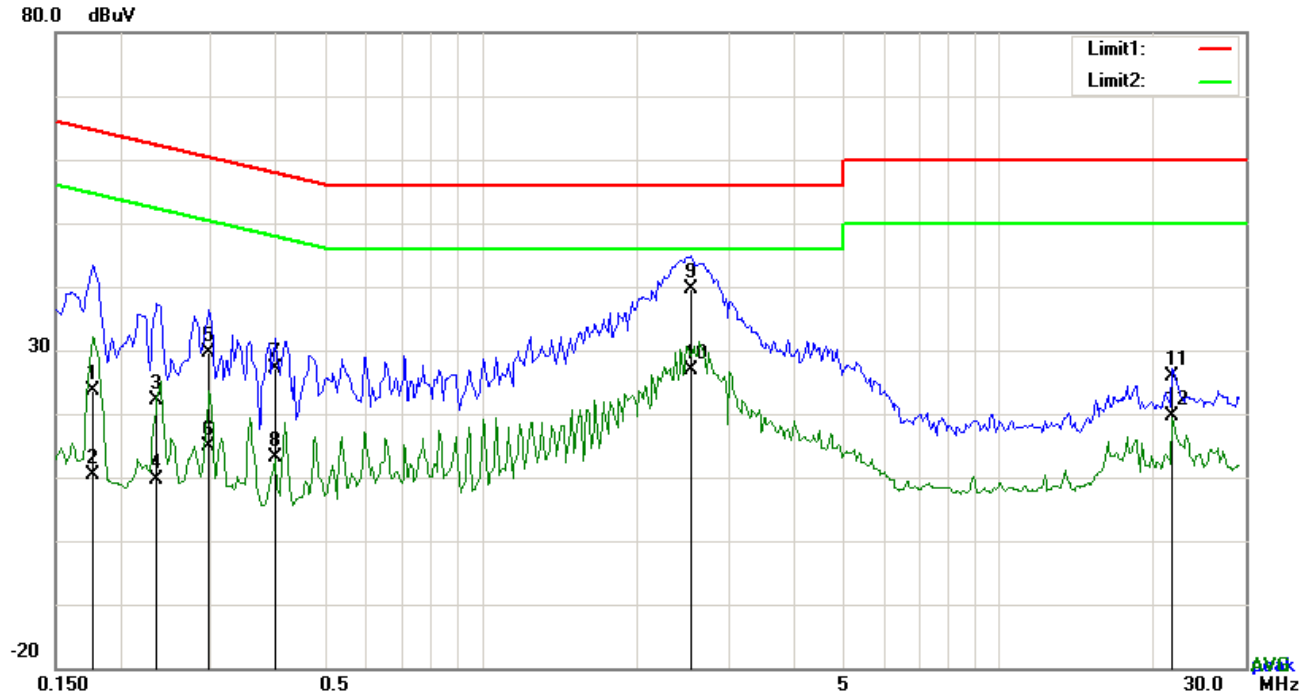
Test Setup	 Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.
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Procedure	- The EUT and supporting equipment were set up in accordance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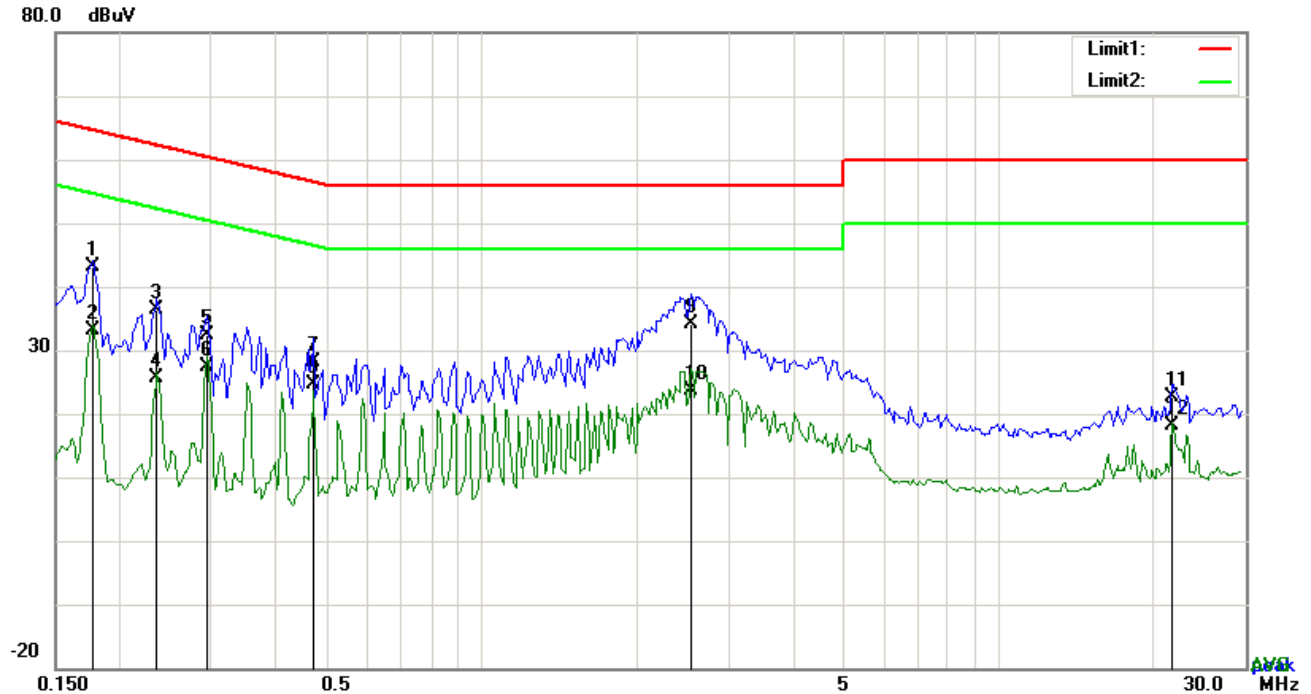


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.1773	10.60	QP	13.10	23.70	64.61	-40.91
2	L1	0.1773	-2.68	AVG	13.10	10.42	54.61	-44.19
3	L1	0.2358	9.13	QP	12.88	22.01	62.24	-40.23
4	L1	0.2358	-3.26	AVG	12.88	9.62	52.24	-42.62
5	L1	0.2982	16.90	QP	12.65	29.55	60.29	-30.74
6	L1	0.2982	2.14	AVG	12.65	14.79	50.29	-35.50
7	L1	0.3996	14.88	QP	12.27	27.15	57.86	-30.71
8	L1	0.3996	0.87	AVG	12.27	13.14	47.86	-34.72
9	L1	2.5446	28.18	QP	11.40	39.58	56.00	-16.42
10	L1	2.5446	15.51	AVG	11.40	26.91	46.00	-19.09
11	L1	21.6654	11.09	QP	14.88	25.97	60.00	-34.03
12	L1	21.6654	4.69	AVG	14.88	19.57	50.00	-30.43

Test Mode: Bluetooth Mode

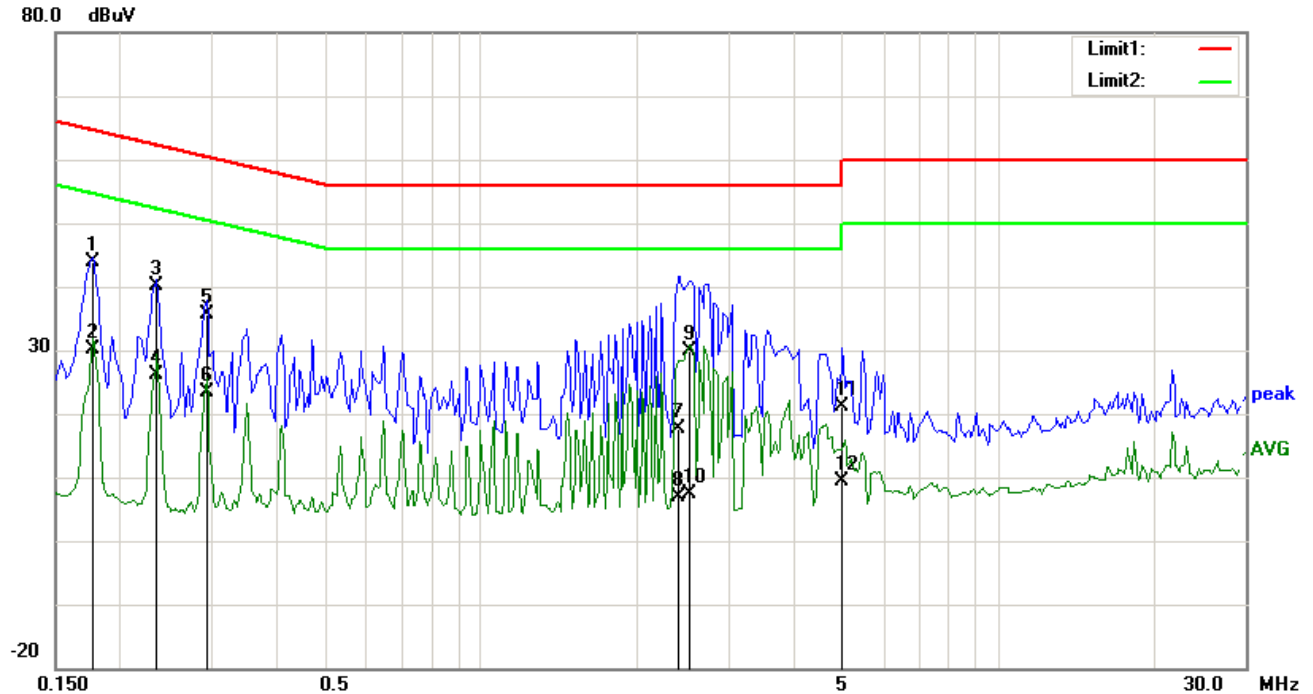


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.1773	29.98	QP	13.10	43.08	64.61	-21.53
2	N	0.1773	20.00	AVG	13.10	33.10	54.61	-21.51
3	N	0.2358	23.41	QP	12.88	36.29	62.24	-25.95
4	N	0.2358	12.81	AVG	12.88	25.69	52.24	-26.55
5	N	0.2943	19.77	QP	12.66	32.43	60.40	-27.97
6	N	0.2943	14.82	AVG	12.66	27.48	50.40	-22.92
7	N	0.4737	16.03	QP	12.00	28.03	56.45	-28.42
8	N	0.4737	12.59	AVG	12.00	24.59	46.45	-21.86
9	N	2.5446	22.43	QP	11.59	34.02	56.00	-21.98
10	N	2.5446	12.14	AVG	11.59	23.73	46.00	-22.27
11	N	21.6654	7.01	QP	15.73	22.74	60.00	-37.26
12	N	21.6654	2.46	AVG	15.73	18.19	50.00	-31.81

Test Mode: Bluetooth Mode

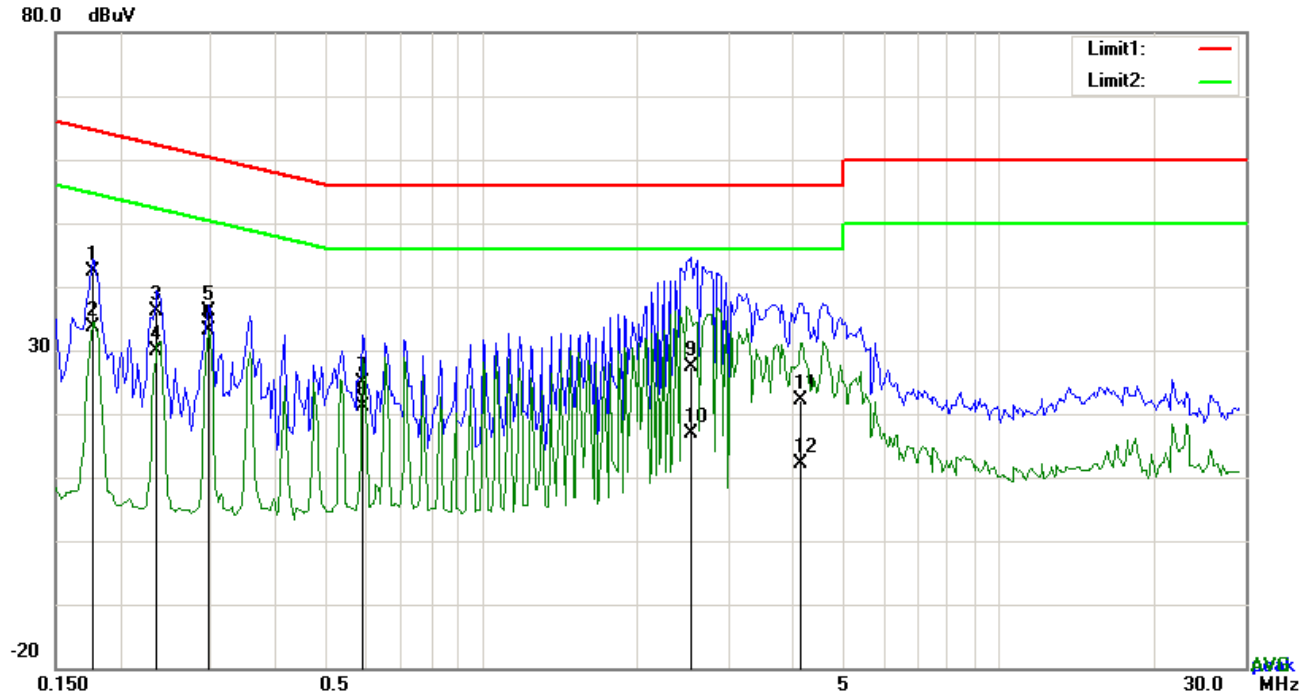


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.1773	30.72	QP	13.10	43.82	64.61	-20.79
2	L1	0.1773	17.12	AVG	13.10	30.22	54.61	-24.39
3	L1	0.2358	27.15	QP	12.88	40.03	62.24	-22.21
4	L1	0.2358	13.33	AVG	12.88	26.21	52.24	-26.03
5	L1	0.2943	23.06	QP	12.66	35.72	60.40	-24.68
6	L1	0.2943	10.83	AVG	12.66	23.49	50.40	-26.91
7	L1	2.4081	6.18	QP	11.40	17.58	56.00	-38.42
8	L1	2.4081	-4.40	AVG	11.40	7.00	46.00	-39.00
9	L1	2.5266	18.38	QP	11.40	29.78	56.00	-26.22
10	L1	2.5266	-3.95	AVG	11.40	7.45	46.00	-38.55
11	L1	4.9890	9.62	QP	11.40	21.02	56.00	-34.98
12	L1	4.9890	-2.05	AVG	11.40	9.35	46.00	-36.65

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	0.1773	29.17	QP	13.10	42.27	64.61	-22.34
2	N	0.1773	20.63	AVG	13.10	33.73	54.61	-20.88
3	N	0.2358	23.35	QP	12.88	36.23	62.24	-26.01
4	N	0.2358	16.93	AVG	12.88	29.81	52.24	-22.43
5	N	0.2982	23.36	QP	12.65	36.01	60.29	-24.28
6	N	0.2982	20.58	AVG	12.65	33.23	50.29	-17.06
7	N	0.5907	13.11	QP	11.81	24.92	56.00	-31.08
8	N	0.5907	9.32	AVG	11.81	21.13	46.00	-24.87
9	N	2.5524	15.87	QP	11.59	27.46	56.00	-28.54
10	N	2.5524	5.30	AVG	11.59	16.89	46.00	-29.11
11	N	4.1544	10.32	QP	11.79	22.11	56.00	-33.89
12	N	4.1544	0.25	AVG	11.79	12.04	46.00	-33.96

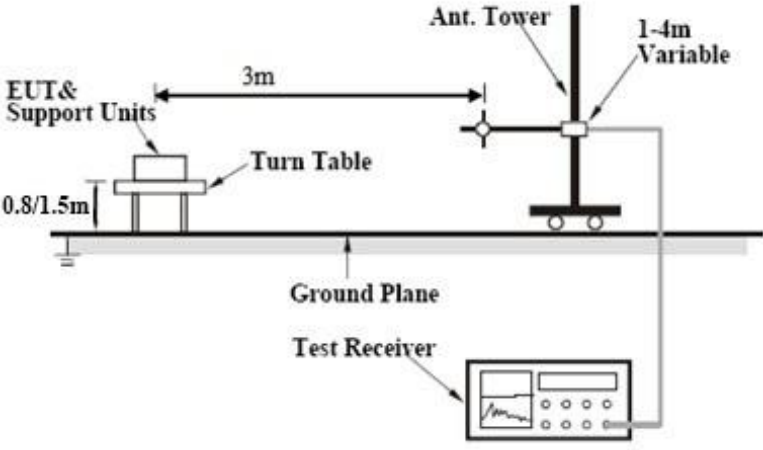
6.9 Radiated Emissions & Restricted Band

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1017mbar
Test date :	September 23, 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>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	- 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: - Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. - The EUT was then rotated to the direction that gave the maximum emission. - Finally, the antenna height was adjusted to the height that gave the maximum emission. - The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. - 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. - 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
------------	-------------------

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.

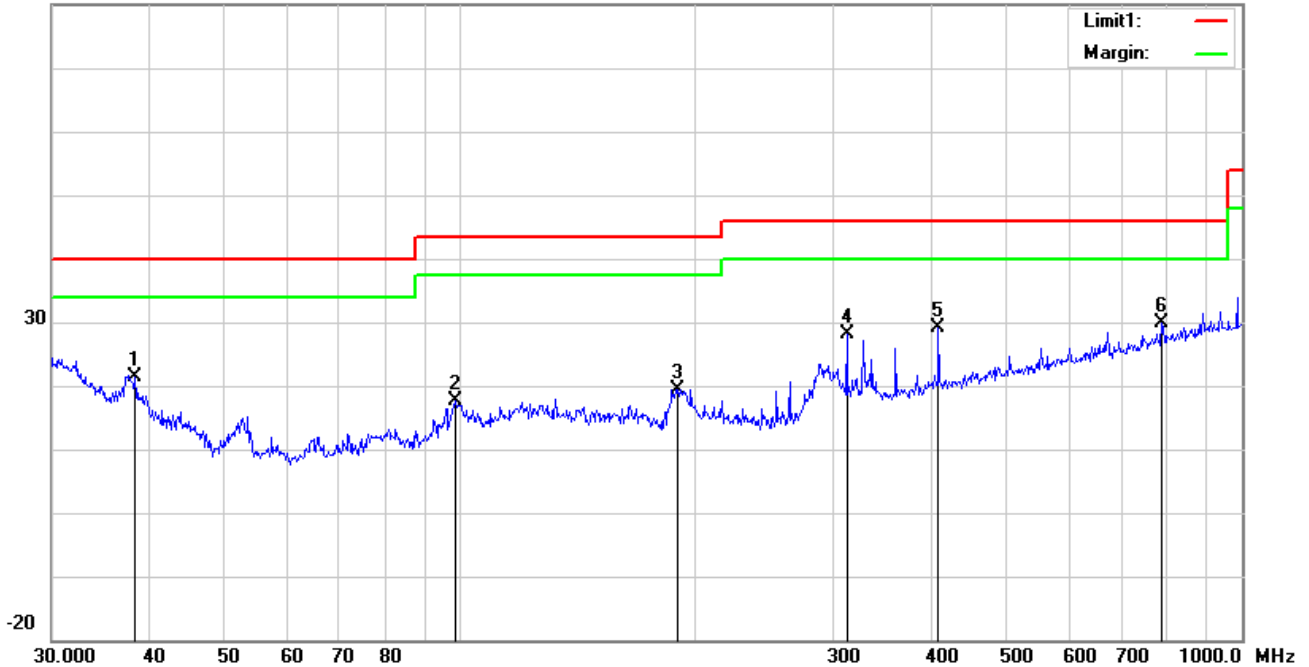
Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

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

Test Mode: Bluetooth Mode

30MHz -1GHz

80.0 dBuV/m



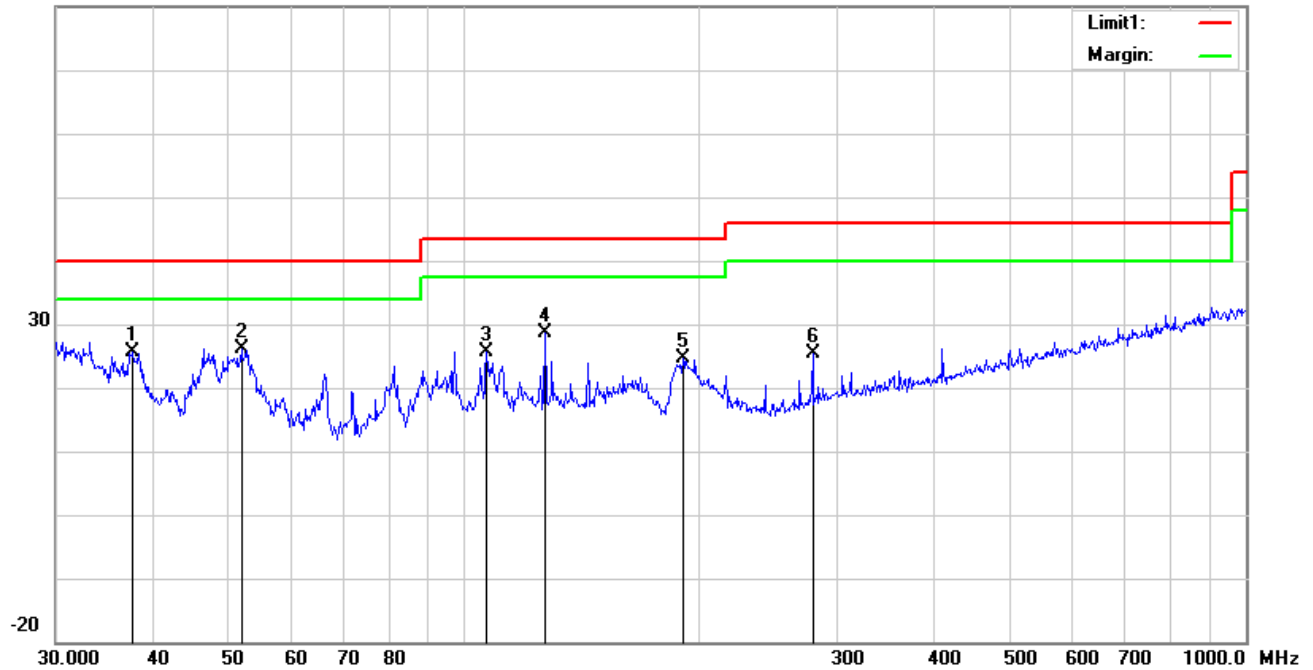
Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	H	38.3462	27.74	peak	15.11	22.27	0.78	21.36	40.00	-18.64	100	47
2	H	98.4866	28.91	peak	10.04	22.32	1.08	17.71	43.50	-25.79	100	181
3	H	189.7385	28.71	peak	11.54	22.31	1.54	19.48	43.50	-24.02	100	146
4	H	312.1794	34.65	peak	13.86	22.26	1.85	28.10	46.00	-17.90	100	347
5	H	408.9460	33.11	peak	15.88	21.99	2.03	29.03	46.00	-16.97	100	324
6	H	787.8513	26.97	peak	21.25	21.18	2.94	29.98	46.00	-16.02	100	297

30MHz -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	37.6798	31.44	peak	15.59	22.27	0.78	25.54	40.00	-14.46	100	179
2	V	51.8430	39.56	peak	8.20	22.39	0.79	26.16	40.00	-13.84	200	198
3	V	106.7587	35.28	peak	11.58	22.33	1.15	25.68	43.50	-17.82	100	93
4	V	126.7723	36.46	peak	13.46	22.38	1.19	28.73	43.50	-14.77	100	353
5	V	190.4050	33.76	peak	11.57	22.32	1.54	24.55	43.50	-18.95	100	234
6	V	279.0436	33.15	peak	12.68	22.29	1.75	25.29	46.00	-20.71	100	269

Above 1GHz

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

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4804	38.87	AV	V	33.39	7.22	48.46	31.02	54	-22.98
4804	38.91	AV	H	33.39	7.22	48.46	31.06	54	-22.94
4804	48.16	PK	V	33.39	7.22	48.46	40.31	74	-33.69
4804	47.4	PK	H	33.39	7.22	48.46	39.55	74	-34.45
7393	25.84	AV	V	37.61	7.61	48.21	22.85	54	-31.15
7393	22.81	AV	H	37.61	7.61	48.21	19.82	54	-34.18
7393	39.99	PK	V	37.61	7.61	48.21	37	74	-37.00
7393	40.68	PK	H	37.61	7.61	48.21	37.69	74	-36.31

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	39.71	AV	V	33.62	7.53	48.36	32.5	54	-21.5
4882	39.77	AV	H	33.62	7.53	48.36	32.56	54	-21.44
4882	48.54	PK	V	33.62	7.53	48.36	41.33	74	-32.67
4882	47.36	PK	H	33.62	7.53	48.36	40.15	74	-33.85
11916	25.68	AV	V	39.85	12.92	46.01	32.44	54	-21.56
11916	24.2	AV	H	39.85	12.92	46.01	30.96	54	-23.04
11916	41.28	PK	V	39.85	12.92	46.01	48.04	74	-25.96
11916	40.75	PK	H	39.85	12.92	46.01	47.51	74	-26.49

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

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	39.58	AV	V	33.89	7.86	48.31	33.02	54	-20.98
4960	39.58	AV	H	33.89	7.86	48.31	33.02	54	-20.98
4960	48.12	PK	V	33.89	7.86	48.31	41.56	74	-32.44
4960	46.36	PK	H	33.89	7.86	48.31	39.8	74	-34.2
17914	25.29	AV	V	43.21	19.43	44.4	43.53	54	-10.47
17914	23.75	AV	H	43.21	19.43	44.4	41.99	54	-12.01
17914	41.14	PK	V	43.21	19.43	44.4	59.38	74	-14.62
17914	41.65	PK	H	43.21	19.43	44.4	59.89	74	-14.11

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.

4, The radiated spurious test above 18GHz is subcontracted to SIEMIC (Nanjing-China) Laboratories. and found 30dB below the limit at least.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/15/2017	09/14/2018	☒
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	☒
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	☒
ISN	ISN T800	34373	09/24/2016	09/23/2017	☐
Transient Limiter	LIT-153	531118	08/30/2017	08/29/2018	☐
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/15/2017	09/14/2018	☒
Power Splitter	1#	1#	08/30/2017	08/29/2018	☒
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	☒
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	☒
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	☒
Horn Antenna	BBHA9170	3145226D1	09/27/2017	09/26/2018	☒
Active Antenna (9kHz-30MHz)	AL-130	121031	10/13/2016	10/12/2017	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	☒
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

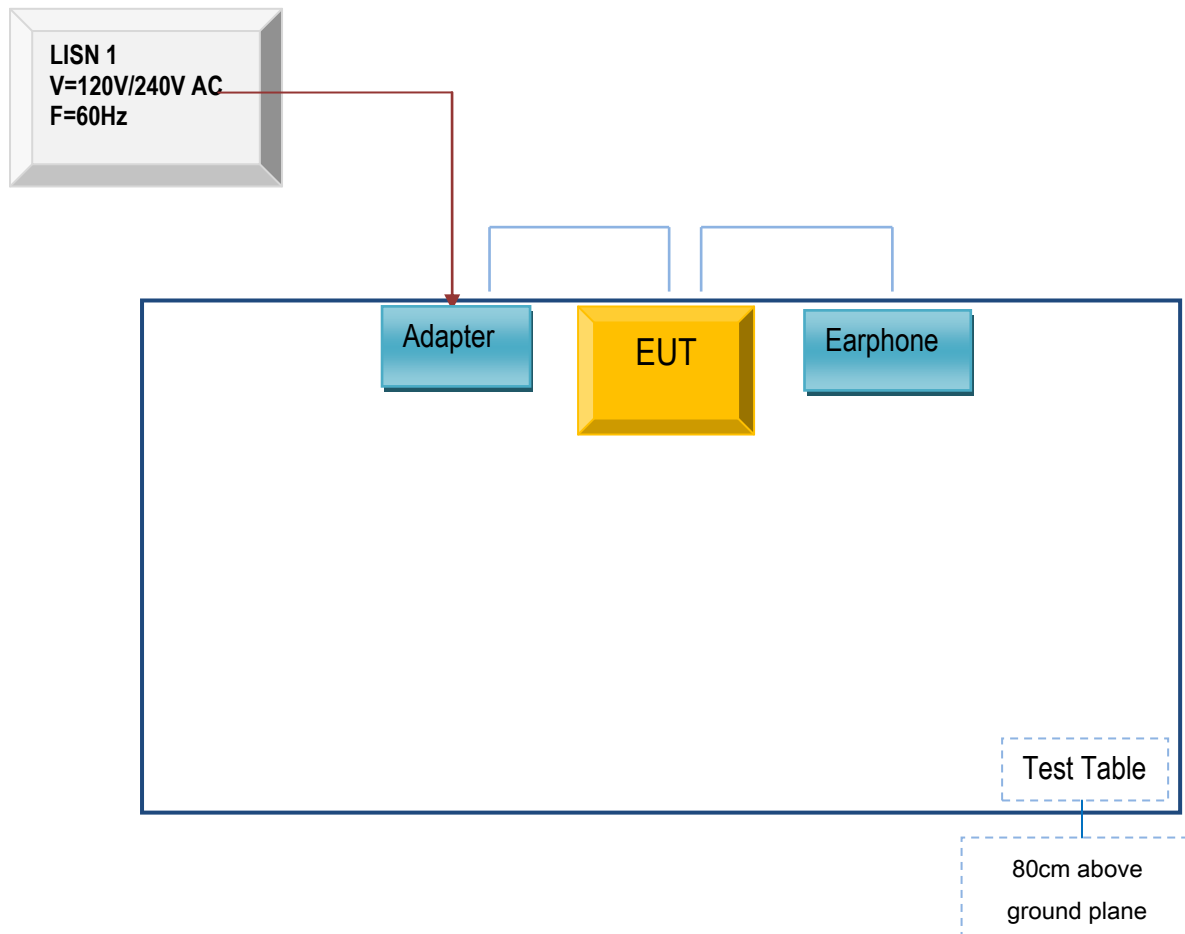
Annex B.ii. Photograph: EUT Internal Photo

Annex B.iii. Photograph: Test Setup Photo

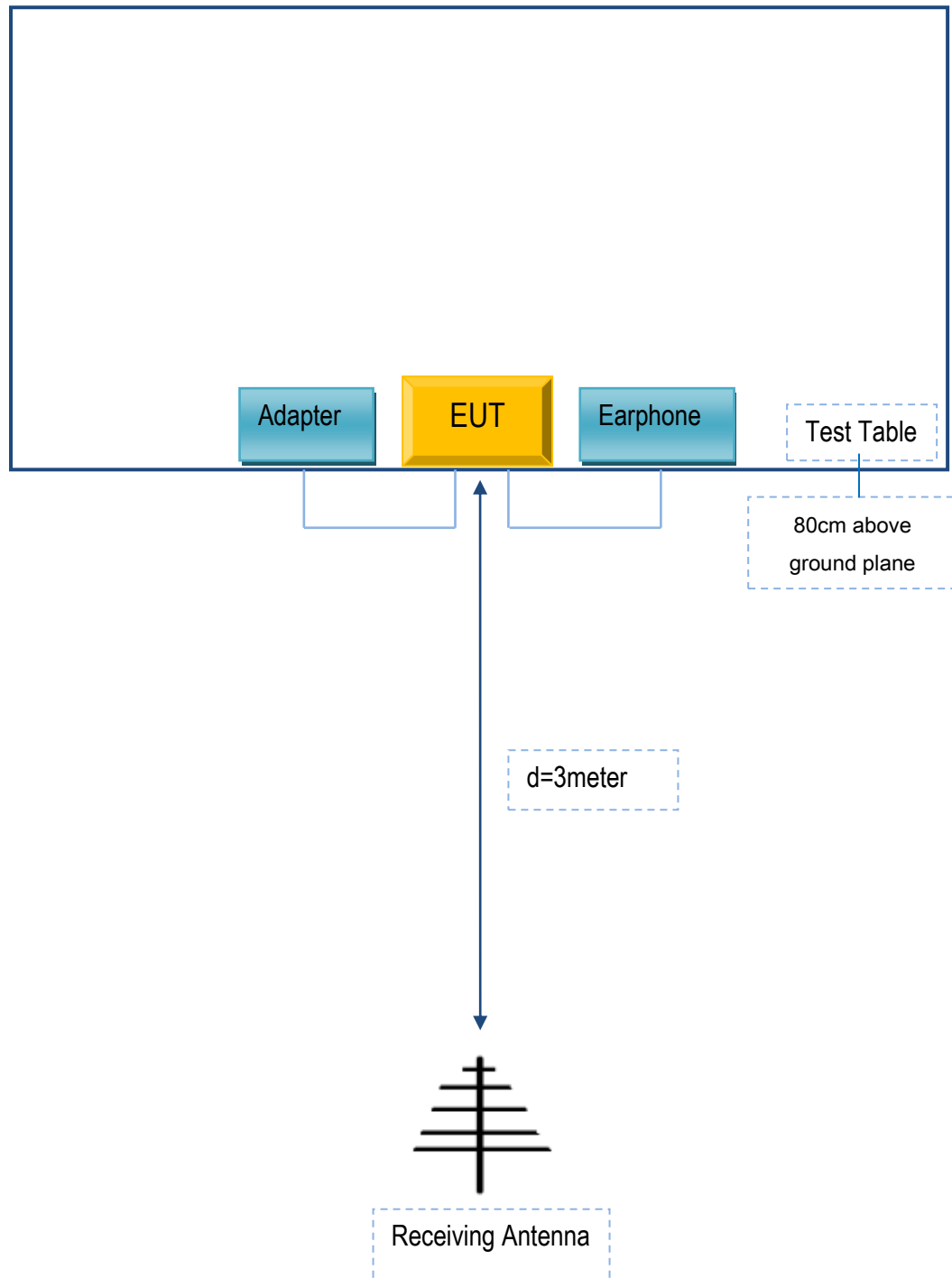
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

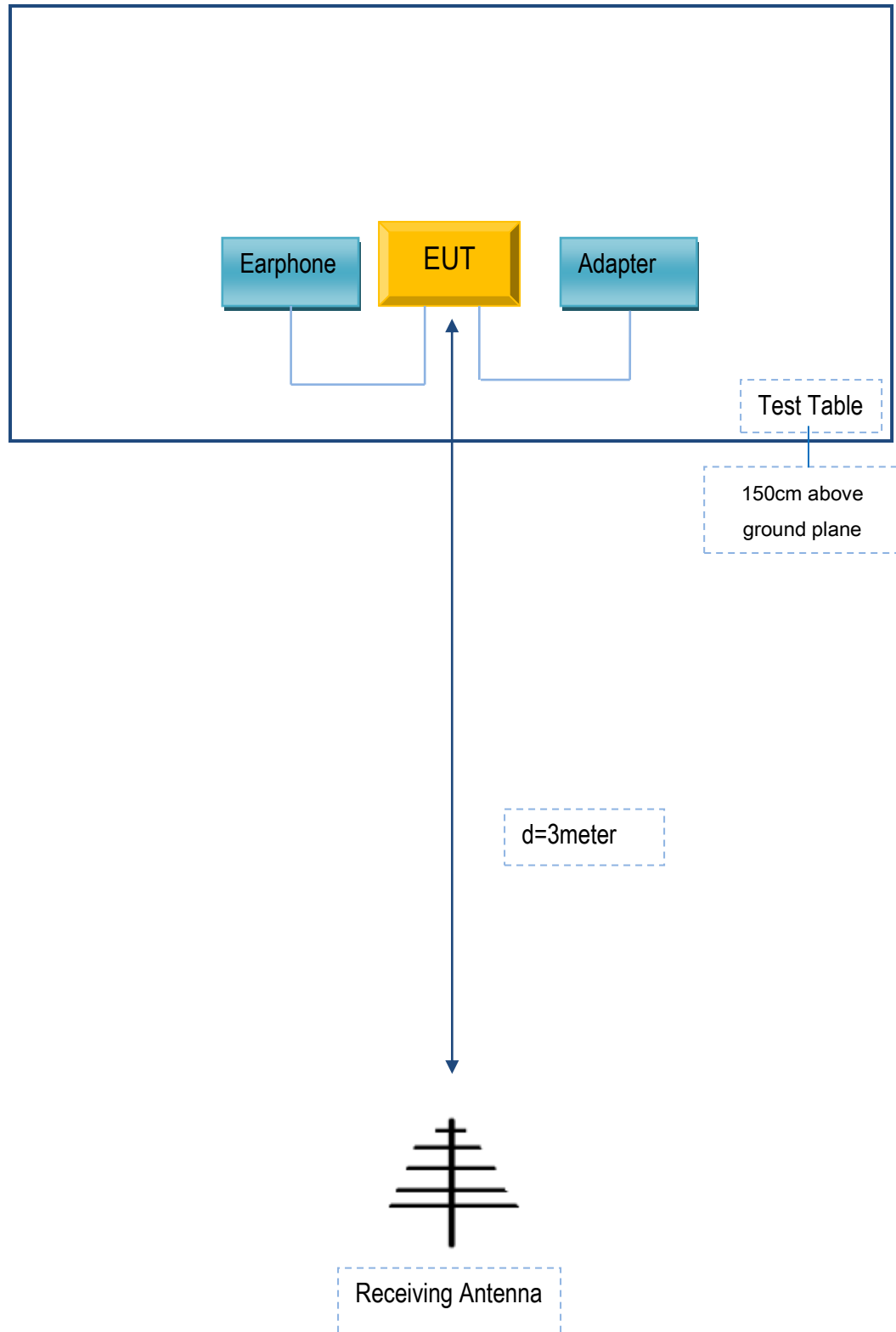
Block Configuration Diagram for AC Line Conducted Emissions



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



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



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
SMT TELECOMM HK LIMITED	Adapter	PCX422	N/A
SMT TELECOMM HK LIMITED	Earphone	X422A	N/A

Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	0.8m	N/A

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

Please see the attachment

Annex E. DECLARATION OF SIMILARITY

N/A