

RF TEST REPORT



Report No.: 15021175-FCC-R1

Supersede Report No.: N/A

Applicant	Ringway Tech(Jiangsu) Co.,Ltd.	
Product Name	Symphony Grand	
Model No.	CSR8670	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2015, ANSI C63.10: 2013	
Test Date	November 20 to December 04, 2015	
Issue Date	December 01,2015	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification	☒	
Equipment did not comply with the specification	☐	
<i>Amos Xia</i>	<i>Herve Idoko</i>	
Amos Xia Test Engineer	Herve Idoko 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:

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
15021175-FCC-R1	NONE	Original	December 01,2015

2. Customer information

Applicant Name	Ringway Tech(Jiangsu) Co.,Ltd.
Applicant Add	No. 101 West Hanjiang Road, Changzhou,Jiangsu, China
Manufacturer	Ringway Tech(Jiangsu) Co.,Ltd.
Manufacturer Add	No. 101 West Hanjiang Road, Changzhou,Jiangsu, China

3. Test site information

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.	986914
IC Test Site No.	4842B-1
Test Software	Labview of SIEMIC version 1.0

4. Equipment under Test (EUT) Information

Description of EUT:	Symphony Grand
Main Model:	CSR8670
Serial Model:	N/A
Date EUT received:	November 12, 2015
Test Date(s):	November 20 to December 04, 2015
Equipment Category :	DSS
Antenna Gain:	Bluetooth/BLE: 1.54 dBi
Type of Modulation:	Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK BLE: GFSK
RF Operating Frequency (ies):	Bluetooth& BLE: 2402-2480 MHz
Max. Output Power:	1.851dBm
Number of Channels:	Bluetooth: 79CH BLE: 40CH
Port:	N/A
Input Power:	DC 5V
Trade Name :	N/A
FCC ID:	OCDSYMPHONY

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	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions	Compliance

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit. And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 1 antennas:

A permanently attached PCB antenna for Bluetooth/BLE, the gain is 1.54dBi for Bluetooth/BLE.

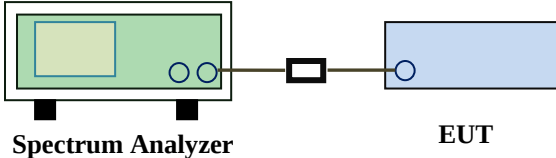
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliant.

6.2 Channel Separation

Temperature	23°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	November 20, 2015
Tested By :	Amos Xia

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)

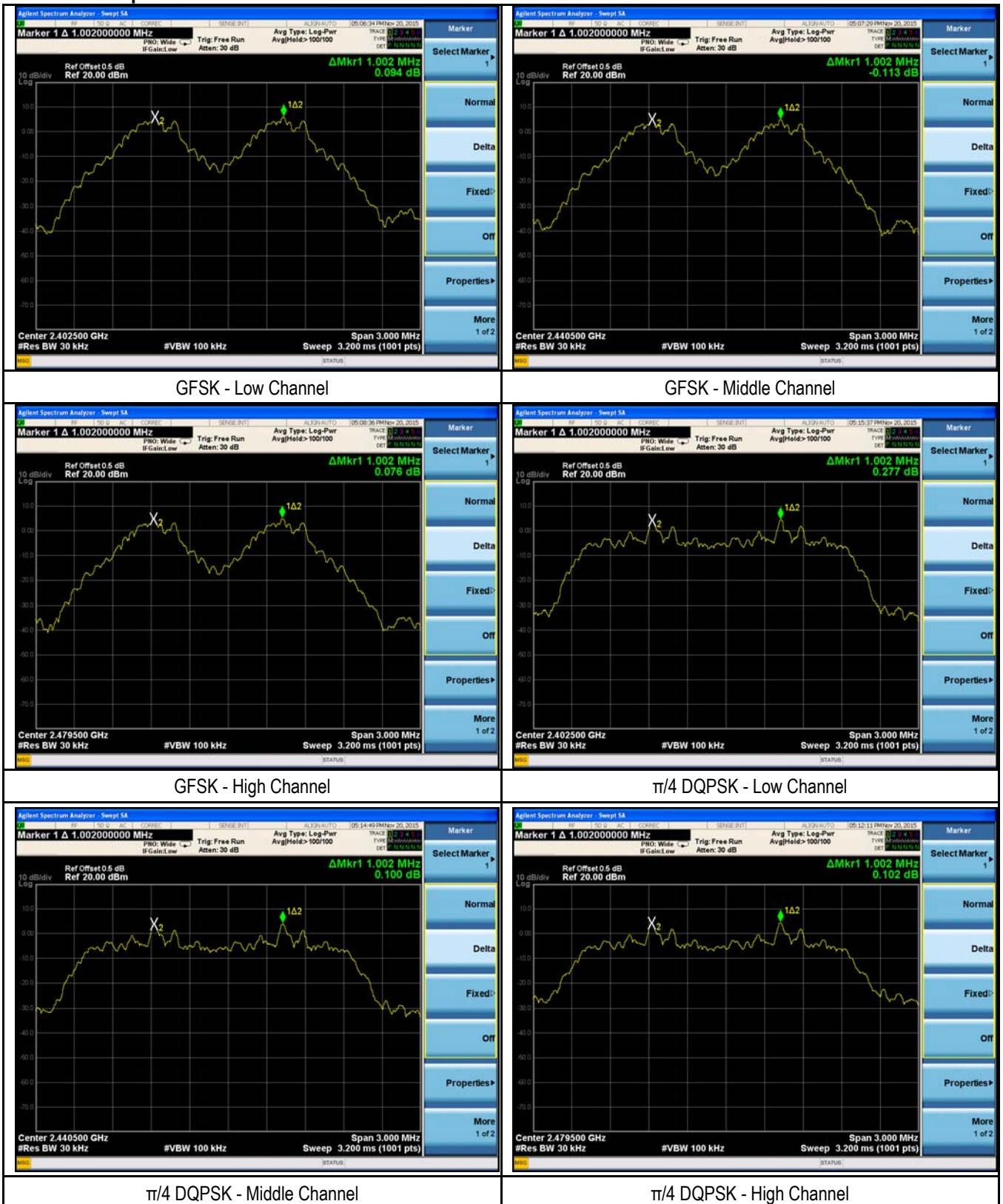
☐ N/A

Channel Separation measurement result

Type/ Modulation	CH	CH Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.9391	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.9339	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.9340	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.002	0.824	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.826	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.847	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.824	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.843	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.846	Pass
	Adjacency Channel	2479			

Test Plots

Channel Separation measurement result





8DPSK - Low Channel



8DPSK - Middle Channel

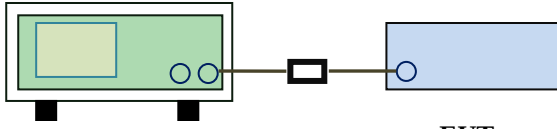


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	23°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	November 20, 2015
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)	a)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	☒
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW $\geq 1\%$ of the 20 dB bandwidth - VBW $\geq$ RBW - Sweep = auto - Detector function = peak - Trace = max hold. - The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference 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

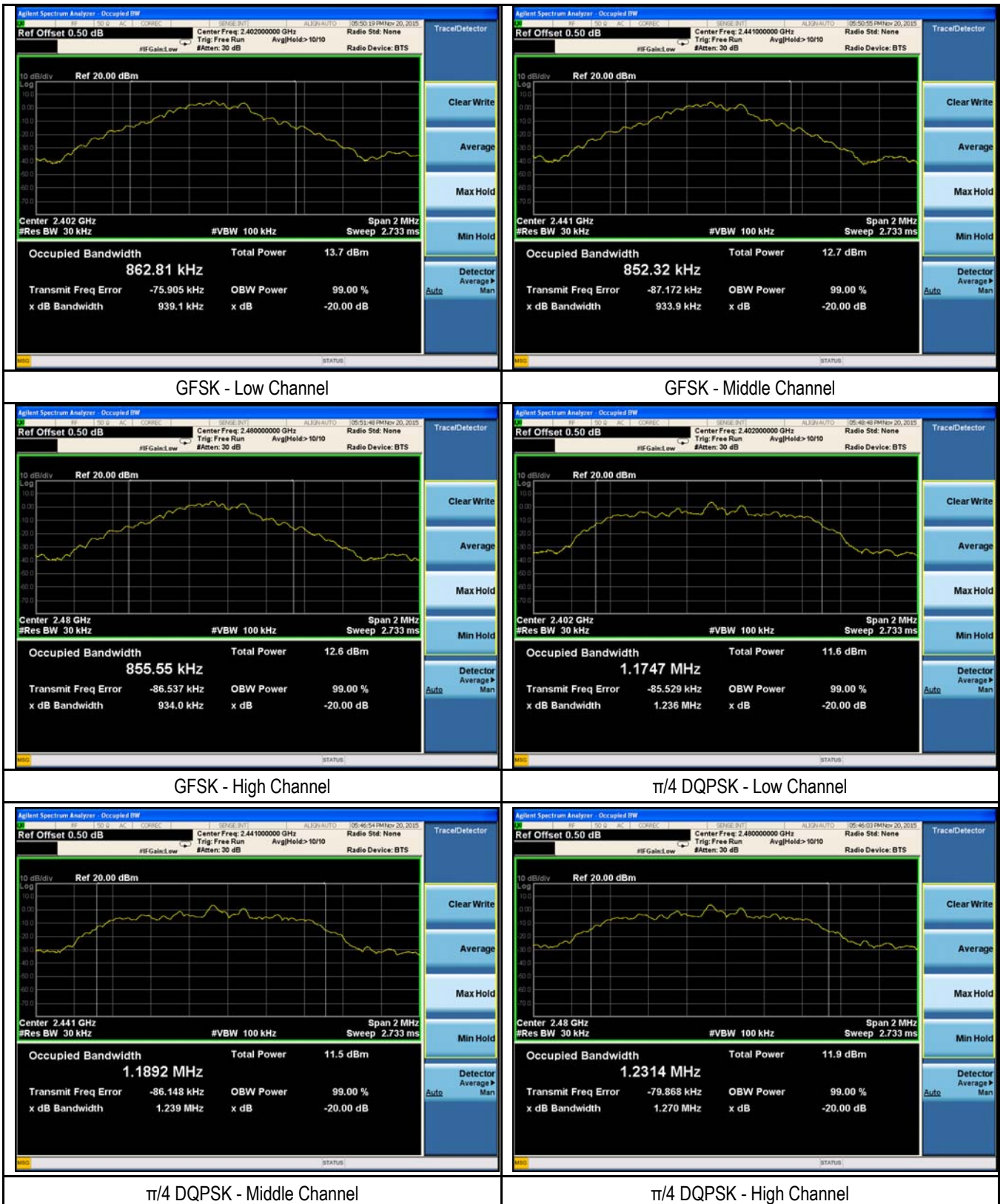
Test Plot ☒ Yes (See below) ☐ N/A

Measurement result

Modulation	CH	CH Freq (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.9391	0.86281
	Mid	2441	0.9339	0.85232
	High	2480	0.9340	0.85555
$\pi/4$ DQPSK	Low	2402	1.236	1.1747
	Mid	2441	1.239	1.1892
	High	2480	1.270	1.2314
8-DPSK	Low	2402	1.263	1.1702
	Mid	2441	1.264	1.1898
	High	2480	1.269	1.2200

Test Plots

20dB Bandwidth measurement result





8DPSK - Low Channel



8DPSK - Middle Channel

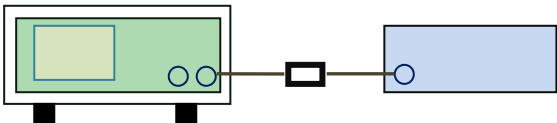


8DPSK - High Channel

6.4 Peak Output Power

Temperature	23°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	November 23, 2015
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (2)	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)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 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

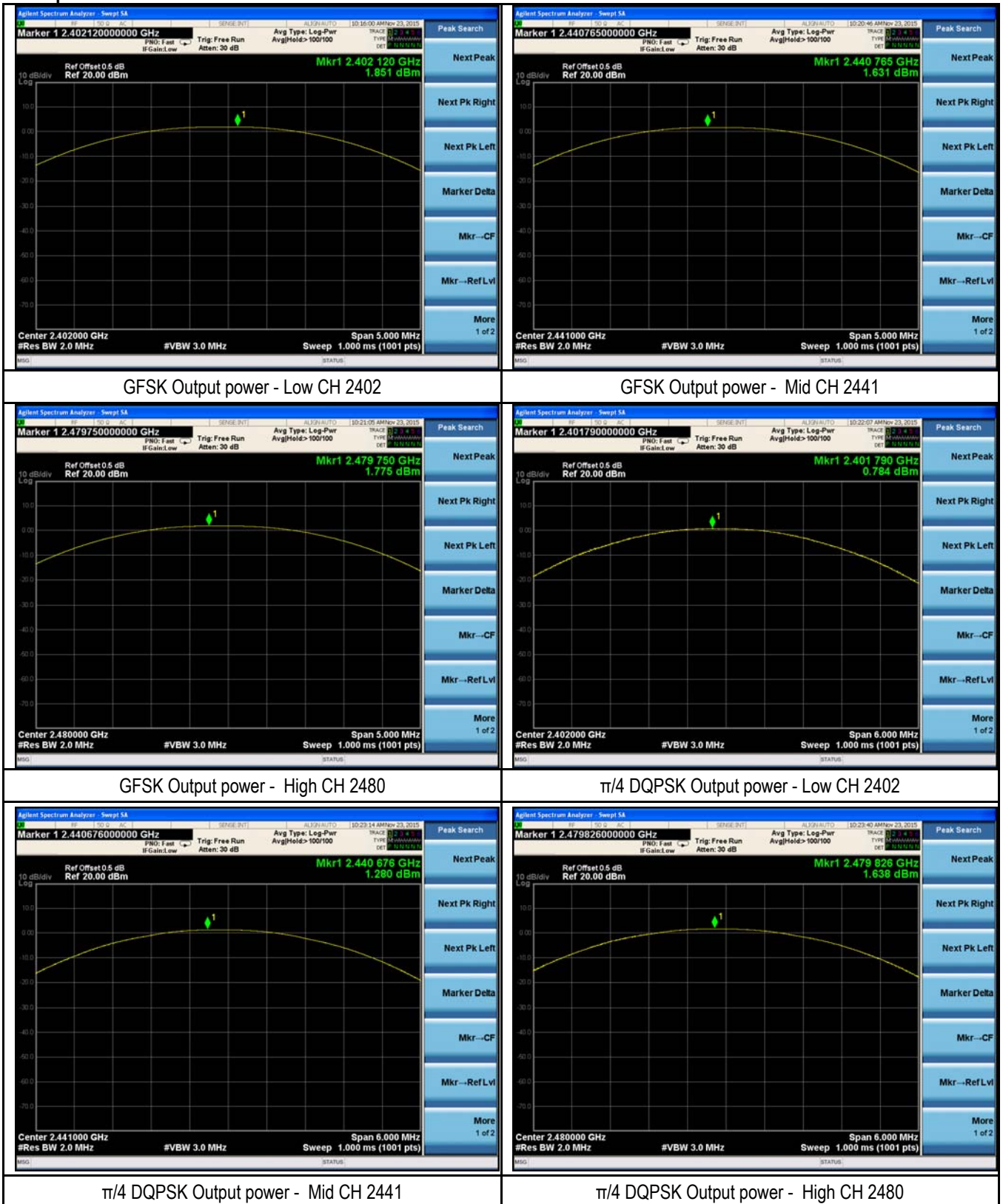
Test Plot ☒ Yes (See below) ☐ N/A

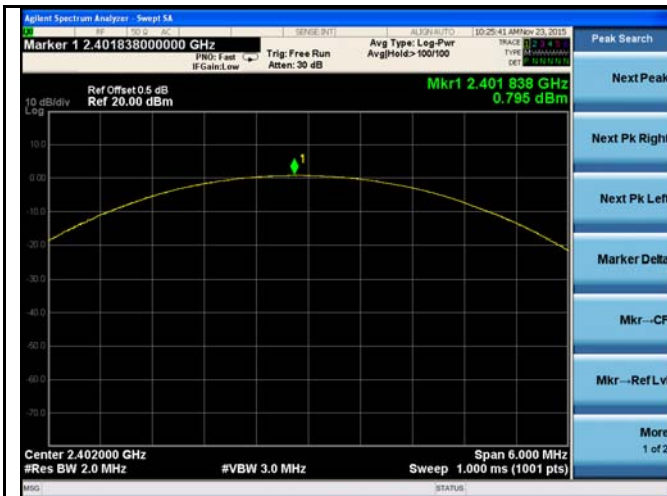
Peak Output Power measurement result

Type	Modulation	CH	Freq (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Result
Output power	GFSK	Low	2402	1.851	1.531	1000	Pass
		Mid	2441	1.631	1.456	1000	Pass
		High	2480	1.775	1.505	1000	Pass
	$\pi/4$ DQPSK	Low	2402	0.784	1.198	125	Pass
		Mid	2441	1.280	1.343	125	Pass
		High	2480	1.638	1.458	125	Pass
	8-DPSK	Low	2402	0.795	1.201	125	Pass
		Mid	2441	1.062	1.277	125	Pass
		High	2480	1.518	1.418	125	Pass

Test Plots

Output Power measurement result





8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

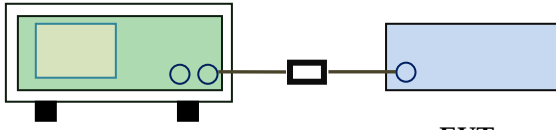


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	23°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	November 23, 2015
Tested By :	Amos Xia

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		

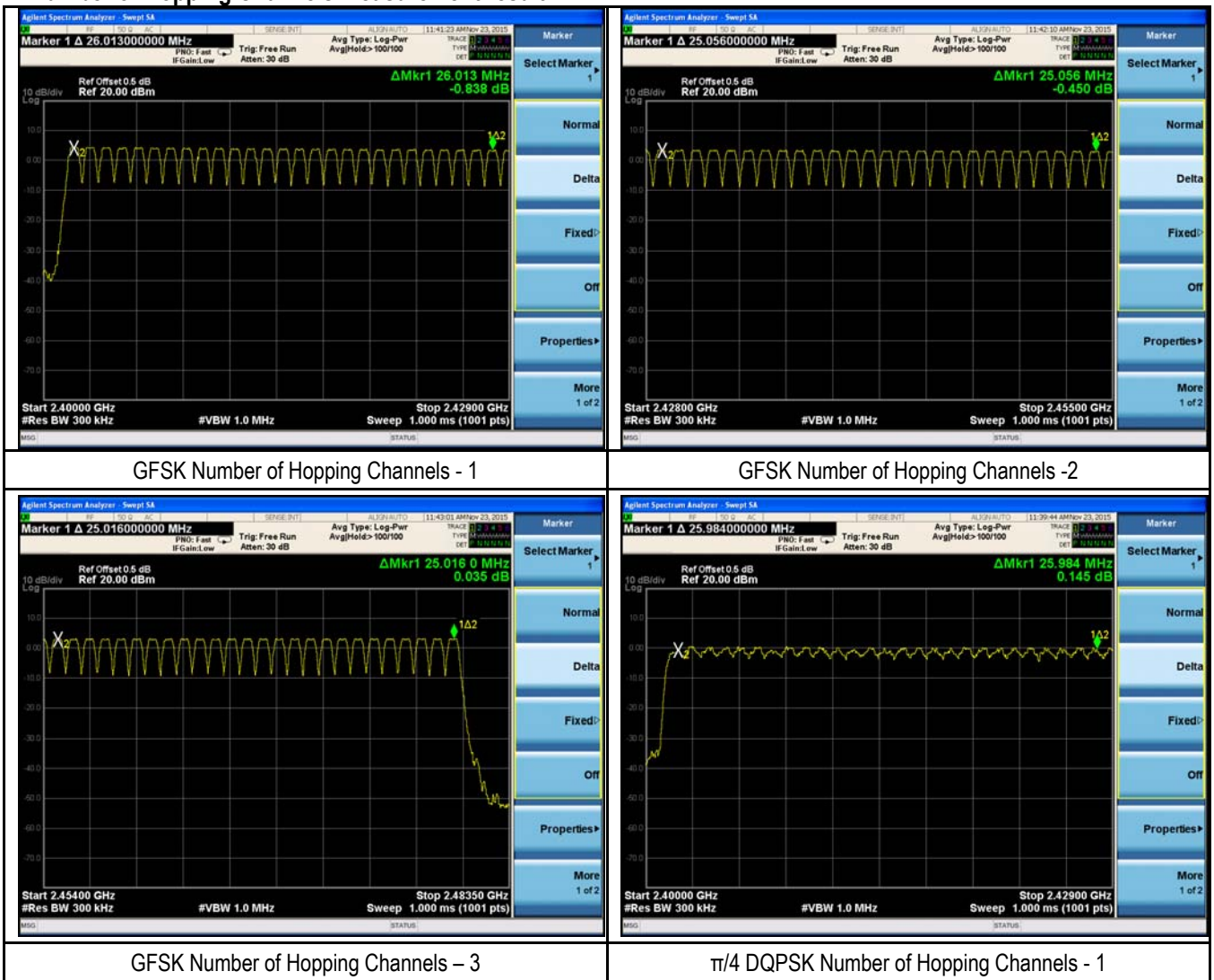
Test Data ☒ Yes ☐ N/A
Test Plot ☒ Yes (See below) ☐ N/A

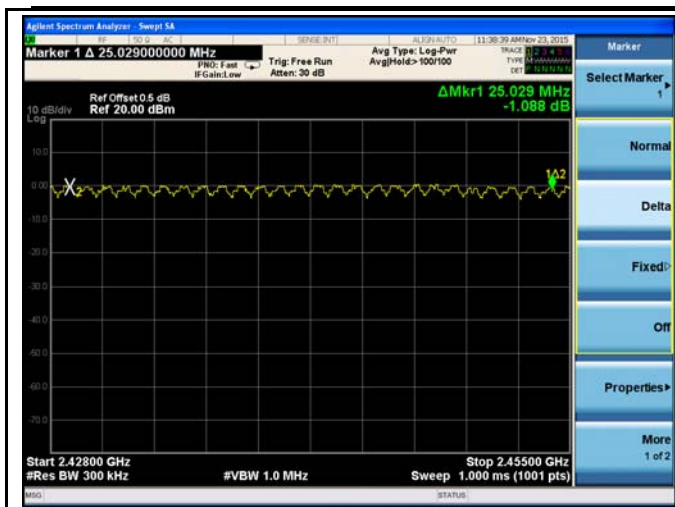
Number of Hopping Channel measurement result

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

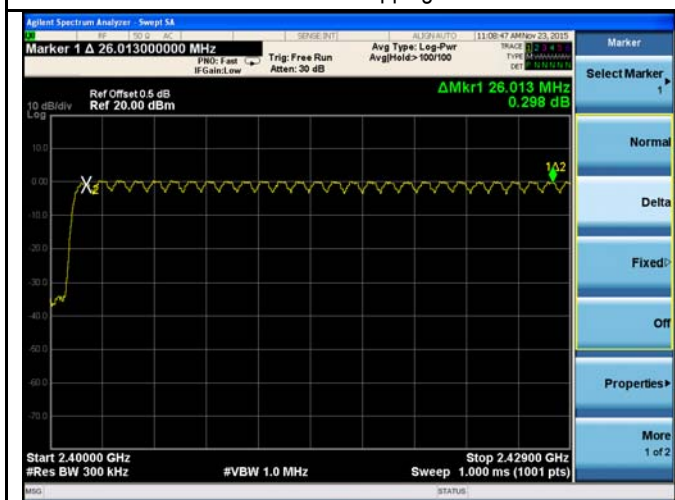




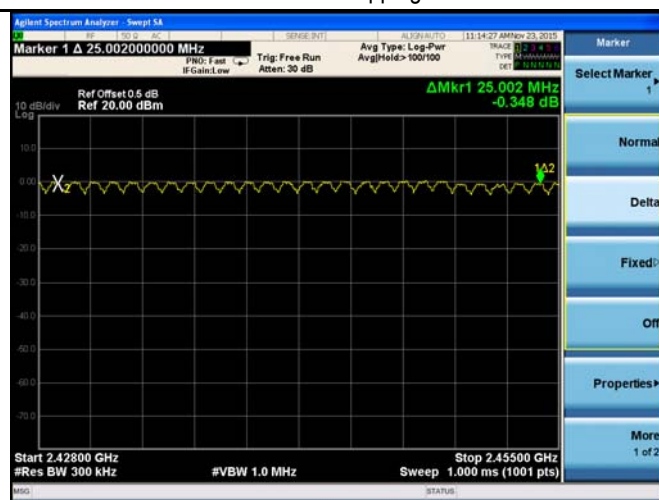
$\pi/4$ DQPSK Number of Hopping Channels - 2



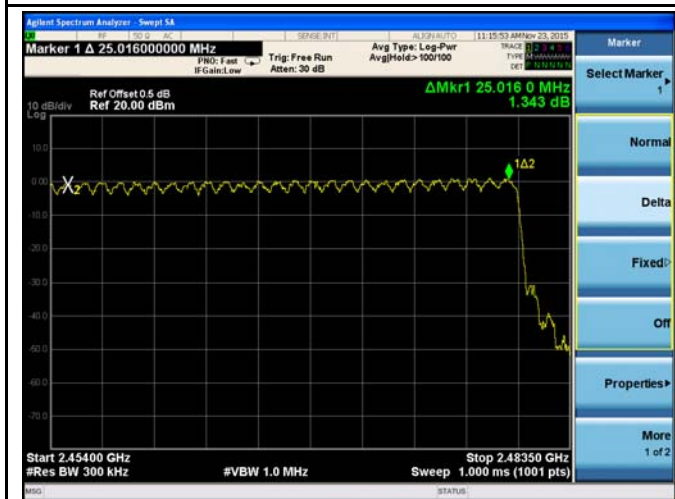
$\pi/4$ DQPSK Number of Hopping Channels - 3



8DPSK Number of Hopping Channels - 1



8DPSK Number of Hopping Channels - 2

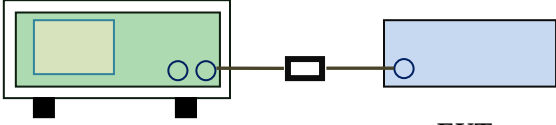


8DPSK Number of Hopping Channels - 3

6.6 Time of Occupancy (Dwell Time)

Temperature	23°C
Relative Humidity	51%
Atmospheric Pressure	1018mbar
Test date :	November 23, 2015
Tested By :	Amos Xia

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

Dwell Time measurement result

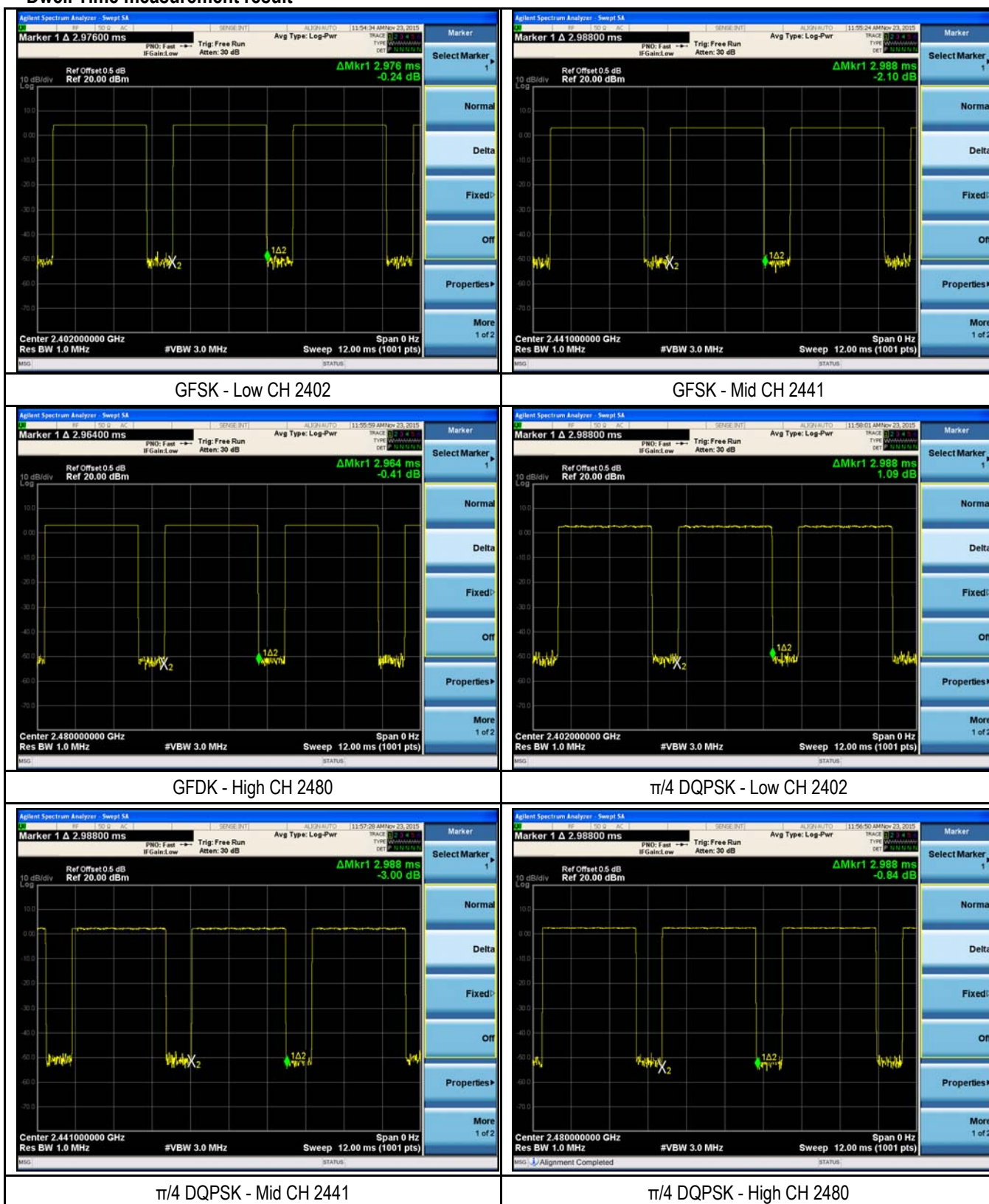
Dwell Time Measurement Result

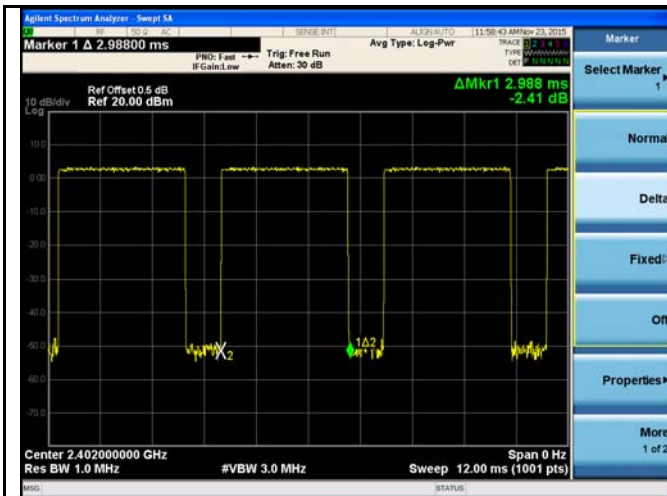
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.976	317.44	400	Pass
		Mid	2.988	318.72	400	Pass
		High	2.964	316.16	400	Pass
	π/4 DQPSK	Low	2.988	318.72	400	Pass
		Mid	2.988	318.72	400	Pass
		High	2.988	318.72	400	Pass
	8-DPSK	Low	2.988	318.72	400	Pass
		Mid	3.024	322.56	400	Pass
		High	3.000	320	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

Note : All packet have been tested (DH1、DH2、DH3) ,but only worst (DH5) case is the reported.

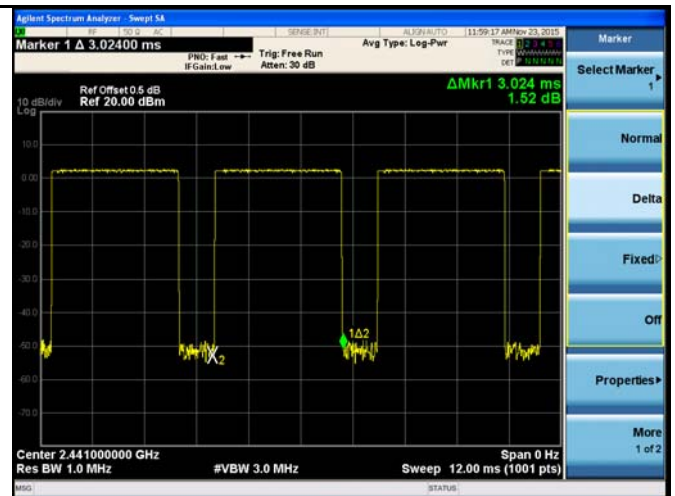
Test Plots

Dwell Time measurement result

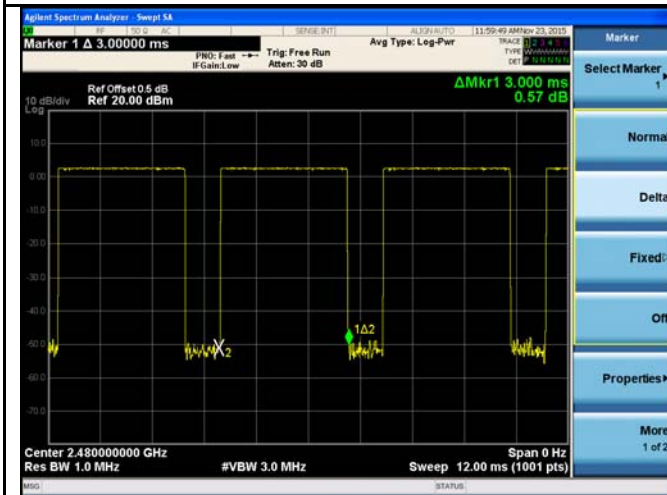




8DPSK - Low CH 2402



8DPSK - Mid CH 2441

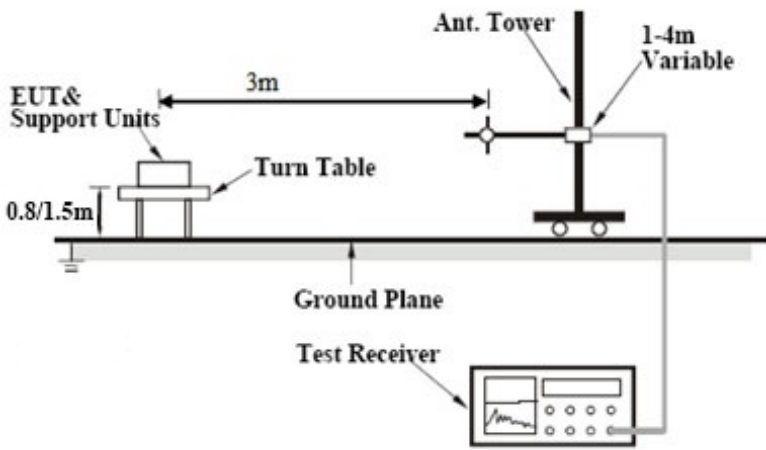


8DPSK - High CH 2480

6.7 Band Edge

Temperature	24°C
Relative Humidity	57%
Atmospheric Pressure	1015mbar
Test date :	November 23, 2015
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.	☒
Test Setup			
Test Procedure		The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi 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			

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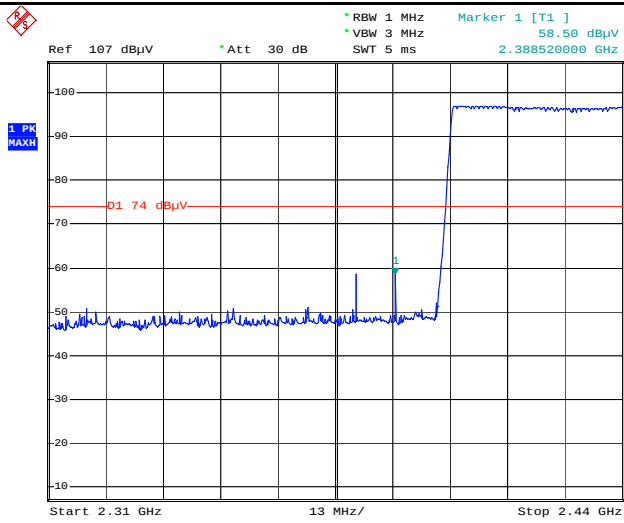
Result	☒ Pass	☐ Fail
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Test Data ☐ Yes ☒ N/A

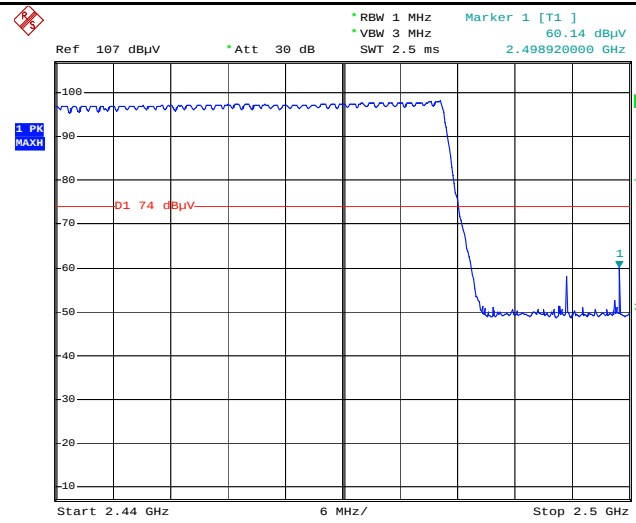
Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

GFSK Mode:

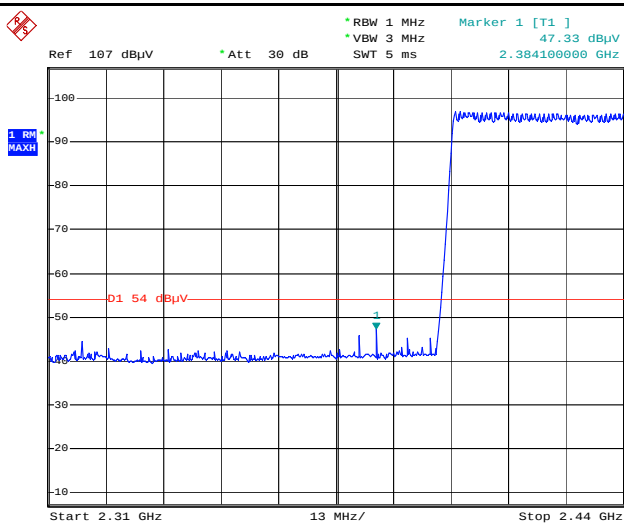


Date: 23.NOV.2015 16:05:27



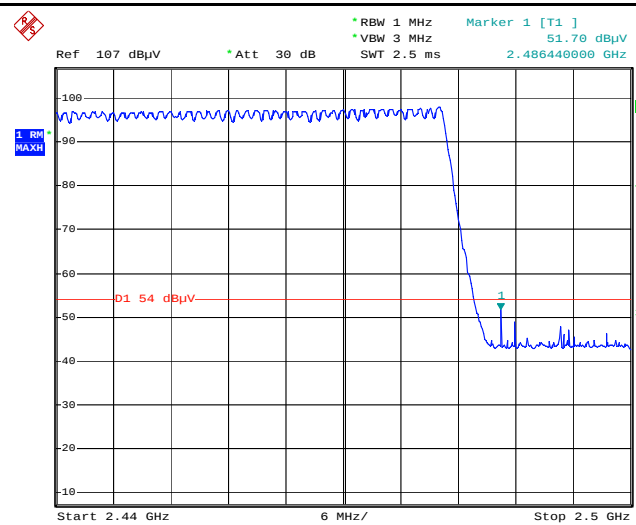
Date: 23.NOV.2015 16:09:13

GFSK-Hopping Left Side-PK



Date: 23.NOV.2015 16:07:20

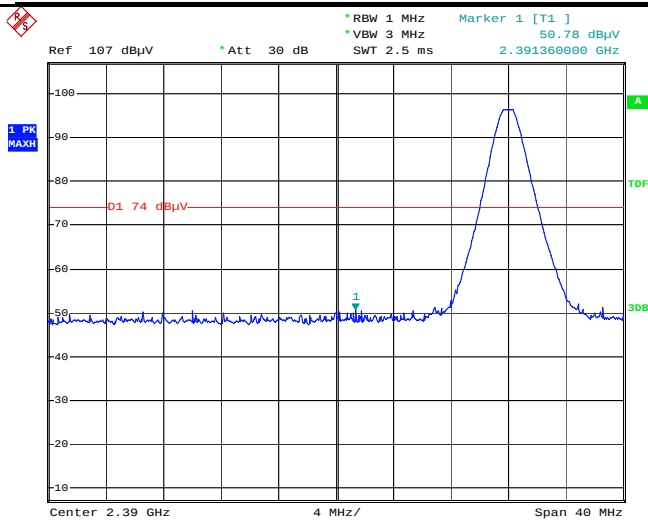
GFSK-Hopping Right Side-PK



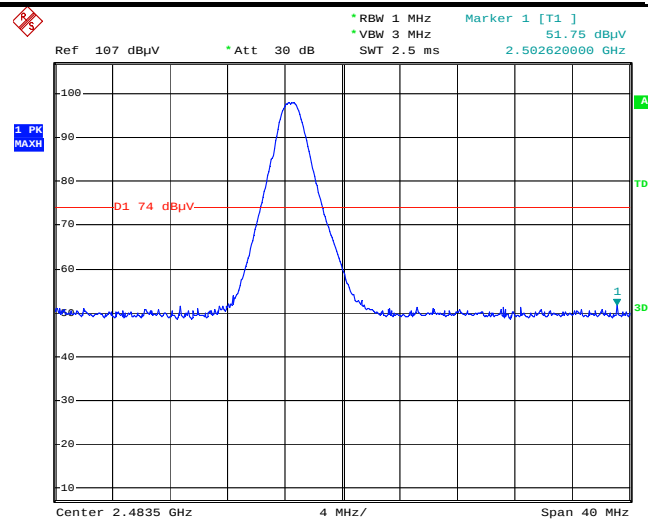
Date: 23.NOV.2015 16:08:21

GFSK-Hopping Left Side-AV

GFSK-Hopping Right Side-AV

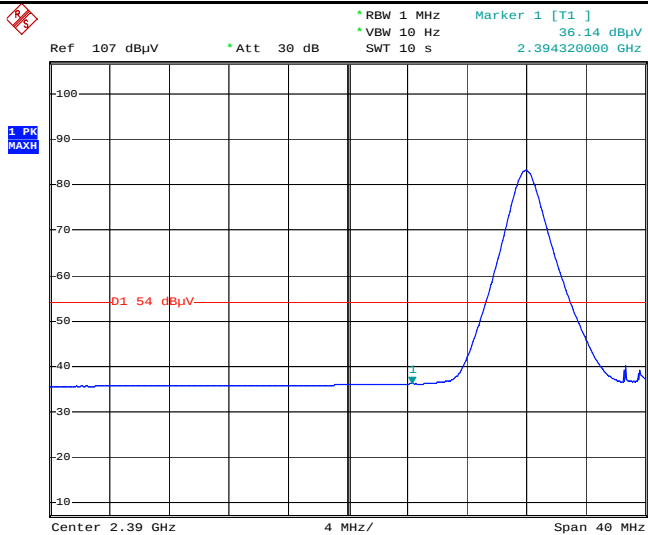


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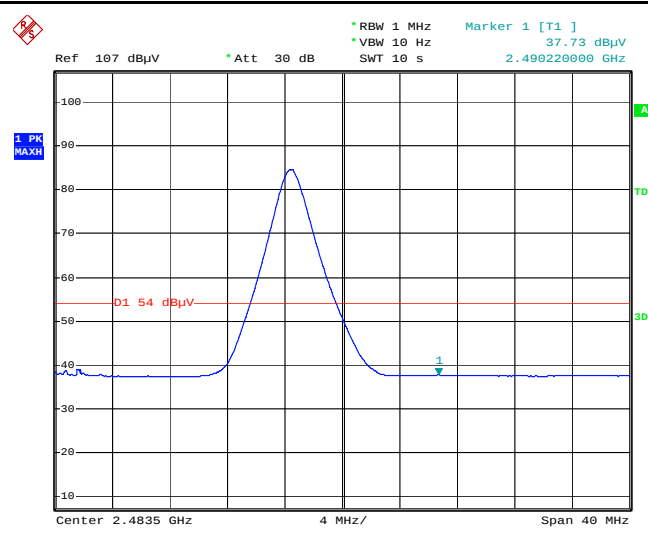
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GFSK-Left Side-PK



Date: 23.NOV.2015 15:41:54

GFSK-Right Side-PK

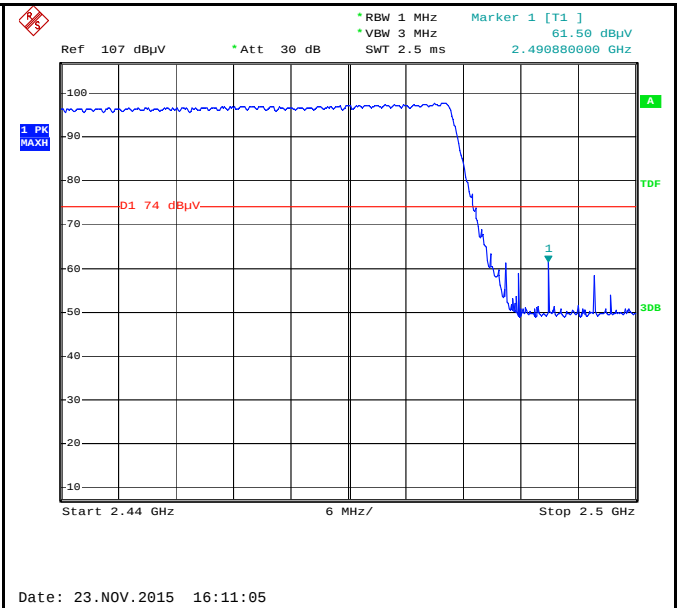
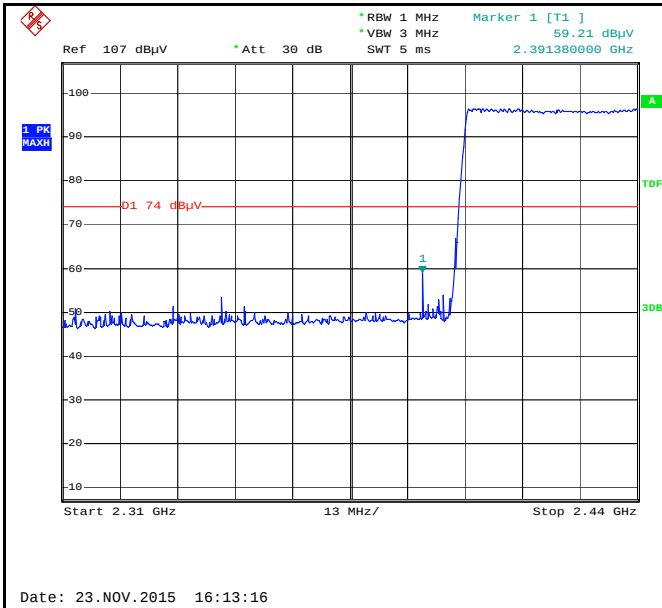


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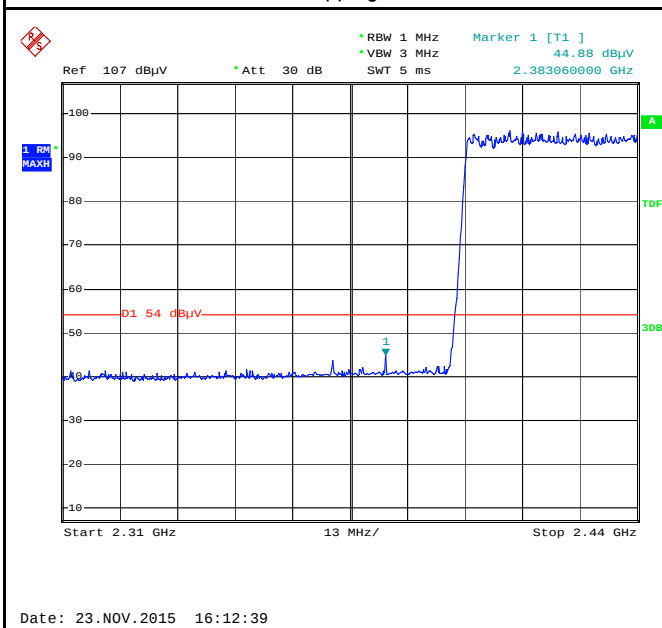
GFSK-Left Side-AV

GFSK-Right Side-AV

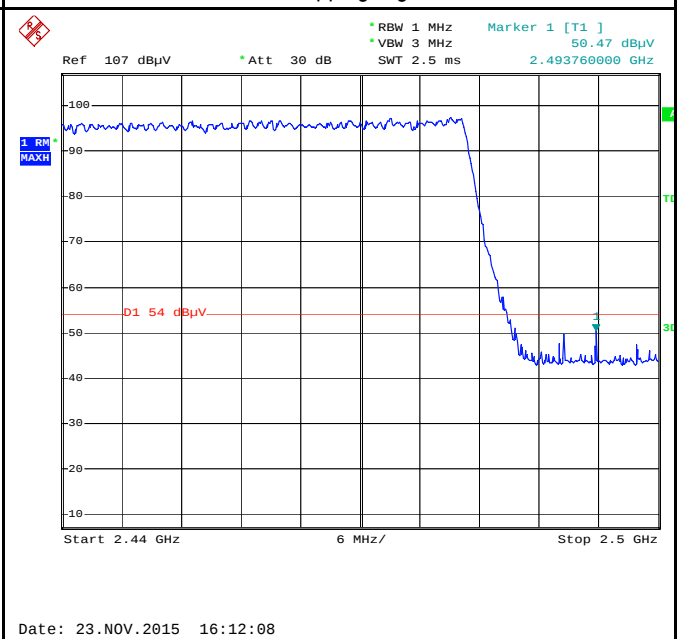
$\pi/4$ DQPSK Mode:



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

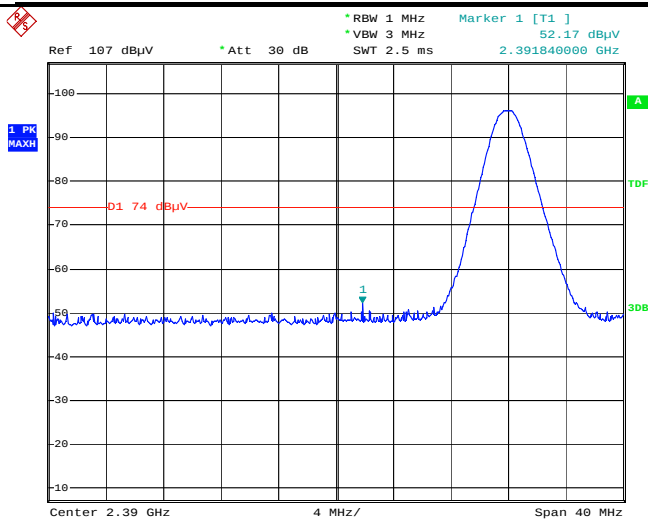


$\pi/4$ DQPSK-Hopping Right Side-PK



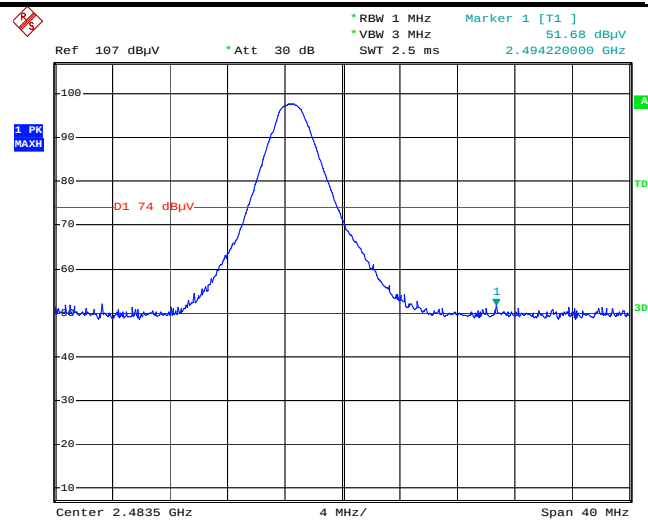
$\pi/4$ DQPSK-Hopping Left-AV

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



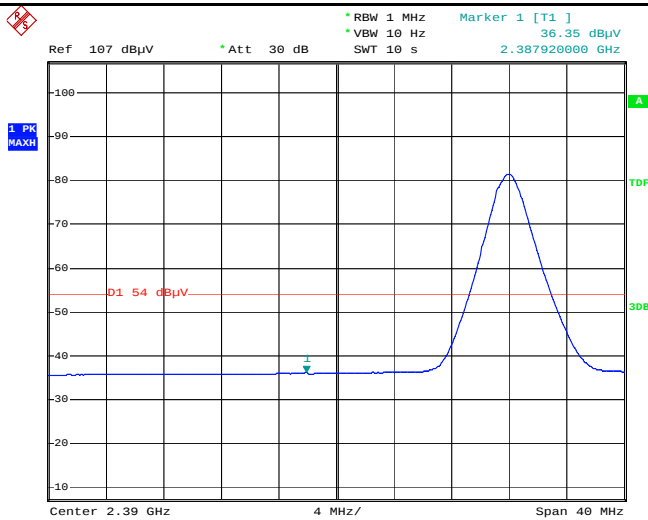
Date: 23.NOV.2015 15:49:04

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



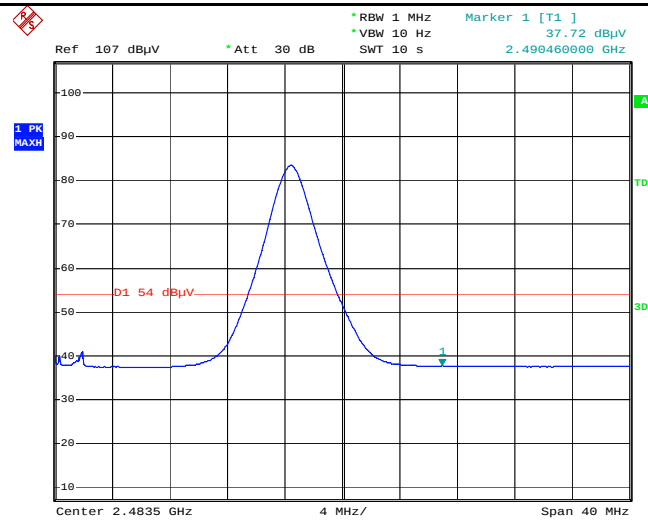
Date: 23.NOV.2015 15:47:40

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



Date: 23.NOV.2015 15:50:19

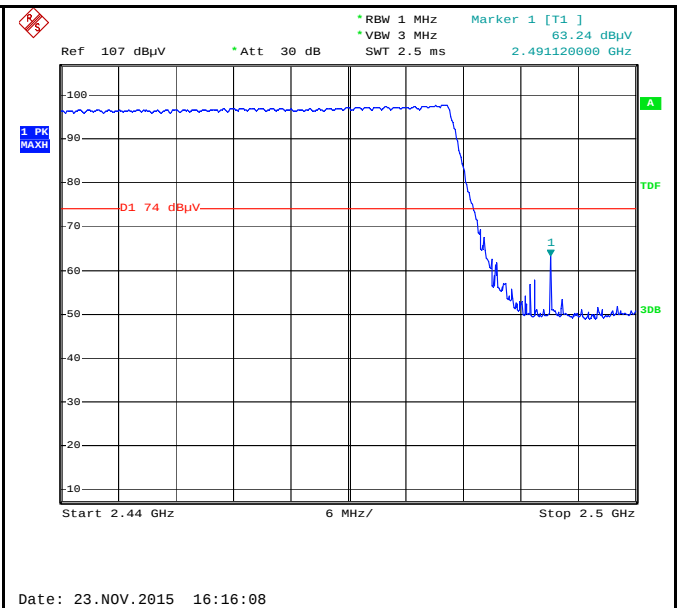
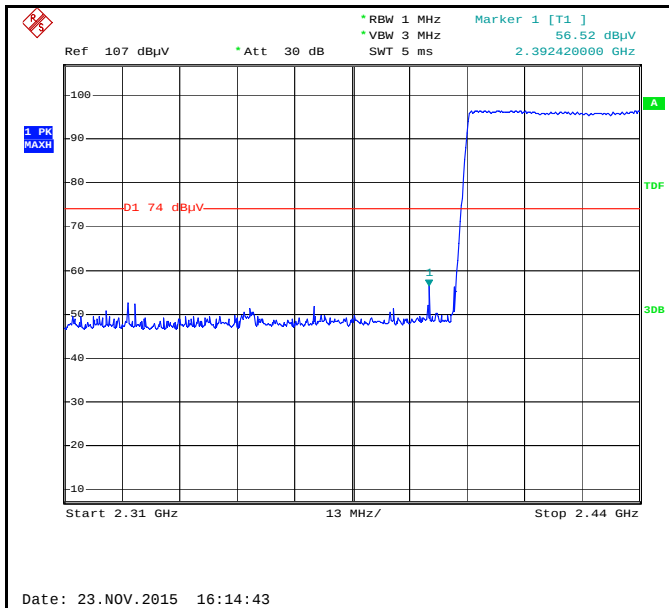
$\pi/4$ DQPSK-Left Side-AV



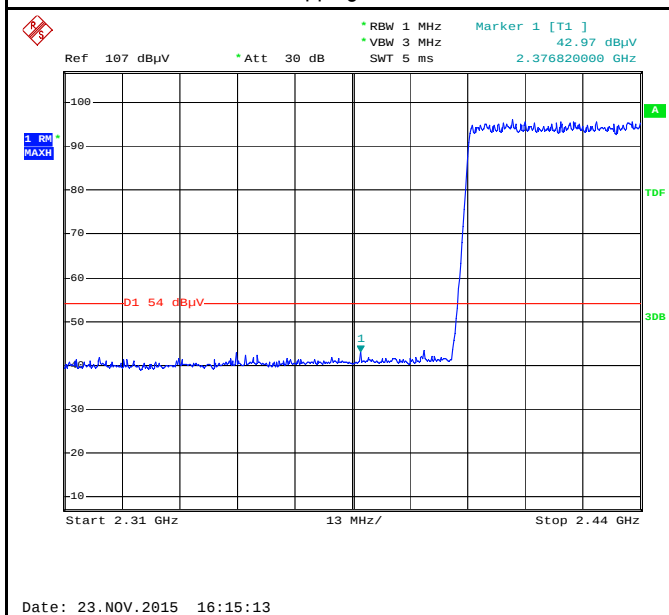
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$\pi/4$ DQPSK-Right Side-AV

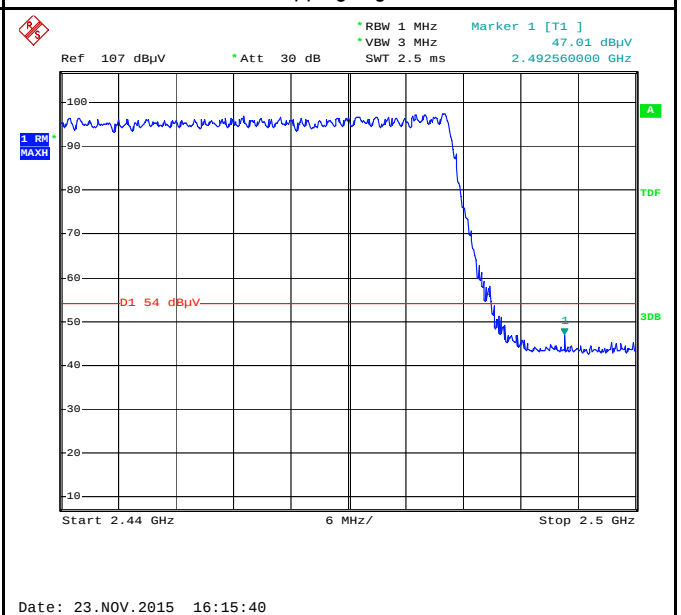
8-DPSK Mode:



8DPSK-Hopping Left Side-PK

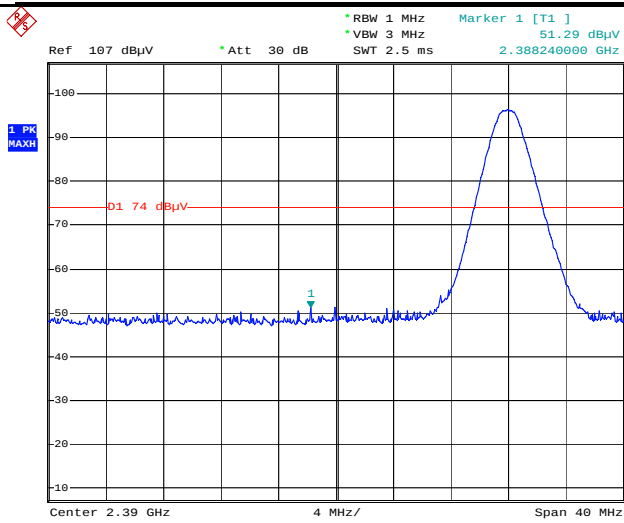


8DPSK-Hopping Right Side-PK

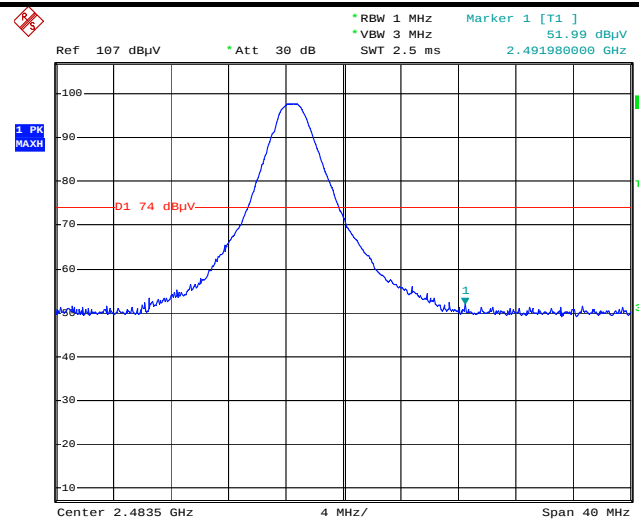


8DPSK-Hopping Left-AV

8DPSK-Hopping Right-AV

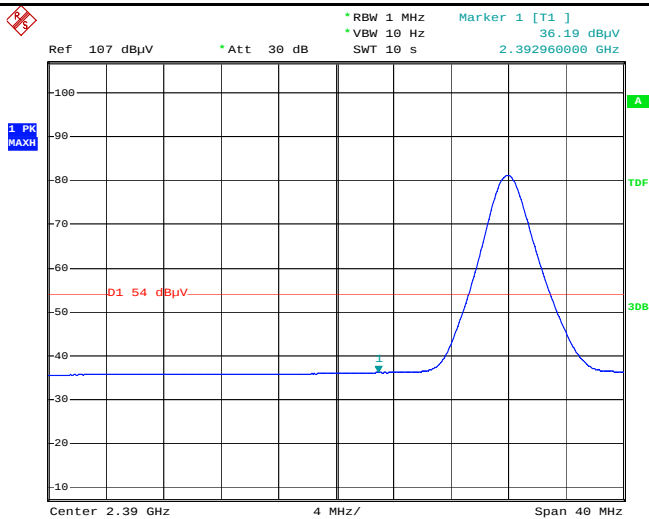


Date: 23.NOV.2015 15:53:05



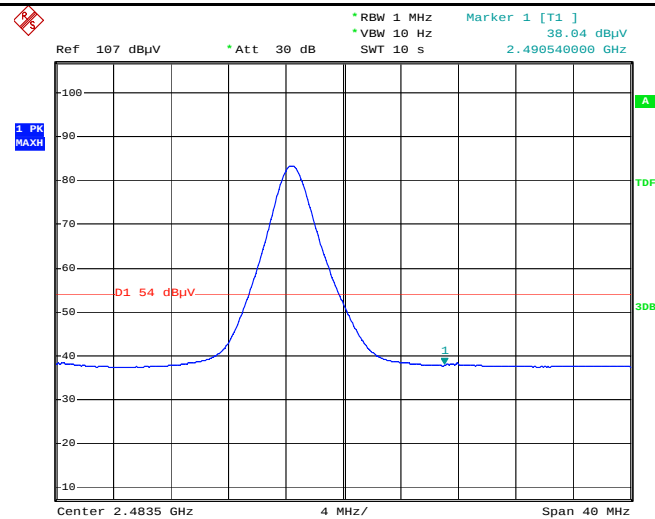
Date: 23.NOV.2015 15:55:25

8DPSK-Left Side-PK



Date: 23.NOV.2015 15:52:26

8DPSK-Right Side-PK



Date: 23.NOV.2015 15:56:00

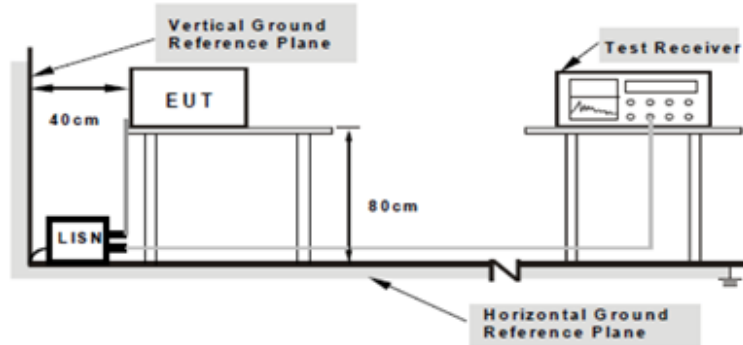
8DPSK-Left Side-AV

8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

Temperature	22°C
Relative Humidity	59%
Atmospheric Pressure	1017mbar
Test date :	December 04,2015
Tested By :	Amos Xia

Requirement(s):

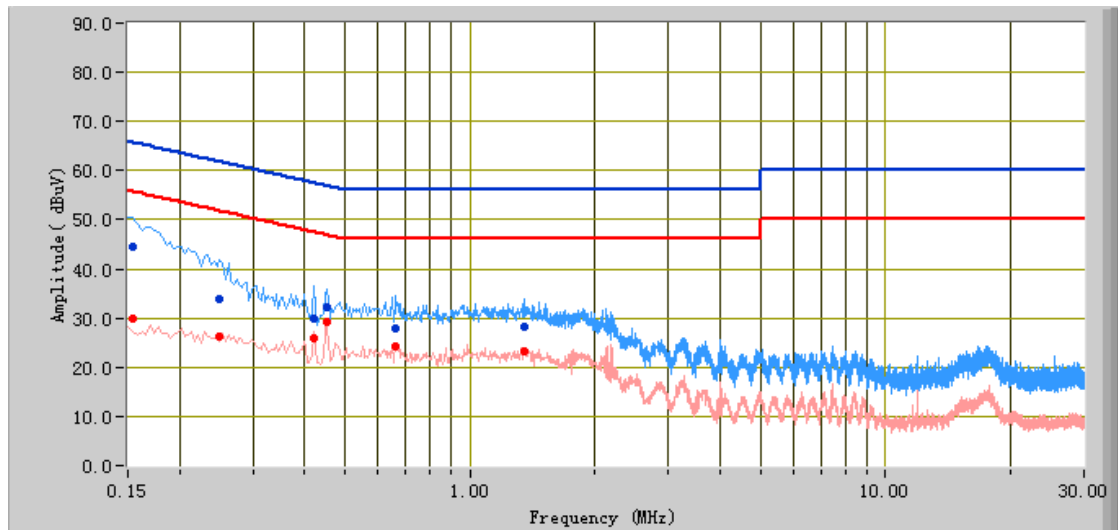
Spec	Item	Requirement	Applicable														
47CFR§15.207, RSS210 (A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [μ]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.																
		Procedure	1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.														
			2. The power supply for the EUT was fed through a 50 [μ]H/50 EUT LISN, connected to filtered mains.														
Remark	Note : The Laptop input power (120V/60Hz、240V/60Hz) have been tested , but only worst (120V/60Hz) case is the reported.																
		Result															
	☒ Pass ☐ Fail																

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Mode: Transmitting BT Mode

Peak Detector  Quasi Peak Limit 
Average Detector  Average Limit 



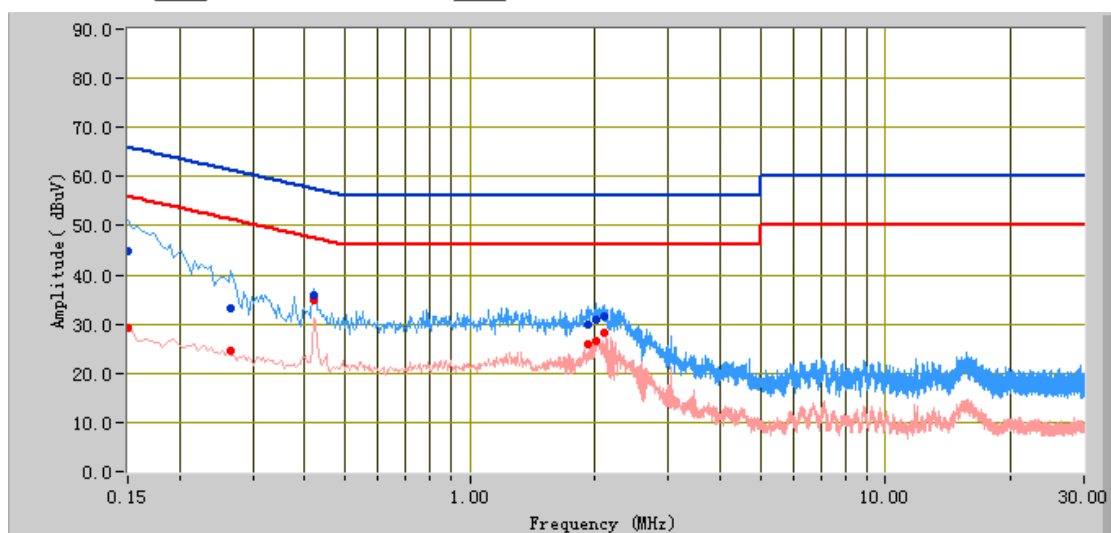
Test Data

Phase Line Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
0.15	44.53	65.78	-21.25	29.98	55.78	-25.80	12.16
0.25	33.93	61.76	-27.83	26.40	51.76	-25.36	11.45
0.42	29.90	57.41	-27.51	25.86	47.41	-21.55	11.20
0.45	32.15	56.80	-24.65	29.06	46.80	-17.74	11.15
0.66	27.91	56.00	-28.09	24.29	46.00	-21.71	10.96
1.35	28.22	56.00	-27.78	23.41	46.00	-22.59	10.75

Test Mode: Transmitting BT Mode

Peak Detector  **Quasi Peak Limit** 
Average Detector  **Average Limit** 



Test Data

Phase Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
0.15	44.84	66.00	-21.16	29.30	56.00	-26.70	12.21
0.42	35.86	57.41	-21.55	34.89	47.41	-12.52	11.18
0.27	33.23	61.24	-28.01	24.62	51.24	-26.62	11.43
2.01	30.86	56.00	-25.14	26.41	46.00	-19.59	10.92
2.09	31.71	56.00	-24.29	28.27	46.00	-17.73	10.92
1.91	30.04	56.00	-25.96	26.03	46.00	-19.97	10.90

6.9 Radiated Spurious Emissions

Temperature	25°C
Relative Humidity	58%
Atmospheric Pressure	1016mbar
Test date :	December 03, 2015
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable	
47CFR§15.205, §15.209, §15.247(d)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges		
		Frequency range (MHz)		Field Strength (µV/m)
		30 – 88		100
		88 – 216		150
		216 960		200
		Above 960		500

Test Setup	
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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 Quasi 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	Note : The Laptop input power (120V/60Hz、 240V/60Hz) have been tested , but only worst (120V/60Hz) case is the reported.
--------	--

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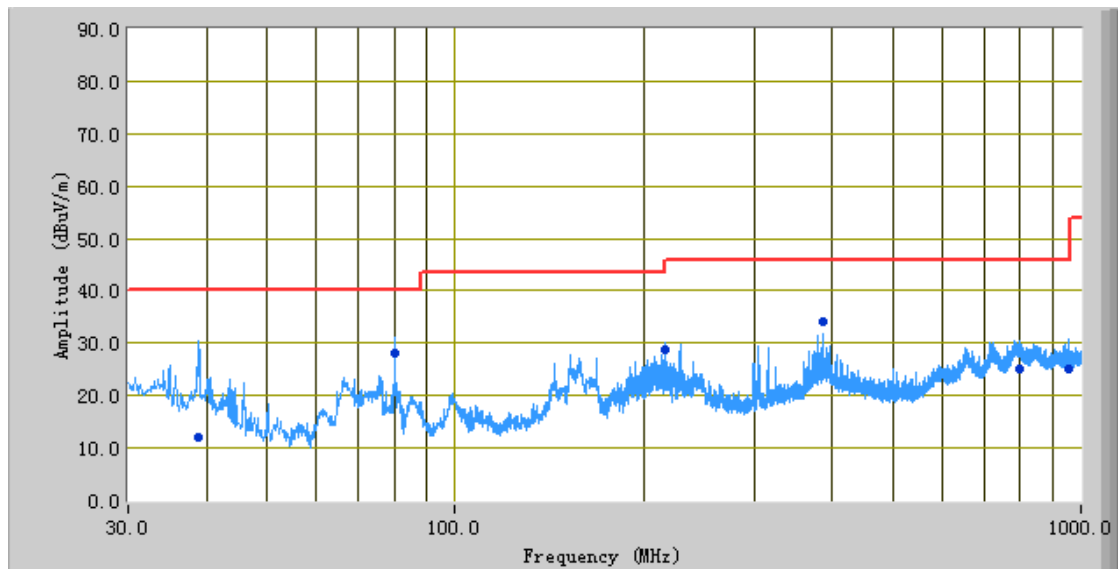
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Test Data	☒ Yes	☐ N/A
Test Plot	☒ Yes (See below)	☐ N/A

Test Mode: Transmitting BT Mode

Below 1GHz

Peak Detector 
Quasi Peak Limit 



Test Data

Horizontal/Vertical Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBuV/m)	Azimuth	Polarity(H/V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
80.01	27.95	189.00	H	240.00	-37.07	40.00	-12.05
38.73	12.10	243.00	H	321.00	-28.63	40.00	-27.90
216.01	28.89	344.00	H	193.00	-31.18	43.50	-14.61
387.98	34.16	273.00	H	104.00	-28.28	46.00	-11.84
953.41	25.21	190.00	V	99.00	-18.14	46.00	-20.79
799.47	25.03	164.00	H	104.00	-17.49	46.00	-20.97

Test Mode:	Transmitting BT Mode
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Mode: GFSK (Worst Case)

Low Channel (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	32.42	AV	V	33.83	6.86	31.72	41.39	54	-12.61
4804	31.85	AV	H	33.83	6.86	31.72	40.82	54	-13.18
4804	45.63	PK	V	33.83	6.86	31.72	54.6	74	-19.4
4804	44.89	PK	H	33.83	6.86	31.72	53.86	74	-20.14

Middle Channel (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	34.43	AV	V	33.86	6.82	31.82	43.29	54	-10.71
4882	33.79	AV	H	33.86	6.82	31.82	42.65	54	-11.35
4882	45.73	PK	V	33.86	6.82	31.82	54.59	74	-19.41
4882	44.88	PK	H	33.86	6.82	31.82	53.74	74	-20.26

High Channel (2480 MHz)

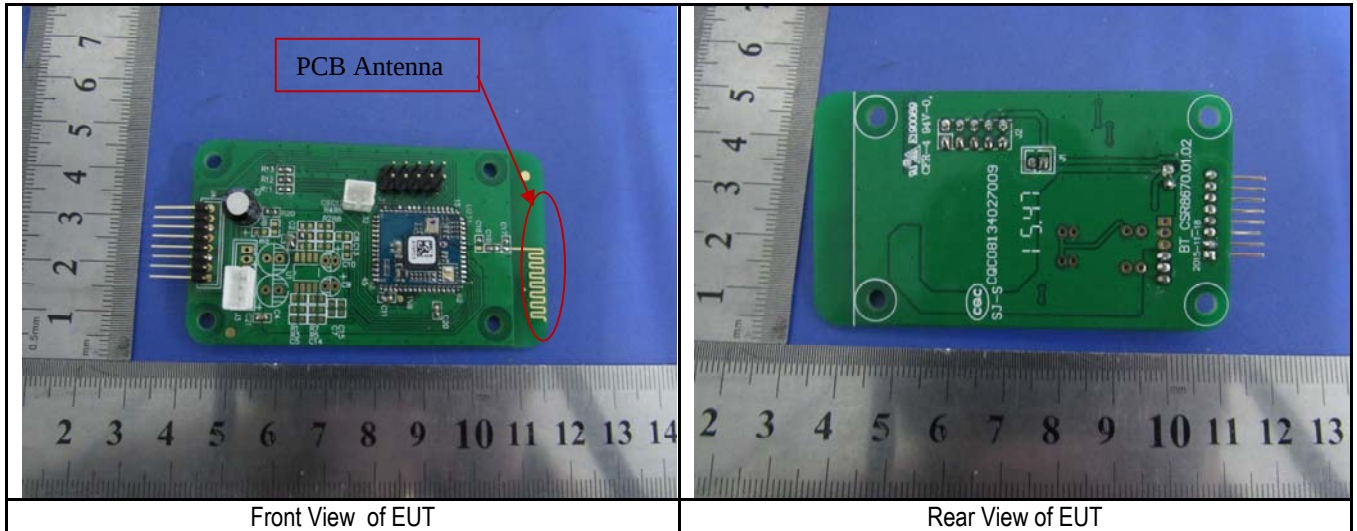
Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	34.97	AV	V	33.9	6.76	31.92	43.71	54	-10.29
4960	33.77	AV	H	33.9	6.76	31.92	42.51	54	-11.49
4960	45.18	PK	V	33.9	6.76	31.92	53.92	74	-20.08
4960	44.43	PK	H	33.9	6.76	31.92	53.17	74	-20.83

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
EMI test receiver	ESCS30	8471241027	09/18/2015	09/17/2016	☒
Line Impedance Stabilization Network	LI-125A	191106	09/26/2015	09/25/2016	☒
Line Impedance Stabilization Network	LI-125A	191107	09/26/2015	09/25/2016	☒
LISN	ISN T800	34373	09/26/2015	09/25/2016	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2015	09/24/2016	☒
Transient Limiter	LIT-153	531118	09/02/2015	09/01/2016	☒
RF conducted test					
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/18/2015	09/17/2016	☒
Power Splitter	1#	1#	09/02/2015	09/01/2016	☒
DC Power Supply	E3640A	MY40004013	09/18/2015	09/17/2016	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/18/2015	09/17/2016	☒
Positioning Controller	UC3000	MF780208282	11/20/2015	11/19/2016	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2015	09/01/2016	☒
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2015	09/21/2016	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2015	09/24/2016	☒
Universal Radio Communication Tester	CMU200	121393	09/26/2015	09/25/2016	☒

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External/Internal Photo



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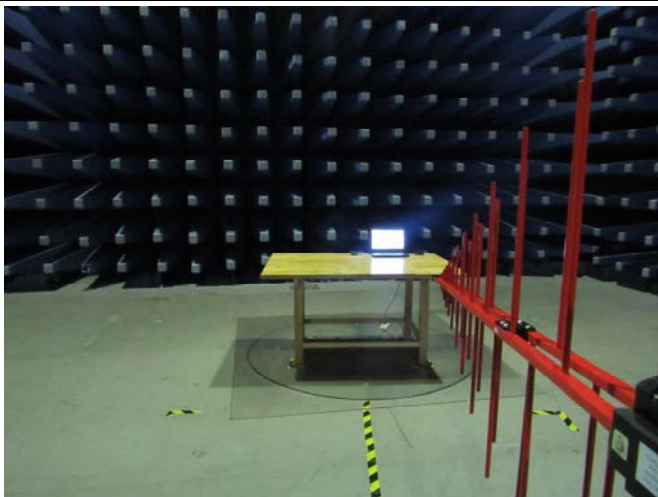
Annex B.ii. Photograph: Test Setup Photo



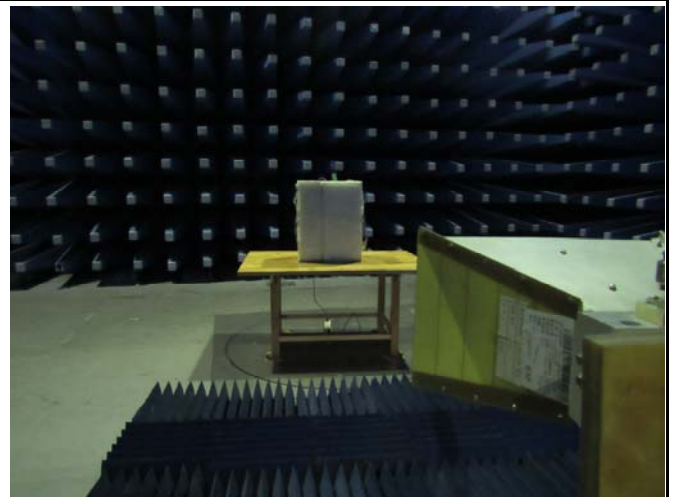
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

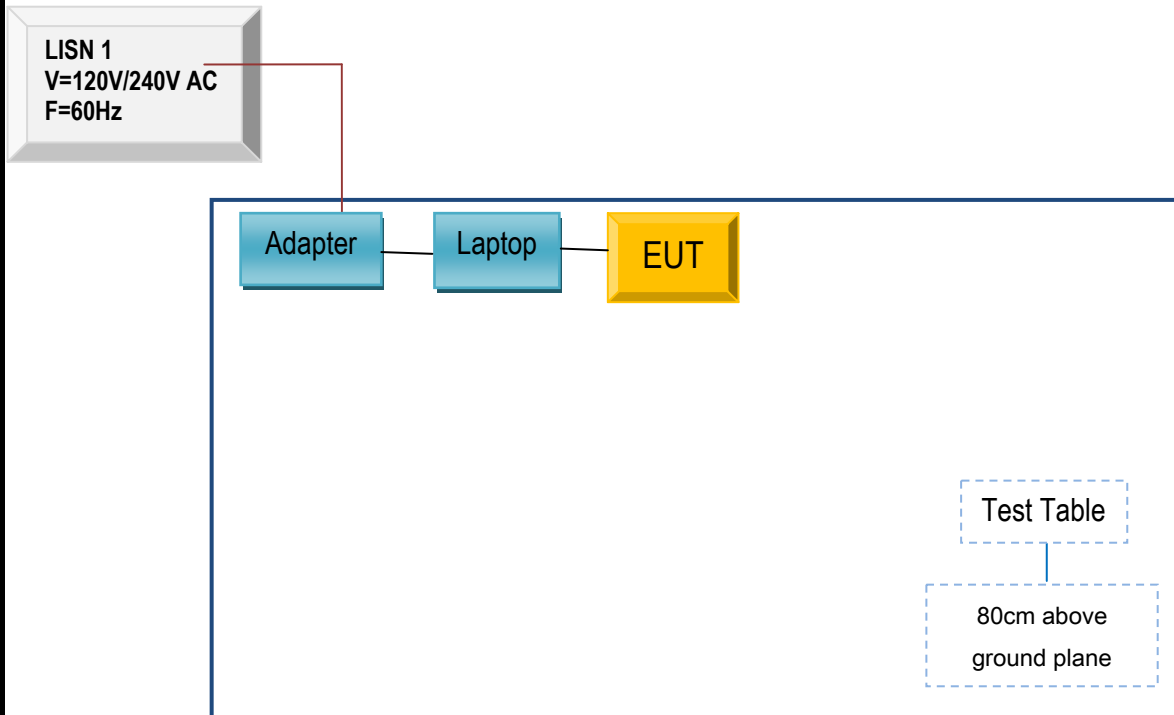


Radiated Spurious Emissions Test Setup Above 1GHz

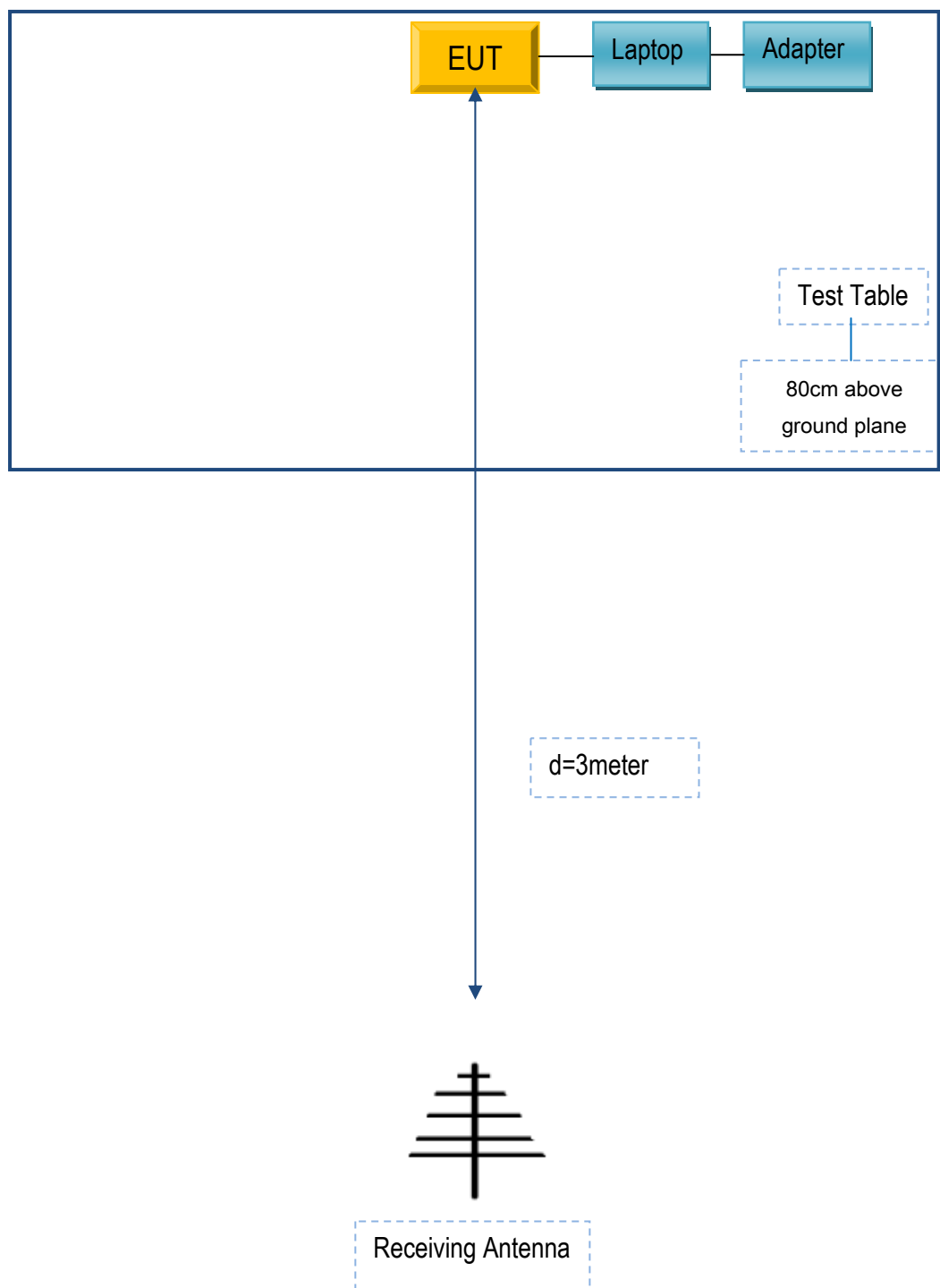
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

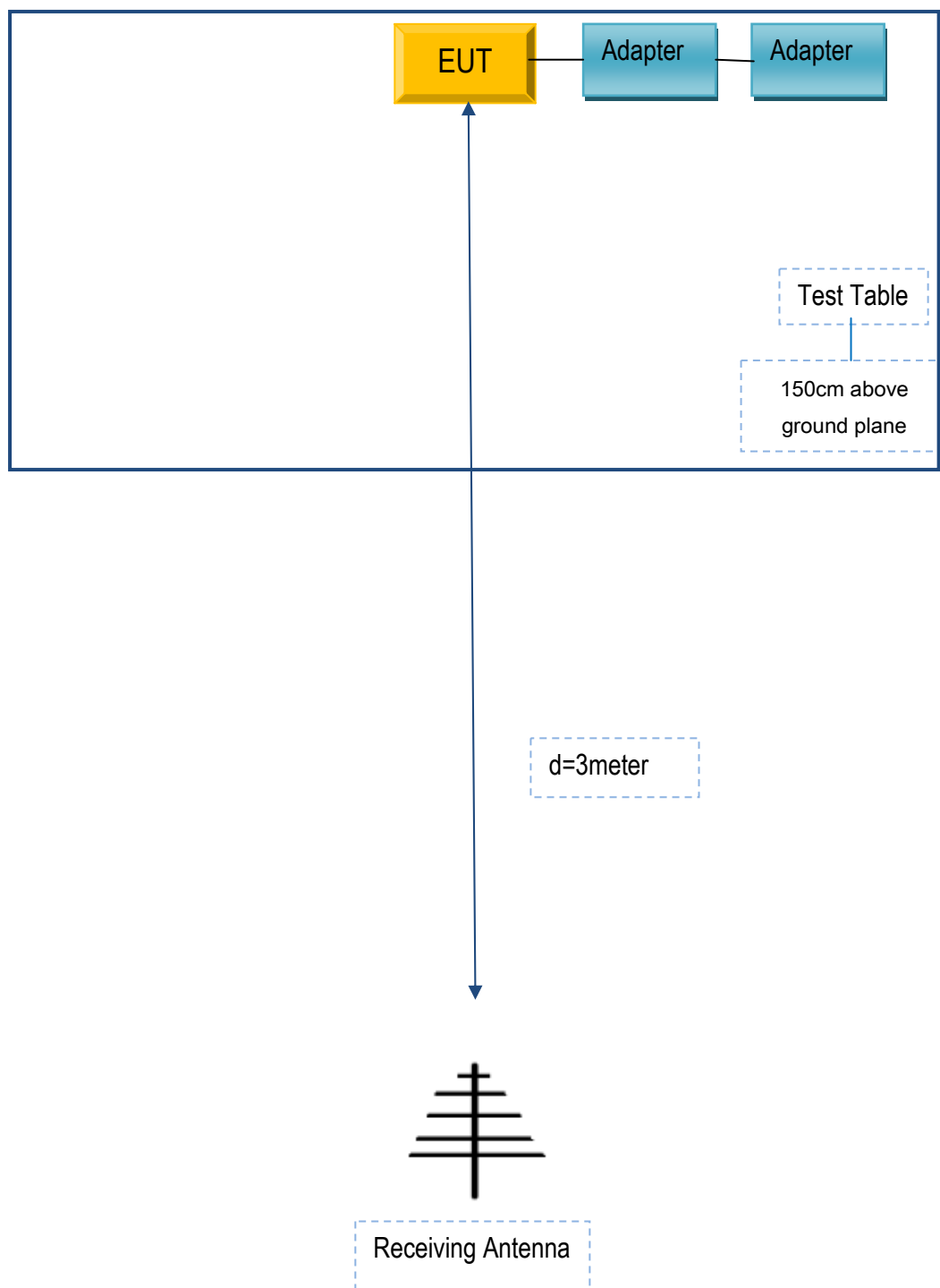
Block Configuration Diagram for AC Line Conducted Emissions



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



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



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Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
Dell Inc	Laptop	DCSM	N/A	N/A

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

Please see attachment

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Annex E. DECLARATION OF SIMILARITY

N/A