

RF TEST REPORT



Report No.: 1105050-FCC-R1

Applicant	Truly Semiconductors Ltd.	
Product Name	Smart Watch	
Model No.	eTimer2	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013	
Test Date	June 01 to June 16,2015	
Issue Date	June 19, 2015	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		
<i>Winnie.Zhang</i>	<i>Chris You</i>	
Winnie zhang Test Engineer	Chris You 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	1105050-FCC-R1
Page	3 of 56

This page has been left blank intentionally.

CONTENTS

1. REPORT REVISION HISTORY	5
2. CUSTOMER INFORMATION	5
3. TEST SITE INFORMATION	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION	6
5. TEST SUMMARY	8
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	9
6.1 ANTENNA REQUIREMENT	9
6.2 CHANNEL SEPARATION	10
6.3 20DB BANDWIDTH	14
6.4 PEAK OUTPUT POWER	18
6.5 NUMBER OF HOPPING CHANNEL	22
6.6 TIME OF OCCUPANCY (DWEIL TIME)	24
6.7 BAND EDGE	28
6.8 AC POWER LINE CONDUCTED EMISSIONS	36
6.9 RADIATED SPURIOUS EMISSIONS	40
ANNEX A. TEST INSTRUMENT	45
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS	46
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT	51
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST	55
ANNEX E. DECLARATION OF SIMILARITY	56

1. Report Revision History

Report No.	Report Version	Description	Issue Date
1105050-FCC-R1	NONE	Original	June 19, 2015

2. Customer information

Applicant Name	Truly Semiconductors Ltd.
Applicant Add	North of the Dong Chong Road, Truly Industrial Area Shan Wei, China
Manufacturer	Truly Semiconductors Ltd.
Manufacturer Add	North of the Dong Chong Road, Truly Industrial Area Shan Wei, China

3. Test site information

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

4. Equipment under Test (EUT) Information

Description of EUT:	Smart Watch
Main Model:	eTimer2
Serial Model:	N/A
Equipment Category :	DSS
Antenna Gain:	Bluetooth& BLE: 0.7dBi
Input Power:	Battery: Model: JK532330 Spec: 3.7Vdc, 300 mAh Charging Limited Voltage: 4.28+/-0.05Vdc
Trade Name :	TRULY
FCC ID:	OORETIMER2

Test Report	1105050-FCC-R1
Page	7 of 56

Max. Output Power: -4.617 dBm

Type of Modulation: Bluetooth: GFSK, π /4DQPSK, 8DPSK
BLE: GFSK

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

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

Port: USB Port

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:

- Antenna must be permanently attached to the unit.
- 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 -0.5dBi for Bluetooth/BLE/WIFI.

A permanently attached PIFA antenna for GSM and UMTS, the gain is 0.8dBi for GSM850, -0.7dBi for UMTS-FDD Band V, -1dBi for PCS1900, the gain is -0.9dBi for UMTS-FDD Band II

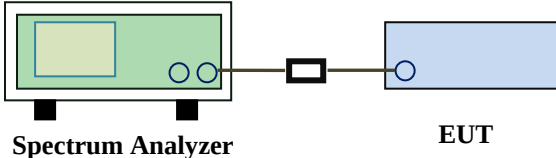
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

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

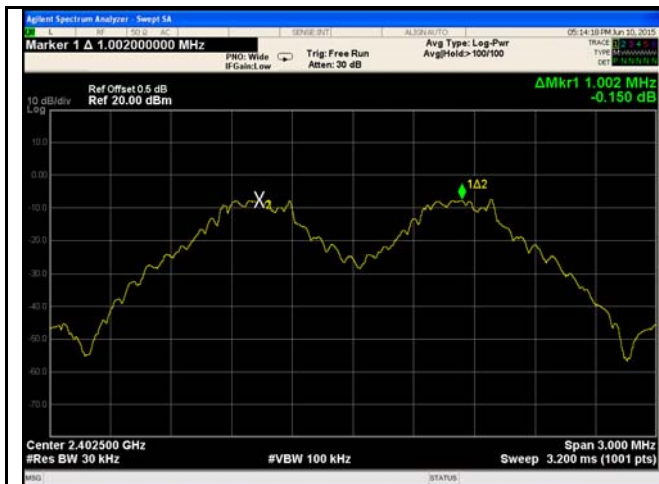
Test Plot ☒ Yes (See below) ☐ N/A

Channel Separation measurement result

Type/ Modulation	CH	CH Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.967	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.691	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.700	Pass
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.002	0.854	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.857	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.859	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.855	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.851	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.852	Pass
	Adjacency Channel	2479			

Test Plots

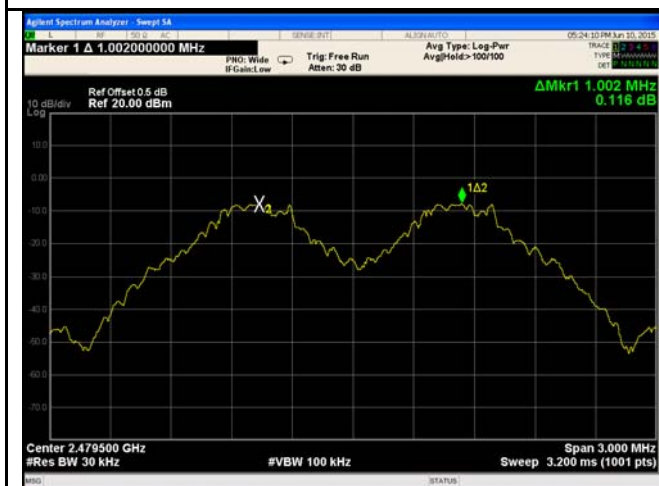
Channel Separation measurement result



GFSK - Low Channel



GFSK - Middle Channel



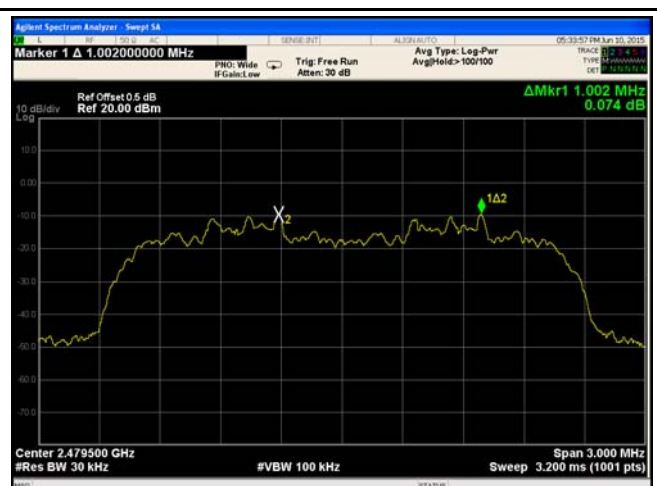
GFSK - High Channel



$\pi/4$ DPSK - Low Channel



$\pi/4$ DQPSK - Middle Channel



$\pi/4$ DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel

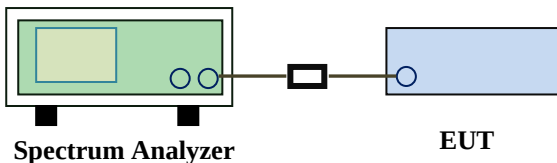


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

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		

Test Report	1105050-FCC-R1
Page	15 of 56

	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

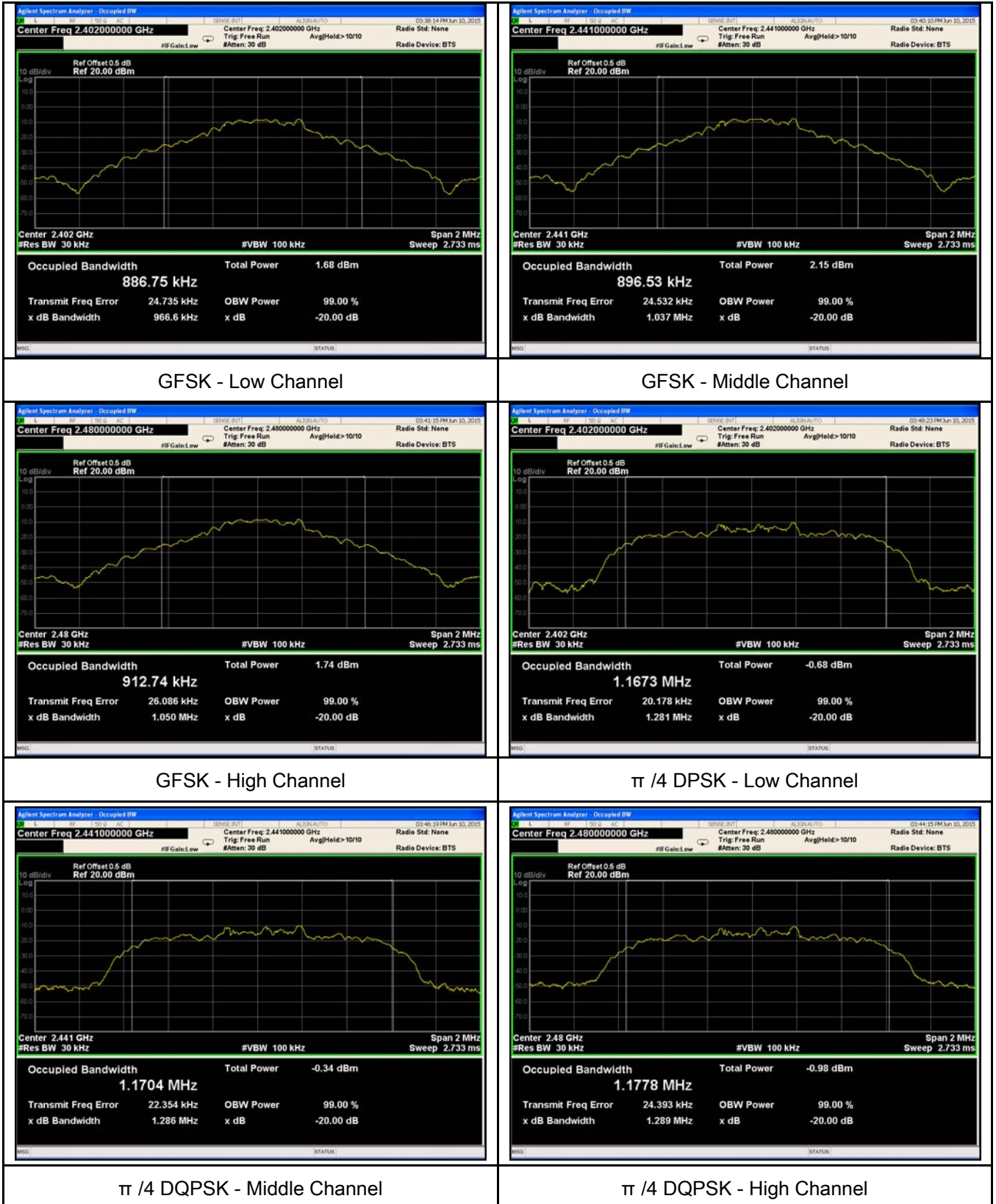
Test Plot ☒ Yes (See below) ☐ N/A

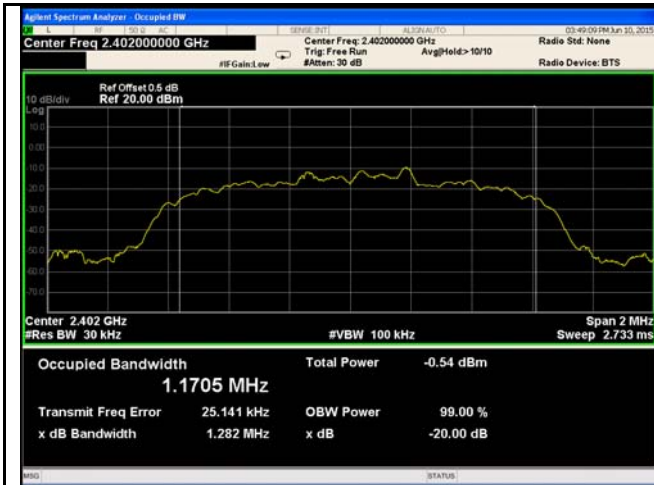
Measurement result

Modulation	CH	CH Freq (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.967	0.887
	Mid	2441	1.037	0.897
	High	2480	1.050	0.913
$\pi/4$ DQPSK	Low	2402	1.281	1.167
	Mid	2441	1.286	1.170
	High	2480	1.289	1.178
8-DPSK	Low	2402	1.282	1.171
	Mid	2441	1.276	1.176
	High	2480	1.278	1.175

Test Plots

20dB Bandwidth measurement result

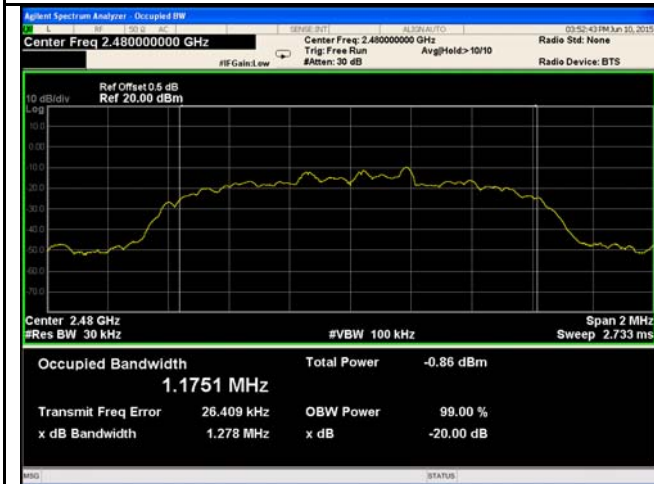




8DPSK - Low Channel



8DPSK - Middle Channel



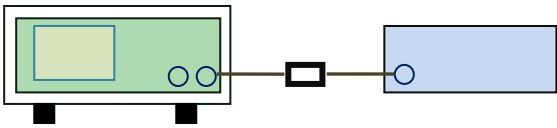
8DPSK - High Channel

6.4 Peak Output Power

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

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. 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
----------------	--

Test Report	1105050-FCC-R1
Page	19 of 56

	- 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)	Limit (mW)	Result
Output power	GFSK	Low	2402	-5.273	125	Pass
		Mid	2441	-4.617	125	Pass
		High	2480	-5.315	125	Pass
	$\pi/4$ DQPSK	Low	2402	-6.052	125	Pass
		Mid	2441	-5.505	125	Pass
		High	2480	-6.116	125	Pass
	8-DPSK	Low	2402	-5.672	125	Pass
		Mid	2441	-5.275	125	Pass
		High	2480	-5.971	125	Pass

Test Plots

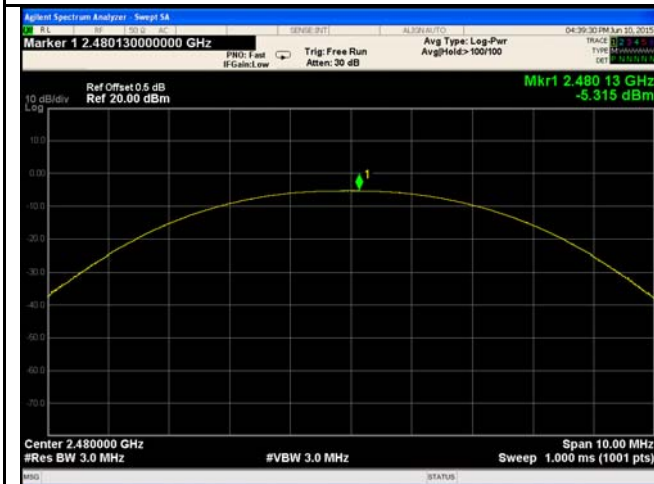
Output Power measurement result



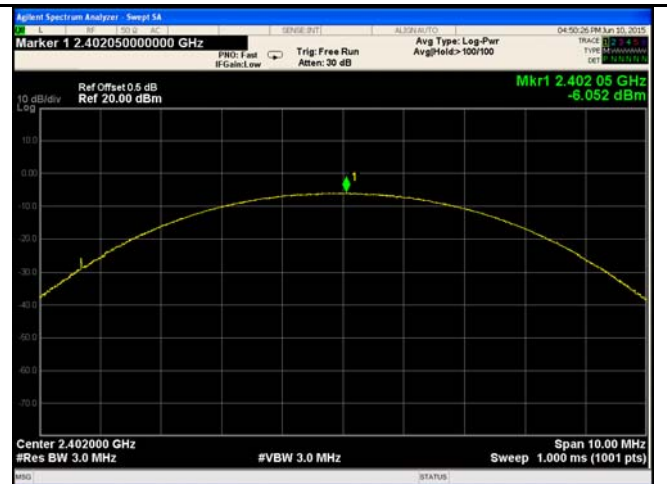
GFSK Output power - Low CH 2402



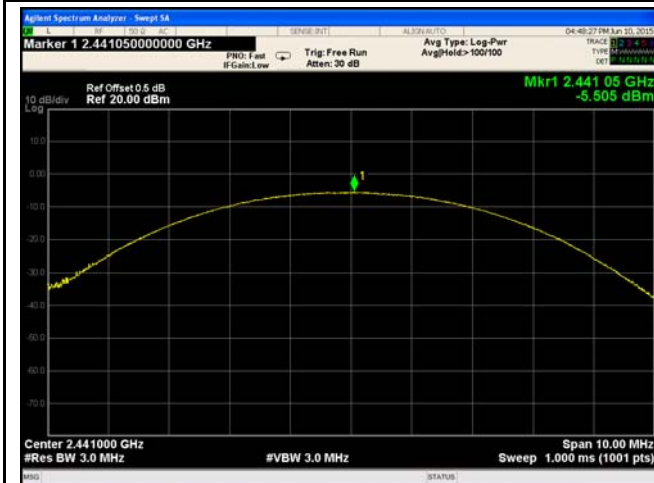
GFSK Output power - Mid CH 2441



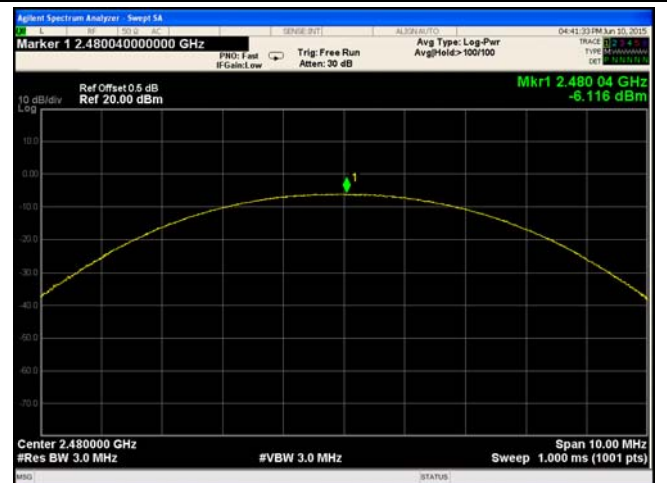
GFSK Output power - High CH 2480



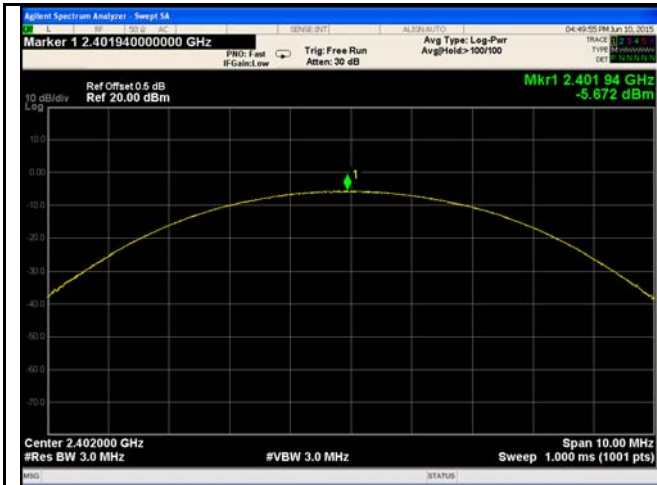
$\pi/4$ DQPSK Output power - Low CH 2402



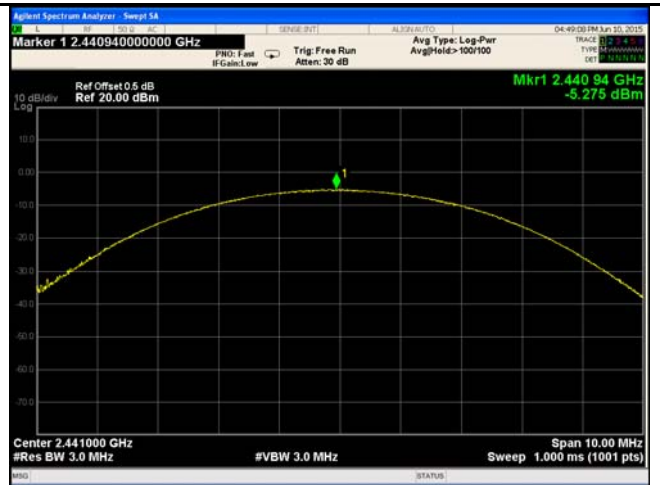
$\pi/4$ DQPSK Output power - Mid CH 2441



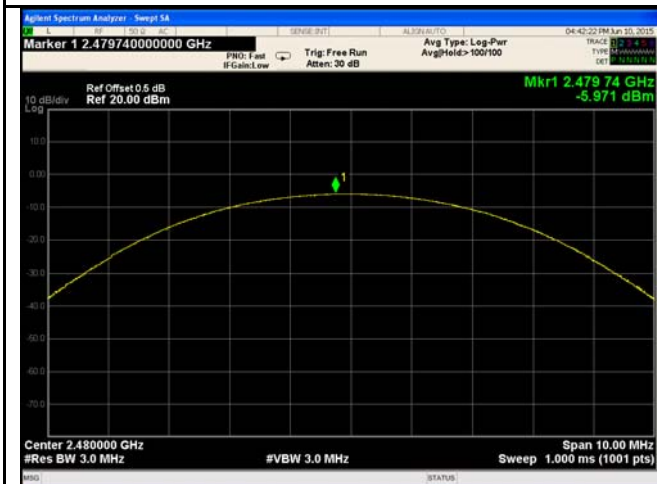
$\pi/4$ DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

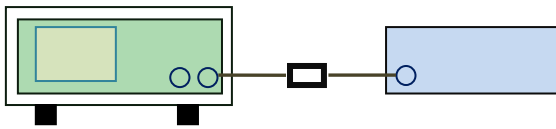


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

Requirement(s):

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

Test Data

☒ Yes

☐ N/A

Test Plot

☒ Yes (See below)

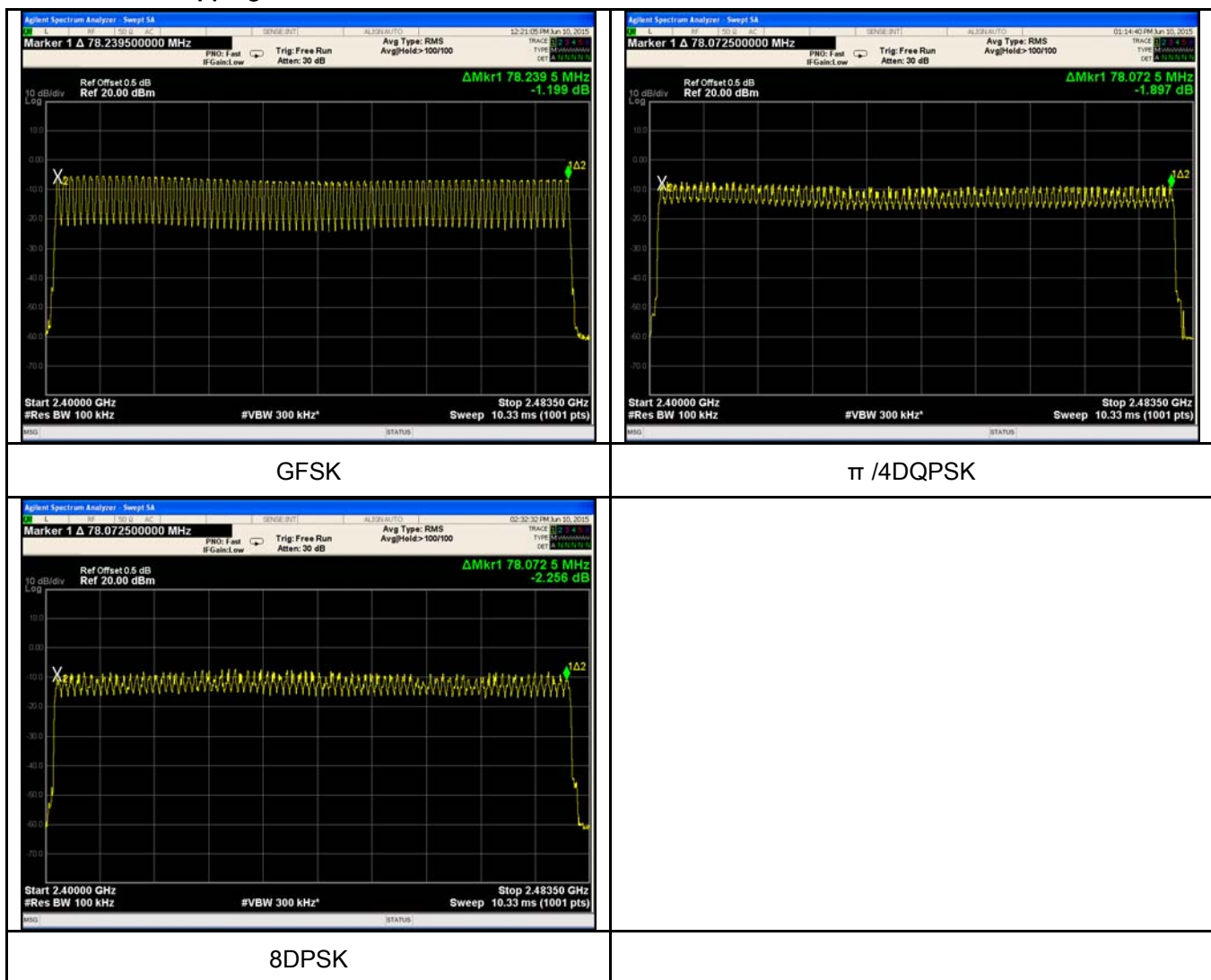
☐ N/A

Number of Hopping Channel measurement result

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

Test Plots

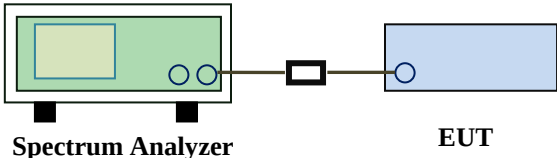
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

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	2.893	308.587	400	Pass
		Mid	2.923	311.787	400	Pass
		High	2.893	308.587	400	Pass
	$\pi/4$ DQPSK	Low	2.923	311.787	400	Pass
		Mid	2.923	311.787	400	Pass
		High	2.893	308.587	400	Pass
	8-DPSK	Low	2.923	311.787	400	Pass
		Mid	2.893	308.587	400	Pass
		High	2.923	311.787	400	Pass
Note: Dwell time=Pulse Time (ms) $\times$ (1600 $\div$ 6 $\div$ 79) $\times$ 31.6						

Test Plots

Dwell Time measurement result



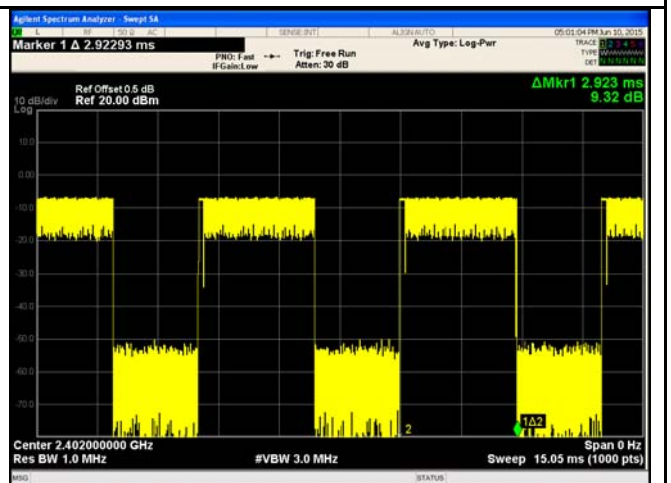
GFSK - Low CH 2402



GFSK - Mid CH 2441



GFSK - High CH 2480



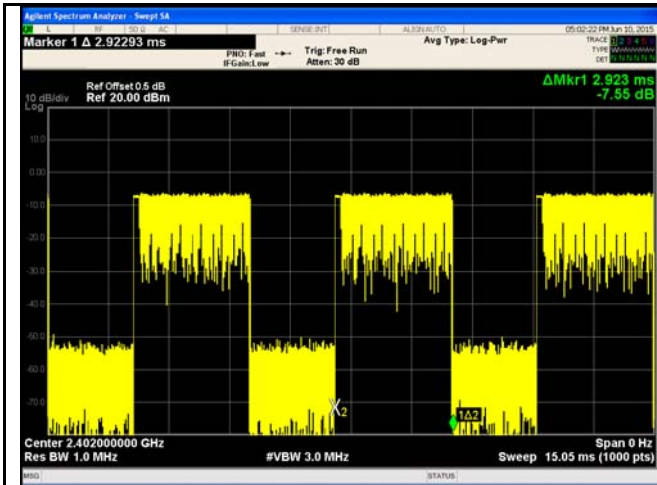
$\pi/4$ DQPSK - Low CH 2402



$\pi/4$ DQPSK - Mid CH 2441



$\pi/4$ DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441

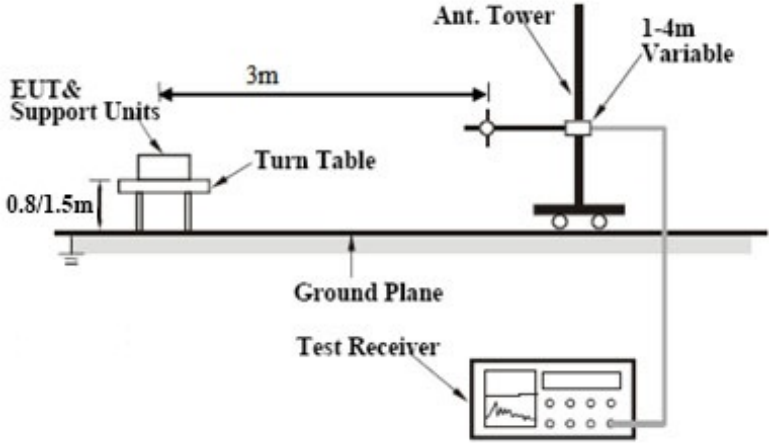


8DPSK - High CH 2480

6.7 Band Edge

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

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,		

Test Report	1105050-FCC-R1
Page	29 of 56

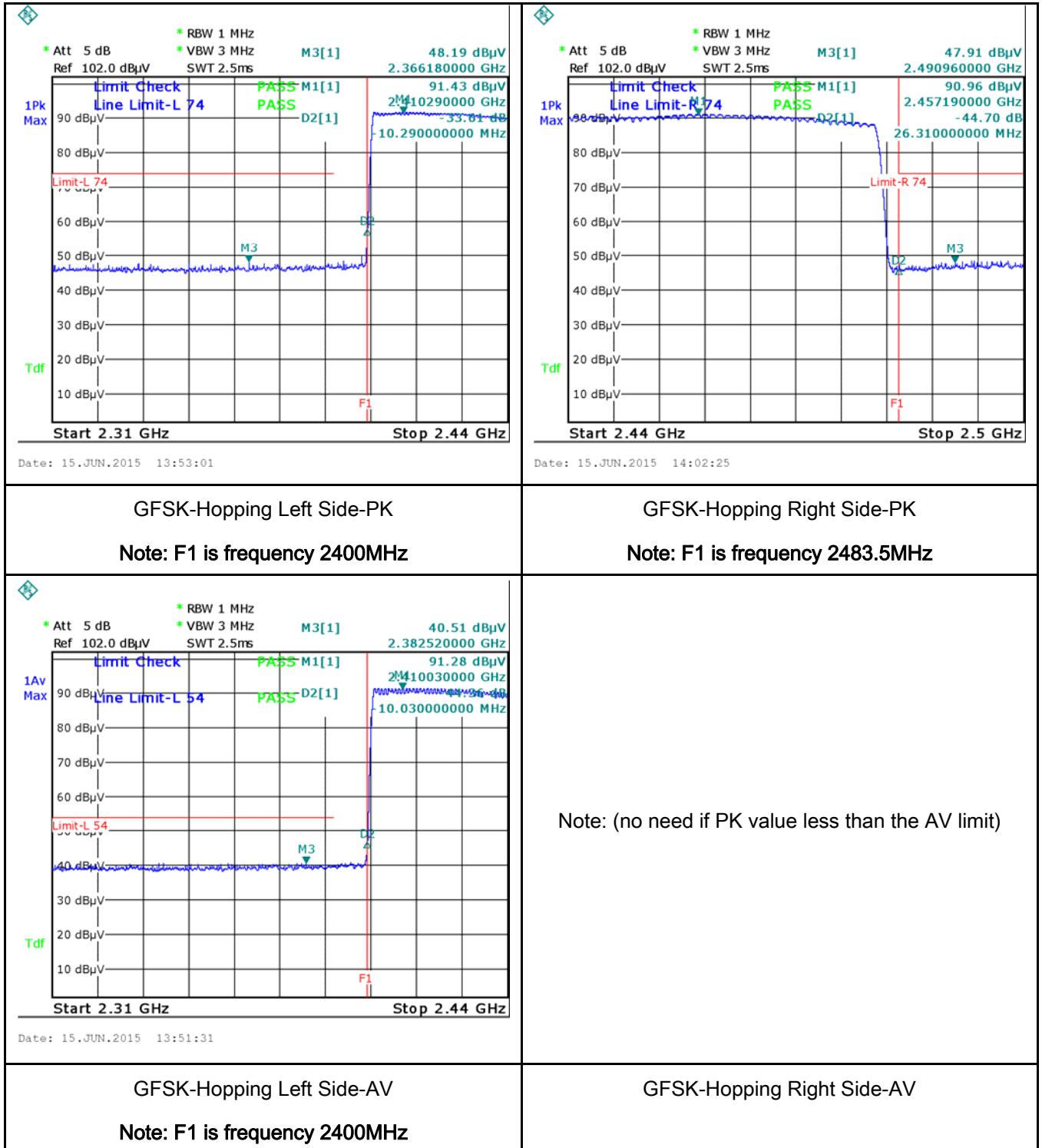
	and make sure the instrument is operated in its linear range. - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. - 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - 5. Repeat above procedures until all measured frequencies were complete.
Remark	
Result	☒ Pass ☐ Fail

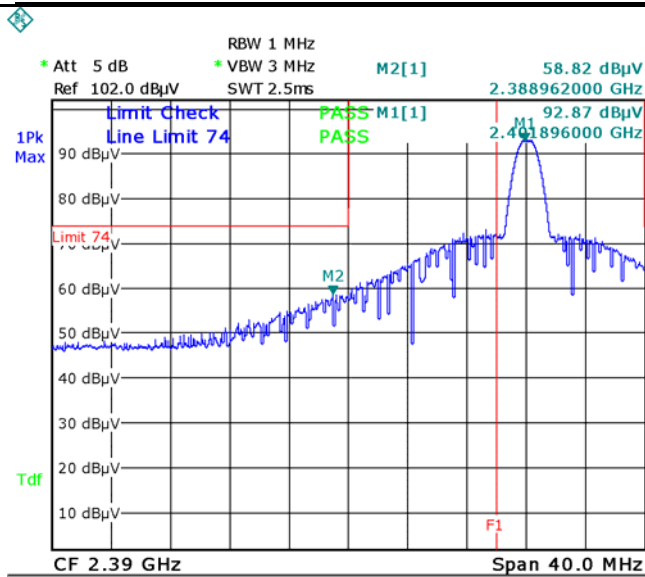
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

GFSK Mode:

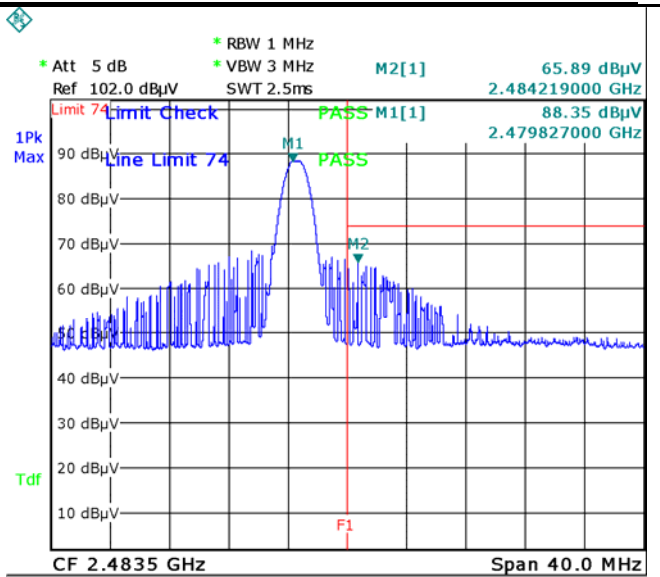




Date: 15.JUN.2015 11:41:11

GFSK-Left Side-PK

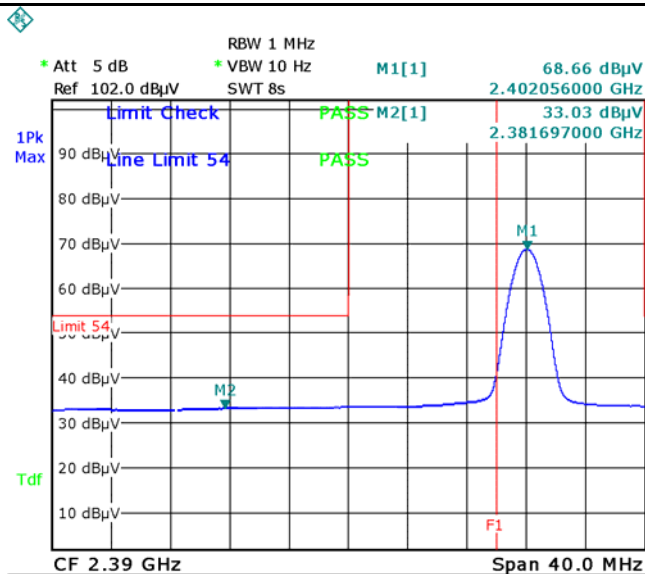
Note: F1 is frequency 2400MHz



Date: 15.JUN.2015 14:08:35

GFSK-Right Side-PK

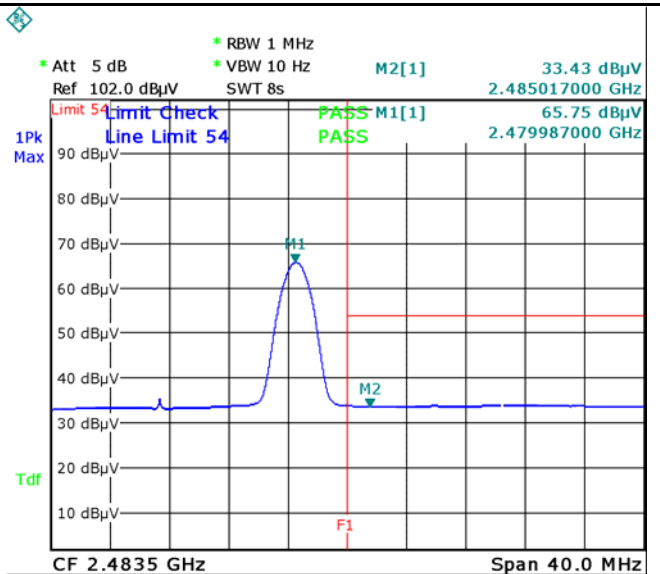
Note: F1 is frequency 2483.5MHz



Date: 15.JUN.2015 11:43:31

GFSK-Left Side-AV

Note: F1 is frequency 2400MHz



Date: 15.JUN.2015 14:10:15

GFSK-Right Side-AV

Note: F1 is frequency 2483.5MHz

Plot 1: $\pi/4$ DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

Plot 2: $\pi/4$ DQPSK-Hopping Right Side-PK

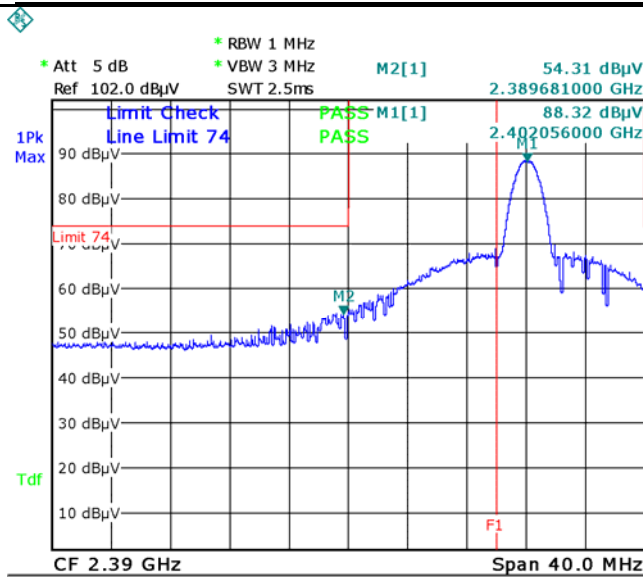
Note: F1 is frequency 2483.5MHz

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

Plot 3: $\pi/4$ DQPSK-Hopping Left-AV

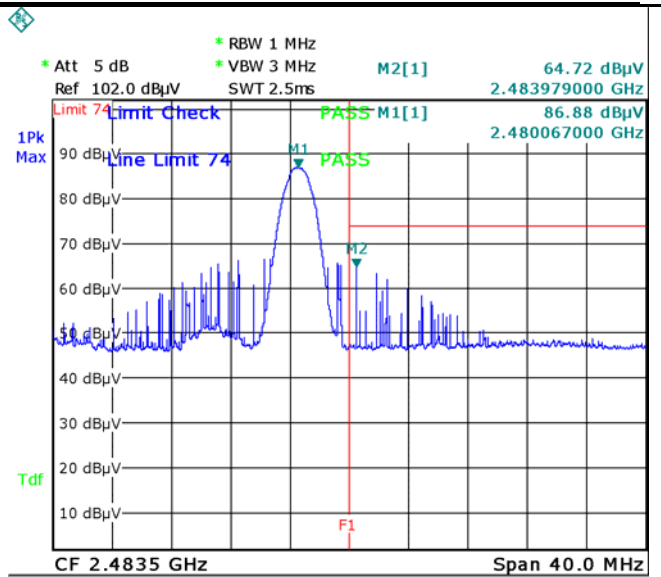
Note: F1 is frequency 2400MHz

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



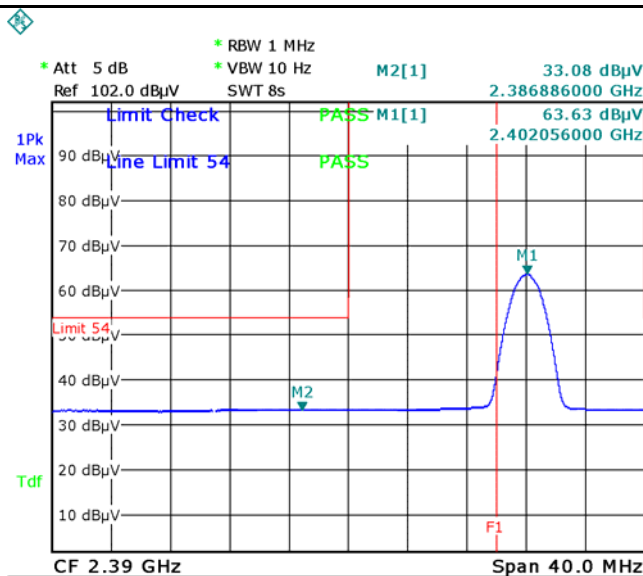
$\pi/4$ DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz



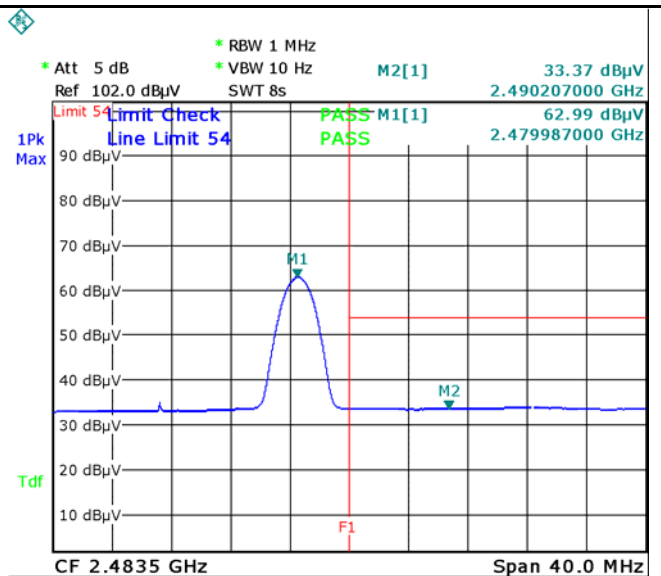
$\pi/4$ DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



GFSK-Left Side-AV

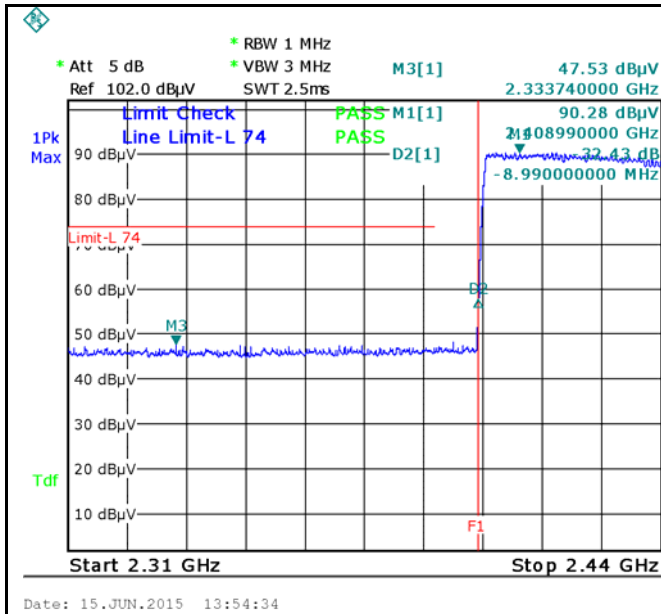
Note: F1 is frequency 2400MHz



GFSK-Right Side-AV

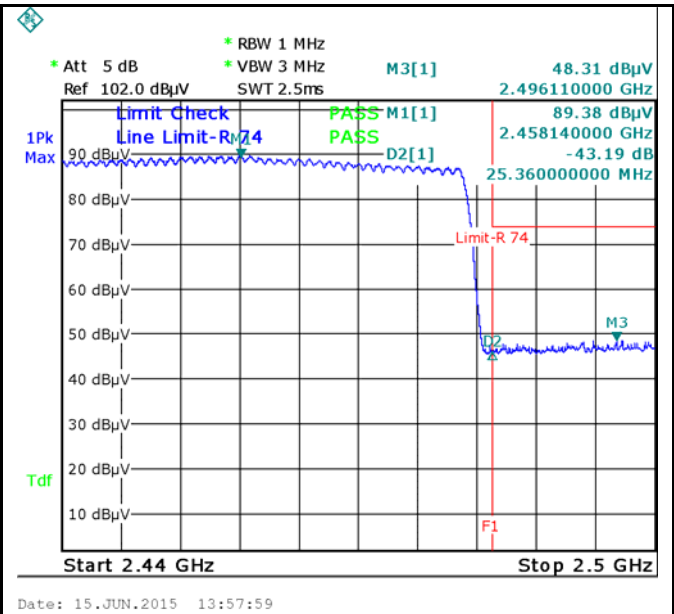
Note: F1 is frequency 2483.5MHz

8-DPSK Mode:



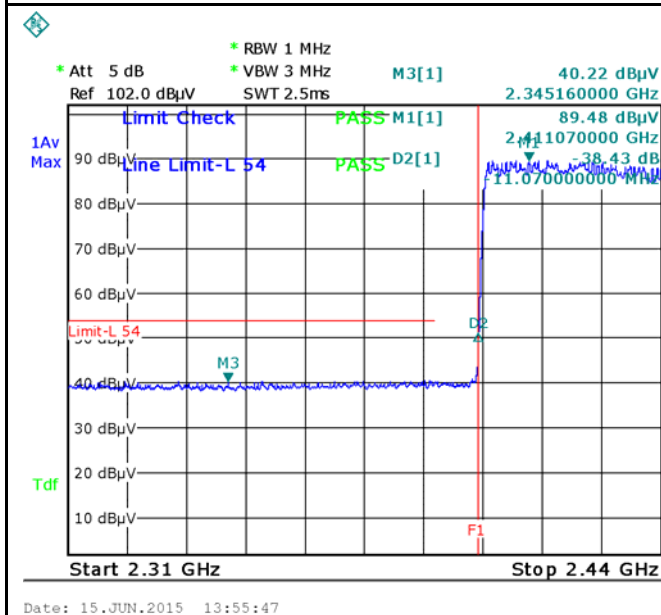
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

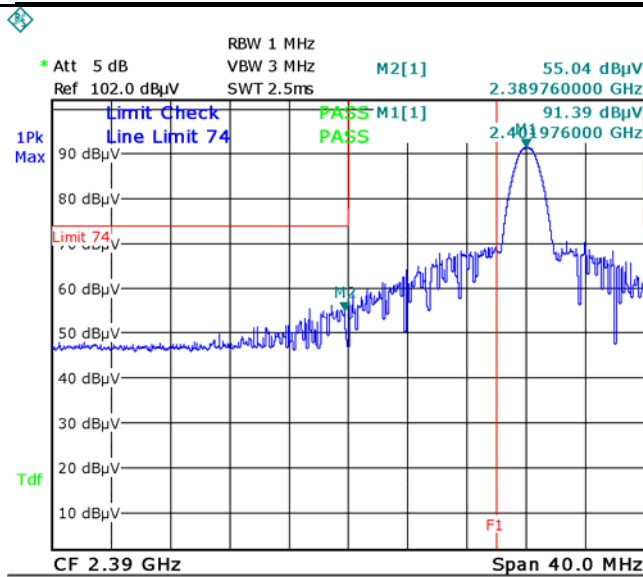


8DPSK-Hopping Left-AV

Note: F1 is frequency 2400MHz

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

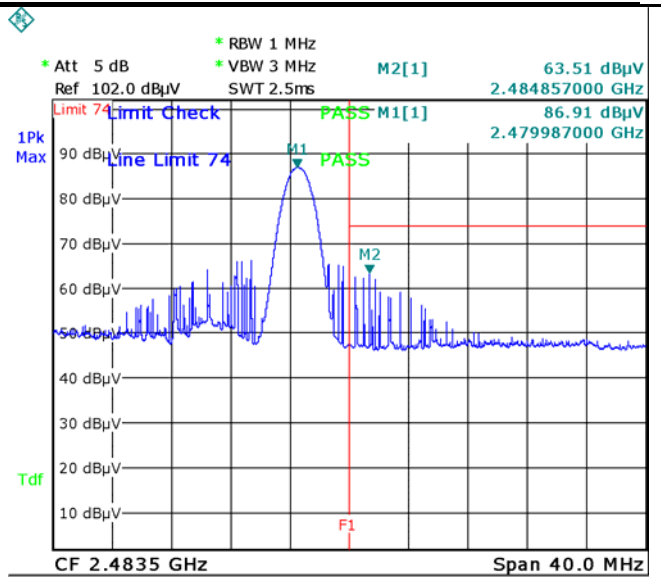
8DPSK-Hopping Right-AV



Date: 15.JUN.2015 11:22:20

8DPSK-Left Side-PK

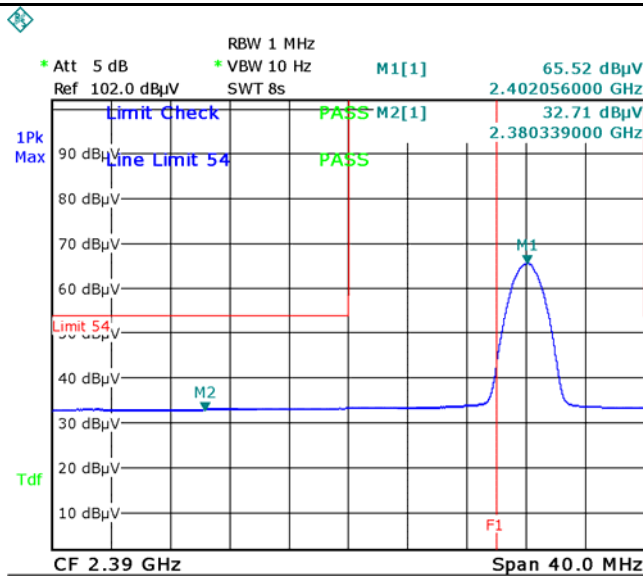
Note: F1 is frequency 2400MHz



Date: 15.JUN.2015 14:19:58

8DPSK-Right Side-PK

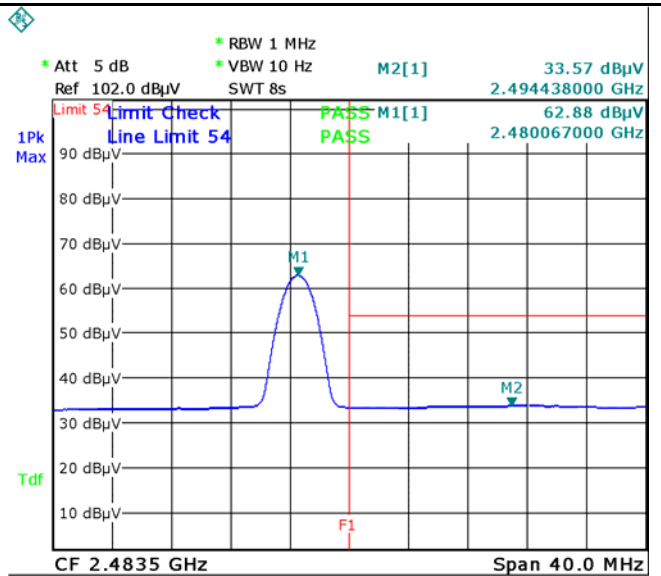
Note: F1 is frequency 2483.5MHz



Date: 15.JUN.2015 11:23:59

GFSK-Left Side-AV

Note: F1 is frequency 2400MHz



Date: 15.JUN.2015 14:21:07

GFSK-Right Side-AV

Note: F1 is frequency 2483.5MHz

6.8 AC Power Line Conducted Emissions

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

Requirement(s):

Spec	Item	Requirement	Applicable														
47CFR§15.207,	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.
------------	--

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 coaxial cable.
-----------	--

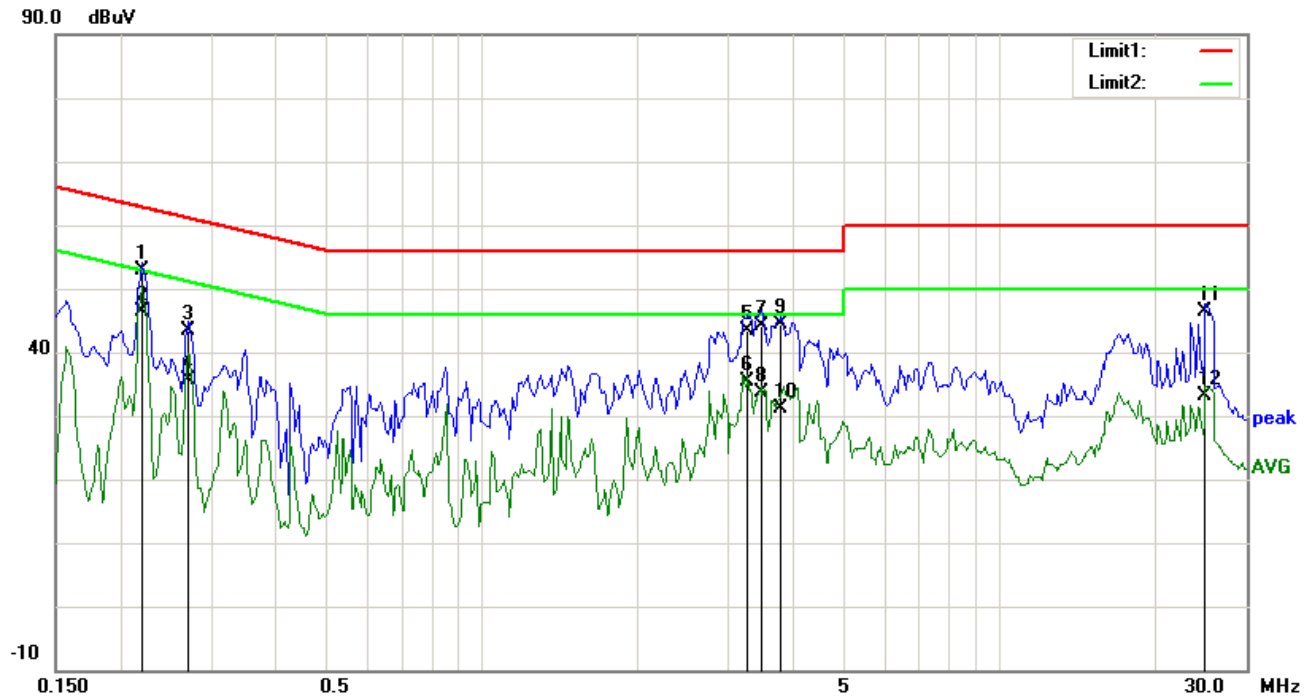
Test Report	1105050-FCC-R1
Page	37 of 56

	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

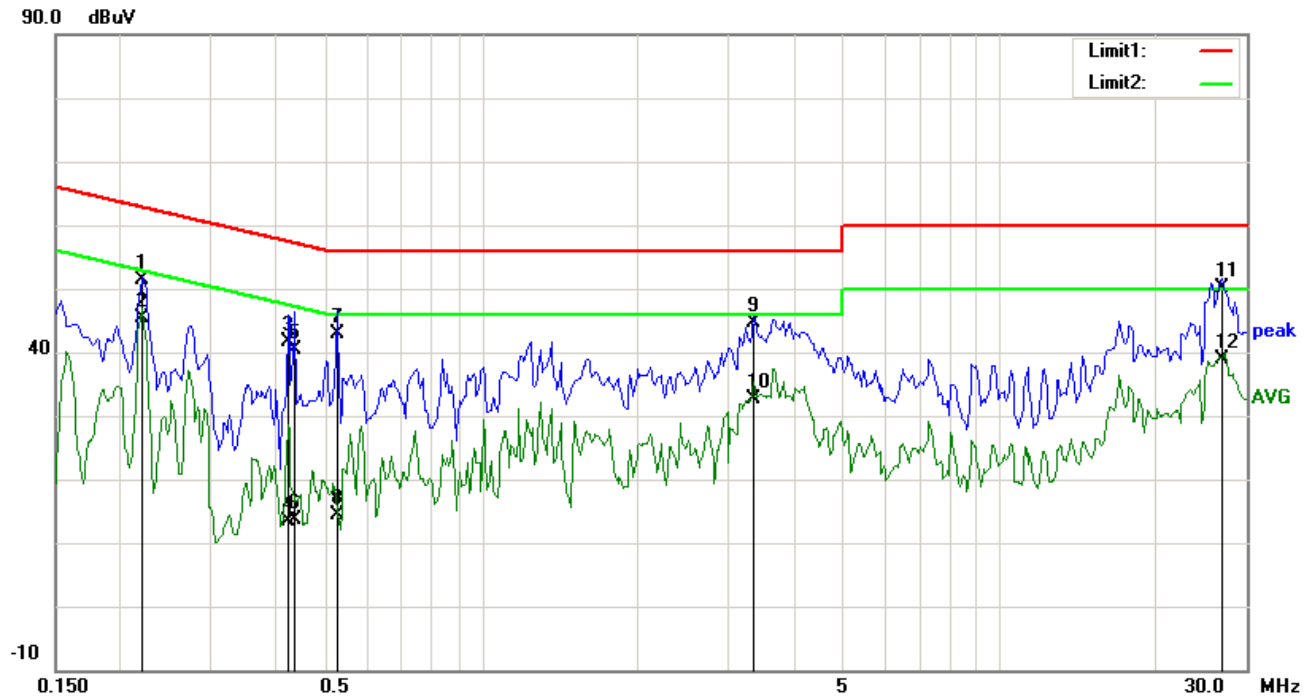


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)	
1	L1	0.2203	40.01	QP	12.94	52.95	62.81	-9.86	
2	L1	0.2203	33.50	AVG	12.94	46.44	52.81	-6.37	
3	L1	0.2711	30.59	QP	12.75	43.34	61.08	-17.74	
4	L1	0.2711	22.91	AVG	12.75	35.66	51.08	-15.42	
5	L1	3.2695	31.86	QP	11.40	43.26	56.00	-12.74	
6	L1	3.2695	23.88	AVG	11.40	35.28	46.00	-10.72	
7	L1	3.4609	32.75	QP	11.40	44.15	56.00	-11.85	
8	L1	3.4609	22.21	AVG	11.40	33.61	46.00	-12.39	
9	L1	3.7930	32.87	QP	11.40	44.27	56.00	-11.73	
10	L1	3.7930	19.85	AVG	11.40	31.25	46.00	-14.75	
11	L1	25.0313	31.94	QP	14.45	46.39	60.00	-13.61	
12	L1	25.0313	18.78	AVG	14.45	33.23	50.00	-16.77	

Test Mode: Bluetooth Mode



Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Comment
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)	
1	N	0.2203	38.55	QP	12.94	51.49	62.81	-11.32	
2	N	0.2203	32.34	AVG	12.94	45.28	52.81	-7.53	
3	N	0.4234	29.56	QP	12.18	41.74	57.38	-15.64	
4	N	0.4234	1.13	AVG	12.18	13.31	47.38	-34.07	
5	N	0.4352	28.15	QP	12.14	40.29	57.15	-16.86	
6	N	0.4352	1.48	AVG	12.14	13.62	47.15	-33.53	
7	N	0.5250	30.89	QP	11.88	42.77	56.00	-13.23	
8	N	0.5250	2.39	AVG	11.88	14.27	46.00	-31.73	
9	N	3.3516	32.99	QP	11.69	44.68	56.00	-11.32	
10	N	3.3516	20.85	AVG	11.69	32.54	46.00	-13.46	
11	N	26.8594	32.42	QP	17.71	50.13	60.00	-9.87	
12	N	26.8594	21.26	AVG	17.71	38.97	50.00	-11.03	

6.9 Radiated Spurious Emissions

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1010mbar
Test date :	June 10, 2015
Tested By :	Winnie zhang

Requirement(s):

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

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

Procedure	- 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:
-----------	---

Test Report	1105050-FCC-R1
Page	41 of 56

	a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. 5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	
Result	☒ Pass ☐ Fail

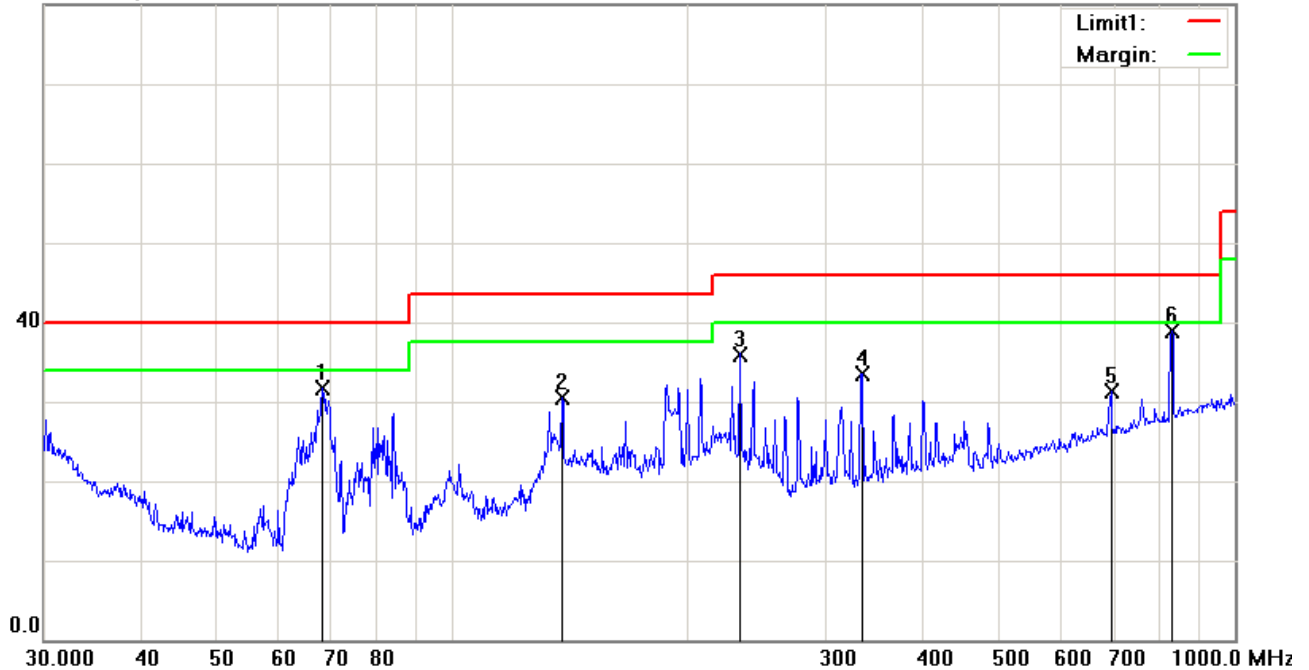
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Mode: Bluetooth Mode

Below 1GHz

80.0 dBuV/m

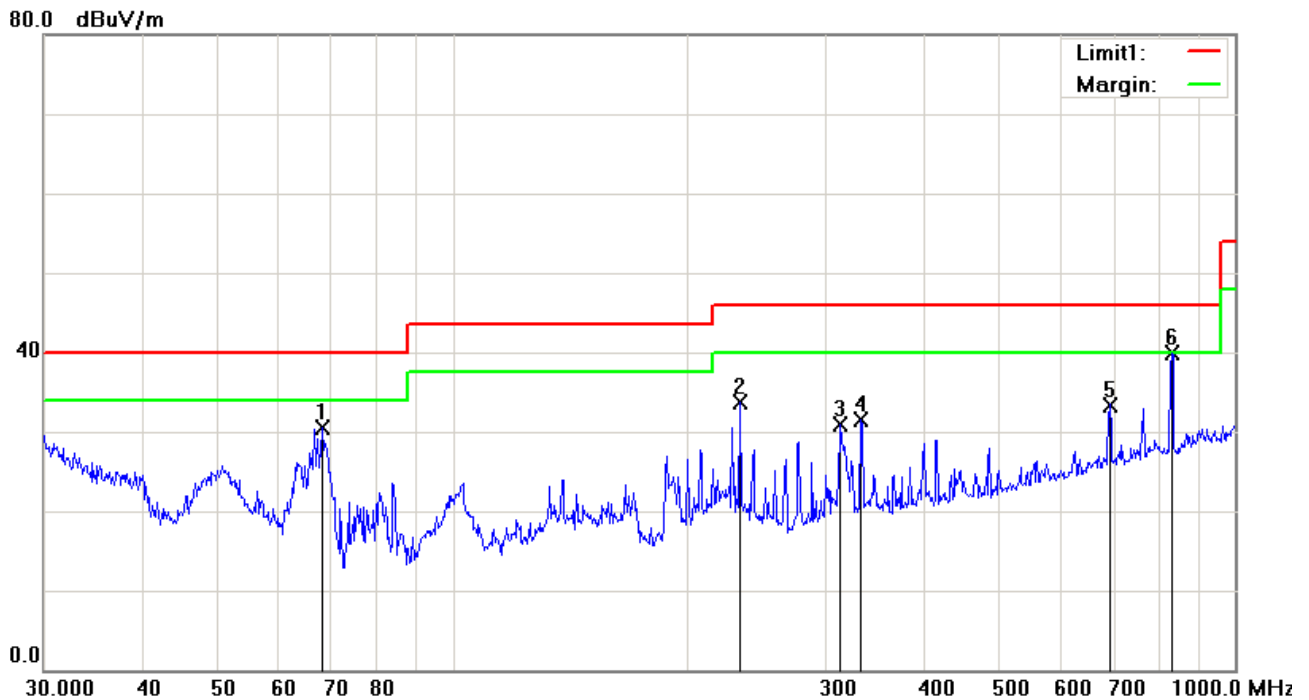


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree ()	Comment
1	H	68.1514	45.41	peak	-13.74	31.67	40.00	-8.33	200	128	
2	H	137.9029	38.96	peak	-8.40	30.56	43.50	-12.94	200	196	
3	H	232.5318	45.04	peak	-9.04	36.00	46.00	-10.00	100	100	
4	H	333.6867	39.53	peak	-5.93	33.60	46.00	-12.40	100	104	
5	H	694.4174	29.91	peak	1.32	31.23	46.00	-14.77	200	136	
6	H	830.4002	35.38	peak	3.57	38.95	46.00	-7.05	100	235	

Below 1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree	Comment
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()	
1	V	68.1514	44.33	peak	-13.74	30.59	40.00	-9.41	100	45	
2	V	233.3487	42.66	peak	-9.04	33.62	46.00	-12.38	100	188	
3	V	313.2760	37.43	peak	-6.51	30.92	46.00	-15.08	100	169	
4	V	332.5187	37.43	peak	-5.97	31.46	46.00	-14.54	200	148	
5	V	691.9867	32.12	peak	1.28	33.40	46.00	-12.60	200	167	
6	V	830.4002	36.31	peak	3.57	39.88	46.00	-6.12	200	197	

Test Mode:	Transmitting Mode
------------	-------------------

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	37.18	AV	V	33.83	6.86	31.72	46.15	54	-7.85
4804	36.85	AV	H	33.83	6.86	31.72	45.82	54	-8.18
4804	50.72	PK	V	33.83	6.86	31.72	59.69	74	-14.31
4804	49.27	PK	H	33.83	6.86	31.72	58.24	74	-15.76

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	37.35	AV	V	33.86	6.82	31.82	46.21	54	-7.79
4882	36.71	AV	H	33.86	6.82	31.82	45.57	54	-8.43
4882	50.59	PK	V	33.86	6.82	31.82	59.45	74	-14.55
4882	50.04	PK	H	33.86	6.82	31.82	58.9	74	-15.1

High Channel (2480 MHz)

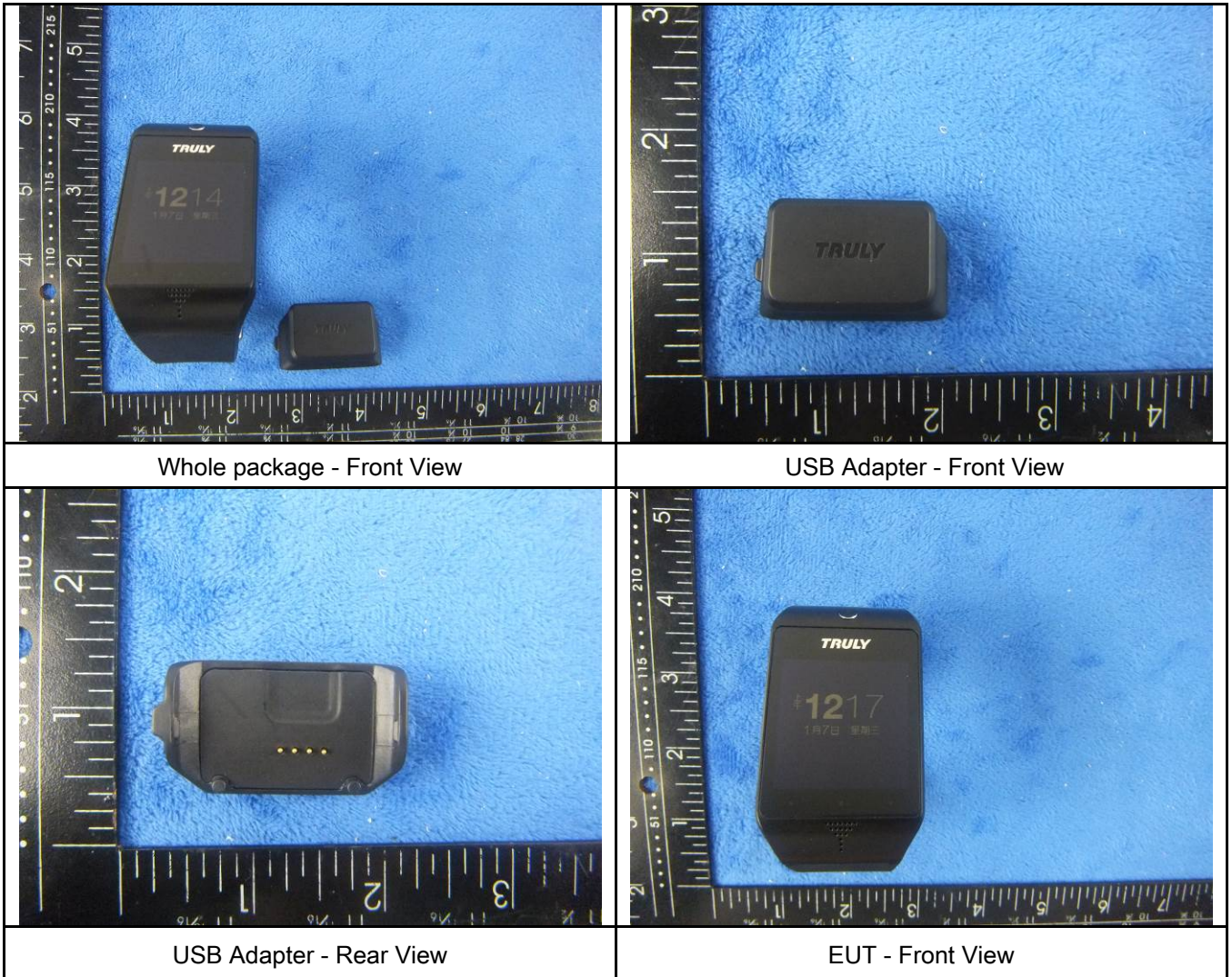
Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	37.84	AV	V	33.9	6.76	31.92	46.58	54	-7.42
4960	37.09	AV	H	33.9	6.76	31.92	45.83	54	-8.17
4960	50.77	PK	V	33.9	6.76	31.92	59.51	74	-14.49
4960	49.52	PK	H	33.9	6.76	31.92	58.26	74	-15.74

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/18/2014	09/17/2015	☒
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	☒
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	☒
LISN	ISN T800	34373	09/26/2014	09/25/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
Transient Limiter	LIT-153	531118	09/02/2014	09/01/2015	☒
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	☒
Power Splitter	1#	1#	09/02/2014	09/01/2015	☒
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	☒
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	☒
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	☒

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



Test Report	1105050-FCC-R1
Page	47 of 56



EUT - Rear View



EUT - Left View



EUT - Right View

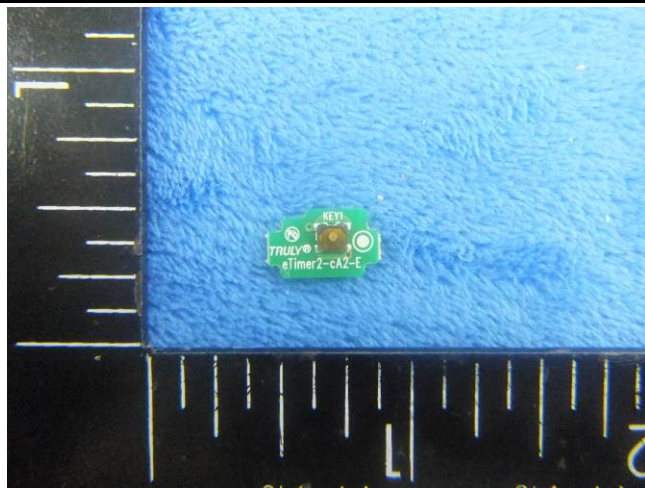
Annex B.ii. Photograph: EUT Internal Photo



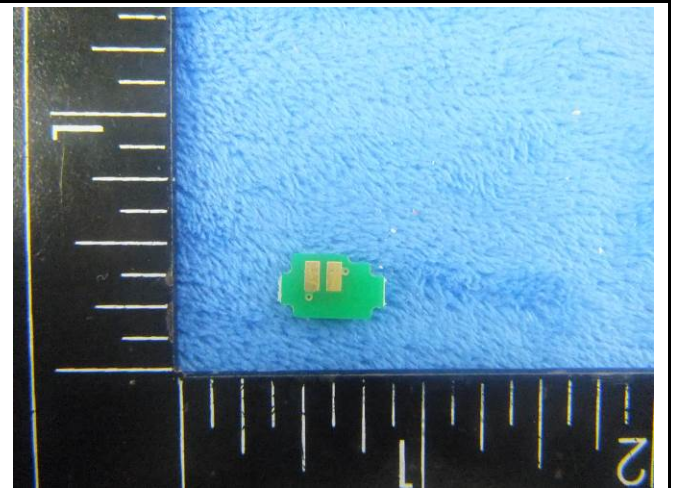
EUT - Uncover Front View 1



EUT - Uncover Front View 2



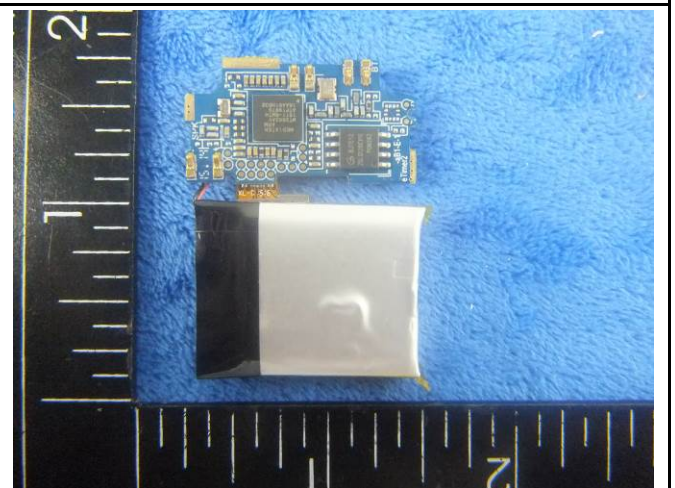
Small board - Front View



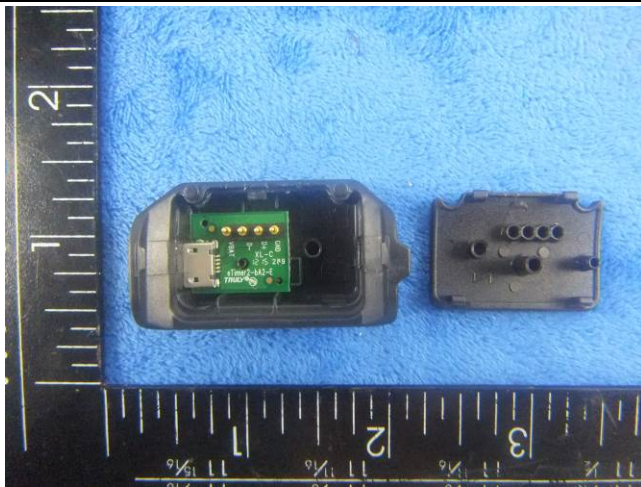
Small board - Rear View



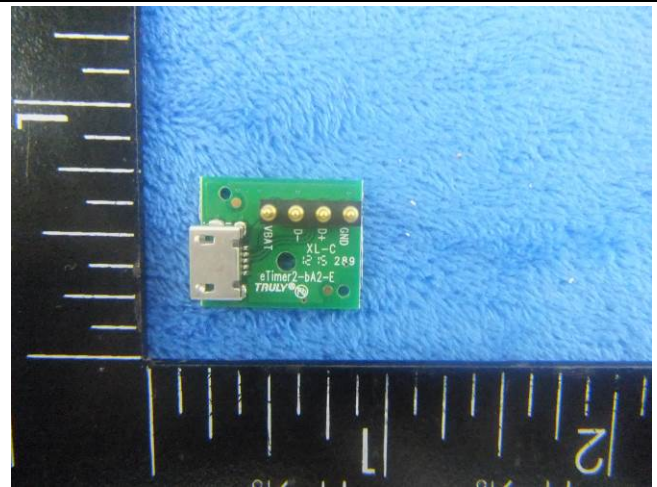
Mainboard and Battery - Front View



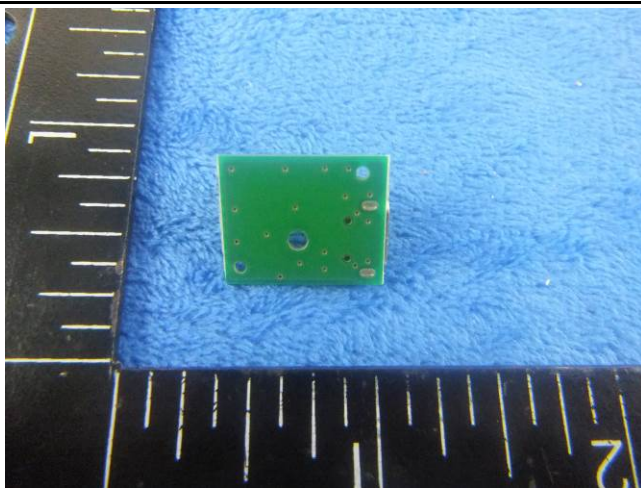
Mainboard and Battery Label - Rear View



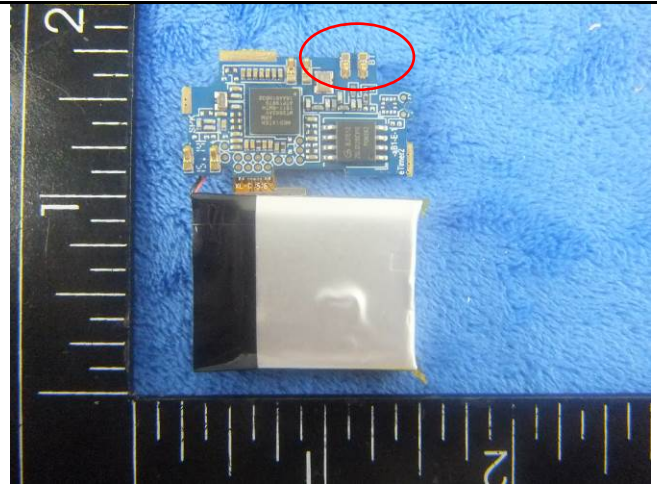
USB Adapter- Uncover Front View



USB Adapter bard - - Front View



USB Adapter bard - Rear View

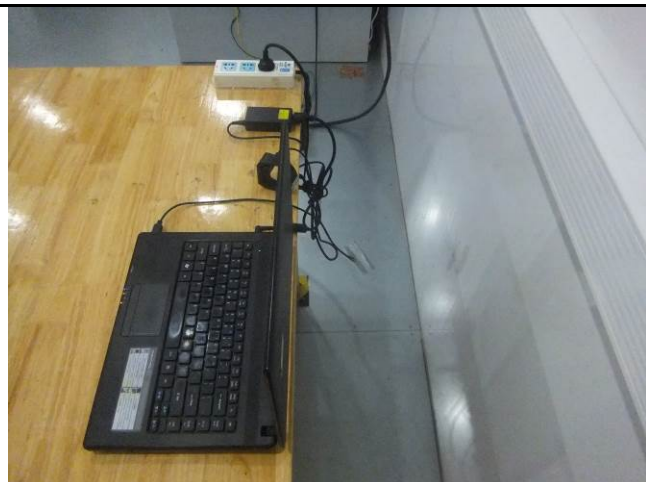


BT Antenna View

Annex B.iii. Photograph: Test Setup Photo



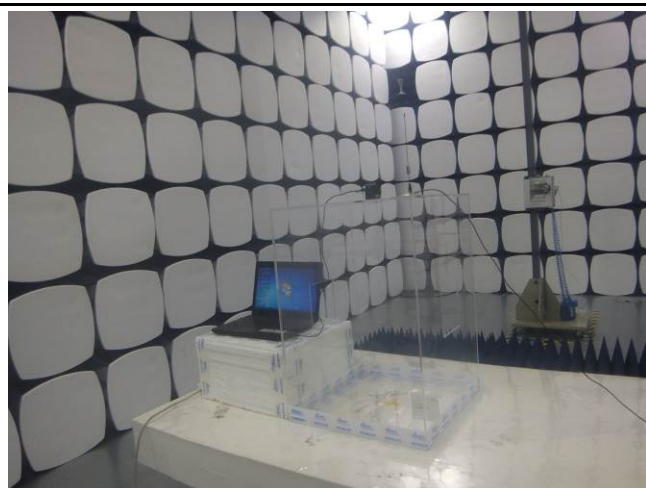
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

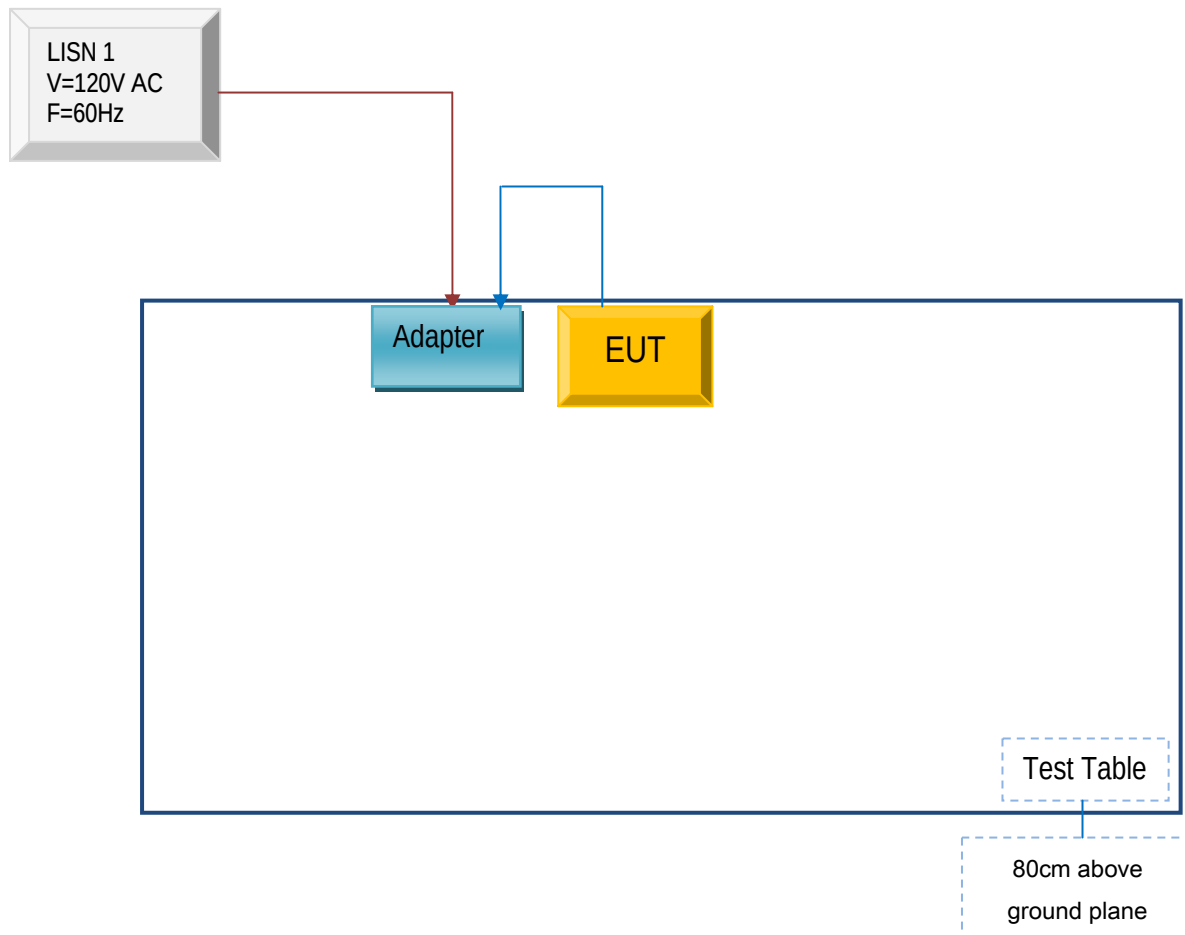


Radiated Spurious Emissions Test Setup Above
1GHz

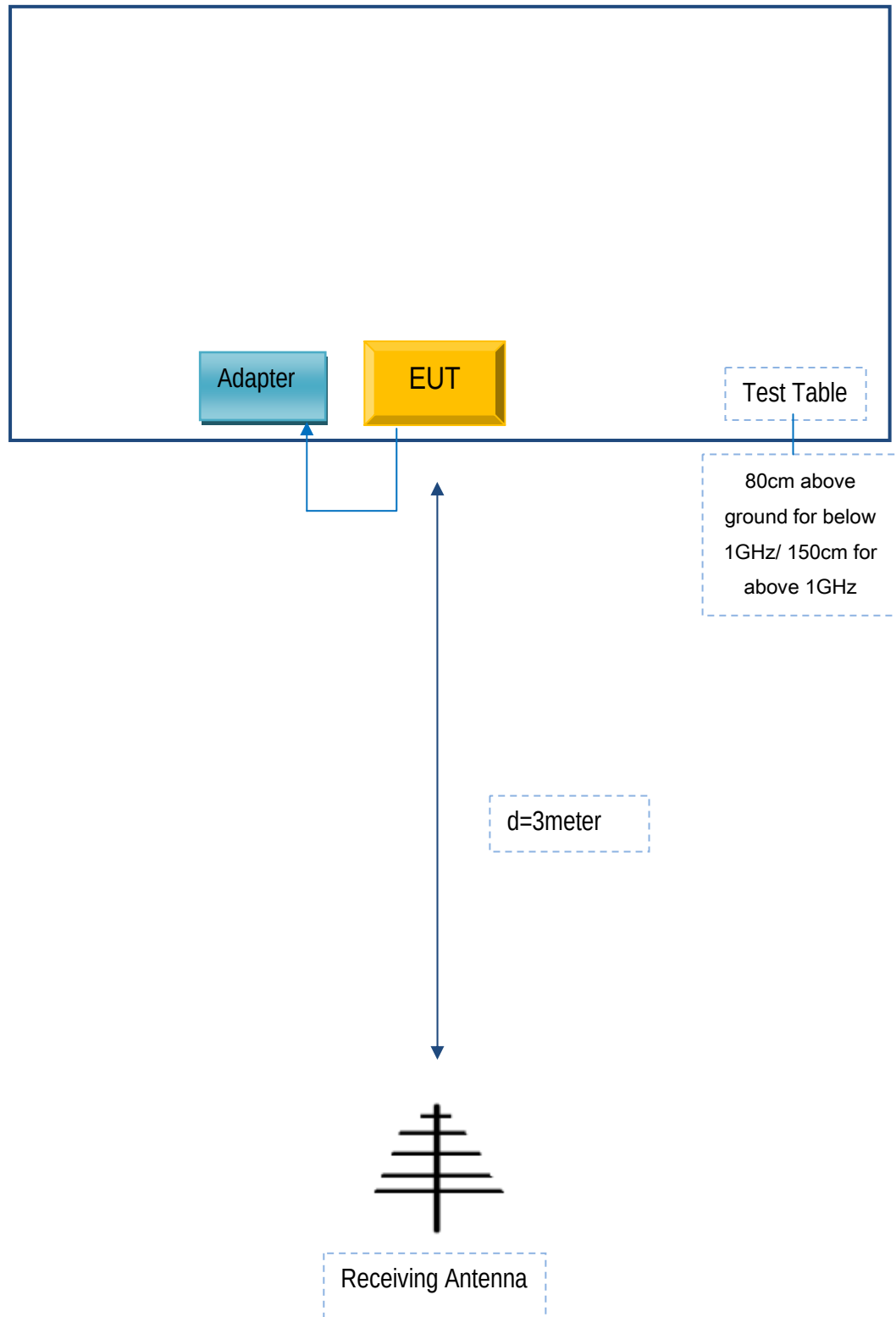
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

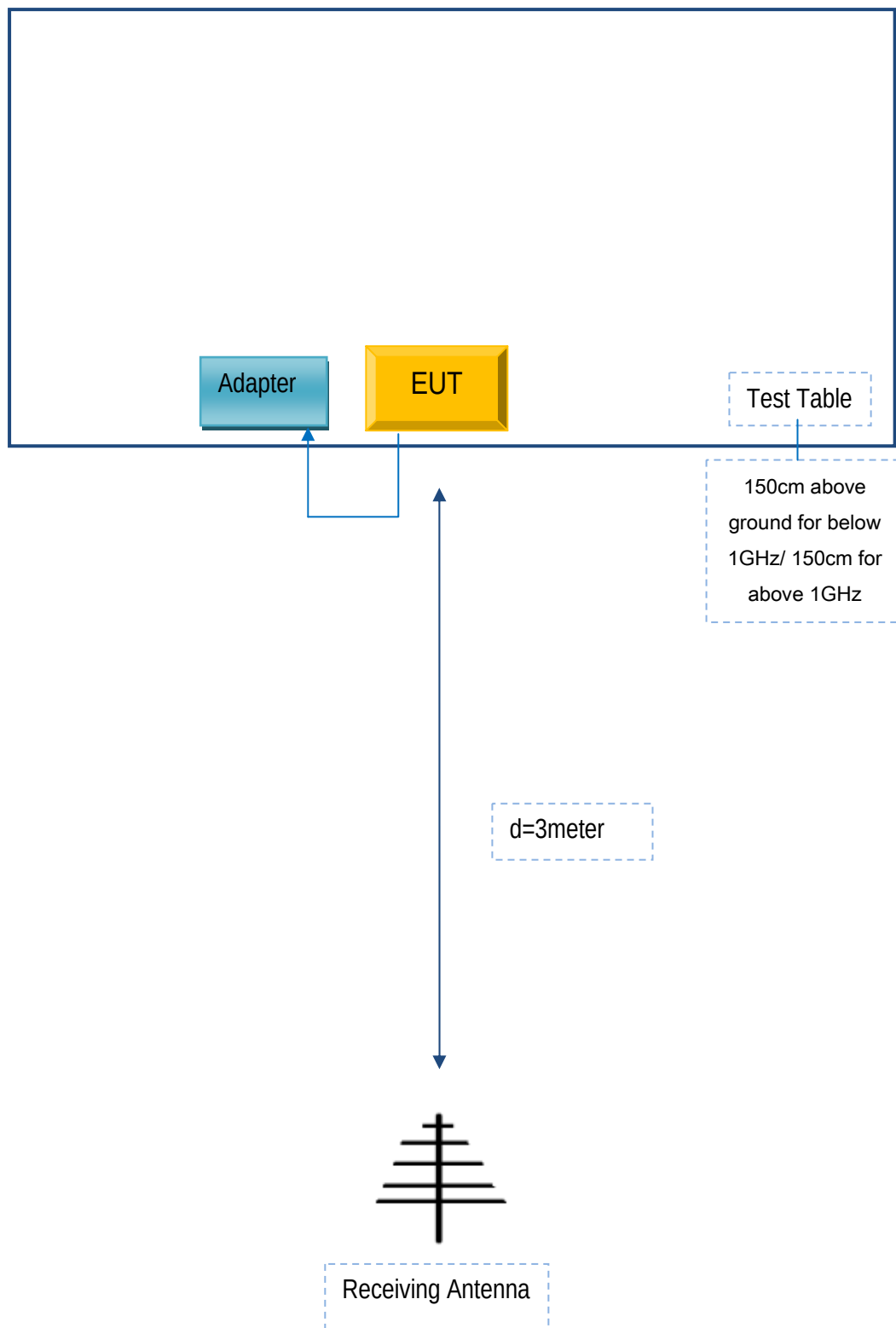
Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions (Below 1GHz)



Block Configuration Diagram for Radiated Emissions (Above 1GHz)



Test Report	1105050-FCC-R1
Page	54 of 56

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
Lenovo	Lenovo Laptop	E40& 0579A52	N/A	N/A

Test Report	1105050-FCC-R1
Page	55 of 56

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

Please see attachment

Test Report	1105050-FCC-R1
Page	56 of 56

Annex E. DECLARATION OF SIMILARITY

N/A