
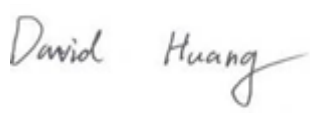



RF TEST REPORT



Report No.: 17070939-FCC-R

Supersede Report No.: N/A

Applicant	HONWA(HK) CORPORATION LIMITED	
Product Name	BLUETOOTH EARPHONE	
Model No.	MBH531	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	September 23 to October 12, 2017	
Issue Date	October 13, 2017	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification	<input checked="" type="checkbox"/>	
Equipment did not comply with the specification	<input type="checkbox"/>	
		
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

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070939-FCC-R	NONE	Original	October 13, 2017

2. Customer information

Applicant Name	HONWA(HK) CORPORATION LIMITED
Applicant Add	MAOGUANG INDUSTRIAL GURAO TOWN CHAOYANG DISTRICT SHANTOU
Manufacturer	HONWA(HK) CORPORATION LIMITED
Manufacturer Add	MAOGUANG INDUSTRIAL GURAO TOWN CHAOYANG DISTRICT SHANTOU

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:	BLUETOOTH EARPHONE
Main Model:	MBH531
Serial Model:	N/A
Date EUT received:	September 22, 2017
Test Date(s):	September 23 to October 12, 2017
Equipment Category :	DSS
Antenna Gain:	-7dBi
Antenna Type:	PCB Antenna
Type of Modulation:	GFSK, π /4DQPSK
RF Operating Frequency (ies):	2402-2480 MHz
Max. Output Power:	-4.594dBm
Number of Channels:	79CH
Port:	USB Port, AUX IN Port, TF-Card Port
Input Power:	Battery: Spec: 3.7V, 450mAh USB: DC 5.0V
Trade Name :	MAGNAVOX
FCC ID:	2AIXC-HW-MBH531

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247(a)(1)	Channel Separation	Compliance
§15.247(a)(1)	20 dB Bandwidth	Compliance
§15.247(b)(1)	Peak Output Power	Compliance
§15.247(a)(1)(iii)	Number of Hopping Channel	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(d)	Band Edge& Restricted Band	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions& Restricted Band	Compliance

Measurement Uncertainty

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

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

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

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

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 1 antenna:

A permanently attached PCB antenna for Bluetooth, the gain is -7dBi for Bluetooth.


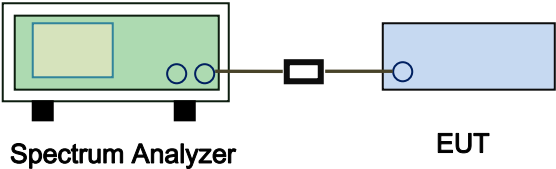
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 29, 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	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> - 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

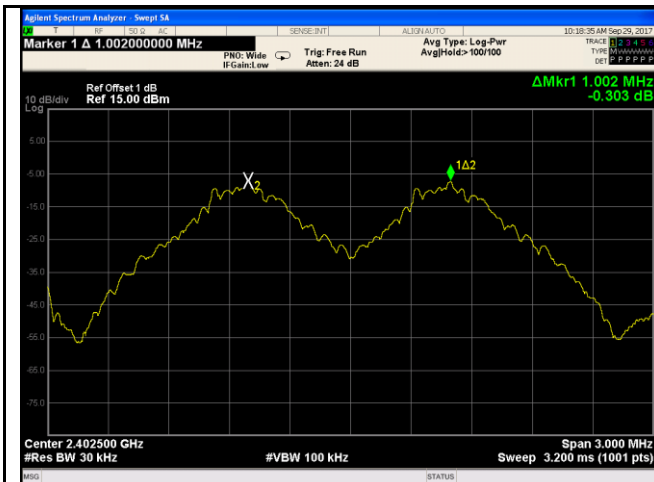
Test Plot ☒ Yes (See below) ☐ N/A

Channel Separation measurement result

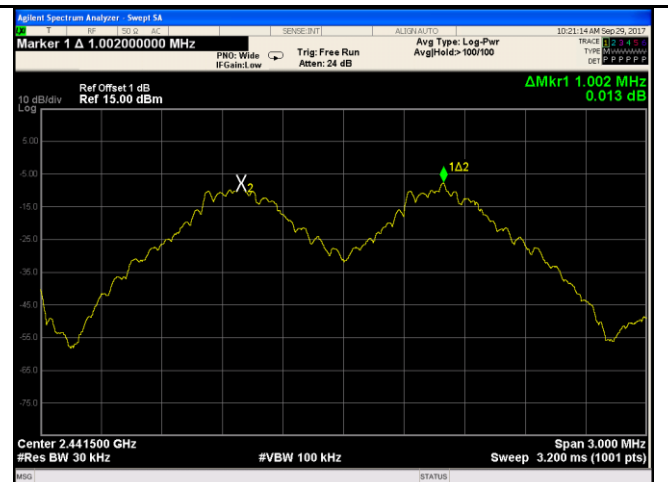
Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.923	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.917	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.918	Pass
	Adjacency Channel	2479			
CH Separation π / 4 DQPSK	Low Channel	2402	1.002	0.815	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.835	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.817	Pass
	Adjacency Channel	2479			

Test Plots

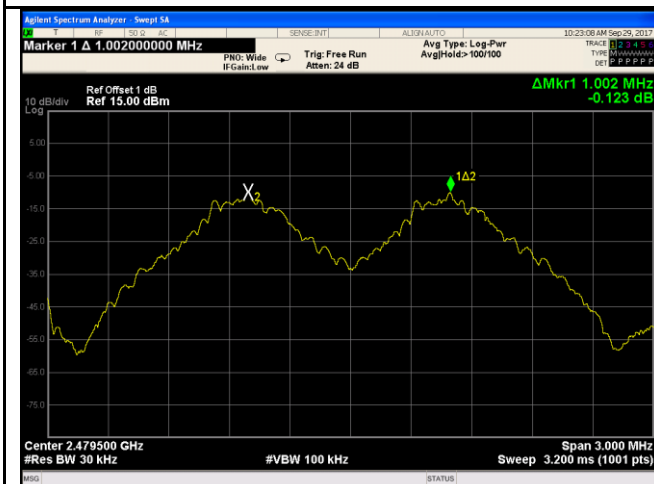
Channel Separation measurement result



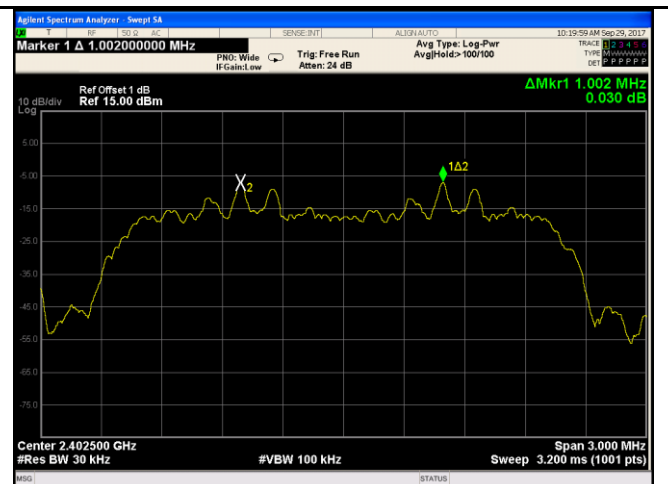
GFSK - Low Channel



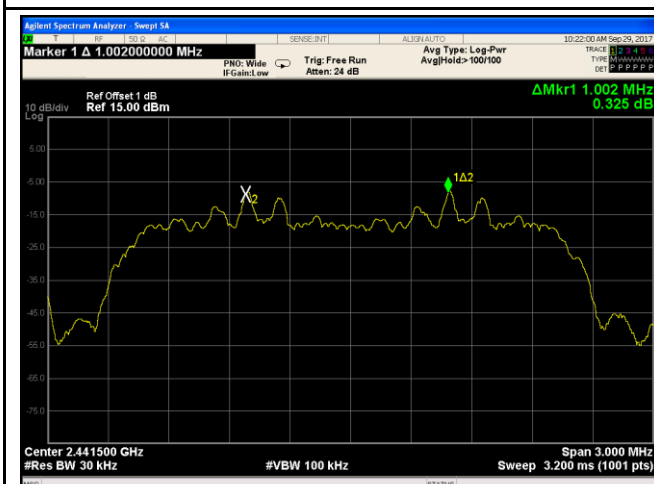
GFSK - Middle Channel



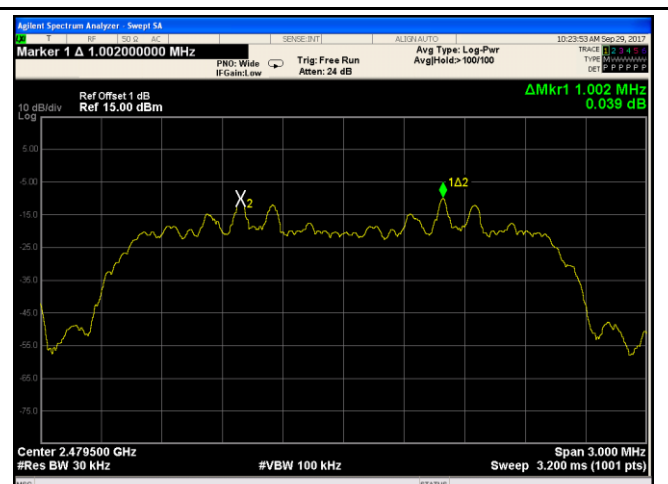
GFSK - High Channel



$\pi/4$ DPSK - Low Channel



$\pi/4$ DQPSK - Middle Channel


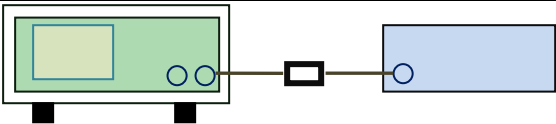


$\pi/4$ DQPSK - High Channel

6.3 20dB Bandwidth

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 29, 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	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer settings:</u></p> <ul style="list-style-type: none"> - 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

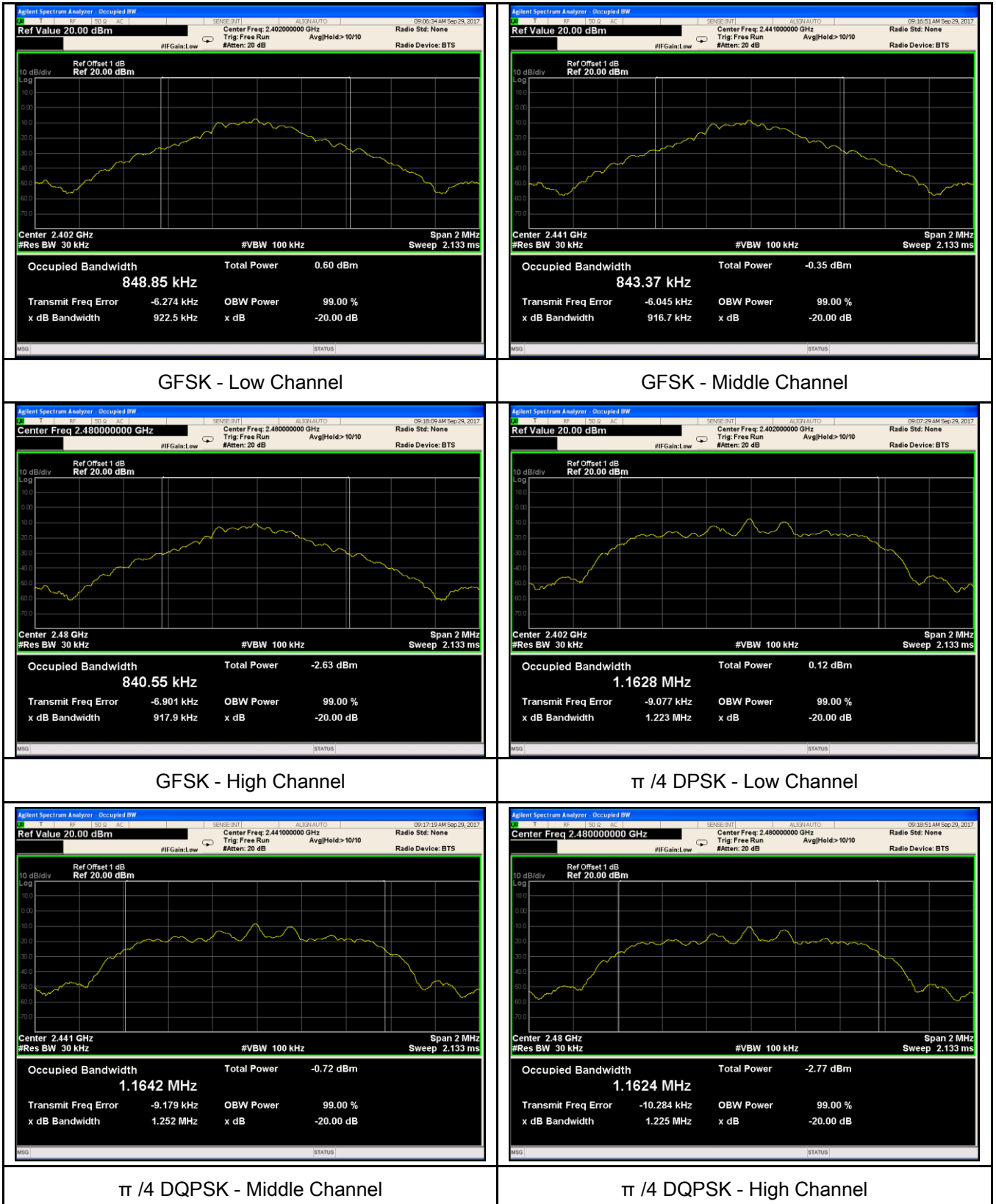
Test Plot ☒ Yes (See below) ☐ N/A

Measurement result

Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.923	0.8489
	Mid	2441	0.917	0.8434
	High	2480	0.918	0.8406
$\pi/4$ DQPSK	Low	2402	1.223	1.1628
	Mid	2441	1.252	1.1642
	High	2480	1.225	1.1624

Test Plots

20dB Bandwidth measurement result

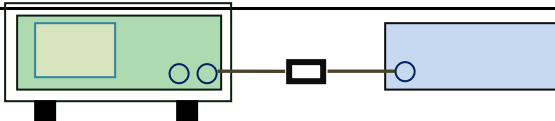


6.4 Peak Output Power

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 29, 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	<input checked="" type="checkbox"/>
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	<input checked="" type="checkbox"/>
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with ≥ 25 & < 50 channels: ≤ 0.25 Watt	<input type="checkbox"/>
	f)	DTS in 902-928MHz, 2400-2483.5MHz: ≤ 1 Watt	<input type="checkbox"/>

Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
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Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <ul style="list-style-type: none"> - 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.
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	<p>- 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.</p>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

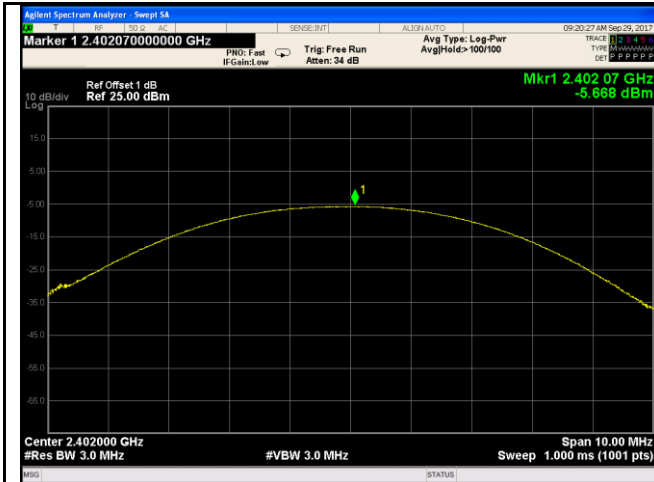
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

Peak Output Power measurement result

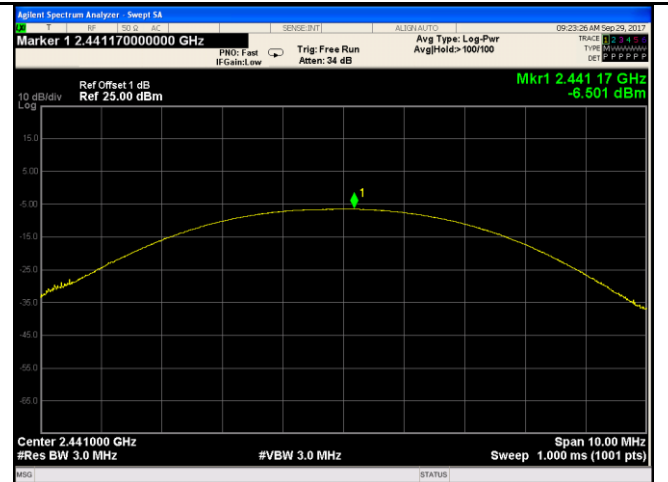
Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	-5.668	1000	Pass
		Mid	2441	-6.501	1000	Pass
		High	2480	-5.613	1000	Pass
	$\pi/4$ DQPSK	Low	2402	-5.038	125	Pass
		Mid	2441	-5.559	125	Pass
		High	2480	-4.594	125	Pass

Test Plots

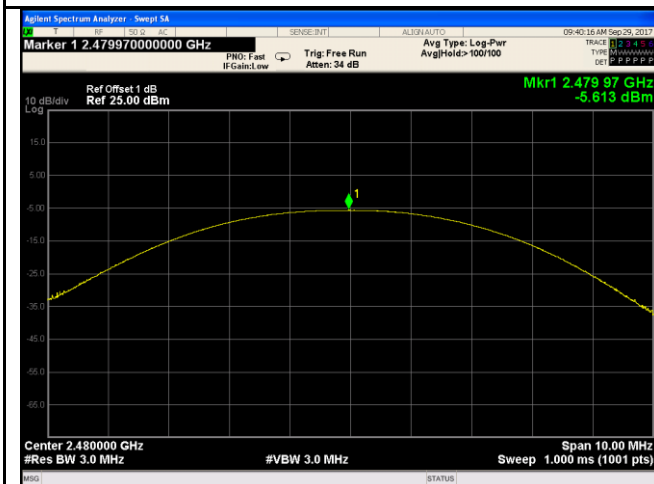
Output Power measurement result



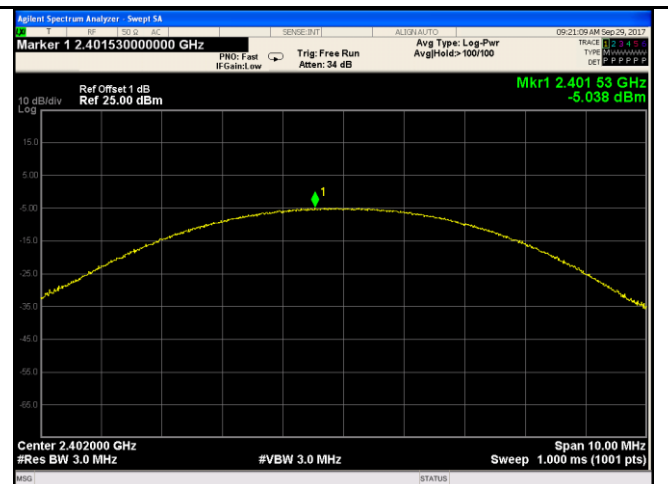
GFSK Output power - Low CH 2402



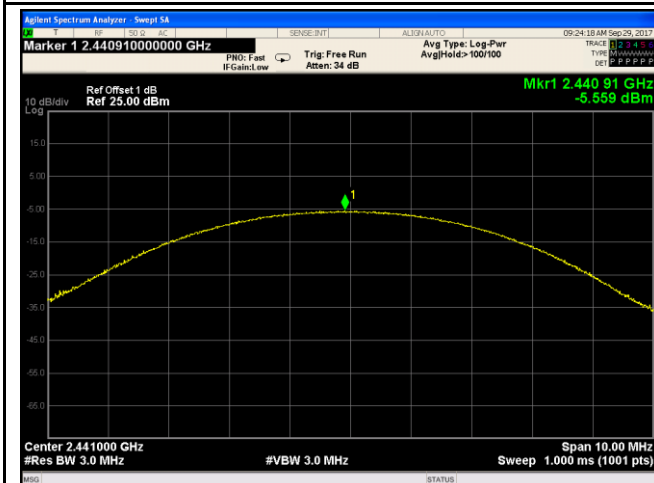
GFSK Output power - Mid CH 2441



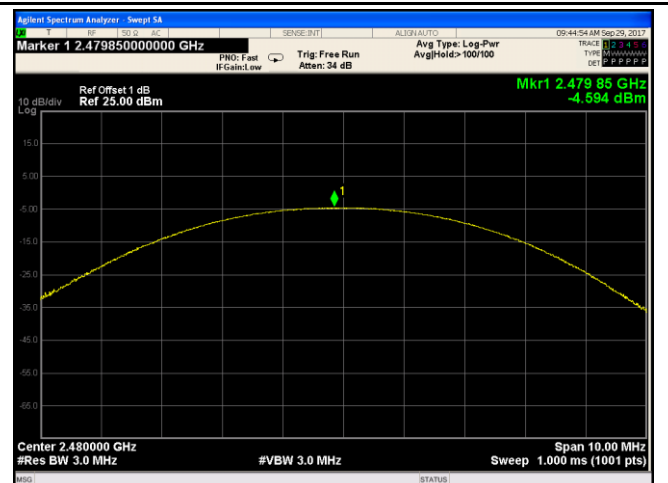
GFSK Output power - High CH 2480



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



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

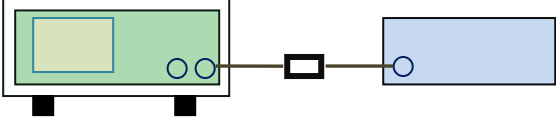


$\pi/4$ DQPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 29, 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	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>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.</p> <ul style="list-style-type: none"> - 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

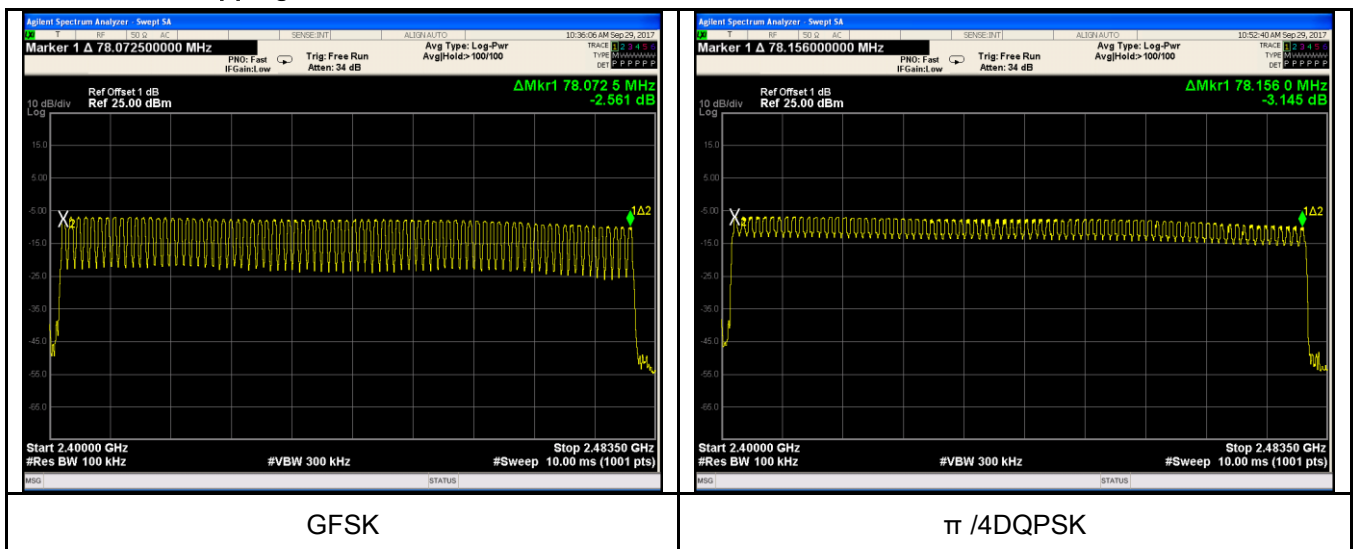
Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

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

Test Plots

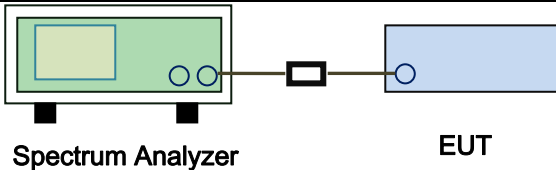
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 29, 2017
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	Dwell Time < 0.4s	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer</u></p> <ul style="list-style-type: none"> - 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

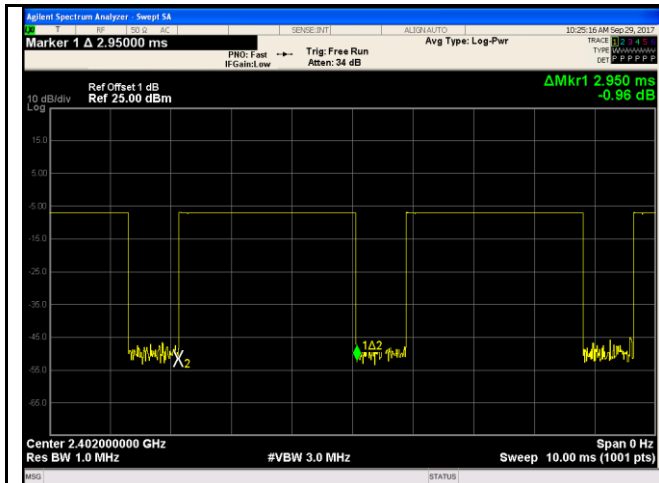
Dwell Time measurement result

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.95	314.667	400	Pass
		Mid	2.95	314.667	400	Pass
		High	2.97	316.800	400	Pass
	π /4 DQPSK	Low	2.98	317.867	400	Pass
		Mid	2.96	315.733	400	Pass
		High	2.96	315.733	400	Pass

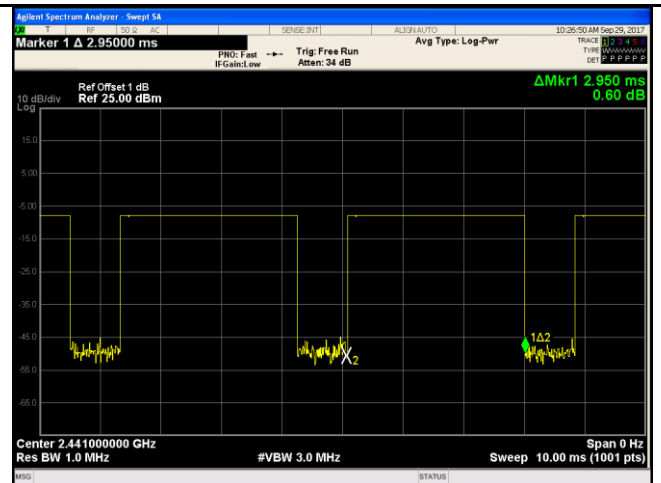
Note: Dwell time=Pulse Time (ms) \times (1600 \div 6 \div 79) \times 31.6

Test Plots

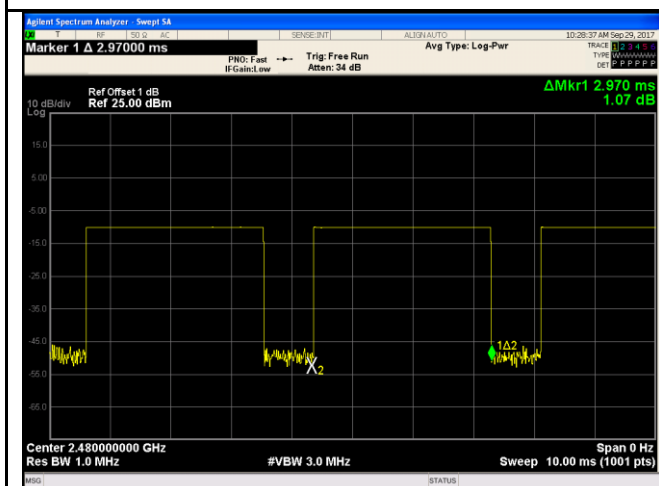
Dwell Time measurement result



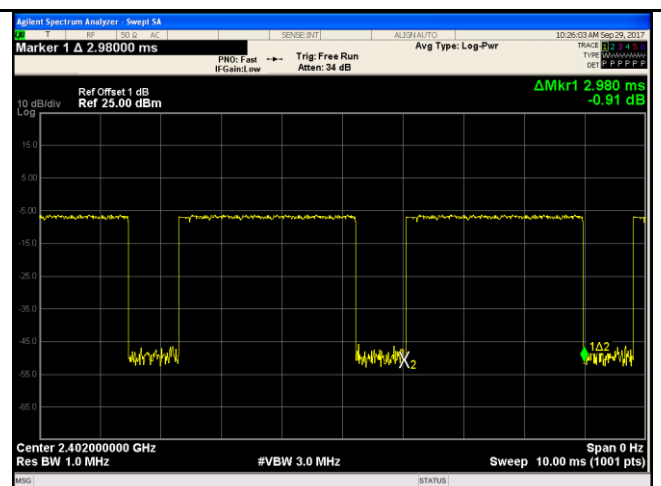
GFSK - Low CH 2402



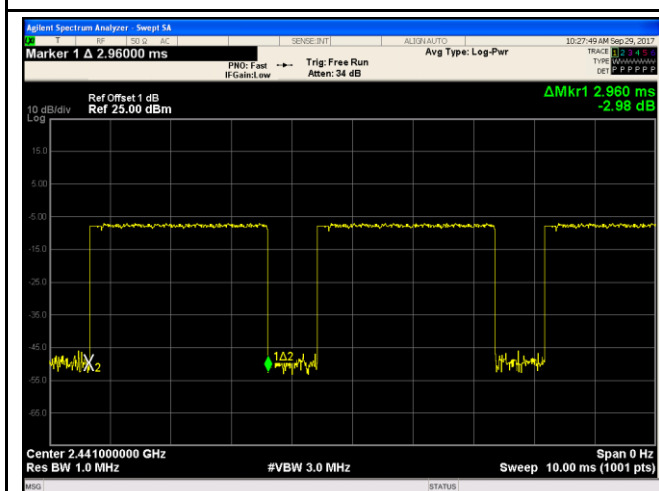
GFSK - Mid CH 2441



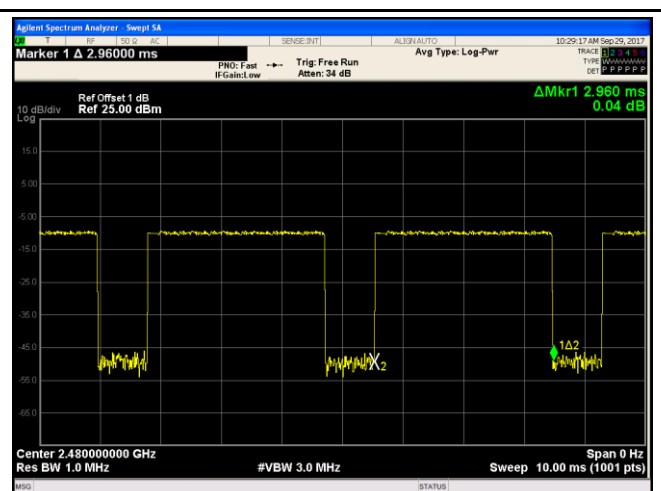
GFSK - High CH 2480



$\pi/4$ DQPSK - Low CH 2402



$\pi/4$ DQPSK - Mid CH 2441



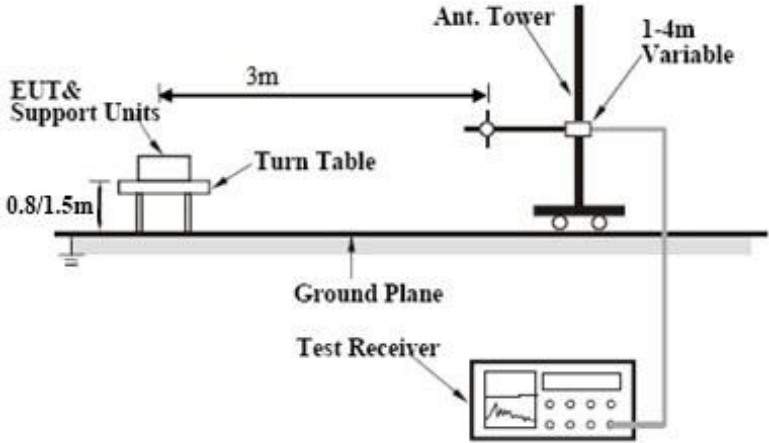
$\pi/4$ DQPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	23°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 28, 2017
Tested By :	Evans He

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. □	<input checked="" type="checkbox"/>

Test Setup	
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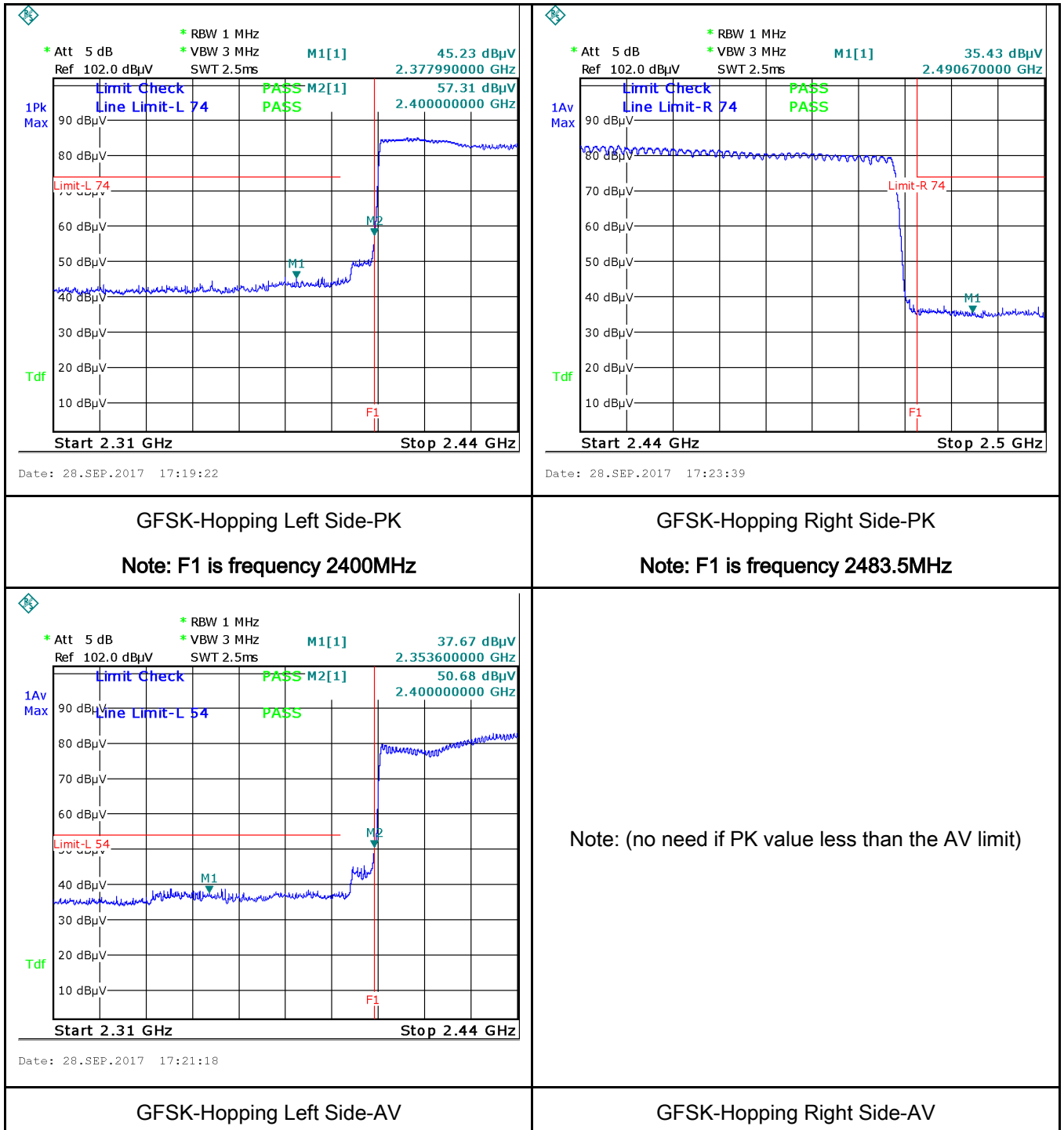
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only</p> <ul style="list-style-type: none"> 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. 2. Position the EUT 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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	<p>and make sure the instrument is operated in its linear range.</p> <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

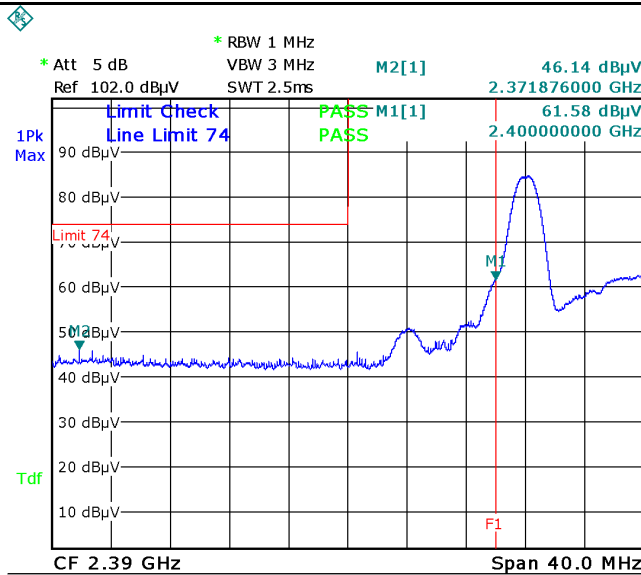
Test Data ☐ Yes ☒ N/A
Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

GFSK Mode:



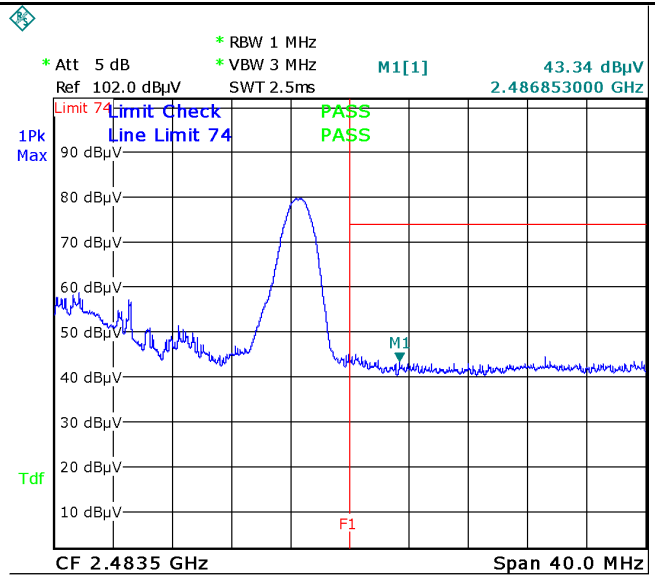
Note: Both Horizontal and vertical polarities were investigated.



Date: 28.SEP.2017 16:46:50

GFSK-Left Side-PK

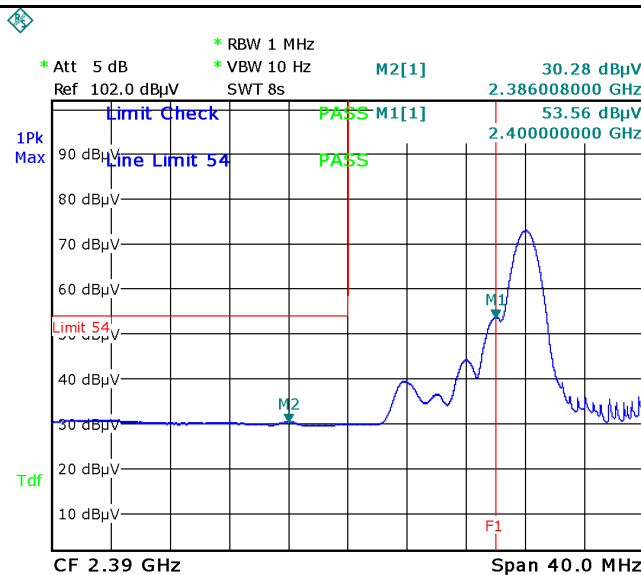
Note: F1 is frequency 2400MHz



Date: 28.SEP.2017 16:55:50

GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



Date: 28.SEP.2017 16:47:42

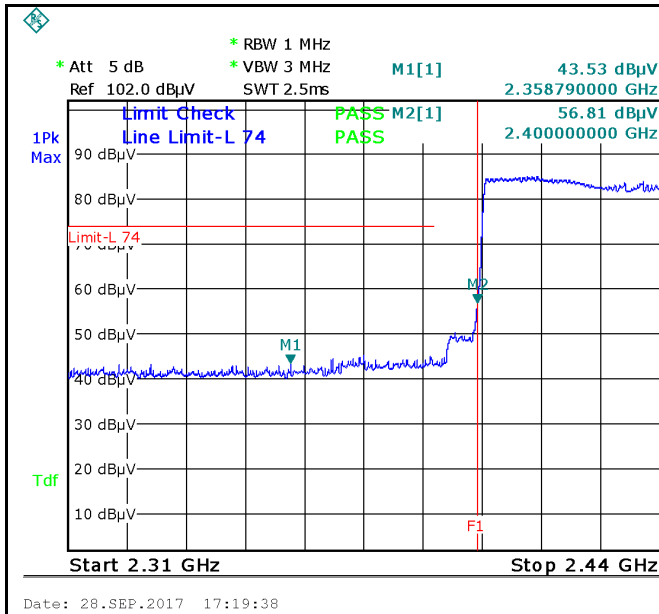
GFSK-Left Side-AV

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

GFSK-Right Side-AV

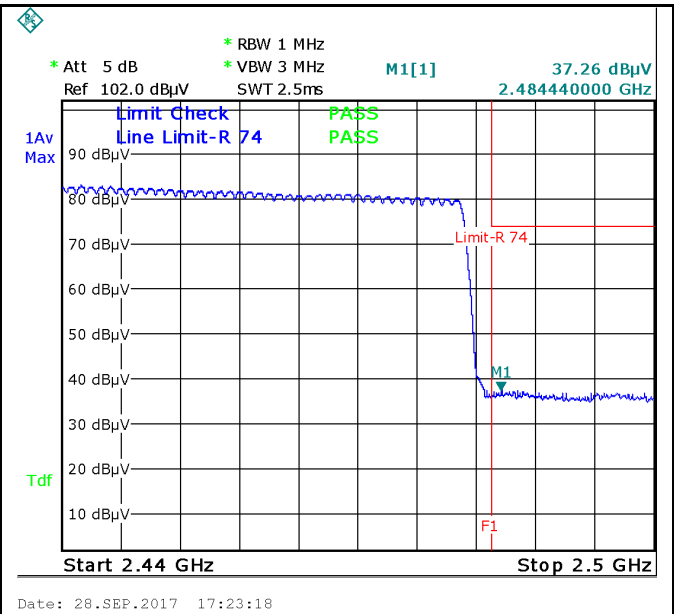
Note: Both Horizontal and vertical polarities were investigated.

$\pi/4$ DQPSK Mode:



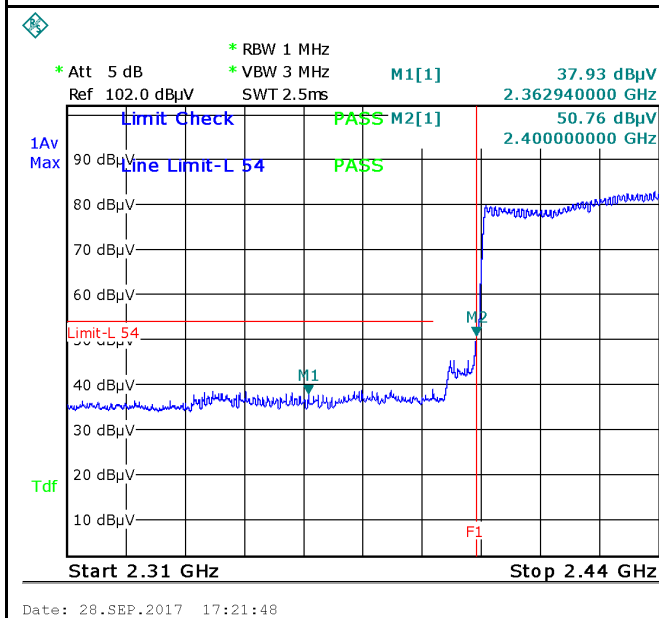
$\pi/4$ DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



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

Note: F1 is frequency 2483.5MHz

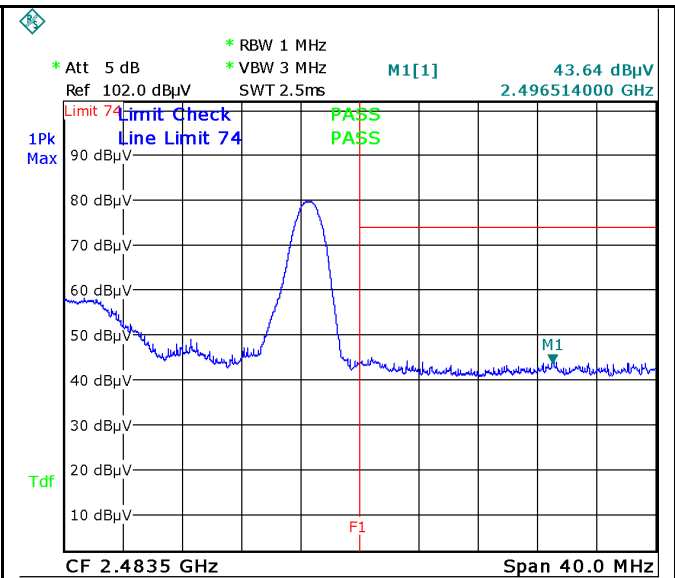
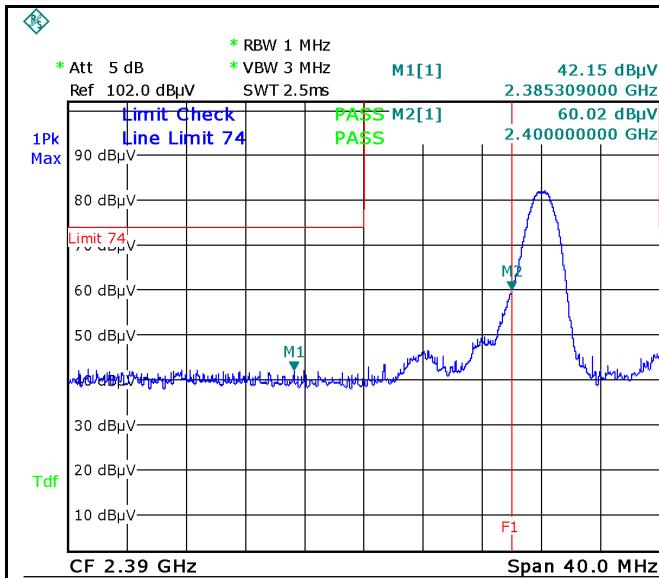


$\pi/4$ DQPSK-Hopping Left-AV

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.

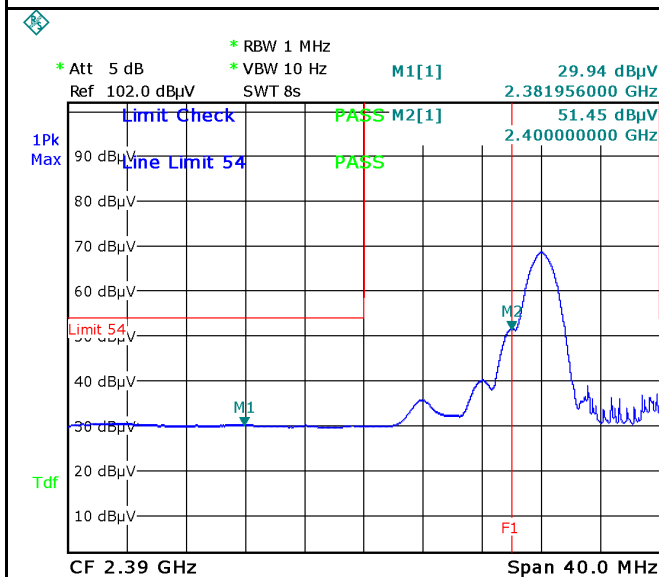


$\pi/4$ DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz

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

Note: F1 is frequency 2483.5MHz



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

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

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

Note: Both Horizontal and vertical polarities were investigated.

6.8 AC Power Line Conducted Emissions

Temperature	23°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 28, 2017
Tested By :	Evans He

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.	<div><input checked="" type="checkbox"/></div>														
		<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															

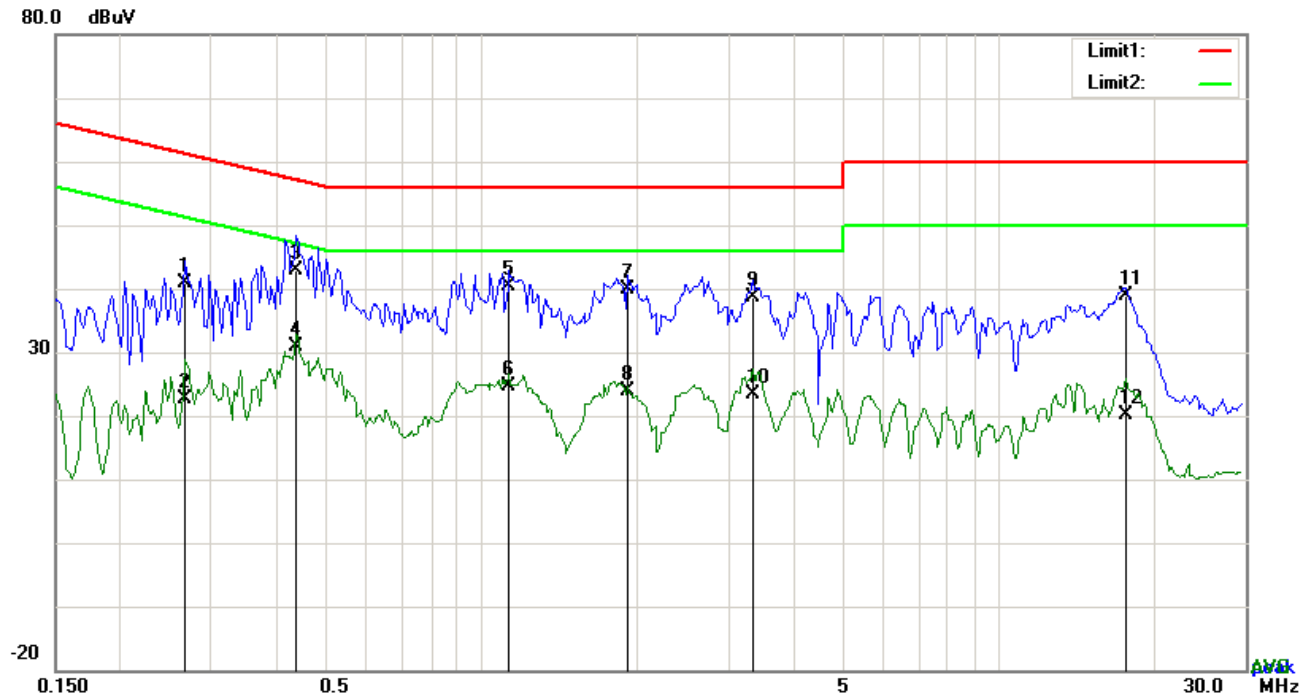
Test Setup	<p>Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p>
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Procedure	<ol style="list-style-type: none"> The EUT and supporting 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

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

Test Mode: Bluetooth Mode

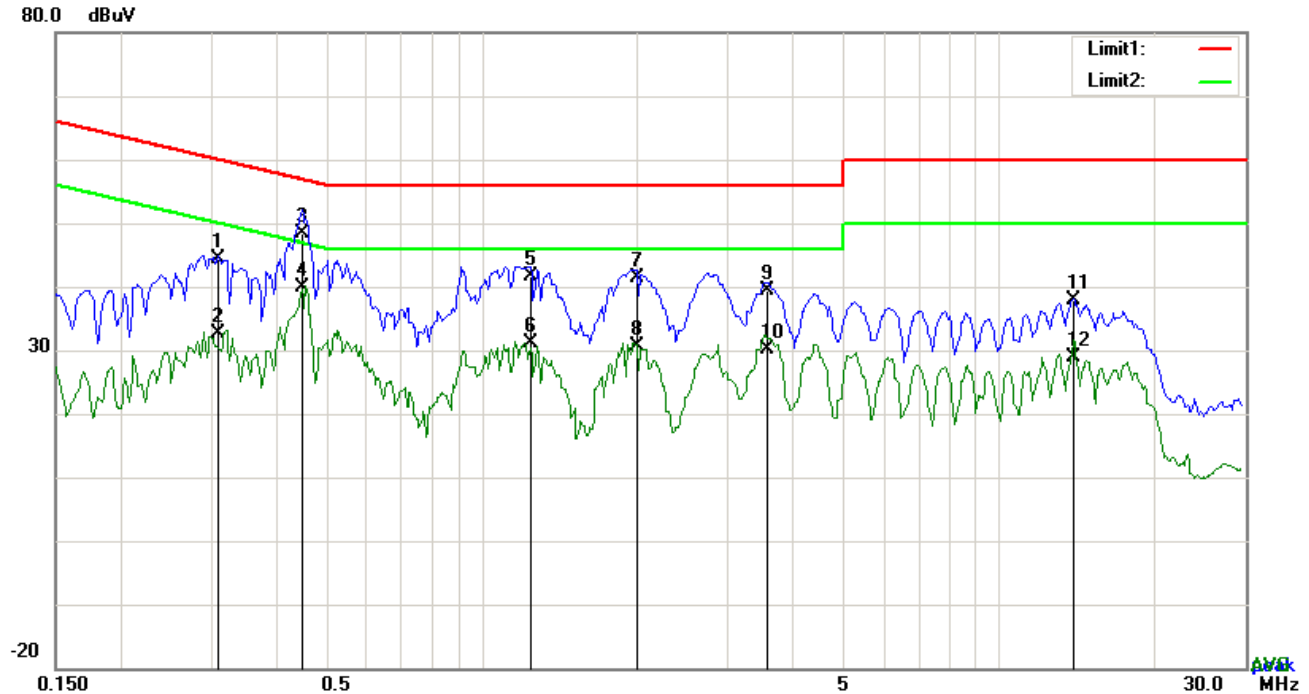


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.2670	30.95	QP	10.03	40.98	61.21	-20.23
2	L1	0.2670	12.52	AVG	10.03	22.55	51.21	-28.66
3	L1	0.4386	32.92	QP	10.03	42.95	57.09	-14.14
4	L1	0.4386	20.78	AVG	10.03	30.81	47.09	-16.28
5	L1	1.1328	30.25	QP	10.03	40.28	56.00	-15.72
6	L1	1.1328	14.71	AVG	10.03	24.74	46.00	-21.26
7	L1	1.9167	29.96	QP	10.04	40.00	56.00	-16.00
8	L1	1.9167	13.83	AVG	10.04	23.87	46.00	-22.13
9	L1	3.3627	28.56	QP	10.06	38.62	56.00	-17.38
10	L1	3.3627	13.20	AVG	10.06	23.26	46.00	-22.74
11	L1	17.5860	28.68	QP	10.26	38.94	60.00	-21.06
12	L1	17.5860	9.97	AVG	10.26	20.23	50.00	-29.77

Test Mode: Bluetooth Mode

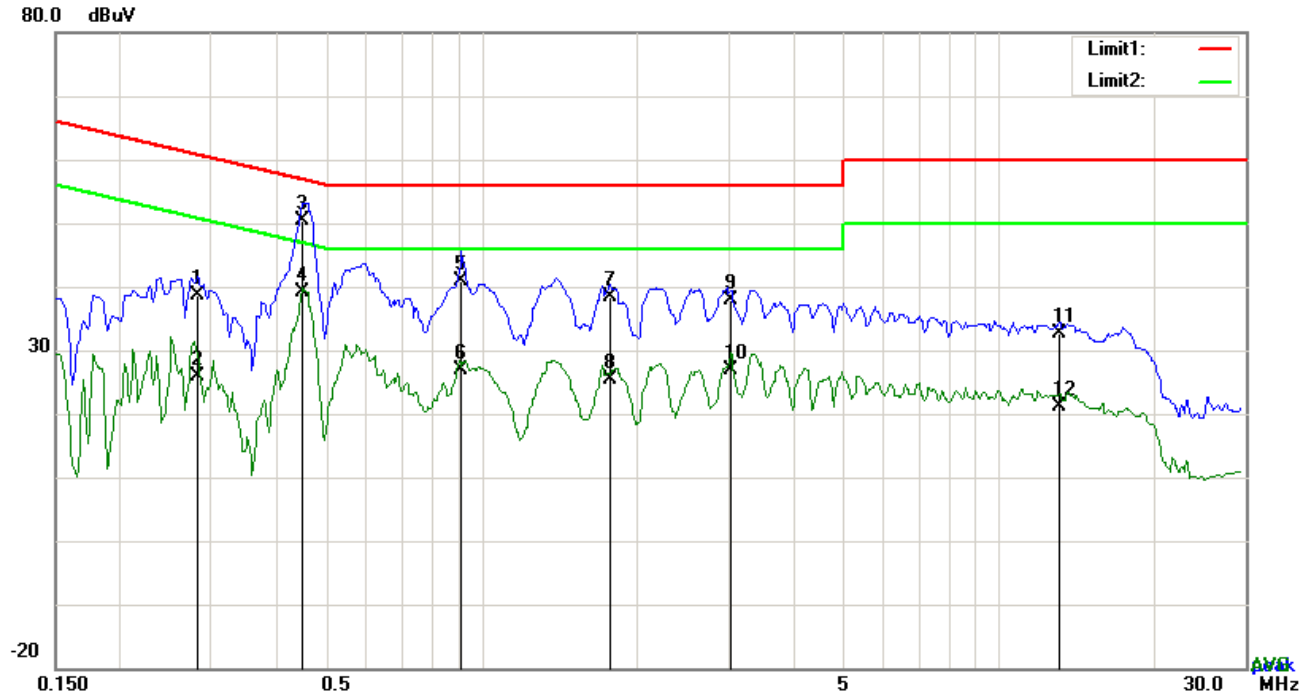


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	N	0.3099	34.41	QP	10.02	44.43	59.97	-15.54
2	N	0.3099	22.53	AVG	10.02	32.55	49.97	-17.42
3	N	0.4503	38.32	QP	10.02	48.34	56.87	-8.53
4	N	0.4503	29.75	AVG	10.02	39.77	46.87	-7.10
5	N	1.2459	31.56	QP	10.03	41.59	56.00	-14.41
6	N	1.2459	21.02	AVG	10.03	31.05	46.00	-14.95
7	N	2.0064	31.31	QP	10.04	41.35	56.00	-14.65
8	N	2.0064	20.61	AVG	10.04	30.65	46.00	-15.35
9	N	3.5811	29.37	QP	10.06	39.43	56.00	-16.57
10	N	3.5811	20.01	AVG	10.06	30.07	46.00	-15.93
11	N	13.9707	27.80	QP	10.19	37.99	60.00	-22.01
12	N	13.9707	18.59	AVG	10.19	28.78	50.00	-21.22

Test Mode: Bluetooth Mode

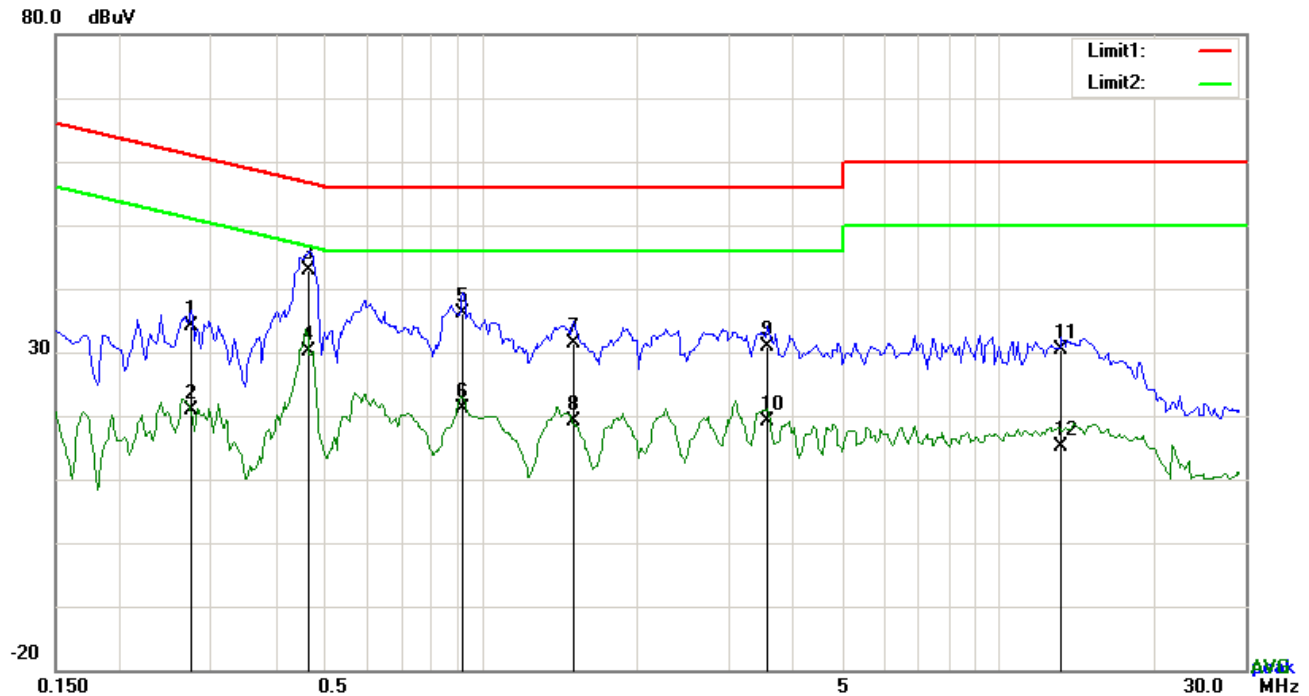


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB)	(dBuV)	(dBuV)	(dB)
1	L1	0.2826	28.66	QP	10.03	38.69	60.74	-22.05
2	L1	0.2826	15.93	AVG	10.03	25.96	50.74	-24.78
3	L1	0.4503	40.34	QP	10.03	50.37	56.87	-6.50
4	L1	0.4503	29.01	AVG	10.03	39.04	46.87	-7.83
5	L1	0.9144	30.88	QP	10.03	40.91	56.00	-15.09
6	L1	0.9144	16.86	AVG	10.03	26.89	46.00	-19.11
7	L1	1.7802	28.44	QP	10.04	38.48	56.00	-17.52
8	L1	1.7802	15.33	AVG	10.04	25.37	46.00	-20.63
9	L1	3.0390	27.94	QP	10.06	38.00	56.00	-18.00
10	L1	3.0390	16.72	AVG	10.06	26.78	46.00	-19.22
11	L1	13.1244	22.36	QP	10.20	32.56	60.00	-27.44
12	L1	13.1244	11.01	AVG	10.20	21.21	50.00	-28.79

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	0.2748	24.08	QP	10.03	34.11	60.97	-26.86
2	N	0.2748	10.89	AVG	10.03	20.92	50.97	-30.05
3	N	0.4659	32.82	QP	10.03	42.85	56.59	-13.74
4	N	0.4659	20.02	AVG	10.03	30.05	46.59	-16.54
5	N	0.9222	26.08	QP	10.03	36.11	56.00	-19.89
6	N	0.9222	11.22	AVG	10.03	21.25	46.00	-24.75
7	N	1.5033	21.35	QP	10.04	31.39	56.00	-24.61
8	N	1.5033	9.19	AVG	10.04	19.23	46.00	-26.77
9	N	3.5694	20.70	QP	10.06	30.76	56.00	-25.24
10	N	3.5694	9.11	AVG	10.06	19.17	46.00	-26.83
11	N	13.2024	20.09	QP	10.20	30.29	60.00	-29.71
12	N	13.2024	4.83	AVG	10.20	15.03	50.00	-34.97

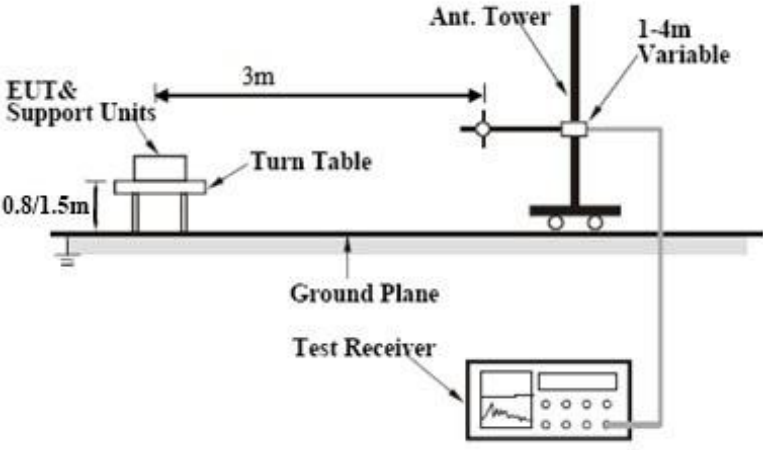
6.9 Radiated Emissions & Restricted Band

Temperature	23°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	September 28, 2017
Tested By :	Evans He

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	<p>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.</p>
------------	--

	
Procedure	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Result:

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

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

Note:

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

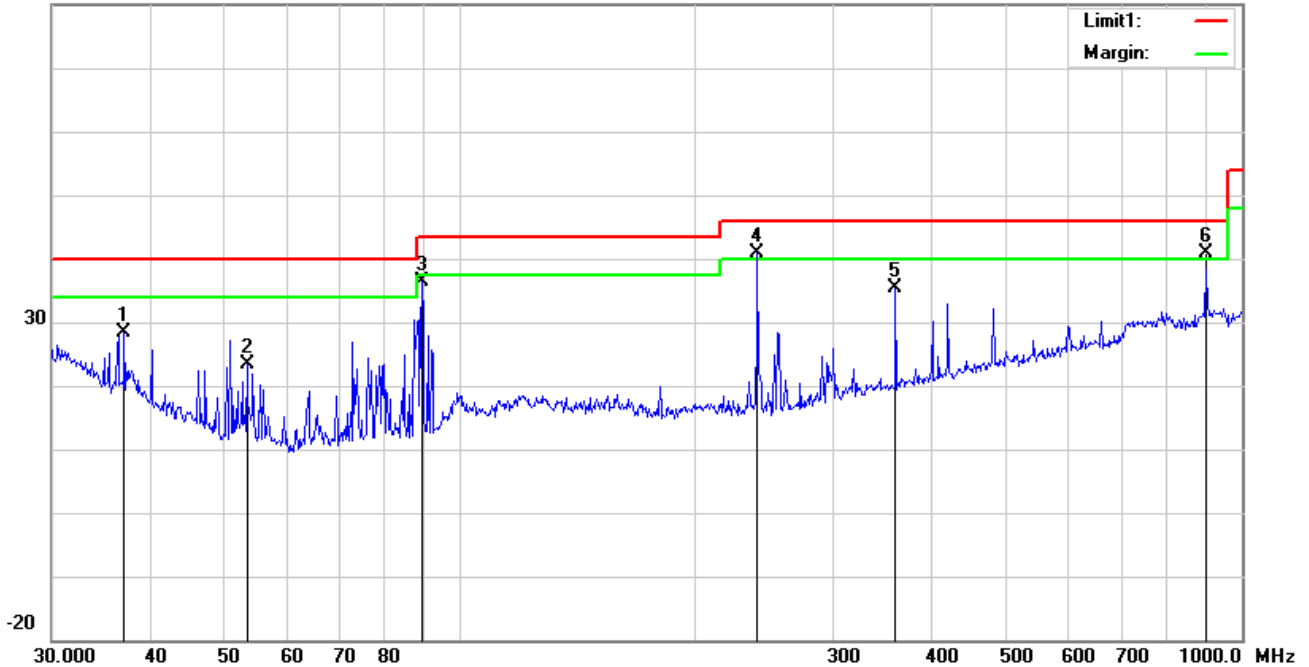
Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

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

Test Mode: Bluetooth Mode

30MHz -1GHz

80.0 dBuV/m



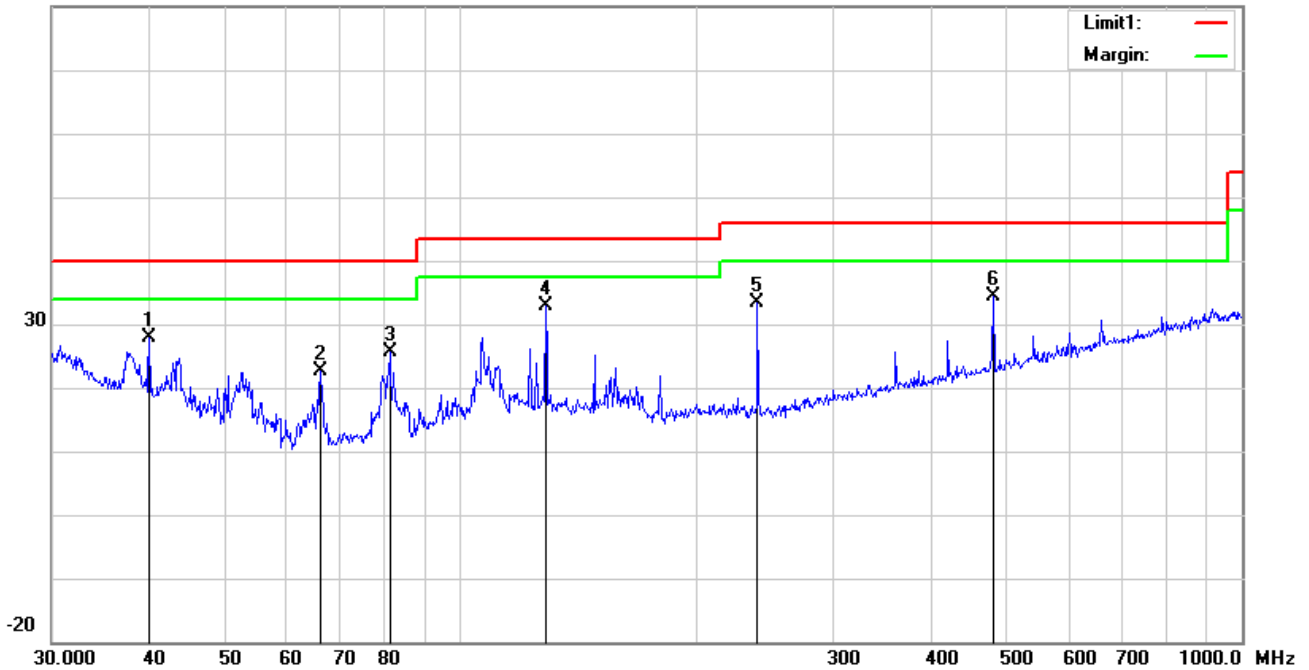
Test Data

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	37.1550	33.86	peak	15.98	22.26	0.77	28.35	40.00	-11.65	100	305
2	H	53.3179	37.03	peak	8.04	22.39	0.79	23.47	40.00	-16.53	100	256
3	H	89.2764	49.77	peak	7.97	22.33	0.97	36.38	43.50	-7.12	100	51
4	H	239.9873	49.90	QP	11.54	22.31	1.67	40.80	46.00	-5.20	100	349
5	H	360.4477	40.51	peak	14.87	22.12	2.03	35.29	46.00	-10.71	100	227
6	H	900.1474	36.16	QP	22.50	20.88	3.07	40.85	46.00	-5.15	100	238

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	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	V	39.9942	35.55	peak	13.90	22.28	0.79	27.96	40.00	-12.04	100	53
2	V	66.2662	36.43	peak	7.61	22.39	0.91	22.56	40.00	-17.44	100	163
3	V	81.2117	39.39	peak	7.65	22.41	1.05	25.68	40.00	-14.32	100	224
4	V	128.5630	40.75	peak	13.34	22.38	1.19	32.90	43.50	-10.60	100	225
5	V	239.9873	42.58	peak	11.54	22.31	1.67	33.48	46.00	-12.52	200	180
6	V	480.5276	36.73	peak	17.31	21.85	2.31	34.50	46.00	-11.50	100	200

Above 1GHz

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

Low Channel: $\pi/4$ DQPSK Mode (Worst Case) (2402 MHz)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4804	40.25	AV	V	33.39	7.22	48.46	32.4	54	-21.6
4804	38.72	AV	H	33.39	7.22	48.46	30.87	54	-23.13
4804	56.74	PK	V	33.39	7.22	48.46	48.89	74	-25.11
4804	54.32	PK	H	33.39	7.22	48.46	46.47	74	-27.53
8533	34.81	AV	V	37.74	7.89	47.8	32.64	54	-21.36
8533	32.06	AV	H	37.74	7.89	47.8	29.89	54	-24.11
8533	48.71	PK	V	37.74	7.89	47.8	46.54	74	-27.46
8533	46.52	PK	H	37.74	7.89	47.8	44.35	74	-29.65

Middle Channel: $\pi/4$ DQPSK Mode (Worst Case) (2441 MHz)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4882	39.12	AV	V	33.62	7.53	48.36	31.91	54	-22.09
4882	38.62	AV	H	33.62	7.53	48.36	31.41	54	-22.59
4882	57.21	PK	V	33.62	7.53	48.36	50	74	-24
4882	55.43	PK	H	33.62	7.53	48.36	48.22	74	-25.78
9469	26.19	AV	V	38.99	9.67	48.16	26.69	54	-27.31
9469	24.51	AV	H	38.99	9.67	48.16	25.01	54	-28.99
9469	44.3	PK	V	38.99	9.67	48.16	44.8	74	-29.2
9469	42.85	PK	H	38.99	9.67	48.16	43.35	74	-30.65

High Channel: $\pi/4$ DQPSK Mode (Worst Case) (2480 MHz)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4960	39.54	AV	V	33.89	7.86	48.31	32.98	54	-21.02
4960	36.12	AV	H	33.89	7.86	48.31	29.56	54	-24.44
4960	59.23	PK	V	33.89	7.86	48.31	52.67	74	-21.33
4960	56.32	PK	H	33.89	7.86	48.31	49.76	74	-24.24
17533	19.42	AV	V	41.99	17	46.01	32.4	54	-21.6
17533	18.69	AV	H	41.99	17	46.01	31.67	54	-22.33
17533	35.74	PK	V	41.99	17	46.01	48.72	74	-25.28
17533	34.62	PK	H	41.99	17	46.01	47.6	74	-26.4

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	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>
ISN	ISN T800	34373	09/23/2017	09/22/2018	<input type="checkbox"/>
Transient Limiter	LIT-153	531118	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Radiated Emissions					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	<input checked="" type="checkbox"/>
Horn Antenna	BBHA9170	3145226D1	09/27/2017	09/26/2018	<input checked="" type="checkbox"/>
Active Antenna (9kHz-30MHz)	AL-130	121031	10/13/2016	10/12/2017	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

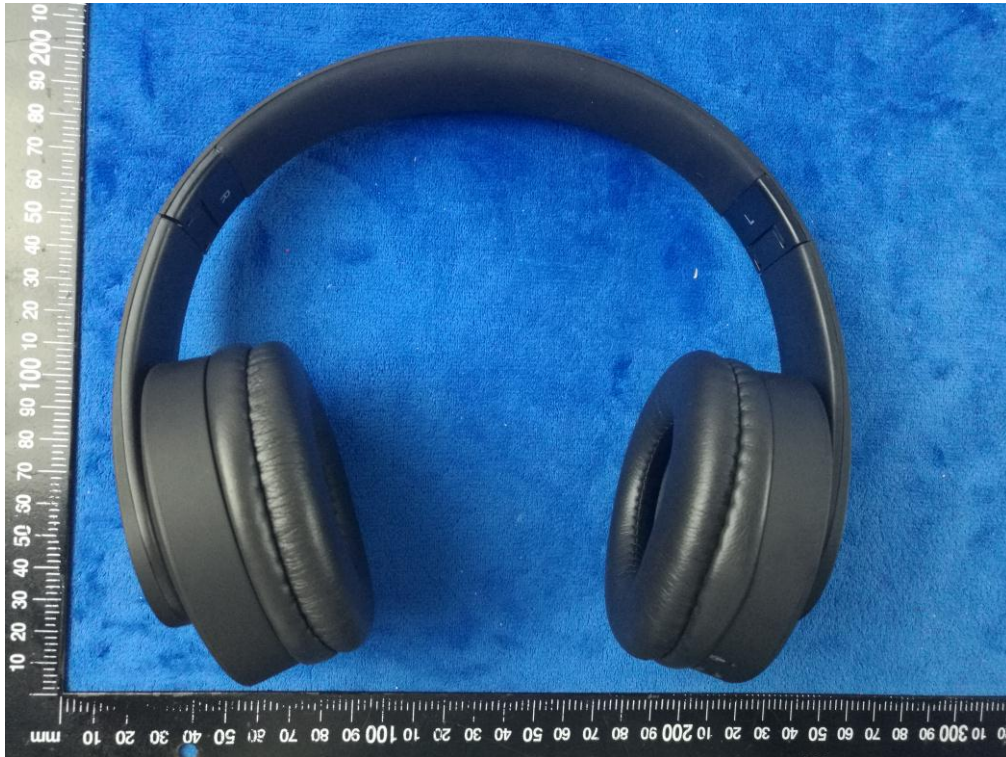
Whole Package View



EUT - Front View



EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

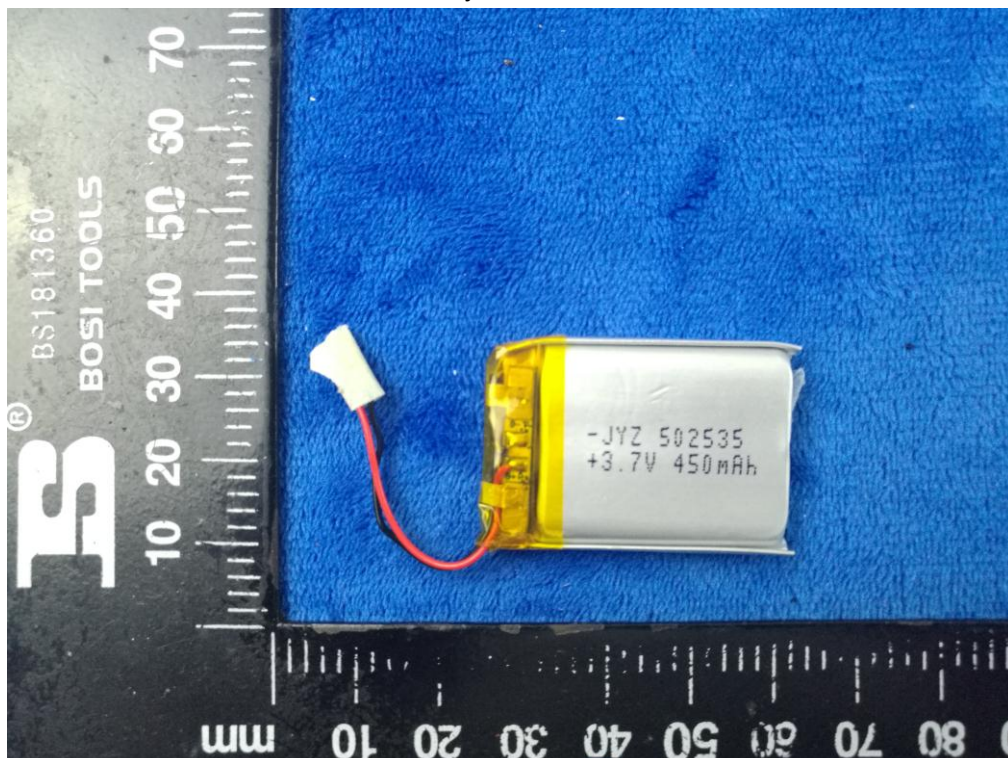


Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View



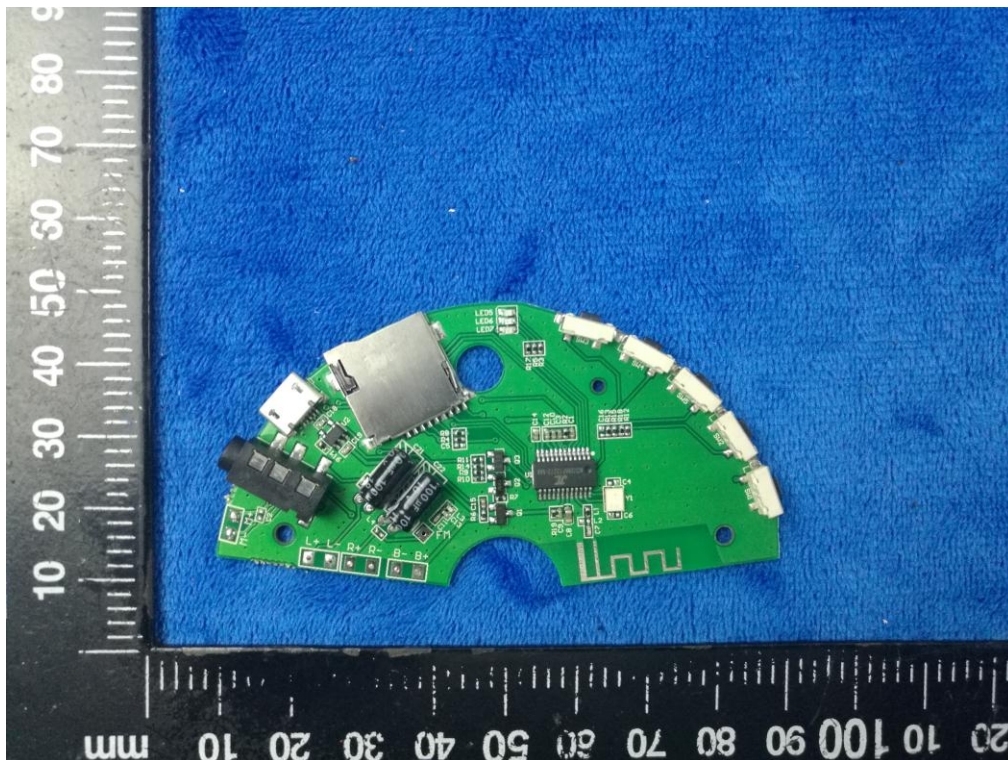
Battery - Front View



Battery - Rear View



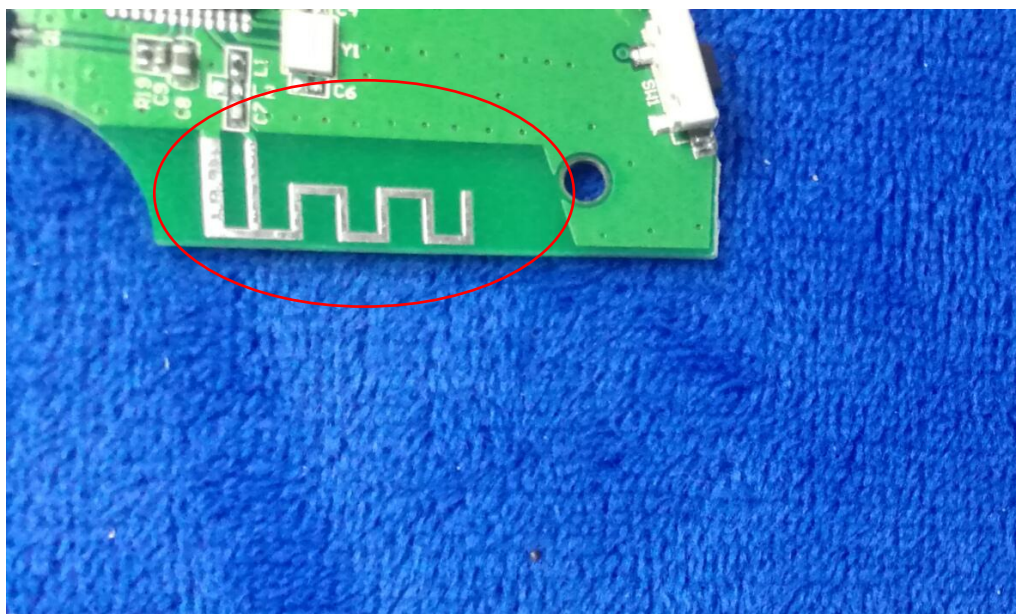
Mainboard - Front View



Mainboard – Rear View



Antenna View



Annex B.iii. Photograph: Test Setup Photo



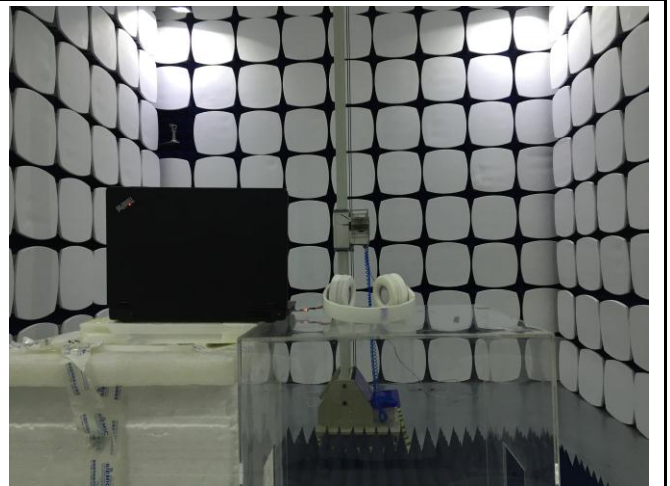
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

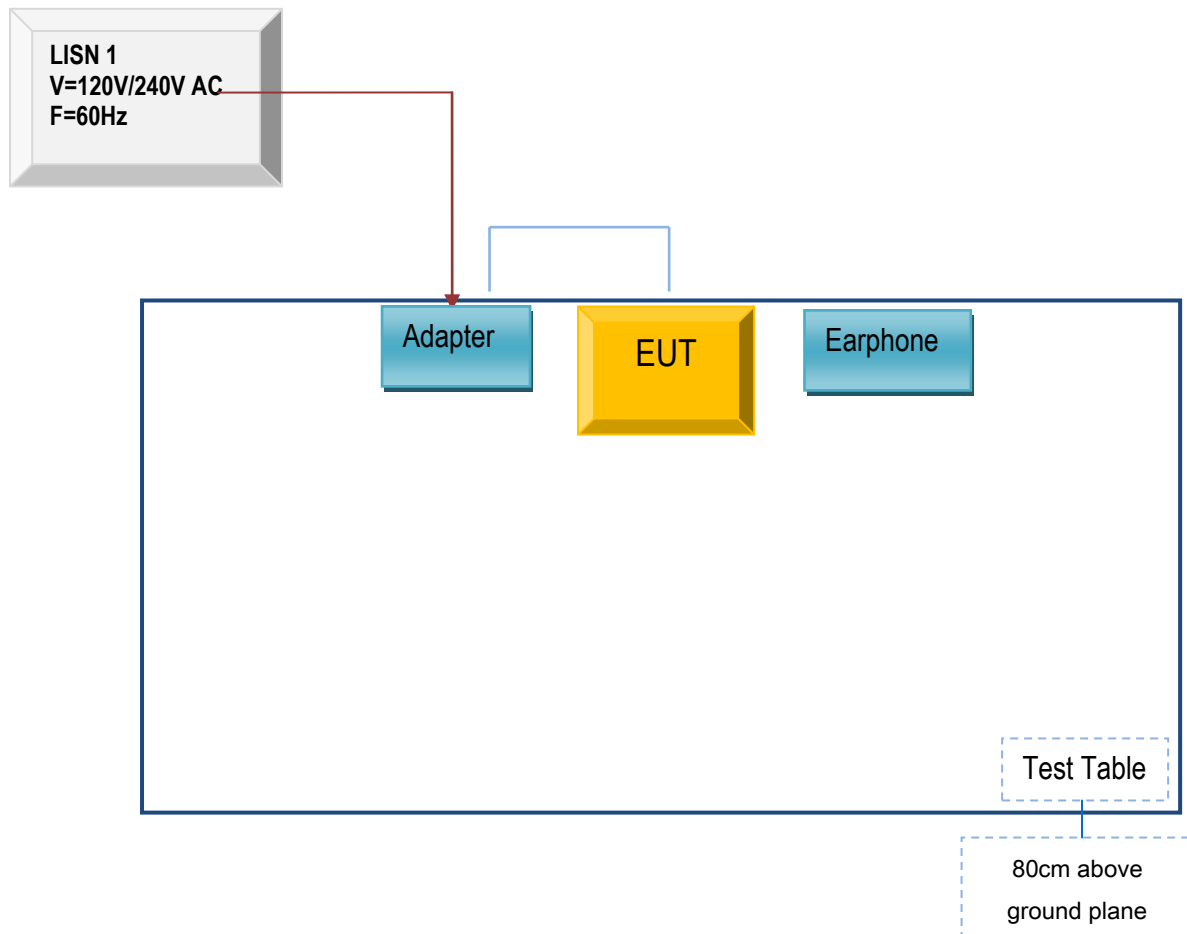


Radiated Spurious Emissions Test Setup Above
1GHz

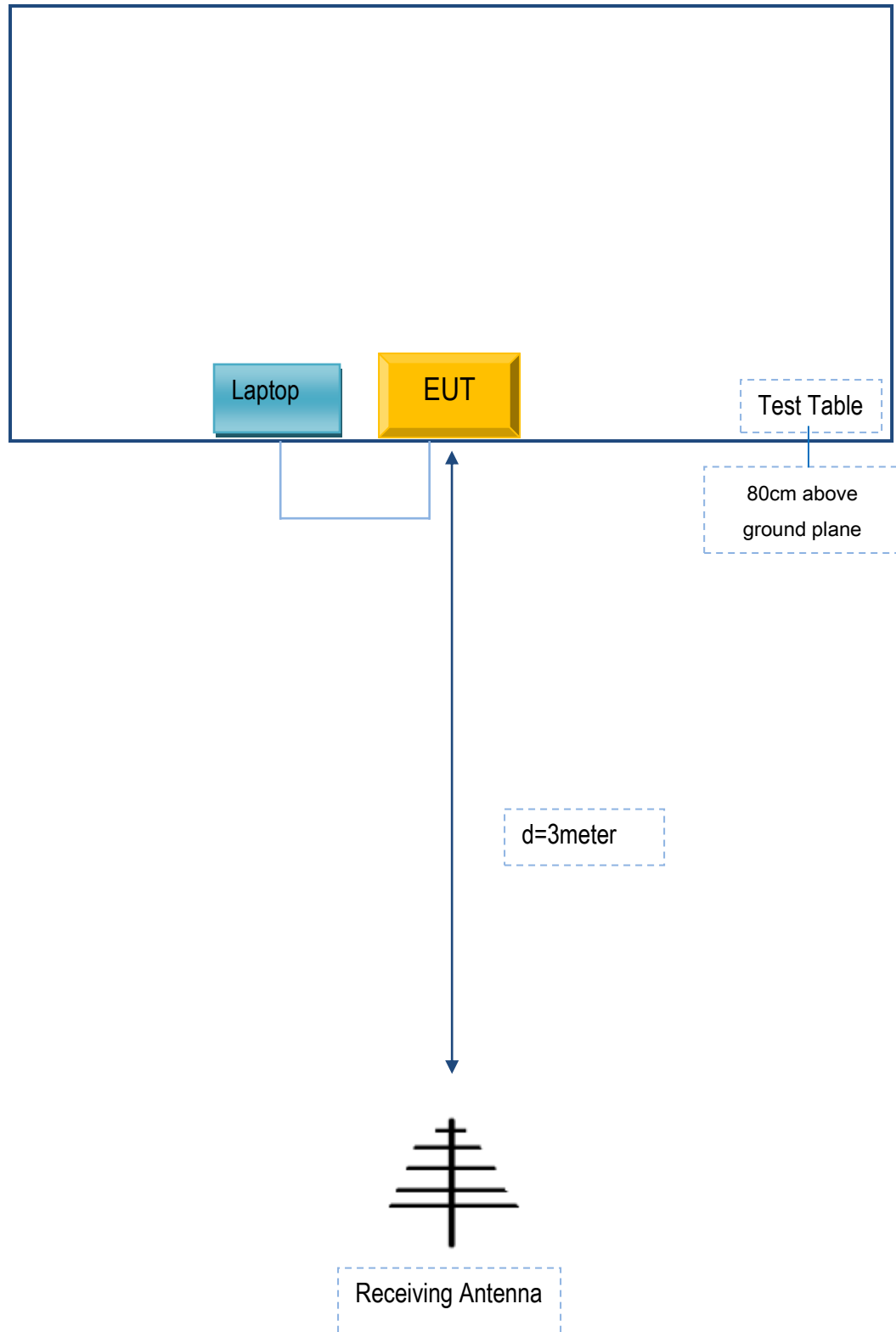
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

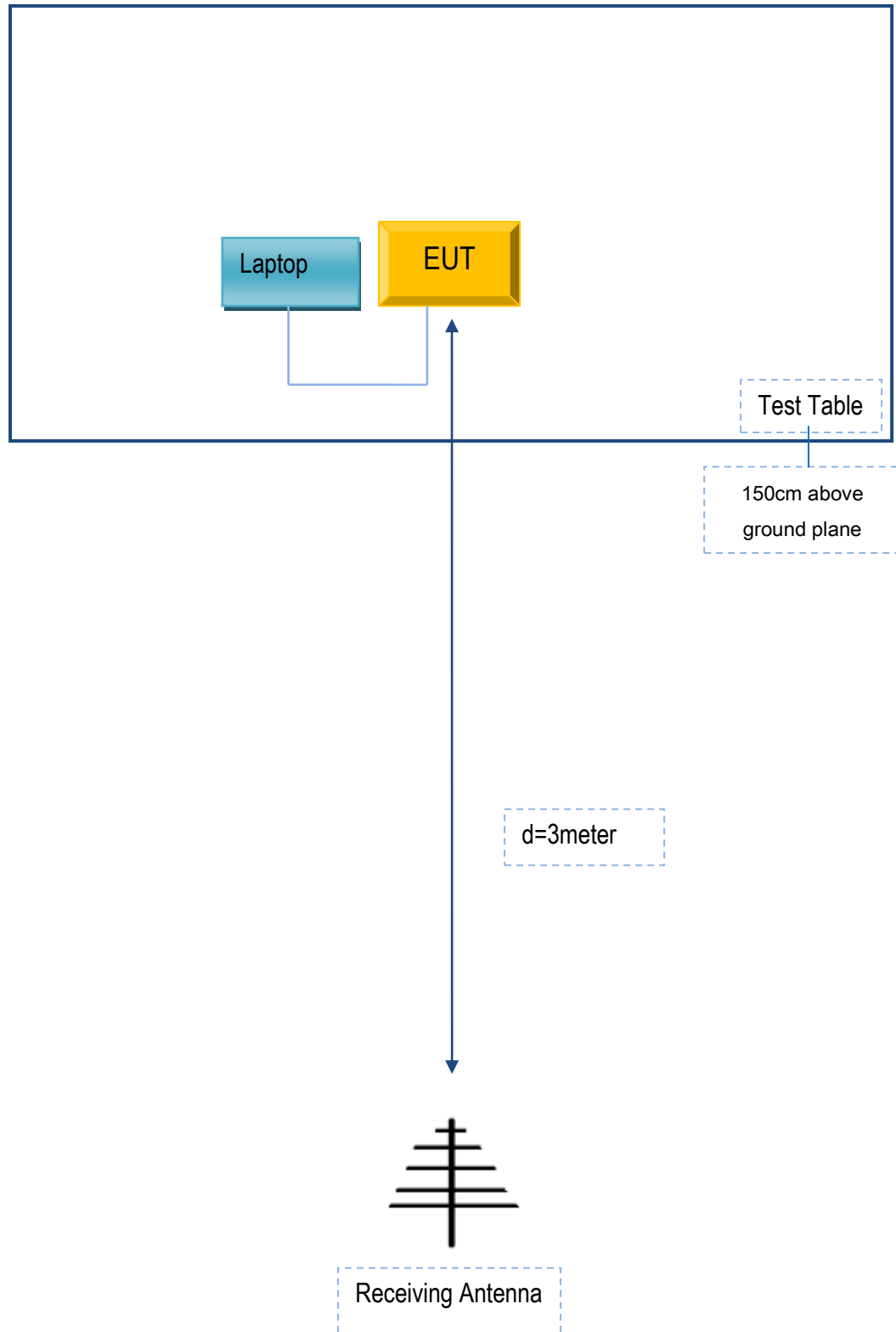
Block Configuration Diagram for AC Line Conducted Emissions



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



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



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
NOKIA	Phone	S6T	N/A
DCA	Adaptor	E2164A	N/A
Lenovo	Laptop	E40	N/A

Supporting Cable:

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