

RF TEST REPORT



Report No.: 17070667-FCC-R3 V1

Supersede Report No.: N/A

Applicant	MOBIWIRE MOBILES (NINGBO) CO.,LTD	
Product Name	4G Smartphone	
Model No.	N504	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	August 11 to September 05, 2017	
Issue Date	September 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	David Huang	
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

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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
17070667-FCC-R3	NONE	Original	September 06, 2017
17070667-FCC-R3 V1	V1	Updating the EUT photos	September 13, 2017

2. Customer information

Applicant Name	MOBIWIRE MOBILES (NINGBO) CO.,LTD
Applicant Add	No.999,Dacheng East Road,Fenghua,Zhejiang,China
Manufacturer	Mobiwire Mobiles (Ningbo) Co.,Ltd
Manufacturer Add	Mobiwire Mobiles,No. 999 Dacheng East Road Fenghua,Zhejiang China

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_EMU(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: 4G Smartphone

Main Model: N504

Serial Model: N/A

Date EUT received: August 10, 2017

Test Date(s): August 11 to September 05, 2017

Equipment Category : DSS

Antenna Gain:
GSM850: -3dBi
PCS1900: -1dBi
UMTS-FDD Band V: -3dBi
UMTS-FDD Band II: -0.5dBi
LTE Band IV: -1dBi
WIFI: 0dBi
Bluetooth/BLE: 0dBi
GPS: 0dBi

Antenna Type: PIFA antenna

Type of Modulation:
GSM / GPRS: GMSK
EGPRS: GMSK,8PSK
UMTS-FDD: QPSK
LTE Band: QPSK, 16QAM
802.11b/g/n: DSSS, OFDM
Bluetooth: GFSK, π /4DQPSK, 8DPSK
BLE: GFSK
GPS:BPSK

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GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz
PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz
UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz
UMTS-FDD Band II TX: 1852.4 ~ 1907.6 MHz;
RX: 1932.4 ~ 1987.6 MHz
LTE Band IV TX: 1710.7 ~ 1754.3 MHz; RX: 2110.7 ~ 2154.3 MHz
WIFI: 802.11b/g/n(20M): 2412-2462 MHz
WIFI: 802.11n(40M): 2422-2452 MHz
Bluetooth& BLE: 2402-2480 MHz
GPS: 1575.42 MHz

RF Operating Frequency (ies):

Max. Output Power: 2.207dBm

GSM 850: 124CH
PCS1900: 299CH
UMTS-FDD Band V : 102CH
UMTS-FDD Band II : 277CH
WIFI :802.11b/g/n(20M): 11CH
WIFI :802.11n(40M): 7CH
Bluetooth: 79CH
BLE: 40CH
GPS:1CH

Port: USB Port, Earphone Port

Adapter:

Model: S005UA0500100

Input: AC100-240V~50/60Hz,150mA
Output: DC 5.0V,1000mA

Battery:

Spec: 3.8V, 8.17Wh, 2150mAh

Trade Name : NOBLEX

FCC ID: 2ADA4N504

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 3 antennas:

A permanently attached PIFA antenna for Bluetooth/BLE/WIFI/GPS, the gain is 0dBi for Bluetooth/BLE, the gain is 0dBi for WIFI, the gain is 0dBi for GPS.

A permanently attached PIFA antenna for GSM/PCS/UMTS, the gain is -3dBi for GSM850, -1dBi for PCS1900, -3dBi for UMTS-FDD Band V, -0.5dBi for UMTS-FDD Band II.

A permanently attached PIFA antenna for LTE Band IV, the gain is -1dBi for LTE Band IV.

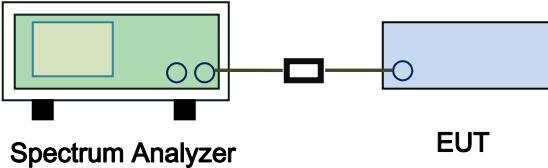
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	August 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	<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.</p> <p><u>Use the following spectrum analyzer settings:</u></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) \geq 1% of the span - Video (or Average) Bandwidth (VBW) \geq RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot. 	

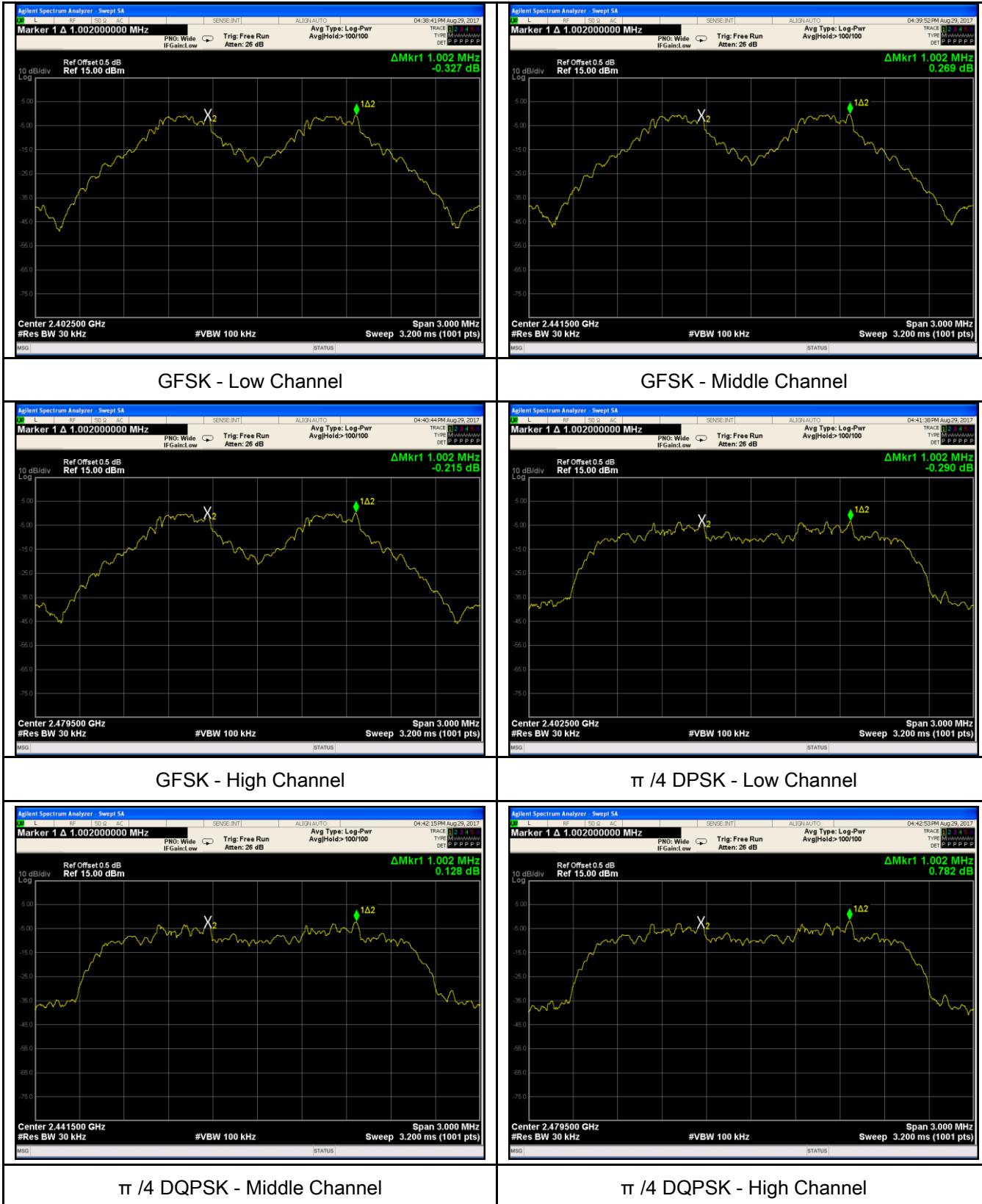
Remark		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Test Data	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> N/A
Test Plot	<input checked="" type="checkbox"/> Yes (See below)	<input type="checkbox"/> N/A

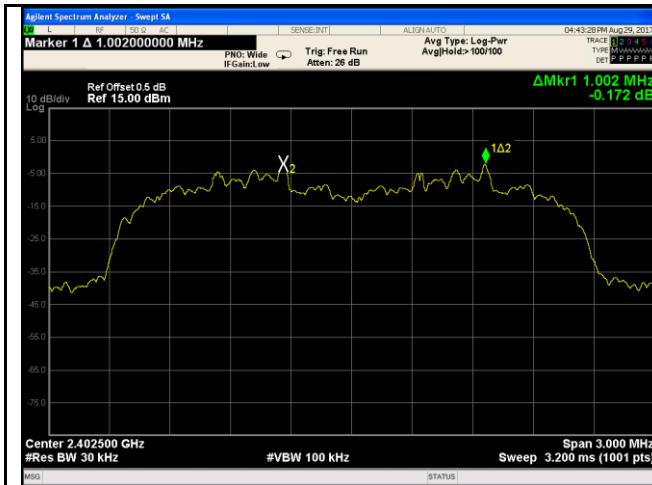
Channel Separation measurement result

Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.645	Pass
	Adjacency Channel	2403			
	Mid Channel	2440			
	Adjacency Channel	2441	1.002	0.642	Pass
	High Channel	2480			
	Adjacency Channel	2479			
CH Separation $\pi/4$ DQPSK	Low Channel	2402	1.002	0.861	Pass
	Adjacency Channel	2403			
	Mid Channel	2440			
	Adjacency Channel	2441	1.002	0.872	Pass
	High Channel	2480			
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.865	Pass
	Adjacency Channel	2403			
	Mid Channel	2440			
	Adjacency Channel	2441	1.002	0.865	Pass
	High Channel	2480			
	Adjacency Channel	2479			

Test Plots

Channel Separation measurement result





8DPSK - Low Channel

8DPSK - Middle Channel

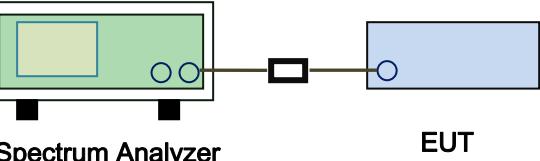


8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	August 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.	<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.</p> <p><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	0.968	0.8848
	Mid	2441	0.963	0.8847
	High	2480	1.027	0.8884
$\pi/4$ DQPSK	Low	2402	1.291	1.1752
	Mid	2441	1.308	1.1781
	High	2480	1.310	1.1787
8-DPSK	Low	2402	1.297	1.1884
	Mid	2441	1.297	1.1959
	High	2480	1.301	1.1916

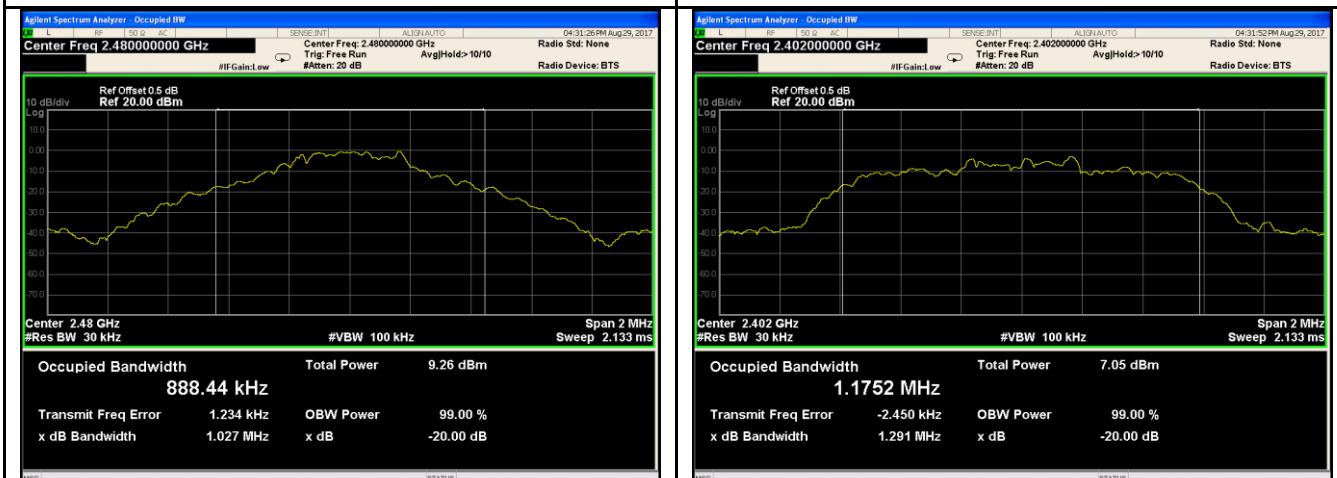
Test Plots

20dB Bandwidth measurement result



GFSK - Low Channel

GFSK - Middle Channel



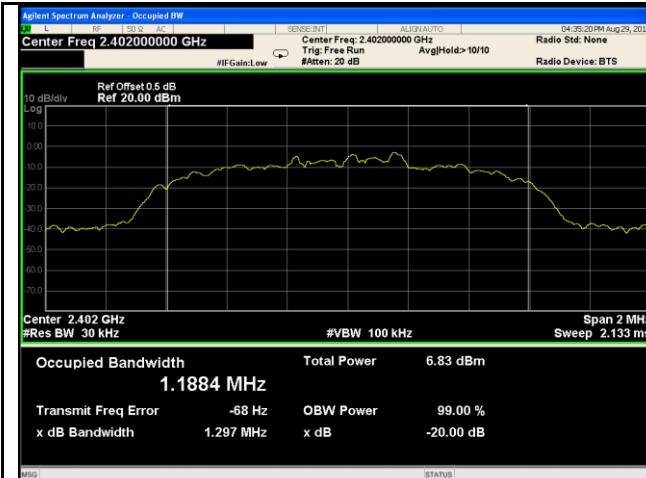
GFSK - High Channel

π /4 DPSK - Low Channel

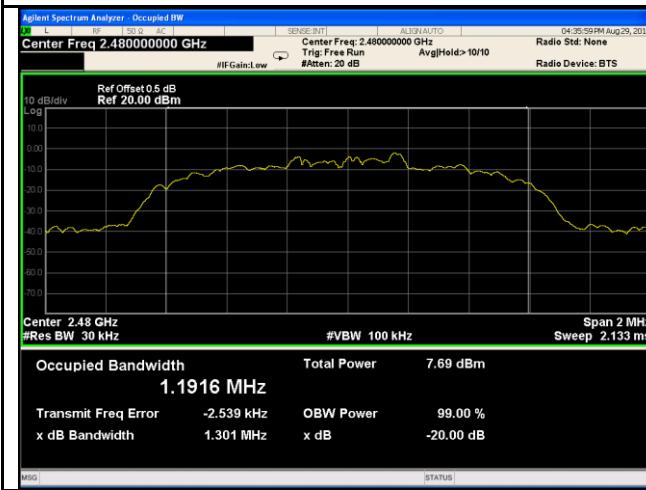


π /4 DQPSK - Middle Channel

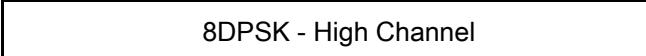
π /4 DQPSK - High Channel



8DPSK - Low Channel



8DPSK - Middle Channel

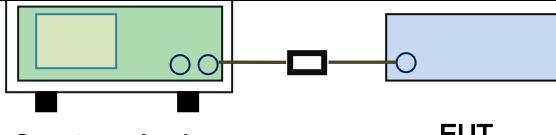


8DPSK - High Channel

6.4 Peak Output Power

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

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3)	a)	FHSS in 2400-2483.5MHz with \geq 75 channels: \leq 1 Watt	<input checked="" type="checkbox"/>
	b)	FHSS in 5725-5850MHz: \leq 1 Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: \leq 0.125 Watt.	<input checked="" type="checkbox"/>
	d)	FHSS in 902-928MHz with \geq 50 channels: \leq 1 Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with \geq 25 & $<$ 50 channels: \leq 0.25 Watt	<input type="checkbox"/>
	f)	DTS in 902-928MHz, 2400-2483.5MHz: \leq 1 Watt	<input type="checkbox"/>
Test Setup			
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. 	

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

Test Data Yes N/A

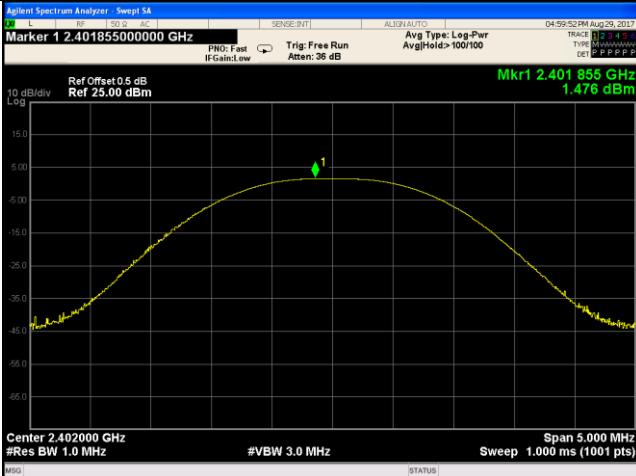
Test Plot Yes (See below) N/A

Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	1.476	1000	Pass
		Mid	2441	1.833	1000	Pass
		High	2480	2.207	125	Pass
	$\pi/4$ DQPSK	Low	2402	0.531	125	Pass
		Mid	2441	1.280	125	Pass
		High	2480	1.401	125	Pass
	8-DPSK	Low	2402	0.622	125	Pass
		Mid	2441	1.414	125	Pass
		High	2480	1.753	125	Pass

Test Plots

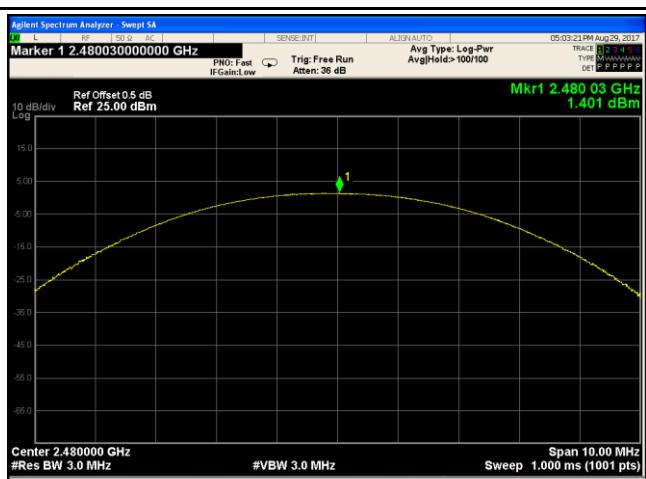
Output Power measurement result



GFSK Output power - Low CH 2402

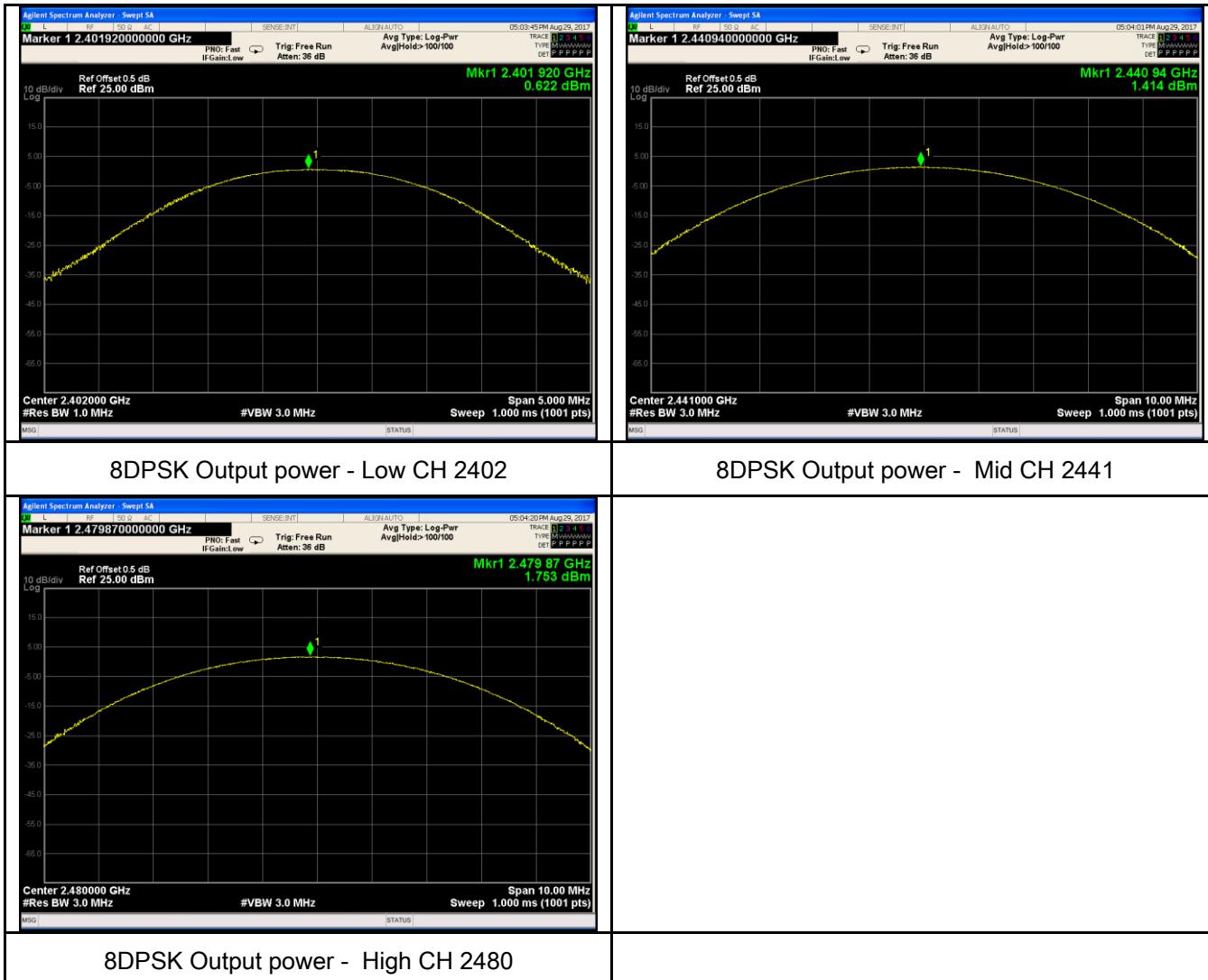


GFSK Output power - High CH 2480



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

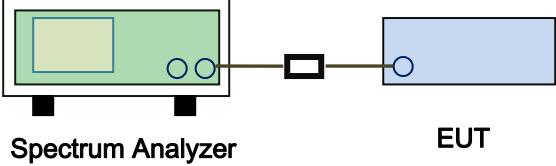
$\pi/4$ DQPSK Output power - High CH 2480



6.5 Number of Hopping Channel

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

Requirement(s):

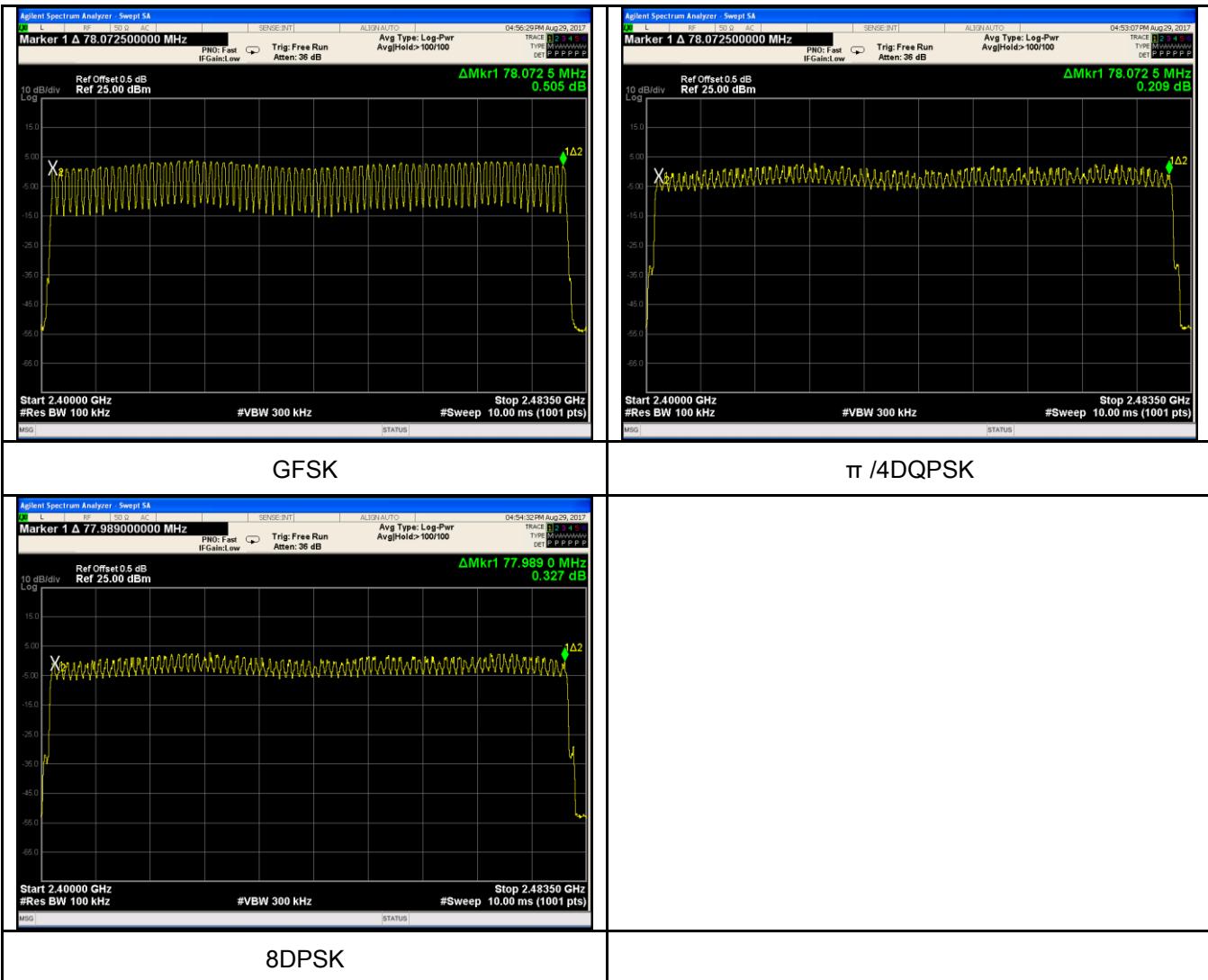
Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	FHSS in 2400-2483.5MHz \geq 15 channels	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <p>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	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> N/A	
Test Plot	<input checked="" type="checkbox"/> Yes (See below)	<input type="checkbox"/> 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

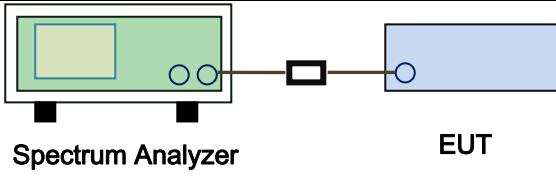
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1020mbar
Test date :	August 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.</p> <p><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 \geq 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

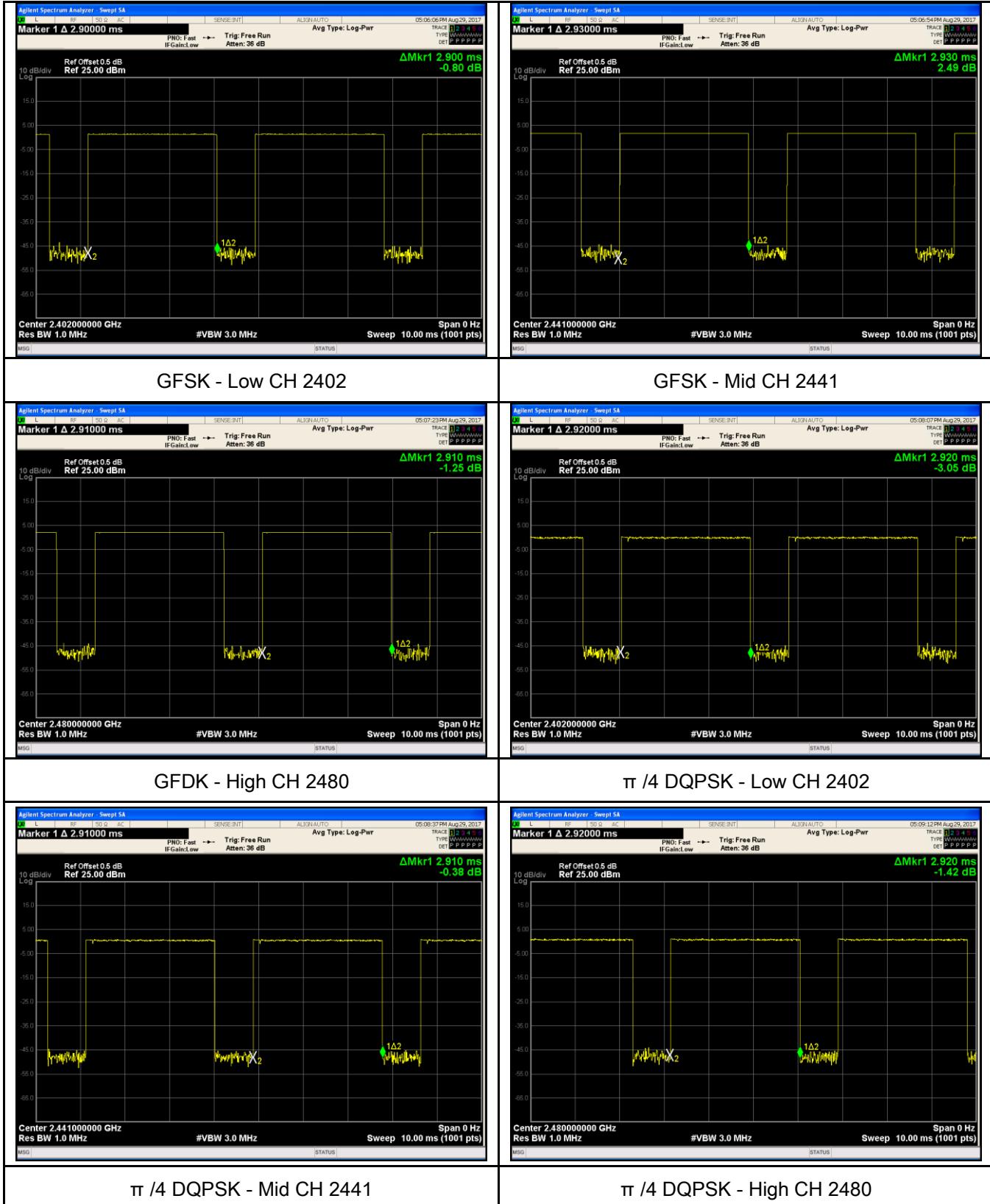
Dwell Time measurement result

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.900	309.333	400	Pass
		Mid	2.930	312.533	400	Pass
		High	2.910	310.400	400	Pass
	$\pi/4$ DQPSK	Low	2.920	311.467	400	Pass
		Mid	2.910	310.400	400	Pass
		High	2.920	311.467	400	Pass
	8-DPSK	Low	2.920	311.467	400	Pass
		Mid	2.920	311.467	400	Pass
		High	2.920	311.467	400	Pass

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6

Test Plots

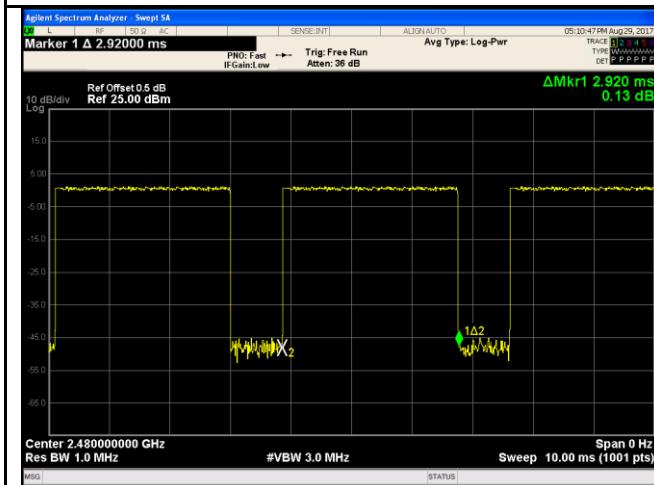
Dwell Time measurement result





8DPSK - Low CH 2402

8DPSK - Mid CH 2441

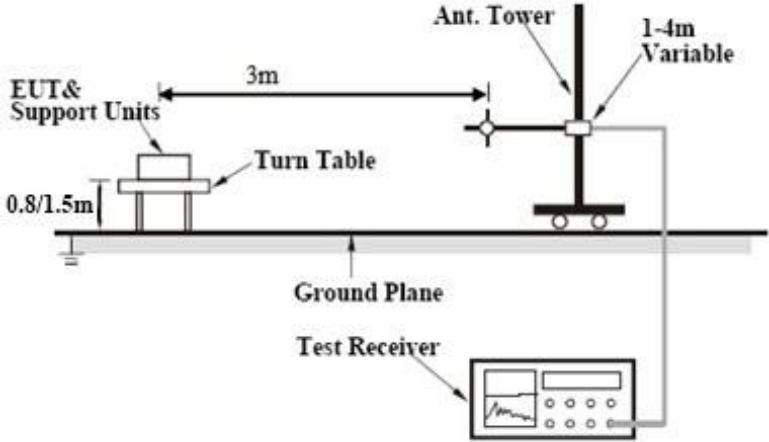


8DPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	27°C
Relative Humidity	55%
Atmospheric Pressure	1023mbar
Test date :	August 22, 2017
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.□	<input checked="" type="checkbox"/>
Test Setup			
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, 		

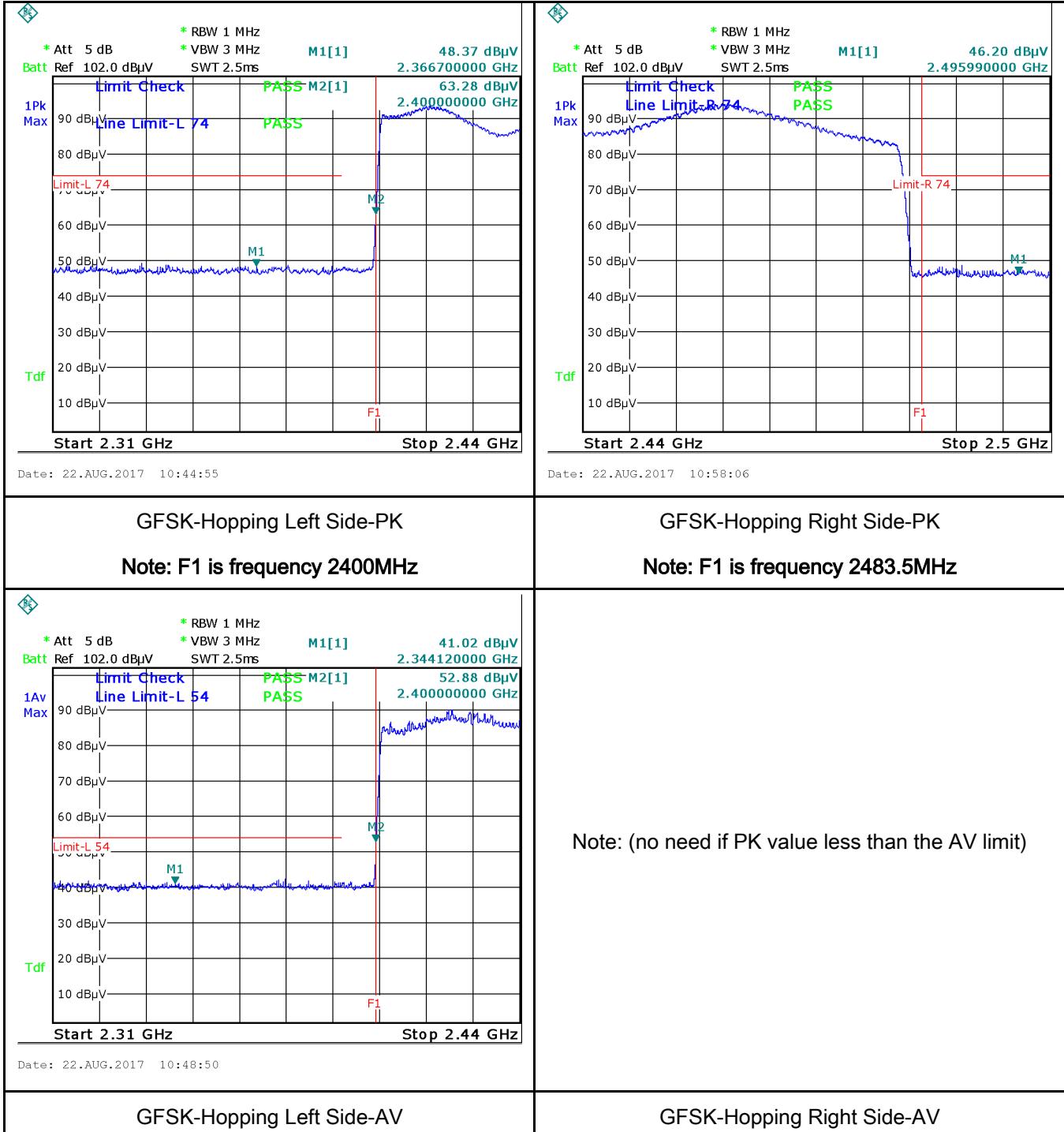
	<p>and make sure the instrument is operated in its linear range.</p> <ul style="list-style-type: none"> - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: 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

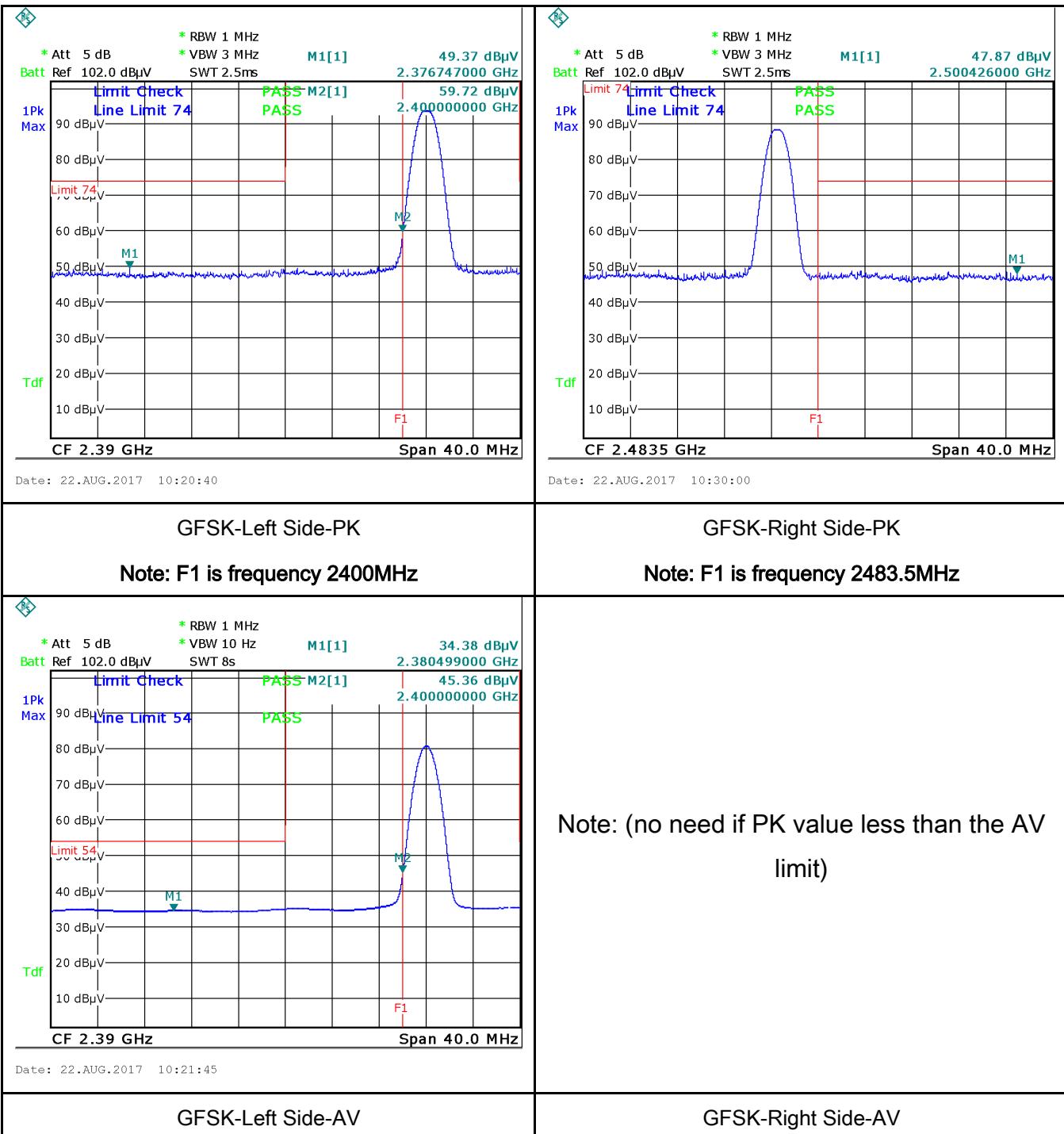
Test Plot Yes (See below) N/A

Test Plots

GFSK Mode:

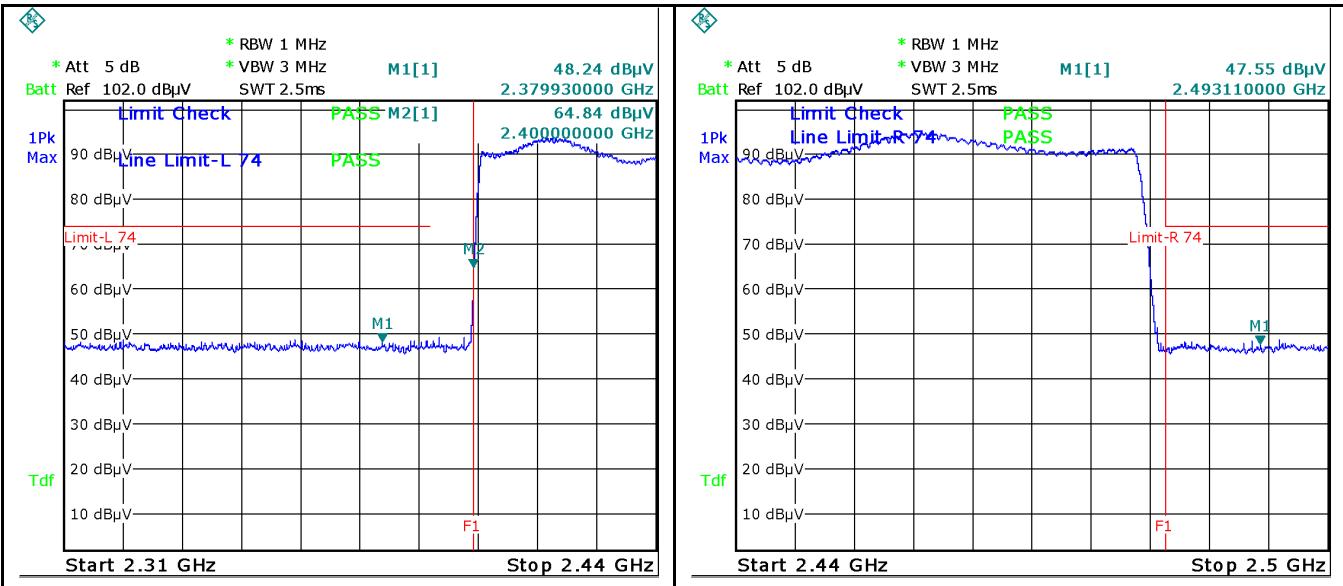


Note: Both Horizontal and vertical polarities were investigated.



Note: Both Horizontal and vertical polarities were investigated.

$\pi/4$ DQPSK Mode:



Date: 22.AUG.2017 10:45:53

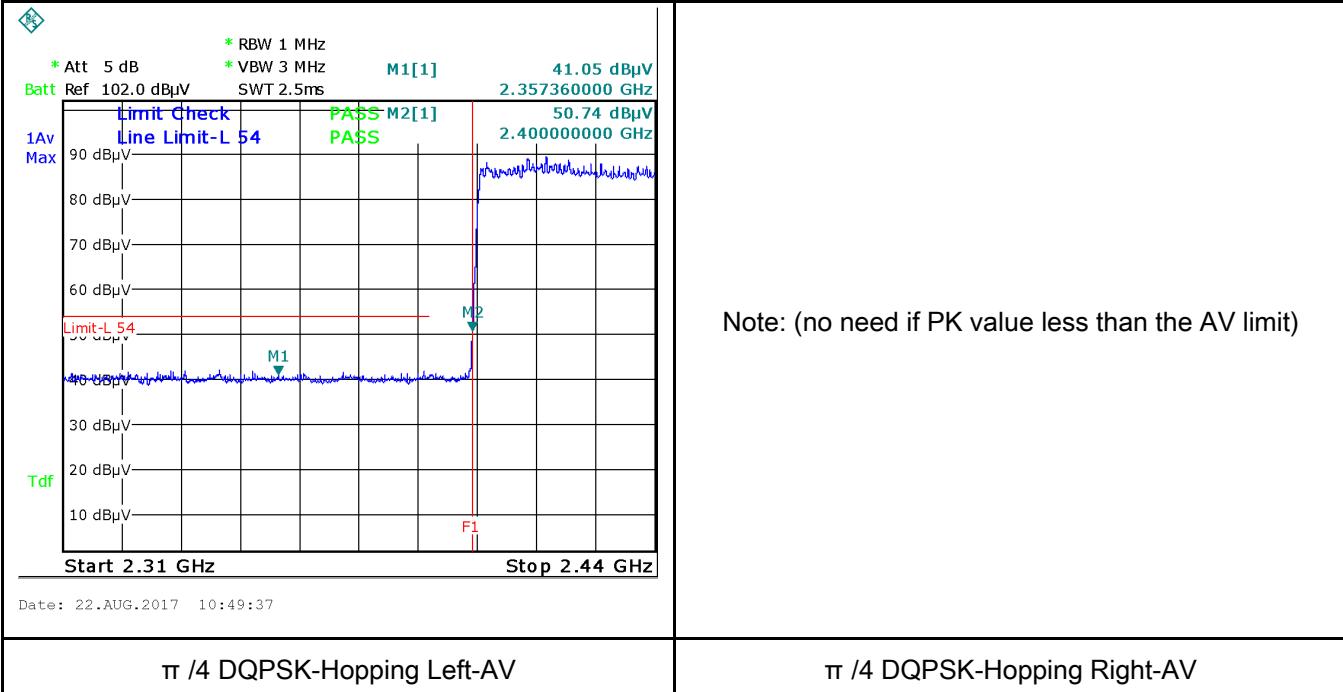
Date: 22.AUG.2017 10:58:44

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

Note: F1 is frequency 2400MHz

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

Note: F1 is frequency 2483.5MHz

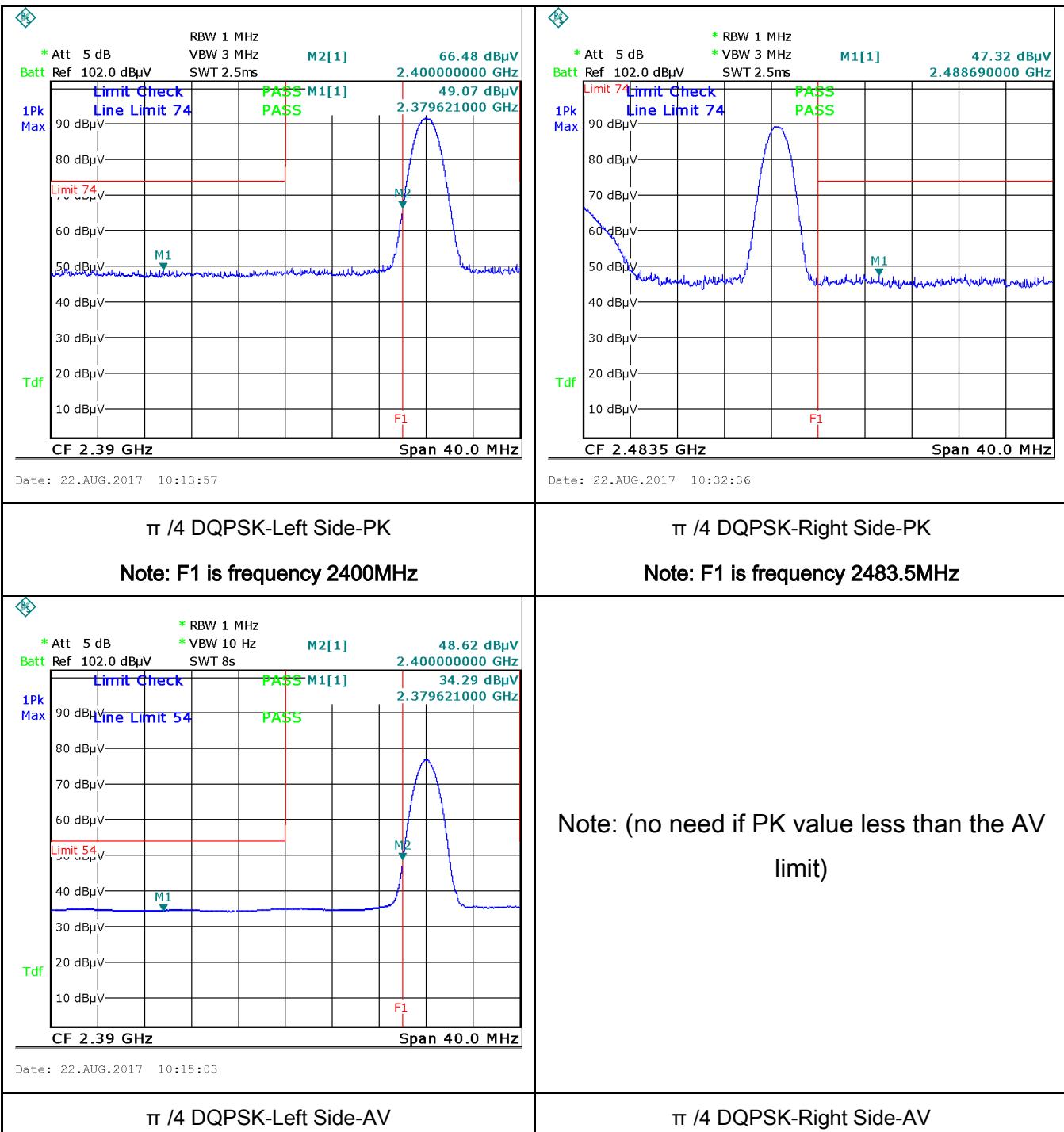


Date: 22.AUG.2017 10:49:37

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

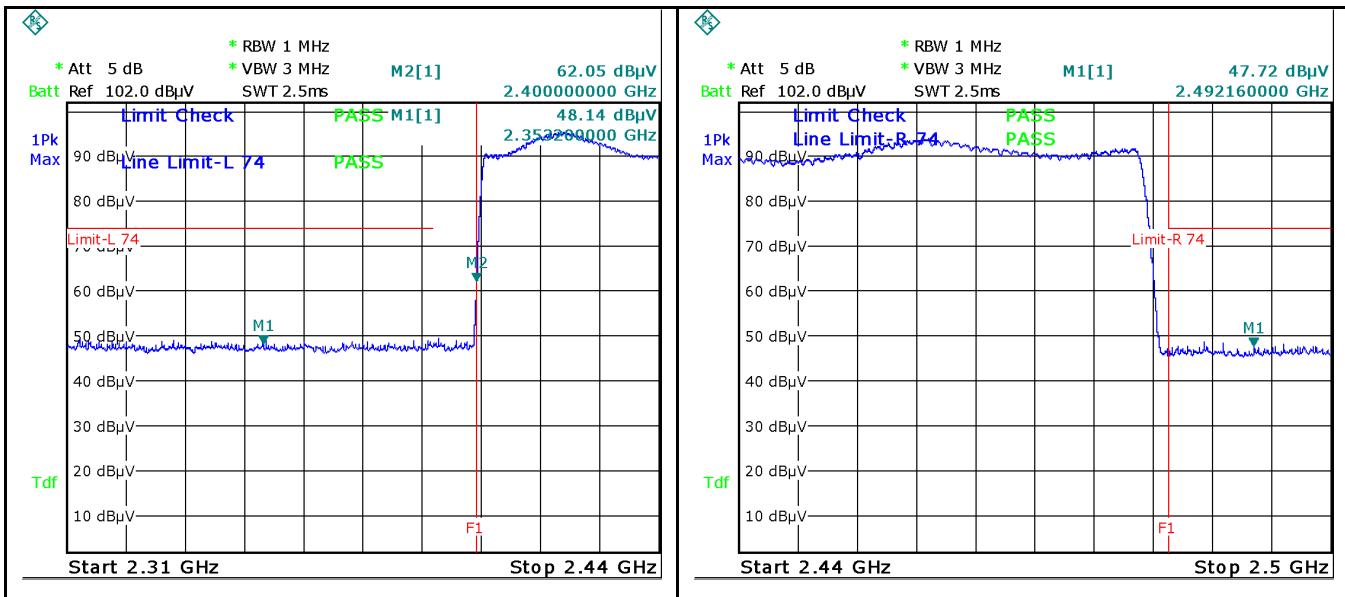
$\pi/4$ DQPSK-Hopping Right-AV

Note: Both Horizontal and vertical polarities were investigated.



Note: Both Horizontal and vertical polarities were investigated.

8-DPSK Mode:



Date: 22.AUG.2017 10:43:48

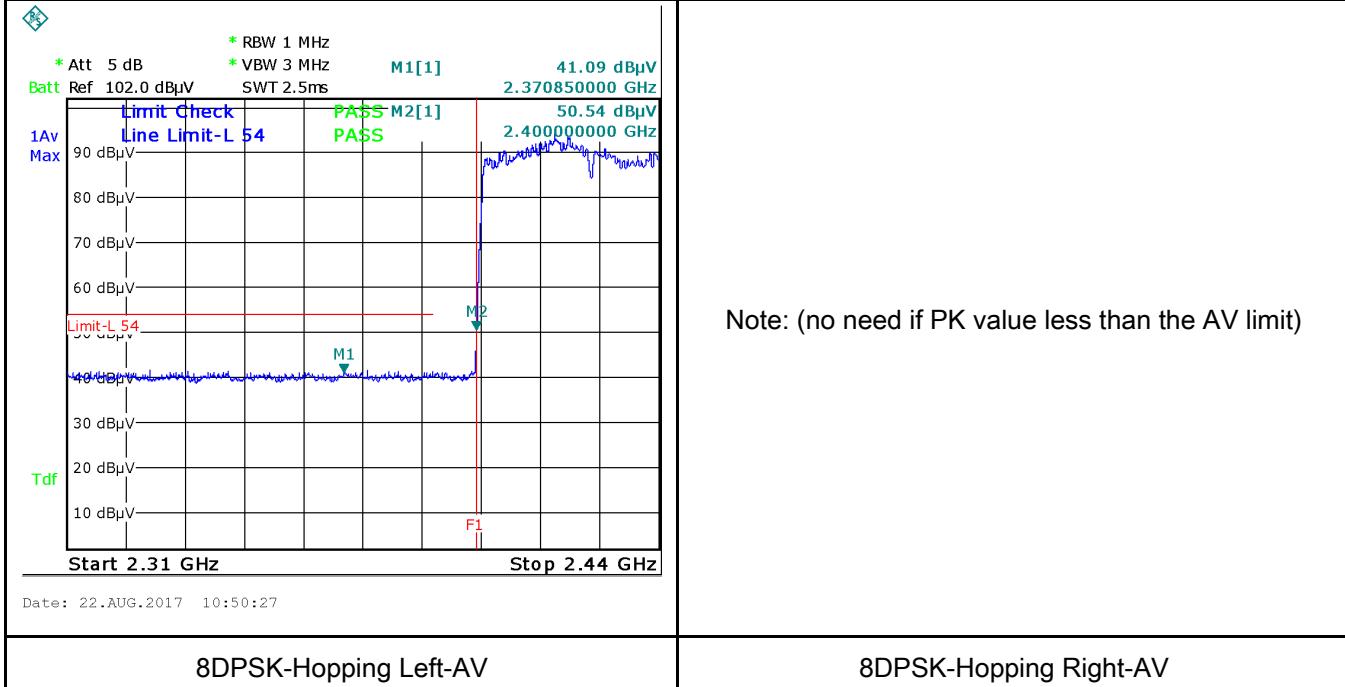
Date: 22.AUG.2017 10:59:07

8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

8DPSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

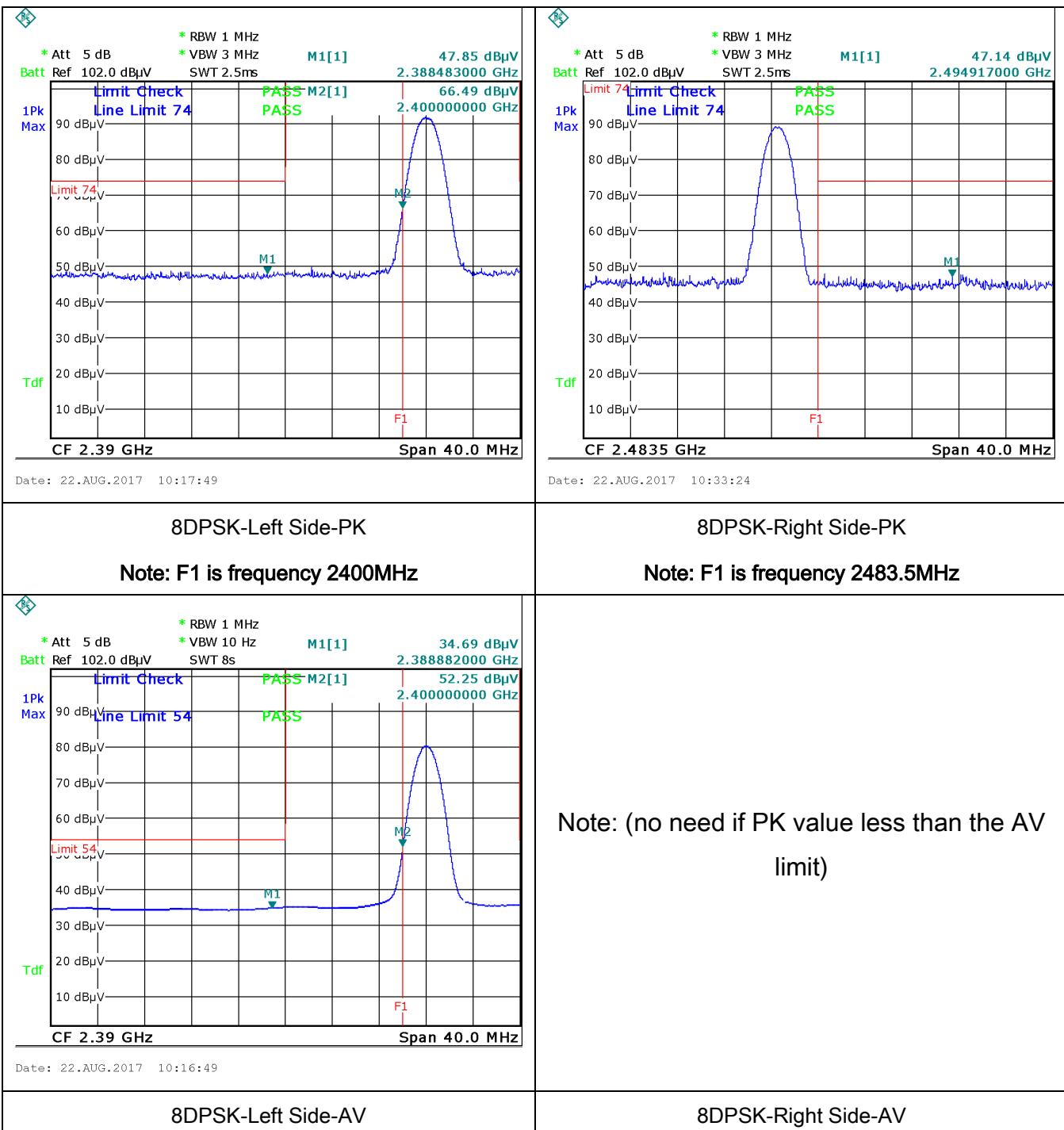


Date: 22.AUG.2017 10:50:27

8DPSK-Hopping Left-AV

8DPSK-Hopping Right-AV

Note: Both Horizontal and vertical polarities were investigated.

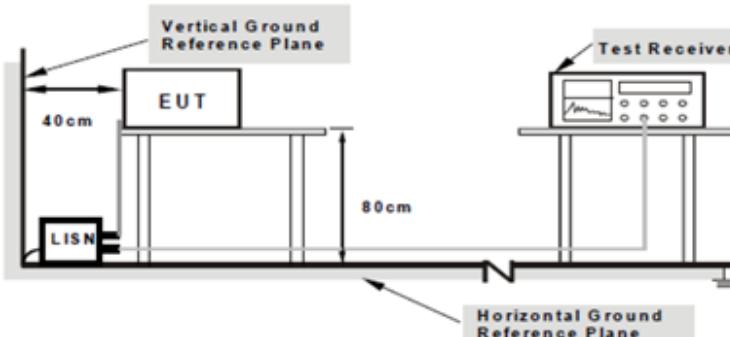


Note: Both Horizontal and vertical polarities were investigated.

6.8 AC Power Line Conducted Emissions

Temperature	27°C
Relative Humidity	55%
Atmospheric Pressure	1023mbar
Test date :	August 22, 2017
Tested By :	Loren Luo

Requirement(s):

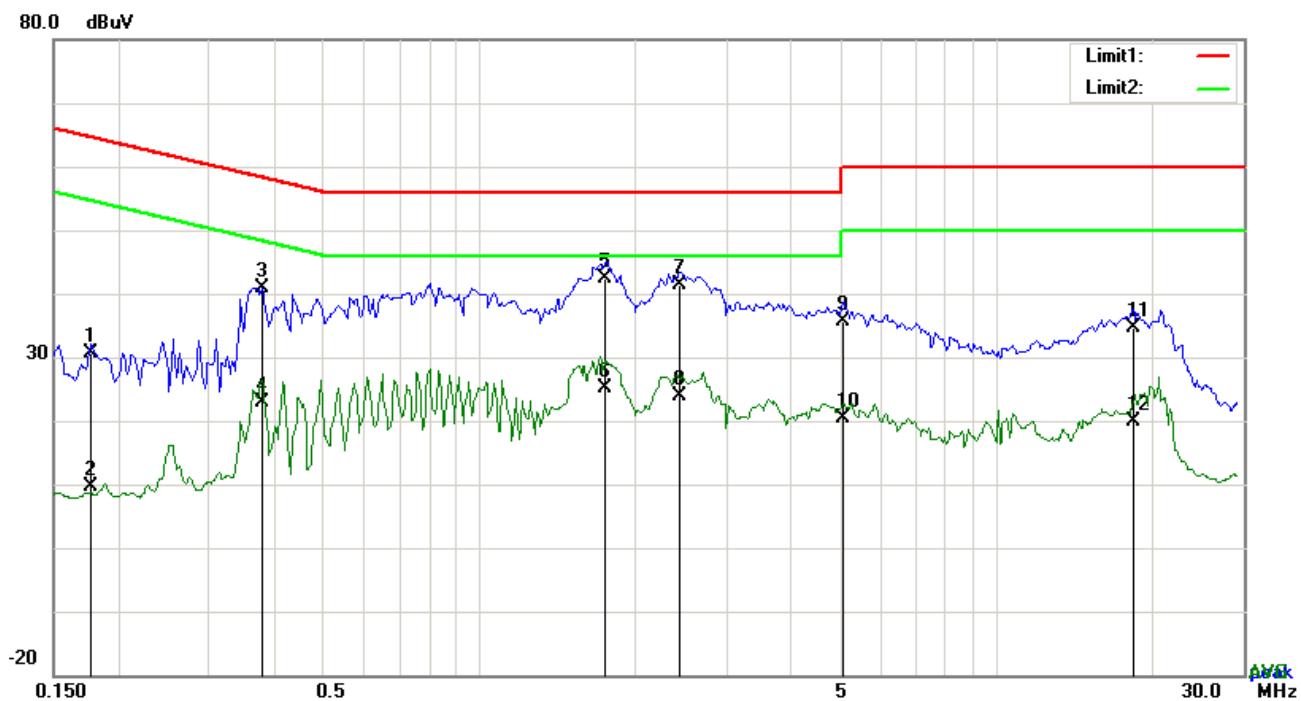
Spec	Item	Requirement	Applicable														
47CFR§15. 207, RSS210 (A8.1)	a)	<p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within 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.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <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> </tbody> </table>	Frequency ranges (MHz)	Limit (dB μ V)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50	<input checked="" type="checkbox"/>
Frequency ranges (MHz)	Limit (dB μ V)																
	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>																
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 																

	<p>coaxial cable.</p> <ol style="list-style-type: none"> 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

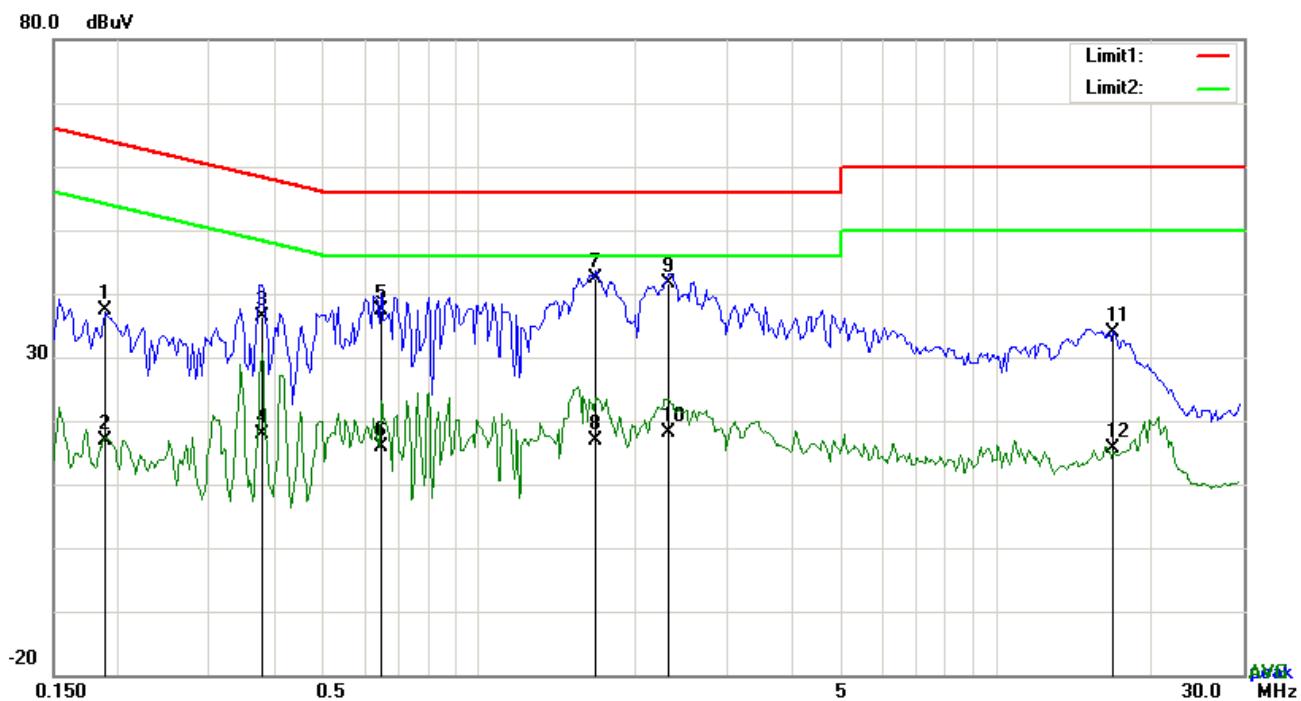


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	L1	0.1773	20.48	QP	10.03	30.51	64.61	-34.10
2	L1	0.1773	-0.36	AVG	10.03	9.67	54.61	-44.94
3	L1	0.3801	30.82	QP	10.03	40.85	58.28	-17.43
4	L1	0.3801	12.97	AVG	10.03	23.00	48.28	-25.28
5	L1	1.7490	32.35	QP	10.04	42.39	56.00	-13.61
6	L1	1.7490	15.14	AVG	10.04	25.18	46.00	-20.82
7	L1	2.4432	31.24	QP	10.05	41.29	56.00	-14.71
8	L1	2.4432	13.93	AVG	10.05	23.98	46.00	-22.02
9	L1	5.0475	25.50	QP	10.08	35.58	60.00	-24.42
10	L1	5.0475	10.25	AVG	10.08	20.33	50.00	-29.67
11	L1	18.3621	24.41	QP	10.28	34.69	60.00	-25.31
12	L1	18.3621	9.56	AVG	10.28	19.84	50.00	-30.16

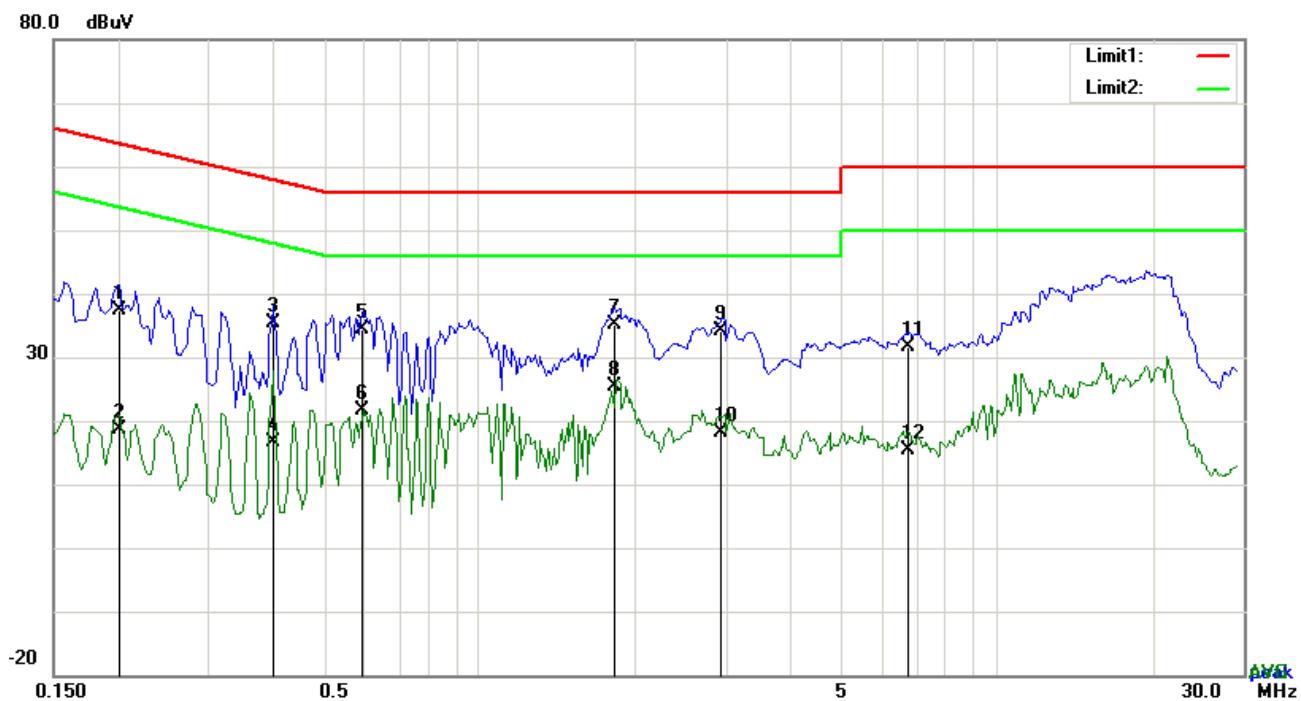
Test Mode: Bluetooth Mode



Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	N	0.1890	27.46	QP	10.02	37.48	64.08	-26.60
2	N	0.1890	6.87	AVG	10.02	16.89	54.08	-37.19
3	N	0.3801	26.48	QP	10.02	36.50	58.28	-21.78
4	N	0.3801	7.96	AVG	10.02	17.98	48.28	-30.30
5	N	0.6453	27.26	QP	10.02	37.28	56.00	-18.72
6	N	0.6453	5.77	AVG	10.02	15.79	46.00	-30.21
7	N	1.6749	32.23	QP	10.04	42.27	56.00	-13.73
8	N	1.6749	6.78	AVG	10.04	16.82	46.00	-29.18
9	N	2.3184	31.57	QP	10.04	41.61	56.00	-14.39
10	N	2.3184	8.09	AVG	10.04	18.13	46.00	-27.87
11	N	16.7826	23.60	QP	10.22	33.82	60.00	-26.18
12	N	16.7826	5.44	AVG	10.22	15.66	50.00	-34.34

Test Mode: Bluetooth Mode

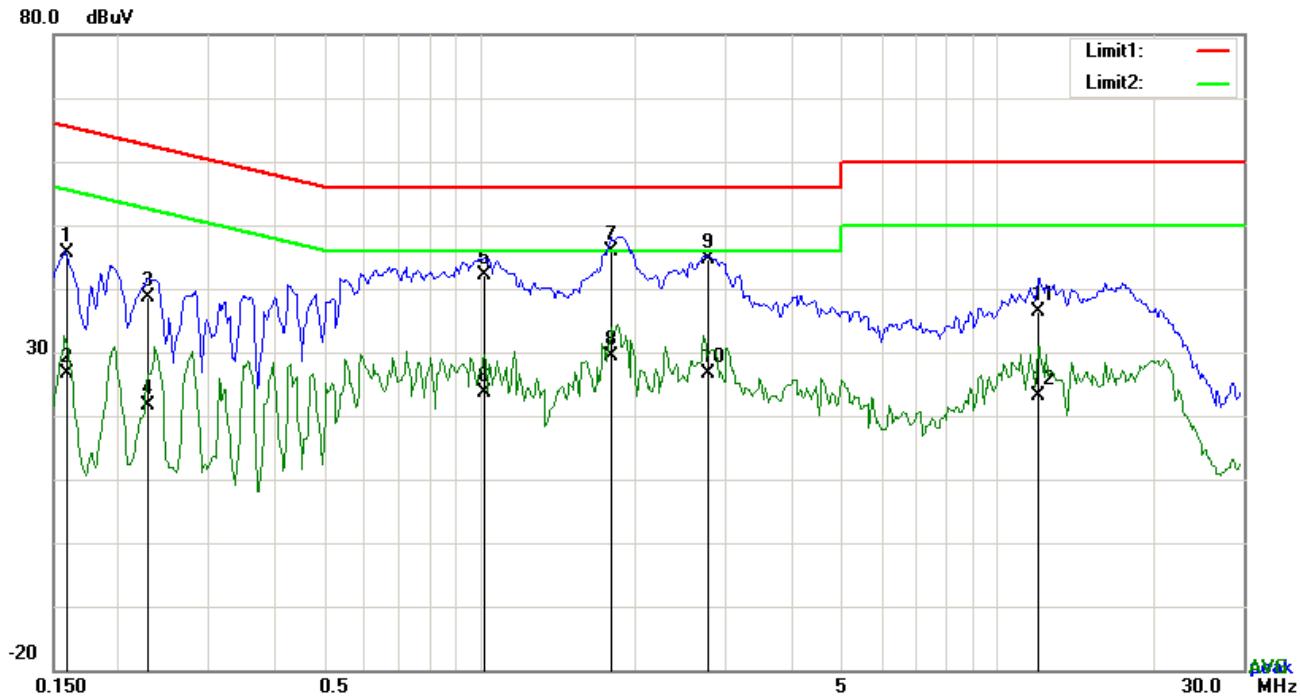


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	L1	0.2007	27.32	QP	10.03	37.35	63.58	-26.23
2	L1	0.2007	8.63	AVG	10.03	18.66	53.58	-34.92
3	L1	0.3996	25.25	QP	10.03	35.28	57.86	-22.58
4	L1	0.3996	6.67	AVG	10.03	16.70	47.86	-31.16
5	L1	0.5946	24.34	QP	10.03	34.37	56.00	-21.63
6	L1	0.5946	11.54	AVG	10.03	21.57	46.00	-24.43
7	L1	1.8192	25.05	QP	10.04	35.09	56.00	-20.91
8	L1	1.8192	15.22	AVG	10.04	25.26	46.00	-20.74
9	L1	2.9385	24.16	QP	10.05	34.21	56.00	-21.79
10	L1	2.9385	8.19	AVG	10.05	18.24	46.00	-27.76
11	L1	6.7401	21.55	QP	10.10	31.65	60.00	-28.35
12	L1	6.7401	5.34	AVG	10.10	15.44	50.00	-34.56

Test Mode: Bluetooth Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

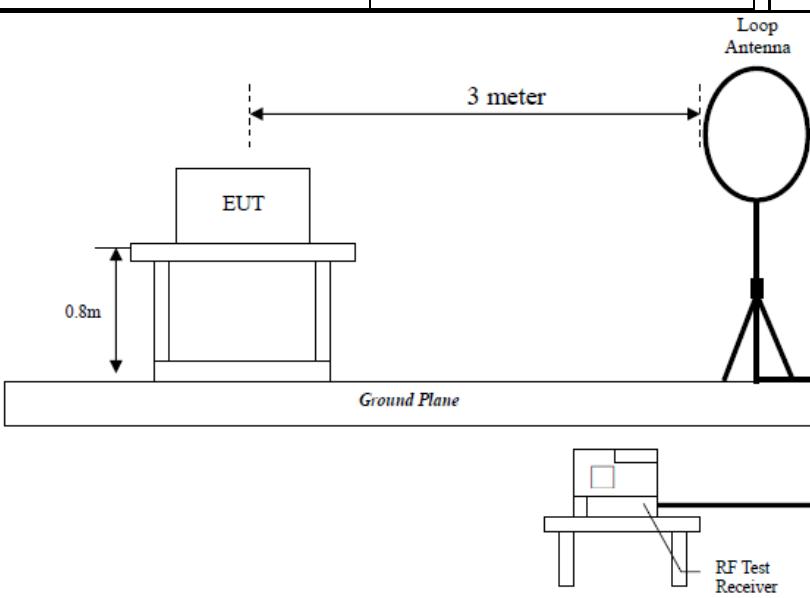
No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	N	0.1590	35.52	QP	10.02	45.54	65.52	-19.98
2	N	0.1590	16.52	AVG	10.02	26.54	55.52	-28.98
3	N	0.2280	28.66	QP	10.02	38.68	62.52	-23.84
4	N	0.2280	11.72	AVG	10.02	21.74	52.52	-30.78
5	N	1.0236	32.08	QP	10.03	42.11	56.00	-13.89
6	N	1.0236	13.55	AVG	10.03	23.58	46.00	-22.42
7	N	1.8036	35.72	QP	10.04	45.76	56.00	-10.24
8	N	1.8036	19.34	AVG	10.04	29.38	46.00	-16.62
9	N	2.7669	34.55	QP	10.05	44.60	56.00	-11.40
10	N	2.7669	16.60	AVG	10.05	26.65	46.00	-19.35
11	N	12.0597	26.20	QP	10.16	36.36	60.00	-23.64
12	N	12.0597	13.06	AVG	10.16	23.22	50.00	-26.78

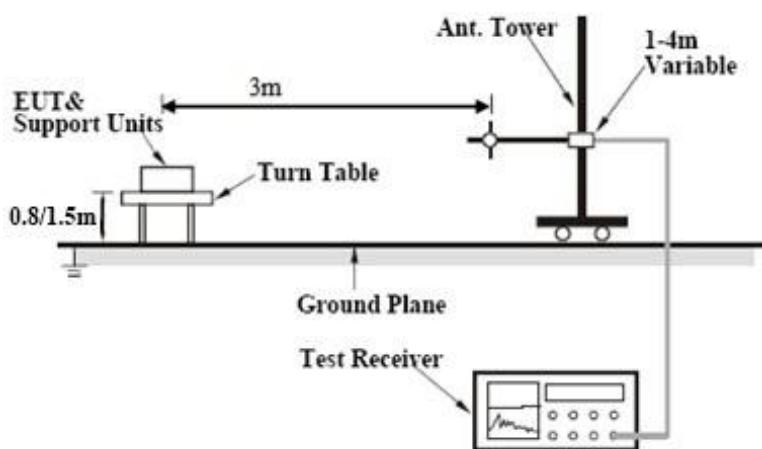
6.9 Radiated Emissions & Restricted Band

Temperature	27°C
Relative Humidity	55%
Atmospheric Pressure	1023mbar
Test date :	August 22, 2017
Tested By :	Loren Luo

Requirement(s):

Spec	Item	Requirement	Applicable																
47CFR§15. 205, §15.209, §15.247(d)	a)	<p>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</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (μV/m)</th> </tr> </thead> <tbody> <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> </tbody> </table>	Frequency range (MHz)	Field Strength (μ V/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	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength (μ V/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	
------------	--



Procedure	<ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> 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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Test Data	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> N/A
Test Plot	<input checked="" type="checkbox"/> Yes (See below) <input type="checkbox"/> N/A

Test Result:

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

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

Note:

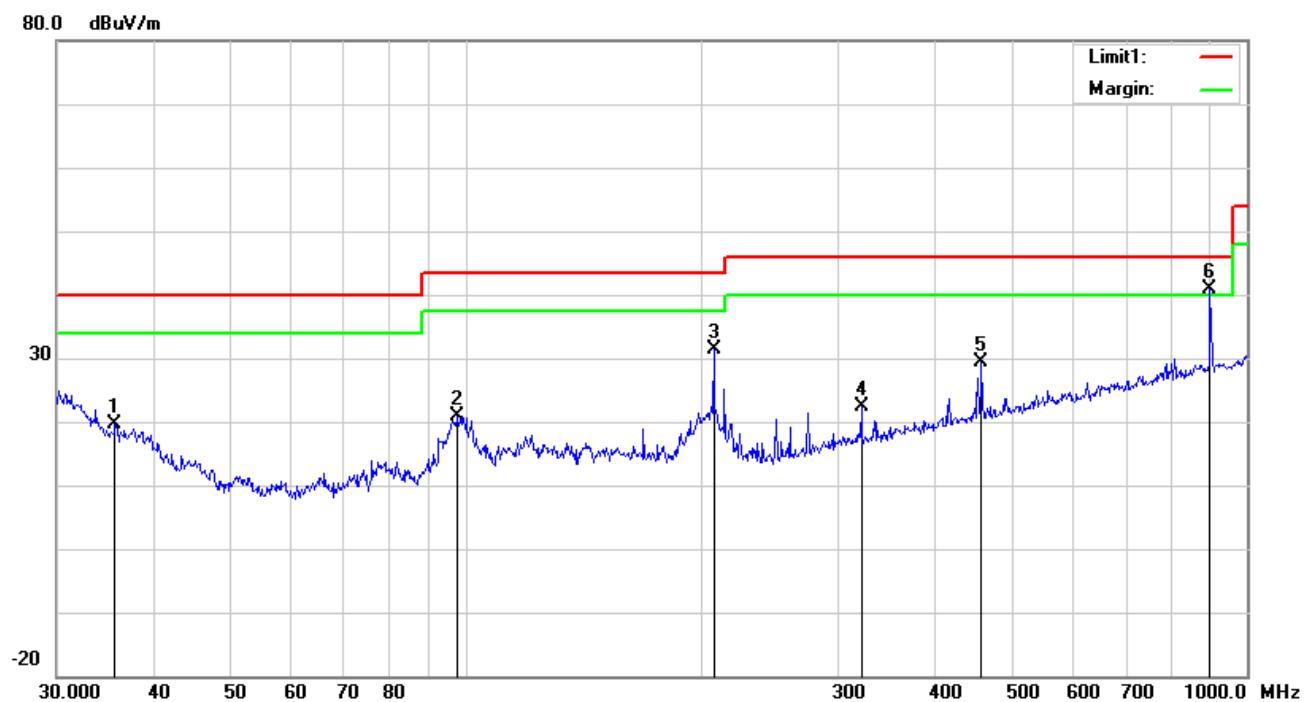
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

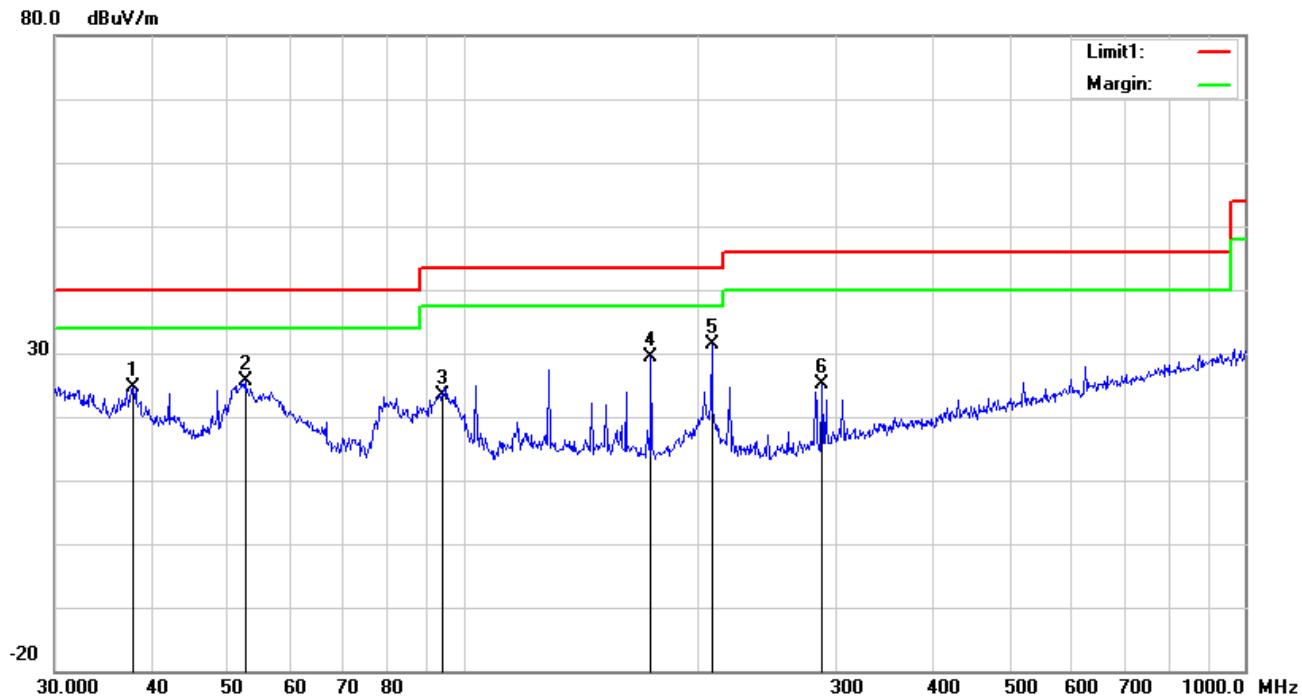


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()
1	H	35.6240	24.02	peak	17.09	22.25	0.76	19.62	40.00	-20.38	100	150
2	H	97.7983	32.34	peak	9.87	22.32	1.06	20.95	43.50	-22.55	100	142
3	H	207.8501	40.30	peak	11.99	22.37	1.57	31.49	43.50	-12.01	100	234
4	H	321.0608	28.74	peak	14.04	22.23	1.90	22.45	46.00	-23.55	100	98
5	H	457.5073	32.29	peak	16.85	21.89	2.17	29.42	46.00	-16.58	100	314
6	H	896.9965	36.18	QP	22.47	20.89	3.06	40.82	46.00	-5.18	100	36

30MHz -1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()
1	V	37.8121	30.58	peak	15.50	22.27	0.78	24.59	40.00	-15.41	100	8
2	V	52.5753	39.20	peak	8.12	22.39	0.79	25.72	40.00	-14.28	100	180
3	V	94.0979	35.85	peak	8.98	22.32	0.98	23.49	43.50	-20.01	100	188
4	V	173.8135	38.75	peak	11.49	22.26	1.36	29.34	43.50	-14.16	100	84
5	V	207.8501	40.12	peak	11.99	22.37	1.57	31.31	43.50	-12.19	100	95
6	V	287.9904	32.66	peak	13.07	22.29	1.77	25.21	46.00	-20.79	100	75

Above 1GHz

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

Low Channel: GFSK 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	46.29	AV	V	33.39	7.22	48.46	38.44	54	-15.56
4804	44.13	AV	H	33.39	7.22	48.46	36.28	54	-17.72
4804	57.25	PK	V	33.39	7.22	48.46	49.4	74	-24.60
4804	55.38	PK	H	33.39	7.22	48.46	47.53	74	-26.47
2978	34.51	AV	V	30.23	5.62	48.45	21.91	54	-32.09
2978	33.68	AV	H	30.23	5.62	48.45	21.08	54	-32.92
2978	49.65	PK	V	30.23	5.62	48.45	37.05	74	-36.95
2978	47.52	PK	H	30.23	5.62	48.45	34.92	74	-39.08

Middle Channel: GFSK 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	47.29	AV	V	33.62	7.53	48.36	40.08	54	-13.92
4882	45.17	AV	H	33.62	7.53	48.36	37.96	54	-16.04
4882	58.43	PK	V	33.62	7.53	48.36	51.22	74	-22.78
4882	57.24	PK	H	33.62	7.53	48.36	50.03	74	-23.97
9533	36.92	AV	V	38.99	9.67	48.16	37.42	54	-16.58
9533	33.25	AV	H	38.99	9.67	48.16	33.75	54	-20.25
9533	48.15	PK	V	38.99	9.67	48.16	48.65	74	-25.35
9533	46.72	PK	H	38.99	9.67	48.16	47.22	74	-26.78

High Channel: GFSK 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	44.75	AV	V	33.89	7.86	48.31	38.19	54	-15.81
4960	41.95	AV	H	33.89	7.86	48.31	35.39	54	-18.61
4960	58.42	PK	V	33.89	7.86	48.31	51.86	74	-22.14
4960	56.34	PK	H	33.89	7.86	48.31	49.78	74	-24.22
17842	19.58	AV	V	43.21	19.44	44.4	37.83	54	-16.17
17842	17.32	AV	H	43.21	19.44	44.4	35.57	54	-18.43
17842	37.26	PK	V	43.21	19.44	44.4	55.51	74	-18.49
17842	36.5	PK	H	43.21	19.44	44.4	54.75	74	-19.25

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	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
ISN	ISN T800	34373	09/24/2016	09/23/2017	<input type="checkbox"/>
Transient Limiter	LIT-153	531118	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Radiated Emissions					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	<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	08/31/2016	08/30/2017	<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	09/28/2016	09/27/2017	<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	09/20/2016	09/19/2017	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

Whole Package View



Adapter - Lable View



EUT - Front View



EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

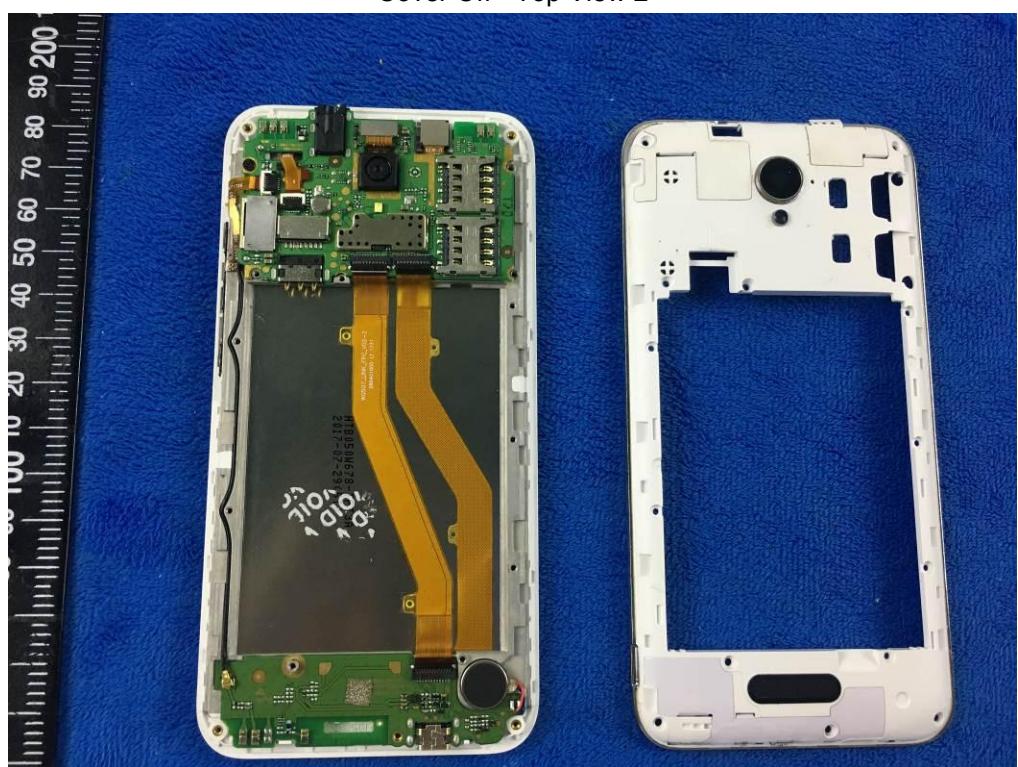


Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View 1



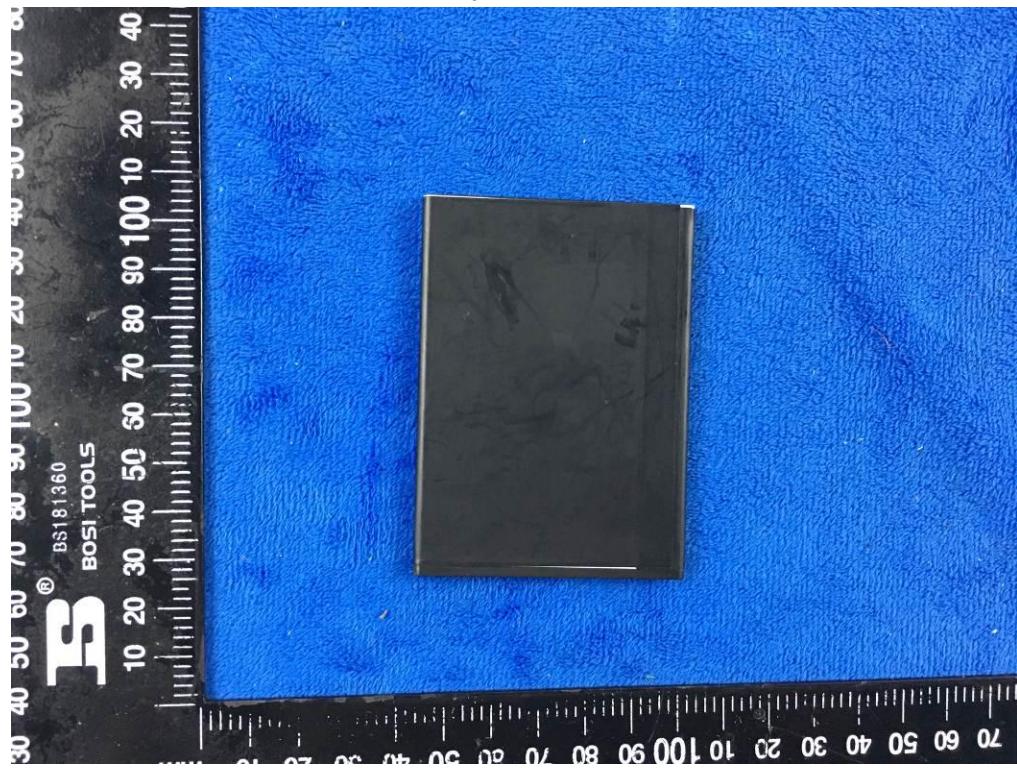
Cover Off - Top View 2



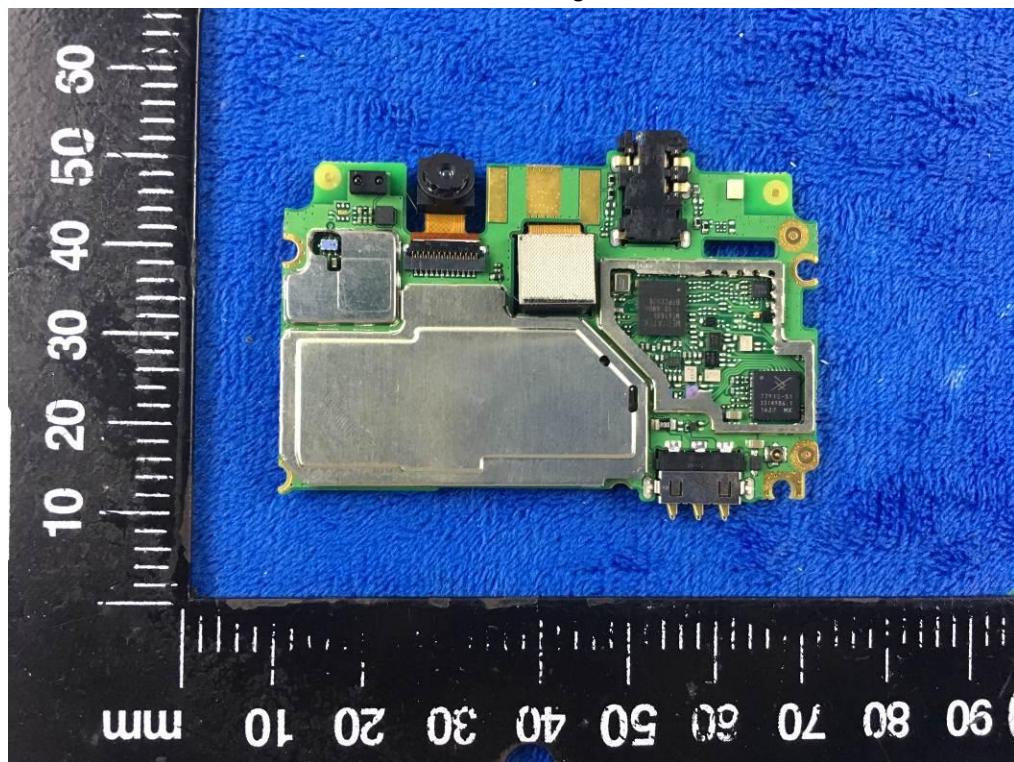
Battery - Front View



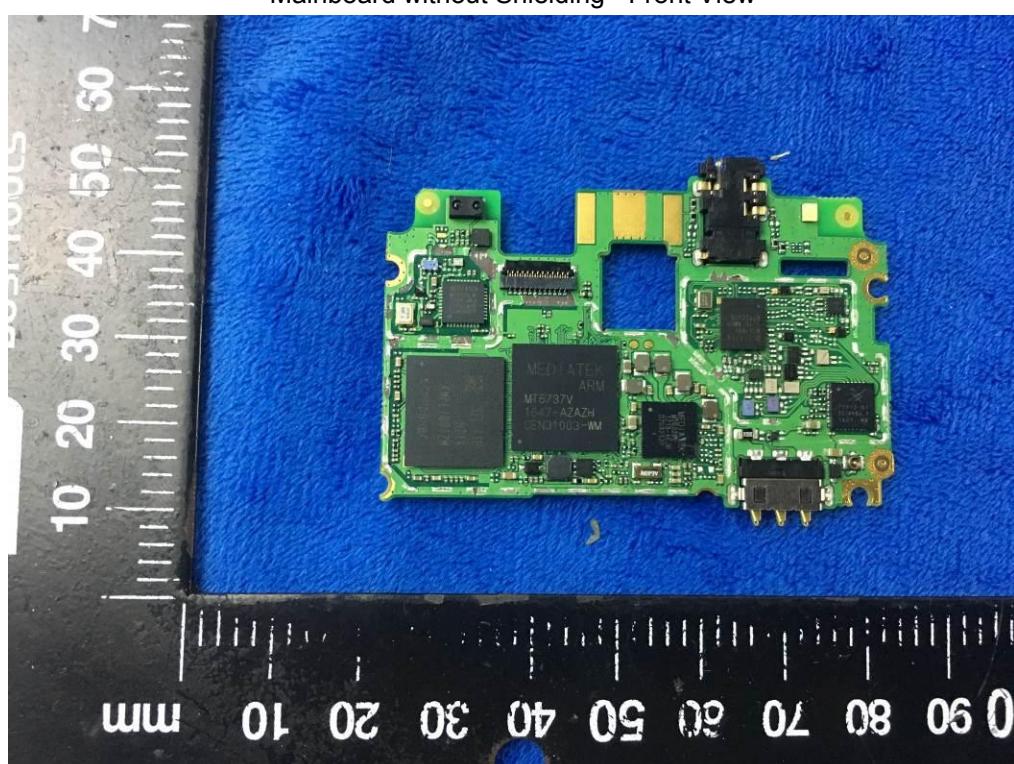
Battery - Rear View



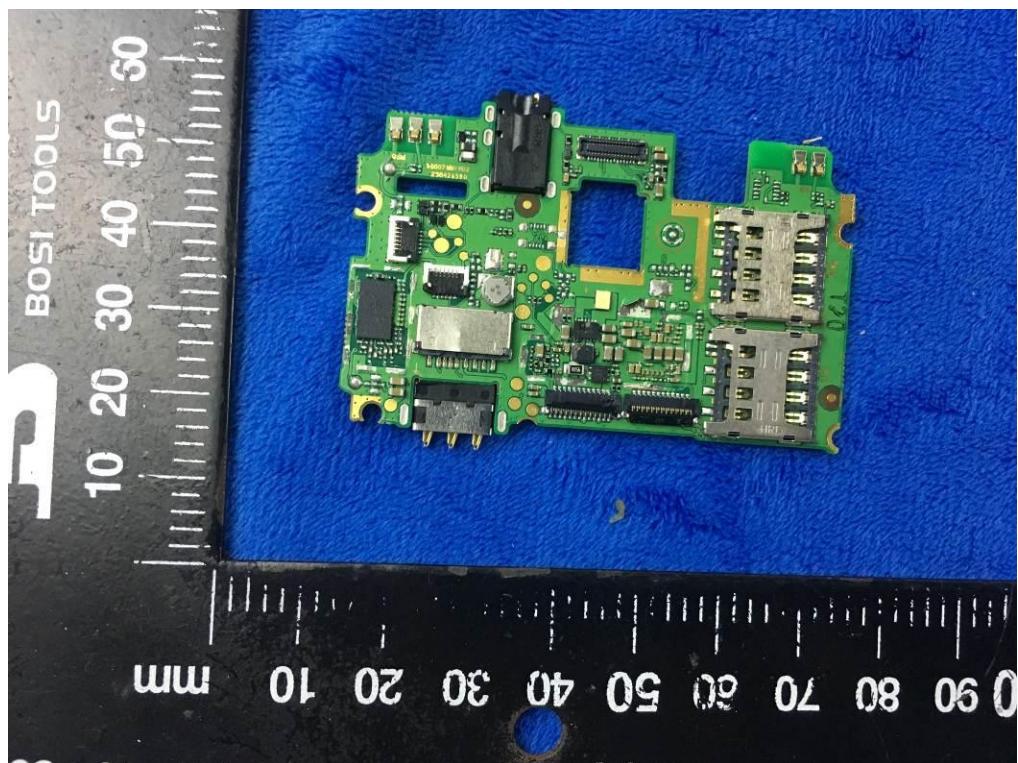
Mainboard with Shielding - Front View



Mainboard without Shielding - Front View



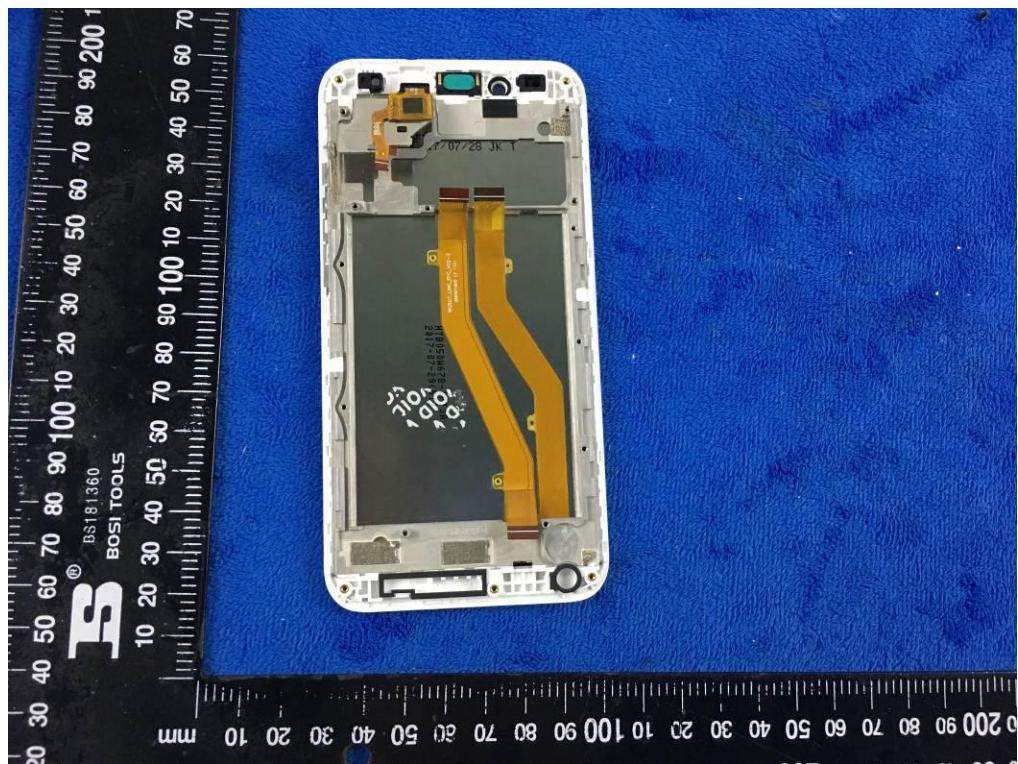
Mainboard – Rear View



LCD – Front View



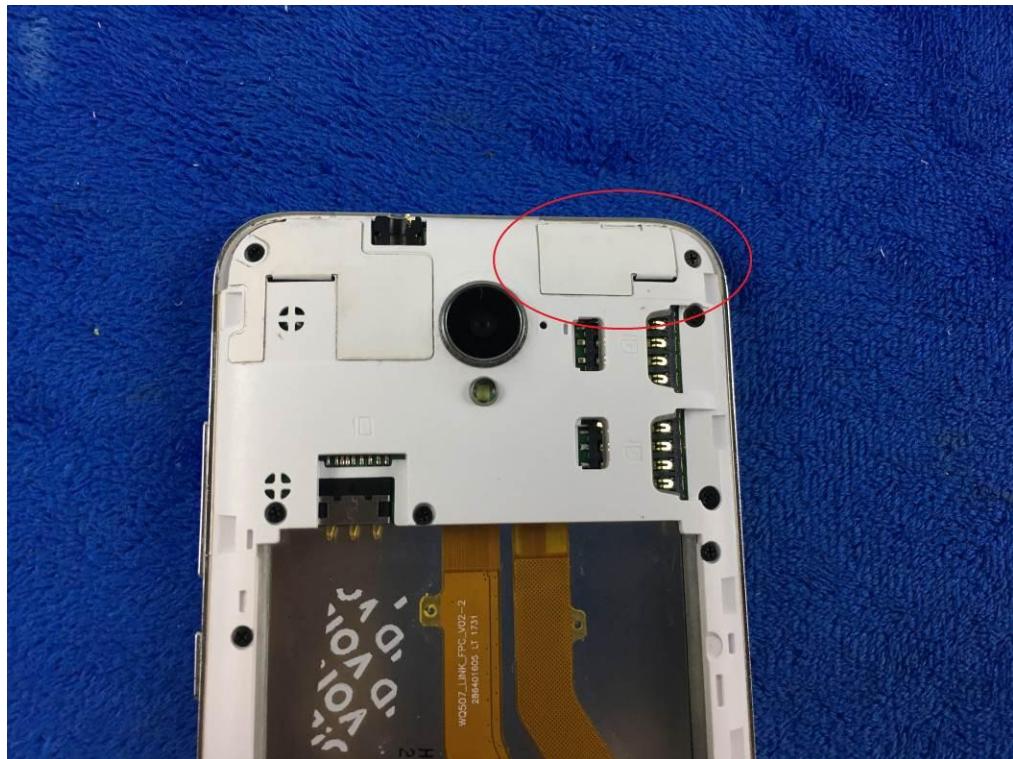
LCD – Rear View



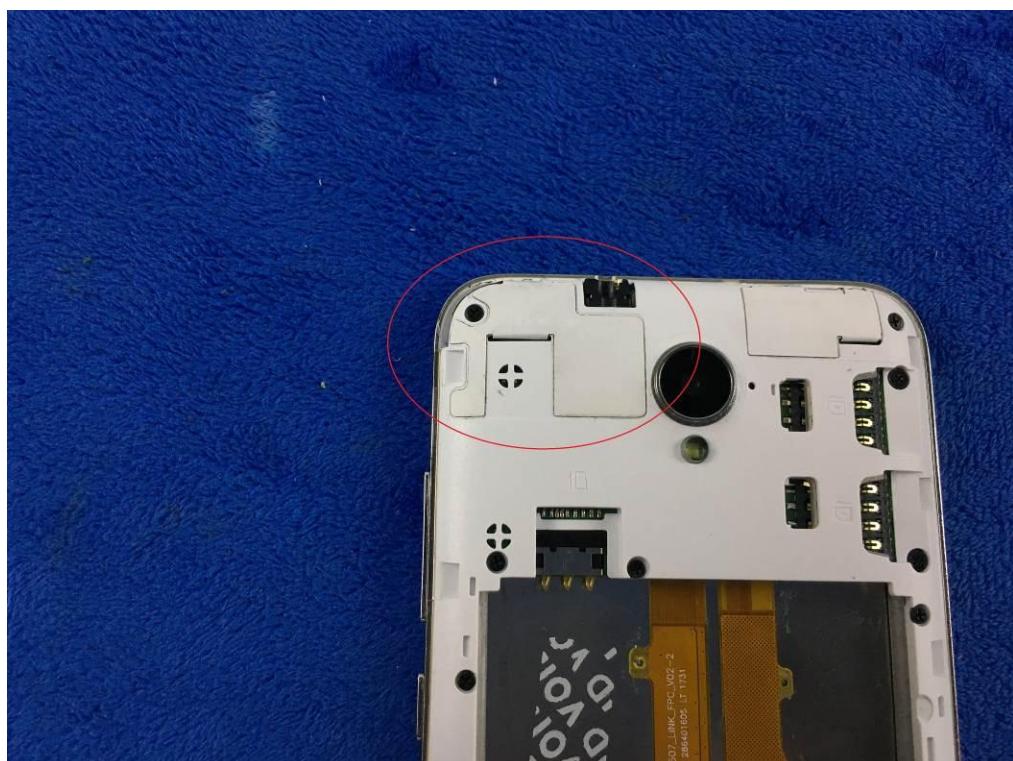
GSM/PCS/UMTS-FDD Antenna View



WIFI/BT/BLE/GPS - Antenna View



LTE - Antenna View



Annex B.iii. Photograph: Test Setup Photo

