RF TEST REPORT

GLOBAL TESTING & CERTIFICATIONS
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Report No.: 15070769-FCC-R2

Supersede Report No.: N/A

Applicant	Verykool USA Inc
Product Name	Mobile phone
Model No.	s5001
Serial No.	N/A
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013
Test Date	September 01 to September 23, 2015
Issue Date	October 08, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Winnie Zhang	David Huang	
Winnie Zhang Test Engineer	David Huang Checked By	

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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
15070769-FCC-R2	NONE	Original	October 08, 2015

2. Customer information

Applicant Name	Verykool USA Inc
Applicant Add	3636 Nobel Drive, Suite 325, San Diego, CA 92122 USA
Manufacturer	HUAWO TECHNOLOGY LIMITED
Manufacturer Add	9A,Gongkan building,Technology south 8th road,High-Tech Park,Nanshan district,Shenzhen

3. Test site information

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

4. Equipment under Test (EUT) Information

Description of EUT:	Mobile phone
Main Model:	s5001
Serial Model:	N/A
Date EUT received:	September 01, 2015
Test Date(s):	September 01 to September 23, 2015
Equipment Category：	DSS
Antenna Gain:	GSM850: -3.9 dBi PCS1900: -3.5 dBi UMTS-FDD Band V: -3.6 dBi UMTS-FDD Band IV: -3.5 dBi UMTS-FDD Band II: -3.5 dBi Bluetooth/BLE: -5.3 dBi WIFI: -5.3 dBi GPS:-3.8 dBi
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK, 8PSK UMTS-FDD: QPSK, 16QAM 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, π /4DQPSK, 8DPSK BLE: GFSK GPS:BPSK
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band IV TX:1712.4 ~ 1752.6 MHz; RX : 2112.4 ~ 2152.6 MHz UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz

	WIFI:802.11b/g/n(20M): 2412-2462 MHz WIFI:802.11n(40M): 2422-2452 MHz Bluetooth& BLE: 2402-2480 MHz GPS RX:1575.42 MHz
Max. Output Power:	1.584dBm
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band V : 102CH UMTS-FDD Band IV: 202CH UMTS-FDD Band II : 277CH WIFI :802.11b/g/n(20M): 11CH WIFI :802.11n(40M): 7CH Bluetooth: 79CH BLE: 40CH GPS:1CH
Port:	Power Port, Earphone Port, USB Port
Input Power:	Battery: Model: 365778 Spec: 3.7V,2000mAh(7.4Wh) Limited Charging Voltage: 4.2V Adapter: Model:ES-CD0501000C Input: 100-240V; 50/60Hz; 0.3A Output: DC 5.0V,1000mA
Trade Name :	VeryKool
GPRS/EGPRS Multi-slot class	8/10/12
FCC ID:	WA6S5001

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

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

Measurement Uncertainty

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

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.
The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:
Antenna must be permanently attached to the unit.
Antenna must use a unique type of connector to attach to the EUT.
Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 2 antennas:
A permanently attached PIFA antenna for Bluetooth/BLE/WIFI/GPS, the gain is -5.3dBi for Bluetooth/BLE, the gain is -5.3dBi for WIFI, the gain is -3.8dBi for GPS.
A permanently attached PIFA antenna for GSM/PCS and UMTS, the gain is -3.9dBi for GSM850, -3.5dBi for PCS1900,-3.6dBi for UMTS-FDD Band V,-3.5dBi for UMTS-FDD Band IV,-3.5dBi for UMTS-FDD Band II.

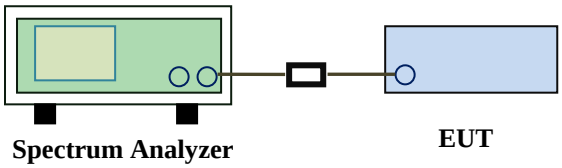
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(a)(1)	a)	Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: The EUT must have its hopping function enabled Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span Video (or Average) Bandwidth (VBW) ≥ RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Channel Separation measurement result

Type/ Modulation	CH	CH Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	1.002	0.687	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.688	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.684	Pass
	Adjacency Channel	2479			
CH Separation π /4 DQPSK	Low Channel	2402	1.002	0.860	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.859	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.859	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.865	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.862	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.861	Pass
	Adjacency Channel	2479			

Test Plots

Channel Separation 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

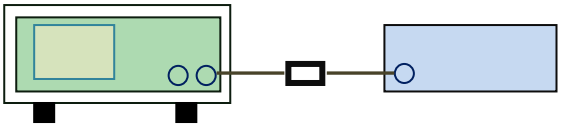
8DPSK - Middle Channel

8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

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

	20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Measurement result

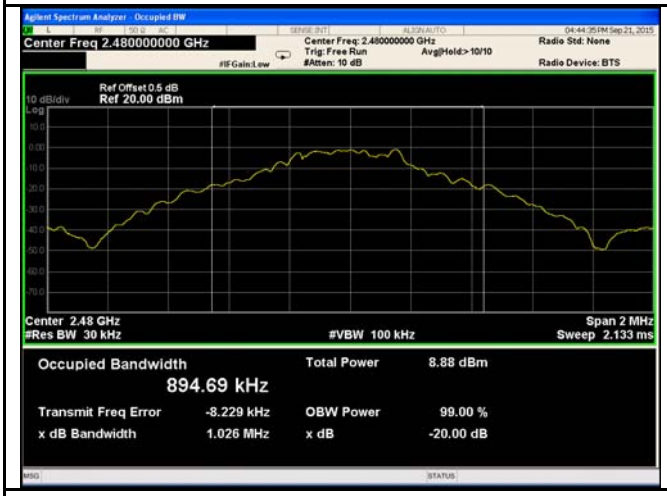
Modulation	CH	CH Freq (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	1.031	0.8987
	Mid	2441	1.032	0.8966
	High	2480	1.026	0.8947
π /4 DQPSK	Low	2402	1.290	1.1704
	Mid	2441	1.289	1.1678
	High	2480	1.288	1.1666
8-DPSK	Low	2402	1.297	1.1788
	Mid	2441	1.293	1.1767
	High	2480	1.291	1.1740

Test Plots

20dB Bandwidth measurement result

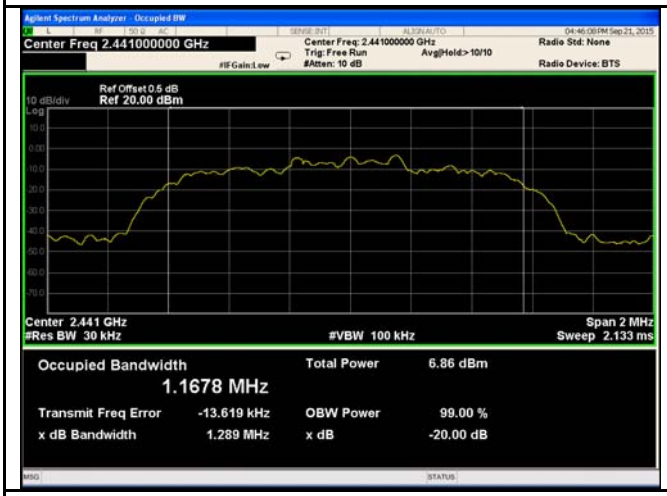
GFSK - Low Channel

GFSK - Middle Channel



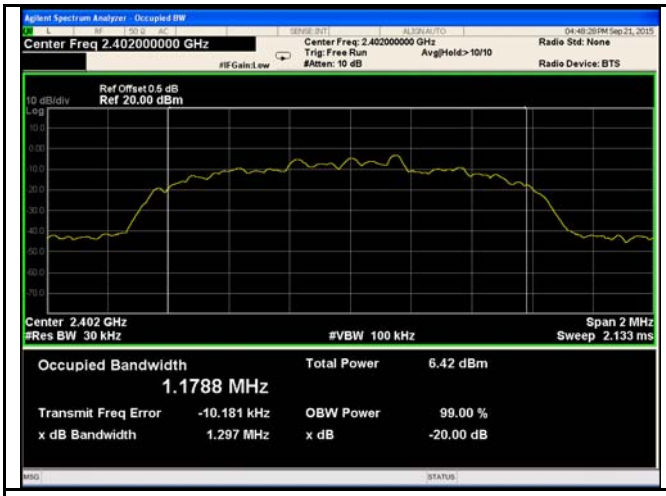
GFSK - High Channel

π /4 DPSK - Low Channel



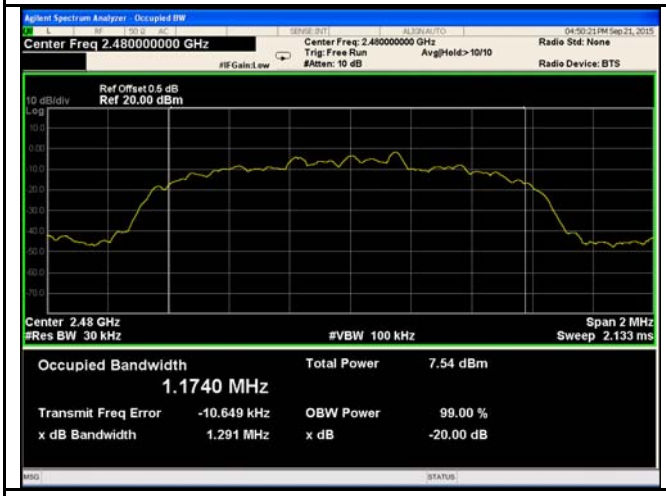
π /4 DQPSK - Middle Channel

π /4 DQPSK - High Channel



8DPSK - Low Channel

8DPSK - Middle Channel

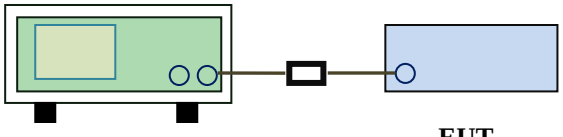


8DPSK - High Channel

6.4 Peak Output Power

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (2)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☑
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☑
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤ 0.25 Watt	☐
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 1 Watt	☐
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold		

	Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer.
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

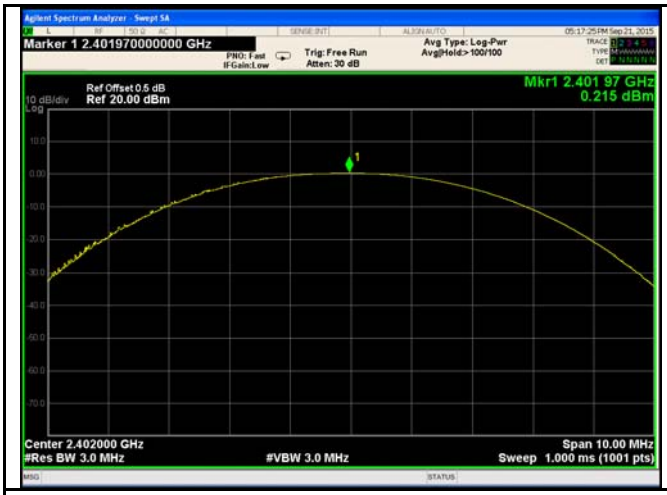
Test Plot ☑ Yes (See below) ☐ N/A

Peak Output Power measurement result

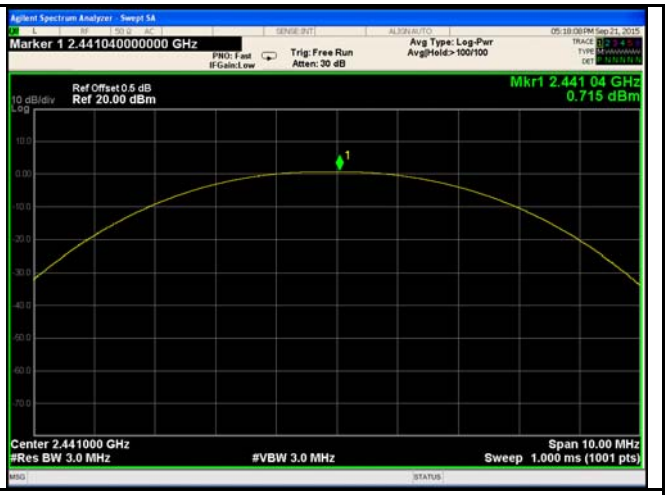
Type	Modulation	CH	Freq (MHz)	Conducted Power (dBm)	Limit (mW)	Result
Output power	GFSK	Low	2402	0.215	125	Pass
		Mid	2441	0.715	125	Pass
		High	2480	**1.584**	125	Pass
	π /4 DQPSK	Low	2402	0.064	125	Pass
		Mid	2441	0.530	125	Pass
		High	2480	1.398	125	Pass
	8-DPSK	Low	2402	0.103	125	Pass
		Mid	2441	0.625	125	Pass
		High	2480	1.503	125	Pass

Test Plots

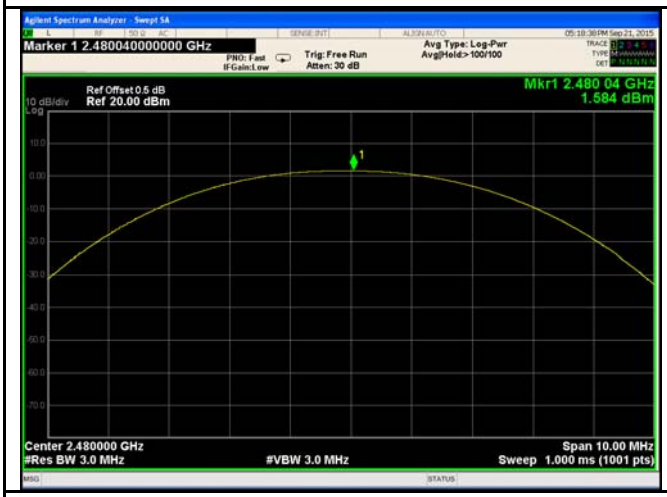
Output Power measurement result



GFSK Output power - Low CH 2402

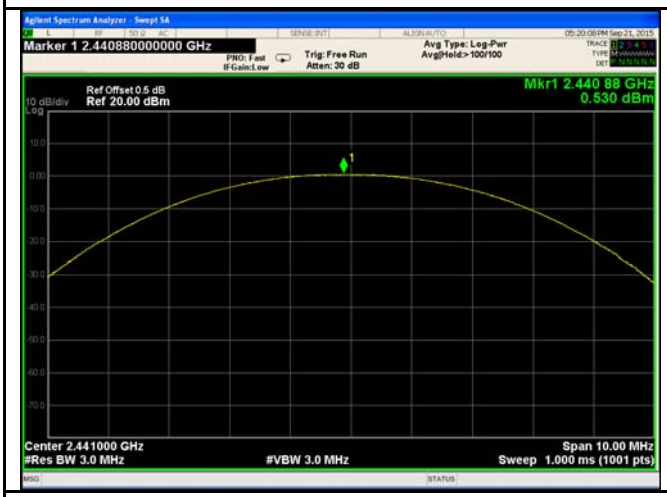


GFSK Output power - Mid CH 2441

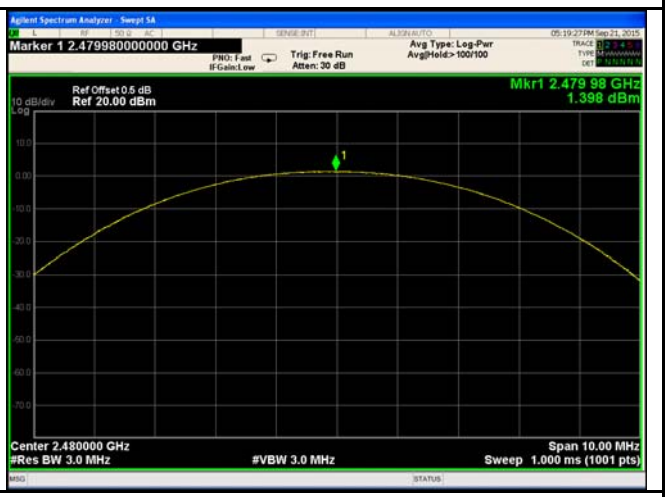


GFSK Output power - High CH 2480

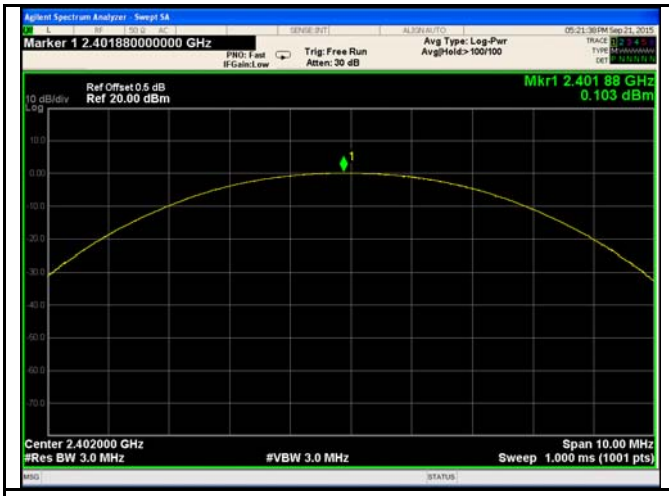
π /4 DQPSK Output power - Low CH 2402



π /4 DQPSK Output power - Mid CH 2441

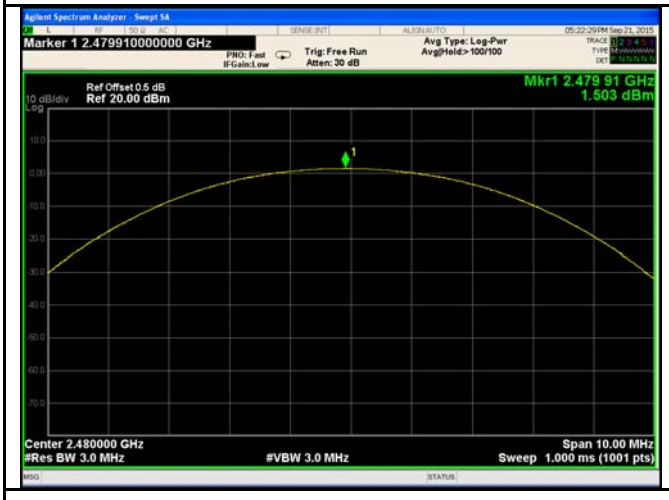


π /4 DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402

8DPSK Output power - Mid CH 2441

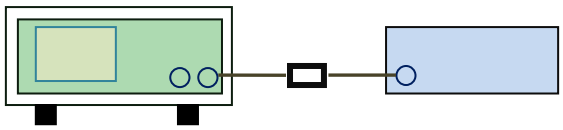


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

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

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Number of Hopping Channel measurement result

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

Test Plots

Number of Hopping Channels measurement result

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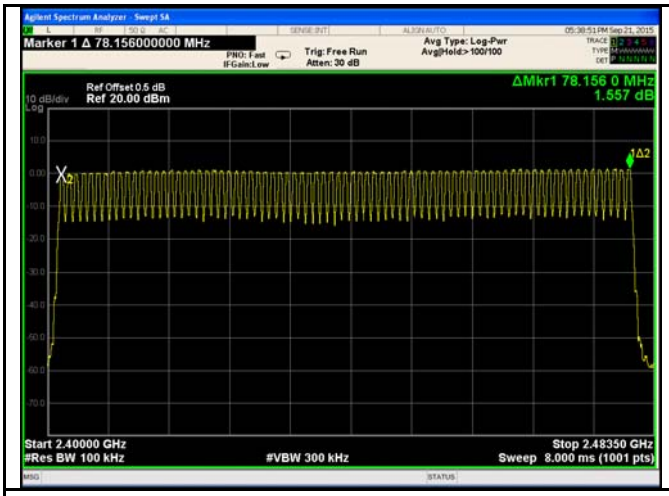
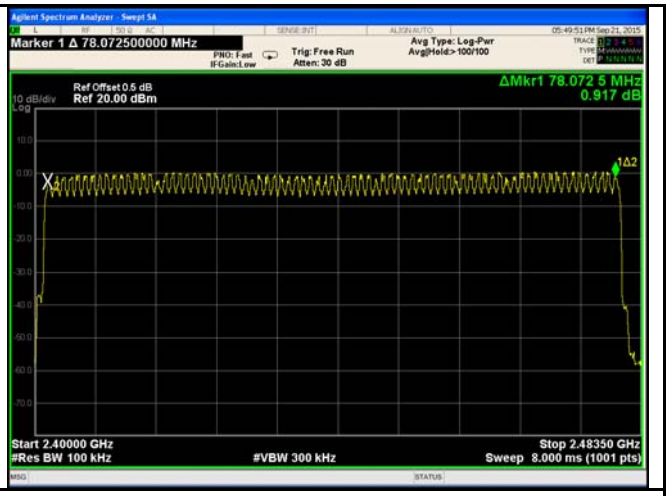
<tr><td> 
</td><td> 
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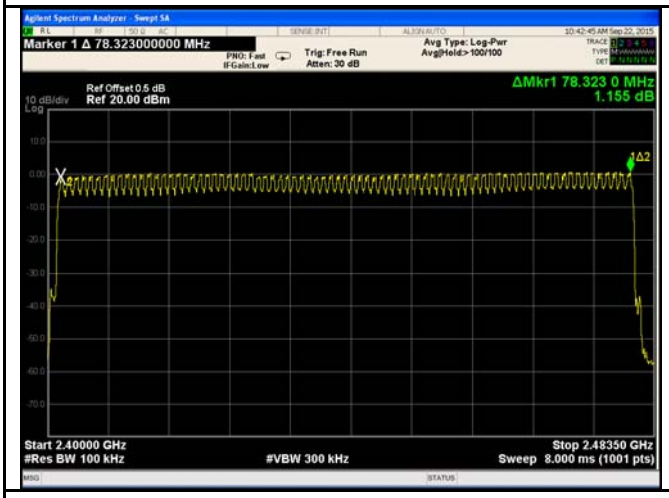
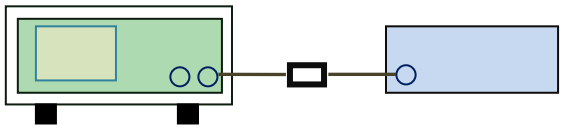
<tr><td>GFSK</td><td>π /4DQPSK</td></tr>
<tr><td> 
</td><td></td></tr>
<tr><td>8DPSK</td><td></td></tr>
</table>

6.6 Time of Occupancy (Dwell Time)

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	Dwell Time < 0.4s	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer Span = zero span, centered on a hopping channel RBW = 1 MHz VBW ≥ RBW Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak Trace = max hold use the marker-delta function to determine the dwell time		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

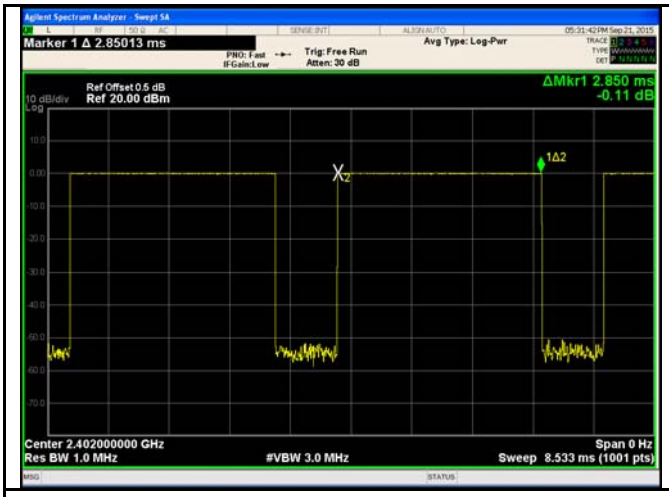
Test Plot ☑ Yes (See below) ☐ N/A

Dwell Time measurement result

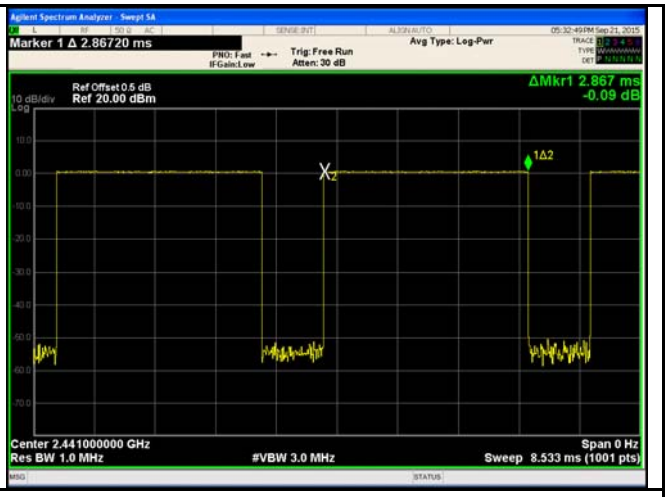
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.850	304.000	400	Pass
		Mid	2.867	305.813	400	Pass
		High	2.876	306.773	400	Pass
	π /4 DQPSK	Low	2.876	306.773	400	Pass
		Mid	2.876	306.773	400	Pass
		High	2.867	305.813	400	Pass
	8-DPSK	Low	2.876	306.773	400	Pass
		Mid	2.884	307.627	400	Pass
		High	2.876	306.773	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

Test Plots

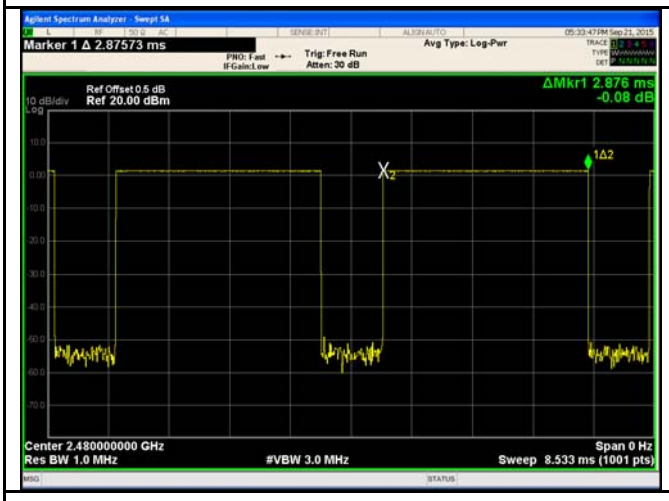
Dwell Time measurement result



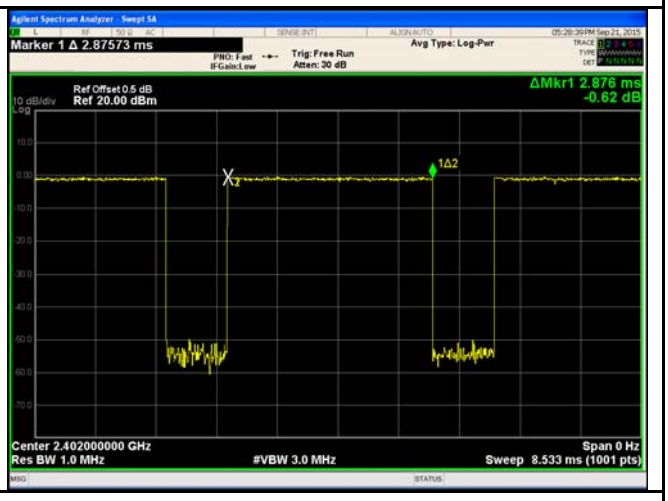
GFSK - Low CH 2402



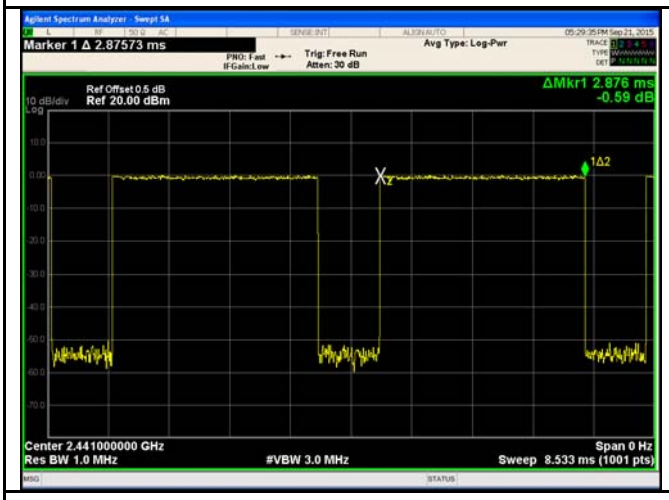
GFSK - Mid CH 2441



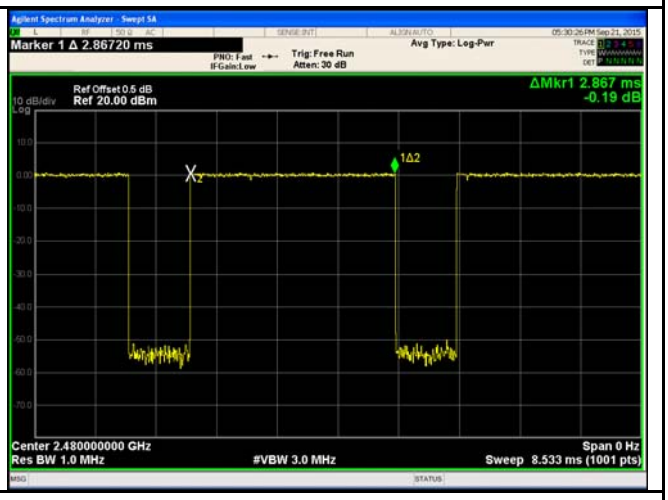
GFDK - High CH 2480



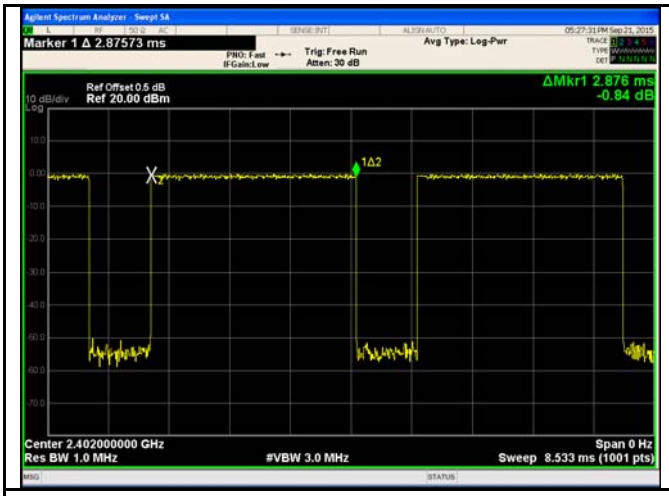
π /4 DQPSK - Low CH 2402



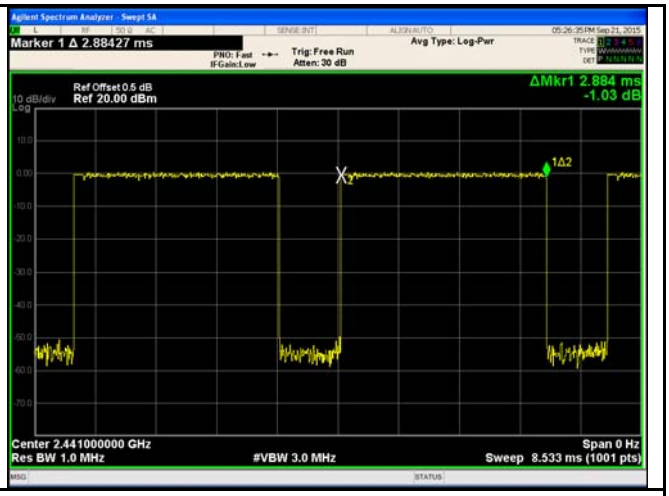
π /4 DQPSK - Mid CH 2441



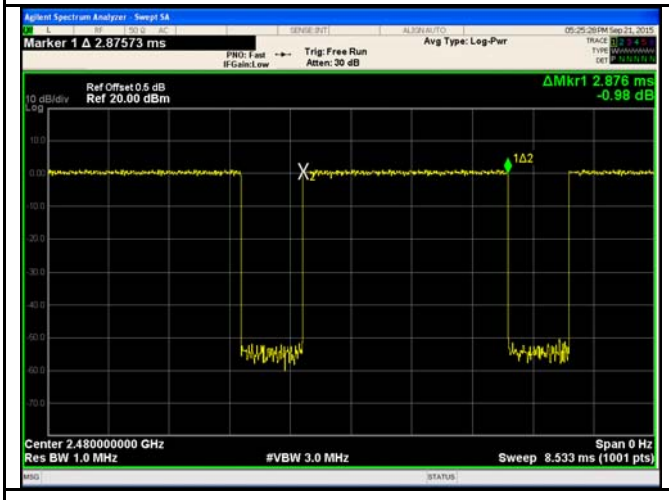
π /4 DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441

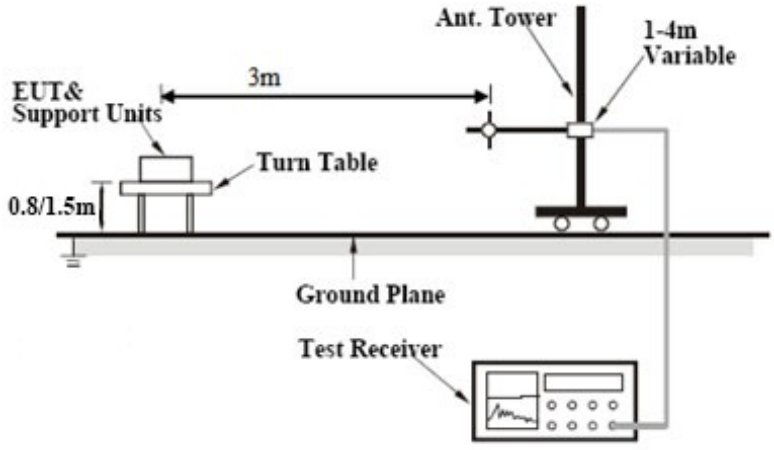


8DPSK - High CH 2480

6.7 Band Edge

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

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

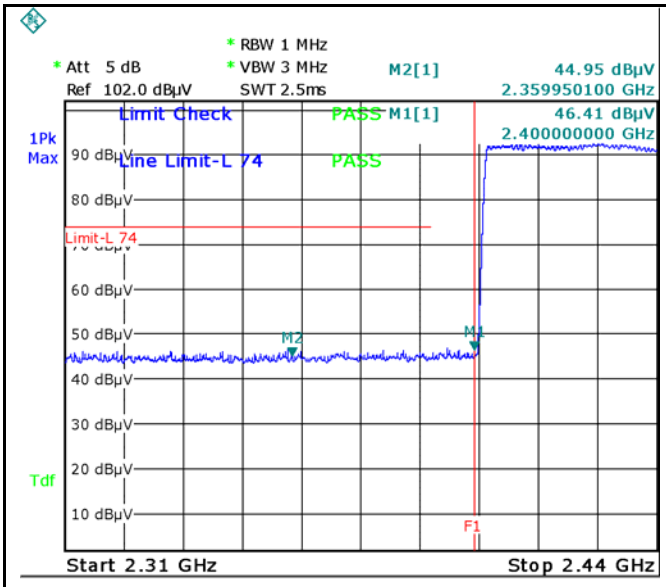
	instrument is operated in its linear range. 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: a. The resolution bandwidth and video bandwidth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

Test Data ☐ Yes ☑ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Plots

GFSK Mode:

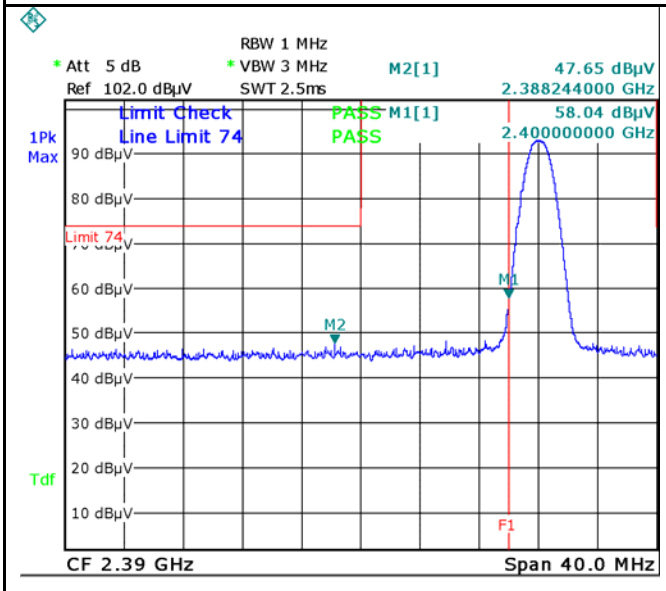


GFSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

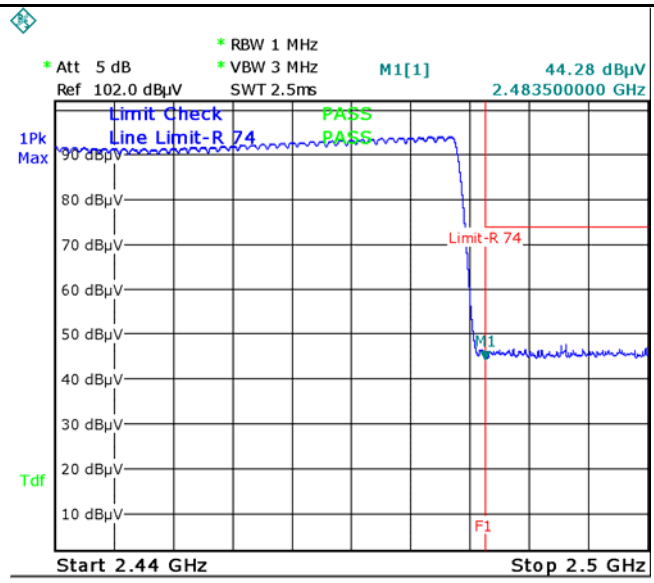
Note: (no need if PK value less than the AV limit)

GFSK-Hopping Left Side-AV



GFSK-Left Side-PK

Note: F1 is frequency 2400MHz

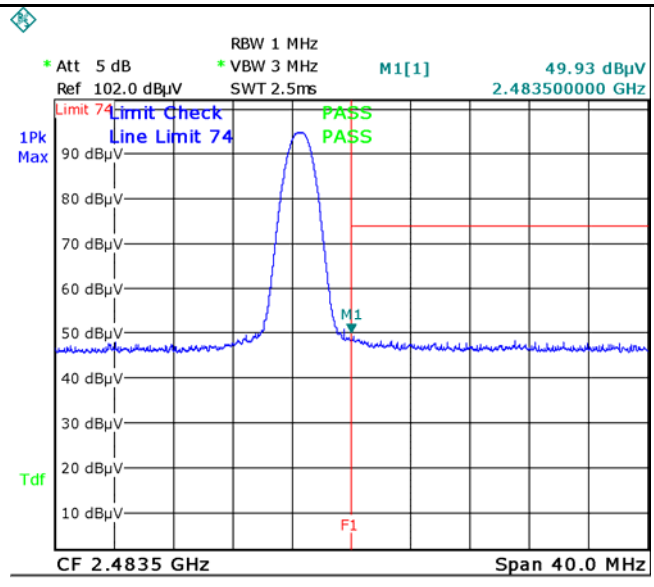


GFSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

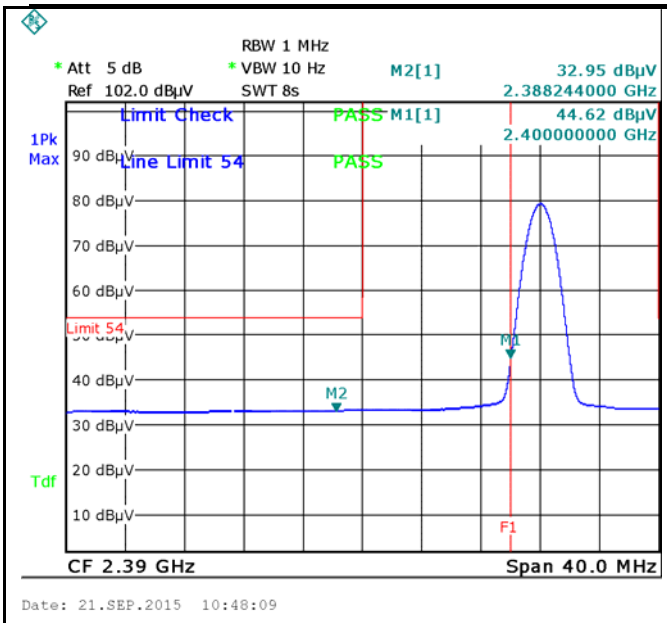
Note: (no need if PK value less than the AV limit)

GFSK-Hopping Right Side-AV



GFSK-Right Side-PK

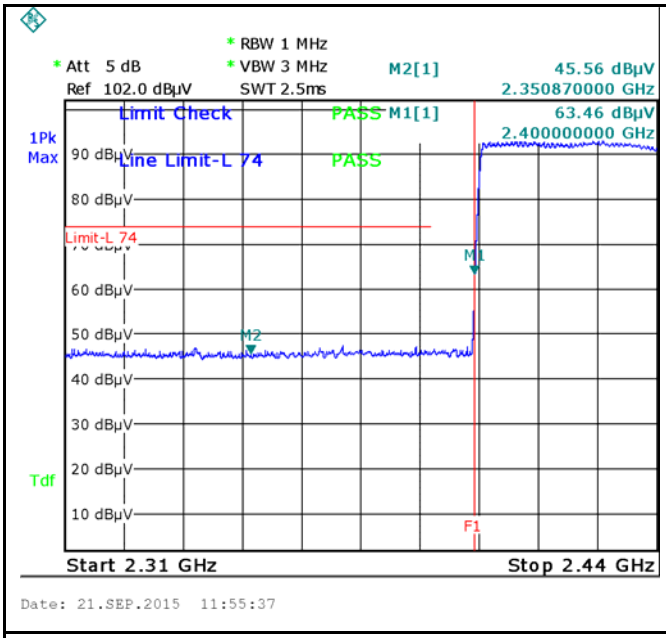
Note: F1 is frequency 2483.5MHz



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

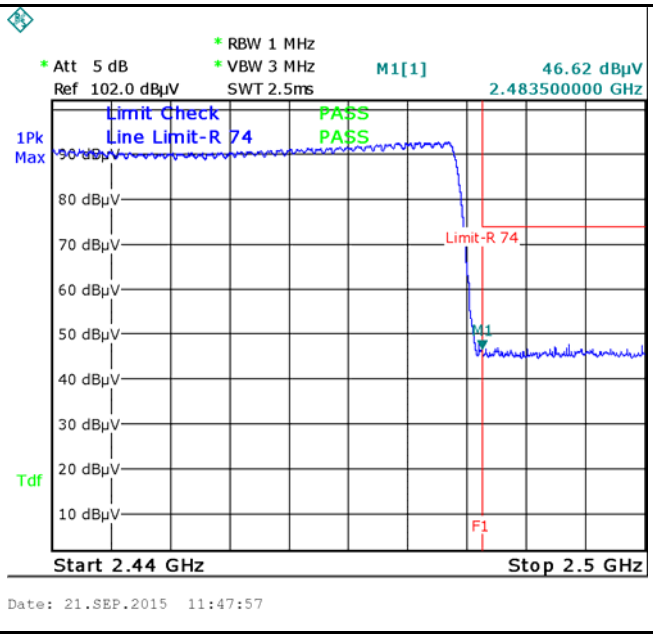
GFSK-Left Side-AV	GFSK-Right Side-AV

π /4 DQPSK Mode:



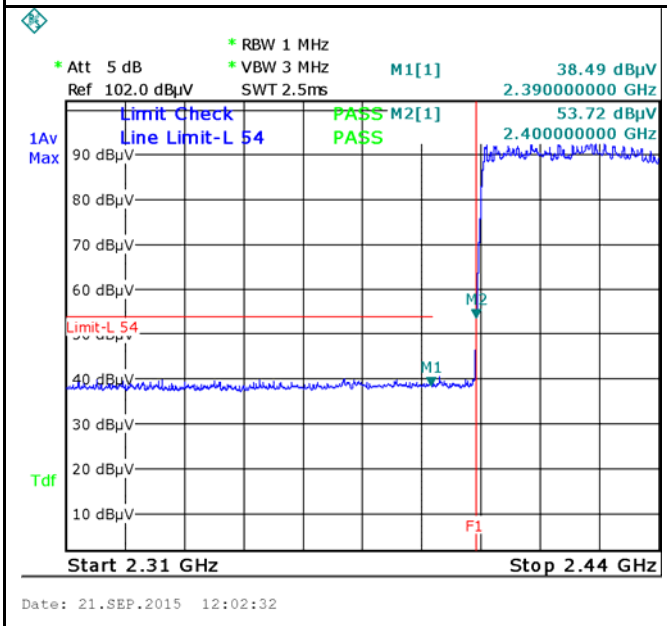
π /4 DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



π /4 DQPSK-Hopping Right Side-PK

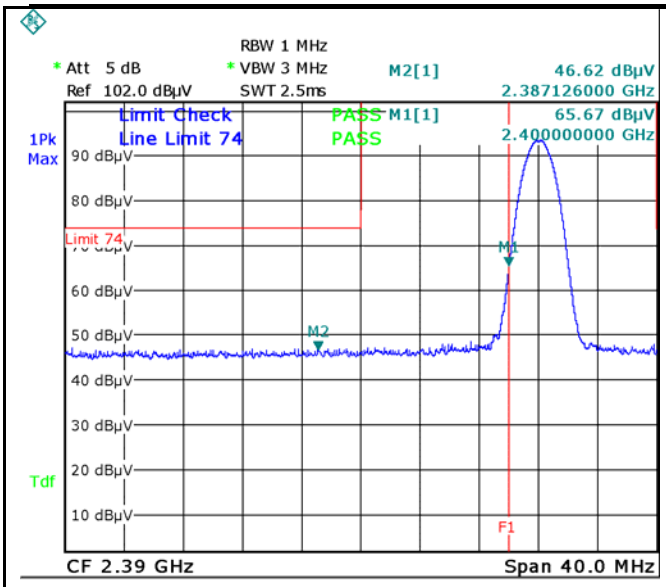
Note: F1 is frequency 2483.5MHz



π /4 DQPSK-Hopping Left-AV

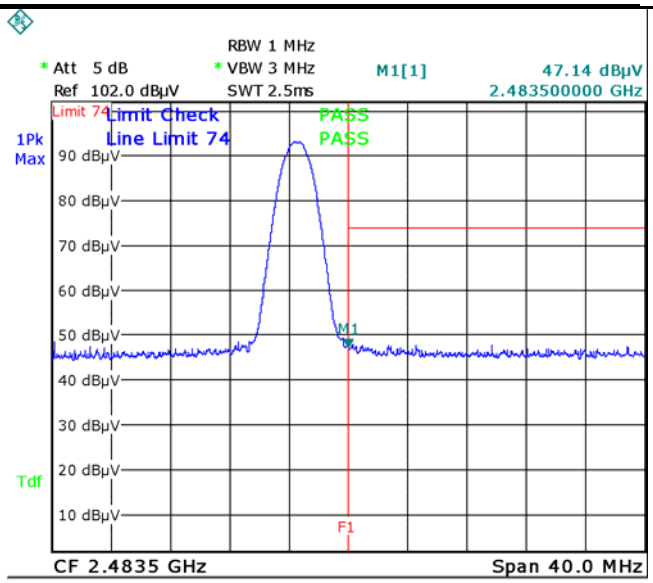
Note: (no need if PK value less than the AV limit)

π /4 DQPSK-Hopping Right-AV



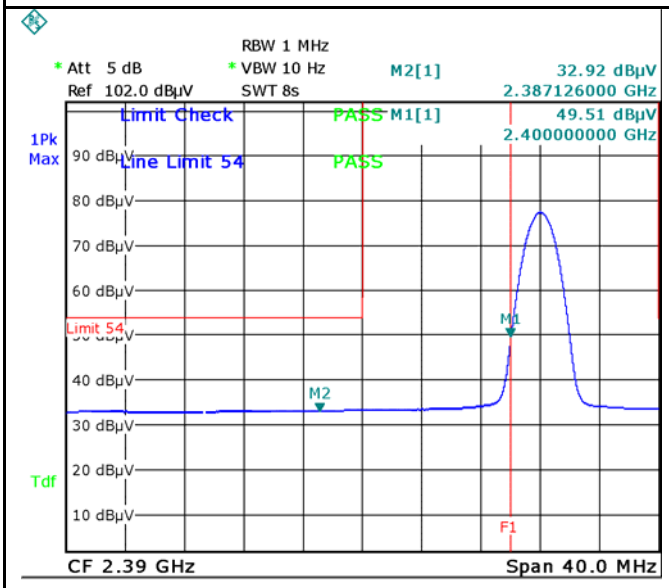
π /4 DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz



π /4 DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

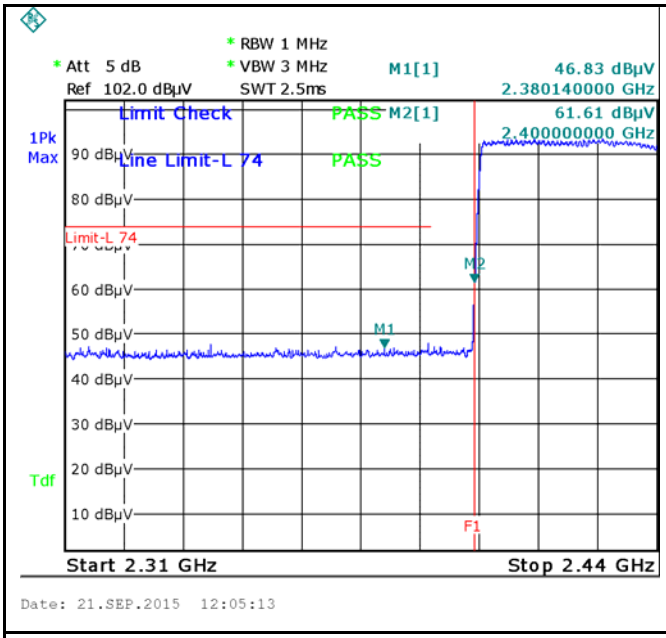


π /4 DQPSK-Left Side-AV

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

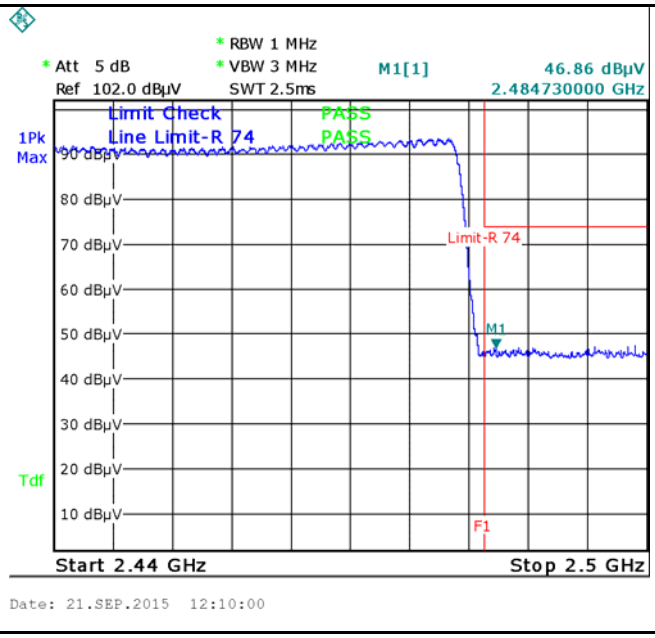
π /4 DQPSK-Right Side-AV

8-DPSK Mode:



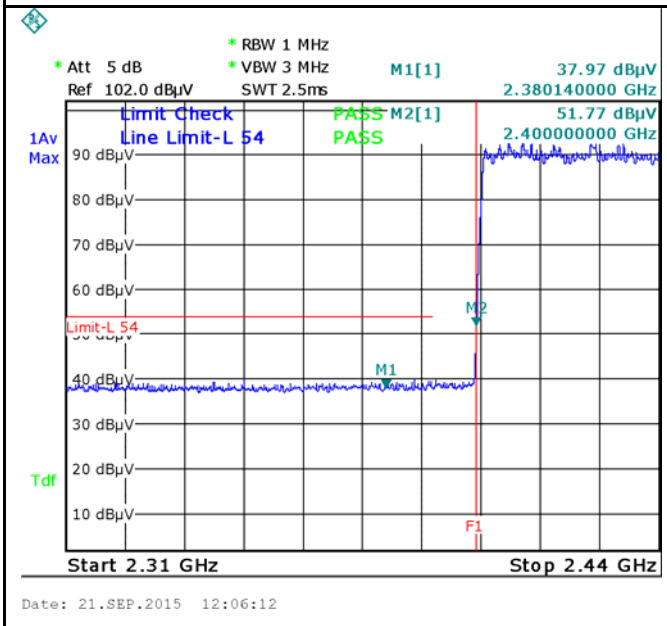
8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

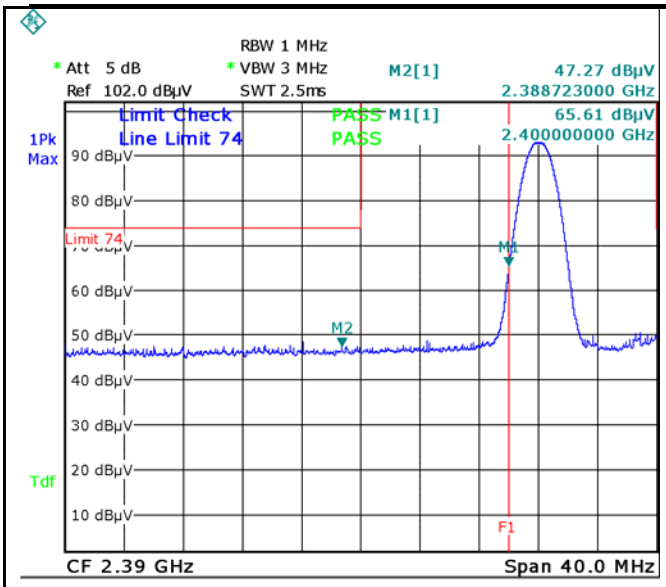
Note: F1 is frequency 2483.5MHz



8DPSK-Hopping Left-AV

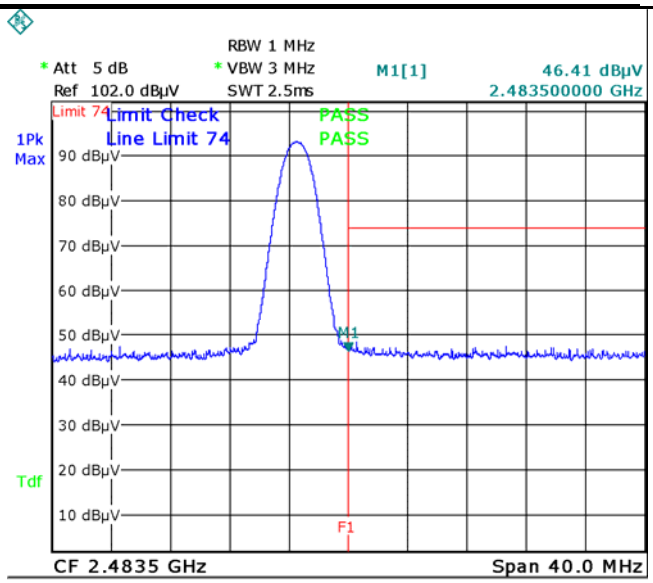
Note: (no need if PK value less than the AV limit)

8DPSK-Hopping Right-AV



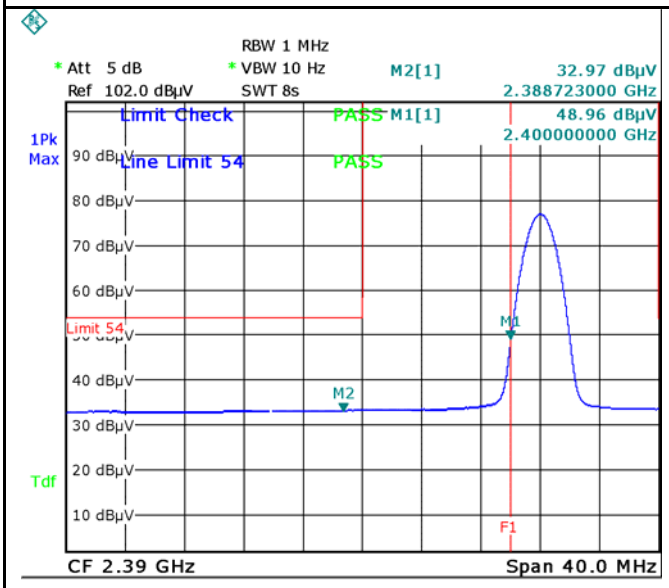
8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz



8DPSK-Left Side-AV

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

8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

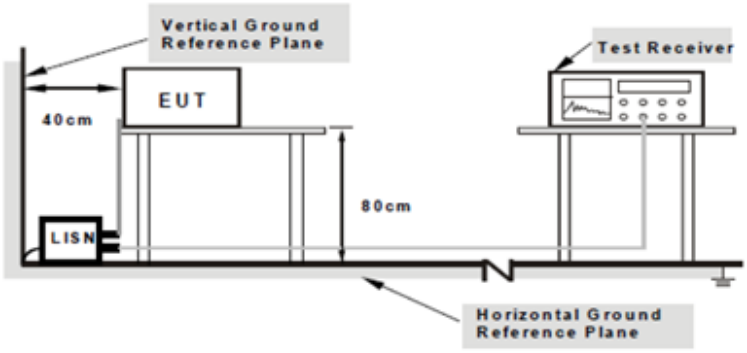
Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

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.	☑

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

Procedure

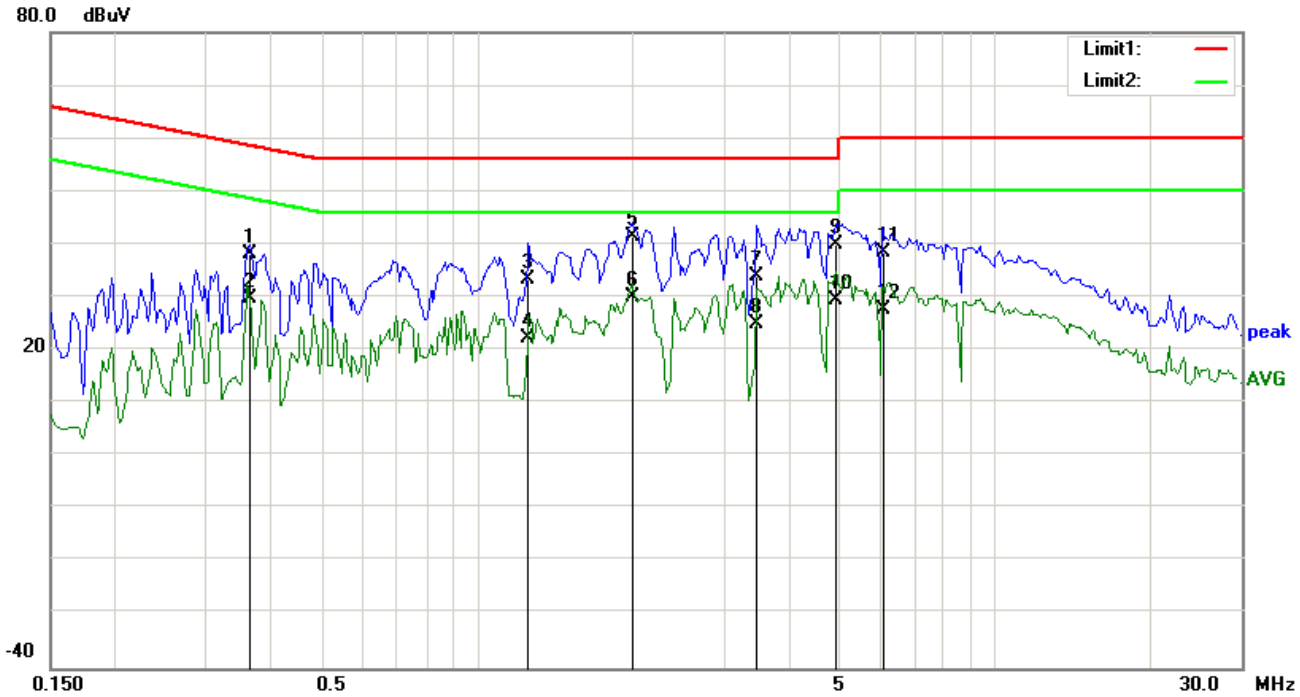
The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial

	cable. All other supporting equipment were powered separately from another main supply. The EUT was switched on and allowed to warm up to its normal operating condition. 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. 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. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	
Result	☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Bluetooth Mode

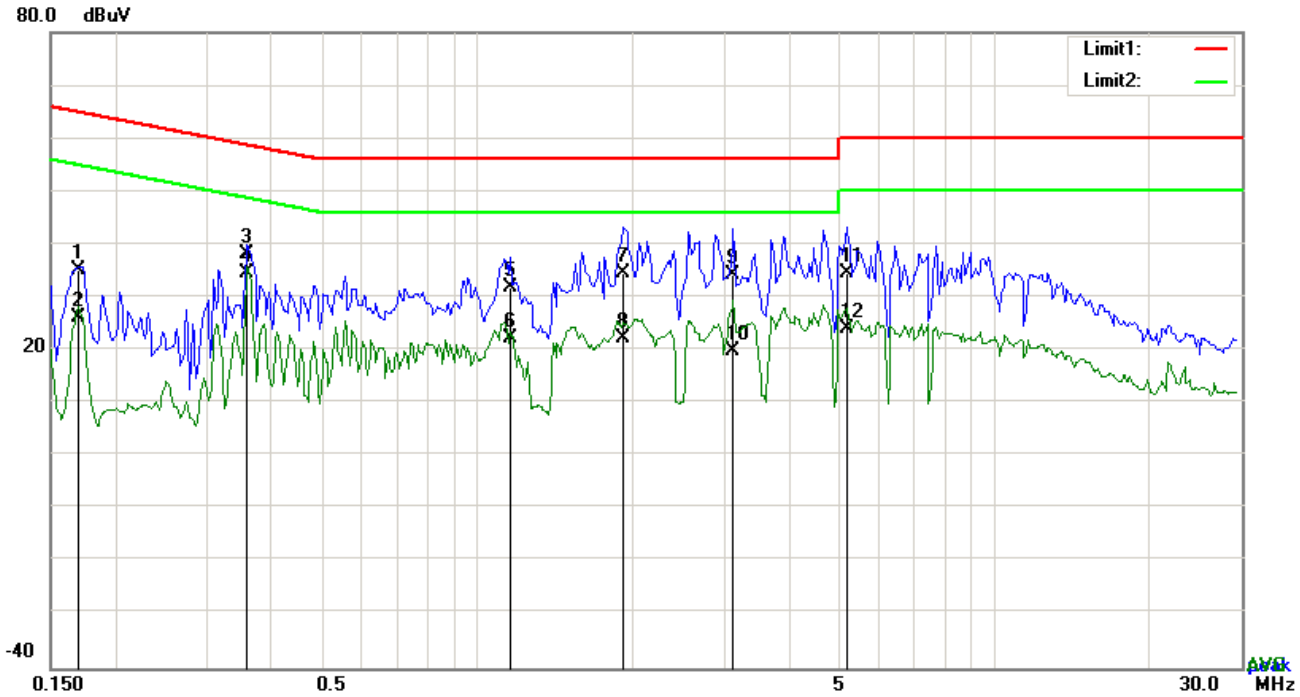


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.3645	28.27	QP	10.03	38.30	58.63	-20.33
2	L1	0.3645	19.73	AVG	10.03	29.76	48.63	-18.87
3	L1	1.2576	23.40	QP	10.03	33.43	56.00	-22.57
4	L1	1.2576	12.26	AVG	10.03	22.29	46.00	-23.71
5	L1	1.9947	31.56	QP	10.04	41.60	56.00	-14.40
6	L1	1.9947	20.01	AVG	10.04	30.05	46.00	-15.95
7	L1	3.4719	23.92	QP	10.06	33.98	56.00	-22.02
8	L1	3.4719	14.80	AVG	10.06	24.86	46.00	-21.14
9	L1	4.9383	29.90	QP	10.08	39.98	56.00	-16.02
10	L1	4.9383	19.25	AVG	10.08	29.33	46.00	-16.67
11	L1	6.0885	28.30	QP	10.10	38.40	60.00	-21.60
12	L1	6.0885	17.60	AVG	10.10	27.70	50.00	-22.30

Test Mode:	Bluetooth Mode

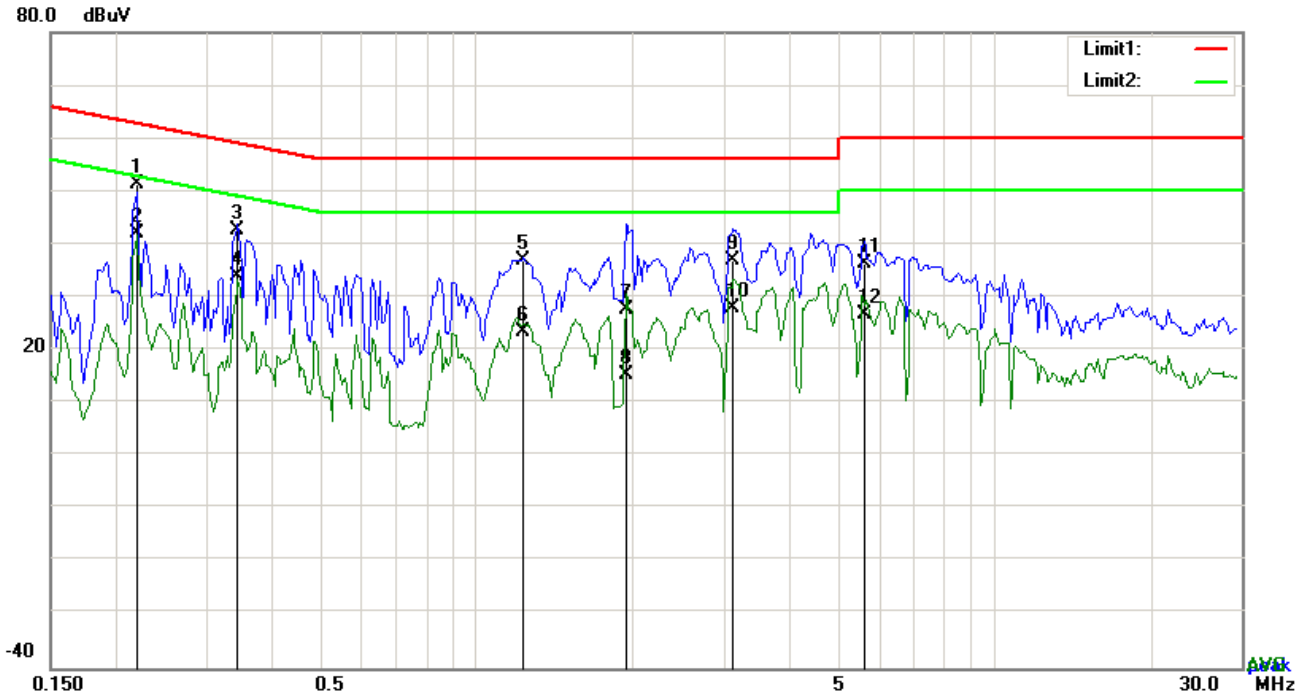


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.1695	25.28	QP	10.02	35.30	64.98	-29.68
2	N	0.1695	16.02	AVG	10.02	26.04	54.98	-28.94
3	N	0.3606	28.26	QP	10.02	38.28	58.71	-20.43
4	N	0.3606	24.46	AVG	10.02	34.48	48.71	-14.23
5	N	1.1601	21.86	QP	10.03	31.89	56.00	-24.11
6	N	1.1601	12.24	AVG	10.03	22.27	46.00	-23.73
7	N	1.9167	24.53	QP	10.04	34.57	56.00	-21.43
8	N	1.9167	12.13	AVG	10.04	22.17	46.00	-23.83
9	N	3.1248	24.11	QP	10.05	34.16	56.00	-21.84
10	N	3.1248	9.80	AVG	10.05	19.85	46.00	-26.15
11	N	5.1762	24.48	QP	10.07	34.55	60.00	-25.45
12	N	5.1762	13.87	AVG	10.07	23.94	50.00	-26.06

Test Mode:	Bluetooth Mode

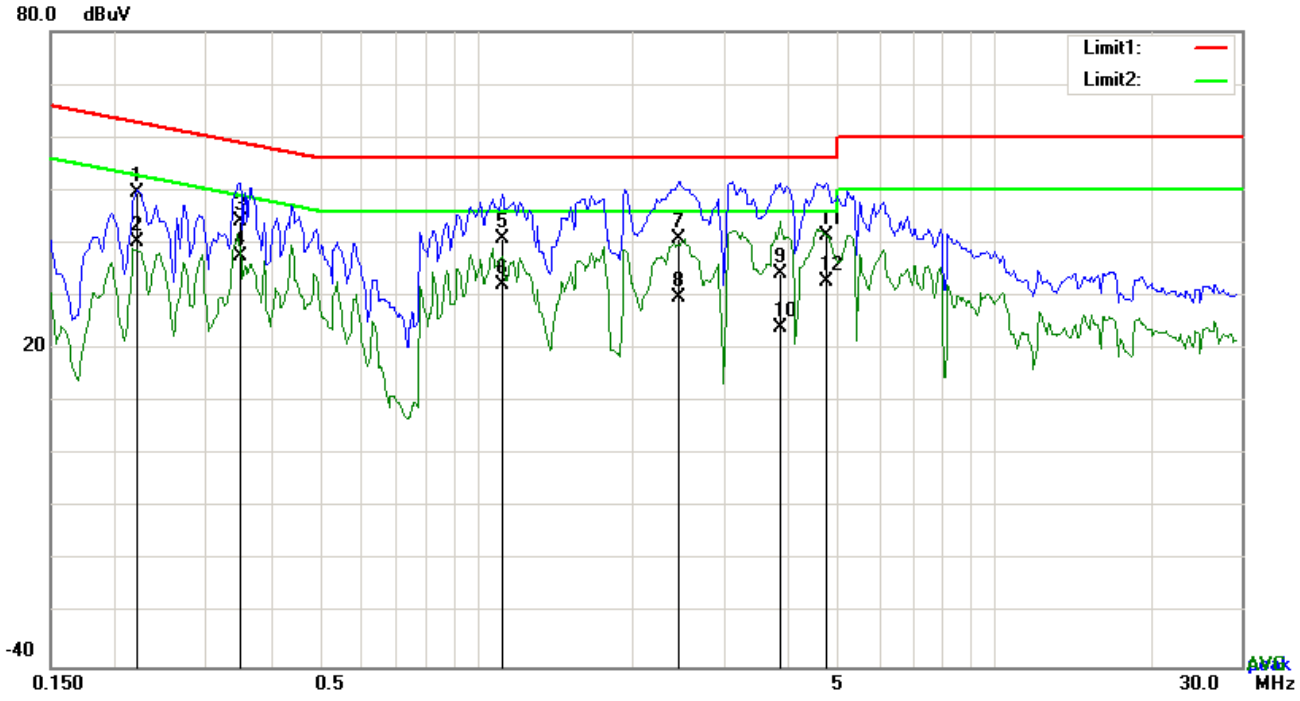


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.2202	41.44	QP	10.03	51.47	62.81	-11.34
2	L1	0.2202	31.90	AVG	10.03	41.93	52.81	-10.88
3	L1	0.3450	32.59	QP	10.03	42.62	59.08	-16.46
4	L1	0.3450	23.88	AVG	10.03	33.91	49.08	-15.17
5	L1	1.2303	26.80	QP	10.03	36.83	56.00	-19.17
6	L1	1.2303	13.49	AVG	10.03	23.52	46.00	-22.48
7	L1	1.9440	17.65	QP	10.04	27.69	56.00	-28.31
8	L1	1.9440	5.19	AVG	10.04	15.23	46.00	-30.77
9	L1	3.1248	26.80	QP	10.06	36.86	56.00	-19.14
10	L1	3.1248	17.97	AVG	10.06	28.03	46.00	-17.97
11	L1	5.5974	26.12	QP	10.09	36.21	60.00	-23.79
12	L1	5.5974	16.70	AVG	10.09	26.79	50.00	-23.21

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	0.2202	39.58	QP	10.02	49.60	62.81	-13.21
2	N	0.2202	30.36	AVG	10.02	40.38	52.81	-12.43
3	N	0.3489	34.20	QP	10.02	44.22	58.99	-14.77
4	N	0.3489	27.47	AVG	10.02	37.49	48.99	-11.50
5	N	1.1211	30.93	QP	10.03	40.96	56.00	-15.04
6	N	1.1211	22.14	AVG	10.03	32.17	46.00	-13.83
7	N	2.4588	30.92	QP	10.04	40.96	56.00	-15.04
8	N	2.4588	19.57	AVG	10.04	29.61	46.00	-16.39
9	N	3.8502	24.25	QP	10.06	34.31	56.00	-21.69
10	N	3.8502	13.96	AVG	10.06	24.02	46.00	-21.98
11	N	4.7277	31.26	QP	10.07	41.33	56.00	-14.67
12	N	4.7277	22.65	AVG	10.07	32.72	46.00	-13.28

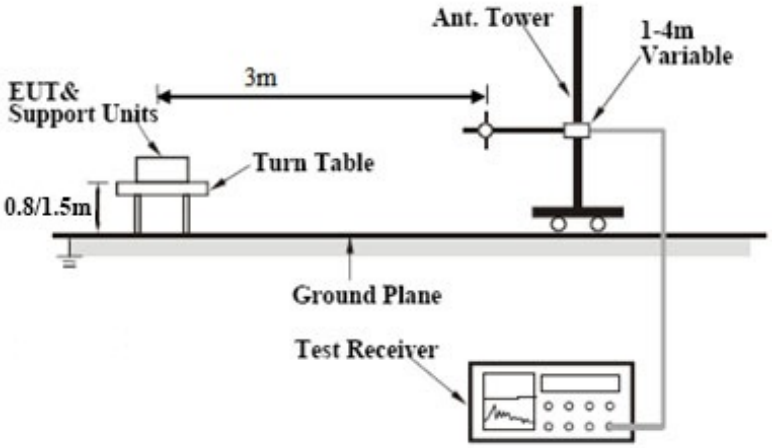
6.9 Radiated Spurious Emissions

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.205, §15.209, §15.247(d)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	☑

Frequency range (MHz)	Field Strength (μV/m)
30 – 88	100
88 – 216	150
216 960	200
Above 960	500

Test Setup	
Procedure	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: a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.

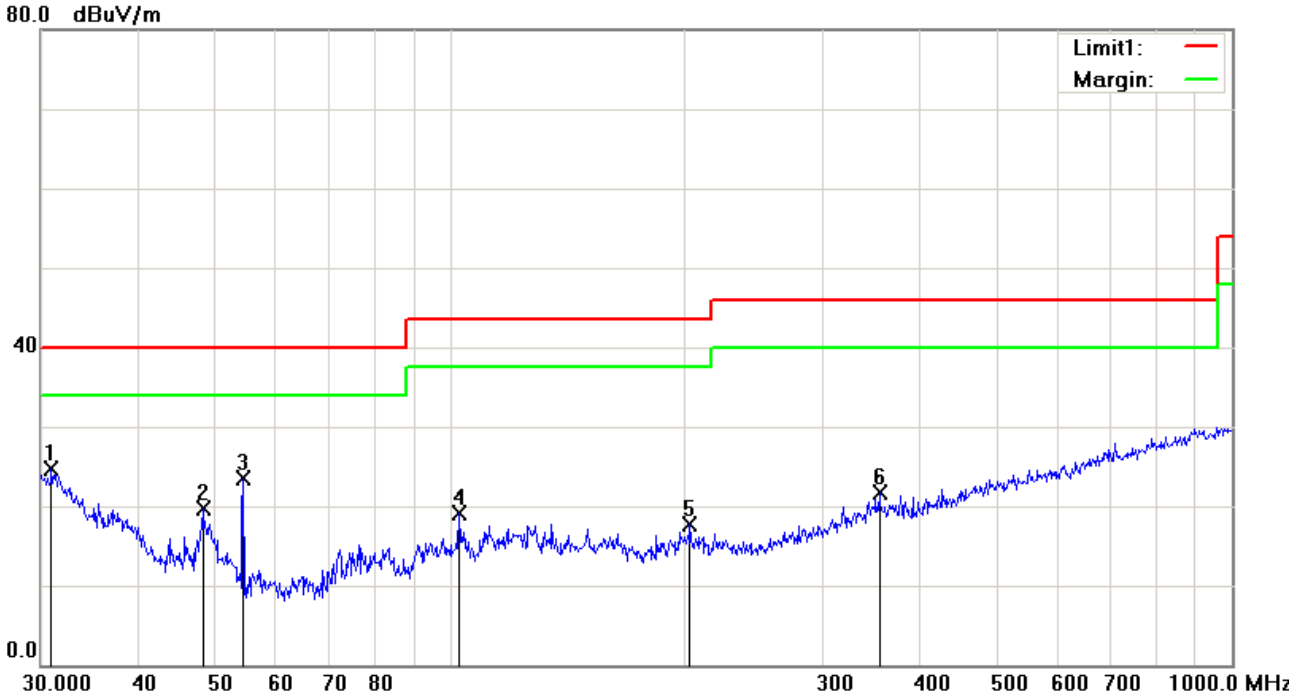
	b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below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

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode:	Bluetooth Mode

Below 1GHz

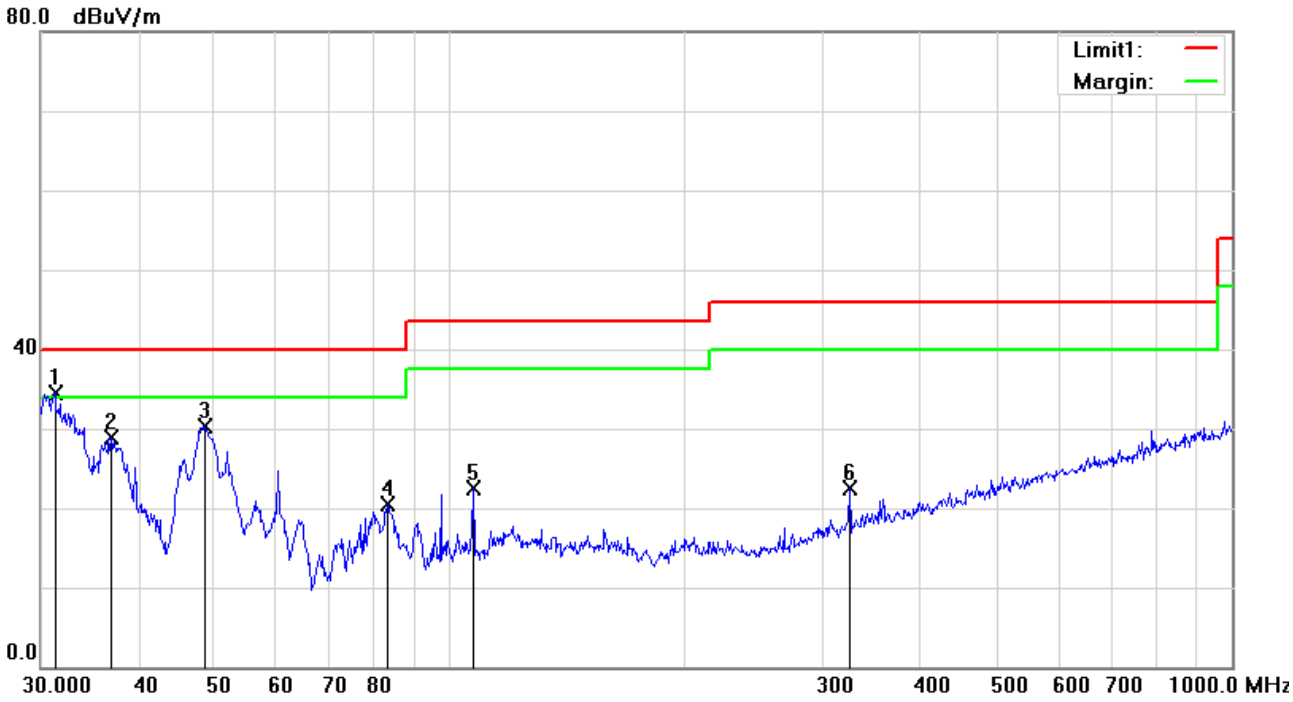


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	H	30.9619	25.57	peak	-0.96	24.61	40.00	-15.39	100	218
2	H	48.3318	32.08	peak	-12.44	19.64	40.00	-20.36	100	203
3	H	54.4516	37.12	peak	-13.70	23.42	40.00	-16.58	100	203
4	H	102.7192	29.51	peak	-10.32	19.19	43.50	-24.31	100	233
5	H	202.8104	26.49	peak	-8.76	17.73	43.50	-25.77	100	124
6	H	354.1831	27.13	peak	-5.36	21.77	46.00	-24.23	100	57

Below 1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	V	31.2893	35.73	peak	-1.20	34.53	40.00	-5.47	100	194
2	V	36.8953	34.13	peak	-5.32	28.81	40.00	-11.19	100	89
3	V	48.6719	42.83	peak	-12.59	30.24	40.00	-9.76	100	273
4	V	83.2298	34.01	peak	-13.60	20.41	40.00	-19.59	100	247
5	V	107.1337	32.06	peak	-9.52	22.54	43.50	-20.96	100	168
6	V	324.4561	28.61	peak	-6.20	22.41	46.00	-23.59	100	153

Test Mode:	Transmitting Mode

Mode: GFSK (Worst Case)

Low Channel (2402 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4804	38.84	AV	V	33.83	6.86	31.72	47.81	54	-6.19
4804	38.17	AV	H	33.83	6.86	31.72	47.14	54	-6.86
4804	46.92	PK	V	33.83	6.86	31.72	55.89	74	-18.11
4804	45.76	PK	H	33.83	6.86	31.72	54.73	74	-19.27

Middle Channel (2441 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4882	38.69	AV	V	33.86	6.82	31.82	47.55	54	-6.45
4882	37.91	AV	H	33.86	6.82	31.82	46.77	54	-7.23
4882	46.85	PK	V	33.86	6.82	31.82	55.71	74	-18.29
4882	45.96	PK	H	33.86	6.82	31.82	54.82	74	-19.18

High Channel (2480 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4960	38.52	AV	V	33.9	6.76	31.92	47.26	54	-6.74
4960	37.98	AV	H	33.9	6.76	31.92	46.72	54	-7.28
4960	46.73	PK	V	33.9	6.76	31.92	55.47	74	-18.53
4960	45.86	PK	H	33.9	6.76	31.92	54.60	74	-19.4

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/17/2015	09/16/2016	☑
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	☑
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	☑
LISN	ISN T800	34373	09/26/2014	09/25/2015	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☑
Transient Limiter	LIT-153	531118	09/01/2015	08/31/2016	☑
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/17/2015	09/16/2016	☑
Power Splitter	1#	1#	09/01/2015	08/31/2016	☑
DC Power Supply	E3640A	MY40004013	09/17/2015	09/16/2016	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/17/2015	09/16/2016	☑
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/01/2015	08/31/2016	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☑
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	☑

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

Whole Package - Top View

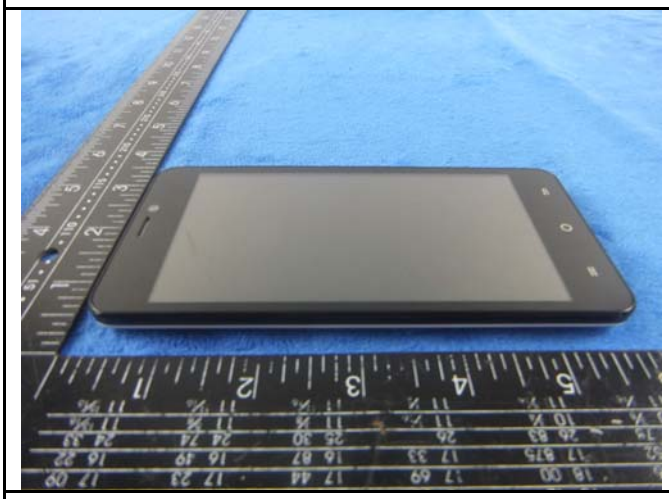
Adapter - Front View

EUT - Front View

EUT - Rear View

EUT - Top View

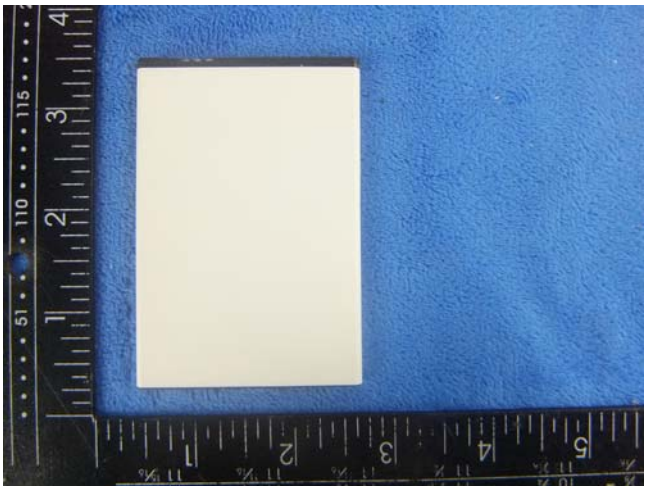
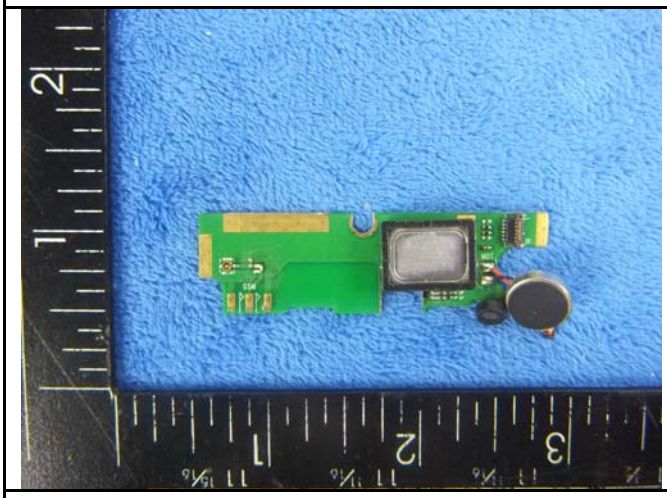
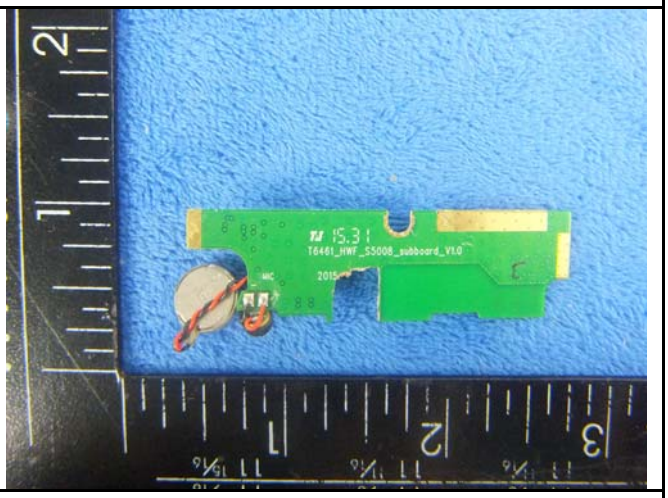
EUT - Bottom View

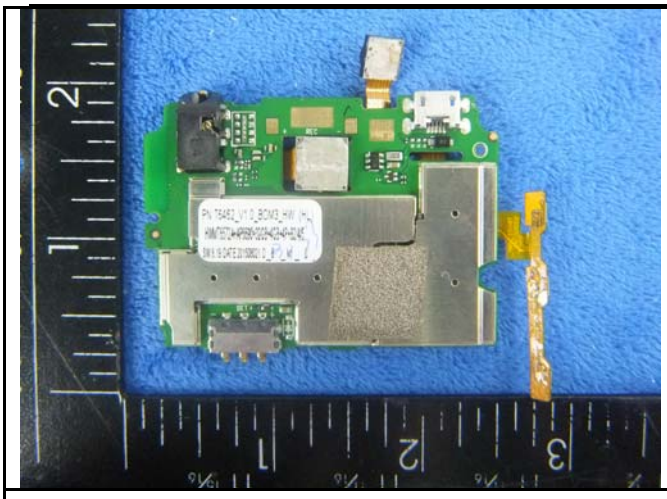


EUT - Left View

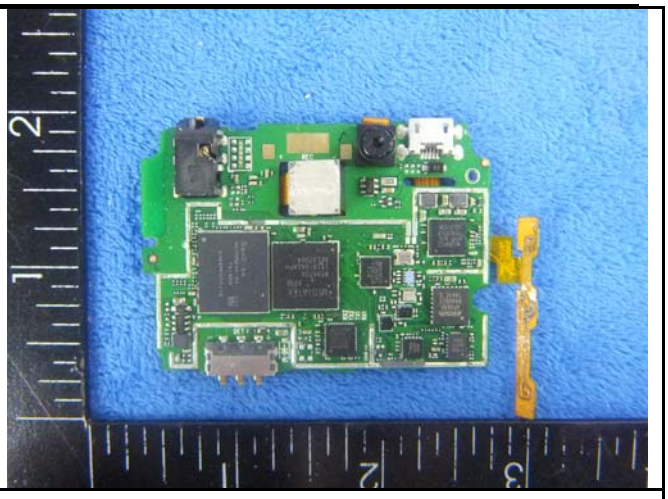
EUT - Right View

Annex B.ii. Photograph: EUT Internal Photo

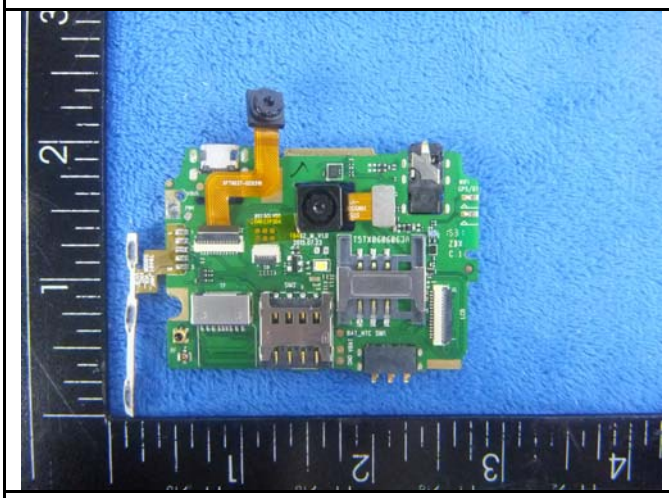
<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Cover Off - Top View 1</td><td>Cover Off - Top View 2</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>Battery - Front View</td><td>Battery Lable - Rear View</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Small board - Front View</td><td>Small board - Rear View</td></tr>
</table>



Mainbard With Shielding – Front View



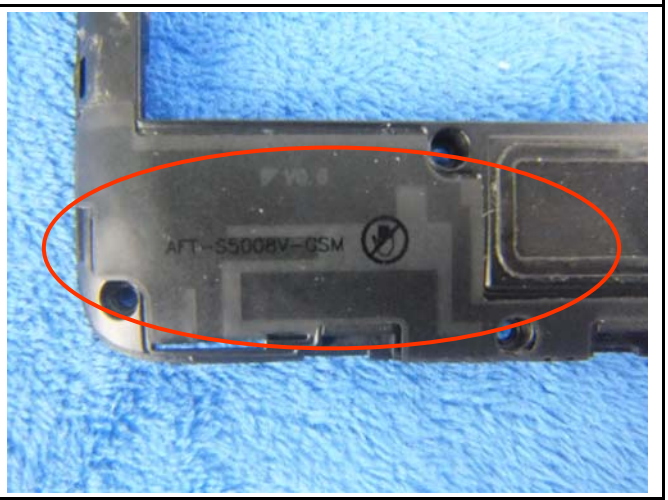
Mainborad Without Shielding - Front View



Mainborad – Rear View

LCD – Front View

LCD – Rear View



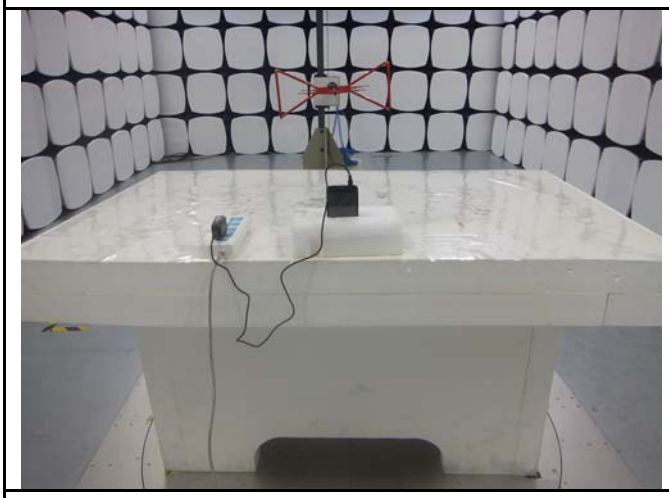
GSM/PCS/UMTS-FDD Antenna View

	
WIFI/BT/BLE/GPS - Antenna View	

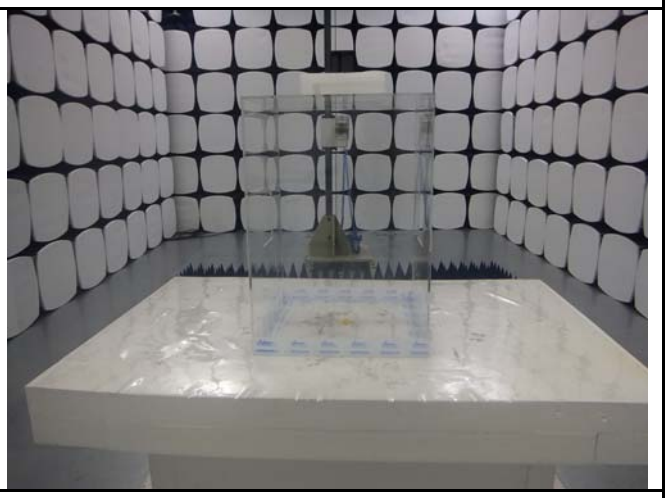
Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup Front View

Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

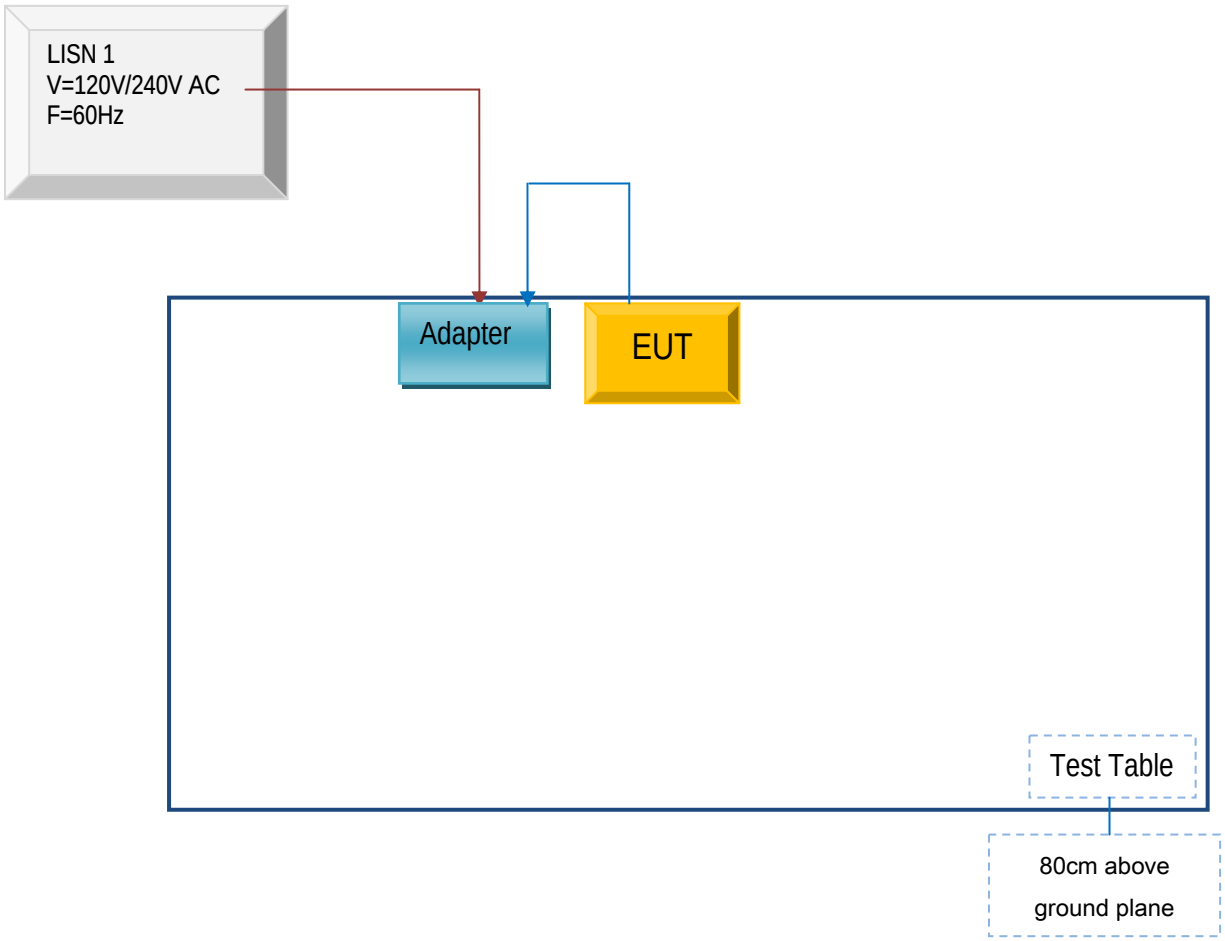


Radiated Spurious Emissions Test Setup Above 1GHz

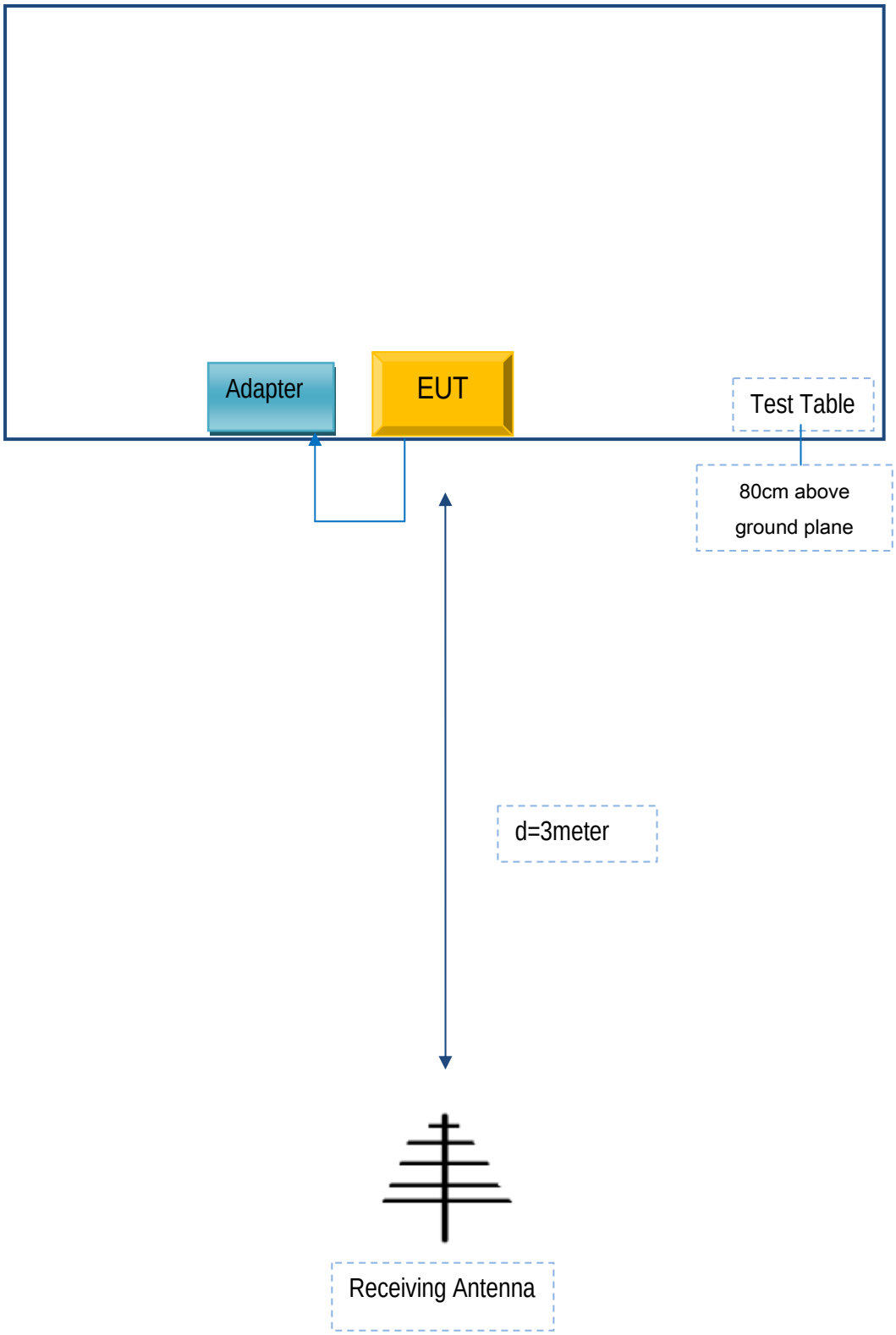
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

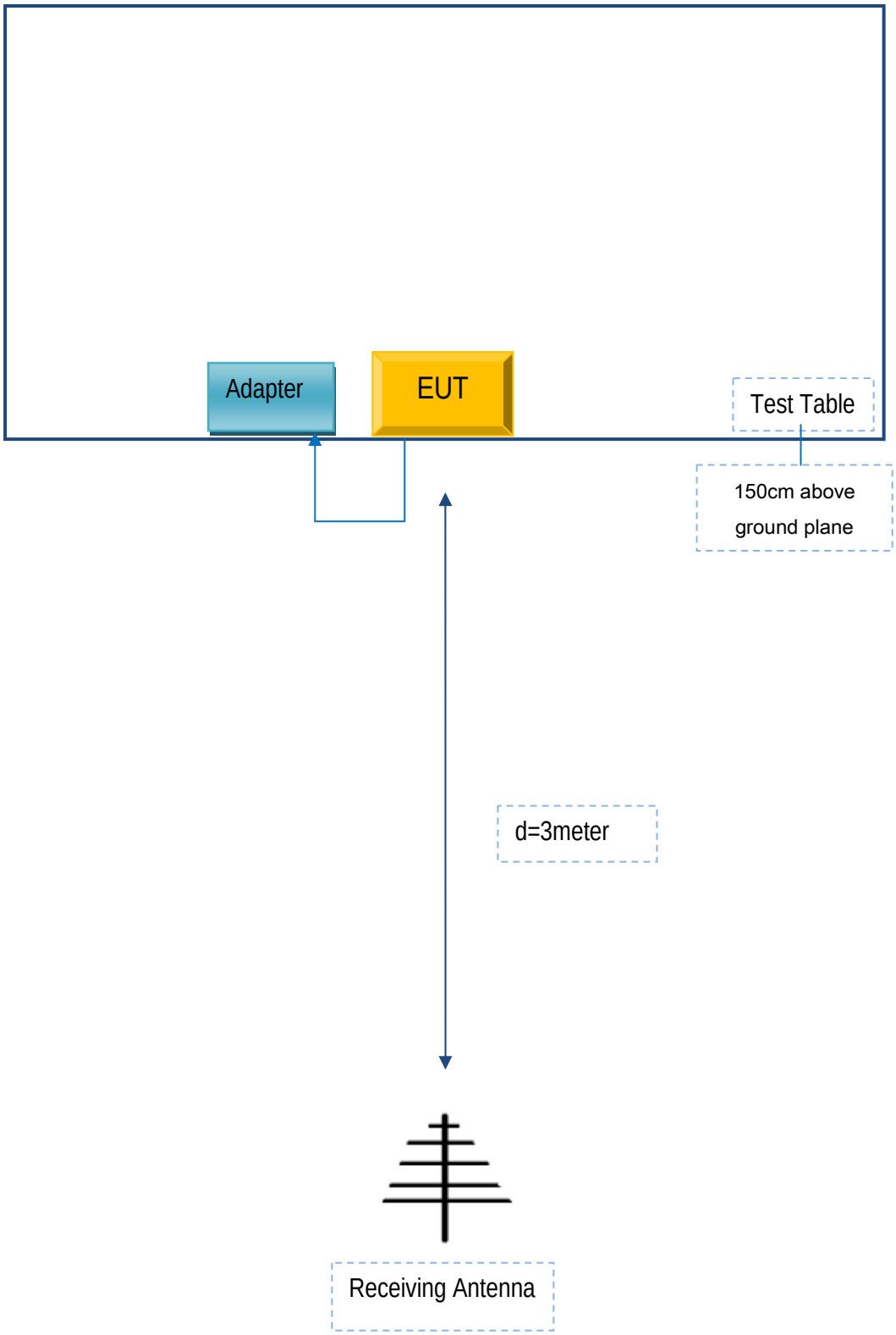
Block Configuration Diagram for AC Line Conducted Emissions



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



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



Annex C. il. SUPPORTING EQUIPMENT DESCRIPTION

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

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A