FCC TEST REPORT

For

Shenzhen Afoundry Electronic Co., Ltd.

Wireless Router

Model No.: AF-EW1200

Prepared for	:	Shenzhen Afoundry Electronic Co., Ltd.
Address	:	Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an District, Shenzhen, Guangdong, China
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Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	March 18, 2016
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	March 18, 2016 - March 31, 2016
Date of Report	:	March 31, 2016

FCC TEST REPORT
FCC CFR 47 PART 15 E(15.407): 2015

Report Reference No.	**:**	**LCS1603181540E**
Date of Issue	:	March 31, 2016
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	:	1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**Shenzhen Afoundry Electronic Co., Ltd.**
Address	:	Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Test Specification		
Standard	:	FCC CFR 47 PART 15 E(15.407): 2015
Test Report Form No.....	**:**	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

EUT Description.	**:**	**Wireless Router**
Trade Mark	:	AFOUNDRY®
Model/ Type reference.....	:	AF-EW1200
Ratings	:	DC 12.0V, 2.0A by Switching Adapter
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Jacky Li		
Jacky Li/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1603181540E	March 31, 2016 Date of issue

EUT.....	: Wireless Router
Type / Model.....	: AF-EW1200
Applicant.....	**: Shenzhen Afoundry Electronic Co., Ltd.**
Address.....	: Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Afoundry Electronic Co., Ltd.**
Address.....	: Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Shenzhen Afoundry Electronic Co., Ltd.**
Address.....	: Longxin Industrial Park, Chuangye Road, Fenghuang 3rd industrial Zone, Fuyong Town, Baoan district, Shenzhen city, China
Telephone.....	: /
Fax.....	: /

Test Result:	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Wireless Router
Model Number	:	AF-EW1200
Power Supply	:	DC 12.0V, 2.0A by AC Adapter
Frequency Range	:	2412.00~2462.00MHz/2422.00~2452.00MHz； 5180.00-5240.00MHz/5745.00-5805.00MHz
Channel Number	:	11 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20) 7 Channels for WIFI 40MHz Bandwidth(802.11n-HT40) 4 Channels for 5180.00-5240.00MHz(802.11a/n-HT20/ac20) 5 Channels for 5745.00-5825.00MHz(802.11a/n-HT20/ac20) 2 Channels for 5190.00-5230.00MHz(802.11n-HT40/ac40) 2 Channels for 5755.00-5795.00MHz(802.11n-HT40/ac40) 1 Channels for 5210.00MHz(802.11ac80) 1 Channels for 5775.00MHz(802.11ac80)
Modulation Technology	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM,QPSK,BPSK) IEEE 802.11ac: OFDM (64QAM, 16QAM,QPSK,BPSK)
Data Rates	:	IEEE 802.11b: 1-11Mbps IEEE 802.11g: 6-54Mbps IEEE 802.11n: MCS0-MCS15 IEEE 802.11a: 6-54Mbps IEEE 802.11ac: MCS0-MCS15
Antenna Type And Gain	:	Integral antenna, 4.0dBi(Max.) for 2412~2462MHz, 7.01dBi for MIMO; 7.0dBi(Max.) for 5180.00~5240.00MHz/5745.00~5805.00MHz, 10.01dBi for MIMO

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
--	AC ADAPTER	LY024SPS-120200UH	--	Voc

1.3. External I/O Port

I/O Port Description	Quantity	Cable
DC	1	1.2m, Unshielded
USB	1	N/A
RJ45	5	0.8m, Shielded

1.4. Description of Test Facility

CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
VCCI Registration Number. is C-4260 and R-3804.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001

1.5. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description Of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:
802.11a Mode : 6 Mbps, OFDM.
802.11n-HT20 Mode: MCS0, OFDM.
802.11n-HT40 Mode: MCS8, OFDM.

Antenna & Bandwidth

Antenna	Single (Port.1)			Two (Port.1 + Port.2)		
Bandwidth Mode	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
802.11a	☐	☐	☐	☑	☐	☐
802.11n	☐	☐	☐	☑	☑	☐
802.11ac	☐	☐	☐	☑	☑	☑

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure 789033 D02 General UNII Test Procedures New Rules v01r01 and KDB 662911 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmit condition.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart E		
FCC Rules	**Description of Test**	**Result**
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(a)	26dB Bandwidth	Compliant
§15.407(a)	99% Occupied Bandwidth	Compliant
§15.407(b)	Radiated Emissions	Compliant
§15.407(b)	Band edge Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.207(a)	Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant
§2.1093	RF Exposure	Compliant

5. TEST RESULT

5.1. Maximum Conducted Output Power Measurement

5.1.1. Standard Applicable

For 5150~5250MHz

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

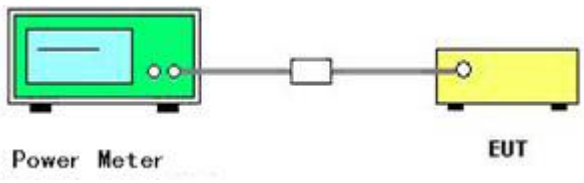
5.1.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the power meter.

5.1.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

5.1.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. Test Result of Maximum Conducted Output Power

Temperature	25°C	Humidty	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11a	36	5180	13.29	13.31	/	30	Complies
	40	5200	12.78	12.95	/	30	Complies
	48	5240	12.90	12.86	/	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11n-HT 20	36	5180	13.05	13.06	16.07	25.99	Complies
	40	5200	12.55	12.59	15.58	25.99	Complies
	48	5240	13.23	13.20	16.23	25.99	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11n-HT 40	38	5190	13.02	13.15	16.10	25.99	Complies
	46	5230	13.37	13.44	16.42	25.99	Complies

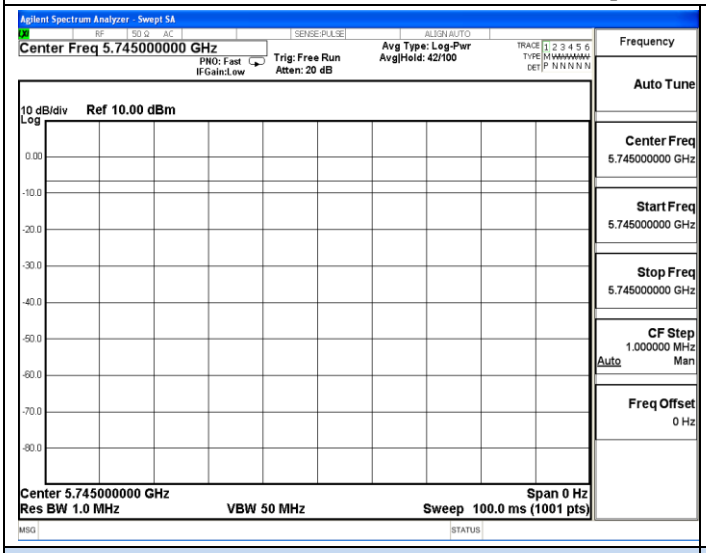
Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11ac20	36	5180	12.59	12.38	15.50	25.99	Complies
	40	5200	12.89	12.63	15.77	25.99	Complies
	48	5240	13.28	13.12	16.21	25.99	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11ac40	38	5190	12.55	12.63	15.60	25.99	Complies
	46	5230	12.93	12.64	15.80	25.99	Complies

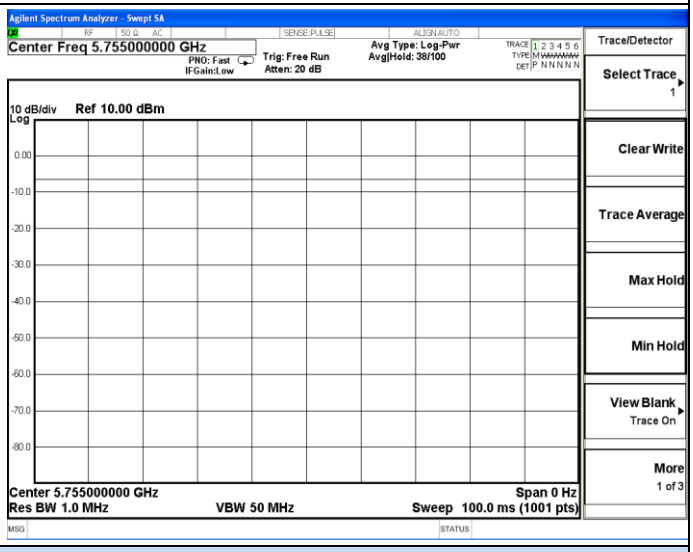
Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)		Sum Power (dBm)	Max. Limit (dBm)	Result
			Chain0	Chain1			
802.11ac80	42	5210	12.14	12.02	15.09	25.99	Complies

Correct Limit=Limit-(Directional Gain-6dBi)

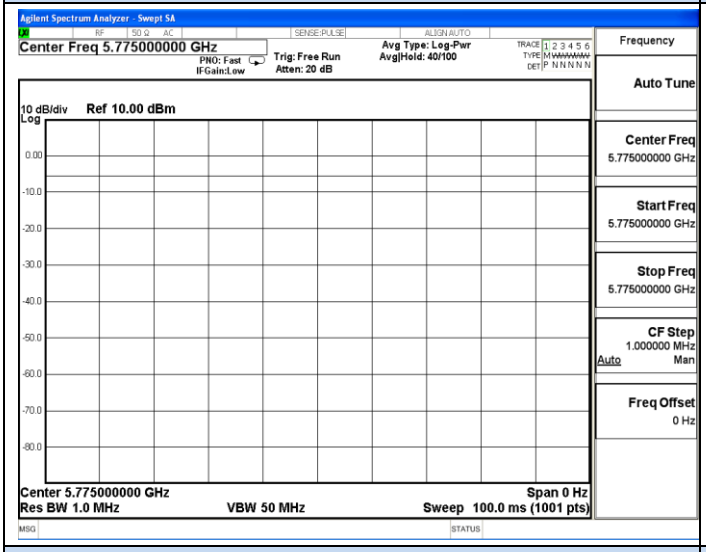
Tet plot of Duty Cycle:



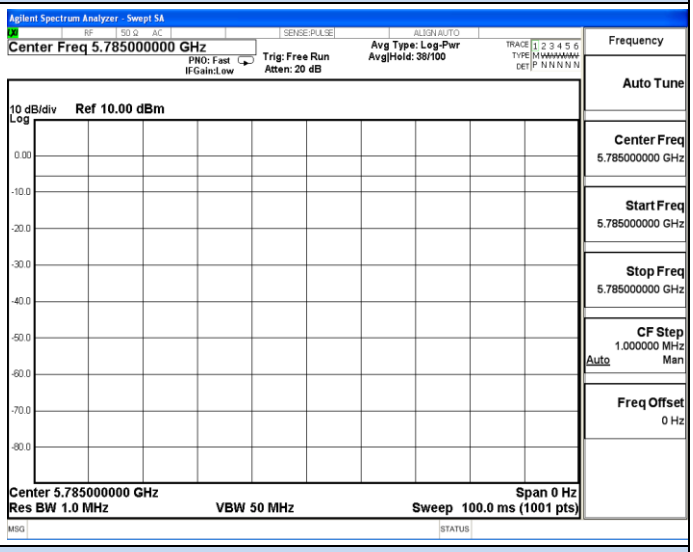
5745MHz



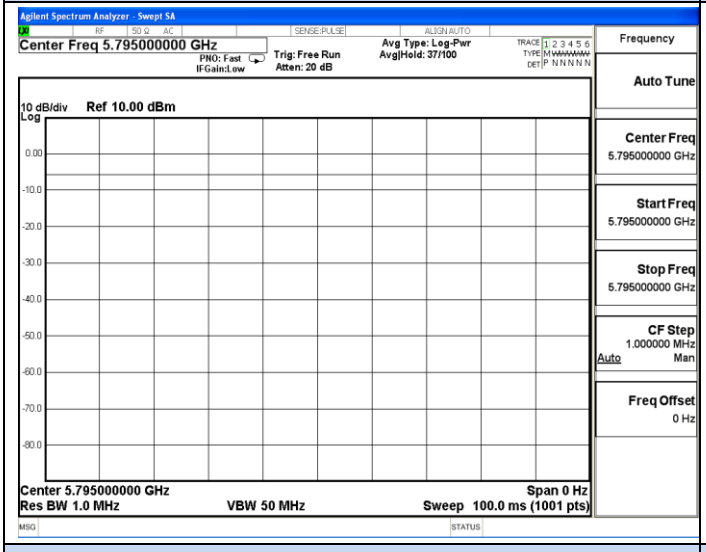
5755MHz



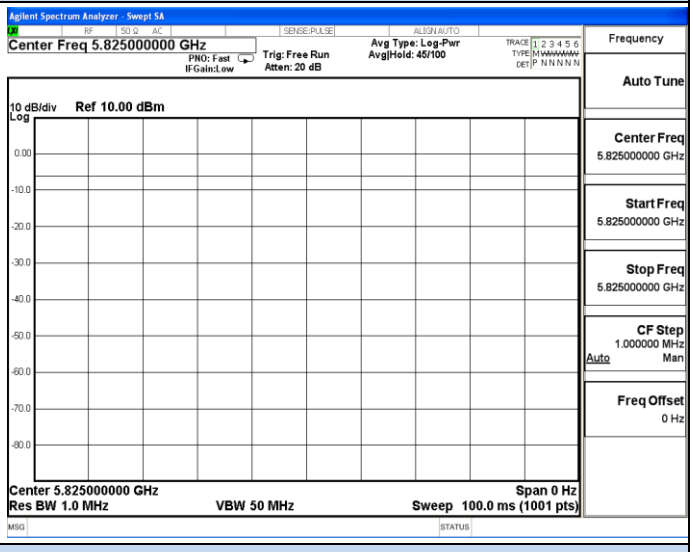
5775MHz



5785MHz



5795MHz



5825MHz

Note: The duty cycle is 100%

5.2. Power Spectral Density Measurement

5.2.1. Standard Applicable

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The power spectral density limits as show follow.

Frequency range(MHz)	Power Spectral Density Limit
5150~5250	17 dBm/MHz

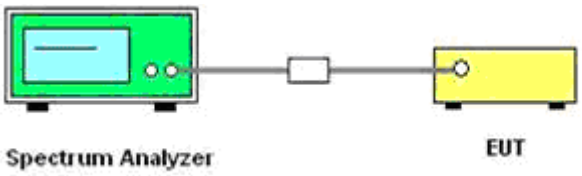
5.2.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of Spectrum Analyzer.

5.2.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 1000 kHz.
4. Set the VBW ≥ 3*RBW
5. Span=Encompass the entire emissions bandwidth (EBW) of the signal
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

5.2.4. Test Setup Layout



5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Test Result of Power Spectral Density

Temperature	25℃	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)		Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
			Chain0	Chain1				
802.11a	36	5180	5.775	5.328	0	/	17	Complies
	40	5200	4.198	4.270	0	/	17	Complies
	48	5240	5.341	5.166	0	/	17	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)		Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
			Chain0	Chain1				
802.11n -HT20	36	5180	4.689	4.698	0	7.704	12.99	Complies
	40	5200	4.166	4.154	0	7.170	12.99	Complies
	48	5240	5.254	5.317	0	8.296	12.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)		Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
			Chain0	Chain1				
802.11n -HT40	38	5190	2.006	2.014	0	5.020	12.99	Complies
	46	5230	3.042	3.484	0	6.279	12.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)		Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
			Chain0	Chain1				
802.11ac20	36	5180	4.075	4.009	0	7.052	12.99	Complies
	40	5200	4.149	4.224	0	7.197	12.99	Complies
	48	5240	4.907	4.857	0	7.892	12.99	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)		Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
			Chain0	Chain1				
802.11ac40	38	5190	1.711	1.441	0	4.588	12.99	Complies
	46	5230	1.727	1.615	0	4.682	12.99	Complies

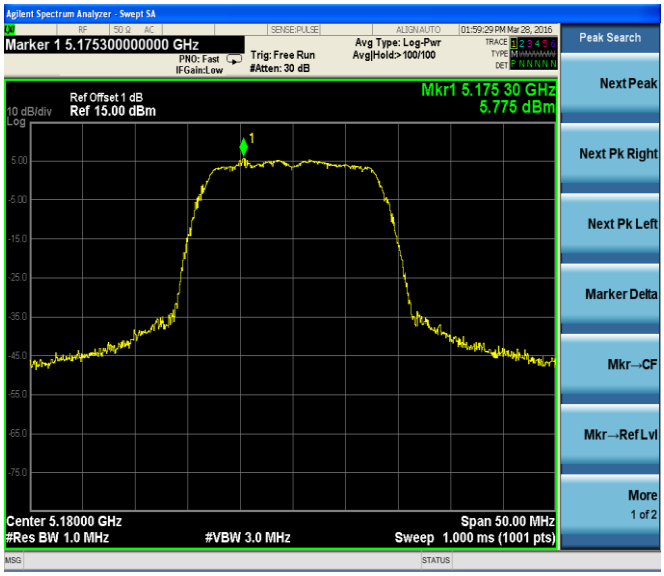
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)		Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
			Chain0	Chain1				
802.11ac40	42	5210	-2.218	-2.453	0	0.676	12.99	Complies

Note: For the EUT transmits continuously so the duty cycle is 100%.

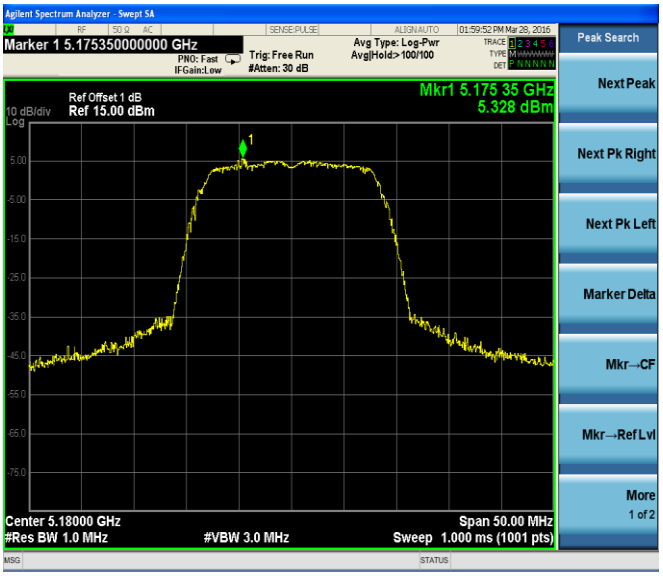
Duty cycle factor=10log(Ton/Tperiod)= 0 dB

Correct Limit=Limit-(Directional Gain-6dBi)

Test Plot of Power Spectral Density:



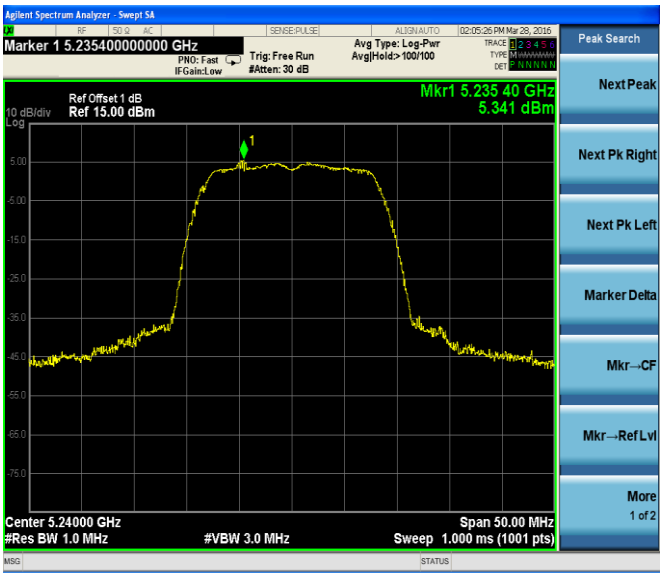
802.11a Chain 0-5180MHz



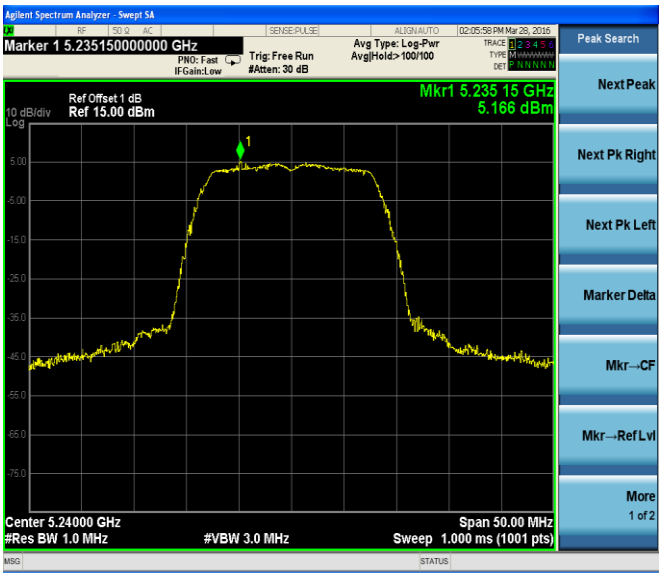
802.11a Chain 1-5180MHz

802.11a Chain 0-5200MHz

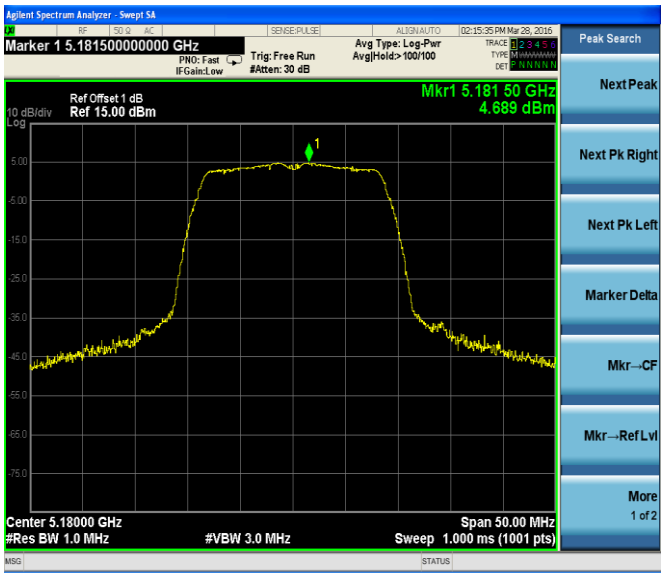
802.11a Chain 1-5200MHz



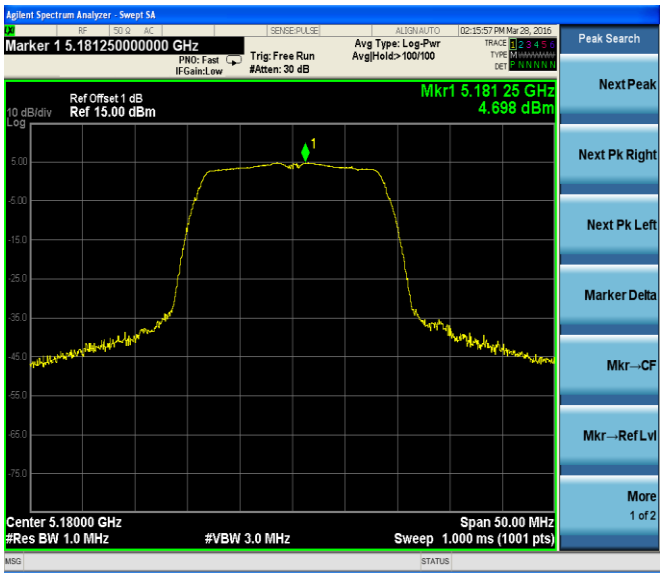
802.11a Chain 0-5240MHz



802.11a Chain 1-5240MHz



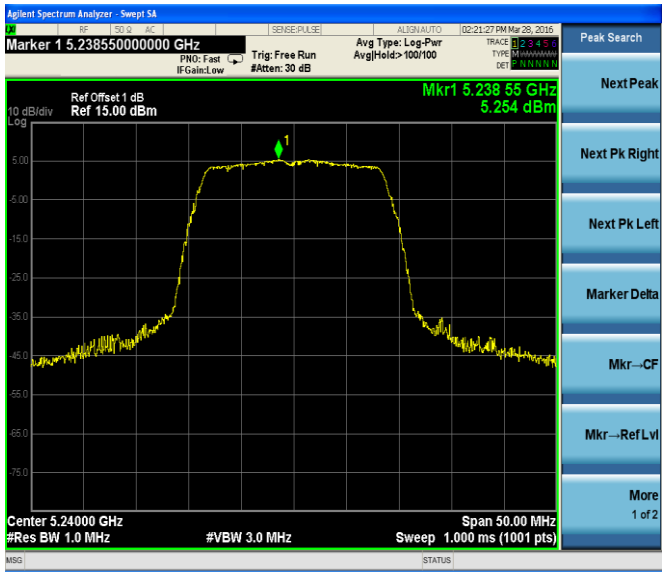
802.11n-HT20 Chain 0-5180MHz



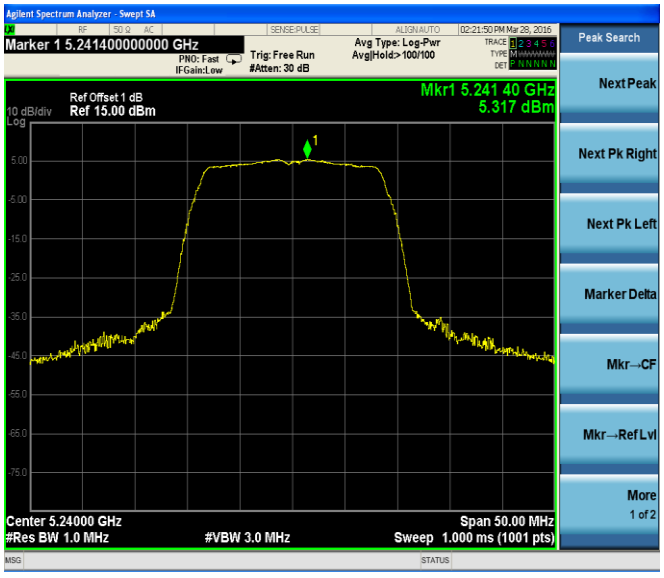
802.11n-HT20 Chain 1-5180MHz

802.11n-HT20 Chain 0-5200MHz

802.11n-HT20 Chain 1-5200MHz



802.11n-HT20 Chain 0-5240MHz



802.11n-HT20 Chain 1-5240MHz

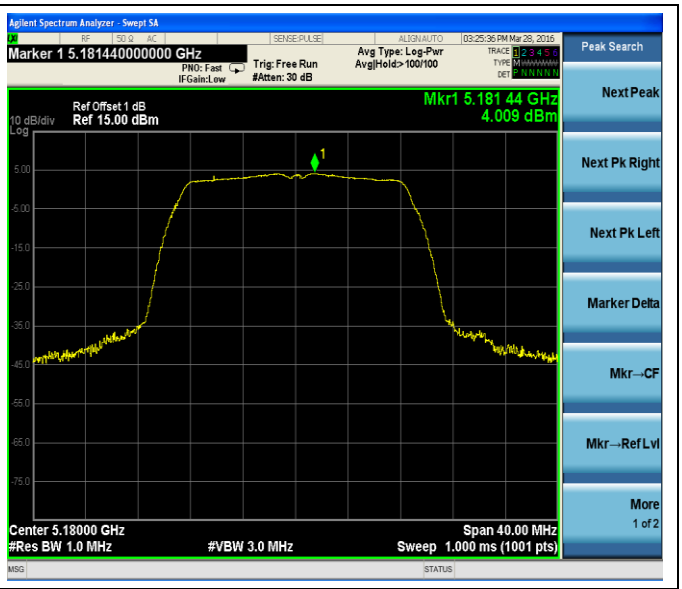
802.11n-HT40 Chain 0-5190MHz

802.11n-HT40 Chain 1-5190MHz

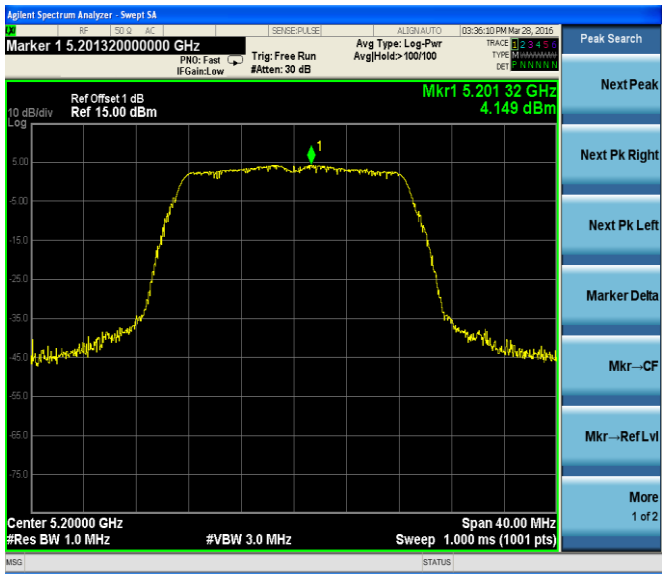
802.11n-HT40 Chain 0-5230MHz

802.11n-HT40 Chain 1-5230MHz

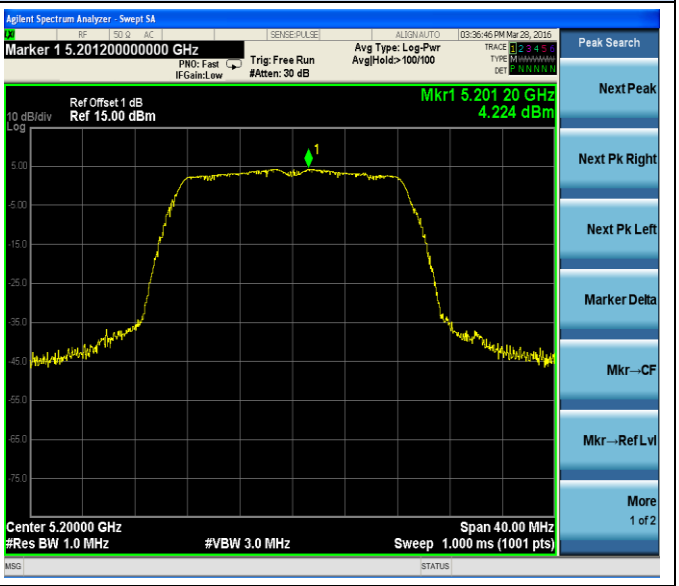
802.11ac20 Chain 0-5180MHz



802.11ac20 Chain 1-5180MHz

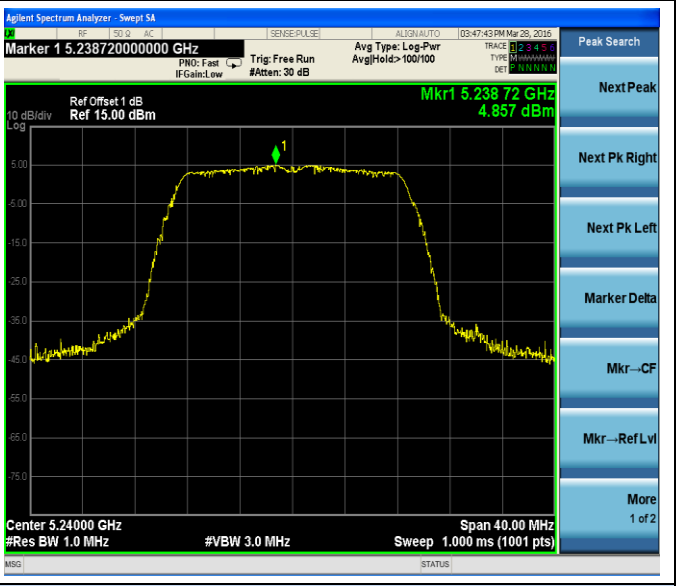


802.11ac20 Chain 0-5200MHz



802.11ac20 Chain 1-5200MHz

802.11ac20 Chain 0-5240MHz



802.11ac20 Chain 1-5240MHz

802.11ac40 Chain 0-5190MHz

802.11ac40 Chain 1-5190MHz

802.11ac40 Chain 0-5230MHz

802.11ac40 Chain 1-5230MHz

802.11ac80 Chain 0-5210MHz

802.11ac80 Chain 1-5210MHz

5.3. 99% and 26dB Occupied Bandwidth Measurement

5.3.1. Standard Applicable

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

5.3.2. Measuring Instruments and Setting

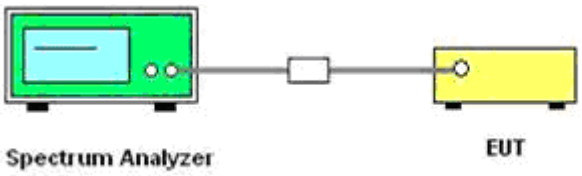
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span	> 26dB Bandwidth
Detector	Peak
Trace	Max Hold
Sweep Time	100ms

5.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were used.
3. Measured the spectrum width with power higher than 26dB below carrier.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.6. Test Result of 99% and 26dB Occupied Bandwidth

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Chain 0	Chain 1	Chain 0	Chain 1
802.11a	36	5180	19.45	19.46	16.610	16.540
	40	5200	19.93	19.95	17.584	17.583
	48	5240	19.54	19.55	16.576	16.599

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Chain 0	Chain 1	Chain 0	Chain 1
802.11n-HT20	36	5180	19.94	19.98	17.589	17.577
	40	5200	19.91	19.91	17.581	17.579
	48	5240	19.95	19.96	17.591	17.570

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Chain 0	Chain 1	Chain 0	Chain 1
802.11n-HT40	38	5190	39.75	39.85	35.986	35.994
	46	5230	40.00	40.09	35.988	36.010

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Chain 0	Chain 1	Chain 0	Chain 1
802.11ac20	36	5180	19.98	20.00	17.582	17.580
	40	5200	19.94	19.96	17.579	17.577
	48	5240	19.97	19.97	17.572	17.572

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Chain 0	Chain 1	Chain 0	Chain 1
802.11ac40	38	5190	39.75	39.71	35.997	35.996
	46	5230	39.93	40.18	35.983	35.989

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Chain 0	Chain 1	Chain 0	Chain 1
802.11ac80	42	5210	80.31	80.75	75.020	75.129

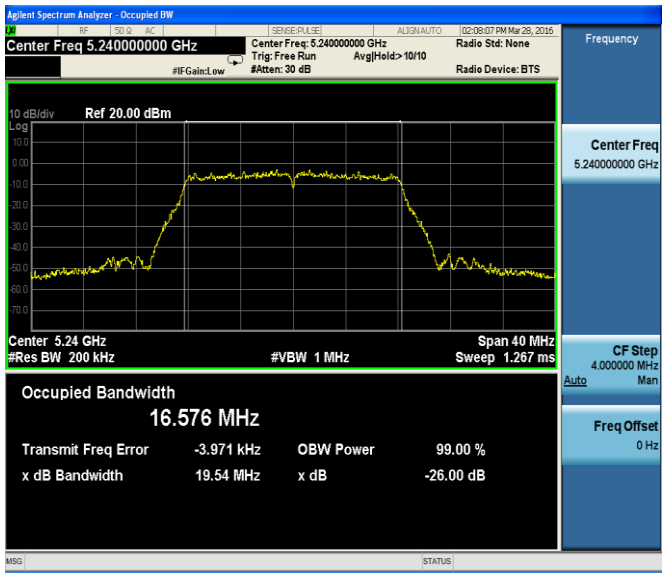
Test Plot of 99% and 26dB Occupied Bandwidth:

802.11a Chain 0-5180MHz

802.11a Chain 1-5180MHz

802.11a Chain 0-5200MHz

802.11a Chain 1-5200MHz



802.11a Chain 0-5240MHz

802.11a Chain 1-5240MHz

802.11n-HT20 Chain 0-5180MHz

802.11n-HT20 Chain 1-5180MHz

802.11n-HT20 Chain 0-5200MHz

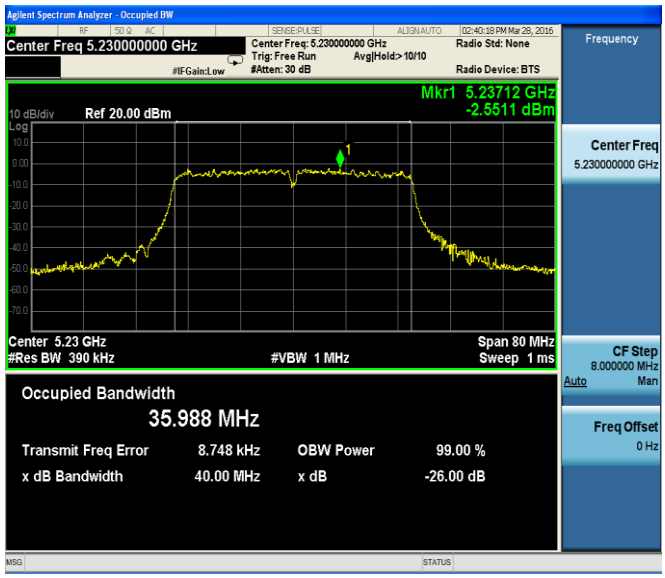
802.11n-HT20 Chain 1-5200MHz

802.11n-HT20 Chain 0-5240MHz

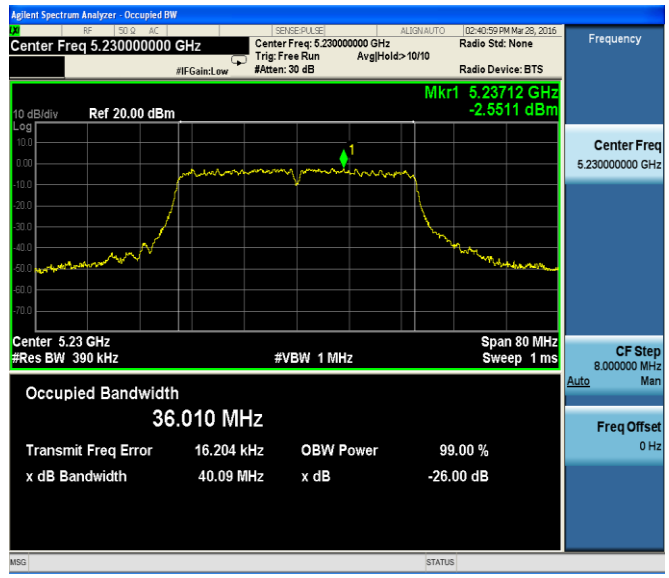
802.11n-HT20 Chain 1-5240MHz

802.11n-HT40 Chain 0-5190MHz

802.11n-HT40 Chain 1-5190MHz



802.11n-HT40 Chain 0-5230MHz



802.11n-HT40 Chain 1-5230MHz

802.11ac20 Chain 0-5180MHz

802.11ac20 Chain 1-5180MHz

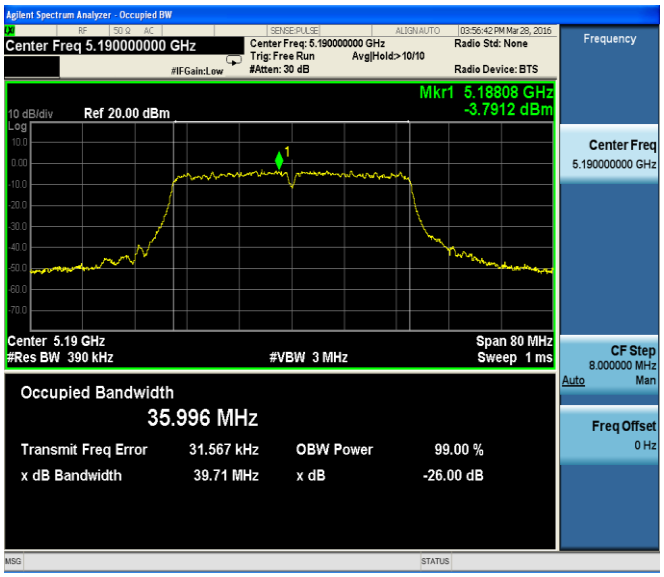
802.11ac20 Chain 0-5200MHz

802.11ac20 Chain 1-5200MHz

802.11ac20 Chain 0-5240MHz

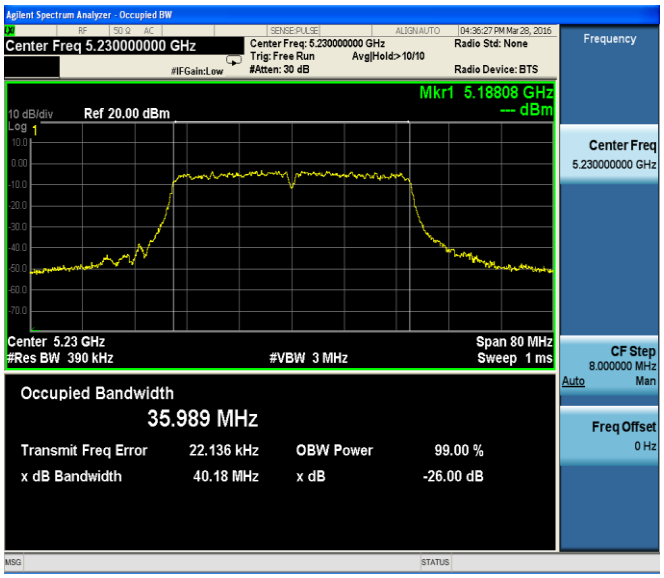
802.11ac20 Chain 1-5240MHz

802.11ac40 Chain 0-5190MHz



802.11ac40 Chain 1-5190MHz

802.11ac40 Chain 0-5230MHz



802.11ac40 Chain 1-5230MHz

802.11ac80 Chain 0-5210MHz

802.11ac80 Chain 1-5210MHz

5.4. Radiated Emissions Measurement

5.4.1. Standard Applicable

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.470-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz (78.3dBuV/m at 3m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies(MHz)	Field Strength(microvolts/meter)	Measurement Distance(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.4.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

5.4.3. Test Procedures

1) **Sequence of testing 9 kHz to 30 MHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0 °to 360 °) and by rotating the elevation axes (0 °to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) **Sequence of testing 30 MHz to 1 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) **Sequence of testing 1 GHz to 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) **Sequence of testing above 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

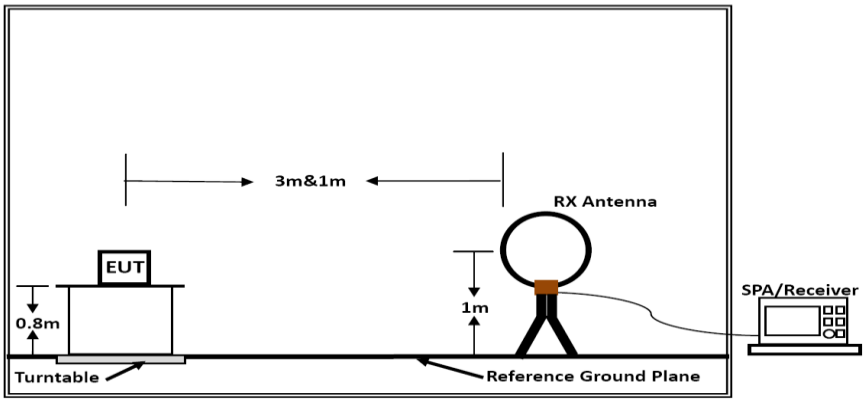
Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

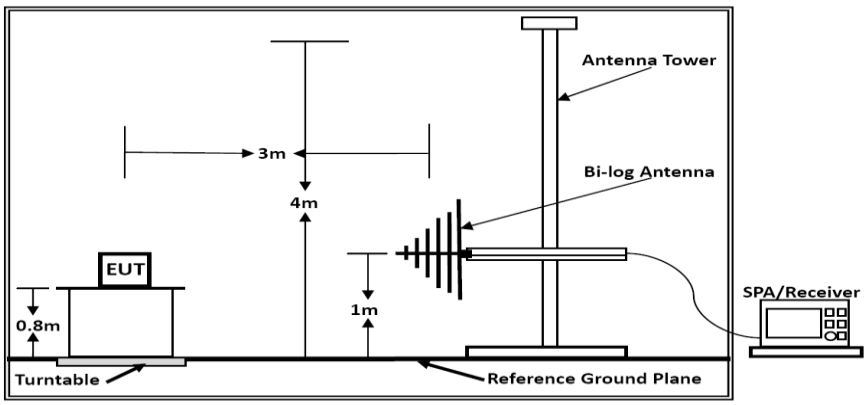
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.4.4. Test Setup Layout

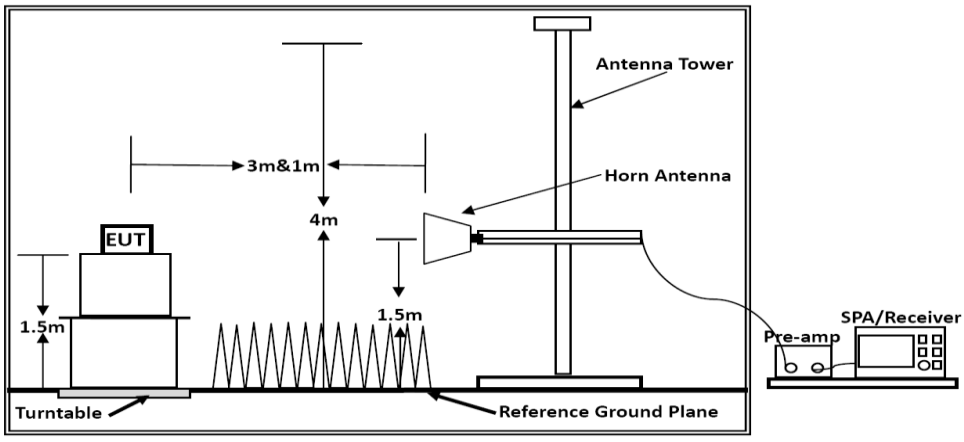
For radiated emissions below 30MHz



Below 30MHz



Below 1GHz



Above 1GHz

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.6. Results of Radiated Emissions (9kHz~30MHz)

Temperature	25°C	Humidty	60%
Test Engineer	Jacky	Configurations	802.11a

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

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

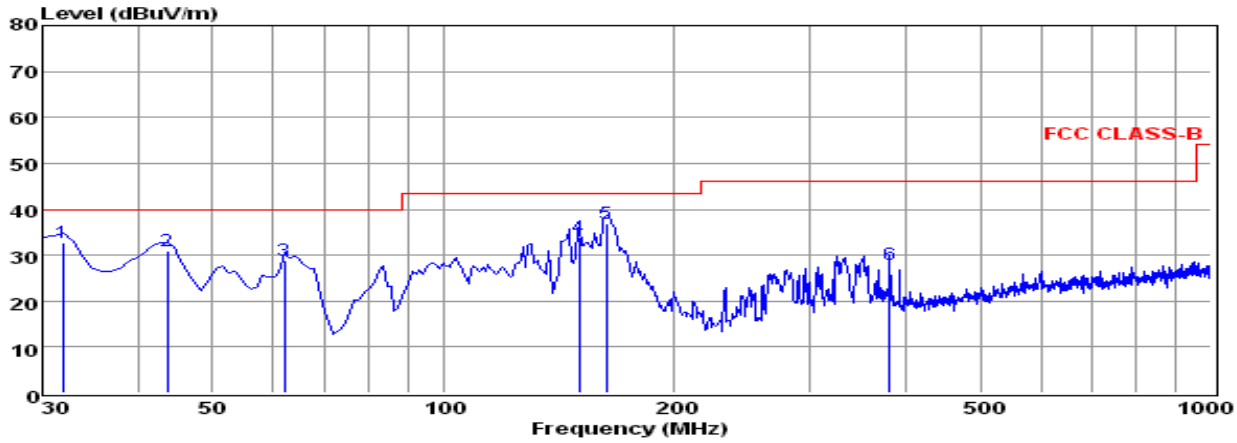
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

5.4.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	25°C	Humidty	60%
Test Engineer	Jacky	Configurations	802.11a, 5180MHz

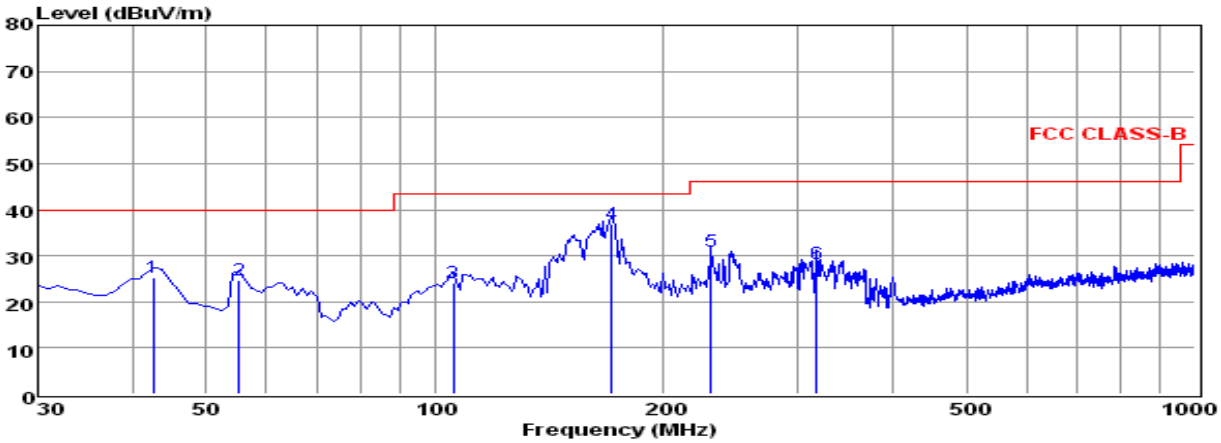
Test result for 802.11a-5180MHz



Env./Ins: 24℃/56%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	31.94	20.15	0.37	12.32	32.84	40.00	-7.16	QP
2	43.58	16.88	0.41	13.56	30.85	40.00	-9.15	QP
3	62.01	16.33	0.48	11.89	28.70	40.00	-11.30	QP
4	150.28	24.86	0.86	8.27	33.99	43.50	-9.51	QP
5	162.89	27.17	0.86	8.76	36.79	43.50	-6.71	QP
6	381.14	12.23	1.18	14.62	28.03	46.00	-17.97	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported



Env./Ins: 24℃/56%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	42.61	11.32	0.50	13.56	25.38	40.00	-14.62	QP
2	55.22	11.33	0.46	13.01	24.80	40.00	-15.20	QP
3	105.66	10.92	0.61	12.64	24.17	43.50	-19.33	QP
4	170.65	26.94	0.80	9.02	36.76	43.50	-6.74	QP
5	230.79	18.16	0.98	11.68	30.82	46.00	-15.18	QP
6	318.09	13.91	1.01	13.30	28.22	46.00	-17.78	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Note:

Pre-scan all mode and recorded the worst case results in this report (802.11a-5180MHz).

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

5.4.8. Results for Radiated Emissions (Above 1GHz)

802.11a/Chain 0+Chain 1

Channel 36

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.54	55.09	33.06	35.04	3.94	57.05	74	-16.95	Peak	Horizontal
15.54	41.91	33.06	35.04	3.94	43.87	54	-10.13	Average	Horizontal
15.54	54.06	33.06	35.04	3.94	56.02	74	-17.98	Peak	Vertical
15.54	40.67	33.06	35.04	3.94	42.63	54	-11.37	Average	Vertical

Channel 40

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.60	55.10	33.16	35.15	3.96	57.07	74	-16.93	Peak	Horizontal
15.60	41.80	33.16	35.15	3.96	43.77	54	-10.23	Average	Horizontal
15.60	55.05	33.16	35.15	3.96	57.02	74	-16.98	Peak	Vertical
15.60	40.47	33.16	35.15	3.96	42.44	54	-11.56	Average	Vertical

Channel 48

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.72	55.06	33.26	35.14	3.98	57.16	74	-16.84	Peak	Horizontal
15.72	40.94	33.26	35.14	3.98	43.04	54	-10.96	Average	Horizontal
15.72	54.16	33.26	35.14	3.98	56.26	74	-17.74	Peak	Vertical
15.72	40.68	33.26	35.14	3.98	42.78	54	-11.22	Average	Vertical

802.11n-HT20/Chain 0+Chain 1

Channel 36

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.54	57.20	33.06	35.04	3.94	59.16	74	-14.84	Peak	Horizontal
15.54	42.08	33.06	35.04	3.94	44.04	54	-9.96	Average	Horizontal
15.54	56.56	33.06	35.04	3.94	58.52	74	-15.48	Peak	Vertical
15.54	41.11	33.06	35.04	3.94	43.07	54	-10.93	Average	Vertical

Channel 40

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.60	57.81	33.16	35.15	3.96	59.78	74	-14.22	Peak	Horizontal
15.60	42.06	33.16	35.15	3.96	44.03	54	-9.97	Average	Horizontal
15.60	56.58	33.16	35.15	3.96	58.55	74	-15.45	Peak	Vertical
15.60	41.19	33.16	35.15	3.96	43.16	54	-10.84	Average	Vertical

Channel 48

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.72	57.01	33.26	35.14	3.98	59.11	74	-14.89	Peak	Horizontal
15.72	42.24	33.26	35.14	3.98	44.34	54	-9.66	Average	Horizontal
15.72	56.16	33.26	35.14	3.98	58.26	74	-15.74	Peak	Vertical
15.72	40.69	33.26	35.14	3.98	42.79	54	-11.21	Average	Vertical

802.11n-HT40/Chain 0+Chain 1

Channel 38

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.57	57.70	33.06	35.04	3.94	59.66	74	-14.34	Peak	Horizontal
15.57	42.05	33.06	35.04	3.94	44.01	54	-9.99	Average	Horizontal
15.57	56.82	33.06	35.04	3.94	58.78	74	-15.22	Peak	Vertical
15.57	41.06	33.06	35.04	3.94	43.02	54	-10.98	Average	Vertical

Channel 46

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.69	57.05	33.16	35.15	3.96	59.02	74	-14.98	Peak	Horizontal
15.69	42.81	33.16	35.15	3.96	44.78	54	-9.22	Average	Horizontal
15.69	56.05	33.16	35.15	3.96	58.02	74	-15.98	Peak	Vertical
15.69	41.50	33.16	35.15	3.96	43.47	54	-10.53	Average	Vertical

802.11ac20/Chain 0+Chain 1

Channel 36

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.54	58.72	33.06	35.04	3.94	60.68	74	-13.32	Peak	Horizontal
15.54	42.30	33.06	35.04	3.94	44.26	54	-9.74	Average	Horizontal
15.54	56.45	33.06	35.04	3.94	58.41	74	-15.59	Peak	Vertical
15.54	41.82	33.06	35.04	3.94	43.78	54	-10.22	Average	Vertical

Channel 44

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.60	58.37	33.16	35.15	3.96	60.34	74	-13.66	Peak	Horizontal
15.60	42.70	33.16	35.15	3.96	44.67	54	-9.33	Average	Horizontal
15.60	57.14	33.16	35.15	3.96	59.11	74	-14.89	Peak	Vertical
15.60	41.79	33.16	35.15	3.96	43.76	54	-10.24	Average	Vertical

Channel 48

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.72	58.04	33.26	35.14	3.98	60.14	74	-13.86	Peak	Horizontal
15.72	42.45	33.26	35.14	3.98	44.55	54	-9.45	Average	Horizontal
15.72	56.68	33.26	35.14	3.98	58.78	74	-15.22	Peak	Vertical
15.72	39.92	33.26	35.14	3.98	42.02	54	-11.98	Average	Vertical

802.11ac40/Chain 0+Chain 1

Channel 38

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.57	57.05	33.06	35.04	3.94	59.01	74	-14.99	Peak	Horizontal
15.57	42.78	33.06	35.04	3.94	44.74	54	-9.26	Average	Horizontal
15.57	56.32	33.06	35.04	3.94	58.28	74	-15.72	Peak	Vertical
15.57	41.08	33.06	35.04	3.94	43.04	54	-10.96	Average	Vertical

Channel 46

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.69	57.27	33.16	35.15	3.96	59.24	74	-14.76	Peak	Horizontal
15.69	42.17	33.16	35.15	3.96	44.14	54	-9.86	Average	Horizontal
15.69	56.67	33.16	35.15	3.96	58.64	74	-15.36	Peak	Vertical
15.69	41.25	33.16	35.15	3.96	43.22	54	-10.78	Average	Vertical

802.11ac80/Chain 0+Chain 1

Channel 42

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
15.63	57.75	33.16	35.15	3.96	59.72	74	-14.28	Peak	Horizontal
15.63	42.09	33.16	35.15	3.96	44.06	54	-9.94	Average	Horizontal
15.63	56.28	33.16	35.15	3.96	58.25	74	-15.75	Peak	Vertical
15.63	41.81	33.16	35.15	3.96	43.78	54	-10.22	Average	Vertical

Notes:

1. *Measuring frequencies from 9k~40GHz, No emission found between lowest internal used/generated frequency to 30MHz.*
2. *Radiated emissions measured in frequency range from 9k~40GHz were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

5.4.9. Results for Band Edge Emissions

802.11a/Chain 0+Chain 1

Channel 36

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5150.00	51.15	33.26	35.14	3.98	53.25	74	-20.75	Peak	Horizontal
5150.00	35.67	33.26	35.14	3.98	37.77	54	-16.23	Average	Horizontal
5150.00	50.02	33.26	35.14	3.98	52.12	74	-21.88	Peak	Vertical
5150.00	35.26	33.26	35.14	3.98	37.36	54	-16.64	Average	Vertical

Channel 48

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5350.00	51.44	33.25	35.16	3.99	53.52	74	-20.48	Peak	Horizontal
5350.00	35.70	33.25	35.16	3.99	37.78	54	-16.22	Average	Horizontal
5350.00	50.28	33.25	35.16	3.99	52.36	74	-21.64	Peak	Vertical
5350.00	34.96	33.25	35.16	3.99	37.04	54	-16.96	Average	Vertical

802.11n-HT20/Chain 0+Chain 1

Channel 36

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5150.00	51.56	33.26	35.14	3.98	53.66	74	-20.34	Peak	Horizontal
5150.00	35.48	33.26	35.14	3.98	37.58	54	-16.42	Average	Horizontal
5150.00	49.91	33.26	35.14	3.98	52.01	74	-21.99	Peak	Vertical
5150.00	35.68	33.26	35.14	3.98	37.78	54	-16.22	Average	Vertical

Channel 48

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5350.00	50.92	33.25	35.16	3.99	53.00	74	-21.00	Peak	Horizontal
5350.00	35.18	33.25	35.16	3.99	37.26	54	-16.74	Average	Horizontal
5350.00	50.63	33.25	35.16	3.99	52.71	74	-21.29	Peak	Vertical
5350.00	34.95	33.25	35.16	3.99	37.03	54	-16.97	Average	Vertical

802.11n-HT40/Chain 0+Chain 1

Channel 38

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5150.00	51.16	33.26	35.14	3.98	53.26	74	-20.74	Peak	Horizontal
5150.00	34.67	33.26	35.14	3.98	36.77	54	-17.23	Average	Horizontal
5150.00	50.04	33.26	35.14	3.98	52.14	74	-21.86	Peak	Vertical
5150.00	35.20	33.26	35.14	3.98	37.30	54	-16.70	Average	Vertical

Channel 46

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5350.00	51.08	33.25	35.16	3.99	53.16	74	-20.84	Peak	Horizontal
5350.00	35.62	33.25	35.16	3.99	37.70	54	-16.30	Average	Horizontal
5350.00	50.14	33.25	35.16	3.99	52.22	74	-21.78	Peak	Vertical
5350.00	34.48	33.25	35.16	3.99	36.56	54	-17.44	Average	Vertical

802.11ac20/Chain 0+Chain 1

Channel 36

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5150.00	51.15	33.26	35.14	3.98	53.25	74	-20.75	Peak	Horizontal
5150.00	35.05	33.26	35.14	3.98	37.15	54	-16.85	Average	Horizontal
5150.00	51.34	33.26	35.14	3.98	53.44	74	-20.56	Peak	Vertical
5150.00	34.92	33.26	35.14	3.98	37.02	54	-16.98	Average	Vertical

Channel 48

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5350.00	51.38	33.25	35.16	3.99	53.46	74	-20.54	Peak	Horizontal
5350.00	33.95	33.25	35.16	3.99	36.03	54	-17.97	Average	Horizontal
5350.00	51.03	33.25	35.16	3.99	53.11	74	-20.89	Peak	Vertical
5350.00	35.69	33.25	35.16	3.99	37.77	54	-16.23	Average	Vertical

802.11ac40/Chain 0+Chain 1

Channel 38

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5150.00	52.59	33.26	35.14	3.98	54.69	74	-19.31	Peak	Horizontal
5150.00	35.04	33.26	35.14	3.98	37.14	54	-16.86	Average	Horizontal
5150.00	51.68	33.26	35.14	3.98	53.78	74	-20.22	Peak	Vertical
5150.00	34.92	33.26	35.14	3.98	37.02	54	-16.98	Average	Vertical

Channel 46

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5350.00	51.61	33.25	35.16	3.99	53.69	74	-20.31	Peak	Horizontal
5350.00	35.70	33.25	35.16	3.99	37.78	54	-16.22	Average	Horizontal
5350.00	51.18	33.25	35.16	3.99	53.26	74	-20.74	Peak	Vertical
5350.00	34.93	33.25	35.16	3.99	37.01	54	-16.99	Average	Vertical

802.11ac80/Chain 0+Chain 1

Channel 42

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5150.00	51.12	33.26	35.14	3.98	53.22	74	-20.78	Peak	Horizontal
5150.00	35.06	33.26	35.14	3.98	37.16	54	-16.84	Average	Horizontal
5150.00	51.34	33.26	35.14	3.98	53.44	74	-20.56	Peak	Vertical
5150.00	34.91	33.26	35.14	3.98	37.01	54	-16.99	Average	Vertical

Channel 42

Freq MHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol/Phase
5350.00	51.66	33.25	35.16	3.99	53.74	74	-20.26	Peak	Horizontal
5350.00	35.37	33.25	35.16	3.99	37.45	54	-16.55	Average	Horizontal
5350.00	51.28	33.25	35.16	3.99	53.36	74	-20.64	Peak	Vertical
5350.00	35.12	33.25	35.16	3.99	37.20	54	-16.8	Average	Vertical

5.5. Frequency Stability Measurement

5.5.1. Standard Applicable

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emissions is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or ±20ppm (IEEE 802.11nspecification).

5.5.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
Span	Entire absence of modulation emissions bandwidth
RBW	10KHz
RBW	10KHz

5.5.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.

2. EUT have transmitted absence of modulation signal and fixed channelize.

3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.

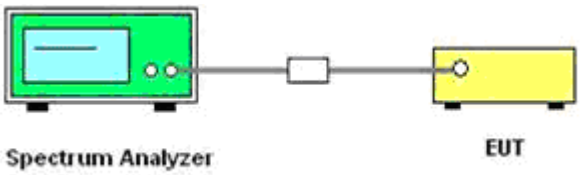
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.

5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc ×106 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).

6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value

7. Extreme temperature rule is -30℃~50℃.

5.5.4. Test Setup Layout



5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.

5.5.6. Test Results of Frequency Stability Measurement

Voltage vs. Frequency Stability for 802.11a

Voltage	Measure Frequency (MHz)
(V)	5200
10.8	5200.0023
12.0	5200.0053
13.2	5200.0044
Max. Deviation (MHz)	+0.0053
Max. Deviation (ppm)	+1.02

Temperature vs. Frequency Stability for 802.11a

Temperature	Measure Frequency (MHz)
(℃)	5200
-30	5200.0041
-20	5200.0047
-10	5200.0025
0	5200.0036
+10	5200.0074
+20	5200.0054
+30	5200.0025
+40	5200.0063
+50	5200.0045
Max. Deviation (MHz)	+0.0074
Max. Deviation (ppm)	+1.42

Voltage vs. Frequency Stability for 802.11n-HT20

Voltage	Measure Frequency (MHz)
(V)	5200
10.8	5200.0025
12.0	5200.0041
13.2	5200.0038
Max. Deviation (MHz)	+0.0041
Max. Deviation (ppm)	+0.79

Temperature vs. Frequency Stability for 802.11n-HT20

Temperature	Measure Frequency (MHz)
(℃)	5200
-30	5200.0045
-20	5200.0062
-10	5200.0048
0	5200.0037
+10	5200.0044
+20	5200.0053
+30	5200.0025
+40	5200.0024
+50	5200.0063
Max. Deviation (MHz)	+0.0063
Max. Deviation (ppm)	+1.21

Voltage vs. Frequency Stability for 802.11n-HT40

Voltage	Measure Frequency (MHz)
(V)	5190
10.8	5190.0022
12.0	5190.0037
13.2	5190.0045
Max. Deviation (MHz)	+0.0045
Max. Deviation (ppm)	+0.87

Temperature vs. Frequency Stability for 802.11n-HT40

Temperature	Measure Frequency (MHz)
(℃)	5190
-30	5190.0049
-20	5190.0056
-10	5190.0048
0	5190.0021
+10	5190.0055
+20	5190.0061
+30	5190.0042
+40	5190.0075
+50	5190.0035
Max. Deviation (MHz)	+0.0075
Max. Deviation (ppm)	+1.45

Voltage vs. Frequency Stability for 802.11ac20

Voltage	Measure Frequency (MHz)
(V)	5200
10.8	5200.0044
12.0	5200.0061
13.2	5200.0026
Max. Deviation (MHz)	+0.0061
Max. Deviation (ppm)	+1.17

Temperature vs. Frequency Stability for 802.11ac20

Temperature	Measure Frequency (MHz)
(℃)	5200
-30	5200.0042
-20	5200.0039
-10	5200.0028
0	5200.0037
+10	5200.0022
+20	5200.0063
+30	5200.0047
+40	5200.0042
+50	5200.0051
Max. Deviation (MHz)	+0.0063
Max. Deviation (ppm)	+1.21

Voltage vs. Frequency Stability for 802.11ac40

Voltage	Measure Frequency (MHz)
(V)	5190
10.8	5190.0025
12.0	5190.0034
13.2	5190.0021
Max. Deviation (MHz)	+0.0034
Max. Deviation (ppm)	0.66

Temperature vs. Frequency Stability for 802.11ac40

Temperature	Measure Frequency (MHz)
(℃)	5190
-30	5190.0034
-20	5190.0014
-10	5190.0027
0	5190.0046
+10	5190.0057
+20	5190.0015
+30	5190.0037
+40	5190.0026
+50	5190.0045
Max. Deviation (MHz)	+0.0057
Max. Deviation (ppm)	+1.10

Voltage vs. Frequency Stability for 802.11ac80

Voltage	Measure Frequency (MHz)
(V)	5210
10.8	5210.0052
12.0	5210.0033
13.2	5210.0041
Max. Deviation (MHz)	+0.0052
Max. Deviation (ppm)	+1.00

Temperature vs. Frequency Stability for 802.11ac40

Temperature	Measure Frequency (MHz)
(℃)	5210
-30	5210.0051
-20	5210.0023
-10	5210.0045
0	5210.0031
+10	5210.0056
+20	5210.0041
+30	5210.0062
+40	5210.0034
+50	5210.0045
Max. Deviation (MHz)	+0.0062
Max. Deviation (ppm)	+1.19

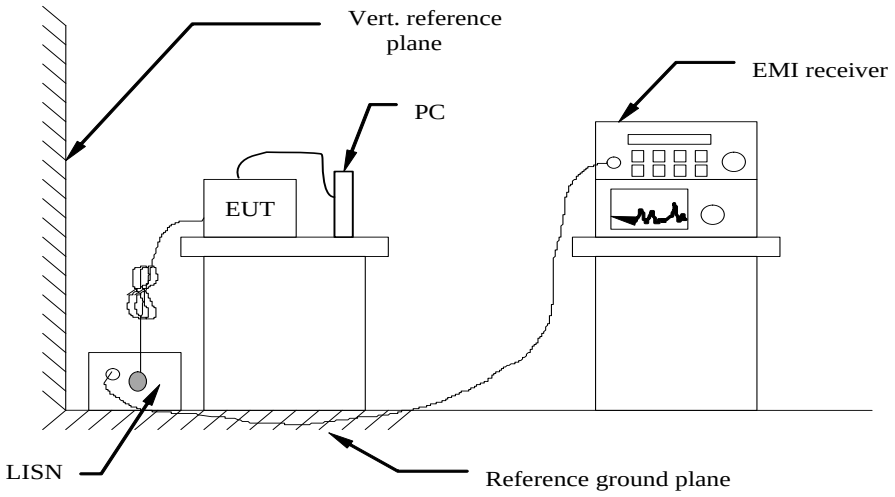
5.6. Power line conducted emissions

5.6.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

5.6.2 Block Diagram of Test Setup

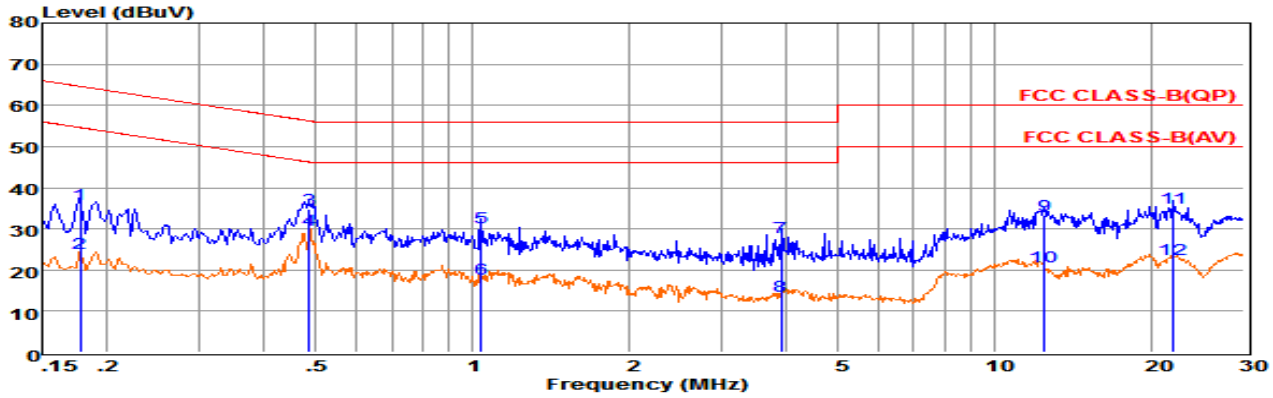


5.6.3 Test Results

PASS.

The test data please refer to following page.

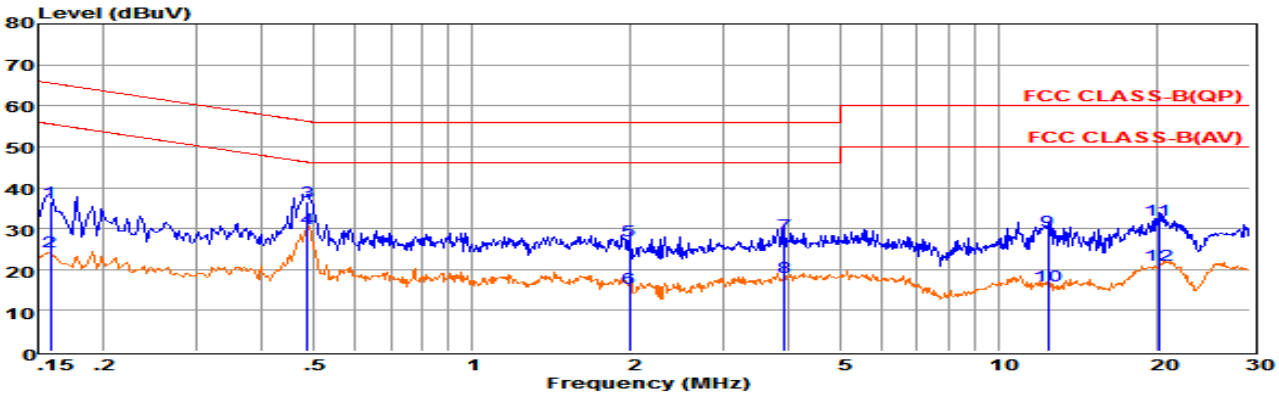
Test result for 802.11a (AC 120 V)



Env. Ins: 24*/56%
Pol: LINE

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.17772	16.36	9.61	0.02	10.00	35.99	64.59	-28.60	QP
2	0.17782	4.31	9.61	0.02	10.00	23.94	54.59	-30.65	Average
3	0.48632	15.17	9.62	0.04	10.00	34.83	56.23	-21.40	QP
4	0.48642	10.05	9.62	0.04	10.00	29.71	46.23	-16.52	Average
5	1.03745	10.66	9.63	0.05	10.00	30.34	56.00	-25.66	QP
6	1.03845	-1.85	9.63	0.05	10.00	17.83	46.00	-28.17	Average
7	3.90144	8.25	9.65	0.06	10.00	27.96	56.00	-28.04	QP
8	3.90244	-5.92	9.65	0.06	10.00	13.79	46.00	-32.21	Average
	912.44945	13.65	9.70	0.09	10.00	33.44	60.00	-26.56	QP
	1012.45045	0.94	9.70	0.09	10.00	20.73	50.00	-29.27	Average
	1121.94626	15.17	9.71	0.12	10.00	35.00	60.00	-25.00	QP
	1221.94726	2.71	9.71	0.12	10.00	22.54	50.00	-27.46	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

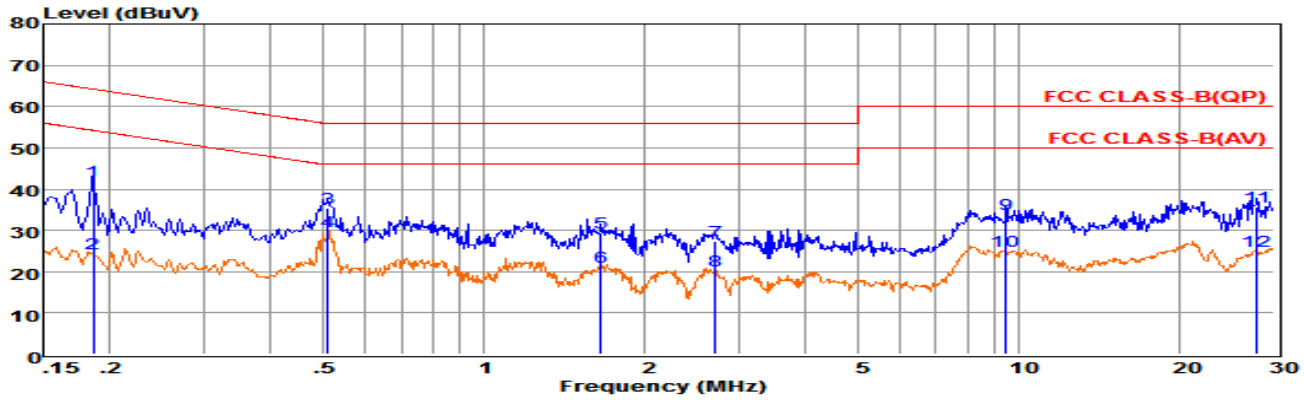


Env. Ins: 24*/56%
Pol: NEUTRAL

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15816	16.96	9.68	0.02	10.00	36.66	65.56	-28.90	QP
2	0.15826	4.70	9.68	0.02	10.00	24.40	55.55	-31.15	Average
3	0.48632	16.81	9.62	0.04	10.00	36.47	56.23	-19.76	QP
4	0.48642	10.50	9.62	0.04	10.00	30.16	46.23	-16.07	Average
5	1.99065	7.46	9.63	0.05	10.00	27.14	56.00	-28.86	QP
6	1.99165	-4.27	9.63	0.05	10.00	15.41	46.00	-30.59	Average
7	3.92216	8.70	9.65	0.06	10.00	28.41	56.00	-27.59	QP
8	3.92316	-1.46	9.65	0.06	10.00	18.25	46.00	-27.75	Average
	912.38367	9.66	9.73	0.09	10.00	29.48	60.00	-30.52	QP
	1012.38467	-3.62	9.73	0.09	10.00	16.20	50.00	-33.80	Average
	1120.05594	12.01	9.89	0.12	10.00	32.02	60.00	-27.98	QP
	1220.05694	1.24	9.89	0.12	10.00	21.25	50.00	-28.75	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

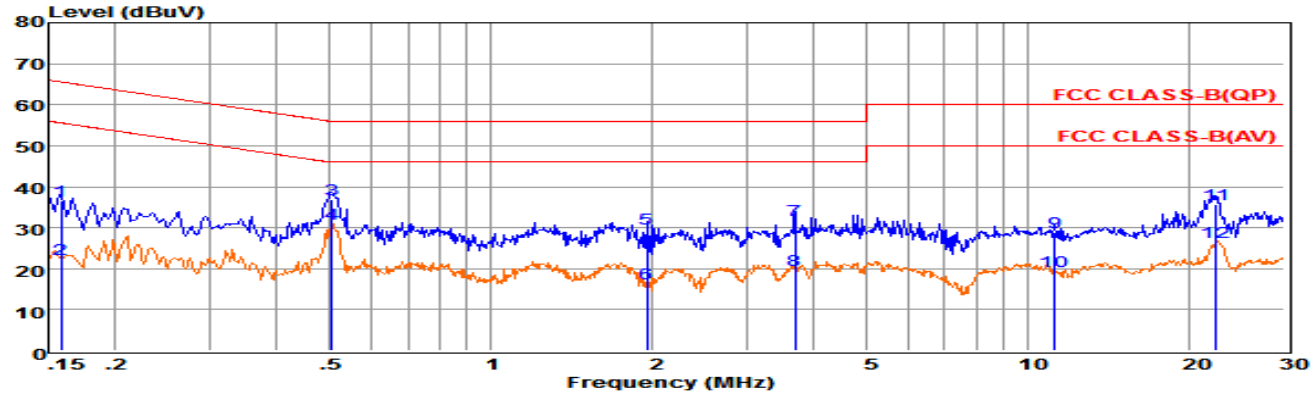
Test result for 802.11a (AC 240 V)



Env. Ins: 24*/56%
Pol: LINE

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.18639	22.39	9.62	0.02	10.00	42.03	64.20	-22.17	QP
2	0.18649	4.73	9.62	0.02	10.00	24.37	54.19	-29.82	Average
3	0.51007	15.86	9.62	0.04	10.00	35.52	56.00	-20.48	QP
4	0.51017	10.19	9.62	0.04	10.00	29.85	46.00	-16.15	Average
5	1.65370	9.80	9.64	0.05	10.00	29.49	56.00	-26.51	QP
6	1.65470	1.54	9.64	0.05	10.00	21.23	46.00	-24.77	Average
7	2.70678	7.76	9.64	0.05	10.00	27.45	56.00	-28.55	QP
8	2.70778	0.66	9.64	0.05	10.00	20.35	46.00	-25.65	Average
9	9.45141	14.12	9.69	0.08	10.00	33.89	60.00	-26.11	QP
10	9.45241	5.31	9.69	0.08	10.00	25.08	50.00	-24.92	Average
1127	.85524	15.92	9.71	0.14	10.00	35.77	60.00	-24.23	QP
1227	.85624	5.10	9.71	0.14	10.00	24.95	50.00	-25.05	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.



Env. Ins: 24*/56%
Pol: NEUTRAL

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15816	17.02	9.68	0.02	10.00	36.72	65.56	-28.84	QP
2	0.15826	2.60	9.68	0.02	10.00	22.30	55.55	-33.25	Average
3	0.50469	17.11	9.62	0.04	10.00	36.77	56.00	-19.23	QP
4	0.50479	11.23	9.62	0.04	10.00	30.89	46.00	-15.11	Average
5	1.94890	9.93	9.63	0.05	10.00	29.61	56.00	-26.39	QP
6	1.94990	-3.40	9.63	0.05	10.00	16.28	46.00	-29.72	Average
7	3.68056	12.13	9.65	0.06	10.00	31.84	56.00	-24.16	QP
8	3.68156	0.06	9.65	0.06	10.00	19.77	46.00	-26.23	Average
911	.19772	9.14	9.73	0.09	10.00	28.96	60.00	-31.04	QP
1011	.19872	-0.46	9.73	0.09	10.00	19.36	50.00	-30.64	Average
1122	.41633	15.86	9.81	0.12	10.00	35.79	60.00	-24.21	QP
1222	.41733	6.62	9.81	0.12	10.00	26.55	50.00	-23.45	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

****Note: Pre-scan all mode and recorded the worst case results in this report (802.11a).*

5.7. Antenna Requirements

5.7.1. Standard Applicable

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.

5.7.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 7.0dBi(For MIMO is 10.01dBi) which is a R-SMA antenna and no consideration of replacement. Please see EUT photo for details.

5.7.3. Results: Compliance.

6. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18, 2015	June 17, 2016
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16, 2015	July 15, 2016
Signal analyzer	Agilent	N9020A	MY50510140	9kHz~26.5GHz	October 27, 2015	October 27, 2016
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18, 2015	June 17, 2016
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18, 2015	June 17, 2016
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18, 2015	June 17, 2016
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18, 2015	June 17, 2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz 3m	June 18, 2015	June 17, 2016
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHzz	June 18, 2015	June 17, 2016
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16, 2015	July 15, 2016
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16, 2015	July 15, 2016
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18, 2015	June 17, 2016
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10, 2015	June 09, 2016
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10, 2015	June 09, 2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10, 2015	June 09, 2016
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18, 2015	June 17, 2016
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18, 2015	June 17, 2016
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18, 2015	June 17, 2016
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18, 2015	June 17, 2016
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18, 2015	June 17, 2016
AC Power Source	HPC	HPA-500E	HPA-9100024	AC 0~300V	June 18, 2015	June 17, 2016
DC power Soure	GW	GPC-6030D	C671845	DC 1V-60V	June 18, 2015	June 17, 2016
Temp. and Humidigy	Giant Force	GTH-225-20-S	MAB0103-00	N/A	June 18, 2015	June 17, 2016
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18, 2015	June 17, 2016
RF CABLE-2m	JYE Bao	RG142	CB)35-2m	20MHz-1GHz	June 18, 2015	June 17, 2016
Note: All equipment through GRGT EST calibration						

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