FCC TEST REPORT

For

Videostrong Technology Co.,Ltd

Android TV BOX

Model No.: KB2

Additional Model No.: Please refer to page 6

Prepared for	:	Videostrong Technology Co.,Ltd
Address	:	402A, Building B, Donglian Industrial 23rd District, Bao'an , Shenzhen, China
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	November 01, 2016
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	November 01, 2016~November 22, 2016
Date of Report	:	November 22, 2016

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

Report Reference No.	**:**	**LCS1611010029E**
Date of Issue	:	November 22, 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 ..... :		**Videostrong Technology Co.,Ltd**
Address	:	402A, Building B, Donglian Industrial 23rd District, Bao'an , Shenzhen, 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. ..... :		**Android TV BOX**
Trade Mark	:	N/A
Model/ Type reference	:	KB2
Ratings	:	DC 5.0V, 2.0A
Result	:	**Positive**

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

FCC -- TEST REPORT

Test Report No. : LCS1611010029E	November 22, 2016 Date of issue

EUT.....	: Android TV BOX
Type / Model.....	: KB2
Applicant.....	**: Videostrong Technology Co.,Ltd**
Address.....	: 402A, Building B, Donglian Industrial 23rd District, Bao'an , Shenzhen, China
Telephone.....	: 0755-27928980
Fax.....	: 0755-27928980
Manufacturer.....	**: Videostrong Technology Co.,Ltd**
Address.....	: 402A, Building B, Donglian Industrial 23rd District, Bao'an , Shenzhen, China
Telephone.....	: 0755-27928980
Fax.....	: 0755-27928980
Factory.....	**: Videostrong Technology Co.,Ltd**
Address.....	: 402A, Building B, Donglian Industrial 23rd District, Bao'an , Shenzhen, China
Telephone.....	: 0755-27928980
Fax.....	: 0755-27928980

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.

Revision History

Revision	Issue Date	Revisions	Revised By
00	2016-11-22	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Android TV BOX

Model Number : KB2,KB2 PRO,BB2,BB2 PRO,KB2x,BB2x(NOTE:x=A-Z Any one of letters)

Model Declaration : PCB board, structure and internal of these model(s) are the same, So no additional models were tested

Test Model : KB2

Power Supply : DC 5.0V, 2.0A

Frequency Range : 2402.00~2480.00MHz; 2412.00~2462.00MHz;
5180.00-5240.00MHz; 5745.00-5825.00MHz

Bluetooth Version : V4.0

Channel Number : 79 Channels for BT V3.0;
40 Channels for BT LE;
11 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20);
4 Channels for 5180.00-5240.00MHz(802.11a/n-HT20/ac VHT20);
5 Channels for 5745.00-5825.00MHz(802.11a/n-HT20/ac VHT20);
2 Channels for 5190.00-5230.00MHz(802.11n-HT40/ac VHT40);
2 Channels for 5755.00-5795.00MHz(802.11n-HT40/ac VHT40);
1 Channels for 5210.00MHz(802.11 ac VHT80);
1 Channels for 5775.00MHz(802.11 ac VHT80)

Modulation Technology : BT V3.0: FHSS(GFSK, π/4-DQPSK, 8-DPSK);
BT LE: DSSS(GFSK);
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 : BT V3.0: 1~3Mbps;
BT LE: 1Mbps;
IEEE 802.11b: 1-11Mbps;
IEEE 802.11g: 6-54Mbps;
IEEE 802.11n: MCS0-MCS7;
IEEE 802.11a: 6-54Mbps;
IEEE 802.11ac: MCS0-MCS15

Antenna Type And Gain : R-SMA antenna, 2.0dBi

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
SHENZHEN KEYU POWER SUPPLY TECHNOLOGY CO., LTD	AC/DC ADAPTER	KA23-0502000DES	--	VoC

1.3. External I/O Port

I/O Port Description	Quantity	Cable
DC	1	N/A
AV	1	N/A
TF	1	N/A
USB	2	N/A
HDMI	1	1.5m, Shielded
RJ45	1	N/A
OPTICAL	1	N/A

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

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

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:
IEEE 802.11a Mode : 6 Mbps, OFDM.
IEEE 802.11n-HT20 Mode: MCS0, OFDM.
IEEE 802.11n-HT40 Mode: MCS0, OFDM.
IEEE 802.11ac20 Mode: MCS0, OFDM.
IEEE 802.11ac40 Mode: MCS0, OFDM.
IEEE 802.11ac80 Mode: MCS0, OFDM.

Antenna & Bandwidth

Antenna	Single (Port.1)			Two (Port.1 + Port.2)		
Bandwidth Mode	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
IEEE 802.11a	☑	☐	☐	☐	☐	☐
IEEE 802.11n	☑	☑	☐	☐	☐	☐
IEEE 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 v01r03 is 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. On Time and Duty Cycle

5.1.1. Standard Applicable

None; for reporting purpose only.

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 spectrum analyse.

5.1.3. Test Procedures

1). Set the centre frequency of the spectrum analyse to the transmiting frequency;

2). Set the span=0MHz, RBW=8MHz, VBW=50MHz, Sweep time=5ms;

3). Detector = peak;

4). Trace mode = Single hold.

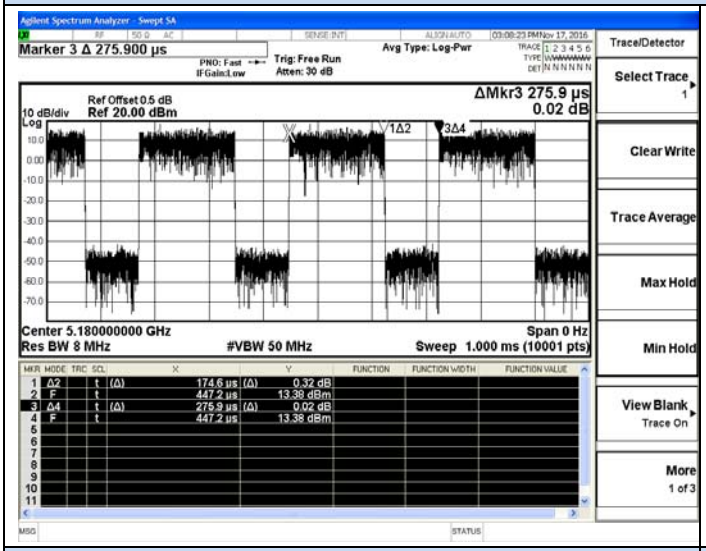
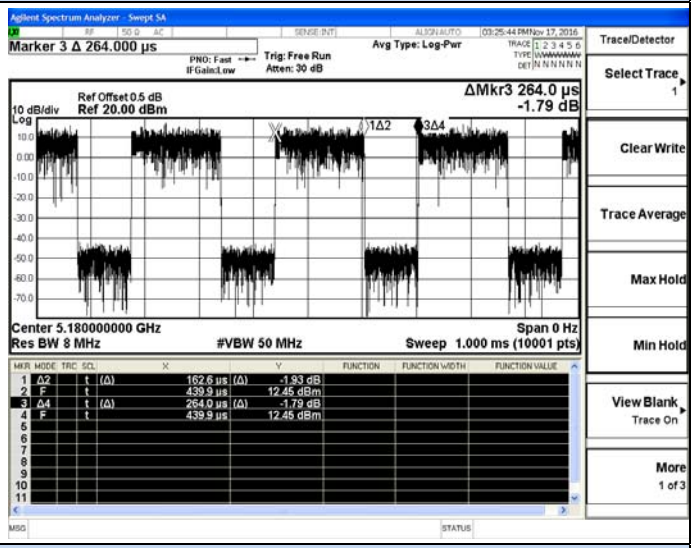
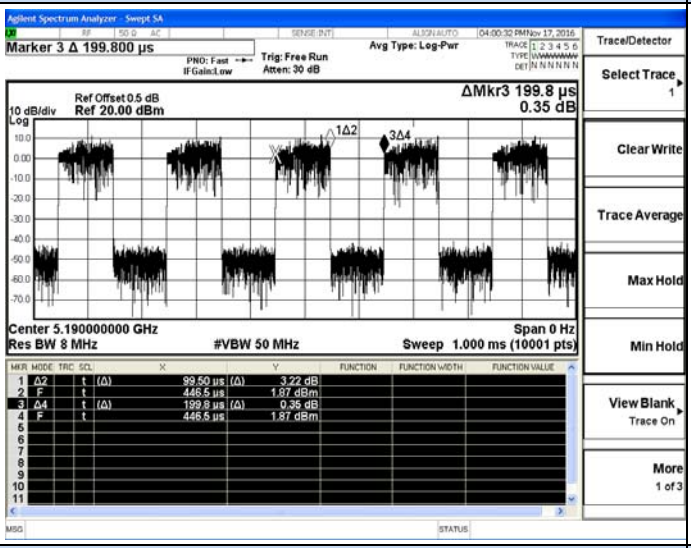
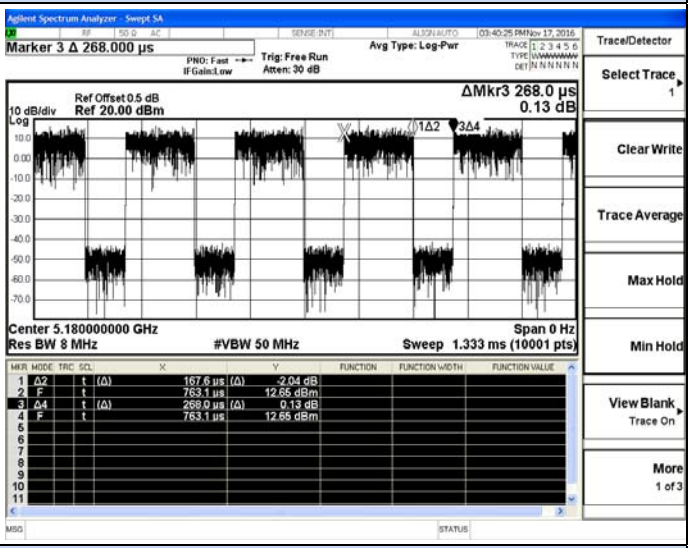
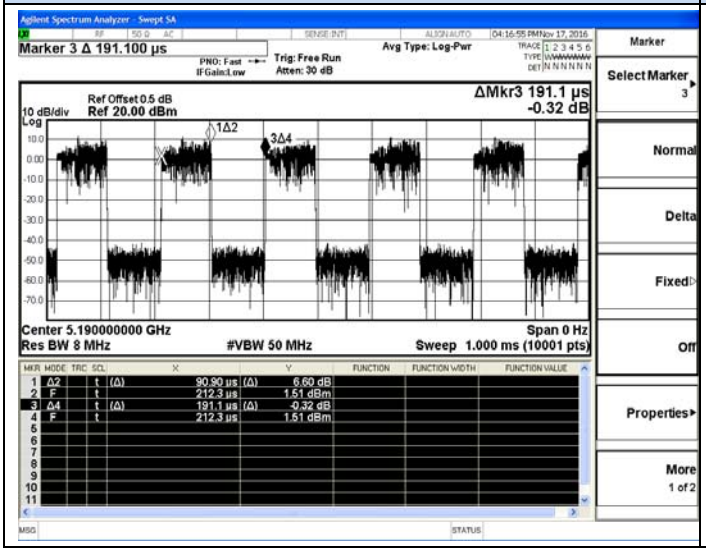
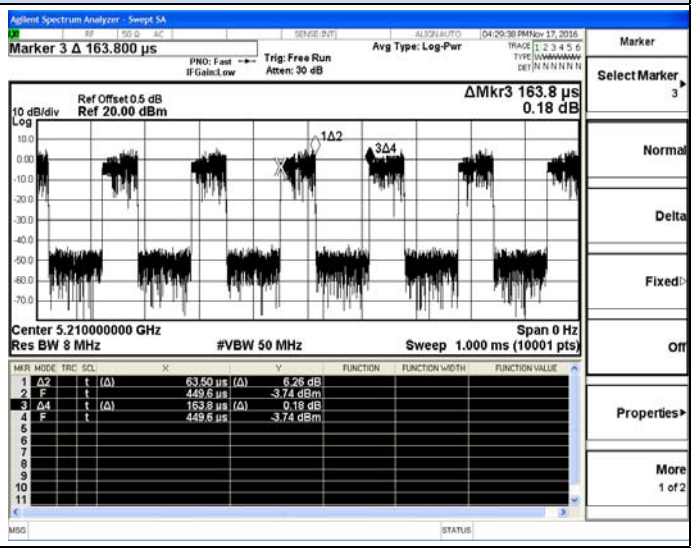
5.1.4. Test Setup Layout

5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. Test result

Mode	On Time B (ms)	Period (ms)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW(KHz)
IEEE 802.11a	0.1746	0.2759	1	63.28	1.987	5.727
IEEE 802.11n-HT20	0.1626	0.2640	1	61.59	2.105	6.150
IEEE 802.11n-HT40	0.0995	0.1998	1	49.80	3.028	10.050
IEEE 802.11ac VHT20	0.1676	0.2680	1	62.54	2.038	5.967
IEEE 802.11ac VHT40	0.0909	0.1911	1	47.57	3.227	11.001
IEEE 802.11ac VHT80	0.0635	0.1638	1	38.77	4.115	15.748
Note: Duty Cycle Correction Factor=10log(1/Duty cycle)						

Test plot of On Time and Duty Cycle	
	
IEEE 802.11a	IEEE 802.11n-HT20
	
IEEE 802.11n-HT40	IEEE 802.11ac VHT20
	
IEEE 802.11ac VHT40	IEEE 802.11ac VHT80

5.2. Maximum Conducted Output Power Measurement

5.2.1. Standard Applicable

For 5150~5250MHz

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 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..

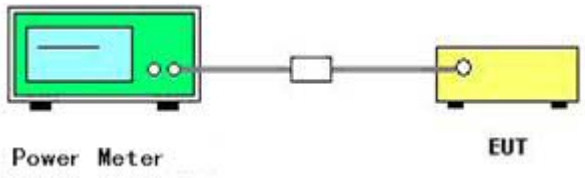
5.2.2. Measuring Instruments and Setting

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

5.2.3. Test Procedures

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

5.2.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Test Result of Maximum Conducted Output Power

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

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11a	36	5180	16.57	1.987	18.557	24	Complies
	40	5200	16.69	1.987	18.677	24	Complies
	48	5200	16.91	1.987	18.897	24	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11n-HT20	36	5180	17.63	2.105	19.735	24	Complies
	40	5200	17.28	2.105	19.385	24	Complies
	48	5240	17.47	2.105	19.575	24	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11n-HT40	38	5190	15.91	3.028	18.938	24	Complies
	46	5230	15.86	3.028	18.888	24	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11ac 20	36	5180	17.66	2.038	19.698	24	Complies
	40	5200	17.61	2.038	19.648	24	Complies
	48	5240	17.75	2.038	19.788	24	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11ac 40	38	5190	15.94	3.227	19.167	24	Complies
	46	5230	16.05	3.227	19.277	24	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11ac 80	42	5210	14.74	4.115	18.855	24	Complies

Note:

Sum Power(dBm)= AVG Conducted Power (dBm)+ Duty cycle factor

5.3. Power Spectral Density Measurement

5.3.1. Standard Applicable

For 5150~5250MHz

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 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..

5.3.2. Measuring Instruments and Setting

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

5.3.3. 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 = 1MHz.

4). Set the VBW ≥ 3*RBW

5). Span=Encompass the entire emissions bandwidth (EBW) of the signal

6). Detector = peak.

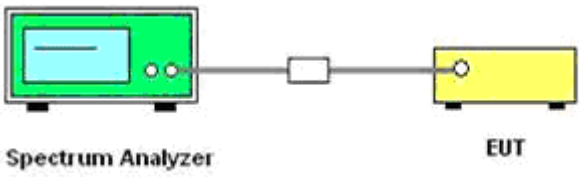
7). Sweep time = auto couple.

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.

5.3.4. 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 Power Spectral Density

Temperature	25℃	Humidity	60%
Test Engineer	Jacky	Configurations	IEEE 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
IEEE 802.11a	36	5180	7.952	1.987	9.939	11	Complies
	40	5200	7.531	1.987	9.518	11	Complies
	48	5240	8.115	1.987	10.102	11	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
IEEE 802.11n-HT20	36	5180	7.900	2.105	10.005	11	Complies
	40	5200	6.450	2.105	8.555	11	Complies
	48	5240	7.295	2.105	9.400	11	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
IEEE 802.11n-HT40	38	5190	3.162	3.028	6.190	11	Complies
	46	5230	4.212	3.028	7.240	11	Complies

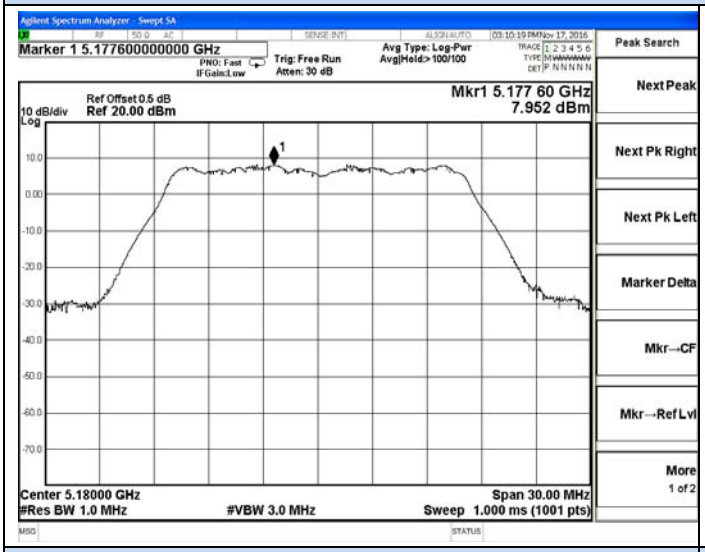
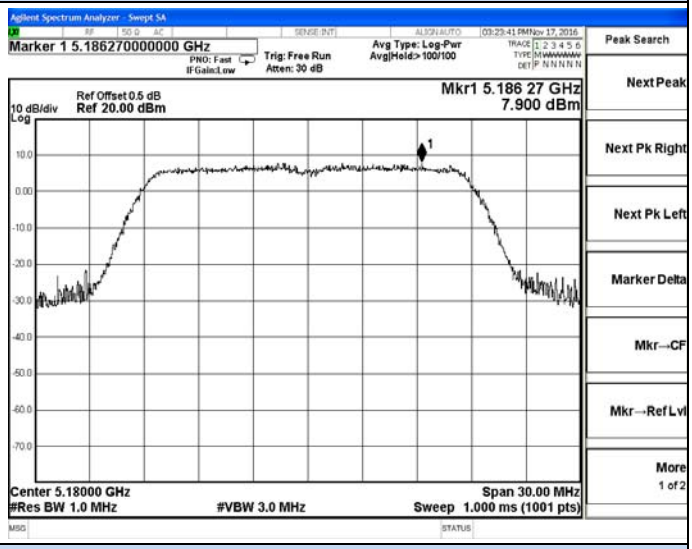
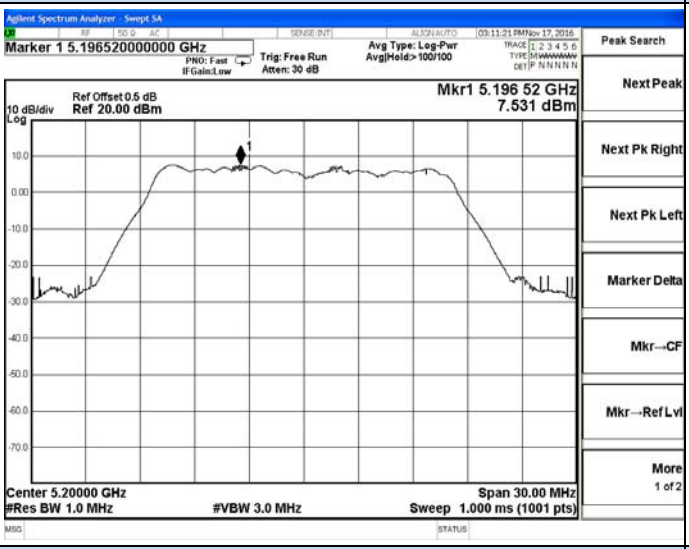
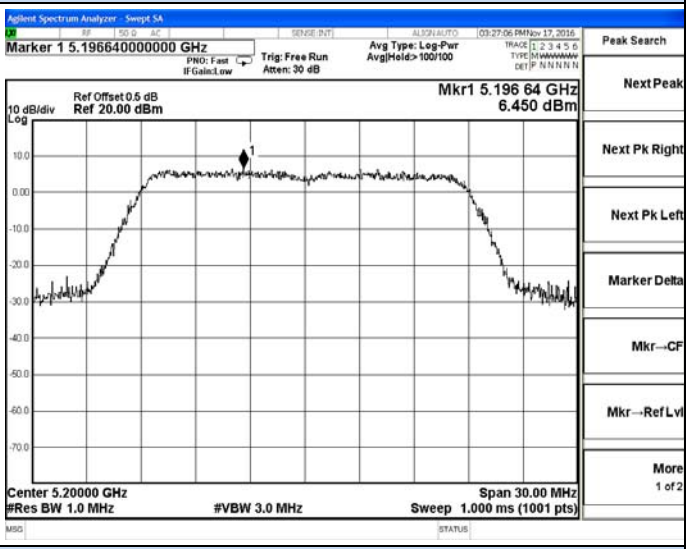
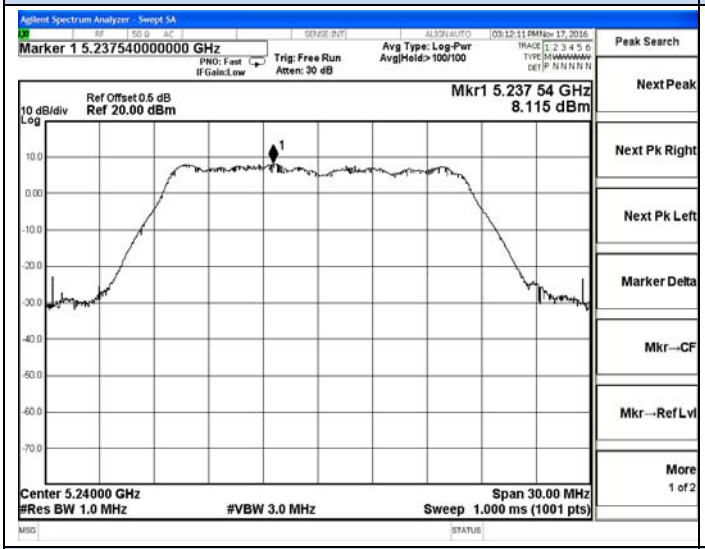
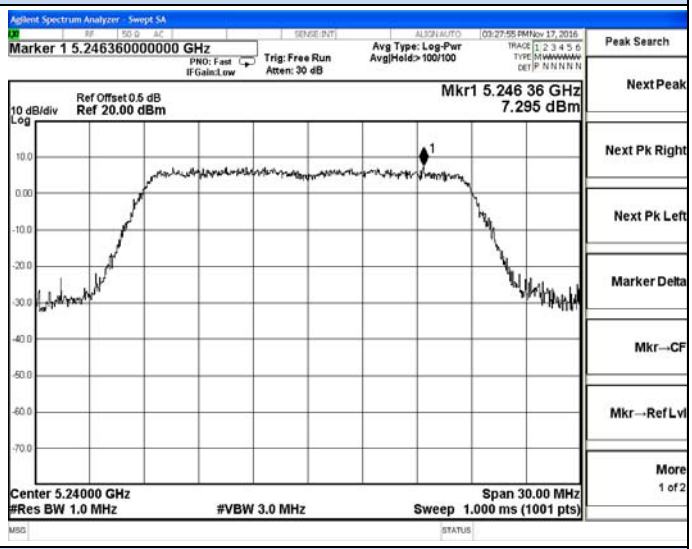
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
IEEE 802.11ac VHT20	36	5180	7.406	2.038	9.444	11	Complies
	40	5200	6.387	2.038	8.425	11	Complies
	48	5240	7.839	2.038	9.877	11	Complies

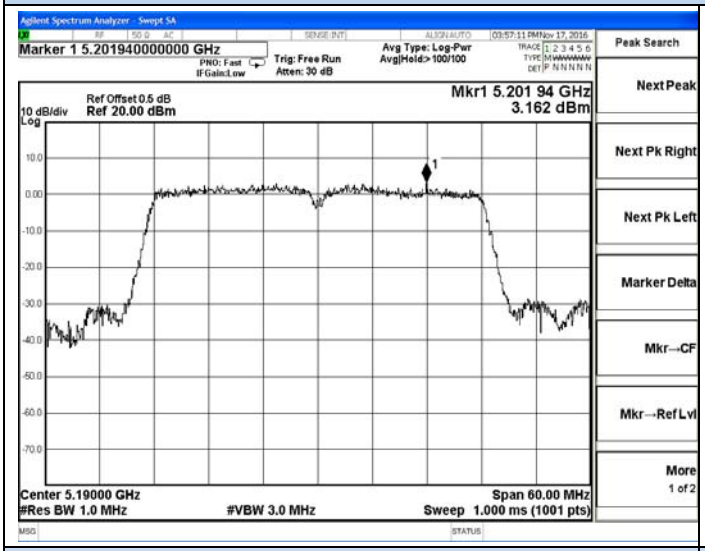
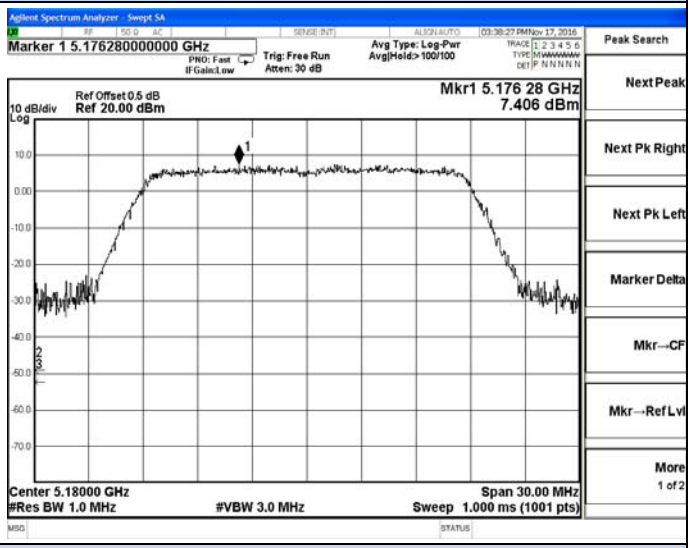
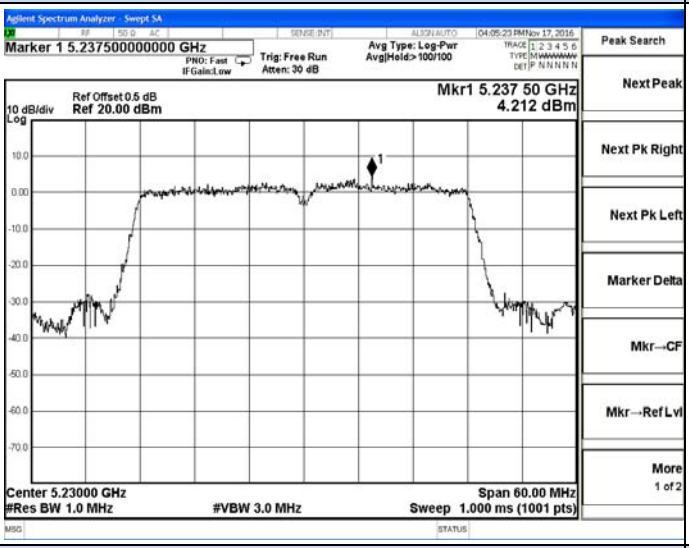
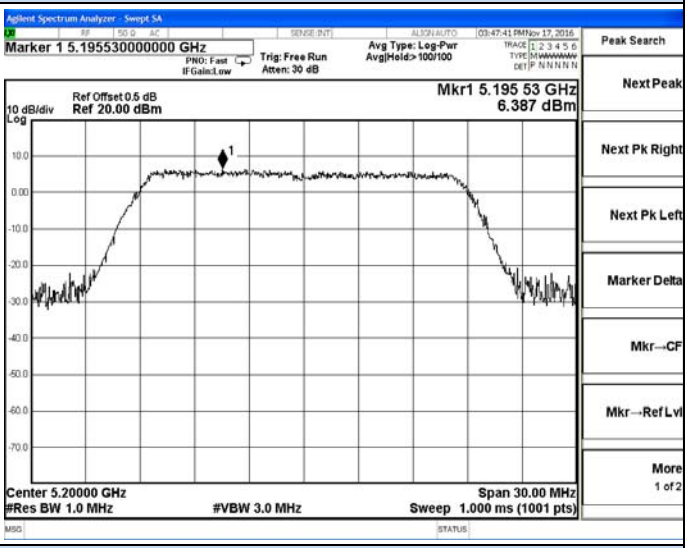
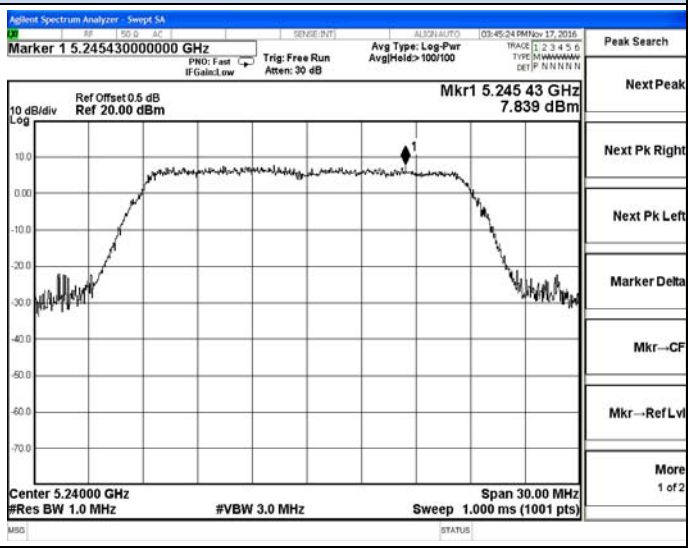
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
IEEE 802.11ac VHT40	38	5190	3.663	3.227	6.890	11	Complies
	46	5230	3.783	3.227	7.010	11	Complies

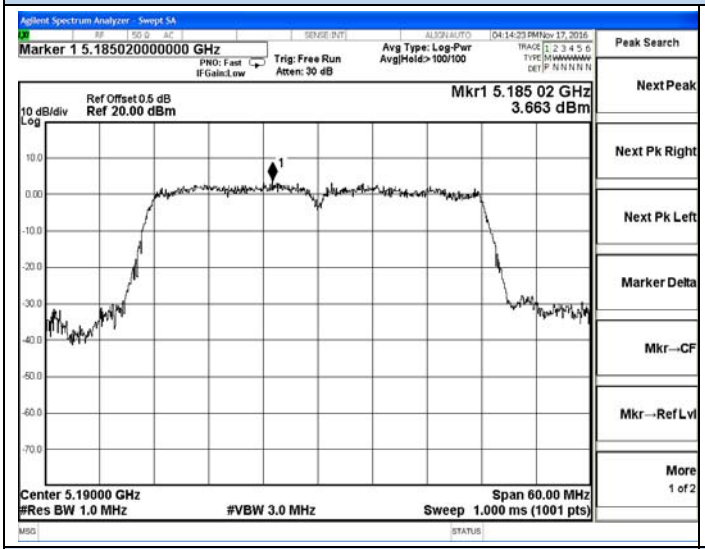
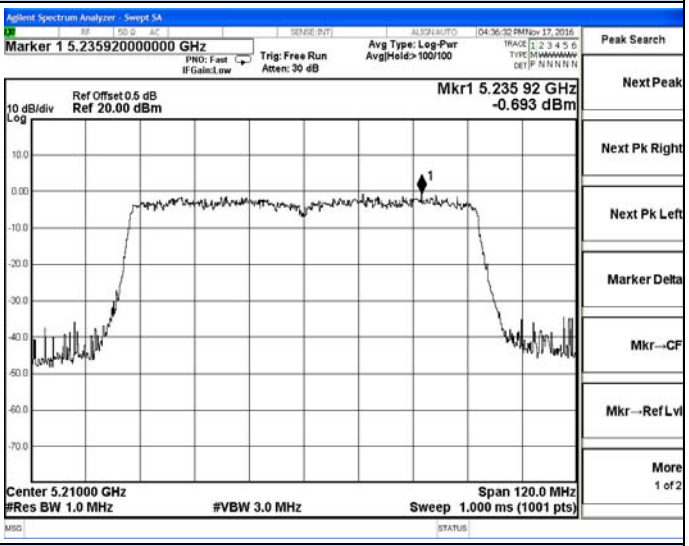
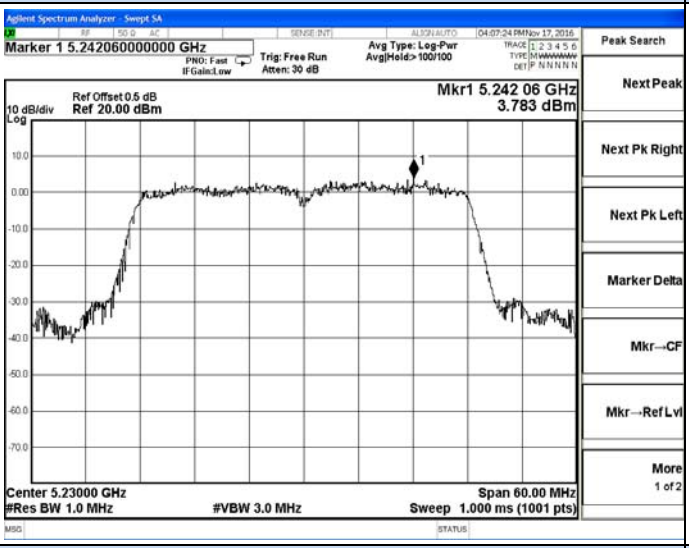
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
IEEE 802.11ac VHT80	42	5190	-0.693	4.115	3.422	11	Complies

Note:

Sum PSD(dBm/MHz)= PSD(dBm/Mz)+ Duty cycle factor

Test Plot of Power Spectral Density	
	
IEEE 802.11a-5180MHz	IEEE 802.11n-HT20-5180MHz
	
IEEE 802.11a-5200MHz	IEEE 802.11n-HT20-5200MHz
	
IEEE 802.11a-5240MHz	IEEE 802.11n-HT20-5240MHz

Test Plot of Power Spectral Density	
	
IEEE 802.11n-HT40-5190MHz	IEEE 802.11ac VHT20-5180MHz
	
IEEE 802.11n-HT40-5230MHz	IEEE 802.11ac VHT20-5200MHz
	
	IEEE 802.11ac VHT20-5240MHz

Test Plot of Power Spectral Density	
	
IEEE 802.11ac VHT40-5190MHz	IEEE 802.11ac VHT80-5210MHz
	
IEEE 802.11ac VHT40-5230MHz	

5.4. 99% and 26dB Occupied Bandwidth Measurement

5.4.1. Standard Applicable

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

5.4.2. Measuring Instruments and Setting

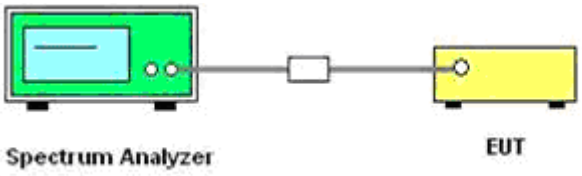
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

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

5.4.3. 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.

5.4.4. Test Setup Layout



5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

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

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11a	36	5180	20.18	16.598
	44	5220	20.33	16.642
	48	5240	20.14	16.607

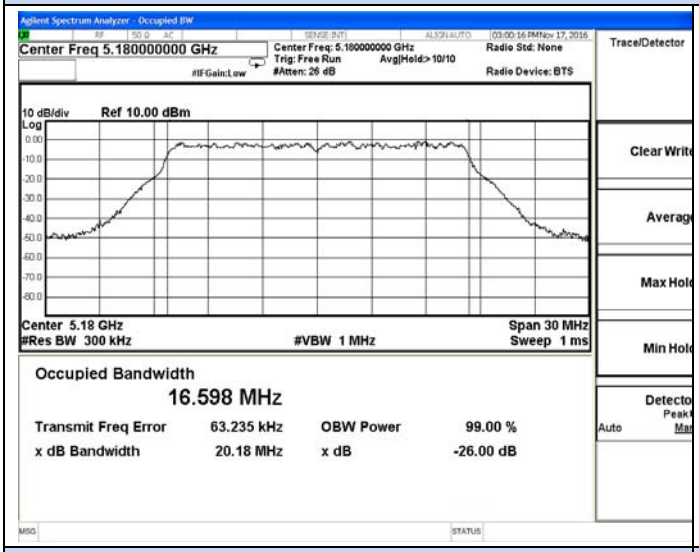
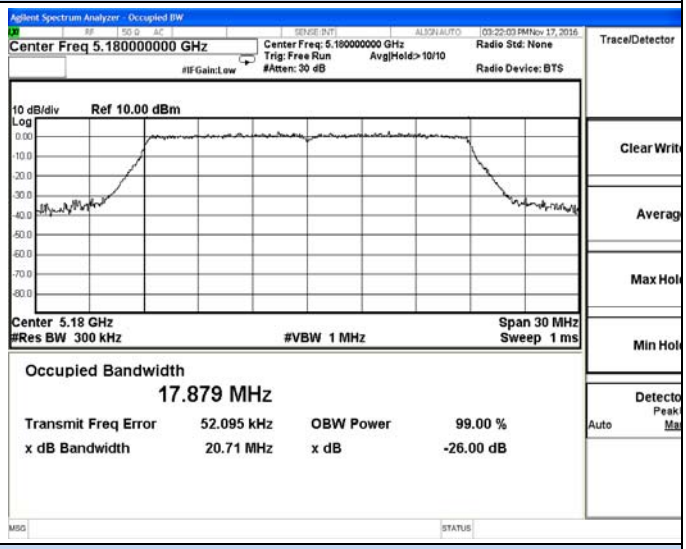
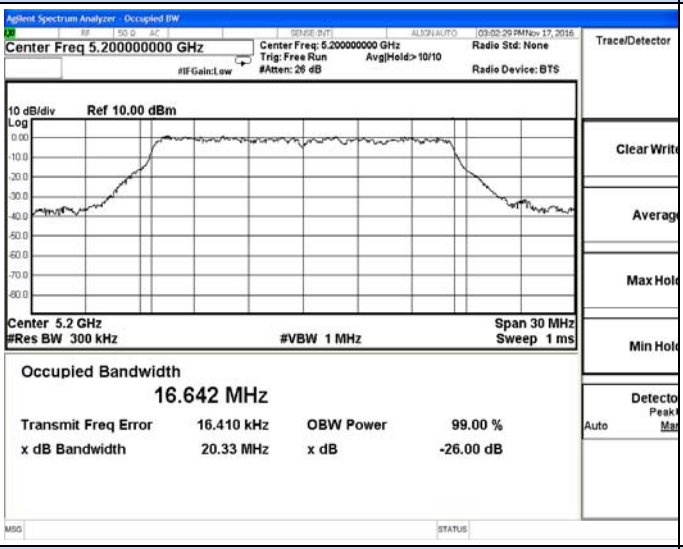
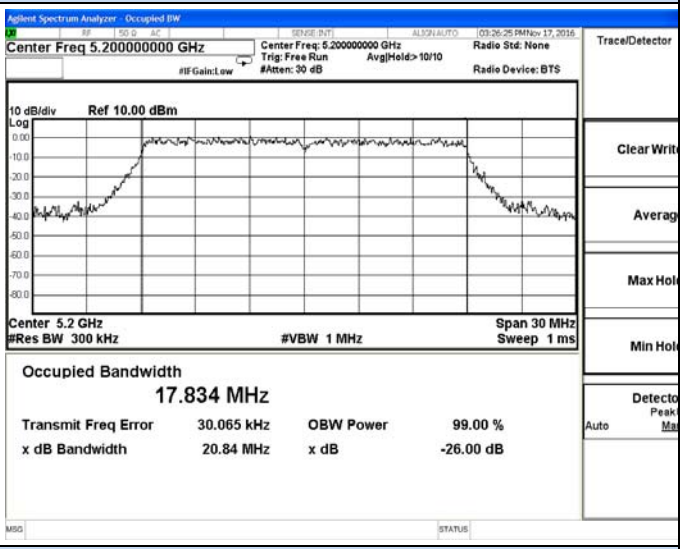
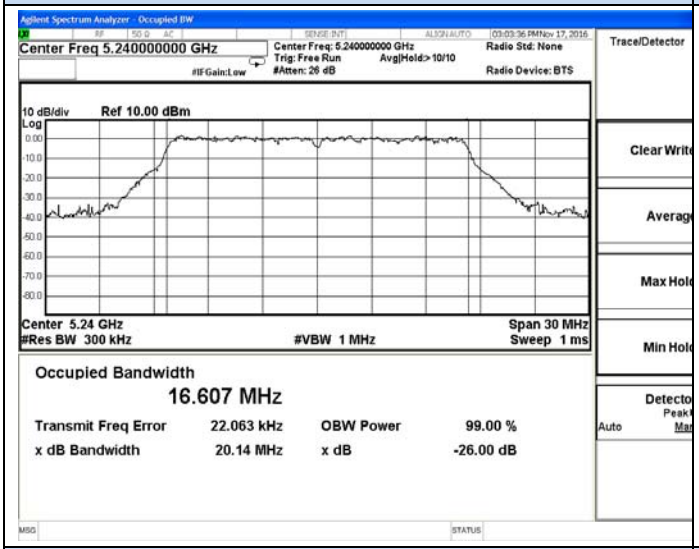
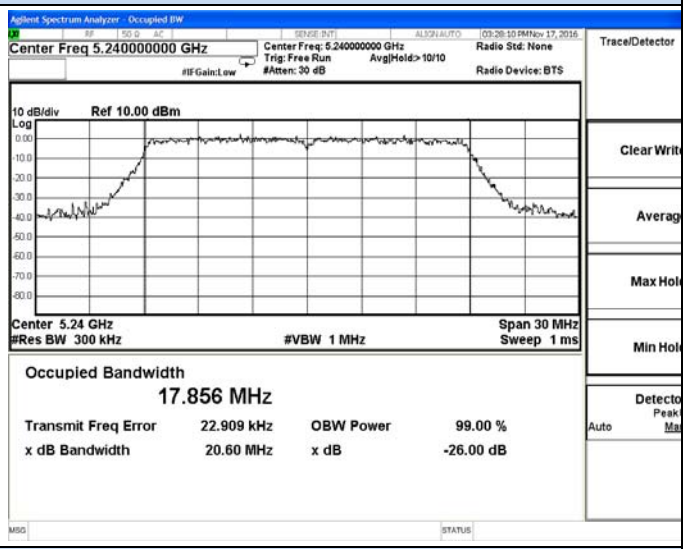
Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11n-HT20	36	5180	20.71	17.879
	44	5220	20.84	17.834
	48	5240	20.60	17.856

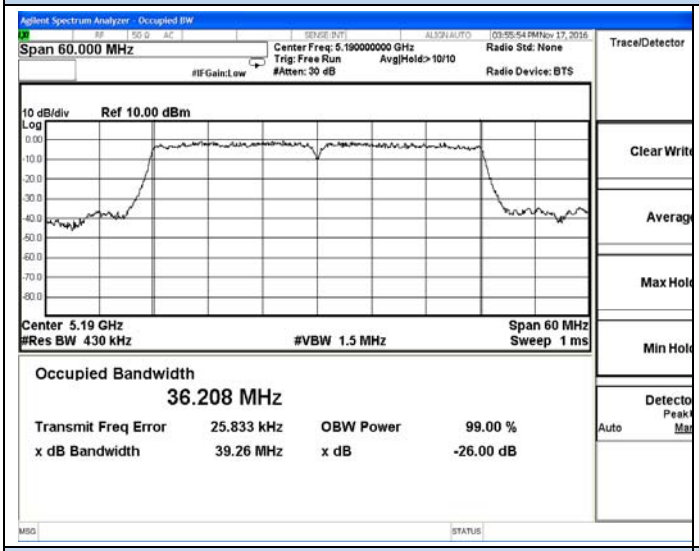
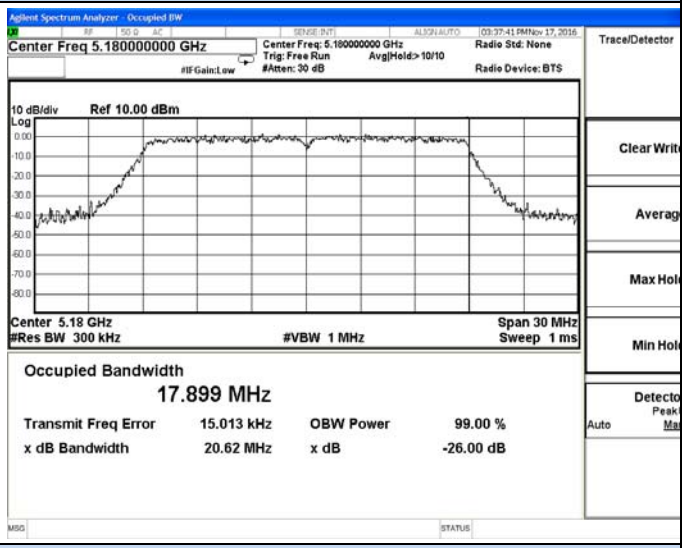
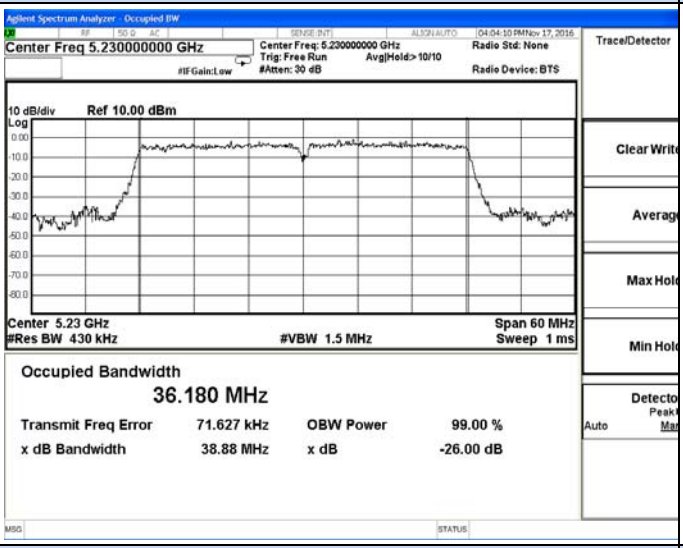
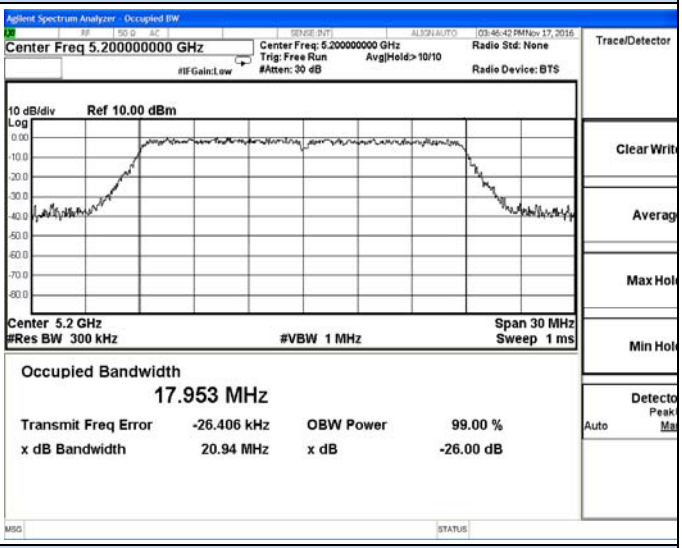
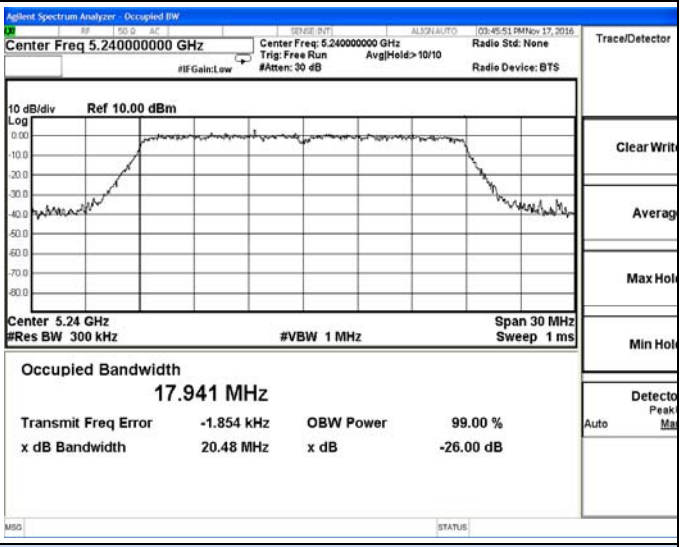
Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11n-HT40	38	5190	39.26	36.208
	46	5230	38.88	36.180

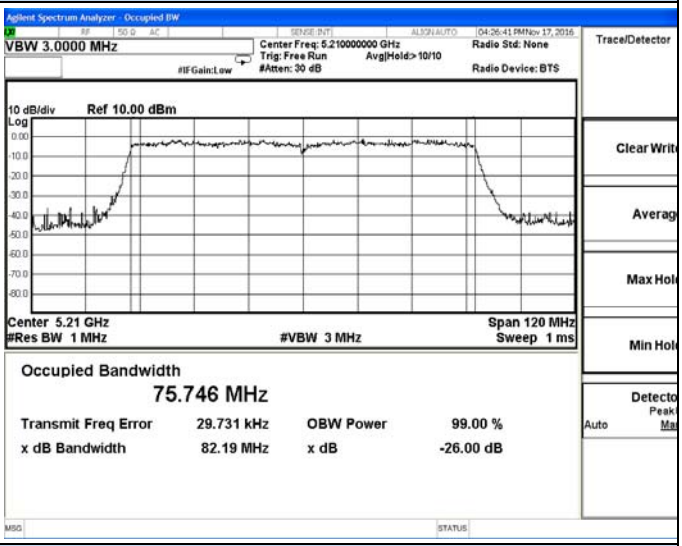
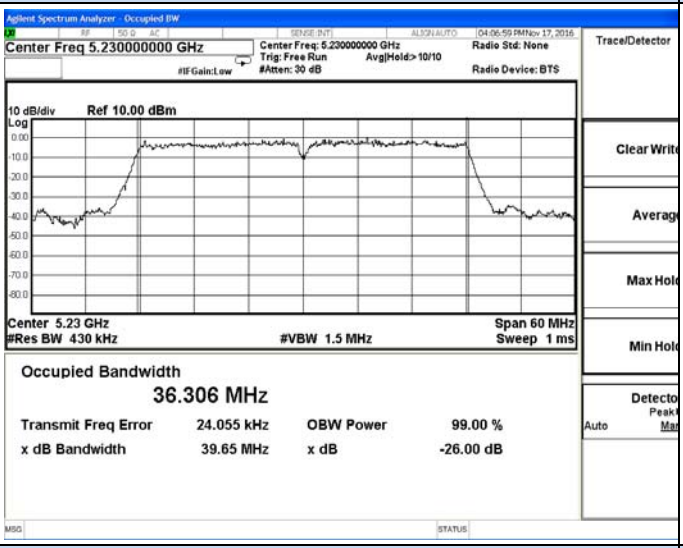
Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11ac VHT20	36	5180	20.62	17.899
	44	5220	20.94	17.953
	48	5240	20.48	17.941

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11ac VHT40	38	5190	39.90	36.389
	46	5230	39.65	36.306

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
IEEE 802.11ac VHT80	42	5210	82.19	75.746

Test Plot of 99% and 26dB Occupied Bandwidth	
	
IEEE 802.11a-5180MHz	IEEE 802.11n-HT20-5180MHz
	
IEEE 802.11a-5200MHz	IEEE 802.11n-HT20-5220MHz
	
IEEE 802.11a-5240MHz	IEEE 802.11n-HT20-5240MHz

Test Plot of 99% and 26dB Occupied Bandwidth	
	
IEEE 802.11n-HT40-5190MHz	IEEE 802.11ac VHT20-5180MHz
	
IEEE 802.11n-HT40-5230MHz	IEEE 802.11ac VHT20-5220MHz
	
	IEEE 802.11ac VHT20-5240MHz

Test Plot of 99% and 26dB Occupied Bandwidth	
	
IEEE 802.11ac VHT40-5190MHz	IEEE 802.11ac VHT80-5210MHz
	
IEEE 802.11ac VHT40-5230MHz	

5.5. Radiated Emissions Measurement

5.5.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz(68.2dBuV/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

5.5.2. 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 / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

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

5.5.3. 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 0.8 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.

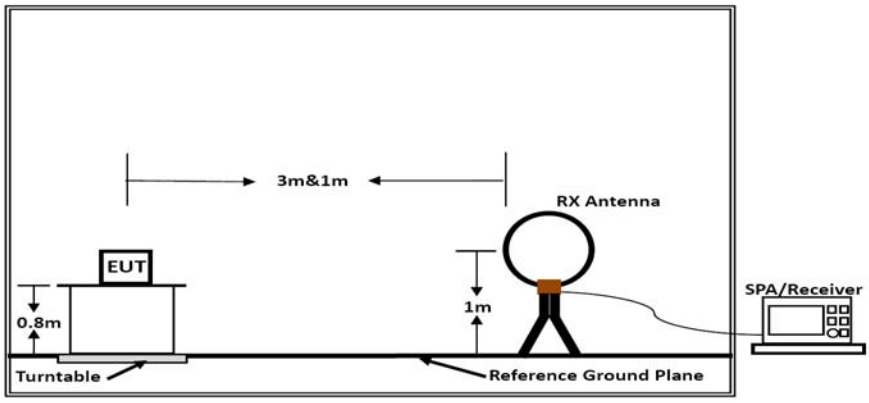
Final measurement:

--- 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.

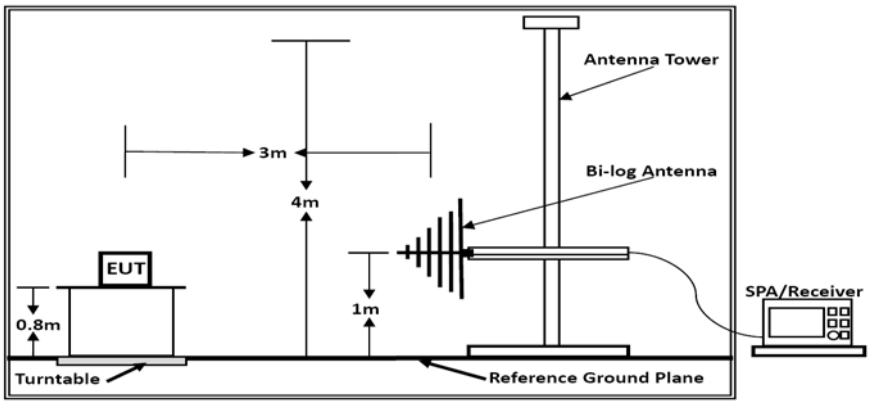
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.5.4. Test Setup Layout

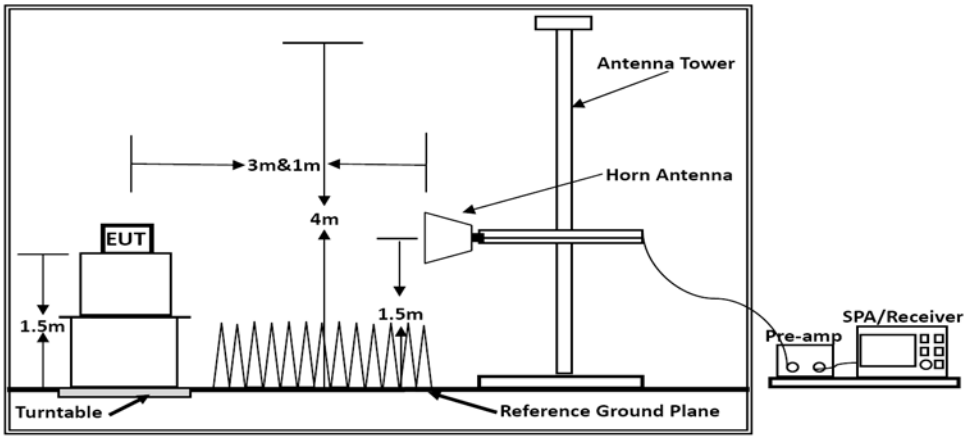
For radiated emissions below 30MHz



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].

5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

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

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.

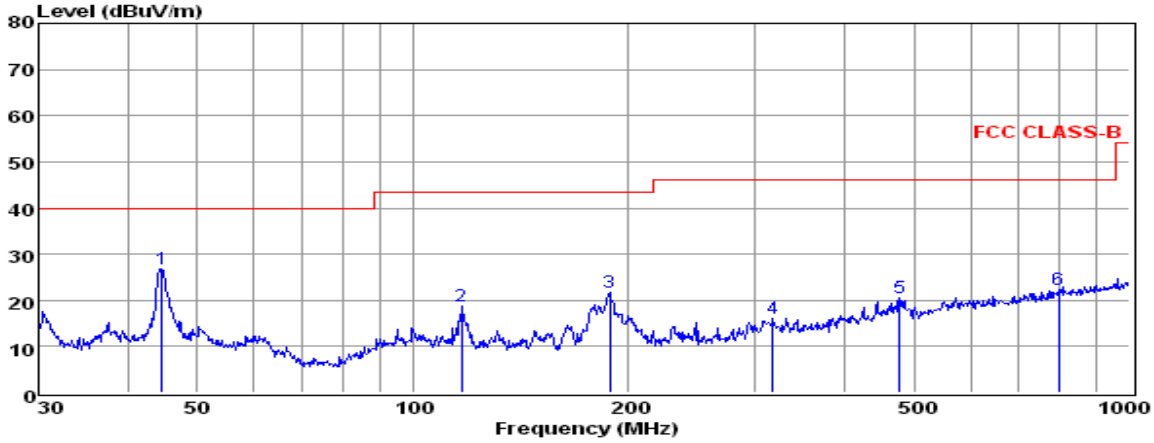
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

Temperature	25℃	Humidty	60%
Test Engineer	Jacky	Configurations	IEEE 802.11a, 5180MHz

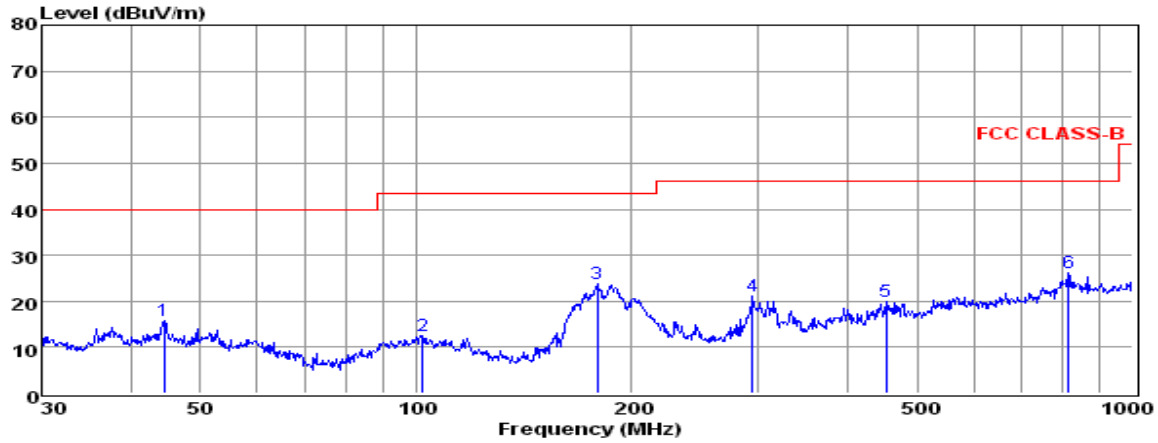
Test result for IEEE 802.11a-5180MHz



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	44.59	12.90	0.41	13.55	26.86	40.00	-13.14	QP
2	116.95	7.13	0.68	11.02	18.83	43.50	-24.67	QP
3	188.41	10.20	0.98	10.42	21.60	43.50	-21.90	QP
4	317.70	1.82	1.01	13.30	16.13	46.00	-29.87	QP
5	477.17	3.10	1.39	16.00	20.49	46.00	-25.51	QP
6	796.18	0.69	1.73	20.01	22.43	46.00	-23.57	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	44.43	1.82	0.41	13.55	15.78	40.00	-24.22	QP
2	102.00	-1.04	0.60	12.98	12.54	43.50	-30.96	QP
3	178.76	13.37	0.89	9.59	23.85	43.50	-19.65	QP
4	295.15	7.11	1.08	12.97	21.16	46.00	-24.84	QP
5	452.72	2.96	1.35	15.58	19.89	46.00	-26.11	QP
6	813.11	4.31	1.78	20.20	26.29	46.00	-19.71	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 (IEEE 802.11a-5180MHz).
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

5.5.8. Results for Radiated Emissions (Above 1GHz)

IEEE 802.11a

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	60.92	33.06	35.04	3.94	62.88	74.0	-11.12	Peak	Horizontal
15.54	43.43	33.06	35.04	3.94	45.39	54.0	-8.61	Average	Horizontal
15.54	58.29	33.06	35.04	3.94	60.25	74.0	-13.75	Peak	Vertical
15.54	42.06	33.06	35.04	3.94	44.02	54.0	-9.98	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	60.99	33.16	35.15	3.96	62.96	74.0	-11.04	Peak	Horizontal
15.60	43.39	33.16	35.15	3.96	45.36	54.0	-8.64	Average	Horizontal
15.60	58.05	33.16	35.15	3.96	60.02	74.0	-13.98	Peak	Vertical
15.60	42.17	33.16	35.15	3.96	44.14	54.0	-9.86	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	60.74	33.26	35.14	3.98	62.84	74.0	-11.16	Peak	Horizontal
15.72	43.26	33.26	35.14	3.98	45.36	54.0	-8.64	Average	Horizontal
15.72	58.05	33.26	35.14	3.98	60.15	74.0	-13.85	Peak	Vertical
15.72	42.12	33.26	35.14	3.98	44.22	54.0	-9.78	Average	Vertical

IEEE 802.11n-HT20

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	60.85	33.06	35.04	3.94	62.81	74.0	-11.19	Peak	Horizontal
15.54	43.67	33.06	35.04	3.94	45.63	54.0	-8.37	Average	Horizontal
15.54	58.06	33.06	35.04	3.94	60.02	74.0	-13.98	Peak	Vertical
15.54	42.45	33.06	35.04	3.94	44.41	54.0	-9.59	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	60.92	33.16	35.15	3.96	62.89	74.0	-11.11	Peak	Horizontal
15.60	43.68	33.16	35.15	3.96	45.65	54.0	-8.35	Average	Horizontal
15.60	58.26	33.16	35.15	3.96	60.23	74.0	-13.77	Peak	Vertical
15.60	42.18	33.16	35.15	3.96	44.15	54.0	-9.85	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	60.27	33.26	35.14	3.98	62.37	74.0	-11.63	Peak	Horizontal
15.72	43.12	33.26	35.14	3.98	45.22	54.0	-8.78	Average	Horizontal
15.72	58.31	33.26	35.14	3.98	60.41	74.0	-13.59	Peak	Vertical
15.72	42.79	33.26	35.14	3.98	44.89	54.0	-9.11	Average	Vertical

IEEE 802.11n-HT40

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	58.70	33.06	35.04	3.94	60.66	74.0	-13.34	Peak	Horizontal
15.57	42.07	33.06	35.04	3.94	44.03	54.0	-9.97	Average	Horizontal
15.57	57.57	33.06	35.04	3.94	59.53	74.0	-14.47	Peak	Vertical
15.57	41.16	33.06	35.04	3.94	43.12	54.0	-10.88	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	58.81	33.16	35.15	3.96	60.78	74.0	-13.22	Peak	Horizontal
15.69	42.72	33.16	35.15	3.96	44.69	54.0	-9.31	Average	Horizontal
15.69	57.28	33.16	35.15	3.96	59.25	74.0	-14.75	Peak	Vertical
15.69	41.44	33.16	35.15	3.96	43.41	54.0	-10.59	Average	Vertical

IEEE 802.11ac VHT20

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	60.29	33.06	35.04	3.94	62.25	74.0	-11.75	Peak	Horizontal
15.54	42.40	33.06	35.04	3.94	44.36	54.0	-9.64	Average	Horizontal
15.54	57.04	33.06	35.04	3.94	59.00	74.0	-15.00	Peak	Vertical
15.54	41.45	33.06	35.04	3.94	43.41	54.0	-10.59	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	60.82	33.16	35.15	3.96	62.79	74.0	-11.21	Peak	Horizontal
15.60	42.42	33.16	35.15	3.96	44.39	54.0	-9.61	Average	Horizontal
15.60	57.28	33.16	35.15	3.96	59.25	74.0	-14.75	Peak	Vertical
15.60	41.44	33.16	35.15	3.96	43.41	54.0	-10.59	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	60.79	33.26	35.14	3.98	62.89	74.0	-11.11	Peak	Horizontal
15.72	42.13	33.26	35.14	3.98	44.23	54.0	-9.77	Average	Horizontal
15.72	57.46	33.26	35.14	3.98	59.56	74.0	-14.44	Peak	Vertical
15.72	41.04	33.26	35.14	3.98	43.14	54.0	-10.86	Average	Vertical

IEEE 802.11ac VHT40

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	58.14	33.06	35.04	3.94	60.10	74.0	-13.9	Peak	Horizontal
15.57	41.86	33.06	35.04	3.94	43.82	54.0	-10.18	Average	Horizontal
15.57	57.39	33.06	35.04	3.94	59.35	74.0	-14.65	Peak	Vertical
15.57	41.00	33.06	35.04	3.94	42.96	54.0	-11.04	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	58.36	33.16	35.15	3.96	60.33	74.0	-13.67	Peak	Horizontal
15.69	41.77	33.16	35.15	3.96	43.74	54.0	-10.26	Average	Horizontal
15.69	57.44	33.16	35.15	3.96	59.41	74.0	-14.59	Peak	Vertical
15.69	40.17	33.16	35.15	3.96	42.14	54.0	-11.86	Average	Vertical

IEEE 802.11ac VHT80

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
15.57	57.42	33.16	35.15	3.96	59.39	74.0	-14.61	Peak	Horizontal
15.57	41.05	33.16	35.15	3.96	43.02	54.0	-10.98	Average	Horizontal
15.57	55.44	33.16	35.15	3.96	57.41	74.0	-16.59	Peak	Vertical
15.57	39.81	33.16	35.15	3.96	41.78	54.0	-12.22	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.

5.5.9. Results for Band Edge and Restricted band Emissions(Conducted)

802.11a						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-53.943	2.0	43.357	74.0	-30.643	Peak
4500.000	-62.387	2.0	34.913	54.0	-19.087	Average
5150.000	-48.769	2.0	48.531	74.0	-25.469	Peak
5150.000	-55.361	2.0	41.939	54.0	-12.061	Average
5350.000	-50.419	2.0	46.881	74.0	-27.119	Peak
5350.000	-58.880	2.0	38.420	54.0	-15.580	Average
5460.000	-49.916	2.0	47.384	74.0	-26.616	Peak
5460.000	-57.349	2.0	39.951	54.0	-14.049	Average

802.11n-HT20						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-52.378	2.0	44.922	74.0	-29.078	Peak
4500.000	-61.724	2.0	35.576	54.0	-18.424	Average
5150.000	-49.242	2.0	48.058	74.0	-25.942	Peak
5150.000	-54.590	2.0	42.710	54.0	-11.290	Average
5350.000	-48.819	2.0	48.481	74.0	-25.519	Peak
5350.000	-59.540	2.0	37.760	54.0	-16.240	Average
5460.000	-49.702	2.0	47.598	74.0	-26.402	Peak
5460.000	-57.312	2.0	39.988	54.0	-14.012	Average

802.11n-HT40						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-52.124	2.0	45.176	74.0	-28.824	Peak
4500.000	-61.066	2.0	36.234	54.0	-17.766	Average
5150.000	-41.761	2.0	55.539	74.0	-18.461	Peak
5150.000	-53.058	2.0	44.242	54.0	-9.758	Average
5350.000	-51.419	2.0	45.881	74.0	-28.119	Peak
5350.000	-58.565	2.0	38.735	54.0	-15.265	Average
5460.000	-51.224	2.0	46.076	74.0	-27.924	Peak
5460.000	-60.010	2.0	37.290	54.0	-16.710	Average

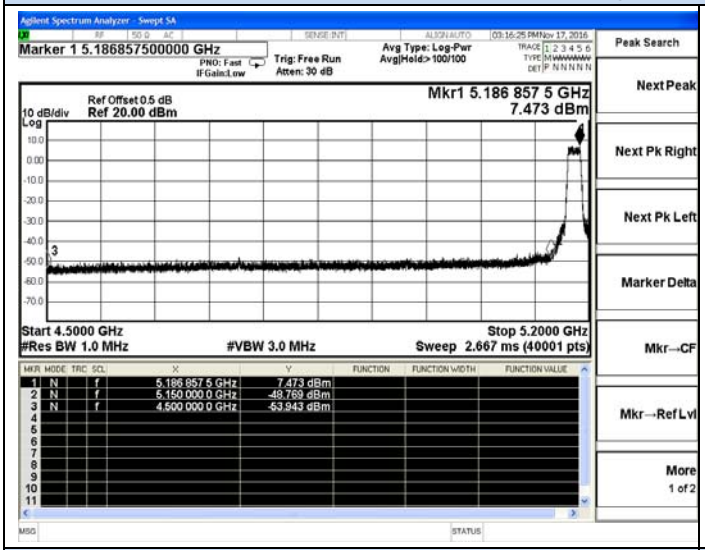
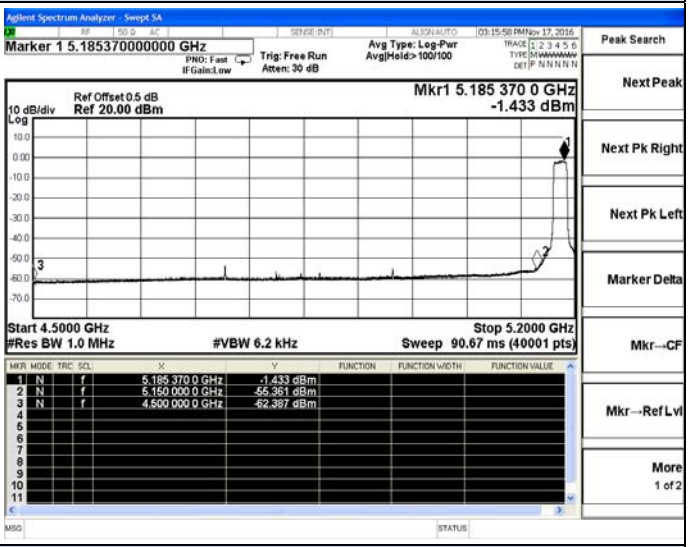
802.11ac20						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-53.324	2.0	43.976	74.0	-30.024	Peak
4500.000	-62.162	2.0	35.138	54.0	-18.862	Average
5150.000	-47.432	2.0	49.868	74.0	-24.132	Peak
5150.000	-55.596	2.0	41.704	54.0	-12.296	Average
5350.000	-50.639	2.0	46.661	74.0	-27.339	Peak
5350.000	-59.604	2.0	37.696	54.0	-16.304	Average
5460.000	-47.250	2.0	50.050	74.0	-23.950	Peak
5460.000	-57.748	2.0	39.552	54.0	-14.448	Average

802.11ac40						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-51.857	2.0	45.443	74.0	-28.557	Peak
4500.000	-61.352	2.0	35.948	54.0	-18.052	Average
5150.000	-40.184	2.0	57.116	74.0	-16.884	Peak
5150.000	-52.976	2.0	44.324	54.0	-9.676	Average
5350.000	-51.441	2.0	45.859	74.0	-28.141	Peak
5350.000	-58.536	2.0	38.764	54.0	-15.236	Average
5460.000	-51.670	2.0	45.630	74.0	-28.370	Peak
5460.000	-59.594	2.0	37.706	54.0	-16.294	Average

802.11ac80						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-52.432	2.0	44.868	74.0	-29.132	Peak
4500.000	-61.302	2.0	35.998	54.0	-18.002	Average
5150.000	-46.182	2.0	51.118	74.0	-22.882	Peak
5150.000	-53.966	2.0	43.334	54.0	-10.666	Average
5350.000	-49.256	2.0	48.044	74.0	-25.956	Peak
5350.000	-58.150	2.0	39.150	54.0	-14.850	Average
5460.000	-52.440	2.0	44.860	74.0	-29.140	Peak
5460.000	-59.339	2.0	37.961	54.0	-16.039	Average

Note:

1). All modes have been tested and we only record the worst test result;
2). Measured E=Reading Level+Antenna Gain+95.2

Test plot of Band Edge and Restricted band Emissions	
	
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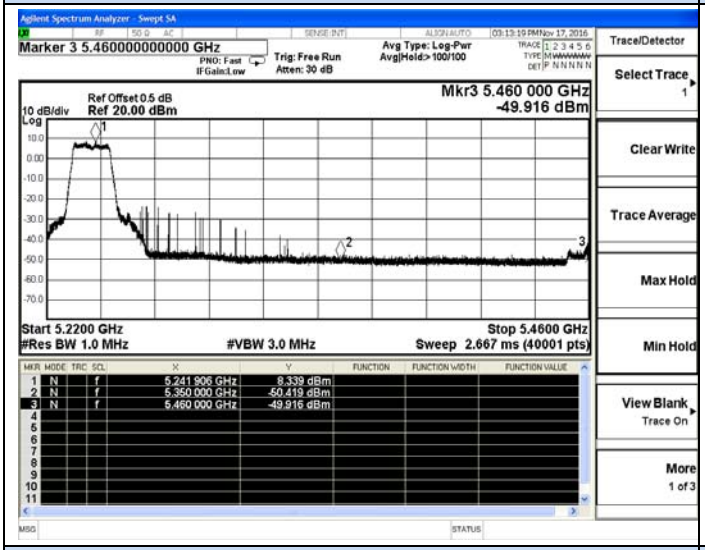	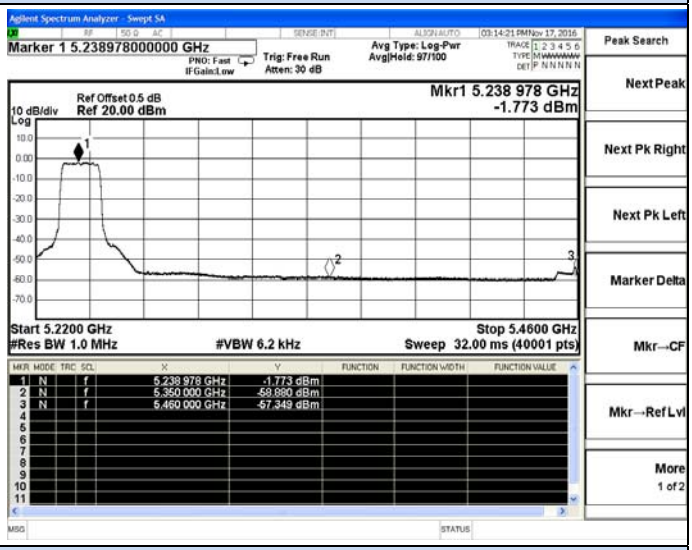
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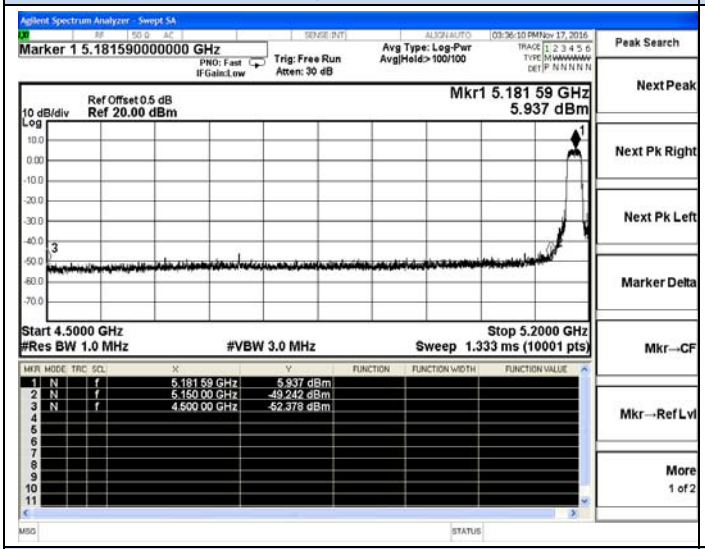	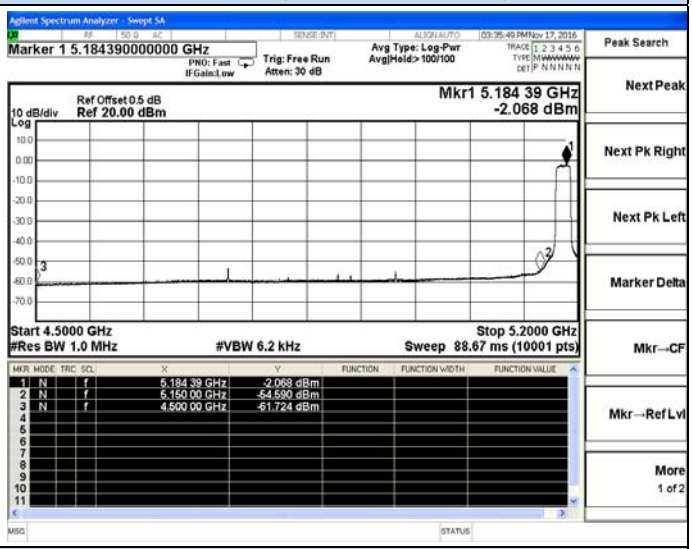
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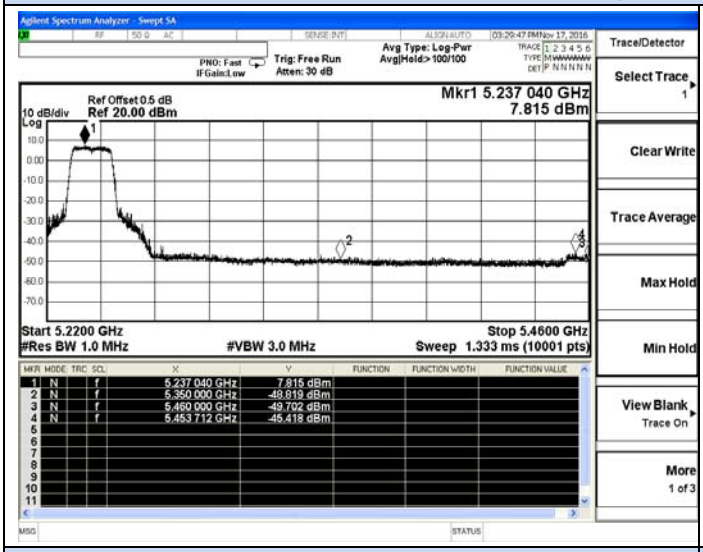
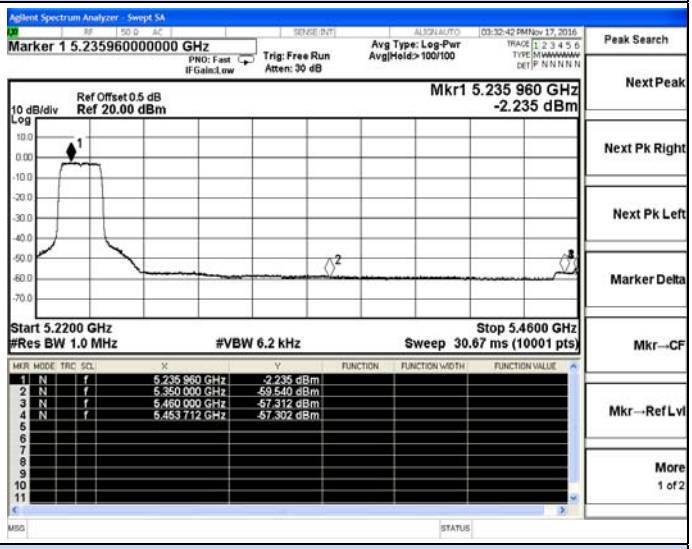
Test plot of Band Edge and Restricted band Emissions	
	
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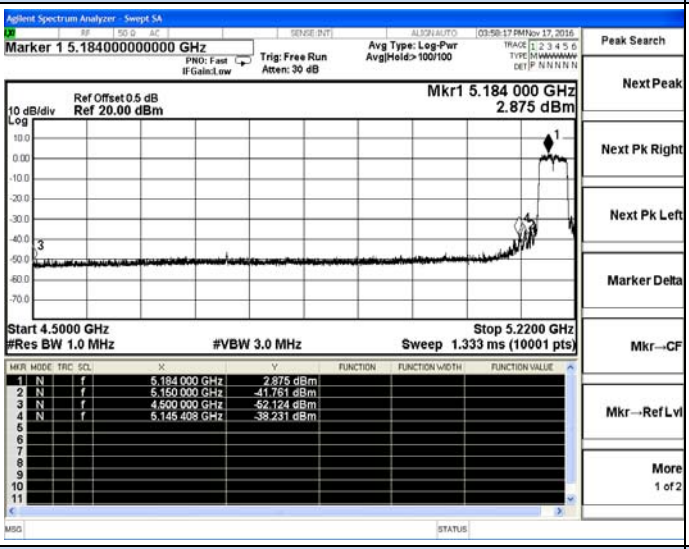	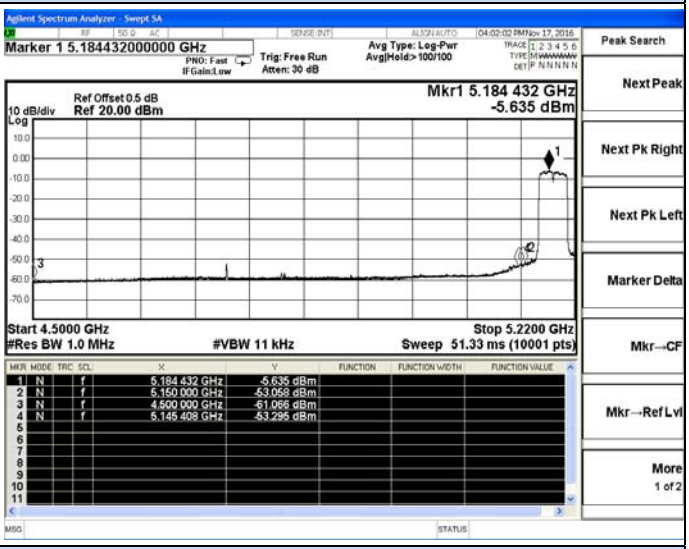
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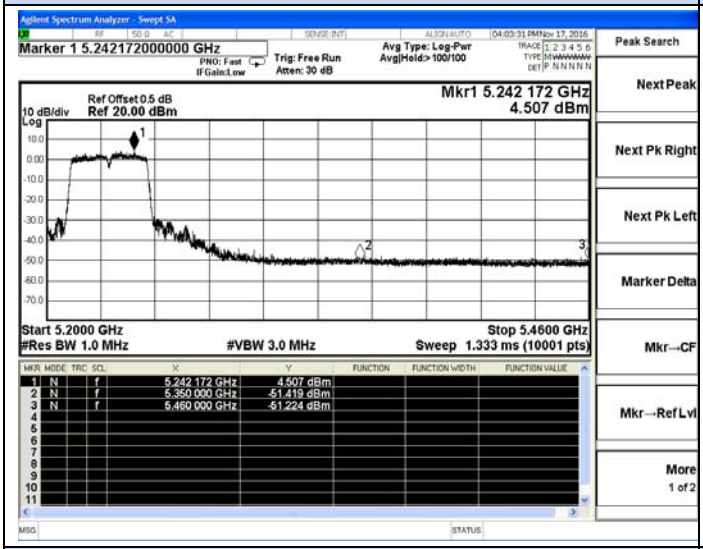	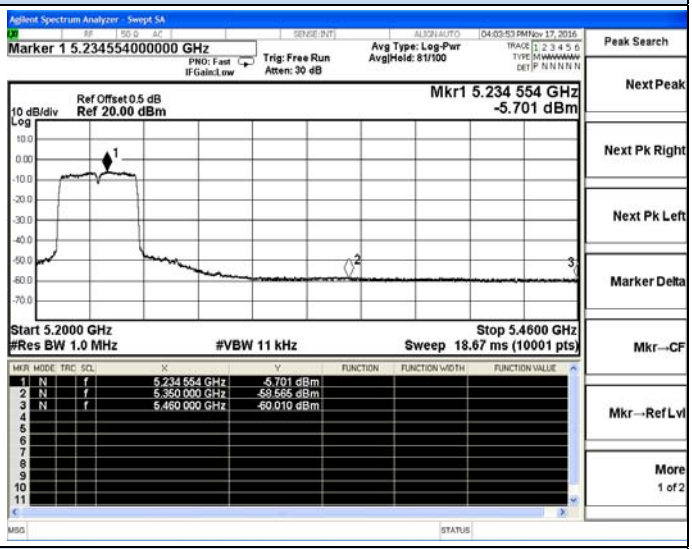
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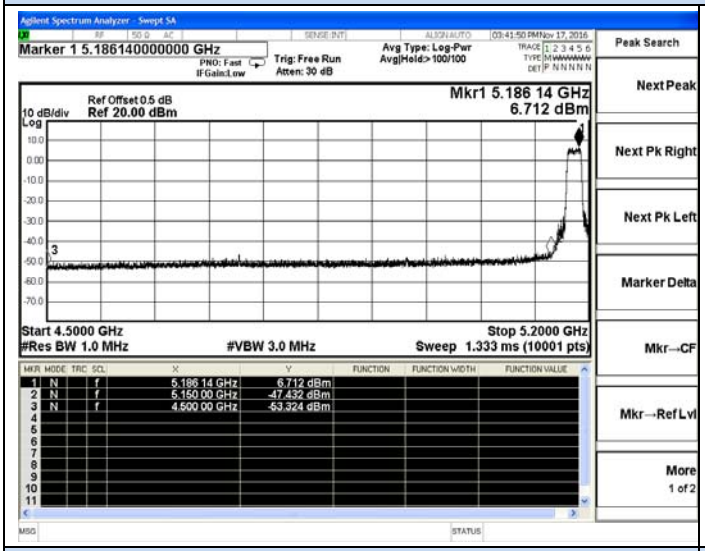
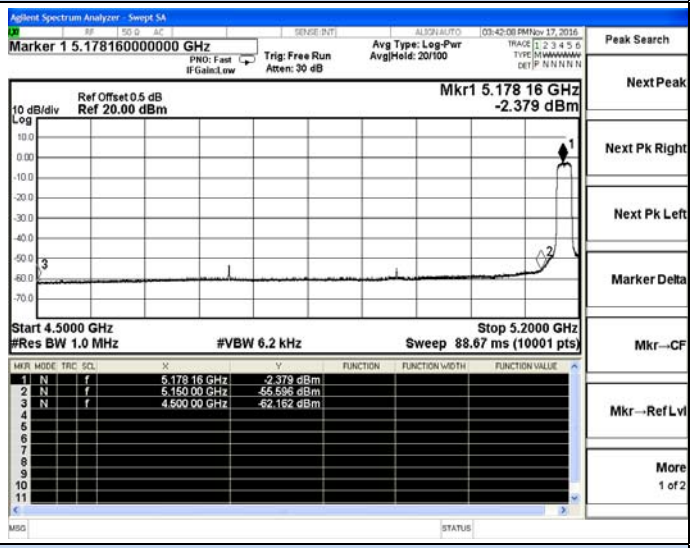
Test plot of Band Edge and Restricted band Emissions	
	
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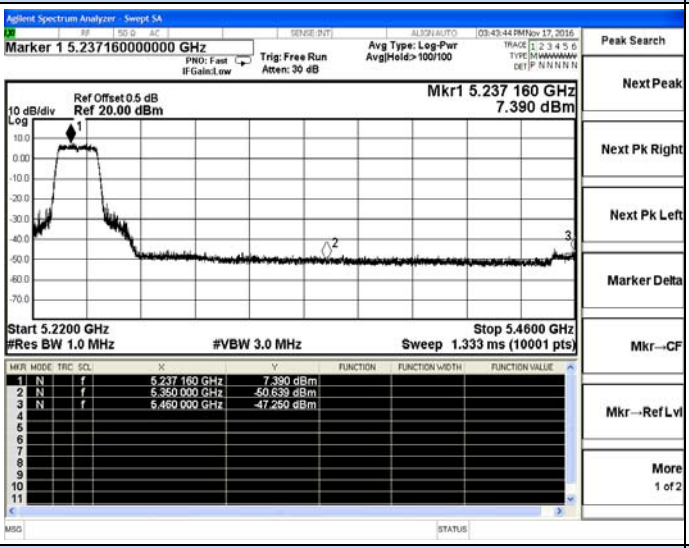
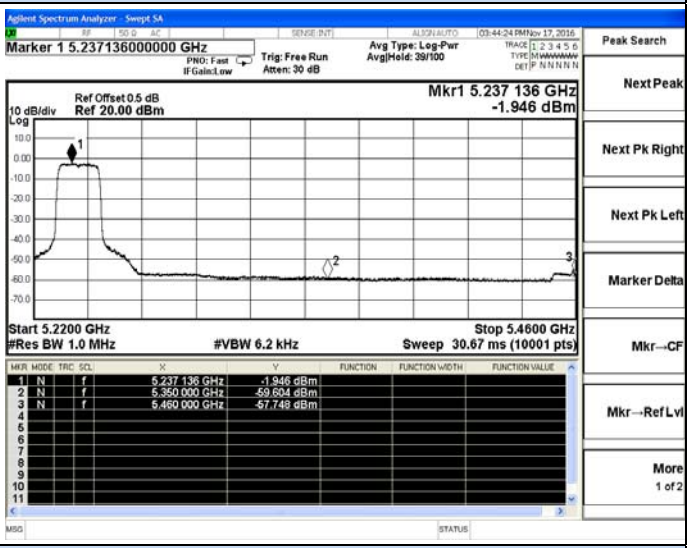
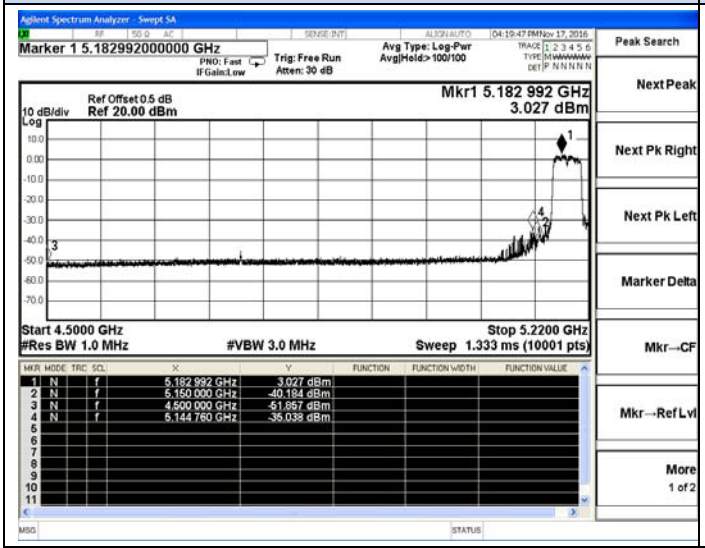
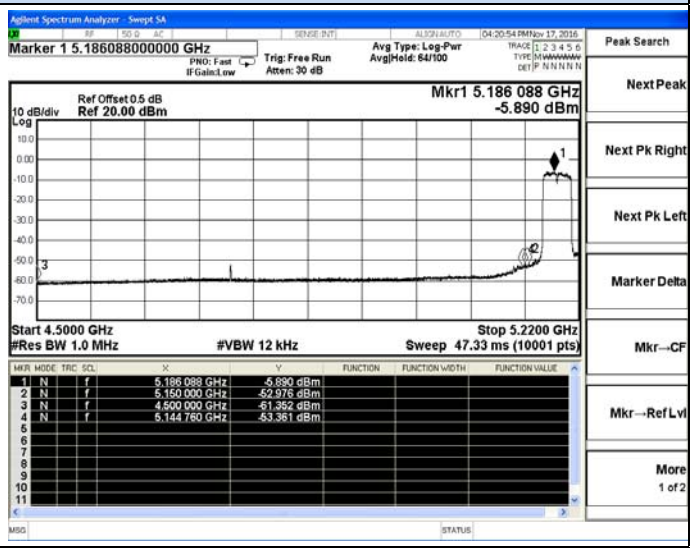
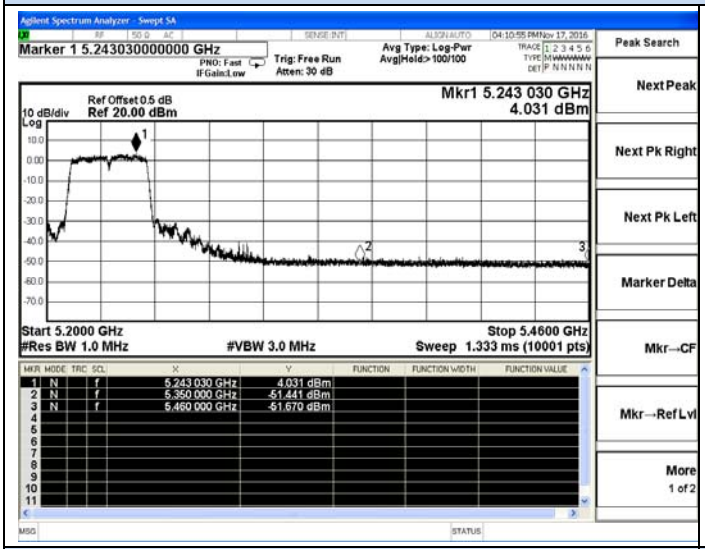
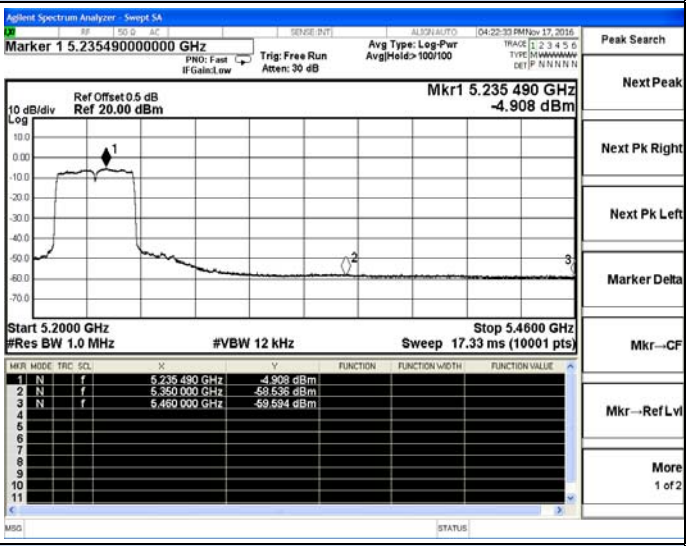
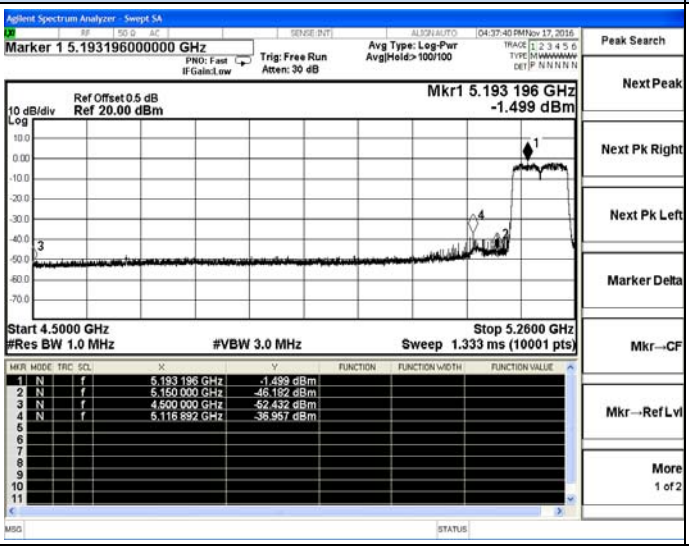
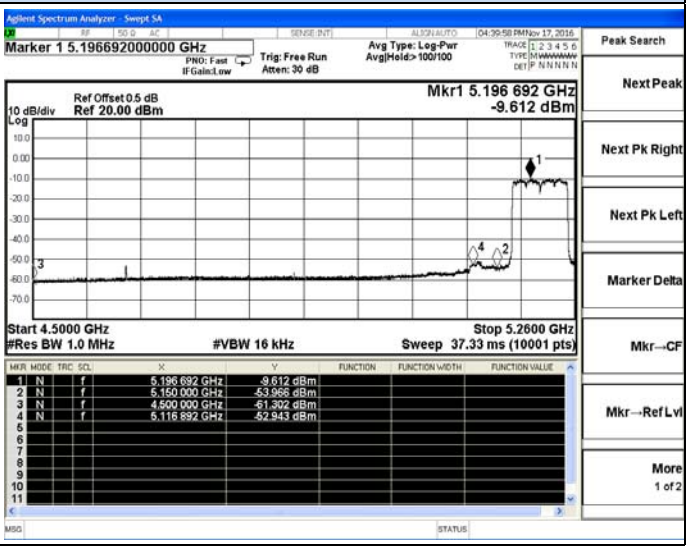
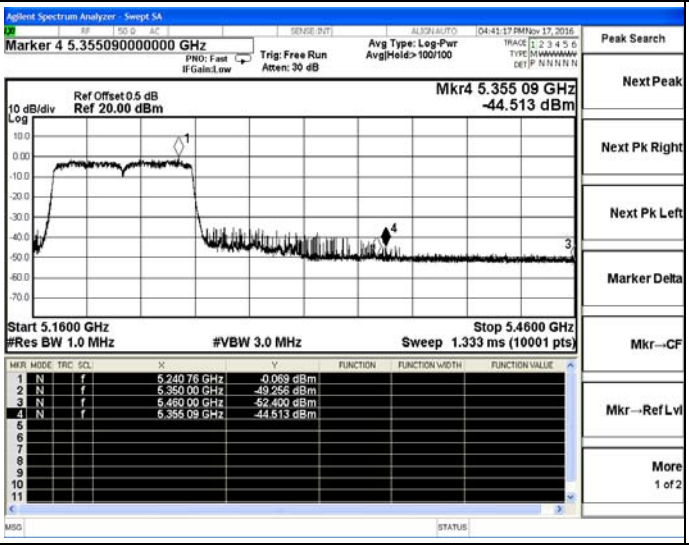
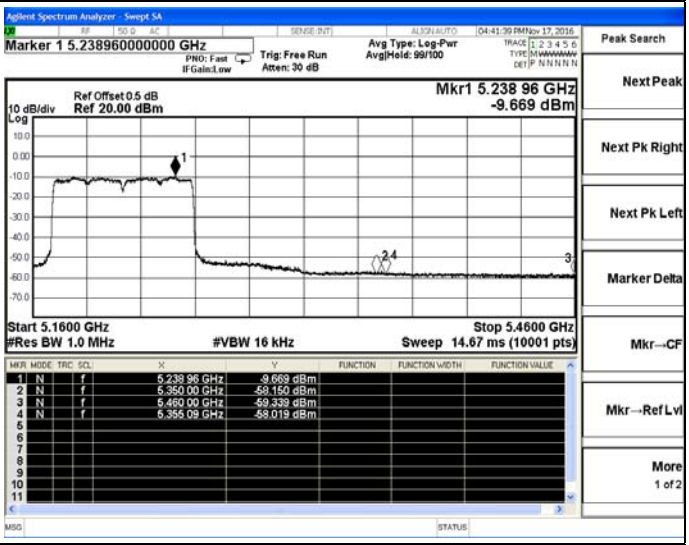
	
802.11ac20-High channel(Peak)	802.11ac20-High channel(Average)
	
802.11ac40-Low channel(Peak)	802.11ac40-Low channel(Average)

Test plot of Band Edge and Restricted band Emissions	
	
802.11ac40-High channel(Peak)	802.11ac40-High channel(Average)
	
802.11ac80-Low channel(Peak)	802.11ac80-Low channel(Average)
	
802.11ac80-High channel(Peak)	802.11ac80-High channel(Average)

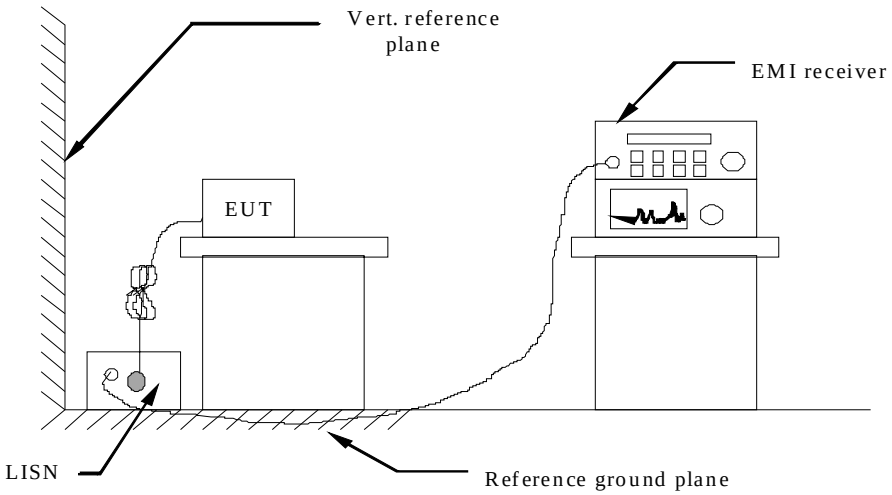
5.6. Power line conducted emissions

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

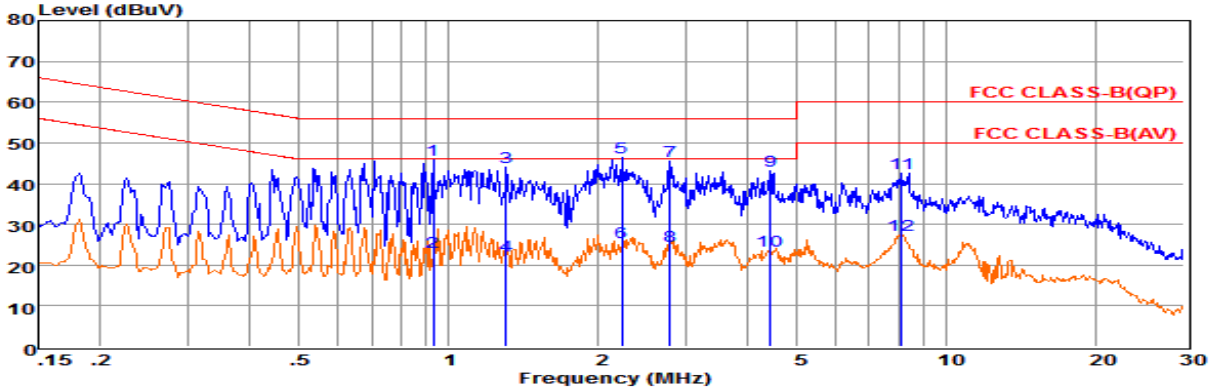


5.6.3 Test Results

PASS.

The test data please refer to following page.

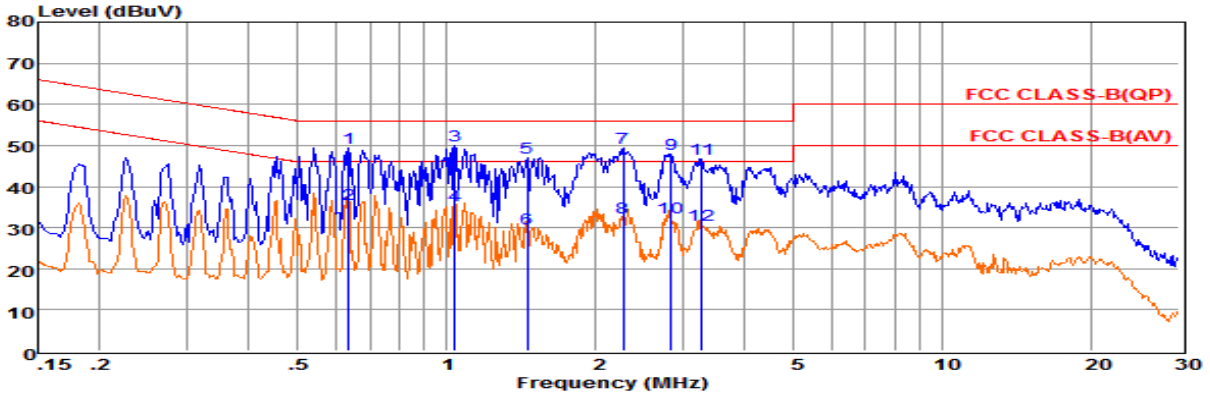
Test result for IEEE 802.11a (AC 120 V)



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

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.93	26.13	9.63	0.05	10.00	45.81	56.00	-10.19	QP
2	0.93	3.63	9.63	0.05	10.00	23.31	46.00	-22.69	Average
3	1.30	24.33	9.63	0.05	10.00	44.01	56.00	-11.99	QP
4	1.30	2.53	9.63	0.05	10.00	22.21	46.00	-23.79	Average
5	2.22	26.76	9.64	0.05	10.00	46.45	56.00	-9.55	QP
6	2.23	5.94	9.64	0.05	10.00	25.63	46.00	-20.37	Average
7	2.78	25.93	9.64	0.05	10.00	45.62	56.00	-10.38	QP
8	2.78	4.98	9.64	0.05	10.00	24.67	46.00	-21.33	Average
9	4.43	23.50	9.65	0.06	10.00	43.21	56.00	-12.79	QP
10	4.43	3.73	9.65	0.06	10.00	23.44	46.00	-22.56	Average
11	8.15	22.66	9.68	0.07	10.00	42.41	60.00	-17.59	QP
12	8.15	7.52	9.68	0.07	10.00	27.27	50.00	-22.73	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

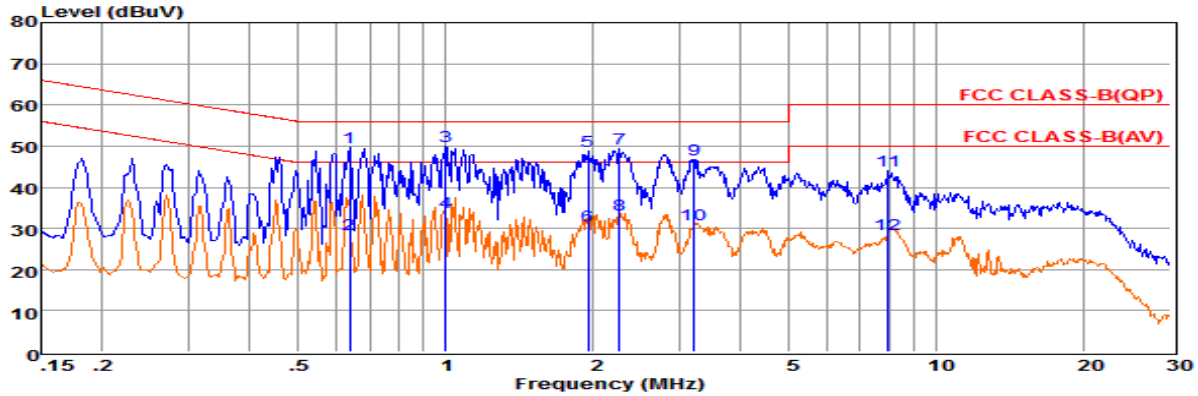


Env. Ins: 24*/56%
Pol: NEUTRAL

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.63	29.75	9.63	0.04	10.00	49.42	56.00	-6.58	QP
2	0.63	16.14	9.63	0.04	10.00	35.81	46.00	-10.19	Average
3	1.04	30.25	9.63	0.05	10.00	49.93	56.00	-6.07	QP
4	1.04	15.60	9.63	0.05	10.00	35.28	46.00	-10.72	Average
5	1.46	27.28	9.63	0.05	10.00	46.96	56.00	-9.04	QP
6	1.46	10.11	9.63	0.05	10.00	29.79	46.00	-16.21	Average
7	2.27	29.54	9.63	0.05	10.00	49.22	56.00	-6.78	QP
8	2.27	12.74	9.63	0.05	10.00	32.42	46.00	-13.58	Average
9	2.84	28.18	9.64	0.06	10.00	47.88	56.00	-8.12	QP
10	2.84	12.72	9.64	0.06	10.00	32.42	46.00	-13.58	Average
11	3.28	27.12	9.65	0.06	10.00	46.83	56.00	-9.17	QP
12	3.28	10.90	9.65	0.06	10.00	30.61	46.00	-15.39	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

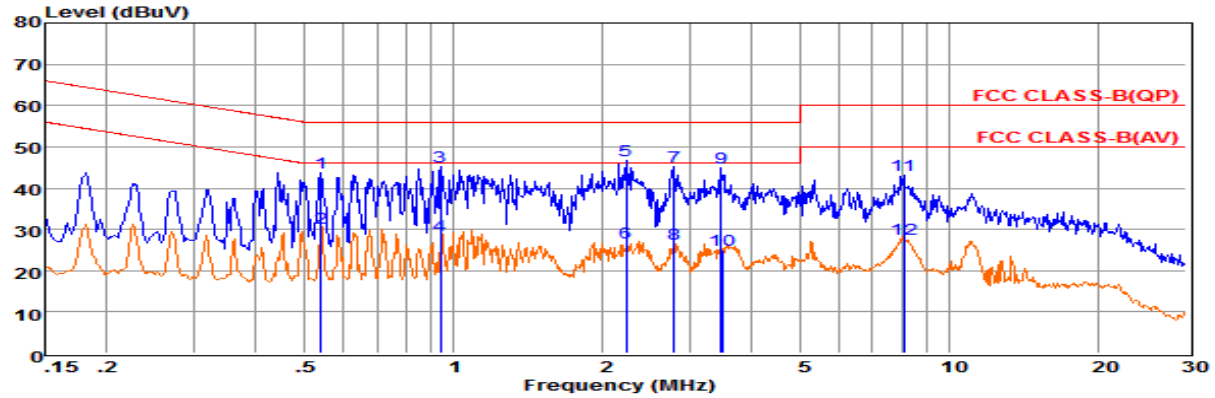
Test result for IEEE 802.11a (AC 240 V)



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

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.64	29.93	9.63	0.04	10.00	49.60	56.00	-6.40	QP
2	0.64	8.86	9.63	0.04	10.00	28.53	46.00	-17.47	Average
3	1.00	30.17	9.63	0.05	10.00	49.85	56.00	-6.15	QP
4	1.00	14.30	9.63	0.05	10.00	33.98	46.00	-12.02	Average
5	1.95	29.12	9.63	0.05	10.00	48.80	56.00	-7.20	QP
6	1.95	10.88	9.63	0.05	10.00	30.56	46.00	-15.44	Average
7	2.26	29.72	9.63	0.05	10.00	49.40	56.00	-6.60	QP
8	2.26	13.59	9.63	0.05	10.00	33.27	46.00	-12.73	Average
9	3.21	27.08	9.65	0.06	10.00	46.79	56.00	-9.21	QP
10	3.21	11.30	9.65	0.06	10.00	31.01	46.00	-14.99	Average
11	7.98	24.18	9.70	0.07	10.00	43.95	60.00	-16.05	QP
12	7.98	8.70	9.70	0.07	10.00	28.47	50.00	-21.53	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.



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

	Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB
1	0.54	24.07	9.62	0.04	10.00	43.73	56.00	-12.27	QP
2	0.54	10.67	9.62	0.04	10.00	30.33	46.00	-15.67	Average
3	0.94	25.54	9.63	0.05	10.00	45.22	56.00	-10.78	QP
4	0.94	8.95	9.63	0.05	10.00	28.63	46.00	-17.37	Average
5	2.22	26.85	9.64	0.05	10.00	46.54	56.00	-9.46	QP
6	2.23	7.02	9.64	0.05	10.00	26.71	46.00	-19.29	Average
7	2.78	25.54	9.64	0.05	10.00	45.23	56.00	-10.77	QP
8	2.78	6.85	9.64	0.05	10.00	26.54	46.00	-19.46	Average
9	3.47	25.10	9.65	0.06	10.00	44.81	56.00	-11.19	QP
10	3.47	5.24	9.65	0.06	10.00	24.95	46.00	-21.05	Average
11	8.11	23.30	9.68	0.07	10.00	43.05	60.00	-16.95	QP
12	8.11	7.79	9.68	0.07	10.00	27.54	50.00	-22.46	Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 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 (IEEE 802.11a).

5.7. Antenna Requirements

5.7.1 Standard Applicable

According to antenna requirement of §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 re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.7.2 Antenna Connected Construction

5.7.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

5.7.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 2.0dBi, and the antenna is an R-SMA antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.7.2.3. Results: Compliance.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.
Conducted power refers ANSI C63.10:2013 Output power test procedure for UNII devices.
Radiated power refers to ANSI C63.10:2013 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep Time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

FCC	IC
Antenna Gain	
6 dBi	

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For WLAN devices, the OFDM (IEEE 802.11a) mode is used;

Tnom	Vnom	Lowest Channel 5180 MHz	Middle Channel 5200 MHz	Highest Channel 5240 MHz
Conducted power [dBm] Measured with OFDM modulation		6.74	6.78	6.89
Radiated power [dBm] Measured with OFDM modulation		8.31	8.64	8.63
Gain [dBi] Calculated		1.57	1.86	1.74
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Result: -/-

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, 2016	June 17, 2017
Signal analyzer	Agilent	E4448A(External mixers to	US44300469	9kHz~40GHz	July 16, 2016	July 15, 2017
Signal analyzer	Agilent	N9020A	MY50510140	9kHz~26.5GHz	October 27, 2016	October 27, 2017
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18, 2016	June 17, 2017
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18, 2016	June 17, 2017
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18, 2016	June 17, 2017
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18, 2016	June 17, 2017
3m Semi Anechoic	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz 3m	June 18, 2016	June 17, 2017
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHzz	June 18, 2016	June 17, 2017
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16, 2016	July 15, 2017
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16, 2016	July 15, 2017
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18, 2016	June 17, 2017
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10, 2016	June 09, 2017
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10, 2016	June 09, 2017
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10, 2016	June 09, 2017
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18, 2016	June 17, 2017
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18, 2016	June 17, 2017
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18, 2016	June 17, 2017
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18, 2016	June 17, 2017
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18, 2016	June 17, 2017
AC Power Source	HPC	HPA-500E	HPA-9100024	AC 0~300V	June 18, 2016	June 17, 2017
DC power Soure	GW	GPC-6030D	C671845	DC 1V-60V	June 18, 2016	June 17, 2017
Temp. and Humidigy	Giant Force	GTH-225-20-S	MAB0103-00	N/A	June 18, 2016	June 17, 2017
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18, 2016	June 17, 2017
RF CABLE-2m	JYE Bao	RG142	CB)35-2m	20MHz-1GHz	June 18, 2016	June 17, 2017
Note: All equipment through GRGT EST calibration						

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

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