FCC TEST REPORT

For

Beijing Cateyes Vision Technology Ltd.

CAT 360 Camera

Model No.: CE-01A

Additional Model No.: Please Refer to page 6

Prepared for	:	Beijing Cateyes Vision Technology Ltd.
Address	:	Xinhua 1949 cultural and creative industry Park, Chegongzhuang Street No.4, Xicheng District, Beijing, 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	:	August 24, 2016
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	August 24, 2016~September 09, 2016
Date of Report	:	September 09, 2016

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

Report Reference No.	**:**	**LCS1609090639E**
Date of Issue	:	September 09, 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 ..... :		**Beijing Cateyes Vision Technology Ltd.**
Address	:	Xinhua 1949 cultural and creative industry Park, Chegongzhuang Street No.4, Xicheng District, Beijing, 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. ..... :		**CAT 360 Camera**
Trade Mark	:	
Model/ Type reference	:	CE-01A
Ratings	:	DC 3.7V by battery Charging voltage: DC 5.0V, 2.0A
Result	:	**Positive**

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

FCC -- TEST REPORT

Test Report No. : LCS1609090639E	September 09, 2016 Date of issue

EUT.....	: CAT 360 Camera
Type / Model.....	: CE-01A
Applicant.....	**: Beijing Cateyes Vision Technology Ltd.**
Address.....	: Xinhua 1949 cultural and creative industry Park, Chegongzhuang Street No.4, Xicheng District, Beijing, China
Telephone.....	: 15815533653
Fax.....	: 15815533653
Manufacturer.....	**: Beijing Cateyes Vision Technology Ltd.**
Address.....	: Xinhua 1949 cultural and creative industry Park, Chegongzhuang Street No.4, Xicheng District, Beijing, China
Telephone.....	: 15815533653
Fax.....	: 15815533653
Factory.....	**: Beijing Cateyes Vision Technology Ltd.**
Address.....	: Xinhua 1949 cultural and creative industry Park, Chegongzhuang Street No.4, Xicheng District, Beijing, China
Telephone.....	: 15815533653
Fax.....	: 15815533653

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	2016-09-09	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	CAT 360 Camera
Model Number	:	CAT360, Cateyes 360, CE-01A, CE-02A, CE-03A, CE-04A, CE-05A, CE-06A, CE-07A, CE-08A, CE-09A, CAT360 mini, CAT 360 MAX, CAT360 Plus, CAT360 Pro, CE8056, CE0102, CE0304, CE0506, CE0607, CE0809, CE0203, CE0405, CE0708
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Test Model	:	CE-01A
Power Supply	:	DC 3.7V by battery Charging voltage: DC 5.0V, 2.0A
Frequency Range	:	2412.00~2462.00MHz/2422.00~2452.00MHz； 5180.00-5240.00MHz/5745.00-5825.00MHz
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(802.11 ac80) 1 Channels for 5775.00MHz(802.11 ac80)
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-MCS7 IEEE 802.11a: 6-54Mbps IEEE 802.11ac: MCS0-MCS7
Antenna Type And Gain	:	FPC antenna, 3.3dBi for 2.4G Part; 2.3dBi for 5G Part

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
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1.3. External I/O Port

I/O Port Description	Quantity	Cable
USB	1	0.8m, Shielded
MIC	1	N/A
Micro SD	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:
802.11a Mode : 6 Mbps, OFDM.
802.11n-HT20 Mode: MCS0, OFDM.
802.11n-HT40 Mode: MCS0, OFDM.
802.11ac20 Mode: MCS0, OFDM.
802.11ac40 Mode: MCS0, OFDM.
802.11ac80 Mode: MCS0, 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 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.

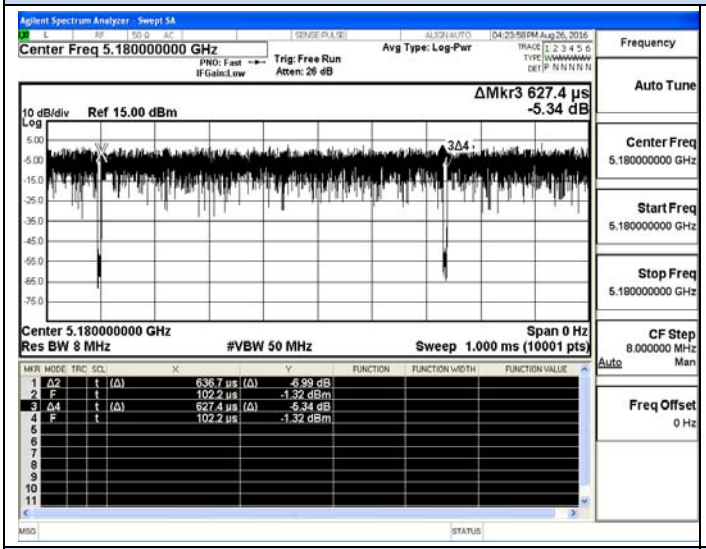
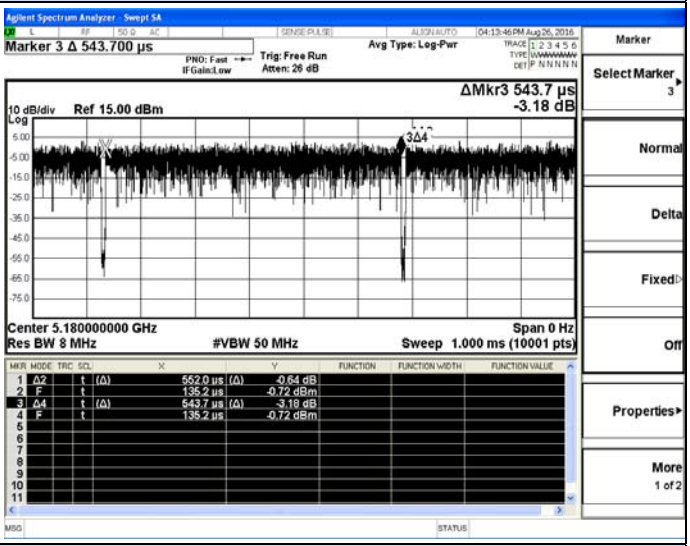
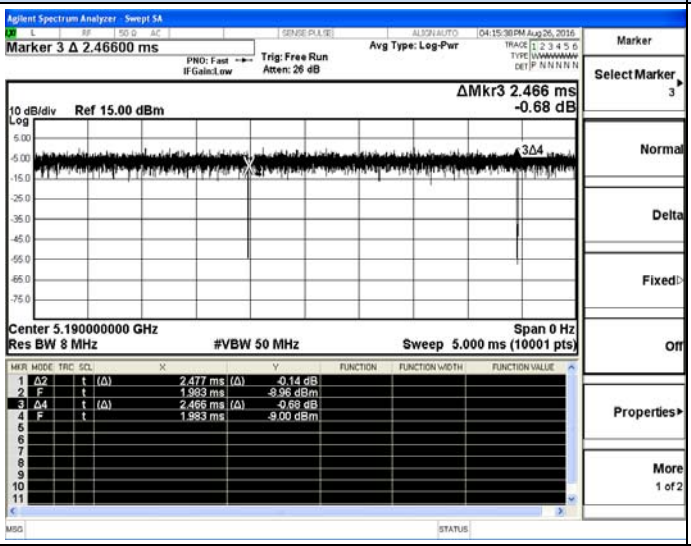
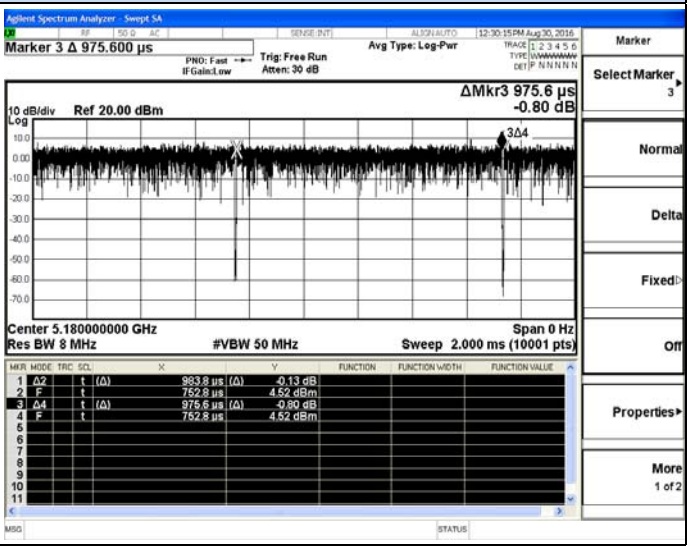
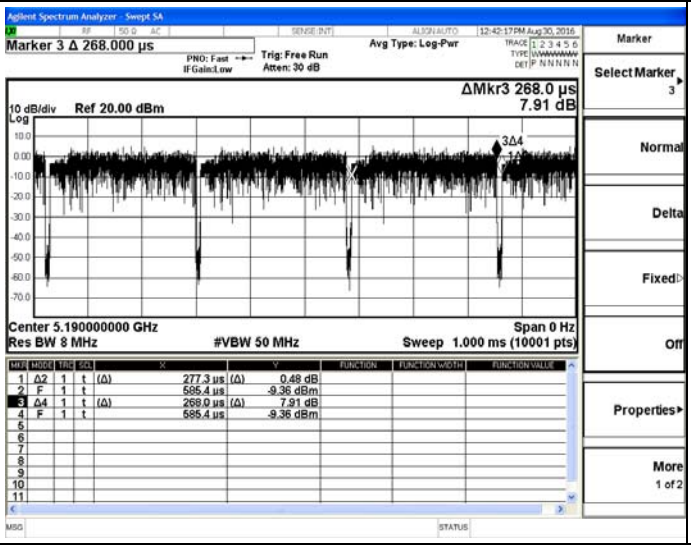
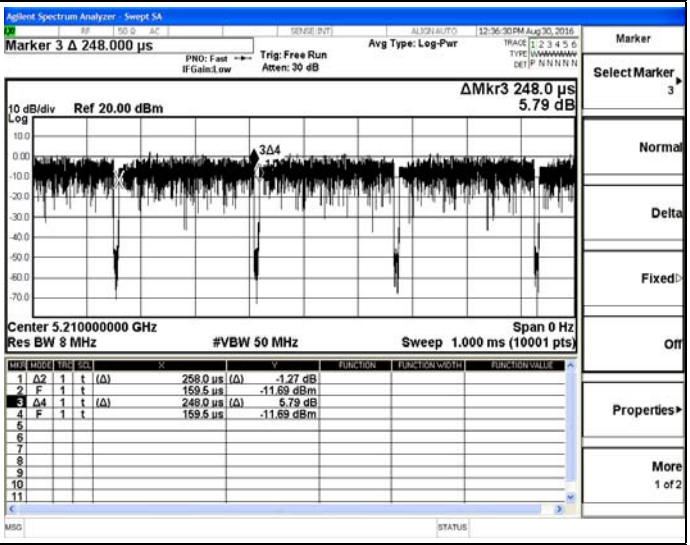
5.1.4. Test Setup Layout

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)
802.11a	0.6274	0.6367	1	98.54	0.000	0.010
802.11n-HT20	0.5437	0.5520	1	98.50	0.000	0.010
802.11n-HT40	2.4660	2.4770	1	99.56	0.000	0.010
802.11ac20	0.9756	0.9838	1	99.17	0.000	0.010
802.11ac40	0.2680	0.2773	1	96.65	0.148	3.731
802.11ac80	0.2480	0.2580	1	96.12	0.172	4.032
Note: Duty Cycle Correction Factor=10log(1/Duty cycle)						

Test plot of On Time and Duty Cycle	
	
802.11a	802.11n-HT20
	
802.11n-HT40	802.11ac20
	
802.11ac40	802.11ac80

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..

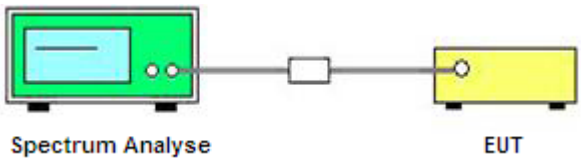
5.2.2. Measuring Instruments and Setting

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	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	9.82	0.000	9.82	24	Complies
	44	5220	8.91	0.000	8.91	24	Complies
	48	5240	8.92	0.000	8.92	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	9.79	0.000	9.79	24	Complies
	44	5220	9.39	0.000	9.39	24	Complies
	48	5240	8.48	0.000	8.48	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	9.68	0.000	9.68	24	Complies
	46	5230	9.08	0.000	9.08	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	10.50	0.000	10.50	24	Complies
	44	5220	10.95	0.000	10.95	24	Complies
	48	5240	10.67	0.000	10.67	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	10.34	0.148	10.488	24	Complies
	46	5230	11.06	0.148	11.208	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	11.00	0.172	11.172	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.

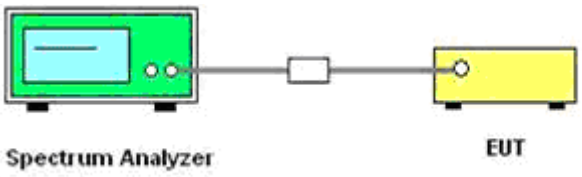
7). Sweep time = auto couple.

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	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
802.11a	36	5180	-4.769	0.000	-4.769	11	Complies
	44	5220	-4.354	0.000	-4.354	11	Complies
	48	5240	-4.968	0.000	-4.968	11	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11n-HT20	36	5180	-5.153	0.000	-5.153	11	Complies
	44	5220	-5.658	0.000	-5.658	11	Complies
	48	5240	-4.465	0.000	-4.465	11	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11n-HT40	38	5190	-5.649	0.000	-5.649	11	Complies
	46	5230	-5.643	0.000	-5.643	11	Complies

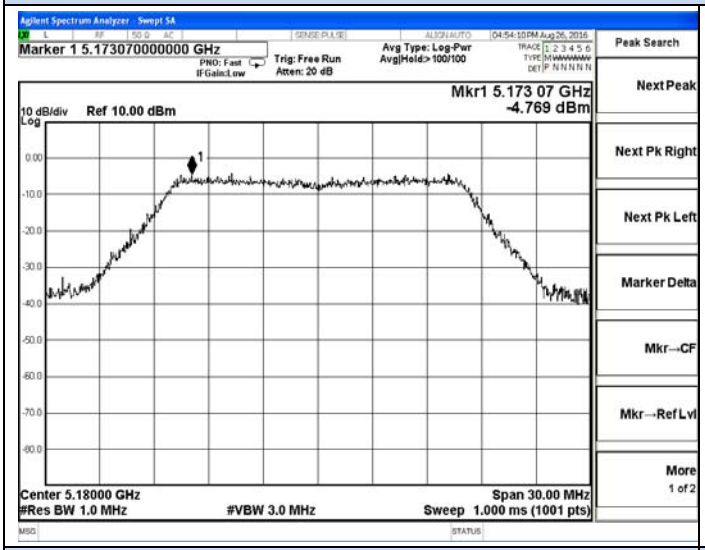
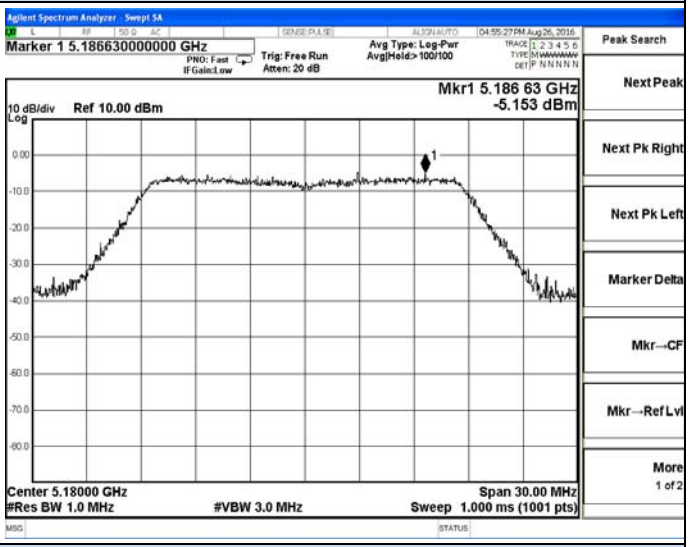
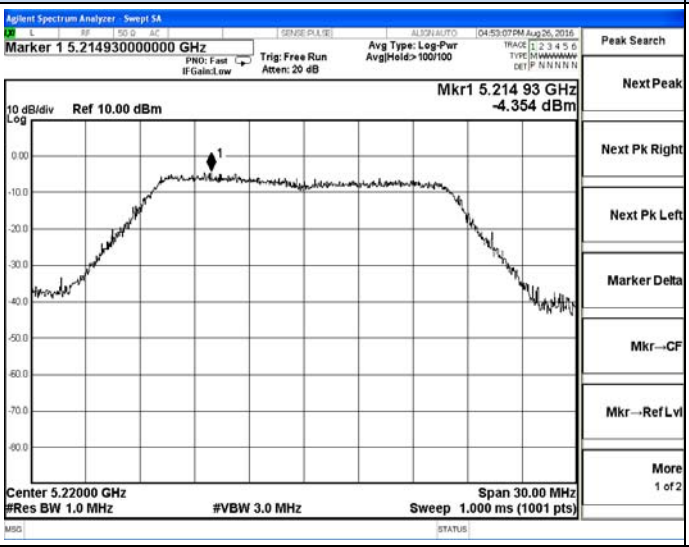
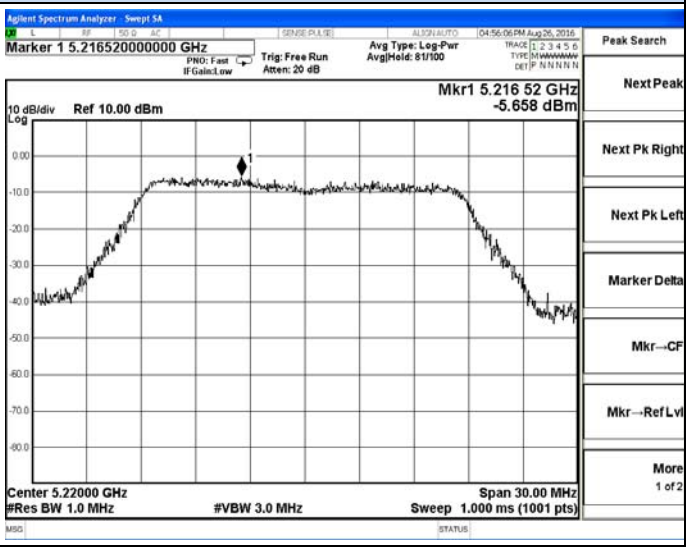
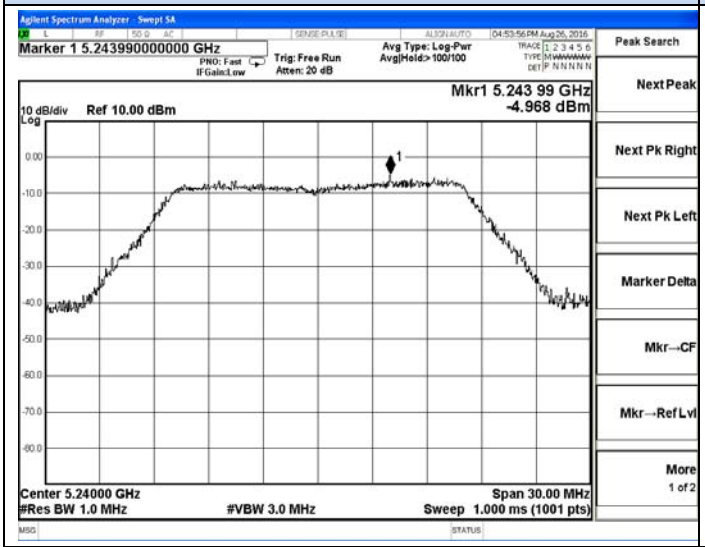
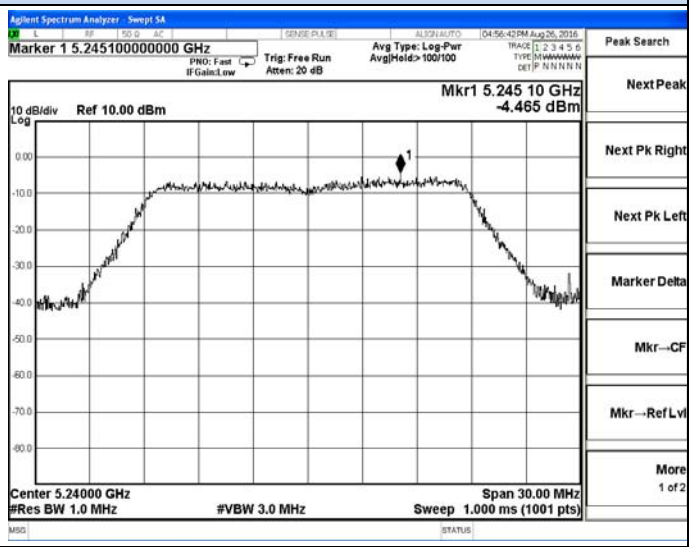
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac 20	36	5180	-1.879	0.000	-1.879	11	Complies
	44	5220	-1.371	0.000	-1.371	11	Complies
	48	5240	-1.111	0.000	-1.111	11	Complies

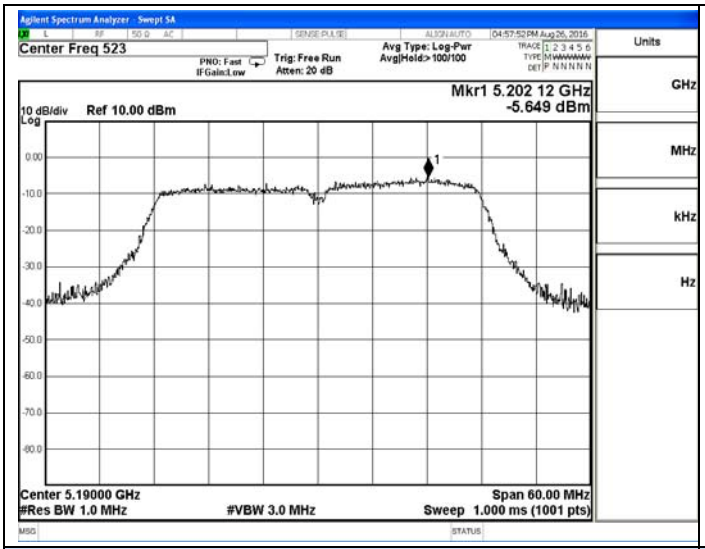
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac 40	38	5190	-1.855	0.148	-1.707	11	Complies
	46	5230	-1.613	0.148	-1.465	11	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty cycle factor (dB)	Sum PSD (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac 80	42	5190	-6.297	0.172	-6.125	11	Complies

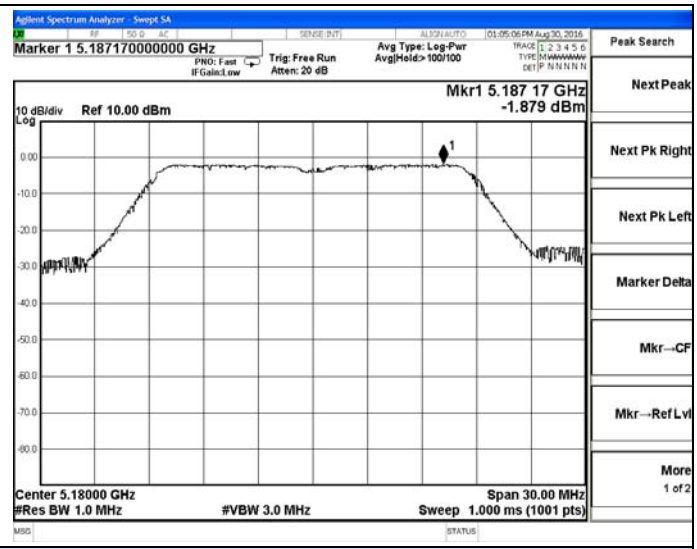
Note:

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

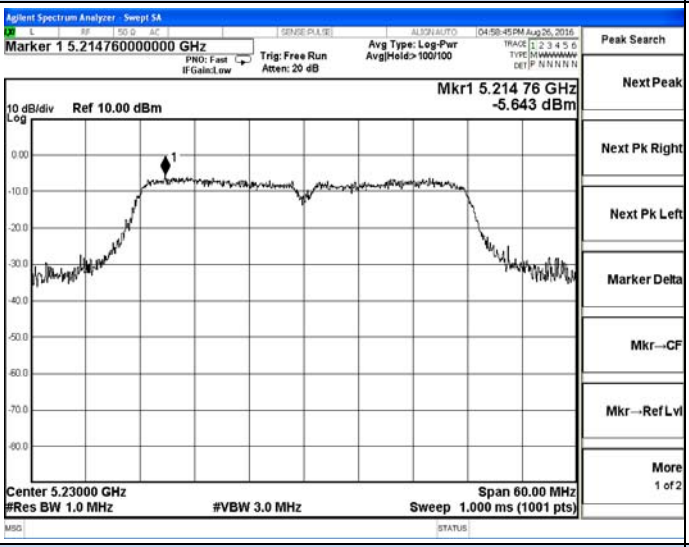
Test Plot of Power Spectral Density	
	
802.11a-5180MHz	802.11n-HT20-5180MHz
	
802.11a-5220MHz	802.11n-HT20-5220MHz
	
802.11a-5240MHz	802.11n-HT20-5240MHz



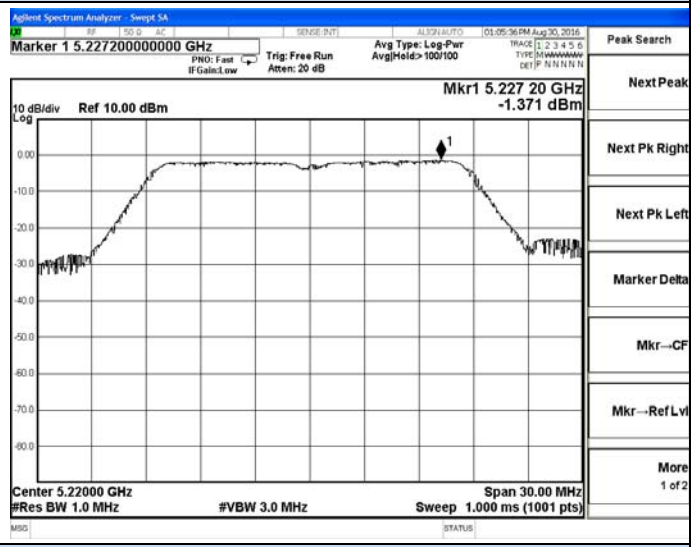
802.11n-HT40-5190MHz



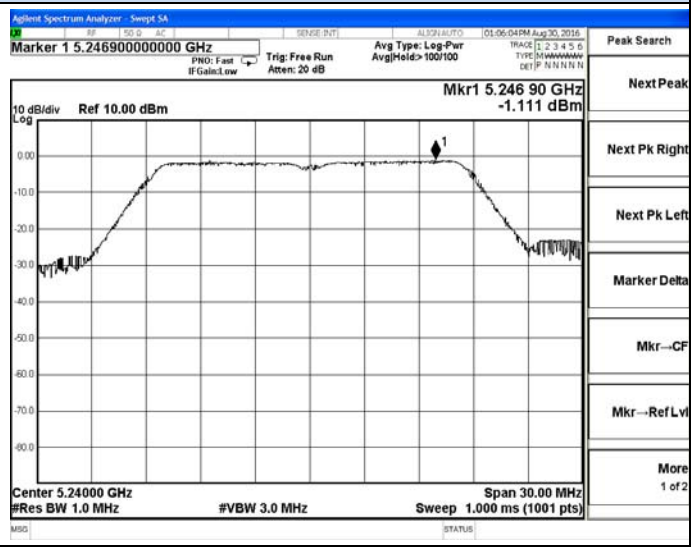
802.11ac20-5180MHz



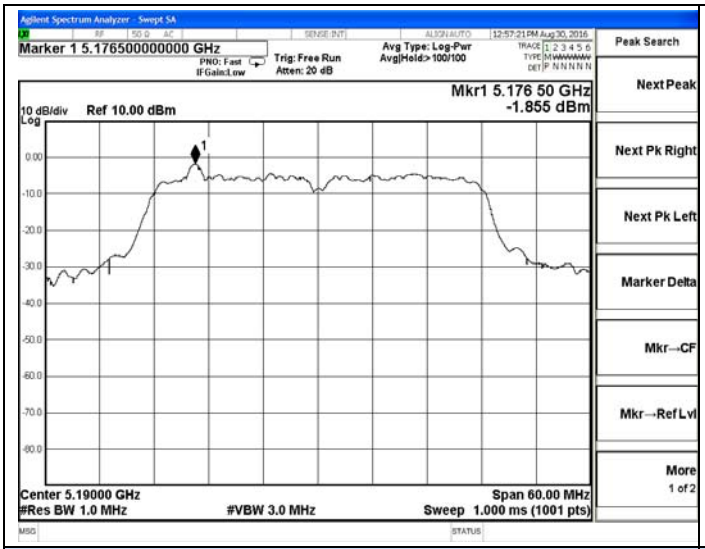
802.11n-HT40-5230MHz



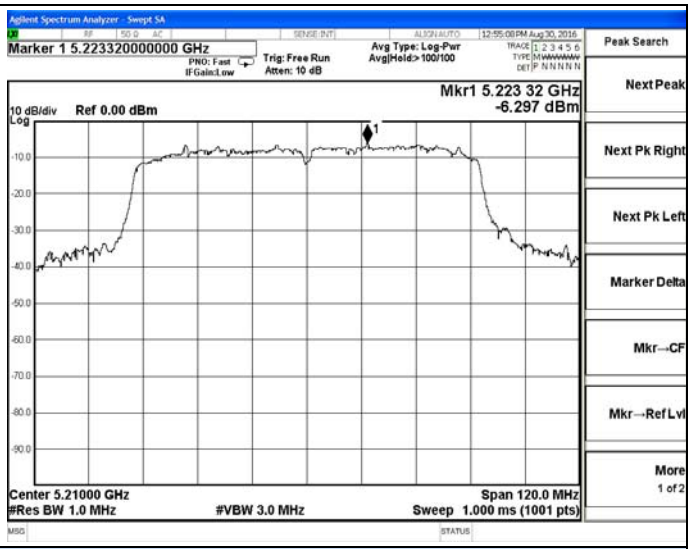
802.11ac20-5220MHz



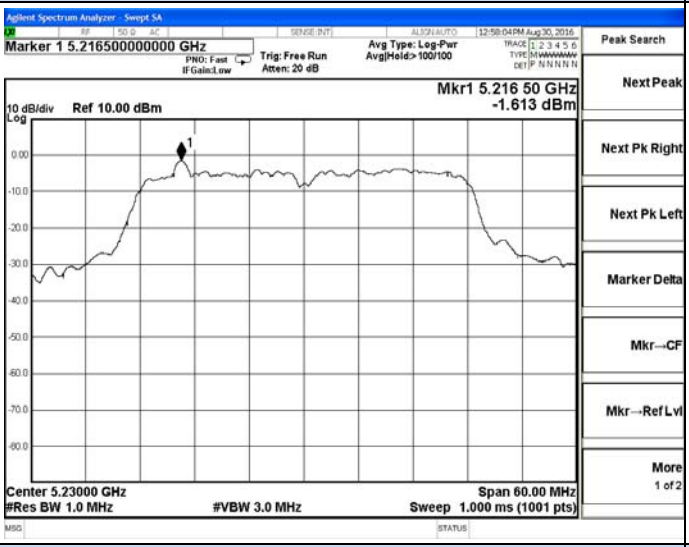
802.11ac20-5240MHz



802.11nac40-5190MHz



802.11ac80-5210MHz



802.11ac40-5230MHz

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

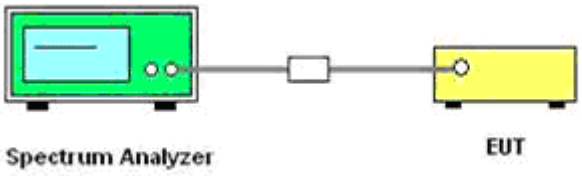
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

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	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a	36	5180	22.10	16.933
	44	5220	21.76	16.935
	48	5240	22.09	16.866

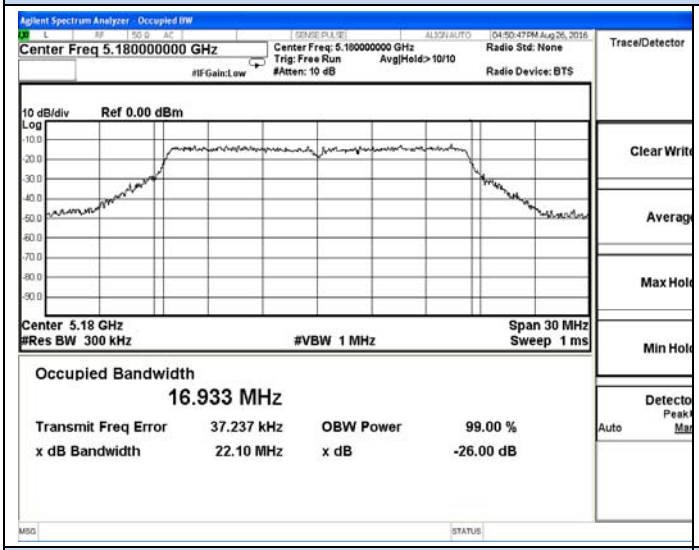
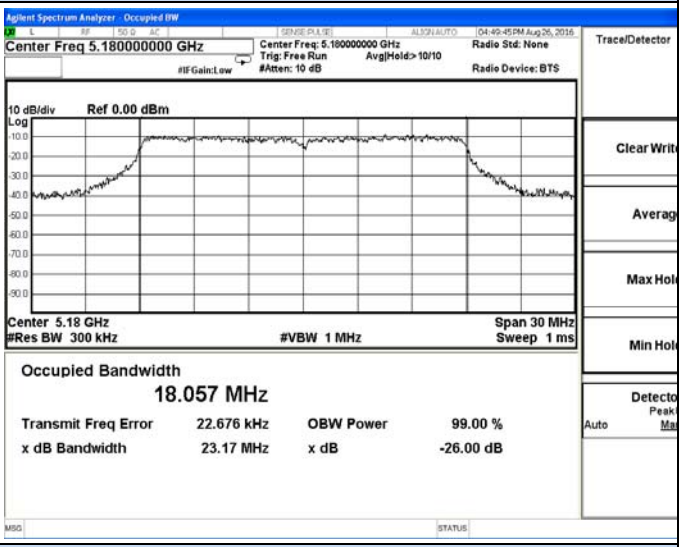
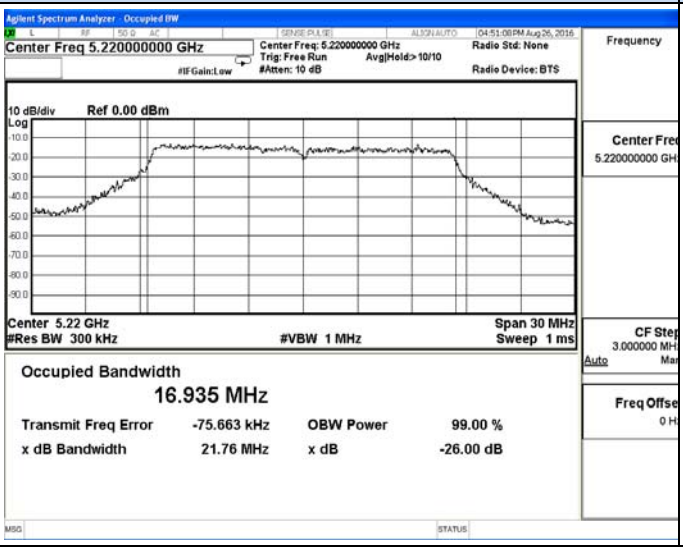
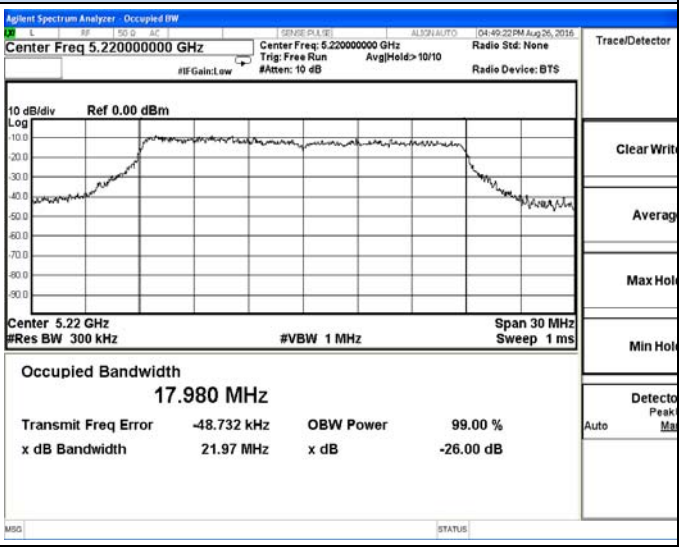
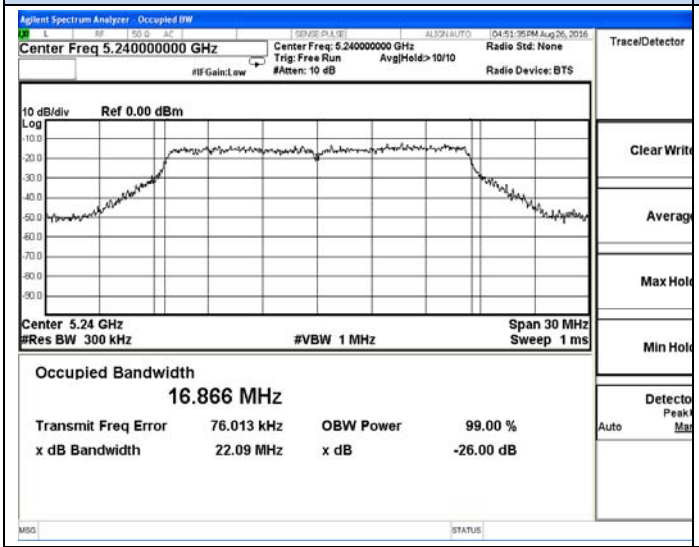
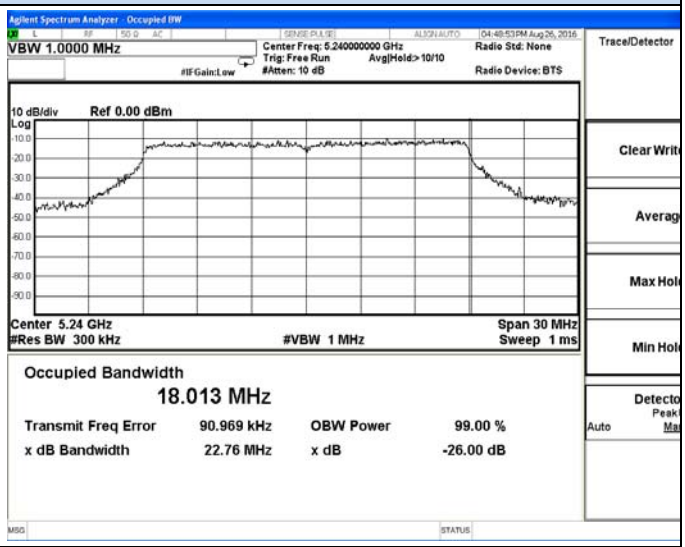
Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11n-HT20	36	5180	23.17	18.057
	44	5220	21.97	17.980
	48	5240	22.76	18.013

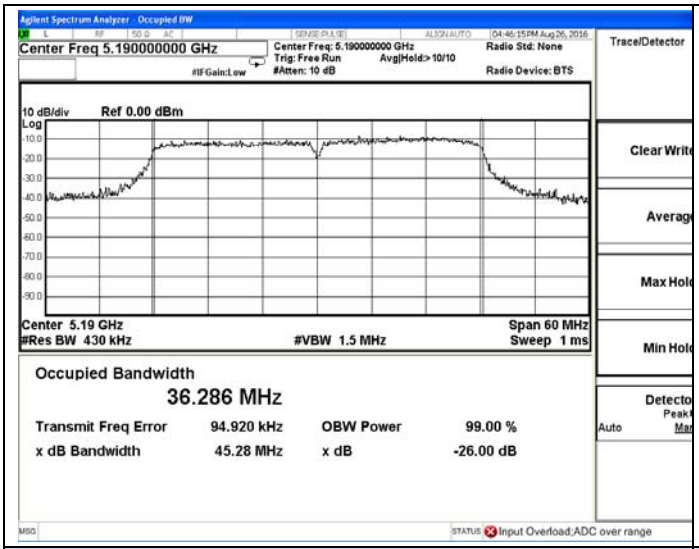
Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11n-HT40	38	5190	45.28	36.286
	46	5230	45.69	36.420

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac20	36	5180	23.03	18.151
	44	5220	25.72	18.115
	48	5240	25.53	18.119

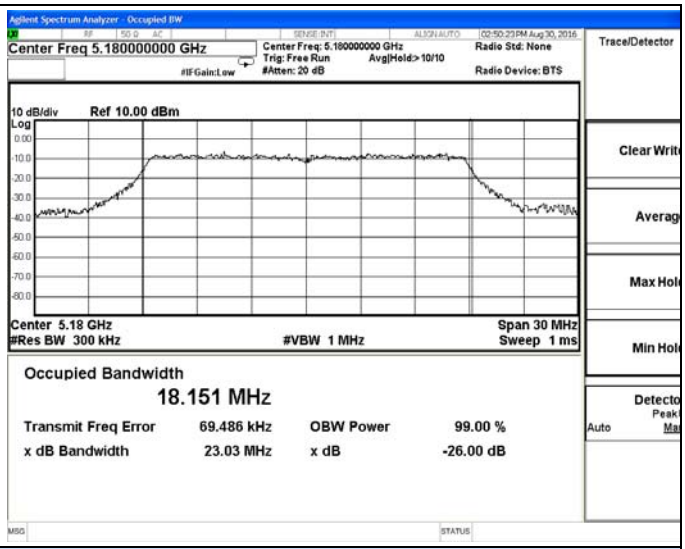
Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac40	38	5190	44.49	36.268
	46	5230	44.12	36.286

Test Mode	Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac80	42	5210	86.74	75.004

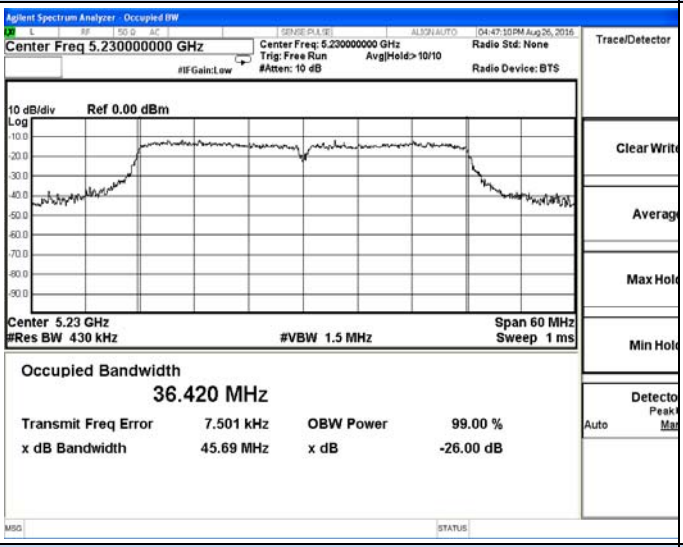
Test Plot of 99% and 26dB Occupied Bandwidth	
	
802.11a-5180MHz	802.11n-HT20-5180MHz
	
802.11a-5220MHz	802.11n-HT20-5220MHz
	
802.11a-5240MHz	802.11n-HT20-5240MHz



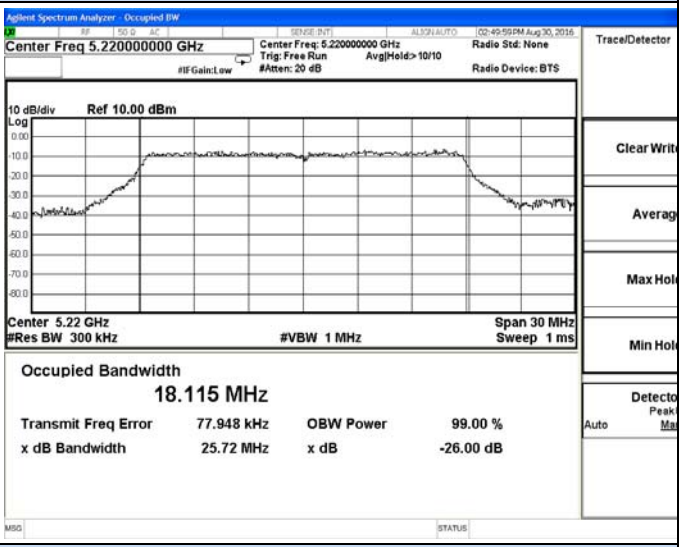
802.11n-HT40-5190MHz



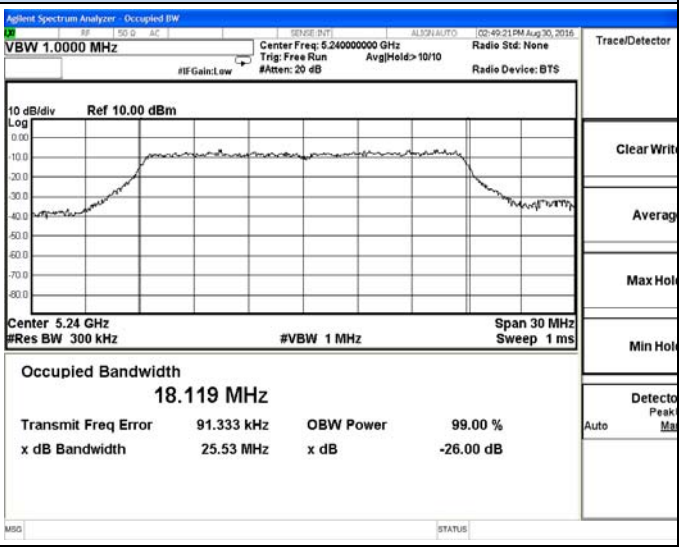
802.11ac20-5180MHz



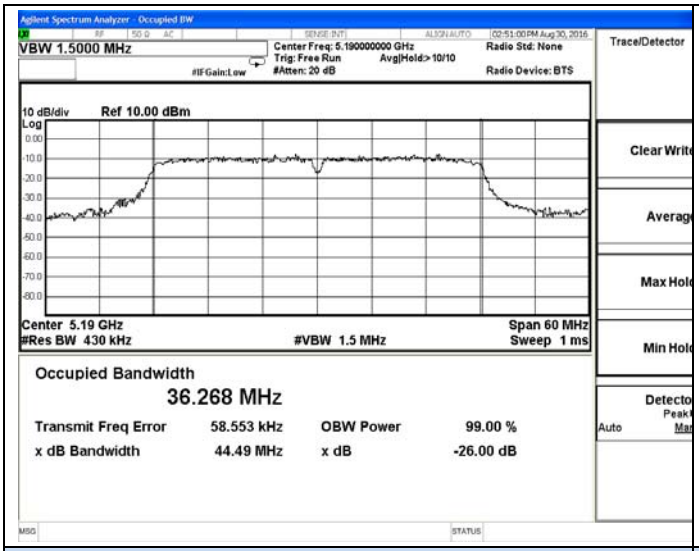
802.11n-HT40-5230MHz



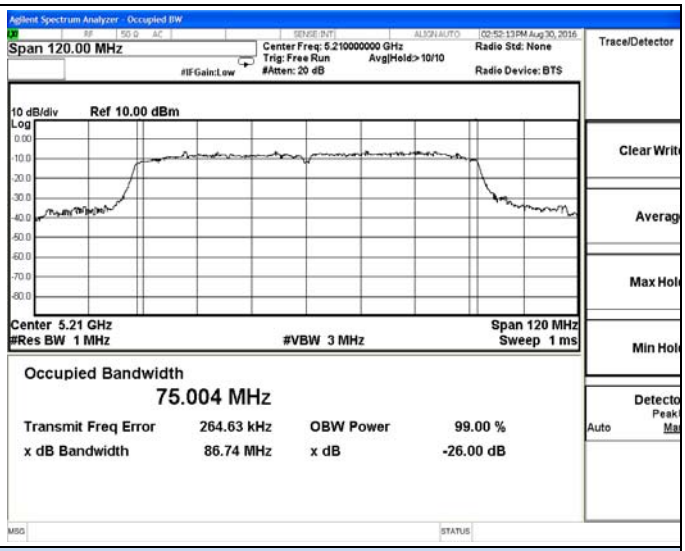
802.11ac20-5220MHz



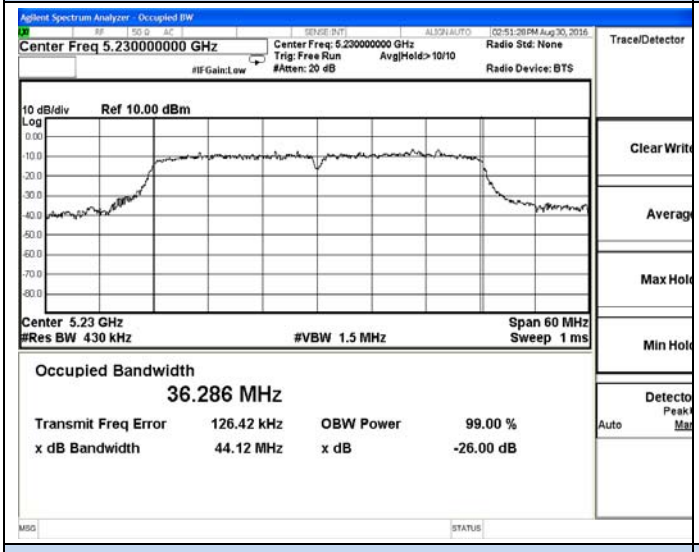
802.11ac20-5240MHz



802.11ac40-5190MHz



802.11ac80-5210MHz



802.11ac40-5230MHz

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.

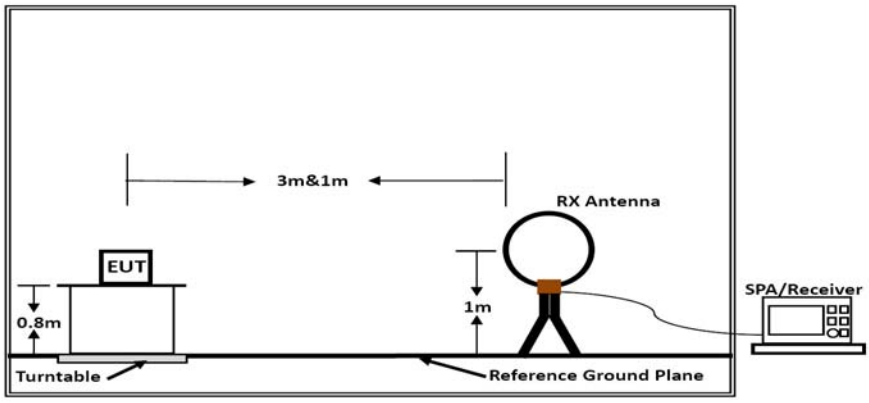
Final measurement:

--- 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.

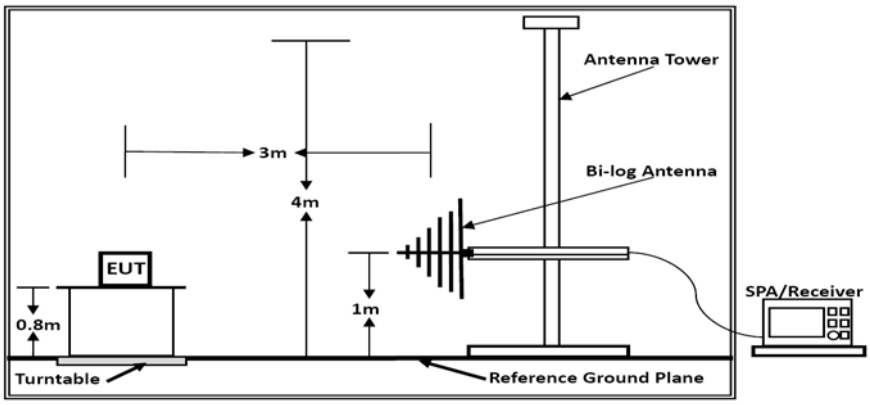
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.5.4. Test Setup Layout

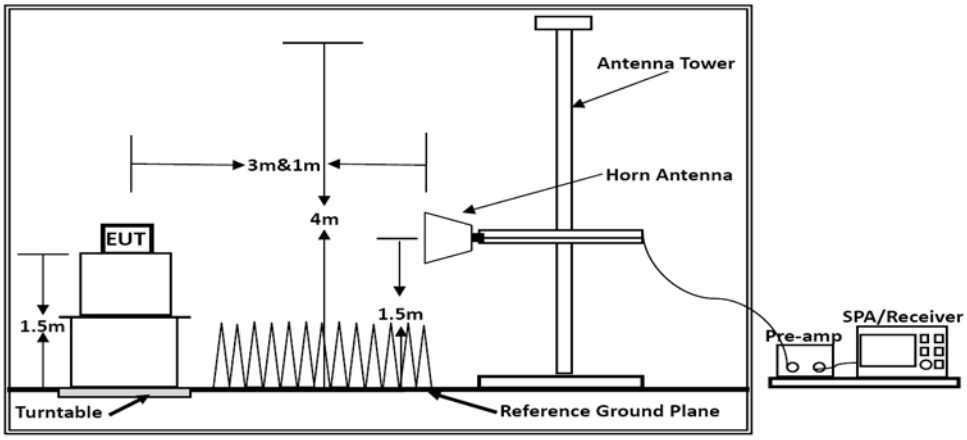
For radiated emissions below 30MHz



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	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.

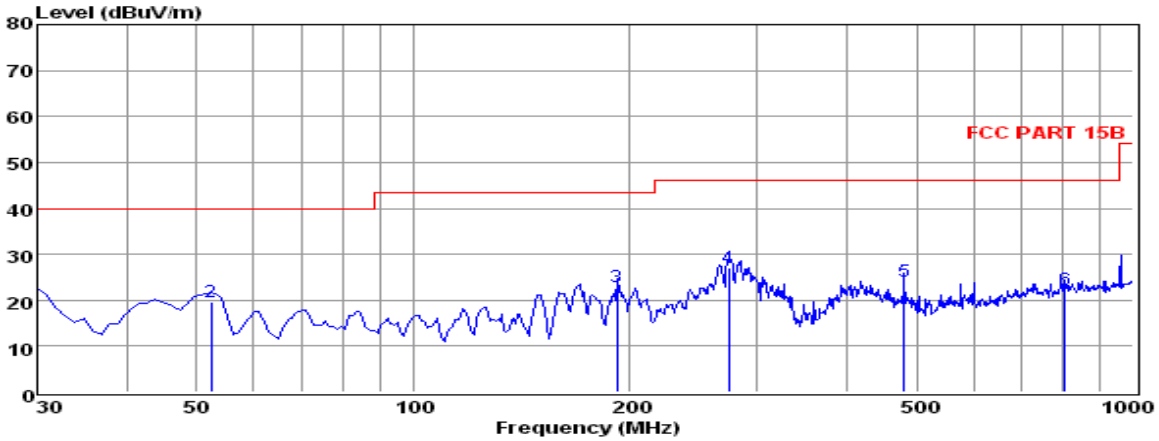
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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	802.11a, 5180MHz

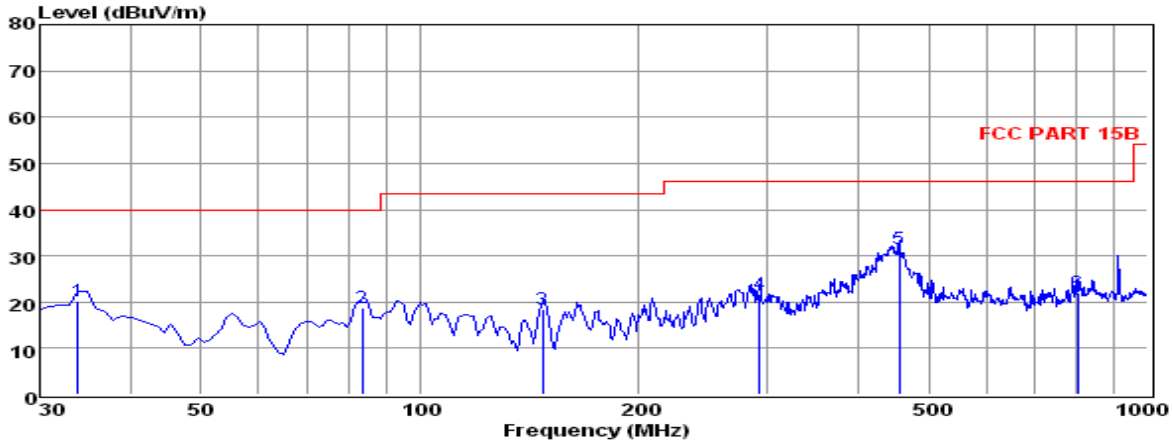
Test result for 802.11a-5180MHz



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	30.00	7.77	0.39	12.33	20.49	40.00	-19.51	QP
2	52.31	6.11	0.46	13.14	19.71	40.00	-20.29	QP
3	191.99	11.47	0.76	10.56	22.79	43.50	-20.71	QP
4	274.44	13.58	1.04	12.50	27.12	46.00	-18.88	QP
5	480.08	6.57	1.31	16.07	23.95	46.00	-22.05	QP
6	804.06	0.50	1.76	20.10	22.36	46.00	-23.64	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	33.88	7.53	0.37	12.31	20.21	40.00	-19.79	QP
2	83.35	8.44	0.54	9.73	18.71	40.00	-21.29	QP
3	147.37	9.31	0.86	8.24	18.41	43.50	-25.09	QP
4	292.87	7.82	1.08	12.92	21.82	46.00	-24.18	QP
5	455.83	14.47	1.39	15.58	31.44	46.00	-14.56	QP
6	801.15	0.20	1.72	20.07	21.99	46.00	-24.01	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.

5.5.8. Results for Radiated Emissions (Above 1GHz)

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	57.66	33.06	35.04	3.94	59.62	74.0	-14.38	Peak	Horizontal
15.54	41.08	33.06	35.04	3.94	43.04	54.0	-10.96	Average	Horizontal
15.54	55.81	33.06	35.04	3.94	57.77	74.0	-16.23	Peak	Vertical
15.54	39.07	33.06	35.04	3.94	41.03	54.0	-12.97	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	57.59	33.16	35.15	3.96	59.56	74.0	-14.44	Peak	Horizontal
15.60	41.05	33.16	35.15	3.96	43.02	54.0	-10.98	Average	Horizontal
15.60	55.91	33.16	35.15	3.96	57.88	74.0	-16.12	Peak	Vertical
15.60	39.40	33.16	35.15	3.96	41.37	54.0	-12.63	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	57.09	33.26	35.14	3.98	59.19	74.0	-14.81	Peak	Horizontal
15.72	41.36	33.26	35.14	3.98	43.46	54.0	-10.54	Average	Horizontal
15.72	54.98	33.26	35.14	3.98	57.08	74.0	-16.92	Peak	Vertical
15.72	39.27	33.26	35.14	3.98	41.37	54.0	-12.63	Average	Vertical

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	58.70	33.06	35.04	3.94	60.66	74.0	-13.34	Peak	Horizontal
15.54	42.29	33.06	35.04	3.94	44.25	54.0	-9.75	Average	Horizontal
15.54	56.08	33.06	35.04	3.94	58.04	74.0	-15.96	Peak	Vertical
15.54	40.61	33.06	35.04	3.94	42.57	54.0	-11.43	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	58.41	33.16	35.15	3.96	60.38	74.0	-13.62	Peak	Horizontal
15.60	42.19	33.16	35.15	3.96	44.16	54.0	-9.84	Average	Horizontal
15.60	56.81	33.16	35.15	3.96	58.78	74.0	-15.22	Peak	Vertical
15.60	40.07	33.16	35.15	3.96	42.04	54.0	-11.96	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	58.01	33.26	35.14	3.98	60.11	74.0	-13.89	Peak	Horizontal
15.72	42.31	33.26	35.14	3.98	44.41	54.0	-9.59	Average	Horizontal
15.72	55.66	33.26	35.14	3.98	57.76	74.0	-16.24	Peak	Vertical
15.72	36.92	33.26	35.14	3.98	39.02	54.0	-14.98	Average	Vertical

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	58.40	33.06	35.04	3.94	60.36	74.0	-13.64	Peak	Horizontal
15.57	41.45	33.06	35.04	3.94	43.41	54.0	-10.59	Average	Horizontal
15.57	55.82	33.06	35.04	3.94	57.78	74.0	-16.22	Peak	Vertical
15.57	37.47	33.06	35.04	3.94	39.43	54.0	-14.57	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	57.49	33.16	35.15	3.96	59.46	74.0	-14.54	Peak	Horizontal
15.69	41.04	33.16	35.15	3.96	43.01	54.0	-10.99	Average	Horizontal
15.69	55.74	33.16	35.15	3.96	57.71	74.0	-16.29	Peak	Vertical
15.69	38.49	33.16	35.15	3.96	40.46	54.0	-13.54	Average	Vertical

802.11ac20

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	59.83	33.06	35.04	3.94	61.79	74.0	-12.21	Peak	Horizontal
15.54	42.3	33.06	35.04	3.94	44.26	54.0	-9.74	Average	Horizontal
15.54	55.05	33.06	35.04	3.94	57.01	74.0	-16.99	Peak	Vertical
15.54	38.82	33.06	35.04	3.94	40.78	54.0	-13.22	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	59.11	33.16	35.15	3.96	61.08	74.0	-12.92	Peak	Horizontal
15.60	42.49	33.16	35.15	3.96	44.46	54.0	-9.54	Average	Horizontal
15.60	55.30	33.16	35.15	3.96	57.27	74.0	-16.73	Peak	Vertical
15.60	38.04	33.16	35.15	3.96	40.01	54.0	-13.99	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	58.85	33.26	35.14	3.98	60.95	74.0	-13.05	Peak	Horizontal
15.72	42.28	33.26	35.14	3.98	44.38	54.0	-9.62	Average	Horizontal
15.72	55.06	33.26	35.14	3.98	57.16	74.0	-16.84	Peak	Vertical
15.72	37.97	33.26	35.14	3.98	40.07	54.0	-13.93	Average	Vertical

802.11ac40

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	58.48	33.06	35.04	3.94	60.44	74.0	-13.56	Peak	Horizontal
15.57	41.40	33.06	35.04	3.94	43.36	54.0	-10.64	Average	Horizontal
15.57	56.06	33.06	35.04	3.94	58.02	74.0	-15.98	Peak	Vertical
15.57	38.82	33.06	35.04	3.94	40.78	54.0	-13.22	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	58.1	33.16	35.15	3.96	60.07	74.0	-13.93	Peak	Horizontal
15.69	41.28	33.16	35.15	3.96	43.25	54.0	-10.75	Average	Horizontal
15.69	57.01	33.16	35.15	3.96	58.98	74.0	-15.02	Peak	Vertical
15.69	38.05	33.16	35.15	3.96	40.02	54.0	-13.98	Average	Vertical

802.11ac80

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	57.14	33.16	35.15	3.96	59.11	74.0	-14.89	Peak	Horizontal
15.57	38.67	33.16	35.15	3.96	40.64	54.0	-13.36	Average	Horizontal
15.57	55.28	33.16	35.15	3.96	57.25	74.0	-16.75	Peak	Vertical
15.57	37.10	33.16	35.15	3.96	39.07	54.0	-14.93	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	-63.029	2.3	34.471	74.0	-39.529	Peak
4500.000	-72.265	2.3	25.235	54.0	-28.765	Average
5150.000	-46.494	2.3	51.006	74.0	-22.994	Peak
5150.000	-60.840	2.3	36.660	54.0	-17.340	Average
5350.000	-63.073	2.3	34.427	74.0	-39.573	Peak
5350.000	-71.458	2.3	26.042	54.0	-27.958	Average
5460.000	-63.081	2.3	34.419	74.0	-39.581	Peak
5460.000	-71.349	2.3	26.151	54.0	-27.849	Average

802.11n-HT20						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-63.290	2.3	34.210	74.0	-39.79	Peak
4500.000	-72.387	2.3	25.113	54.0	-28.887	Average
5150.000	-49.171	2.3	48.329	74.0	-25.671	Peak
5150.000	-59.840	2.3	37.660	54.0	-16.34	Average
5350.000	-61.987	2.3	35.513	74.0	-38.487	Peak
5350.000	-71.189	2.3	26.311	54.0	-27.689	Average
5460.000	-62.925	2.3	34.575	74.0	-39.425	Peak
5460.000	-71.517	2.3	25.983	54.0	-28.017	Average

802.11n-HT40						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-63.380	2.3	34.120	74.0	-39.88	Peak
4500.000	-72.826	2.3	24.674	54.0	-29.326	Average
5150.000	-41.246	2.3	56.254	74.0	-17.746	Peak
5150.000	-52.483	2.3	45.017	54.0	-8.983	Average
5350.000	-62.816	2.3	34.684	74.0	-39.316	Peak
5350.000	-71.506	2.3	25.994	54.0	-28.006	Average
5460.000	-63.420	2.3	34.080	74.0	-39.920	Peak
5460.000	-71.860	2.3	25.640	54.0	-28.360	Average

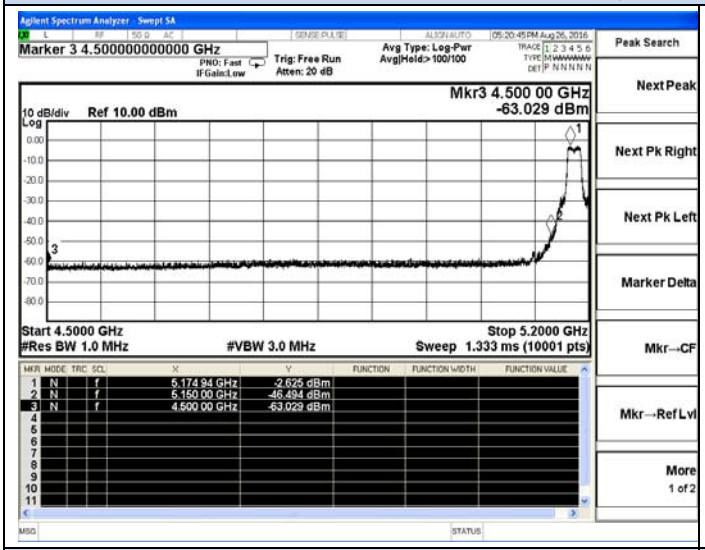
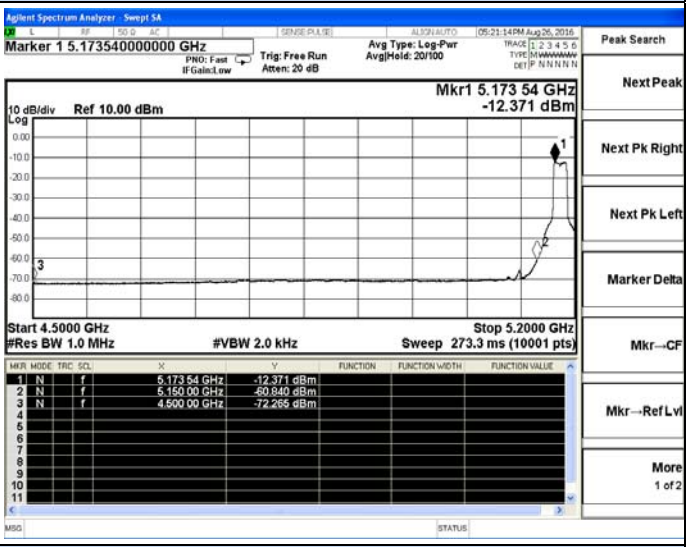
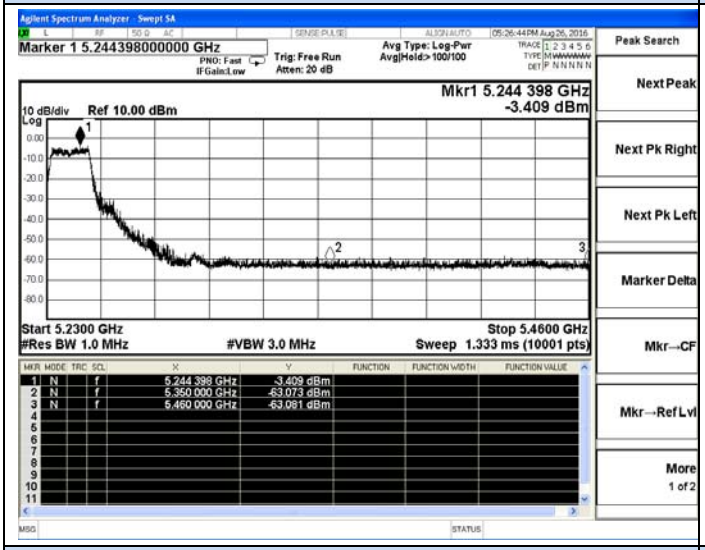
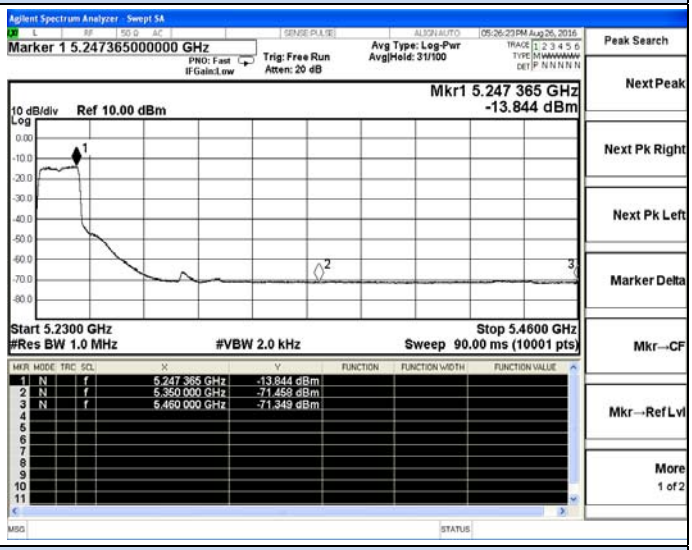
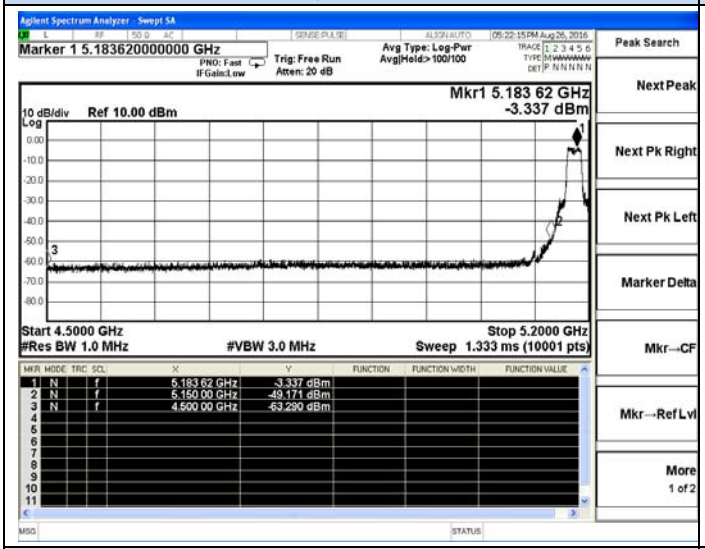
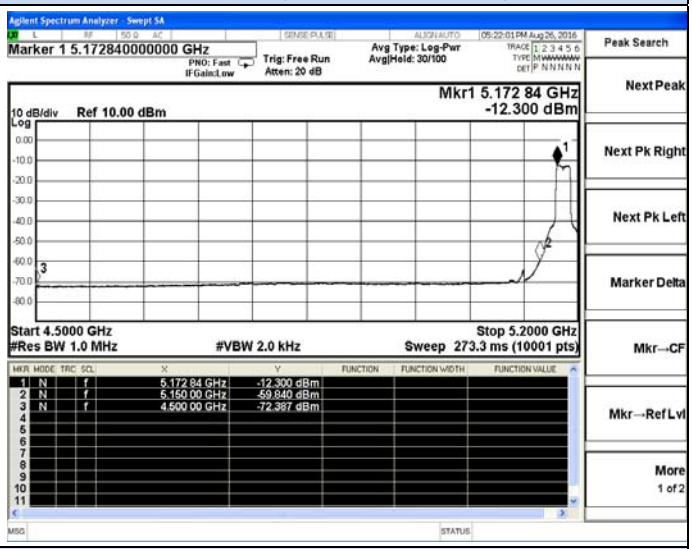
802.11ac20						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-63.576	2.3	33.924	74.0	-40.076	Peak
4500.000	-72.579	2.3	24.921	54.0	-29.079	Average
5150.000	-49.718	2.3	47.782	74.0	-26.218	Peak
5150.000	-60.446	2.3	37.054	54.0	-16.946	Average
5350.000	-58.410	2.3	39.090	74.0	-34.910	Peak
5350.000	-70.774	2.3	26.726	54.0	-27.274	Average
5460.000	-60.076	2.3	37.424	74.0	-36.576	Peak
5460.000	-70.730	2.3	26.770	54.0	-27.230	Average

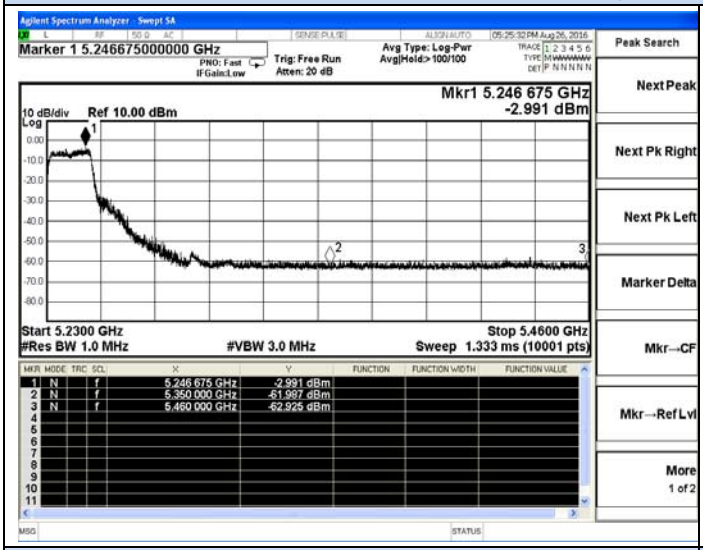
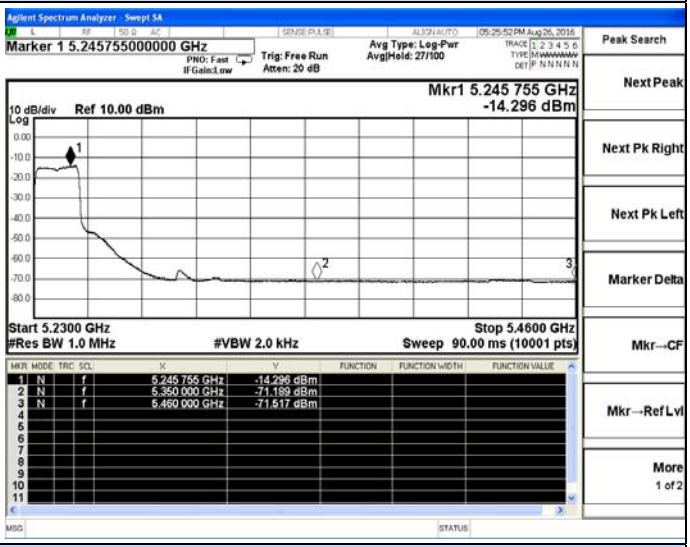
802.11ac40						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-64.684	2.3	32.816	74.0	-41.184	Peak
4500.000	-72.469	2.3	25.031	54.0	-28.969	Average
5150.000	-41.748	2.3	55.752	74.0	-18.248	Peak
5150.000	-51.475	2.3	46.025	54.0	-7.975	Average
5350.000	-59.605	2.3	37.895	74.0	-36.105	Peak
5350.000	-70.274	2.3	27.226	54.0	-26.774	Average
5460.000	-61.006	2.3	36.494	74.0	-37.506	Peak
5460.000	-70.763	2.3	26.737	54.0	-27.263	Average

802.11ac80						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
4500.000	-63.735	2.3	33.765	74.0	-40.235	Peak
4500.000	-72.192	2.3	25.308	54.0	-28.692	Average
5150.000	-42.057	2.3	55.443	74.0	-18.557	Peak
5150.000	-51.790	2.3	45.710	54.0	-8.290	Average
5350.000	-55.278	2.3	42.222	74.0	-31.778	Peak
5350.000	-64.827	2.3	32.673	54.0	-21.327	Average
5460.000	-61.496	2.3	36.004	74.0	-37.996	Peak
5460.000	-70.634	2.3	26.866	54.0	-27.134	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	
	
802.11a-Low channel(Peak)	802.11a-Low channel(Average)
	
802.11a-High channel(Peak)	802.11a-High channel(Average)
	
802.11n-HT20-Low channel(Peak)	802.11n-HT20-Low channel(Average)

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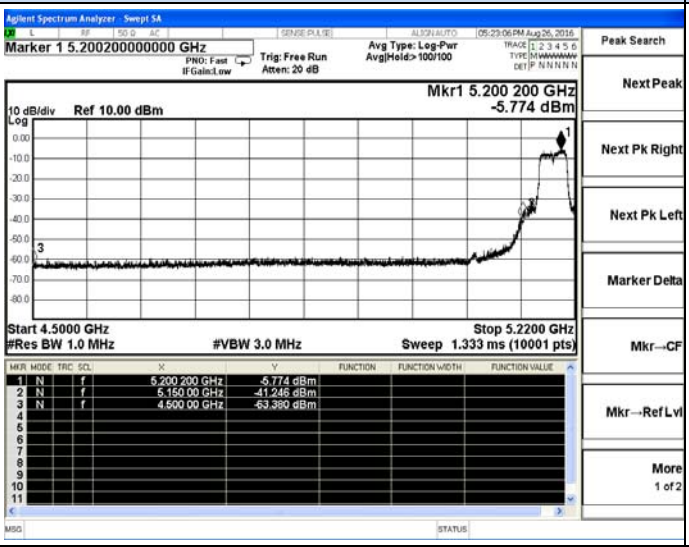	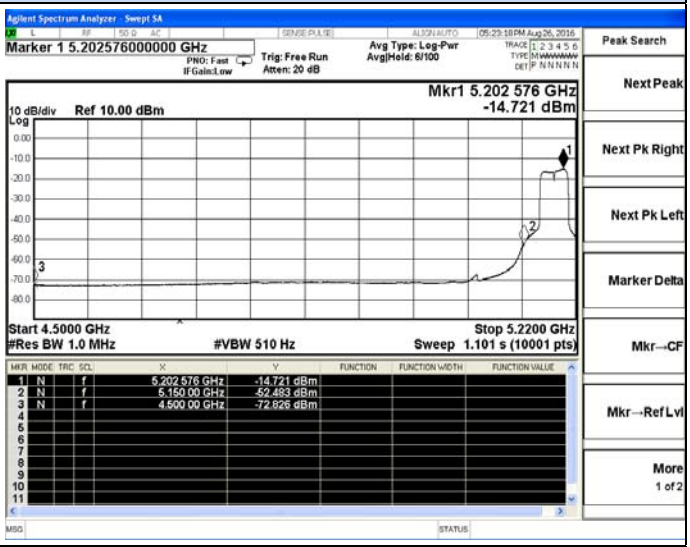
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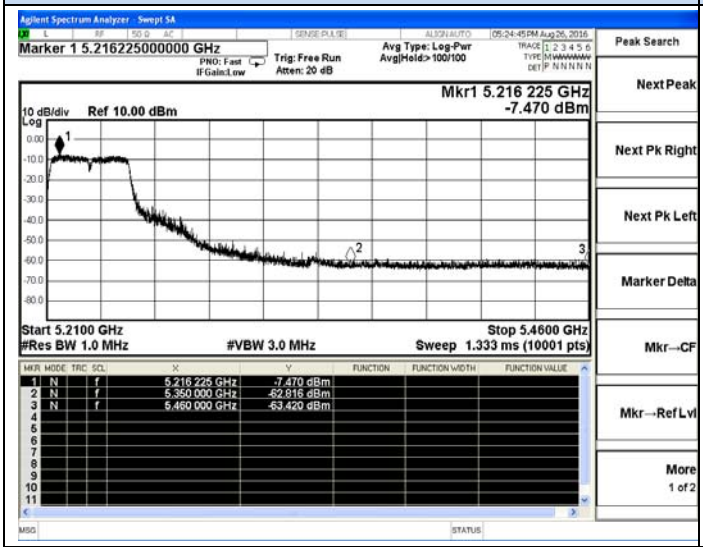	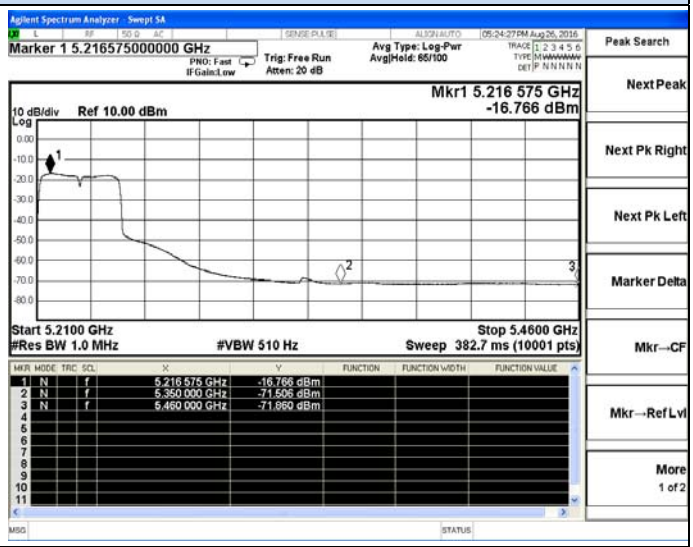
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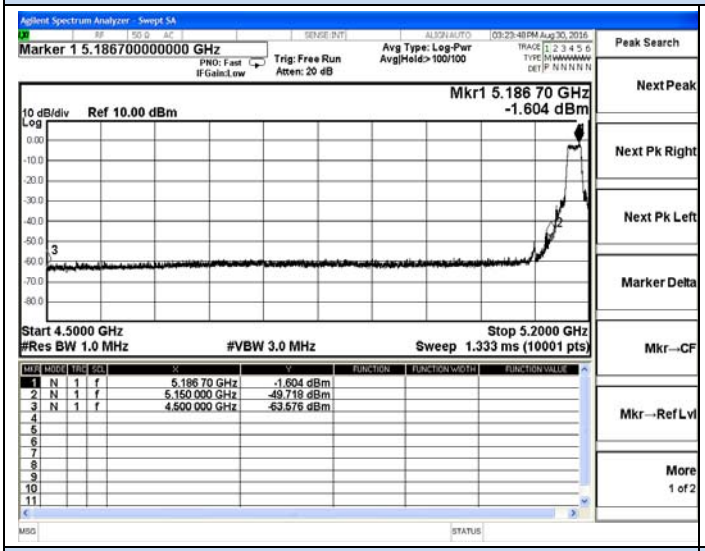
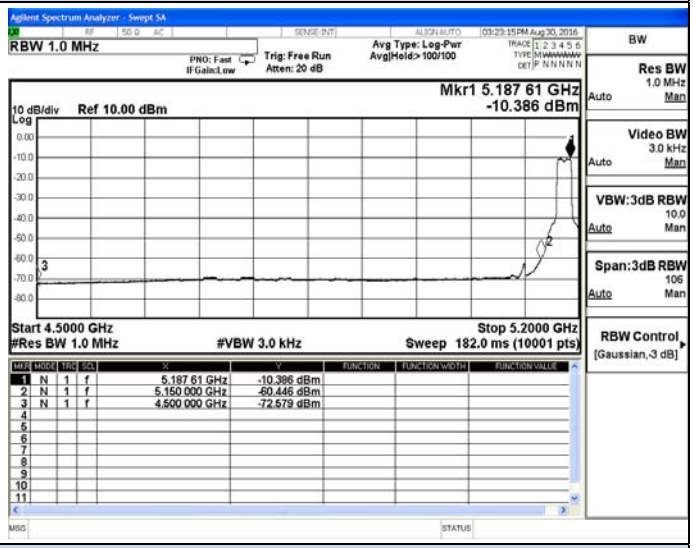
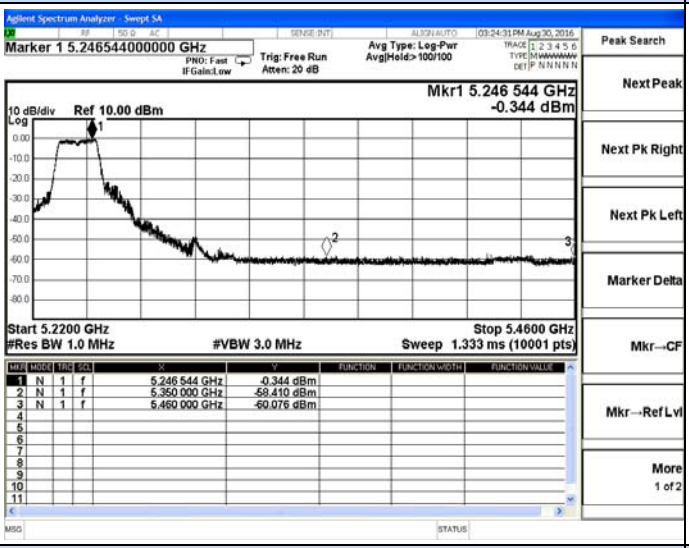
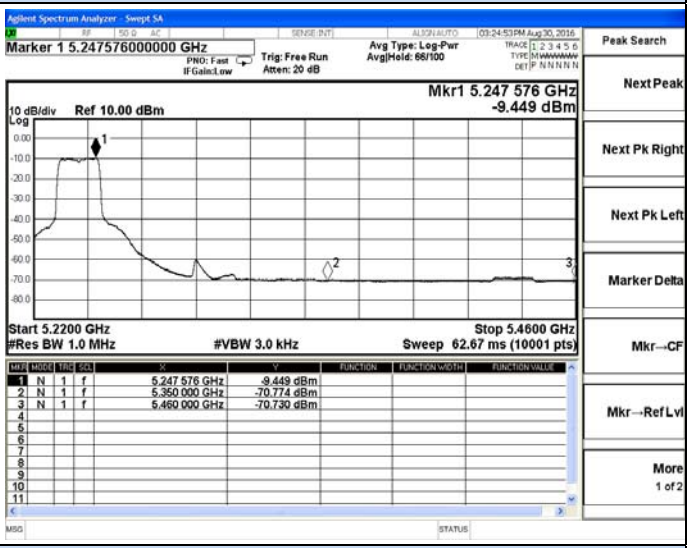
Test plot of Band Edge and Restricted band Emissions	
	
802.11ac20-Low channel(Peak)	802.11ac20-Low channel(Average)
	
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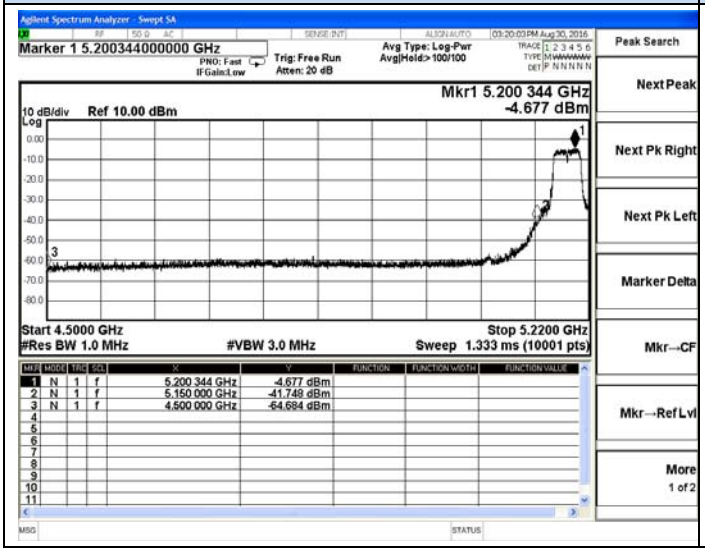
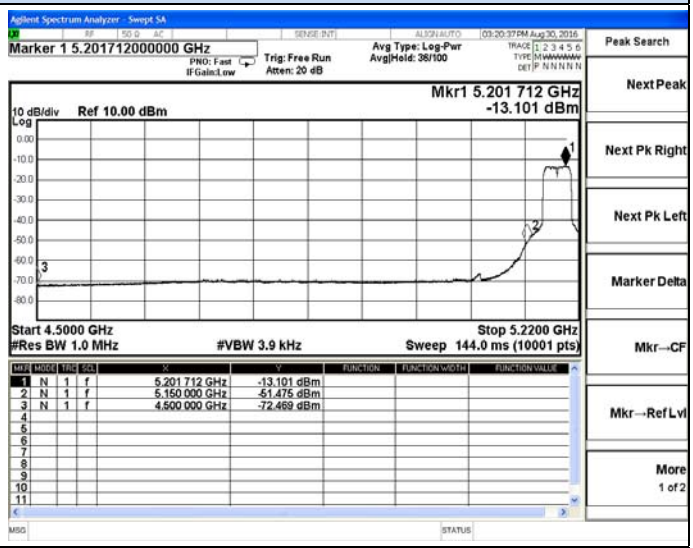
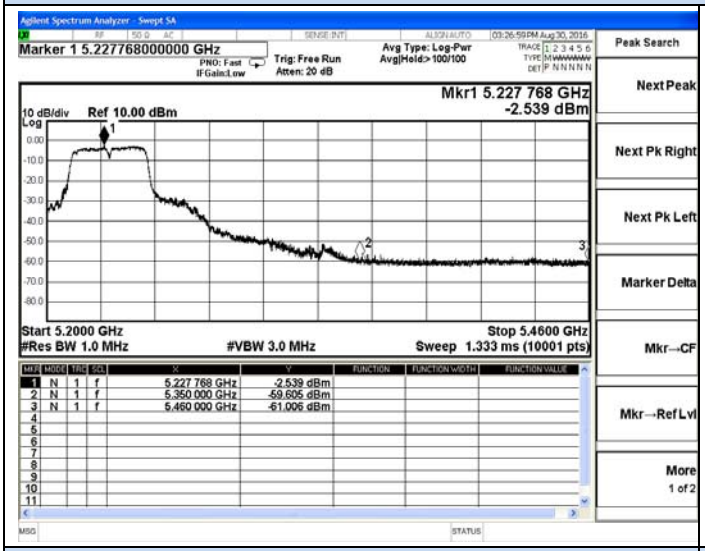
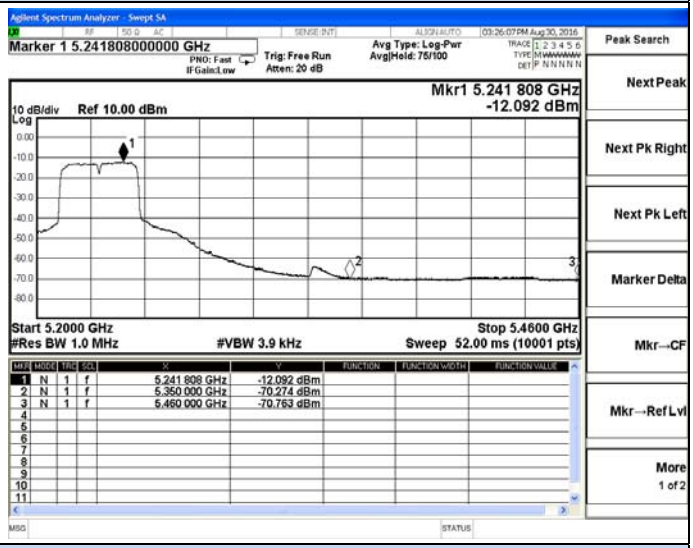
	
802.11ac40-Low channel(Peak)	802.11ac40-Low channel(Average)

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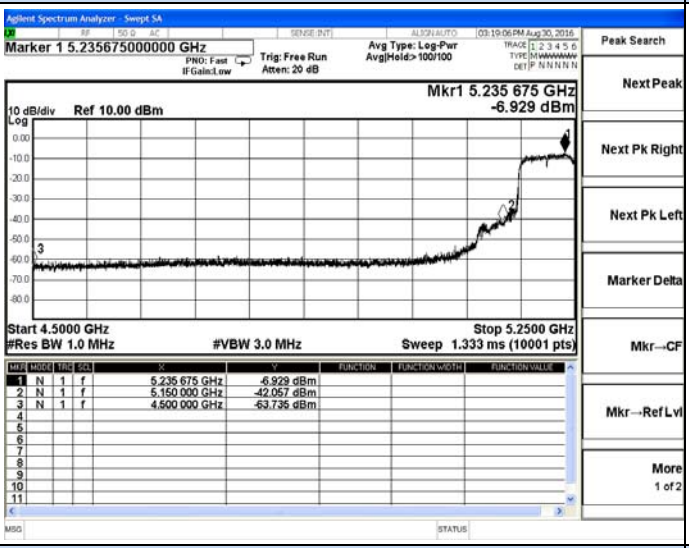
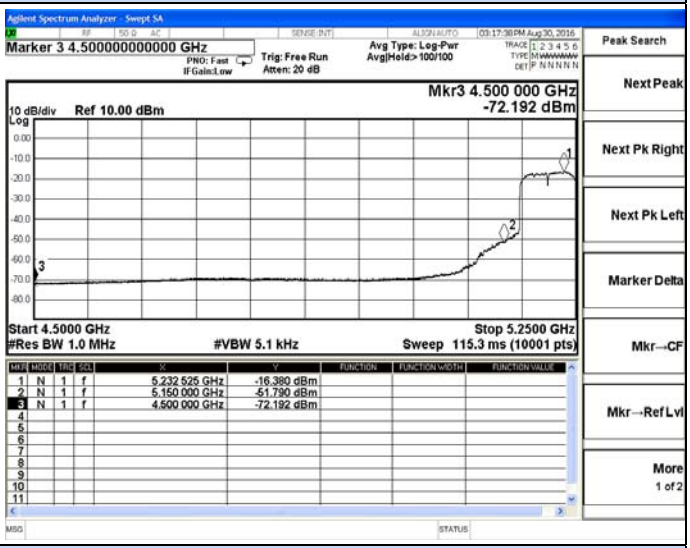
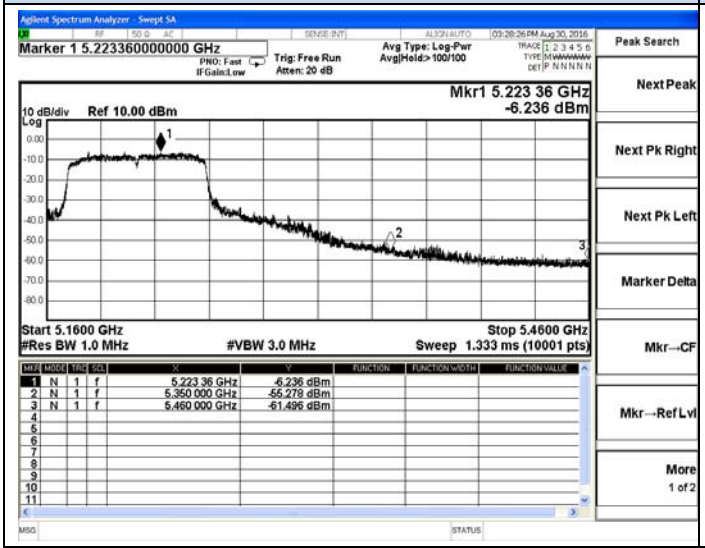
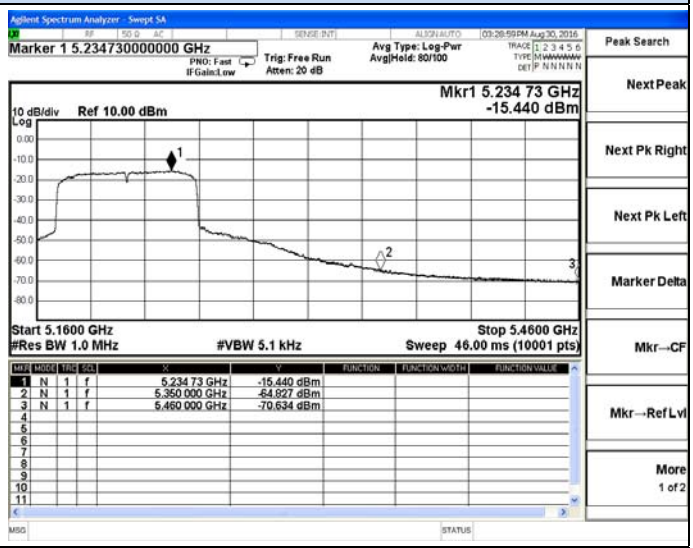
	
802.11ac80-Low channel(Peak)	802.11ac80-Low channel(Average)
	
802.11ac80-High channel(Peak)	802.11ac80-High channel(Average)

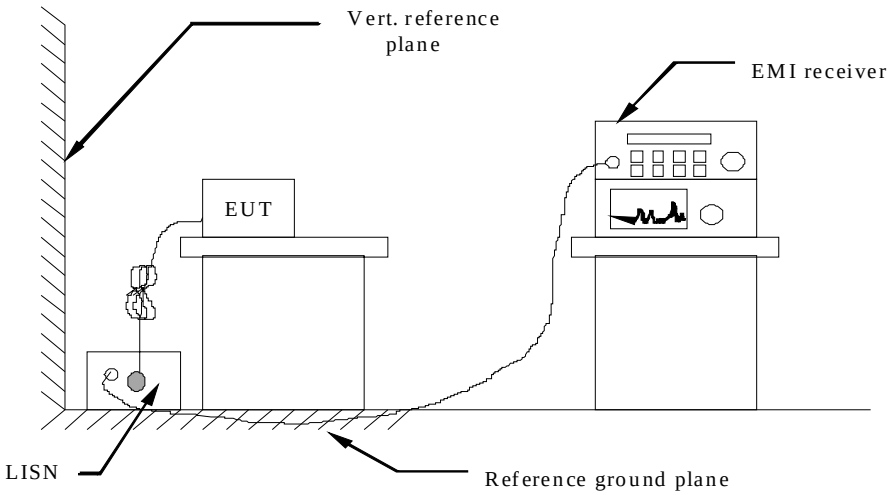
5.6. Power line conducted emissions

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

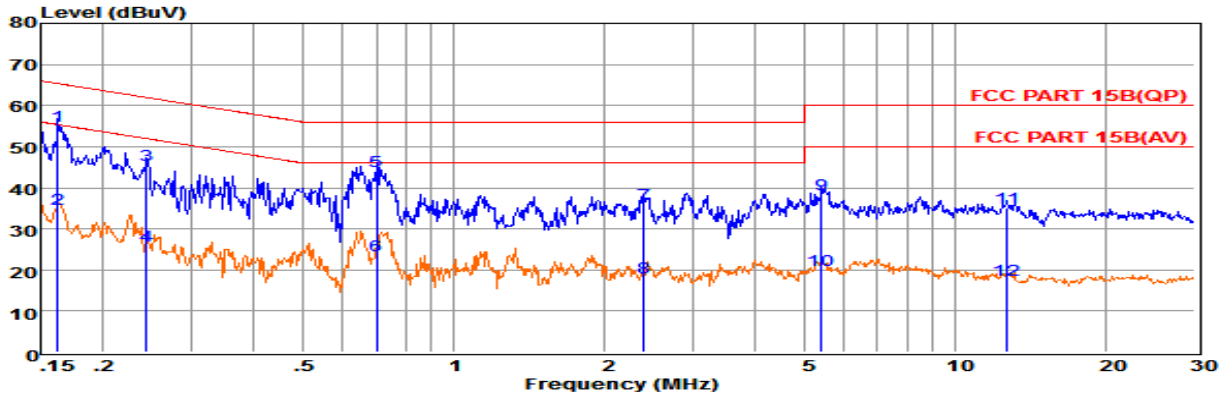


5.6.3 Test Results

PASS.

The test data please refer to following page.

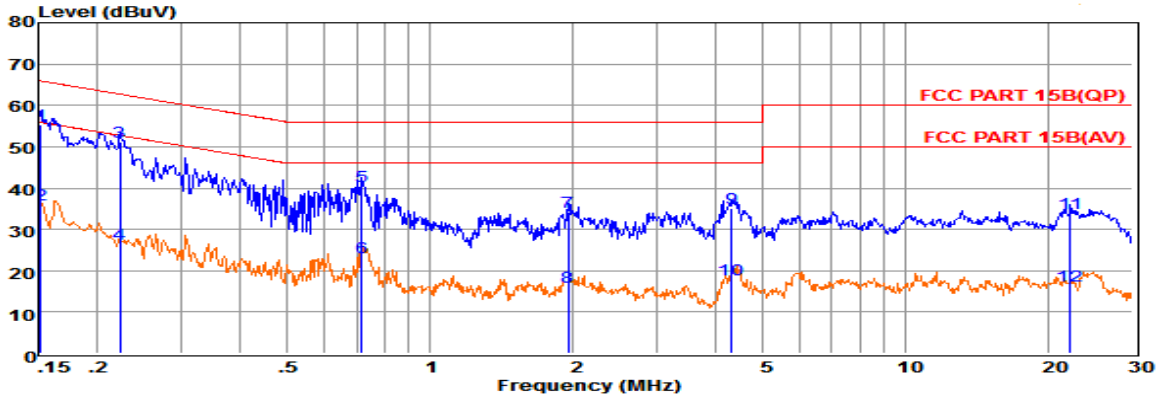
Test result for 802.11a (AC 120 V)



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	0.16241	35.26	9.67	0.02	10.00	54.95	65.34	-10.39	QP
2	0.16251	15.00	9.67	0.02	10.00	34.69	55.33	-20.64	Average
3	0.24422	25.75	9.60	0.03	10.00	45.38	61.95	-16.57	QP
4	0.24432	6.29	9.60	0.03	10.00	25.92	51.95	-26.03	Average
5	0.70096	24.28	9.63	0.04	10.00	43.95	56.00	-12.05	QP
6	0.70106	3.77	9.63	0.04	10.00	23.44	46.00	-22.56	Average
7	2.39624	16.37	9.64	0.05	10.00	36.06	56.00	-19.94	QP
8	2.39724	-1.63	9.64	0.05	10.00	18.06	46.00	-27.94	Average
9	5.41862	18.55	9.67	0.06	10.00	38.28	60.00	-21.72	QP
10	5.41962	0.08	9.67	0.06	10.00	19.81	50.00	-30.19	Average
1112	.71611	15.19	9.73	0.09	10.00	35.01	60.00	-24.99	QP
1212	.71711	-2.28	9.73	0.09	10.00	17.54	50.00	-32.46	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.

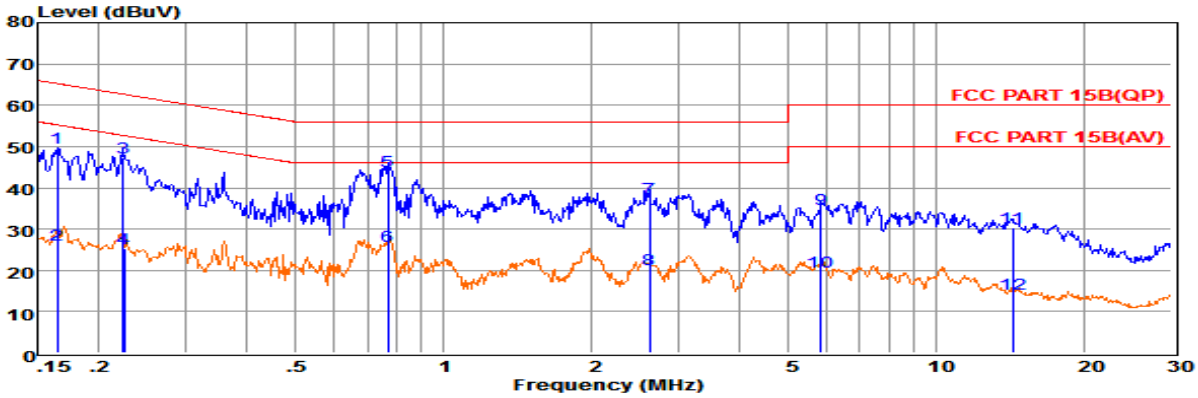


Env. Ins: 24*/56%
Pol: LINE

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15160	35.67	9.57	0.02	10.00	55.26	65.91	-10.65	QP
2	0.15170	16.52	9.57	0.02	10.00	36.11	55.91	-19.80	Average
3	0.22319	31.45	9.63	0.03	10.00	51.11	62.70	-11.59	QP
4	0.22329	6.72	9.63	0.03	10.00	26.38	52.70	-26.32	Average
5	0.71977	20.71	9.64	0.04	10.00	40.39	56.00	-15.61	QP
6	0.71987	3.51	9.64	0.04	10.00	23.19	46.00	-22.81	Average
7	1.94890	14.44	9.64	0.05	10.00	34.13	56.00	-21.87	QP
8	1.94990	-3.65	9.64	0.05	10.00	16.04	46.00	-29.96	Average
9	4.31464	15.52	9.65	0.06	10.00	35.23	56.00	-20.77	QP
10	4.31564	-1.78	9.65	0.06	10.00	17.93	46.00	-28.07	Average
1122	.18005	14.10	9.71	0.12	10.00	33.93	60.00	-26.07	QP
1222	.18105	-3.37	9.71	0.12	10.00	16.46	50.00	-33.54	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.

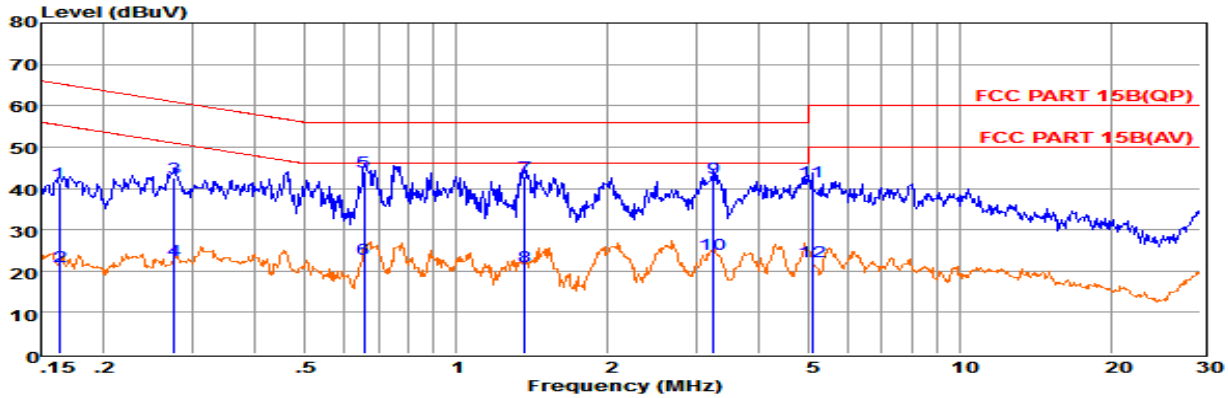
Test result for 802.11a (AC 240 V)



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

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16414	29.83	9.67	0.02	10.00	49.52	65.25	-15.73	QP
2	0.16424	6.50	9.67	0.02	10.00	26.19	55.25	-29.06	Average
3	0.22437	27.63	9.59	0.03	10.00	47.25	62.66	-15.41	QP
4	0.22446	5.68	9.59	0.03	10.00	25.30	52.65	-27.35	Average
5	0.77110	24.45	9.63	0.04	10.00	44.12	56.00	-11.88	QP
6	0.77120	6.35	9.63	0.04	10.00	26.02	46.00	-19.98	Average
7	2.62209	17.75	9.64	0.05	10.00	37.44	56.00	-18.56	QP
8	2.62309	0.44	9.64	0.05	10.00	20.13	46.00	-25.87	Average
9	5.83584	15.10	9.67	0.06	10.00	34.83	60.00	-25.17	QP
10	5.83684	-0.13	9.67	0.06	10.00	19.60	50.00	-30.40	Average
1114	.28819	10.55	9.74	0.10	10.00	30.39	60.00	-29.61	QP
1214	.28919	-5.70	9.74	0.10	10.00	14.14	50.00	-35.86	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: LINE

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16327	21.70	9.59	0.02	10.00	41.31	65.30	-23.99	QP
2	0.16337	1.40	9.59	0.02	10.00	21.01	55.29	-34.28	Average
3	0.27587	22.97	9.63	0.03	10.00	42.63	60.94	-18.31	QP
4	0.27597	2.83	9.63	0.03	10.00	22.49	50.94	-28.45	Average
5	0.65778	24.32	9.64	0.04	10.00	44.00	56.00	-12.00	QP
6	0.65788	3.20	9.64	0.04	10.00	22.88	46.00	-23.12	Average
7	1.36654	23.14	9.63	0.05	10.00	42.82	56.00	-13.18	QP
8	1.36754	1.51	9.63	0.05	10.00	21.19	46.00	-24.81	Average
9	3.24107	22.73	9.65	0.06	10.00	42.44	56.00	-13.56	QP
10	3.24207	4.40	9.65	0.06	10.00	24.11	46.00	-21.89	Average
11	5.08483	21.92	9.65	0.06	10.00	41.63	60.00	-18.37	QP
12	5.08583	2.53	9.65	0.06	10.00	22.24	50.00	-27.76	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 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 2.3dBi, and the antenna is an FPC 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 DTS 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 DSSS mode is used;

Tnom	Vnom	Lowest Channel 2412 MHz	Middle Channel 2437 MHz	Highest Channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		-4.25	-4.54	-4.89
Radiated power [dBm] Measured with DSSS modulation		-2.08	-2.39	-2.68
Gain [dBi] Calculated		2.17	2.15	2.21
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, 2015	October 27, 2016
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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