

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.
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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. : LCS1609090640E

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

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EUT Description. : CAT 360 Camera

Trade Mark : [LOYOU logo]

Model/ Type reference : CE-01A

Ratings : DC 3.7V by battery
Charging voltage: DC 5.0V, 2.0A

Result : Positive

Compiled by:

[Signature of Jacky Li]

Jacky Li/ File administrators

Supervised by:

[Signature of Glin Lu]

Glin Lu/ Technique principal

Approved by:

[Signature of Gavin Liang]

Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1609090640E	<u>September 09, 2016</u> Date of issue
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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
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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

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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 Bandwidth Mode	Single (Port.1)			Two (Port.1 + Port.2)		
	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
802.11a	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
802.11n	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
802.11ac	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 and KDB 6622911 are required to be used for this kind of FCC 15.407 UII device.

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

2.3. General Test Procedures

2.3.1 Conducted Emissions

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

2.3.2 Radiated Emissions

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

3. SYSTEM TEST CONFIGURATION

3.1. Justification

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

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

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

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart E		
FCC Rules	Description of Test	Result
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(e)	6dB Bandwidth	Compliant
§15.407(b)	Radiated Emissions	Compliant
§15.407(b)	Band edge Emissions	Compliant
§15.407(g)	Frequency Stability	Note
§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.

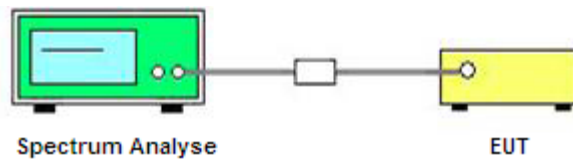
5.1.2. Measuring Instruments and Setting

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 transmitting 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

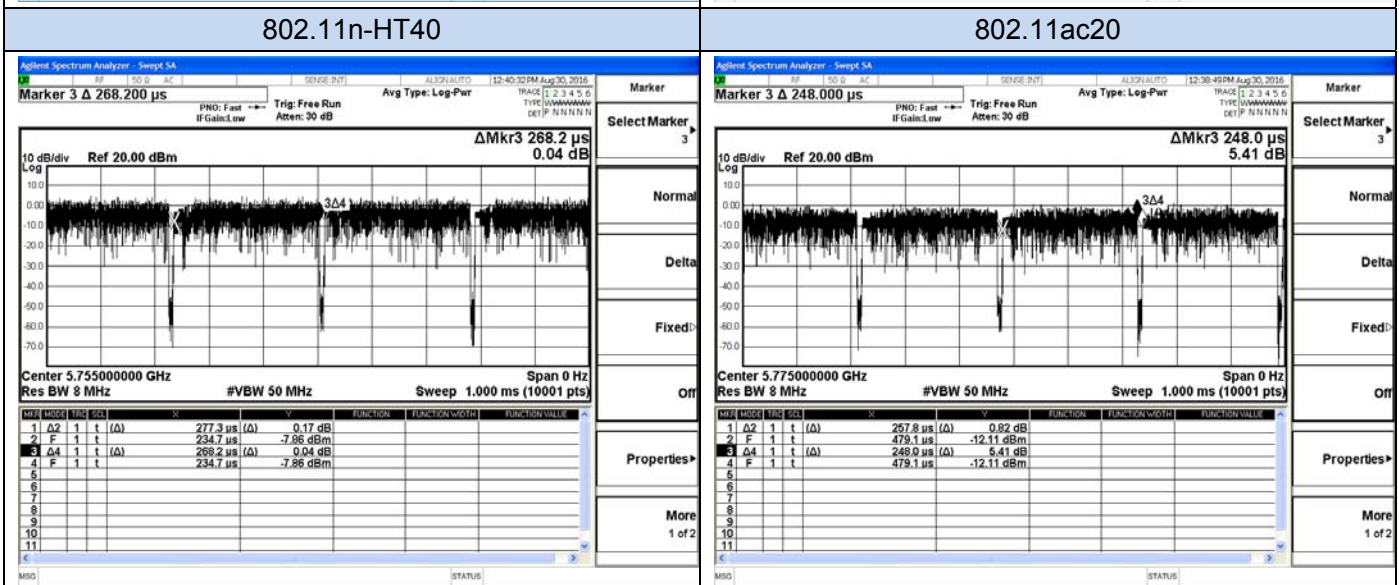
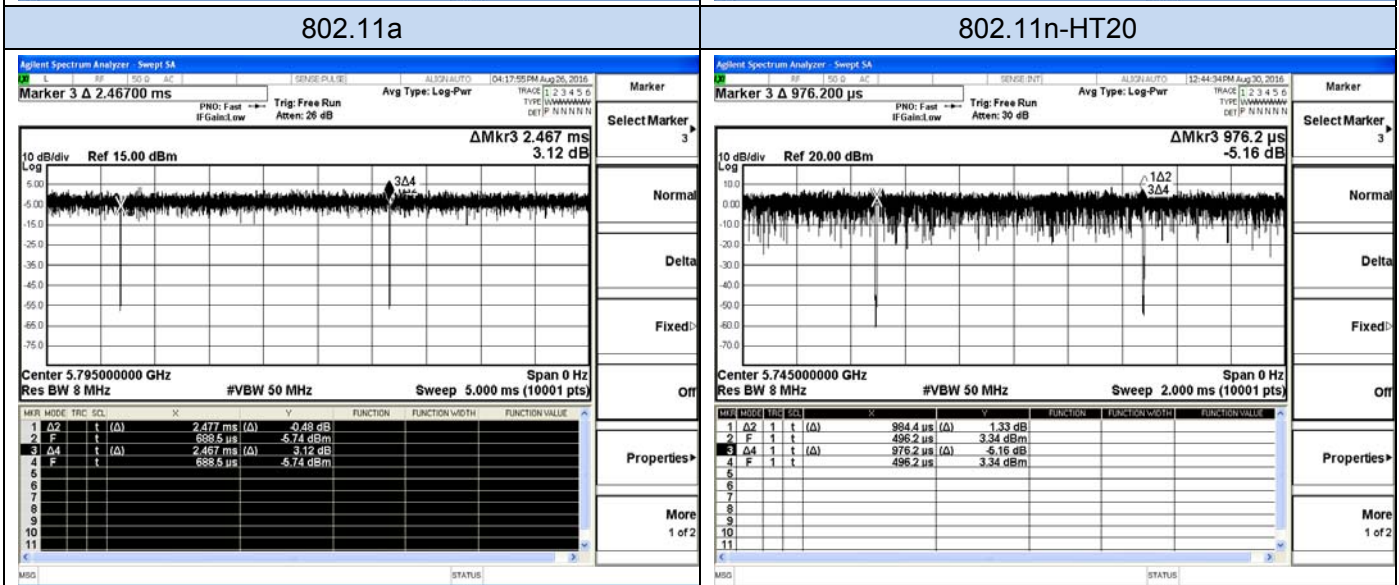
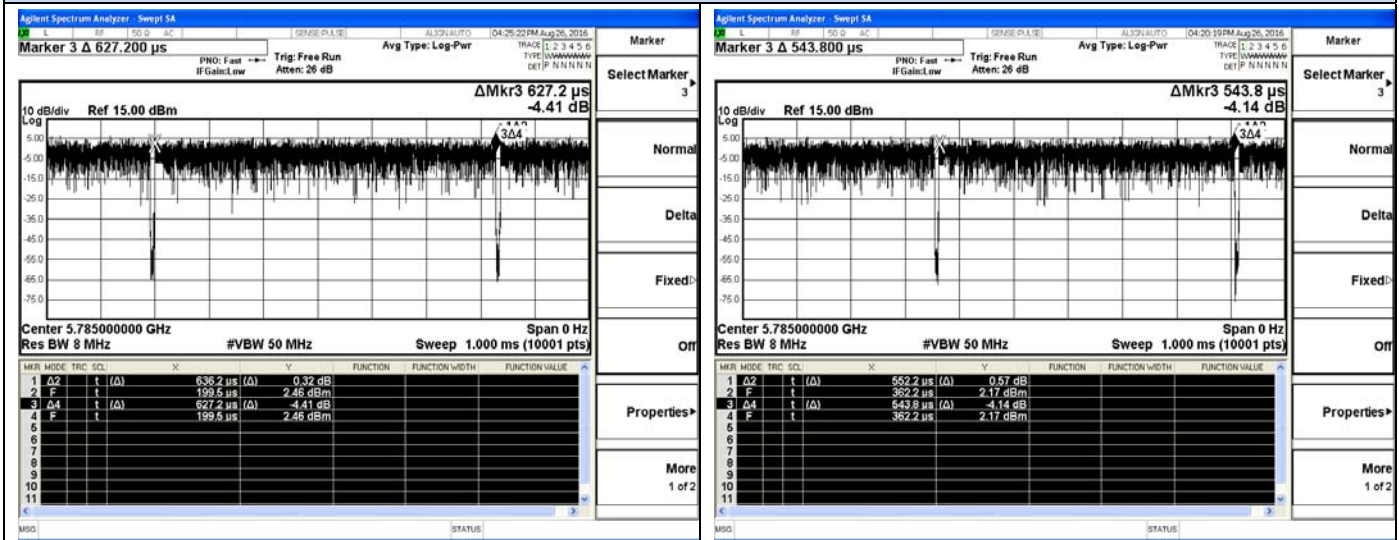
The EUT was programmed to be in continuously transmitting mode.

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	0.6272	0.6362	1	98.59	0.000	0.010
802.11n-HT20	0.5438	0.5522	1	98.48	0.000	0.010
802.11n-HT40	2.4670	2.4770	1	99.60	0.000	0.010
802.11ac20	0.9762	0.9844	1	99.17	0.000	0.010
802.11ac40	0.2682	0.2773	1	96.72	0.145	3.729
802.11ac80	0.2480	0.2578	1	96.20	0.168	4.032

Note: Duty Cycle Correction Factor=10log(1/Duty cycle)

Test plot of On Time and Duty Cycle



5.2. Maximum Conducted Output Power Measurement

5.2.1. Standard Applicable

For 5725~5850MHz

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

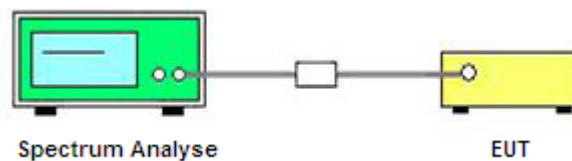
5.2.2. Measuring Instruments and Setting

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



5.2.5. 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°C	Humidity	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	149	5745	12.12	0.000	12.120	30	Complies
	157	5785	11.13	0.000	11.130	30	Complies
	165	5825	11.01	0.000	11.010	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11n- HT20	149	5745	12.37	0.000	12.370	30	Complies
	157	5785	11.42	0.000	11.420	30	Complies
	165	5825	11.24	0.000	11.240	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11n- HT40	151	5755	11.38	0.000	11.380	30	Complies
	159	5795	11.19	0.000	11.190	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11ac 20	149	5745	12.70	0.000	12.700	30	Complies
	157	5785	12.15	0.000	12.150	30	Complies
	165	5825	11.77	0.000	11.770	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11ac 40	151	5755	11.92	0.145	12.065	30	Complies
	159	5795	11.17	0.145	11.315	30	Complies

Test Mode	Channel	Frequency (MHz)	AVG Conducted Power (dBm)	Duty Cycle Factor (dB)	Sum Power (dBm)	Max. Limit (dBm)	Result
802.11ac 80	155	5775	11.83	0.168	11.998	30	Complies

Note:

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

5.3. Power Spectral Density Measurement

5.3.1. Standard Applicable

For 5725~5850MHz

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

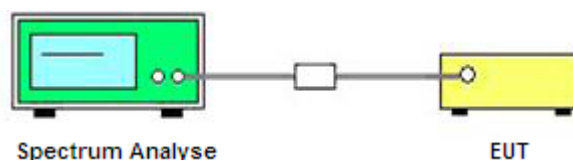
5.3.2. Measuring Instruments and Setting

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 = 300kHz
- 4). Set the VBW $\geq 3 \times$ 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°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a/n/ac

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/300kHz)	10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
802.11a	149	5745	-2.554	2.22	0.000	-0.334	30	Complies
	157	5785	-2.963	2.22	0.000	-0.743	30	Complies
	165	5825	-3.493	2.22	0.000	-1.273	30	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/300kHz)	10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
802.11n-HT20	149	5745	-2.062	2.22	0.000	0.158	30	Complies
	157	5785	-2.585	2.22	0.000	-0.365	30	Complies
	165	5825	-3.074	2.22	0.000	-0.854	30	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/300kHz)	10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
802.11n-HT40	151	5755	-4.043	2.22	0.000	-1.823	30	Complies
	159	5795	-4.558	2.22	0.000	-2.338	30	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/300kHz)	10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
802.11ac20	149	5745	-3.711	2.22	0.000	-1.491	30	Complies
	157	5785	-4.713	2.22	0.000	-2.493	30	Complies
	165	5825	-5.456	2.22	0.000	-3.236	30	Complies

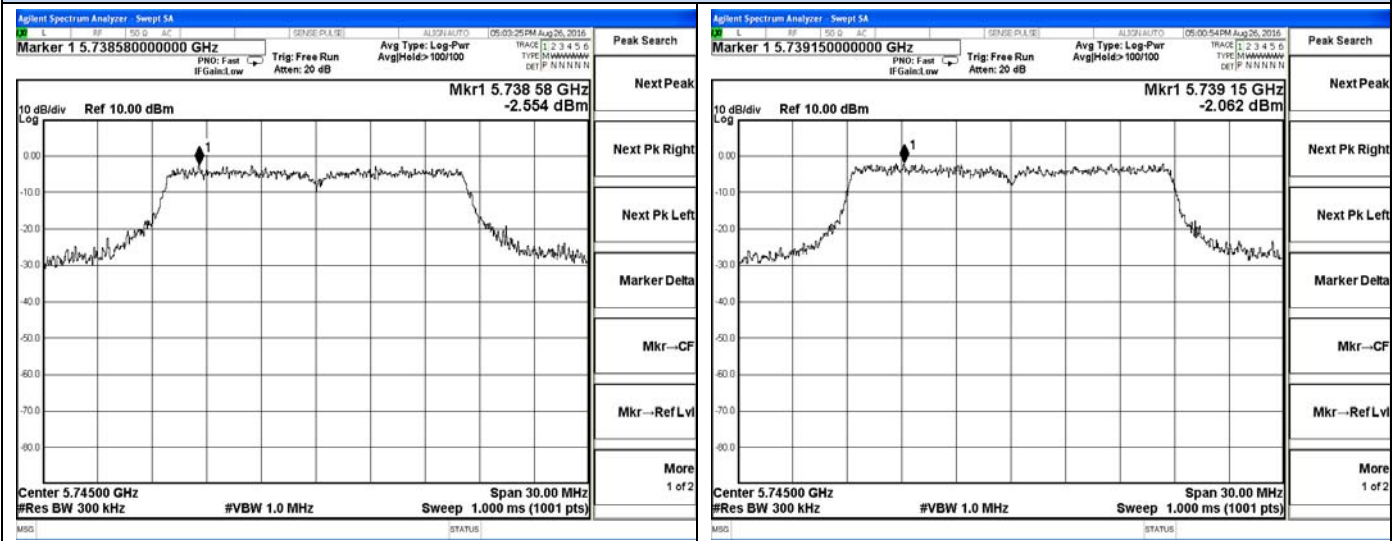
Test Mode	Channel	Frequency (MHz)	Power Density (dBm/300kHz)	10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
802.11ac40	151	5755	-7.077	2.22	0.145	-4.712	30	Complies
	159	5795	-8.209	2.22	0.145	-5.844	30	Complies

Test Mode	Channel	Frequency (MHz)	Power Density (dBm/300kHz)	10log(500kHz/RBW) Factor (dB)	Duty cycle factor (dB)	Sum PSD (dBm/500kHz)	Max. Limit (dBm/500kHz)	Result
802.11ac80	155	5775	-10.401	2.22	0.168	-8.013	30	Complies

Note:

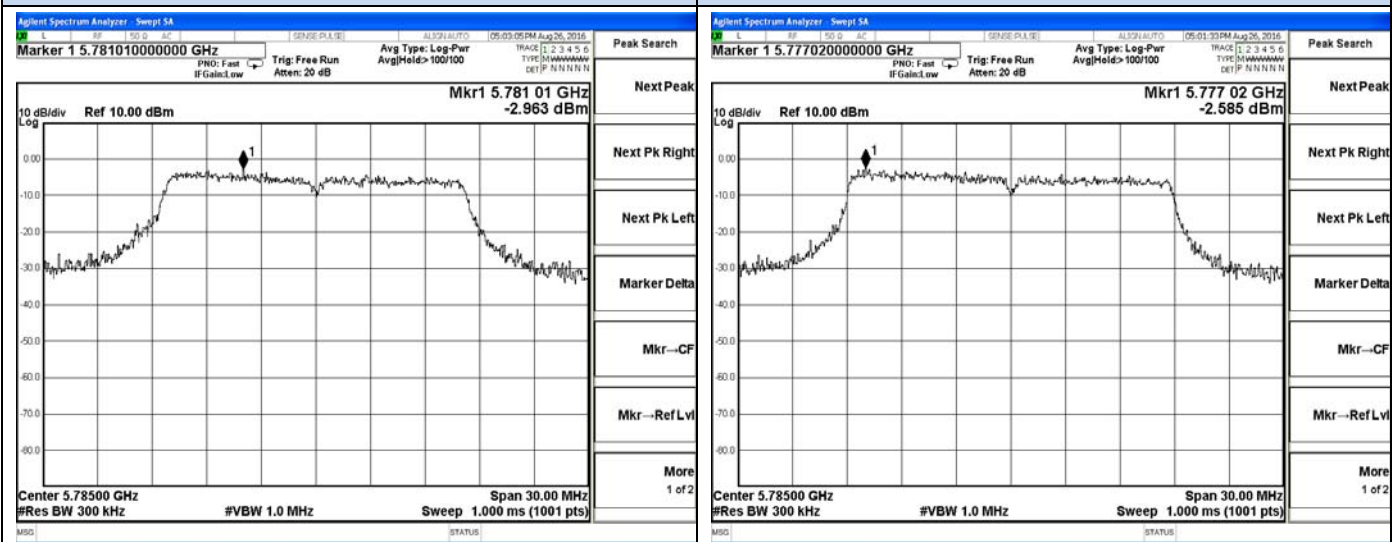
$$\text{Sum PSD(dBm/500kHz)} = \text{PSD(dBm/300kHz)} + \text{Duty cycle factor} + 10\log(500\text{kHz/RBW}) \text{ Factor}$$

Test plot of Power Spectral Density



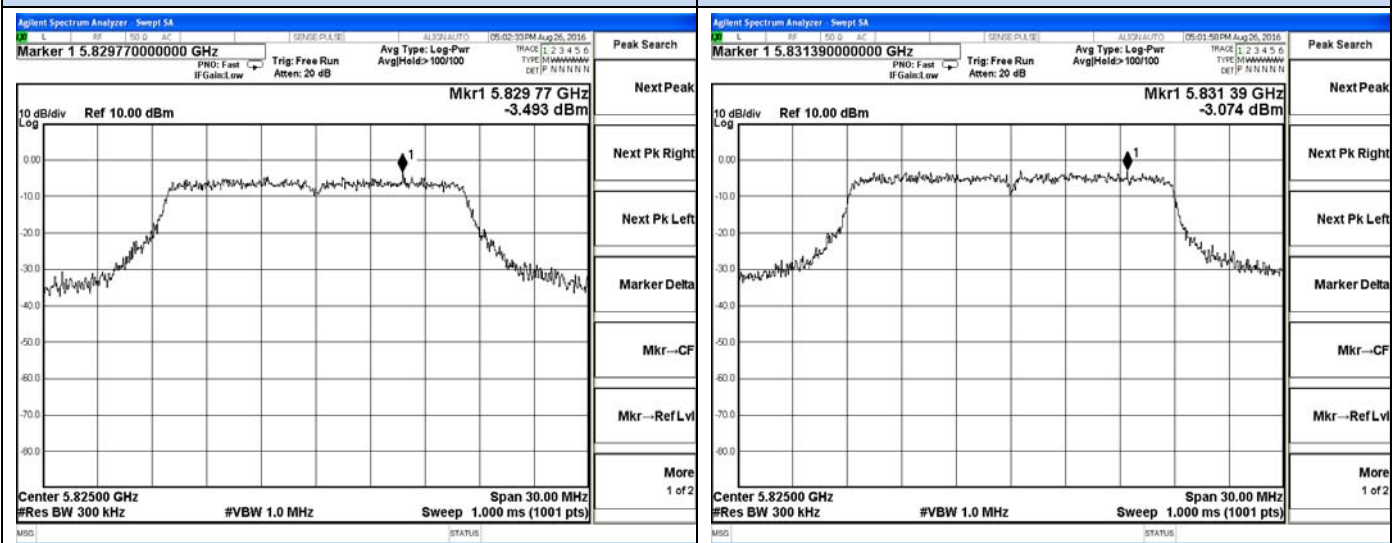
802.11a-5745MHz

802.11n-HT20-5745MHz



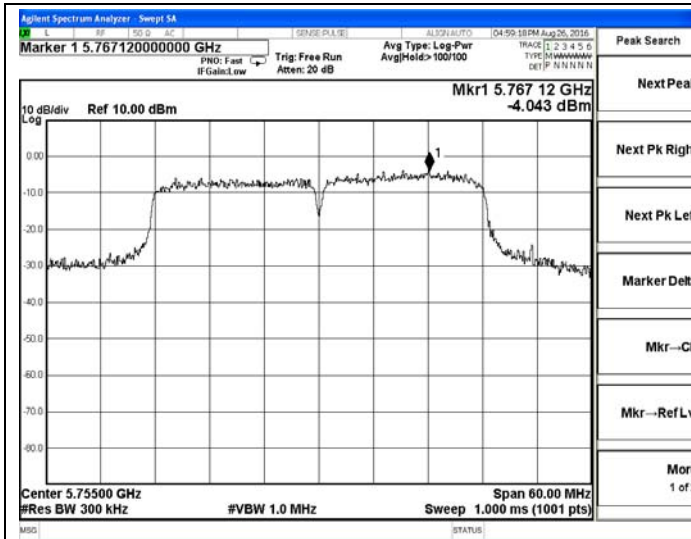
802.11a-5785MHz

802.11n-HT20-5785MHz

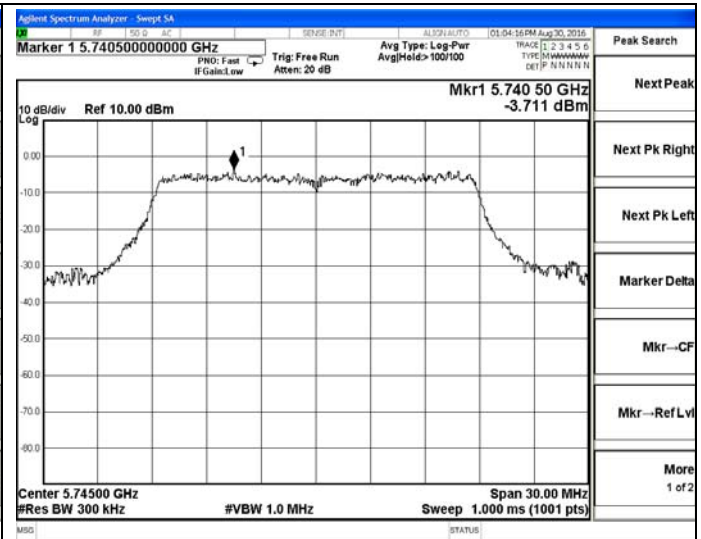


802.11a-5825MHz

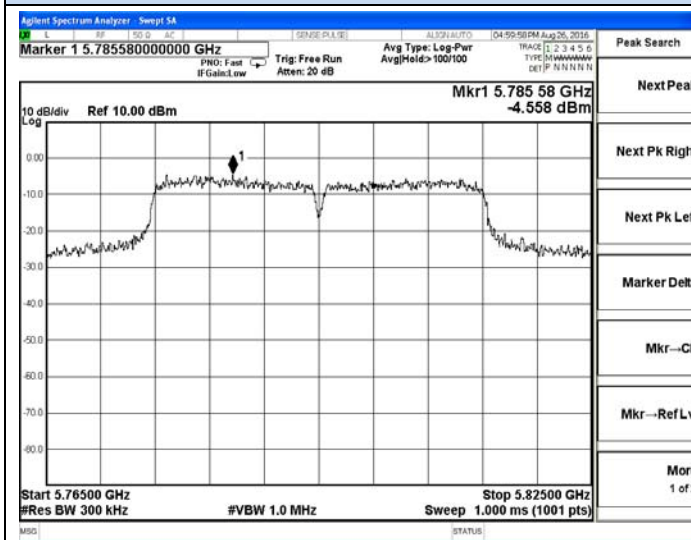
802.11n-HT20-5825MHz



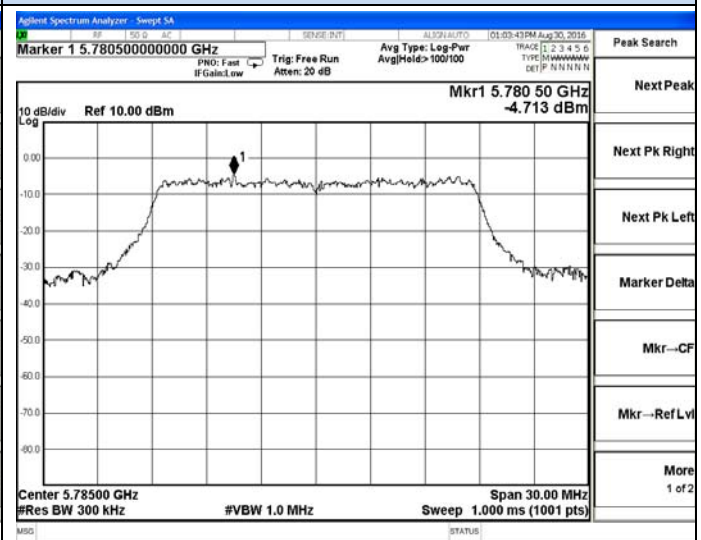
802.11n-HT40-5755MHz



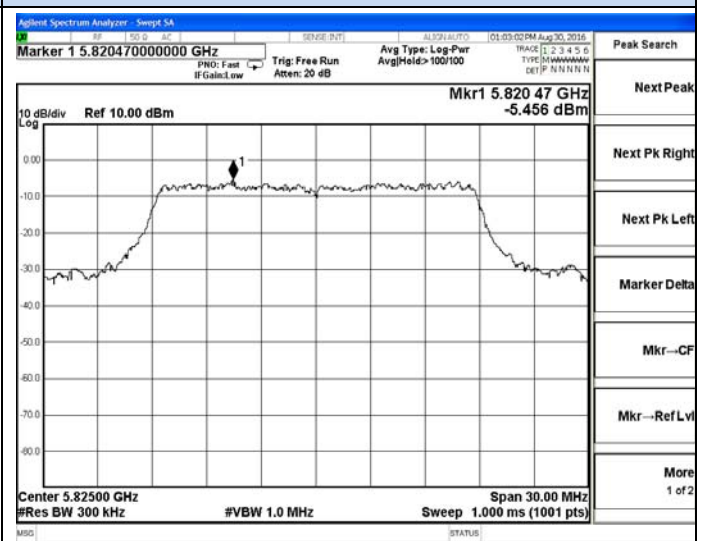
802.11ac20-5745MHz



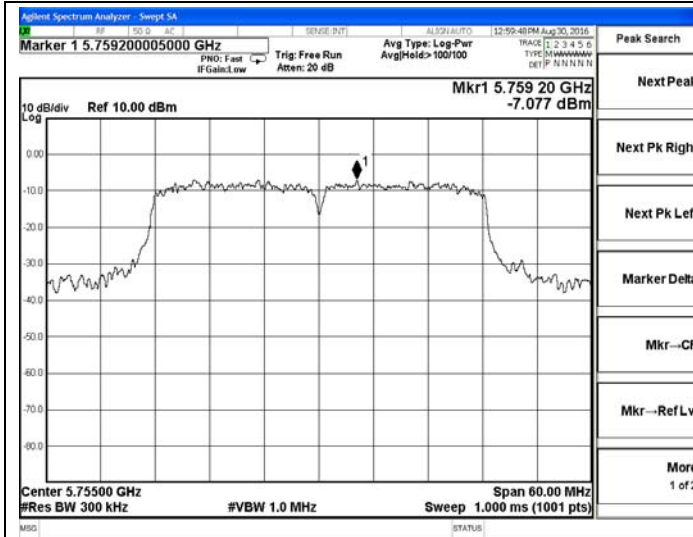
802.11n-HT40-5765MHz



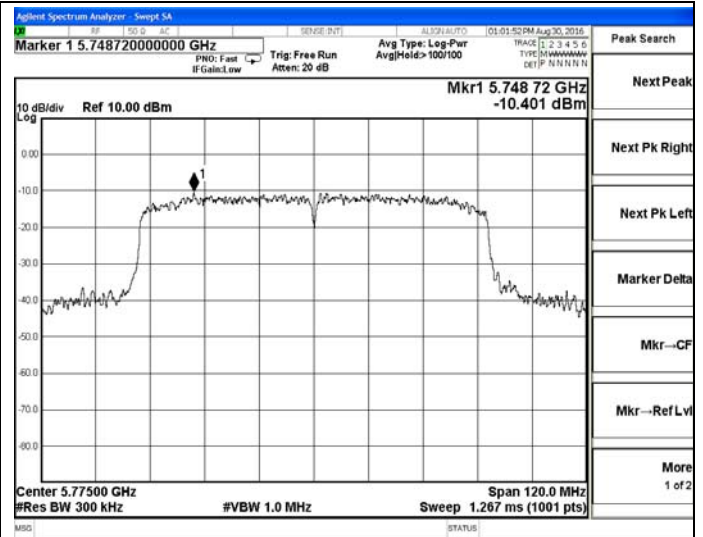
802.11ac20-5785MHz



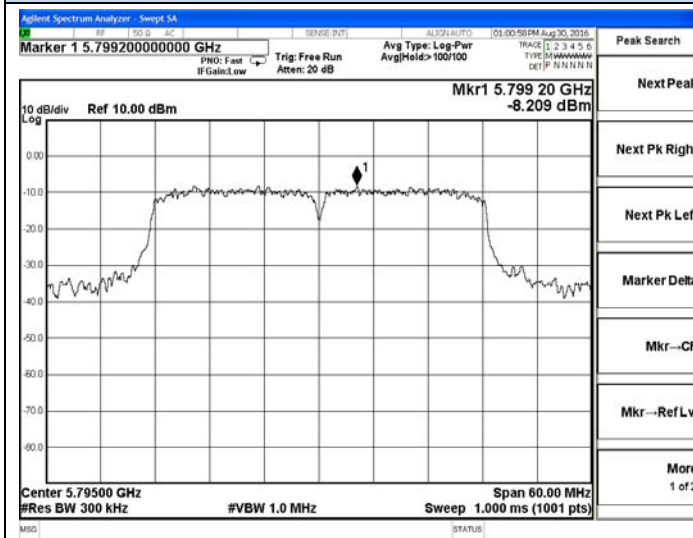
802.11ac20-5825MHz



802.11nac40-5755MHz



802.11ac80-5775MHz



802.11ac40-5795MHz

5.4. 6dB Occupied Bandwidth Measurement

5.4.1. Standard Applicable

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.4.2. Measuring Instruments and Setting

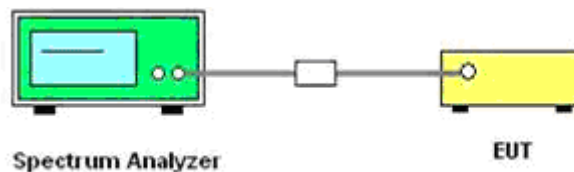
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

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

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 100 kHz and the video bandwidth of 300 kHz were used.
3. Measured the spectrum width with power higher than 6dB 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 6dB Occupied Bandwidth

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

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11a	149	5745	16.50
	157	5785	16.38
	163	5825	16.43

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11n-HT20	149	5745	17.75
	157	5785	17.70
	163	5825	17.68

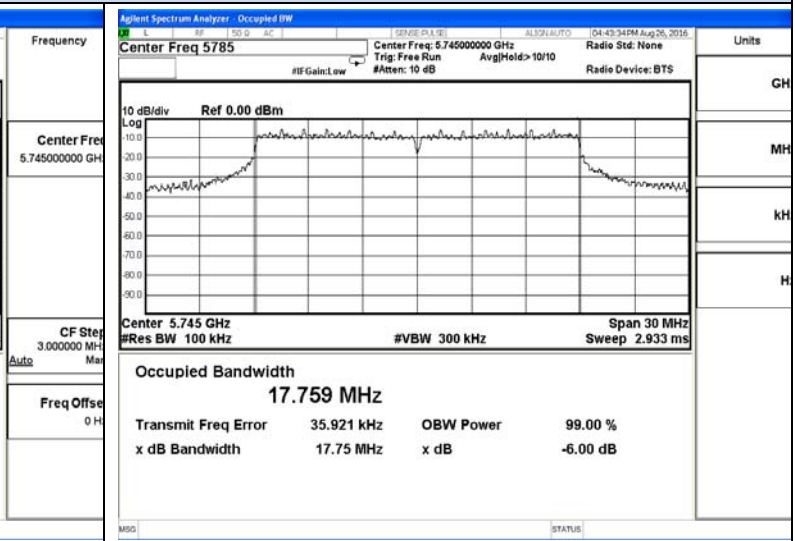
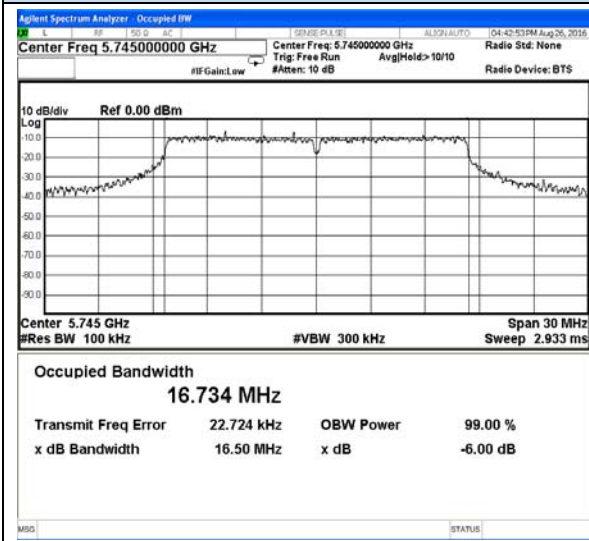
Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11n-HT40	151	5755	33.91
	159	5795	35.82

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11ac20	149	5745	17.62
	157	5785	17.62
	163	5825	17.61

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11ac40	151	5755	35.22
	159	5795	35.23

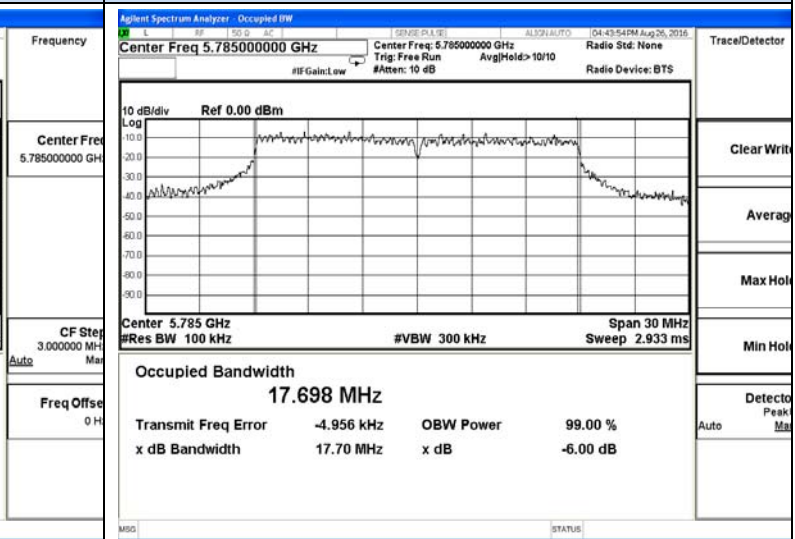
Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
802.11ac80	155	5775	75.15

Test plot of 6dB Occupied Bandwidth



802.11a-5745MHz

802.11n-HT20-5745MHz



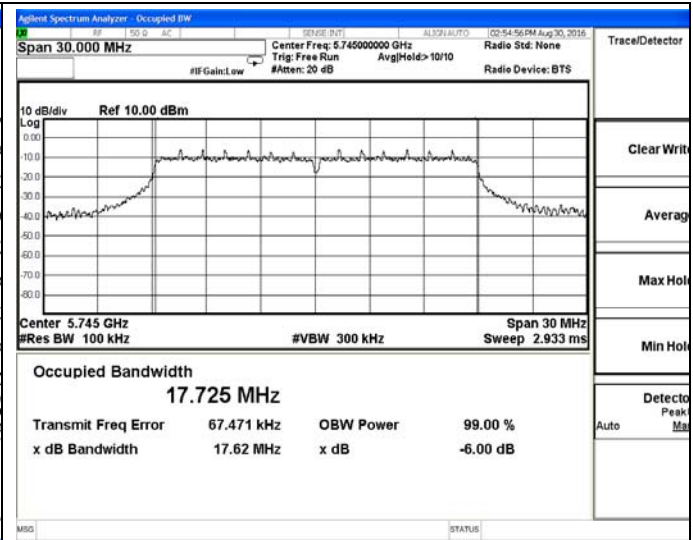
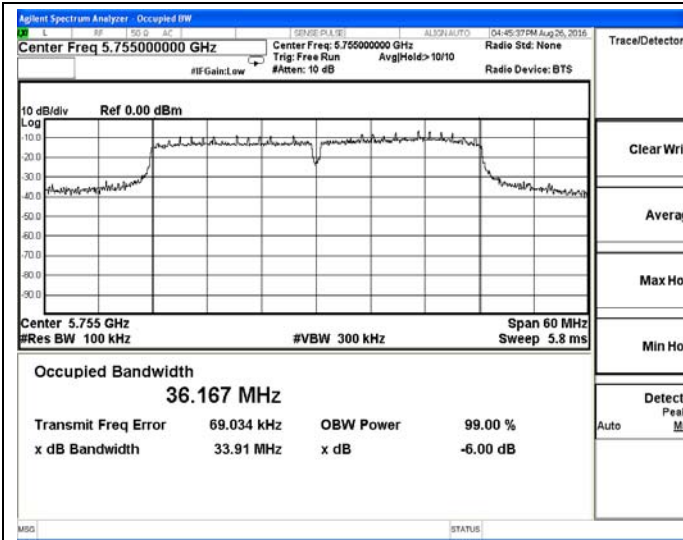
802.11a-5785MHz

802.11n-HT20-5785MHz



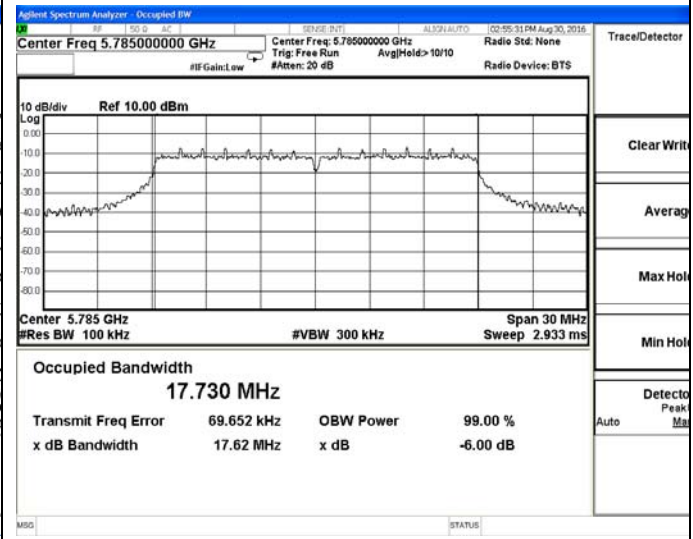
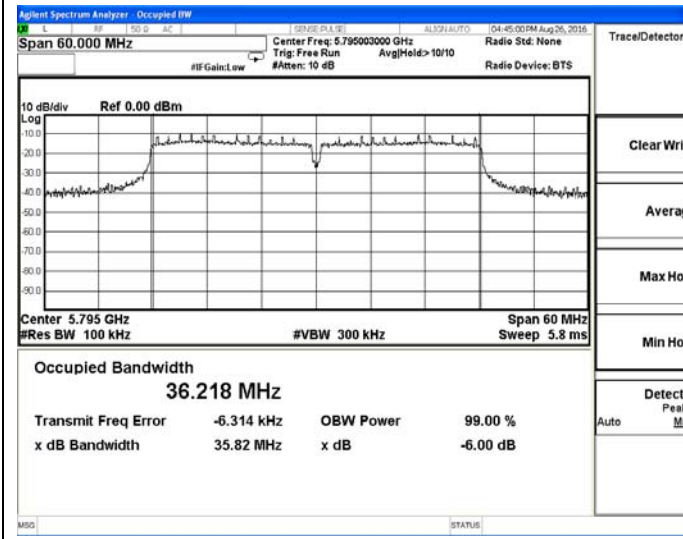
802.11a-5825MHz

802.11n-HT20-5825MHz



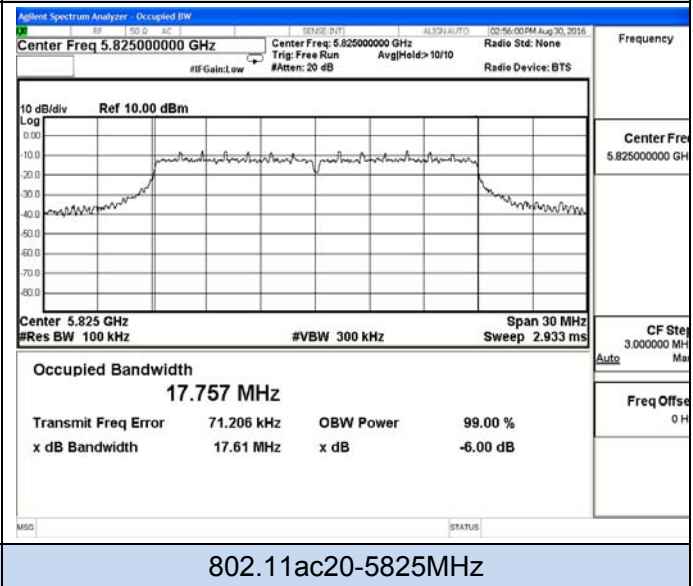
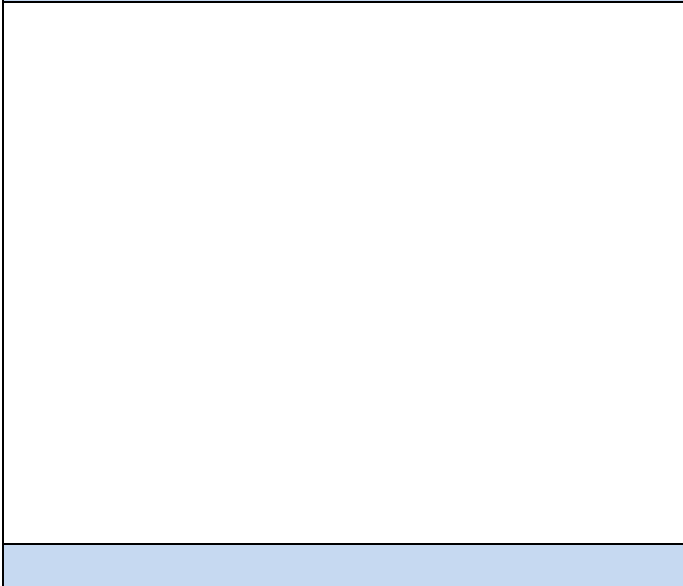
802.11n-HT40-5755MHz

802.11ac20-5745MHz

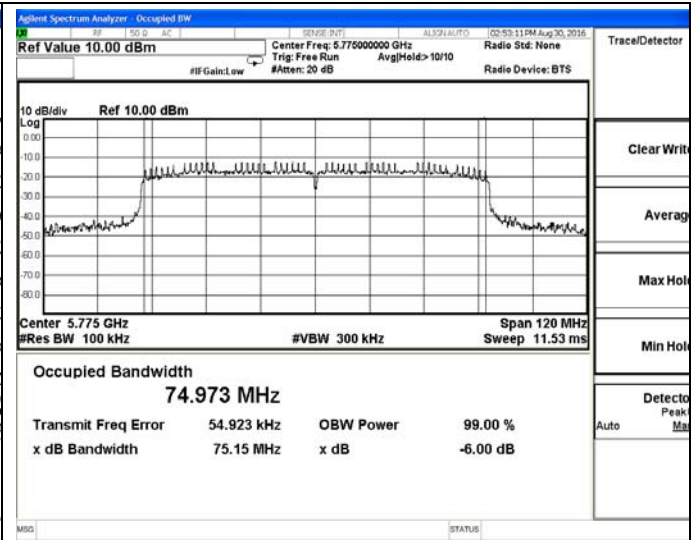
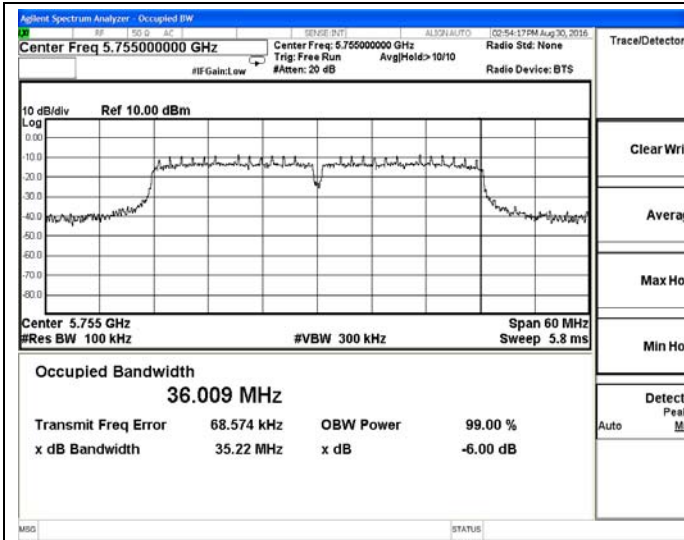


802.11n-HT40-5795MHz

802.11ac20-5785MHz

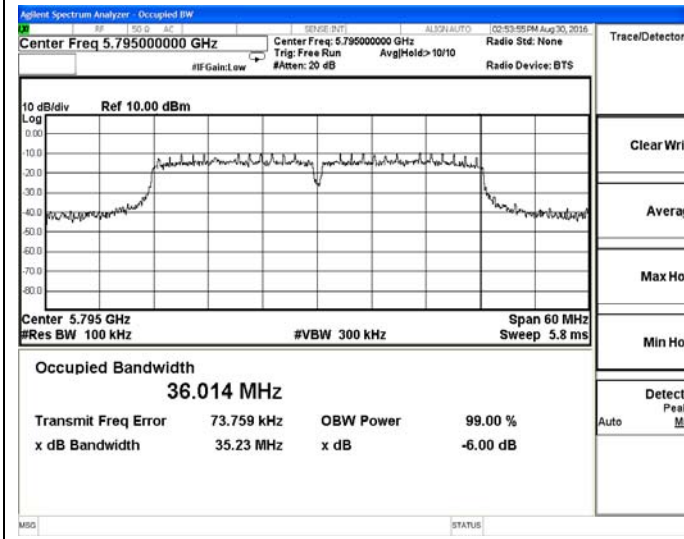


802.11ac20-5825MHz



802.11ac40-5755MHz

802.11ac80-5775MHz



802.11ac40-5795MHz

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 5.725-5.85 GHz band:

All emissions shall be limited to a level of -27 dBm/MHz(68.2dBuV/m at 3m) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz(105.2dBuV/m at 3m) at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6(110.8dBuV/m at 3m) dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz(122.2dBuV/m at 3m) at the band edge.

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
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
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 ($\pm 45^\circ$) 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 ($\pm 45^\circ$) 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:

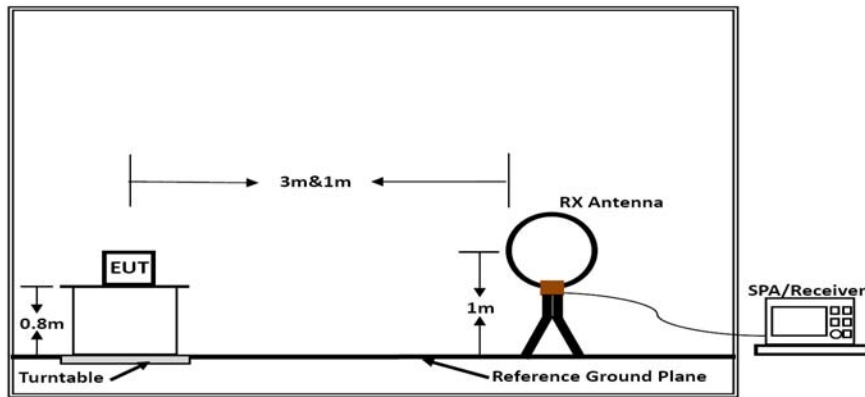
- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

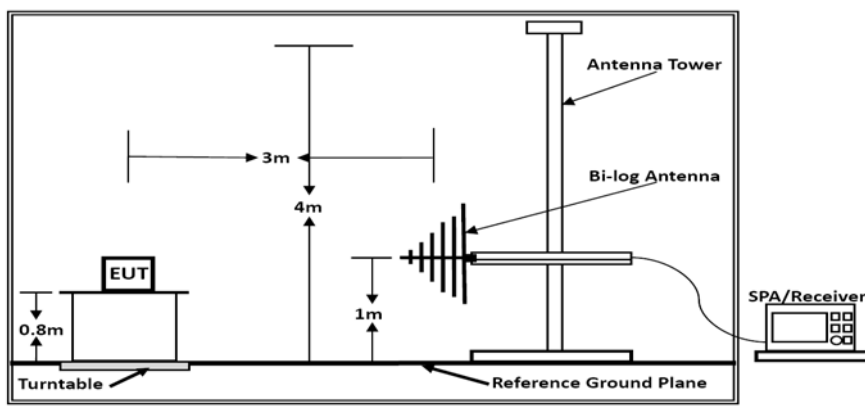
- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.5.4. Test Setup Layout

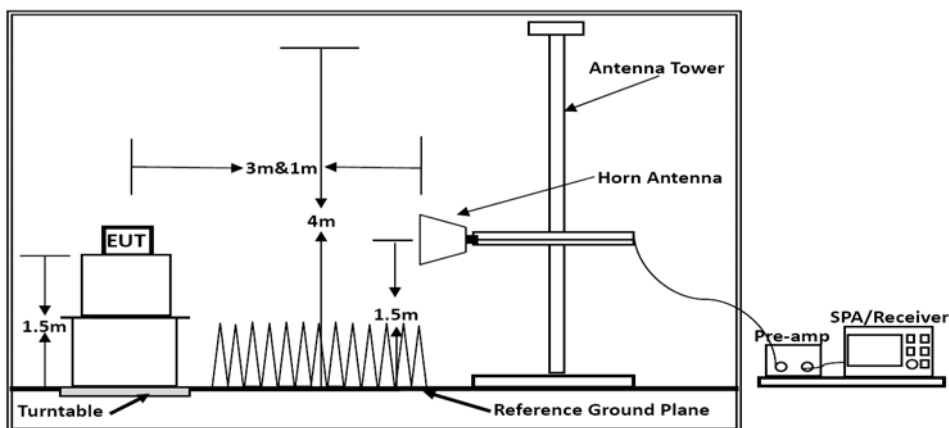
For radiated emissions below 30MHz



Below 30MHz



Below 1GHz



Above 1GHz

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

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$ (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°C	Humidity	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.

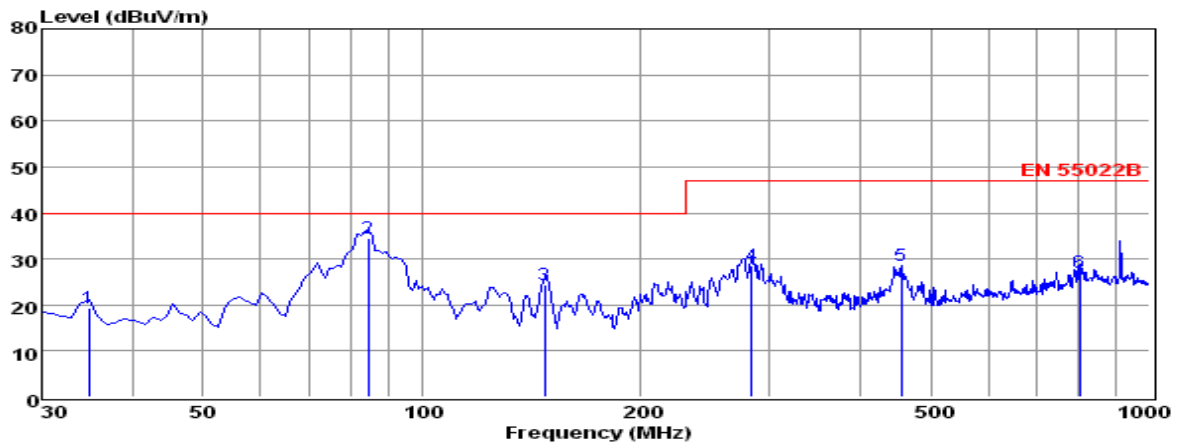
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

Temperature	25°C	Humidity	60%
Test Engineer	Jacky	Configurations	802.11a, 5825MHz

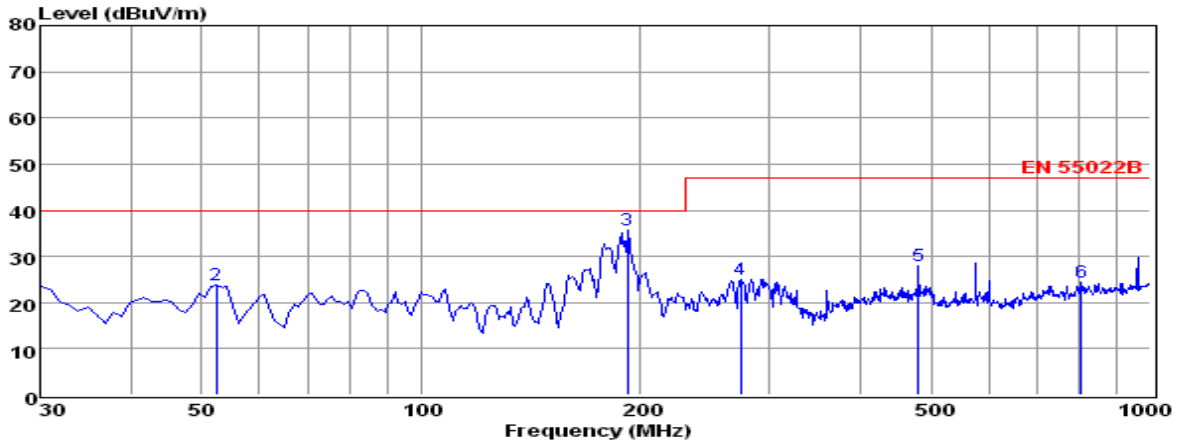
Test result for 802.11a-5825MHz



Env./Ins: 24°C/56%
 pol: HORIZONTAL

	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	34.85	6.49	0.41	12.30	19.20	40.00	-20.80	QP
2	84.32	23.77	0.54	10.07	34.38	40.00	-5.62	QP
3	147.37	15.31	0.86	8.24	24.41	40.00	-15.59	QP
4	284.14	14.82	1.00	12.75	28.57	47.00	-18.43	QP
5	455.83	11.47	1.39	15.58	28.44	47.00	-18.56	QP
6	801.15	5.20	1.72	20.07	26.99	47.00	-20.01	QP

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



Env./Ins: 24 °C / 56%
 pol: VERTICAL

	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	30.00	10.77	0.39	12.33	23.49	40.00	-16.51	QP
2	52.31	10.11	0.46	13.14	23.71	40.00	-16.29	QP
3	191.99	24.47	0.76	10.56	35.79	40.00	-4.21	QP
4	274.44	11.58	1.04	12.50	25.12	47.00	-21.88	QP
5	480.08	10.57	1.31	16.07	27.95	47.00	-19.05	QP
6	804.06	2.50	1.76	20.10	24.36	47.00	-22.64	QP

Note: 1. All readings are Quasi-peak values.
 2. Measured= Reading + Antenna Factor + Cable Loss
 3. The emission 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-5825MHz).
 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 149

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
17.235	59.28	33.23	35.04	3.91	61.38	68.2	-6.82	Peak	Horizontal
17.235	43.16	33.23	35.04	3.91	45.26	54.0	-8.74	Average	Horizontal
17.235	56.94	33.23	35.04	3.91	59.04	68.2	-9.16	Peak	Vertical
17.235	42.68	33.23	35.04	3.91	44.78	54.0	-9.22	Average	Vertical

Channel 157

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
17.355	59.8	33.27	35.15	3.93	61.85	68.2	-6.35	Peak	Horizontal
17.355	43.32	33.27	35.15	3.93	45.37	54.0	-8.63	Average	Horizontal
17.355	57.01	33.27	35.15	3.93	59.06	68.2	-9.14	Peak	Vertical
17.355	42.09	33.27	35.15	3.93	44.14	54.0	-9.86	Average	Vertical

Channel 163

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
17.475	59.26	33.32	35.14	3.97	61.41	68.2	-6.79	Peak	Horizontal
17.475	43.64	33.32	35.14	3.97	45.79	54.0	-8.21	Average	Horizontal
17.475	58.40	33.32	35.14	3.97	60.55	68.2	-7.65	Peak	Vertical
17.475	41.87	33.32	35.14	3.97	44.02	54.0	-9.98	Average	Vertical

802.11n-HT20

Channel 149

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
17.235	60.16	33.23	35.04	3.91	62.26	68.2	-5.94	Peak	Horizontal
17.235	43.93	33.23	35.04	3.91	46.03	54.0	-7.97	Average	Horizontal
17.235	58.31	33.23	35.04	3.91	60.41	68.2	-7.79	Peak	Vertical
17.235	42.68	33.23	35.04	3.91	44.78	54.0	-9.22	Average	Vertical

Channel 157

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
17.355	60.08	33.27	35.15	3.93	62.13	68.2	-6.07	Peak	Horizontal
17.355	44.72	33.27	35.15	3.93	46.77	54.0	-7.23	Average	Horizontal
17.355	58.04	33.27	35.15	3.93	60.09	68.2	-8.11	Peak	Vertical
17.355	42.51	33.27	35.15	3.93	44.56	54.0	-9.44	Average	Vertical

Channel 163

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
17.475	60.10	33.32	35.14	3.97	62.25	68.2	-5.95	Peak	Horizontal
17.475	44.48	33.32	35.14	3.97	46.63	54.0	-7.37	Average	Horizontal
17.475	58.63	33.32	35.14	3.97	60.78	68.2	-7.42	Peak	Vertical
17.475	42.99	33.32	35.14	3.97	45.14	54.0	-8.86	Average	Vertical

802.11n-HT40

Channel 151

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
17.265	59.29	33.23	35.04	3.91	61.39	68.2	-6.81	Peak	Horizontal
17.265	43.16	33.23	35.04	3.91	45.26	54.0	-8.74	Average	Horizontal
17.265	57.94	33.23	35.04	3.91	60.04	68.2	-8.16	Peak	Vertical
17.265	42.68	33.23	35.04	3.91	44.78	54.0	-9.22	Average	Vertical

Channel 159

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
17.385	59.79	33.27	35.15	3.93	61.84	68.2	-6.36	Peak	Horizontal
17.385	43.40	33.27	35.15	3.93	45.45	54.0	-8.55	Average	Horizontal
17.385	58.97	33.27	35.15	3.93	61.02	68.2	-7.18	Peak	Vertical
17.385	42.93	33.27	35.15	3.93	44.98	54.0	-9.02	Average	Vertical

802.11ac20

Channel 149

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
17.235	62.14	33.23	35.04	3.91	64.24	68.2	-3.96	Peak	Horizontal
17.235	45.01	33.23	35.04	3.91	47.11	54.0	-6.89	Average	Horizontal
17.235	58.91	33.23	35.04	3.91	61.01	68.2	-7.19	Peak	Vertical
17.235	43.35	33.23	35.04	3.91	45.45	54.0	-8.55	Average	Vertical

Channel 157

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
17.355	61.60	33.27	35.15	3.93	63.65	68.2	-4.55	Peak	Horizontal
17.355	44.09	33.27	35.15	3.93	46.14	54.0	-7.86	Average	Horizontal
17.355	58.97	33.27	35.15	3.93	61.02	68.2	-7.18	Peak	Vertical
17.355	43.70	33.27	35.15	3.93	45.75	54.0	-8.25	Average	Vertical

Channel 163

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
17.475	61.37	33.32	35.14	3.97	63.52	68.2	-4.68	Peak	Horizontal
17.475	44.86	33.32	35.14	3.97	47.01	54.0	-6.99	Average	Horizontal
17.475	58.92	33.32	35.14	3.97	61.07	68.2	-7.13	Peak	Vertical
17.475	43.31	33.32	35.14	3.97	45.46	54.0	-8.54	Average	Vertical

802.11ac40

Channel 151

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
17.265	59.31	33.23	35.04	3.91	61.41	68.2	-6.79	Peak	Horizontal
17.265	42.68	33.23	35.04	3.91	44.78	54.0	-9.22	Average	Horizontal
17.265	58.15	33.23	35.04	3.91	60.25	68.2	-7.95	Peak	Vertical
17.265	40.92	33.23	35.04	3.91	43.02	54.0	-10.98	Average	Vertical

Channel 159

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
17.385	59.71	33.27	35.15	3.93	61.76	68.2	-6.44	Peak	Horizontal
17.385	42.73	33.27	35.15	3.93	44.78	54.0	-9.22	Average	Horizontal
17.385	58.01	33.27	35.15	3.93	60.06	68.2	-8.14	Peak	Vertical
17.385	41.36	33.27	35.15	3.93	43.41	54.0	-10.59	Average	Vertical

802.11ac80

Channel 155

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
17.325	59.27	33.27	35.15	3.93	61.32	68.2	-6.88	Peak	Horizontal
17.325	42.11	33.27	35.15	3.93	44.16	54.0	-9.84	Average	Horizontal
17.325	58.53	33.27	35.15	3.93	60.58	68.2	-7.62	Peak	Vertical
17.325	41.20	33.27	35.15	3.93	43.25	54.0	-10.75	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 Emissions

802.11a						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
5650.0000	-59.213	2.3	38.920	68.20	-29.280	Peak
5700.0000	-50.014	2.3	49.244	105.20	-55.956	Peak
5720.0000	-32.621	2.3	64.727	110.80	-46.073	Peak
5725.0000	-23.990	2.3	74.002	122.20	-48.198	Peak
5850.0000	-39.961	2.3	53.474	122.20	-68.726	Peak
5855.0000	-42.457	2.3	51.908	110.80	-58.892	Peak
5875.0000	-51.930	2.3	41.361	105.20	-63.839	Peak
5925.0000	-60.516	2.3	38.516	68.20	-29.684	Peak

802.11n-HT20						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
5650.000	-55.031	2.3	42.469	68.20	-25.731	Peak
5700.000	-46.256	2.3	51.244	105.20	-53.956	Peak
5720.000	-30.308	2.3	67.192	110.80	-43.608	Peak
5725.000	-30.655	2.3	66.845	122.20	-55.355	Peak
5850.000	-53.833	2.3	43.667	122.20	-78.533	Peak
5855.000	-54.073	2.3	43.427	110.80	-67.373	Peak
5875.000	-58.269	2.3	39.231	105.20	-65.969	Peak
5925.000	-60.312	2.3	37.188	68.20	-31.012	Peak

802.11n-HT40

Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
5650.000	-55.580	2.3	41.920	68.20	-26.280	Peak
5700.000	-47.374	2.3	50.126	105.20	-55.074	Peak
5720.000	-26.961	2.3	70.539	110.80	-40.261	Peak
5725.000	-28.262	2.3	69.238	122.20	-52.962	Peak
5850.000	-48.118	2.3	49.382	122.20	-72.818	Peak
5855.000	-49.048	2.3	48.452	110.80	-62.348	Peak
5875.000	-52.952	2.3	44.548	105.20	-60.652	Peak
5925.000	-60.625	2.3	36.875	68.20	-31.325	Peak

802.11ac20

Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
5650.000	-57.093	2.3	40.407	68.20	-27.793	Peak
5700.000	-54.046	2.3	43.454	105.20	-61.746	Peak
5720.000	-38.464	2.3	59.036	110.80	-51.764	Peak
5725.000	-29.212	2.3	68.288	122.2	-53.912	Peak
5850.000	-37.518	2.3	59.982	122.20	-62.218	Peak
5855.000	-46.270	2.3	51.230	110.80	-59.570	Peak
5875.000	-57.871	2.3	39.629	105.20	-65.571	Peak
5925.000	-58.923	2.3	38.577	68.20	-29.623	Peak

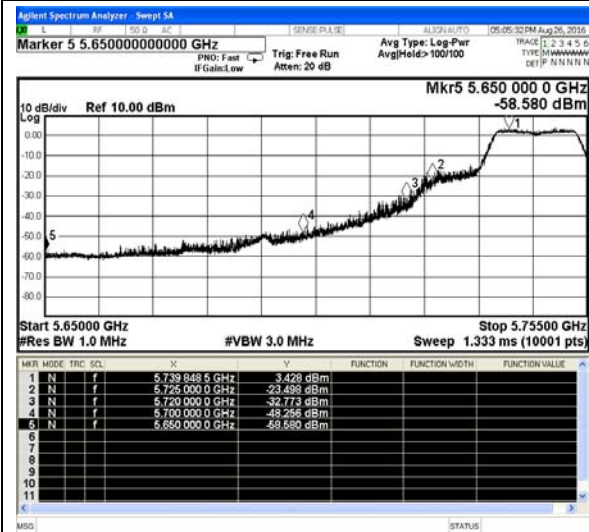
802.11ac40						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
5650.000	-55.031	2.3	42.469	68.20	-25.731	Peak
5700.000	-46.256	2.3	51.244	105.20	-53.956	Peak
5720.000	-30.308	2.3	67.192	110.80	-43.608	Peak
5725.000	-30.655	2.3	66.845	122.2	-55.355	Peak
5850.000	-53.833	2.3	43.667	122.20	-78.533	Peak
5855.000	-54.073	2.3	43.427	110.80	-67.373	Peak
5875.000	-58.269	2.3	39.231	105.20	-65.969	Peak
5925.000	-60.312	2.3	37.188	68.20	-31.012	Peak

802.11ac80						
Freq. MHz	Reading Level dBm	Antenna Gain dBi	Measured E dBuV/m	Limit dBuV/m	Margin dB	Remark
5650.000	-51.550	2.3	45.950	68.20	-22.250	Peak
5700.000	-39.029	2.3	58.471	105.20	-46.729	Peak
5720.000	-34.244	2.3	63.256	110.80	-47.544	Peak
5725.000	-32.580	2.3	64.920	122.20	-57.280	Peak
5850.000	-42.150	2.3	55.350	122.20	-66.850	Peak
5855.000	-44.533	2.3	52.967	110.80	-57.833	Peak
5875.000	-50.144	2.3	47.356	105.20	-57.844	Peak
5925.000	-60.116	2.3	37.384	68.20	-30.816	Peak

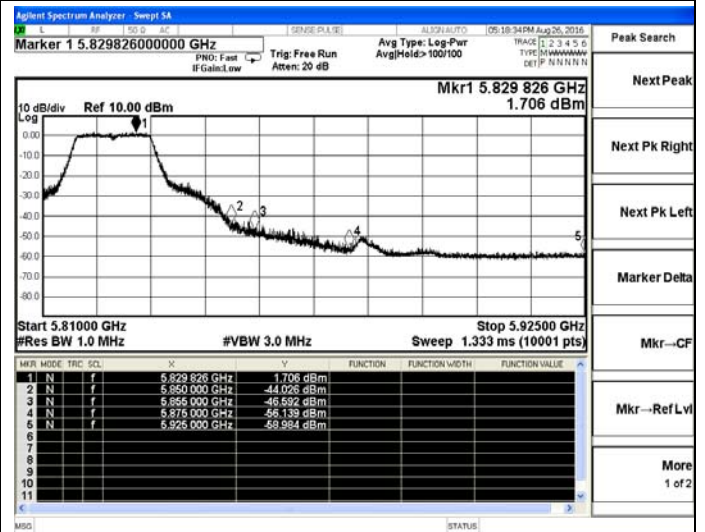
Note:

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

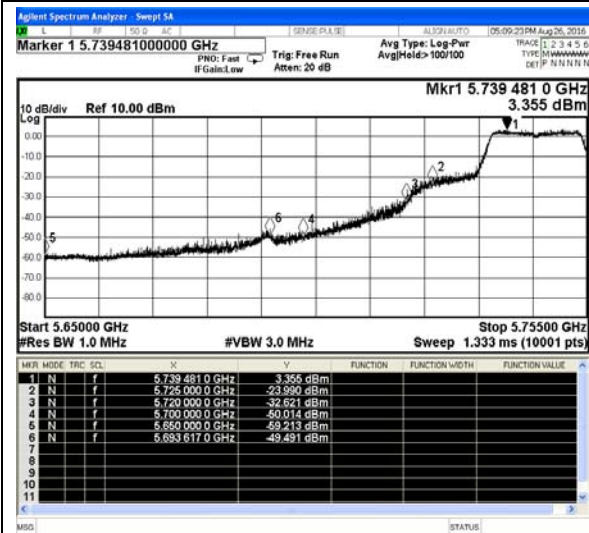
Test plot of Band Edge and Restricted band Emissions



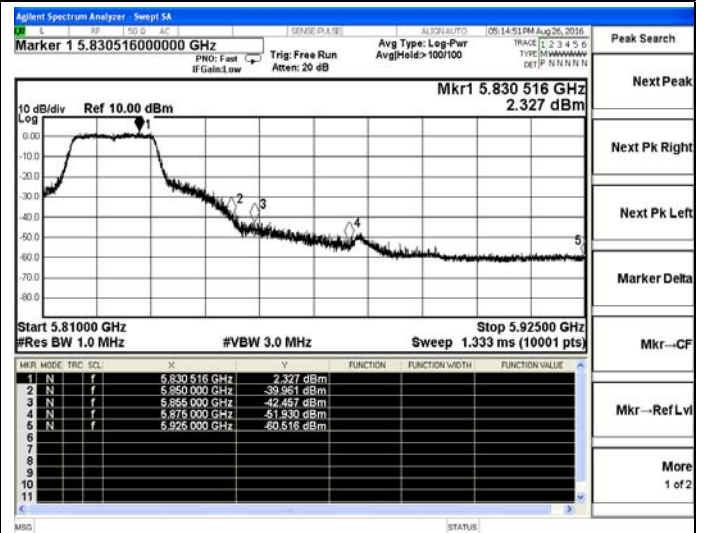
802.11a-Low channel(Peak)



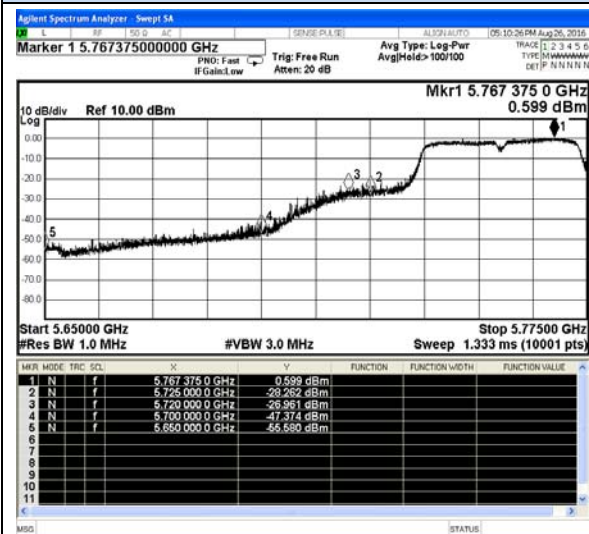
802.11a-High channel(Peak)



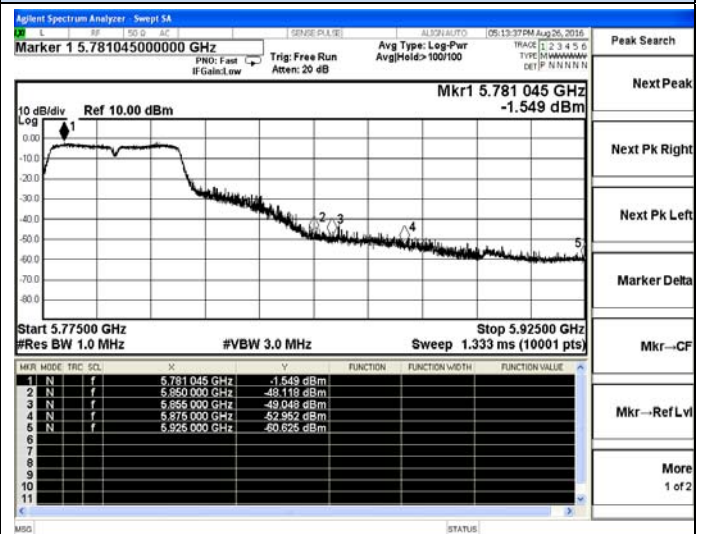
802.11n-HT20-Low channel(Peak)



802.11n-HT20-High channel(Peak)

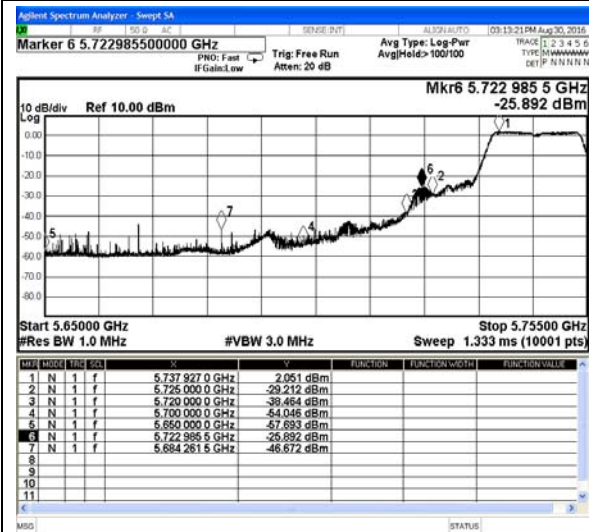


802.11n-HT40-Low channel(Peak)

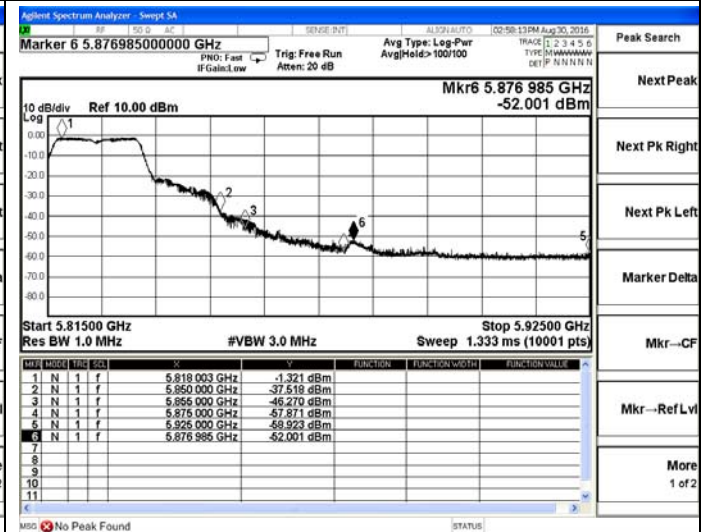


802.11n-HT40-High channel(Peak)

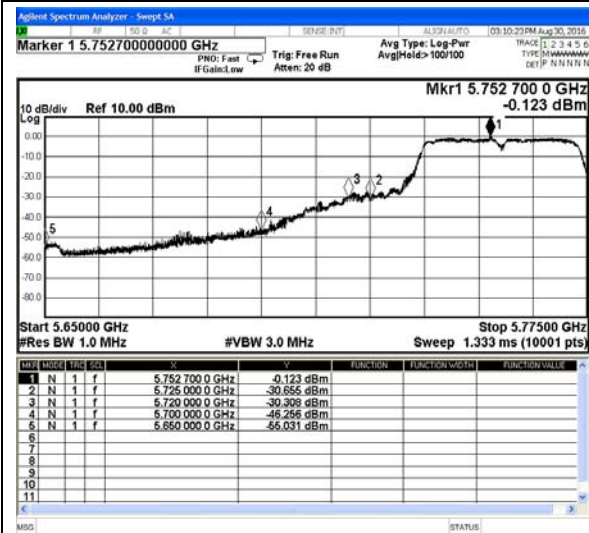
Test plot of Band Edge and Restricted band Emissions



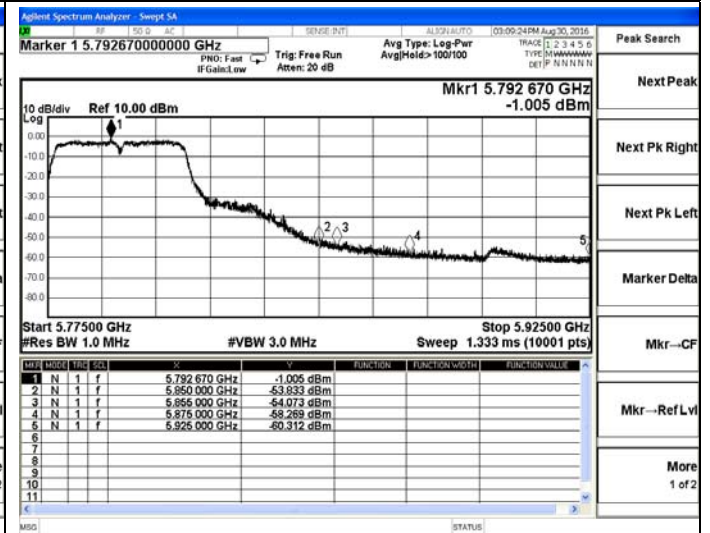
802.11ac20-Low channel(Peak)



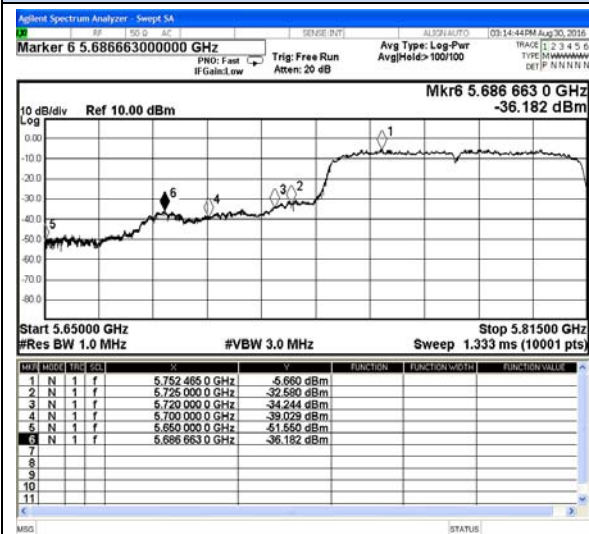
802.11ac20-High channel(Peak)



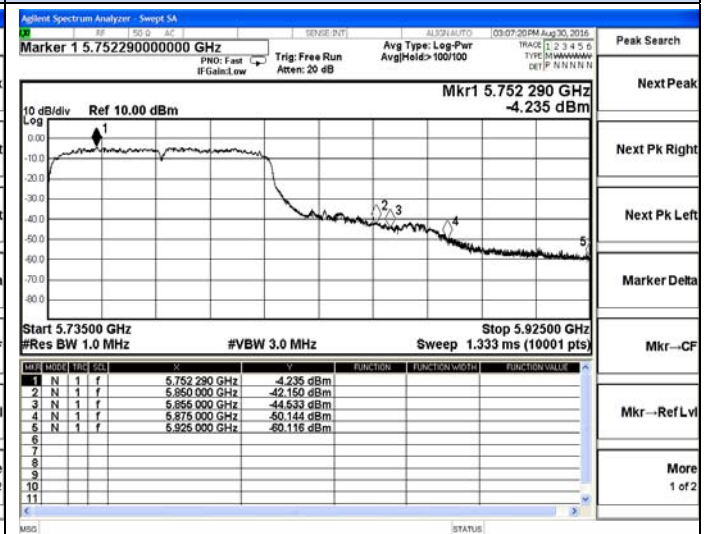
802.11ac40-Low channel(Peak)



802.11ac40-High channel(Peak)



802.11ac80-Low channel(Peak)



802.11ac80-High channel(Peak)

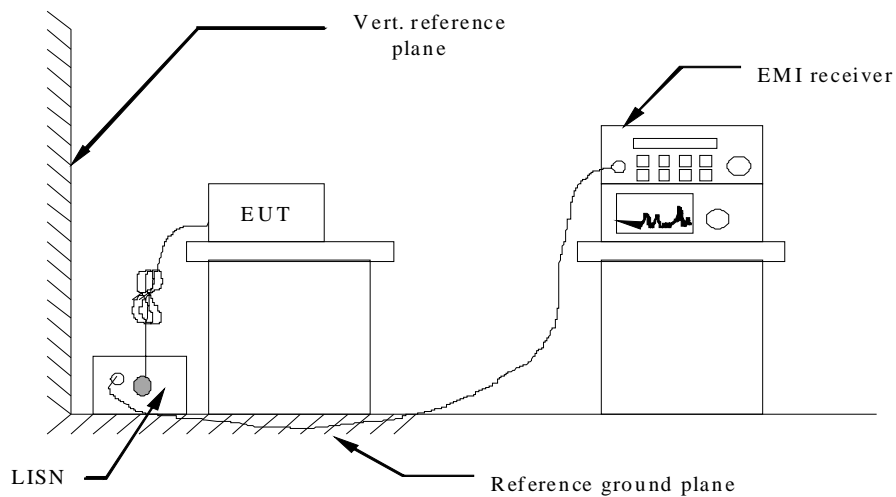
5.6. Power line conducted emissions

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

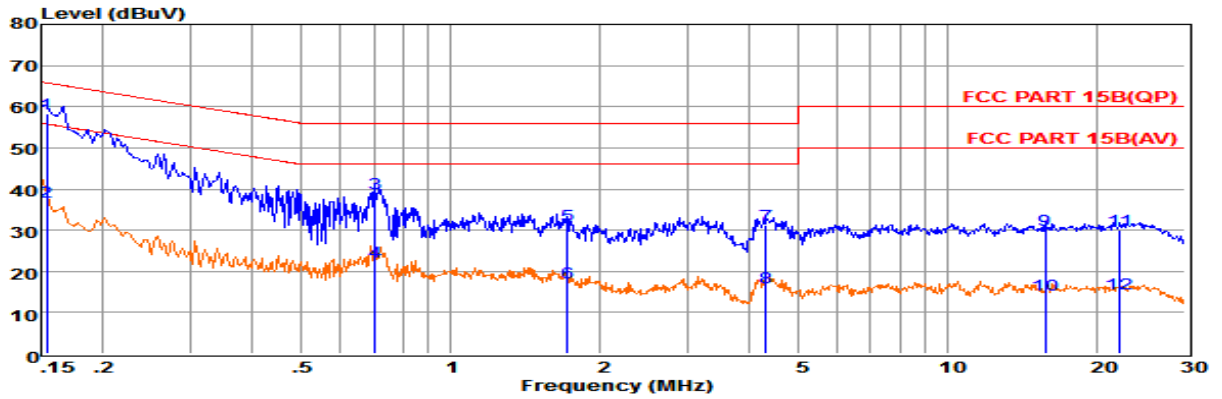


5.6.3 Test Results

PASS.

The test data please refer to following page.

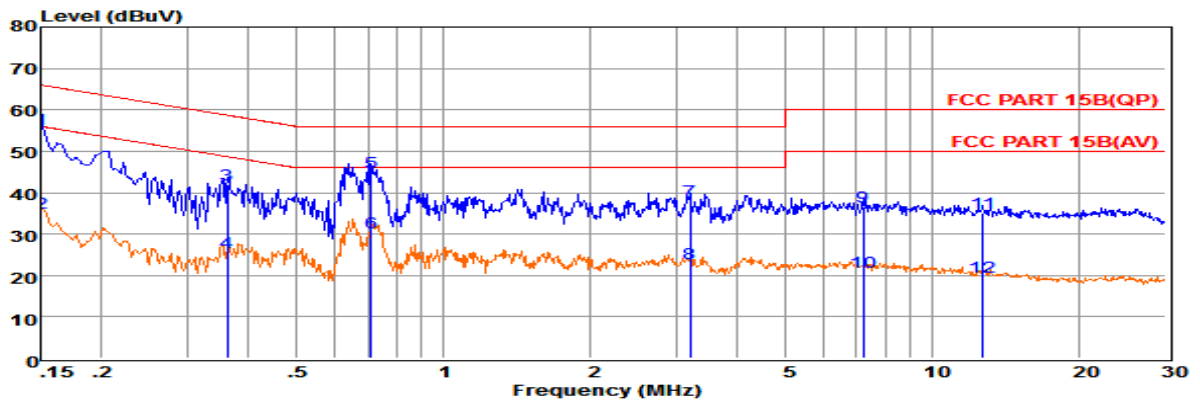
Test result for 802.11a(AC 120V)



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 0.15403	38.80	9.58	0.02	10.00	58.40	65.78	-7.38	QP
2 0.15413	17.32	9.58	0.02	10.00	36.92	55.77	-18.85	Average
3 0.70468	19.28	9.64	0.04	10.00	38.96	56.00	-17.04	QP
4 0.70478	2.75	9.64	0.04	10.00	22.43	46.00	-23.57	Average
5 1.71619	11.63	9.64	0.05	10.00	31.32	56.00	-24.68	QP
6 1.71719	-2.57	9.64	0.05	10.00	17.12	46.00	-28.88	Average
7 4.31464	11.52	9.65	0.06	10.00	31.23	56.00	-24.77	QP
8 4.31564	-3.78	9.65	0.06	10.00	15.93	46.00	-30.07	Average
9 15.71794	10.27	9.72	0.10	10.00	30.09	60.00	-29.91	QP
10 15.71894	-5.47	9.72	0.10	10.00	14.35	50.00	-35.65	Average
11 22.18005	10.10	9.71	0.12	10.00	29.93	60.00	-30.07	QP
12 22.18105	-5.37	9.71	0.12	10.00	14.46	50.00	-35.54	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.

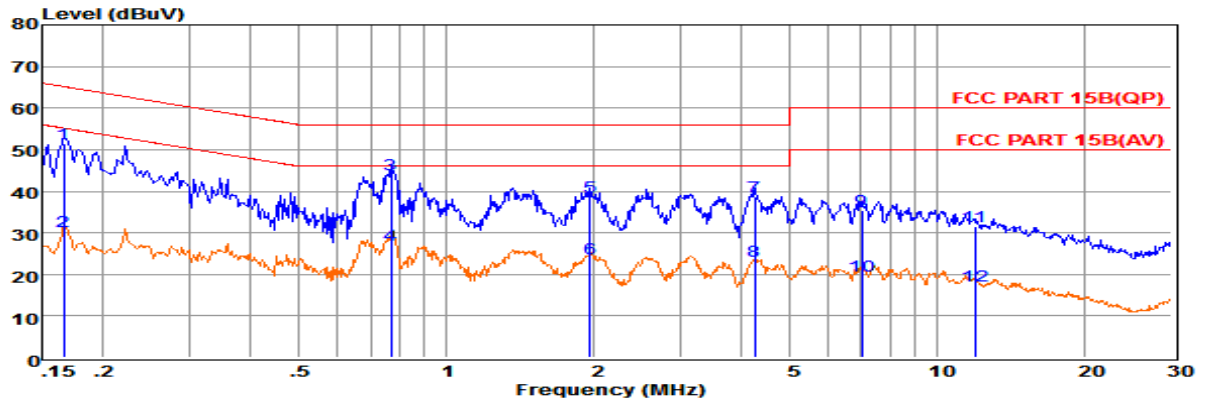


Env. Ins: 24*/56%
 Pol: NEUTRAL

Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.15000	35.53	9.70	0.02	10.00	55.25	66.00	-10.75	QP
2 0.15010	15.51	9.70	0.02	10.00	35.23	55.99	-20.76	Average
3 0.36146	22.15	9.61	0.03	10.00	41.79	58.69	-16.90	QP
4 0.36156	5.81	9.61	0.03	10.00	25.45	48.69	-23.24	Average
5 0.71219	25.31	9.63	0.04	10.00	44.98	56.00	-11.02	QP
6 0.71229	10.63	9.63	0.04	10.00	30.30	46.00	-15.70	Average
7 3.18996	18.21	9.65	0.06	10.00	37.92	56.00	-18.08	QP
8 3.19096	3.26	9.65	0.06	10.00	22.97	46.00	-23.03	Average
9 7.21347	16.87	9.69	0.07	10.00	36.63	60.00	-23.37	QP
10 7.21447	1.02	9.69	0.07	10.00	20.78	50.00	-29.22	Average
11 21.71611	15.19	9.73	0.09	10.00	35.01	60.00	-24.99	QP
12 21.71711	-0.28	9.73	0.09	10.00	19.54	50.00	-30.46	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.

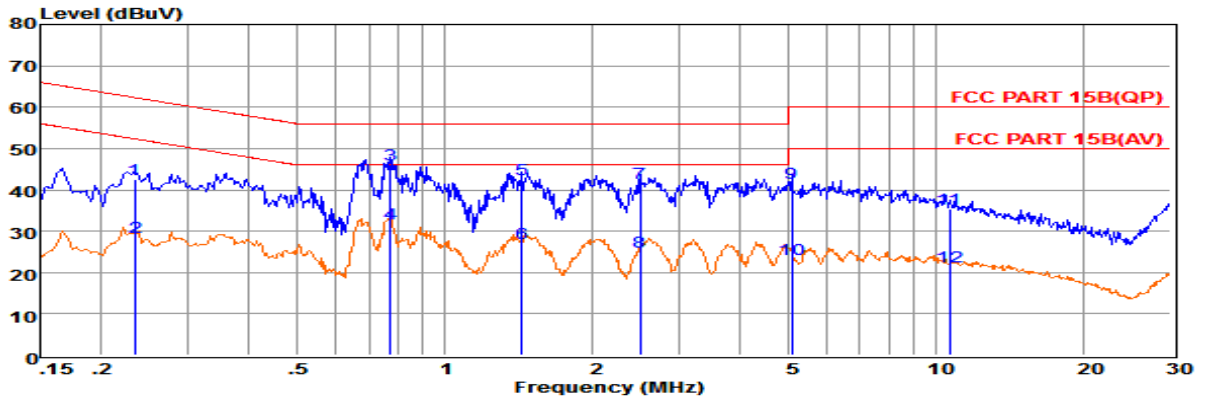
Test result for 802.11a(AC 240V)



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 0.16589	31.68	9.66	0.02	10.00	51.36	65.16	-13.80	QP
2 0.16599	10.63	9.66	0.02	10.00	30.31	55.16	-24.85	Average
3 0.77110	24.45	9.63	0.04	10.00	44.12	56.00	-11.88	QP
4 0.77120	7.35	9.63	0.04	10.00	27.02	46.00	-18.98	Average
5 1.95925	18.93	9.63	0.05	10.00	38.61	56.00	-17.39	QP
6 1.96025	4.01	9.63	0.05	10.00	23.69	46.00	-22.31	Average
7 4.24660	18.94	9.65	0.06	10.00	38.65	56.00	-17.35	QP
8 4.24760	3.59	9.65	0.06	10.00	23.30	46.00	-22.70	Average
9 7.02488	15.76	9.69	0.07	10.00	35.52	60.00	-24.48	QP
10 7.02588	-0.09	9.69	0.07	10.00	19.67	50.00	-30.33	Average
1111.93279	11.61	9.73	0.09	10.00	31.43	60.00	-28.57	QP
1211.93379	-2.57	9.73	0.09	10.00	17.25	50.00	-32.75	Average

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



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 0.23409	22.83	9.63	0.03	10.00	42.49	62.30	-19.81	QP
2 0.23419	8.81	9.63	0.03	10.00	28.47	52.30	-23.83	Average
3 0.77519	26.27	9.64	0.04	10.00	45.95	56.00	-10.05	QP
4 0.77529	12.00	9.64	0.04	10.00	31.68	46.00	-14.32	Average
5 1.43328	22.72	9.64	0.05	10.00	42.41	56.00	-13.59	QP
6 1.43428	7.26	9.64	0.05	10.00	26.95	46.00	-19.05	Average
7 2.49999	21.91	9.64	0.05	10.00	41.60	56.00	-14.40	QP
8 2.50099	5.19	9.64	0.05	10.00	24.88	46.00	-21.12	Average
9 5.08483	21.92	9.65	0.06	10.00	41.63	60.00	-18.37	QP
10 5.08583	3.53	9.65	0.06	10.00	23.24	50.00	-26.76	Average
1110.67629	15.58	9.69	0.08	10.00	35.35	60.00	-24.65	QP
1210.67729	1.73	9.69	0.08	10.00	21.50	50.00	-28.50	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		0.36	0.33	0.10
Radiated power [dBm] Measured with DSSS modulation		2.47	2.62	2.15
Gain [dBi] Calculated		2.11	2.29	2.05
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 40GHz)	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 Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz 3m	June 18, 2016	June 17, 2017
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHz	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 Source	GW	GPC-6030D	C671845	DC 1V-60V	June 18, 2016	June 17, 2017
Temp. and Humidity	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	CBJ35-2m	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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