SPORTON International Inc.
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FCC RADIO TEST REPORT

Applicant's company	**NETGEAR, Inc.**
Applicant Address	350 East Plumeria Drive, San Jose, California 95134, USA
FCC ID	**PY314200274**

Product Name	AC1200 Smart WiFi Router with External Antennas
Brand Name	NETGEAR
Model No.	R6220
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5725 ~ 5850 MHz
Received Date	Jun. 29, 2015
Final Test Date	Sep. 17, 2015
Submission Type	Class II Change

Statement

Test result included is for the IEEE 802.11n and IEEE 802.11a/ac of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013**, **47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01, KDB662911 D01 v02r01, KDB644545 D03 v01.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

TAF
Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR481105-06	Rev. 01	Initial issue of report	Oct. 06, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	AC1200 Smart WiFi Router with External Antennas
Brand Name	:	NETGEAR
Model No.	:	R6220
Applicant	:	NETGEAR, Inc.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jun. 29, 2015 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.2	15.407(e)	6dB Spectrum Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	0.53 dB
4.4	15.407(a)	Power Spectral Density	Complies	16.19 dB
4.5	15.407(b)	Radiated Emissions	Complies	0.80 dB
4.6	15.407(b)	Band Edge Emissions	Complies	0.06 dB
4.7	15.407(g)	Frequency Stability	Complies	-
4.8	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n/ac: see the below table
Frequency Range	5725 ~ 5850 MHz
Channel Number	5 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	IEEE 802.11a: 25.20 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 26.64 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 39.40 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.20 MHz
Maximum Conducted Output Power	IEEE 802.11a: 29.47 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 28.86 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 27.59 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 22.60 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Communication Mode	☒ IP Based (Load Based)	☐ Frame Based
Beamforming Function	☐ With beamforming	☒ Without beamforming
Operating Mode	☐ Outdoor access point	
	☒ Indoor access point	
	☐ Fixed point-to-point access points	
	☐ Mobile and portable client devices	

Antenna and Band width

Antenna	Two (TX)		
Band width Mode	20 MHz	40 MHz	80 MHz
IEEE 802.11a	V	X	X
IEEE 802.11n	V	V	X
IEEE 802.11ac	V	V	V

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 0-15
802.11n (HT40)	2	MCS 0-15
802.11ac (VHT20)	2	MCS 0-9/Nss1-2
802.11ac (VHT40)	2	MCS 0-9/Nss1-2
802.11ac (VHT80)	2	MCS 0-9/Nss1-2

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT supports HT20 and HT40.

Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT supports VHT20, VHT40 and VHT80.

Note 3: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac

3.2. Accessories

Power	Brand	Model	P/N	Rating
Adapter 1	NETGEAR	AD817F10	332-10301-02	Input:100-120Vac, 50-60Hz, 0.56A Output:12Vdc, 1.5A
Adapter 2	NETGEAR	SAL018F1 NA	332-10375-01	Input:100-120Vac, 47-63Hz, 0.6A Output:12Vdc, 1.5A

Others			
Cable	Brand	Model	Description
RJ-45 Cable 1	Nienyi Industrial Corporation	SMDR02GB0010	Non-shielded, 1.5m
RJ-45 Cable 2	D&S	NYA2667	Non-shielded, 1.5m

3.3. Table for Filed Antenna

For 5GHz WLAN function:

Ant.	Model Name	Antenna Type	Connector	Gain (dBi)	
				5GHz B1	5GHz B4
1	R6220	Dipole	I-PEX	3.09	3.56
2	R6220	Dipole	I-PEX	3.09	3.56

Note: The EUT has two antennas for 5GHz WLAN function.

Chain 1 and Chain 2 can be used as transmitting/receiving antennas.

Chain 1 and Chain 2 could transmit/receive simultaneously.

3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 151, 159.

For 80MHz bandwidth systems, use Channel 155.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5725~5850 MHz Band 4	149	5745 MHz	157	5785 MHz
	151	5755 MHz	159	5795 MHz
	153	5765 MHz	161	5805 MHz
	155	5775 MHz	165	5825 MHz

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode		Data Rate	Channel	Chain
Max. Conducted Output Power	11a/BPSK	Band 4	6Mbps	149/157/165	1+2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
Power Spectral Density	11a/BPSK	Band 4	6Mbps	149/157/165	1+2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	1+2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
6dB Spectrum Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	1+2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
Radiated Emission Above 1GHz	11a/BPSK	Band 4	6Mbps	149/157/165	1+2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
Band Edge Emission	11a/BPSK	Band 4	6Mbps	149/157/165	1+2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
Frequency Stability	20 MHz	Band 4	-	157	1
	40 MHz	Band 4	-	151	1
	80 MHz	Band 4	-	155	1

The following test modes were performed for all tests:

For Radiated Emission Above 1GHz test:

The EUT was performed at X axis, Y axis and Z axis position, and the worst case was found at Y axis. So the measurement will follow this same test configuration.

For Co-location MPE test:

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to FA481105-06) test is added for simultaneously transmit between 2.4GHz WLAN function and 5GHz WLAN function.

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	**Site Category**	**Location**	**FCC Reg. No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

3.7. Table for Class II Change

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
Changing 5GHz Band 4 to “New Rules” from “Old Rules”.	1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement 2. 6dB Spectrum Bandwidth 3. Max. Conducted Output Power. 4. Power Spectral Density. 5. Radiated Emission Above 1GHz. 6. Band Edge Emission. 7. Frequency Stability.

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC

3.9. Table for Parameters of Test Software Setting

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Test Software Version	MT7662 QA V1.0.3.2		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5745 MHz	5785 MHz	5825 MHz
802.11a	1C/1B	2F/2E	26/25
802.11ac MCS0/Nss1 VHT20	1A/19	2F/2F	23/22
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5755 MHz	5795 MHz	
	1C/1B	24/24	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5775 MHz		
	18/18		

3.10. EUT Operation during Test

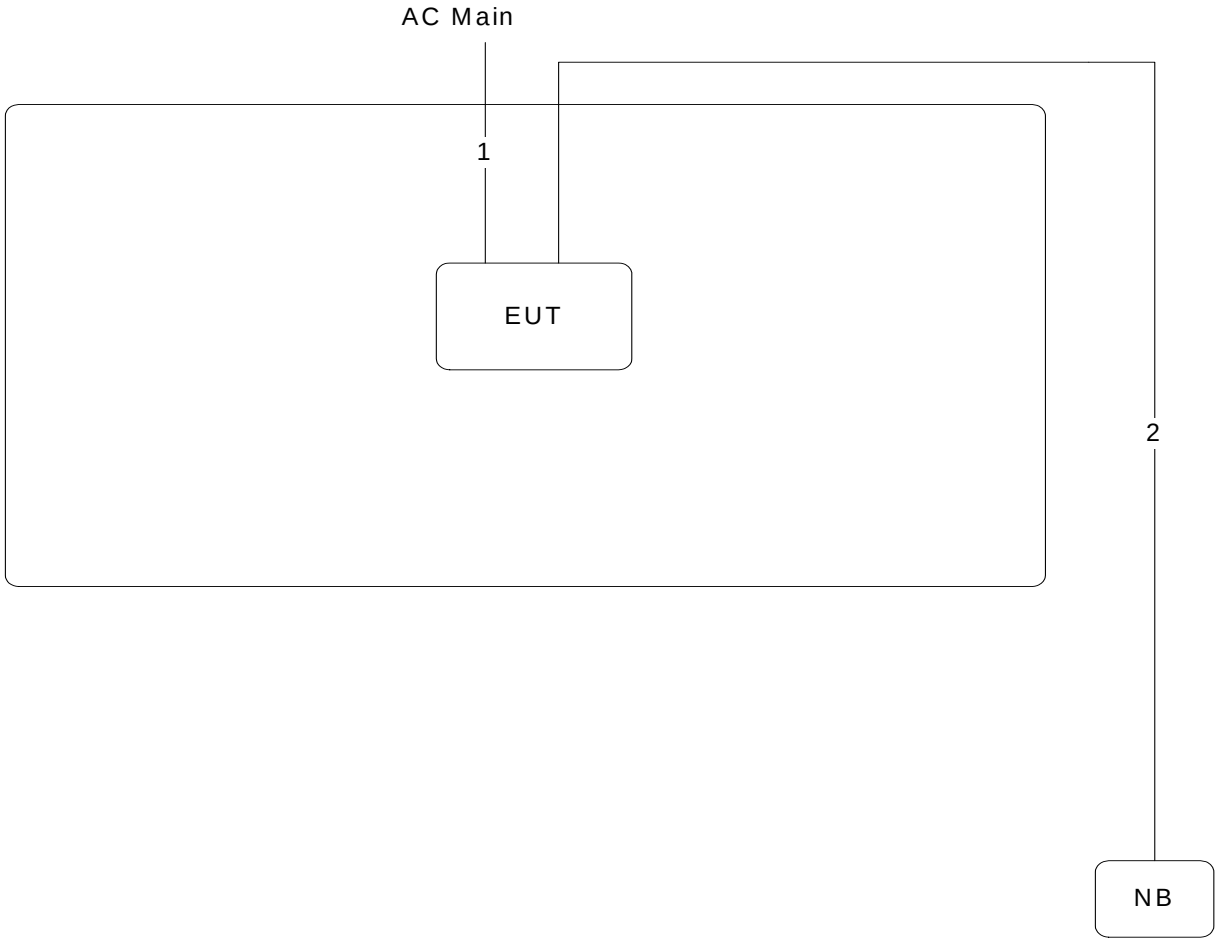
The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	1.432	1.449	98.80%	0.05	0.01
802.11ac MCS0/Nss1 VHT20	1.357	1.368	99.15%	0.04	0.01
802.11ac MCS0/Nss1 VHT40	0.661	0.674	98.07%	0.08	0.01
802.11ac MCS0/Nss1 VHT80	0.322	0.342	94.07%	0.27	3.11

3.12. Test Configurations

3.12.1. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m

4. TEST RESULT

4.1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

4.1.1. Limit

No restriction limits.

4.1.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

26dB Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	VBW > RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth	
Spectrum Parameters	**Setting**
Span	1.5 times to 5.0 times the OBW
RBW	1 % to 5 % of the OBW
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold

4.1.3. Test Procedures

For Radiated 26dB Bandwidth and 99% Occupied Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.1.4. Test Setup Layout

For Radiated 26dB Bandwidth and 99% Occupied Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.5.4.

4.1.5. Test Deviation

There is no deviation with the original standard.

4.1.6. EUT Operation during Test

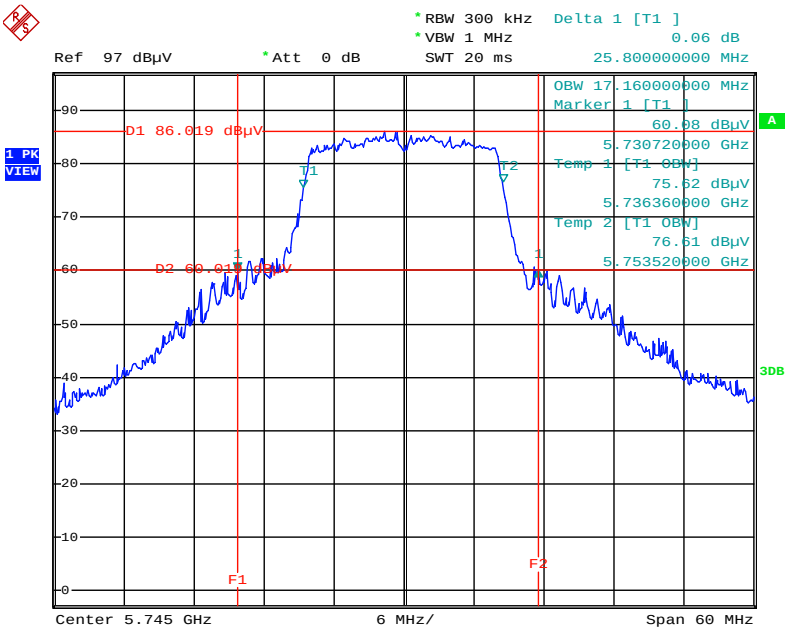
The EUT was programmed to be in continuously transmitting mode.

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

Temperature	25°C	Humidity	45%
Test Engineer	Jim Huang		

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5745 MHz	25.80	17.16
	5785 MHz	39.12	25.20
	5825 MHz	32.64	18.84
802.11ac MCS0/Nss1 VHT20	5745 MHz	20.52	17.76
	5785 MHz	43.20	26.64
	5825 MHz	31.32	18.36
802.11ac MCS0/Nss1 VHT40	5755 MHz	41.40	36.40
	5795 MHz	73.40	39.40
802.11ac MCS0/Nss1 VHT80	5775 MHz	80.80	75.20

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5745 MHz



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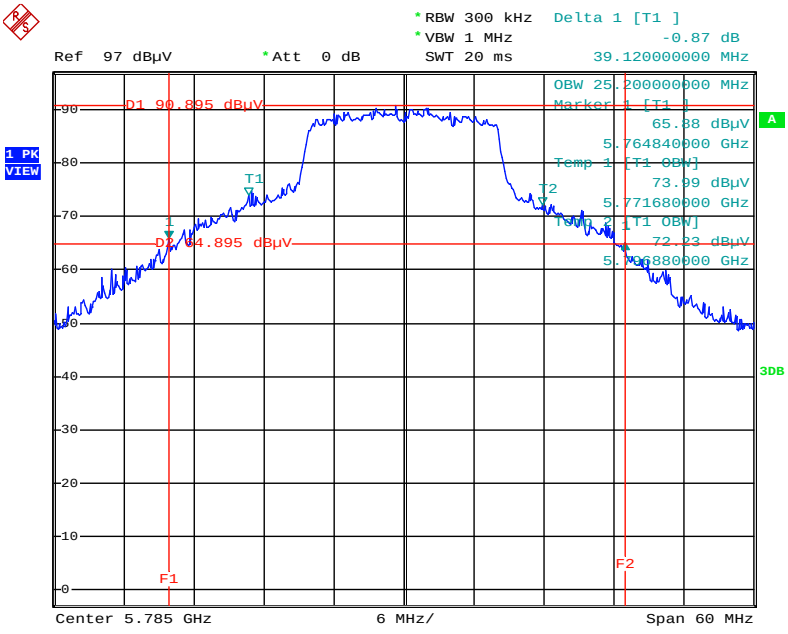
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5785 MHz



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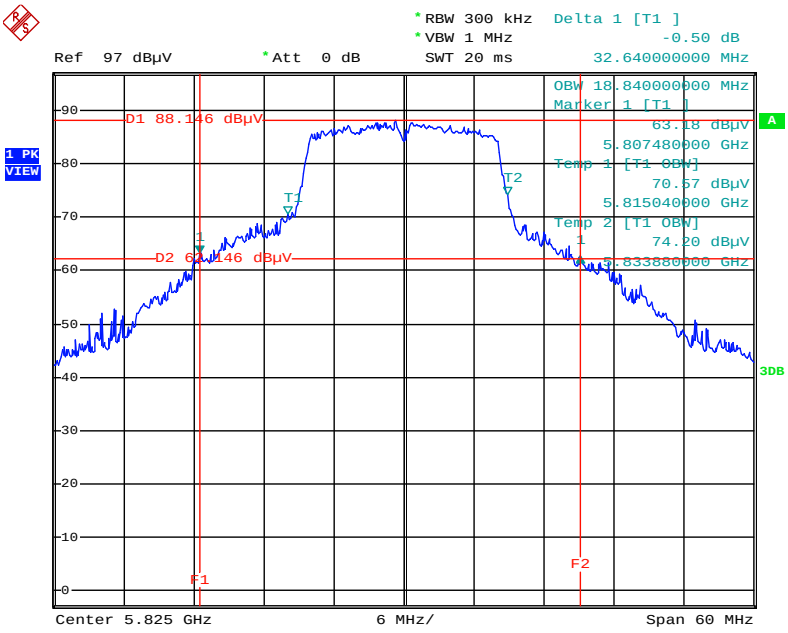
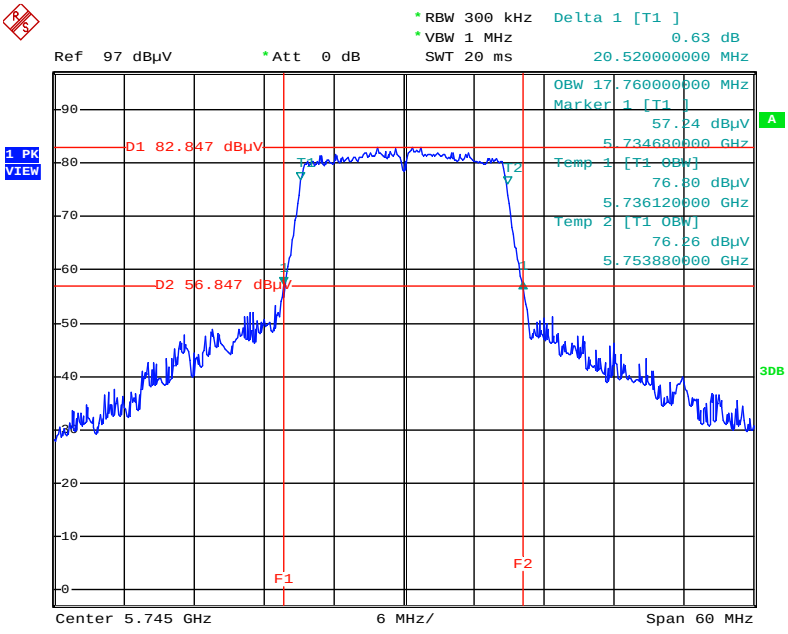
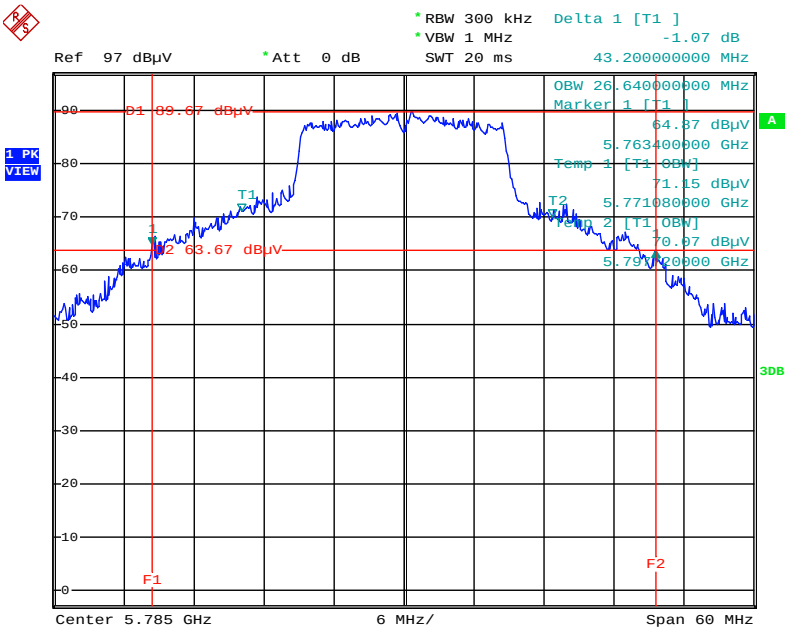
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5825 MHz



26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5745 MHz



26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



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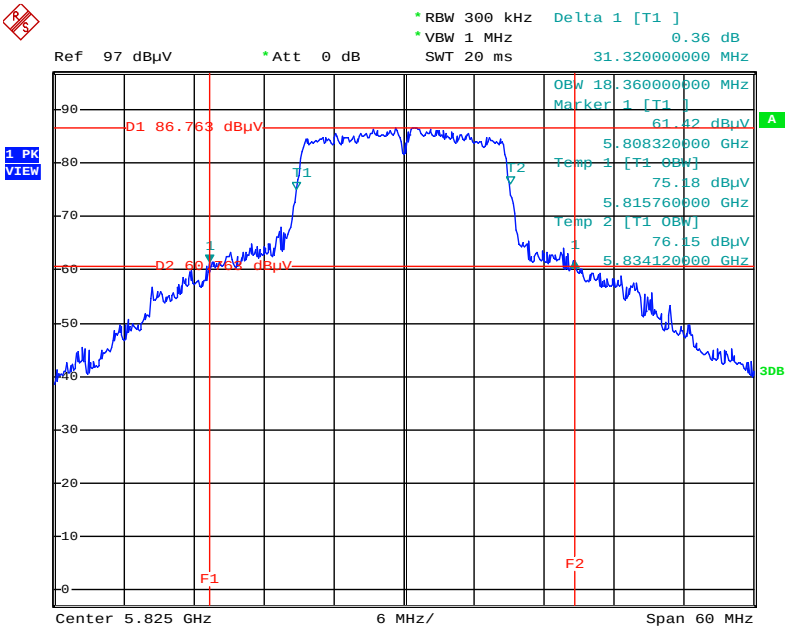
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5825 MHz



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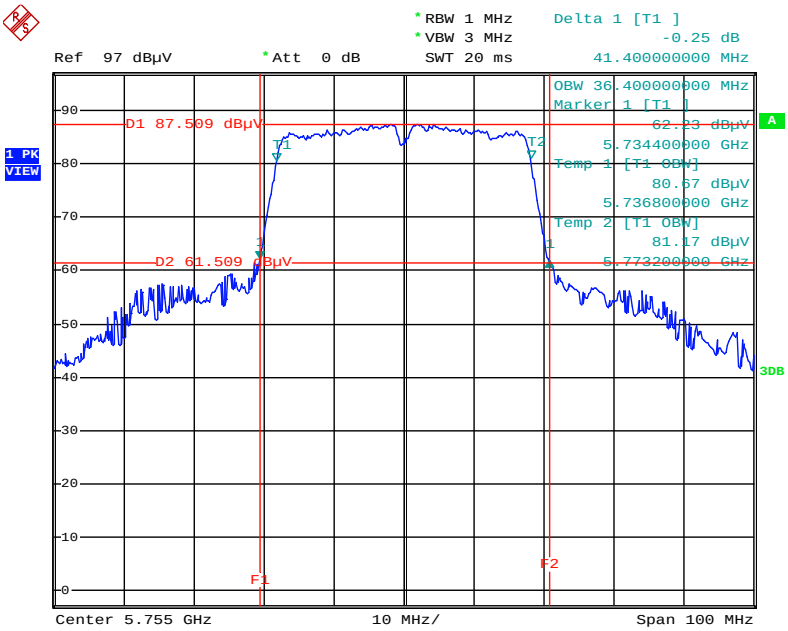
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5755 MHz



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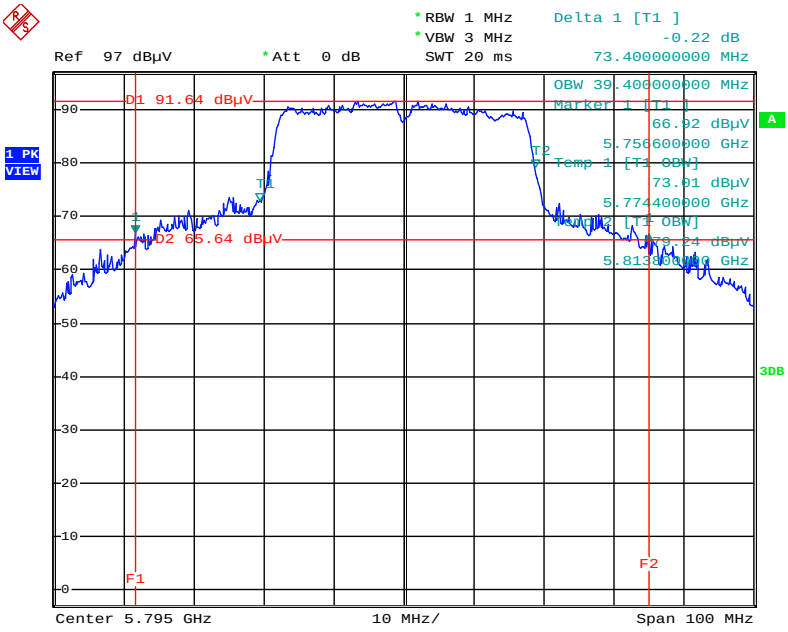
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5795 MHz



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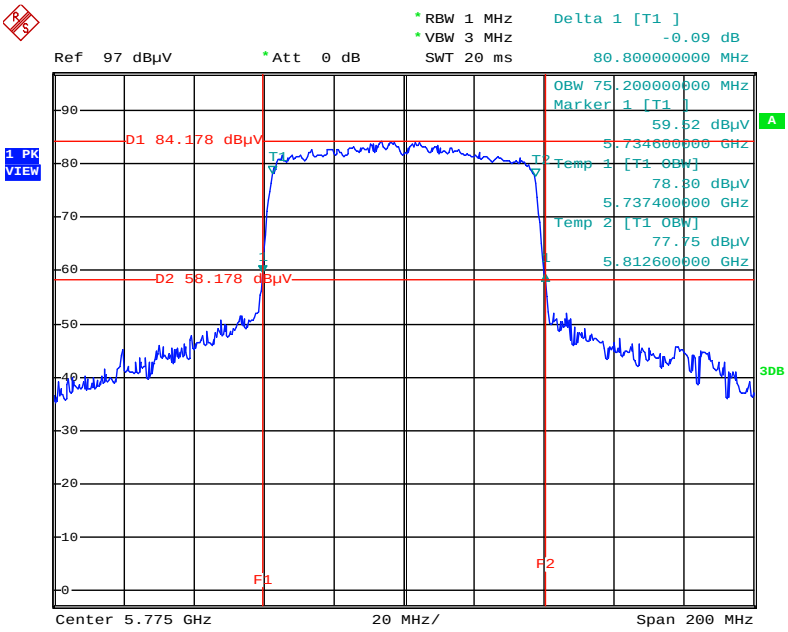
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 / 5775 MHz



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4.2. 6dB Spectrum Bandwidth Measurement

4.2.1. Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

4.2.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

6dB Spectrum Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. Test Procedures

For Radiated 6dB Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth.
3. Multiple antenna system was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. Measured the spectrum width with power higher than 6dB below carrier.

4.2.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.5.4.

4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of 6dB Spectrum Bandwidth

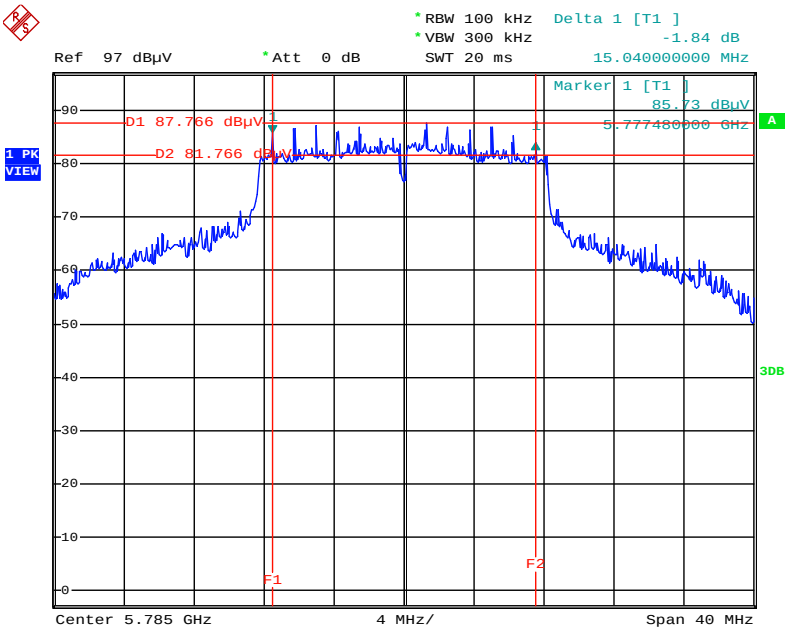
Temperature	25°C	Humidity	45%
Test Engineer	Jim Huang		

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11a	5745 MHz	16.32	500	Complies
	5785 MHz	15.04	500	Complies
	5825 MHz	15.76	500	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	17.12	500	Complies
	5785 MHz	16.88	500	Complies
	5825 MHz	17.04	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	35.20	500	Complies
	5795 MHz	35.20	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	70.40	500	Complies

Note: All the test values were listed in the report.

For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5785 MHz



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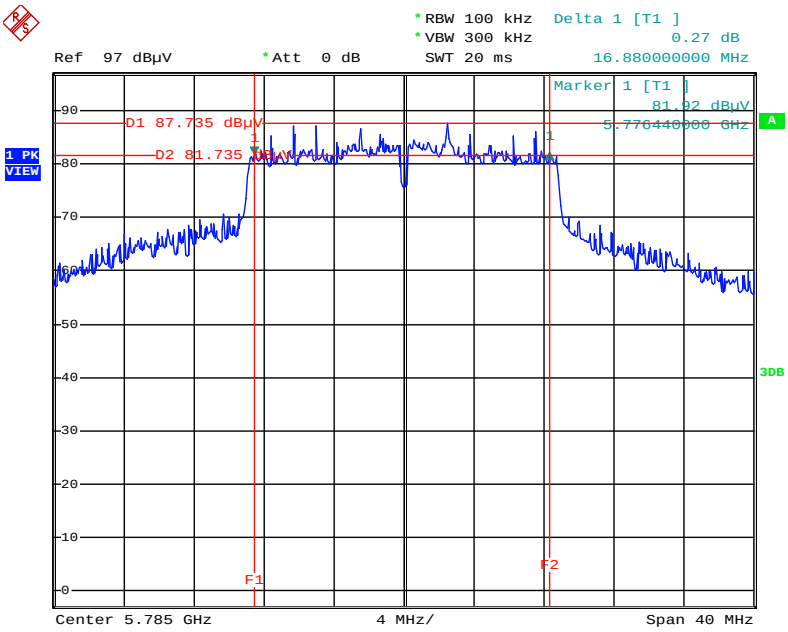
6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



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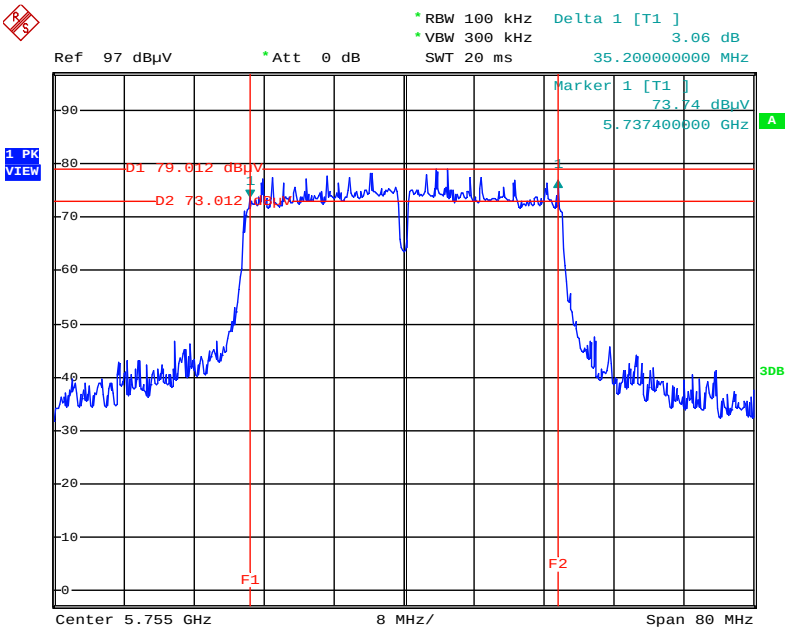
6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5755MHz



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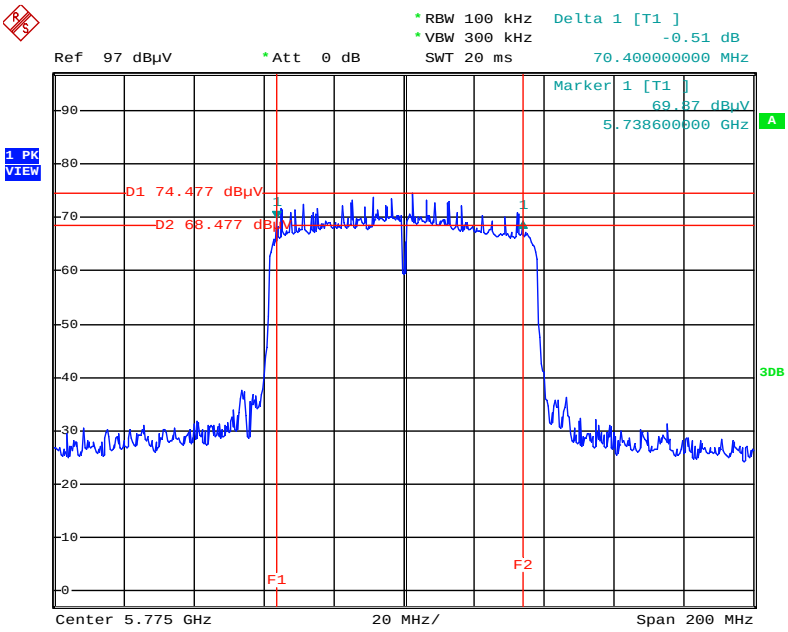
6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 / 5775 MHz



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4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

Frequency Band		Limit
☐	5.15~5.25 GHz	
	Operating Mode	
	☐ Outdoor access point	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
	☐ Indoor access point	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. 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.
	☐ Fixed point-to-point access points	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.
	☐ Mobile and portable client devices	The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. 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.

☒	5.725~5.85 GHz	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). 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.

4.3.2. Measuring Instruments and Setting

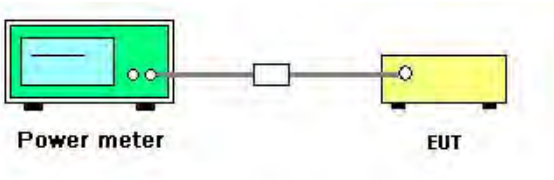
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter).
3. Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Maximum Conducted Output Power

Temperature	25°C	Humidity	45%
Test Engineer	Jim Huang	Test Date	Sep. 17, 2015

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
802.11a	5745 MHz	23.44	22.31	25.92	30.00	Complies
	5785 MHz	26.64	26.28	29.47	30.00	Complies
	5825 MHz	24.84	24.61	27.74	30.00	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	20.36	20.35	23.37	30.00	Complies
	5785 MHz	25.90	25.79	28.86	30.00	Complies
	5825 MHz	23.24	23.04	26.15	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	22.07	21.82	24.96	30.00	Complies
	5795 MHz	24.64	24.51	27.59	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	19.66	19.52	22.60	30.00	Complies

4.4. Power Spectral Density Measurement

4.4.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.3.1.

Frequency Band			Limit
☐	5.15~5.25 GHz		
	Operating Mode		
	☐	Outdoor access point	17 dBm/MHz
	☐	Indoor access point	17 dBm/MHz
	☐	Fixed point-to-point access points	17 dBm/MHz
	☐	Mobile and portable client devices	11 dBm/MHz
☒	5.725~5.85 GHz		30 dBm/500kHz

4.4.2. Measuring Instruments and Setting

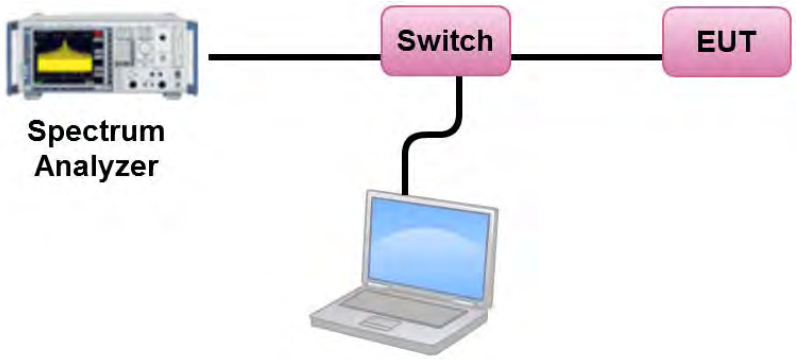
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1000 kHz
VBW	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times
Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.	

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD).
3. Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements (a) Measure and sum the spectra across the outputs.
4. When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.
5. For 5.725~5.85 GHz, the measured result of PSD level must add 10log(500kHz/RBW) and the final result should ≤ 30 dBm.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

Temperature	25°C	Humidity	45%
Test Engineer	Jim Huang		

Configuration IEEE 802.11a

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	12.84	-3.01	9.83	29.43	Complies
157	5785 MHz	16.25	-3.01	13.24	29.43	Complies
165	5825 MHz	14.70	-3.01	11.69	29.43	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.57dBi, so limit=30 – (6.57-6)=29.43

Configuration 802.11ac MCS0/Nss1 VHT20

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	10.21	-3.01	7.20	29.43	Complies
157	5785 MHz	15.83	-3.01	12.82	29.43	Complies
165	5825 MHz	13.06	-3.01	10.05	29.43	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.57dBi, so limit=30 – (6.57-6)=29.43

Configuration 802.11ac MCS0/Nss1 VHT40

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
151	5755 MHz	8.67	-3.01	5.66	29.43	Complies
159	5795 MHz	11.47	-3.01	8.46	29.43	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.57dBi, so limit=30 – (6.57-6)=29.43

Configuration 802.11ac MCS0/Nss1 VHT80

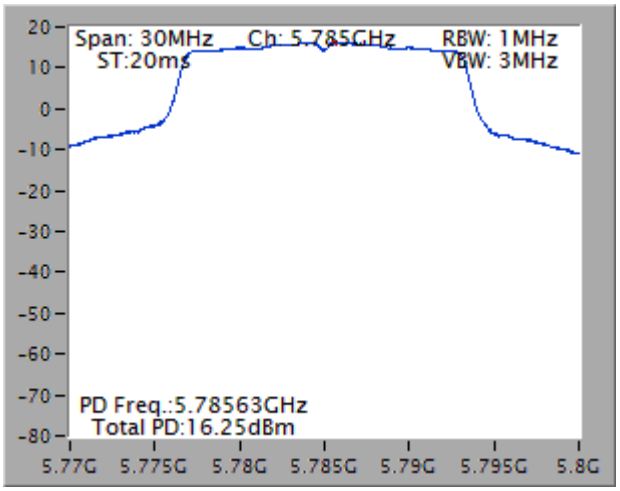
Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	3.51	-3.01	0.50	29.43	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.57dBi, so limit=30 – (6.57-6)=29.43

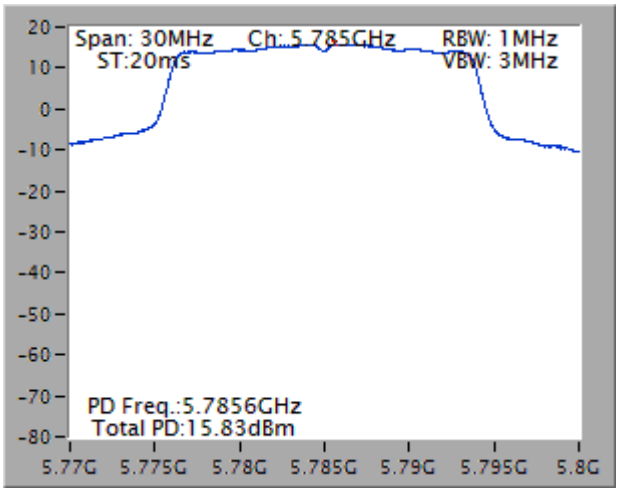
Note: All the test values were listed in the report.

For plots, only the channel with worse result was shown.

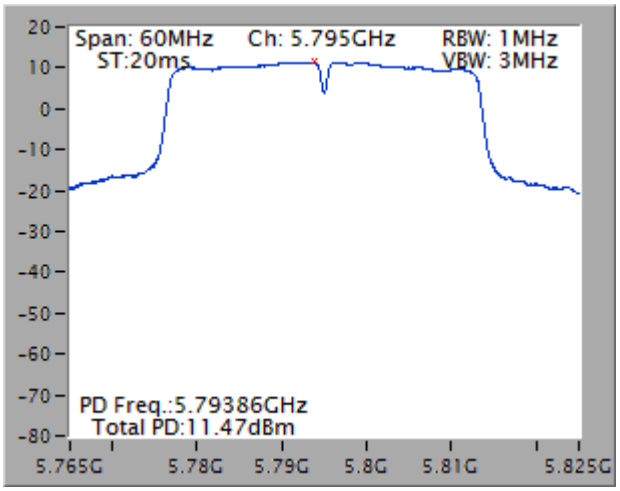
Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5785 MHz



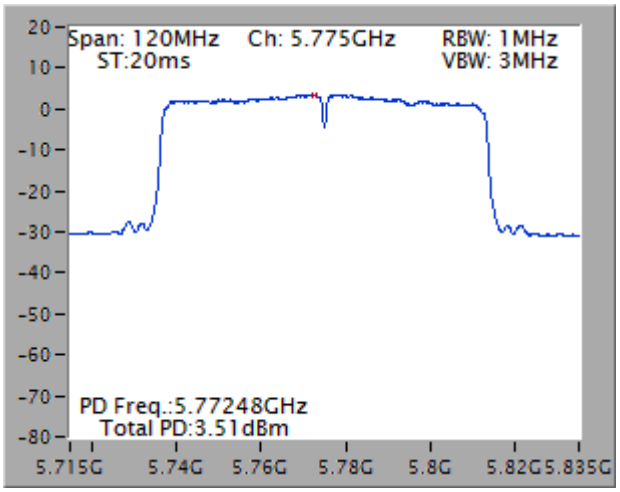
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5795 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 / 5775 MHz



4.5. Radiated Emissions Measurement

4.5.1. Limit

For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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 (micorvolts/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

4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

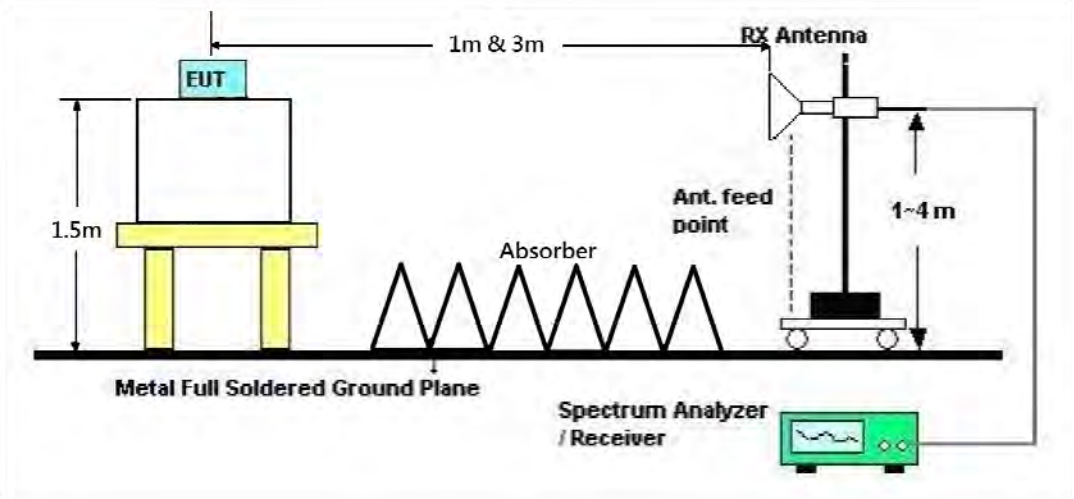
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
8. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
9. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.5.4. Test Setup Layout



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Results for Radiated Emissions (1GHz~40GHz)

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11a CH 149 / Chain 1 + Chain 2
Test Date	Jul. 18, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11485.89	65.47	74.00	-8.53	49.77	39.90	11.03	35.23	197	59	HORIZONTAL	Peak
2	11490.00	51.25	54.00	-2.75	35.55	39.90	11.03	35.23	197	59	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11486.29	68.59	74.00	-5.41	52.89	39.90	11.03	35.23	200	46	VERTICAL	Peak
2	11489.97	53.20	54.00	-0.80	37.50	39.90	11.03	35.23	200	46	VERTICAL	Average

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11a CH 157 / Chain 1 + Chain 2
Test Date	Jul. 18, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11566.32	64.91	74.00	-9.09	49.30	39.77	11.07	35.23	194	59	HORIZONTAL	Peak
2	11567.86	50.20	54.00	-3.80	34.59	39.77	11.07	35.23	194	59	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11566.35	66.81	74.00	-7.19	51.20	39.77	11.07	35.23	200	47	VERTICAL	Peak
2	11567.97	52.47	54.00	-1.53	36.86	39.77	11.07	35.23	200	47	VERTICAL	Average

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11a CH 165 / Chain 1 + Chain 2
Test Date	Jul. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11652.30	58.92	74.00	-15.08	45.29	9.28	39.19	34.84	Peak	170	360	HORIZONTAL
2	11653.90	46.88	54.00	-7.12	33.25	9.28	39.19	34.84	Average	170	360	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11646.30	60.56	74.00	-13.44	46.94	9.28	39.18	34.84	Peak	208	2	VERTICAL
2	11652.10	50.12	54.00	-3.88	36.49	9.28	39.19	34.84	Average	208	2	VERTICAL

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Chain 1 + Chain 2
Test Date	Jul. 18, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11489.87	47.29	54.00	-6.71	31.59	39.90	11.03	35.23	104	273	HORIZONTAL	Average
2	11491.61	59.64	74.00	-14.36	43.93	39.90	11.04	35.23	104	273	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11488.07	62.33	74.00	-11.67	46.63	39.90	11.03	35.23	100	42	VERTICAL	Peak
2	11490.28	48.02	54.00	-5.98	32.32	39.90	11.03	35.23	100	42	VERTICAL	Average

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Chain 1 + Chain 2
Test Date	Jul. 19, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11567.94	48.11	54.00	-5.89	32.50	39.77	11.07	35.23	100	299	HORIZONTAL	Average
2	11567.98	62.36	74.00	-11.64	46.75	39.77	11.07	35.23	100	299	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11568.07	61.74	74.00	-12.26	46.13	39.77	11.07	35.23	100	15	VERTICAL	Peak
2	11570.03	48.71	54.00	-5.29	33.10	39.77	11.07	35.23	100	15	VERTICAL	Average

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Chain 1 + Chain 2
Test Date	Jul. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11653.40	46.90	54.00	-7.10	33.27	9.28	39.19	34.84	Average	175	84	HORIZONTAL
2	11673.40	59.66	74.00	-14.34	46.03	9.28	39.20	34.85	Peak	175	84	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11648.60	60.10	74.00	-13.90	46.48	9.28	39.18	34.84	Peak	204	2	VERTICAL
2	11652.90	47.61	54.00	-6.39	33.98	9.28	39.19	34.84	Average	204	2	VERTICAL

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Chain 1 + Chain 2
Test Date	Jul. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11504.30	58.14	74.00	-15.86	44.59	9.25	39.10	34.80	Peak	174	360	HORIZONTAL
2	11510.00	46.09	54.00	-7.91	32.54	9.25	39.10	34.80	Average	174	360	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11509.70	47.75	54.00	-6.25	34.20	9.25	39.10	34.80	Average	206	0	VERTICAL
2	11511.00	60.70	74.00	-13.30	47.15	9.25	39.10	34.80	Peak	206	0	VERTICAL

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Chain 1 + Chain 2
Test Date	Jul. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11590.60	57.91	74.00	-16.09	44.31	9.27	39.15	34.82	Peak	172	236	HORIZONTAL
2	11608.10	46.85	54.00	-7.15	33.25	9.27	39.16	34.83	Average	172	236	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11589.70	47.34	54.00	-6.66	33.74	9.27	39.15	34.82	Average	200	0	VERTICAL
2	11589.80	59.07	74.00	-14.93	45.47	9.27	39.15	34.82	Peak	200	0	VERTICAL

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 1 + Chain 2
Test Date	Jul. 19, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11547.73	45.56	54.00	-8.44	29.90	39.83	11.06	35.23	147	189	HORIZONTAL	Average
2	11550.34	59.26	74.00	-14.74	43.66	39.77	11.06	35.23	147	189	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	11548.68	58.49	74.00	-15.51	42.83	39.83	11.06	35.23	154	276	VERTICAL	Peak
2	11551.53	45.51	54.00	-8.49	29.91	39.77	11.06	35.23	154	276	VERTICAL	Average

Note:

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

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

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

4.6. Band Edge Emissions Measurement

4.6.1. Limit

For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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 (micorvolts/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

4.6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for Peak

4.6.3. Test Procedures

1. The test procedure is the same as section 4.5.3.

4.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11a CH 149, 157, 165 / Chain 1 + Chain 2
Test Date	Jul. 18, 2015 & Jul. 29, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5709.60	64.34	74.00	-9.66	58.29	6.44	34.64	35.03	Peak	207	180	VERTICAL
2	5715.00	48.99	54.00	-5.01	42.94	6.44	34.64	35.03	Average	207	180	VERTICAL
3	5724.60	77.92	78.20	-0.28	71.86	6.45	34.64	35.03	Peak	207	180	VERTICAL
4	5740.20	115.52			109.46	6.45	34.65	35.04	Peak	207	180	VERTICAL
5	5744.00	104.41			98.35	6.45	34.65	35.04	Average	207	180	VERTICAL

Item 4, 5 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	5715.00	62.97	68.20	-5.23	56.12	32.06	7.79	33.00	191	155	VERTICAL	Peak
2	5721.82	66.17	78.20	-12.03	59.32	32.06	7.79	33.00	191	155	VERTICAL	Peak
3	5785.87	109.95			103.01	32.14	7.83	33.03	191	155	VERTICAL	Average
4	5786.16	120.51			113.57	32.14	7.83	33.03	191	155	VERTICAL	Peak
5	5850.29	61.56	78.20	-16.64	54.52	32.22	7.87	33.05	191	155	VERTICAL	Peak
6	5869.26	62.37	68.20	-5.83	55.31	32.24	7.88	33.06	191	155	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5785 MHz.

Channel 165

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5826.20	107.90			101.81	6.48	34.67	35.06	Average	208	185	VERTICAL
2	5826.20	117.72			111.63	6.48	34.67	35.06	Peak	208	185	VERTICAL
3	5850.00	78.02	78.20	-0.18	71.92	6.49	34.67	35.06	Peak	208	185	VERTICAL
4	5860.60	52.57	54.00	-1.43	46.47	6.50	34.67	35.07	Average	208	185	VERTICAL
5	5863.00	69.54	74.00	-4.46	63.44	6.50	34.67	35.07	Peak	208	185	VERTICAL

Item 1, 2 are the fundamental frequency at 5825 MHz.

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Chain 1 + Chain 2
Test Date	Jul. 18, 2015 & Jul. 29, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5714.60	63.84	74.00	-10.16	57.79	6.44	34.64	35.03	Peak	196	162	VERTICAL
2	5715.00	48.72	54.00	-5.28	42.67	6.44	34.64	35.03	Average	196	162	VERTICAL
3	5725.00	77.95	78.20	-0.25	71.89	6.45	34.64	35.03	Peak	196	162	VERTICAL
4	5742.20	114.01			107.95	6.45	34.65	35.04	Peak	196	162	VERTICAL
5	5746.60	103.63			97.57	6.45	34.65	35.04	Average	196	162	VERTICAL

Item 4, 5 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	5713.26	62.23	68.20	-5.97	55.38	32.06	7.79	33.00	196	164	VERTICAL	Peak
2	5725.00	66.03	78.20	-12.17	59.16	32.08	7.79	33.00	196	164	VERTICAL	Peak
3	5785.58	109.54			102.60	32.14	7.83	33.03	196	164	VERTICAL	Average
4	5786.16	119.99			113.05	32.14	7.83	33.03	196	164	VERTICAL	Peak
5	5853.47	66.40	78.20	-11.80	59.36	32.22	7.87	33.05	196	164	VERTICAL	Peak
6	5863.47	62.15	68.20	-6.05	55.10	32.24	7.87	33.06	196	164	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5785 MHz.

Channel 165

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5827.80	106.31			100.22	6.48	34.67	35.06	Average	208	185	VERTICAL
2	5827.80	116.07			109.98	6.48	34.67	35.06	Peak	208	185	VERTICAL
3	5850.00	78.14	78.20	-0.06	72.04	6.49	34.67	35.06	Peak	208	185	VERTICAL
4	5860.00	51.03	54.00	-2.97	44.93	6.50	34.67	35.07	Average	208	185	VERTICAL
5	5861.80	70.95	74.00	-3.05	64.85	6.50	34.67	35.07	Peak	208	185	VERTICAL

Item 1, 2 are the fundamental frequency at 5825 MHz.

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Chain 1 + Chain 2
Test Date	Jul. 29, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5714.20	52.54	54.00	-1.46	46.49	6.44	34.64	35.03	Average	188	163	VERTICAL
2	5714.60	73.76	74.00	-0.24	67.71	6.44	34.64	35.03	Peak	188	163	VERTICAL
3	5724.20	78.05	78.20	-0.15	71.99	6.45	34.64	35.03	Peak	188	163	VERTICAL
4	5749.80	112.16			106.10	6.45	34.65	35.04	Peak	188	163	VERTICAL
5	5753.40	101.17			95.10	6.46	34.65	35.04	Average	188	163	VERTICAL

Item 4, 5 are the fundamental frequency at 5755 MHz.

Channel 159

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5711.00	61.29	74.00	-12.71	55.24	6.44	34.64	35.03	Peak	202	185	VERTICAL
2	5715.00	48.73	54.00	-5.27	42.68	6.44	34.64	35.03	Average	202	185	VERTICAL
3	5725.00	64.17	78.20	-14.03	58.11	6.45	34.64	35.03	Peak	202	185	VERTICAL
4	5789.40	113.04			106.96	6.47	34.66	35.05	Peak	202	185	VERTICAL
5	5793.80	103.68			97.60	6.47	34.66	35.05	Average	202	185	VERTICAL
6	5851.00	71.16	78.20	-7.04	65.06	6.49	34.67	35.06	Peak	202	185	VERTICAL
7	5860.00	53.90	54.00	-0.10	47.80	6.50	34.67	35.07	Average	202	185	VERTICAL
8	5863.40	68.55	74.00	-5.45	62.45	6.50	34.67	35.07	Peak	202	185	VERTICAL

Item 4, 5 are the fundamental frequency at 5795 MHz.

Temperature	24°C	Humidity	55%
Test Engineer	Stim Song	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 1 + Chain 2
Test Date	Jul. 29, 2015		

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5699.80	53.93	54.00	-0.07	47.89	6.43	34.64	35.03	Average	172	180	VERTICAL
2	5714.20	67.91	74.00	-6.09	61.86	6.44	34.64	35.03	Peak	172	180	VERTICAL
3	5725.00	71.41	78.20	-6.79	65.35	6.45	34.64	35.03	Peak	172	180	VERTICAL
4	5754.20	107.57			101.50	6.46	34.65	35.04	Peak	172	180	VERTICAL
5	5778.20	96.98			90.91	6.46	34.66	35.05	Average	172	180	VERTICAL
6	5850.00	65.77	78.20	-12.43	59.67	6.49	34.67	35.06	Peak	172	180	VERTICAL
7	5861.40	67.52	74.00	-6.48	61.42	6.50	34.67	35.07	Peak	172	180	VERTICAL
8	5883.80	51.91	54.00	-2.09	45.80	6.50	34.68	35.07	Average	172	180	VERTICAL

Item 4, 5 are the fundamental frequency at 5775 MHz.

Note:

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

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

4.7. Frequency Stability Measurement

4.7.1. Limit

In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

4.7.2. Measuring Instruments and Setting

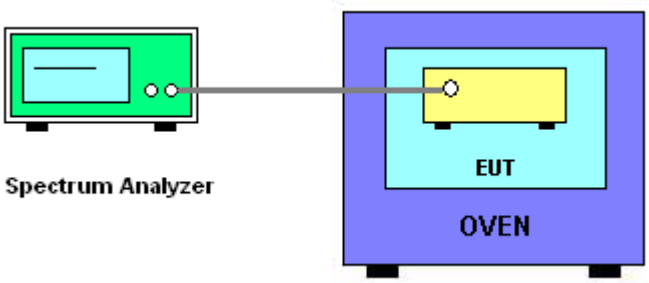
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Sweep Time	Auto

4.7.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
7. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
8. Extreme temperature is 0°C~40°C.

4.7.4. Test Setup Layout



4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

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

4.7.7. Test Result of Frequency Stability

Temperature	25°C	Humidity	45%
Test Engineer	Jim Huang	Test Date	Sep. 17, 2015

Mode: 20 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9788	5784.9800	5784.9772	5784.9782
110.00	5784.9800	5784.9802	5784.9788	5784.9790
93.50	5784.9812	5784.9816	5784.9796	5784.9794
Max. Deviation (MHz)	**0.0212**	**0.0200**	**0.0228**	**0.0218**
Max. Deviation (ppm)	**3.66**	**3.46**	**3.94**	**3.77**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5784.9766	5784.9774	5784.9752	5784.9752
10	5784.9774	5784.9800	5784.9760	5784.9778
20	5784.9800	5784.9802	5784.9788	5784.9790
30	5784.9822	5784.9814	5784.9794	5784.9804
40	5784.9826	5784.9836	5784.9802	5784.9814
Max. Deviation (MHz)	**0.0234**	**0.0226**	**0.0248**	**0.0248**
Max. Deviation (ppm)	**4.04**	**3.91**	**4.29**	**4.29**
Result	Complies			

Mode: 40 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5754.9740	5754.9720	5754.9704	5754.9688
110.00	5754.9742	5754.9728	5754.9714	5754.9694
93.50	5754.9748	5754.9734	5754.9618	5754.9698
Max. Deviation (MHz)	**0.0260**	**0.0280**	**0.0382**	**0.0312**
Max. Deviation (ppm)	**4.52**	**4.87**	**6.64**	**5.42**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5754.9724	5754.9712	5754.9702	5754.9684
10	5754.9738	5754.9720	5754.9708	5754.9688
20	5754.9742	5754.9728	5754.9714	5754.9694
30	5754.9748	5754.9734	5754.9722	5754.9702
40	5754.9756	5754.9742	5754.9726	5754.9712
Max. Deviation (MHz)	**0.0276**	**0.0288**	**0.0298**	**0.0316**
Max. Deviation (ppm)	**4.80**	**5.00**	**5.18**	**5.49**
Result	Complies			

Mode: 80 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5774.9952	5774.9954	5774.9948	5774.9936
110.00	5774.9964	5774.9966	5774.9962	5774.9954
93.50	5774.9980	5774.9970	5774.9976	5774.9978
Max. Deviation (MHz)	**0.0048**	**0.0046**	**0.0052**	**0.0064**
Max. Deviation (ppm)	**0.83**	**0.80**	**0.90**	**1.11**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5774.9942	5774.9942	5774.9928	5774.9912
10	5774.9956	5774.9960	5774.9940	5774.9936
20	5774.9964	5774.9966	5774.9962	5774.9954
30	5774.9978	5774.9972	5774.9966	5774.9960
40	5774.9986	5774.9982	5774.9974	5774.9968
Max. Deviation (MHz)	**0.0058**	**0.0058**	**0.0072**	**0.0088**
Max. Deviation (ppm)	**1.00**	**1.00**	**1.25**	**1.52**
Result	Complies			

4.8. Antenna Requirements

4.8.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.8.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 28, 2014	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2014	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 25, 2014	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 06, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100979	9kHz~40GHz	Dec. 12, 2014	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 03, 2014	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%