SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**Realtek Semiconductor Corp.**
Applicant Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan
FCC ID	**TX2-RTL8821AE**
Manufacturer's company	**Realtek Semiconductor Corp.**
Manufacturer Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan

Product Name	802.11a/b/g/n/ac RTL8821AE Combo module
Brand Name	REALTEK
Model No.	RTL8821AE
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850 MHz
Received Date	Dec. 08, 2015
Final Test Date	Dec. 27, 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
FR342603-36	Rev. 01	Initial issue of report	Jan. 29, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	802.11a/b/g/n/ac RTL8821AE Combo module
Brand Name	:	REALTEK
Model No.	:	RTL8821AE
Applicant	:	Realtek Semiconductor Corp.
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 Dec. 08, 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	13.62 dB
4.4	15.407(a)	Power Spectral Density	Complies	29.68 dB
4.5	15.407(b)	Radiated Emissions	Complies	5.18 dB
4.6	15.407(b)	Band Edge Emissions	Complies	0.51 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 (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From host system
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	5150 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850 MHz
Channel Number	21 for 20MHz bandwidth ; 9 for 40MHz bandwidth 4 for 80MHz bandwidth
Channel Band Width (99%)	IEEE 802.11a: 16.93 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 18.06 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 37.48 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz
Maximum Conducted Output Power	IEEE 802.11a: 16.32 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 16.38 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 16.12 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 12.06 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
TPC Function	☒ With TPC	☐ Without TPC
Weather Band (5600~5650MHz)	☐ With 5600~5650MHz	☒ Without 5600~5650MHz
Beamforming Function	☐ With beamforming	☒ Without beamforming

Antenna & Band width

Antenna	Single (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)	1	MCS 0-7
802.11n (HT40)	1	MCS 0-7
802.11ac (VHT20)	1	MCS 0-9/Nss1
802.11ac (VHT40)	1	MCS 0-9/Nss1
802.11ac (VHT80)	1	MCS 0-9/Nss1
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

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	LYNwave	ALA110-222050-300011	PIFA Antenna	I-PEX MHF4	3.5	5.0
2	LYNwave	ALA110-222050-300010	PIFA Antenna	I-PEX	3.5	5.0
3	JOYMAX	TWF-614XMPXX-500	Dipole Antenna	I-PEX	3.0	5.0

There are fourteen configurations of EUT. The more information is listed as below table.

Configuration	Type	Module	Power Type	Antenna Variety	Type of Antenna
1	HMC	-	PCI-E	Diversity	PIFA with I-PEX connector
					Dipole with I-PEX connector
2	HMC	-	PCI-E	Fixed	PIFA with I-PEX connector
					Dipole with I-PEX connector
3	NGFF	-	PCI-E	Diversity	PIFA with I-PEX MHF4 connector
4	NGFF	-	SDIO	Diversity	PIFA with I-PEX MHF4 connector
5	NGFF	-	PCI-E	Fixed	PIFA with I-PEX MHF4 connector
6	NGFF	-	SDIO	Fixed	PIFA with I-PEX MHF4 connector
7	HMC	RC	PCI-E	Diversity	PIFA with I-PEX connector
					Dipole with I-PEX connector
8	HMC	RC	PCI-E	Fixed	PIFA with I-PEX connector
					Dipole with I-PEX connector
9	NGFF	RC	PCI-E	Diversity	PIFA with I-PEX MHF4 connector
10	NGFF	RC	PCI-E	Fixed	PIFA with I-PEX MHF4 connector
11	NGFF	RC	SDIO	Diversity	PIFA with I-PEX MHF4 connector
12	NGFF	RC	SDIO	Fixed	PIFA with I-PEX MHF4 connector
13	HMC	RC+LNA	PCI-E	Diversity	PIFA with I-PEX connector
					Dipole with I-PEX connector
14	HMC	RC+LNA	PCI-E	Fixed	PIFA with I-PEX connector
					Dipole with I-PEX connector

Note: The more detail information of diversity type and fixed type is listed as below.

For diversity type: (Both of those two antenna connectors can be used.)

<For 2.4GHz Band:>

The EUT supports the antenna with TX/RX diversity function for 2.4GHz WLAN and Bluetooth, but only one of them will be used at the same time.

Base on WLAN's operation mode to select the other antenna to work.

(Ex. Assume Main port was selected to conduct transmitting function in 2.4GHz WLAN, so AUX port was selected in Bluetooth Mode. Vice versa.)

<For 5GHz Band:>

The EUT supports the antenna with TX/RX diversity function for 5GHz WLAN and Bluetooth, and both them can transmit and receive signal simultaneously.

For WLAN function (1TX, 1RX):

Both of Chain 1 and Chain 2 can be used as transmitting/receiving functions, but only one antenna can be used as transmitting/receiving functions at the same time.

Chain 1 generated the worst case than Chain 2, so it is tested and recorded in the report.

For Bluetooth function (1TX, 1RX):

Both of Chain 1 and Chain 2 can be used as transmitting/receiving functions, but only one antenna can be used as transmitting/receiving functions at the same time.

Chain 1 generated the worst case than Chain 2, so it is tested and recorded in the report.

For fixed type: (Chain 1 is designated for 2.4 GHz WLAN function, Chain 2 is designated for 5GHz WLAN and Bluetooth functions.)

For 2.4GHz WLAN function (1TX, 1RX):

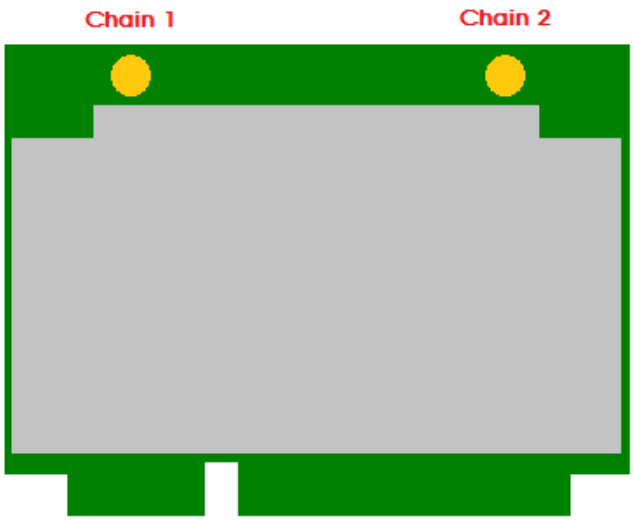
Only Chain 1 can be used as transmitting/receiving functions.

For 5GHz WLAN function (1TX, 1RX):

Only Chain 2 can be used as transmitting/receiving functions.

For Bluetooth function (1TX, 1RX):

Only Chain 2 can be used as transmitting/receiving functions.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 132, 136, 140, 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 38, 46, 54, 62, 102, 110, 134, 151, 159.

For 80MHz bandwidth systems, use Channel 42, 58, 106, 155.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
	42	5210 MHz	-	-
5250~5350 MHz Band 2	52	5260 MHz	60	5300 MHz
	54	5270 MHz	62	5310 MHz
	56	5280 MHz	64	5320 MHz
	58	5290 MHz	-	-
5470~5725 MHz Band 3	100	5500 MHz	112	5560 MHz
	102	5510 MHz	116	5580 MHz
	104	5520 MHz	132	5660 MHz
	106	5530 MHz	134	5670 MHz
	108	5540 MHz	136	5680 MHz
	110	5550 MHz	140	5700 MHz
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	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	2
	11ac VHT80	Band 4	MCS0/Nss1	155	2
Power Spectral Density	11a/BPSK	Band 4	6Mbps	149/157/165	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	2
	11ac VHT80	Band 4	MCS0/Nss1	155	2
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	2
	11ac VHT80	Band 4	MCS0/Nss1	155	2
6dB Spectrum Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	2
	11ac VHT80	Band 4	MCS0/Nss1	155	2
Radiated Emission Above 1GHz	11a/BPSK	Band 4	6Mbps	149/157/165	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165/	2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	2
	11ac VHT80	Band 4	MCS0/Nss1	155	2
Band Edge Emission	11a/BPSK	Band 4	6Mbps	149/157/165	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	2
	11ac VHT80	Band 4	MCS0/Nss1	155	2
Frequency Stability	20 MHz	Band 4	-	157	2
	40 MHz	Band 4	-	151	2
	80 MHz	Band 4	-	155	2

After evaluating, configuration 14 has been evaluated to be the worst case, so it was selected to test and record in this test report. The following test modes were performed for all tests:

For other test itmes

Mode 1. Configuration 14

For Radiated Emission and Band Edge Emission test

Mode 1. Configuration 14 + PIFA Ant. (I-PEX connector)

Mode 2. Configuration 14 + Dipole Ant. (I-PEX connector)

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

This product is an extension of original one reported under Sporton project number: FR342603-07AA and FR342603-07AB

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

Modifications	Performance Checking
Updating 5GHz Band 1 to "New Rules" from "Old Rules".	The output power remains the same, so it's no need to re-test.
Updating 5GHz Band 2~3 to "New Rules" from "Old Rules".	After evaluating, it's no need to re-test.
Updating 5GHz Band 4 to "New Rules" from "Old Rules".	1. 26dB Bandwidth and 99% Occupied Bandwidth 2. 6dB Spectrum Bandwidth 3. Maximum Conducted Output Power 4. Power Spectral Density 5. Radiated Emissions above 1GHz (1GHz~40GHz) 6. Band Edge Emissions 7. Frequency Stability
Remove the Slot antenna	-
Adding antennas and the total antennas amounted to 175 sets.	Adding 125 sets same type of PIFA antenna and 7 sets same type of Dipole antenna with lower gain than the original Certificate, and it is not necessary to verify for RF test. Please refer to the Appendix B for detail.

Note: There is no hardware or electrical modification made to the applying modular transmitter itself.

3.8. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
Test fixture	REALTEK	N/A	N/A

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	Realtek		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5745 MHz	5785 MHz	5825 MHz
802.11a	51	51	51
802.11ac MCS0/Nss1 VHT20	51	51	51
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5755 MHz	5795 MHz	
	48	52	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5775 MHz		
	44		

3.10. EUT Operation during Test

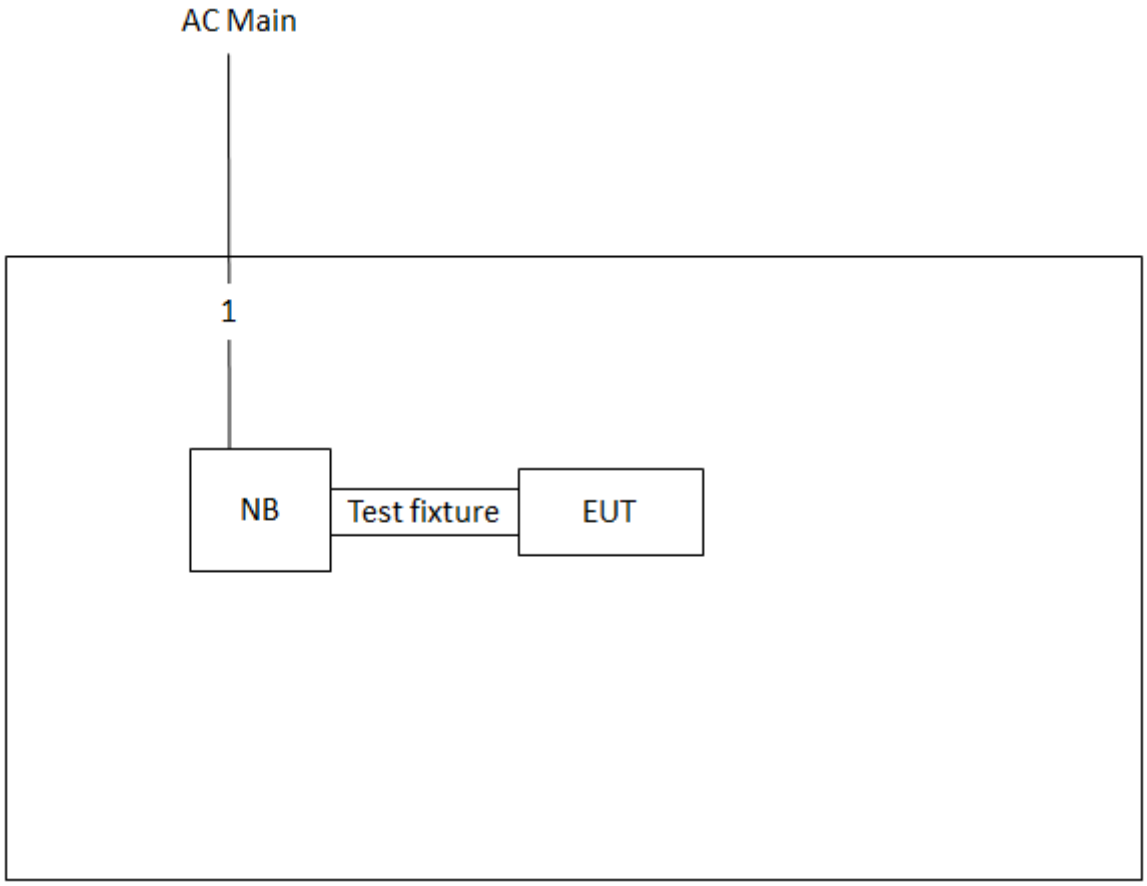
The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	1.000	1.000	100.00	0.00	0.01
802.11ac MCS0/Nss1 VHT20	1.000	1.000	100.00	0.00	0.01
802.11ac MCS0/Nss1 VHT40	1.000	1.000	100.00	0.00	0.01
802.11ac MCS0/Nss1 VHT80	1.000	1.000	100.00	0.00	0.01

3.12. Test Configurations

3.12.1. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length(m)
1	Power cable	No	2.6

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

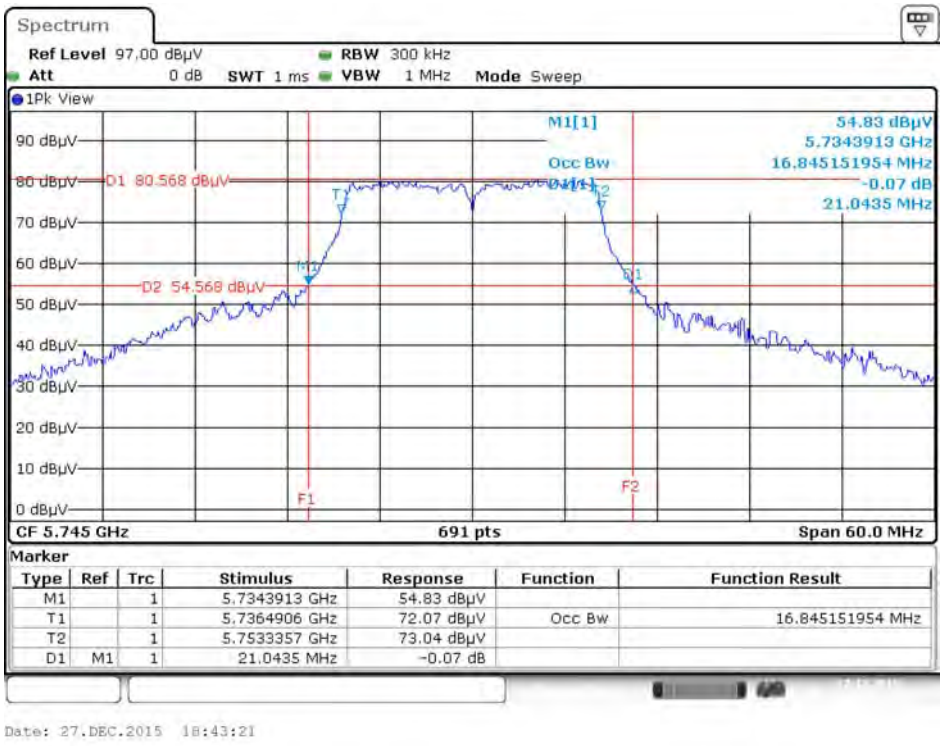
The EUT was programmed to be in continuously transmitting mode.

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

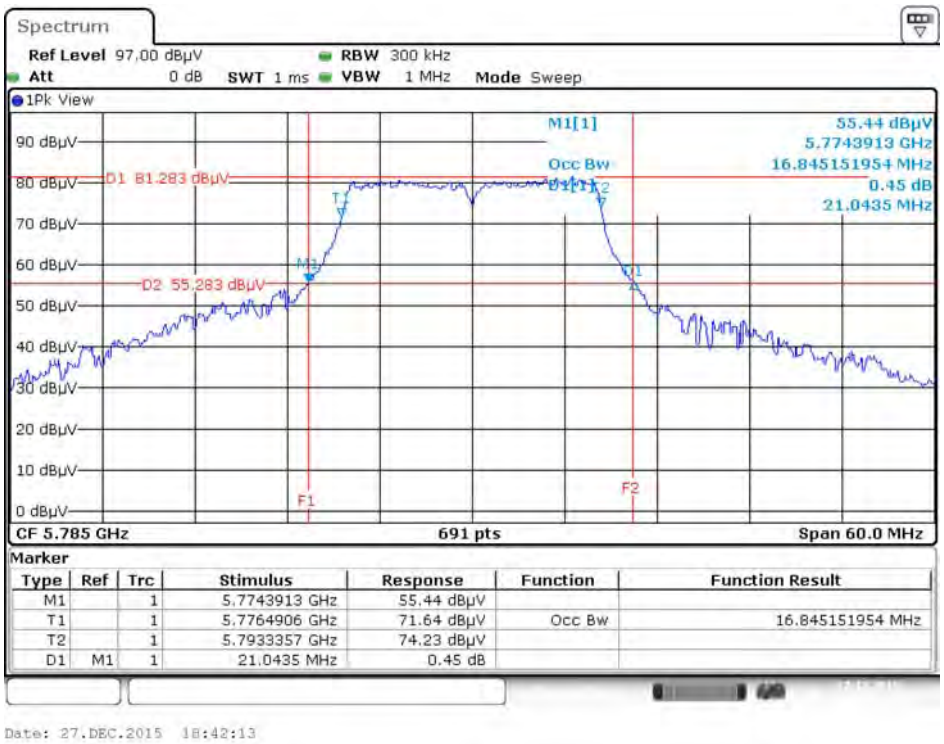
Temperature	24°C	Humidity	60%
Test Engineer	Clemens Fang		

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5745 MHz	21.04	16.85
	5785 MHz	21.04	16.85
	5825 MHz	22.96	16.93
802.11ac MCS0/Nss1 VHT20	5745 MHz	21.65	17.89
	5785 MHz	22.26	17.97
	5825 MHz	22.35	18.06
802.11ac MCS0/Nss1 VHT40	5755 MHz	45.36	37.48
	5795 MHz	56.52	37.48
802.11ac MCS0/Nss1 VHT80	5775 MHz	84.35	76.12

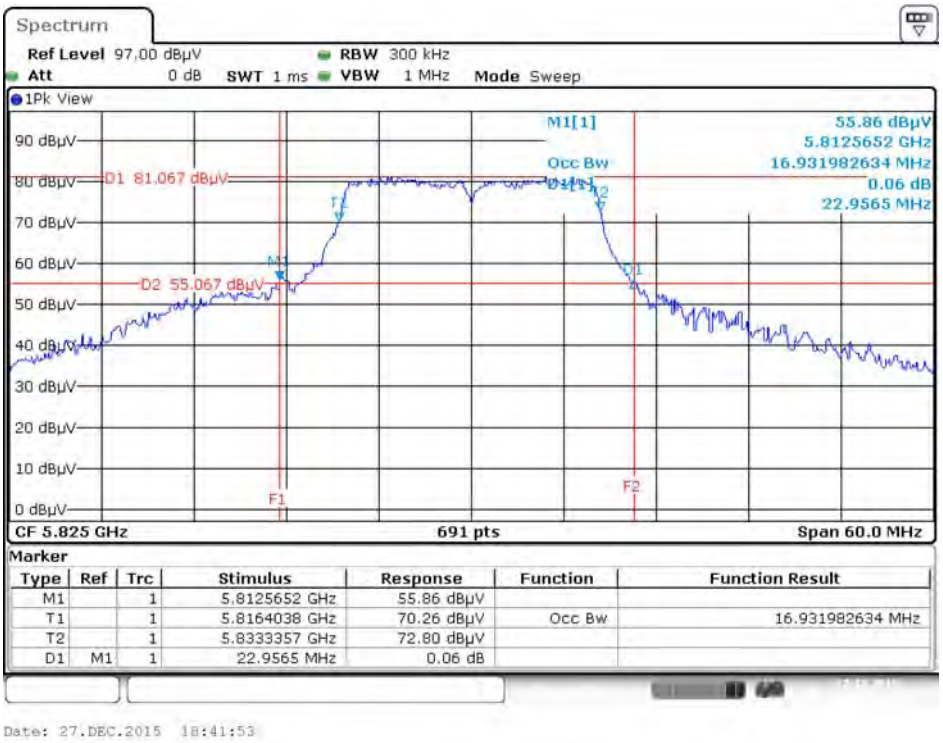
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5745 MHz



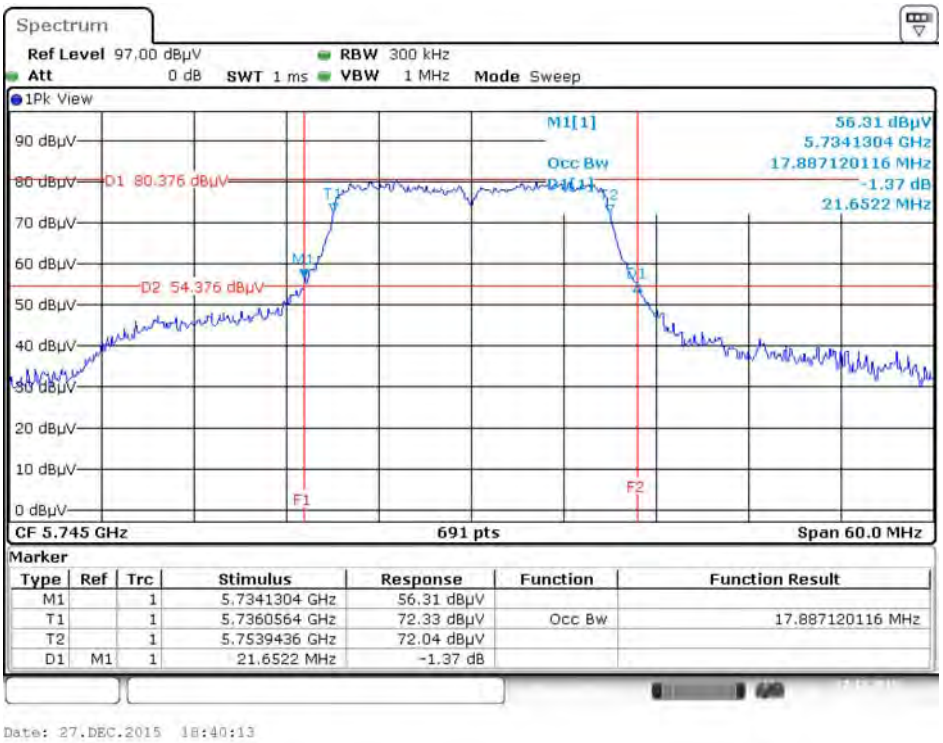
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5785 MHz



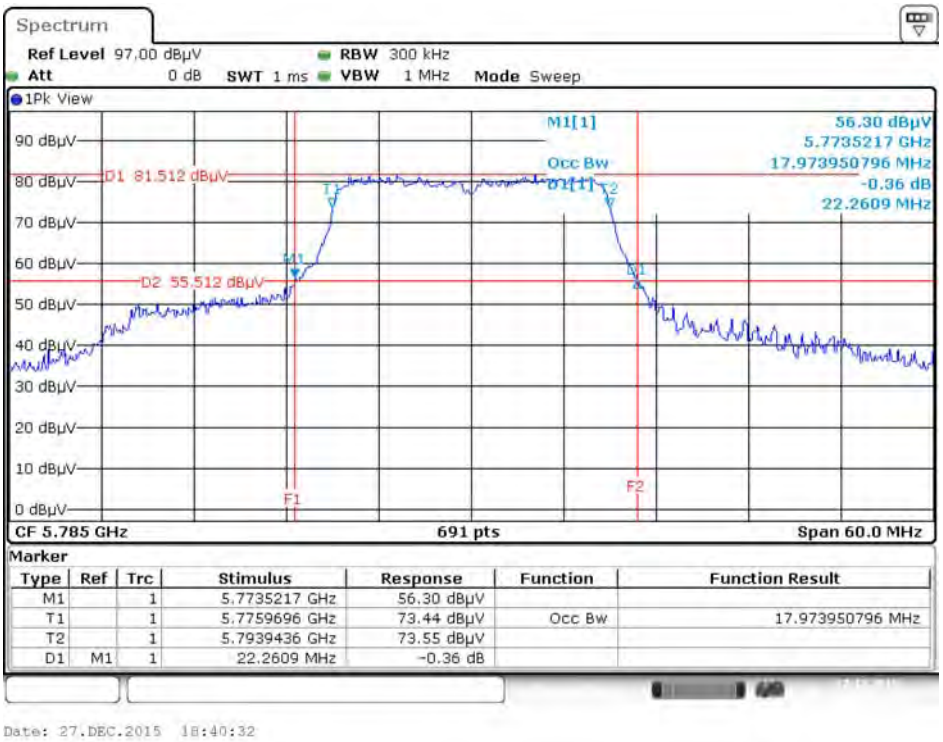
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5825 MHz



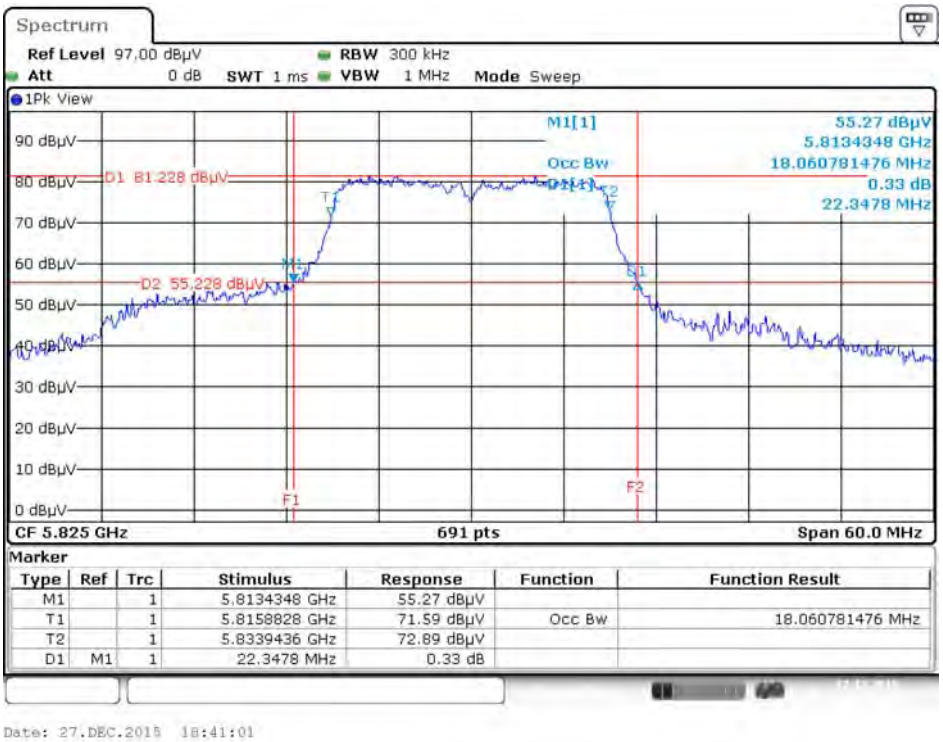
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 2 / 5745 MHz



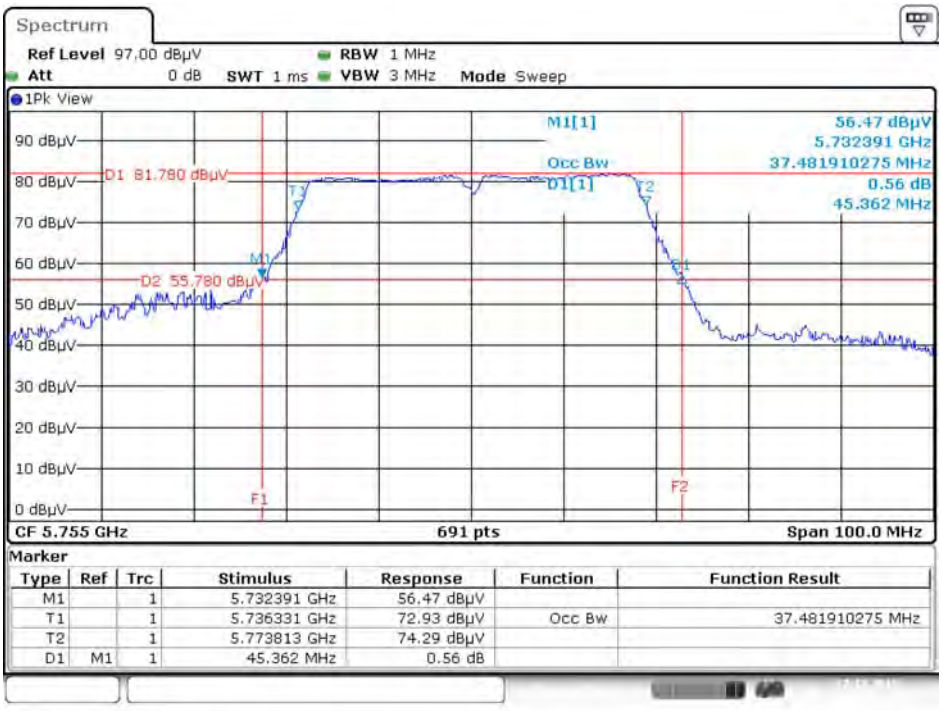
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 2 / 5785 MHz



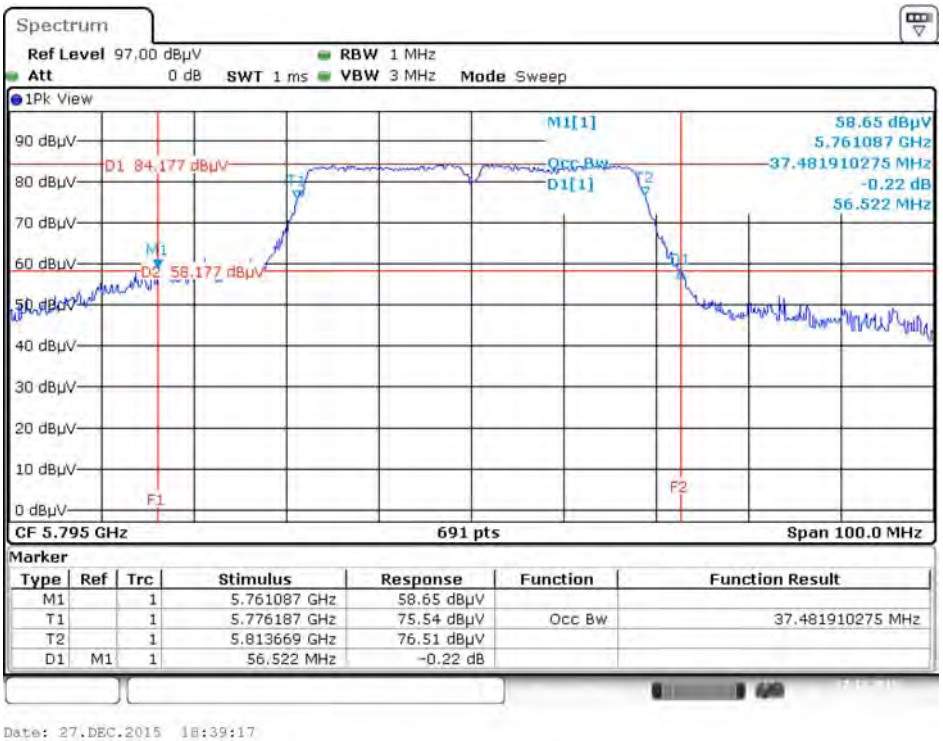
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 2 / 5825 MHz



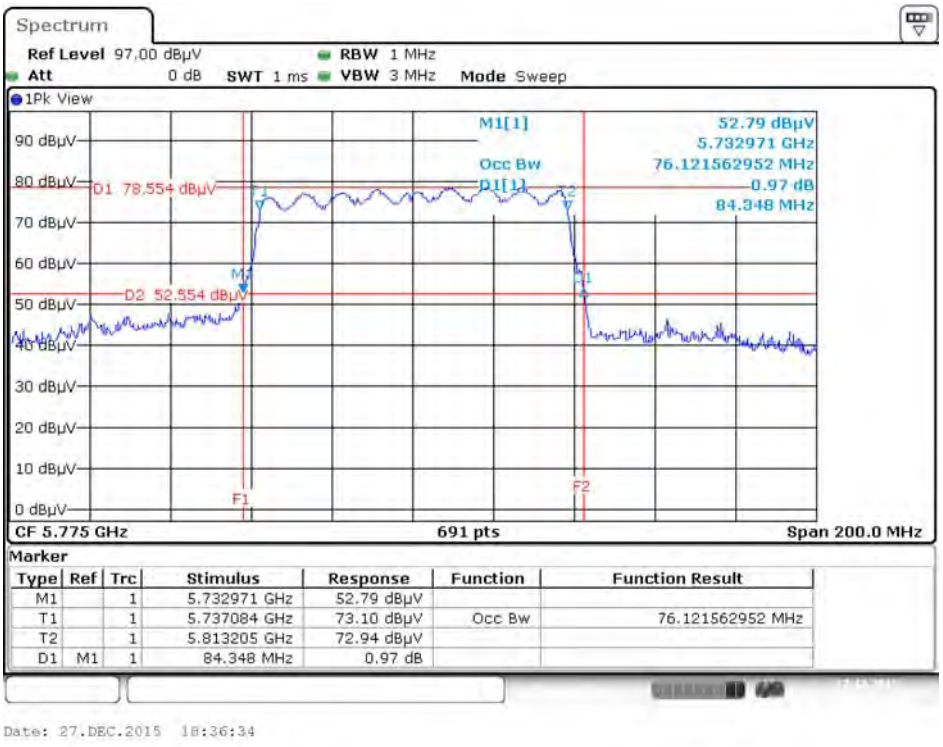
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 2 / 5755 MHz



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



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



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

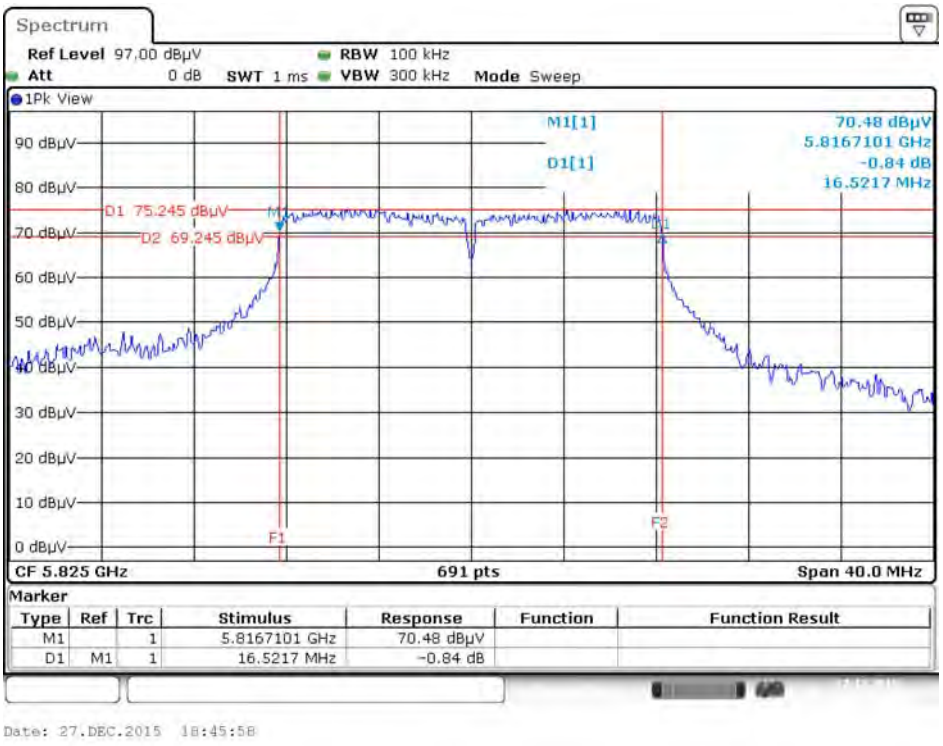
Temperature	24°C	Humidity	60%
Test Engineer	Clemens Fang		

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11a	5745 MHz	16.58	500	Complies
	5785 MHz	16.58	500	Complies
	5825 MHz	16.52	500	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	17.80	500	Complies
	5785 MHz	17.74	500	Complies
	5825 MHz	17.68	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	36.52	500	Complies
	5795 MHz	36.52	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	76.52	500	Complies

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

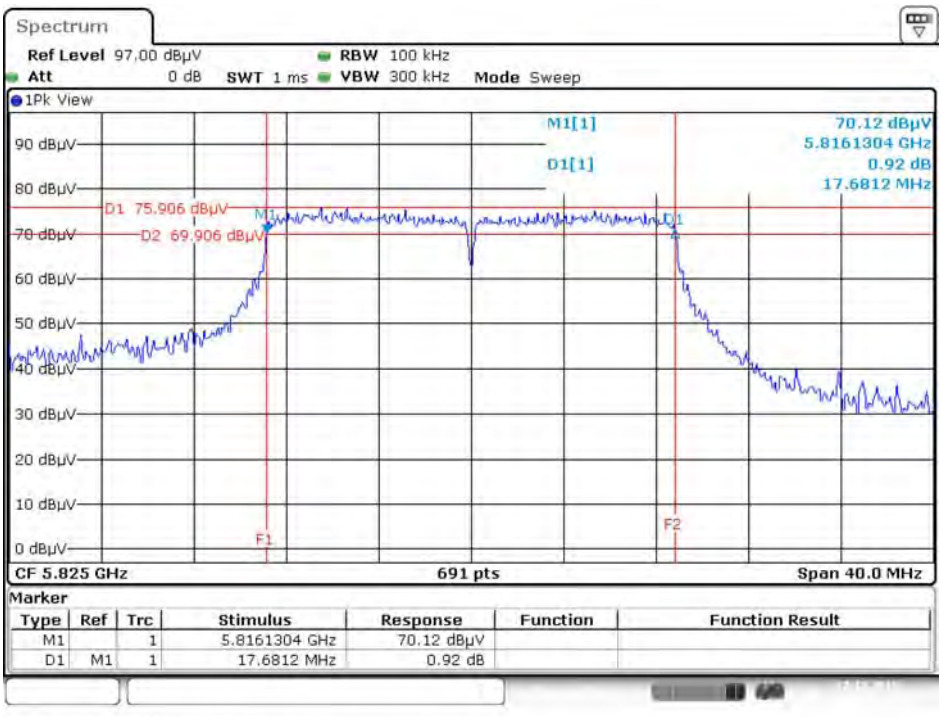
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5825 MHz



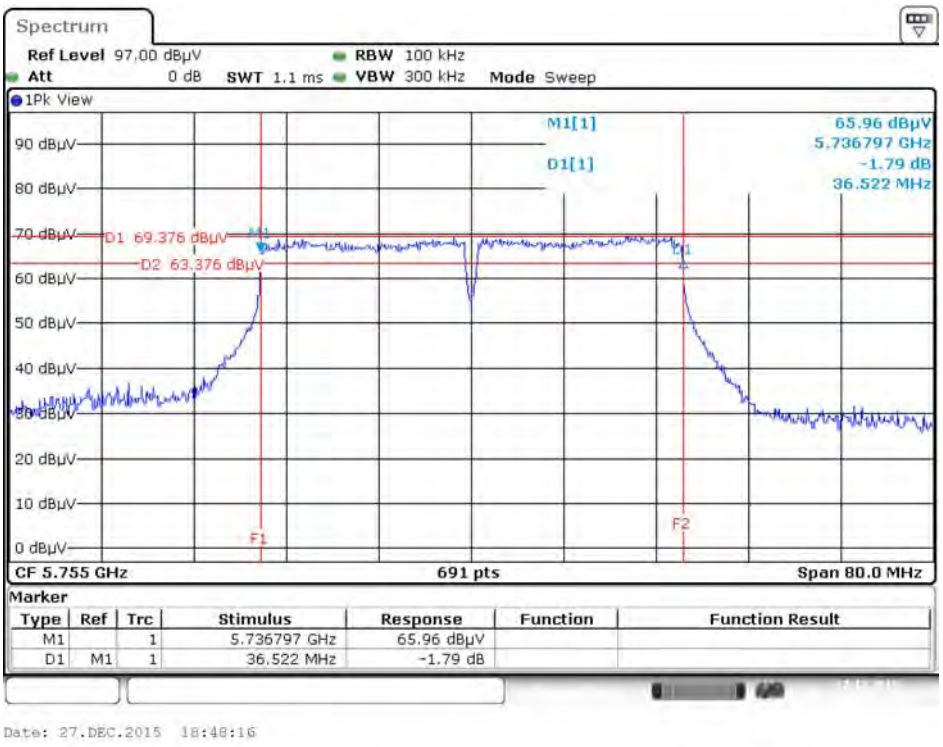
Date: 27.DEC.2015 18:45:58

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 2 / 5825 MHz

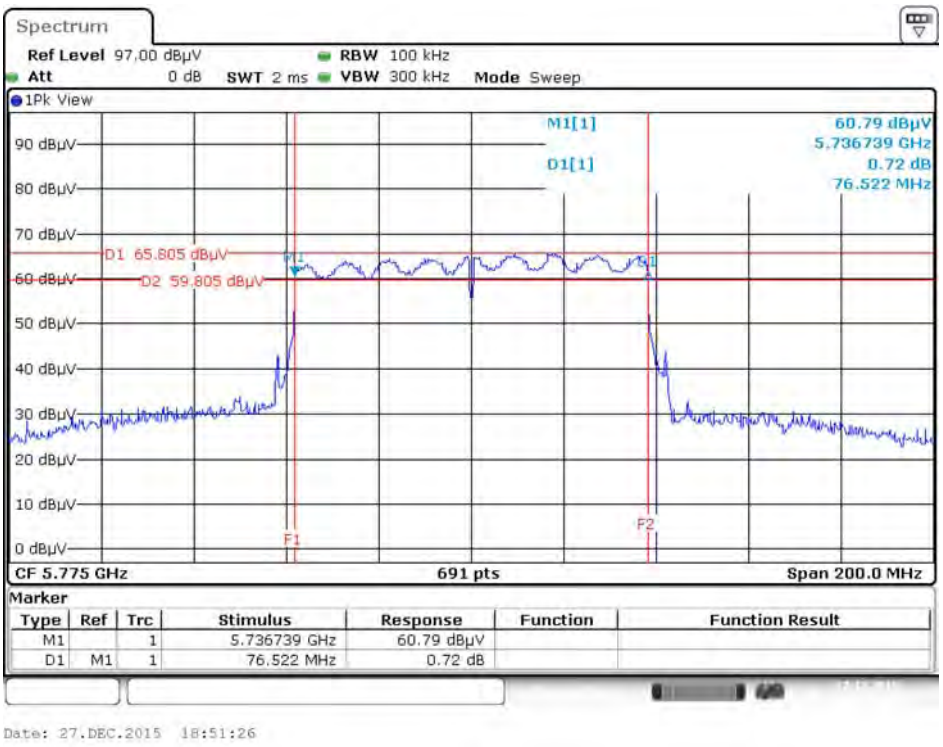


Date: 27.DEC.2015 18:46:34

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



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



4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

Frequency Band		Limit
☒	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

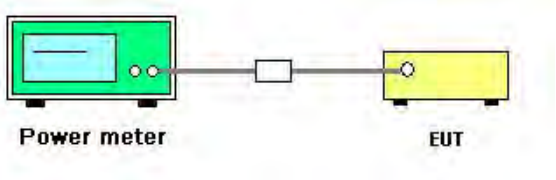
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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	24°C	Humidity	60%
Test Engineer	Clemens Fang	Test Date	Dec. 27, 2015

Mode	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 2		
802.11a	5745 MHz	16.29	30.00	Complies
	5785 MHz	16.32	30.00	Complies
	5825 MHz	16.21	30.00	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	16.18	30.00	Complies
	5785 MHz	16.38	30.00	Complies
	5825 MHz	16.31	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	13.68	30.00	Complies
	5795 MHz	16.12	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	12.06	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
☒	5.725~5.85 GHz	30 dBm/500kHz

4.4.2. Measuring Instruments and Setting

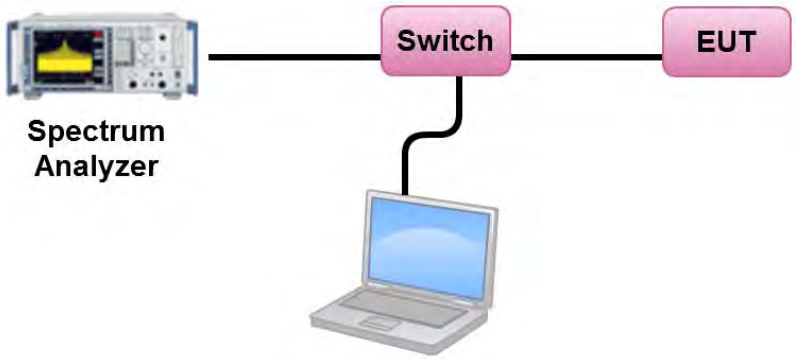
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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	24°C	Humidity	60%
Test Engineer	Clemens Fang		

Configuration IEEE 802.11a / Chain 2

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	3.09	-3.01	0.08	30.00	Complies
157	5785 MHz	3.07	-3.01	0.06	30.00	Complies
165	5825 MHz	3.10	-3.01	0.09	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 2

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	3.08	-3.01	0.07	30.00	Complies
157	5785 MHz	3.33	-3.01	0.32	30.00	Complies
165	5825 MHz	3.25	-3.01	0.24	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 2

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
151	5755 MHz	-2.35	-3.01	-5.36	30.00	Complies
159	5795 MHz	-0.06	-3.01	-3.07	30.00	Complies

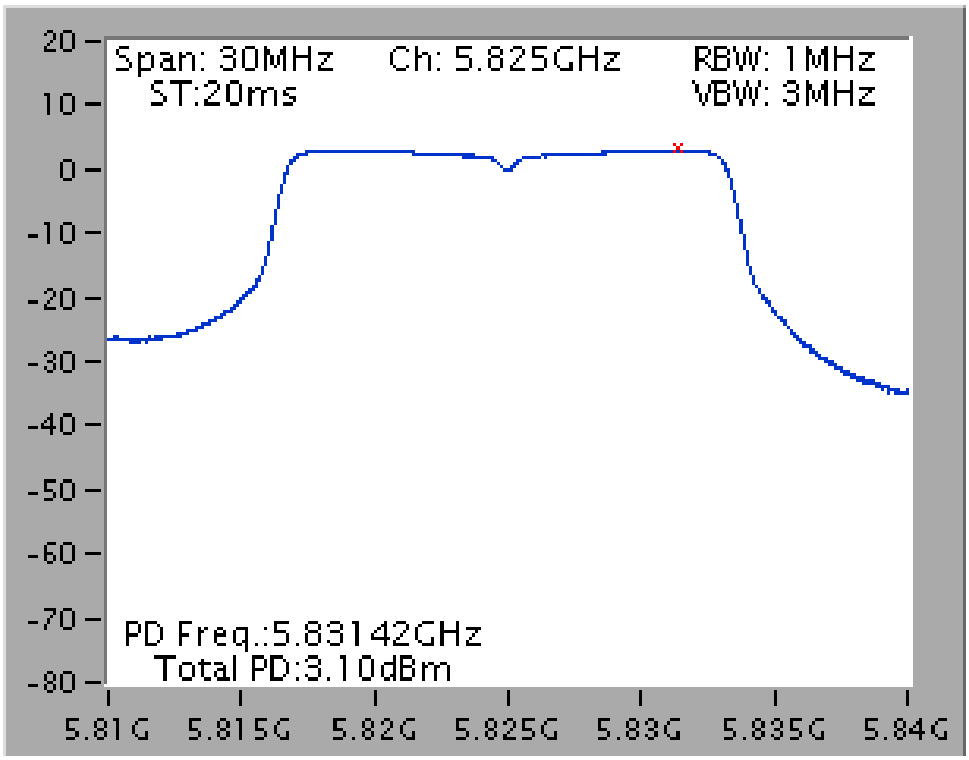
Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 2

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	-7.13	-3.01	-10.14	30.00	Complies

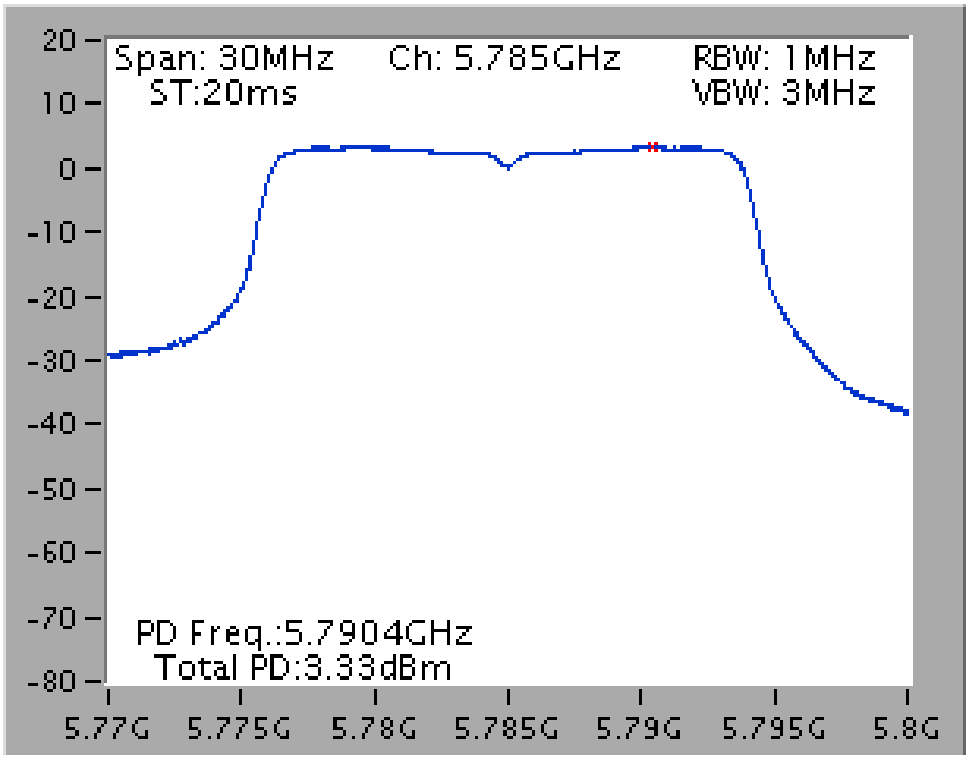
Note: All the test values were listed in the report.

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

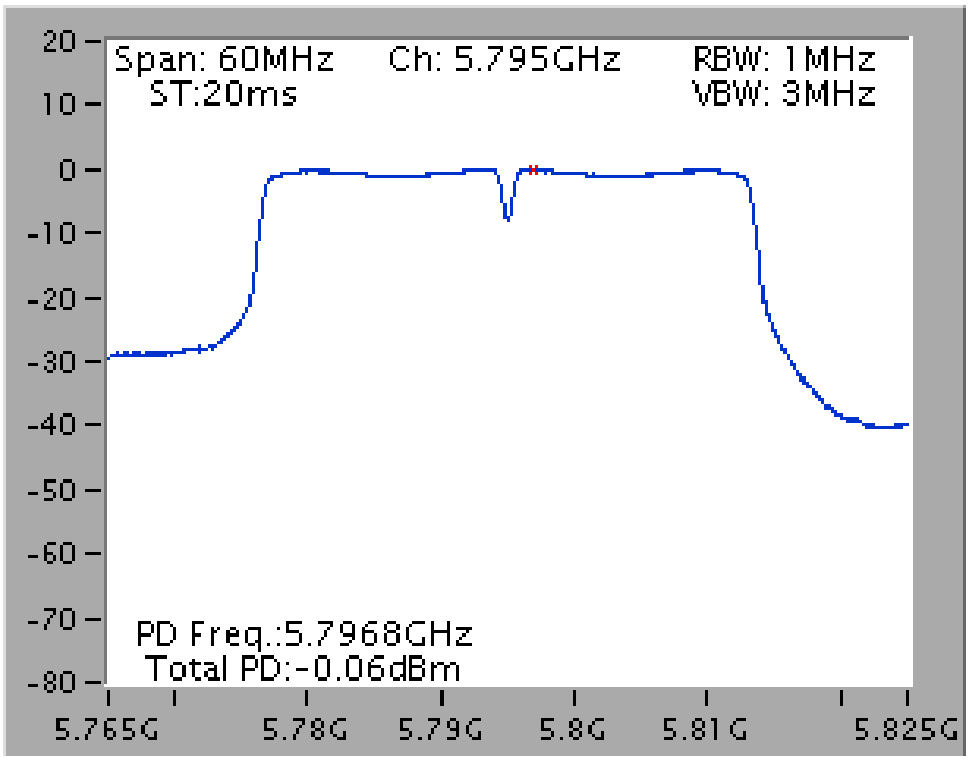
Power Density Plot on Configuration IEEE 802.11a / Chain 2 / 5825 MHz



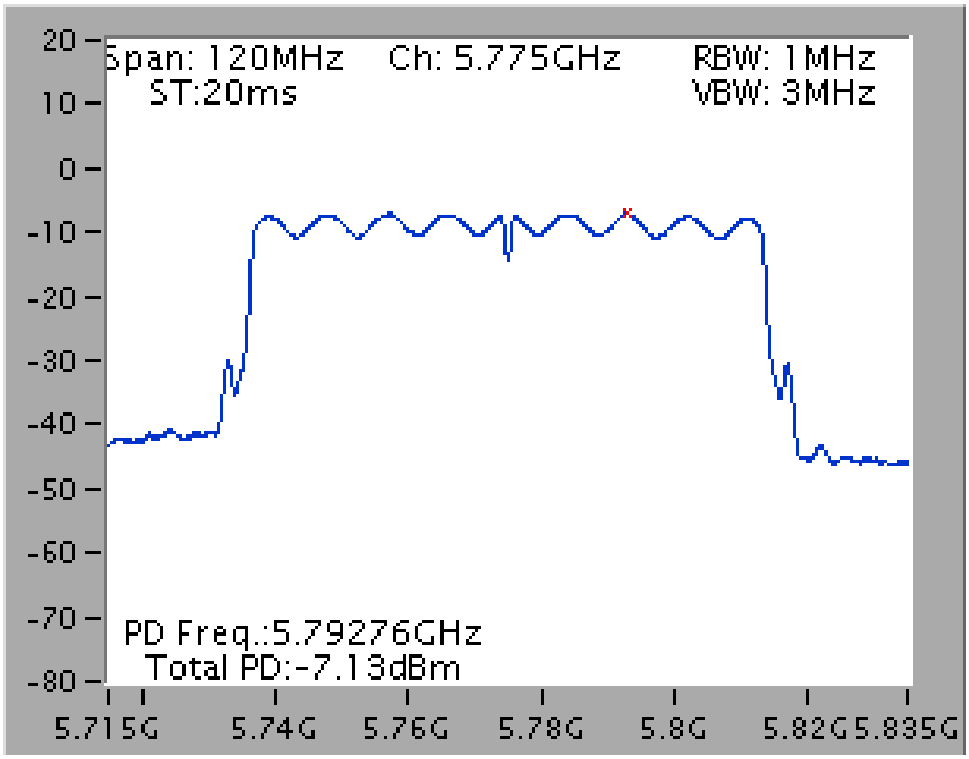
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 2 / 5785 MHz



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



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / 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.

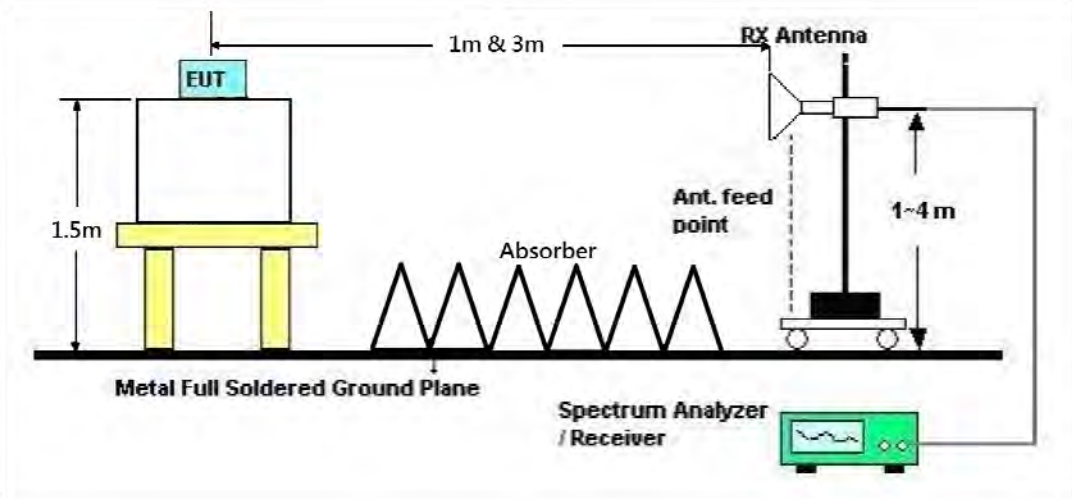
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

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)

For PIFA Antenna:

Temperature	23°C	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 149 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.06	46.25	54.00	-7.75	26.18	14.24	39.20	33.37	121	339	Average	HORIZONTAL
2	11489.37	59.37	74.00	-14.63	39.30	14.24	39.20	33.37	121	339	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.44	46.39	54.00	-7.61	26.32	14.24	39.20	33.37	123	333	Average	VERTICAL
2	11490.69	58.91	74.00	-15.09	38.84	14.24	39.20	33.37	123	333	Peak	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 157 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11570.38	47.62	54.00	-6.38	27.46	14.35	39.20	33.39	115	327	Average	HORIZONTAL
2	11570.72	61.41	74.00	-12.59	41.25	14.35	39.20	33.39	115	327	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11569.65	60.90	74.00	-13.10	40.74	14.35	39.20	33.39	118	341	Peak	VERTICAL
2	11570.77	47.50	54.00	-6.50	27.34	14.35	39.20	33.39	118	341	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 165 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11649.02	61.53	74.00	-12.47	41.29	14.45	39.20	33.41	108	332	Peak	HORIZONTAL
2	11650.92	48.63	54.00	-5.37	28.33	14.51	39.20	33.41	108	332	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11649.78	61.85	74.00	-12.15	41.61	14.45	39.20	33.41	111	328	Peak	VERTICAL
2	11650.74	48.82	54.00	-5.18	28.58	14.45	39.20	33.41	111	328	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11490.43	59.63	74.00	-14.37	39.56	14.24	39.20	33.37	105	331	Peak	HORIZONTAL
2	11490.73	46.40	54.00	-7.60	26.33	14.24	39.20	33.37	105	331	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.05	59.99	74.00	-14.01	39.92	14.24	39.20	33.37	107	324	Peak	VERTICAL
2	11489.44	46.41	54.00	-7.59	26.34	14.24	39.20	33.37	107	324	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11569.26	61.01	74.00	-12.99	40.85	14.35	39.20	33.39	100	311	Peak	HORIZONTAL
2	11570.82	47.70	54.00	-6.30	27.54	14.35	39.20	33.39	100	311	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11570.12	61.06	74.00	-12.94	40.90	14.35	39.20	33.39	102	328	Peak	VERTICAL
2	11570.64	47.86	54.00	-6.14	27.70	14.35	39.20	33.39	102	328	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11650.13	48.67	54.00	-5.33	28.43	14.45	39.20	33.41	102	289	Average	HORIZONTAL
2	11650.55	62.22	74.00	-11.78	41.98	14.45	39.20	33.41	102	289	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11650.10	61.60	74.00	-12.40	41.36	14.45	39.20	33.41	104	298	Peak	VERTICAL
2	11650.44	48.76	54.00	-5.24	28.52	14.45	39.20	33.41	104	298	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11509.17	46.83	54.00	-7.17	26.77	14.24	39.20	33.38	100	279	Average	HORIZONTAL
2	11509.31	60.40	74.00	-13.60	40.34	14.24	39.20	33.38	100	279	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11509.11	47.14	54.00	-6.86	27.08	14.24	39.20	33.38	101	282	Average	VERTICAL
2	11509.49	60.26	74.00	-13.74	40.20	14.24	39.20	33.38	101	282	Peak	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11590.50	48.29	54.00	-5.71	28.09	14.40	39.20	33.40	120	271	Average	HORIZONTAL
2	11590.55	62.08	74.00	-11.92	41.88	14.40	39.20	33.40	120	271	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11590.85	61.12	74.00	-12.88	40.92	14.40	39.20	33.40	122	269	Peak	VERTICAL
2	11590.90	48.16	54.00	-5.84	27.96	14.40	39.20	33.40	122	269	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11550.50	47.32	54.00	-6.68	27.16	14.35	39.20	33.39	118	279	Average	HORIZONTAL
2	11550.78	60.55	74.00	-13.45	40.39	14.35	39.20	33.39	118	279	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11550.25	47.67	54.00	-6.33	27.51	14.35	39.20	33.39	122	287	Average	VERTICAL
2	11550.51	60.90	74.00	-13.10	40.74	14.35	39.20	33.39	122	287	Peak	VERTICAL

For Dipole Antenna:

Temperature	23℃	**Humidity**	60%
Test Engineer	Gary Chu	**Configurations**	IEEE 802.11a CH 149 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.50	58.94	74.00	-15.06	38.87	14.24	39.20	33.37	120	16	Peak	HORIZONTAL
2	11490.92	45.99	54.00	-8.01	25.92	14.24	39.20	33.37	120	16	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.47	46.24	54.00	-7.76	26.17	14.24	39.20	33.37	118	11	Average	VERTICAL
2	11489.77	59.24	74.00	-14.76	39.17	14.24	39.20	33.37	118	11	Peak	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 157 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11569.10	60.58	74.00	-13.42	40.42	14.35	39.20	33.39	122	21	Peak	HORIZONTAL
2	11570.70	47.29	54.00	-6.71	27.13	14.35	39.20	33.39	122	21	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11569.41	59.96	74.00	-14.04	39.80	14.35	39.20	33.39	119	18	Peak	VERTICAL
2	11570.95	47.24	54.00	-6.76	27.08	14.35	39.20	33.39	119	18	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 165 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11650.58	48.52	54.00	-5.48	28.28	14.45	39.20	33.41	118	21	Average	HORIZONTAL
2	11650.61	61.30	74.00	-12.70	41.06	14.45	39.20	33.41	118	21	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11650.66	48.49	54.00	-5.51	28.25	14.45	39.20	33.41	121	25	Average	VERTICAL
2	11650.77	61.54	74.00	-12.46	41.24	14.51	39.20	33.41	121	25	Peak	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.17	59.45	74.00	-14.55	39.38	14.24	39.20	33.37	114	28	Peak	HORIZONTAL
2	11489.38	46.08	54.00	-7.92	26.01	14.24	39.20	33.37	114	28	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11489.30	46.08	54.00	-7.92	26.01	14.24	39.20	33.37	115	31	Average	VERTICAL
2	11490.80	59.51	74.00	-14.49	39.44	14.24	39.20	33.37	115	31	Peak	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11570.00	47.43	54.00	-6.57	27.27	14.35	39.20	33.39	109	38	Average	HORIZONTAL
2	11570.09	60.53	74.00	-13.47	40.37	14.35	39.20	33.39	109	38	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11569.06	60.60	74.00	-13.40	40.44	14.35	39.20	33.39	112	33	Peak	VERTICAL
2	11570.12	47.52	54.00	-6.48	27.36	14.35	39.20	33.39	112	33	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11649.16	48.45	54.00	-5.55	28.21	14.45	39.20	33.41	105	52	Average	HORIZONTAL
2	11650.37	61.47	74.00	-12.53	41.23	14.45	39.20	33.41	105	52	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11649.41	61.23	74.00	-12.77	40.99	14.45	39.20	33.41	107	41	Peak	VERTICAL
2	11650.39	48.68	54.00	-5.32	28.44	14.45	39.20	33.41	107	41	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11509.08	46.51	54.00	-7.49	26.45	14.24	39.20	33.38	104	65	Average	HORIZONTAL
2	11509.71	59.25	74.00	-14.75	39.19	14.24	39.20	33.38	104	65	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11509.03	46.65	54.00	-7.35	26.59	14.24	39.20	33.38	108	62	Average	VERTICAL
2	11510.95	59.74	74.00	-14.26	39.68	14.24	39.20	33.38	108	62	Peak	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11590.14	61.07	74.00	-12.93	40.87	14.40	39.20	33.40	100	71	Peak	HORIZONTAL
2	11590.94	47.91	54.00	-6.09	27.71	14.40	39.20	33.40	100	71	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11590.34	61.16	74.00	-12.84	40.96	14.40	39.20	33.40	102	69	Peak	VERTICAL
2	11590.62	48.04	54.00	-5.96	27.84	14.40	39.20	33.40	102	69	Average	VERTICAL

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 2
Test Date	Dec. 15, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11549.16	60.52	74.00	-13.48	40.42	14.29	39.20	33.39	137	93	Peak	HORIZONTAL
2	11550.90	47.34	54.00	-6.66	27.18	14.35	39.20	33.39	137	93	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11550.60	47.34	54.00	-6.66	27.18	14.35	39.20	33.39	133	82	Average	VERTICAL
2	11550.87	60.18	74.00	-13.82	40.02	14.35	39.20	33.39	133	82	Peak	VERTICAL

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

For PIFA Antenna:

Temperature	23°C	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 149, 157, 165 / Chain 2
Test Date	Dec. 14, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5714.60	63.05	68.20	-5.15	53.24	8.51	34.43	33.13	149	189	Peak	VERTICAL
2	5724.60	71.17	78.20	-7.03	61.39	8.47	34.44	33.13	149	189	Peak	VERTICAL
3	5751.20	95.12			85.38	8.43	34.45	33.14	149	189	Average	VERTICAL
4	5751.40	104.14			94.40	8.43	34.45	33.14	149	189	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5698.60	60.74	68.20	-7.46	50.89	8.56	34.42	33.13	155	217	Peak	HORIZONTAL
2	5721.40	61.61	78.20	-16.59	51.80	8.51	34.43	33.13	155	217	Peak	HORIZONTAL
3	5778.60	103.42			93.75	8.35	34.47	33.15	155	217	Peak	HORIZONTAL
4	5778.60	93.97			84.30	8.35	34.47	33.15	155	217	Average	HORIZONTAL
5	5855.00	62.28	78.20	-15.92	52.38	8.56	34.51	33.17	155	217	Peak	HORIZONTAL
6	5869.40	62.16	68.20	-6.04	52.18	8.64	34.52	33.18	155	217	Peak	HORIZONTAL

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	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5831.20	95.80			86.00	8.47	34.50	33.17	153	215	Average	HORIZONTAL
2	5831.40	104.65			94.85	8.47	34.50	33.17	153	215	Peak	HORIZONTAL
3	5850.00	68.06	78.20	-10.14	58.16	8.56	34.51	33.17	153	215	Peak	HORIZONTAL
4	5864.40	63.60	68.20	-4.60	53.62	8.64	34.52	33.18	153	215	Peak	HORIZONTAL

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

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Chain 2
Test Date	Dec. 14, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5709.80	64.57	68.20	-3.63	54.76	8.51	34.43	33.13	151	182	Peak	VERTICAL
2	5723.40	75.19	78.20	-3.01	65.41	8.47	34.44	33.13	151	182	Peak	VERTICAL
3	5750.40	94.97			85.23	8.43	34.45	33.14	151	182	Average	VERTICAL
4	5751.40	104.50			94.76	8.43	34.45	33.14	151	182	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5709.80	60.82	68.20	-7.38	51.01	8.51	34.43	33.13	151	219	Peak	HORIZONTAL
2	5723.00	60.84	78.20	-17.36	51.06	8.47	34.44	33.13	151	219	Peak	HORIZONTAL
3	5779.40	103.46			93.79	8.35	34.47	33.15	151	219	Peak	HORIZONTAL
4	5779.40	93.97			84.30	8.35	34.47	33.15	151	219	Average	HORIZONTAL
5	5854.00	61.64	78.20	-16.56	51.74	8.56	34.51	33.17	151	219	Peak	HORIZONTAL
6	5877.40	62.64	68.20	-5.56	52.57	8.72	34.53	33.18	151	219	Peak	HORIZONTAL

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	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5831.40	106.11			96.31	8.47	34.50	33.17	153	183	Peak	VERTICAL
2	5832.00	96.71			86.91	8.47	34.50	33.17	153	183	Average	VERTICAL
3	5851.80	68.98	78.20	-9.22	59.08	8.56	34.51	33.17	153	183	Peak	VERTICAL
4	5861.00	65.64	68.20	-2.56	55.66	8.64	34.52	33.18	153	183	Peak	VERTICAL

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

Temperature	23°C	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Chain 2
Test Date	Dec. 15, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5715.00	67.54	68.20	-0.66	57.73	8.51	34.43	33.13	148	187	Peak	VERTICAL
2	5719.00	72.30	78.20	-5.90	62.49	8.51	34.43	33.13	148	187	Peak	VERTICAL
3	5752.60	99.45			89.71	8.43	34.45	33.14	148	187	Peak	VERTICAL
4	5756.60	90.37			80.66	8.39	34.46	33.14	148	187	Average	VERTICAL

Item 3, 4 are the fundamental frequency at 5755 MHz.

Channel 159

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5714.60	61.16	68.20	-7.04	51.35	8.51	34.43	33.13	157	217	Peak	HORIZONTAL
2	5715.80	62.37	78.20	-15.83	52.56	8.51	34.43	33.13	157	217	Peak	HORIZONTAL
3	5805.40	101.28			91.65	8.31	34.48	33.16	157	217	Peak	HORIZONTAL
4	5810.60	91.89			82.17	8.39	34.49	33.16	157	217	Average	HORIZONTAL
5	5859.00	65.58	78.20	-12.62	55.59	8.64	34.52	33.17	157	217	Peak	HORIZONTAL
6	5864.20	64.31	68.20	-3.89	54.33	8.64	34.52	33.18	157	217	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5795 MHz.

Temperature	23°C	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 2
Test Date	Dec. 15, 2015		

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5704.00	67.68	68.20	-0.52	57.83	8.56	34.42	33.13	152	186	Peak	VERTICAL
2	5720.00	68.20	78.20	-10.00	58.39	8.51	34.43	33.13	152	186	Peak	VERTICAL
3	5793.00	96.49			86.85	8.31	34.48	33.15	152	186	Peak	VERTICAL
4	5793.00	86.65			77.01	8.31	34.48	33.15	152	186	Average	VERTICAL
5	5851.00	63.91	78.20	-14.29	54.01	8.56	34.51	33.17	152	186	Peak	VERTICAL
6	5869.00	64.96	68.20	-3.24	54.98	8.64	34.52	33.18	152	186	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5775 MHz.

For Dipole Antenna:

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11a CH 149, 157, 165 / Chain 2
Test Date	Dec. 15, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5713.40	63.61	68.20	-4.59	53.80	8.51	34.43	33.13	225	197	Peak	VERTICAL
2	5725.00	73.96	78.20	-4.24	64.18	8.47	34.44	33.13	225	197	Peak	VERTICAL
3	5738.60	109.37			99.60	8.47	34.44	33.14	225	197	Peak	VERTICAL
4	5739.80	99.65			89.91	8.43	34.45	33.14	225	197	Average	VERTICAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5713.00	60.22	68.20	-7.98	50.41	8.51	34.43	33.13	224	195	Peak	VERTICAL
2	5725.00	59.33	78.20	-18.87	49.55	8.47	34.44	33.13	224	195	Peak	VERTICAL
3	5778.60	105.99			96.32	8.35	34.47	33.15	224	195	Peak	VERTICAL
4	5779.80	96.46			86.79	8.35	34.47	33.15	224	195	Average	VERTICAL
5	5850.00	59.68	78.20	-18.52	49.78	8.56	34.51	33.17	224	195	Peak	VERTICAL
6	5861.00	62.47	68.20	-5.73	52.49	8.64	34.52	33.18	224	195	Peak	VERTICAL

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	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5818.60	108.14			98.42	8.39	34.49	33.16	225	197	Peak	VERTICAL
2	5831.20	98.80			89.00	8.47	34.50	33.17	225	197	Average	VERTICAL
3	5850.00	70.30	78.20	-7.90	60.40	8.56	34.51	33.17	225	197	Peak	VERTICAL
4	5860.20	64.67	68.20	-3.53	54.69	8.64	34.52	33.18	225	197	Peak	VERTICAL

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

Temperature	23℃	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Chain 2
Test Date	Dec. 15, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5710.80	64.42	68.20	-3.78	54.61	8.51	34.43	33.13	221	197	Peak	VERTICAL
2	5724.60	77.12	78.20	-1.08	67.34	8.47	34.44	33.13	221	197	Peak	VERTICAL
3	5739.40	99.96			90.22	8.43	34.45	33.14	221	197	Average	VERTICAL
4	5739.60	108.50			98.76	8.43	34.45	33.14	221	197	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5704.20	61.32	68.20	-6.88	51.47	8.56	34.42	33.13	224	199	Peak	VERTICAL
2	5719.80	61.27	78.20	-16.93	51.46	8.51	34.43	33.13	224	199	Peak	VERTICAL
3	5779.40	108.82			99.15	8.35	34.47	33.15	224	199	Peak	VERTICAL
4	5779.40	99.30			89.63	8.35	34.47	33.15	224	199	Average	VERTICAL
5	5853.20	62.76	78.20	-15.44	52.86	8.56	34.51	33.17	224	199	Peak	VERTICAL
6	5870.20	62.78	68.20	-5.42	52.80	8.64	34.52	33.18	224	199	Peak	VERTICAL

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	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5819.40	98.91			89.19	8.39	34.49	33.16	223	199	Average	VERTICAL
2	5820.20	108.34			98.62	8.39	34.49	33.16	223	199	Peak	VERTICAL
3	5851.60	71.22	78.20	-6.98	61.32	8.56	34.51	33.17	223	199	Peak	VERTICAL
4	5860.20	66.94	68.20	-1.26	56.96	8.64	34.52	33.18	223	199	Peak	VERTICAL

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

Temperature	23°C	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Chain 2
Test Date	Dec. 15, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5714.60	67.69	68.20	-0.51	57.88	8.51	34.43	33.13	224	198	Peak	VERTICAL
2	5719.00	71.97	78.20	-6.23	62.16	8.51	34.43	33.13	224	198	Peak	VERTICAL
3	5740.20	94.41			84.67	8.43	34.45	33.14	224	198	Average	VERTICAL
4	5741.00	102.71			92.97	8.43	34.45	33.14	224	198	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5755 MHz.

Channel 159

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5708.20	61.62	68.20	-6.58	51.81	8.51	34.43	33.13	227	200	Peak	VERTICAL
2	5725.00	62.89	78.20	-15.31	53.11	8.47	34.44	33.13	227	200	Peak	VERTICAL
3	5780.20	95.81			86.14	8.35	34.47	33.15	227	200	Average	VERTICAL
4	5781.00	105.18			95.51	8.35	34.47	33.15	227	200	Peak	VERTICAL
5	5851.40	66.39	78.20	-11.81	56.49	8.56	34.51	33.17	227	200	Peak	VERTICAL
6	5861.40	63.38	68.20	-4.82	53.40	8.64	34.52	33.18	227	200	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5795 MHz.

Temperature	23°C	Humidity	60%
Test Engineer	Gary Chu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 2
Test Date	Dec. 15, 2015		

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5695.00	67.59	68.20	-0.61	57.74	8.56	34.42	33.13	227	200	Peak	VERTICAL
2	5724.00	70.10	78.20	-8.10	60.32	8.47	34.44	33.13	227	200	Peak	VERTICAL
3	5783.00	99.80			90.13	8.35	34.47	33.15	227	200	Peak	VERTICAL
4	5784.00	90.55			80.88	8.35	34.47	33.15	227	200	Average	VERTICAL
5	5851.00	67.60	78.20	-10.60	57.70	8.56	34.51	33.17	227	200	Peak	VERTICAL
6	5866.00	67.18	68.20	-1.02	57.20	8.64	34.52	33.18	227	200	Peak	VERTICAL

Item 3, 4 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

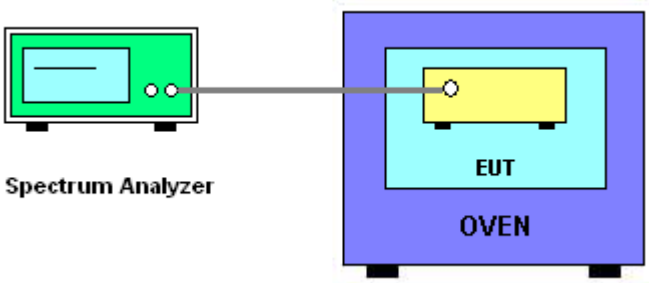
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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 -20°C~70°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	24°C	Humidity	60%
Test Engineer	Clemens Fang	Test Date	Dec. 27, 2015

Mode: 20 MHz / Chain 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9782	5784.9768	5784.9750	5784.9729
110.00	5784.9770	5784.9757	5784.9741	5784.9722
93.50	5784.9756	5784.9745	5784.9733	5784.9711
Max. Deviation (MHz)	0.0244	0.0255	0.0267	0.0289
Max. Deviation (ppm)	4.22	4.41	4.62	5.00
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
-20	5784.9824	5784.9811	5784.9794	5784.9770
-10	5784.9809	5784.9797	5784.9781	5784.9762
0	5784.9795	5784.9783	5784.9764	5784.9742
10	5784.9782	5784.9769	5784.9754	5784.9736
20	5784.9770	5784.9757	5784.9741	5784.9722
30	5784.9756	5784.9745	5784.9731	5784.9715
40	5784.9740	5784.9725	5784.9709	5784.9689
50	5784.9723	5784.9711	5784.9696	5784.9669
60	5784.9722	5784.9709	5784.9694	5784.9658
70	5784.9721	5784.9701	5784.9690	5784.9658
Max. Deviation (MHz)	0.0279	0.0299	0.0310	0.0342
Max. Deviation (ppm)	4.82	5.17	5.36	5.91
Result	Complies			

Mode: 40 MHz / Chain 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5754.9778	5754.9764	5754.9746	5754.9725
110.00	5754.9766	5754.9753	5754.9737	5754.9718
93.50	5754.9752	5754.9741	5754.9729	5754.9707
Max. Deviation (MHz)	0.0248	0.0259	0.0271	0.0293
Max. Deviation (ppm)	4.32	4.51	4.72	5.10
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
-20	5754.9820	5754.9807	5754.9790	5754.9766
-10	5754.9805	5754.9793	5754.9777	5754.9758
0	5754.9791	5754.9779	5754.9760	5754.9738
10	5754.9778	5754.9765	5754.9750	5754.9732
20	5754.9766	5754.9753	5754.9737	5754.9718
30	5754.9752	5754.9741	5754.9727	5754.9711
40	5754.9736	5754.9721	5754.9705	5754.9685
50	5754.9719	5754.9707	5754.9692	5754.9665
60	5754.9712	5754.9701	5754.9690	5754.9665
70	5754.9706	5754.9688	5754.9680	5754.9662
Max. Deviation (MHz)	0.0294	0.0312	0.0320	0.0338
Max. Deviation (ppm)	5.11	5.42	5.56	5.87
Result	Complies			

Mode: 80 MHz / Chain 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5774.9773	5774.9759	5774.9741	5774.9720
110.00	5774.9761	5774.9748	5774.9732	5774.9713
93.50	5774.9747	5774.9736	5774.9724	5774.9702
Max. Deviation (MHz)	0.0253	0.0264	0.0276	0.0298
Max. Deviation (ppm)	4.38	4.57	4.78	5.16
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
-20	5774.9815	5774.9802	5774.9785	5774.9761
-10	5774.9800	5774.9788	5774.9772	5774.9753
0	5774.9786	5774.9774	5774.9755	5774.9733
10	5774.9773	5774.9760	5774.9745	5774.9727
20	5774.9761	5774.9748	5774.9732	5774.9713
30	5774.9747	5774.9736	5774.9722	5774.9706
40	5774.9731	5774.9716	5774.9700	5774.9680
50	5774.9714	5774.9702	5774.9687	5774.9660
60	5774.9712	5774.9702	5774.9679	5774.9655
70	5774.9703	5774.9703	5774.9672	5774.9650
Max. Deviation (MHz)	0.0297	0.0297	0.0328	0.0350
Max. Deviation (ppm)	5.14	5.14	5.68	6.06
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. 22, 2015	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	Feb.10, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	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. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	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%