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FCC RADIO TEST REPORT

Applicant's company	**Ubee Interactive**
Applicant Address	10F-1, No. 5, Taiyuan 1st St. Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
FCC ID	**XCNDDW36C**

Product Name	Wireless Cable Modem
Brand Name	Ubee Interactive
Model No.	DDW36C
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5725 ~ 5850 MHz
Received Date	Jun. 18, 2014
Final Test Date	Oct. 21, 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.

Testing Laboratory
1190

Table of Contents

1. VERIFICATION OF COMPLIANCE 1
2. SUMMARY OF THE TEST RESULT 2
3. GENERAL INFORMATION 3
3.1. Product Details 3
3.2. Accessories 4
3.3. Table for Filed Antenna 5
3.4. Table for Carrier Frequencies 6
3.5. Table for Test Modes 7
3.6. Table for Testing Locations 9
3.7. Table for Class II Change 9
3.8. Table for Supporting Units 10
3.9. Table for Parameters of Test Software Setting 11
3.10. EUT Operation during Test 12
3.11. Duty Cycle 12
3.12. Test Configurations 13
4. TEST RESULT 15
4.1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement 15
4.2. 6dB Spectrum Bandwidth Measurement 28
4.3. Maximum Conducted Output Power Measurement 35
4.4. Power Spectral Density Measurement 39
4.5. Radiated Emissions Measurement 49
4.6. Band Edge Emissions Measurement 67
4.7. Frequency Stability Measurement 76
4.8. Antenna Requirements 80
5. LIST OF MEASURING EQUIPMENTS 81
6. MEASUREMENT UNCERTAINTY 82
APPENDIX A. TEST PHOTOS ..... A1 ~ A2

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR470106-01	Rev. 01	Initial issue of report	Nov. 16, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	Wireless Cable Modem
Brand Name	:	Ubee Interactive
Model No.	:	DDW36C
Applicant	:	Ubee Interactive
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. 18, 2014 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

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	1.78 dB
4.4	15.407(a)	Power Spectral Density	Complies	16.96 dB
4.5	15.407(b)	Radiated Emissions	Complies	13.04 dB
4.6	15.407(b)	Band Edge Emissions	Complies	0.03 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	IEEE 802.11a/n/ac: WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From Internal Power
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%)	<For non-beamforming mode> IEEE 802.11a: 17.04 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 17.88 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 37.00 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.40 MHz <For beamforming mode> IEEE 802.11ac MCS0/Nss1 (VHT20): 18.00 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.80 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.40 MHz
Maximum Conducted Output Power	<For non-beamforming mode> IEEE 802.11a: 25.36 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 25.31 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 23.95 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 21.19 dBm <For beamforming mode> IEEE 802.11ac MCS0/Nss1 (VHT20): 24.74 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 23.95 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 21.19 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	

Note: The product has beamforming function for 802.11n/ac in 5GHz.

Antenna and Band width

Antenna	Three (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)	3	MCS 0-23
802.11n (HT40)	3	MCS 0-23
802.11ac (VHT20)	3	MCS 0-9/Nss1-3
802.11ac (VHT40)	3	MCS 0-9/Nss1-3
802.11ac (VHT80)	3	MCS 0-9/Nss1-3

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

Others
Power cable, Non-shielded, 1.5m

3.3. Table for Filed Antenna

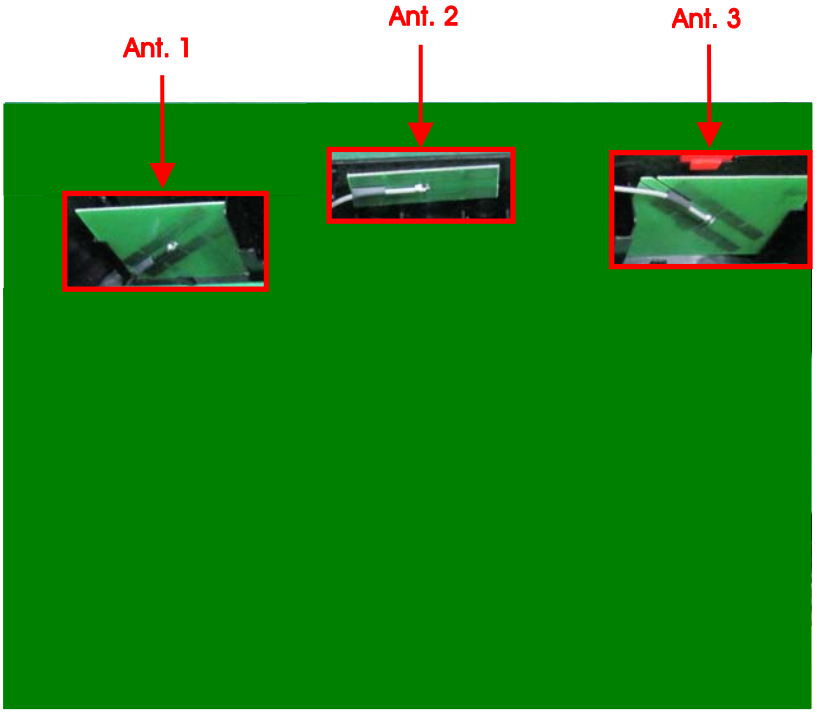
Ant.	Brand	Model Name	Antenna Type	Connector	5GHz B4 Gain (dBi)
1	M.gear	C107-511135-A	PCB Antenna	I-PEX	5.0
2	M.gear	C107-511136-A	PCB Antenna	I-PEX	4.8
3	M.gear	C107-511137-A	PCB Antenna	I-PEX	4.3

Note: The EUT has three Antennas.

For IEEE 802.11a/n/ac mode (3TX/3RX):

Ant. 1, Ant. 2 and Ant. 3 can be used as transmitting/receiving antenna.

Ant. 1, Ant. 2 and Ant. 3 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	Antenna
Max. Conducted Output Power	<For non-beamforming mode>				
	11a/BPSK	Band 4	6Mbps	149/157/165	1+2+3
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
	<For beamforming mode>				
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
Power Spectral Density	<For non-beamforming mode>				
	11a/BPSK	Band 4	6Mbps	149/157/165	1+2+3
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
	<For beamforming mode>				
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	<For non-beamforming mode>				
	11a/BPSK	Band 4	6Mbps	149/157/165	1+2+3
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
	<For beamforming mode>				
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3

6dB Spectrum Bandwidth Measurement	<For non-beamforming mode>				
	11a/BPSK	Band 4	6Mbps	149/157/165	1+2+3
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
	<For beamforming mode>				
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
Radiated Emission Above 1GHz	<For non-beamforming mode>				
	11a/BPSK	Band 4	6Mbps	149/157/165	1+2+3
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
	<For beamforming mode>				
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
Band Edge Emission	<For non-beamforming mode>				
	11a/BPSK	Band 4	6Mbps	149/157/165	1+2+3
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
	<For beamforming mode>				
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2+3
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2+3
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2+3
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:

Mode 1. EUT Standing - CTX

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: FR470106AA

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

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

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB / Above 1GHz

<For non-beamforming mode>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC

<For beamforming mode>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC
Notebook	DELL	E4300	DoC
WLAN ac Dongle	Netgear	A6200	PY312200200

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.

<For non-beamforming mode>

Test Software Version	Mtool 2.0.1.0		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5745 MHz	5785 MHz	5825 MHz
802.11a	70	78	77
802.11ac MCS0/Nss1 VHT20	70	78	75
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5755 MHz	5795 MHz	
	65	72	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5775 MHz		
	62		

<For beamforming mode>

Test Software Version	Mtool 2.0.1.0		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5745 MHz	5785 MHz	5825 MHz
802.11ac MCS0/Nss1 VHT20	68	76	70
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5755 MHz	5795 MHz	
	63	72	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5775 MHz		
	62		

3.10. EUT Operation during Test

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN XP were executed.

The program was executed as follows:

1. During the test, the EUT operation to normal function.
2. Executed command fixed test channel under DOS.
3. Executed "Lantest.exe " to link with the remote workstation to receive and transmit packet by WLAN ac Dongle and transmit duty cycle no less 98%

3.11. Duty Cycle

For non-beamforming mode:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.046	2.064	99.13	0.04	0.01
802.11ac MCS0/Nss1 VHT20	1.878	1.908	98.43	0.07	0.01
802.11ac MCS0/Nss1 VHT40	0.908	0.936	97.01	0.13	1.10
802.11ac MCS0/Nss1 VHT80	0.448	0.475	94.32	0.25	2.23

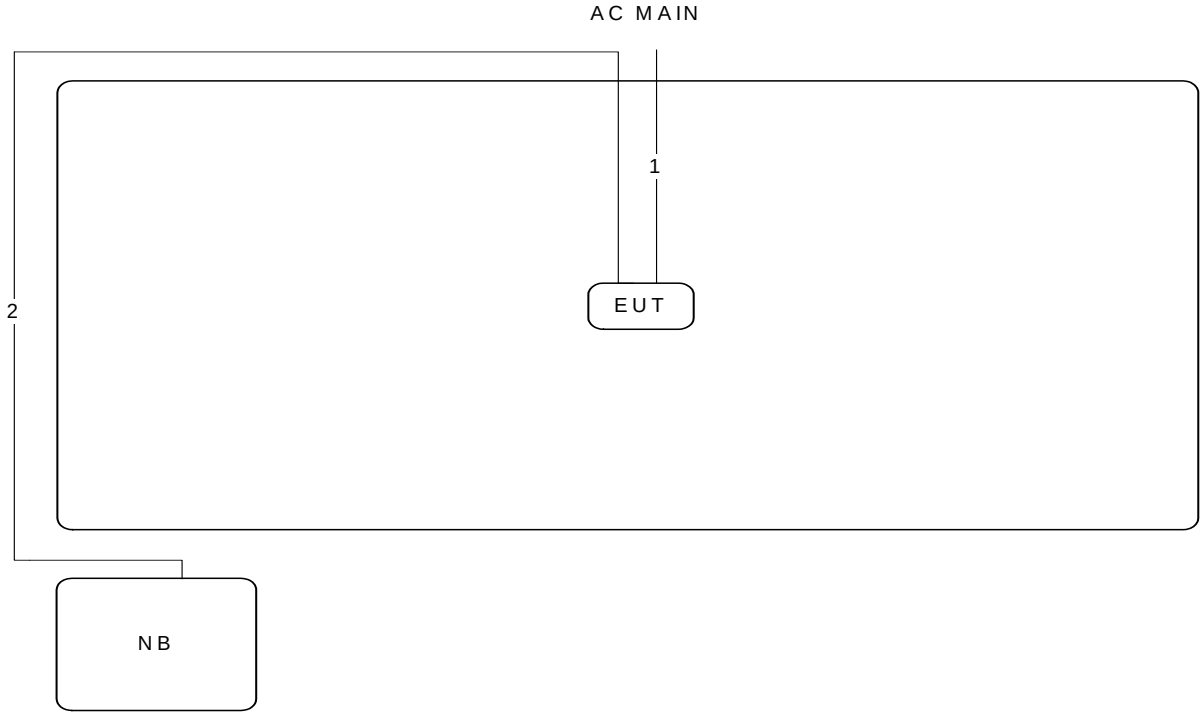
For beamforming mode:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.660	3.765	97.21	0.12	0.27
802.11ac MCS0/Nss1 VHT40	4.490	4.610	97.40	0.11	0.22
802.11ac MCS0/Nss1 VHT80	5.010	5.090	98.43	0.07	0.01

3.12. Test Configurations

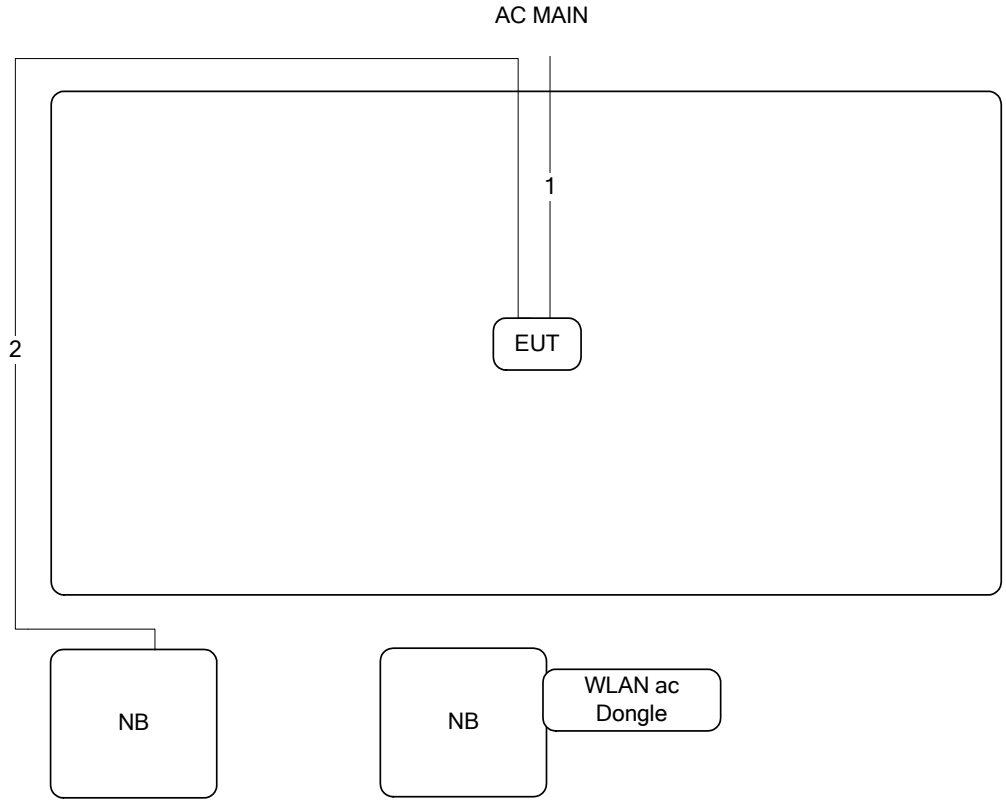
3.12.1. Radiation Emissions Test Configuration

<For non-beamforming mode>



Item	Connection	Shielded	Length(m)
1	Power Cable	No	1.5m
2	RJ-45 Cable	No	10m

<For beamforming mode>



Item	Connection	Shielded	Length(m)
1	Power Cable	No	1.5m
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	23.4°C	Humidity	64%
Test Engineer	YC Chen		

<For non-beamforming mode>

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5745 MHz	21.24	17.04
	5785 MHz	20.40	16.80
	5825 MHz	20.64	16.92
802.11ac MCS0/Nss1 VHT20	5745 MHz	20.16	17.76
	5785 MHz	22.92	17.88
	5825 MHz	20.64	17.76
802.11ac MCS0/Nss1 VHT40	5755 MHz	40.60	37.00
	5795 MHz	40.60	37.00
802.11ac MCS0/Nss1 VHT80	5775 MHz	82.40	76.40

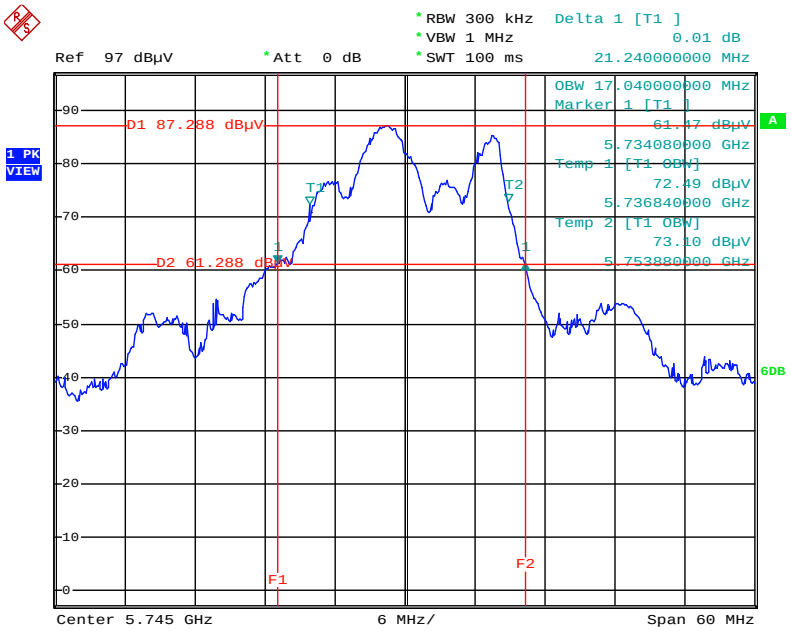
Temperature	23.4°C	Humidity	64%
Test Engineer	YC Chen		

<For beamforming mode>

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT20	5745 MHz	20.64	17.88
	5785 MHz	20.40	18.00
	5825 MHz	20.40	17.88
802.11ac MCS0/Nss1 VHT40	5755 MHz	40.80	36.80
	5795 MHz	40.60	36.80
802.11ac MCS0/Nss1 VHT80	5775 MHz	82.80	76.40

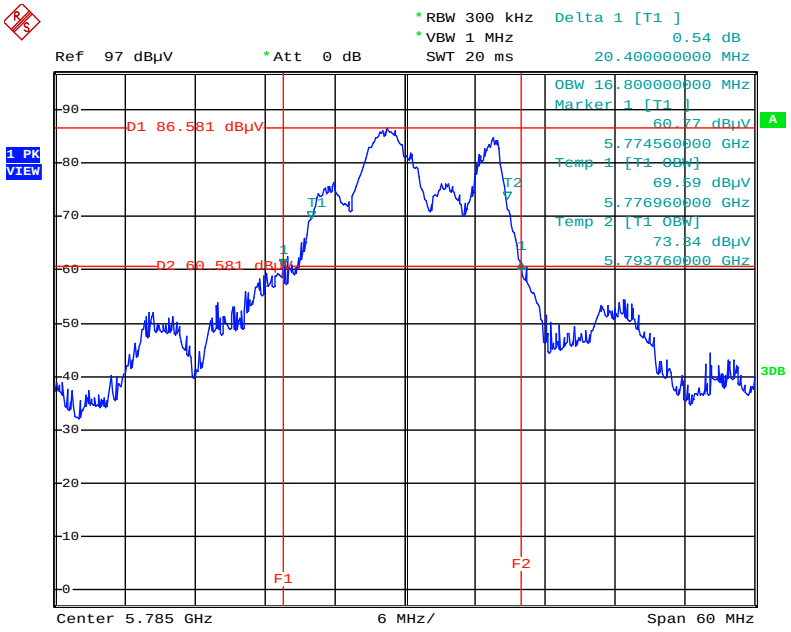
<For non-beamforming mode>

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Antenna 1 + Antenna 2 + Antenna 3 / 5745 MHz



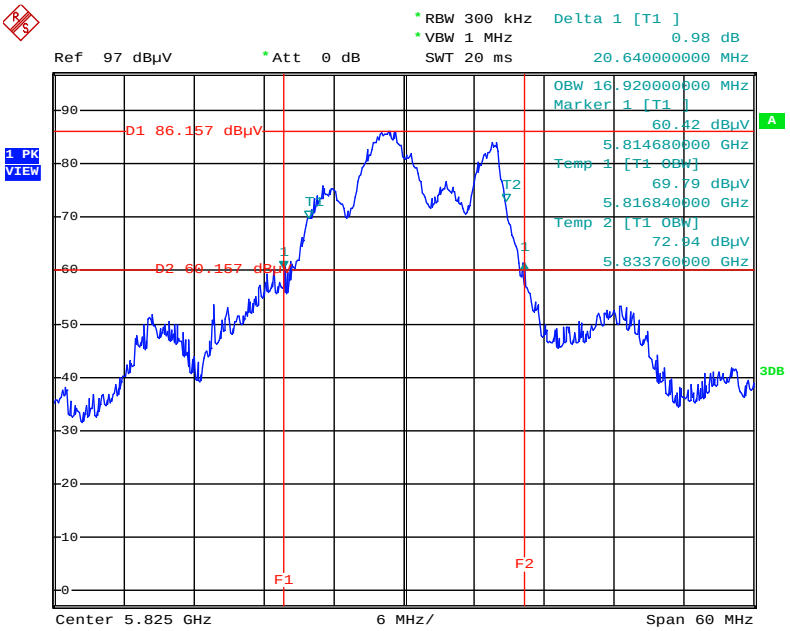
Date: 21.OCT.2015 00:56:31

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Antenna 1 + Antenna 2 + Antenna 3 / 5785 MHz



Date: 21.OCT.2015 01:01:29

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Antenna 1 + Antenna 2 + Antenna 3 / 5825 MHz



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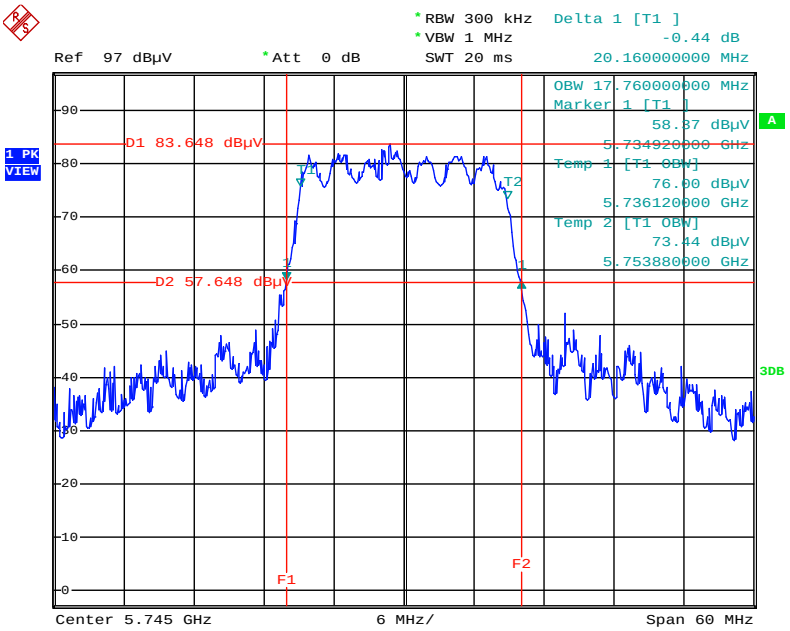
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5745 MHz



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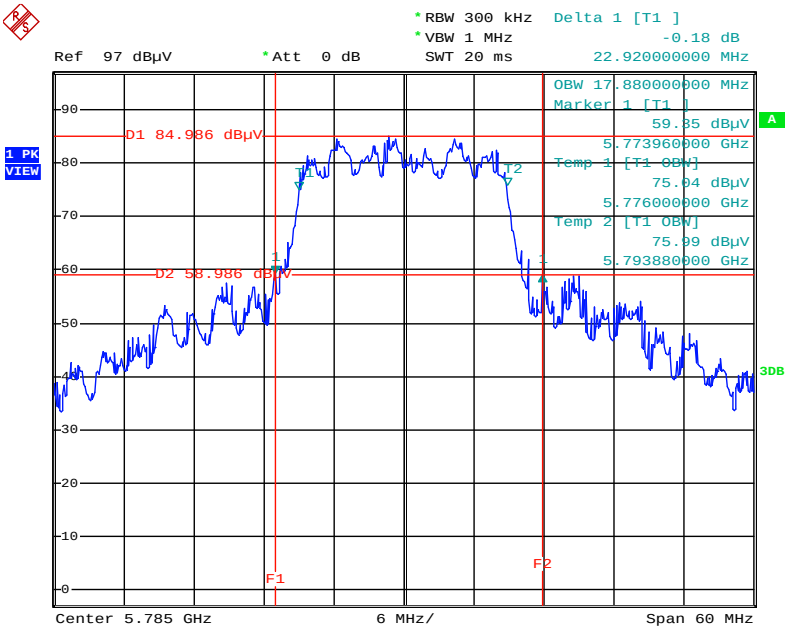
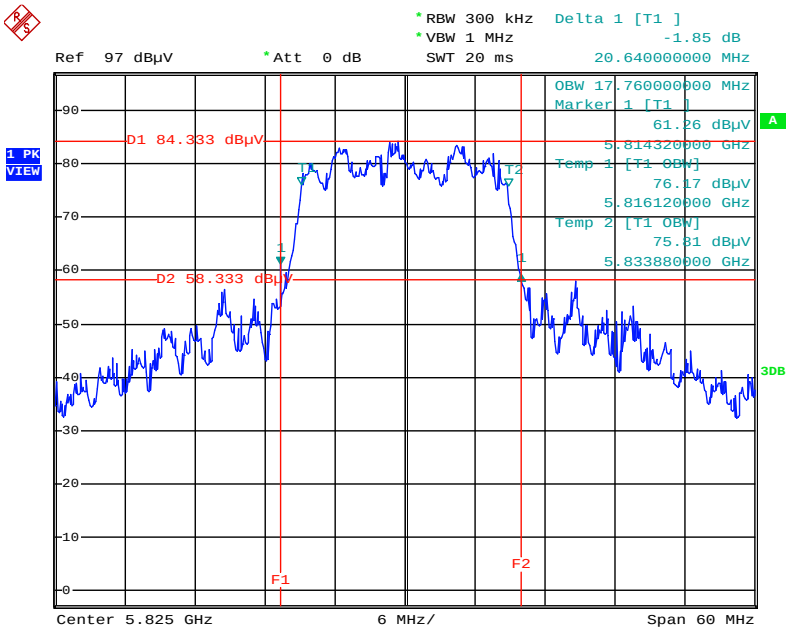
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5785 MHz



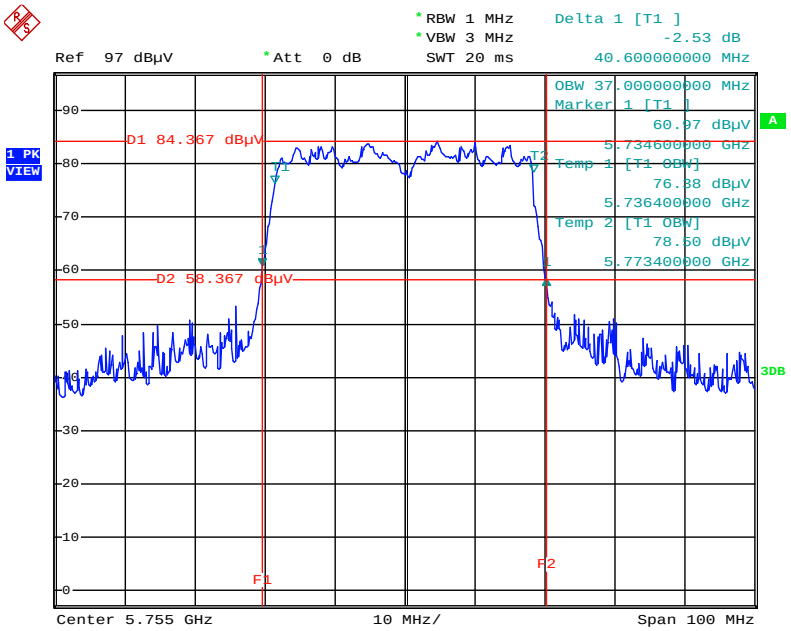
Date: 21.OCT.2015 01:04:45

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5825 MHz



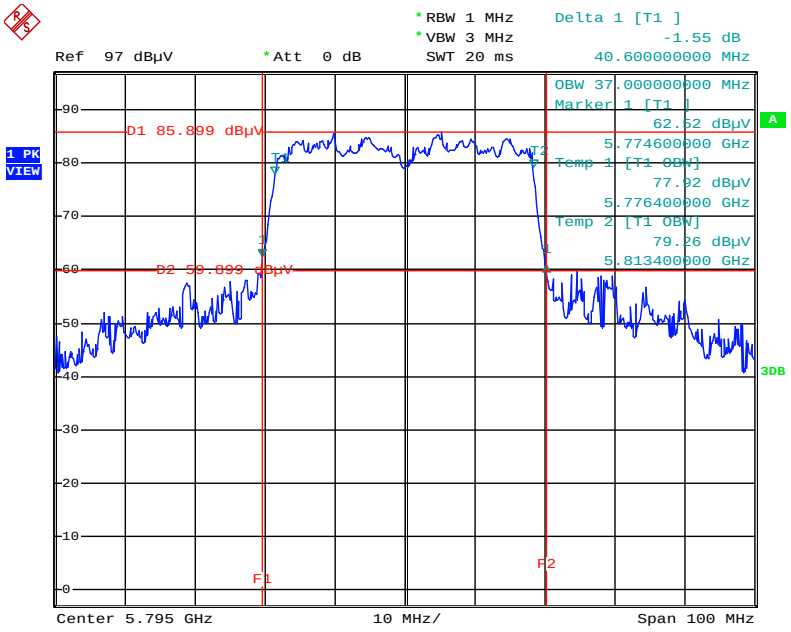
Date: 21.OCT.2015 01:06:27

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5755 MHz



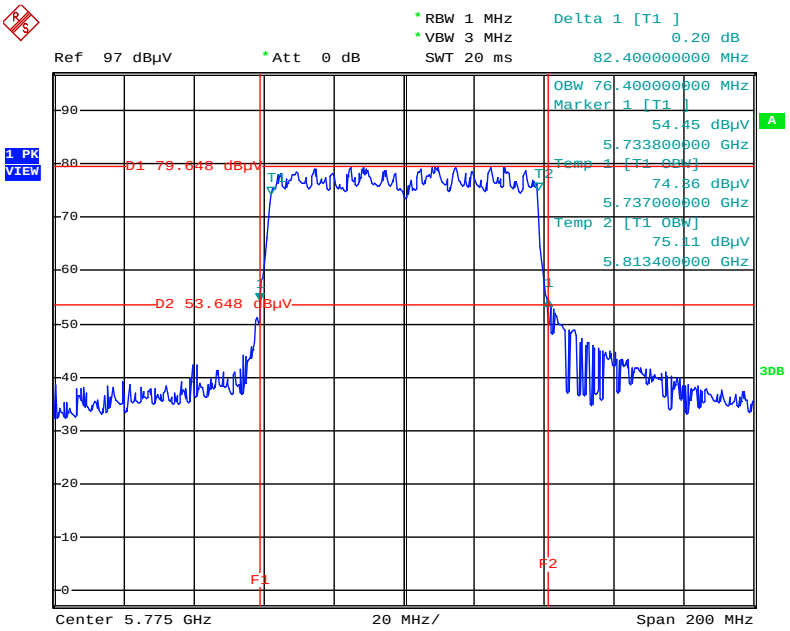
Date: 21.OCT.2015 01:07:42

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5795 MHz



Date: 21.OCT.2015 01:08:27

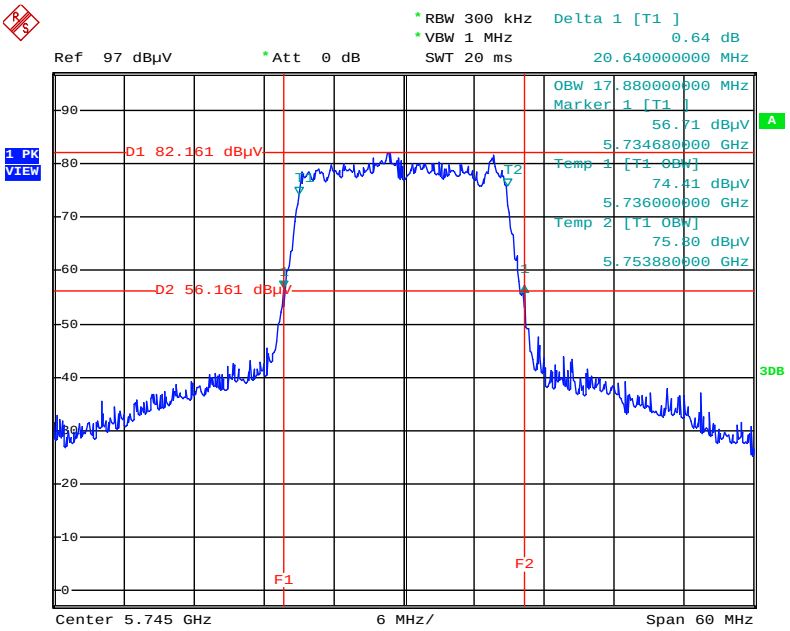
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3 / 5775 MHz



Date: 21.OCT.2015 01:09:31

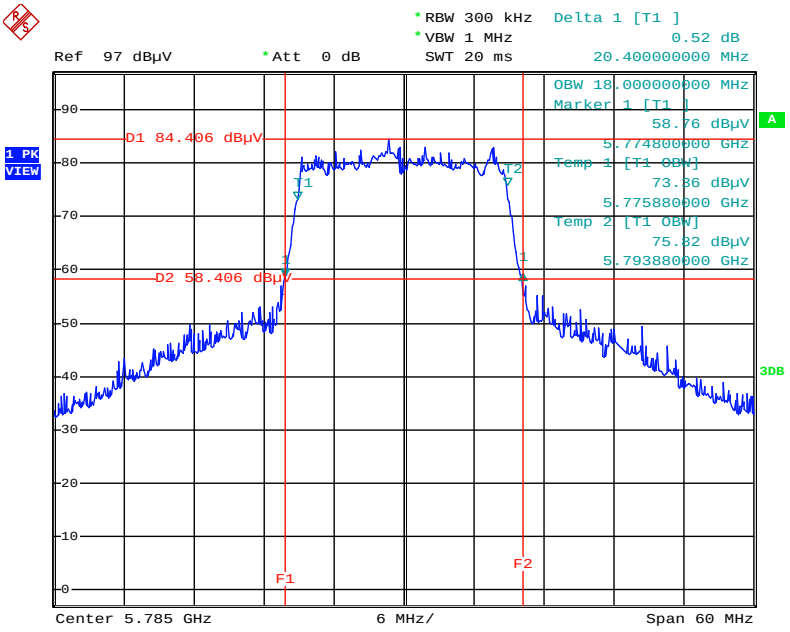
<For beamforming mode>

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5745 MHz



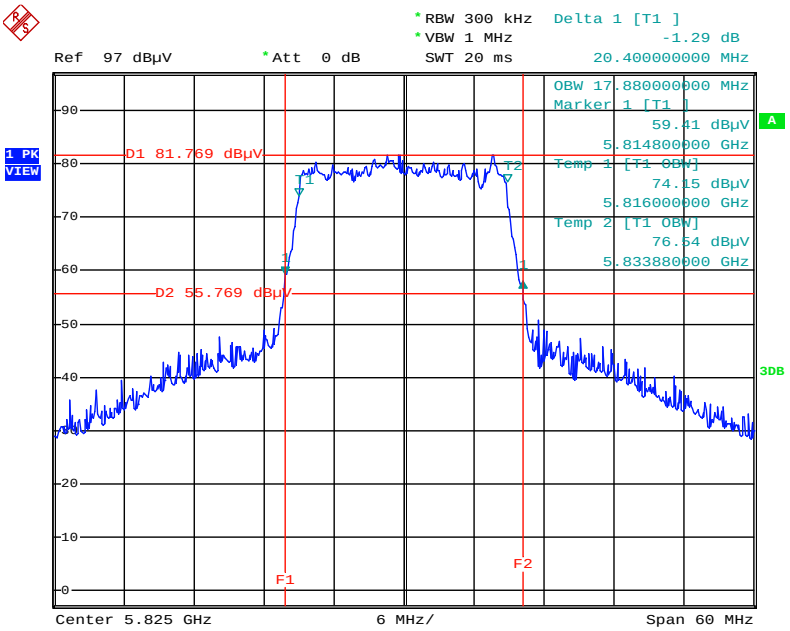
Date: 21.OCT.2015 02:12:50

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5785 MHz



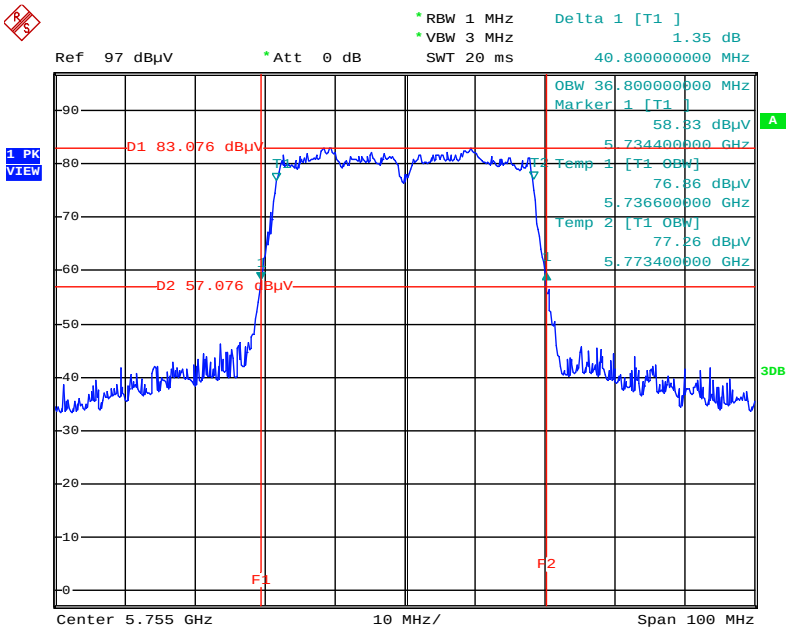
Date: 21.OCT.2015 02:13:54

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5825 MHz



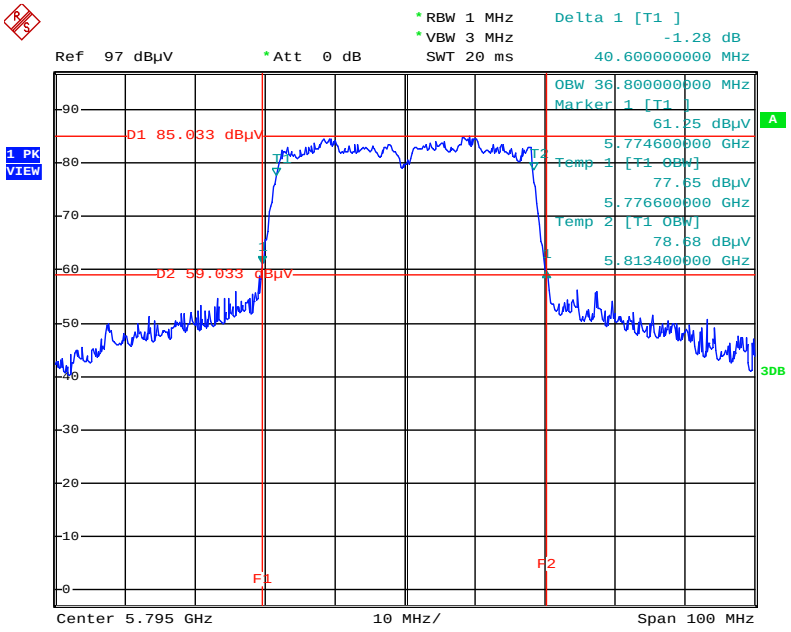
Date: 21.OCT.2015 02:14:58

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5755 MHz



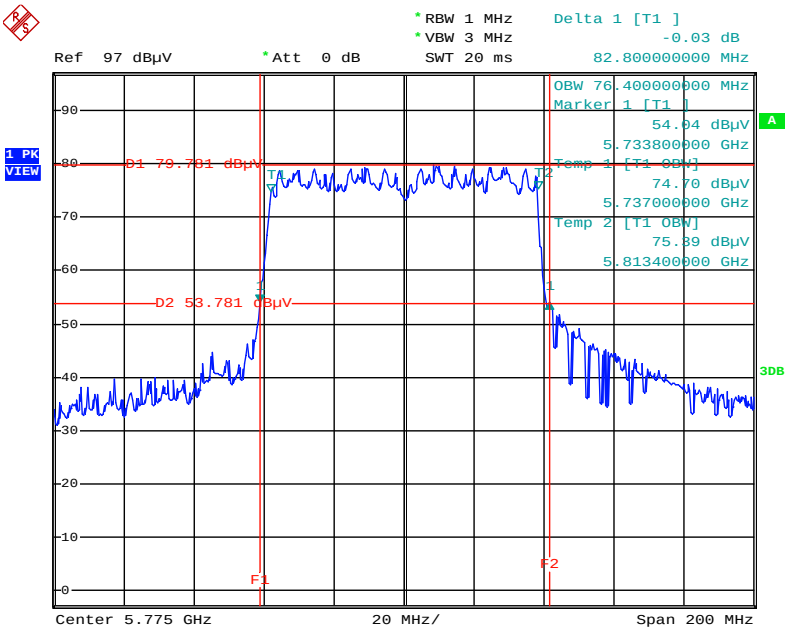
Date: 21.OCT.2015 02:07:53

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5795 MHz



Date: 21.OCT.2015 02:10:07

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3 / 5775 MHz



Date: 21.OCT.2015 02:11:18

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	23.4°C	Humidity	64%
Test Engineer	YC Chen		

<For non-beamforming mode>

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11a	5745 MHz	11.36	500	Complies
	5785 MHz	11.44	500	Complies
	5825 MHz	10.96	500	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	10.64	500	Complies
	5785 MHz	16.32	500	Complies
	5825 MHz	16.40	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	30.88	500	Complies
	5795 MHz	33.76	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	70.40	500	Complies

Temperature	23.4°C	Humidity	64%
Test Engineer	YC Chen		

<For beamforming mode>

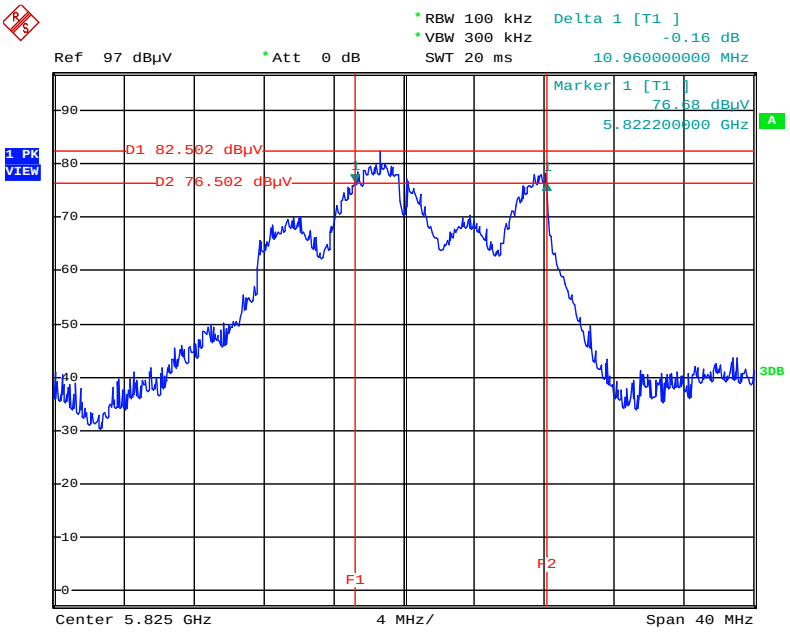
Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11ac MCS0/Nss1 VHT20	5745 MHz	12.80	500	Complies
	5785 MHz	16.88	500	Complies
	5825 MHz	15.04	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	30.72	500	Complies
	5795 MHz	32.64	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	74.00	500	Complies

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

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

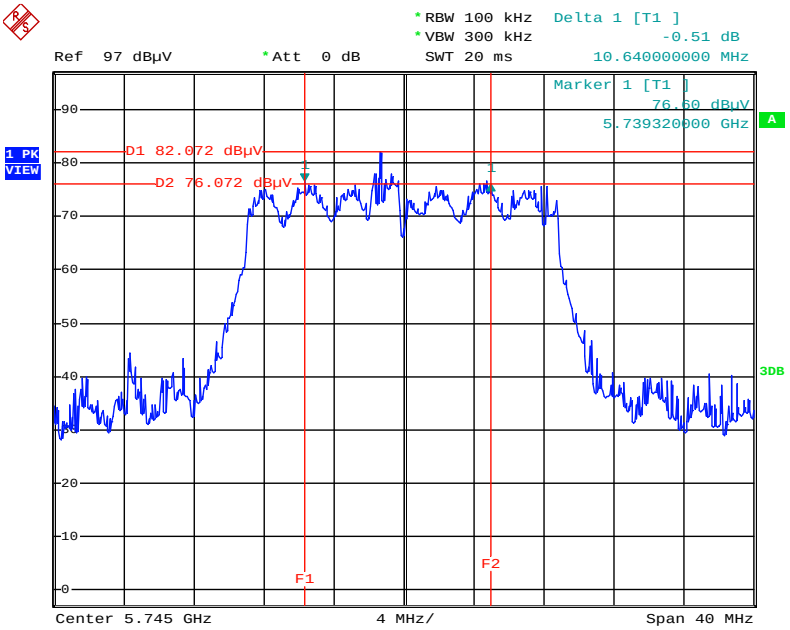
<For non-beamforming mode>

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Antenna 1 + Antenna 2 + Antenna 3 / 5825 MHz



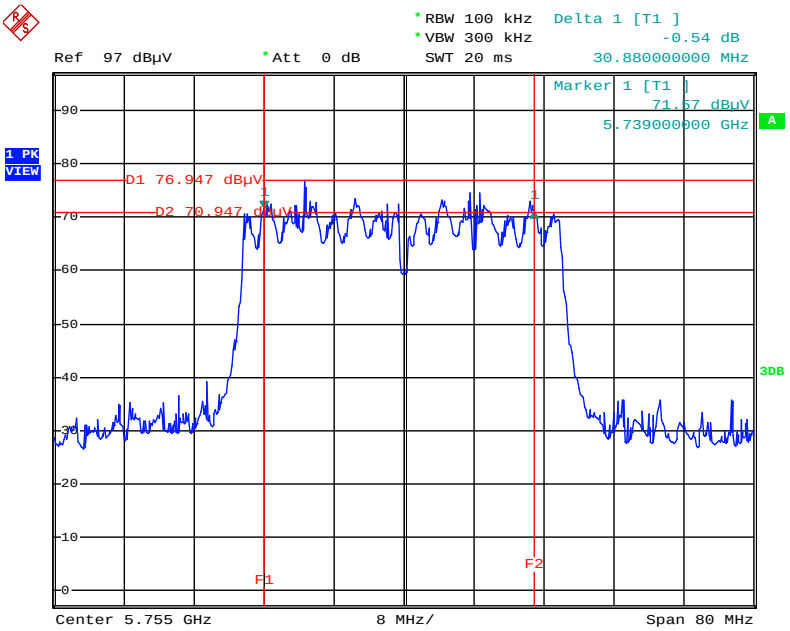
Date: 21.OCT.2015 01:33:22

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5745 MHz



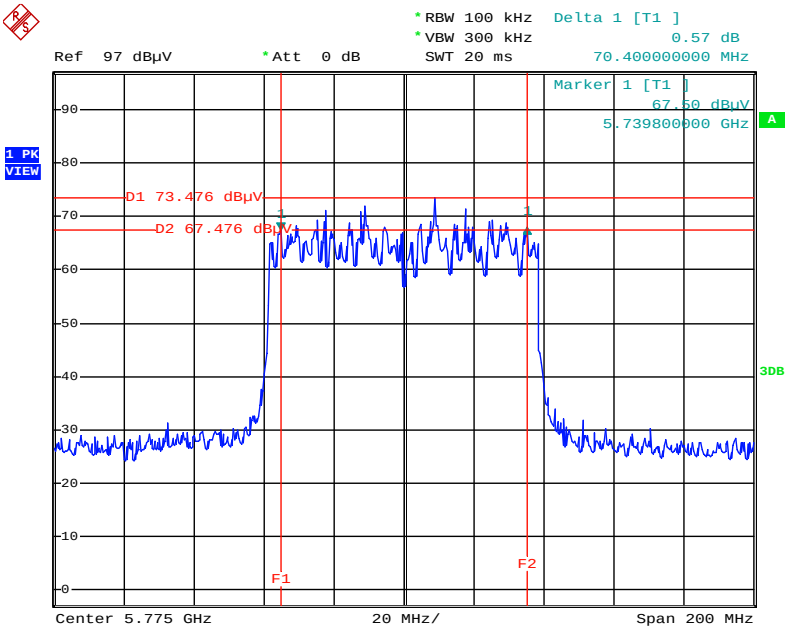
Date: 21.OCT.2015 01:30:22

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5755MHz



Date: 21.OCT.2015 01:27:43

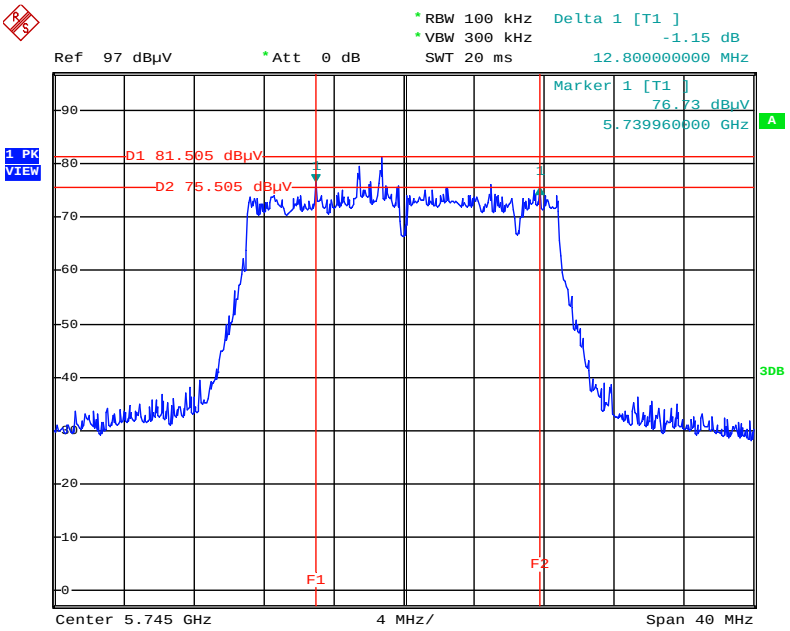
6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3 / 5775 MHz



Date: 21.OCT.2015 01:24:27

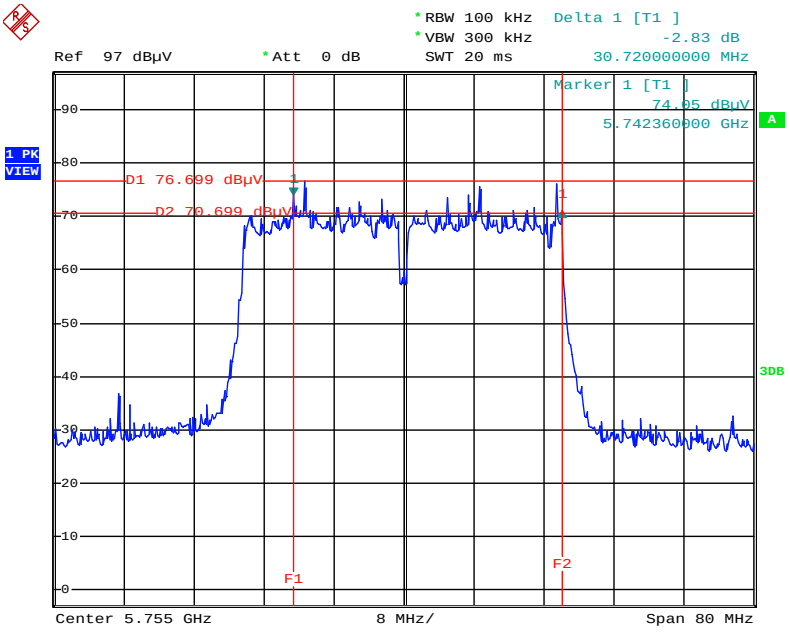
<For beamforming mode>

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5745 MHz



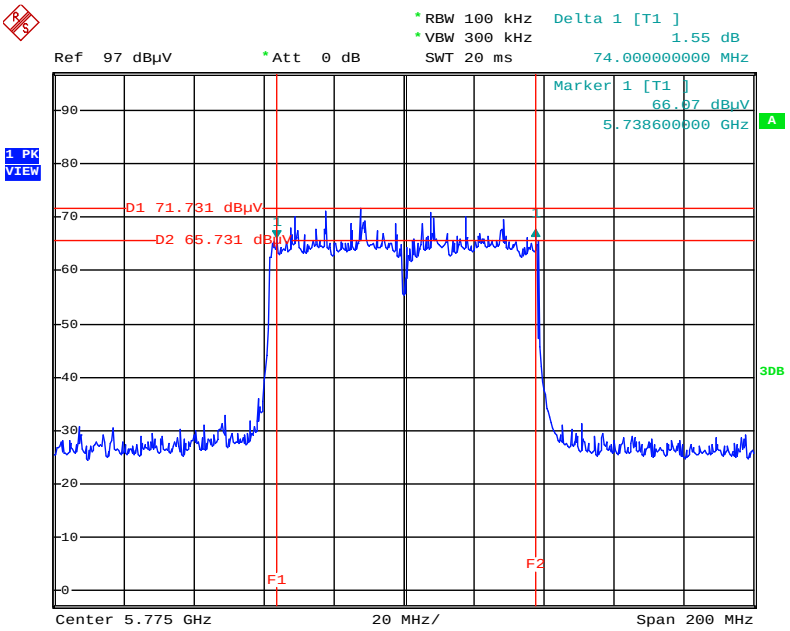
Date: 21.OCT.2015 01:57:49

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5755MHz



Date: 21.OCT.2015 02:02:12

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3 / 5775 MHz



Date: 21.OCT.2015 02:03:38

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

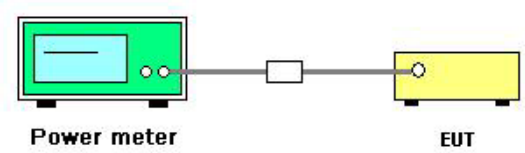
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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	23.4°C	Humidity	64%
Test Engineer	YC Chen	Test Date	Oct. 21, 2015

<For non-beamforming mode>

Mode	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Antenna 1	Antenna 2	Antenna 3	Total		
802.11a	5745 MHz	18.76	18.65	18.11	23.29	30.00	Complies
	5785 MHz	20.81	20.67	20.27	25.36	30.00	Complies
	5825 MHz	20.66	20.48	20.01	25.16	30.00	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	18.71	18.62	18.07	23.25	30.00	Complies
	5785 MHz	20.85	20.71	20.02	25.31	30.00	Complies
	5825 MHz	19.93	19.83	19.41	24.50	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	17.82	17.81	17.12	22.37	30.00	Complies
	5795 MHz	19.39	19.38	18.75	23.95	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	16.77	16.39	16.08	21.19	30.00	Complies

Temperature	23.4°C	Humidity	64%
Test Engineer	YC Chen	Test Date	Oct. 21, 2015

<For beamforming mode>

Mode	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Antenna 1	Antenna 2	Antenna 3	Total		
802.11ac MCS0/Nss1 VHT20	5745 MHz	18.32	18.36	17.83	22.95	26.52	Complies
	5785 MHz	20.13	20.11	19.66	24.74	26.52	Complies
	5825 MHz	18.85	18.79	18.15	23.38	26.52	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	17.33	17.28	16.64	21.87	26.52	Complies
	5795 MHz	19.39	19.38	18.75	23.95	26.52	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	16.77	16.39	16.08	21.19	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi > 6dBi, So Limit =30-(9.48-6)=26.52dBm.

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

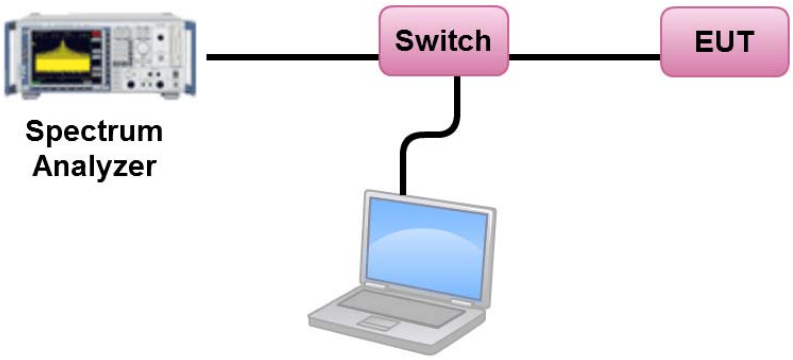
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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	23.4°C	Humidity	64%
Test Engineer	YC Chen		

<For non-beamforming mode>

Configuration IEEE 802.11a / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	10.25	-3.01	7.24	26.52	Complies
157	5785 MHz	12.57	-3.01	9.56	26.52	Complies
165	5825 MHz	12.27	-3.01	9.26	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	10.14	-3.01	7.13	26.52	Complies
157	5785 MHz	12.45	-3.01	9.44	26.52	Complies
165	5825 MHz	11.22	-3.01	8.21	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
151	5755 MHz	6.11	-3.01	3.10	26.52	Complies
159	5795 MHz	8.21	-3.01	5.20	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	2.06	-3.01	-0.95	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

Temperature	23.4°C	Humidity	64%
Test Engineer	YC Chen		

<For beamforming mode>

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	9.70	-3.01	6.69	26.52	Complies
157	5785 MHz	11.69	-3.01	8.68	26.52	Complies
165	5825 MHz	9.93	-3.01	6.92	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
151	5755 MHz	5.57	-3.01	2.56	26.52	Complies
159	5795 MHz	8.00	-3.01	4.99	26.52	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	2.29	-3.01	-0.72	26.52	Complies

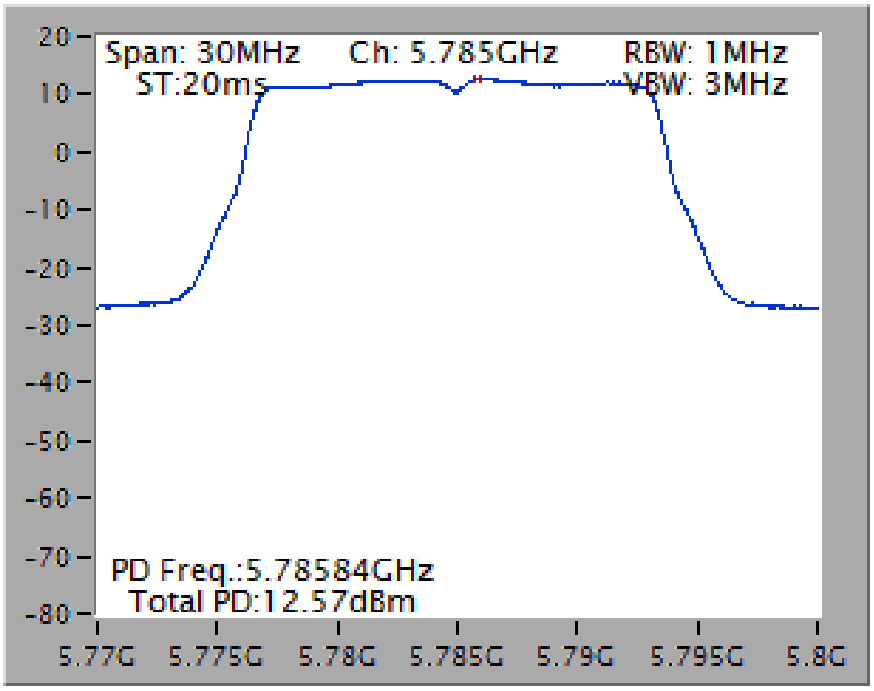
Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.48dBi>6dBi, So Limit =30-(9.48-6)=26.52dBm/500kHz.

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

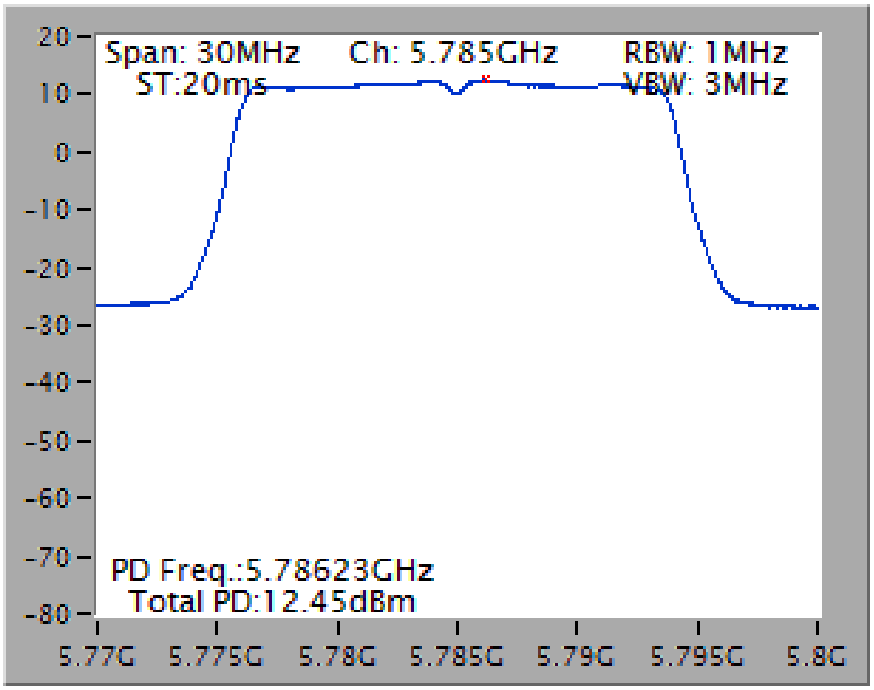
For plots, only the channel with worse result was shown.

<For non-beamforming mode>

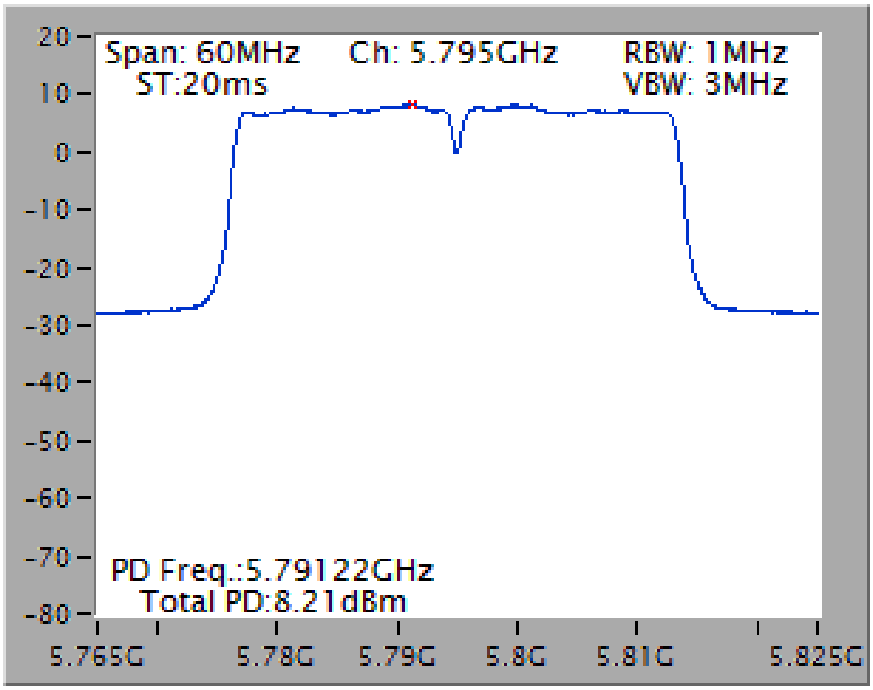
Power Density Plot on Configuration IEEE 802.11a / Antenna 1 + Antenna 2 + Antenna 3 / 5785 MHz



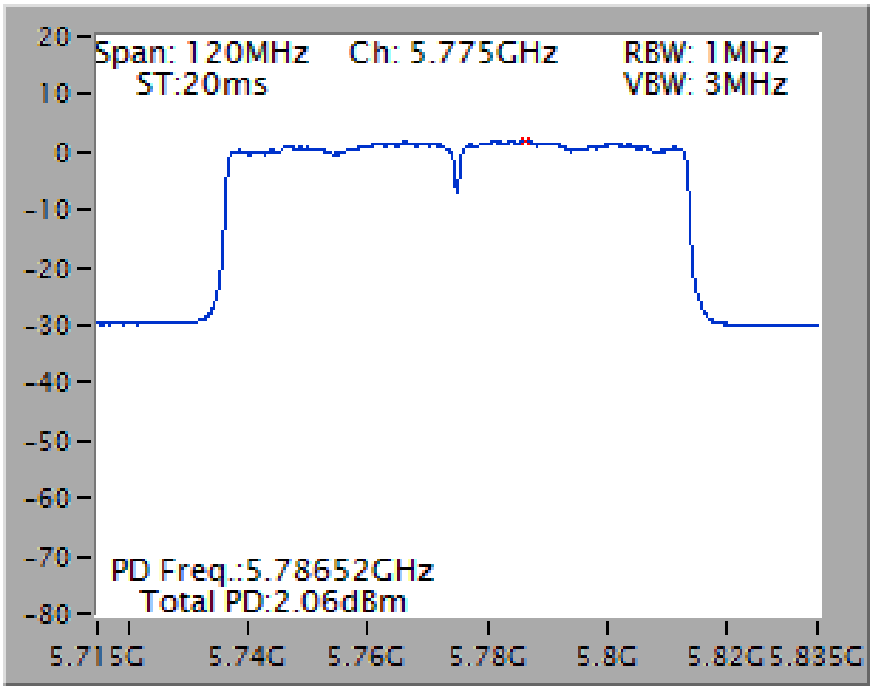
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5785 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5795 MHz

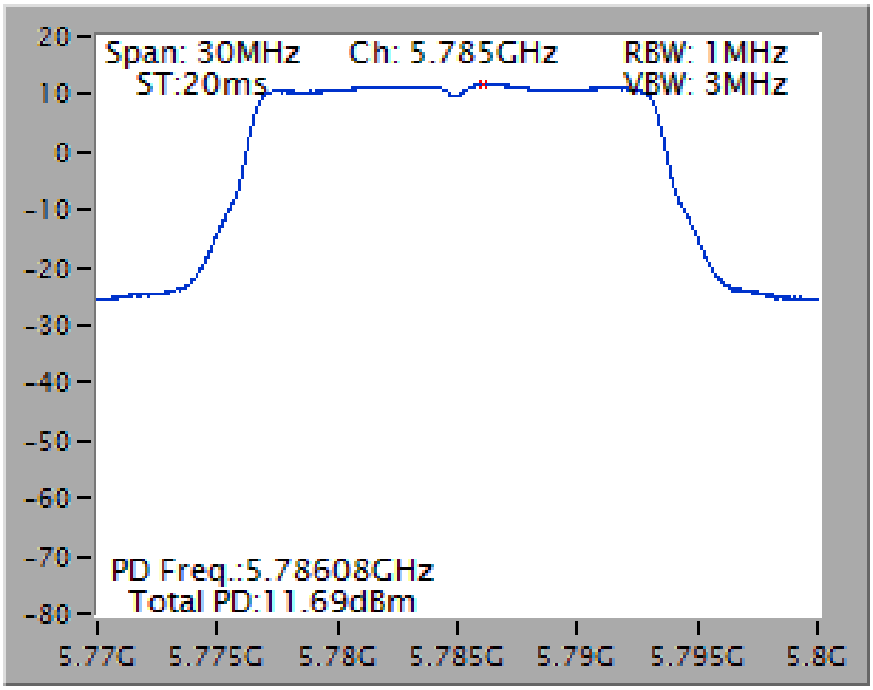


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3 / 5775 MHz

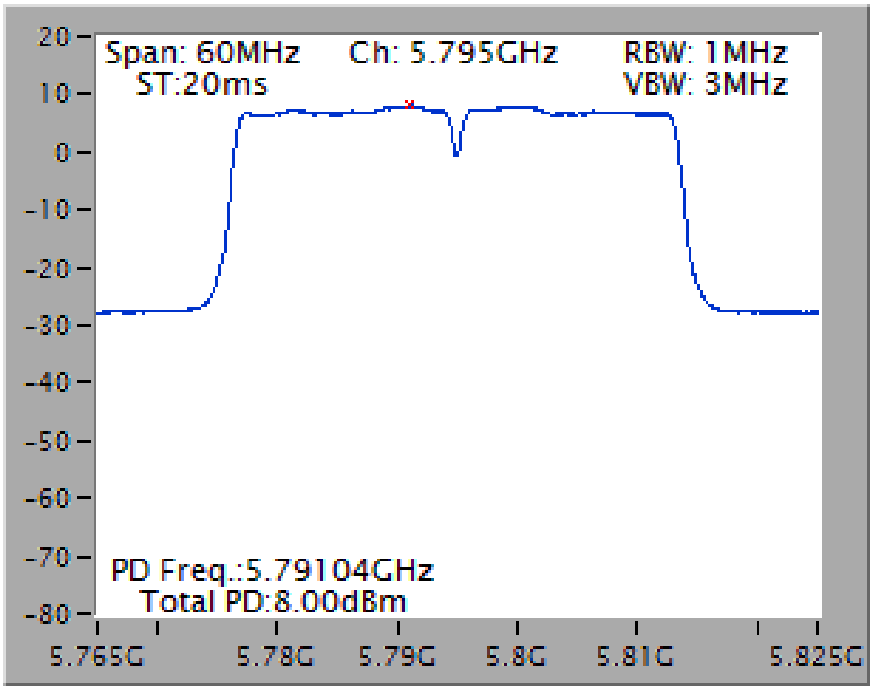


<For beamforming mode>

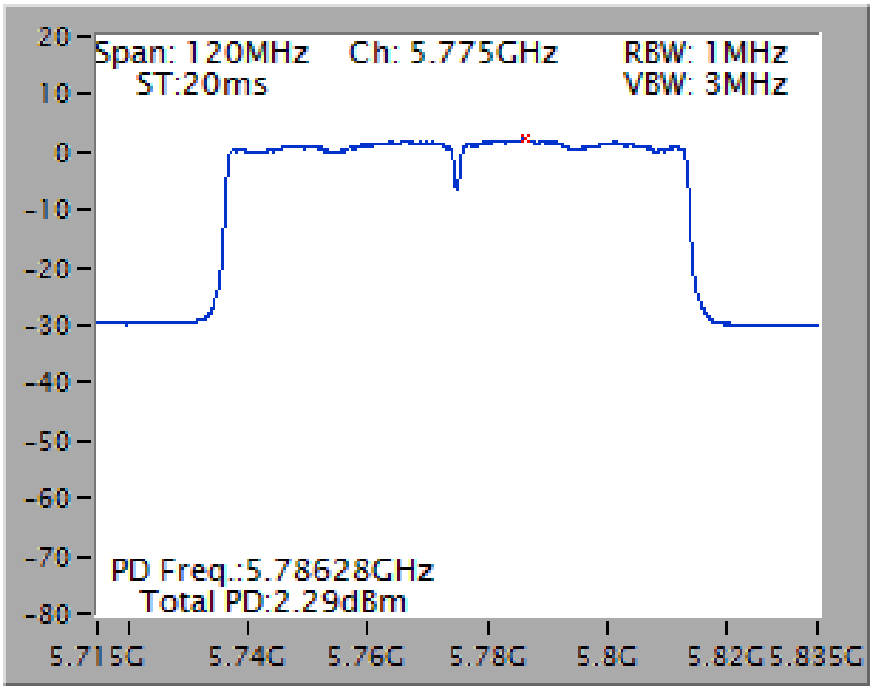
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Antenna 1 + Antenna 2 + Antenna 3 / 5785 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Antenna 1 + Antenna 2 + Antenna 3 / 5795 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Antenna 1 + Antenna 2 + Antenna 3 / 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.

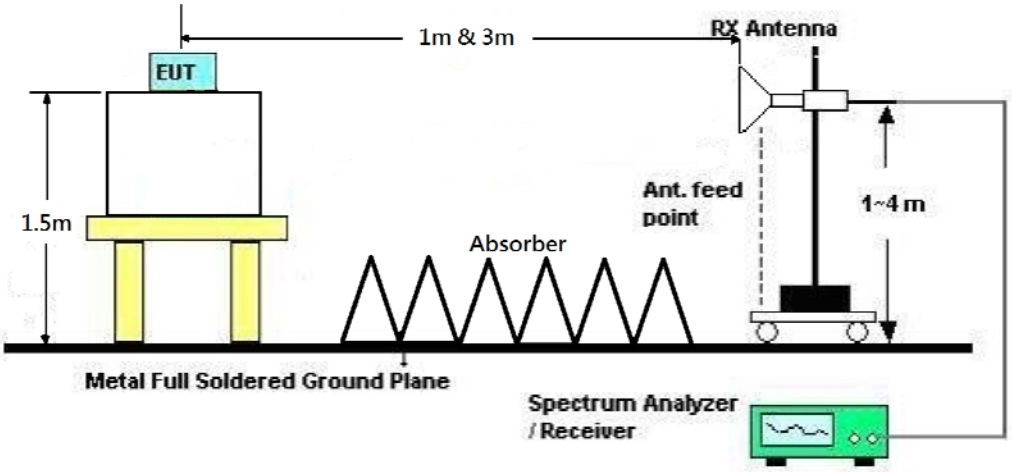
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

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

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

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

<For non-beamforming mode>

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 149 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11568.52	40.00	54.00	-14.00	28.52	7.41	38.71	34.64	332	165	Average	HORIZONTAL
2	11578.68	52.86	74.00	-21.14	41.39	7.41	38.71	34.65	332	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11562.12	52.87	74.00	-21.13	41.41	7.39	38.71	34.64	359	165	Peak	VERTICAL
2	11570.52	40.96	54.00	-13.04	29.49	7.41	38.71	34.65	359	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 157 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11563.36	52.88	74.00	-21.12	41.42	7.39	38.71	34.64	350	165	Peak	HORIZONTAL
2	11565.84	39.96	54.00	-14.04	28.48	7.41	38.71	34.64	350	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11566.32	52.93	74.00	-21.07	41.45	7.41	38.71	34.64	330	165	Peak	VERTICAL
2	11568.92	40.20	54.00	-13.80	28.72	7.41	38.71	34.64	330	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 165 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11641.64	52.51	74.00	-21.49	40.95	7.50	38.73	34.67	304	165	Peak	HORIZONTAL
2	11654.56	39.94	54.00	-14.06	28.37	7.52	38.73	34.68	304	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11641.28	53.22	74.00	-20.78	41.66	7.50	38.73	34.67	280	165	Peak	VERTICAL
2	11642.04	40.80	54.00	-13.20	29.24	7.50	38.73	34.67	280	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11482.40	53.06	74.00	-20.94	41.64	7.34	38.70	34.62	263	165	Peak	HORIZONTAL
2	11490.08	40.13	54.00	-13.87	28.71	7.34	38.70	34.62	263	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11491.60	53.69	74.00	-20.31	42.27	7.34	38.70	34.62	245	165	Peak	VERTICAL
2	11492.76	40.02	54.00	-13.98	28.60	7.34	38.70	34.62	245	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11572.76	52.93	74.00	-21.07	41.46	7.41	38.71	34.65	228	165	Peak	HORIZONTAL
2	11575.92	40.00	54.00	-14.00	28.53	7.41	38.71	34.65	228	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11562.96	52.95	74.00	-21.05	41.49	7.39	38.71	34.64	208	165	Peak	VERTICAL
2	11573.04	40.95	54.00	-13.05	29.48	7.41	38.71	34.65	208	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11643.36	39.84	54.00	-14.16	28.28	7.50	38.73	34.67	180	165	Average	HORIZONTAL
2	11656.44	53.88	74.00	-20.12	42.31	7.52	38.73	34.68	180	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11649.24	53.51	74.00	-20.49	41.96	7.50	38.73	34.68	166	165	Peak	VERTICAL
2	11652.16	40.10	54.00	-13.90	28.53	7.52	38.73	34.68	166	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11502.64	53.60	74.00	-20.40	42.19	7.33	38.70	34.62	136	165	Peak	HORIZONTAL
2	11513.36	40.00	54.00	-14.00	28.59	7.33	38.70	34.62	136	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11503.24	54.21	74.00	-19.79	42.80	7.33	38.70	34.62	106	165	Peak	VERTICAL
2	11516.40	40.11	54.00	-13.89	28.68	7.35	38.70	34.62	106	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11583.20	39.93	54.00	-14.07	28.43	7.43	38.72	34.65	86	165	Average	HORIZONTAL
2	11589.36	53.14	74.00	-20.86	41.64	7.43	38.72	34.65	86	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11581.64	39.88	54.00	-14.12	28.41	7.41	38.71	34.65	65	165	Average	VERTICAL
2	11593.72	52.53	74.00	-21.47	41.03	7.43	38.72	34.65	65	165	Peak	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11541.44	39.90	54.00	-14.10	28.45	7.37	38.71	34.63	52	165	Average	HORIZONTAL
2	11557.08	53.26	74.00	-20.74	41.80	7.39	38.71	34.64	52	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11547.56	40.09	54.00	-13.91	28.65	7.37	38.71	34.64	30	165	Average	VERTICAL
2	11555.28	53.31	74.00	-20.69	41.85	7.39	38.71	34.64	30	165	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.

<For beamforming mode>

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11491.76	53.15	74.00	-20.85	41.73	7.34	38.70	34.62	67	165	Peak	HORIZONTAL
2	11496.04	39.85	54.00	-14.15	28.43	7.34	38.70	34.62	67	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11481.76	39.92	54.00	-14.08	28.50	7.34	38.70	34.62	122	165	Average	VERTICAL
2	11485.56	52.75	74.00	-21.25	41.33	7.34	38.70	34.62	122	165	Peak	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11571.64	52.47	74.00	-21.53	41.00	7.41	38.71	34.65	142	165	Peak	HORIZONTAL
2	11572.80	39.73	54.00	-14.27	28.26	7.41	38.71	34.65	142	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11562.20	39.76	54.00	-14.24	28.30	7.39	38.71	34.64	161	165	Average	VERTICAL
2	11569.40	53.09	74.00	-20.91	41.61	7.41	38.71	34.64	161	165	Peak	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11646.56	52.79	74.00	-21.21	41.24	7.50	38.73	34.68	194	165	Peak	HORIZONTAL
2	11656.20	39.65	54.00	-14.35	28.08	7.52	38.73	34.68	194	165	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11652.88	39.52	54.00	-14.48	27.95	7.52	38.73	34.68	230	165	Average	VERTICAL
2	11659.92	53.30	74.00	-20.70	41.73	7.52	38.73	34.68	230	165	Peak	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11500.20	39.93	54.00	-14.07	28.52	7.33	38.70	34.62	242	165	Average	HORIZONTAL
2	11514.36	52.93	74.00	-21.07	41.52	7.33	38.70	34.62	242	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11500.40	52.70	74.00	-21.30	41.29	7.33	38.70	34.62	256	165	Peak	VERTICAL
2	11502.52	39.88	54.00	-14.12	28.47	7.33	38.70	34.62	256	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11581.68	39.59	54.00	-14.41	28.12	7.41	38.71	34.65	284	165	Average	HORIZONTAL
2	11583.52	52.44	74.00	-21.56	40.94	7.43	38.72	34.65	284	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11582.56	52.43	74.00	-21.57	40.93	7.43	38.72	34.65	309	165	Peak	VERTICAL
2	11584.48	39.61	54.00	-14.39	28.11	7.43	38.72	34.65	309	165	Average	VERTICAL

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11554.24	39.81	54.00	-14.19	28.35	7.39	38.71	34.64	349	165	Average	HORIZONTAL
2	11554.48	53.27	74.00	-20.73	41.81	7.39	38.71	34.64	349	165	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11541.56	53.32	74.00	-20.68	41.87	7.37	38.71	34.63	341	165	Peak	VERTICAL
2	11554.04	39.70	54.00	-14.30	28.24	7.39	38.71	34.64	341	165	Average	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

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

<For non-beamforming mode>

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 149, 157, 165 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 24, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5714.40	67.84	68.20	-0.36	62.05	5.78	34.52	34.51	39	148	Peak	VERTICAL
2	5723.80	77.27	78.20	-0.93	71.42	5.79	34.57	34.51	39	148	Peak	VERTICAL
3	5743.80	115.20			109.30	5.80	34.62	34.52	39	148	Peak	VERTICAL
4	5744.40	106.09			100.19	5.80	34.62	34.52	39	148	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5703.40	66.65	68.20	-1.55	60.86	5.78	34.52	34.51	35	140	Peak	VERTICAL
2	5722.60	59.68	78.20	-18.52	53.83	5.79	34.57	34.51	35	140	Peak	VERTICAL
3	5784.20	118.00			111.97	5.83	34.73	34.53	35	140	Peak	VERTICAL
4	5784.20	109.00			102.97	5.83	34.73	34.53	35	140	Average	VERTICAL
5	5859.60	63.56	78.20	-14.64	57.23	5.88	34.99	34.54	35	140	Peak	VERTICAL
6	5944.20	68.17	68.20	-0.03	61.56	5.93	35.24	34.56	35	140	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5826.20	117.81			111.60	5.86	34.88	34.53	354	154	Peak	VERTICAL
2	5826.20	108.12			101.91	5.86	34.88	34.53	354	154	Average	VERTICAL
3	5856.80	73.18	78.20	-5.02	66.85	5.88	34.99	34.54	354	154	Peak	VERTICAL
4	5907.20	67.93	68.20	-0.27	61.43	5.91	35.14	34.55	354	154	Peak	VERTICAL

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

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5715.00	68.16	68.20	-0.04	62.37	5.78	34.52	34.51	32	168	Peak	VERTICAL
2	5725.00	76.15	78.20	-2.05	70.30	5.79	34.57	34.51	32	168	Peak	VERTICAL
3	5744.40	106.15			100.25	5.80	34.62	34.52	32	168	Average	VERTICAL
4	5749.80	115.22			109.32	5.80	34.62	34.52	32	168	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5704.20	66.69	68.20	-1.51	60.90	5.78	34.52	34.51	43	161	Peak	VERTICAL
2	5721.00	59.19	78.20	-19.01	53.34	5.79	34.57	34.51	43	161	Peak	VERTICAL
3	5784.20	117.23			111.20	5.83	34.73	34.53	43	161	Peak	VERTICAL
4	5784.20	107.05			101.02	5.83	34.73	34.53	43	161	Average	VERTICAL
5	5857.20	65.82	78.20	-12.38	59.49	5.88	34.99	34.54	43	161	Peak	VERTICAL
6	5944.20	67.98	68.20	-0.22	61.37	5.93	35.24	34.56	43	161	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5825.00	107.16			100.95	5.86	34.88	34.53	38	147	Average	VERTICAL
2	5829.00	116.59			110.38	5.86	34.88	34.53	38	147	Peak	VERTICAL
3	5850.00	76.19	78.20	-2.01	69.93	5.87	34.93	34.54	38	147	Peak	VERTICAL
4	5860.00	68.10	68.20	-0.10	61.77	5.88	34.99	34.54	38	147	Peak	VERTICAL

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

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5710.20	72.91	74.00	-1.09	67.12	5.78	34.52	34.51	37	159	Peak	VERTICAL
2	5714.20	53.21	54.00	-0.79	47.42	5.78	34.52	34.51	37	159	Average	VERTICAL
3	5724.60	77.95	78.20	-0.25	72.10	5.79	34.57	34.51	37	159	Peak	VERTICAL
4	5749.40	102.11			96.21	5.80	34.62	34.52	37	159	Average	VERTICAL
5	5759.00	112.77			106.80	5.82	34.68	34.53	37	159	Peak	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5715.00	65.33	68.20	-2.87	59.54	5.78	34.52	34.51	31	154	Peak	VERTICAL
2	5719.80	66.51	78.20	-11.69	60.66	5.79	34.57	34.51	31	154	Peak	VERTICAL
3	5799.80	114.10			108.01	5.84	34.78	34.53	31	154	Peak	VERTICAL
4	5799.80	104.15			98.06	5.84	34.78	34.53	31	154	Average	VERTICAL
5	5855.00	70.44	78.20	-7.76	64.11	5.88	34.99	34.54	31	154	Peak	VERTICAL
6	5860.00	68.07	68.20	-0.13	61.74	5.88	34.99	34.54	31	154	Peak	VERTICAL

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

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5714.00	68.08	68.20	-0.12	62.29	5.78	34.52	34.51	38	156	Peak	VERTICAL
2	5722.00	70.51	78.20	-7.69	64.66	5.79	34.57	34.51	38	156	Peak	VERTICAL
3	5779.00	107.98			101.95	5.83	34.73	34.53	38	156	Peak	VERTICAL
4	5785.00	97.41			91.38	5.83	34.73	34.53	38	156	Average	VERTICAL
5	5859.00	67.13	78.20	-11.07	60.80	5.88	34.99	34.54	38	156	Peak	VERTICAL
6	5860.00	65.73	68.20	-2.47	59.40	5.88	34.99	34.54	38	156	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

<For beamforming mode>

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5715.00	66.40	68.20	-1.80	60.61	5.78	34.52	34.51	27	155	Peak	VERTICAL
2	5725.00	77.98	78.20	-0.22	72.13	5.79	34.57	34.51	27	155	Peak	VERTICAL
3	5741.80	106.73			100.83	5.80	34.62	34.52	27	155	Average	VERTICAL
4	5742.60	116.42			110.52	5.80	34.62	34.52	27	155	Peak	VERTICAL
5	5858.00	61.66	78.20	-16.54	55.33	5.88	34.99	34.54	27	155	Peak	VERTICAL
6	5904.20	67.77	68.20	-0.43	61.33	5.90	35.09	34.55	27	155	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5707.40	67.40	68.20	-0.80	61.61	5.78	34.52	34.51	43	157	Peak	VERTICAL
2	5719.40	73.46	78.20	-4.74	67.61	5.79	34.57	34.51	43	157	Peak	VERTICAL
3	5786.60	108.75			102.66	5.84	34.78	34.53	43	157	Average	VERTICAL
4	5787.40	119.08			112.99	5.84	34.78	34.53	43	157	Peak	VERTICAL
5	5858.80	66.36	78.20	-11.84	60.03	5.88	34.99	34.54	43	157	Peak	VERTICAL
6	5867.40	67.97	68.20	-0.23	61.64	5.88	34.99	34.54	43	157	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5823.40	107.19			100.98	5.86	34.88	34.53	28	150	Average	VERTICAL
2	5826.60	117.36			111.15	5.86	34.88	34.53	28	150	Peak	VERTICAL
3	5852.20	73.33	78.20	-4.87	67.07	5.87	34.93	34.54	28	150	Peak	VERTICAL
4	5903.40	68.12	68.20	-0.08	61.68	5.90	35.09	34.55	28	150	Peak	VERTICAL

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

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5687.80	51.15	54.00	-2.85	45.42	5.77	34.47	34.51	32	149	Average	VERTICAL
2	5713.40	71.28	74.00	-2.72	65.49	5.78	34.52	34.51	32	149	Peak	VERTICAL
3	5723.00	75.31	78.20	-2.89	69.46	5.79	34.57	34.51	32	149	Peak	VERTICAL
4	5742.20	102.22			96.32	5.80	34.62	34.52	32	149	Average	VERTICAL
5	5743.80	112.89			106.99	5.80	34.62	34.52	32	149	Peak	VERTICAL
6	5851.60	63.18	78.20	-15.02	56.92	5.87	34.93	34.54	32	149	Peak	VERTICAL
7	5909.40	53.93	54.00	-0.07	47.44	5.91	35.14	34.56	32	149	Average	VERTICAL
8	5911.00	65.28	74.00	-8.72	58.79	5.91	35.14	34.56	32	149	Peak	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5711.80	64.53	68.20	-3.67	58.74	5.78	34.52	34.51	48	148	Peak	VERTICAL
2	5718.20	66.01	78.20	-12.19	60.16	5.79	34.57	34.51	48	148	Peak	VERTICAL
3	5790.20	104.58			98.49	5.84	34.78	34.53	48	148	Average	VERTICAL
4	5791.80	115.15			109.06	5.84	34.78	34.53	48	148	Peak	VERTICAL
5	5851.80	71.40	78.20	-6.80	65.14	5.87	34.93	34.54	48	148	Peak	VERTICAL
6	5862.20	67.91	68.20	-0.29	61.58	5.88	34.99	34.54	48	148	Peak	VERTICAL

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

Temperature	24°C	Humidity	56%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Antenna 1 + Antenna 2 + Antenna 3
Test Date	Sep. 25, 2015		

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5714.00	68.17	68.20	-0.03	62.38	5.78	34.52	34.51	26	147	Peak	VERTICAL
2	5724.00	71.25	78.20	-6.95	65.40	5.79	34.57	34.51	26	147	Peak	VERTICAL
3	5765.00	98.37			92.40	5.82	34.68	34.53	26	147	Average	VERTICAL
4	5803.00	109.07			102.92	5.85	34.83	34.53	26	147	Peak	VERTICAL
5	5850.00	70.64	78.20	-7.56	64.38	5.87	34.93	34.54	26	147	Peak	VERTICAL
6	5863.00	66.21	68.20	-1.99	59.88	5.88	34.99	34.54	26	147	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

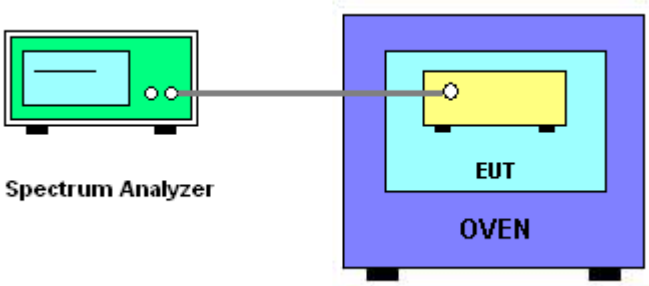
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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～50°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	23.4°C	Humidity	64%
Test Engineer	YC Chen	Test Date	Oct. 21, 2015

Mode: 20 MHz / Antenna 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9443	5784.9430	5784.9414	5784.9395
110.00	5784.9431	5784.9418	5784.9402	5784.9383
93.50	5784.9417	5784.9404	5784.9388	5784.9369
Max. Deviation (MHz)	0.0583	0.0596	0.0612	0.0631
Max. Deviation (ppm)	10.07	10.30	10.57	10.90
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
-20	5784.9509	5784.9496	5784.9479	5784.9458
-10	5784.9492	5784.9479	5784.9463	5784.9444
0	5784.9478	5784.9465	5784.9449	5784.9430
10	5784.9465	5784.9452	5784.9436	5784.9417
20	5784.9453	5784.9440	5784.9424	5784.9405
30	5784.9438	5784.9425	5784.9409	5784.9390
40	5784.9423	5784.9410	5784.9394	5784.9375
50	5784.9402	5784.9388	5784.9371	5784.9350
Max. Deviation (MHz)	0.0598	0.0612	0.0629	0.0650
Max. Deviation (ppm)	10.34	10.58	10.87	11.24
Result	Complies			

Mode: 40 MHz / Antenna 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5754.9443	5754.9430	5754.9414	5754.9395
110.00	5754.9431	5754.9418	5754.9402	5754.9383
93.50	5754.9417	5754.9404	5754.9388	5754.9369
Max. Deviation (MHz)	0.0583	0.0596	0.0612	0.0631
Max. Deviation (ppm)	10.13	10.35	10.63	10.96
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
-20	5754.9840	5754.9023	5754.9842	5754.9025
-10	5754.9741	5754.9122	5754.9743	5754.9124
0	5754.9642	5754.9221	5754.9644	5754.9223
10	5754.9543	5754.9320	5754.9545	5754.9322
20	5754.9431	5754.9432	5754.9433	5754.9434
30	5754.9332	5754.9531	5754.9334	5754.9533
40	5754.9231	5754.9632	5754.9233	5754.9634
50	5754.9127	5754.9736	5754.9129	5754.9738
Max. Deviation (MHz)	0.0873	0.0977	0.0871	0.0975
Max. Deviation (ppm)	15.16	16.97	15.13	16.94
Result	Complies			

Mode: 80 MHz / Antenna 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5774.9439	5774.9426	5774.9410	5774.9391
110.00	5774.9427	5774.9414	5774.9398	5774.9379
93.50	5774.9413	5774.9400	5774.9384	5774.9365
Max. Deviation (MHz)	0.0587	0.0600	0.0616	0.0635
Max. Deviation (ppm)	10.17	10.39	10.67	11.00
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
-20	5774.9483	5774.9470	5774.9453	5774.9432
-10	5774.9466	5774.9453	5774.9437	5774.9418
0	5774.9452	5774.9439	5774.9423	5774.9404
10	5774.9439	5774.9426	5774.9410	5774.9391
20	5774.9427	5774.9414	5774.9398	5774.9379
30	5774.9412	5774.9399	5774.9383	5774.9364
40	5774.9397	5774.9384	5774.9368	5774.9349
50	5774.9376	5774.9362	5774.9345	5774.9324
Max. Deviation (MHz)	0.0624	0.0638	0.0655	0.0676
Max. Deviation (ppm)	10.81	11.05	11.34	11.71
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	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-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	100080	9kHz~40GHz	Sep. 21, 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. 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 (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
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%