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FCC RADIO TEST REPORT

Applicant's company	**Roku, Inc.**
Applicant Address	12980 Saratoga Avenue Suite #D Saratoga California United States 95070
FCC ID	**TC2-N1003**
Manufacturer's company	**LITE-ON TECHNOLOGY (Changzhou) CO., LTD**
Manufacturer Address	A9 Building, No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone ,Changzhou City,Jiangsu Province 213100 China

Product Name	WIFI Module
Brand Name	Roku
Model No.	WM05
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Aug. 13, 2015
Final Test Date	Sep. 10, 2015
Submission Type	Original Equipment

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

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR581323AB	Rev. 01	Initial issue of report	Oct. 22, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	WIFI Module
Brand Name	:	Roku
Model No.	:	WM05
Applicant	:	Roku, Inc.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Aug. 13, 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	15.207	AC Power Line Conducted Emissions	Complies	3.38 dB
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.3	15.407(e)	6dB Spectrum Bandwidth	Complies	-
4.4	15.407(a)	Maximum Conducted Output Power	Complies	2.79 dB
4.5	15.407(a)	Power Spectral Density	Complies	2.84 dB
4.6	15.407(b)	Radiated Emissions	Complies	5.79 dB
4.7	15.407(b)	Band Edge Emissions	Complies	0.02 dB
4.8	15.407(g)	Frequency Stability	Complies	-
4.9	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	IEEE 802.11a: WLAN (1TX, 1RX) IEEE 802.11n/ac: WLAN (2TX, 2RX)
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 ~ 5250 MHz / 5725 ~ 5850 MHz
Channel Number	9 for 20MHz bandwidth ; 4 for 40MHz bandwidth 2 for 80MHz bandwidth
Channel Band Width (99%)	Band 1: IEEE 802.11a: 18.06 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 18.41 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 37.34 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.83 MHz Band 4: IEEE 802.11a: 18.49 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 18.67 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.90 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz
Maximum Conducted Output Power	Band 1: IEEE 802.11a: 18.86 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 21.21 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 20.86 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 13.99 dBm Band 4: IEEE 802.11a: 19.64 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 20.37 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 19.89 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 15.64 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

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

Antenna and Band width

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

IEEE 11n/ac Spec.

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

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

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

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

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)			Remark
					2.4GHz	5GHz		
						Band 1	Band 4	
1	LiteON	WM950B DVT2	PIFA Antenna	I-PEX	3.7	3.8	4.5	External WiFi Antenna
2	LiteON	WM950B DVT2	PIFA Antenna	N/A	4.6	1.2	3.4	On-board WiFi Antenna

Note: The EUT has two antennas.

For 2.4GHz

For IEEE 802.11b/g mode (1TX, 1RX):

The EUT supports the antenna with TX and RX diversity functions.

Both Ant. 1 and Ant. 2 support transmit and receive functions, but only one of them will be used at one time.

The Ant. 1 generated the worst case, so it was selected to test and record in the report.

For IEEE 802.11n mode (2TX, 2RX):

Ant. 1 and Ant. 2 will transmit/receive the same signal simultaneously.

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

For 5GHz

For IEEE 802.11a mode (1TX, 1RX):

The EUT supports the antenna with TX and RX diversity functions.

Both Ant. 1 and Ant. 2 support transmit and receive functions, but only one of them will be used at one time.

The Ant. 1 generated the worst case, so it was selected to test and record in the report.

For IEEE 802.11n/ac mode (2TX, 2RX):

Ant. 1 and Ant. 2 will transmit/receive the same signal simultaneously.

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

3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48, 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 38, 46, 151, 159.

For 80MHz bandwidth systems, use Channel 42, 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	-	-
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	Ant.
AC Power Conducted Emission	Normal Link		-	-	-
Max. Conducted Output Power	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
Power Spectral Density	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
6dB Spectrum Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	1
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
Radiated Emission Below 1GHz	Normal Link		-	-	-
Radiated Emission Above 1GHz	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2

Band Edge Emission	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
Frequency Stability	20 MHz	Band 1&4	-	40/157	2
	40 MHz	Band 1&4	-	38/151	2
	80 MHz	Band 1&4	-	42/155	2

Note:

VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.

The following test modes were performed for all tests:

For Conducted Emission test:

The EUT was performed at Z, Y, X axis position and 2.4GHz, 5GHz wireless function for Radiated emission below 1GHz test, and the worst case was found at Z axis and 5GHz. So the Conducted Emissions measurement will follow this same test configuration.

Mode 1. Normal Link-EUT in Z axis for 5GHz

For Radiated Emission test (Below 1GHz):

Mode 1. Normal Link-EUT in Z axis for 2.4GHz

Mode 2. Normal Link-EUT in Y axis for 2.4GHz

Mode 3. Normal Link-EUT in X axis for 2.4GHz

Mode 1 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4 will follow this same test mode.

Mode 4. Normal Link-EUT in Z axis for 5GHz

Mode 4 is the worst case, so it was selected to record in this test report.

For Radiated Emission test (Above 1GHz):

The EUT was performed at X axis, Y axis and Z axis position for Radiated emission above 1GHz test, and the worst case was found at X axis. So the measurement will follow this same test configuration.

Mode 1. CTX - EUT in X-axis

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	-
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

3.7. Table for Supporting Units

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Mouse	Logitech	M-U0026	DoC
Earphone	SHYARO CHI	MIC-04	N/A
Fixture	LiteON	CA-P120	N/A
NB	DELL	E4300	Doc

For Test Site No: 03CH01-CB (Below 1GHz)

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
Earphone	SHYARO CHI	MIC-04	N/A
Mouse	HP	FM100	DoC
Fixture	LiteON	CA-P120	N/A
Wireless ac AP	Netgear	R6300V2	PY313200227

For Test Site No: 03CH01-CB (Above1GHz)

Support Unit	Brand	Model	FCC ID
Fixture	LiteON	CA-P120	N/A
NB	DELL	E4300	DoC

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC
Fixture	LiteON	CA-P120	N/A

3.8. 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	Mtool 2.0.2.3					
Mode	Test Frequency (MHz)					
	NCB: 20MHz					
	5180 MHz	5200 MHz	5240 MHz	5745 MHz	5785 MHz	5825 MHz
802.11a	76	76	76	76	76	76
802.11ac MCS0/Nss1 VHT20	74	74	74	70	74	74
Mode	NCB: 40MHz					
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz		5755 MHz	5795 MHz
	52		74		54	74
Mode	NCB: 80MHz					
802.11ac MCS0/Nss1 VHT80	5210 MHz				5775 MHz	
	45				54	

3.9. EUT Operation during Test

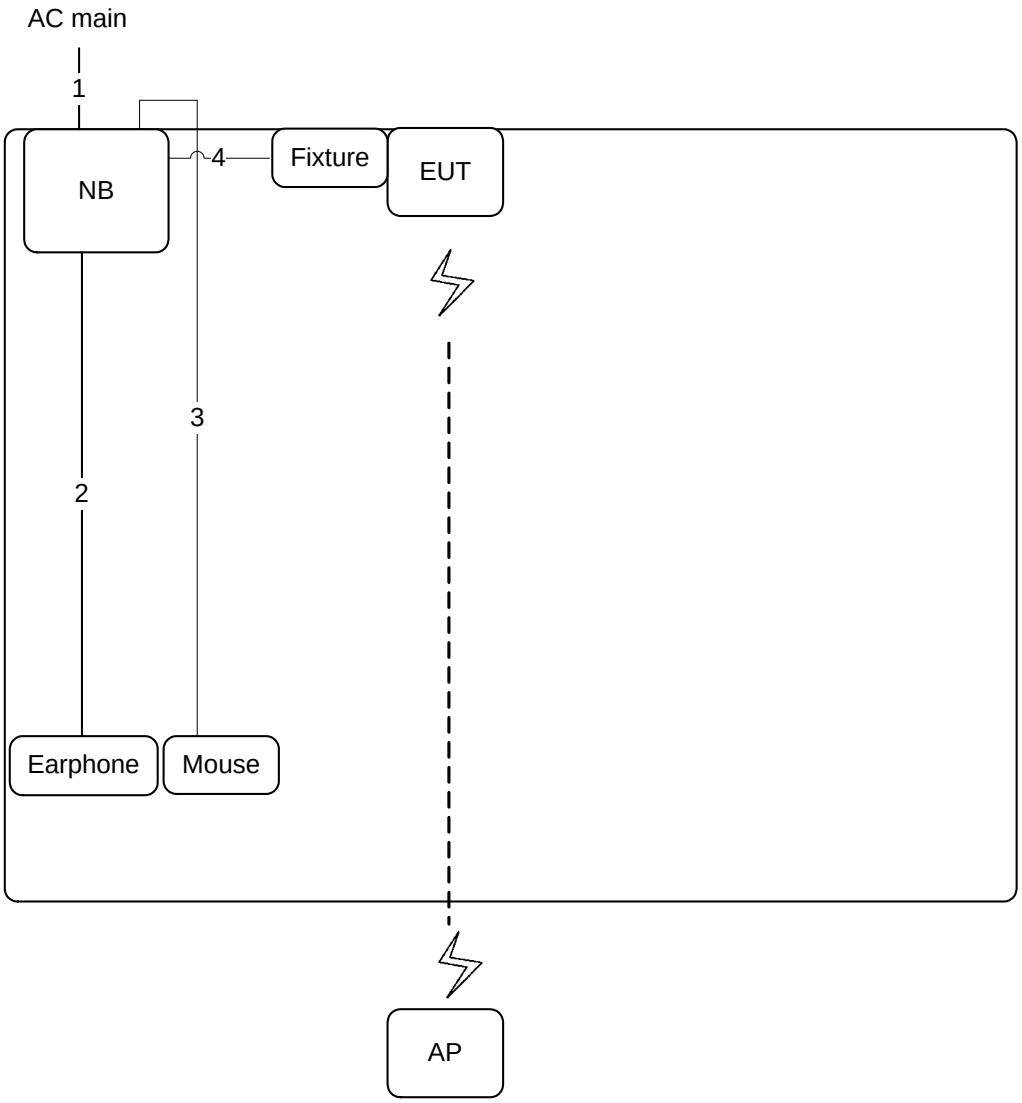
The EUT was programmed to be in continuously transmitting mode.

3.10. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.05797	2.087	98.61	0.06	0.01
802.11ac MCS0/Nss1 VHT20	1.920	1.94928	98.51	0.07	0.01
802.11ac MCS0/Nss1 VHT40	0.954	0.97971	97.34	0.12	1.05
802.11ac MCS0/Nss1 VHT80	0.464	0.48841	94.96	0.22	2.16

3.11. Test Configurations

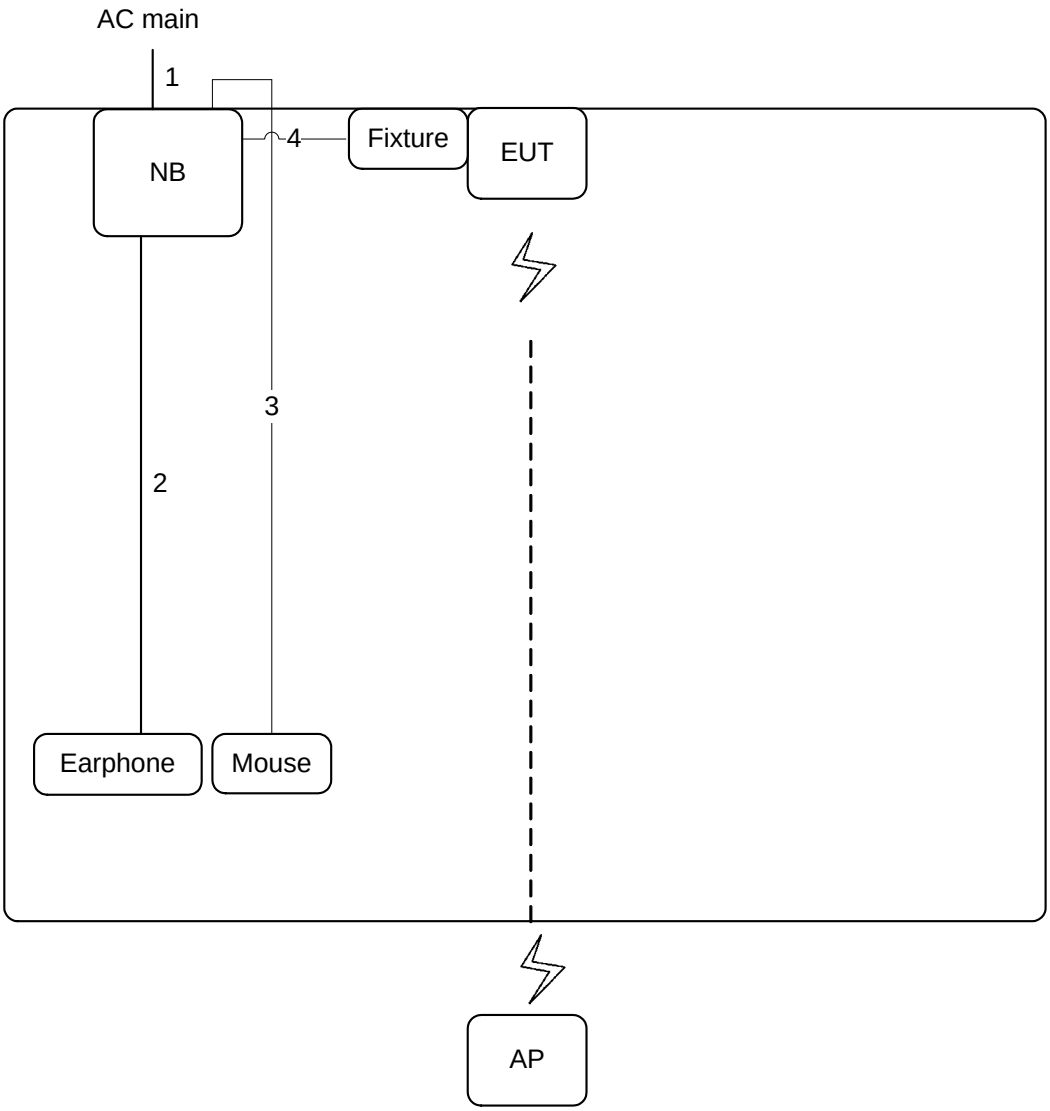
3.11.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Audio cable	No	1.5m
3	USB cable	Yes	1.8m
4	USB cable	Yes	0.1m

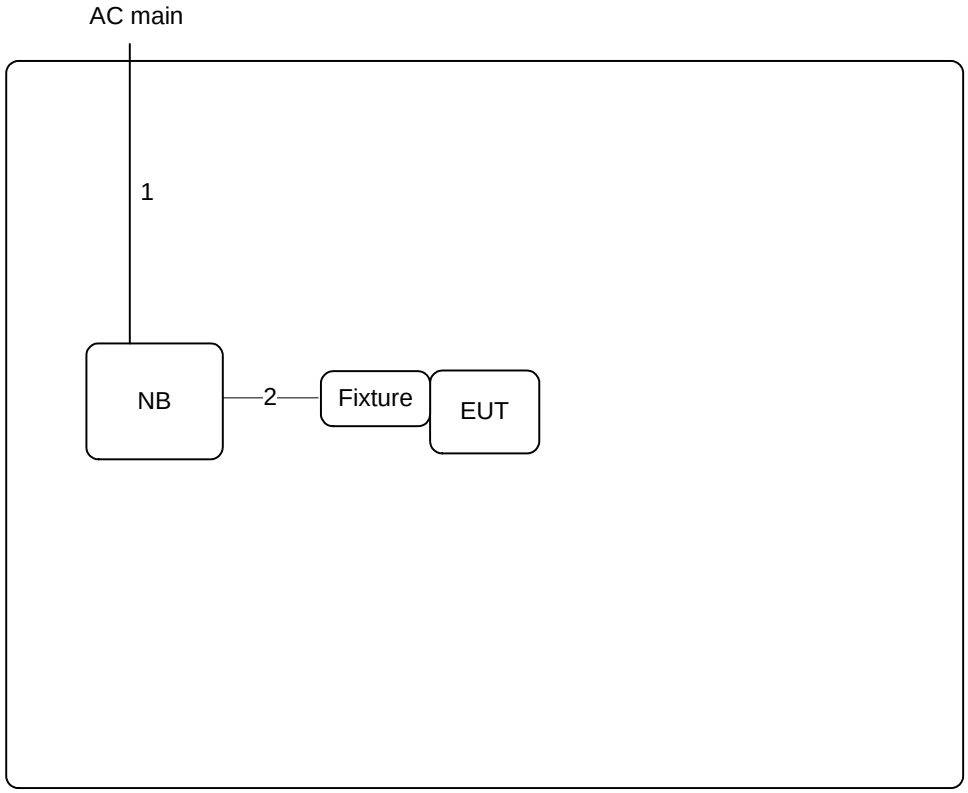
3.11.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz ~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Audio cable	No	1.5m
3	USB cable	Yes	1.8m
4	USB cable	Yes	0.1m

Test Configuration: above 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	USB cable	Yes	0.1m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product that is designed to connect to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

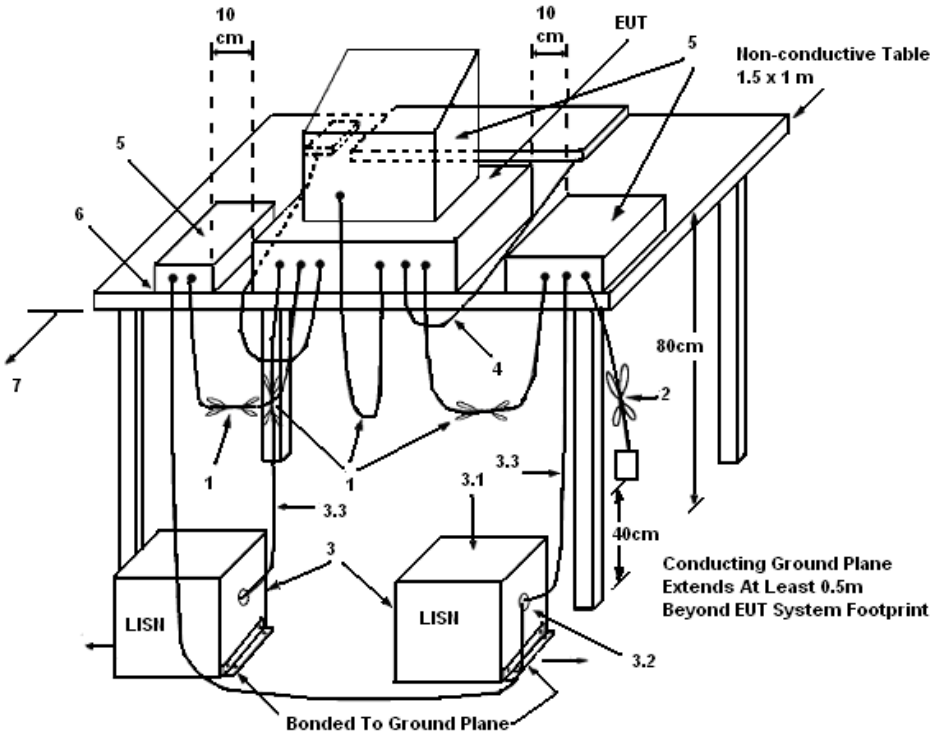
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

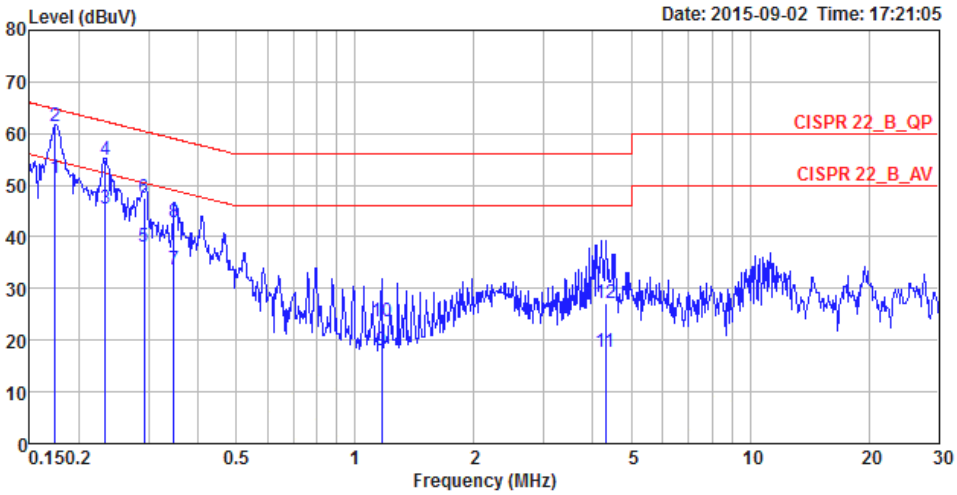
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

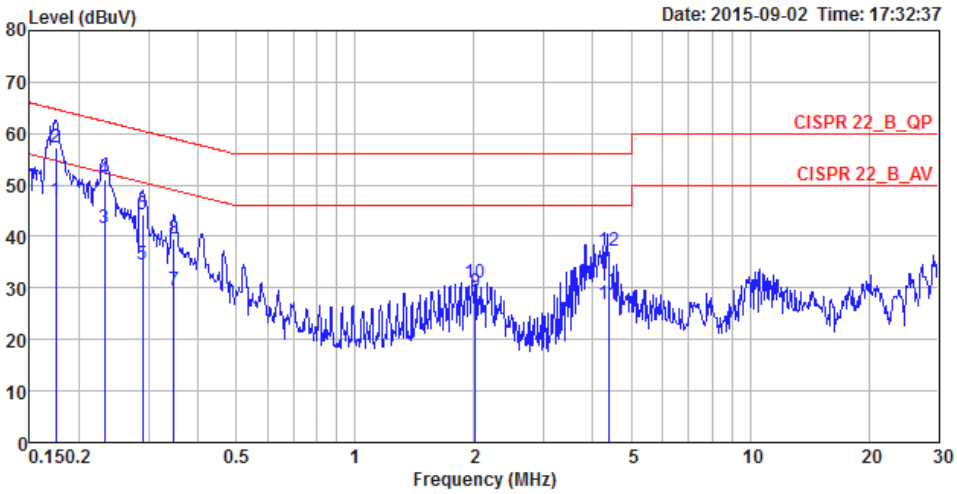
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	22°C	Humidity	54%
Test Engineer	Da Deng	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1740	51.39	-3.38	54.77	41.44	9.93	0.02	LINE	Average
2	0.1740	61.36	-3.41	64.77	51.41	9.93	0.02	LINE	QP
3	0.2329	45.41	-6.94	52.35	35.45	9.93	0.03	LINE	Average
4	0.2329	55.00	-7.35	62.35	45.04	9.93	0.03	LINE	QP
5	0.2924	38.19	-12.27	50.46	28.22	9.93	0.04	LINE	Average
6	0.2924	47.58	-12.88	60.46	37.61	9.93	0.04	LINE	QP
7	0.3483	33.51	-15.49	49.00	23.54	9.93	0.04	LINE	Average
8	0.3483	42.89	-16.11	59.00	32.92	9.93	0.04	LINE	QP
9	1.1657	17.88	-28.12	46.00	7.86	9.97	0.05	LINE	Average
10	1.1657	23.63	-32.37	56.00	13.61	9.97	0.05	LINE	QP
11	4.3146	17.72	-28.28	46.00	7.61	10.03	0.08	LINE	Average
12	4.3146	27.20	-28.80	56.00	17.09	10.03	0.08	LINE	QP

Temperature	22°C	Humidity	54%
Test Engineer	Da Deng	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1749	46.94	-7.78	54.72	37.13	9.79	0.02	NEUTRAL	Average
2	0.1749	57.20	-7.52	64.72	47.39	9.79	0.02	NEUTRAL	QP
3	0.2316	41.60	-10.79	52.39	31.78	9.79	0.03	NEUTRAL	Average
4	0.2316	51.22	-11.17	62.39	41.40	9.79	0.03	NEUTRAL	QP
5	0.2893	34.53	-16.01	50.54	24.70	9.79	0.04	NEUTRAL	Average
6	0.2893	44.24	-16.30	60.54	34.41	9.79	0.04	NEUTRAL	QP
7	0.3483	29.63	-19.37	49.00	19.80	9.79	0.04	NEUTRAL	Average
8	0.3483	39.54	-19.46	59.00	29.71	9.79	0.04	NEUTRAL	QP
9	2.0156	29.14	-16.86	46.00	19.24	9.84	0.06	NEUTRAL	Average
10	2.0156	31.07	-24.93	56.00	21.17	9.84	0.06	NEUTRAL	QP
11	4.3766	26.88	-19.12	46.00	16.92	9.88	0.08	NEUTRAL	Average
12	4.3766	37.20	-18.80	56.00	27.24	9.88	0.08	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

4.2.1. Limit

No restriction limits.

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 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

4.2.3. 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%.

4.2.4. Test Setup Layout

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

This test setup layout is the same as that shown in section 4.6.4.

4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

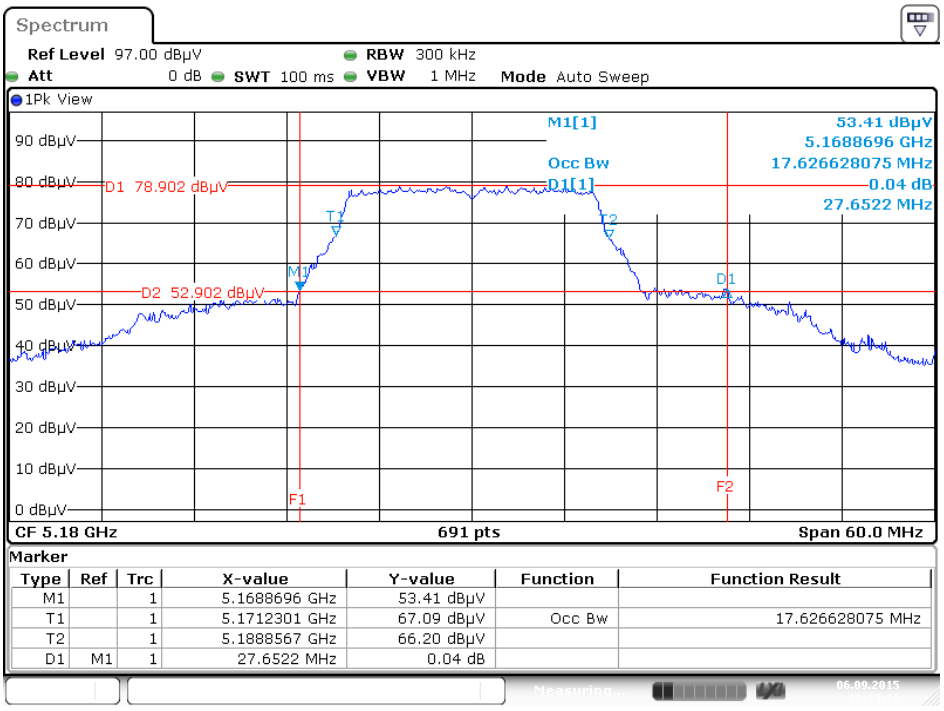
The EUT was programmed to be in continuously transmitting mode.

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

Temperature	28°C	Humidity	64%
Test Engineer	Roki Liu		

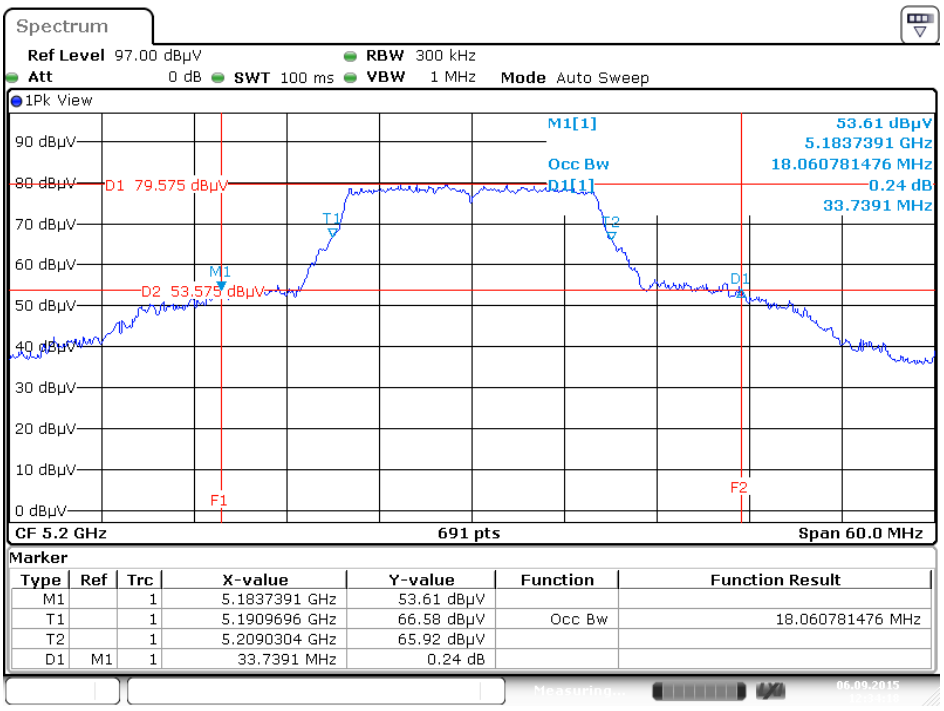
Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	27.65	17.63
	5200 MHz	33.74	18.06
	5240 MHz	30.35	17.80
	5745 MHz	34.78	18.49
	5785 MHz	33.91	18.23
	5825 MHz	30.26	17.71
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.74	18.41
	5200 MHz	22.00	18.41
	5240 MHz	21.83	18.32
	5745 MHz	21.83	18.41
	5785 MHz	27.22	18.67
	5825 MHz	21.83	18.41
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.58	36.61
	5230 MHz	83.19	37.34
	5755 MHz	40.73	36.61
	5795 MHz	79.71	36.90
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.74	75.83
	5775 MHz	81.74	76.12

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5180 MHz



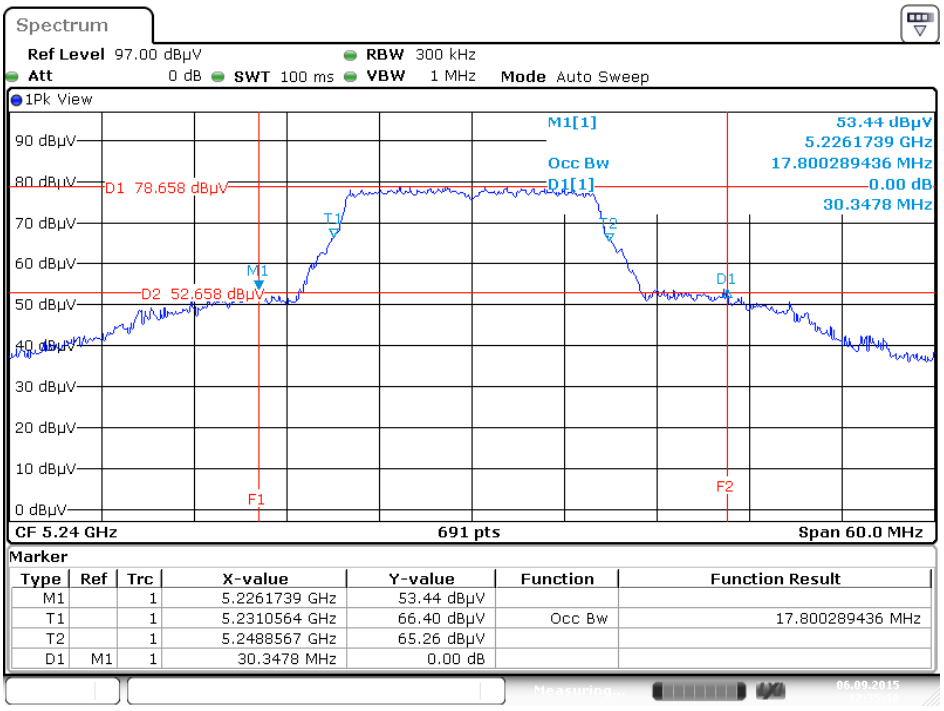
Date: 6.SEP.2015 12:33:29

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5200 MHz



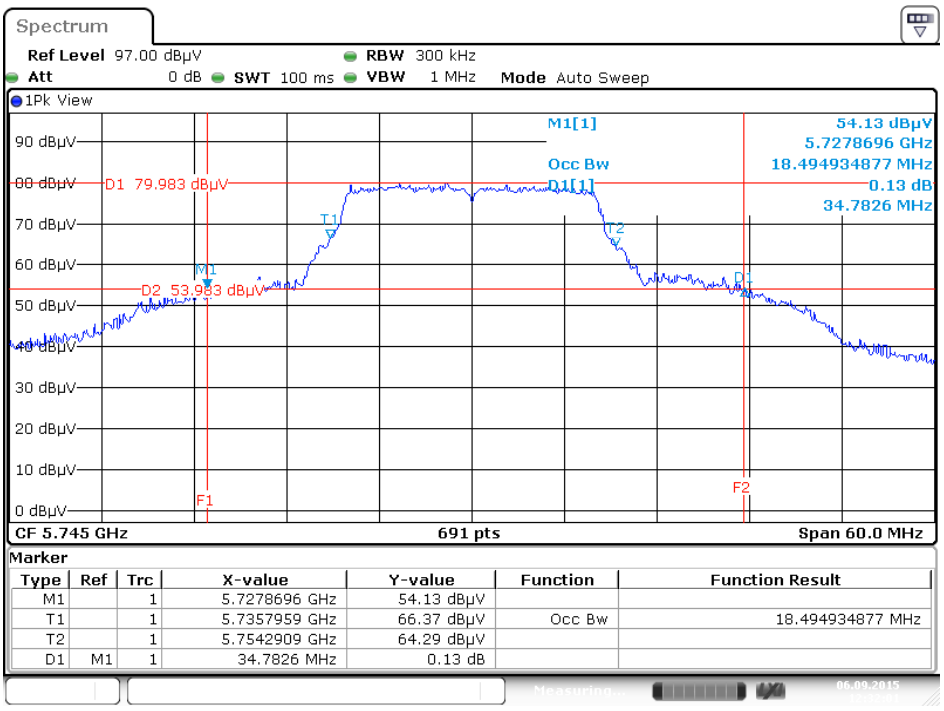
Date: 6.SEP.2015 12:34:19

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5240 MHz



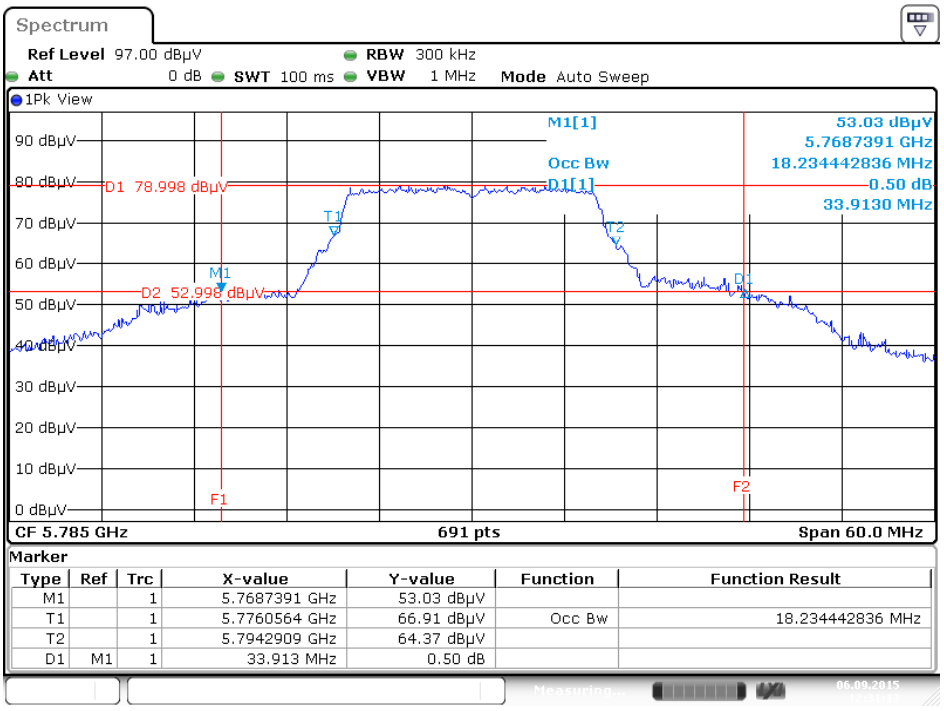
Date: 6.SEP.2015 12:35:18

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5745 MHz



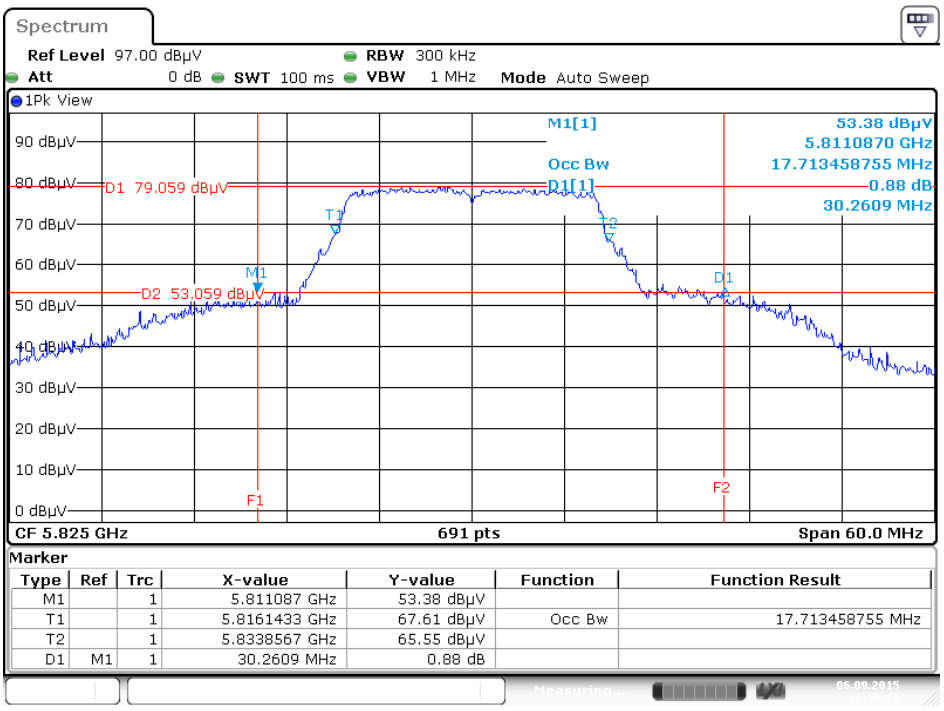
Date: 6.SEP.2015 12:32:01

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



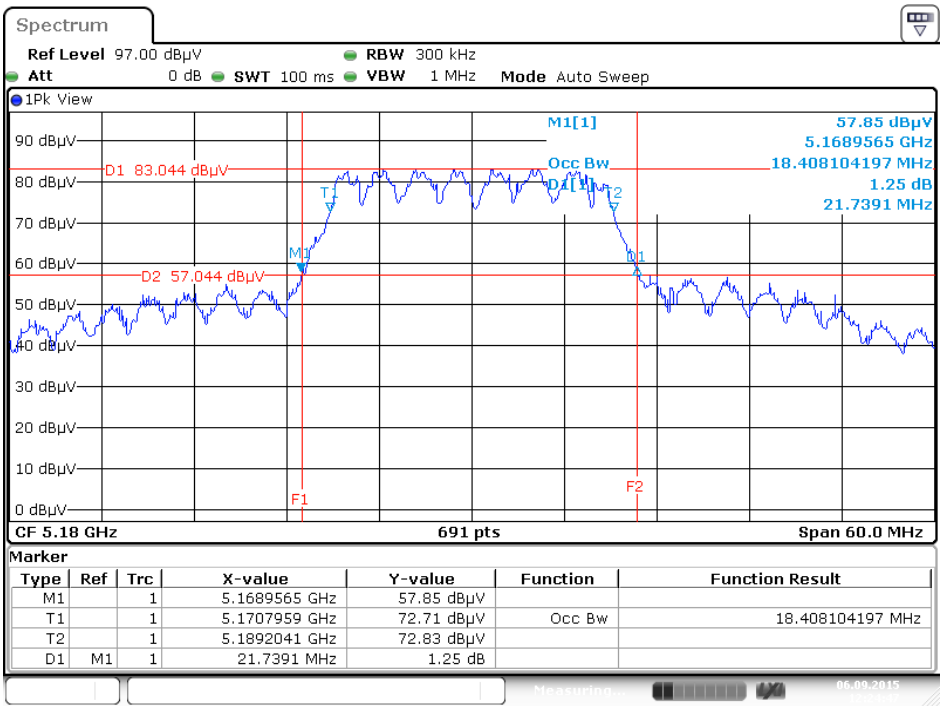
Date: 6.SEP.2015 12:31:12

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5825 MHz



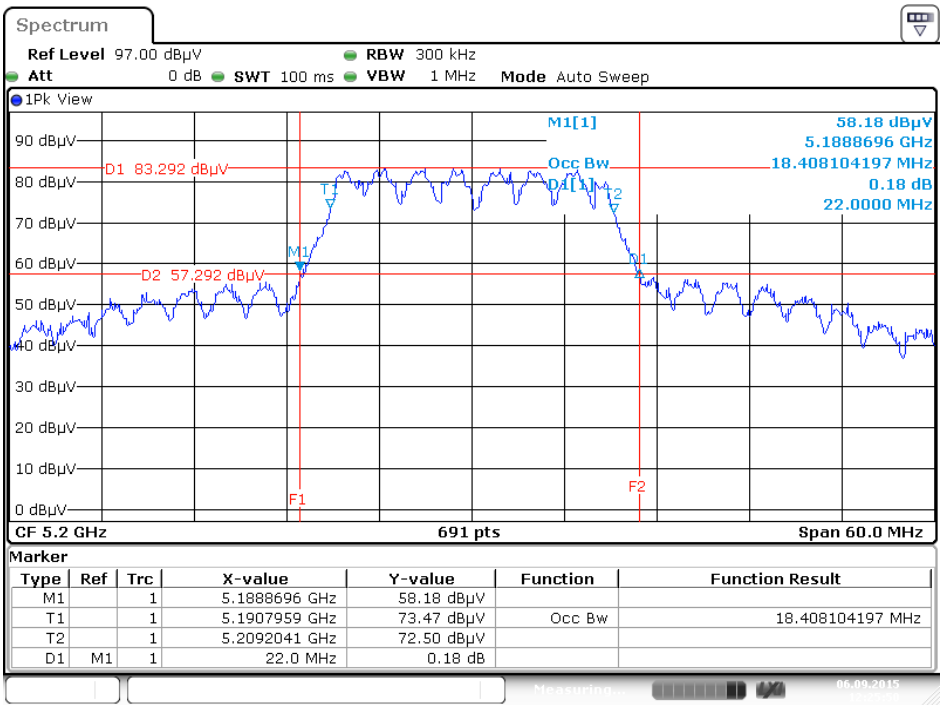
Date: 6.SEP.2015 12:30:28

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5180 MHz



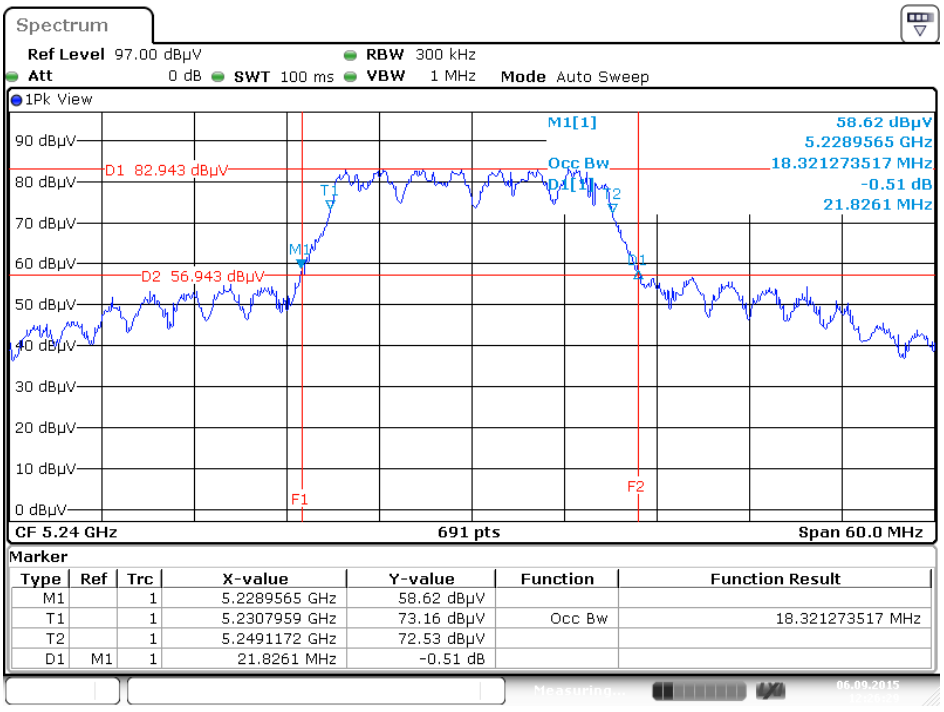
Date: 6.SEP.2015 12:24:48

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5200 MHz



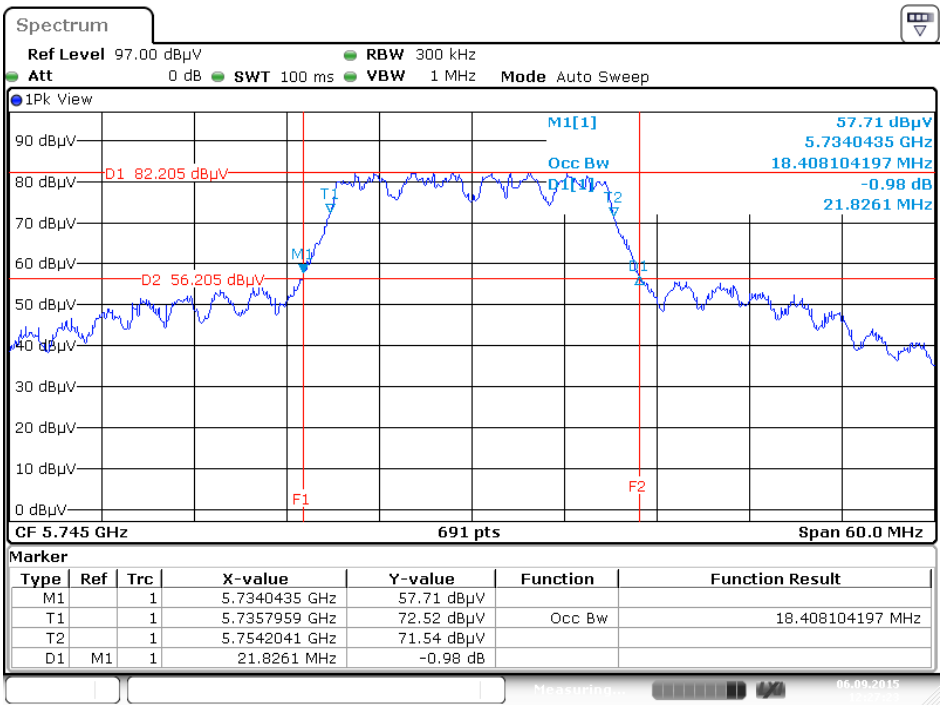
Date: 6.SEP.2015 12:25:50

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5240 MHz



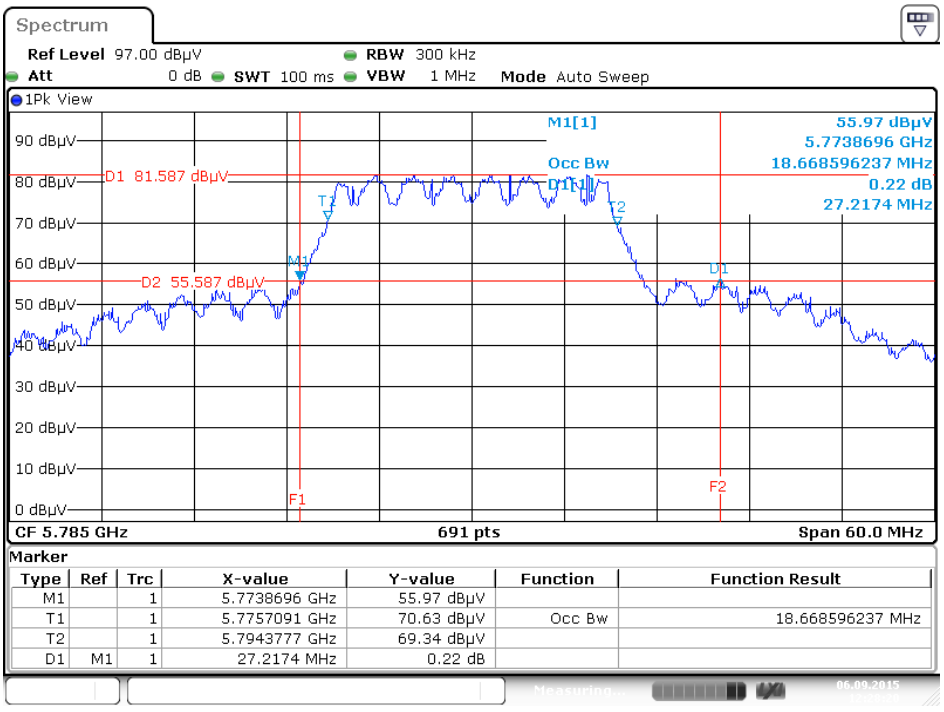
Date: 6.SEP.2015 12:26:29

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



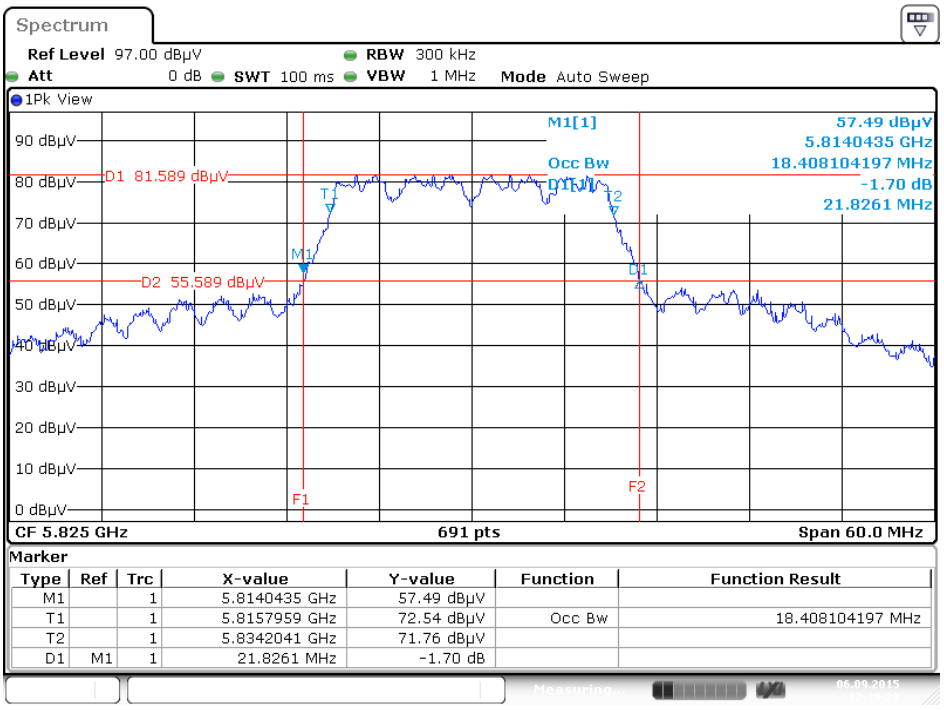
Date: 6.SEP.2015 12:27:24

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



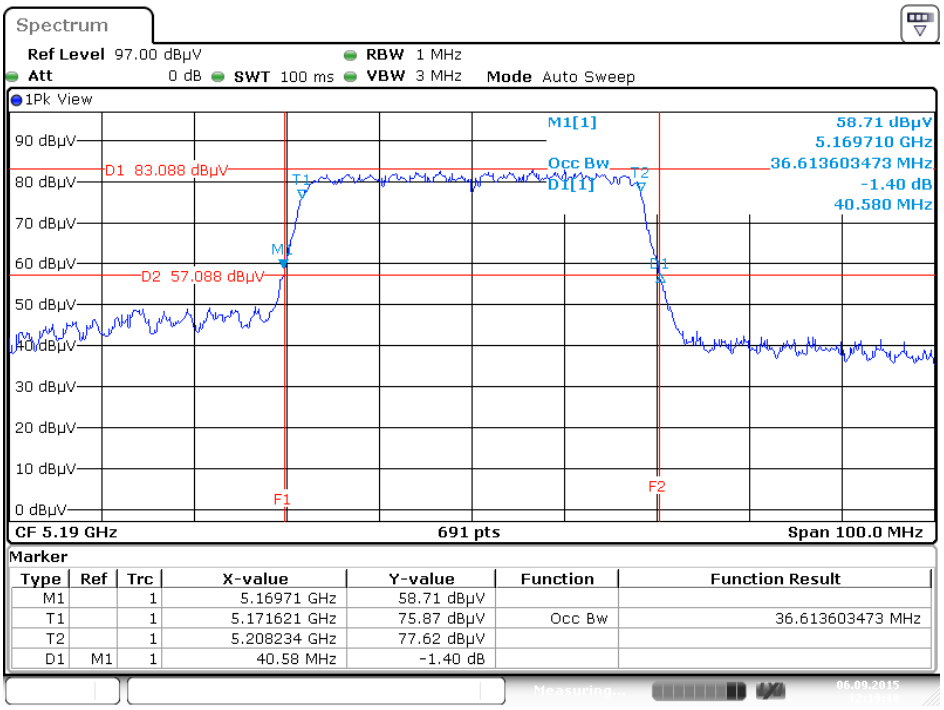
Date: 6.SEP.2015 12:28:20

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



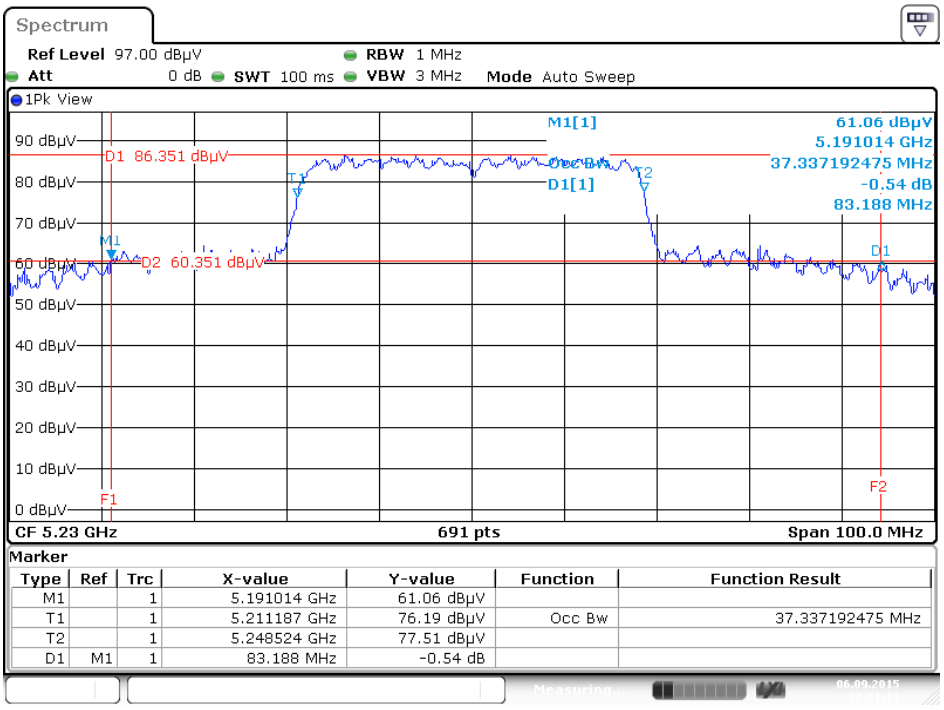
Date: 6.SEP.2015 12:29:28

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5190 MHz



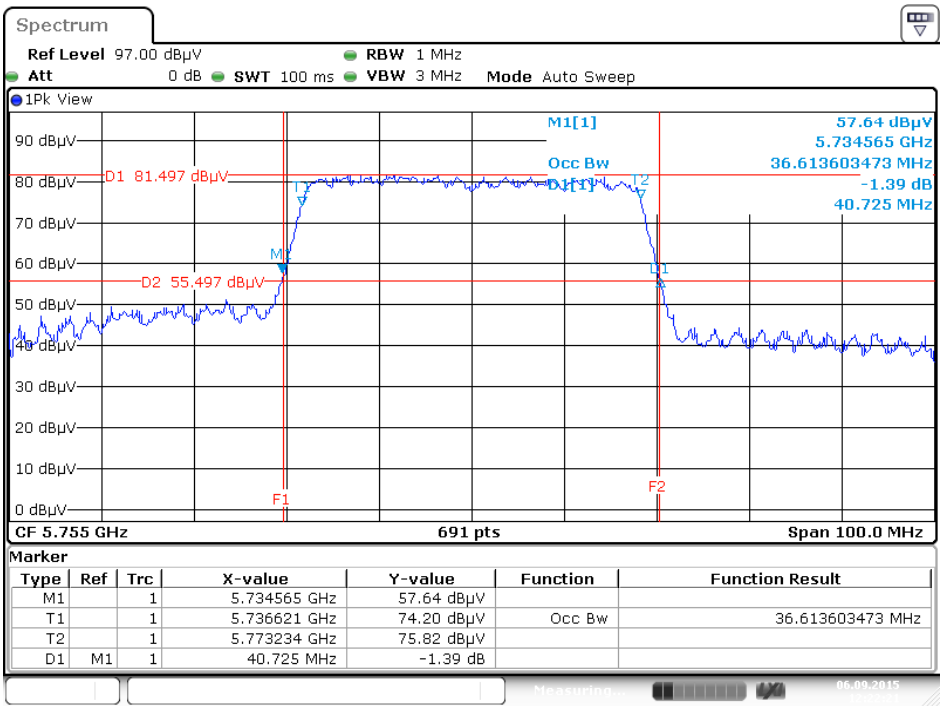
Date: 6.SEP.2015 12:19:18

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5230 MHz



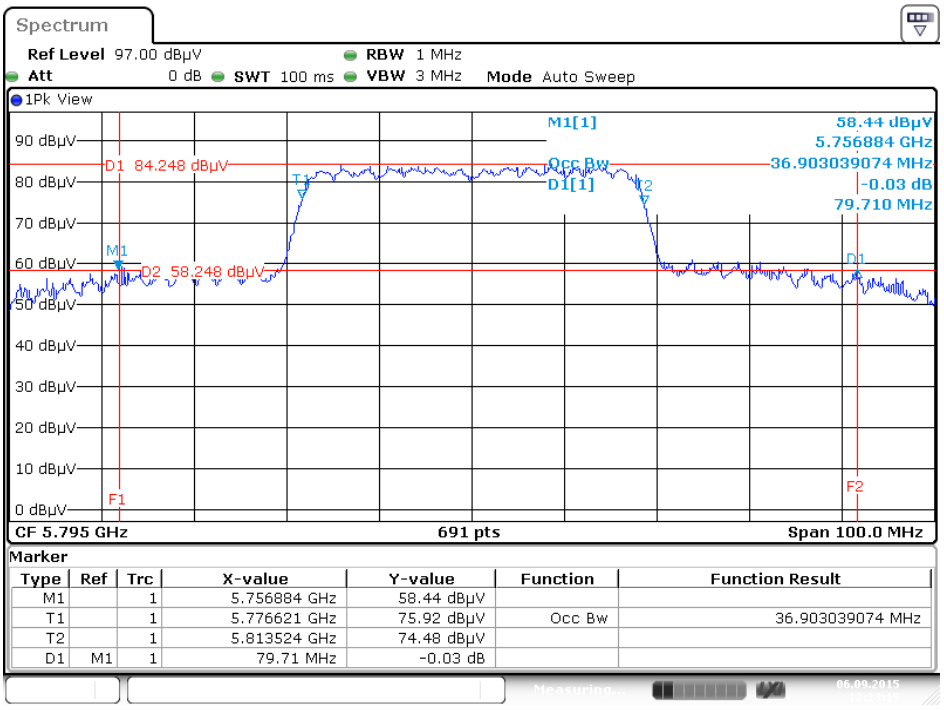
Date: 6.SEP.2015 12:21:11

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



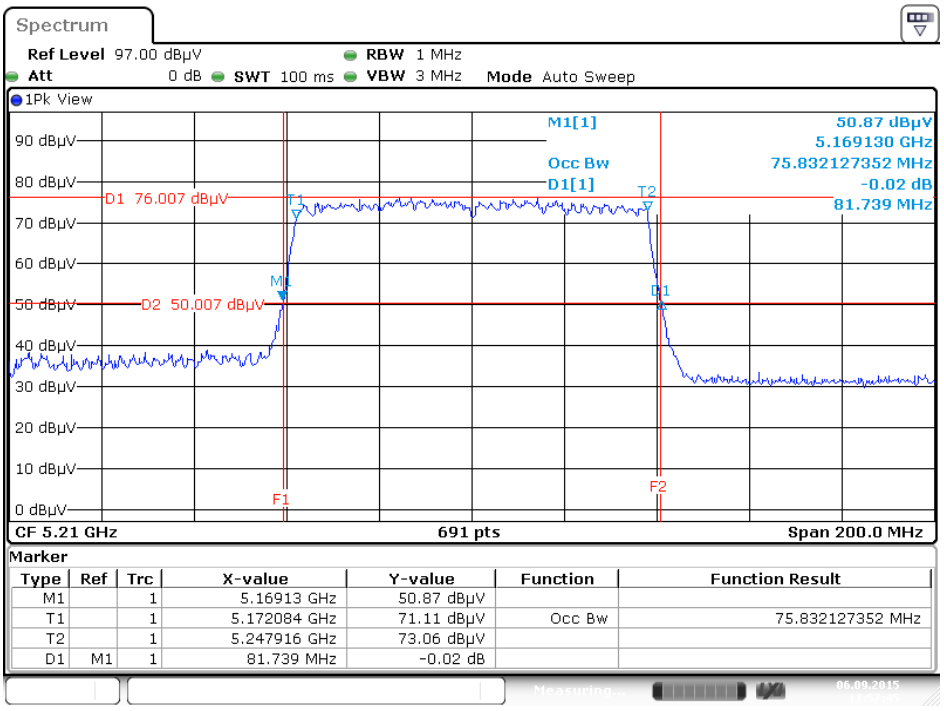
Date: 6.SEP.2015 12:22:21

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



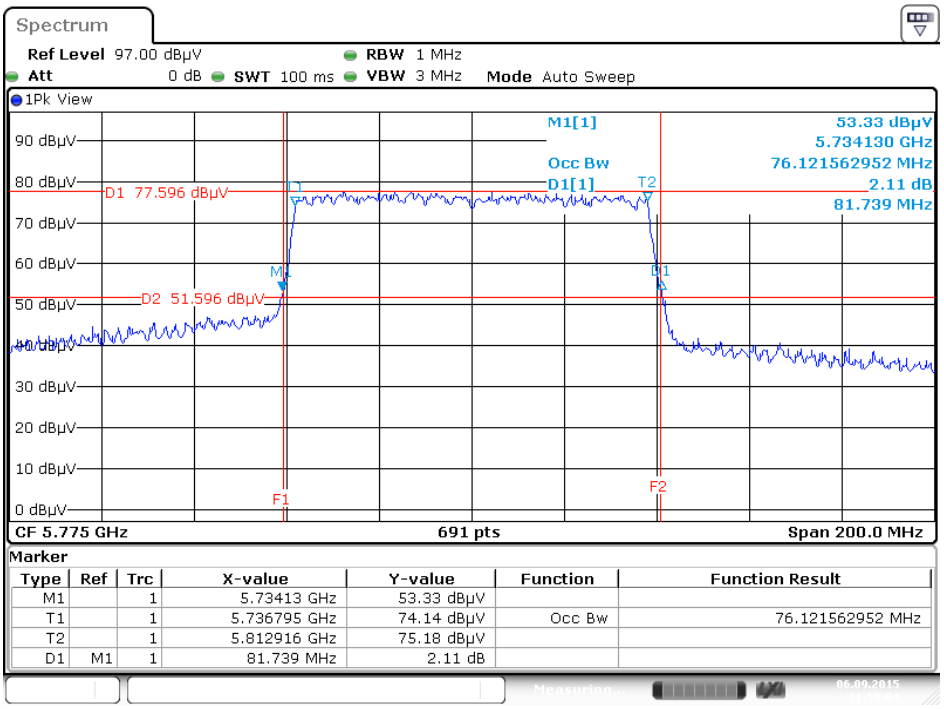
Date: 6.SEP.2015 12:23:16

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 / 5210 MHz



Date: 6.SEP.2015 11:57:46

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



Date: 6.SEP.2015 11:59:04

4.3. 6dB Spectrum Bandwidth Measurement

4.3.1. Limit

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

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 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

4.3.3. 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.

4.3.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.6.4.

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 6dB Spectrum Bandwidth

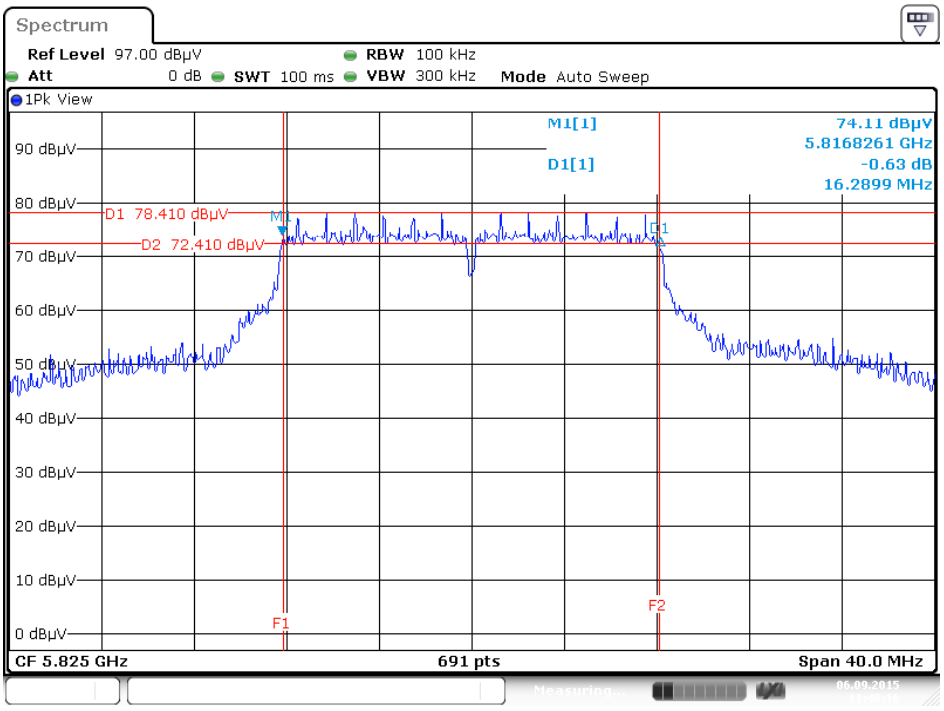
Temperature	28°C	Humidity	64%
Test Engineer	Roki Liu		

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11a	5745 MHz	16.35	500	Complies
	5785 MHz	16.41	500	Complies
	5825 MHz	16.29	500	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	17.57	500	Complies
	5785 MHz	17.57	500	Complies
	5825 MHz	17.57	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	35.13	500	Complies
	5795 MHz	35.25	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	75.07	500	Complies

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

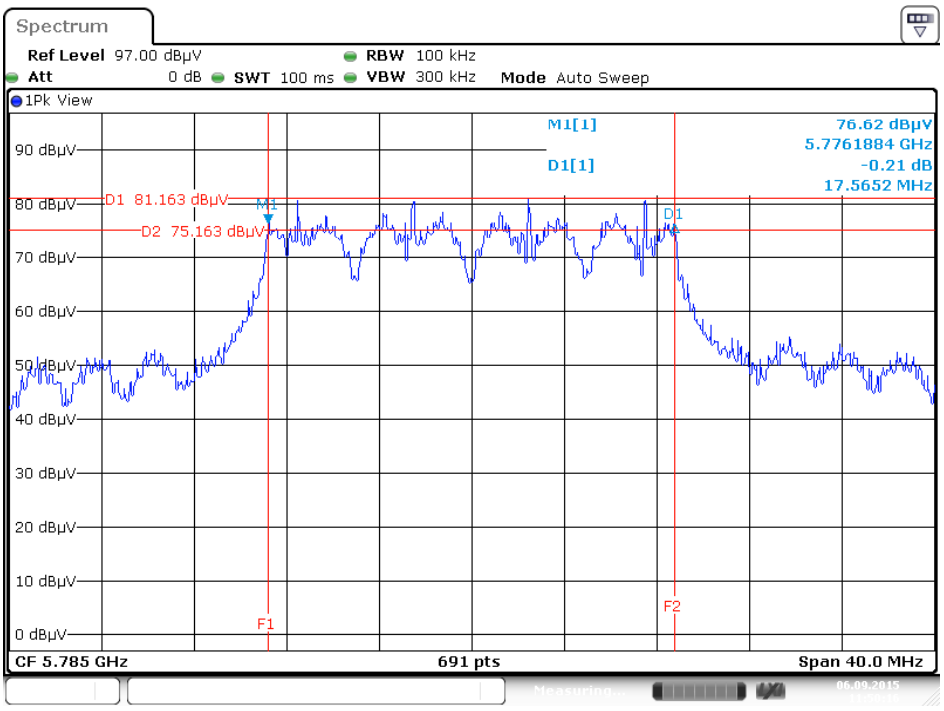
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5825 MHz



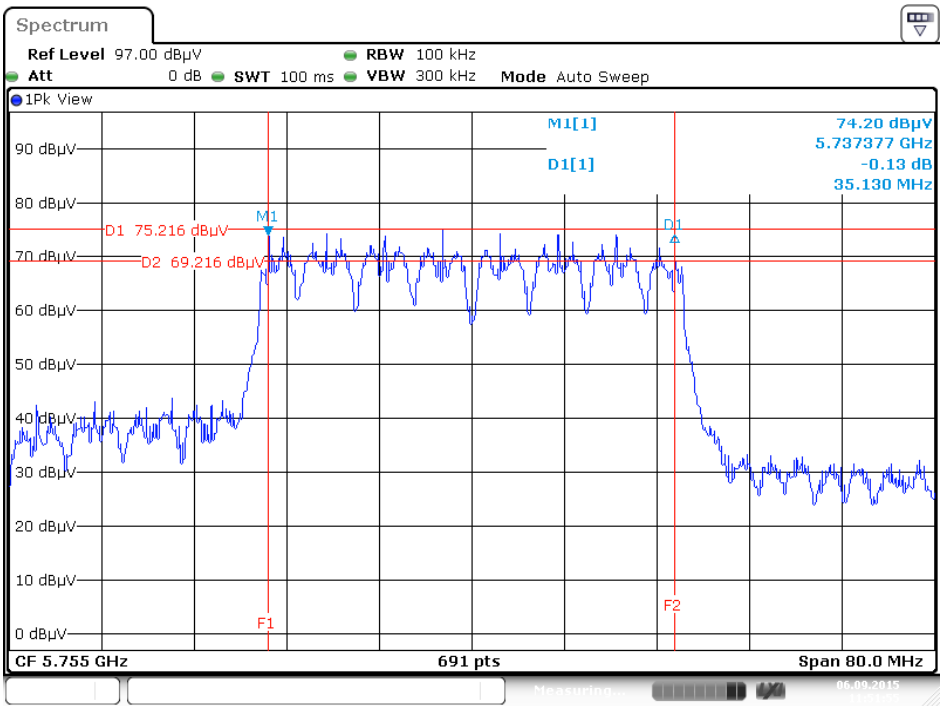
Date: 6.SEP.2015 11:48:17

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



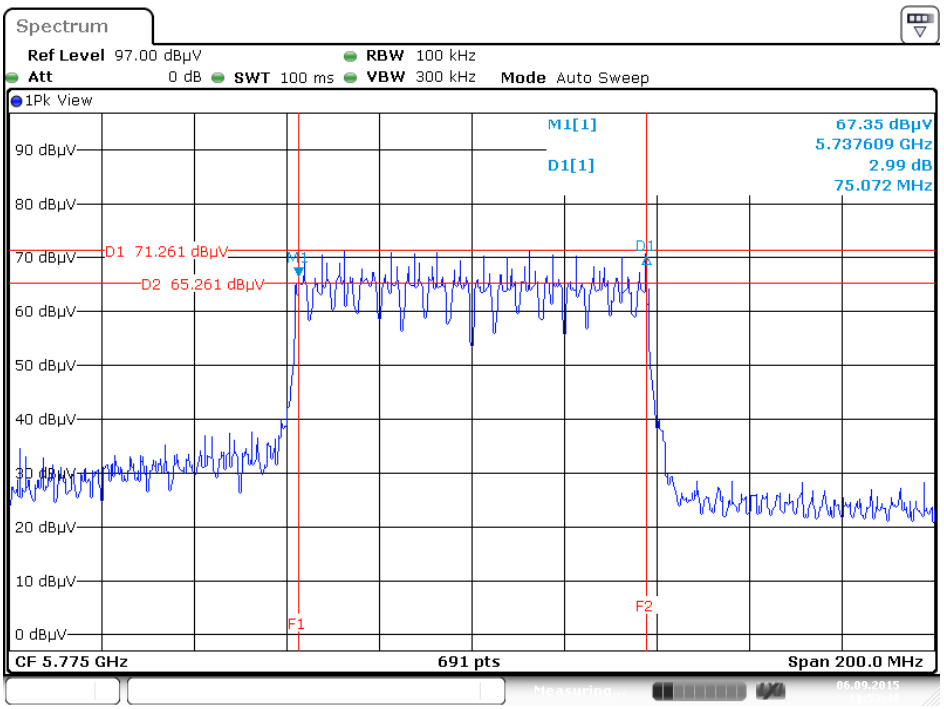
Date: 6.SEP.2015 11:50:16

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



Date: 6.SEP.2015 11:51:55

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



Date: 6.SEP.2015 11:53:48

4.4. Maximum Conducted Output Power Measurement

4.4.1. Limit

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

☒	5.725~5.85 GHz	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

4.4.2. Measuring Instruments and Setting

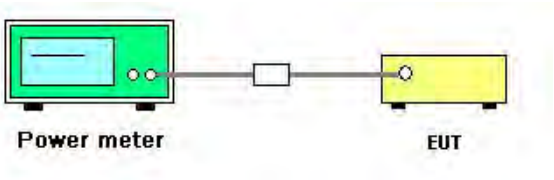
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.4.3. 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.

4.4.4. 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 Maximum Conducted Output Power

Temperature	28°C	Humidity	64%
Test Engineer	Roki Liu	Test Date	Sep. 04, 2015

Mode	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 1		
802.11a	5180 MHz	18.86	24.00	Complies
	5200 MHz	18.84	24.00	Complies
	5240 MHz	18.85	24.00	Complies
	5745 MHz	19.52	30.00	Complies
	5785 MHz	19.54	30.00	Complies
	5825 MHz	19.64	30.00	Complies

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Total		
802.11ac MCS0/Nss1 VHT20	5180 MHz	18.34	18.05	21.21	24.00	Complies
	5200 MHz	17.84	17.83	20.85	24.00	Complies
	5240 MHz	17.51	17.65	20.59	24.00	Complies
	5745 MHz	17.75	16.24	20.07	30.00	Complies
	5785 MHz	17.82	16.68	20.30	30.00	Complies
	5825 MHz	17.85	16.81	20.37	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	13.27	13.16	16.23	24.00	Complies
	5230 MHz	17.85	17.84	20.86	24.00	Complies
	5755 MHz	14.25	13.21	16.77	30.00	Complies
	5795 MHz	16.71	17.05	19.89	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	11.01	10.95	13.99	24.00	Complies
	5775 MHz	12.77	12.49	15.64	30.00	Complies

4.5. Power Spectral Density Measurement

4.5.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.4.1.

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

4.5.2. Measuring Instruments and Setting

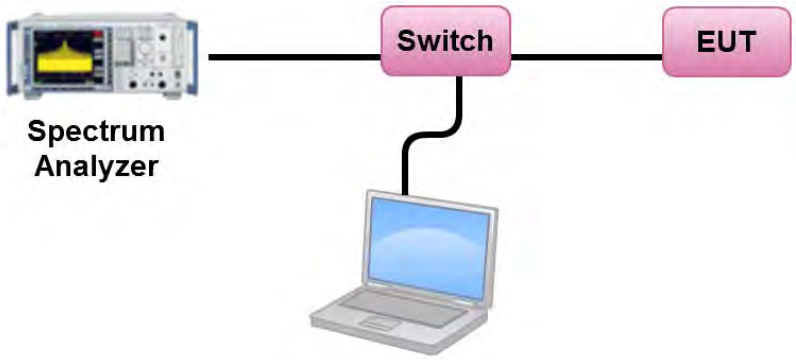
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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.	

4.5.3. 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.

4.5.4. 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. Test Result of Power Spectral Density

Temperature	28°C	Humidity	64%
Test Engineer	Roki Liu		

Configuration IEEE 802.11a / Ant. 1

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	5.81	11.00	Complies
40	5200 MHz	5.84	11.00	Complies
48	5240 MHz	5.70	11.00	Complies

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	6.66	-3.01	3.65	30.00	Complies
157	5785 MHz	6.97	-3.01	3.96	30.00	Complies
165	5825 MHz	6.62	-3.01	3.61	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	8.02	11.00	Complies
40	5200 MHz	8.16	11.00	Complies
48	5240 MHz	7.83	11.00	Complies

Note: $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ =5.61dBi <6dBi, so the limit doesn't reduce.

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	6.81	-3.01	3.80	29.02	Complies
157	5785 MHz	7.33	-3.01	4.32	29.02	Complies
165	5825 MHz	7.55	-3.01	4.54	29.02	Complies

Note: $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ = 6.98dBi, so limit=30-(6.98-6)=29.02dBm/MHz

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	1.13	11.00	Complies
46	5230 MHz	5.37	11.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =5.61dBi <6dBi, so the limit doesn't reduce.

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
151	5755 MHz	0.59	-3.01	-2.42	29.02	Complies
159	5795 MHz	3.45	-3.01	0.44	29.02	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ = 6.98dBi, so limit=30-(6.98-6)=29.02dBm/MHz

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-4.62	11.00	Complies

Note: $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ =5.61dBi <6dBi, so the limit doesn't reduce.

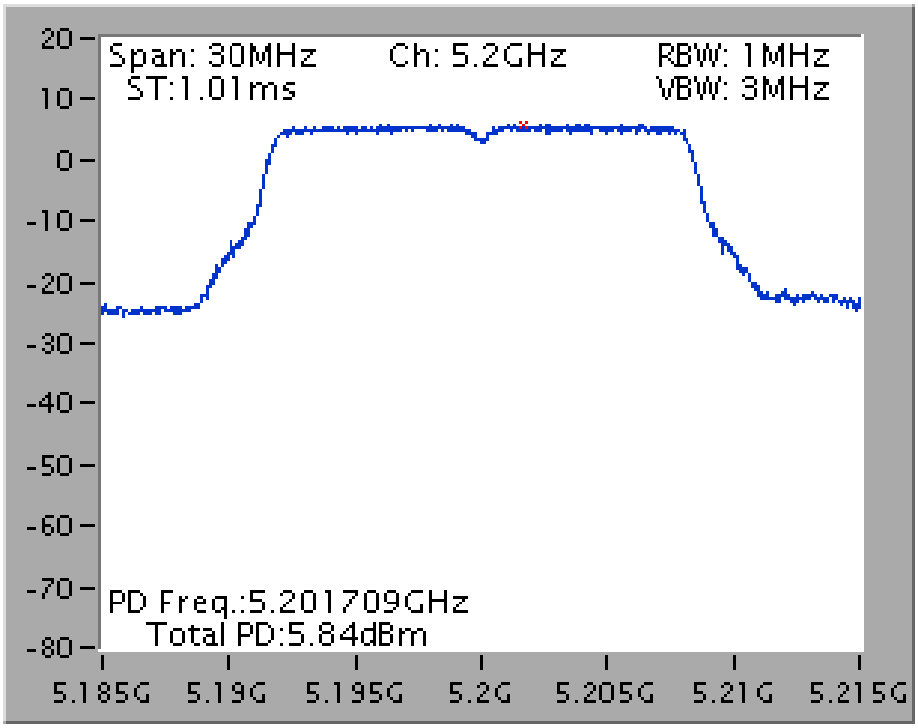
Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	-2.85	-3.01	-5.86	29.02	Complies

Note: $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ = 6.98dBi, so limit=30-(6.98-6)=29.02dBm/MHz

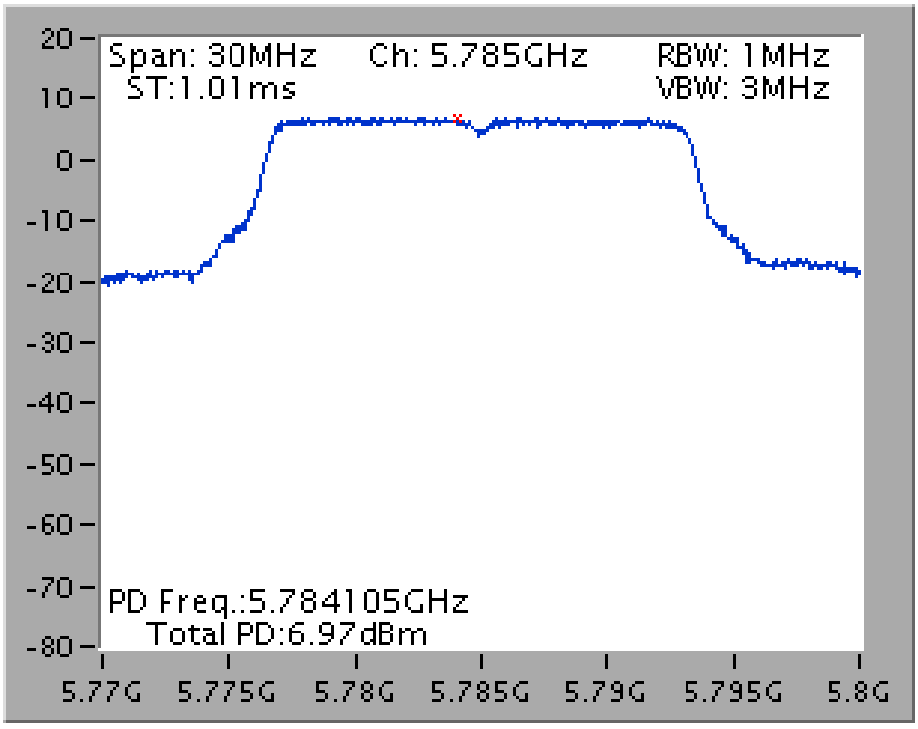
Note: All the test values were listed in the report.

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

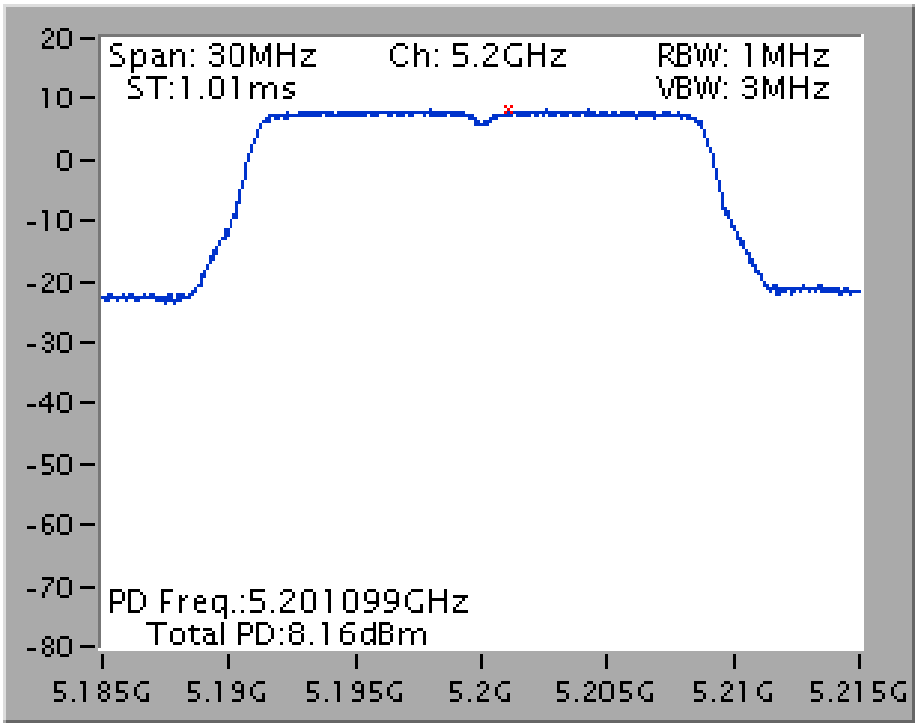
Power Density Plot on Configuration IEEE 802.11a / Ant. 1 / 5200 MHz



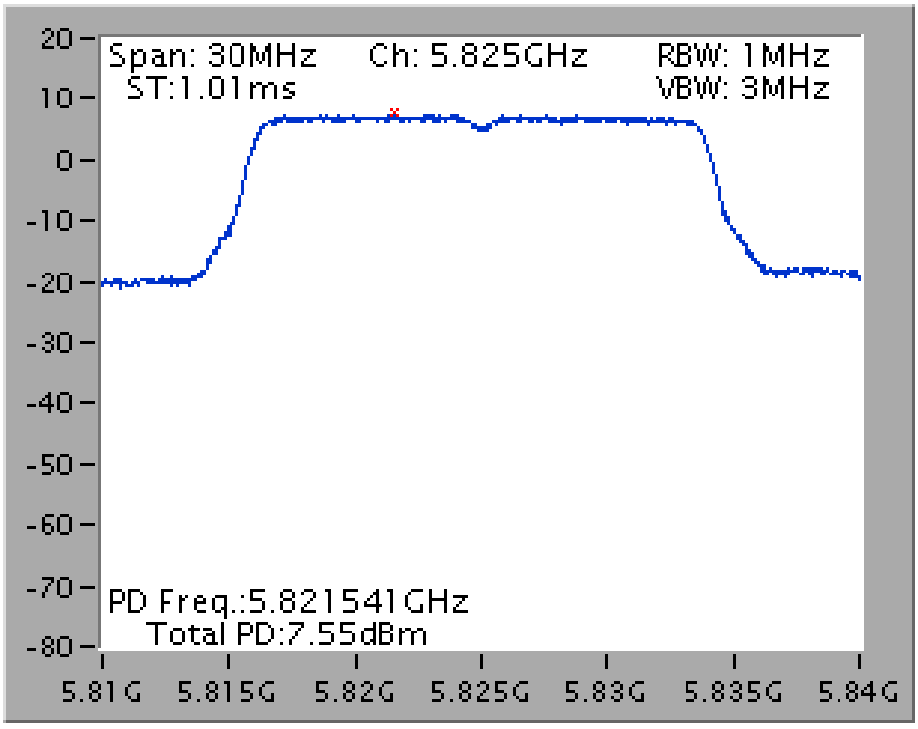
Power Density Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



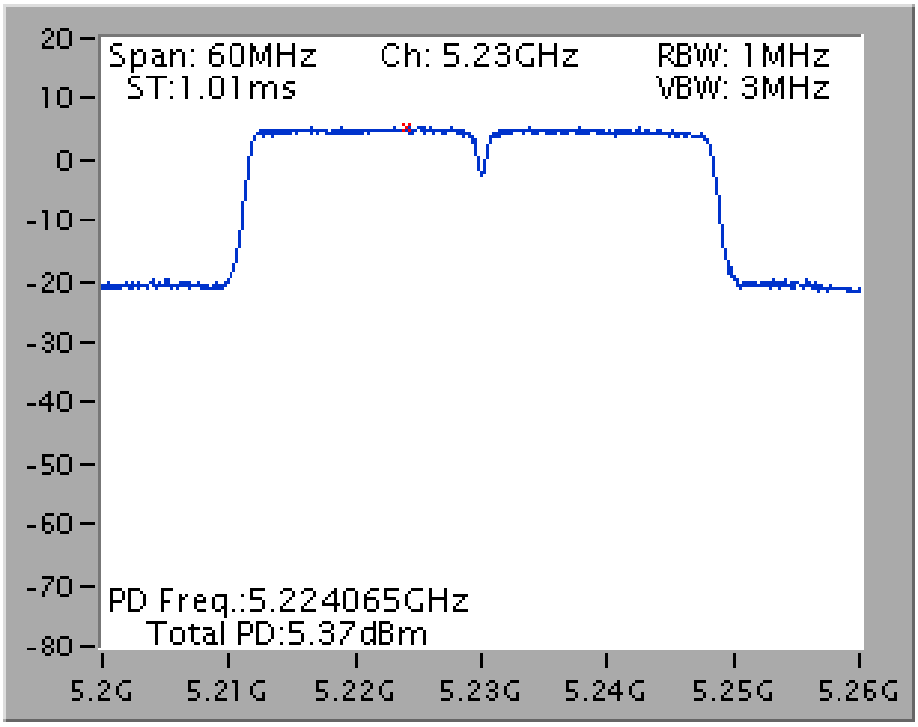
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5200 MHz



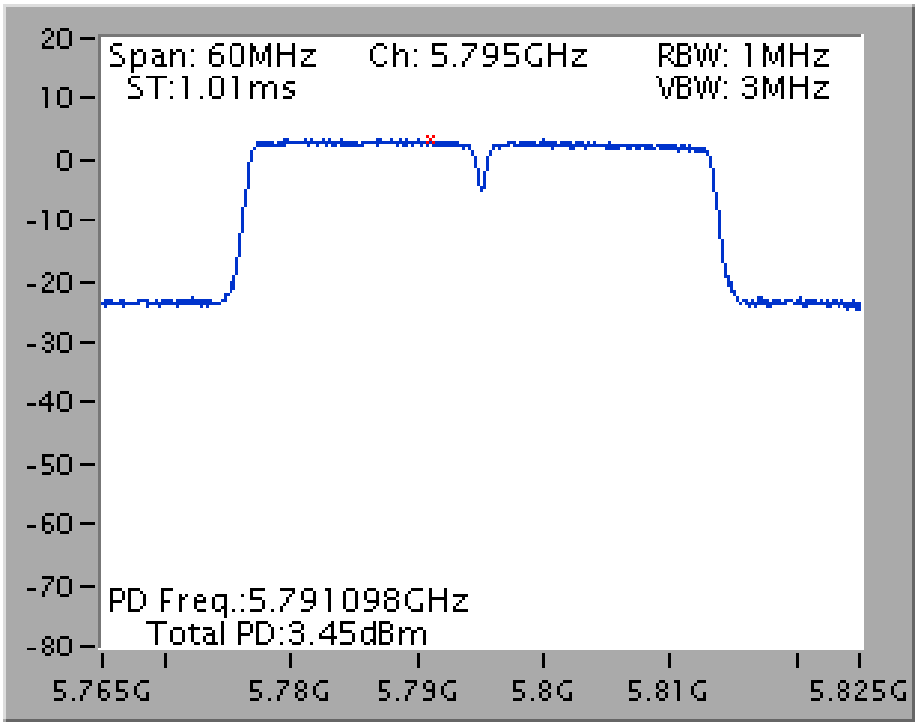
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5825 MHz



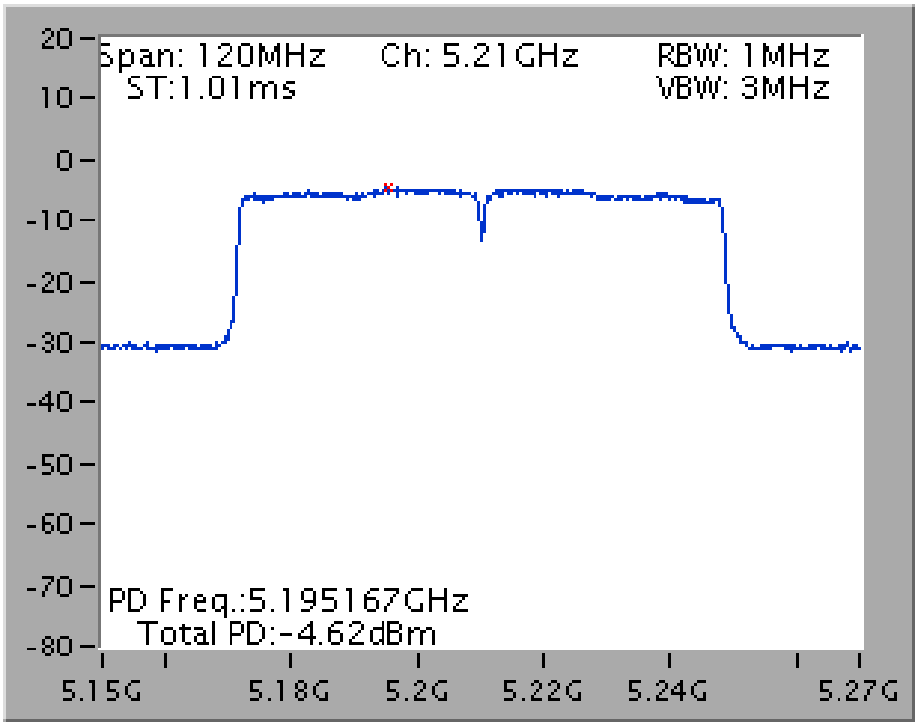
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5230 MHz



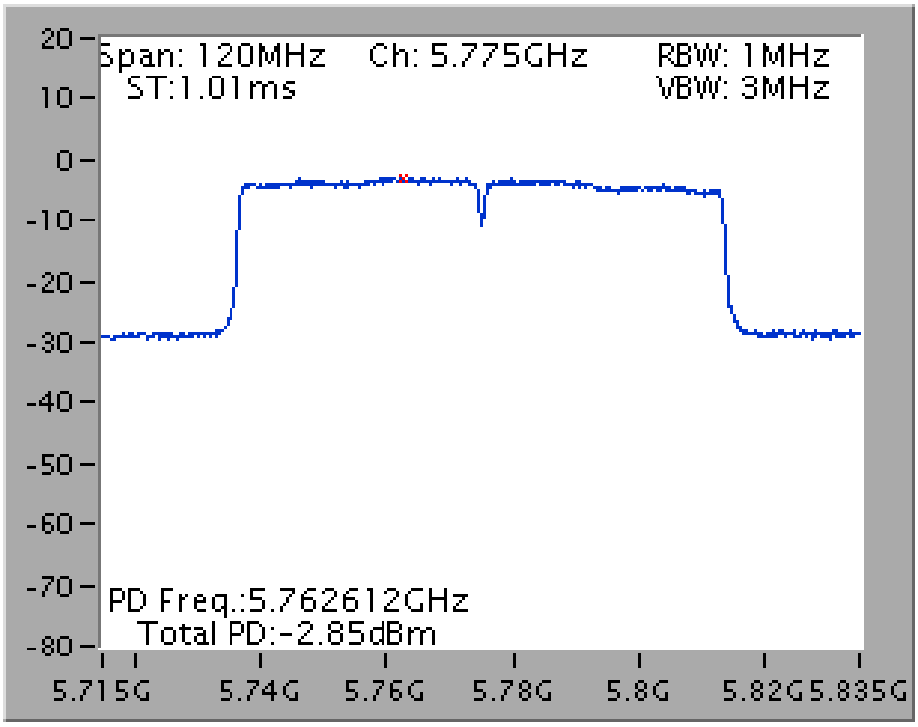
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5795 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 / 5210 MHz



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



4.6. Radiated Emissions Measurement

4.6.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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 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

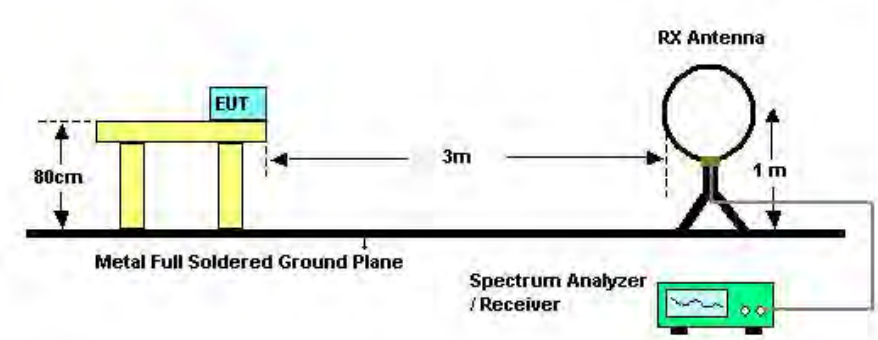
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.6.3. Test Procedures

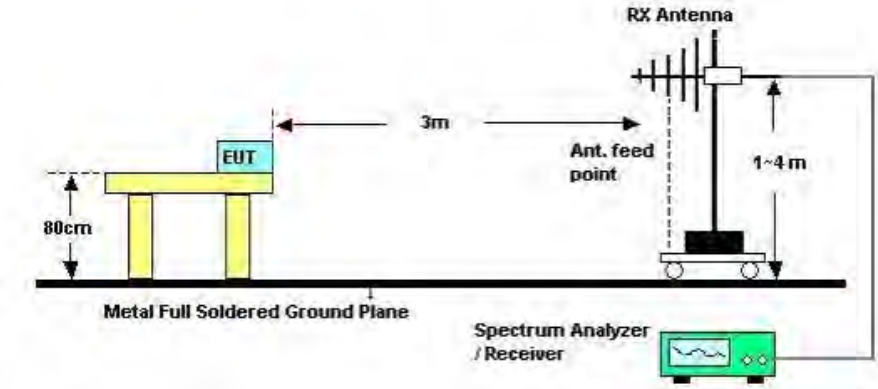
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.6.4. Test Setup Layout

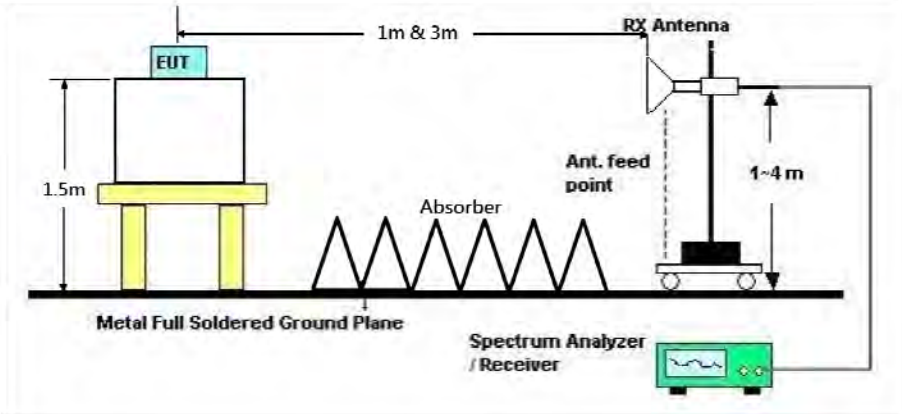
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



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. Results of Radiated Emissions (9kHz~30MHz)

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	Normal Link
Test Date	Aug. 14, 2015	Test Mode	Mode 4

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

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

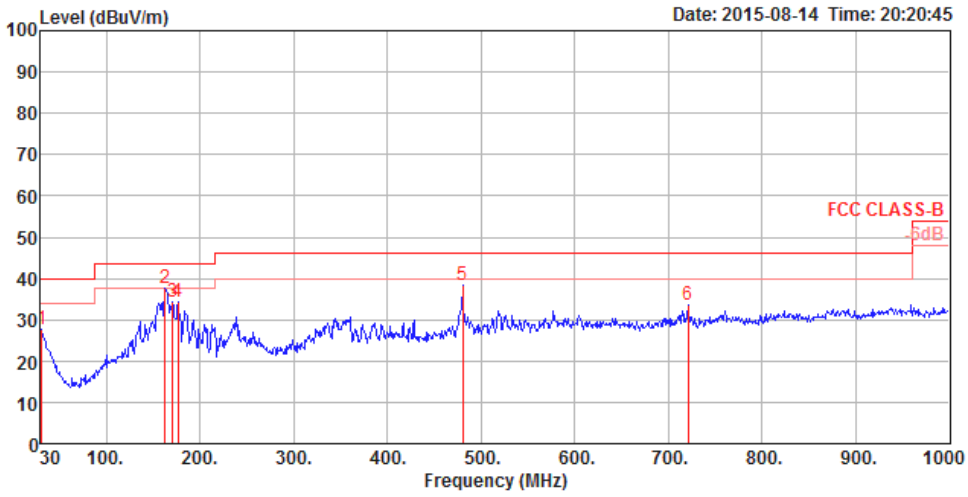
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

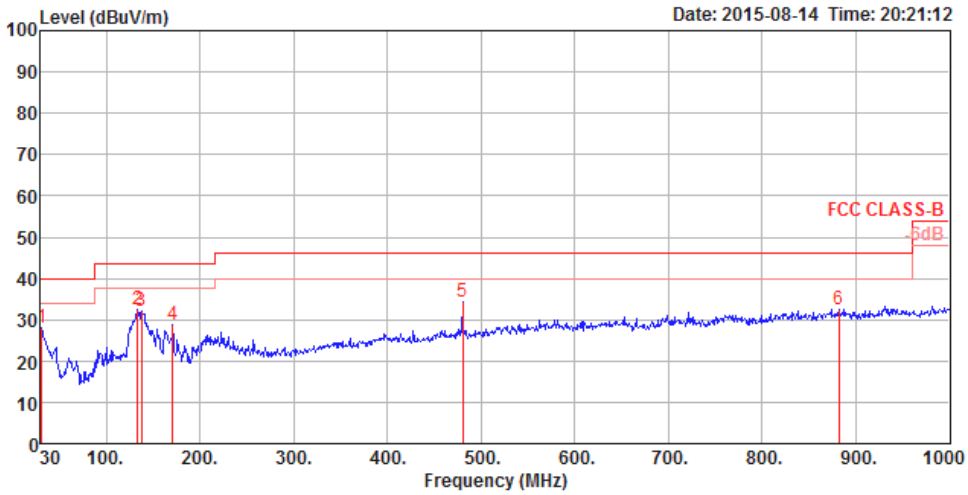
Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	Normal Link
Test Mode	Mode 4		

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	30.97	27.67	40.00	-12.33	39.94	0.64	19.49	32.40	200	13	Peak	HORIZONTAL
2	162.89	37.71	43.50	-5.79	58.22	1.18	10.66	32.35	200	200	Peak	HORIZONTAL
3	170.65	34.47	43.50	-9.03	55.38	1.17	10.26	32.34	200	200	Peak	HORIZONTAL
4	176.47	34.20	43.50	-9.30	55.44	1.17	9.93	32.34	200	200	Peak	HORIZONTAL
5	480.08	38.54	46.00	-7.46	51.48	1.87	17.54	32.35	100	194	Peak	HORIZONTAL
6	720.64	33.46	46.00	-12.54	43.62	2.17	20.01	32.34	150	109	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	30.97	27.98	40.00	-12.02	40.25	0.64	19.49	32.40	200	300	Peak	VERTICAL
2	133.79	32.29	43.50	-11.21	51.12	1.06	12.47	32.36	100	119	Peak	VERTICAL
3	137.67	32.01	43.50	-11.49	51.09	1.07	12.21	32.36	100	248	Peak	VERTICAL
4	170.65	28.61	43.50	-14.89	49.52	1.17	10.26	32.34	150	93	Peak	VERTICAL
5	480.08	34.48	46.00	-11.52	47.42	1.87	17.54	32.35	100	290	Peak	VERTICAL
6	881.66	32.58	46.00	-13.42	40.44	2.41	21.55	31.82	150	313	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.

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

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 36 / Ant. 1
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15541.19	57.11	74.00	-16.89	44.57	10.04	38.22	35.72	165	244	HORIZONTAL	Peak
2	15542.92	45.11	54.00	-8.89	32.57	10.04	38.22	35.72	165	244	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15532.47	57.37	74.00	-16.63	44.83	10.04	38.22	35.72	165	303	VERTICAL	Peak
2	15534.99	45.24	54.00	-8.76	32.70	10.04	38.22	35.72	165	303	VERTICAL	Average

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 40 / Ant. 1
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15603.73	57.35	74.00	-16.65	44.77	10.06	38.25	35.73	165	105	HORIZONTAL	Peak
2	15605.27	44.30	54.00	-9.70	31.72	10.06	38.25	35.73	165	105	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15594.59	44.34	54.00	-9.66	31.78	10.05	38.24	35.73	165	209	VERTICAL	Average
2	15602.78	58.22	74.00	-15.78	45.64	10.06	38.25	35.73	165	209	VERTICAL	Peak

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 48 / Ant. 1
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15715.43	56.76	74.00	-17.24	44.13	10.09	38.29	35.75	165	148	HORIZONTAL	Peak
2	15726.54	44.38	54.00	-9.62	31.75	10.09	38.29	35.75	165	148	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15723.27	44.57	54.00	-9.43	31.94	10.09	38.29	35.75	165	237	VERTICAL	Average
2	15724.57	57.55	74.00	-16.45	44.92	10.09	38.29	35.75	165	237	VERTICAL	Peak

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 149 / Ant. 1
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11490.14	42.87	54.00	-11.13	29.27	8.73	39.20	34.33	165	159	HORIZONTAL	Average
2	11491.25	56.30	74.00	-17.70	42.70	8.73	39.20	34.33	165	159	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11482.62	56.04	74.00	-17.96	42.43	8.73	39.21	34.33	165	98	VERTICAL	Peak
2	11489.54	43.00	54.00	-11.00	29.40	8.73	39.20	34.33	165	98	VERTICAL	Average

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 157 / Ant. 1
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11566.29	43.17	54.00	-10.83	29.59	8.78	39.17	34.37	165	141	HORIZONTAL	Average
2	11573.96	56.60	74.00	-17.40	43.02	8.78	39.17	34.37	165	141	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11567.05	43.46	54.00	-10.54	29.88	8.78	39.17	34.37	165	62	VERTICAL	Average
2	11569.07	56.22	74.00	-17.78	42.64	8.78	39.17	34.37	165	62	VERTICAL	Peak

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 165 / Ant. 1
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11643.78	56.70	74.00	-17.30	43.14	8.82	39.15	34.41	165	136	HORIZONTAL	Peak
2	11652.26	43.62	54.00	-10.38	30.08	8.82	39.13	34.41	165	136	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11643.05	43.59	54.00	-10.41	30.03	8.82	39.15	34.41	165	230	VERTICAL	Average
2	11648.55	56.47	74.00	-17.53	42.91	8.82	39.15	34.41	165	230	VERTICAL	Peak

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15540.81	57.61	74.00	-16.39	45.07	10.04	38.22	35.72	165	260	HORIZONTAL	Peak
2	15549.84	44.45	54.00	-9.55	31.90	10.05	38.22	35.72	165	260	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15535.25	57.02	74.00	-16.98	44.48	10.04	38.22	35.72	165	176	VERTICAL	Peak
2	15547.76	44.46	54.00	-9.54	31.91	10.05	38.22	35.72	165	176	VERTICAL	Average

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15591.72	44.44	54.00	-9.56	31.88	10.05	38.24	35.73	165	192	HORIZONTAL	Average
2	15597.80	57.15	74.00	-16.85	44.58	10.06	38.24	35.73	165	192	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15590.68	44.53	54.00	-9.47	31.97	10.05	38.24	35.73	165	90	VERTICAL	Average
2	15595.43	58.12	74.00	-15.88	45.56	10.05	38.24	35.73	165	90	VERTICAL	Peak

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15711.52	57.33	74.00	-16.67	44.69	10.09	38.29	35.74	165	231	HORIZONTAL	Peak
2	15721.48	44.04	54.00	-9.96	31.41	10.09	38.29	35.75	165	231	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15727.84	44.54	54.00	-9.46	31.91	10.09	38.29	35.75	165	323	VERTICAL	Average
2	15729.72	57.15	74.00	-16.85	44.52	10.09	38.29	35.75	165	323	VERTICAL	Peak

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11490.87	56.53	74.00	-17.47	42.93	8.73	39.20	34.33	165	252	HORIZONTAL	Peak
2	11491.39	43.05	54.00	-10.95	29.45	8.73	39.20	34.33	165	252	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11484.15	43.22	54.00	-10.78	29.62	8.73	39.20	34.33	165	170	VERTICAL	Average
2	11489.71	55.79	74.00	-18.21	42.19	8.73	39.20	34.33	165	170	VERTICAL	Peak

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11577.96	43.22	54.00	-10.78	29.64	8.78	39.17	34.37	165	252	HORIZONTAL	Average
2	11578.22	56.67	74.00	-17.33	43.09	8.78	39.17	34.37	165	252	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11560.07	43.29	54.00	-10.71	29.71	8.78	39.17	34.37	165	346	VERTICAL	Average
2	11562.13	56.23	74.00	-17.77	42.65	8.78	39.17	34.37	165	346	VERTICAL	Peak

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11650.55	43.42	54.00	-10.58	29.86	8.82	39.15	34.41	165	238	HORIZONTAL	Average
2	11650.72	56.75	74.00	-17.25	43.19	8.82	39.15	34.41	165	238	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11643.52	57.03	74.00	-16.97	43.47	8.82	39.15	34.41	165	153	VERTICAL	Peak
2	11643.95	43.58	54.00	-10.42	30.02	8.82	39.15	34.41	165	153	VERTICAL	Average

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15562.88	57.75	74.00	-16.25	45.19	10.05	38.24	35.73	165	226	HORIZONTAL	Peak
2	15567.37	44.48	54.00	-9.52	31.92	10.05	38.24	35.73	165	226	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15568.55	44.49	54.00	-9.51	31.93	10.05	38.24	35.73	165	186	VERTICAL	Average
2	15569.42	57.44	74.00	-16.56	44.88	10.05	38.24	35.73	165	186	VERTICAL	Peak

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15680.39	57.54	74.00	-16.46	44.94	10.07	38.27	35.74	165	266	HORIZONTAL	Peak
2	15681.11	44.48	54.00	-9.52	31.88	10.07	38.27	35.74	165	266	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15680.30	58.06	74.00	-15.94	45.46	10.07	38.27	35.74	165	334	VERTICAL	Peak
2	15686.38	44.67	54.00	-9.33	32.07	10.07	38.27	35.74	165	334	VERTICAL	Average

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11512.23	43.45	54.00	-10.55	29.87	8.73	39.20	34.35	165	172	HORIZONTAL	Average
2	11513.65	56.81	74.00	-17.19	43.23	8.73	39.20	34.35	165	172	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11508.21	55.78	74.00	-18.22	42.18	8.73	39.20	34.33	165	82	VERTICAL	Peak
2	11512.61	43.42	54.00	-10.58	29.84	8.73	39.20	34.35	165	82	VERTICAL	Average

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11582.33	55.94	74.00	-18.06	42.36	8.78	39.17	34.37	165	239	HORIZONTAL	Peak
2	11595.04	43.27	54.00	-10.73	29.70	8.80	39.16	34.39	165	239	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11581.92	43.40	54.00	-10.60	29.82	8.78	39.17	34.37	165	306	VERTICAL	Average
2	11599.03	56.06	74.00	-17.94	42.49	8.80	39.16	34.39	165	306	VERTICAL	Peak

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15628.26	57.33	74.00	-16.67	44.75	10.06	38.25	35.73	165	186	HORIZONTAL	Peak
2	15631.68	44.42	54.00	-9.58	31.84	10.06	38.25	35.73	165	186	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15630.70	44.38	54.00	-9.62	31.80	10.06	38.25	35.73	165	255	VERTICAL	Average
2	15635.85	57.84	74.00	-16.16	45.26	10.06	38.25	35.73	165	255	VERTICAL	Peak

Temperature	25℃	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11541.40	43.43	54.00	-10.57	29.84	8.75	39.19	34.35	165	176	HORIZONTAL	Average
2	11546.87	55.94	74.00	-18.06	42.37	8.75	39.19	34.37	165	176	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11546.24	57.28	74.00	-16.72	43.69	8.75	39.19	34.35	165	240	VERTICAL	Peak
2	11546.50	43.47	54.00	-10.53	29.88	8.75	39.19	34.35	165	240	VERTICAL	Average

Note:

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

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

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

4.7. Band Edge Emissions Measurement

4.7.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

4.7.2. 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	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

4.7.3. Test Procedures

1. The test procedure is the same as section 4.6.3.

4.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

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 transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 36, 40, 48 / Ant. 1
Test Date	Aug. 26, 2015		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5150.00	53.76	54.00	-0.24	49.42	5.51	33.17	34.34	214	332	VERTICAL	Average
2	5150.00	70.33	74.00	-3.67	65.99	5.51	33.17	34.34	214	332	VERTICAL	Peak
3	5172.47	96.23			91.82	5.52	33.23	34.34	214	332	VERTICAL	Average
4	5178.26	107.19			102.78	5.52	33.23	34.34	214	332	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5180 MHz.

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5145.30	59.50	74.00	-14.50	55.16	5.51	33.17	34.34	223	337	VERTICAL	Peak
2	5149.64	47.02	54.00	-6.98	42.68	5.51	33.17	34.34	223	337	VERTICAL	Average
3	5193.92	96.51			92.07	5.53	33.25	34.34	223	337	VERTICAL	Average
4	5198.26	106.29			101.85	5.53	33.25	34.34	223	337	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5200 MHz.

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.54	45.26	54.00	-8.74	40.92	5.51	33.17	34.34	157	138	HORIZONTAL	Average
2	5148.83	56.74	74.00	-17.26	52.40	5.51	33.17	34.34	157	138	HORIZONTAL	Peak
3	5238.26	103.65			99.11	5.54	33.34	34.34	157	138	HORIZONTAL	Peak
4	5241.45	93.73			89.17	5.55	33.34	34.33	157	138	HORIZONTAL	Average

Item 3, 4 are the fundamental frequency at 5240 MHz.

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11a CH 149, 157, 165 / Ant. 1
Test Date	Aug. 26, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5715.00	53.06	54.00	-0.94	47.12	5.85	34.45	34.36	226	354	VERTICAL	Average
2	5715.00	69.33	74.00	-4.67	63.39	5.85	34.45	34.36	226	354	VERTICAL	Peak
3	5725.00	78.11	78.20	-0.09	72.12	5.85	34.50	34.36	226	354	VERTICAL	Peak
4	5751.37	106.02			99.96	5.88	34.55	34.37	226	354	VERTICAL	Peak
5	5751.51	95.17			89.11	5.88	34.55	34.37	226	354	VERTICAL	Average

Item 4, 5 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	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5682.54	60.33	74.00	-13.67	54.52	5.81	34.35	34.35	199	349	VERTICAL	Peak
2	5708.15	47.41	54.00	-6.59	41.47	5.85	34.45	34.36	199	349	VERTICAL	Average
3	5719.79	60.09	78.20	-18.11	54.15	5.85	34.45	34.36	199	349	VERTICAL	Peak
4	5778.92	96.65			90.47	5.90	34.65	34.37	199	349	VERTICAL	Average
5	5780.22	106.04			99.86	5.90	34.65	34.37	199	349	VERTICAL	Peak
6	5850.99	60.82	78.20	-17.38	54.41	5.95	34.85	34.39	199	349	VERTICAL	Peak
7	5861.85	48.12	54.00	-5.88	41.64	5.97	34.90	34.39	199	349	VERTICAL	Average
8	5911.77	60.99	74.00	-13.01	54.35	5.99	35.05	34.40	199	349	VERTICAL	Peak

Item 4, 5 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	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5822.11	96.37			90.06	5.94	34.75	34.38	211	351	VERTICAL	Average
2	5823.26	106.10			99.74	5.94	34.80	34.38	211	351	VERTICAL	Peak
3	5850.00	69.54	78.20	-8.66	63.13	5.95	34.85	34.39	211	351	VERTICAL	Peak
4	5860.00	51.88	54.00	-2.12	45.42	5.95	34.90	34.39	211	351	VERTICAL	Average
5	5862.05	64.88	74.00	-9.12	58.40	5.97	34.90	34.39	211	351	VERTICAL	Peak

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

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.45	68.58	74.00	-5.42	64.24	5.51	33.17	34.34	204	321	VERTICAL	Peak
2	5150.00	52.66	54.00	-1.34	48.32	5.51	33.17	34.34	204	321	VERTICAL	Average
3	5185.07	107.48			103.07	5.52	33.23	34.34	204	321	VERTICAL	Peak
4	5185.50	96.15			91.74	5.52	33.23	34.34	204	321	VERTICAL	Average

Item 3, 4 are the fundamental frequency at 5180 MHz.

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.61	58.23	74.00	-15.77	53.89	5.51	33.17	34.34	206	324	VERTICAL	Peak
2	5150.00	46.58	54.00	-7.42	42.24	5.51	33.17	34.34	206	324	VERTICAL	Average
3	5195.37	97.87			93.43	5.53	33.25	34.34	206	324	VERTICAL	Average
4	5195.66	107.06			102.62	5.53	33.25	34.34	206	324	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5200 MHz.

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5145.35	58.80	74.00	-15.20	54.46	5.51	33.17	34.34	199	325	VERTICAL	Peak
2	5147.38	45.19	54.00	-8.81	40.85	5.51	33.17	34.34	199	325	VERTICAL	Average
3	5242.89	97.43			92.87	5.55	33.34	34.33	199	325	VERTICAL	Average
4	5242.89	107.13			102.57	5.55	33.34	34.33	199	325	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5240 MHz.

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5713.60	53.53	54.00	-0.47	47.59	5.85	34.45	34.36	185	330	VERTICAL	Average
2	5713.74	72.60	74.00	-1.40	66.66	5.85	34.45	34.36	185	330	VERTICAL	Peak
3	5723.29	77.97	78.20	-0.23	71.98	5.85	34.50	34.36	185	330	VERTICAL	Peak
4	5740.80	97.47			91.41	5.87	34.55	34.36	185	330	VERTICAL	Average
5	5741.24	109.10			103.04	5.87	34.55	34.36	185	330	VERTICAL	Peak

Item 4, 5 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	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5705.98	61.92	74.00	-12.08	55.99	5.83	34.45	34.35	165	333	VERTICAL	Peak
2	5712.93	49.13	54.00	-4.87	43.19	5.85	34.45	34.36	165	333	VERTICAL	Average
3	5724.22	63.78	78.20	-14.42	57.79	5.85	34.50	34.36	165	333	VERTICAL	Peak
4	5780.66	100.41			94.23	5.90	34.65	34.37	165	333	VERTICAL	Average
5	5787.60	110.24			104.05	5.92	34.65	34.38	165	333	VERTICAL	Peak
6	5855.33	62.94	78.20	-15.26	56.53	5.95	34.85	34.39	165	333	VERTICAL	Peak
7	5860.00	49.24	54.00	-4.76	42.78	5.95	34.90	34.39	165	333	VERTICAL	Average
8	5863.15	60.63	74.00	-13.37	54.15	5.97	34.90	34.39	165	333	VERTICAL	Peak

Item 4, 5 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	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5818.20	97.90			91.60	5.93	34.75	34.38	188	340	VERTICAL	Average
2	5818.20	108.87			102.57	5.93	34.75	34.38	188	340	VERTICAL	Peak
3	5850.18	76.78	78.20	-1.42	70.37	5.95	34.85	34.39	188	340	VERTICAL	Peak
4	5860.17	52.29	54.00	-1.71	45.83	5.95	34.90	34.39	188	340	VERTICAL	Average
5	5860.75	67.93	74.00	-6.07	61.45	5.97	34.90	34.39	188	340	VERTICAL	Peak

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

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Channel 38

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.32	53.95	54.00	-0.05	49.61	5.51	33.17	34.34	219	325	VERTICAL	Average
2	5148.90	66.72	74.00	-7.28	62.38	5.51	33.17	34.34	219	325	VERTICAL	Peak
3	5193.18	93.20			88.76	5.53	33.25	34.34	219	325	VERTICAL	Average
4	5203.60	102.64			98.17	5.53	33.28	34.34	219	325	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5190 MHz.

Channel 46

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.95	49.12	54.00	-4.88	44.78	5.51	33.17	34.34	227	327	VERTICAL	Average
2	5148.81	61.16	74.00	-12.84	56.82	5.51	33.17	34.34	227	327	VERTICAL	Peak
3	5225.66	95.08			90.57	5.54	33.31	34.34	227	327	VERTICAL	Average
4	5243.02	104.44			99.88	5.55	33.34	34.33	227	327	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5230 MHz.

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5713.03	68.06	68.20	-0.14	62.12	5.85	34.45	34.36	182	337	VERTICAL	Peak
2	5721.14	71.05	78.20	-7.15	65.11	5.85	34.45	34.36	182	337	VERTICAL	Peak
3	5748.34	103.71			97.65	5.88	34.55	34.37	182	337	VERTICAL	Peak
4	5750.95	93.64			87.58	5.88	34.55	34.37	182	337	VERTICAL	Average

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	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5713.81	65.88	68.20	-2.32	59.94	5.85	34.45	34.36	179	335	VERTICAL	Peak
2	5724.67	71.13	78.20	-7.07	65.14	5.85	34.50	34.36	179	335	VERTICAL	Peak
3	5780.67	96.64			90.46	5.90	34.65	34.37	179	335	VERTICAL	Average
4	5783.28	107.17			101.00	5.90	34.65	34.38	179	335	VERTICAL	Peak
5	5852.74	68.96	78.20	-9.24	62.55	5.95	34.85	34.39	179	335	VERTICAL	Peak
6	5860.00	66.63	68.20	-1.57	60.17	5.95	34.90	34.39	179	335	VERTICAL	Peak

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

Temperature	25°C	Humidity	60%
Test Engineer	Owen Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42, 155 / Ant. 1 + Ant. 2
Test Date	Aug. 26, 2015		

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5118.54	65.91	74.00	-8.09	61.64	5.50	33.12	34.35	216	322	VERTICAL	Peak
2	5145.75	53.79	54.00	-0.21	49.45	5.51	33.17	34.34	216	322	VERTICAL	Average
3	5195.53	88.98			84.54	5.53	33.25	34.34	216	322	VERTICAL	Average
4	5206.53	98.79			94.31	5.54	33.28	34.34	216	322	VERTICAL	Peak
5	5350.00	47.01	54.00	-6.99	42.21	5.59	33.53	34.32	216	322	VERTICAL	Average
6	5350.00	57.85	74.00	-16.15	53.05	5.59	33.53	34.32	216	322	VERTICAL	Peak

Item 3, 4 are the fundamental frequency at 5210 MHz.

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5711.32	68.18	68.20	-0.02	62.24	5.85	34.45	34.36	192	335	VERTICAL	Peak
2	5717.69	68.59	78.20	-9.61	62.65	5.85	34.45	34.36	192	335	VERTICAL	Peak
3	5761.11	90.94			84.83	5.88	34.60	34.37	192	335	VERTICAL	Average
4	5761.69	100.18			94.07	5.88	34.60	34.37	192	335	VERTICAL	Peak
5	5852.32	61.96	78.20	-16.24	55.55	5.95	34.85	34.39	192	335	VERTICAL	Peak
6	5908.72	62.37	68.20	-5.83	55.73	5.99	35.05	34.40	192	335	VERTICAL	Peak

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

4.8. Frequency Stability Measurement

4.8.1. 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).

4.8.2. Measuring Instruments and Setting

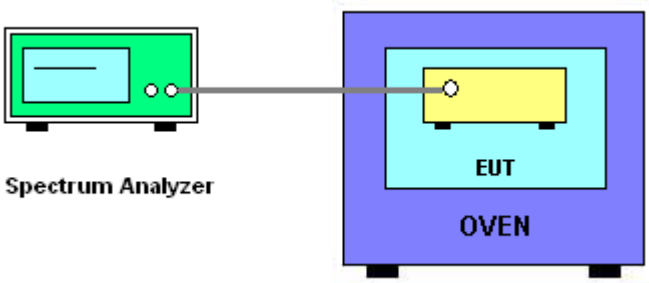
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.8.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
7. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
8. Extreme temperature is 0°C~70°C.

4.8.4. Test Setup Layout



4.8.5. Test Deviation

There is no deviation with the original standard.

4.8.6. EUT Operation during Test

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

4.8.7. Test Result of Frequency Stability

Temperature	28°C	Humidity	64%
Test Engineer	Roki Liu	Test Date	Sep. 04, 2015

Mode: 20 MHz / Ant. 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5199.9735	5199.9736	5199.9735	5199.9734
110.00	5199.9736	5199.9726	5199.9716	5199.9711
93.50	5199.9737	5199.9734	5199.9735	5199.9726
Max. Deviation (MHz)	**0.0265**	**0.0274**	**0.0284**	**0.0289**
Max. Deviation (ppm)	**5.10**	**5.26**	**5.46**	**5.55**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5199.9584	5199.9574	5199.9564	5199.9554
10	5199.9678	5199.9668	5199.9658	5199.9648
20	5199.9736	5199.9726	5199.9716	5199.9711
30	5199.9784	5199.9786	5199.9787	5199.9789
40	5199.9823	5199.9825	5199.9826	5199.9824
50	5199.9926	5199.9924	5199.9922	5199.9925
60	5199.9974	5199.9972	5199.9968	5199.9971
70	5200.0366	5200.0362	5200.0364	5200.0365
Max. Deviation (MHz)	**0.0416**	**0.0426**	**0.0436**	**0.0446**
Max. Deviation (ppm)	**8.00**	**8.19**	**8.38**	**8.58**
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9734	5784.9736	5784.9738	5784.9736
110.00	5784.9736	5784.9732	5784.9728	5784.9730
93.50	5784.9738	5784.9736	5784.9736	5784.9736
Max. Deviation (MHz)	**0.0266**	**0.0268**	**0.0272**	**0.0270**
Max. Deviation (ppm)	**4.60**	**4.63**	**4.70**	**4.67**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5784.9578	5784.9574	5784.9576	5784.9572
10	5784.9654	5784.9658	5784.9660	5784.9659
20	5784.9782	5784.9732	5784.9728	5784.9730
30	5784.9846	5784.9844	5784.9848	5784.9850
40	5784.9924	5784.9928	5784.9932	5784.9928
50	5784.9988	5784.9984	5784.9980	5784.9982
60	5785.0170	5785.0175	5785.0178	5785.0176
70	5785.0646	5785.0644	5785.0642	5785.0648
Max. Deviation (MHz)	**0.0646**	**0.0644**	**0.0642**	**0.0648**
Max. Deviation (ppm)	**11.17**	**11.13**	**11.10**	**11.20**
Result	Complies			

Mode: 40 MHz / Ant. 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5189.9727	5189.9729	5189.9731	5189.9723
110.00	5189.9724	5189.9728	5189.9730	5189.9722
93.50	5189.9721	5189.9729	5189.9726	5189.9723
Max. Deviation (MHz)	**0.0279**	**0.0272**	**0.0274**	**0.0278**
Max. Deviation (ppm)	**5.38**	**5.24**	**5.28**	**5.36**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5189.9593	5189.9596	5189.9601	5189.9592
10	5189.9684	5189.9681	5189.9678	5189.9674
20	5189.9724	5189.9728	5189.9730	5189.9722
30	5189.9776	5189.9774	5189.9777	5189.9771
40	5189.9823	5189.9827	5189.9826	5189.9825
50	5189.9884	5189.9888	5189.9886	5189.9882
60	5189.9938	5189.9940	5189.9936	5189.9934
70	5190.0440	5190.0448	5190.0447	5190.0445
Max. Deviation (MHz)	**0.0440**	**0.0448**	**0.0447**	**0.0445**
Max. Deviation (ppm)	**8.48**	**8.63**	**8.61**	**8.57**
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5754.9662	5754.9665	5754.9664	5754.9668
110.00	5754.9667	5754.9662	5754.9668	5754.9663
93.50	5754.9664	5754.9668	5754.9663	5754.9661
Max. Deviation (MHz)	**0.0338**	**0.0338**	**0.0337**	**0.0339**
Max. Deviation (ppm)	**5.87**	**5.87**	**5.86**	**5.89**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5754.9481	5754.9485	5754.9483	5754.9487
10	5754.9576	5754.9574	5754.9573	5754.9578
20	5754.9667	5754.9662	5754.9668	5754.9663
30	5754.9744	5754.9748	5754.9746	5754.9742
40	5754.9831	5754.9835	5754.9839	5754.9833
50	5754.9914	5754.9920	5754.9918	5754.9916
60	5754.9992	5754.9990	5754.9984	5754.9988
70	5755.0002	5755.0014	5755.0008	5755.0006
Max. Deviation (MHz)	**0.0519**	**0.0515**	**0.0517**	**0.0513**
Max. Deviation (ppm)	**9.02**	**8.95**	**8.98**	**8.91**
Result	Complies			

Mode: 80 MHz / Ant. 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5209.9828	5209.9824	5209.9826	5209.9825
110.00	5209.9823	5209.9829	5209.9832	5209.9834
93.50	5209.9818	5209.9821	5209.9827	5209.9828
Max. Deviation (MHz)	**0.0182**	**0.0179**	**0.0174**	**0.0175**
Max. Deviation (ppm)	**3.49**	**3.44**	**3.34**	**3.36**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5209.9682	5209.9676	5209.9672	5209.9688
10	5209.9764	5209.9766	5209.9769	5209.9765
20	5209.9823	5209.9829	5209.9832	5209.9834
30	5209.9904	5209.9906	5209.9892	5209.9898
40	5209.9923	5209.9928	5209.9922	5209.9925
50	5210.0152	5210.0148	5210.0144	5210.0154
60	5210.0236	5210.0240	5210.0232	5210.0248
70	5210.0342	5210.0349	5210.0338	5210.0344
Max. Deviation (MHz)	**0.0342**	**0.0349**	**0.0338**	**0.0344**
Max. Deviation (ppm)	**6.56**	**6.70**	**6.49**	**6.60**
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5774.9827	5774.9824	5774.9818	5774.9817
110.00	5774.9812	5774.9823	5774.9814	5774.9816
93.50	5774.9821	5774.9829	5774.9813	5774.9811
Max. Deviation (MHz)	**0.0188**	**0.0177**	**0.0187**	**0.0189**
Max. Deviation (ppm)	**3.26**	**3.06**	**3.24**	**3.27**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5774.9687	5774.9692	5774.9684	5774.9688
10	5774.9732	5774.9737	5774.9735	5774.9736
20	5774.9812	5774.9823	5774.9814	5774.9816
30	5774.9893	5774.9887	5774.9889	5774.9895
40	5774.9966	5774.9962	5774.9960	5774.9964
50	5775.0176	5775.0170	5775.0172	5775.0179
60	5775.0211	5775.0216	5775.0215	5775.0219
70	5775.0348	5775.0344	5775.0347	5775.0343
Max. Deviation (MHz)	**0.0348**	**0.0344**	**0.0347**	**0.0343**
Max. Deviation (ppm)	**6.03**	**5.96**	**6.01**	**5.94**
Result	Complies			

4.9. Antenna Requirements

4.9.1. 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.

4.9.2. 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
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 22, 2015	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 02, 2014	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 02, 2014	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	Dec. 03, 2014	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 06, 2015	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 12, 2015*	Radiation (03CH01-CB)
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	8447D	2944A10991	0.1MHz ~ 1.3GHz	Feb. 24, 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)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 21, 2015	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100979	9kHz~40GHz	Dec. 12, 2014	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 03, 2014	Conducted (TH01-CB)

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

"*" Calibration Interval of instruments listed above is two years.

N.C.R means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
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%