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FCC RADIO TEST REPORT

Applicant's company	**Realtek Semiconductor Corp.**
Applicant Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan
FCC ID	**TX2RTL8812AENF**
Manufacturer's company	**Realtek Semiconductor Corp.**
Manufacturer Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan

Product Name	802.11a/b/g/n/ac RTL8812AENF Combo module
Brand Name	REALTEK
Model No.	RTL8812AENF
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Mar. 07, 2014
Final Test Date	Nov. 28, 2014
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.

TAF
Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR422118AB	Rev. 01	Initial issue of report	Jan. 13, 2015

Certificate No.: CB10312066

1. CERTIFICATE OF COMPLIANCE

Product Name	:	802.11a/b/g/n/ac RTL8812AENF Combo module
Brand Name	:	REALTEK
Model No.	:	RTL8812AENF
Applicant	:	Realtek Semiconductor Corp.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Mar. 07, 2014 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen
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	14.29 dB
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	1.28 dB
4.4	15.407(a)	Power Spectral Density	Complies	1.29 dB
4.5	15.407(b)	Radiated Emissions	Complies	3.15 dB
4.6	15.407(b)	Band Edge Emissions	Complies	1.51 dB
4.7	15.407(g)	Frequency Stability	Complies	-
4.8	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n/ac

Items	Description
Product Type	WLAN (1TX/2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	see the below table for IEEE 802.11n/ac
Data Modulation	For 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) For 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n/ac
Frequency Range	5150 ~ 5250MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	802.11ac MCS0/Nss1 (VHT20): 18.06 MHz ; 802.11ac MCS0/Nss1 (VHT40): 37.16 MHz ; 802.11ac MCS0/Nss1 (VHT80): 60.43 MHz
Maximum Conducted Output Power	802.11ac MCS0/Nss1 (VHT20): 20.71 dBm ; 802.11ac MCS0/Nss1 (VHT40): 20.57 dBm ; 802.11ac MCS0/Nss1 (VHT80): 15.55 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11a

Items	Description
Product Type	WLAN (1TX/2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	OFDM for IEEE 802.11a
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	OFDM (6/9/12/18/24/36/48/54)
Frequency Range	5150 ~ 5250MHz
Channel Number	4
Channel Band Width (99%)	For 1TX: 16.97 MHz / For 2TX: 17.14 MHz
Maximum Conducted Output Power	For 1TX: 17.96 dBm / For 2TX: 20.94 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

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

Note: The product has beamforming function for 802.11n in 2.4G and 11n/ac in 5GHz.

Antenna and Band width

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	1 / 2	MCS 0-7 / 0-15
802.11n (HT40)	1 / 2	MCS 0-7 / 0-15
802.11ac (VHT20)	1 / 2	MCS 0-8/Nss1 / MCS 0-8/Nss1-2
802.11ac (VHT40)	1 / 2	MCS 0-9/Nss1 / MCS 0-9/Nss1-2
802.11ac (VHT80)	1 / 2	MCS 0-9/Nss1 / MCS 0-9/Nss1-2
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT support VHT20, VHT40 and VHT80. Note 3: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac		

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	LYNwave	ALA110-222050-300011	PIFA Antenna	IPEX MHF4	3.5	5

<For 2.4GHz Band>

For IEEE 802.11b mode (1TX, 1RX)

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

For IEEE 802.11g mode (1TX/2TX, 2RX)

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For 2TX

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

Chain 1 and Chain 2 could both transmit/receive simultaneously.

For IEEE 802.11n mode (1TX/2TX, 2RX)

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For 2TX

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

Chain 1 and Chain 2 could both transmit/receive simultaneously.

Only 2TX function was selected to test and record in the report, the 1TX test results were covered by 2TX test results.

<For 5GHz Band>

For IEEE 802.11a mode (1TX/2TX, 2RX):

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For 2TX

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

Chain 1 and Chain 2 could both transmit/receive simultaneously.

For IEEE 802.11n/ac mode (1TX/2TX, 2RX):

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

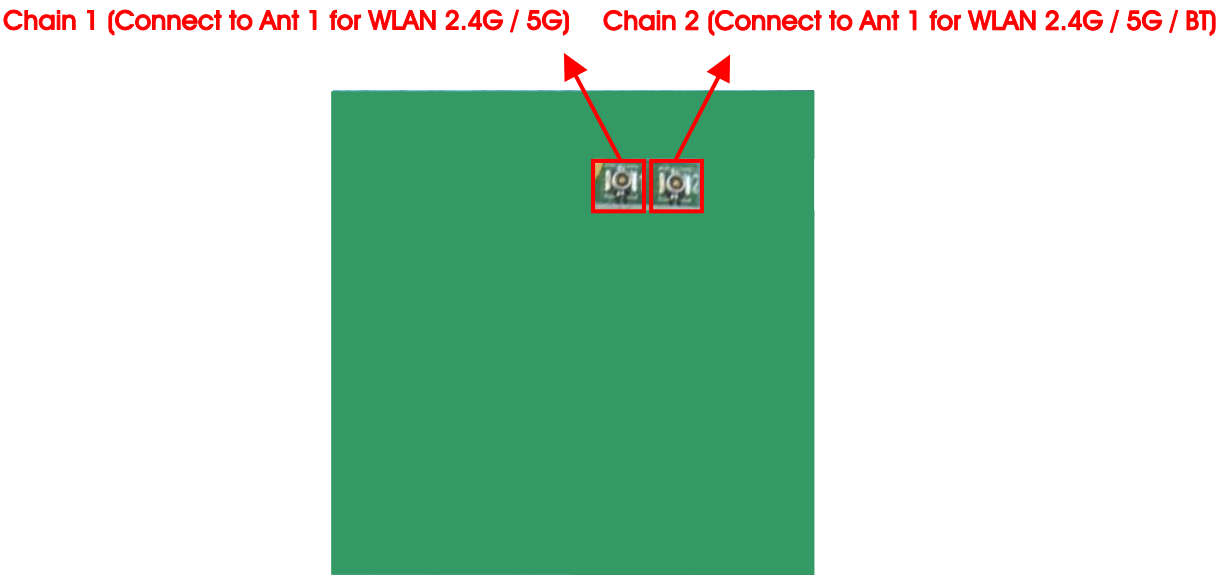
Chain 1 and Chain 2 could receive simultaneously.

For 2TX

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

Chain 1 and Chain 2 could both transmit/receive simultaneously.

Only 2TX function was selected to test and record in the report, the 1TX test results were covered by 2TX test results.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48.

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

For 80MHz bandwidth systems, use Channel 42.

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	-	-

3.5. Table for Test Modes

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

Test Items	Mode		Data Rate	Channel	Chain
AC Power Conducted Emission	Normal Link		-	-	-
Max. Conducted Output Power	For beamforming mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2
	For non-beamforming mode				
	11a/BPSK	Band 1	6Mbps	36/40/48	1 1+2
Power Spectral Density	For beamforming mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2
	For non-beamforming mode				
	11a/BPSK	Band 1	6Mbps	36/40/48	1 1+2
26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement	For beamforming mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2
	For non-beamforming mode				
	11a/BPSK	Band 1	6Mbps	36/40/48	1 1+2
Radiated Emission Below 1GHz	Normal Link		-	-	-
Radiated Emission Above 1GHz	For beamforming mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2
	For non-beamforming mode				
	11a/BPSK	Band 1	6Mbps	36/40/48	1 1+2

Band Edge Emission	For beamforming mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2
	For non-beamforming mode				
	11a/BPSK	Band 1	6Mbps	36/40/48	1 1+2
Frequency Stability	Un-modulation		-	40	1+2

Note: VHT20/VHT40 covers HT20/HT40, due to same modulation.

Note: There are two modes of EUT, one is beamforming mode, and the other is non-beamforming mode for n/ac, after evaluating, beamforming mode has been evaluated to be the worst case, so it was selected to test and record in this test report.

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1. Normal Link

For Radiated Emission below 1GHz test:

Mode 1. Normal Link

For Radiated Emission above 1GHz test:

Mode 1. CTX

For Radiated Emission Co-location Test:

Mode 1. EUT- 2.4G WLAN + Bluetooth

Mode 2. EUT- 5G WLAN + Bluetooth

For Co-location MPE:

The EUT could be applied with 2.4GHz WLAN+Bluetooth function and 5GHz WLAN+Bluetooth functiontherefore; Co-location Maximum Permissible Exposure (Please refer to Appendix B) and Radiated Emission Co-location (please refer to Appendix C) tests are added for simultaneously transmit among 2.4GHz WLAN+Bluetooth function and 5GHz WLAN+Bluetooth function.

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	**Site Category**	**Location**	**FCC Reg. No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
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
Notebook*2	DELL	E6430	DoC
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Mouse	Logitech	M-U0026	DoC
Earphone	SHYARO CHI	MIC-04	N/A
Device	REALTEK	RTL8812AENF	TX2RTL8812AENF
Test Fixture*2	Realtek	NGFF Adapter	N/A

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Test Fixture	Realtek	NGFF Adapter	N/A

For Test Site No: 03CH01-CB<Below 1GHz test>

Support Unit	Brand	Model	FCC ID
Notebook*2	DELL	E6430	DoC
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Mouse	Logitech	M-U0026	DoC
Earphone	E-BOOKI	E-EPC040	N/A
Device	REALTEK	RTL8812AENF	TX2RTL8812AENF
Test Fixture*2	Realtek	NGFF Adapter	N/A

For Test Site No: 03CH01-CB <Above 1GHz test / For non-beamforming mode>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Test Fixture	Realtek	NGFF Adapter	N/A

For Test Site No: 03CH01-CB <Above 1GHz test / For beamforming mode>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Notebook	DELL	D420	DoC
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Test Fixture	Realtek	NGFF Adapter	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.

<For non-beamforming mode>

Power Parameters of IEEE 802.11a

Test Software Version	Realtek 11ac 8812A PCIE WLAN MP Diagnostic Program 0.0057.02.20140110		
Frequency	5180 MHz	5200 MHz	5240 MHz
802.11a / 1TX	47	46	45
802.11a / 2TX	48/47	48/47	48/47

<For beamforming mode>

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT20

Test Software Version	Realtek 11ac 8812A PCIE WLAN MP Diagnostic Program 0.0057.02.20140110		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS0/Nss1 VHT20	48/47	48/48	47/47

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT40

Test Software Version	Realtek 11ac 8812A PCIE WLAN MP Diagnostic Program 0.0057.02.20140110	
Frequency	5190 MHz	5230 MHz
MCS0/Nss1 VHT40	42/42	50/49

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT80

Test Software Version	Realtek 11ac 8812A PCIE WLAN MP Diagnostic Program 0.0057.02.20140110
Frequency	5210 MHz
MCS0/Nss1 VHT80	37/38

3.9. EUT Operation during Test

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

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

The program was executed as follows:

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

3.10. Duty Cycle

For non-beamforming mode:

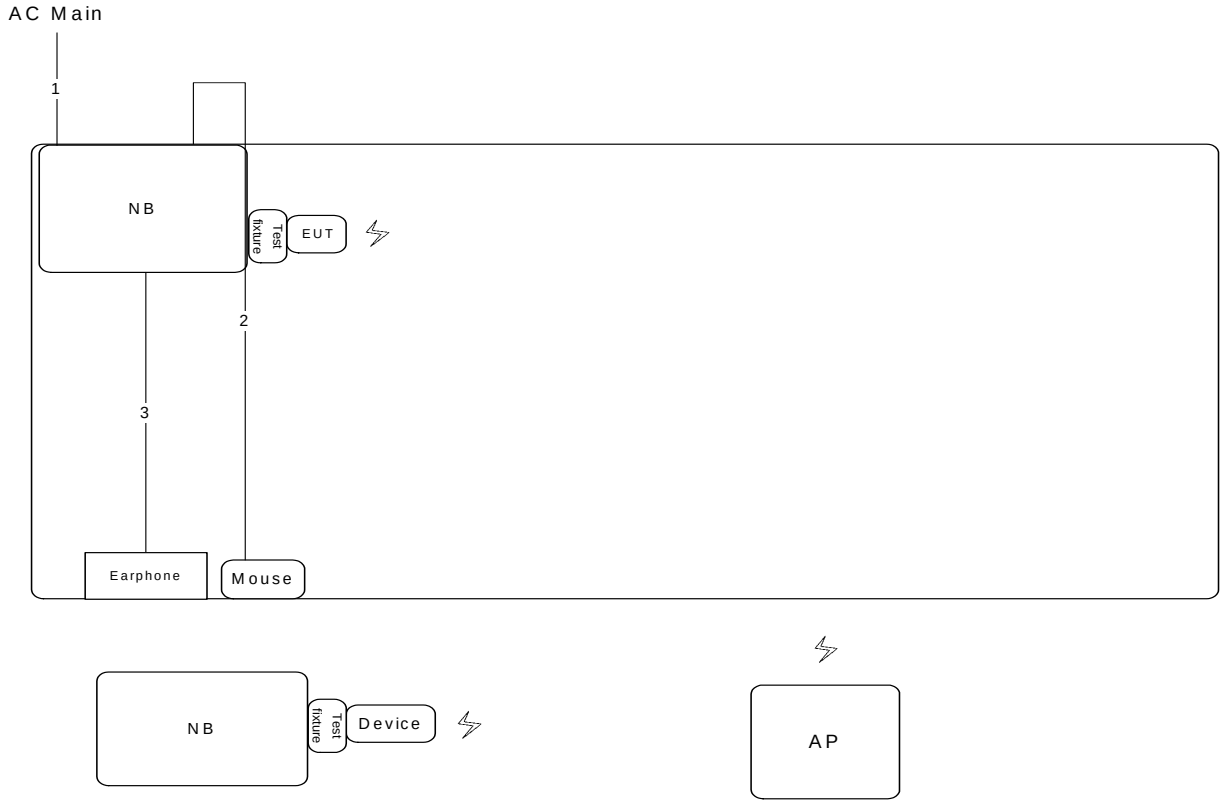
Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	1.000	1.000	100.00%	0.00	0.01

For beamforming mode:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	1.930	2.085	92.57%	0.34	0.52
802.11ac MCS0/Nss1 VHT40	0.896	1.032	86.82%	0.61	1.12
802.11ac MCS0/Nss1 VHT80	1.715	1.85	92.70%	0.33	0.58

3.11. Test Configurations

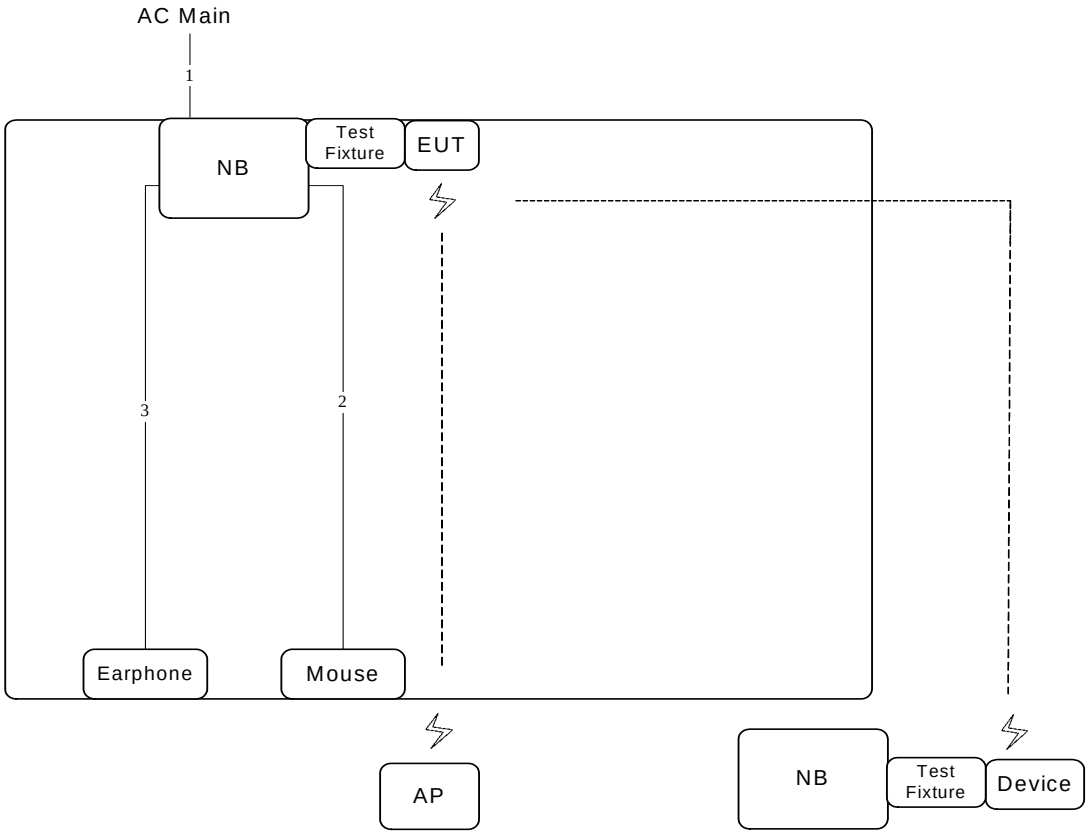
3.11.1. AC Power Line Conduction Emissions Test Configuration



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

3.11.2. Radiation Emissions Test Configuration

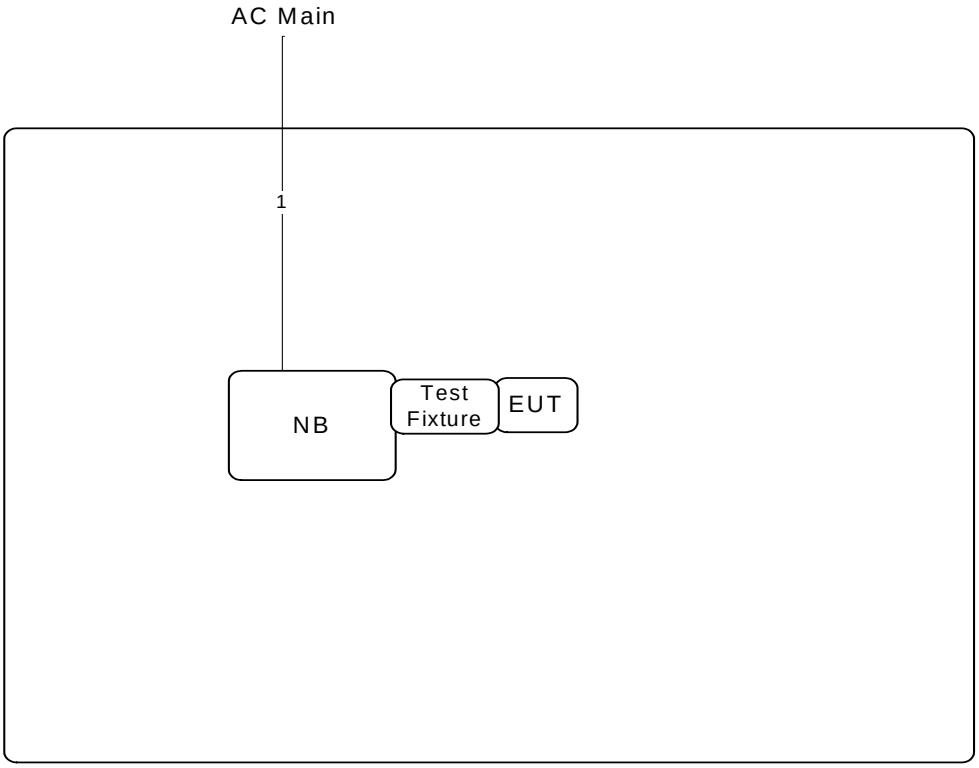
Test Configuration: 30MHz~1GHz



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

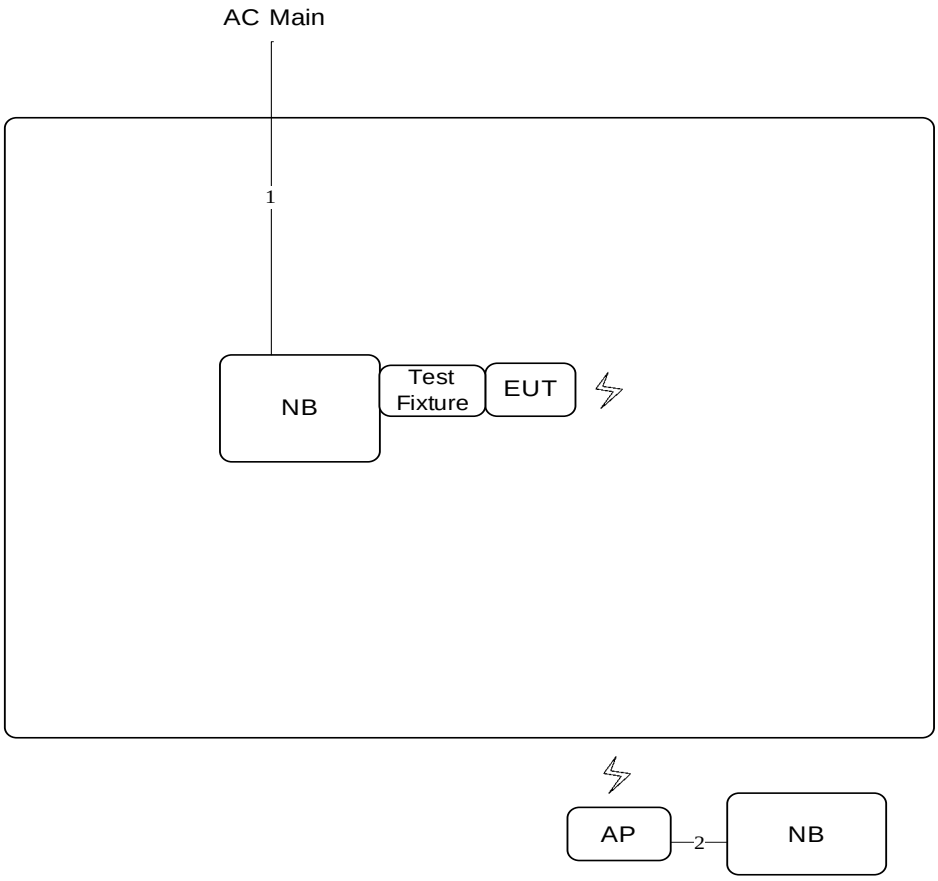
Test Configuration: above 1GHz

For non-beamforming mode



Item	Connection	Shielded	Length
1	Power cable	No	2.6m

For beamforming mode



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	RJ-45 cable	No	1.5m

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

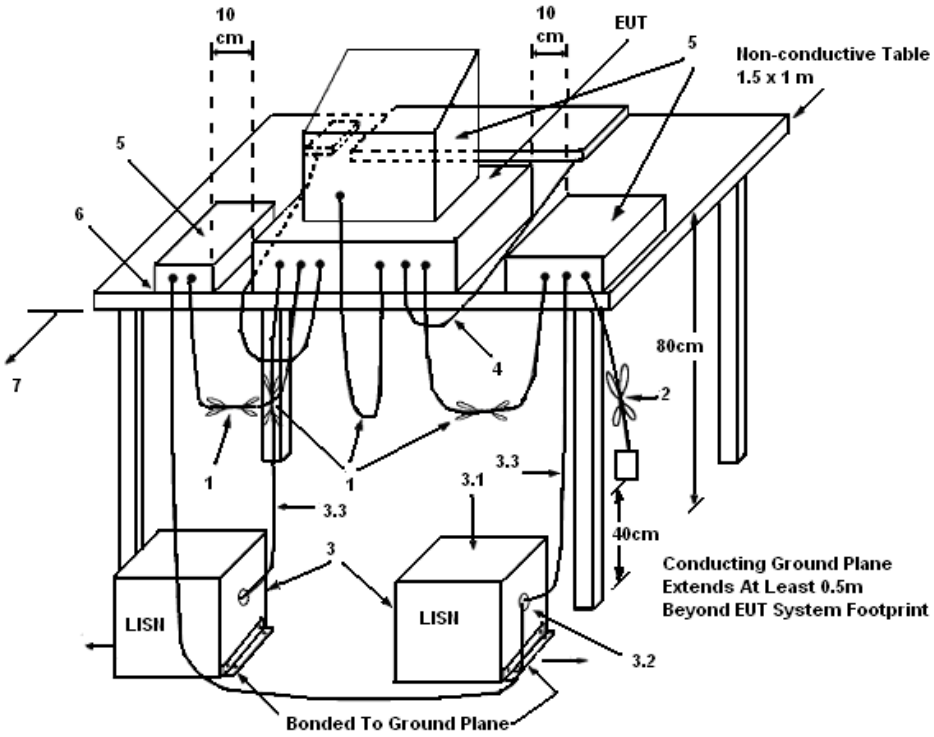
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

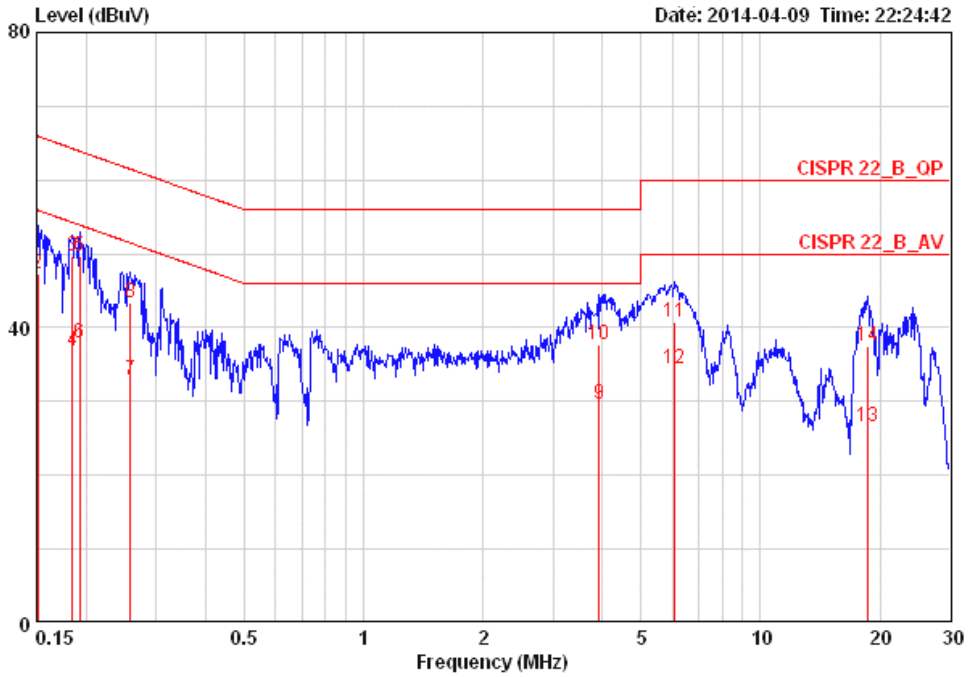
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

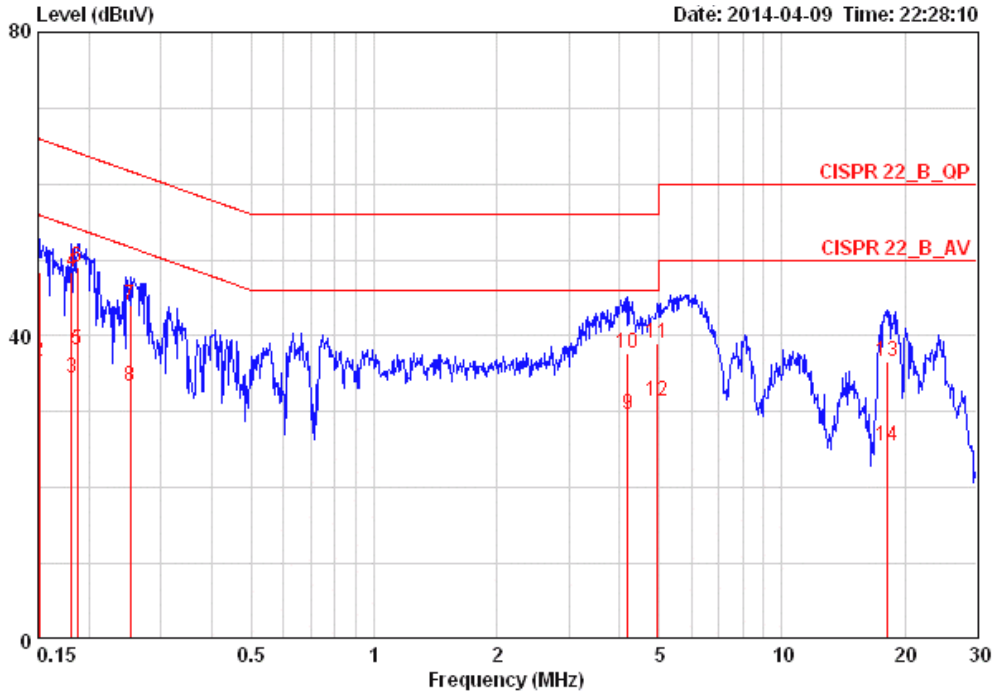
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	52%
Test Engineer	Parody Lin	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1	0.15080	34.93	-21.03	55.96	0.15	34.60	0.18	LINE	AVERAGE
2	0.15080	47.41	-18.55	65.96	0.15	47.08	0.18	LINE	QP
3 @	0.18443	49.79	-14.49	64.28	0.15	49.45	0.19	LINE	QP
4	0.18443	36.73	-17.55	54.28	0.15	36.39	0.19	LINE	AVERAGE
5 @	0.19242	49.64	-14.29	63.93	0.15	49.29	0.20	LINE	QP
6	0.19242	37.91	-16.02	53.93	0.15	37.56	0.20	LINE	AVERAGE
7	0.25888	32.88	-18.59	51.47	0.15	32.53	0.20	LINE	AVERAGE
8	0.25888	43.47	-18.00	61.47	0.15	43.12	0.20	LINE	QP
9	3.922	29.68	-16.32	46.00	0.28	29.11	0.30	LINE	AVERAGE
10	3.922	37.68	-18.32	56.00	0.28	37.11	0.30	LINE	QP
11	6.056	40.86	-19.14	60.00	0.31	40.22	0.33	LINE	QP
12	6.056	34.40	-15.60	50.00	0.31	33.76	0.33	LINE	AVERAGE
13	18.622	26.57	-23.43	50.00	0.57	25.51	0.49	LINE	AVERAGE
14	18.622	37.44	-22.56	60.00	0.57	36.38	0.49	LINE	QP

Temperature	25°C	Humidity	52%
Test Engineer	Parody Lin	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1	0.15080	48.43	-17.53	65.96	0.07	48.18	0.18	NEUTRAL	QP
2	0.15080	36.52	-19.44	55.96	0.07	36.27	0.18	NEUTRAL	AVERAGE
3	0.18152	34.34	-20.07	54.42	0.07	34.08	0.19	NEUTRAL	AVERAGE
4	0.18152	48.39	-16.02	64.42	0.07	48.13	0.19	NEUTRAL	QP
5	0.18739	38.26	-15.90	54.15	0.07	37.99	0.20	NEUTRAL	AVERAGE
6	0.18739	48.98	-15.18	64.15	0.07	48.71	0.20	NEUTRAL	QP
7	0.25211	44.06	-17.63	61.69	0.07	43.79	0.20	NEUTRAL	QP
8	0.25211	33.45	-18.24	51.69	0.07	33.18	0.20	NEUTRAL	AVERAGE
9	4.180	29.73	-16.27	46.00	0.13	29.29	0.30	NEUTRAL	AVERAGE
10	4.180	37.82	-18.18	56.00	0.13	37.38	0.30	NEUTRAL	QP
11	4.952	38.97	-17.03	56.00	0.15	38.50	0.32	NEUTRAL	QP
12 @	4.952	31.34	-14.66	46.00	0.15	30.87	0.32	NEUTRAL	AVERAGE
13	18.039	36.63	-23.37	60.00	0.41	35.73	0.48	NEUTRAL	QP
14	18.039	25.46	-24.54	50.00	0.41	24.56	0.48	NEUTRAL	AVERAGE

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 4.5.4.

4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Configurations	IEEE 802.11a

<For non-beamforming mode>

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	25.50	16.97
40	5200 MHz	25.39	16.97
48	5240 MHz	24.69	16.88

Configuration IEEE 802.11a / Chain 1 + Chain 2

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	22.26	16.97
40	5200 MHz	22.49	17.14
48	5240 MHz	22.37	16.67

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Configurations	IEEE 802.11ac

<For beamforming mode>

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	28.99	18.01
40	5200 MHz	26.08	18.06
48	5240 MHz	26.32	17.93

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	45.21	36.55
46	5230 MHz	58.66	37.16

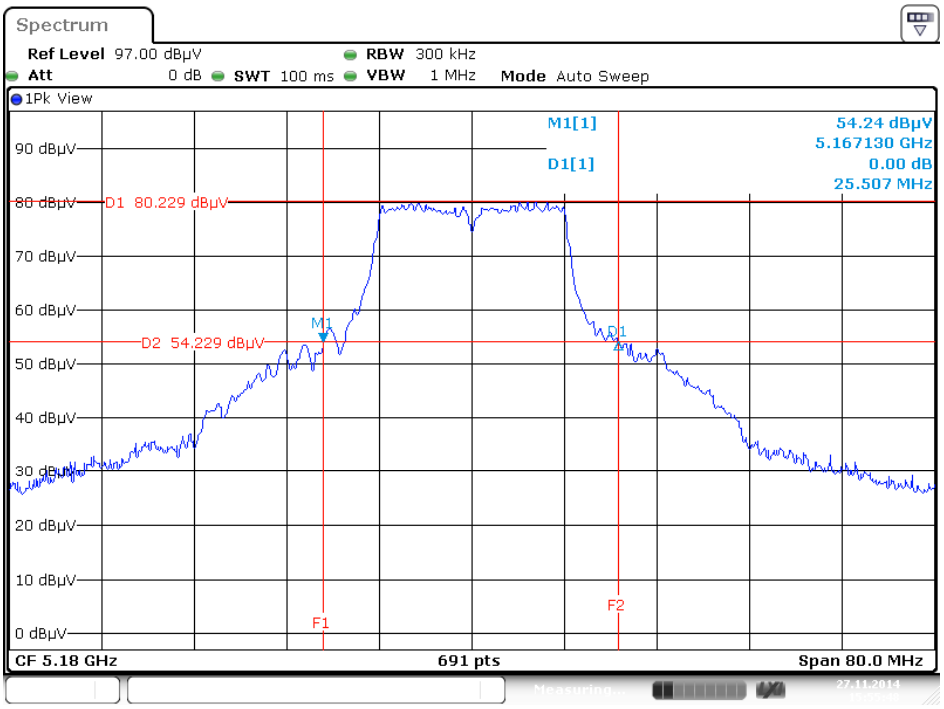
Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
42	5210 MHz	82.55	60.43

<For non-beamforming mode>

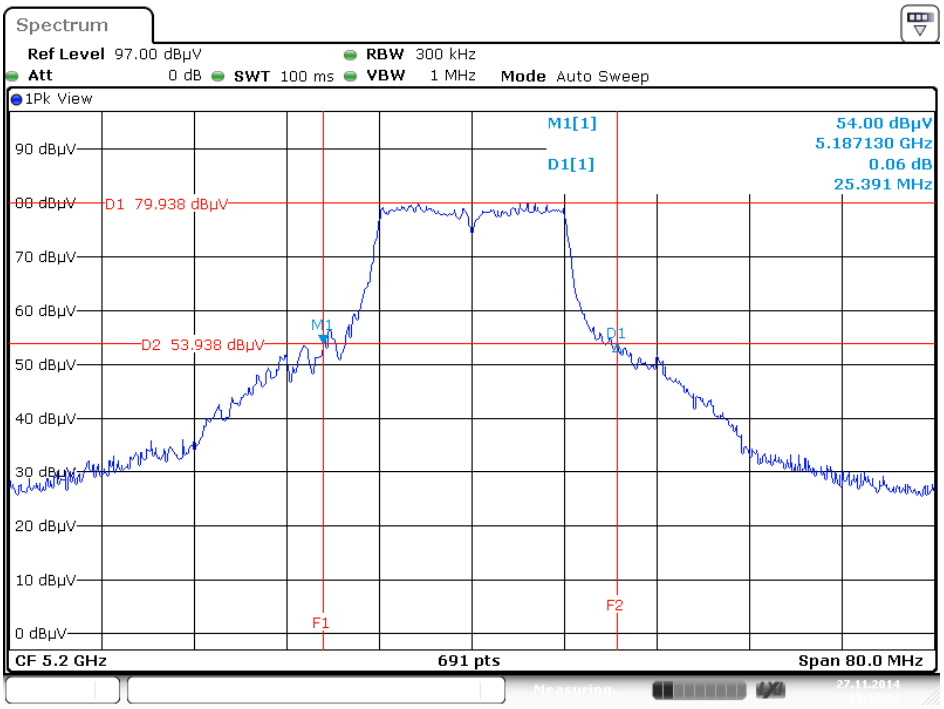
For 1TX

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



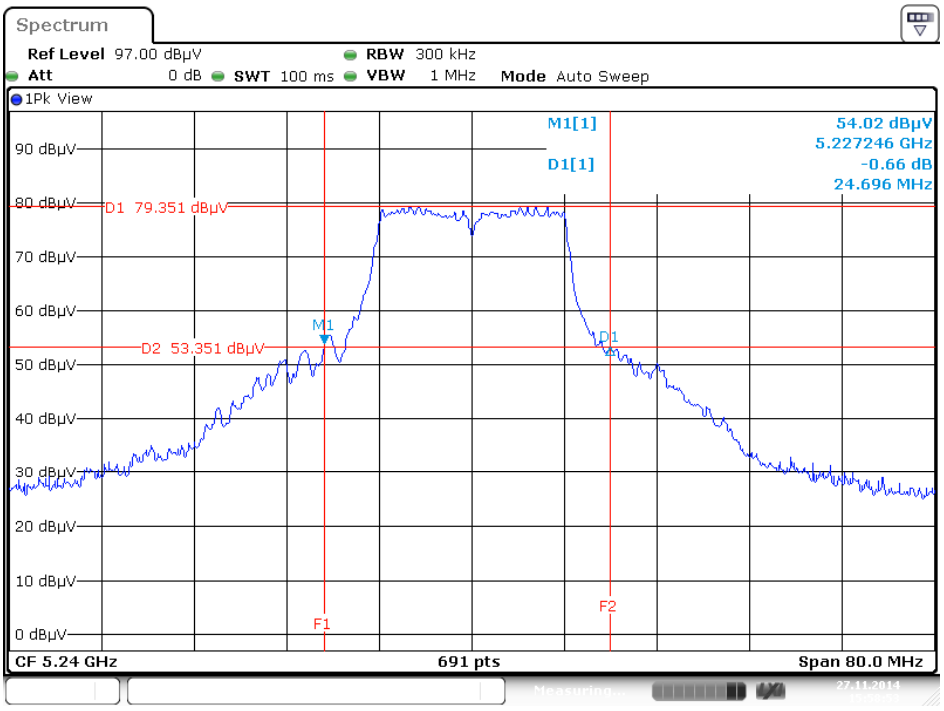
Date: 27.NOV.2014 15:55:48

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



Date: 27.NOV.2014 15:57:42

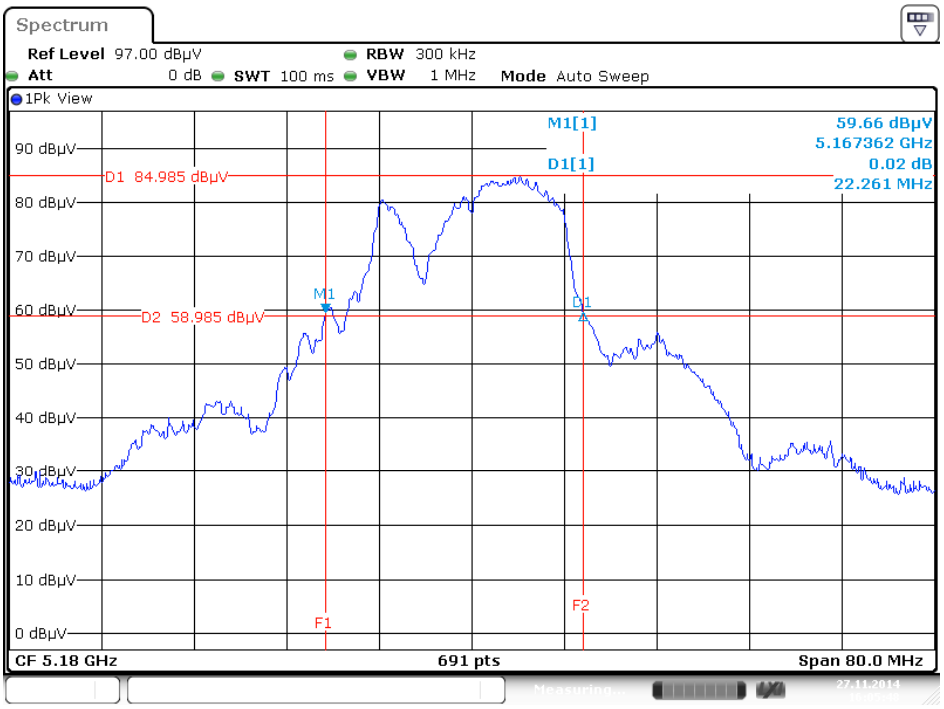
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 / 5240 MHz



Date: 27.NOV.2014 15:58:53

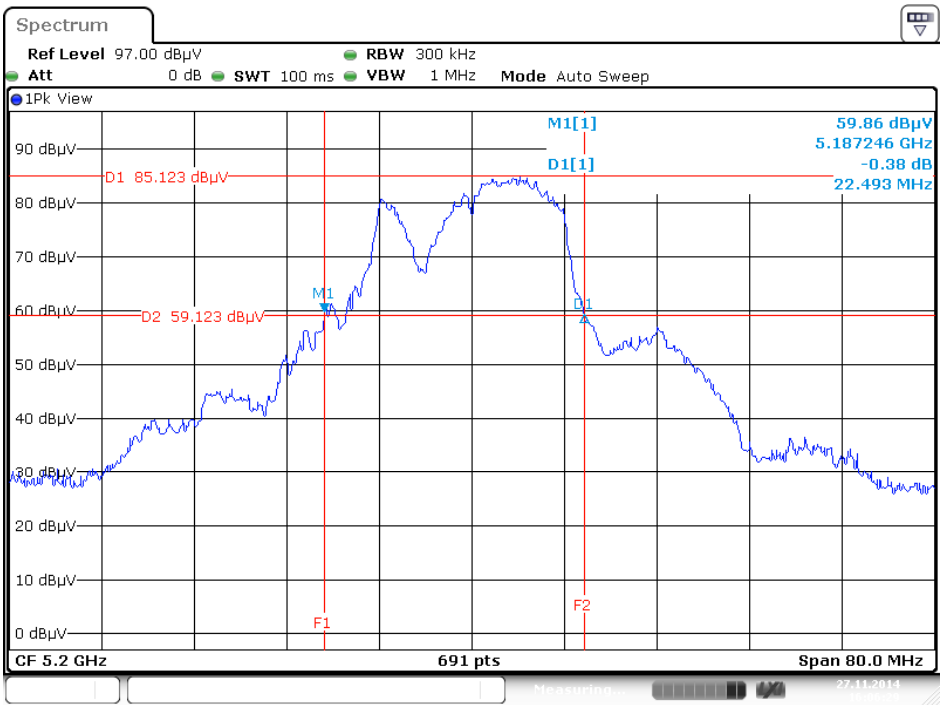
For 2TX

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5180 MHz



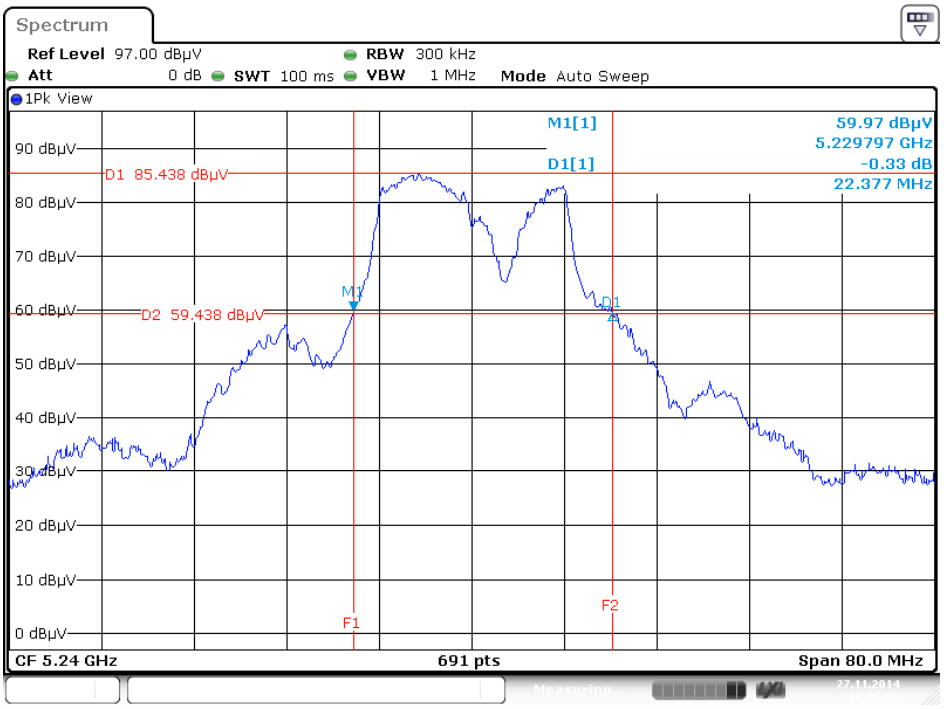
Date: 27.NOV.2014 16:05:48

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5200 MHz



Date: 27.NOV.2014 16:06:29

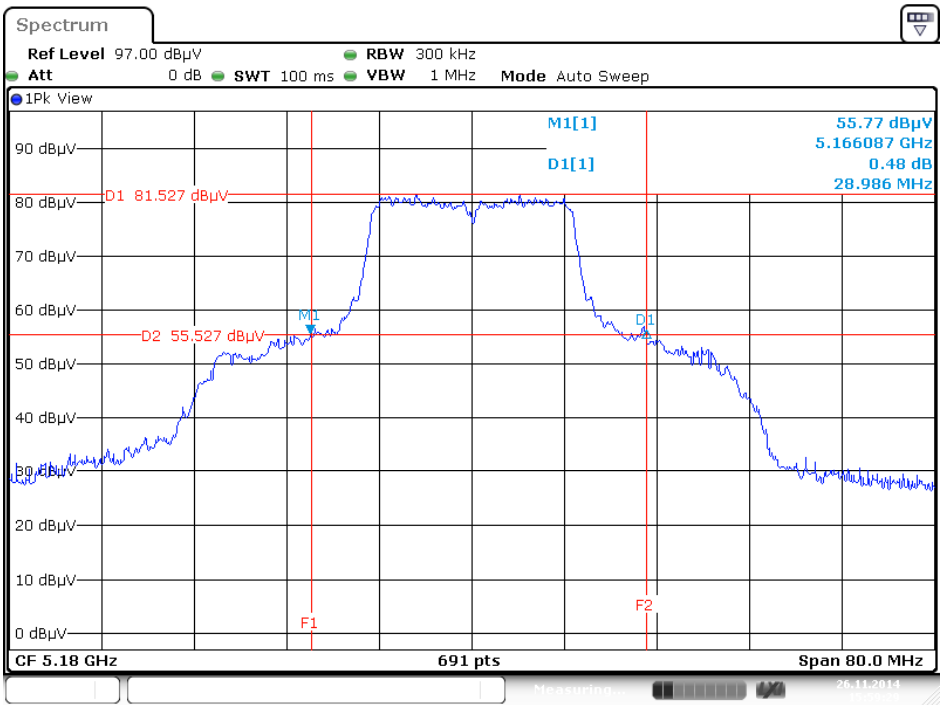
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5240 MHz



Date: 27.NOV.2014 16:06:50

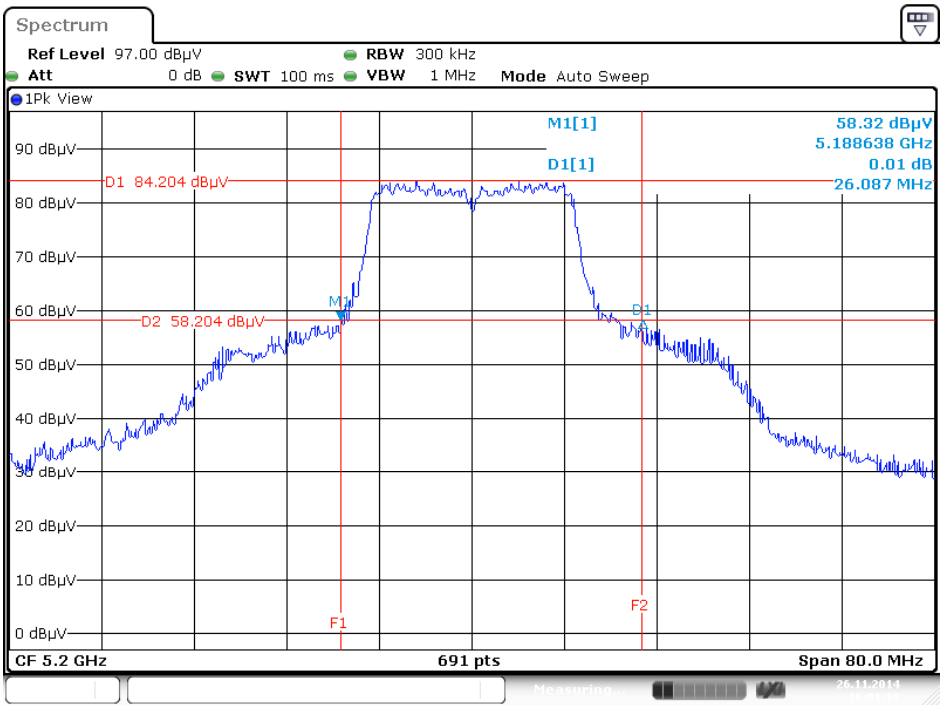
<For beamforming mode>

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



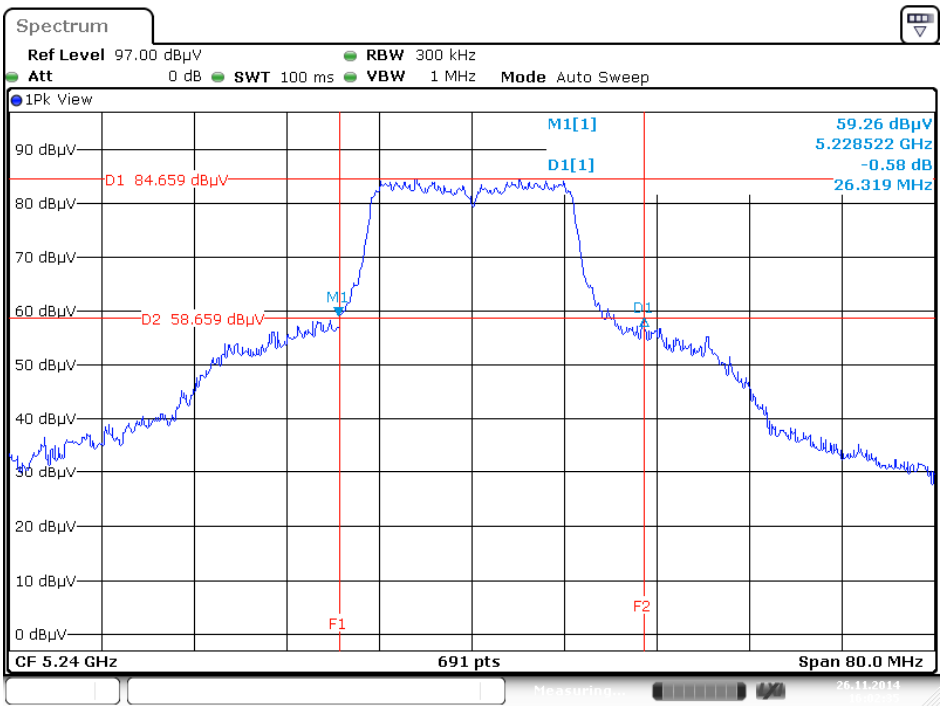
Date: 26.NOV.2014 15:59:30

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



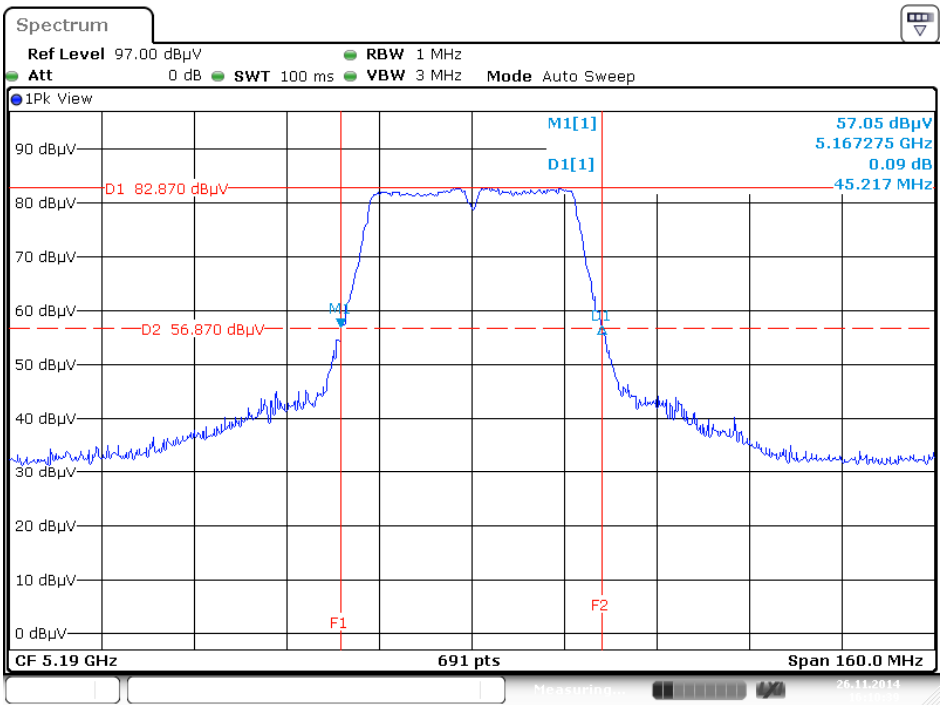
Date: 26.NOV.2014 16:01:19

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



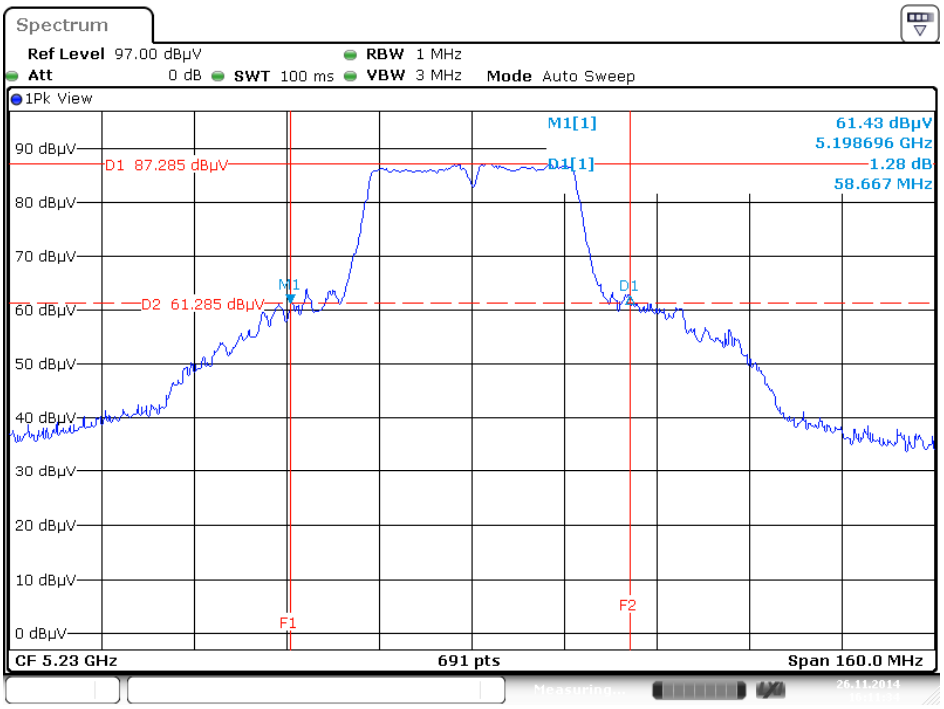
Date: 26.NOV.2014 16:02:36

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



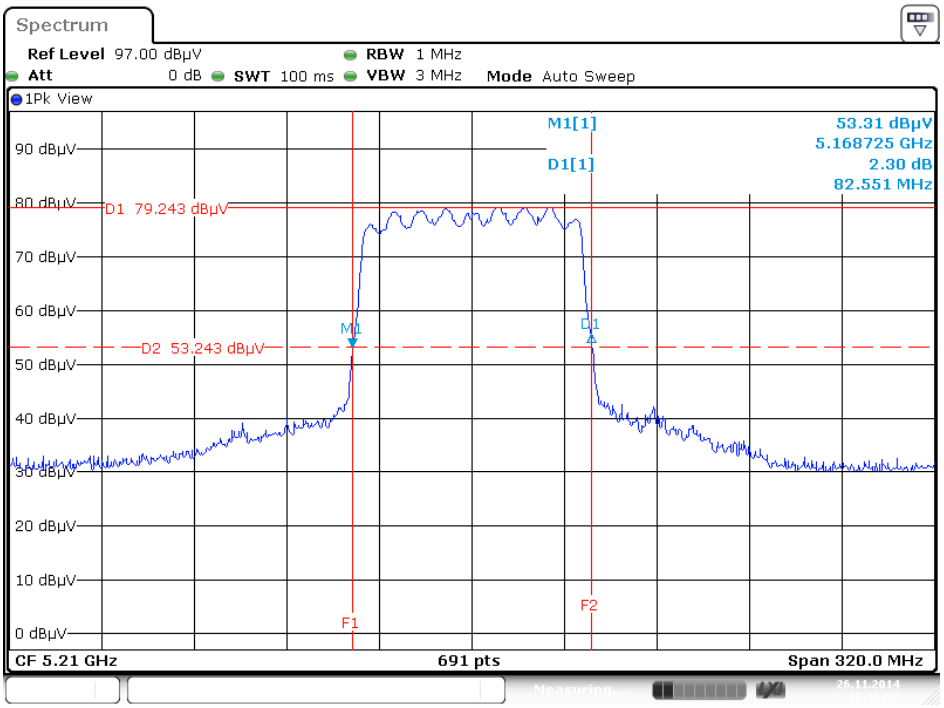
Date: 26.NOV.2014 16:10:39

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



Date: 26.NOV.2014 16:11:34

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



Date: 26.NOV.2014 16:15:57

4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

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

4.3.2. Measuring Instruments and Setting

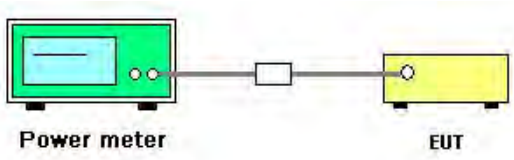
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.3.3. Test Procedures

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

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Maximum Conducted Output Power

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Configurations	IEEE 802.11a
Test Date	Nov. 26, 2014		

<For non-beamforming mode>

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	17.96	24.00	Complies
40	5200 MHz	17.73	24.00	Complies
48	5240 MHz	17.53	24.00	Complies

Configuration IEEE 802.11a / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
36	5180 MHz	17.64	17.54	20.60	24.00	Complies
40	5200 MHz	17.99	17.86	20.94	24.00	Complies
48	5240 MHz	17.83	17.88	20.87	24.00	Complies

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Configurations	IEEE 802.11ac
Test Date	Nov. 26, 2014		

<For beamforming mode>

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
36	5180 MHz	17.55	17.58	20.58	21.99	Complies
40	5200 MHz	17.88	17.52	20.71	21.99	Complies
48	5240 MHz	17.52	17.73	20.64	21.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} w_{j,k}\right\}^2}{N_{ANT}}\right]$=8.01dBi > 6dBi,So Power Limit =24-(8.01-6)=21.99dBm

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
38	5190 MHz	14.26	14.18	17.23	21.99	Complies
46	5230 MHz	17.5	17.61	20.57	21.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} w_{j,k}\right\}^2}{N_{ANT}}\right]$=8.01dBi > 6dBi,So Power Limit =24-(8.01-6)=21.99dBm

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
42	5210 MHz	12.43	12.64	15.55	21.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} w_{j,k}\right\}^2}{N_{ANT}}\right]$=8.01dBi > 6dBi,So Power Limit =24-(8.01-6)=21.99dBm

4.4. Power Spectral Density Measurement

4.4.1. Limit

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

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

4.4.2. Measuring Instruments and Setting

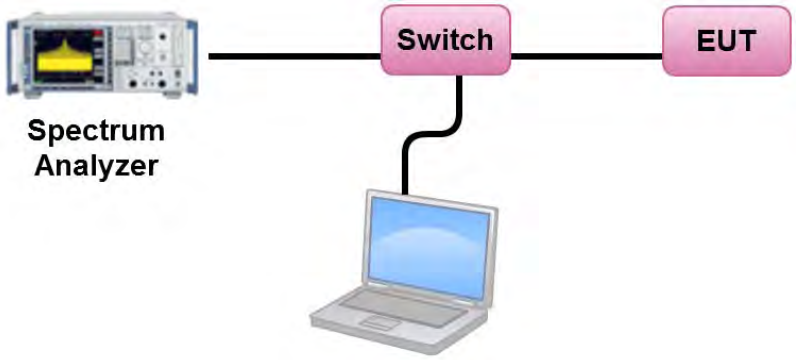
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1000 kHz
VBW	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD).
3. Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements (a) Measure and sum the spectra across the outputs.
4. When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Configurations	IEEE 802.11a
Test Date	Nov. 26, 2014		

<For non-beamforming mode>

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	5.11	11.00	Complies
40	5200 MHz	4.88	11.00	Complies
48	5240 MHz	5.51	11.00	Complies

Configuration IEEE 802.11a / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	7.17	8.99	Complies
40	5200 MHz	5.69	8.99	Complies
48	5240 MHz	7.70	8.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{ANT}}\left\{\sum_{k=1}^{N_{SS}} x_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.01dBi > 6dBi,So PSD Limit =11-(8.01-6)=8.99dBm/MHz

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Configurations	IEEE 802.11ac
Test Date	Nov. 26, 2014		

<For beamforming mode>

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	6.90	8.99	Complies
40	5200 MHz	7.11	8.99	Complies
48	5240 MHz	6.94	8.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.01dBi > 6dBi,So PSD Limit =11-(8.01-6)=8.99dBm/MHz

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	0.71	8.99	Complies
46	5230 MHz	4.75	8.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.01dBi > 6dBi,So PSD Limit =11-(8.01-6)=8.99dBm/MHz

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-3.07	8.99	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.01dBi > 6dBi,So PSD Limit =11-(8.01-6)=8.99dBm/MHz

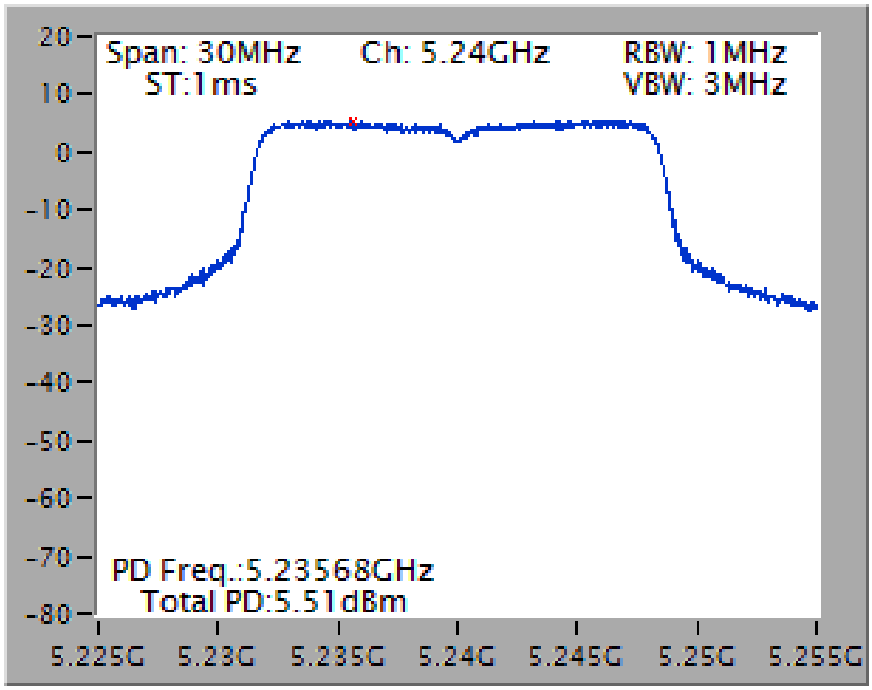
Note: All the test values were listed in the report.

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

<For non-beamforming mode>

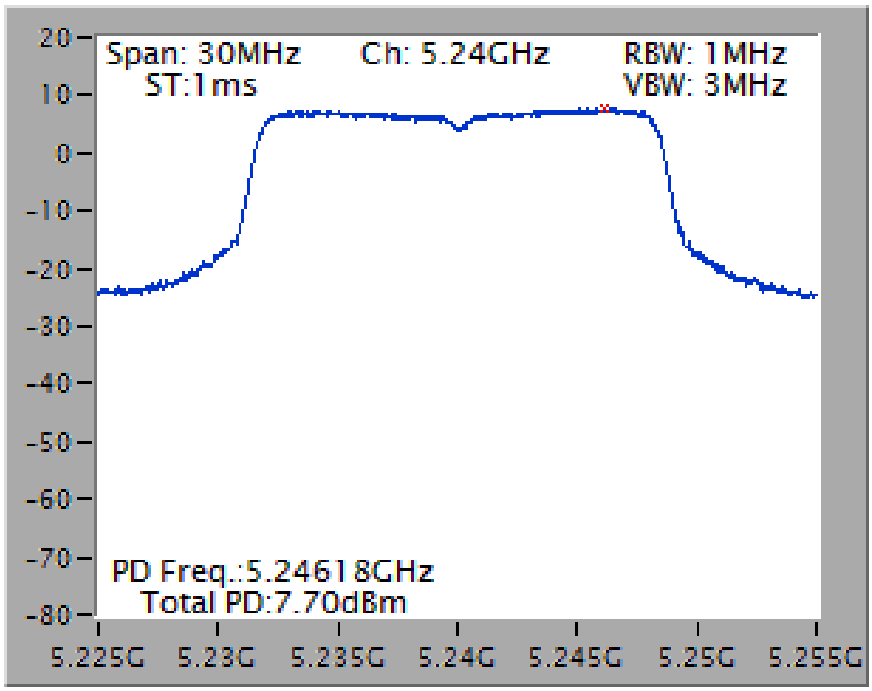
For 1TX

Power Density Plot on Configuration IEEE 802.11a / Chain 1 / 5240 MHz



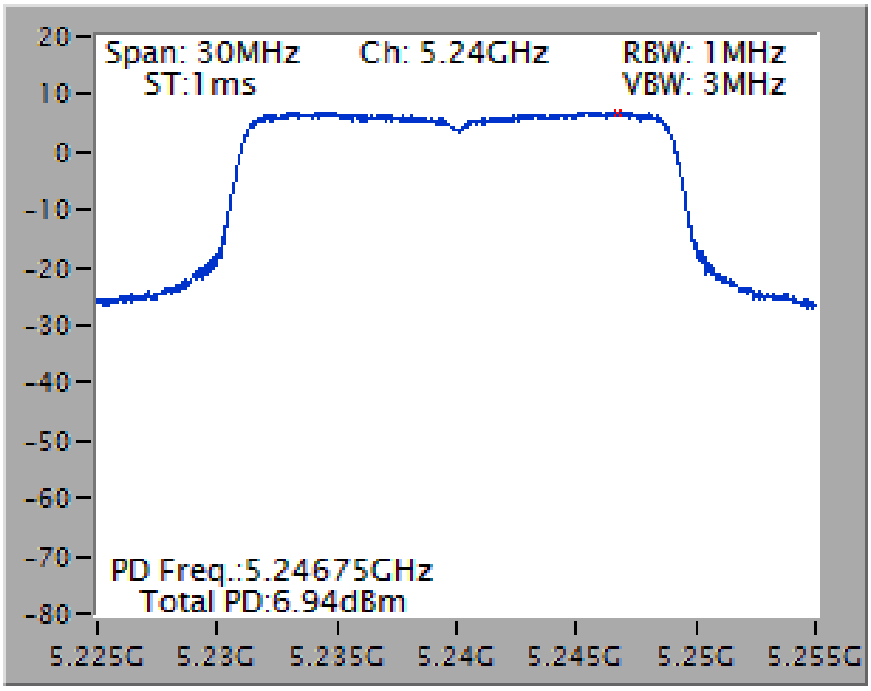
For 2TX

Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5240 MHz

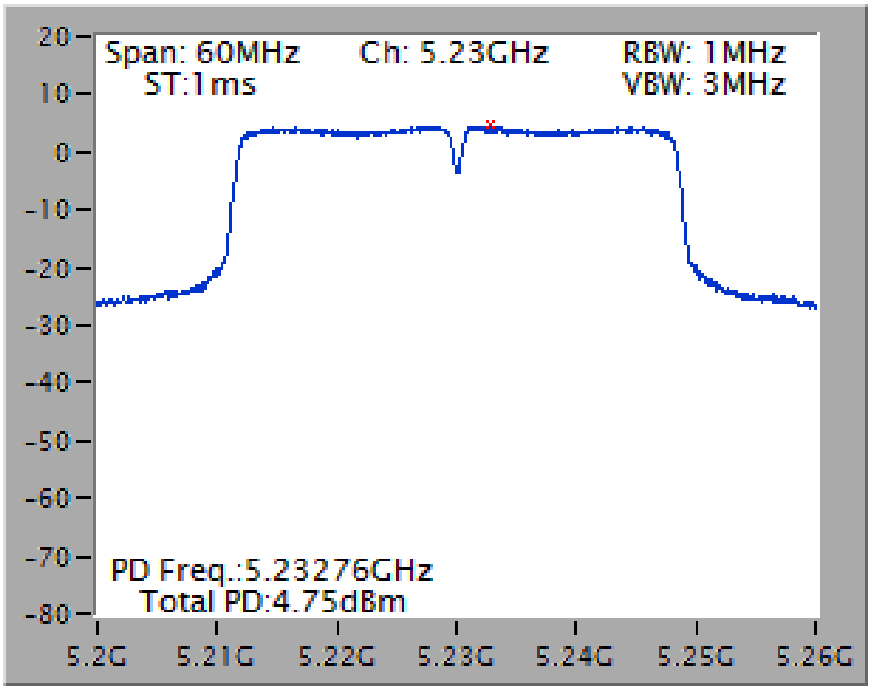


<For beamforming mode>

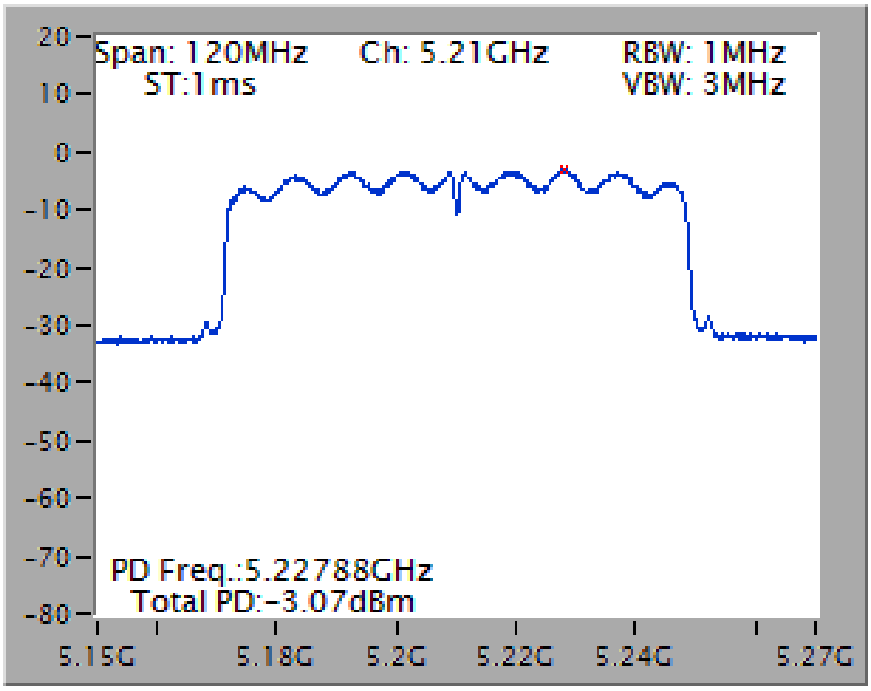
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5240 MHz



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



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



4.5. Radiated Emissions Measurement

4.5.1. 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.

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.5.2. Measuring Instruments and Setting

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

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

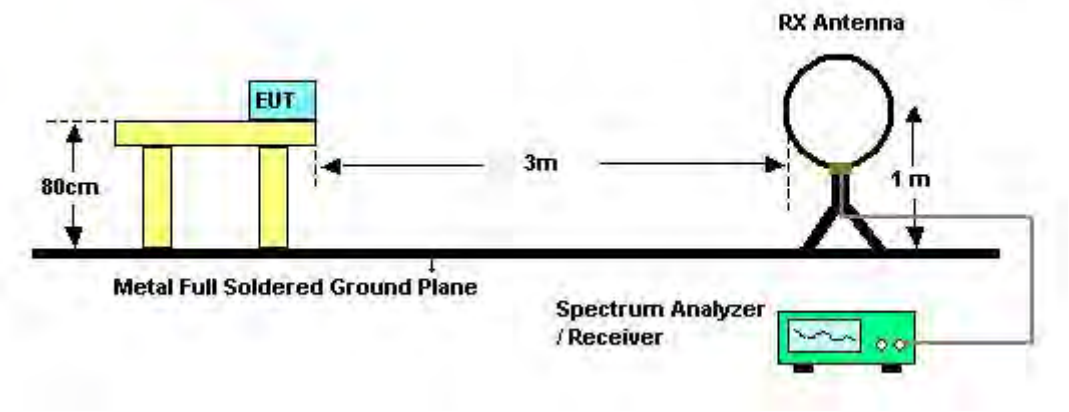
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

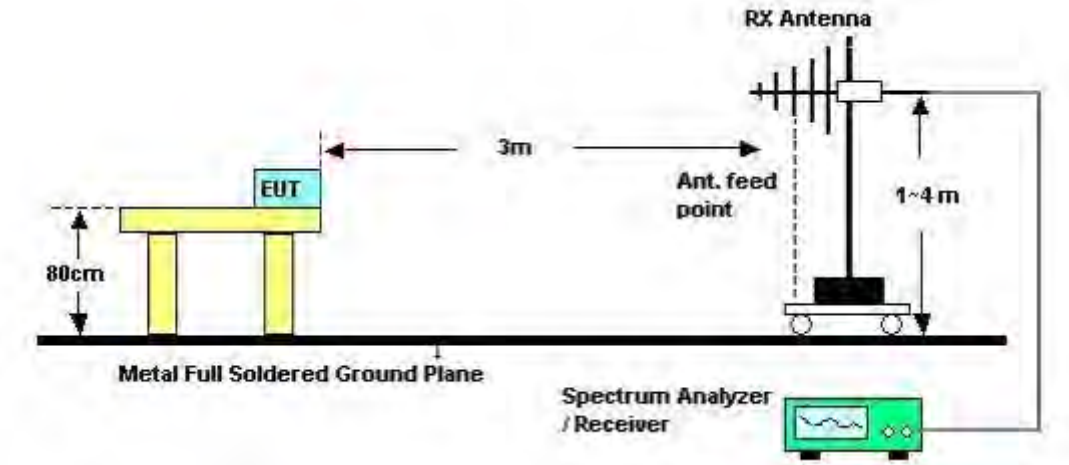
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

4.5.4. Test Setup Layout

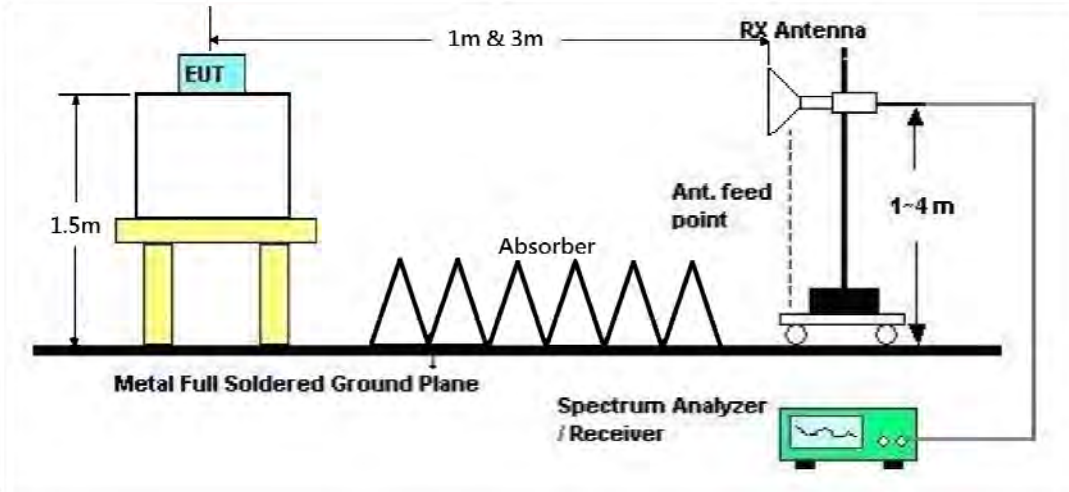
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	Normal Link
Test Date	Nov. 28, 2014		

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.

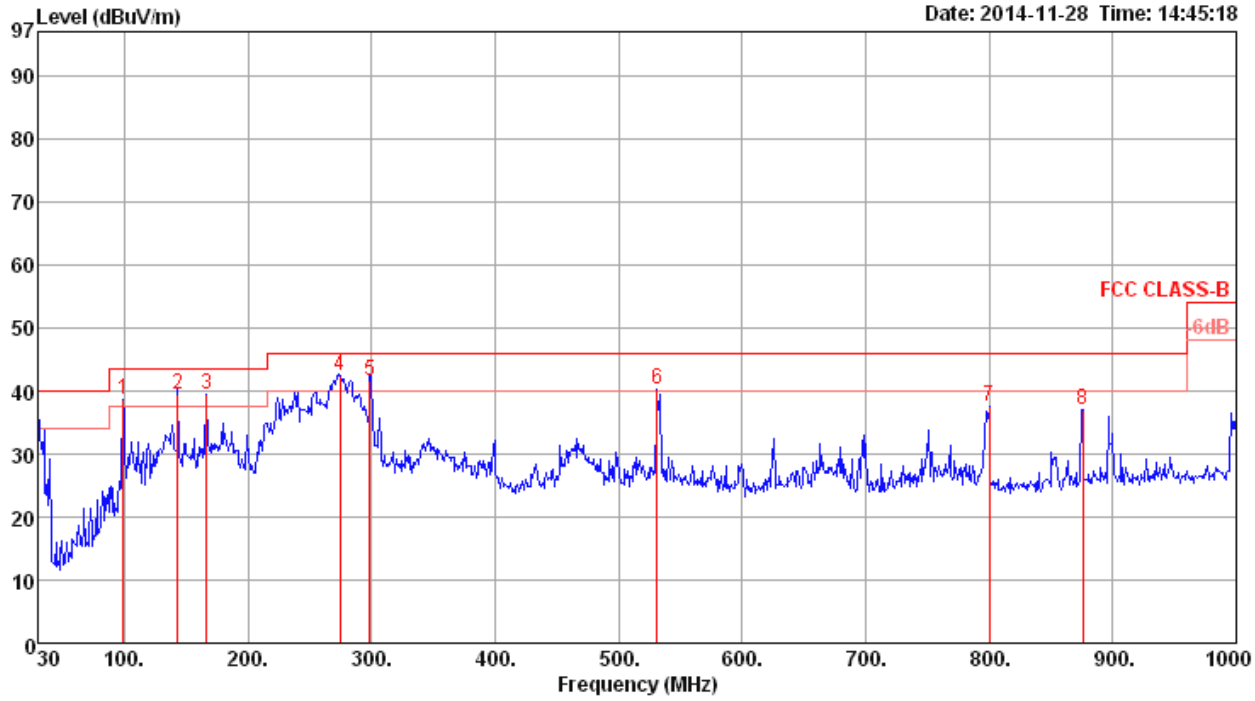
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

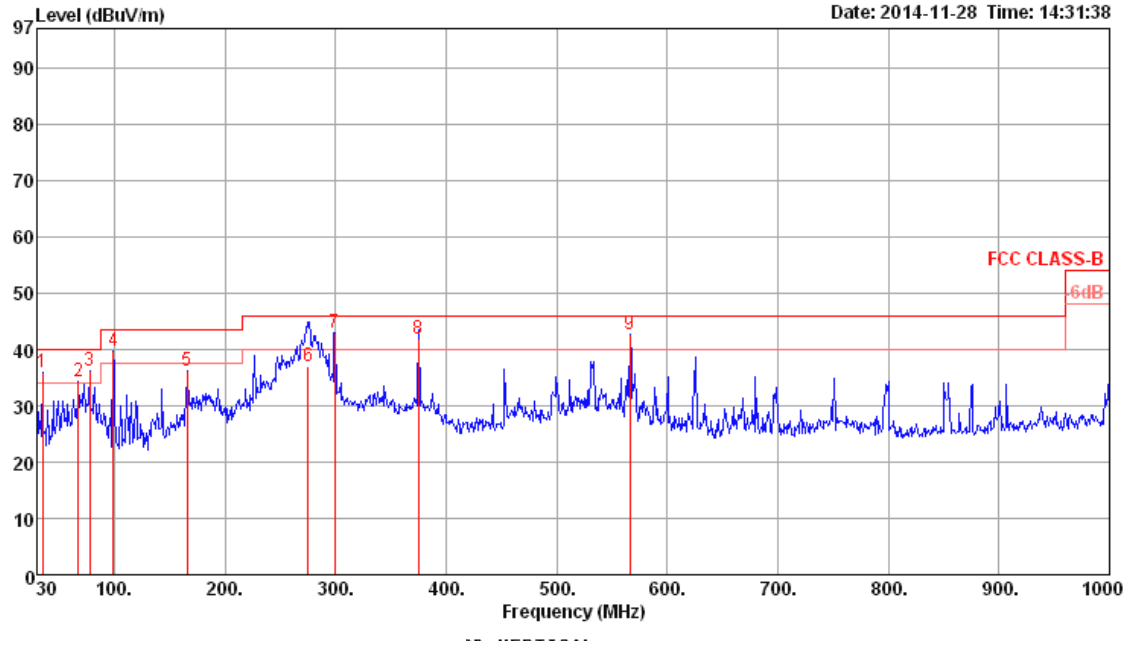
Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	Normal Link

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	98.87	38.76	43.50	-4.74	54.41	1.17	10.79	27.61	Peak	100	0	HORIZONTAL
2	143.49	39.55	43.50	-3.95	53.34	1.42	12.17	27.38	Peak	100	0	HORIZONTAL
3	166.77	39.33	43.50	-4.17	52.60	1.46	12.54	27.27	Peak	100	0	HORIZONTAL
4	274.44	42.52	46.00	-3.48	54.51	1.90	13.06	26.95	Peak	100	0	HORIZONTAL
5	298.69	41.67	46.00	-4.33	53.19	2.03	13.35	26.90	Peak	100	0	HORIZONTAL
6	531.49	40.14	46.00	-5.86	47.52	2.74	17.98	28.10	Peak	100	0	HORIZONTAL
7	800.18	37.47	46.00	-8.53	42.08	3.22	19.77	27.60	Peak	100	0	HORIZONTAL
8	875.84	37.10	46.00	-8.90	40.74	3.46	20.35	27.45	Peak	100	0	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	34.85	36.04	40.00	-3.96	47.06	0.70	16.08	27.80	Peak	400	0	VERTICAL
2	67.83	34.26	40.00	-5.74	54.35	0.97	6.67	27.73	Peak	400	0	VERTICAL
3	77.53	36.33	40.00	-3.67	56.04	0.95	7.03	27.69	Peak	400	0	VERTICAL
4	98.87	39.75	43.50	-3.75	55.40	1.17	10.79	27.61	Peak	400	0	VERTICAL
5	165.80	36.21	43.50	-7.29	49.56	1.45	12.47	27.27	Peak	400	0	VERTICAL
6	275.41	36.90	46.00	-9.10	48.87	1.91	13.07	26.95	QP	298	360	VERTICAL
7	299.66	42.85	46.00	-3.15	54.36	2.03	13.36	26.90	Peak	400	0	VERTICAL
8	375.32	42.00	46.00	-4.00	51.83	2.20	15.40	27.43	QP	159	224	VERTICAL
9	566.41	42.75	46.00	-3.25	49.68	2.79	18.38	28.10	Peak	400	0	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.

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

<For non-beamforming mode>

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 36 / Chain 1
Test Date	Nov. 27, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15533.60	55.53	74.00	-18.47	44.02	7.56	38.67	34.72	Peak	129	155	HORIZONTAL
2	15537.68	42.49	54.00	-11.51	30.98	7.56	38.67	34.72	Average	129	155	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15538.29	42.21	54.00	-11.79	30.70	7.56	38.67	34.72	Average	351	160	VERTICAL
2	15546.77	56.46	74.00	-17.54	44.96	7.56	38.66	34.72	Peak	351	160	VERTICAL

Temperature	26℃	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 40 / Chain 1
Test Date	Nov. 27, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15607.50	42.36	54.00	-11.64	30.95	7.58	38.62	34.79	Average	163	155	HORIZONTAL
2	15608.34	55.33	74.00	-18.67	43.92	7.58	38.62	34.79	Peak	163	155	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15590.22	55.46	74.00	-18.54	44.03	7.57	38.63	34.77	Peak	342	158	VERTICAL
2	15592.56	42.07	54.00	-11.93	30.64	7.57	38.63	34.77	Average	342	158	VERTICAL

Temperature	26℃	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 48 / Chain 1
Test Date	Nov. 27, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15726.63	55.58	74.00	-18.42	44.34	7.62	38.52	34.90	Peak	108	172	HORIZONTAL
2	15729.99	42.59	54.00	-11.41	31.35	7.62	38.52	34.90	Average	108	172	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15710.91	55.87	74.00	-18.13	44.60	7.62	38.53	34.88	Peak	300	155	VERTICAL
2	15727.21	42.28	54.00	-11.72	31.04	7.62	38.52	34.90	Average	300	155	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2
Test Date	Nov. 27, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15530.48	42.80	54.00	-11.20	31.29	7.56	38.67	34.72	Average	121	159	HORIZONTAL
2	15534.33	55.84	74.00	-18.16	44.33	7.56	38.67	34.72	Peak	121	159	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15531.17	42.52	54.00	-11.48	31.01	7.56	38.67	34.72	Average	75	155	VERTICAL
2	15536.76	56.36	74.00	-17.64	44.85	7.56	38.67	34.72	Peak	75	155	VERTICAL

Temperature	26℃	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 40 / Chain 1 + Chain 2
Test Date	Nov. 27, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15593.29	55.41	74.00	-18.59	43.98	7.57	38.63	34.77	Peak	203	155	HORIZONTAL
2	15601.77	42.63	54.00	-11.37	31.22	7.58	38.62	34.79	Average	203	155	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15594.93	56.07	74.00	-17.93	44.64	7.58	38.62	34.77	Peak	229	155	VERTICAL
2	15603.33	42.31	54.00	-11.69	30.90	7.58	38.62	34.79	Average	229	155	VERTICAL

Temperature	26℃	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 48 / Chain 1 + Chain 2
Test Date	Nov. 27, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15720.46	42.72	54.00	-11.28	31.46	7.62	38.52	34.88	Average	6	155	HORIZONTAL
2	15723.91	55.92	74.00	-18.08	44.66	7.62	38.52	34.88	Peak	6	155	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	15721.22	42.48	54.00	-11.52	31.22	7.62	38.52	34.88	Average	354	155	VERTICAL
2	15729.78	56.61	74.00	-17.39	45.37	7.62	38.52	34.90	Peak	354	155	VERTICAL

Note:

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

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

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

<For beamforming mode>

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2
Test Date	Jul. 22, 2014		

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	15538.59	45.56	54.00	-8.44	30.92	10.37	38.78	34.51	100	94	HORIZONTAL	Average
2	15542.50	58.20	74.00	-15.80	43.57	10.37	38.78	34.52	100	94	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	15537.96	45.68	54.00	-8.32	31.04	10.37	38.78	34.51	100	176	VERTICAL	Average
2	15541.29	58.67	74.00	-15.33	44.04	10.37	38.78	34.52	100	176	VERTICAL	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2
Test Date	Jul. 22, 2014		

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	15599.72	57.87	74.00	-16.13	43.33	10.36	38.77	34.59	100	101	HORIZONTAL	Peak
2	15602.20	45.49	54.00	-8.51	30.97	10.36	38.75	34.59	100	101	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	15599.30	58.00	74.00	-16.00	43.46	10.36	38.77	34.59	100	184	VERTICAL	Peak
2	15602.23	46.49	54.00	-7.51	31.97	10.36	38.75	34.59	100	184	VERTICAL	Average

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2
Test Date	Jul. 23, 2014		

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	15725.84	44.39	54.00	-9.61	30.06	10.36	38.72	34.75	100	270	HORIZONTAL	Average
2	15728.06	56.77	74.00	-17.23	42.44	10.36	38.72	34.75	100	270	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	15716.05	47.00	54.00	-7.00	32.66	10.36	38.72	34.74	100	215	VERTICAL	Average
2	15723.87	56.25	74.00	-17.75	41.91	10.36	38.72	34.74	100	215	VERTICAL	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2
Test Date	Jul. 23, 2014		

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	15566.45	46.03	54.00	-7.97	31.44	10.37	38.77	34.55	100	255	HORIZONTAL	Average
2	15575.40	56.70	74.00	-17.30	42.13	10.36	38.77	34.56	100	255	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	15588.65	46.05	54.00	-7.95	31.50	10.36	38.77	34.58	100	230	VERTICAL	Average
2	15593.85	56.62	74.00	-17.38	42.07	10.36	38.77	34.58	100	230	VERTICAL	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2
Test Date	Jul. 23, 2014		

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	15691.51	56.45	74.00	-17.55	42.07	10.36	38.72	34.70	100	197	HORIZONTAL	Peak
2	15692.12	44.31	54.00	-9.69	29.94	10.36	38.72	34.71	100	197	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	15690.50	45.93	54.00	-8.07	31.54	10.36	38.73	34.70	100	218	VERTICAL	Average
2	15690.87	58.59	74.00	-15.41	44.20	10.36	38.73	34.70	100	218	VERTICAL	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2
Test Date	Jul. 23, 2014		

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	15628.91	58.97	74.00	-15.03	44.49	10.36	38.75	34.63	100	125	HORIZONTAL	Peak
2	15632.40	45.18	54.00	-8.82	30.70	10.36	38.75	34.63	100	125	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	15630.28	57.40	74.00	-16.60	42.92	10.36	38.75	34.63	100	149	VERTICAL	Peak
2	15631.92	46.04	54.00	-7.96	31.56	10.36	38.75	34.63	100	149	VERTICAL	Average

Note:

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

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

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

4.6. Band Edge Emissions Measurement

4.6.1. Limit

For transmitters operating in the 5.15-5.25 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.

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.6.2. Measuring Instruments and Setting

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

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

4.6.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.

4.6.4. Test Setup Layout

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

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

<For non-beamforming mode>

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 1
Test Date	Nov. 26, 2014		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5148.60	61.56	74.00	-12.44	54.82	6.21	34.11	33.58	295	100	Peak	VERTICAL
2	5150.00	46.02	54.00	-7.98	39.28	6.21	34.11	33.58	295	100	Average	VERTICAL
3	5185.60	104.20			97.37	6.24	34.16	33.57	295	100	Peak	VERTICAL
4	5186.20	94.71			87.88	6.24	34.16	33.57	295	100	Average	VERTICAL

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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5107.20	57.35	74.00	-16.65	50.75	6.14	34.06	33.60	291	100	Peak	VERTICAL
2	5150.00	43.40	54.00	-10.60	36.66	6.21	34.11	33.58	291	100	Average	VERTICAL
3	5193.60	104.73			97.87	6.24	34.18	33.56	291	100	Peak	VERTICAL
4	5195.20	94.73			87.84	6.27	34.18	33.56	291	100	Average	VERTICAL

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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5106.20	57.04	74.00	-16.96	50.44	6.14	34.06	33.60	303	241	Peak	HORIZONTAL
2	5119.40	44.29	54.00	-9.71	37.65	6.17	34.06	33.59	303	241	Average	HORIZONTAL
3	5245.40	103.56			96.56	6.30	34.25	33.55	303	241	Peak	HORIZONTAL
4	5246.00	94.19			87.15	6.34	34.25	33.55	303	241	Average	HORIZONTAL
5	5369.00	44.31	54.00	-9.69	36.93	6.47	34.41	33.50	303	241	Average	HORIZONTAL
6	5378.60	57.81	74.00	-16.19	50.37	6.50	34.44	33.50	303	241	Peak	HORIZONTAL

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

Temperature	26℃	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 1 + Chain 2
Test Date	Nov. 26, 2014 ~ Nov. 27, 2014		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5106.80	46.23	54.00	-7.77	39.63	6.14	34.06	33.60	288	120	Average	VERTICAL
2	5145.20	60.55	74.00	-13.45	53.81	6.21	34.11	33.58	288	120	Peak	VERTICAL
3	5187.20	99.75			92.92	6.24	34.16	33.57	288	120	Average	VERTICAL
4	5187.20	109.06			102.23	6.24	34.16	33.57	288	120	Peak	VERTICAL

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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5113.60	58.64	74.00	-15.36	52.04	6.14	34.06	33.60	284	213	Peak	VERTICAL
2	5120.00	46.98	54.00	-7.02	40.34	6.17	34.06	33.59	284	213	Average	VERTICAL
3	5194.80	111.63			104.74	6.27	34.18	33.56	284	213	Peak	VERTICAL
4	5195.20	102.24			95.35	6.27	34.18	33.56	284	213	Average	VERTICAL

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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5120.00	44.17	54.00	-9.83	37.53	6.17	34.06	33.59	293	100	Average	VERTICAL
2	5127.20	57.15	74.00	-16.85	50.48	6.17	34.09	33.59	293	100	Peak	VERTICAL
3	5244.80	100.10			93.10	6.30	34.25	33.55	293	100	Average	VERTICAL
4	5245.40	109.70			102.70	6.30	34.25	33.55	293	100	Peak	VERTICAL
5	5372.00	44.46	54.00	-9.54	37.08	6.47	34.41	33.50	293	100	Average	VERTICAL
6	5386.40	57.79	74.00	-16.21	50.34	6.50	34.44	33.49	293	100	Peak	VERTICAL

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

Note:

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

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

<For beamforming mode>

Temperature	26℃	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2
Test Date	Jul. 22, 2014 ~ Jul. 23, 2014		

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	5149.00	66.47	74.00	-7.53	62.87	5.99	33.02	35.41	100	85	VERTICAL	Peak
2	5150.00	52.33	54.00	-1.67	48.73	5.99	33.02	35.41	100	85	VERTICAL	Average
3	5173.60	102.91			99.28	6.01	33.04	35.42	100	85	VERTICAL	Average
4	5174.40	115.24			111.61	6.01	33.04	35.42	100	85	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	5149.40	66.35	74.00	-7.65	62.75	5.99	33.02	35.41	100	87	VERTICAL	Peak
2	5150.00	52.45	54.00	-1.55	48.85	5.99	33.02	35.41	100	87	VERTICAL	Average
3	5194.20	107.37			103.73	6.02	33.05	35.43	100	87	VERTICAL	Average
4	5205.80	117.39			113.73	6.03	33.06	35.43	100	87	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	5148.00	59.89	74.00	-14.11	56.29	5.99	33.02	35.41	100	88	VERTICAL	Peak
2	5150.00	45.74	54.00	-8.26	42.14	5.99	33.02	35.41	100	88	VERTICAL	Average
3	5245.60	105.88			102.19	6.05	33.09	35.45	100	88	VERTICAL	Average
4	5245.80	117.30			113.61	6.05	33.09	35.45	100	88	VERTICAL	Peak

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2
Test Date	Jul. 23, 2014		

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	5146.80	68.71	74.00	-5.29	65.11	5.99	33.02	35.41	100	90	VERTICAL	Peak
2	5150.00	52.42	54.00	-1.58	48.82	5.99	33.02	35.41	100	90	VERTICAL	Average
3	5192.80	94.34			90.70	6.02	33.05	35.43	100	90	VERTICAL	Average
4	5201.40	107.76			104.12	6.02	33.05	35.43	100	90	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	5148.60	67.64	74.00	-6.36	64.04	5.99	33.02	35.41	100	96	VERTICAL	Peak
2	5150.00	52.44	54.00	-1.56	48.84	5.99	33.02	35.41	100	96	VERTICAL	Average
3	5217.40	113.25			109.58	6.03	33.08	35.44	100	96	VERTICAL	Peak
4	5232.60	98.29			94.60	6.04	33.09	35.44	100	96	VERTICAL	Average

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Andy Tsai	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2
Test Date	Jul. 23, 2014		

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	5150.00	52.49	54.00	-1.51	48.89	5.99	33.02	35.41	100	87	VERTICAL	Average
2	5150.00	64.27	74.00	-9.73	60.67	5.99	33.02	35.41	100	87	VERTICAL	Peak
3	5201.00	94.45			90.81	6.02	33.05	35.43	100	87	VERTICAL	Average
4	5218.00	104.19			100.52	6.03	33.08	35.44	100	87	VERTICAL	Peak

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

Note:

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

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

4.7. Frequency Stability Measurement

4.7.1. Limit

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

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

4.7.2. Measuring Instruments and Setting

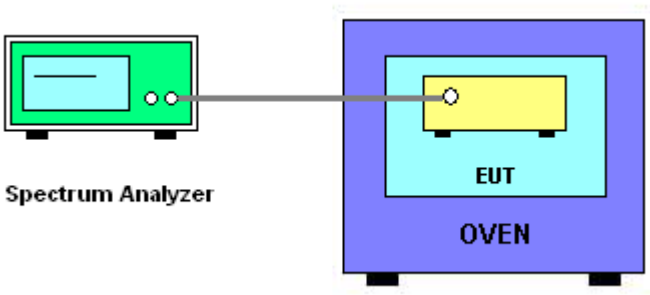
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.7.3. Test Procedures

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

4.7.4. Test Setup Layout



4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

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

4.7.7. Test Result of Frequency Stability

Temperature	20°C	Humidity	52%
Test Engineer	Lucas Huang	Test Date	Nov. 26, 2014

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5200 MHz
126.50	5200.0001
110.00	5200.0001
93.50	5200.0001
Max. Deviation (MHz)	0.000120
Max. Deviation (ppm)	0.02

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	5200 MHz
-20	5200.0000
-10	5200.0001
0	5200.0000
10	5200.0000
20	5199.9999
30	5200.0000
40	5199.9999
50	5200.0000
60	5199.9998
70	5199.9997
Max. Deviation (MHz)	0.000300
Max. Deviation (ppm)	0.06

4.8. Antenna Requirements

4.8.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.8.2. Antenna Connector Construction

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

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 12, 2013	Conduction (CO01-CB)
MXE EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8GHz	Dec. 25, 2013	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov. 23, 2013	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Nov. 23, 2013	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	Dec. 04, 2013	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 26, 2014	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Oct. 28, 2014	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	--	26GHz ~ 40GHz	Feb. 17, 2014	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Apr. 22, 2014	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 2013	Radiation (03CH01-CB)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Dec. 12, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO 2000	N/A	1 m - 4 m	N.C.R.	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-3	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	101026	9kHz~40GHz	Aug. 28, 2014	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2014	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	1126203	300MHz~40GHz	Oct. 06, 2014	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1210004	300MHz~40GHz	Oct. 06, 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)	2.4 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%