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

FCC RADIO TEST REPORT

Applicant's company	**Linksys LLC**
Applicant Address	121 Theory Drive, Irvine, CA 92617, USA
FCC ID	**Q87-EA9200**

Product Name	AC3200 Tri-Band Smart Wi-Fi Router
Brand Name	Linksys LLC
Model No.	EA9200
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Aug. 22, 2014
Final Test Date	Sep.10, 2014
Submission Type	Original Equipment
Operating Mode	Master

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 D01 v01r02.**

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
FR482206AB	Rev. 01	Initial issue of report	Oct. 01, 2014

Certificate No.: CB10309112

1. CERTIFICATE OF COMPLIANCE

Product Name	:	AC3200 Tri-Band Smart WI-FI Router
Brand Name	:	Linksys LLC
Model No.	:	EA9200
Applicant	:	Linksys LLC
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. 22, 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	11.62 dB
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	3.44 dB
4.4	15.407(a)	Power Spectral Density	Complies	5.58 dB
4.5	15.407(b)	Radiated Emissions	Complies	3.16 dB
4.6	15.407(b)	Band Edge Emissions	Complies	1.00 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 (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
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): 18.08 MHz ; 802.11ac MCS0/Nss1 (VHT40): 36.48 MHz ; 802.11ac MCS0/Nss1 (VHT80): 76.16 MHz
Maximum Conducted Output Power	802.11ac MCS0/Nss1 (VHT20): 22.72 dBm ; 802.11ac MCS0/Nss1 (VHT40): 24.69 dBm ; 802.11ac MCS0/Nss1 (VHT80): 18.16 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, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
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%)	17.76 MHz
Maximum Conducted Output Power	24.29 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
Band 1 Information	☒ Point-to-multipoint	☐ Fixed point-to-point
	☒ Indoor	
	☐ Outdoor	

Beamforming Function

Band width Mode	Description	
IEEE 802.11a	☐ With beamforming	☒ Without beamforming
IEEE 802.11n	☒ With beamforming	☐ Without beamforming
IEEE 802.11ac	☒ With beamforming	☐ Without beamforming

Antenna and Band width

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3	MCS 0-23
802.11n (HT40)	3	MCS 0-23
802.11ac (VHT20)	3	MCS 0-9/Nss1-3
802.11ac (VHT40)	3	MCS 0-9/Nss1-3
802.11ac (VHT80)	3	MCS 0-9/Nss1-3
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT 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

Power	Brand	Model No.	Rating
Adapter	APD	DA-48Q12	Input: 100-240Vac, 50-60Hz, 1.2A Max. Output: 12Vdc, 4A
Other			
Power Cable*1: Non-shielded, 1.8m			

3.3. Table for Filed Antenna

Ant.	Brand	Model No.	Type	Connector	Gain (dBi)
1	Dockon	DMA-300-5020	Printend	N/A	3.10
2	Dockon	DMA-300-5020	Printend	N/A	3.10
3	Dockon	DMA-300-5020	Printend	N/A	3.10

Note: The EUT has three antennas of 5 GHz Band 1 WLAN function.

For 5 GHz WLAN function:

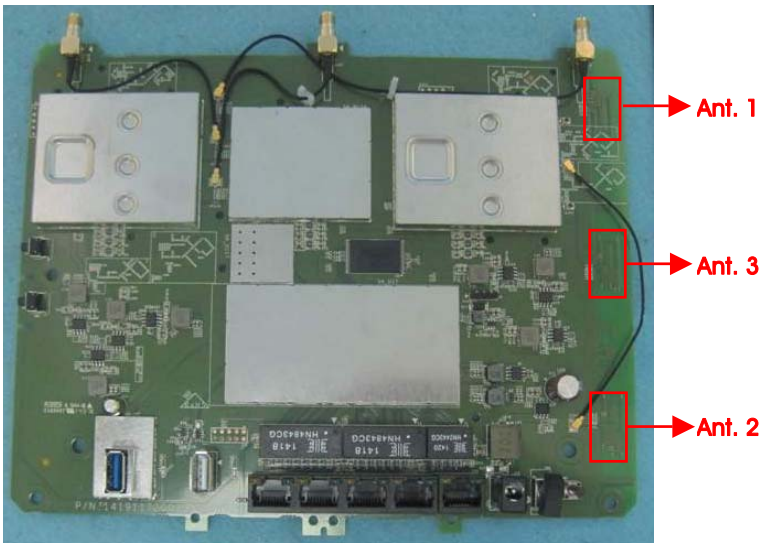
For IEEE 802.11a mode (1TX/3RX):

Only Ant. 1 can be used as transmitting.

Ant. 1, Ant. 2 and Ant. 3 could receive simultaneously.

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

Ant. 1, Ant. 2 and Ant. 3 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 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	Antenna
AC Power Conducted Emission	Normal Link		-	-	-
Max. Conducted Output Power	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1
Power Spectral Density	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1
26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1
Radiated Emission Below 1GHz	Normal Link		-	-	-
Radiated Emission Above 1GHz	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1
Band Edge Emission	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1
Frequency Stability	Un-modulation		-	40	1

Note: 1. VHT20/VHT40 covers HT20/HT40, due to same modulation.

2. There are two functions of EUT, one is beamforming function, and the other is non-beamforming function for 802.11n/ac, after evaluating, beamforming function has been evaluated to be the worst case, so it was selected to test and record in this test report.

For Co-location MPE and Radiated Emission Co-location tests:

The EUT could be applied with 2.4GHz WLAN function, 5GHz Band 1 WLAN function and 5GHz Band 4 WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to Appendix C) and Radiated Emission Co-location (please refer to Appendix D) tests are added for simultaneously transmit between 2.4GHz WLAN function, 5GHz Band 1 WLAN function and 5GHz Band 4 WLAN function.

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	**Site Category**	**Location**	**FCC Reg. No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
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
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
Flash Disk	Silicon	I-Series	DoC
Flash Disk	Transcend	JetFlash-700	DoC

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC

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

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
Flash Disk	Silicon	I-Series	DoC
Flash Disk	Transcend	JetFlash-700	DoC

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

For non-beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC

For beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
WLAN ac Dongle	Netgear	A6200	PY31220200

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.

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT20

Test Software Version	Mtool 2.0.1.6		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS0/Nss1 VHT20	72	61	70

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT40

Test Software Version	Mtool 2.0.1.6	
Frequency	5190 MHz	5230 MHz
MCS0/Nss1 VHT40	53	77

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT80

Test Software Version	Mtool 2.0.1.6
Frequency	5210 MHz
MCS0/Nss1 VHT80	53

Power Parameters of IEEE 802.11a

Test Software Version	Mtool 2.0.1.6		
Frequency	5180 MHz	5200 MHz	5240 MHz
802.11a	80	90	90

3.9. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN 7 were executed.

The program was executed as follows:

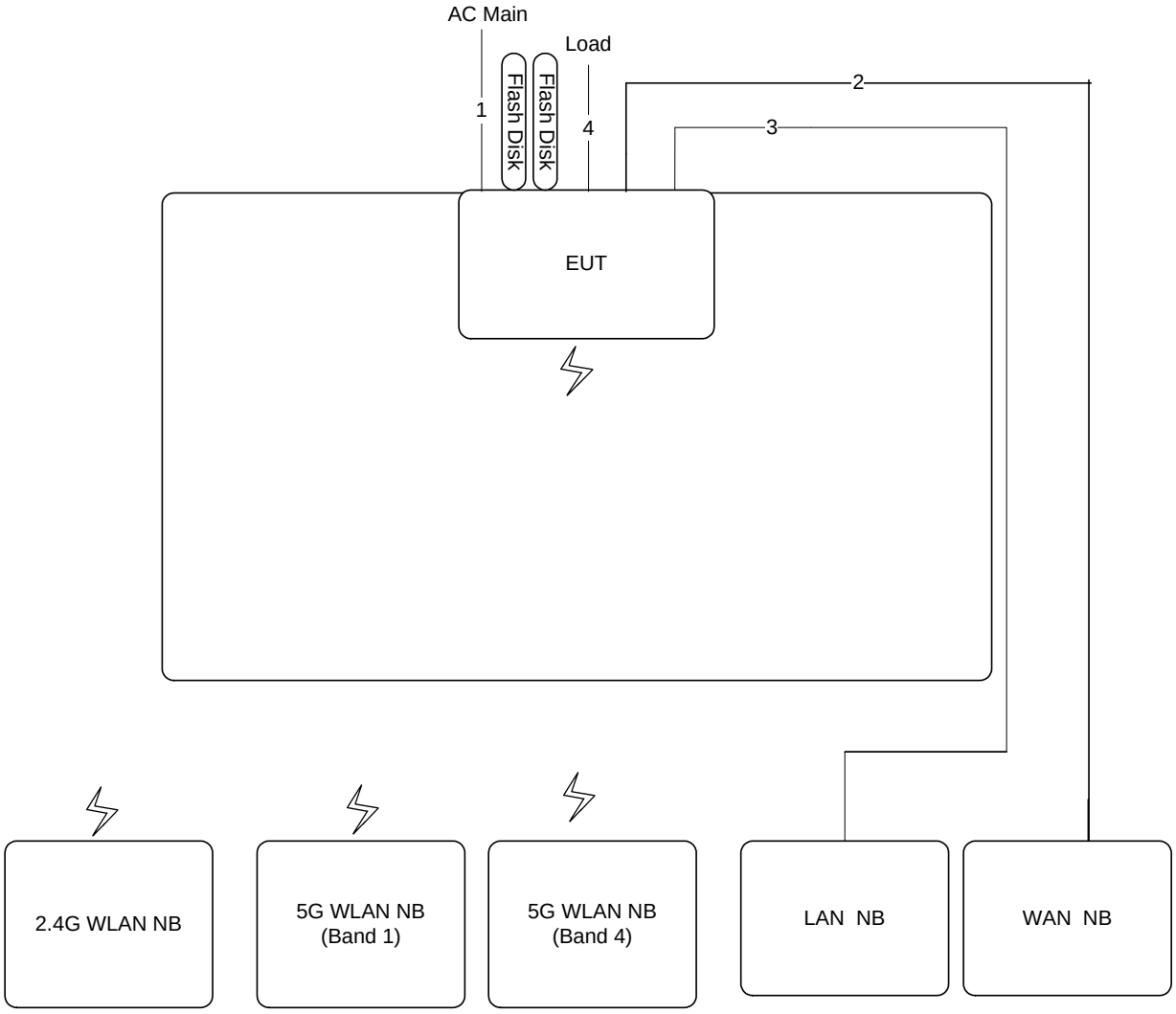
1. During the test, the EUT operation to normal function.
2. Executed command fixed test channel under DOS.
3. Executed "Lantest.exe " to link with the remote workstation to receive and transmit packet by WLAN ac Dongle and transmit duty cycle no less 98%

3.10. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.94	4.15	94.94	0.23	0.25
802.11ac MCS0/Nss1 VHT40	23.88	25.28	94.46	0.25	0.04
802.11ac MCS0/Nss1 VHT80	23.00	24.60	93.50	0.29	0.04
802.11a	2.06	2.10	98.10	0.08	0.01

3.11. Test Configurations

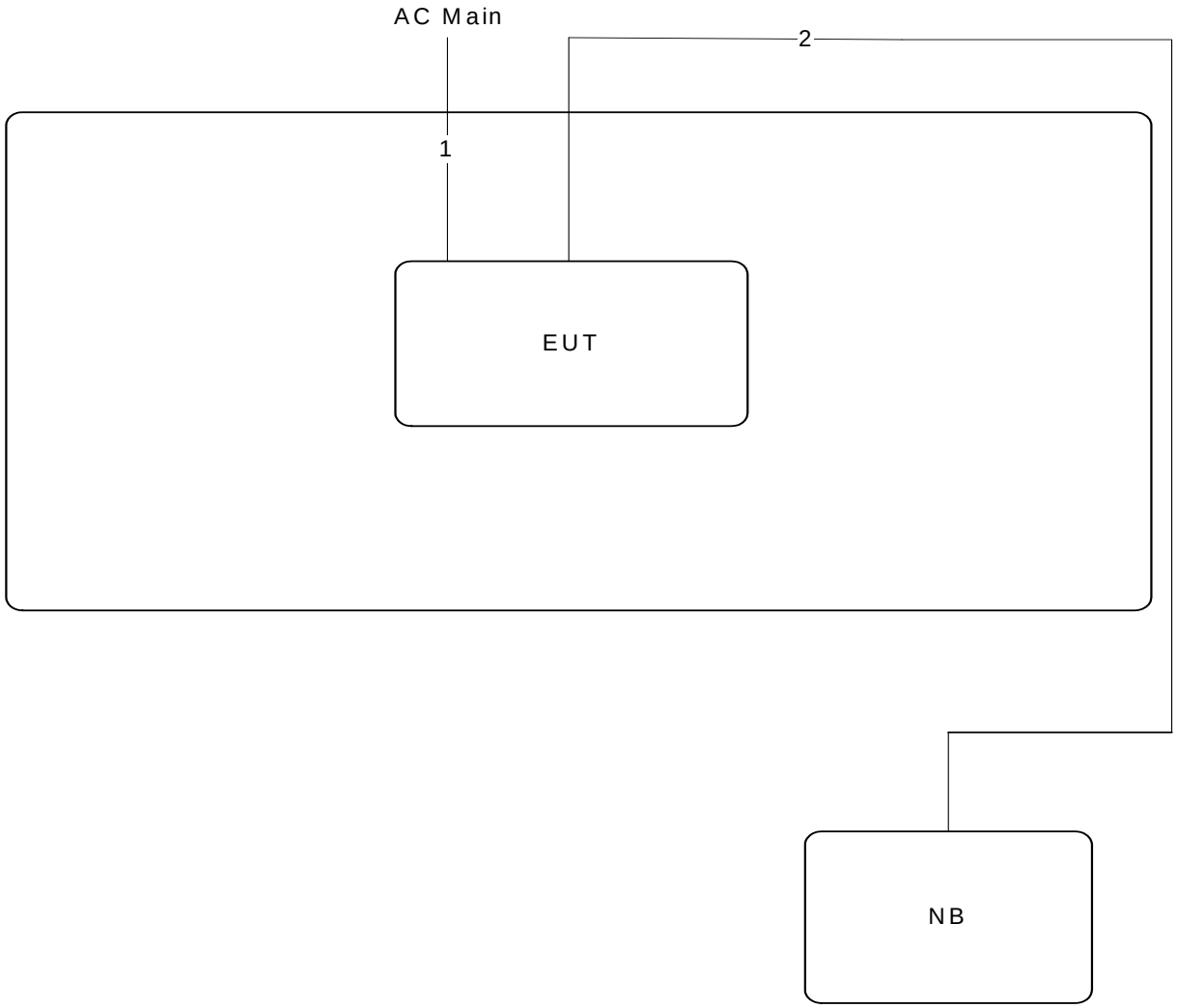
3.11.1. AC Power Line Conduction Emissions and Radiation Emissions below 1GHz Test Configuration



Item	Connection	Shielded	Length	Remark
1	Power cable	No	3m	-
2	RJ-45 cable	No	10m	-
3	RJ-45 cable	No	10m	-
4	RJ-45 cable*3	No	1.5m	Load

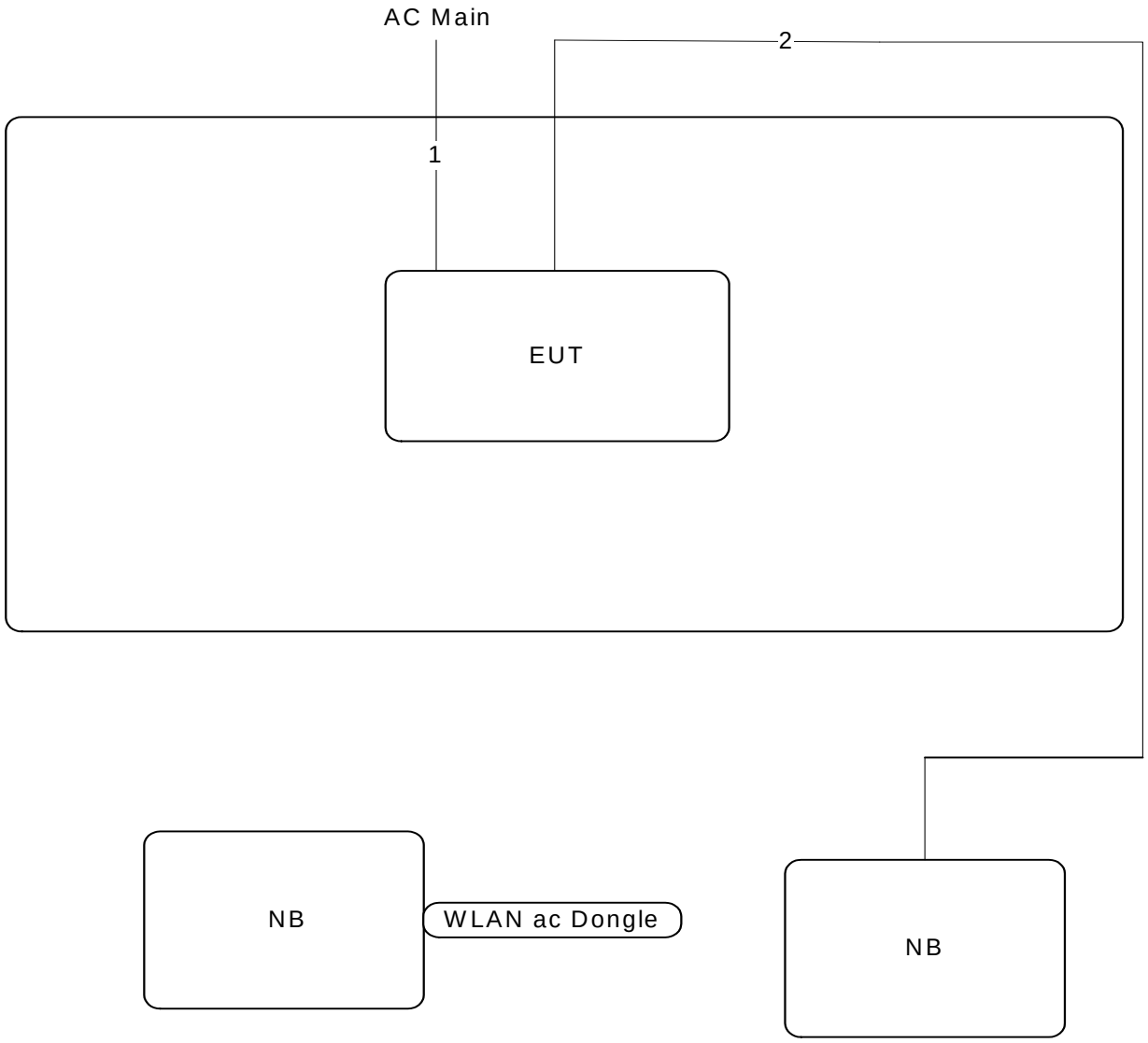
3.11.2. Radiation Emissions above 1GHz Test Configuration

For non-beamforming function:



Item	Connection	Shielded	Length
1	Power cable	No	3m
2	RJ-45 cable	No	10m

For beamforming function:



Item	Connection	Shielded	Length
1	Power cable	No	3m
2	RJ-45 cable	No	10m

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

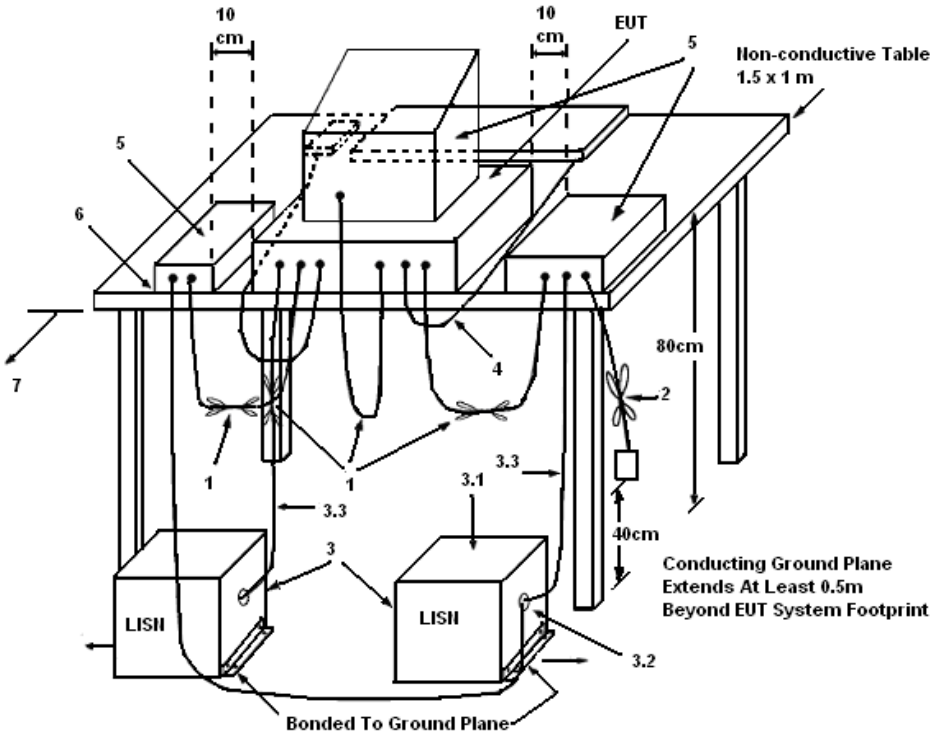
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

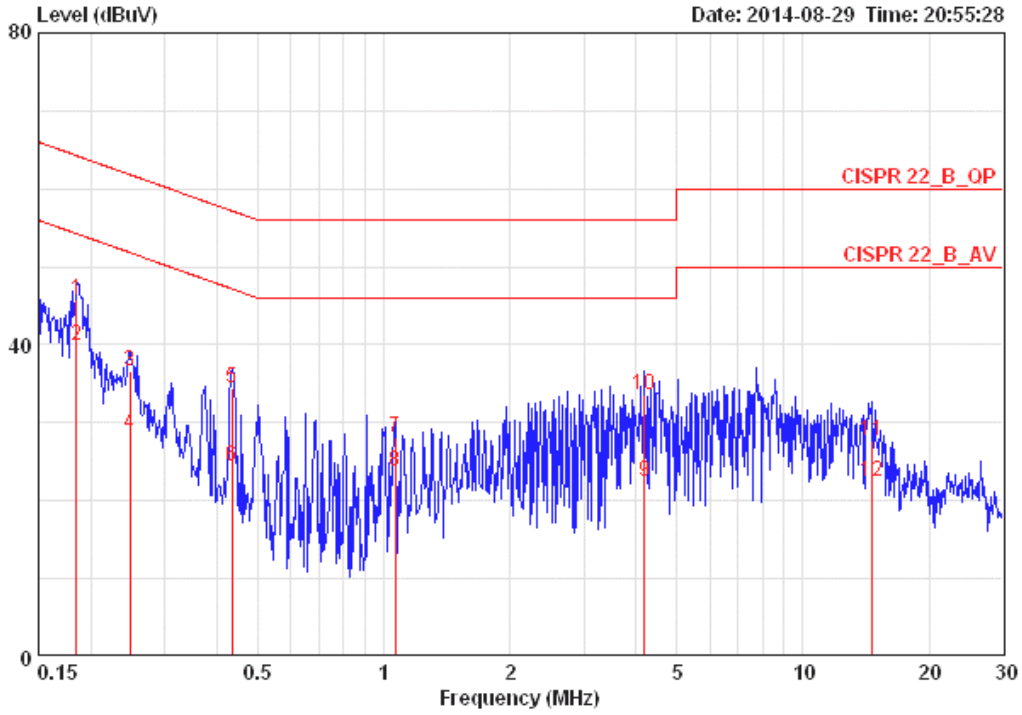
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

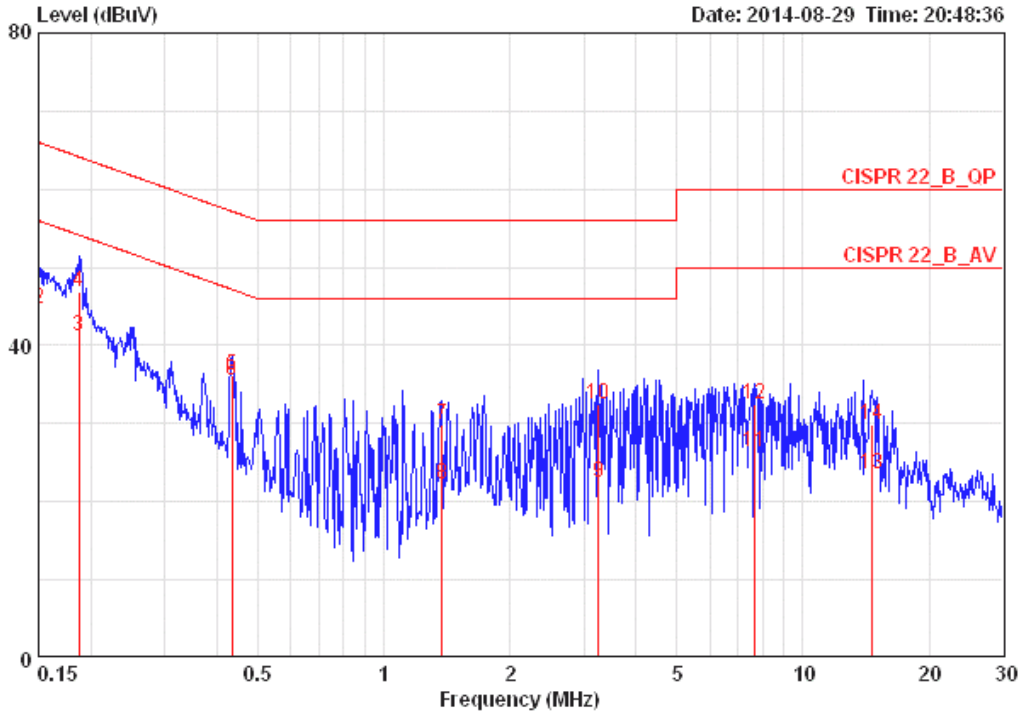
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	24°C	Humidity	54%
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	0.18443	45.86	-18.42	64.28	0.10	45.60	0.16	LINE	QP
2	0.18443	39.99	-14.29	54.28	0.10	39.73	0.16	LINE	AVERAGE
3	0.24814	36.57	-25.25	61.82	0.10	36.30	0.17	LINE	QP
4	0.24814	28.53	-23.29	51.82	0.10	28.26	0.17	LINE	AVERAGE
5	0.43511	34.33	-22.82	57.15	0.10	34.05	0.18	LINE	QP
6	0.43511	24.50	-22.65	47.15	0.10	24.22	0.18	LINE	AVERAGE
7	1.065	28.09	-27.91	56.00	0.13	27.75	0.20	LINE	QP
8	1.065	23.87	-22.13	46.00	0.13	23.53	0.20	LINE	AVERAGE
9	4.180	22.51	-23.49	46.00	0.22	21.99	0.30	LINE	AVERAGE
10	4.180	33.52	-22.48	56.00	0.22	33.00	0.30	LINE	QP
11	14.594	27.72	-32.28	60.00	0.42	26.86	0.44	LINE	QP
12	14.594	22.37	-27.63	50.00	0.42	21.51	0.44	LINE	AVERAGE

Temperature	24°C	Humidity	54%
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	0.15000	35.56	-20.44	56.00	0.09	35.31	0.16	NEUTRAL	AVERAGE
2	0.15000	44.67	-21.33	66.00	0.09	44.42	0.16	NEUTRAL	QP
3	0.18739	41.14	-13.01	54.15	0.09	40.89	0.16	NEUTRAL	AVERAGE
4	0.18739	46.82	-17.33	64.15	0.09	46.57	0.16	NEUTRAL	QP
5	0.43511	36.08	-21.07	57.15	0.09	35.81	0.18	NEUTRAL	QP
6	0.43511	35.53	-11.62	47.15	0.09	35.26	0.18	NEUTRAL	AVERAGE
7	1.374	29.92	-26.08	56.00	0.13	29.57	0.22	NEUTRAL	QP
8	1.374	22.17	-23.83	46.00	0.13	21.82	0.22	NEUTRAL	AVERAGE
9	3.258	22.48	-23.52	46.00	0.17	22.02	0.28	NEUTRAL	AVERAGE
10	3.258	32.57	-23.43	56.00	0.17	32.11	0.28	NEUTRAL	QP
11	7.687	26.44	-23.56	50.00	0.28	25.80	0.36	NEUTRAL	AVERAGE
12	7.687	32.37	-27.63	60.00	0.28	31.73	0.36	NEUTRAL	QP
13	14.672	23.59	-26.41	50.00	0.39	22.76	0.44	NEUTRAL	AVERAGE
14	14.672	29.97	-30.03	60.00	0.39	29.14	0.44	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 4.5.4.

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	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11ac

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	21.28	17.92
40	5200 MHz	21.12	18.08
48	5240 MHz	21.12	17.92

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	39.68	36.48
46	5230 MHz	39.36	36.48

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

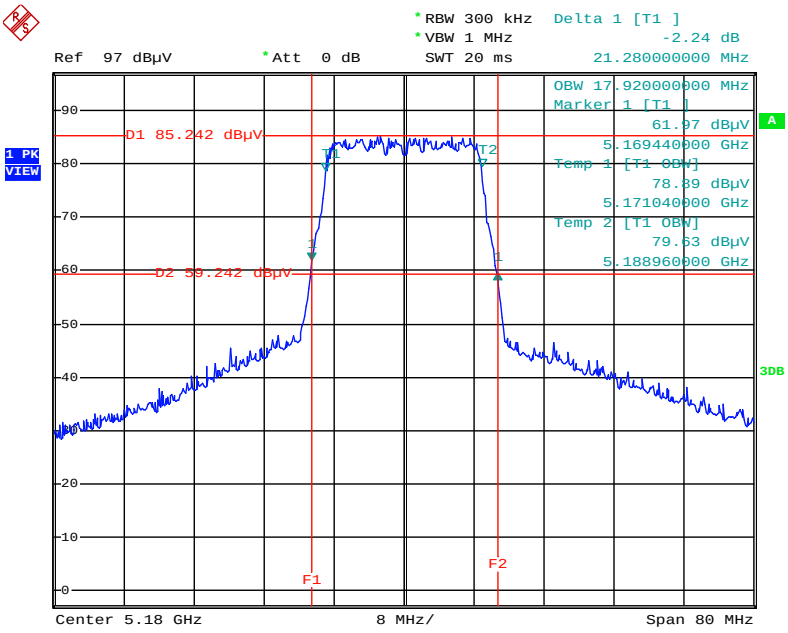
Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
42	5210 MHz	81.28	76.16

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11a

Configuration IEEE 802.11a / Ant. 1

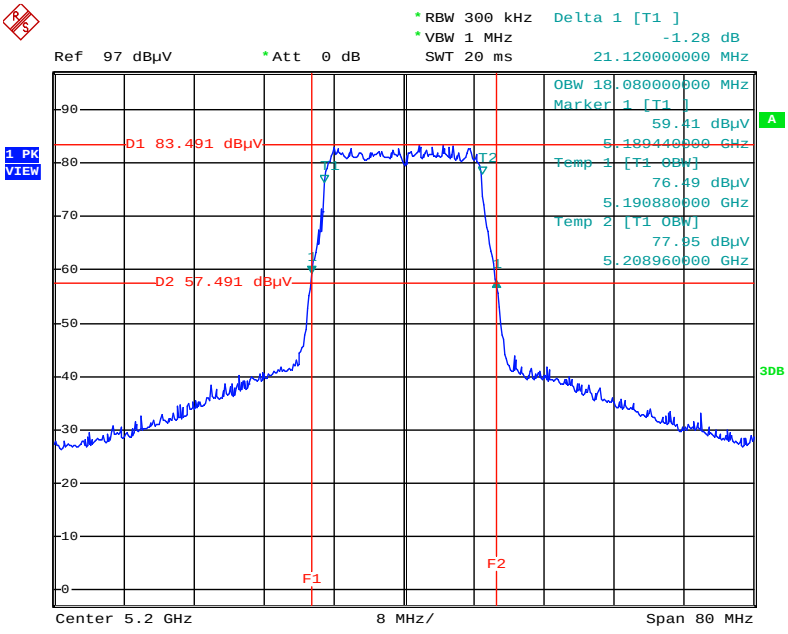
Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	21.12	17.12
40	5200 MHz	28.80	17.76
48	5240 MHz	29.12	17.76

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 + Ant. 3 / 5180 MHz



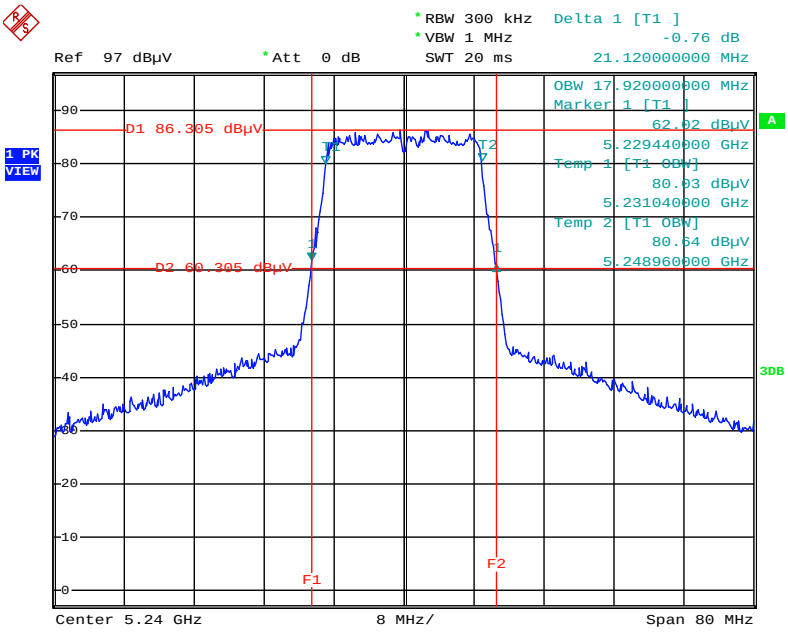
Date: 8.SEP.2014 12:20:18

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 + Ant. 3 / 5200 MHz



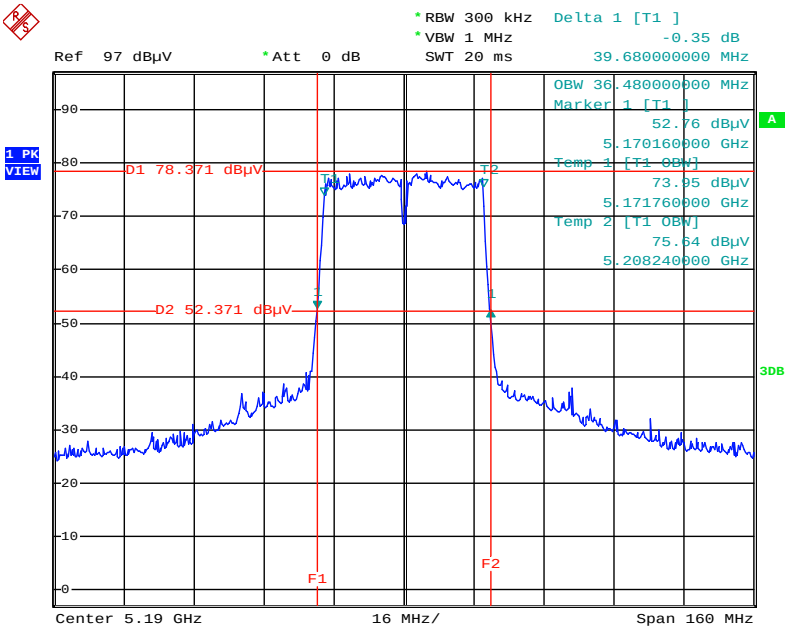
Date: 8.SEP.2014 12:20:49

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 + Ant. 3 / 5240 MHz



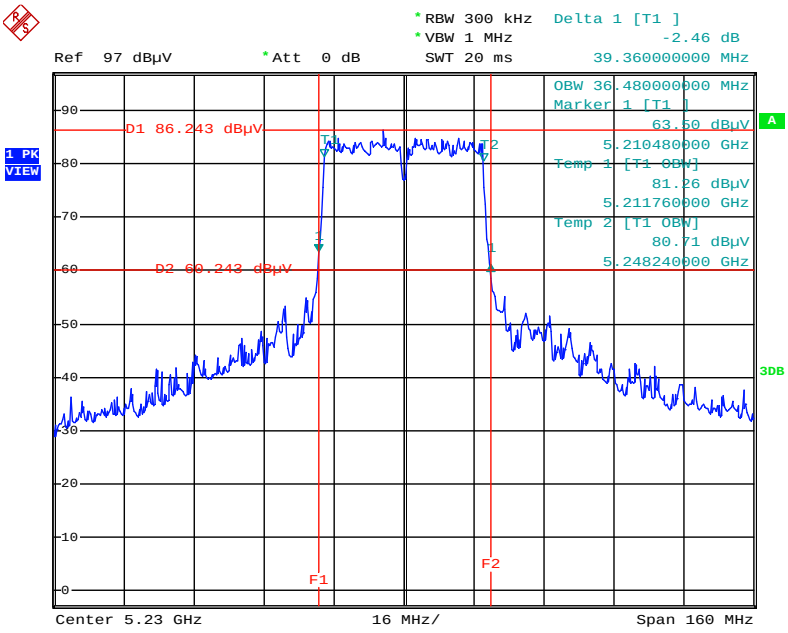
Date: 8.SEP.2014 12:23:59

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 + Ant. 3 / 5190 MHz



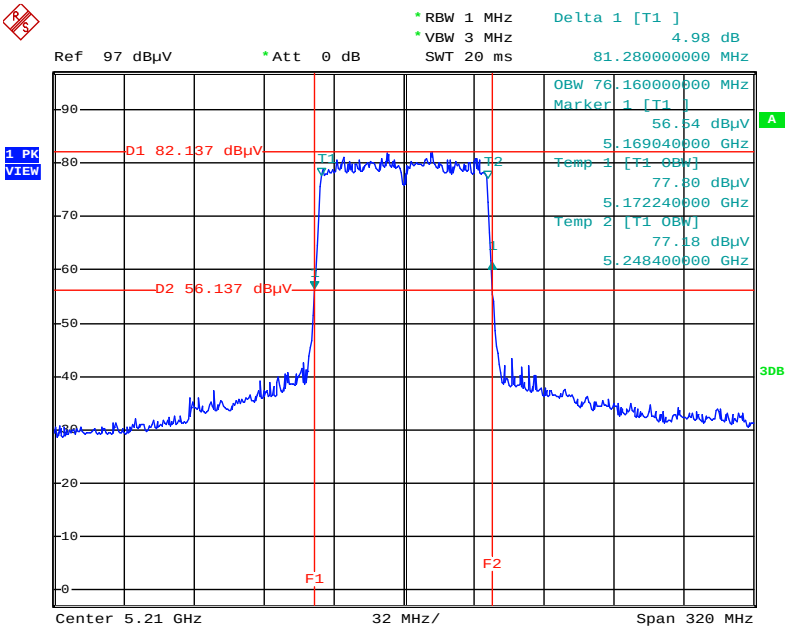
Date: 8.SEP.2014 12:22:45

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 + Ant. 3 / 5230 MHz



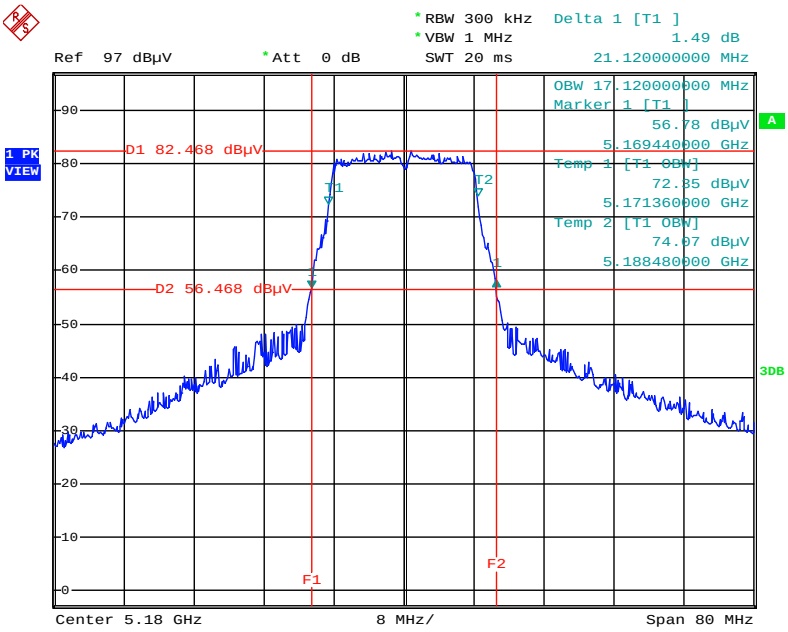
Date: 8.SEP.2014 12:22:59

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 + Ant. 3 / 5210 MHz



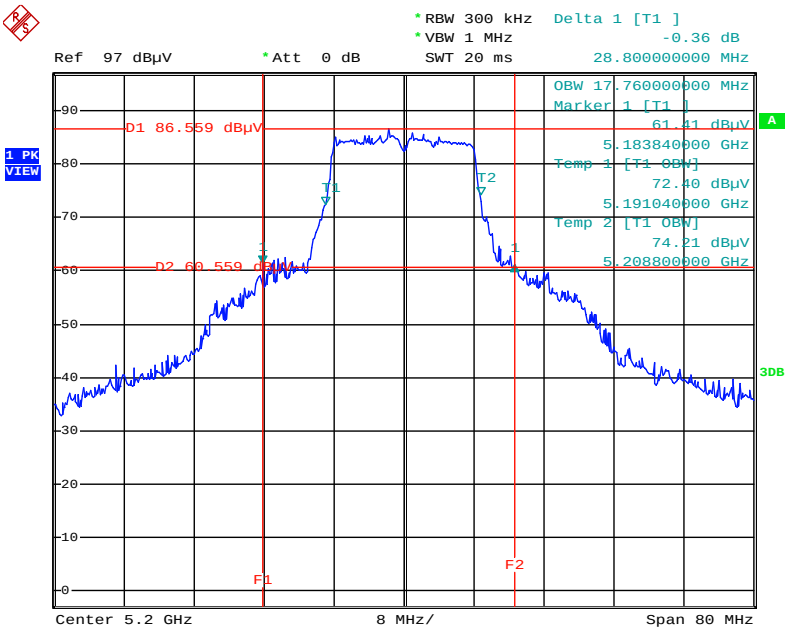
Date: 8.SEP.2014 12:26:01

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



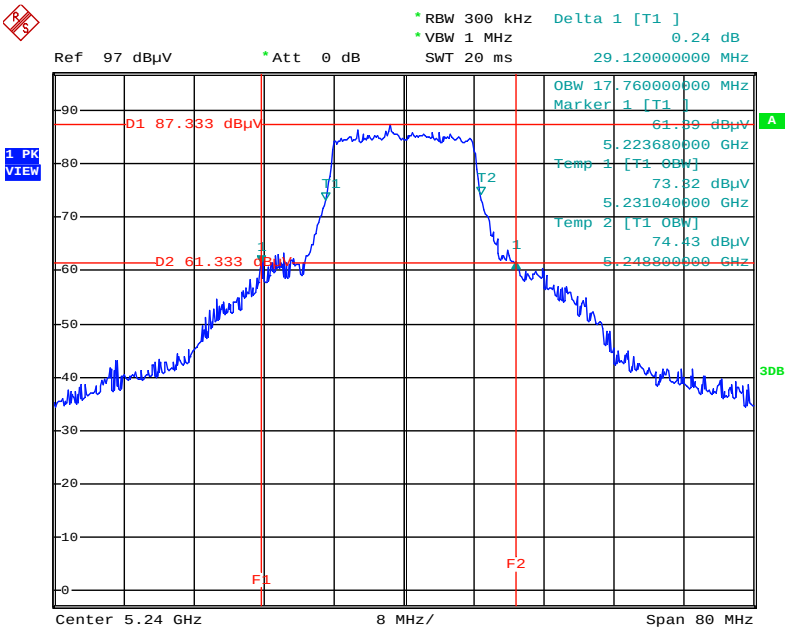
Date: 8.SEP.2014 10:36:05

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



Date: 8.SEP.2014 10:35:30

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



Date: 8.SEP.2014 10:34:38

4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

For the band 5.15~5.25 GHz, 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.

4.3.2. Measuring Instruments and Setting

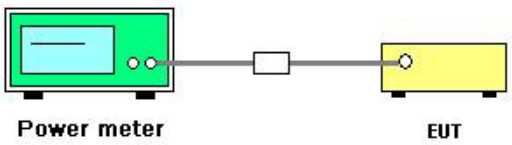
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11ac
Test Date	Sep. 08, 2014		

Configuration IEEE 802.11ac MCS0/Nss1 VHT20

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Ant. 3	Total		
36	5180 MHz	17.36	17.54	17.98	22.41	28.13	Complies
40	5200 MHz	14.62	15.29	15.98	20.10	28.13	Complies
48	5240 MHz	17.32	17.85	18.58	22.72	28.13	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.87dBi>6dBi, so limit=30 – (7.87 – 6)=28.13dBm.

Configuration IEEE 802.11ac MCS0/Nss1 VHT40

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Ant. 3	Total		
38	5190 MHz	12.88	13.49	13.99	18.25	28.13	Complies
46	5230 MHz	19.81	19.59	20.31	24.69	28.13	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.87dBi>6dBi, so limit=30 – (7.87 – 6)=28.13dBm.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Ant. 3	Total		
42	5210 MHz	12.82	13.51	13.79	18.16	28.13	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.87dBi>6dBi, so limit=30 – (7.87 – 6)=28.13dBm.

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11a
Test Date	Sep. 08, 2014		

Configuration IEEE 802.11a / Ant. 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	20.24	30.00	Complies
40	5200 MHz	24.18	30.00	Complies
48	5240 MHz	24.29	30.00	Complies

4.4. Power Spectral Density Measurement

4.4.1. Limit

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The following table is power spectral density limits and decrease power density limit rule refer to section 4.3.1.

Frequency Range	Power Spectral Density limit (dBm/MHz)
5.15~5.25 GHz	17

4.4.2. Measuring Instruments and Setting

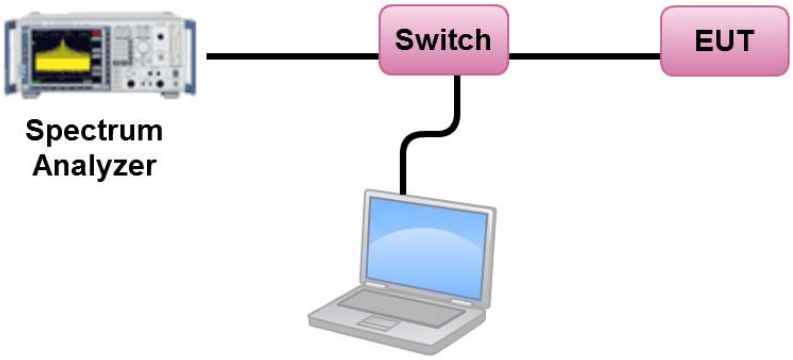
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11ac
Test Date	Sep. 08, 2014		

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	9.08	15.13	Complies
40	5200 MHz	6.94	15.13	Complies
48	5240 MHz	9.55	15.13	Complies

Note: Directional gain= $10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ =7.87dBi>6dBi, so limit=17 – (7.87 – 6)=15.13dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	1.96	15.13	Complies
46	5230 MHz	8.33	15.13	Complies

Note: Directional gain= $10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ =7.87dBi>6dBi, so limit=17 – (7.87 – 6)=15.13dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-1.20	15.13	Complies

Note: Directional gain= $10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ =7.87dBi>6dBi, so limit=17 – (7.87 – 6)=15.13dBm/MHz.

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11a
Test Date	Sep. 08, 2014		

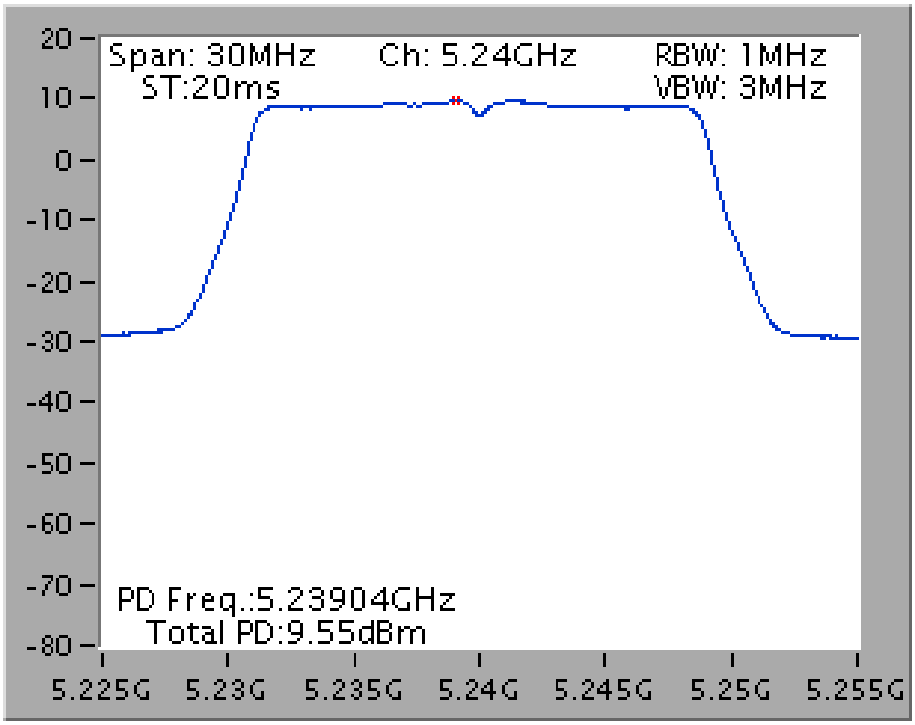
Configuration IEEE 802.11a / Ant. 1

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	7.05	17.00	Complies
40	5200 MHz	10.94	17.00	Complies
48	5240 MHz	11.15	17.00	Complies

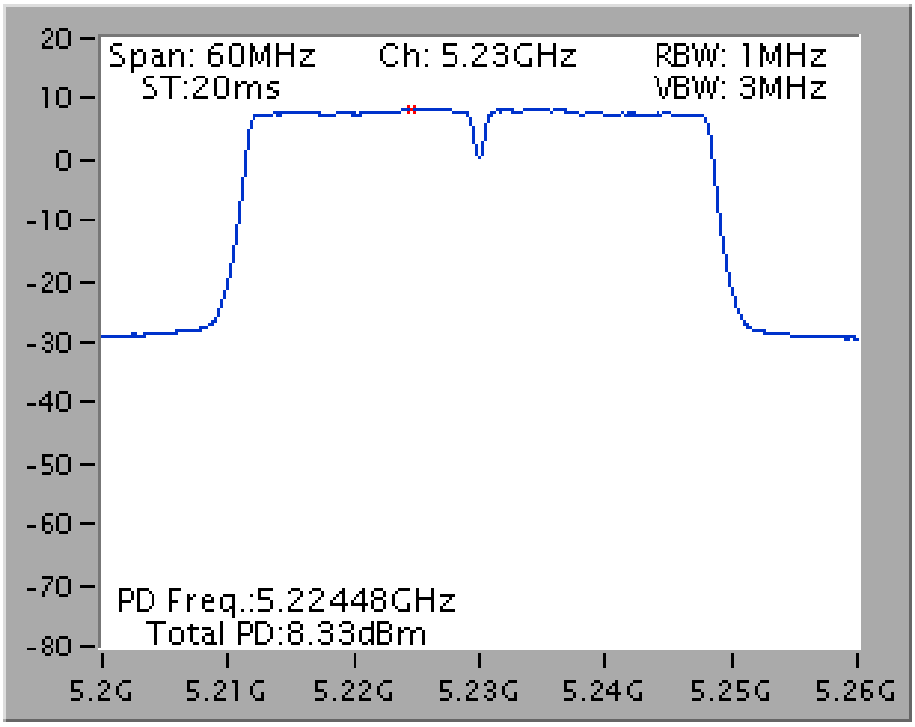
Note: All the test values were listed in the report.

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

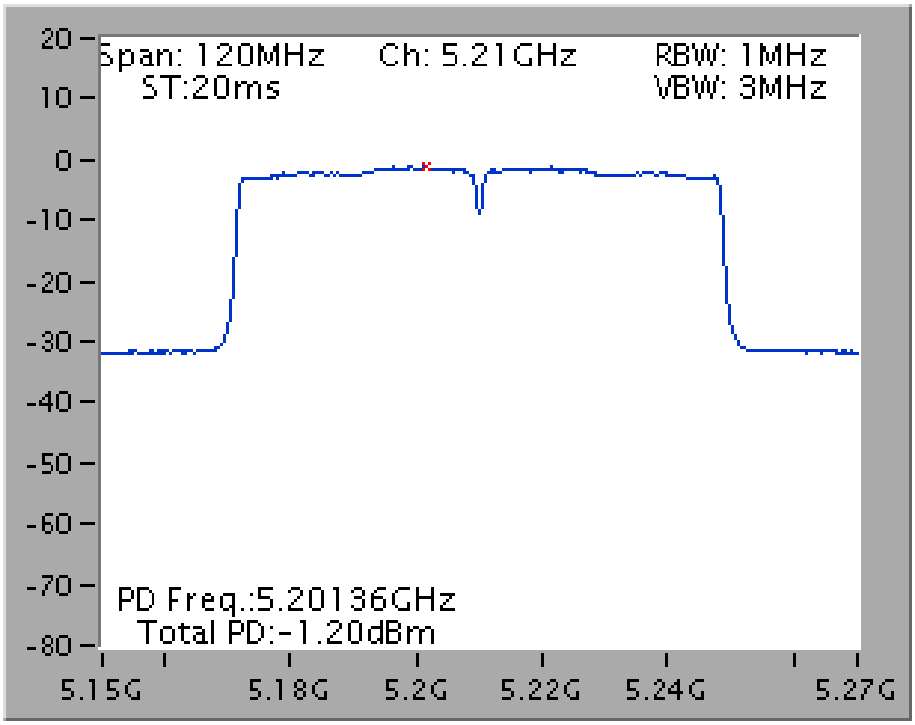
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 + Ant. 3 / 5240 MHz



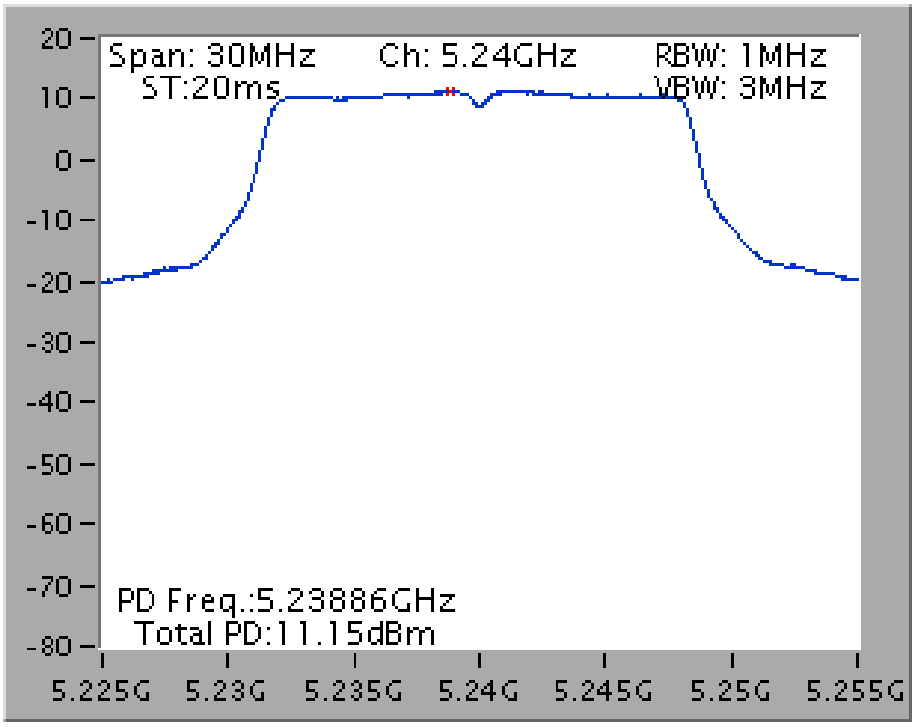
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 + Ant. 3 / 5230 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 + Ant. 3 / 5210 MHz



Power Density Plot on Configuration IEEE 802.11a / Ant. 1 / 5240 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

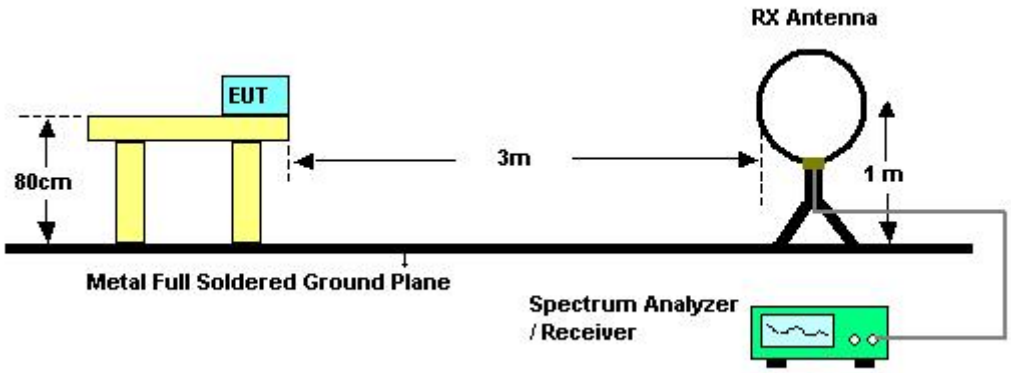
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

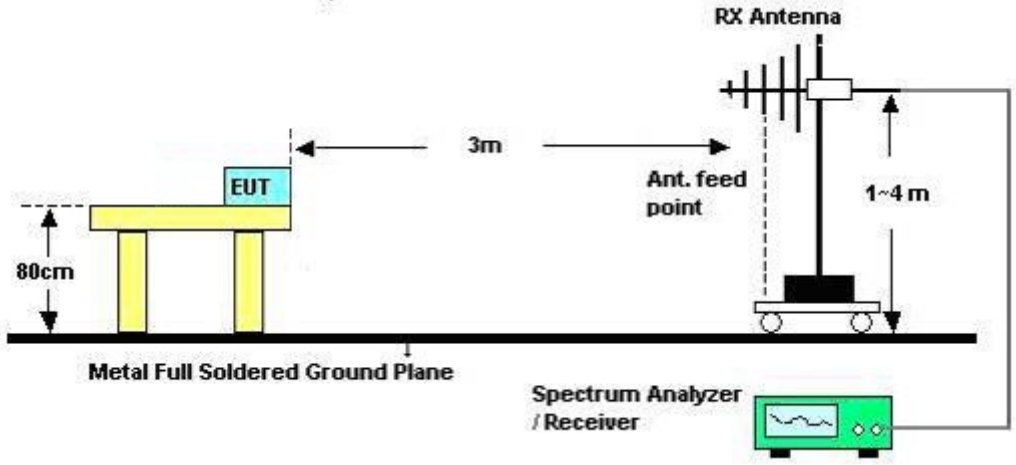
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

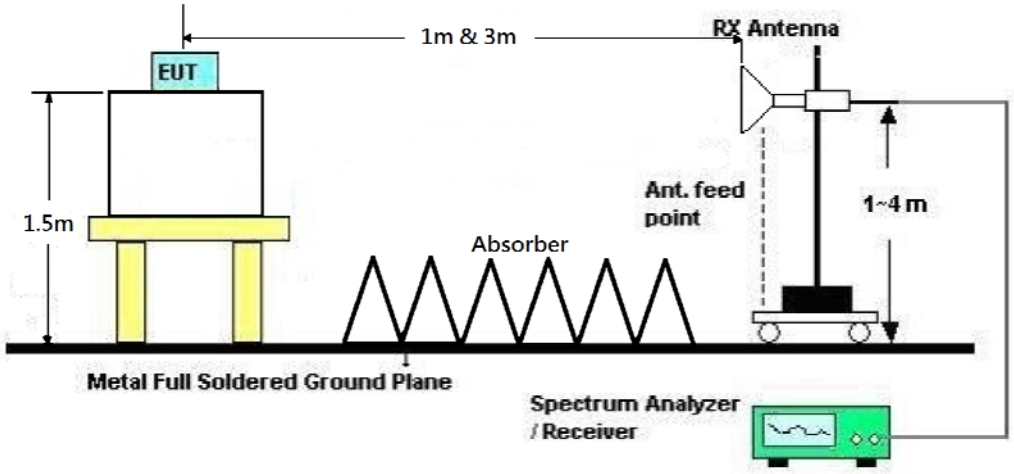
For Radiated Emissions: 9kHz ~30MHz



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 function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

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	Serway Li	Configurations	Normal Link
Test Date	Sep. 10, 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.

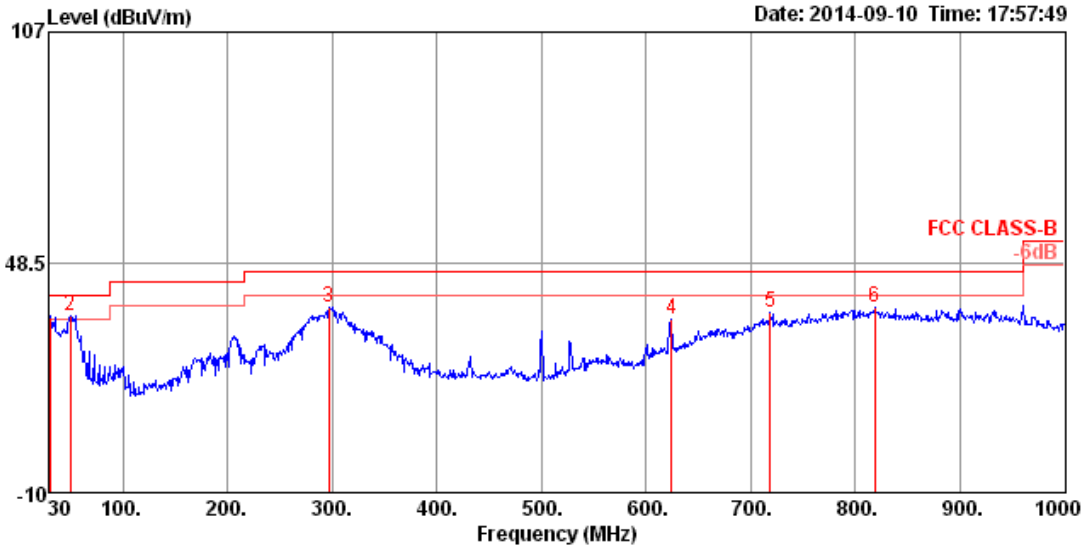
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

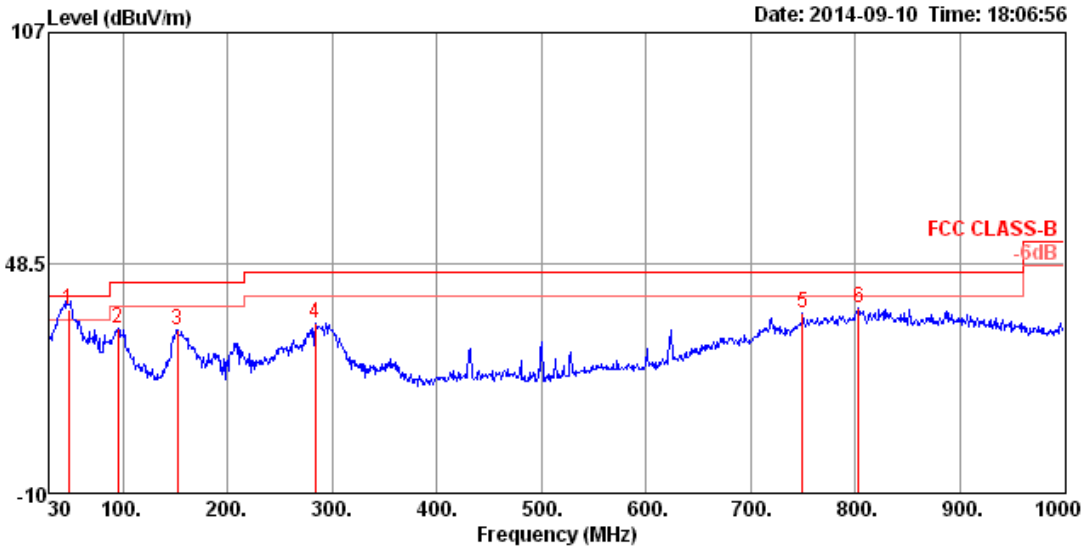
Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	Normal Link

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	30.00	34.45	40.00	-5.55	47.64	0.64	17.98	31.81	150	354	HORIZONTAL	Peak
2	49.40	34.87	40.00	-5.13	57.95	0.83	7.88	31.79	150	0	HORIZONTAL	Peak
3	296.75	37.06	46.00	-8.94	53.52	2.11	12.89	31.46	100	170	HORIZONTAL	Peak
4	624.61	34.01	46.00	-11.99	43.62	3.18	18.61	31.40	150	148	HORIZONTAL	Peak
5	718.70	35.74	46.00	-10.26	44.27	3.45	19.26	31.24	125	109	HORIZONTAL	Peak
6	818.61	36.92	46.00	-9.08	44.13	3.72	20.27	31.20	100	155	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	48.30	36.84	40.00	-3.16	59.50	0.82	8.32	31.80	125	77	VERTICAL	QP
2	94.99	32.08	43.50	-11.42	52.91	1.16	9.58	31.57	125	37	VERTICAL	Peak
3	152.22	31.65	43.50	-11.85	51.87	1.48	9.86	31.56	100	109	VERTICAL	Peak
4	284.14	33.01	46.00	-12.99	49.92	2.05	12.58	31.54	200	206	VERTICAL	Peak
5	749.74	35.75	46.00	-10.25	43.90	3.53	19.69	31.37	100	222	VERTICAL	Peak
6	803.09	37.11	46.00	-8.89	44.81	3.68	19.88	31.26	100	23	VERTICAL	Peak

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)

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Sep. 05, 2014		

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	15534.90	51.32	74.00	-22.68	41.91	6.13	38.45	35.17	Peak	163	207	HORIZONTAL
2	15559.00	38.31	54.00	-15.69	28.92	6.13	38.43	35.17	Average	163	207	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	15553.90	38.66	54.00	-15.34	29.27	6.13	38.43	35.17	Average	100	210	VERTICAL
2	15559.00	52.25	74.00	-21.75	42.86	6.13	38.43	35.17	Peak	100	210	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Sep. 05, 2014		

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	15615.60	51.43	74.00	-22.57	42.16	6.13	38.33	35.19	Peak	100	171	HORIZONTAL
2	15624.70	39.20	54.00	-14.80	29.92	6.14	38.33	35.19	Average	100	171	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	15609.50	52.17	74.00	-21.83	42.87	6.13	38.36	35.19	Peak	135	237	VERTICAL
2	15623.30	39.04	54.00	-14.96	29.77	6.13	38.33	35.19	Average	135	237	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Sep. 05, 2014		

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	15706.90	39.28	54.00	-14.72	30.14	6.14	38.21	35.21	Average	100	152	HORIZONTAL
2	15743.50	52.27	74.00	-21.73	43.19	6.14	38.16	35.22	Peak	100	152	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	15702.40	52.58	74.00	-21.42	43.44	6.14	38.21	35.21	Peak	161	246	VERTICAL
2	15735.90	39.34	54.00	-14.66	30.26	6.14	38.16	35.22	Average	161	246	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Sep. 05, 2014		

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	15557.70	52.12	74.00	-21.88	42.73	6.13	38.43	35.17	Peak	100	117	HORIZONTAL
2	15569.20	38.72	54.00	-15.28	29.36	6.13	38.40	35.17	Average	100	117	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	15561.10	51.37	74.00	-22.63	42.01	6.13	38.40	35.17	Peak	208	163	VERTICAL
2	15566.40	38.71	54.00	-15.29	29.35	6.13	38.40	35.17	Average	208	163	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Sep. 05, 2014		

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	15669.10	38.97	54.00	-15.03	29.77	6.14	38.26	35.20	Average	126	184	HORIZONTAL
2	15704.50	51.71	74.00	-22.29	42.57	6.14	38.21	35.21	Peak	126	184	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	15669.20	50.11	74.00	-23.89	40.91	6.14	38.26	35.20	Peak	166	270	VERTICAL
2	15702.20	38.99	54.00	-15.01	29.85	6.14	38.21	35.21	Average	166	270	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Sep. 05, 2014		

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	15619.20	52.12	74.00	-21.88	42.85	6.13	38.33	35.19	Peak	100	319	HORIZONTAL
2	15627.80	38.73	54.00	-15.27	29.45	6.14	38.33	35.19	Average	100	319	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	15627.90	38.81	54.00	-15.19	29.53	6.14	38.33	35.19	Average	176	95	VERTICAL
2	15630.90	51.51	74.00	-22.49	42.25	6.14	38.31	35.19	Peak	176	95	VERTICAL

Temperature	26℃	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11a CH 36 / Ant. 1
Test Date	Aug. 25, 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	15537.52	57.70	74.00	-16.30	43.06	10.37	38.78	34.51	100	261	HORIZONTAL	Peak
2	15538.37	48.21	54.00	-5.79	33.57	10.37	38.78	34.51	100	261	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	15544.16	47.41	54.00	-6.59	32.78	10.37	38.78	34.52	100	322	VERTICAL	Average
2	15544.77	57.39	74.00	-16.61	42.76	10.37	38.78	34.52	100	322	VERTICAL	Peak

Temperature	26℃	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11a CH 40 / Ant. 1
Test Date	Aug. 25, 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	15596.75	47.67	54.00	-6.33	33.13	10.36	38.77	34.59	100	226	HORIZONTAL	Average
2	15602.43	58.28	74.00	-15.72	43.76	10.36	38.75	34.59	100	226	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	15597.49	57.67	74.00	-16.33	43.13	10.36	38.77	34.59	100	278	VERTICAL	Peak
2	15600.71	48.75	54.00	-5.25	34.23	10.36	38.75	34.59	100	278	VERTICAL	Average

Temperature	26℃	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11a CH 48 / Ant. 1
Test Date	Aug. 25, 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	15715.63	47.83	54.00	-6.17	33.48	10.36	38.72	34.73	100	132	HORIZONTAL	Average
2	15723.09	58.47	74.00	-15.53	44.13	10.36	38.72	34.74	100	132	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	15721.82	58.56	74.00	-15.44	44.22	10.36	38.72	34.74	100	250	VERTICAL	Peak
2	15724.60	47.81	54.00	-6.19	33.48	10.36	38.72	34.75	100	250	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 function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	26°C	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Aug. 29, 2014		

Channel 36

	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	5149.00	65.39	74.00	-8.61	60.45	6.13	34.01	35.20	Peak	122	279	VERTICAL
2	5150.00	52.64	54.00	-1.36	47.70	6.13	34.01	35.20	Average	122	279	VERTICAL
3	5174.00	115.77			110.78	6.15	34.04	35.20	Peak	122	279	VERTICAL
4	5188.00	107.67			102.64	6.15	34.08	35.20	Average	122	279	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	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5202.00	114.77			109.70	6.16	34.11	35.20	Peak	109	26	HORIZONTAL
2	5208.00	104.62			99.54	6.17	34.11	35.20	Average	109	26	HORIZONTAL
3	5359.00	63.07	74.00	-10.93	57.59	6.26	34.42	35.20	Peak	109	26	HORIZONTAL
4	5368.00	52.98	54.00	-1.02	47.45	6.27	34.46	35.20	Average	109	26	HORIZONTAL

Item 1, 2 are the fundamental frequency at 5200 MHz.

Channel 48

	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	5237.00	107.77			102.61	6.18	34.18	35.20	Average	107	287	VERTICAL
2	5237.00	117.35			112.19	6.18	34.18	35.20	Peak	107	287	VERTICAL
3	5392.00	52.85	54.00	-1.15	47.28	6.28	34.49	35.20	Average	107	287	VERTICAL
4	5394.00	62.36	74.00	-11.64	56.79	6.28	34.49	35.20	Peak	107	287	VERTICAL

Item 1, 2 are the fundamental frequency at 5240 MHz.

Temperature	26℃	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Aug. 29, 2014		

Channel 38

	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	5148.00	65.39	74.00	-8.61	60.45	6.13	34.01	35.20	Peak	110	290	VERTICAL
2	5150.00	52.52	54.00	-1.48	47.58	6.13	34.01	35.20	Average	110	290	VERTICAL
3	5183.00	111.68			106.65	6.15	34.08	35.20	Peak	110	290	VERTICAL
4	5188.00	101.14			96.11	6.15	34.08	35.20	Average	110	290	VERTICAL

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	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5149.00	51.90	54.00	-2.10	46.96	6.13	34.01	35.20	Average	109	292	VERTICAL
2	5149.00	61.98	74.00	-12.02	57.04	6.13	34.01	35.20	Peak	109	292	VERTICAL
3	5235.00	108.26			103.10	6.18	34.18	35.20	Average	109	292	VERTICAL
4	5238.00	117.40			112.24	6.18	34.18	35.20	Peak	109	292	VERTICAL
5	5377.00	52.80	54.00	-1.20	47.27	6.27	34.46	35.20	Average	109	292	VERTICAL
6	5377.00	64.63	74.00	-9.37	59.10	6.27	34.46	35.20	Peak	109	292	VERTICAL

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

Temperature	26℃	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Ant. 1 + Ant. 2 + Ant. 3
Test Date	Aug. 29, 2014		

Channel 42

	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	5149.00	63.18	74.00	-10.82	58.24	6.13	34.01	35.20	Peak	119	287	VERTICAL
2	5150.00	52.43	54.00	-1.57	47.49	6.13	34.01	35.20	Average	119	287	VERTICAL
3	5187.00	98.58			93.55	6.15	34.08	35.20	Average	119	287	VERTICAL
4	5198.00	107.63			102.56	6.16	34.11	35.20	Peak	119	287	VERTICAL
5	5353.00	58.94	74.00	-15.06	53.46	6.26	34.42	35.20	Peak	119	287	VERTICAL
6	5355.00	47.83	54.00	-6.17	42.35	6.26	34.42	35.20	Average	119	287	VERTICAL

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

Temperature	26℃	Humidity	68%
Test Engineer	Serway Li	Configurations	IEEE 802.11a CH 36, 40, 48 / Ant. 1
Test Date	Aug. 25, 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	5150.00	52.99	54.00	-1.01	49.39	5.99	33.02	35.41	100	277	VERTICAL	Average
2	5150.00	62.62	74.00	-11.38	59.02	5.99	33.02	35.41	100	277	VERTICAL	Peak
3	5175.60	109.91			106.28	6.01	33.04	35.42	100	277	VERTICAL	Peak
4	5178.80	103.27			99.64	6.01	33.04	35.42	100	277	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	5148.80	61.48	74.00	-12.52	57.88	5.99	33.02	35.41	100	294	VERTICAL	Peak
2	5150.00	49.94	54.00	-4.06	46.34	5.99	33.02	35.41	100	294	VERTICAL	Average
3	5198.12	113.88			110.24	6.02	33.05	35.43	100	294	VERTICAL	Peak
4	5198.80	107.79			104.15	6.02	33.05	35.43	100	294	VERTICAL	Average
5	5356.00	61.88	74.00	-12.12	57.80	6.12	33.45	35.49	100	294	VERTICAL	Peak
6	5358.00	53.00	54.00	-1.00	48.92	6.12	33.45	35.49	100	294	VERTICAL	Average

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	5241.20	107.34			103.65	6.05	33.09	35.45	109	292	VERTICAL	Average
2	5241.60	114.19			110.50	6.05	33.09	35.45	109	292	VERTICAL	Peak
3	5392.40	50.42	54.00	-3.58	46.23	6.14	33.55	35.50	109	292	VERTICAL	Average
4	5402.40	60.04	74.00	-13.96	55.80	6.14	33.60	35.50	109	292	VERTICAL	Peak

Item 1, 2 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

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

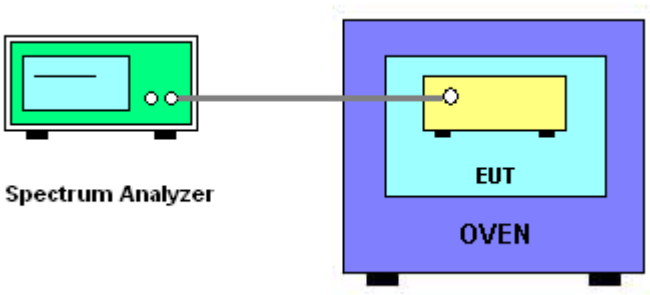
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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 0°C~40°C.

4.7.4. Test Setup Layout



4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

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

4.7.7. Test Result of Frequency Stability

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Test Date	Sep. 08, 2014

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5200 MHz
126.50	5199.9900
110.00	5199.9904
93.50	5199.9912
Max. Deviation (MHz)	0.0100
Max. Deviation (ppm)	1.92

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	5200 MHz
0	5199.9902
10	5199.9906
20	5199.9904
30	5199.9924
40	5199.9932
Max. Deviation (MHz)	0.0098
Max. Deviation (ppm)	1.88

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	9 kHz ~ 2.75 GHz	Apr. 23, 2014	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150 kHz ~ 100 MHz	Nov. 23, 2013	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 11, 2013	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150 kHz ~ 30 MHz	Dec. 04, 2013	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	1126203	300MHz~40GHz	Sep. 30, 2013	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1210004	300MHz~40GHz	Sep. 30, 2013	Conducted (TH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Oct. 23, 2013	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	CO2000	N/A	1 m - 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	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-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-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%