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FCC RADIO TEST REPORT

Applicant's company	**Buffalo Inc.**
Applicant Address	AKAMONDORI Bldg., 30-20, Ohsu 3-chome, Naka-ku, Nagoya 460-8315 Japan
FCC ID	**FDI000000022**
Manufacturer's company	**Buffalo Inc.**
Manufacturer Address	AKAMONDORI Bldg., 30-20, Ohsu 3-chome, Naka-ku, Nagoya 460-8315 Japan

Product Name	AirStation
Brand Name	Buffalo Inc.
Model No.	WXR-1900DHP, WXR-1900DHPD
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Aug. 15, 2014
Final Test Date	Jul. 05, 2016
Submission Type	Class II Change

Statement

Test result included is for the IEEE 802.11n and IEEE 802.11a/ac of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013**, **47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01r02, KDB662911 D01 v02r01, KDB644545 D03 v01, ET Docket No. 13–49; FCC 16–24.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR481508-08AB	Rev. 01	Initial issue of report	Aug. 01, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	AirStation
Brand Name	:	Buffalo Inc.
Model No.	:	WXR-1900DHP, WXR-1900DHPD
Applicant	:	Buffalo Inc.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Aug. 15, 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**
4.1	15.207	AC Power Line Conducted Emissions	Complies
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies
4.3	15.407(a)	Maximum Conducted Output Power	Complies
4.4	15.407(a)	Power Spectral Density	Complies
4.5	15.407(b)	Radiated Emissions	Complies
4.6	15.407(g)	Frequency Stability	Complies
4.7	15.203	Antenna Requirements	Complies

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n/ac: see the below table
Frequency Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Channel Number	9 for 20MHz bandwidth ; 4 for 40MHz bandwidth 2 for 80MHz bandwidth
Channel Band Width (99%)	**<For Non-Beamforming Mode>** Band 1: IEEE 802.11a: 16.80 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 17.97 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 35.84 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 74.88 MHz **<For Beamforming Mode>** Band 1: IEEE 802.11ac MCS0/Nss1 (VHT20): 9.10 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 5.69 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.16 MHz
Maximum Conducted Output Power	**<For Non-Beamforming Mode>** Band 1: IEEE 802.11a: 22.11 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 22.23 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 22.02 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 17.55 dBm **<For Beamforming Mode>** Band 1: IEEE 802.11ac MCS0/Nss1 (VHT20): 22.02 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 21.80 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 18.03 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 for 802.11n/ac in 5GHz	☐ Without beamforming
Operate Condition	☒ Indoor	☐ Outdoor

Antenna and Band width

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3	MCS 0-23
802.11n (HT40)	3	MCS 0-23
802.11ac (VHT20)	3	MCS 0-9/Nss1-3
802.11ac (VHT40)	3	MCS 0-9/Nss1-3
802.11ac (VHT80)	3	MCS 0-9/Nss1-3

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT 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	Rating
Adapter	APD	WA-36A12FU	Input: 100-240V ~ 50-60Hz 0.9A Max. Output: 12V. 3A
Other			
Cradle*1			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	M.gear	C600-510026-A	Dipole Antenna	Reversed-SMA	2	3
2	M.gear	C600-510026-A	Dipole Antenna	Reversed-SMA	2	3
3	M.gear	C600-510026-A	Dipole Antenna	Reversed-SMA	2	3

Note1: The EUT has three antennas.

For 2.4GHz function:

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

Chain 1, Chain 2 and Chain 3 will transmit/receive the same signal simultaneously.

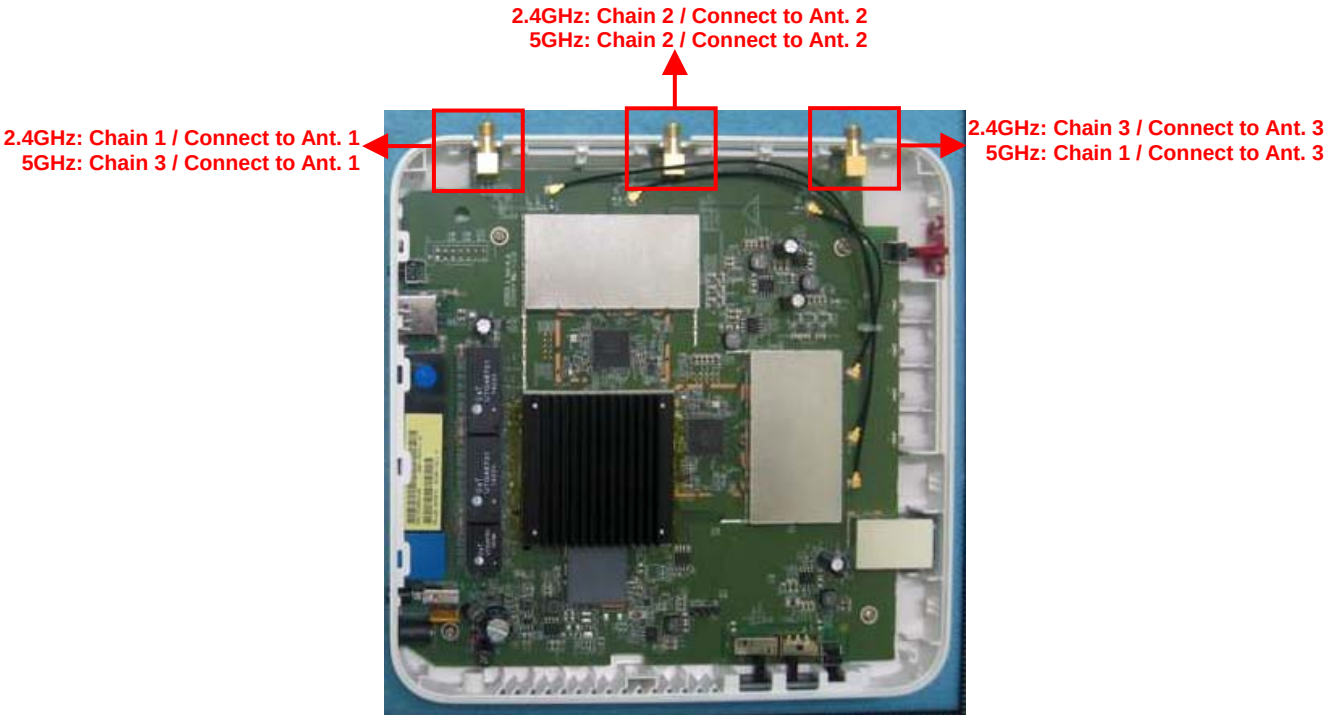
Chain 1, Chain 2 and Chain 3 can be used as transmitting/receiving antennas.

For 5GHz function:

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

Chain 1, Chain 2 and Chain 3 will transmit/receive the same signal simultaneously.

Chain 1, Chain 2 and Chain 3 can be used as transmitting/receiving antennas.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

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

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

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

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
	42	5210 MHz	-	-
5725~5850 MHz Band 4	149	5745 MHz	157	5785 MHz
	151	5755 MHz	159	5795 MHz
	153	5765 MHz	161	5805 MHz
	155	5775 MHz	165	5825 MHz

3.5. Table for Test Modes

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

Test Items	Mode		Data Rate	Channel	Chain
AC Power Conducted Emission	Normal Link		-	-	-
Max. Conducted Output Power	<For Non-Beamforming Mode>				
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
	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
	<For Beamforming Mode>				
	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
Power Spectral Density	<For Non-Beamforming Mode>				
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
	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
	<For Beamforming Mode>				
	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
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	<For Non-Beamforming Mode>				
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
	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
	<For Beamforming Mode>				
	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
Radiated Emission Below 1GHz	Normal Link		-	-	-
Frequency Stability	20 MHz	Band 1	-	40	3

Note 1: The EUT can only be used at Y axis position.

Note 2: VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1: Normal Link - Client mode + 2.4GHz function

Mode 2: Normal Link - Client mode + 5GHz function

Mode 1 generated the worst test result, so it was recorded in this report.

For Radiated Emission test<Below 1GHz>:

Mode 1: Normal Link - Client mode + 2.4GHz function

Mode 2: Normal Link - Client mode + 5GHz function

Mode 2 generated the worst test result, so it was recorded in this report.

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 Designation No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	TW0006	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	TW0006	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR481508-07

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

Modifications	Performance Checking
1. Adding client mode and updating 5GHz band 1.	1. Maximum Conducted Output Power Measurement 2. Power Spectral Density Measurement 3. 26dB Bandwidth and 99% Occupied Bandwidth Measurement 4. Frequency Stability Measurement
2. Adding an adapter (model name: WA-36A12FU).	1. AC Power Line Conducted Emissions 2. Radiated Emissions (Below 1GHz)
3. Adding model name: WXR-1900DHPD.	It's not necessary to re-test.

3.8. Table for Multiple Listing

The EUT has two model names which are identical to each other in all aspects except for the following table:

Model Name	Description
WXR-1900DHP	The different model names served as marketing strategy.
WXR-1900DHPD	

Note: From the above models, model: WXR-1900DHP was selected as representative model for the test and its data was recorded in this report.

3.9. Table for Supporting Units

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
Flash disk	Silicon Power	Touch 835	DoC
Flash disk3.0	Silicon Power	B06	DoC
WLAN AP	D-LINK	DIR860L	KA2IR860LA1

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E6430	DoC
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Flash disk3.0	ADATA	C103	DoC
Flash disk	Silicon power	I-Series	DoC

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

3.10. Table for Parameters of Test Software Setting

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

<For Non-Beamforming Mode>

Test Software Version	Mtool_2.0.1.6		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11a	70	54	68
802.11ac MCS0/Nss1 VHT20	68	58	69
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	59	69	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	50		

<For Beamforming Mode>

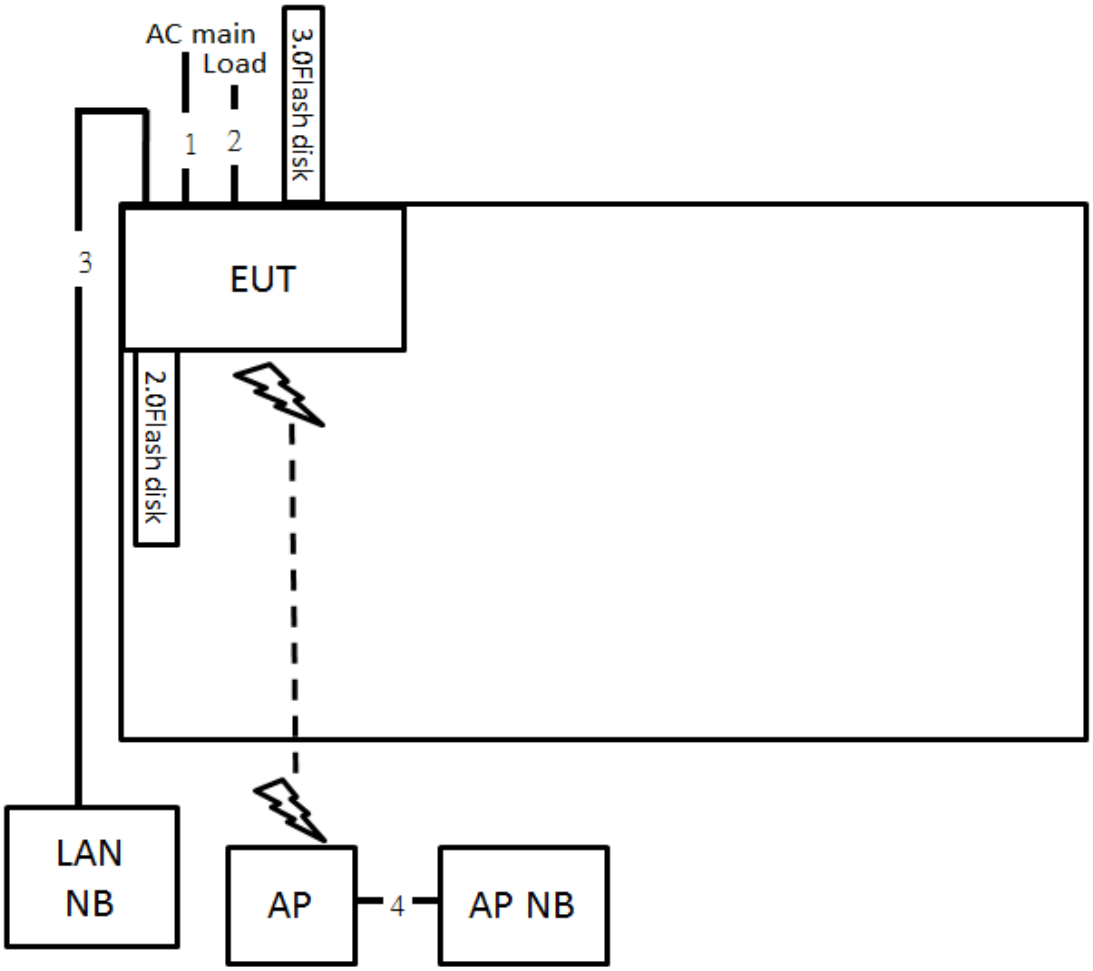
Test Software Version	Mtool_2.0.1.6		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11ac MCS0/Nss1 VHT20	67	39	75
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	58	69	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	54		

3.11. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.12. Test Configurations

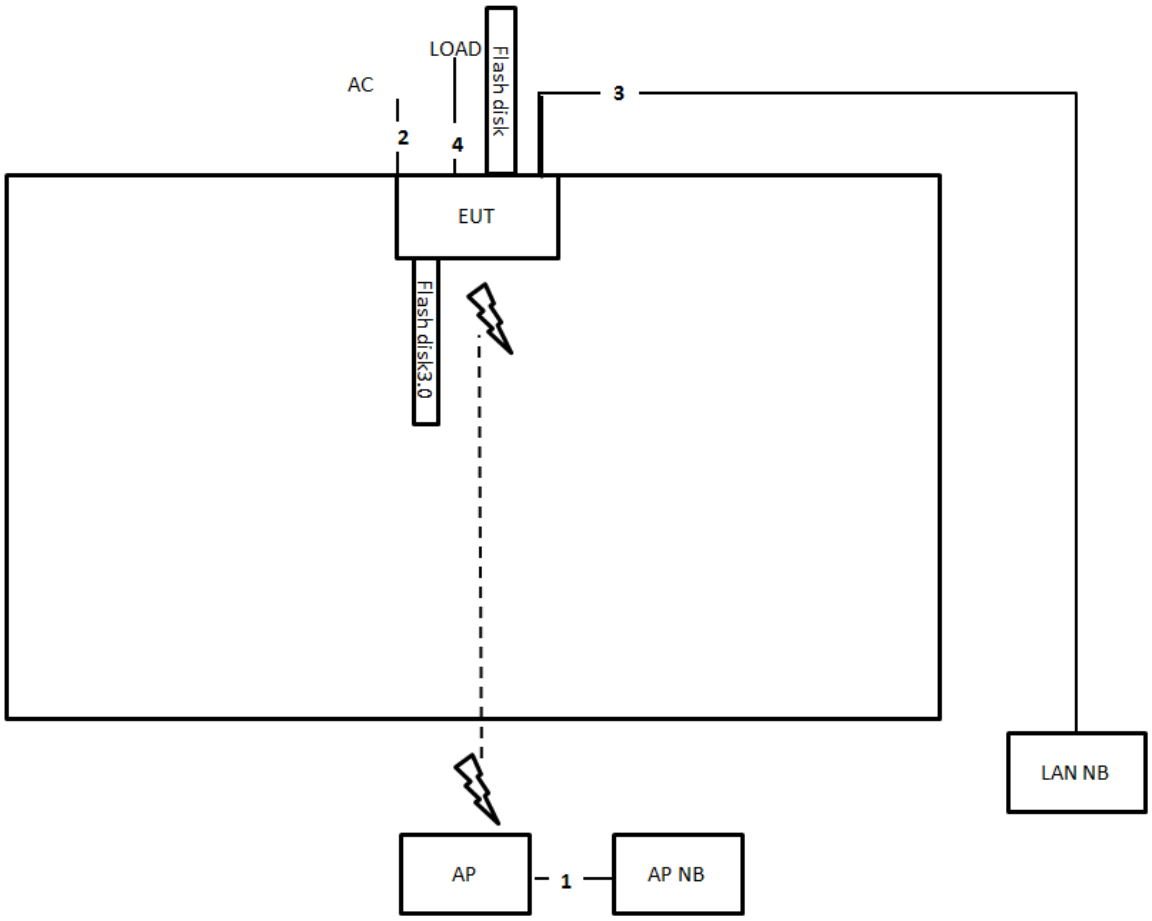
3.12.1. AC Power Line Conduction Emissions Test Configuration



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

3.12.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz ~1GHz



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

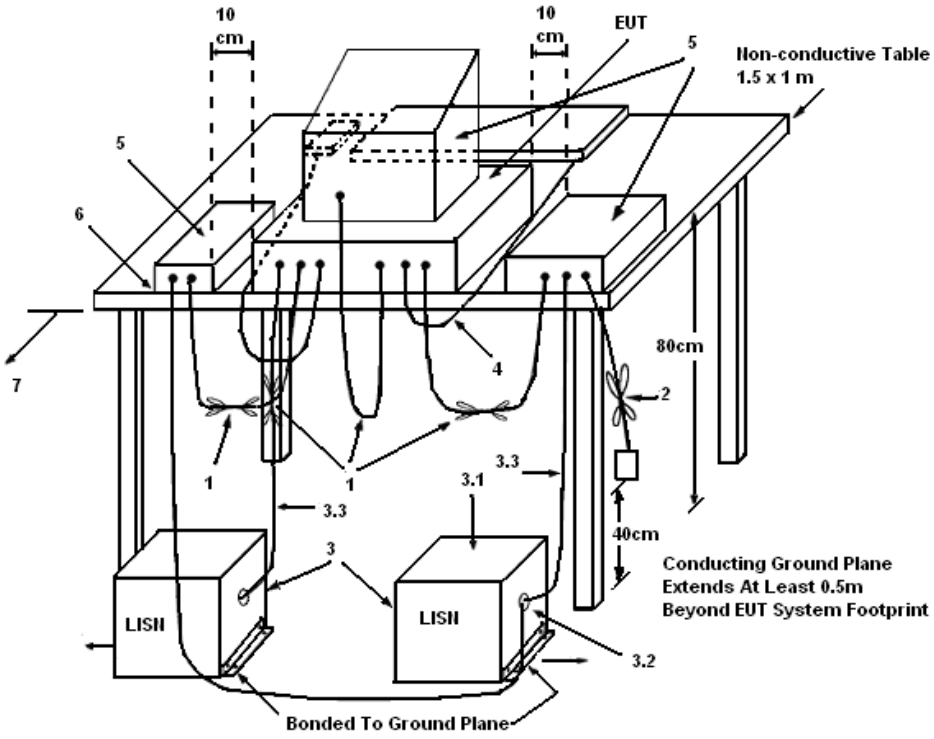
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

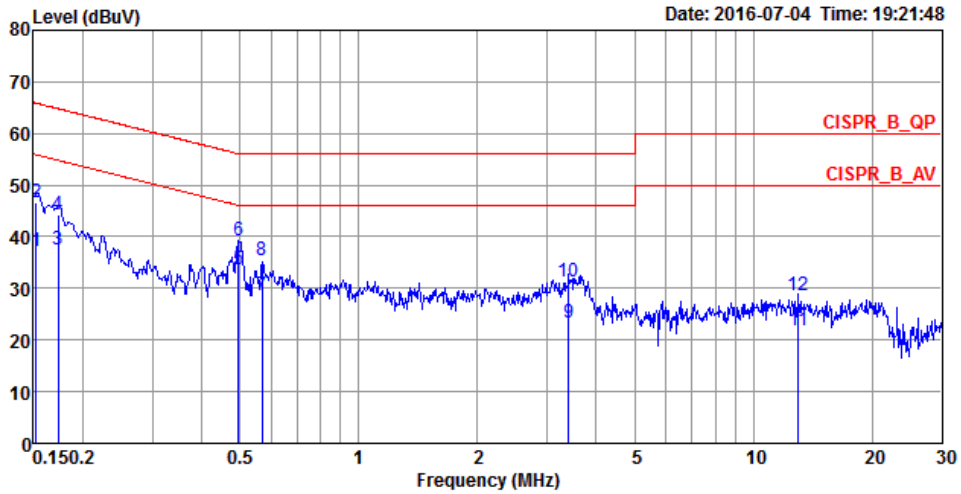
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

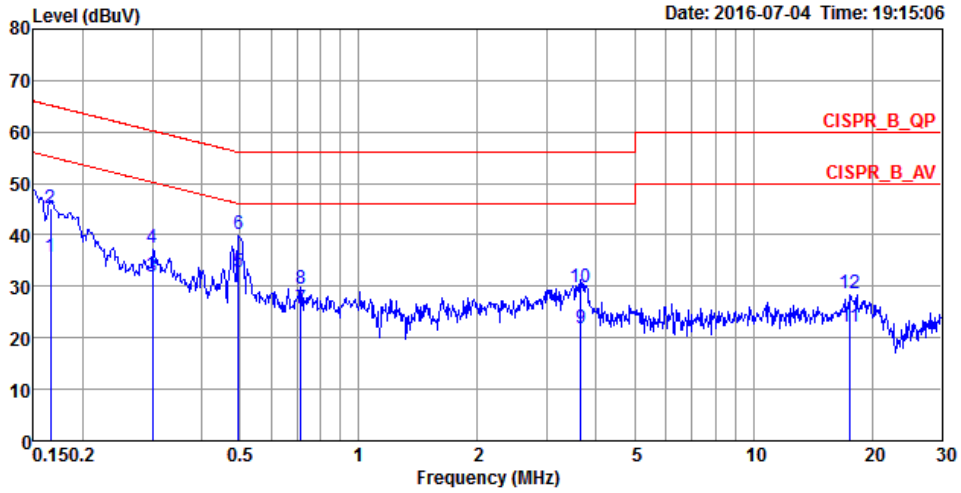
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	22℃	Humidity	63%
Test Engineer	GN Hou	Phase	Line
Configuration	Normal Link	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1524	37.15	-18.72	55.87	26.97	10.02	0.16	LINE	Average
2	0.1524	46.54	-19.33	65.87	36.36	10.02	0.16	LINE	QP
3	0.1731	37.38	-17.43	54.81	27.18	10.02	0.18	LINE	Average
4	0.1731	44.29	-20.52	64.81	34.09	10.02	0.18	LINE	QP
5	0.4967	33.70	-12.35	46.05	23.60	9.92	0.18	LINE	Average
6	0.4967	39.20	-16.85	56.05	29.10	9.92	0.18	LINE	QP
7	0.5701	28.62	-17.38	46.00	18.40	9.93	0.29	LINE	Average
8	0.5701	35.32	-20.68	56.00	25.10	9.93	0.29	LINE	QP
9	3.3994	23.27	-22.73	46.00	13.21	9.98	0.08	LINE	Average
10	3.3994	31.32	-24.68	56.00	21.26	9.98	0.08	LINE	QP
11	12.9885	21.89	-28.11	50.00	11.50	10.20	0.19	LINE	Average
12	12.9885	28.55	-31.45	60.00	18.16	10.20	0.19	LINE	QP

Temperature	22℃	Humidity	63%
Test Engineer	GN Hou	Phase	Neutral
Configuration	Normal Link	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1659	35.85	-19.31	55.16	25.66	10.02	0.17	NEUTRAL	Average
2	0.1659	45.04	-20.12	65.16	34.85	10.02	0.17	NEUTRAL	QP
3	0.3003	31.92	-18.32	50.24	21.91	9.92	0.09	NEUTRAL	Average
4	0.3003	37.43	-22.81	60.24	27.42	9.92	0.09	NEUTRAL	QP
5	0.4967	32.79	-13.26	46.05	22.69	9.92	0.18	NEUTRAL	Average
6	0.4967	40.01	-16.04	56.05	29.91	9.92	0.18	NEUTRAL	QP
7	0.7122	25.77	-20.23	46.00	15.37	9.93	0.47	NEUTRAL	Average
8	0.7122	29.49	-26.51	56.00	19.09	9.93	0.47	NEUTRAL	QP
9	3.6611	21.80	-24.20	46.00	11.72	9.99	0.09	NEUTRAL	Average
10	3.6611	29.68	-26.32	56.00	19.60	9.99	0.09	NEUTRAL	QP
11	17.5678	22.08	-27.92	50.00	11.58	10.27	0.23	NEUTRAL	Average
12	17.5678	28.67	-31.33	60.00	18.17	10.27	0.23	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.

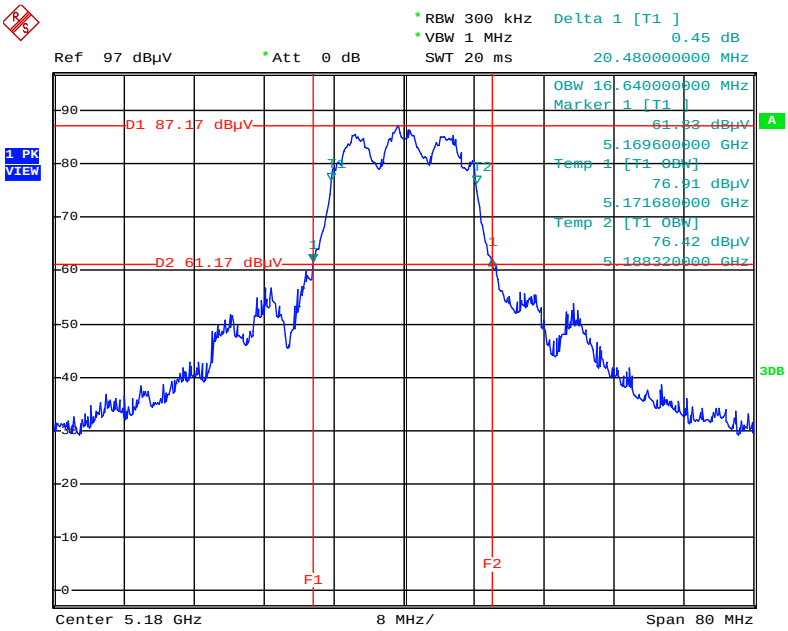
4.2.7. Test Result of 26dB Bandwidth and 99% Occupied Bandwidth

<For Non-Beamforming Mode>

Temperature	22℃	Humidity	54%
Test Engineer	Nick Peng		

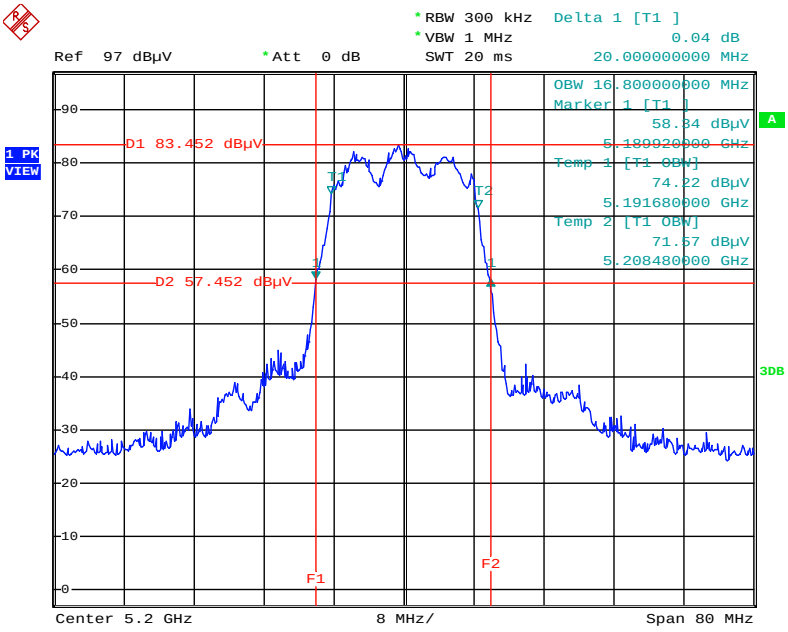
Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	20.48	16.64
	5200 MHz	20.00	16.80
	5240 MHz	19.82	16.32
802.11ac MCS0/Nss1 VHT20	5180 MHz	20.48	17.92
	5200 MHz	19.84	17.92
	5240 MHz	20.17	17.97
802.11ac MCS0/Nss1 VHT40	5190 MHz	38.40	35.84
	5230 MHz	38.40	35.84
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.28	74.88

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 / 5180 MHz



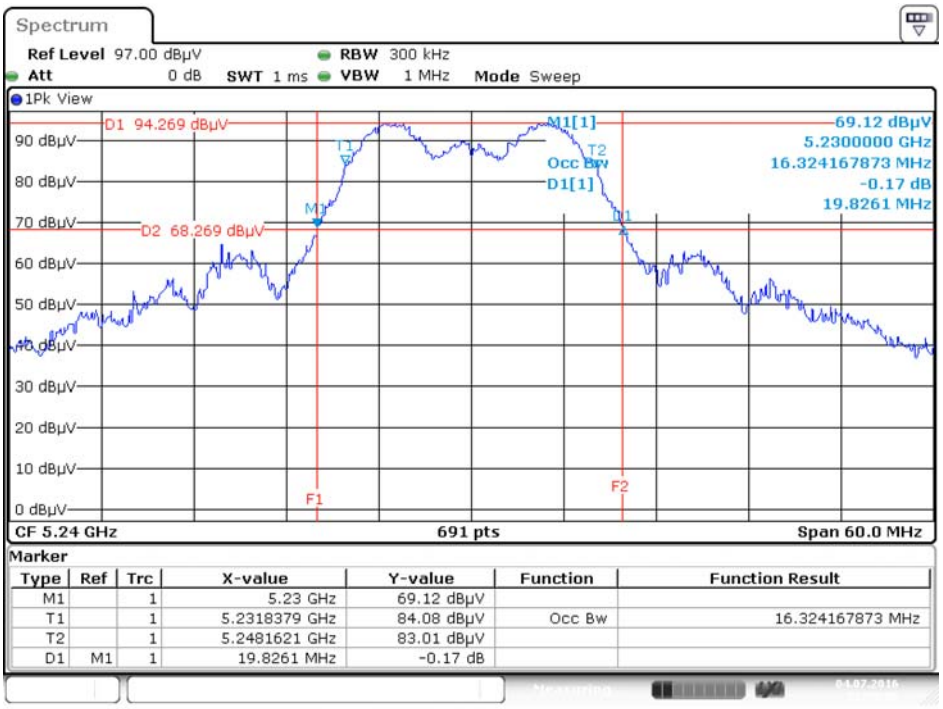
Date: 24.SEP.2014 17:11:12

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 / 5200 MHz



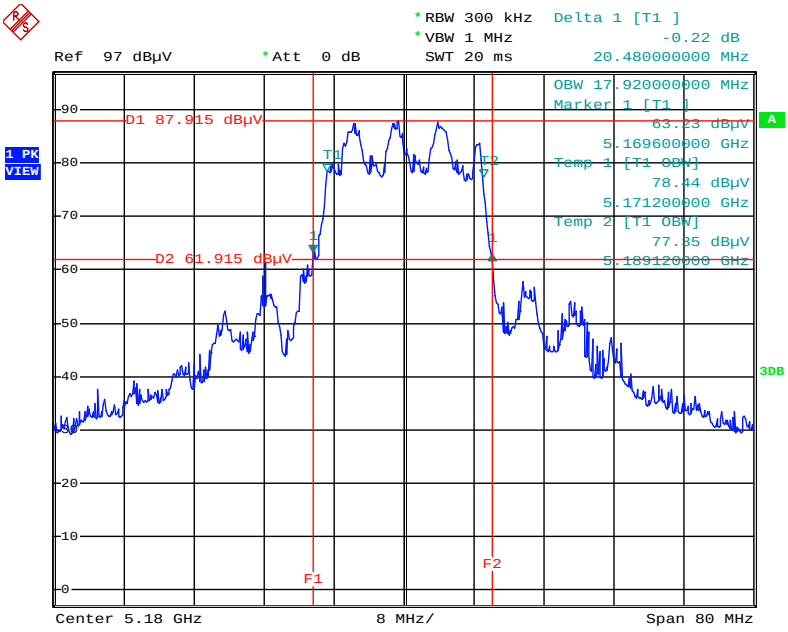
Date: 24.SEP.2014 17:11:53

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



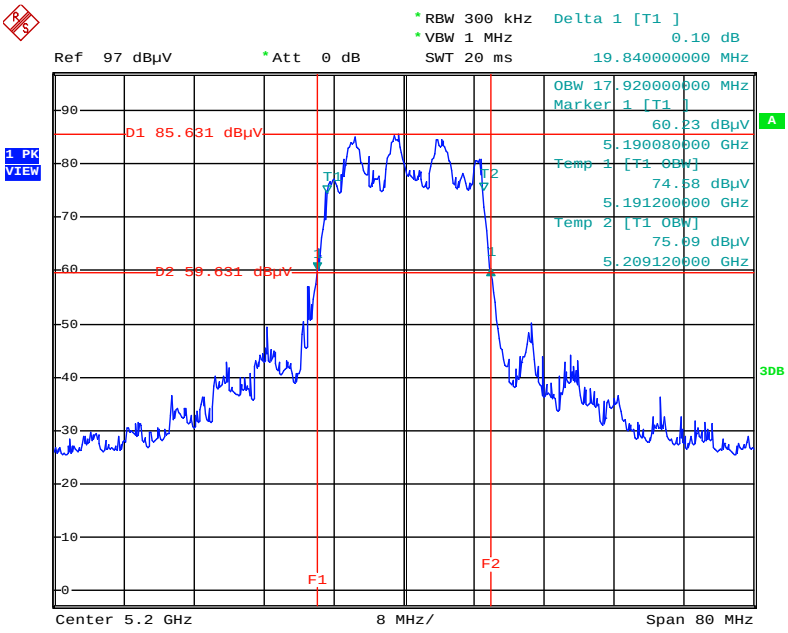
Date: 4.JUL.2016 22:55:36

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



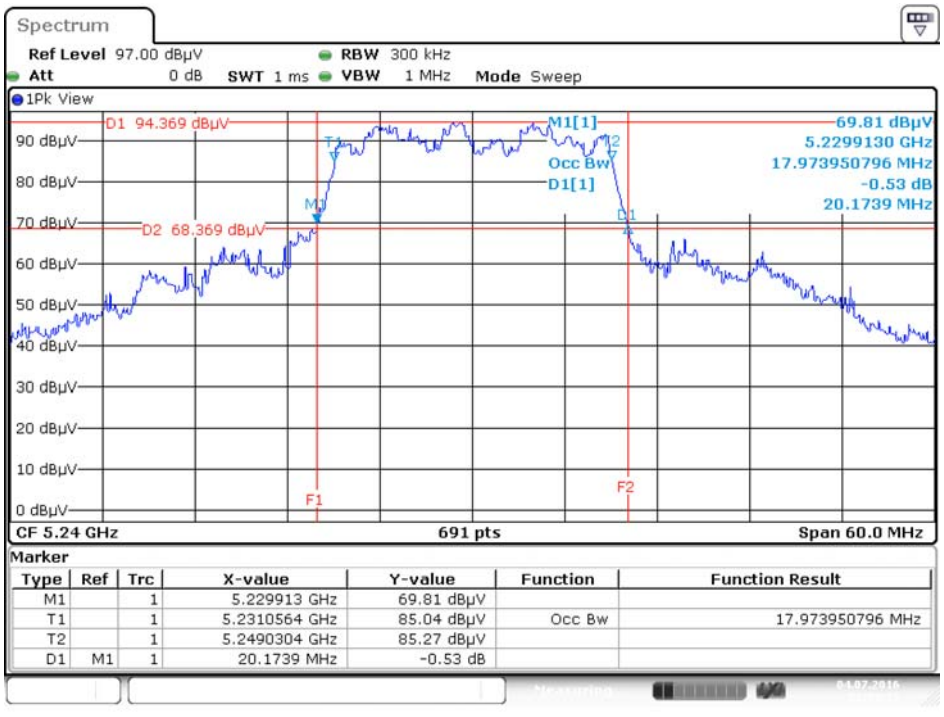
Date: 25.SEP.2014 08:15:44

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



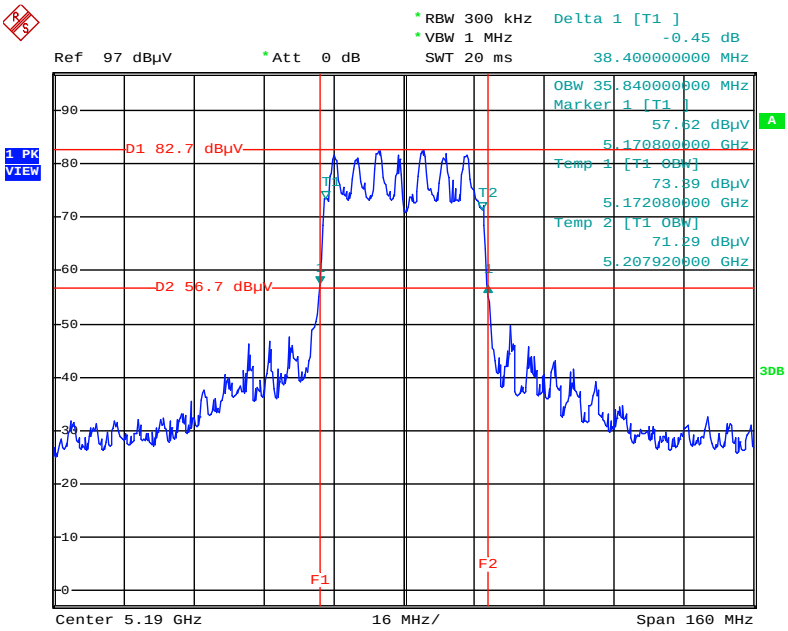
Date: 25.SEP.2014 08:17:41

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



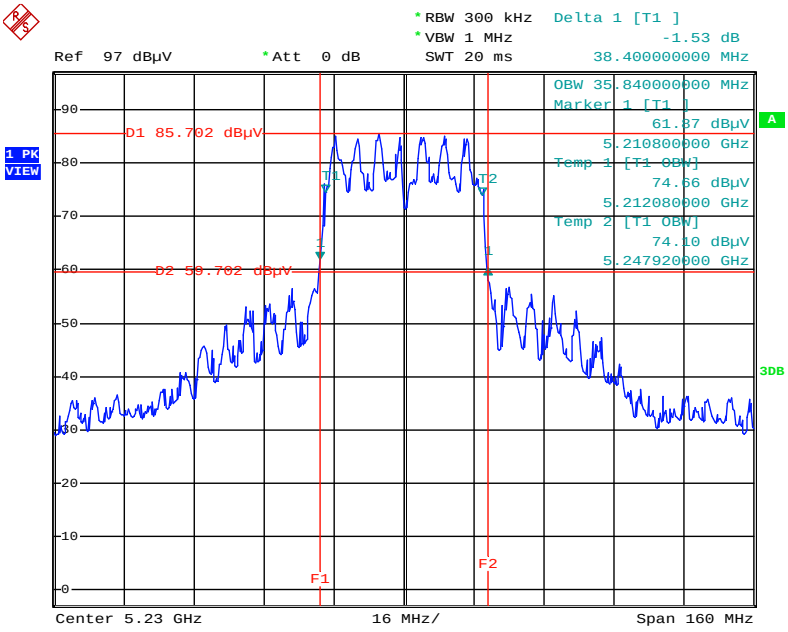
Date: 4.JUL.2016 22:53:22

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



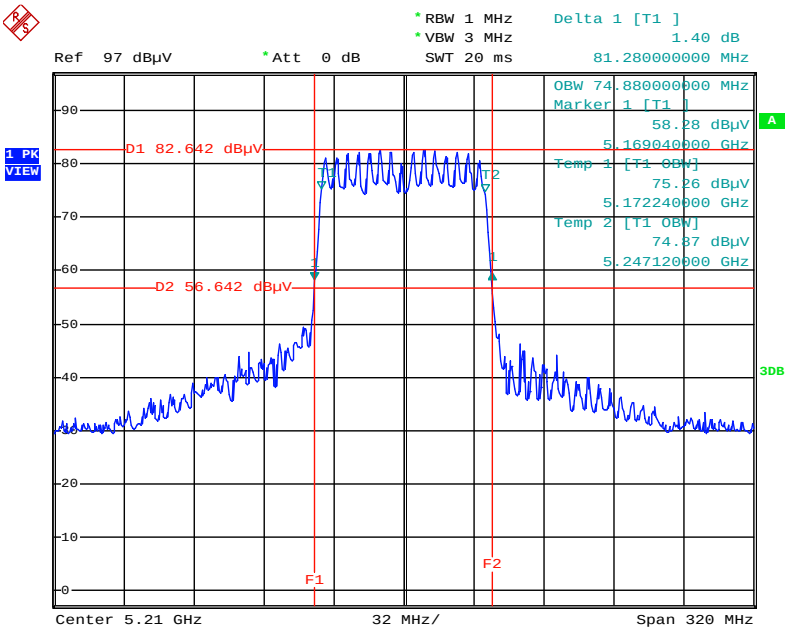
Date: 25.SEP.2014 08:19:24

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



Date: 25.SEP.2014 08:19:51

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



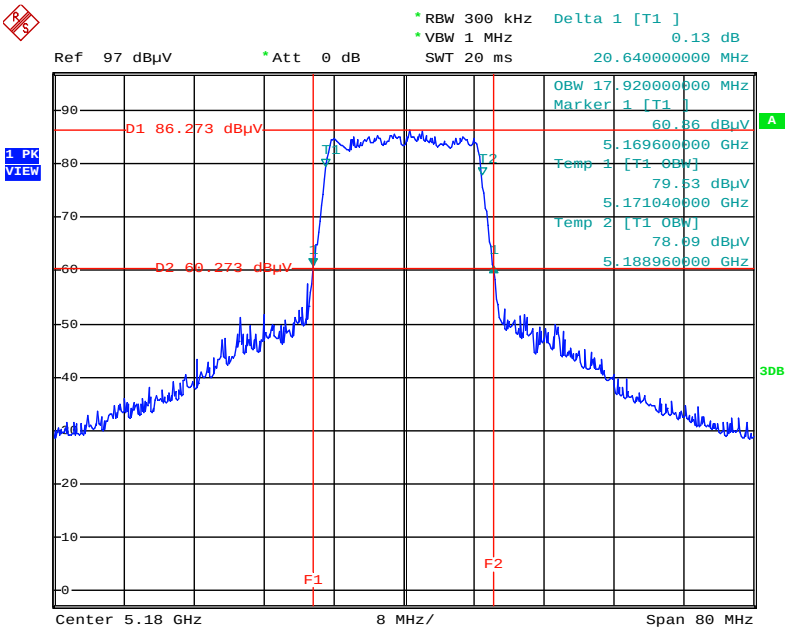
Date: 25.SEP.2014 08:20:28

<For Beamforming Mode>

Temperature	22°C	Humidity	54%
Test Engineer	Nick Peng		

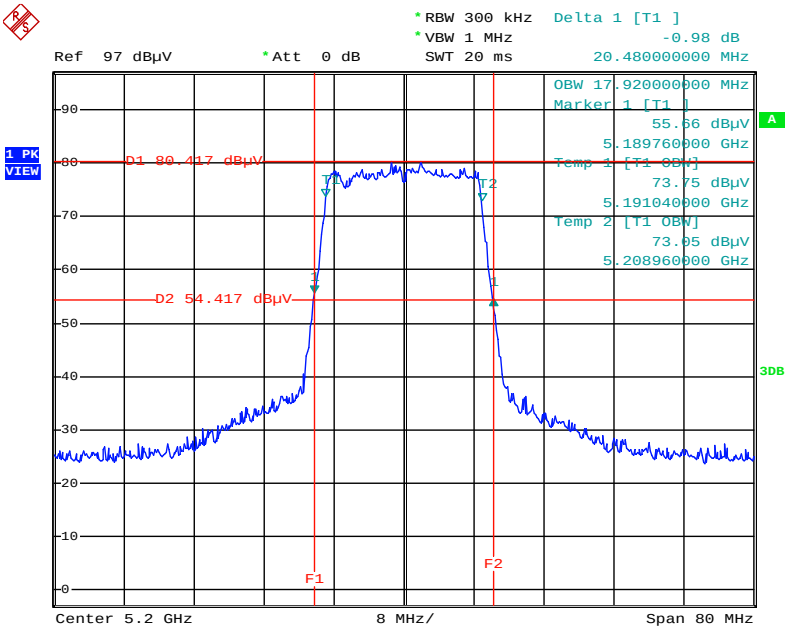
Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT20	5180 MHz	20.64	17.92
	5200 MHz	20.48	17.92
	5240 MHz	20.95	17.88
802.11ac MCS0/Nss1 VHT40	5190 MHz	39.36	36.48
	5230 MHz	39.36	36.48
802.11ac MCS0/Nss1 VHT80	5210 MHz	82.56	76.16

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



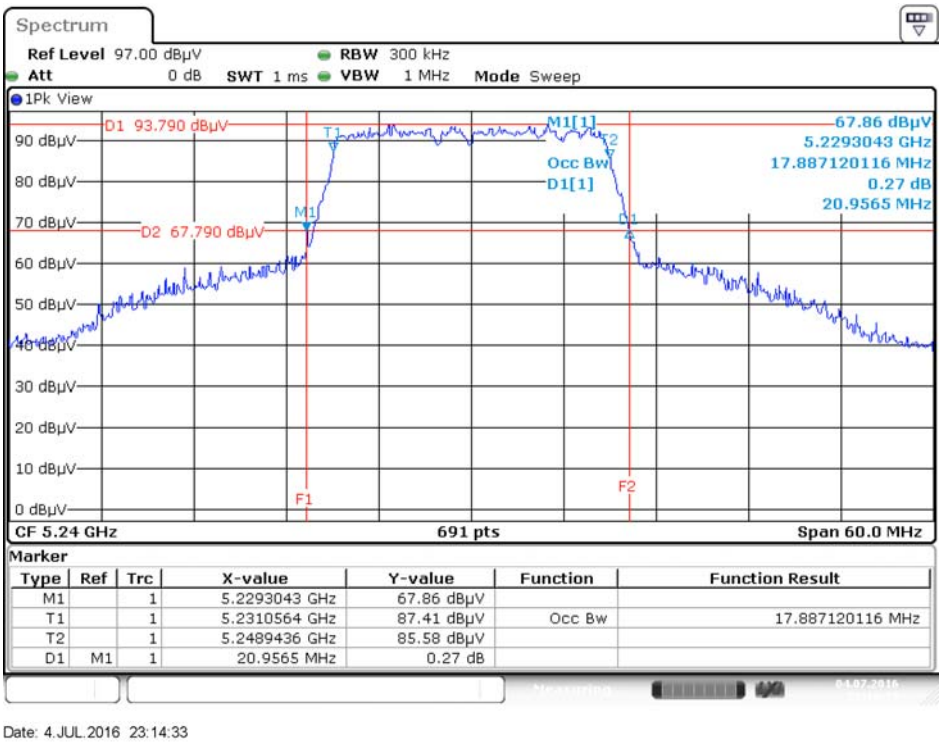
Date: 24.SEP.2014 17:24:18

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



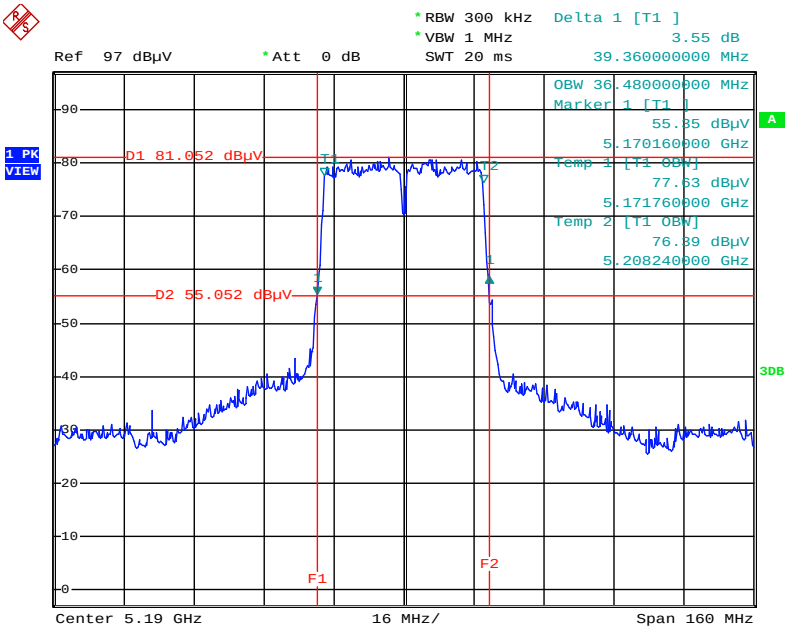
Date: 24.SEP.2014 17:24:57

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



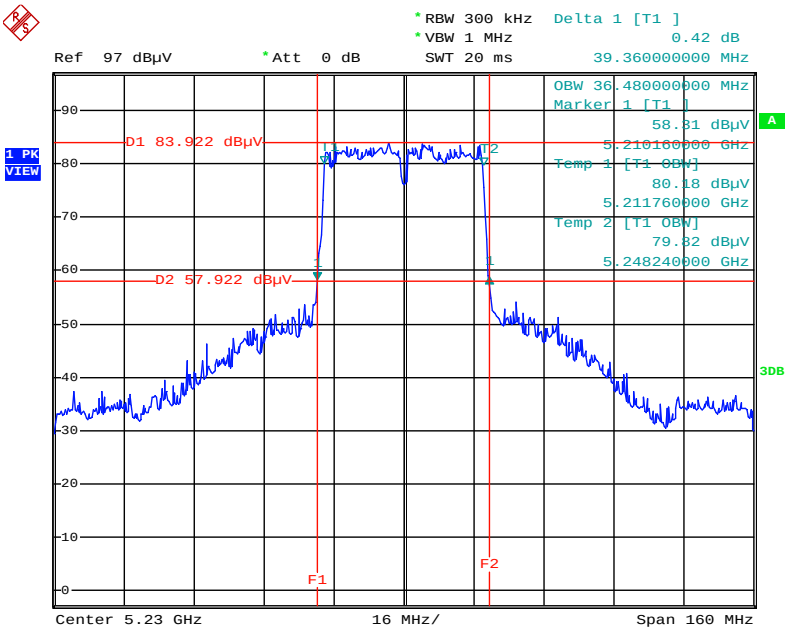
Date: 4.JUL.2016 23:14:33

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



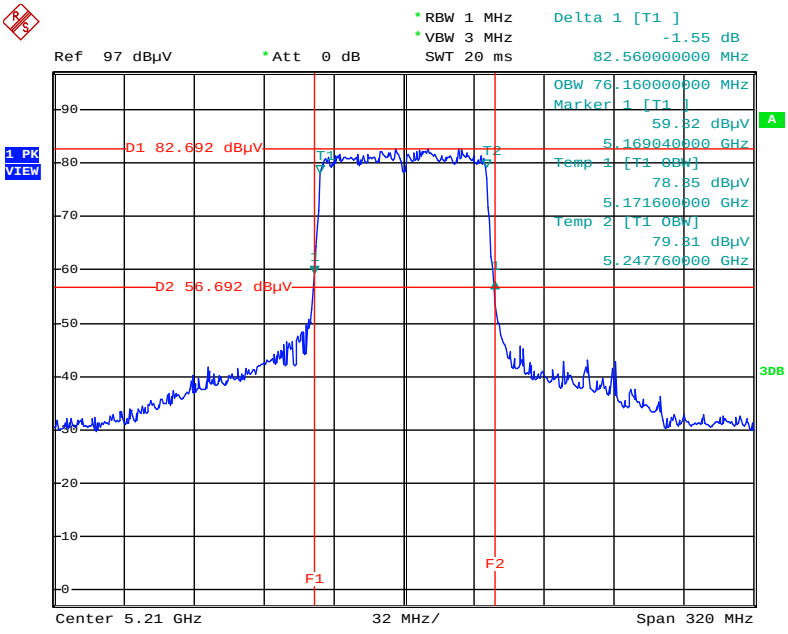
Date: 24.SEP.2014 17:28:38

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



Date: 24.SEP.2014 17:29:18

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



Date: 24.SEP.2014 17:29:57

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.
	☒	Client devices	The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

4.3.2. Measuring Instruments and Setting

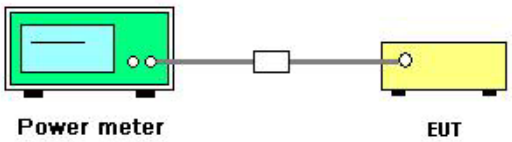
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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 v01r02 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

<For Non-Beamforming Mode>

Temperature	22℃	Humidity	54%
Test Engineer	Nick Peng	Test Date	Sep. 24, 2014 ~ Jul. 04, 2016

Mode	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
802.11a	5180 MHz	17.22	17.02	17.75	22.11	23.98	Complies
	5200 MHz	13.33	13.03	13.84	18.18	23.98	Complies
	5240 MHz	17.30	17.02	17.50	22.05	23.98	Complies
802.11ac MCS0/Nss1 VHT20	5180 MHz	17.12	16.81	17.38	21.88	23.98	Complies
	5200 MHz	14.37	14.12	14.77	19.20	23.98	Complies
	5240 MHz	17.45	17.24	17.67	22.23	23.98	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	14.65	14.39	15.13	19.51	23.98	Complies
	5230 MHz	17.17	16.92	17.63	22.02	23.98	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	12.79	12.47	13.06	17.55	23.98	Complies

<For Beamforming Mode>

Temperature	22°C	Humidity	54%
Test Engineer	Nick Peng	Test Date	Sep. 24, 2014 ~ Jul. 04, 2016

Mode	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
802.11ac MCS0/Nss1 VHT20	5180 MHz	16.32	15.61	17.17	21.18	22.21	Complies
	5200 MHz	9.89	9.48	10.32	14.68	22.21	Complies
	5240 MHz	17.24	17.03	17.46	22.02	22.21	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	14.29	14.01	14.98	19.22	23.98	Complies
	5230 MHz	16.92	16.23	17.79	21.80	23.98	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	12.95	12.66	14.05	18.03	23.98	Complies

Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ =7.77dBi >6dBi, so Limit=23.98-(7.77-6)=22.21dBm.

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
	☒	Client devices	11 dBm/MHz
☐	5.725~5.85 GHz		30 dBm/500kHz

4.4.2. Measuring Instruments and Setting

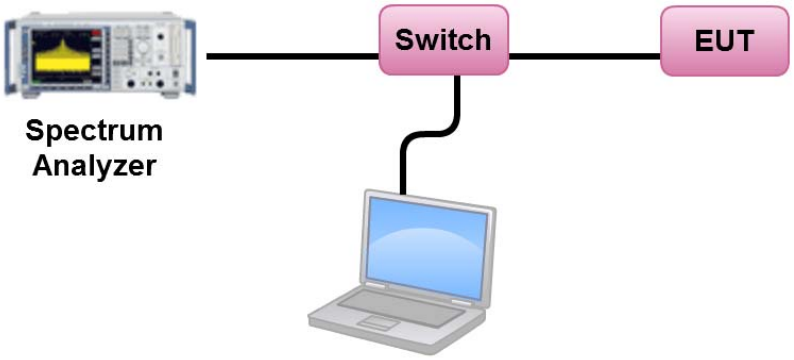
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1000 kHz
VBW	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times
Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.	

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01r02 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 and sum the spectra across the outputs.
4. For 5.725~5.85 GHz, the measured result of PSD level must add 10log(500kHz/RBW) and the final result should ≤ 30 dBm.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

<For Non-Beamforming Mode>

Temperature	22°C	Humidity	54%
Test Engineer	Nick Peng	Test Date	Sep. 24, 2014 ~ Jul. 04, 2016

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	9.03	9.23	Complies
40	5200 MHz	5.09	9.23	Complies
48	5240 MHz	9.07	9.23	Complies

Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	8.44	9.23	Complies
40	5200 MHz	6.21	9.23	Complies
48	5240 MHz	9.14	9.23	Complies

Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	3.39	9.23	Complies
46	5230 MHz	5.99	9.23	Complies

Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-1.82	9.23	Complies

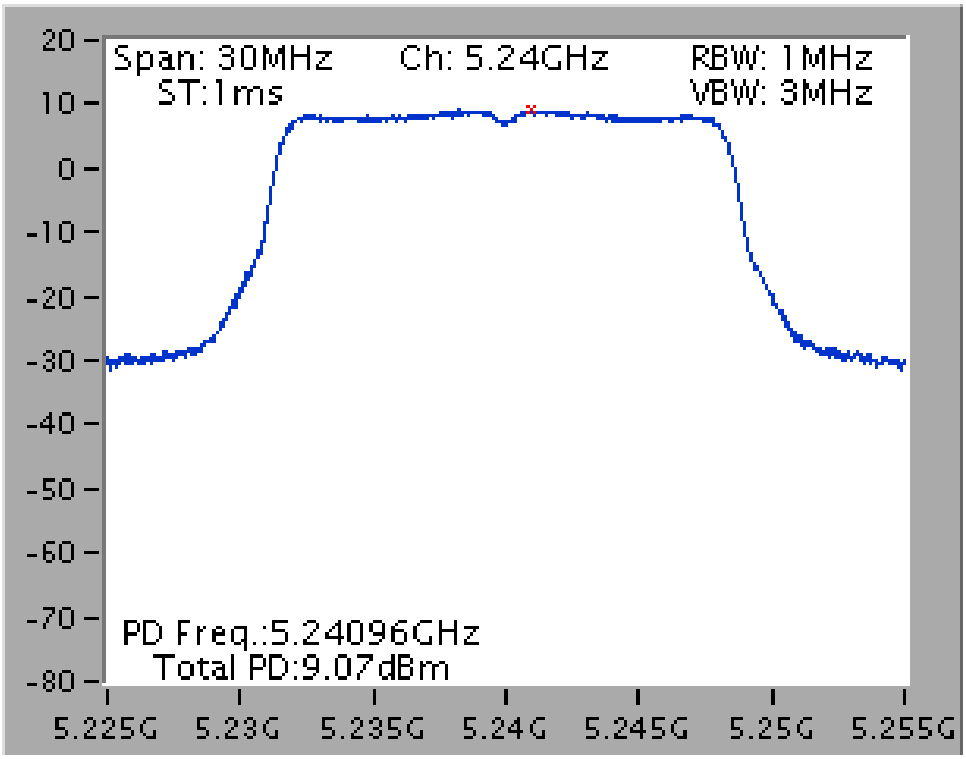
Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

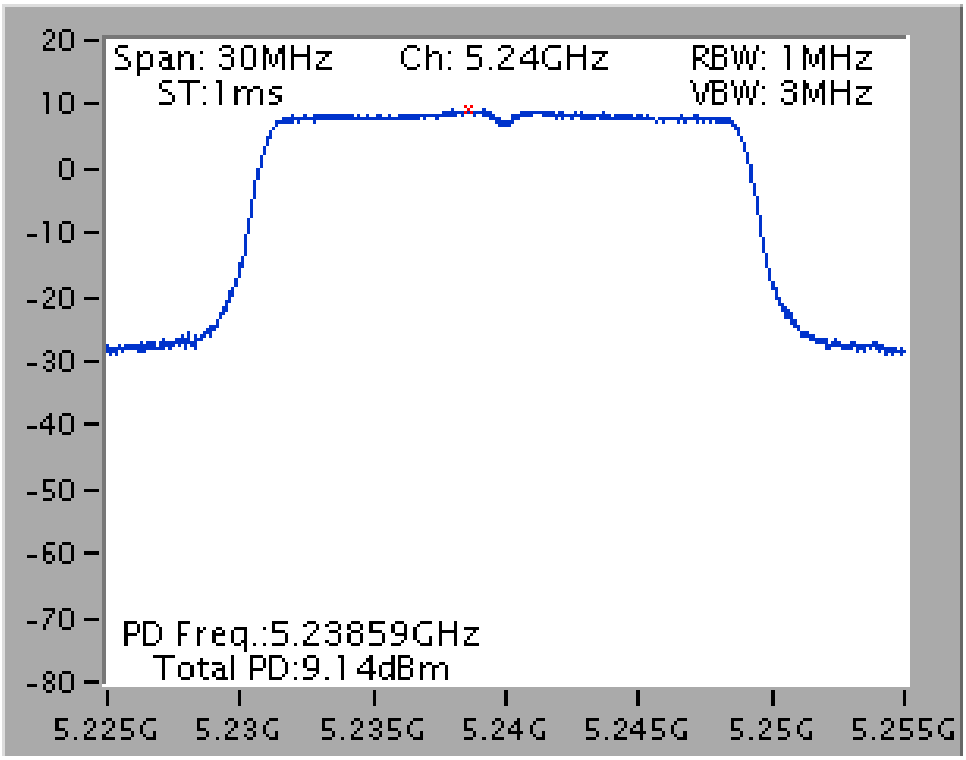
Note: All the test values were listed in the report.

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

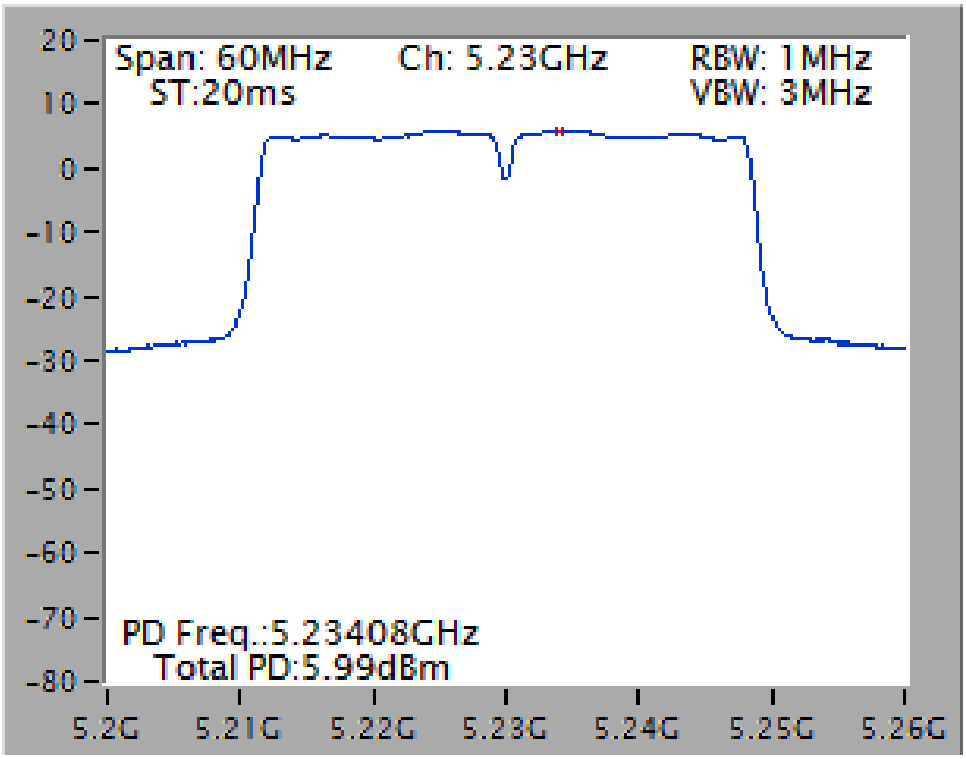
Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



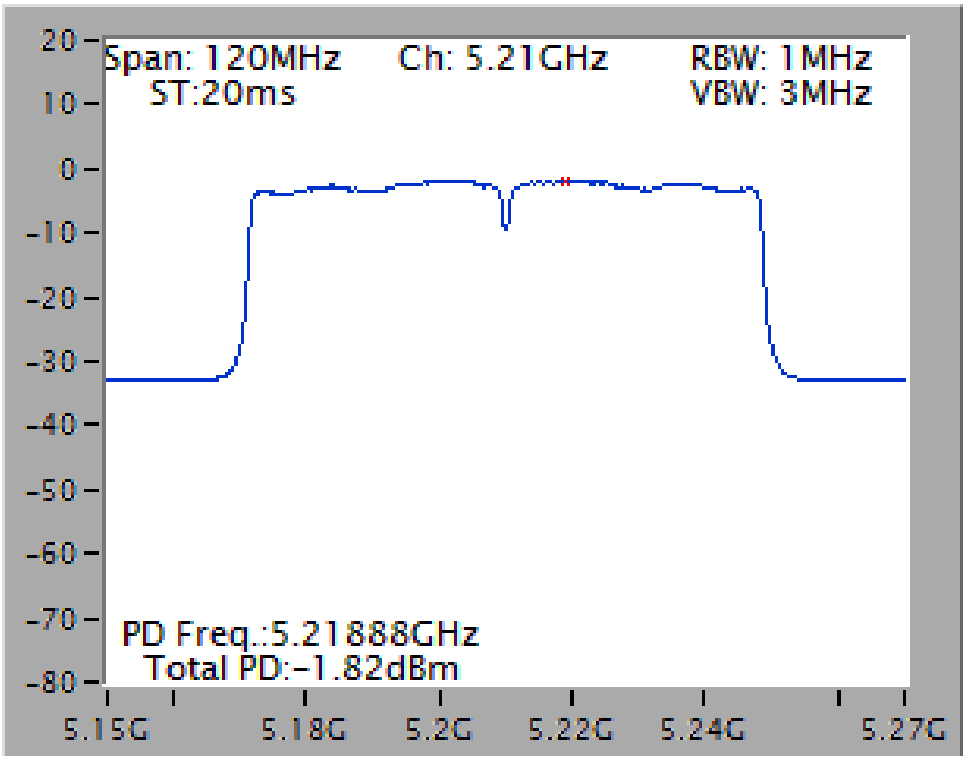
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



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



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



<For Beamforming Mode>

Temperature	22°C	Humidity	54%
Test Engineer	Nick Peng	Test Date	Sep. 24, 2014 ~ Jul. 04, 2016

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	7.75	9.23	Complies
40	5200 MHz	1.52	9.23	Complies
48	5240 MHz	9.10	9.23	Complies

Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	2.82	9.23	Complies
46	5230 MHz	5.69	9.23	Complies

Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-1.33	9.23	Complies

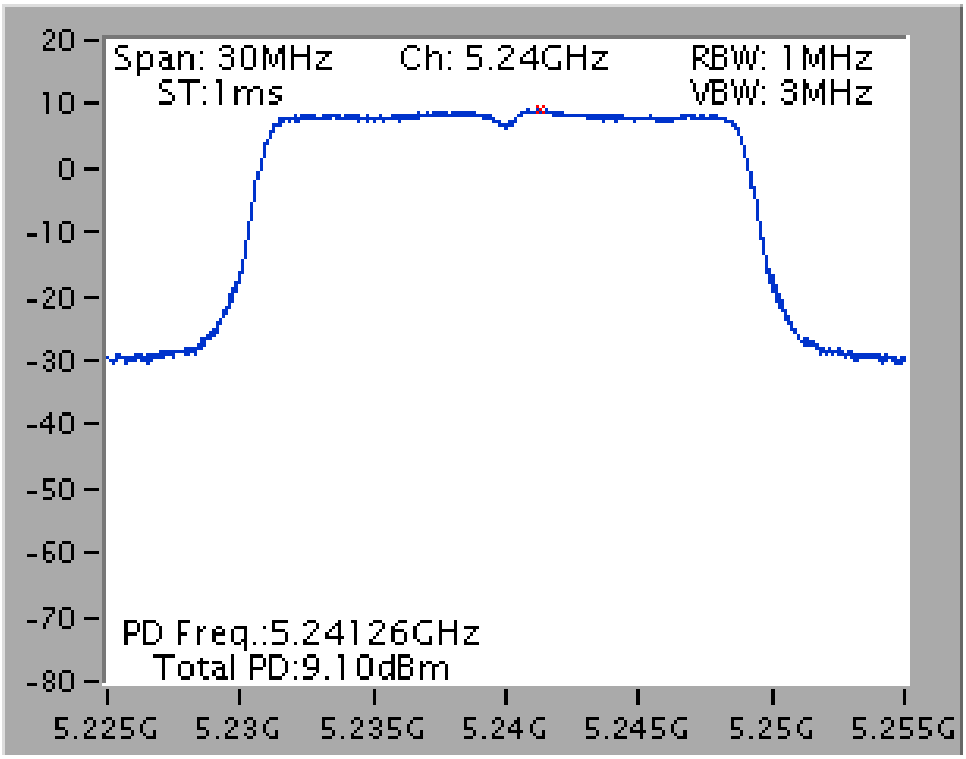
Note:

5150~5250 MHz= $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so Limit=11-(7.77-6)=9.23dBm/MHz.

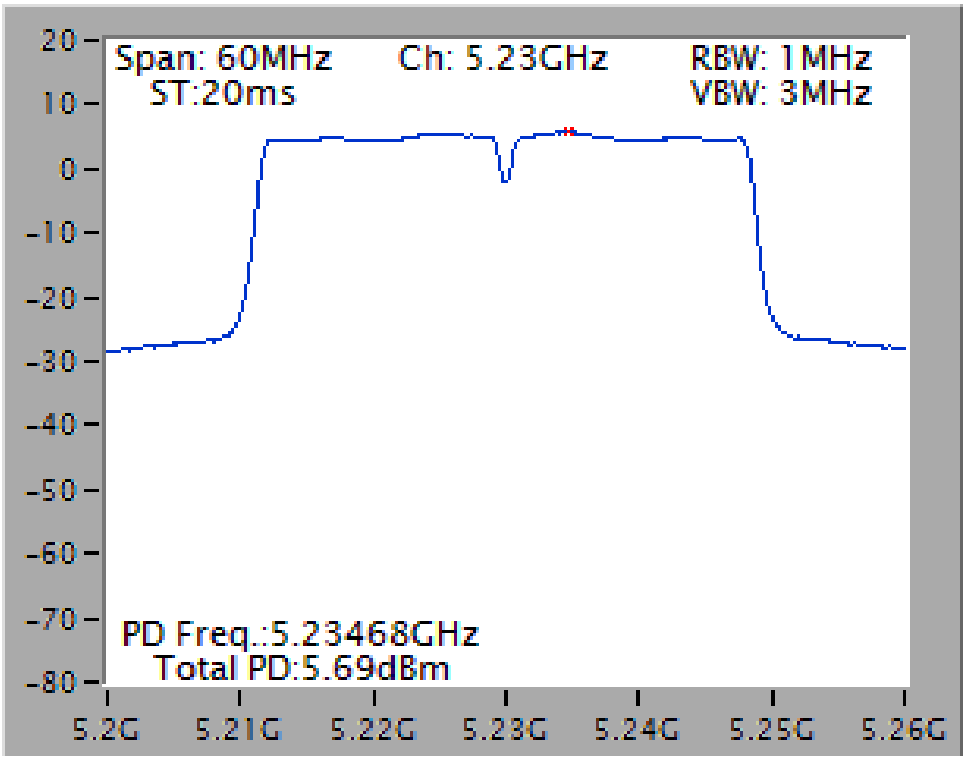
Note: All the test values were listed in the report.

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

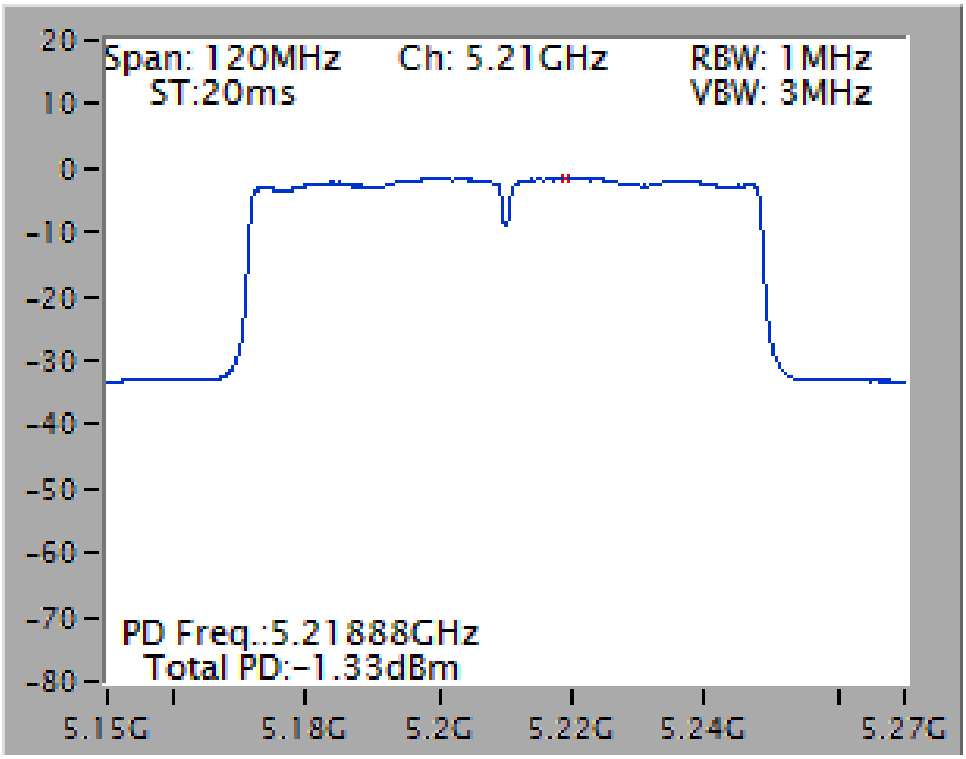
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



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



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

For transmitters operating in the 5.725-5.85 GHz band: Follow 15.407(b)(4)(ii), the emission limits in § 15.247(d), 30dBc in any 100 kHz bandwidth outside the operating frequency band.

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

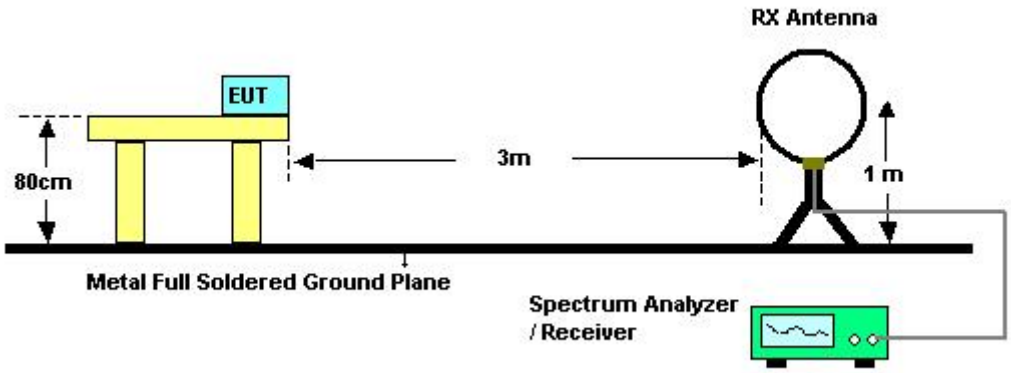
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

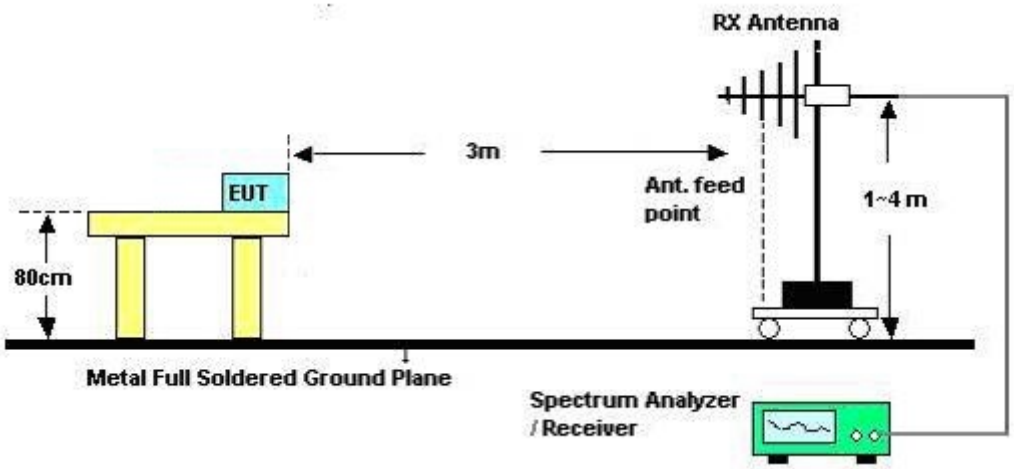
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
8. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
9. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.5.4. Test Setup Layout

For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~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	22°C	Humidity	54%
Test Engineer	DK Chang	Configurations	Normal Link
Test Date	Jul. 05, 2016	Test Mode	Mode 2

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.

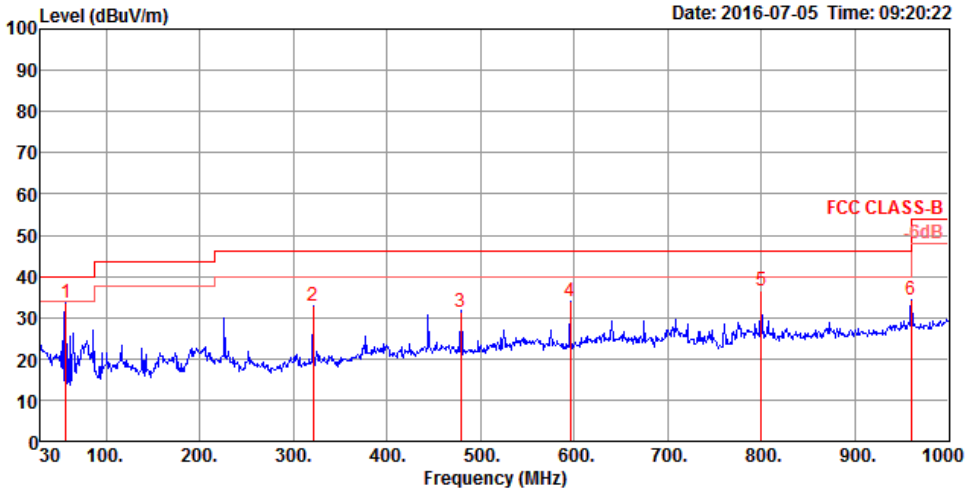
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

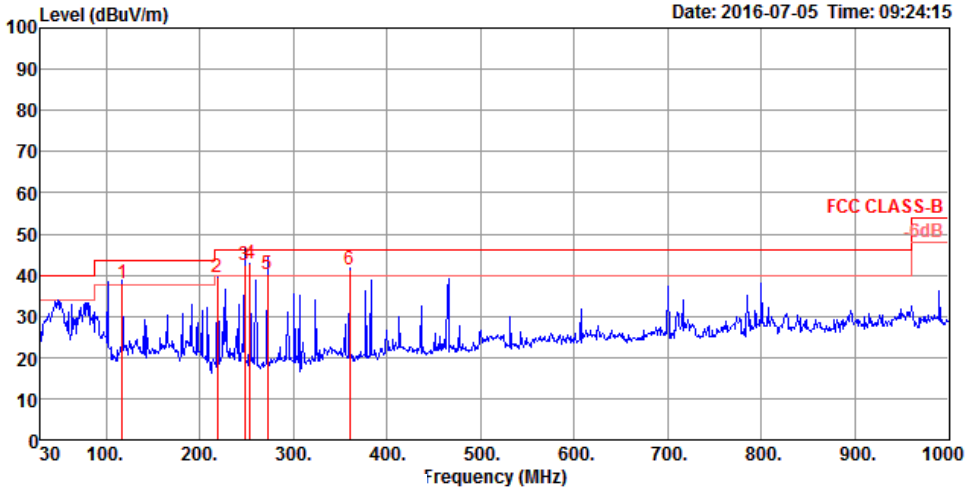
Temperature	22°C	Humidity	54%
Test Engineer	DK Chang	Configurations	Normal Link
Test Mode	Mode 2		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	57.16	33.61	40.00	-6.39	51.33	0.67	14.02	32.41	200	61	Peak	HORIZONTAL
2	321.00	32.77	46.00	-13.23	42.92	1.54	20.60	32.29	300	191	Peak	HORIZONTAL
3	479.11	31.34	46.00	-14.66	38.11	1.90	23.68	32.35	200	296	Peak	HORIZONTAL
4	595.51	34.06	46.00	-11.94	39.01	2.11	25.35	32.41	300	274	Peak	HORIZONTAL
5	800.18	36.45	46.00	-9.55	39.43	2.46	26.80	32.24	100	193	Peak	HORIZONTAL
6	960.23	34.39	54.00	-19.61	34.69	2.69	28.20	31.19	100	70	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	117.30	37.83	43.50	-5.67	50.25	0.94	19.02	32.38	100	198	Peak	VERTICAL
2	219.15	39.32	46.00	-6.68	53.49	1.27	16.88	32.32	150	311	Peak	VERTICAL
3	248.25	42.46	46.00	-3.54	54.44	1.34	18.98	32.30	100	109	QP	VERTICAL
4	254.07	42.94	46.00	-3.06	54.50	1.35	19.39	32.30	300	246	Peak	VERTICAL
5	272.50	40.28	46.00	-5.72	51.55	1.40	19.62	32.29	150	288	QP	VERTICAL
6	359.80	41.29	46.00	-4.71	50.33	1.63	21.64	32.31	150	283	Peak	VERTICAL

Note:

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

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

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

4.6. Frequency Stability Measurement

4.6.1. 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).

4.6.2. Measuring Instruments and Setting

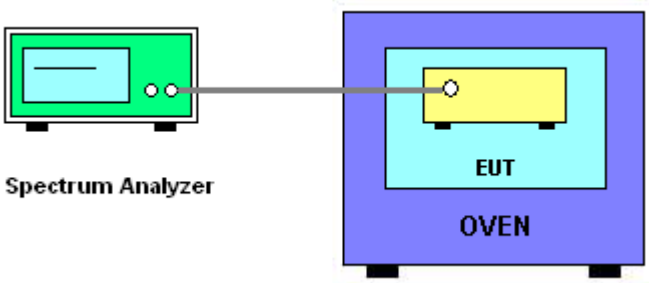
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.6.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
7. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
8. Extreme temperature is 0°C~40°C.

4.6.4. Test Setup Layout



4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

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

4.6.7. Test Result of Frequency Stability

Temperature	22°C	Humidity	54%
Test Engineer	Nick Peng	Test Date	Jul. 04, 2016

Mode: 20 MHz / Chain 3

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5200 MHz
126.50	5199.9922
110.00	5199.9958
93.50	5199.9976
Max. Deviation (MHz)	0.007800
Max. Deviation (ppm)	1.50
Result	Complies

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	5200 MHz
0	5199.9864
10	5199.9908
20	5199.9958
30	5199.9982
40	5200.0036
Max. Deviation (MHz)	0.013600
Max. Deviation (ppm)	2.62
Result	Complies

4.7. Antenna Requirements

4.7.1. 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.

4.7.2. 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 Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 2016	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 24, 2016	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	TESEQ	CBL6112D	37880	20MHz ~ 2GHz	Sep. 03, 2015	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 16, 2016	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-l0-7	N/A	N/A	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2014	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2016	Conducted (TH01-CB)
RF Power Divider	Woken	2 Way	0120A02056002D	2GHz ~ 18GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Power Divider	Woken	3 Way	MDC2366	2GHz ~ 18GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Power Divider	Woken	4 Way	0120A04056002D	2GHz ~ 18GHz	Nov. 17, 2013	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	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 02, 2015	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	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 02, 2015	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	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 02, 2015	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)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.
"*" Calibration Interval of instruments listed above is two years.
NCR means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%