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FCC RADIO TEST REPORT

Applicant's company	**D-Link Corporation**
Applicant Address	No.289, Sinhu 3rd Rd., Neihu District, Taipei City 114, Taiwan, R.O.C.
FCC ID	**KA2AP2660A1**

Product Name	Wireless AC1200 Concurrent Dual Band PoE Access Point
Brand Name	D-Link
Model No.	DAP-2660
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Mar. 03, 2014
Final Test Date	Sep. 18, 2014
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 C63.10-2009**, **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

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR432156-13	Rev. 01	Initial issue of report	Jun. 01, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	Wireless AC1200 Concurrent Dual Band PoE Access Point
Brand Name	:	D-Link
Model No.	:	DAP-2660
Applicant	:	D-Link Corporation
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Mar. 03, 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	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies
4.2	15.407(a)	Maximum Conducted Output Power	Complies
4.3	15.407(a)	Power Spectral Density	Complies
4.4	15.407(b)	Radiated Emissions	Complies
4.5	15.407(b)	Band Edge 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 (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter or PoE
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%)	IEEE 802.11a: 17.69 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 18.33 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.15 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.38 MHz
Maximum Conducted Output Power	IEEE 802.11a: 27.54 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 27.58 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 26.57 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 20.19 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Communication Mode	☒ IP Based (Load Based)	☐ Frame Based
Beamforming Function	☐ With beamforming	☒ Without beamforming
Operate Condition	☒ Indoor	☐ Outdoor

Antenna and Band width

Antenna	Two (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)	2	MCS 0-15
802.11n (HT40)	2	MCS 0-15
802.11ac (VHT20)	2	MCS 0-9/Nss1-2
802.11ac (VHT40)	2	MCS 0-9/Nss1-2
802.11ac (VHT80)	2	MCS 0-9/Nss1-2

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

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

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

3.2. Accessories

Power	Brand	Model	Rating
Adapter 1	D-Link	AMS9-1201000FU2	Input:100-240V~50/60Hz, 0.5A/27VA Output:12 V, 1.0 A
Adapter 2	D-Link	F12W3-120100SPAU	Input:100-240V~50/60Hz, 0.3A Output:12V, 1A
Others			
Wall-mounted rack*1			

3.3. Table for Filed Antenna

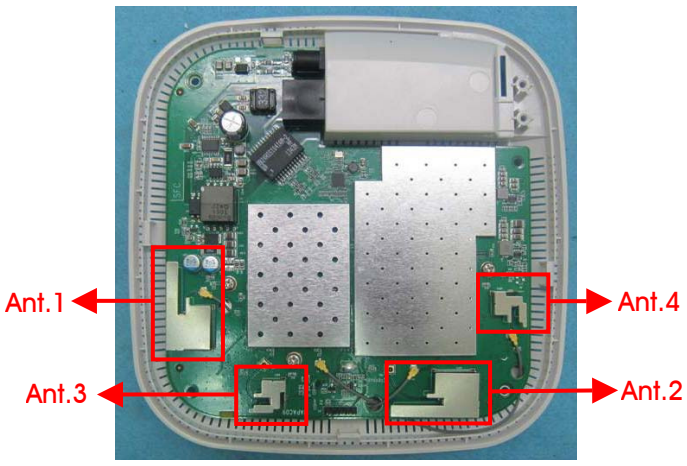
Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)		Cable loss (dBi)		True Gain (dBi)	
					2.4GHz	5GHz	2.4GHz	5GHz	2.4GHz	5GHz
1	HONGLIN	290-20113	PIFA Antenna	I-PEX	2.67	-	0.47	-	2.2	-
2	HONGLIN	290-20113	PIFA Antenna	Murata	3.88	-	-	-	3.88	-
3	HONGLIN	290-20114	PIFA Antenna	Murata	-	Note 2	-	-	-	Note 2
4	HONGLIN	290-20114	PIFA Antenna	I-PEX	-	Note 2	-	Note 2	-	Note 2

Note 1: The EUT has four antennas.

For <2.4GHz>
For IEEE 802.11b/g/n mode (2TX/2RX)
Ant. 1 and Ant. 2 could transmit/receive simultaneously.
For <5GHz>
For IEEE 802.11a/n/ac mode (2TX, 2RX)
Ant. 3 and Ant. 4 could transmit/receive simultaneously.

Note 2:

Ant.3		Ant.4			
Frequency (MHz)	Gain (dBi)	Frequency (MHz)	Gain (dBi)	Cable loss (dBi)	True Gain (dBi)
5180	3.66	5180	3.51	0.46	3.05
5190	3.66	5190	3.51	0.46	3.05
5200	3.66	5200	3.51	0.46	3.05
5210	3.66	5210	3.51	0.46	3.05
5230	3.66	5230	3.51	0.46	3.05
5240	3.66	5240	3.51	0.46	3.05
5745	4.03	5745	5.1	0.46	4.64
5755	4.03	5755	5.1	0.46	4.64
5775	4.03	5775	5.1	0.46	4.64
5785	4.03	5785	5.1	0.46	4.64
5795	4.02	5795	4.9	0.46	4.44
5825	4.02	5825	4.9	0.46	4.44



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

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

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

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

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

3.5. Table for Test Modes

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

Test Items	Mode		Data Rate	Channel	Ant.
Max. Conducted Output Power	11a/BPSK	Band 1	6Mbps	36/40/48	3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	3+4
Power Spectral Density	11a/BPSK	Band 1	6Mbps	36/40/48	3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	3+4
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11a/BPSK	Band 1	6Mbps	36/40/48	3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	3+4
Radiated Emission Above 1GHz	11a/BPSK	Band 1	6Mbps	36/40/48	3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	3+4
Band Edge Emission	11a/BPSK	Band 1	6Mbps	36/40/48	3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	3+4
Frequency Stability	Un-modulation		-	40	3+4

Note1: VHT20/VHT40 covers HT20/HT40, due to same modulation.

Note2: The PoE information as below, and the PoE is for testing purposes only, will not be marketed.

Support Unit	Brand	Model	FCC ID
PoE	LB	SA06-20S48-V	N/A

The following test modes were performed for all tests:

For Radiated Emission test:

There are two modes of EUT, one is Stand of EUT, and the other is Laying of EUT.

After evaluating, Stand of EUT has been evaluated to be the worst case.

Consequently, measurement for Radiated Emission above 1GHz test will follow this same test mode.

Mode 1. CTX

For Co-location MPE Test:

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to Sporton test report: FA432156-13) test is added for simultaneously transmit

between 2.4GHz WLAN function and 5GHz 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 Designation No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	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: FR432156AA and FR432156AB.

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

Modifications	Performance Checking
Updating 5GHz Band 1 to “New Rules” from “Old Rules”.	1. 26dB Bandwidth and 99% Occupied Bandwidth 2. Maximum Conducted Output Power 3. Power Spectral Density 4. Radiated Emissions above 1GHz 5. Band Edge Emissions 6. Frequency Stability 7. Maximum Permissible Exposure
Updating test rule of 5GHz band 4 to “15.407 (b)(4)(ii) of New Rules (ET Docket No. 13–49; FCC 16–24)” from “Old Rules”.	After evaluating, it's not necessary to re-test all test items for 5GHz Band 4 updating to "New Rules" due to the same power as original filing.

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	DoC

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC

3.9. Table for Parameters of Test Software Setting

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

Test Software Version	DOS		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11a	20.5	24	24
802.11ac MCS0/Nss1 VHT20	20.5	24	24
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz	5230 MHz	
	18.5	24	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	18		

3.10. EUT Operation during Test

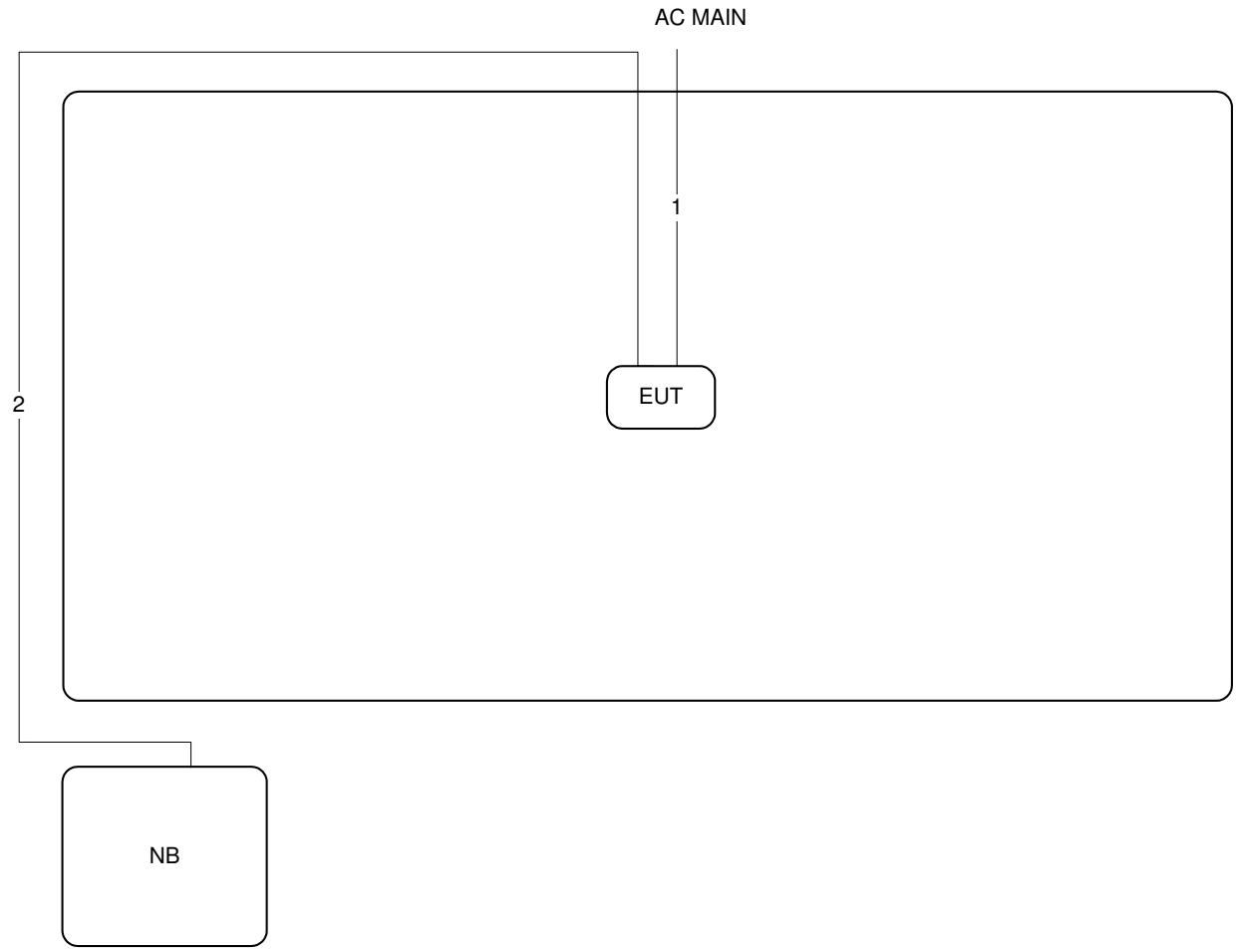
The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.030	2.080	97.60%	0.11	0.49
802.11ac MCS0/Nss1 VHT20	1.900	1.950	97.44%	0.11	0.53
802.11ac MCS0/Nss1 VHT40	0.920	0.960	95.83%	0.18	1.09
802.11ac MCS0/Nss1 VHT80	0.440	0.490	89.80%	0.47	2.27

3.12. Test Configurations

3.12.1. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.2m
2	RJ-45 cable	No	10m

4. TEST RESULT

4.1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

4.1.1. Limit

No restriction limits.

4.1.2. Measuring Instruments and Setting

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

26dB Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	VBW > RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth	
Spectrum Parameters	**Setting**
Span	1.5 times to 5.0 times the OBW
RBW	1 % to 5 % of the OBW
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold

4.1.3. Test Procedures

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

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.1.4. Test Setup Layout

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

This test setup layout is the same as that shown in section 4.4.4.

4.1.5. Test Deviation

There is no deviation with the original standard.

4.1.6. EUT Operation during Test

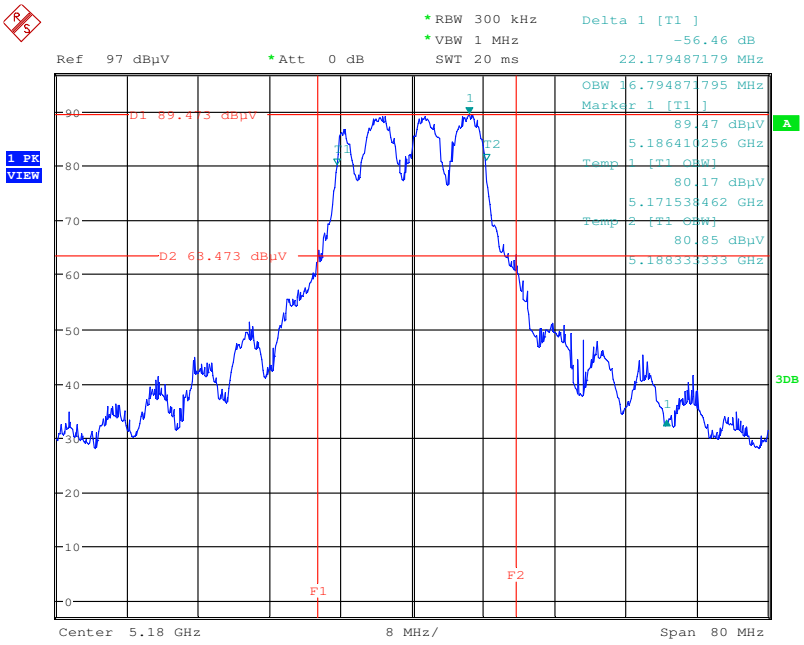
The EUT was programmed to be in continuously transmitting mode.

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

Temperature	20°C	Humidity	52%
Test Engineer	Jim Huang		

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	22.17	16.79
	5200 MHz	31.41	17.69
	5240 MHz	27.05	17.30
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.66	18.07
	5200 MHz	27.82	18.33
	5240 MHz	26.92	18.33
802.11ac MCS0/Nss1 VHT40	5190 MHz	41.28	36.15
	5230 MHz	47.69	36.15
802.11ac MCS0/Nss1 VHT80	5210 MHz	82.56	75.38

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5180 MHz



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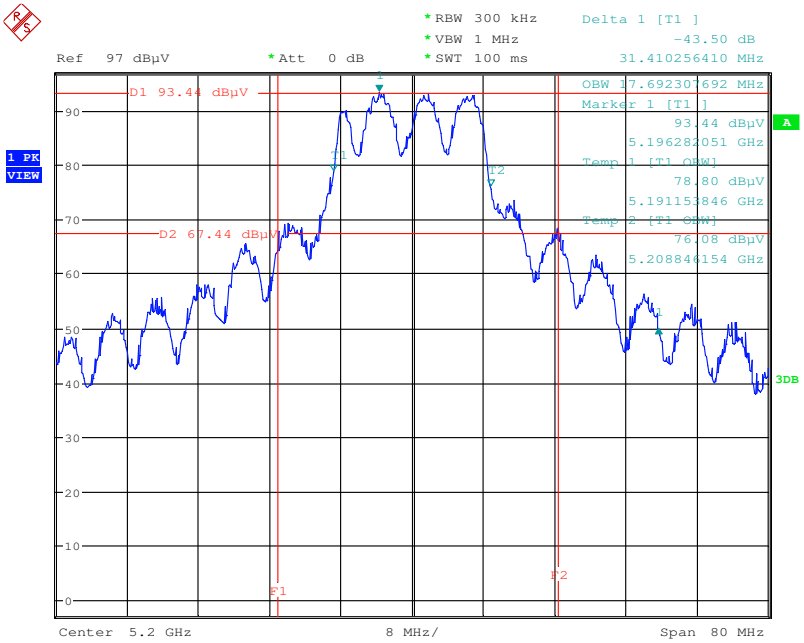
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5200 MHz



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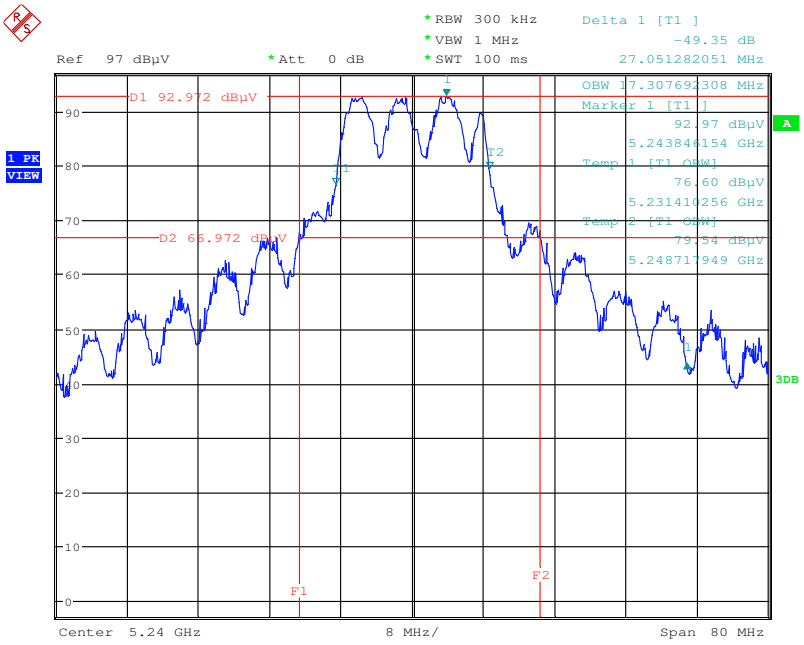
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5240 MHz



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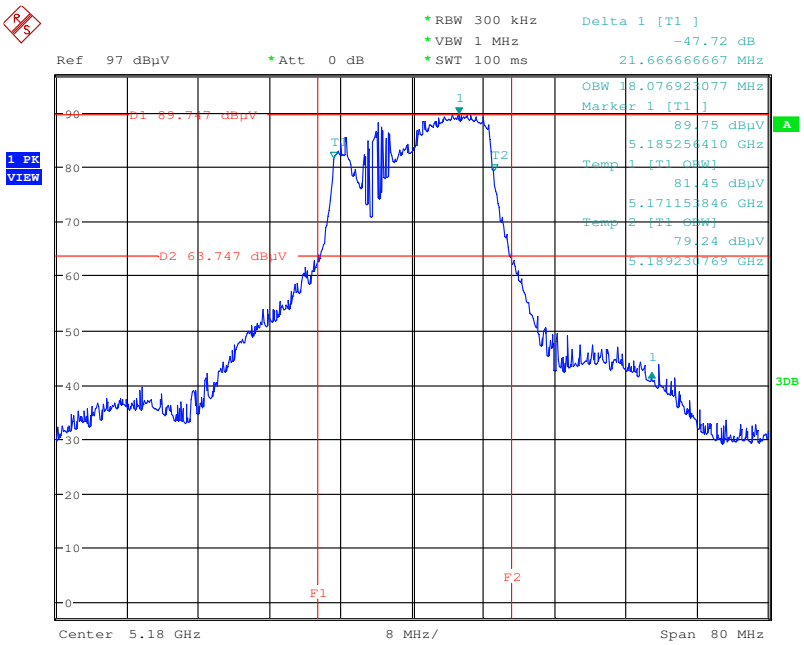
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5180 MHz



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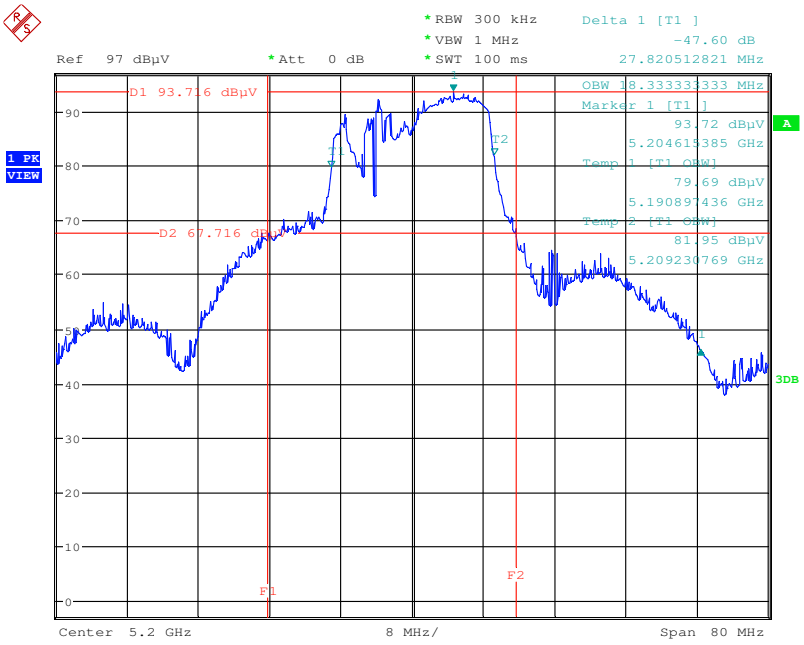

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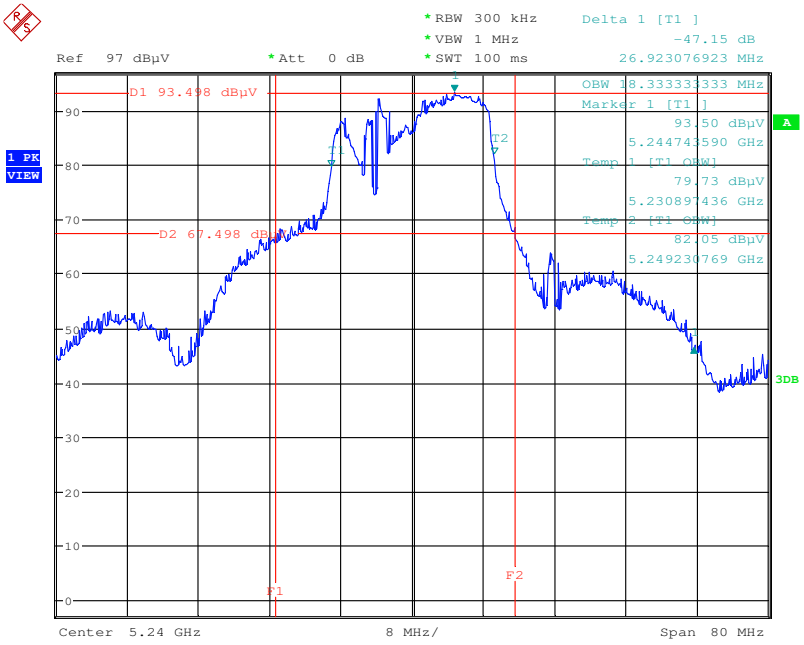
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5240 MHz



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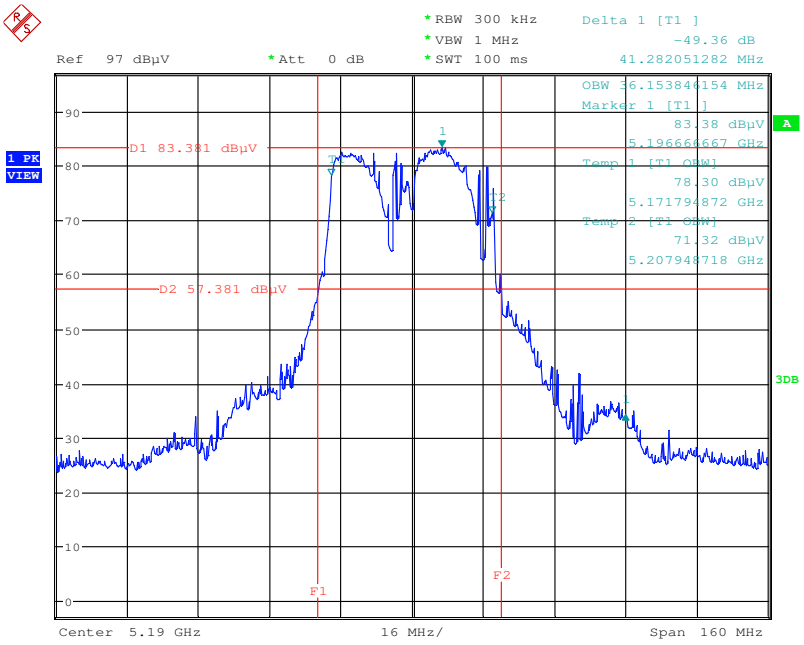
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4 / 5190 MHz



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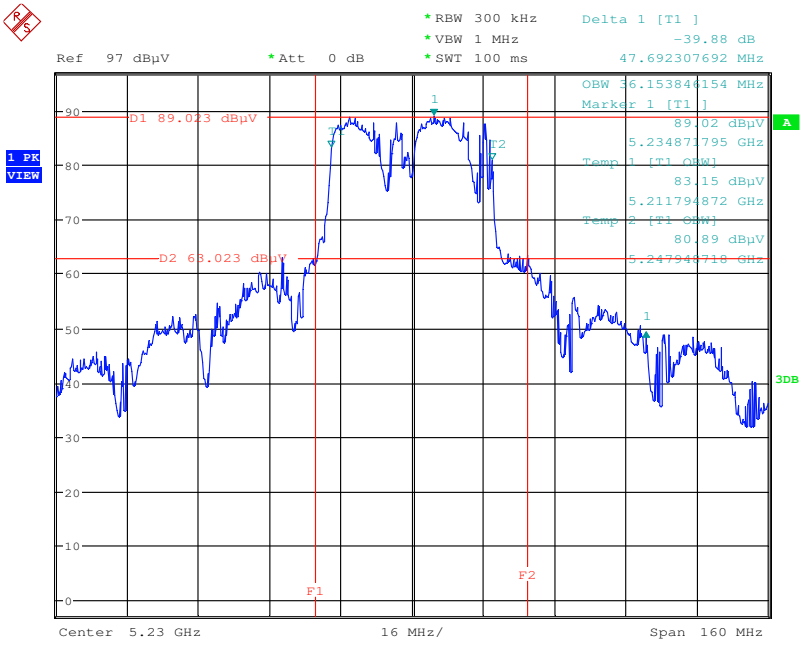
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4 / 5230 MHz



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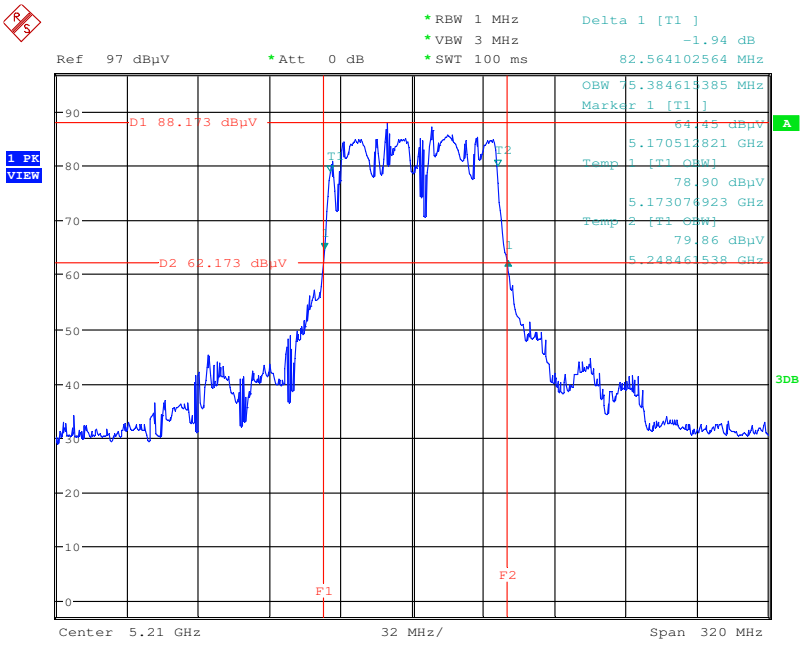
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 3 + Ant. 4 / 5210 MHz



4.2. Maximum Conducted Output Power Measurement

4.2.1. 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.

4.2.2. Measuring Instruments and Setting

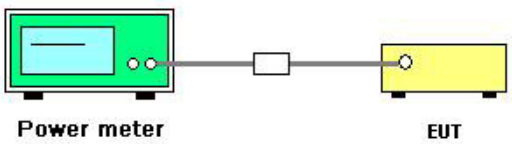
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.2.3. 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.

4.2.4. Test Setup Layout



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 Maximum Conducted Output Power

Temperature	20°C	Humidity	52%
Test Engineer	Jim Huang	Test Date	Sep. 18, 2014

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Ant. 3	Ant. 4	Total		
802.11a	5180 MHz	21.53	21.03	24.30	30.00	Complies
	5200 MHz	24.81	24.24	27.54	30.00	Complies
	5240 MHz	24.86	24.05	27.48	30.00	Complies
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.61	20.87	24.27	30.00	Complies
	5200 MHz	24.95	24.15	27.58	30.00	Complies
	5240 MHz	24.81	23.97	27.42	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	18.44	18.02	21.25	30.00	Complies
	5230 MHz	23.78	23.33	26.57	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	16.56	17.72	20.19	30.00	Complies

4.3. Power Spectral Density Measurement

4.3.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.2.1.

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

4.3.2. Measuring Instruments and Setting

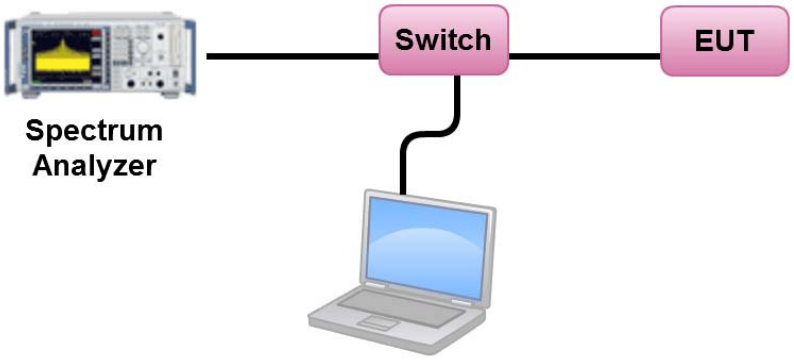
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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.	

4.3.3. 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.

4.3.4. 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 Power Spectral Density

Temperature	20°C	Humidity	52%
Test Engineer	Jim Huang		

Configuration IEEE 802.11a / Ant. 3 + Ant. 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	10.95	16.62	Complies
40	5200 MHz	14.36	16.62	Complies
48	5240 MHz	14.23	16.62	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	10.84	16.62	Complies
40	5200 MHz	14.36	16.62	Complies
48	5240 MHz	14.29	16.62	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	4.96	16.62	Complies
46	5230 MHz	10.22	16.62	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 3 + Ant. 4

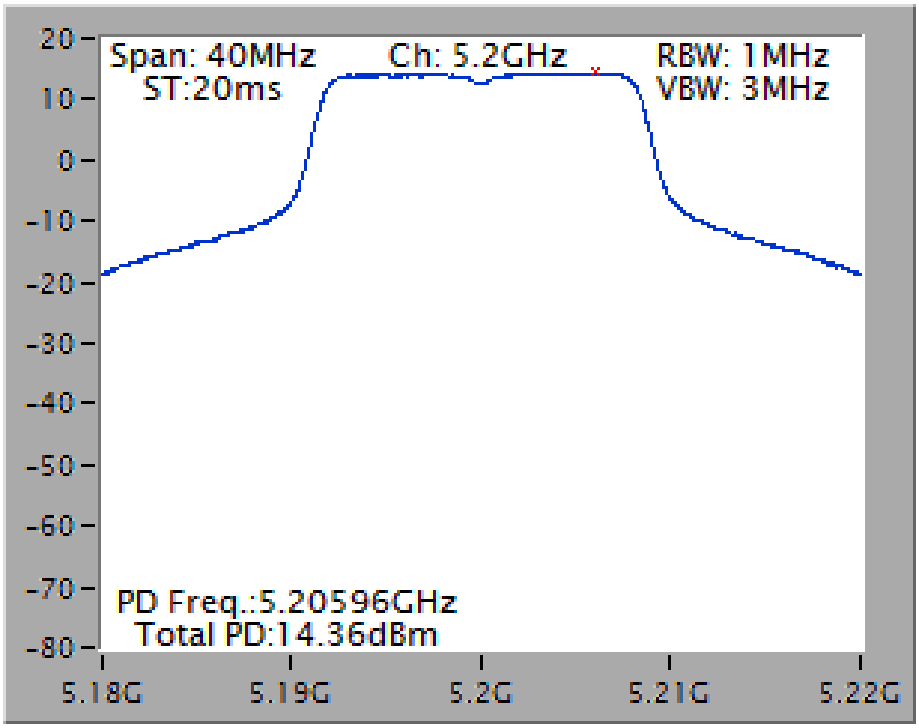
Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	0.94	16.62	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.38dBi >6dBi, so Limit=17-(6.38-6)=16.62dBm/MHz.

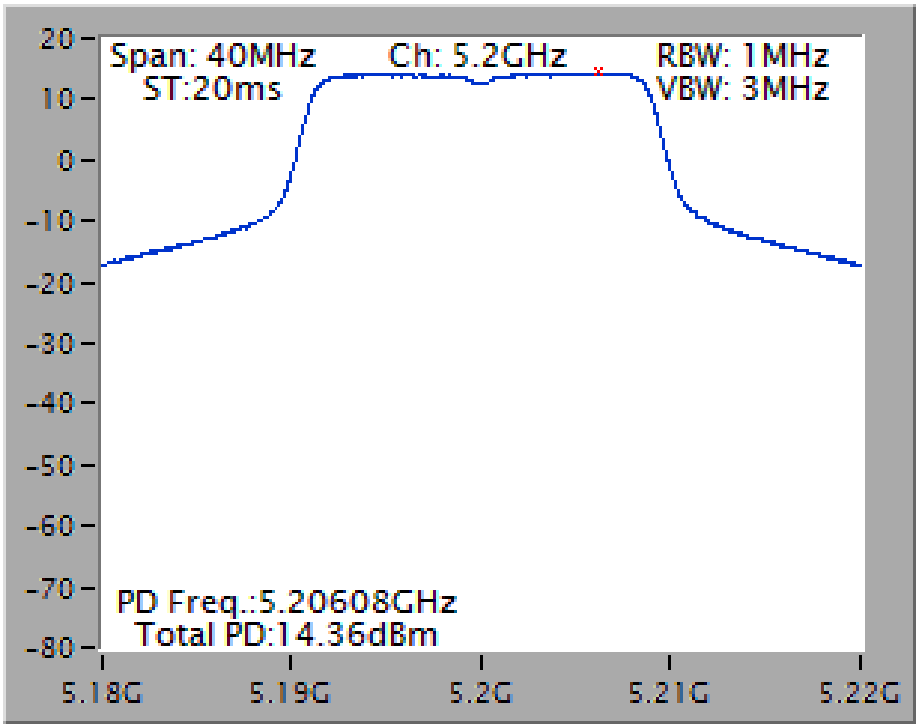
Note: All the test values were listed in the report.

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

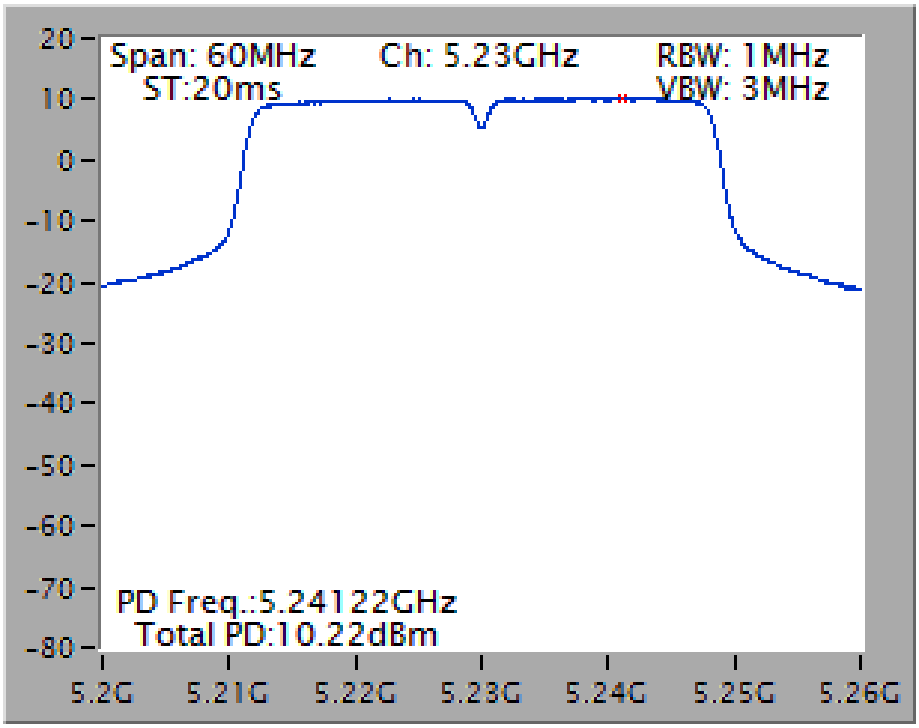
Power Density Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5200 MHz



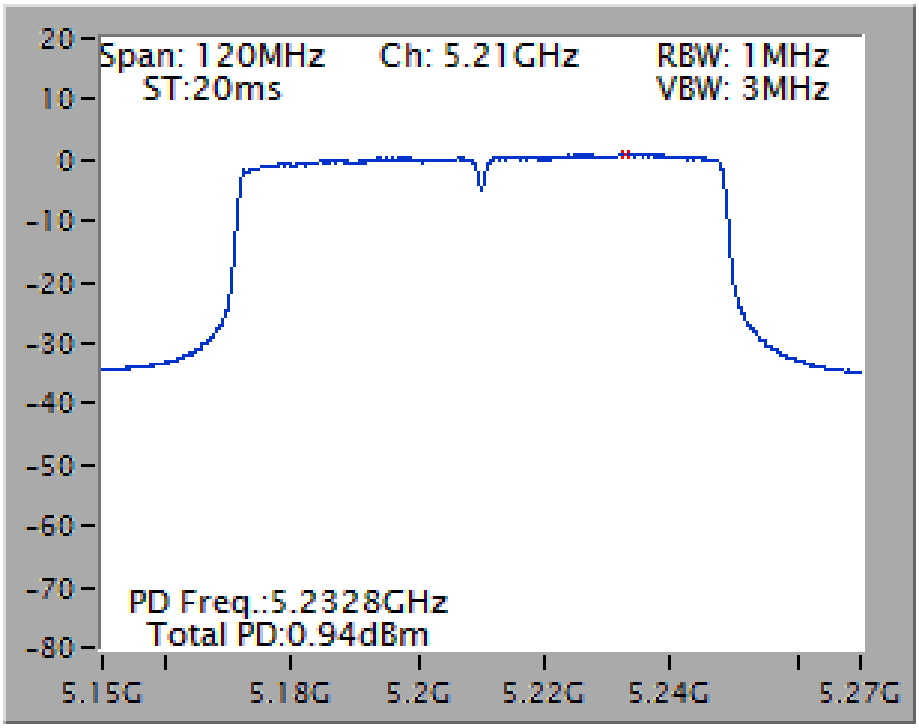
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5200 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4 / 5230 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 3 + Ant. 4 / 5210 MHz



4.4. Radiated Emissions Measurement

4.4.1. 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

4.4.2. 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

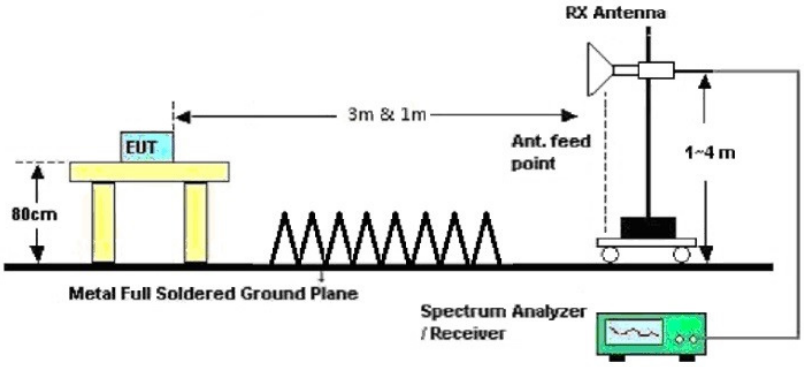
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.4.3. 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.

4.4.4. Test Setup Layout

For Radiated Emissions: Above 1GHz



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

Temperature	25.1℃	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11a CH 36 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15540.00	44.48	54.00	-9.52	31.18	10.77	38.12	35.59	Average	100	360	HORIZONTAL
2	15540.00	58.79	74.00	-15.21	45.49	10.77	38.12	35.59	Peak	100	360	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	15540.00	44.39	54.00	-9.61	31.09	10.77	38.12	35.59	Average	100	65	VERTICAL
2	15540.00	57.59	74.00	-16.41	44.29	10.77	38.12	35.59	Peak	100	65	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11a CH 40 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15600.00	44.31	54.00	-9.69	31.07	10.78	38.04	35.58	Average	162	360	HORIZONTAL
2	15600.00	59.58	74.00	-14.42	46.34	10.78	38.04	35.58	Peak	162	360	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	15600.00	46.54	54.00	-7.46	33.30	10.78	38.04	35.58	Average	167	29	VERTICAL
2	15600.00	62.15	74.00	-11.85	48.91	10.78	38.04	35.58	Peak	167	29	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11a CH 48 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15720.00	48.49	54.00	-5.51	35.41	10.79	37.85	35.56	Average	167	318	HORIZONTAL
2	15720.00	64.32	74.00	-9.68	51.24	10.79	37.85	35.56	Peak	167	318	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	15720.00	48.93	54.00	-5.07	35.85	10.79	37.85	35.56	Average	181	0	VERTICAL
2	15720.00	64.88	74.00	-9.12	51.80	10.79	37.85	35.56	Peak	181	0	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15540.00	44.32	54.00	-9.68	31.02	10.77	38.12	35.59	Average	100	246	HORIZONTAL
2	15540.00	57.89	74.00	-16.11	44.59	10.77	38.12	35.59	Peak	100	246	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	15540.00	44.21	54.00	-9.79	30.91	10.77	38.12	35.59	Average	100	322	VERTICAL
2	15540.00	58.57	74.00	-15.43	45.27	10.77	38.12	35.59	Peak	100	322	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15600.00	43.43	54.00	-10.57	30.19	10.78	38.04	35.58	Average	100	89	HORIZONTAL
2	15600.00	57.61	74.00	-16.39	44.37	10.78	38.04	35.58	Peak	100	89	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	15600.00	43.21	54.00	-10.79	29.97	10.78	38.04	35.58	Average	100	193	VERTICAL
2	15600.00	57.61	74.00	-16.39	44.37	10.78	38.04	35.58	Peak	100	193	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15720.00	44.51	54.00	-9.49	31.43	10.79	37.85	35.56	Average	101	54	HORIZONTAL
2	15720.00	57.20	74.00	-16.80	44.12	10.79	37.85	35.56	Peak	100	54	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	15720.00	44.04	54.00	-9.96	30.96	10.79	37.85	35.56	Average	100	153	VERTICAL
2	15720.00	58.51	74.00	-15.49	45.43	10.79	37.85	35.56	Peak	100	153	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15539.04	44.70	54.00	-9.30	31.40	10.77	38.12	35.59	Average	100	153	HORIZONTAL
2	15540.50	58.19	74.00	-15.81	44.89	10.77	38.12	35.59	Peak	100	153	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	15539.36	44.49	54.00	-9.51	31.19	10.77	38.12	35.59	Average	100	123	VERTICAL
2	15540.76	58.05	74.00	-15.95	44.75	10.77	38.12	35.59	Peak	100	123	VERTICAL

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15689.40	44.02	54.00	-9.98	30.88	10.79	37.91	35.56	Average	100	265	HORIZONTAL
2	15690.28	57.60	74.00	-16.40	44.46	10.79	37.91	35.56	Peak	100	265	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	15689.08	57.46	74.00	-16.54	44.32	10.79	37.91	35.56	Peak	100	216	VERTICAL
2	15690.88	43.85	54.00	-10.15	30.71	10.79	37.91	35.56	Average	100	216	VERTICAL

Temperature	25.1℃	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Ant. 3 + Ant. 4
Test Date	Sep. 06, 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	15629.49	42.72	54.00	-11.28	29.52	10.78	37.99	35.57	Average	100	120	HORIZONTAL
2	15629.80	57.97	74.00	-16.03	44.77	10.78	37.99	35.57	Peak	100	120	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	15630.91	57.92	74.00	-16.08	44.72	10.78	37.99	35.57	Peak	100	254	VERTICAL
2	15630.97	42.71	54.00	-11.29	29.51	10.78	37.99	35.57	Average	100	254	VERTICAL

Note:

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

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

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

4.5. Band Edge 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 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
RBW / VBW (30dBc in any 100 kHz bandwidth emission)	100 kHz / 300 kHz for Peak

4.5.3. Test Procedures

The test procedure is the same as section 4.4.3.

4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.4.4.

4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Test Result of Band Edge and Fundamental Emissions

Temperature	25.1℃	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11a CH 36, 40, 48 / Ant. 3 + Ant. 4
Test Date	Sep. 04, 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	5149.60	68.71	74.00	-5.29	63.77	6.13	34.01	35.20	Peak	180	59	HORIZONTAL
2	5150.00	52.24	54.00	-1.76	47.30	6.13	34.01	35.20	Average	180	59	HORIZONTAL
3	5201.20	109.22			104.15	6.16	34.11	35.20	Average	180	59	HORIZONTAL
4	5206.40	118.38			113.31	6.16	34.11	35.20	Peak	180	59	HORIZONTAL

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	5149.60	68.71	74.00	-5.29	63.77	6.13	34.01	35.20	Peak	180	59	HORIZONTAL
2	5150.00	52.24	54.00	-1.76	47.30	6.13	34.01	35.20	Average	180	59	HORIZONTAL
3	5201.20	109.22			104.15	6.16	34.11	35.20	Average	180	59	HORIZONTAL
4	5206.40	118.38			113.31	6.16	34.11	35.20	Peak	180	59	HORIZONTAL

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	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5149.20	59.52	74.00	-14.48	54.58	6.13	34.01	35.20	Peak	184	52	HORIZONTAL
2	5150.00	46.86	54.00	-7.14	41.92	6.13	34.01	35.20	Average	184	52	HORIZONTAL
3	5236.00	118.48			113.32	6.18	34.18	35.20	Peak	184	52	HORIZONTAL
4	5236.40	109.20			104.04	6.18	34.18	35.20	Average	184	52	HORIZONTAL

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

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Ant. 3 + Ant. 4
Test Date	Sep. 04, 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	5147.90	69.48	74.00	-4.52	64.54	6.13	34.01	35.20	Peak	191	50	HORIZONTAL
2	5150.00	53.94	54.00	-0.06	49.00	6.13	34.01	35.20	Average	191	50	HORIZONTAL
3	5175.80	115.77			110.78	6.15	34.04	35.20	Peak	191	50	HORIZONTAL
4	5176.10	103.86			98.87	6.15	34.04	35.20	Average	191	50	HORIZONTAL

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	5149.20	70.92	74.00	-3.08	65.98	6.13	34.01	35.20	Peak	180	55	HORIZONTAL
2	5150.00	53.96	54.00	-0.04	49.02	6.13	34.01	35.20	Average	180	55	HORIZONTAL
3	5194.40	120.41			115.37	6.16	34.08	35.20	Peak	180	55	HORIZONTAL
4	5194.80	108.76			103.69	6.16	34.11	35.20	Average	180	55	HORIZONTAL

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	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	5146.40	47.40	54.00	-6.60	42.46	6.13	34.01	35.20	Average	183	56	HORIZONTAL
2	5150.00	60.43	74.00	-13.57	55.49	6.13	34.01	35.20	Peak	183	56	HORIZONTAL
3	5234.00	109.66			104.50	6.18	34.18	35.20	Average	183	56	HORIZONTAL
4	5235.20	121.33			116.17	6.18	34.18	35.20	Peak	183	56	HORIZONTAL

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

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Ant. 3 + Ant. 4
Test Date	Sep. 04, 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	5148.40	53.48	54.00	-0.52	48.54	6.13	34.01	35.20	Average	189	55	HORIZONTAL
2	5148.80	68.53	74.00	-5.47	63.59	6.13	34.01	35.20	Peak	189	55	HORIZONTAL
3	5186.40	111.17			106.14	6.15	34.08	35.20	Peak	189	55	HORIZONTAL
4	5203.20	101.15			96.08	6.16	34.11	35.20	Average	189	55	HORIZONTAL

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	5150.00	53.98	54.00	-0.02	49.04	6.13	34.01	35.20	Average	189	53	HORIZONTAL
2	5150.00	68.63	74.00	-5.37	63.69	6.13	34.01	35.20	Peak	189	53	HORIZONTAL
3	5234.80	107.02			101.86	6.18	34.18	35.20	Average	189	53	HORIZONTAL
4	5234.80	116.79			111.63	6.18	34.18	35.20	Peak	189	53	HORIZONTAL

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

Temperature	25.1°C	Humidity	50%
Test Engineer	Mars Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Ant. 3 + Ant. 4
Test Date	Sep. 04, 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	5138.00	66.69	74.00	-7.31	61.79	6.12	33.98	35.20	Peak	182	295	HORIZONTAL
2	5146.80	53.65	54.00	-0.35	48.71	6.13	34.01	35.20	Average	182	295	HORIZONTAL
3	5198.80	110.28			105.21	6.16	34.11	35.20	Peak	182	295	HORIZONTAL
4	5226.80	96.88			91.75	6.18	34.15	35.20	Average	182	295	HORIZONTAL

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

Note:

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

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

4.6. 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

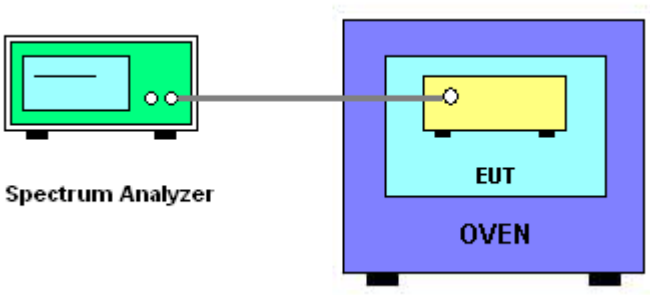
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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. 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~50°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	20°C	Humidity	52%
Test Engineer	Mars Lin	Test Date	Sep. 18, 2014

Mode: 20 MHz

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5200 MHz
126.50	5199.9732
110.00	5199.9875
93.50	5199.9964
Max. Deviation (MHz)	0.026800
Max. Deviation (ppm)	5.15

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	5200 MHz
0	5199.9798
10	5199.9844
20	5199.9875
30	5200.0058
40	5200.0134
50	5200.0212
Max. Deviation (MHz)	0.021200
Max. Deviation (ppm)	4.08

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
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	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)
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-3	N/A	1GHz – 40GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1GHz - 40GHz	Nov. 17, 2013	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
Signal analyzer	Agilent	N9010A	MY52220519	10Hz~44GHz	Dec. 11, 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)

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

N.C.R means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
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%