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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	**KA2IR880LA1**

Product Name	Wireless AC1900 Dual Band Gigabit Cloud Router
Brand Name	D-Link
Model No.	DIR-880L, DIR-880LW
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Nov. 09, 2013
Final Test Date	Aug. 08, 2014
Submission Type	Class II Change
Operating Mode	Master

Statement

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

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

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

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009**, **47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01, KDB662911 D01 v02r01, KDB644545 D01 v01r02.**

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

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR410860-02	Rev. 01	Initial issue of report	Aug. 19, 2014

Certificate No.: CB10308238

1. CERTIFICATE OF COMPLIANCE

Product Name	:	Wireless AC1900 Dual Band Gigabit Cloud Router
Brand Name	:	D-Link
Model No.	:	DIR-880L, DIR-880LW
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 Nov. 09, 2013 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.2	15.407(a)	Maximum Conducted Output Power	Complies	0.09 dB
4.3	15.407(a)	Power Spectral Density	Complies	0.45 dB
4.4	15.407(b)	Radiated Emissions	Complies	6.88 dB
4.5	15.407(b)	Band Edge Emissions	Complies	0.05 dB
4.6	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n/ac

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	see the below table for IEEE 802.11n/ac
Data Modulation	For 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) For 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n/ac
Frequency Range	5150 ~ 5250MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	For non-beamforming function: 802.11ac MCS0/Nss1 (VHT20): 17.60 MHz ; 802.11ac MCS0/Nss1 (VHT40): 36.48 MHz ; 802.11ac MCS0/Nss1 (VHT80): 76.80 MHz For beamforming function: 802.11ac MCS0/Nss1 (VHT20): 17.92 MHz ; 802.11ac MCS0/Nss1 (VHT40): 36.48 MHz ; 802.11ac MCS0/Nss1 (VHT80): 76.80 MHz
Maximum Conducted Output Power	For non-beamforming function: 802.11ac MCS0/Nss1 (VHT20): 25.42 dBm ; 802.11ac MCS0/Nss1 (VHT40): 25.18 dBm ; 802.11ac MCS0/Nss1 (VHT80): 16.96 dBm For beamforming function: 802.11ac MCS0/Nss1 (VHT20): 28.14 dBm ; 802.11ac MCS0/Nss1 (VHT40): 23.20 dBm ; 802.11ac MCS0/Nss1 (VHT80): 17.63 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11a

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	OFDM for IEEE 802.11a
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	OFDM (6/9/12/18/24/36/48/54)
Frequency Range	5150 ~ 5250MHz
Channel Number	4
Channel Band Width (99%)	16.64 MHz
Maximum Conducted Output Power	26.77 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
For 802.11a: Beamforming Function	☐ With beamforming	☒ Without beamforming
For 802.11n/ac: Beamforming Function	☒ With beamforming	☐ Without beamforming

Antenna and Bandwidth

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:

11a: IEEE 802.11a, HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac

3.2. Accessories

Power	Brand	Model No.	Rating
Adapter	APD	WA-36C12R	Input: 100-240Vac, 50-60Hz, 1A Max. Output: 12Vdc, 3A
Other			
Plug*1			

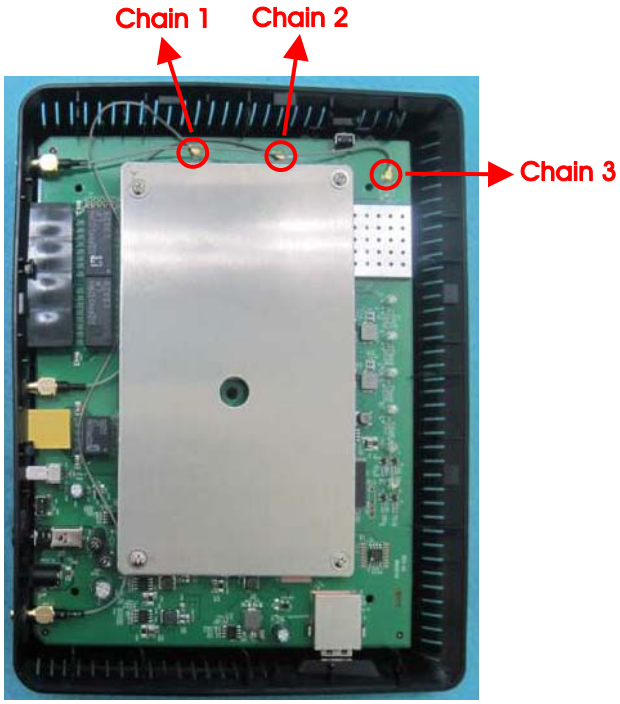
3.3. Table for Filed Antenna

Ant.	Brand	Model No.	Type	Connector	Gain (dBi)		Cable loss		True Gain (dBi)	
					2.4GHz	5GHz	2.4GHz	5GHz	2.4GHz	5GHz
1	WHA YU	C037-510901-A	Dipole	SMA	2.7	4.15	0.7	1.15	2	3
2	WHA YU	C037-511311-A	Dipole	SMA	2.7	4.15	0.7	1.15	2	3
3	WHA YU	C037-511313-A	Dipole	SMA	2.7	4.15	0.7	1.15	2	3

Note: 1. The total antennas amounted to three sets.

Ant. 1, Ant. 2 and Ant. 3 are identical except for the appearance of case, only the "Ant. 1" was tested and recorded in the report.

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



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

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

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

For 80MHz bandwidth systems, use Channel 42.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
	42	5210 MHz	-	-

3.5. Table for Test Modes

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

Test Items	Mode		Data Rate	Channel	Chain
Max. Conducted Output Power	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
Power Spectral Density	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
Radiated Emission Above 1GHz	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
Band Edge Emission	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3

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

2. There are two modes of 802.11n/ac, one is non-beamforming function, and the other is beamforming function, and all test results were recorded in the report.

The following test modes were performed for all tests:

For Radiated Emission Above 1GHz test:

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

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

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

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	**Site Category**	**Location**	**FCC Reg. No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

3.7. Table for Multiple Listing

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

Model No.	Color of housing	Description
DIR-880L	Black	Matched with Ant. 1(C037-510901-A) or Ant. 2 (C037-511311-A).
DIR-880LW	White	Matched with Ant. 3 (C037-511313-A)

From the above models, model: DIR-880L was selected as representative model for the test and its data was recorded in this report.

3.8. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR410860

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

Modifications	Performance Checking
Updating test rule of 5GHz Band 1(5150~5250 MHz) to "New Rules" from "Old Rules".	1. 26dB Spectrum Bandwidth and 99% Occupied Bandwidth. 2. Maximum Conducted Output Power. 3. Power Spectral Density. 4. Radiated Emission Above 1GHz. 5. Band Edge Emissions. 6. Maximum Permissible Exposure.

Note: Maximum Permissible Exposure of 5GHz ISM Band and 2.4GHz Band are based on original test report (please refer to Appendix B).

3.9. Table for Supporting Units

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC

For Test Site No: 03CH01-CB

For non-beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC

For beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
NB	DELL	D420	DoC
WiFi USB Adapter	NETGEAR	A6200	PY312200200

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 function:

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT20

Test Software Version	Manual Tool Version 2.0.1.0		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS0/Nss1 VHT20	83	72	80

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT40

Test Software Version	Manual Tool Version 2.0.1.0	
Frequency	5190 MHz	5230 MHz
MCS0/Nss1 VHT40	56	82

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT80

Test Software Version	Manual Tool Version 2.0.1.0
Frequency	5210 MHz
MCS0/Nss1 VHT80	48

Power Parameters of IEEE 802.11a

Test Software Version	Manual Tool Version 2.0.1.0		
Frequency	5180 MHz	5200 MHz	5240 MHz
802.11a	88	74	85

For beamforming function:

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT20

Test Software Version	Manual Tool Version 2.0.1.0		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS0/Nss1 VHT20	82	68	94

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT40

Test Software Version	Manual Tool Version 2.0.1.0	
Frequency	5190 MHz	5230 MHz
MCS0/Nss1 VHT40	52	77

Power Parameters of IEEE 802.11ac MCS0/Nss1 VHT80

Test Software Version	Manual Tool Version 2.0.1.0
Frequency	5210 MHz
MCS0/Nss1 VHT80	56

3.11. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

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

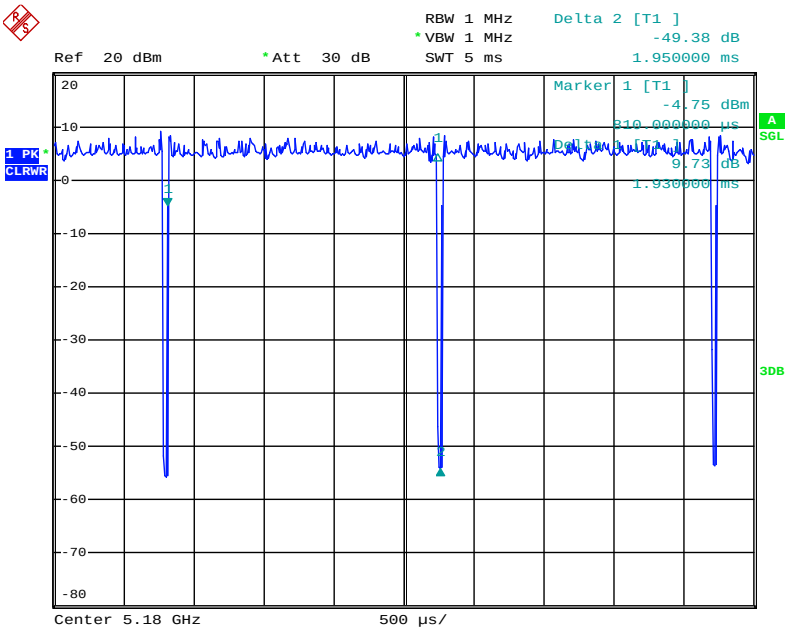
The program was executed as follows:

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

3.12. Duty Cycle

For non-beamforming function:

IEEE 802.11ac MCS0/Nss1 VHT20



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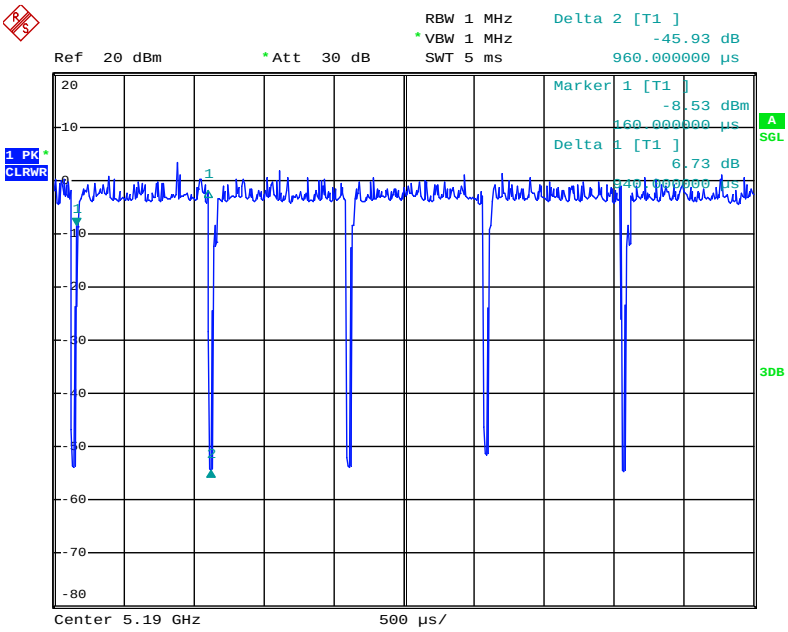
IEEE 802.11ac MCS0/Nss1 VHT40



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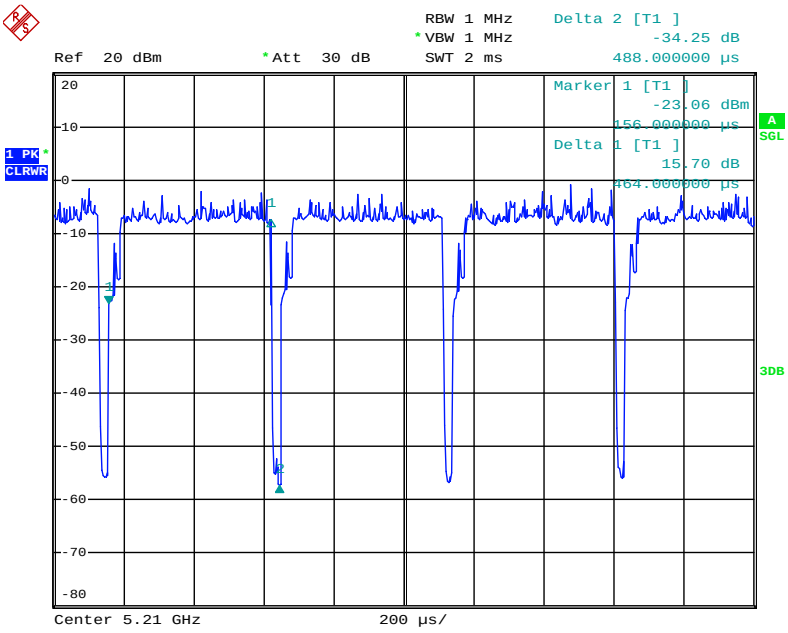
IEEE 802.11ac MCS0/Nss1 VHT80



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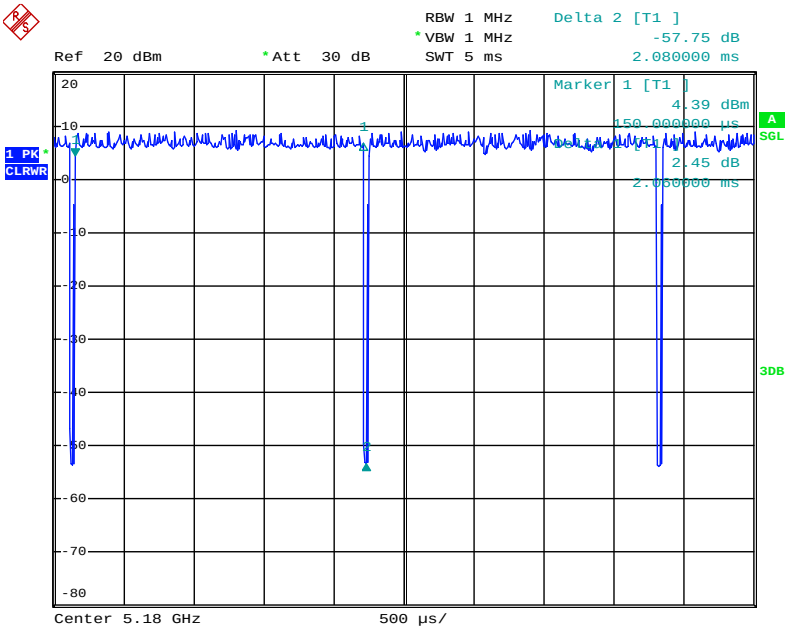
IEEE 802.11a



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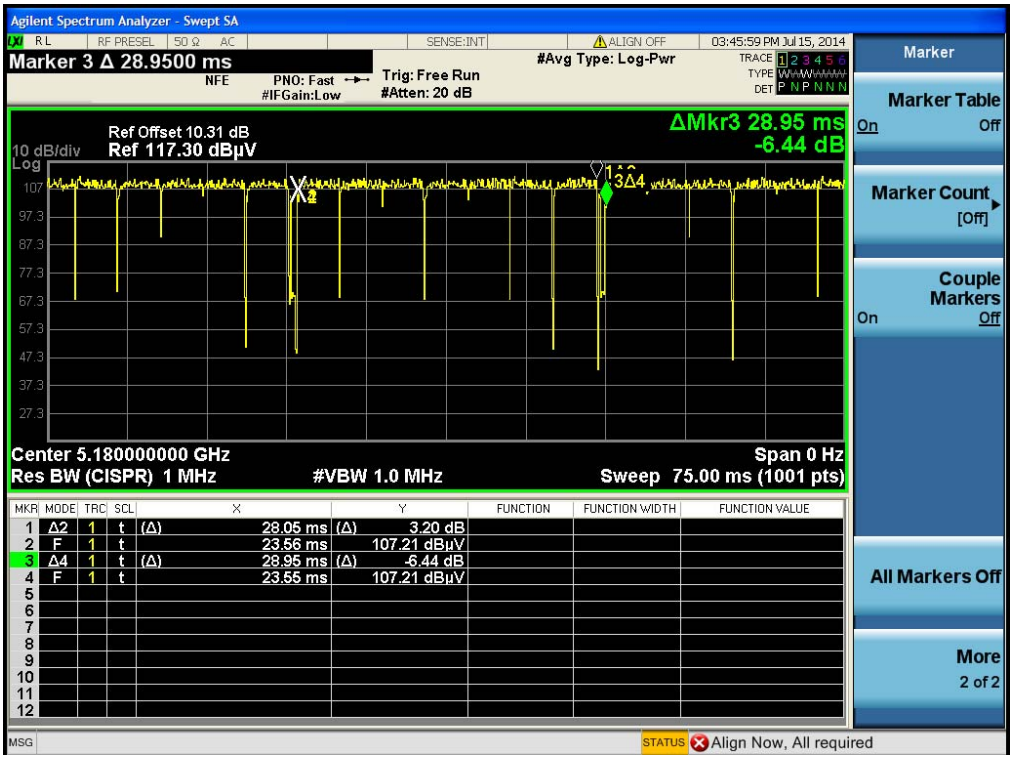
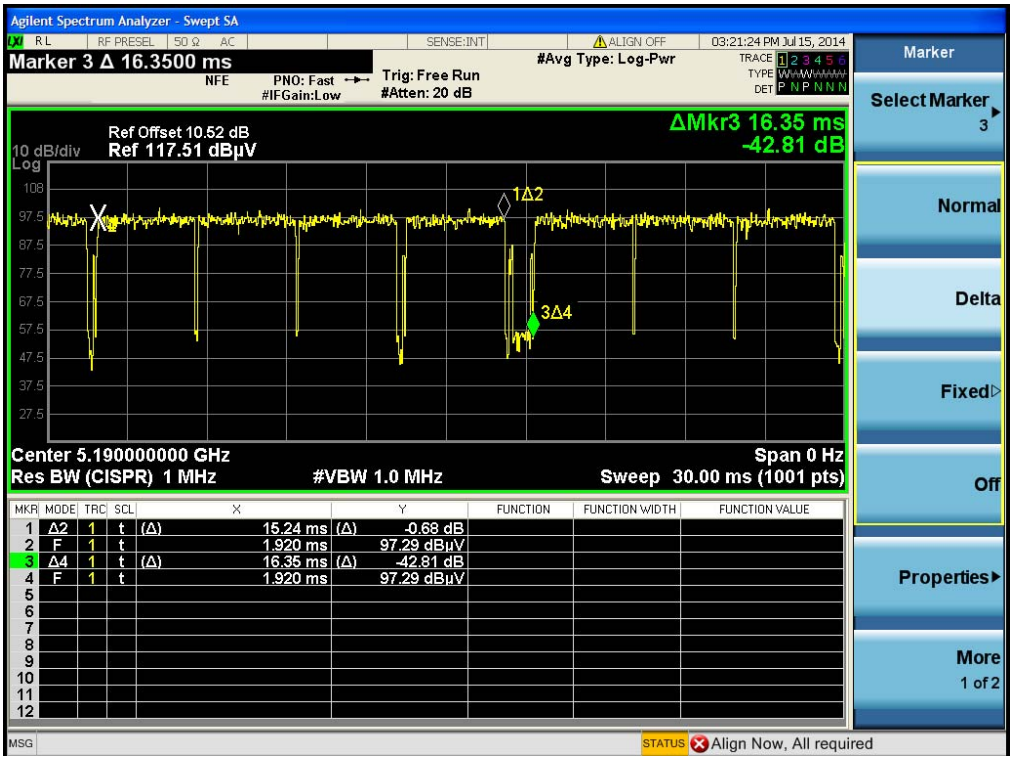
For beamforming function:

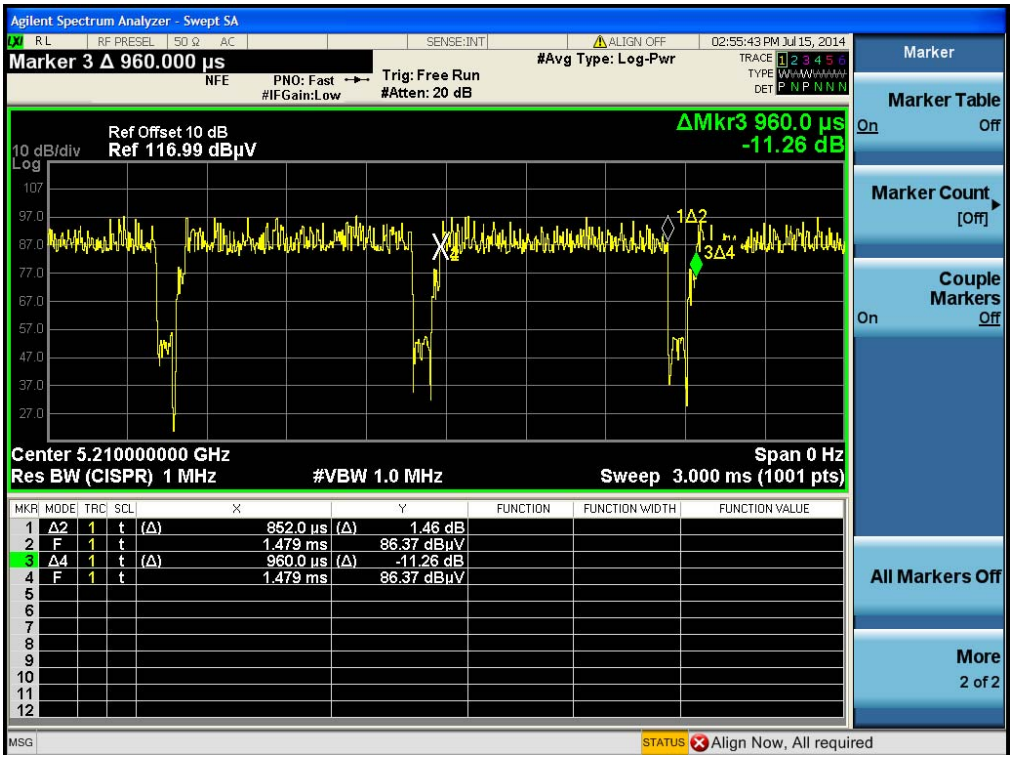
IEEE 802.11ac MCS0/Nss1 VHT20



IEEE 802.11ac MCS0/Nss1 VHT40

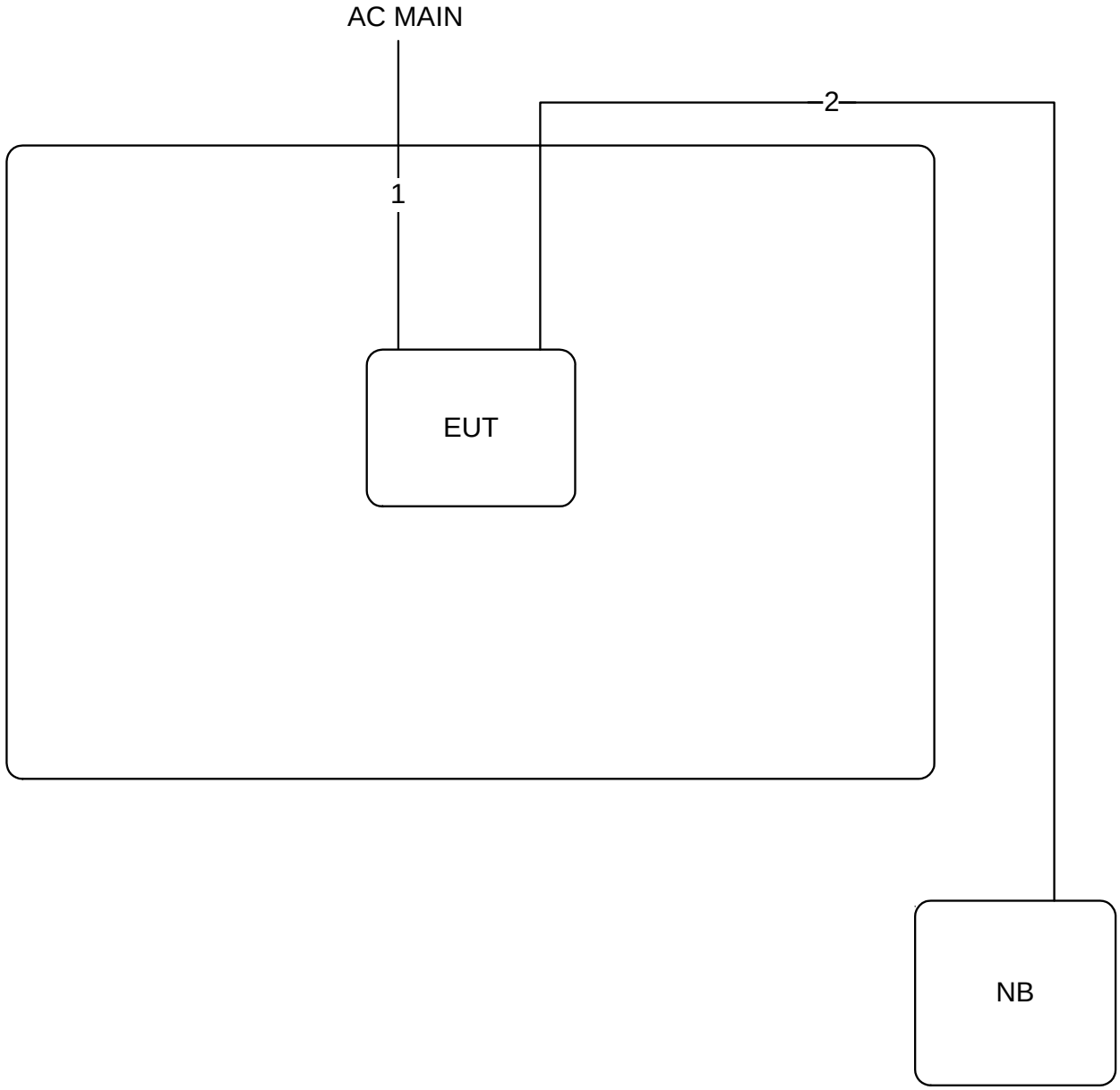


IEEE 802.11ac MCS0/Nss1 VHT80



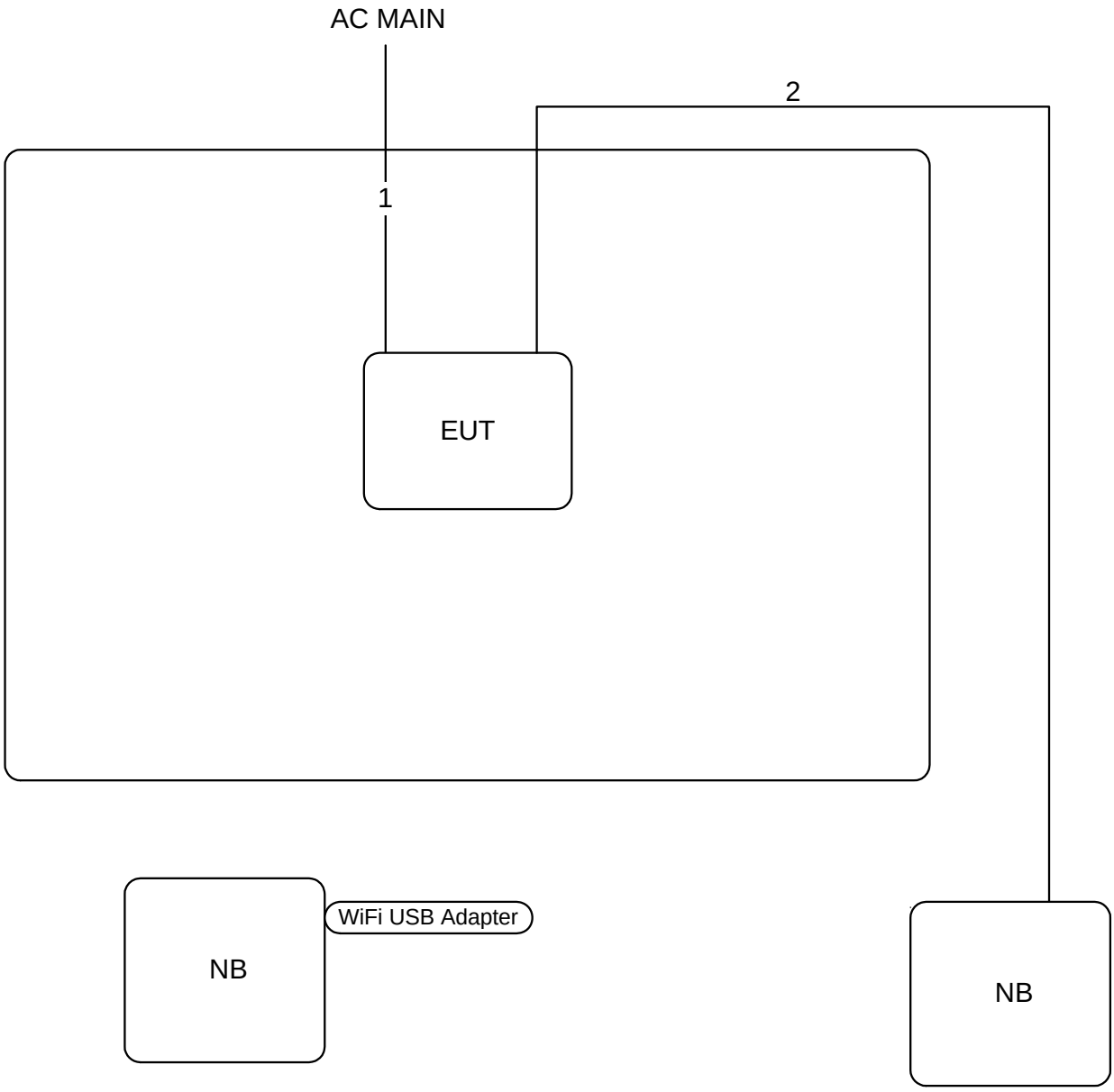
3.13. Test Configurations

For non-beamforming function:



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

For beamforming function:



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
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	60%
Test Engineer	Jim Huang	Configurations	IEEE 802.11ac
Test Function	Non-beamforming function		

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	20.16	17.60
40	5200 MHz	20.00	17.60
48	5240 MHz	20.16	17.60

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	38.72	36.48
46	5230 MHz	39.04	36.48

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
42	5210 MHz	81.92	76.80

Temperature	20°C	Humidity	60%
Test Engineer	Jim Huang	Configurations	IEEE 802.11a
Test Function	Non-beamforming function		

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	19.20	16.64
40	5200 MHz	19.20	16.64
48	5240 MHz	19.36	16.48

Temperature	20℃	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11ac
Test Function	Beamforming function		

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	20.48	17.92
40	5200 MHz	20.32	17.92
48	5240 MHz	20.48	17.92

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

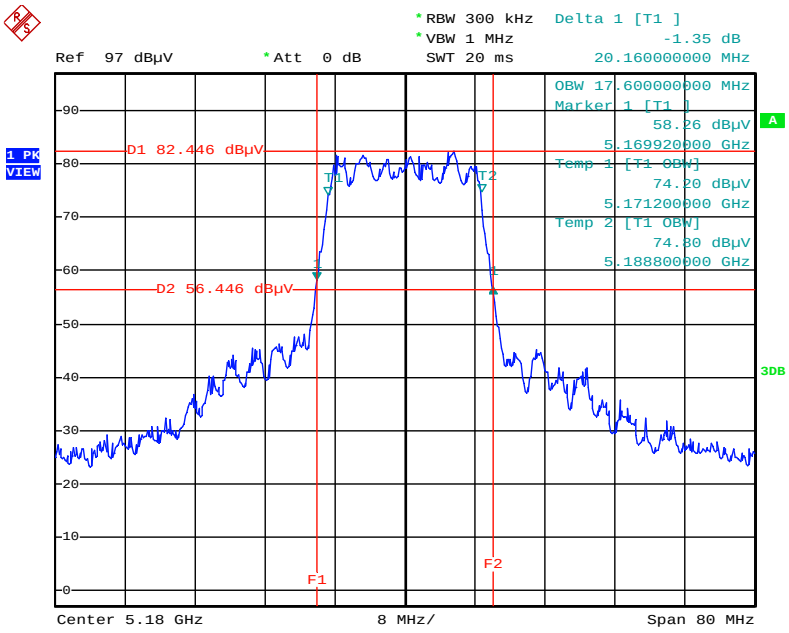
Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	39.04	36.48
46	5230 MHz	39.04	36.48

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
42	5210 MHz	82.56	76.80

For non-beamforming function:

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



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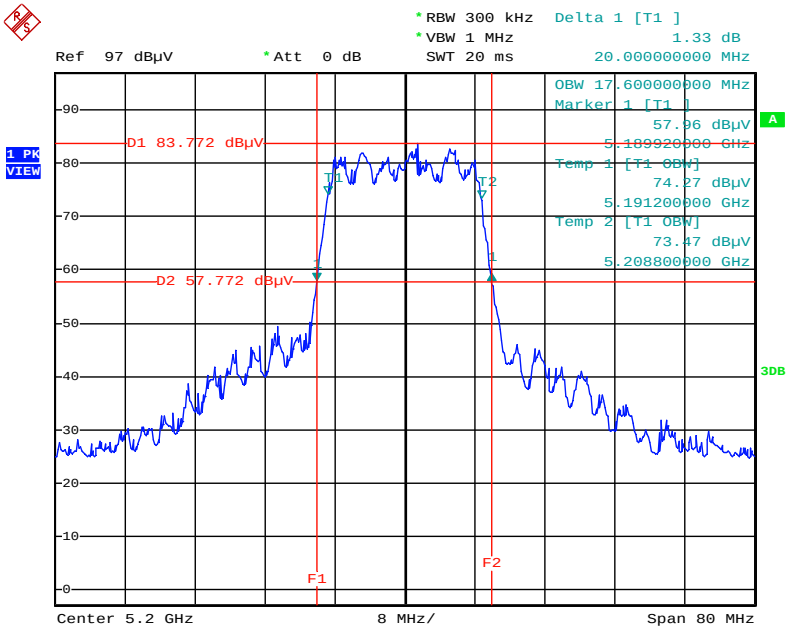
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 / 5200 MHz



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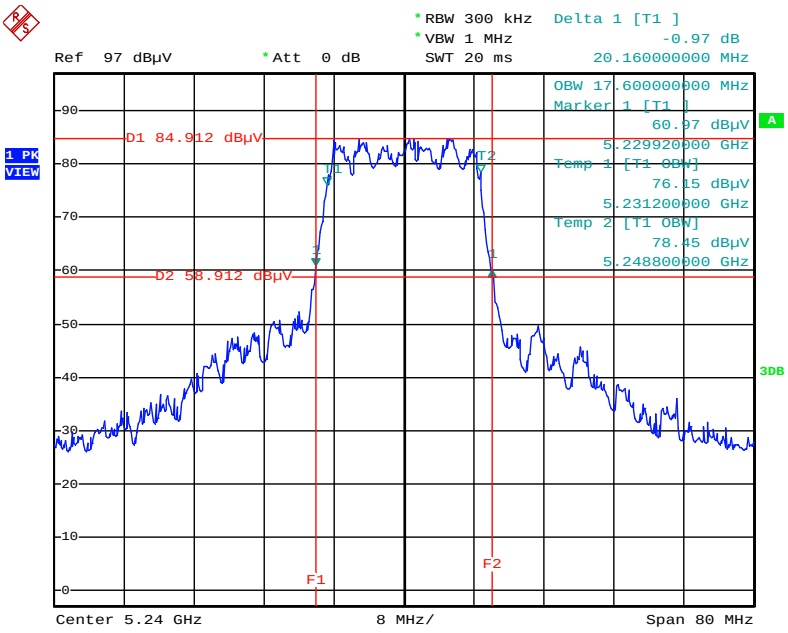
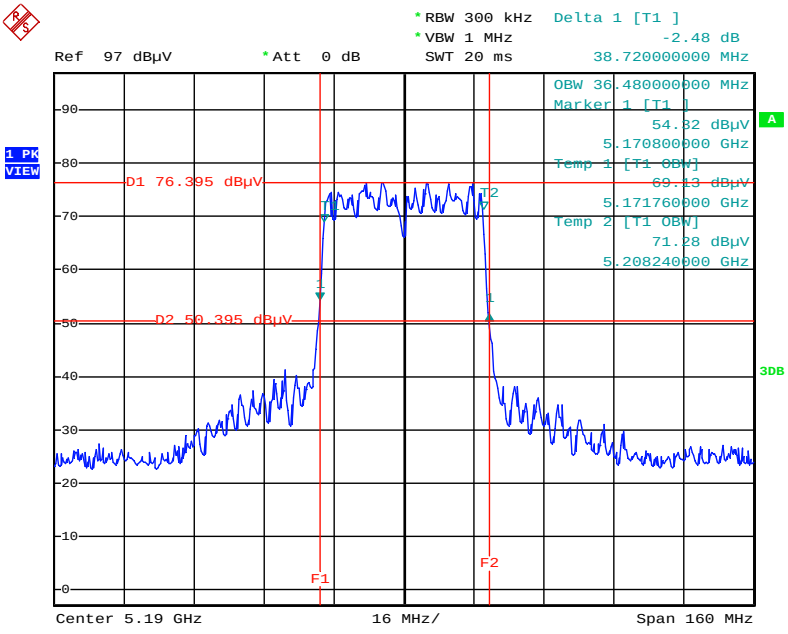
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



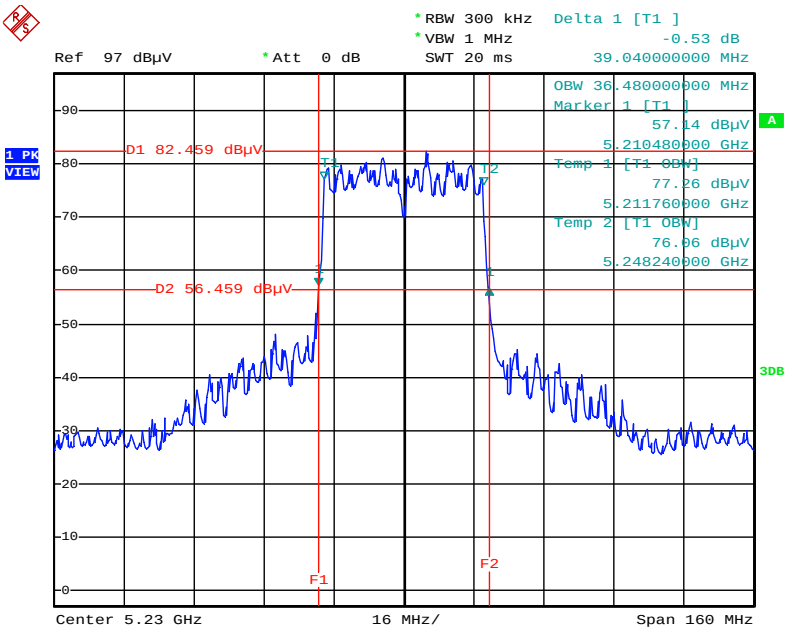
Date: 21.JUL.2014 21:06:47

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



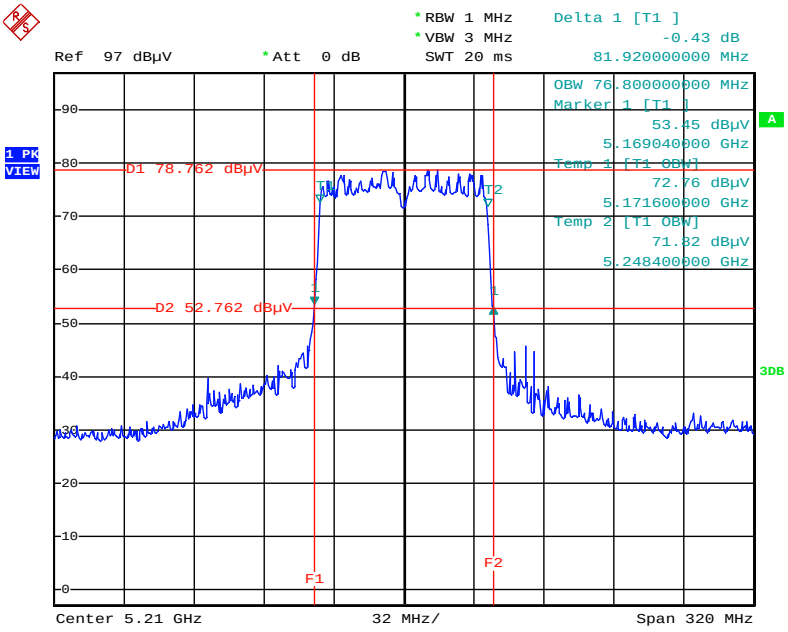
Date: 21.JUL.2014 21:08:20

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



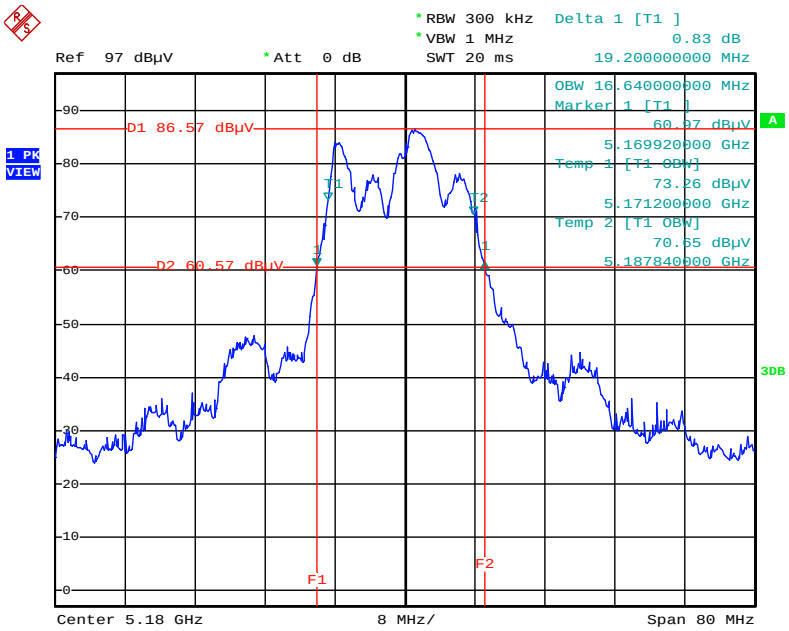
Date: 21.JUL.2014 21:08:48

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



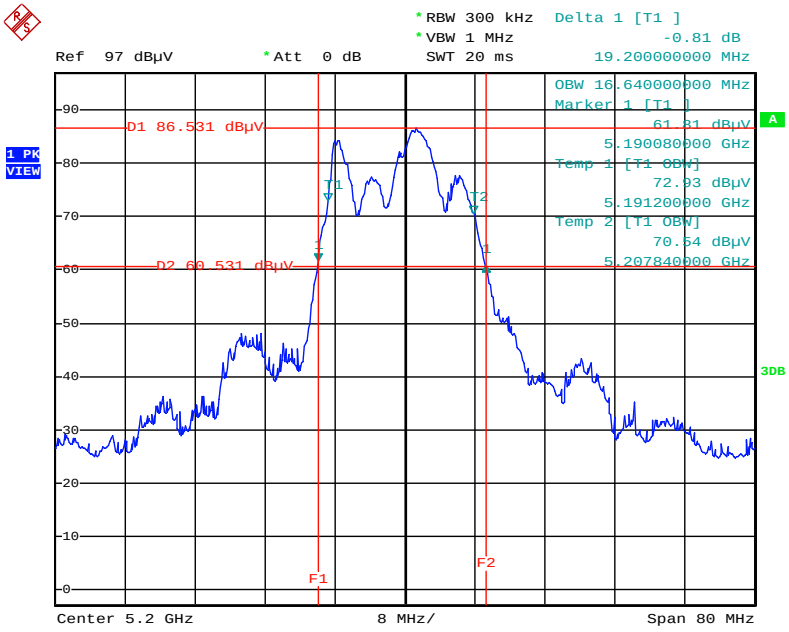
Date: 21.JUL.2014 21:09:19

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



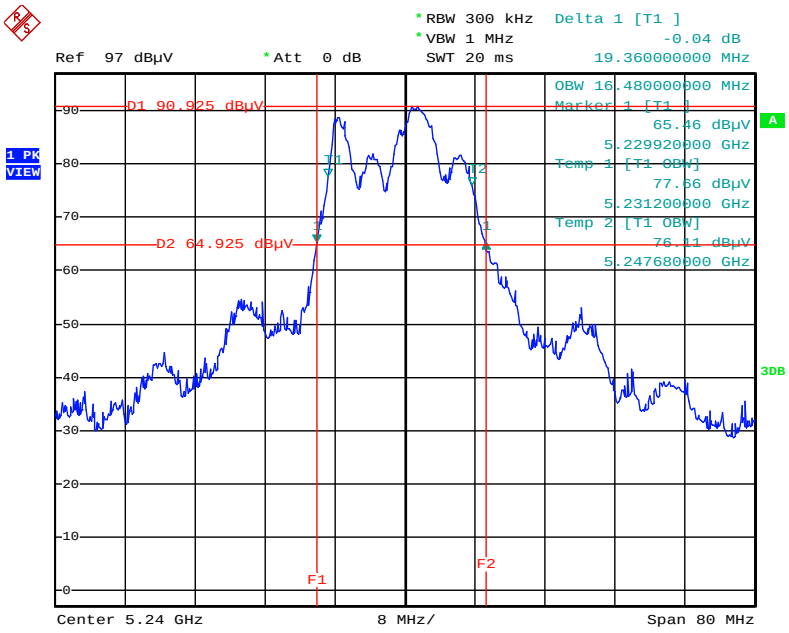
Date: 21.JUL.2014 21:05:40

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



Date: 21.JUL.2014 21:04:32

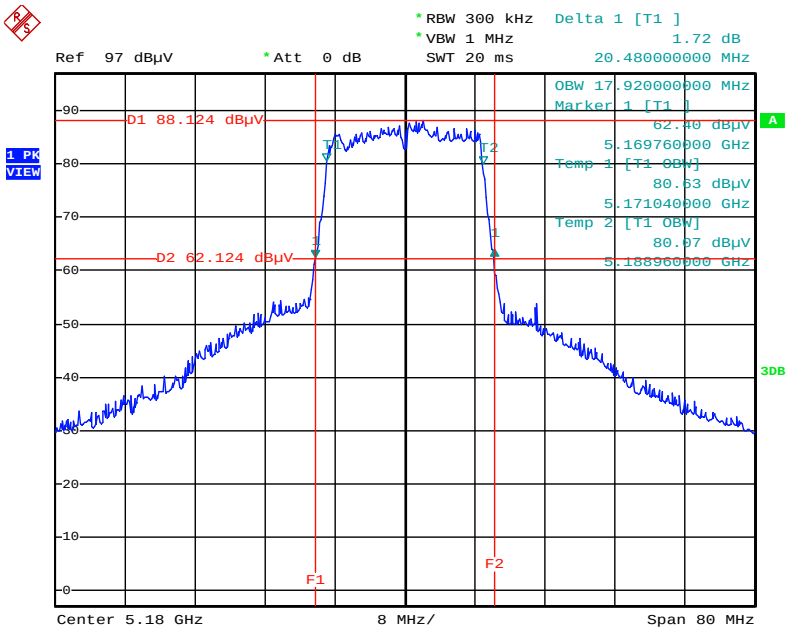
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



Date: 21.JUL.2014 21:06:14

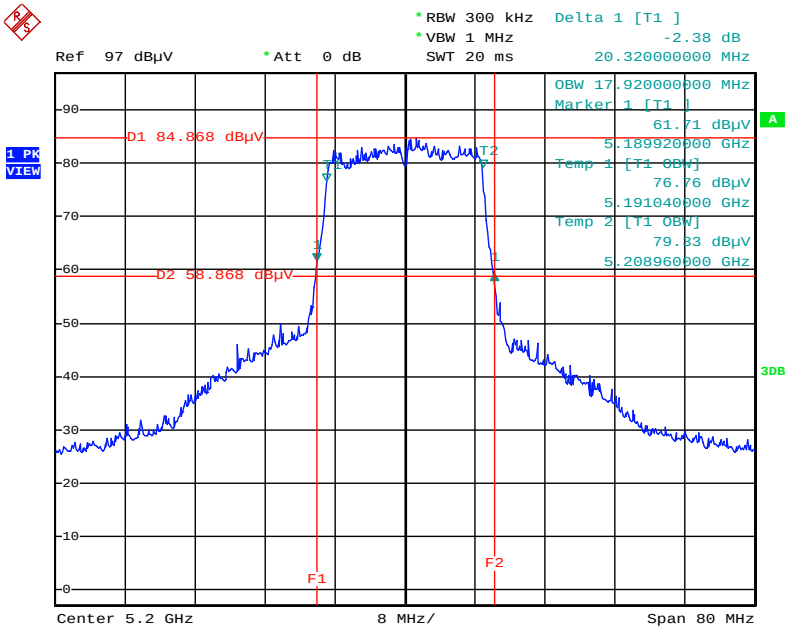
For beamforming function:

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



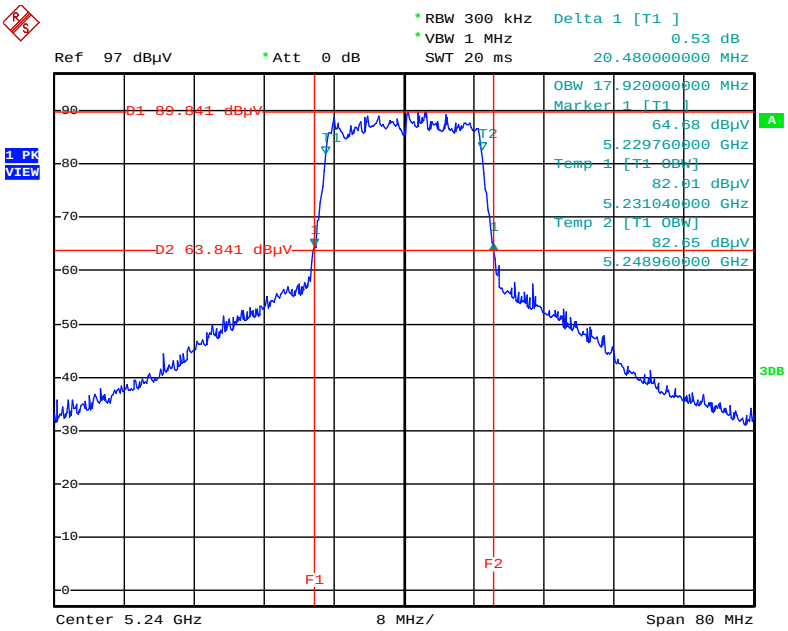
Date: 21.JUL.2014 21:11:32

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



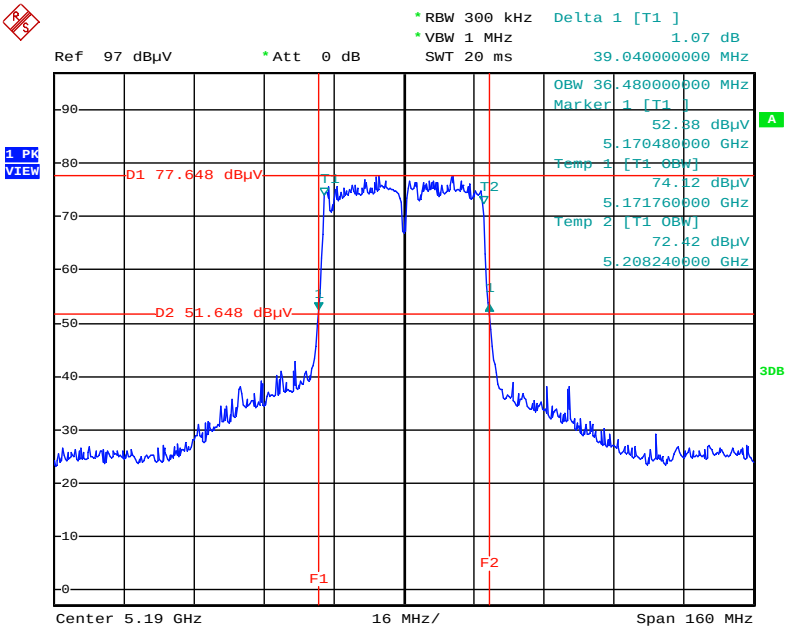
Date: 21.JUL.2014 21:12:02

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



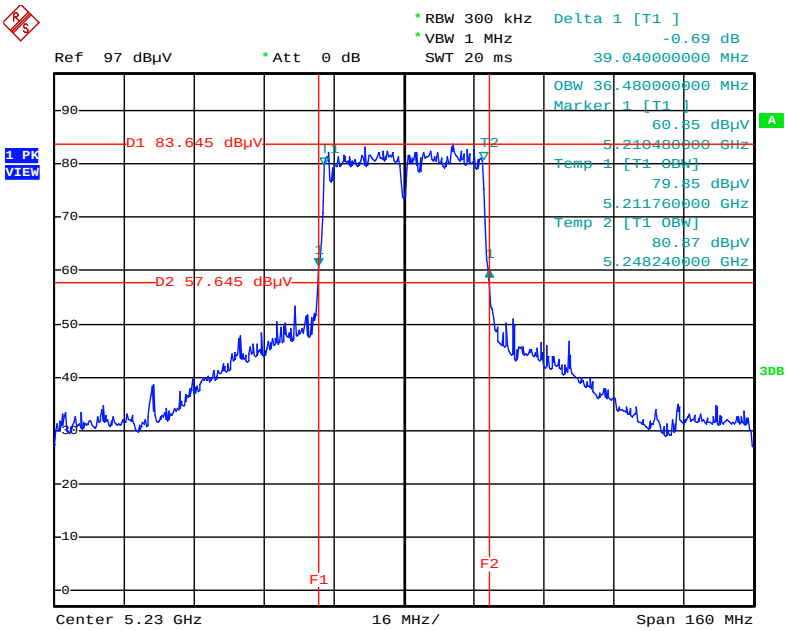
Date: 21.JUL.2014 21:12:43

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



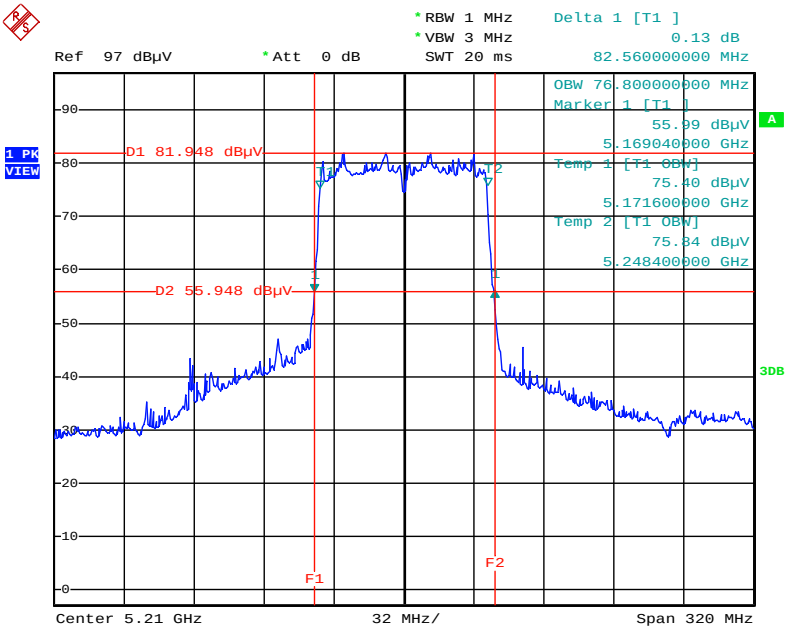
Date: 21.JUL.2014 21:10:22

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



Date: 21.JUL.2014 21:10:46

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



Date: 21.JUL.2014 21:09:50

4.2. Maximum Conducted Output Power Measurement

4.2.1. Limit

For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2. Measuring Instruments and Setting

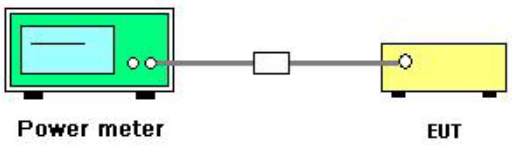
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

4.2.4. 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	60%
Test Engineer	Jim Huang	Configurations	IEEE 802.11ac
Test Date	Aug. 08, 2014	Test Function	Non-beamforming function

Configuration IEEE 802.11ac MCS0/Nss1 VHT20

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
36	5180 MHz	20.07	20.78	21.05	25.42	30.00	Complies
40	5200 MHz	17.65	18.28	18.64	22.98	30.00	Complies
48	5240 MHz	19.35	20.24	20.25	24.74	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT40

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
38	5190 MHz	13.87	14.51	14.71	19.15	30.00	Complies
46	5230 MHz	19.77	20.62	20.78	25.18	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT80

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
42	5210 MHz	11.35	12.36	12.75	16.96	30.00	Complies

Temperature	20°C	Humidity	60%
Test Engineer	Jim Huang	Configurations	IEEE 802.11a
Test Date	Aug. 08, 2014	Test Function	Non-beamforming function

Configuration IEEE 802.11a

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
36	5180 MHz	21.42	22.11	22.42	26.77	30.00	Complies
40	5200 MHz	18.11	18.72	18.93	23.37	30.00	Complies
48	5240 MHz	20.36	21.49	21.55	25.94	30.00	Complies

Temperature	20°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11ac
Test Date	Jul. 21, 2014	Test Function	Beamforming function

Configuration IEEE 802.11ac MCS0/Nss1 VHT20

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
36	5180 MHz	19.98	20.19	20.96	25.17	28.23	Complies
40	5200 MHz	16.68	16.71	17.26	21.66	28.23	Complies
48	5240 MHz	23.02	23.28	23.78	28.14	28.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=30 – (7.77 – 6)=28.23dBm.

Configuration IEEE 802.11ac MCS0/Nss1 VHT40

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
38	5190 MHz	12.18	12.23	12.89	17.22	28.23	Complies
46	5230 MHz	18.23	18.13	18.89	23.20	28.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=30 – (7.77 – 6)=28.23dBm.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
42	5210 MHz	12.53	12.49	13.47	17.63	28.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=30 – (7.77 – 6)=28.23dBm.

4.3. Power Spectral Density Measurement

4.3.1. Limit

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The following table is power spectral density limits and decrease power density limit rule refer to section 4.2.1.

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

4.3.2. Measuring Instruments and Setting

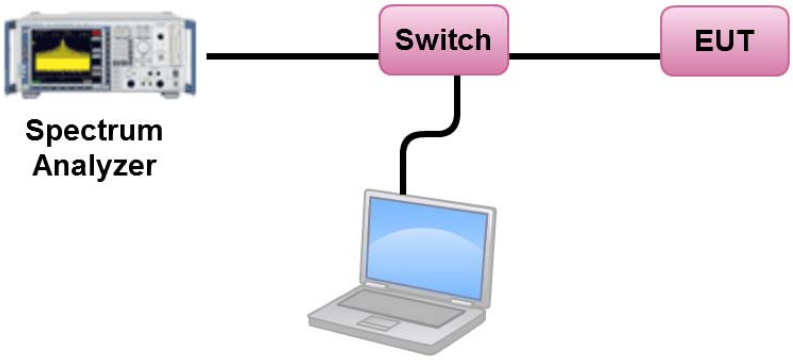
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

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

4.3.4. 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	60%
Test Engineer	Jim Huang	Configurations	IEEE 802.11ac
Test Date	Aug. 08, 2014	Test Function	Non-beamforming function

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	11.30	15.23	Complies
40	5200 MHz	8.56	15.23	Complies
48	5240 MHz	10.81	15.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	2.00	15.23	Complies
46	5230 MHz	8.29	15.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-3.16	15.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Jim Huang	Configurations	IEEE 802.11a
Test Date	Aug. 08, 2014	Test Function	Non-beamforming function

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	13.03	15.23	Complies
40	5200 MHz	9.54	15.23	Complies
48	5240 MHz	12.44	15.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11ac
Test Date	Jul. 21, 2014	Test Function	Beamforming function

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	11.71	15.23	Complies
40	5200 MHz	8.43	15.23	Complies
48	5240 MHz	14.78	15.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	0.92	15.23	Complies
46	5230 MHz	6.88	15.23	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-1.63	15.23	Complies

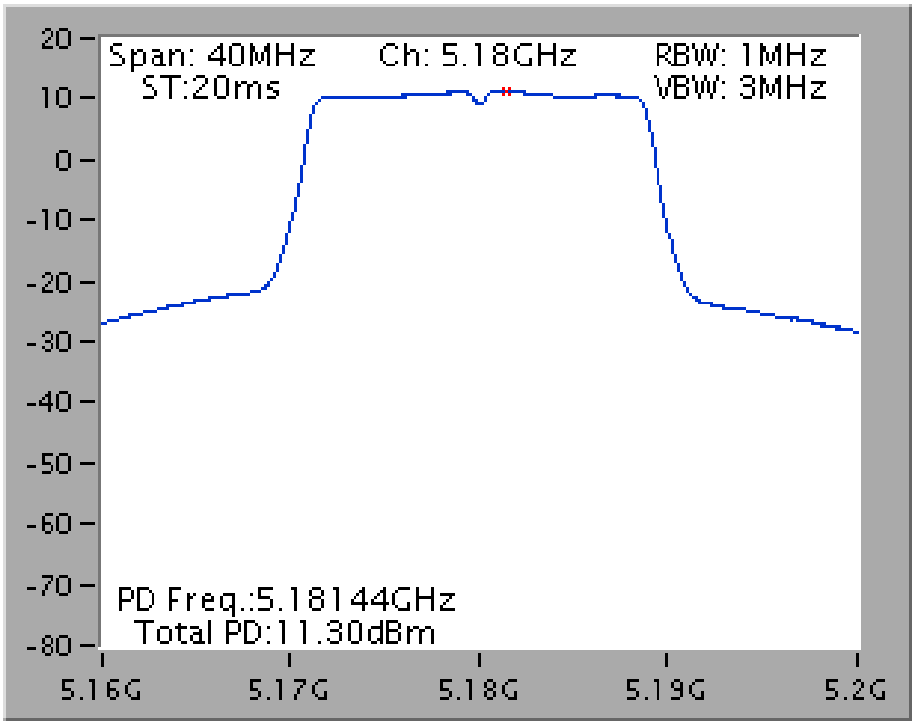
Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =7.77dBi >6dBi, so limit=17 – (7.77 – 6)=15.23dBm/MHz.

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

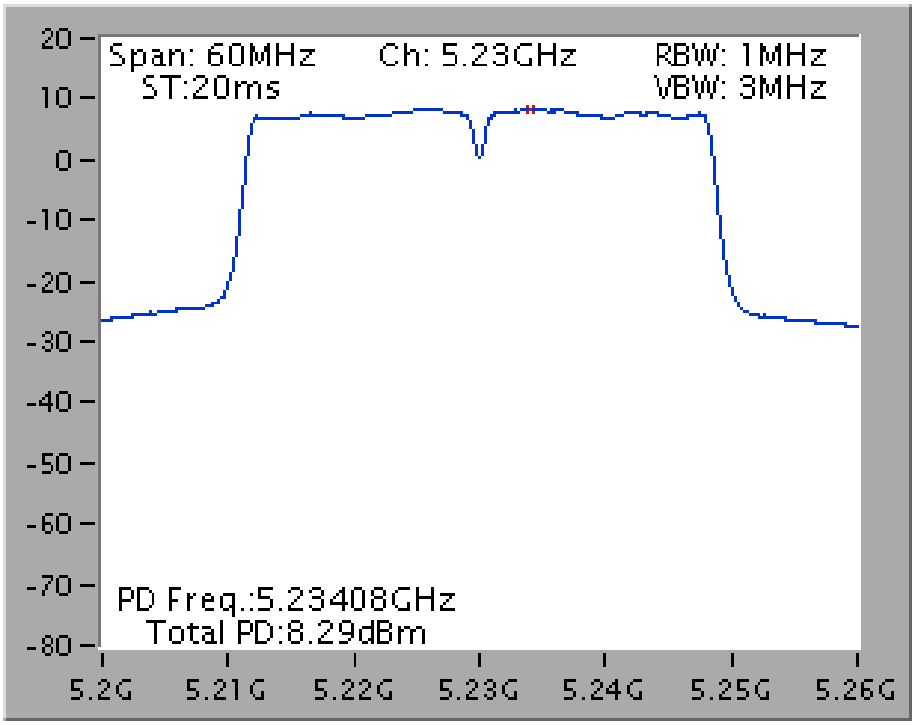
For plots, only the channel with worse result was shown.

For non-beamforming function:

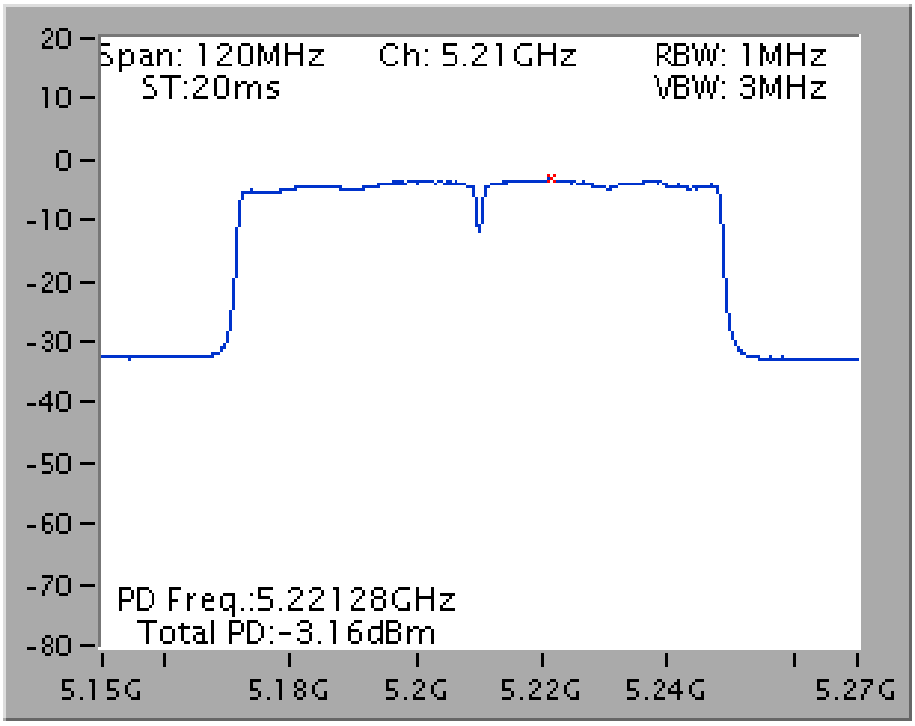
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 / 5180 MHz



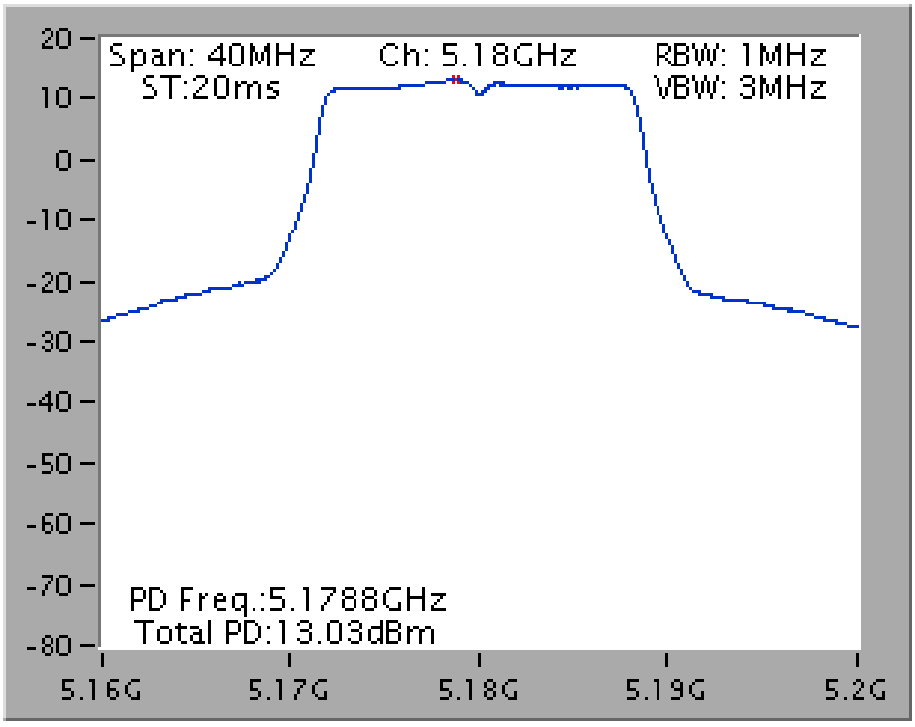
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 / 5230 MHz



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

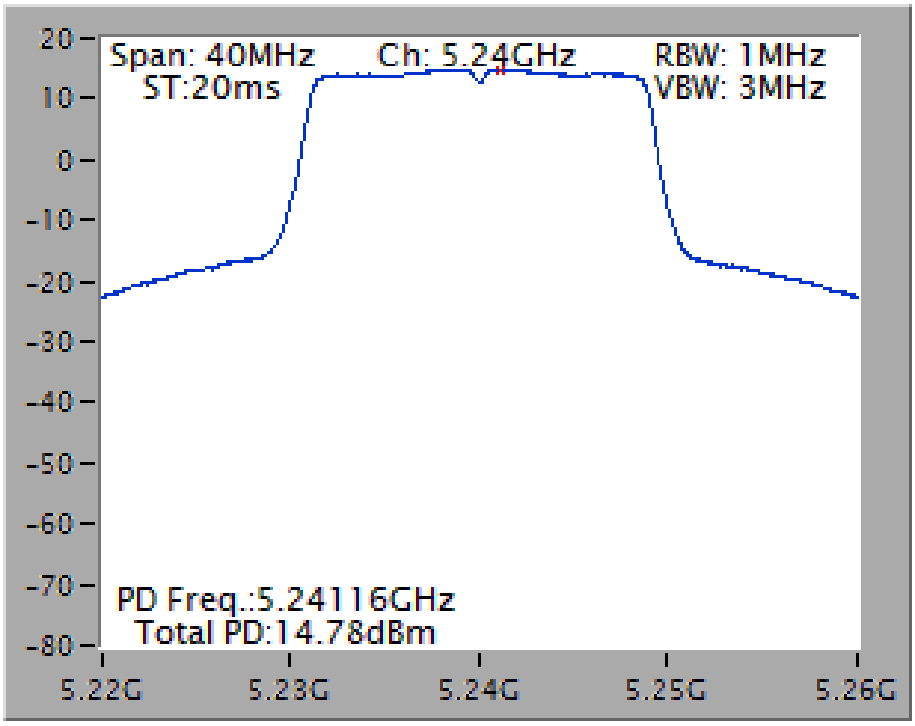


Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 / 5180 MHz

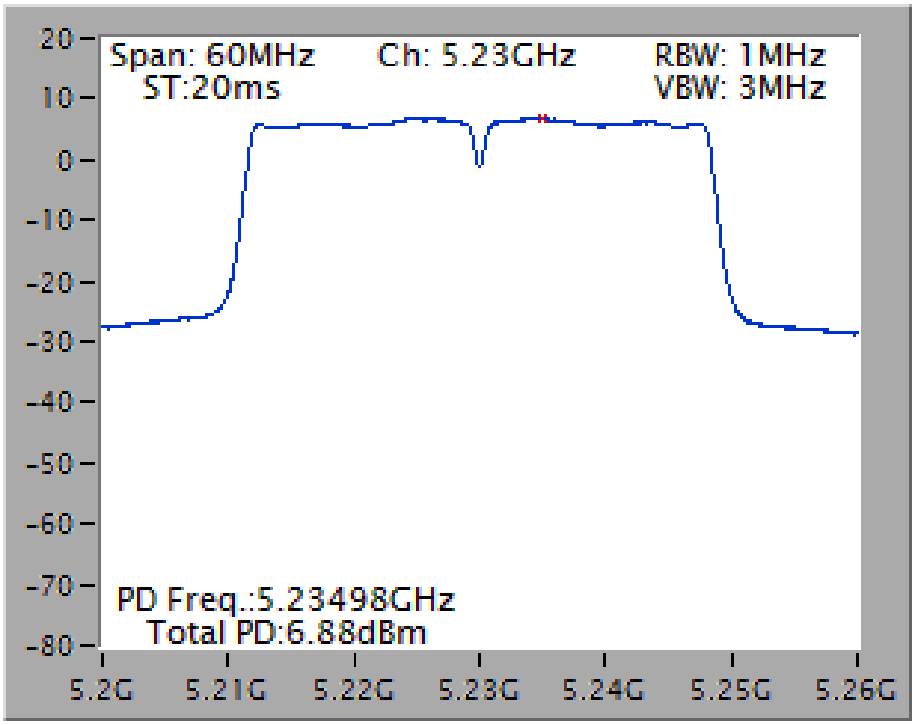


For beamforming function:

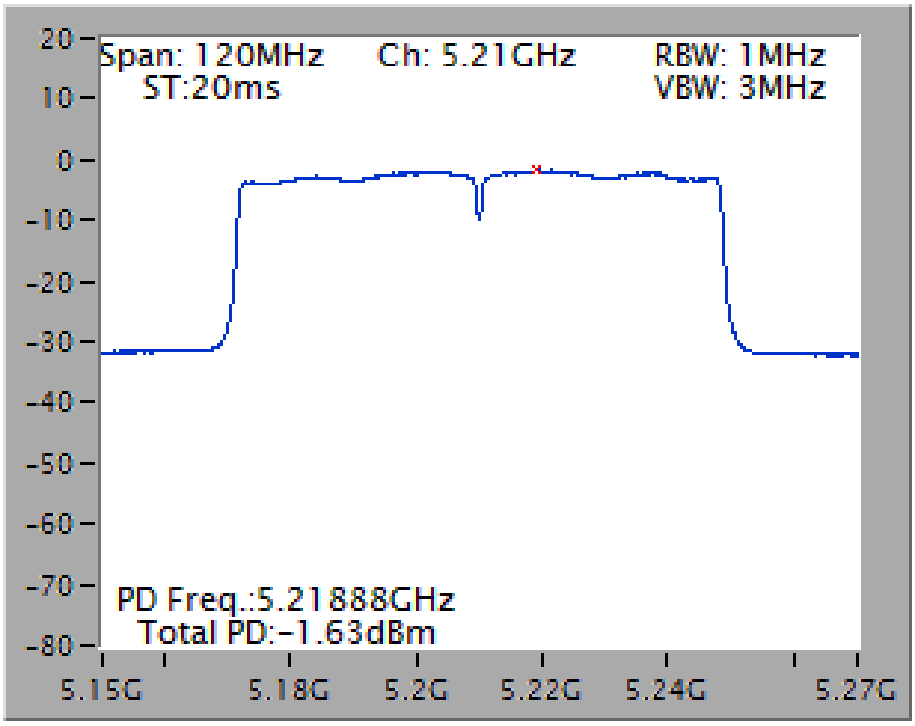
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 / 5240 MHz



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



4.4. 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.

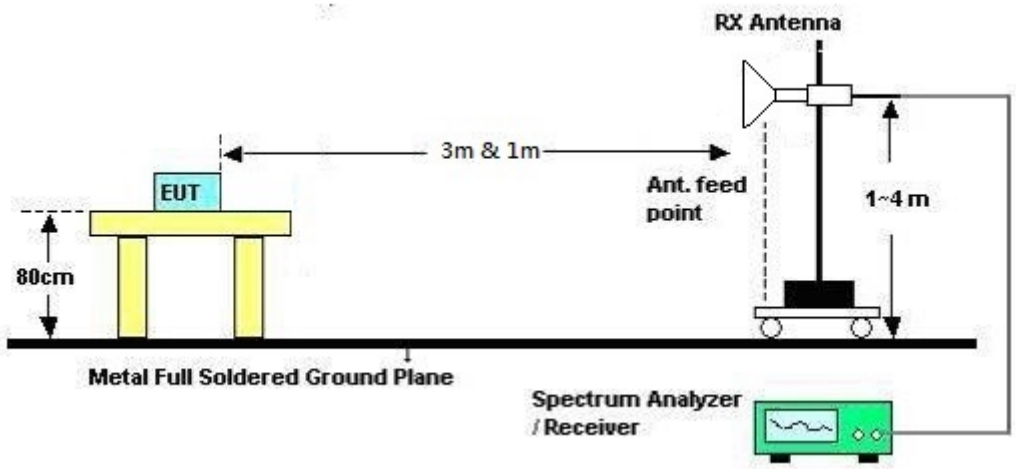
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

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

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

For Non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15546.62	57.51	74.00	-16.49	42.88	10.37	38.78	34.52	100	122	HORIZONTAL	Peak
2	15548.86	44.87	54.00	-9.13	30.25	10.37	38.78	34.53	100	122	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15539.98	57.67	74.00	-16.33	43.03	10.37	38.78	34.51	100	27	VERTICAL	Peak
2	15549.50	44.83	54.00	-9.17	30.21	10.37	38.78	34.53	100	27	VERTICAL	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15608.10	57.61	74.00	-16.39	43.10	10.36	38.75	34.60	100	159	HORIZONTAL	Peak
2	15608.74	45.01	54.00	-8.99	30.50	10.36	38.75	34.60	100	159	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15598.92	57.34	74.00	-16.66	42.80	10.36	38.77	34.59	100	112	VERTICAL	Peak
2	15607.42	45.04	54.00	-8.96	30.53	10.36	38.75	34.60	100	112	VERTICAL	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15720.68	57.15	74.00	-16.85	42.81	10.36	38.72	34.74	100	120	HORIZONTAL	Peak
2	15724.68	44.77	54.00	-9.23	30.44	10.36	38.72	34.75	100	120	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15712.40	44.79	54.00	-9.21	30.44	10.36	38.72	34.73	100	22	VERTICAL	Average
2	15722.64	56.27	74.00	-17.73	41.93	10.36	38.72	34.74	100	22	VERTICAL	Peak

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15563.34	46.28	54.00	-7.72	31.68	10.37	38.77	34.54	100	357	HORIZONTAL	Average
2	15563.46	58.15	74.00	-15.85	43.55	10.37	38.77	34.54	100	357	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15560.34	46.35	54.00	-7.65	31.75	10.37	38.77	34.54	100	357	VERTICAL	Average
2	15566.94	57.99	74.00	-16.01	43.40	10.37	38.77	34.55	100	357	VERTICAL	Peak

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15685.74	46.40	54.00	-7.60	32.01	10.36	38.73	34.70	100	353	HORIZONTAL	Average
2	15696.30	57.38	74.00	-16.62	43.01	10.36	38.72	34.71	100	353	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15685.12	46.40	54.00	-7.60	32.01	10.36	38.73	34.70	100	61	VERTICAL	Average
2	15685.42	57.26	74.00	-16.74	42.87	10.36	38.73	34.70	100	61	VERTICAL	Peak

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15633.66	46.92	54.00	-7.08	32.44	10.36	38.75	34.63	100	228	HORIZONTAL	Average
2	15637.94	57.43	74.00	-16.57	42.96	10.36	38.75	34.64	100	228	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15622.36	47.12	54.00	-6.88	32.63	10.36	38.75	34.62	117	101	VERTICAL	Average
2	15635.68	58.98	74.00	-15.02	44.50	10.36	38.75	34.63	117	101	VERTICAL	Peak

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15531.26	45.97	54.00	-8.03	31.32	10.37	38.78	34.50	100	300	HORIZONTAL	Average
2	15531.40	57.82	74.00	-16.18	43.17	10.37	38.78	34.50	100	300	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15539.16	57.60	74.00	-16.40	42.96	10.37	38.78	34.51	100	64	VERTICAL	Peak
2	15543.08	46.20	54.00	-7.80	31.57	10.37	38.78	34.52	100	64	VERTICAL	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11a CH 40 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15592.08	46.30	54.00	-7.70	31.75	10.36	38.77	34.58	100	88	HORIZONTAL	Average
2	15605.94	57.68	74.00	-16.32	43.17	10.36	38.75	34.60	100	88	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15598.20	46.25	54.00	-7.75	31.71	10.36	38.77	34.59	100	246	VERTICAL	Average
2	15605.96	58.99	74.00	-15.01	44.48	10.36	38.75	34.60	100	246	VERTICAL	Peak

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11a CH 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15718.86	45.84	54.00	-8.16	31.50	10.36	38.72	34.74	100	114	HORIZONTAL	Average
2	15728.46	57.11	74.00	-16.89	42.78	10.36	38.72	34.75	100	114	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15714.32	56.48	74.00	-17.52	42.13	10.36	38.72	34.73	100	204	VERTICAL	Peak
2	15724.96	46.03	54.00	-7.97	31.70	10.36	38.72	34.75	100	204	VERTICAL	Average

Temperature	21℃	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 16, 2014	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15535.60	43.80	54.00	-10.20	32.25	7.85	38.49	34.79	HORIZONTAL	100	125	Average
2	15540.24	55.92	74.00	-18.08	44.37	7.85	38.49	34.79	HORIZONTAL	100	125	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15534.04	43.50	54.00	-10.50	31.95	7.85	38.49	34.79	VERTICAL	100	258	Average
2	15534.28	56.19	74.00	-17.81	44.64	7.85	38.49	34.79	VERTICAL	100	258	Peak

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 16, 2014	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15598.84	42.92	54.00	-11.08	31.42	7.88	38.48	34.86	HORIZONTAL	100	59	Average
2	15609.56	55.42	74.00	-18.58	43.92	7.88	38.48	34.86	HORIZONTAL	100	59	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15590.72	57.39	74.00	-16.61	45.87	7.87	38.48	34.83	VERTICAL	100	5	Peak
2	15598.64	43.71	54.00	-10.29	32.18	7.88	38.48	34.83	VERTICAL	100	5	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 16, 2014	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15712.00	42.80	54.00	-11.20	31.37	7.91	38.46	34.94	HORIZONTAL	100	122	Average
2	15726.04	55.33	74.00	-18.67	43.89	7.92	38.46	34.94	HORIZONTAL	100	122	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15711.84	55.33	74.00	-18.67	43.90	7.91	38.46	34.94	VERTICAL	100	295	Peak
2	15722.36	43.39	54.00	-10.61	31.95	7.92	38.46	34.94	VERTICAL	100	295	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 16, 2014	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15558.48	43.40	54.00	-10.60	31.86	7.86	38.49	34.81	HORIZONTAL	100	34	Average
2	15566.40	56.06	74.00	-17.94	44.52	7.86	38.49	34.81	HORIZONTAL	100	34	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15551.92	56.44	74.00	-17.56	44.90	7.86	38.49	34.81	VERTICAL	100	257	Peak
2	15559.12	43.74	54.00	-10.26	32.20	7.86	38.49	34.81	VERTICAL	100	257	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 16, 2014	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15535.60	43.80	54.00	-10.20	32.25	7.85	38.49	34.79	HORIZONTAL	100	125	Average
2	15540.24	55.92	74.00	-18.08	44.37	7.85	38.49	34.79	HORIZONTAL	100	125	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Pol/Phase	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	15676.80	56.10	74.00	-17.90	44.65	7.90	38.47	34.92	VERTICAL	100	169	Peak
2	15698.00	43.42	54.00	-10.58	31.97	7.91	38.46	34.92	VERTICAL	100	169	Average

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 16, 2014	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15634.78	57.31	74.00	-16.69	42.83	10.36	38.75	34.63	100	286	HORIZONTAL	Peak
2	15638.62	44.83	54.00	-9.17	30.36	10.36	38.75	34.64	100	286	HORIZONTAL	Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15638.02	57.45	74.00	-16.55	42.98	10.36	38.75	34.64	100	215	VERTICAL	Peak
2	15638.36	44.79	54.00	-9.21	30.32	10.36	38.75	34.64	100	215	VERTICAL	Average

Note:

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

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

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

4.5. 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

4.5.3. Test Procedures

The test procedure is the same as section 4.4.3, only the frequency range investigated is limited to 100MHz around bandedges.

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

For Non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

4.5.7. Test Result of Band Edge and Fundamental Emissions

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.80	53.84	54.00	-0.16	50.24	5.99	33.02	35.41	111	147	VERTICAL	Average
2	5148.80	68.42	74.00	-5.58	64.82	5.99	33.02	35.41	111	147	VERTICAL	Peak
3	5178.40	117.01			113.38	6.01	33.04	35.42	111	147	VERTICAL	Peak
4	5178.80	106.56			102.93	6.01	33.04	35.42	111	147	VERTICAL	Average

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5118.40	51.61	54.00	-2.39	48.05	5.97	32.99	35.40	120	35	VERTICAL	Average
2	5118.40	63.00	74.00	-11.00	59.44	5.97	32.99	35.40	120	35	VERTICAL	Peak
3	5198.80	104.38			100.74	6.02	33.05	35.43	120	35	VERTICAL	Average
4	5198.80	116.25			112.61	6.02	33.05	35.43	120	35	VERTICAL	Peak
5	5358.80	53.59	54.00	-0.41	49.51	6.12	33.45	35.49	120	35	VERTICAL	Average
6	5368.00	65.10	54.00	11.10	61.02	6.12	33.45	35.49	120	35	VERTICAL	Average

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5238.80	117.32			113.63	6.05	33.09	35.45	125	88	VERTICAL	Peak
2	5239.60	106.55			102.86	6.05	33.09	35.45	125	88	VERTICAL	Average
3	5392.80	64.73	74.00	-9.27	60.54	6.14	33.55	35.50	125	88	VERTICAL	Peak
4	5399.60	52.87	54.00	-1.13	48.68	6.14	33.55	35.50	125	88	VERTICAL	Average

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Channel 38

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5150.00	53.49	54.00	-0.51	49.89	5.99	33.02	35.41	100	139	VERTICAL	Average
2	5150.00	65.75	74.00	-8.25	62.15	5.99	33.02	35.41	100	139	VERTICAL	Peak
3	5194.80	108.32			104.68	6.02	33.05	35.43	100	139	VERTICAL	Peak
4	5195.20	95.93			92.29	6.02	33.05	35.43	100	139	VERTICAL	Average

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

Channel 46

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5142.80	65.09	74.00	-8.91	61.49	5.99	33.02	35.41	117	75	VERTICAL	Peak
2	5148.80	53.88	54.00	-0.12	50.28	5.99	33.02	35.41	117	75	VERTICAL	Average
3	5223.20	104.19			100.51	6.04	33.08	35.44	117	75	VERTICAL	Average
4	5232.40	115.65			111.96	6.04	33.09	35.44	117	75	VERTICAL	Peak
5	5394.80	52.04	54.00	-1.96	47.85	6.14	33.55	35.50	117	75	VERTICAL	Average
6	5404.80	65.44	74.00	-8.56	61.20	6.15	33.60	35.51	117	75	VERTICAL	Peak

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.20	53.83	54.00	-0.17	50.23	5.99	33.02	35.41	119	360	VERTICAL	Average
2	5147.20	69.30	74.00	-4.70	65.70	5.99	33.02	35.41	119	360	VERTICAL	Peak
3	5217.20	93.01			89.34	6.03	33.08	35.44	119	360	VERTICAL	Average
4	5222.40	105.77			102.09	6.04	33.08	35.44	119	360	VERTICAL	Peak

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 22, 2014	Test Function	Non-beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5020.50	53.85	54.00	-0.15	50.40	5.91	32.91	35.37	100	218	VERTICAL	Average
2	5150.00	65.76	74.00	-8.24	62.16	5.99	33.02	35.41	100	218	VERTICAL	Peak
3	5181.00	107.54			103.92	6.01	33.04	35.43	100	218	VERTICAL	Average
4	5181.50	117.36			113.74	6.01	33.04	35.43	100	218	VERTICAL	Peak

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5121.20	53.26	54.00	-0.74	49.69	5.98	32.99	35.40	100	140	VERTICAL	Average
2	5122.80	64.77	74.00	-9.23	61.20	5.98	32.99	35.40	100	140	VERTICAL	Peak
3	5201.60	104.84			101.19	6.02	33.06	35.43	100	140	VERTICAL	Average
4	5201.60	114.47			110.82	6.02	33.06	35.43	100	140	VERTICAL	Peak
5	5360.80	53.42	54.00	-0.58	49.34	6.12	33.45	35.49	100	140	VERTICAL	Average
6	5361.60	64.17	74.00	-9.83	60.09	6.12	33.45	35.49	100	140	VERTICAL	Peak

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5241.50	108.72			105.03	6.05	33.09	35.45	111	79	VERTICAL	Average
2	5242.50	119.03			115.34	6.05	33.09	35.45	111	79	VERTICAL	Peak
3	5402.00	53.72	54.00	-0.28	49.48	6.14	33.60	35.50	111	79	VERTICAL	Average
4	5403.00	64.56	74.00	-9.44	60.33	6.14	33.60	35.51	111	79	VERTICAL	Peak

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 15, 2014	Test Function	Beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5149.50	53.48	54.00	-0.52	49.88	5.99	33.02	35.41	100	225	VERTICAL	Average
2	5150.00	71.52	74.00	-2.48	67.92	5.99	33.02	35.41	100	225	VERTICAL	Peak
3	5177.00	119.41			115.78	6.01	33.04	35.42	100	225	VERTICAL	Peak
4	5178.50	108.16			104.53	6.01	33.04	35.42	100	225	VERTICAL	Average
5	5350.00	46.41	54.00	-7.59	42.39	6.11	33.40	35.49	100	225	VERTICAL	Average
6	5360.50	61.76	74.00	-12.24	57.68	6.12	33.45	35.49	100	225	VERTICAL	Peak

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5119.00	65.33	74.00	-8.67	61.77	5.97	32.99	35.40	100	352	VERTICAL	Peak
2	5121.50	53.82	54.00	-0.18	50.25	5.98	32.99	35.40	100	352	VERTICAL	Average
3	5199.50	104.37			100.73	6.02	33.05	35.43	100	352	VERTICAL	Average
4	5204.50	115.02			111.36	6.03	33.06	35.43	100	352	VERTICAL	Peak
5	5358.00	61.65	74.00	-12.35	57.57	6.12	33.45	35.49	100	352	VERTICAL	Peak
6	5362.50	49.80	54.00	-4.20	45.72	6.12	33.45	35.49	100	352	VERTICAL	Average

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5073.50	62.18	74.00	-11.82	58.66	5.95	32.96	35.39	100	230	VERTICAL	Peak
2	5078.00	51.88	54.00	-2.12	48.36	5.95	32.96	35.39	100	230	VERTICAL	Average
3	5238.50	121.62			117.93	6.05	33.09	35.45	100	230	VERTICAL	Peak
4	5241.50	111.31			107.62	6.05	33.09	35.45	100	230	VERTICAL	Average
5	5392.50	65.17	74.00	-8.83	60.98	6.14	33.55	35.50	100	230	VERTICAL	Peak
6	5402.00	53.95	54.00	-0.05	49.71	6.14	33.60	35.50	100	230	VERTICAL	Average

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 15, 2014	Test Function	Beamforming function

Channel 38

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.00	63.50	74.00	-10.50	59.90	5.99	33.02	35.41	100	255	VERTICAL	Peak
2	5150.00	53.28	54.00	-0.72	49.68	5.99	33.02	35.41	100	255	VERTICAL	Average
3	5186.80	98.40			94.76	6.02	33.05	35.43	100	255	VERTICAL	Average
4	5187.40	107.11			103.47	6.02	33.05	35.43	100	255	VERTICAL	Peak

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

Channel 46

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5146.50	64.26	74.00	-9.74	60.66	5.99	33.02	35.41	100	13	VERTICAL	Peak
2	5148.00	53.60	54.00	-0.40	50.00	5.99	33.02	35.41	100	13	VERTICAL	Average
3	5234.00	114.95			111.26	6.04	33.09	35.44	100	13	VERTICAL	Peak
4	5234.50	106.65			102.96	6.04	33.09	35.44	100	13	VERTICAL	Average
5	5393.50	63.45	74.00	-10.55	59.26	6.14	33.55	35.50	100	13	VERTICAL	Peak
6	5395.00	51.22	54.00	-2.78	47.03	6.14	33.55	35.50	100	13	VERTICAL	Average

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

Temperature	21°C	Humidity	53%
Test Engineer	YC Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Jul. 15, 2014	Test Function	Beamforming function

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5145.50	63.24	74.00	-10.76	59.64	5.99	33.02	35.41	100	222	VERTICAL	Peak
2	5148.00	53.67	54.00	-0.33	50.07	5.99	33.02	35.41	100	222	VERTICAL	Average
3	5216.00	95.19			91.54	6.03	33.06	35.44	100	222	VERTICAL	Average
4	5222.50	101.55			97.87	6.04	33.08	35.44	100	222	VERTICAL	Peak

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

Note:

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

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

4.6. Antenna Requirements

4.6.1. 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.

4.6.2. 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
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	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)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Dec. 12, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)

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

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

N.C.R. means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
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%