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FCC RADIO TEST REPORT

Applicant's company	ASUSTeK COMPUTER INC.
Applicant Address	4F, No. 150, Li-Te Rd., Peitou, Taipei 112, Taiwan
FCC ID	MSQ-RTGW00
Manufacturer's company (1)	ASKEY TECHNOLOGY (JIANG SU) LTD
Manufacturer Address	NO1388, Jiao Tong Road, Wujiang Economic Technological Development Area Jiangsu Province 215200 China
Manufacturer's company (2)	Compal Networking (KunShan) Co., LTD.
Manufacturer Address	No. 520, Nabbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China

Product Name	Wireless-AC3100 Dual Band Gigabit Router
Brand Name	ASUS
Model No.	RT-AC3100,RT-AC88R,RT-AC88U
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz
Received Date	Apr. 10, 2015
Final Test Date	Mar. 22, 2017
Submission Type	Class II Change

Statement

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

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

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

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013, 47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01r03, KDB662911 D01 v02r01, KDB644545 D03 v01.**

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



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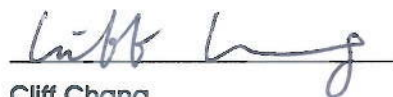
History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR531828-08	Rev. 01	Initial issue of report	May 02, 2017

1. VERIFICATION OF COMPLIANCE

Product Name : Wireless-AC3100 Dual Band Gigabit Router
Brand Name : ASUS
Model No. : RT-AC3100,RT-AC88R,RT-AC88U
Applicant : ASUSTeK COMPUTER INC.
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Apr. 10, 2015 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.



Cliff Chang

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	15.203	Antenna Requirements	Complies

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (3TX/3RX, 4TX/4RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM, 1024QAM)
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
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Maximum Conducted Output Power	<For Non-Beamforming Mode> Band 1: IEEE 802.11ac MCS0/Nss4 VHT80: 24.98 dBm <For Beamforming Mode> Band 1: IEEE802.11ac MCS0/Nss1 VHT40: 23.57 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description
Communication Mode	☒ IP Based (Load Based) ☐ Frame Based
Beamforming Function	☒ With beamforming for 802.11n/ac in 2.4GHz/5GHz ☐ Without beamforming
Operate Condition	☒ Indoor ☐ Outdoor

Antenna and Band width

Antenna	Four (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)	4	MCS0-31
802.11n (HT40)	4	MCS0-31
802.11ac (VHT20)	4	MCS0-11/Nss1-4
802.11ac (VHT40)	4	MCS0-11/Nss1-4
802.11ac (VHT80)	4	MCS0-11/Nss1-4

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	ASUS	ADP-45BW B	Input: 100-240V ~ 50-60Hz 1.2A Output: 19V, 2.37A
Adapter 2	ASUS	AD883J20	Input: 100-240V ~ 50-60Hz 1.0A Output: 19V, 2.37A
Adapter 3	ASUS	ADP-65DW B	Input: 100-240V ~ 50-60Hz 1.5A Output: 19V, 3.42A
Adapter 4	ASUS	ADP-45BW B	Input: 100-240V ~ 50-60Hz 1.2A Output: 19V, 2.37A
Adapter 5	ASUS	AD883J20	Input: 100-240V ~ 50-60Hz 1.0A Output: 19V, 2.37A
Adapter 6	ASUS	ADP-65DW B	Input: 100-240V ~ 50-60Hz 1.5A Output: 19V, 3.42A
Other			
RJ-45 Cable*1: Non-Shielded, 1.5m			

3.3. Table for Filed Antenna

Set	Brand	P/N	Antenna Type	Connector	Gain (dBi)		Color Ring
					2.4GHz	5GHz	
1	PSA	RFDPA171300SBLB809	Dipole Antenna	Reversed-SMA	2.25	3.37	Red
2	PSA	RFDPA171300SBLB810	Dipole Antenna	Reversed-SMA	2.25	3.37	Black
3	PSA	RFDPA171300SBLB811	Dipole Antenna	Reversed-SMA	2.20	3.36	Black
4	PSA	RFDPA171300SBLB812	Dipole Antenna	Reversed-SMA	2.18	3.19	Black
5	PSA	RFDPA171300SBLB813	Dipole Antenna	Reversed-SMA	2.20	3.36	Red
6	PSA	RFDPA171300SBLB814	Dipole Antenna	Reversed-SMA	2.18	3.19	Red
7	WHA YU	C660-510345-A(SRF2015719)	Dipole Antenna	Reversed-SMA	2.25	3.20	Red
8	WHA YU	C660-510346-A(SRF2015720)	Dipole Antenna	Reversed-SMA	2.25	3.20	Black
9	WHA YU	C660-510364-A(SRF20151386)	Dipole Antenna	Reversed-SMA	1.9	3.3	Black
10	WHA YU	C660-510365-A(SRF20151717)	Dipole Antenna	Reversed-SMA	1.9	3.3	Black

Note: 1. The EUT has ten sets of antenna and there are four antennas for each set.

2. Both antennas above are the same type. Besides, only set 1 antenna was selected to perform the test and written in this report due to the highest gain.

For IEEE 802.11a/b/g/n/ac mode:

For 2.4GHz and 5GHz (3TX/3RX) function:

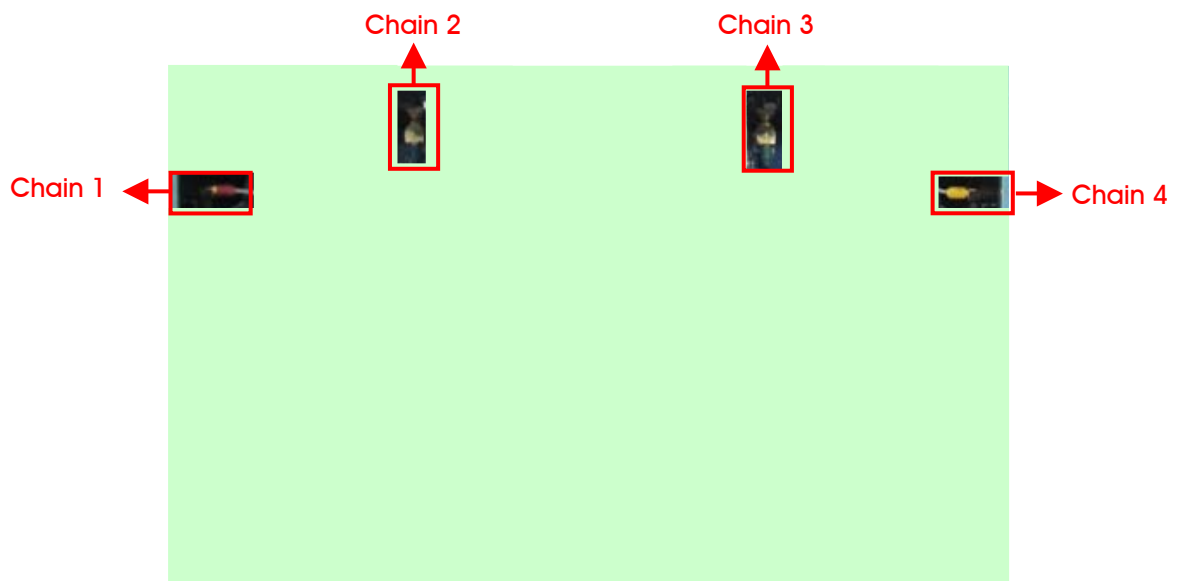
Chain 1, Chain 2 and Chain 3 can be used as transmitting/receiving antenna.

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

For 2.4GHz and 5GHz (4TX/4RX) function:

Chain 1, Chain 2, Chain 3 and Chain 4 can be used as transmitting/receiving antenna.

Chain 1, Chain 2, Chain 3 and Chain 4 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 149, 153, 157, 161, 165.

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

For 80MHz bandwidth systems, use Channel 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	-	-

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
26dB Bandwidth and 99% Occupied Bandwidth	<For Non-Beamforming Mode>				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss4	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss4	42	1+2+3+4
	<For Beamforming Mode>				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
Max. Conducted Output Power	<For Non-Beamforming Mode>				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss4	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss4	42	1+2+3+4
	<For Beamforming Mode>				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
Power Spectral Density	<For Non-Beamforming Mode>				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss4	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss4	42	1+2+3+4
	<For Beamforming Mode>				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4

Note 1: VHT40 covers HT40, due to same modulation. The power setting for 802.11n HT40 is the same or lower than 802.11ac VHT40.

Note 2: The EUT can only be used at Z axis position

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 FA531828-08) 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
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

3.7. Table for Multiple List

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

Model No.	LAN Port	Heat sink color
RT-AC88U	8 LAN ports	Silver, Red
RT-AC88R	8 LAN ports	Silver, Red
RT-AC3100	4 LAN ports	Silver, Black

Note 1: From the above models, model: RT-AC88U was selected as representative model for the test and its data was recorded in this report.

Note 2: Red and Black Heat sink each of the three groups, the different just appearance.

3.8. Table for SKU List

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

SKU	Description
A	Rev 5.01 (PCB version)
B	Rev 5.20 (PCB version).

Note: SKU B was selected as representative model for the test and its data.

3.9. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR531828-04AA

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

Modifications	Performance Checking
Consider the component with precision and make sure each device in mass production to comply with regulation rule. Test it by mass product, not golden sample.	Max. Conducted Output Power, 26dB Bandwidth and 99% Occupied Bandwidth and Power Spectral Density: <For Non-Beamforming Mode> MCS0/Nss1 VHT40 CH 38 (5190MHz) MCS0/Nss4 VHT40 CH 38 (5190MHz) MCS0/Nss1 VHT80 CH 42 (5210MHz) MCS0/Nss4 VHT80 CH 42 (5210MHz) <For Beamforming Mode> MCS0/Nss1 VHT40 CH 38 (5190MHz) MCS0/Nss1 VHT80 CH 42 (5210MHz)

3.10. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

3.11. Table for Parameters of Test Software Setting

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

<For Non-Beamforming Mode>

Test Software Version	Myool 2.0.2.6
Mode	Test Frequency (MHz)
	NCB: 40MHz
	5190 MHz
802.11ac MCS0/Nss1 VHT40	71
802.11ac MCS0/Nss4 VHT40	75
802.11ac MCS0/Nss1 VHT80	71
802.11ac MCS0/Nss4 VHT80	78

<For Beamforming Mode>

Test Software Version	Myool 2.0.2.6
Mode	Test Frequency (MHz)
	NCB: 80MHz
	5210 MHz
802.11ac MCS0/Nss1 VHT40	73
802.11ac MCS0/Nss1 VHT80	65

3.12. EUT Operation during Test

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

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

The program was executed as follows:

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

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	$\geq 3 \times \text{RBW}$
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 Deviation

There is no deviation with the original standard.

4.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	26°C	Humidity	53%
Test Engineer	Gino Huang	Test Date	Mar. 22, 2017

<For Non-Beamforming Mode>

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.72	36.61
802.11ac MCS0/Nss4 VHT40	5190 MHz	40.29	36.75
802.11ac MCS0/Nss1 VHT80	5210 MHz	80.29	73.80
802.11ac MCS0/Nss4 VHT80	5210 MHz	80.58	74.96

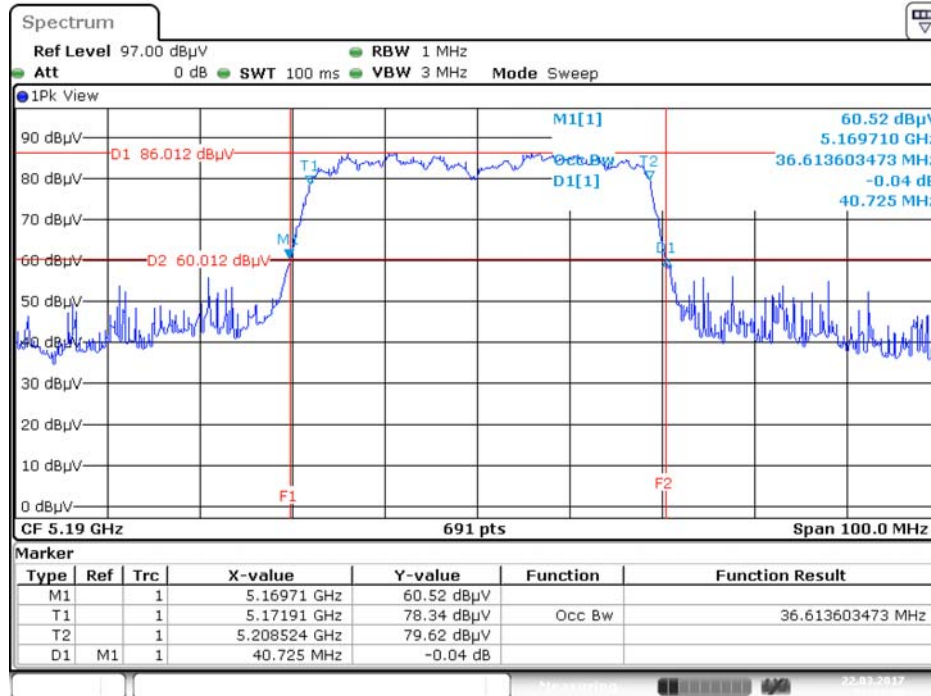
Temperature	26°C	Humidity	53%
Test Engineer	Gino Huang	Test Date	Mar. 22, 2017

<For Beamforming Mode>

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.29	36.75
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.15	75.25

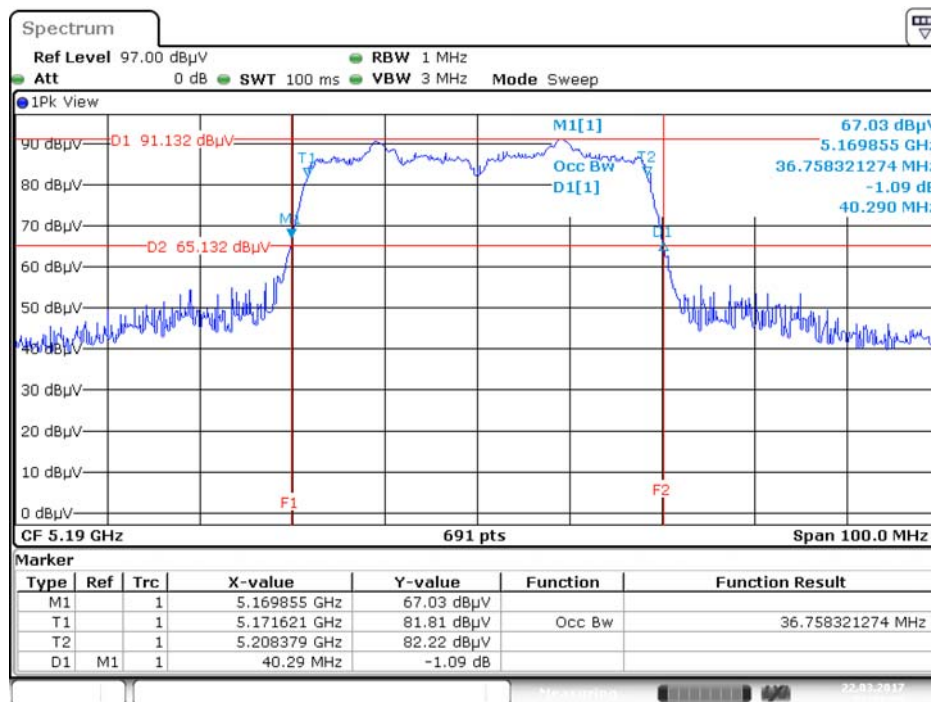
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



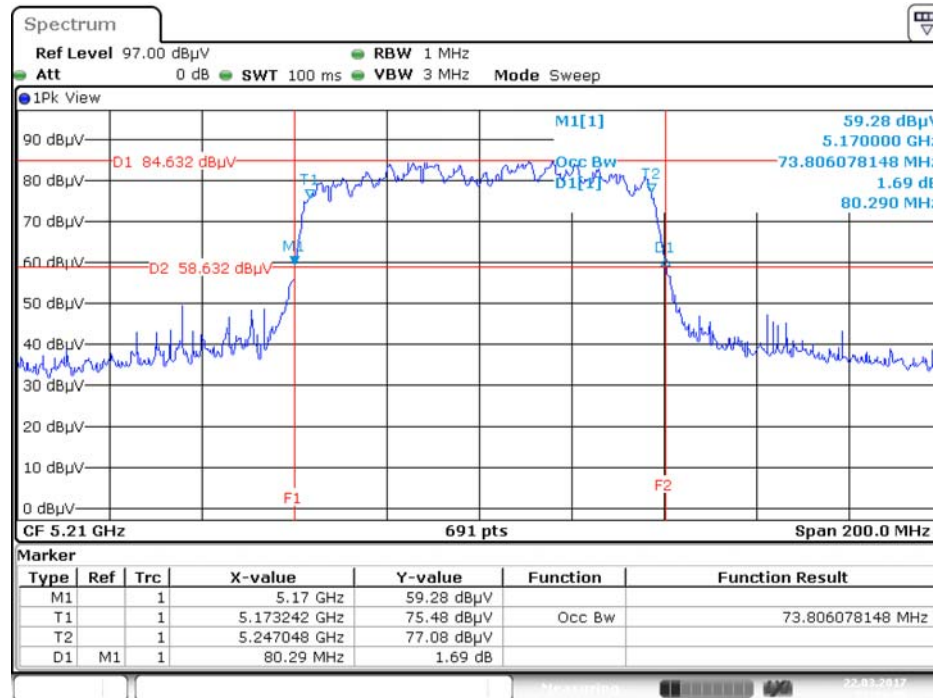
Date: 22.MAR.2017 22:33:29

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



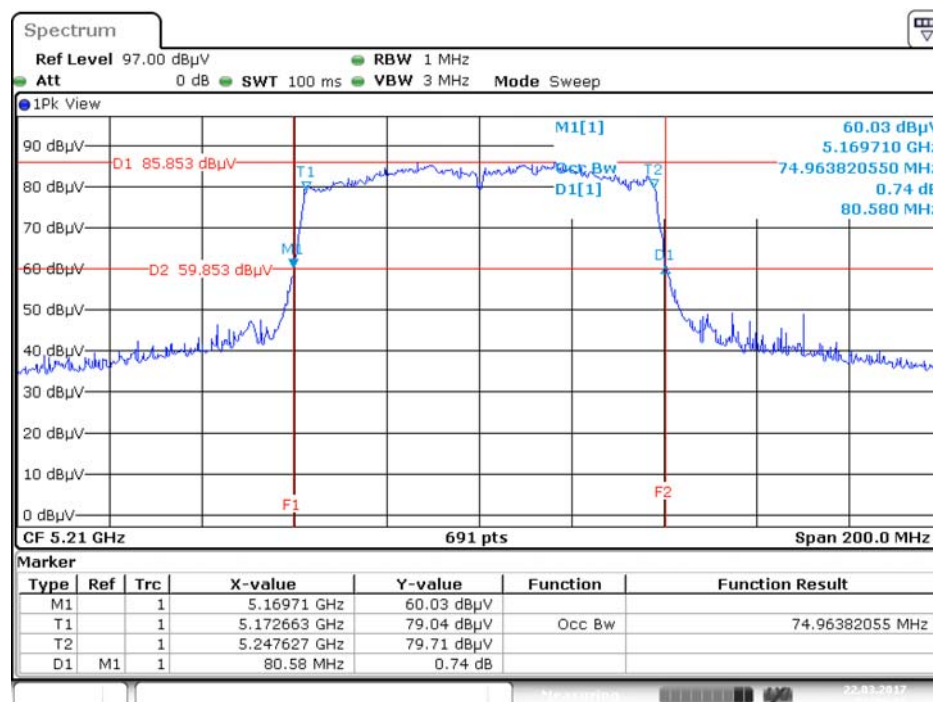
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



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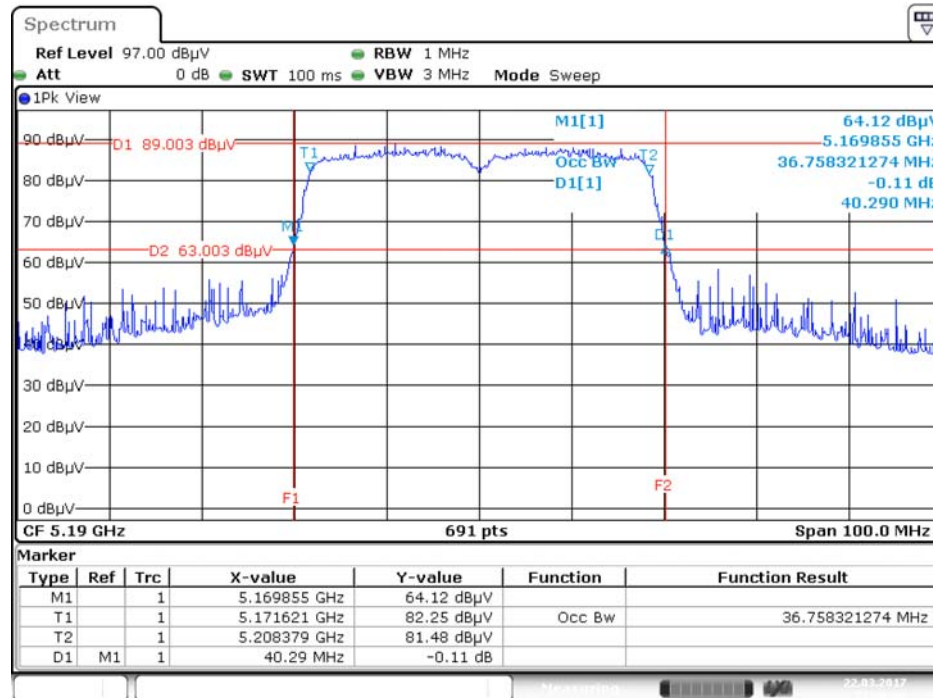
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



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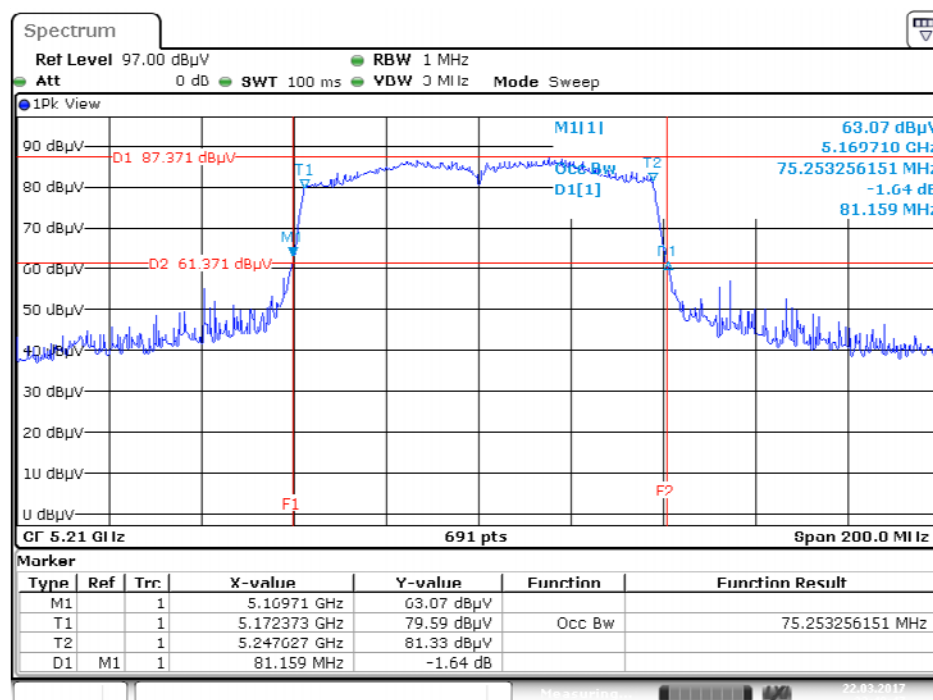
<For Beamforming Mode>

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



Date: 22.MAR.2017 22:48:40

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

4.2.2. Measuring Instruments and Setting

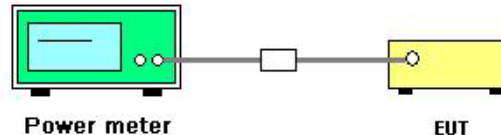
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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 v01r03 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

<For Non-Beamforming Mode>

Temperature	26°C	Humidity	53%
Test Engineer	Gino Huang	Test Date	Mar. 22, 2017

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT40	5190	17.11	17.07	17.22	17.15	23.16	30.00	Complies
802.11ac MCS0/Nss4 VHT40	5190	18.39	18.56	18.15	18.11	24.33	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5210	17.27	17.21	17.25	17.13	23.24	30.00	Complies
802.11ac MCS0/Nss4 VHT80	5210	18.82	19.31	18.85	18.82	24.98	30.00	Complies

<For Beamforming Mode>

Temperature	26°C	Humidity	53%
Test Engineer	Gino Huang	Test Date	Mar. 22, 2017

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT40	5190	17.57	17.47	17.65	17.51	23.57	26.61	Complies
802.11ac MCS0/Nss1 VHT80	5210	16.87	17.01	16.96	16.94	22.97	26.61	Complies

Note: $Directional\ Gain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 9.39\text{dBi}$, so limit= 30-(9.39-6)= 26.61 dBm

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
☐	Mobile and portable client devices	11 dBm/MHz

4.3.2. Measuring Instruments and Setting

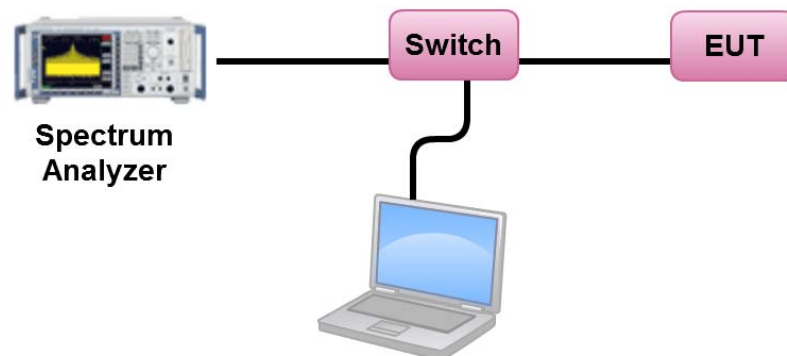
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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 v01r03 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.

4.3.4. 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	26°C	Humidity	53%
Test Engineer	Gino Huang	Test Date	Mar. 22, 2017

<For Non-Beamforming Mode>

Mode	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac MCS0/Nss1 VHT40	5190 MHz	6.92	13.61	Complies
802.11ac MCS0/Nss4 VHT40	5190 MHz	8.24	17.00	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	4.17	13.61	Complies
802.11ac MCS0/Nss4 VHT80	5210 MHz	5.69	17.00	Complies

<For Beamforming Mode>

Mode	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac MCS0/Nss1 VHT40	5190 MHz	7.42	13.61	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	3.29	13.61	Complies

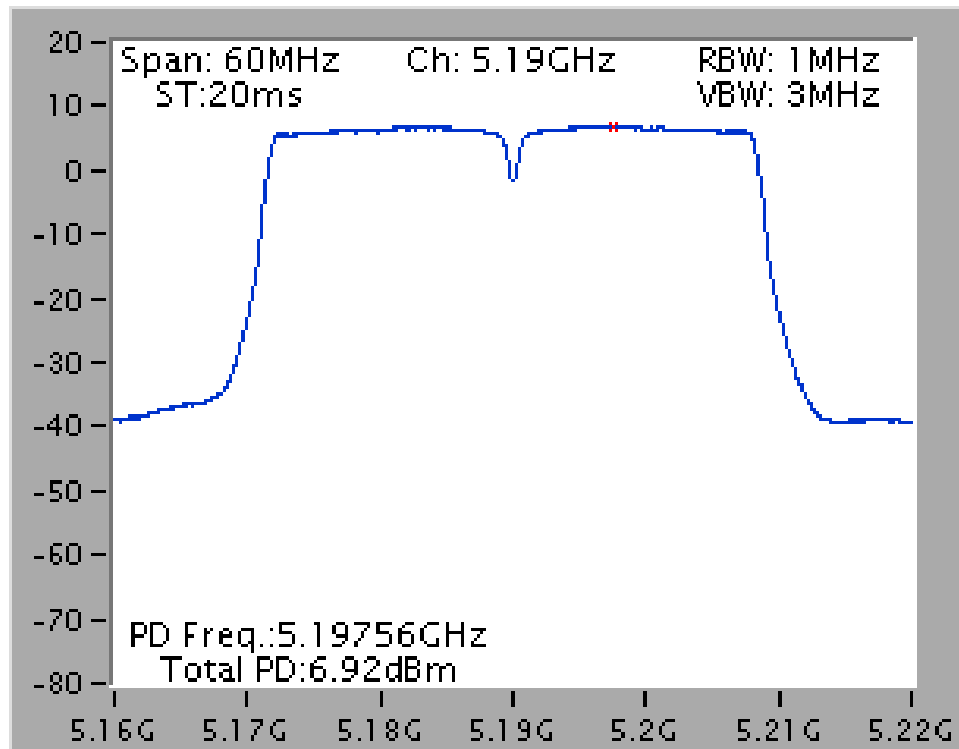
Note: $\text{Directional Gain} = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{\text{ant}}} \left\{ \sum_{k=1}^{M_{\text{ant}}} g_{j,k} \right\}^2}{N_{\text{ant}}} \right] = 9.39 \text{ dBi}$, so limit = $17 - (9.39 - 6) = 13.61 \text{ dBm}$

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

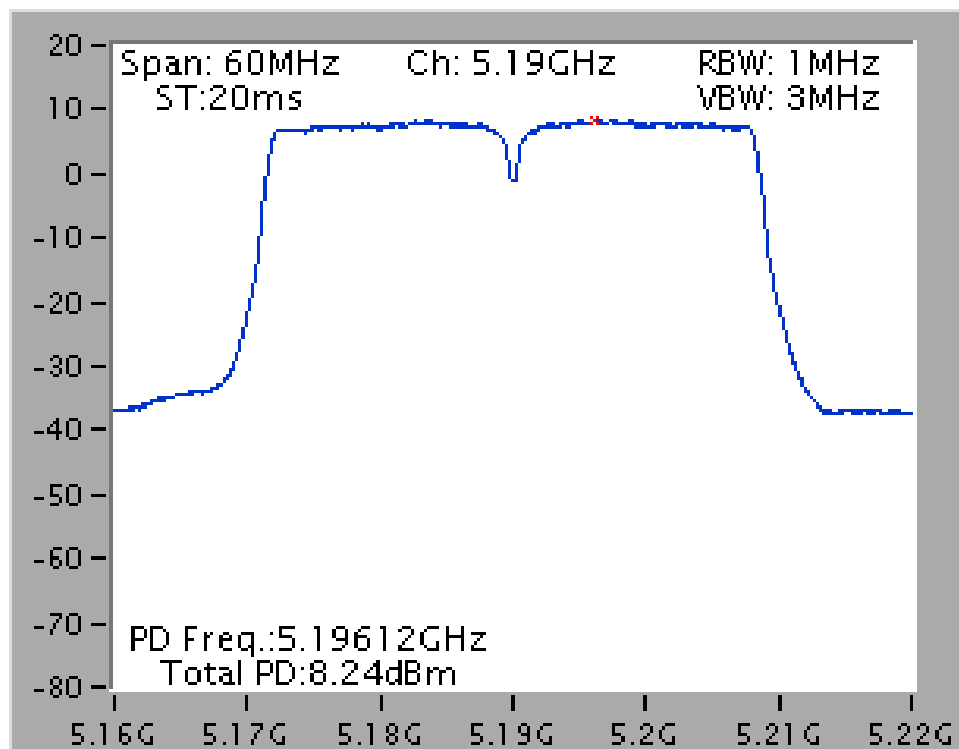
For plots, only the channel with worse result was shown.

<For Non-Beamforming Mode>

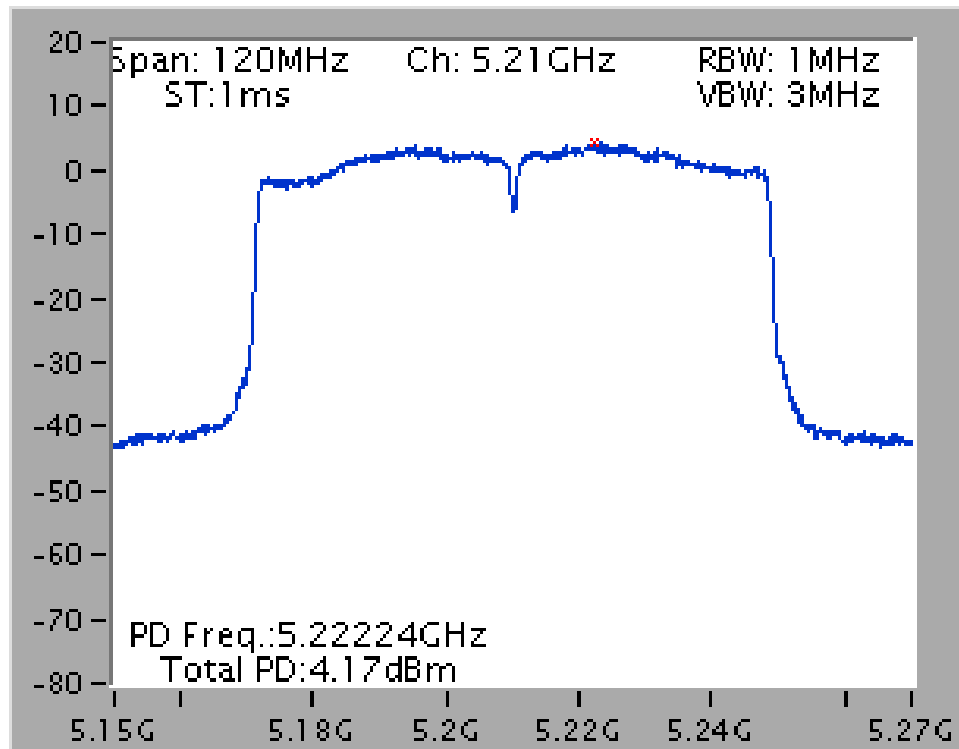
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



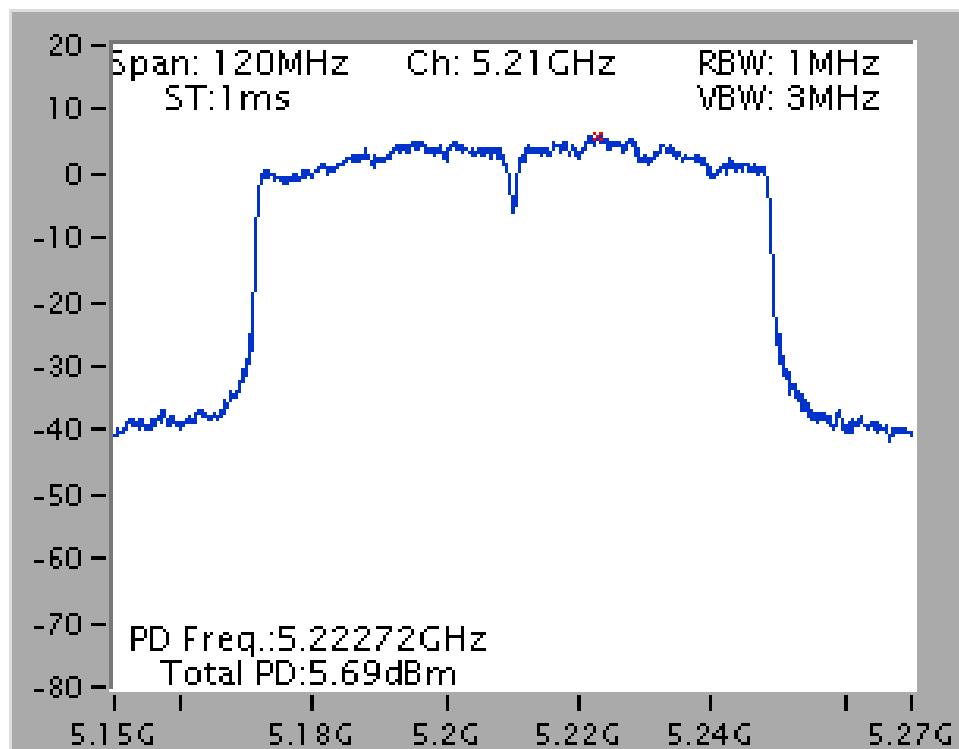
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz

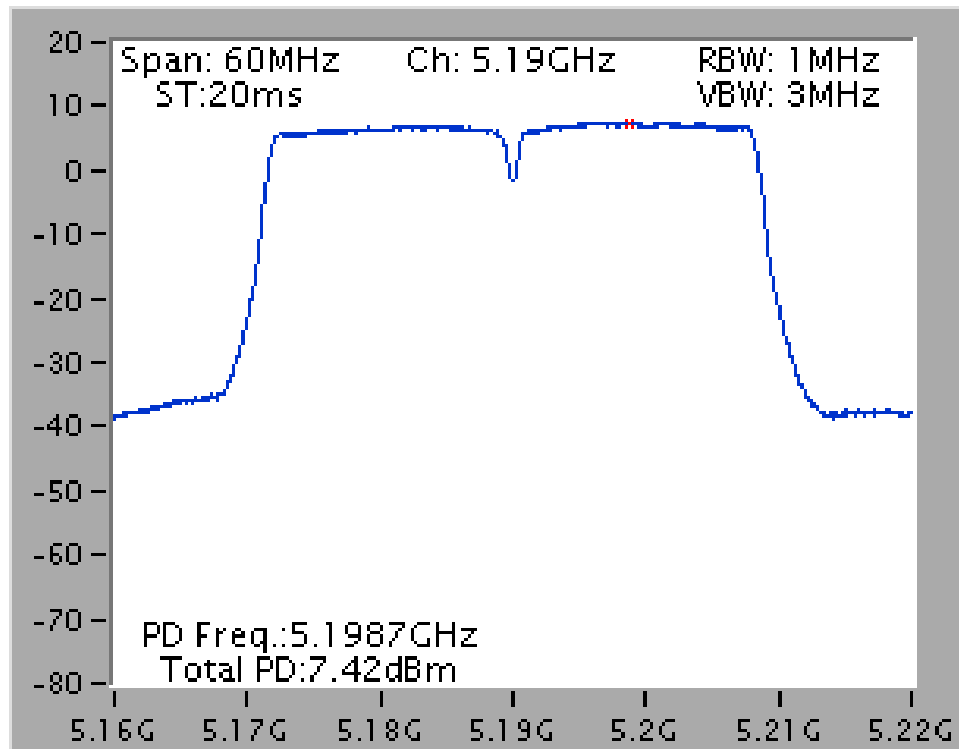


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz

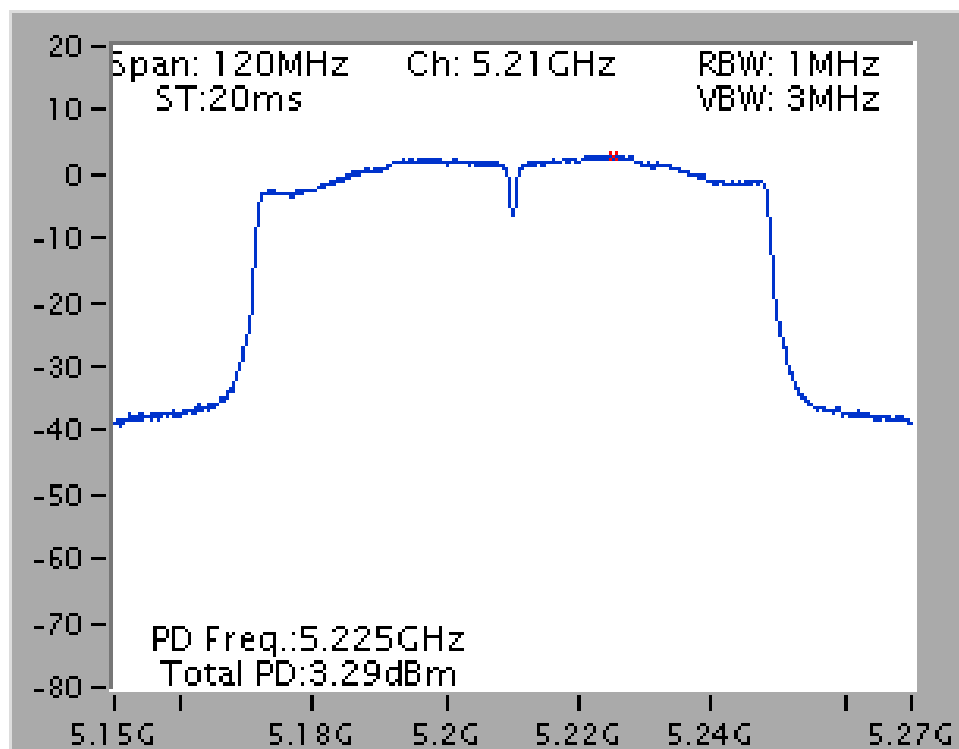


<For Beamforming Mode>

Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



4.4. Antenna Requirements

4.4.1. 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.

4.4.2. 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
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 26, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Oct. 24, 2016	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 22, 2016	Conducted (TH01-CB)

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

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission	1.7 dB	Confidence levels of 95%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%