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FCC RADIO TEST REPORT

Applicant's company	**ZyXEL Communications Corporation**
Applicant Address	No.2, Gongye E. 9th Road, Hsinchu Science Park, Hsinchu, Taiwan
FCC ID	**I88C2100Z**
Manufacturer's company (1)	**MitraStar Technology Corporation**
Manufacturer Address	No. 6, Innovation Rd II, Hsinchu Science Park, Hsinchu 30076, Taiwan
Manufacturer's company (2)	**WuXi MitraStar Technology Co. Ltd**
Manufacturer Address	60#-E, Minshan Road, Wuxi New district Jangsu, P.R.C.

Product Name	Dual-Band Wireless AC/N VDSL2 4-port Bonding Combo Wan IAD with HPNA3.1
Brand Name	ZyXEL
Model No.	C2100Z, VMG4825-B10A, VMG9823-B10A
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5250 ~ 5350MHz / 5470 ~ 5725MHz
Received Date	Aug. 12, 2015
Final Test Date	Mar. 23, 2016
Submission Type	Class II Change

Statement

Test result included is for the IEEE 802.11n and IEEE 802.11ac 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 v01r01, KDB662911 D01 v02r01, KDB644545 D03 v01.**

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR581406-01	Rev. 01	Initial issue of report	May 11, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	Dual-Band Wireless AC/N VDSL2 4-port Bonding Combo Wan IAD with HPNA3.1
Brand Name	:	ZyXEL
Model No.	:	C2100Z, VMG4825-B10A, VMG9823-B10A
Applicant	:	ZyXEL Communications 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 Aug. 12, 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.

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(e)	6dB Spectrum Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	0.01 dB
4.4	15.407(a)	Power Spectral Density	Complies	0.42 dB
4.5	15.407(b)	Radiated Emissions	Complies	6.33 dB
4.6	15.407(b)	Band Edge Emissions	Complies	0.10 dB
4.7	15.407(g)	Frequency Stability	Complies	-
4.8	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (4TX, 4RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	IEEE 802.11n/ac: see the below table
Frequency Range	5250 ~ 5350MHz / 5470 ~ 5725MHz
Channel Number	8 for 40MHz bandwidth; 4 for 80MHz bandwidth
Channel Band Width (99%)	Band 2: For non-beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 35.60 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 73.81 MHz For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 36.76 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.25 MHz Band 3: For non-beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 36.03 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 74.96 MHz For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 36.76 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.54 MHz

Maximum Conducted Output Power	Band 2: For non-beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 22.67 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 22.93 dBm For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 19.72 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 20.18 dBm Band 3: For non-beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 22.98 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 23.92 dBm For beamforming function: IEEE 802.11ac MCS0/Nss1 (VHT40): 20.16 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 19.84 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
TPC Function	☒ With TPC	☐ Without TPC
Weather Band (5600~5650MHz)	☒ With 5600~5650MHz	☐ Without 5600~5650MHz
Beamforming Function	☒ With beamforming for 802.11n/ac in 5GHz band.	☐ Without beamforming
Operate Condition	☒ Indoor	☐ Outdoor

Antenna and Band width

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

Note: The EUT only support 40MHz and 80MHz bandwidth at Band 2 ~ Band 3 .

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT40)	4	MCS 0-31
802.11ac (VHT40)	4	MCS 0-9/Nss1-4
802.11ac (VHT80)	4	MCS 0-9/Nss1-4
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT supports HT40. Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT supports VHT40 and VHT80. Note 3: Modulation modes consist of below configuration: HT40: IEEE 802.11n, VHT40/VHT80: IEEE 802.11ac		

3.2. Accessories

Power	Brand	Model	Rating
AC Power Adapter	DVE	DSA-36PFH-12 FUS	Input: 100-240Vac, 50/60Hz, 1A Output: 12Vdc, 3A
Others			
Ethernet cable	1.8 meter, non-shielded, w/o ferrite core		
Phone cable	3.66 meter, non-shielded, w/o ferrite core (For Model No.: C2100Z)		
Phone cable	1.8 meter, non-shielded, w/o ferrite core (For Model No.: VMG4825-B10A, VMG9823-B10A)		

3.3. Table for Filed Antenna

Ant.	Brand	Part No.	Type	Connector	Gain (dBi)	Cable Length (mm)	Remark
1	AIRGAIN	N5X20B-T-PK1-B125U N5X20B-TP-PK1-B125U	PCB	I-PEX	3.4	125	5G TX/RX
2	AIRGAIN	N5X20B-T-PK1-W85U N5X20B-TP-PK1-W85U	PCB	I-PEX	4.2	85	5G TX/RX
3	AIRGAIN	N5X20B-T-PK1-G65U N5X20B-TP-PK1-G65U	PCB	I-PEX	4.4	65	5G TX/RX
4	AIRGAIN	N5X20B-T-PK1-W85U N5X20B-TP-PK1-W85U	PCB	I-PEX	3.0	85	5G TX/RX
5	AIRGAIN	M2410CM-T2-B130S6 M2410CM-T2P-B130S6	Metal	Soldering	3.7	130	2.4G TX/RX
6	AIRGAIN	M2410CM-T2-G200S6 M2410CM-T2P-G200S6	Metal	Soldering	1.4	200	2.4G TX/RX

Note: The EUT has six antennas.

For 2.4GHz WLAN function:

For IEEE 802.11b/g/n mode (1TX/1RX):

Only Chain 5 could transmit/receive.

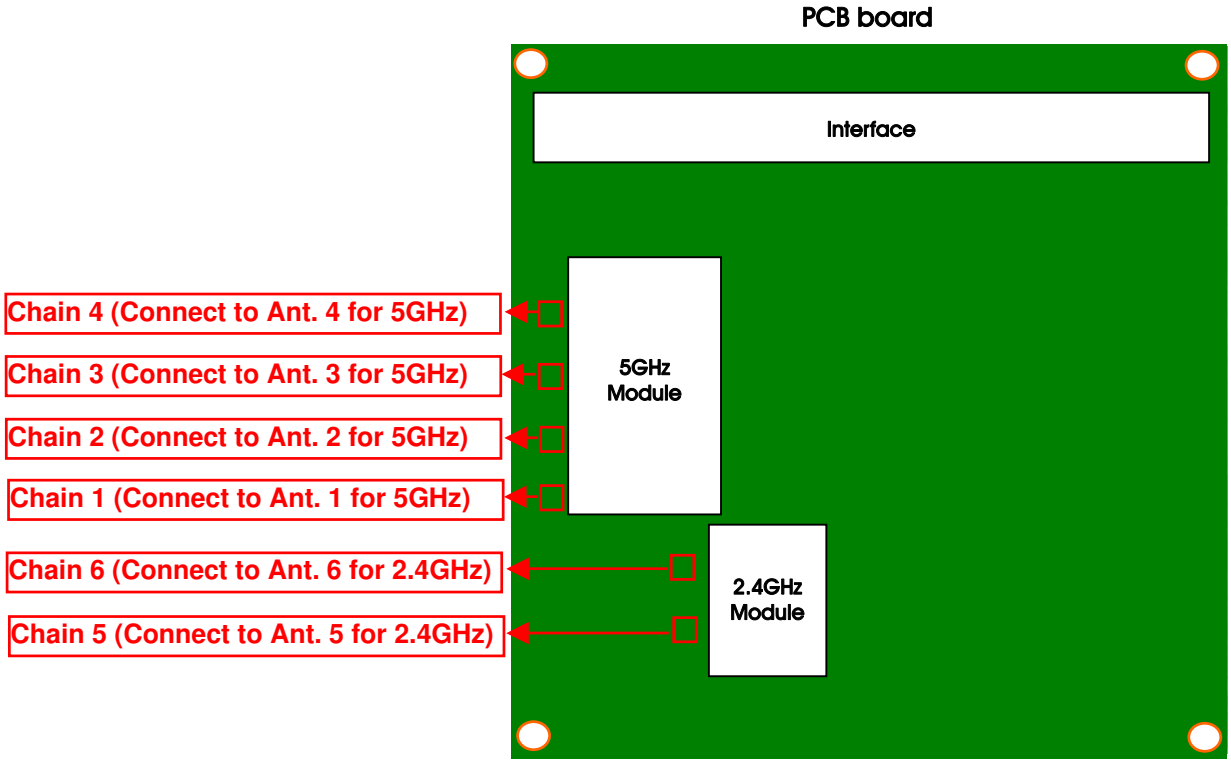
For IEEE 802.11n mode (2TX/2RX):

Chain 5 and Chain 6 could transmit/receive simultaneously.

For 5GHz WLAN function:

For IEEE 802.11a/n/ac mode (4TX/4RX):

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



3.4. Table for Carrier Frequencies

There are two bandwidth systems.

For 40MHz bandwidth systems, use Channel 54, 62, 102, 110, 118, 126, 134, 142.

For 80MHz bandwidth systems, use Channel 58, 106, 122, 138.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5250~5350 MHz Band 2	54	5270 MHz	62	5310 MHz
	58	5290 MHz	-	-
5470~5725 MHz Band 3	102	5510 MHz	126	5630 MHz
	106	5530 MHz	134	5670 MHz
	110	5550 MHz	138	5690 MHz
	118	5590 MHz	142	5710 MHz
	122	5610 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 Power Spectral Density 26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement	11ac VHT40	Band 2-3	MCS0/Nss1	54/62/102/110 /134/142	1+2+3+4
	11ac VHT80	Band 2-3	MCS0/Nss1	58/106/122/138	1+2+3+4
6dB Spectrum Bandwidth Measurement	11ac VHT40	Band 4	MCS0/Nss1	142	1+2+3+4
	11ac VHT80	Band 4	MCS0/Nss1	138	1+2+3+4
Radiated Emission Above 1GHz and Band Edge Emission	11ac VHT40	Band 2-3	MCS0/Nss1	54/62/102/110/ 134/142	1+2+3+4
	11ac VHT80	Band 2-3	MCS0/Nss1	58/106/122/138	1+2+3+4
Frequency Stability	40 MHz	Band 2-3	-	62/110	1
	80 MHz	Band 2-3	-	58/106	1

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

2. The test configuration, test mode and test software were written in this test report are designated by the applicant.
3. VHT40 covers HT40, due to same modulation. The power setting for 802.11n HT40 is the same or lower than 802.11ac VHT40.
4. There are two functions of EUT, one is beamforming function, and the other is non-beamforming function for 802.11n/ac in 5GHz band, and all the results have been recorded in this report.

The following test modes were performed for all tests:

For Co-location MPE:

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to FA581406-01) is added for simultaneously transmits between 2.4GHz WLAN function and 5GHz WLAN function.

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	**Site Category**	**Location**	**FCC Designation No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	TW0006	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

3.7. Table for Multiple Listing

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

Model No.	Interface							
	WAN	LAN	DSL	FXS	HPNA	USB	Wi-Fi 2.4GHz 2×2	Wi-Fi 5GHz 4×4
C2100Z	×1	×4	×1	×2	×1	×1	V	V
VMG9823-B10A	×1	×4	×1	×2	-	×1	V	V
VMG4825-B10A	×1	×4	×1	-	-	×1	V	V

Only the most complex mode for Model No.: C2100Z was performed for all the tests and recorded in this report.

3.8. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR581406

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

Description	Performance Checking
1. Adding 5 GHz Band 2 and Band 3 (5250~5350 MHz, 5470~5725 MHz)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth 6dB Spectrum Bandwidth Maximum Conducted Output Power Power Spectral Density Radiated Emissions (Above 1GHz) Band Edge Emissions Frequency Stability Measurement

3.9. Table for Supporting Units

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

For non-beamforming mode:

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

For beamforming mode:

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
Wireless ac AP	Quantenna	HGW-5600BNAC-QC	N/A

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

3.10. Table for Parameters of Test Software Setting

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

For non-beamforming mode:

Test Software Version	DOS					
Mode	Test Frequency (MHz)					
	NCB: 40MHz					
802.11ac MCS0/Nss1 VHT40	5270 MHz	5310 MHz	5510 MHz	5550 MHz	5670 MHz	5710 MHz
	16	16	16	16	16	16.5
Mode	NCB: 80MHz					
802.11ac MCS0/Nss1 VHT80	5290 MHz		5530 MHz	5610 MHz		5690 MHz
	17		16	18		18.5

For beamforming mode:

Test Software Version	DOS					
Mode	Test Frequency (MHz)					
	NCB: 40MHz					
802.11ac MCS0/Nss1 VHT40	5270 MHz	5310 MHz	5510 MHz	5550 MHz	5670 MHz	5710 MHz
	13	13	13	13	13	12.5
Mode	NCB: 80MHz					
802.11ac MCS0/Nss1 VHT80	5290 MHz		5530 MHz	5610 MHz		5690 MHz
	14		13	13		13

3.11. 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 Wireless ac AP and transmit duty cycle no less 98%

3.12. Duty Cycle

For non-beamforming mode:

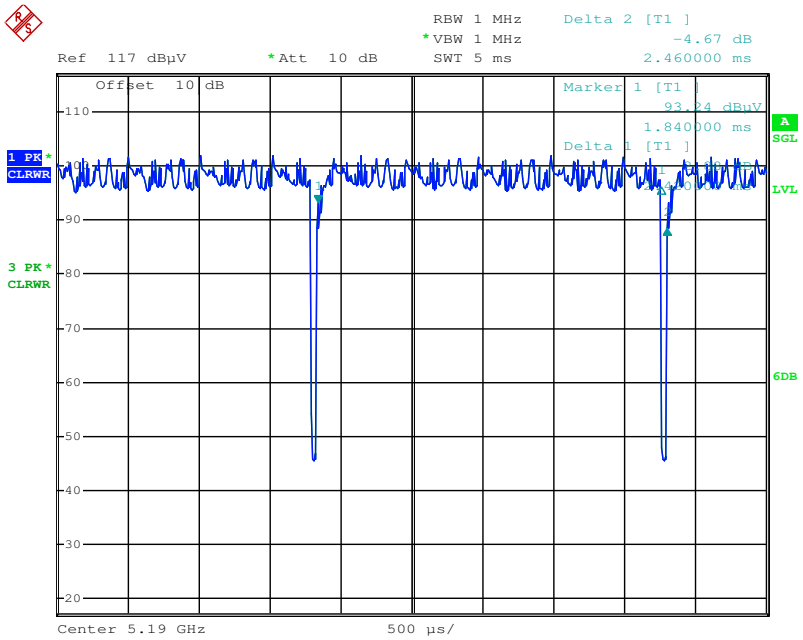
Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT40	2.420	2.460	98.37%	0.07	0.01
802.11ac MCS0/Nss1 VHT80	1.138	1.232	92.35%	0.35	0.88

For beamforming mode:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT40	2.946	3.076	95.76%	0.19	0.34
802.11ac MCS0/Nss1 VHT80	1.699	1.788	95.01%	0.22	0.59

For non-beamforming mode:

802.11ac MCS0/Nss1 VHT40



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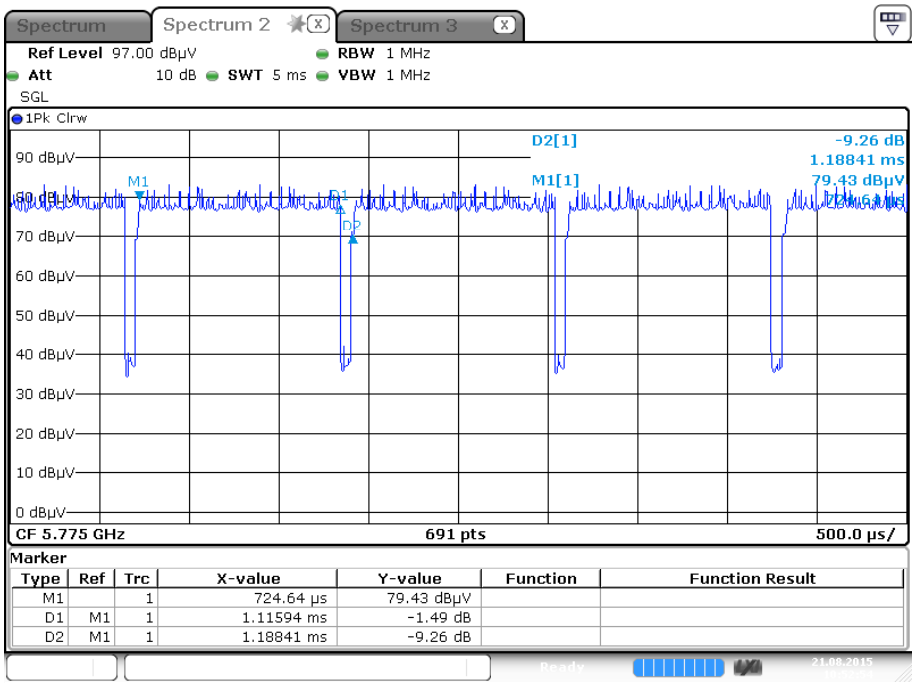
802.11ac MCS0/Nss1 VHT80



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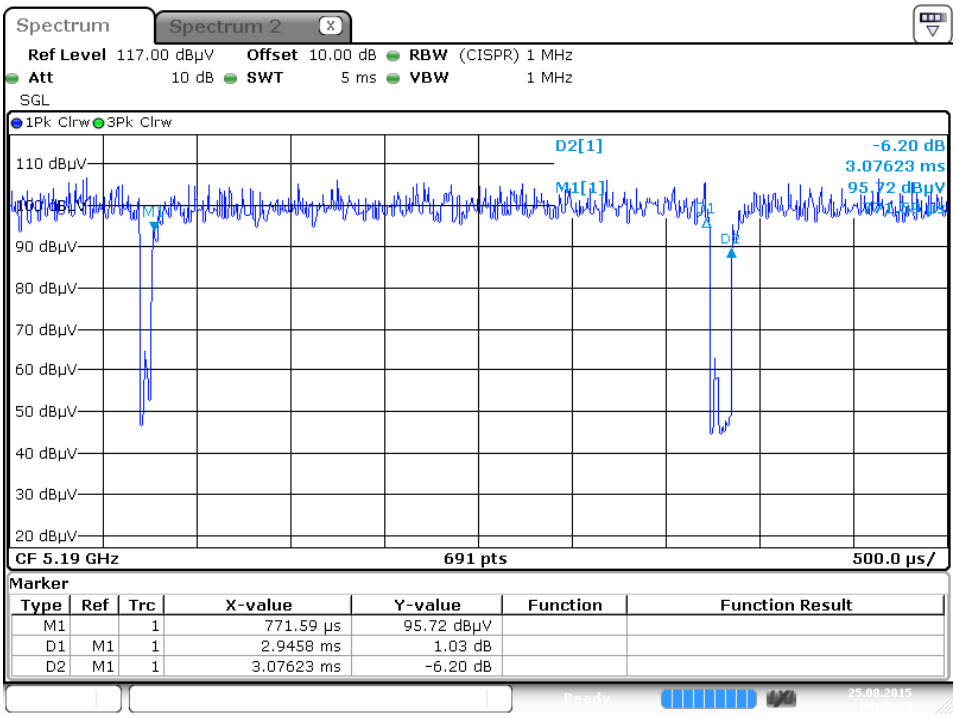
For beamforming mode:

802.11ac MCS0/Nss1 VHT40



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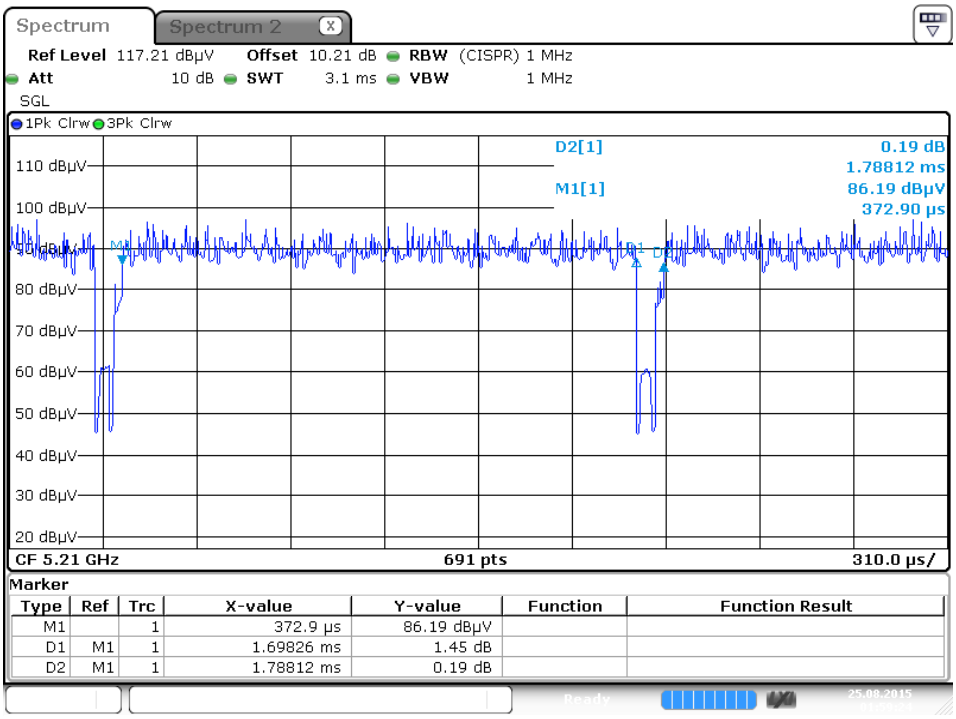
802.11ac MCS0/Nss1 VHT80



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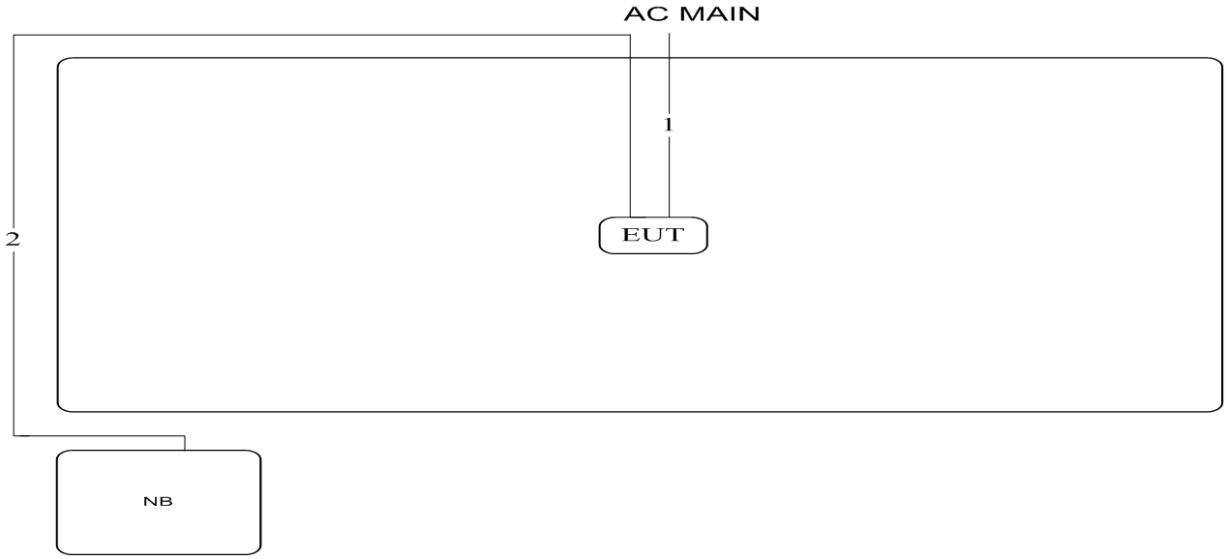
3.13. Test Configurations

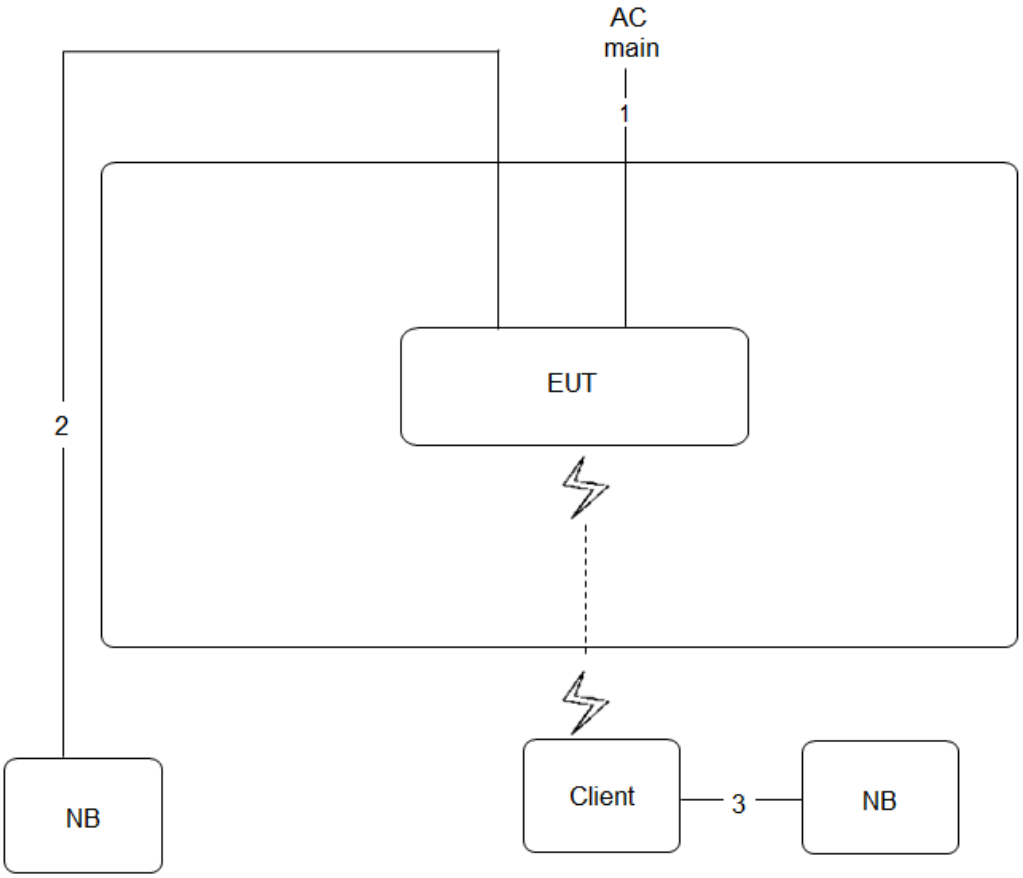
3.13.1. Radiation Emissions Test Configuration

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
3	RJ-45 cable	No	1.5m

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 4.5.4.

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	25℃	Humidity	56%
Test Engineer	Wen Chao		

For non-beamforming mode:

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT40	5270 MHz	41.74	35.60
	5310 MHz	41.59	35.46
	5510 MHz	41.88	36.03
	5550 MHz	41.45	36.03
	5670 MHz	41.30	35.46
802.11ac MCS0/Nss1 VHT80	5290 MHz	80.58	73.81
	5530 MHz	80.87	74.38
	5610 MHz	80.29	74.96

For beamforming mode:

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT40	5270 MHz	43.04	36.76
	5310 MHz	43.33	36.76
	5510 MHz	43.77	36.76
	5550 MHz	44.20	36.76
	5670 MHz	41.88	36.76
802.11ac MCS0/Nss1 VHT80	5290 MHz	80.00	75.25
	5530 MHz	81.74	75.54
	5610 MHz	81.16	75.25

Straddle Channel

For non-beamforming mode:

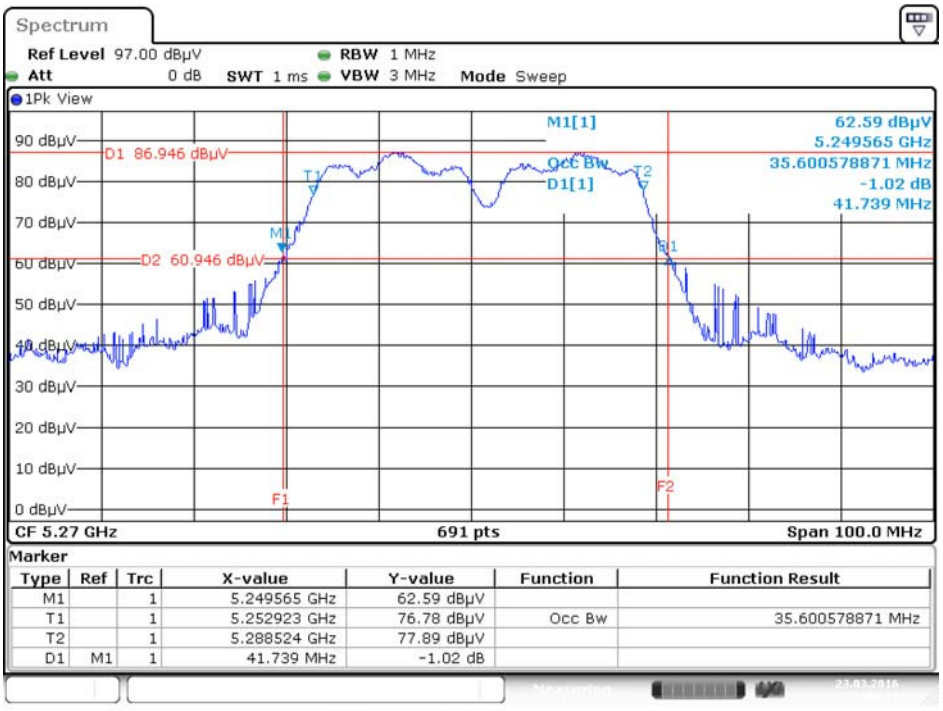
Mode	Frequency	26dB BW (MHz)	99% OBW (MHz)	26dB BW F1 (MHz)	99% OBW T1 (MHz)	UNII 2C 26dB BW (MHz)	UNII 3 26dB BW (MHz)	UNII 2C 99% BW (MHz)	UNII 3 99% BW (MHz)
802.11ac MCS0/Nss1 VHT40	5710 MHz	40.58	34.88	5690.29	5693.07	34.71	5.87	31.93	2.94
802.11ac MCS0/Nss1 VHT80	5690 MHz	79.13	72.36	5650.58	5654.11	74.42	4.71	70.89	1.47

For beamforming mode:

Mode	Frequency	26dB BW (MHz)	99% OBW (MHz)	26dB BW F1 (MHz)	99% OBW T1 (MHz)	UNII 2C 26dB BW (MHz)	UNII 3 26dB BW (MHz)	UNII 2C 99% BW (MHz)	UNII 3 99% BW (MHz)
802.11ac MCS0/Nss1 VHT40	5710 MHz	44.20	36.90	5687.83	5691.62	37.17	7.03	33.38	3.52
802.11ac MCS0/Nss1 VHT80	5690 MHz	80.29	75.25	5650.00	5652.37	75.00	5.29	72.63	2.63

For non-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 / 5270 MHz



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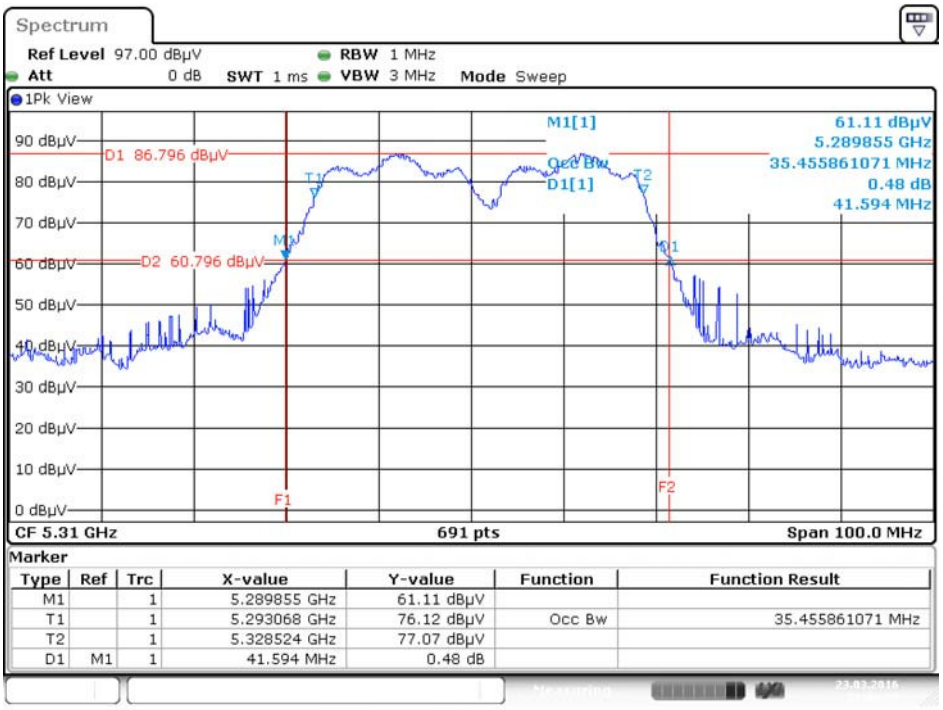
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5310 MHz



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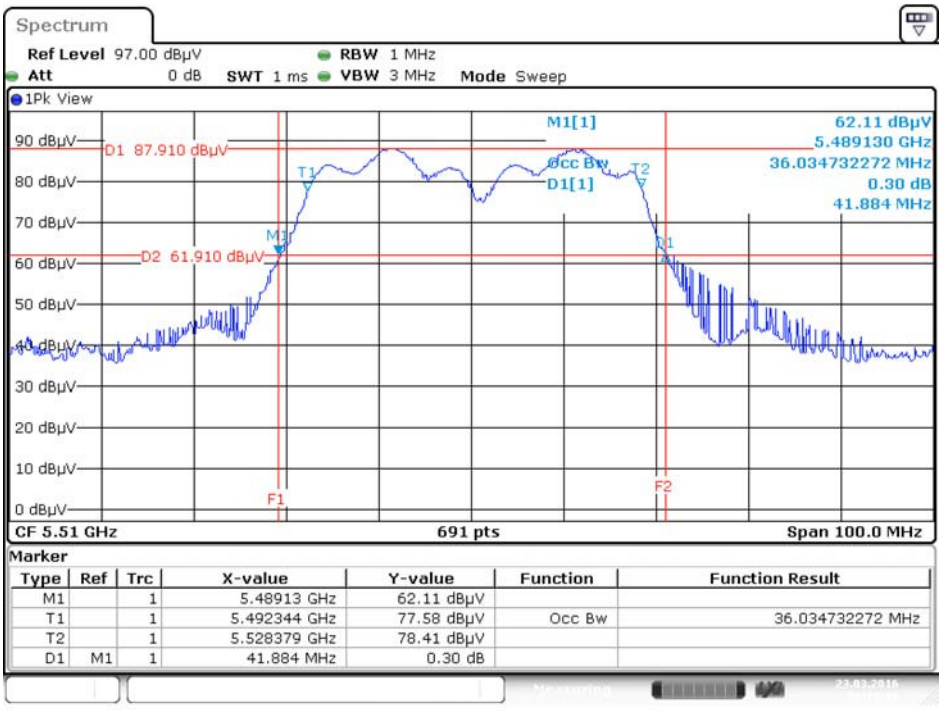
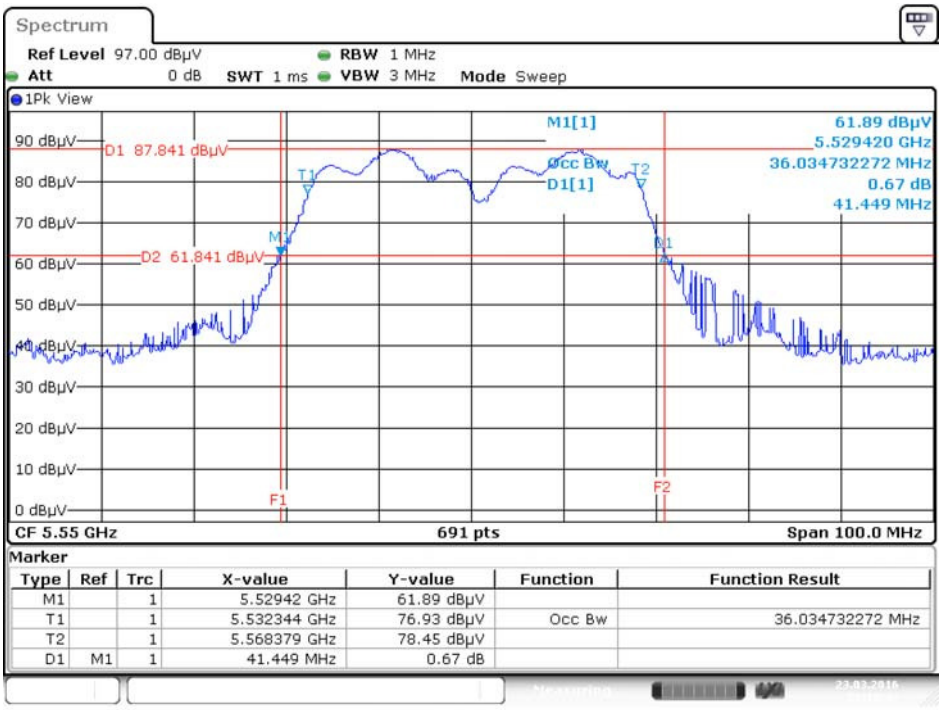
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5510 MHz



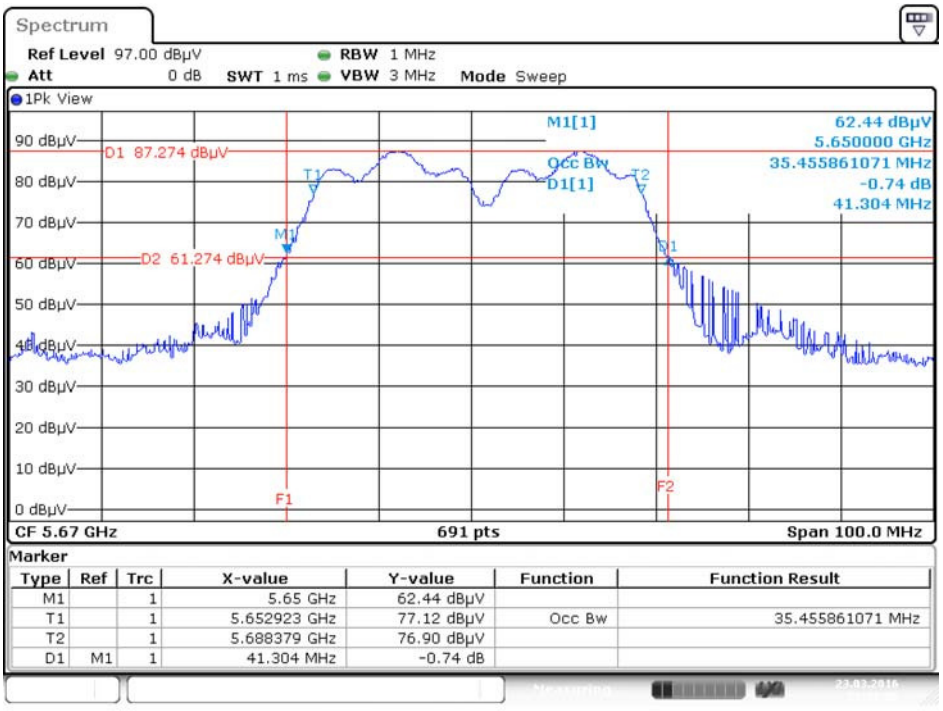
Date: 23.MAR.2016 21:10:16

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5550 MHz



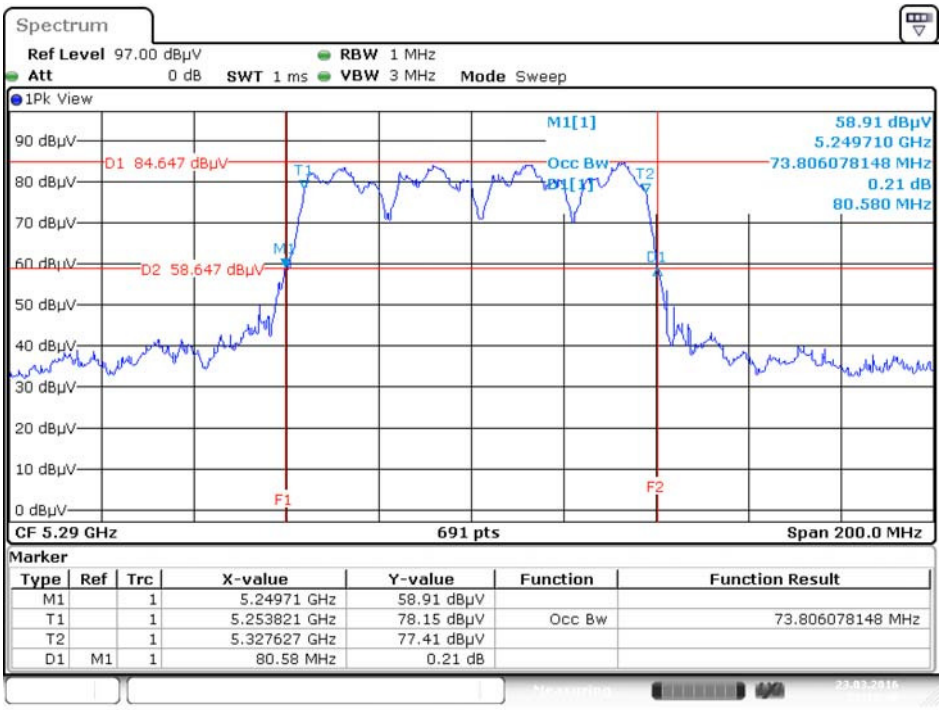
Date: 23.MAR.2016 21:10:41

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5670 MHz



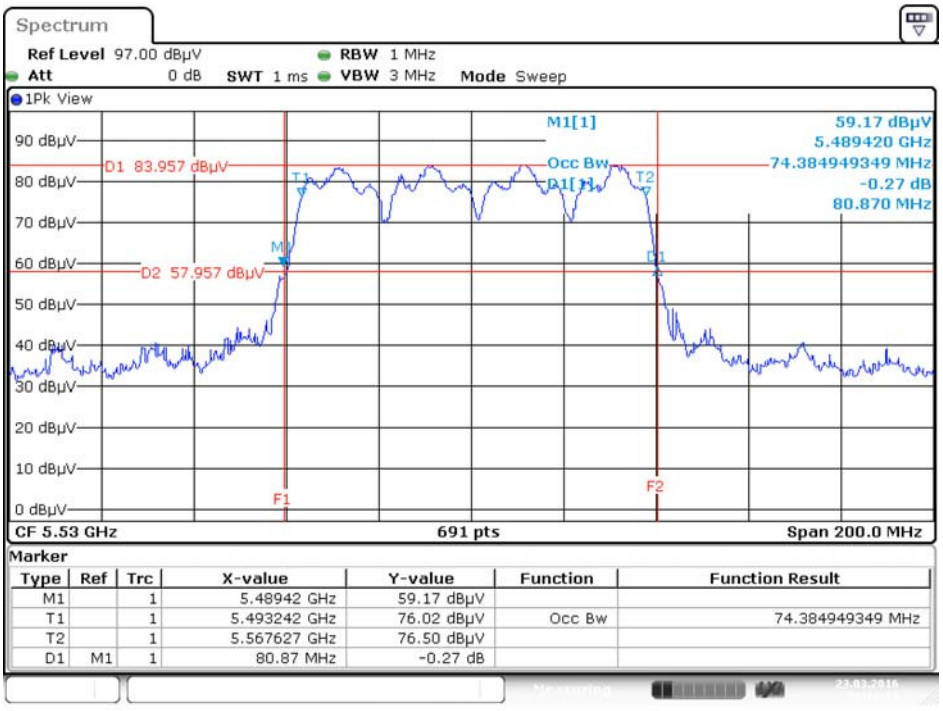
Date: 23.MAR.2016 21:11:06

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5290 MHz



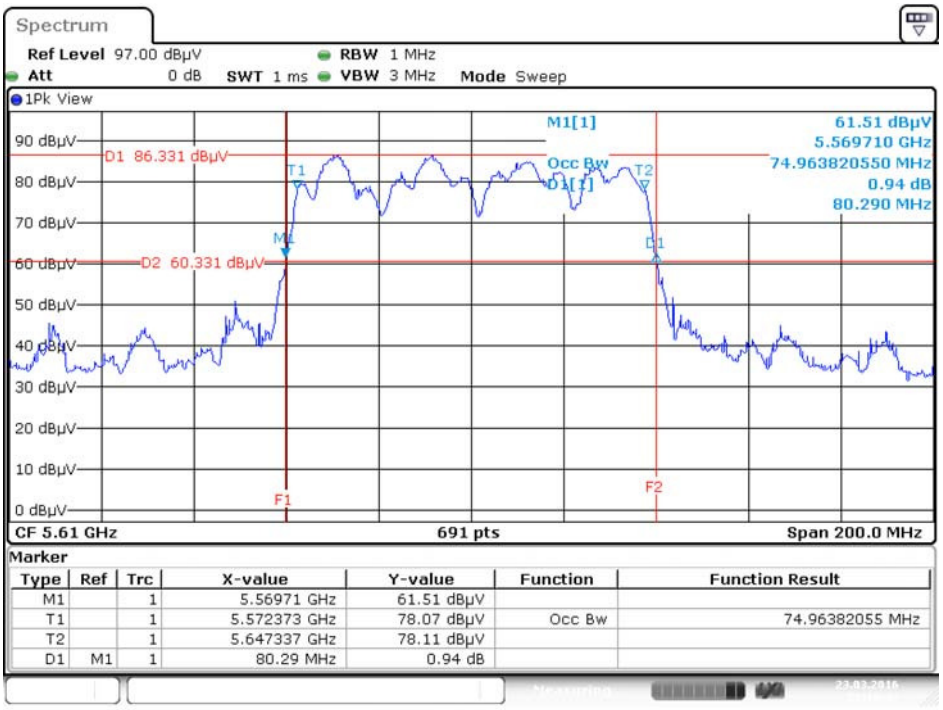
Date: 23.MAR.2016 21:13:40

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5530 MHz



Date: 23.MAR.2016 21:14:16

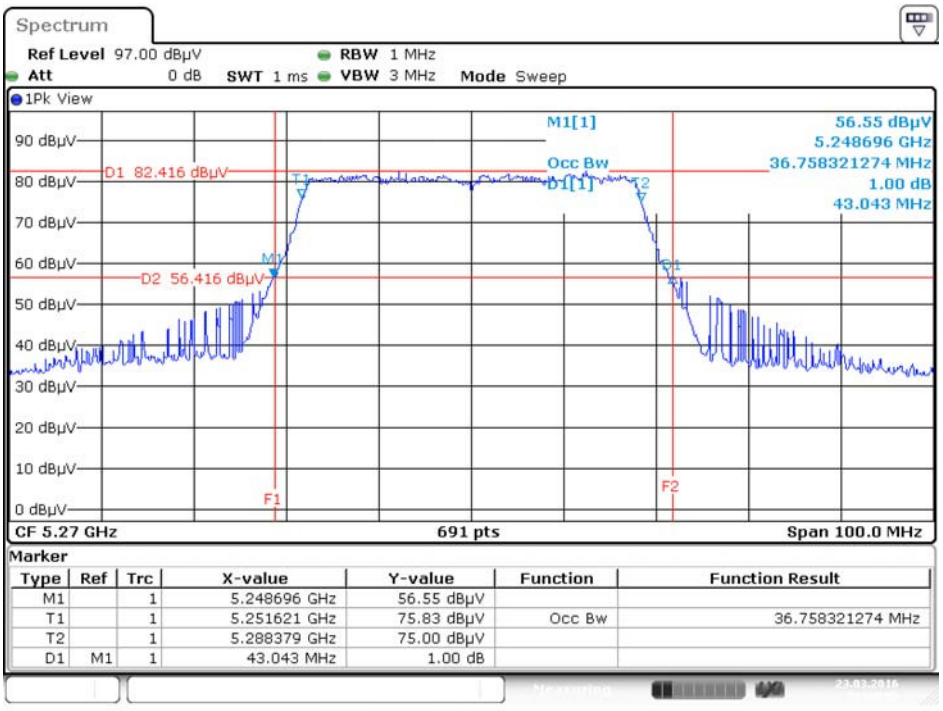
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5610 MHz



Date: 23.MAR.2016 21:14:41

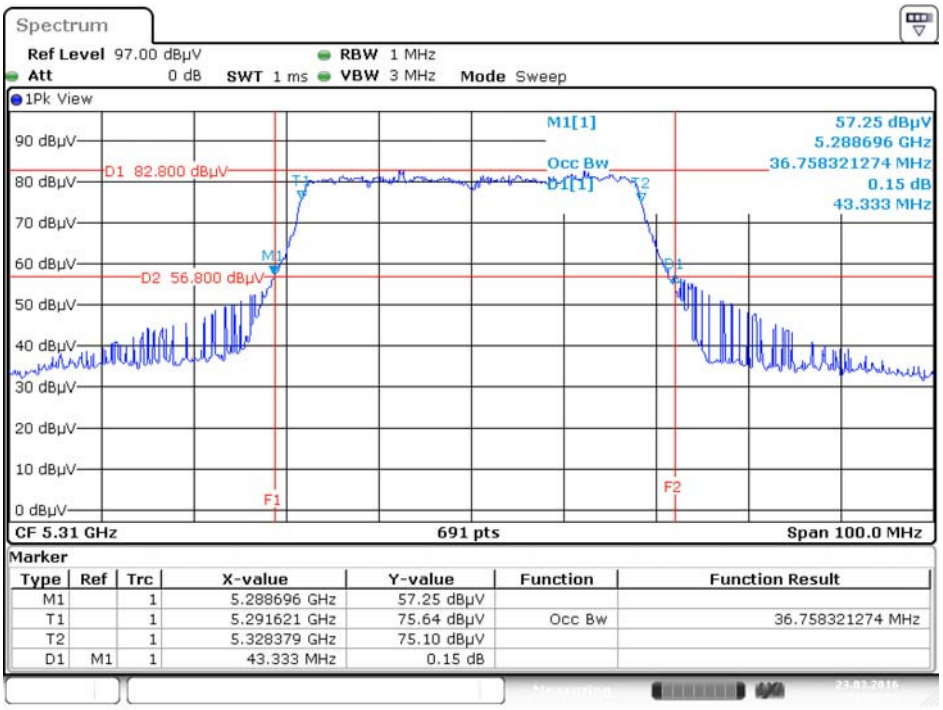
For beamforming mode:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5270 MHz



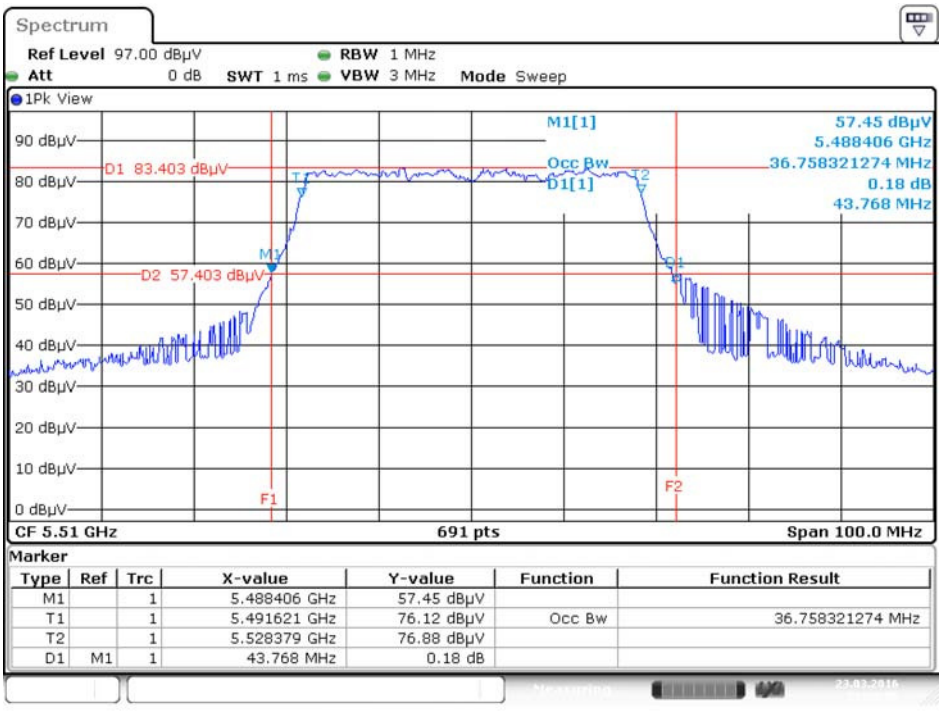
Date: 23.MAR.2016 21:20:02

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5310 MHz



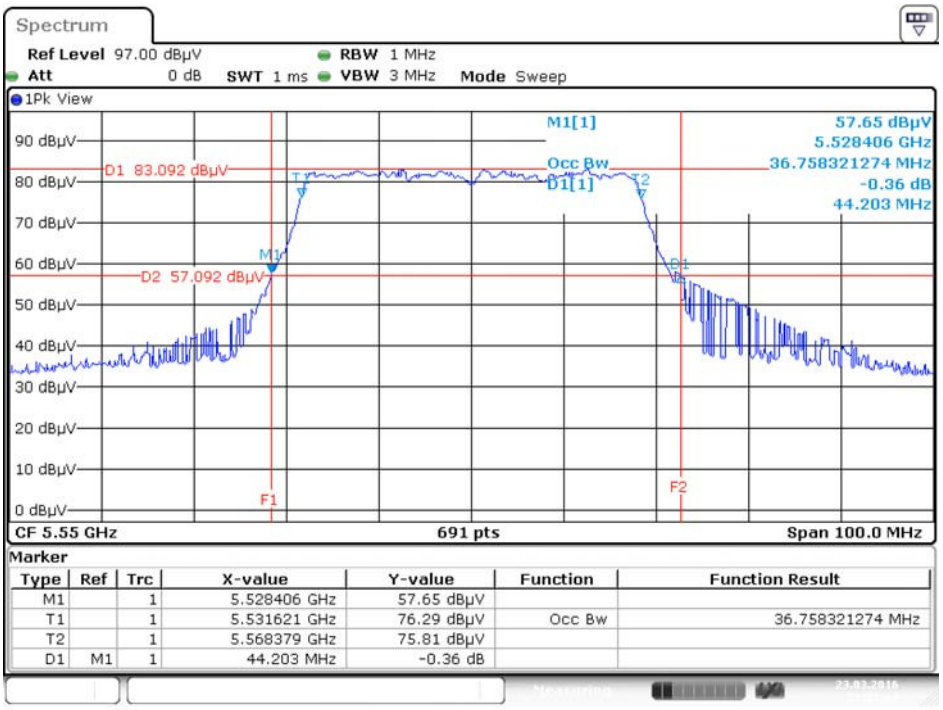
Date: 23.MAR.2016 21:20:35

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5510 MHz



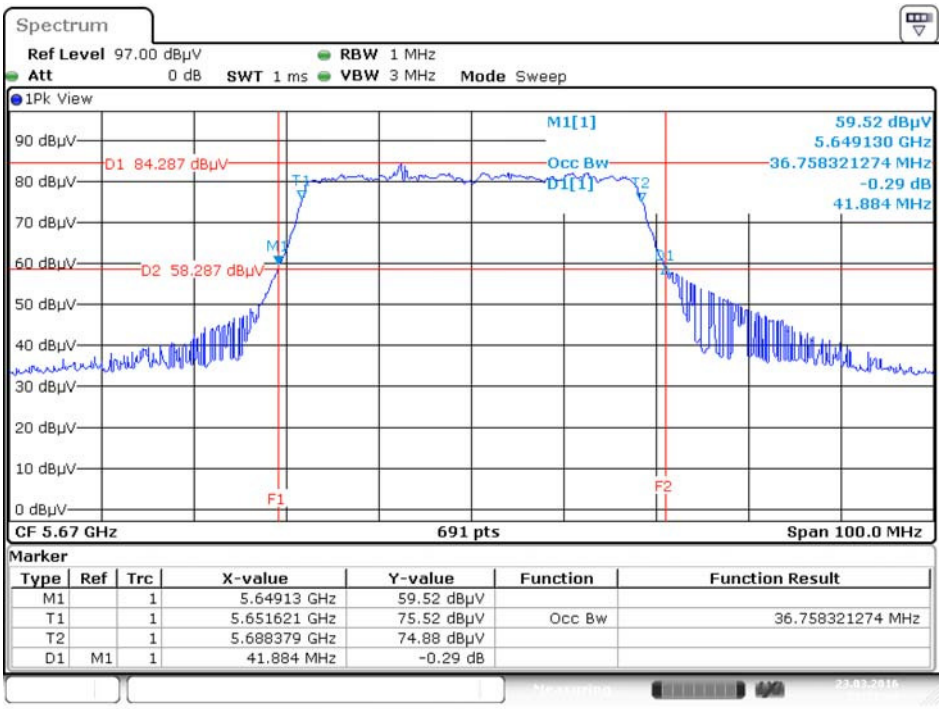
Date: 23.MAR.2016 21:20:56

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5550 MHz



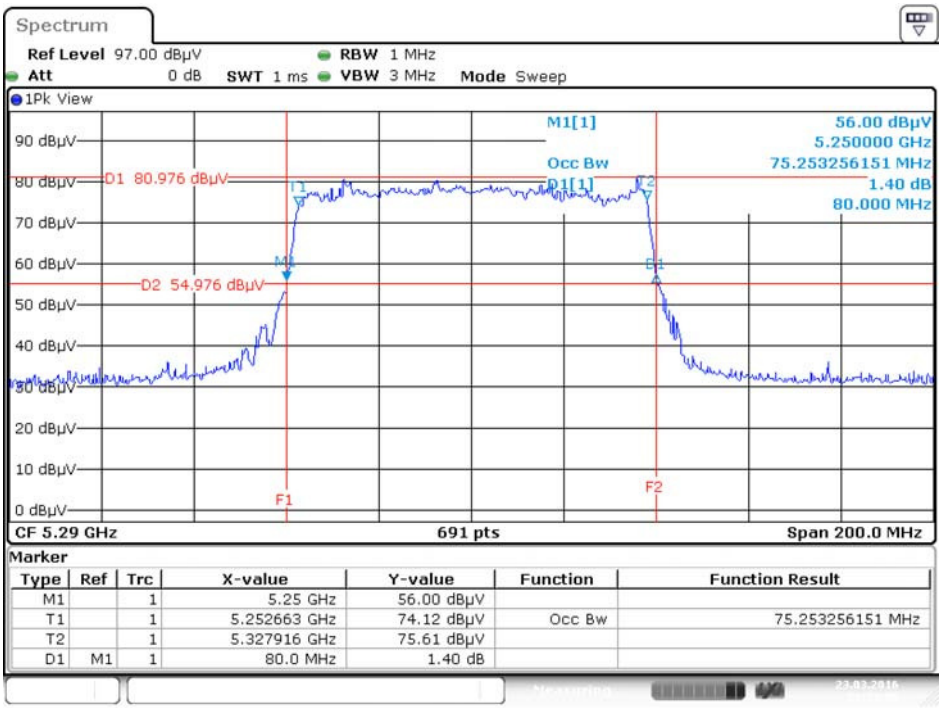
Date: 23.MAR.2016 21:21:14

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5670 MHz



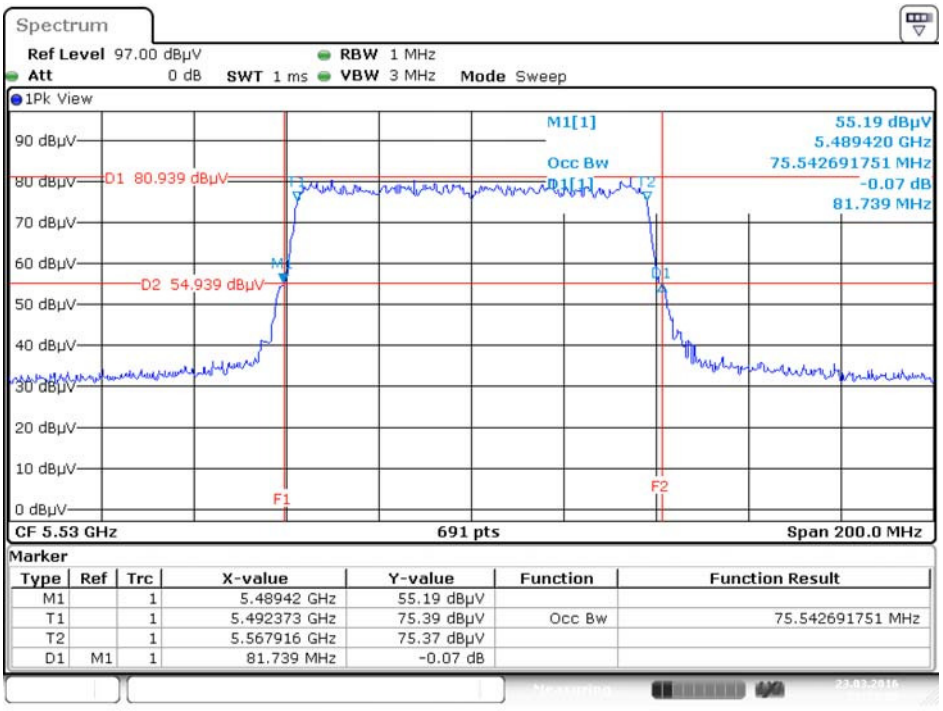
Date: 23.MAR.2016 21:21:34

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5290 MHz



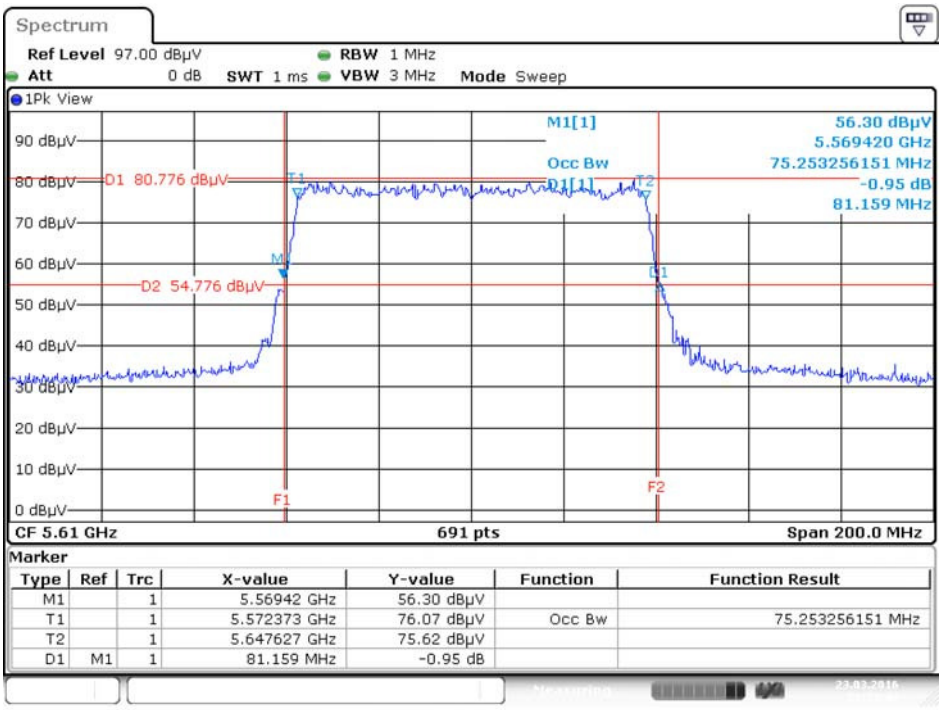
Date: 23.MAR.2016 21:23:05

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5530 MHz



Date: 23.MAR.2016 21:23:30

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5610 MHz

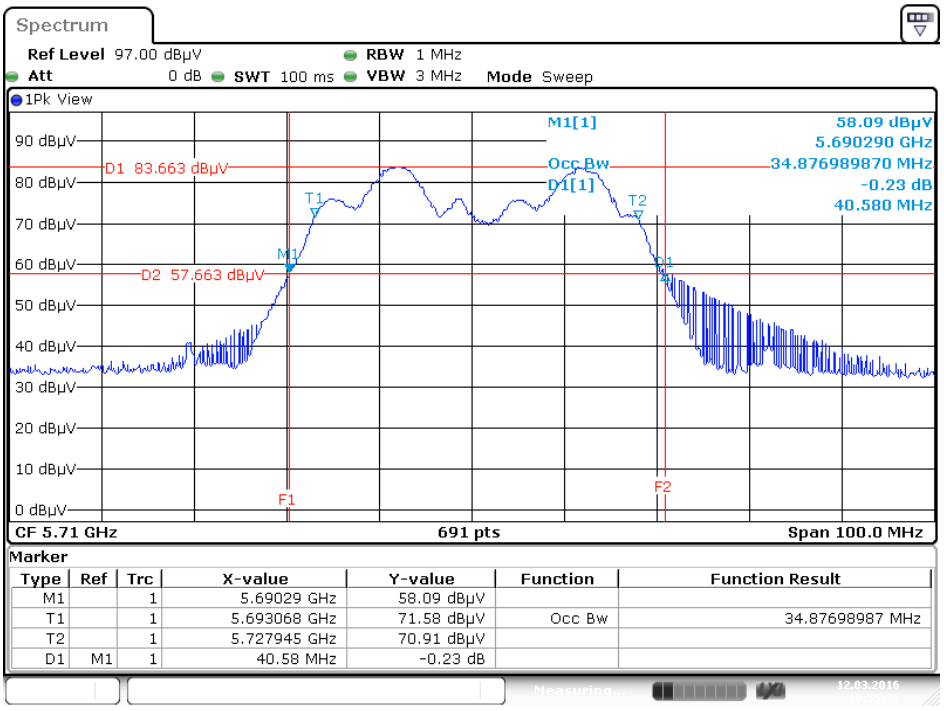


Date: 23.MAR.2016 21:23:50

Straddle Channel

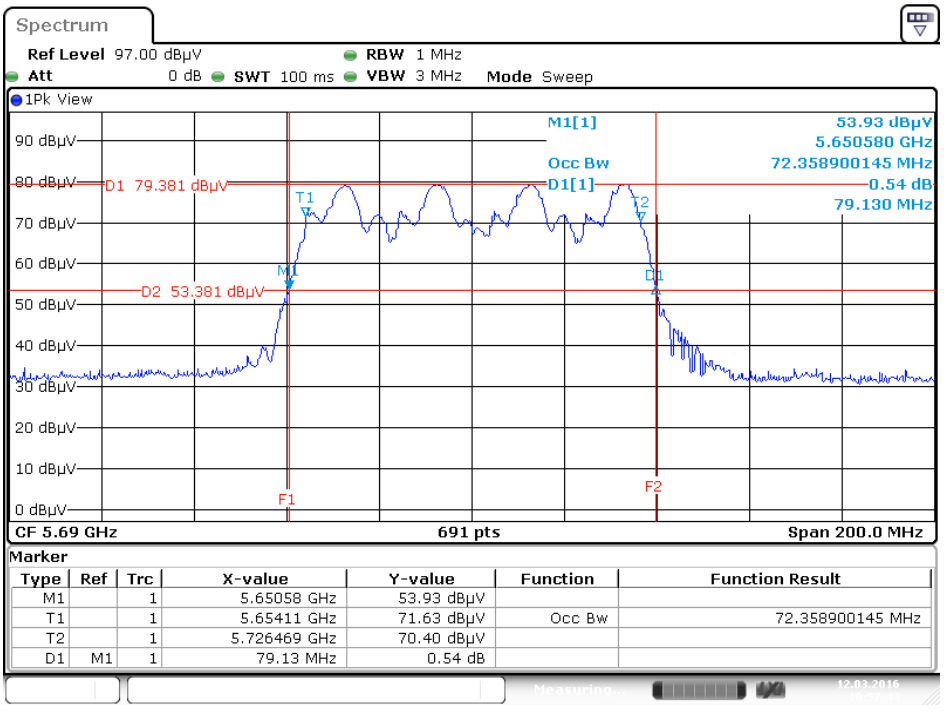
For non-beamforming mode:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz



Date: 12.MAR.2016 10:55:37

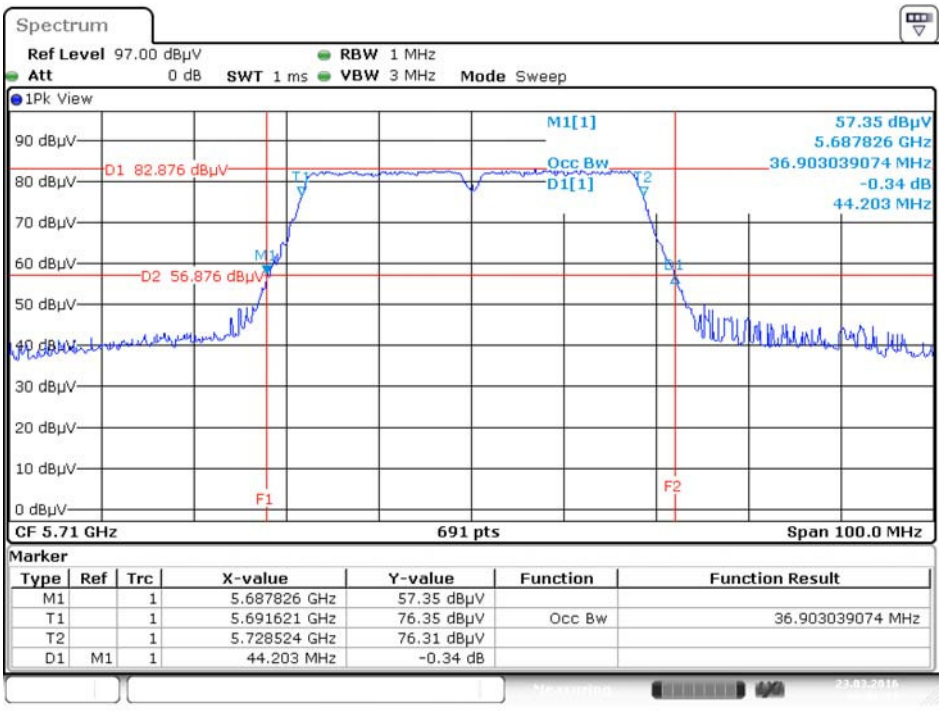
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz



Date: 12.MAR.2016 10:57:44

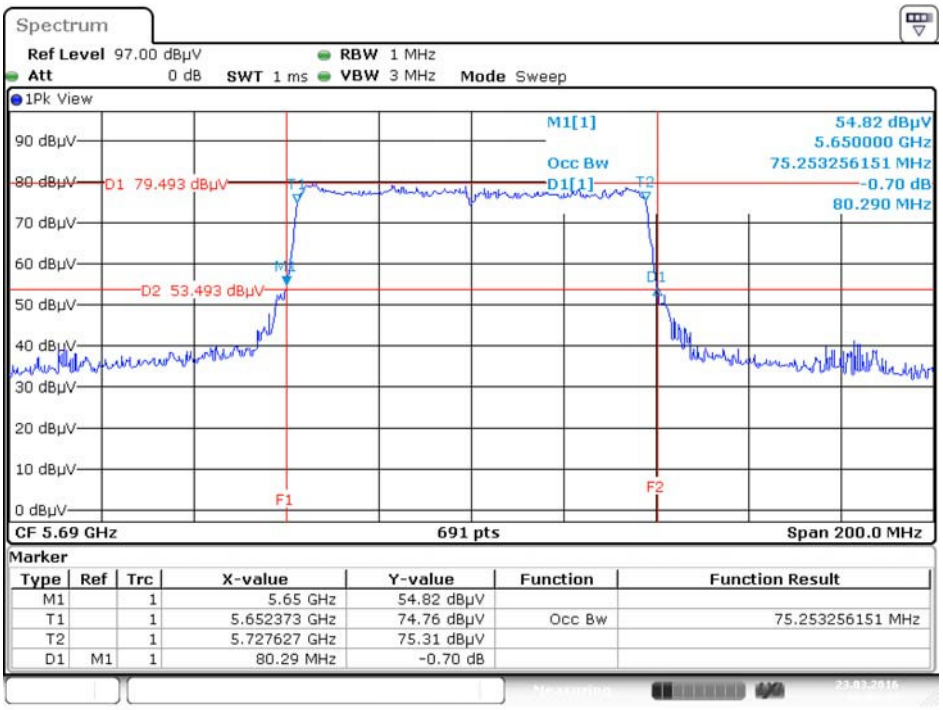
For beamforming mode:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz



Date: 23.MAR.2016 00:06:19

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz



Date: 23.MAR.2016 00:09:43

4.2. 6dB Spectrum Bandwidth Measurement

4.2.1. Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

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 spectrum analyzer.

6dB Spectrum Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. Test Procedures

1. The transmitter was conducted to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth.
3. Multiple antenna system was performed in accordance with KDB662911 D01 v02r01 Emissio ns Testing of Transmitters with Multiple Outputs in the Same Band.
4. Measurement perform conducted of each port.
5. Measured the spectrum width with power higher than 6dB below carrier.

4.2.4. Test Setup Layout

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

4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of 6dB Spectrum Bandwidth

Temperature	25°C	Humidity	56%
Test Engineer	Wen Chao		

Straddle Channel

For non-beamforming mode:

Mode	Frequency	6dB BW (MHz)	6dB BW M1 (MHz)	UNII 3 BW (MHz)	Min. Limit (kHz)	Test Result
802.11ac MCS0/Nss1 VHT40	5710 MHz	33.86	5693.65	2.51	500	Complies
802.11ac MCS0/Nss1 VHT80	5690 MHz	73.62	5654.06	2.68	500	Complies

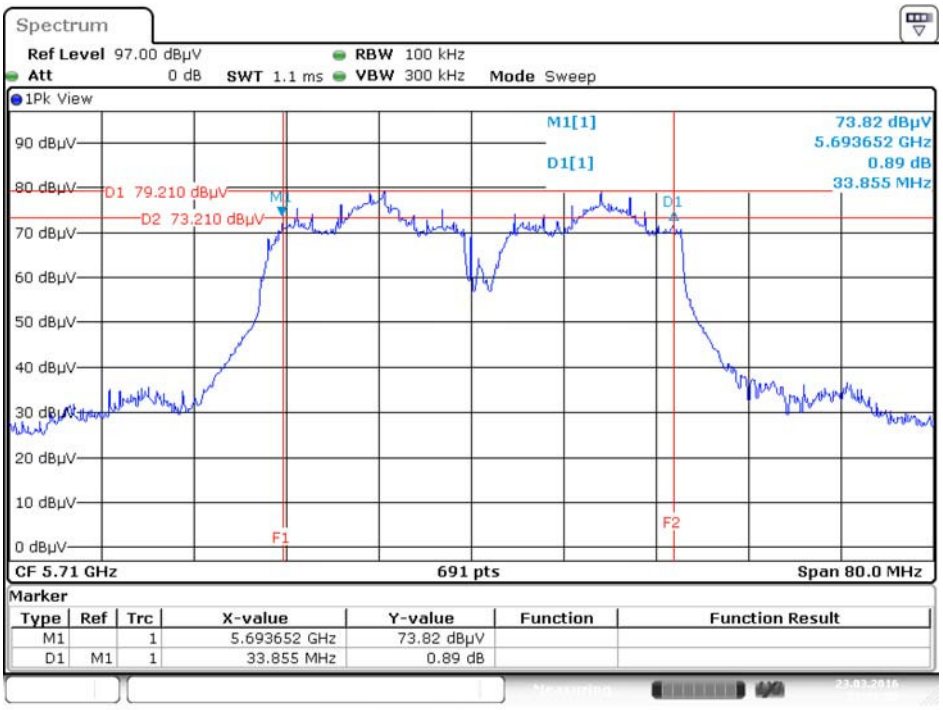
For beamforming mode:

Mode	Frequency	6dB BW (MHz)	6dB BW M1 (MHz)	UNII 3 BW (MHz)	Min. Limit (kHz)	Test Result
802.11ac MCS0/Nss1 VHT40	5710 MHz	34.20	5692.38	1.58	500	Complies
802.11ac MCS0/Nss1 VHT80	5690 MHz	73.04	5653.77	1.81	500	Complies

Straddle Channel

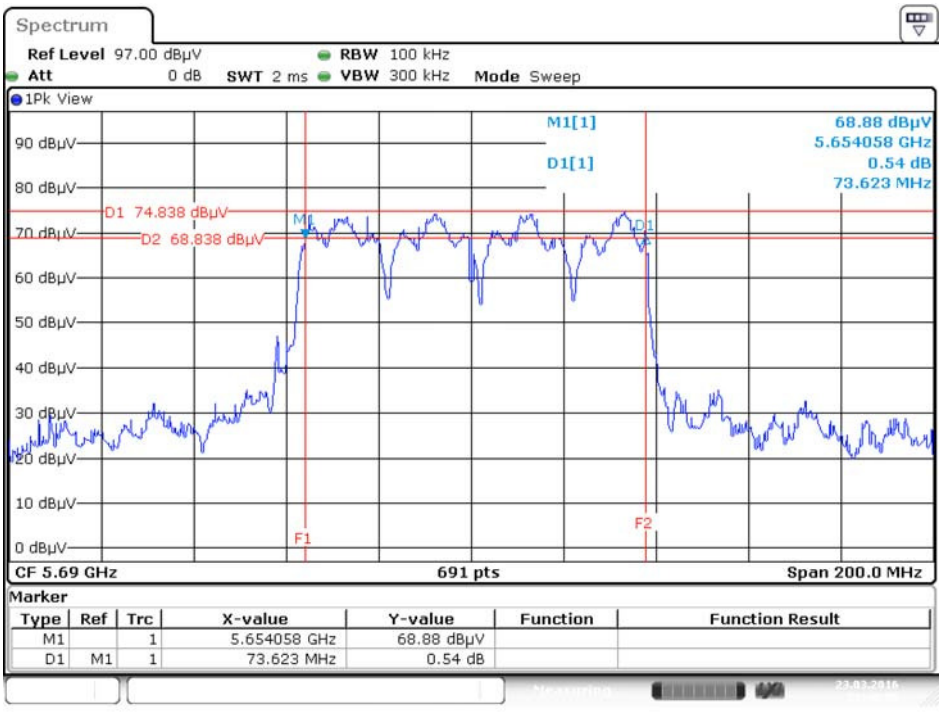
For non-beamforming mode:

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz



Date: 23.MAR.2016 21:32:00

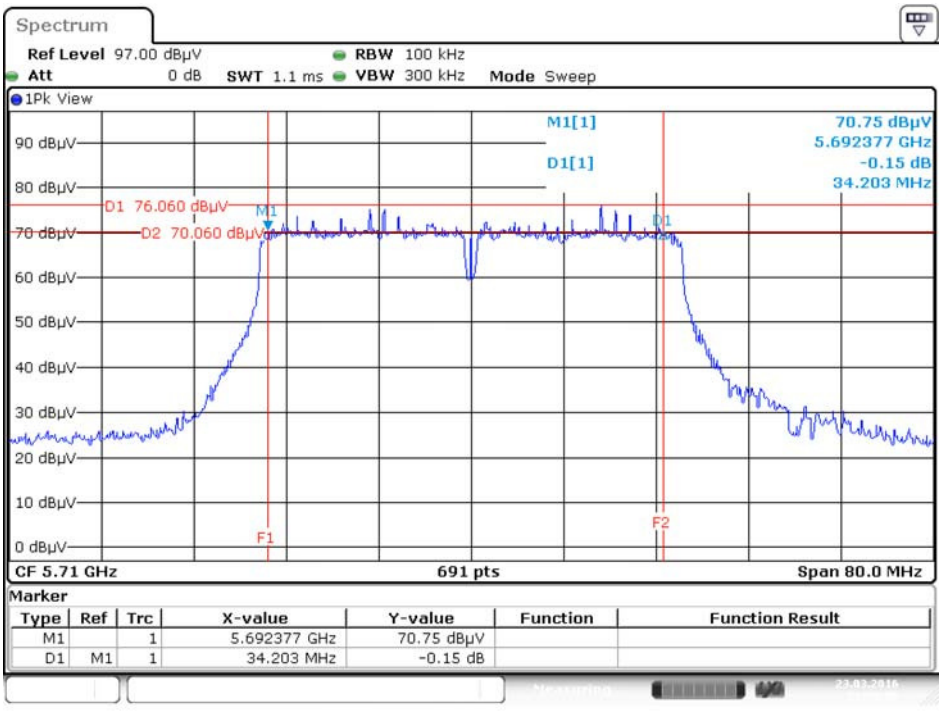
6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz



Date: 23.MAR.2016 21:40:55

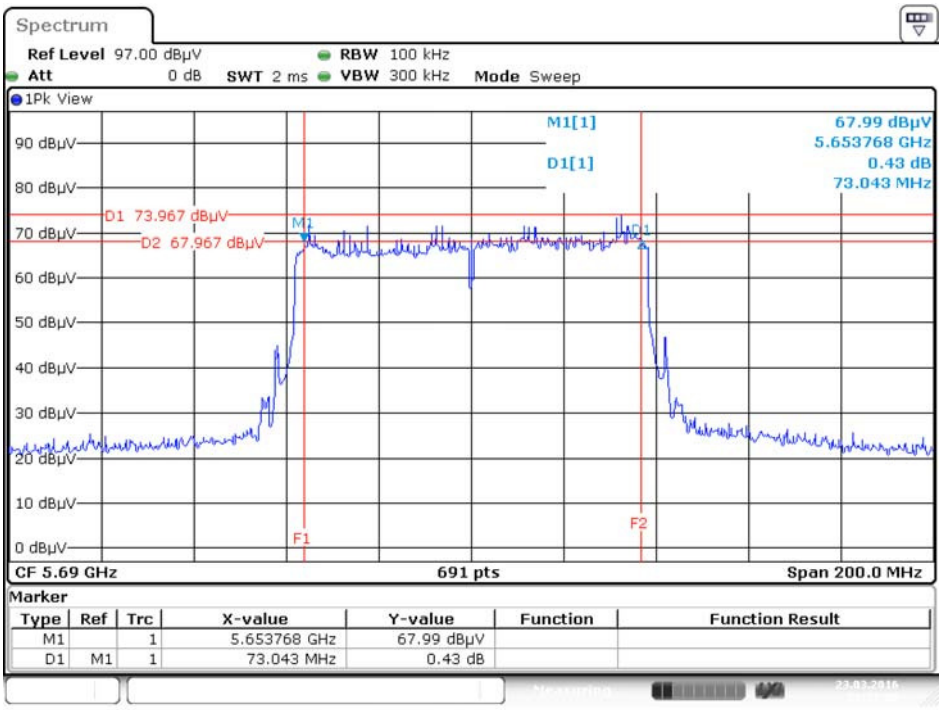
For beamforming mode:

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz



Date: 23.MAR.2016 21:25:57

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz



Date: 23.MAR.2016 21:27:30

4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

Frequency Band		Limit
☒	5.25-5.35 GHz	The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
☒	5.470-5.725 GHz	

4.3.2. Measuring Instruments and Setting

For other channel:

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

For straddle channel:

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 count 100
Sweep Time	Auto

4.3.3. Test Procedures

For other channel:

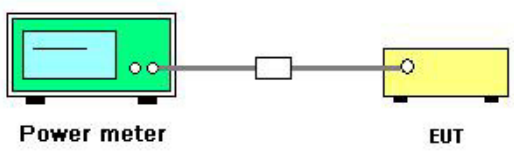
1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01r01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power 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.

For straddle channel:

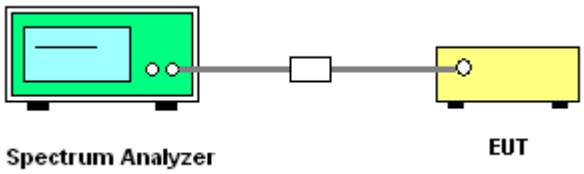
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with FCC Public Notice DA 02-2138, August 30, 2002.

4.3.4. Test Setup Layout

For other channel:



For straddle channel:



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Maximum Conducted Output Power

Temperature	25°C	Humidity	56%
Test Engineer	Wen Chao	Test Date	Mar. 23, 2016

For non-beamforming mode:

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT40	5270 MHz	16.27	16.01	15.95	18.00	22.67	23.98	Complies
	5310 MHz	16.51	16.47	16.13	16.55	22.44	23.98	Complies
	5510 MHz	17.48	16.69	16.81	16.82	22.98	23.98	Complies
	5550 MHz	17.21	16.83	16.79	16.87	22.95	23.98	Complies
	5670 MHz	16.87	16.69	16.40	16.85	22.73	23.98	Complies
802.11ac MCS0/Nss1 VHT80	5290 MHz	17.13	16.64	16.86	16.99	22.93	23.98	Complies
	5530 MHz	16.41	15.73	15.87	16.46	22.15	23.98	Complies
	5610 MHz	18.36	17.76	17.66	17.80	23.92	23.98	Complies

For beamforming mode:

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT40	5270 MHz	13.78	13.66	13.36	13.99	19.72	20.19	Complies
	5310 MHz	13.67	13.47	13.13	13.68	19.51	20.19	Complies
	5510 MHz	14.62	13.85	13.94	14.12	20.16	20.19	Complies
	5550 MHz	14.48	13.97	13.38	14.01	20.00	20.19	Complies
	5670 MHz	14.18	13.86	13.43	14.03	19.90	20.19	Complies
802.11ac MCS0/Nss1 VHT80	5290 MHz	14.23	14.09	14.15	14.17	20.18	20.19	Complies
	5530 MHz	14.02	13.56	13.33	13.97	19.75	20.19	Complies
	5610 MHz	13.81	13.38	13.11	13.93	19.59	20.19	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=23.98-(9.79-6)=20.19 dBm.

Straddle Channel

For non-beamforming mode:

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT40	5710 MHz (UNII 2C)	16.55	17.30	16.81	16.11	22.73	23.98	Complies
	5710 MHz (UNII 3)	6.10	6.70	6.21	6.24	12.34	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5690 MHz (UNII 2C)	18.14	17.42	16.84	17.53	23.46	23.98	Complies
	5690 MHz (UNII 3)	3.62	2.90	2.17	3.79	9.19	30.00	Complies

For beamforming mode:

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT40	5710 MHz (UNII 2C)	13.25	14.32	13.61	14.23	19.90	20.19	Complies
	5710 MHz (UNII 3)	2.99	3.94	2.86	4.27	9.58	26.21	Complies
802.11ac MCS0/Nss1 VHT80	5690 MHz (UNII 2C)	13.88	13.70	13.43	14.24	19.84	20.19	Complies
	5690 MHz (UNII 3)	-0.39	-0.42	-1.07	0.32	5.66	26.21	Complies

For UNII 2C: Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=23.98-(9.79-6)=20.19 dBm.

For UNII 3: Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=30-(9.79-6)=26.21 dBm.

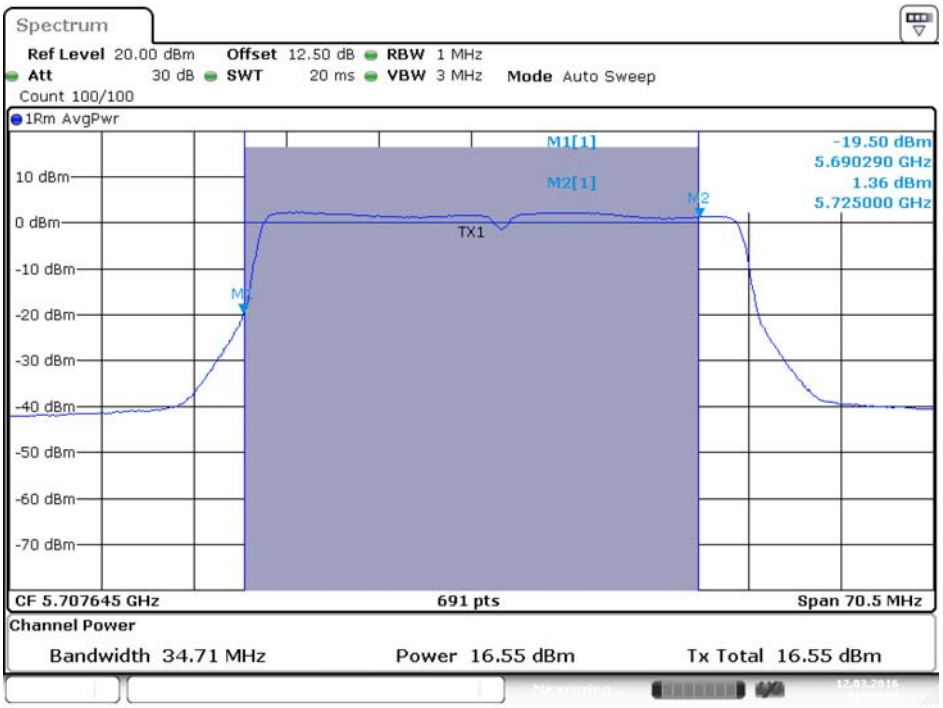
Note: All the test values were listed in the report.

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

Straddle Channel

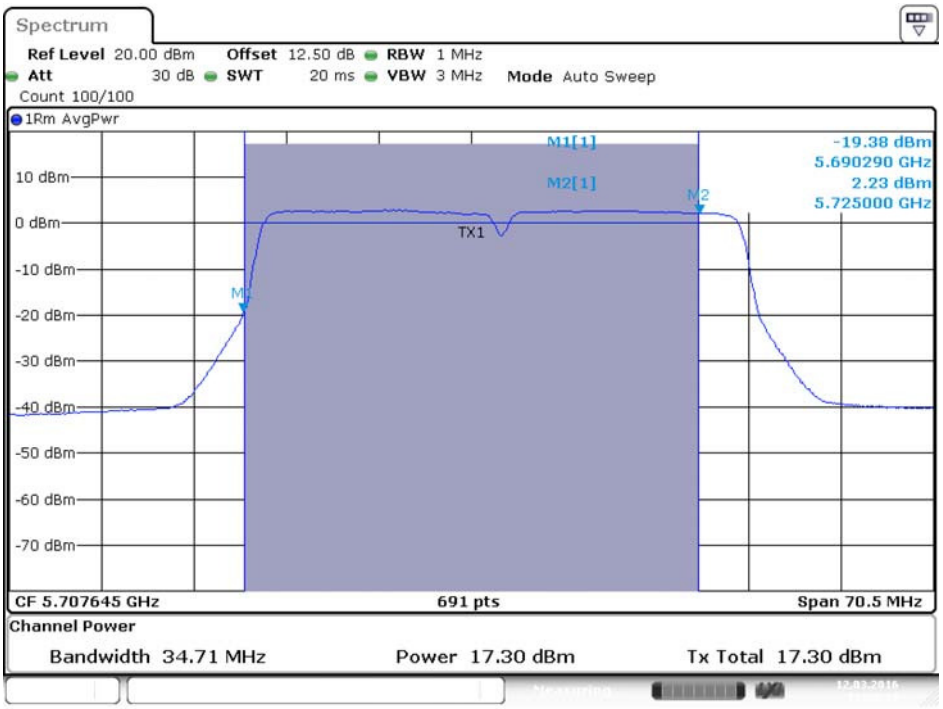
For non-beamforming mode:

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 / 5710 MHz (UNII 2C)



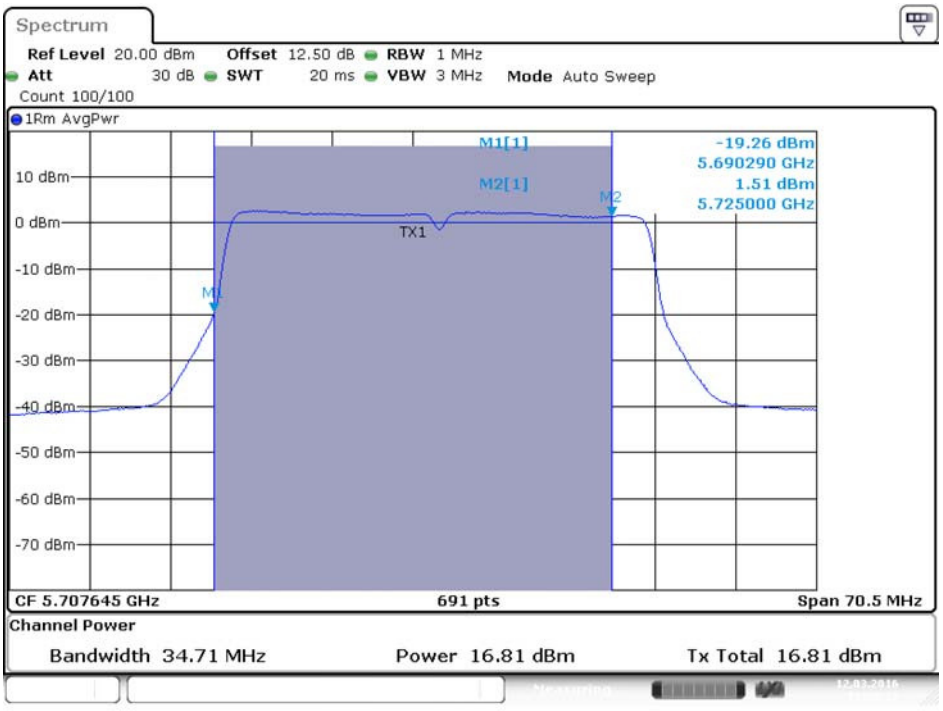
Date: 12.MAR.2016 13:50:03

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 2 / 5710 MHz (UNII 2C)



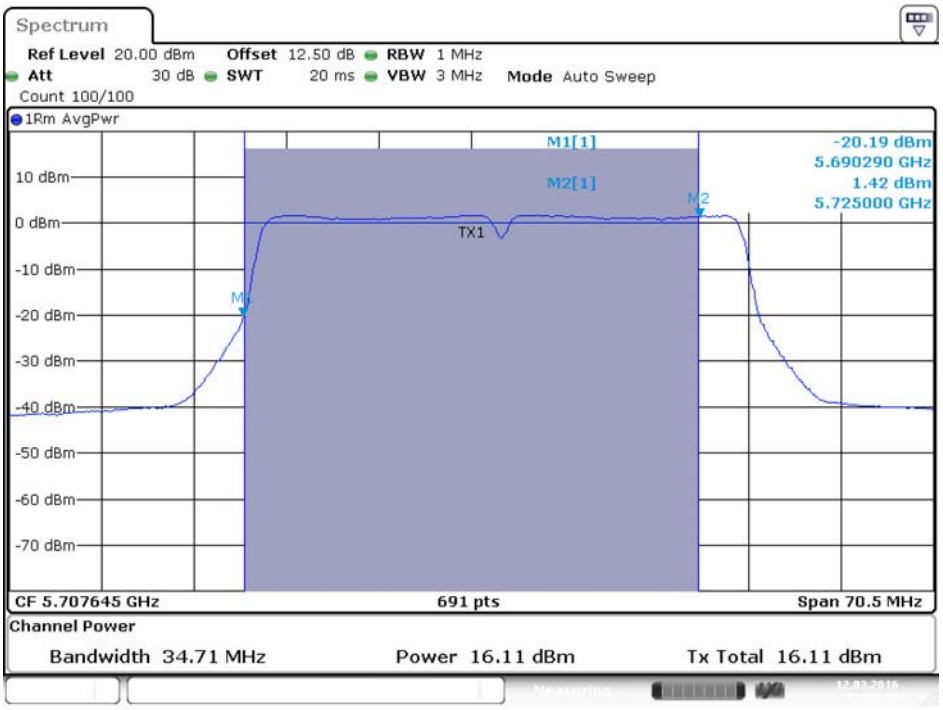
Date: 12.MAR.2016 13:50:10

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 3 / 5710 MHz (UNII 2C)



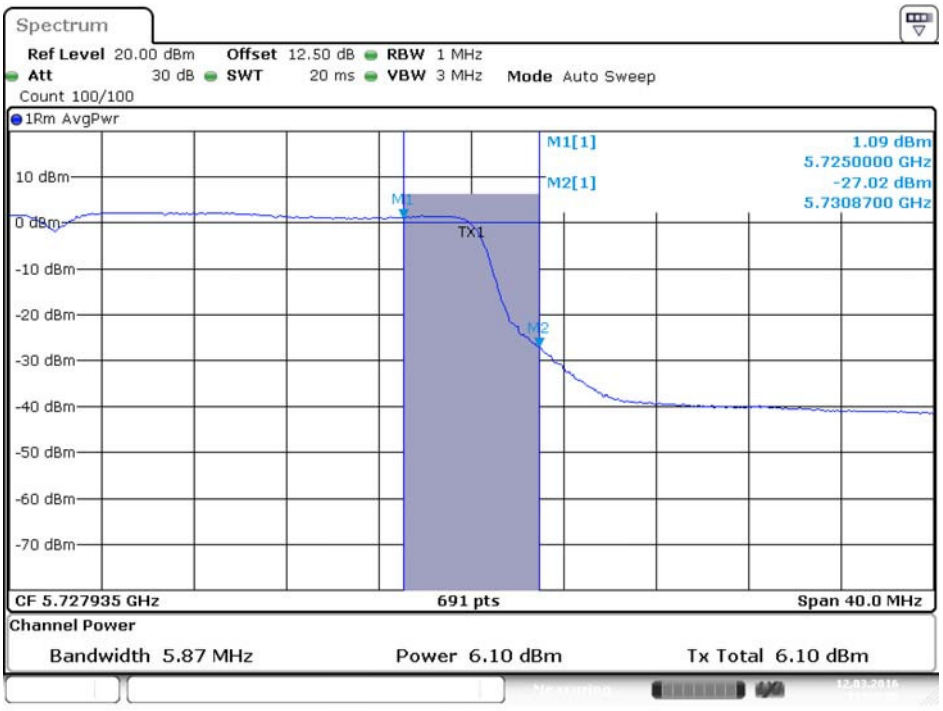
Date: 12.MAR.2016 13:50:17

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 4 / 5710 MHz (UNII 2C)



Date: 12.MAR.2016 13:50:24

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 / 5710 MHz (UNII 3)

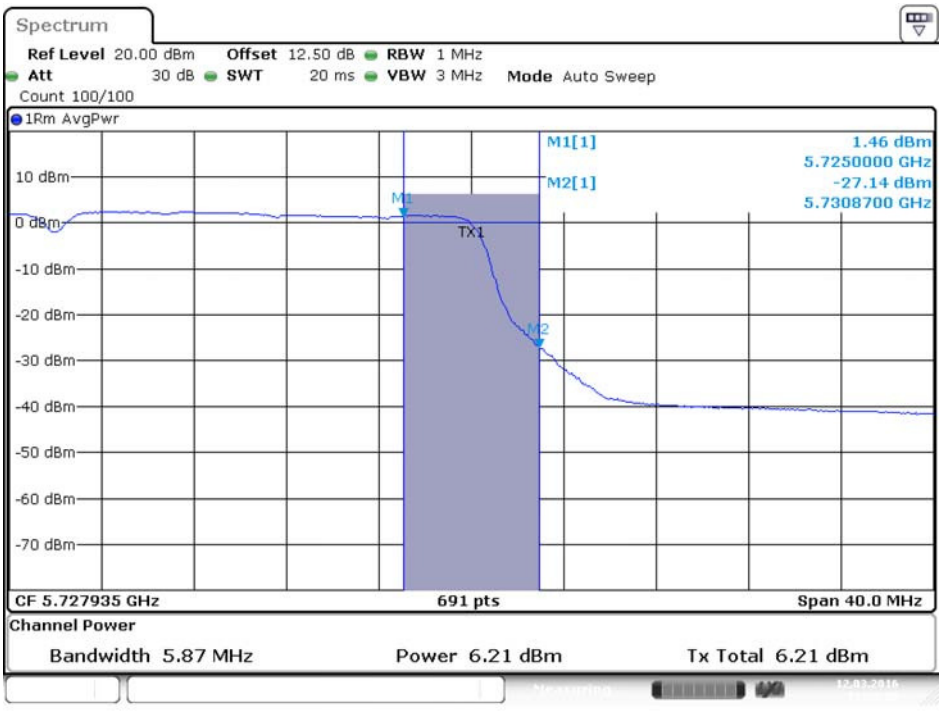


Date: 12.MAR.2016 13:50:06

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 2 / 5710 MHz (UNII 3)

Date: 12.MAR.2016 13:50:13

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 3 / 5710 MHz (UNII 3)

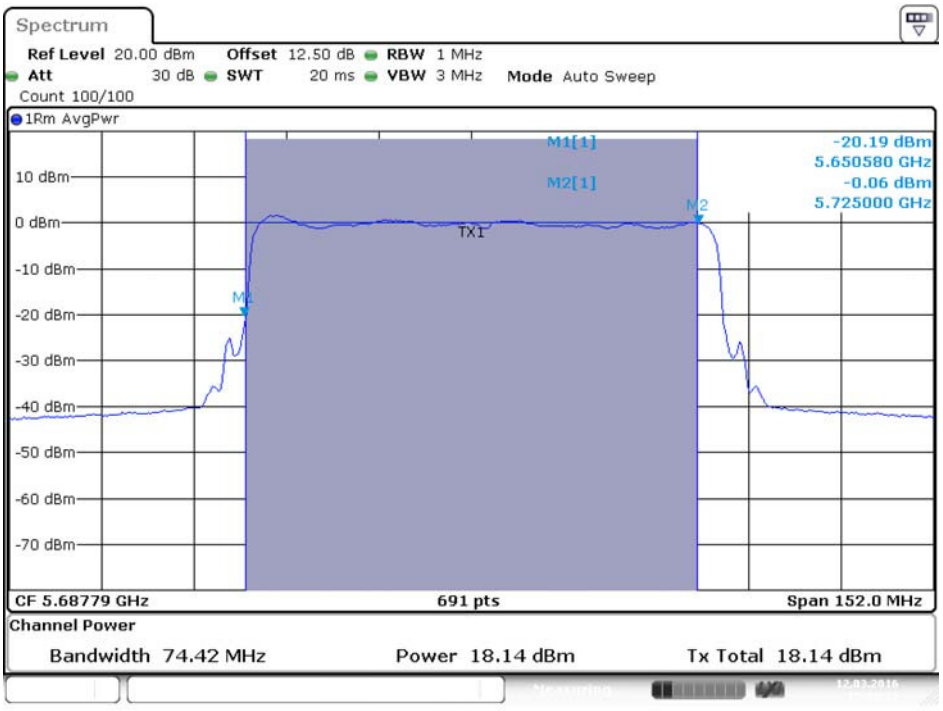


Date: 12.MAR.2016 13:50:20

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 4 / 5710 MHz (UNII 3)

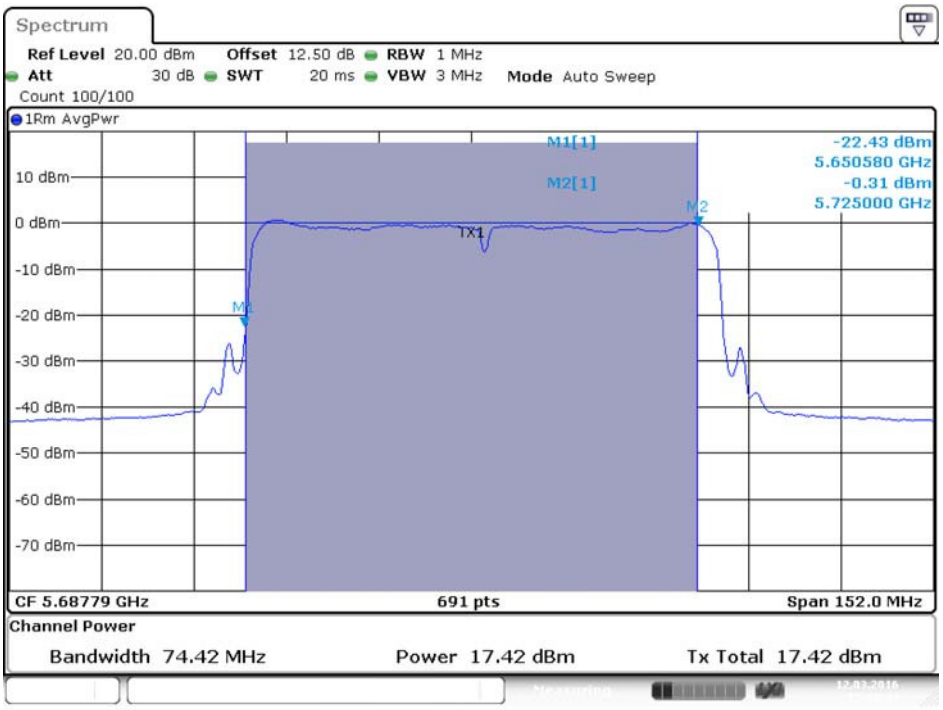
Date: 12.MAR.2016 13:50:27

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 / 5690 MHz (UNII 2C)



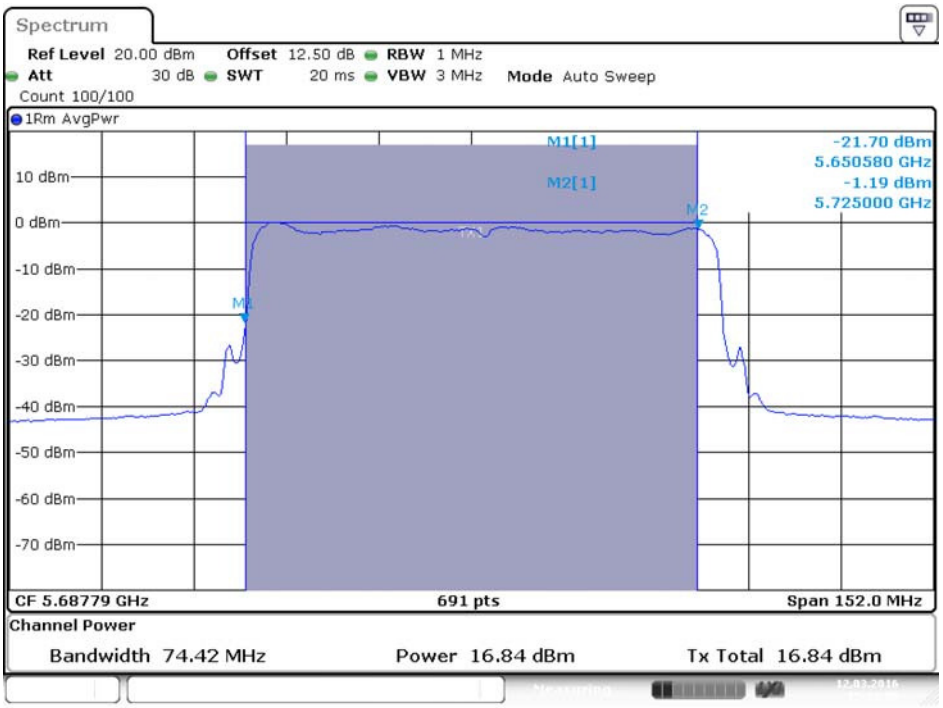
Date: 12.MAR.2016 15:03:37

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 2 / 5690 MHz (UNII 2C)



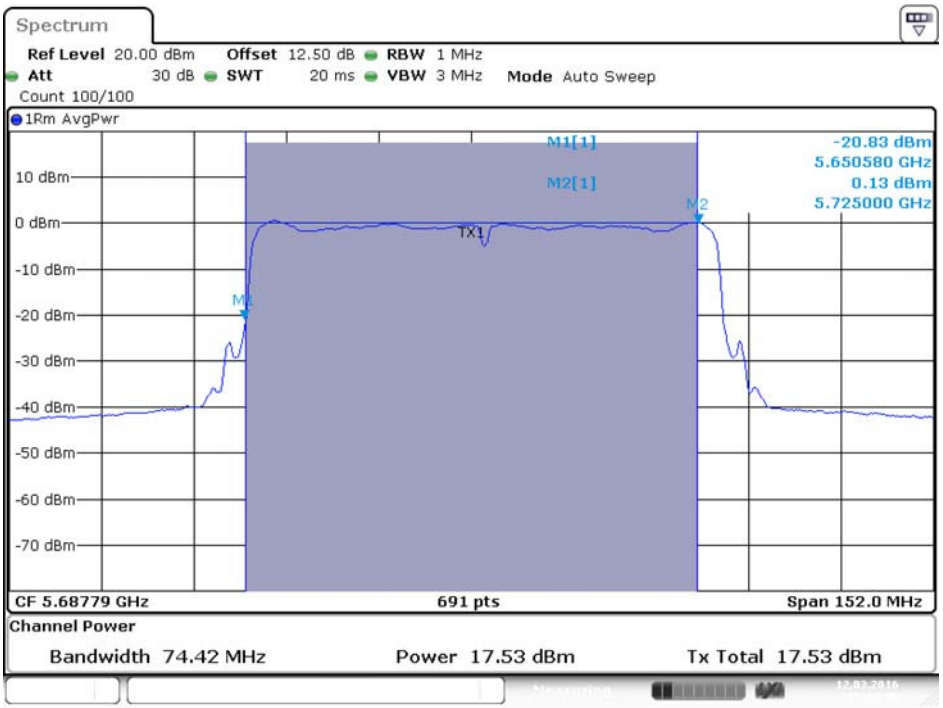
Date: 12.MAR.2016 15:03:44

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 3 / 5690 MHz (UNII 2C)



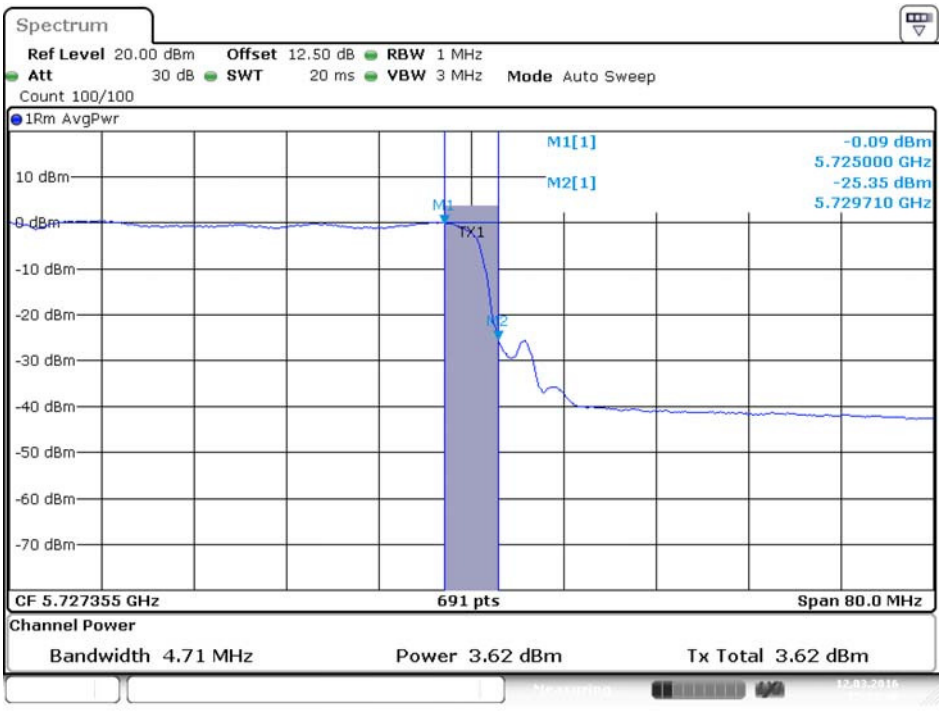
Date: 12.MAR.2016 15:03:51

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 4 / 5690 MHz (UNII 2C)



Date: 12.MAR.2016 15:03:58

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 / 5690 MHz (UNII 3)



Date: 12.MAR.2016 15:03:40

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 2 / 5690 MHz (UNII 3)

Date: 12.MAR.2016 15:03:47

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 3 / 5690 MHz (UNII 3)

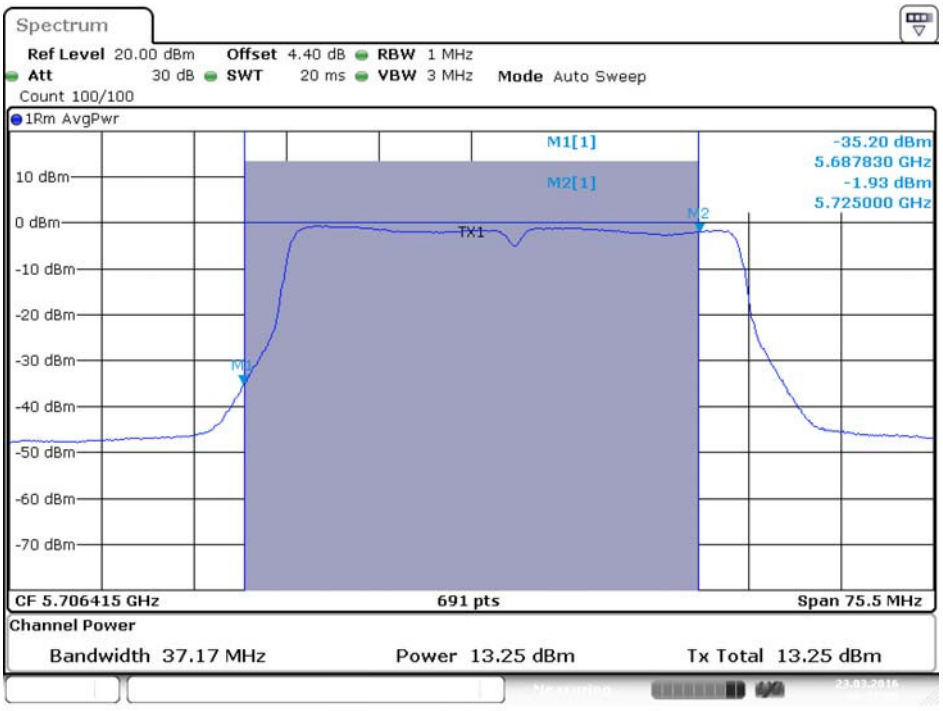
Date: 12.MAR.2016 15:03:54

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 4 / 5690 MHz (UNII 3)

Date: 12.MAR.2016 15:04:01

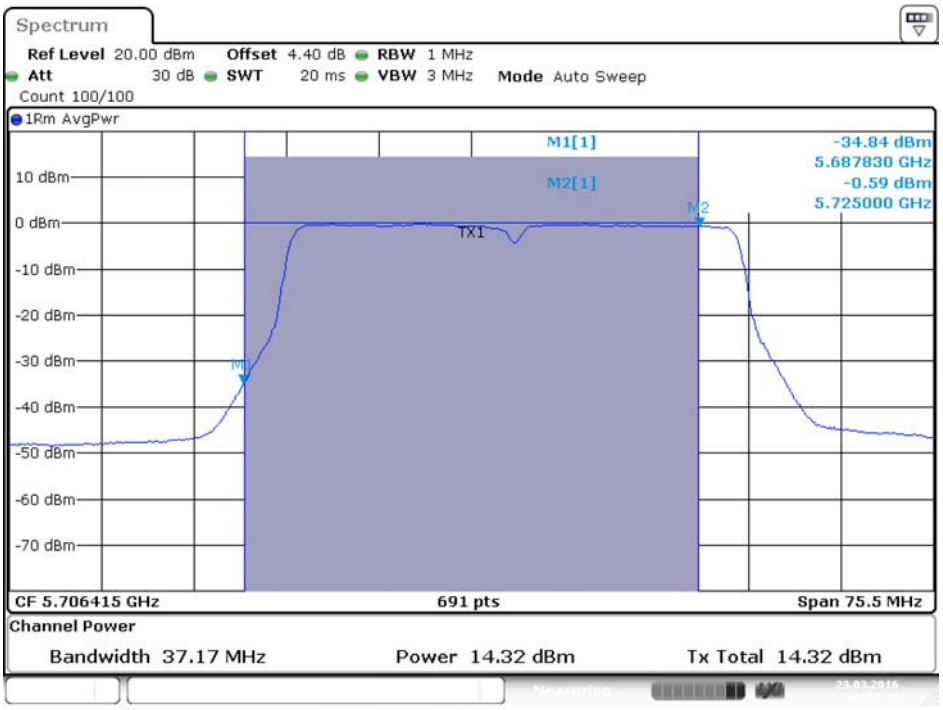
For beamforming mode:

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 / 5710 MHz (UNII 2C)



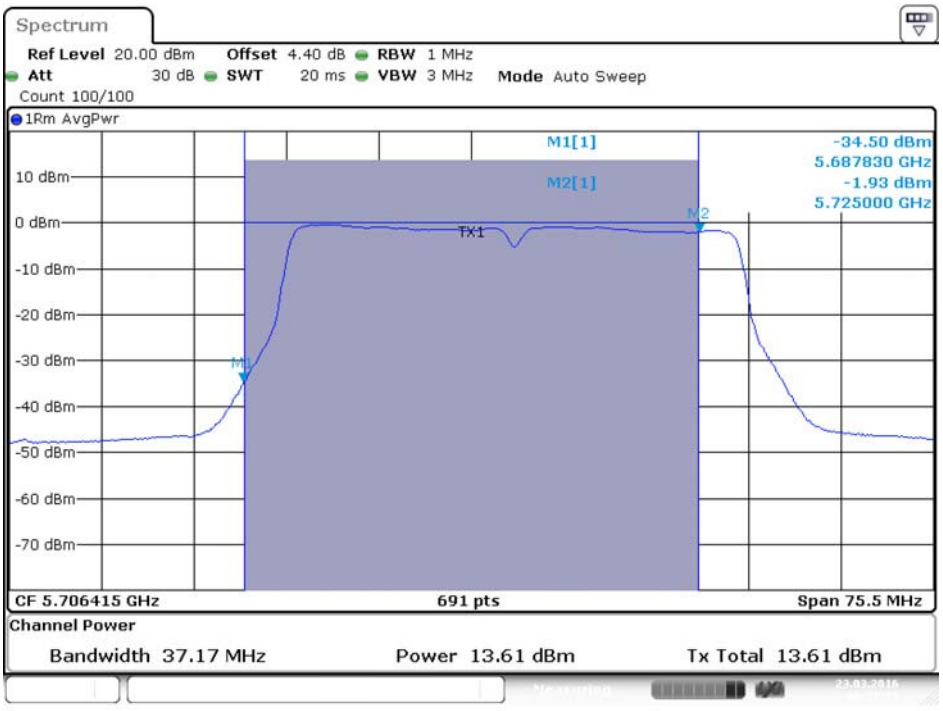
Date: 23.MAR.2016 00:27:36

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 2 / 5710 MHz (UNII 2C)



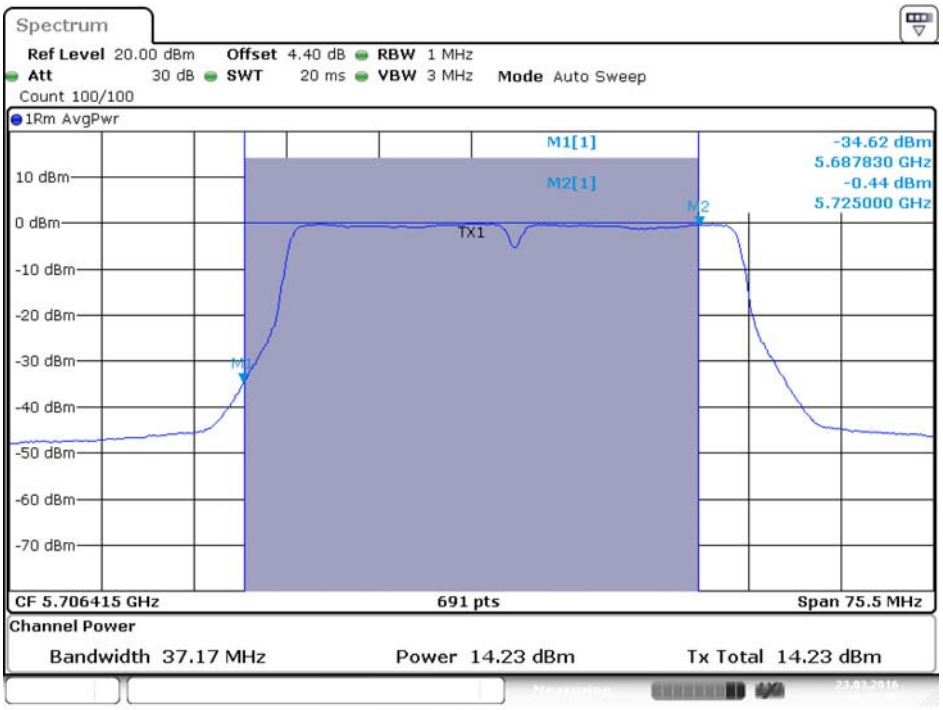
Date: 23.MAR.2016 00:27:43

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 3 / 5710 MHz (UNII 2C)



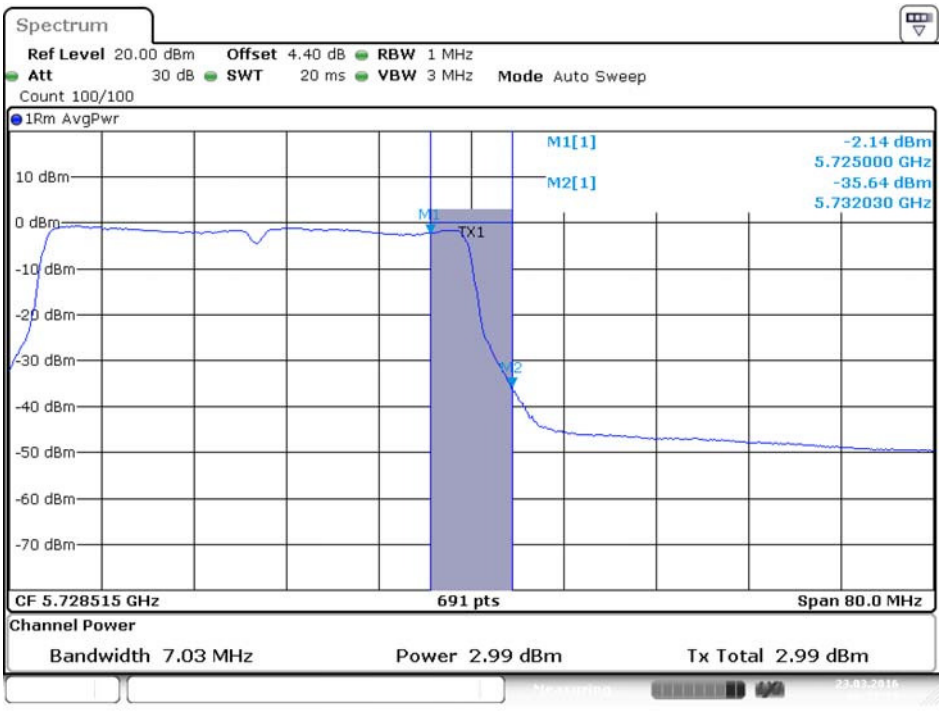
Date: 23.MAR.2016 00:27:51

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 4 / 5710 MHz (UNII 2C)



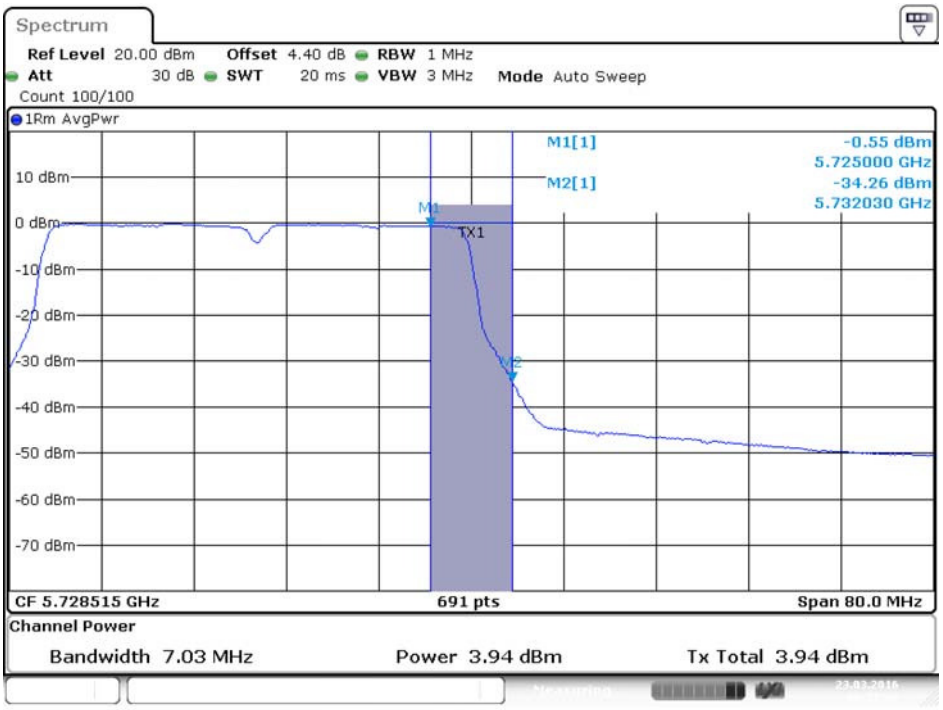
Date: 23.MAR.2016 00:27:58

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 / 5710 MHz (UNII 3)



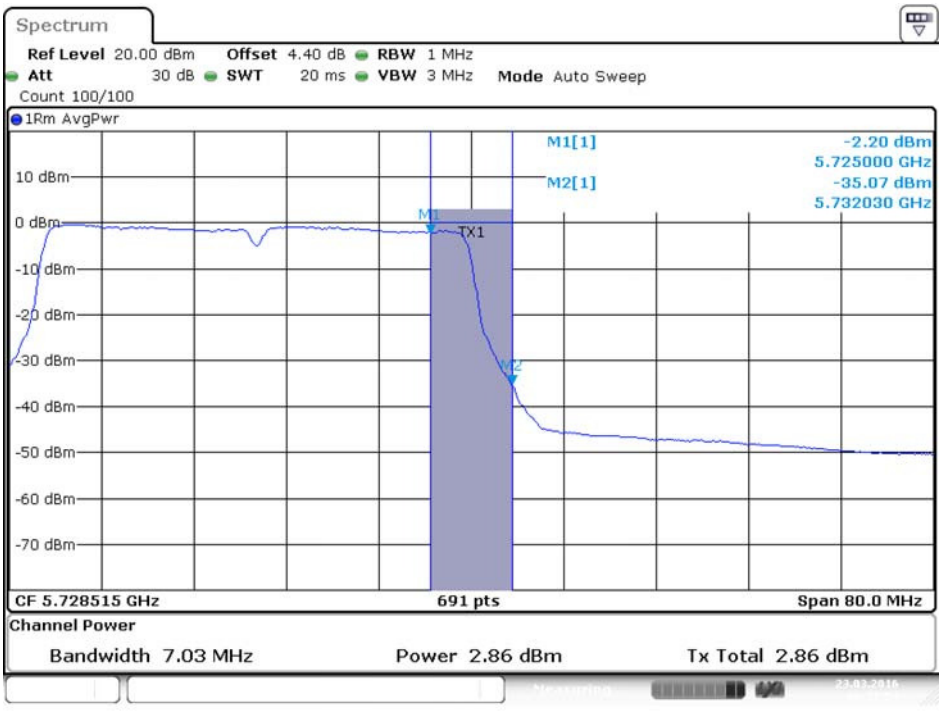
Date: 23.MAR.2016 00:27:40

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 2 / 5710 MHz (UNII 3)



Date: 23.MAR.2016 00:27:47

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 3 / 5710 MHz (UNII 3)

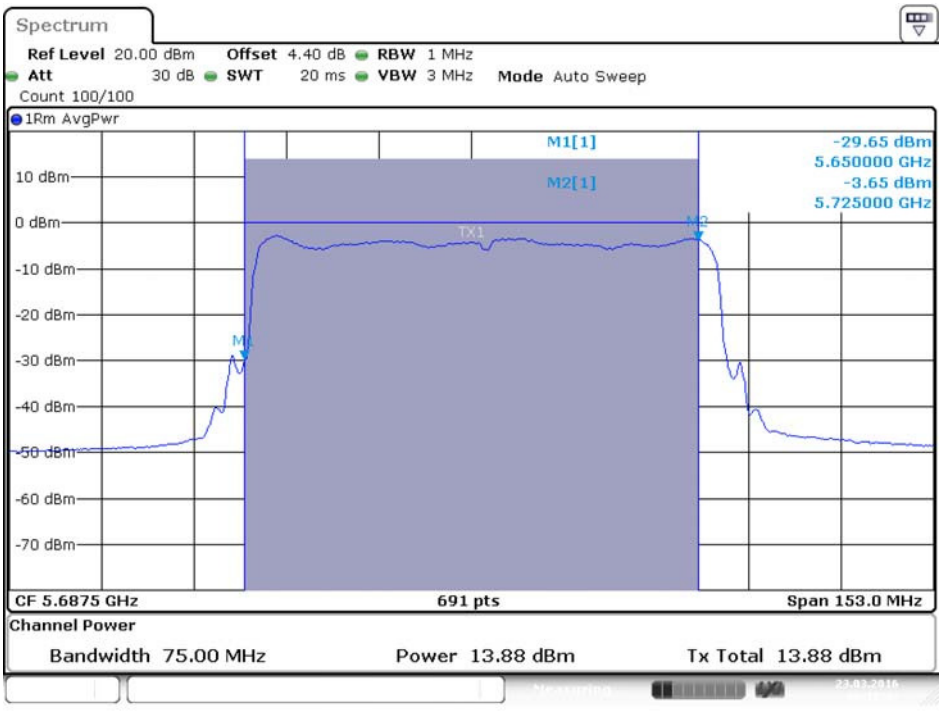


Date: 23.MAR.2016 00:27:54

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 4 / 5710 MHz (UNII 3)

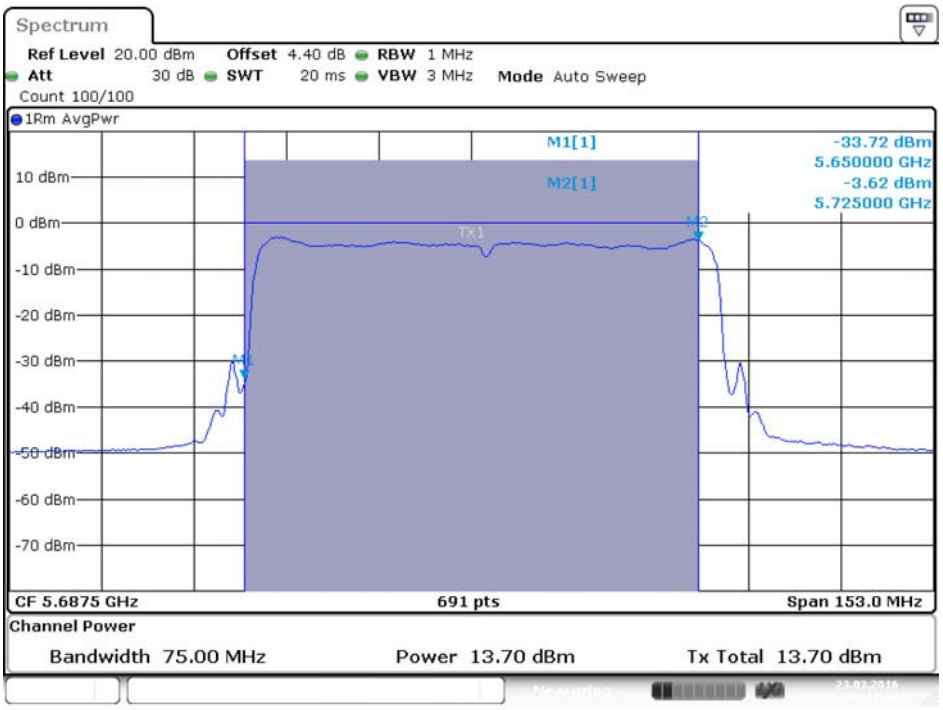
Date: 23.MAR.2016 00:28:01

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 / 5690 MHz (UNII 2C)



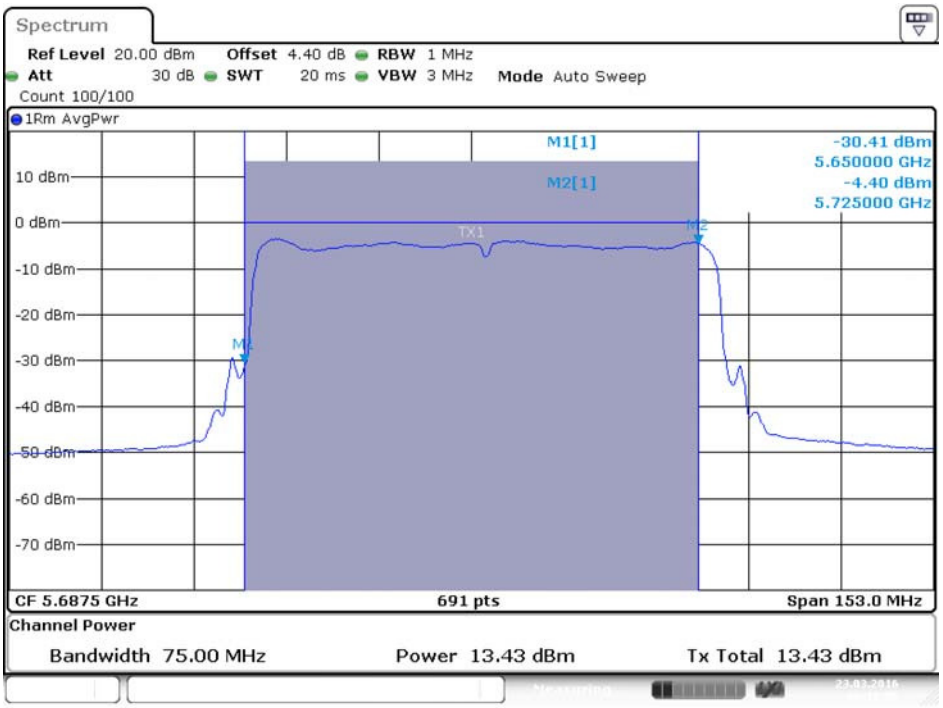
Date: 23.MAR.2016 00:18:43

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 2 / 5690 MHz (UNII 2C)



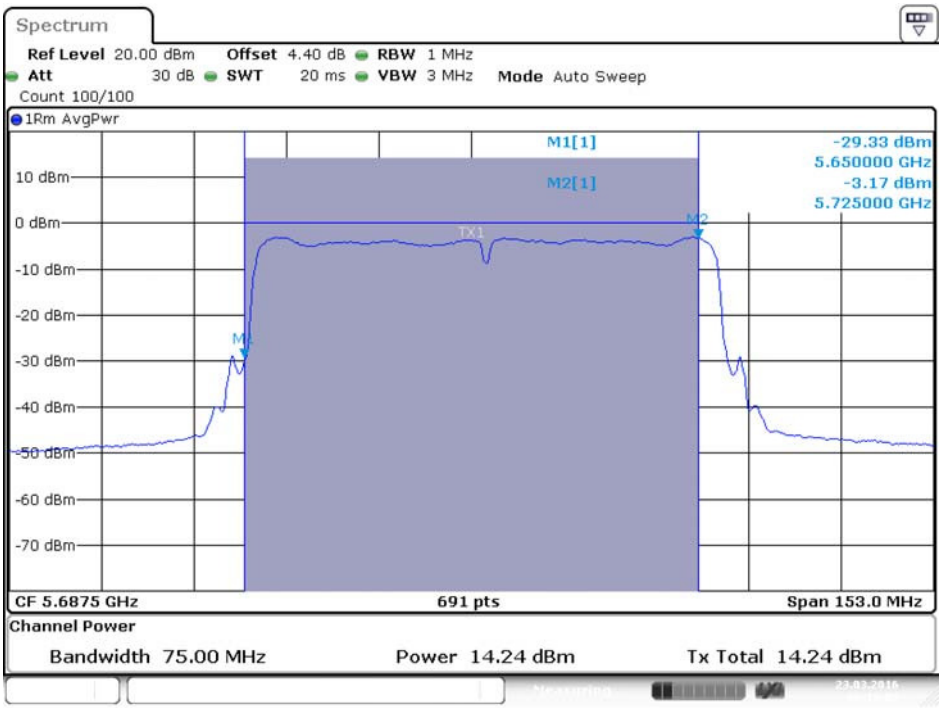
Date: 23.MAR.2016 00:18:50

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 3 / 5690 MHz (UNII 2C)



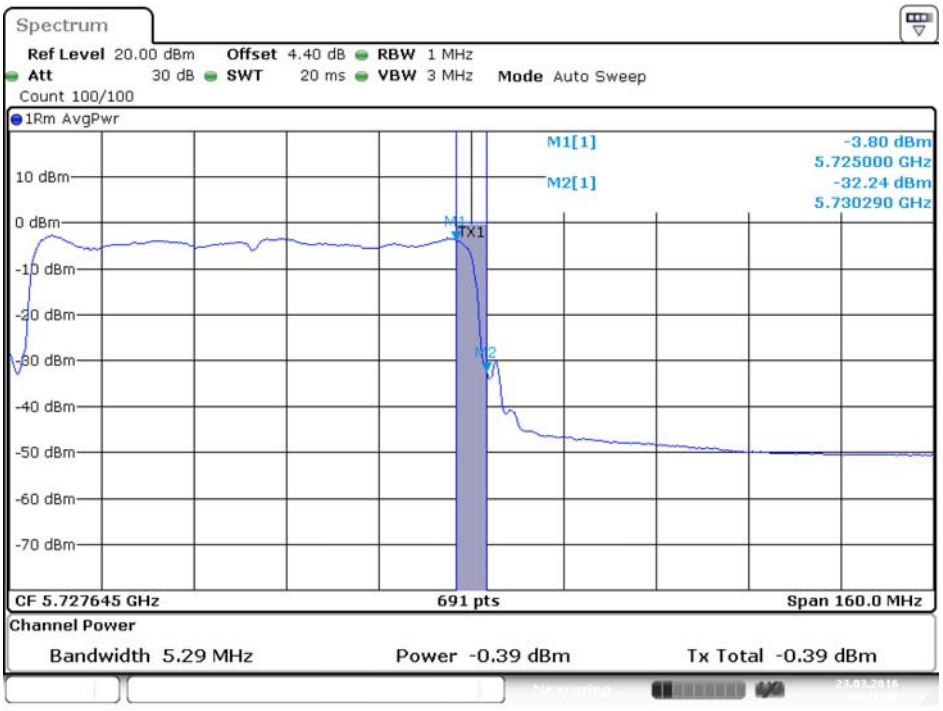
Date: 23.MAR.2016 00:18:57

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 4 / 5690 MHz (UNII 2C)



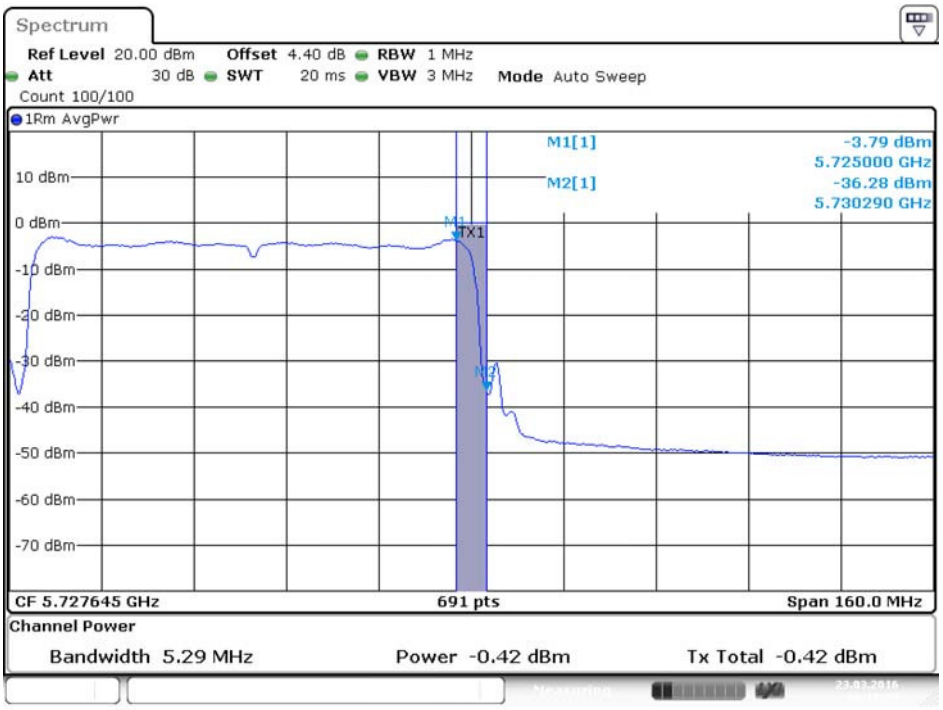
Date: 23.MAR.2016 00:19:04

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 / 5690 MHz (UNII 3)



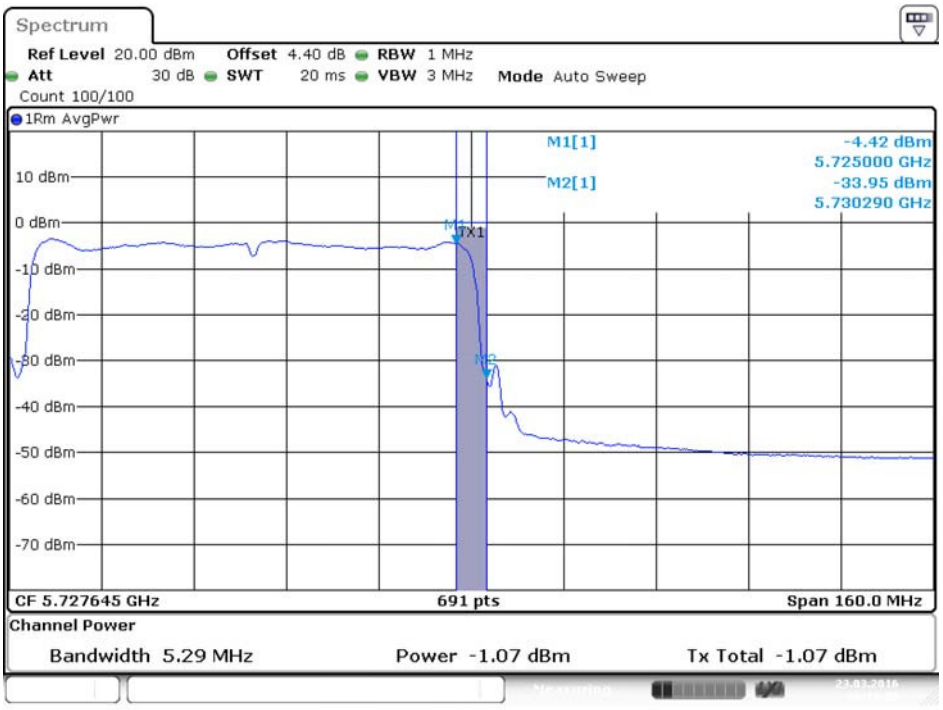
Date: 23.MAR.2016 00:18:46

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 2 / 5690 MHz (UNII 3)



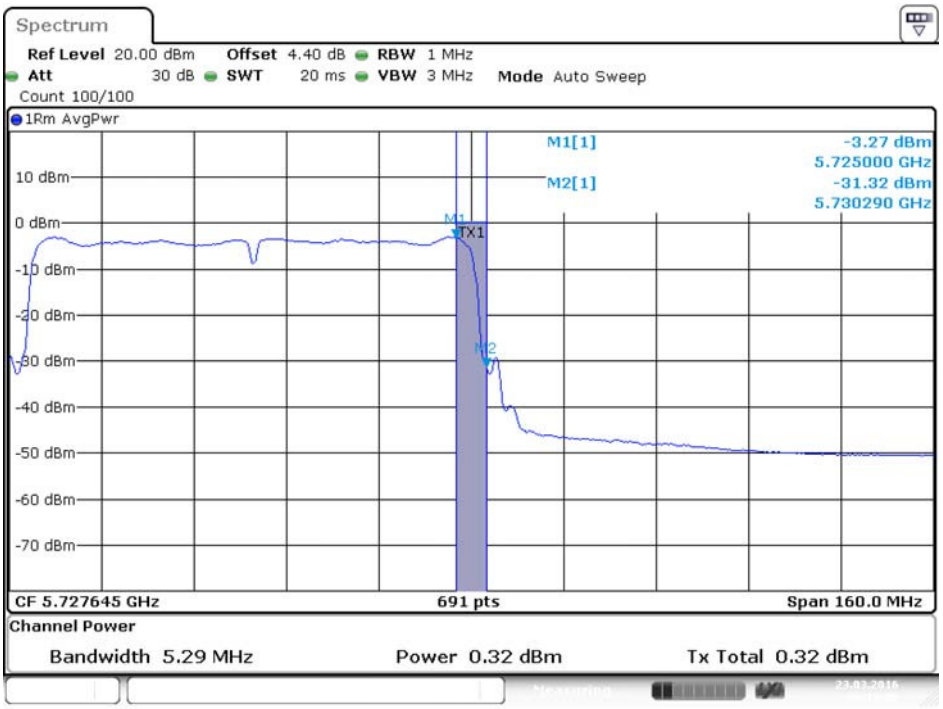
Date: 23.MAR.2016 00:18:53

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 3 / 5690 MHz (UNII 3)



Date: 23.MAR.2016 00:19:00

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 4 / 5690 MHz (UNII 3)



Date: 23.MAR.2016 00:19:07

4.4. Power Spectral Density Measurement

4.4.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.3.1.

Frequency Band		Limit
☒	5.25-5.35 GHz	11 dBm/MHz
☒	5.470-5.725 GHz	11 dBm/MHz

4.4.2. Measuring Instruments and Setting

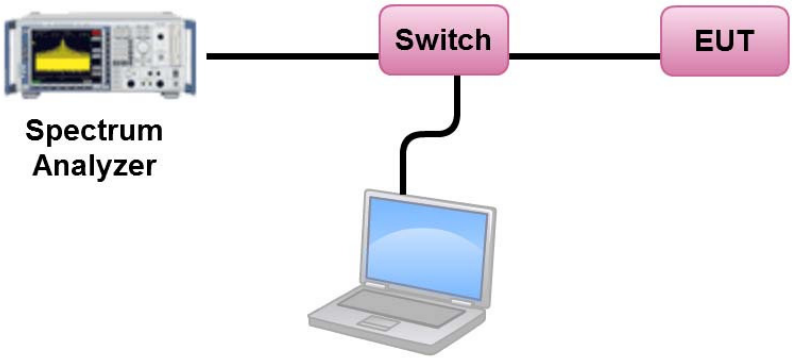
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1000 kHz
VBW	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01r01 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.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

Temperature	25°C	Humidity	56%
Test Engineer	Wen Chao		

For non-beamforming mode:

Mode	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac MCS0/Nss1 VHT40	5270 MHz	6.50	7.21	Complies
	5310 MHz	6.25	7.21	Complies
	5510 MHz	6.79	7.21	Complies
	5550 MHz	6.70	7.21	Complies
	5670 MHz	6.41	7.21	Complies
802.11ac MCS0/Nss1 VHT80	5290 MHz	3.78	7.21	Complies
	5530 MHz	2.94	7.21	Complies
	5610 MHz	4.90	7.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=11-(9.79-6)=7.21 dBm/MHz.

For beamforming mode:

Mode	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac MCS0/Nss1 VHT40	5270 MHz	3.50	7.21	Complies
	5310 MHz	3.31	7.21	Complies
	5510 MHz	3.90	7.21	Complies
	5550 MHz	3.72	7.21	Complies
	5670 MHz	3.70	7.21	Complies
802.11ac MCS0/Nss1 VHT80	5290 MHz	1.05	7.21	Complies
	5530 MHz	0.54	7.21	Complies
	5610 MHz	0.21	7.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=11-(9.79-6)=7.21 dBm/MHz.

Straddle Channel

For non-beamforming mode:

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
142	5710 MHz (UNII 2C)	6.89	7.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=11-(9.79-6)=7.21 dBm/MHz.

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
142	5710 MHz (UNII 3)	6.29	-3.01	3.28	26.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=30-(9.79-6)=26.21 dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
138	5690 MHz (UNII 2C)	5.41	7.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=11-(9.79-6)=7.21 dBm/MHz.

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
138	5690 MHz (UNII 3)	4.50	-3.01	1.49	26.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=30-(9.79-6)=26.21 dBm/500kHz.

For beamforming mode:

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
142	5710 MHz (UNII 2C)	4.27	7.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=11-(9.79-6)=7.21 dBm/MHz.

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
142	5710 MHz (UNII 3)	3.72	-3.01	0.71	26.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=30-(9.79-6)=26.21 dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
138	5690 MHz (UNII 2C)	1.49	7.21	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=11-(9.79-6)=7.21 dBm/MHz.

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
138	5690 MHz (UNII 3)	0.87	-3.01	-2.14	26.21	Complies

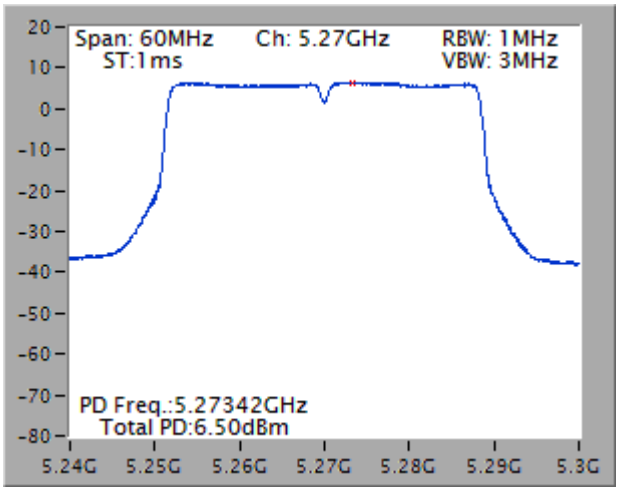
Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =9.79dBi, so limit=30-(9.79-6)=26.21 dBm/500kHz.

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

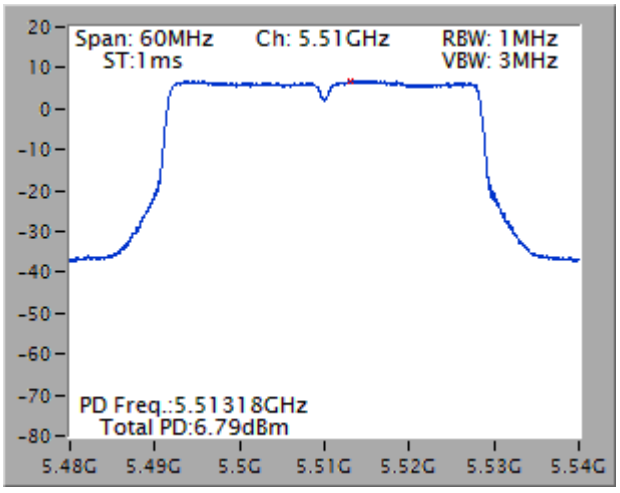
For plots, only the channel with worse result was shown.

For non-beamforming mode:

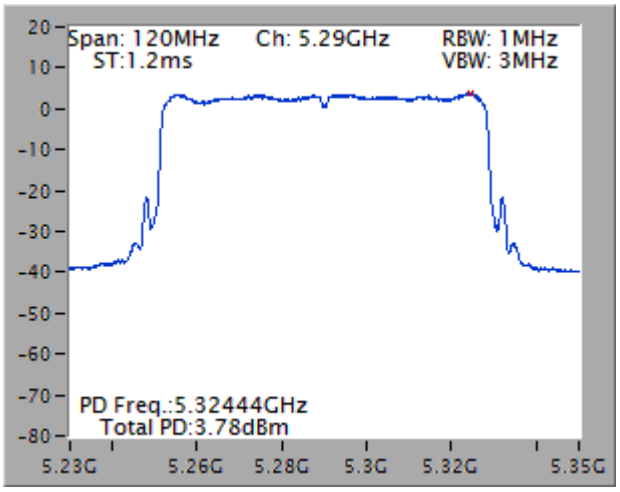
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5270 MHz



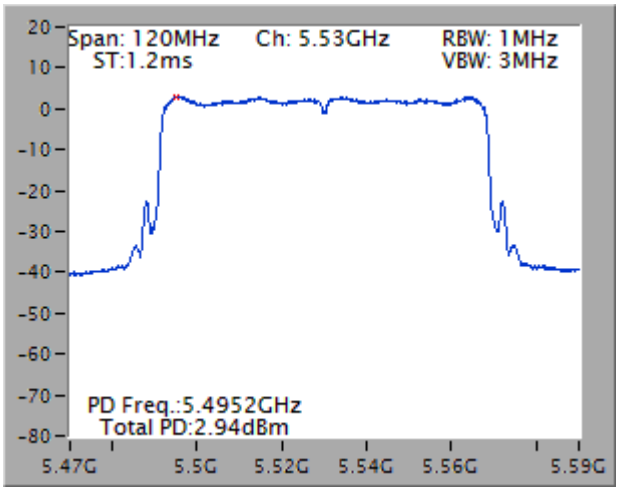
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5510 MHz



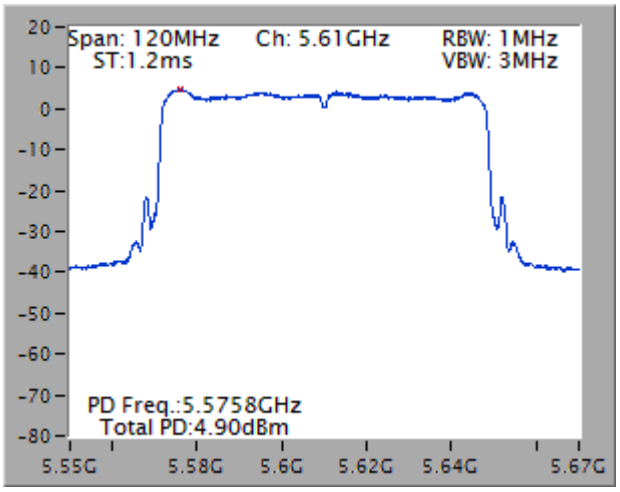
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5290 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5530 MHz

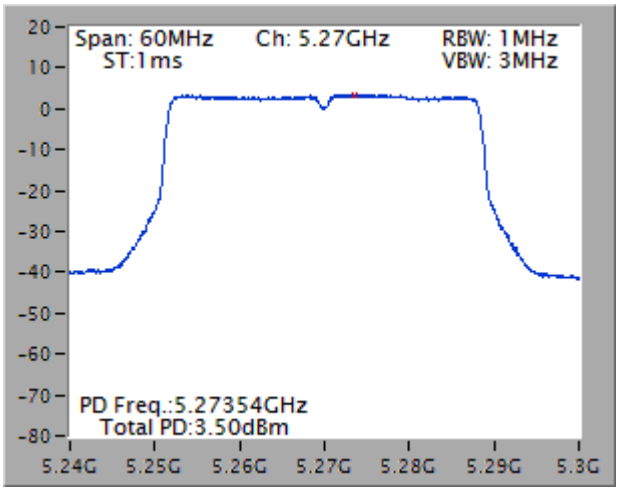


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5610 MHz

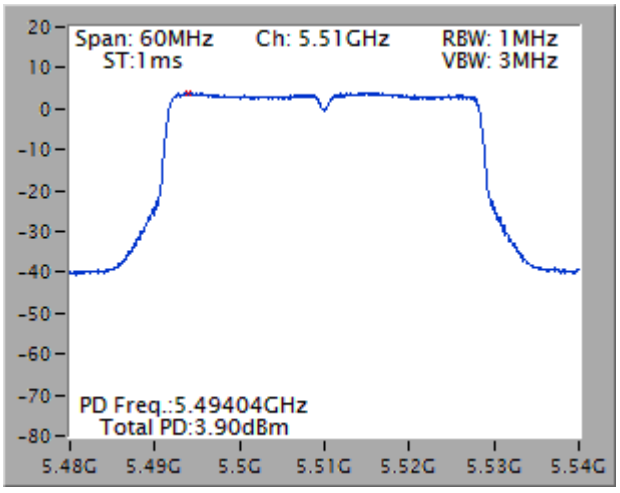


For beamforming mode:

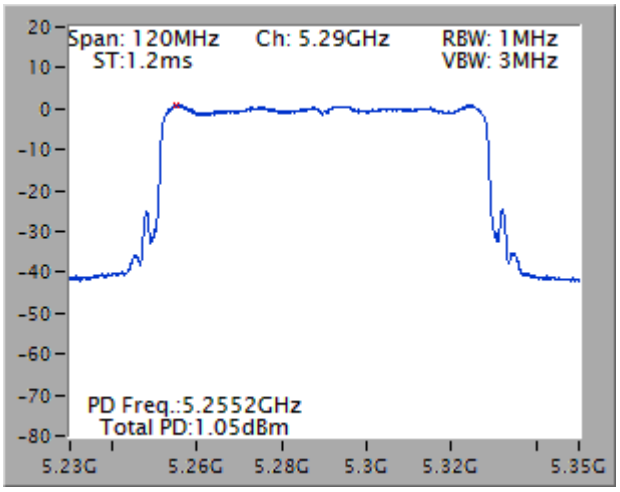
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5270 MHz



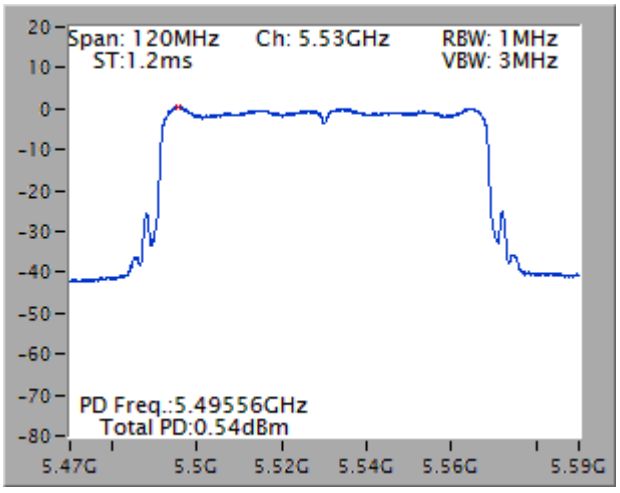
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5510 MHz



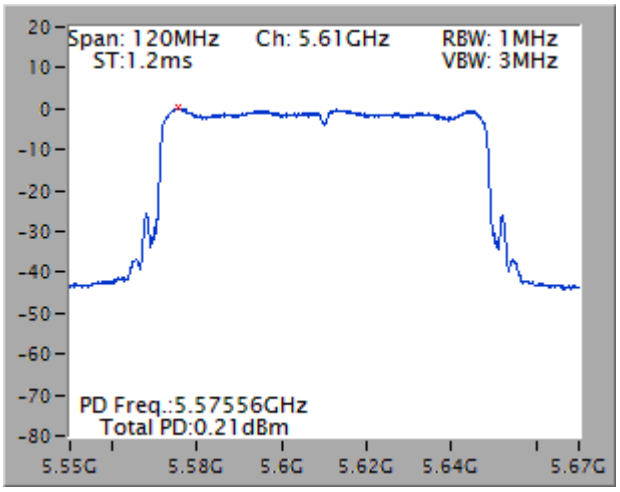
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5290 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5530 MHz



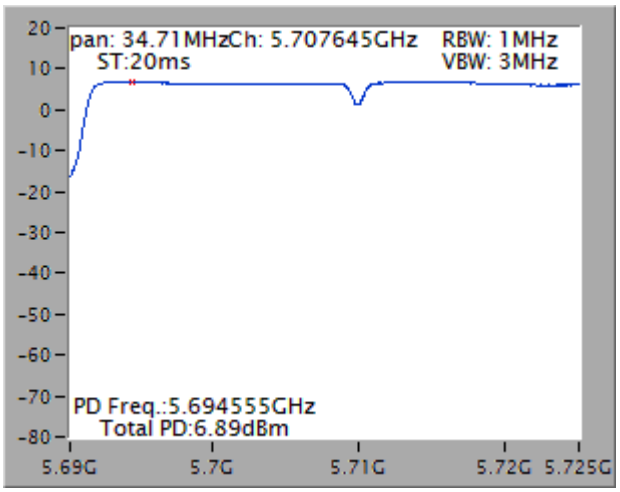
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5610 MHz



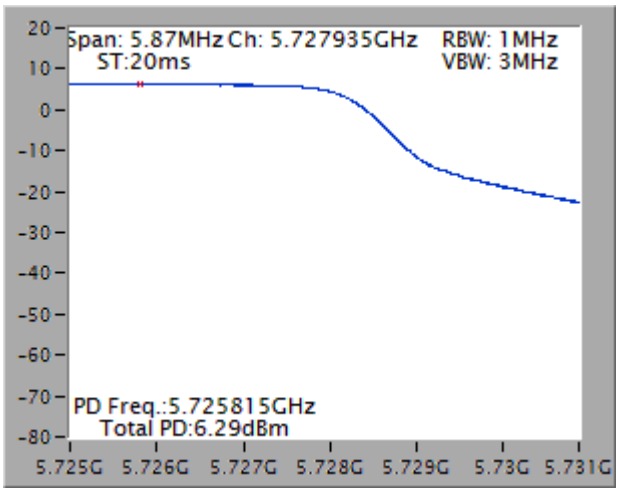
Straddle Channel

For non-beamforming mode:

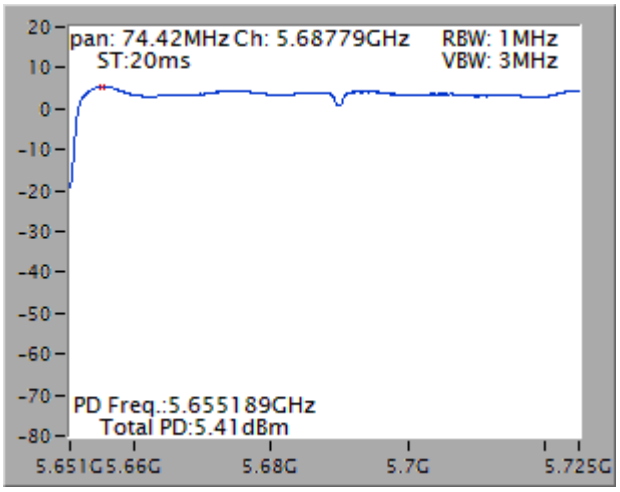
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz (UNII 2C)



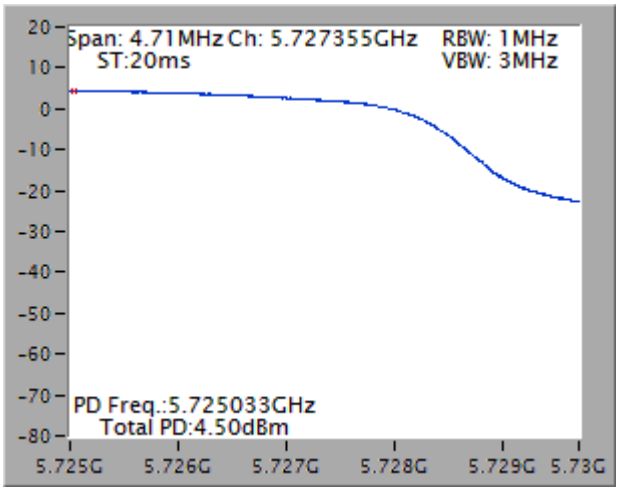
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz (UNII 3)



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz (UNII 2C)

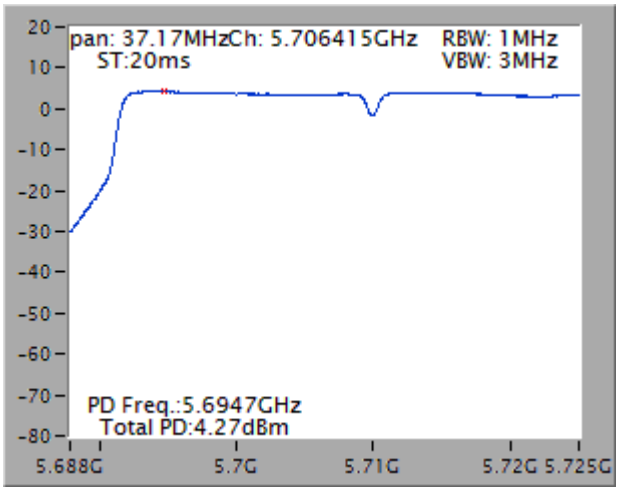


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz (UNII 3)

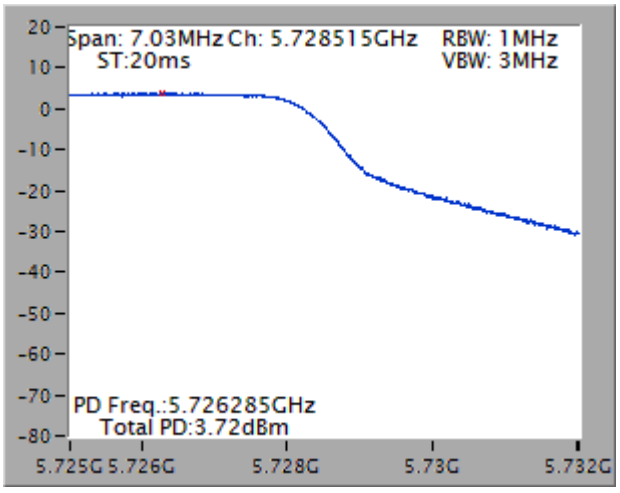


For beamforming mode:

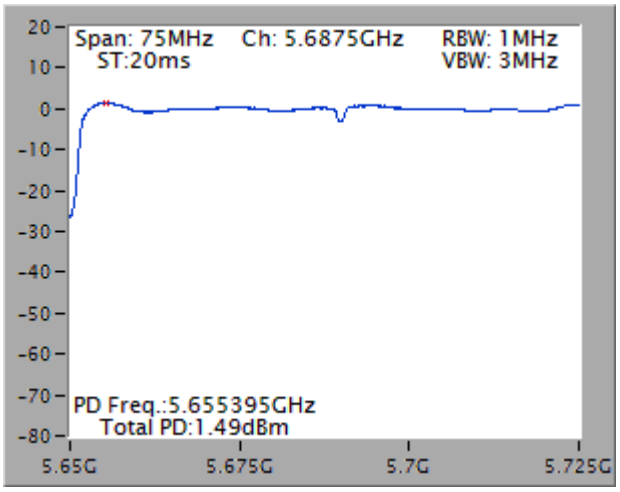
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz (UNII 2C)



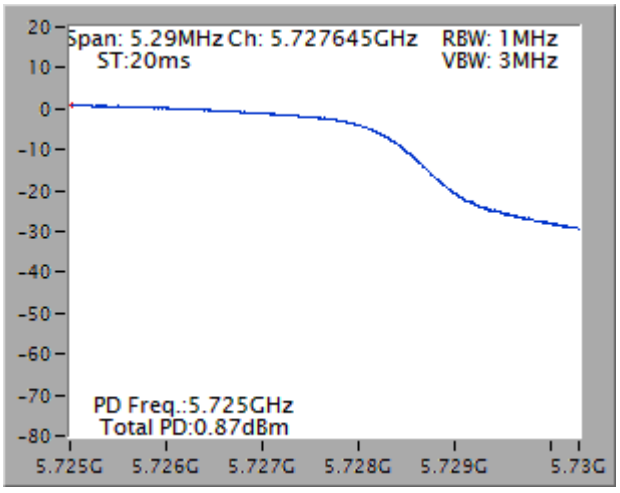
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5710 MHz (UNII 3)



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz (UNII 2C)



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5690 MHz (UNII 3)



4.5. Radiated Emissions Measurement

4.5.1. Limit

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.5.2. Measuring Instruments and Setting

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

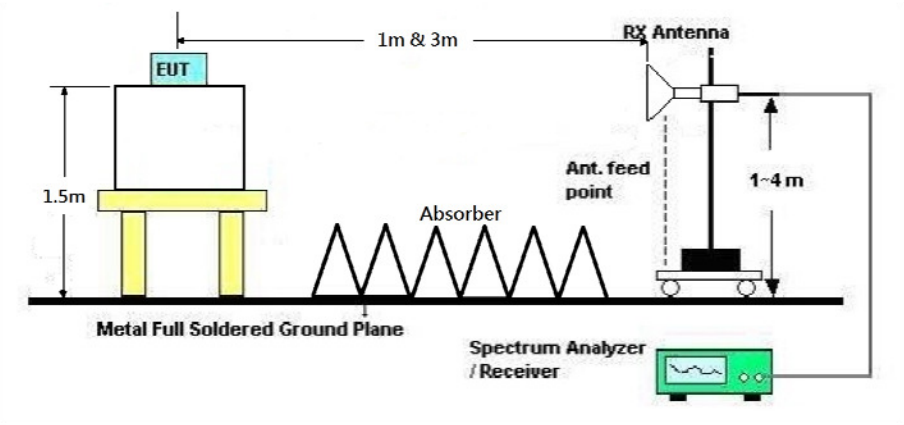
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

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

4.5.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
8. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
9. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.5.4. Test Setup Layout



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

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

For non-beamforming mode:

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 54 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	10538.42	42.51	54.00	-11.49	29.87	9.12	38.50	34.98	123	256	Average	HORIZONTAL
2	10544.08	55.43	74.00	-18.57	42.79	9.12	38.50	34.98	123	256	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	10538.68	42.59	54.00	-11.41	29.95	9.12	38.50	34.98	61	223	Average	VERTICAL
2	10539.02	56.19	74.00	-17.81	43.55	9.12	38.50	34.98	61	223	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 62 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	10621.10	42.57	54.00	-11.43	29.84	9.16	38.50	34.93	179	207	Average	HORIZONTAL
2	10624.02	55.29	74.00	-18.71	42.54	9.18	38.50	34.93	179	207	Peak	HORIZONTAL
3	15925.08	47.08	54.00	-6.92	31.63	11.69	38.74	34.98	195	191	Average	HORIZONTAL
4	15930.22	60.95	74.00	-13.05	45.50	11.69	38.74	34.98	195	191	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	10615.08	55.59	74.00	-18.41	42.86	9.16	38.50	34.93	232	131	Peak	VERTICAL
2	10615.70	42.66	54.00	-11.34	29.93	9.16	38.50	34.93	232	131	Average	VERTICAL
3	15930.62	47.32	54.00	-6.68	31.87	11.69	38.74	34.98	269	151	Average	VERTICAL
4	15933.10	60.30	74.00	-13.70	44.85	11.69	38.74	34.98	269	151	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 102 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11015.32	55.05	74.00	-18.95	41.81	9.40	38.50	34.66	252	272	Peak	HORIZONTAL
2	11016.82	42.25	54.00	-11.75	29.01	9.40	38.50	34.66	252	272	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11021.24	55.72	74.00	-18.28	42.48	9.40	38.50	34.66	233	226	Peak	VERTICAL
2	11023.44	42.31	54.00	-11.69	29.07	9.40	38.50	34.66	233	226	Average	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 110 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11097.96	42.69	54.00	-11.31	29.39	9.45	38.50	34.65	266	256	Average	HORIZONTAL
2	11104.30	55.74	74.00	-18.26	42.44	9.45	38.50	34.65	266	256	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11101.54	42.89	54.00	-11.11	29.59	9.45	38.50	34.65	215	217	Average	VERTICAL
2	11104.94	55.48	74.00	-18.52	42.18	9.45	38.50	34.65	215	217	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 134 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11336.22	55.32	74.00	-18.68	41.87	9.58	38.50	34.63	172	216	Peak	HORIZONTAL
2	11341.92	42.47	54.00	-11.53	29.02	9.58	38.50	34.63	172	216	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11335.82	42.61	54.00	-11.39	29.16	9.58	38.50	34.63	140	118	Average	VERTICAL
2	11341.56	55.77	74.00	-18.23	42.32	9.58	38.50	34.63	140	118	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 58 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15869.98	46.86	54.00	-7.14	31.55	11.64	38.61	34.94	256	238	Average	HORIZONTAL
2	15871.84	60.36	74.00	-13.64	45.05	11.64	38.61	34.94	256	238	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15868.20	60.06	74.00	-13.94	44.75	11.64	38.61	34.94	20	216	Peak	VERTICAL
2	15874.58	46.79	54.00	-7.21	31.39	11.67	38.67	34.94	20	216	Average	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 106 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11058.98	42.73	54.00	-11.27	29.47	9.42	38.50	34.66	99	146	Average	HORIZONTAL
2	11061.52	56.19	74.00	-17.81	42.92	9.43	38.50	34.66	99	146	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11061.08	42.84	54.00	-11.16	29.57	9.43	38.50	34.66	335	173	Average	VERTICAL
2	11064.26	56.17	74.00	-17.83	42.90	9.43	38.50	34.66	335	173	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 122 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11219.52	55.50	74.00	-18.50	42.13	9.51	38.50	34.64	45	173	Peak	HORIZONTAL
2	11219.84	42.54	54.00	-11.46	29.17	9.51	38.50	34.64	45	173	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11218.50	55.58	74.00	-18.42	42.21	9.51	38.50	34.64	239	183	Peak	VERTICAL
2	11219.80	44.70	54.00	-9.30	31.33	9.51	38.50	34.64	239	183	Average	VERTICAL

For beamforming mode:

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 54 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15809.09	59.74	74.00	-14.26	44.43	11.61	38.55	34.85	155	134	Peak	HORIZONTAL
2	15809.68	46.52	54.00	-7.48	31.21	11.61	38.55	34.85	155	134	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15809.17	59.19	74.00	-14.81	43.88	11.61	38.55	34.85	125	106	Peak	VERTICAL
2	15810.17	46.43	54.00	-7.57	31.12	11.61	38.55	34.85	125	106	Average	VERTICAL

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 62 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	10619.82	42.60	54.00	-11.40	29.87	9.16	38.50	34.93	139	178	Average	HORIZONTAL
2	10620.68	54.99	74.00	-19.01	42.26	9.16	38.50	34.93	139	178	Peak	HORIZONTAL
3	15929.15	47.67	54.00	-6.33	32.22	11.69	38.74	34.98	111	132	Average	HORIZONTAL
4	15930.76	61.73	74.00	-12.27	46.28	11.69	38.74	34.98	111	132	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	10619.62	41.75	54.00	-12.25	29.02	9.16	38.50	34.93	122	154	Average	VERTICAL
2	10619.85	55.14	74.00	-18.86	42.41	9.16	38.50	34.93	122	154	Peak	VERTICAL
3	15929.22	47.47	54.00	-6.53	32.02	11.69	38.74	34.98	132	150	Average	VERTICAL
4	15929.26	60.38	74.00	-13.62	44.93	11.69	38.74	34.98	132	150	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 102 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11019.07	44.65	54.00	-9.35	31.41	9.40	38.50	34.66	87	121	Average	HORIZONTAL
2	11020.15	54.85	74.00	-19.15	41.61	9.40	38.50	34.66	87	121	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11019.21	42.02	54.00	-11.98	28.78	9.40	38.50	34.66	124	152	Average	VERTICAL
2	11020.74	54.53	74.00	-19.47	41.29	9.40	38.50	34.66	124	152	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 110 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11099.25	55.09	74.00	-18.91	41.79	9.45	38.50	34.65	140	172	Peak	HORIZONTAL
2	11100.90	42.34	54.00	-11.66	29.04	9.45	38.50	34.65	140	172	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11099.68	42.36	54.00	-11.64	29.06	9.45	38.50	34.65	131	167	Average	VERTICAL
2	11100.27	55.42	74.00	-18.58	42.12	9.45	38.50	34.65	131	167	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 134 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11339.96	42.42	54.00	-11.58	28.97	9.58	38.50	34.63	104	202	Average	HORIZONTAL
2	11340.83	55.45	74.00	-18.55	42.00	9.58	38.50	34.63	104	202	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11340.36	55.12	74.00	-18.88	41.67	9.58	38.50	34.63	147	235	Peak	VERTICAL
2	11340.98	42.46	54.00	-11.54	29.01	9.58	38.50	34.63	147	235	Average	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 58 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15870.29	58.97	74.00	-15.03	43.66	11.64	38.61	34.94	56	106	Peak	HORIZONTAL
2	15870.52	46.71	54.00	-7.29	31.40	11.64	38.61	34.94	56	106	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15869.10	46.77	54.00	-7.23	31.46	11.64	38.61	34.94	24	138	Average	VERTICAL
2	15869.46	59.83	74.00	-14.17	44.52	11.64	38.61	34.94	24	138	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 106 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11059.15	55.89	74.00	-18.11	42.63	9.42	38.50	34.66	218	127	Peak	HORIZONTAL
2	11059.22	43.40	54.00	-10.60	30.14	9.42	38.50	34.66	218	127	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11060.05	42.59	54.00	-11.41	29.33	9.42	38.50	34.66	251	152	Average	VERTICAL
2	11060.49	55.27	74.00	-18.73	42.00	9.43	38.50	34.66	251	152	Peak	VERTICAL

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 122 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11219.87	44.23	54.00	-9.77	30.86	9.51	38.50	34.64	217	144	Average	HORIZONTAL
2	11219.90	55.25	74.00	-18.75	41.88	9.51	38.50	34.64	217	144	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11219.90	44.74	54.00	-9.26	31.37	9.51	38.50	34.64	255	142	Average	VERTICAL
2	11219.96	56.62	74.00	-17.38	43.25	9.51	38.50	34.64	255	142	Peak	VERTICAL

Straddle Channel

For non-beamforming mode:

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 142 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 12, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11426.16	45.74	54.00	-8.26	29.24	11.69	40.03	35.22	160	221	Average	HORIZONTAL
2	11426.52	58.34	74.00	-15.66	41.84	11.69	40.03	35.22	160	221	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11412.84	59.28	74.00	-14.72	42.78	11.68	40.04	35.22	153	260	Peak	VERTICAL
2	11415.80	46.67	54.00	-7.33	30.17	11.68	40.04	35.22	153	260	Average	VERTICAL

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 138 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 12, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11381.12	58.73	74.00	-15.27	42.24	11.66	40.05	35.22	159	290	Peak	HORIZONTAL
2	11384.68	45.79	54.00	-8.21	29.29	11.68	40.04	35.22	159	290	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11374.64	58.89	74.00	-15.11	42.40	11.66	40.05	35.22	165	332	Peak	VERTICAL
2	11380.20	46.02	54.00	-7.98	29.53	11.66	40.05	35.22	165	332	Average	VERTICAL

For beamforming mode:

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 142 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11419.68	55.46	74.00	-18.54	41.96	9.63	38.50	34.63	213	191	Peak	HORIZONTAL
2	11419.76	43.47	54.00	-10.53	29.97	9.63	38.50	34.63	213	191	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11410.80	45.37	54.00	-8.63	31.87	9.63	38.50	34.63	267	178	Average	VERTICAL
2	11416.40	58.86	74.00	-15.14	45.36	9.63	38.50	34.63	267	178	Peak	VERTICAL

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 138 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11382.56	45.18	54.00	-8.82	28.69	11.66	40.05	35.22	156	337	Average	HORIZONTAL
2	11386.60	57.99	74.00	-16.01	41.49	11.68	40.04	35.22	156	337	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11377.48	58.70	74.00	-15.30	42.21	11.66	40.05	35.22	150	102	Peak	VERTICAL
2	11388.12	45.21	54.00	-8.79	28.71	11.68	40.04	35.22	150	102	Average	VERTICAL

Note:

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

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

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

4.6. Band Edge Emissions Measurement

4.6.1. Limit

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.6.2. Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for Peak

4.6.3. Test Procedures

1. The test procedure is the same as section 4.5.3.

4.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

For non-beamforming mode:

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 54, 62 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Channel 54

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5258.80	119.16			113.82	6.35	33.46	34.47	250	204	Peak	VERTICAL
2	5259.60	109.77			104.43	6.35	33.46	34.47	250	204	Average	VERTICAL
3	5359.60	53.46	54.00	-0.54	47.70	6.62	33.61	34.47	250	204	Average	VERTICAL
4	5362.00	66.59	74.00	-7.41	60.83	6.62	33.61	34.47	250	204	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5270 MHz.

Channel 62

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5294.80	113.07			107.55	6.47	33.52	34.47	239	203	Peak	VERTICAL
2	5315.20	103.34			97.75	6.51	33.55	34.47	239	203	Average	VERTICAL
3	5356.40	53.84	54.00	-0.16	48.08	6.62	33.61	34.47	239	203	Average	VERTICAL
4	5356.80	67.07	74.00	-6.93	61.31	6.62	33.61	34.47	239	203	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5310 MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 102, 110, 134 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Channel 102

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5454.40	53.25	54.00	-0.75	47.19	6.79	33.74	34.47	240	200	Average	VERTICAL
2	5454.80	65.22	74.00	-8.78	59.16	6.79	33.74	34.47	240	200	Peak	VERTICAL
3	5467.20	66.46	68.20	-1.74	60.35	6.82	33.76	34.47	240	200	Peak	VERTICAL
4	5494.80	113.58			107.43	6.84	33.78	34.47	240	200	Peak	VERTICAL
5	5514.40	104.19			97.93	6.88	33.85	34.47	240	200	Average	VERTICAL

Item 4, 5 are the fundamental frequency at 5510 MHz.

Channel 110

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5457.20	65.83	74.00	-8.17	59.77	6.79	33.74	34.47	240	195	Peak	VERTICAL
2	5458.00	53.84	54.00	-0.16	47.78	6.79	33.74	34.47	240	195	Average	VERTICAL
3	5469.60	65.23	68.20	-2.97	59.12	6.82	33.76	34.47	240	195	Peak	VERTICAL
4	5533.60	109.45			103.12	6.91	33.90	34.48	240	195	Average	VERTICAL
5	5555.20	118.64			112.24	6.93	33.95	34.48	240	195	Peak	VERTICAL

Item 4, 5 are the fundamental frequency at 5550 MHz.

Channel 134

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5675.20	116.10			109.61	6.65	34.35	34.51	242	197	Peak	VERTICAL
2	5675.20	106.91			100.42	6.65	34.35	34.51	242	197	Average	VERTICAL
3	5733.60	67.80	68.20	-0.40	61.39	6.43	34.50	34.52	242	197	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5670 MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 58, 106, 122 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 03, 2016		

Channel 58

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5111.00	61.73	74.00	-12.27	56.94	6.01	33.25	34.47	278	155	Peak	VERTICAL
2	5124.00	49.68	54.00	-4.32	44.84	6.04	33.27	34.47	278	155	Average	VERTICAL
3	5290.00	99.84			94.38	6.43	33.50	34.47	278	155	Average	VERTICAL
4	5292.00	107.10			101.64	6.43	33.50	34.47	278	155	Peak	VERTICAL
5	5350.00	53.66	54.00	-0.34	47.96	6.58	33.59	34.47	278	155	Average	VERTICAL
6	5352.00	65.21	74.00	-8.79	59.51	6.58	33.59	34.47	278	155	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5290 MHz.

Channel 106

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5454.00	53.57	54.00	-0.43	47.51	6.79	33.74	34.47	241	192	Average	VERTICAL
2	5457.00	63.97	74.00	-10.03	57.91	6.79	33.74	34.47	241	192	Peak	VERTICAL
3	5466.00	65.52	68.20	-2.68	59.41	6.82	33.76	34.47	241	192	Peak	VERTICAL
4	5495.00	110.30			104.15	6.84	33.78	34.47	241	192	Peak	VERTICAL
5	5495.00	100.25			94.10	6.84	33.78	34.47	241	192	Average	VERTICAL
6	5731.00	63.22	68.20	-4.98	56.81	6.43	34.50	34.52	241	192	Peak	VERTICAL

Item 4, 5 are the fundamental frequency at 5530 MHz.

Channel 122

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5456.00	64.46	74.00	-9.54	58.40	6.79	33.74	34.47	241	209	Peak	VERTICAL
2	5456.00	52.10	54.00	-1.90	46.04	6.79	33.74	34.47	241	209	Average	VERTICAL
3	5468.00	66.00	68.20	-2.20	59.89	6.82	33.76	34.47	241	209	Peak	VERTICAL
4	5575.00	114.33			107.86	6.95	34.00	34.48	241	209	Peak	VERTICAL
5	5575.00	103.97			97.50	6.95	34.00	34.48	241	209	Average	VERTICAL
6	5737.00	68.07	68.20	-0.13	61.66	6.43	34.50	34.52	241	209	Peak	VERTICAL

Item 4, 5 are the fundamental frequency at 5610 MHz.

For beamforming mode:

Temperature	20℃	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 54, 62 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Channel 54

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5255.20	111.16			105.82	6.35	33.46	34.47	344	112	Average	VERTICAL
2	5258.40	122.54			117.20	6.35	33.46	34.47	344	112	Peak	VERTICAL
3	5350.40	53.85	54.00	-0.15	48.15	6.58	33.59	34.47	344	112	Average	VERTICAL
4	5352.00	66.00	74.00	-8.00	60.30	6.58	33.59	34.47	344	112	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5270 MHz.

Channel 62

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5293.60	103.59			98.07	6.47	33.52	34.47	353	135	Average	VERTICAL
2	5307.20	114.83			109.31	6.47	33.52	34.47	353	135	Peak	VERTICAL
3	5351.20	53.49	54.00	-0.51	47.79	6.58	33.59	34.47	353	135	Average	VERTICAL
4	5352.40	65.53	74.00	-8.47	59.83	6.58	33.59	34.47	353	135	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5310 MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 102, 110, 134 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Channel 102

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5459.60	65.56	74.00	-8.44	59.50	6.79	33.74	34.47	350	142	Peak	VERTICAL
2	5460.00	53.47	54.00	-0.53	47.41	6.79	33.74	34.47	350	142	Average	VERTICAL
3	5468.80	68.06	68.20	-0.14	61.95	6.82	33.76	34.47	350	142	Peak	VERTICAL
4	5518.40	104.79			98.53	6.88	33.85	34.47	350	142	Average	VERTICAL
5	5521.20	115.37			109.11	6.88	33.85	34.47	350	142	Peak	VERTICAL

Item 4, 5 are the fundamental frequency at 5510 MHz.

Channel 110

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5451.20	65.61	74.00	-8.39	59.55	6.79	33.74	34.47	0	137	Peak	VERTICAL
2	5458.40	52.68	54.00	-1.32	46.62	6.79	33.74	34.47	0	137	Average	VERTICAL
3	5467.20	67.59	68.20	-0.61	61.48	6.82	33.76	34.47	0	137	Peak	VERTICAL
4	5532.80	110.21			103.88	6.91	33.90	34.48	0	137	Average	VERTICAL
5	5546.00	122.27			115.87	6.93	33.95	34.48	0	137	Peak	VERTICAL

Item 4, 5 are the fundamental frequency at 5550 MHz.

Channel 134

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5665.60	118.42			111.90	6.72	34.30	34.50	347	135	Peak	VERTICAL
2	5686.80	107.23			100.74	6.65	34.35	34.51	347	135	Average	VERTICAL
3	5737.60	67.63	68.20	-0.57	61.22	6.43	34.50	34.52	347	135	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5670 MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 58, 106, 122 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 04, 2016		

Channel 58

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5132.00	60.63	74.00	-13.37	55.74	6.07	33.29	34.47	0	155	Peak	VERTICAL
2	5149.00	49.22	54.00	-4.78	44.27	6.11	33.31	34.47	0	155	Average	VERTICAL
3	5256.00	100.59			95.25	6.35	33.46	34.47	0	155	Average	VERTICAL
4	5291.00	110.93			105.47	6.43	33.50	34.47	0	155	Peak	VERTICAL
5	5351.00	53.90	54.00	-0.10	48.20	6.58	33.59	34.47	0	155	Average	VERTICAL
6	5353.00	66.04	74.00	-7.96	60.34	6.58	33.59	34.47	0	155	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5290 MHz.

Channel 106

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5456.00	63.94	74.00	-10.06	57.88	6.79	33.74	34.47	350	110	Peak	VERTICAL
2	5460.00	53.02	54.00	-0.98	46.96	6.79	33.74	34.47	350	110	Average	VERTICAL
3	5495.00	100.99			94.84	6.84	33.78	34.47	350	110	Average	VERTICAL
4	5496.00	111.25			105.06	6.86	33.80	34.47	350	110	Peak	VERTICAL
5	5727.00	63.04	68.20	-5.16	56.63	6.43	34.50	34.52	350	110	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 5530 MHz.

Channel 122

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5458.00	65.48	74.00	-8.52	59.42	6.79	33.74	34.47	351	137	Peak	VERTICAL
2	5460.00	53.37	54.00	-0.63	47.31	6.79	33.74	34.47	351	137	Average	VERTICAL
3	5466.00	66.05	68.20	-2.15	59.94	6.82	33.76	34.47	351	137	Peak	VERTICAL
4	5576.00	118.31			111.76	6.98	34.05	34.48	351	137	Peak	VERTICAL
5	5576.00	107.59			101.04	6.98	34.05	34.48	351	137	Average	VERTICAL
6	5730.00	67.49	68.20	-0.71	61.08	6.43	34.50	34.52	351	137	Peak	VERTICAL

Item 4, 5 are the fundamental frequency at 5610 MHz.

Straddle Channel

For non-beamforming mode:

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 142 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 12, 2016		

Channel 142

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5696.80	105.23			98.18	8.01	32.04	33.00	248	281	Average	VERTICAL
2	5697.40	115.00			107.95	8.01	32.04	33.00	248	281	Peak	VERTICAL
3	5850.00	61.60	68.20	-6.60	54.25	8.18	32.22	33.05	248	281	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5710 MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 138 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 12, 2016		

Channel 138

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5655.00	101.35			94.40	7.95	31.98	32.98	229	244	Average	VERTICAL
2	5655.00	110.71			103.76	7.95	31.98	32.98	229	244	Peak	VERTICAL
3	5856.00	61.29	68.20	-6.91	53.91	8.19	32.24	33.05	229	244	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5690 MHz.

For beamforming mode:

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 142 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 15, 2016		

Channel 142

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5694.00	111.01			103.23	7.89	34.40	34.51	354	144	Average	VERTICAL
2	5717.00	124.14			116.32	7.88	34.45	34.51	354	144	Peak	VERTICAL
3	5856.00	64.52	68.20	-3.68	56.37	7.79	34.90	34.54	354	144	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5710 MHz.

Temperature	20°C	Humidity	60%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 138 / Chain 1 + Chain 2 + Chain 3+ Chain 4
Test Date	Mar. 15, 2016		

Channel 138

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5656.00	103.69			96.74	7.95	31.98	32.98	150	2	Average	VERTICAL
2	5656.00	115.02			108.07	7.95	31.98	32.98	150	2	Peak	VERTICAL
3	5857.00	64.95	68.20	-3.25	57.57	8.19	32.24	33.05	150	2	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 5690 MHz.

Note:

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

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

4.7. Frequency Stability Measurement

4.7.1. Limit

In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

4.7.2. Measuring Instruments and Setting

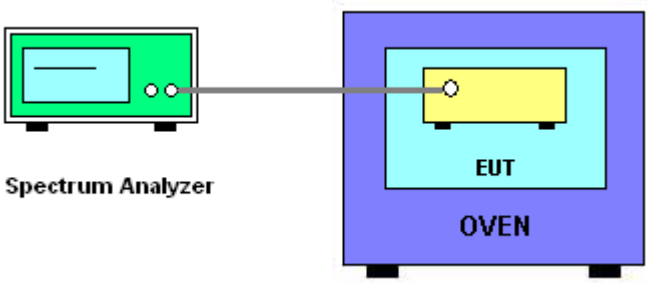
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.7.3. Test Procedures

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

4.7.4. Test Setup Layout



4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

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

4.7.7. Test Result of Frequency Stability

Temperature	25°C	Humidity	56%
Test Engineer	Wen Chao	Test Date	Mar. 23, 2016

Mode: 40 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5310 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5309.9365	5309.9363	5309.9354	5309.9349
110.00	5309.9361	5309.9356	5309.9353	5309.9347
93.50	5309.9358	5309.9353	5309.9352	5309.9351
Max. Deviation (MHz)	**0.0642**	**0.0647**	**0.0648**	**0.0653**
Max. Deviation (ppm)	**12.09**	**12.18**	**12.20**	**12.30**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5310 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5309.9344	5309.9337	5309.9336	5309.9329
10	5309.9347	5309.9341	5309.9331	5309.9323
20	5309.9361	5309.9355	5309.9345	5309.9339
30	5309.9487	5309.9483	5309.9481	5309.9475
40	5309.9499	5309.9491	5309.9490	5309.9488
Max. Deviation (MHz)	**0.0693**	**0.0697**	**0.0699**	**0.0704**
Max. Deviation (ppm)	**13.05**	**13.13**	**13.16**	**13.26**
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5550 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5549.9362	5549.9359	5549.9355	5549.9352
110.00	5549.9361	5549.9356	5549.9353	5549.9348
93.50	5549.9354	5549.9346	5549.9336	5549.9326
Max. Deviation (MHz)	**0.0646**	**0.0654**	**0.0664**	**0.0674**
Max. Deviation (ppm)	**11.64**	**11.78**	**11.96**	**12.14**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5550 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5549.9334	5549.9328	5549.9327	5549.9323
10	5549.9343	5549.9335	5549.9331	5549.9323
20	5549.9361	5549.9357	5549.9349	5549.9347
30	5549.9487	5549.9484	5549.9478	5549.9470
40	5549.9490	5549.9485	5549.9481	5549.9471
Max. Deviation (MHz)	**0.0695**	**0.0702**	**0.0709**	**0.0715**
Max. Deviation (ppm)	**12.52**	**12.65**	**12.77**	**12.88**
Result	Complies			

Mode: 80 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5290 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5289.9365	5289.9361	5289.9354	5289.9348
110.00	5289.9361	5289.9355	5289.9353	5289.9344
93.50	5289.9360	5289.9351	5289.9344	5289.9335
Max. Deviation (MHz)	0.0640	0.0649	0.0656	0.0665
Max. Deviation (ppm)	12.10	12.27	12.40	12.57
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5290 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5289.9350	5289.9348	5289.9346	5289.9343
10	5289.9357	5289.9355	5289.9345	5289.9335
20	5289.9361	5289.9358	5289.9353	5289.9348
30	5289.9487	5289.9482	5289.9472	5289.9463
40	5289.9499	5289.9496	5289.9490	5289.9486
Max. Deviation (MHz)	**0.0679**	**0.0683**	**0.0692**	**0.0697**
Max. Deviation (ppm)	**12.84**	**12.91**	**13.08**	**13.18**
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5530 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5529.9366	5529.9356	5529.9350	5529.9348
110.00	5529.9361	5529.9352	5529.9348	5529.9339
93.50	5529.9356	5529.9349	5529.9344	5529.9341
Max. Deviation (MHz)	**0.0644**	**0.0651**	**0.0656**	**0.0661**
Max. Deviation (ppm)	**11.65**	**11.77**	**11.86**	**11.95**
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5530 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5529.9340	5529.9336	5529.9327	5529.9320
10	5529.9347	5529.9343	5529.9339	5529.9337
20	5529.9361	5529.9351	5529.9349	5529.9342
30	5529.9487	5529.9481	5529.9472	5529.9469
40	5529.9501	5529.9493	5529.9489	5529.9484
Max. Deviation (MHz)	**0.0696**	**0.0703**	**0.0707**	**0.0717**
Max. Deviation (ppm)	**12.59**	**12.71**	**12.78**	**12.97**
Result	Complies			

4.8. Antenna Requirements

4.8.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.8.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 22, 2015	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov.13, 2015	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100979	9kHz~40GHz	Dec. 12, 2014	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Conducted (TH01-CB)

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

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%