



# SPORTON International Inc.

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## FCC RADIO TEST REPORT

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FCC ID	MSQ-RTGZ00
Manufacturer's company (1)	ASKEY TECHNOLOGY (JIANG SU) LTD
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Manufacturer's company (2)	Compal Networking (KunShan) Co., LTD.
Manufacturer Address (2)	No. 520, Nabbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China

Product Name	Wireless-AC5300 Tri-band Gigabit Router, ROG Rapture Tri-band Gaming Router, Extreme Gaming Router
Brand Name	ASUS
Model No.	RT-AC5300, RT-AC5300R, RT-AC5300W, RT-AC5300P, RT-AC95U, RT-AC96U, GT-AC5300, ROG Rapture GT-AC5300
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Apr. 28, 2015
Final Test Date	Jan. 24, 2017
Submission Type	Class II Change

### Statement

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

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

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

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013, 47 CFR FCC Part 15 Subpart E,**

**KDB789033 D02 v01r03, KDB662911 D01 v02r01, KDB644545 D03 v01, ET Docket No. 13-49; FCC 16-24.**

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



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## History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR532637-11AB	Rev. 01	Initial issue of report	Jan. 26, 2017

## 1. VERIFICATION OF COMPLIANCE

Product Name : Wireless-AC5300 Tri-band Gigabit Router, ROG Rapture Tri-band Gaming Router, Extreme Gaming Router  
Brand Name : ASUS  
Model No. : RT-AC5300, RT-AC5300R, RT-AC5300W, RT-AC5300P, RT-AC95U, RT-AC96U, GT-AC5300, ROG Rapture GT-AC5300  
Applicant : ASUSTeK COMPUTER INC.  
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Apr. 28, 2015 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

  
Cliff Chang  
SPORTON INTERNATIONAL INC.

## 2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E			
Part	Rule Section	Description of Test	Result
4.1	15.207	AC Power Line Conducted Emissions	Complies
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies
4.3	15.407(a)	Maximum Conducted Output Power	Complies
4.4	15.407(a)	Power Spectral Density	Complies
4.5	15.407(b)	Radiated Emissions	Complies
4.6	15.407(b)	Band Edge Emissions	Complies
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) for verison 1 WLAN (3TX/3RX, 4TX/4RX) for verison 2
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM, 1024QAM)
Data Rate (Mbps)	IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n/ac: see the below table
Frequency Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	<b>EUT: Version 2 (4TX4RX)</b> <b>5G Band 1</b> <u>For Non-beamforming function:</u> IEEE 802.11a: 16.85 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 17.89 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.47 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.54 MHz IEEE 802.11ac MCS0/Nss4 (VHT20): 18.06 MHz IEEE 802.11ac MCS0/Nss4 (VHT40): 36.76 MHz IEEE 802.11ac MCS0/Nss4 (VHT80): 76.12 MHz <u>For Beamforming function:</u> IEEE 802.11ac MCS0/Nss1 (VHT20): 18.06 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 36.76 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz
Maximum Conducted Output Power	<b>EUT: Version 2 (4TX4RX)</b> <b>5G Band 1</b> <u>For Non-beamforming function:</u> IEEE 802.11a: 26.76 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 26.91 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 28.22 dBm

	IEEE 802.11ac MCS0/Nss1 (VHT80): 22.30 dBm IEEE 802.11ac MCS0/Nss4 (VHT20): 26.05 dBm IEEE 802.11ac MCS0/Nss4 (VHT40): 24.46 dBm IEEE 802.11ac MCS0/Nss4 (VHT80): 23.61 dBm <u>For Beamforming function:</u> IEEE 802.11ac MCS0/Nss1 (VHT20): 26.46 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 26.38 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 24.43 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description			
Communication Mode	<input checked="" type="checkbox"/>	IP Based (Load Based)	<input type="checkbox"/>	Frame Based
Beamforming Function	<input checked="" type="checkbox"/>	With beamforming	<input type="checkbox"/>	Without beamforming
Operate Condition	<input checked="" type="checkbox"/>	Indoor	<input type="checkbox"/>	Outdoor

Note: The product has beamforming function for 802.11 n/ac in 2.4GHz/5GHz.

#### Antenna and Bandwidth

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

#### IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3, 4	MCS0-23, MCS0-31
802.11n (HT40)	3, 4	MCS0-23, MCS0-31
802.11ac (VHT20)	3, 4	MCS0-11/Nss1-3, MCS0-11/Nss1-4
802.11ac (VHT40)	3, 4	MCS0-11/Nss1-3, MCS0-11/Nss1-4
802.11ac (VHT80)	3, 4	MCS0-11/Nss1-3, MCS0-11/Nss1-4

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

Then EUT supports HT20 and HT40.

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

Note 3: Modulation modes consist of below configuration:

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

### 3.2. Accessories

Power	Brand	Model No.	Rating
Adapter 1	ASUS	ADP-65DW B	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Adapter 2	ASUS	AD887320	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Adapter 3	ASUS	PA-1650-93	Input: 100-240Vac, 50-60Hz, 1.7A Output: 19Vdc, 3.42A
Adapter 4	ASUS	ADP-65DW B	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
Adapter 5	ASUS	PA-1650-63	Input: 100-240Vac, 50-60Hz, 1.7A Output: 19Vdc, 3.42A
Adapter 6	ASUS	AD887320	Input: 100-240Vac, 50-60Hz, 1.5A Output: 19Vdc, 3.42A
<b>Other</b>			
RJ-45 cable*1: Shielded, 1.5m			

Note1: The difference between adapter 1(model: ADP-65DW B) and adapter 4 (model: ADP-65DW B) as below:

Adapter 1			
Design No	MFG TITLE	MFG PART	DESCRIPTION
Q1	AUK	SMK0760F	FET 600V 7A 1.2ohm TO-220F-3P
Q1	ST	STP6NK60ZFP	FET 600V 6A 1.2ohm TO-220FP-3P
Q1	TOSHIBA	TK10A60DR(STA4,X)	FET 600V 10A 750mohm TO-220SIS-3P
D101	ST	STPS20S100CT	DIO SBD 20A 100V TO-220AB-3P C.C.
D101	ST	STPS20SM100ST	DIO SBD 20A 100V TO-220AB-3P
D101	ST	STPS30SM100ST	DIO SBD 30A 100V TO-220AB-3P
IC31	ON	DAPO22ASN65T1G	IC ASIC PWM CURRENT MODE TSOP-6P SMD
IC131	TI	TL432BIDBZR	IC VOL REF ADJ 2.495V 100mA 0.5%
IC131	NXP	TL431BMFDT	IC VOL REF ADJ 2.495V 100mA 0.5%
IC131	DIODES	AS431ANTR-G1	IC VOL REF ADJ 2.5V 100mA 0.5% SOT-23-3P
IC32	EVERLIGHT	EL816M(Y)(D)-VG	PHOTO TR 50mA 80V DIP-4P 150%-300%
IC32	SHARP	PC123Y92FZ0F	PHOTO TR 50mA 70V DIP-4P 160%-300%
IC32	Renesas	PS2561DL1-1Y-V-A(G)	EOL PHOTO TR 40mA 80V DIP-4P 150%-300%
CX1	EUROPTRONIC	MPX2224K30B15LXD20	CAP X2 MP PC 305VAC 0.22uF K S15
CX1	OKAYA	LE224-MX-30-C3.2	CAP X2 MP PC 300VAC 0.22uF K S15
CX1	HUA	MKP-224K0275AB115S-G	CAP X2 MP PC 275VAC 0.22uF K S15
FL1	DELTA	HFV-MP13202	LINE FILTER T14 14mH MIN
FL101	DELTA	LFV-MP13303	LINE FILTER T10 17uH MIN

T1	DELTA	MV-MP13167	TRANSFORMER MAIN RM10 1mH +/-5%
C1	NICHICON	UPT2G680MHD3	CAP AL 400V 68uF M 16*25 P7.5
C1	NCC	EKMG401ELL680ML25S	CAP AL 400V 68uF M 16*25 P7.5
C1	L-Tec	TYJ2GM680K25O	CAP AL 400V 68uF M 16*25 P7.5
CY1	MURATA	DE1B3KX221KNHAN99F	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
CY1	TDK	CD70-B2GA221KYVK	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
CY1	WALSIN	YPOAH221K061DASDAB	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
<b>Adapter 4</b>			
Design No	MFG TITLE	MFG PART	DESCRIPTION
Q1	TOSHIBA	TK10A60DR(STA4,X)	FET 600V 10A 750mohm TO-220SIS-3P
Q1	FUJI	FMV11N60ES	FET 600V 11A 750mohm TO-220F-3P
D101	ST	STPS20S100CT	DIO SBD 20A 100V TO-220AB-3P C.C.
D101	ST	STPS20H100CT	DIO SBD 20A 100V TO-220AB-3P C.C.
D101	ST	STPS30H100CT	DIO SBD 30A 100V TO-220AB-3P C.C.
IC31	NeoEnergy	DAP022AT	IC ASIC PWM CURRENT MODE SOT-26-6P SMD
IC131	LITE-ON	LA431OCRPA	IC REGU ADJ 2.495V 100mA 0.4% SOT-23R-3P
IC131	TI	TL432BIDBZR	IC VOL REF ADJ 2.495V 100mA 0.5%
IC131	NXP	TL431BMFDT	IC VOL REF ADJ 2.495V 100mA 0.5%
IC32	EVERLIGHT	EL816M(Y)(D)-VG	PHOTO TR 50mA 80V DIP-4P 150%-300%
IC32	SHARP	PC123Y92FZ0F	PHOTO TR 50mA 70V DIP-4P 160%-300%
IC32	TOSHIBA	TLP785F(D4-GRH,F	PHOTO TR 60mA 80V DIP-4P 150%-300%
CX1	HUA	MKP-334K0275AB115S-G	CAP X2 MP PC 275VAC 0.33uF K S15
CX1	HUA	MKP-334K0275AB115S-P	CAP X2 MP PC 275VAC 0.33uF K S15
CX1	EUROPTRONIC	MPX2334K30B15LXD31	CAP X2 MP PC 305VAC 0.33uF K S15
FL1	DELTA	HFV-MP15027	LINE FILTER T16 12.7mH MIN
FL101	DELTA	LFV-MP13171	LINE FILTER T6 1.55uH MIN
T1	DELTA	MV-MP15037	TRANSFORMER MAIN RM10 1000uH +/-5%
C1	NCC	EKMG401ELL680ML25S	CAP AL 400V 68uF M 16*25 P7.5
CY1	MURATA	DE1B3KX221KNHAN99F	CAP Y1/X1 CD 250VAC 220pF K B TP VI10
CY1	WALSIN	YPOAH221K061DASDAB	CAP Y1/X1 CD 250VAC 220pF K B TP VI10

Note2: The difference between adapter 3 (model: PA-1650-93) and adapter 5 (model: PA-1650-63) as below:

Adapter 3	Adapter 5
Model: PA-1650-93	Model: PA-1650-63

Note3: The difference between adapter 2 (model: AD887320) and new adapter 6 (model: AD887320) as below:

Adapter 2	Adapter 6
Type: 010KLF BAH	Type: 010K-3LF

### 3.3. Table for Filed Antenna

Set	Brand	Part No.	Antenna Type	Connector
1	PSA	RFDPA131000SBLB805	Dipole Antenna	Reversed-SMA
2	PSA	RFDPA151000SBLB802	Dipole Antenna	Reversed-SMA
3	M.gear	C660-510368-A	Dipole Antenna	Reversed-SMA
4	M.gear	C660-510369-A	Dipole Antenna	Reversed-SMA
5	M.gear	C660-510370-A	Dipole Antenna	Reversed-SMA
6	M.gear	C660-510391-A	Dipole Antenna	Reversed-SMA
7	M.gear	C660-510392-A	Dipole Antenna	Reversed-SMA

Set	Gain (dBi)		Cable Loss		True Gain (dBi)	
	2.4GHz	5GHz	2.4GHz	5GHz	2.4GHz	5GHz
1	2.32	3.47	-	-	2.32	3.47
2	1.98	3.37	-	-	1.98	3.37
3	1.50	3.30	0.39	0.61	1.11	2.69
4	2.00	3.20	0.35	0.55	1.65	2.65
5	2.20	3.20	0.33	0.51	1.87	2.69
6	2.14	2.98	-	-	2.14	2.98
7	1.91	2.97	-	-	1.91	2.97

Note: 1. The EUT has seven set of antenna, and each set contains eight antennas.

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

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

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

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

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

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

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

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

3. The EUT has two versions theirs measure information as below:



### 3.4. Table for Carrier Frequencies

There are three bandwidth systems.

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

For 40MHz bandwidth systems, use Channel 38, 46

For 80MHz bandwidth systems, use Channel 42

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

### 3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Chain	
AC Power Conducted Emission	Normal Link	-	-	-	
Max. Conducted Output Power	For Non-beamforming function				
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss4	36	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss4	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss4	42	1+2+3+4
	For Beamforming function				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	Power Spectral Density	For Non-beamforming function			
11a/BPSK		Band 1	6Mbps	36/40/48	1+2+3+4
11ac VHT20		Band 1	MCS0/Nss1	36/40/48	1+2+3+4
11ac VHT40		Band 1	MCS0/Nss1	38/46	1+2+3+4
11ac VHT80		Band 1	MCS0/Nss1	42	1+2+3+4
11ac VHT20		Band 1	MCS0/Nss4	36	1+2+3+4
11ac VHT40		Band 1	MCS0/Nss4	38	1+2+3+4
11ac VHT80		Band 1	MCS0/Nss4	42	1+2+3+4
For Beamforming function					
11ac VHT20		Band 1	MCS0/Nss1	36/40/48	1+2+3+4
11ac VHT40		Band 1	MCS0/Nss1	38/46	1+2+3+4
11ac VHT80		Band 1	MCS0/Nss1	42	1+2+3+4
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement		For Non-beamforming function			
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss4	36	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss4	38	1+2+3+4

	11ac VHT80	Band 1	MCS0/Nss4	42	1+2+3+4
	For Beamforming function				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
Radiated Emission Below 1GHz	Normal Link		-	-	-
Radiated Emission Above 1GHz	For Non-beamforming function				
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	11ac VHT20	Band 1	MCS0/Nss4	36	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss4	38	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss4	42	1+2+3+4
	For Beamforming function				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3+4
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3+4
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3+4
	Band Edge Emission	For Non-beamforming function			
11a/BPSK		Band 1	6Mbps	36/40/48	1+2+3+4
11ac VHT20		Band 1	MCS0/Nss1	36/40/48	1+2+3+4
11ac VHT40		Band 1	MCS0/Nss1	38/46	1+2+3+4
11ac VHT80		Band 1	MCS0/Nss1	42	1+2+3+4
11ac VHT20		Band 1	MCS0/Nss4	36	1+2+3+4
11ac VHT40		Band 1	MCS0/Nss4	38	1+2+3+4
11ac VHT80		Band 1	MCS0/Nss4	42	1+2+3+4
For Beamforming function					
11ac VHT20		Band 1	MCS0/Nss1	36/40/48	1+2+3+4
11ac VHT40		Band 1	MCS0/Nss1	38/46	1+2+3+4
11ac VHT80		Band 1	MCS0/Nss1	42	1+2+3+4
Frequency Stability		20 MHz	Band 1	-	40
	40 MHz	Band 1	-	38	1
	80 MHz	Band 1	-	42	1

Note: 1. There are two functions of EUT, one is beamforming function, and the other is non-beamforming function for 802.11n and 802.11ac. All test results were recorded in the report.

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

3. The EUT is used for laying only.

The following test modes were performed for all tests:

**For Conducted Emission test:**

There are three level 6 Adapters (Adapter 4~6) of original report, after evaluating, Adapter 4 has been evaluated to be the worst case, thus measurement will follow this same test configuration.

Mode 1. EUT 4 (Version 2 - Rev 1.311) + Adapter 4 + SKU A

Mode 2. EUT 5 (Version 2 - Rev 1.411) + Adapter 4 + SKU A

Mode 2 is the worst case, so it was selected to record in this test report.

**For Radiated Emission test below 1GHz:**

There are three level 6 Adapters (Adapter 4~6) of original report, after evaluating, Adapter 6 has been evaluated to be the worst case, thus measurement will follow this same test configuration.

Mode 1. EUT 3 (Version 2 - Rev 1.33) + Adapter 6 + SKU B

Mode 2. EUT 4 (Version 2 - Rev 1.311) + Adapter 6 + SKU A

Mode 3. EUT 5 (Version 2 - Rev 1.411) + Adapter 6 + SKU A

Mode 2 is the worst case, so it was selected to record in this test report.

**For Radiated Emission test above 1GHz:**

Mode 1. CTX Mode

**For Co-location MPE and Radiated Emission Co-location Test:**

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to FA532637-11) is added for simultaneously transmit between 2.4GHz WLAN function and 5GHz WLAN function.

### 3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	Site Category	Location	FCC Designation No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	TW0006	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	TW0006	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

### 3.7. Table for Multiple Listing and Class II Change

The model numbers in the following table are all refer to the identical product.

Model No.	Description
RT-AC5300	The models are identical except for the model numbers as marketing strategy.
RT-AC5300R	
RT-AC5300W	
RT-AC5300P	
RT-AC95U	
RT-AC96U	
GT-AC5300	
ROG Rapture GT-AC5300	

Note: Model: RT-AC5300 was selected as representative model for the test and its data was recorded in this report.

The EUT has five types, which are identical to each other in all aspects except for the following table:

EUT	LAN Port	EUT Version	Transformer	Resistance (Size)	Thickness of Heat sink (mm)	Pad (mm)	Fan
EUT 1	8	Version 1, 2 (Rev 1.30)	SKU A	0402/0201	4.2mm/2mm	1mm/5mm	V
EUT 2	4	Version 1, 2 (Rev 1.30)	SKU A	0402/0201	4.2mm/2mm	1mm/5mm	V / X
		Version 2 (Rev 1.30, Rev 1.31)	SKU A ~ SKU C	0402/0201	4.2mm/2mm	1mm/5mm	V / X
EUT 3	4	Version 2 (Rev 1.33)	SKU B	0402/0201	2mm	5mm	X
EUT 4	8	Version 2 (Rev 1.311)	SKU A	0402/0201	2mm	5mm	X
EUT 5	8	Version 2 (Rev1.411)	SKU A	0402/0201	2mm	5mm	X

Note 1: All the specification of test configurations and test modes were based on customer's request.

Note 2: V : With X :Without

The transformer information as below:

Transformer	Brand	LAN	LAN	WAN
SKU A	Mingtek	HN8011VG	HN8011VG	HN18101CG
SKU B	Mingtek	HN8014VG	HN8015VG	HN18101CG
SKU C	FCE	NS777207	NS777208	NS771802

The Version information as below:

Version		Rev 1.31	Rev 1.33	Rev 1.311	Rev 1.411	
RF	2G	Mainchip	BCM4366	BCM4366	BCM4366	BCM4366
		TX	PA SE2623L	PA SE2623L	PA SE2623L	PA SE2623L
		RX	RX FEM SKY85201	RX FEM SKY85201	RX FEM SKY85201	Discrete RX BFP842 + RTC6619
	5G Low/ High Band	Mainchip	BCM4366	BCM4366	BCM4366	BCM4366
		TX	PA RFPA5542	PA RFPA5542	PA RFPA5542	PA RFPA5542
		RX	RX FEM SKY85605	RX FEM SKY85605	RX FEM SKY85614	RX FEM SKY85614
BB	CPU		BCM4709C0	BCM4709C0	BCM4908	BCM4908
	DDR		512MBx1	512MBx1	512MBx2	512MBx1
	Gigabit switch		RTL8365MB (Reserved)	RTL8365MB (Reserved)	BCM53134S	BCM53134S
	LAN port		4 (Reserved extra 4)	4 (Reserved extra 4)	8	8
	Flash		128MB	128MB	256MB	256MB
	EMI Filter for low voltage		MURATA/ NFM18PS105R0J3 D	none	none	none
	Power IC		FR9618+ IT76630M	RT8290A	RT8290A+RT6220 +RT6217E	RT8290A+RT6220 +RT6217E
	USB		2.0x1/3.0x1	2.0x1/3.0x1	3.0x2	3.0x2

This product is an extension of original one reported under Sporton project number: FR532637-04AB

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

Modifications	Performance Checking
1. Adding equipment names: ROG Rapture Tri-band Gaming Router and Extreme Gaming Router. 2. Adding model names: GT-AC5300 and ROG Rapture GT-AC5300.	1. It is not necessary to perform for all tests.
3. Adding two sets of antennas with lower gain. (P/N: C660-510391-A& C660-510392-A)	2. After evaluating, it is not necessary to verify.
4. Adding three versions of the device: Rev 1.33&Rev 1.311&Rev 1.411	3. AC Power Line Conducted Emissions for versions Rev 1.311&Rev 1.411 4. Radiated Emissions below 1GHz for versions Rev 1.33 & Rev 1.311 & Rev 1.411.
5. Consider the component with precision and make sure each device in mass production to comply with regulation rule. Test it by mass product, not golden sample for version 2 4TX4RX.	5. 26dB Bandwidth and 99% Occupied Bandwidth 6. Maximum Conducted Output Power 7. Power Spectral Density 8. Radiated Emissions above 1GHz 9. Band Edge and Fundamental Emissions 10. Frequency Stability 11. Maximum Permissible Exposure After evaluating, these test items should be tested and recorded in this report for 5G Band 1 only.

### 3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

For Radiated Emissions below 1GHz

Support Unit	Brand	Model	FCC ID
NB*6	DELL	E4300	DoC
Flash disk*2	Silicon Power	I-Series	DoC

For Radiated Emissions above 1GHz

For Non-beamforming function

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

For Beamforming function

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
Wireless ac AP (Device)	ASUS	RT-AC88U	MSQ-RTGW00

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
NB*6	DELL	E6430	DoC
Flash disk3.0*2	Transcend	JetFlash-700	DoC

### 3.9. Table for Parameters of Test Software Setting

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

For Non-beamforming function:

Test Software Version	MTool_2.0.2.7		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11a	85	86	88
802.11ac MCS0/Nss1 VHT20	81	88	89
802.11ac MCS0/Nss4 VHT20	84	-	-
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz
	72	94	
802.11ac MCS0/Nss4 VHT40	77	-	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	69		
802.11ac MCS0/Nss4 VHT80	76		

For Beamforming function:

Test Software Version	MTool_2.0.2.7		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11ac MCS0/Nss1 VHT20	83	85	85
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz
	68	86	
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	77		

### 3.10. EUT Operation during Test

For Non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For Beamforming function:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

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

The program was executed as follows:

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

### 3.11. Duty Cycle

For Non-beamforming function:

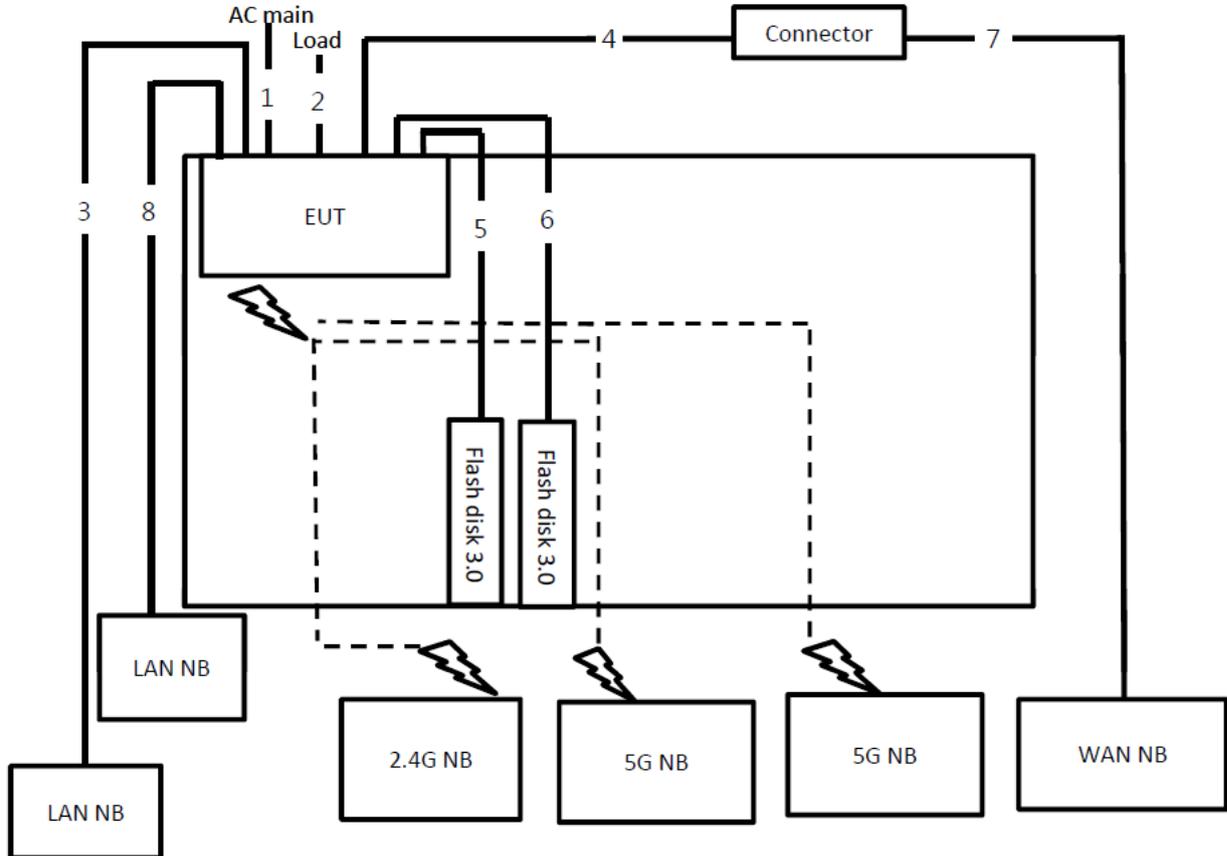
Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.080	2.090	99.52	0.02	0.01
802.11ac MCS0/Nss1 VHT20	1.940	1.950	99.49	0.02	0.01
802.11ac MCS0/Nss1 VHT40	0.964	0.984	97.97	0.09	1.04
802.11ac MCS0/Nss1 VHT80	0.462	0.488	94.67	0.24	2.16
802.11ac MCS0/Nss4 VHT20	0.522	0.549	95.08	0.22	1.92
802.11ac MCS0/Nss4 VHT40	0.282	0.308	91.56	0.38	3.55
802.11ac MCS0/Nss4 VHT80	0.162	0.188	86.17	0.65	6.17

For Beamforming function:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.840	4.140	92.75	0.33	0.26
802.11ac MCS0/Nss1 VHT40	3.672	3.984	92.17	0.35	0.27
802.11ac MCS0/Nss1 VHT80	3.384	3.720	90.97	0.41	0.30

### 3.12. Test Configurations

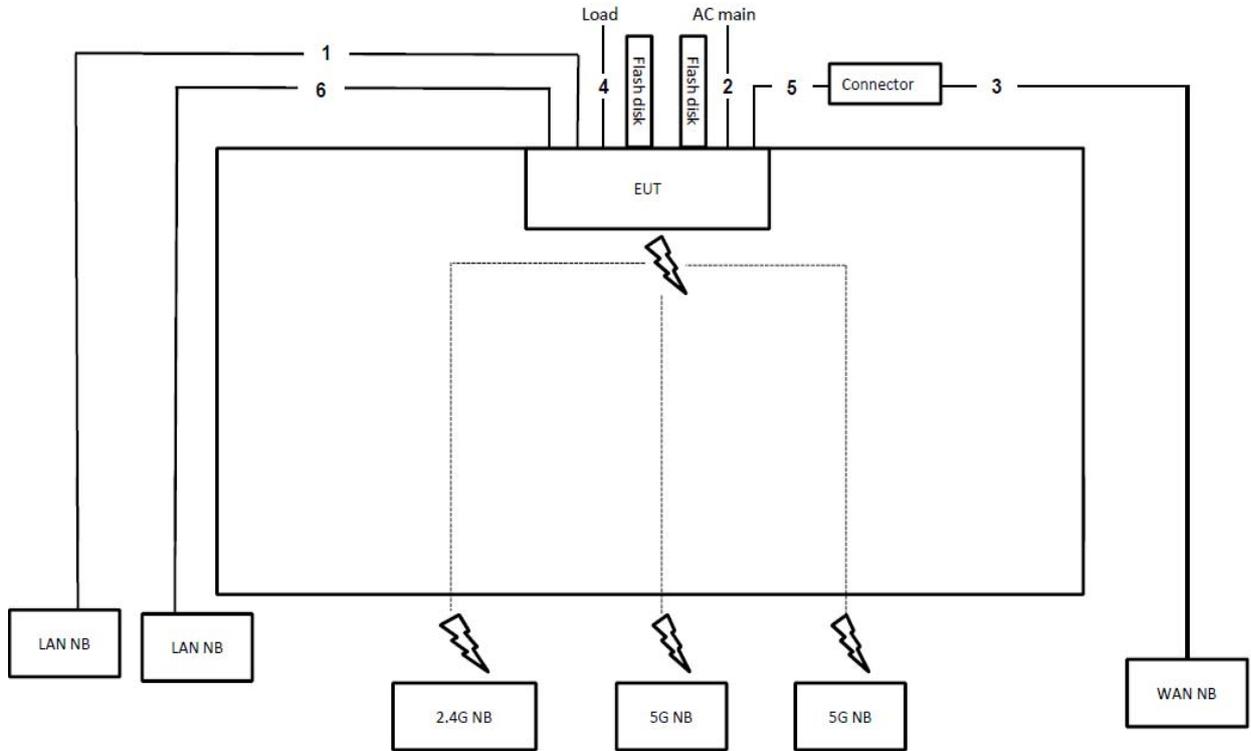
#### 3.12.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	2.3m
2	RJ-45 cable*6	No	1m
3	RJ-45 cable	No	10m
4	RJ-45 cable	Yes	1.5m
5	USB cable	Yes	1.5m
6	USB cable	Yes	1.5m
7	RJ-45 cable	Yes	10m
8	RJ-45 cable	No	10m

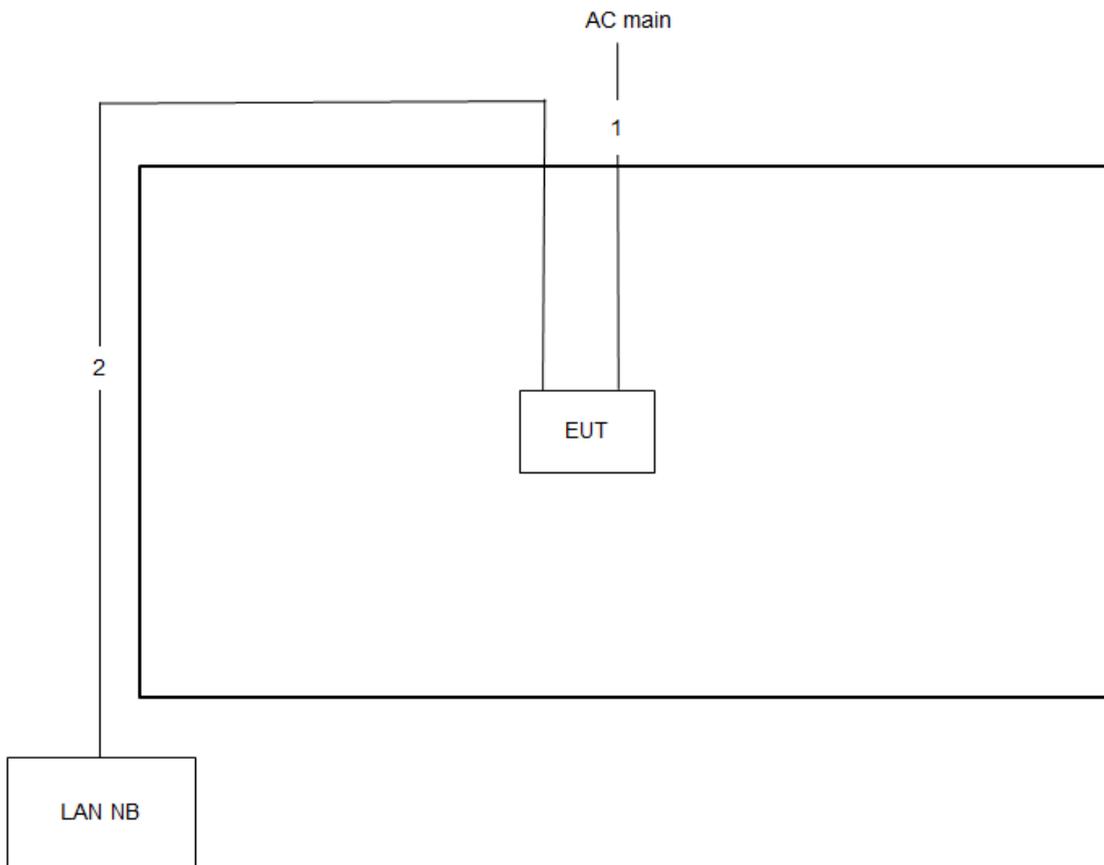
### 3.12.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



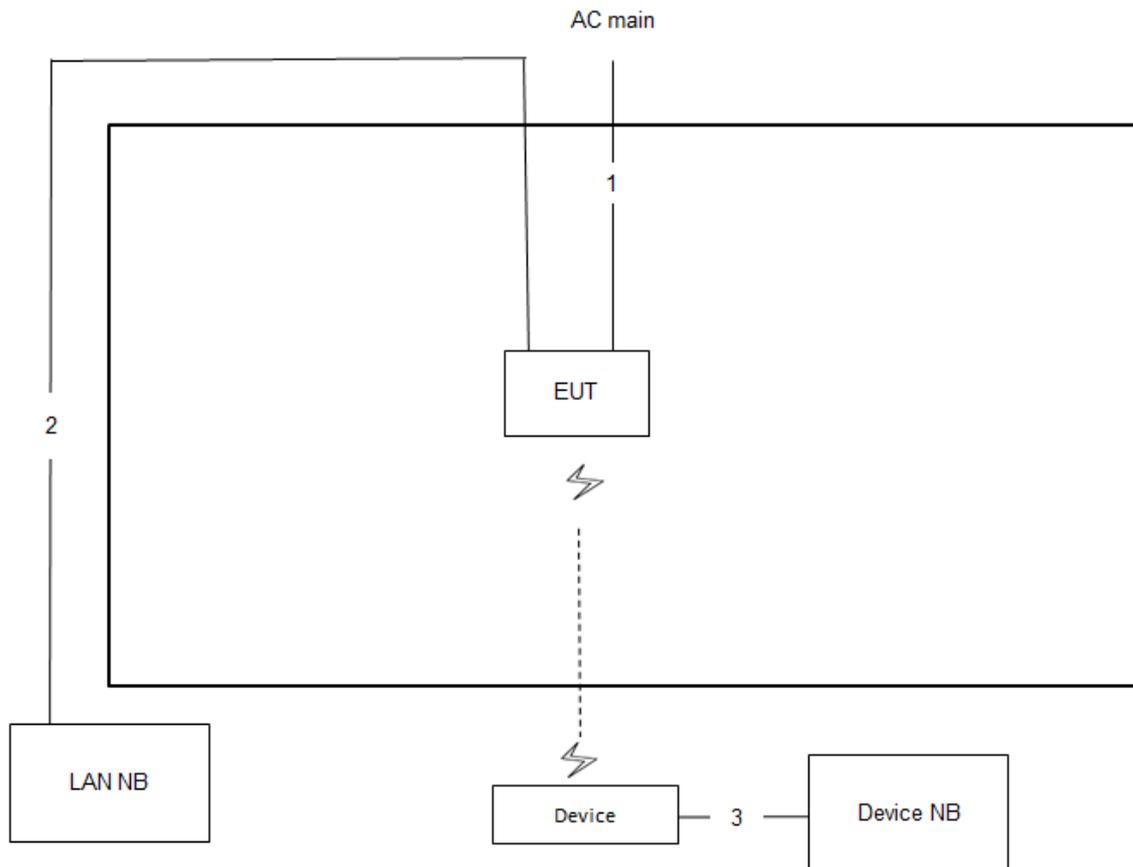
Item	Connection	Shielded	Length
1	RJ-45 cable	No	10m
2	Power cable	No	2.3m
3	RJ-45 cable	No	10m
4	RJ-45 cable*6	No	1.5m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	10m

Test Configuration: above 1GHz  
 For Non-beamforming function:



Item	Connection	Shielded	Length
1	Power cable	No	2.3m
2	RJ-45 cable	No	10m

For Beamforming function:



Item	Connection	Shielded	Length
1	Power cable	No	2.3m
2	RJ-45 cable	No	10m
3	RJ-45 cable	No	5m

## 4. TEST RESULT

### 4.1. AC Power Line Conducted Emissions Measurement

#### 4.1.1. Limit

For this product that is designed to connect to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

#### 4.1.2. Measuring Instruments and Setting

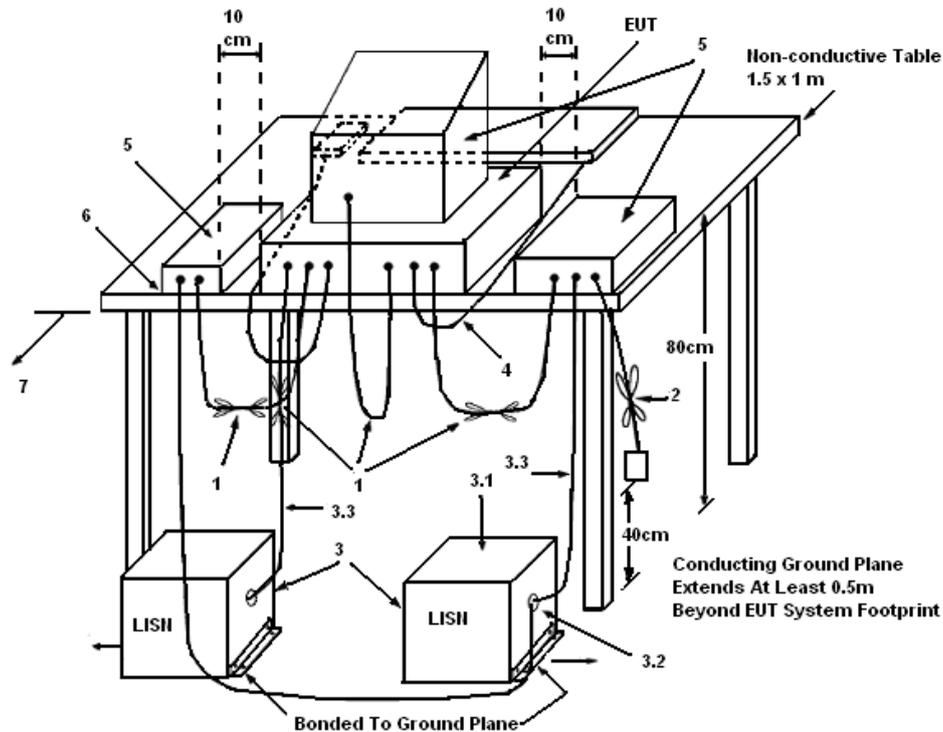
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

#### 4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

#### 4.1.4. Test Setup Layout



#### LEGEND:

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

#### 4.1.5. Test Deviation

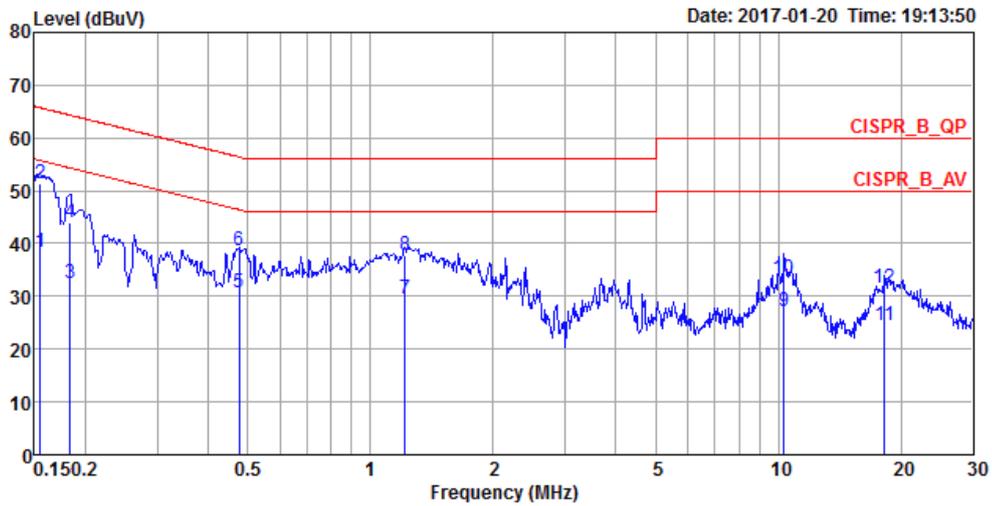
There is no deviation with the original standard.

#### 4.1.6. EUT Operation during Test

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

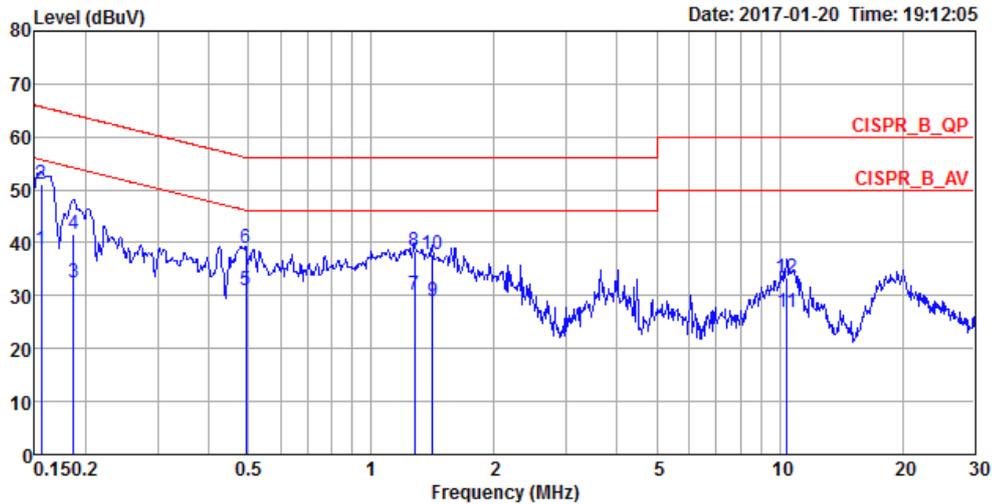
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23°C	Humidity	55%
Test Engineer	Deven Huang	Phase	Line
Configuration	Normal Link	Test Mode	Mode 2



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1548	38.47	-17.27	55.74	28.48	9.95	0.04	Average	LINE
2	0.1548	51.35	-14.39	65.74	41.36	9.95	0.04	QP	LINE
3	0.1835	32.42	-21.91	54.33	22.43	9.94	0.05	Average	LINE
4	0.1835	44.02	-20.31	64.33	34.03	9.94	0.05	QP	LINE
5	0.4761	30.76	-15.65	46.41	20.82	9.90	0.04	Average	LINE
6	0.4761	38.81	-17.60	56.41	28.87	9.90	0.04	QP	LINE
7	1.2162	29.46	-16.54	46.00	19.42	9.98	0.06	Average	LINE
8	1.2162	37.87	-18.13	56.00	27.83	9.98	0.06	QP	LINE
9	10.3422	27.05	-22.95	50.00	16.79	10.07	0.19	Average	LINE
10	10.3422	33.25	-26.75	60.00	22.99	10.07	0.19	QP	LINE
11	18.2316	24.39	-25.61	50.00	13.95	10.20	0.24	Average	LINE
12	18.2316	31.57	-28.43	60.00	21.13	10.20	0.24	QP	LINE

Temperature	23°C	Humidity	55%
Test Engineer	Deven Huang	Phase	Neutral
Configuration	Normal Link	Test Mode	Mode 2



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1557	38.67	-17.02	55.69	28.69	9.94	0.04	Average	NEUTRAL
2	0.1557	51.04	-14.65	65.69	41.06	9.94	0.04	QP	NEUTRAL
3	0.1864	32.50	-21.70	54.20	22.48	9.97	0.05	Average	NEUTRAL
4	0.1864	41.59	-22.61	64.20	31.57	9.97	0.05	QP	NEUTRAL
5	0.4941	30.86	-15.24	46.10	20.85	9.97	0.04	Average	NEUTRAL
6	0.4941	39.04	-17.06	56.10	29.03	9.97	0.04	QP	NEUTRAL
7	1.2756	30.12	-15.88	46.00	20.07	9.98	0.07	Average	NEUTRAL
8	1.2756	38.40	-17.60	56.00	28.35	9.98	0.07	QP	NEUTRAL
9	1.4107	28.95	-17.05	46.00	18.90	9.98	0.07	Average	NEUTRAL
10	1.4107	37.82	-18.18	56.00	27.77	9.98	0.07	QP	NEUTRAL
11	10.3972	26.76	-23.24	50.00	16.40	10.17	0.19	Average	NEUTRAL
12	10.3972	33.48	-26.52	60.00	23.12	10.17	0.19	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

## 4.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

### 4.2.1. Limit

No restriction limits.

### 4.2.2. Measuring Instruments and Setting

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

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

### 4.2.3. Test Procedures

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

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

### 4.2.4. Test Setup Layout

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

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

### 4.2.5. Test Deviation

There is no deviation with the original standard.

### 4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

<b>Temperature</b>	23°C	<b>Humidity</b>	45%
<b>Test Engineer</b>	Wen Chao		

##### For Non-beamforming function:

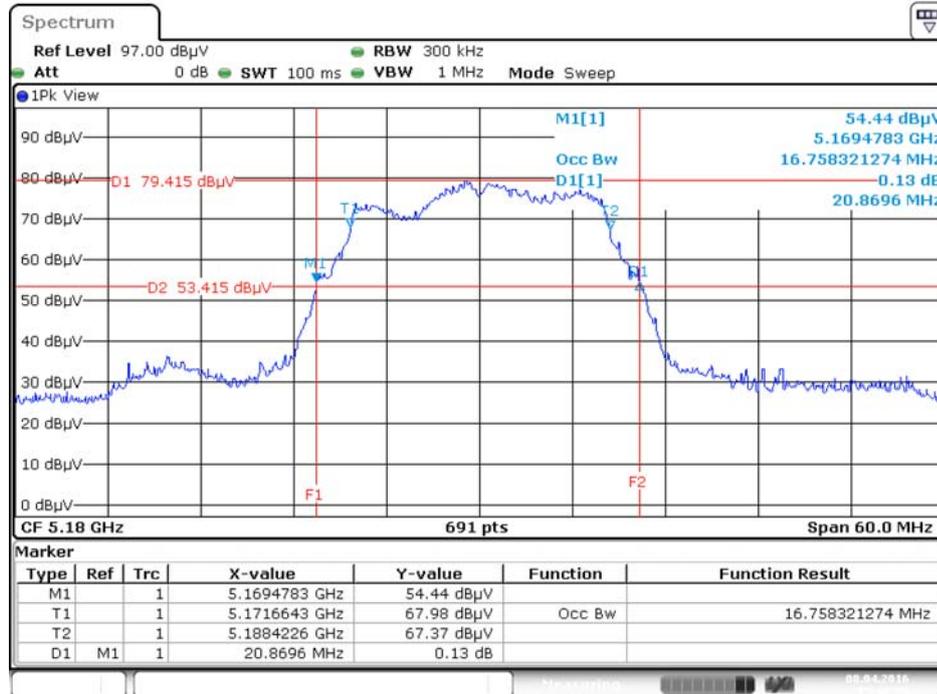
Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	20.87	16.76
	5200 MHz	21.04	16.85
	5240 MHz	21.13	16.76
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.22	17.89
	5200 MHz	20.96	17.80
	5240 MHz	21.30	17.89
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.00	36.32
	5230 MHz	40.44	36.47
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.16	75.54
802.11ac MCS0/Nss4 VHT20	5180 MHz	21.39	18.06
802.11ac MCS0/Nss4 VHT40	5190 MHz	40.58	36.76
802.11ac MCS0/Nss4 VHT80	5210 MHz	81.74	76.12

##### For Beamforming function:

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.22	18.06
	5200 MHz	21.65	18.06
	5240 MHz	21.48	18.06
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.87	36.76
	5230 MHz	40.58	36.76
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.45	76.12

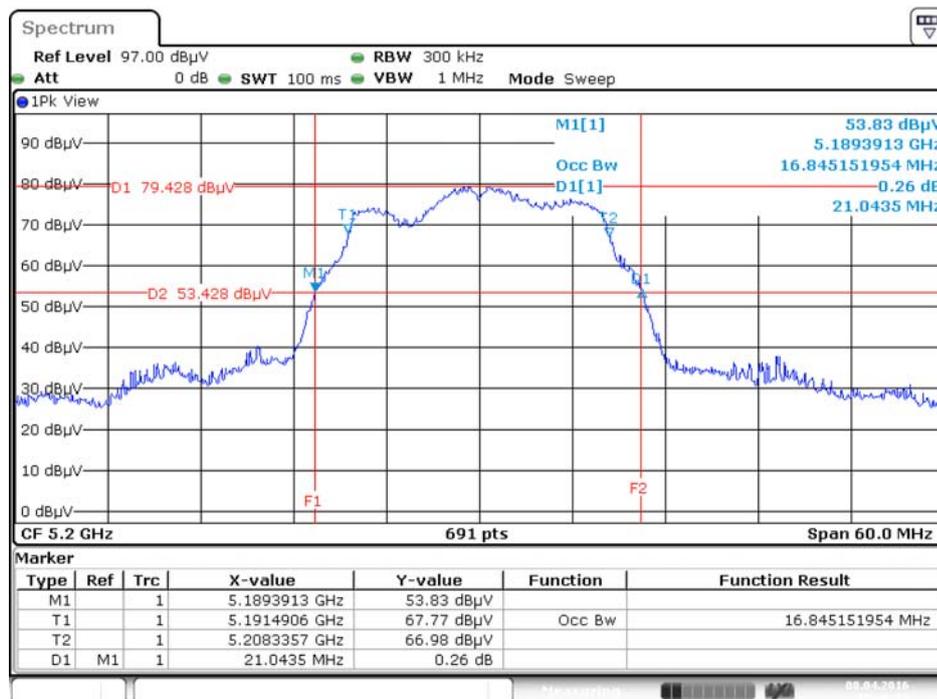
For Non-beamforming function:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz



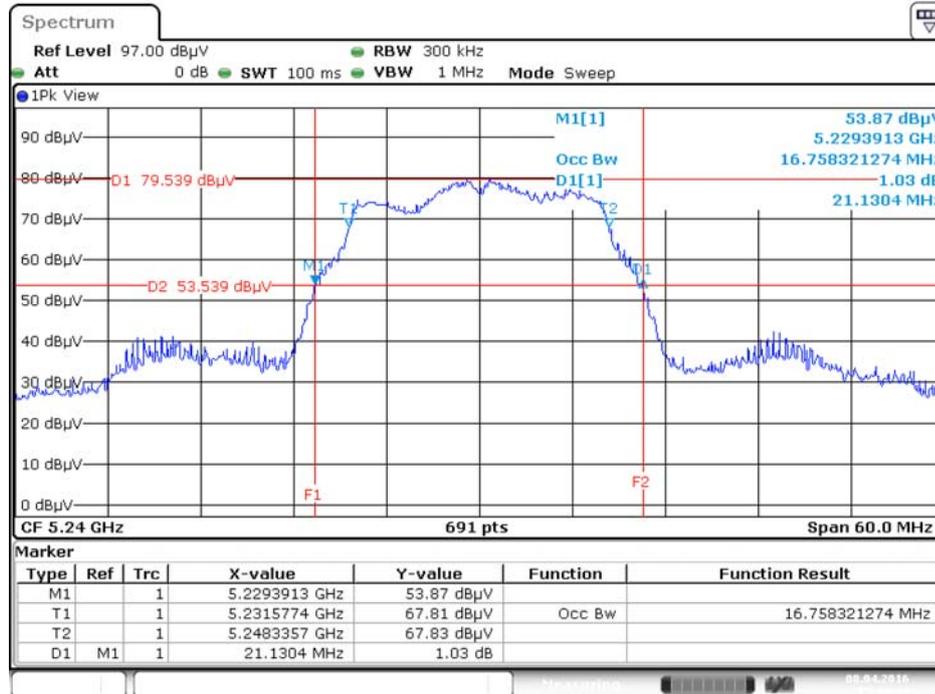
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz



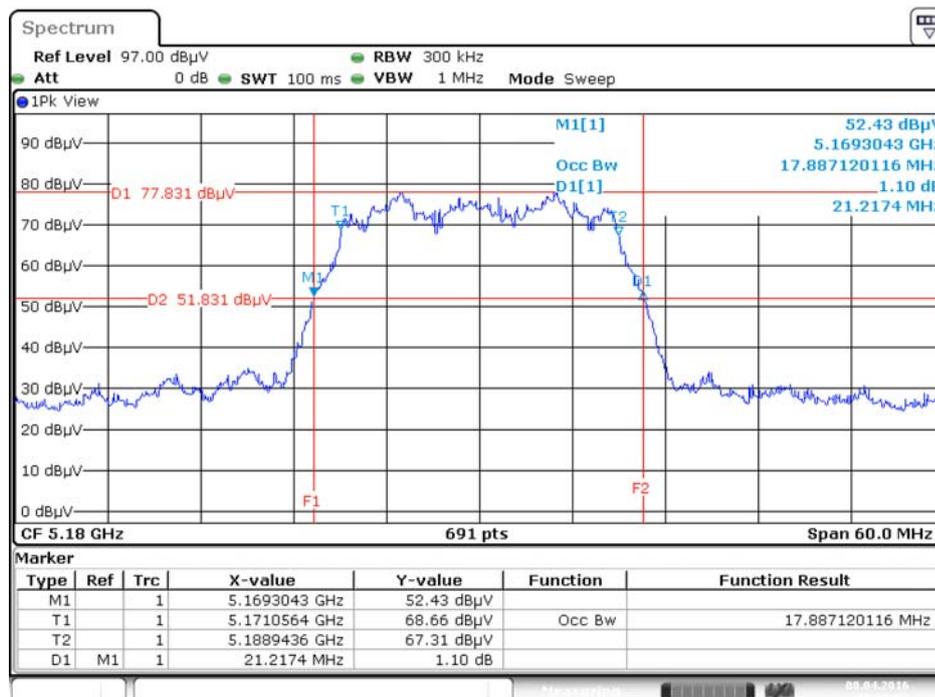
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



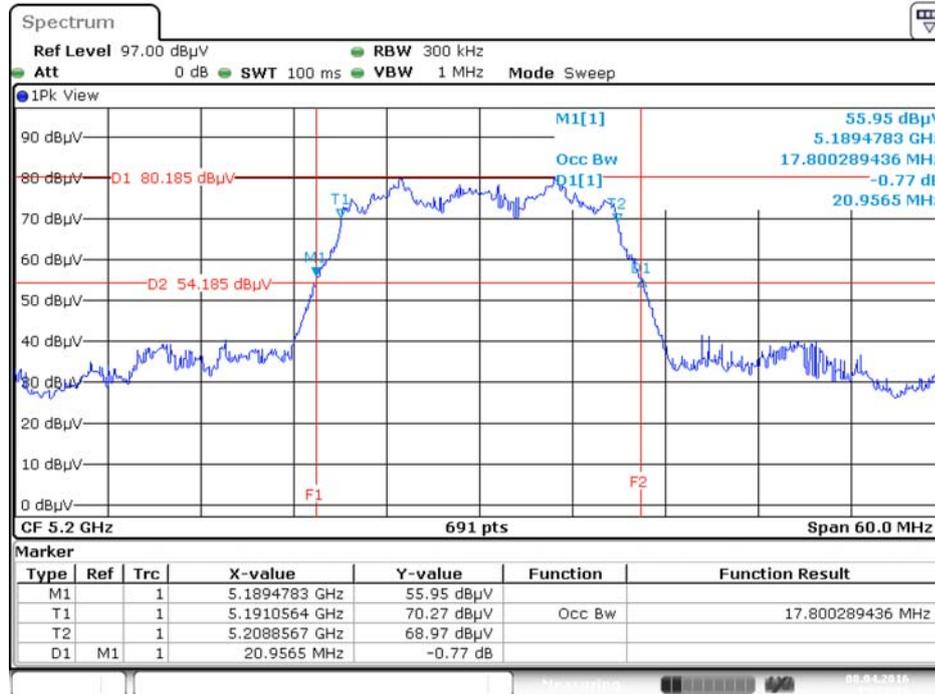
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz



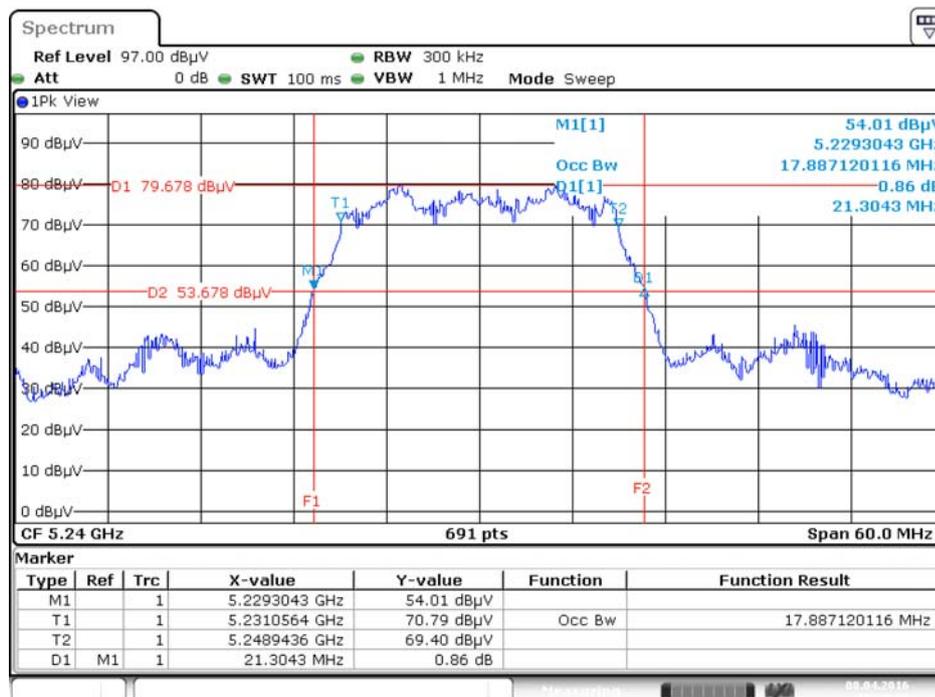
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz



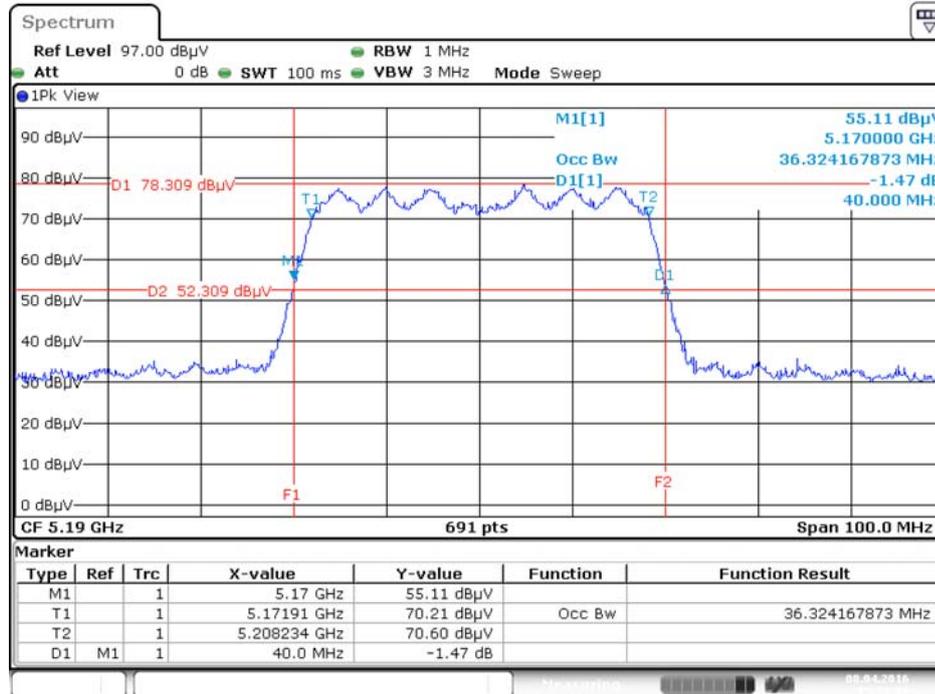
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26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



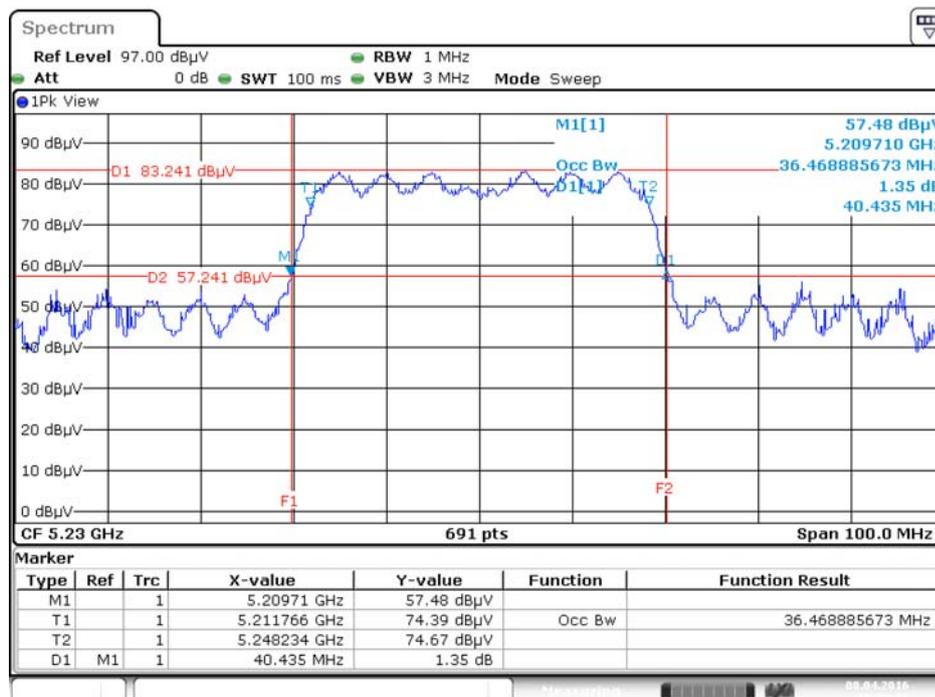
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**26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz**



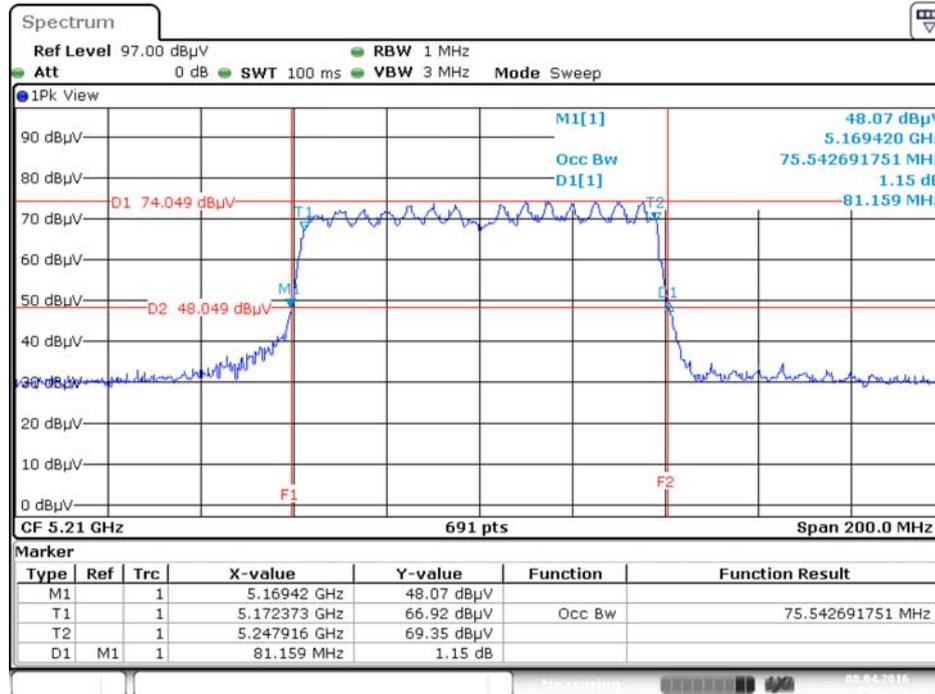
Date: 8.APR.2016 15:52:38

**26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5230 MHz**



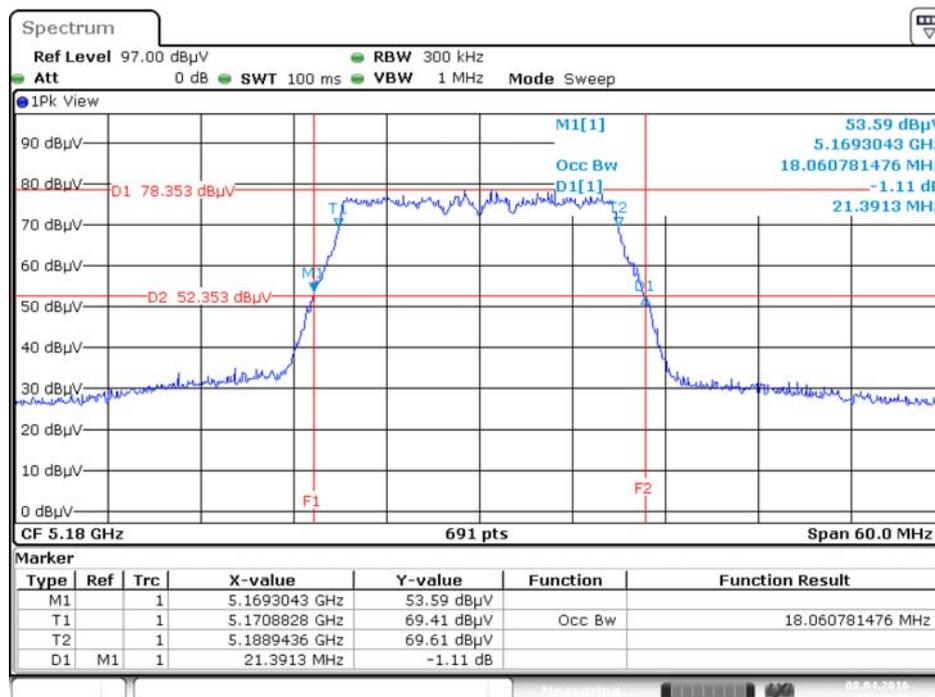
Date: 8.APR.2016 15:53:15

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



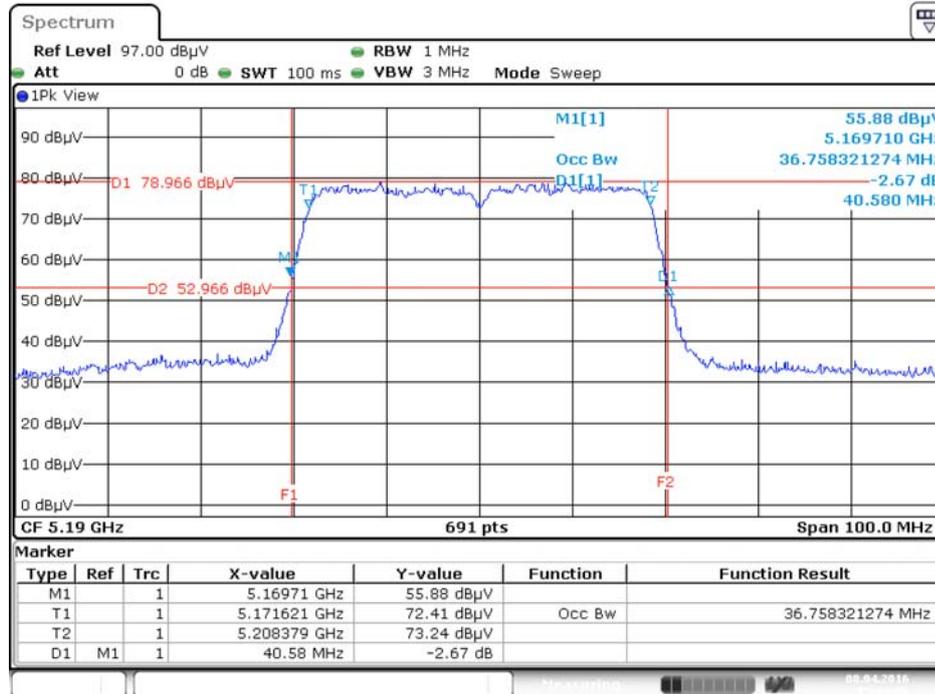
Date: 8.APR.2016 15:36:22

**26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz**



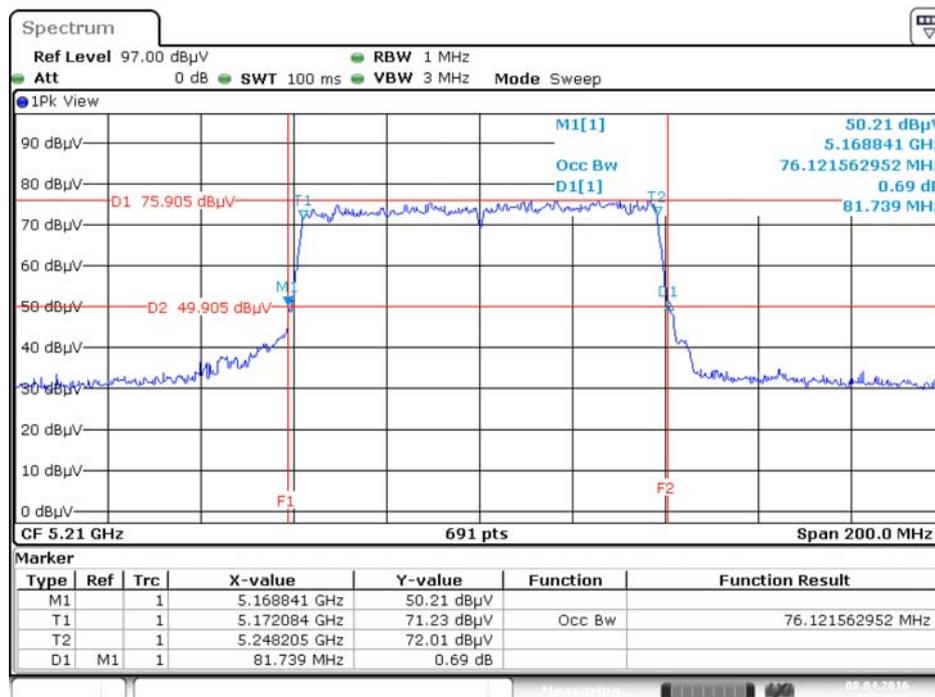
Date: 8.APR.2016 15:45:40

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



Date: 8.APR.2016 15:44:36

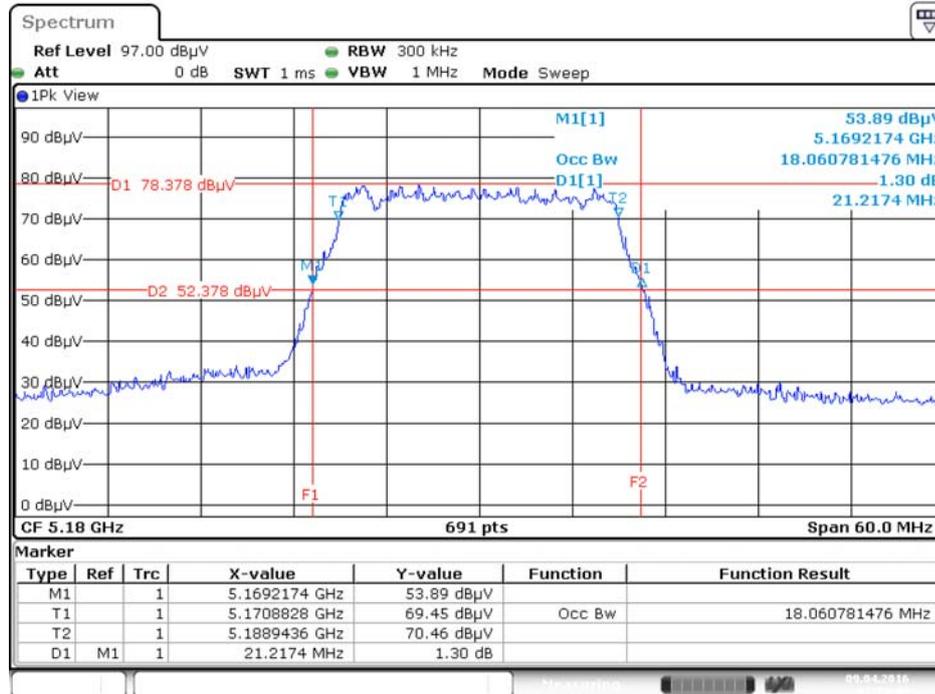
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



Date: 8.APR.2016 15:40:12

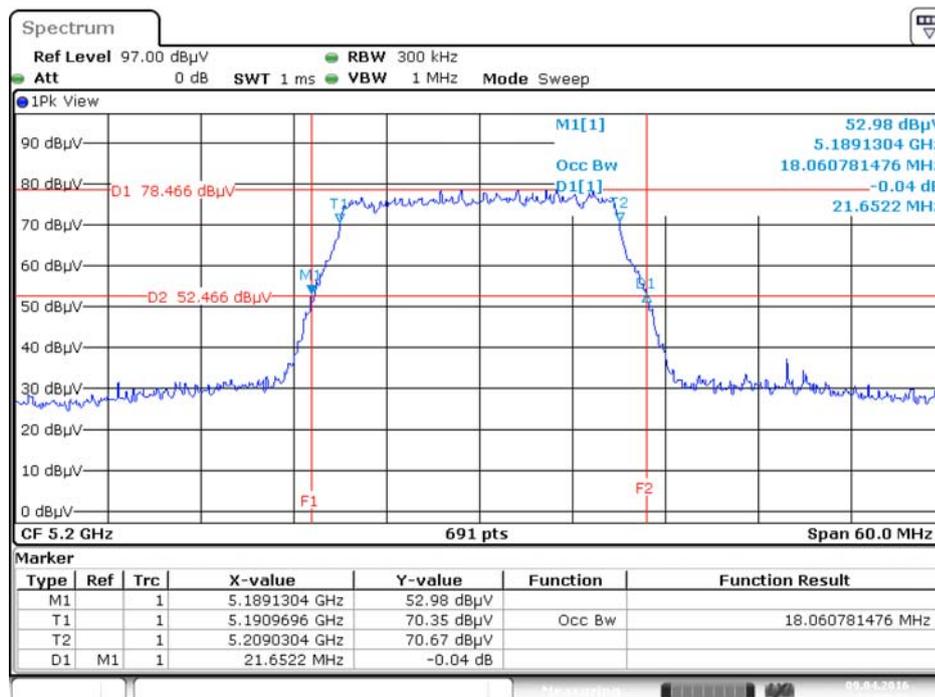
For Beamforming function:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz



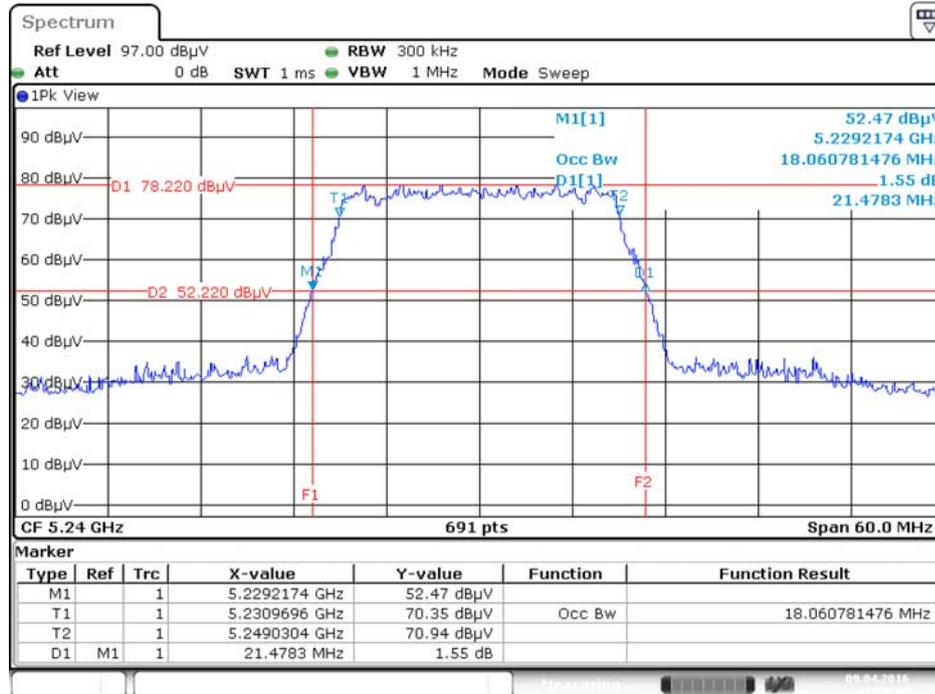
Date: 9.APR.2016 02:24:50

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz



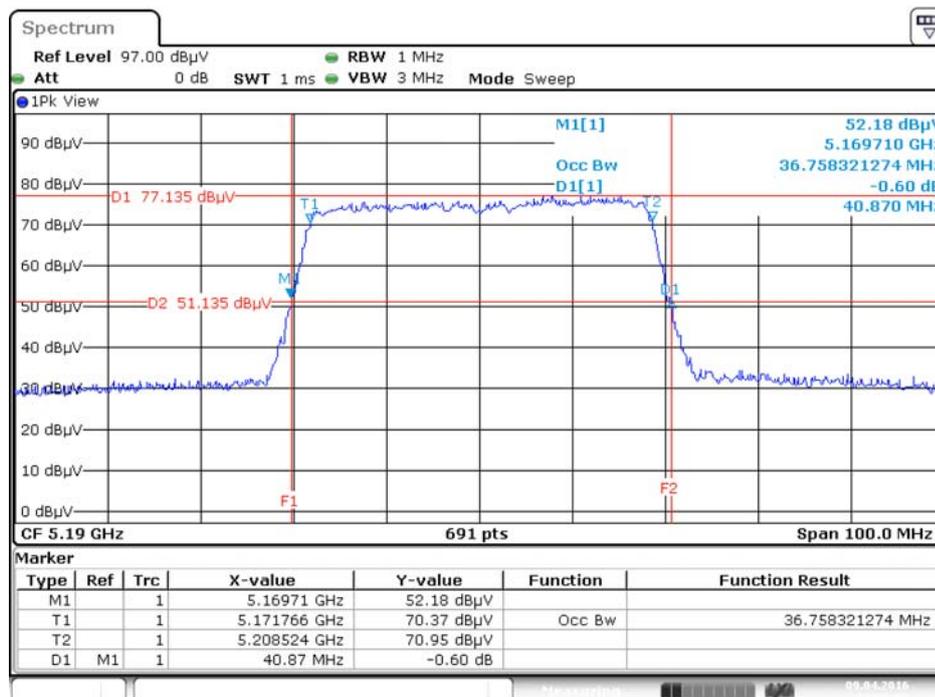
Date: 9.APR.2016 02:25:22

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



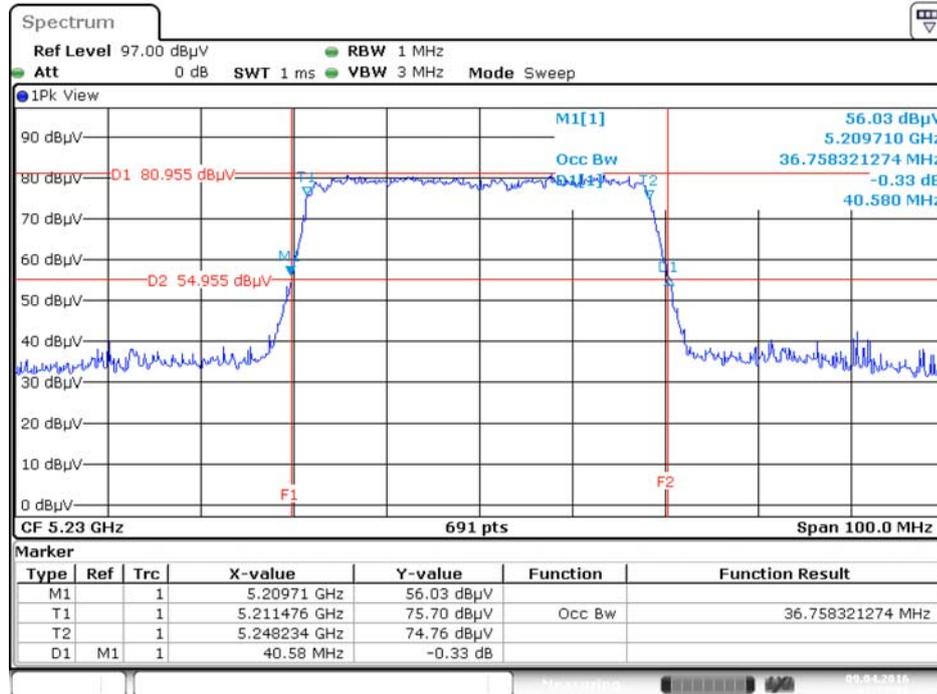
Date: 9.APR.2016 02:25:44

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



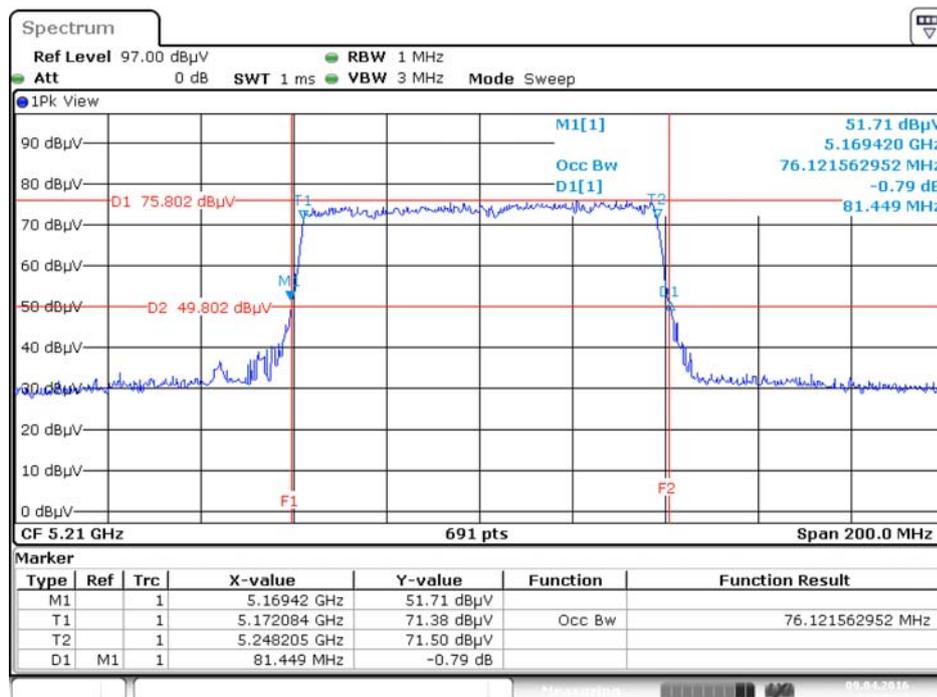
Date: 9.APR.2016 02:26:53

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5230 MHz



Date: 9.APR.2016 02:27:17

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



Date: 9.APR.2016 02:28:34

### 4.3. Maximum Conducted Output Power Measurement

#### 4.3.1. Limit

Frequency Band	Limit
<input checked="" type="checkbox"/> 5.15~5.25 GHz	
Operating Mode	
<input type="checkbox"/> Outdoor access point	<p>The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).</p>
<input checked="" type="checkbox"/> Indoor access point	<p>The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>
<input type="checkbox"/> Fixed point-to-point access points	<p>The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.</p>
<input type="checkbox"/> Client devices	<p>The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>

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

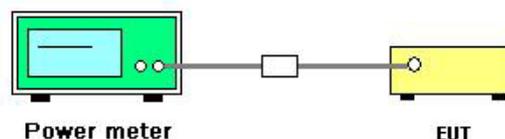
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

#### 4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01r03 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter).
3. Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

#### 4.3.4. Test Setup Layout



#### 4.3.5. Test Deviation

There is no deviation with the original standard.

#### 4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.3.7. Test Result of Maximum Conducted Output Power

Temperature	23°C	Humidity	45%
Test Engineer	Wen Chao	Test Date	Apr. 08, 2016~Apr. 09, 2016

For Non-beamforming function:

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11a	5180 MHz	19.85	20.19	19.86	19.98	25.99	30.00	Complies
	5200 MHz	20.93	20.72	20.63	20.35	26.68	30.00	Complies
	5240 MHz	20.89	20.63	20.57	20.86	26.76	30.00	Complies
802.11ac MCS0/Nss1 VHT20	5180 MHz	19.45	19.51	19.24	19.21	25.38	30.00	Complies
	5200 MHz	21.09	20.76	20.73	20.41	26.77	30.00	Complies
	5240 MHz	21.11	20.82	20.53	21.06	26.91	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	16.79	16.82	16.68	16.42	22.70	30.00	Complies
	5230 MHz	22.56	22.13	21.85	22.24	28.22	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	16.26	16.06	16.41	16.39	22.30	30.00	Complies
802.11ac MCS0/Nss4 VHT20	5180 MHz	19.92	20.15	19.95	20.09	26.05	30.00	Complies
802.11ac MCS0/Nss4 VHT40	5190 MHz	18.49	18.43	18.37	18.47	24.46	30.00	Complies
802.11ac MCS0/Nss4 VHT80	5210 MHz	17.45	17.62	17.60	17.69	23.61	30.00	Complies

## For Beamforming function:

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11ac MCS0/Nss1 VHT20	5180 MHz	19.43	20.11	19.84	19.82	25.83	26.51	Complies
	5200 MHz	20.22	20.47	20.52	20.55	26.46	26.51	Complies
	5240 MHz	20.19	20.52	20.07	20.81	26.43	26.51	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	16.89	16.31	16.63	16.82	22.69	26.51	Complies
	5230 MHz	20.29	20.37	20.31	20.47	26.38	26.51	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	18.12	18.79	18.12	18.58	24.43	26.51	Complies

Note:  $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right] = 9.49\text{dBi} > 6\text{dBi}$ , so limit =  $30 - (9.49 - 6) = 26.51\text{dBm}$ .

## 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
<input checked="" type="checkbox"/>	5.15~5.25 GHz	
	Operating Mode	
<input type="checkbox"/>	Outdoor access point	17 dBm/MHz
<input checked="" type="checkbox"/>	Indoor access point	17 dBm/MHz
<input type="checkbox"/>	Fixed point-to-point access points	17 dBm/MHz
<input type="checkbox"/>	Client devices	11 dBm/MHz
<input type="checkbox"/>	5.725~5.85 GHz	30 dBm/500kHz

### 4.4.2. Measuring Instruments and Setting

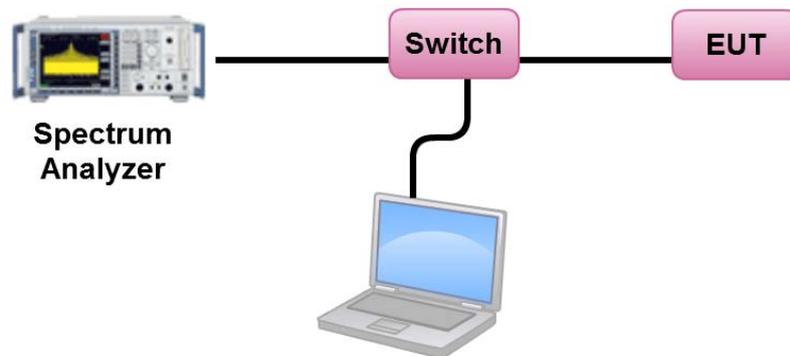
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

#### 4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01r03 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD).
3. Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements and sum the spectra across the outputs.
4. For 5.725~5.85 GHz, the measured result of PSD level must add  $10\log(500\text{kHz}/\text{RBW})$  and the final result should  $\leq 30$  dBm.

#### 4.4.4. Test Setup Layout



#### 4.4.5. Test Deviation

There is no deviation with the original standard.

#### 4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.4.7. Test Result of Power Spectral Density

Temperature	23°C	Humidity	45%
Test Engineer	Wen Chao		

For Non-beamforming function:

Mode	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11a	5180 MHz	12.60	13.51	Complies
	5200 MHz	13.26	13.51	Complies
	5240 MHz	13.44	13.51	Complies
802.11ac MCS0/Nss1 VHT20	5180 MHz	12.00	13.51	Complies
	5200 MHz	13.30	13.51	Complies
	5240 MHz	13.44	13.51	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	6.67	13.51	Complies
	5230 MHz	11.98	13.51	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	3.25	13.51	Complies
802.11ac MCS0/Nss4 VHT20	5180 MHz	12.60	17.00	Complies
802.11ac MCS0/Nss4 VHT40	5190 MHz	8.42	17.00	Complies
802.11ac MCS0/Nss4 VHT80	5210 MHz	4.54	17.00	Complies

Note: 802.11ac MCS0/Nss1 VHT20/40/80:

$$\text{Directional Gain} = 10 \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left( \sum_{k=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 9.49 \text{dBi} > 6 \text{dBi}, \text{ so limit} = 17 - (9.49 - 6) = 13.51 \text{dBm/MHz}.$$

## For Beamforming function:

Mode	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
802.11ac MCS0/Nss1 VHT20	5180 MHz	12.69	13.51	Complies
	5200 MHz	13.16	13.51	Complies
	5240 MHz	13.03	13.51	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	6.28	13.51	Complies
	5230 MHz	10.38	13.51	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	5.38	13.51	Complies

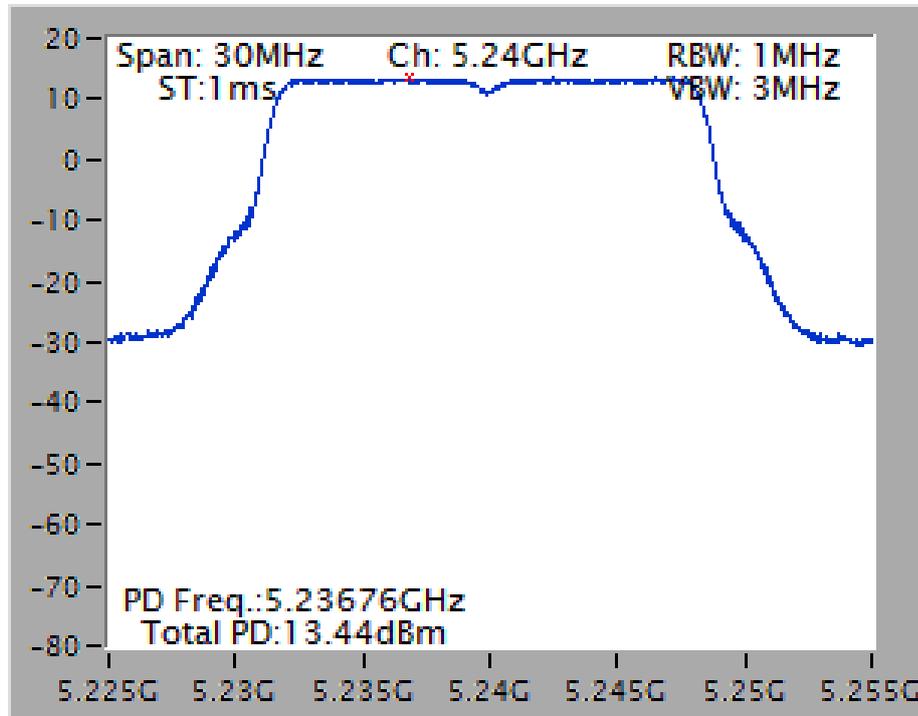
Note:  $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right] = 9.49\text{dBi} > 6\text{dBi}$ , so limit =  $17 - (9.49 - 6) = 13.51\text{ dBm/MHz}$ .

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

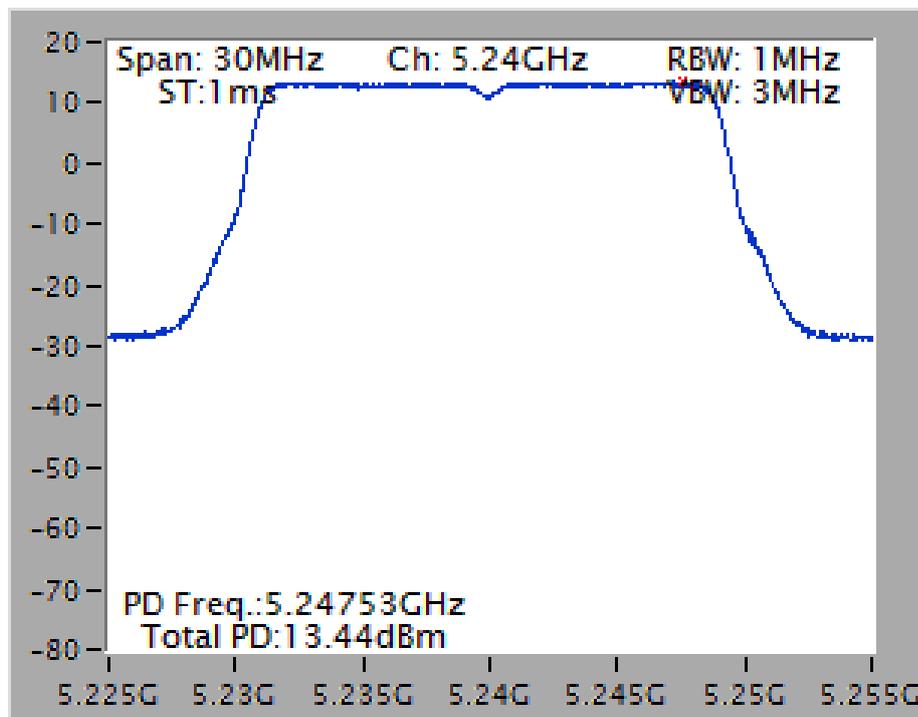
For plots, only the channel with worse result was shown.

For Non-beamforming function:

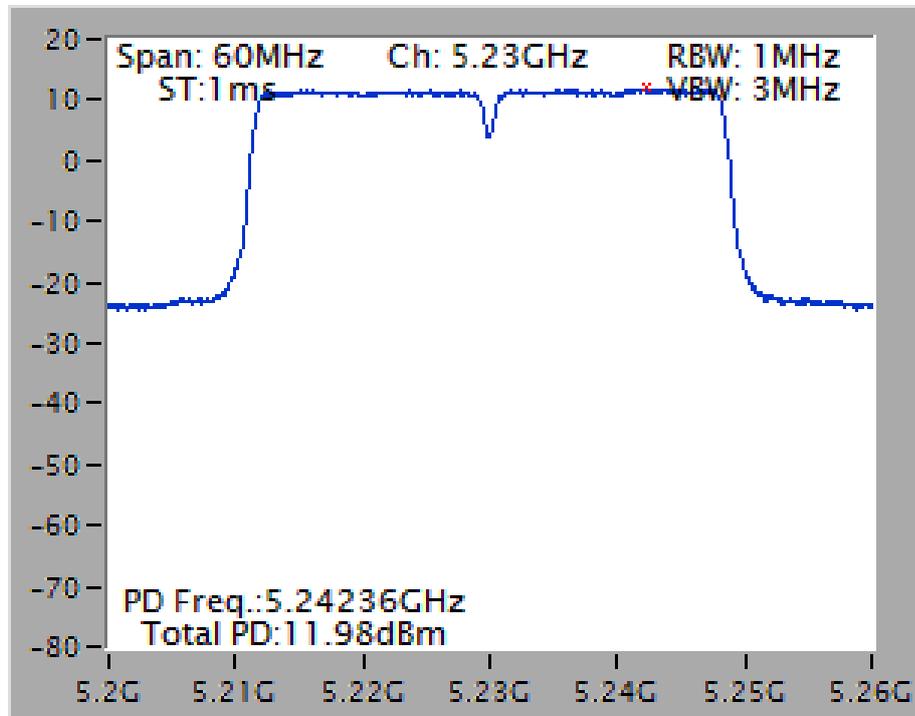
Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



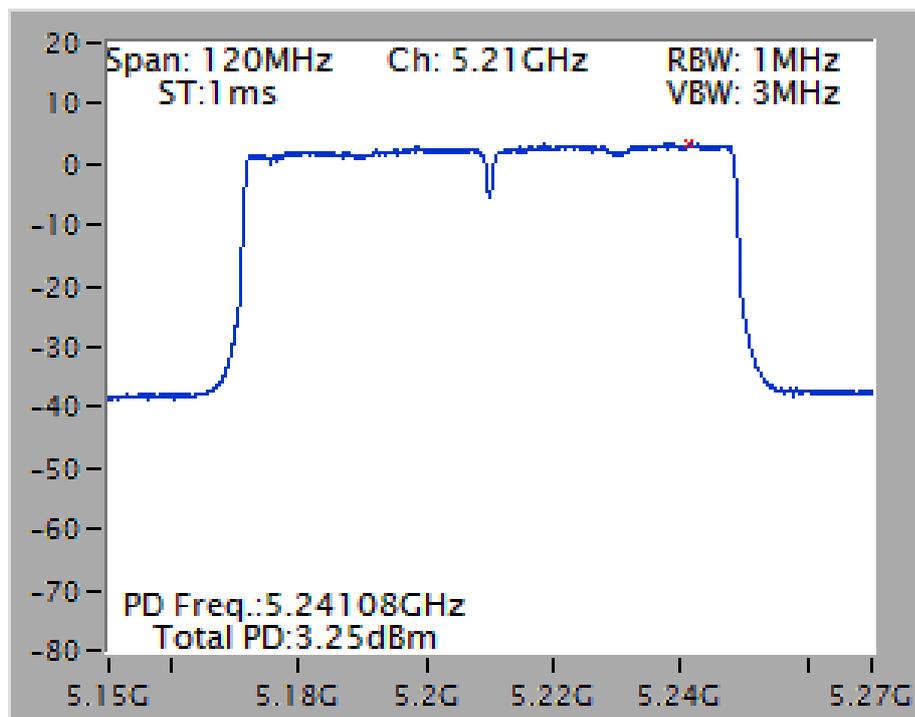
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



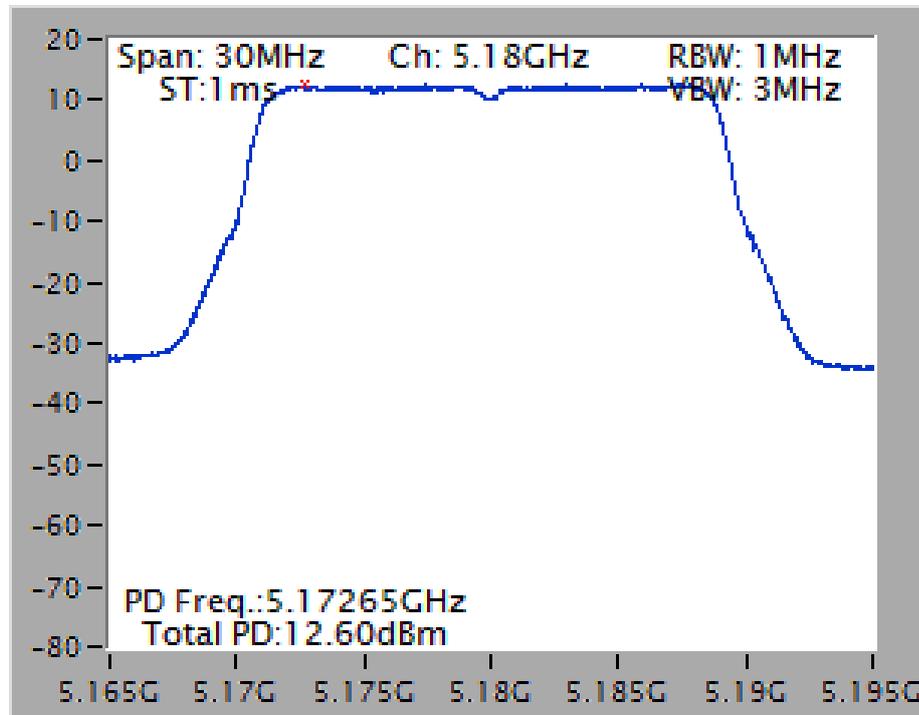
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5230 MHz



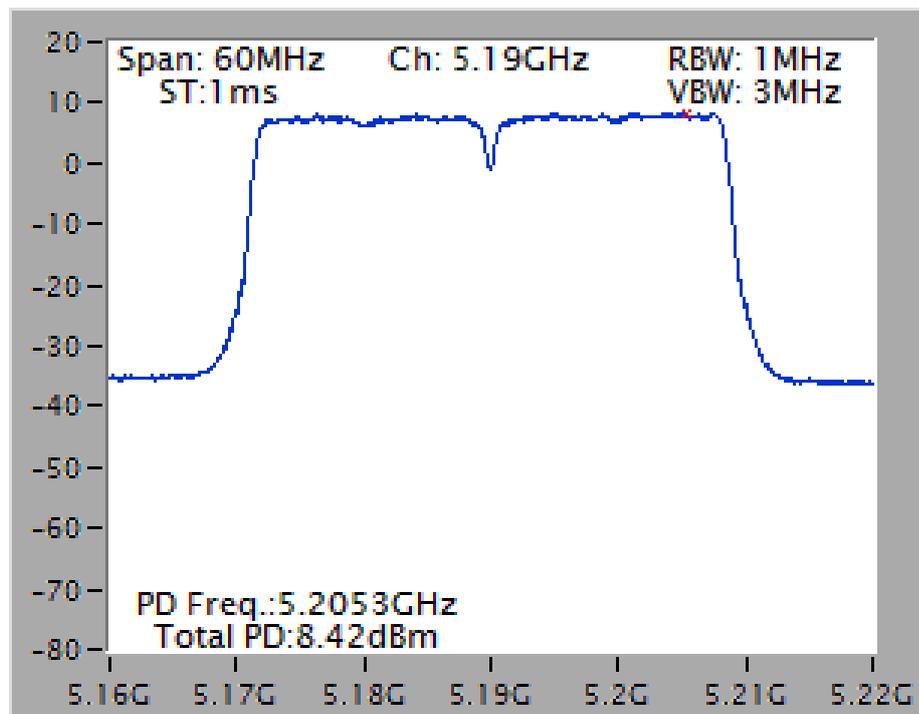
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



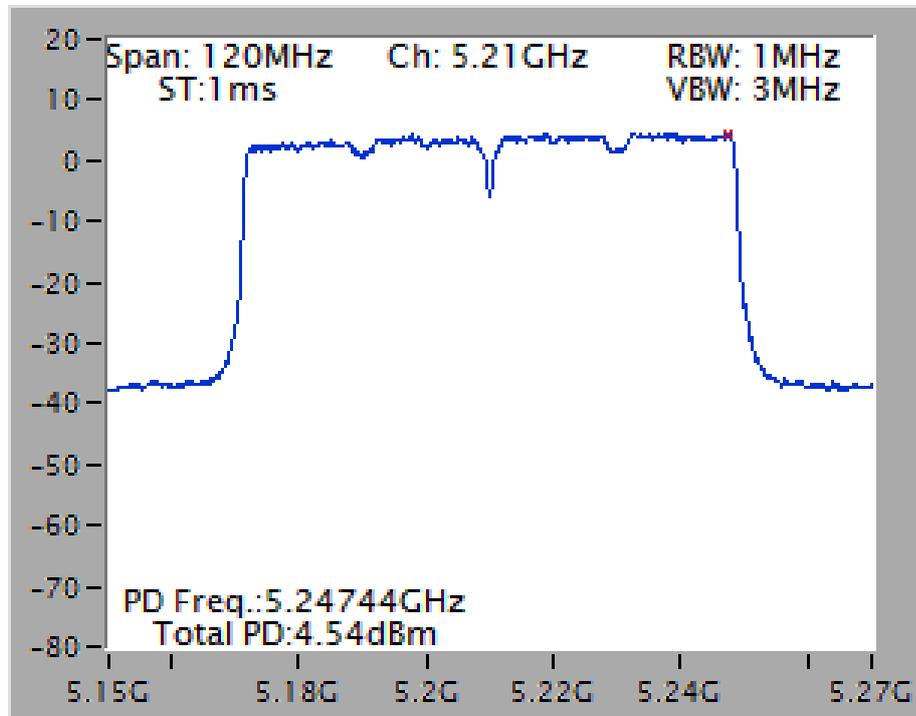
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz



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

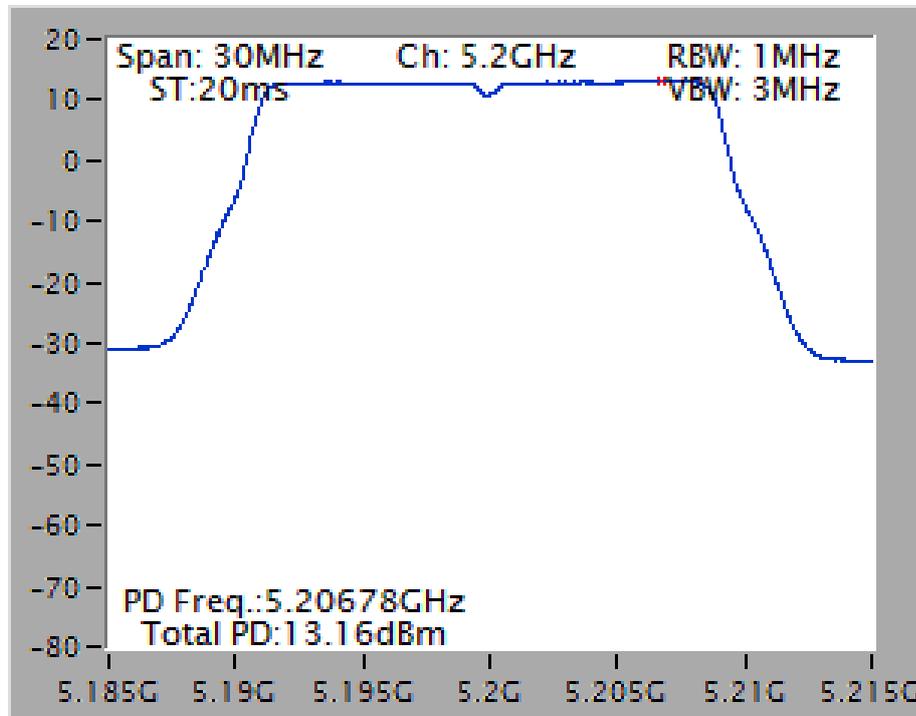


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss4 VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz

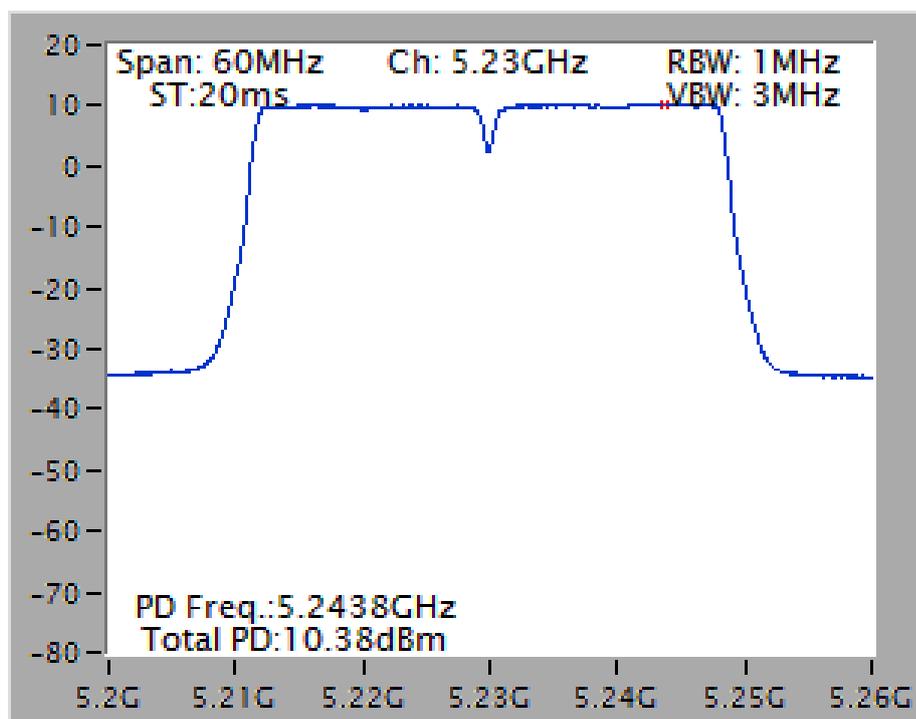


For Beamforming function:

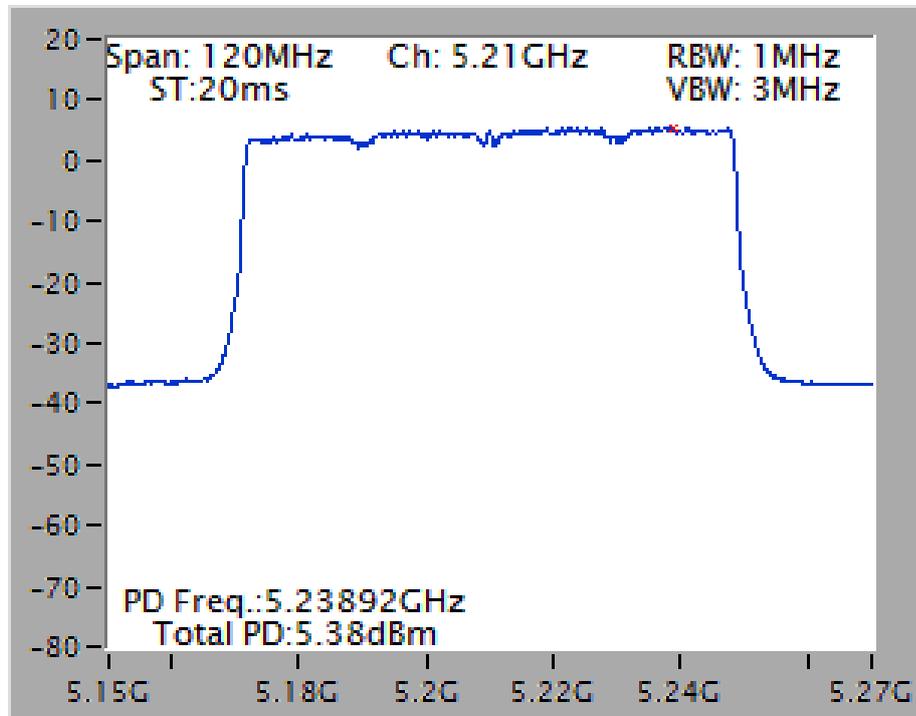
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5230 MHz



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



## 4.5. Radiated Emissions Measurement

### 4.5.1. Limit

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

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 (micovolts/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)	1 MHz / 3MHz for Peak, 1 MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1 MHz / 3MHz for peak

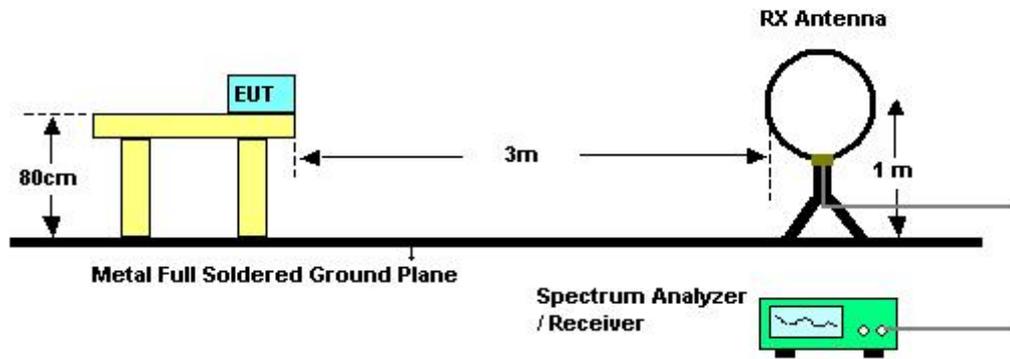
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

### 4.5.3. Test Procedures

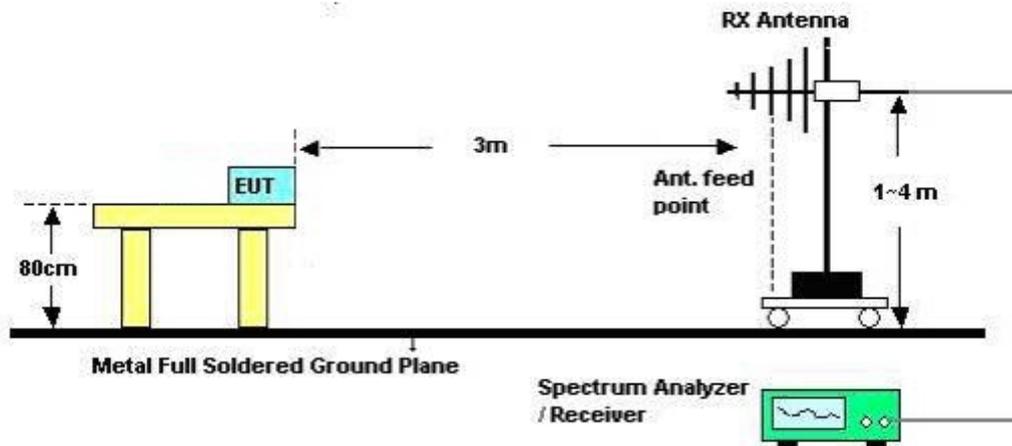
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting 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

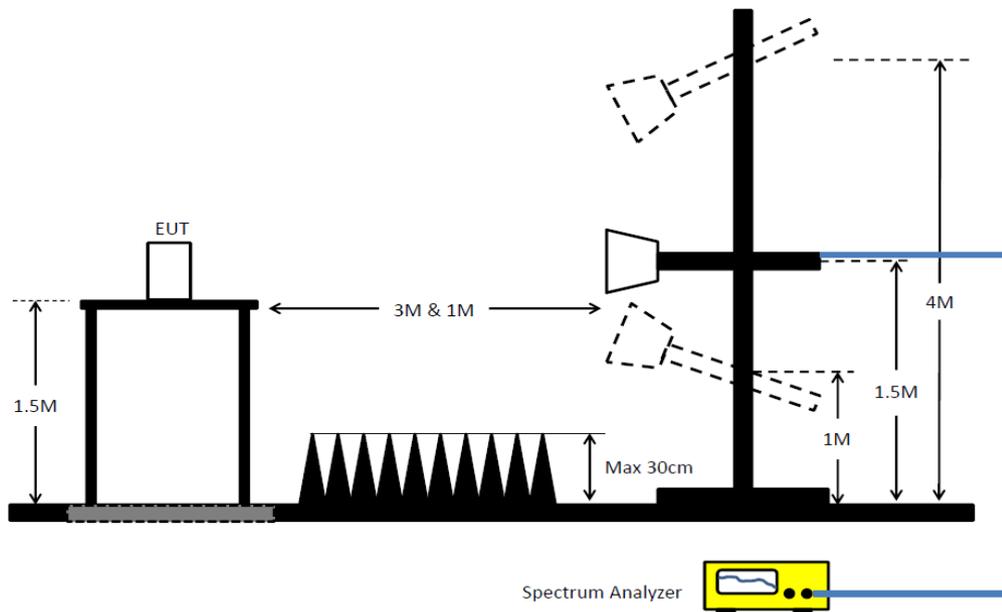
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



#### 4.5.5. Test Deviation

There is no deviation with the original standard.

#### 4.5.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

#### 4.5.7. Results of Radiated Emissions (9kHz~30MHz)

<b>Temperature</b>	22°C	<b>Humidity</b>	54%
<b>Test Engineer</b>	Steven Liang & Welson Chen	<b>Configurations</b>	Normal Link
<b>Test Date</b>	Jan. 24, 2017	<b>Test Mode</b>	Mode 2

<b>Freq. (MHz)</b>	<b>Level (dBuV)</b>	<b>Over Limit (dB)</b>	<b>Limit Line (dBuV)</b>	<b>Remark</b>
-	-	-	-	See Note

Note:

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

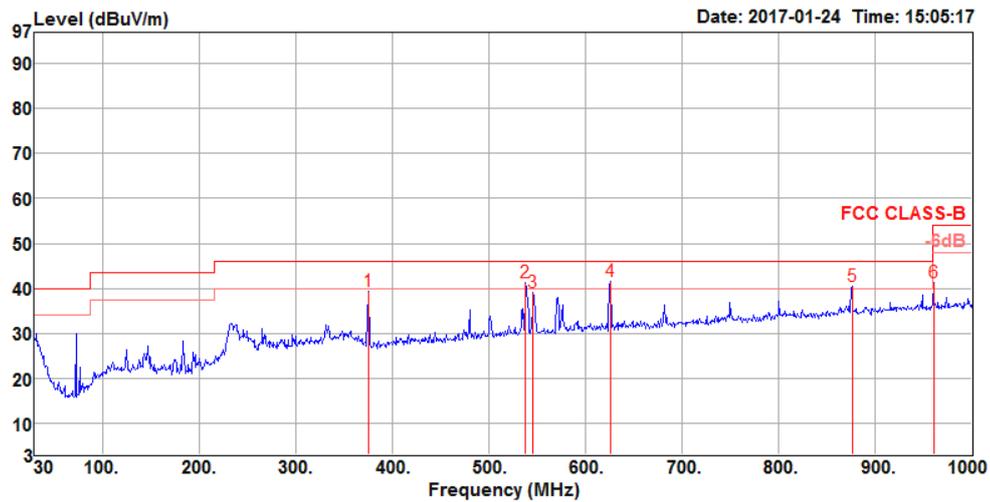
Distance extrapolation factor =  $40 \log(\text{specific distance} / \text{test distance})$  (dB);

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

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

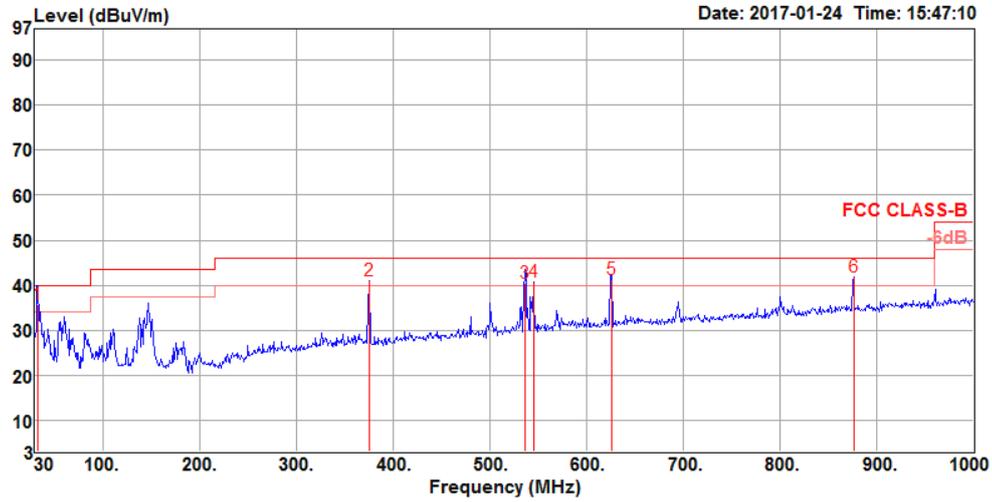
Temperature	22°C	Humidity	54%
Test Engineer	Steven Liang & Welson Chen	Configurations	Normal Link
Test Mode	Mode 2		

Horizontal



	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	375.32	39.41	46.00	-6.59	46.51	3.40	21.78	32.28	100	264	Peak	HORIZONTAL
2	538.28	41.17	46.00	-4.83	45.12	4.09	24.33	32.37	200	124	Peak	HORIZONTAL
3	546.04	39.10	46.00	-6.90	42.93	4.12	24.42	32.37	200	172	Peak	HORIZONTAL
4	625.58	41.59	46.00	-4.41	44.37	4.44	25.16	32.38	175	243	Peak	HORIZONTAL
5	875.84	40.58	46.00	-5.42	39.88	5.30	27.20	31.80	125	329	Peak	HORIZONTAL
6	960.23	41.27	54.00	-12.73	39.11	5.55	27.74	31.13	100	74	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	32.91	35.86	40.00	-4.14	43.31	0.92	24.03	32.40	100	155	QP	VERTICAL
2	375.32	41.07	46.00	-4.93	48.17	3.40	21.78	32.28	200	28	Peak	VERTICAL
3	536.34	40.53	46.00	-5.47	44.50	4.09	24.30	32.36	175	205	QP	VERTICAL
4	545.07	40.67	46.00	-5.33	44.50	4.12	24.42	32.37	125	227	Peak	VERTICAL
5	625.58	41.33	46.00	-4.67	44.11	4.44	25.16	32.38	125	342	QP	VERTICAL
6	875.84	41.79	46.00	-4.21	41.09	5.30	27.20	31.80	100	353	Peak	VERTICAL

**Note:**

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

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

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

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

For Non-beamforming function:

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

##### Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm	
1	15539.46	59.92	74.00	-14.08	44.95	11.45	38.16	34.64	220	235 Peak	HORIZONTAL
2	15539.76	47.04	54.00	-6.96	32.07	11.45	38.16	34.64	220	235 Average	HORIZONTAL

##### Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm	
1	15538.34	59.75	74.00	-14.25	44.78	11.45	38.16	34.64	84	224 Peak	VERTICAL
2	15539.42	47.00	54.00	-7.00	32.03	11.45	38.16	34.64	84	224 Average	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11a CH 40 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15601.10	47.52	54.00	-6.48	32.41	11.50	38.29	34.68	307	192	Average	HORIZONTAL
2	15601.32	60.64	74.00	-13.36	45.53	11.50	38.29	34.68	307	192	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15601.40	60.09	74.00	-13.91	44.98	11.50	38.29	34.68	224	209	Peak	VERTICAL
2	15604.96	47.44	54.00	-6.56	32.33	11.50	38.29	34.68	224	209	Average	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11a CH 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15718.82	47.67	54.00	-6.33	32.50	11.56	38.42	34.81	177	219	Average	HORIZONTAL
2	15723.36	60.64	74.00	-13.36	45.47	11.56	38.42	34.81	177	219	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15718.80	47.72	54.00	-6.28	32.55	11.56	38.42	34.81	62	236	Average	VERTICAL
2	15721.92	61.34	74.00	-12.66	46.17	11.56	38.42	34.81	62	236	Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15536.18	59.62	74.00	-14.38	44.65	11.45	38.16	34.64	128	193 Peak	HORIZONTAL
2	15542.66	47.13	54.00	-6.87	32.16	11.45	38.16	34.64	128	193 Average	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15539.64	60.35	74.00	-13.65	45.38	11.45	38.16	34.64	222	220 Peak	VERTICAL
2	15542.00	47.28	54.00	-6.72	32.31	11.45	38.16	34.64	222	220 Average	VERTICAL

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

### Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15596.36	60.03	74.00	-13.97	45.00	11.48	38.23	34.68	167	173 Peak	HORIZONTAL
2	15603.48	47.53	54.00	-6.47	32.42	11.50	38.29	34.68	167	173 Average	HORIZONTAL

### Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15602.60	47.65	54.00	-6.35	32.54	11.50	38.29	34.68	252	208 Average	VERTICAL
2	15603.70	60.47	74.00	-13.53	45.36	11.50	38.29	34.68	252	208 Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15715.62	47.78	54.00	-6.22	32.61	11.56	38.42	34.81	282	192	Average	HORIZONTAL
2	15723.46	61.00	74.00	-13.00	45.83	11.56	38.42	34.81	282	192	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15718.66	47.79	54.00	-6.21	32.62	11.56	38.42	34.81	157	198	Average	VERTICAL
2	15722.74	60.66	74.00	-13.34	45.49	11.56	38.42	34.81	157	198	Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15569.46	60.38	74.00	-13.62	45.35	11.48	38.23	34.68	184	192 Peak	HORIZONTAL
2	15573.40	47.52	54.00	-6.48	32.49	11.48	38.23	34.68	184	192 Average	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15568.20	47.49	54.00	-6.51	32.46	11.48	38.23	34.68	70	238 Average	VERTICAL
2	15569.04	60.34	74.00	-13.66	45.31	11.48	38.23	34.68	70	238 Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15685.04	47.95	54.00	-6.05	32.84	11.53	38.35	34.77	19	244	Average	HORIZONTAL
2	15687.30	60.85	74.00	-13.15	45.74	11.53	38.35	34.77	19	244	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15686.42	47.98	54.00	-6.02	32.87	11.53	38.35	34.77	274	224	Average	VERTICAL
2	15688.94	60.98	74.00	-13.02	45.87	11.53	38.35	34.77	274	224	Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 22, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15631.38	47.99	54.00	-6.01	32.93	11.50	38.29	34.73	229	224	Average	HORIZONTAL
2	15633.88	61.20	74.00	-12.80	46.14	11.50	38.29	34.73	229	224	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15629.98	60.93	74.00	-13.07	45.87	11.50	38.29	34.73	328	199	Peak	VERTICAL
2	15633.38	48.07	54.00	-5.93	33.01	11.50	38.29	34.73	328	199	Average	VERTICAL

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss4 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 23, 2016		

### Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15532.56	60.69	74.00	-13.31	45.72	11.45	38.16	34.64	199	178 Peak	HORIZONTAL
2	15538.16	47.44	54.00	-6.56	32.47	11.45	38.16	34.64	199	178 Average	HORIZONTAL

### Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15533.56	60.77	74.00	-13.23	45.80	11.45	38.16	34.64	311	194 Peak	VERTICAL
2	15536.44	47.46	54.00	-6.54	32.49	11.45	38.16	34.64	311	194 Average	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss4 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 23, 2016		

**Horizontal**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15572.84	60.52	74.00	-13.48	45.49	11.48	38.23	34.68	207	217 Peak	HORIZONTAL
2	15574.80	47.62	54.00	-6.38	32.59	11.48	38.23	34.68	207	217 Average	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15567.36	60.34	74.00	-13.66	45.31	11.48	38.23	34.68	109	233 Peak	VERTICAL
2	15575.64	47.75	54.00	-6.25	32.72	11.48	38.23	34.68	109	233 Average	VERTICAL

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss4 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 23, 2016		

### Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15626.16	60.45	74.00	-13.55	45.39	11.50	38.29	34.73	306	194 Peak	HORIZONTAL
2	15629.36	48.19	54.00	-5.81	33.13	11.50	38.29	34.73	306	194 Average	HORIZONTAL

### Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15624.64	61.35	74.00	-12.65	46.29	11.50	38.29	34.73	137	216 Peak	VERTICAL
2	15633.80	47.97	54.00	-6.03	32.91	11.50	38.29	34.73	137	216 Average	VERTICAL

## For Beamforming function:

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 25, 2016		

**Horizontal**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	deg	cm		
			dBuV/m	dB	dBuV	dB	dB/m	dB			
1	15530.00	59.49	74.00	-14.51	44.52	11.45	38.16	34.64	72	146 Peak	HORIZONTAL
2	15534.88	46.32	54.00	-7.68	31.35	11.45	38.16	34.64	72	146 Average	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	deg	cm		
			dBuV/m	dB	dBuV	dB	dB/m	dB			
1	15534.92	46.47	54.00	-7.53	31.50	11.45	38.16	34.64	83	114 Average	VERTICAL
2	15549.52	59.31	74.00	-14.69	44.34	11.45	38.16	34.64	83	114 Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 25, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15600.32	46.83	54.00	-7.17	31.80	11.48	38.23	34.68	133	145	Average	HORIZONTAL
2	15609.00	60.07	74.00	-13.93	44.96	11.50	38.29	34.68	133	145	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15592.56	60.14	74.00	-13.86	45.11	11.48	38.23	34.68	126	129	Peak	VERTICAL
2	15604.72	47.01	54.00	-6.99	31.90	11.50	38.29	34.68	126	129	Average	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 25, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15723.04	48.00	54.00	-6.00	32.83	11.56	38.42	34.81	153	168	Average	HORIZONTAL
2	15723.76	59.65	74.00	-14.35	44.48	11.56	38.42	34.81	153	168	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15710.00	47.28	54.00	-6.72	32.07	11.56	38.42	34.77	92	141	Average	VERTICAL
2	15722.64	59.96	74.00	-14.04	44.79	11.56	38.42	34.81	92	141	Peak	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 25, 2016		

**Horizontal**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15566.28	59.14	74.00	-14.86	44.11	11.48	38.23	34.68	217	203 Peak	HORIZONTAL
2	15574.20	46.68	54.00	-7.32	31.65	11.48	38.23	34.68	217	203 Average	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15560.48	58.09	74.00	-15.91	43.06	11.48	38.23	34.68	188	215 Peak	VERTICAL
2	15572.12	45.81	54.00	-8.19	30.78	11.48	38.23	34.68	188	215 Average	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 25, 2016		

**Horizontal**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15684.40	59.78	74.00	-14.22	44.67	11.53	38.35	34.77	222	210	Peak	HORIZONTAL
2	15686.52	46.95	54.00	-7.05	31.84	11.53	38.35	34.77	222	210	Average	HORIZONTAL

**Vertical**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna 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	15680.96	60.39	74.00	-13.61	45.28	11.53	38.35	34.77	244	199	Peak	VERTICAL
2	15685.32	47.63	54.00	-6.37	32.52	11.53	38.35	34.77	244	199	Average	VERTICAL



<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
<b>Test Date</b>	Feb. 25, 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	15621.00	60.04	74.00	-13.96	44.98	11.50	38.29	34.73	45	188	Peak	HORIZONTAL
2	15632.48	47.51	54.00	-6.49	32.45	11.50	38.29	34.73	45	188	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	15621.88	60.34	74.00	-13.66	45.28	11.50	38.29	34.73	13	206	Peak	VERTICAL
2	15633.32	47.94	54.00	-6.06	32.88	11.50	38.29	34.73	13	206	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 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

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

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

Frequencies (MHz)	Field Strength (microvolts/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)	1 MHz / 3MHz for Peak, 1 MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1 MHz / 3MHz for Peak
RBW / VBW (30dBc in any 100 kHz bandwidth emission)	100 kHz / 300 kHz for Peak

### 4.6.3. Test Procedures

For Radiated band edges Measurement:

The test procedure is the same as section 4.5.3.

For Radiated Emissions in non-restricted frequency bands Measurement:

Test was performed in accordance with Clause 11.11 of ANSI C63.10-2013 and/or in Section 11.0 of KDB Publication 558074.

#### 4.6.4. Test Setup Layout

For Radiated band edges Measurement:

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

For Radiated Emissions in non-restricted frequency bands Measurement:

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:

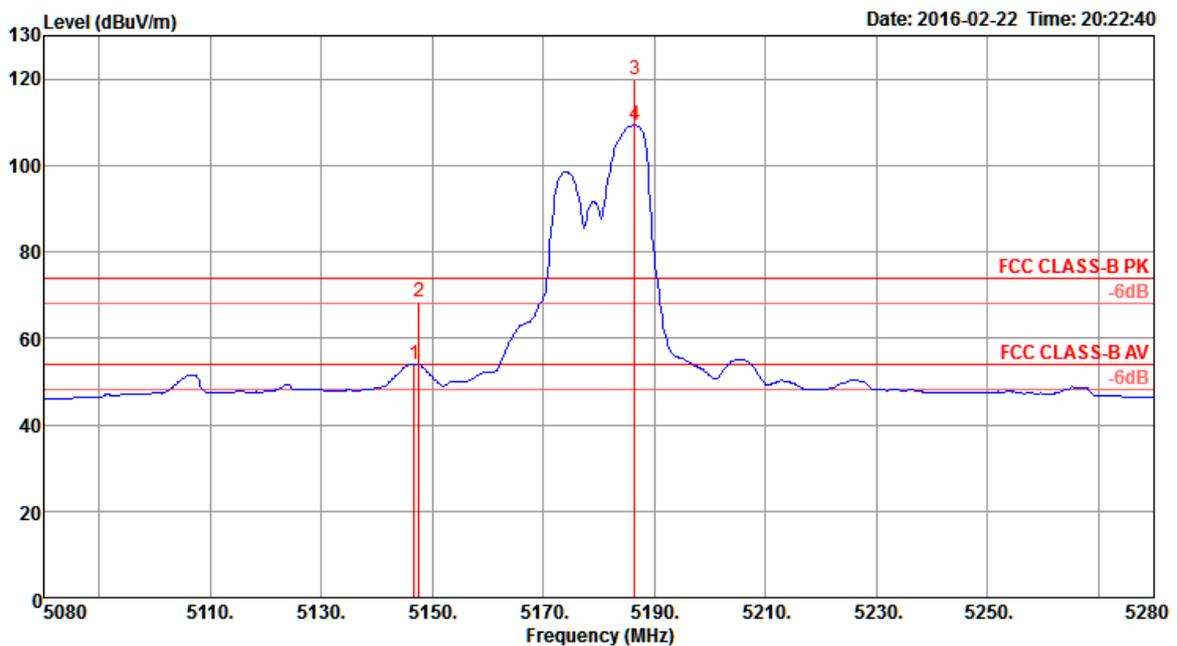
The EUT was programmed to be in beamforming transmitting mode.

#### 4.6.7. Test Result of Band Edge and Fundamental Emissions

For Non-beamforming function:

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11a CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4

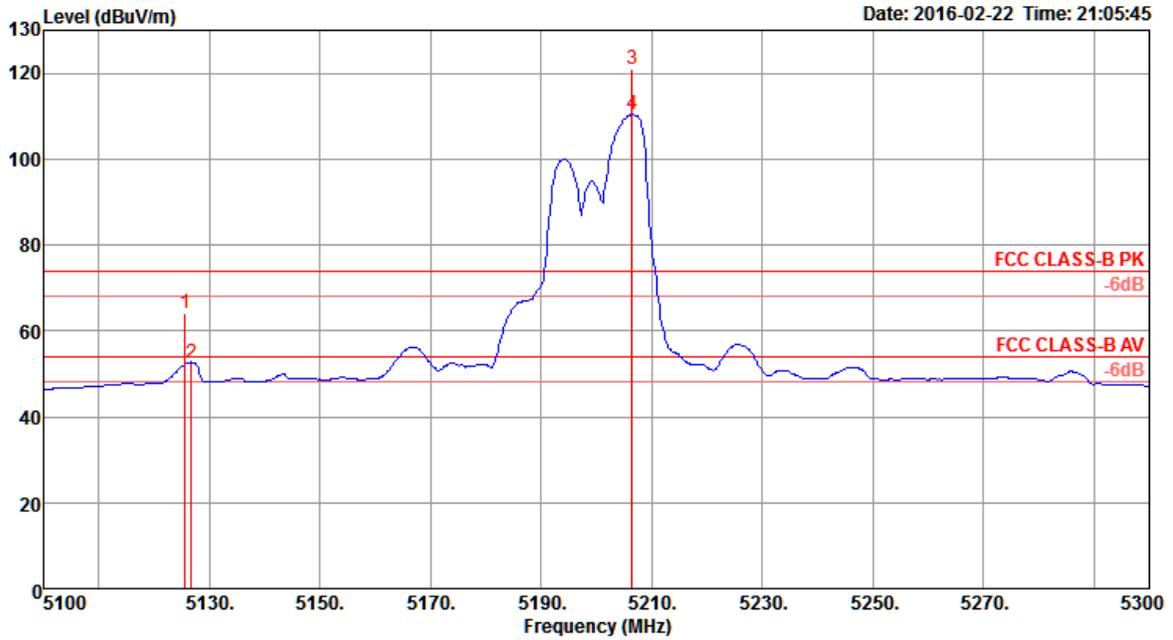
##### Channel 36



	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5146.80	53.88	54.00	-0.12	48.93	6.11	33.31	34.47	153	224	Average	VERTICAL
2	5147.60	68.40	74.00	-5.60	63.45	6.11	33.31	34.47	153	224	Peak	VERTICAL
3	5186.40	119.73			114.68	6.17	33.35	34.47	153	224	Peak	VERTICAL
4	5186.40	109.25			104.20	6.17	33.35	34.47	153	224	Average	VERTICAL

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

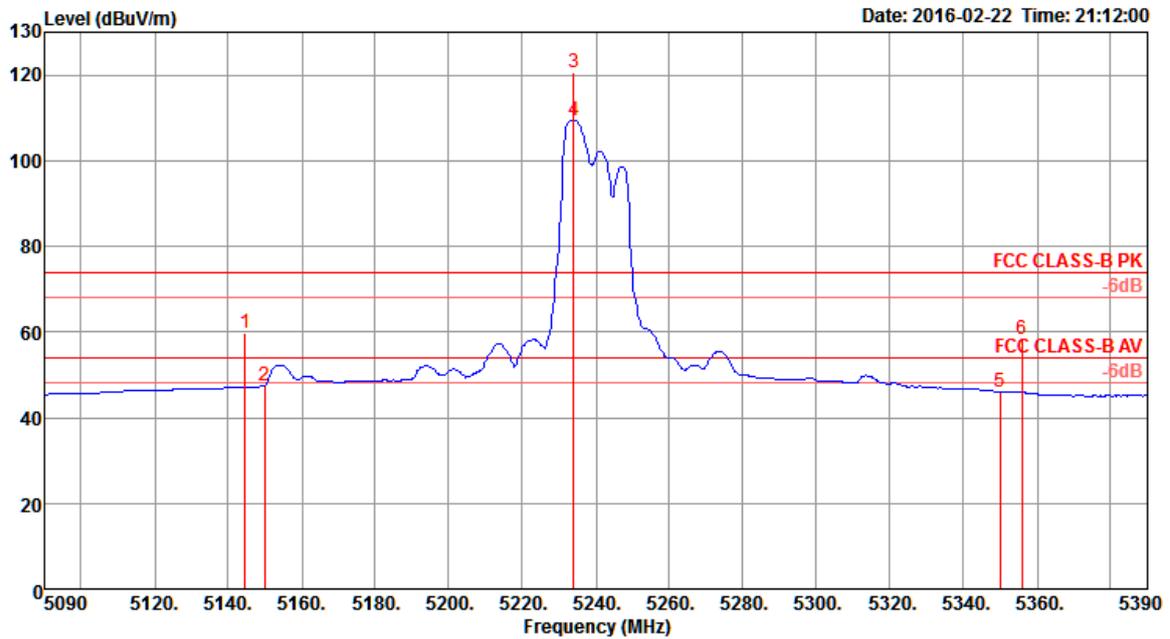
Channel 40



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5125.60	63.95	74.00	-10.05	59.11	6.04	33.27	34.47	154	214	Peak	VERTICAL
2	5126.80	52.66	54.00	-1.34	47.82	6.04	33.27	34.47	154	214	Average	VERTICAL
3	5206.40	120.94			115.77	6.24	33.40	34.47	154	214	Peak	VERTICAL
4	5206.40	110.38			105.21	6.24	33.40	34.47	154	214	Average	VERTICAL

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

Channel 48

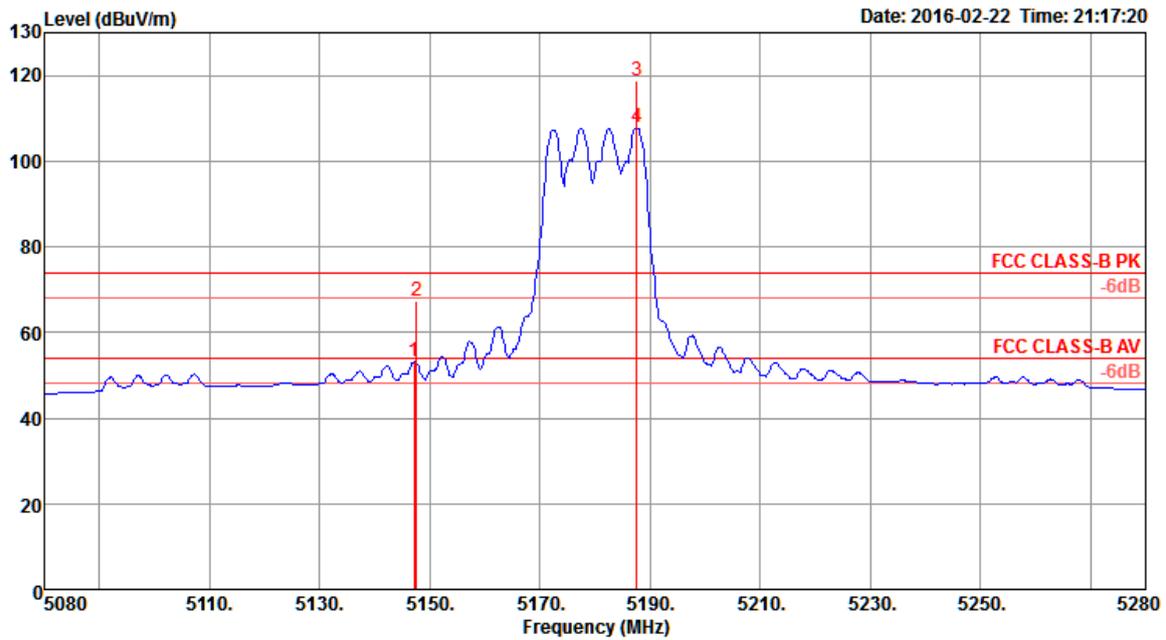


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5144.60	59.88	74.00	-14.12	54.93	6.11	33.31	34.47	170	240	Peak	VERTICAL
2	5150.00	47.43	54.00	-6.57	42.48	6.11	33.31	34.47	170	240	Average	VERTICAL
3	5234.00	120.54			115.25	6.32	33.44	34.47	170	240	Peak	VERTICAL
4	5234.00	109.54			104.25	6.32	33.44	34.47	170	240	Average	VERTICAL
5	5350.00	46.04	54.00	-7.96	40.34	6.58	33.59	34.47	170	240	Average	VERTICAL
6	5355.80	58.30	74.00	-15.70	52.54	6.62	33.61	34.47	170	240	Peak	VERTICAL

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

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4

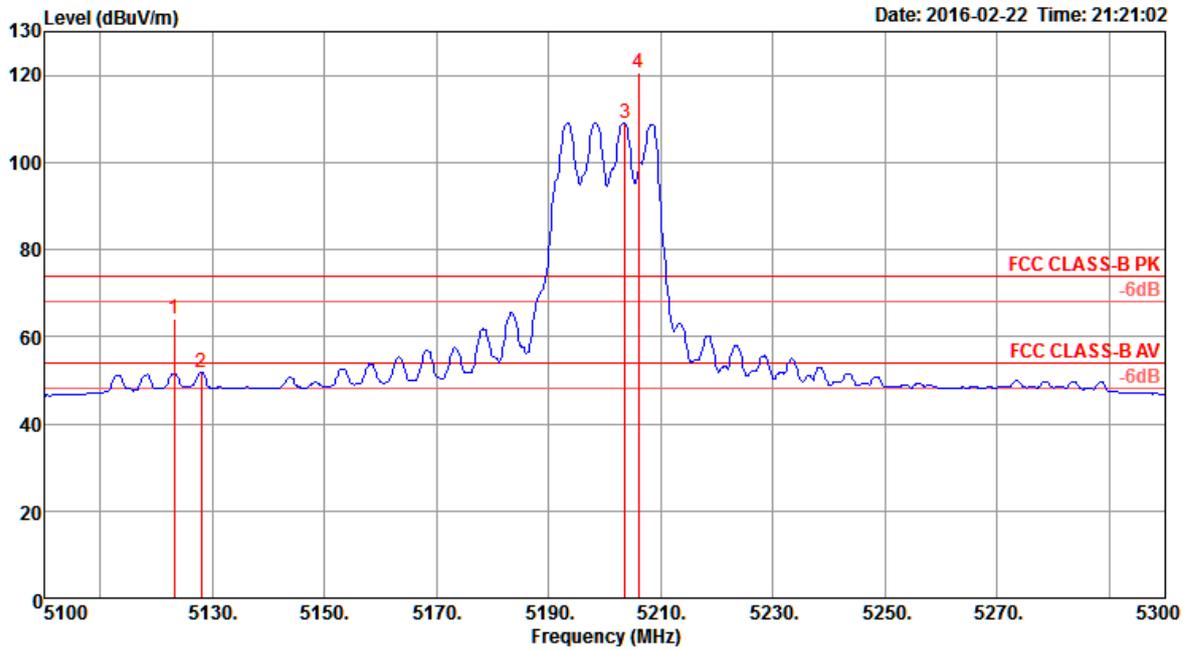
Channel 36



	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	5147.20	53.13	54.00	-0.87	48.18	6.11	33.31	34.47	322	225	Average	VERTICAL
2	5147.60	67.40	74.00	-6.60	62.45	6.11	33.31	34.47	322	225	Peak	VERTICAL
3	5187.60	118.77			113.66	6.20	33.38	34.47	322	225	Peak	VERTICAL
4	5187.60	107.74			102.63	6.20	33.38	34.47	322	225	Average	VERTICAL

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

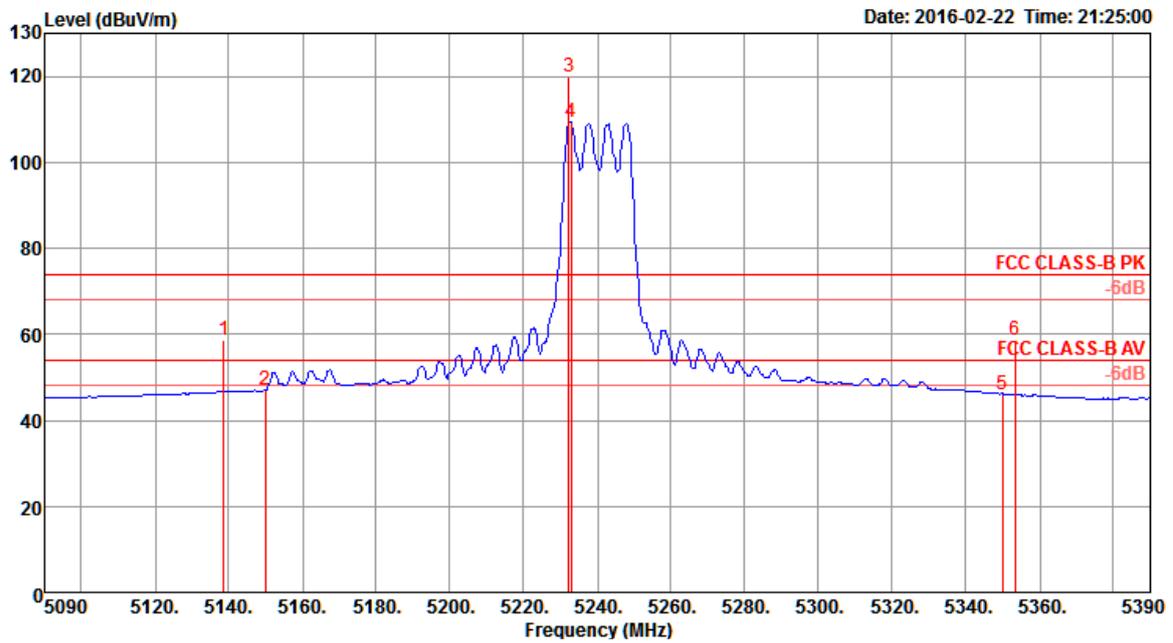
Channel 40



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5123.20	63.93	74.00	-10.07	59.09	6.04	33.27	34.47	154	225	Peak	VERTICAL
2	5128.00	51.75	54.00	-2.25	46.86	6.07	33.29	34.47	154	225	Average	VERTICAL
3	5203.60	108.96			103.79	6.24	33.40	34.47	154	225	Average	VERTICAL
4	5206.00	120.56			115.39	6.24	33.40	34.47	154	225	Peak	VERTICAL

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

Channel 48

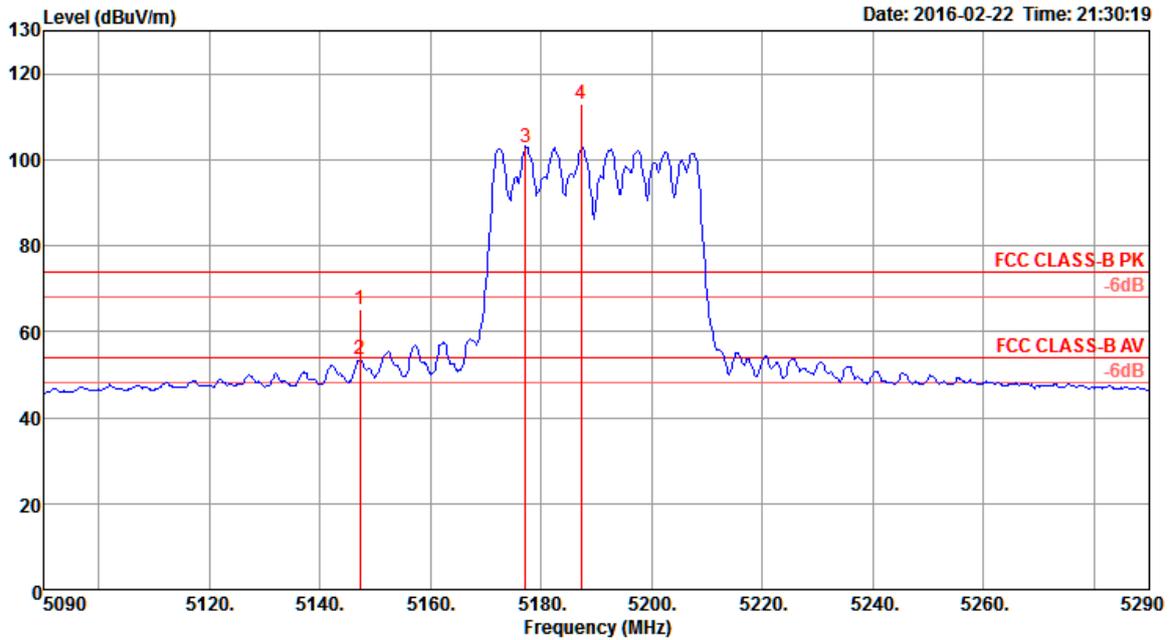


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5138.60	58.51	74.00	-15.49	53.62	6.07	33.29	34.47	319	210	Peak	VERTICAL
2	5150.00	46.96	54.00	-7.04	42.01	6.11	33.31	34.47	319	210	Average	VERTICAL
3	5232.20	120.04			114.75	6.32	33.44	34.47	319	210	Peak	VERTICAL
4	5232.80	109.30			104.01	6.32	33.44	34.47	319	210	Average	VERTICAL
5	5350.00	46.15	54.00	-7.85	40.45	6.58	33.59	34.47	319	210	Average	VERTICAL
6	5353.40	58.78	74.00	-15.22	53.08	6.58	33.59	34.47	319	210	Peak	VERTICAL

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

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4

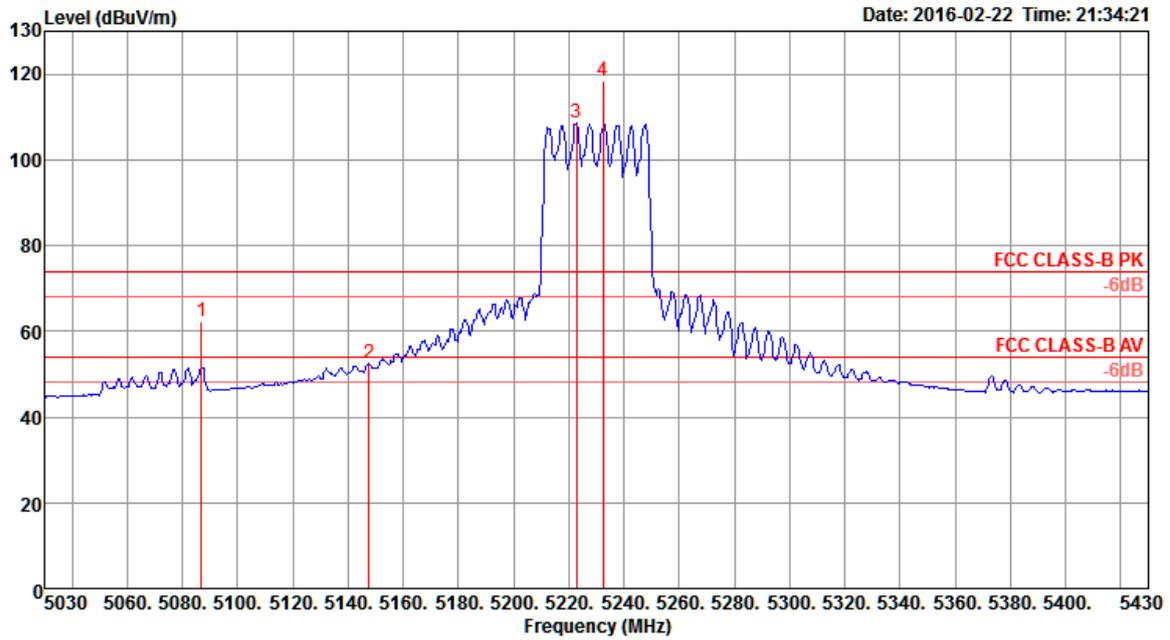
**Channel 38**



	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	5147.20	65.30	74.00	-8.70	60.35	6.11	33.31	34.47	323	225	Peak	VERTICAL
2	5147.20	53.64	54.00	-0.36	48.69	6.11	33.31	34.47	323	225	Average	VERTICAL
3	5177.20	103.01			97.96	6.17	33.35	34.47	323	225	Average	VERTICAL
4	5187.20	113.06			107.95	6.20	33.38	34.47	323	225	Peak	VERTICAL

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

Channel 46

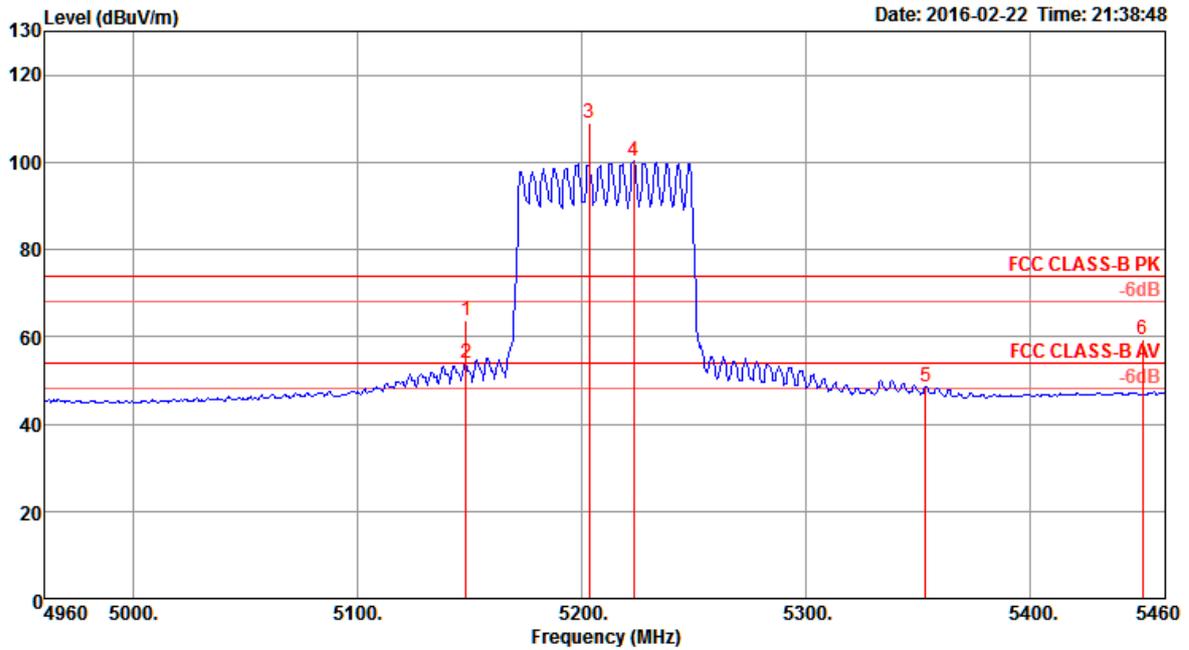


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5086.80	62.41	74.00	-11.59	57.67	5.98	33.23	34.47	321	217	Peak	VERTICAL
2	5147.60	52.43	54.00	-1.57	47.48	6.11	33.31	34.47	321	217	Average	VERTICAL
3	5222.80	108.47			103.24	6.28	33.42	34.47	321	217	Average	VERTICAL
4	5232.40	118.51			113.22	6.32	33.44	34.47	321	217	Peak	VERTICAL

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

<b>Temperature</b>	22.9°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Charlie Cheng	<b>Configurations</b>	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4

**Channel 42**

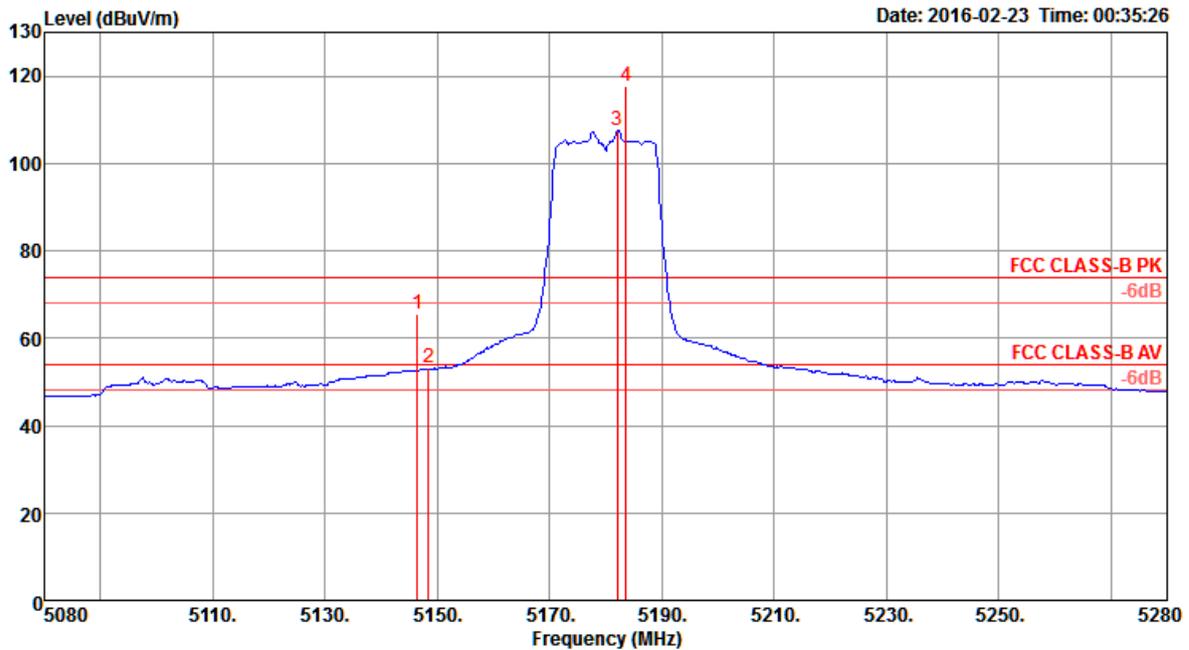


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5148.00	63.83	74.00	-10.17	58.88	6.11	33.31	34.47	319	231	Peak	VERTICAL
2	5148.00	53.85	54.00	-0.15	48.90	6.11	33.31	34.47	319	231	Average	VERTICAL
3	5203.00	109.02			103.85	6.24	33.40	34.47	319	231	Peak	VERTICAL
4	5223.00	100.18			94.95	6.28	33.42	34.47	319	231	Average	VERTICAL
5	5353.00	48.56	54.00	-5.44	42.86	6.58	33.59	34.47	319	231	Average	VERTICAL
6	5450.00	59.43	74.00	-14.57	53.37	6.79	33.74	34.47	319	231	Peak	VERTICAL

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

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss4 VHT20 CH 36 Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel 36

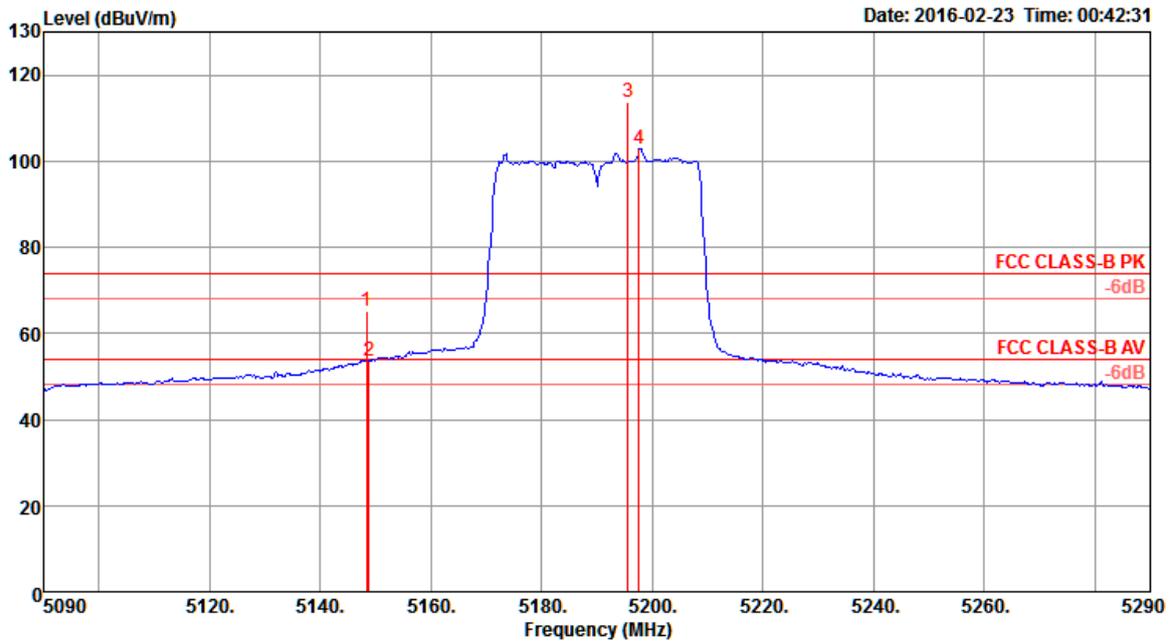


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5146.40	65.51	74.00	-8.49	60.56	6.11	33.31	34.47	321	234	Peak	VERTICAL
2	5148.40	53.40	54.00	-0.60	48.45	6.11	33.31	34.47	321	234	Average	VERTICAL
3	5182.00	107.69			102.64	6.17	33.35	34.47	321	234	Average	VERTICAL
4	5183.60	117.59			112.54	6.17	33.35	34.47	321	234	Peak	VERTICAL

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

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss4 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel 38

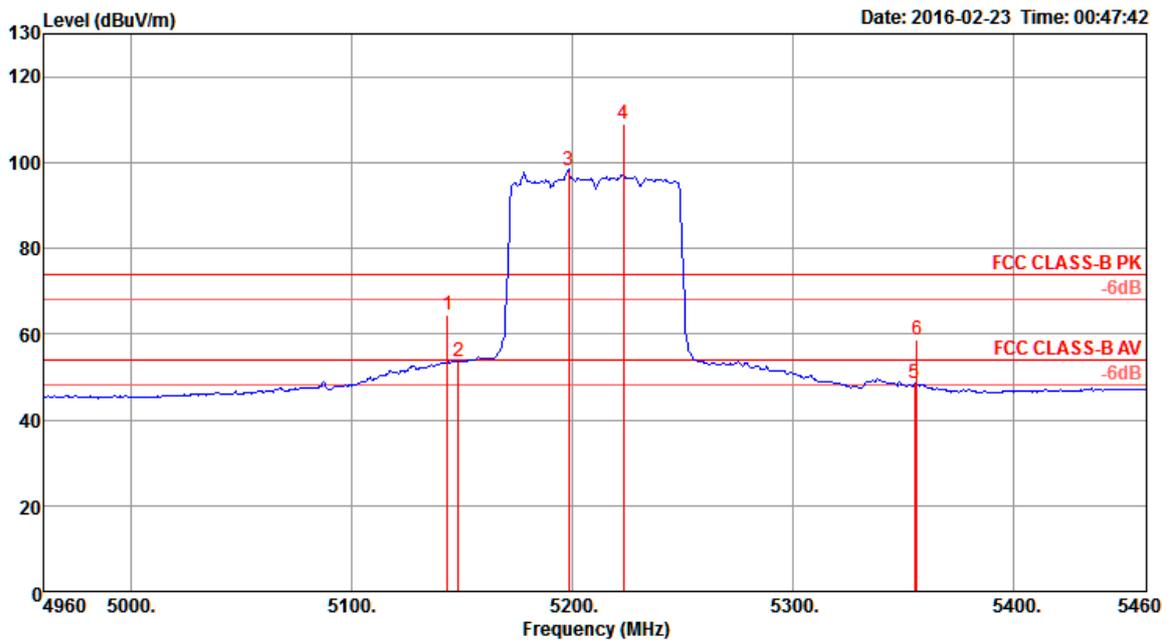


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5148.40	65.22	74.00	-8.78	60.27	6.11	33.31	34.47	26	220	Peak	VERTICAL
2	5148.80	53.63	54.00	-0.37	48.68	6.11	33.31	34.47	26	220	Average	VERTICAL
3	5195.60	113.73			108.62	6.20	33.38	34.47	26	220	Peak	VERTICAL
4	5197.60	102.93			97.82	6.20	33.38	34.47	26	220	Average	VERTICAL

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

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss4 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel 42



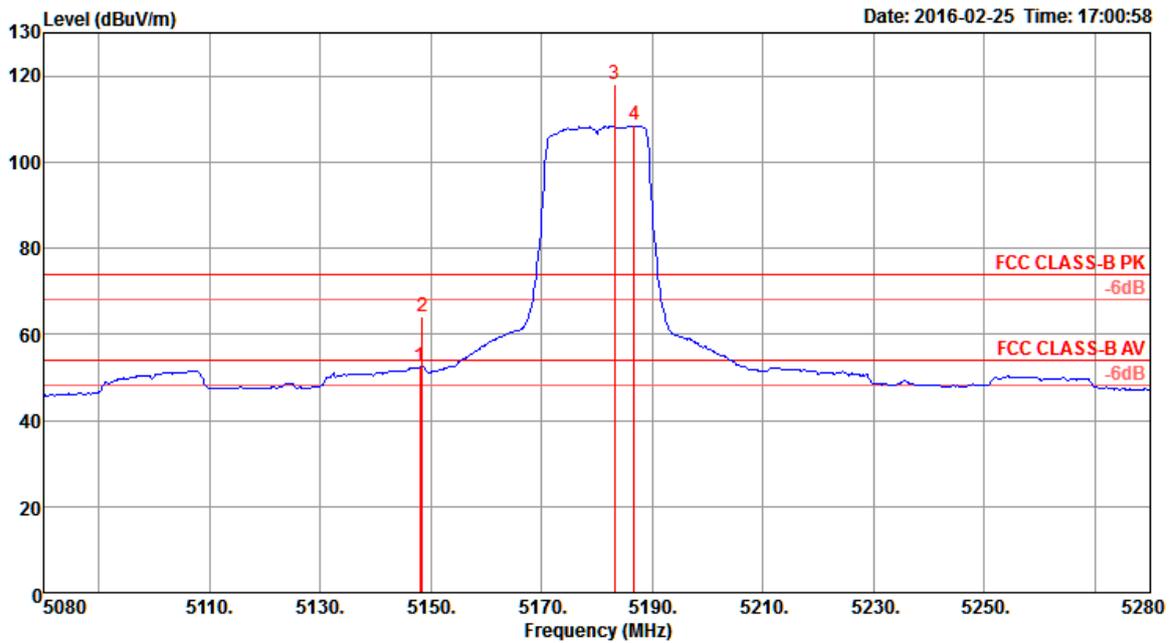
	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5143.00	64.47	74.00	-9.53	59.52	6.11	33.31	34.47	317	242	Peak	VERTICAL
2	5148.00	53.75	54.00	-0.25	48.80	6.11	33.31	34.47	317	242	Average	VERTICAL
3	5198.00	98.29			93.18	6.20	33.38	34.47	317	242	Average	VERTICAL
4	5223.00	109.16			103.93	6.28	33.42	34.47	317	242	Peak	VERTICAL
5	5355.00	48.43	54.00	-5.57	42.67	6.62	33.61	34.47	317	242	Average	VERTICAL
6	5356.00	58.71	74.00	-15.29	52.95	6.62	33.61	34.47	317	242	Peak	VERTICAL

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

For Beamforming function:

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4

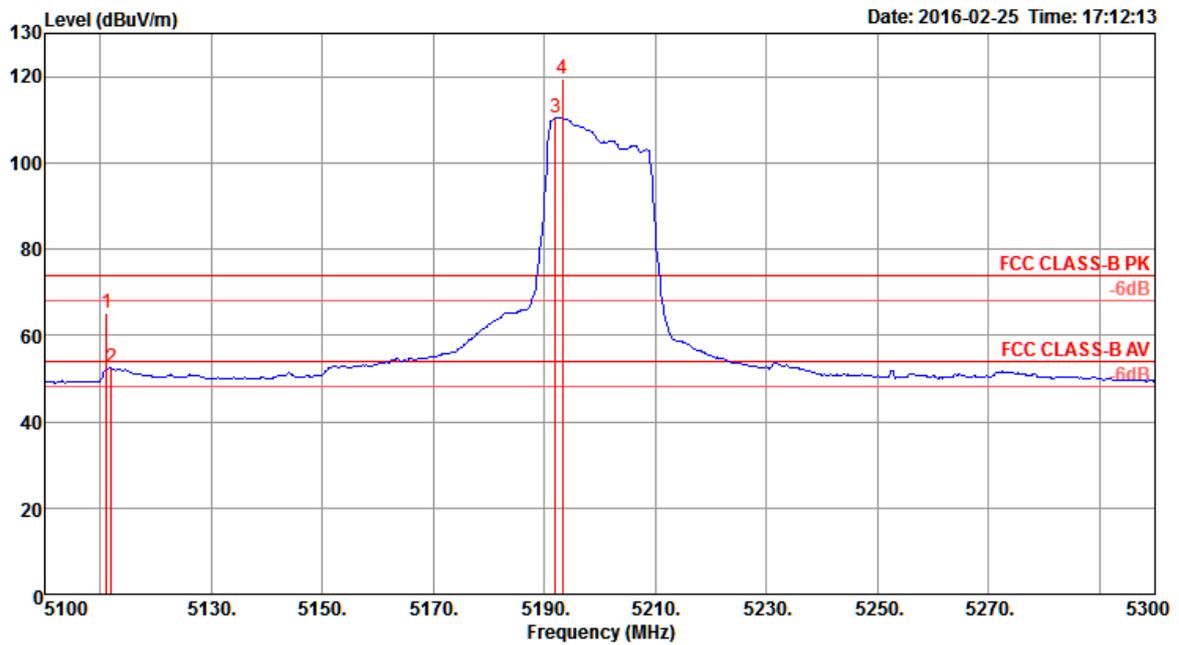
Channel 36



	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	5148.00	52.64	54.00	-1.36	47.69	6.11	33.31	34.47	115	153	Average	VERTICAL
2	5148.40	64.04	74.00	-9.96	59.09	6.11	33.31	34.47	115	153	Peak	VERTICAL
3	5183.20	118.04			112.99	6.17	33.35	34.47	115	153	Peak	VERTICAL
4	5186.80	108.64			103.53	6.20	33.38	34.47	115	153	Average	VERTICAL

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

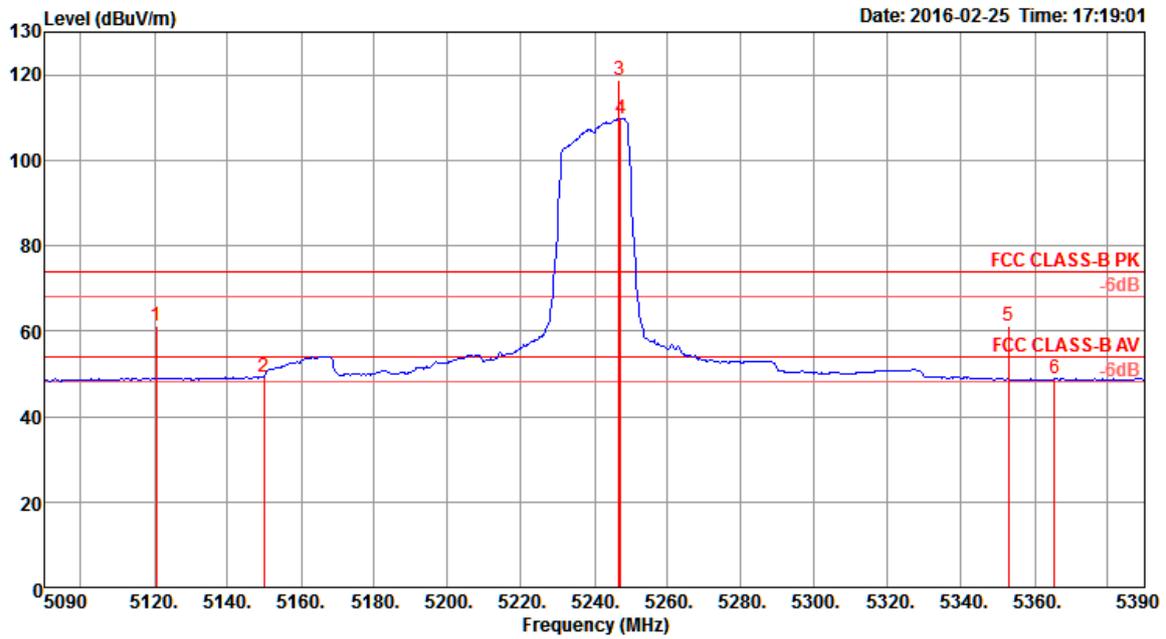
Channel 40



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5111.20	65.29	74.00	-8.71	60.50	6.01	33.25	34.47	198	227	Peak	VERTICAL
2	5112.00	52.48	54.00	-1.52	47.69	6.01	33.25	34.47	198	227	Average	VERTICAL
3	5192.00	110.51			105.40	6.20	33.38	34.47	198	227	Average	VERTICAL
4	5193.20	119.35			114.24	6.20	33.38	34.47	198	227	Peak	VERTICAL

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

Channel 48

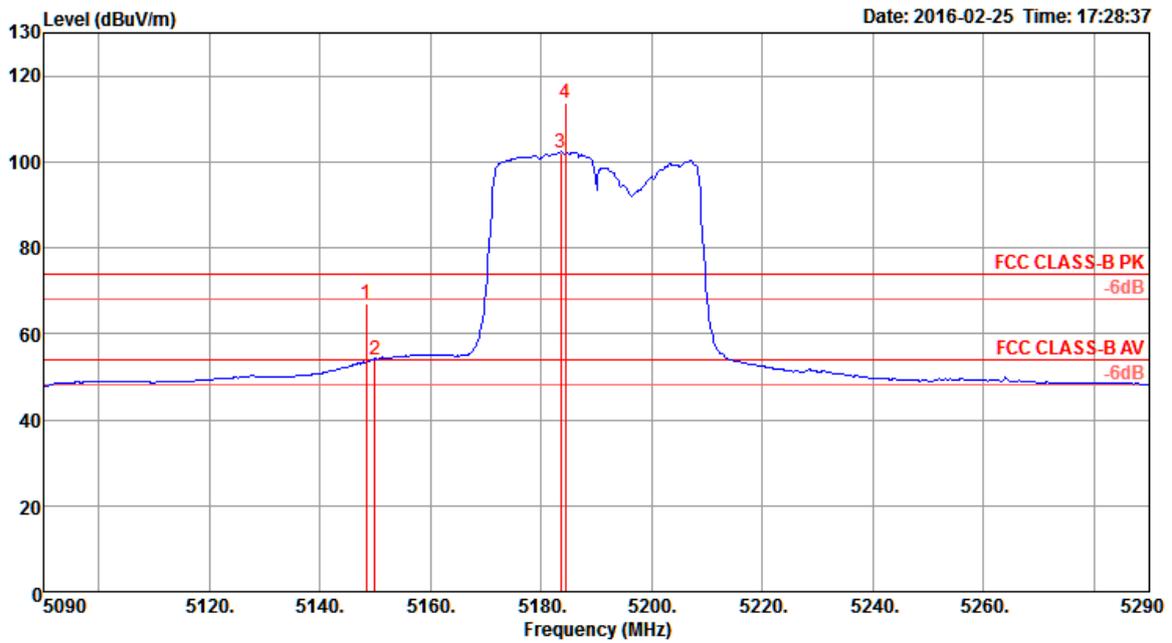


	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5120.60	61.15	74.00	-12.85	56.31	6.04	33.27	34.47	291	227	Peak	VERTICAL
2	5150.00	49.31	54.00	-4.69	44.36	6.11	33.31	34.47	291	227	Average	VERTICAL
3	5246.60	118.73			113.44	6.32	33.44	34.47	291	227	Peak	VERTICAL
4	5247.20	109.89			104.55	6.35	33.46	34.47	291	227	Average	VERTICAL
5	5352.80	61.11	74.00	-12.89	55.41	6.58	33.59	34.47	291	227	Peak	VERTICAL
6	5365.40	48.90	54.00	-5.10	43.14	6.62	33.61	34.47	291	227	Average	VERTICAL

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

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4

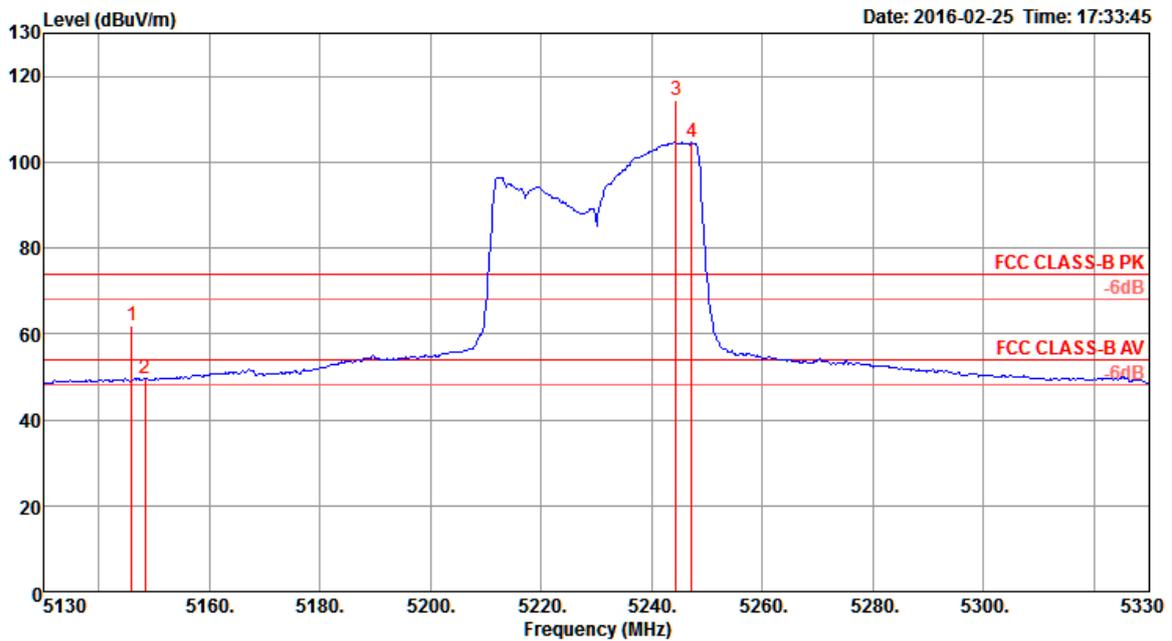
Channel 38



	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	5148.40	67.14	74.00	-6.86	62.19	6.11	33.31	34.47	100	230	Peak	VERTICAL
2	5150.00	53.96	54.00	-0.04	49.01	6.11	33.31	34.47	100	230	Average	VERTICAL
3	5183.60	102.29			97.24	6.17	33.35	34.47	100	230	Average	VERTICAL
4	5184.40	113.58			108.53	6.17	33.35	34.47	100	230	Peak	VERTICAL

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

Channel 46

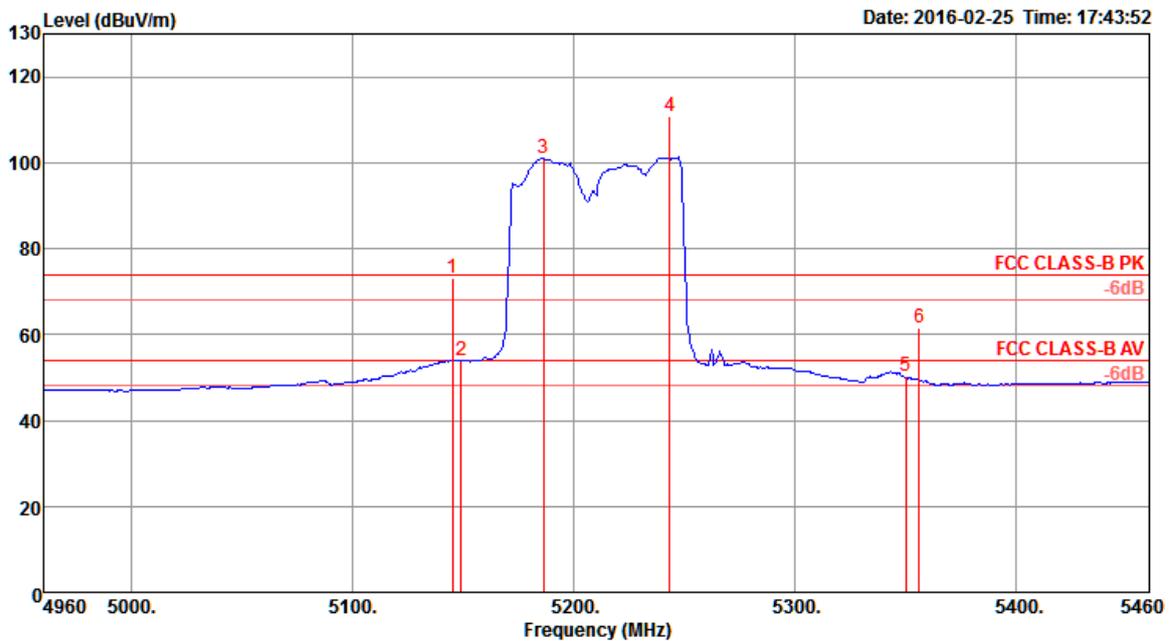


	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5146.00	61.96	74.00	-12.04	57.01	6.11	33.31	34.47	348	224	Peak	VERTICAL
2	5148.40	49.64	54.00	-4.36	44.69	6.11	33.31	34.47	348	224	Average	VERTICAL
3	5244.40	114.47			109.18	6.32	33.44	34.47	348	224	Peak	VERTICAL
4	5247.20	104.50			99.16	6.35	33.46	34.47	348	224	Average	VERTICAL

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

Temperature	22.9°C	Humidity	57%
Test Engineer	Charlie Cheng	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel 42



	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	5145.00	73.23	74.00	-0.77	68.28	6.11	33.31	34.47	293	220	Peak	VERTICAL
2	5149.00	53.86	54.00	-0.14	48.91	6.11	33.31	34.47	293	220	Average	VERTICAL
3	5186.00	101.08			96.03	6.17	33.35	34.47	293	220	Average	VERTICAL
4	5243.00	110.74			105.45	6.32	33.44	34.47	293	220	Peak	VERTICAL
5	5350.00	50.30	54.00	-3.70	44.60	6.58	33.59	34.47	293	220	Average	VERTICAL
6	5356.00	61.50	74.00	-12.50	55.74	6.62	33.61	34.47	293	220	Peak	VERTICAL

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

Note:

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

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

## 4.7. 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  $\pm 20$  ppm maximum for the 5 GHz band (IEEE 802.11n specification).

### 4.7.2. Measuring Instruments and Setting

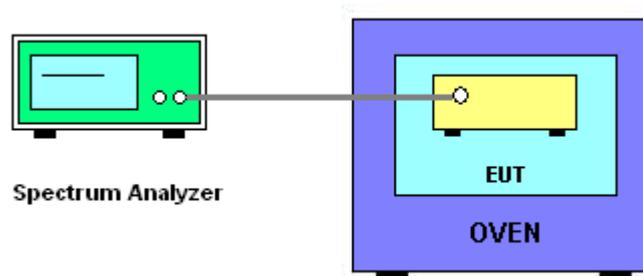
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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.  $f_c$  is declaring of channel frequency. Then the frequency error formula is  $(f_c - f) / f_c \times 10^6$  ppm and the limit is less than  $\pm 20$  ppm (IEEE 802.11n specification).
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  $0^\circ\text{C} \sim 40^\circ\text{C}$ .

### 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

<b>Temperature</b>	23°C	<b>Humidity</b>	45%
<b>Test Engineer</b>	Wen Chao	<b>Test Date</b>	Apr. 08, 2016~Apr. 09, 2016

Mode: 20 MHz / Chain 1

#### Voltage vs. Frequency Stability

Voltage (V)	Measurement Frequency (MHz)			
	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5199.9950	5199.9947	5199.9943	5199.9940
110.00	5199.9946	5199.9941	5199.9938	5199.9937
93.50	5199.9940	5199.9939	5199.9935	5199.9925
Max. Deviation (MHz)	0.0060	0.0061	0.0065	0.0075
Max. Deviation (ppm)	1.15	1.17	1.25	1.44
Result	Complies			

#### Temperature vs. Frequency Stability

Temperature (°C)	Measurement Frequency (MHz)			
	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5199.9943	5199.9931	5199.9912	5199.9890
10	5199.9930	5199.9917	5199.9902	5199.9884
20	5199.9918	5199.9905	5199.9889	5199.9870
30	5199.9904	5199.9893	5199.9879	5199.9863
40	5199.9888	5199.9873	5199.9857	5199.9837
Max. Deviation (MHz)	0.0129	0.0141	0.0156	0.0183
Max. Deviation (ppm)	2.48	2.71	3.00	3.52
Result	Complies			

Mode: 40 MHz / Chain 1

**Voltage vs. Frequency Stability**

Voltage	Measurement Frequency (MHz)			
(V)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5189.9968	5189.9961	5189.9955	5189.9945
110.00	5189.9965	5189.9957	5189.9952	5189.9947
93.50	5189.9963	5189.9962	5189.9955	5189.9950
Max. Deviation (MHz)	0.0037	0.0043	0.0048	0.0055
Max. Deviation (ppm)	0.71	0.83	0.92	1.06
Result	Complies			

**Temperature vs. Frequency Stability**

Temperature	Measurement Frequency (MHz)			
(°C)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5190.0023	5190.0011	5189.9992	5189.9970
10	5190.0010	5189.9997	5189.9982	5189.9964
20	5189.9998	5189.9985	5189.9969	5189.9950
30	5189.9984	5189.9973	5189.9959	5189.9943
40	5189.9968	5189.9953	5189.9937	5189.9917
Max. Deviation (MHz)	0.0068	0.0061	0.0076	0.0103
Max. Deviation (ppm)	1.31	1.18	1.46	1.98
Result	Complies			

Mode: 80 MHz / Chain 1

## Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5209.9998	5209.9996	5209.9993	5209.9987
110.00	5209.9997	5209.9996	5209.9987	5209.9977
93.50	5209.9996	5209.9986	5209.9985	5209.9982
Max. Deviation (MHz)	0.0004	0.0014	0.0015	0.0023
Max. Deviation (ppm)	0.08	0.27	0.29	0.44
Result	Complies			

## Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5209.9982	5209.9970	5209.9951	5209.9929
10	5209.9969	5209.9956	5209.9941	5209.9923
20	5209.9957	5209.9944	5209.9928	5209.9909
30	5209.9943	5209.9932	5209.9918	5209.9902
40	5209.9927	5209.9912	5209.9896	5209.9876
Max. Deviation (MHz)	0.0090	0.0102	0.0117	0.0144
Max. Deviation (ppm)	1.73	1.96	2.25	2.76
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
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 2016	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 14, 2016	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 21, 2016	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 24, 2016	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2016	Radiation (O3CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (O3CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 22, 2015	Radiation (O3CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Radiation (O3CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (O3CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (O3CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 13, 2015	Radiation (O3CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (O3CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 21, 2016	Radiation (O3CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 16, 2016	Radiation (O3CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 27, 2016	Radiation (O3CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 24, 2016	Radiation (O3CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (O3CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (O3CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (O3CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (O3CH01-CB)
Test Software	Audix	E3	6.2009-10-7	N/A	N/A	Radiation (O3CH01-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-6	1 GHz ~ 26.5 GHz	Nov. 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)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Conducted (TH01-CB)

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

“\*” Calibration Interval of instruments listed above is two years.

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

## 6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
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%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	$9.74 \times 10^{-8}$	Confidence levels of 95%
Frequency Stability	$6.06 \times 10^{-8}$	Confidence levels of 95%