

NCC RADIO TEST REPORT

Equipment : Wireless Access Point Radio module
Brand Name : riverbed
Model Name : XDR240
Applicant : RIVERBED TECHNOLOGY INC
680 Folsom Street San Francisco, California
94107-1397, USA
Manufacturer : RIVERBED TECHNOLOGY INC
680 Folsom Street San Francisco, California
94107-1397, USA
Standard : NCC LP0002 Section 4.7

The product was received on Dec. 10, 2015, and testing was started from Dec. 18, 2015 and completed on Apr. 20, 2018. We, SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013, NCC LP0002 (Jan. 10, 2018), KDB789033 D02 v02r01, KDB662911 D01 v02r01, ET Docket No. 13-49; FCC 16-24 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB Ver1.0

Page Number : 3 of 100
Issued Date : Apr. 27, 2018
Report Version : 01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2.1	2.3	AC Power Line Conducted Emissions	PASS	-
2.2	4.7.3	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	PASS	-
2.3	4.7.3	Maximum Conducted Output Power	PASS	-
2.4	4.7.3	Power Spectral Density	PASS	-
2.5	4.7.4	Radiated Emissions	PASS	-
2.6	4.7.4	Band Edge Emissions	PASS	-
2.7	4.7.8	Antenna Requirements	PASS	-

Reviewed by: Sam Chen

Report Producer: Wendy Pan

1. General Information

1.1. Product Details

Items	Description
Product Type	WLAN (4TX, 4RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM, 1024QAM)
Data Rate (Mbps)	IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n/ac: see the below table
Frequency Range	5150 ~ 5250 MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Bandwidth (99%)	<u>For non-beamforming function:</u> IEEE 802.11a: 23.44 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 20.49 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 37.48 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 74.96 MHz <u>For beamforming function:</u> IEEE 802.11ac MCS0/Nss1 (VHT20): 18.32 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 44.72 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 67.73 MHz
Maximum Conducted Output Power	<u>For non-beamforming function:</u> IEEE 802.11a: 23.76 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 23.88 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 23.70 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 18.94 dBm <u>For beamforming function:</u> IEEE 802.11ac MCS0/Nss1 (VHT20): 25.75 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 23.68 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 18.27 dBm

Carrier Frequencies	Please refer to section 1.4
Antenna	Please refer to section 1.3

Note: 1. The EUT is a limited module which only limited to the Wireless Access Point (brand: riverbed / model: XD4240).

2. The EUT was installed to the Wireless Access Point (brand: riverbed / model: XD4240) to perform all the tests.

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

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

Antenna and Bandwidth

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	4	MCS 0-31
802.11n (HT40)	4	MCS 0-31
802.11ac (VHT20)	4	MCS0-11/Nss1-4
802.11ac (VHT40)	4	MCS0-11/Nss1-4
802.11ac (VHT80)	4	MCS0-11/Nss1-4

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

Then EUT supports HT20 and HT40.

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

Note 3: Modulation modes consist of below configuration:

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

1.2. Accessories

N/A

1.3. Table for Filed Antenna

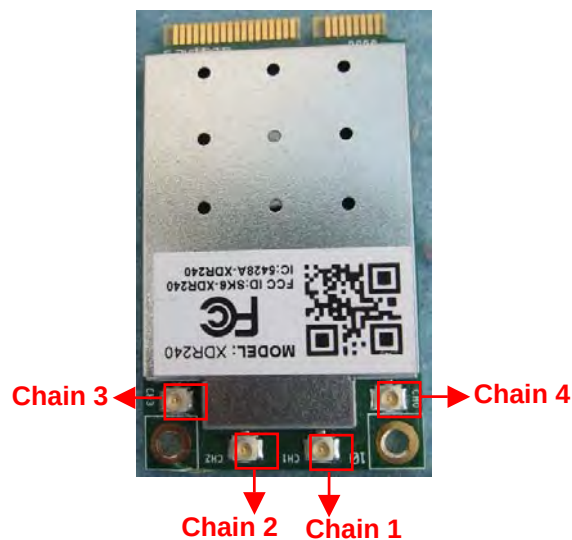
Ant.	Brand	Model No.	Type	Connector	WLAN Gain (dBi)				
					2.4GHz Band	5GHz Band 1	5GHz Band 2	5GHz Band 3	5GHz Band 4
1	LITEON	WP8898-XS	PIFA	I-PEX	-3.0	3.8	2.8	4.2	4.3
2	LITEON	WP8898-XS	PIFA	I-PEX	-1.1	4.6	4.8	5.6	2.4
3	LITEON	WP8898-XS	PIFA	I-PEX	-0.6	4.6	4.0	5.5	4.7
4	LITEON	WP8898-XS	PIFA	I-PEX	3.9	1.5	3.1	5.5	5.2

Note: The EUT has four antennas.

For WLAN Function(4TX, 4RX):

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

Chain 1: Connect to Ant. 1, Chain 2: Connect to Ant. 2, Chain 3: Connect to Ant. 3, Chain 4: Connect to Ant. 4.





1.4. 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	-	-

1.5. 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 Line Conducted Emissions	Intentional - CTX		-	-	-
	Unintentional - CRX		-	-	-
Max. Conducted Output Power	<u>For non-beamforming function:</u>				
	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
	<u>For beamforming function:</u>				
	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	<u>For non-beamforming function:</u>				
	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
	<u>For beamforming function:</u>				
	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	<u>For non-beamforming function:</u>				
	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
	<u>For beamforming function:</u>				
	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 Emissions 9kHz~1GHz	Intentional - CTX		-	-	-
	Unintentional - CRX		-	-	-
Radiated Emissions 1GHz~5 th Harmonic	Unintentional - CRX		-	-	-
Radiated Emission Above 1GHz	<u>For non-beamforming function:</u>				
	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
	<u>For beamforming function:</u>				
	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	<u>For non-beamforming function:</u>				
	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
	<u>For beamforming function:</u>				
	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

Note: 1. 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.



2. There are two functions of EUT, one is beamforming function, and the other is non-beamforming function for 802.11n in 5GHz band / 802.11ac in 2.4GHz band and 5GHz band. All test results were recorded in the report.
3. The Wireless Access Point (brand: riverbed / model: XD4240) will install four radio modules. These four radios will be operated in different bands. If they are used in the same band, the output power of each radio will be reduced to make sure that total power is equal to max output power of single radio module.
2. The test configuration, test mode and test software were written in this test report are designated by the applicant.

The PoE is for measurement only, would not be marketed.

Support Unit	Brand	Model	FCC ID
PoE	Microsemi	PD-9501-10G	N/A
PoE	HP	PD-9001GR/AT/AC	N/A
PoE	XIRRUS	XP1-MSI-75	N/A

The following test modes were performed for all tests:

For Conducted Emission test:

Intentional – CTX

Mode 1. CTX - 2.4GHz

Mode 2. CTX - 5GHz

Mode 1 is the worst case, so it was selected to record in this test report.

Unintentional – CRX

Mode 1. CRX - 2.4GHz

Mode 2. CRX - 5GHz

Mode 1 is the worst case, so it was selected to record in this test report.

For Radiated Emissions 9kHz~1GHz test:

Intentional – CTX

Mode 1. CTX - 2.4GHz EUT Y axis

Mode 2. CTX - 2.4GHz EUT Z axis

Mode 3. CTX - 5GHz EUT Y axis

Mode 4. CTX - 5GHz EUT Z axis

Mode 3 is the worst case, so it was selected to record in this test report.

Unintentional – CRX

Mode 1. CRX - 2.4GHz EUT Y axis

Mode 2. CRX - 2.4GHz EUT Z axis



Mode 3. CRX - 5GHz EUT Y axis

Mode 4. CRX - 5GHz EUT Z axis

Mode 3 is the worst case, so it was selected to record in this test report.

For Radiated Emissions 1GHz~5th Harmonic test:

Unintentional – CRX

Mode 1. CRX - 2.4GHz EUT X axis

Mode 2. CRX - 2.4GHz EUT Y axis

Mode 3. CRX - 2.4GHz EUT Z axis

Mode 4. CRX - 5GHz EUT X axis

Mode 5. CRX - 5GHz EUT Y axis

Mode 6. CRX - 5GHz EUT Z axis

Mode 5 is the worst case, so it was selected to record in this test report.

For Radiated Emissions 1GHz~10th Harmonic test:

The EUT was performed at X axis, Y axis and Z axis position for Radiated emission above 1GHz test, and the worst case was found at Y axis. So the measurement will follow this same test configuration.

1.6. 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
10CH01-CB (Below 1GHz and Unintentional - CRX Above 1GHz)	SAC	Hsin Chu	TW0006	IC 4086D	-
03CH01-CB (Intentional - CTX Above 1GHz)	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).

**1.7. Table for Supporting Units****For Test Site No: 03CH01-CB(Below 1GHz and Unintentional – CRX / Above 1GHz)**

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC
Wireless Access Point	riverbed	XD4240	SK6-XDR240
PoE	HP	PD-9001GR/AT/AC	N/A

For Test Site No: 03CH01-CB(Intentional – CTX / Above 1GHz)For non-beamforming function:

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC
Wireless Access Point	riverbed	XD4240	SK6-XDR240
PoE	Microsemi	PD-9501-10G	N/A

For beamforming function:

Support Unit	Brand	Model	FCC ID
Notebook*2	DELL	E4300	DoC
Wireless Access Point	riverbed	XD4240	SK6-XDR240
PoE	Microsemi	PD-9501-10G	N/A
WLAN ac Dongle (RX Device)	Broadcom	Bcm4366	DoC

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Wireless Access Point	riverbed	XD4240	SK6-XDR240
PoE	XIRRUS	XP1-MSI-75	N/A

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Wireless Access Point	riverbed	XD4240	SK6-XDR240
PoE	Microsemi	PD-9501-10G	N/A

1.8. Table for Parameters of Test Software Setting

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

Test Function	Non-beamforming function		
Test Software Version	Xircon V1.0.2.25		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11a	70	75	67
802.11ac MCS0/Nss1 VHT20	73	75	70
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz
	53		69
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	50		

Test Function	Beamforming function		
Test Software Version	Xircon V1.0.2.25		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	5180 MHz	5200 MHz	5240 MHz
802.11ac MCS0/Nss1 VHT20	72	89	71
Mode	NCB: 40MHz		
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz
	55		69
Mode	NCB: 80MHz		
802.11ac MCS0/Nss1 VHT80	5210 MHz		
	47		

1.9. EUT Operation during Test

For CTX/CRX Mode:

non-beamforming mode:

The EUT was programmed to be in continuously transmitting/receiving 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 Xircon V1.0.2.25.
3. Executed "Lantest.exe" to link with the remote workstation to receive and transmit packet by RX Device and transmit duty cycle no less 98%

1.10. Duty Cycle

For non-beamforming function:

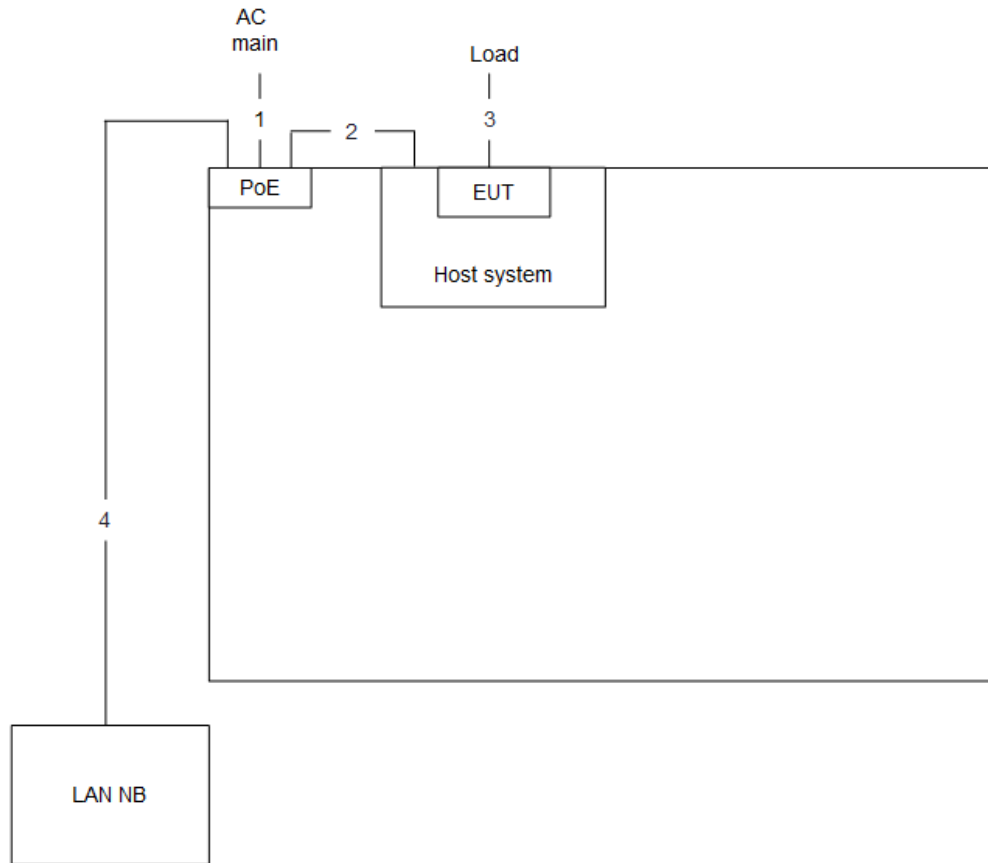
Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.064	2.092	98.66	0.06	0.01
802.11ac MCS0/Nss1 VHT20	1.920	1.950	98.46	0.07	0.01
802.11ac MCS0/Nss1 VHT40	0.916	0.976	93.85	0.28	1.09
802.11ac MCS0/Nss1 VHT80	0.430	0.480	89.58	0.48	2.33

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	3.834	4.212	91.03	0.41	0.26
802.11ac MCS0/Nss1 VHT40	3.640	4.020	90.55	0.43	0.27
802.11ac MCS0/Nss1 VHT80	3.384	3.784	89.43	0.49	0.30

1.11. Test Configurations

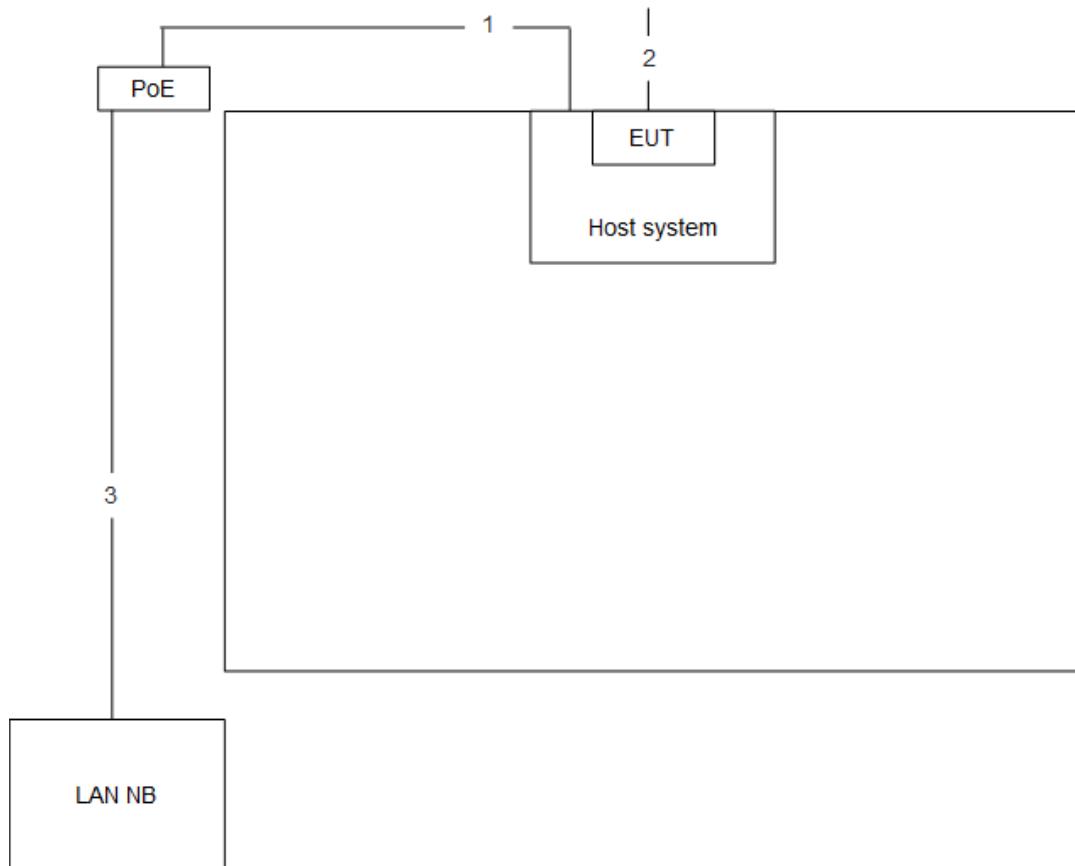
1.11.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	1.5m
3	RJ-45 cable	No	1.5m
4	RJ-45 cable	No	10m

1.11.2. Radiation Emissions Test Configuration

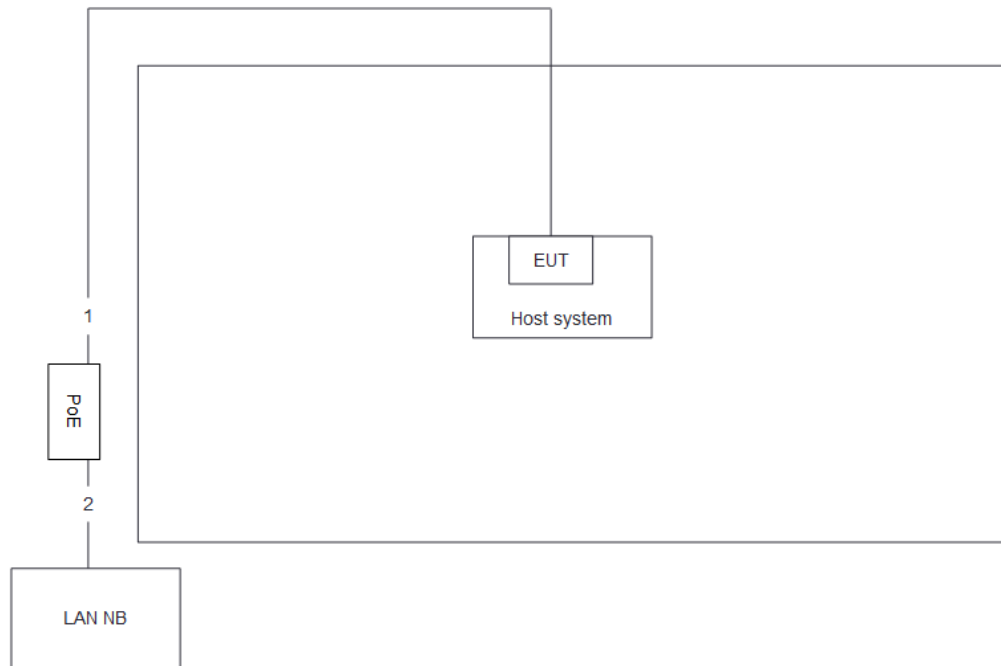
Test Configuration: 30MHz~1GHz Intentional – CTX and Unintentional – CRX and above 1GHz /
Unintentional – CRX



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

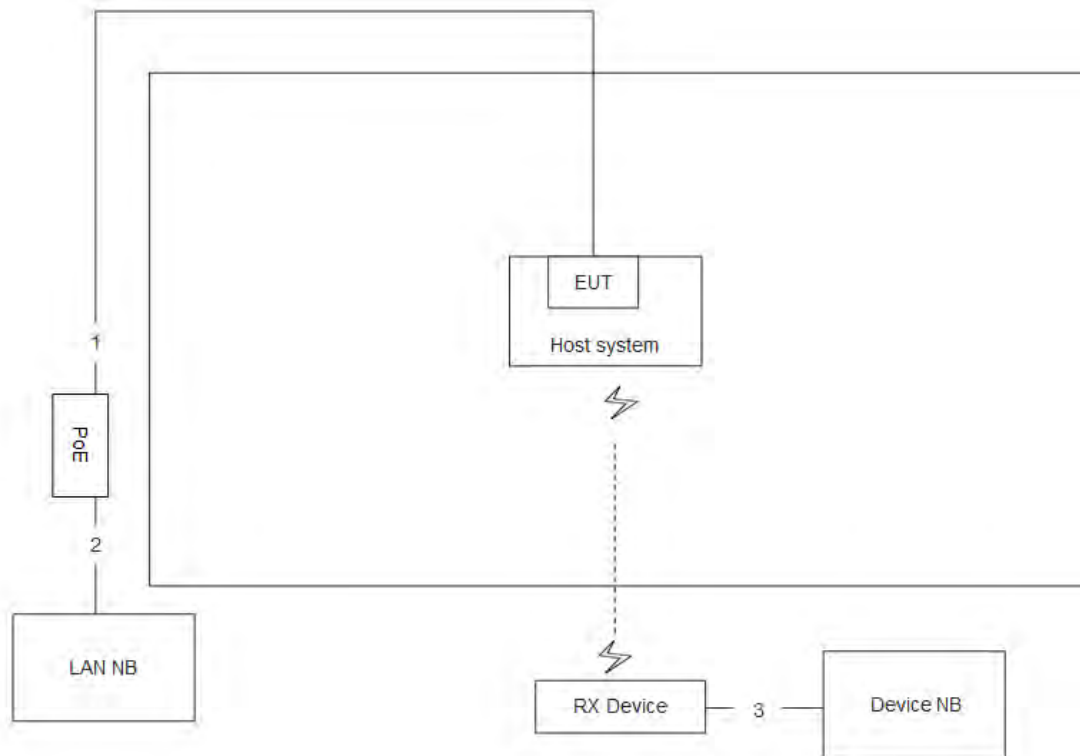
Test Configuration: above 1GHz Intentional – CTX

For non-beamforming function:



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

For beamforming function:



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

2. Test Result

2.1. AC Power Line Conducted Emissions Measurement

2.1.1. 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

2.1.2. Measuring Instruments and Setting

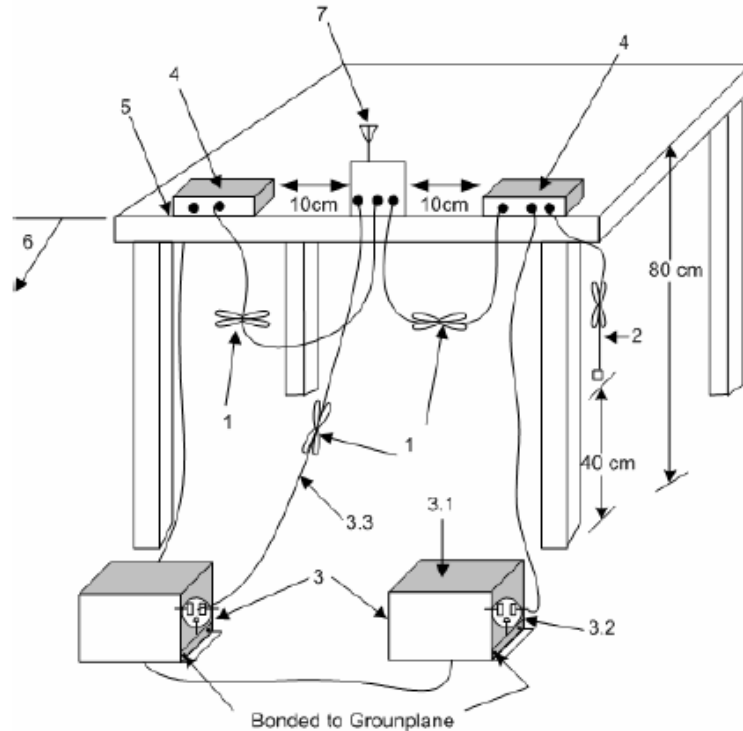
Please refer to section 3 of equipments list in this report. The following table is the setting of the receiver.

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

2.1.3. 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.

2.1.4. Test Setup Layout



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 cm to 40 cm long.

2—The I/O cables that are not connected to an accessory 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 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.

3.1—All other equipment powered from additional LISN(s).

3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.

3.3—LISN at least 80 cm from nearest part of EUT chassis.

4—Non-EUT components of EUT system being tested.

5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.

6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

2.1.5. Test Deviation

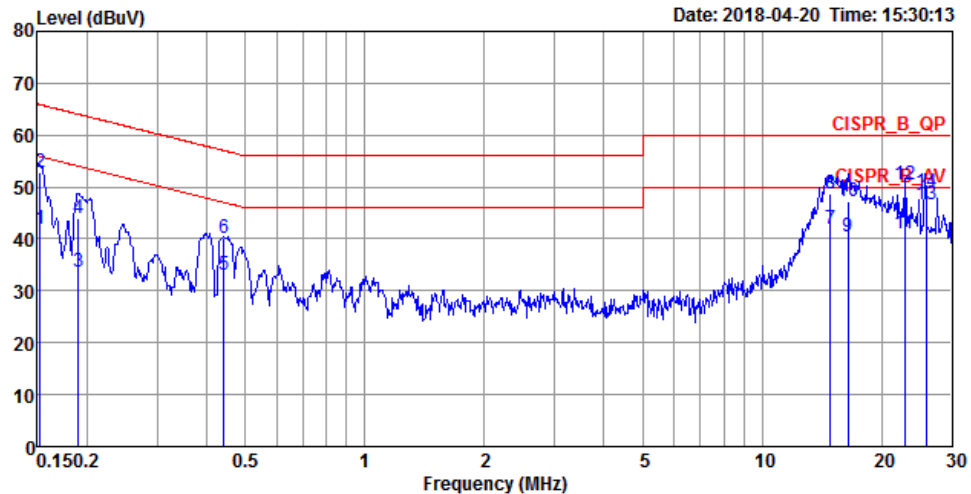
There is no deviation with the original standard.

2.1.6. EUT Operation during Test

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

2.1.7. Results of AC Power Line Conducted Emissions Measurement

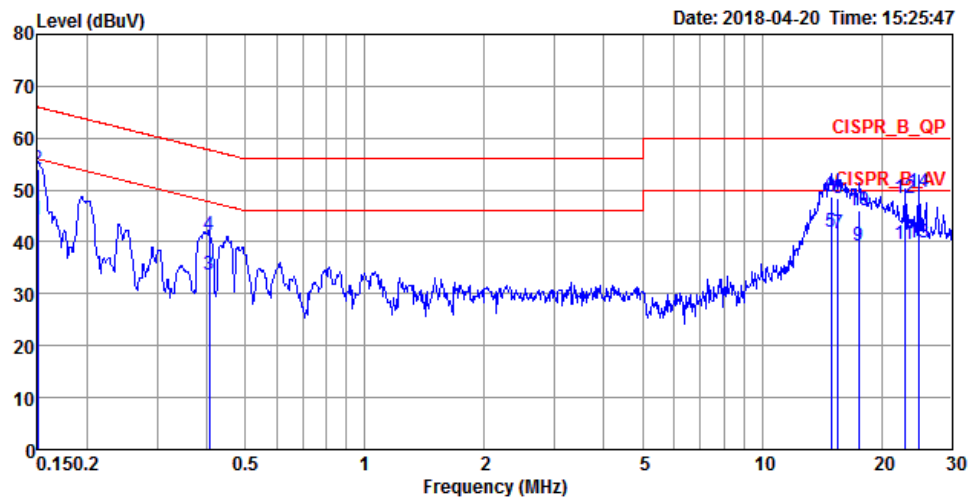
Temperature	21°C	Humidity	60%
Test Engineer	Peter Wu	Phase	Line
Configuration	Intentional – CTX / Mode 1		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1524	42.04	-13.83	55.87	32.04	9.99	0.01	Average	LINE
2	0.1524	52.70	-13.17	65.87	42.70	9.99	0.01	QP	LINE
3	0.1904	33.58	-20.44	54.02	23.65	9.92	0.01	Average	LINE
4	0.1904	44.13	-19.89	64.02	34.20	9.92	0.01	QP	LINE
5	0.4421	33.10	-13.92	47.02	23.19	9.88	0.03	Average	LINE
6	0.4421	40.07	-16.95	57.02	30.16	9.88	0.03	QP	LINE
7	14.8281	41.96	-8.04	50.00	31.72	10.14	0.10	Average	LINE
8	14.8281	48.64	-11.36	60.00	38.40	10.14	0.10	QP	LINE
9	16.4856	40.44	-9.56	50.00	30.17	10.16	0.11	Average	LINE
10	16.4856	47.24	-12.76	60.00	36.97	10.16	0.11	QP	LINE
11	22.8065	40.97	-9.03	50.00	30.55	10.26	0.16	Average	LINE
12	22.8065	50.49	-9.51	60.00	40.07	10.26	0.16	QP	LINE
13	25.8711	46.72	-3.28	50.00	36.20	10.31	0.21	Average	LINE
14	25.8711	49.01	-10.99	60.00	38.49	10.31	0.21	QP	LINE



Temperature	21°C	Humidity	60%
Test Engineer	Peter Wu	Phase	Neutral
Configuration	Intentional – CTX / Mode 1		

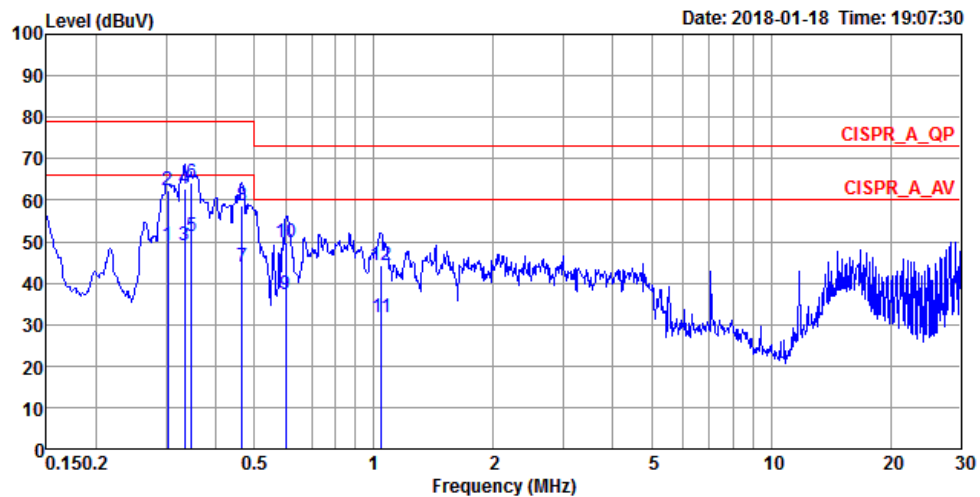


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	44.26	-11.74	56.00	34.21	10.04	0.01	Average	NEUTRAL
2	0.1500	53.93	-12.07	66.00	43.88	10.04	0.01	QP	NEUTRAL
3	0.4061	33.63	-14.10	47.73	23.66	9.94	0.03	Average	NEUTRAL
4	0.4061	41.30	-16.43	57.73	31.33	9.94	0.03	QP	NEUTRAL
5	14.9068	41.90	-8.10	50.00	31.58	10.22	0.10	Average	NEUTRAL
6	14.9068	48.81	-11.19	60.00	38.49	10.22	0.10	QP	NEUTRAL
7	15.5523	41.54	-8.46	50.00	31.21	10.23	0.10	Average	NEUTRAL
8	15.5523	48.38	-11.62	60.00	38.05	10.23	0.10	QP	NEUTRAL
9	17.4750	39.27	-10.73	50.00	28.91	10.25	0.11	Average	NEUTRAL
10	17.4750	46.12	-13.88	60.00	35.76	10.25	0.11	QP	NEUTRAL
11	22.8115	39.54	-10.46	50.00	29.09	10.29	0.16	Average	NEUTRAL
12	22.8115	48.53	-11.47	60.00	38.08	10.29	0.16	QP	NEUTRAL
13	24.7124	39.92	-10.08	50.00	29.42	10.30	0.20	Average	NEUTRAL
14	24.7124	49.60	-10.40	60.00	39.10	10.30	0.20	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

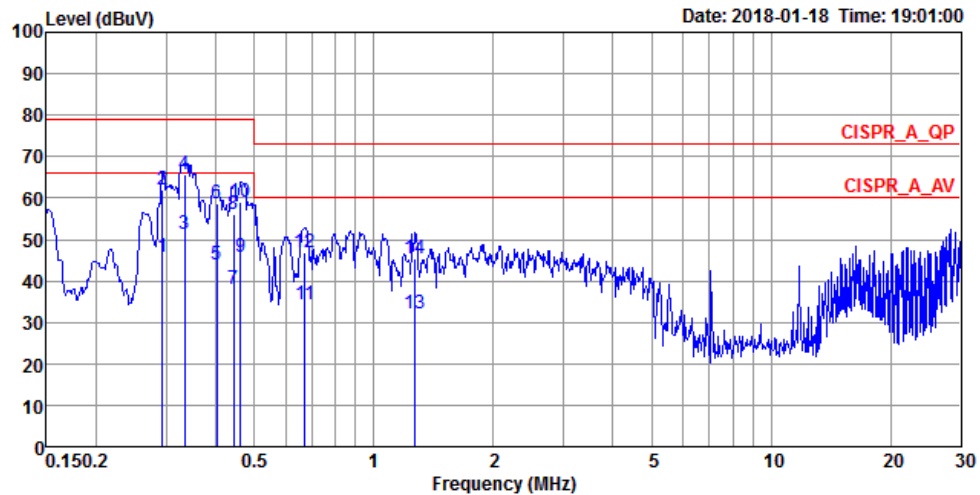
Temperature	21°C	Humidity	60%
Test Engineer	Ryo Fan	Phase	Line
Configuration	Unintentional - Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.3035	49.10	-16.90	66.00	39.11	9.93	0.06	Average	LINE
2	0.3035	62.41	-16.59	79.00	52.42	9.93	0.06	QP	LINE
3	0.3338	49.04	-16.96	66.00	39.06	9.94	0.04	Average	LINE
4	0.3338	62.59	-16.41	79.00	52.61	9.94	0.04	QP	LINE
5	0.3483	51.17	-14.83	66.00	41.20	9.94	0.03	Average	LINE
6	0.3483	64.08	-14.92	79.00	54.11	9.94	0.03	QP	LINE
7	0.4661	43.97	-22.03	66.00	33.98	9.95	0.04	Average	LINE
8	0.4661	58.84	-20.16	79.00	48.85	9.95	0.04	QP	LINE
9	0.6011	37.17	-22.83	60.00	27.13	9.95	0.09	Average	LINE
10	0.6011	49.76	-23.24	73.00	39.72	9.95	0.09	QP	LINE
11	1.0430	31.82	-28.18	60.00	21.67	9.96	0.19	Average	LINE
12	1.0430	44.15	-28.85	73.00	34.00	9.96	0.19	QP	LINE



Temperature	22°C	Humidity	57%
Test Engineer	Ryo Fan	Phase	Neutral
Configuration	Unintentional - Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.2940	45.81	-20.19	66.00	35.60	10.15	0.06	Average	NEUTRAL
2	0.2940	61.82	-17.18	79.00	51.61	10.15	0.06	QP	NEUTRAL
3	0.3338	51.16	-14.84	66.00	40.93	10.19	0.04	Average	NEUTRAL
4	0.3338	65.82	-13.18	79.00	55.59	10.19	0.04	QP	NEUTRAL
5	0.4019	43.76	-22.24	66.00	33.49	10.26	0.01	Average	NEUTRAL
6	0.4019	58.55	-20.45	79.00	48.28	10.26	0.01	QP	NEUTRAL
7	0.4444	37.86	-28.14	66.00	27.59	10.24	0.03	Average	NEUTRAL
8	0.4444	55.98	-23.02	79.00	45.71	10.24	0.03	QP	NEUTRAL
9	0.4612	45.65	-20.35	66.00	35.37	10.24	0.04	Average	NEUTRAL
10	0.4612	58.90	-20.10	79.00	48.62	10.24	0.04	QP	NEUTRAL
11	0.6719	34.46	-25.54	60.00	24.18	10.17	0.11	Average	NEUTRAL
12	0.6719	46.97	-26.03	73.00	36.69	10.17	0.11	QP	NEUTRAL
13	1.2688	32.05	-27.95	60.00	21.83	10.02	0.20	Average	NEUTRAL
14	1.2688	45.32	-27.68	73.00	35.10	10.02	0.20	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

2.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

2.2.1. Limit

No restriction limits.

2.2.2. Measuring Instruments and Setting

Please refer to section 3 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

2.2.3. 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%.

2.2.4. Test Setup Layout

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

This test setup layout is the same as that shown in section 2.5.4.

2.2.5. Test Deviation

There is no deviation with the original standard.



2.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

**2.2.7. Test Result of 26dB Bandwidth and 99% Occupied Bandwidth**

Temperature	25°C	Humidity	59%
Test Engineer	Peter Wu	Test Function	Non-beamforming function

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	28.96	21.36
	5200 MHz	32.87	23.44
	5240 MHz	25.83	18.49
802.11ac MCS0/Nss1 VHT20	5180 MHz	38.00	19.88
	5200 MHz	36.43	20.49
	5240 MHz	25.65	18.58
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.87	37.05
	5230 MHz	71.30	37.48
802.11ac MCS0/Nss1 VHT80	5210 MHz	78.84	74.96



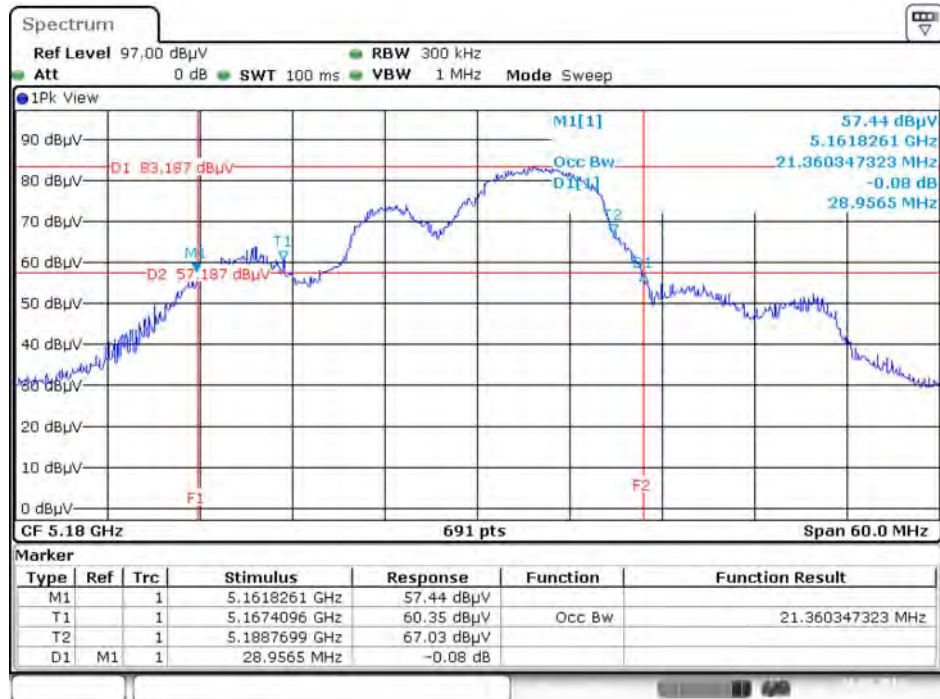
Temperature	25°C	Humidity	59%
Test Engineer	Peter Wu	Test Function	Beamforming function

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT20	5180 MHz	22.17	18.15
	5200 MHz	24.09	18.32
	5240 MHz	22.52	18.23
802.11ac MCS0/Nss1 VHT40	5190 MHz	39.71	36.90
	5230 MHz	71.01	44.72
802.11ac MCS0/Nss1 VHT80	5210 MHz	77.10	67.73



For non-beamforming function:

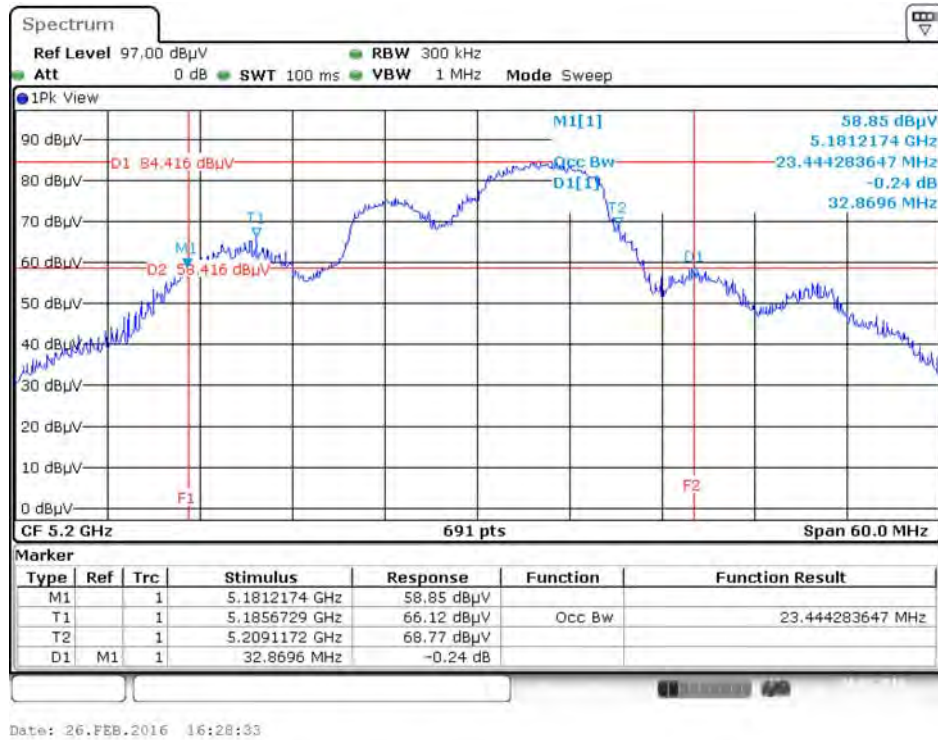
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz



Date: 26.FEB.2016 16:29:12

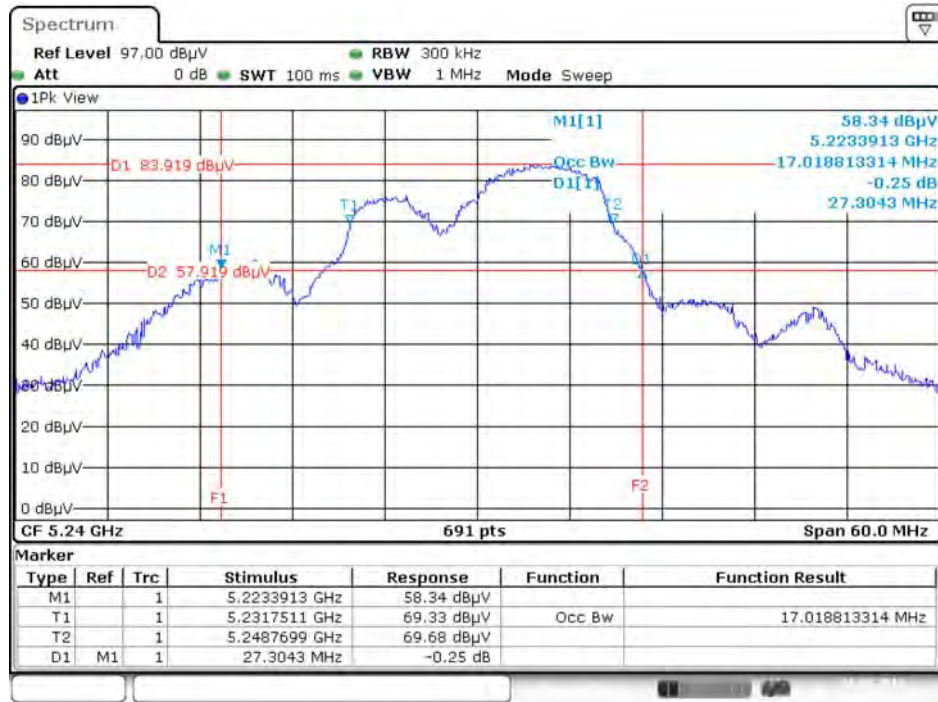


26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz





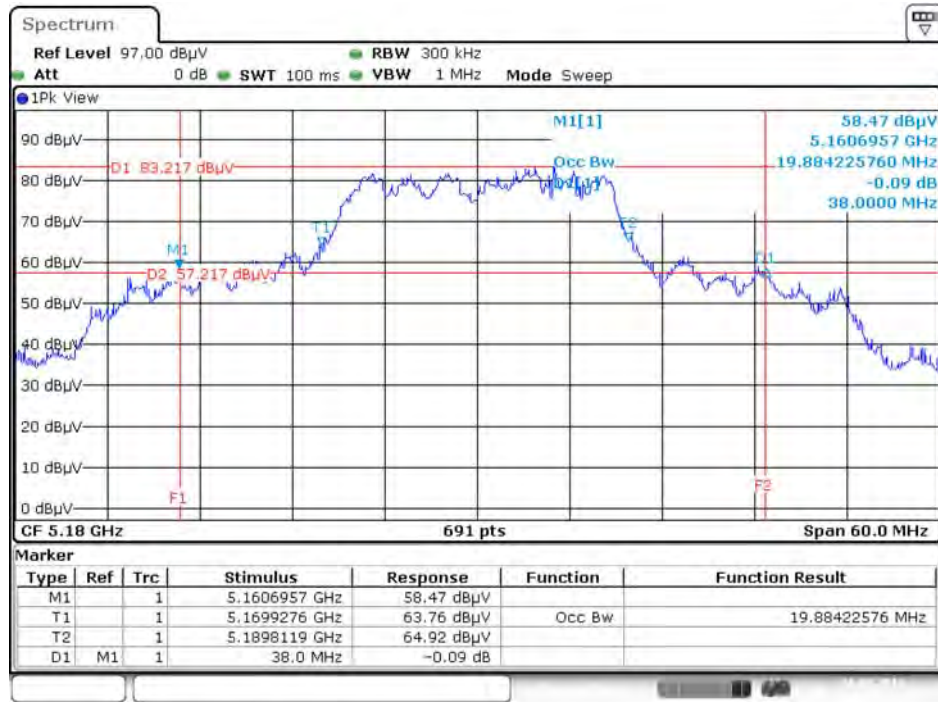
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



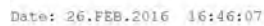
Date: 26.FEB.2016 16:27:47



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

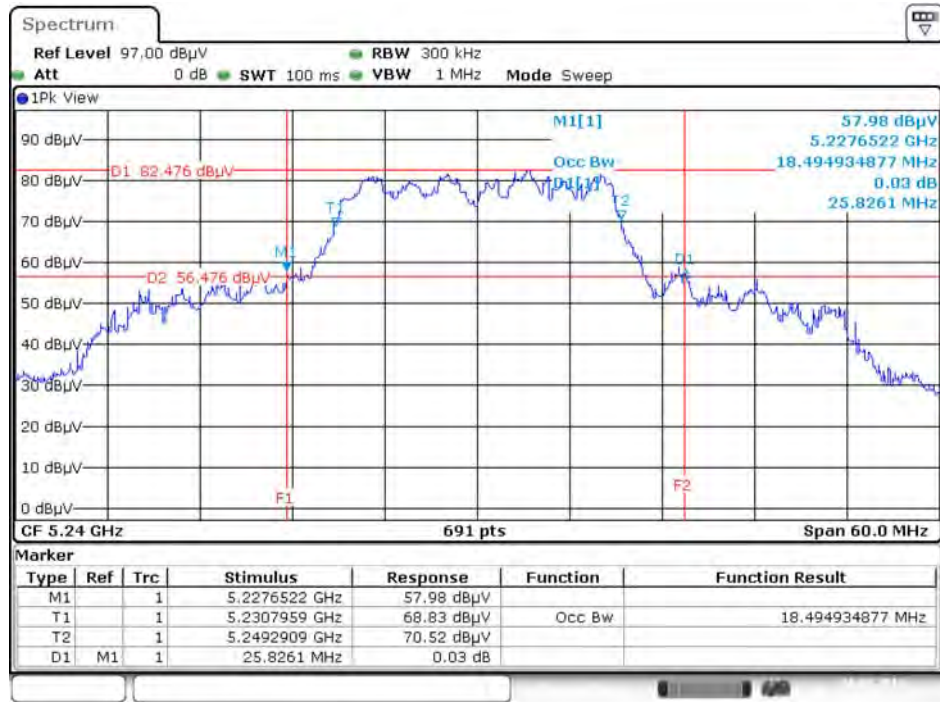


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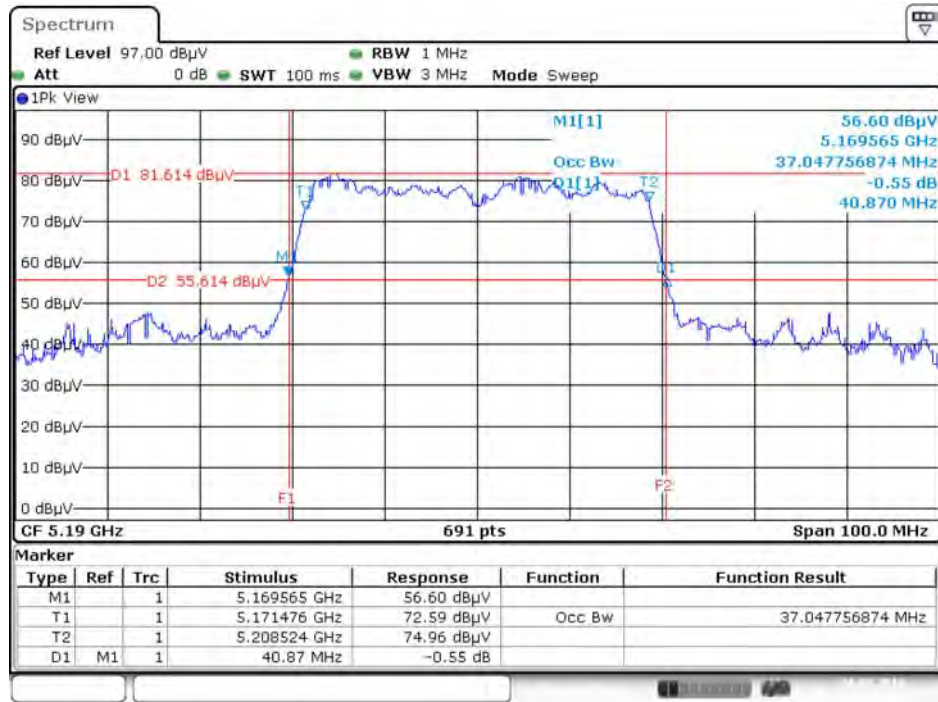
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1
VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5240 MHz



Date: 26.FEB.2016 17:06:16



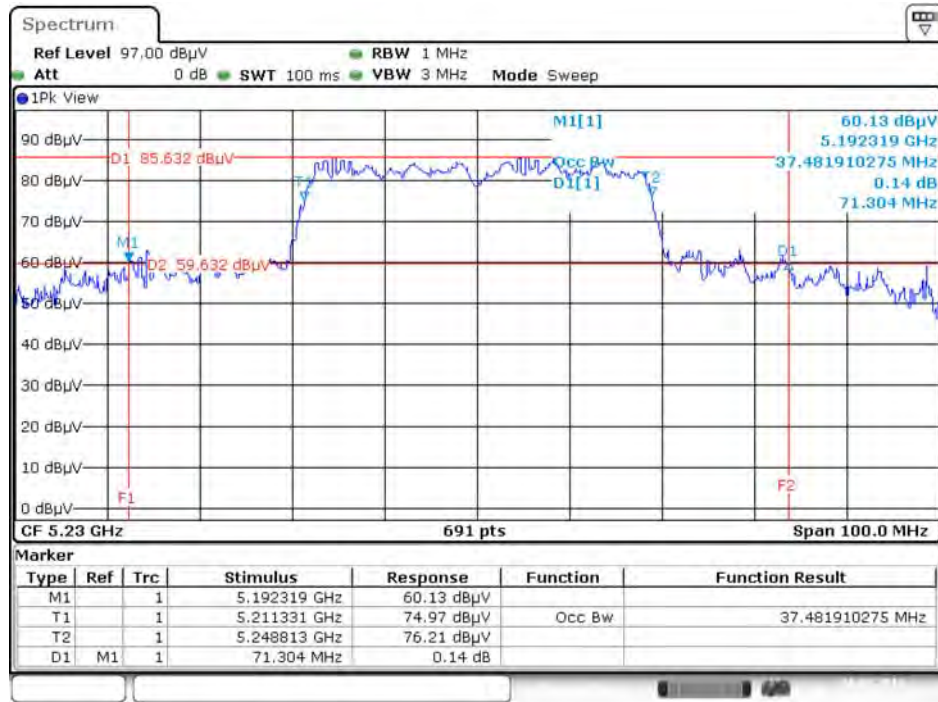
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1
VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



Date: 26.FEB.2016 16:49:16



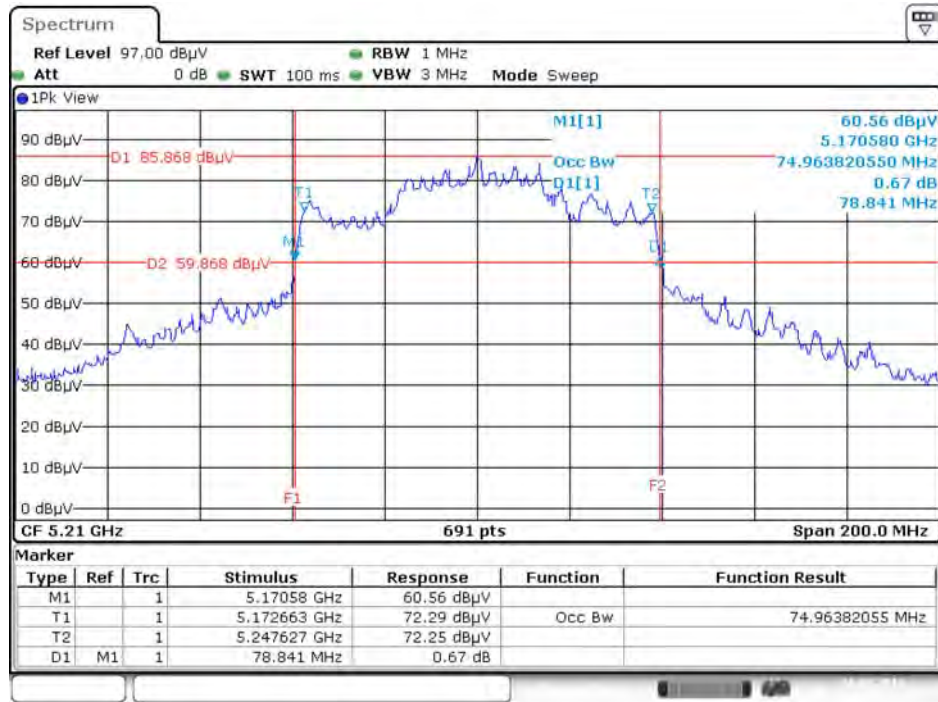
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1
VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5230 MHz



Date: 26.FEB.2016 16:50:04



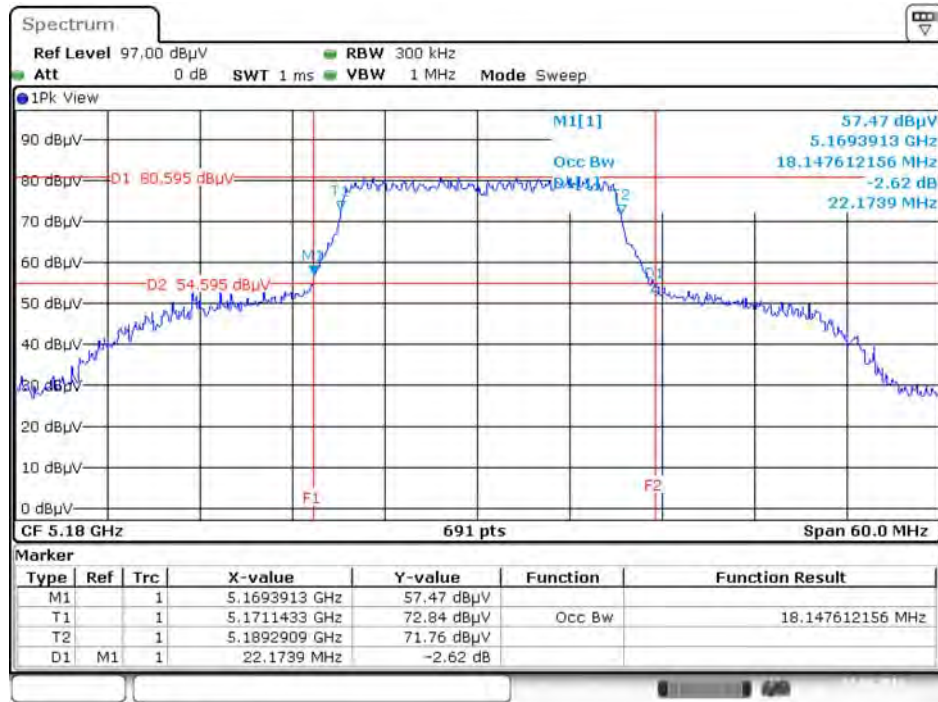
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1
VHT80 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5210 MHz



Date: 26.FEB.2016 16:55:17

For beamforming function:

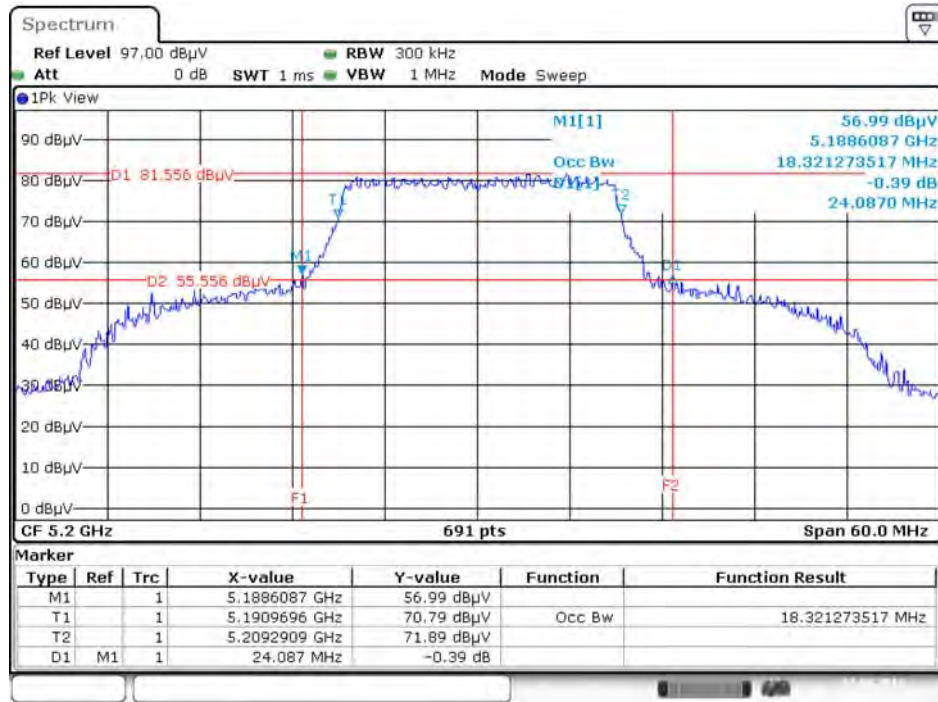
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5180 MHz



Date: 23.MAR.2016 02:05:47

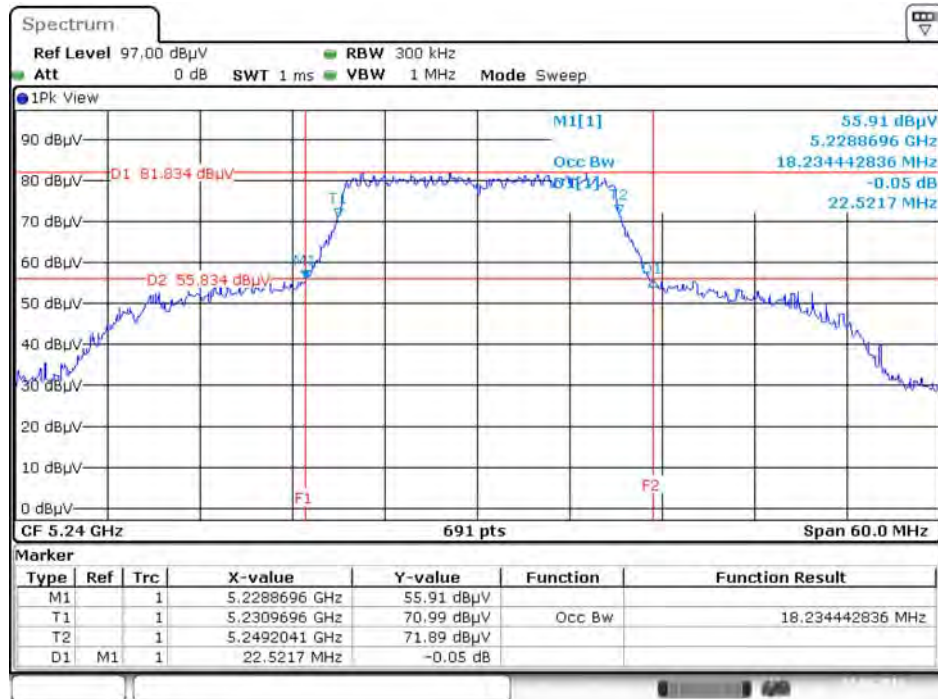


26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1
VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz



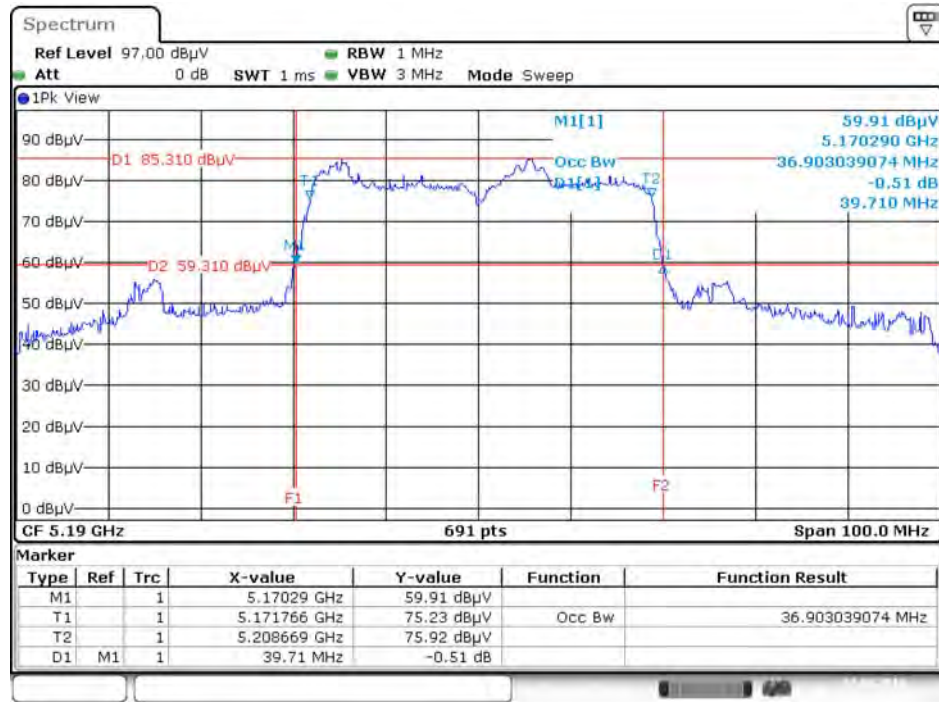
Date: 23.MAR.2016 02:06:44

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: 23.MAR.2016 02:07:15

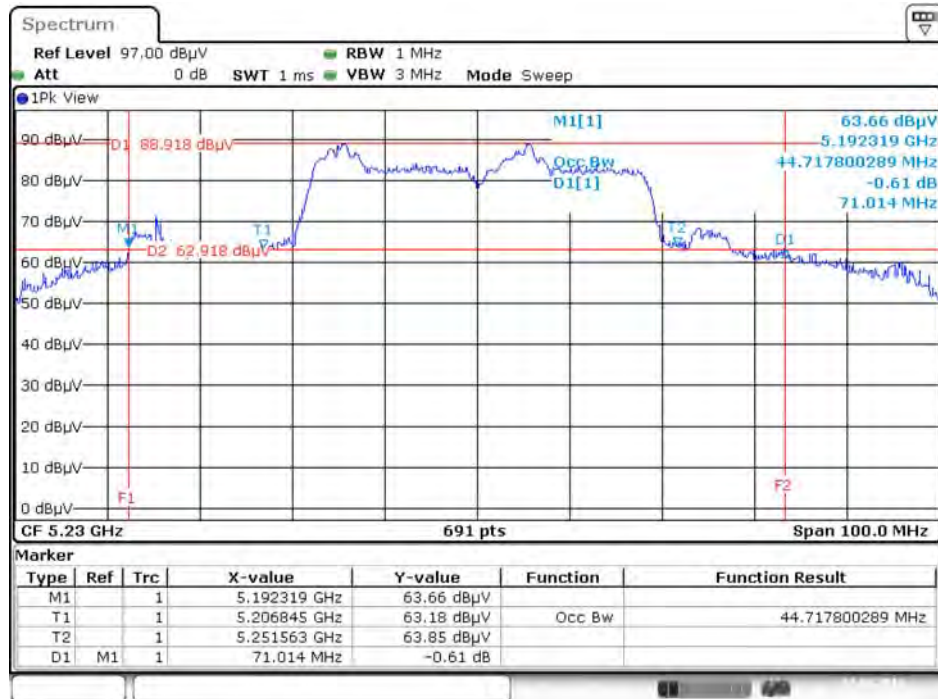
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5190 MHz



Date: 23.MAR.2016 02:13:38



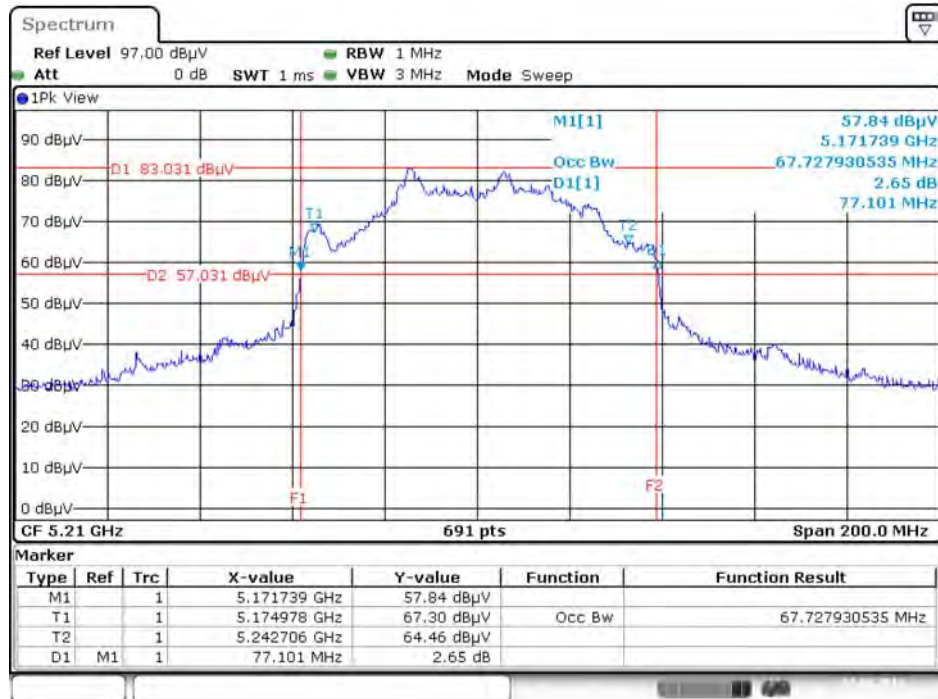
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1
VHT40 / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5230 MHz



Date: 23.MAR.2016 02:14:28



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: 23.MAR.2016 02:23:35

2.3. Maximum Conducted Output Power Measurement

2.3.1. Limit

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

2.3.2. Measuring Instruments and Setting

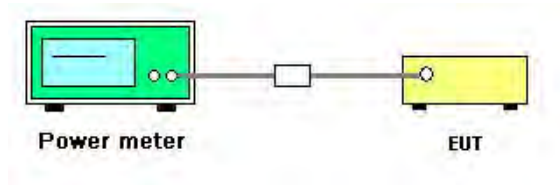
Please refer to section 3 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

2.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v02r01 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.

2.3.4. Test Setup Layout



2.3.5. Test Deviation

There is no deviation with the original standard.

2.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

**2.3.7. Test Result of Maximum Conducted Output Power**

Temperature	25°C	Humidity	59%
Test Engineer	Peter Wu	Test Date	Feb. 25, 2016~Feb. 26, 2016
Test Function	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	16.97	17.64	17.42	16.95	23.28	30.00	Complies
	5200 MHz	17.52	18.08	17.63	17.69	23.76	30.00	Complies
	5240 MHz	16.56	17.17	17.28	16.67	22.95	30.00	Complies
802.11ac MCS0/Nss1 VHT20	5180 MHz	17.52	17.99	18.01	17.35	23.75	30.00	Complies
	5200 MHz	17.61	18.49	17.56	17.73	23.88	30.00	Complies
	5240 MHz	17.23	17.86	17.93	17.28	23.61	30.00	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	13.72	13.80	13.86	13.46	19.73	30.00	Complies
	5230 MHz	17.26	17.69	17.91	17.83	23.70	30.00	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	12.36	13.16	13.28	12.82	18.94	30.00	Complies

Temperature	25°C	Humidity	59%
Test Engineer	Peter Wu	Test Date	Mar. 22, 2016
Test Function	Beamforming function		

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
802.11ac	5180 MHz	18.38	17.41	17.55	17.36	23.72	26.27	Complies
MCS0/Nss1	5200 MHz	20.28	19.75	19.58	19.24	25.75	26.27	Complies
VHT20	5240 MHz	18.08	17.02	17.11	17.52	23.47	26.27	Complies
802.11ac	5190 MHz	14.63	14.05	13.83	14.62	20.32	26.27	Complies
MCS0/Nss1	5230 MHz	18.16	17.09	17.25	18.03	23.68	26.27	Complies
VHT40								
802.11ac	5210 MHz	12.58	11.86	11.84	12.66	18.27	26.27	Complies
MCS0/Nss1								
VHT80								

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$

1. 5150~5250 MHz directional gain=9.73dBi >6dBi, so limit=30 – (9.73 – 6)=26.27dBm.
2. 5725~5850 MHz directional gain=10.23dBi >6dBi, so limit=30 – (10.23 – 6)=25.77dBm.

2.4. Power Spectral Density Measurement

2.4.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 2.3.1.

Frequency Band		Limit
☒	5.15~5.25 GHz	
	Operating Mode	
☐	Outdoor access point	17 dBm/MHz
☒	Indoor access point	17 dBm/MHz
☐	Fixed point-to-point access points	17 dBm/MHz
☐	Client devices	11 dBm/MHz

2.4.2. Measuring Instruments and Setting

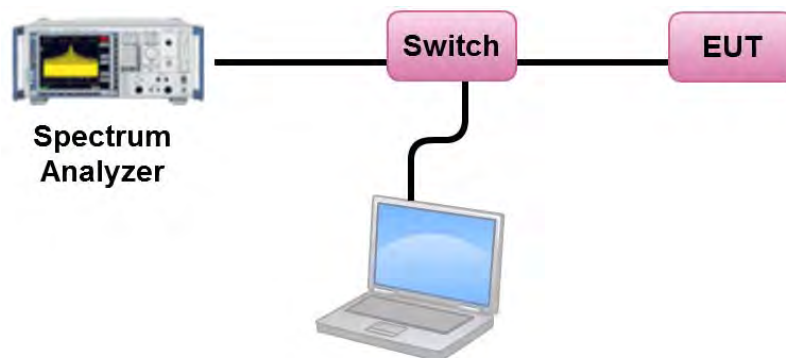
Please refer to section 3 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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.	

2.4.3. 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 v02r01 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 ≤ 30 dBm.

2.4.4. Test Setup Layout



2.4.5. Test Deviation

There is no deviation with the original standard.

2.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4.7. Test Result of Power Spectral Density

Temperature	25°C	Humidity	59%
Test Engineer	Peter Wu	Test Date	Feb. 25, 2016~Feb. 26, 2016
Test Function	Non-beamforming function		

Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	10.28	13.27	Complies
40	5200 MHz	10.67	13.27	Complies
48	5240 MHz	9.91	13.27	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{K=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 9.73 \text{dBi} > 6 \text{dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{dBm/MHz}$.

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	10.70	13.27	Complies
40	5200 MHz	10.51	13.27	Complies
48	5240 MHz	10.46	13.27	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{K=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 9.73 \text{dBi} > 6 \text{dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{dBm/MHz}$.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	3.53	13.27	Complies
46	5230 MHz	7.63	13.27	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{K=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 9.73 \text{dBi} > 6 \text{dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{dBm/MHz}$.



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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-0.34	13.27	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{K=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 9.73 \text{dBi} > 6 \text{dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{dBm/MHz}$.



Temperature	25°C	Humidity	59%
Test Engineer	Peter Wu	Test Date	Mar. 22, 2016
Test Function	Beamforming function		

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3 + Chain 4

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	10.64	13.27	Complies
40	5200 MHz	12.76	13.27	Complies
48	5240 MHz	10.40	13.27	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 9.73 \text{ dBi} > 6 \text{ dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{ dBm/MHz}$.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	4.24	13.27	Complies
46	5230 MHz	7.62	13.27	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 9.73 \text{ dBi} > 6 \text{ dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{ dBm/MHz}$.

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-0.77	13.27	Complies

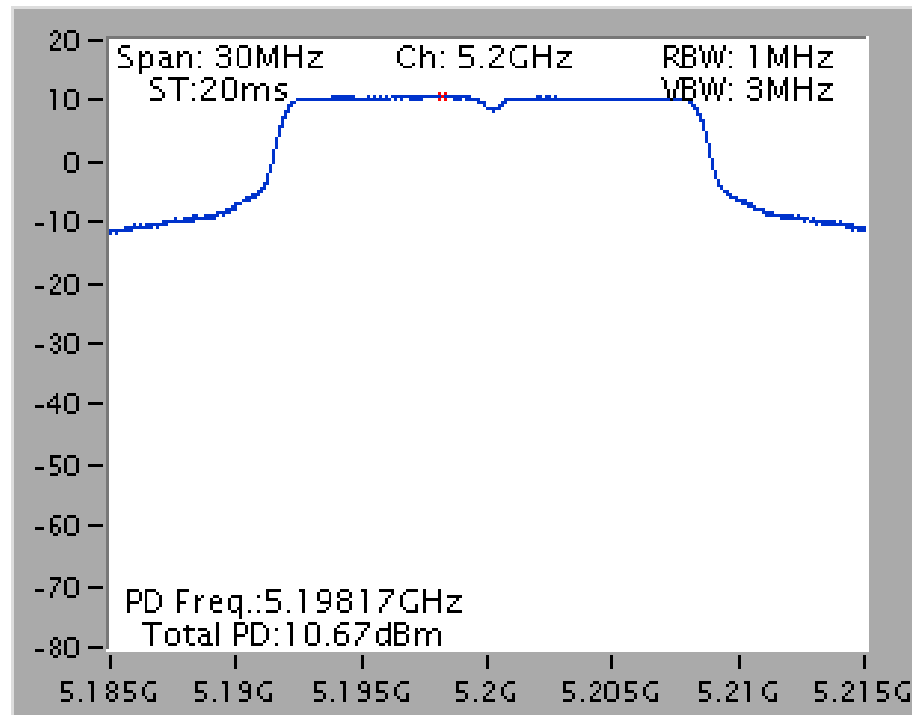
Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 9.73 \text{ dBi} > 6 \text{ dBi}$, so limit = $17 - (9.73 - 6) = 13.27 \text{ dBm/MHz}$.

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

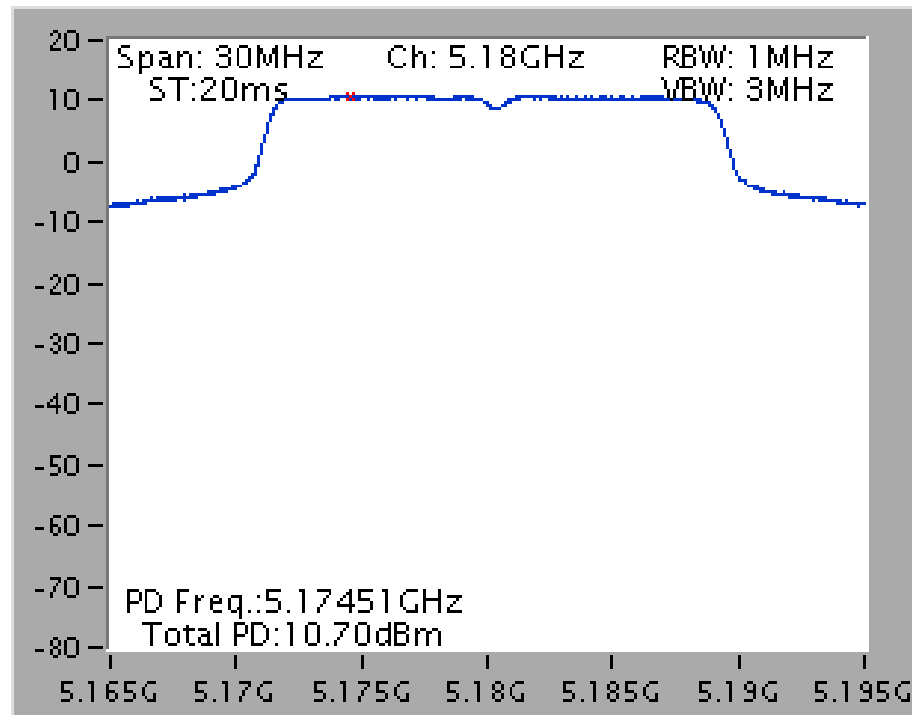
For plots, only the channel with worse result was shown.

For non-beamforming function:

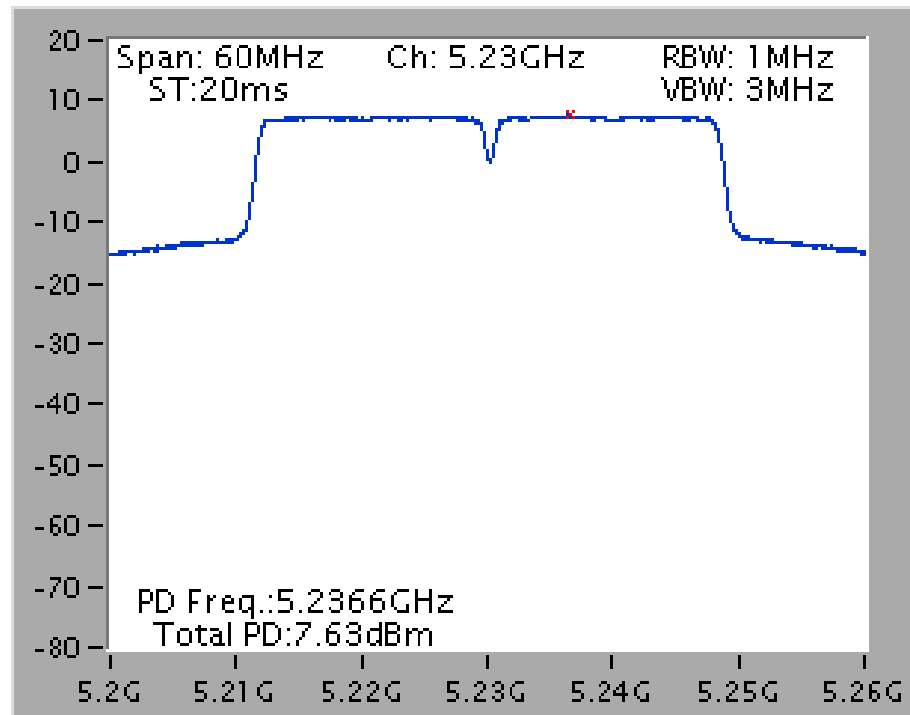
Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 + Chain 3 + Chain 4 / 5200 MHz



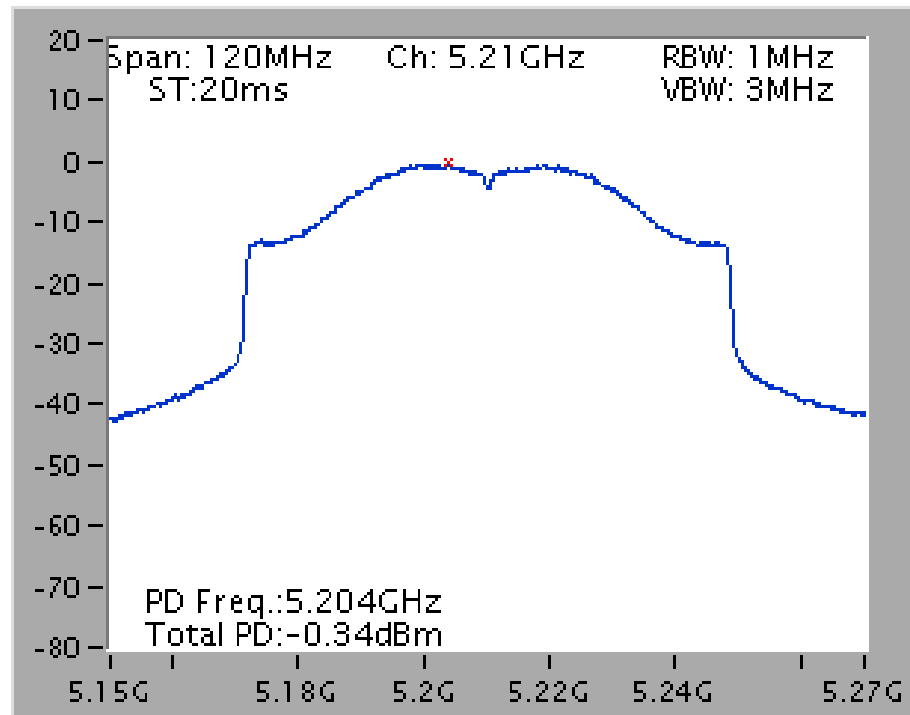
**Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3
+ Chain 4 / 5180 MHz**



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

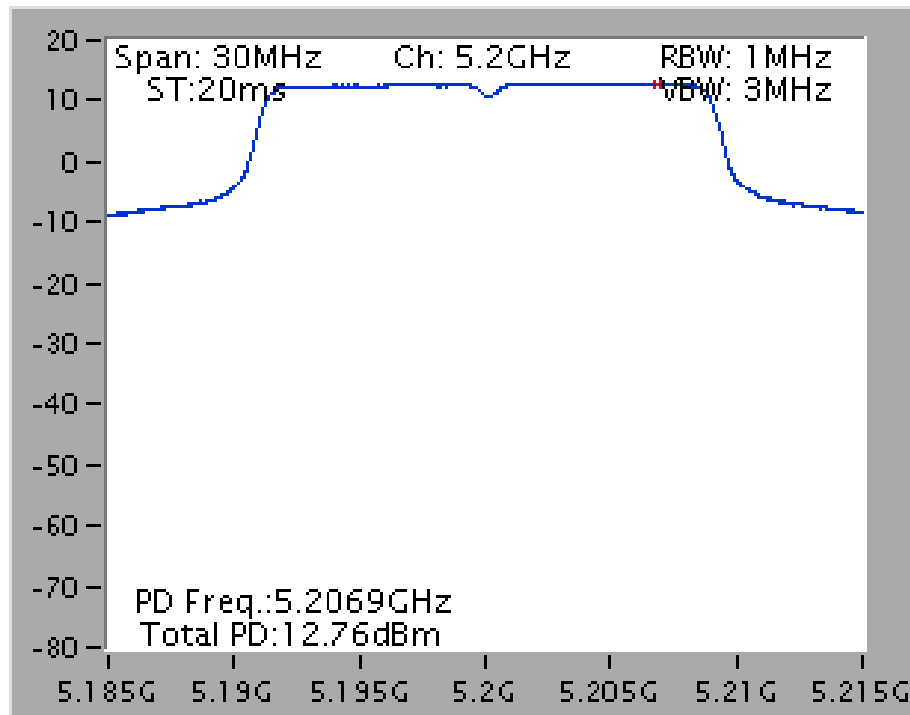


**Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3
+ Chain 4 / 5210 MHz**

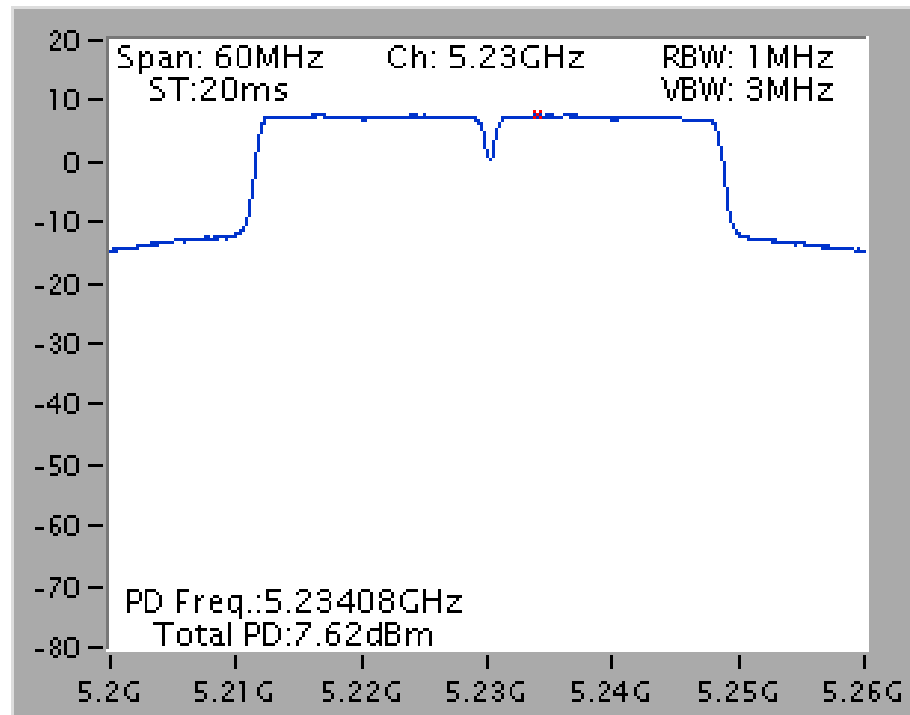


For beamforming function:

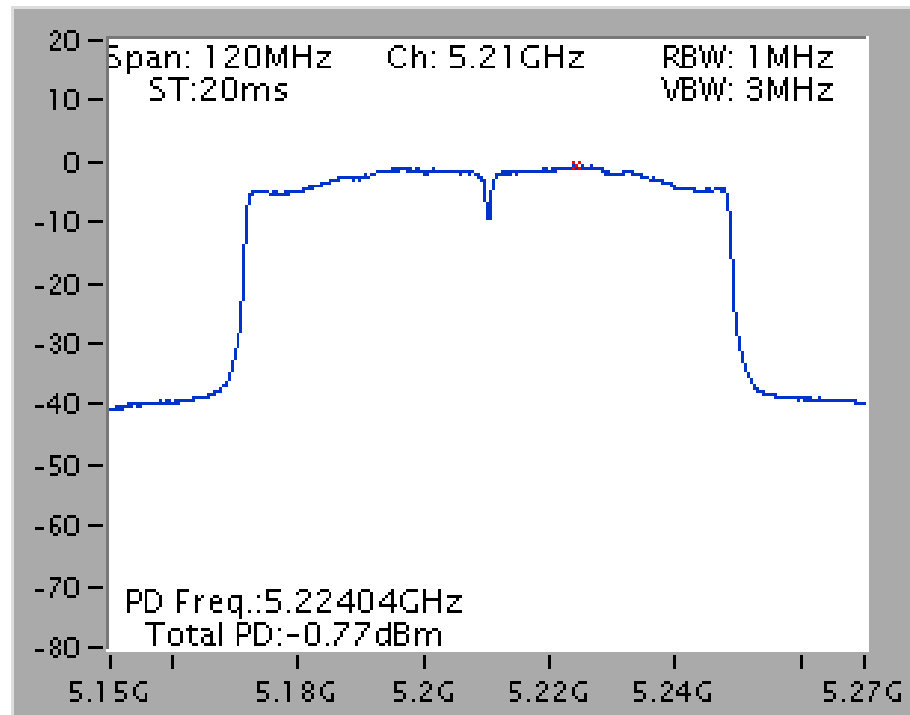
**Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 + Chain 3
+ Chain 4 / 5200 MHz**



**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**



2.5. Radiated Emissions Measurement

2.5.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.25-5.35 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 2.7, then the 2.8 limit in the table below has to be followed.

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

2.5.2. Measuring Instruments and Setting

Please refer to section 3 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

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

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

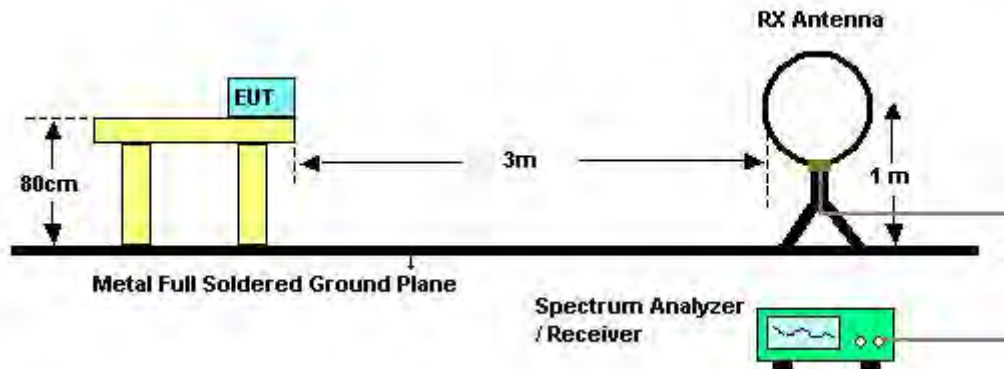


2.5.3. Test Procedures

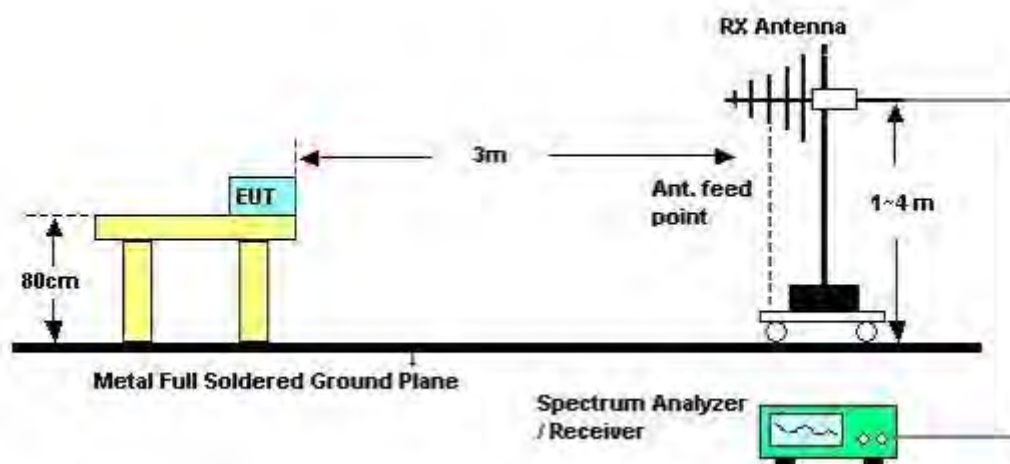
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting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

2.5.4. Test Setup Layout

For Radiated Emissions: 9kHz ~30MHz



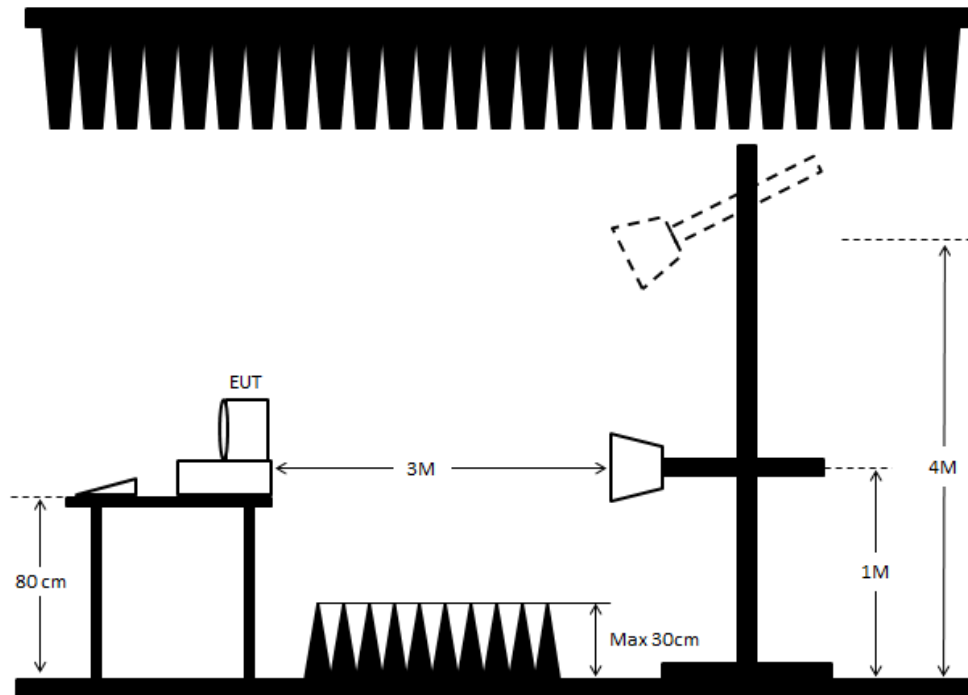
For Radiated Emissions: 30MHz~1GHz



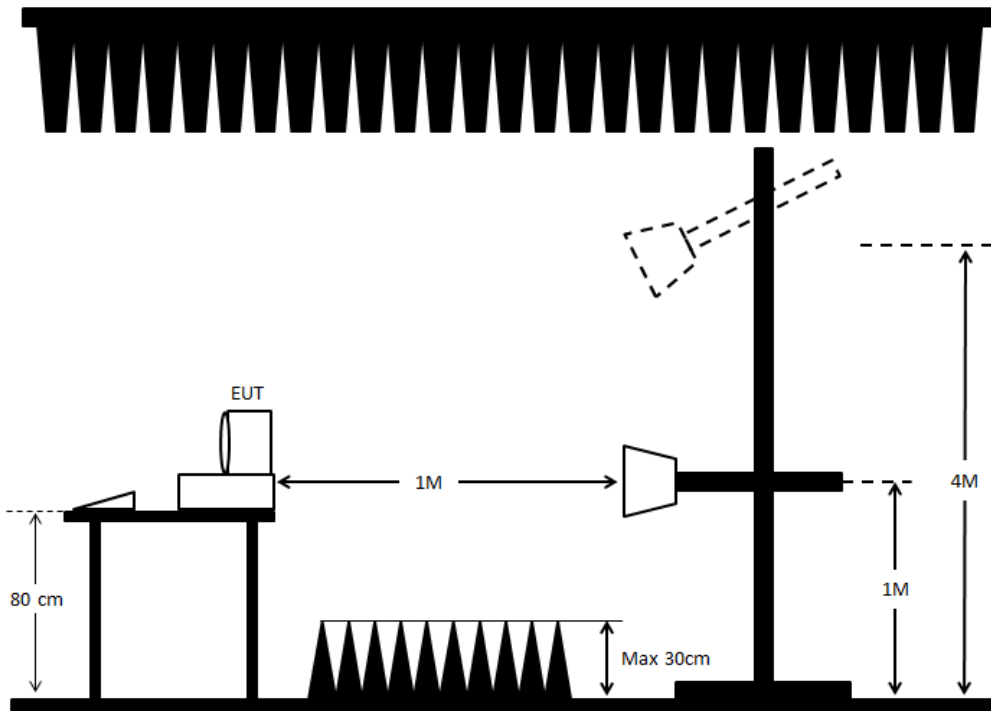
For Radiated Emissions: Above 1GHz

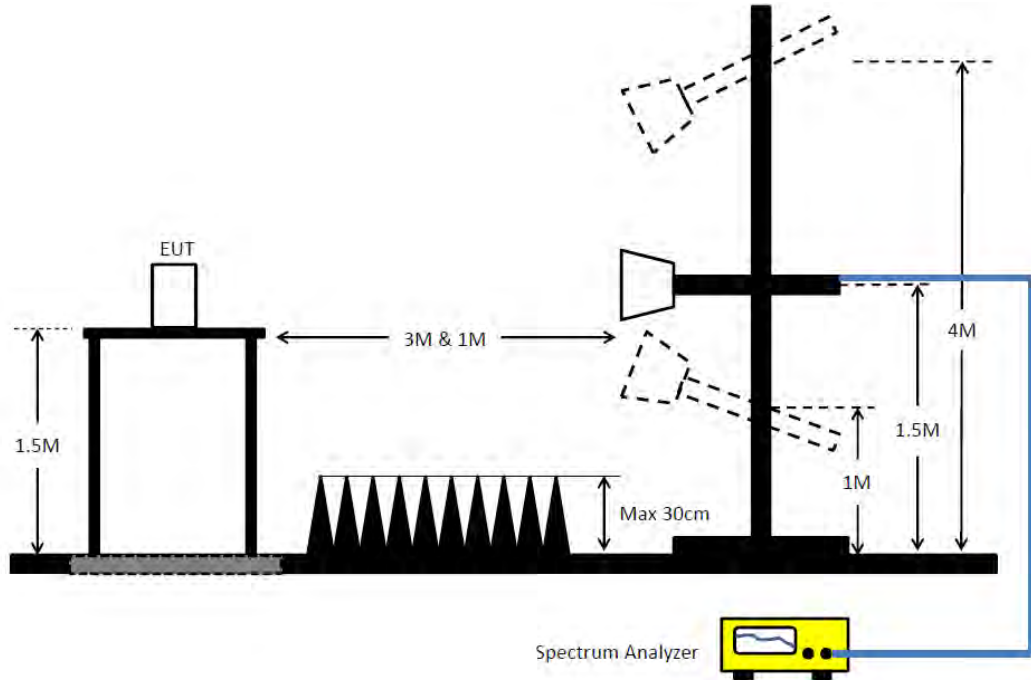
Unintentional – CRX

1,000~18,000 MHz



18,000~30,000 MHz



Intentional – CTX

2.5.5. Test Deviation

There is no deviation with the original standard.

2.5.6. 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.

**2.5.7. Results of Radiated Emissions (9kHz~30MHz)**

Temperature	22°C	Humidity	58%
Test Engineer	Howard Liu	Configurations	Intentional – CTX / Mode 3
Test Date	Apr. 10, 2018		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

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

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

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

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

Temperature	22°C	Humidity	58%
Test Engineer	Howard Liu	Configurations	Unintentional – CRX / Mode 3
Test Date	Apr. 10, 2018		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

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

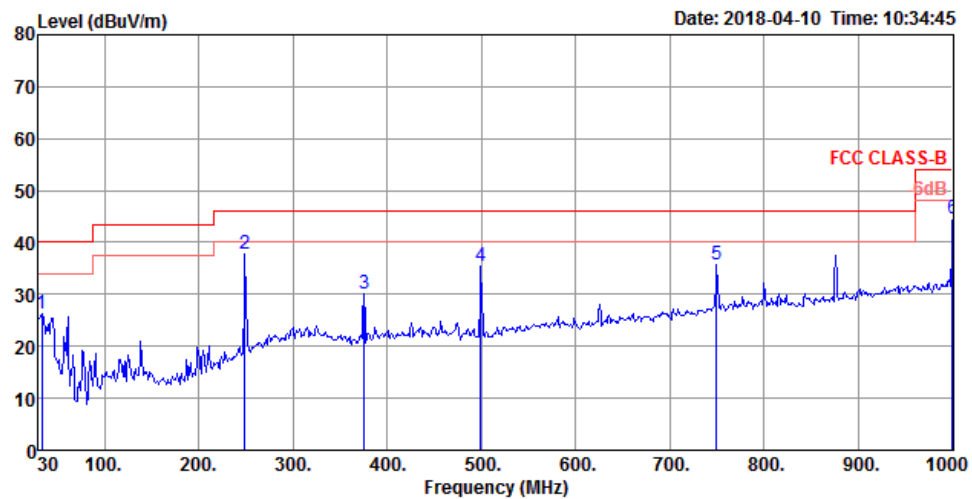
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

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

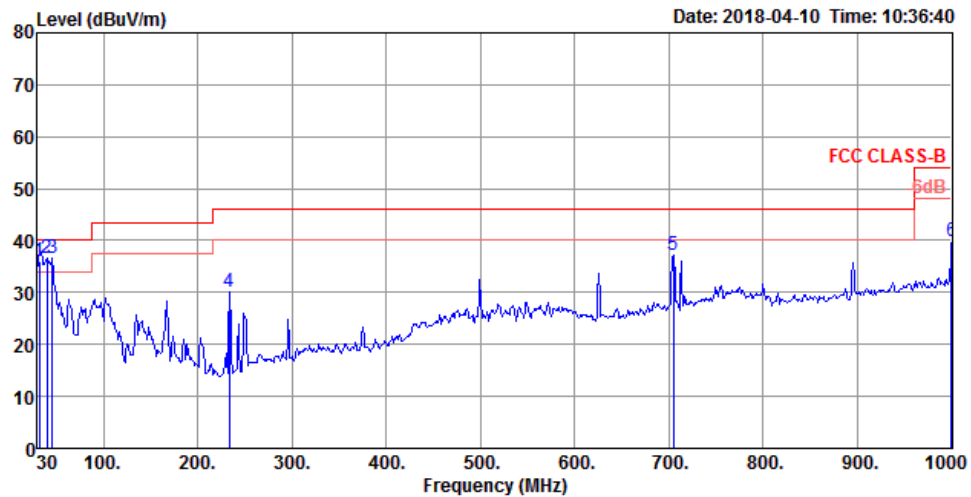
Limit line = specific limits (dBuV) + distance extrapolation factor.

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

Temperature	22°C	Humidity	58%
Test Engineer	Howard Liu	Configurations	Intentional – CTX / Mode 3

Horizontal

	Freq	Level	Limit	Over	Read	Preamp	Antenna	Cable	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	33.88	26.18	40.00	-13.82	34.04	27.84	18.04	1.94	Peak	100	360	HORIZONTAL
2	249.22	37.81	46.00	-8.19	47.05	27.22	13.01	4.97	Peak	100	360	HORIZONTAL
3	375.32	30.07	46.00	-15.93	35.46	27.75	16.26	6.10	Peak	100	360	HORIZONTAL
4	499.48	35.44	46.00	-10.56	38.78	28.54	18.19	7.01	Peak	100	360	HORIZONTAL
5	749.74	35.80	46.00	-10.20	32.84	28.02	22.30	8.68	Peak	100	360	HORIZONTAL
6	1000.00	44.62	54.00	-9.38	36.39	26.98	24.90	10.31	Peak	100	360	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	Preamp	Antenna	Cable	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	31.94	35.95	40.00	-4.05	42.80	27.84	19.12	1.87	QP	100	0	VERTICAL
2	39.70	36.66	40.00	-3.34	47.47	27.83	14.90	2.12	Peak	100	0	VERTICAL
3	45.52	36.53	40.00	-3.47	50.36	27.82	11.77	2.22	Peak	100	0	VERTICAL
4	233.70	30.21	46.00	-15.79	40.96	27.25	11.68	4.82	Peak	100	0	VERTICAL
5	705.12	37.13	46.00	-8.87	35.68	28.22	21.13	8.54	Peak	100	0	VERTICAL
6	1000.00	39.77	54.00	-14.23	31.54	26.98	24.90	10.31	Peak	100	0	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.

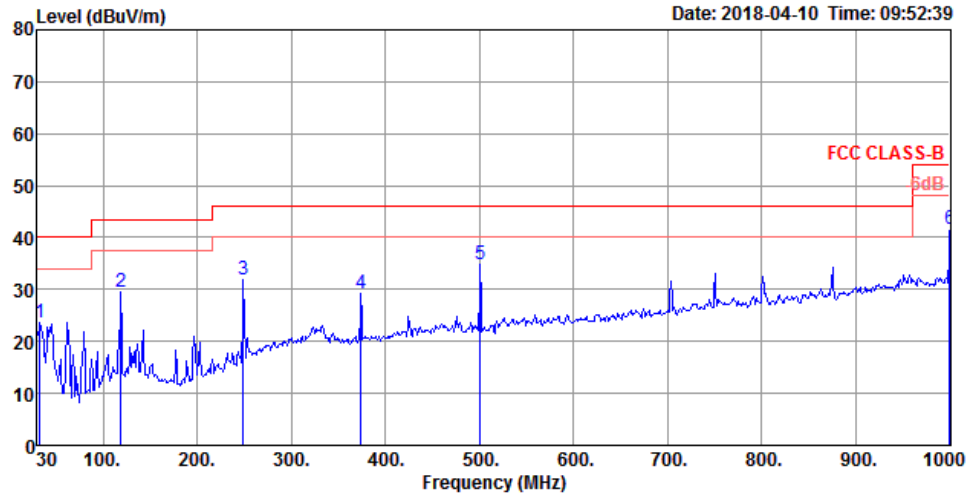
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

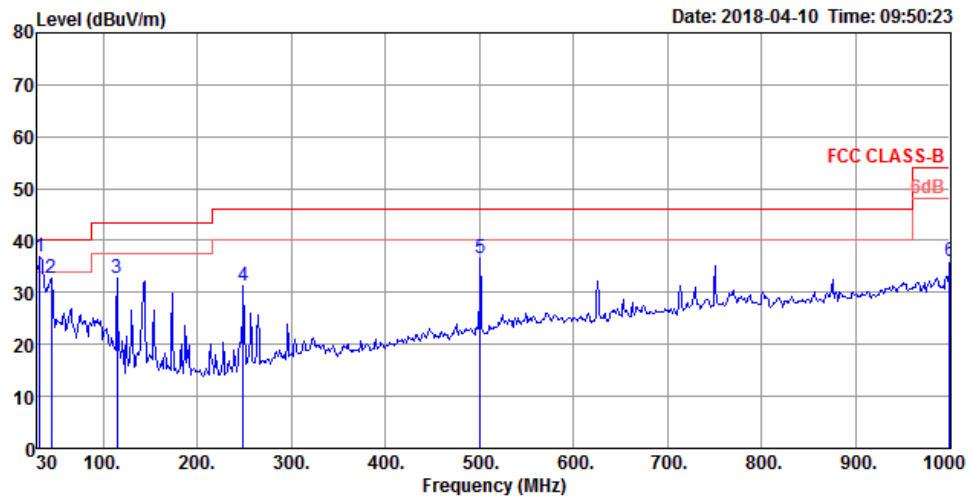


Temperature	22°C	Humidity	58%
Test Engineer	Howard Liu	Configurations	Unintentional – CRX / Mode 3

Horizontal



	Freq	Level	Limit	Over	Read	Preamp	Antenna	Cable	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	32.80	23.53	40.00	-16.47	30.88	27.84	18.58	1.91	Peak	100	360	HORIZONTAL
2	118.60	29.66	43.50	-13.84	41.54	27.62	12.29	3.45	Peak	100	360	HORIZONTAL
3	249.25	31.99	46.00	-14.01	41.23	27.22	13.01	4.97	Peak	100	360	HORIZONTAL
4	374.05	29.23	46.00	-16.77	34.64	27.74	16.24	6.09	Peak	100	360	HORIZONTAL
5	500.80	34.83	46.00	-11.17	38.16	28.55	18.20	7.02	Peak	100	360	HORIZONTAL
6	1000.00	41.63	54.00	-12.37	33.40	26.98	24.90	10.31	Peak	100	360	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	Preamp	Antenna	Cable		A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	Remark	cm	deg	
1	32.80	36.77	40.00	-3.23	44.12	27.84	18.58	1.91	Peak	100	0	VERTICAL
2	44.50	32.86	40.00	-7.14	46.28	27.82	12.20	2.20	Peak	100	0	VERTICAL
3	114.70	32.71	43.50	-10.79	44.87	27.63	12.07	3.40	Peak	100	0	VERTICAL
4	249.25	31.41	46.00	-14.59	40.65	27.22	13.01	4.97	Peak	100	0	VERTICAL
5	500.80	36.65	46.00	-9.35	39.98	28.55	18.20	7.02	Peak	100	0	VERTICAL
6	1000.00	36.12	54.00	-17.88	27.89	26.98	24.90	10.31	Peak	100	0	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).

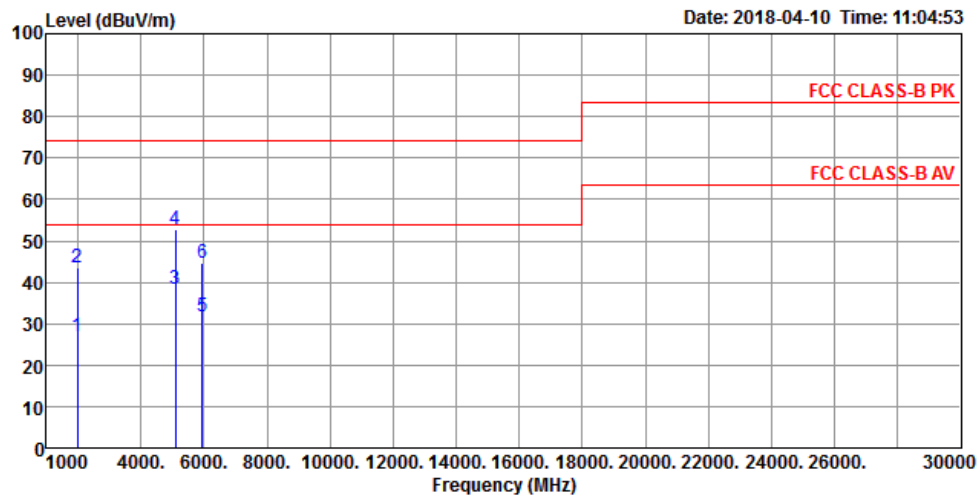
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.



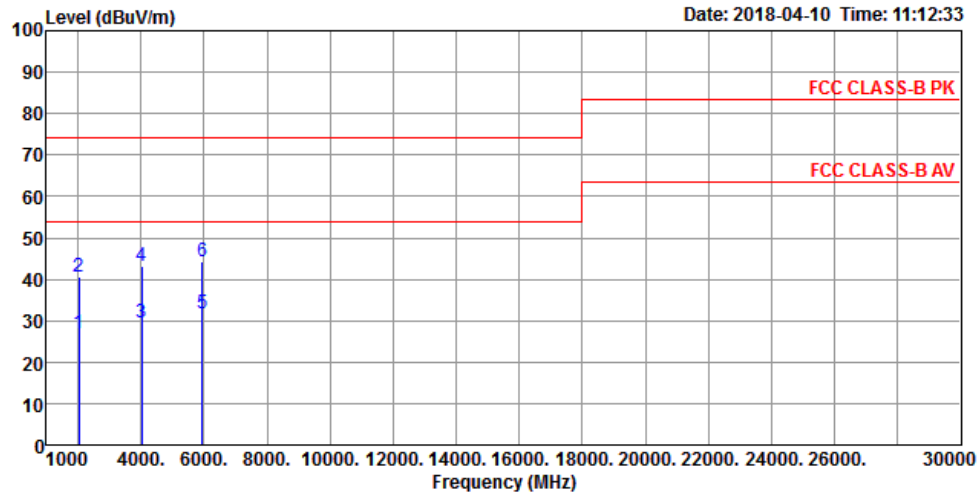
2.5.9. Results for Radiated Emissions (1GHz~5th Harmonic)

Temperature	22°C	Humidity	58%
Test Engineer	Howard Liu	Configurations	Unintentional – CRX / Mode 5

Horizontal



	Freq	Level	Limit	Over	Read	Preamp	Antenna	Cable	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	1986.00	26.92	54.00	-27.08	28.70	35.75	31.08	2.89	Average	100	190	HORIZONTAL
2	1986.00	43.45	74.00	-30.55	45.23	35.75	31.08	2.89	Peak	100	190	HORIZONTAL
3	5097.00	38.40	54.00	-15.60	34.93	36.12	34.56	5.03	Average	100	92	HORIZONTAL
4	5097.00	52.69	74.00	-21.31	49.22	36.12	34.56	5.03	Peak	100	92	HORIZONTAL
5	5947.00	31.80	54.00	-22.20	26.65	36.03	35.74	5.44	Average	100	168	HORIZONTAL
6	5947.00	44.61	74.00	-29.39	39.46	36.03	35.74	5.44	Peak	100	168	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	Preamp	Antenna	Cable	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2020.00	26.82	54.00	-27.18	28.41	35.76	31.24	2.93	Average	100	8	VERTICAL
2	2020.00	40.63	74.00	-33.37	42.22	35.76	31.24	2.93	Peak	100	8	VERTICAL
3	4009.00	29.60	54.00	-24.40	27.46	36.14	33.62	4.66	Average	100	4	VERTICAL
4	4009.00	43.34	74.00	-30.66	41.20	36.14	33.62	4.66	Peak	100	4	VERTICAL
5	5930.00	31.63	54.00	-22.37	26.53	36.03	35.72	5.41	Average	100	325	VERTICAL
6	5930.00	44.36	74.00	-29.64	39.26	36.03	35.72	5.41	Peak	100	325	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.



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

Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	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	15538.18	60.45	74.00	-13.55	45.48	11.45	38.16	34.64	145	150	Peak	HORIZONTAL
2	15539.78	47.30	54.00	-6.70	32.33	11.45	38.16	34.64	145	150	Average	HORIZONTAL

Vertical

	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	15537.65	47.28	54.00	-6.72	32.31	11.45	38.16	34.64	118	150	Average	VERTICAL
2	15538.26	61.41	74.00	-12.59	46.44	11.45	38.16	34.64	118	150	Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11a CH 40 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15598.92	60.70	74.00	-13.30	45.67	11.48	38.23	34.68	86	150 Peak	HORIZONTAL
2	15600.39	47.87	54.00	-6.13	32.84	11.48	38.23	34.68	86	150 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15602.09	48.01	54.00	-5.99	32.90	11.50	38.29	34.68	67	150 Average	VERTICAL
2	15602.15	61.07	74.00	-12.93	45.96	11.50	38.29	34.68	67	150 Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11a CH 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15717.60	47.38	54.00	-6.62	32.21	11.56	38.42	34.81	48	150 Average	HORIZONTAL
2	15720.01	60.32	74.00	-13.68	45.15	11.56	38.42	34.81	48	150 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15718.20	47.35	54.00	-6.65	32.18	11.56	38.42	34.81	28	150 Average	VERTICAL
2	15719.96	60.33	74.00	-13.67	45.16	11.56	38.42	34.81	28	150 Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15538.24	60.87	74.00	-13.13	45.90	11.45	38.16	34.64	126	150 Peak	HORIZONTAL
2	15540.27	47.09	54.00	-6.91	32.12	11.45	38.16	34.64	126	150 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15539.84	61.28	74.00	-12.72	46.31	11.45	38.16	34.64	133	150 Peak	VERTICAL
2	15540.46	47.28	54.00	-6.72	32.31	11.45	38.16	34.64	133	150 Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15598.37	60.97	74.00	-13.03	45.94	11.48	38.23	34.68	143	150 Peak	HORIZONTAL
2	15600.64	47.89	54.00	-6.11	32.78	11.50	38.29	34.68	143	150 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15600.27	47.74	54.00	-6.26	32.71	11.48	38.23	34.68	154	150 Average	VERTICAL
2	15600.54	62.22	74.00	-11.78	47.11	11.50	38.29	34.68	154	150 Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15718.16	60.08	74.00	-13.92	44.91	11.56	38.42	34.81	164	150 Peak	HORIZONTAL
2	15719.78	47.25	54.00	-6.75	32.08	11.56	38.42	34.81	164	150 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15717.62	60.53	74.00	-13.47	45.36	11.56	38.42	34.81	176	150 Peak	VERTICAL
2	15720.46	47.19	54.00	-6.81	32.02	11.56	38.42	34.81	176	150 Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15570.82	60.75	74.00	-13.25	45.72	11.48	38.23	34.68	301	150 Peak	HORIZONTAL
2	15571.83	47.49	54.00	-6.51	32.46	11.48	38.23	34.68	301	150 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15569.42	61.37	74.00	-12.63	46.34	11.48	38.23	34.68	320	150 Peak	VERTICAL
2	15569.92	47.59	54.00	-6.41	32.56	11.48	38.23	34.68	320	150 Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15688.54	47.57	54.00	-6.43	32.46	11.53	38.35	34.77	333	150 Average	HORIZONTAL
2	15689.32	60.92	74.00	-13.08	45.81	11.53	38.35	34.77	333	150 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15687.55	47.82	54.00	-6.18	32.71	11.53	38.35	34.77	347	150 Average	VERTICAL
2	15688.76	60.77	74.00	-13.23	45.66	11.53	38.35	34.77	347	150 Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15627.79	47.82	54.00	-6.18	32.76	11.50	38.29	34.73	283	150 Average	HORIZONTAL
2	15630.31	61.39	74.00	-12.61	46.33	11.50	38.29	34.73	283	150 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15629.07	47.81	54.00	-6.19	32.75	11.50	38.29	34.73	258	150 Average	VERTICAL
2	15631.30	62.11	74.00	-11.89	47.05	11.50	38.29	34.73	258	150 Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm			
1	15536.10	59.06	74.00	-14.94	44.09	11.45	38.16	34.64	87	178	Peak	HORIZONTAL
2	15542.86	47.10	54.00	-6.90	32.13	11.45	38.16	34.64	87	178	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15536.00	59.22	74.00	-14.78	44.25	11.45	38.16	34.64	96	200	Peak	VERTICAL
2	15542.60	46.91	54.00	-7.09	31.94	11.45	38.16	34.64	96	200	Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15536.10	59.06	74.00	-14.94	44.09	11.45	38.16	34.64	87	178 Peak	HORIZONTAL
2	15542.86	47.10	54.00	-6.90	32.13	11.45	38.16	34.64	87	178 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15596.80	46.57	54.00	-7.43	31.54	11.48	38.23	34.68	145	182 Average	VERTICAL
2	15601.74	59.78	74.00	-14.22	44.67	11.50	38.29	34.68	145	182 Peak	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15715.28	59.19	74.00	-14.81	44.02	11.56	38.42	34.81	107	136 Peak	HORIZONTAL
2	15723.58	46.28	54.00	-7.72	31.11	11.56	38.42	34.81	107	136 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15718.96	59.55	74.00	-14.45	44.38	11.56	38.42	34.81	141	198 Peak	VERTICAL
2	15719.72	46.25	54.00	-7.75	31.08	11.56	38.42	34.81	141	198 Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15572.72	59.85	74.00	-14.15	44.82	11.48	38.23	34.68	209	143 Peak	HORIZONTAL
2	15574.18	47.77	54.00	-6.23	32.74	11.48	38.23	34.68	209	143 Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	deg	cm		
1	15572.68	59.86	74.00	-14.14	44.83	11.48	38.23	34.68	254	136 Peak	VERTICAL
2	15573.62	46.62	54.00	-7.38	31.59	11.48	38.23	34.68	254	136 Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15690.00	59.96	74.00	-14.04	44.85	11.53	38.35	34.77	173	159	Peak	HORIZONTAL
2	15690.94	47.45	54.00	-6.55	32.24	11.56	38.42	34.77	173	159	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15687.92	59.00	74.00	-15.00	43.89	11.53	38.35	34.77	222	135	Peak	VERTICAL
2	15692.32	46.49	54.00	-7.51	31.28	11.56	38.42	34.77	222	135	Average	VERTICAL



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm	
1	15625.44	47.71	54.00	-6.29	32.65	11.50	38.29	34.73	146	169 Average	HORIZONTAL
2	15633.04	59.32	74.00	-14.68	44.26	11.50	38.29	34.73	146	169 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm	
1	15626.00	46.54	54.00	-7.46	31.48	11.50	38.29	34.73	189	177 Average	VERTICAL
2	15632.54	60.25	74.00	-13.75	45.19	11.50	38.29	34.73	189	177 Peak	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.

2.6. Band Edge Emissions Measurement

2.6.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.25-5.35 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 2.7, then the 2.8 limit in the table below has to be followed.

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

2.6.2. Measuring Instruments and Setting

Please refer to section 3 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

**2.6.3. Test Procedures**

The test procedure is the same as section 2.5.3.

2.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 2.5.4.

2.6.5. Test Deviation

There is no deviation with the original standard.

2.6.6. 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.



2.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 17, 2015	Test Function	Non-beamforming function

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	5150.00	71.82	74.00	-2.18	66.87	6.11	33.31	34.47	278	285	Peak	HORIZONTAL
2	5150.00	53.87	54.00	-0.13	48.92	6.11	33.31	34.47	278	285	Average	HORIZONTAL
3	5172.40	104.47			99.42	6.17	33.35	34.47	278	285	Average	HORIZONTAL
4	5172.60	114.72			109.67	6.17	33.35	34.47	278	285	Peak	HORIZONTAL

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

Channel 40

	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	5150.00	65.24	74.00	-8.76	60.29	6.11	33.31	34.47	283	239	Peak	HORIZONTAL
2	5150.00	50.20	54.00	-3.80	45.25	6.11	33.31	34.47	283	239	Average	HORIZONTAL
3	5192.40	107.23			102.12	6.20	33.38	34.47	283	239	Average	HORIZONTAL
4	5192.80	117.65			112.54	6.20	33.38	34.47	283	239	Peak	HORIZONTAL

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	5147.60	58.54	74.00	-15.46	53.59	6.11	33.31	34.47	282	240	Peak	HORIZONTAL
2	5150.00	46.08	54.00	-7.92	41.13	6.11	33.31	34.47	282	240	Average	HORIZONTAL
3	5232.20	104.78			99.49	6.32	33.44	34.47	282	240	Average	HORIZONTAL
4	5232.80	114.71			109.42	6.32	33.44	34.47	282	240	Peak	HORIZONTAL
5	5354.00	46.73	54.00	-7.27	41.03	6.58	33.59	34.47	282	240	Average	HORIZONTAL
6	5365.40	59.99	74.00	-14.01	54.23	6.62	33.61	34.47	282	240	Peak	HORIZONTAL

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



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 17, 2015	Test Function	Non-beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5146.80	72.43	74.00	-1.57	67.48	6.11	33.31	34.47	58	294	Peak	HORIZONTAL
2	5150.00	53.92	54.00	-0.08	48.97	6.11	33.31	34.47	58	294	Average	HORIZONTAL
3	5176.40	105.33			100.28	6.17	33.35	34.47	58	294	Average	HORIZONTAL
4	5182.00	116.88			111.83	6.17	33.35	34.47	58	294	Peak	HORIZONTAL

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5149.60	65.41	74.00	-8.59	60.46	6.11	33.31	34.47	69	292	Peak	HORIZONTAL
2	5150.00	52.15	54.00	-1.85	47.20	6.11	33.31	34.47	69	292	Average	HORIZONTAL
3	5206.60	118.34			113.17	6.24	33.40	34.47	69	292	Peak	HORIZONTAL
4	5206.60	108.98			103.81	6.24	33.40	34.47	69	292	Average	HORIZONTAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5150.00	59.31	74.00	-14.69	54.36	6.11	33.31	34.47	56	301	Peak	HORIZONTAL
2	5150.00	47.97	54.00	-6.03	43.02	6.11	33.31	34.47	56	301	Average	HORIZONTAL
3	5236.80	117.18			111.89	6.32	33.44	34.47	56	301	Peak	HORIZONTAL
4	5247.20	106.95			101.61	6.35	33.46	34.47	56	301	Average	HORIZONTAL
5	5352.40	59.37	74.00	-14.63	53.67	6.58	33.59	34.47	56	301	Peak	HORIZONTAL
6	5392.00	49.31	54.00	-4.69	43.43	6.70	33.65	34.47	56	301	Average	HORIZONTAL

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



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 17, 2015	Test Function	Non-beamforming function

Channel 38

	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	70.56	74.00	-3.44	65.61	6.11	33.31	34.47	53	293	Peak	HORIZONTAL
2	5148.00	53.65	54.00	-0.35	48.70	6.11	33.31	34.47	53	293	Average	HORIZONTAL
3	5197.20	108.95			103.84	6.20	33.38	34.47	53	293	Peak	HORIZONTAL
4	5206.80	98.70			93.53	6.24	33.40	34.47	53	293	Average	HORIZONTAL
5	5356.80	50.23	54.00	-3.77	44.47	6.62	33.61	34.47	53	293	Average	HORIZONTAL
6	5361.60	61.65	74.00	-12.35	55.89	6.62	33.61	34.47	53	293	Peak	HORIZONTAL

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

Channel 46

	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	5136.40	61.07	74.00	-12.93	56.18	6.07	33.29	34.47	63	290	Peak	HORIZONTAL
2	5146.00	49.42	54.00	-4.58	44.47	6.11	33.31	34.47	63	290	Average	HORIZONTAL
3	5242.00	104.10			98.81	6.32	33.44	34.47	63	290	Average	HORIZONTAL
4	5246.80	113.99			108.70	6.32	33.44	34.47	63	290	Peak	HORIZONTAL
5	5376.40	52.30	54.00	-1.70	46.48	6.66	33.63	34.47	63	290	Average	HORIZONTAL
6	5387.20	63.57	74.00	-10.43	57.69	6.70	33.65	34.47	63	290	Peak	HORIZONTAL

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



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42, / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Dec. 18, 2015	Test Function	Non-beamforming function

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm	
1	5150.00	65.14	74.00	-8.86	60.19	6.11	33.31	34.47	59	216 Peak	HORIZONTAL
2	5150.00	53.75	54.00	-0.25	48.80	6.11	33.31	34.47	59	216 Average	HORIZONTAL
3	5222.00	104.66			99.43	6.28	33.42	34.47	59	216 Peak	HORIZONTAL
4	5227.00	95.34			90.11	6.28	33.42	34.47	59	216 Average	HORIZONTAL
5	5362.00	61.38	74.00	-12.62	55.62	6.62	33.61	34.47	59	216 Peak	HORIZONTAL
6	5378.00	49.82	54.00	-4.18	44.00	6.66	33.63	34.47	59	216 Average	HORIZONTAL

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



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 07, 2016	Test Function	Beamforming function

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5144.40	73.78	74.00	-0.22	68.83	6.11	33.31	34.47	284	240	Peak	HORIZONTAL
2	5150.00	53.62	54.00	-0.38	48.67	6.11	33.31	34.47	284	240	Average	HORIZONTAL
3	5182.80	103.92			98.87	6.17	33.35	34.47	284	240	Average	HORIZONTAL
4	5183.60	114.74			109.69	6.17	33.35	34.47	284	240	Peak	HORIZONTAL

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5150.00	69.20	74.00	-4.80	64.25	6.11	33.31	34.47	287	223	Peak	HORIZONTAL
2	5150.00	49.14	54.00	-4.86	44.19	6.11	33.31	34.47	287	223	Average	HORIZONTAL
3	5192.00	104.94			99.83	6.20	33.38	34.47	287	223	Average	HORIZONTAL
4	5192.80	114.68			109.57	6.20	33.38	34.47	287	223	Peak	HORIZONTAL
5	5352.00	46.43	54.00	-7.57	40.73	6.58	33.59	34.47	287	223	Average	HORIZONTAL
6	5364.00	59.26	74.00	-14.74	53.50	6.62	33.61	34.47	287	223	Peak	HORIZONTAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5122.40	58.01	74.00	-15.99	53.17	6.04	33.27	34.47	291	221	Peak	HORIZONTAL
2	5150.00	45.75	54.00	-8.25	40.80	6.11	33.31	34.47	291	221	Average	HORIZONTAL
3	5237.00	112.88			107.59	6.32	33.44	34.47	291	221	Peak	HORIZONTAL
4	5243.00	102.92			97.63	6.32	33.44	34.47	291	221	Average	HORIZONTAL
5	5360.00	45.90	54.00	-8.10	40.14	6.62	33.61	34.47	291	221	Average	HORIZONTAL
6	5367.20	58.77	74.00	-15.23	53.01	6.62	33.61	34.47	291	221	Peak	HORIZONTAL

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



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

Channel 38

	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	5146.80	69.47	74.00	-4.53	64.52	6.11	33.31	34.47	84	222 Peak	HORIZONTAL
2	5150.00	53.82	54.00	-0.18	48.87	6.11	33.31	34.47	84	222 Average	HORIZONTAL
3	5200.80	111.58			106.47	6.20	33.38	34.47	84	222 Peak	HORIZONTAL
4	5204.40	102.56			97.39	6.24	33.40	34.47	84	222 Average	HORIZONTAL
5	5365.20	51.71	54.00	-2.29	45.95	6.62	33.61	34.47	84	222 Average	HORIZONTAL
6	5367.60	63.49	74.00	-10.51	57.73	6.62	33.61	34.47	84	222 Peak	HORIZONTAL

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

Channel 46

	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	5072.80	63.11	74.00	-10.89	58.42	5.95	33.21	34.47	82	224 Peak	HORIZONTAL
2	5080.00	51.18	54.00	-2.82	46.49	5.95	33.21	34.47	82	224 Average	HORIZONTAL
3	5232.40	116.24			110.95	6.32	33.44	34.47	82	224 Peak	HORIZONTAL
4	5236.00	105.89			100.60	6.32	33.44	34.47	82	224 Average	HORIZONTAL
5	5378.80	52.94	54.00	-1.06	47.12	6.66	33.63	34.47	82	224 Average	HORIZONTAL
6	5401.60	64.97	74.00	-9.03	59.05	6.72	33.67	34.47	82	224 Peak	HORIZONTAL

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



Temperature	22°C	Humidity	54%
Test Engineer	Taka Hsu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3 + Chain 4
Test Date	Mar. 09, 2016	Test Function	Beamforming function

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	5150.00	65.38	74.00	-8.62	60.43	6.11	33.31	34.47	52	223	Peak	HORIZONTAL
2	5150.00	53.62	54.00	-0.38	48.67	6.11	33.31	34.47	52	223	Average	HORIZONTAL
3	5176.00	96.69			91.64	6.17	33.35	34.47	52	223	Average	HORIZONTAL
4	5228.00	106.73			101.50	6.28	33.42	34.47	52	223	Peak	HORIZONTAL
5	5356.00	61.80	74.00	-12.20	56.04	6.62	33.61	34.47	52	223	Peak	HORIZONTAL
6	5389.00	49.02	54.00	-4.98	43.14	6.70	33.65	34.47	52	223	Average	HORIZONTAL

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

Note:

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

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



2.7. Antenna Requirements

2.7.1. Limit

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

2.7.2. Antenna Connector Construction

The antenna connector complied with the requirements.

3. List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 23, 2017	Jan. 22, 2018	Conduction (CO01-CB)
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 31, 2018	Jan. 30, 2019	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 20, 2017	Dec. 19, 2018	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 29, 2017	Dec. 28, 2018	Conduction (CO01-CB)
Impulsbegrenzer Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 21, 2017	Feb. 20, 2018	Conduction (CO01-CB)
Impulsbegrenzer Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 06, 2018	Feb. 05, 2019	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 23, 2017	May 22, 2018	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
10m Semi Anechoic Chamber	TDK	NSA	10CH01-CB	30MHz~1GHz 10m	Mar. 18, 2017	Mar. 17, 2018	Radiation (10CH01-CB)
10m Semi Anechoic Chamber	TDK	NSA	10CH01-CB	30MHz~1GHz 10m,3m	Mar. 18, 2018	Mar. 17, 2019	Radiation (10CH01-CB)
10m Semi Anechoic Chamber	TDK	VSWR	10CH01-CB	1GHz ~40GHz 3m	Mar. 17, 2017	Mar. 16, 2018	Radiation (10CH01-CB)
10m Semi Anechoic Chamber	TDK	VSWR	10CH01-CB	1GHz ~18GHz 3m	Mar. 17, 2018	Mar. 16, 2019	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10783	9kHz ~ 1.3GHz	Mar. 27, 2017	Mar. 26, 2018	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10783	9kHz ~ 1.3GHz	Mar. 26, 2018	Mar. 25, 2019	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10784	9kHz ~ 1.3GHz	Mar. 13, 2017	Mar. 12, 2018	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10784	9kHz ~ 1.3GHz	Mar. 13, 2018	Mar. 12, 2019	Radiation (10CH01-CB)
Low Cable	Woken	SUCOFLEX 104	low cable-01	25MHz ~ 1GHz	Nov. 27, 2017	Nov. 26, 2018	Radiation (10CH01-CB)
High Cable	Woken	SUCOFLEX 104	low cable-02	25MHz ~ 1GHz	Nov. 27, 2017	Nov. 26, 2018	Radiation (10CH01-CB)
Biconical Antenna	Schwarzbeck	VHBB 9124	324	30MHz ~ 200MHz	May 03, 2017	May 02, 2018	Radiation (10CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 05, 2017	Jul. 04, 2018	Radiation (10CH01-CB)
Log Antenna	Schwarzbeck	VUSLP 9111	247	200MHz ~ 1GHz	May 26, 2017	May 25, 2018	Radiation (10CH01-CB)
EMI Test Receiver	Rohde&Schwarz	ESCI	100186	9kHz ~ 3GHz	Jul. 12, 2017	Jul. 11, 2018	Radiation (10CH01-CB)
Spectrum Analyzer	Rohde&Schwarz	FSV30	101026	9kHz ~ 30GHz	Jan. 10, 2018	Jan. 09, 2019	Radiation (10CH01-CB)
Horn Antenna	ESCO	3117	00081283	1GHz ~ 18GHz	Dec. 04, 2017	Dec. 03, 2018	Radiation (10CH01-CB)
Amplifier	Agilent	8449B	3008A02660	1GHz ~ 26.5GHz	May 25, 2017	May 24, 2018	Radiation (10CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 10, 2017	Jul. 09, 2018	Radiation (10CH01-CB)
CABLE(1~40G)	Woken	SUCOFLEX 104	high cable-01	1GHz ~ 40GHz	Nov. 27, 2017	Nov. 26, 2018	Radiation (10CH01-CB)
Loop Antenna	R&S	HFH2-Z2	100330	9kHz ~ 30 MHz	Nov. 13, 2017	Nov. 12, 2018	Radiation (10CH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Software	Audix	E3	6.120210m	-	N.C.R.	N.C.R.	Radiation (10CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 22, 2015	Oct. 21, 2016	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Jul. 20, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Jan. 11, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Jan. 17, 2017	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov.13, 2015	Nov.12, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Oct. 26, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Nov. 01, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Nov. 01, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Nov. 01, 2016	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Nov. 01, 2016	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Dec. 08, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz ~ 26.5 GHz	Nov. 02, 2015	Nov. 01, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz ~ 26.5 GHz	Nov. 02, 2015	Nov. 01, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz ~ 26.5 GHz	Nov. 02, 2015	Nov. 01, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz ~ 26.5 GHz	Nov. 02, 2015	Nov. 01, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz ~ 26.5 GHz	Nov. 02, 2015	Nov. 01, 2016	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Nov. 01, 2016	Conducted (TH01-CB)

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

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

4. Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.0 dB	Confidence levels of 95%
Radiated Emission Unintentional 1GHz~5th Harmonic (1GHz ~ 18GHz)	5.0 dB	Confidence levels of 95%
Radiated Emission Unintentional 1GHz~5th Harmonic (18GHz ~ 30GHz)	5.0 dB	Confidence levels of 95%
Radiated Emission Intentional 1GHz~10th Harmonic (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission Intentional 1GHz~10th Harmonic (18GHz ~ 40GHz)	3.5 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 x10 ⁻⁸	Confidence levels of 95%