

NCC RADIO TEST REPORT

Applicant's company	RIVERBED TECHNOLOGY INC
Applicant Address	680 Folsom Street San Francisco, California 94107-1397, USA
Manufacturer's company	RIVERBED TECHNOLOGY INC
Manufacturer Address	680 Folsom Street San Francisco, California 94107-1397, USA

Product Name	Wireless Access Point
Brand Name	riverbed
Model No.	XD2240
Test Rule Part(s)	NCC LP0002 Section 4.7
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Aug. 17, 2015
Final Test Date	Sep. 28, 2017
Submission Type	Original Equipment

Statement

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

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

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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, NCC LP0002 (Aug. 23, 2016), KDB789033 D02 v02r01, KDB662911 D01 v02r01.**

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
TR582537-04AD	Rev. 01	Initial issue of report	Dec. 28, 2017
TR582537-04AD	Rev. 02	1. Changing the Applicant's company / Manufacturer's company and address. 2. Changing the brand name of Antenna to Liteon from Walsin.	Jan. 05, 2018

1. VERIFICATION OF COMPLIANCE

Product Name : Wireless Access Point
Brand Name : riverbed
Model No. : XD2240
Applicant : RIVERBED TECHNOLOGY INC
Test Rule Part(s) : NCC LP0002 Section 4.7

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Aug. 17, 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: NCC LP0002 (Aug. 23, 2016)			
Part	Rule Section	Description of Test	Result
4.1	2.3	AC Power Line Conducted Emissions	Complies
4.2	4.7.3	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies
4.3	4.7.5	6dB Spectrum Bandwidth	Complies
4.4	4.7.3	Maximum Conducted Output Power	Complies
4.5	4.7.3	Power Spectral Density	Complies
4.6	4.7.4	Radiated Emissions	Complies
4.7	4.7.4	Band Edge Emissions	Complies
4.8	-	Frequency Stability	Complies
4.9	4.7.8	Antenna Requirements	Complies

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (4TX, 4RX)
Radio Type	Intentional Transceiver
Power Type	From PoE
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)
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	9 for 20MHz bandwidth ; 4 for 40MHz bandwidth 2 for 80MHz bandwidth
Channel Band Width (99%)	Band 1: IEEE 802.11ac MCS0/Nss1 (VHT20): 18.06 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 38.78 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz Band 4: IEEE 802.11ac MCS0/Nss1 (VHT20): 31.00 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 52.53 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 77.86 MHz
Maximum Conducted Output Power	Band 1: IEEE 802.11ac MCS0/Nss1 (VHT20): 23.31 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 22.75 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 19.86 dBm Band 4: IEEE 802.11ac MCS0/Nss1 (VHT20): 26.59 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 26.73 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 24.47 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

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

Antenna and Band width

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	4	MCS 0-31
802.11n (HT40)	4	MCS 0-31
802.11ac (VHT20)	4	MCS 0-9/Nss1-4
802.11ac (VHT40)	4	MCS 0-9/Nss1-4
802.11ac (VHT80)	4	MCS 0-9/Nss1-4

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput).
Then EUT supports 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, VHT80 in 5GHz.

Note 3: Modulation modes consist of below configuration:
HT20/HT40: IEEE 802.11n, VHT20/VHT40: IEEE 802.11ac

3.2. Accessories

Others
Wall-mounted rack*1

3.3. Table for Filed Antenna

<For Radio 1 >

Ant.	Brand	Model Name	Antenna Type	Connector
1	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX
3	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX
5	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX
7	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX

Ant.	Frequency (MHz) / Antenna Gain (dBi)		
	2412, 2422	2437	2452, 2462
1	2.07	1.35	1.84
3	4.67	3.82	4.52
5	3.68	3.64	3.04
7	4.23	4.10	3.51

Ant.	5GHz Band / Antenna Gain (dBi)	
	Band 1	Band 4
1	0.23	3.09
3	4.19	4.29
5	4.93	4.86
7	4.65	3.94

Frequency Band (MHz)	Correlated Composite Gain (4TX, 1S)	Uncorrelated Composite Gain (4TX, 4S)
2412, 2422	6.99	1.40
2437	7.02	1.36
2452, 2462	7.22	1.68
5150 ~ 5250 (Band 1)	6.10	0.78
5725 ~ 5850 (Band 4)	7.29	1.56

<For Radio 2>

Ant.	Brand	Model Name	Antenna Type	Connector
2	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX
4	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX
6	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX
8	Liteon	WP8868-E-XS	PIFA Ant.	I-PEX

Ant.	Frequency (MHz) / Antenna Gain (dBi)		
	2412, 2422	2437	2452, 2462
2	1.79	1.19	1.08
4	3.96	3.51	3.06
6	2.93	2.93	3.38
8	2.10	2.49	1.79

Ant.	5GHz Band / Antenna Gain (dBi)	
	Band 1	Band 4
2	1.64	4.60
4	3.02	3.45
6	3.48	4.78
8	3.93	3.69

Frequency Band (MHz)	Correlated Composite Gain (4TX, 1S)	Uncorrelated Composite Gain (4TX, 4S)
2412, 2422	6.01	0.65
2437	5.86	0.22
2452, 2462	5.33	-0.26
5150 ~ 5250 (Band 1)	4.88	-0.30
5725 ~ 5850 (Band 4)	6.98	1.68

<For Radio 3>

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
9	Liteon	WP8868-E-XS	PIFA Ant.	N/A	3.20

Note: 1. The EUT has three radios.

Radio 1 and Radio 2 supports 2.4GHz WLAN function and 5GHz WLAN function, Radio 3 supports Bluetooth function only.

For Conducted test:

Radio 1 and Radio 2 are the same radios, radio 2 has been evaluated to be the worst case so it's chosen to conduct tests.

Radio 1 and Radio 2 equipped the same type antennas, radio 1 has the higher gain than radio 2 so it's chosen to conduct the gain test.

For Radiated test:

Radio 1 and Radio 2 are the same radios; radio 2 has been evaluated to be the worst case so it's chosen to radiate tests.

2. The EUT has nine antennas.

For WLAN function (4TX/4RX):

For Radio 1:

Chain 5, Chain 6, Chain 7 and Chain 8 could transmit/receive simultaneously.

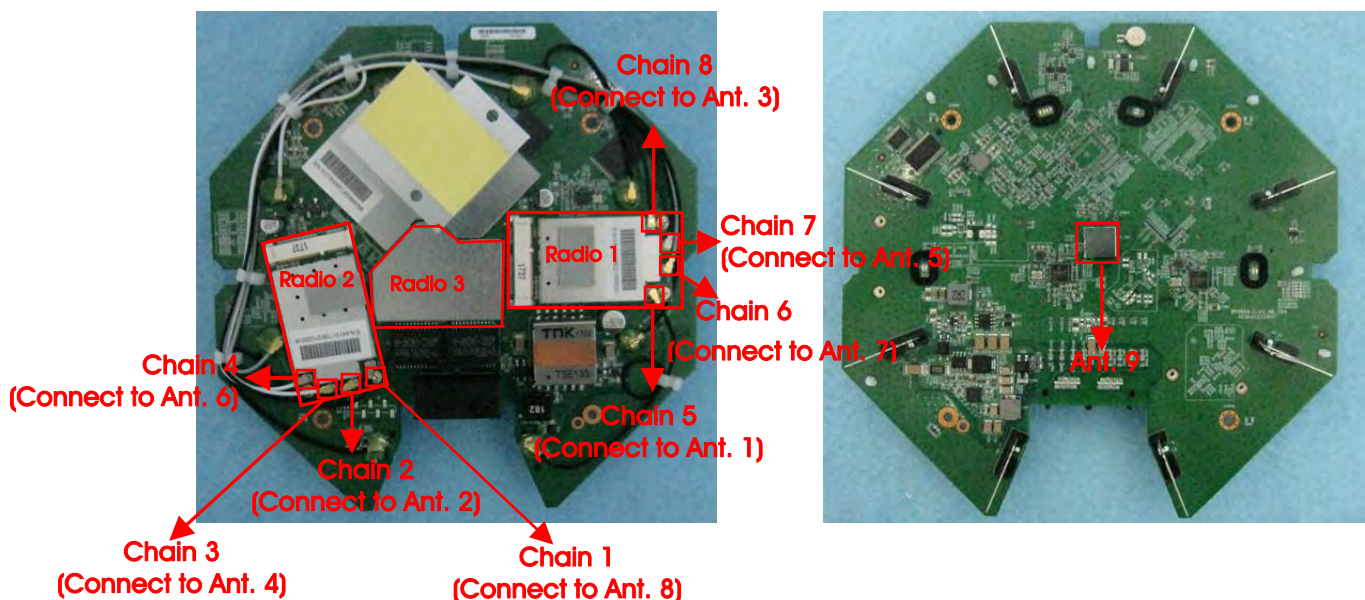
For Radio 2:

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

For Bluetooth function (1TX/1RX):

For Radio 3:

Only Ant. 9 can be used as transmitting/receiving antenna.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48, 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 38, 46, 151, 159.

For 80MHz bandwidth systems, use Channel 42, 155.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
	42	5210 MHz	-	-
5725~5850 MHz Band 4	149	5745 MHz	157	5785 MHz
	151	5755 MHz	159	5795 MHz
	153	5765 MHz	161	5805 MHz
	155	5775 MHz	165	5825 MHz

3.5. Table for Test Modes

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

Test Items	Mode		Data Rate	Channel	Chain
AC Power Line Conducted Emissions	Unintentional – Normal Link		-	-	-
Max. Conducted Output Power	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	5+6+7+8
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	5+6+7+8
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	5+6+7+8
Power Spectral Density	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	5+6+7+8
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	5+6+7+8
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	5+6+7+8
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	5+6+7+8
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	5+6+7+8
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	5+6+7+8
6dB Spectrum Bandwidth Measurement	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	5+6+7+8
	11ac VHT40	Band 4	MCS0/Nss1	151/159	5+6+7+8
	11ac VHT80	Band 4	MCS0/Nss1	155	5+6+7+8
Radiated Emissions 9kHz~1GHz	Intentional – CTX		-	-	-
	Unintentional – Normal Link		-	-	-
Radiated Emissions 1GHz~5 th Harmonic	Unintentional – Normal Link		-	-	-
Radiated Emissions 1GHz~10 th Harmonic	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	5+6+7+8
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	5+6+7+8
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	5+6+7+8
Band Edge Emission	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	5+6+7+8
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	5+6+7+8
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	5+6+7+8

Frequency Stability	20 MHz	Band 1&4	-	40/157	7
	40 MHz	Band 1&4	-	38/151	7
	80 MHz	Band 1&4	-	42/155	7

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. The PoE below are for measurement only, would not be marketed.

Power	Brand	Model No.	FCC ID
PoE	PowerDsine	PD-9001GR/AC	DoC
PoE	H3C	EWPA11NPoE	N/A
PoE	PowerDsine	PD-7001G	DoC
PoE	XIRRUS	XP-1-MSI-75	DoC

3. There are two modes of EUT, one is beamforming function, and the other is non-beamforming function for 802.11n/ac. Test results of beamforming function was recorded in this report, test results of non-beamforming function was recorded in Report No.: TR582537-04AC.

The following test modes were performed for all tests:

The following test modes were performed for all tests:

Radiated Emissions 9kHz~1GHz:

Operating Mode: Intentional – CTX

Mode 1. EUT Y axis 2.4GHz_WiFi

Mode 2. EUT Z axis 2.4GHz_WiFi

Mode 3. EUT Y axis 5GHz_WiFi

Mode 4. EUT Z axis 5GHz_WiFi

Mode 5. EUT Y axis_Bluetooth

Mode 6. EUT Z axis_Bluetooth

Mode 3 generated the worst test result, so it was recorded in this report.

Operating Mode: Unintentional – Normal Link

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

Radiated Emissions Unintentional 1GHz~5th Harmonic:

Operating Mode: Unintentional – Normal Link

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

Radiated Emissions 1GHz~10th Harmonic:

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

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	TW0006	IC 4086D	CO01-CB
TH01-CB	OVEN Room	Hsin Chu	-	-	-

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

3.7. Table for Supporting Units

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
NB*4	DELL	E6430	DoC
Tablet	Samsung	TAB3	DoC
PoE	PowerDsine	PD-9001GR/AC	DoC

For Test Site No: 03CH01-CB

Operating Mode: Intentional – CTX (30MHz~1GHz)

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
PoE	XIRRUS	XP-1-MSI-75	DoC

Operating Mode: Unintentional – Normal Link (30MHz~1GHz)

and Radiated Emissions Unintentional 1GHz~5th Harmonic:

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
NB*2	Apple	Mac Book	DoC
Tablet	Samsung	TAB3	DoC
PoE	XIRRUS	XP-1-MSI-75	DoC

Operating Mode: Radiated Emissions 1GHz~10th Harmonic

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
PoE	H3C	EWPAM1NPOE	N/A
RX Client	BCM	BCM58535EAP	DoC

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
PoE	H3C	EWPAM1NPOE	N/A

3.8. 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 Software Version	Xircon v1.0.2.25					
Mode	Test Frequency (MHz)					
	NCB: 20MHz					
	5180 MHz	5200 MHz	5240 MHz	5745 MHz	5785 MHz	5825 MHz
802.11ac MCS0/Nss1 VHT20	90	90	70	90	90	90
Mode	NCB: 40MHz					
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz		5755 MHz	
	56		70		90	
Mode	NCB: 80MHz					
802.11ac MCS0/Nss1 VHT80	5210 MHz			5775 MHz		
	58			76		

3.9. EUT Operation during Test

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

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

The program was executed as follows:

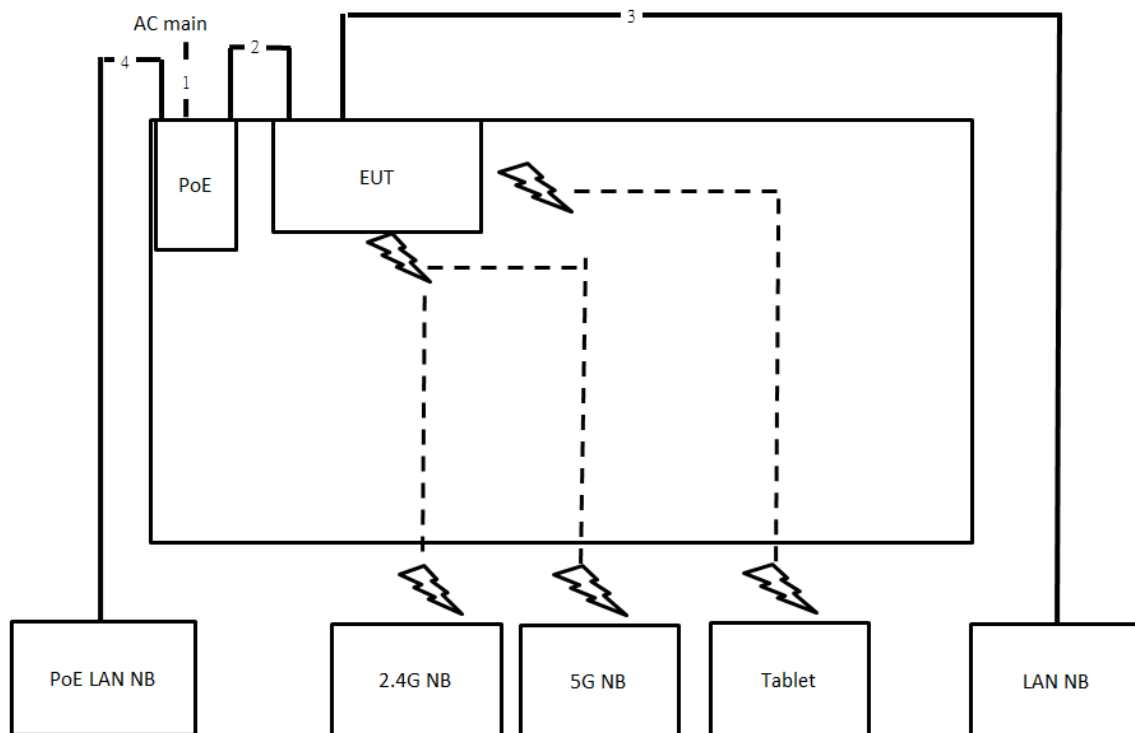
1. During the test, the EUT operation to normal function.
2. Executed command fixed test channel under DOS.
3. Executed "Lantest.exe" to link with the remote workstation to receive and transmit packet by RX Client and transmit duty cycle no less 98%

3.10. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.830	4.183	91.57%	0.38	0.26
802.11ac MCS0/Nss1 VHT40	3.653	4.070	89.75%	0.47	0.27
802.11ac MCS0/Nss1 VHT80	5.043	5.478	92.06%	0.36	0.20

3.11. Test Configurations

3.11.1. AC Power Line Conduction Emissions Test Configuration

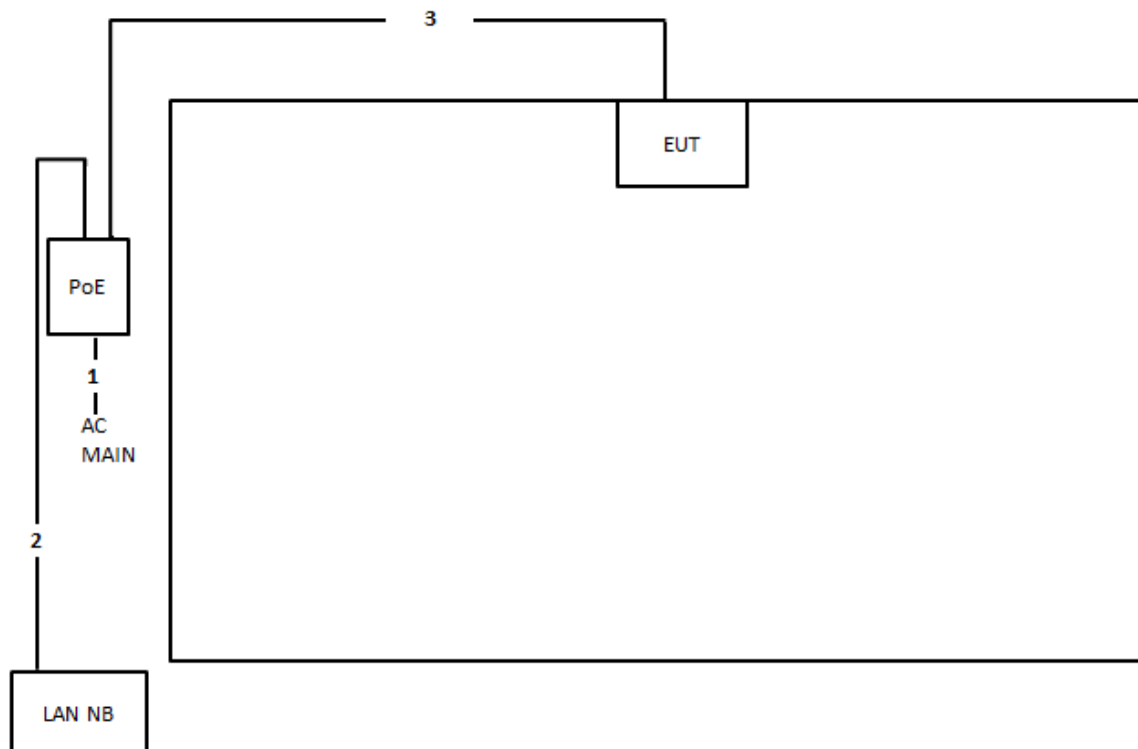


Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable	No	1.5m
3	RJ-45 cable	No	10m
4	RJ-45 cable	No	10m

3.11.2. Radiation Emissions Test Configuration

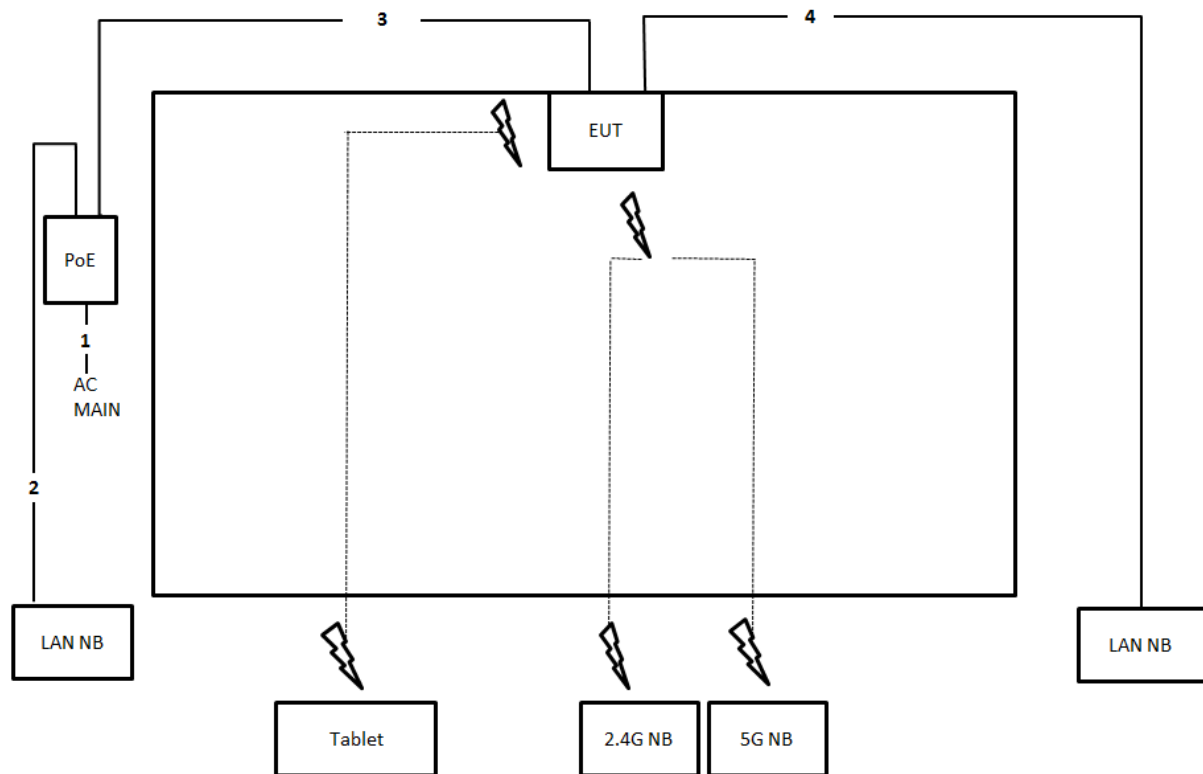
Test Configuration: 30MHz~1GHz

Operating Mode: Intentional – CTX



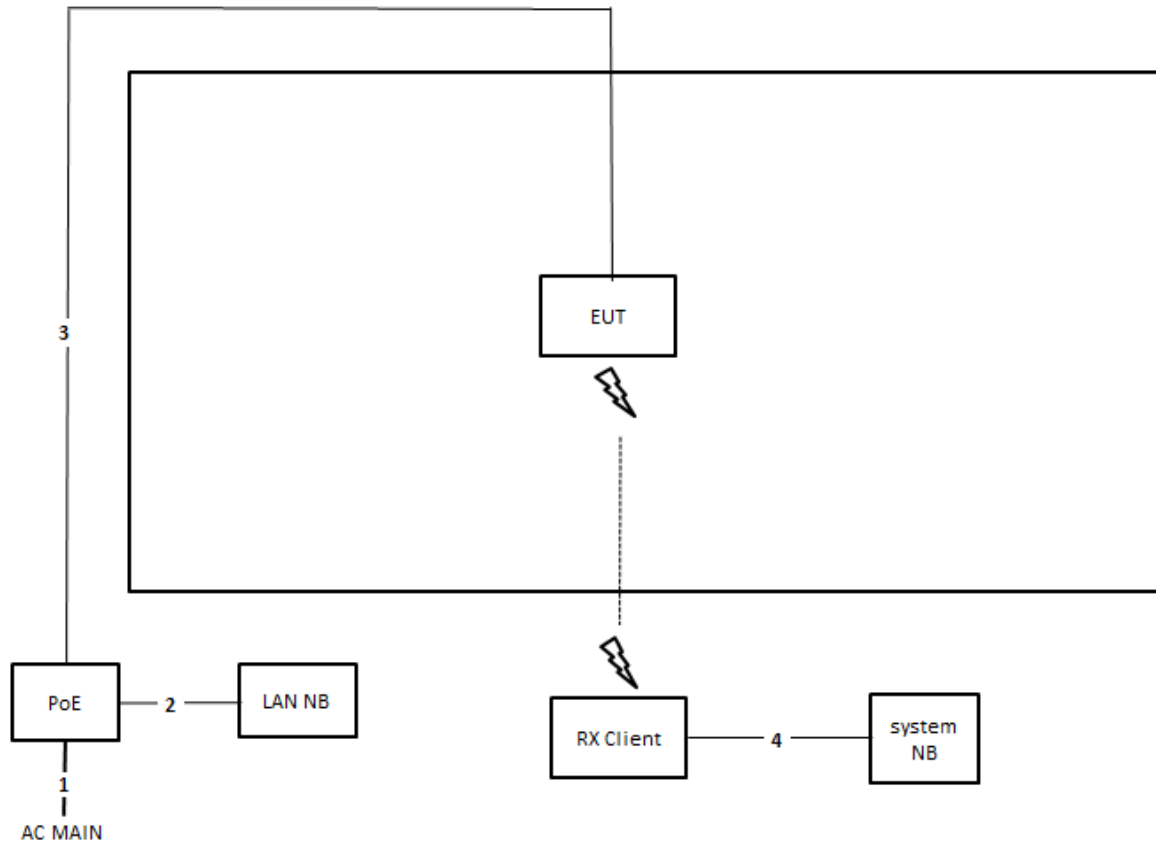
Item	Connection	Shielded	Length
1	Power Cable	No	1.5m
2	RJ-45 Cable	No	1.5m
3	RJ-45 Cable	No	10m

Operating Mode: Unintentional – Normal Link (30MHz~1GHz)
and Radiated Emissions Unintentional 1GHz~5th Harmonic:



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

Operating Mode: Radiated Emissions 1GHz~10th Harmonic



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

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

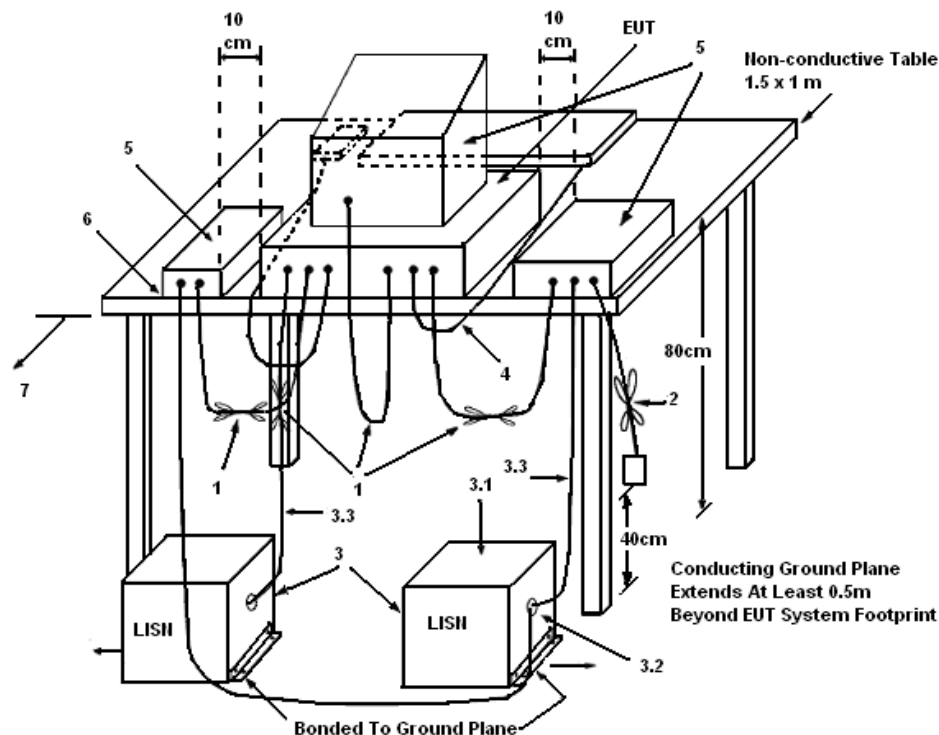
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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 Ω . 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

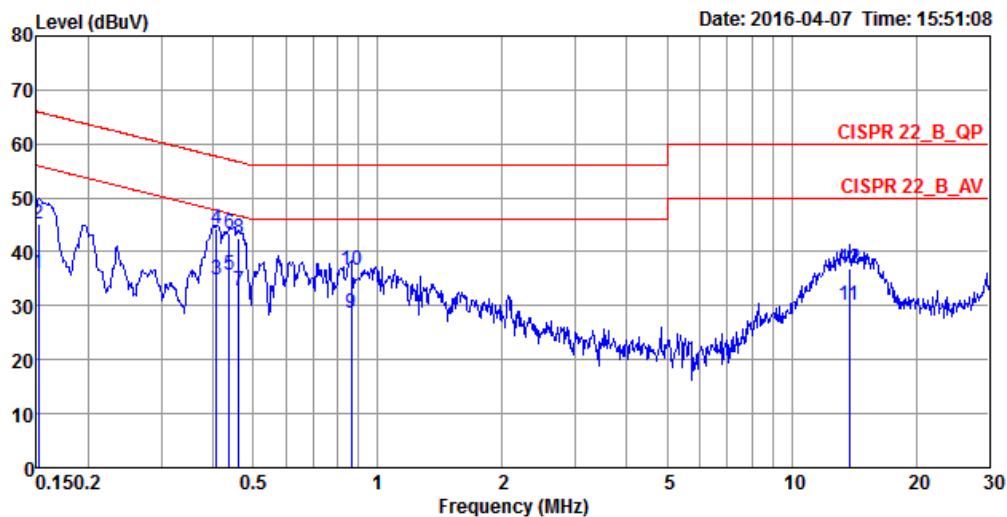
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

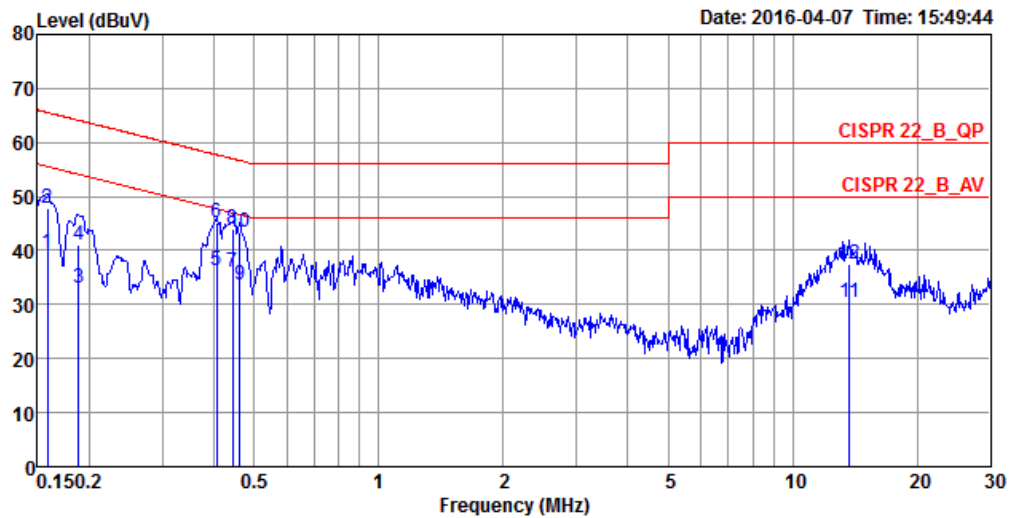
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	24°C	Humidity	62%
Test Engineer	Deven Huang	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1516	35.97	-19.94	55.91	25.93	10.02	0.02	LINE	Average
2	0.1516	45.31	-20.60	65.91	35.27	10.02	0.02	LINE	QP
3	0.4083	34.93	-12.75	47.68	24.97	9.92	0.04	LINE	Average
4	0.4083	44.16	-13.52	57.68	34.20	9.92	0.04	LINE	QP
5	0.4374	35.80	-11.31	47.11	25.84	9.92	0.04	LINE	Average
6	0.4374	43.46	-13.65	57.11	33.50	9.92	0.04	LINE	QP
7	0.4612	32.74	-13.93	46.67	22.78	9.92	0.04	LINE	Average
8	0.4612	42.48	-14.19	56.67	32.52	9.92	0.04	LINE	QP
9	0.8618	28.51	-17.49	46.00	18.54	9.93	0.04	LINE	Average
10	0.8618	36.62	-19.38	56.00	26.65	9.93	0.04	LINE	QP
11	13.7680	30.08	-19.92	50.00	19.62	10.21	0.25	LINE	Average
12	13.7680	36.79	-23.21	60.00	26.33	10.21	0.25	LINE	QP

Temperature	24°C	Humidity	62%
Test Engineer	Deven Huang	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over	Limit	Read	LISN	Cable	Pol/Phase	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss		
			dB	dBuV	dBuV	dB	dB		
1	0.1582	39.55	-16.01	55.56	29.51	10.02	0.02	NEUTRAL	Average
2	0.1582	47.93	-17.63	65.56	37.89	10.02	0.02	NEUTRAL	QP
3	0.1884	32.99	-21.12	54.11	23.05	9.92	0.02	NEUTRAL	Average
4	0.1884	40.96	-23.15	64.11	31.02	9.92	0.02	NEUTRAL	QP
5	0.4061	36.35	-11.38	47.73	26.39	9.92	0.04	NEUTRAL	Average
6	0.4061	45.12	-12.61	57.73	35.16	9.92	0.04	NEUTRAL	QP
7	0.4444	35.89	-11.09	46.98	25.93	9.92	0.04	NEUTRAL	Average
8	0.4444	44.10	-12.88	56.98	34.14	9.92	0.04	NEUTRAL	QP
9	0.4612	33.52	-13.15	46.67	23.56	9.92	0.04	NEUTRAL	Average
10	0.4612	43.44	-13.23	56.67	33.48	9.92	0.04	NEUTRAL	QP
11	13.6952	30.34	-19.66	50.00	19.88	10.21	0.25	NEUTRAL	Average
12	13.6952	37.48	-22.52	60.00	27.02	10.21	0.25	NEUTRAL	QP

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 4.6.4.

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

Band 1:

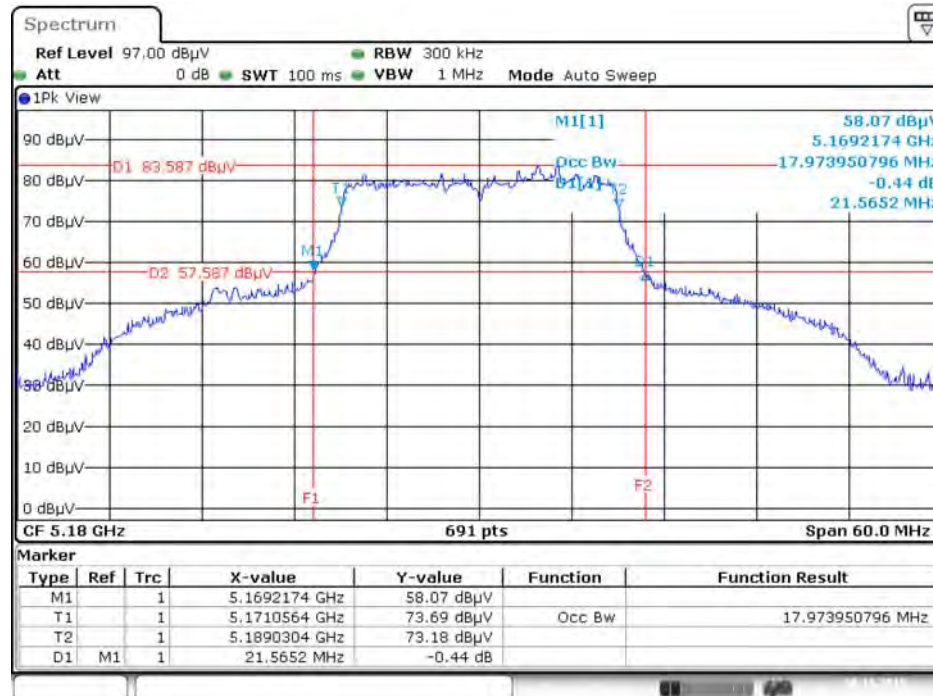
Temperature	25°C	Humidity	54%
Test Engineer	Clemens Fang		

Band 4:

Temperature	23°C	Humidity	54%
Test Engineer	Lucke Hsieh		

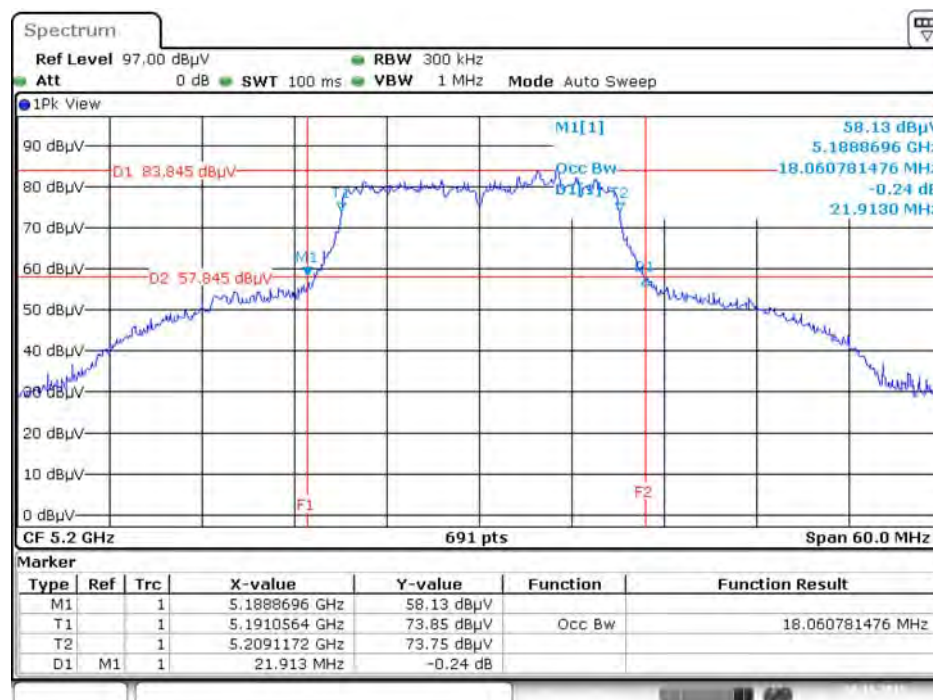
Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.57	17.97
	5200 MHz	21.91	18.06
	5240 MHz	21.39	18.06
	5745 MHz	46.09	29.00
	5785 MHz	45.48	29.52
	5825 MHz	47.65	31.00
802.11ac MCS0/Nss1 VHT40	5190 MHz	45.51	37.05
	5230 MHz	68.99	38.78
	5755 MHz	92.17	52.53
	5795 MHz	86.09	45.30
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.45	76.12
	5775 MHz	160.87	77.86

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5180 MHz



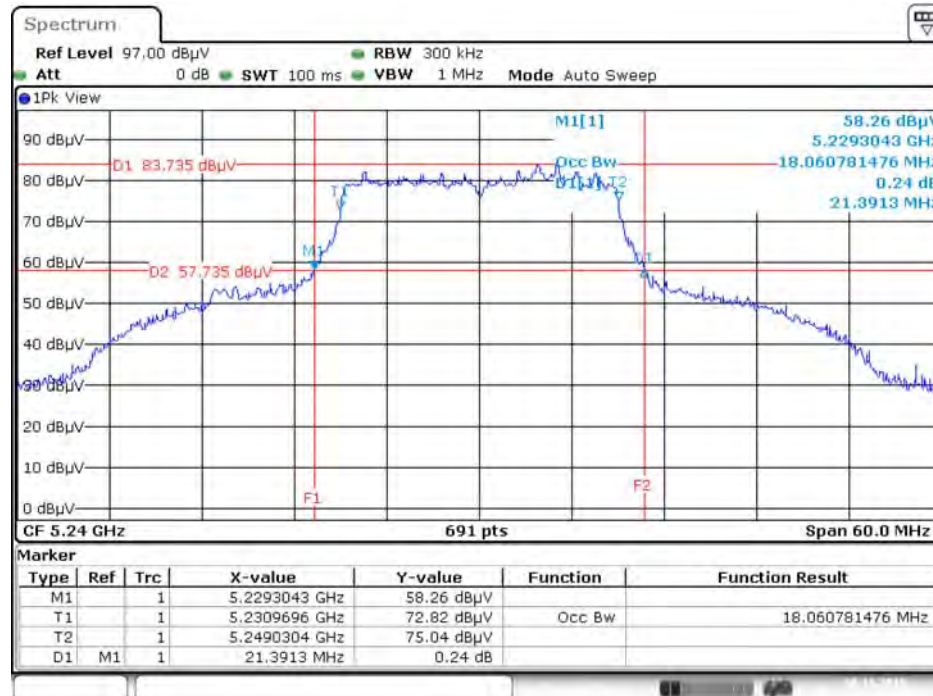
Date: 30.NOV.2015 22:55:48

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5200 MHz



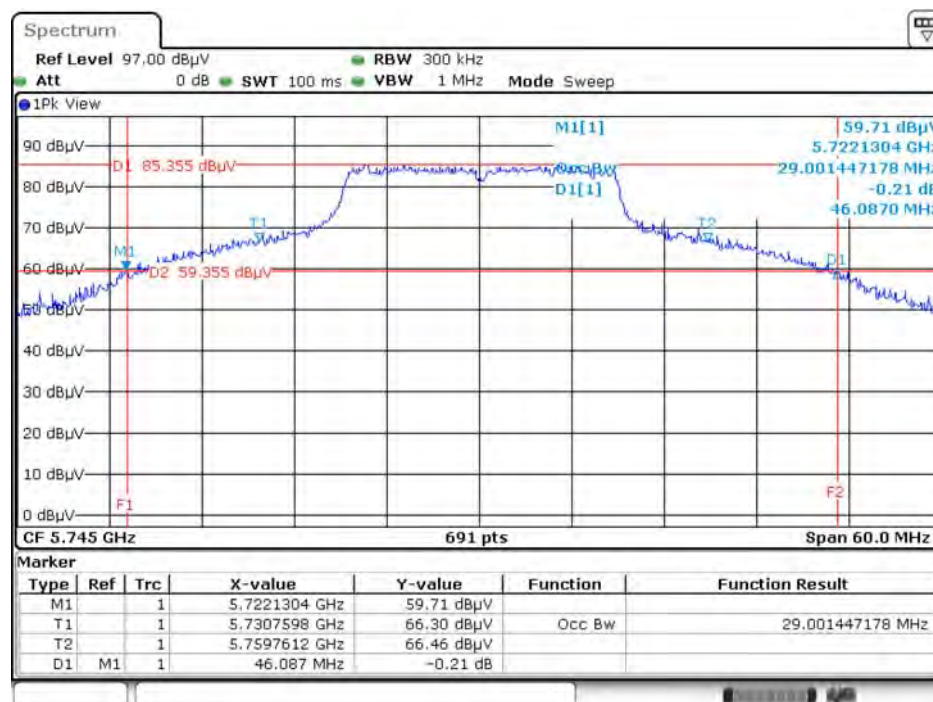
Date: 30.NOV.2015 22:54:21

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5240 MHz



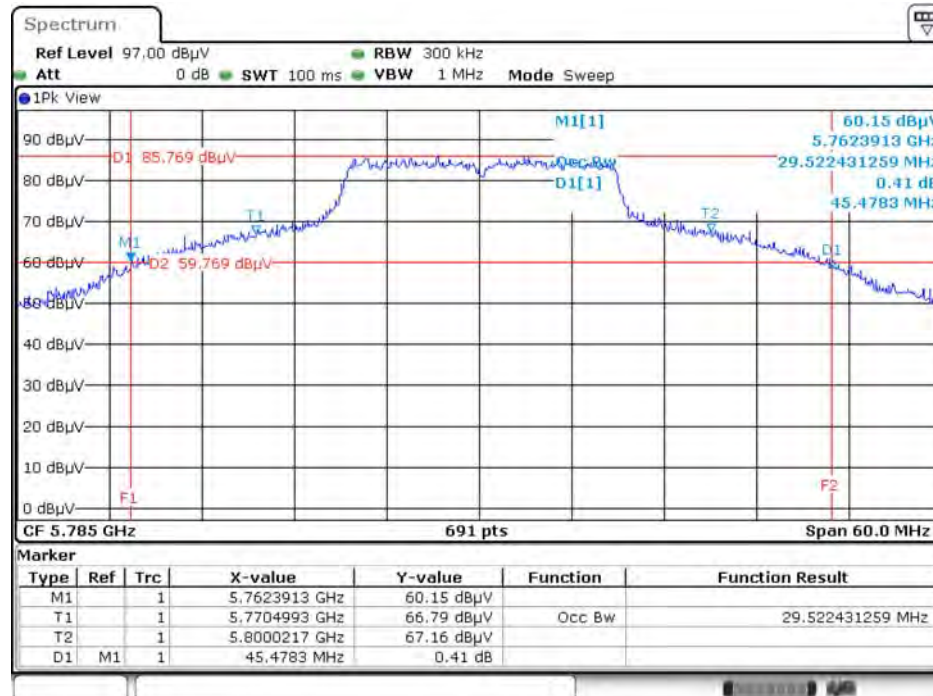
Date: 30.NOV.2015 22:57:20

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5745 MHz



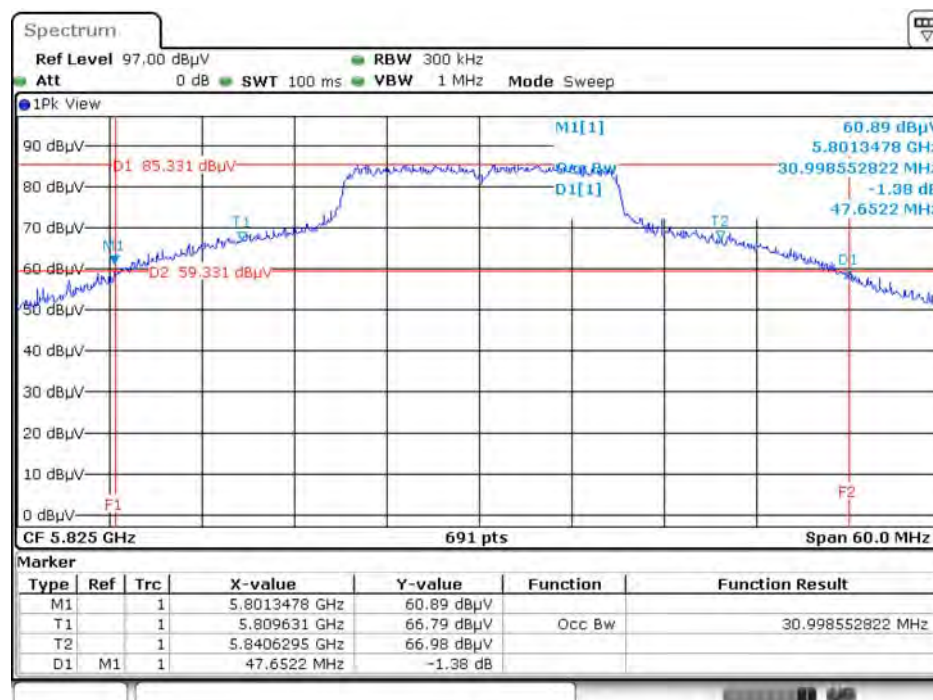
Date: 20.SEP.2017 00:43:37

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8/ 5785 MHz



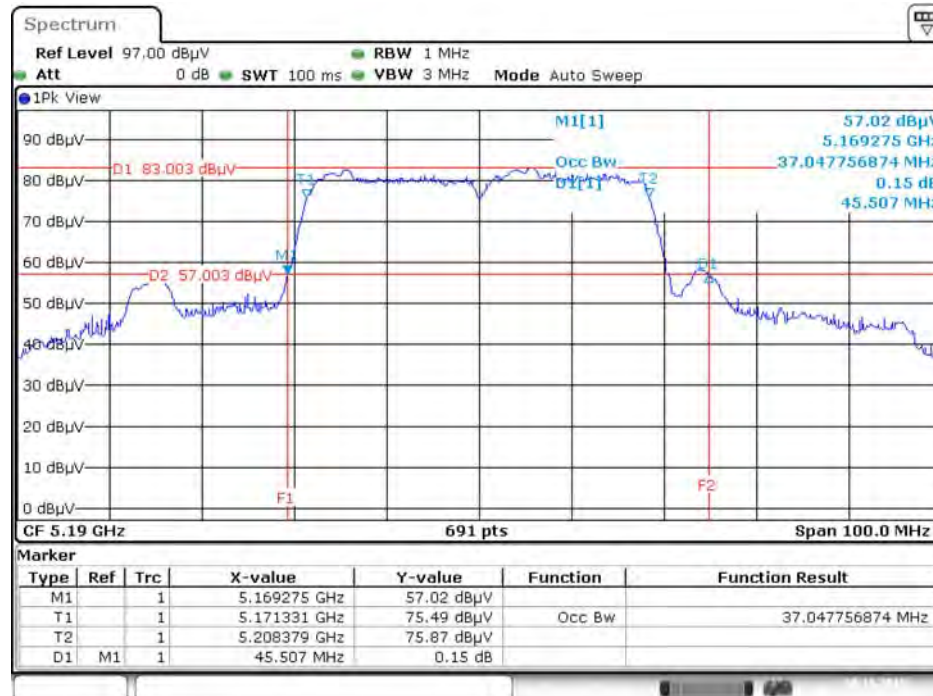
Date: 20.SEP.2017 00:45:15

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5825 MHz



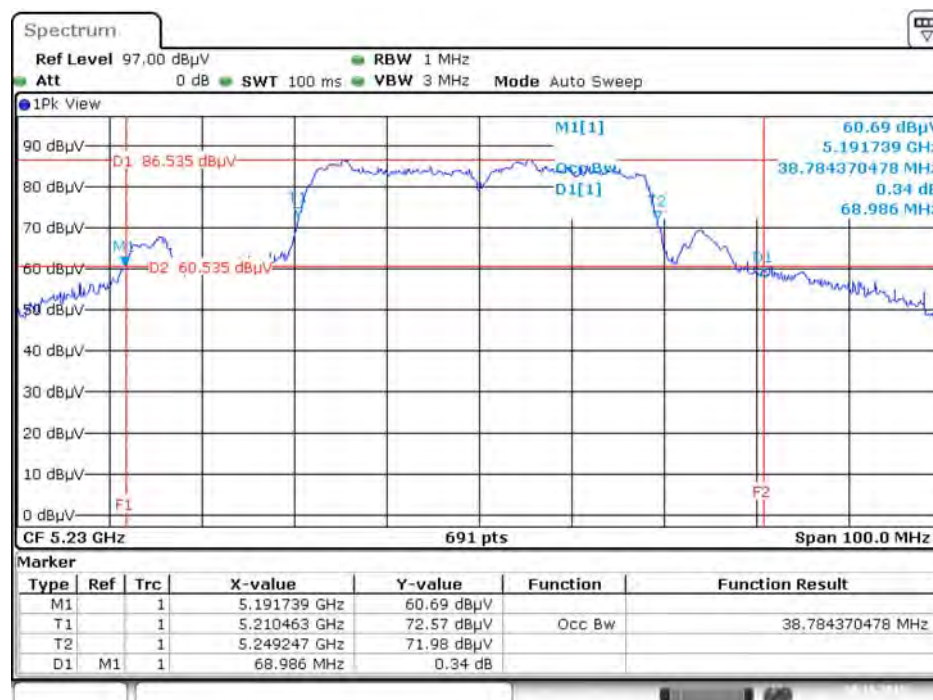
Date: 20.SEP.2017 00:49:30

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5190 MHz



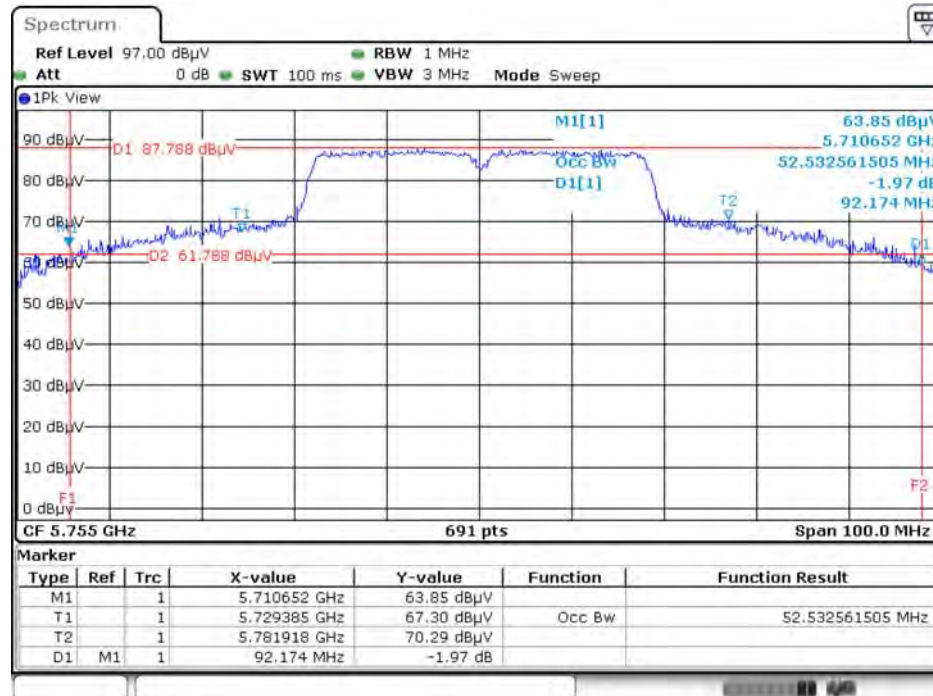
Date: 30.NOV.2015 23:35:11

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5230 MHz



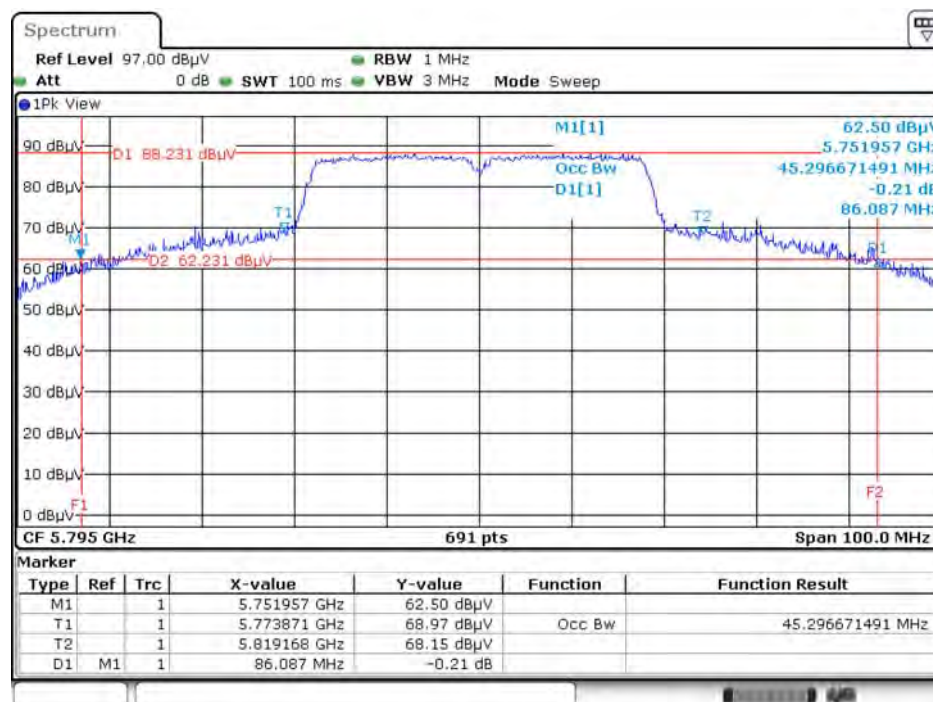
Date: 30.NOV.2015 23:36:44

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5755 MHz



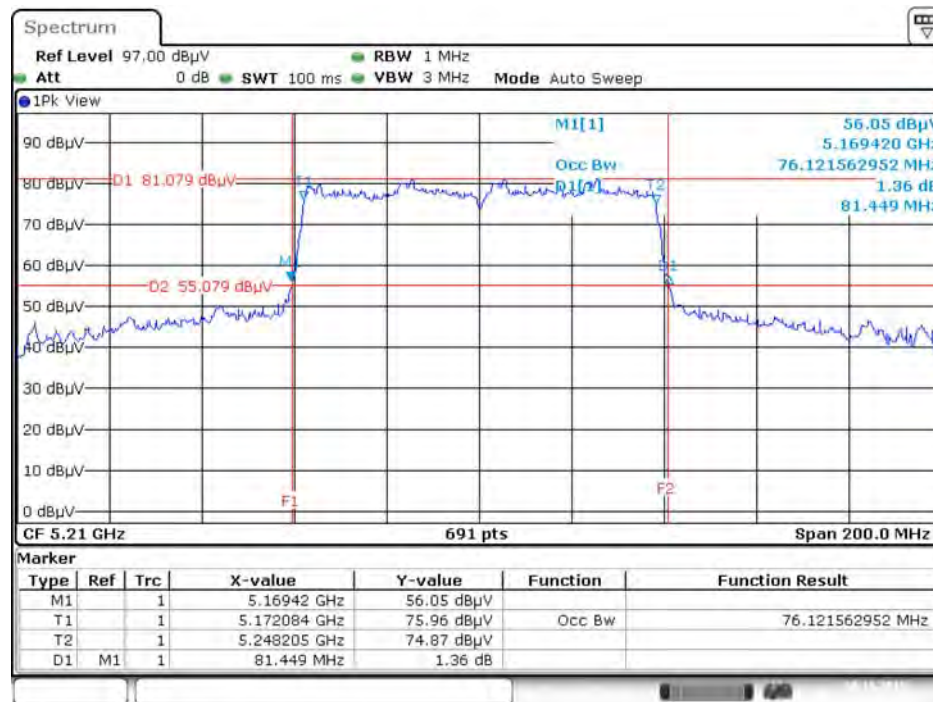
Date: 20.SEP.2017 00:51:29

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5795 MHz



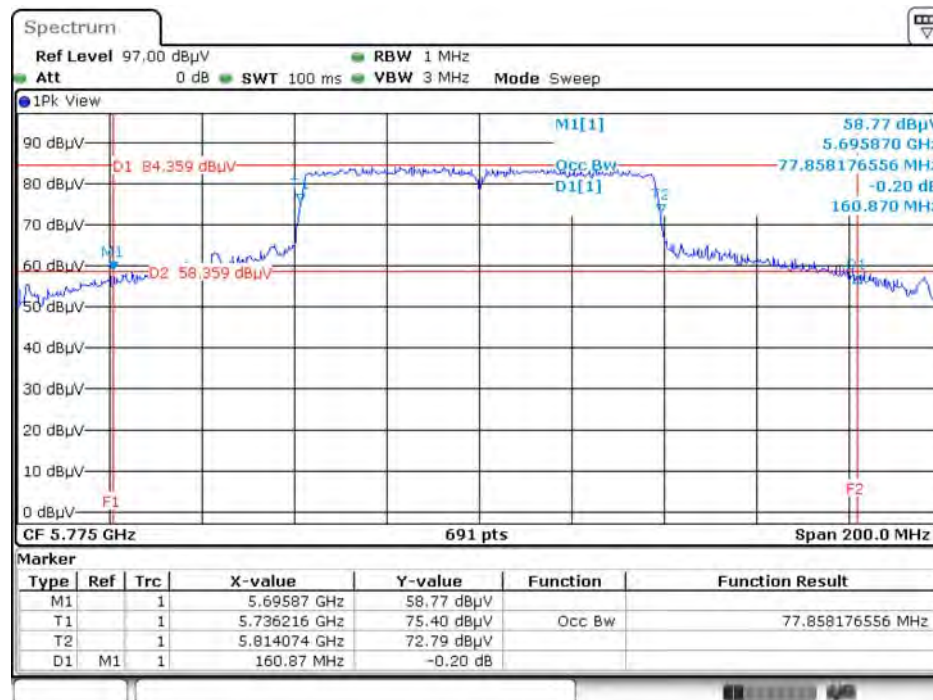
Date: 20.SEP.2017 01:08:53

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5210 MHz



Date: 30.NOV.2015 23:40:33

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5775 MHz



Date: 20.SEP.2017 01:11:19

4.3. 6dB Spectrum Bandwidth Measurement

4.3.1. Limit

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

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 spectrum analyzer.

6dB Spectrum Bandwidth	
Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3.3. Test Procedures

For Radiated 6dB Bandwidth Measurement:

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

4.3.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.6.4.

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 6dB Spectrum Bandwidth

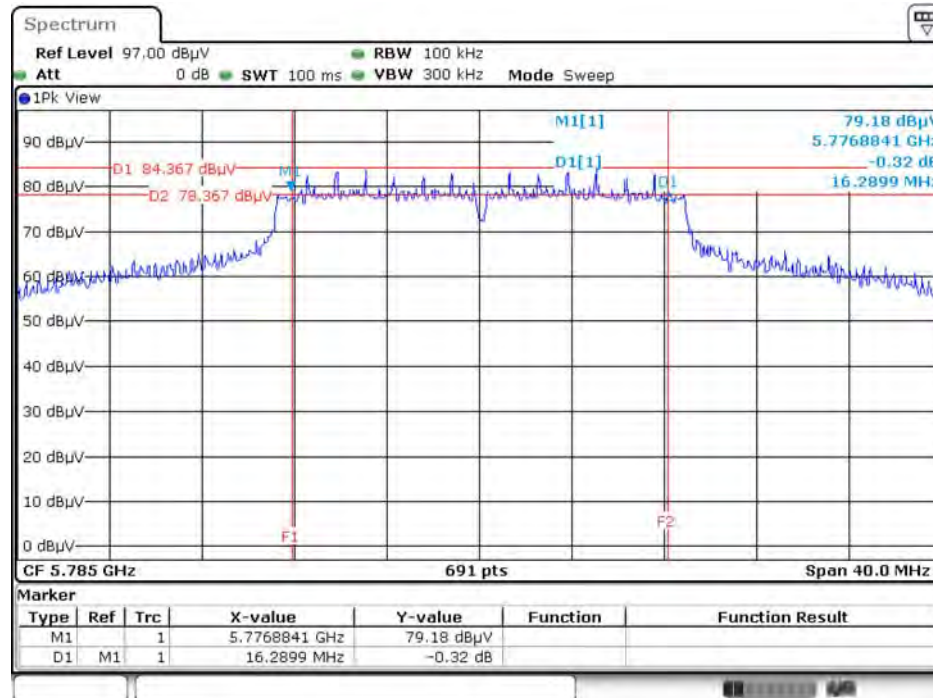
Temperature	23°C	Humidity	54%
Test Engineer	Lucke Hsieh		

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11ac MCS0/Nss1 VHT20	5745 MHz	17.57	500	Complies
	5785 MHz	16.29	500	Complies
	5825 MHz	16.99	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	36.29	500	Complies
	5795 MHz	36.29	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	75.36	500	Complies

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

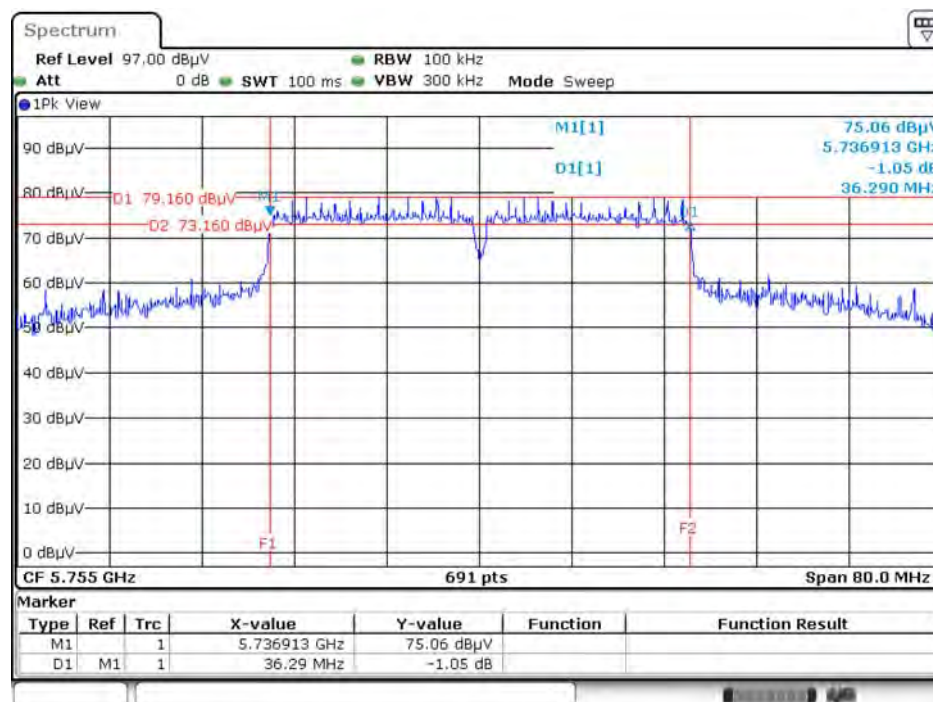
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5785 MHz



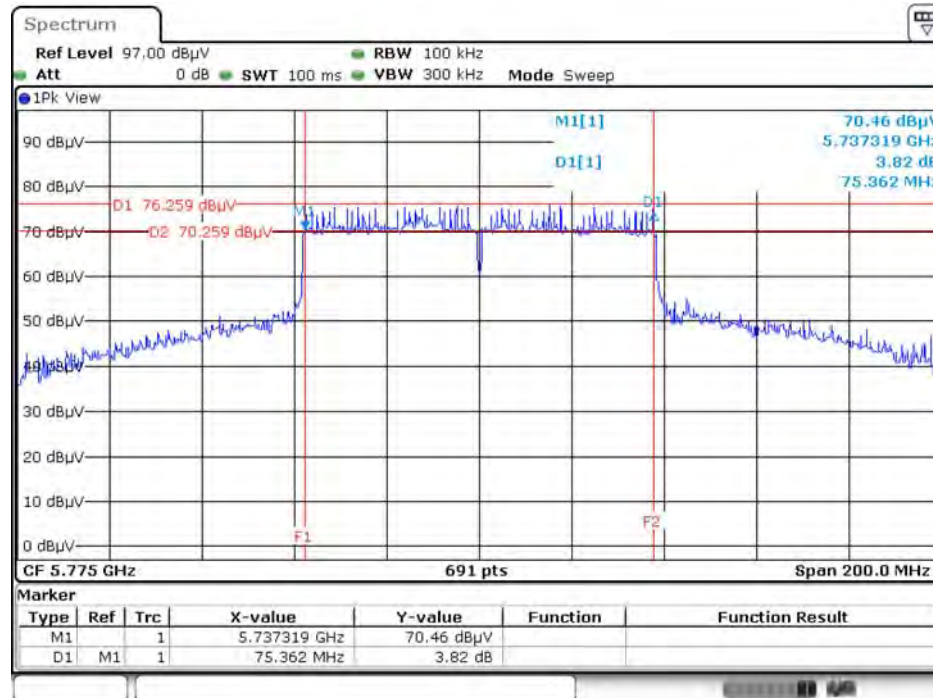
Date: 20.SEP.2017 01:23:24

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5755MHz



Date: 20.SEP.2017 01:21:49

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5775 MHz



Date: 20.SEP.2017 01:15:12

4.4. Maximum Conducted Output Power Measurement

4.4.1. Limit

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

☒	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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4.4.2. Measuring Instruments and Setting

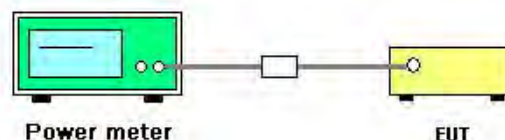
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.4.3. 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.

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 Maximum Conducted Output Power

Band 1:

Temperature	25°C	Humidity	54%
Test Engineer	Clemens Fang	Test Date	Nov. 30, 2015

Band 4:

Temperature	23°C	Humidity	54%
Test Engineer	Lucke Hsieh	Test Date	Sep. 19, 2017~Sep. 20, 2017

Mode	Frequency	Conducted Power (dBm)					Max. Limit (dBm)	Result
		Chain 5	Chain 6	Chain 7	Chain 8	Total		
802.11ac MCS0/Nss1 VHT20	5180 MHz	17.02	17.30	16.70	17.40	23.13	29.90	Complies
	5200 MHz	17.19	17.73	16.38	17.74	23.31	29.90	Complies
	5240 MHz	15.87	16.82	15.96	16.37	22.29	29.90	Complies
	5745 MHz	20.65	20.43	21.07	19.63	26.50	28.71	Complies
	5785 MHz	20.93	20.44	21.04	19.55	26.55	28.71	Complies
	5825 MHz	21.09	20.53	21.06	19.38	26.59	28.71	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	13.26	13.71	13.21	13.74	19.51	29.90	Complies
	5230 MHz	16.16	17.14	16.43	17.12	22.75	29.90	Complies
	5755 MHz	21.18	20.66	21.26	19.51	26.73	28.71	Complies
	5795 MHz	21.15	20.59	21.16	19.52	26.67	28.71	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	13.86	14.24	12.79	14.29	19.86	29.90	Complies
	5775 MHz	19.01	18.14	18.89	17.62	24.47	28.71	Complies

Note:

802.11ac MCS0/Nss1 VHT20 5180 MHz / 5200 MHz / 5240 MHz

802.11ac MCS0/Nss1 VHT40 5190 MHz / 5230 MHz

802.11ac MCS0/Nss1 VHT80 5210 MHz

$$Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 6.10 \text{ dBi, so limit} = 30 - (6.10 - 6) = 29.90 \text{ dBm}$$

802.11ac MCS0/Nss1 VHT20 5745 MHz / 5785 MHz / 5825 MHz

802.11ac MCS0/Nss1 VHT40 5755 MHz / 5795 MHz

802.11ac MCS0/Nss1 VHT80 5775 MHz

$$Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 7.29 \text{ dBi, so limit} = 30 - (7.29 - 6) = 28.71 \text{ dBm}$$

4.5. Power Spectral Density Measurement

4.5.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.4.1.

Frequency Band		Limit
☒	5.15~5.25 GHz	
	Operating Mode	
☐	Outdoor access point	17 dBm/MHz
☒	Indoor access point	17 dBm/MHz
☐	Fixed point-to-point access points	17 dBm/MHz
☐	Mobile and portable client devices	11 dBm/MHz
☒	5.725~5.85 GHz	30 dBm/500kHz

4.5.2. Measuring Instruments and Setting

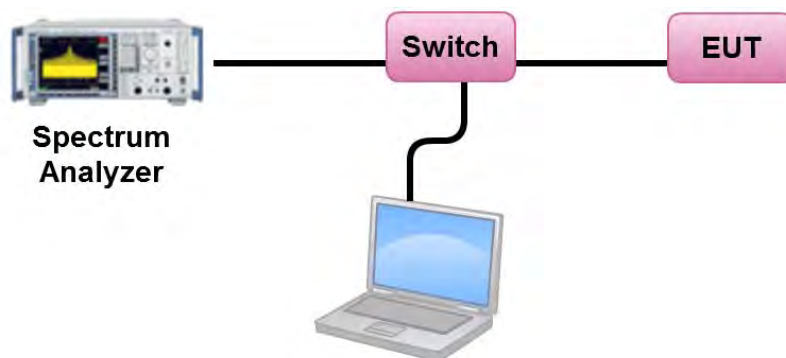
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	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.	

4.5.3. 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 (a) Measure and sum the spectra across the outputs.
4. When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.
5. 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.

4.5.4. Test Setup Layout



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Test Result of Power Spectral Density

Band 1:

Temperature	25°C	Humidity	54%
Test Engineer	Clemens Fang	Test Date	Nov. 30, 2015

Band 4:

Temperature	23°C	Humidity	54%
Test Engineer	Lucke Hsieh	Test Date	Sep. 19, 2017~Sep. 20, 2017

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	9.92	16.90	Complies
40	5200 MHz	10.23	16.90	Complies
48	5240 MHz	8.95	16.90	Complies

Note: $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right] = 6.10\text{dBi}$, so limit = 17-(6.10-6)=16.90 dBm/MHz

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	13.21	-3.01	10.20	28.71	Complies
157	5785 MHz	13.32	-3.01	10.31	28.71	Complies
165	5825 MHz	13.27	-3.01	10.26	28.71	Complies

Note: $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right] = 7.29\text{dBi}$, so limit = 30-(7.29-6)=28.71 dBm/500kHz

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	3.30	16.90	Complies
46	5230 MHz	6.55	16.90	Complies

Note: $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right] = 6.10\text{dBi}$, so limit = 17-(6.10-6)=16.90 dBm/MHz

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
151	5755 MHz	10.43	-3.01	7.42	28.71	Complies
159	5795 MHz	10.56	-3.01	7.55	28.71	Complies

$Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right] = 7.29\text{dBi}$, so limit = 30-(7.29-6)=28.71 dBm/500kHz

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 5 + Chain 6 + Chain 7 + Chain 8

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	0.56	16.90	Complies

Note: $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right] = 6.10\text{dBi}$, so limit = 17-(6.10-6)=16.90 dBm/MHz

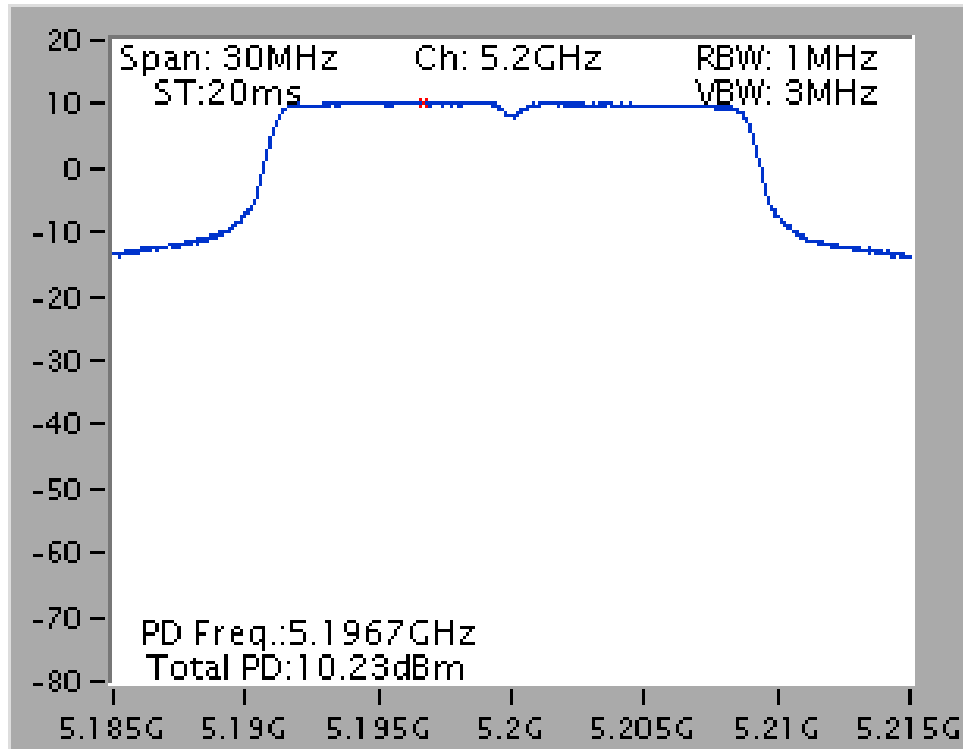
Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	5.40	-3.01	2.39	28.71	Complies

$Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right] = 7.29\text{dBi}$, so limit = 30-(7.29-6)=28.71 dBm/500kHz

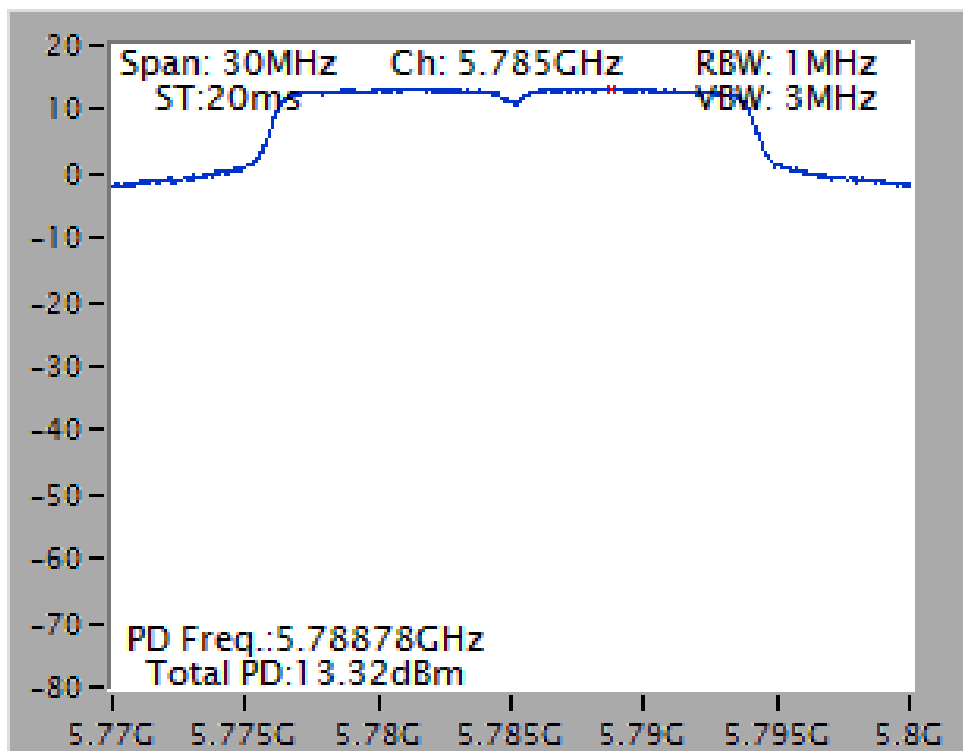
Note: All the test values were listed in the report.

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

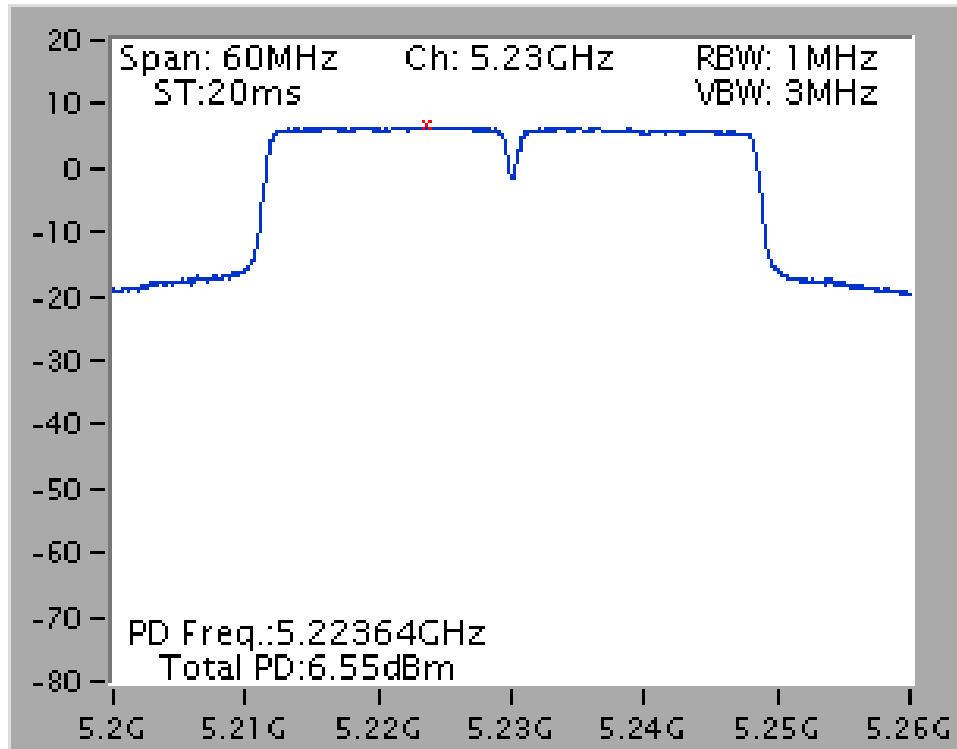
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5200 MHz



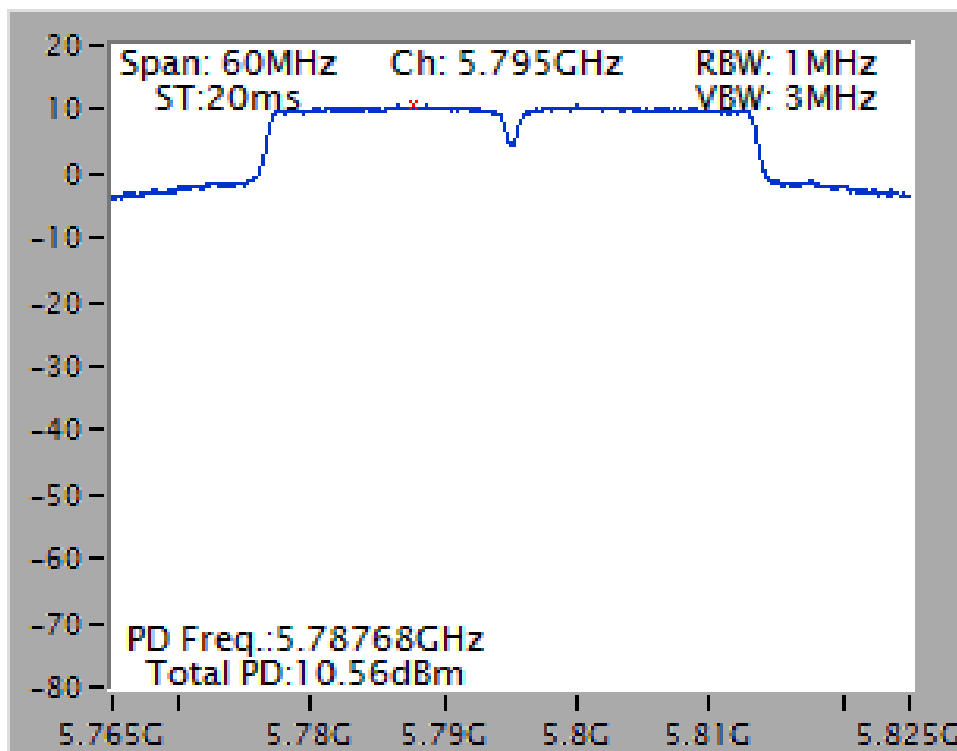
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5785 MHz



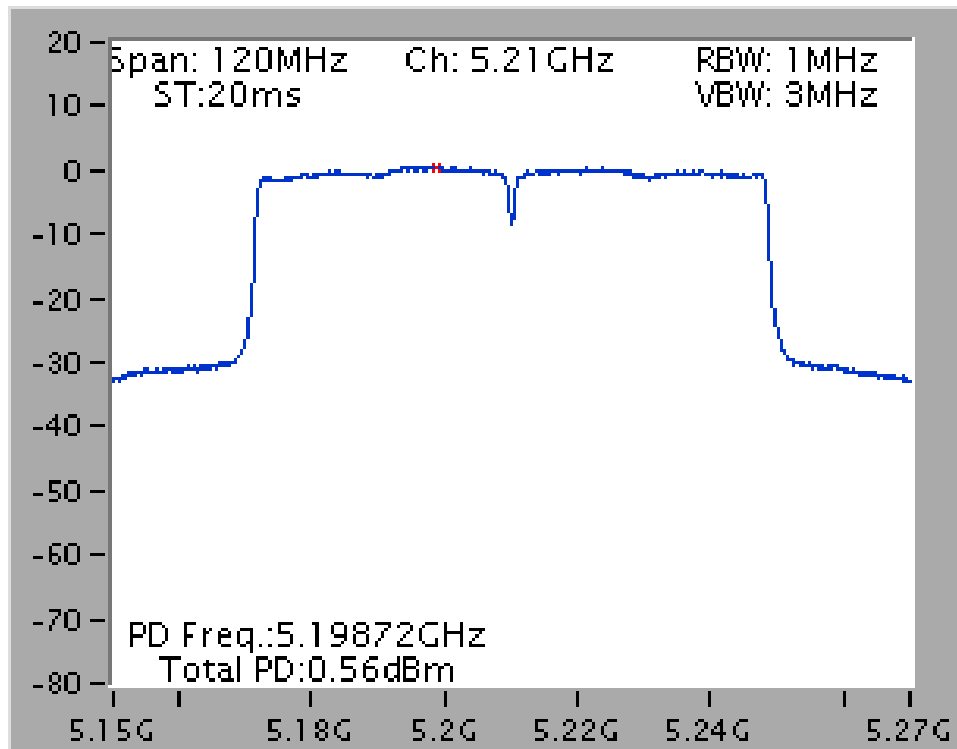
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5230 MHz



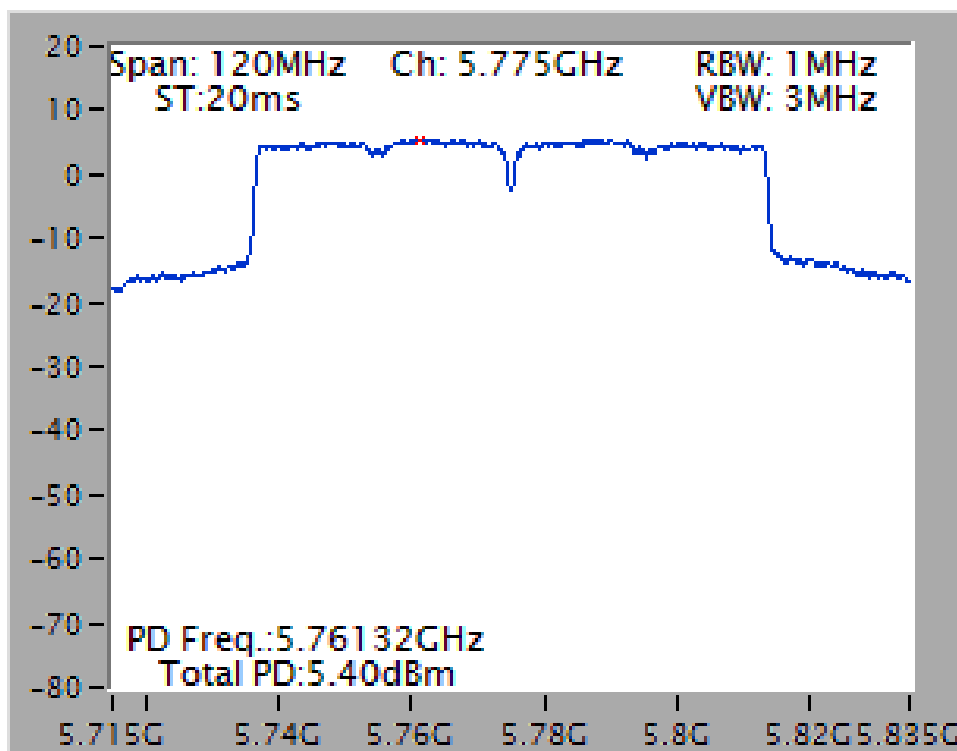
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5795 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5210 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 5 + Chain 6 + Chain 7 + Chain 8 / 5775 MHz



4.6. Radiated 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 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

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 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

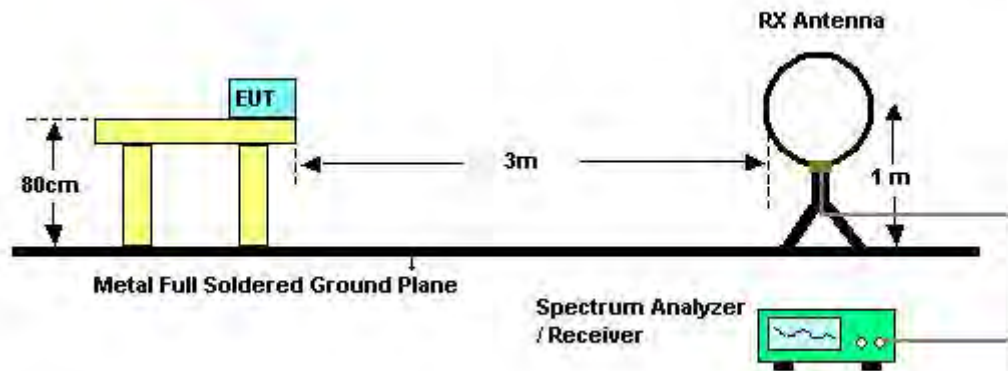
4.6.3. Test Procedures

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.

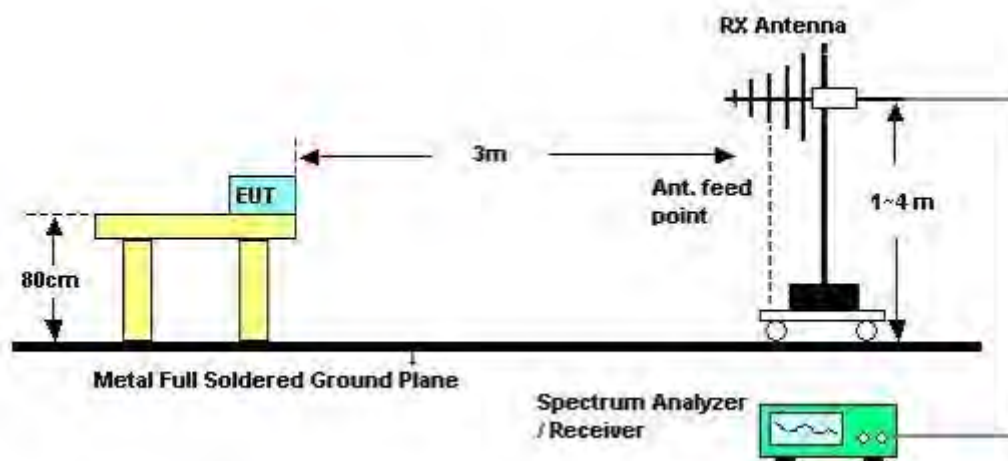
4.6.4. Test Setup Layout

Operating Mode: Intentional – CTX and Unintentional – Normal Link

For Radiated Emissions: 9kHz ~30MHz



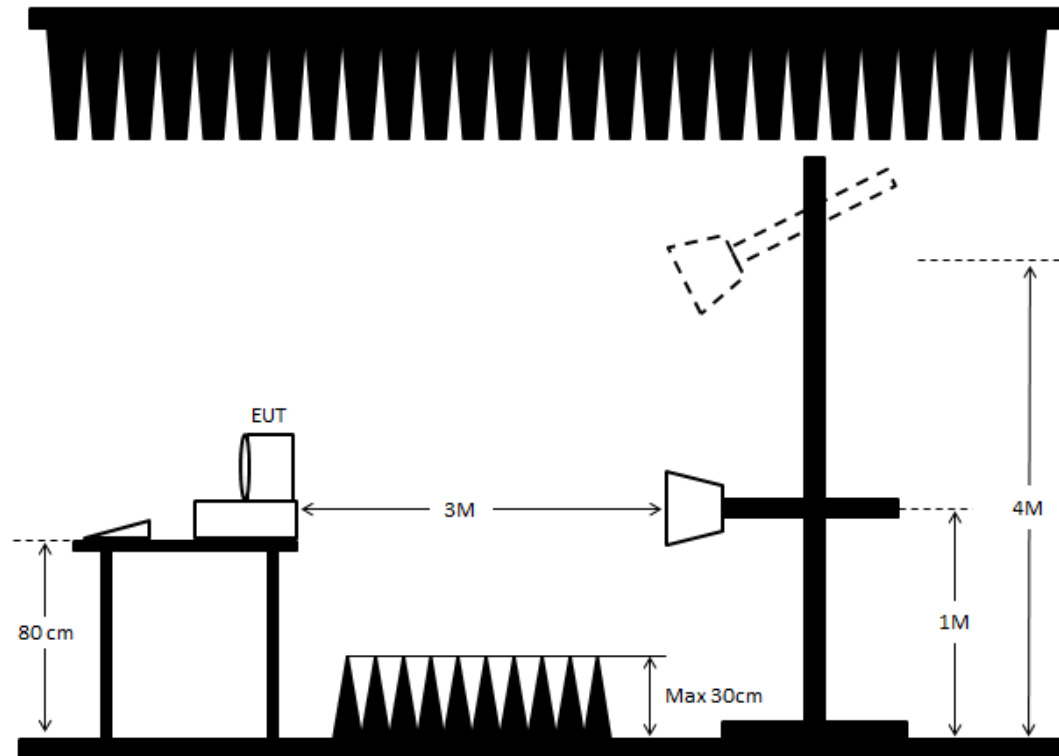
For Radiated Emissions: 30MHz~1GHz



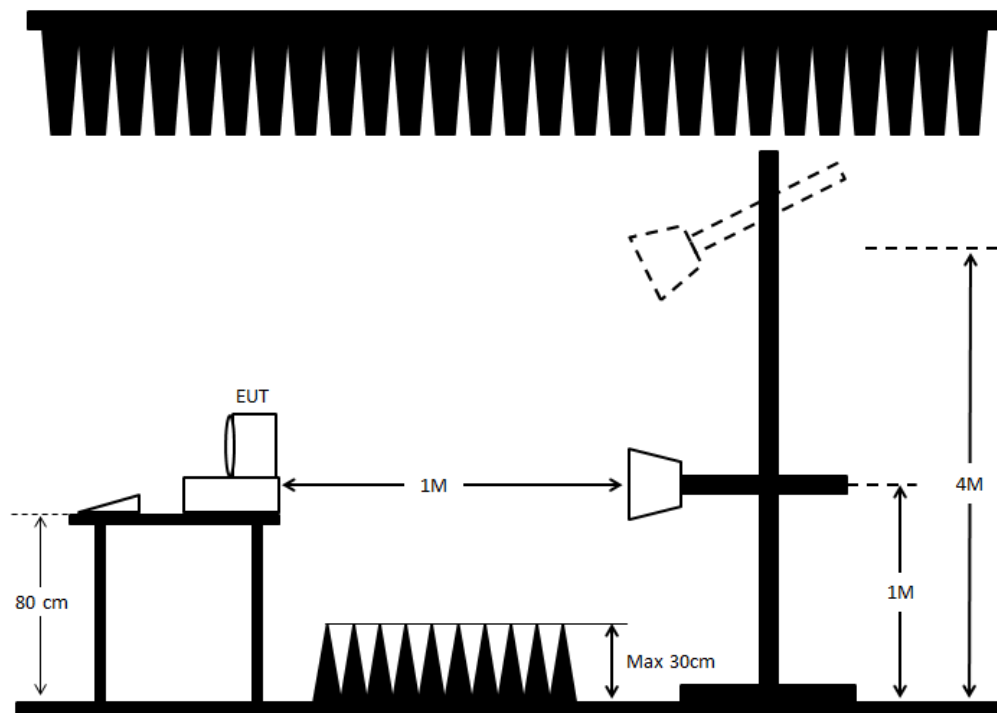
For Radiated Emissions: Above 1GHz

Operating Mode: Unintentional 1GHz~5th Harmonic – Normal Link

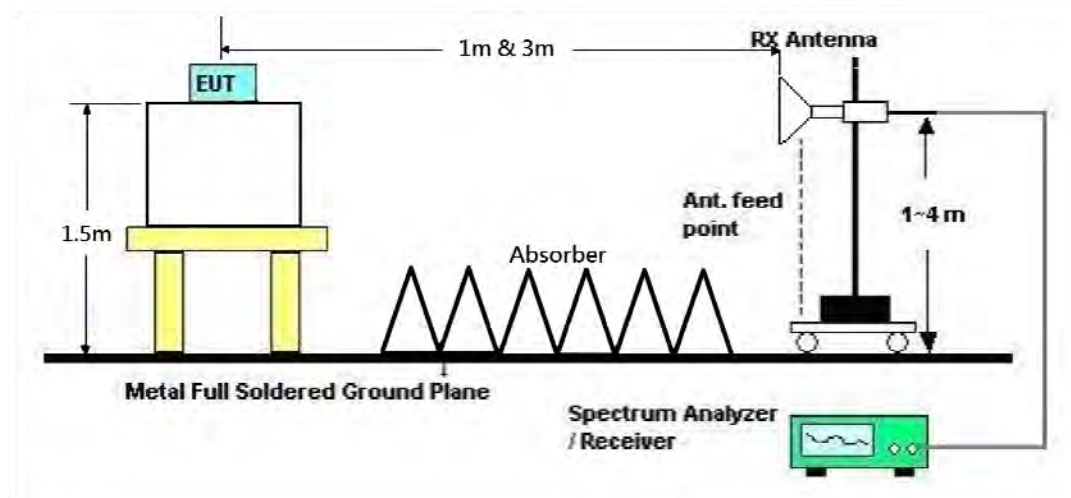
1,000~18,000 MHz



18,000~30,000 MHz



Operating Mode: Intentional 1GHz~10th Harmonic – CTX



4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in beamforming transmitting mode.

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

Operating Mode: Intentional

Temperature	25°C	Humidity	58%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	CTX
Test Date	Nov. 27, 2017	Test Mode	Mode 3

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.

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

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

Operating Mode: Unintentional

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	Normal Link
Test Date	Sep. 28, 2017	Test Mode	Mode 1

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.

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

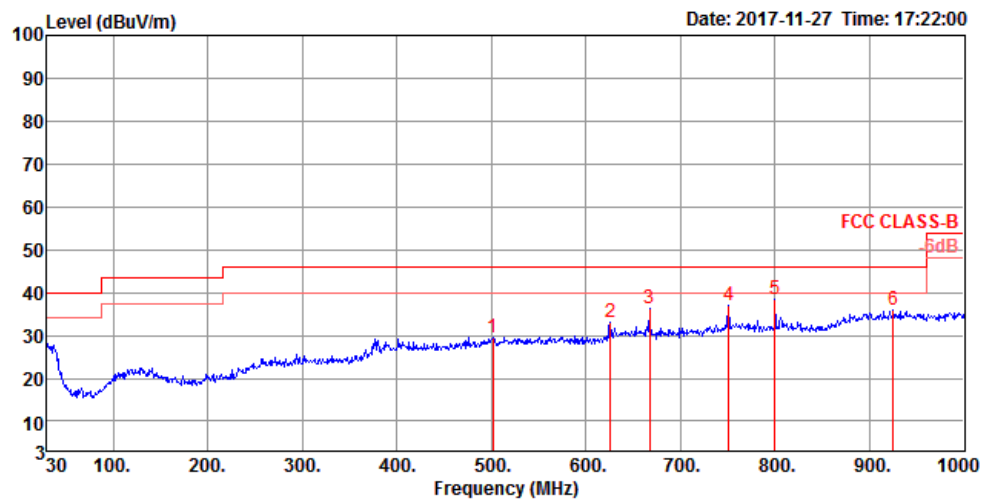
Limit line = specific limits (dBuV) + distance extrapolation factor.

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

Operating Mode: Intentional

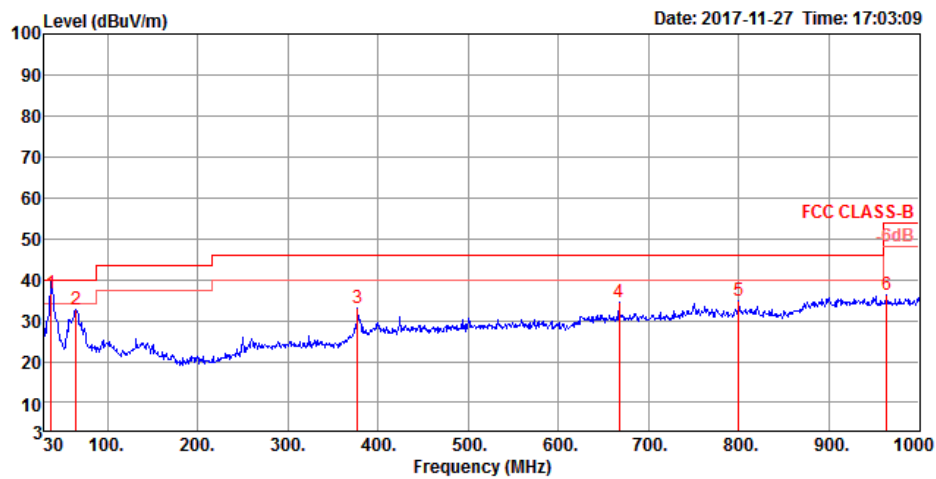
Temperature	25°C	Humidity	58%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	CTX
Test Mode	Mode 3		

Horizontal



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	501.42	29.52	46.00	-16.48	35.09	2.94	23.82	32.33	100	360 Peak	HORIZONTAL
2	625.58	33.12	46.00	-12.88	37.58	2.76	25.16	32.38	150	330 Peak	HORIZONTAL
3	667.29	36.44	46.00	-9.56	39.88	3.48	25.44	32.36	100	175 Peak	HORIZONTAL
4	750.71	36.99	46.00	-9.01	39.34	3.78	26.10	32.23	100	155 Peak	HORIZONTAL
5	800.18	38.46	46.00	-7.54	40.47	3.51	26.60	32.12	150	192 Peak	HORIZONTAL
6	925.31	35.81	46.00	-10.19	35.07	4.37	27.71	31.34	200	52 Peak	HORIZONTAL

Vertical



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	37.76	36.69	40.00	-3.31	47.00	1.10	21.02	32.43	100	178 QP	VERTICAL
2	64.92	32.62	40.00	-7.38	51.24	1.14	12.65	32.41	150	194 Peak	VERTICAL
3	377.26	32.94	46.00	-13.06	41.15	2.26	21.82	32.29	200	290 Peak	VERTICAL
4	667.29	34.51	46.00	-11.49	37.95	3.48	25.44	32.36	100	340 Peak	VERTICAL
5	800.18	34.84	46.00	-11.16	36.85	3.51	26.60	32.12	100	102 Peak	VERTICAL
6	964.11	36.25	54.00	-17.75	35.36	3.90	28.00	31.01	100	236 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.

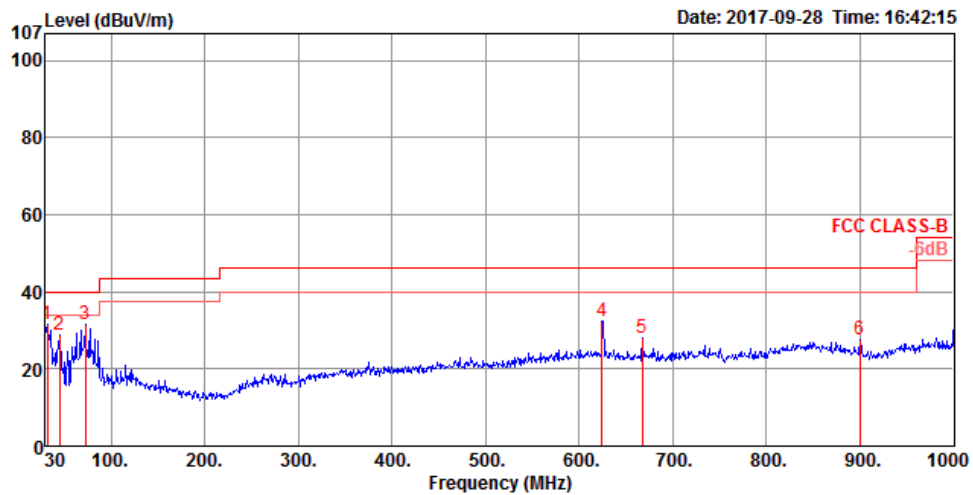
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

Operating Mode: Unintentional

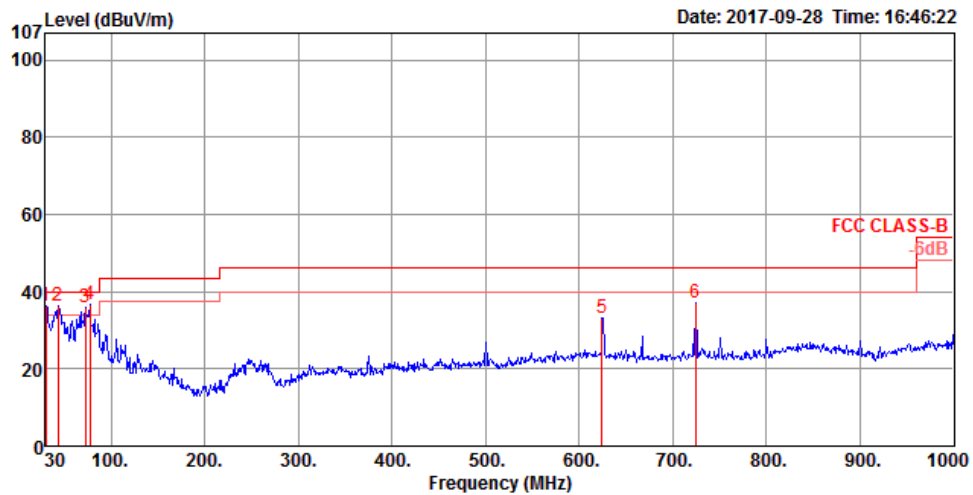
Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	Normal Link
Test Mode	Mode 1		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	31.94	31.63	40.00	-8.37	39.41	0.53	23.19	31.50	200	220	Peak
2	44.55	28.98	40.00	-11.02	43.85	0.60	16.22	31.69	300	352	Peak
3	72.68	31.45	40.00	-8.55	50.28	0.75	12.26	31.84	200	16	Peak
4	624.61	32.55	46.00	-13.45	37.98	1.97	25.03	32.43	100	217	Peak
5	667.29	28.03	46.00	-17.97	33.05	2.04	25.42	32.48	150	359	Peak
6	900.09	27.46	46.00	-18.54	31.03	2.40	26.43	32.40	100	0	Peak

Vertical



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	30.00	36.41	40.00	-3.59	42.89	0.53	24.45	31.46	100	232 Peak	VERTICAL
2	43.58	36.50	40.00	-3.50	50.85	0.59	16.74	31.68	100	54 Peak	VERTICAL
3	72.68	36.01	40.00	-3.99	54.84	0.75	12.26	31.84	100	170 Peak	VERTICAL
4	77.53	36.66	40.00	-3.34	55.30	0.75	12.46	31.85	100	170 Peak	VERTICAL
5	624.61	33.28	46.00	-12.72	38.71	1.97	25.03	32.43	100	263 Peak	VERTICAL
6	724.52	37.03	46.00	-8.97	41.98	2.14	25.42	32.51	100	31 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).

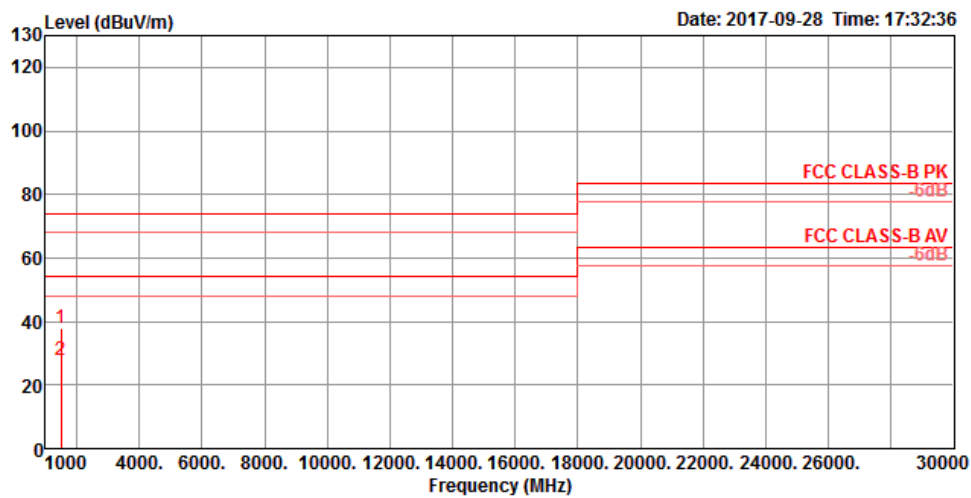
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

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

Operating Mode: Unintentional

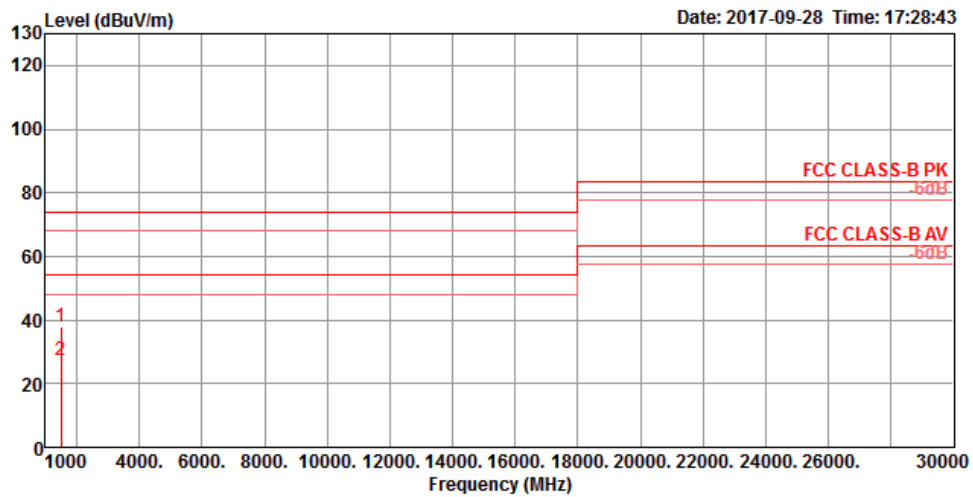
Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	Normal Link
Test Mode	Mode 1		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	1499.97	37.70	74.00	-36.30	45.44	4.09	25.60	37.43	232	26 Peak	HORIZONTAL
2	1500.05	27.96	54.00	-26.04	35.70	4.09	25.60	37.43	232	26 Average	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	1499.88	37.74	74.00	-36.26	45.48	4.09	25.60	37.43	100	58 Peak	VERTICAL
2	1500.05	27.39	54.00	-26.61	35.13	4.09	25.60	37.43	100	58 Average	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.

4.6.10. Results for Radiated Emissions (1GHz~10th Harmonic)

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	15536.42	47.24	54.00	-6.76	32.08	12.49	38.39	35.72	250	116	HORIZONTAL Average
2	15542.50	60.32	74.00	-13.68	45.16	12.49	38.39	35.72	250	116	HORIZONTAL Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	15535.00	46.73	54.00	-7.27	31.57	12.49	38.39	35.72	250	278	VERTICAL Average
2	15543.92	60.74	74.00	-13.26	45.58	12.49	38.39	35.72	250	278	VERTICAL Peak

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	15598.94	59.92	74.00	-14.08	44.75	12.52	38.38	35.73	250	205	HORIZONTAL Peak
2	15600.24	46.90	54.00	-7.10	31.73	12.52	38.38	35.73	250	205	HORIZONTAL Average

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	15596.54	47.38	54.00	-6.62	32.21	12.52	38.38	35.73	250	144	VERTICAL Average
2	15598.42	59.85	74.00	-14.15	44.68	12.52	38.38	35.73	250	144	VERTICAL Peak

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15720.30	46.18	54.00	-7.82	30.98	12.60	38.35	35.75	250	52	HORIZONTAL	Average
2	15724.38	59.66	74.00	-14.34	44.46	12.60	38.35	35.75	250	52	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15717.36	59.02	74.00	-14.98	43.82	12.60	38.35	35.75	250	195	VERTICAL	Peak
2	15724.38	46.26	54.00	-7.74	31.06	12.60	38.35	35.75	250	195	VERTICAL	Average

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Aug. 17, 2017~Sep. 28, 2017		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11483.44	58.51	74.00	-15.49	41.49	10.99	39.83	33.80	150	140	Peak	HORIZONTAL
2	11496.08	45.35	54.00	-8.65	28.34	11.01	39.80	33.80	150	140	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11485.00	45.67	54.00	-8.33	28.66	11.01	39.80	33.80	130	304	Average	VERTICAL
2	11492.68	59.38	74.00	-14.62	42.37	11.01	39.80	33.80	130	304	Peak	VERTICAL

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Aug. 17, 2017~Sep. 28, 2017		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11567.20	58.71	74.00	-15.29	41.77	11.04	39.68	33.78	174	333	Peak	HORIZONTAL
2	11574.16	46.74	54.00	-7.26	29.80	11.04	39.68	33.78	174	333	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11566.00	45.57	54.00	-8.43	28.63	11.04	39.68	33.78	147	85	Average	VERTICAL
2	11577.08	58.86	74.00	-15.14	41.92	11.04	39.68	33.78	147	85	Peak	VERTICAL

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Aug. 17, 2017~Sep. 28, 2017		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11647.68	58.48	74.00	-15.52	41.62	11.07	39.56	33.77	128	154	Peak	HORIZONTAL
2	11654.04	45.39	54.00	-8.61	28.57	11.09	39.50	33.77	128	154	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11650.52	45.70	54.00	-8.30	28.84	11.07	39.56	33.77	202	324	Average	VERTICAL
2	11657.88	58.66	74.00	-15.34	41.84	11.09	39.50	33.77	202	324	Peak	VERTICAL

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015		

Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	cm	deg	
1	15565.26	60.56	74.00	-13.44	45.39	12.52	38.38	35.73	250	75 HORIZONTAL	Peak
2	15575.00	47.23	54.00	-6.77	32.06	12.52	38.38	35.73	250	75 HORIZONTAL	Average

Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	cm	deg	
1	15565.92	47.10	54.00	-6.90	31.93	12.52	38.38	35.73	250	189 VERTICAL	Average
2	15569.82	60.30	74.00	-13.70	45.13	12.52	38.38	35.73	250	189 VERTICAL	Peak

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	10456.98	44.13	54.00	-9.87	28.74	10.38	38.84	33.83	250	136	HORIZONTAL	Average
2	10462.56	57.34	74.00	-16.66	41.95	10.38	38.84	33.83	250	136	HORIZONTAL	Peak

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	10459.18	57.51	74.00	-16.49	42.12	10.38	38.84	33.83	250	82	VERTICAL	Peak
2	10464.94	43.91	54.00	-10.09	28.52	10.38	38.84	33.83	250	82	VERTICAL	Average

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Aug. 17, 2017~Sep. 28, 2017		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11510.68	45.98	54.00	-8.02	28.96	11.01	39.80	33.79	172	220	Average	HORIZONTAL
2	11515.28	58.84	74.00	-15.16	41.82	11.01	39.80	33.79	172	220	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11516.32	45.96	54.00	-8.04	28.94	11.01	39.80	33.79	131	154	Average	VERTICAL
2	11518.88	58.85	74.00	-15.15	41.88	11.02	39.74	33.79	131	154	Peak	VERTICAL

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Aug. 17, 2017~Sep. 28, 2017		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	11580.20	45.45	54.00	-8.55	28.51	11.04	39.68	33.78	195	5 Average	HORIZONTAL
2	11584.28	58.12	74.00	-15.88	41.22	11.06	39.62	33.78	195	5 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	11591.68	45.65	54.00	-8.35	28.75	11.06	39.62	33.78	138	276 Average	VERTICAL
2	11593.92	59.41	74.00	-14.59	42.51	11.06	39.62	33.78	138	276 Peak	VERTICAL

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015		

Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	15635.36	46.53	54.00	-7.47	31.34	12.55	38.37	35.73	250	91 HORIZONTAL	Average
2	15637.44	59.71	74.00	-14.29	44.52	12.55	38.37	35.73	250	91 HORIZONTAL	Peak

Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	15624.60	46.49	54.00	-7.51	31.30	12.55	38.37	35.73	250	254 VERTICAL	Average
2	15625.84	58.97	74.00	-15.03	43.78	12.55	38.37	35.73	250	254 VERTICAL	Peak

Temperature	25°C	Humidity	56%
Test Engineer	Brian Sun / Cola Fan / Justin Lin	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Aug. 17, 2017~Sep. 28, 2017		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11552.44	46.17	54.00	-7.83	29.23	11.04	39.68	33.78	167	321	Average	HORIZONTAL
2	11555.28	59.14	74.00	-14.86	42.20	11.04	39.68	33.78	167	321	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11556.76	58.61	74.00	-15.39	41.67	11.04	39.68	33.78	173	51	Peak	VERTICAL
2	11557.44	45.97	54.00	-8.03	29.03	11.04	39.68	33.78	173	51	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.

4.7. Band Edge Emissions Measurement

4.7.1. 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 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

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	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

4.7.3. Test Procedures

1. The test procedure is the same as section 4.6.3.

4.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

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 beamforming transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 28, 2015		

Channel 36

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5144.40	67.59	74.00	-6.41	61.52	7.24	33.17	34.34	232	130 VERTICAL	Peak
2	5149.60	50.83	54.00	-3.17	44.76	7.24	33.17	34.34	232	130 VERTICAL	Average
3	5173.20	112.09			105.91	7.29	33.23	34.34	232	130 VERTICAL	Peak
4	5174.80	101.86			95.68	7.29	33.23	34.34	232	130 VERTICAL	Average

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

Channel 40

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5147.60	63.29	74.00	-10.71	57.22	7.24	33.17	34.34	265	135 VERTICAL	Peak
2	5150.00	45.84	54.00	-8.16	39.77	7.24	33.17	34.34	265	135 VERTICAL	Average
3	5192.00	99.81			93.58	7.32	33.25	34.34	265	135 VERTICAL	Average
4	5192.40	110.84			104.61	7.32	33.25	34.34	265	135 VERTICAL	Peak

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

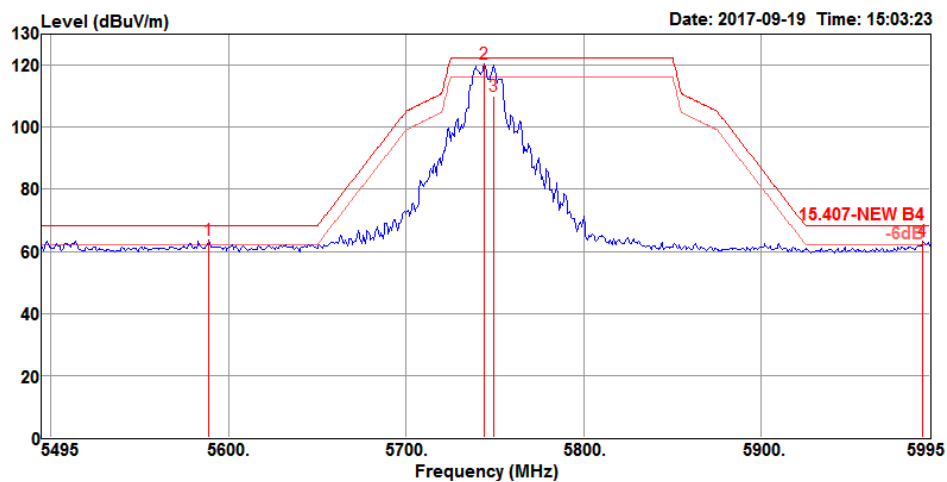
Channel 48

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5150.00	44.79	54.00	-9.21	38.72	7.24	33.17	34.34	258	136 VERTICAL	Average
2	5150.00	57.25	74.00	-16.75	51.18	7.24	33.17	34.34	258	136 VERTICAL	Peak
3	5241.20	101.68			95.32	7.36	33.34	34.34	258	136 VERTICAL	Average
4	5243.20	111.07			104.70	7.36	33.34	34.33	258	136 VERTICAL	Peak

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

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 28, 2015		

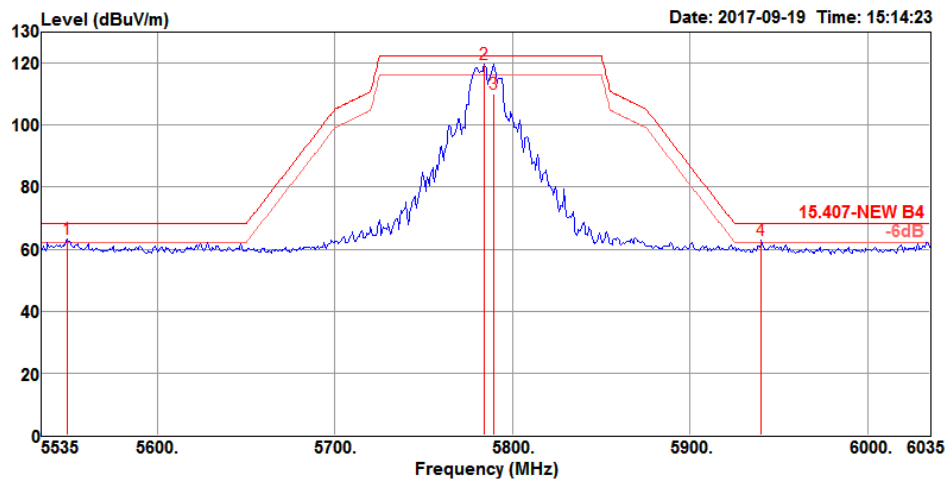
Channel 149



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5589.00	63.49	68.20	-4.71	55.28	7.85	32.00	31.64	229	136	Peak
2	5744.00	120.58			112.26	7.83	32.20	31.71	229	136	Peak
3	5749.00	110.00			101.68	7.83	32.20	31.71	229	136	Average
4	5991.00	63.46	68.20	-4.74	54.78	8.01	32.48	31.81	229	136	Peak

Item 2, 3 are the fundamental frequency at 5745 MHz.

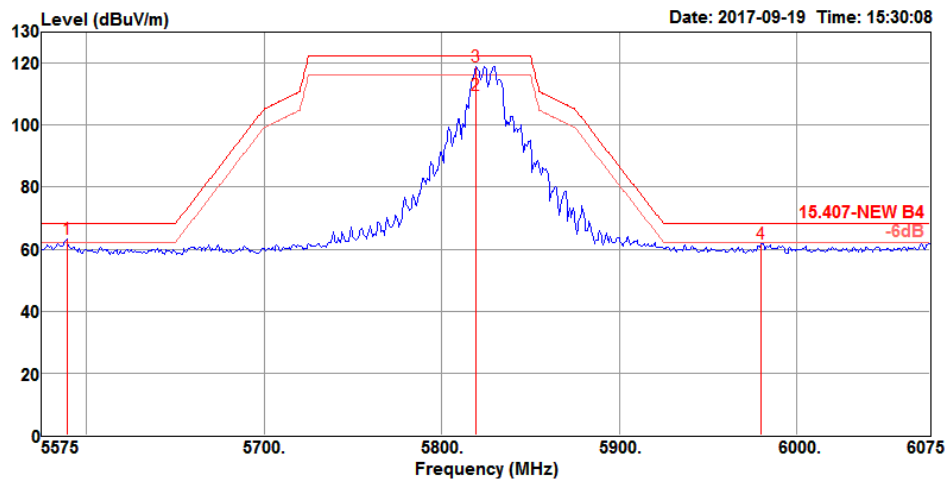
Channel 157



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5549.00	63.47	68.20	-4.73	55.33	7.80	31.96	31.62	229	138 Peak	VERTICAL
2	5784.00	119.54			111.21	7.82	32.24	31.73	229	138 Peak	VERTICAL
3	5789.00	110.06			101.71	7.82	32.26	31.73	229	138 Average	VERTICAL
4	5940.00	63.00	68.20	-5.20	54.42	7.96	32.42	31.80	229	138 Peak	VERTICAL

Item 2, 3 are the fundamental frequency at 5785 MHz.

Channel 165



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5589.00	63.32	68.20	-4.88	55.11	7.85	32.00	31.64	234	137	Peak
2	5819.00	109.81			101.43	7.84	32.28	31.74	234	137	Average
3	5819.00	118.94			110.56	7.84	32.28	31.74	234	137	Peak
4	5980.00	61.87	68.20	-6.33	53.19	8.01	32.48	31.81	234	137	Peak

Item 2, 3 are the fundamental frequency at 5825 MHz.

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 28, 2015		

Channel 38

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5146.00	70.24	74.00	-3.76	64.17	7.24	33.17	34.34	250	134 VERTICAL	Peak
2	5150.00	53.84	54.00	-0.16	47.77	7.24	33.17	34.34	250	134 VERTICAL	Average
3	5185.20	105.39			99.21	7.29	33.23	34.34	250	134 VERTICAL	Peak
4	5188.40	94.37			88.14	7.32	33.25	34.34	250	134 VERTICAL	Average

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

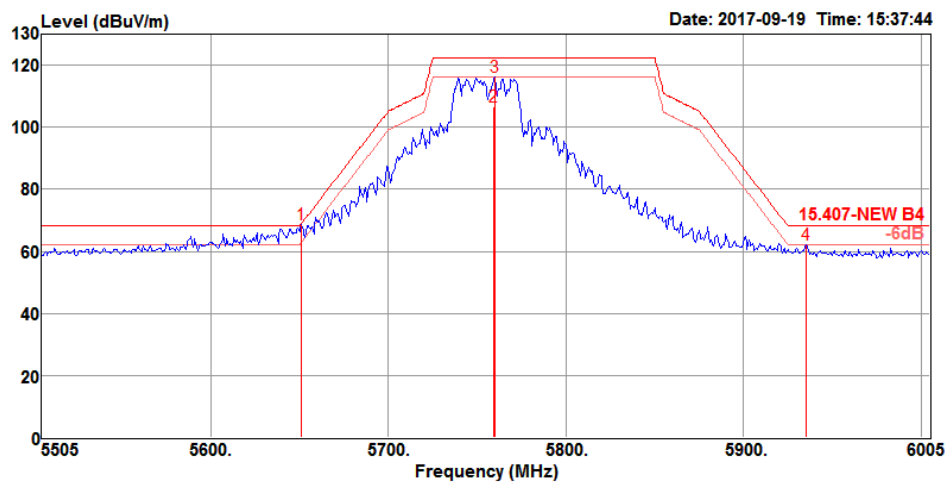
Channel 46

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5145.00	48.06	54.00	-5.94	41.99	7.24	33.17	34.34	250	135 VERTICAL	Average
2	5150.00	59.26	74.00	-14.74	53.19	7.24	33.17	34.34	250	135 VERTICAL	Peak
3	5236.00	100.03			93.67	7.36	33.34	34.34	250	135 VERTICAL	Average
4	5238.00	109.89			103.53	7.36	33.34	34.34	250	135 VERTICAL	Peak

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

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 28, 2015~Dec. 29, 2015		

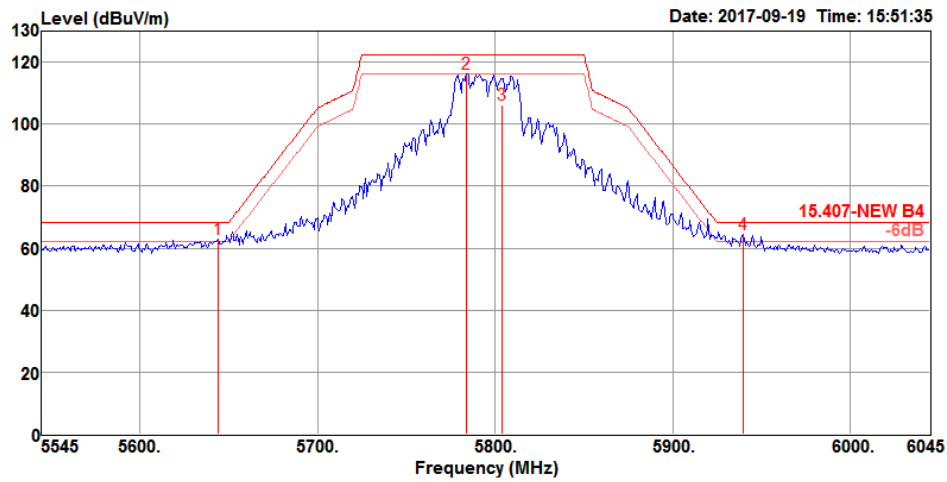
Channel 151



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5651.00	68.55	68.94	-0.39	60.28	7.86	32.08	31.67	237	140	Peak
2	5759.00	106.66			98.32	7.83	32.22	31.71	237	140	Average
3	5760.00	116.12			107.78	7.83	32.22	31.71	237	140	Peak
4	5935.00	62.23	68.20	-5.97	53.64	7.96	32.42	31.79	237	140	Peak

Item 2, 3 are the fundamental frequency at 5755 MHz.

Channel 159



	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	5644.00	63.09	68.20	-5.11	54.82	7.86	32.08	31.67	233	140	Peak	VERTICAL
2	5784.00	116.37			108.04	7.82	32.24	31.73	233	140	Peak	VERTICAL
3	5804.00	106.42			98.08	7.82	32.26	31.74	233	140	Average	VERTICAL
4	5940.00	64.52	68.20	-3.68	55.94	7.96	32.42	31.80	233	140	Peak	VERTICAL

Item 2, 3 are the fundamental frequency at 5795 MHz.

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42/ Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015~Jan. 20, 2016		

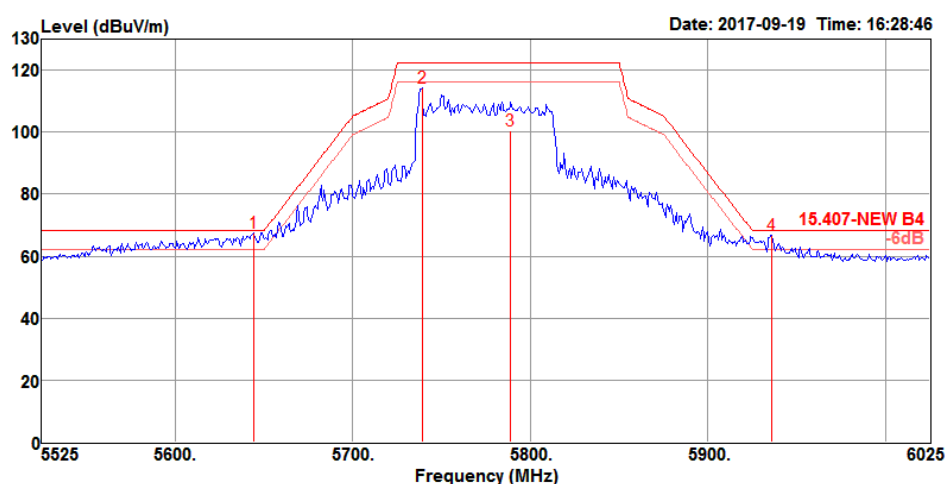
Channel 42

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5145.20	67.20	74.00	-6.80	61.13	7.24	33.17	34.34	250	164	VERTICAL	Peak
2	5149.20	53.87	54.00	-0.13	47.80	7.24	33.17	34.34	250	164	VERTICAL	Average
3	5212.40	101.61			95.34	7.33	33.28	34.34	250	164	VERTICAL	Peak
4	5216.40	92.47			86.20	7.33	33.28	34.34	250	164	VERTICAL	Average

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

Temperature	25°C	Humidity	56%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 5 + Chain 6 + Chain 7 + Chain 8
Test Date	Dec. 29, 2015~Jan. 20, 2016		

Channel 155



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	5644.00	67.53	68.20	-0.67	59.26	7.86	32.08	31.67	248	310	Peak
2	5739.00	114.12			105.80	7.83	32.20	31.71	248	310	Peak
3	5789.00	100.38			92.03	7.82	32.26	31.73	248	310	Average
4	5936.00	66.83	68.20	-1.37	58.24	7.96	32.42	31.79	248	310	Peak

Item 2, 3 are the fundamental frequency at 5775 MHz.

Note:

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

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

4.8. Frequency Stability Measurement

4.8.1. Limit

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

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

4.8.2. Measuring Instruments and Setting

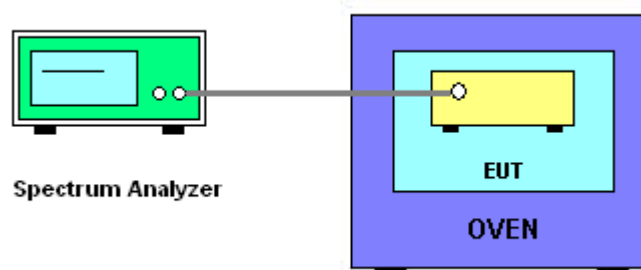
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.8.3. 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 ± 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 $0^\circ\text{C} \sim 50^\circ\text{C}$.

4.8.4. Test Setup Layout



4.8.5. Test Deviation

There is no deviation with the original standard.

4.8.6. EUT Operation during Test

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

4.8.7. Test Result of Frequency Stability

Band 1:

Temperature	25°C	Humidity	54%
Test Engineer	Clemens Fang	Test Date	Nov. 30, 2015

Mode: 20 MHz / Chain 7

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5200.0229	5200.0215	5200.0197	5200.0176
110.00	5200.0217	5200.0204	5200.0188	5200.0169
93.50	5200.0203	5200.0192	5200.0180	5200.0158
Max. Deviation (MHz)	0.0229	0.0215	0.0197	0.0176
Max. Deviation (ppm)	4.40	4.13	3.79	3.38
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5200.0242	5200.0230	5200.0211	5200.0189
10	5200.0229	5200.0216	5200.0201	5200.0183
20	5200.0217	5200.0204	5200.0188	5200.0169
30	5200.0203	5200.0192	5200.0178	5200.0162
40	5200.0187	5200.0172	5200.0156	5200.0136
50	5200.0170	5200.0158	5200.0143	5200.0116
Max. Deviation (MHz)	0.0242	0.0230	0.0211	0.0189
Max. Deviation (ppm)	4.65	4.42	4.06	3.63
Result	Complies			

Mode: 40 MHz / Chain 7

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5190.0264	5190.0250	5190.0232	5190.0211
110.00	5190.0252	5190.0239	5190.0223	5190.0204
93.50	5190.0238	5190.0227	5190.0215	5190.0193
Max. Deviation (MHz)	0.0264	0.0250	0.0232	0.0211
Max. Deviation (ppm)	5.09	4.82	4.47	4.07
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5190.0277	5190.0265	5190.0246	5190.0224
10	5190.0264	5190.0251	5190.0236	5190.0218
20	5190.0252	5190.0239	5190.0223	5190.0204
30	5190.0238	5190.0227	5190.0213	5190.0197
40	5190.0222	5190.0207	5190.0191	5190.0171
50	5190.0205	5190.0193	5190.0178	5190.0151
Max. Deviation (MHz)	0.0277	0.0265	0.0246	0.0224
Max. Deviation (ppm)	5.34	5.11	4.74	4.32
Result	Complies			

Mode: 80 MHz / Chain 7

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5210.0260	5210.0246	5210.0228	5210.0207
110.00	5210.0248	5210.0235	5210.0219	5210.0200
93.50	5210.0234	5210.0223	5210.0211	5210.0189
Max. Deviation (MHz)	0.0260	0.0246	0.0228	0.0207
Max. Deviation (ppm)	4.99	4.72	4.38	3.97
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5210.0273	5210.0261	5210.0242	5210.0220
10	5210.0260	5210.0247	5210.0232	5210.0214
20	5210.0248	5210.0235	5210.0219	5210.0200
30	5210.0234	5210.0223	5210.0209	5210.0193
40	5210.0218	5210.0203	5210.0187	5210.0167
50	5210.0201	5210.0189	5210.0174	5210.0147
Max. Deviation (MHz)	0.0273	0.0261	0.0242	0.0220
Max. Deviation (ppm)	5.24	5.01	4.64	4.22
Result	Complies			

Band 4:

Temperature	23°C	Humidity	54%
Test Engineer	Lucke Hsieh	Test Date	Sep. 19, 2017~Sep. 20, 2017

Mode: 20 MHz / Chain 7
Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9964	5784.9956	5784.9950	5784.9945
110.00	5784.9958	5784.9953	5784.9944	5784.9938
93.50	5784.9953	5784.9947	5784.9944	5784.9942
Max. Deviation (MHz)	0.0047	0.0053	0.0056	0.0062
Max. Deviation (ppm)	0.81	0.92	0.97	1.07
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5784.9989	5784.9985	5784.9977	5784.9968
10	5784.9969	5784.9967	5784.9964	5784.9963
20	5784.9958	5784.9955	5784.9954	5784.9950
30	5784.9896	5784.9890	5784.9881	5784.9876
40	5784.9882	5784.9875	5784.9873	5784.9865
50	5784.9867	5784.9858	5784.9854	5784.9844
Max. Deviation (MHz)	0.0133	0.0142	0.0146	0.0156
Max. Deviation (ppm)	2.30	2.45	2.52	2.70
Result	Complies			

Mode: 40 MHz / Chain 7

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5754.9964	5754.9954	5754.9945	5754.9935
110.00	5754.9958	5754.9956	5754.9950	5754.9945
93.50	5754.9953	5754.9949	5754.9941	5754.9937
Max. Deviation (MHz)	0.0047	0.0051	0.0059	0.0065
Max. Deviation (ppm)	0.82	0.89	1.03	1.13
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5754.9980	5754.9972	5754.9964	5754.9958
10	5754.9963	5754.9959	5754.9951	5754.9949
20	5754.9958	5754.9952	5754.9946	5754.9937
30	5754.9896	5754.9892	5754.9890	5754.9888
40	5754.9880	5754.9870	5754.9864	5754.9862
50	5754.9879	5754.9875	5754.9866	5754.9865
Max. Deviation (MHz)	0.0121	0.0130	0.0136	0.0138
Max. Deviation (ppm)	2.10	2.26	2.36	2.40
Result	Complies			

Mode: 80 MHz / Chain 7

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5774.9966	5774.9963	5774.9957	5774.9955
110.00	5774.9958	5774.9950	5774.9947	5774.9940
93.50	5774.9954	5774.9953	5774.9946	5774.9945
Max. Deviation (MHz)	0.0046	0.0050	0.0054	0.0060
Max. Deviation (ppm)	0.80	0.87	0.94	1.04
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5774.9972	5774.9971	5774.9964	5774.9954
10	5774.9961	5774.9955	5774.9948	5774.9942
20	5774.9958	5774.9955	5774.9947	5774.9943
30	5774.9896	5774.9887	5774.9884	5774.9877
40	5774.9895	5774.9894	5774.9886	5774.9882
50	5774.9884	5774.9876	5774.9869	5774.9866
Max. Deviation (MHz)	0.0116	0.0124	0.0131	0.0134
Max. Deviation (ppm)	2.01	2.15	2.27	2.32
Result	Complies			

4.9. Antenna Requirements

4.9.1. 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.

4.9.2. 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	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 2016	Jan. 26, 2017	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Dec. 07, 2016	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Dec. 22, 2016	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 25, 2015	May 24, 2016	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2017	Aug. 29, 2018	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Mar. 16, 2018*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 28, 2014	Oct. 27, 2015	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 10, 2016	Nov. 09, 2017	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Jul. 20, 2016	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 05, 2017	Jul. 04, 2018	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Mar. 14, 2017	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2017	May 01, 2018	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 16, 2017	Jan. 15, 2018	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Jan. 11, 2016	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 10, 2017	Jul. 09, 2018	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 25, 2014	Nov. 24, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Oct. 26, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 22, 2016	Nov. 21, 2017	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 06, 2017	May 05, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Nov. 15, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	1 GHz ~ 40 GHz	Nov. 15, 2014	Nov. 14, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Oct. 24, 2016	Oct. 23, 2017	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100979	9kHz~40GHz	Dec. 12, 2014	Dec. 11 2015	Conducted (TH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 26, 2016	Dec. 25, 2017	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2014	Jun. 02 2015	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 02, 2017	Jun. 01, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 15, 2014	Nov. 14, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 15, 2014	Nov. 14, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 15, 2014	Nov. 14, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 15, 2014	Nov. 14, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 15, 2014	Nov. 14, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Oct. 24, 2016	Oct. 23, 2017	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 03, 2014	Nov. 02, 2014	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 22, 2016	Nov. 21, 2017	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%