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FCC RADIO TEST REPORT

Applicant's company	**Roku, Inc.**
Applicant Address	150 Winchester Circle, Los Gatos, CA 95032
FCC ID	**TC2-R1013**
Manufacturer's company	**Lite-On Network Communication (Dongguan) Limited**
Manufacturer Address	30#Keji Rd., Yin Hu Industrial Area, Qingxi Town, DongGuan City, Guangdong, China

Product Name	4640X, 4630X, 4620X
Brand Name	Roku
Model No.	4640X, 4630X, 4620X
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Jun. 16, 2016
Final Test Date	Jul. 27, 2016
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.

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

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013**, **47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01r03, KDB662911 D01 v02r01, KDB644545 D03 v01, ET Docket No. 13–49; FCC 16–24.**

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

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR662329AB	Rev. 01	Initial issue of report	Jul. 29, 2016
FR662329AB	Rev. 02	Change multiple list	Sep. 08, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	4640X, 4630X, 4620X
Brand Name	:	Roku
Model No.	:	4640X, 4630X, 4620X
Applicant	:	Roku, Inc.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jun. 16, 2016 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E			
Part	**Rule Section**	**Description of Test**	**Result**
4.1	15.207	AC Power Line Conducted Emissions	Complies
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies
4.3	15.407(e)	6dB Spectrum Bandwidth	Complies
4.4	15.407(a)	Maximum Conducted Output Power	Complies
4.5	15.407(a)	Power Spectral Density	Complies
4.6	15.407(b)	Radiated Emissions	Complies
4.7	15.407(b)	Band Edge Emissions	Complies
4.8	15.407(g)	Frequency Stability	Complies
4.9	15.203	Antenna Requirements	Complies

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	IEEE 802.11a: WLAN (1TX, 2RX) IEEE 802.11n/ac: WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	IEEE 802.11a: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
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
Channel Bandwidth (99%)	Band 1: IEEE 802.11a: 19.28 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 19.28 MHz Band 4: IEEE 802.11a: 21.97 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 24.23 MHz
Maximum Conducted Output Power	Band 1: IEEE 802.11a: 18.36 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 21.33 dBm Band 4: IEEE 802.11a: 18.92 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 21.98 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	☒ Without beamforming
Operate Condition	☒ Indoor	☐ Outdoor

Antenna and Bandwidth

Antenna	Single (TX)	Two (TX)
Bandwidth Mode	20 MHz	20 MHz
IEEE 802.11a	V	X
IEEE 802.11n	X	V
IEEE 802.11ac	X	V

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 0-15
802.11ac (VHT20)	2	MCS 0-9/Nss1-2
Note 1: IEEE Std. 802.11n modulation consists of HT20 (HT: High Throughput). Then EUT supports HT20.		
Note 2: IEEE Std. 802.11ac modulation consists of VHT20 (VHT: Very High Throughput). Then EUT supports VHT20.		
Note 3: Modulation modes consist of below configuration: HT20: IEEE 802.11n, VHT20: IEEE 802.11ac		

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Part Number	Antenna Type	Connector	Gain (dBi)	
					B1	B4
1	Airgain	M2450LNTSU2	PIFA Antenna	I-PEX	2.6	1.3
2	Airgain	M2450LNTSU2	PIFA Antenna	I-PEX	-0.4	3.1

Note: The EUT has two antennas.

For IEEE 802.11a mode (1TX, 1RX):

The EUT supports the antenna with TX and RX diversity functions.

Both Chain 1 and Chain 2 support transmit and receive functions, but only one of them will be used at one time.

The Chain 2 generated the worst case, so it was selected to test and record in the report.

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

Both chain 1 and chain 2 could transmit/receive simultaneously.

3.4. Table for Carrier Frequencies

There is a bandwidth system.

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

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	40	5200 MHz	48	5240 MHz
5725~5850 MHz Band 4	149	5745 MHz	161	5805 MHz
	153	5765 MHz	165	5825 MHz
	157	5785 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 Conducted Emission	CTX		-	-	-
Max. Conducted Output Power	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	2
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
Power Spectral Density	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	2
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	2
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
6dB Spectrum Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	2
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
Radiated Emission Below 1GHz	CTX		-	-	-
Radiated Emission Above 1GHz	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	2
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
Band Edge Emission	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	2
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
Frequency Stability	20 MHz	Band 1&4	-	40/157	1

Note1: VHT20 covers HT20, due to same modulation. The power setting for 802.11n HT20 is the same or lower than 802.11ac VHT20.

Note2: All the specification of test configurations and test modes were based on customer's request.

The following test modes were performed for all tests:

For Conducted Emission and Radiated Emission test:

Mode 1. CTX - EUT 1 in Z axis - 5G

3.6. Table for Testing Locations

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

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

3.7. Table for Multiple Listing

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

EUT	Model Name	Description
1	4640X	The RF specifications are the same for all models.
2	4630X	
3	4620X	

From the above models, model: 4640X was selected as representative model for the test and its data was recorded in this report.

3.8. Table for Supporting Units

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Flash disk3.0	Transcend	JetFlash-700	DoC
Micro SD Card	Transcend	TS16GUSDHC10	DoC
Adapter	Roku	PA-1120-42RU -ROHS	DoC

For Test Site No: 03CH01-CB and TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E4300	DoC
Adapter	Roku	PA-1120-42RU -ROHS	DoC

3.9. Table for Parameters of Test Software Setting

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

Test Software Version	Mtool_2.0.2.3					
Mode	Test Frequency (MHz)					
	NCB: 20MHz					
	5180 MHz	5200 MHz	5240 MHz	5745 MHz	5785 MHz	5825 MHz
802.11a	73	80	78	80	80	80
802.11ac MCS0/Nss1 VHT20	68	80	78	80	80	80

3.10. EUT Operation during Test

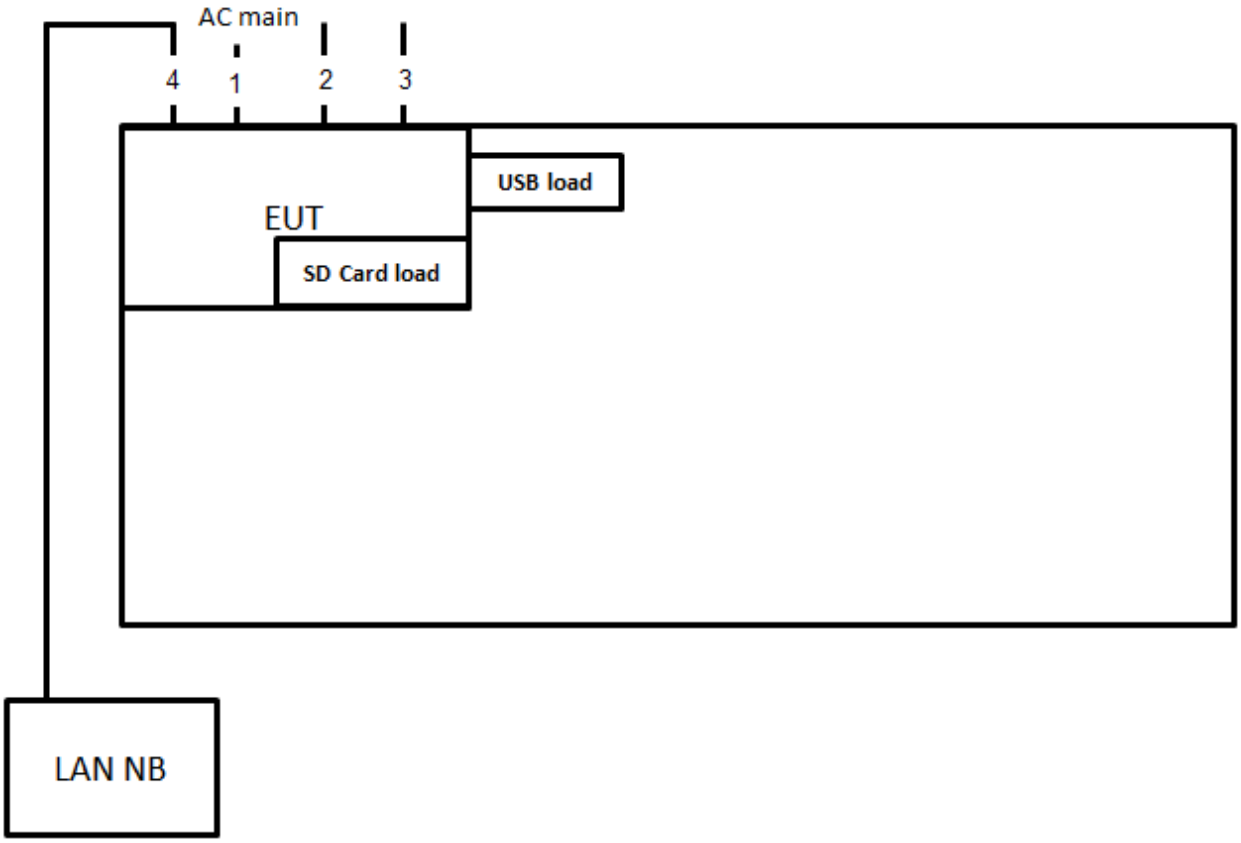
The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.064	2.088	98.85%	0.05	0.01
802.11ac MCS0/Nss1 VHT20	1.924	1.966	97.86%	0.09	0.52

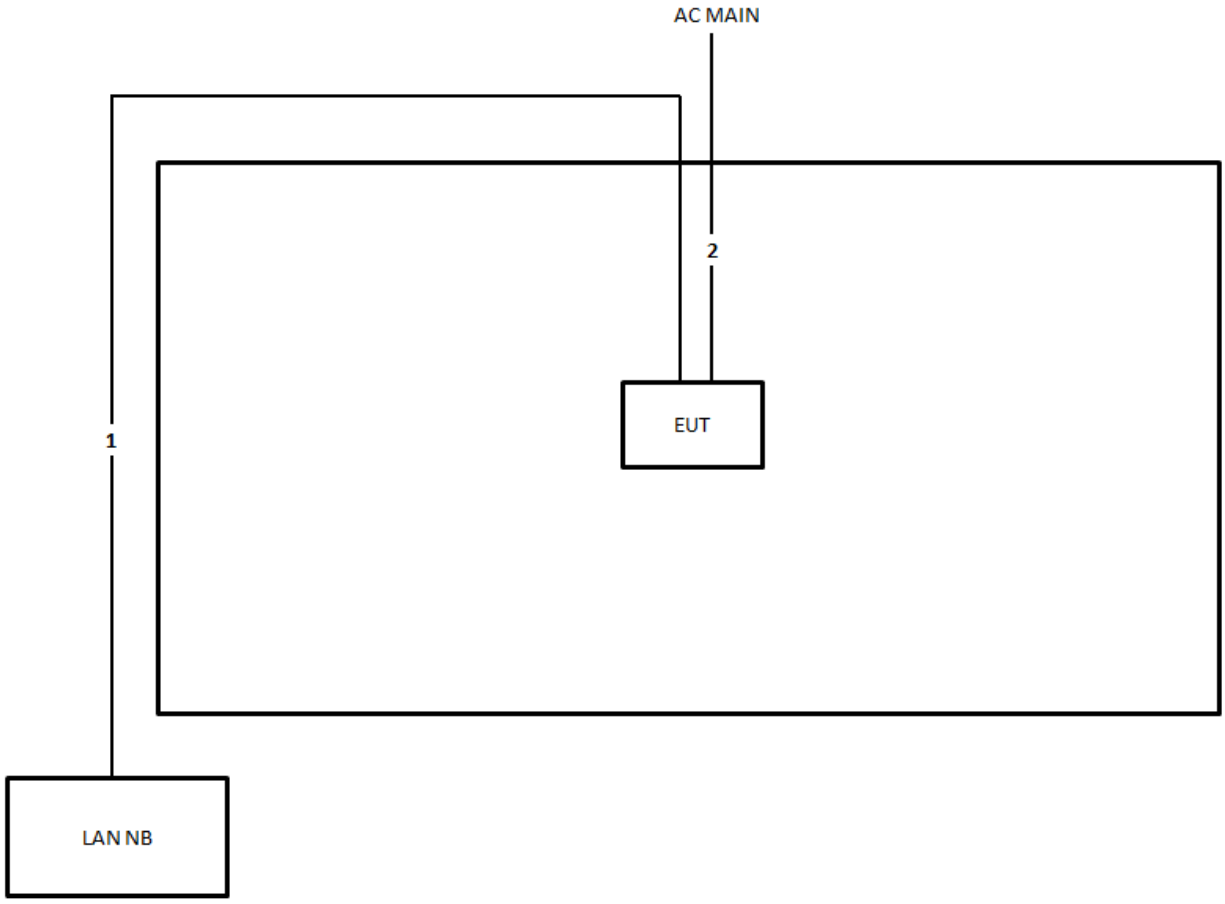
3.12. Test Configurations

3.12.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	HDMI cable	Yes	1.5m
3	Audio cable	No	1.3m
4	RJ-45 cable	No	10m

3.12.2. Radiation Emissions Test Configuration



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

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

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

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

4.1.2. Measuring Instruments and Setting

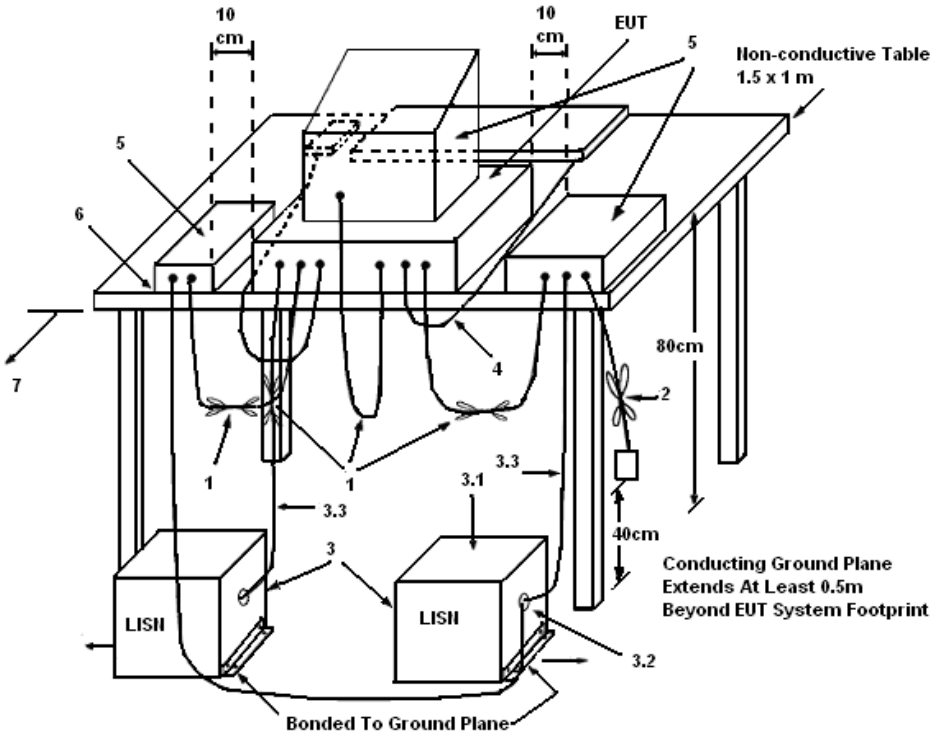
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

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

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 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

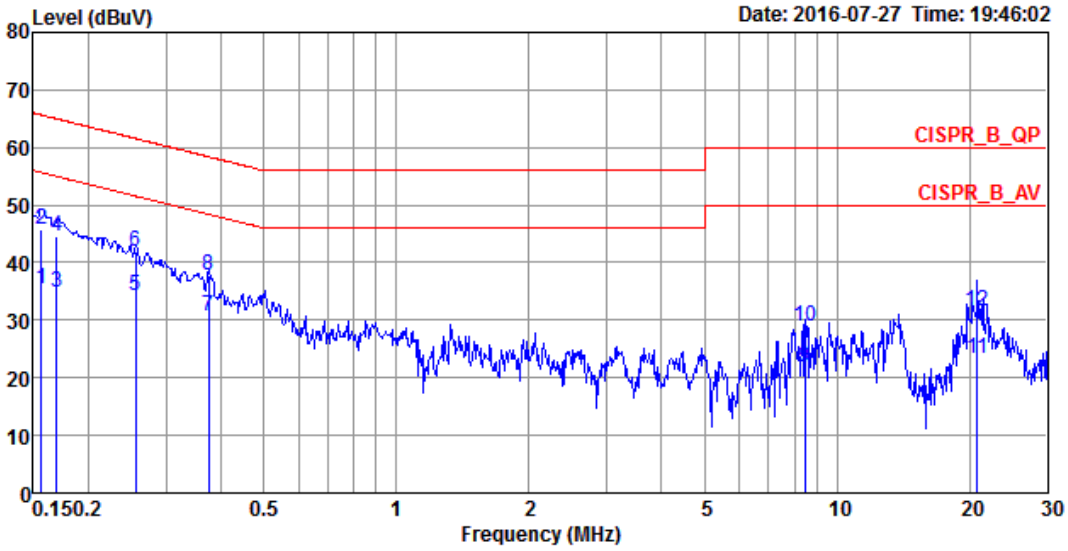
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

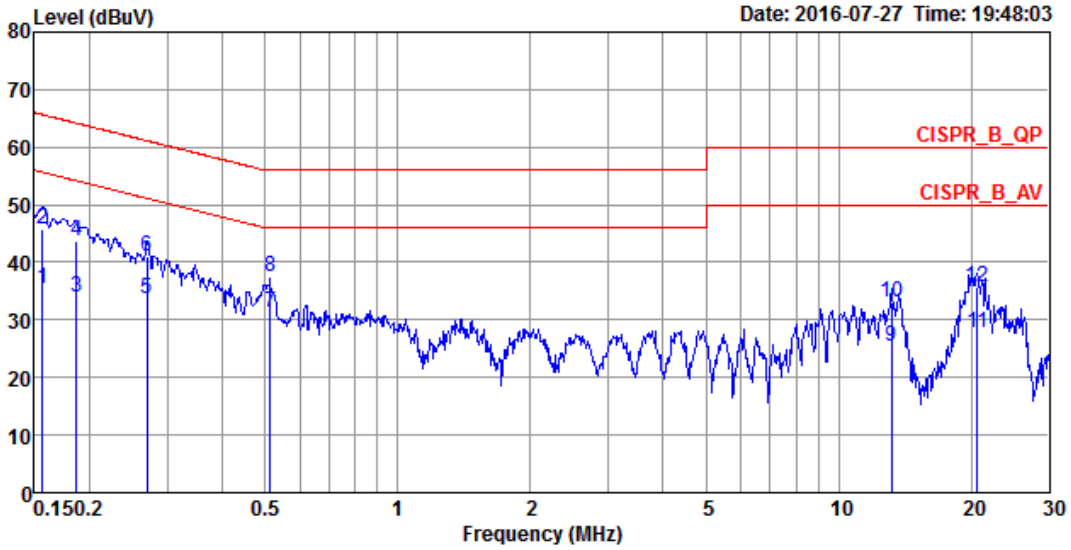
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	22℃	Humidity	60%
Test Engineer	Edison Lin	Phase	Line
Configuration	CTX	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1565	35.43	-20.22	55.65	25.24	10.02	0.17	LINE	Average
2	0.1565	45.86	-19.79	65.65	35.67	10.02	0.17	LINE	QP
3	0.1694	34.73	-20.26	54.99	24.54	10.02	0.17	LINE	Average
4	0.1694	44.48	-20.51	64.99	34.29	10.02	0.17	LINE	QP
5	0.2562	34.26	-17.30	51.56	24.21	9.92	0.13	LINE	Average
6	0.2562	41.87	-19.69	61.56	31.82	9.92	0.13	LINE	QP
7	0.3751	30.55	-17.84	48.39	20.60	9.92	0.03	LINE	Average
8	0.3751	37.85	-20.54	58.39	27.90	9.92	0.03	LINE	QP
9	8.4562	21.80	-28.20	50.00	11.55	10.11	0.14	LINE	Average
10	8.4562	28.91	-31.09	60.00	18.66	10.11	0.14	LINE	QP
11	20.8137	23.18	-26.82	50.00	12.60	10.33	0.25	LINE	Average
12	20.8137	31.65	-28.35	60.00	21.07	10.33	0.25	LINE	QP

Temperature	22℃	Humidity	60%
Test Engineer	Edison Lin	Phase	Neutral
Configuration	CTX	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1565	35.57	-20.08	55.65	25.38	10.02	0.17	NEUTRAL	Average
2	0.1565	45.78	-19.87	65.65	35.59	10.02	0.17	NEUTRAL	QP
3	0.1864	34.00	-20.20	54.20	23.90	9.92	0.18	NEUTRAL	Average
4	0.1864	43.80	-20.40	64.20	33.70	9.92	0.18	NEUTRAL	QP
5	0.2701	33.79	-17.33	51.12	23.76	9.92	0.11	NEUTRAL	Average
6	0.2701	41.05	-20.07	61.12	31.02	9.92	0.11	NEUTRAL	QP
7	0.5128	31.26	-14.74	46.00	21.14	9.92	0.20	NEUTRAL	Average
8	0.5128	37.59	-18.41	56.00	27.47	9.92	0.20	NEUTRAL	QP
9	13.1966	25.50	-24.50	50.00	15.10	10.20	0.20	NEUTRAL	Average
10	13.1966	33.10	-26.90	60.00	22.70	10.20	0.20	NEUTRAL	QP
11	20.5944	27.76	-22.24	50.00	17.20	10.32	0.24	NEUTRAL	Average
12	20.5944	35.79	-24.21	60.00	25.23	10.32	0.24	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	≥ 3 x 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

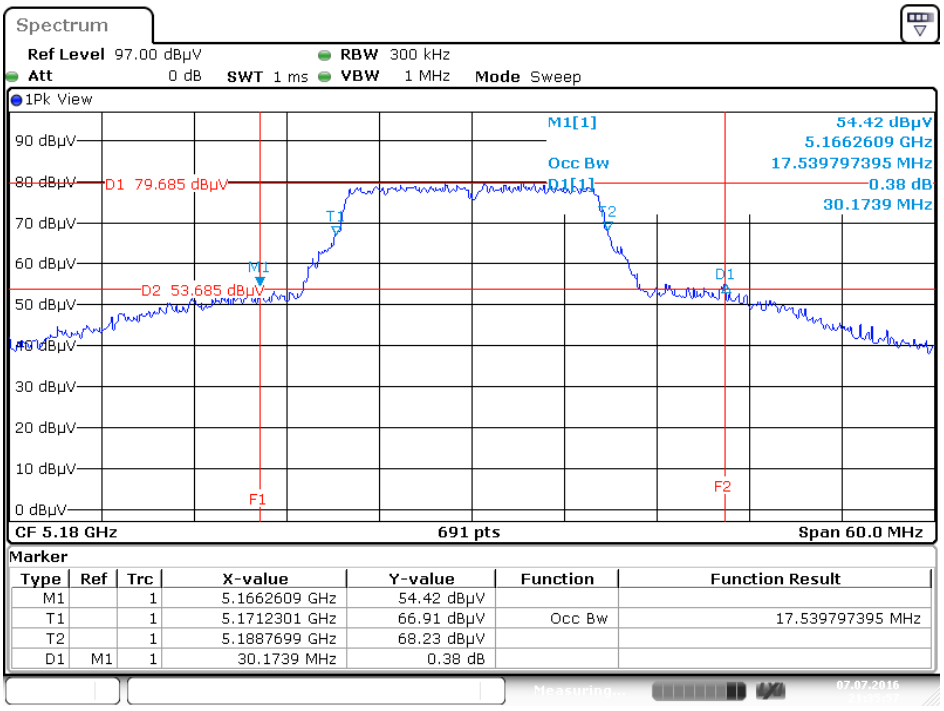
The EUT was programmed to be in continuously transmitting mode.

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

Temperature	25℃	Humidity	57%
Test Engineer	Paul Chen		

Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	30.17	17.54
	5200 MHz	36.44	18.67
	5240 MHz	38.78	19.28
	5745 MHz	40.17	21.97
	5785 MHz	40.44	21.36
	5825 MHz	41.83	21.53
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.39	17.97
	5200 MHz	35.13	18.58
	5240 MHz	38.61	19.28
	5745 MHz	45.48	24.23
	5785 MHz	43.22	22.75
	5825 MHz	40.61	21.62

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



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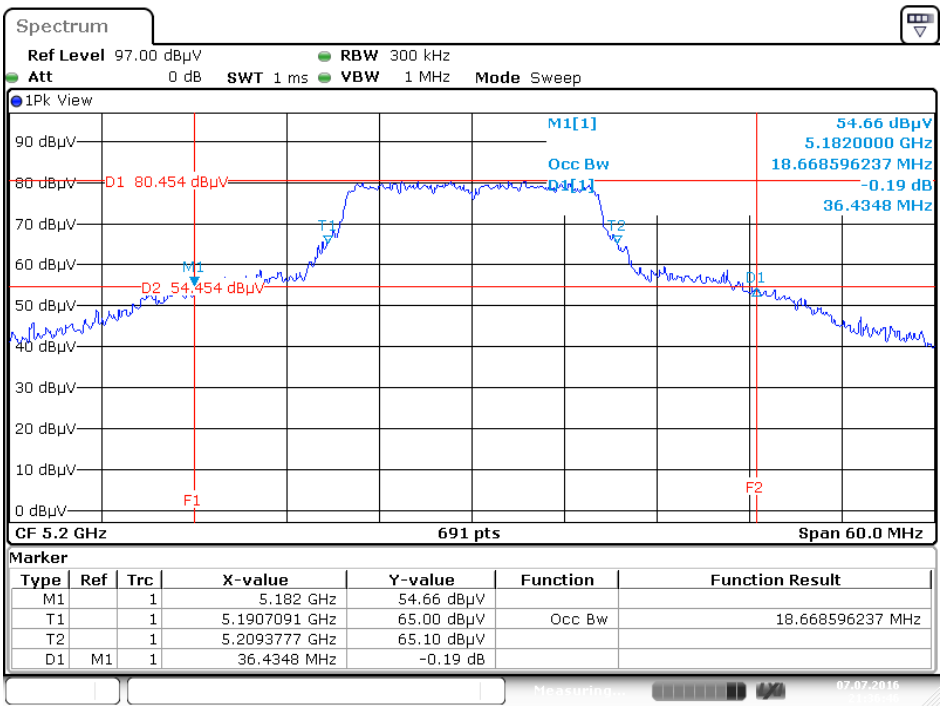
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5200 MHz



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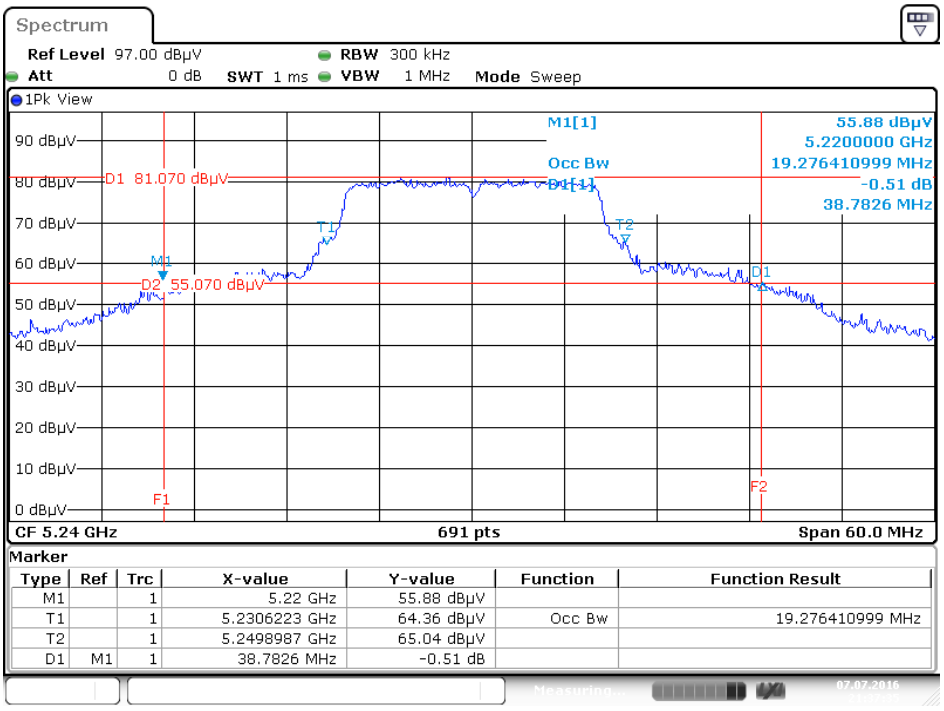
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5240 MHz



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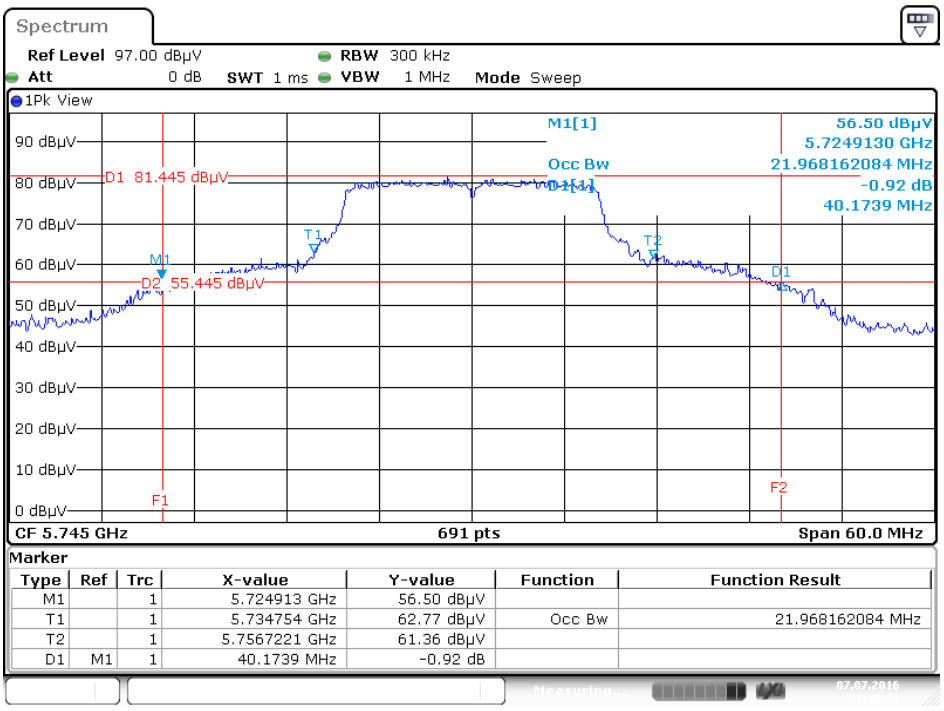
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5745 MHz



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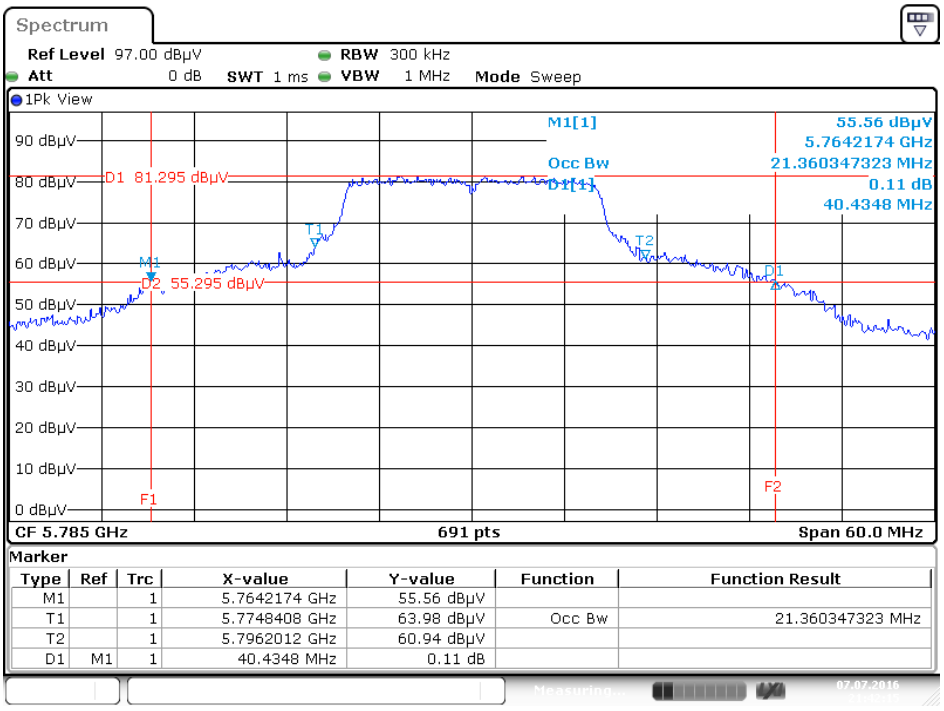
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5785 MHz



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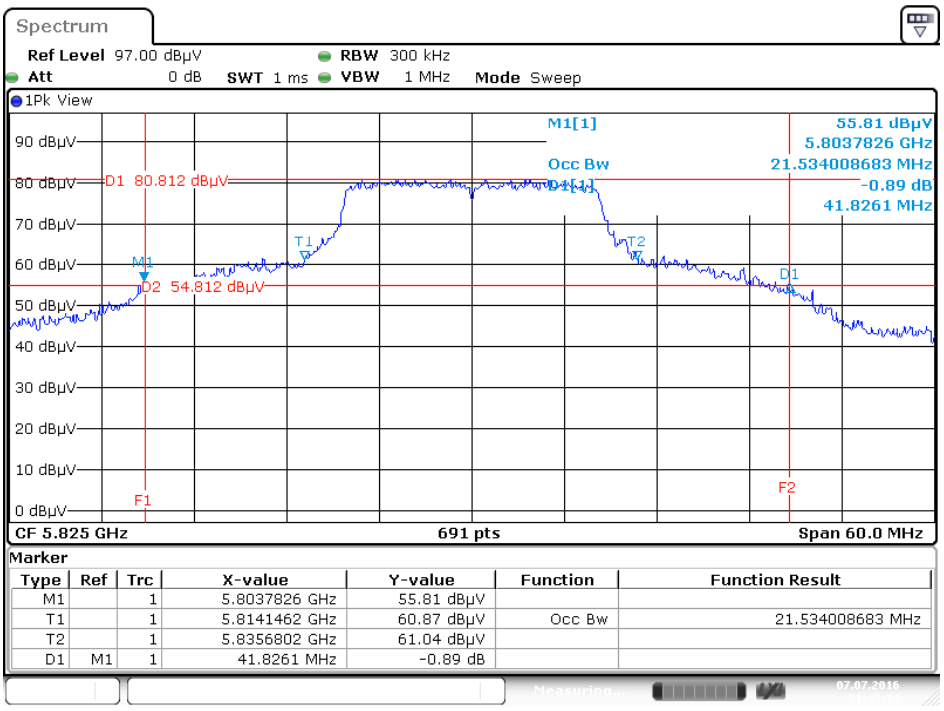
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5825 MHz



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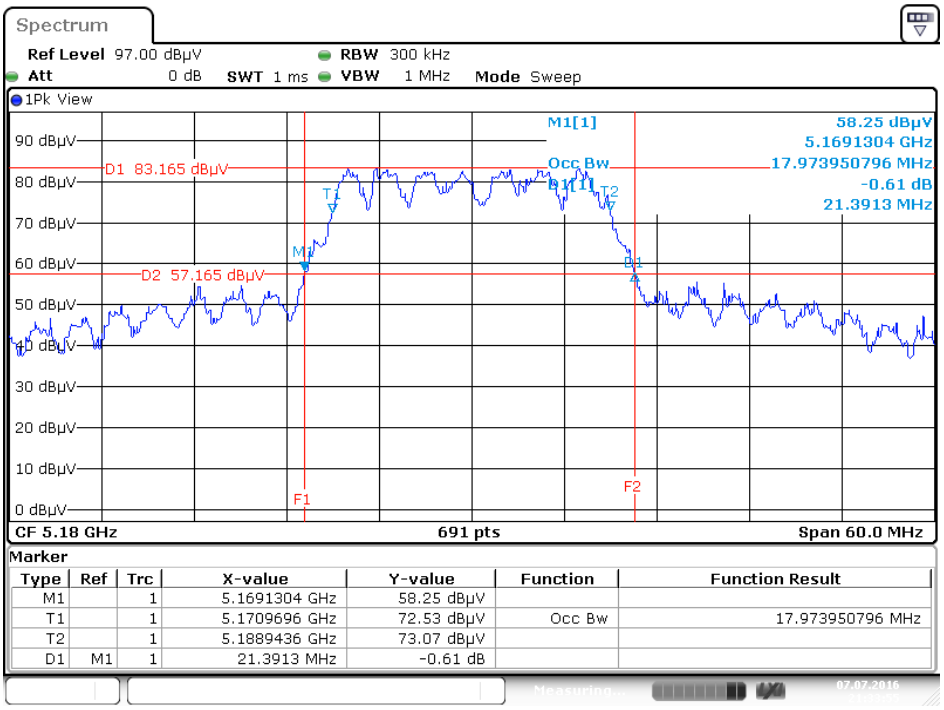
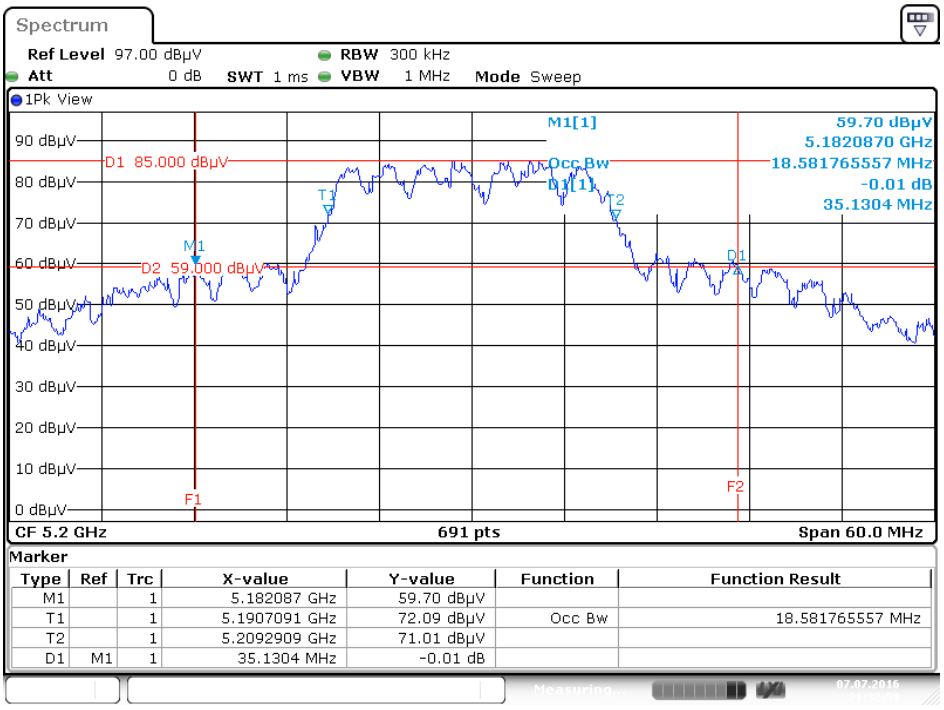
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5180 MHz



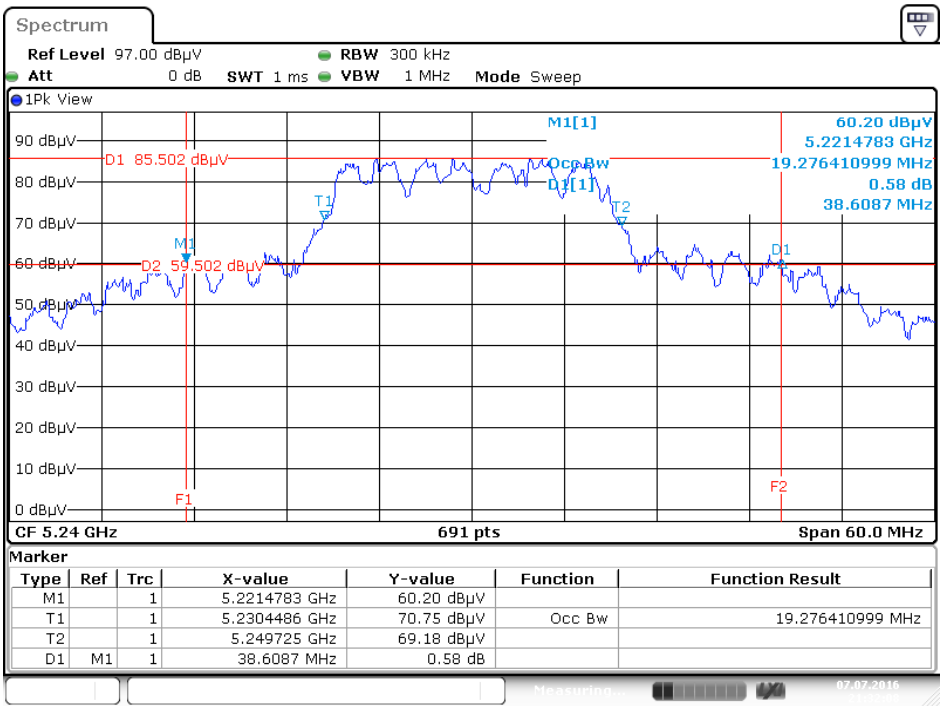
Date: 7.JUL.2016 21:33:55

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



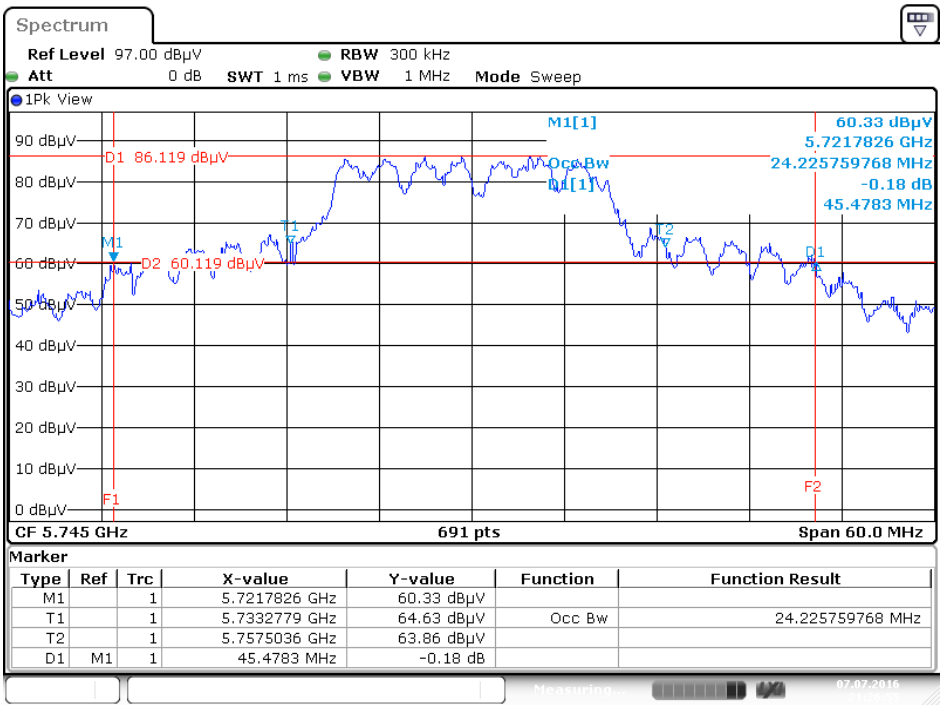
Date: 7.JUL.2016 21:32:59

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



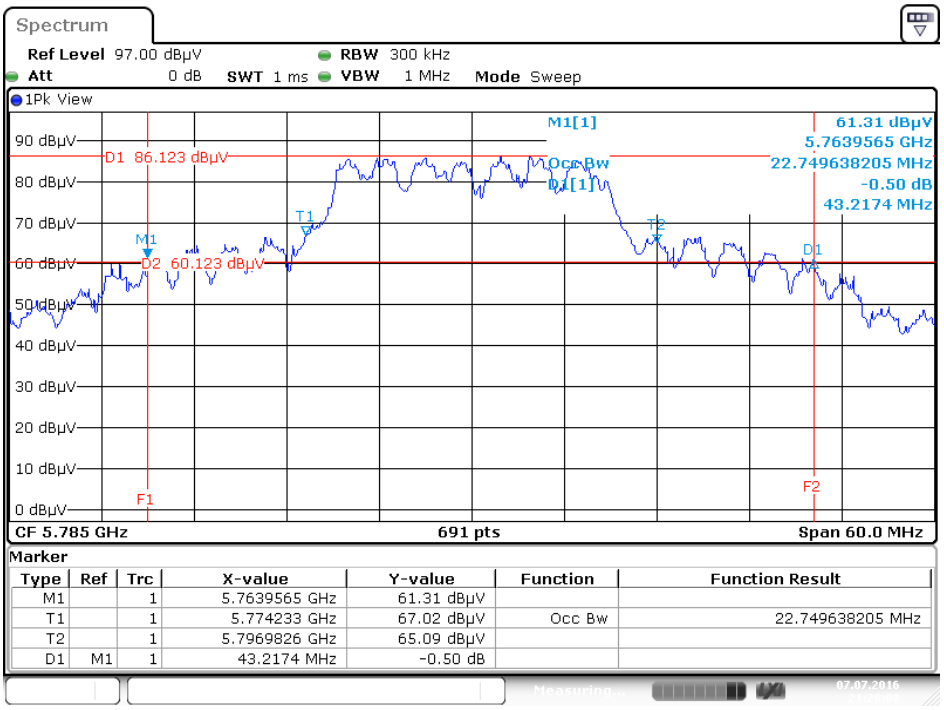
Date: 7.JUL.2016 21:32:08

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5745 MHz



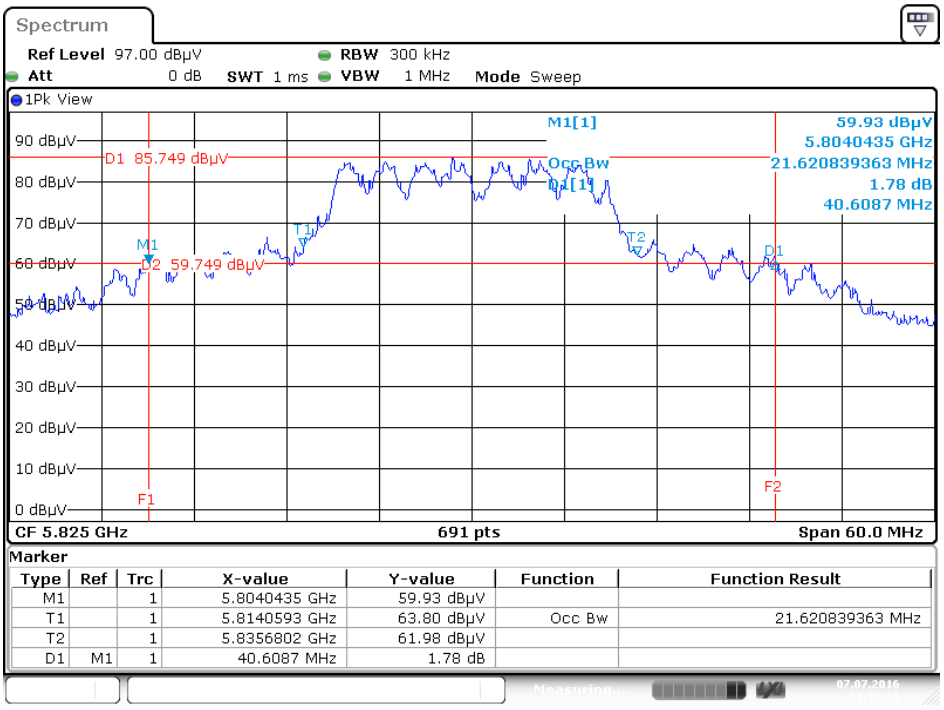
Date: 7.JUL.2016 21:26:56

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



Date: 7.JUL.2016 21:28:08

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5825 MHz



Date: 7.JUL.2016 21:31:11

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	≥ 3 x 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 v01r03 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

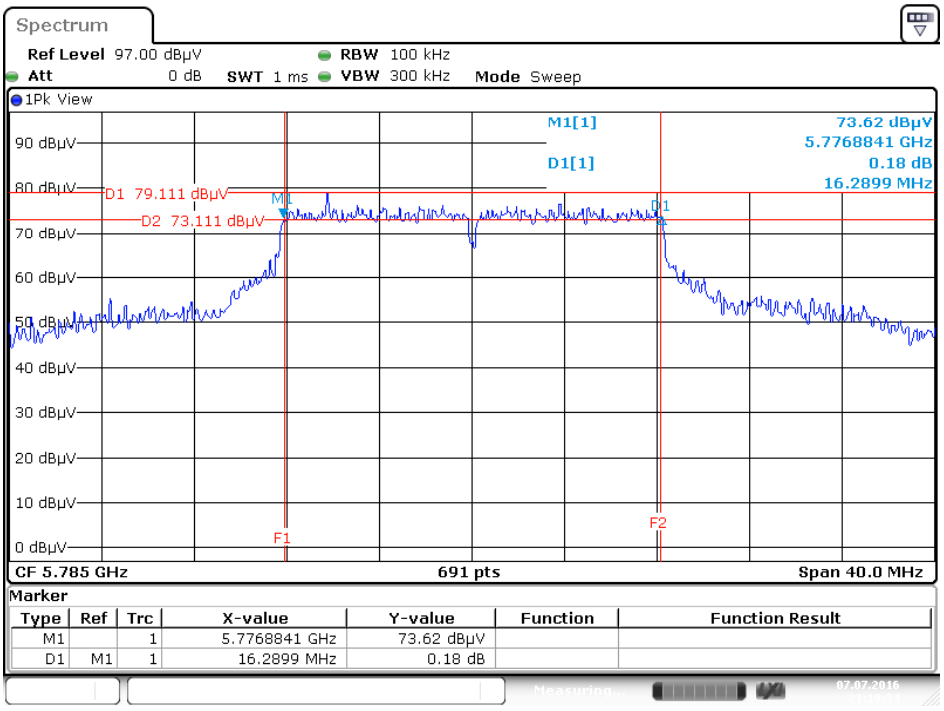
Temperature	25℃	Humidity	57%
Test Engineer	Paul Chen		

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11a	5745 MHz	16.41	500	Complies
	5785 MHz	16.29	500	Complies
	5825 MHz	16.29	500	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	15.77	500	Complies
	5785 MHz	15.30	500	Complies
	5825 MHz	16.00	500	Complies

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

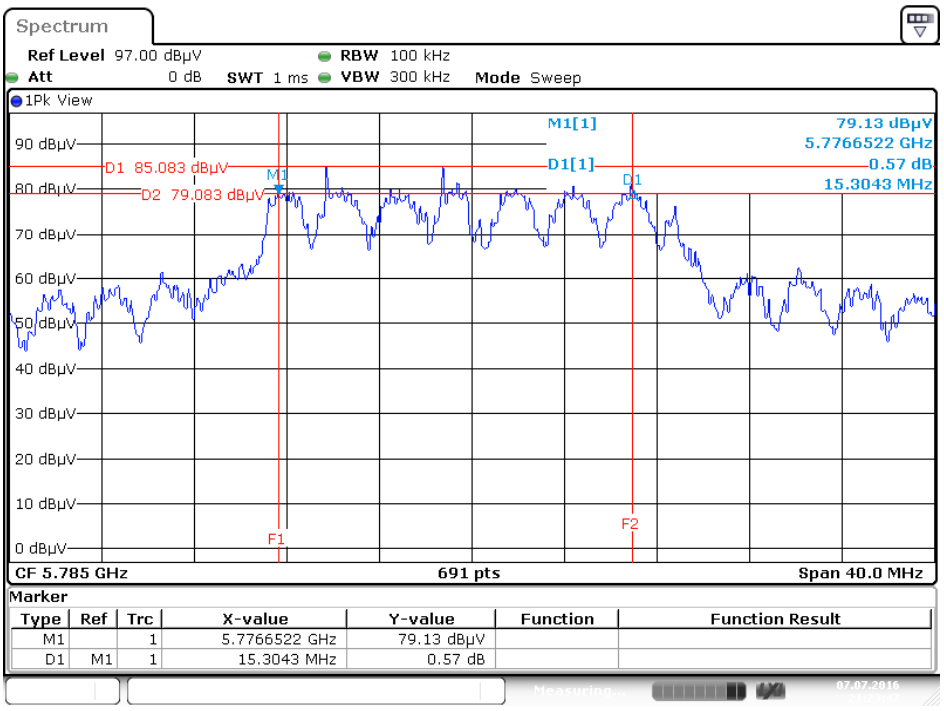
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Chain 2 / 5785 MHz



Date: 7.JUL.2016 21:19:34

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



Date: 7.JUL.2016 21:23:47

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.
	☒	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.

4.4.2. Measuring Instruments and Setting

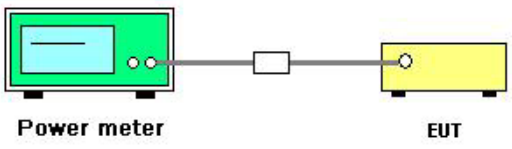
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

4.4.4. 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

Temperature	25℃	Humidity	57%
Test Engineer	Paul Chen	Test Date	Jul. 07, 2016

Mode	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 2		
802.11a	5180 MHz	17.68	23.98	Complies
	5200 MHz	18.19	23.98	Complies
	5240 MHz	18.36	23.98	Complies
	5745 MHz	18.92	30.00	Complies
	5785 MHz	18.72	30.00	Complies
	5825 MHz	18.73	30.00	Complies

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
802.11ac MCS0/Nss1 VHT20	5180 MHz	17.03	16.66	19.86	23.98	Complies
	5200 MHz	18.11	18.13	21.13	23.98	Complies
	5240 MHz	18.31	18.33	21.33	23.98	Complies
	5745 MHz	19.19	18.73	21.98	30.00	Complies
	5785 MHz	18.78	18.65	21.73	30.00	Complies
	5825 MHz	18.27	18.58	21.44	30.00	Complies

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
	☒	Client devices	11 dBm/MHz
☒	5.725~5.85 GHz		30 dBm/500kHz

4.5.2. Measuring Instruments and Setting

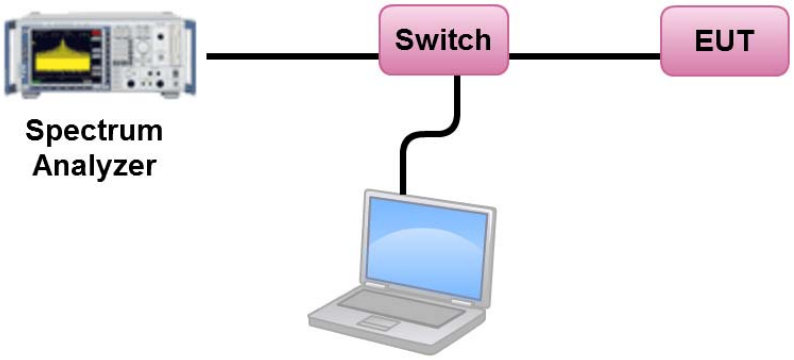
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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 10log(500kHz/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 v01r03 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD).
3. Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements and sum the spectra across the outputs.
4. For 5.725~5.85 GHz, the measured result of PSD level must add 10log(500kHz/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

Temperature	25℃	Humidity	57%
Test Engineer	Paul Chen		

Configuration IEEE 802.11a / Chain 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	4.62	11.00	Complies
40	5200 MHz	5.13	11.00	Complies
48	5240 MHz	5.31	11.00	Complies

Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	5.91	-3.01	2.90	30.00	Complies
157	5785 MHz	5.68	-3.01	2.67	30.00	Complies
165	5825 MHz	5.64	-3.01	2.63	30.00	Complies

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

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	6.83	11.00	Complies
40	5200 MHz	8.12	11.00	Complies
48	5240 MHz	8.27	11.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =4.24dBi <6dBi, so the limit doesn't reduce.

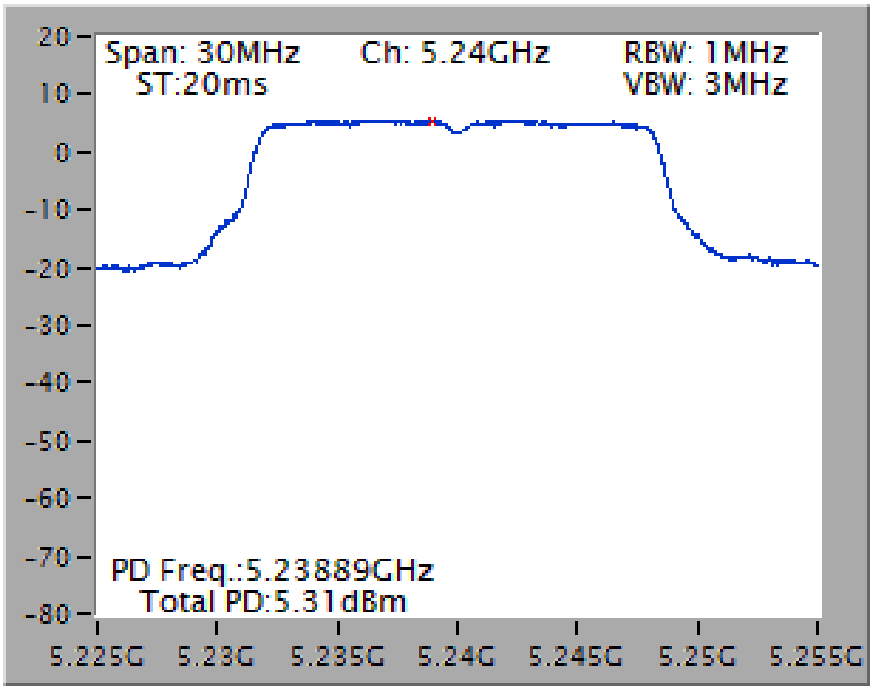
Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
149	5745 MHz	8.96	-3.01	5.95	30.00	Complies
157	5785 MHz	8.69	-3.01	5.68	30.00	Complies
165	5825 MHz	8.38	-3.01	5.37	30.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =4.12dBi <6dBi, so the limit doesn't reduce.

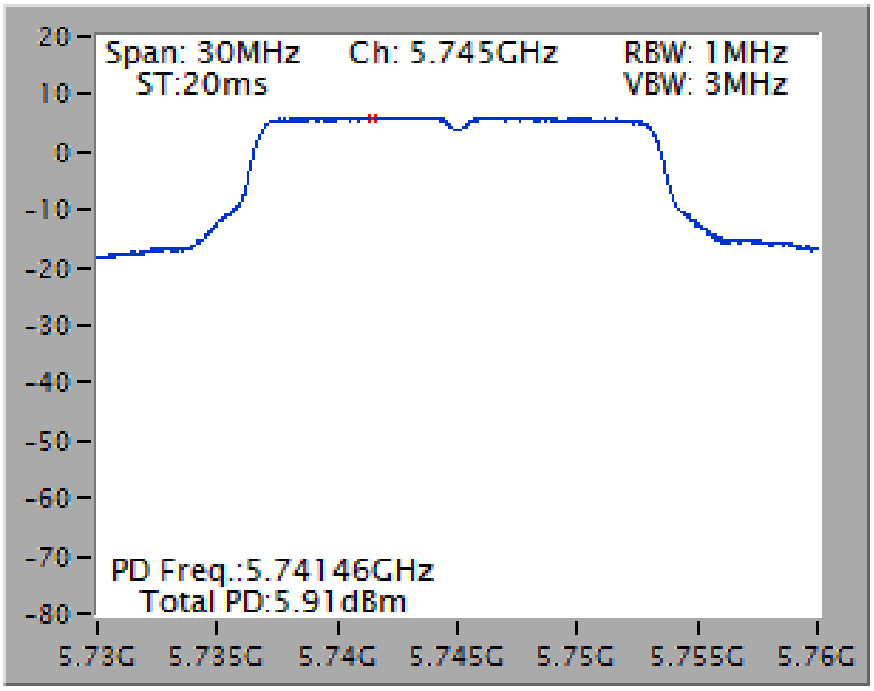
Note: All the test values were listed in the report.

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

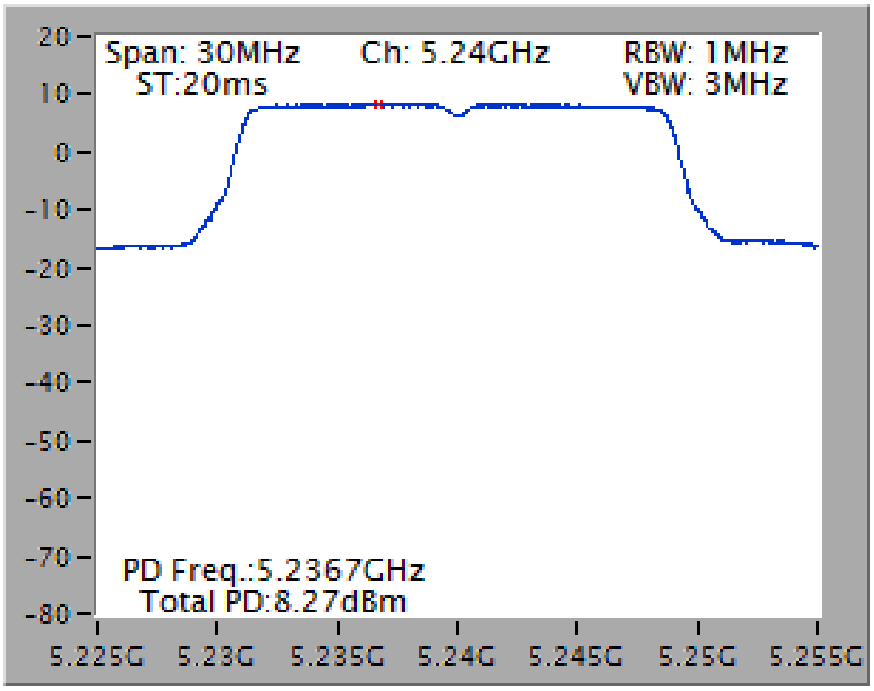
Power Density Plot on Configuration IEEE 802.11a / Chain 2 / 5240 MHz



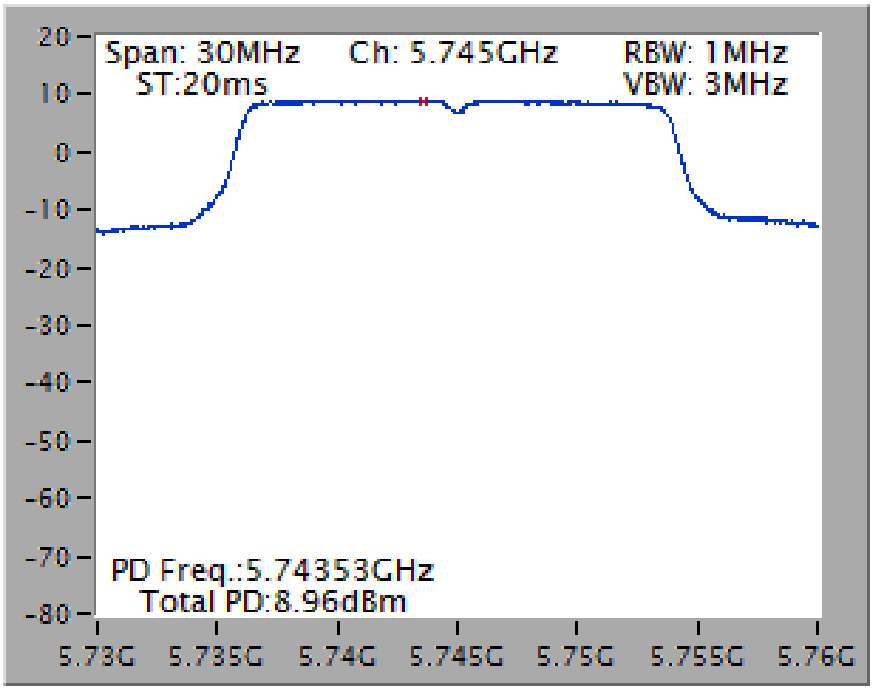
Power Density Plot on Configuration IEEE 802.11a / Chain 2 / 5745 MHz



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



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5745 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: all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

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

4.6.2. Measuring Instruments and Setting

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

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

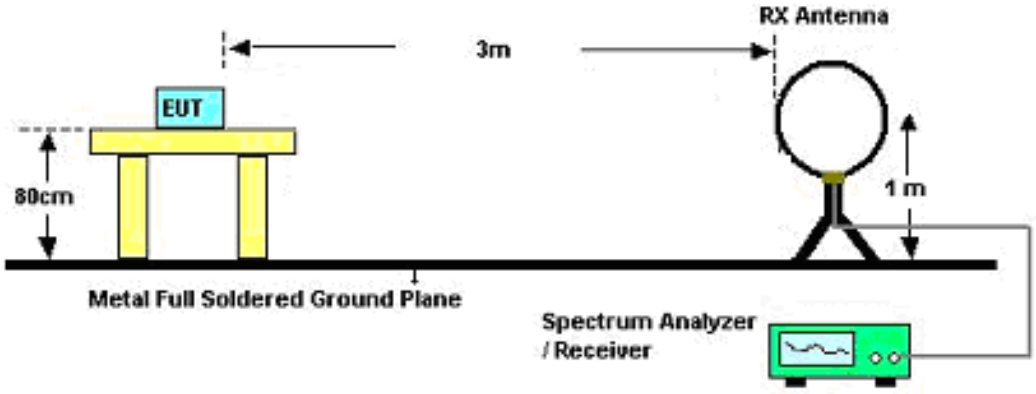
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.6.3. Test Procedures

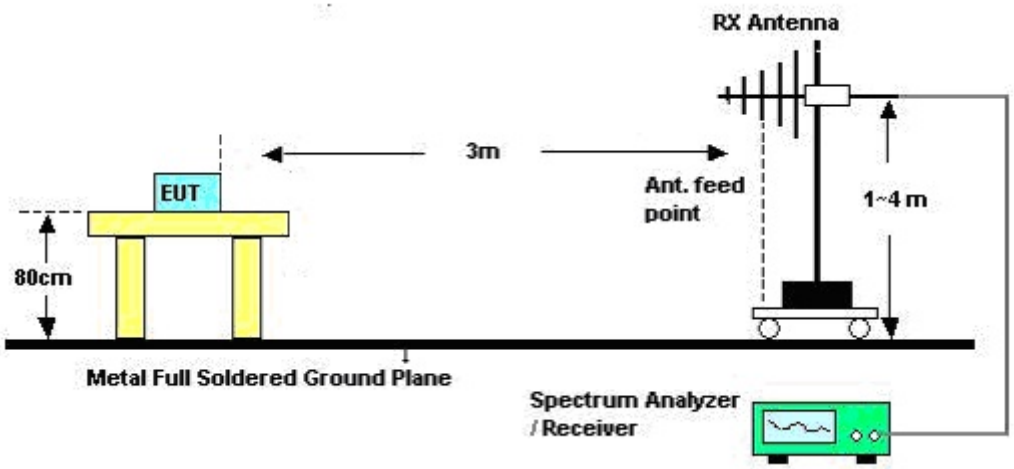
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting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

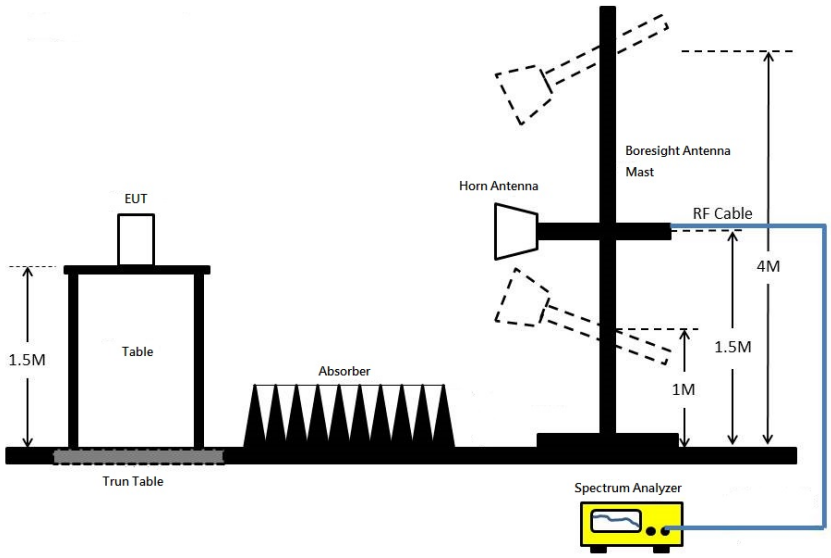
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.6.5. Test Deviation

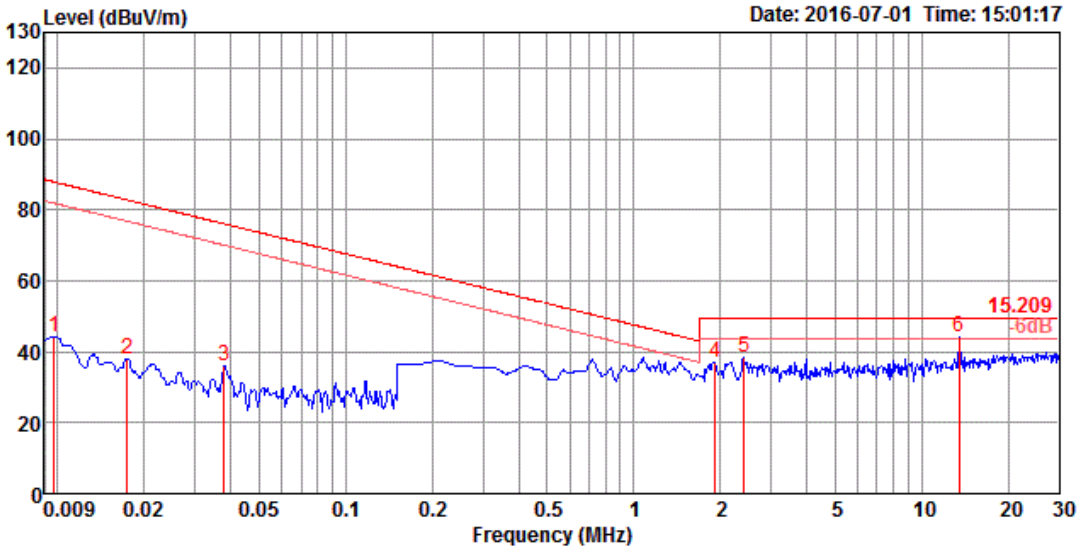
There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	CTX
Test Mode	Mode 1		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	cm	deg	
1	0.01	44.29	87.86	-43.57	21.98	1.00	21.31	100	111	Peak
2	0.02	37.99	82.75	-44.76	15.49	1.00	21.50	100	98	Peak
3	0.04	36.12	76.03	-39.91	13.75	1.00	21.37	100	224	Peak
4	1.92	37.06	49.54	-12.48	16.02	1.06	19.98	100	212	Peak
5	2.43	38.59	49.54	-10.95	17.68	1.07	19.84	100	177	Peak
6	13.55	44.16	49.54	-5.38	21.07	1.38	21.71	100	214	Peak

Note:

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

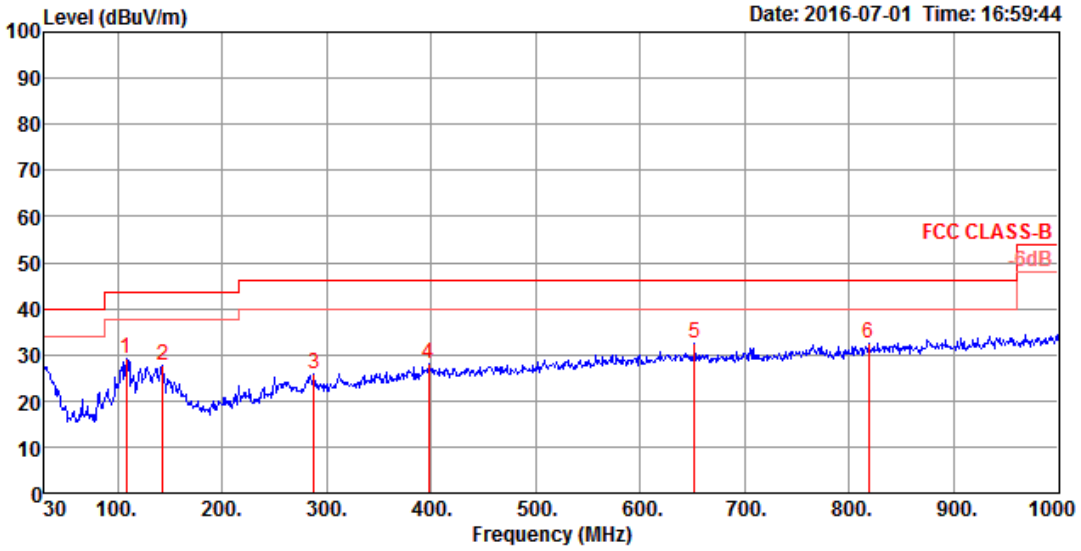
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

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

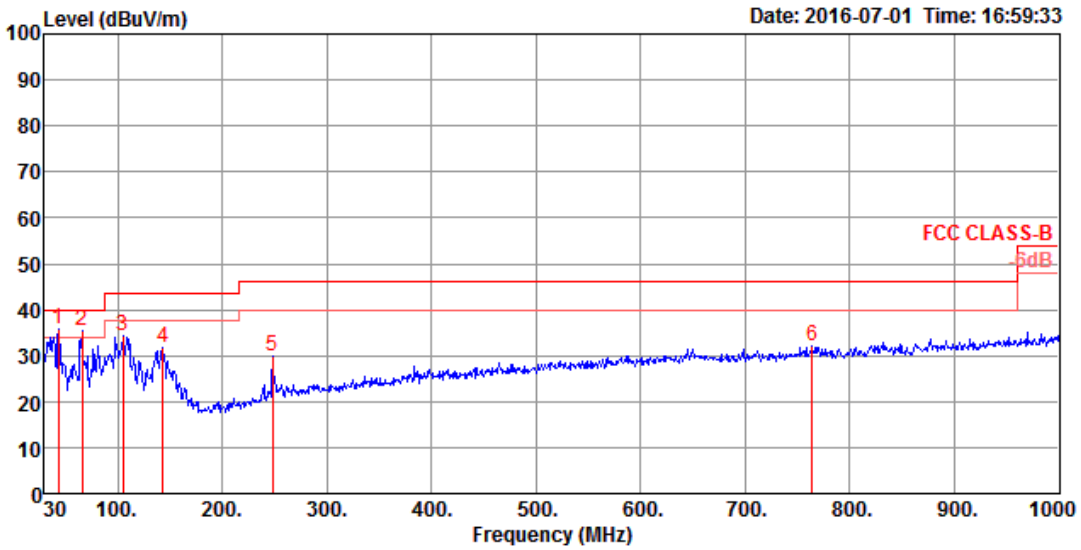
Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	CTX
Test Mode	Mode 1		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	108.57	29.29	43.50	-14.21	42.14	0.90	18.63	32.38	100	87	Peak	HORIZONTAL
2	143.49	27.54	43.50	-15.96	40.99	1.02	17.89	32.36	100	227	Peak	HORIZONTAL
3	288.02	25.73	46.00	-20.27	36.79	1.45	19.78	32.29	100	117	Peak	HORIZONTAL
4	397.63	27.96	46.00	-18.04	35.94	1.72	22.63	32.33	100	92	Peak	HORIZONTAL
5	651.77	32.50	46.00	-13.50	36.59	2.20	26.09	32.38	100	19	Peak	HORIZONTAL
6	818.61	32.55	46.00	-13.45	35.18	2.48	27.03	32.14	100	242	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	43.58	35.78	40.00	-4.22	49.60	0.58	18.01	32.41	100	144	Peak	VERTICAL
2	65.89	35.42	40.00	-4.58	53.89	0.70	13.23	32.40	100	144	Peak	VERTICAL
3	104.69	34.34	43.50	-9.16	47.69	0.88	18.16	32.39	100	315	Peak	VERTICAL
4	143.49	31.68	43.50	-11.82	45.13	1.02	17.89	32.36	100	22	Peak	VERTICAL
5	248.25	29.90	46.00	-16.10	41.88	1.34	18.98	32.30	100	44	Peak	VERTICAL
6	764.29	32.16	46.00	-13.84	35.54	2.39	26.51	32.28	100	293	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~40GHz)

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 36 / Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15532.08	60.81	74.00	-13.19	43.48	12.95	38.25	33.87	100	38	Peak	HORIZONTAL
2	15539.84	46.66	54.00	-7.34	29.33	12.95	38.25	33.87	100	38	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15533.00	46.77	54.00	-7.23	29.44	12.95	38.25	33.87	100	29	Average	VERTICAL
2	15548.36	60.80	74.00	-13.20	43.47	12.95	38.25	33.87	100	29	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 40 / Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15591.92	46.53	54.00	-7.47	29.25	12.97	38.19	33.88	100	62	Average	HORIZONTAL
2	15600.36	60.06	74.00	-13.94	42.78	12.97	38.19	33.88	100	62	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15590.40	46.48	54.00	-7.52	29.20	12.97	38.19	33.88	100	44	Average	VERTICAL
2	15596.04	59.33	74.00	-14.67	42.05	12.97	38.19	33.88	100	44	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 48 / Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15720.92	46.62	54.00	-7.38	29.46	13.03	38.03	33.90	100	68	Average	HORIZONTAL
2	15721.11	60.02	74.00	-13.98	42.86	13.03	38.03	33.90	100	68	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15720.77	60.01	74.00	-13.99	42.85	13.03	38.03	33.90	100	73	Peak	VERTICAL
2	15722.24	46.49	54.00	-7.51	29.33	13.03	38.03	33.90	100	73	Average	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 149 / Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11488.18	45.52	54.00	-8.48	28.18	11.18	40.00	33.84	100	327	Average	HORIZONTAL
2	11488.21	58.64	74.00	-15.36	41.30	11.18	40.00	33.84	100	327	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11487.55	45.44	54.00	-8.56	28.10	11.18	40.00	33.84	100	329	Average	VERTICAL
2	11489.82	58.44	74.00	-15.56	41.10	11.18	40.00	33.84	100	329	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 157 / Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11567.54	45.25	54.00	-8.75	28.01	11.21	39.87	33.84	100	294	Average	HORIZONTAL
2	11571.96	58.02	74.00	-15.98	40.78	11.21	39.87	33.84	100	294	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11568.13	45.16	54.00	-8.84	27.92	11.21	39.87	33.84	100	283	Average	VERTICAL
2	11568.60	58.63	74.00	-15.37	41.39	11.21	39.87	33.84	100	283	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 165 / Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11648.01	58.79	74.00	-15.21	41.66	11.24	39.73	33.84	100	236	Peak	HORIZONTAL
2	11651.58	45.55	54.00	-8.45	28.46	11.26	39.67	33.84	100	236	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11647.74	45.70	54.00	-8.30	28.57	11.24	39.73	33.84	100	245	Average	VERTICAL
2	11648.12	58.78	74.00	-15.22	41.65	11.24	39.73	33.84	100	245	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15540.07	59.91	74.00	-14.09	42.58	12.95	38.25	33.87	100	91	Peak	HORIZONTAL
2	15540.81	46.65	54.00	-7.35	29.32	12.95	38.25	33.87	100	91	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15539.55	46.62	54.00	-7.38	29.29	12.95	38.25	33.87	100	83	Average	VERTICAL
2	15541.01	59.46	74.00	-14.54	42.13	12.95	38.25	33.87	100	83	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15598.40	59.89	74.00	-14.11	42.61	12.97	38.19	33.88	100	147	Peak	HORIZONTAL
2	15601.46	46.45	54.00	-7.55	29.20	12.99	38.14	33.88	100	147	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15598.97	59.40	74.00	-14.60	42.12	12.97	38.19	33.88	100	136	Peak	VERTICAL
2	15600.40	46.49	54.00	-7.51	29.21	12.97	38.19	33.88	100	136	Average	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15719.26	59.66	74.00	-14.34	42.50	13.03	38.03	33.90	100	197	Peak	HORIZONTAL
2	15722.00	46.62	54.00	-7.38	29.46	13.03	38.03	33.90	100	197	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15719.86	59.70	74.00	-14.30	42.54	13.03	38.03	33.90	100	172	Peak	VERTICAL
2	15722.07	46.53	54.00	-7.47	29.37	13.03	38.03	33.90	100	172	Average	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11487.87	45.49	54.00	-8.51	28.15	11.18	40.00	33.84	100	203	Average	HORIZONTAL
2	11490.69	58.74	74.00	-15.26	41.40	11.18	40.00	33.84	100	203	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11487.79	45.42	54.00	-8.58	28.08	11.18	40.00	33.84	100	233	Average	VERTICAL
2	11490.78	58.70	74.00	-15.30	41.36	11.18	40.00	33.84	100	233	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11567.98	58.72	74.00	-15.28	41.48	11.21	39.87	33.84	100	174	Peak	HORIZONTAL
2	11569.96	45.53	54.00	-8.47	28.29	11.21	39.87	33.84	100	174	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11567.95	45.49	54.00	-8.51	28.25	11.21	39.87	33.84	100	182	Average	VERTICAL
2	11569.74	58.58	74.00	-15.42	41.34	11.21	39.87	33.84	100	182	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11647.51	58.70	74.00	-15.30	41.57	11.24	39.73	33.84	100	120	Peak	HORIZONTAL
2	11647.67	45.59	54.00	-8.41	28.46	11.24	39.73	33.84	100	120	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	11648.09	45.72	54.00	-8.28	28.59	11.24	39.73	33.84	100	111	Average	VERTICAL
2	11650.09	58.75	74.00	-15.25	41.62	11.24	39.73	33.84	100	111	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.

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: all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

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

4.7.2. 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)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for Peak

4.7.3. Test Procedures

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 continuously transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 2
Test Date	Jun. 17, 2016		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.00	68.66	74.00	-5.34	61.44	7.34	31.52	31.64	101	43	Peak	VERTICAL
2	5150.00	53.85	54.00	-0.15	46.63	7.34	31.52	31.64	101	43	Average	VERTICAL
3	5178.20	106.19			98.91	7.37	31.55	31.64	101	43	Peak	VERTICAL
4	5186.40	95.34			88.06	7.37	31.55	31.64	101	43	Average	VERTICAL

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.20	62.55	74.00	-11.45	55.33	7.34	31.52	31.64	100	46	Peak	VERTICAL
2	5150.00	49.17	54.00	-4.83	41.95	7.34	31.52	31.64	100	46	Average	VERTICAL
3	5198.40	107.64			100.33	7.39	31.56	31.64	100	46	Peak	VERTICAL
4	5203.20	97.19			89.85	7.41	31.57	31.64	100	46	Average	VERTICAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5142.80	46.10	54.00	-7.90	38.88	7.34	31.52	31.64	101	46	Average	VERTICAL
2	5142.80	58.70	74.00	-15.30	51.48	7.34	31.52	31.64	101	46	Peak	VERTICAL
3	5241.20	97.43			90.03	7.45	31.59	31.64	101	46	Average	VERTICAL
4	5242.40	107.75			100.34	7.45	31.59	31.63	101	46	Peak	VERTICAL
5	5350.40	46.67	54.00	-7.33	39.01	7.60	31.68	31.62	101	46	Average	VERTICAL
6	5381.00	59.35	74.00	-14.65	51.63	7.64	31.70	31.62	101	46	Peak	VERTICAL

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

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11a CH 149, 157, 165 / Chain 2
Test Date	Jun. 17, 2016		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5642.00	60.08	68.20	-8.12	52.11	7.66	31.98	31.67	299	354	Peak	HORIZONTAL
2	5742.00	93.66			85.51	7.76	32.10	31.71	299	354	Average	HORIZONTAL
3	5746.00	103.45			95.30	7.76	32.10	31.71	299	354	Peak	HORIZONTAL
4	5962.00	60.62	68.20	-7.58	52.15	7.91	32.36	31.80	299	354	Peak	HORIZONTAL

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

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5586.00	59.61	68.20	-8.59	51.75	7.61	31.90	31.65	100	38	Peak	VERTICAL
2	5782.00	99.70			91.49	7.79	32.14	31.72	100	38	Average	VERTICAL
3	5784.00	109.29			101.09	7.79	32.14	31.73	100	38	Peak	VERTICAL
4	5992.00	60.56	68.20	-7.64	52.06	7.92	32.38	31.80	100	38	Peak	VERTICAL

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

Channel 165

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5599.00	59.64	68.20	-8.56	51.76	7.61	31.92	31.65	290	336	Peak	HORIZONTAL
2	5822.00	92.84			84.58	7.82	32.18	31.74	290	336	Average	HORIZONTAL
3	5823.00	102.73			94.44	7.83	32.20	31.74	290	336	Peak	HORIZONTAL
4	6013.00	60.83	68.20	-7.37	52.24	7.94	32.46	31.81	290	336	Peak	HORIZONTAL

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

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.20	69.69	74.00	-4.31	62.47	7.34	31.52	31.64	111	345	Peak	HORIZONTAL
2	5149.00	53.90	54.00	-0.10	46.68	7.34	31.52	31.64	111	345	Average	HORIZONTAL
3	5175.80	108.03			100.75	7.37	31.55	31.64	111	345	Peak	HORIZONTAL
4	5181.20	97.74			90.46	7.37	31.55	31.64	111	345	Average	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	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5146.00	64.73	74.00	-9.27	57.51	7.34	31.52	31.64	106	78	Peak	VERTICAL
2	5150.00	50.71	54.00	-3.29	43.49	7.34	31.52	31.64	106	78	Average	VERTICAL
3	5202.40	110.71			103.37	7.41	31.57	31.64	106	78	Peak	VERTICAL
4	5203.60	100.88			93.54	7.41	31.57	31.64	106	78	Average	VERTICAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5132.00	46.31	54.00	-7.69	39.13	7.32	31.51	31.65	103	76	Average	VERTICAL
2	5134.40	59.32	74.00	-14.68	52.14	7.32	31.51	31.65	103	76	Peak	VERTICAL
3	5238.80	111.31			103.91	7.45	31.59	31.64	103	76	Peak	VERTICAL
4	5241.20	100.96			93.56	7.45	31.59	31.64	103	76	Average	VERTICAL
5	5354.00	60.58	74.00	-13.42	52.92	7.60	31.68	31.62	103	76	Peak	VERTICAL
6	5354.60	47.22	54.00	-6.78	39.53	7.62	31.69	31.62	103	76	Average	VERTICAL

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

Temperature	22℃	Humidity	54%
Test Engineer	Steven Liang	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Chain 1 + Chain 2
Test Date	Jun. 17, 2016		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5523.00	60.82	68.20	-7.38	52.99	7.63	31.82	31.62	100	30	Peak	VERTICAL
2	5740.00	112.04			103.89	7.76	32.10	31.71	100	30	Peak	VERTICAL
3	5748.00	102.22			94.07	7.76	32.10	31.71	100	30	Average	VERTICAL
4	5959.00	60.78	68.20	-7.42	52.31	7.91	32.36	31.80	100	30	Peak	VERTICAL

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

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5648.00	59.54	68.20	-8.66	51.57	7.66	31.98	31.67	100	227	Peak	HORIZONTAL
2	5780.00	96.27			88.06	7.79	32.14	31.72	100	227	Average	HORIZONTAL
3	5783.00	105.79			97.59	7.79	32.14	31.73	100	227	Peak	HORIZONTAL
4	5932.00	60.40	68.20	-7.80	51.97	7.89	32.32	31.78	100	227	Peak	HORIZONTAL

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

Channel 165

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5611.00	59.31	68.20	-8.89	51.39	7.63	31.94	31.65	100	31	Peak	VERTICAL
2	5818.00	111.88			103.62	7.82	32.18	31.74	100	31	Peak	VERTICAL
3	5820.00	101.20			92.94	7.82	32.18	31.74	100	31	Average	VERTICAL
4	5930.00	60.65	68.20	-7.55	52.22	7.89	32.32	31.78	100	31	Peak	VERTICAL

Item 2, 3 are the fundamental frequency at 5825 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

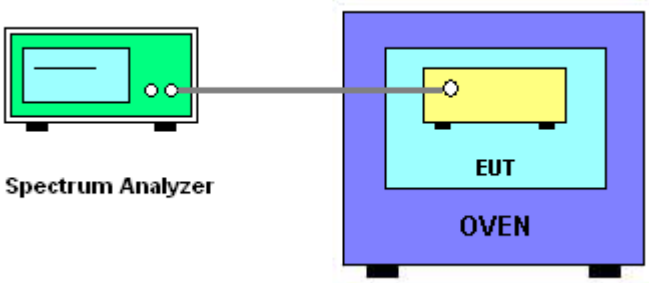
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
7. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
8. Extreme temperature is 0°C~40°C.

4.8.4. 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

Temperature	25℃	Humidity	57%
Test Engineer	Paul Chen	Test Date	Jul. 07, 2016

Mode: 20 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5199.9953	5199.9952	5199.9950	5199.9944
110.00	5199.9944	5199.9936	5199.9928	5199.9923
93.50	5199.9941	5199.9937	5199.9935	5199.9930
Max. Deviation (MHz)	0.0059	0.0064	0.0072	0.0077
Max. Deviation (ppm)	1.14	1.24	1.39	1.49
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(℃)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5199.9957	5199.9954	5199.9945	5199.9936
10	5199.9956	5199.9952	5199.9948	5199.9940
20	5199.9948	5199.9947	5199.9945	5199.9936
30	5199.9944	5199.9934	5199.9925	5199.9920
40	5199.9942	5199.9938	5199.9933	5199.9929
Max. Deviation (MHz)	0.0073	0.0075	0.0078	0.0082
Max. Deviation (ppm)	1.41	1.45	1.51	1.58
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9945	5784.9935	5784.9928	5784.9925
110.00	5784.9944	5784.9934	5784.9928	5784.9922
93.50	5784.9934	5784.9933	5784.9927	5784.9925
Max. Deviation (MHz)	0.0066	0.0067	0.0073	0.0078
Max. Deviation (ppm)	1.15	1.17	1.27	1.36
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(℃)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5784.9980	5784.9972	5784.9971	5784.9962
10	5784.9961	5784.9958	5784.9953	5784.9943
20	5784.9948	5784.9943	5784.9935	5784.9933
30	5784.9944	5784.9941	5784.9940	5784.9936
40	5784.9936	5784.9927	5784.9925	5784.9919
Max. Deviation (MHz)	0.0076	0.0081	0.0087	0.0097
Max. Deviation (ppm)	1.32	1.41	1.51	1.68
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	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 27, 2016	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 24, 2016	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	TESEQ	CBL6112D	37880	20MHz ~ 2GHz	Sep. 03, 2015	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 22, 2015	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 13, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 16, 2016	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Conducted (TH01-CB)

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

"*" Calibration Interval of instruments listed above is two years.

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

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%