SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**AirTies Wireless Networks**
Applicant Address	Gülbahar Mah. Avni Dilligil Sok. Celik Is Merkezi No 5 mecidiyekoy ISTANBUL, 34394 Turkey
FCC ID	**Z3WAIR7405**
Manufacturer's company	**Karel Elektronik**
Manufacturer Address	Organize Sanayi Bölgesi Gazneliler Caddesi No:10 06935 Sincan Ankara/Turkey

Product Name	HD IP Set-Top Box with Wireless
Brand Name	AirTies
Model No.	Air 7405
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. 30, 2015
Final Test Date	Dec. 18, 2015
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 v01, KDB662911 D01 v02r01, KDB644545 D03 v01.**

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR570157AB	Rev. 01	Initial issue of report	Dec. 28, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	HD IP Set-Top Box with Wireless
Brand Name	:	AirTies
Model No.	:	Air 7405
Applicant	:	AirTies Wireless Networks
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. 30, 2015 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	11.89 dB
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	0.08 dB
4.5	15.407(a)	Power Spectral Density	Complies	0.10 dB
4.6	15.407(b)	Radiated Emissions	Complies	3.25 dB
4.7	15.407(b)	Band Edge Emissions	Complies	0.03 dB
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, 1RX) 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 ; 4 for 40MHz bandwidth 2 for 80MHz bandwidth
Channel Band Width (99%)	Band 1: IEEE 802.11a: 27.18 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 23.01 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 38.06 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.54 MHz Band 4: IEEE 802.11a: 35.43 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 32.91 MHz IEEE 802.11ac MCS0/Nss1 (VHT40): 41.97 MHz IEEE 802.11ac MCS0/Nss1 (VHT80): 75.83 MHz
Maximum Conducted Output Power	Band 1: IEEE 802.11a: 21.16 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 23.31 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 21.89 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 16.51 dBm Band 4: IEEE 802.11a: 20.90 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 23.38 dBm IEEE 802.11ac MCS0/Nss1 (VHT40): 21.41 dBm IEEE 802.11ac MCS0/Nss1 (VHT80): 14.91 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
	The product has beamforming function for 802.11n/ac in 5GHz.	

Antenna and Band width

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 0-15
802.11n (HT40)	2	MCS 0-15
802.11ac (VHT20)	2	MCS 0-9/Nss1-2
802.11ac (VHT40)	2	MCS 0-9/Nss1-2
802.11ac (VHT80)	2	MCS 0-9/Nss1-2

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

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

Note 3: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac

3.2. Accessories

Power	Brand	Model No.	Rating
Adapter	MOSO	MSA-C2000IC5.0-12W-US	Input: 100-240Vac, 50/60Hz, 0.5A max. Output: 5.0Vdc, 2A
Others			
RJ-45 cable*1: Non-shielded, 1.5m			
HDMI cable*1: Shielded, 1.5m			
Scart cable*1: Non-shielded, 1.2m			
Remote controller*1			

3.3. Table for Filed Antenna

Ant.	Brand	Model No.	Antenna Type	Connector	Gain (dBi)		Remark
					2.4GHz	5GHz	
1	-	-	Printed Antenna	N/A	3.0	3.6	WLAN
2	-	-	Printed Antenna	N/A	3.0	3.6	
Ant.	**Brand**	**Model No.**	**Antenna Type**	**Connector**	**Gain (dBi)**		**Remark**
					2.4GHz		
3	-	-	Printed Antenna	N/A	0		ZigBee
4	-	-	Printed Antenna	N/A	0		RF4CE

Note: The EUT has four antennas.

For WLAN Function

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

Only Ant. 1 can be used as transmitting/receiving antenna.

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

Ant. 1 and Ant. 2 can be used as transmitting/receiving antenna.

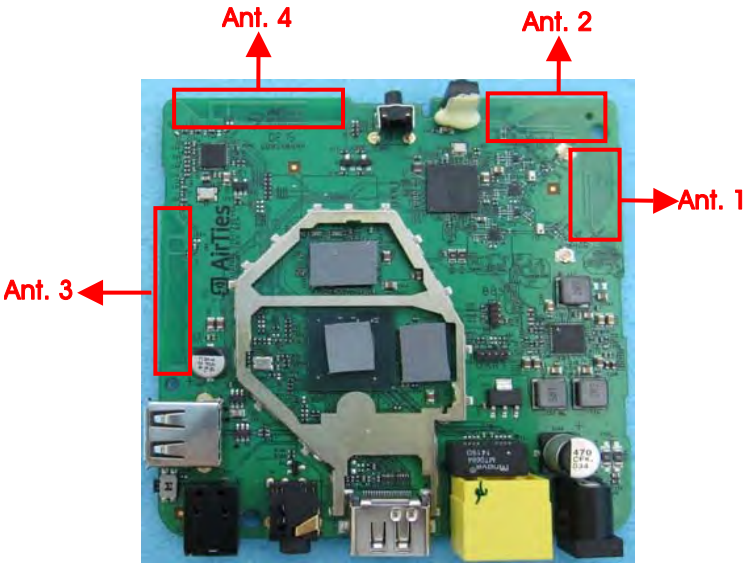
Ant. 1 and Ant. 2 could transmit/receive simultaneously.

For ZigBee RF4CE function (1TX/1RX)

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

Both Ant. 3 and Ant. 4 support transmit and receive functions, but only one of them will be used at one time.

The Ant. 3 generated the worst case, so it was selected to test and record in the report.



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	Ant.
AC Power Conducted Emission	Normal Link		-	-	-
Max. Conducted Output Power	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
Power Spectral Density	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
6dB Spectrum Bandwidth Measurement	11a/BPSK	Band 4	6Mbps	149/157/165	1
	11ac VHT20	Band 4	MCS0/Nss1	149/157/165	1+2
	11ac VHT40	Band 4	MCS0/Nss1	151/159	1+2
	11ac VHT80	Band 4	MCS0/Nss1	155	1+2
Radiated Emission Below 1GHz	Normal Link		-	-	-
Radiated Emission Above 1GHz	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
Band Edge Emission	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
	11ac VHT20	Band 1&4	MCS0/Nss1	36/40/48/149/157/165	1+2
	11ac VHT40	Band 1&4	MCS0/Nss1	38/46/151/159	1+2
	11ac VHT80	Band 1&4	MCS0/Nss1	42/155	1+2
Frequency Stability	20 MHz	Band 1&4	-	40/157	2
	40 MHz	Band 1&4	-	38/151	2
	80 MHz	Band 1&4	-	42/155	2

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

2. All the specification of test configurations and test modes were based on customer's request.
3. 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.
4. There are two functions of EUT, one is beamforming function, and the other is non-beamforming function for 802.11n/ac, after evaluating, beamforming function has been evaluated to be the worst case, so it was selected to test and record in this test report.

The following test modes were performed for all tests:

For Radiated Emission below 1GHz test:

Mode 1. 2.4GHz WLAN function

Mode 2. 5GHz WLAN function

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

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.**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D
CO02-CB	Conduction	Hsin Chu	262045	IC 4086D
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: CO02-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
Flash disk	Silicon Power	I-Series	DoC
SD card	Apacer	SD card	N/A
TV	SONY	KLV-32U300A	DoC

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

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
SD card	Apacer	SD card	N/A
Flash disk	Silicon Power	I-Series	DoC
Wireless ac AP	Netgear	R6300V2	PY313200227
HDMI box	Gefen	AF1208127396	N/A

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

For non-beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

For beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
NB	DELL	E4300	DoC
Wireless ac AP	Netgear	R7000	PY313200233

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

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	Mtool 2.0.0.7					
Mode	Test Frequency (MHz)					
	NCB: 20MHz					
	5180 MHz	5200 MHz	5240 MHz	5745 MHz	5785 MHz	5825 MHz
802.11a	71	84	79	61	88	68
802.11ac MCS0/Nss1 VHT20	71	89	79	58	100	60
Mode	NCB: 40MHz					
802.11ac MCS0/Nss1 VHT40	5190 MHz		5230 MHz		5755 MHz	5795 MHz
	51		75		42	64
Mode	NCB: 80MHz					
802.11ac MCS0/Nss1 VHT80	5210 MHz				5775 MHz	
	51				40	

3.9. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN 7 were executed.

The program was executed as follows:

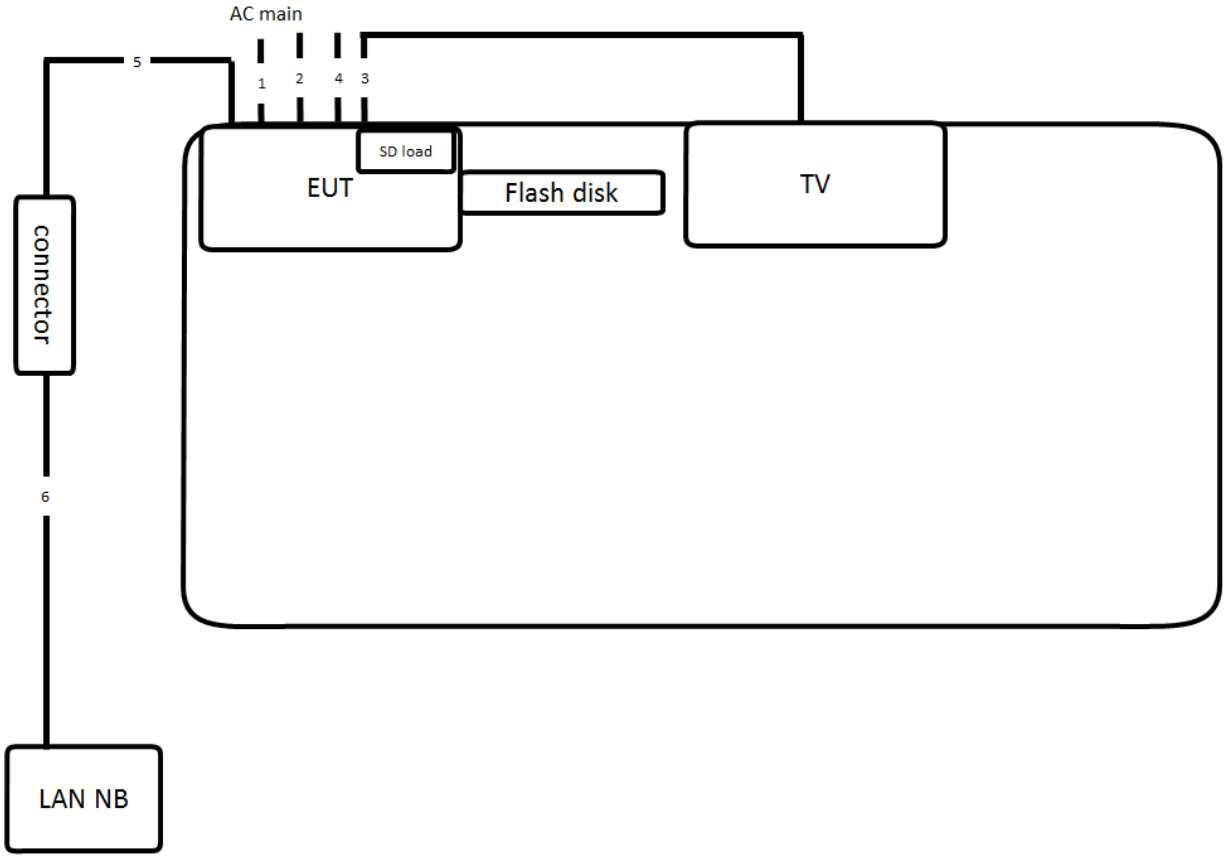
1. During the test, the EUT operation to normal function.
2. Executed command fixed test channel under DOS.
3. Executed "Lantest.exe" to link with the remote workstation to receive and transmit packet by Wireless ac AP and transmit duty cycle no less 98%

3.10. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.072	2.100	98.67	0.06	0.01
802.11ac MCS0/Nss1 VHT20	3.840	4.128	93.02	0.31	0.26
802.11ac MCS0/Nss1 VHT40	0.458	0.472	97.03	0.13	2.18
802.11ac MCS0/Nss1 VHT80	0.509	0.542	93.81	0.28	1.97

3.11. Test Configurations

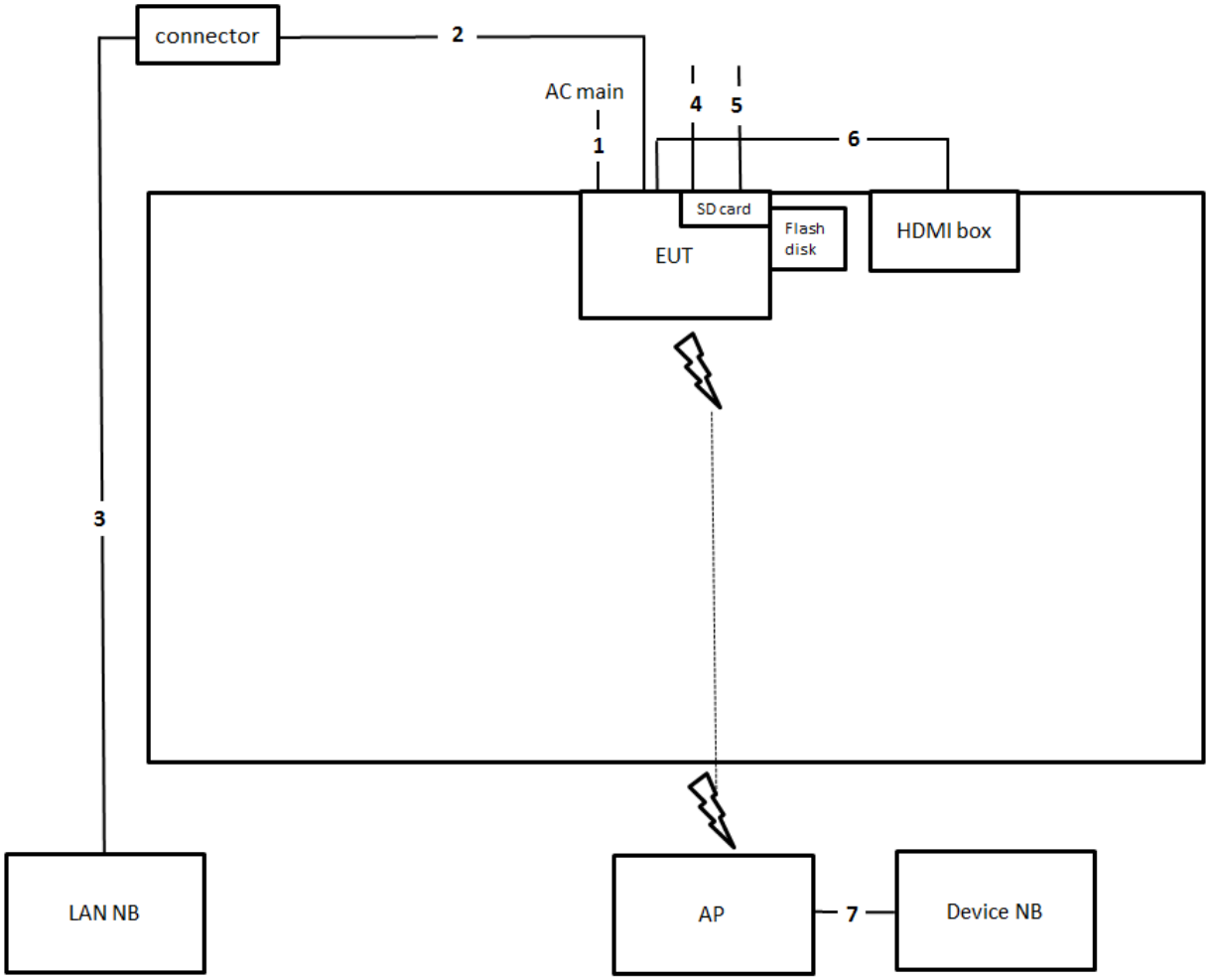
3.11.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	Scart cable	No	1.2m
3	HDMI cable	Yes	1.5m
4	Fiber cable	No	1m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	10m

3.11.2. Radiation Emissions Test Configuration

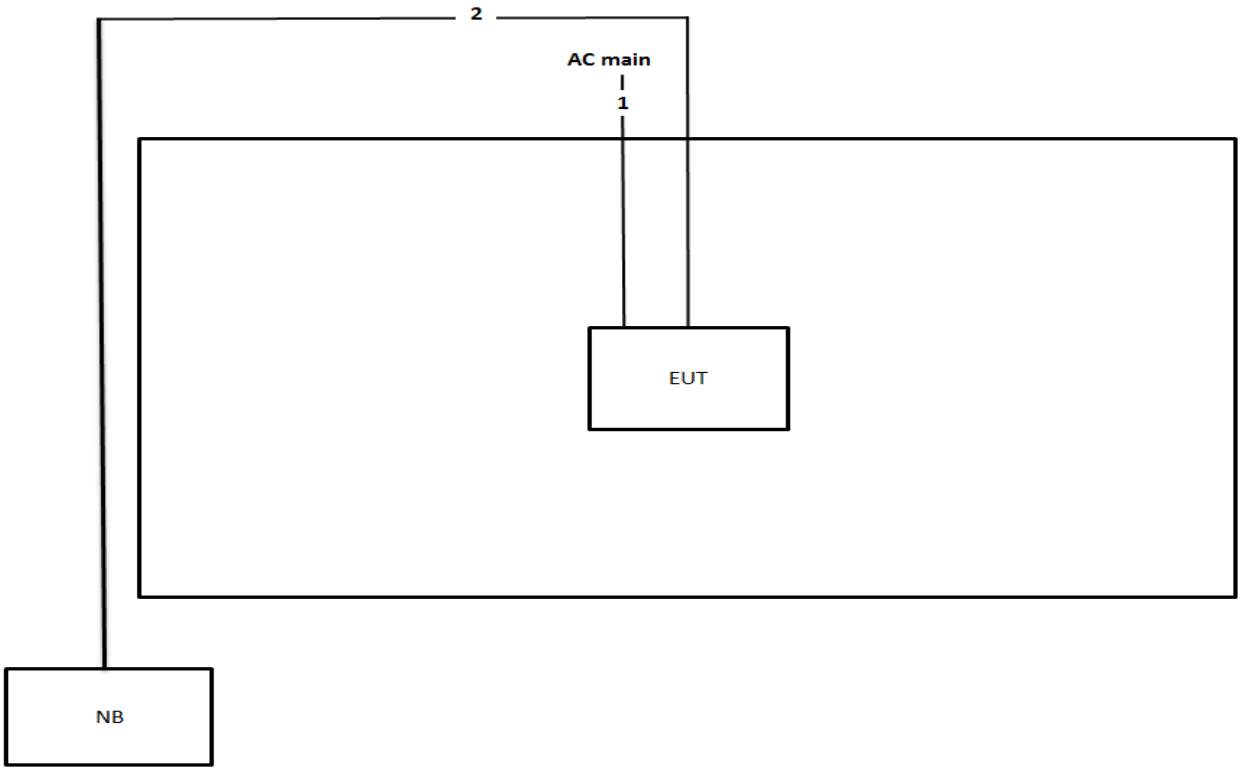
Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable	No	1.5m
3	RJ-45 cable	No	10m
4	Scart cable	No	1.2m
5	Fiber cable	No	1m
6	HDMI cable	Yes	1.5m
7	RJ-45 cable	No	1.5m

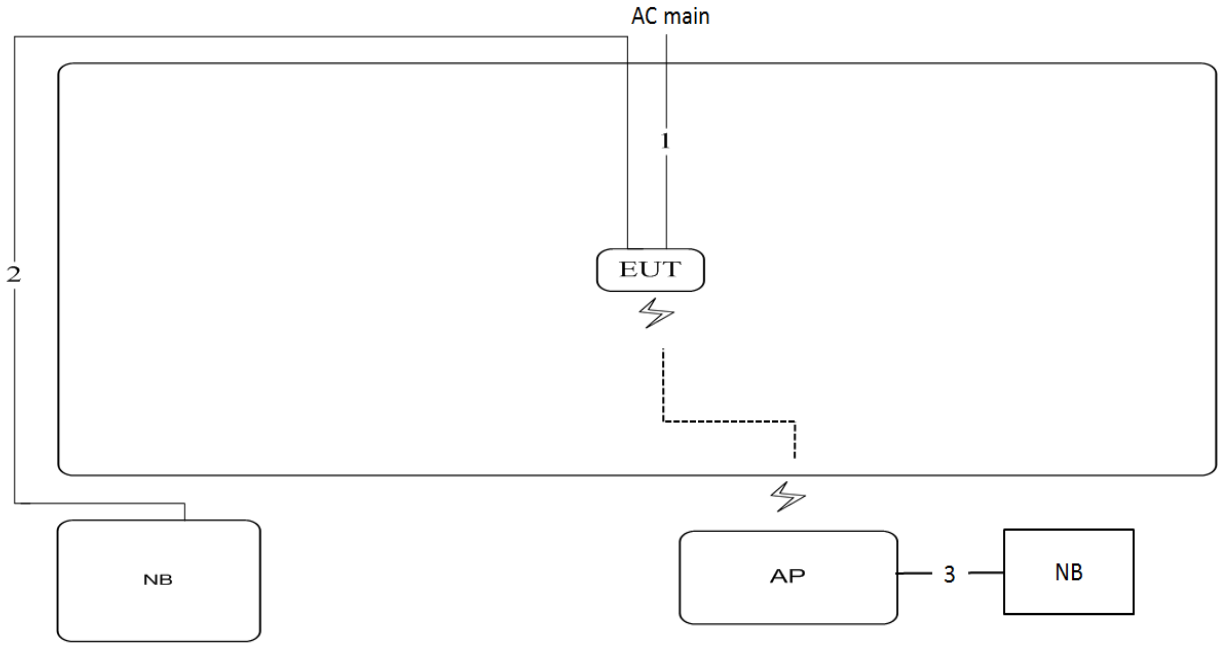
Test Configuration: above 1GHz

For non-beamforming function:



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

For beamforming function:



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

4. TEST RESULT

4.1. 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

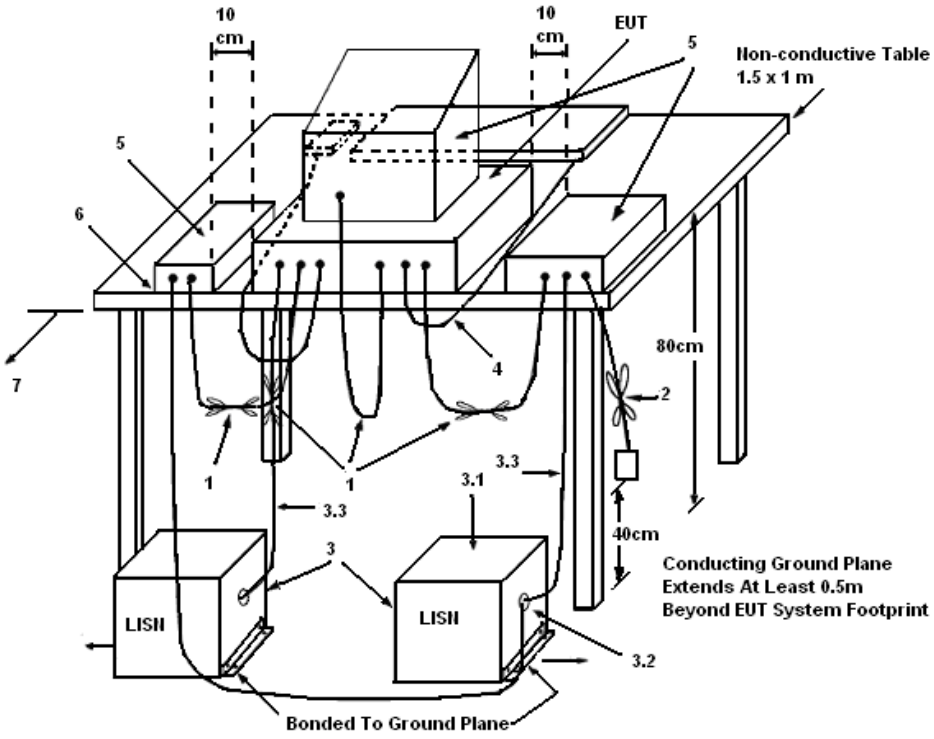
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

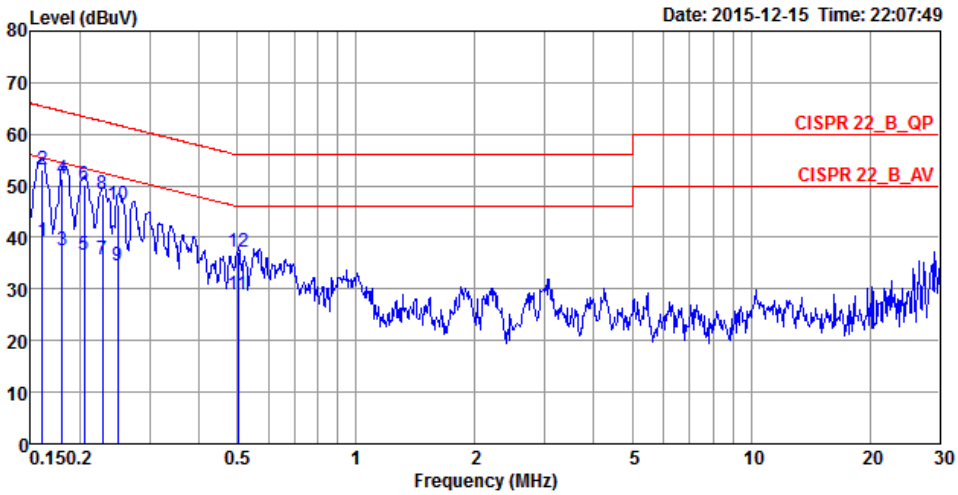
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

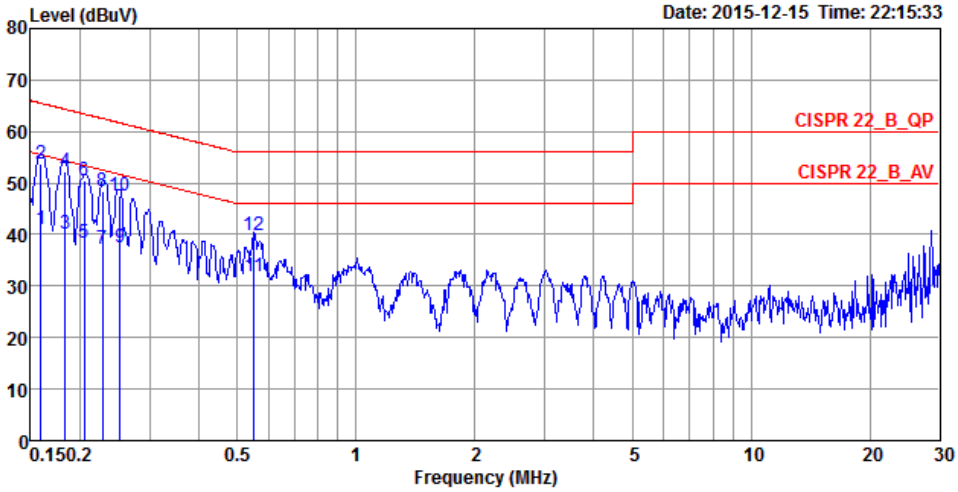
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	22°C	Humidity	60%
Test Engineer	Deven Huang	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.1607	39.12	-16.31	55.43	29.00	9.96	Average	LINE
2	0.1607	53.25	-12.18	65.43	43.13	9.96	QP	LINE
3	0.1806	37.38	-17.08	54.46	27.25	9.95	Average	LINE
4	0.1806	51.51	-12.95	64.46	41.38	9.95	QP	LINE
5	0.2050	36.62	-16.78	53.40	26.49	9.95	Average	LINE
6	0.2050	50.18	-13.22	63.40	40.05	9.95	QP	LINE
7	0.2280	35.58	-16.94	52.52	25.44	9.96	Average	LINE
8	0.2280	48.41	-14.11	62.52	38.27	9.96	QP	LINE
9	0.2495	34.48	-17.30	51.78	24.32	9.97	Average	LINE
10	0.2495	46.35	-15.43	61.78	36.19	9.97	QP	LINE
11	0.5020	29.04	-16.96	46.00	18.82	10.02	Average	LINE
12	0.5020	37.08	-18.92	56.00	26.86	10.02	QP	LINE

Temperature	22°C	Humidity	60%
Test Engineer	Deven Huang	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.1590	41.01	-14.51	55.52	30.89	9.96	Average	NEUTRAL
2	0.1590	53.63	-11.89	65.52	43.51	9.96	QP	NEUTRAL
3	0.1835	40.16	-14.17	54.33	30.02	9.96	Average	NEUTRAL
4	0.1835	52.35	-11.98	64.33	42.21	9.96	QP	NEUTRAL
5	0.2050	38.40	-15.00	53.40	28.26	9.96	Average	NEUTRAL
6	0.2050	50.46	-12.94	63.40	40.32	9.96	QP	NEUTRAL
7	0.2280	37.23	-15.29	52.52	27.09	9.96	Average	NEUTRAL
8	0.2280	48.55	-13.97	62.52	38.41	9.96	QP	NEUTRAL
9	0.2521	37.57	-14.12	51.69	27.42	9.96	Average	NEUTRAL
10	0.2521	47.46	-14.23	61.69	37.31	9.96	QP	NEUTRAL
11	0.5523	31.89	-14.11	46.00	21.72	9.97	Average	NEUTRAL
12	0.5523	39.83	-16.17	56.00	29.66	9.97	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

4.2.1. Limit

No restriction limits.

4.2.2. Measuring Instruments and Setting

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

26dB Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	VBW > RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth	
Spectrum Parameters	**Setting**
Span	1.5 times to 5.0 times the OBW
RBW	1 % to 5 % of the OBW
VBW	≥ 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

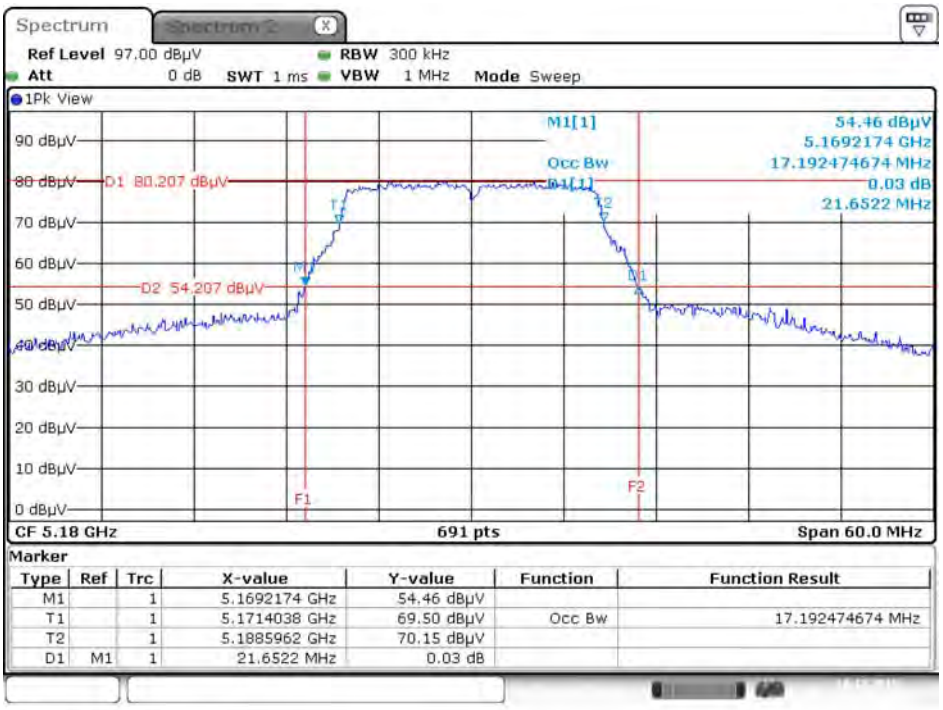
The EUT was programmed to be in continuously transmitting mode.

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

Temperature	24°C	Humidity	60%
Test Engineer	Clemens Fang		

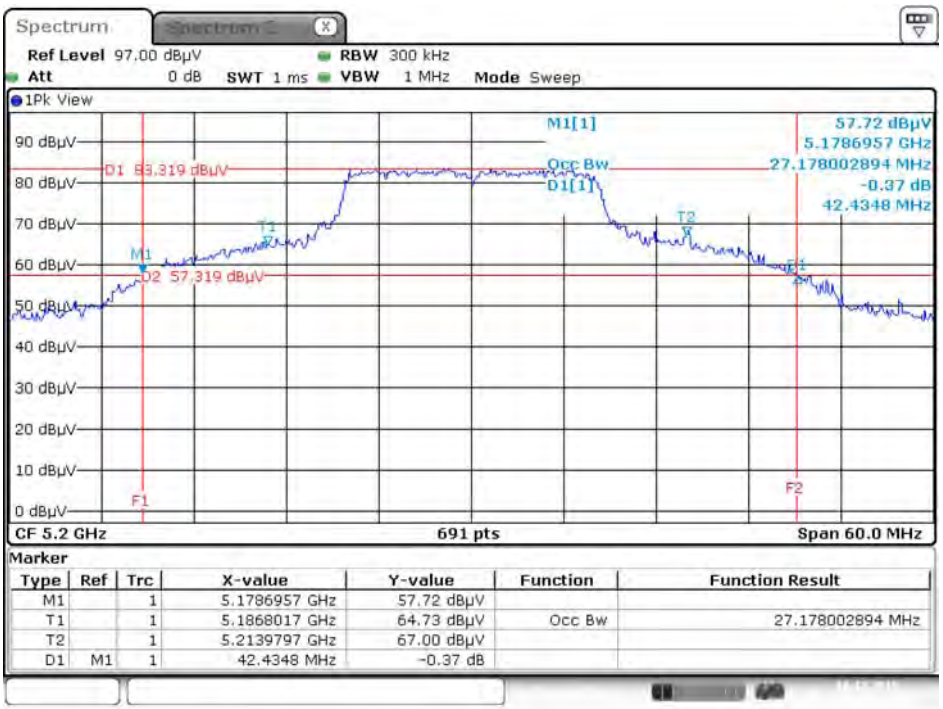
Mode	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
802.11a	5180 MHz	21.65	17.19
	5200 MHz	42.43	27.18
	5240 MHz	39.13	19.10
	5745 MHz	21.91	17.45
	5785 MHz	51.22	35.43
	5825 MHz	39.04	20.23
802.11ac MCS0/Nss1 VHT20	5180 MHz	21.48	18.06
	5200 MHz	41.91	23.01
	5240 MHz	27.22	18.41
	5745 MHz	21.65	18.06
	5785 MHz	48.09	32.91
	5825 MHz	21.65	18.15
802.11ac MCS0/Nss1 VHT40	5190 MHz	40.73	36.76
	5230 MHz	83.91	38.06
	5755 MHz	40.87	36.76
	5795 MHz	88.70	41.97
802.11ac MCS0/Nss1 VHT80	5210 MHz	81.16	75.54
	5775 MHz	81.45	75.83

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5180 MHz



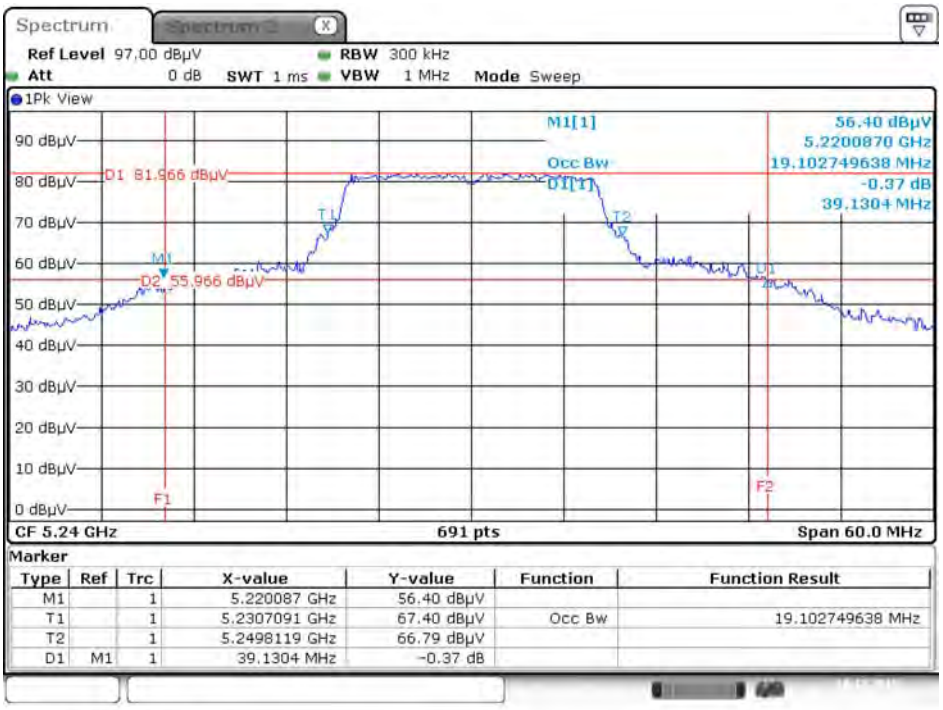
Date: 18.DEC.2015 10:13:38

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5200 MHz



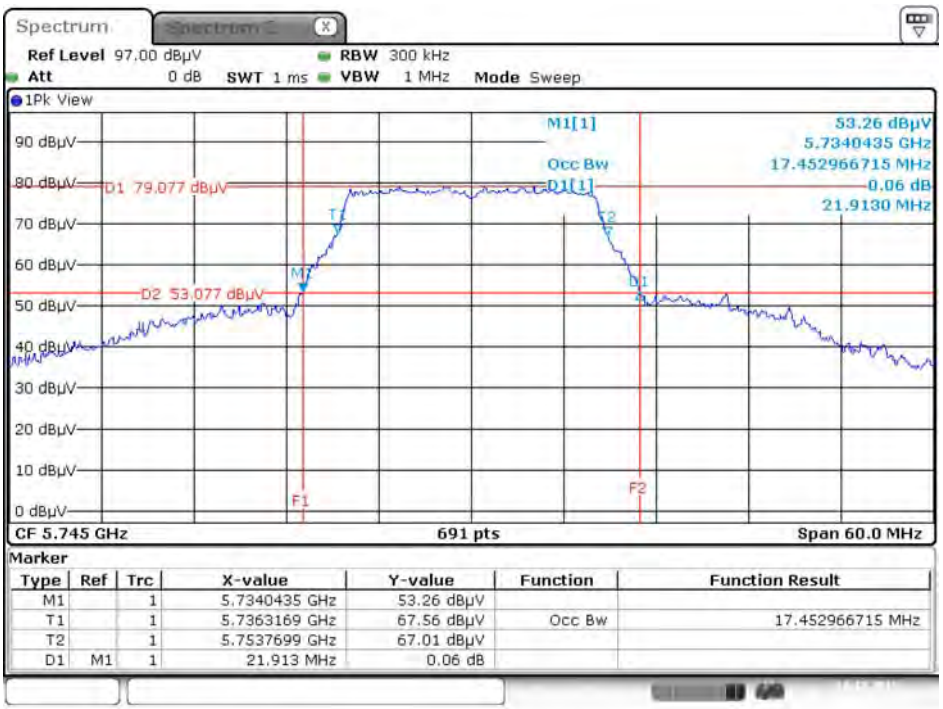
Date: 18.DEC.2015 10:14:53

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5240 MHz



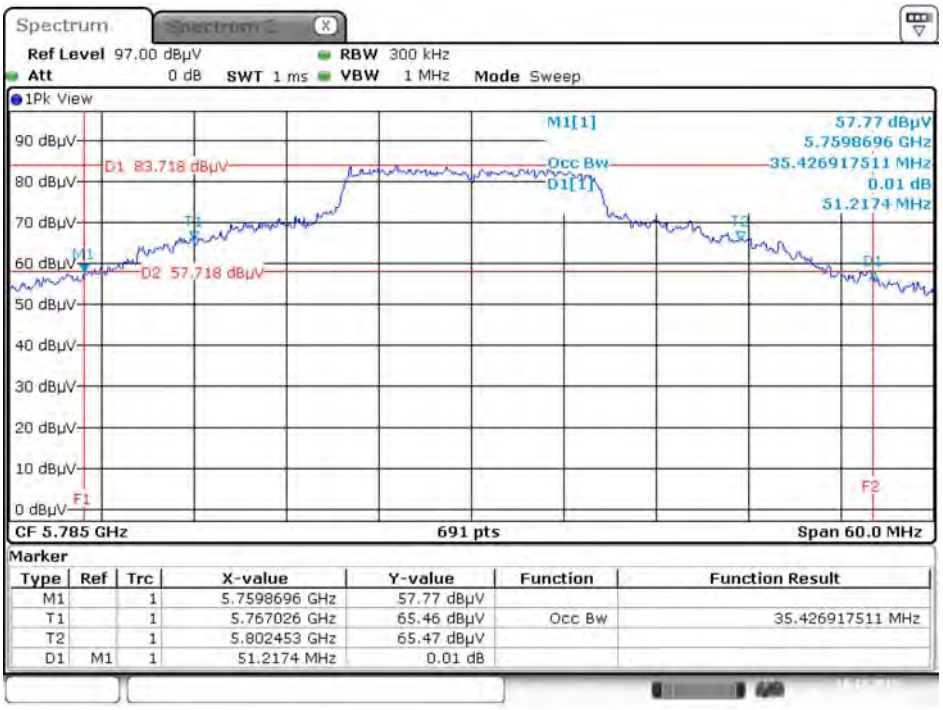
Date: 18.DEC.2015 10:15:42

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5745 MHz



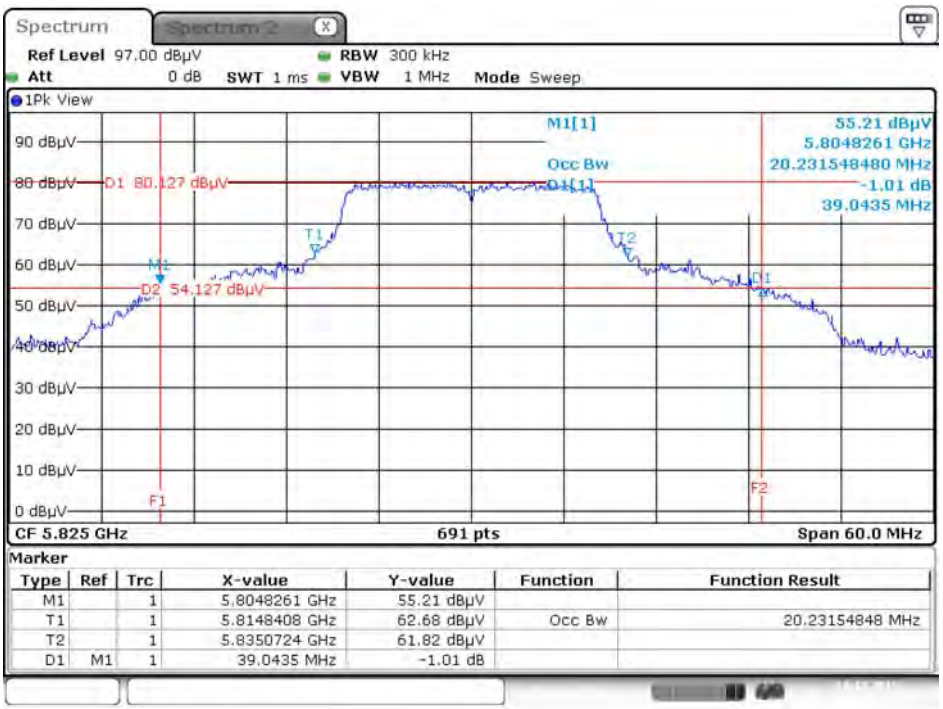
Date: 18.DEC.2015 10:16:58

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



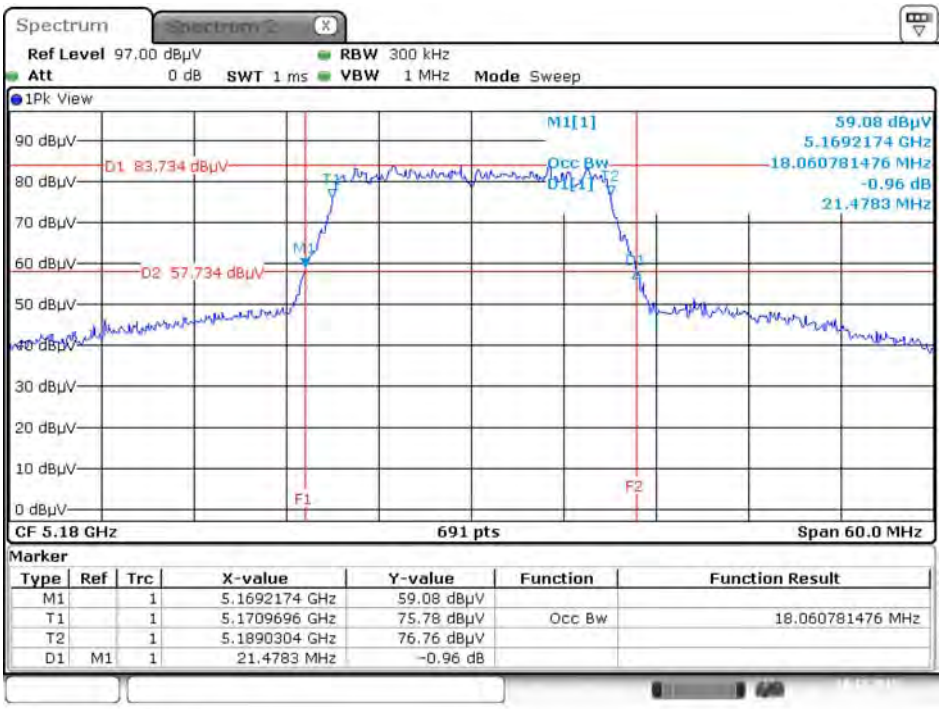
Date: 18.DEC.2015 10:17:42

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5825 MHz



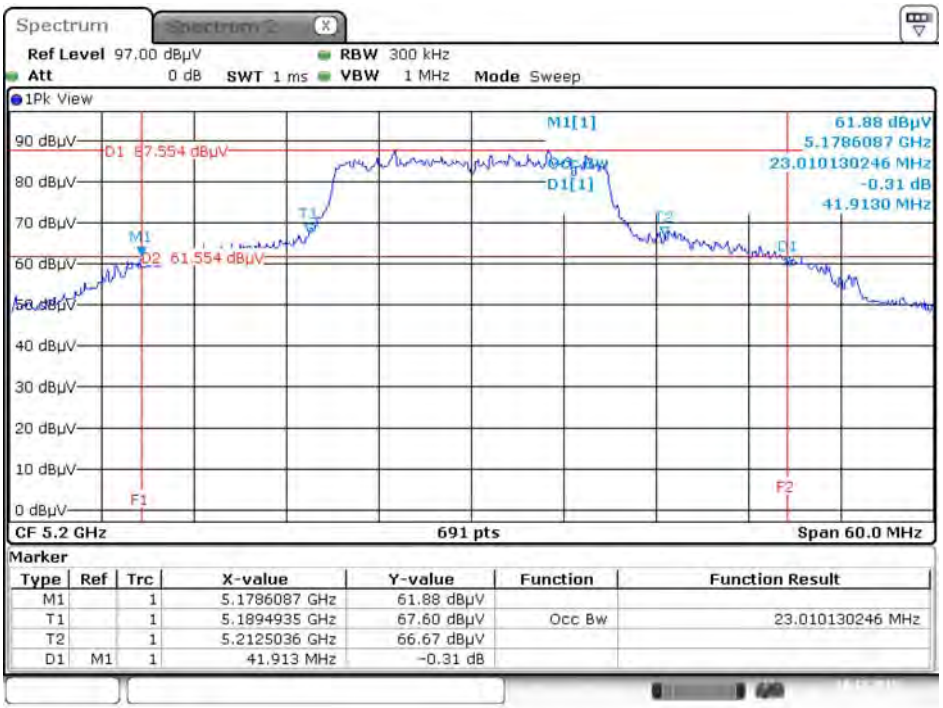
Date: 18.DEC.2015 10:18:28

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



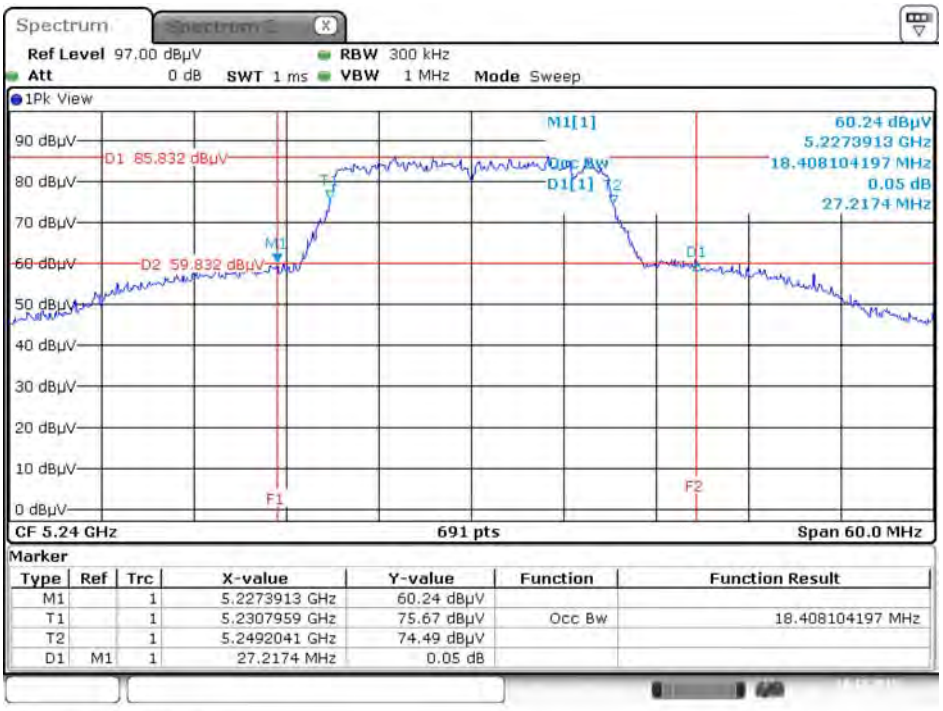
Date: 18.DEC.2015 10:28:10

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



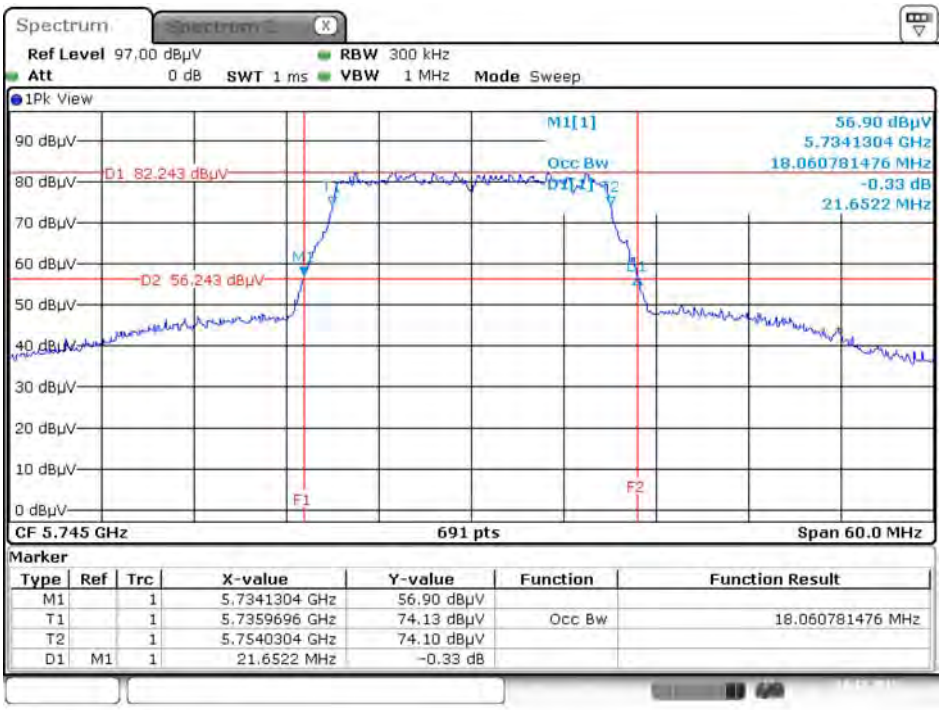
Date: 18.DEC.2015 10:33:21

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



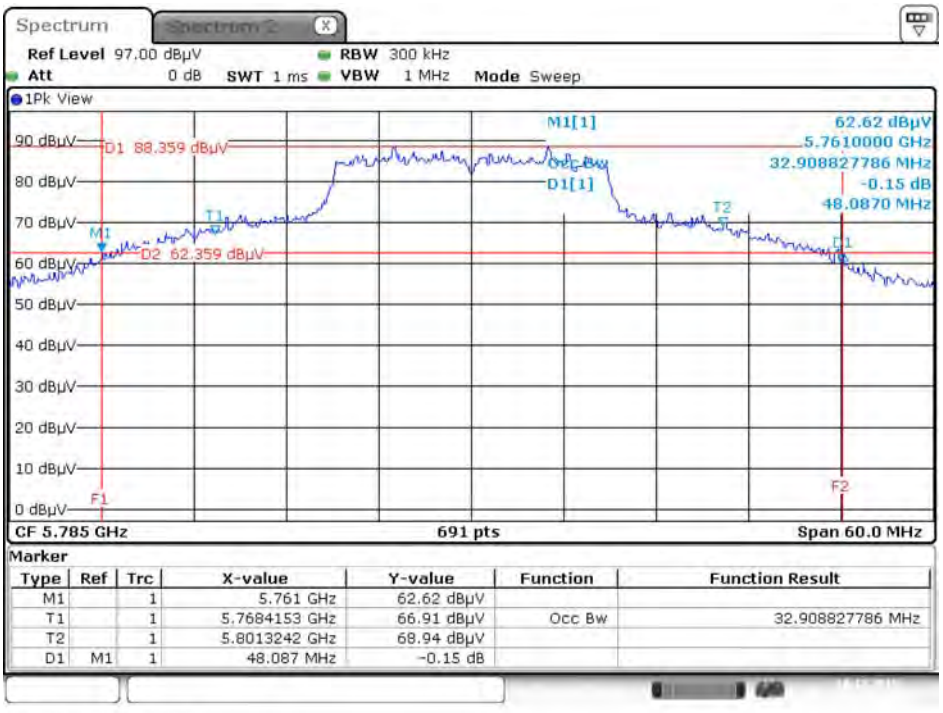
Date: 18.DEC.2015 10:35:12

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



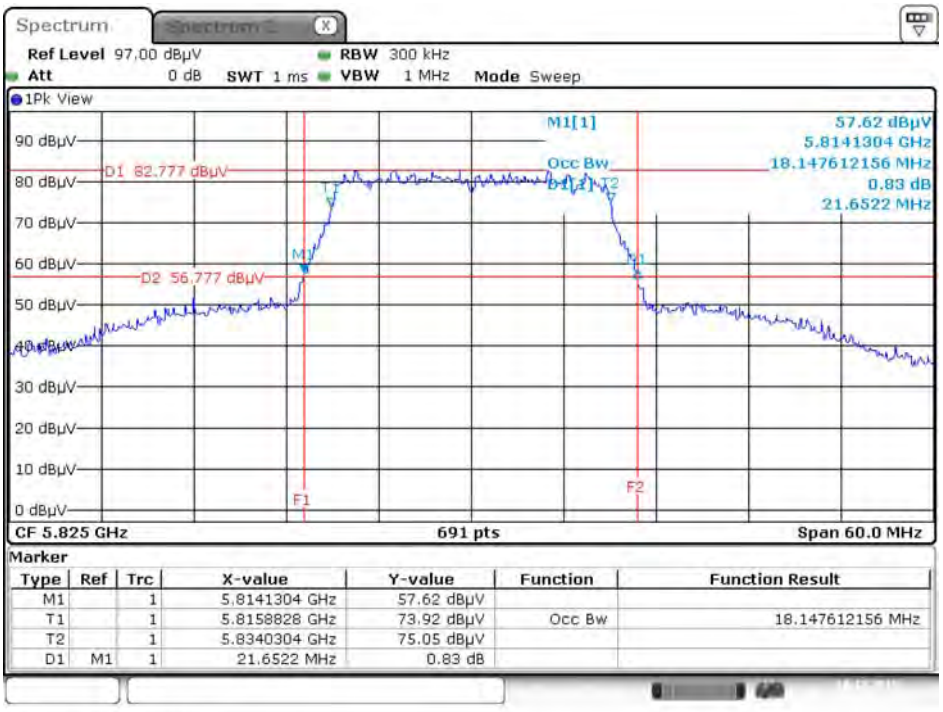
Date: 18.DEC.2015 10:22:09

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



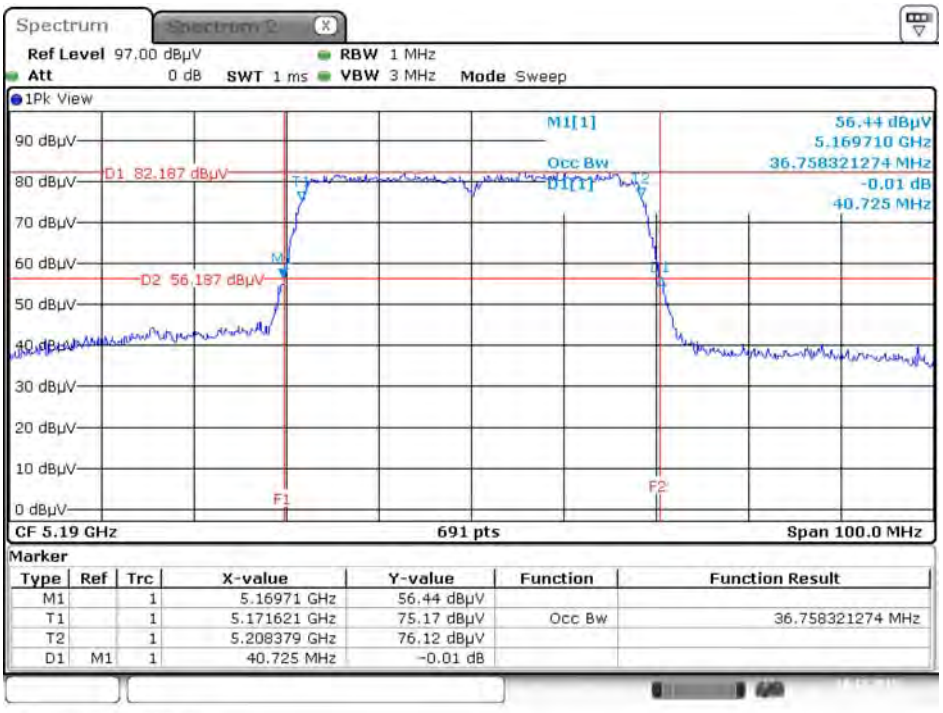
Date: 18.DEC.2015 10:20:47

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



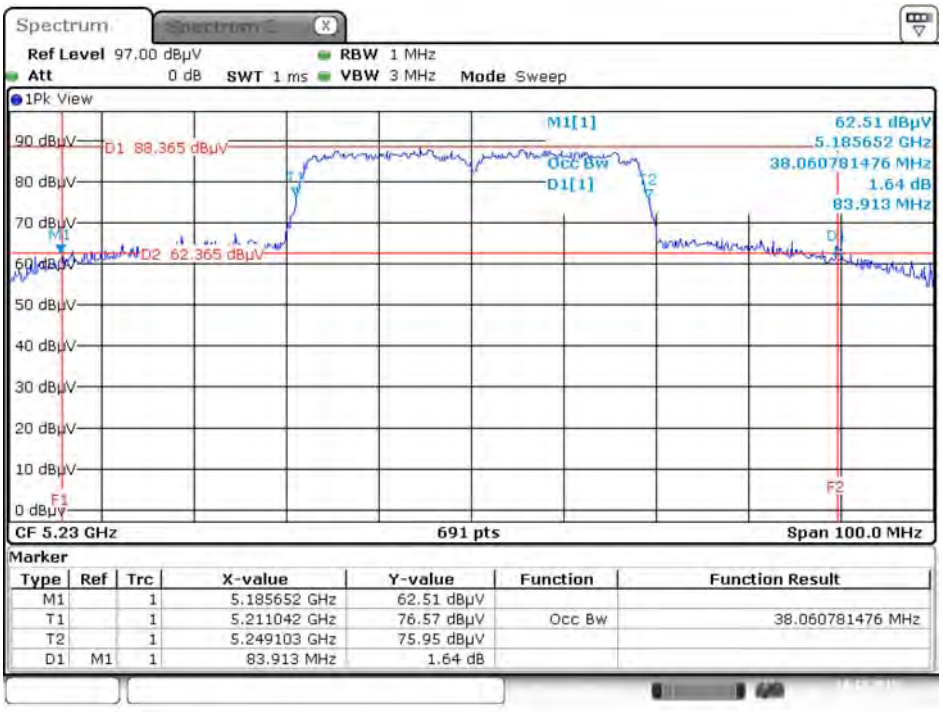
Date: 18.DEC.2015 10:20:07

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



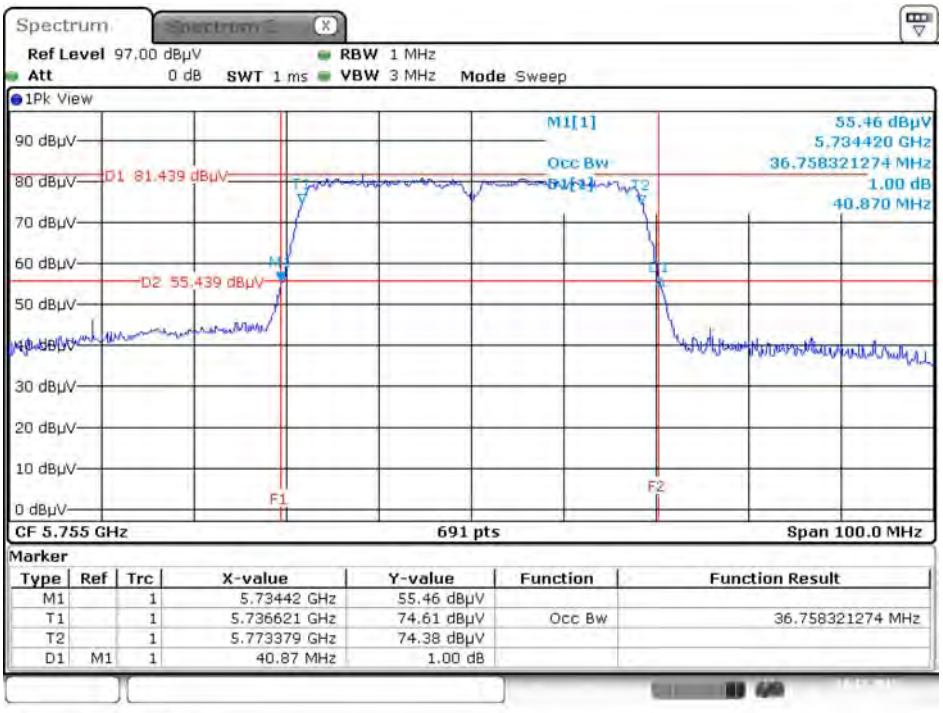
Date: 18.DEC.2015 10:36:20

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



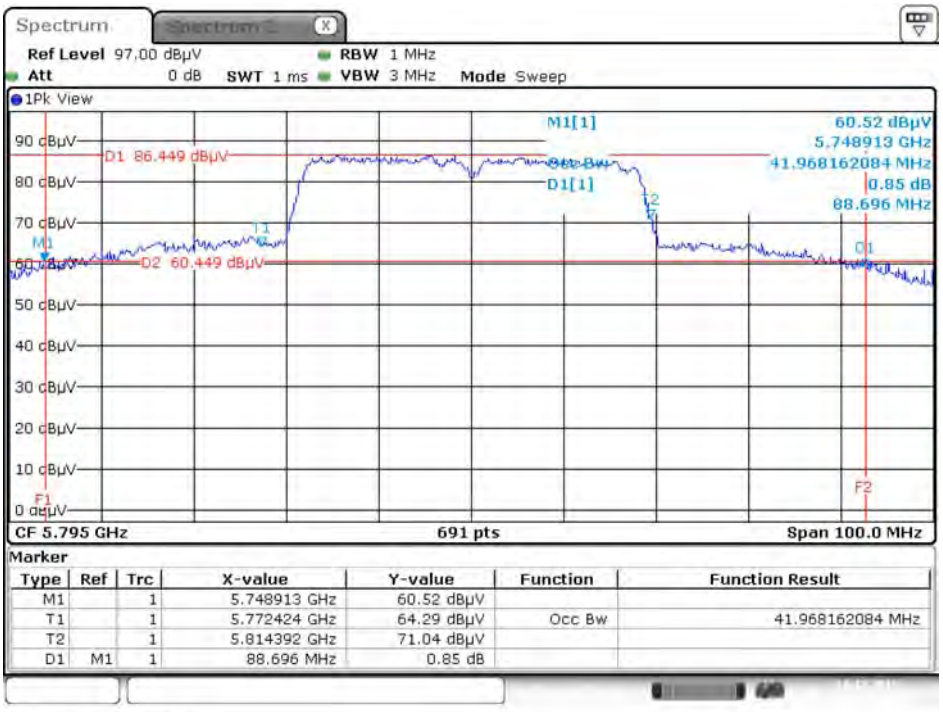
Date: 18.DEC.2015 10:37:15

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5755 MHz



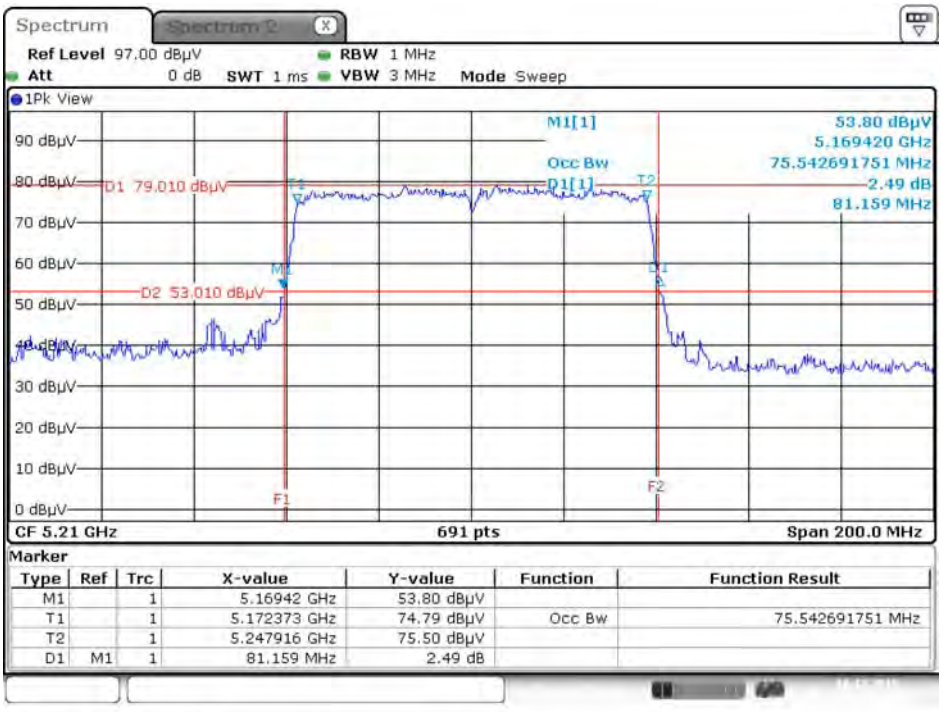
Date: 18.DEC.2015 10:38:11

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5795 MHz



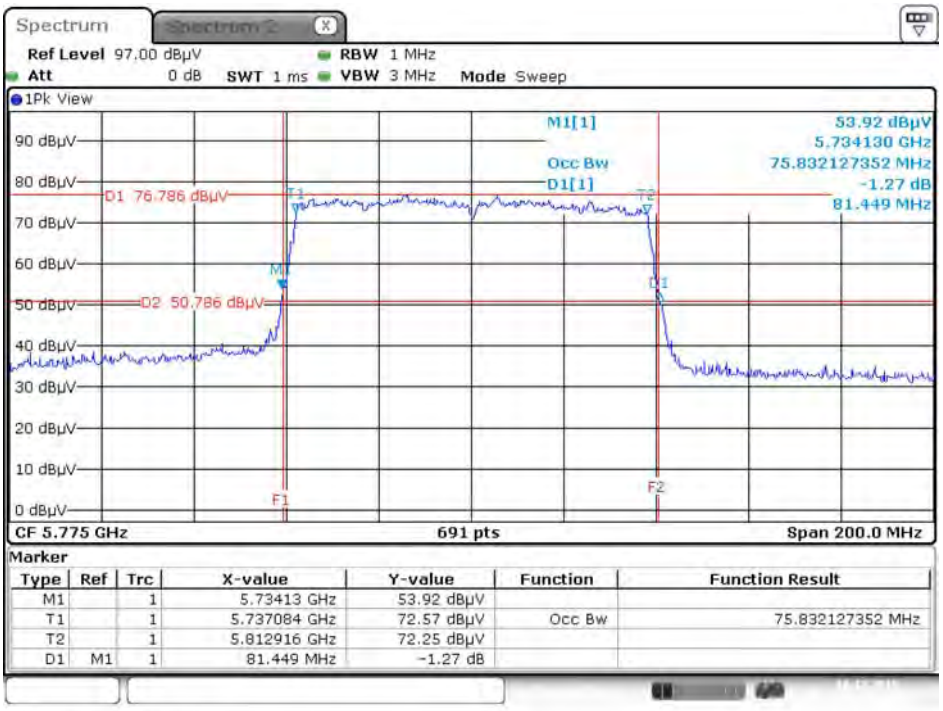
Date: 18.DEC.2015 10:38:55

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



Date: 18.DEC.2015 10:41:30

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 / 5775 MHz



Date: 18.DEC.2015 10:42:20

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 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth.
3. Multiple antenna system was performed in accordance with KDB662911 D01 v02r01 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

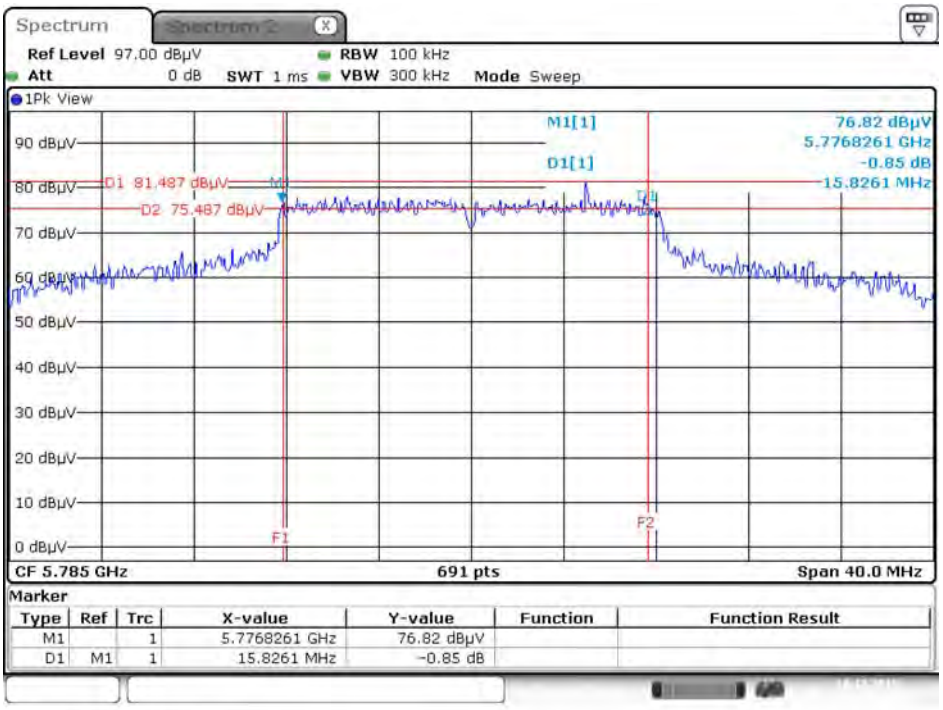
Temperature	24°C	Humidity	60%
Test Engineer	Clemens Fang		

Mode	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11a	5745 MHz	16.29	500	Complies
	5785 MHz	15.83	500	Complies
	5825 MHz	16.29	500	Complies
802.11ac MCS0/Nss1 VHT20	5745 MHz	17.62	500	Complies
	5785 MHz	16.58	500	Complies
	5825 MHz	17.57	500	Complies
802.11ac MCS0/Nss1 VHT40	5755 MHz	35.01	500	Complies
	5795 MHz	35.71	500	Complies
802.11ac MCS0/Nss1 VHT80	5775 MHz	75.94	500	Complies

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

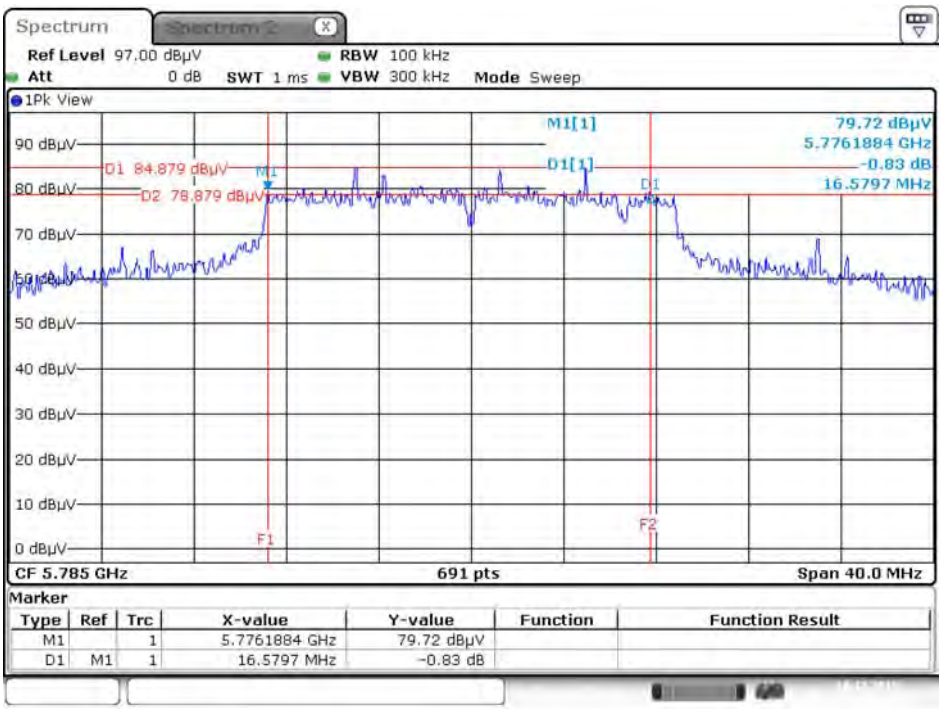
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



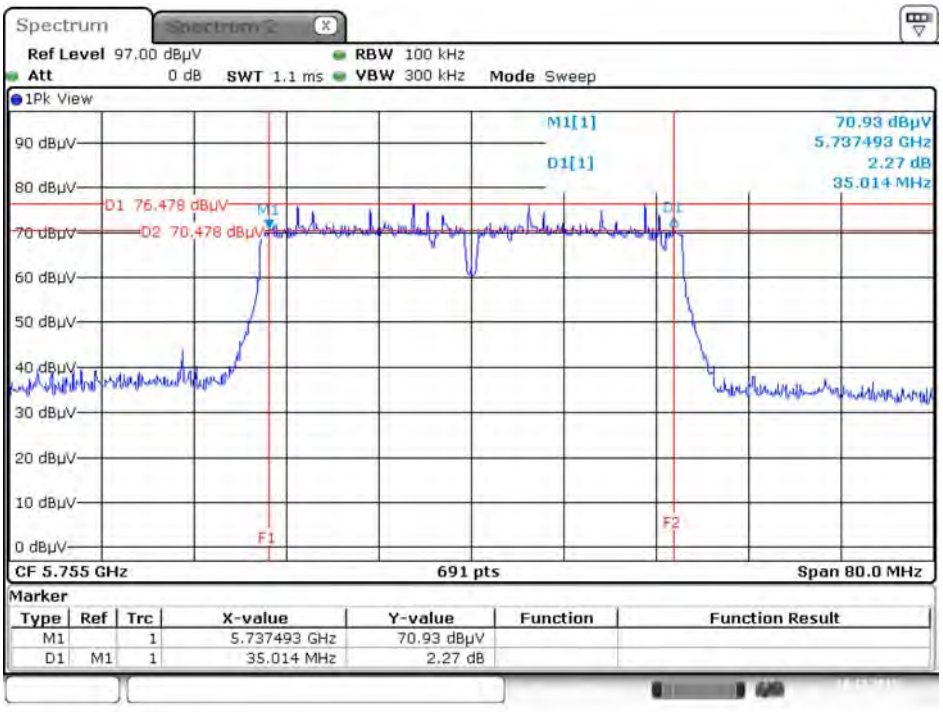
Date: 18.DEC.2015 10:53:30

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



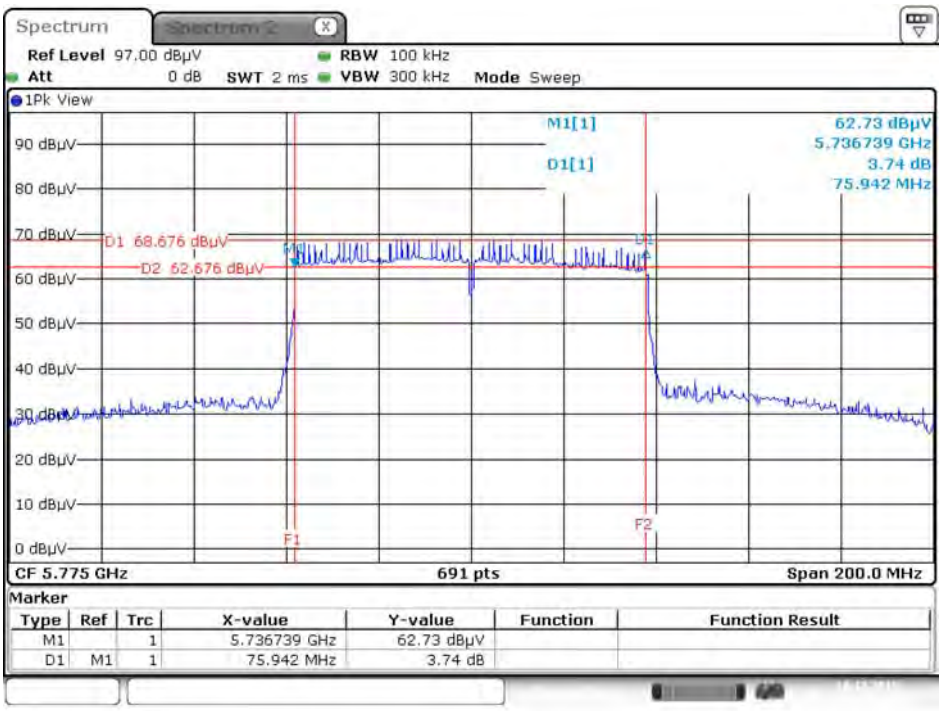
Date: 18.DEC.2015 10:50:17

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5755 MHz



Date: 18.DEC.2015 10:44:57

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 / 5775 MHz



Date: 18.DEC.2015 10:44:08

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.

4.4.2. Measuring Instruments and Setting

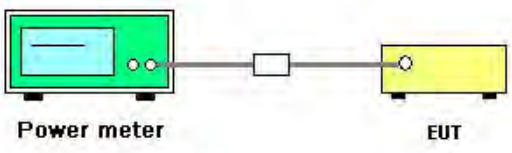
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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 v01 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	24°C	Humidity	60%
Test Engineer	Clemens Fang	Test Date	Dec. 17, 2015

Mode	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 1		
802.11a	5180 MHz	17.92	24.00	Complies
	5200 MHz	21.16	24.00	Complies
	5240 MHz	19.57	24.00	Complies
	5745 MHz	16.54	30.00	Complies
	5785 MHz	20.90	30.00	Complies
	5825 MHz	18.27	30.00	Complies

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Total		
802.11ac MCS0/Nss1 VHT20	5180 MHz	17.74	16.84	20.32	23.39	Complies
	5200 MHz	20.98	19.50	23.31	23.39	Complies
	5240 MHz	19.38	17.94	21.73	23.39	Complies
	5745 MHz	15.86	16.33	19.11	29.39	Complies
	5785 MHz	20.11	20.61	23.38	29.39	Complies
	5825 MHz	16.10	16.59	19.36	29.39	Complies
802.11ac MCS0/Nss1 VHT40	5190 MHz	13.25	13.56	16.42	23.39	Complies
	5230 MHz	19.56	18.08	21.89	23.39	Complies
	5755 MHz	12.49	12.73	15.62	29.39	Complies
	5795 MHz	18.68	18.09	21.41	29.39	Complies
802.11ac MCS0/Nss1 VHT80	5210 MHz	13.38	13.61	16.51	23.39	Complies
	5775 MHz	11.70	12.09	14.91	29.39	Complies

Note: $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi.

1. For band 1 limit=24 – (6.61 – 6)= 23.39dBm.
2. For band 4 limit=30 – (6.61 – 6)= 29.39dBm.

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

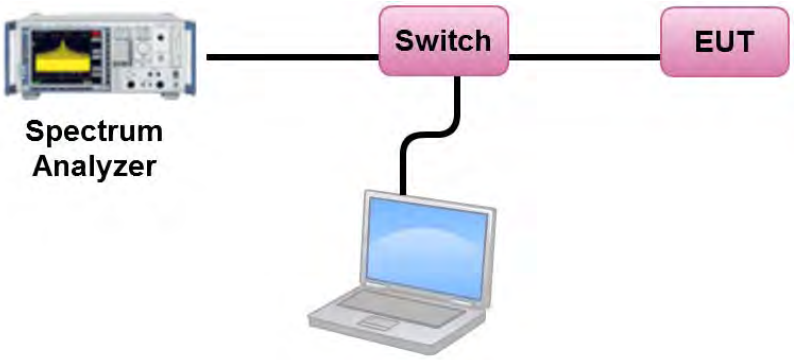
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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 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 v01 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 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	24°C	Humidity	60%
Test Engineer	Clemens Fang	Test Date	Dec. 17, 2015

Configuration IEEE 802.11a / Ant. 1

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	4.78	11.00	Complies
40	5200 MHz	7.87	11.00	Complies
48	5240 MHz	6.55	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	3.47	-3.01	0.46	30.00	Complies
157	5785 MHz	7.52	-3.01	4.51	30.00	Complies
165	5825 MHz	4.99	-3.01	1.98	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	7.24	10.39	Complies
40	5200 MHz	10.29	10.39	Complies
48	5240 MHz	8.44	10.39	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi, so limit=11 – (6.61 – 6)=10.39dBm/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	5.89	-3.01	2.88	29.39	Complies
157	5785 MHz	9.99	-3.01	6.98	29.39	Complies
165	5825 MHz	5.94	-3.01	2.93	29.39	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi, so limit=30 – (6.61 – 6)=29.39 dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	0.20	10.39	Complies
46	5230 MHz	5.65	10.39	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi, so limit=11 – (6.61 – 6)=10.39dBm/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	-0.40	-3.01	-3.41	29.39	Complies
159	5795 MHz	5.15	-3.01	2.14	29.39	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi, so limit=30 – (6.61 – 6)=29.39 dBm/500kHz.

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-2.80	10.39	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi, so limit=11 – (6.61 – 6)=10.39dBm/MHz.

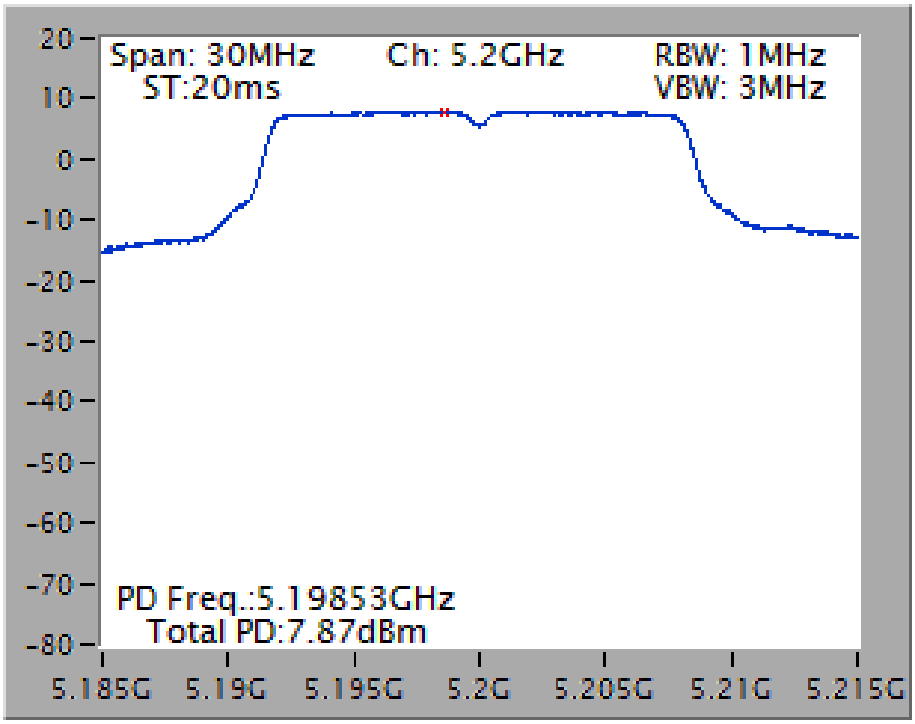
Channel	Frequency	Power Density (dBm/MHz)	10log(500kHz/RBW) Factor (dB)	Power Density (dBm/500kHz)	Power Density Limit (dBm/500kHz)	Result
155	5775 MHz	-4.47	-3.01	-7.48	29.39	Complies

Note: $Directional\,Gain = 10\log\left[\frac{\sum_{j=1}^{Nss}\left\{\sum_{K=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.61dBi >6dBi, so limit=30 – (6.61 – 6)=29.39 dBm/500kHz.

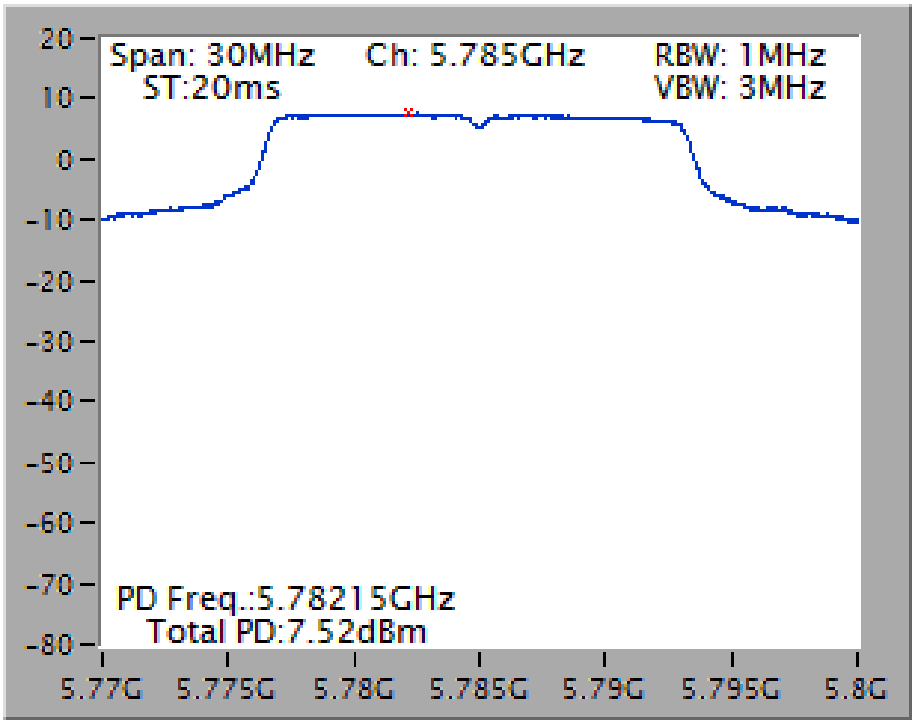
Note: All the test values were listed in the report.

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

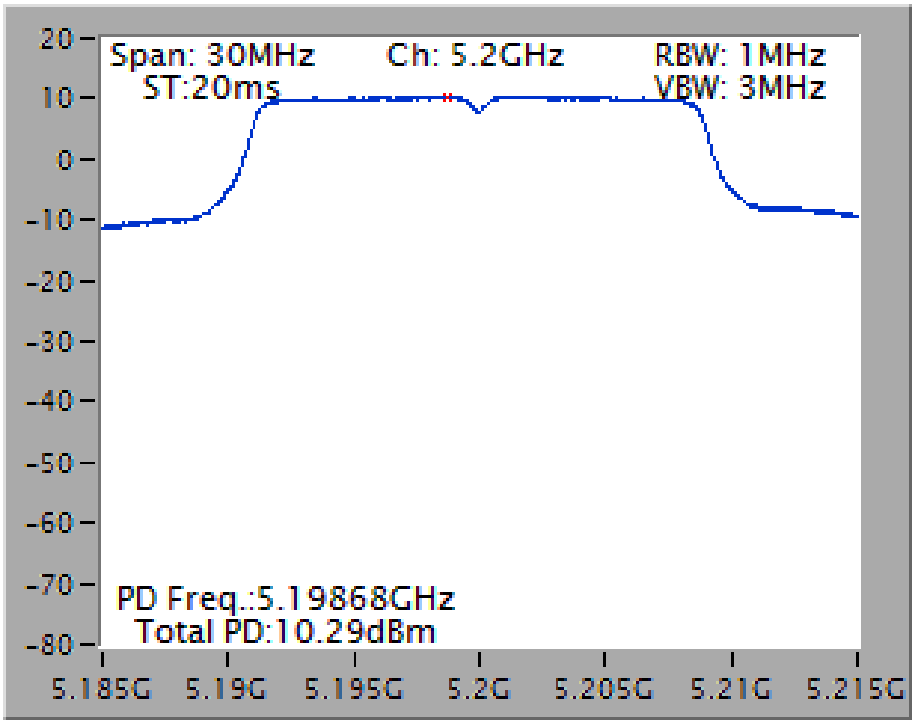
Power Density Plot on Configuration IEEE 802.11a / Ant. 1 / 5200 MHz



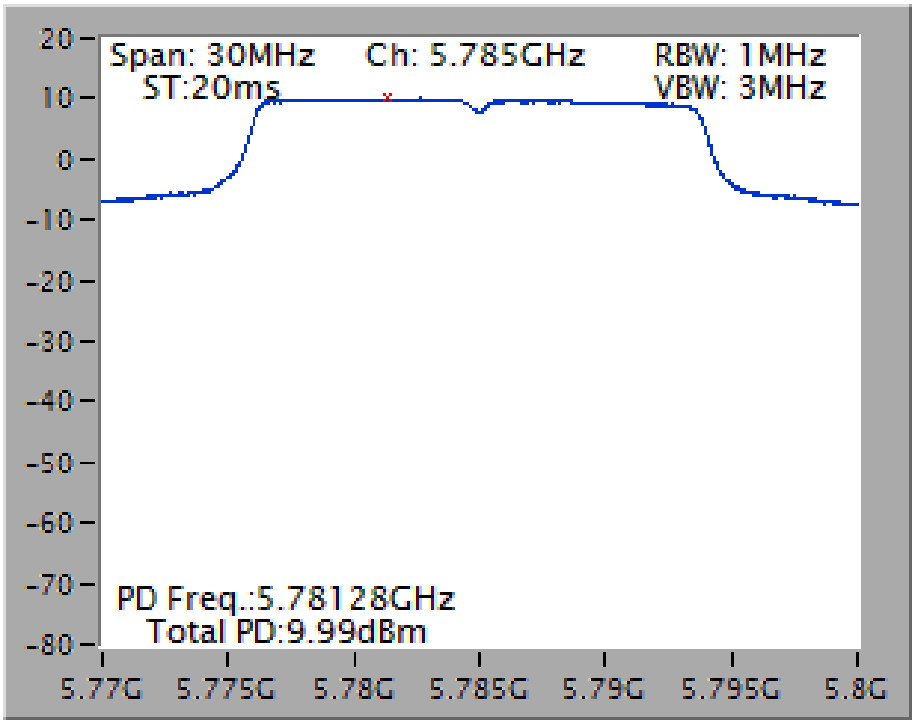
Power Density Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



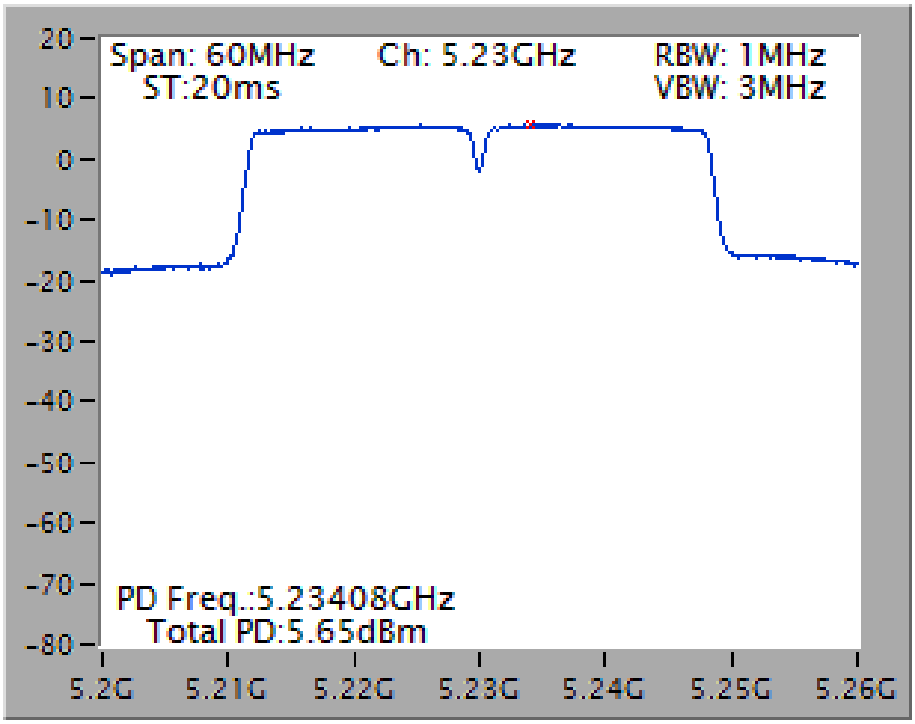
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5200 MHz



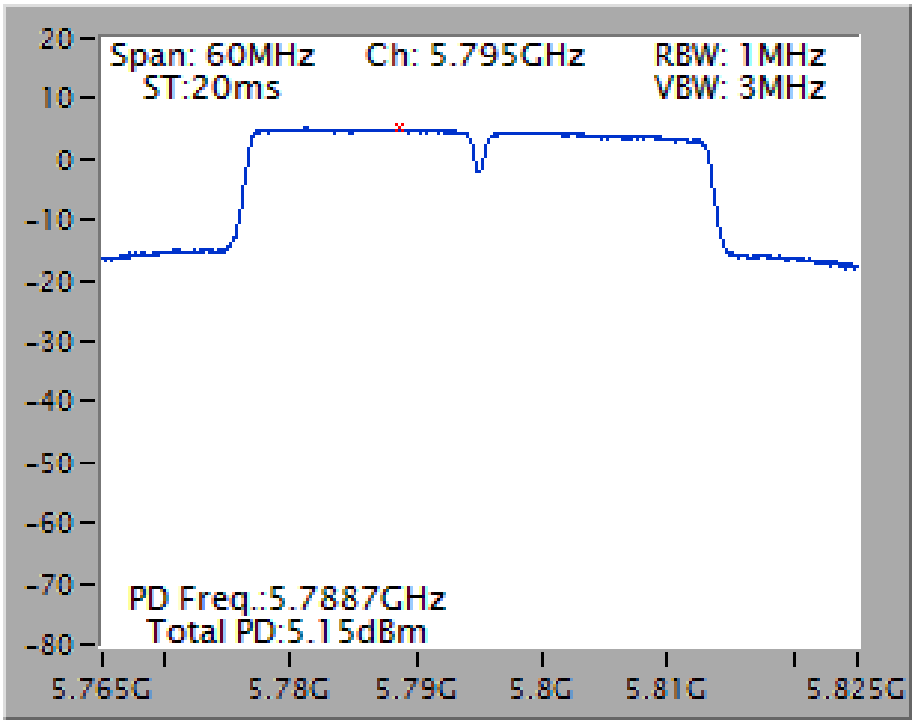
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 1 + Ant. 2 / 5785 MHz



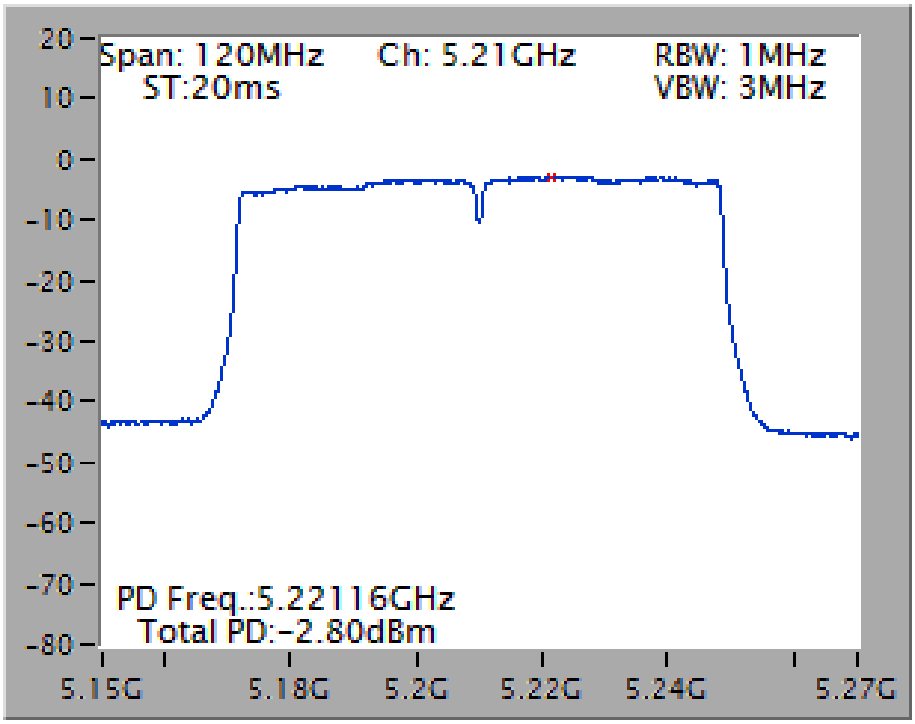
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5230 MHz



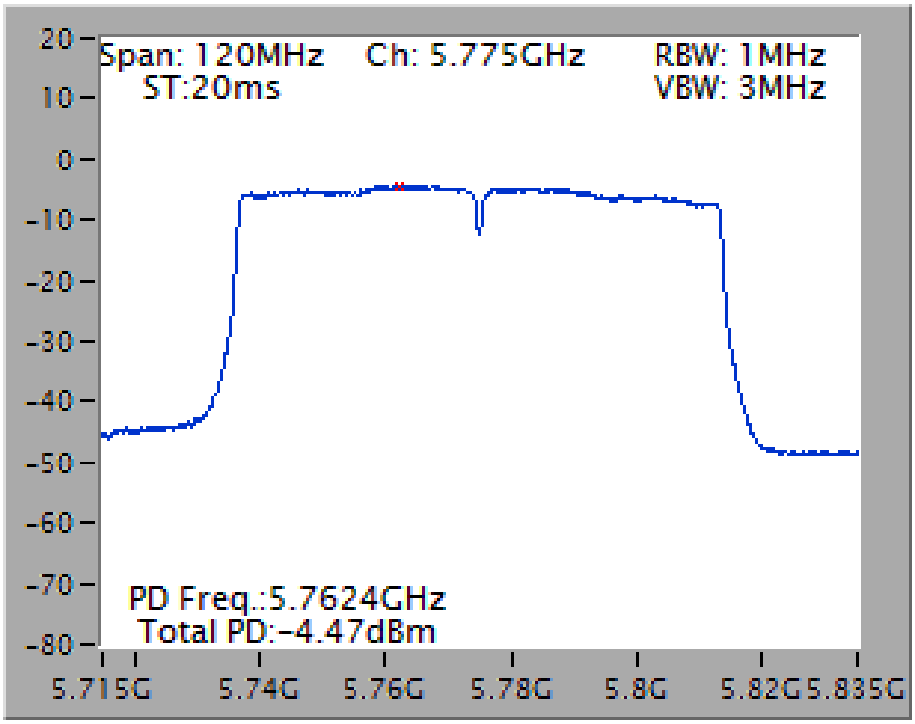
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 1 + Ant. 2 / 5795 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 / 5210 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 1 + Ant. 2 / 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: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

4.6.2. Measuring Instruments and Setting

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

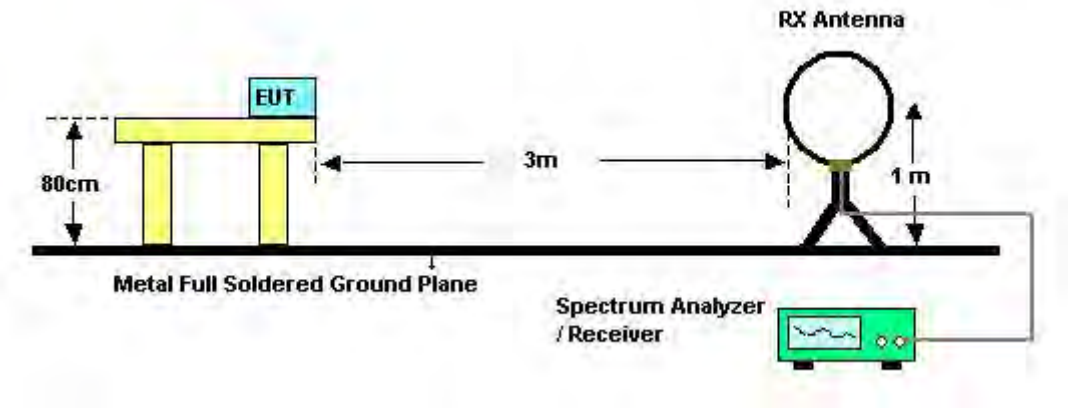
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.6.3. Test Procedures

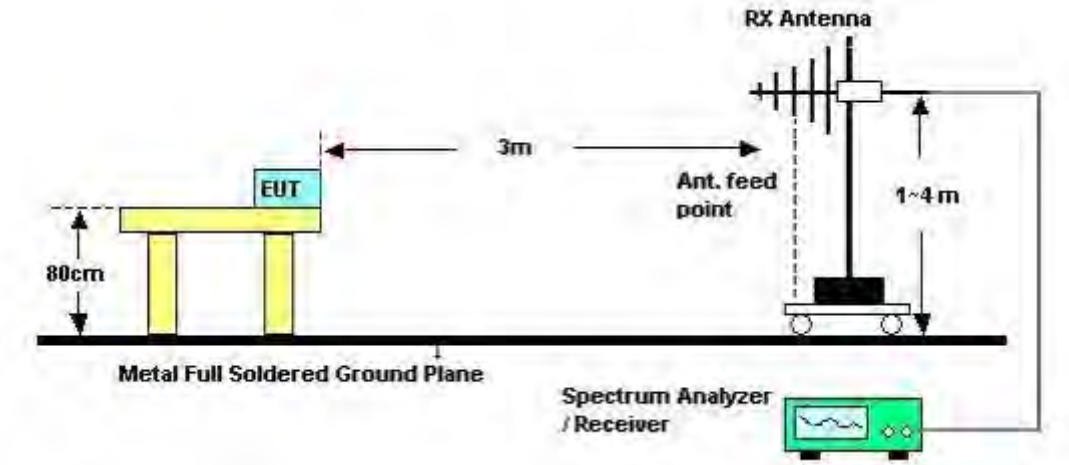
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting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

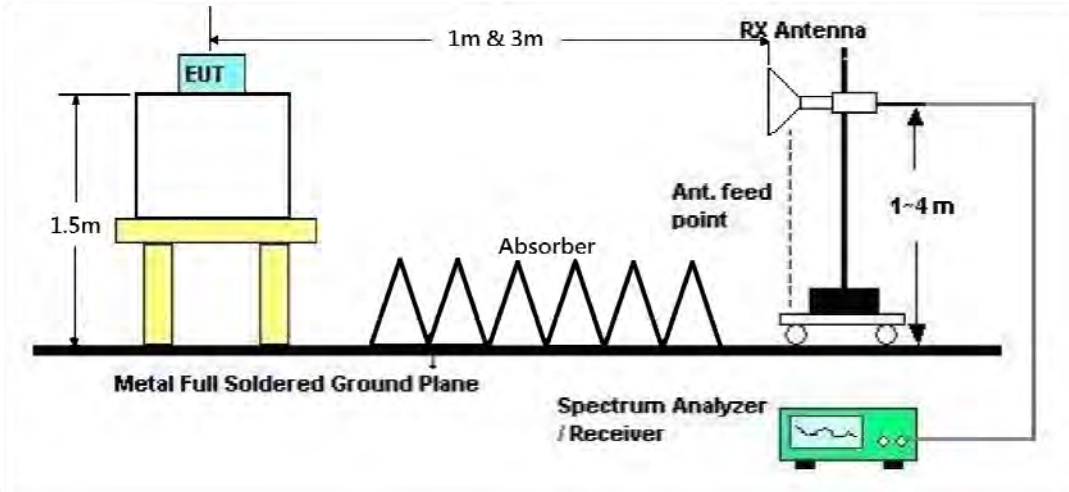
For Radiated Emissions: 9kHz ~30MHz



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

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

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

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	Normal Link
Test Date	Dec. 18, 2015	Test Mode	Mode 1

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

Note:

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

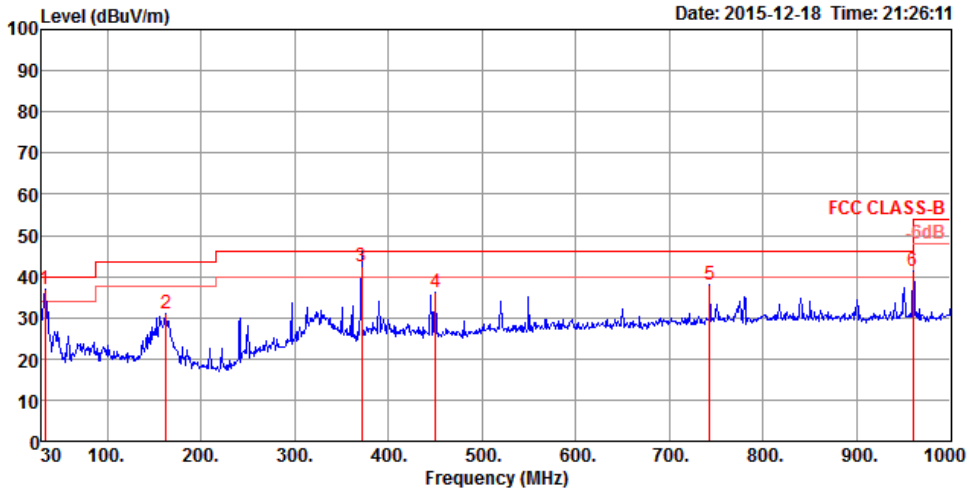
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

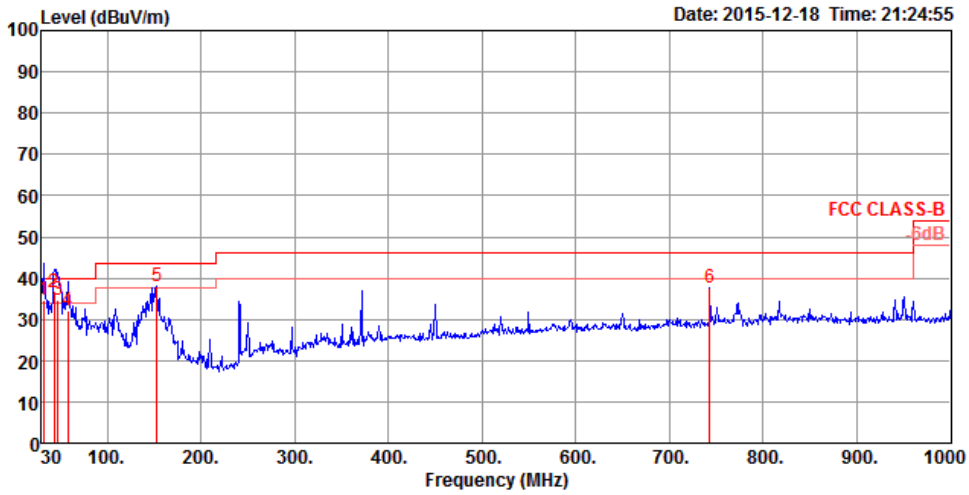
Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	Normal Link
Test Mode	Mode 1		

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	33.88	36.75	40.00	-3.25	50.93	0.51	17.71	32.40	100	225	Peak	HORIZONTAL
2	162.89	30.86	43.50	-12.64	51.46	1.09	10.66	32.35	200	185	Peak	HORIZONTAL
3	371.44	42.25	46.00	-3.75	56.98	1.66	15.93	32.32	100	213	QP	HORIZONTAL
4	450.01	36.05	46.00	-9.95	49.25	1.84	17.30	32.34	100	267	Peak	HORIZONTAL
5	742.95	38.07	46.00	-7.93	47.71	2.36	20.31	32.31	150	193	Peak	HORIZONTAL
6	960.23	41.35	54.00	-12.65	47.91	2.69	21.94	31.19	200	40	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	31.94	34.85	40.00	-5.15	47.88	0.50	18.87	32.40	100	220	QP	VERTICAL
2	43.58	36.43	40.00	-3.57	56.14	0.58	12.12	32.41	100	165	QP	VERTICAL
3	47.46	34.62	40.00	-5.38	56.22	0.61	10.20	32.41	100	352	QP	VERTICAL
4	58.13	32.02	40.00	-7.98	56.55	0.68	7.20	32.41	100	214	QP	VERTICAL
5	153.19	37.90	43.50	-5.60	58.06	1.06	11.13	32.35	100	131	Peak	VERTICAL
6	742.95	37.71	46.00	-8.29	47.35	2.36	20.31	32.31	150	166	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 = Leve

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

Temperature	24℃	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 36 / Ant. 1
Test Date	Dec. 09, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15539.29	60.90	74.00	-13.10	45.93	11.45	38.16	34.64	83	150	Peak	HORIZONTAL
2	15539.37	48.29	54.00	-5.71	33.32	11.45	38.16	34.64	83	150	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15539.03	48.00	54.00	-6.00	33.03	11.45	38.16	34.64	222	150	Average	VERTICAL
2	15541.83	61.47	74.00	-12.53	46.50	11.45	38.16	34.64	222	150	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 40 / Ant. 1
Test Date	Dec. 09, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15600.39	48.11	54.00	-5.89	33.08	11.48	38.23	34.68	225	150	Average	HORIZONTAL
2	15600.55	60.96	74.00	-13.04	45.85	11.50	38.29	34.68	225	150	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15599.83	61.43	74.00	-12.57	46.40	11.48	38.23	34.68	82	150	Peak	VERTICAL
2	15601.75	47.94	54.00	-6.06	32.83	11.50	38.29	34.68	82	150	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 48 / Ant. 1
Test Date	Dec. 09, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15718.86	61.23	74.00	-12.77	46.06	11.56	38.42	34.81	110	150	Peak	HORIZONTAL
2	15720.37	48.22	54.00	-5.78	33.05	11.56	38.42	34.81	110	150	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15721.37	47.83	54.00	-6.17	32.66	11.56	38.42	34.81	279	150	Average	VERTICAL
2	15721.51	61.52	74.00	-12.48	46.35	11.56	38.42	34.81	279	150	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 149 / Ant. 1
Test Date	Dec. 09, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11489.33	44.84	54.00	-9.16	31.29	9.67	38.50	34.62	12	150	Average	HORIZONTAL
2	11491.14	57.42	74.00	-16.58	43.87	9.67	38.50	34.62	12	150	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11489.67	43.90	54.00	-10.10	30.35	9.67	38.50	34.62	229	150	Average	VERTICAL
2	11491.54	57.85	74.00	-16.15	44.30	9.67	38.50	34.62	229	150	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 157 / Ant. 1
Test Date	Dec. 09, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11570.36	48.04	54.00	-5.96	34.45	9.71	38.53	34.65	7	114	Average	HORIZONTAL
2	11570.45	61.65	74.00	-12.35	48.06	9.71	38.53	34.65	7	114	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11569.28	45.69	54.00	-8.31	32.10	9.71	38.53	34.65	327	142	Average	VERTICAL
2	11570.70	59.43	74.00	-14.57	45.84	9.71	38.53	34.65	327	142	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 165 / Ant. 1
Test Date	Dec. 09, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11650.22	47.11	54.00	-6.89	33.49	9.75	38.55	34.68	6	112	Average	HORIZONTAL
2	11650.28	61.27	74.00	-12.73	47.65	9.75	38.55	34.68	6	112	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11648.75	58.96	74.00	-15.04	45.34	9.75	38.55	34.68	336	141	Peak	VERTICAL
2	11649.32	45.49	54.00	-8.51	31.87	9.75	38.55	34.68	336	141	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15531.60	49.35	54.00	-4.65	34.38	11.45	38.16	34.64	277	101	Average	HORIZONTAL
2	15540.04	63.11	74.00	-10.89	48.14	11.45	38.16	34.64	277	101	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15540.76	47.63	54.00	-6.37	32.66	11.45	38.16	34.64	257	100	Average	VERTICAL
2	15543.88	60.95	74.00	-13.05	45.98	11.45	38.16	34.64	257	100	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15598.56	62.55	74.00	-11.45	47.52	11.48	38.23	34.68	278	117	Peak	HORIZONTAL
2	15601.84	49.84	54.00	-4.16	34.73	11.50	38.29	34.68	278	117	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15595.56	61.87	74.00	-12.13	46.84	11.48	38.23	34.68	281	100	Peak	VERTICAL
2	15598.64	48.76	54.00	-5.24	33.73	11.48	38.23	34.68	281	100	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15720.00	64.57	74.00	-9.43	49.40	11.56	38.42	34.81	277	110	Peak	HORIZONTAL
2	15723.64	49.63	54.00	-4.37	34.46	11.56	38.42	34.81	277	110	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15718.88	61.81	74.00	-12.19	46.64	11.56	38.42	34.81	284	100	Peak	VERTICAL
2	15723.56	48.65	54.00	-5.35	33.48	11.56	38.42	34.81	284	100	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11491.68	43.18	54.00	-10.82	29.63	9.67	38.50	34.62	244	100	Average	HORIZONTAL
2	11495.32	56.08	74.00	-17.92	42.53	9.67	38.50	34.62	244	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11488.32	41.15	54.00	-12.85	27.60	9.67	38.50	34.62	221	100	Average	VERTICAL
2	11499.44	53.96	74.00	-20.04	40.41	9.67	38.50	34.62	221	100	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11560.12	45.82	54.00	-8.18	32.23	9.71	38.53	34.65	221	100	Average	HORIZONTAL
2	11561.80	58.80	74.00	-15.20	45.21	9.71	38.53	34.65	221	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11573.60	57.95	74.00	-16.05	44.36	9.71	38.53	34.65	221	102	Peak	VERTICAL
2	11573.80	44.96	54.00	-9.04	31.37	9.71	38.53	34.65	221	102	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11640.44	55.20	74.00	-18.80	41.58	9.75	38.55	34.68	254	100	Peak	HORIZONTAL
2	11657.84	43.90	54.00	-10.10	30.24	9.77	38.57	34.68	254	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11653.32	54.79	74.00	-19.21	41.13	9.77	38.57	34.68	274	100	Peak	VERTICAL
2	11659.92	42.14	54.00	-11.86	28.48	9.77	38.57	34.68	274	100	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15560.92	46.33	54.00	-7.67	31.30	11.48	38.23	34.68	304	100	Average	HORIZONTAL
2	15572.92	59.43	74.00	-14.57	44.40	11.48	38.23	34.68	304	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15564.96	46.19	54.00	-7.81	31.16	11.48	38.23	34.68	273	100	Average	VERTICAL
2	15569.68	59.19	74.00	-14.81	44.16	11.48	38.23	34.68	273	100	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15693.04	61.61	74.00	-12.39	46.40	11.56	38.42	34.77	276	102	Peak	HORIZONTAL
2	15698.80	48.99	54.00	-5.01	33.78	11.56	38.42	34.77	276	102	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15680.56	61.21	74.00	-12.79	46.10	11.53	38.35	34.77	277	100	Peak	VERTICAL
2	15696.92	48.24	54.00	-5.76	33.03	11.56	38.42	34.77	277	100	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11500.16	54.18	74.00	-19.82	40.63	9.67	38.50	34.62	272	100	Peak	HORIZONTAL
2	11517.28	40.53	54.00	-13.47	26.96	9.69	38.51	34.63	272	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11517.76	40.38	54.00	-13.62	26.81	9.69	38.51	34.63	256	100	Average	VERTICAL
2	11519.88	53.53	74.00	-20.47	39.96	9.69	38.51	34.63	256	100	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11597.68	55.02	74.00	-18.98	41.41	9.73	38.54	34.66	231	100	Peak	HORIZONTAL
2	11599.28	41.70	54.00	-12.30	28.09	9.73	38.54	34.66	231	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11593.68	54.21	74.00	-19.79	40.60	9.73	38.54	34.66	270	100	Peak	VERTICAL
2	11598.60	41.45	54.00	-12.55	27.84	9.73	38.54	34.66	270	100	Average	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15622.08	46.05	54.00	-7.95	30.99	11.50	38.29	34.73	243	100	Average	HORIZONTAL
2	15624.44	59.24	74.00	-14.76	44.18	11.50	38.29	34.73	243	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	15626.44	45.90	54.00	-8.10	30.84	11.50	38.29	34.73	228	100	Average	VERTICAL
2	15632.08	58.80	74.00	-15.20	43.74	11.50	38.29	34.73	228	100	Peak	VERTICAL

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11548.24	40.61	54.00	-13.39	27.06	9.69	38.51	34.65	262	100	Average	HORIZONTAL
2	11550.92	53.46	74.00	-20.54	39.87	9.71	38.53	34.65	262	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11542.76	54.45	74.00	-19.55	40.88	9.69	38.51	34.63	288	100	Peak	VERTICAL
2	11545.64	40.60	54.00	-13.40	27.03	9.69	38.51	34.63	288	100	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: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

4.7.2. 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

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

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 36, 40, 48 / Ant. 1
Test Date	Dec. 08, 2015		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5149.20	69.83	74.00	-4.17	64.88	6.11	33.31	34.47	241	100	Peak	HORIZONTAL
2	5150.00	53.95	54.00	-0.05	49.00	6.11	33.31	34.47	241	100	Average	HORIZONTAL
3	5178.20	110.00			104.95	6.17	33.35	34.47	241	100	Peak	HORIZONTAL
4	5183.00	99.05			94.00	6.17	33.35	34.47	241	100	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5149.60	68.17	74.00	-5.83	63.22	6.11	33.31	34.47	241	102	Peak	HORIZONTAL
2	5150.00	53.92	54.00	-0.08	48.97	6.11	33.31	34.47	241	102	Average	HORIZONTAL
3	5196.80	102.71			97.60	6.20	33.38	34.47	241	102	Average	HORIZONTAL
4	5203.60	113.44			108.27	6.24	33.40	34.47	241	102	Peak	HORIZONTAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4806.00	45.99	54.00	-8.01	41.51	6.21	32.80	34.53	240	100	Average	HORIZONTAL
2	4970.00	58.77	74.00	-15.23	54.34	5.85	33.06	34.48	240	100	Peak	HORIZONTAL
3	5242.00	112.43			107.14	6.32	33.44	34.47	240	100	Peak	HORIZONTAL
4	5244.00	102.01			96.72	6.32	33.44	34.47	240	100	Average	HORIZONTAL
5	5460.00	48.21	54.00	-5.79	42.15	6.79	33.74	34.47	240	100	Average	HORIZONTAL
6	5466.00	60.20	74.00	-13.80	54.09	6.82	33.76	34.47	240	100	Peak	HORIZONTAL

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

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11a CH 149, 157, 165 / Ant. 1
Test Date	Dec. 08, 2015 / Dec. 09, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5714.80	68.39	74.00	-5.61	61.95	6.50	34.45	34.51	190	100	Peak	HORIZONTAL
2	5715.00	53.53	54.00	-0.47	47.09	6.50	34.45	34.51	190	100	Average	HORIZONTAL
3	5723.60	77.49	78.20	-0.71	71.07	6.43	34.50	34.51	190	100	Peak	HORIZONTAL
4	5742.00	98.82			92.43	6.36	34.55	34.52	190	100	Average	HORIZONTAL
5	5743.40	109.73			103.34	6.36	34.55	34.52	190	100	Peak	HORIZONTAL

Item 4, 5 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5713.60	64.60	68.20	-3.60	58.16	6.50	34.45	34.51	190	100	Peak	HORIZONTAL
2	5723.80	67.16	78.20	-11.04	60.74	6.43	34.50	34.51	190	100	Peak	HORIZONTAL
3	5777.80	102.29			95.95	6.22	34.65	34.53	190	100	Average	HORIZONTAL
4	5788.60	113.63			107.29	6.22	34.65	34.53	190	100	Peak	HORIZONTAL
5	5852.80	62.95	78.20	-15.25	56.25	6.39	34.85	34.54	190	100	Peak	HORIZONTAL
6	5863.00	61.64	68.20	-6.56	54.81	6.47	34.90	34.54	190	100	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5785 MHz.

Channel 165

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5821.60	100.06			93.62	6.23	34.75	34.54	182	100	Average	HORIZONTAL
2	5823.20	110.93			104.36	6.31	34.80	34.54	182	100	Peak	HORIZONTAL
3	5850.80	72.24	78.20	-5.96	65.54	6.39	34.85	34.54	182	100	Peak	HORIZONTAL
4	5860.00	68.11	68.20	-0.09	61.28	6.47	34.90	34.54	182	100	Peak	HORIZONTAL

Item 1, 2 are the fundamental frequency at 5825 MHz.

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Ant. 1 + Ant. 2
Test Date	Dec. 09, 2015		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5148.40	53.92	54.00	-0.08	48.97	6.11	33.31	34.47	311	101	Average	HORIZONTAL
2	5149.40	69.18	74.00	-4.82	64.23	6.11	33.31	34.47	311	101	Peak	HORIZONTAL
3	5186.40	113.70			108.65	6.17	33.35	34.47	311	101	Peak	HORIZONTAL
4	5187.80	104.07			98.96	6.20	33.38	34.47	311	101	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	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5149.20	67.86	74.00	-6.14	62.91	6.11	33.31	34.47	347	102	Peak	HORIZONTAL
2	5149.60	53.75	54.00	-0.25	48.80	6.11	33.31	34.47	347	102	Average	HORIZONTAL
3	5208.00	114.98			109.81	6.24	33.40	34.47	347	102	Peak	HORIZONTAL
4	5208.00	105.66			100.49	6.24	33.40	34.47	347	102	Average	HORIZONTAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5138.00	58.51	74.00	-15.49	53.62	6.07	33.29	34.47	277	100	Peak	HORIZONTAL
2	5139.20	45.15	54.00	-8.85	40.26	6.07	33.29	34.47	277	100	Average	HORIZONTAL
3	5231.60	113.83			108.60	6.28	33.42	34.47	277	100	Peak	HORIZONTAL
4	5231.60	105.68			100.45	6.28	33.42	34.47	277	100	Average	HORIZONTAL
5	5360.00	59.53	74.00	-14.47	53.77	6.62	33.61	34.47	277	100	Peak	HORIZONTAL
6	5363.60	46.82	54.00	-7.18	41.06	6.62	33.61	34.47	277	100	Average	HORIZONTAL

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

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 149, 157, 165 / Ant. 1 + Ant. 2
Test Date	Dec. 09, 2015		

Channel 149

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5713.60	63.31	68.20	-4.89	56.87	6.50	34.45	34.51	229	101	Peak	HORIZONTAL
2	5722.80	77.73	78.20	-0.47	71.31	6.43	34.50	34.51	229	101	Peak	HORIZONTAL
3	5737.60	100.31			93.90	6.43	34.50	34.52	229	101	Average	HORIZONTAL
4	5739.60	110.55			104.16	6.36	34.55	34.52	229	101	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5709.00	59.79	68.20	-8.41	53.35	6.50	34.45	34.51	182	100	Peak	HORIZONTAL
2	5725.00	62.74	78.20	-15.46	56.32	6.43	34.50	34.51	182	100	Peak	HORIZONTAL
3	5777.00	105.01			98.67	6.22	34.65	34.53	182	100	Average	HORIZONTAL
4	5777.80	114.26			107.92	6.22	34.65	34.53	182	100	Peak	HORIZONTAL
5	5859.00	60.98	78.20	-17.22	54.15	6.47	34.90	34.54	182	100	Peak	HORIZONTAL
6	5865.40	60.59	68.20	-7.61	53.76	6.47	34.90	34.54	182	100	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5785 MHz.

Channel 165

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5831.60	111.21			104.64	6.31	34.80	34.54	170	111	Peak	HORIZONTAL
2	5832.60	101.56			94.99	6.31	34.80	34.54	170	111	Average	HORIZONTAL
3	5850.20	77.87	78.20	-0.33	71.17	6.39	34.85	34.54	170	111	Peak	HORIZONTAL
4	5868.20	62.17	68.20	-6.03	55.34	6.47	34.90	34.54	170	111	Peak	HORIZONTAL

Item 1, 2 are the fundamental frequency at 5825 MHz.

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Ant. 1 + Ant. 2
Test Date	Dec. 09, 2015		

Channel 38

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5144.00	53.97	54.00	-0.03	49.02	6.11	33.31	34.47	349	100	Average	HORIZONTAL
2	5144.80	65.80	74.00	-8.20	60.85	6.11	33.31	34.47	349	100	Peak	HORIZONTAL
3	5174.80	104.71			99.66	6.17	33.35	34.47	349	100	Peak	HORIZONTAL
4	5174.80	96.41			91.36	6.17	33.35	34.47	349	100	Average	HORIZONTAL

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

Channel 46

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5137.60	62.61	74.00	-11.39	57.72	6.07	33.29	34.47	283	122	Peak	HORIZONTAL
2	5150.00	51.84	54.00	-2.16	46.89	6.11	33.31	34.47	283	122	Average	HORIZONTAL
3	5225.80	102.86			97.63	6.28	33.42	34.47	283	122	Average	HORIZONTAL
4	5226.40	111.35			106.12	6.28	33.42	34.47	283	122	Peak	HORIZONTAL

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

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 151, 159 / Ant. 1 + Ant. 2
Test Date	Dec. 09, 2015 / Dec. 10, 2015		

Channel 151

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5710.20	70.83	74.00	-3.17	64.39	6.50	34.45	34.51	169	108	Peak	HORIZONTAL
2	5715.00	53.89	54.00	-0.11	47.45	6.50	34.45	34.51	169	108	Average	HORIZONTAL
3	5725.00	73.06	78.20	-5.14	66.64	6.43	34.50	34.51	169	108	Peak	HORIZONTAL
4	5752.60	95.87			89.48	6.36	34.55	34.52	169	108	Average	HORIZONTAL
5	5753.80	104.91			98.52	6.36	34.55	34.52	169	108	Peak	HORIZONTAL

Item 4, 5 are the fundamental frequency at 5755 MHz.

Channel 159

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5713.20	66.99	74.00	-7.01	60.55	6.50	34.45	34.51	214	109	Peak	HORIZONTAL
2	5715.00	51.77	54.00	-2.23	45.33	6.50	34.45	34.51	214	109	Average	HORIZONTAL
3	5725.00	70.93	78.20	-7.27	64.51	6.43	34.50	34.51	214	109	Peak	HORIZONTAL
4	5790.20	100.79			94.47	6.15	34.70	34.53	214	109	Average	HORIZONTAL
5	5791.40	110.36			104.04	6.15	34.70	34.53	214	109	Peak	HORIZONTAL
6	5852.60	77.91	78.20	-0.29	71.21	6.39	34.85	34.54	214	109	Peak	HORIZONTAL
7	5860.00	70.16	74.00	-3.84	63.33	6.47	34.90	34.54	214	109	Peak	HORIZONTAL
8	5861.60	53.50	54.00	-0.50	46.67	6.47	34.90	34.54	214	109	Average	HORIZONTAL

Item 4, 5 are the fundamental frequency at 5795 MHz.

Temperature	24°C	Humidity	41%
Test Engineer	Paul Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42, 155 / Ant. 1 + Ant. 2
Test Date	Dec. 10, 2015		

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5147.00	69.94	74.00	-4.06	64.99	6.11	33.31	34.47	265	103	Peak	HORIZONTAL
2	5150.00	53.90	54.00	-0.10	48.95	6.11	33.31	34.47	265	103	Average	HORIZONTAL
3	5239.00	94.16			88.87	6.32	33.44	34.47	265	103	Average	HORIZONTAL
4	5240.00	103.36			98.07	6.32	33.44	34.47	265	103	Peak	HORIZONTAL
5	5350.00	59.16	74.00	-14.84	53.46	6.58	33.59	34.47	265	103	Peak	HORIZONTAL
6	5359.00	48.10	54.00	-5.90	42.34	6.62	33.61	34.47	265	103	Average	HORIZONTAL

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

Channel 155

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	5709.00	67.83	68.20	-0.37	61.39	6.50	34.45	34.51	309	101	Peak	HORIZONTAL
2	5718.00	71.36	78.20	-6.84	64.92	6.50	34.45	34.51	309	101	Peak	HORIZONTAL
3	5765.00	91.51			85.15	6.29	34.60	34.53	309	101	Average	HORIZONTAL
4	5766.00	100.61			94.25	6.29	34.60	34.53	309	101	Peak	HORIZONTAL
5	5853.00	66.32	78.20	-11.88	59.62	6.39	34.85	34.54	309	101	Peak	HORIZONTAL
6	5867.00	65.54	68.20	-2.66	58.71	6.47	34.90	34.54	309	101	Peak	HORIZONTAL

Item 3, 4 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

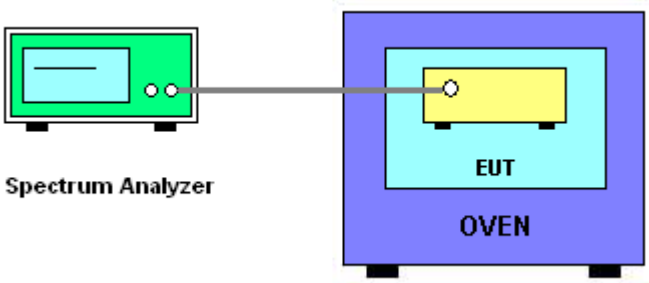
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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. 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	24℃	Humidity	60%
Test Engineer	Clemens Fang	Test Date	Dec. 17, 2015

Mode: 20 MHz / Ant. 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5199.9669	5199.9655	5199.9637	5199.9616
110.00	5199.9657	5199.9644	5199.9628	5199.9609
93.50	5199.9643	5199.9632	5199.9620	5199.9598
Max. Deviation (MHz)	0.0357	0.0368	0.0380	0.0402
Max. Deviation (ppm)	6.87	7.08	7.31	7.73
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(℃)	5200 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5199.9682	5199.9670	5199.9651	5199.9629
10	5199.9669	5199.9656	5199.9641	5199.9623
20	5199.9657	5199.9644	5199.9628	5199.9609
30	5199.9643	5199.9632	5199.9618	5199.9602
40	5199.9627	5199.9612	5199.9596	5199.9576
Max. Deviation (MHz)	0.0390	0.0402	0.0417	0.0444
Max. Deviation (ppm)	7.50	7.73	8.02	8.54
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5784.9604	5784.9590	5784.9572	5784.9551
110.00	5784.9592	5784.9579	5784.9563	5784.9544
93.50	5784.9578	5784.9567	5784.9555	5784.9533
Max. Deviation (MHz)	0.0422	0.0433	0.0445	0.0467
Max. Deviation (ppm)	7.30	7.49	7.69	8.07
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5785 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5784.9617	5784.9605	5784.9586	5784.9564
10	5784.9604	5784.9591	5784.9576	5784.9558
20	5784.9592	5784.9579	5784.9563	5784.9544
30	5784.9578	5784.9567	5784.9553	5784.9537
40	5784.9562	5784.9547	5784.9531	5784.9511
Max. Deviation (MHz)	0.0455	0.0467	0.0482	0.0509
Max. Deviation (ppm)	7.87	8.07	8.33	8.80
Result	Complies			

Mode: 40 MHz / Ant. 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5189.9660	5189.9646	5189.9628	5189.9607
110.00	5189.9648	5189.9635	5189.9619	5189.9600
93.50	5189.9634	5189.9623	5189.9611	5189.9589
Max. Deviation (MHz)	0.0366	0.0377	0.0389	0.0411
Max. Deviation (ppm)	7.05	7.26	7.49	7.91
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5190 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5189.9673	5189.9661	5189.9642	5189.9620
10	5189.9660	5189.9647	5189.9632	5189.9614
20	5189.9648	5189.9635	5189.9619	5189.9600
30	5189.9634	5189.9623	5189.9609	5189.9593
40	5189.9618	5189.9603	5189.9587	5189.9567
Max. Deviation (MHz)	0.0399	0.0411	0.0426	0.0453
Max. Deviation (ppm)	7.68	7.91	8.20	8.72
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5754.9608	5754.9594	5754.9576	5754.9555
110.00	5754.9596	5754.9583	5754.9567	5754.9548
93.50	5754.9582	5754.9571	5754.9559	5754.9537
Max. Deviation (MHz)	0.0418	0.0429	0.0441	0.0463
Max. Deviation (ppm)	7.26	7.45	7.66	8.04
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5755 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5754.9621	5754.9609	5754.9590	5754.9568
10	5754.9608	5754.9595	5754.9580	5754.9562
20	5754.9596	5754.9583	5754.9567	5754.9548
30	5754.9582	5754.9571	5754.9557	5754.9541
40	5754.9566	5754.9551	5754.9535	5754.9515
Max. Deviation (MHz)	0.0451	0.0463	0.0478	0.0505
Max. Deviation (ppm)	7.83	8.04	8.30	8.77
Result	Complies			

Mode: 80 MHz / Ant. 2

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5209.9656	5209.9642	5209.9624	5209.9603
110.00	5209.9644	5209.9631	5209.9615	5209.9596
93.50	5209.9630	5209.9619	5209.9607	5209.9585
Max. Deviation (MHz)	0.0370	0.0381	0.0393	0.0415
Max. Deviation (ppm)	7.10	7.31	7.54	7.97
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5210 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5209.9669	5209.9657	5209.9638	5209.9616
10	5209.9656	5209.9643	5209.9628	5209.9610
20	5209.9644	5209.9631	5209.9615	5209.9596
30	5209.9630	5209.9619	5209.9605	5209.9589
40	5209.9614	5209.9599	5209.9583	5209.9563
Max. Deviation (MHz)	0.0403	0.0415	0.0430	0.0457
Max. Deviation (ppm)	7.74	7.97	8.25	8.77
Result	Complies			

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)			
(V)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
126.50	5774.9608	5774.9594	5774.9576	5774.9555
110.00	5774.9596	5774.9583	5774.9567	5774.9548
93.50	5774.9582	5774.9571	5774.9559	5774.9537
Max. Deviation (MHz)	0.0418	0.0429	0.0441	0.0463
Max. Deviation (ppm)	7.23	7.43	7.63	8.01
Result	Complies			

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)			
(°C)	5775 MHz			
	0 Minute	2 Minute	5 Minute	10 Minute
0	5774.9621	5774.9609	5774.9590	5774.9568
10	5774.9608	5774.9595	5774.9580	5774.9562
20	5774.9596	5774.9583	5774.9567	5774.9548
30	5774.9582	5774.9571	5774.9557	5774.9541
40	5774.9566	5774.9551	5774.9535	5774.9515
Max. Deviation (MHz)	0.0451	0.0463	0.0478	0.0505
Max. Deviation (ppm)	7.81	8.01	8.27	8.74
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
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 16, 2015	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 13, 2015	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	Jan. 13, 2015	Conduction (CO02-CB)
COND Cable	Woken	Cable	01	0.15MHz ~ 30MHz	Dec. 01, 2015	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO02-CB)
Pulse Limiter	Schwarzbeck	VTSD 9561F	9561-F073	9kHz ~ 30MHz	Sep. 30, 2015	Conduction (CO02-CB)
BILOG ANTENNA	Schaffner	CBL6112D	37880	20MHz ~ 2GHz	Sep. 03, 2015	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	Feb. 24, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Feb.10, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 21, 2015	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)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 12, 2015*	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Conducted (TH01-CB)

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

"*" 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%