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FCC RADIO TEST REPORT

Applicant's company	**ASUSTeK COMPUTER INC.**
Applicant Address	4F, No. 150, Li-Te Rd., Peitou, Taipei 112, Taiwan
FCC ID	**MSQ-RTAC68UV2**
Manufacturer's company (1)	**Compal Networking (KunShan) Co., LTD.**
Manufacturer Address	No. 520, Nabbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China
Manufacturer's company (2)	**Askey Technology (Jiangsu) Ltd.**
Manufacturer Address	1388, Jiao Tong Road, Wujiang Economic Technological Development Area, Jiang Su Province, P.R.C

Product Name	Wireless-AC1900 Dual Band Gigabit Router
Brand Name	ASUS
Model No.	RT-AC68U, RT-AC68R, RT-AC68W, RT-AC68P, TM-AC1900, RT-AC1900, RT-AC68U V2, RT-AC1900P
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Dec. 04, 2014
Final Test Date	Mar. 24, 2016
Submission Type	Class II Change
Operating Mode	Master

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 v01r01, 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
FR3D0426-07AB	Rev. 01	Initial issue of report	Mar. 25, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	Wireless-AC1900 Dual Band Gigabit Router
Brand Name	:	ASUS
Model No.	:	RT-AC68U, RT-AC68R, RT-AC68W, RT-AC68P, TM-AC1900, RT-AC1900, RT-AC68U V2, RT-AC1900P
Applicant	:	ASUSTeK COMPUTER INC.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Dec. 04, 2014 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	11.47 dB
4.2	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	6.21 dB
4.4	15.407(a)	Power Spectral Density	Complies	6.58 dB
4.5	15.407(b)	Radiated Emissions	Complies	1.42 dB
4.6	15.407(b)	Band Edge Emissions	Complies	0.85 dB
4.7	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n/ac

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	see the below table for IEEE 802.11n/ac
Data Modulation	For 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) For 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n/ac
Frequency Range	5150 ~ 5250MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	For non-beamforming function: 802.11ac MCS0/Nss1 (VHT40): 36.47 MHz ; 802.11ac MCS0/Nss1 (VHT80): 75.54 MHz For beamforming function: 802.11ac MCS0/Nss1 (VHT20): 17.89 MHz ;
Maximum Conducted Output Power	For non-beamforming function: 802.11ac MCS0/Nss1 (VHT40): 18.61 dBm ; 802.11ac MCS0/Nss1 (VHT80): 16.50 dBm For beamforming function: 802.11ac MCS0/Nss1 (VHT20): 20.98 dBm ;
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11a

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	OFDM for IEEE 802.11a
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	OFDM (6/9/12/18/24/36/48/54)
Frequency Range	5150 ~ 5250MHz
Channel Number	4
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

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

Antenna and Band width

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

IEEE 11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3	MCS0-23
802.11n (HT40)	3	MCS0-23
802.11ac (VHT20)	3	MCS 0-9/Nss1-3
802.11ac (VHT40)	3	MCS 0-9/Nss1-3
802.11ac (VHT80)	3	MCS 0-9/Nss1-3
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT support 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	Rating
Adapter 1	PIE	AD890326	Input: 100-240V ~ 50/60Hz 0.8A Output: 19V, 1.75A
Adapter 2	Delta	ADP-33AW B	Input: 100-240V ~ 1A 50-60Hz Output: 19V, 1.75A
Other			
RJ-45 cable*1: Shielded, 1.5m			

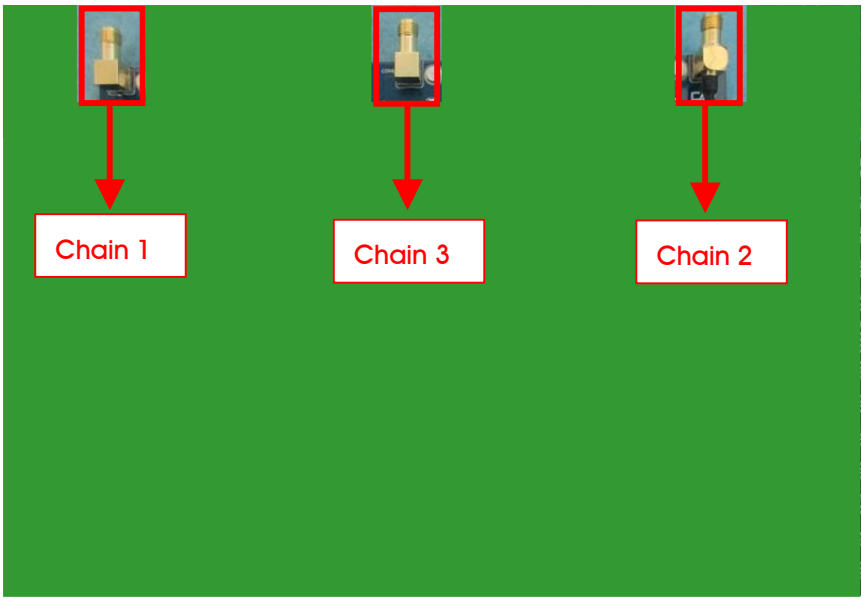
3.3. Table for Filed Antenna

Set	Brand	P/N	Antenna Type	Connector	Gain (dBi)		
					2.4GHz	5GHz	
						Band 1	Band 4
1	PSA	RFDPA141000SBLB802	Dipole Antenna	Reverse SMA	1.91	4.04	3.94
2	M.gear	C660-510333-A	Dipole	Reverse SMA	1.51	2.76	3.29
3	PSA	RFDPA161300SBLB803	Dipole	Reverse SMA	1.61	2.63	3.47

Note: The EUT has three set of antenna and each set has three antennas.

Because above antenna are the same type antennas, only the higher gain antenna "Set 1" was tested.

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



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

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

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

For 80MHz bandwidth systems, use Channel 42.

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

3.5. Table for Test Modes

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

Test Items	Mode		Data Rate	Channel	Chain
AC Power Conducted Emission	CTX		-	-	-
Max. Conducted Output Power	For Non-Beamforming Mode				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	For Beamforming Mode				
	11ac VHT20	Band 1	MCS0/Nss1	48	1+2+3
Power Spectral Density	For Non-Beamforming Mode				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	For Beamforming Mode				
	11ac VHT20	Band 1	MCS0/Nss1	48	1+2+3
26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement	For Non-Beamforming Mode				
	11ac VHT40	Band 1	MCS0/Nss1	38	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	For Beamforming Mode				
	11ac VHT20	Band 1	MCS0/Nss1	48	1+2+3
Radiated Emission Below 1GHz	CTX		-	-	-
Radiated Emission Above 1GHz and Band Edge Emission	For Non-Beamforming Mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3
	11a/BPSK	Band 1	6Mbps	36/40/48	1+2+3
	For Beamforming Mode				
	11ac VHT20	Band 1	MCS0/Nss1	36/40/48	1+2+3
	11ac VHT40	Band 1	MCS0/Nss1	38/46	1+2+3
	11ac VHT80	Band 1	MCS0/Nss1	42	1+2+3

Note: 1.VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.

2.The EUT has non-beamforming function and beamforming function for 802.11n/ac. They were verified for all tests, and all test results were recorded in the report.

The following test modes were performed for all tests:

For AC Power Line Conducted Emissions and Radiated Emissions Below 1GHz test:

Mode 1. EUT Y axis CTX - 2.4GHz with Adapter 1

Mode 2. EUT Y axis CTX - 5GHz with Adapter 1

Mode 2 has been evaluated to be the worst case between Mode 1~2, thus measurement for Mode 3 will follow this same test mode.

Mode 3. EUT Y axis CTX - 5GHz with Adapter 2

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

For Radiated Emissions Above 1GHz test:

Mode 1. EUT Y axis CTX

For Co-location MPE:

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to FA3D0426-07) test is added for simultaneously transmits between 2.4GHz WLAN function and 5GHz WLAN function.

3.6. Table for Testing Locations

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

The EUT has eight model names, which are identical to each other in all aspects except for the following table:

Brand Name	Model Name	Description
ASUS	RT-AC68U	All the models are identical; the different model numbers served as marketing strategy.
	RT-AC68R	
	RT-AC68W	
	RT-AC68P	
	TM-AC1900	
	RT-AC1900	
	RT-AC68U V2	
	RT-AC1900P	

From the above models, model: RT-AC68U was selected as representative model for the test and its data was recorded in this report.

3.8. Table for SKU information

SKU 3 information			
Vendor	LAN port transformer (Model No.)	WAN port transformer (Model No.)	Spec
NET SWAPN(FCE)	FCE_NS773602	FCE_NS771802	DIP 10/100/1000 BASE-T

3.9. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR3D0426AA

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

Modifications	Performance Checking
1. Adding two sets of same type antenna (dipole antenna) with lower gain: Brand: M.gear, P/N: C660-510333-A. Brand: PSA, P/N: RFDPA161300SBLB803. 2. Adding two model names: RT-AC68U V2 and RT-AC1900P.	Original and additional antennas have similar in-band and out-of-band characteristics, so it is not necessary to re-test all test items.
3. Changing the adapters to model: AD890326 and ADP-33AW B. (1) For model: AD890326, the adapter updates to LV6 from LV5 but the model name remains the same. 4. Changing the CPU clock from external oscillator to external crystal. 5. Adding TVS at power connector. 6. Changing the type of LED on/off button. 7. CPU from 1.0GHz to 1.4GHz.	AC Power Line Conducted Emissions Radiated Emissions Below 1GHz
8. Changing Low Noise Amplifier for 2.4GHz and 5GHz.	Radiated Emissions Above 1GHz Band Edge Emissions

Note: 1.Above changes made are the SKU 3 of the EUT.

2.For item 8 the above test items will be based on original output power to re-test.

3.For item 8 configuration IEEE 802.11ac MCS0/Nss1 VHT40 CH38, 11ac MCS0/Nss1 VHT80 CH42 (for non-beamforming Mode) and 11ac 802.11ac MCS0/Nss1 VHT20 CH48 (for beamforming Mode) power reduced due to limitation of Band Edge Emissions, so the 26dB Bandwidth and 99% Occupied Bandwidth Measurement、Maximum Conducted Output Power Measurement and Power Spectral Density Measurement were retested.

3.10. Table for Supporting Units

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
Flash Disk 3.0	ADATA	C103	DoC
Flash Disk	Silicon	I-Series	DoC

For Test Site No: 03CH01-CB (below 1GHz) and 03CH01-CB (above 1GHz) / For non-beamforming function:

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC

For Test Site No:

03CH01-CB (above 1GHz) / For Beamforming function:

Support Unit	Brand	Model	FCC ID
NB*2	DELL	E4300	DoC
WLAN module	Boardcom	BCM943162ZP	QDS-BRCM1075

3.11. Table for Parameters of Test Software Setting

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

For non-beamforming function:

Test Software Version	Mtool 2.0.0.8	
Frequency	5190 MHz	5210 MHz
802.11ac MCS0/Nss1 VHT40	52	-
802.11ac MCS0/Nss1 VHT80	-	46

For beamforming function:

Test Software Version	DOS
Frequency	5240 MHz
802.11ac MCS0/Nss1 VHT20	64

3.12. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

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

The program was executed as follows:

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

3.13. Duty Cycle

For non-beamforming mode:

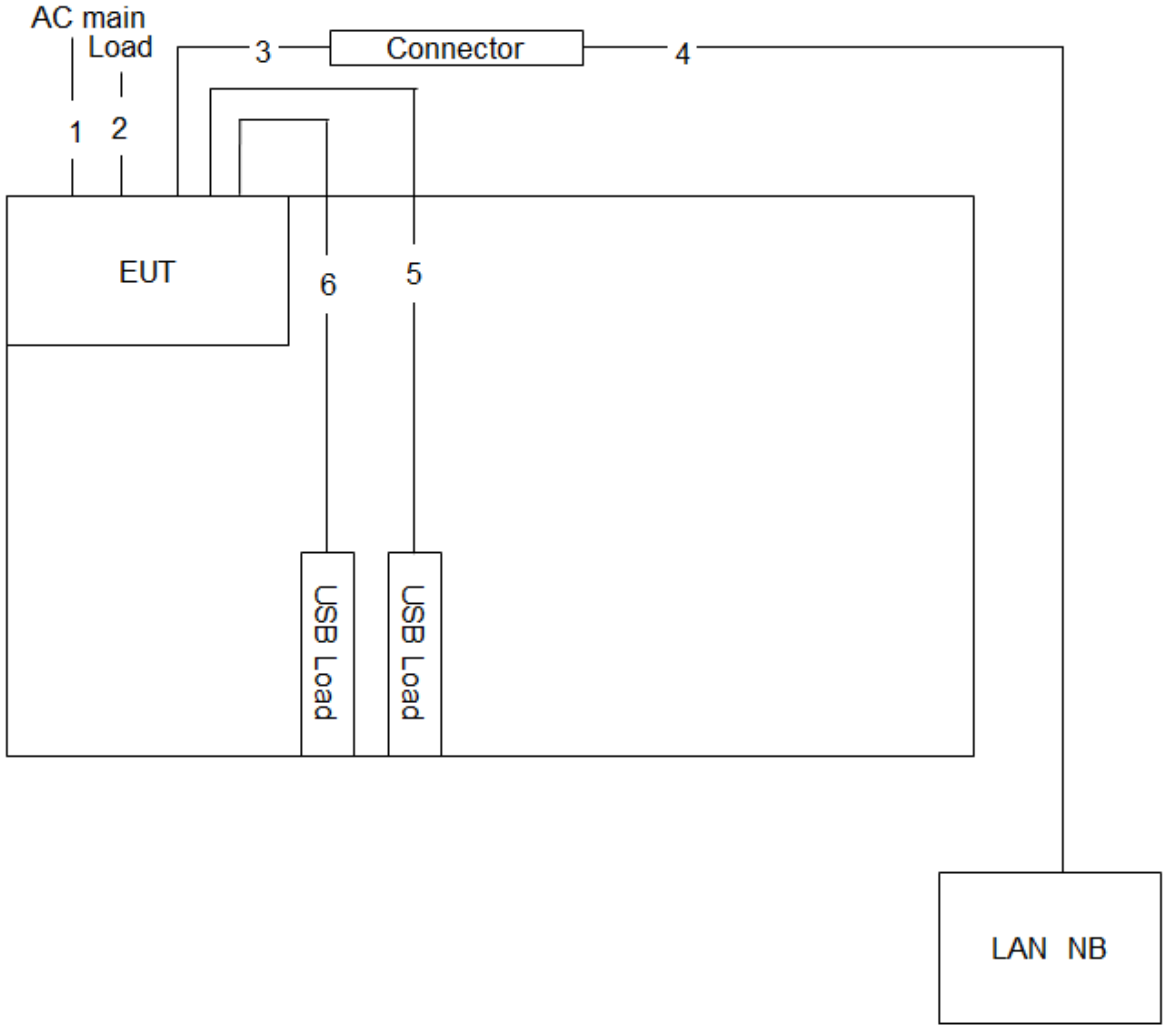
Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11a	2.060	2.100	98.10%	0.08	0.01
802.11ac MCS0/Nss1 VHT20	1.930	1.960	98.47%	0.07	0.01
802.11ac MCS0/Nss1 VHT40	0.950	0.985	96.45%	0.16	1.05
802.11ac MCS0/Nss1 VHT80	0.441	0.493	89.45%	0.48	2.27

For beamforming mode:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	3.725	4.230	88.06%	0.55	0.27
802.11ac MCS0/Nss1 VHT40	3.653	4.038	90.47%	0.44	0.27
802.11ac MCS0/Nss1 VHT80	5.052	5.482	92.15%	0.36	0.20

3.14. Test Configurations

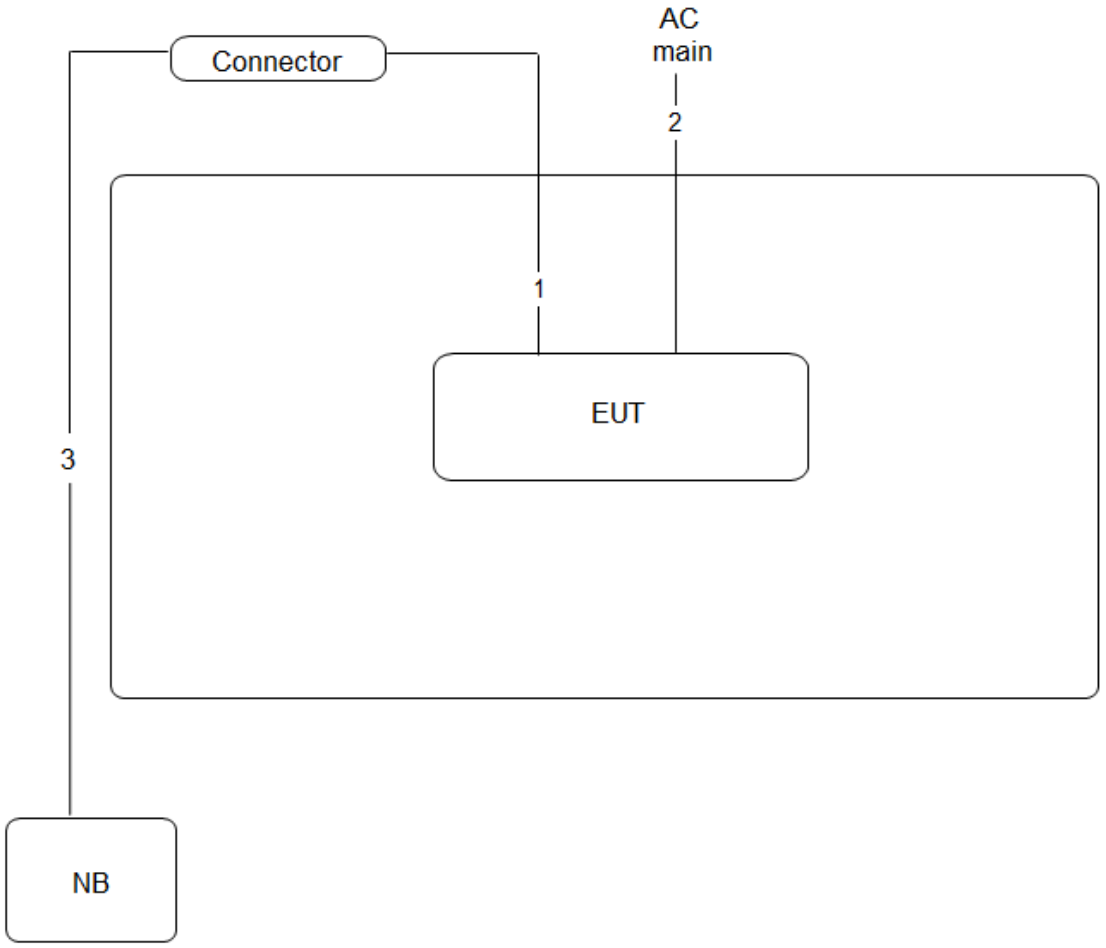
3.14.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	2.2m
2	RJ-45 cable*4	No	1.5m
3	RJ-45 cable	Yes	1.5m
4	RJ-45 cable	Yes	10m
5	USB cable	Yes	1.8m
6	USB cable	Yes	1.8m

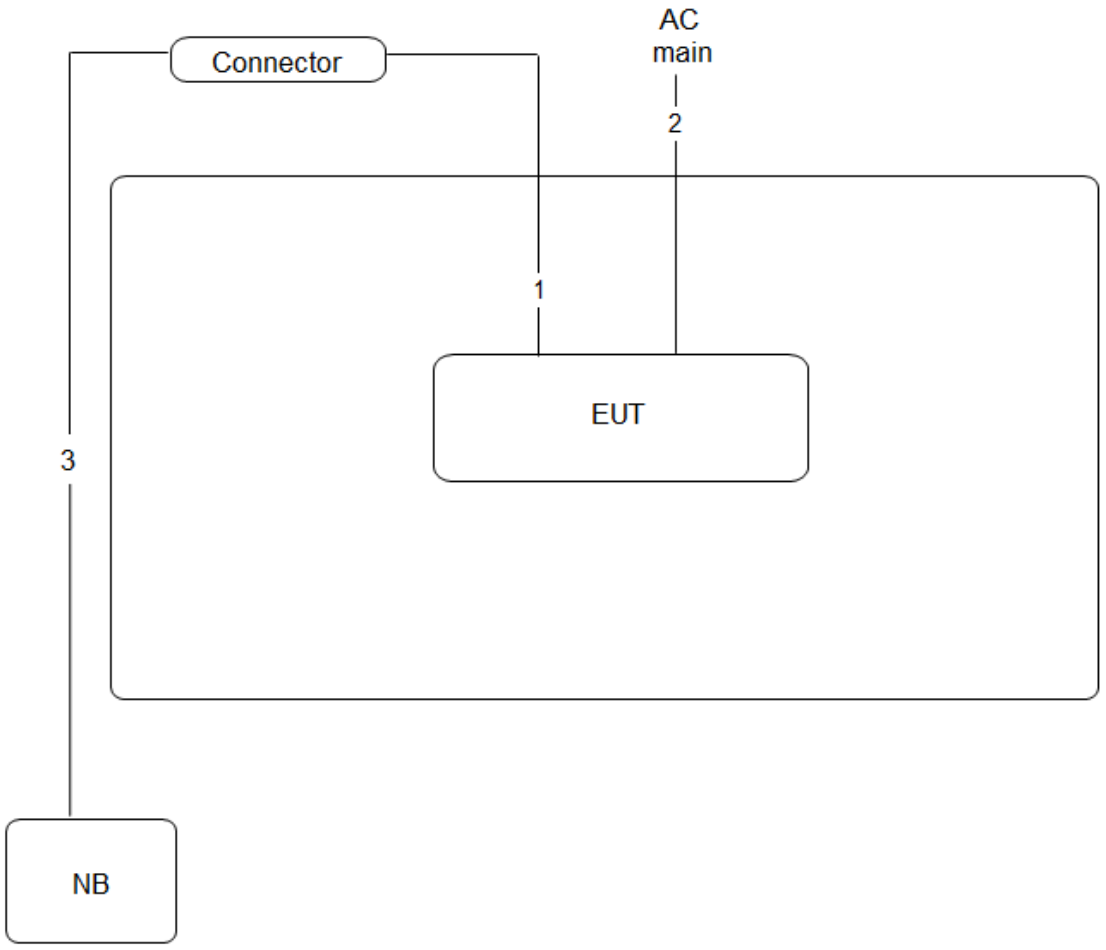
3.14.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



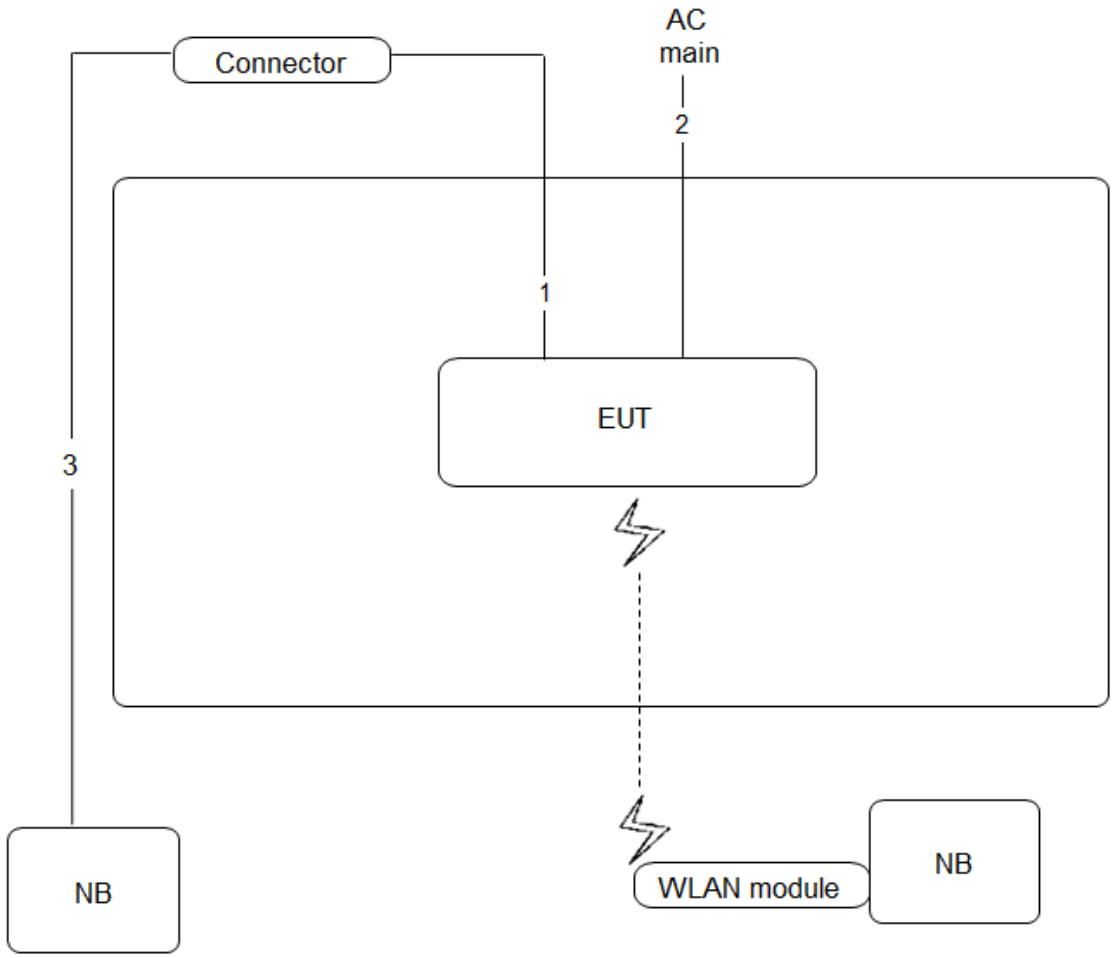
Item	Connection	Shielded	Length
1	RJ-45 cable	Yes	1.5m
2	Power cable	No	2.2m
3	RJ-45 cable	Yes	10m

Test Configuration: above 1GHz / <u>For non-beamforming function:</u>



Item	Connection	Shielded	Length
1	RJ-45 cable	Yes	1.5m
2	Power cable	No	2.2m
3	RJ-45 cable	Yes	10m

Test Configuration: above 1GHz / For beamforming function:



Item	Connection	Shielded	Length
1	RJ-45 cable	Yes	1.5m
2	Power cable	No	2.2m
3	RJ-45 cable	Yes	10m

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

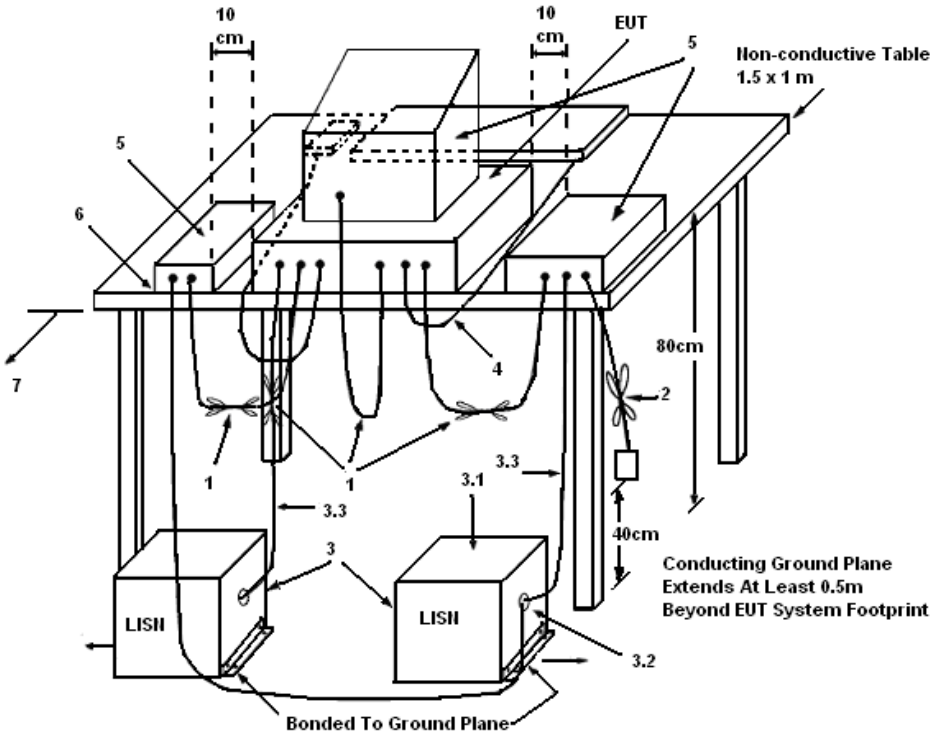
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

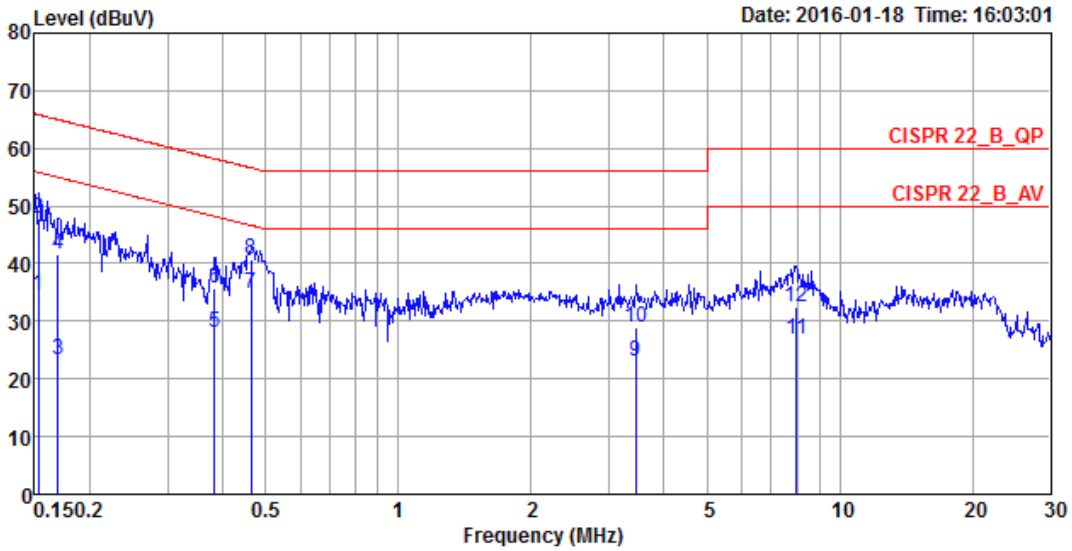
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

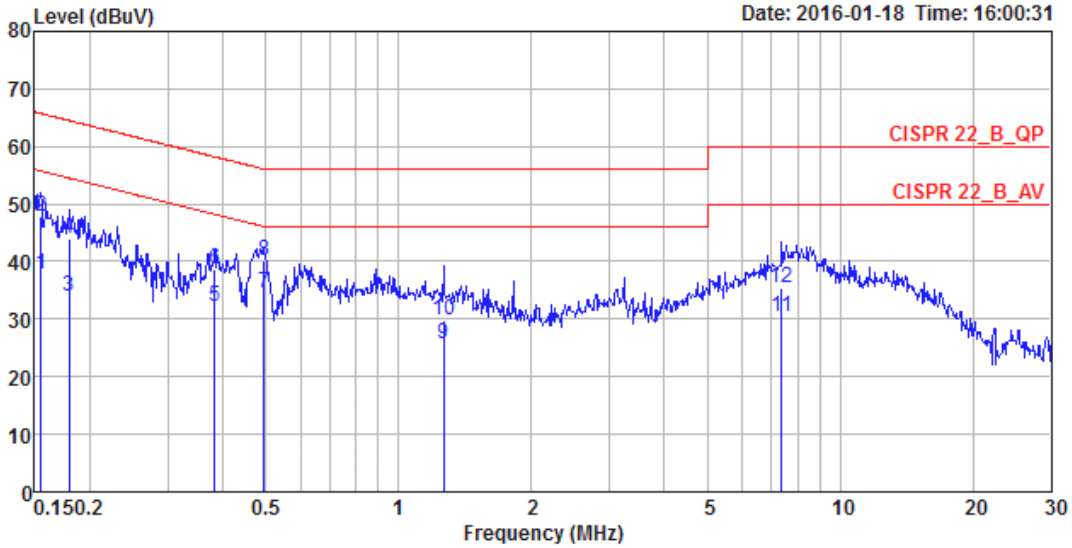
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23°C	Humidity	64%
Test Engineer	Deven Huang	Phase	Line
Configuration	CTX	Test Mode	Mode 2



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1532	34.57	-21.25	55.82	24.62	9.93	0.02	LINE	Average
2	0.1532	47.86	-17.96	65.82	37.91	9.93	0.02	LINE	QP
3	0.1694	23.20	-31.79	54.99	13.25	9.93	0.02	LINE	Average
4	0.1694	41.60	-23.39	64.99	31.65	9.93	0.02	LINE	QP
5	0.3832	28.06	-20.15	48.21	18.09	9.93	0.04	LINE	Average
6	0.3832	35.68	-22.53	58.21	25.71	9.93	0.04	LINE	QP
7	0.4637	34.75	-11.88	46.63	24.78	9.93	0.04	LINE	Average
8	0.4637	40.88	-15.75	56.63	30.91	9.93	0.04	LINE	QP
9	3.4538	23.14	-22.86	46.00	13.07	10.01	0.06	LINE	Average
10	3.4538	28.87	-27.13	56.00	18.80	10.01	0.06	LINE	QP
11	7.9774	26.87	-23.13	50.00	16.56	10.14	0.17	LINE	Average
12	7.9774	32.45	-27.55	60.00	22.14	10.14	0.17	LINE	QP

Temperature	23°C	Humidity	64%
Test Engineer	Deven Huang	Phase	Neutral
Configuration	CTX	Test Mode	Mode 2



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1548	37.70	-18.04	55.74	27.90	9.78	0.02	NEUTRAL	Average
2	0.1548	47.87	-17.87	65.74	38.07	9.78	0.02	NEUTRAL	QP
3	0.1796	33.86	-20.64	54.50	24.05	9.79	0.02	NEUTRAL	Average
4	0.1796	43.95	-20.55	64.50	34.14	9.79	0.02	NEUTRAL	QP
5	0.3832	32.28	-15.93	48.21	22.45	9.79	0.04	NEUTRAL	Average
6	0.3832	38.53	-19.68	58.21	28.70	9.79	0.04	NEUTRAL	QP
7	0.4967	34.58	-11.47	46.05	24.75	9.79	0.04	NEUTRAL	Average
8	0.4967	40.19	-15.86	56.05	30.36	9.79	0.04	NEUTRAL	QP
9	1.2621	25.77	-20.23	46.00	15.90	9.82	0.05	NEUTRAL	Average
10	1.2621	29.70	-26.30	56.00	19.83	9.82	0.05	NEUTRAL	QP
11	7.3680	30.37	-19.63	50.00	20.27	9.96	0.14	NEUTRAL	Average
12	7.3680	35.31	-24.69	60.00	25.21	9.96	0.14	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

4.2.1. Limit

No restriction limits.

4.2.2. Measuring Instruments and Setting

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

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

4.2.3. Test Procedures

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

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

4.2.4. Test Setup Layout

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

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

4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	23°C	Humidity	60%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11ac

For Non-beamforming function

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	39.71	36.47

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
42	5210 MHz	81.45	75.54

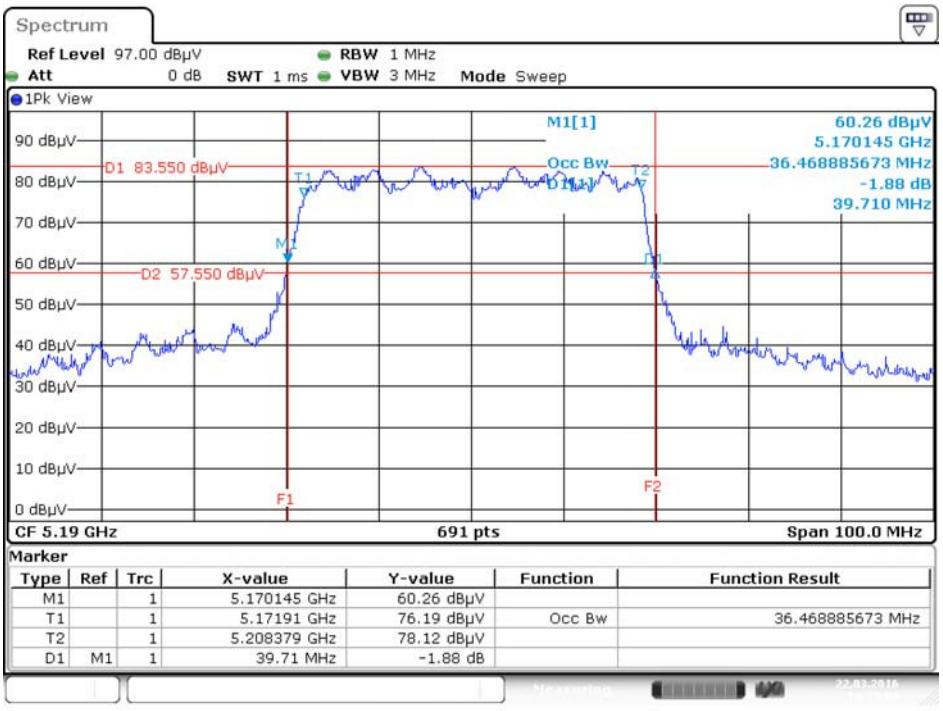
For beamforming function

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

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
48	5240 MHz	20.00	17.89

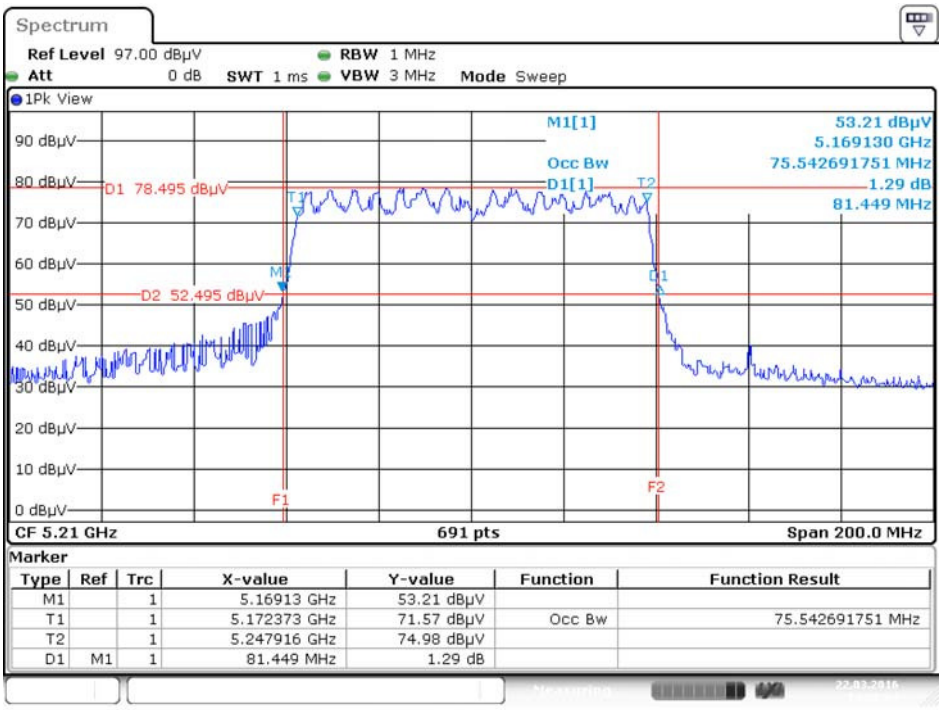
For Non-beamforming function:

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



Date: 22.MAR.2016 14:23:03

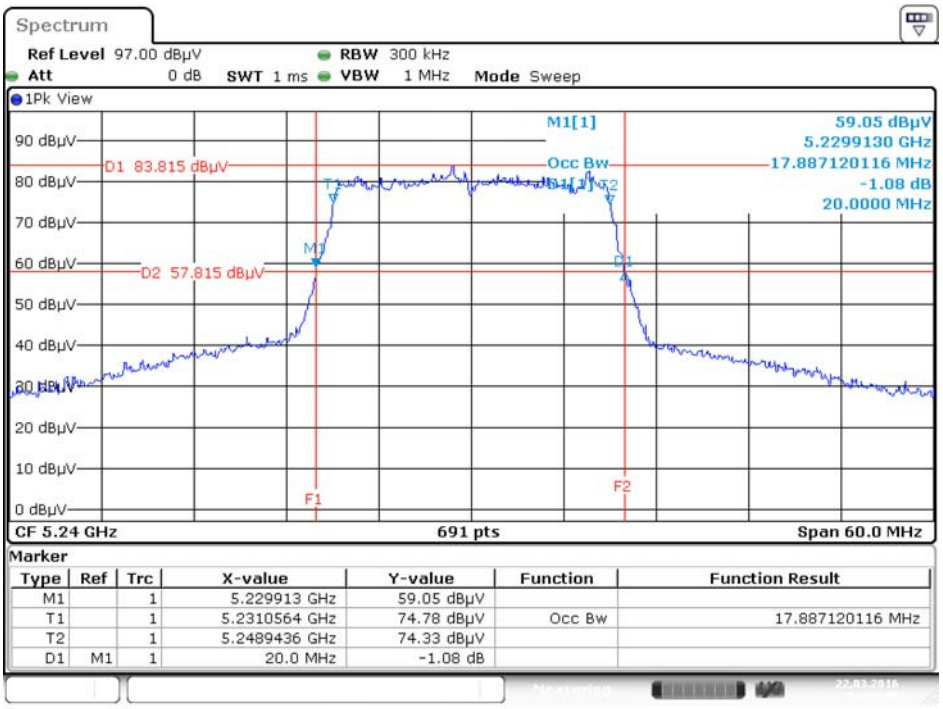
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 / 5210 MHz



Date: 22.MAR.2016 14:28:04

For beamforming function:

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



Date: 22.MAR.2016 14:20:58

4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

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

4.3.2. Measuring Instruments and Setting

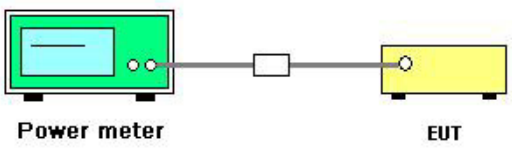
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01r01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter).
3. Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. When measuring maximum conducted output power with multiple antenna systems,add every result of the values by mathematic formula.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Maximum Conducted Output Power

Temperature	23°C	Humidity	60%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11ac
Test Date	Mar. 22, 2016 ~ Mar. 23, 2016		

For Non-beamforming function:

Configuration IEEE 802.11ac MCS0/Nss1 VHT40

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
38	5190 MHz	13.75	14.01	13.76	18.61	30.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 VHT80

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
42	5210 MHz	11.45	12.03	11.69	16.50	30.00	Complies

For beamforming function:

Configuration IEEE 802.11ac MCS0/Nss1 VHT20

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 1	Chain 2	Chain 3	Total		
48	5240 MHz	16.19	16.12	16.31	20.98	27.19	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.81dBi, so limit=30-(8.81-6)= 27.19 dBm.

4.4. Power Spectral Density Measurement

4.4.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.3.1.

Frequency Band		Limit
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

4.4.2. Measuring Instruments and Setting

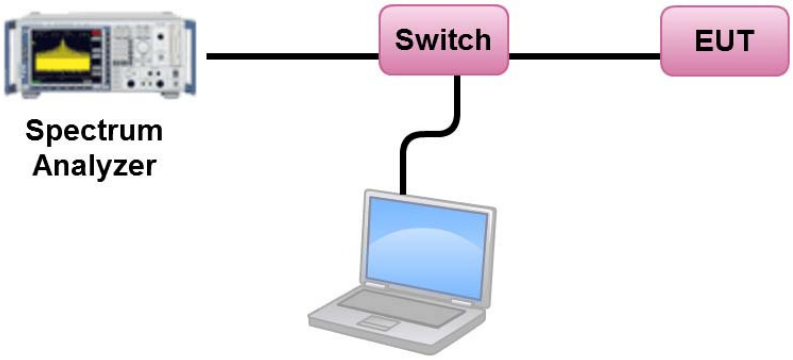
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1000 kHz
VBW	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01r01 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.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

Temperature	23°C	Humidity	60%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11ac

For Non-beamforming function:

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	2.51	14.19	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.81dBi, so limit=17-(8.81-6)= 14.19 dBm/MHz.

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
42	5210 MHz	-2.65	14.19	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.81dBi, so limit=17-(8.81-6)= 14.19 dBm/MHz.

For beamforming function:

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

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
48	5240 MHz	7.61	14.19	Complies

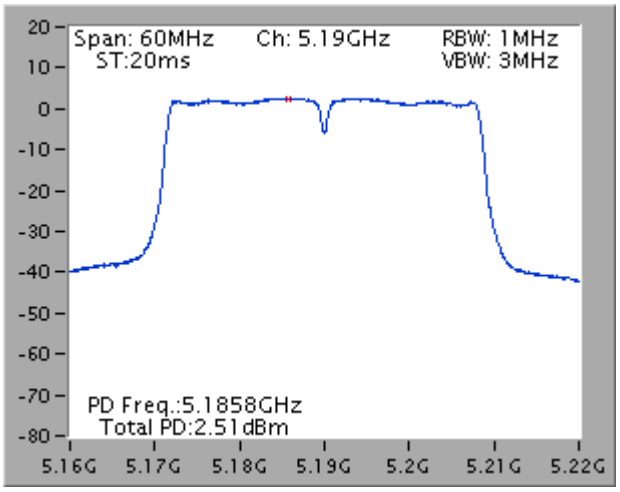
Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =8.81dBi, so limit=17-(8.81-6)= 14.19 dBm/MHz.

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

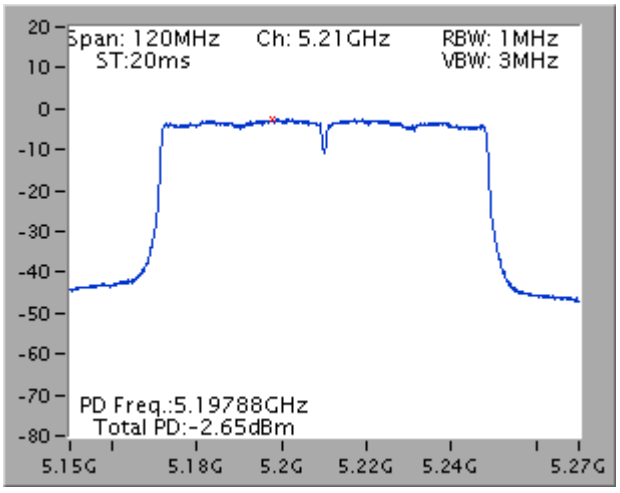
For plots, only the channel with worse result was shown.

For Non-beamforming function:

Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 + Chain 3 / 5190 MHz

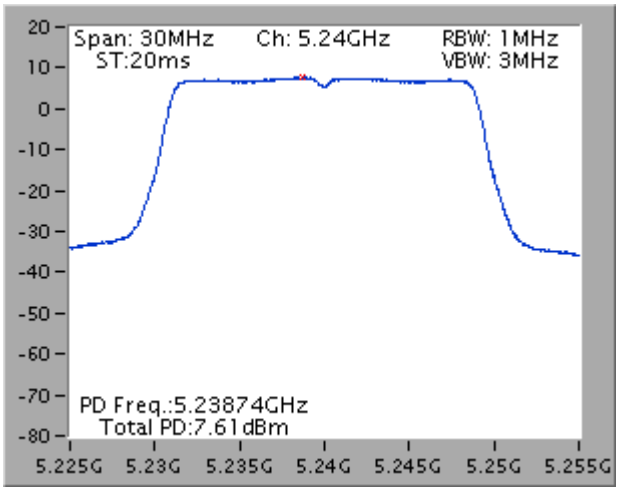


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 + Chain 3 / 5210 MHz



For beamforming function:

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



4.5. Radiated Emissions Measurement

4.5.1. Limit

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

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

Frequencies (MHz)	Field Strength (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

4.5.2. Measuring Instruments and Setting

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

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

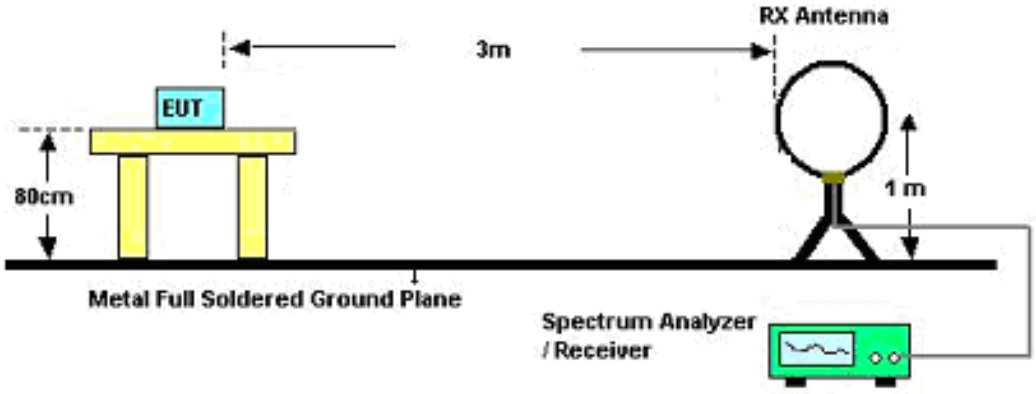
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

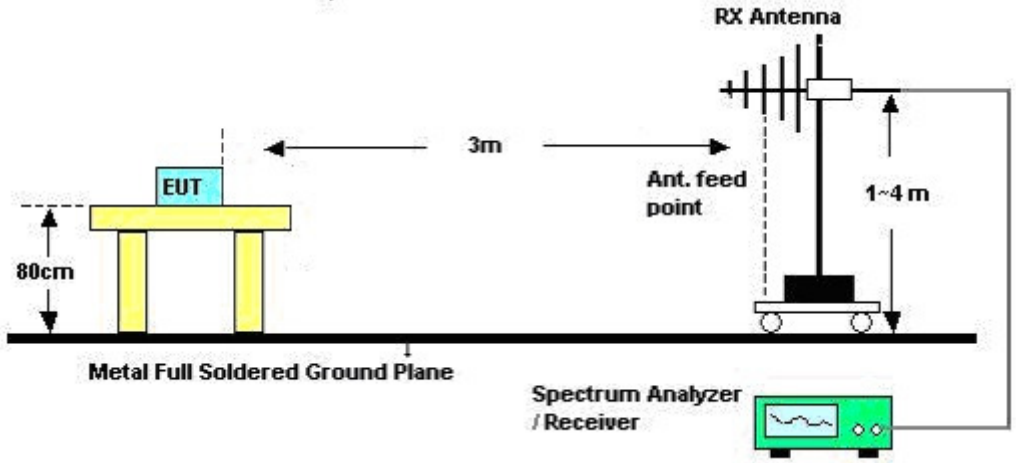
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
8. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
9. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.5.4. Test Setup Layout

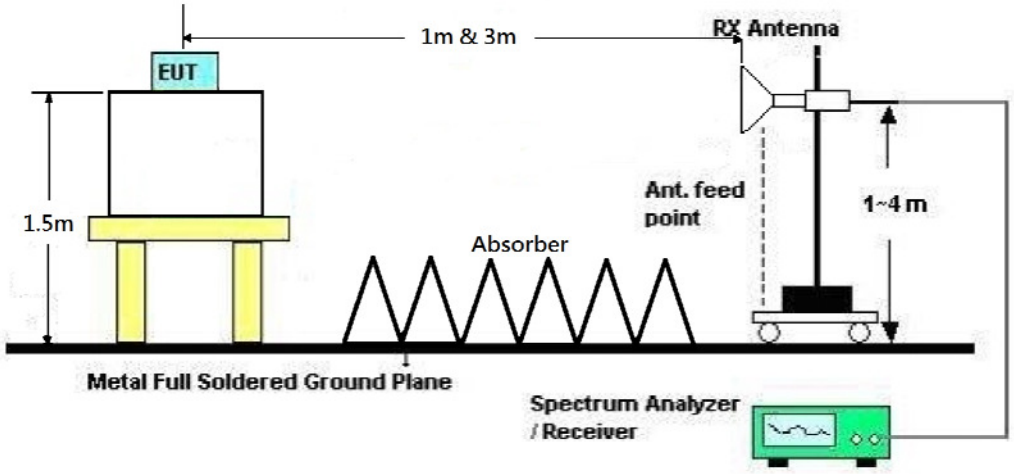
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

For non-beamforming function:

The EUT was programmed to be in continuously transmitting mode.

For beamforming function:

The EUT was programmed to be in beamforming transmitting mode.

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

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	CTX
Test Date	Mar. 24, 2016	Test Mode	Mode 2

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 20 dB below the permissible value has no need to be reported.

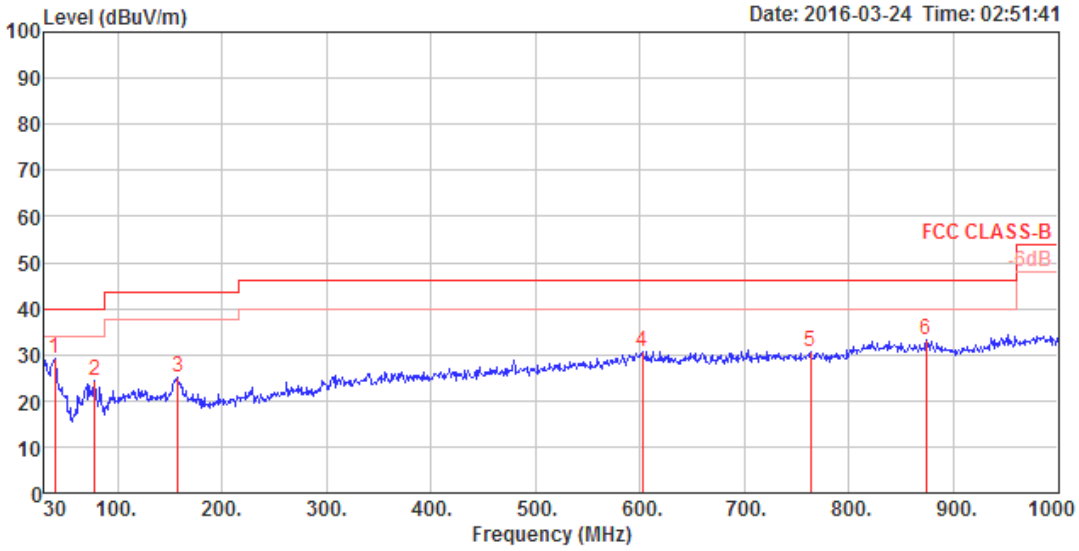
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

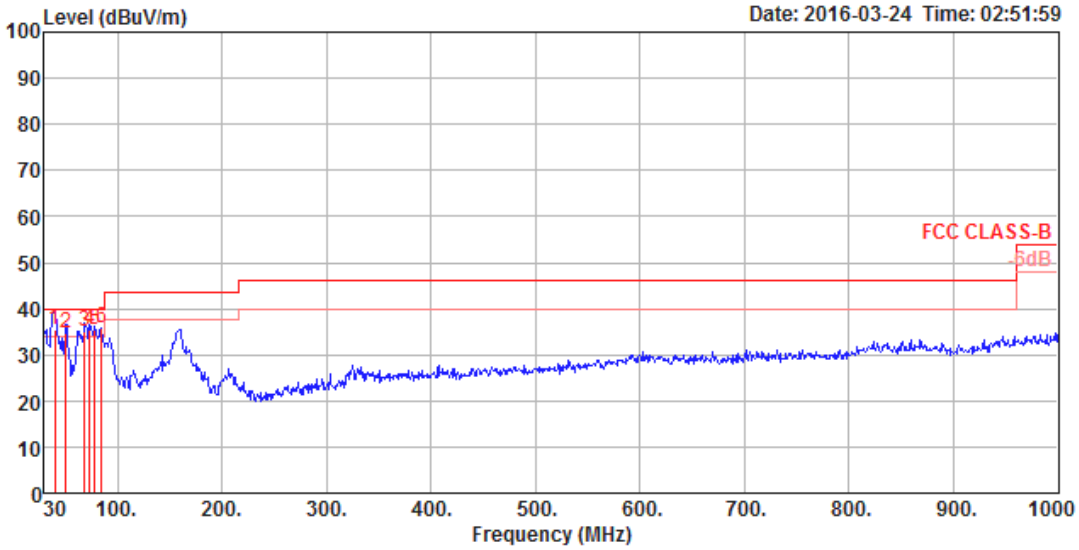
Temperature	24.3℃	Humidity	62%
Test Engineer	Eason Chen	Configurations	CTX
Test Mode	Mode 2		

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	39.70	29.26	40.00	-10.74	40.77	0.54	20.36	32.41	175	97	Peak	HORIZONTAL
2	78.50	24.40	40.00	-15.60	42.54	0.77	13.49	32.40	150	226	Peak	HORIZONTAL
3	158.04	25.14	43.50	-18.36	39.45	1.07	16.97	32.35	112	283	Peak	HORIZONTAL
4	602.30	30.64	46.00	-15.36	35.50	2.12	25.43	32.41	158	129	Peak	HORIZONTAL
5	763.32	30.52	46.00	-15.48	33.91	2.39	26.51	32.29	125	199	Peak	HORIZONTAL
6	873.90	33.23	46.00	-12.77	34.99	2.55	27.55	31.86	100	63	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	39.70	35.57	40.00	-4.43	47.08	0.54	20.36	32.41	125	257	QP	VERTICAL
2	50.37	34.65	40.00	-5.35	51.60	0.61	14.85	32.41	100	298	QP	VERTICAL
3	68.80	34.93	40.00	-5.07	53.62	0.72	12.99	32.40	175	98	QP	VERTICAL
4	73.65	35.41	40.00	-4.59	53.91	0.74	13.16	32.40	150	182	QP	VERTICAL
5	78.50	35.30	40.00	-4.70	53.44	0.77	13.49	32.40	100	203	QP	VERTICAL
6	84.32	35.80	40.00	-4.20	52.93	0.80	14.46	32.39	145	203	Peak	VERTICAL

Note:

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

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

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

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

For Non-beamforming function

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11a CH 36 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15537.36	52.58	54.00	-1.42	31.81	16.37	38.13	33.73	180	136	Average	HORIZONTAL
2	15538.48	65.22	74.00	-8.78	44.45	16.37	38.13	33.73	180	136	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	15535.58	52.43	54.00	-1.57	31.66	16.37	38.13	33.73	200	282	Average	VERTICAL
2	15544.18	65.75	74.00	-8.25	44.98	16.37	38.13	33.73	200	282	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11a CH 40 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15595.66	51.97	54.00	-2.03	31.29	16.40	38.05	33.77	180	122	Average	HORIZONTAL
2	15603.30	64.66	74.00	-9.34	44.02	16.43	37.98	33.77	180	122	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	15595.52	51.88	54.00	-2.12	31.20	16.40	38.05	33.77	199	300	Average	VERTICAL
2	15600.32	65.20	74.00	-8.80	44.52	16.40	38.05	33.77	199	300	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11a CH 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15719.20	51.06	54.00	-2.94	30.66	16.48	37.84	33.92	185	112	Average	HORIZONTAL
2	15723.54	64.69	74.00	-9.31	44.29	16.48	37.84	33.92	185	112	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	15716.54	64.03	74.00	-9.97	43.63	16.48	37.84	33.92	166	268	Peak	VERTICAL
2	15717.60	51.04	54.00	-2.96	30.64	16.48	37.84	33.92	166	268	Average	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15535.70	52.45	54.00	-1.55	31.68	16.37	38.13	33.73	188	61	Average	HORIZONTAL
2	15536.62	66.34	74.00	-7.66	45.57	16.37	38.13	33.73	188	61	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	15539.88	65.32	74.00	-8.68	44.55	16.37	38.13	33.73	175	227	Peak	VERTICAL
2	15542.94	52.49	54.00	-1.51	31.72	16.37	38.13	33.73	175	227	Average	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15598.30	65.10	74.00	-8.90	44.42	16.40	38.05	33.77	179	294	Peak	HORIZONTAL
2	15602.34	51.68	54.00	-2.32	31.04	16.43	37.98	33.77	179	294	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15595.02	51.85	54.00	-2.15	31.17	16.40	38.05	33.77	187	84	Average	VERTICAL
2	15597.18	64.91	74.00	-9.09	44.23	16.40	38.05	33.77	187	84	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 15, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15715.38	51.01	54.00	-2.99	30.61	16.48	37.84	33.92	155	163	Average	HORIZONTAL
2	15718.20	63.77	74.00	-10.23	43.37	16.48	37.84	33.92	155	163	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	15716.50	51.06	54.00	-2.94	30.66	16.48	37.84	33.92	163	298	Average	VERTICAL
2	15720.36	63.99	74.00	-10.01	43.59	16.48	37.84	33.92	163	298	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15561.04	50.64	54.00	-3.36	29.96	16.40	38.05	33.77	168	216	Average	HORIZONTAL
2	15573.56	63.48	74.00	-10.52	42.80	16.40	38.05	33.77	168	216	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	15572.00	63.49	74.00	-10.51	42.81	16.40	38.05	33.77	192	283	Peak	VERTICAL
2	15573.24	50.94	54.00	-3.06	30.26	16.40	38.05	33.77	192	283	Average	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15694.00	62.50	74.00	-11.50	42.05	16.48	37.84	33.87	174	317	Peak	HORIZONTAL
2	15694.40	50.43	54.00	-3.57	29.98	16.48	37.84	33.87	174	317	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15684.96	62.91	74.00	-11.09	42.42	16.45	37.91	33.87	184	256	Peak	VERTICAL
2	15696.36	50.23	54.00	-3.77	29.78	16.48	37.84	33.87	184	256	Average	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15617.28	49.98	54.00	-4.02	29.39	16.43	37.98	33.82	188	187	Average	HORIZONTAL
2	15648.40	63.47	74.00	-10.53	42.93	16.45	37.91	33.82	188	187	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	15611.36	49.91	54.00	-4.09	29.32	16.43	37.98	33.82	177	288	Average	VERTICAL
2	15648.24	62.86	74.00	-11.14	42.32	16.45	37.91	33.82	177	288	Peak	VERTICAL

Note:

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

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

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

For beamforming function

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15538.78	62.79	74.00	-11.21	42.02	16.37	38.13	33.73	164	245	Peak	HORIZONTAL
2	15542.82	50.60	54.00	-3.40	29.83	16.37	38.13	33.73	164	245	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15538.40	63.36	74.00	-10.64	42.59	16.37	38.13	33.73	174	318	Peak	VERTICAL
2	15540.35	50.87	54.00	-3.13	30.10	16.37	38.13	33.73	174	318	Average	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15595.45	62.50	74.00	-11.50	41.82	16.40	38.05	33.77	161	184	Peak	HORIZONTAL
2	15607.63	49.97	54.00	-4.03	29.33	16.43	37.98	33.77	161	184	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15591.22	50.19	54.00	-3.81	29.51	16.40	38.05	33.77	157	228	Average	VERTICAL
2	15593.43	63.29	74.00	-10.71	42.61	16.40	38.05	33.77	157	228	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15715.83	50.09	54.00	-3.91	29.69	16.48	37.84	33.92	181	324	Average	HORIZONTAL
2	15718.08	63.39	74.00	-10.61	42.99	16.48	37.84	33.92	181	324	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	15716.28	50.11	54.00	-3.89	29.71	16.48	37.84	33.92	171	253	Average	VERTICAL
2	15720.26	63.91	74.00	-10.09	43.51	16.48	37.84	33.92	171	253	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15562.47	63.07	74.00	-10.93	42.39	16.40	38.05	33.77	158	215	Peak	HORIZONTAL
2	15566.73	49.83	54.00	-4.17	29.15	16.40	38.05	33.77	158	215	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15566.12	50.19	54.00	-3.81	29.51	16.40	38.05	33.77	188	157	Average	VERTICAL
2	15569.65	62.81	74.00	-11.19	42.13	16.40	38.05	33.77	188	157	Peak	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15688.91	63.08	74.00	-10.92	42.59	16.45	37.91	33.87	164	239	Peak	HORIZONTAL
2	15689.62	50.16	54.00	-3.84	29.67	16.45	37.91	33.87	164	239	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15698.88	62.60	74.00	-11.40	42.15	16.48	37.84	33.87	140	40	Peak	VERTICAL
2	15699.94	50.13	54.00	-3.87	29.68	16.48	37.84	33.87	140	40	Average	VERTICAL

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 09, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15629.52	62.92	74.00	-11.08	42.33	16.43	37.98	33.82	204	278	Peak	HORIZONTAL
2	15633.62	49.88	54.00	-4.12	29.29	16.43	37.98	33.82	204	278	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	15627.53	49.95	54.00	-4.05	29.36	16.43	37.98	33.82	184	126	Average	VERTICAL
2	15636.73	63.35	74.00	-10.65	42.76	16.43	37.98	33.82	184	126	Peak	VERTICAL

Note:

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

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

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

4.6. Band Edge Emissions Measurement

4.6.1. Limit

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

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 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

4.6.3. Test Procedures

The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.

4.6.4. Test Setup Layout

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

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

For Non-beamforming 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. Test Result of Band Edge and Fundamental Emissions

For Non-beamforming function

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 08, 2016		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5101.80	63.51	74.00	-10.49	54.92	7.97	33.67	33.05	166	236	Peak	VERTICAL
2	5102.12	53.11	54.00	-0.89	44.52	7.97	33.67	33.05	166	236	Average	VERTICAL
3	5182.24	118.99			109.99	8.26	33.79	33.05	166	236	Peak	VERTICAL
4	5182.24	108.22			99.22	8.26	33.79	33.05	166	236	Average	VERTICAL

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5118.59	53.15	54.00	-0.85	44.48	8.03	33.69	33.05	163	217	Average	VERTICAL
2	5119.23	63.63	74.00	-10.37	54.96	8.03	33.69	33.05	163	217	Peak	VERTICAL
3	5199.36	119.30			110.21	8.32	33.82	33.05	163	217	Peak	VERTICAL
4	5199.36	109.02			99.93	8.32	33.82	33.05	163	217	Average	VERTICAL
5	5358.97	63.75	74.00	-10.25	54.54	8.19	34.08	33.06	163	217	Peak	VERTICAL
6	5359.62	52.56	54.00	-1.44	43.35	8.19	34.08	33.06	163	217	Average	VERTICAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5077.82	61.57	74.00	-12.43	53.14	7.86	33.62	33.05	162	218	Peak	VERTICAL
2	5078.46	50.67	54.00	-3.33	42.24	7.86	33.62	33.05	162	218	Average	VERTICAL
3	5239.36	118.40			109.27	8.29	33.89	33.05	162	218	Peak	VERTICAL
4	5239.36	108.34			99.21	8.29	33.89	33.05	162	218	Average	VERTICAL
5	5399.62	64.10	74.00	-9.90	54.86	8.17	34.13	33.06	162	218	Peak	VERTICAL
6	5399.62	52.94	54.00	-1.06	43.70	8.17	34.13	33.06	162	218	Average	VERTICAL

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

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Feb. 26, 2016 / Mar. 08, 2016		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.95	52.21	54.00	-1.79	49.15	6.39	33.17	36.50	195	302	Average	VERTICAL
2	5147.95	68.75	74.00	-5.25	65.69	6.39	33.17	36.50	195	302	Peak	VERTICAL
3	5178.40	106.30			103.13	6.43	33.23	36.49	195	302	Average	VERTICAL
4	5182.40	118.06			114.89	6.43	33.23	36.49	195	302	Peak	VERTICAL

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4975.64	51.75	54.00	-2.25	49.23	6.19	32.85	36.52	297	200	Average	VERTICAL
2	4990.87	62.17	74.00	-11.83	59.61	6.20	32.88	36.52	297	200	Peak	VERTICAL
3	5191.99	106.82			103.61	6.45	33.25	36.49	297	200	Average	VERTICAL
4	5191.99	117.14			113.93	6.45	33.25	36.49	297	200	Peak	VERTICAL
5	5357.05	53.02	54.00	-0.98	49.28	6.65	33.55	36.46	297	200	Average	VERTICAL
6	5357.85	64.24	74.00	-9.76	60.50	6.65	33.55	36.46	297	200	Peak	VERTICAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5080.39	49.21	54.00	-4.79	40.78	7.86	33.62	33.05	148	211	Average	VERTICAL
2	5081.03	59.85	74.00	-14.15	51.42	7.86	33.62	33.05	148	211	Peak	VERTICAL
3	5240.64	117.45			108.32	8.29	33.89	33.05	148	211	Peak	VERTICAL
4	5240.64	107.27			98.14	8.29	33.89	33.05	148	211	Average	VERTICAL
5	5400.90	63.13	74.00	-10.87	53.82	8.22	34.15	33.06	148	211	Peak	VERTICAL
6	5400.90	52.14	54.00	-1.86	42.83	8.22	34.15	33.06	148	211	Average	VERTICAL

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

Temperature	24.3℃	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Feb. 26, 2016 / Mar. 08, 2016		

Channel 38

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5148.33	52.74	54.00	-1.26	49.68	6.39	33.17	36.50	184	187	Average	VERTICAL
2	5148.33	66.62	74.00	-7.38	63.56	6.39	33.17	36.50	184	187	Peak	VERTICAL
3	5183.59	109.74			106.57	6.43	33.23	36.49	184	187	Peak	VERTICAL
4	5188.40	100.00			96.79	6.45	33.25	36.49	184	187	Average	VERTICAL

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

Channel 46

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5140.26	64.01	74.00	-9.99	55.25	8.09	33.72	33.05	148	213	Peak	VERTICAL
2	5145.39	53.02	54.00	-0.98	44.18	8.15	33.74	33.05	148	213	Average	VERTICAL
3	5235.13	117.88			108.75	8.29	33.89	33.05	148	213	Peak	VERTICAL
4	5235.77	105.88			96.75	8.29	33.89	33.05	148	213	Average	VERTICAL
5	5376.15	63.25	74.00	-10.75	54.02	8.18	34.11	33.06	148	213	Peak	VERTICAL
6	5376.15	51.73	54.00	-2.27	42.50	8.18	34.11	33.06	148	213	Average	VERTICAL

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

Temperature	24.3℃	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Feb. 26, 2016		

Channel 42

	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	5144.30	52.90	54.00	-1.10	49.84	6.39	33.17	36.50	196	186	Average	VERTICAL
2	5149.10	65.51	74.00	-8.49	62.45	6.39	33.17	36.50	196	186	Peak	VERTICAL
3	5198.78	104.53			101.32	6.45	33.25	36.49	196	186	Peak	VERTICAL
4	5238.85	95.46			92.09	6.51	33.34	36.48	196	186	Average	VERTICAL
5	5355.83	59.78	74.00	-14.22	56.04	6.65	33.55	36.46	196	186	Peak	VERTICAL
6	5374.26	47.56	54.00	-6.44	43.77	6.67	33.58	36.46	196	186	Average	VERTICAL

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

Note:

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

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

For beamforming function

Temperature	24.3°C	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Chain 1 + Chain 2 + Chain 3
Test Date	Feb. 26, 2016		

Channel 36

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5101.47	52.96	54.00	-1.04	50.04	6.34	33.09	36.51	218	315	Average	VERTICAL
2	5106.28	63.77	74.00	-10.23	60.85	6.34	33.09	36.51	218	315	Peak	VERTICAL
3	5182.40	107.30			104.13	6.43	33.23	36.49	218	315	Average	VERTICAL
4	5183.21	117.04			113.87	6.43	33.23	36.49	218	315	Peak	VERTICAL

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

Channel 40

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5112.66	62.94	74.00	-11.06	59.97	6.36	33.12	36.51	195	322	Peak	VERTICAL
2	5114.26	52.61	54.00	-1.39	49.64	6.36	33.12	36.51	195	322	Average	VERTICAL
3	5193.59	107.89			104.68	6.45	33.25	36.49	195	322	Average	VERTICAL
4	5193.59	117.56			114.35	6.45	33.25	36.49	195	322	Peak	VERTICAL

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

Channel 48

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5014.04	52.88	54.00	-1.12	50.24	6.23	32.93	36.52	197	318	Average	VERTICAL
2	5014.04	63.54	74.00	-10.46	60.90	6.23	32.93	36.52	197	318	Peak	VERTICAL
3	5231.99	107.25			103.88	6.51	33.34	36.48	197	318	Average	VERTICAL
4	5237.60	117.15			113.78	6.51	33.34	36.48	197	318	Peak	VERTICAL
5	5451.54	50.89	54.00	-3.11	46.88	6.73	33.72	36.44	197	318	Average	VERTICAL
6	5453.94	62.20	74.00	-11.80	58.19	6.73	33.72	36.44	197	318	Peak	VERTICAL

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

Temperature	24.3℃	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT40 CH 38, 46 / Chain 1 + Chain 2 + Chain 3
Test Date	Mar. 08, 2016 / Mar. 18, 2016		

Channel 38

	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	5150.00	52.86	54.00	-1.14	44.02	8.15	33.74	33.05	166	233	Average	VERTICAL
2	5150.00	64.91	74.00	-9.09	56.07	8.15	33.74	33.05	166	233	Peak	VERTICAL
3	5176.54	109.30			100.30	8.26	33.79	33.05	166	233	Peak	VERTICAL
4	5177.82	99.64			90.64	8.26	33.79	33.05	166	233	Average	VERTICAL

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

Channel 46

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5145.39	52.73	54.00	-1.27	43.89	8.15	33.74	33.05	150	237	Average	VERTICAL
2	5146.67	64.41	74.00	-9.59	55.57	8.15	33.74	33.05	150	237	Peak	VERTICAL
3	5224.23	106.82			97.71	8.30	33.86	33.05	150	237	Average	VERTICAL
4	5226.15	116.45			107.34	8.30	33.86	33.05	150	237	Peak	VERTICAL

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

Temperature	24.3℃	Humidity	62%
Test Engineer	Eason Chen	Configurations	IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 / Chain 1 + Chain 2 + Chain 3
Test Date	Feb. 26, 2016		

Channel 42

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	5147.50	52.80	54.00	-1.20	49.74	6.39	33.17	36.50	196	320	Average	VERTICAL
2	5147.50	65.54	74.00	-8.46	62.48	6.39	33.17	36.50	196	320	Peak	VERTICAL
3	5178.75	108.75			105.58	6.43	33.23	36.49	196	320	Peak	VERTICAL
4	5193.97	96.64			93.43	6.45	33.25	36.49	196	320	Average	VERTICAL
5	5380.67	47.40	54.00	-6.60	43.61	6.67	33.58	36.46	196	320	Average	VERTICAL
6	5380.67	59.87	74.00	-14.13	56.08	6.67	33.58	36.46	196	320	Peak	VERTICAL

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

Note:

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

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

4.7. Antenna Requirements

4.7.1. Limit

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

4.7.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 22, 2015	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 08, 2015	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 23, 2015	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 25, 2015	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	37880	20MHz ~ 2GHz	Sep. 03, 2015	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Oct. 22, 2015	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Feb. 24, 2015	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10940	0.1MHz ~ 1.3GHz	Feb. 24, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 13, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Oct. 27, 2015	Radiation (03CH01-CB)
EMI Test Receiver	Rohde&Schwarz	ESCI	100186	9kHz ~ 3GHz	Jul. 14, 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)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
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%