FCC Test Report

Report No.:	RF150415D03-1
FCC ID:	PY315200306
Test Model:	D7000
Received Date:	Apr. 15, 2015
Test Date:	Apr. 22 ~ May 14, 2015
Issued Date:	May 18, 2015
Applicant:	NETGEAR INC.
Address:	350 East Plumeria Drive, San Jose, CA 95134, USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF150415D03-1	Original release.	May 18, 2015

1 Certificate of Conformity

Product:	AC1900 WiFi VDSL/ADSL Modem Router
Brand:	NETGEAR
Test Model:	D7000
Sample Status:	Engineering sample
Applicant:	NETGEAR INC.
Test Date:	Apr. 22 ~ May 14, 2015
Standard:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2009

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** May 18, 2015

Celia Chen / Senior Specialist

Approved by : _____ , **Date:** May 18, 2015

Rex Lai / Assistant Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (SECTION 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -11.36dB at 0.16283MHz.
15.407(b) (1/2/3/4/6)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.2dB at 5101.00MHz, 5150.00MHz, 5350.00MHz, 5393.00MHz.
15.407(a) (1/2/3)	Max Average Transmit Power	PASS	Meet the requirement of limit.
15.407(a) (1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is R-SMA not a standard connector.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.43 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	4.00 dB
Radiated Emissions above 1 GHz	1GHz ~ 40GHz	3.36 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	AC1900 WiFi VDSL/ADSL Modem Router
Brand	NETGEAR
Test Model	D7000
Status of EUT	Engineering sample
Power Supply Rating	12Vdc from Adapter
Modulation Type	64QAM, 16QAM, QPSK, BPSK 256QAM for 11ac mode only.
Modulation Technology	OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 450Mbps 802.11ac: up to 1299.9Mbps
Operating Frequency	5180 ~ 5240MHz
Number of Channel	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)
Output Power	**CDD Mode:** 802.11a: 281.89mW **Beamforming Mode:** 802.11ac (VHT20): 272.252mW 802.11ac (VHT40): 539.057mW 802.11ac (VHT80): 147.055mW
Antenna Type	Dipole antenna with 2dBi gain
Antenna Connector	R-SMA connector
Accessory Device	Adapter
Data Cable Supplied	Non-shielded DC cable (1.8m) Non-shielded RJ11 cable (1.5m) Non-shielded RJ45 cable (1.5m)

Note:

1. The EUT provides 3 completed transmitters and 3 receivers.

Modulation Mode	TX Function	
	5.0GHz (Non-Beamforming)	5.0GHz (Beamforming)
802.11a	3TX	-
802.11n (HT20)	3TX	-
802.11n (HT40)	3TX	-
802.11ac (VHT20)	3TX	3TX
802.11ac (VHT40)	3TX	3TX
802.11ac (VHT80)	3TX	3TX

Note: The modulation and bandwidth are similar for 802.11n mode for HT20 (HT40) and 802.11ac mode for VHT20 (VHT40), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT uses following adapter.

Adapter	1	2	3
Brand	NETGEAR	NETGEAR	NETGEAR
Model	AD898020	AD898220	AD898120
AC Input Power	100-240V, 50/60Hz, 1.0A	100-240V, 50/60Hz, 1.0A	100-240V, 50/60Hz, 1.0A
DC Output Power	12V, 3.5A	12V, 3.5A	12V, 3.5A
Plug Type	EU Plug	UK Plug	AU Plug
The adapter 1-3 are identical with each other except for their plug type difference			

Adapter	4
Brand	NETGEAR
Model	MU42-3120350-A1
AC Input Power	100-240V, 50/60Hz, 1.5A
DC Output Power	12V, 3.5A
Plug Type	US Plug

Adapter	5	6	7	8
Brand	NETGEAR	NETGEAR	NETGEAR	NETGEAR
Model	2ABN42F NA	2AAF042F GE	2AAF042F AU	2AAF042F UK
AC Input Power	100-240V, 50/60Hz, 1.3A	100-240V, 50/60Hz, 1.3A	100-240V, 50/60Hz, 1.3A	100-240V, 50/60Hz, 1.3A
DC Output Power	12.0V, 3.5A	12.0V, 3.5A	12.0V, 3.5A	12.0V, 3.5A
Plug Type	US Plug	EU Plug	AU Plug	UK Plug
The adapter 5-8 are identical with each other except for their plug type difference				

After pre-tested above adapters, **adapter 1** was selected as a representative one and therefore only its test data was recorded in this report.

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

FOR 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

CDD MODE							
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
Beamforming MODE							
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11ac (VHT20)	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	19.5
-	802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	40.5
-	802.11ac (VHT80)		42	42	OFDM	BPSK	87.9

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Beamforming MODE							
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11ac (VHT20)	5180-5240	36 to 48	48	OFDM	BPSK	19.5

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Beamforming MODE							
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11ac (VHT20)	5180-5240	36 to 48	48	OFDM	BPSK	19.5

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

CDD MODE							
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
Beamforming MODE							
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11ac (VHT20)	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	19.5
-	802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	40.5
-	802.11ac (VHT80)		42	42	OFDM	BPSK	87.9

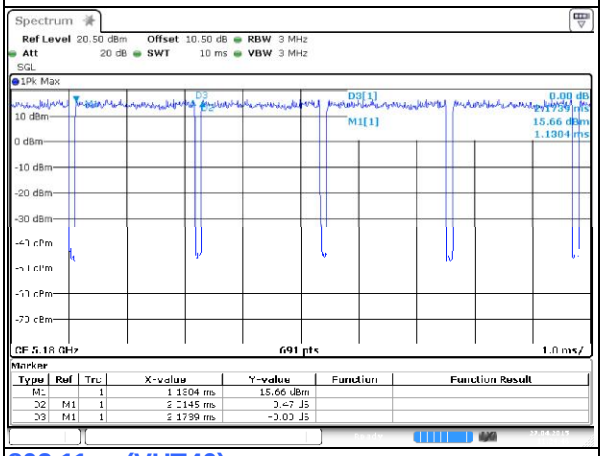
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	23deg. C, 70%RH	120Vac, 60Hz	Dalen Dai
RE<1G	24deg. C, 72%RH	120Vac, 60Hz	Dalen Dai
PLC	24deg. C, 70%RH	120Vac, 60Hz	Aaron You
APCM	25deg. C, 60%RH	120Vac, 60Hz	Saxon Lee

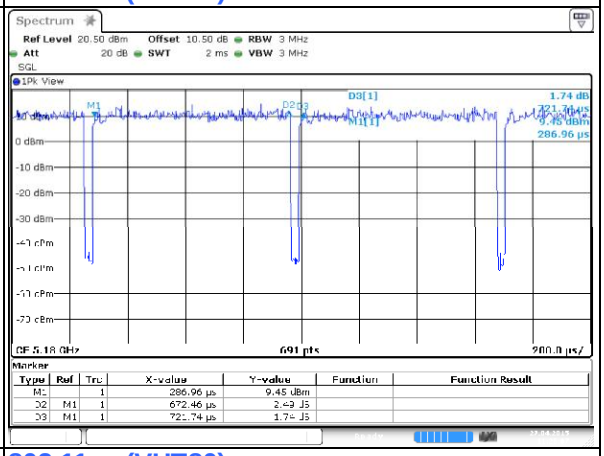
3.3 Duty Cycle of Test Signal

If duty cycle of test signal is < 98%, duty factor shall be considered.
802.11a: Duty cycle = 2.014/2.173 = 0.927, Duty factor = 10 * log(1/0.927) = 0.33
802.11ac (VHT20): Duty cycle = 0.672/0.721 = 0.932, Duty factor = 10 * log(1/0.932) = 0.31
802.11ac (VHT40): Duty cycle = 0.321/0.385 = 0.834, Duty factor = 10 * log(1/0.834) = 0.79
802.11ac (VHT80): Duty cycle = 0.182/0.22 = 0.827, Duty factor = 10 * log(1/0.827) = 0.82

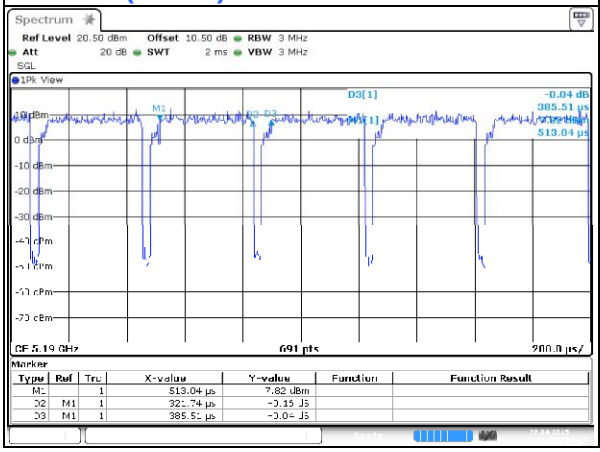
802.11a



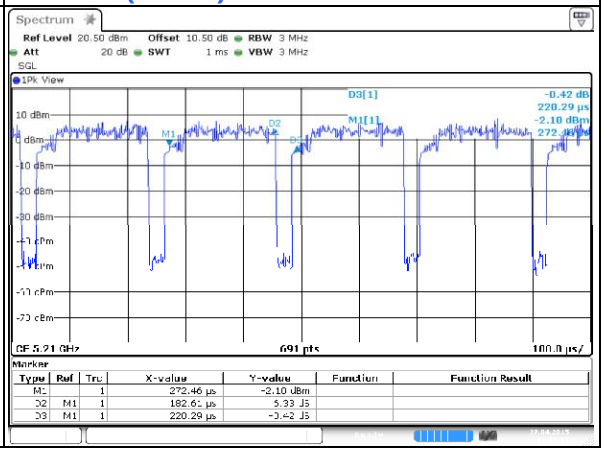
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	EUT	NETGEAR	D7000	-	-	-
B.	AC ADAPTER	NETGEAR	AD898020	N/A	FCC DoC Approved	Supplied by client
C.	LOAD	N/A	N/A	N/A	N/A	Provided by Lab
D.	NOTEBOOK COMPUTER	DELL	PP27L	8SNZ12S	FCC DoC Approved	Provided by Lab

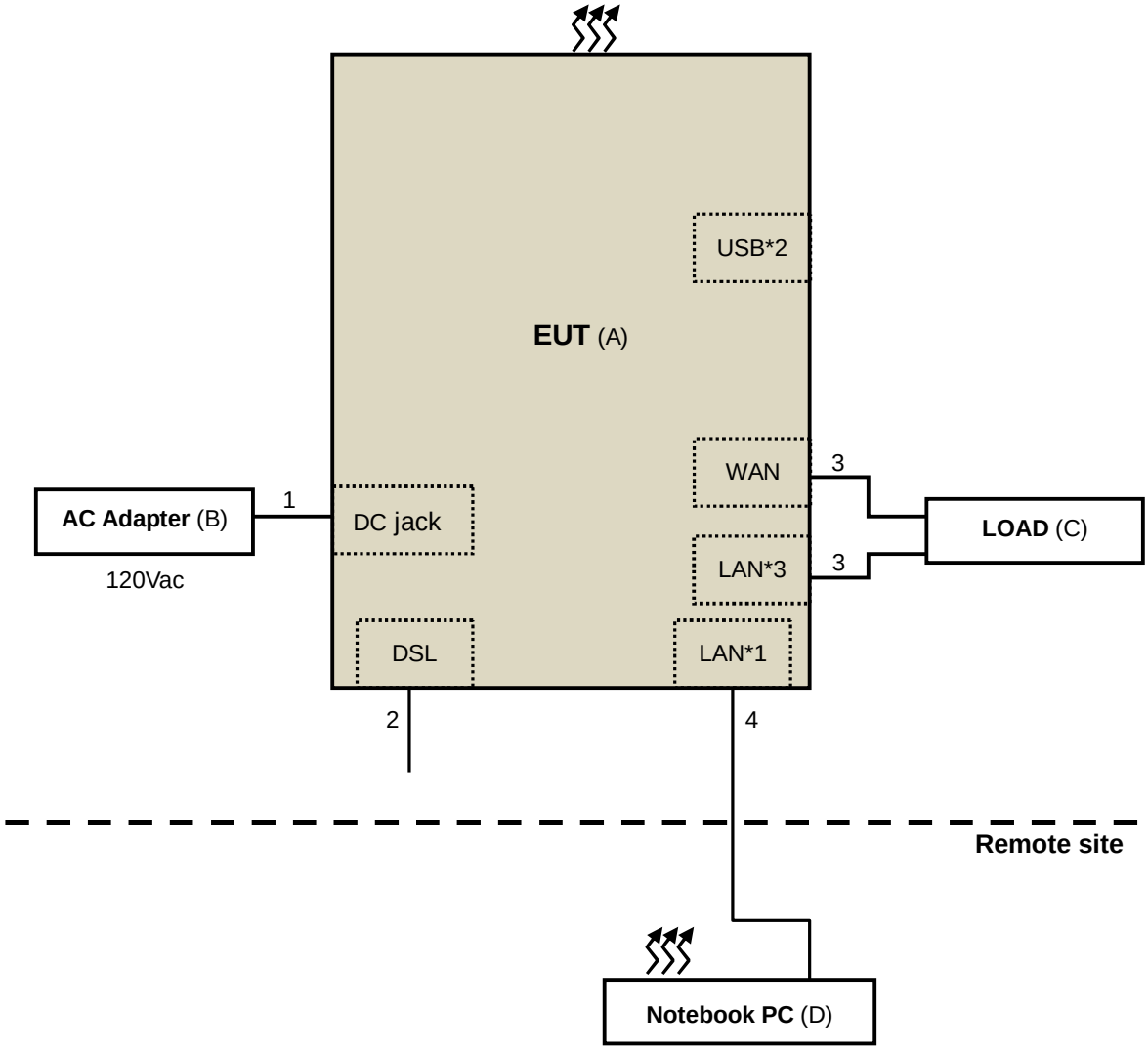
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item D acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	1.8	N	0	Supplied by client
2.	RJ11 cable	1	1.5	N	0	Supplied by client
3.	RJ45 cable	4	1.8	N	0	Provided by Lab
4.	RJ45 cable	1	10	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standard

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart E (15.407)
789033 D02 General UNII Test Procedure New Rules v01
662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

APPLICABLE TO	**LIMIT**	
789033 D02 General UNII Test Procedure New Rules v01	FIELD STRENGTH AT 3m	
	PK:74 (dBμV/m)	AV:54 (dBμV/m)
APPLICABLE TO	**EIRP LIMIT**	**EQUIVALENT FIELD STRENGTH AT 3m**
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)	PK:-27 (dBm/MHz) *1 PK:-17 (dBm/MHz) *2	PK: 68.2(dBμV/m) *1 PK:78.2 (dBμV/m) *2

NOTE: *1 beyond 10MHz of the band edge *2 within 10 MHz of band edge

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts).

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 26, 2015	Feb. 25, 2016
HP Preamplifier	8449B	3008A01201	Feb. 26, 2015	Feb. 25, 2016
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 01, 2015	Feb. 28, 2016
Agilent Spectrum	E4446A	MY51100050	Oct. 24, 2014	Oct. 23, 2015
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 20, 2015	Jan. 19, 2016
Schwarzbeck Antenna	VULB 9168	139	Feb. 04, 2015	Feb. 03, 2016
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2013	May 28, 2015
Schwarzbeck Horn Antenna	BBHA-9170	212	Feb. 09, 2015	Feb. 08, 2016
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Feb. 10, 2015	Feb. 09, 2016
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
SUHNER RF cable	SF104	CABLE-CH6	Aug. 15, 2014	Aug. 14, 2015
SUHNER RF cable	SF102	Cable-CH8-3.6m	Aug. 15, 2014	Aug. 14, 2015
EMCO Horn Antenna	3115	00028257	Feb. 05, 2015	Feb. 04, 2016
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 29, 2014	Sep. 28, 2015
Anritsu Power Sensor	MA2411B	0738404	Apr. 21, 2015	Apr. 20, 2016
Anritsu Power Meter	ML2495A	0842014	Apr. 21, 2015	Apr. 20, 2016

NOTE: 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.
4. The Industry Canada Reference No. IC 7450E-6.
5. The FCC Site Registration No. is 447212.

4.1.3 Test Procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

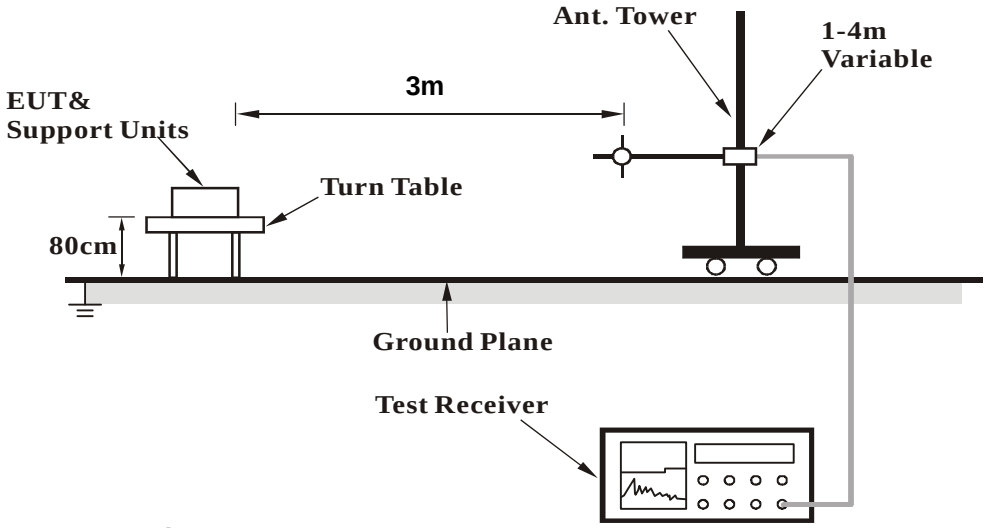
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
6. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

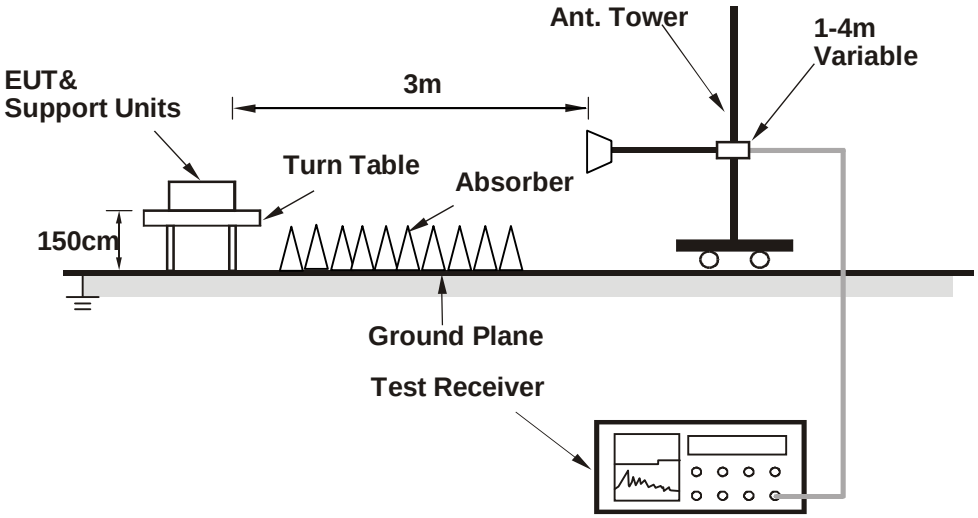
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Condition

a. Placed the EUT on the testing table.
b. Prepared notebooks to act as communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".
e. The necessary accessories enable the system in full functions.

4.1.7 Test Results

ABOVE 1GHz DATA：

CDD MODE

802.11a

CHANNEL	TX Channel 36	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	5100.00	60.1 PK	74.0	-13.9	1.00 H	341	56.48	3.59
2	5100.00	46.6 AV	54.0	-7.5	1.00 H	341	42.96	3.59
3	5150.00	59.7 PK	74.0	-14.3	1.00 H	341	56.14	3.60
4	5150.00	46.2 AV	54.0	-7.8	1.00 H	341	42.58	3.60
5	*5180.00	104.9 PK			1.00 H	341	101.23	3.62
6	*5180.00	94.7 AV			1.00 H	341	91.08	3.62
7	#10360.00	55.5 PK	74.0	-18.5	1.39 H	217	42.58	12.90
8	#10360.00	41.6 AV	54.0	-12.4	1.39 H	217	28.73	12.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	5100.00	66.2 PK	74.0	-7.8	1.88 V	336	62.61	3.59
2	5100.00	53.7 AV	54.0	-0.3	1.88 V	336	50.09	3.59
3	5150.00	65.1 PK	74.0	-8.9	1.88 V	336	61.47	3.60
4	5150.00	51.2 AV	54.0	-2.8	1.88 V	336	47.62	3.60
5	*5180.00	118.9 PK			1.88 V	336	115.27	3.62
6	*5180.00	108.7 AV			1.88 V	336	105.09	3.62
7	#10360.00	59.2 PK	74.0	-14.8	2.27 V	327	46.29	12.90
8	#10360.00	45.6 AV	54.0	-8.5	2.27 V	327	32.65	12.90

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 40	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	104.5 PK			1.00 H	239	100.86	3.63
2	*5200.00	94.4 AV			1.00 H	239	90.77	3.63
3	5350.00	60.4 PK	74.0	-13.7	1.00 H	239	56.43	3.92
4	5350.00	48.5 AV	54.0	-5.5	1.00 H	239	44.57	3.92
5	#10400.00	54.3 PK	74.0	-19.7	1.26 H	208	41.25	13.01
6	#10400.00	40.9 AV	54.0	-13.2	1.26 H	208	27.84	13.01
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	118.0 PK			1.90 V	337	114.38	3.63
2	*5200.00	107.8 AV			1.90 V	337	104.21	3.63
3	5350.00	65.2 PK	74.0	-8.8	1.90 V	337	61.28	3.92
4	**5350.00**	**53.9 AV**	**54.0**	**-0.2**	**1.90 V**	**337**	**49.93**	**3.92**
5	#10400.00	58.0 PK	74.0	-16.1	2.34 V	297	44.94	13.01
6	#10400.00	44.9 AV	54.0	-9.1	2.34 V	297	31.88	13.01

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	104.1 PK			1.16 H	243	100.33	3.72
2	*5240.00	93.9 AV			1.16 H	243	90.15	3.72
3	5350.00	58.1 PK	74.0	-15.9	1.16 H	243	54.19	3.92
4	5350.00	49.5 AV	54.0	-4.5	1.16 H	243	45.62	3.92
5	5400.00	60.1 PK	74.0	-13.9	1.16 H	243	56.08	3.99
6	5400.00	50.9 AV	54.0	-3.1	1.16 H	243	46.95	3.99
7	#10480.00	55.5 PK	74.0	-18.5	1.49 H	199	42.31	13.19
8	#10480.00	41.7 AV	54.0	-12.3	1.49 H	199	28.50	13.19
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	118.6 PK			1.96 V	337	114.83	3.72
2	*5240.00	108.5 AV			1.96 V	337	104.76	3.72
3	5350.00	62.7 PK	74.0	-11.3	1.96 V	337	58.77	3.92
4	5350.00	50.4 AV	54.0	-3.6	1.96 V	337	46.48	3.92
5	5400.00	65.5 PK	74.0	-8.6	1.96 V	337	61.46	3.99
6	5400.00	53.8 AV	54.0	-0.3	1.96 V	337	49.76	3.99
7	#10480.00	58.9 PK	74.0	-15.1	2.21 V	264	45.69	13.19
8	#10480.00	45.3 AV	54.0	-8.7	2.21 V	264	32.07	13.19

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Beamforming MODE

802.11ac (VHT20)

CHANNEL	TX Channel 36	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	5101.00	57.2 PK	74.0	-16.8	1.00 H	355	53.61	3.59
2	5101.00	45.2 AV	54.0	-8.8	1.00 H	355	41.57	3.59
3	5150.00	56.4 PK	74.0	-17.6	1.00 H	335	52.81	3.60
4	5150.00	45.0 AV	54.0	-9.0	1.00 H	335	41.38	3.60
5	*5180.00	105.6 PK			1.00 H	335	101.95	3.62
6	*5180.00	94.6 AV			1.00 H	335	91.00	3.62
7	#10360.00	53.4 PK	74.0	-20.6	1.53 H	221	40.47	12.90
8	#10360.00	40.2 AV	54.0	-13.8	1.53 H	221	27.28	12.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	5101.00	64.5 PK	74.0	-9.6	1.89 V	340	60.86	3.59
2	**5101.00**	**53.8 AV**	**54.0**	**-0.2**	**1.89 V**	**340**	**50.25**	**3.59**
3	5150.00	66.5 PK	74.0	-7.6	1.89 V	340	62.85	3.60
4	5150.00	50.2 AV	54.0	-3.8	1.89 V	340	46.58	3.60
5	*5180.00	119.6 PK			1.89 V	340	116.02	3.62
6	*5180.00	108.7 AV			1.89 V	340	105.08	3.62
7	#10360.00	61.3 PK	74.0	-12.7	2.46 V	349	48.43	12.90
8	#10360.00	46.8 AV	54.0	-7.3	2.46 V	349	33.85	12.90

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 40	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	104.5 PK			1.00 H	234	100.90	3.63
2	*5200.00	94.4 AV			1.00 H	234	90.73	3.63
3	5350.00	58.0 PK	74.0	-16.0	1.00 H	234	54.07	3.92
4	5350.00	45.5 AV	54.0	-8.5	1.00 H	234	41.61	3.92
5	#10400.00	53.4 PK	74.0	-20.6	1.49 H	218	40.38	13.01
6	#10400.00	40.7 AV	54.0	-13.3	1.49 H	218	27.66	13.01
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	118.5 PK			1.96 V	331	114.88	3.63
2	*5200.00	107.0 AV			1.96 V	331	103.35	3.63
3	5350.00	64.5 PK	74.0	-9.5	1.96 V	331	60.55	3.92
4	5350.00	53.7 AV	54.0	-0.3	1.96 V	331	49.78	3.92
5	#10400.00	61.7 PK	74.0	-12.3	2.39 V	348	48.66	13.01
6	#10400.00	46.7 AV	54.0	-7.3	2.39 V	348	33.69	13.01

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	105.4 PK			1.00 H	332	101.70	3.72
2	*5240.00	94.6 AV			1.00 H	332	90.92	3.72
3	5350.00	57.7 PK	74.0	-16.3	1.00 H	332	53.79	3.92
4	5350.00	44.5 AV	54.0	-9.5	1.00 H	332	40.56	3.92
5	5392.00	57.7 PK	74.0	-16.3	1.00 H	332	53.74	3.98
6	5392.00	44.5 AV	54.0	-9.5	1.00 H	332	40.48	3.98
7	#10480.00	53.4 PK	74.0	-20.6	1.62 H	219	40.18	13.19
8	#10480.00	40.3 AV	54.0	-13.7	1.62 H	219	27.11	13.19
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	117.0 PK			1.87 V	329	113.30	3.72
2	*5240.00	108.0 AV			1.87 V	329	104.26	3.72
3	5350.00	63.3 PK	74.0	-10.7	1.87 V	329	59.36	3.92
4	5350.00	51.5 AV	54.0	-2.5	1.87 V	329	47.55	3.92
5	5392.00	64.9 PK	74.0	-9.1	1.87 V	329	60.94	3.98
6	5392.00	53.7 AV	54.0	-0.3	1.87 V	329	49.73	3.98
7	#10480.00	61.1 PK	74.0	-13.0	2.33 V	340	47.86	13.19
8	#10480.00	46.2 AV	54.0	-7.8	2.33 V	340	32.97	13.19

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT40)

CHANNEL	TX Channel 38	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.1 PK	74.0	-15.9	1.21 H	234	54.54	3.60
2	5150.00	45.5 AV	54.0	-8.5	1.21 H	234	41.86	3.60
3	*5190.00	100.6 PK			1.21 H	234	97.01	3.63
4	*5190.00	91.3 AV			1.21 H	234	87.69	3.63
5	5350.00	58.3 PK	74.0	-15.8	1.21 H	234	54.33	3.92
6	5350.00	44.4 AV	54.0	-9.7	1.21 H	234	40.43	3.92
7	#10380.00	53.2 PK	74.0	-20.8	1.55 H	232	40.27	12.94
8	#10380.00	40.1 AV	54.0	-13.9	1.55 H	232	27.13	12.94
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	70.5 PK	74.0	-3.5	1.89 V	19	66.92	3.60
2	5150.00	53.5 AV	54.0	-0.5	1.89 V	19	49.93	3.60
3	*5190.00	117.5 PK			1.89 V	19	113.89	3.63
4	*5190.00	107.2 AV			1.89 V	19	103.55	3.63
5	5350.00	65.6 PK	74.0	-8.4	1.89 V	360	61.66	3.92
6	5350.00	53.6 AV	54.0	-0.4	1.89 V	360	49.69	3.92
7	#10380.00	59.8 PK	74.0	-14.2	2.45 V	346	46.83	12.94
8	#10380.00	44.2 AV	54.0	-9.8	2.45 V	346	31.27	12.94

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 46	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.1 PK	74.0	-15.9	1.00 H	331	54.54	3.60
2	5150.00	45.1 AV	54.0	-8.9	1.00 H	331	41.51	3.60
3	*5230.00	104.3 PK			1.00 H	331	100.60	3.69
4	*5230.00	94.3 AV			1.00 H	331	90.60	3.69
5	5350.00	55.3 PK	74.0	-18.7	1.00 H	331	51.39	3.92
6	5350.00	44.1 AV	54.0	-9.9	1.00 H	331	40.22	3.92
7	5393.00	58.5 PK	74.0	-15.5	1.00 H	331	54.56	3.98
8	5393.00	44.4 AV	54.0	-9.6	1.00 H	331	40.45	3.98
9	#10460.00	54.1 PK	74.0	-19.9	1.48 H	220	41.00	13.14
10	#10460.00	41.5 AV	54.0	-12.5	1.48 H	220	28.36	13.14
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	64.2 PK	74.0	-9.8	1.94 V	333	60.57	3.60
2	5150.00	51.6 AV	54.0	-2.4	1.94 V	333	48.01	3.60
3	*5230.00	118.5 PK			1.94 V	333	114.85	3.69
4	*5230.00	108.3 AV			1.94 V	333	104.57	3.69
5	5350.00	61.0 PK	74.0	-13.1	1.94 V	333	57.03	3.92
6	5350.00	49.7 AV	54.0	-4.3	1.94 V	333	45.76	3.92
7	5393.00	64.5 PK	74.0	-9.5	1.94 V	333	60.51	3.98
8	**5393.00**	**53.9 AV**	**54.0**	**-0.2**	**1.94 V**	**333**	**49.87**	**3.98**
9	#10460.00	62.3 PK	74.0	-11.7	2.29 V	347	49.20	13.14
10	#10460.00	47.3 AV	54.0	-6.7	2.29 V	347	34.17	13.14

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ac (VHT80)

CHANNEL	TX Channel 42	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.5 PK	74.0	-15.5	1.02 H	331	54.90	3.60
2	5150.00	45.4 AV	54.0	-8.6	1.02 H	331	41.76	3.60
3	*5210.00	96.7 PK			1.02 H	331	93.02	3.65
4	*5210.00	85.1 AV			1.02 H	331	81.42	3.65
5	5350.00	47.7 PK	74.0	-26.3	1.02 H	331	43.78	3.92
6	5350.00	44.2 AV	54.0	-9.8	1.02 H	331	40.27	3.92
7	#10420.00	53.1 PK	74.0	-20.9	1.37 H	240	40.08	13.05
8	#10420.00	40.3 AV	54.0	-13.7	1.37 H	240	27.22	13.05
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	72.5 PK	74.0	-1.5	1.81 V	18	68.94	3.60
2	**5150.00**	**53.8 AV**	**54.0**	**-0.2**	**1.81 V**	**18**	**50.17**	**3.60**
3	*5210.00	110.0 PK			1.81 V	18	106.30	3.65
4	*5210.00	99.4 AV			1.81 V	18	95.79	3.65
5	5350.00	62.0 PK	74.0	-12.0	1.81 V	18	58.11	3.92
6	5350.00	53.6 AV	54.0	-0.4	1.81 V	18	49.65	3.92
7	#10420.00	58.8 PK	74.0	-15.2	2.29 V	360	45.77	13.05
8	#10420.00	43.9 AV	54.0	-10.1	2.29 V	360	30.86	13.05

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Data:

Beamforming MODE

802.11ac (VHT20)

CHANNEL	TX Channel 48	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	106.44	33.5 QP	43.5	-10.0	1.53 H	267	51.01	-17.52
2	169.97	27.4 QP	43.5	-16.1	1.49 H	190	41.28	-13.86
3	201.11	28.5 QP	43.5	-15.0	2.17 H	110	44.79	-16.30
4	334.68	26.2 QP	46.0	-19.8	2.08 H	142	37.80	-11.61
5	532.46	37.2 QP	46.0	-8.8	1.77 H	172	45.12	-7.95
6	861.69	27.2 QP	46.0	-18.8	1.65 H	43	29.42	-2.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	34.96	36.4 QP	40.0	-3.6	1.85 V	182	51.72	-15.28
2	107.45	34.2 QP	43.5	-9.3	1.73 V	215	51.69	-17.47
3	147.52	27.4 QP	43.5	-16.1	1.94 V	79	41.14	-13.74
4	329.18	31.4 QP	46.0	-14.6	1.66 V	138	42.99	-11.63
5	532.46	37.3 QP	46.0	-8.7	1.71 V	118	45.29	-7.95
6	828.73	27.2 QP	46.0	-18.8	1.22 V	88	29.74	-2.56

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100292	Dec. 18, 2014	Dec. 17, 2015
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 04, 2014	Dec. 03, 2015
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 04, 2014	Dec. 03, 2015
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Oct. 21, 2014	Oct. 20, 2015
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 08, 2014	May 07, 2015
Software	ADT_Cond_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C09.01	Feb. 24, 2015	Feb. 23, 2016
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 20, 2014	May 19, 2015
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 20, 2014	Nov. 19, 2015
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 20, 2014	Nov. 19, 2015

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 9.
3. The VCCI Site Registration No. C-1312.

4.2.3 Test Procedure

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

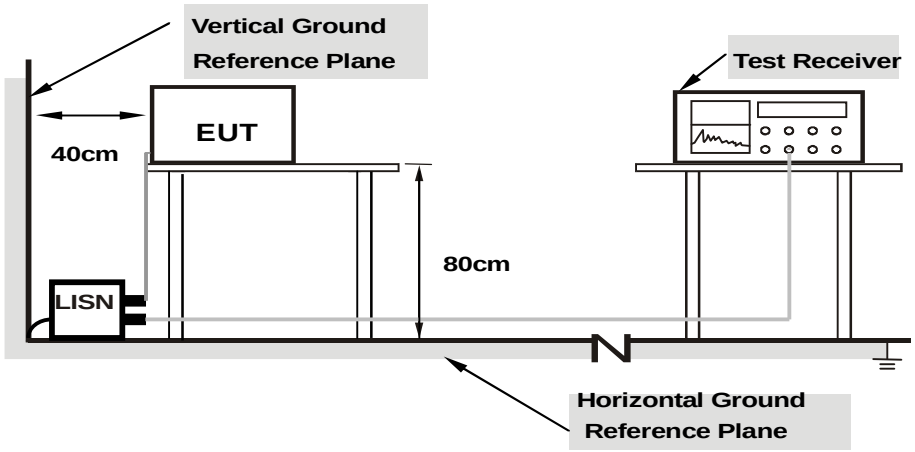
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Condition

Same as item 4.1.6.

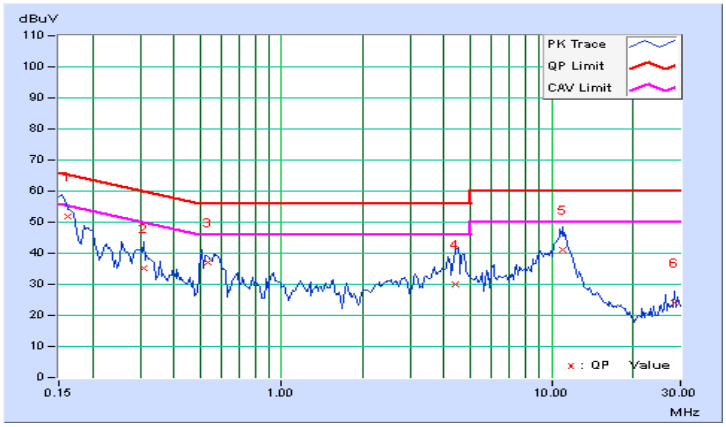
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.16283**	**0.21**	**51.62**	**43.75**	**51.83**	**43.96**	**65.32**	**55.32**	**-13.49**	**-11.36**
2	0.31011	0.25	34.88	23.43	35.13	23.68	59.97	49.97	-24.84	-26.29
3	0.53155	0.29	36.71	31.22	37.00	31.51	56.00	46.00	-19.00	-14.49
4	4.40629	0.57	29.43	20.31	30.00	20.88	56.00	46.00	-26.00	-25.12
5	11.00786	0.80	40.22	35.02	41.02	35.82	60.00	50.00	-18.98	-14.18
6	28.62473	1.13	22.91	20.55	24.04	21.68	60.00	50.00	-35.96	-28.32

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

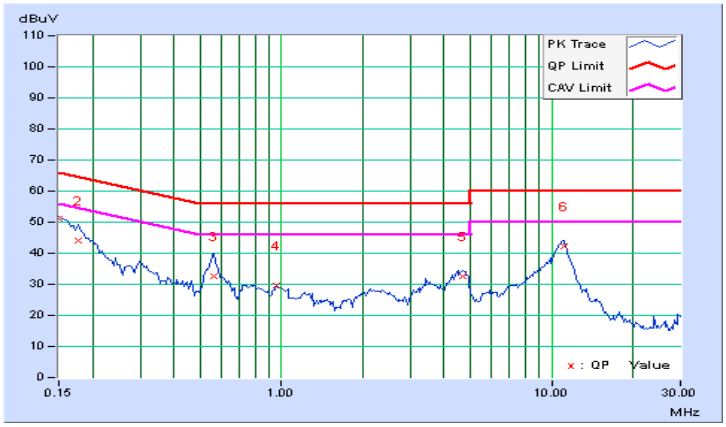


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15005	0.21	50.77	43.72	50.98	43.93	66.00	56.00	-15.02	-12.07
2	0.17711	0.22	44.01	27.55	44.23	27.77	64.62	54.62	-20.39	-26.85
3	0.56021	0.31	32.33	28.12	32.64	28.43	56.00	46.00	-23.36	-17.57
4	0.96259	0.37	29.25	24.51	29.62	24.88	56.00	46.00	-26.38	-21.12
5	4.69135	0.59	31.89	23.66	32.48	24.25	56.00	46.00	-23.52	-21.75
6	11.10128	0.77	41.37	35.89	42.14	36.66	60.00	50.00	-17.86	-13.34

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.3 Transmit Power Measurment

4.3.1 Limits of Transmit Power Measurement

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
	√	Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A	---		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	---		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	---		1 Watt (30 dBm)

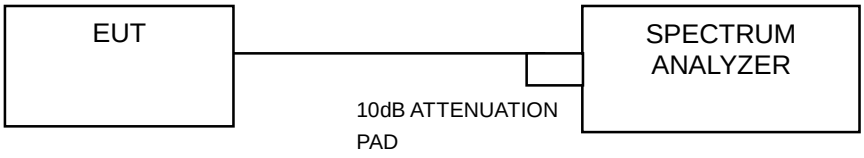
*B is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

FOR AVERAGE POWER MEASUREMENT

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

FOR 26dB BANDWIDTH

1) Set RBW = approximately 1% of the emission bandwidth.
2) Set the VBW > RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) 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%.

FOR 99% BANDWIDTH

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

POWER OUTPUT:

CDD Mode

CHAN.	CHAN. FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
802.11a								
36	5180	20.18	19.70	19.26	**281.89**	24.50	30	PASS
40	5200	18.22	17.74	17.28	179.259	22.53	30	PASS
48	5240	18.19	17.65	17.27	177.46	22.49	30	PASS

Beamforming Mode

CHAN.	CHAN. FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
802.11ac (VHT20)								
36	5180	20.02	19.62	19.04	**272.252**	24.35	29.23	PASS
40	5200	18.11	17.73	17.15	175.887	22.45	29.23	PASS
48	5240	18.07	17.71	17.13	174.783	22.42	29.23	PASS
802.11ac (VHT40)								
38	5190	18.62	18.19	17.89	200.213	23.01	29.23	PASS
46	5230	22.59	22.18	22.84	**539.057**	27.32	29.23	PASS
802.11ac (VHT80)								
42	5210	17.42	16.91	16.31	**147.055**	21.67	29.23	PASS

NOTE: Directional gain = 2dBi + 10log(3) = 6.77dBi > 6dBi , so the conducted power limit shall be reduced to 30-(6.77-6) = 29.23dBm.

26dB BANDWIDTH:

CDD Mode

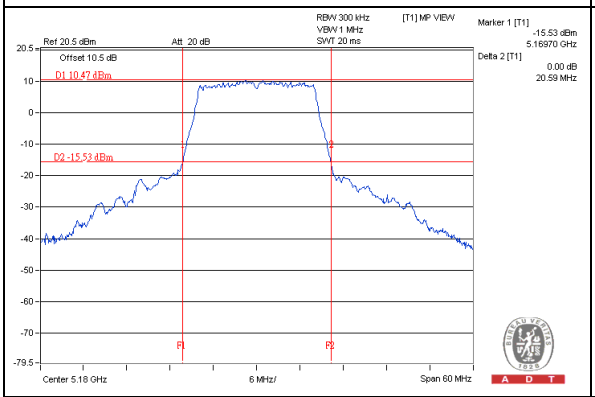
CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
802.11a					
36	5180	20.52	20.37	20.59	PASS
40	5200	20.51	20.43	20.38	PASS
48	5240	20.45	20.39	20.47	PASS

Beamforming Mode

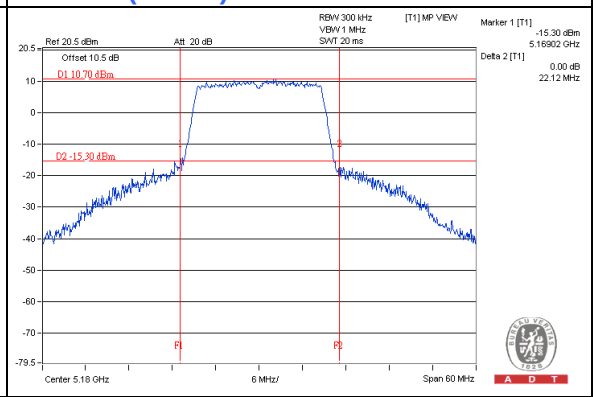
CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
802.11ac (VHT20)					
36	5180	21.33	22.12	20.83	PASS
40	5200	20.88	20.81	20.92	PASS
48	5240	20.83	20.91	20.77	PASS
802.11ac (VHT40)					
38	5190	40.47	40.41	40.27	PASS
46	5230	55.39	47.96	43.59	PASS
802.11ac (VHT80)					
42	5210	82.65	83.32	83.30	PASS

SPECTRUM PLOT OF WORST VALUE

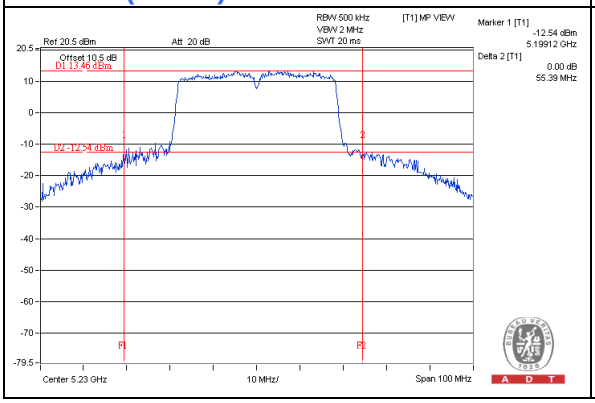
802.11a



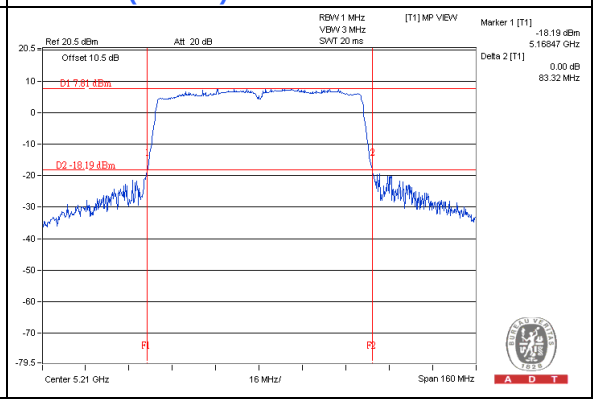
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



99% BANDWIDTH:

CDD Mode

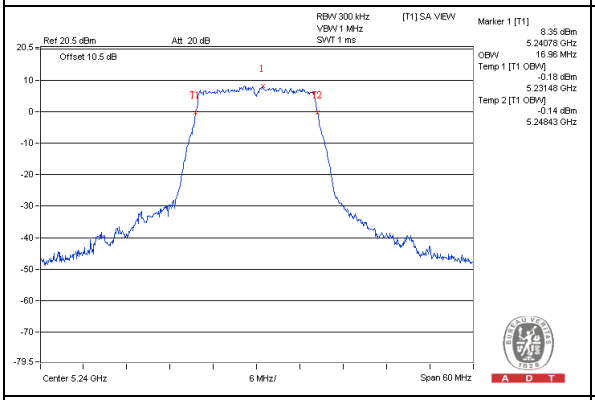
CHANNEL	CHANNEL FREQUENCY (MHz)	99% BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
802.11a					
48	5240	16.96	16.96	16.96	PASS

Beamforming Mode

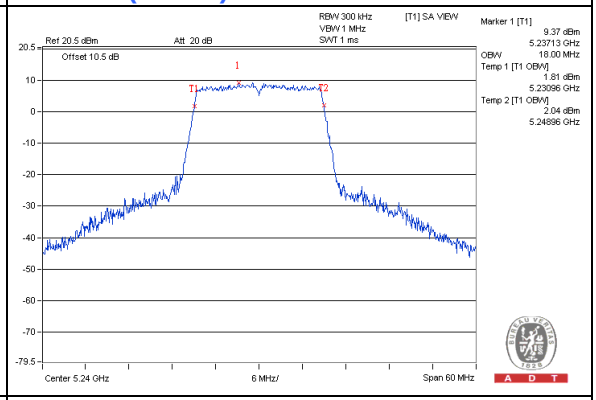
CHANNEL	CHANNEL FREQUENCY (MHz)	99% BANDWIDTH (MHz)			PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2	
802.11ac (VHT20)					
48	5240	18.00	18.00	17.91	PASS
802.11ac (VHT40)					
46	5230	36.96	36.96	37.10	PASS
802.11ac (VHT80)					
42	5210	75.65	75.65	75.65	PASS

SPECTRUM PLOT OF WORST VALUE

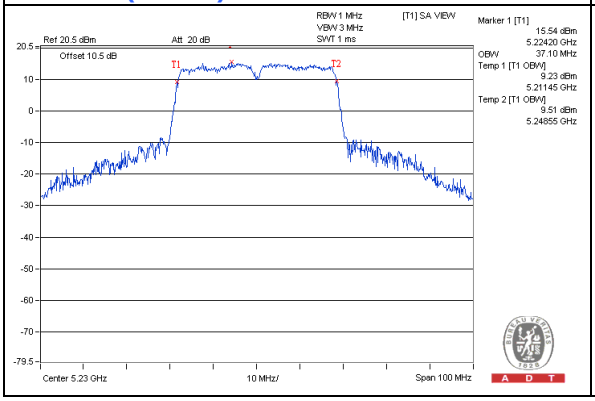
802.11a



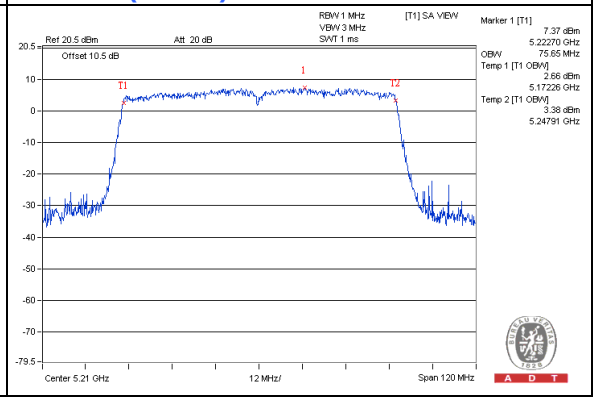
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)

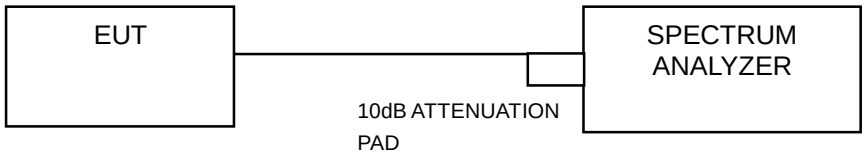


4.4 Peak Power Spectral Density Measurement

4.4.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
	√	Indoor Access Point	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A	---		11dBm/ MHz
U-NII-2C	---		11dBm/ MHz
U-NII-3	---		30dBm/ 500kHz

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedure

Using method SA-2
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 30 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value and add 10 log (1/duty cycle)

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as Item 4.3.6.

4.4.7 Test Results

CDD Mode

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)			TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2					
802.11a									
36	5180	5.88	5.67	4.33	10.12	0.33	10.45	16.23	PASS
40	5200	4.00	3.79	2.95	8.37	0.33	8.70	16.23	PASS
48	5240	3.85	3.67	3.36	8.40	0.33	8.73	16.23	PASS

NOTE:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 2dBi + 10log(3) = 6.77dBi > 6dBi , so the power density limit shall be reduced to 17-(6.77-6) = 16.23dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Beamforming Mode

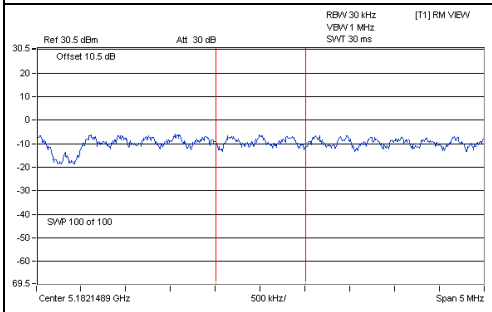
CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)			TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2					
802.11ac (VHT20)									
36	5180	6.17	6.03	5.53	10.69	0.31	11.00	16.23	PASS
40	5200	4.72	4.19	3.78	9.01	0.31	9.32	16.23	PASS
48	5240	4.92	4.24	3.84	9.12	0.31	9.43	16.23	PASS
802.11ac (VHT40)									
38	5190	0.45	-0.12	-0.54	4.72	0.79	5.51	16.23	PASS
46	5230	4.25	4.29	3.36	8.76	0.79	9.55	16.23	PASS
802.11ac (VHT80)									
42	5210	-3.23	-3.08	-4.02	1.35	0.82	2.17	16.23	PASS

NOTE:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 2dBi + 10log(3) = 6.77dBi > 6dBi , so the power density limit shall be reduced to 17-(6.77-6) = 16.23dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

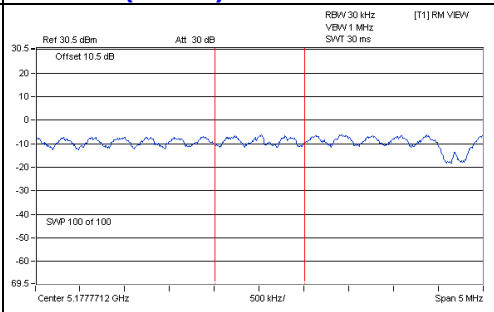
SPECTRUM PLOT OF WORST VALUE

802.11a



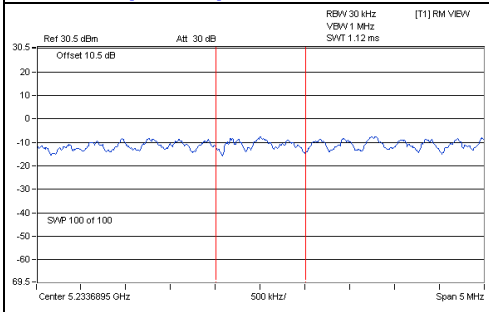
TX Channel Bandwidth 1 MHz Power 5.88 dBm

802.11ac (VHT20)



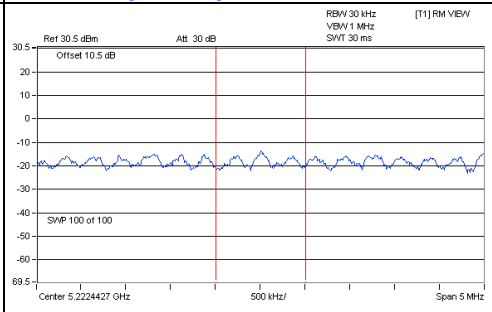
TX Channel Bandwidth 1 MHz Power 6.17 dBm

802.11ac (VHT40)



TX Channel Bandwidth 1 MHz Power 4.29 dBm

802.11ac (VHT80)



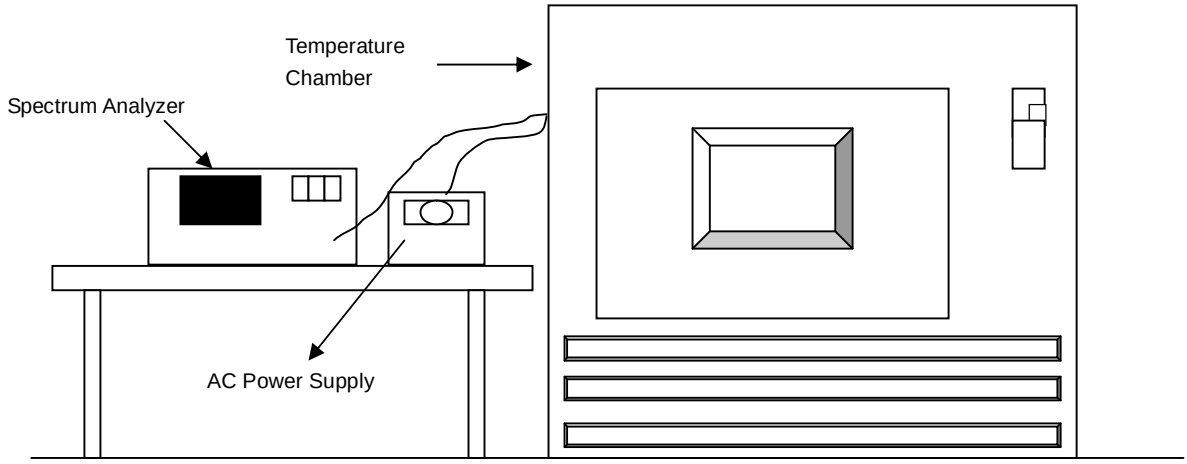
TX Channel Bandwidth 1 MHz Power -3.08 dBm

4.5 Frequency Stability Measurement

4.5.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
b. Turn the EUT on and couple its output to a spectrum analyzer.
c. Turn the EUT off and set the chamber to the highest temperature specified.
d. 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.
e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.5.7 Test Results

FREQUEMCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (℃)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
50	120	5180.042616	8.2270925	5180.04275	8.2528958	5180.042879	8.2777945	5180.042987	8.2986486
40	120	5180.043039	8.3087623	5180.042705	8.2442085	5180.042925	8.2867706	5180.04288	8.2779923
30	120	5180.043631	8.4229943	5180.043681	8.4326255	5180.043535	8.4045079	5180.04347	8.3918919
20	120	5180.042764	8.2555735	5180.042755	8.2538610	5180.042981	8.2975505	5180.043003	8.3017375
10	120	5180.042655	8.2346482	5180.042626	8.2289575	5180.042569	8.2180498	5180.042665	8.2364865
0	120	5180.043233	8.3461434	5180.043364	8.3714286	5180.043017	8.3044208	5180.043132	8.3266409
-10	120	5180.043463	8.3905138	5180.042979	8.2971042	5180.043066	8.3139267	5180.0431	8.3204633
-20	120	5180.043182	8.3362928	5180.042768	8.2564668	5180.043497	8.3970857	5180.04297	8.2953750

FREQUEMCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5180MHz									
TEMP. (℃)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
20	138	5180.043238	8.3470697	5180.043274	8.3540541	5180.043390	8.3763912	5180.043285	8.3561776
	120	5180.042764	8.2555735	5180.042755	8.2538610	5180.042981	8.2975505	5180.043003	8.3017375
	102	5180.042159	8.1388545	5180.042142	8.1355212	5180.042303	8.1665179	5180.042364	8.1783784

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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