

FCC Test Report (15.407)

Report No.: RF150430E10-1

FCC ID: PY315200310

Test Model: R7800

Received Date: Mar. 25, 2015

Test Date: May 07 to 15, 2015

Issued Date: May 21, 2015

Applicant: NETGEAR, Inc.

Address: 350 East Plumeria Drive San Jose, CA 95134

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

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Table of Contents

Release Control Record	4
1 Certificate of Conformity.....	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information.....	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	10
3.2.1 Test Mode Applicability and Tested Channel Detail	11
3.3 Duty Cycle of Test Signal	13
3.4 Description of Support Units	14
3.4.1 Configuration of System under Test	14
3.5 General Description of Applied Standard	15
4 Test Types and Results	16
4.1 Radiated Emission and Bandedge Measurement.....	16
4.1.1 Limits of Radiated Emission and Bandedge Measurement	16
4.1.2 Test Instruments	17
4.1.3 Test Procedure	19
4.1.4 Deviation from Test Standard	19
4.1.5 Test Setup.....	20
4.1.6 EUT Operating Condition	20
4.1.7 Test Results	21
4.2 Conducted Emission Measurement	31
4.2.1 Limits of Conducted Emission Measurement	31
4.2.2 Test Instruments	31
4.2.3 Test Procedure	32
4.2.4 Deviation from Test Standard	32
4.2.5 Test Setup.....	32
4.2.6 EUT Operating Condition	32
4.2.7 Test Results	33
4.3 Transmit Power Measurement	35
4.3.1 Limits of Transmit Power Measurement	35
4.3.2 Test Setup.....	35
4.3.3 Test Instruments	35
4.3.4 Test Procedure	36
4.3.5 Deviation from Test Standard	36
4.3.6 EUT Operating Condition	36
4.3.7 Test Result.....	37
4.4 Peak Power Spectral Density Measurement	38
4.4.1 Limits of Peak Power Spectral Density Measurement	38
4.4.2 Test Setup.....	38
4.4.3 Test Instruments	38
4.4.4 Test Procedure	39
4.4.5 Deviation from Test Standard	39
4.4.6 EUT Operating Condition	39
4.4.7 Test Results	40
4.5 Frequency Stability Measurement.....	42
4.5.1 Limits of Frequency Stability Measurement	42
4.5.2 Test Setup.....	42
4.5.3 Test Instruments	42
4.5.4 Test Procedure	42
4.5.5 Deviation from Test Standard	43
4.5.6 EUT Operating Condition	43



4.5.7 Test Results	44
5 Pictures of Test Arrangements	45
Appendix – Information on the Testing Laboratories	46



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Release Control Record

Issue No.	Description	Date Issued
RF150430E10-1	Original release.	May 21, 2015

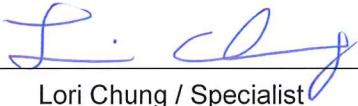


A D T

1 Certificate of Conformity

Product: Nighthawk X4S Smart WIFI Router
Brand: NETGEAR
Test Model: R7800
Sample Status: ENGINEERING SAMPLE
Applicant: NETGEAR, Inc.
Test Date: May 07 to 15, 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. This report contains Radiated Emissions & Band Edge Measurement (above 1GHz) test data that were produced under subcontract by Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories.

Prepared by : , **Date:** May 21, 2015
Lori Chung / Specialist

Approved by : , **Date:** May 21, 2015
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (SECTION 15.407 Under New Rule)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -10.33dB at 11.67969MHz.
15.407(b)(1/2/3/4/6)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 15720.00MHz & 15600.00MHz.
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 i-pex(MHF) not a standard connector.

NOTE: The EUT was operating in 2.400 ~ 2.4835GHz, 5.15~5.25GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 5.15~5.25GHz. For the 2.400 ~ 2.4835GHz and 5.725~5.850GHz RF parameters was recorded in another test report.

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	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Nighthawk X4S Smart WIFI Router
Brand	NETGEAR
Test Model	R7800
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	19Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps
Operating Frequency	For 15.407 5.18 ~ 5.24GHz
	For 15.247 2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.745 ~ 5.825GHz
Number of Channel	For 15.407 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)
	For 15.247 (2.4GHz) 11 for 802.11b For 15.247 (5GHz) 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)
Output Power	For 15.407 CDD Mode: 802.11a: 918.069mW 802.11ac (VHT20): 951.947mW 802.11ac (VHT40): 711.113mW 802.11ac (VHT80): 238.875mW Beamforming Mode: 802.11ac (VHT20): 744.333mW 802.11ac (VHT40): 711.113mW 802.11ac (VHT80): 238.875mW
	For 15.247 (2.4GHz) CDD Mode: 802.11b: 962.497mW For 15.247 (5GHz) CDD Mode: 802.11a: 944.69mW Beamforming Mode: 802.11ac (VHT20): 936.896mW 802.11ac (VHT40): 937.418mW 802.11ac (VHT80): 658.63mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	Ethernet cable (shielded, 1.5m)

Note:

1. The emission of the simultaneous operation (2.4GHz & 5GHz) has been evaluated and no non-compliance was found.
2. The EUT must be supplied with a power adapter as following table:

Brand	NETGEAR
Model	AD2003F10
P/N	332-10631-01
Input Power	100-120Vac, 50/60Hz, 1.5A
Output Power	19Vdc, 3.16A
Power Line	DC output cable: Unshielded, 1.8m

3. The antennas provided to the EUT, please refer to the following table:

Antenna No.	Ant. Gain(dBi)	Frequency range (GHz to GHz)	Antenna Type	Connector Type
External (1)	0.67	2.4~2.4835	Dipole	i-pex(MHF)
	1.16	5.15~5.25	Dipole	i-pex(MHF)
	0.62	5.25~5.35	Dipole	i-pex(MHF)
	0.4	5.47~5.725	Dipole	i-pex(MHF)
	0.21	5.725~5.85	Dipole	i-pex(MHF)
External (2)	0.67	2.4~2.4835	Dipole	i-pex(MHF)
	1.16	5.15~5.25	Dipole	i-pex(MHF)
	0.62	5.25~5.35	Dipole	i-pex(MHF)
	0.4	5.47~5.725	Dipole	i-pex(MHF)
	0.21	5.725~5.85	Dipole	i-pex(MHF)
External (3)	0.67	2.4~2.4835	Dipole	i-pex(MHF)
	1.16	5.15~5.25	Dipole	i-pex(MHF)
	0.62	5.25~5.35	Dipole	i-pex(MHF)
	0.4	5.47~5.725	Dipole	i-pex(MHF)
	0.21	5.725~5.85	Dipole	i-pex(MHF)
External (4)	0.67	2.4~2.4835	Dipole	i-pex(MHF)
	1.16	5.15~5.25	Dipole	i-pex(MHF)
	0.62	5.25~5.35	Dipole	i-pex(MHF)
	0.4	5.47~5.725	Dipole	i-pex(MHF)
	0.21	5.725~5.85	Dipole	i-pex(MHF)

4. The EUT incorporates a MIMO function with beamforming for 5GHz (802.11n & 802.11ac mode).

For 2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	4TX	4RX
For 5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	4TX	4RX
802.11n (HT20)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11n (HT40)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11ac (VHT20)	MCS 0~8, Nss=1	4TX	4RX
	MCS 0~8, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX
802.11ac (VHT40)	MCS 0~9, Nss=1	4TX	4RX
	MCS 0~9, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX
802.11ac (VHT80)	MCS 0~9, Nss=1	4TX	4RX
	MCS 0~9, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

5. 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 2 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						
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
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3

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.

CDD MODE						
MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11ac (VHT20)	5180-5240	36 to 48	40	OFDM	BPSK	6.5

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.

CDD MODE						
MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11ac (VHT20)	5180-5240	36 to 48	40	OFDM	BPSK	6.5

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.

For Transmit Power Measurement

CDD 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
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3

Beamforming 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	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3

For Peak Power Spectral Density Measurement

CDD 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
802.11ac (VHT20)		36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)		42	42	OFDM	BPSK	29.3

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 69%RH	120Vac, 60Hz	Gary Cheng
RE<1G	25deg. C, 68%RH	120Vac, 60Hz	Robert Cheng
PLC	25deg. C, 70%RH	120Vac, 60Hz	Mike Hsieh
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

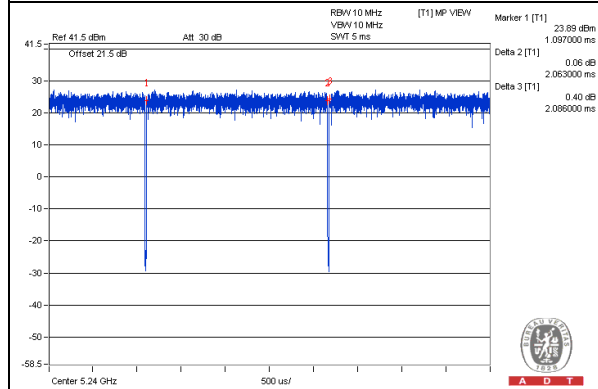
802.11a: Duty cycle = $2.063 \text{ ms} / 2.086 \text{ ms} = 0.989$

802.11ac (VHT20): Duty cycle = $1.926 \text{ ms} / 1.957 \text{ ms} = 0.984$

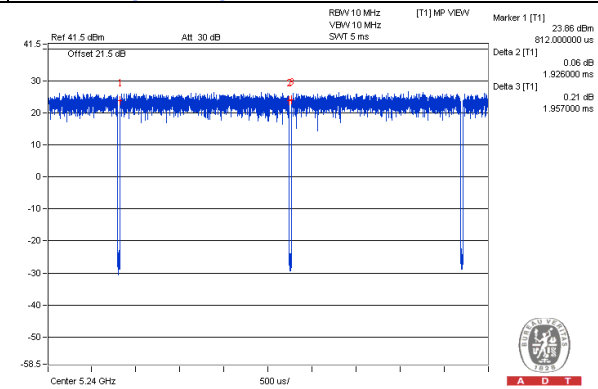
802.11ac (VHT40): Duty cycle = $0.953 \text{ ms} / 0.968 \text{ ms} = 0.985$

802.11ac (VHT80): Duty cycle = $0.459 \text{ ms} / 0.478 \text{ ms} = 0.96$, Duty factor = $10 * \log(1/0.96) = 0.18$

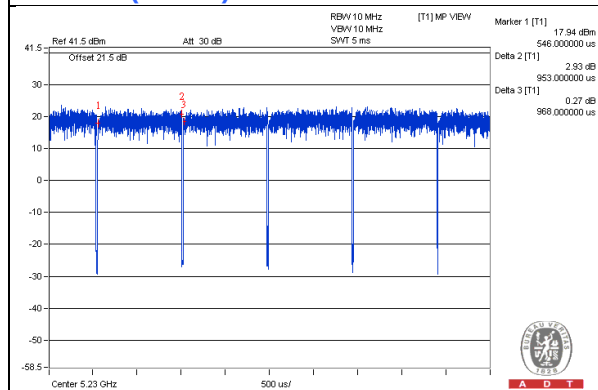
802.11a



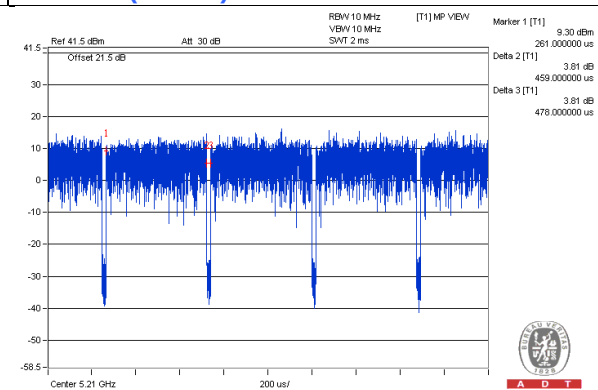
802.11ac (VHT20)



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.

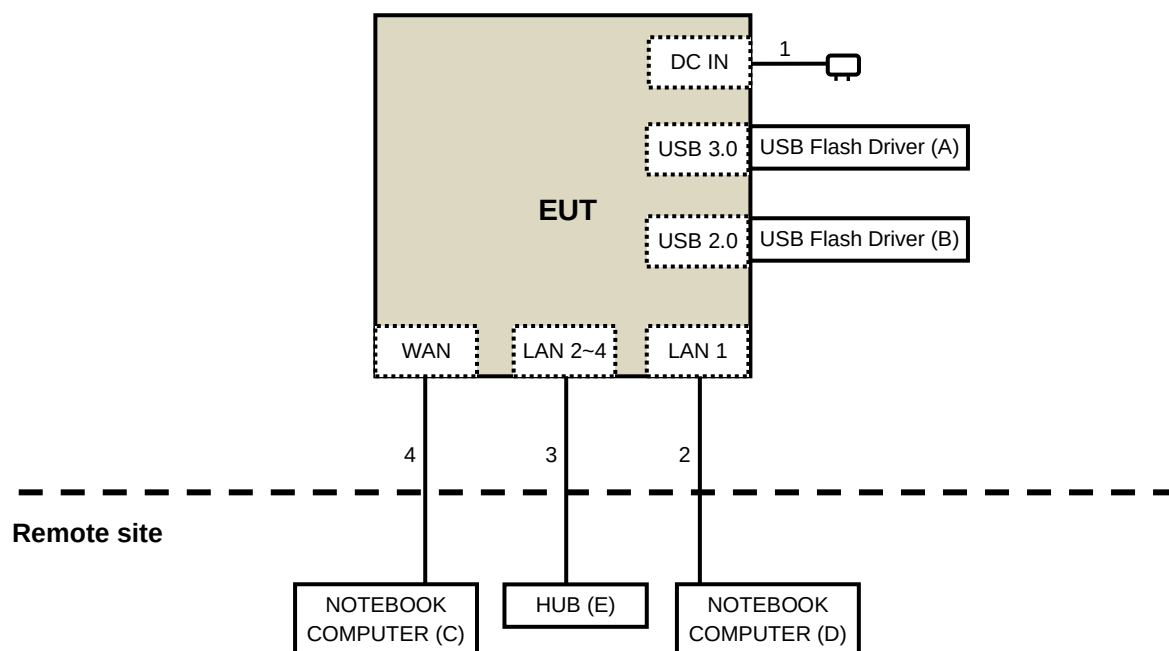
No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	USB Flash Driver	Transcend	JetFlash 790	NA	NA	Provided by Lab
B	USB Flash Driver	Transcend	JetFlash 790	NA	NA	Provided by Lab
C	NOTEBOOK COMPUTER	DELL	PP32LA	HSLB32S	FCC DoC	Provided by Lab
D	NOTEBOOK COMPUTER	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
E	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab

NOTE:

- All power cords of the above support units are non-shielded (1.8 m).

No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	DC	1	1.8	No	0	Supplied by Client
2	RJ45	1	10	No	0	Provided by Lab
3	RJ45	3	10	No	0	Provided by Lab
4	RJ45	1	10	No	0	Provided by Lab

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:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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 (dBuV/m)	AV:54 (dBuV/m)
APPLICABLE TO	EIRP LIMIT	EQUIVALENT FIELD STRENGTH AT 3m
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBuV/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(dBuV/m) ^{*1} PK:78.2 (dBuV/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:

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

4.1.2 Test Instruments

For above 1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 06, 2014	Oct. 05, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	July 25, 2014	July 24, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 06, 2015	Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01961	Oct. 18, 2014	Oct. 17, 2015
Preamplifier Agilent	8447D	2944A10738	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Aug. 09, 2014	Aug. 08, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table BV ADT	TT100	TT93021704	NA	NA
Turn Table Controller BV ADT	SC100	SC93021704	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 18, 2014	Oct. 17, 2015

- NOTE: 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 HwaYa Chamber 4.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 460141.
5. The IC Site Registration No. is IC7450F-4.
6. Tested Date: May 11, 2015

For below 1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 11, 2014	Aug. 10, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Feb. 06, 2015	Feb. 05, 2016
RF Cable	NA	CHHCAB_001	Oct. 05, 2014	Oct. 04, 2015
Horn_Antenna AISI	AIH.8018	0000220091110	Feb. 06, 2015	Feb. 05, 2016
Pre-Amplifier Agilent	8449B	300801923	Oct. 28, 2014	Oct. 27, 2015
RF Cable	NA	131206 131213 131215 SNMY23685/4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 12, 2014	Dec. 11, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Feb. 05, 2015	Feb. 04, 2016
RF Cable	NA	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
- 5 The CANADA Site Registration No. is IC 7450H-3.
- 6 Tested Date: May 12, 2015

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:

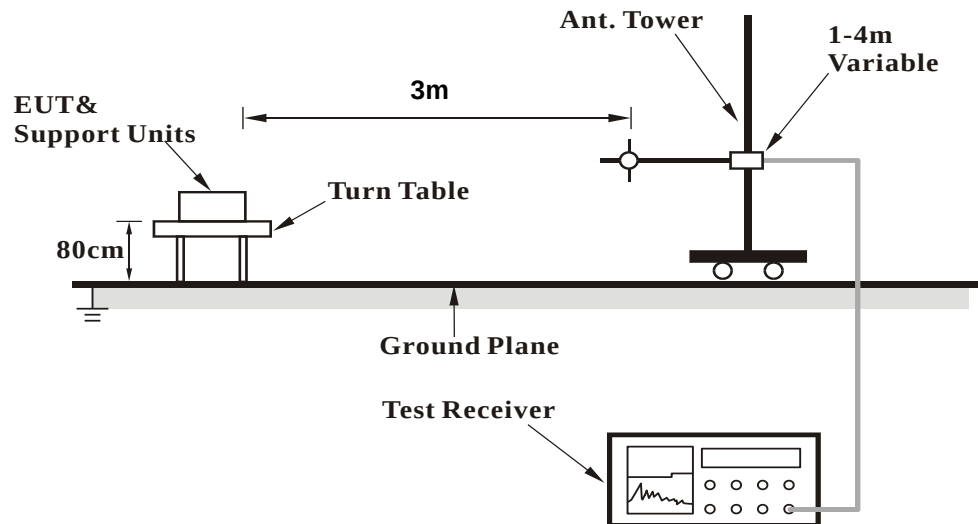
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution 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 ($10 \log(1/\text{duty cycle})$).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) 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

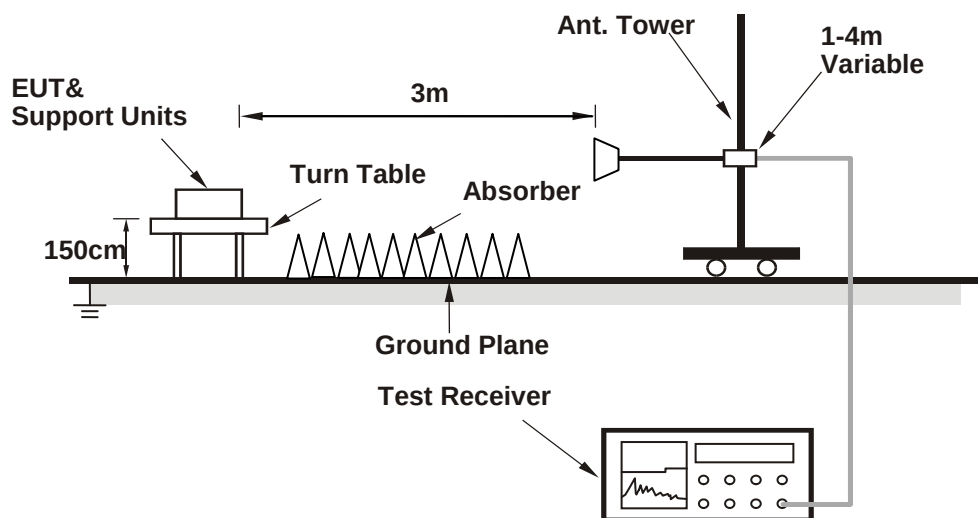
No deviation.

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

1. Connect the EUT with the support units C-D (NOTEBOOK COMPUTER) which is placed on remote site.
2. Controlling software (Mtool.exe_2_0_2_7) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data (Subcontract Item):

CDD Mode

802.11a

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

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	57.1 PK	74.0	-16.9	1.00 H	45	47.13	9.97
2	5150.00	40.3 AV	54.0	-13.7	1.00 H	45	30.33	9.97
3	*5180.00	104.2 PK			1.00 H	45	94.04	10.16
4	*5180.00	95.1 AV			1.00 H	45	84.94	10.16
5	#10360.00	57.0 PK	74.0	-17.0	1.00 H	278	40.02	16.98
6	#10360.00	44.7 AV	54.0	-9.3	1.00 H	278	27.72	16.98
7	15540.00	64.6 PK	74.0	-9.4	1.00 H	145	42.67	21.93
8	15540.00	48.8 AV	54.0	-5.2	1.00 H	145	26.87	21.93
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	71.0 PK	74.0	-3.0	1.64 V	51	61.03	9.97
2	5150.00	53.5 AV	54.0	-0.5	1.64 V	51	43.53	9.97
3	*5180.00	119.6 PK			1.64 V	51	109.44	10.16
4	*5180.00	110.1 AV			1.64 V	51	99.94	10.16
5	#10360.00	59.1 PK	74.0	-14.9	1.65 V	341	42.12	16.98
6	#10360.00	46.7 AV	54.0	-7.3	1.65 V	341	29.72	16.98
7	15540.00	66.0 PK	74.0	-8.0	1.14 V	37	44.07	21.93
8	15540.00	51.1 AV	54.0	-2.9	1.14 V	37	29.17	21.93

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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	106.8 PK			1.00 H	48	96.54	10.26
2	*5200.00	97.3 AV			1.00 H	48	87.04	10.26
3	#10400.00	57.4 PK	74.0	-16.6	1.03 H	299	40.34	17.06
4	#10400.00	44.8 AV	54.0	-9.2	1.03 H	299	27.74	17.06
5	15600.00	64.8 PK	74.0	-9.2	1.02 H	156	42.52	22.28
6	15600.00	48.9 AV	54.0	-5.1	1.02 H	156	26.62	22.28
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	122.7 PK			1.70 V	145	112.44	10.26
2	*5200.00	113.0 AV			1.70 V	145	102.74	10.26
3	#10400.00	60.1 PK	74.0	-13.9	1.19 V	173	43.04	17.06
4	#10400.00	48.0 AV	54.0	-6.0	1.19 V	173	30.94	17.06
5	15600.00	69.2 PK	74.0	-4.8	1.34 V	121	46.92	22.28
6	15600.00	53.7 AV	54.0	-0.3	1.34 V	121	31.42	22.28

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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	106.6 PK			1.00 H	31	96.27	10.33
2	*5240.00	97.3 AV			1.00 H	31	86.97	10.33
3	5406.00	57.5 PK	74.0	-16.5	1.03 H	43	46.78	10.72
4	5406.00	40.7 AV	54.0	-13.3	1.03 H	43	29.98	10.72
5	#10480.00	57.5 PK	74.0	-16.5	1.00 H	292	40.77	16.73
6	#10480.00	45.0 AV	54.0	-9.0	1.00 H	292	28.27	16.73
7	15720.00	64.7 PK	74.0	-9.3	1.00 H	149	42.07	22.63
8	15720.00	49.1 AV	54.0	-4.9	1.00 H	149	26.47	22.63
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	123.1 PK			1.48 V	131	112.77	10.33
2	*5240.00	113.2 AV			1.48 V	131	102.87	10.33
3	5406.00	61.2 PK	74.0	-12.8	1.48 V	131	50.48	10.72
4	5406.00	50.4 AV	54.0	-3.6	1.48 V	131	39.68	10.72
5	#10480.00	60.3 PK	74.0	-13.7	1.14 V	159	43.57	16.73
6	#10480.00	47.7 AV	54.0	-6.3	1.14 V	159	30.97	16.73
7	15720.00	68.7 PK	74.0	-5.3	1.64 V	115	46.07	22.63
8	15720.00	53.9 AV	54.0	-0.1	1.64 V	115	31.27	22.63

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 (VHT20)

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

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	5147.00	57.3 PK	74.0	-16.7	1.02 H	34	47.35	9.95
2	5147.00	40.5 AV	54.0	-13.5	1.02 H	34	30.55	9.95
3	*5180.00	104.6 PK			1.00 H	44	94.44	10.16
4	*5180.00	95.6 AV			1.00 H	44	85.44	10.16
5	#10360.00	57.0 PK	74.0	-17.0	1.09 H	292	40.02	16.98
6	#10360.00	44.7 AV	54.0	-9.3	1.09 H	292	27.72	16.98
7	15540.00	64.6 PK	74.0	-9.4	1.04 H	155	42.67	21.93
8	15540.00	49.1 AV	54.0	-4.9	1.04 H	155	27.17	21.93
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	5147.00	69.7 PK	74.0	-4.3	1.72 V	49	59.75	9.95
2	5147.00	53.5 AV	54.0	-0.5	1.72 V	49	43.55	9.95
3	*5180.00	119.0 PK			1.72 V	49	108.84	10.16
4	*5180.00	108.7 AV			1.72 V	49	98.54	10.16
5	#10360.00	59.0 PK	74.0	-15.0	1.11 V	69	42.02	16.98
6	#10360.00	46.6 AV	54.0	-7.4	1.11 V	69	29.62	16.98
7	15540.00	66.1 PK	74.0	-7.9	1.11 V	40	44.17	21.93
8	15540.00	51.4 AV	54.0	-2.6	1.11 V	40	29.47	21.93

REMARKS:

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

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

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	107.2 PK			1.01 H	32	96.94	10.26
2	*5200.00	97.5 AV			1.01 H	32	87.24	10.26
3	#10400.00	56.7 PK	74.0	-17.3	1.09 H	302	39.64	17.06
4	#10400.00	44.5 AV	54.0	-9.5	1.09 H	302	27.44	17.06
5	15600.00	64.9 PK	74.0	-9.1	1.06 H	140	42.62	22.28
6	15600.00	49.1 AV	54.0	-4.9	1.06 H	140	26.82	22.28
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	122.5 PK			1.68 V	145	112.24	10.26
2	*5200.00	111.8 AV			1.68 V	145	101.54	10.26
3	#10400.00	60.2 PK	74.0	-13.8	1.11 V	34	43.14	17.06
4	#10400.00	47.6 AV	54.0	-6.4	1.11 V	34	30.54	17.06
5	15600.00	68.2 PK	74.0	-5.8	1.14 V	140	45.92	22.28
6	15600.00	53.9 AV	54.0	-0.1	1.14 V	140	31.62	22.28

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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	106.2 PK			1.05 H	51	95.87	10.33
2	*5240.00	96.9 AV			1.05 H	51	86.57	10.33
3	5392.00	56.7 PK	74.0	-17.3	1.00 H	57	46.03	10.67
4	5392.00	40.0 AV	54.0	-14.0	1.00 H	57	29.33	10.67
5	#10480.00	56.5 PK	74.0	-17.5	1.05 H	284	39.77	16.73
6	#10480.00	44.2 AV	54.0	-9.8	1.05 H	284	27.47	16.73
7	15720.00	64.6 PK	74.0	-9.4	1.00 H	151	41.97	22.63
8	15720.00	49.1 AV	54.0	-4.9	1.00 H	151	26.47	22.63
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	123.7 PK			1.76 V	133	113.37	10.33
2	*5240.00	112.8 AV			1.76 V	133	102.47	10.33
3	5392.00	61.4 PK	74.0	-12.6	1.76 V	133	50.73	10.67
4	5392.00	49.6 AV	54.0	-4.4	1.76 V	133	38.93	10.67
5	#10480.00	58.3 PK	74.0	-15.7	1.02 V	21	41.57	16.73
6	#10480.00	46.0 AV	54.0	-8.0	1.02 V	21	29.27	16.73
7	15720.00	68.2 PK	74.0	-5.8	1.57 V	115	45.57	22.63
8	15720.00	53.6 AV	54.0	-0.4	1.57 V	115	30.97	22.63

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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	56.8 PK	74.0	-17.2	1.00 H	46	46.83	9.97
2	5150.00	40.3 AV	54.0	-13.7	1.00 H	46	30.33	9.97
3	*5190.00	99.8 PK			1.01 H	54	89.60	10.20
4	*5190.00	89.6 AV			1.01 H	54	79.40	10.20
5	#10380.00	56.6 PK	74.0	-17.4	1.11 H	289	39.58	17.02
6	#10380.00	44.7 AV	54.0	-9.3	1.11 H	289	27.68	17.02
7	15570.00	65.0 PK	74.0	-9.0	1.00 H	141	42.90	22.10
8	15570.00	49.0 AV	54.0	-5.0	1.00 H	141	26.90	22.10
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	72.6 PK	74.0	-1.4	1.57 V	146	62.63	9.97
2	5150.00	53.2 AV	54.0	-0.8	1.57 V	146	43.23	9.97
3	*5190.00	115.2 PK			1.79 V	132	105.00	10.20
4	*5190.00	104.6 AV			1.79 V	132	94.40	10.20
5	#10380.00	58.7 PK	74.0	-15.3	1.00 V	30	41.68	17.02
6	#10380.00	46.5 AV	54.0	-7.5	1.00 V	30	29.48	17.02
7	15570.00	64.2 PK	74.0	-9.8	1.50 V	100	42.10	22.10
8	15570.00	48.6 AV	54.0	-5.4	1.50 V	100	26.50	22.10

REMARKS:

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

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

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	57.2 PK	74.0	-16.8	1.03 H	48	47.23	9.97
2	5150.00	40.5 AV	54.0	-13.5	1.03 H	48	30.53	9.97
3	*5230.00	113.2 PK			1.02 H	53	102.88	10.32
4	*5230.00	92.4 AV			1.02 H	53	82.08	10.32
5	5375.00	59.1 PK	74.0	-14.9	1.03 H	48	48.47	10.63
6	5375.00	42.3 AV	54.0	-11.7	1.03 H	48	31.67	10.63
7	#10460.00	56.6 PK	74.0	-17.4	1.06 H	301	39.78	16.82
8	#10460.00	44.7 AV	54.0	-9.3	1.06 H	301	27.88	16.82
9	15690.00	64.2 PK	74.0	-9.8	1.06 H	139	41.68	22.52
10	15690.00	48.5 AV	54.0	-5.5	1.06 H	139	25.98	22.52

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	61.6 PK	74.0	-12.4	1.56 V	101	51.63	9.97
2	5150.00	49.9 AV	54.0	-4.1	1.56 V	101	39.93	9.97
3	*5230.00	118.6 PK			1.77 V	129	108.28	10.32
4	*5230.00	107.8 AV			1.77 V	129	97.48	10.32
5	5375.00	65.8 PK	74.0	-8.2	1.56 V	101	55.17	10.63
6	5375.00	53.9 AV	54.0	-0.1	1.56 V	101	43.27	10.63
7	#10460.00	58.1 PK	74.0	-15.9	1.07 V	19	41.28	16.82
8	#10460.00	45.7 AV	54.0	-8.3	1.07 V	19	28.88	16.82
9	15690.00	65.1 PK	74.0	-8.9	1.59 V	111	42.58	22.52
10	15690.00	49.2 AV	54.0	-4.8	1.59 V	111	26.68	22.52

REMARKS:

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

802.11ac (VHT80)

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

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	57.8 PK	74.0	-16.2	1.00 H	35	47.83	9.97
2	5150.00	40.4 AV	54.0	-13.6	1.00 H	35	30.43	9.97
3	*5210.00	94.3 PK			1.00 H	52	84.03	10.27
4	*5210.00	84.2 AV			1.00 H	52	73.93	10.27
5	5350.00	56.7 PK	74.0	-17.3	1.00 H	35	46.15	10.55
6	5350.00	39.9 AV	54.0	-14.1	1.00 H	35	29.35	10.55
7	#10420.00	57.3 PK	74.0	-16.7	1.07 H	302	40.32	16.98
8	#10420.00	44.8 AV	54.0	-9.2	1.07 H	302	27.82	16.98
9	15630.00	64.2 PK	74.0	-9.8	1.04 H	141	41.83	22.37
10	15630.00	48.4 AV	54.0	-5.6	1.04 H	141	26.03	22.37
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	65.0 PK	74.0	-9.0	1.62 V	146	55.03	9.97
2	5150.00	53.7 AV	54.0	-0.3	1.62 V	146	43.73	9.97
3	*5210.00	109.7 PK			1.73 V	120	99.43	10.27
4	*5210.00	99.6 AV			1.73 V	120	89.33	10.27
5	5350.00	60.6 PK	74.0	-13.4	1.73 V	123	50.05	10.55
6	5350.00	49.1 AV	54.0	-4.9	1.73 V	123	38.55	10.55
7	#10420.00	57.6 PK	74.0	-16.4	1.05 V	33	40.62	16.98
8	#10420.00	45.6 AV	54.0	-8.4	1.05 V	33	28.62	16.98
9	15630.00	64.3 PK	74.0	-9.7	1.48 V	105	41.93	22.37
10	15630.00	48.7 AV	54.0	-5.3	1.48 V	105	26.33	22.37

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:

CDD MODE

802.11ac (VHT20)

CHANNEL	TX Channel 40	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	Below 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	219.68	41.8 QP	46.0	-4.2	1.50 H	198	57.83	-16.05
2	318.96	42.0 QP	46.0	-4.1	1.00 H	127	53.07	-11.12
3	331.58	43.0 QP	46.0	-3.0	1.00 H	129	53.74	-10.78
4	379.83	41.6 QP	46.0	-4.4	1.00 H	109	51.73	-10.11
5	392.10	41.2 QP	46.0	-4.8	1.00 H	303	50.98	-9.81
6	750.03	42.0 QP	46.0	-4.1	1.00 H	0	43.94	-1.99
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	51.92	36.4 QP	40.0	-3.6	1.00 V	336	49.74	-13.36
2	62.25	35.1 QP	40.0	-4.9	1.00 V	193	49.52	-14.41
3	340.13	42.9 QP	46.0	-3.1	1.50 V	360	53.63	-10.77
4	368.00	41.9 QP	46.0	-4.1	1.50 V	125	52.16	-10.28
5	404.18	41.3 QP	46.0	-4.7	1.00 V	360	50.79	-9.51
6	749.98	41.3 QP	46.0	-4.7	1.50 V	360	43.28	-1.99

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100375	May 06, 2015	May 05, 2016
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable (JYEBAO)	5D-FB	COCCAB-001	Mar. 09, 2015	Mar. 08, 2016
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 2015
Software ADT	BV ADT_Cond_V7.3.7.3	NA	NA	NA

Note:

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. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: May 07, 2015

4.2.3 Test Procedure

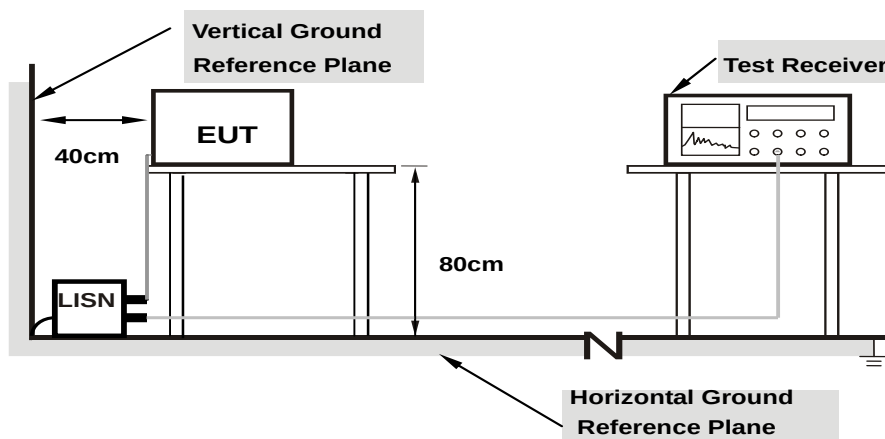
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

4.2.6 EUT Operating Condition

Same as 4.1.6.

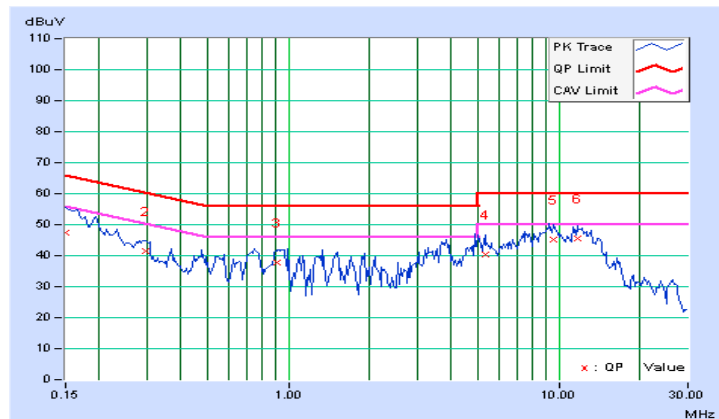
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.08	47.15	23.07	47.23	23.15	66.00	56.00	-18.77	-32.85
2	0.29844	0.09	41.33	32.53	41.42	32.62	60.29	50.29	-18.86	-17.66
3	0.91172	0.13	37.69	27.46	37.82	27.59	56.00	46.00	-18.18	-18.41
4	5.33984	0.27	40.13	33.63	40.40	33.90	60.00	50.00	-19.60	-16.10
5	9.55469	0.43	44.68	38.64	45.11	39.07	60.00	50.00	-14.89	-10.93
6	11.67969	0.49	44.96	39.18	45.45	39.67	60.00	50.00	-14.55	-10.33

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.

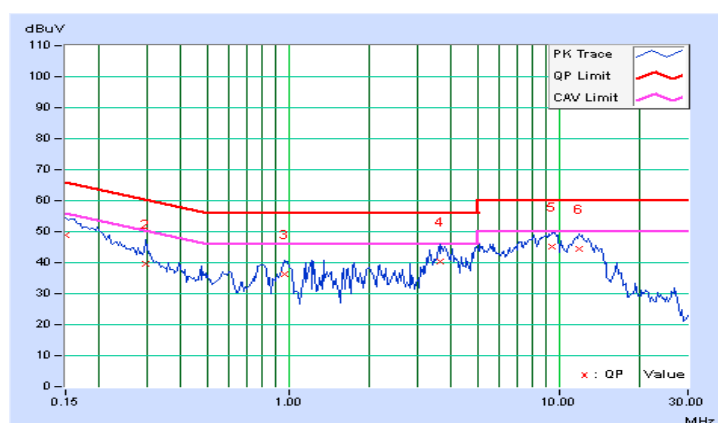


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.08	48.87	26.24	48.95	26.32	66.00	56.00	-17.05	-29.68
2	0.29844	0.09	39.63	32.03	39.72	32.12	60.29	50.29	-20.57	-18.17
3	0.96250	0.13	36.29	24.94	36.42	25.07	56.00	46.00	-19.58	-20.93
4	3.65625	0.22	40.06	31.80	40.28	32.02	56.00	46.00	-15.72	-13.98
5	9.48438	0.44	44.84	39.02	45.28	39.46	60.00	50.00	-14.72	-10.54
6	11.93359	0.51	43.87	38.49	44.38	39.00	60.00	50.00	-15.62	-11.00

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 Measurement

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 $\leq$ 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,

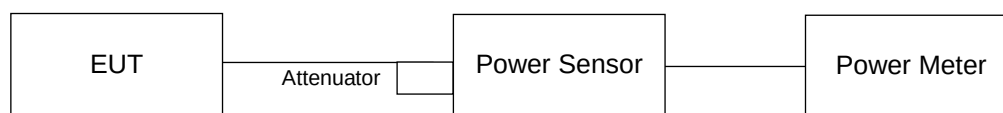
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power Meter Anritsu	ML2495A	0824006	May 22, 2014	May 21, 2015
Power Sensor Anritsu	MA2411B	0738172	May 22, 2014	May 21, 2015

- NOTE:**
1. The test was performed in Oven room B.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 15, 2015

4.3.4 Test Procedure

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.

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

CDD Mode

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
802.11a									
36	5180	21.26	20.84	21.12	21.50	525.673	27.21	30	Pass
40	5200	23.50	23.63	23.79	23.28	906.693	29.57	30	Pass
48	5240	23.56	23.40	23.86	23.60	918.069	29.63	30	Pass
802.11ac (VHT20)									
36	5180	20.91	20.92	21.06	21.53	516.782	27.13	30	Pass
40	5200	23.82	23.40	23.82	24.00	951.947	29.79	30	Pass
48	5240	23.59	23.39	24.02	23.83	940.727	29.73	30	Pass
802.11ac (VHT40)									
38	5190	19.35	19.17	19.49	19.83	353.784	25.49	30	Pass
46	5230	22.44	22.26	22.31	22.95	711.113	28.52	30	Pass
802.11ac (VHT80)									
42	5210	17.61	17.18	17.90	18.28	238.875	23.78	30	Pass

Beamforming Mode

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
802.11ac (VHT20)									
36	5180	20.91	20.92	21.06	21.53	516.782	27.13	28.82	Pass
40	5200	22.75	22.30	22.60	23.10	744.333	28.72	28.82	Pass
48	5240	22.58	22.36	23.10	22.50	735.323	28.66	28.82	Pass
802.11ac (VHT40)									
38	5190	19.35	19.17	19.49	19.83	353.784	25.49	28.82	Pass
46	5230	22.44	22.26	22.31	22.95	711.113	28.52	28.82	Pass
802.11ac (VHT80)									
42	5210	17.61	17.18	17.90	18.28	238.875	23.78	28.82	Pass

Note: Directional gain = $1.16\text{dBi} + 10\log(4) = 7.18\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (7.18 - 6) = 28.82$.

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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSV 40	100964	July 05, 2014	July 04, 2015

- NOTE:**
1. The test was performed in Oven room B.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 15, 2015

4.4.4 Test Procedure

For 802.11a, 802.11ac (VHT20) & 802.11ac (VHT40)

Using method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW $\geq$ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run".
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

For 802.11ac (VHT80)

Using method SA-2

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW $\geq$ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run".
4. Trace average at least 100 traces in power averaging mode.
5. 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 Power Density (dBm)	MAX. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3			
802.11a								
36	5180	6.07	6.27	7.38	7.13	12.77	15.82	Pass
40	5200	8.85	8.92	9.43	9.20	15.13	15.82	Pass
48	5240	9.53	8.80	9.50	9.53	15.37	15.82	Pass
802.11ac (VHT20)								
36	5180	6.17	6.02	6.49	7.17	12.51	15.82	Pass
40	5200	9.02	8.50	9.15	9.57	15.10	15.82	Pass
48	5240	8.40	8.78	9.47	9.37	15.05	15.82	Pass
802.11ac (VHT40)								
38	5190	1.88	1.60	2.28	2.56	8.12	15.82	Pass
46	5230	4.91	4.95	4.92	5.54	11.11	15.82	Pass

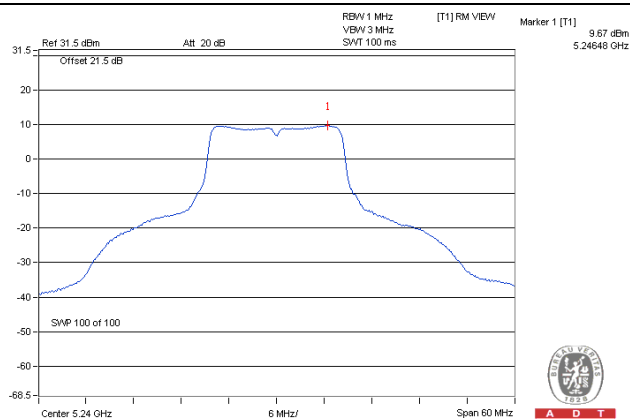
- Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $1.16\text{dBi} + 10\log(4) = 7.18\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(7.18-6) = 15.82\text{dBm}$.

Chan.	Chan. Freq. (MHz)	PSD w/o duty factor (dBm)				Duty Factor (dB)	Total PSD with Duty Factor (dBm)	MAX. Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
802.11ac (VHT80)									
42	5210	-2.28	-2.76	-2.39	-2.00	0.18	3.85	15.82	Pass

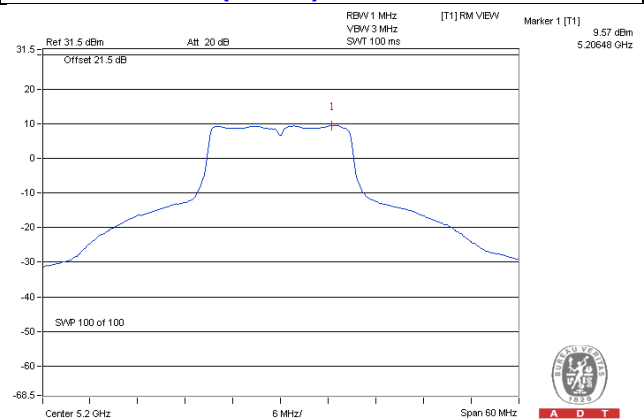
- Note: 1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $1.16\text{dBi} + 10\log(4) = 7.18\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(7.18-6) = 15.82\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

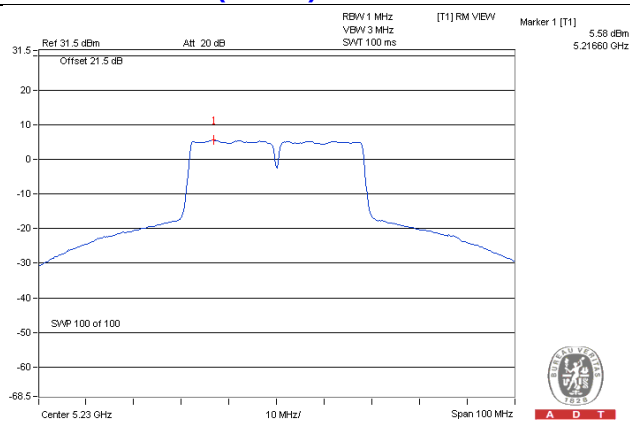
802.11a – Chain 3: CH 48



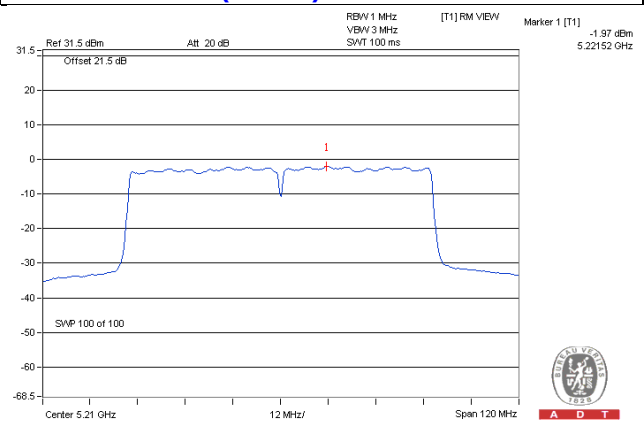
802.11ac (VHT20) – Chain 3: CH 40



802.11ac (VHT40) – Chain 3: CH 46



802.11ac (VHT80) – Chain 3: CH 42

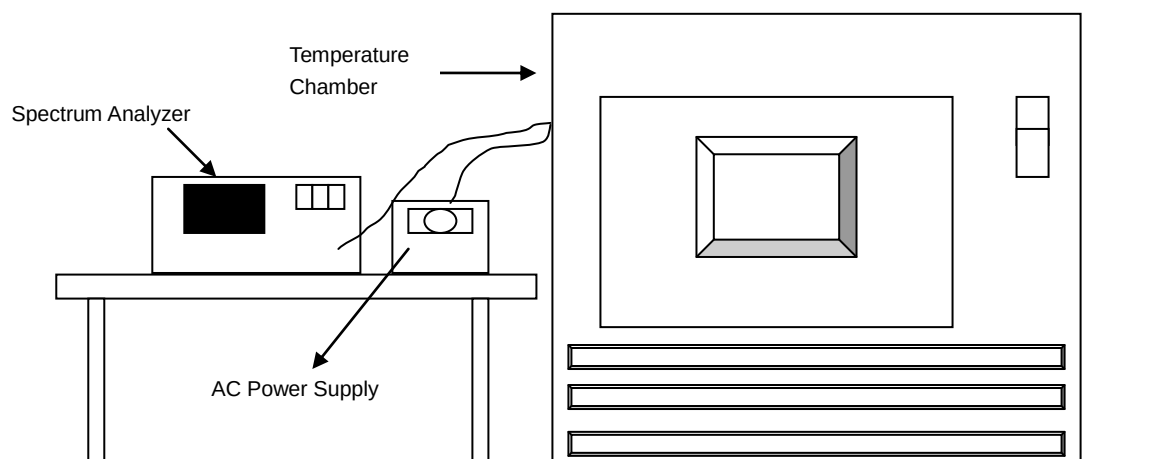


4.5 Frequency Stability Measurement

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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSV 40	100964	July 05, 2014	July 04, 2015
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-S P-AR	MAA0812-0 08	Jan. 12, 2015	Jan. 11, 2016

- NOTE:**
1. The test was performed in Oven room B.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 15, 2015

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

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	5179.9925	-0.00014	5179.9925	-0.00014	5179.9945	-0.00011	5179.997	-0.00006
40	120	5180.0025	0.00005	5180.0004	0.00001	5180.0003	0.00001	5179.9983	-0.00003
30	120	5180.0188	0.00036	5180.0173	0.00033	5180.0206	0.00040	5180.0204	0.00039
20	120	5180.0182	0.00035	5180.0195	0.00038	5180.0204	0.00039	5180.0207	0.00040
10	120	5179.999	-0.00002	5180.0008	0.00002	5180.0001	0.00000	5179.9969	-0.00006
0	120	5180.0231	0.00045	5180.0201	0.00039	5180.0199	0.00038	5180.0222	0.00043
-10	120	5180.0009	0.00002	5180	0.00000	5180.0036	0.00007	5180.0013	0.00003
-20	120	5179.9917	-0.00016	5179.9908	-0.00018	5179.9916	-0.00016	5179.9921	-0.00015
-30	120	5179.9846	-0.00030	5179.9884	-0.00022	5179.9868	-0.00025	5179.9868	-0.00025

FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5180.0179	0.00035	5180.0193	0.00037	5180.0211	0.00041	5180.0212	0.00041
	120	5180.0182	0.00035	5180.0195	0.00038	5180.0204	0.00039	5180.0207	0.00040
	102	5180.0181	0.00035	5180.0196	0.00038	5180.0195	0.00038	5180.0205	0.00040

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:

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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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