FCC Test Report

Report No.:	RF150514C27-1
FCC ID:	PY315100302
Test Model:	D7800
Received Date:	May 14, 2015
Test Date:	May 15 ~ May 22, 2015
Issued Date:	May 22, 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.
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

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Release Control Record

Issue No.	Description	Date Issued
RF150514C27-1	Original release	May 22, 2015

1 Certificate of Conformity

Product:	AC2600 WiFi VDSL/ADSL Modem Router
Brand:	NETGEAR
Test Model:	D7800
Sample Status:	Engineering sample
Applicant:	NETGEAR INC.
Test Date:	May 15 ~ May 22, 2015
Standards:	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 22, 2015

Polly Chien / Specialist

Approved by : _____ , **Date:** May 22, 2015

Ken Liu / Senior Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -12.29dB at 0.33750MHz.
15.407(b) (1/2/3/4/6)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.2dB at 5150.00MHz.
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 RSMA 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 ports0	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 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	AC2600 WiFi VDSL/ADSL Modem Router
Brand	NETGEAR
Test Model	D7800
Status of EUT	Engineering sample
Power Supply Rating	12Vdc from adapter
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	OFDM
Transfer Rate	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 600.0Mbps 802.11ac: up to 1300.0Mbps
Operating Frequency	5180 ~ 5240MHz
Number of Channel	4 for 802.11a, 802.11n (20MHz), 802.11ac (20MHz) 2 for 802.11n (40MHz), 802.11ac (40MHz) 1 for 802.11ac (80MHz)
Output Power	CDD Mode: 998.214mW Beamforming_NSS1 Mode: 835.798mW Beamforming_NSS2 Mode: 992.692mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Data Cable Supplied	N/A

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitters and 4 receivers.

Band	Modulation Mode	Beamforming Mode	TX Function
5GHz	802.11a	Not Support	4TX
	802.11n (20MHz)	Support	4TX
	802.11n (40MHz)	Support	4TX
	802.11ac (80MHz)	Support	4TX

* For 802.11a, the EUT doesn't support Beamforming mode.
* The modulation and bandwidth are similar for 802.11n mode for 20MHz / 40MHz and 802.11ac mode for V20MHz / V40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)
* For 5GHz band 802.11n and 802.11ac, after pre-tested two modes (with beamforming mode Nss=1 / 2 and CDD mode) found CDD mode was the worst, therefore chosen for final test for radiated emission and power line conducted emission test and presented in the test report.

2. The EUT uses following antennas.

Ant. Type	Connecter Type	Antenna Gain (dBi)				
		2412MHz	2422MHz	2437MHz	2452MHz	2462MHz
Dipole	RSMA	0.21	0.41	0.41	0.21	0.11
		5180MHz	5190MHz	5200MHz	5210MHz	5230MHz
		0.61	0.71	0.71	0.81	0.91
		5240MHz	5745MHz	5755MHz	5775MHz	5785MHz
		0.91	1.61	1.51	1.51	1.51
		5795MHz	5825MHz			
		1.61	1.61			

3. The EUT consumes power from the following adapters.

Adapter 1	
Brand	NETGEAR
Model	MU42-3120350-A1
Part No.	332-10762-01 (LEI)
Input Power	100-240Vac, 50/60Hz, 1.5A
Output Power	12Vdc, 3.5A
Power Line	1.8m cable without core attached on adapter

Adapter 2	
Brand	NETGEAR
Model	2ABN042F NA
Part No.	332-10761-01 (CWT)
Input Power	100-240Vac, 50/60Hz, 1.3A
Output Power	12Vdc, 3.5A
Power Line	1.85m cable without core attached on adapter

3.2 Description of Test Modes

For 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (20MHz), 802.11ac (20MHz):

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

2 channels are provided for 802.11n (40MHz), 802.11ac (40MHz):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (80MHz):

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	
A	√	√	√	√	Adapter 1
B	-	√	√	-	Adapter 2

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane.
2. "-" means no effect.

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.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
A	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
A	802.11n (40MHz)		38 to 46	38, 46	OFDM	BPSK	15.0
A	802.11ac (80MHz)		42	42	OFDM	BPSK	130.0

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.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A, B	802.11a	5180-5240	36 to 48	36	OFDM	BPSK	6.0

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.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A, B	802.11a	5180-5240	36 to 48	36	OFDM	BPSK	6.0

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.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
A	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
A	802.11n (40MHz)		38 to 46	38, 46	OFDM	BPSK	15.0
A	802.11ac (80MHz)		42	42	OFDM	BPSK	130.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	26deg. C, 62%RH	120Vac, 60Hz	Alan Wu
RE<1G	27deg. C, 65%RH	120Vac, 60Hz	Chris Lin
PLC	23deg. C, 65%RH	120Vac, 60Hz	Alan Wu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Antony Lee

3.3 Duty Cycle of Test Signal

CDD Mode

Duty cycle is < 98%, duty factor shall be considered.

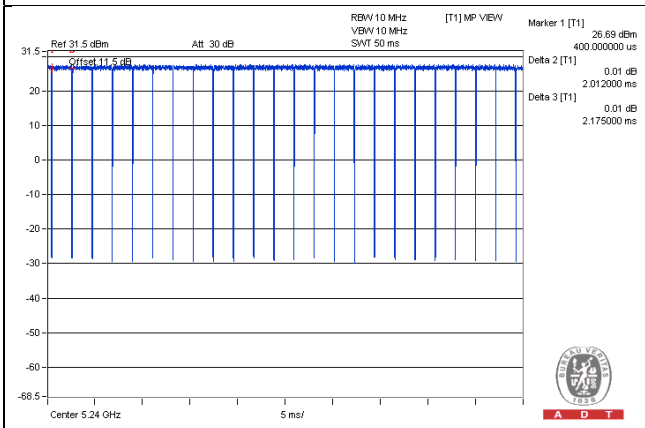
802.11a: Duty cycle = 2.012/2.175 = 0.925, Duty factor = 10 * log(1/0.925) = 0.34

802.11n (20MHz): Duty cycle = 4.975/5.100 = 0.975, Duty factor = 10 * log(1/0.975) = 0.11

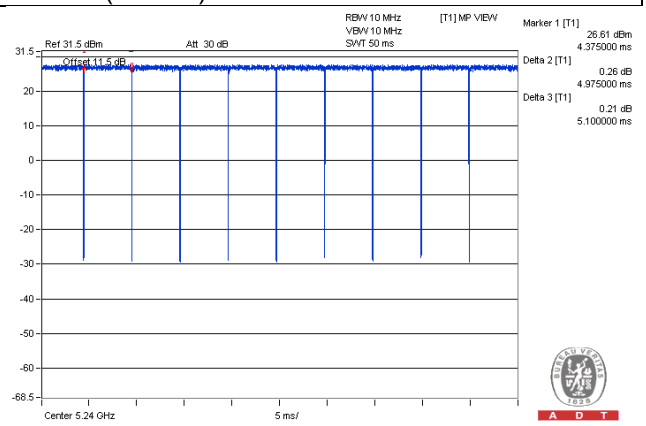
802.11n (40MHz): Duty cycle = 2.375/2.550 = 0.931, Duty factor = 10 * log(1/0.931) = 0.31

802.11ac (80MHz): Duty cycle = 1.099/1.224 = 0.898, Duty factor = 10 * log(1/0.898) = 0.47

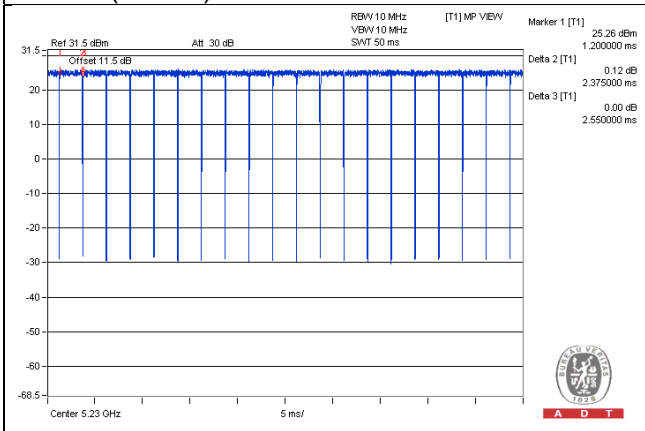
802.11a



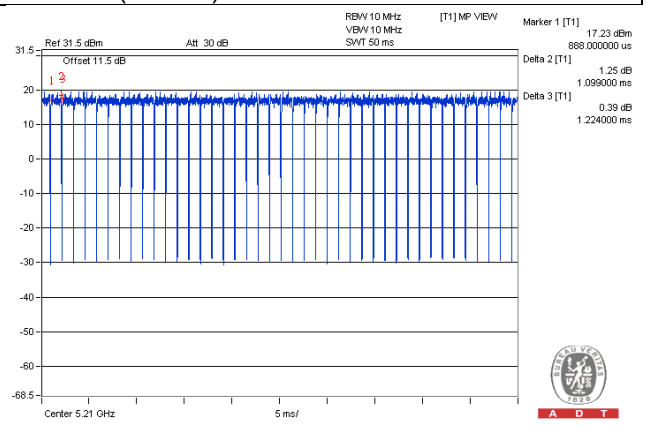
802.11n (20MHz)



802.11n (40MHz)



802.11ac (80MHz)



Beamforming_NSS1 Mode

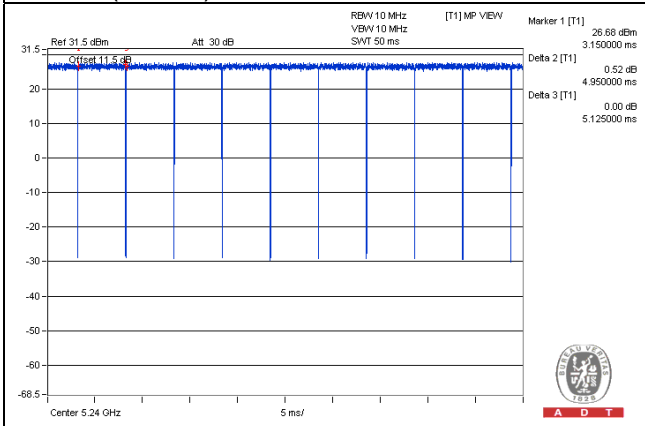
Duty cycle is < 98%, duty factor shall be considered.

802.11n (20MHz): Duty cycle = 4.950/5.125 = 0.966, Duty factor = 10 * log(1/0.966) = 0.15

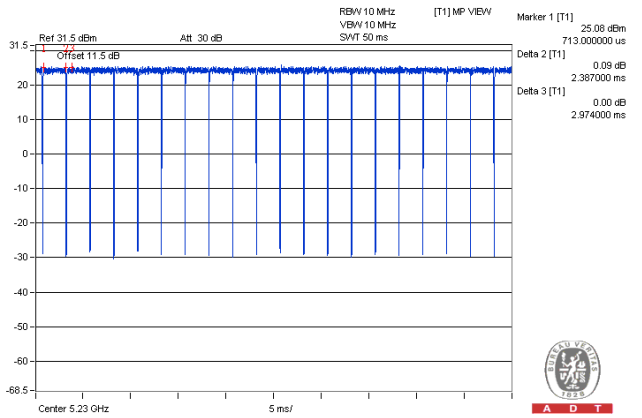
802.11n (40MHz): Duty cycle = 2.387/2.974 = 0.803, Duty factor = 10 * log(1/0.803) = 0.95

802.11ac (80MHz): Duty cycle = 1.074/1.212 = 0.886, Duty factor = 10 * log(1/0.886) = 0.53

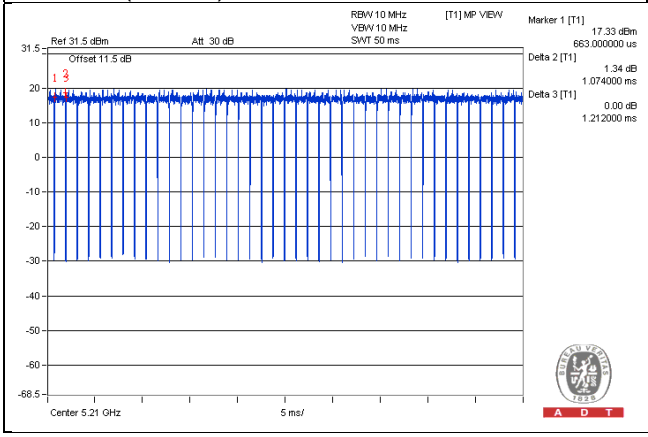
802.11n (20MHz)



802.11n (40MHz)



802.11ac (80MHz)



Beamforming_NSS2 Mode

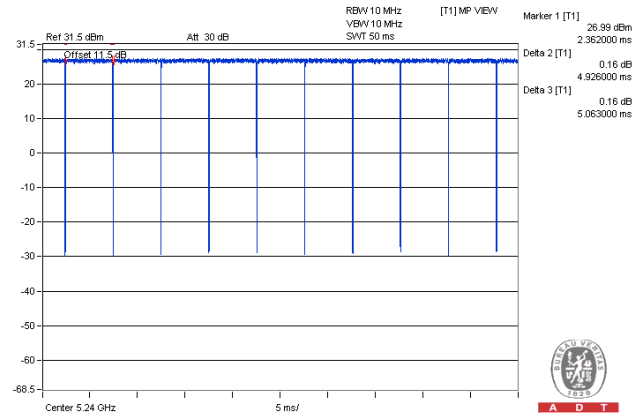
Duty cycle is < 98%, duty factor shall be considered.

802.11n (20MHz): Duty cycle = 4.926/5.063 = 0.973, Duty factor = 10 * log(1/0.973) = 0.12

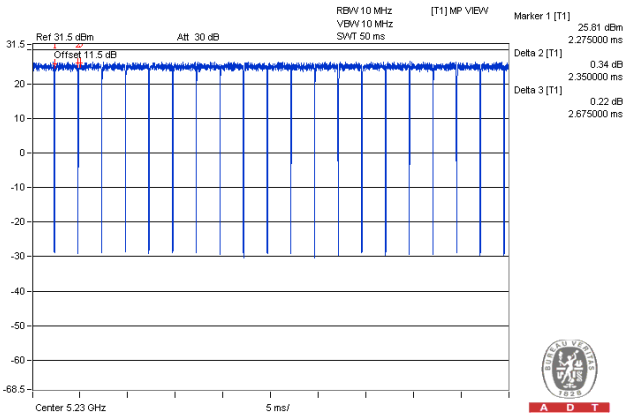
802.11n (40MHz): Duty cycle = 2.350/2.675 = 0.879, Duty factor = 10 * log(1/0.879) = 0.56

802.11ac (80MHz): Duty cycle = 1.050/1.250 = 0.840, Duty factor = 10 * log(1/0.840) = 0.76

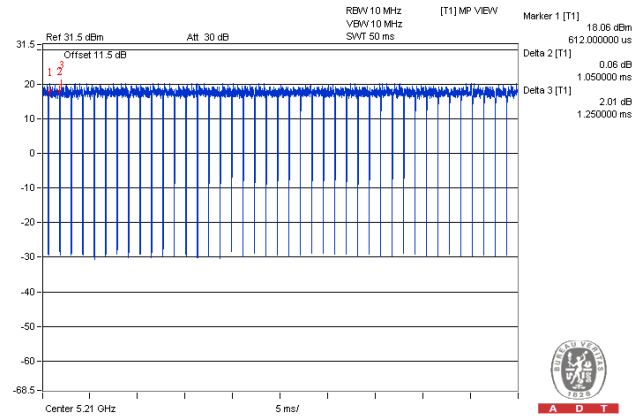
802.11n (20MHz)



802.11n (40MHz)



802.11ac (80MHz)



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.

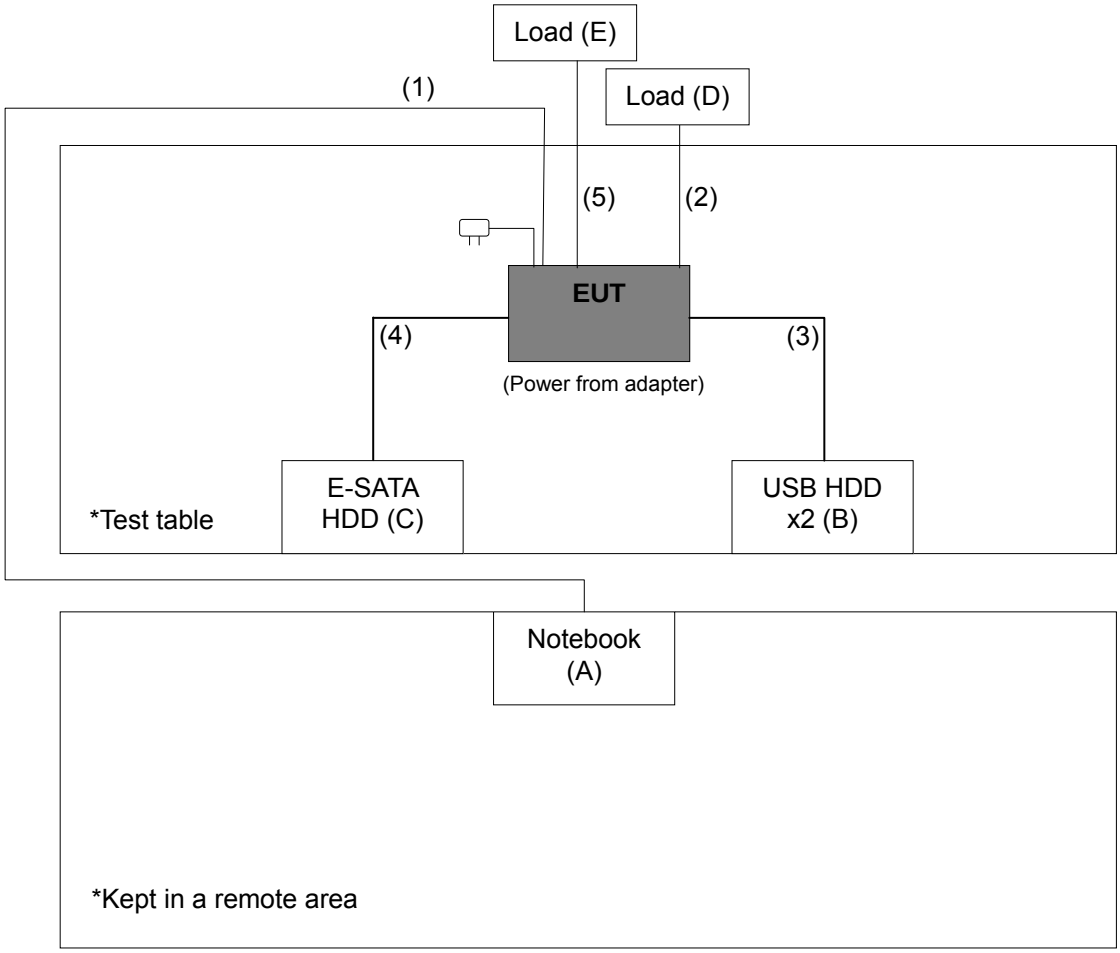
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5420	BPQ8MQ1	FCC DoC Approved	-
B.	USB HDD x 2	WD	WDBACY5000ABL	WX41A81P8576	FCC DoC Approved	-
		WD	WDBACY5000ABL-01	WX51C12T6215	FCC DoC Approved	-
C.	E-SATA HDD	Sarotech	FHD-354US	E80P048380919	FCC DoC Approved	-
D.	Load	NA	NA	NA	NA	-
E.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ 45	1	3	N	0	-
2.	RJ 45	4	1.8	N	0	-
3.	USB	2	1.8	Y	0	-
4.	E-SATA	1	0.5	Y	0	-
5.	RJ 11	1	1.8	N	0	-

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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 Procedures 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 is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It 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. Other emissions shall be at least 20dB below the highest level of the desired power:

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 Procedures 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.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 06, 2014	Oct. 05, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 25, 2014	Jul. 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	3008A01960	Aug. 09, 2014	Aug. 08, 2015
Preamplifier Agilent	8447D	2944A10631	Aug. 09, 2014	Aug. 08, 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 BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100.	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 18, 2014	Oct. 17, 2015
High Speed Peak Power Meter	ML2495A	0824011	Jul. 26, 2014	Jul. 25, 2015
Power Sensor	MA2411B	0738171	Jul. 26, 2014	Jul. 25, 2015
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 09, 2014	Jun. 08, 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.

4.1.3 Test Procedures

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:

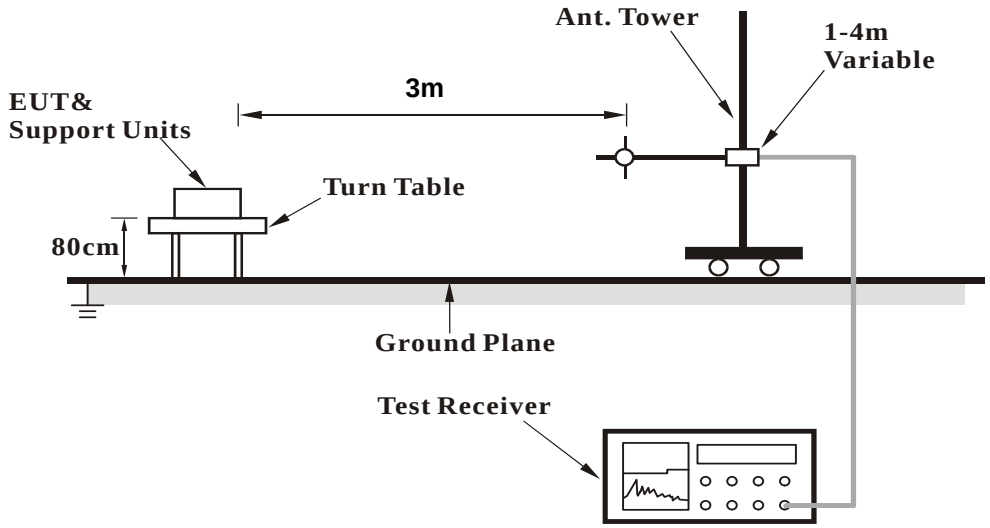
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution 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

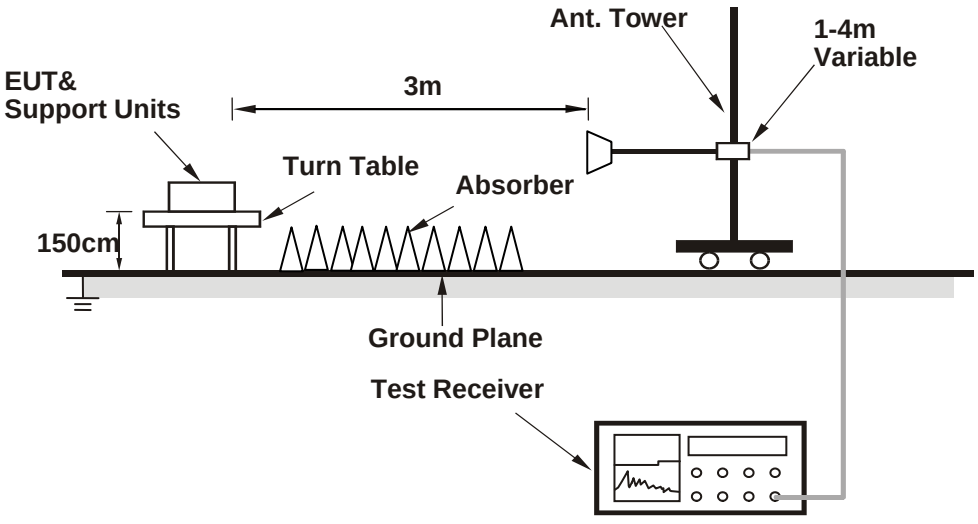
No deviation.

4.1.5 Test Set Up

<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 Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a 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

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	5150.00	59.8 PK	74.0	-14.2	1.09 H	58	54.50	5.30
2	5150.00	46.3 AV	54.0	-7.7	1.09 H	58	41.00	5.30
3	*5180.00	108.7 PK			1.09 H	58	69.50	39.20
4	*5180.00	98.1 AV			1.09 H	58	58.90	39.20
5	#10360.00	59.3 PK	74.0	-14.7	1.81 H	282	40.90	18.40
6	#10360.00	47.3 AV	54.0	-6.7	1.81 H	282	28.90	18.40
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	68.4 PK	74.0	-5.6	2.07 V	219	63.10	5.30
2	5150.00	53.6 AV	54.0	-0.4	2.07 V	219	48.30	5.30
3	*5180.00	122.6 PK			2.07 V	219	83.40	39.20
4	*5180.00	111.6 AV			2.07 V	219	72.40	39.20
5	#10360.00	61.7 PK	74.0	-12.3	1.00 V	195	43.30	18.40
6	#10360.00	48.5 AV	54.0	-5.5	1.00 V	195	30.10	18.40

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	109.6 PK			1.00 H	144	70.30	39.30
2	*5200.00	99.7 AV			1.00 H	144	60.40	39.30
3	#10400.00	58.8 PK	74.0	-15.2	1.73 H	279	40.60	18.20
4	#10400.00	46.8 AV	54.0	-7.2	1.73 H	279	28.60	18.20
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	*5200.00	122.1 PK			1.96 V	217	82.80	39.30
2	*5200.00	112.0 AV			1.96 V	217	72.70	39.30
3	#10400.00	61.5 PK	74.0	-12.5	1.02 V	197	43.30	18.20
4	#10400.00	48.3 AV	54.0	-5.7	1.02 V	197	30.10	18.20

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	111.4 PK			1.08 H	138	72.10	39.30
2	*5240.00	100.8 AV			1.08 H	138	61.50	39.30
3	5350.00	57.8 PK	74.0	-16.2	1.08 H	138	52.20	5.60
4	5350.00	44.7 AV	54.0	-9.3	1.08 H	138	39.10	5.60
5	#10480.00	60.7 PK	74.0	-13.3	1.79 H	273	43.10	17.60
6	#10480.00	47.4 AV	54.0	-6.6	1.79 H	273	29.80	17.60
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	123.3 PK			2.12 V	147	84.00	39.30
2	*5240.00	113.2 AV			2.12 V	147	73.90	39.30
3	5350.00	58.9 PK	74.0	-15.1	2.12 V	147	53.30	5.60
4	5350.00	45.6 AV	54.0	-8.4	2.12 V	147	40.00	5.60
5	#10480.00	61.0 PK	74.0	-13.0	1.00 V	195	43.40	17.60
6	#10480.00	47.7 AV	54.0	-6.3	1.00 V	195	30.10	17.60

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.

802.11n (20MHz)

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	5150.00	57.5 PK	74.0	-16.5	1.00 H	56	52.20	5.30
2	5150.00	43.3 AV	54.0	-10.7	1.00 H	56	38.00	5.30
3	*5180.00	107.3 PK			1.00 H	56	68.10	39.20
4	*5180.00	94.9 AV			1.00 H	56	55.70	39.20
5	#10360.00	58.6 PK	74.0	-15.4	1.76 H	278	40.20	18.40
6	#10360.00	47.4 AV	54.0	-6.6	1.76 H	278	29.00	18.40
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	72.1 PK	74.0	-1.9	1.89 V	218	66.80	5.30
2	5150.00	53.6 AV	54.0	-0.4	1.89 V	218	48.30	5.30
3	*5180.00	121.9 PK			1.89 V	218	82.70	39.20
4	*5180.00	109.8 AV			1.89 V	218	70.60	39.20
5	#10360.00	61.3 PK	74.0	-12.7	1.00 V	187	42.90	18.40
6	#10360.00	48.5 AV	54.0	-5.5	1.00 V	187	30.10	18.40

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	110.3 PK			1.60 H	136	71.00	39.30
2	*5200.00	98.3 AV			1.60 H	136	59.00	39.30
3	#10400.00	60.3 PK	74.0	-13.7	1.92 H	301	42.10	18.20
4	#10400.00	46.4 AV	54.0	-7.6	1.92 H	301	28.20	18.20
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	*5200.00	123.2 PK			2.07 V	217	83.90	39.30
2	*5200.00	110.4 AV			2.07 V	217	71.10	39.30
3	#10400.00	61.8 PK	74.0	-12.2	1.05 V	200	43.60	18.20
4	#10400.00	49.2 AV	54.0	-4.8	1.05 V	200	31.00	18.20

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	111.5 PK			1.62 H	136	72.20	39.30
2	*5240.00	98.5 AV			1.62 H	136	59.20	39.30
3	5350.00	57.8 PK	74.0	-16.2	1.62 H	136	52.20	5.60
4	5350.00	43.8 AV	54.0	-10.2	1.62 H	136	38.20	5.60
5	#10480.00	60.9 PK	74.0	-13.1	1.79 H	286	43.30	17.60
6	#10480.00	46.8 AV	54.0	-7.2	1.79 H	286	29.20	17.60
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	124.2 PK			2.12 V	217	84.90	39.30
2	*5240.00	110.9 AV			2.12 V	217	71.60	39.30
3	5350.00	58.9 PK	74.0	-15.1	2.12 V	217	53.30	5.60
4	5350.00	44.7 AV	54.0	-9.3	2.12 V	217	39.10	5.60
5	#10480.00	61.8 PK	74.0	-12.2	1.02 V	195	44.20	17.60
6	#10480.00	49.8 AV	54.0	-4.2	1.02 V	195	32.20	17.60

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.

802.11n (40MHz)

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	63.5 PK	74.0	-10.5	1.00 H	51	58.20	5.30
2	5150.00	49.2 AV	54.0	-4.8	1.00 H	51	43.90	5.30
3	*5190.00	103.5 PK			1.00 H	51	64.30	39.20
4	*5190.00	94.2 AV			1.00 H	51	55.00	39.20
5	#10380.00	58.4 PK	74.0	-15.6	1.80 H	273	40.20	18.20
6	#10380.00	46.2 AV	54.0	-7.8	1.80 H	273	28.00	18.20
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	5150.00	67.6 PK	74.0	-6.4	1.87 V	217	62.30	5.30
2	5150.00	53.6 AV	54.0	-0.4	1.87 V	217	48.30	5.30
3	*5190.00	114.4 PK			1.87 V	217	75.20	39.20
4	*5190.00	105.2 AV			1.87 V	217	66.00	39.20
5	#10380.00	61.1 PK	74.0	-12.9	1.00 V	179	42.90	18.20
6	#10380.00	48.3 AV	54.0	-5.7	1.00 V	179	30.10	18.20

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	61.5 PK	74.0	-12.5	1.02 H	53	56.20	5.30
2	5150.00	47.7 AV	54.0	-6.3	1.02 H	53	42.40	5.30
3	*5230.00	108.8 PK			1.02 H	53	69.50	39.30
4	*5230.00	98.8 AV			1.02 H	53	59.50	39.30
5	#10460.00	58.7 PK	74.0	-15.3	1.79 H	275	41.00	17.70
6	#10460.00	46.0 AV	54.0	-8.0	1.79 H	275	28.30	17.70
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	67.8 PK	74.0	-6.2	2.02 V	217	62.50	5.30
2	5150.00	53.7 AV	54.0	-0.3	2.02 V	217	48.40	5.30
3	*5230.00	119.7 PK			2.02 V	217	80.40	39.30
4	*5230.00	109.8 AV			2.02 V	217	70.50	39.30
5	#10460.00	61.3 PK	74.0	-12.7	1.02 V	199	43.60	17.70
6	#10460.00	48.0 AV	54.0	-6.0	1.02 V	199	30.30	17.70

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 (80MHz)

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	60.2 PK	74.0	-13.8	1.00 H	53	54.90	5.30
2	5150.00	47.2 AV	54.0	-6.8	1.00 H	53	41.90	5.30
3	*5210.00	99.3 PK			1.00 H	53	60.00	39.30
4	*5210.00	89.6 AV			1.00 H	53	50.30	39.30
5	#10420.00	58.2 PK	74.0	-15.8	1.63 H	277	40.20	18.00
6	#10420.00	45.9 AV	54.0	-8.1	1.63 H	277	27.90	18.00
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	2.02 V	218	65.70	5.30
2	**5150.00**	**53.8 AV**	**54.0**	**-0.2**	**2.02 V**	**218**	**48.50**	**5.30**
3	*5210.00	110.4 PK			2.02 V	218	71.10	39.30
4	*5210.00	100.9 AV			2.02 V	218	61.60	39.30
5	#10420.00	60.2 PK	74.0	-13.8	1.00 V	188	42.20	18.00
6	#10420.00	47.8 AV	54.0	-6.2	1.00 V	188	29.80	18.00

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: 802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
TEST MODE	A		

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	136.62	34.5 QP	43.5	-9.0	2.00 H	135	49.20	-14.70
2	268.57	34.6 QP	46.0	-11.4	1.01 H	181	48.00	-13.40
3	375.29	42.9 QP	46.0	-3.1	1.01 H	300	54.10	-11.20
4	416.04	39.8 QP	46.0	-6.2	2.00 H	355	50.30	-10.50
5	625.60	40.4 QP	46.0	-5.6	1.51 H	313	46.70	-6.30
6	875.91	42.7 QP	46.0	-3.3	2.00 H	339	44.90	-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	55.13	36.0 QP	40.0	-4.0	1.49 V	105	50.20	-14.20
2	287.97	40.1 QP	46.0	-5.9	1.49 V	254	52.90	-12.80
3	375.29	43.0 QP	46.0	-3.0	1.49 V	86	54.20	-11.20
4	625.60	40.8 QP	46.0	-5.2	1.00 V	64	47.10	-6.30
5	875.91	43.0 QP	46.0	-3.0	1.24 V	54	45.20	-2.20
6	936.07	38.0 QP	46.0	-8.0	1.99 V	13	39.00	-1.00

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

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
TEST MODE	B		

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	95.87	30.8 QP	43.5	-12.7	1.99 H	12	50.10	-19.30
2	237.52	35.2 QP	46.0	-10.8	1.24 H	12	50.30	-15.10
3	375.29	42.8 QP	46.0	-3.2	1.00 H	63	54.00	-11.20
4	625.60	40.5 QP	46.0	-5.5	1.24 H	116	46.80	-6.30
5	747.85	40.0 QP	46.0	-6.0	1.24 H	12	43.60	-3.60
6	875.91	42.2 QP	46.0	-3.8	1.00 H	326	44.40	-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	57.07	36.0 QP	40.0	-4.0	2.00 V	63	50.40	-14.40
2	287.97	34.8 QP	46.0	-11.2	2.00 V	245	47.60	-12.80
3	375.29	43.0 QP	46.0	-3.0	1.51 V	260	54.20	-11.20
4	625.60	40.9 QP	46.0	-5.1	1.01 V	72	47.20	-6.30
5	730.38	40.0 QP	46.0	-6.0	1.51 V	94	44.50	-4.50
6	875.91	42.3 QP	46.0	-3.7	1.25 V	49	44.50	-2.20

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.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Apr. 27, 2015	Apr. 26, 2016
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 30, 2014	Dec. 29, 2015
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 10, 2014	Jul. 09, 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 HwaYa Shielded Room 2.
3. The VCCI Site Registration No. is C-2047.

4.2.3 Test Procedures

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.

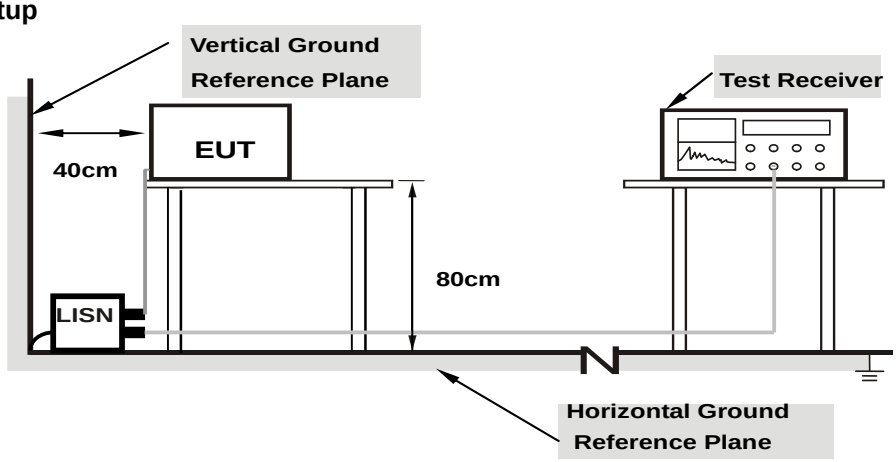
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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 Conditions

Same as 4.1.6.

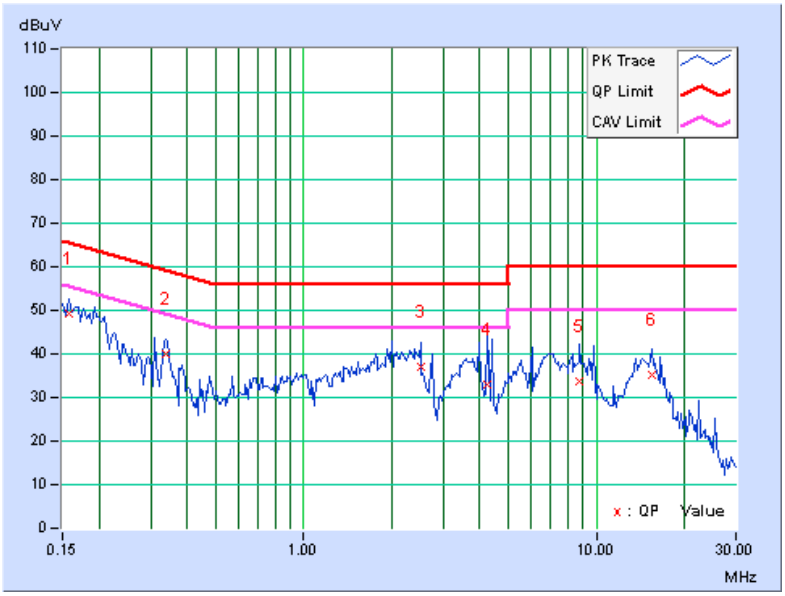
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	0.20	49.08	35.78	49.28	35.98	65.58	55.58	-16.30	-19.60
2	**0.33750**	**0.20**	**39.96**	**36.77**	**40.16**	**36.97**	**59.26**	**49.26**	**-19.10**	**-12.29**
3	2.51172	0.38	36.68	26.76	37.06	27.14	56.00	46.00	-18.94	-18.86
4	4.25000	0.43	32.60	23.04	33.03	23.47	56.00	46.00	-22.97	-22.53
5	8.78516	0.49	33.36	28.61	33.85	29.10	60.00	50.00	-26.15	-20.90
6	15.44922	0.59	34.72	30.63	35.31	31.22	60.00	50.00	-24.69	-18.78

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.

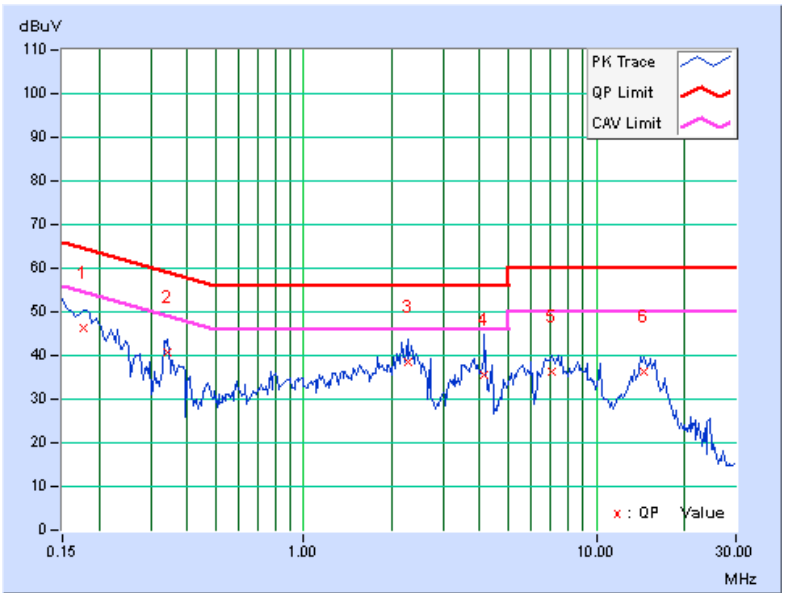


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test mode	A		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17734	0.21	46.14	33.24	46.35	33.45	64.61	54.61	-18.26	-21.16
2	0.34141	0.24	40.42	33.73	40.66	33.97	59.17	49.17	-18.51	-15.20
3	2.26563	0.41	38.28	30.30	38.69	30.71	56.00	46.00	-17.31	-15.29
4	4.14453	0.46	35.10	25.72	35.56	26.18	56.00	46.00	-20.44	-19.82
5	7.05859	0.52	35.80	31.46	36.32	31.98	60.00	50.00	-23.68	-18.02
6	14.63281	0.70	35.49	31.67	36.19	32.37	60.00	50.00	-23.81	-17.63

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.

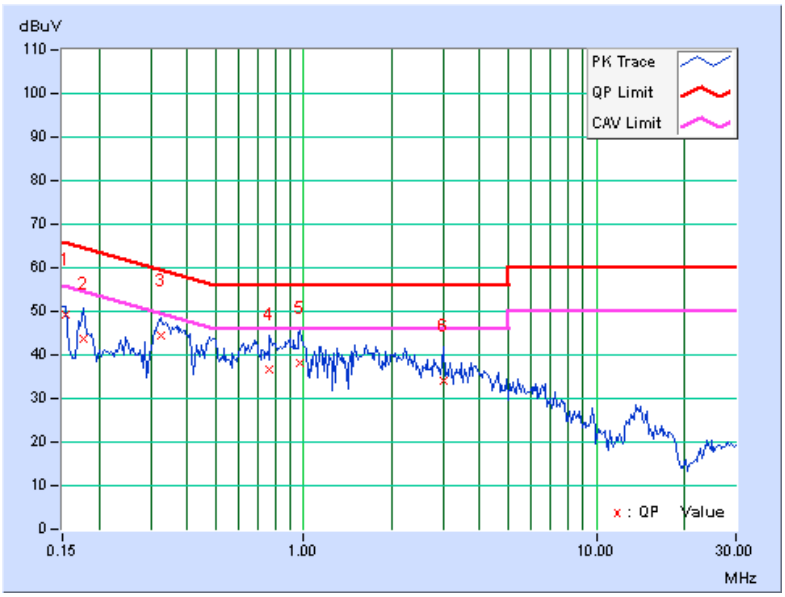


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.20	49.07	34.04	49.27	34.24	65.79	55.79	-16.52	-21.55
2	0.17734	0.20	43.65	30.97	43.85	31.17	64.61	54.61	-20.76	-23.44
3	0.32578	0.20	44.18	36.58	44.38	36.78	59.56	49.56	-15.18	-12.78
4	0.76719	0.26	36.59	25.96	36.85	26.22	56.00	46.00	-19.15	-19.78
5	0.97422	0.30	37.78	29.35	38.08	29.65	56.00	46.00	-17.92	-16.35
6	3.00391	0.40	33.78	26.46	34.18	26.86	56.00	46.00	-21.82	-19.14

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.

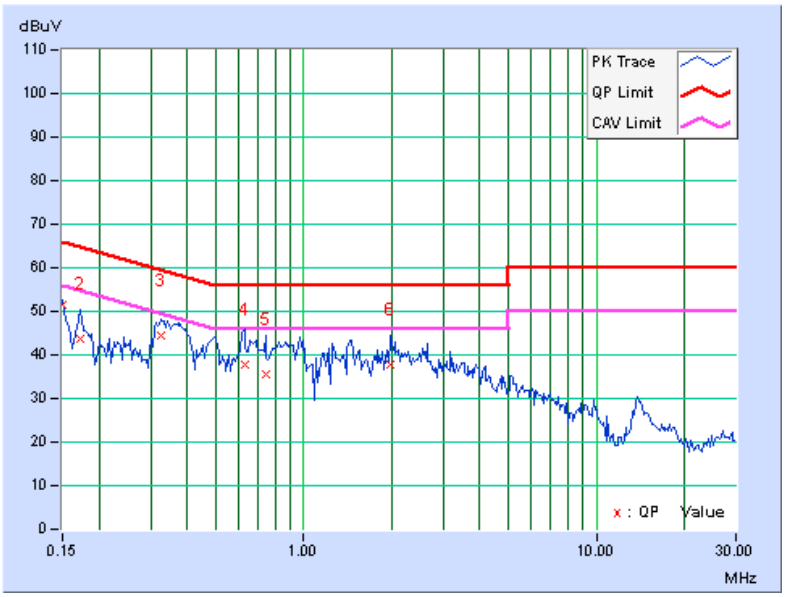


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.20	51.10	37.97	51.30	38.17	66.00	56.00	-14.70	-17.83
2	0.17344	0.21	43.42	28.79	43.63	29.00	64.79	54.79	-21.16	-25.79
3	0.32578	0.24	44.35	35.74	44.59	35.98	59.56	49.56	-14.97	-13.58
4	0.62656	0.27	37.34	26.98	37.61	27.25	56.00	46.00	-18.39	-18.75
5	0.74375	0.28	35.18	24.70	35.46	24.98	56.00	46.00	-20.54	-21.02
6	1.98828	0.40	37.41	30.22	37.81	30.62	56.00	46.00	-18.19	-15.38

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

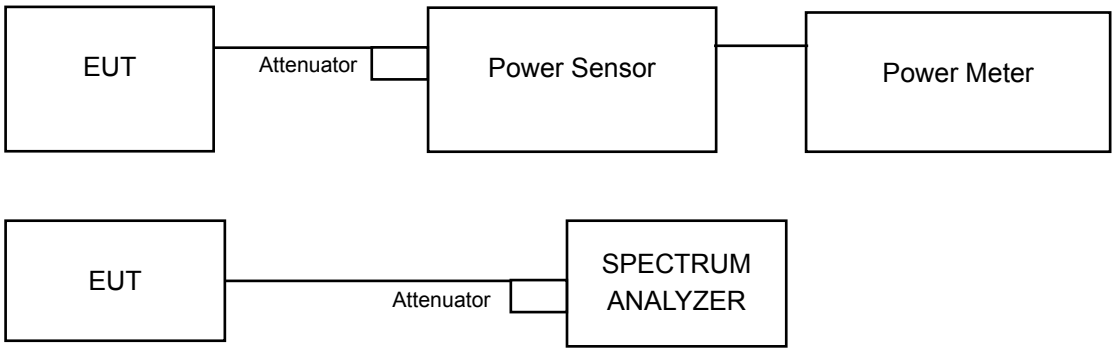
Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
	√	Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client 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*

*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

For 802.11a, 802.11n (20MHz), 802.11n (40MHz), 802.11ac (20MHz), 802.11ac (40MHz)

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 802.11ac (80MHz)

a. Set span to encompass the entire 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
b. Set sweep trigger to “free run”.
c. Set RBW = 1 MHz.
d. Set VBW ≥ 3 MHz
e. Number of points in sweep ≥ 2 Span / RBW.
f. Sweep time ≤ (number of points in sweep) * T
g. Using emission bandwidth to determine the frequency span for integration the channel bandwidth.
h. Detector = RMS.
i. Trace mode = max hold.
j. Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

802.11a

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	Chain 3				
36	5180	22.97	22.70	22.84	22.23	743.780	28.71	30	Pass
40	5200	23.95	23.76	23.51	23.41	929.665	29.68	30	Pass
48	5240	23.89	23.40	23.10	23.27	880.180	29.45	30	Pass

802.11n (20MHz)

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	Chain 3				
36	5180	22.82	22.88	22.74	22.91	768.881	28.86	30	Pass
40	5200	23.40	23.05	23.15	23.84	869.254	29.39	30	Pass
48	5240	23.51	23.96	23.85	24.06	970.618	29.87	30	Pass

802.11n (40MHz)

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	Chain 3				
38	5190	19.75	19.94	19.98	19.95	391.430	25.93	30	Pass
46	5230	23.81	23.90	24.09	24.08	**998.214**	29.99	30	Pass

802.11ac (80MHz)

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	Chain 3				
42	5210	18.12	17.92	17.76	18.05	250.337	23.99	30	Pass

Beamforming_NSS1 Mode

802.11n (20MHz)

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	Chain 3				
36	5180	20.51	20.52	20.11	19.99	427.515	26.31	29.37	Pass
40	5200	23.06	23.14	23.02	23.56	**835.798**	29.22	29.27	Pass
48	5240	23.02	23.05	23.09	22.96	803.685	29.05	29.07	Pass

Note:

5180MHz: Directional gain = 0.61dBi + 10log(4) = 6.63dBi > 6dBi, so the power limit shall be reduced to 30-(6.63-6) = 29.37dBm.

5200MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power limit shall be reduced to 30-(6.73-6) = 29.27dBm.

5240MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power limit shall be reduced to 30-(6.93-6) = 29.07dBm.

802.11n (40MHz)

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	Chain 3				
38	5190	19.44	19.38	19.21	18.96	336.671	25.27	29.27	Pass
46	5230	22.72	23.08	23.16	23.14	803.381	29.05	29.07	Pass

Note:

5190MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power limit shall be reduced to 30-(6.73-6) = 29.27dBm.

5230MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power limit shall be reduced to 30-(6.93-6) = 29.07dBm.

802.11ac (80MHz)

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	Chain 3				
42	5210	18.14	17.82	17.93	17.42	242.992	23.86	29.17	Pass

Note:

5210MHz: Directional gain = 0.81dBi + 10log(4) = 6.83dBi > 6dBi, so the power limit shall be reduced to 30-(6.83-6) = 29.17dBm.

Beamforming_NSS2 Mode

802.11n (20MHz)

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	Chain 3				
36	5180	21.95	21.22	21.01	21.92	570.889	27.57	30.00	Pass
40	5200	23.89	24.12	24.16	23.58	991.781	29.96	30.00	Pass
48	5240	24.31	24.12	23.89	23.42	**992.692**	29.97	30.00	Pass

Note:

5180MHz: Directional gain = 0.61dBi + 10log(4/2) = 3.62dBi < 6dBi, so the power limit no need to reduced.

5200MHz: Directional gain = 0.71dBi + 10log(4/2) = 3.72dBi < 6dBi, so the power limit no need to reduced.

5240MHz: Directional gain = 0.91dBi + 10log(4/2) = 3.92dBi < 6dBi, so the power limit no need to reduced.

802.11n (40MHz)

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	Chain 3				
38	5190	19.52	19.89	19.32	19.12	354.200	25.49	30.00	Pass
46	5230	23.87	24.12	23.12	24.19	969.545	29.87	30.00	Pass

Note:

5190MHz: Directional gain = 0.71dBi + 10log(4/2) = 3.72dBi < 6dBi, so the power limit no need to reduced.

5230MHz: Directional gain = 0.91dBi + 10log(4/2) = 3.92dBi < 6dBi, so the power limit no need to reduced.

802.11ac (80MHz)

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	Chain 3				
42	5210	18.82	19.22	19.58	18.97	329.436	25.18	30.00	Pass

Note:

5210MHz: Directional gain = 0.81dBi + 10log(4/2) = 3.82dBi < 6dBi, so the power limit no need to reduced.

26dB Bandwidth:

CDD Mode

802.11a

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	20.51	20.73	21.03	19.46	Pass
40	5200	29.06	27.85	32.58	23.47	Pass
48	5240	34.54	31.62	33.68	29.09	Pass

802.11n (20MHz)

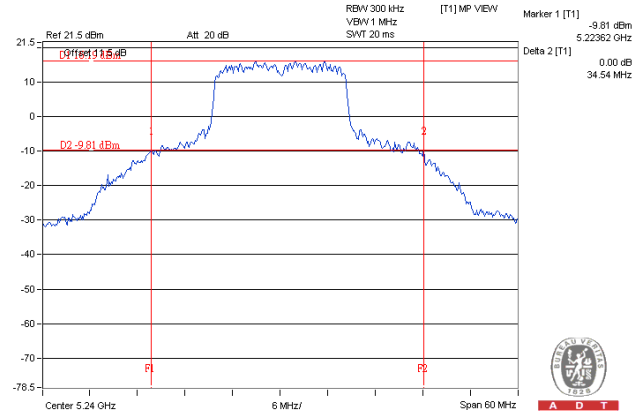
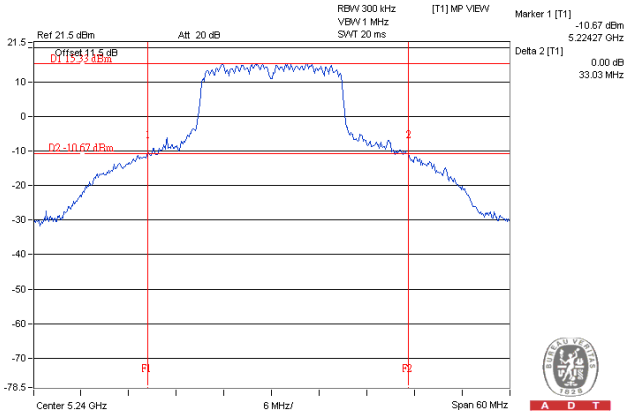
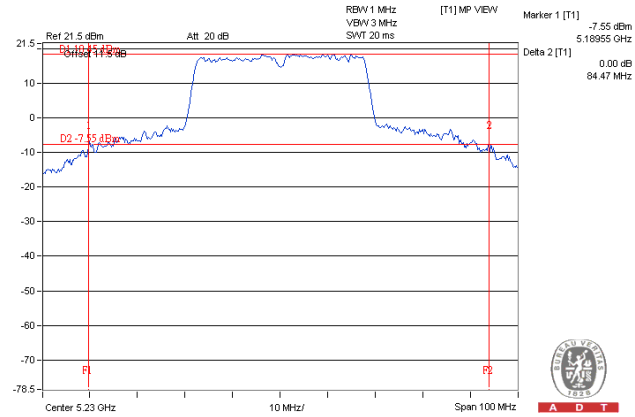
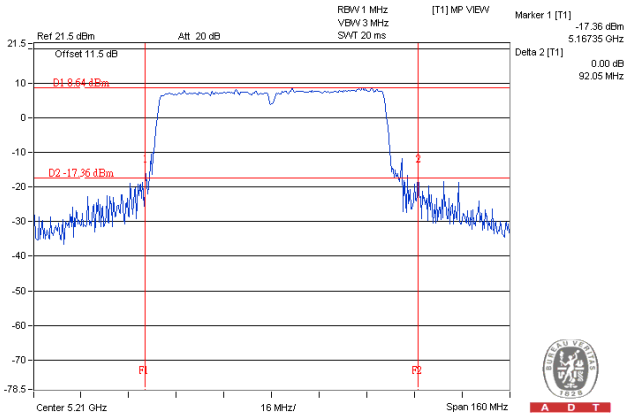
Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	21.01	21.27	21.33	20.78	Pass
40	5200	28.25	28.76	31.24	22.70	Pass
48	5240	33.03	30.11	31.78	26.31	Pass

802.11n (40MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
38	5180	40.60	71.30	40.99	40.76	Pass
46	5200	84.47	71.90	73.34	65.57	Pass

802.11ac (80MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
42	5210	86.94	82.29	84.80	92.05	Pass

Spectrum Plot of Worst Value	
802.11a	802.11n (20MHz)
	
802.11n (40MHz)	802.11ac (80MHz)
	

Beamforming_NSS1 Mode

802.11n (20MHz)

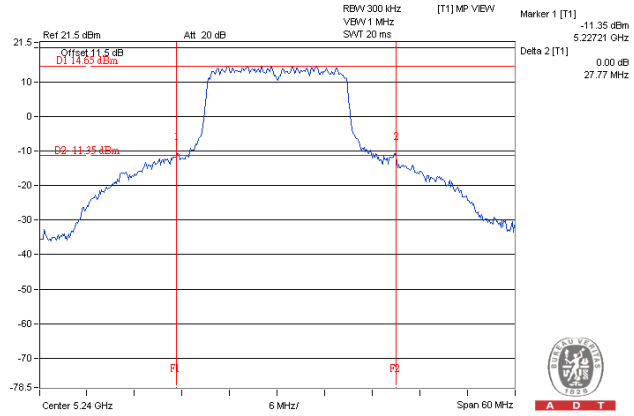
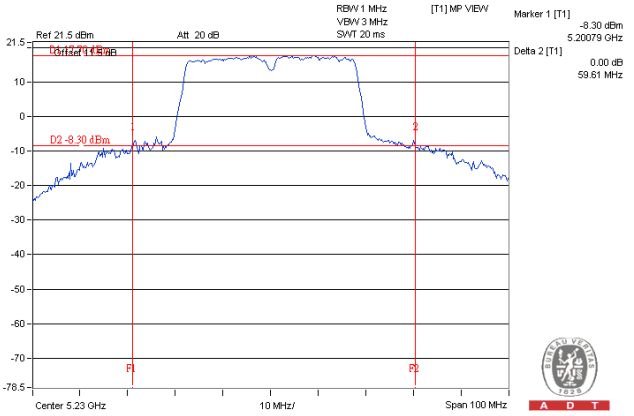
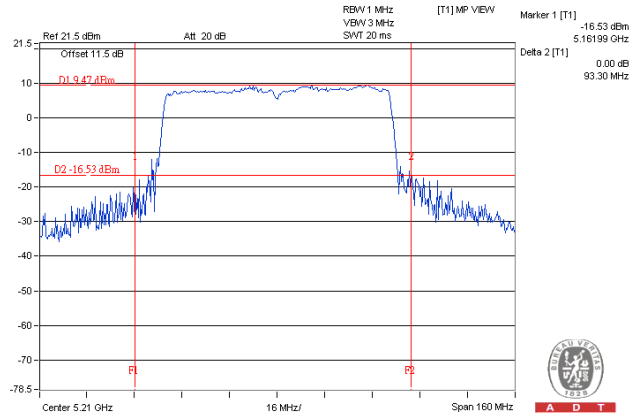
Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	20.25	20.64	20.55	20.29	Pass
40	5200	21.21	21.90	22.89	20.65	Pass
48	5240	25.73	24.68	27.77	21.39	Pass

802.11n (40MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
38	5180	40.36	40.60	41.07	40.75	Pass
46	5200	51.48	56.68	59.61	41.26	Pass

802.11ac (80MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
42	5210	90.32	93.30	82.50	86.92	Pass

Spectrum Plot of Worst Value	
802.11n (20MHz)	802.11n (40MHz)
	
802.11ac (80MHz)	
	

Beamforming_NSS2 Mode

802.11n (20MHz)

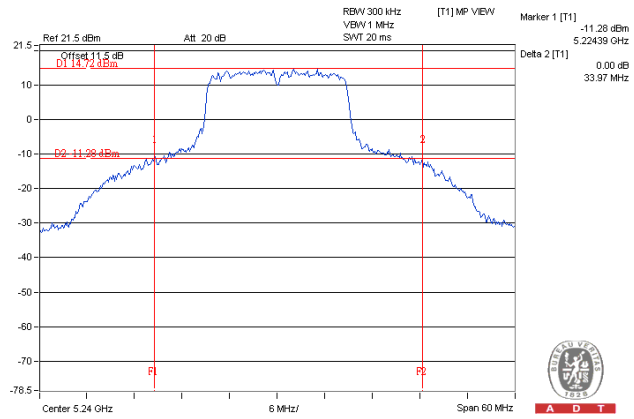
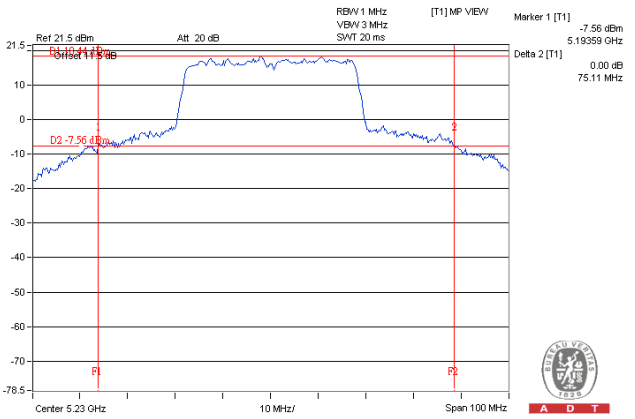
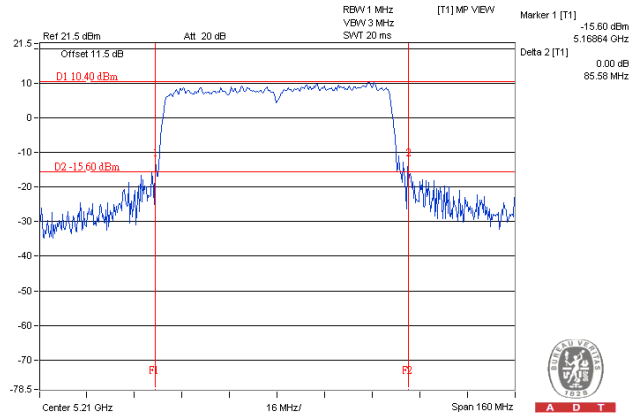
Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	20.57	20.85	20.54	20.46	Pass
40	5200	28.63	26.69	28.50	23.20	Pass
48	5240	33.97	31.43	31.45	25.16	Pass

802.11n (40MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
38	5180	40.76	40.57	40.91	41.08	Pass
46	5200	75.11	72.22	74.59	65.25	Pass

802.11ac (80MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
42	5210	84.90	85.58	85.29	84.57	Pass

Spectrum Plot of Worst Value	
802.11n (20MHz)	802.11n (40MHz)
	
802.11ac (80MHz)	
	

Occupied Bandwidth:

CDD Mode

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	16.52	16.52	16.52	16.52
40	5200	16.56	16.80	16.80	16.68
48	5240	16.92	16.80	16.92	16.80

802.11n (20MHz)

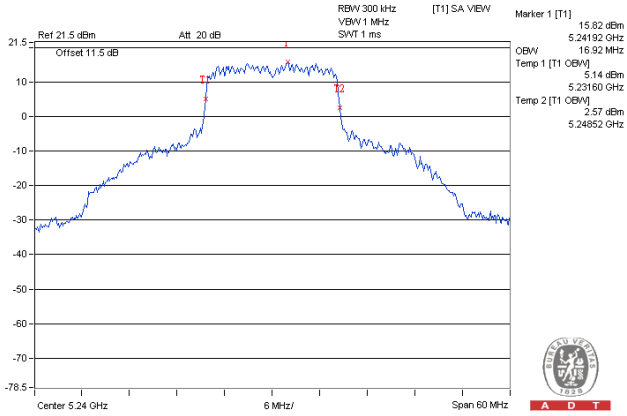
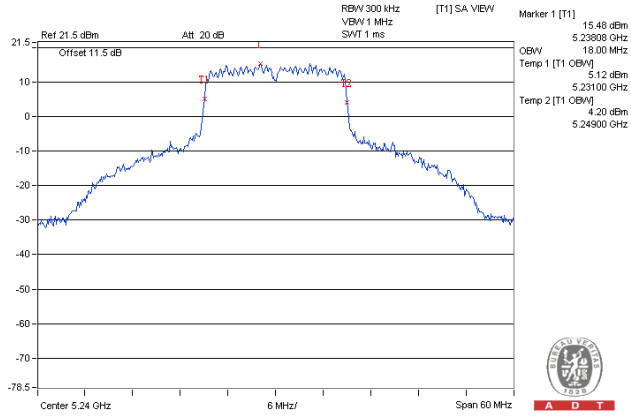
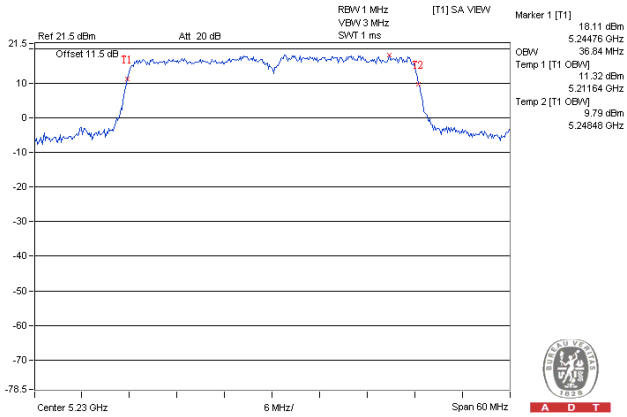
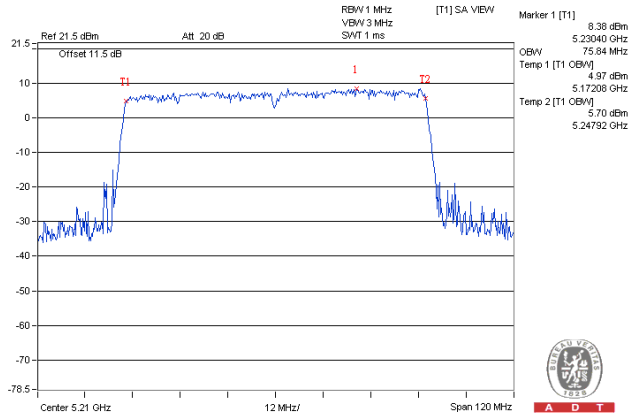
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	17.64	17.76	17.64	17.64
40	5200	17.88	17.88	17.88	17.76
48	5240	18.00	18.00	17.88	17.76

802.11n (40MHz)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
38	5180	36.36	36.60	36.36	36.24
46	5200	36.84	36.60	36.72	36.48

802.11ac (80MHz)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
42	5210	75.84	75.84	75.84	75.84

Spectrum Plot of Worst Value	
802.11a	802.11n (20MHz)
	
802.11n (40MHz)	802.11ac (80MHz)
	

Beamforming_NSS1 Mode

802.11n (20MHz)

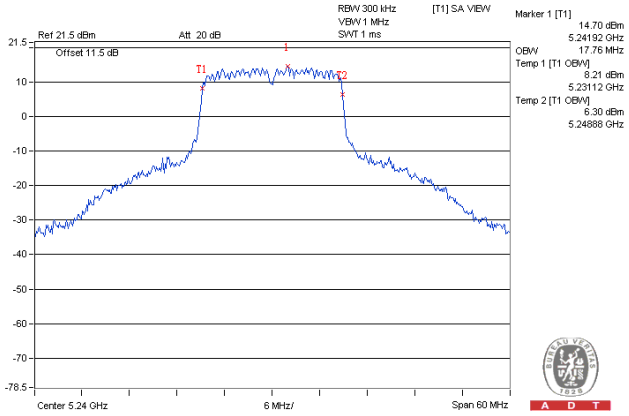
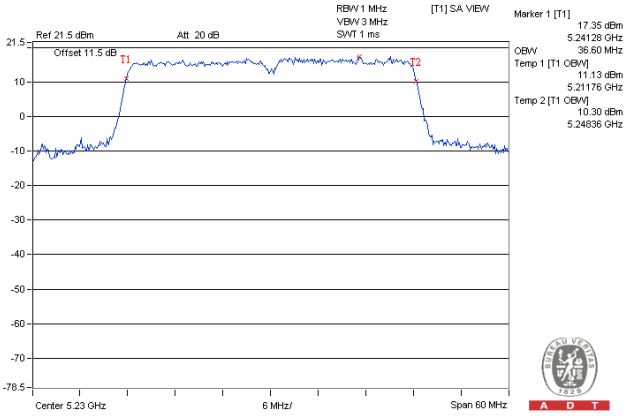
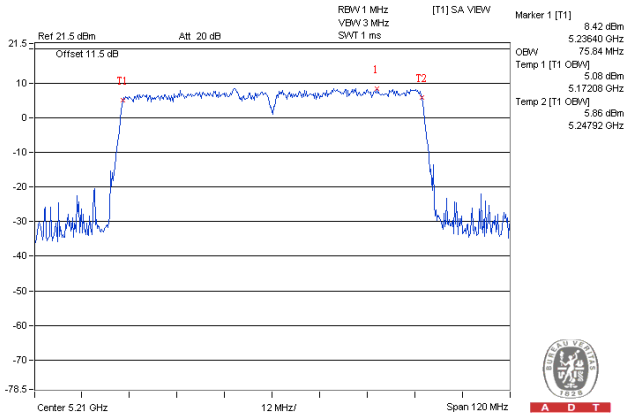
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	17.65	17.65	17.65	17.65
40	5200	17.64	17.76	17.76	17.64
48	5240	17.76	17.76	17.76	17.64

802.11n (40MHz)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
38	5180	36.43	36.24	36.36	36.24
46	5200	36.60	36.36	36.48	36.36

802.11ac (80MHz)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
42	5210	75.84	75.84	75.84	75.84

Spectrum Plot of Worst Value	
802.11n (20MHz)	802.11n (40MHz)
	
802.11ac (80MHz)	
	

Beamforming_NSS2 Mode

802.11n (20MHz)

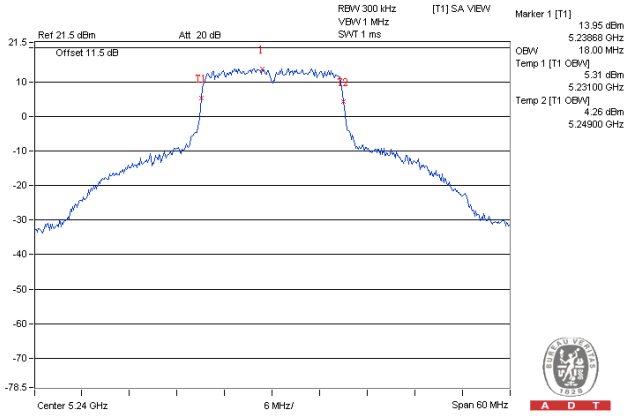
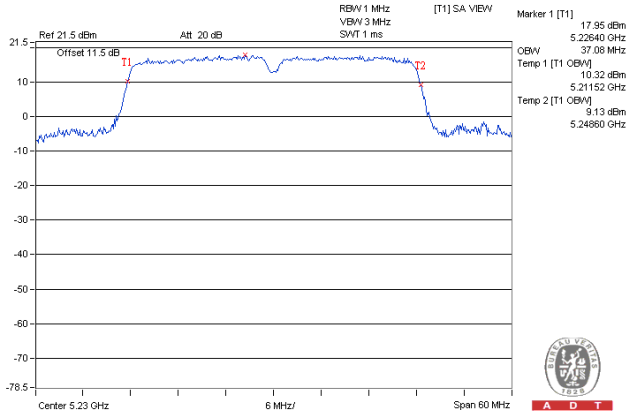
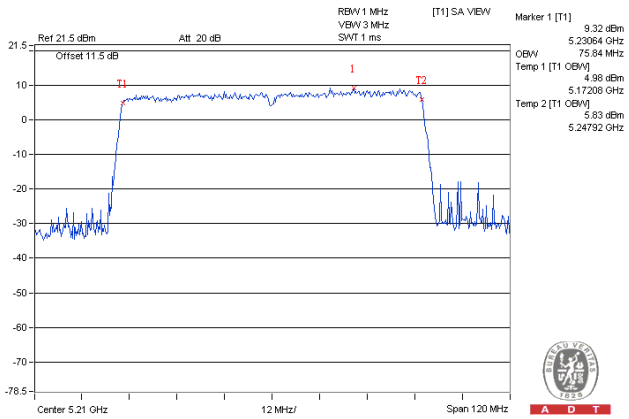
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	17.57	17.74	17.74	17.74
40	5200	17.88	18.00	17.88	17.88
48	5240	18.00	18.00	18.00	17.88

802.11n (40MHz)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
38	5180	36.48	36.24	36.36	36.24
46	5200	36.96	36.96	37.08	36.84

802.11ac (80MHz)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
42	5210	75.84	75.84	75.60	75.84

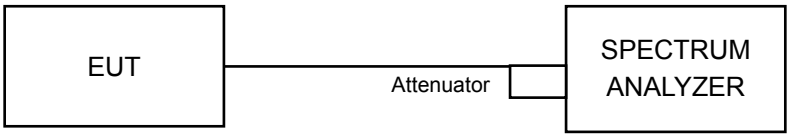
Spectrum Plot of Worst Value	
802.11n (20MHz)	802.11n (40MHz)
	
802.11ac (80MHz)	
	

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

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 Procedures

For duty cycle > 98%

Using method SA-1

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 30 kHz, Set VBW ≥ 1 MHz, Detector = RMS
c. Set Channel power measure = 1MHz
d. Sweep time = auto, trigger set to “free run”.
e. Trace average at least 100 traces in power averaging mode.
f. Record the max value

For duty cycle < 98%

Using method SA-2

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 30 kHz, Set VBW ≥ 1 MHz, Detector = RMS
c. Set Channel power measure = 1MHz
d. Sweep time = auto, trigger set to “free run”.
e. Trace average at least 100 traces in power averaging mode.
f. 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 Conditions

Same as Item 4.3.6.

4.4.7 Test Results

CDD Mode

802.11a

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	Chain 3					
36	5180	8.61	9.18	9.28	8.38	14.90	0.34	15.24	16.37	Pass
40	5200	9.35	9.98	10.01	9.32	15.70	0.34	16.04	16.27	Pass
48	5240	9.61	9.89	9.96	9.32	15.72	0.34	16.06	16.07	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. 5180MHz: Directional gain = 0.61dBi + 10log(4) = 6.63dBi > 6dBi, so the power density limit shall be reduced to 17-(6.63-6) = 16.37dBm.
   5200MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power density limit shall be reduced to 17-(6.73-6) = 16.27dBm.
   5240MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power density limit shall be reduced to 17-(6.93-6) = 16.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

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	Chain 3					
36	5180	8.93	9.02	8.98	8.46	14.87	0.11	14.98	16.37	Pass
40	5200	9.42	9.70	9.98	9.26	15.62	0.11	15.73	16.27	Pass
48	5240	9.36	9.80	9.80	9.34	15.60	0.11	15.71	16.07	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. 5180MHz: Directional gain = 0.61dBi + 10log(4) = 6.63dBi > 6dBi, so the power density limit shall be reduced to 17-(6.63-6) = 16.37dBm.
   5200MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power density limit shall be reduced to 17-(6.73-6) = 16.27dBm.
   5240MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power density limit shall be reduced to 17-(6.93-6) = 16.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

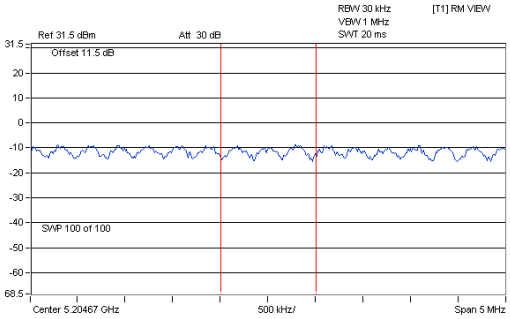
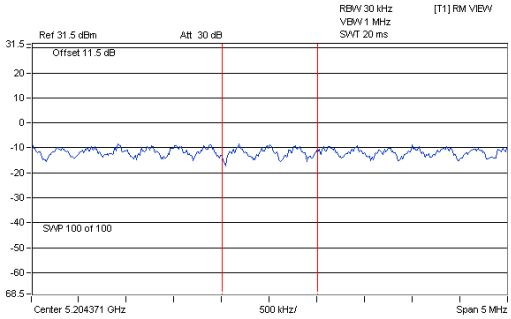
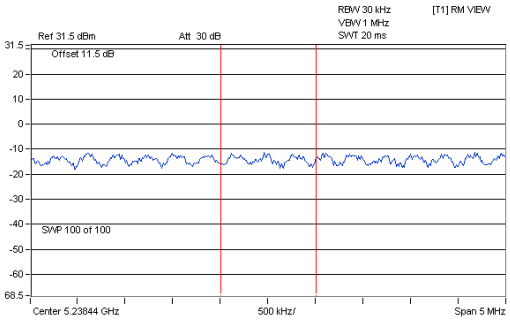
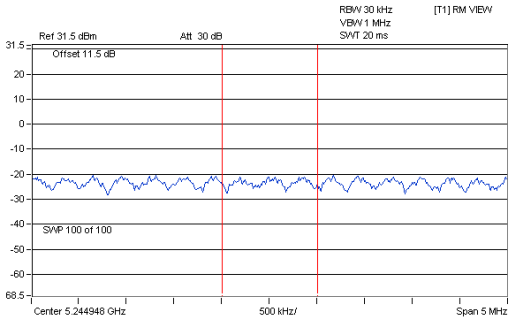
Chan.	Chan. Freq. (MHz)	PSD (dBm)				Total PSD W/O Duty Factor (dBm)	Duty Factor	Total PSD With Duty Factor (dBm)	Max. Limit (dBm)	Pass/ Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
38	5190	2.39	2.99	3.15	2.45	8.78	0.31	9.09	16.27	Pass
46	5230	6.47	7.59	7.43	6.58	13.07	0.31	13.38	16.07	Pass

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. 5190MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power density limit shall be reduced to 17-(6.73-6) = 16.27dBm.
   5230MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power density limit shall be reduced to 17-(6.93-6) = 16.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (80MHz)

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	Chain 3					
42	5210	-2.49	-1.84	-1.68	-3.02	3.79	0.47	4.26	16.17	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. 5210MHz: Directional gain = 0.81dBi + 10log(4) = 6.83dBi > 6dBi, so the power density limit shall be reduced to 17-(6.83-6) = 16.17dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value	
802.11a	802.11n (20MHz)
 TX Channel Bandwidth 1 MHz Power 10.01 dBm	 TX Channel Bandwidth 1 MHz Power 9.98 dBm
802.11n (40MHz)	802.11ac (80MHz)
 TX Channel Bandwidth 1 MHz Power 7.59 dBm	 TX Channel Bandwidth 1 MHz Power -1.68 dBm

Beamforming_NSS1 Mode

802.11n (20MHz)

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	Chain 3					
36	5180	6.69	7.04	7.20	6.38	12.86	0.15	13.01	16.37	Pass
40	5200	8.83	9.06	8.82	8.31	14.78	0.15	14.93	16.27	Pass
48	5240	9.00	8.98	9.29	8.43	14.96	0.15	15.11	16.07	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. 5180MHz: Directional gain = 0.61dBi + 10log(4) = 6.63dBi > 6dBi, so the power density limit shall be reduced to 17-(6.63-6) = 16.37dBm.

   5200MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power density limit shall be reduced to 17-(6.73-6) = 16.27dBm.

   5240MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power density limit shall be reduced to 17-(6.93-6) = 16.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

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	Chain 3					
38	5190	1.75	1.75	2.17	1.36	7.79	0.95	8.74	16.27	Pass
46	5230	6.01	6.46	6.38	5.49	12.13	0.95	13.08	16.07	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. 5190MHz: Directional gain = 0.71dBi + 10log(4) = 6.73dBi > 6dBi, so the power density limit shall be reduced to 17-(6.73-6) = 16.27dBm.

   5230MHz: Directional gain = 0.91dBi + 10log(4) = 6.93dBi > 6dBi, so the power density limit shall be reduced to 17-(6.93-6) = 16.07dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (80MHz)

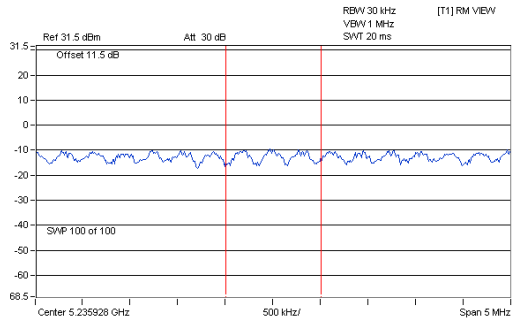
Chan.	Chan. Freq. (MHz)	PSD (dBm)				Total PSD W/O Duty Factor (dBm)	Duty Factor	Total PSD With Duty Factor (dBm)	Max. Limit (dBm)	Pass/ Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
42	5210	-2.43	-1.75	-1.37	-2.95	3.94	0.53	4.47	16.17	Pass

Note:

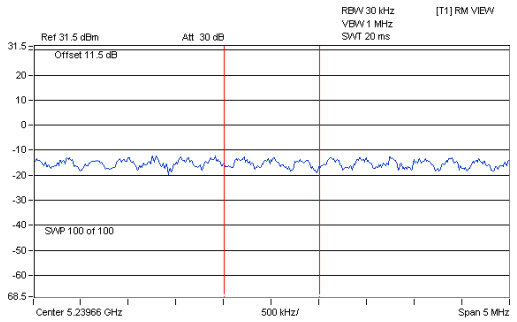
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. 5210MHz: Directional gain = 0.81dBi + 10log(4) = 6.83dBi > 6dBi, so the power density limit shall be reduced to 17-(6.83-6) = 16.17dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

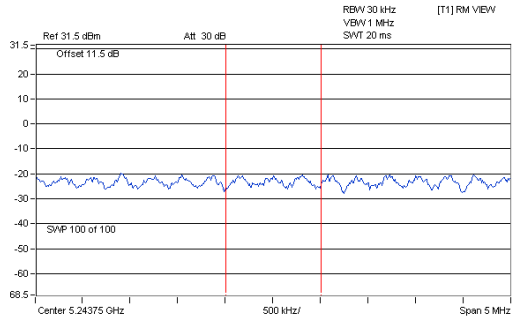
802.11n (20MHz)



802.11n (40MHz)



802.11ac (80MHz)



Beamforming_NSS2 Mode

802.11n (20MHz)

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	Chain 3					
36	5180	7.35	7.30	7.70	7.00	13.36	0.12	13.48	17.00	Pass
40	5200	9.31	9.25	9.64	9.04	15.33	0.12	15.45	17.00	Pass
48	5240	9.33	9.45	9.73	9.26	15.47	0.12	15.59	17.00	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. 5180MHz: Directional gain = 0.61dBi + 10log(4/2) = 3.62dBi < 6dBi, so the power density limit no need to reduced.

   5200MHz: Directional gain = 0.71dBi + 10log(4/2) = 3.72dBi < 6dBi, so the power density limit no need to reduced.

   5240MHz: Directional gain = 0.91dBi + 10log(4/2) = 3.92dBi < 6dBi, so the power density limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

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	Chain 3					
38	5190	1.46	1.67	1.96	1.12	7.58	0.56	8.14	17.00	Pass
46	5230	6.55	7.16	6.92	6.45	12.80	0.56	13.36	17.00	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. 5190MHz: Directional gain = 0.71dBi + 10log(4/2) = 3.72dBi < 6dBi, so the power density limit no need to reduced.

   5230MHz: Directional gain = 0.91dBi + 10log(4/2) = 3.92dBi < 6dBi, so the power density limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ac (80MHz)

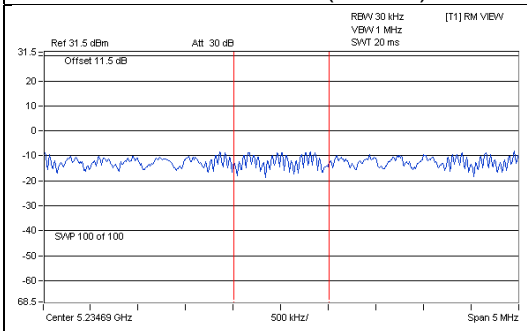
Chan.	Chan. Freq. (MHz)	PSD (dBm)				Total PSD W/O Duty Factor (dBm)	Duty Factor	Total PSD With Duty Factor (dBm)	Max. Limit (dBm)	Pass/ Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
42	5210	-2.10	-1.22	-0.58	-2.28	4.53	0.76	5.29	17.00	Pass

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. 5210MHz: Directional gain = 0.81dBi + 10log(4/2) = 3.82dBi < 6dBi, so the power density limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

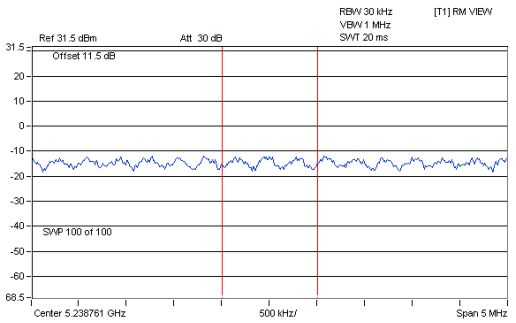
Spectrum Plot of Worst Value

802.11n (20MHz)



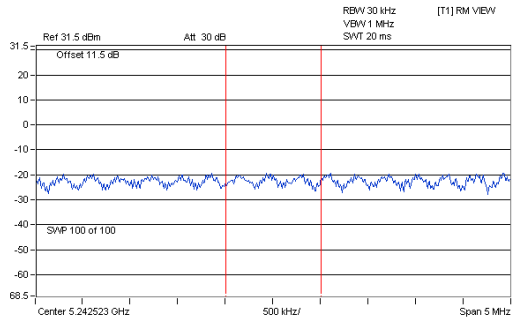
TX Channel Bandwidth 1 MHz Power 9.73 dBm

802.11n (40MHz)



TX Channel Bandwidth 1 MHz Power 7.16 dBm

802.11ac (80MHz)



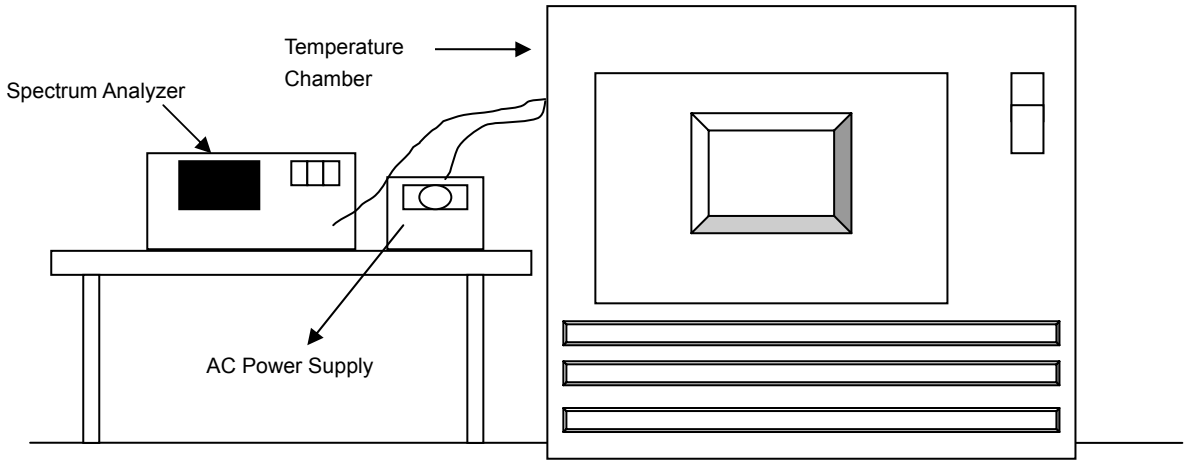
TX Channel Bandwidth 1 MHz Power -0.58 dBm

4.5 Frequency Stability

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: 5240MHz									
Temp. (℃)	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	5239.9955	-0.00009	5239.9939	-0.00012	5239.9933	-0.00013	5239.9941	-0.00011
40	120	5240.014	0.00027	5240.0158	0.00030	5240.0151	0.00029	5240.0128	0.00024
30	120	5239.9897	-0.00020	5239.9869	-0.00025	5239.9867	-0.00025	5239.9874	-0.00024
20	120	5239.9979	-0.00004	5239.9952	-0.00009	5239.9986	-0.00003	5239.9947	-0.00010
10	120	5239.9863	-0.00026	5239.9865	-0.00026	5239.9889	-0.00021	5239.9875	-0.00024
0	120	5239.9753	-0.00047	5239.9761	-0.00046	5239.9752	-0.00047	5239.978	-0.00042

Frequemcy Stability Versus Temp.									
Operating Frequency: 5240MHz									
Temp. (℃)	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	5239.9978	-0.00004	5239.9959	-0.00008	5239.9995	-0.00001	5239.9941	-0.00011
	120	5239.9979	-0.00004	5239.9952	-0.00009	5239.9986	-0.00003	5239.9947	-0.00010
	102	5239.9979	-0.00004	5239.9955	-0.00009	5239.9982	-0.00003	5239.9941	-0.00011

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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