FCC Test Report

Report No.:	RF141007C29H
FCC ID:	PY314200277
Test Model:	WNDR4500v3
Received Date:	Jun. 25, 2015
Test Date:	Jun. 30 ~ Sep. 18, 2015
Issued Date:	Sep. 23, 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.
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Release Control Record

Issue No.	Description	Date Issued
RF141007C29H	Original release	Sep. 23, 2015

1 Certificate of Conformity

Product:	N900 Wireless Dual Band Gigabit Router
Brand:	Netgear
Test Model:	WNDR4500v3
Sample Status:	Engineering sample
Applicant:	NETGEAR INC.
Test Date:	Jun. 30 ~ Sep. 18, 2015
Standards:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10:2013

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 : Celine Chou , **Date:** Sep. 23, 2015

Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Sep. 23, 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 -4.36dB at 0.39400MHz.
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 5714.90MHz.
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(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
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.

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	N900 Wireless Dual Band Gigabit Router
Brand	Netgear
Test Model	WNDR4500v3
Status of EUT	Engineering sample
Power Supply Rating	12Vdc (Adapter)
Modulation Type	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 450.0Mbps
Operating Frequency	5745 ~ 5825MHz
Number of Channel	5 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
Output Power	586.136mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change.
2. This report is issued as a supplementary report to the original BV ADT report no.: RF141007C29-1. The difference compared with the original report is updating U-NII-3 band to new rules. All test data had been re-tested.
3. The EUT incorporates a MIMO function. Physically, the EUT provides three completed transmitters and three receivers.

Modulation Mode	TX Function
802.11a	3TX
802.11n (20MHz)	3TX
802.11n (40MHz)	3TX

* 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)

4. The EUT consumes power from the following adapter.

Adapter 1	
Brand	NETGEAR
Model	MU30-5120250-A1
Part No.	332-10234-01
Input Power	100-240Vac, 50/60Hz, 0.8A
Output Power	12Vdc, 2.5A
Power Line	1.8m cable without core attached on adapter

Adapter 2	
Brand	NETGEAR
Model	P030WF120B 11200-6LF
Part No.	332-10200-02
Input Power	100-240Vac, 50/60Hz, 1.0A
Output Power	12Vdc, 2.5A
Power Line	1.8m cable without core attached on adapter

Adapter 3	
Brand	NETGEAR
Model	SAS030F1 NA
Part No.	332-10451-01
Input Power	100-120Vac, 47-63Hz, 0.9A
Output Power	12Vdc, 2.5A
Power Line	1.8m cable without core attached on adapter

* After pre-tested three adapters found adapter 3 was the worse, therefore chosen for final test and presented in the test report.

5. The following antennas were provided to the EUT.

Ant. No.	Brand	Model	Ant. Type	Connecter Type	Antenna Gain(dBi) Including cable loss	
					2.4GHz	5.0GHz
1, 2	Master Wave Technology Co., Ltd.	98P2LPIPF000	PCB	i-pex(MHF)	3.37	3.03
3	Master Wave Technology Co., Ltd.	98P2LPIPF001	PCB	i-pex(MHF)	2.64	3.31

3.2 Description of Test Modes

For 5745 ~ 5825MHz

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

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

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

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

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

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

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

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.0
-	802.11n (20MHz)		149 to 165	149, 157, 165	OFDM	BPSK	7.2
-	802.11n (40MHz)		151 to 159	151, 159	OFDM	BPSK	15.0

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)
-	802.11a	5745-5825	149 to 165	149	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)
-	802.11a	5745-5825	149 to 165	149	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)
-	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6.0
-	802.11n (20MHz)		149 to 165	149, 157, 165	OFDM	BPSK	7.2
-	802.11n (40MHz)		151 to 159	151, 159	OFDM	BPSK	15.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	26deg. C, 61%RH	120Vac, 60Hz	Alan Wu
RE<1G	26deg. C, 61%RH	120Vac, 60Hz	Alan Wu
PLC	26deg. C, 61%RH	120Vac, 60Hz	Alan Wu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Leo Tsai

3.3 Duty Cycle of Test Signal

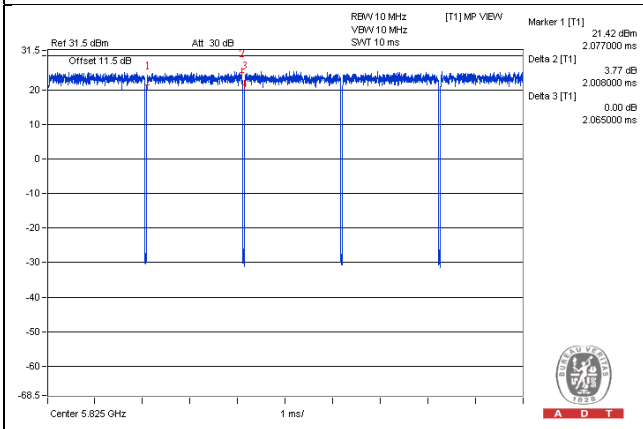
Duty cycle is < 98%, duty factor shall be considered.

802.11a: Duty cycle = 2.008/2.065 = 0.972, Duty factor = 10 * log(1/0.972) = 0.12

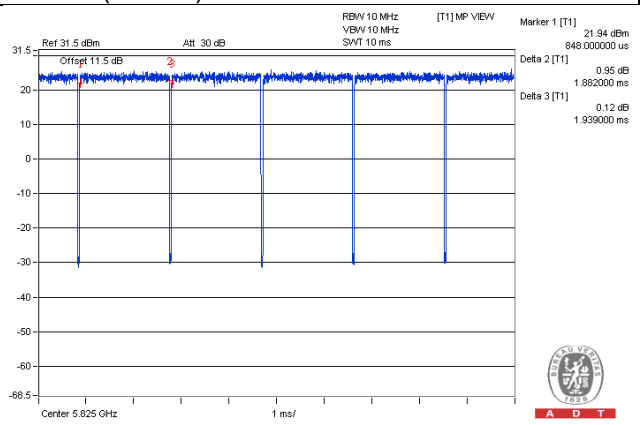
802.11n (20MHz): Duty cycle = 1.882/1.939 = 0.971, Duty factor = 10 * log(1/0.971) = 0.13

802.11n (40MHz): Duty cycle = 0.919/0.969 = 0.948, Duty factor = 10 * log(1/0.948) = 0.23

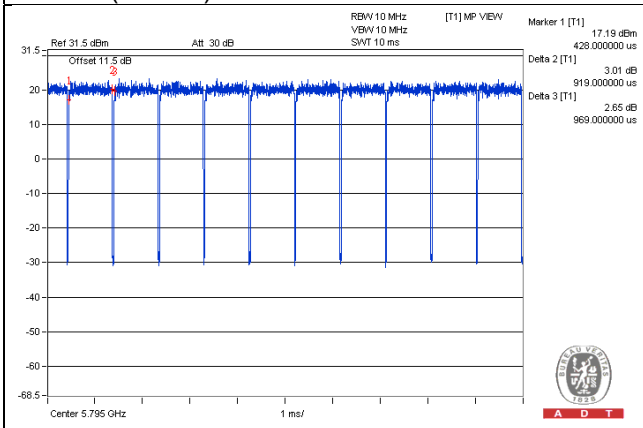
802.11a



802.11n (20MHz)



802.11n (40MHz)



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.

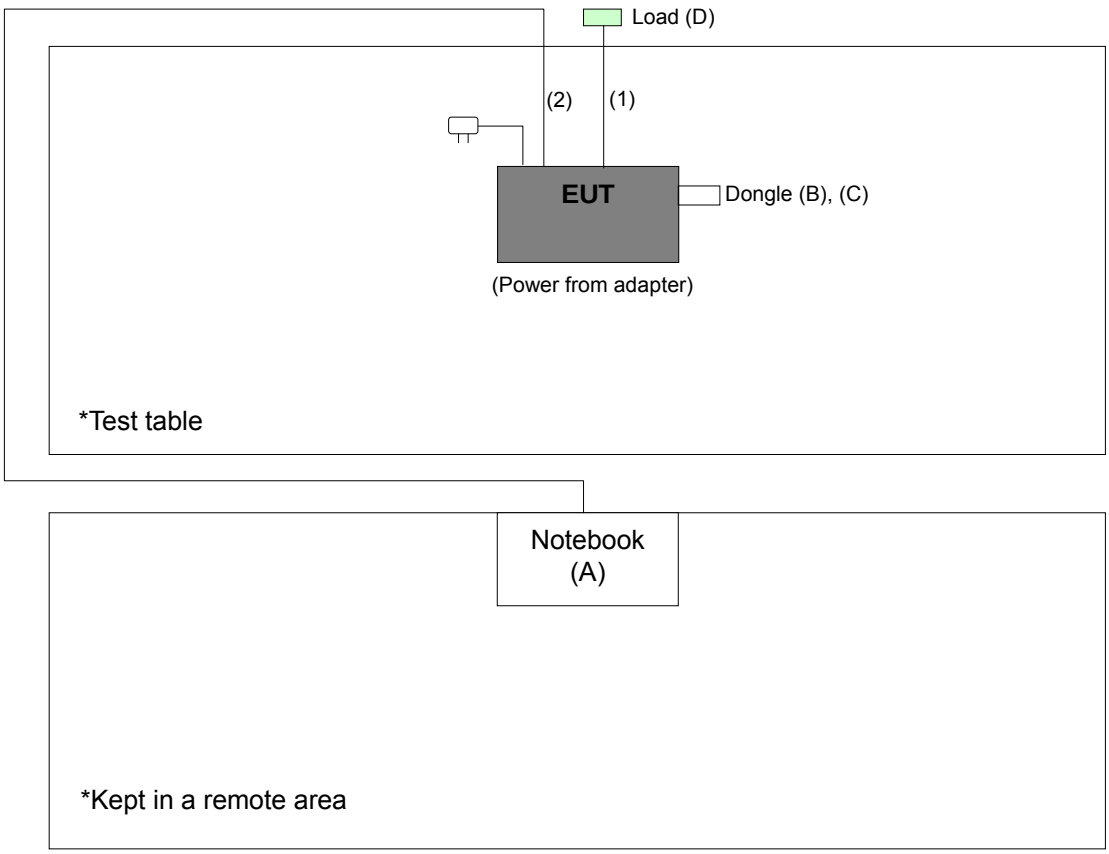
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5420	BPQ8MQ1	FCC DoC Approved	-
B.	Dongle	SANDISK	SDCZ6-1024	NA	NA	-
C.	Dongle	SANDISK	SDCZ6-1024	NA	NA	-
D.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN Cable	4	1.8	N	0	-
2.	LAN Cable	1	10	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 C63.10-2013

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.

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 06, 2014	Oct. 05, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 08, 2014	Jul. 07, 2015
			Jul. 08, 2015	Jul. 07, 2016
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
			Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10631	Aug. 09, 2014	Aug. 08, 2015
			Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-02(295012+ 309220)	Aug. 09, 2014	Aug. 08, 2015
			Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03(250724)	Aug. 09, 2014	Aug. 08, 2015
			Aug. 09, 2015	Aug. 08, 2016
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. 09, 2014	Jul. 08, 2015
			Jul. 09, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 09, 2014	Jul. 08, 2015
			Jul. 09, 2015	Jul. 08, 2016
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 08, 2015	Jun. 07, 2016

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 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 (for below 1GHz) / 1.5 meters (for above 1GHz) 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:

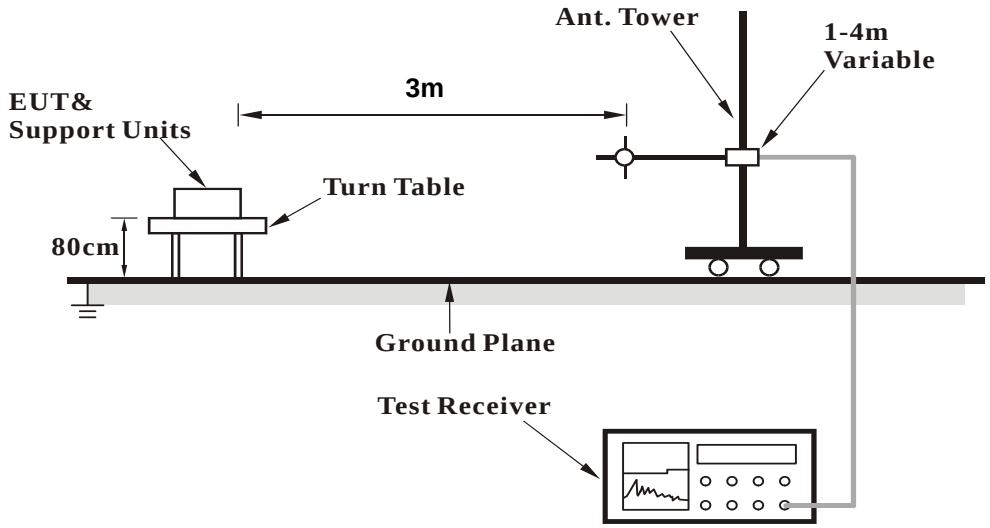
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. 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)).
4. 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.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

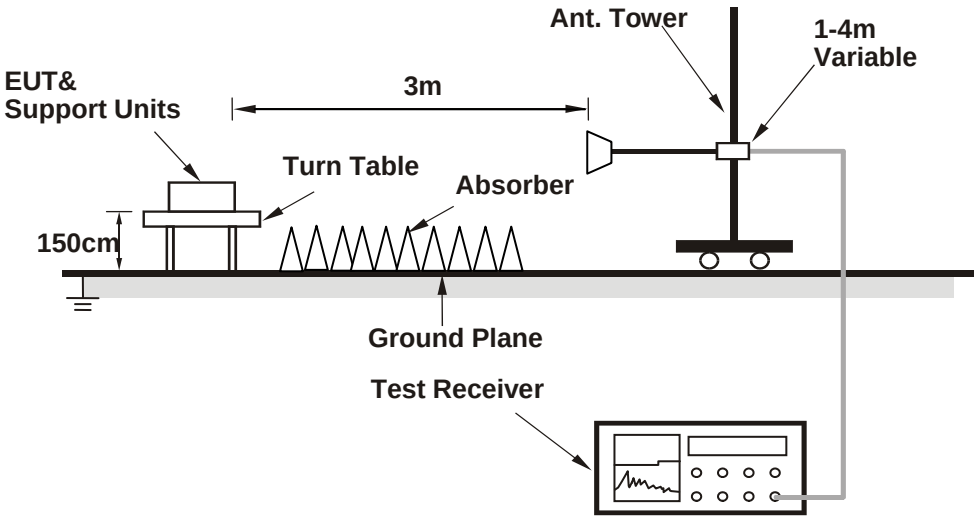
No deviation.

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 enabled the system in full functions.

4.1.7 Test Results

Above 1GHz Data

802.11a

CHANNEL	TX Channel 149	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	#5714.90	63.6 PK	74.0	-10.4	1.90 H	95	57.30	6.30
2	#5714.90	45.9 AV	54.0	-8.1	1.90 H	95	39.60	6.30
3	#5722.90	72.0 PK	78.2	-6.2	1.90 H	95	65.70	6.30
4	#5725.00	57.0 PK	78.2	-21.2	1.90 H	95	50.70	6.30
5	*5745.00	113.6 PK			1.90 H	95	73.30	40.30
6	*5745.00	102.9 AV			1.90 H	95	62.60	40.30
7	11490.00	61.9 PK	74.0	-12.1	1.00 H	314	44.70	17.20
8	11490.00	47.5 AV	54.0	-6.5	1.00 H	314	30.30	17.20
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	#5714.90	71.6 PK	74.0	-2.4	1.97 V	229	65.30	6.30
2	#5714.90	52.1 AV	54.0	-1.9	1.97 V	229	45.80	6.30
3	#5722.90	77.6 PK	78.2	-0.6	1.97 V	229	71.30	6.30
4	#5725.00	62.7 PK	78.2	-15.5	1.97 V	229	56.40	6.30
5	*5745.00	116.9 PK			1.97 V	229	76.60	40.30
6	*5745.00	107.0 AV			1.97 V	229	66.70	40.30
7	11490.00	61.5 PK	74.0	-12.5	1.10 V	211	44.30	17.20
8	11490.00	46.7 AV	54.0	-7.3	1.10 V	211	29.50	17.20

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)
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 157	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	5440.00	63.6 PK	74.0	-10.4	1.41 H	255	57.80	5.80
2	5440.00	53.0 AV	54.0	-1.0	1.41 H	255	47.20	5.80
3	*5785.00	117.2 PK			1.73 H	104	76.80	40.40
4	*5785.00	106.6 AV			1.73 H	104	66.20	40.40
5	11570.00	64.0 PK	74.0	-10.0	1.00 H	355	46.70	17.30
6	11570.00	51.2 AV	54.0	-2.8	1.00 H	355	33.90	17.30
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	5440.00	64.2 PK	74.0	-9.8	1.89 V	230	58.40	5.80
2	5440.00	53.7 AV	54.0	-0.3	1.89 V	230	47.90	5.80
3	*5785.00	121.2 PK			1.82 V	230	80.80	40.40
4	*5785.00	111.4 AV			1.82 V	230	71.00	40.40
5	11570.00	62.3 PK	74.0	-11.7	1.50 V	242	45.00	17.30
6	11570.00	49.5 AV	54.0	-4.5	1.50 V	242	32.20	17.30

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 165	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	*5825.00	114.9 PK			1.77 H	97	74.40	40.50
2	*5825.00	104.2 AV			1.77 H	97	63.70	40.50
3	#5850.00	52.6 PK	78.2	-25.6	1.77 H	97	46.00	6.60
4	#5852.10	69.8 PK	78.2	-8.4	1.77 H	97	63.20	6.60
5	#5860.10	72.3 PK	74.0	-1.7	1.77 H	97	65.70	6.60
6	#5860.10	46.9 AV	54.0	-7.1	1.77 H	97	40.30	6.60
7	11650.00	62.8 PK	74.0	-11.2	1.00 H	327	45.10	17.70
8	11650.00	49.5 AV	54.0	-4.5	1.00 H	327	31.80	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	*5825.00	120.7 PK			1.82 V	227	80.20	40.50
2	*5825.00	110.8 AV			1.82 V	227	70.30	40.50
3	#5850.00	58.0 PK	78.2	-20.2	1.82 V	227	51.40	6.60
4	#5852.10	77.5 PK	78.2	-0.7	1.82 V	227	70.90	6.60
5	#5860.10	69.2 PK	74.0	-4.8	1.82 V	227	62.60	6.60
6	#5860.10	52.2 AV	54.0	-1.8	1.82 V	227	45.60	6.60
7	11650.00	61.9 PK	74.0	-12.1	1.41 V	241	44.20	17.70
8	11650.00	48.8 AV	54.0	-5.2	1.41 V	241	31.10	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)
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 149	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	#5714.90	65.8 PK	74.0	-8.2	1.87 H	96	59.50	6.30
2	#5714.90	47.1 AV	54.0	-6.9	1.87 H	96	40.80	6.30
3	#5722.90	64.3 PK	78.2	-13.9	1.87 H	96	58.00	6.30
4	#5725.00	49.0 PK	78.2	-29.2	1.87 H	96	42.70	6.30
5	*5745.00	109.3 PK			1.87 H	96	69.00	40.30
6	*5745.00	99.2 AV			1.87 H	96	58.90	40.30
7	11490.00	61.9 PK	74.0	-12.1	1.00 H	312	44.70	17.20
8	11490.00	47.7 AV	54.0	-6.3	1.00 H	312	30.50	17.20
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	#5714.90	61.6 PK	74.0	-12.4	1.98 V	231	55.30	6.30
2	#5714.90	48.3 AV	54.0	-5.7	1.98 V	231	42.00	6.30
3	#5722.90	77.4 PK	78.2	-0.8	1.98 V	231	71.10	6.30
4	#5725.00	54.8 PK	78.2	-23.4	1.98 V	231	48.50	6.30
5	*5745.00	117.7 PK			1.98 V	231	77.40	40.30
6	*5745.00	107.3 AV			1.98 V	231	67.00	40.30
7	11490.00	61.4 PK	74.0	-12.6	1.50 V	232	44.20	17.20
8	11490.00	47.3 AV	54.0	-6.7	1.50 V	232	30.10	17.20

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)
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 157	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	5440.00	64.6 PK	74.0	-9.4	1.43 H	251	58.80	5.80
2	5440.00	52.5 AV	54.0	-1.5	1.43 H	251	46.70	5.80
3	*5785.00	118.5 PK			2.06 H	100	78.10	40.40
4	*5785.00	108.2 AV			2.06 H	100	67.80	40.40
5	11570.00	64.3 PK	74.0	-9.7	1.22 H	145	47.00	17.30
6	11570.00	51.6 AV	54.0	-2.4	1.22 H	145	34.30	17.30
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	5440.00	65.3 PK	74.0	-8.7	1.82 V	230	59.50	5.80
2	5440.00	53.2 AV	54.0	-0.8	1.82 V	230	47.40	5.80
3	*5785.00	122.5 PK			1.83 V	228	82.10	40.40
4	*5785.00	111.9 AV			1.83 V	228	71.50	40.40
5	11570.00	67.1 PK	74.0	-6.9	1.02 V	100	49.80	17.30
6	11570.00	53.3 AV	54.0	-0.7	1.02 V	100	36.00	17.30

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)
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 165	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	*5825.00	115.0 PK			1.92 H	102	74.50	40.50
2	*5825.00	104.9 AV			1.92 H	102	64.40	40.50
3	#5850.00	52.4 PK	78.2	-25.8	1.92 H	102	45.80	6.60
4	#5852.10	69.1 PK	78.2	-9.1	1.92 H	102	62.50	6.60
5	#5860.10	72.6 PK	74.0	-1.4	1.92 H	102	66.00	6.60
6	#5860.10	48.7 AV	54.0	-5.3	1.92 H	102	42.10	6.60
7	11650.00	62.5 PK	74.0	-11.5	1.20 H	144	44.80	17.70
8	11650.00	49.3 AV	54.0	-4.7	1.20 H	144	31.60	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	*5825.00	119.6 PK			2.04 V	231	79.10	40.50
2	*5825.00	109.7 AV			2.04 V	231	69.20	40.50
3	#5850.00	60.9 PK	78.2	-17.3	2.04 V	231	54.30	6.60
4	#5852.10	77.7 PK	78.2	-0.5	2.04 V	231	71.10	6.60
5	#5860.10	70.3 PK	74.0	-3.7	2.04 V	231	63.70	6.60
6	#5860.10	53.8 AV	54.0	-0.2	2.04 V	231	47.20	6.60
7	11650.00	62.7 PK	74.0	-11.3	1.05 V	109	45.00	17.70
8	11650.00	49.6 AV	54.0	-4.4	1.05 V	109	31.90	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)
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 151	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	#5714.90	63.4 PK	74.0	-10.6	1.86 H	92	57.10	6.30
2	#5714.90	48.4 AV	54.0	-5.6	1.86 H	92	42.10	6.30
3	#5722.90	69.3 PK	78.2	-8.9	1.86 H	92	63.00	6.30
4	#5725.00	48.7 PK	78.2	-29.5	1.86 H	92	42.40	6.30
5	*5755.00	106.6 PK			1.86 H	92	66.30	40.30
6	*5755.00	96.2 AV			1.86 H	92	55.90	40.30
7	11510.00	60.2 PK	74.0	-13.8	1.00 H	315	43.10	17.10
8	11510.00	46.1 AV	54.0	-7.9	1.00 H	315	29.00	17.10
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	#5714.90	69.8 PK	74.0	-4.2	1.98 V	232	63.50	6.30
2	**#5714.90**	**53.9 AV**	**54.0**	**-0.1**	**1.98 V**	**232**	**47.60**	**6.30**
3	#5722.90	76.3 PK	78.2	-1.9	1.98 V	232	70.00	6.30
4	#5725.00	54.5 PK	78.2	-23.7	1.98 V	232	48.20	6.30
5	*5755.00	112.6 PK			1.98 V	232	72.30	40.30
6	*5755.00	102.6 AV			1.98 V	232	62.30	40.30
7	11510.00	60.9 PK	74.0	-13.1	1.52 V	266	43.80	17.10
8	11510.00	46.9 AV	54.0	-7.1	1.52 V	266	29.80	17.10

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)
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 159	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	*5795.00	112.7 PK			2.06 H	111	72.30	40.40
2	*5795.00	102.6 AV			2.06 H	111	62.20	40.40
3	#5850.00	45.9 PK	78.2	-32.3	2.06 H	111	39.30	6.60
4	#5852.10	69.0 PK	78.2	-9.2	2.06 H	111	62.40	6.60
5	#5860.10	72.9 PK	74.0	-1.1	2.06 H	111	66.30	6.60
6	#5860.10	48.4 AV	54.0	-5.6	2.06 H	111	41.80	6.60
7	11590.00	61.0 PK	74.0	-13.0	1.26 H	146	43.80	17.20
8	11590.00	48.4 AV	54.0	-5.6	1.26 H	146	31.20	17.20
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	*5795.00	117.2 PK			1.96 V	235	76.80	40.40
2	*5795.00	107.2 AV			1.96 V	235	66.80	40.40
3	#5850.00	52.7 PK	78.2	-25.5	1.96 V	235	46.10	6.60
4	#5852.10	70.2 PK	78.2	-8.0	1.96 V	235	63.60	6.60
5	#5860.10	69.4 PK	74.0	-4.6	1.96 V	235	62.80	6.60
6	#5860.10	53.6 AV	54.0	-0.4	1.96 V	235	47.00	6.60
7	11590.00	61.9 PK	74.0	-12.1	1.00 V	100	44.70	17.20
8	11590.00	48.9 AV	54.0	-5.1	1.00 V	100	31.70	17.20

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)
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 149	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	82.29	36.6 QP	40.0	-3.4	2.00 H	18	55.10	-18.50
2	223.94	33.3 QP	46.0	-12.7	1.51 H	168	49.90	-16.60
3	375.29	31.7 QP	46.0	-14.3	1.01 H	204	43.10	-11.40
4	499.48	41.5 QP	46.0	-4.5	1.51 H	148	50.80	-9.30
5	625.60	33.0 QP	46.0	-13.0	1.26 H	48	39.50	-6.50
6	749.79	32.7 QP	46.0	-13.3	1.01 H	298	36.30	-3.60
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	55.13	36.8 QP	40.0	-3.2	1.24 V	20	50.80	-14.00
2	82.29	36.9 QP	40.0	-3.1	1.00 V	189	55.40	-18.50
3	375.29	31.5 QP	46.0	-14.5	1.00 V	13	42.90	-11.40
4	499.48	41.3 QP	46.0	-4.7	1.00 V	139	50.60	-9.30
5	625.60	33.7 QP	46.0	-12.3	1.00 V	148	40.20	-6.50
6	961.29	41.2 QP	54.0	-12.8	1.00 V	254	41.60	-0.40

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
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 1.
3. The VCCI Site Registration No. is C-2040.

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.

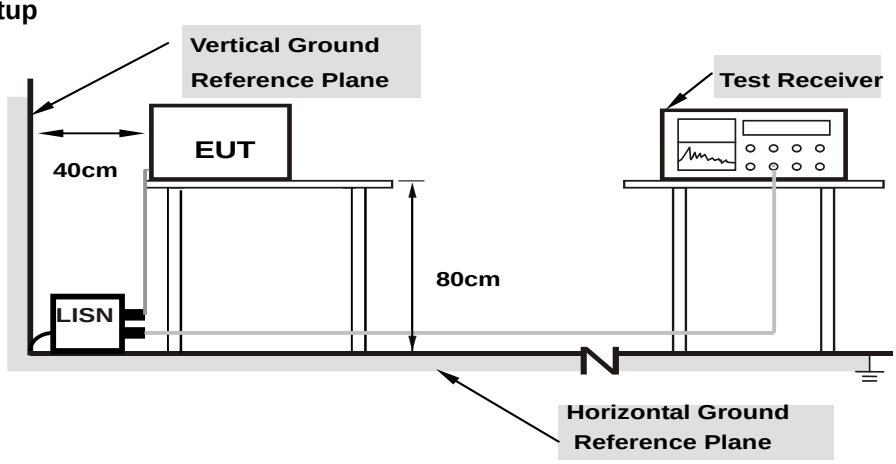
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

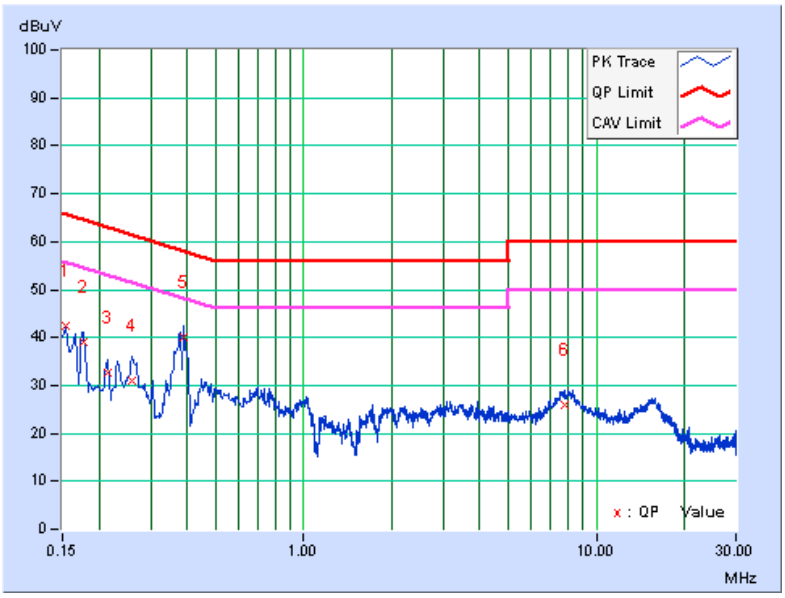
4.2.7 Test Results

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

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	0.15400	9.85	32.45	26.88	42.30	36.73	65.78	55.78	-23.48	-19.05
2	0.17800	9.89	29.28	19.31	39.17	29.20	64.58	54.58	-25.41	-25.38
3	0.21406	9.93	22.58	15.28	32.51	25.21	63.05	53.05	-30.54	-27.84
4	0.25810	9.92	21.06	12.19	30.98	22.11	61.49	51.49	-30.51	-29.38
5	0.39000	9.90	30.28	24.41	40.18	34.31	58.06	48.06	-17.88	-13.75
6	7.84593	10.41	15.52	11.04	25.93	21.45	60.00	50.00	-34.07	-28.55

Remarks:

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

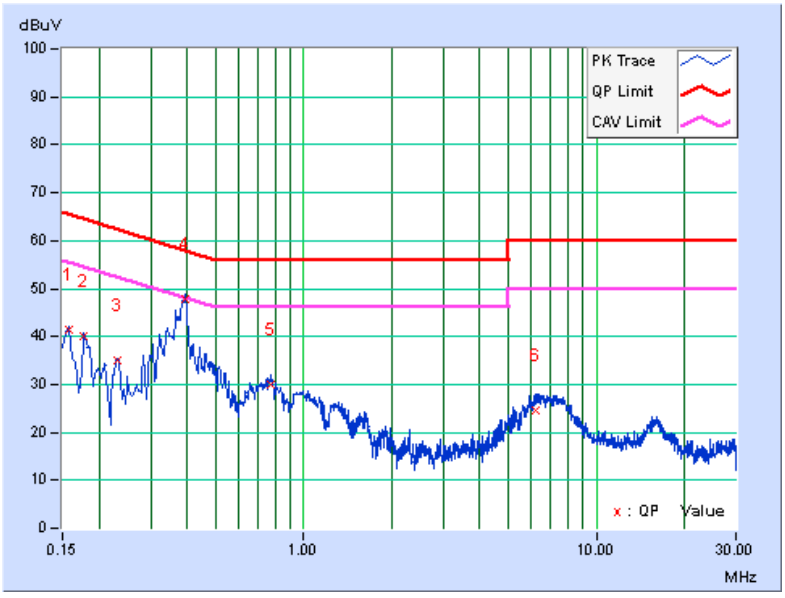


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	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	0.15728	9.82	31.72	25.14	41.54	34.96	65.61	55.61	-24.06	-20.64
2	0.17801	9.83	30.35	23.12	40.18	32.95	64.58	54.58	-24.40	-21.63
3	0.22985	9.84	25.21	20.59	35.05	30.43	62.46	52.46	-27.41	-22.03
4	**0.39400**	**9.88**	**37.79**	**33.74**	**47.67**	**43.62**	**57.98**	**47.98**	**-10.31**	**-4.36**
5	0.77023	9.91	20.15	16.59	30.06	26.50	56.00	46.00	-25.94	-19.50
6	6.20600	10.26	14.41	8.91	24.67	19.17	60.00	50.00	-35.33	-30.83

Remarks:

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



4.3 Transmit Power Measurment

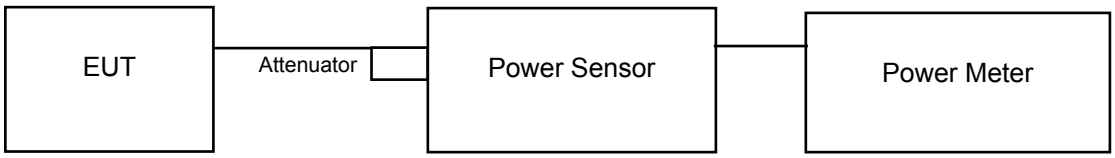
4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.
For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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 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:

802.11a

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)			Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
149	5745	18.49	17.35	17.42	180.165	22.56	30	Pass
157	5785	21.85	21.59	21.42	435.997	26.39	30	Pass
165	5825	19.68	19.10	19.62	265.802	24.25	30	Pass

802.11n (20MHz)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)			Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
149	5745	16.46	15.32	15.14	110.959	20.45	30	Pass
157	5785	23.37	22.38	22.92	**586.136**	27.68	30	Pass
165	5825	20.21	20.35	20.19	317.819	25.02	30	Pass

802.11n (40MHz)

Chan.	Freq. (MHz)	Maximum Conducted Power (dBm)			Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
151	5755	14.25	14.03	13.08	72.224	18.59	30	Pass
159	5795	19.57	18.67	18.63	237.14	23.75	30	Pass

Occupied Bandwidth:

802.11a

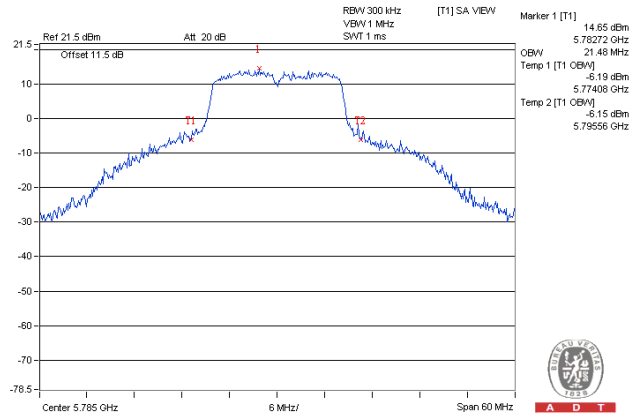
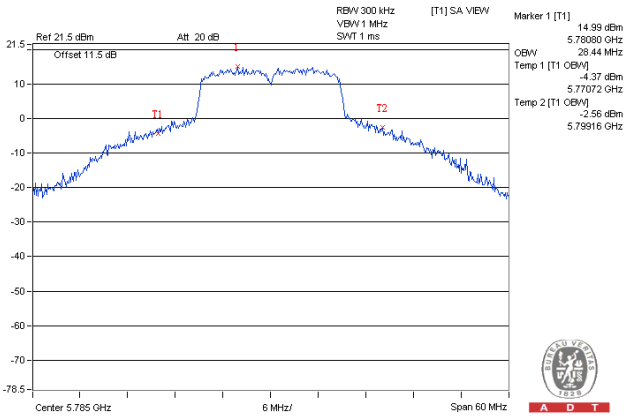
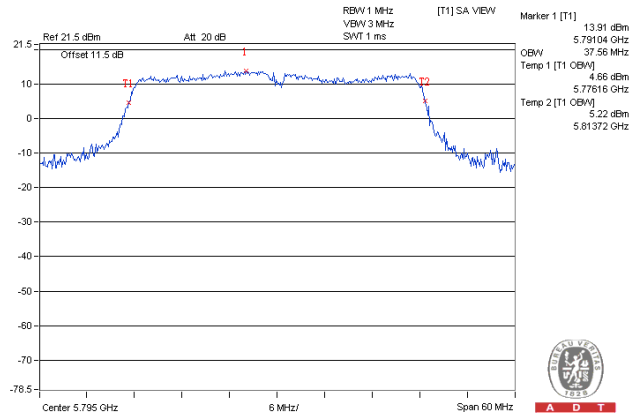
Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
149	5745	16.96	16.78	16.78
157	5785	21.48	18.72	18.96
165	5825	17.16	16.92	16.92

802.11n (20MHz)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
149	5745	18.00	17.88	17.88
157	5785	28.44	25.56	26.52
165	5825	18.36	17.88	18.00

802.11n (40MHz)

Chan.	Freq. (MHz)	Occupied Bandwidth (MHz)		
		Chain 0	Chain 1	Chain 2
151	5755	37.32	37.32	37.20
159	5795	37.44	37.56	37.08

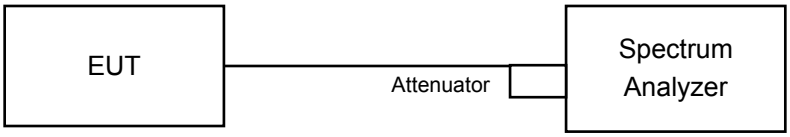
Spectrum Plot of Worst Value	
802.11a	802.11n (20MHz)
	
802.11n (40MHz)	
	

4.4 Peak Power Spectral Density Measurement

4.4.1 Limits of Peak Power Spectral Density Measurement

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.

b. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS

c. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.

d. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz/300kHz)

e. Sweep time = auto, trigger set to “free run”.

f. Trace average at least 100 traces in power averaging mode.

g. 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

802.11a

TX chain	Chan.	Freq. (MHz)	PSD (dBm/300 kHz)	PSD (dBm/500 kHz)	10 log (N=3) dB	Duty factor	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	-2.63	-0.41	4.77	0.12	4.48	28.10	Pass
	157	5785	1.46	3.68	4.77	0.12	8.57	28.10	Pass
	165	5825	-0.75	1.47	4.77	0.12	6.36	28.10	Pass
1	149	5745	-2.45	-0.23	4.77	0.12	4.66	28.10	Pass
	157	5785	0.85	3.07	4.77	0.12	7.96	28.10	Pass
	165	5825	0.12	2.34	4.77	0.12	7.23	28.10	Pass
2	149	5745	-3.41	-1.19	4.77	0.12	3.70	28.10	Pass
	157	5785	0.57	2.79	4.77	0.12	7.68	28.10	Pass
	165	5825	-0.75	1.47	4.77	0.12	6.36	28.10	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/3$]= 7.90 dBi > 6dBi, so the power density limit shall be reduced to 30-(7.90-6) = 28.10dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

TX chain	Chan.	Freq. (MHz)	PSD (dBm/300 kHz)	PSD (dBm/500 kHz)	10 log (N=3) dB	Duty factor	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	149	5745	-4.72	-2.50	4.77	0.13	2.40	28.10	Pass
	157	5785	1.84	4.06	4.77	0.13	8.96	28.10	Pass
	165	5825	-0.18	2.04	4.77	0.13	6.94	28.10	Pass
1	149	5745	-5.24	-3.02	4.77	0.13	1.88	28.10	Pass
	157	5785	2.27	4.49	4.77	0.13	9.39	28.10	Pass
	165	5825	0.11	2.33	4.77	0.13	7.23	28.10	Pass
2	149	5745	-6.18	-3.96	4.77	0.13	0.94	28.10	Pass
	157	5785	1.61	3.83	4.77	0.13	8.73	28.10	Pass
	165	5825	-0.57	1.65	4.77	0.13	6.55	28.10	Pass

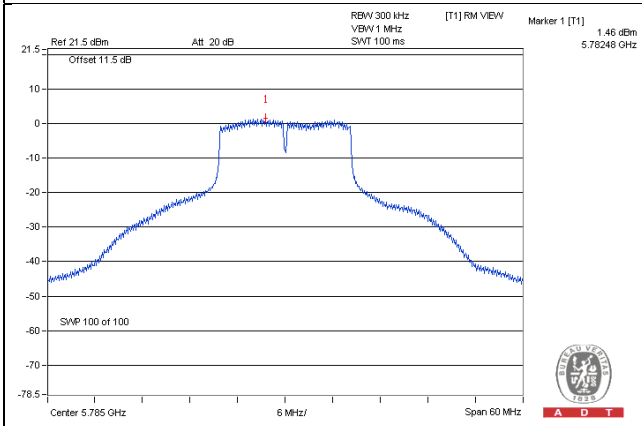
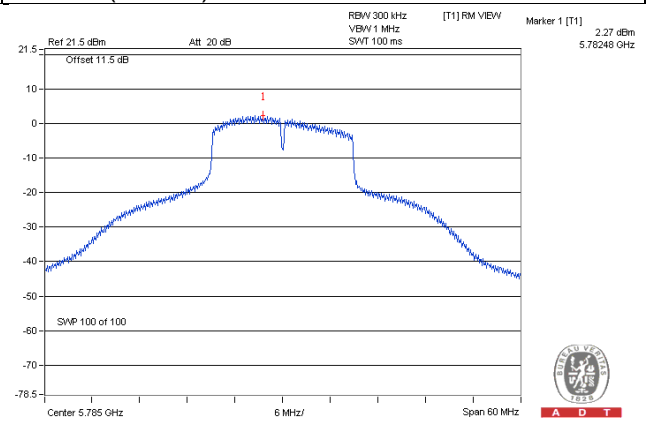
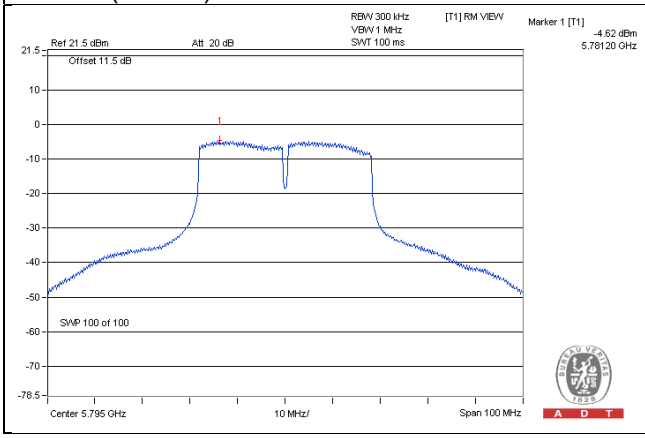
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/3$]= 7.90 dBi > 6dBi, so the power density limit shall be reduced to 30-(7.90-6) = 28.10dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

TX chain	Chan.	Freq. (MHz)	PSD (dBm/300 kHz)	PSD (dBm/500 kHz)	10 log (N=3) dB	Duty factor	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	151	5755	-9.48	-7.26	4.77	0.23	-2.26	28.10	Pass
	159	5795	-4.62	-2.40	4.77	0.23	2.60	28.10	Pass
1	151	5755	-9.60	-7.38	4.77	0.23	-2.38	28.10	Pass
	159	5795	-4.68	-2.46	4.77	0.23	2.54	28.10	Pass
2	151	5755	-11.55	-9.33	4.77	0.23	-4.33	28.10	Pass
	159	5795	-5.23	-3.01	4.77	0.23	1.99	28.10	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/3$]= 7.90 dBi > 6dBi, so the power density limit shall be reduced to 30-(7.90-6) = 28.10dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

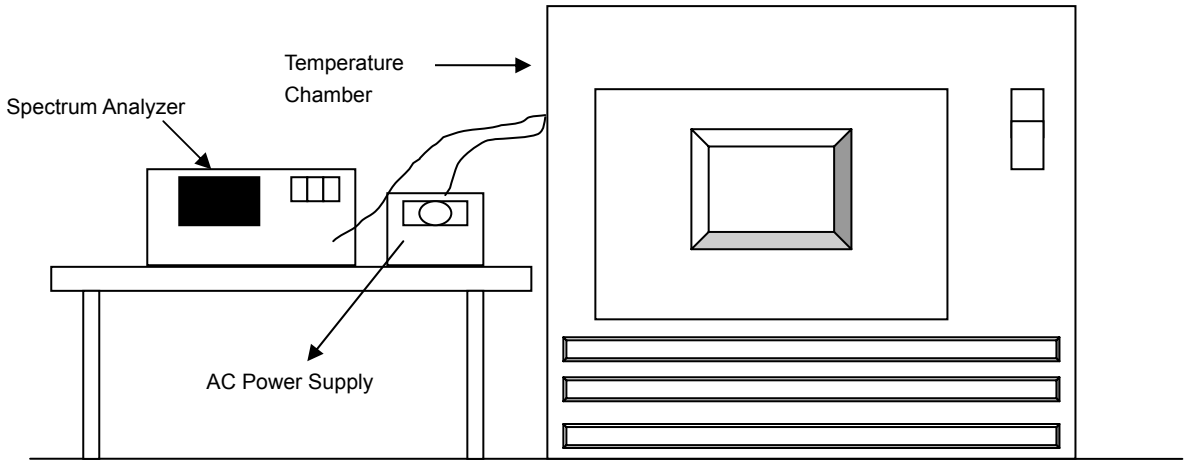
Spectrum Plot of Worst Value	
802.11a	802.11n (20MHz)
	
802.11n (40MHz)	
	

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: 5745MHz									
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	5744.993	-0.00012	5744.9898	-0.00018	5744.9895	-0.00018	5744.9928	-0.00013
40	120	5744.9752	-0.00043	5744.9796	-0.00036	5744.9787	-0.00037	5744.9755	-0.00043
30	120	5745.0051	0.00009	5745.0029	0.00005	5745.0061	0.00011	5745.0043	0.00007
20	120	5744.9791	-0.00036	5744.9778	-0.00039	5744.9773	-0.00040	5744.9806	-0.00034
10	120	5744.991	-0.00016	5744.9867	-0.00023	5744.99	-0.00017	5744.9877	-0.00021
0	120	5745.0244	0.00042	5745.0258	0.00045	5745.0271	0.00047	5745.0267	0.00046
-10	120	5744.9989	-0.00002	5744.9959	-0.00007	5744.9993	-0.00001	5744.9984	-0.00003
-20	120	5744.994	-0.00010	5744.9955	-0.00008	5744.9979	-0.00004	5744.9983	-0.00003
-30	120	5745.0268	0.00047	5745.0243	0.00042	5745.0238	0.00041	5745.0269	0.00047

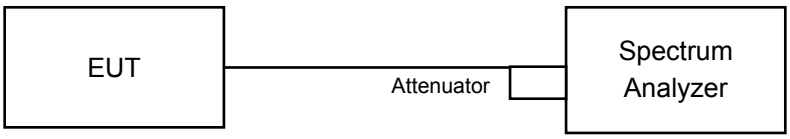
Frequemcy Stability Versus Temp.									
Operating Frequency: 5745MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5744.9793	-0.00036	5744.9772	-0.00040	5744.9765	-0.00041	5744.9807	-0.00034
	120	5744.9791	-0.00036	5744.9778	-0.00039	5744.9773	-0.00040	5744.9806	-0.00034
	102	5744.9795	-0.00036	5744.9769	-0.00040	5744.978	-0.00038	5744.9801	-0.00035

4.6 6dB Bandwidth Measurment

4.6.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

a. Set resolution bandwidth (RBW) = 100kHz

b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.

c. Trace mode = max hold.

d. Sweep = auto couple.

e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

802.11a

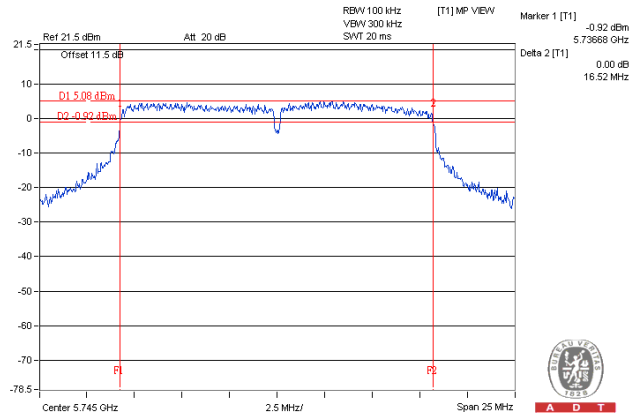
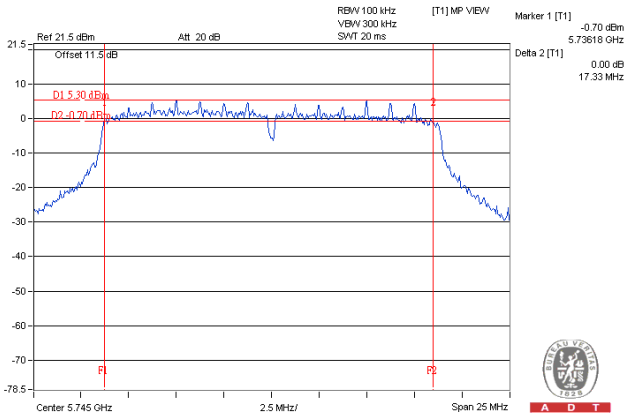
Chan.	Freq. (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
149	5745	16.52	15.76	15.99	0.5	Pass
157	5785	16.32	15.76	16.31	0.5	Pass
165	5825	16.38	15.72	15.78	0.5	Pass

802.11n (20MHz)

Chan.	Freq. (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
149	5745	17.33	16.75	17.29	0.5	Pass
157	5785	17.12	16.02	16.98	0.5	Pass
165	5825	17.12	15.41	16.42	0.5	Pass

802.11n (40MHz)

Chan.	Freq. (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
151	5755	35.89	35.78	35.60	0.5	Pass
159	5795	35.89	35.83	35.81	0.5	Pass

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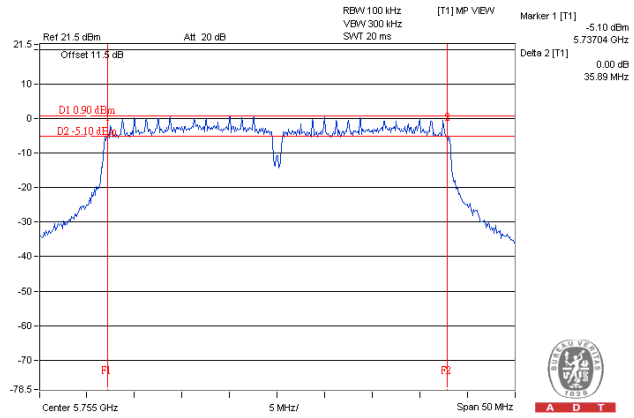	

5 Pictures of Test Arrangements

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

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