

FCC Test Report

Report No.: RF150422C24-1

FCC ID: TE7C2600

Test Model: Archer C2600

Received Date: Apr. 22, 2015

Test Date: May 12 ~ May 20, 2015

Issued Date: May 20, 2015

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A D T

Release Control Record

Issue No.	Description	Date Issued
RF150422C24-1	Original release	May 20, 2015

1 Certificate of Conformity

Product: AC2600 Wireless Dual Band Gigabit Router

Brand: TP-LINK

Test Model: Archer C2600

Sample Status: Prototype

Applicant: TP-LINK TECHNOLOGIES CO., LTD.

Test Date: May 12 ~ May 20, 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 20, 2015
Pettie Chen / Senior Specialist

Approved by :  , **Date:** May 20, 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 -16.98dB at 13.30469MHz.
15.407(b) (1/2/3/4/6)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.1dB 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 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	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 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 Wireless Dual Band Gigabit Router
Brand	TP-LINK
Test Model	Archer C2600
Status of EUT	Prototype
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 800.0Mbps with 256QAM 802.11ac: up to 1733.3Mbps
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	729.075mW
Antenna Type	Omni-Directional antenna with 4.95dBi gain
Antenna Connector	i-pex MHF
Accessory Device	1.45m shielded AC power cable without core, adapter
Data Cable Supplied	N/A

Note:

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

Modulation Mode	TX Function
802.11a	4TX
802.11n (20MHz)	4TX
802.11n (40MHz)	4TX
802.11ac (20MHz)	4TX
802.11ac (40MHz)	4TX
802.11ac (80MHz)	4TX

* 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)

2. The EUT uses following adapter.

Adapter	
Brand	Huntkey
Model	HKA04812040-7D
Input Power	100-240Vac~1.2A 50/60Hz
Output Power	12.0Vdc / 4.0A
Power Line	1.8m cable without core attached on adapter

3.2 Description of Test Modes

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

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

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

Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz

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	
-	√	√	√	√	-

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	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
-	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
-	802.11n (40MHz)		38 to 46	38, 46	OFDM	BPSK	15.0
-	802.11ac (80MHz)		42	42	OFDM	BPSK	117.0

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)
-	802.11n (20MHz)	5180-5240	36 to 48	48	OFDM	BPSK	7.2

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)
-	802.11n (20MHz)	5180-5240	36 to 48	48	OFDM	BPSK	7.2

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	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
-	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
-	802.11n (40MHz)		38 to 46	38, 46	OFDM	BPSK	15.0
-	802.11ac (80MHz)		42	42	OFDM	BPSK	117.0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	18deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
RE $<$ 1G	18deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
PLC	18deg. C, 70%RH	120Vac, 60Hz	Nick Hsu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Antony Lee

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor is required

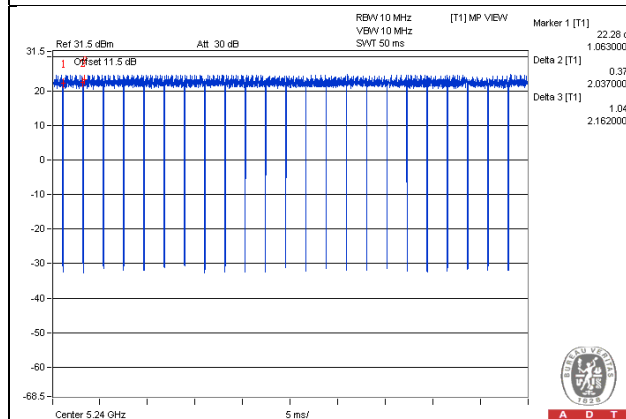
802.11a: Duty cycle = $2.037/2.162 = 0.942$, Duty factor = $10 * \log(1/0.942) = 0.26$

802.11n (20MHz): Duty cycle = $4.95/5.125 = 0.966$, Duty factor = $10 * \log(1/0.966) = 0.15$

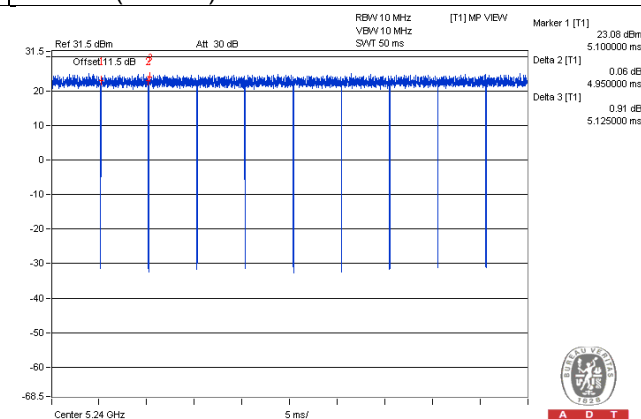
802.11n (40MHz): Duty cycle = $2.363/2.938 = 0.804$, Duty factor = $10 * \log(1/0.804) = 0.95$

802.11ac (80MHz): Duty cycle = $1.088/1.225 = 0.888$, Duty factor = $10 * \log(1/0.888) = 0.52$

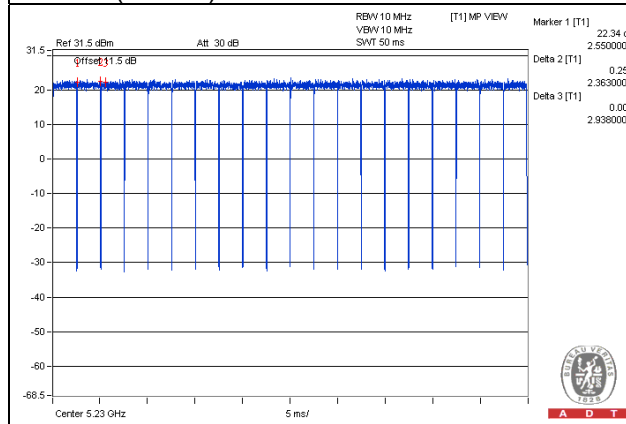
802.11a



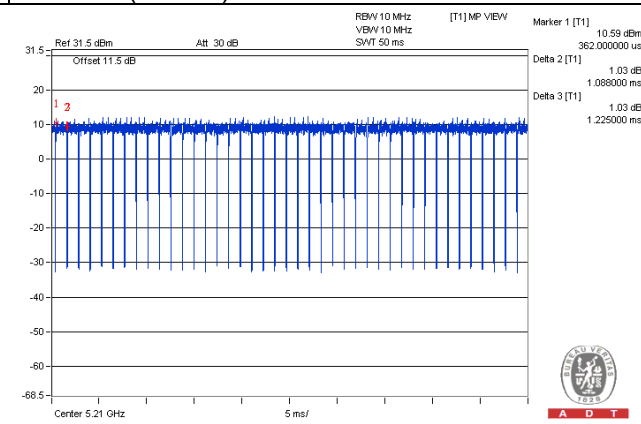
802.11n (20MHz)



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.

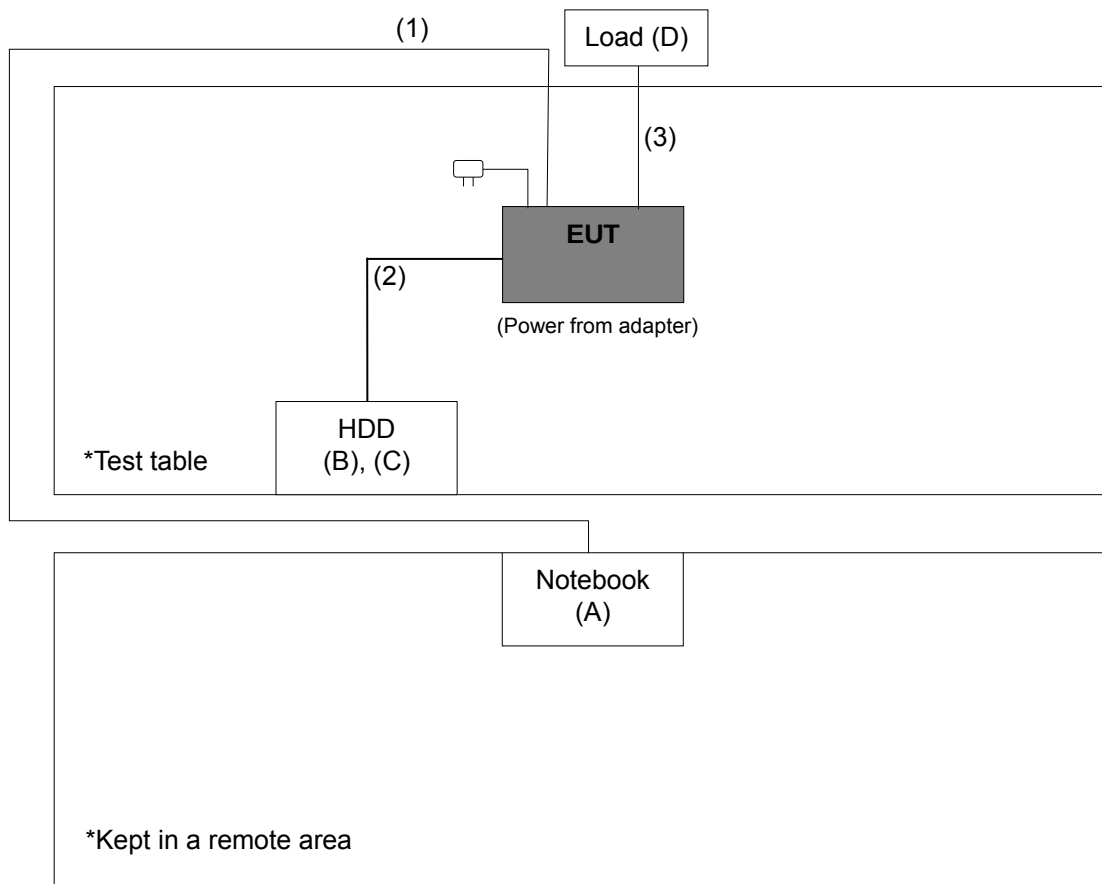
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	D531	CN-0XM006-48643-81 U-2610	QDS-BRCM1020	-
B.	External Hard Disk	WD	WDBACY5000ABL-01	WXS1CC1D3606	NA	-
C.	External Hard Disk	WD	WDBACY5000ABL-01	WX51C1245403	NA	-
D.	Load	NA	NA	NA	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ 45	1	10	N	0	-
2.	USB	1	1.8	Y	0	-
3.	RJ 45	4	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 (dBuV/m)	AV:54 (dBuV/m)
APPLICABLE TO	EIRP LIMIT	EQUIVALENT FIELD STRENGTH AT 3m
15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBuV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)	PK:-27 (dBm/MHz) ^{*1} PK:-17 (dBm/MHz) ^{*2}	PK: 68.2(dBuV/m) ^{*1} PK:78.2 (dBuV/m) ^{*2}

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

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Apr. 10, 2015	Apr. 09, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Aug. 29, 2014	Aug. 28, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	9120D	209	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8447D	2944A10738	Oct. 18, 2014	Oct. 17, 2015
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2014	Aug. 21, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	214378/4	Aug. 22, 2014	Aug. 21, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 106	12738/6 +309224/4	Aug. 22, 2014	Aug. 21, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	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
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 3.
 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 988962.
 5. The IC Site Registration No. is IC 7450F-3.

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:

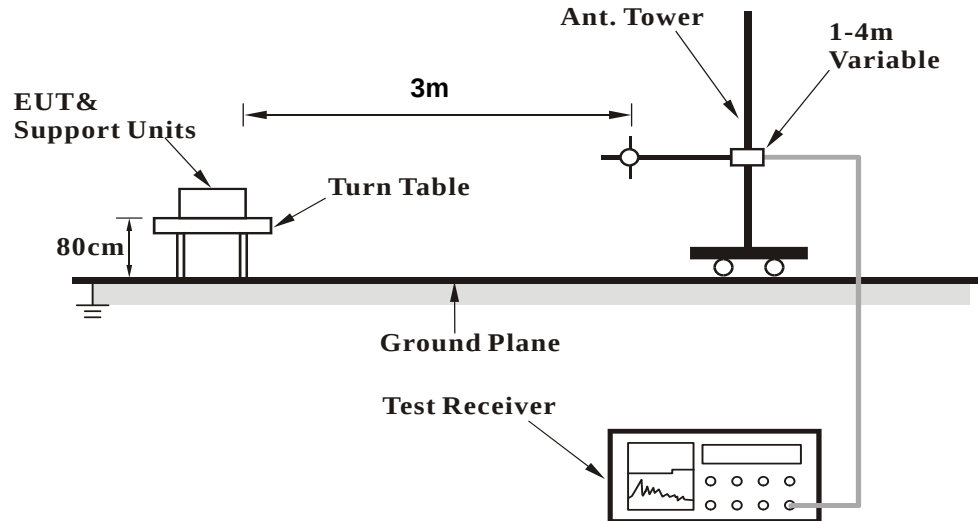
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test. (Tracking Number 307455)
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
6. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

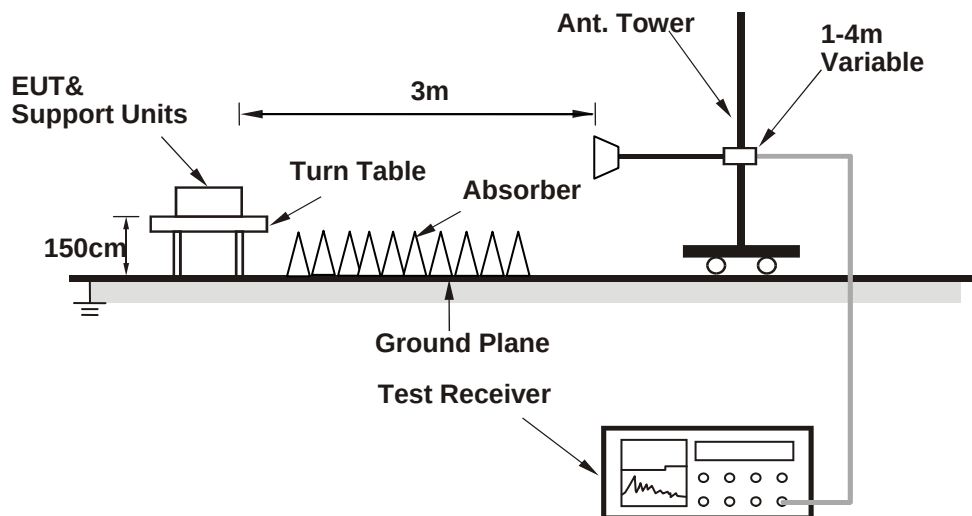
No deviation.

4.1.5 Test 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

- Placed the EUT on the testing table.
- Prepared a notebook to act as communication partner and placed it outside of testing area.
- 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.
- The communication partner sent data to EUT by command "PING".
- 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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	57.1 PK	74.0	-16.9	1.08 H	154	51.10	6.00
2	5150.00	44.5 AV	54.0	-9.5	1.08 H	154	38.50	6.00
3	*5180.00	107.4 PK			1.33 H	194	67.90	39.50
4	*5180.00	96.7 AV			1.33 H	194	57.20	39.50
5	#6906.00	57.6 PK	68.2	-10.6	1.05 H	3	46.10	11.50
6	#10360.00	64.2 PK	74.0	-9.8	1.24 H	118	45.80	18.40
7	#10360.00	51.2 AV	54.0	-2.8	1.24 H	118	32.80	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	71.5 PK	74.0	-2.5	1.73 V	315	65.50	6.00
2	5150.00	53.6 AV	54.0	-0.4	1.73 V	315	47.60	6.00
3	*5180.00	125.0 PK			1.87 V	196	85.50	39.50
4	*5180.00	114.2 AV			1.87 V	196	74.70	39.50
5	#6906.00	63.5 PK	68.2	-4.7	1.14 V	39	52.00	11.50
6	#10360.00	64.8 PK	74.0	-9.2	1.12 V	168	46.40	18.40
7	#10360.00	52.1 AV	54.0	-1.9	1.12 V	168	33.70	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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	56.9 PK	74.0	-17.1	1.06 H	159	50.90	6.00
2	5150.00	44.2 AV	54.0	-9.8	1.06 H	159	38.20	6.00
3	*5200.00	110.9 PK			1.33 H	194	71.30	39.60
4	*5200.00	100.7 AV			1.33 H	194	61.10	39.60
5	#6933.00	58.0 PK	68.2	-10.2	1.00 H	7	46.30	11.70
6	#10400.00	63.7 PK	74.0	-10.3	1.39 H	119	45.20	18.50
7	#10400.00	51.1 AV	54.0	-2.9	1.39 H	119	32.60	18.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	65.4 PK	74.0	-8.6	1.64 V	149	59.40	6.00
2	5150.00	52.1 AV	54.0	-1.9	1.64 V	149	46.10	6.00
3	*5200.00	130.1 PK			1.82 V	149	90.50	39.60
4	*5200.00	118.9 AV			1.82 V	149	79.30	39.60
5	#6933.00	65.3 PK	68.2	-2.9	1.08 V	310	53.60	11.70
6	#10400.00	68.0 PK	74.0	-6.0	1.07 V	169	49.50	18.50
7	#10400.00	53.6 AV	54.0	-0.4	1.07 V	169	35.10	18.50

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	57.6 PK	74.0	-16.4	1.17 H	175	51.60	6.00
2	5150.00	44.2 AV	54.0	-9.8	1.17 H	175	38.20	6.00
3	*5240.00	110.2 PK			1.00 H	194	70.60	39.60
4	*5240.00	99.5 AV			1.00 H	194	59.90	39.60
5	#6986.00	58.2 PK	68.2	-10.0	1.02 H	321	45.90	12.30
6	#10480.00	61.8 PK	74.0	-12.2	1.12 H	117	42.80	19.00
7	#10480.00	49.6 AV	54.0	-4.4	1.12 H	117	30.60	19.00
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	66.3 PK	74.0	-7.7	1.62 V	329	60.30	6.00
2	5150.00	50.4 AV	54.0	-3.6	1.62 V	329	44.40	6.00
3	*5240.00	130.1 PK			1.91 V	150	90.50	39.60
4	*5240.00	119.2 AV			1.91 V	150	79.60	39.60
5	#6986.00	64.3 PK	68.2	-3.9	1.15 V	345	52.00	12.30
6	#10480.00	68.5 PK	74.0	-5.5	1.34 V	170	49.50	19.00
7	#10480.00	53.5 AV	54.0	-0.5	1.34 V	170	34.50	19.00

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	56.7 PK	74.0	-17.3	1.16 H	172	50.70	6.00
2	5150.00	44.1 AV	54.0	-9.9	1.16 H	172	38.10	6.00
3	*5180.00	107.9 PK			1.33 H	194	68.40	39.50
4	*5180.00	96.8 AV			1.33 H	194	57.30	39.50
5	#6906.00	57.9 PK	68.2	-10.3	1.05 H	0	46.40	11.50
6	#10360.00	63.4 PK	74.0	-10.6	1.21 H	117	45.00	18.40
7	#10360.00	50.5 AV	54.0	-3.5	1.21 H	117	32.10	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	68.6 PK	74.0	-5.4	1.70 V	358	62.60	6.00
2	5150.00	53.9 AV	54.0	-0.1	1.70 V	358	47.90	6.00
3	*5180.00	126.4 PK			1.81 V	195	86.90	39.50
4	*5180.00	114.9 AV			1.81 V	195	75.40	39.50
5	#6906.00	63.1 PK	68.2	-5.1	1.02 V	20	51.60	11.50
6	#10360.00	64.0 PK	74.0	-10.0	1.08 V	168	45.60	18.40
7	#10360.00	51.4 AV	54.0	-2.6	1.08 V	168	33.00	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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	57.7 PK	74.0	-16.3	1.28 H	21	51.70	6.00
2	5150.00	44.3 AV	54.0	-9.7	1.28 H	21	38.30	6.00
3	*5200.00	110.9 PK			1.13 H	191	71.30	39.60
4	*5200.00	100.5 AV			1.13 H	191	60.90	39.60
5	#6933.00	58.8 PK	68.2	-9.4	1.14 H	2	47.10	11.70
6	#10400.00	65.4 PK	74.0	-8.6	1.32 H	118	46.90	18.50
7	#10400.00	52.9 AV	54.0	-1.1	1.32 H	118	34.40	18.50
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	64.9 PK	74.0	-9.1	1.65 V	149	58.90	6.00
2	5150.00	52.5 AV	54.0	-1.5	1.65 V	149	46.50	6.00
3	*5200.00	129.3 PK			1.88 V	195	89.70	39.60
4	*5200.00	118.4 AV			1.88 V	195	78.80	39.60
5	#6933.00	64.1 PK	68.2	-4.1	1.06 V	313	52.40	11.70
6	#10400.00	68.7 PK	74.0	-5.3	1.27 V	177	50.20	18.50
7	#10400.00	53.6 AV	54.0	-0.4	1.27 V	177	35.10	18.50

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	56.2 PK	74.0	-17.8	1.26 H	182	50.20	6.00
2	5150.00	44.1 AV	54.0	-9.9	1.26 H	182	38.10	6.00
3	*5240.00	110.3 PK			1.07 H	199	70.70	39.60
4	*5240.00	99.9 AV			1.07 H	199	60.30	39.60
5	#6986.00	58.6 PK	68.2	-9.6	1.10 H	319	46.30	12.30
6	#10480.00	61.2 PK	74.0	-12.8	1.10 H	115	42.20	19.00
7	#10480.00	48.7 AV	54.0	-5.3	1.10 H	115	29.70	19.00
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	66.0 PK	74.0	-8.0	1.57 V	194	60.00	6.00
2	5150.00	50.1 AV	54.0	-3.9	1.57 V	194	44.10	6.00
3	*5240.00	129.6 PK			1.87 V	148	90.00	39.60
4	*5240.00	119.2 AV			1.87 V	148	79.60	39.60
5	#6986.00	63.8 PK	68.2	-4.4	1.04 V	346	51.50	12.30
6	#10480.00	68.8 PK	74.0	-5.2	1.32 V	164	49.80	19.00
7	#10480.00	53.5 AV	54.0	-0.5	1.32 V	164	34.50	19.00

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	56.1 PK	74.0	-17.9	1.35 H	173	50.10	6.00
2	5150.00	44.0 AV	54.0	-10.0	1.35 H	173	38.00	6.00
3	*5190.00	98.9 PK			1.07 H	195	59.40	39.50
4	*5190.00	89.7 AV			1.07 H	195	50.20	39.50
5	#6920.00	58.6 PK	68.2	-9.6	1.00 H	3	46.90	11.70
6	#10380.00	59.8 PK	74.0	-14.2	1.27 H	294	41.30	18.50
7	#10380.00	47.4 AV	54.0	-6.6	1.27 H	294	28.90	18.50
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	67.2 PK	74.0	-6.8	1.70 V	189	61.20	6.00
2	5150.00	53.7 AV	54.0	-0.3	1.70 V	189	47.70	6.00
3	*5190.00	117.6 PK			1.61 V	193	78.10	39.50
4	*5190.00	108.0 AV			1.61 V	193	68.50	39.50
5	#6920.00	63.1 PK	68.2	-5.1	1.13 V	39	51.40	11.70
6	#10380.00	60.1 PK	74.0	-13.9	1.16 V	110	41.60	18.50
7	#10380.00	47.2 AV	54.0	-6.8	1.16 V	110	28.70	18.50

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	57.1 PK	74.0	-16.9	1.03 H	120	51.10	6.00
2	5150.00	43.6 AV	54.0	-10.4	1.03 H	120	37.60	6.00
3	*5230.00	105.9 PK			1.07 H	194	66.30	39.60
4	*5230.00	96.7 AV			1.07 H	194	57.10	39.60
5	#6973.00	57.5 PK	68.2	-10.7	1.02 H	322	45.20	12.30
6	#10460.00	60.1 PK	74.0	-13.9	1.22 H	52	41.20	18.90
7	#10460.00	47.3 AV	54.0	-6.7	1.22 H	52	28.40	18.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	67.5 PK	74.0	-6.5	1.77 V	193	61.50	6.00
2	5150.00	53.5 AV	54.0	-0.5	1.77 V	193	47.50	6.00
3	*5230.00	125.6 PK			1.86 V	197	86.00	39.60
4	*5230.00	115.5 AV			1.86 V	197	75.90	39.60
5	#6973.00	64.7 PK	68.2	-3.5	2.48 V	346	52.40	12.30
6	#10460.00	61.0 PK	74.0	-13.0	2.00 V	97	42.10	18.90
7	#10460.00	49.2 AV	54.0	-4.8	2.00 V	97	30.30	18.90

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
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)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5144.00	56.4 PK	74.0	-17.6	1.22 H	127	50.40	6.00
2	5144.00	44.3 AV	54.0	-9.7	1.22 H	127	38.30	6.00
3	*5210.00	93.8 PK			1.00 H	197	54.20	39.60
4	*5210.00	83.5 AV			1.00 H	197	43.90	39.60
5	#6946.00	56.6 PK	68.2	-11.6	1.13 H	4	44.60	12.00
6	#10420.00	59.9 PK	74.0	-14.1	1.22 H	69	41.30	18.60
7	#10420.00	47.5 AV	54.0	-6.5	1.22 H	69	28.90	18.60
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	5144.00	70.8 PK	74.0	-3.2	1.78 V	192	64.80	6.00
2	5144.00	53.5 AV	54.0	-0.5	1.78 V	192	47.50	6.00
3	*5210.00	112.8 PK			1.84 V	195	73.20	39.60
4	*5210.00	102.5 AV			1.84 V	195	62.90	39.60
5	#6946.00	61.0 PK	68.2	-7.2	2.31 V	19	49.00	12.00
6	#10420.00	60.7 PK	74.0	-13.3	1.32 V	326	42.10	18.60
7	#10420.00	47.0 AV	54.0	-7.0	1.32 V	326	28.40	18.60

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)
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

802.11n (20MHz)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	375.98	44.4 QP	46.0	-1.6	1.00 H	234	55.40	-11.00
2	597.63	42.7 QP	46.0	-3.3	1.00 H	45	49.00	-6.30
3	665.68	44.2 QP	46.0	-1.8	1.00 H	51	49.30	-5.10
4	778.45	44.5 QP	46.0	-1.5	1.00 H	33	46.90	-2.40
5	817.34	43.1 QP	46.0	-2.9	1.00 H	344	45.10	-2.00
6	875.67	44.1 QP	46.0	-1.9	1.49 H	41	45.20	-1.10
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	31.84	35.2 QP	40.0	-4.8	1.01 V	135	51.30	-16.10
2	294.32	36.0 QP	46.0	-10.0	1.51 V	174	48.60	-12.60
3	375.98	39.1 QP	46.0	-6.9	2.00 V	76	50.10	-11.00
4	624.85	42.6 QP	46.0	-3.4	1.51 V	158	48.20	-5.60
5	665.68	38.8 QP	46.0	-7.2	1.51 V	342	43.90	-5.10
6	774.56	41.2 QP	46.0	-4.8	1.01 V	316	43.70	-2.50

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.	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

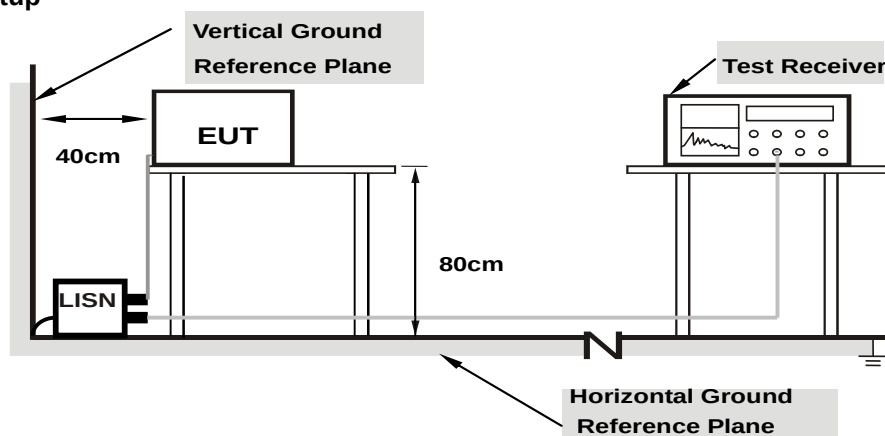
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: 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.

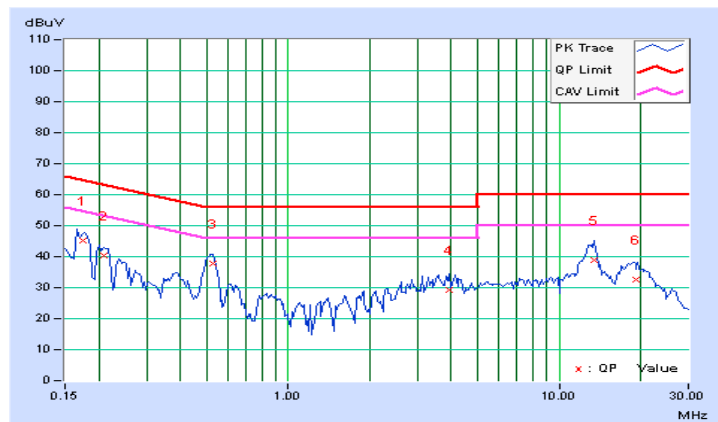
4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17479	0.17	45.11	34.57	45.28	34.74	64.73	54.73	-19.45	-19.99
2	0.20859	0.17	40.11	29.89	40.28	30.06	63.26	53.26	-22.98	-23.20
3	0.52891	0.19	37.77	27.57	37.96	27.76	56.00	46.00	-18.04	-18.24
4	3.91016	0.35	28.99	18.21	29.34	18.56	56.00	46.00	-26.66	-27.44
5	13.49609	0.51	38.27	31.57	38.78	32.08	60.00	50.00	-21.22	-17.92
6	19.11719	0.61	31.80	26.49	32.41	27.10	60.00	50.00	-27.59	-22.90

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.

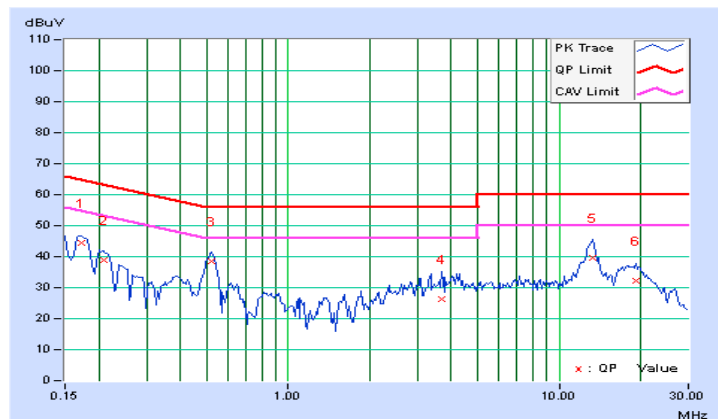


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17344	0.18	44.17	34.24	44.35	34.42	64.79	54.79	-20.45	-20.38
2	0.20859	0.18	38.66	29.91	38.84	30.09	63.26	53.26	-24.42	-23.17
3	0.52109	0.21	38.34	27.87	38.55	28.08	56.00	46.00	-17.45	-17.92
4	3.70703	0.37	26.11	16.99	26.48	17.36	56.00	46.00	-29.52	-28.64
5	13.30469	0.61	39.11	32.41	39.72	33.02	60.00	50.00	-20.28	-16.98
6	19.15234	0.77	31.62	26.24	32.39	27.01	60.00	50.00	-27.61	-22.99

Remarks:

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



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

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

*B is the 26 dB emission bandwidth in megahertz

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

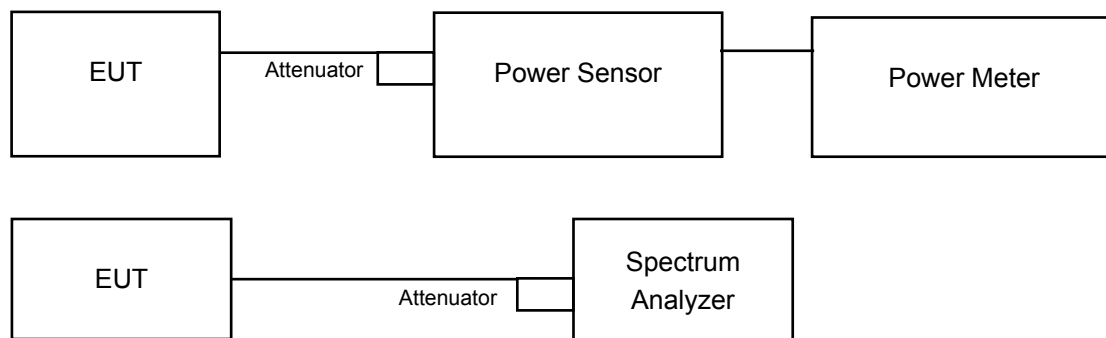
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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 $\geq$ 3 MHz
- e. Number of points in sweep $\geq$ 2 Span / RBW.
- f. Sweep time $\leq$ (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 from Test 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.	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	19.99	20.11	19.51	19.97	390.978	25.92	30	Pass
40	5200	20.16	20.20	20.03	20.11	411.724	26.15	30	Pass
48	5240	20.09	20.13	20.26	20.02	411.765	26.15	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	19.99	20.28	19.40	20.04	394.451	25.96	30	Pass
40	5200	20.22	20.33	20.15	20.24	422.287	26.26	30	Pass
48	5240	20.11	20.26	20.33	20.25	422.555	26.26	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	15.48	15.67	15.16	15.57	141.084	21.49	30	Pass
46	5230	22.69	22.70	22.66	22.37	729.075	28.63	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	12.65	12.38	12.54	12.52	71.518	18.54	30	Pass

26dB Bandwidth:

802.11a

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	19.46	19.45	19.23	19.33	Pass
40	5200	19.51	19.29	19.41	19.36	Pass
48	5240	19.49	19.54	19.45	19.29	Pass

802.11n (20MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	20.43	20.43	20.76	20.36	Pass
40	5200	20.57	20.67	20.85	20.44	Pass
48	5240	20.57	20.56	21.30	20.43	Pass

802.11n (40MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
38	5190	41.00	41.05	40.88	40.19	Pass
46	5230	41.31	41.32	48.75	40.74	Pass

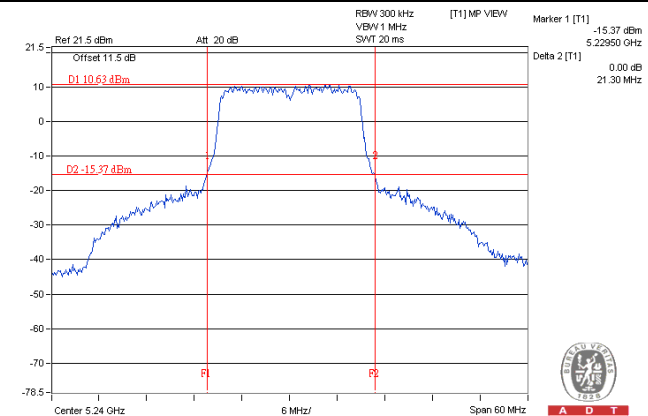
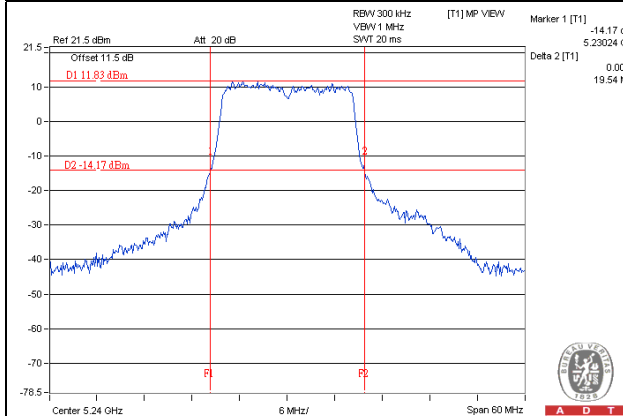
802.11ac (80MHz)

Channel	Channel Frequency (MHz)	26dBc Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
42	5210	83.96	91.35	86.17	81.70	Pass

Spectrum Plot of Worst Value

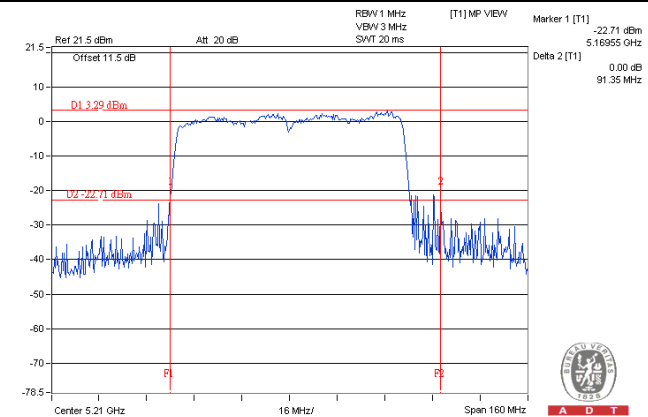
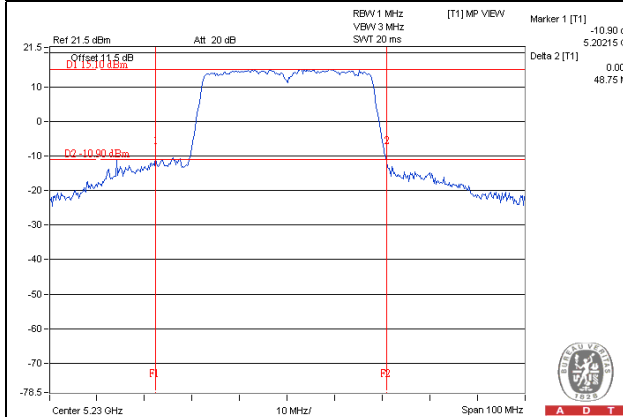
802.11a

802.11n (20MHz)



802.11n (40MHz)

802.11ac (80MHz)



For Occupied Bandwidth:

802.11a

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
36	5180	16.56	16.44	16.56	16.68	Pass
40	5200	16.56	16.68	16.56	16.68	Pass
48	5240	16.56	16.56	16.56	16.68	Pass

802.11n (20MHz)

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

802.11n (40MHz)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
38	5190	36.36	36.36	36.36	36.12	Pass
46	5230	36.48	36.36	36.60	36.12	Pass

802.11ac (80MHz)

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)				Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3	
42	5210	75.84	75.84	76.08	75.60	Pass

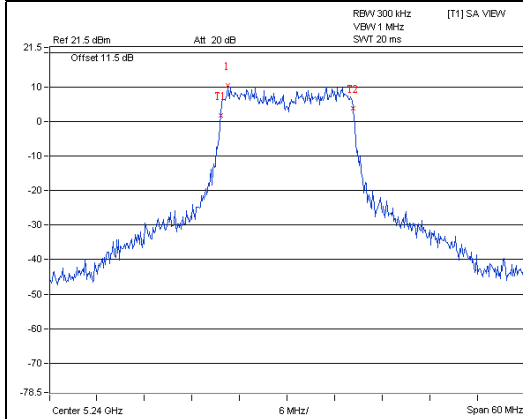


A D T

Spectrum Plot of Worst Value

802.11a

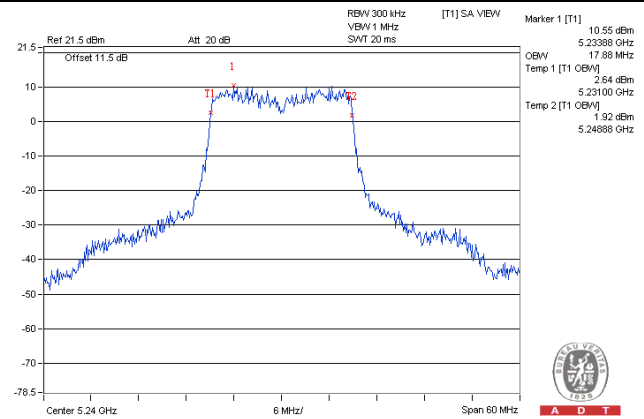
802.11n (20MHz)



Marker 1 [T1]
10.41 dBm
5.23244 GHz
OBW 16.68 MHz
Temp 1 [T1] OBW 1.89 dBm
5.23160 GHz
Temp 2 [T1] OBW 3.76 dBm
5.24628 GHz



A D T



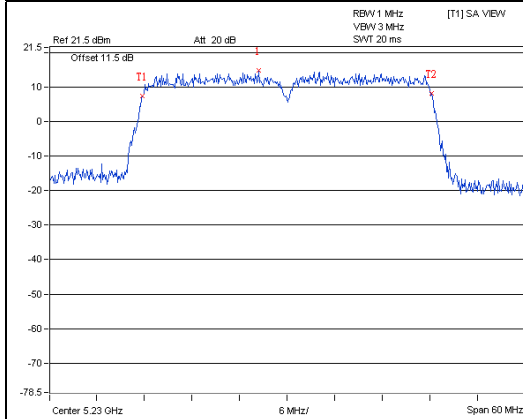
Marker 1 [T1]
10.55 dBm
5.23388 GHz
OBW 17.88 MHz
Temp 1 [T1] OBW 2.84 dBm
5.23100 GHz
Temp 2 [T1] OBW 1.92 dBm
5.24888 GHz



A D T

802.11n (40MHz)

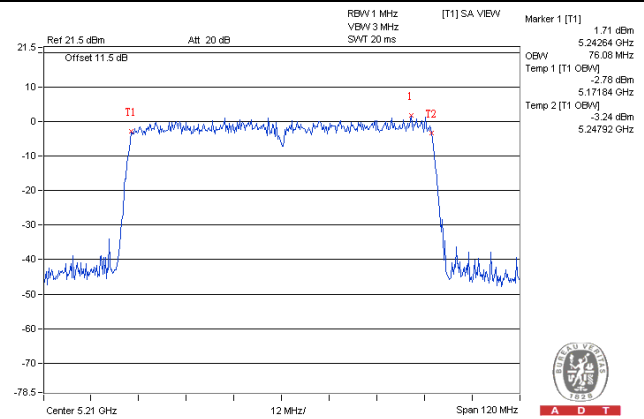
802.11ac (80MHz)



Marker 1 [T1]
14.91 dBm
5.22640 GHz
OBW 36.60 MHz
Temp 1 [T1] OBW 7.37 dBm
5.21164 GHz
Temp 2 [T1] OBW 6.14 dBm
5.24624 GHz



A D T



Marker 1 [T1]
1.71 dBm
5.24264 GHz
OBW 76.08 MHz
Temp 1 [T1] OBW -2.78 dBm
5.17184 GHz
Temp 2 [T1] OBW -3.24 dBm
5.24792 GHz



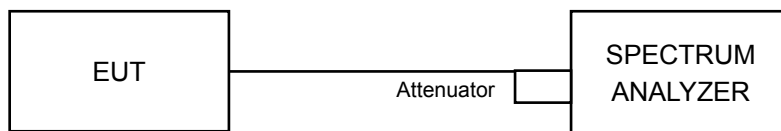
A D T

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

Using method SA-2

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
- Sweep time = auto, trigger set to “free run”.
- Trace average at least 100 traces in power averaging mode.
- 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

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)				Total PSD W/O Duty Factor (dBm/MHz)	Duty Factor	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
36	5180	4.87	5.66	4.40	5.39	11.13	0.26	11.39	12.03	Pass
40	5200	5.64	6.06	5.03	6.15	11.76	0.26	12.02	12.03	Pass
48	5240	5.57	6.01	5.30	6.01	11.75	0.26	12.01	12.03	Pass

Note:

- 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.
- Directional gain = $4.95\text{dBi} + 10\log(4) = 10.97\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(10.97-6) = 12.03\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)				Total PSD W/O Duty Factor (dBm/MHz)	Duty Factor	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
36	5180	4.72	5.52	4.23	5.38	11.01	0.15	11.16	12.03	Pass
40	5200	5.52	5.78	5.09	6.06	11.65	0.15	11.80	12.03	Pass
48	5240	5.39	5.13	5.32	5.97	11.48	0.15	11.63	12.03	Pass

Note:

- 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.
- Directional gain = $4.95\text{dBi} + 10\log(4) = 10.97\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(10.97-6) = 12.03\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)				Total PSD W/O Duty Factor (dBm/MHz)	Duty Factor	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
38	5190	-2.60	-2.76	-3.11	-1.57	3.55	0.95	4.50	12.03	Pass
46	5230	4.71	4.60	4.50	5.54	10.88	0.95	11.83	12.03	Pass

Note:

- 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.
- Directional gain = $4.95\text{dBi} + 10\log(4) = 10.97\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17-(10.97-6) = 12.03\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

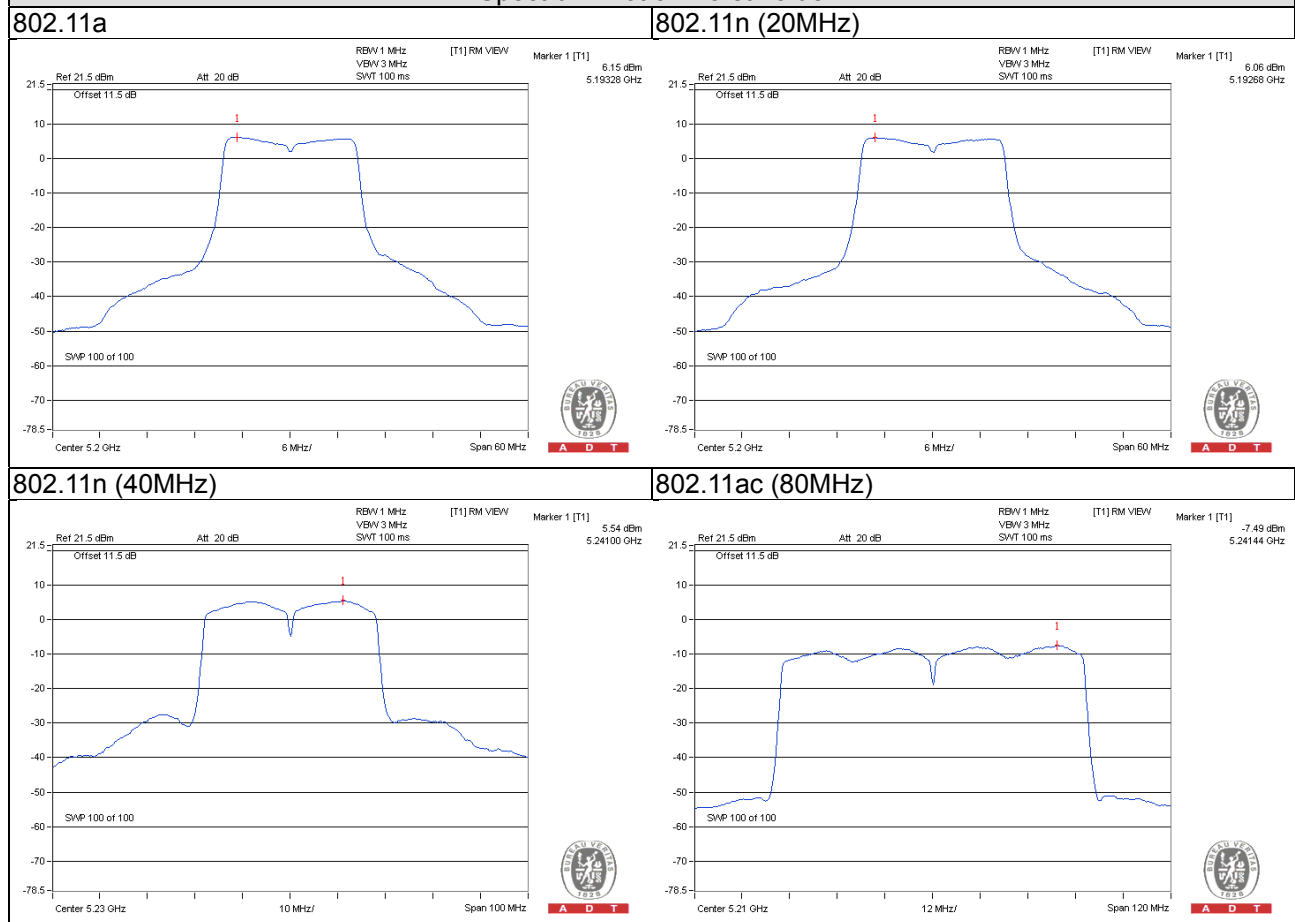
802.11ac (80MHz)

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)				Total PSD W/O Duty Factor (dBm/MHz)	Duty Factor	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3					
42	5210	-8.90	-8.31	-8.81	-7.49	-2.32	0.52	-1.80	12.03	Pass

Note:

- 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.
- Directional gain = $4.95\text{dBi} + 10\log(4) = 10.97\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $17 - (10.97 - 6) = 12.03\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

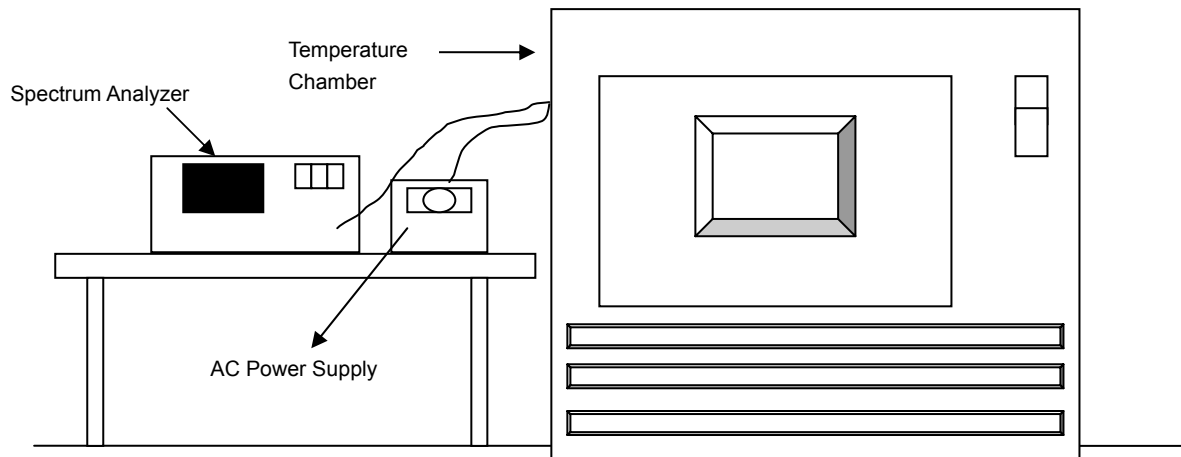


4.5 Frequency Stability

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

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

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

4.5.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5240MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
40	120	5240.0002	0.00000	5240.0045	0.00009	5240.0042	0.00008	5240.0022	0.00004
30	120	5239.9810	-0.00036	5239.9798	-0.00039	5239.9813	-0.00036	5239.9825	-0.00033
20	120	5239.9745	-0.00049	5239.9730	-0.00052	5239.9740	-0.00050	5239.9772	-0.00044
10	120	5240.0265	0.00051	5240.0237	0.00045	5240.0231	0.00044	5240.0232	0.00044
0	120	5240.0177	0.00034	5240.0189	0.00036	5240.0150	0.00029	5240.0152	0.00029

Frequency Stability Versus Temp.									
Operating Frequency: 5240MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5239.9747	-0.00048	5239.9723	-0.00053	5239.9736	-0.00050	5239.9774	-0.00043
	120	5239.9745	-0.00049	5239.9730	-0.00052	5239.9740	-0.00050	5239.9772	-0.00044
	102	5239.9737	-0.00050	5239.9720	-0.00053	5239.9746	-0.00048	5239.9768	-0.00044

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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Hsin Chu EMC/RF Lab/Telecom Lab

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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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