



FCC TEST REPORT (15.407)

REPORT NO.: RF120614C11-1
MODEL NO.: RSVLC-1103
FCC ID: B94RSVLC1103
RECEIVED: Jun. 14, 2012
TESTED: Jun. 25 ~ Jul. 20, 2012
ISSUED: Jul. 27, 2012

APPLICANT: Hewlett-Packard Company

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF120614C11-1	Original release	Jul. 27, 2012



1. CERTIFICATION

PRODUCT: HP M220 802.11n AM Access Point (refer to item 3.1 for more detail)

MODEL NO.: RSVLC-1103

BRAND: HP

APPLICANT: Hewlett-Packard Company

TESTED: Jun. 25 ~ Jul. 20, 2012

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 15, Subpart E (Section 15.407)

ANSI C63.10-2009

The above equipment (model: RSVLC-1103) 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 : Andrea Hsia , DATE : Jul. 27, 2012
Andrea Hsia / Specialist

APPROVED BY : Gary Chang , DATE : Jul. 27, 2012
Gary Chang / Technical Manager

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.407(b)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -9.72dB at 0.36875MHz.
15.407(b/1/2/3) (b)(6)	Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 5150.00MHz.
15.407(a/1/2)	Peak Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(6)	Peak Power Excursion	PASS	Meet the requirement of limit.
15.407(a/1/2)	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 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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.34 dB
	200MHz ~1000MHz	3.35 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	HP M220 802.11n AM Access Point (refer to note as below)
MODEL NO.	RSVLC-1103
POWER SUPPLY	12Vdc (Adapter) 48Vdc (POE)
MODULATION TYPE	64QAM, 16QAM, QPSK, BPSK
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 300.0Mbps
OPERATING FREQUENCY	5180.0 ~ 5240.0MHz
NUMBER OF CHANNEL	4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
OUTPUT POWER	29.6mW
ANTENNA TYPE	PCB antenna with 5dBi gain
ANTENNA CONNECTOR	I-PEX
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter

NOTE:

- The product names as below are identical to each other except for their model designation and brand name due to marketing purpose.

Brand	Model	Product name
HP	RSVLC-1103	HP M220 802.11n AM Access Point
		HP M220 802.11n WW Access Point

- The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and three receivers.

MODULATION MODE	TX FUNCTION
802.11a	2TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX

- The EUT were powered by the following adapter & POE:

ADAPTER	
BRAND:	DELTA ELECTRONICS, INC.
MODEL:	EADP-15DC A
INPUT:	100-240Vac, 0.4A, 50/60Hz LPS
OUTPUT:	12Vdc, 1.25A
POWER LINE:	1.8m non-shielded cable without core

POE	
BRAND:	PowerDsine
MODEL:	PD-3501G/AC
INPUT:	100-240Vac, 0.5A, 50/60Hz
OUTPUT:	48Vdc, 0.35A
POWER LINE:	1.9m non-shielded cable without core

* POE is provided as support units only.

4. The EUT had been pre-tested on the positioned of each 3 modes. The worst case was found when positioned on mode 2.

TEST MODE	POSITIONED
MODE 1	Horizontal (desk top) mounting
MODE 2	Vertical (wall) mounting
MODE 3	Inverted horizontal (ceiling) mounting

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

3.2 DESCRIPTION OF TEST MODES

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
36	5180MHz	44	5220MHz
40	5200MHz	48	5240MHz

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190MHz	46	5230MHz

POWER SETTING

802.11a		802.11n (20MHz)	
CHANNEL	POWER SETTING (txpwr1 -o -q)	CHANNEL	POWER SETTING (txpwr1 -o -q)
36	30	36	32
40	30	40	30
48	30	48	32

802.11n (40MHz)	
CHANNEL	POWER SETTING (txpwr1 -o -q)
38	44
46	44

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	Power from Adapter
B	-	√	√	-	Power from POE

Where **RE \geq 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement
NOTE: “-” means no effect.

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane (Vertical (wall) mounting)**.

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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0
A	802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	7.2
A	802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	15.0

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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A & B	802.11n (40MHz)	38 to 46	46	OFDM	BPSK	15.0

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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A & B	802.11n (40MHz)	38 to 46	46	OFDM	BPSK	15.0

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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0
A	802.11n (20MHz)	36 to 48	36, 40, 48	OFDM	BPSK	7.2
A	802.11n (40MHz)	38 to 46	38, 46	OFDM	BPSK	15.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	23deg. C, 67%RH	120Vac, 60Hz	Anderson Hong
RE $<$ 1G	22deg. C, 70%RH 25deg. C, 68%RH	120Vac, 60Hz 48Vdc	Sun Lin
PLC	23deg. C, 53%RH	120Vac, 60Hz 48Vdc	Skys Huang
APCM	22deg. C, 70%RH	120Vac, 60Hz	Sun Lin

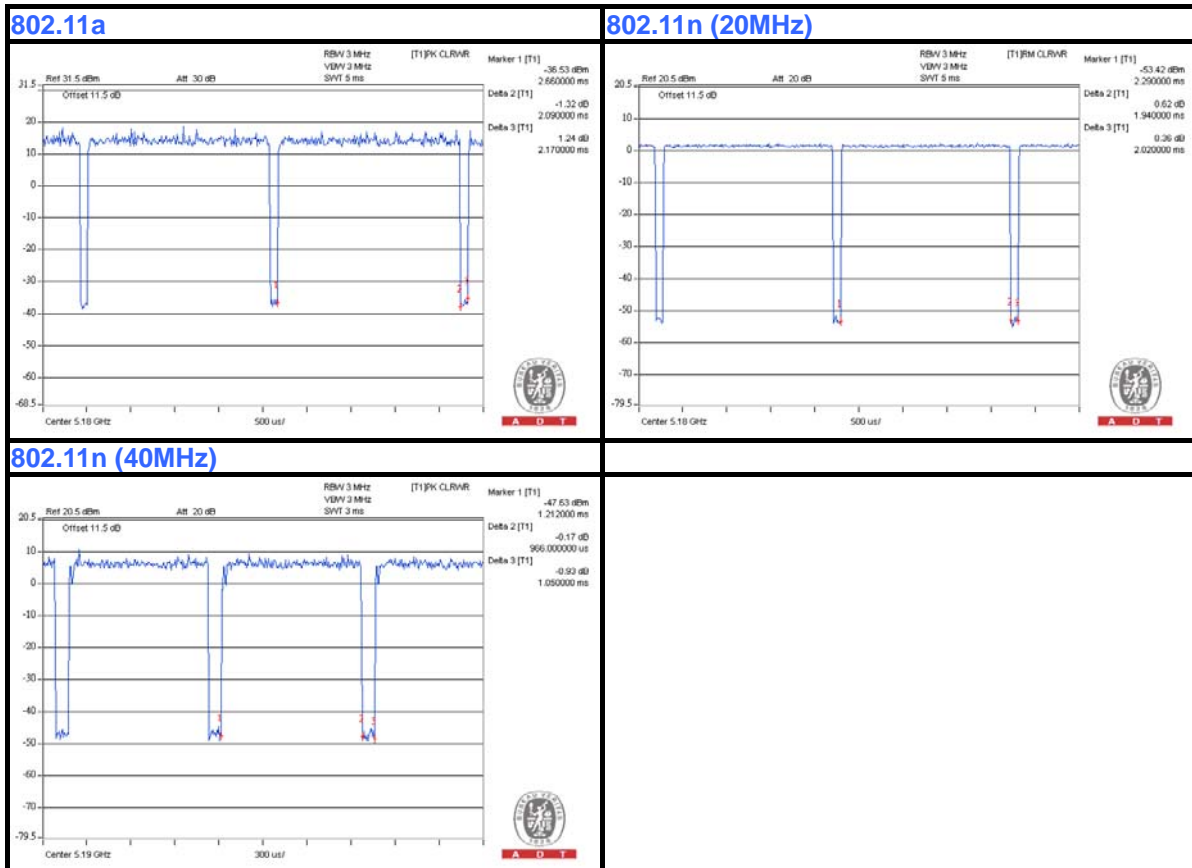
3.3 DUTY CYCLE OF TEST SIGNAL

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

802.11a: Duty cycle = 2.09/2.17 = 0.963, Duty factor = $10 * \log(1/0.963) = 0.16$

802.11n (20MHz): Duty cycle = 1.94/2.02 = 0.960, Duty factor = $10 * \log(1/0.960) = 0.18$

802.11n (40MHz): Duty cycle = 0.966/1.05 = 0.920, Duty factor = $10 * \log(1/0.920) = 0.36$



3.4 DESCRIPTION OF SUPPORT UNITS

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

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	D531	CN-0XM006-48643-81U-2610	QDS-BRCM1020

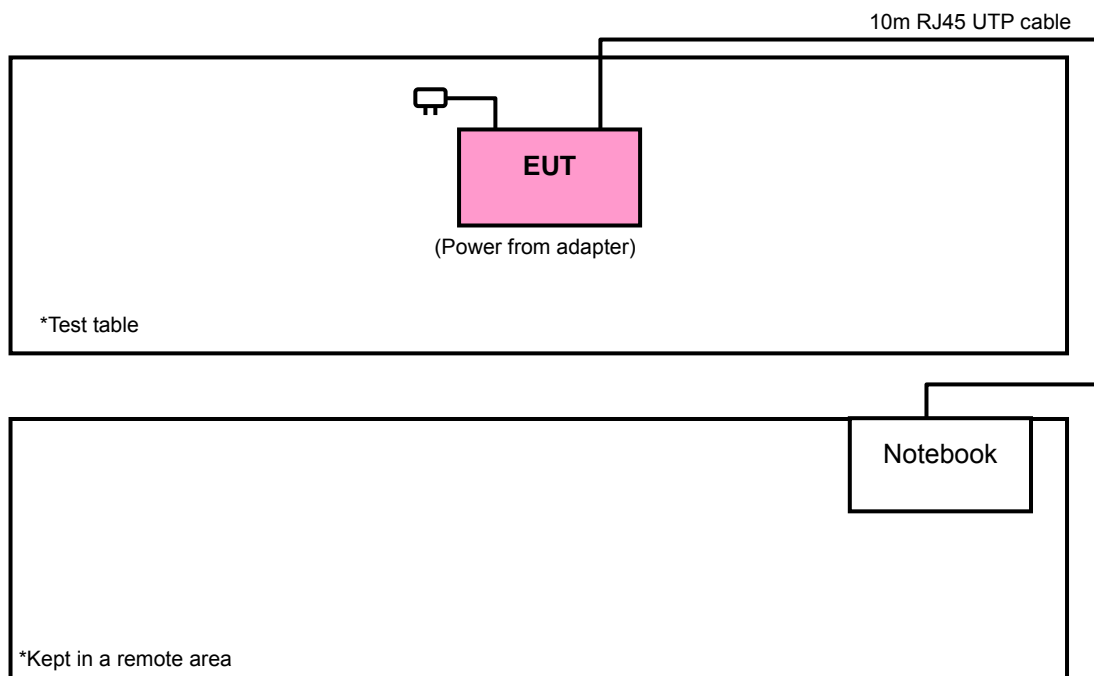
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	10m RJ45 cable without core, 0.8m RJ45 cable without core

NOTE:

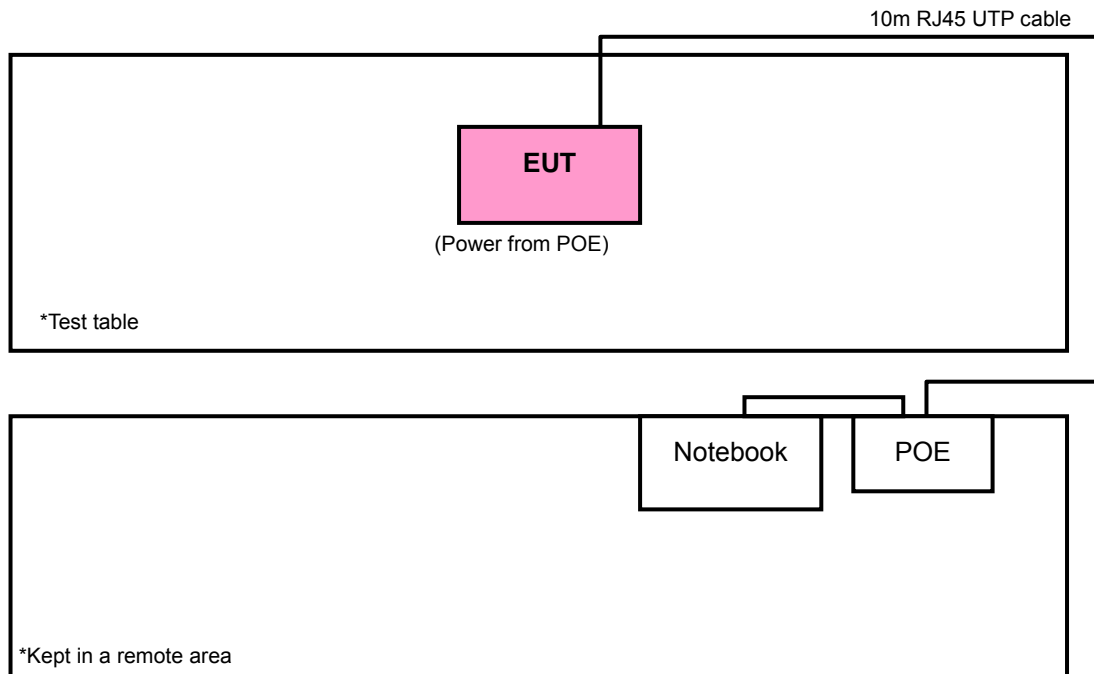
1. All power cords of the above support units are non shielded (1.8m).
2. Item 1 acted as communication partner to transfer data.

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST

TEST MODE A



TEST MODE B



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 D01 General UNII Test Procedures v01r01

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:

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.

4.1.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

EIRP LIMIT (dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dBµV/m)
PK	PK
-27	68.3

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

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

4.1.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100744	Apr. 19, 2012	Apr. 18, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jan. 30, 2012	Jan. 29, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Apr. 03, 2012	Apr. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Sep. 06, 2011	Sep. 05, 2012
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Jan. 03, 2012	Jan. 02, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier Agilent	8449B	3008A01911	Oct. 29, 2011	Oct. 28, 2012
Preamplifier Agilent	8447D	2944A10638	Oct. 29, 2011	Oct. 28, 2012
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295013/4 283403/4	Aug. 19, 2011	Aug. 18, 2012
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 13, 2011	Aug. 12, 2012
Software	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	NA	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 29, 2011	Oct. 28, 2012
High Speed Peak Power Meter	ML2495A	0842014	Apr. 28, 2012	Apr. 27, 2013
Power Sensor	MA2411B	0738404	Apr. 28, 2012	Apr. 27, 2013
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 13, 2012	Jun. 12, 2013

- 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 calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. The test was performed in HwaYa Chamber 4.
 4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 5. The FCC Site Registration No. is 460141.
 6. The IC Site Registration No. is IC7450F-4.

4.1.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

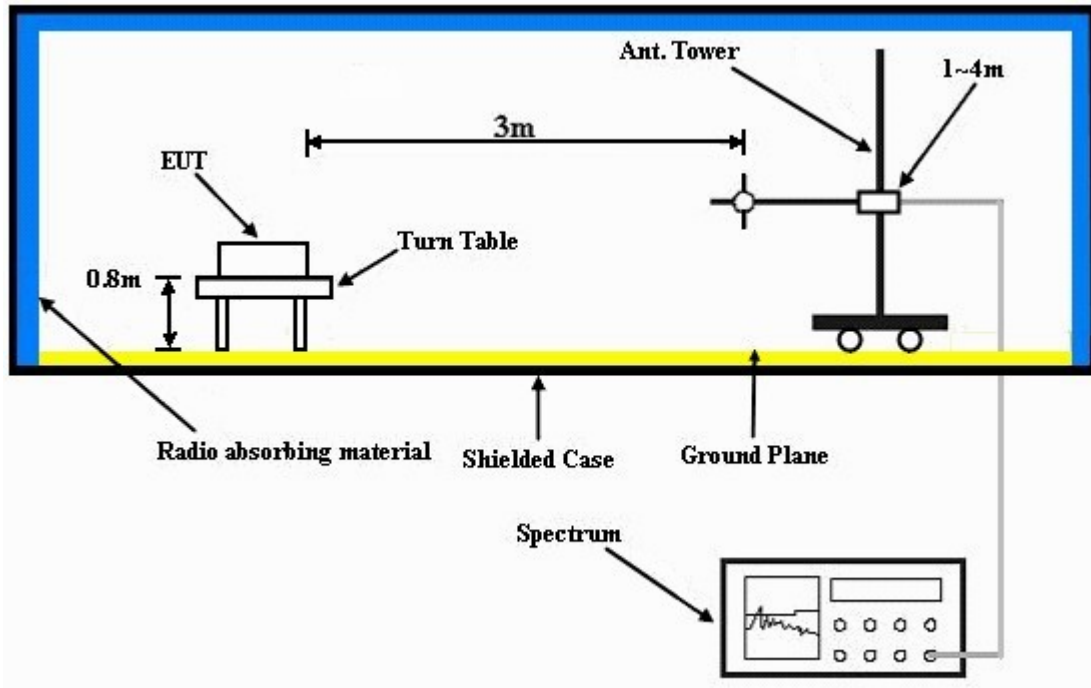
NOTE:

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

4.1.5 DEVIATION FROM TEST STANDARD

No deviation.

4.1.6 TEST SETUP



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

4.1.7 EUT OPERATING CONDITION

- a. Placed the EUT on the testing table.
- b. Prepared notebooks and wireless AP to act as communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and run 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".

4.1.8 TEST RESULTS

ABOVE 1GHz DATA:

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

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	55.0 PK	74.0	-19.0	1.00 H	89	16.80	38.20
2	5150.00	42.4 AV	54.0	-11.6	1.00 H	89	4.20	38.20
3	*5180.00	93.9 PK			1.00 H	93	55.70	38.20
4	*5180.00	83.6 AV			1.00 H	93	45.40	38.20
5	#10360.00	57.1 PK	68.3	-11.2	1.10 H	210	9.10	48.00
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	55.9 PK	74.0	-18.1	1.22 V	79	17.70	38.20
2	5150.00	43.6 AV	54.0	-10.4	1.22 V	79	5.40	38.20
3	*5180.00	106.9 PK			1.30 V	96	68.70	38.20
4	*5180.00	96.6 AV			1.30 V	96	58.40	38.20
5	#10360.00	56.7 PK	68.3	-11.6	1.03 V	329	8.70	48.00

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 the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	93.2 PK			1.00 H	343	55.00	38.20
2	*5200.00	83.2 AV			1.00 H	343	45.00	38.20
3	#10400.00	56.7 PK	68.3	-11.6	1.13 H	219	8.60	48.10
4	15600.00	58.4 PK	74.0	-15.6	1.04 H	93	9.30	49.10
5	15600.00	45.5 AV	54.0	-8.5	1.04 H	93	-3.60	49.10
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	*5200.00	105.5 PK			1.12 V	303	67.30	38.20
2	*5200.00	95.3 AV			1.12 V	303	57.10	38.20
3	#10400.00	56.3 PK	68.3	-12.0	1.05 V	333	8.20	48.10
4	15600.00	58.7 PK	74.0	-15.3	1.11 V	231	9.60	49.10
5	15600.00	45.3 AV	54.0	-8.7	1.11 V	231	-3.80	49.10

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 the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	93.3 PK			1.00 H	346	55.00	38.30
2	*5240.00	83.2 AV			1.00 H	346	44.90	38.30
3	5350.00	56.2 PK	74.0	-17.8	1.00 H	346	17.70	38.50
4	5350.00	42.6 AV	54.0	-11.4	1.00 H	346	4.10	38.50
5	#10480.00	56.7 PK	68.3	-11.6	1.13 H	218	8.50	48.20
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	*5240.00	106.4 PK			1.29 V	96	68.10	38.30
2	*5240.00	96.3 AV			1.29 V	96	58.00	38.30
3	5350.00	56.4 PK	74.0	-17.6	1.29 V	96	17.90	38.50
4	5350.00	43.1 AV	54.0	-10.9	1.29 V	96	4.60	38.50
5	#10480.00	56.3 PK	68.3	-12.0	1.05 V	333	8.10	48.20

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 the restricted band.

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

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	54.8 PK	74.0	-19.2	1.00 H	90	16.60	38.20
2	5150.00	42.1 AV	54.0	-11.9	1.00 H	90	3.90	38.20
3	*5180.00	94.2 PK			1.00 H	90	56.00	38.20
4	*5180.00	82.6 AV			1.00 H	90	44.40	38.20
5	#10360.00	56.4 PK	68.3	-11.9	1.13 H	218	8.40	48.00

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	56.7 PK	74.0	-17.3	1.19 V	75	18.50	38.20
2	5150.00	43.9 AV	54.0	-10.1	1.19 V	75	5.70	38.20
3	*5180.00	107.0 PK			1.10 V	78	68.80	38.20
4	*5180.00	95.8 AV			1.10 V	78	57.60	38.20
5	#10360.00	56.5 PK	68.3	-11.8	1.05 V	325	8.50	48.00

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 the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	93.5 PK			1.00 H	346	55.30	38.20
2	*5200.00	82.5 AV			1.00 H	346	44.30	38.20
3	#10400.00	56.1 PK	68.3	-12.2	1.15 H	223	8.00	48.10
4	15600.00	58.7 PK	74.0	-15.3	1.08 H	96	9.60	49.10
5	15600.00	45.8 AV	54.0	-8.2	1.08 H	96	-3.30	49.10

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	*5200.00	106.8 PK			1.20 V	86	68.60	38.20
2	*5200.00	95.7 AV			1.20 V	86	57.50	38.20
3	#10400.00	56.2 PK	68.3	-12.1	1.01 V	321	8.10	48.10
4	15600.00	59.1 PK	74.0	-14.9	1.15 V	237	10.00	49.10
5	15600.00	45.7 AV	54.0	-8.3	1.15 V	237	-3.40	49.10

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 the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	93.6 PK			1.00 H	344	55.30	38.30
2	*5240.00	82.8 AV			1.00 H	344	44.50	38.30
3	5350.00	56.0 PK	74.0	-18.0	1.00 H	344	17.50	38.50
4	5350.00	42.4 AV	54.0	-11.6	1.00 H	344	3.90	38.50
5	#10480.00	56.4 PK	68.3	-11.9	1.15 H	221	8.20	48.20
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	*5240.00	107.1 PK			1.08 V	79	68.80	38.30
2	*5240.00	95.9 AV			1.08 V	79	57.60	38.30
3	5350.00	55.8 PK	74.0	-18.2	1.08 V	79	17.30	38.50
4	5350.00	43.0 AV	54.0	-11.0	1.08 V	79	4.50	38.50
5	#10480.00	56.8 PK	68.3	-11.5	1.09 V	327	8.60	48.20

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 the restricted band.

802.11n (40MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 38	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.9 PK	74.0	-15.1	1.00 H	90	20.70	38.20
2	5150.00	44.7 AV	54.0	-9.3	1.00 H	90	6.50	38.20
3	*5190.00	94.1 PK			1.00 H	90	55.90	38.20
4	*5190.00	82.7 AV			1.00 H	90	44.50	38.20
5	#10380.00	56.5 PK	68.3	-11.8	1.15 H	222	8.50	48.00

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	69.1 PK	74.0	-4.9	1.00 V	80	30.90	38.20
2	5150.00	53.0 AV	54.0	-1.0	1.00 V	80	14.80	38.20
3	*5190.00	106.5 PK			1.00 V	80	68.30	38.20
4	*5190.00	94.9 AV			1.00 V	80	56.70	38.20
5	#10380.00	56.9 PK	68.3	-11.4	1.00 V	331	8.90	48.00

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 the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 46	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH	TESTED BY	Anderson Hong

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	*5230.00	93.1 PK			1.08 H	90	54.80	38.30
2	*5230.00	81.6 AV			1.08 H	90	43.30	38.30
3	5350.00	54.4 PK	74.0	-19.6	1.08 H	90	15.90	38.50
4	5350.00	42.2 AV	54.0	-11.8	1.08 H	90	3.70	38.50
5	#10460.00	56.9 PK	68.3	-11.4	1.11 H	218	8.70	48.20
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	*5230.00	107.0 PK			1.08 V	78	68.70	38.30
2	*5230.00	95.5 AV			1.08 V	78	57.20	38.30
3	5350.00	56.3 PK	74.0	-17.7	1.08 V	78	17.80	38.50
4	5350.00	43.7 AV	54.0	-10.3	1.08 V	78	5.20	38.50
5	#10460.00	57.3 PK	68.3	-11.0	1.02 V	329	9.10	48.20

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 the restricted band.

BELOW 1GHz WORST-CASE DATA : 802.11n (40MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 46	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	22deg. C, 70%RH	TEST MODE	A
TESTED BY	Sun Lin		

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	146.40	32.2 QP	43.5	-11.3	1.25 H	102	18.40	13.80
2	222.06	31.8 QP	46.0	-14.2	1.00 H	197	19.80	12.00
3	274.44	29.3 QP	46.0	-16.7	1.00 H	100	15.40	13.90
4	454.86	34.5 QP	46.0	-11.5	1.50 H	43	15.60	18.90
5	499.48	31.3 QP	46.0	-14.7	1.50 H	210	11.20	20.10
6	625.58	32.1 QP	46.0	-13.9	1.25 H	17	9.60	22.50
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	101.78	31.2 QP	43.5	-12.3	1.00 V	267	21.50	9.70
2	146.40	34.2 QP	43.5	-9.3	1.00 V	243	20.40	13.80
3	224.00	30.9 QP	46.0	-15.1	1.00 V	295	18.80	12.10
4	454.86	28.7 QP	46.0	-17.3	1.50 V	343	9.80	18.90
5	625.58	32.6 QP	46.0	-13.4	1.50 V	17	10.10	22.50
6	875.84	35.2 QP	46.0	-10.8	1.00 V	4	9.20	26.00

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.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 46	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH	TEST MODE	B
TESTED BY	Sun Lin		

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	165.80	30.3 QP	43.5	-13.2	1.50 H	90	16.60	13.70
2	291.90	28.6 QP	46.0	-17.4	1.00 H	319	14.00	14.60
3	452.92	31.8 QP	46.0	-14.2	1.50 H	216	13.00	18.80
4	499.48	30.2 QP	46.0	-15.8	1.50 H	219	10.10	20.10
5	625.58	29.5 QP	46.0	-16.5	1.00 H	237	7.00	22.50
6	875.84	31.9 QP	46.0	-14.1	1.50 H	295	5.90	26.00
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	78.50	33.4 QP	40.0	-6.6	1.00 V	346	23.10	10.30
2	189.08	31.4 QP	43.5	-12.1	1.00 V	224	19.40	12.00
3	274.44	29.7 QP	46.0	-16.3	1.50 V	4	15.80	13.90
4	375.32	28.4 QP	46.0	-17.6	1.25 V	199	11.60	16.80
5	625.58	28.3 QP	46.0	-17.7	1.50 V	190	5.80	22.50
6	875.84	33.1 QP	46.0	-12.9	1.00 V	57	7.10	26.00

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.

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Nov. 23, 2011	Nov. 22, 2012
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 29, 2011	Dec. 28, 2012
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 02, 2012	Jul. 01, 2013
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 07, 2012	Feb. 06, 2013
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

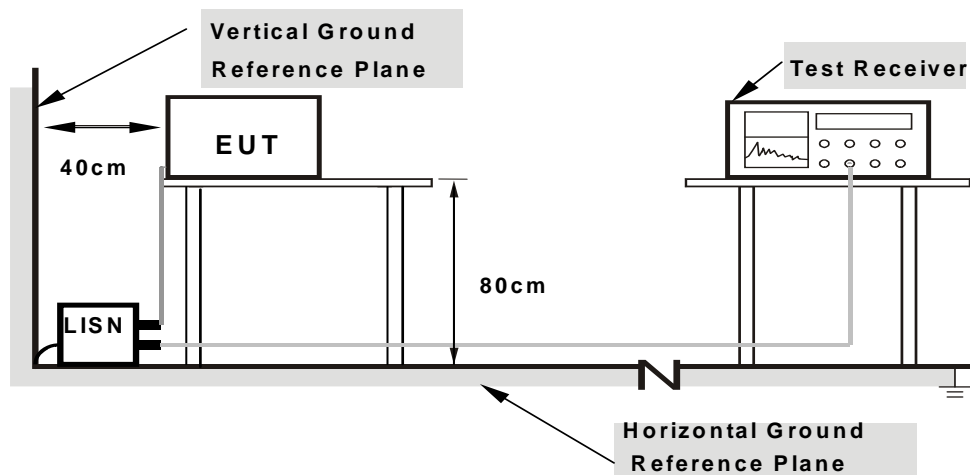
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



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

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

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

4.2.7 TEST RESULTS

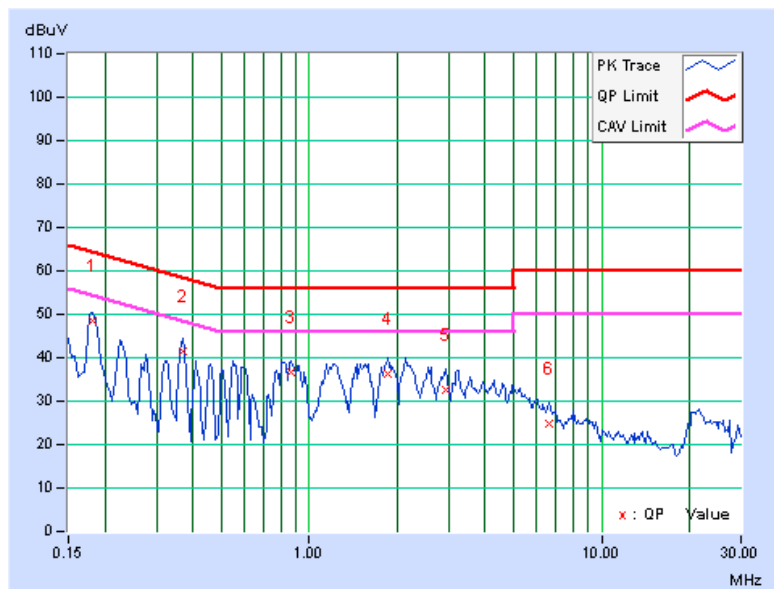
CONDUCTED WORST-CASE DATA : 802.11n (40MHz)

PHASE	Line 1	6dB BANDWIDTH	9kHz
TEST MODE	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18125	0.12	48.37	37.52	48.49	37.64	64.43	54.43	-15.93	-16.78
2	0.36875	0.13	41.29	38.68	41.42	38.81	58.53	48.53	-17.11	-9.72
3	0.86484	0.18	36.63	32.74	36.81	32.92	56.00	46.00	-19.19	-13.08
4	1.86328	0.22	36.10	30.23	36.32	30.45	56.00	46.00	-19.68	-15.55
5	2.92188	0.28	32.14	26.27	32.42	26.55	56.00	46.00	-23.58	-19.45
6	6.63672	0.47	24.45	19.11	24.92	19.58	60.00	50.00	-35.08	-30.42

REMARKS:

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

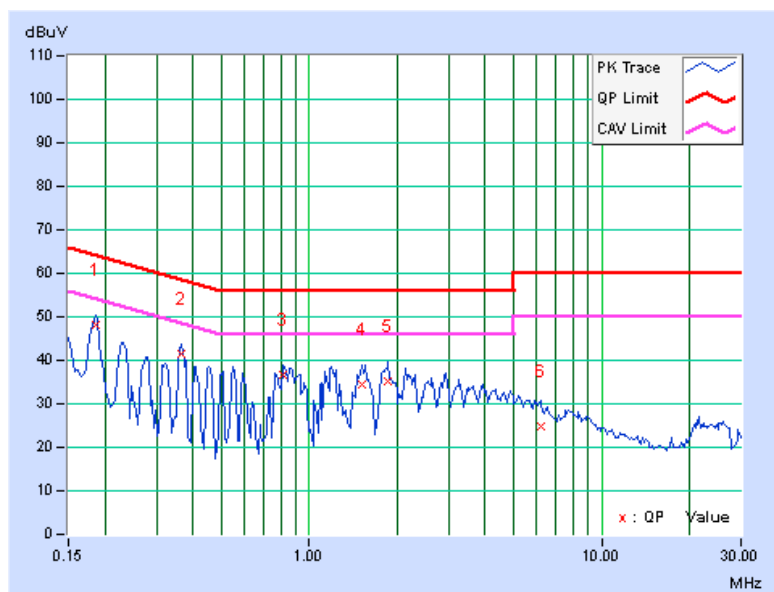


PHASE	Line 2	6dB BANDWIDTH	9kHz
TEST MODE	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18516	0.14	47.95	37.73	48.09	37.87	64.25	54.25	-16.17	-16.39
2	0.36484	0.15	41.15	37.91	41.30	38.06	58.62	48.62	-17.32	-10.56
3	0.81797	0.19	36.34	32.75	36.53	32.94	56.00	46.00	-19.47	-13.06
4	1.51953	0.22	34.37	27.97	34.59	28.19	56.00	46.00	-21.41	-17.81
5	1.86328	0.23	35.09	30.13	35.32	30.36	56.00	46.00	-20.68	-15.64
6	6.16797	0.44	24.37	18.71	24.81	19.15	60.00	50.00	-35.19	-30.85

REMARKS:

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

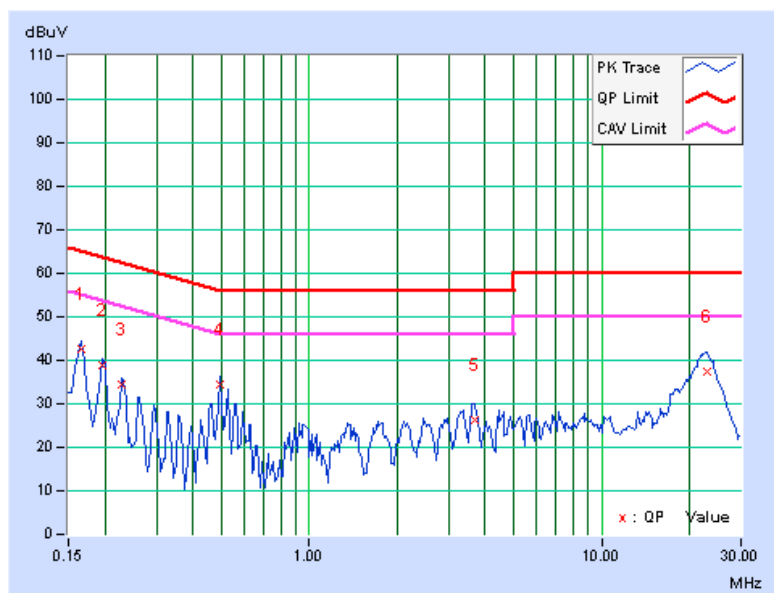


PHASE	Line 1	6dB BANDWIDTH	9kHz
TEST MODE	B		

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.12	42.63	33.39	42.75	33.51	65.18	55.18	-22.43	-21.67
2	0.19687	0.13	38.72	28.99	38.85	29.12	63.74	53.74	-24.89	-24.62
3	0.22812	0.13	34.21	23.77	34.34	23.90	62.52	52.52	-28.18	-28.62
4	0.49375	0.14	34.32	33.68	34.46	33.82	56.10	46.10	-21.65	-12.29
5	3.67578	0.32	25.85	19.40	26.17	19.72	56.00	46.00	-29.83	-26.28
6	22.92188	1.31	36.17	30.38	37.48	31.69	60.00	50.00	-22.52	-18.31

REMARKS:

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

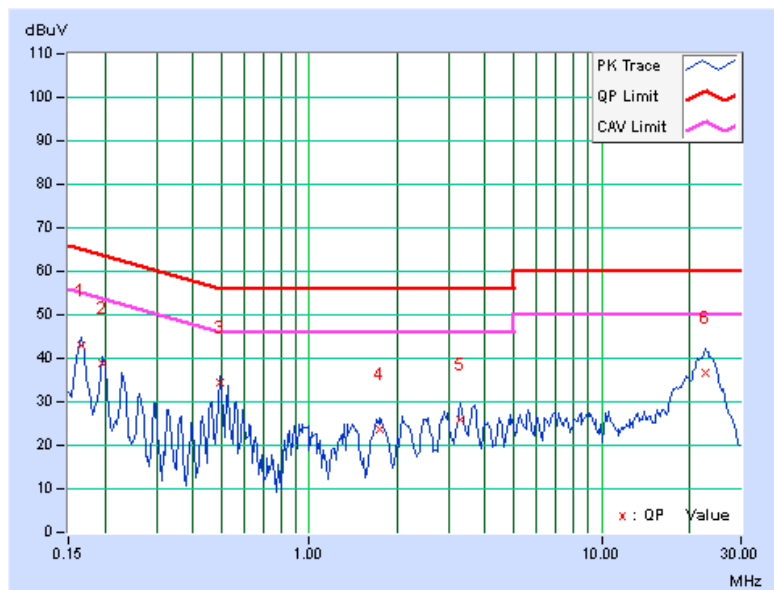


PHASE	Line 2	6dB BANDWIDTH	9kHz
TEST MODE	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.13	42.79	33.45	42.92	33.58	65.18	55.18	-22.26	-21.60
2	0.19687	0.14	38.80	29.03	38.94	29.17	63.74	53.74	-24.80	-24.57
3	0.49375	0.16	34.26	33.78	34.42	33.94	56.10	46.10	-21.69	-12.17
4	1.74219	0.22	23.49	19.82	23.71	20.04	56.00	46.00	-32.29	-25.96
5	3.28516	0.31	25.76	19.99	26.07	20.30	56.00	46.00	-29.93	-25.70
6	22.64063	1.06	35.62	29.85	36.68	30.91	60.00	50.00	-23.32	-19.09

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 PEAK TRANSMIT POWER MEASUREMENT

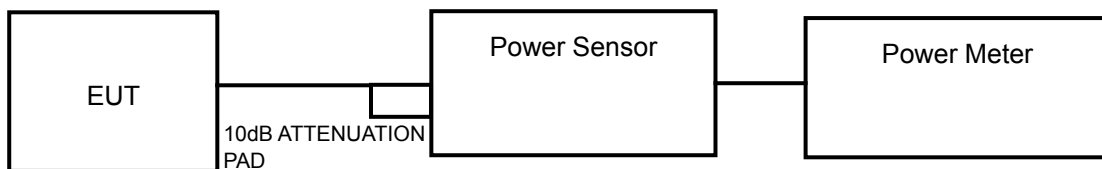
4.3.1 LIMITS OF PEAK TRANSMIT POWER MEASUREMENT

FREQUENCY BAND	LIMIT
5.15 ~ 5.25GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB

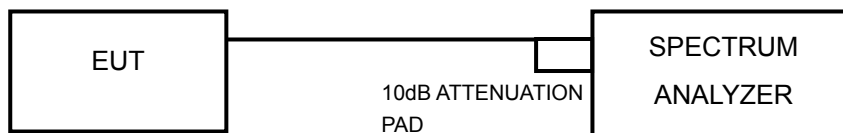
NOTE: Where B is the 26dB emission bandwidth in MHz.

4.3.2 TEST SETUP

FOR POWER OUTPUT MEASUREMENT



FOR 26dB BANDWIDTH



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.3.4 TEST PROCEDURE

FOR AVERAGE POWER MEASUREMENT

Duty cycle of test signal is < 98 %. Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

FOR 26dB BANDWIDTH

- 1) Set RBW = approximately 1% of the emission bandwidth.
- 2) Set the VBW > RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

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 specific channel frequencies individually.

4.3.7 TEST RESULTS

POWER OUTPUT: 802.11a

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
36	5180	8.56	9.02	15.2	11.81	15	PASS
40	5200	8.71	9.12	15.6	11.93	15	PASS
48	5240	8.64	9.09	15.4	11.88	15	PASS

NOTE: Directional gain = 5dBi + 10log(2) = 8dBi > 6dBi , so the limit shall be reduced to 17-(8-6) = 15dBm.

802.11n (20MHz)

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
36	5180	8.81	9.89	17.4	12.39	15	PASS
40	5200	8.72	9.31	16.0	12.04	15	PASS
48	5240	9.12	9.73	17.6	12.45	15	PASS

NOTE: Directional gain = 5dBi + 10log(2) = 8dBi > 6dBi , so the limit shall be reduced to 17-(8-6) = 15dBm.

802.11n (40MHz)

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
38	5190	10.86	12.28	29.1	14.64	15	PASS
46	5230	11.12	12.21	29.6	14.71	15	PASS

NOTE: Directional gain = 5dBi + 10log(2) = 8dBi > 6dBi , so the limit shall be reduced to 17-(8-6) = 15dBm.



26dB BANDWIDTH: 802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	20.88	20.82	PASS
40	5200	21.07	20.71	PASS
48	5240	20.90	20.82	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	21.45	21.07	PASS
40	5200	21.43	21.03	PASS
48	5240	21.31	20.97	PASS

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
38	5190	41.75	41.81	PASS
46	5230	42.09	41.89	PASS

4.4 PEAK POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

FREQUENCY BAND	LIMIT
5.15 ~ 5.25GHz	4dBm

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.4.4 TEST PROCEDURES

Using method SA-2 alternative

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 1 MHz, Set VBW \geq 3 MHz, Detector = RMS
- 3) Sweep time = 11 second.
- 4) Perform a single sweep.
- 5) Record the max value and add 10 log (1/duty cycle)

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as 4.3.6.



4.4.7 TEST RESULTS

802.11a

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1					
36	5180	-1.87	-1.51	1.247	0.16	1.407	2	PASS
40	5200	-1.95	-1.42	1.270	0.16	1.430	2	PASS
48	5240	-1.98	-1.63	1.178	0.16	1.338	2	PASS

NOTE:

1. Directional gain = $5\text{dBi} + 10\log(2) = 8\text{dBi} > 6\text{dBi}$, so the limit shall be reduced to $4-(8-6) = 2\text{dBm}$.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1					
36	5180	-2.16	-0.85	1.488	0.18	1.668	2	PASS
40	5200	-2.09	-1.54	1.137	0.18	1.317	2	PASS
48	5240	-1.91	-1.32	1.373	0.18	1.553	2	PASS

NOTE:

1. Directional gain = $5\text{dBi} + 10\log(2) = 8\text{dBi} > 6\text{dBi}$, so the limit shall be reduced to $4-(8-6) = 2\text{dBm}$.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1					
38	5190	-2.42	-1.33	1.154	0.36	1.514	2	PASS
46	5230	-2.37	-1.12	1.299	0.36	1.659	2	PASS

NOTE:

1. Directional gain = $5\text{dBi} + 10\log(2) = 8\text{dBi} > 6\text{dBi}$, so the limit shall be reduced to $4-(8-6) = 2\text{dBm}$.
2. Refer to section 3.3 for duty cycle spectrum plot.

4.5 PEAK POWER EXCURSION MEASUREMENT

4.5.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

Shall not exceed 13 dB

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.5.4 TEST PROCEDURE

- 1) Set RBW = 1 MHz, VBW \geq 3 MHz, Detector = peak.
- 2) Trace mode = max-hold. Allow the sweeps to continue until the trace stabilizes.
- 3) Use the peak search function to find the peak of the spectrum.
- 4) Measure the PPSD.
- 5) Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITIONS

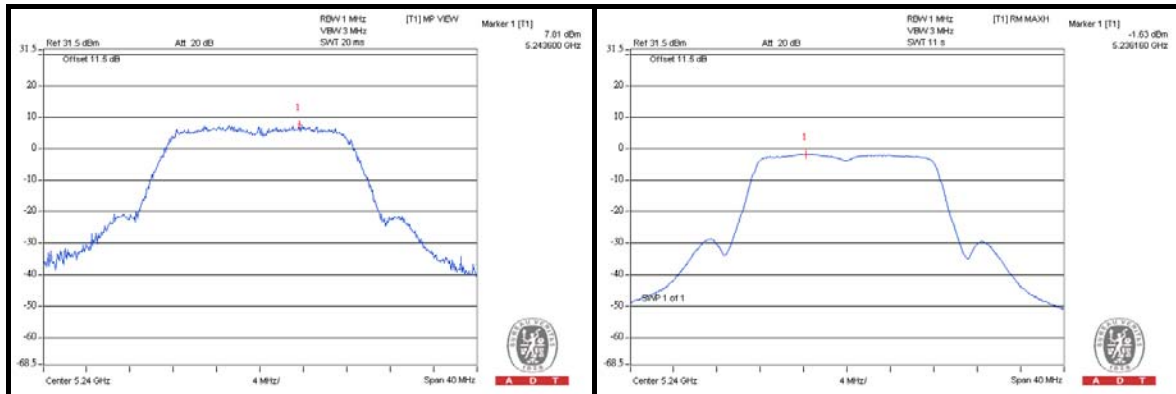
Same as 4.2.6

4.5.7 TEST RESULTS

802.11a

TX chain	CHAN.	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD WITHOUT DUTY FACTOR (dBm)	PPSD WITH DUTY FACTOR (dBm)	PEAK POWER EXCURSION (dB)	PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS /FAIL
0	36	5180	6.86	-1.87	-1.71	8.57	13	PASS
	40	5200	7.28	-1.95	-1.79	9.07	13	PASS
	48	5240	6.74	-1.98	-1.82	8.56	13	PASS
1	36	5180	7.80	-1.51	-1.35	9.15	13	PASS
	40	5200	7.92	-1.42	-1.26	9.18	13	PASS
	48	5240	7.81	-1.63	-1.47	9.28	13	PASS

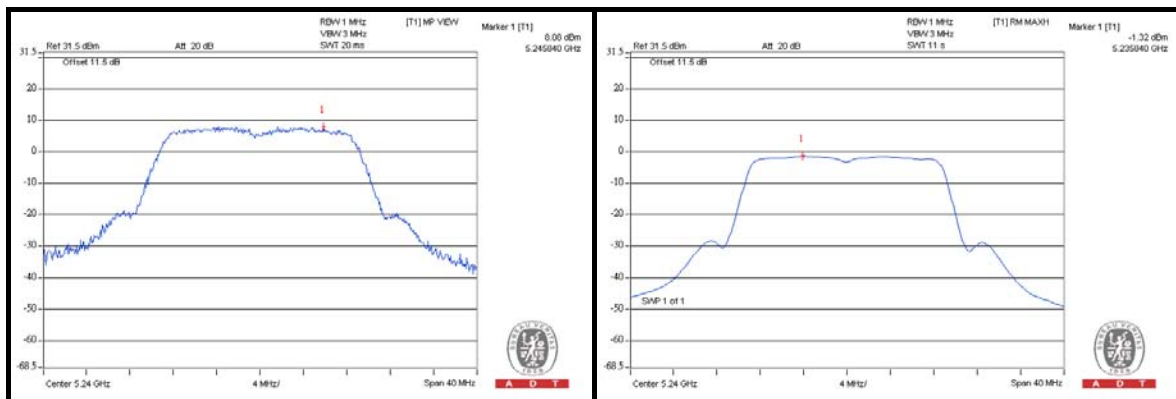
NOTE: Refer to section 3.3 for duty cycle spectrum plot.



802.11n (20MHz)

TX chain	CHAN.	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD WITHOUT DUTY FACTOR (dBm)	PPSD WITH DUTY FACTOR (dBm)	PEAK POWER EXCURSION (dB)	PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS /FAIL
0	36	5180	6.52	-2.16	-1.98	8.50	13	PASS
	40	5200	6.30	-2.09	-1.91	8.21	13	PASS
	48	5240	6.58	-1.91	-1.73	8.31	13	PASS
1	36	5180	8.05	-0.85	-0.67	8.72	13	PASS
	40	5200	7.67	-1.54	-1.36	9.03	13	PASS
	48	5240	8.08	-1.32	-1.14	9.22	13	PASS

NOTE: Refer to section 3.3 for duty cycle spectrum plot.



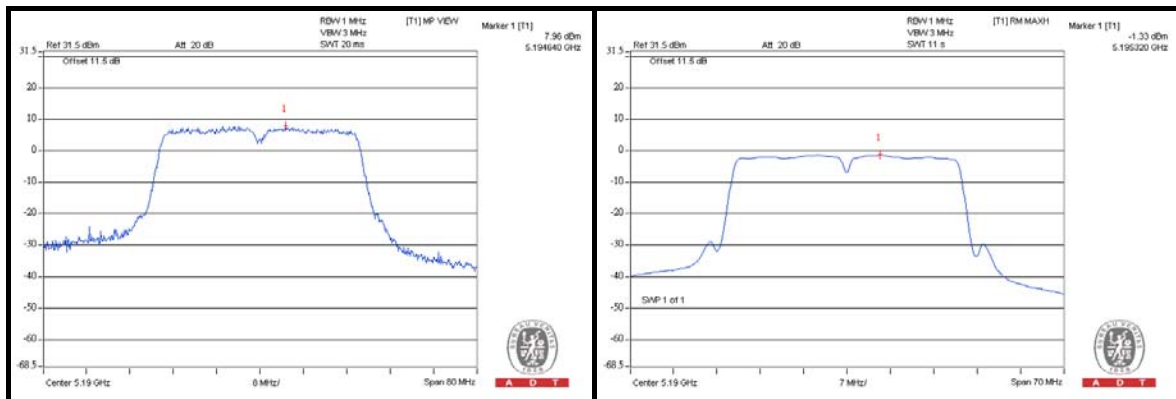


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802.11n (40MHz)

TX chain	CHAN.	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD WITHOUT DUTY FACTOR (dBm)	PPSD WITH DUTY FACTOR (dBm)	PEAK POWER EXCURSION (dB)	PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS /FAIL
0	38	5190	5.95	-2.42	-2.06	8.01	13	PASS
	46	5230	6.05	-2.37	-2.01	8.06	13	PASS
1	38	5190	7.96	-1.33	-0.97	8.93	13	PASS
	46	5230	7.99	-1.12	-0.76	8.75	13	PASS

NOTE: Refer to section 3.3 for duty cycle spectrum plot.

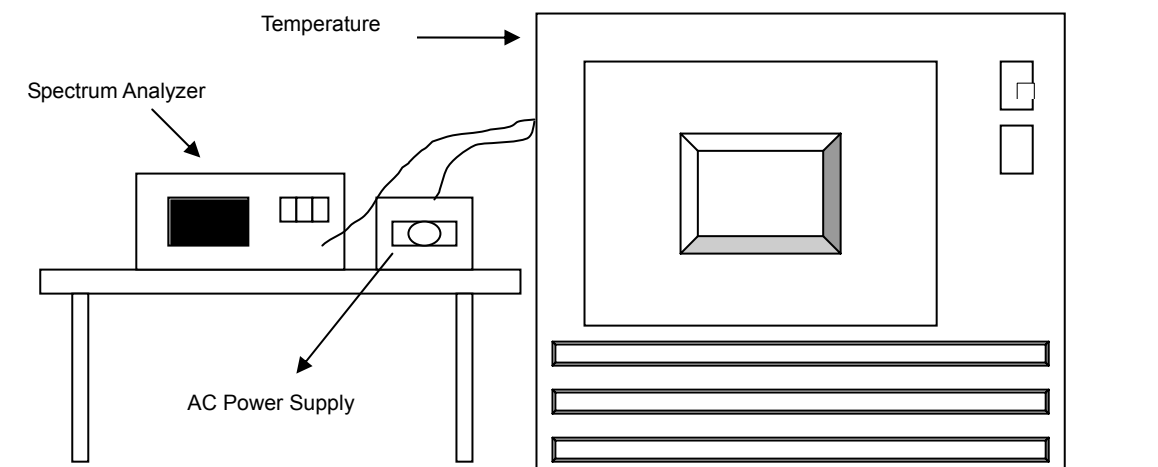


4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

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

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.6.4 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.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

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



4.6.7 TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5200MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
50	110.0	5200.003149	0.606	5200.003228	0.621	5200.003324	0.639	5200.003026	0.582
40	110.0	5200.003598	0.692	5200.003586	0.690	5200.004103	0.789	5200.003864	0.743
30	110.0	5200.005599	1.077	5200.005367	1.032	5200.005231	1.006	5200.005002	0.962
20	110.0	5200.005810	1.117	5200.006326	1.217	5200.006130	1.179	5200.005936	1.142
10	110.0	5200.008025	1.543	5200.007617	1.465	5200.007776	1.495	5200.008104	1.558
0	110.0	5200.006374	1.226	5200.006249	1.202	5200.006322	1.216	5200.006106	1.174
-10	110.0	5200.004911	0.944	5200.004554	0.876	5200.004587	0.882	5200.004612	0.887
-20	110.0	5200.004127	0.794	5200.004153	0.799	5200.004082	0.785	5200.004325	0.832
-30	110.0	5200.003498	0.673	5200.003590	0.690	5200.003383	0.651	5200.002992	0.575

FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5200MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
20	93.5	5200.005859	1.127	5200.005758	1.107	5200.005805	1.116	5200.005947	1.144
	110.0	5200.005810	1.117	5200.006326	1.217	5200.006130	1.179	5200.005936	1.142
	126.5	5200.008331	1.602	5200.008492	1.633	5200.007854	1.510	5200.008272	1.591

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



6. INFORMATION ON THE TESTING LABORATORIES

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

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

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

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Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

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

7. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

---END---