



# FCC TEST REPORT (15.407)

**REPORT NO.:** RF970602L11-1

**MODEL NO.:** EOA-8670 (refer to item3.1 for more detail)

**RECEIVED:** Jun. 02, 2008

**TESTED:** Jul. 12 ~ Nov. 25, 2008

**ISSUED:** Nov. 25, 2008

**APPLICANT:** Senao Networks Inc.

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**ISSUED BY:** Advance Data Technology Corporation

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**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
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R.O.C.

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# 1. CERTIFICATION

**PRODUCT:** 802.11a/b/g Outdoor Layer-2 MESH AP

**MODEL NO.:** EOA-8670 (refer to item 3.1 for more detail)

**BRAND:** EnGenius

**APPLICANT:** Senao Networks Inc.

**TEST SAMPLE:** ENGINEERING SAMPLE

**TESTED:** Jul. 12 ~ Nov. 25, 2008

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

ANSI C63.4-2003

The above equipment (Model: EOA-8670, EOM-8670) has been tested by **Advance Data Technology Corporation**, 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:** Nov. 25, 2008  
Andrea Hsia / Specialist

**TECHNICAL ACCEPTANCE** : Long Chen , **DATE:** Nov. 25, 2008  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY** : Gary Chang , **DATE:** Nov. 25, 2008  
Gary Chang / Assistant 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 AND LIMIT	RESULT	REMARK
15.407(b)(5)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -17.16dB at 17.695MHz.
15.407(b/1/2/3) (b)(5)	Electric Field Strength Spurious Emissions, 30MHz ~ 40000MHz	PASS	Meet the requirement of limit. Minimum passing margin is -1.23dB at 10360.00MHz.
15.407(a/1/2/3)	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/1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.

### 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	2.44dB
Radiated emissions	30MHz ~ 1GHz	4.03dB
	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

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

<b>PRODUCT</b>	802.11a/b/g Outdoor Layer-2 MESH AP
<b>MODEL NO.</b>	EOA-8670 (refer to note as below)
<b>FCC ID</b>	U2M-OA86708001
<b>POWER SUPPLY</b>	48Vdc from POE
<b>MODULATION TYPE</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
<b>MODULATION TECHNOLOGY</b>	DSSS, OFDM
<b>TRANSFER RATE</b>	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps
<b>FREQUENCY RANGE</b>	2.4GHz: 2400.0 ~ 2483.5MHz 5.0GHz: 5150.0 ~ 5250.0MHz, 5725.0 ~ 5850.0MHz
<b>NUMBER OF CHANNEL</b>	802.11b & 802.11g: 11 802.11a: 9
<b>CHANNEL SPACING</b>	802.11b & 802.11g: 5MHz 802.11a: 20MHz
<b>OUTPUT POWER</b>	319.154mW for 2400.0 ~ 2483.5MHz 38.371mW for 5150.0 ~ 5250.0MHz 30.339mW for 5725.0 ~ 5850.0MHz
<b>ANTENNA TYPE</b>	Refer to note as below
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	RJ45
<b>ASSOCIATED DEVICES</b>	Grounding cable (1.8m)

**NOTE:**

1. The following models are provided to this EUT.

BRAND	MODEL NAME	REMARK
EnGenius	EOA-8670	For plastics housing
EnGenius	EOM-8670	For iron housing

2. The following antennas were provided to this EUT.

Antenna Type	Gain (dBi)				Antenna connector
	2.4G		5.0G		
	Peak	Average	Peak	Average	
Omni-directional external	4.5	2.5	7.0	5.0	N-type

3. The EUT was operated with following POE.

<b>BRAND:</b>	EnGenius
<b>MODEL:</b>	NPE-4818
<b>OUTPUT:</b>	48Vdc, 0.375A

\* The POE is for support unit only.

4. The POE was operated with following adapter.

<b>BRAND:</b>	MW
<b>MODEL:</b>	ES18U48-480
<b>INPUT:</b>	100-240Vac,50/60Hz, 0.5A
<b>OUTPUT:</b>	48Vdc, 0.375A

\* The adapter is for support unit only.

5. The EUT is an 802.11a/b/g Outdoor Layer-2 MESH AP. The functions of EUT listed as below:

	TEST STANDARD	REFERENCE REPORT
<b>WLAN 802.11b/g</b>	FCC Part 15, Subpart C (Section 15.247)	RF970602L11
<b>WLAN 802.11a (5725~5850 MHz)</b>		
<b>WLAN 802.11a (5150~ 5250MHz)</b>	FCC Part 15, Subpart E (Section 15.407)	RF970602L11-1

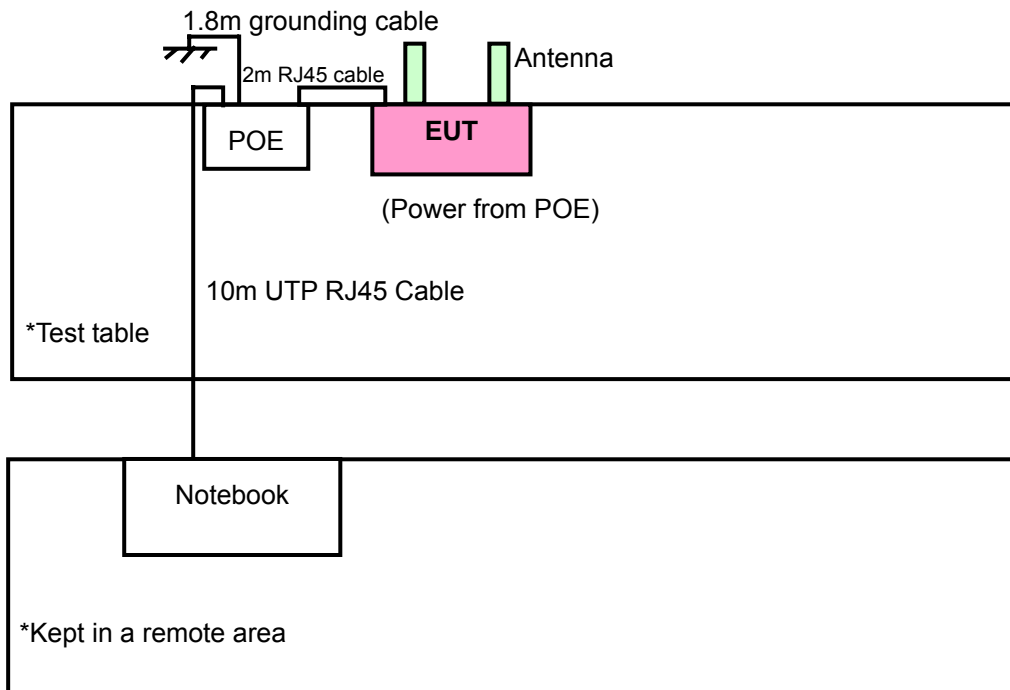
6. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 DESCRIPTION OF TEST MODES

4 channels are provided for 802.11a:

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

#### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST







### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	-	For model: EOA-8670
B	√	√	√	√	For model: EOM-8670

Where **RE≥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

#### 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, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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)	AXIZ
A	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0	Z
B	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0	Z

#### 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, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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)	AXIZ
A	802.11a	36 to 48	36	OFDM	BPSK	6.0	Z
B	802.11a	36 to 48	36	OFDM	BPSK	6.0	Z

#### 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	802.11a	36 to 48	36	OFDM	BPSK	6.0
B	802.11a	36 to 48	36	OFDM	BPSK	6.0

**BANDEDGE MEASUREMENT:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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)	AXIZ
A	802.11a	36 to 48	36, 48	OFDM	BPSK	6.0	Z
B	802.11a	36 to 48	36, 48	OFDM	BPSK	6.0	Z

**ANTENNA PORT CONDUCTED MEASUREMENT:**

- 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)
B	802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6.0



### 3.3 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)**

**ANSI C63.4-2003**

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.

### 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	POE	EnGenius	NPE-4818	NA	NA
2	NOTEBOOK COMPUTER	DELL	PP05L	16484462992	E2K24CLNS

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	2m RJ45 cable; 1.8m grounding cable
2	NA

**NOTE 1:** All power cords of the above support units are non shielded (1.8m).

**NOTE 2:** Item 2 acted as communication partners to transfer data.

**NOTE 3:** Item 1 & 2m RJ 45 were supplied from client and only for test.

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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. As shown in 15.35(b), 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

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m) *note 3
5150~5250	-27	68.3

**NOTE:**

1. For frequencies 10MHz or greater above or below the band edge.
2. All emissions within the frequency range from the band edge to 10MHz above or below the band edge.
3. 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

#### Above 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	100033	Jun. 30, 2008	Jun. 29, 2009
Spectrum Analyzer Agilent	FSP	100041	Apr. 22, 2008	Apr. 21, 2009
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	May, 02, 2008	May, 01, 2009
HORN Antenna SCHWARZBECK	9120D	9120D-209	Jun. 24, 2008	Jun. 23, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2007	Dec. 24, 2008
Preamplifier Agilent	8447D	2944A10633	Oct. 29, 2007	Oct. 28, 2008
Preamplifier Agilent	8449B	3008A01964	Oct. 24, 2007	Oct. 23, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283402/4	Dec. 07, 2007	Dec. 06, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	251644/4	Dec. 07, 2007	Dec. 06, 2008
Software ADT.	ADT_Radiated_V7.6	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	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 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 IC3789B-3.



**Below 1GHz:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ TEST RECEIVER	ESCI	100412	Jul. 22, 2008	Jul. 21, 2009
SCHAFFENR BILOG Antenna	CBL6111D	21872	Apr. 29, 2008	Apr. 28, 2009
ADT. Turn Table	TT100	0505	NA	NA
ADT. Tower	AT100	0505	NA	NA
Software	ADT_Radiated_V7.6.15	NA	NA	NA
ADT RF Switches BOX	EM-H-01-1	1002	Aug. 19, 2008	Aug. 18, 2009
TIMES RF cable	LMR-600	CABLE-ST5-01	Aug. 19, 2008	Aug. 18, 2009

- 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 Open Site No. 5.
  3. The VCCI Site Registration No. R-1039.
  4. The Industry Canada Reference No. IC 3789A-5

#### 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 meters semi-anechoic chamber and open test area side. 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.

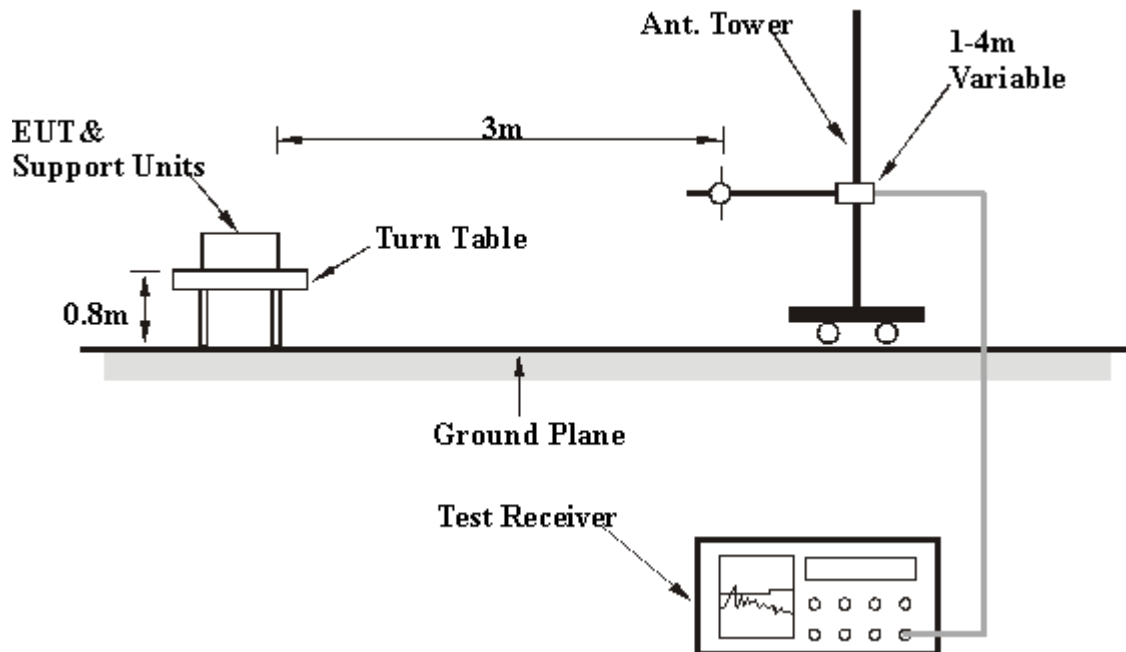
**NOTE:**

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 10Hz 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

- Placed the EUT on a testing table.
- Prepared a notebook computer and placed it outside of testing area to act as communication partner for EUT.
- The EUT ran a test program (provided by manufacturer) to enable all functions under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



## 4.1.8 TEST RESULTS

### 802.11a OFDM MODULATION

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	25deg. C, 65%RH 1000hPa	TEST MODE	A
TESTED BY	Match Tsui		

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	53.03 PK	74.00	-20.97	1.19 H	169	14.14	38.89
2	5150.00	38.23 AV	54.00	-15.77	1.19 H	169	-0.66	38.89
3	*5180.00	103.29 PK			1.19 H	169	64.31	38.98
4	*5180.00	92.91 AV			1.19 H	169	53.93	38.98
5	#10360.00	67.07 PK	68.30	-1.23	1.29 H	193	17.53	49.54
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	#3453.00	53.59 PK	68.30	-14.71	1.24 V	160	18.98	34.61
2	5150.00	62.58 PK	74.00	-11.42	1.06 V	210	23.69	38.89
3	5150.00	43.77 AV	54.00	-10.23	1.06 V	210	4.88	38.89
4	*5180.00	115.52 PK			1.06 V	210	76.54	38.98
5	*5180.00	104.42 AV			1.06 V	210	65.44	38.98
6	#10360.00	66.46 PK	68.30	-1.84	1.14 V	207	16.92	49.54

- 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.



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	25deg. C, 65%RH 1000hPa	TEST MODE	A
TESTED BY	Match Tsui		

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	103.42 PK			1.20 H	177	64.38	39.04
2	*5200.00	92.96 AV			1.20 H	177	53.92	39.04
3	#10400.00	66.61 PK	68.30	-1.69	1.10 H	180	16.93	49.68
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	115.18 PK			1.04 V	177	76.14	39.04
2	*5200.00	104.42 AV			1.04 V	177	65.38	39.04
3	#10400.00	66.30 PK	68.30	-2.00	1.00 V	160	16.62	49.68

- 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.

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	25deg. C, 65%RH 1000hPa	TEST MODE	A
TESTED BY	Match Tsui		

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	103.17 PK			1.21 H	196	64.06	39.11
2	*5240.00	92.75 AV			1.21 H	196	53.64	39.11
3	5350.00	51.77 PK	74.00	-22.23	1.21 H	196	12.56	39.21
4	5350.00	38.78 AV	54.00	-15.22	1.21 H	196	-0.43	39.21
5	#10480.00	66.58 PK	68.30	-1.72	1.25 H	200	16.76	49.82
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	115.65 PK			1.11 V	177	76.54	39.11
2	*5240.00	104.51 AV			1.11 V	177	65.40	39.11
3	5350.00	51.87 PK	74.00	-22.13	1.12 V	200	12.66	39.21
4	5350.00	39.04 AV	54.00	-14.96	1.12 V	200	-0.17	39.21
5	#10480.00	66.72 PK	68.30	-1.58	1.11 V	199	16.90	49.82

- 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.



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	24deg. C, 64%RH 1000hPa	TEST MODE	B
TESTED BY	Match Tsui		

**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	51.84 PK	74.00	-22.16	1.04 H	307	12.95	38.89
2	5150.00	37.78 AV	54.00	-16.22	1.04 H	307	-1.11	38.89
3	*5180.00	104.18 PK			1.04 H	307	65.20	38.98
4	*5180.00	93.94 AV			1.04 H	307	54.96	38.98
5	#10360.00	59.83 PK	68.30	-8.47	1.00 H	0	10.29	49.54

**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	67.60 PK	74.00	-6.40	1.21 V	283	28.71	38.89
2	5150.00	46.64 AV	54.00	-7.36	1.21 V	283	7.75	38.89
3	*5180.00	115.69 PK			1.20 V	279	76.71	38.98
4	*5180.00	104.99 AV			1.20 V	279	66.01	38.98
5	#10360.00	59.88 PK	68.30	-8.42	1.21 V	360	10.34	49.54

- 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.



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	24deg. C, 64%RH 1000hPa	TEST MODE	B
TESTED BY	Match Tsui		

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	104.26 PK			1.01 H	298	65.22	39.04
2	*5200.00	94.07 AV			1.01 H	298	55.03	39.04
3	#10400.00	59.98 PK	68.30	-8.32	1.10 H	0	10.30	49.68
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	115.47 PK			1.18 V	293	76.43	39.04
2	*5200.00	104.29 AV			1.18 V	293	65.25	39.04
3	#10400.00	60.14 PK	68.30	-8.16	1.00 V	360	10.46	49.68

- 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.

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	24deg. C, 64%RH 1000hPa	TEST MODE	B
TESTED BY	Match Tsui		

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	103.92 PK			1.02 H	355	64.81	39.11
2	*5240.00	93.51 AV			1.02 H	355	54.40	39.11
3	5350.00	51.87 PK	74.00	-22.13	1.02 H	355	12.66	39.21
4	5350.00	39.14 AV	54.00	-14.86	1.02 H	355	-0.07	39.21
5	#10480.00	60.41 PK	68.30	-7.89	1.10 H	360	10.59	49.82
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	115.41 PK			1.12 V	200	76.30	39.11
2	*5240.00	104.39 AV			1.12 V	200	65.28	39.11
3	5350.00	51.67 PK	74.00	-22.33	1.12 V	200	12.46	39.21
4	5350.00	38.91 AV	54.00	-15.09	1.12 V	200	-0.31	39.21
5	#10480.00	60.11 PK	68.30	-8.19	1.19 V	0	10.29	49.82

- 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 : 802.11a OFDM MODULATION**

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	28deg. C, 63%RH 999hPa	TEST MODE	A
TESTED BY	Rober Tsai		

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	74.75	28.88 QP	40.00	-11.12	1.66 H	269	20.62	8.26
2	108.00	39.60 QP	43.50	-3.90	1.40 H	202	27.84	11.76
3	132.01	30.75 QP	43.50	-12.75	1.50 H	33	17.59	13.16
4	143.48	32.23 QP	43.50	-11.27	1.58 H	151	19.10	13.13
5	166.22	30.46 QP	43.50	-13.04	1.99 H	315	17.96	12.50
6	200.02	29.86 QP	43.50	-13.64	2.02 H	134	19.46	10.40
7	233.87	37.47 QP	46.00	-8.53	1.99 H	358	23.82	13.65
8	250.05	37.68 QP	46.00	-8.32	1.66 H	336	22.48	15.20
9	316.36	34.90 QP	46.00	-11.10	1.00 H	116	18.87	16.03
10	352.03	31.79 QP	46.00	-14.21	1.00 H	156	14.78	17.01
11	375.03	35.75 QP	46.00	-10.25	1.55 H	283	18.08	17.67
12	500.05	41.07 QP	46.00	-4.93	1.49 H	192	20.49	20.58
13	600.03	30.15 QP	46.00	-15.85	1.00 H	203	6.33	23.82
14	625.00	32.49 QP	46.00	-13.51	2.01 H	322	8.44	24.05
15	750.01	30.75 QP	46.00	-15.25	1.00 H	339	5.19	25.56
16	935.01	31.62 QP	46.00	-14.38	2.06 H	46	4.51	27.11

- 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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	28deg. C, 63%RH 999hPa	TEST MODE	A
TESTED BY	Rober Tsai		

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	38.97	35.37 QP	40.00	-4.63	1.10 V	138	20.41	14.96
2	39.49	37.54 QP	40.00	-2.46	1.14 V	171	22.85	14.69
3	44.15	32.85 QP	40.00	-7.15	1.00 V	7	20.88	11.97
4	58.77	36.82 QP	40.00	-3.18	1.30 V	113	30.33	6.49
5	66.31	34.50 QP	40.00	-5.50	1.88 V	276	27.45	7.05
6	69.08	36.10 QP	40.00	-3.90	1.00 V	342	28.63	7.47
7	71.09	37.06 QP	40.00	-2.94	1.53 V	271	29.30	7.76
8	86.05	34.74 QP	40.00	-5.26	1.91 V	314	25.06	9.68
9	108.63	36.04 QP	43.50	-7.46	1.58 V	233	24.21	11.83
10	120.08	37.95 QP	43.50	-5.55	2.01 V	263	24.81	13.14
11	125.03	34.80 QP	43.50	-8.70	1.00 V	191	21.65	13.15
12	132.15	34.99 QP	43.50	-8.51	1.00 V	187	21.83	13.16
13	143.39	37.49 QP	43.50	-6.01	1.00 V	80	24.36	13.13
14	151.57	37.96 QP	43.50	-5.54	1.00 V	330	24.87	13.09
15	155.65	35.86 QP	43.50	-7.64	1.00 V	289	22.64	13.22
16	250.04	39.10 QP	46.00	-6.90	1.00 V	150	23.90	15.20
17	500.05	42.62 QP	46.00	-3.38	1.40 V	10	22.04	20.58
18	528.00	36.38 QP	46.00	-9.62	1.07 V	129	14.85	21.53
19	575.04	36.07 QP	46.00	-9.93	1.00 V	337	13.02	23.05
20	600.01	34.91 QP	46.00	-11.09	1.49 V	96	11.09	23.82
21	625.00	31.42 QP	46.00	-14.58	1.00 V	232	7.37	24.05
22	750.05	33.11 QP	46.00	-12.89	1.00 V	139	7.55	25.56

- 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.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	28deg. C, 63%RH 999hPa	TEST MODE	B
TESTED BY	Rober Tsai		

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	61.64	26.84 QP	40.00	-13.16	1.00 H	195	20.50	6.34
2	85.43	29.88 QP	40.00	-10.12	1.82 H	53	20.28	9.60
3	111.47	37.20 QP	43.50	-6.30	1.64 H	286	25.04	12.16
4	132.26	32.19 QP	43.50	-11.31	1.90 H	69	19.03	13.16
5	165.00	28.99 QP	43.50	-14.51	2.12 H	295	16.32	12.66
6	250.00	40.21 QP	46.00	-5.79	1.00 H	227	25.01	15.20
7	275.01	33.41 QP	46.00	-12.59	2.00 H	68	17.93	15.48
8	500.05	30.83 QP	46.00	-15.17	1.94 H	180	10.25	20.58
9	575.04	30.31 QP	46.00	-15.69	2.50 H	3	7.26	23.05
10	600.01	32.85 QP	46.00	-13.15	1.53 H	173	9.03	23.82
11	711.27	30.45 QP	46.00	-15.55	1.32 H	171	5.58	24.87
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	50.52	37.08 QP	40.00	-2.92	1.53 V	36	27.87	9.21
2	61.92	35.89 QP	40.00	-4.11	2.00 V	104	29.51	6.38
3	78.59	35.67 QP	40.00	-4.33	1.30 V	319	26.88	8.79
4	85.72	37.01 QP	40.00	-2.99	1.00 V	231	27.37	9.64
5	110.52	37.99 QP	43.50	-5.51	1.47 V	243	25.94	12.05
6	131.84	30.02 QP	43.50	-13.48	1.51 V	105	16.86	13.16
7	165.00	33.71 QP	43.50	-9.79	2.02 V	59	21.05	12.66
8	250.02	37.80 QP	46.00	-8.20	2.16 V	217	22.60	15.20
9	275.00	29.51 QP	46.00	-16.49	2.08 V	90	14.03	15.48
10	500.05	32.14 QP	46.00	-13.86	2.43 V	247	11.56	20.58
11	525.00	30.13 QP	46.00	-15.87	2.52 V	76	8.71	21.42
12	575.00	31.34 QP	46.00	-14.66	1.00 V	334	8.30	23.04
13	600.03	31.48 QP	46.00	-14.52	1.90 V	271	7.66	23.82
14	750.00	30.60 QP	46.00	-15.40	2.49 V	186	5.04	25.56
15	850.01	30.24 QP	46.00	-15.76	2.63 V	284	3.78	26.46

- 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 $\mu$ 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. 19, 2008	Nov. 18, 2009
RF signal cable Woken	5D-FB	Cable-HYC01-01	Jan. 04, 2008	Jan. 03, 2009
LISN ROHDE & SCHWARZ	ESH3-Z5	100312	Jun. 13, 2008	Jun. 12, 2009
V-LISN SCHWARZBECK	NNBL 8226-2	8226-142	Jun. 10, 2008	Jun. 09, 2009
Software ADT	ADT_Cond_V3	NA	NA	NA

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

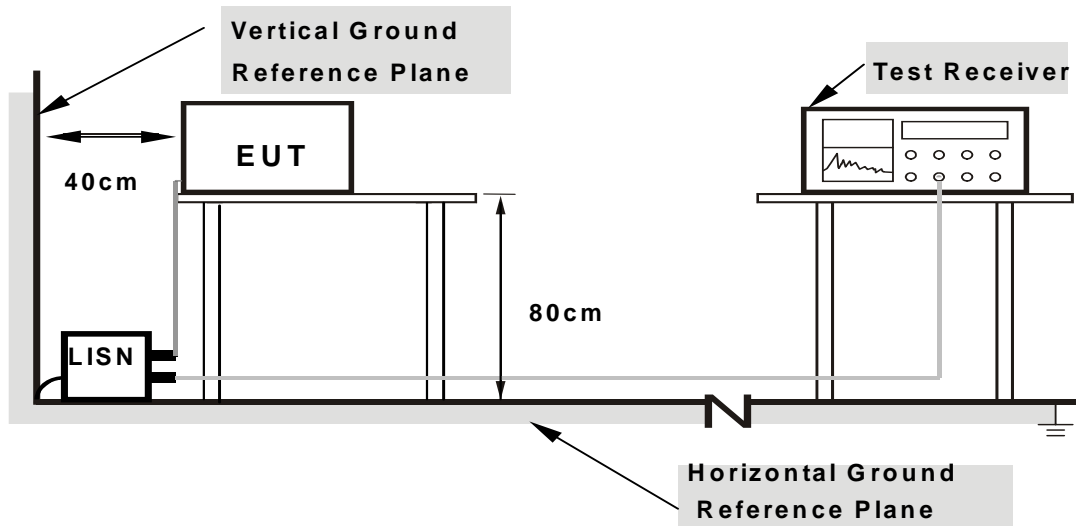
#### 4.2.3 TEST PROCEDURES

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

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.2.5 TEST SETUP



**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm 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.

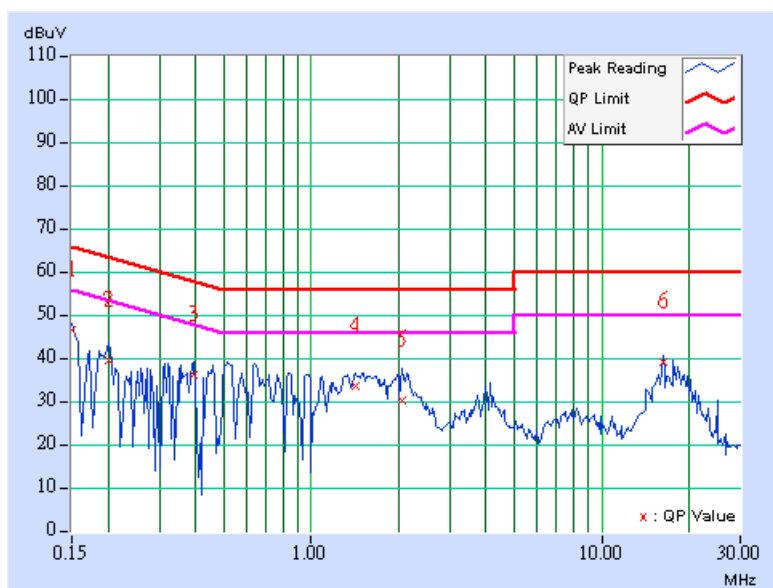
## 4.2.7 TEST RESULTS

### CONDUCTED WORST-CASE DATA : 802.11a OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	PHASE	Line 1
MODULATION TYPE	BPSK	INPUT POWER (SYSTEM)	120Vac, 60Hz
TRANSFER RATE	6Mbps	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 982hPa	TEST MODE	A
TESTED BY	Match Tsui		

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	0.150	0.20	46.00	-	46.20	-	66.00
2	0.201	0.20	38.66	-	38.86	-	63.58	53.58	-24.72	-
3	0.396	0.20	35.33	-	35.53	-	57.93	47.93	-22.40	-
4	1.426	0.20	33.00	-	33.20	-	56.00	46.00	-22.80	-
5	2.059	0.21	29.34	-	29.55	-	56.00	46.00	-26.45	-
6	16.229	0.85	38.30	-	39.15	-	60.00	50.00	-20.85	-

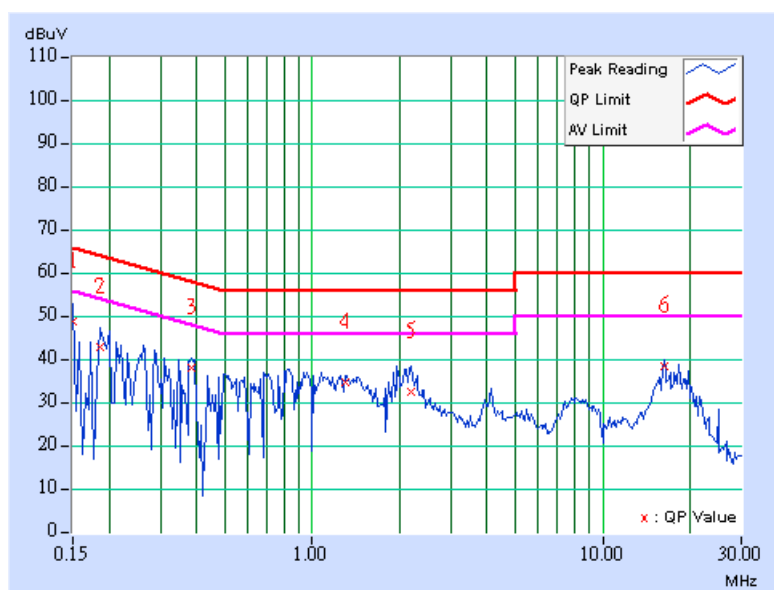
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	PHASE	Line 2
MODULATION TYPE	BPSK	INPUT POWER (SYSTEM)	120Vac, 60Hz
TRANSFER RATE	6Mbps	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 982hPa	TEST MODE	A
TESTED BY	Match Tsui		

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	0.150	0.20	48.41	-	48.61	-	66.00
2	0.185	0.20	42.28	-	42.48	-	64.25	54.25	-21.77	-
3	0.384	0.20	37.58	-	37.78	-	58.18	48.18	-20.40	-
4	1.305	0.20	34.33	-	34.53	-	56.00	46.00	-21.47	-
5	2.199	0.22	32.18	-	32.40	-	56.00	46.00	-23.60	-
6	16.230	0.50	38.14	-	38.64	-	60.00	50.00	-21.36	-

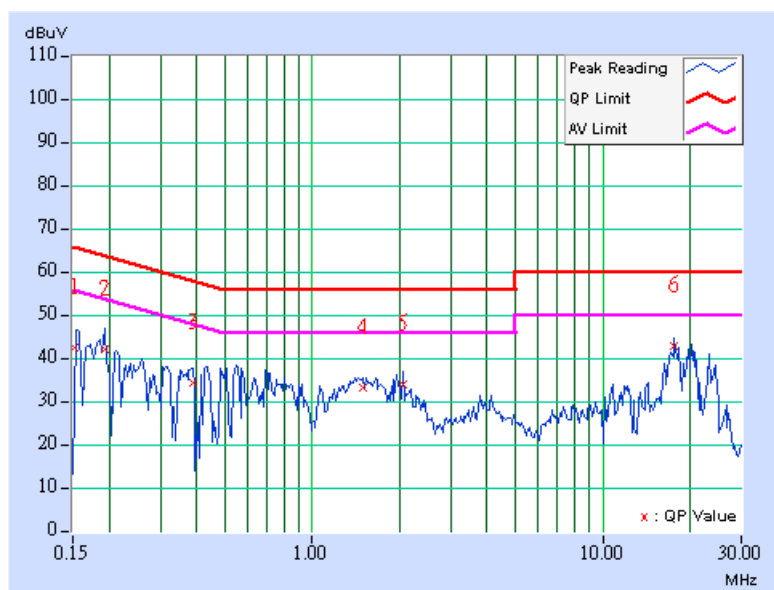
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	PHASE	Line 1
MODULATION TYPE	BPSK	INPUT POWER (SYSTEM)	120Vac, 60Hz
TRANSFER RATE	6Mbps	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 982hPa	TEST MODE	B
TESTED BY	Match Tsui		

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	0.151	0.20	41.54	-	41.74	-	65.93	55.93	-24.19	-
2	0.193	0.20	41.18	-	41.38	-	63.91	53.91	-22.53	-
3	0.388	0.20	33.45	-	33.65	-	58.10	48.10	-24.45	-
4	1.492	0.20	32.42	-	32.62	-	56.00	46.00	-23.38	-
5	2.055	0.21	33.29	-	33.50	-	56.00	46.00	-22.50	-
6	17.695	0.91	41.93	-	42.84	-	60.00	50.00	-17.16	-

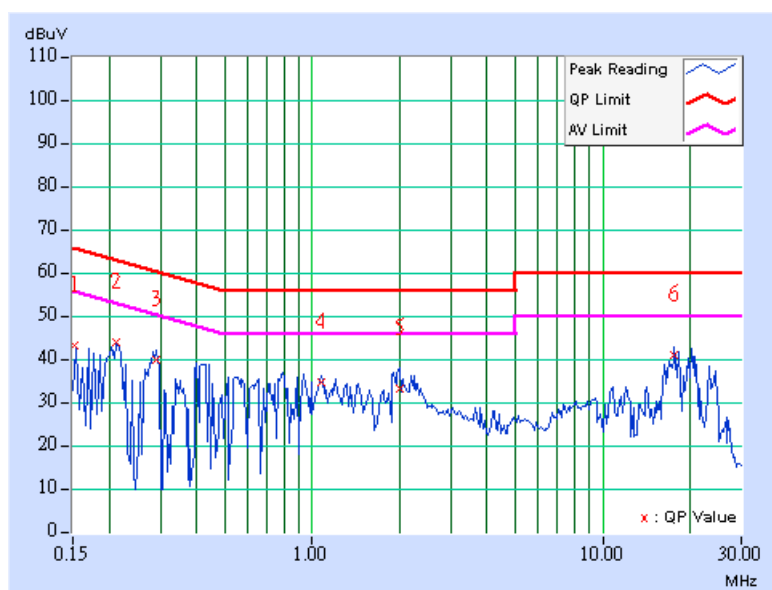
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	PHASE	Line 2
MODULATION TYPE	BPSK	INPUT POWER (SYSTEM)	120Vac, 60Hz
TRANSFER RATE	6Mbps	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 982hPa	TEST MODE	B
TESTED BY	Match Tsui		

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	0.151	0.20	43.00	-	43.20	-	65.93	55.93	-22.73	-
2	0.213	0.20	43.42	-	43.62	-	63.11	53.11	-19.49	-
3	0.291	0.20	39.55	-	39.75	-	60.51	50.51	-20.76	-
4	1.070	0.20	34.34	-	34.54	-	56.00	46.00	-21.46	-
5	1.996	0.20	32.67	-	32.87	-	56.00	46.00	-23.13	-
6	17.691	0.51	40.67	-	41.18	-	60.00	50.00	-18.82	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. 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 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.3.3 TEST PROCEDURE

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set span to encompass the entire emission bandwidth of the signal.
- c. Set RBW to 1MHz, VBW to 3MHz.
- d. Using the spectrum analyzer's channel power measurement function to measure the output power.

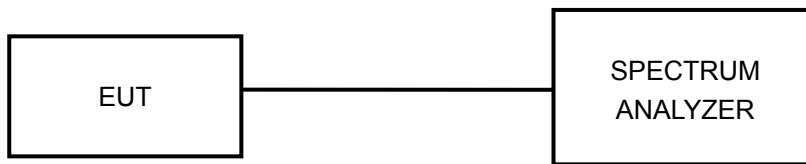
**NOTE:** The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.3.5 TEST SETUP



#### 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

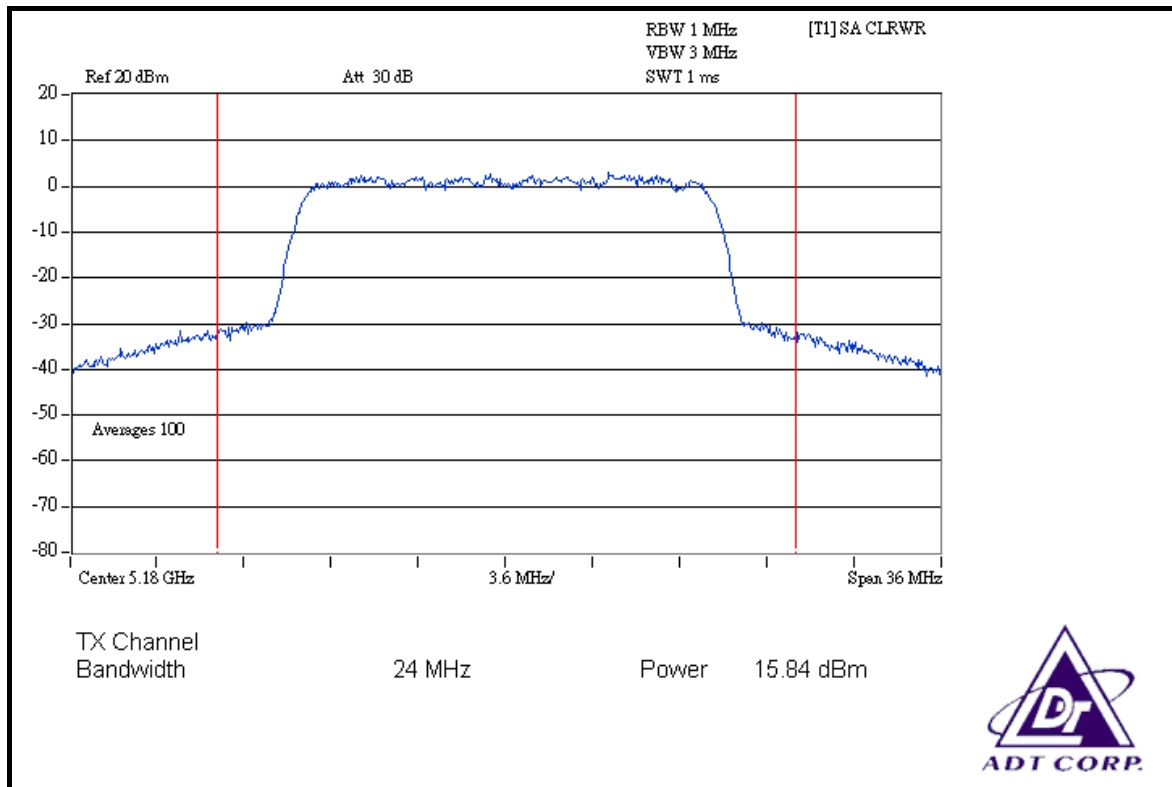
#### PEAK POWER OUTPUT: 802.11a OFDM MODULATION

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6.0Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>ENVIRONMENTAL CONDITIONS</b>	27deg.C, 66%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

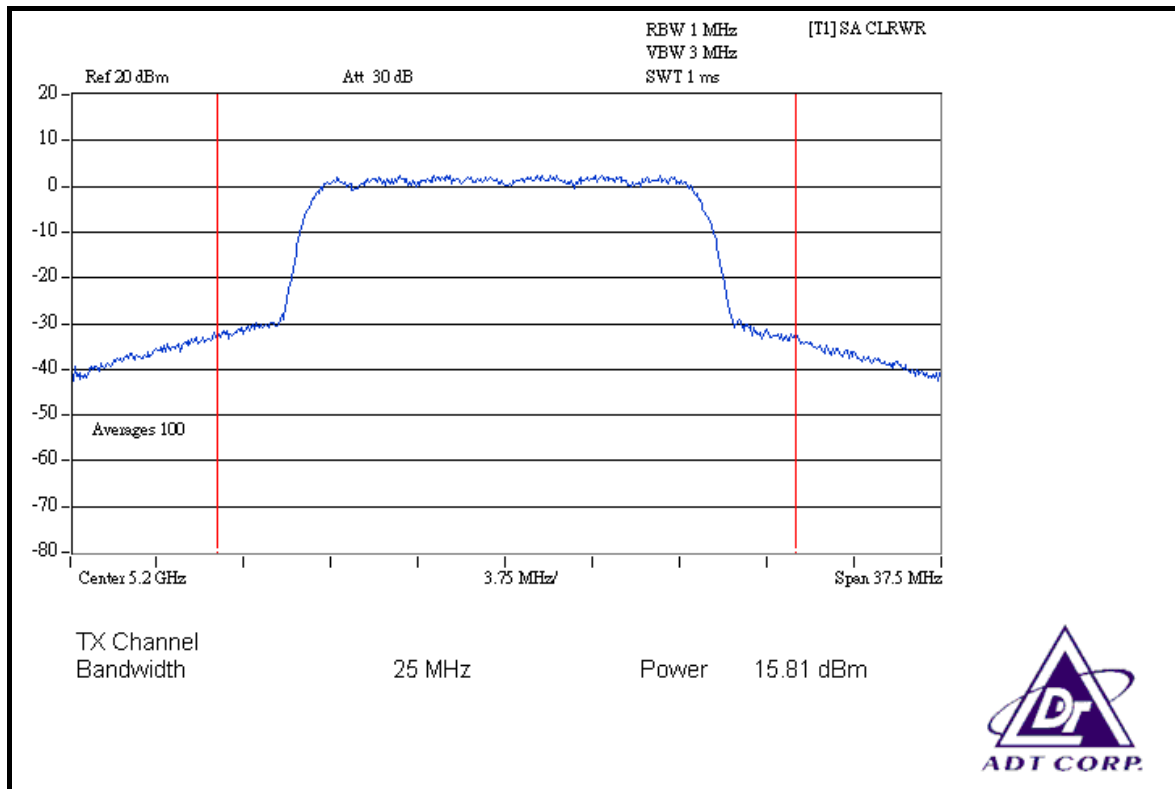
CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
36	5180	38.371	15.84	16.00	PASS
40	5200	38.107	15.81	16.00	PASS
48	5240	38.194	15.82	16.00	PASS

**NOTE:** According to 15.407(a)(1)(2), the maximum antenna gain 7dBi is higher than 6dBi, so the limit of peak power shall be reduced by 1dB.

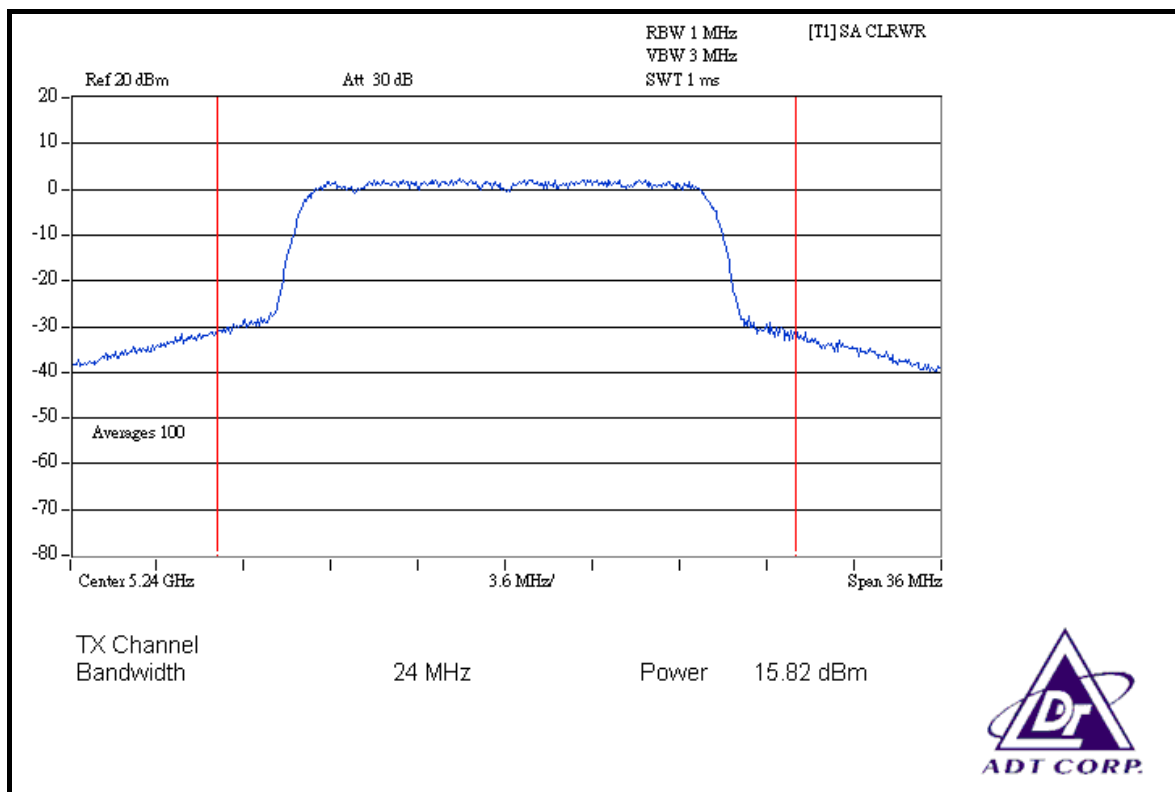
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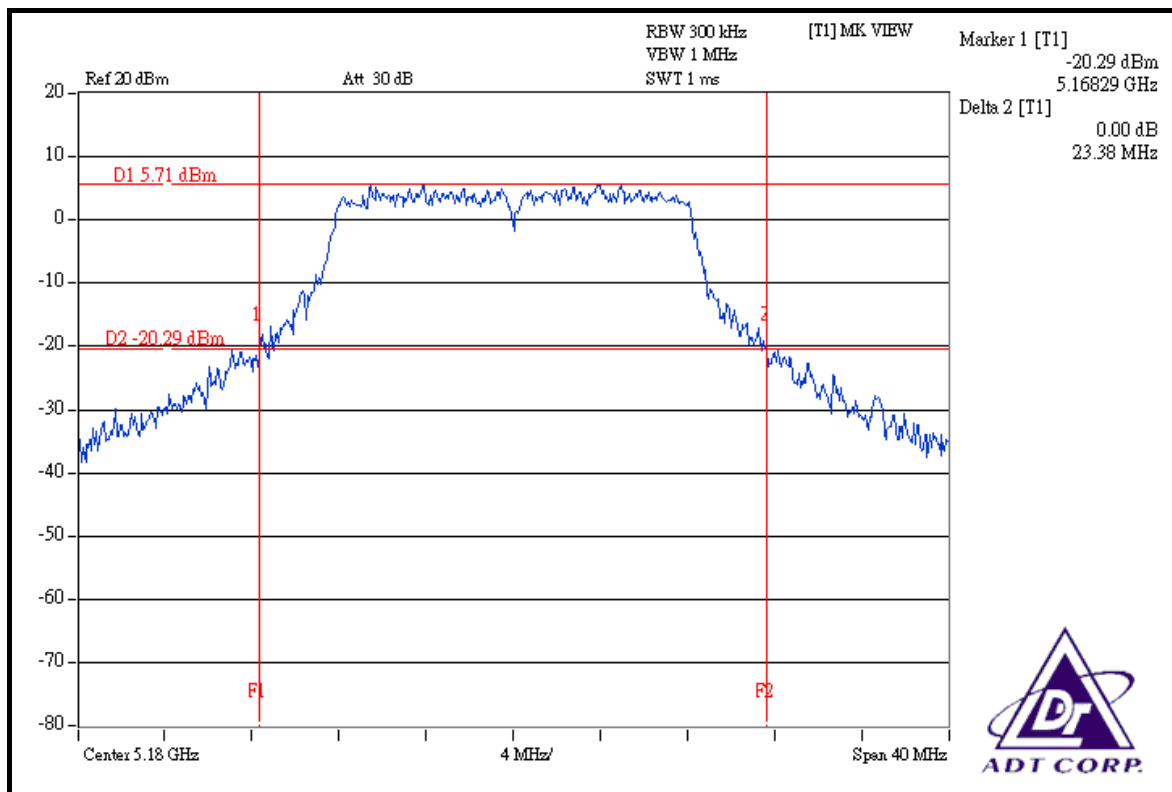


**26dB OCCUPIED BANDWIDTH: 802.11a OFDM MODULATION**

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6.0Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>ENVIRONMENTAL CONDITIONS</b>	27deg.C, 66%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

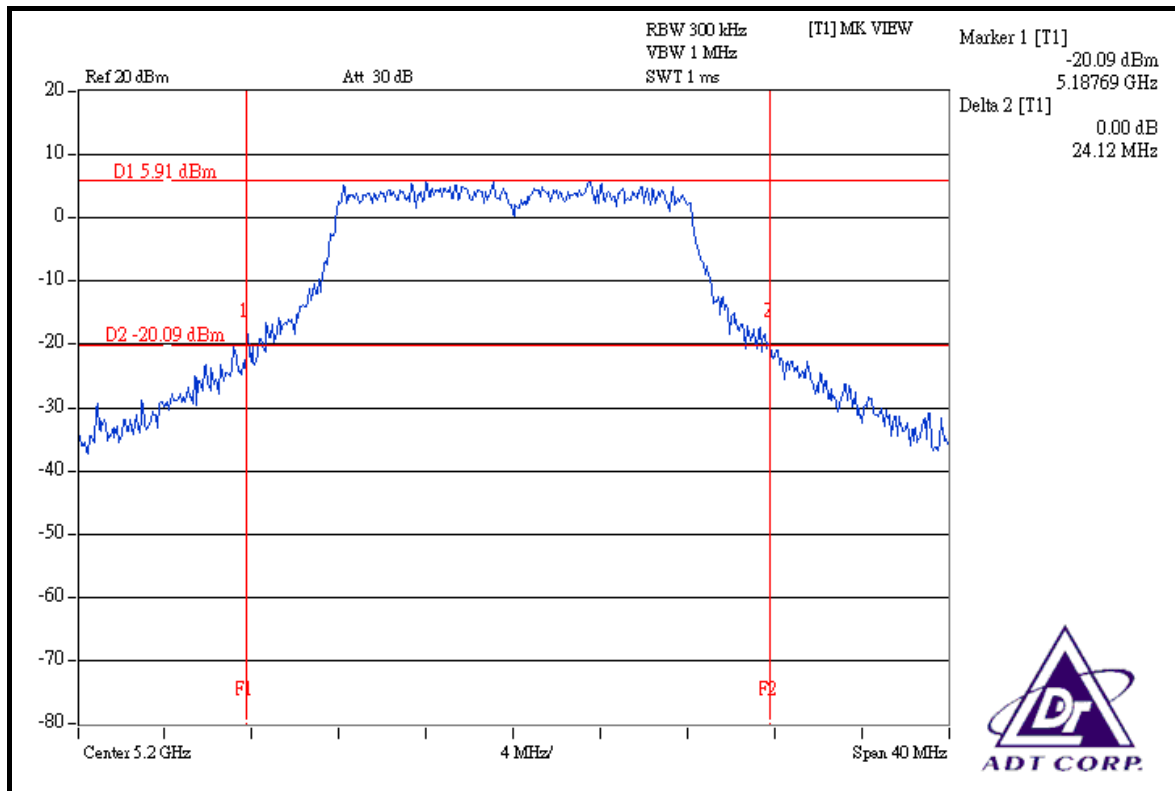
CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc OCCUPIED BANDWIDTH (MHz)	PASS / FAIL
36	5180	23.38	PASS
40	5200	24.12	PASS
48	5240	23.77	PASS

**CH 36**

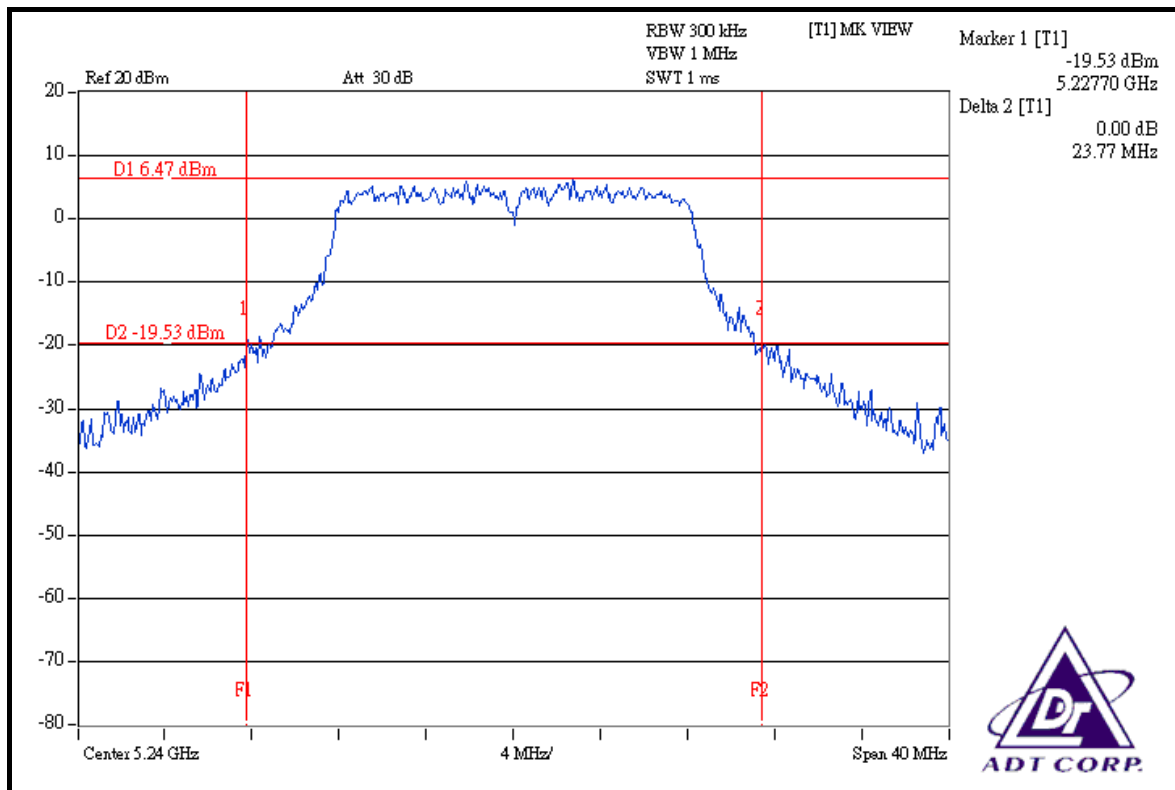




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#### 4.4 PEAK POWER EXCURSION MEASUREMENT

##### 4.4.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

FREQUENCY BAND	LIMIT
5.15 ~ 5.25GHz	13dB

##### 4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

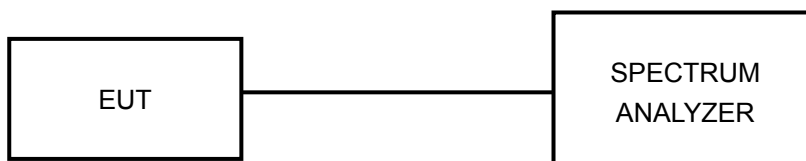
##### 4.4.3 TEST PROCEDURE

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set the spectrum bandwidth span to view the entire spectrum.
- c. Using peak detector and Max-hold function for Trace 1 (RB = 1MHz, VB = 3MHz) and 2 (RB = 1MHz, VB = 300kHz).
- d. The largest difference between Trace 1 and Trace 2 in any 1MHz band on any frequency was recorded.

#### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.4.5 TEST SETUP



#### 4.4.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



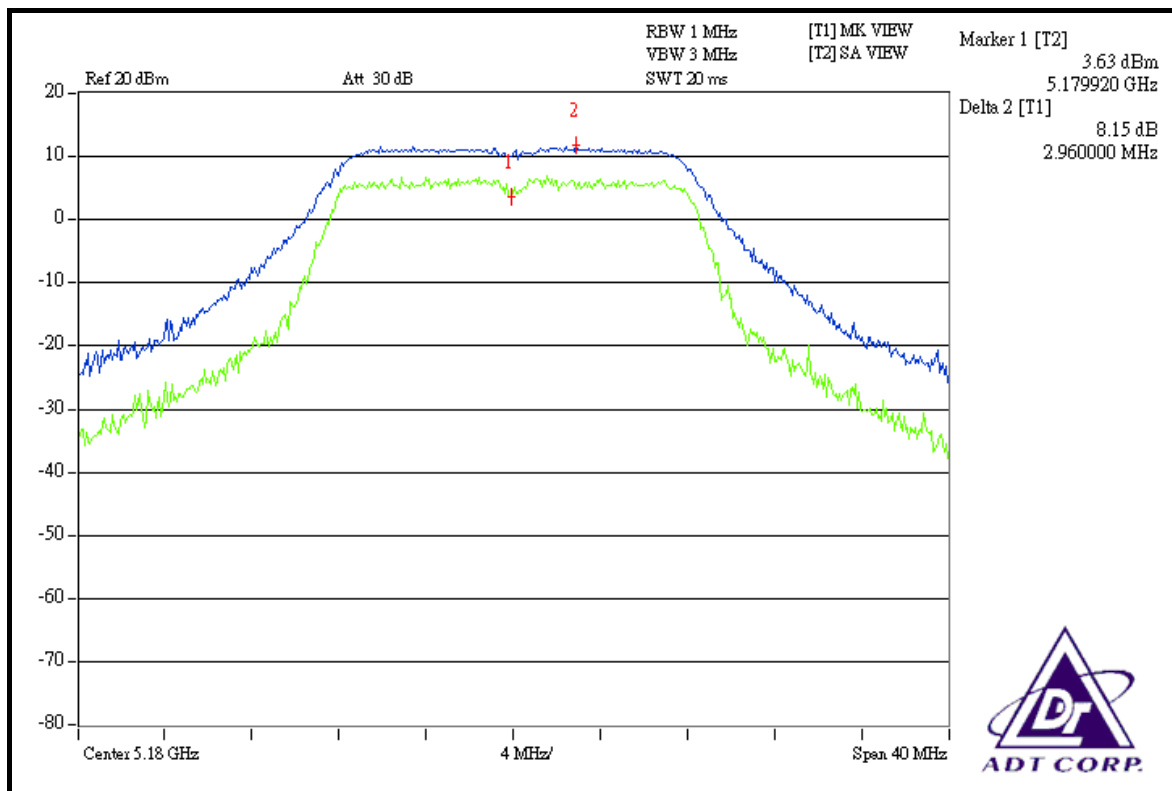
#### 4.4.7 TEST RESULTS

##### 802.11a OFDM MODULATION

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6.0Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>ENVIRONMENTAL CONDITIONS</b>	27deg.C, 66%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

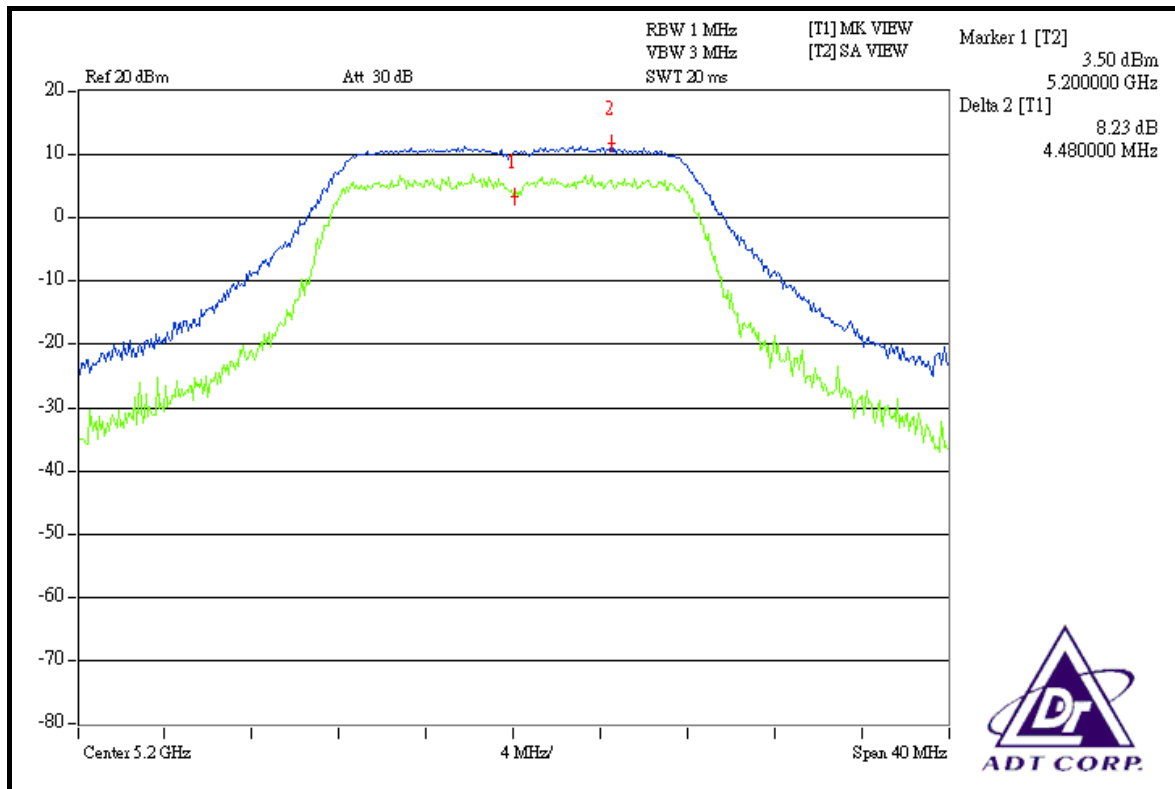
CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)	PEAK TO AVERAGE EXCURSION LIMIT (dB)	PASS / FAIL
36	5180	8.15	13	PASS
40	5200	8.23	13	PASS
48	5240	8.15	13	PASS

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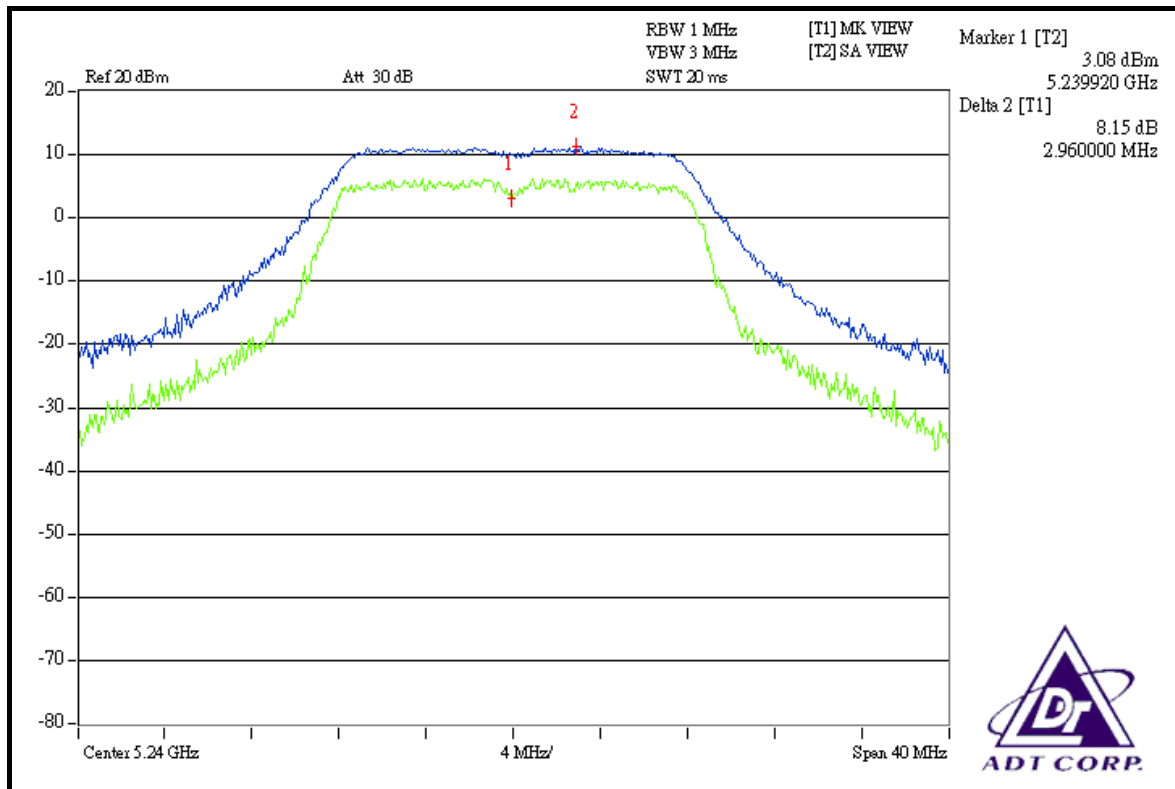




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## 4.5 PEAK POWER SPECTRAL DENSITY MEASUREMENT

### 4.5.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

FREQUENCY BAND	LIMIT
5.15 ~ 5.25GHz	4dBm

### 4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

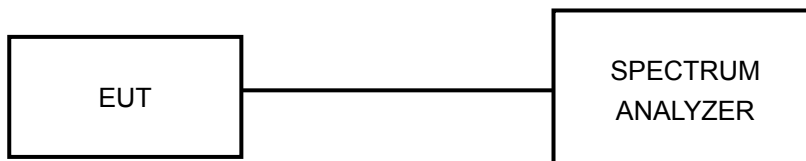
### 4.5.3 TEST PROCEDURES

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW = 1MHz, VBW = 3MHz. The PPSD is the highest level found across the emission in any 1MHz band.

#### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.5.5 TEST SETUP



#### 4.5.6 EUT OPERATING CONDITIONS

Same as 5.3.6



## 4.5.7 TEST RESULTS

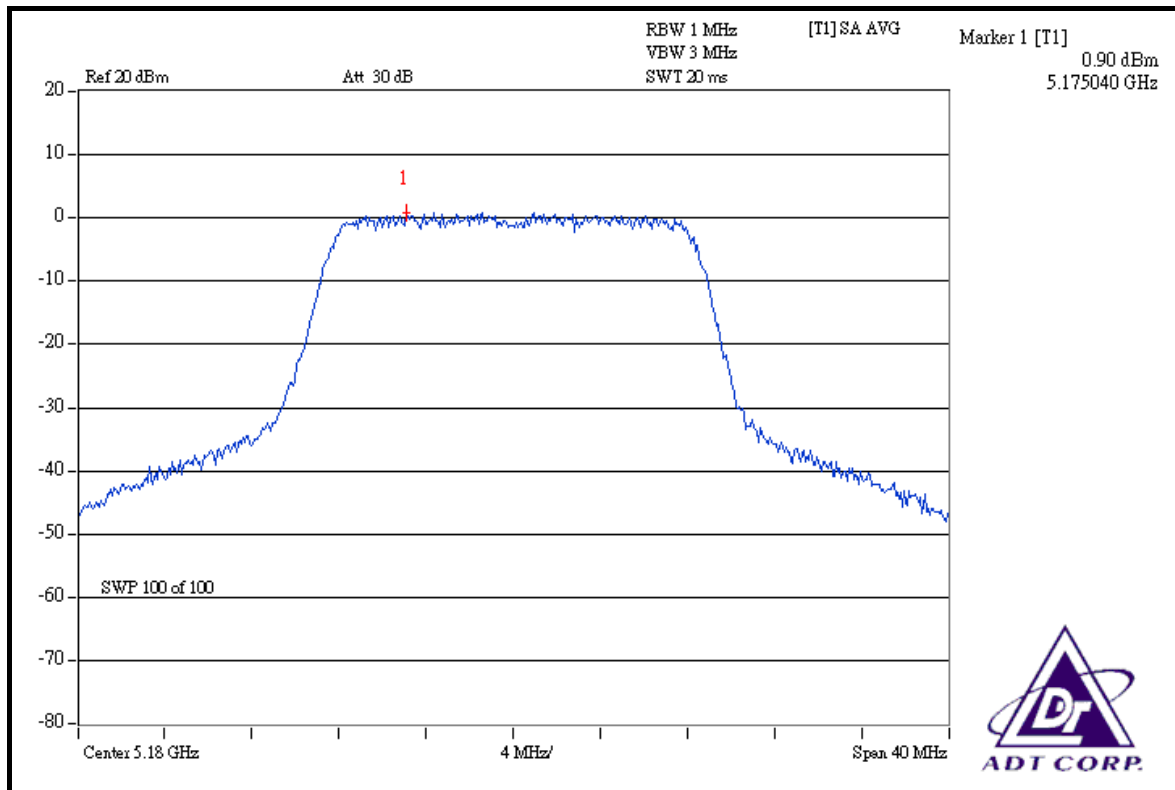
### 802.11a OFDM MODULATION

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6.0Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>ENVIRONMENTAL CONDITIONS</b>	27deg.C, 66%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 1MHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
36	5180	0.90	3	PASS
40	5200	0.84	3	PASS
48	5240	0.94	3	PASS

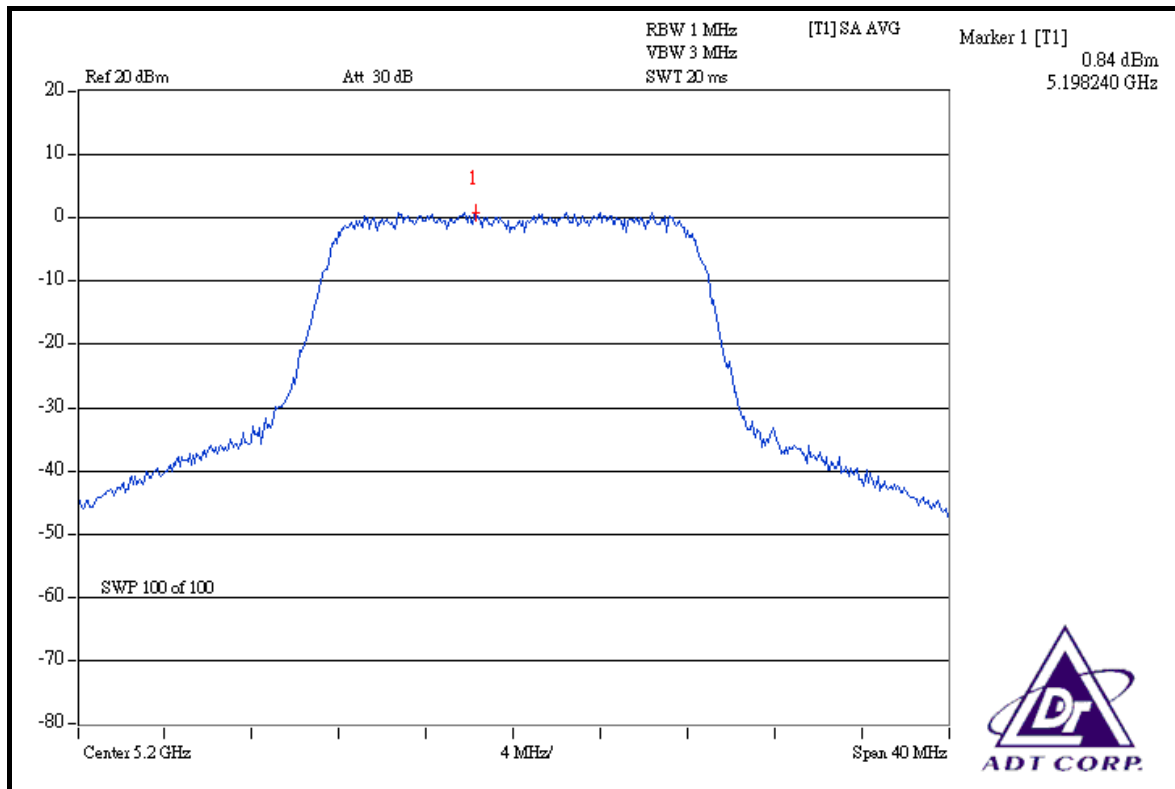
**NOTE:** According to 15.407(a)(1)(2), the maximum antenna gain 7dBi is higher than 6dBi, so the limit of peak power shall be reduced by 1dB.

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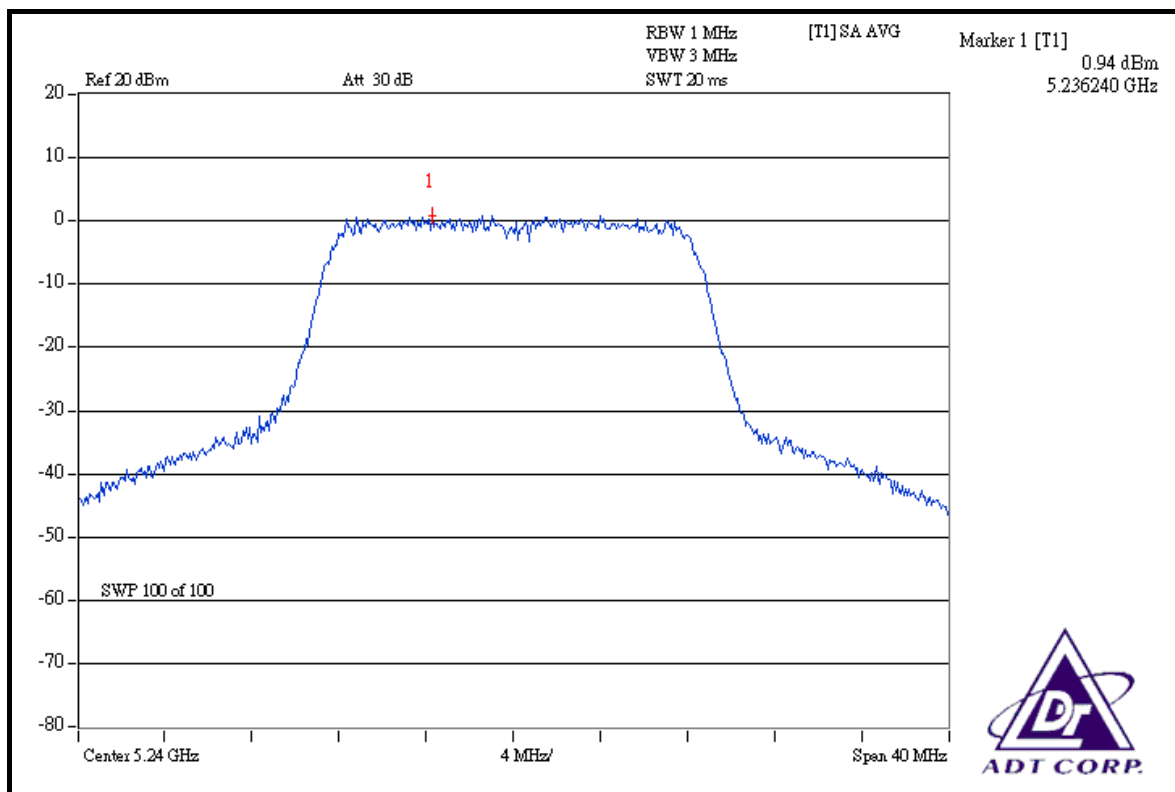




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## 4.6 FREQUENCY STABILITY

### 4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
ANRITSU SPECTRUM ANALYZER	MS2667C	M10281	Nov. 22, 2007	Nov. 21, 2008
WIT STANDARD TEMPERATURE AND HUMIDITY CHAMBER	TH-4S-C	W981030	Jun. 28, 2008	Jun. 27, 2009

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

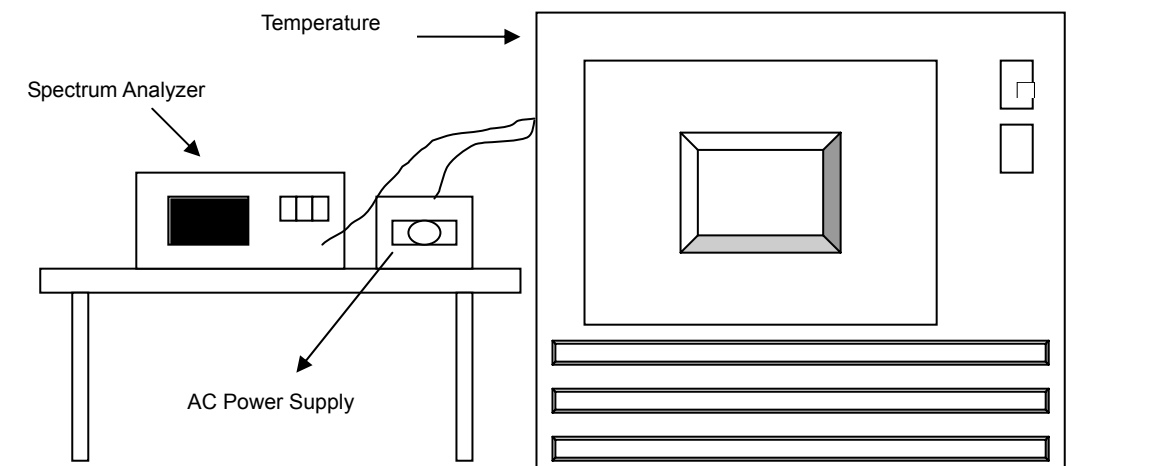
### 4.6.3 TEST PROCEDURE

- a. The EUT was placed inside the environmental test chamber and powered by nominal DC 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.

#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.6.5 TEST SETUP



#### 4.6.6 EUT OPERATING CONDITION

Same as Item 4.1.6





#### 4.6.7 TEST RESULTS

OPERATING FREQUENCY: 5200MHz						LIMIT: ± 0.01%			
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	126.5	5199.949152	-0.0009778	5199.937734	-0.0011974	5199.942013	-0.0011151	5199.937081	-0.0012100
	110.0	5199.948824	-0.0009842	5199.937501	-0.0012019	5199.941833	-0.0011186	5199.937018	-0.0012112
	93.5	5199.948634	-0.0009878	5199.937828	-0.0011956	5199.942142	-0.0011127	5199.937295	-0.0012059
40	126.5	5199.949117	-0.0009785	5199.937774	-0.0011967	5199.941950	-0.0011163	5199.936872	-0.0012140
	110.0	5199.948672	-0.0009871	5199.937806	-0.0011960	5199.942068	-0.0011141	5199.936952	-0.0012125
	93.5	5199.948601	-0.0009884	5199.937917	-0.0011939	5199.942193	-0.0011117	5199.937512	-0.0012017
30	126.5	5199.949113	-0.0009786	5199.937682	-0.0011984	5199.942146	-0.0011126	5199.936923	-0.0012130
	110.0	5199.948807	-0.0009845	5199.937745	-0.0011972	5199.941994	-0.0011155	5199.936857	-0.0012143
	93.5	5199.948653	-0.0009874	5199.937808	-0.0011960	5199.942223	-0.0011111	5199.937268	-0.0012064
20	126.5	5199.948933	-0.0009821	5199.937609	-0.0011998	5199.942089	-0.0011137	5199.937082	-0.0012100
	110.0	5199.949018	-0.0009804	5199.937663	-0.0011988	5199.942144	-0.0011126	5199.936947	-0.0012126
	93.5	5199.948819	-0.0009842	5199.937707	-0.0011979	5199.941994	-0.0011155	5199.936907	-0.0012133
10	126.5	5199.948835	-0.0009839	5199.937609	-0.0011998	5199.942101	-0.0011134	5199.936804	-0.0012153
	110.0	5199.948916	-0.0009824	5199.937387	-0.0012041	5199.941881	-0.0011177	5199.936844	-0.0012145
	93.5	5199.948965	-0.0009814	5199.937670	-0.0011987	5199.942116	-0.0011132	5199.937130	-0.0012090
0	126.5	5199.949102	-0.0009788	5199.937695	-0.0011982	5199.942011	-0.0011152	5199.936979	-0.0012119
	110.0	5199.949108	-0.0009787	5199.937311	-0.0012056	5199.941966	-0.0011160	5199.936835	-0.0012147
	93.5	5199.948844	-0.0009838	5199.937405	-0.0012037	5199.941861	-0.0011181	5199.936986	-0.0012118
-10	126.5	5199.948889	-0.0009829	5199.937718	-0.0011977	5199.941999	-0.0011154	5199.936959	-0.0012123
	110.0	5199.948842	-0.0009838	5199.937850	-0.0011952	5199.941862	-0.0011180	5199.937086	-0.0012099
	93.5	5199.948669	-0.0009871	5199.937783	-0.0011965	5199.942035	-0.0011147	5199.936707	-0.0012172
-20	126.5	5199.949054	-0.0009797	5199.937726	-0.0011976	5199.941896	-0.0011174	5199.937173	-0.0012082
	110.0	5199.948858	-0.0009835	5199.937619	-0.0011996	5199.942026	-0.0011149	5199.936919	-0.0012131
	93.5	5199.948797	-0.0009847	5199.937578	-0.0012004	5199.941973	-0.0011159	5199.937130	-0.0012090
-30	126.5	5199.948894	-0.0009828	5199.937937	-0.0011935	5199.941975	-0.0011159	5199.937021	-0.0012111
	110.0	5199.949010	-0.0009806	5199.937516	-0.0012016	5199.942173	-0.0011121	5199.936700	-0.0012173
	93.5	5199.948789	-0.0009848	5199.937664	-0.0011988	5199.942013	-0.0011151	5199.936940	-0.0012127



## 4.7 BAND EDGES MEASUREMENT

### 4.7.1 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.7.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz and 300kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (Peak RBW=100kHz, VBW=300kHz; Average RBW=1MHz, VBW= 10Hz) are attached on the following pages.

### 4.7.3 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

#### 4.7.4 TEST RESULTS

For signals in the restricted bands above and below the 5.15 to 5.25GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak field strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

The spectrum plots (Peak RBW = 1MHz, VBW = 3MHz) are attached on the following pages.

#### 802.11a OFDM MODULATION

##### TEST MODE A

##### Channel 36 (5180MHz)

The band edge emission plot on the next second page shows 49.07dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 36 is 115.52dBuV/m (Peak), so the maximum field strength in restrict band is  $115.52 - 49.07 = 66.45$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next second page shows 56.79dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 36 is 104.42dBuV/m (Average), so the maximum field strength in restrict band is  $104.42 - 56.79 = 47.63$ dBuV/m which is under 54dBuV/m limit.

##### Channel 48 (5240MHz)

The band edge emission plot on the next third page shows 57.55dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 48 is 115.65dBuV/m (Peak), so the maximum field strength in restrict band is  $115.65 - 57.55 = 58.10$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next fourth page shows 60.14dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 48 is 104.51dBuV/m (Average), so the maximum field strength in restrict band is  $104.51 - 60.14 = 44.37$ dBuV/m which is under 54dBuV/m limit.

## TEST MODE B

### Channel 36 (5180MHz)

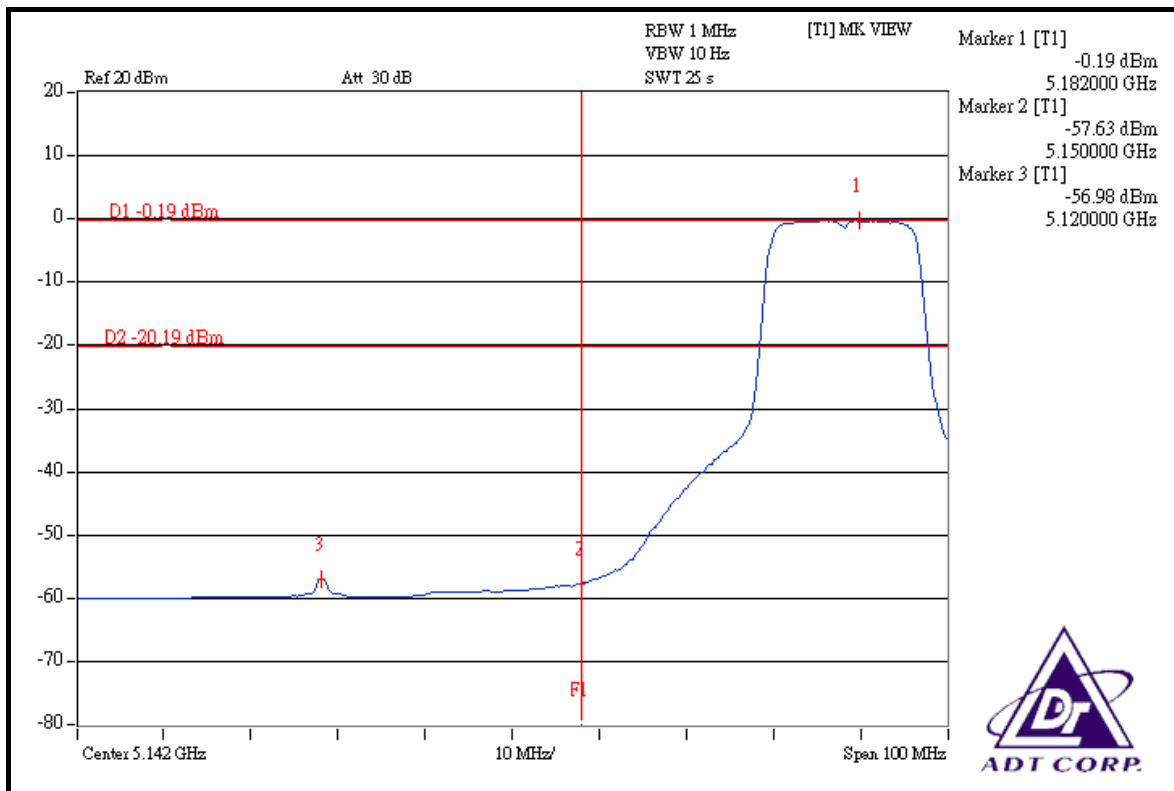
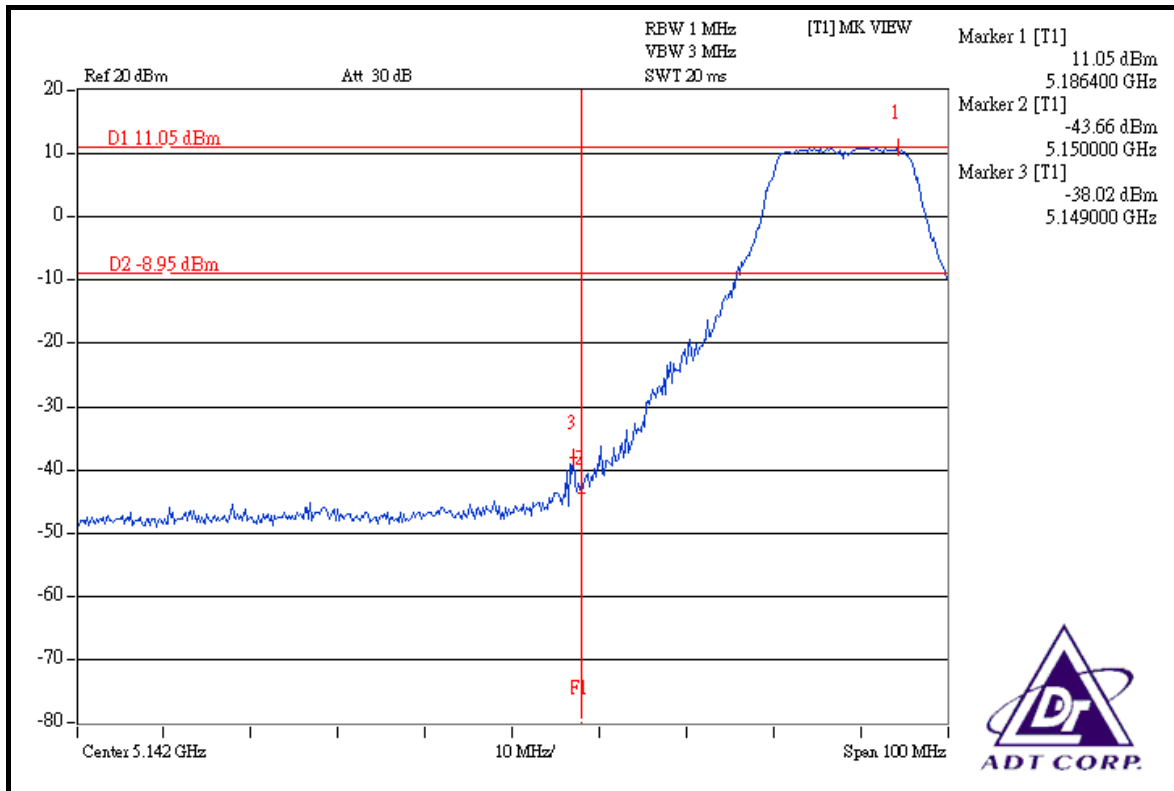
The band edge emission plot on the next page shows 49.07dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 36 is 115.69dBuV/m (Peak), so the maximum field strength in restrict band is  $115.69 - 49.07 = 66.62$ dBuV/m which is under 74dBuV/m limit.

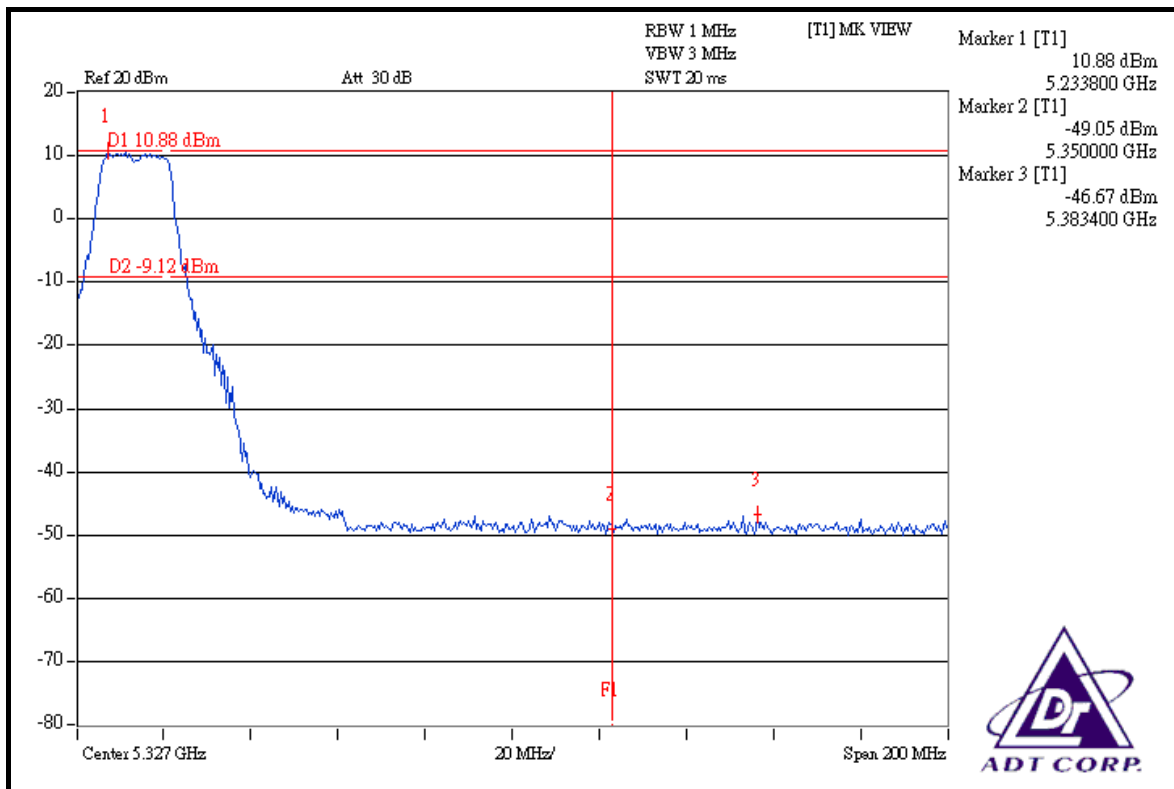
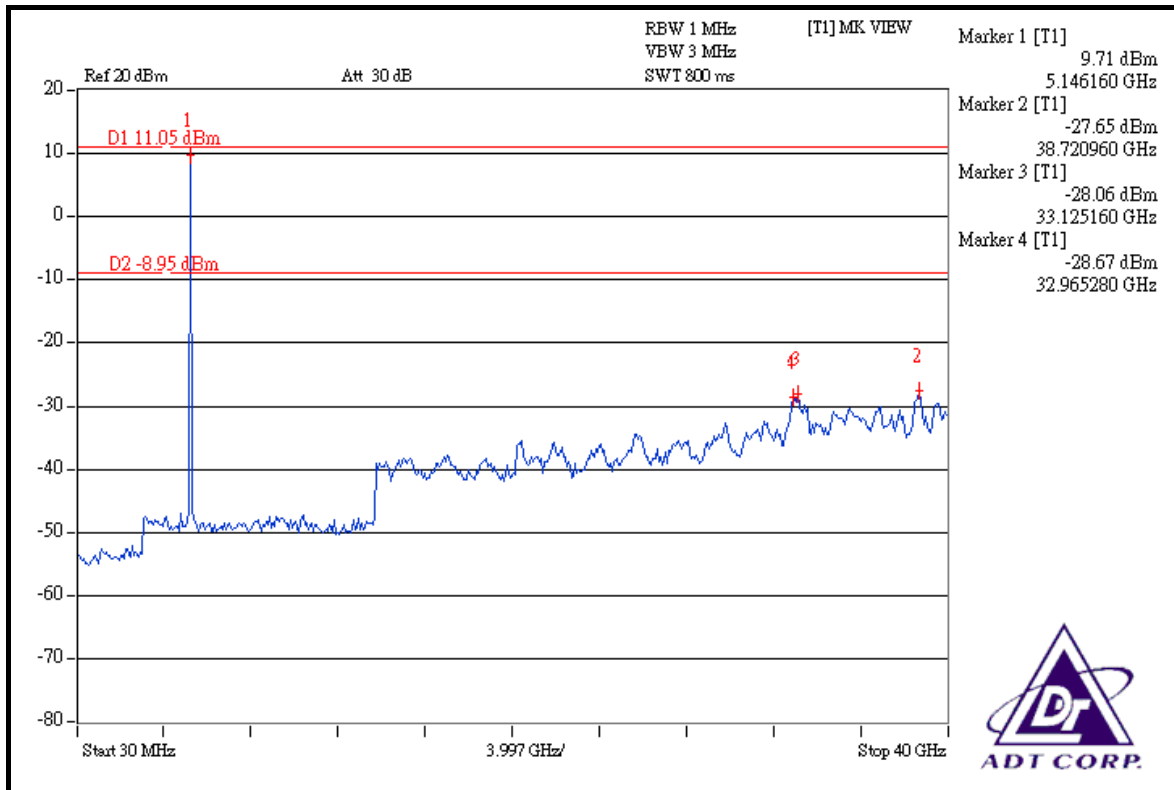
The band edge emission plot on the next page shows 56.79dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 36 is 104.99dBuV/m (Average), so the maximum field strength in restrict band is  $104.99 - 56.79 = 48.20$ dBuV/m which is under 54dBuV/m limit.

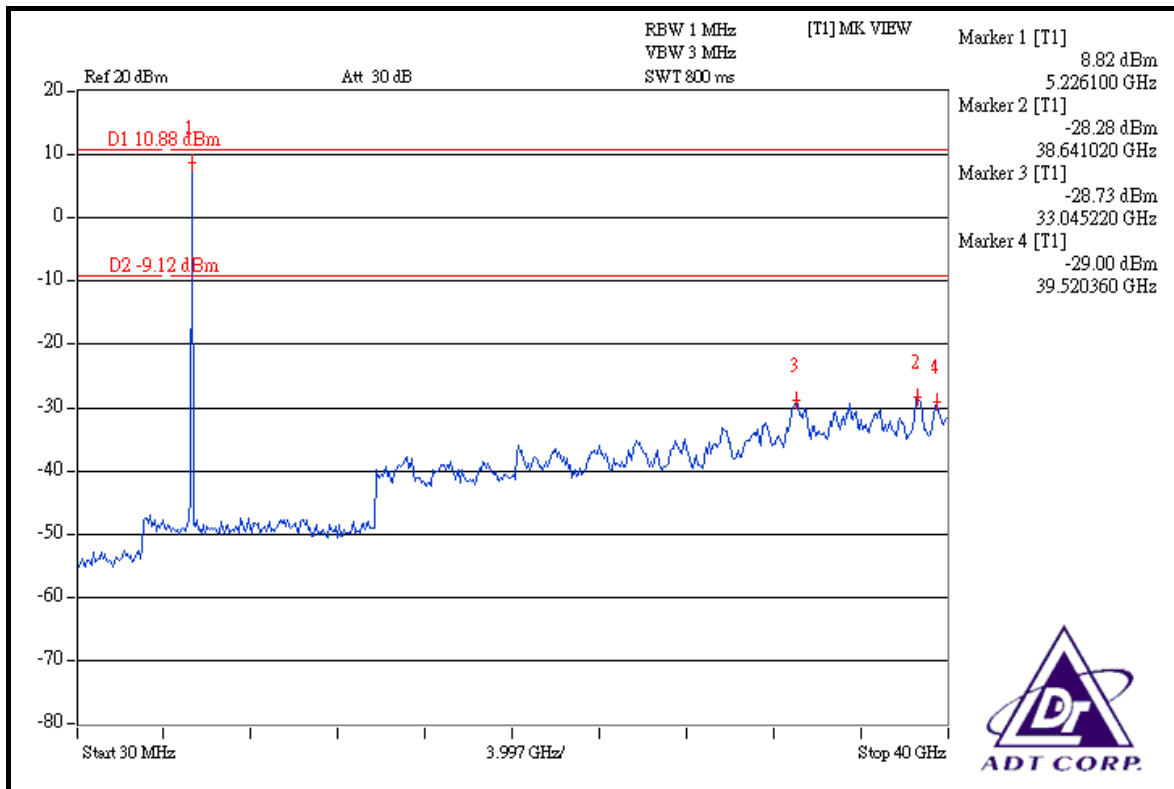
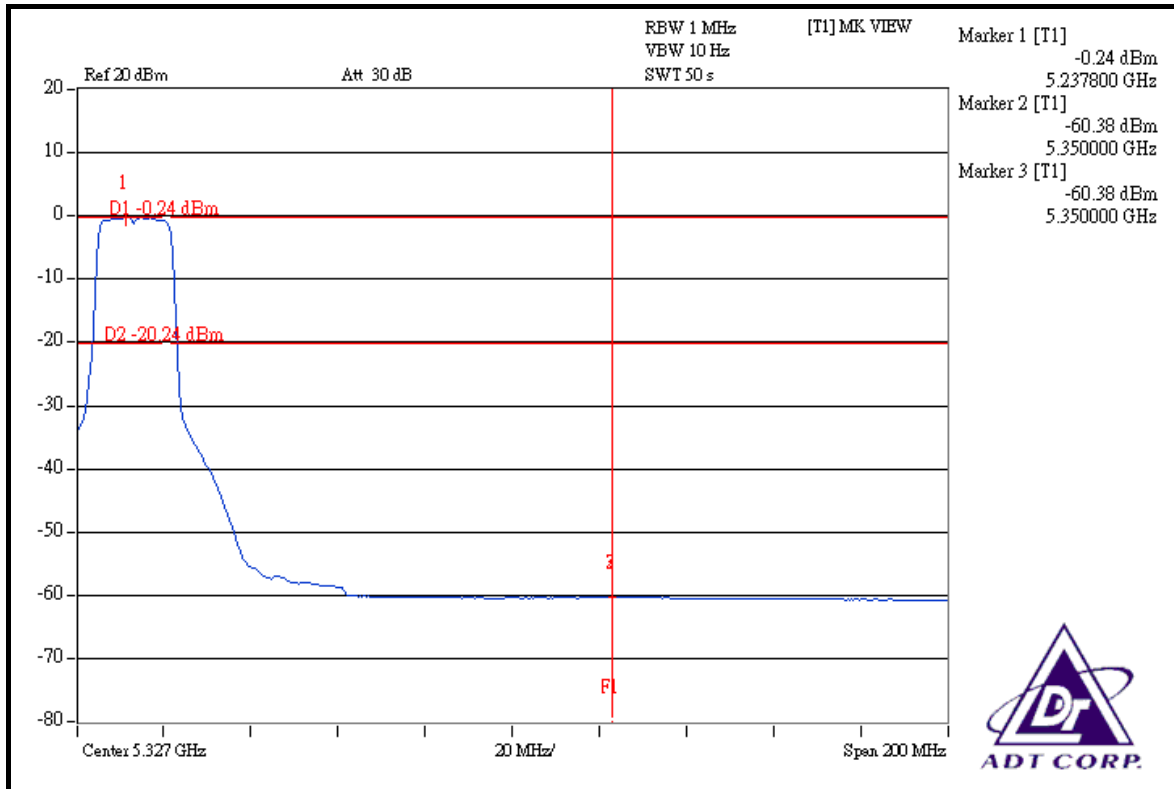
### Channel 48 (5240MHz)

The band edge emission plot on the next second page shows 57.55dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 48 is 115.41dBuV/m (Peak), so the maximum field strength in restrict band is  $115.41 - 57.55 = 57.86$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next third page shows 60.14dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 48 is 104.39dBuV/m (Average), so the maximum field strength in restrict band is  $104.39 - 60.14 = 44.25$ dBuV/m which is under 54dBuV/m limit.









## **4.8 ANTENNA REQUIREMENT**

### **4.8.1 STANDARD APPLICABLE**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.407(a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **4.8.2 ANTENNA CONNECTED CONSTRUCTION**

The antenna used in this product is Omni-directional external with N type connector. The maximum Gain of the antenna is 7.0dBi.





## **5. PHOTOGRAPHS OF THE TEST CONFIGURATION**

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



## 6. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC, UL
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA , CSA
<b>R.O.C.</b>	TAF, BSMI, NCC
<b>Netherlands</b>	Telefication
<b>Singapore</b>	GOST-ASIA(MOU)
<b>Russia</b>	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:  
[www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml). 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:**  
Tel: 886-3-5935343  
Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab:**  
Tel: 886-3-3183232  
Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://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 any modifications are made to the EUT by the lab during the test.

**---END---**