



A D T

# FCC TEST REPORT (15.247)

**REPORT NO.:** RF990203H11

**MODEL NO.:** WMP-A01

**RECEIVED:** Feb. 03, 2010

**TESTED:** Apr. 23 to 29, 2010

**ISSUED:** Jan. 14, 2011

**APPLICANT:** Alpha Networks Inc.

**ADDRESS:** No.8 Li-shing 7th Rd., Science-based  
Industrial Park, Hsinchu, Taiwan, R.O.C.

**ISSUED BY:** Bureau Veritas Consumer Products Services (H.K.)  
Ltd., Taoyuan Branch Hsin Chu Laboratory

**LAB LOCATION (1):** No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

**LAB LOCATION (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

This test report consists of 55 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by any government agencies. The test results in the report only apply to the tested sample.



A D T

## Table of Contents

1. CERTIFICATION .....	4
2. SUMMARY OF TEST RESULTS .....	5
2.1 MEASUREMENT UNCERTAINTY .....	6
3. GENERAL INFORMATION .....	7
3.1 GENERAL DESCRIPTION OF EUT .....	7
3.2 DESCRIPTION OF TEST MODES .....	9
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL .....	10
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS .....	13
3.4 DESCRIPTION OF SUPPORT UNITS .....	14
3.5 CONFIGURATION OF SYSTEM UNDER TEST .....	14
4. TEST TYPES AND RESULTS (802.11a, 5725~5850MHz Band) .....	15
4.1 CONDUCTED EMISSION MEASUREMENT .....	15
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT .....	15
4.1.2 TEST INSTRUMENTS .....	15
4.1.3 TEST PROCEDURES .....	16
4.1.4 DEVIATION FROM TEST STANDARD .....	16
4.1.5 TEST SETUP .....	17
4.1.6 EUT OPERATING CONDITIONS .....	17
4.1.7 TEST RESULTS .....	18
4.2 RADIATED EMISSION MEASUREMENT .....	20
4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT .....	20
4.2.2 TEST INSTRUMENTS .....	21
4.2.3 TEST PROCEDURES .....	22
4.2.4 DEVIATION FROM TEST STANDARD .....	22
4.2.5 TEST SETUP .....	23
4.2.6 EUT OPERATING CONDITIONS .....	23
4.2.7 TEST RESULTS .....	24
4.3 6dB BANDWIDTH MEASUREMENT .....	33
4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT .....	33
4.3.2 TEST INSTRUMENTS .....	33
4.3.3 TEST PROCEDURE .....	34
4.3.4 DEVIATION FROM TEST STANDARD .....	34
4.3.5 TEST SETUP .....	34
4.3.6 EUT OPERATING CONDITIONS .....	34
4.3.7 TEST RESULTS .....	35
4.4 MAXIMUM PEAK OUTPUT POWER .....	38
4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT .....	38
4.4.2 INSTRUMENTS .....	38
4.4.3 TEST PROCEDURES .....	38
4.4.4 DEVIATION FROM TEST STANDARD .....	38



A D T

4.4.5 TEST SETUP .....	38
4.4.6 EUT OPERATING CONDITIONS .....	38
4.4.7 TEST RESULTS .....	39
4.5 POWER SPECTRAL DENSITY MEASUREMENT .....	40
4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT .....	40
4.5.2 TEST INSTRUMENTS .....	40
4.5.3 TEST PROCEDURE .....	41
4.5.4 DEVIATION FROM TEST STANDARD .....	41
4.5.5 TEST SETUP .....	41
4.5.6 EUT OPERATING CONDITION .....	41
4.5.7 TEST RESULTS .....	42
4.6 CONDUCTED OUT-BAND EMISSION MEASUREMENT .....	45
4.6.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT .....	45
4.6.2 TEST INSTRUMENTS .....	45
4.6.3 TEST PROCEDURE .....	46
4.6.4 DEVIATION FROM TEST STANDARD .....	46
4.6.5 EUT OPERATING CONDITION .....	46
4.6.6 TEST RESULTS .....	47
5. INFORMATION ON THE TESTING LABORATORIES .....	54
6. APPENDIX-A- MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB .....	55



A D T

## 1. CERTIFICATION

**PRODUCT:** Wireless Mini PCI adapter

**BRAND NAME:** Alpha

**MODEL NO.:** WMP-A01

**TEST SAMPLE:** MASS-PRODUCTION

**TESTED:** Apr. 23 to 29, 2010

**APPLICANT:** Alpha Networks Inc.

**STANDARDS:** FCC Part 15, Subpart C (Section 15.247),  
ANSI C63.4-2003

The above equipment (Model: WMP-A01) 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** : Midoli Peng , **DATE:** Jan. 14, 2011  
( Midoli Peng, Specialist )

**TECHNICAL  
ACCEPTANCE** : Hank Chung , **DATE:** Jan. 14, 2011  
( Hank Chung, Deputy Manager )

**APPROVED BY** : May Chen , **DATE:** Jan. 14, 2011  
(May Chen, Deputy Manager )



A D T

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For 802.11a, 5725~5850MHz Band

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.247)			
Standard Section	Test Type and Limit	Result	Remark
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -25.45dB at 17.115MHz
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -0.6dB at 5135.7MHz & 5150.0MHz
15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit.
15.247(d)	Conducted Out-Band Emission Measurement Limit: 20dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is RP-N plug not a standard connector.

**NOTE:**

1. The EUT was operating in 5.15~5.25GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 5.725~5.850GHz. For the 5.15~5.25GHz RF parameters was recorded in another test report.



A D T

## 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:

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

Measurement	Value
Conducted emissions	2.45 dB
Radiated emissions (30MHz-1GHz)	3.30 dB
Radiated emissions (1GHz -18GHz)	2.19 dB
Radiated emissions (18GHz -40GHz)	2.55 dB



A D T

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Wireless Mini PCI adapter
<b>MODEL NO.</b>	WMP-A01
<b>FCC ID</b>	RRKWMAPA01A1
<b>POWER SUPPLY</b>	DC3.3V±10% and 5V±5% from host equipment
<b>MODULATION TYPE</b>	64QAM, 16QAM, QPSK, BPSK for OFDM
<b>MODULATION TECHNOLOGY</b>	OFDM
<b>TRANSFER RATE</b>	802.11a: 54/48/36/24/18/12/9/6Mbps HT20 MCS0~7 (800ns GI): 6.5Mbps, 13Mbps, 19.5Mbps, 26Mbps, 39Mbps, 52Mbps, 58.5Mbps, 65Mbps. HT20 MCS8~15 (800ns GI): 13Mbps, 26Mbps, 39Mbps, 52Mbps, 78Mbps, 104Mbps, 117Mbps, 130Mbps. HT40 MCS0~7 (800ns GI): 13.5Mbps, 27Mbps, 40.5Mbps, 54Mbps, 81Mbps, 108Mbps, 121.5Mbps, 135Mbps. HT40 MCS8~15 (800ns GI): 27Mbps, 54Mbps, 81Mbps, 108Mbps, 162Mbps, 216Mbps, 243Mbps, 270Mbps. HT20 MCS0~7 (400ns GI): 7.2Mbps, 14.4Mbps, 21.7Mbps, 28.9Mbps, 43.3Mbps, 57.8Mbps, 65.0Mbps, 72.2Mbps. HT20 MCS8~15 (400ns GI): 14.444Mbps, 28.889Mbps, 43.333Mbps, 57.778Mbps, 86.667Mbps, 115.556Mbps, 130.000Mbps, 144.444Mbps. HT40 MCS0~7 (400ns GI): 15.0Mbps, 30.0Mbps, 45.0Mbps, 60.0Mbps, 90.0Mbps, 120.0Mbps, 135.0Mbps, 150.0Mbps. HT40 MCS8~15 (400ns GI): 30.0Mbps, 60.0Mbps, 90.0Mbps, 120.0Mbps, 180.0Mbps, 240.0Mbps, 270.0Mbps, 300.0Mbps.
<b>OPERATING FREQUENCY</b>	For 15.407 802.11a: 5.18 ~ 5.24GHz For 15.247 802.11a: 5.745 ~ 5.825GHz



A D T

<b>NUMBER OF CHANNEL</b>	<b>For 15.407</b> 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
	<b>For 15.247</b> 5 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
<b>MAXIMUM OUTPUT POWER</b>	<b>For 15.407</b> 802.11a: 22.3mW 802.11n (20MHz): 42.8mW 802.11n (40MHz): 42.9mW <b>For 15.247</b> 802.11a: 729.2mW 802.11n (20MHz): 973.5mW 802.11n (40MHz): 905.0mW
<b>ANTENNA TYPE</b>	Please see note 1
<b>ANTENNA CONNECTOR</b>	Please see note 1
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	NA
<b>ASSOCIATED DEVICES</b>	NA

**NOTE:**

1. There are two antennas provided to this EUT, please refer to the following table:

Chain	Manufacture	Model	Gain (dBi)	Cable Loss(dB)	Net Gain (dBi)	Cable Length (cm)	Antenna Type	Connector
Chain (0) Antenna (1)	Grand-Tek	R-SA64G7210180C	7	1) 3 2) 2.4	1) 4 2) 4.6	1) 20 2) 20	Dipole	RP-N plug
Chain (1) Antenna (2)	Grand-Tek	R-SA64G7210380C	7	1) 3.3 2) 3.0	1) 3.7 2) 4	1) 40 2) 40	Dipole	RP-N plug

The EUT was pre-tested with above antennas, the worse case was found in antenna gain < 2)4.6dBi > and gain < 2)4dBi >.

2. The EUT incorporates a MIMO function with 802.11n. Physically, the EUT provides two completed transmitters and two completed receivers.
3. The EUT is 2 \* 2 spatial MIMO (2Tx & 2Rx) without beam forming function. The antenna configurations are two transmitter antennas and two receiver antennas, as there are 2 Dipole antennas. Spatial multiplexing modes for simultaneous transmission using 2 antennas, and for simultaneous receiver using 2 antennas.



A D T

4. The EUT complies with 802.11n standards and backwards compatible with 802.11a products.
5. 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

#### Operated in 5725 ~ 5850MHz band:

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz		

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

CHANNEL	FREQUENCY
151	5755 MHz
159	5795 MHz



A D T

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	PLC	RE < 1G	RE ≥ 1G	APCM	
-	√	√	√	√	-

Where **PLC**: Power Line Conducted Emission **RE < 1G**: Radiated Emission below 1GHz

**RE ≥ 1G**: Radiated Emission above 1GHz

**APCM**: Antenna Port Conducted Measurement

### ANTENNA COMBINATION MODE:

COMBINATION MODE	OPERATION MODE	TX CHAIN(0)	TX CHAIN(1)
A	802.11 a	√	√
B	802.11n(20MHz) for MCS0~7, 800nsGI	√	√
C	802.11n(20MHz) for MCS8~15, 800nsGI	√	√
D	802.11n(40MHz) for MCS0~7, 800nsGI	√	√
E	802.11n(40MHz) for MCS8~15, 800nsGI	√	√
F	802.11n(20MHz) for MCS0~7, 400nsGI	√	√
G	802.11n(20MHz) for MCS8~15, 400nsGI	√	√
H	802.11n(40MHz) for MCS0~7, 400nsGI	√	√
I	802.11n(40MHz) for MCS8~15, 400nsGI	√	√

#### Note:

1. The above information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
2. Mode A, B and D the worst modes, were selected as representative mode for the report.



A D T

**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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	TX COMBINATION
802.11n (20MHz)	149 to 165	149	OFDM	BPSK	6.5	B

**RADIATED EMISSION TEST (BELOW 1 GHz):**

- 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	TX COMBINATION
802.11n (20MHz)	149 to 165	149	OFDM	BPSK	6.5	B

**RADIATED EMISSION TEST (ABOVE 1 GHz):**

- 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	TX COMBINATION
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6	A
802.11n (20MHz)	149 to 165	149, 157, 165	OFDM	BPSK	6.5	B
802.11n (40MHz)	151 to 159	151, 159	OFDM	BPSK	13.5	D



A D T

### **CONDUCTED OUT-BAND EMISSION 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	TX COMBINATION
802.11a	149 to 165	149, 165	OFDM	BPSK	6	A
802.11n (20MHz)	149 to 165	149, 165	OFDM	BPSK	6.5	B
802.11n (40MHz)	151 to 159	151, 159	OFDM	BPSK	13.5	D

※ After verification, conducted out band emission as show worst chain in report by investigations.

### **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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	TX COMBINATION
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6	A
802.11n (20MHz)	149 to 165	149, 157, 165	OFDM	BPSK	6.5	B
802.11n (40MHz)	151 to 159	151, 159	OFDM	BPSK	13.5	D

※ After verification, bandwidth as show worst chain in report by investigations.

### **TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	20deg. C, 73%RH, 1014 hPa	120Vac, 60Hz	Eric Lee
RE<1G	21deg. C, 71%RH, 1014 hPa	120Vac, 60Hz	Eric Lee
PLC	23deg. C, 75%RH, 1014 hPa	120Vac, 60Hz	Leo Peng
APCM	21deg. C, 67%RH, 1014 hPa	120Vac, 60Hz	Rex Huang



A D T

### **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 C. (15.247)**

**ANSI C63.4-2003**

All test items have been performed and recorded as per the above standards.



A D T

### 3.4 DESCRIPTION OF SUPPORT UNITS

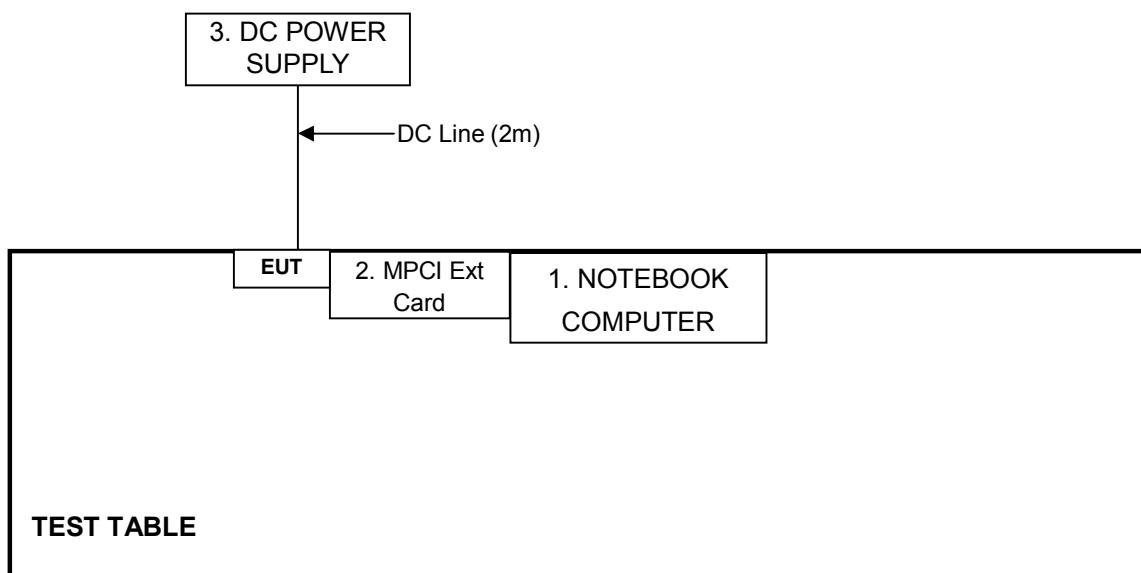
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	MPCI Ext Card	NA	NA	NA	NA
3	DC POWER SUPPLY	Topward	6603D	795558	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
3	NA

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

### 3.5 CONFIGURATION OF SYSTEM UNDER TEST





A D T

## 4. TEST TYPES AND RESULTS (802.11a, 5725~5850MHz Band)

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 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 0.50 MHz.  
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.

#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 09, 2010	Mar. 08, 2011
Line-Impedance Stabilization Network (for EUT)	NSLK 8127	8127-522	Sep. 23, 2009	Sep. 22, 2010
Line-Impedance Stabilization Network (for Peripheral)	ESH3-Z5	848773/004	Oct. 26, 2009	Oct. 25, 2010
RF Cable (JYEBAO)	5DFB	COBCAB-001	Nov. 24, 2009	Nov. 23, 2010
50 ohms Terminator	50	3	Oct. 28, 2009	Oct. 27, 2010
Software	BV ADT_Cond_V7.3.7	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 Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.



A D T

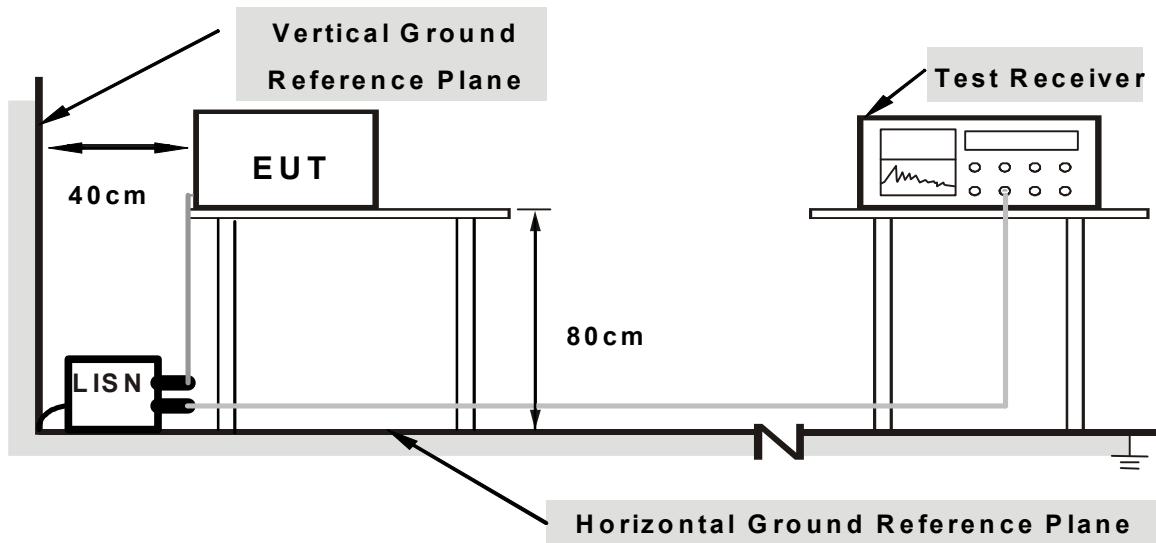
#### 4.1.3 TEST PROCEDURES

- 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) were not recorded.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.5 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 related item – Photographs of the Test Configuration.

#### 4.1.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which placed on a testing table.
2. The communication partner run test program “ART v9b21” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

## 4.1.7 TEST RESULTS

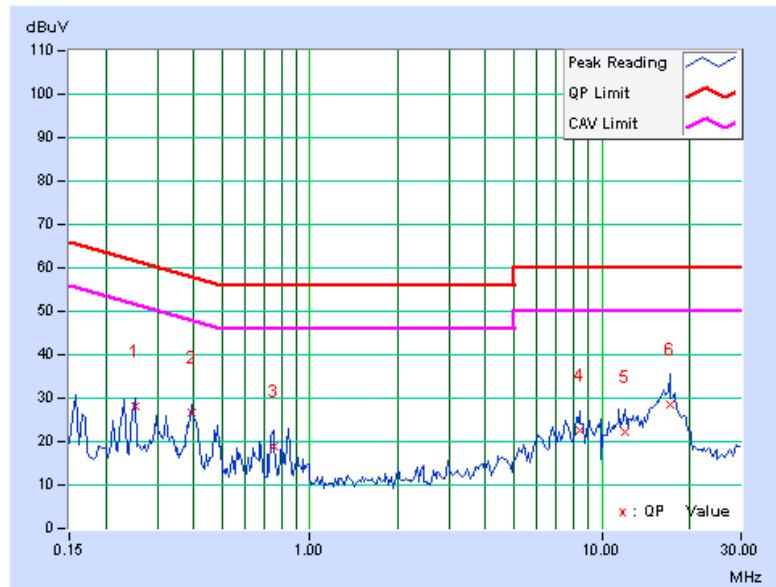
## 802.11a OFDM MODULATION:

PHASE	Line (L)	6dB BANDWIDTH	9 kHz
-------	----------	---------------	-------

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	Factor		[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.252	0.05	28.08	20.70	28.13	20.75	61.71	51.71	-33.57	-30.95
2	0.392	0.06	26.56	14.11	26.62	14.17	58.02	48.02	-31.40	-33.85
3	0.752	0.08	18.65	15.30	18.73	15.38	56.00	46.00	-37.27	-30.62
4	8.406	0.31	22.13	19.53	22.44	19.84	60.00	50.00	-37.56	-30.16
5	11.945	0.38	22.01	18.58	22.39	18.96	60.00	50.00	-37.61	-31.04
<b>6</b>	<b>17.115</b>	<b>0.46</b>	<b>28.17</b>	<b>24.09</b>	<b>28.63</b>	<b>24.55</b>	<b>60.00</b>	<b>50.00</b>	<b>-31.37</b>	<b>-25.45</b>

**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.





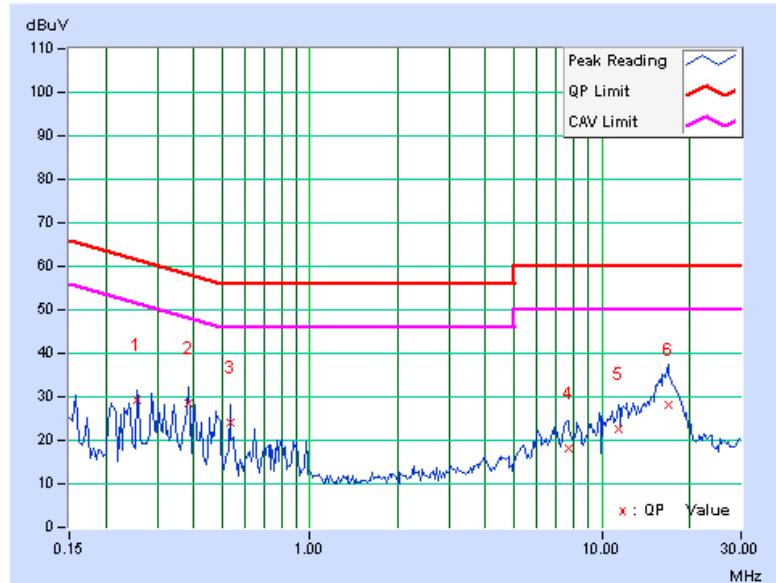
A D T

PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz
-------	-------------	---------------	-------

No	Freq. [MHz]	Corr. (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]
1	0.255	0.06	29.06	21.04	29.12	21.10	61.58	51.58	-32.45	-30.47
2	0.384	0.07	28.37	19.27	28.44	19.34	58.18	48.18	-29.75	-28.85
3	0.533	0.08	24.07	15.86	24.15	15.94	56.00	46.00	-31.85	-30.06
4	7.660	0.30	18.01	15.29	18.31	15.59	60.00	50.00	-41.69	-34.41
5	11.393	0.38	22.15	19.78	22.53	20.16	60.00	50.00	-37.47	-29.84
6	16.941	0.47	27.78	21.54	28.25	22.01	60.00	50.00	-31.75	-27.99

**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.





## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 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 (dB<sub>u</sub>V/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.



#### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250253	Aug. 03, 2009	Aug. 02, 2010
Agilent Pre-Selector	N9039A	MY46520311	Aug. 17, 2009	Aug. 16, 2010
Agilent Signal Generator	N5181A	MY49060517	July 20, 2009	July 19, 2010
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-03	Nov. 18, 2009	Nov. 17, 2010
Agilent Pre-Amplifier	8449B	3008A02578	July 06, 2009	July 05, 2010
Miteq Pre-Amplifier	AFS33-1800265 0-30-8P-44	881786	NA	NA
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Sep. 30, 2009	Sep. 29, 2010
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 16, 2009	Nov. 15, 2010
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Sep. 30, 2009	Sep. 29, 2010
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 24, 2009	Dec. 23, 2010
RF Cable	NA	CHGCAB_001	NA	NA
Software	ADT_Radiated_V8.7.05	NA	NA	NA
CT Antenna Tower & Turn Table	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.  
3. The test was performed in 966 Chamber No. G.  
4. The FCC Site Registration No. is 656396.  
5. The VCCI Site Registration No. is R-1626.  
6. The CANADA Site Registration No. is IC 7450G-3.



A D T

#### 4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. 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.

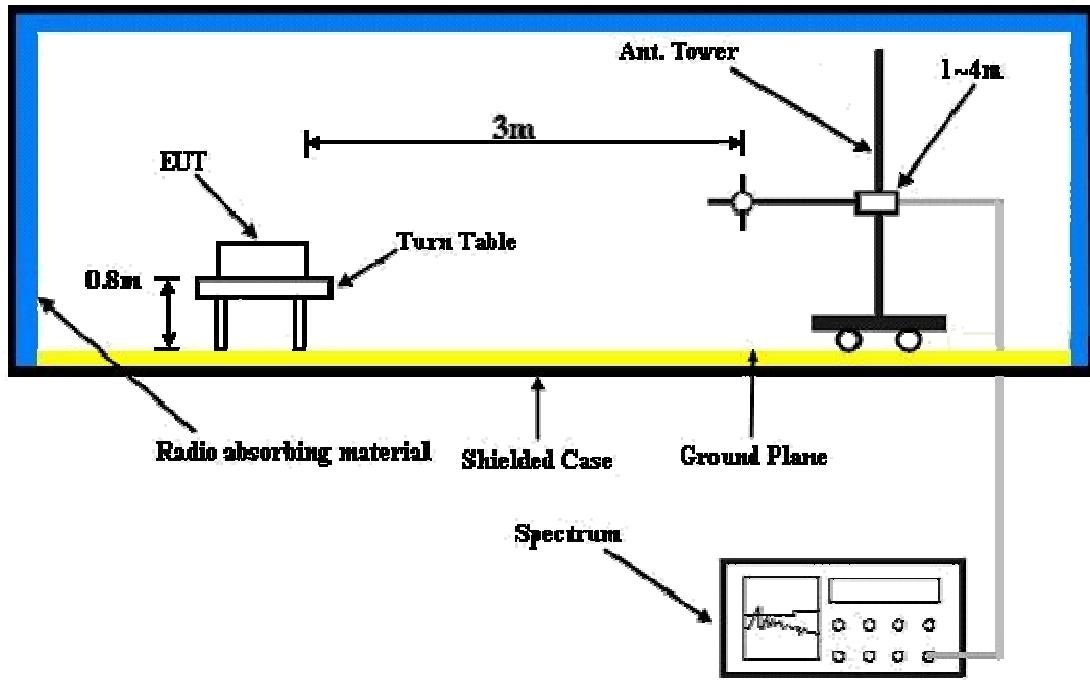
##### NOTE:

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 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.2.6 EUT OPERATING CONDITIONS

Same as the 4.1.6



A D T

#### 4.2.7 TEST RESULTS

##### BELOW 1GHz WORST-CASE DATA : 802.11n (20MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 149		FREQUENCY RANGE Below 1000MHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Quasi-Peak
ENVIRONMENTAL CONDITIONS		21deg. C, 71%RH 1014 hPa		TESTED BY Eric Lee

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	215.00	33.2 QP	43.5	-10.3	1.25 H	45	21.93	11.27
2	233.02	34.9 QP	46.0	-11.2	1.50 H	236	22.76	12.09
3	310.89	39.1 QP	46.0	-6.9	1.65 H	25	24.36	14.74
4	322.03	41.0 QP	46.0	-5.0	1.25 H	24	25.97	15.03
5	351.60	38.0 QP	46.0	-8.0	1.68 H	96	22.18	15.82
6	565.00	35.2 QP	46.0	-10.8	1.50 H	326	14.32	20.88
7	592.30	36.2 QP	46.0	-9.8	1.32 H	62	14.68	21.56
8	618.10	37.5 QP	46.0	-8.5	1.69 H	96	15.51	21.99
9	744.03	30.3 QP	46.0	-15.7	1.50 H	245	6.45	23.85
10	949.03	33.3 QP	46.0	-12.8	1.95 H	32	6.73	26.52

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	210.74	29.6 QP	43.5	-13.9	2.00 V	154	18.52	11.08
2	232.74	30.2 QP	46.0	-15.8	1.09 V	25	18.17	12.07
3	304.65	32.6 QP	46.0	-13.4	1.04 V	21	17.99	14.57
4	322.00	35.0 QP	46.0	-11.0	1.95 V	32	20.00	15.03
5	365.21	31.9 QP	46.0	-14.1	1.00 V	47	15.72	16.17
6	564.35	33.3 QP	46.0	-12.7	1.54 V	26	12.40	20.86
7	608.75	35.6 QP	46.0	-10.4	1.54 V	89	13.75	21.87
8	621.34	33.0 QP	46.0	-13.0	1.00 V	139	10.99	22.03
9	747.96	32.6 QP	46.0	-13.4	1.00 V	3	8.69	23.91
10	848.01	31.3 QP	46.0	-14.8	1.56 V	63	5.82	25.43

**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.



A D T

## ABOVE 1GHz DATA

## 802.11a OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 40GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		TESTED BY		Eric Lee

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	5141.00	55.1 PK	74.0	-18.9	1.20 H	84	15.17	39.92
2	5141.00	46.1 AV	54.0	-7.9	1.20 H	84	6.19	39.92
3	*5745.00	103.0 PK			1.19 H	131	61.42	41.56
4	*5745.00	91.7 AV			1.19 H	131	50.11	41.56
5	11490.00	59.7 PK	74.0	-14.3	1.39 H	209	11.95	47.71
6	11490.00	48.3 AV	54.0	-5.7	1.39 H	209	0.63	47.71
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	5141.00	65.0 PK	74.0	-9.0	1.10 V	40	25.07	39.92
2	5141.00	52.8 AV	54.0	-1.2	1.10 V	40	12.90	39.92
3	*5745.00	120.5 PK			1.10 V	187	78.93	41.56
4	*5745.00	109.2 AV			1.10 V	187	67.66	41.56
5	11490.00	63.2 PK	74.0	-10.8	1.17 V	257	15.47	47.71
6	11490.00	50.7 AV	54.0	-3.3	1.17 V	257	2.95	47.71

**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 limit value is defined as per 15.247.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 157		FREQUENCY RANGE 1 ~ 40GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		20deg. C, 73%RH 1014 hPa		TESTED BY Eric Lee

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	5135.70	57.1 PK	74.0	-16.9	1.69 H	350	17.18	39.90
2	5135.70	47.2 AV	54.0	-6.8	1.69 H	350	7.32	39.90
3	*5785.00	103.1 PK			1.20 H	111	61.43	41.68
4	*5785.00	91.9 AV			1.20 H	111	50.26	41.68
5	11570.00	60.1 PK	74.0	-13.9	1.32 H	256	12.36	47.75
6	11570.00	49.6 AV	54.0	-4.4	1.32 H	256	1.82	47.75
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	5135.70	65.3 PK	74.0	-8.7	1.09 V	39	25.38	39.90
2	<b>5135.70</b>	<b>53.4 AV</b>	<b>54.0</b>	<b>-0.6</b>	<b>1.09 V</b>	<b>39</b>	<b>13.50</b>	<b>39.90</b>
3	*5785.00	120.1 PK			1.11 V	198	78.40	41.68
4	*5785.00	109.3 AV			1.11 V	198	67.60	41.68
5	11570.00	64.5 PK	74.0	-9.5	1.20 V	292	16.76	47.75
6	11570.00	52.1 AV	54.0	-1.9	1.20 V	292	4.36	47.75

**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 limit value is defined as per 15.247.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 165		FREQUENCY RANGE 1 ~ 40GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		20deg. C, 73%RH 1014 hPa		TESTED BY Eric Lee

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	5137.20	59.8 PK	74.0	-14.2	1.11 H	48	19.91	39.91
2	5137.20	46.8 AV	54.0	-7.2	1.11 H	48	6.93	39.91
3	*5825.00	103.0 PK			1.25 H	275	61.21	41.78
4	*5825.00	91.5 AV			1.25 H	275	49.72	41.78
5	11650.00	61.5 PK	74.0	-12.6	1.28 H	288	13.63	47.82
6	11650.00	49.9 AV	54.0	-4.1	1.28 H	288	2.05	47.82
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	5137.20	64.9 PK	74.0	-9.1	1.10 V	40	24.98	39.91
2	5137.20	52.5 AV	54.0	-1.6	1.10 V	40	12.54	39.91
3	*5825.00	119.4 PK			1.15 V	199	77.66	41.78
4	*5825.00	107.1 AV			1.15 V	199	65.30	41.78
5	11650.00	64.3 PK	74.0	-9.7	1.18 V	266	16.46	47.82
6	11650.00	50.9 AV	54.0	-3.1	1.18 V	266	3.07	47.82

**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 limit value is defined as per 15.247.



A D T

## 802.11n (20MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 149		FREQUENCY RANGE 1 ~ 40GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		20deg. C, 73%RH 1014 hPa		TESTED BY Eric Lee

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	5140.00	59.6 PK	74.0	-14.4	1.46 H	298	19.66	39.91
2	5140.00	46.2 AV	54.0	-7.8	1.46 H	298	6.31	39.91
3	*5745.00	102.0 PK			1.69 H	28	60.43	41.56
4	*5745.00	90.7 AV			1.69 H	28	49.09	41.56
5	11490.00	59.7 PK	74.0	-14.3	1.50 H	205	12.03	47.71
6	11490.00	46.8 AV	54.0	-7.2	1.50 H	205	-0.95	47.71
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	5140.00	65.8 PK	74.0	-8.3	1.10 V	44	25.84	39.91
2	5140.00	53.0 AV	54.0	-1.0	1.10 V	44	13.08	39.91
3	*5745.00	120.7 PK			1.11 V	40	79.12	41.56
4	*5745.00	109.1 AV			1.11 V	40	67.55	41.56
5	11490.00	64.3 PK	74.0	-9.7	1.48 V	127	16.62	47.71
6	11490.00	50.5 AV	54.0	-3.5	1.48 V	127	2.77	47.71

**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 limit value is defined as per 15.247.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 157		FREQUENCY RANGE 1 ~ 40GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		20deg. C, 73%RH 1014 hPa		TESTED BY Eric Lee

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	58.7 PK	74.0	-15.3	1.57 H	304	18.75	39.94
2	5150.00	46.8 AV	54.0	-7.2	1.57 H	304	6.85	39.94
3	*5785.00	103.6 PK			1.73 H	84	61.93	41.68
4	*5785.00	92.5 AV			1.73 H	84	50.77	41.68
5	11570.00	60.1 PK	74.0	-13.9	1.58 H	2	12.35	47.75
6	11570.00	47.7 AV	54.0	-6.3	1.58 H	2	-0.06	47.75
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	66.1 PK	74.0	-7.9	1.11 V	50	26.17	39.94
2	<b>5150.00</b>	<b>53.4 AV</b>	<b>54.0</b>	<b>-0.6</b>	<b>1.11 V</b>	<b>50</b>	<b>13.44</b>	<b>39.94</b>
3	*5785.00	120.6 PK			1.09 V	63	78.90	41.68
4	*5785.00	110.3 AV			1.09 V	63	68.61	41.68
5	11570.00	64.3 PK	74.0	-9.7	1.65 V	77	16.54	47.75
6	11570.00	51.3 AV	54.0	-2.7	1.65 V	77	3.54	47.75

**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 limit value is defined as per 15.247.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 165		FREQUENCY RANGE 1 ~ 40GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		20deg. C, 73%RH 1014 hPa		TESTED BY Eric Lee

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	5137.80	57.2 PK	74.0	-16.8	1.68 H	222	17.31	39.91
2	5137.80	47.0 AV	54.0	-7.0	1.68 H	222	7.08	39.91
3	*5825.00	102.2 PK			1.67 H	58	60.44	41.78
4	*5825.00	91.7 AV			1.67 H	58	49.91	41.78
5	11650.00	59.9 PK	74.0	-14.1	1.76 H	114	12.04	47.82
6	11650.00	48.3 AV	54.0	-5.7	1.76 H	114	0.45	47.82
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	5137.80	65.8 PK	74.0	-8.2	1.11 V	48	25.86	39.91
2	5137.80	52.9 AV	54.0	-1.1	1.11 V	48	12.95	39.91
3	*5825.00	119.4 PK			1.14 V	71	77.60	41.78
4	*5825.00	109.8 AV			1.14 V	71	68.06	41.78
5	11650.00	63.7 PK	74.0	-10.3	1.48 V	38	15.90	47.82
6	11650.00	50.7 AV	54.0	-3.3	1.48 V	38	2.84	47.82

**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 limit value is defined as per 15.247.



A D T

## 802.11n (40MHz) OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 40GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		TESTED BY		Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	60.1 PK	74.0	-13.9	1.33 H	274	20.17	39.94
2	5150.00	47.8 AV	54.0	-6.2	1.33 H	274	7.86	39.94
3	5459.00	59.8 PK	74.0	-14.2	1.46 H	80	19.08	40.76
4	5459.00	47.0 AV	54.0	-7.0	1.46 H	80	6.21	40.76
5	*5755.00	96.9 PK			1.11 H	48	55.28	41.58
6	*5755.00	86.1 AV			1.11 H	48	44.53	41.58
7	11510.00	59.2 PK	74.0	-14.8	1.69 H	158	11.50	47.72
8	11510.00	47.6 AV	54.0	-6.4	1.69 H	158	-0.10	47.72

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	64.3 PK	74.0	-9.7	1.17 V	247	24.38	39.94
2	5150.00	52.4 AV	54.0	-1.6	1.17 V	247	12.48	39.94
3	5459.00	62.8 PK	74.0	-11.2	1.06 V	111	22.06	40.76
4	5459.00	41.9 AV	54.0	-12.1	1.06 V	111	1.18	40.76
5	*5755.00	115.5 PK			1.09 V	108	73.90	41.58
6	*5755.00	103.6 AV			1.09 V	108	62.00	41.58
7	11510.00	65.7 PK	74.0	-8.3	1.28 V	69	17.97	47.72
8	11510.00	50.7 AV	54.0	-3.3	1.28 V	69	3.01	47.72

**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 limit value is defined as per 15.247.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 159		FREQUENCY RANGE 1 ~ 40GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		20deg. C, 73%RH 1014 hPa		TESTED BY Eric Lee

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	5135.00	59.6 PK	74.0	-14.4	1.69 H	50	19.67	39.90
2	5135.00	46.1 AV	54.0	-7.9	1.69 H	50	6.21	39.90
3	5459.00	60.1 PK	74.0	-13.9	1.71 H	161	19.35	40.76
4	5459.00	47.6 AV	54.0	-6.4	1.71 H	161	6.82	40.76
5	*5795.00	97.7 PK			1.12 H	60	55.99	41.70
6	*5795.00	85.4 AV			1.12 H	60	43.73	41.70
7	11590.00	58.6 PK	74.0	-15.4	1.29 H	111	10.85	47.76
8	11590.00	40.9 AV	54.0	-13.2	1.29 H	111	-6.91	47.76

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	5135.00	65.1 PK	74.0	-8.9	1.06 V	148	25.19	39.90
2	5135.00	52.6 AV	54.0	-1.4	1.06 V	148	12.71	39.90
3	5459.00	63.0 PK	74.0	-11.0	1.09 V	108	22.25	40.76
4	5459.00	51.3 AV	54.0	-2.7	1.09 V	108	10.57	40.76
5	*5795.00	115.1 PK			1.11 V	69	73.44	41.70
6	*5795.00	102.7 AV			1.11 V	69	60.99	41.70
7	11590.00	67.0 PK	74.0	-7.0	1.30 V	70	19.20	47.76
8	11590.00	51.7 AV	54.0	-2.3	1.30 V	70	3.98	47.76

**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 limit value is defined as per 15.247.



A D T

## 4.3 6dB BANDWIDTH MEASUREMENT

### 4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	E4446A	MY48250254	Aug. 03, 2009	Aug. 02, 2010

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



A D T

#### 4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 100kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

#### 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 lowest, middle and highest channel frequencies individually.



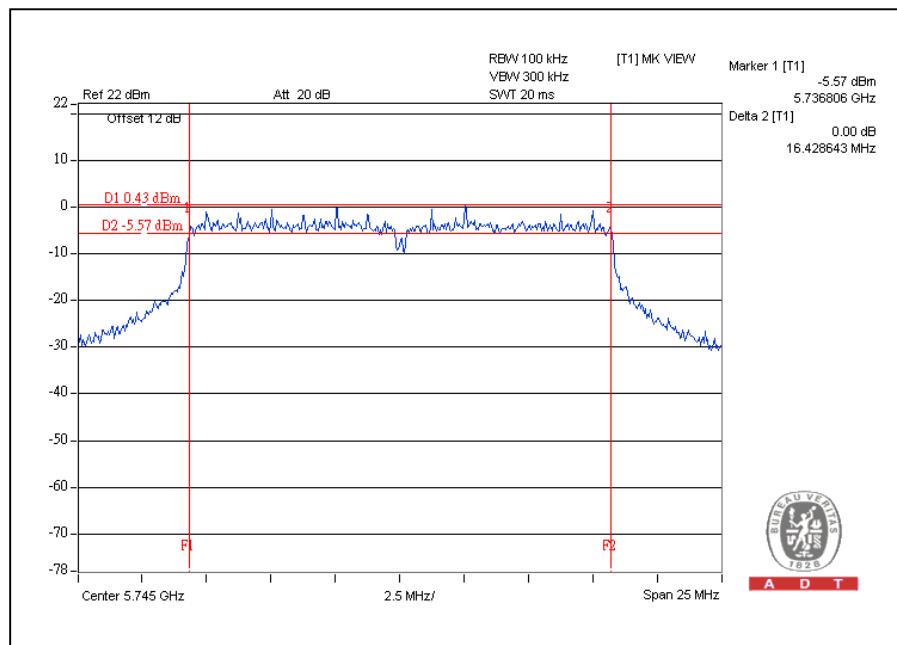
A D T

#### 4.3.7 TEST RESULTS

##### 802.11a OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
149	5745	16.42	0.5	PASS
157	5785	16.41	0.5	PASS
165	5825	16.41	0.5	PASS

CH149



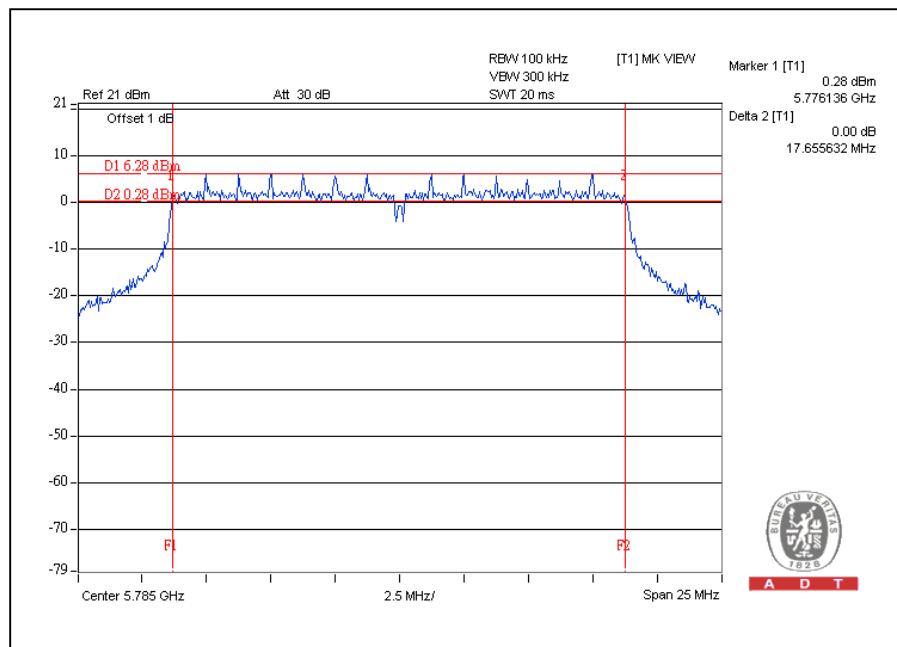


A D T

### 802.11n (20MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
149	5745	17.61	0.5	PASS
157	5785	17.65	0.5	PASS
165	5825	17.60	0.5	PASS

CH157



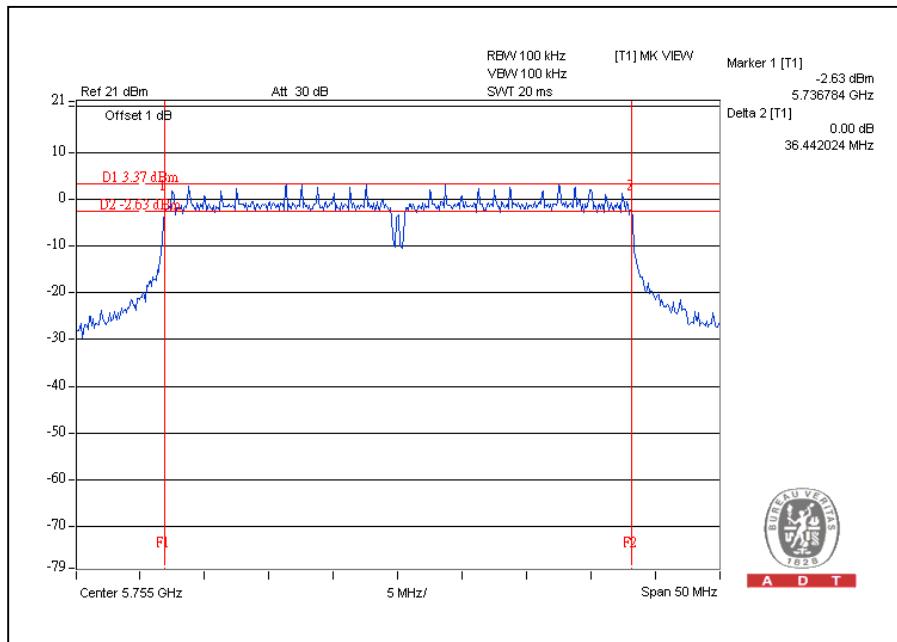


A D T

### 802.11n (40MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
151	5755	36.44	0.5	PASS
159	5795	36.43	0.5	PASS

CH151





A D T

## 4.4 MAXIMUM PEAK OUTPUT POWER

### 4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

### 4.4.2 INSTRUMENTS

Test date: Apr. 23, 2010

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Peak Power Meter	ML2495A	0824006	Apr. 25, 2009	Apr. 24, 2010
Power Sensor	MA2411B	0738172	Apr. 25, 2009	Apr. 24, 2010

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

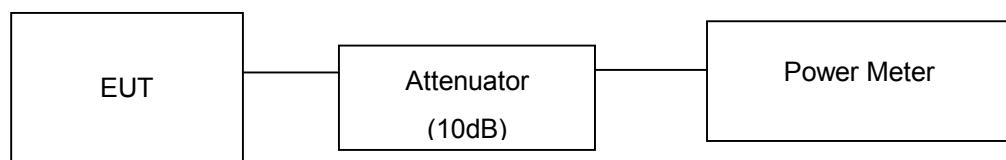
### 4.4.3 TEST PROCEDURES

1. The transmitter output was connected to the power meter through an attenuator; the bandwidth of the fundamental frequency was measured with the power meter.
2. Record the power level.

### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.4.5 TEST SETUP



### 4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6



A D T

#### 4.4.7 TEST RESULTS

##### 802.11a OFDM modulation

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)				
149	5745	25.2	26.0	729.2	28.6	28.7	PASS
157	5785	25.3	25.2	670.0	28.3	28.7	PASS
165	5825	25.3	25.3	677.7	28.3	28.7	PASS

$$\text{Directional gain} = \text{Effective Legacy Gain (dBi)} = 10 \log(10^{G1/20} + 10^{G2/20})^2 / 2$$

$$\text{Effective Legacy Gain (dBi)} = 7.3$$

The effective legacy gain is 7.3dBi, therefore the limit needs to reduce.

##### 802.11n (20MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)				
149	5745	26.4	27.3	973.5	29.9	30	PASS
157	5785	26.4	26.5	883.2	29.5	30	PASS
165	5825	26.7	26.9	957.5	29.8	30	PASS

##### 802.11n (40MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)		TOTAL PEAK POWER (mW)	TOTAL PEAK POWER (dBm)	PEAK POWER LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)				
151	5755	25.3	27.5	901.2	29.5	30	PASS
159	5795	25.8	27.2	905.0	29.6	30	PASS



A D T

## 4.5 POWER SPECTRAL DENSITY MEASUREMENT

### 4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

### 4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	E4446A	MY48250254	Aug. 03, 2009	Aug. 02, 2010

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



A D T

#### 4.5.3 TEST PROCEDURE

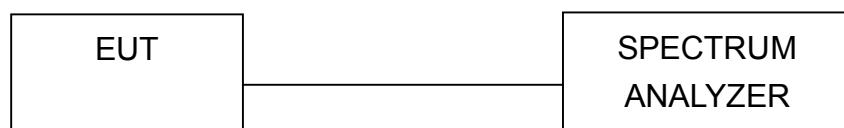
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time = span/3 kHz. The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span/3 kHz for a full response of the mixer in the spectrum analyzer.

#### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.5.5 TEST SETUP



#### 4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6



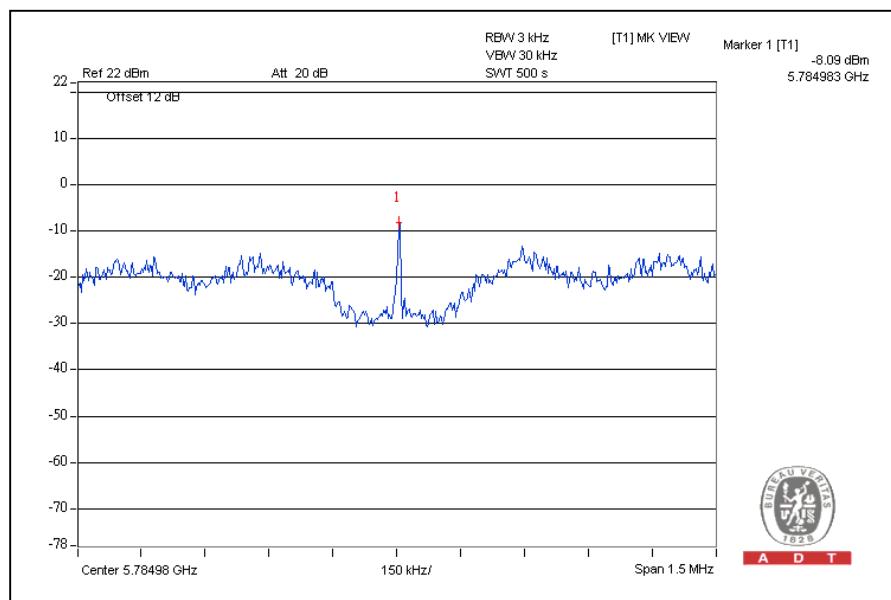
A D T

#### 4.5.7 TEST RESULTS

##### 802.11a OFDM modulation

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)			
149	5745	-11.8	-14.6	-10.0	8	PASS
157	5785	-16.4	-8.1	-7.5	8	PASS
161	5805	-15.3	-13.1	-11.1	8	PASS

For Chain(1): CH157



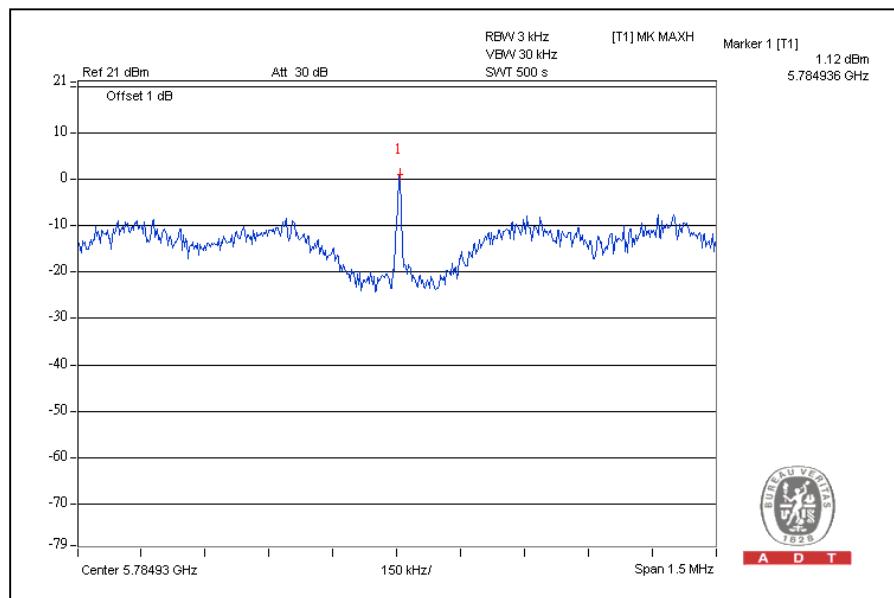


A D T

### 802.11n (20MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)			
149	5745	-7.2	-2.8	-1.5	8	PASS
157	5785	-4.4	1.1	2.2	8	PASS
161	5805	-3.8	-3.6	-0.7	8	PASS

For Chain(1): CH157



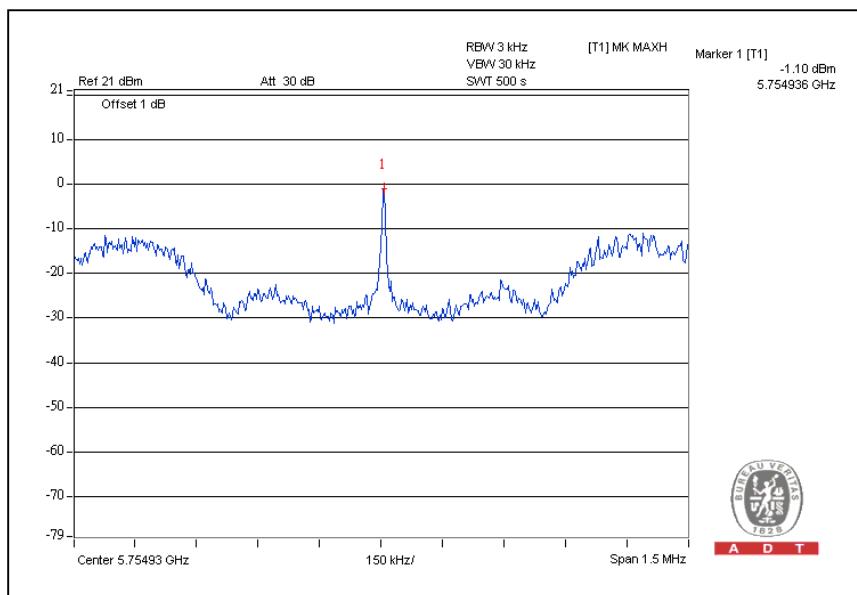


A D T

### 802.11n (40MHz) OFDM MODULATION:

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(1)			
151	5755	-5.9	-1.1	0.1	8	PASS
159	5795	-3.8	-3.4	-0.6	8	PASS

For Chain(1): CH151





A D T

## 4.6 CONDUCTED OUT-BAND EMISSION MEASUREMENT

### 4.6.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer	E4446A	MY48250254	Aug. 03, 2009	Aug. 02, 2010

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



A D T

#### 4.6.3 TEST PROCEDURE

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

#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.6.5 EUT OPERATING CONDITION

Same as Item 4.3.6



A D T

#### 4.6.6 TEST RESULTS

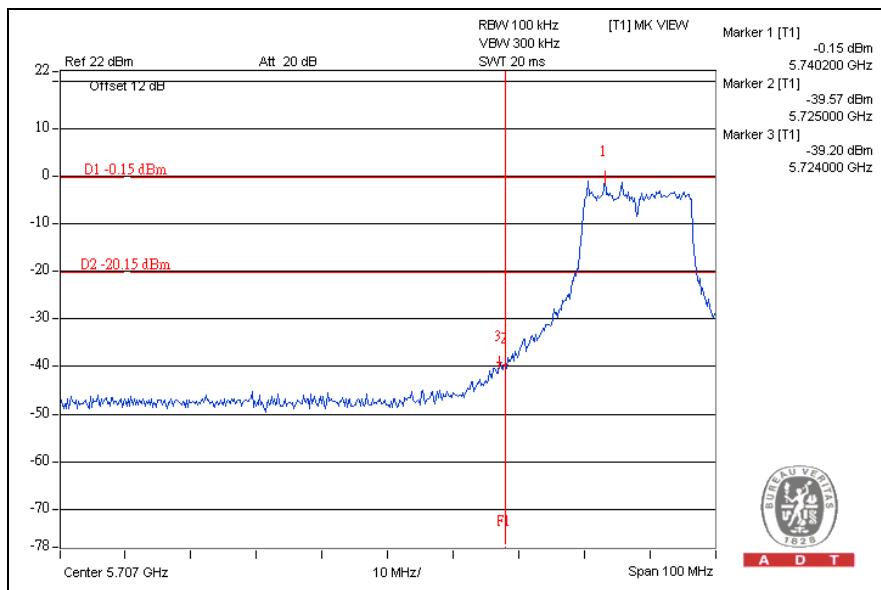
The spectrum plots are attached on the following pages. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.247(d).



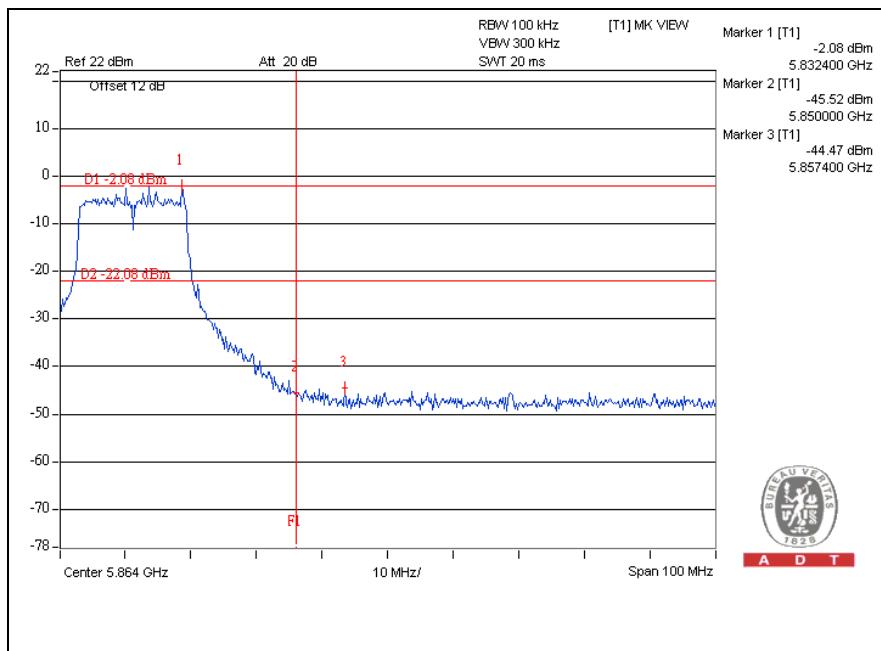
A D T

## 802.11a OFDM modulation

CH149



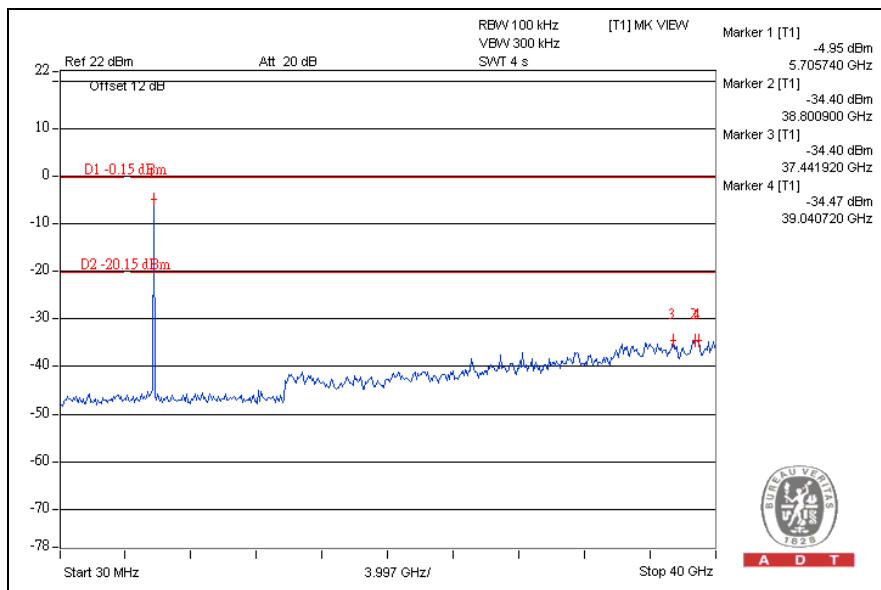
CH165



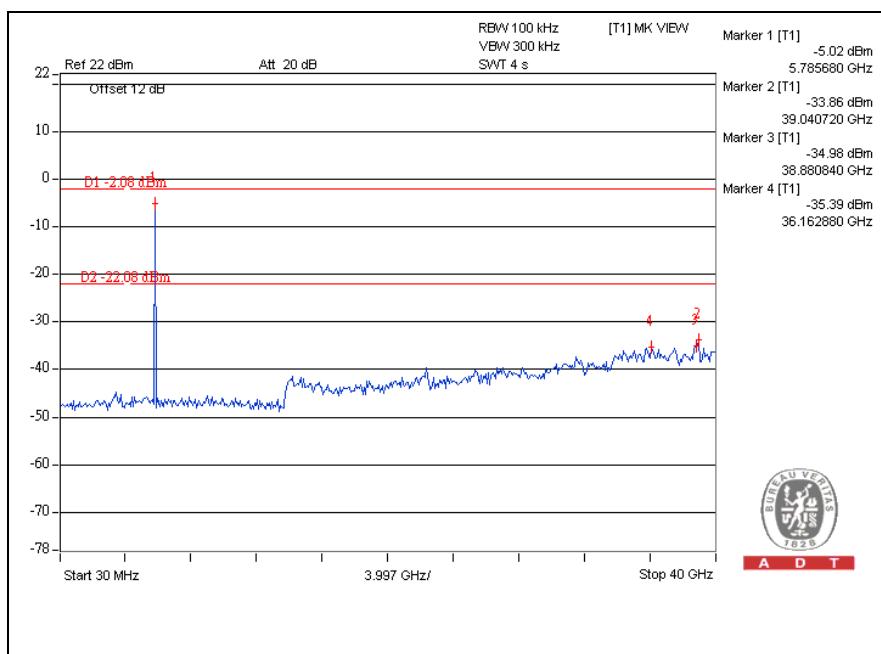


A D T

## CH149



## CH165

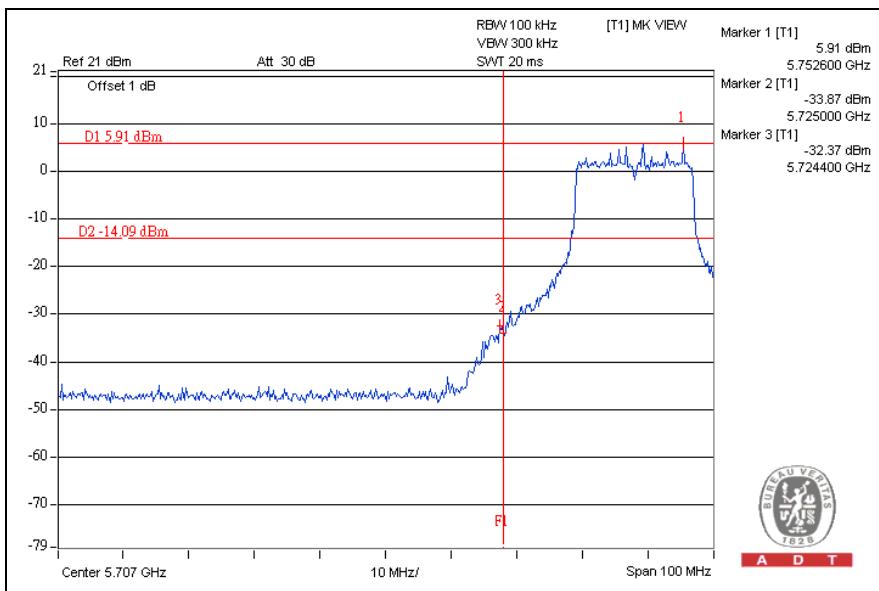




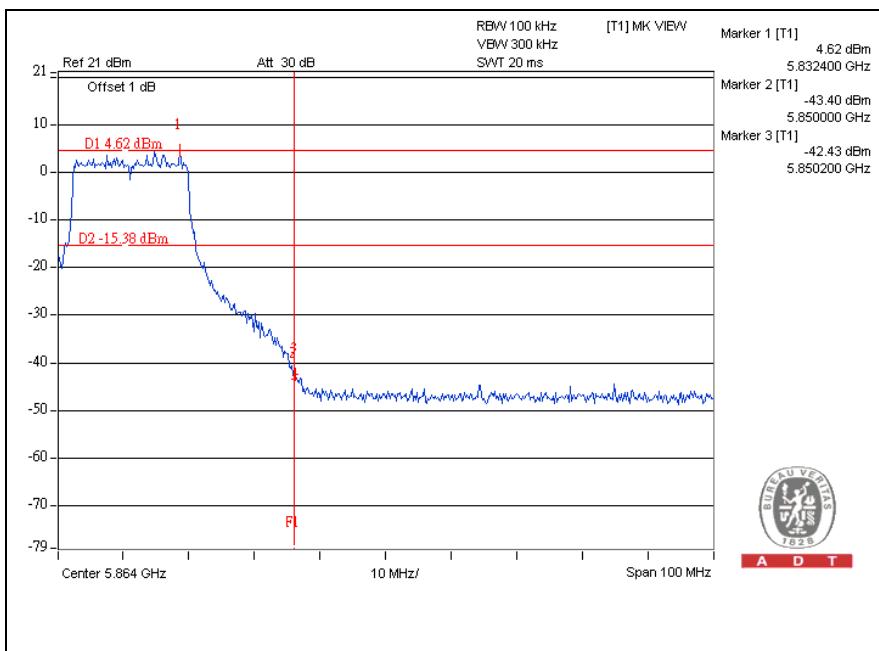
A D T

## 802.11n (20MHz) OFDM MODULATION:

CH149



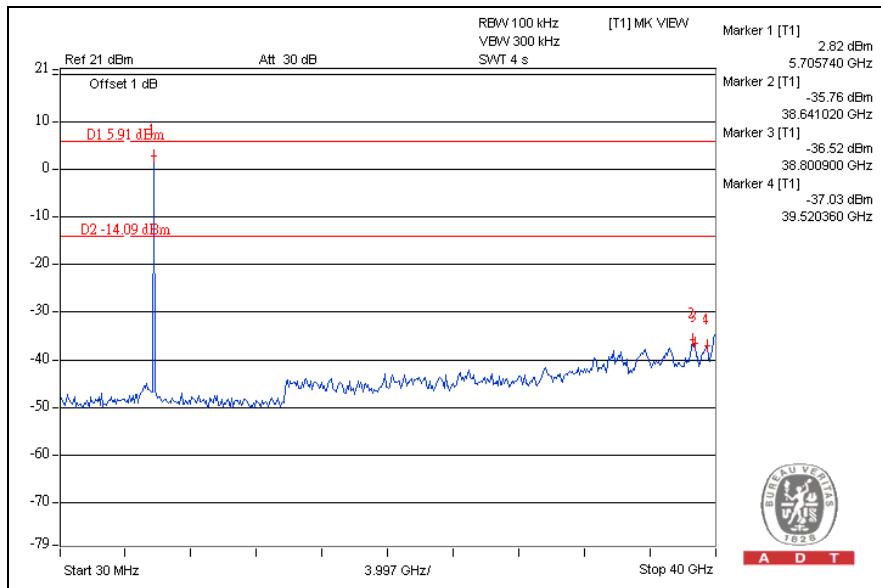
CH165



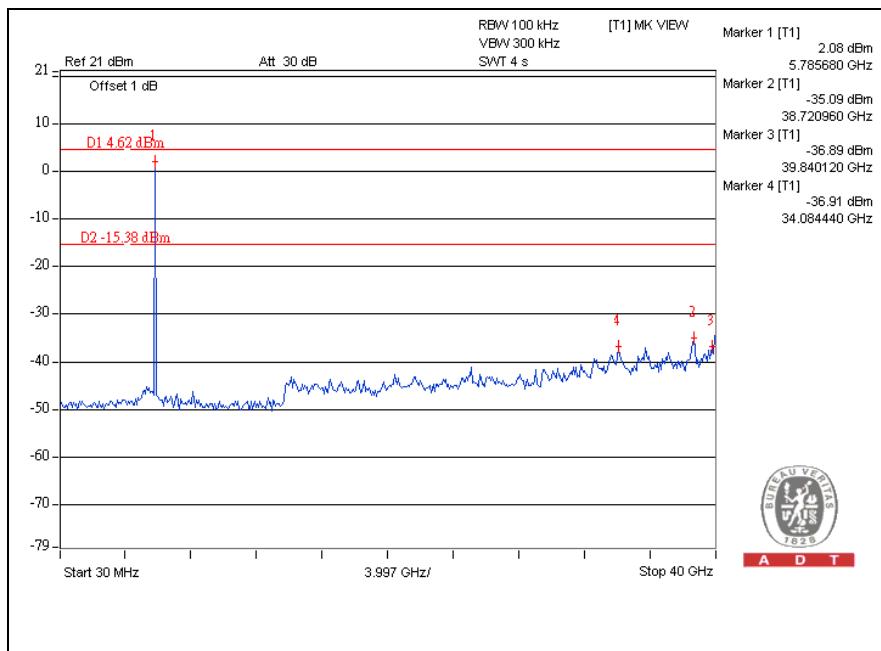


A D T

## CH149



## CH165

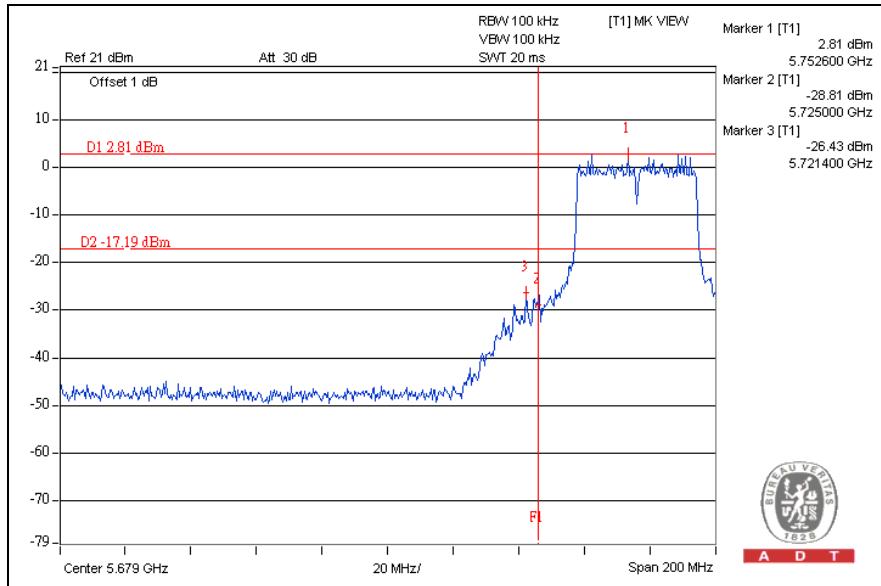




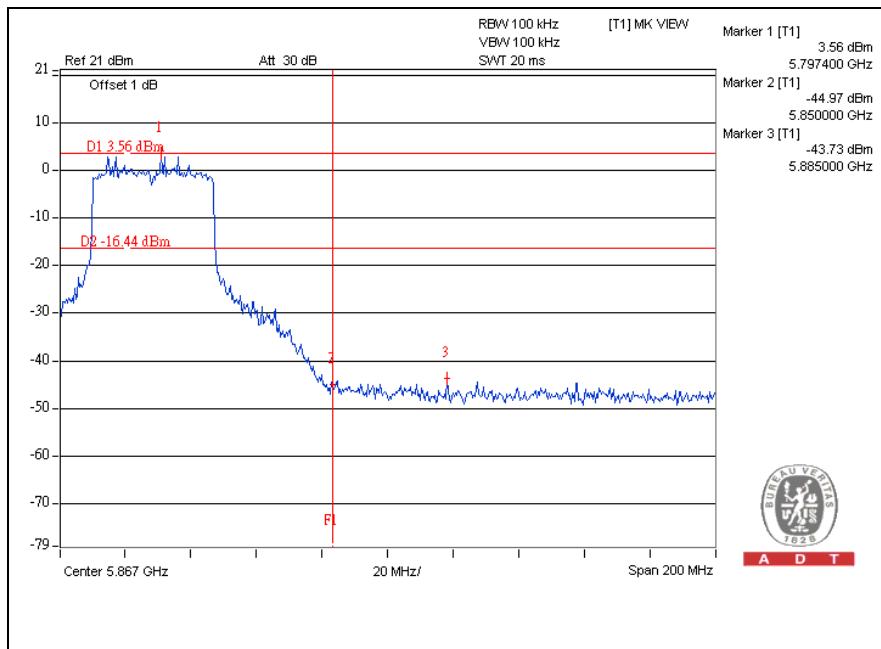
A D T

## 802.11n (40MHz) OFDM MODULATION:

CH151



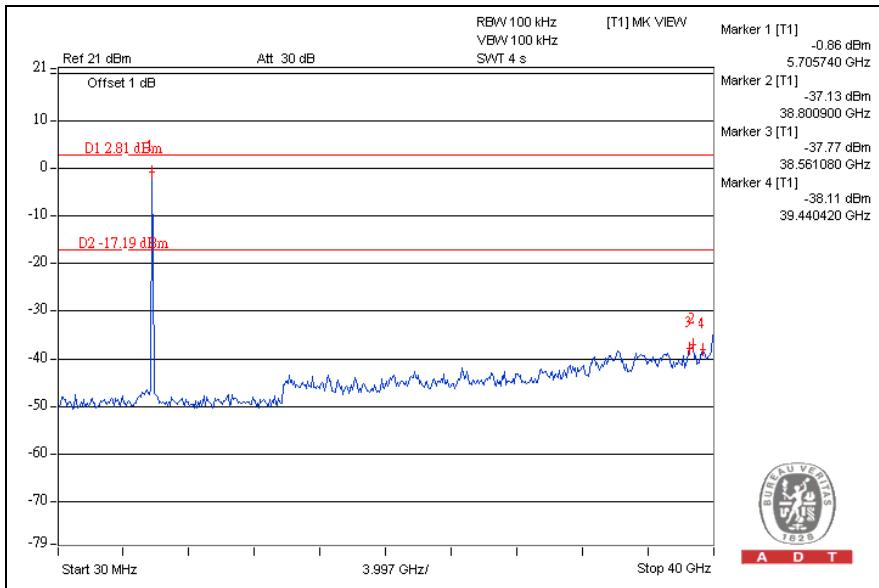
CH159



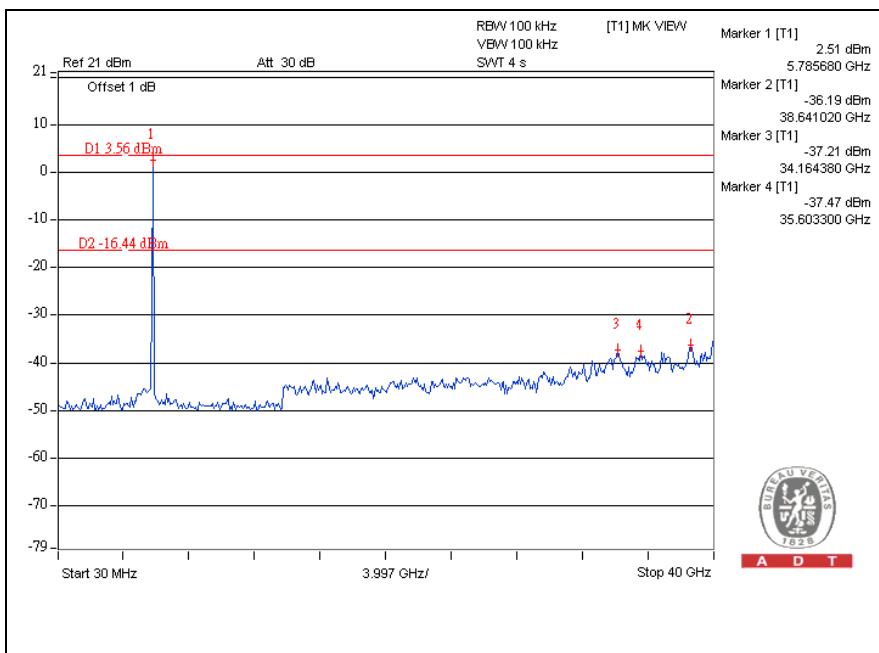


A D T

## CH151



## CH159





A D T

## 5. 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.

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: 886-2-26052943

**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



A D T

## 6.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---