

# FCC TEST REPORT (15.407)

**REPORT NO.:** RF950206H07

**MODEL NO.:** WA8011A-A

**RECEIVED:** Feb. 06, 2006

**TESTED:** Feb. 20 to March 3, 2006

**ISSUED:** March 3, 2006

**APPLICANT:** Microelectronics Technology Inc.

**ADDRESS:** 1, Innovation Road II, Hsinchu Science-based  
Industrial Park, Hsinchu, Taiwan, R.O.C.

**ISSUED BY:** Advance Data Technology Corporation

**TEST LOCATION:** No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung  
Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien,  
Taiwan, R.O.C.

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No. 2177-01

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## 1. CERTIFICATION

**PRODUCT:** A8 802.11ab/g AP BS/Bridge AC  
**BRAND NAME:** MTI, ALTAI, ASTRI  
**MODEL NO.:** WA8011A-A  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**TESTED:** Feb. 20 to March 3, 2006  
**APPLICANT:** Microelectronics Technology Inc.  
**STANDARDS:** FCC Part 15, Subpart E (Section 15.407)  
ANSI C63.4-2003

The above equipment (Model: WA8011A-A) 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 :** Carol Liao , **DATE:** March 3, 2006  
( Carol Liao )

**TECHNICAL**  
**ACCEPTANCE :** Hank Chung , **DATE:** March 3, 2006  
Responsible for RF ( Hank Chung )

**APPROVED BY :** May Chen , **DATE:** March 3, 2006  
(May Chen, Deputy Manager)

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart E (Section 15.407)			
Standard Section	Test Type	Result	Remark
15.407(b)(5)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -0.76dB at 1.005MHz
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 -2.0dB at 5350.00MHz
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.

### NOTE:

1. The EUT was operating in 2.412 ~ 2.462GHz, 5.250 ~ 5.350GHz and 5.725 ~ 5.850GHz frequencies band. This report was recorded the RF parameters including 5.250 ~ 5.350GHz. For the 2.412 ~ 2.462GHz and 5.725 ~ 5.850GHz RF parameters was recorded in another test report.

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	A8 802.11ab/g AP BS/Bridge AC
<b>MODEL NO.</b>	WA8011A-A
<b>FCC ID</b>	MAD-WA8011-A
<b>POWER SUPPLY</b>	Voltage/90-264 V AC, Power/58 W (RMS), Frequency/47-63 Hz
<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: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11a: 54/48/36/24/18/12/9/6Mbps
<b>FREQUENCY RANGE</b>	802.11b & 802.11g: 2412 ~ 2462MHz 802.11a: 5.25 ~ 5.35GHz and 5.725 ~ 5.850GHz
<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 for Normal mode
<b>OUTPUT POWER</b>	802.11b: 114.815mW 802.11g: 138.038mW 802.11a: 96.383mW
<b>ANTENNA TYPE</b>	Please see note 3 (on next page)

#### NOTE:

1. The EUT operates in both the 5GHz and 2.4GHz Bands and compatibility with 802.11a and 802.11b, 802.11g technology.
2. There are four sector antennas (receive and transmit) of the 2.4GHz Band, but only one of the sector antennas can act at the same time. The EUT can operate in 5GHz and 2.4GHz Bands at the same time. The equipment is professionally installed.
3. The EUT has three brand names which are identical to each other in all aspects except for the followings:

Brand Name	Model Name
MTI (Microelectronics Technology Inc.)	WA8011A-A
ALTAI (Altai Technologies Limited)	
ASTRI (Hong Kong Applied Science and Technology Research Institute Company Limited)	

4. The EUT can be equipped with following antennas:

For 2.4GHz						
No.	Model No.	Gain (dBi)	Cable Loss (dB)	Net Gain (dB)	Antenna Type	Antenna Connector
1-4	B8-R2-75mm	14.0	1.0	13.0	(H-Plane)Sector	N-Female
For 5GHz						
No.	Model No.	Gain (dBi)	Cable Loss (dB)	Net Gain (dB)	Antenna Type	Antenna Connector
A	HG5310U	10.0	2.0	8.0	OMNI Dipole	N-Female
B	HG5808U	8.0	2.0	6.0	OMNI Dipole	N-Female
C	SA-A04-090250	18.0	2.0	16.0	Panel Directional	N-Jack
<b>Note:</b> <ol style="list-style-type: none"> <li>1. All of the above antennas are outdoor Antenna.</li> <li>2. From above antennas, the different type of antennas was chosen for final test and its data were recorded in this report.</li> <li>3. For 2.4GHz antennas, antenna 1, 2, 3 and 4 are the same type of antenna ( (H-Plane)Sector ), we choose the worst antenna (decided by pretest) for final test. Antenna 1, the worst antenna, was selected as representative antenna for the test.</li> <li>4. For 5GHz antenna, all of the antennas are different type or frequency band, was selected as all antenna for the test.</li> <li>5. Antenna Model No. SA-A04-090250 can be used in point-to-point applications.</li> </ol>						

5. According to the RF ports assignment, connect RF cables with antenna according to the table below:

For 2.4GHz			
Antenna No.	Antenna Port	Port name	Port no.
No.1	1L	1A	8
	1R	1B	7
No.2	2L	2A	6
	2R	2B	5
No.3	3L	3A	4
	3R	3B	3
No.4	4L	4A	2
	4R	4B	1
For 5GHz			
Antenna No.	Antenna Port	Port name	Port no.
A, B, C	9	A	9



6. Frequency Range of each Antennas are as followings:

For 2.4GHz	
Antenna No.	Frequency Range
No. 1 ~ 4	2400MHz ~ 2483.5MHz
For 5GHz	
Antenna No.	Frequency Range
A	5.15GHz ~ 5.35GHz
B	5.725 GHz ~ 5.85GHz
C	5.25 GHz ~ 5.875

7. Maximum peak output power (Unit : dBm) :

No.	Model No. (Antenna)	Operating Frequency (MHz)		
		2412~2462	5250~5350	5725~5850
1-4	B8-R2-75mm	21.40	NA	NA
A	HG5310U	NA	19.84	NA
B	HG5808U	NA	NA	18.90
C	SA-A04-090250	NA	11.87	21.27

8. RF cable loss:

For 2.4GHz	
Cable No.	Cable Loss
No. 1 ~ 8	1dB (For 2400MHz ~ 2483.5MHz)
For 5GHz	
Cable No.	Cable Loss
No. 9	2dB (For 5.250GHz ~ 5.850GHz)

9. The above EUT information was declared by the 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 5250MHz ~ 5350MHz bands:

Four channels are provided to this EUT for normal mode.

Channel	Frequency
1	5260 MHz
2	5280 MHz
3	5300 MHz
4	5320 MHz

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT configure mode	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
-	X	X	X	X	NA

Where PLC: Power Line Conducted Emission

RE<1G RE: Radiated Emission below 1GHz

RE≥1G: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

#### **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)
802.11a	1 to 4	4	OFDM	BPSK	6

#### **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)
802.11a	1 to 4	4	OFDM	BPSK	6

#### **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)
802.11a	1 to 4	1, 4	OFDM	BPSK	6

### **Bandedge 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)
802.11a	1 to 4	1, 4	OFDM	BPSK	6

### **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.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11a	1 to 4	1, 4	OFDM	BPSK	6

### **3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is an A8 802.11ab/g AP BS/Bridge AC. 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

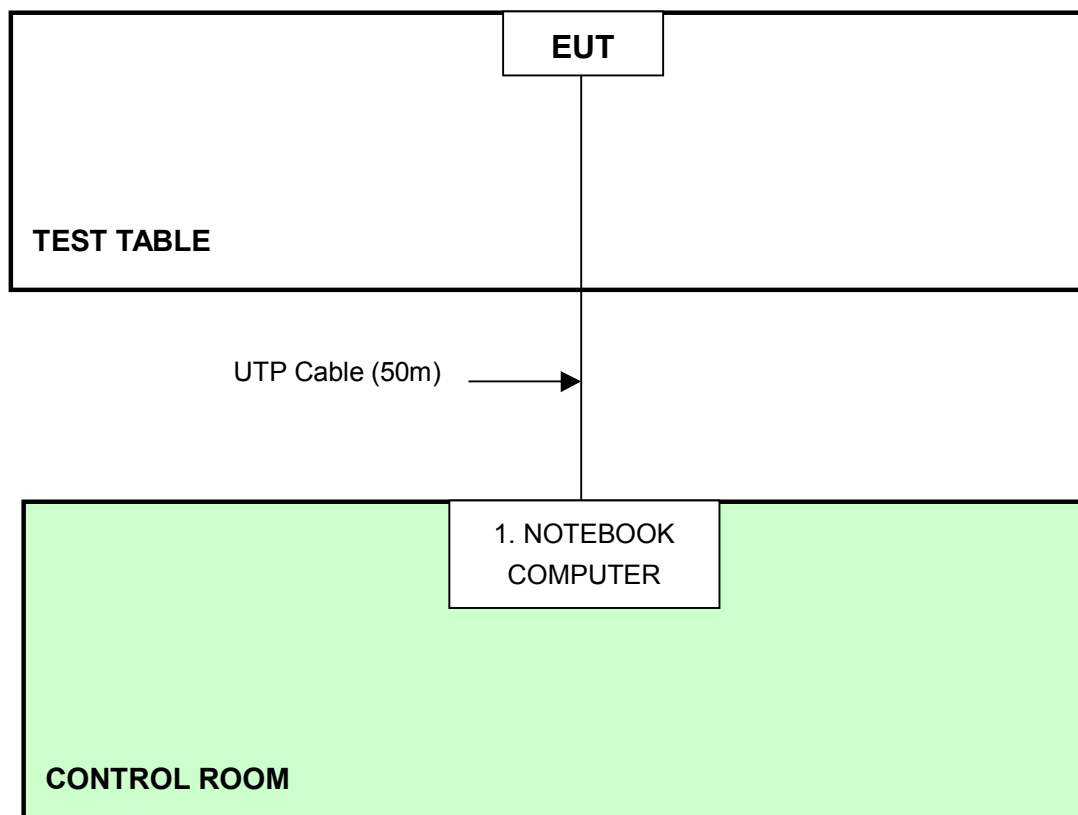
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP01L	TW-0791UH- 12800-0CK-3735	FCC DoC

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

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

### 3.5 CONFIGURATION OF SYSTEM UNDER TEST



**NOTE:** 1. Support unit 1 was kept in the control room during the test.  
2. Please refer to the photos of test configuration in Item 6 also.

## 4. TEST TYPES AND RESULTS

### 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 UNTIL
Test Receiver	ESCS 30	100375	Sep. 19, 2006
Line-Impedance Stabilization Network(for EUT)	ENV-216	100071	Nov. 10, 2006
ROHDE & SCHWARZ LISN	KNW-407	8/1395/12	Jul. 19, 2006
RF Signal Cable	RG233/U	Cable_CA_02	Dec. 10, 2006
Terminator(for KYORITSU)	50	2	Oct. 08, 2006
Software	ADT_Cond_V7.3.2	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 ADT Shielded Room No. B.
3. The VCCI Con B Registration No. is C-2193.
5. The measurement uncertainty is 2.26 dB, which is calculated as per the document CISPR 16-4. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



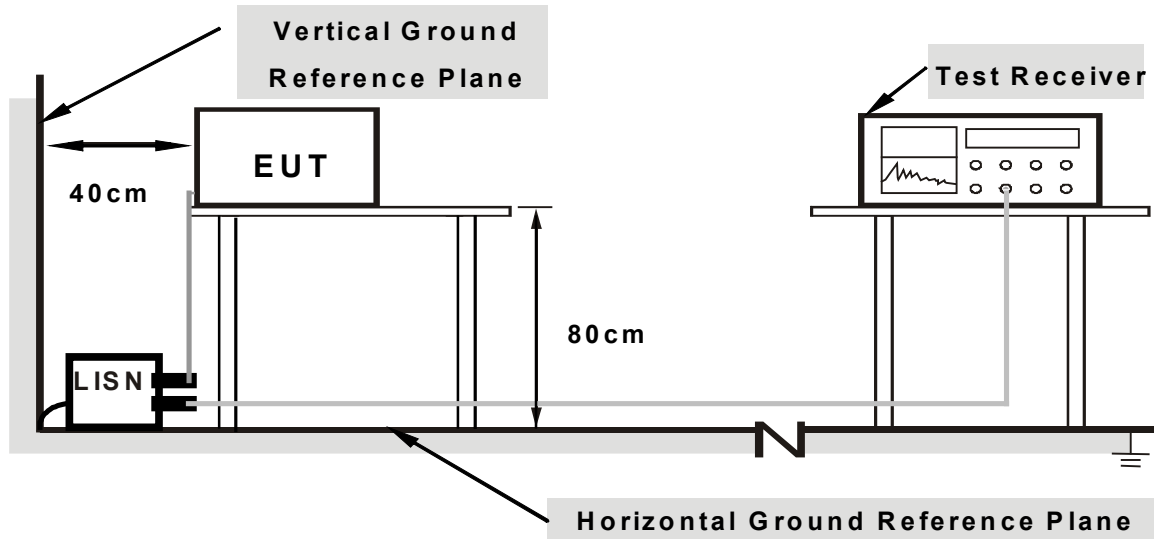
#### 4.1.3 TEST PROCEDURES

- 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 level under (Limit - 20dB) was 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 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

- a. Placed the EUT on the testing table.
- b. Prepared another computer system to act as a communication partner and placed it outside of testing area.
- c. The communication partner run test program “ART53 Build 5” to enable EUT under transmission/receiving condition continuously at specific channel frequency via UTP cable.

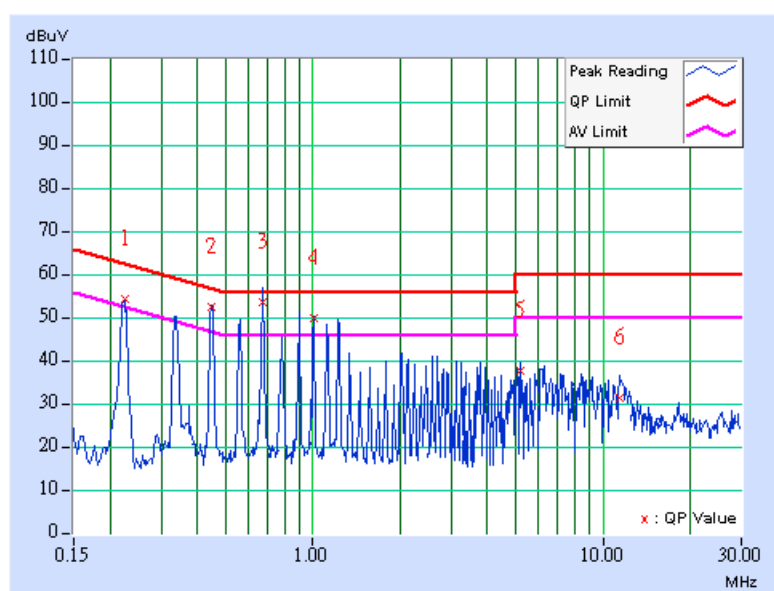
#### 4.1.7 TEST RESULTS

##### Conducted Worst-Case Data

<b>MODULATION TYPE</b>	BPSK	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120VAC, 60 HZ	<b>TRANSFER RATE</b>	6Mbps
<b>ENVIRONMENTAL CONDITIONS</b>	20deg. C, 60%RH, 973hPa	<b>PHASE</b>	Line (L)
<b>TESTED BY</b>	Rex Huang		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.224	9.65	44.18	37.35	53.83	47.00	62.66	52.66	-8.83	-5.66
2	0.447	9.67	42.32	36.40	51.99	46.07	56.93	46.93	-4.94	-0.86
3	0.672	9.68	43.50	35.40	53.18	45.08	56.00	46.00	-2.82	-0.92
<b>4</b>	<b>1.005</b>	<b>9.70</b>	<b>39.83</b>	<b>35.54</b>	<b>49.53</b>	<b>45.24</b>	<b>56.00</b>	<b>46.00</b>	<b>-6.47</b>	<b>-0.76</b>
5	5.168	9.89	27.66	-	37.55	-	60.00	50.00	-22.45	-
6	11.426	10.09	21.29	-	31.38	-	60.00	50.00	-28.62	-

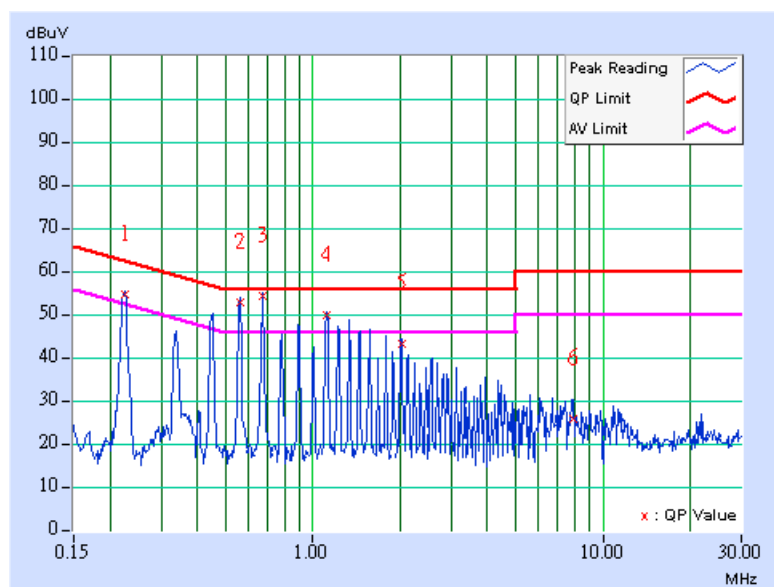
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value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



<b>MODULATION TYPE</b>	BPSK	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TRANSFER RATE</b>	6Mbps
<b>ENVIRONMENTAL CONDITIONS</b>	20deg. C, 60%RH, 973hPa	<b>PHASE</b>	Neutral (N)
<b>TESTED BY</b>	Rex Huang		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.224	9.65	44.97	37.80	54.62	47.45	62.66	52.66	-8.04	-5.21
2	0.560	9.68	42.96	35.43	52.64	45.11	56.00	46.00	-3.36	-0.89
3	0.674	9.68	44.35	35.46	54.03	45.14	56.00	46.00	-1.97	-0.86
4	1.123	9.71	40.11	35.34	49.82	45.05	56.00	46.00	-6.18	-0.95
5	2.021	9.75	33.21	-	42.96	-	56.00	46.00	-13.04	-
6	7.949	9.98	16.04	-	26.02	-	60.00	50.00	-33.98	-

- 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 (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.

#### 4.2.2 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
5250~5350	-27	68.3
5725~5825	-27 *note 1	68.3
	-17 *note 2	78.3

**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

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

#### 4.2.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 07, 2006
HP Pre_Amplifier	8449B	3008A01922	Oct. 02, 2006
ROHDE & SCHWARZ Test Receiver	ESCS30	100287	Dec. 08, 2006
CHASE Broadband Antenna	VULB9168	138	Dec. 21, 2006
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 11, 2006
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 05, 2007
SCHWARZBECK Biconical Antenna	VHBA9123	459	Jun. 26, 2006
SCHWARZBECK Periodic Antenna	UPA6108	1148	Jun. 26, 2006
RF Switches (ARNITSU)	CS-201	1565157	NA
RF CABLE (Chaintek) 1GHz-20GHz	SF102	22054-2	Nov. 16, 2006
RF Cable(RICHTEC)	9913-30M	STCCAB-30M- 1GHz-021	Jul. 16, 2006
Software	ADT_Radiated_V 5.14	NA	NA
CHANCE MOST Antenna Tower	AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

Note: 1. The calibration interval of the above test instruments is 12 months (36 months for Periodic Antenna) and the calibrations are traceable to NML/ROC and NIST/USA.

2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Open Site No. C.
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 4824-3.
7. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated emissions (30MHz-1GHz)	2.98 dB
Radiated emissions (1GHz ~18GHz)	2.21 dB
Radiated emissions (18GHz ~20GHz)	1.88 dB

#### 4.2.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

**NOTE:**

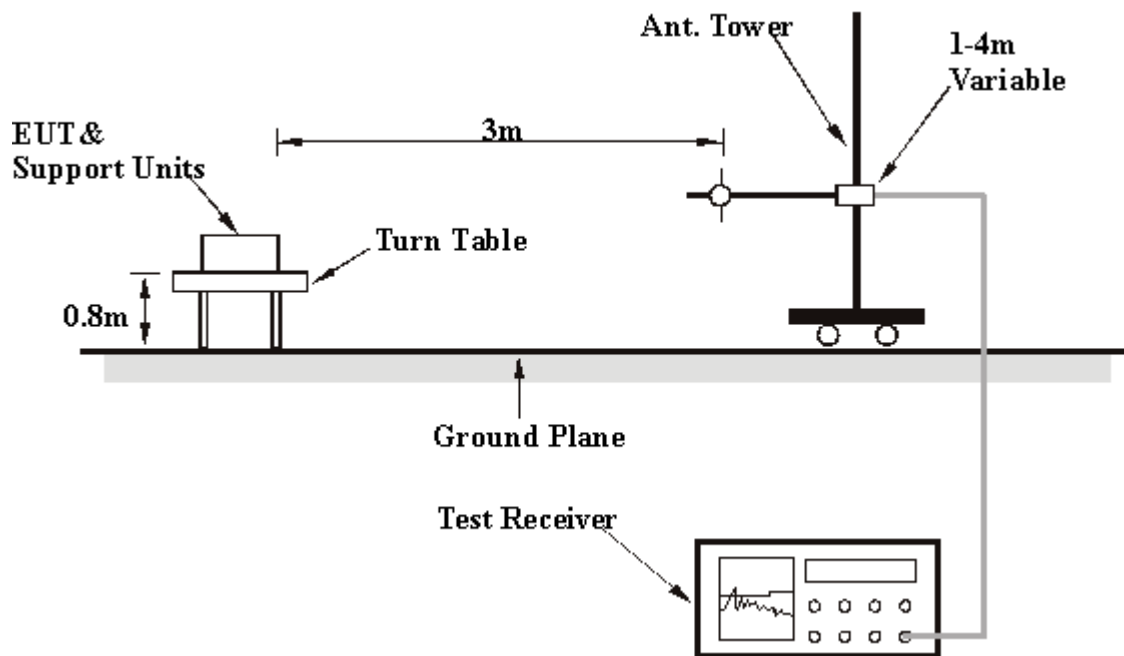
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 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.

#### 4.2.5 DEVIATION FROM TEST STANDARD

No deviation



#### 4.2.6 TEST SETUP



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

#### 4.2.7 EUT OPERATING CONDITION

Same as 4.1.6

#### 4.2.8 TEST RESULTS (ANTENNA A)

##### Below 1GHz Worst-Case Data

<b>MODULATION TYPE</b>	BPSK	<b>FREQUENCY RANGE</b>	Below 1000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TRANSFER RATE</b>	6Mbps
<b>ENVIRONMENTAL CONDITIONS</b>	14deg. C, 70%RH, 973hPa	<b>DETECTOR FUNCTION</b>	Quasi-Peak
<b>TESTED BY</b>	Moris Lin		

##### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	125.00	12.20 QP	43.50	-31.30	2.10 H	330	0.00	12.20
2	250.00	16.60 QP	46.00	-29.40	1.70 H	33	2.80	13.80
3	305.45	30.20 QP	46.00	-15.80	1.30 H	50	13.30	16.90
4	390.03	29.20 QP	46.00	-16.80	1.10 H	280	10.50	18.70
5	566.60	30.10 QP	46.00	-15.90	1.50 H	220	6.40	23.70
6	651.25	33.60 QP	46.00	-12.40	1.07 H	20	8.60	25.00

##### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	125.00	20.10 QP	43.50	-23.40	1.10 V	333	7.90	12.20
2	250.00	17.90 QP	46.00	-28.10	1.30 V	120	4.10	13.80
3	305.45	36.60 QP	46.00	-9.40	1.78 V	80	19.70	16.90
4	390.01	33.20 QP	46.00	-12.80	1.60 V	330	14.50	18.70
5	566.60	28.80 QP	46.00	-17.20	1.90 V	340	5.10	23.70
6	651.25	36.60 QP	46.00	-9.40	2.10 V	54	11.60	25.00

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value

### 802.11a OFDM modulation

<b>CHANNEL</b>	Channel 1	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	17deg. C, 59%RH, 973HPA	<b>TESTED BY</b>	Rex Huang

#### 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	37.80 PK	74.00	-36.20	1.61 H	22	2.00	35.80
1	#5150.00	27.60 AV	54.00	-26.40	1.61 H	22	-8.20	35.80
2	*5260.00	96.20 PK			1.61 H	22	60.40	35.80
2	*5260.00	87.60 AV			1.61 H	22	51.80	35.80
3	#11520.00	58.70 PK	74.00	-15.30	1.74 H	327	7.60	51.10
3	#11520.00	47.90 AV	54.00	-6.10	1.74 H	327	-3.20	51.10

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5150.00	54.70 PK	74.00	-19.30	1.75 V	8	18.90	35.80
1	#5150.00	44.80 AV	54.00	-9.20	1.75 V	8	9.00	35.80
2	*5260.00	113.10 PK			1.75 V	8	77.30	35.80
2	*5260.00	104.80 AV			1.75 V	8	69.00	35.80
3	10520.00	55.60 PK	68.30	-12.70	1.01 V	24	10.90	44.70

- NOTE:**
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 falling in the restricted band.

<b>CHANNEL</b>	Channel 4	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	17deg. C, 59%RH, 973hPa	<b>TESTED BY</b>	Rex Huang

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	*5320.00	93.80 PK			1.58 H	20	58.00	35.80
1	*5320.00	84.70 AV			1.58 H	20	48.90	35.80
2	#5350.00	52.40 PK	74.00	-21.60	1.58 H	20	16.60	35.80
2	#5350.00	35.10 AV	54.00	-18.90	1.58 H	20	-0.70	35.80
3	#10640.00	54.30 PK	74.00	-19.70	1.76 H	300	8.40	45.90
3	#10640.00	42.20 AV	54.00	-11.80	1.76 H	300	-3.70	45.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5320.00	109.20 PK			1.77 V	12	73.40	35.80
1	*5320.00	101.60 AV			1.77 V	12	65.80	35.80
2	#5350.00	67.80 PK	74.00	-6.20	1.77 V	12	32.00	35.80
2	#5350.00	52.00 AV	54.00	-2.00	1.77 V	12	16.20	35.80
3	#10640.00	53.00 PK	74.00	-21.00	1.65 V	21	7.10	45.90
3	#10640.00	41.90 AV	54.00	-12.10	1.65 V	21	-4.00	45.90

- NOTE:**
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 falling in the restricted band.

#### 4.2.9 TEST RESULTS (ANTENNA C)

##### Below 1GHz Worst-Case Data

<b>MODULATION TYPE</b>	BPSK	<b>FREQUENCY RANGE</b>	Below 1000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TRANSFER RATE</b>	6Mbps
<b>ENVIRONMENTAL CONDITIONS</b>	14deg. C, 70%RH, 973hPa	<b>DETECTOR FUNCTION</b>	Quasi-Peak
<b>TESTED BY</b>	Moris Lin		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	125.00	12.90 QP	43.50	-30.60	1.84 H	21	0.70	12.20
2	250.01	16.10 QP	46.00	-29.90	1.57 H	57	2.40	13.80
3	305.45	28.40 QP	46.00	-17.60	1.25 H	153	11.50	16.90
4	390.02	27.30 QP	46.00	-18.70	1.31 H	139	8.60	18.70
5	566.66	27.60 QP	46.00	-18.40	1.25 H	1	4.00	23.70
6	651.25	32.30 QP	46.00	-13.70	1.11 H	355	7.30	25.00

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	125.00	21.50 QP	43.50	-22.00	1.06 V	65	9.30	12.20
2	250.01	18.90 QP	46.00	-27.10	1.50 V	21	5.10	13.80
3	300.01	19.60 QP	46.00	-26.40	1.62 V	1	2.80	16.80
4	390.03	32.50 QP	46.00	-13.50	1.59 V	21	13.80	18.70
5	566.66	29.50 QP	46.00	-16.50	1.77 V	2	5.90	23.70
6	651.25	38.20 QP	46.00	-7.80	2.16 V	1	13.10	25.00

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value

### 802.11a OFDM modulation

<b>CHANNEL</b>	Channel 1	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	26deg. C, 68%RH, 973hPa	<b>TESTED BY</b>	Rex Huang

#### 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	36.90 PK	74.00	-37.10	1.41 H	353	1.10	35.80
1	#5150.00	27.70 AV	54.00	-26.30	1.41 H	353	-8.10	35.80
2	*5260.00	94.70 PK			1.41 H	353	58.90	35.80
2	*5260.00	86.20 AV			1.41 H	353	50.40	35.80
3	10520.00	52.60 PK	68.30	-15.70	1.86 H	313	7.90	44.70

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5150.00	54.80 PK	74.00	-19.20	1.48 V	4	19.00	35.80
1	#5150.00	45.80 AV	54.00	-8.20	1.48 V	4	10.00	35.80
2	*5260.00	112.60 PK			1.48 V	4	76.80	35.80
2	*5260.00	104.30 AV			1.48 V	4	68.50	35.80
3	10520.00	55.50 PK	68.30	-12.80	1.55 V	329	10.80	44.70

- NOTE:**
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 falling in the restricted band.

<b>CHANNEL</b>	Channel 4	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	26deg. C, 68%RH, 973hPa	<b>TESTED BY</b>	Rex Huang

<b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b>								
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	*5320.00	93.60 PK			1.39 H	355	57.80	35.80
1	*5320.00	85.40 AV			1.39 H	355	49.60	35.80
2	#5350.00	46.70 PK	74.00	-27.30	1.39 H	353	10.90	35.80
2	#5350.00	30.20 AV	54.00	-23.80	1.39 H	353	-5.60	35.80
3	#5353.00	48.10 PK	74.00	-25.90	1.39 H	353	12.30	35.80
3	#5353.00	31.00 AV	54.00	-23.00	1.39 H	353	-4.80	35.80
4	#10640.00	52.50 PK	74.00	-21.50	1.51 H	339	6.60	45.90
4	#10640.00	41.00 AV	54.00	-13.00	1.51 H	339	-4.90	45.90

<b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b>								
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	*5320.00	111.50 PK			1.55 V	6	75.70	35.80
1	*5320.00	103.10 AV			1.55 V	6	67.30	35.80
2	#5350.00	64.60 PK	74.00	-9.40	1.55 V	6	28.80	35.80
2	#5350.00	47.90 AV	54.00	-6.10	1.55 V	6	12.10	35.80
3	#5353.00	66.00 PK	74.00	-8.00	1.55 V	6	30.20	35.80
3	#5353.00	48.70 AV	54.00	-5.30	1.55 V	6	12.90	35.80
4	#10640.00	58.00 PK	74.00	-16.00	1.67 V	336	12.10	45.90
4	#10640.00	41.90 AV	54.00	-12.10	1.67 V	336	-4.00	45.90

- NOTE:**
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 falling in the restricted band.

### 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
5.25 – 5.35GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.725 – 5.825GHz	The lesser of 1W (30dBm) or 17dBm + 10logB

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

#### 4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2006

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.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

1. The transmitter output was connected to the spectrum analyzer.
2. Set span to encompass the entire emission bandwidth of the signal.
3. Set RBW to 1MHz, VBW to 300kHz.
4. Using the spectrum analyzer's channel power measurement function to measure the output power.

**NOTE:**

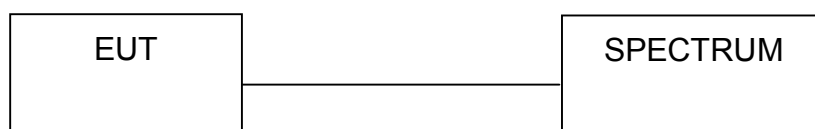
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

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 (ANTENNA A)

##### 802.11a OFDM modulation

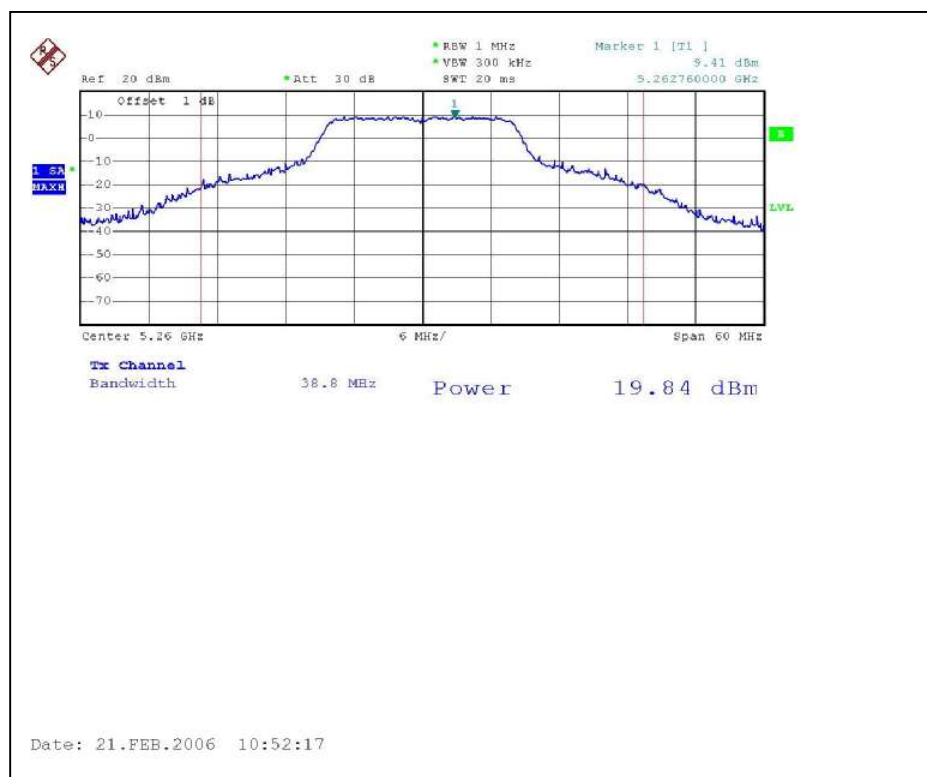
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	23deg.C, 68%RH, 973hPa
<b>TESTED BY</b>	Moris Lin		

Antenna (Gain : 10.0 dBi) + Antenna Cable (2.0dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)	PASS/FAIL
1	5260	19.84	22	38.8	PASS
4	5320	17.07	22	35.76	PASS

**NOTE:** The 26dBc Occupied Bandwidth plot, please refer to the following pages.

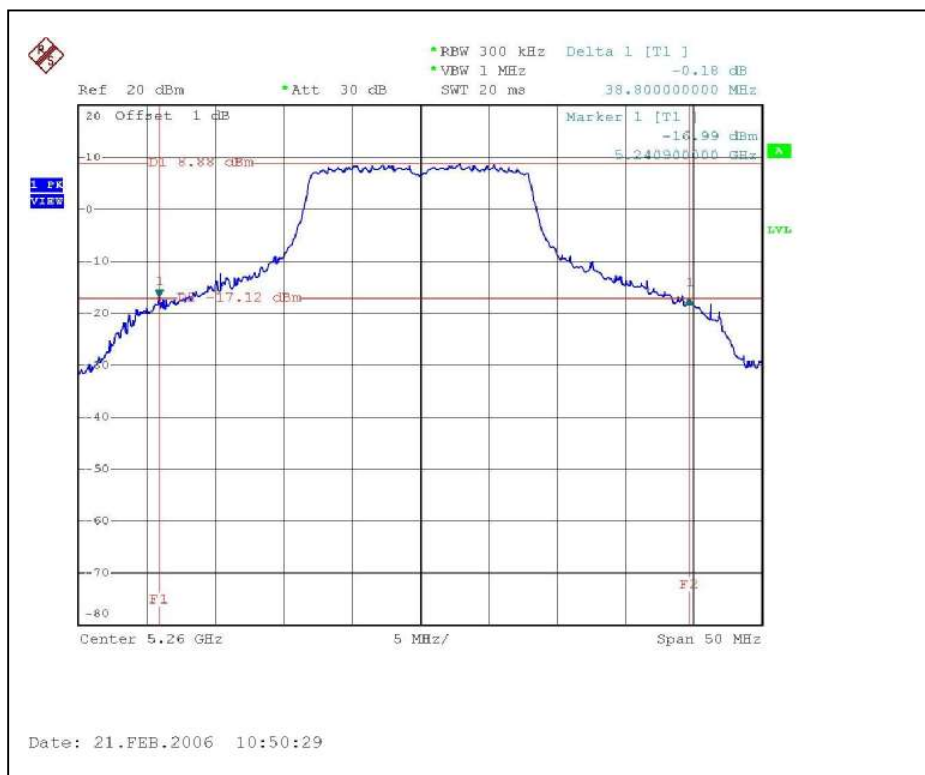
## Peak Power Output: CH1



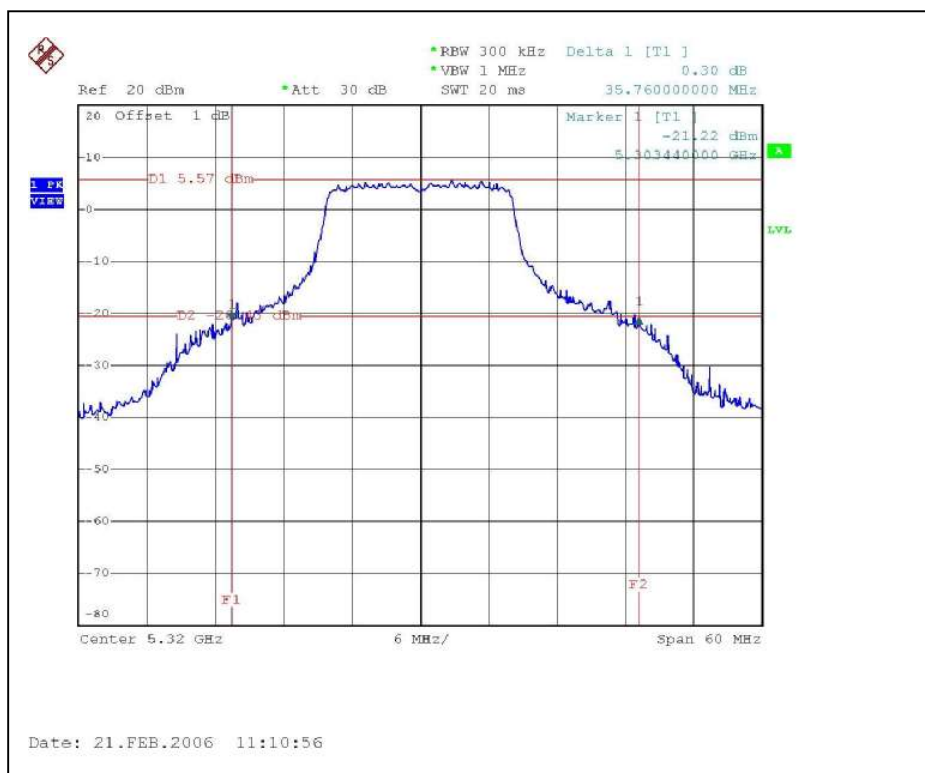
## CH4



## 26dB Occupied Bandwidth: CH1



## CH4



#### 4.3.8 TEST RESULTS (ANTENNA C)

##### 802.11a OFDM modulation

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	23deg.C, 68%RH, 973hPa
<b>TESTED BY</b>	Moris Lin		

Antenna (Gain : 18.0 dBi) + Antenna Cable (2.0dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)	PASS/FAIL
1	5260	11.87	14	25.44	PASS
4	5320	11.65	14	25.70	PASS

**NOTE:** The 26dBc Occupied Bandwidth plot, please refer to the following pages.

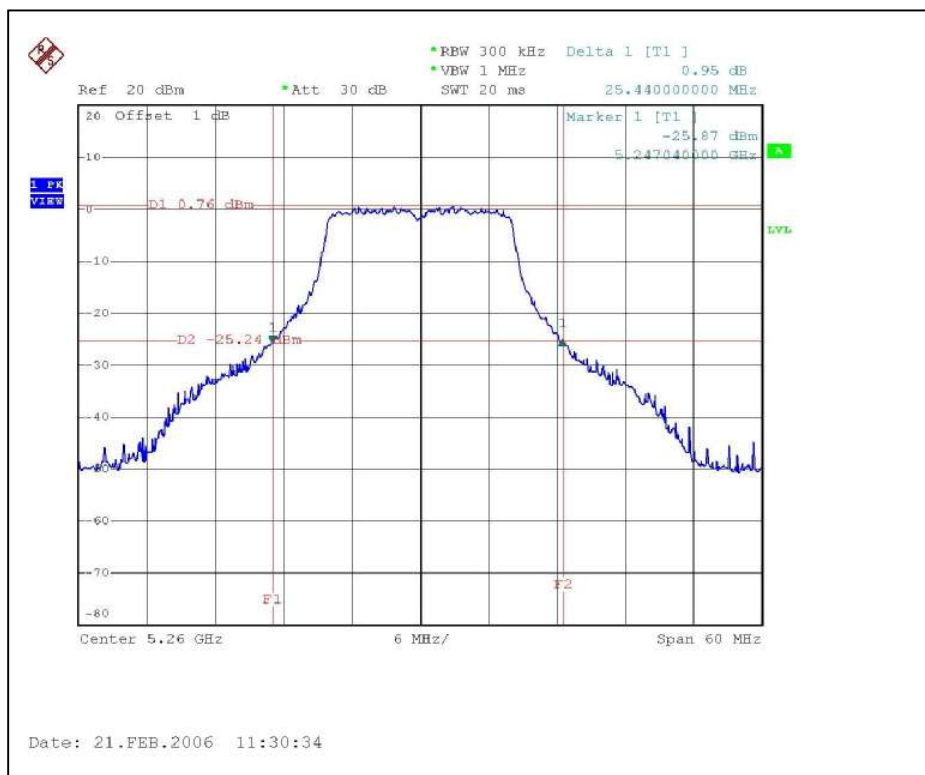
## Peak Power Output: CH1



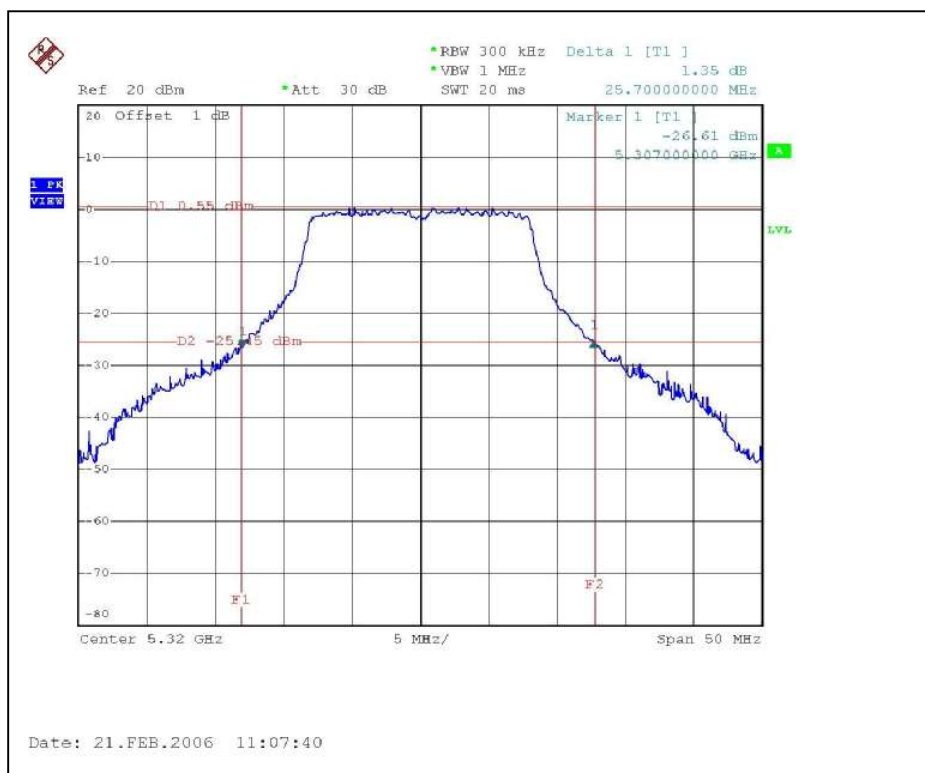
## CH4



## 26dB Occupied Bandwidth: CH1



## CH4



## 4.4 PEAK POWER EXCURSION MEASUREMENT

### 4.4.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

Frequency Band	Limit
5.15 – 5.25 GHz	13dB
5.25 – 5.35 GHz	13dB
5.725 – 5.825 GHz	13dB

### 4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2006

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



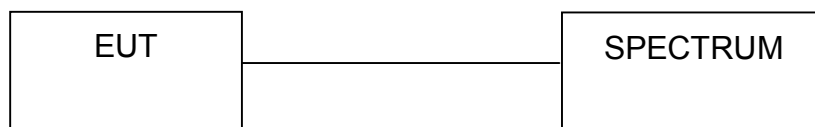
#### 4.4.3 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer.
2. Set the spectrum bandwidth span to view the entire spectrum.
3. Using peak detector and Max-hold function for Trace 1 (RB=1MHz, VB=3MHz) and 2 (RB=1MHz, VB=300KHz).
4. 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.

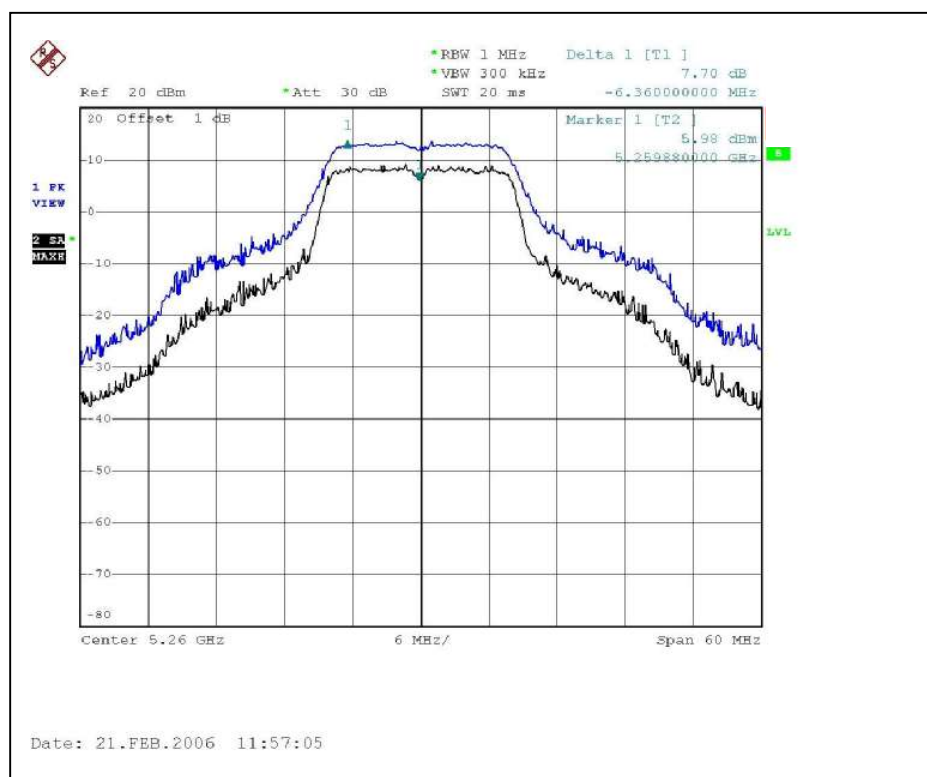
#### 4.4.7 TEST RESULTS (ANTENNA A)

##### 802.11a OFDM modulation

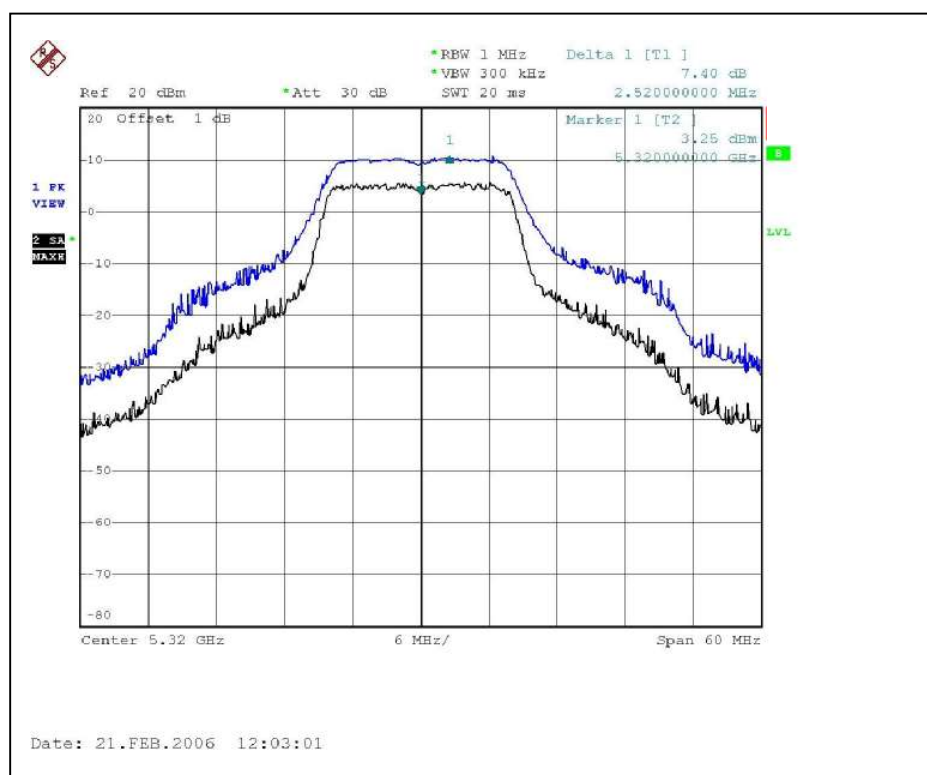
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	23deg.C, 68%RH, 973hPa
<b>TESTED BY</b>	Moris Lin		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)	PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
1	5260	7.7	13	PASS
4	5320	7.4	13	PASS

# CH1



# CH4



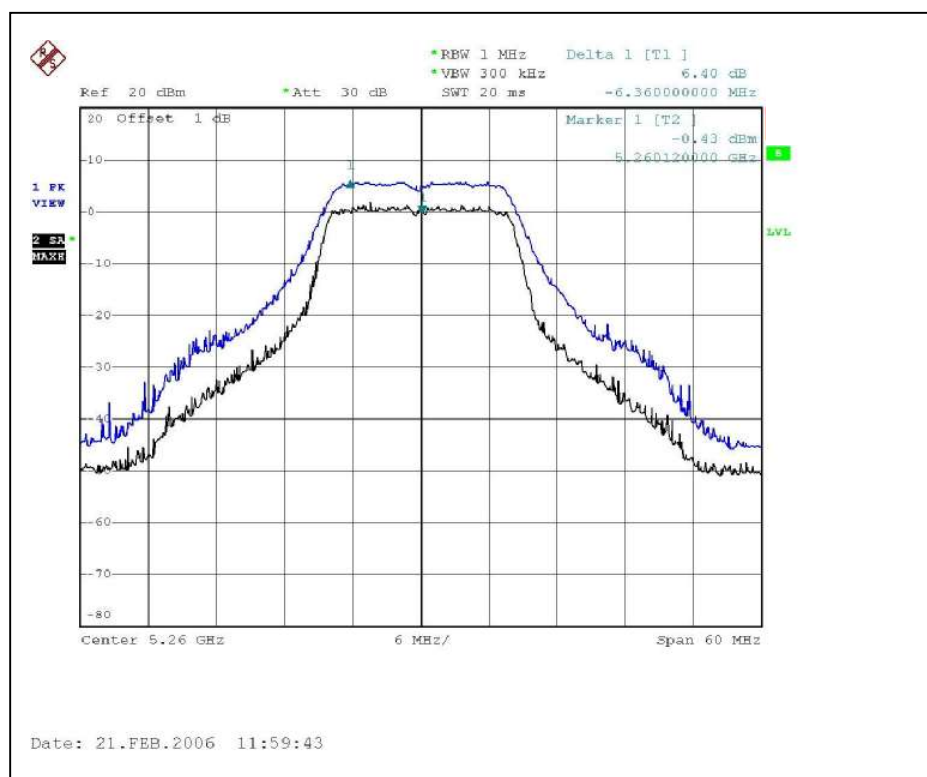
#### 4.4.8 TEST RESULTS (ANTENNA C)

##### 802.11a OFDM modulation

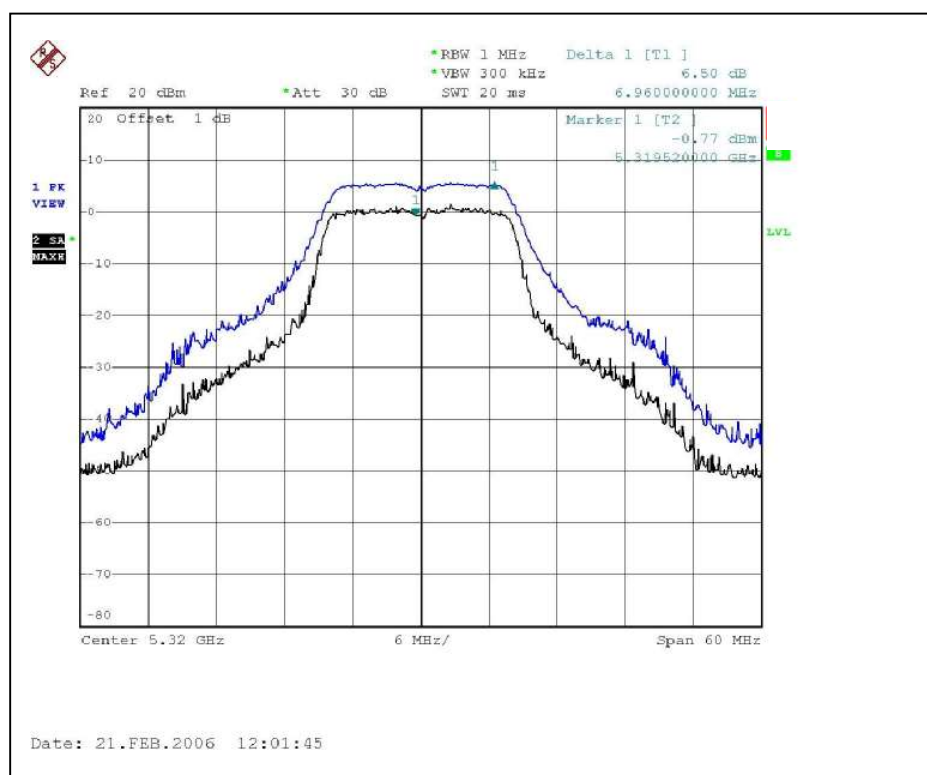
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	23deg.C, 68%RH, 973hPa
<b>TESTED BY</b>	Moris Lin		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER EXCURSION (dB)	PEAK to AVERAGE EXCURSION LIMIT (dB)	PASS/FAIL
1	5260	6.4	13	PASS
4	5320	6.5	13	PASS

## CH1



## CH4



## 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
5.25 ~ 5.35GHz	11dBm
5.725 ~ 5.825GHz	17dBm

### 4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2006

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.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

1. The transmitter output was connected to the spectrum analyzer.
2. 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 4.3.6

#### 4.5.7 TEST RESULTS (ANTENNA A)

##### 802.11a OFDM modulation

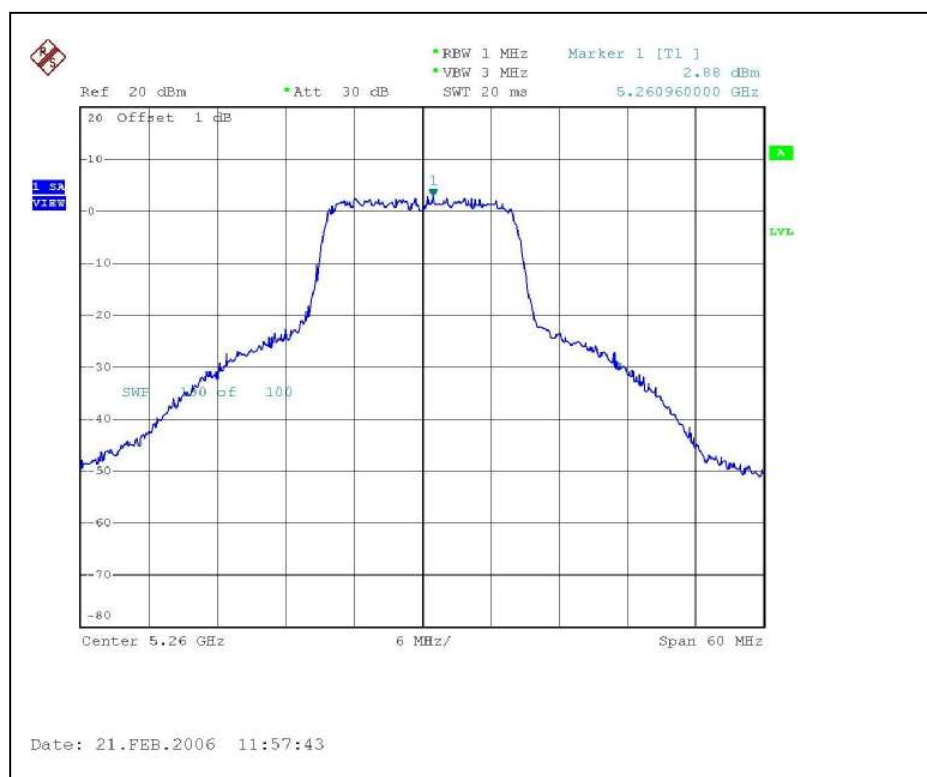
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	23deg.C, 68%RH, 973hPa
<b>TESTED BY</b>	Moris Lin		

Antenna (Gain : 10.0 dBi) + Antenna Cable (2.0dB loss)

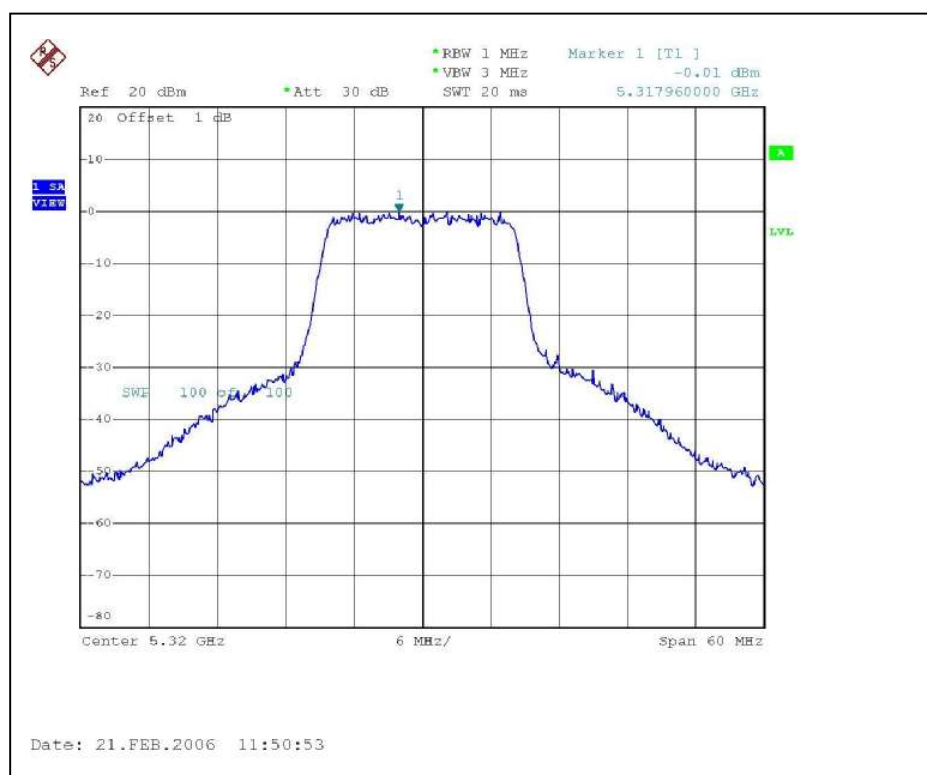
CHANNEL	CHANNEL FREQUENCY (MHz )	RF POWER LEVEL IN 1MHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	5260	2.88	9	PASS
4	5320	-0.01	9	PASS



## CH1



## CH4



#### 4.5.8 TEST RESULTS (ANTENNA C)

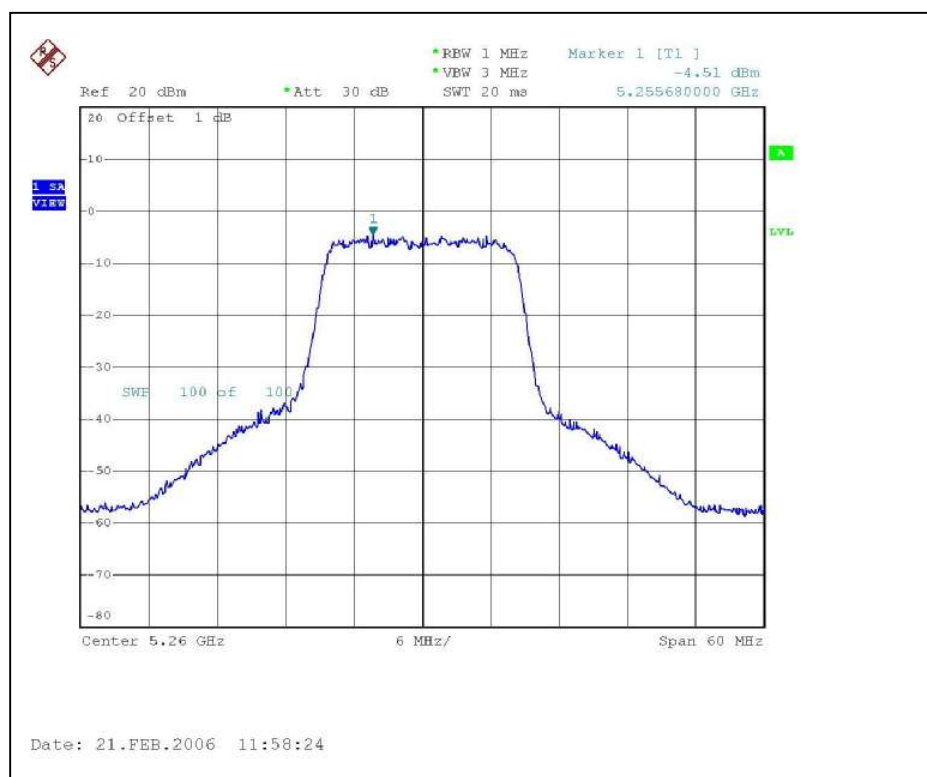
##### 802.11a OFDM modulation

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	23deg.C, 68%RH, 973hPa
<b>TESTED BY</b>	Moris Lin		

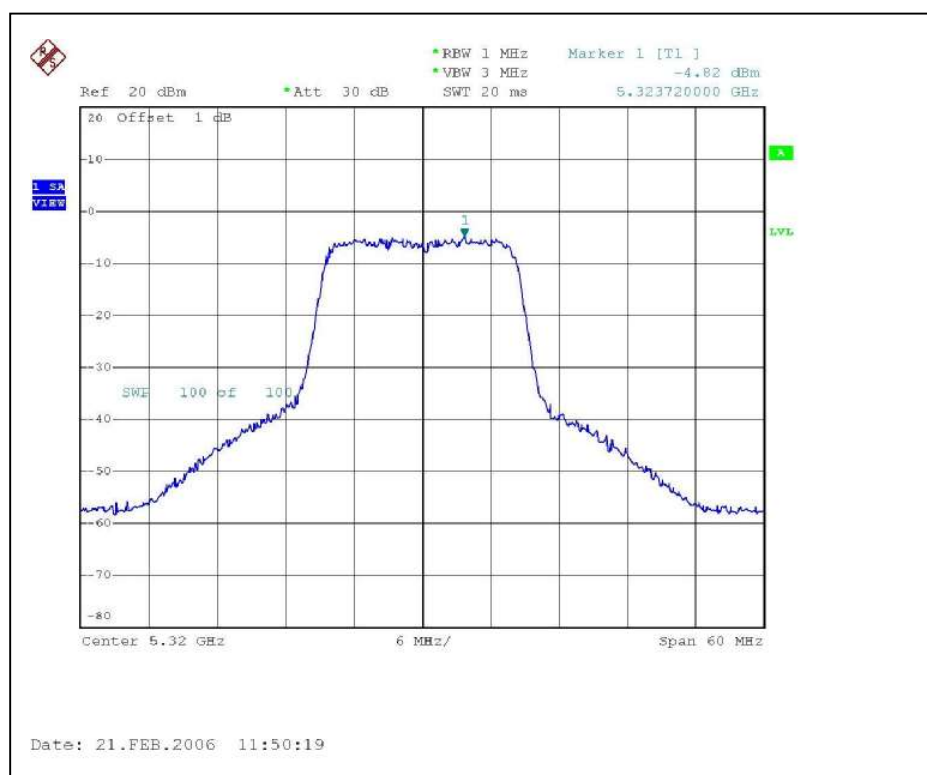
Antenna (Gain : 18.0 dBi) + Antenna Cable (2.0dB loss)

CHANNEL	CHANNEL FREQUENCY (MHz )	RF POWER LEVEL IN 1MHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	5260	-4.51	1	PASS
4	5320	-4.82	1	PASS

## CH1



## CH4



## 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.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2006

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

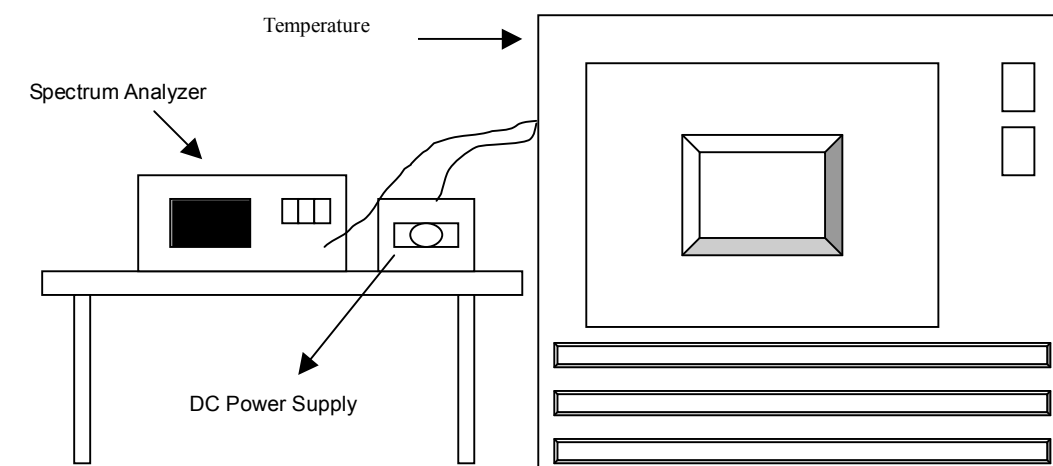
### 4.6.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. 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.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. 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

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

#### 4.6.7 TEST RESULTS

Operating frequency: 5320MHz				Limit : $\pm 0.02\%$			
Temp. (°C)	Power supply (VAC)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	126.5	5320.03124	0.000587	5320.0302	0.000568	5320.0568	0.001068
	110	5320.03132	0.000589	5320.0308	0.000579	5320.0362	0.000680
	93.5	5320.03124	0.000587	5320.0318	0.000598	5320.0362	0.000680
40	126.5	5319.9912	0.000165	5319.9976	0.000045	5319.9973	0.000051
	110	5319.9924	0.000143	5319.9976	0.000045	5319.9975	0.000047
	93.5	5319.9912	0.000165	5319.9979	0.000039	5319.9972	0.000053
30	126.5	5319.9922	0.000147	5319.9919	0.000152	5319.9917	0.000156
	110	5319.9922	0.000147	5319.9921	0.000148	5319.9918	0.000154
	93.5	5319.9922	0.000147	5319.9919	0.000152	5319.9916	0.000158
20	126.5	5320.0071	0.000133	5320.0068	0.000128	5320.0065	0.000122
	110	5320.0072	0.000135	5320.0072	0.000135	5320.0069	0.000130
	93.5	5320.0071	0.000133	5320.0068	0.000128	5320.0065	0.000122
10	126.5	5320.0124	0.000233	5320.0122	0.000229	5320.0119	0.000224
	110	5320.0124	0.000233	5320.0122	0.000229	5320.0121	0.000227
	93.5	5320.0124	0.000233	5320.0121	0.000227	5320.0118	0.000222
0	126.5	5320.023	0.000432	5320.0180	0.000338	5320.0180	0.000338
	110	5320.023	0.000432	5320.0210	0.000395	5320.0190	0.000357
	93.5	5320.021	0.000395	5320.0180	0.000338	5320.0180	0.000338
-10	126.5	5320.0306	0.000575	5320.0290	0.000545	5320.0270	0.000508
	110	5320.0304	0.000571	5320.0310	0.000583	5320.0290	0.000545
	93.5	5320.0304	0.000571	5320.0280	0.000526	5320.0270	0.000508
-20	126.5	5320.0336	0.000632	5320.0250	0.000470	5320.0210	0.000395
	110	5320.0312	0.000586	5320.0280	0.000526	5320.0240	0.000451
	93.5	5320.0308	0.000579	5320.0240	0.000451	5320.0220	0.000414
-30	126.5	5320.0112	0.000211	5320.0111	0.000209	5320.0108	0.000203
	110	5320.0114	0.000214	5320.0113	0.000212	5320.0111	0.000209
	93.5	5320.0114	0.000214	5320.0111	0.000209	5320.0108	0.000203

## 4.7 BAND EDGES MEASUREMENT

### 4.7.1 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2006

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2.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 1MHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

### 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 (ANTENNA A)

For signals in the restricted bands above and below the 5.15 to 5.35GHz 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=VBW=1MHz; Average RBW=1MHz, VBW=10Hz) are attached on the following pages.



## 802.11a OFDM modulation

### NOTE (Peak):

The band edge emission plot on the following first page shows 58.36dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 113.1dBuV/m (Peak), so the maximum field strength in restrict band is  $113.1 - 58.36 = 54.74$ dBuV/m which is under 74dBuV/m limit.

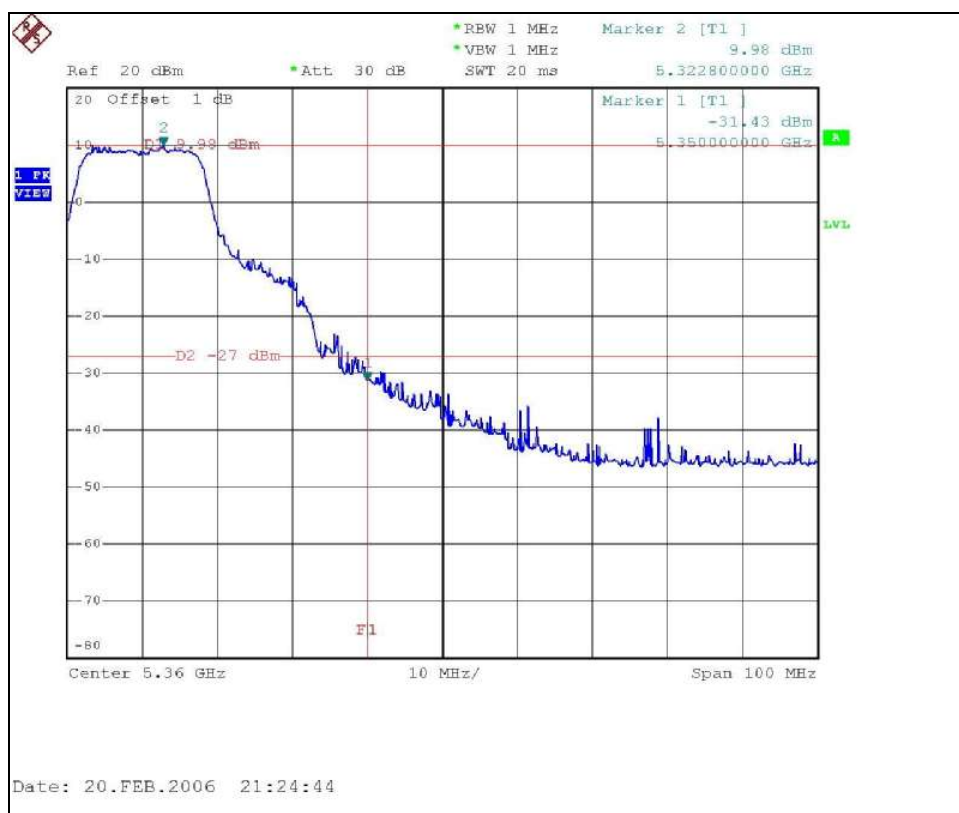
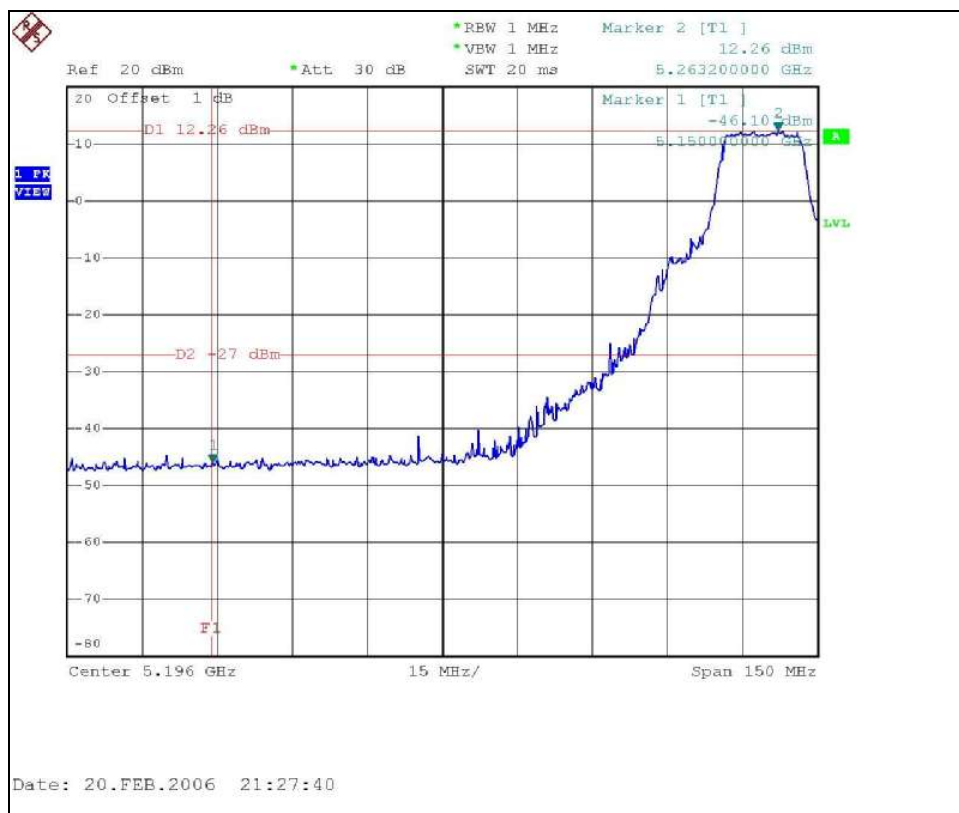
The band edge emission plot on the following first page shows 41.41dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 4 is 109.2dBuV/m (Peak), so the maximum field strength in restrict band is  $109.2 - 41.41 = 67.79$ dBuV/m which is under 74dBuV/m limit.

### NOTE (Average):

The band edge emission plot on the following second page shows 60.0dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 104.8dBuV/m (Average), so the maximum field strength in restrict band is  $104.8 - 60.0 = 44.8$ dBuV/m which is under 54dBuV/m limit.

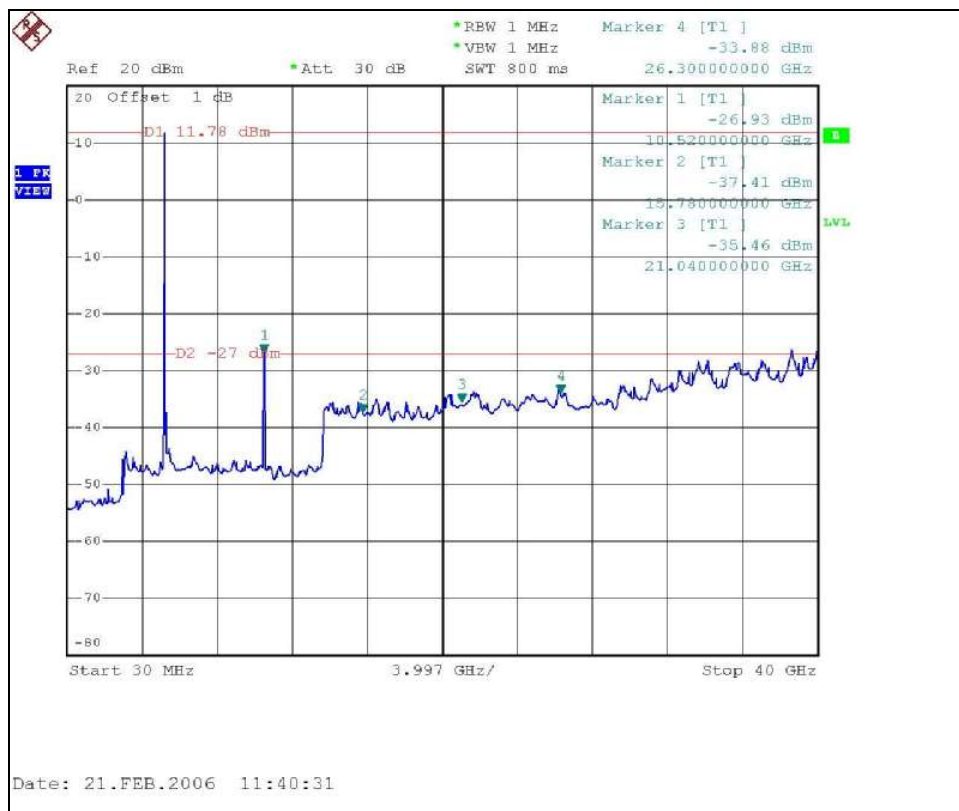
The band edge emission plot on the following second page shows 49.59dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 4 is 101.6dBuV/m (Average), so the maximum field strength in restrict band is  $101.6 - 49.59 = 52.01$ dBuV/m which is under 54dBuV/m limit.

## 802.11a OFDM modulation

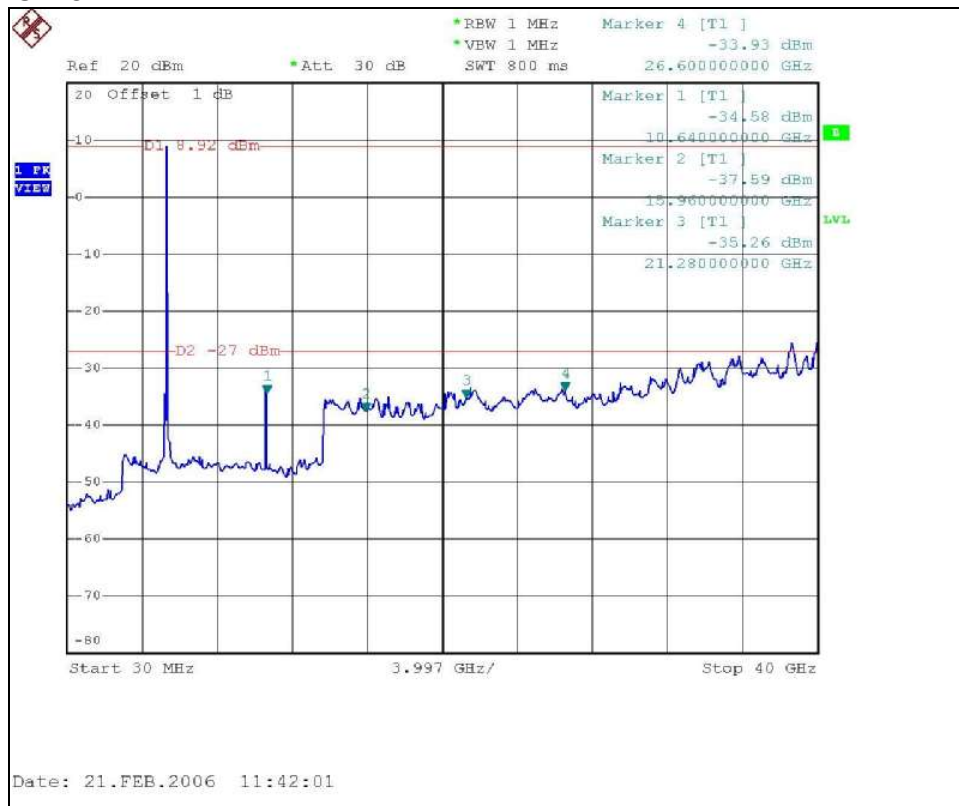




## CH 1



## CH 8



#### 4.7.5 TEST RESULTS (ANTENNA C)

For signals in the restricted bands above and below the 5.15 to 5.35GHz 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=VBW=1MHz; Average RBW=1MHz, VBW=10Hz) are attached on the following pages.

## 802.11a OFDM modulation

### NOTE (Peak):

The band edge emission plot on the following first page shows 57.83dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 112.6dBuV/m (Peak), so the maximum field strength in restrict band is  $112.6 - 57.83 = 54.77$ dBuV/m which is under 74dBuV/m limit.

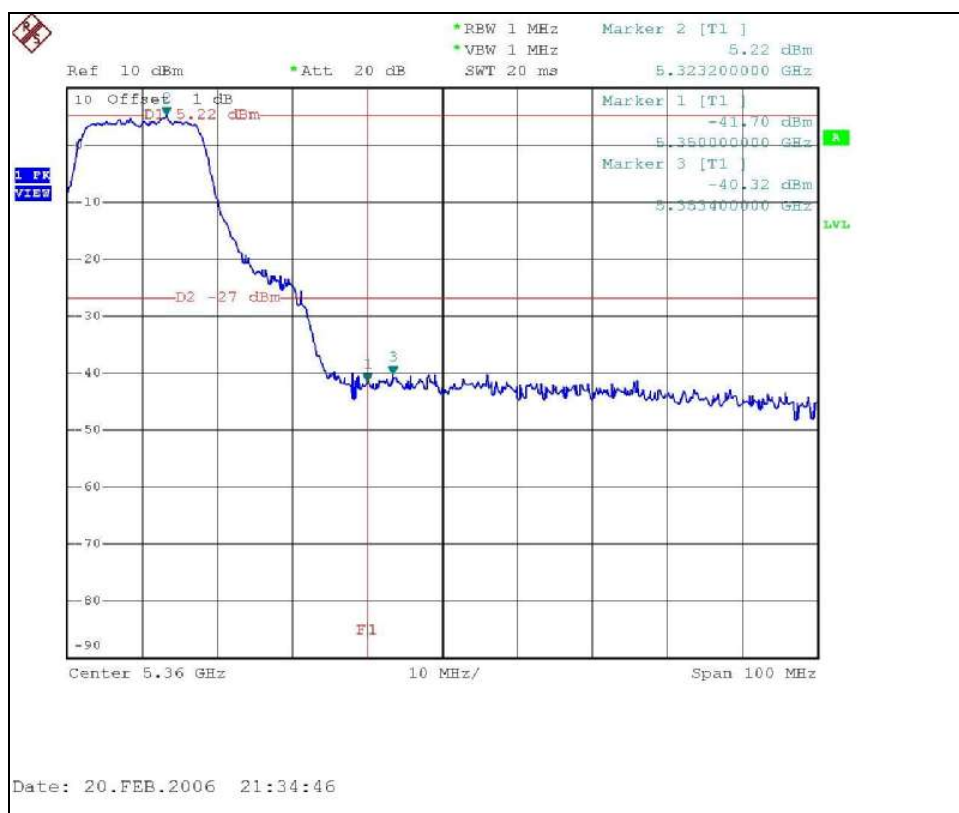
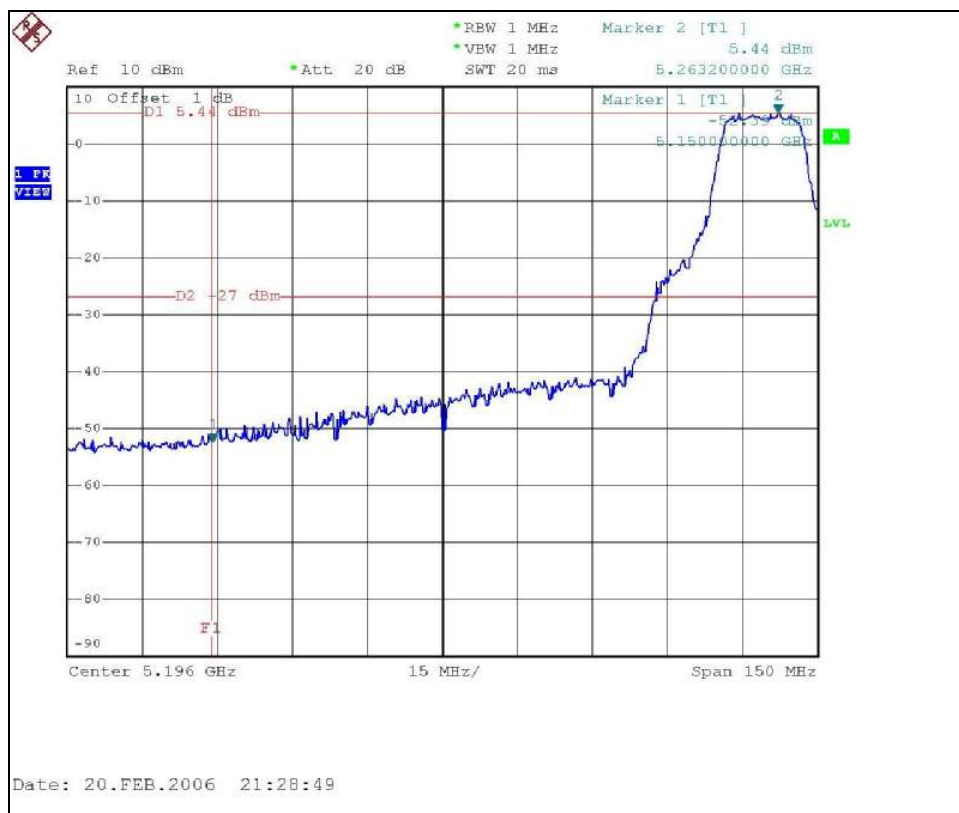
The band edge emission plot on the following first page shows 46.92dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 4 is 111.5dBuV/m (Peak), so the maximum field strength in restrict band is  $111.5 - 46.92 = 64.58$ dBuV/m which is under 74dBuV/m limit.

### NOTE (Average):

The band edge emission plot on the following second page shows 58.51dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 104.3dBuV/m (Average), so the maximum field strength in restrict band is  $104.3 - 58.51 = 45.79$ dBuV/m which is under 54dBuV/m limit.

The band edge emission plot on the following second page shows 55.23dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 4 is 103.1dBuV/m (Average), so the maximum field strength in restrict band is  $103.1 - 55.23 = 47.87$ dBuV/m which is under 54dBuV/m limit.

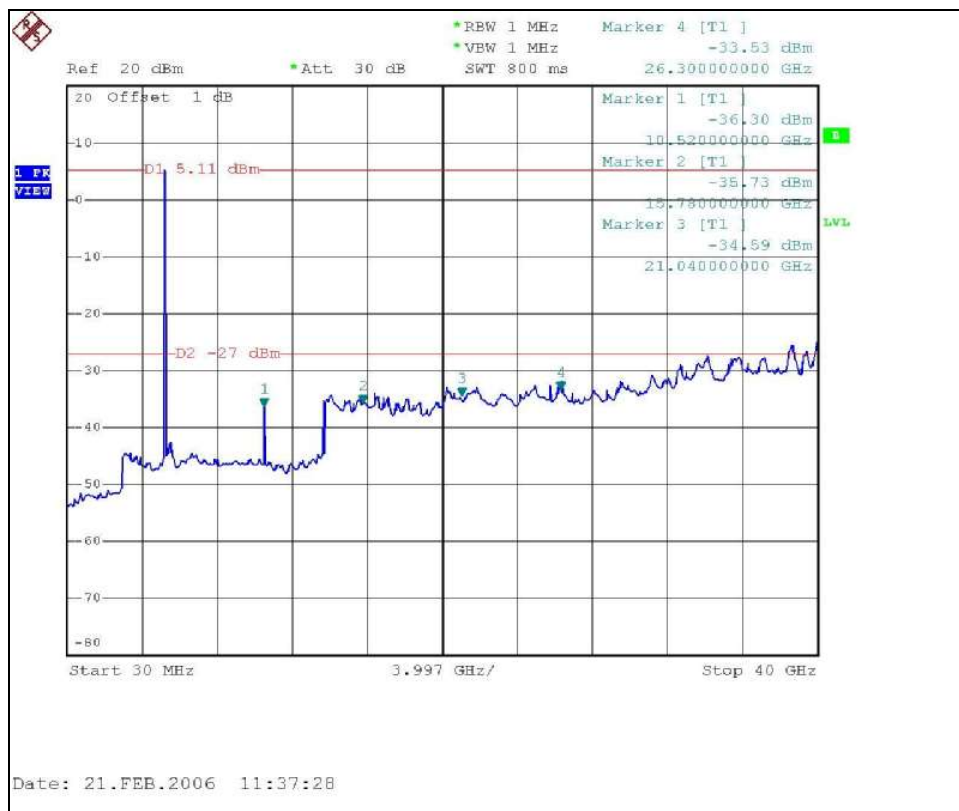
## 802.11a OFDM modulation



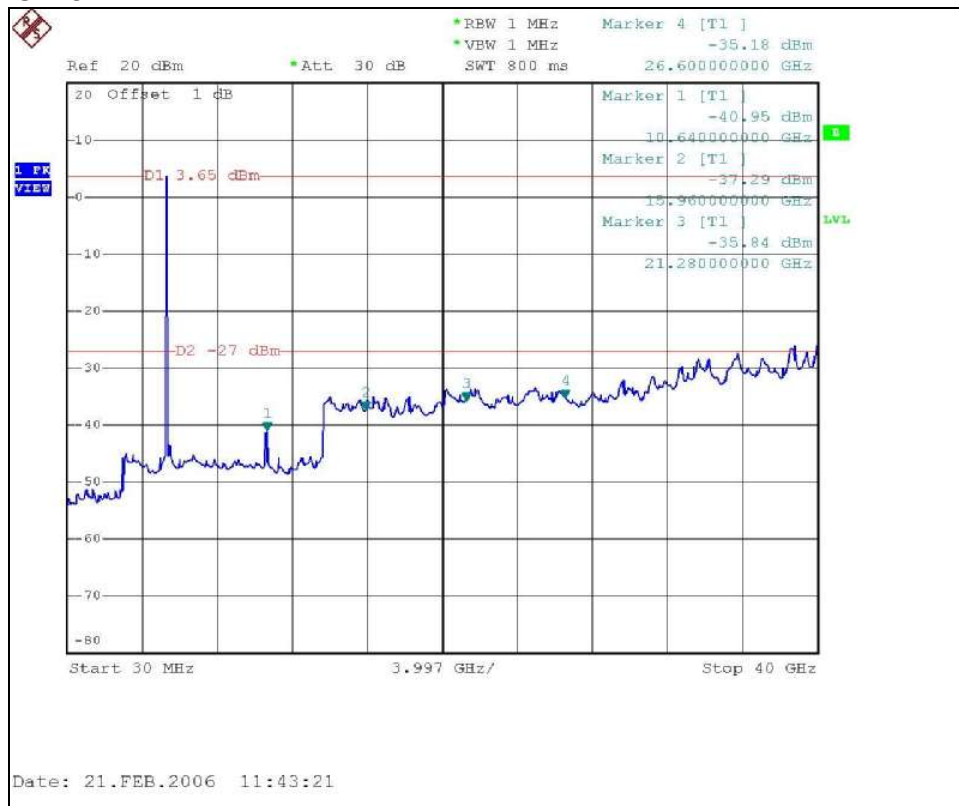




## CH 1



## CH 8



## 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 antennas used in this product are as following:

No.	Model No.	Gain (dBi)	Cable Loss (dB)	Antenna Type	Antenna Connector
1	HG5310U	10.0	2.0	OMNI Dipole	N-Female
2	HG5808U	8.0	2.0	OMNI Dipole	N-Female
3	SA-A04-090250	18.0	2.0	Panel Directional	N-Jack

## 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, A2LA
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA , CSA
<b>R.O.C.</b>	CNLA, BSMI, DGT
<b>Netherlands</b>	Telefication
<b>Singapore</b>	PSB , 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: 886-2-26052943

**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

## **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.