

FCC TEST REPORT (15.407)

REPORT NO.: RF940330L05A
MODEL NO.: WMIA-139AG
RECEIVED: Aug. 04, 2005
TESTED: Aug. 09 ~ Aug. 16, 2005
ISSUED: Aug. 18, 2005

APPLICANT: SparkLAN Communications, Inc.

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ILAC MRA



No. 2177-01

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1. CERTIFICATION

PRODUCT: 802.11a Wireless MiniPCI Card
BRAND NAME: SparkLAN
MODEL NO.: WMIA-139AG
APPLICANT: SparkLAN Communications, Inc.
TEST SAMPLE: Engineering Sample
TESTED: Aug. 09 ~ Aug. 16, 2005
STANDARDS: FCC Part 15, Subpart E (Section 15.407)
ANSI C63.4-2003

The above equipment has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Andrea Hsia , **DATE:** Aug. 18, 2005
(Andrea Hsia)

TECHNICAL
ACCEPTANCE : Gary Chang , **DATE:** Aug. 18, 2005
Responsible for
RF (Gary Chang)

APPROVED BY : Cody Chang , **DATE:** Aug. 18, 2005
(Cody Chang, 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 -17.18dB at 0.377MHz
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 -2.22dB at 5150MHz
15.407(a/1/2/3)	Peak Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(6)	Peak Power Excursion	PASS	Meet the requirement of limit.
15.407(a/1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz ~ 30MHz	2.44 dB
	30MHz ~ 200MHz	3.73 dB
Radiated emissions	200MHz ~ 1000MHz	3.74 dB
	1GHz ~ 18GHz	2.20 dB
	18GHz ~ 40GHz	1.88 dB

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	802.11a Wireless MiniPCI Card
MODEL NO.	WMIA-139AG
POWER SUPPLY	5.0Vdc from host equipment
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11a: 54/48/36/24/18/12/9/6Mbps (Turbo mode: up to 108Mbps *see Note 5)
FREQUENCY RANGE	802.11a: 5.150 ~ 5.350GHz and 5.725 ~ 5.850GHz
NUMBER OF CHANNEL	802.11a: 13 for Normal mode / 5 for Turbo mode
CHANNEL SPACING	802.11a: 20MHz for Normal mode / 40MHz for Turbo mode
OUTPUT POWER	67.143mW for 5.150 ~ 5.350GHz 63.680mW for 5.725 ~ 5.850GHz
ANTENNA TYPE	Refer to NOTE 5 below
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. This report is issued as a supplementary report of ADT report no.: RF940330L05. The model in this report is identical to the original application one.
2. This report is prepared for FCC class II permissive change. The difference compared with the original design is adding one antenna.
3. The EUT operates in the 5GHz Bands and compatibility with 802.11a technology.
4. This EUT is capable of providing data rates of up to 108 Mbps in 802.11a Turbo mode depending upon reception quality.
5. The following antennas are used in this EUT.

Item	Antenna Brand	Antenna Type	Gain(dBi)	Remark
1	PINWHEEL	Printed	2.70	Certificated Antenna
2	PINWHEEL	Printed	2.70	Certificated Antenna
3	TIKI	Printed	7.51	Certificated Antenna
4	NA	Dipole	2.00	Additional Antenna

*Item 4 is for additional test and recorded in this report.

6. 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 5150 ~ 5250MHz, 5250MHz ~ 5350MHz bands:

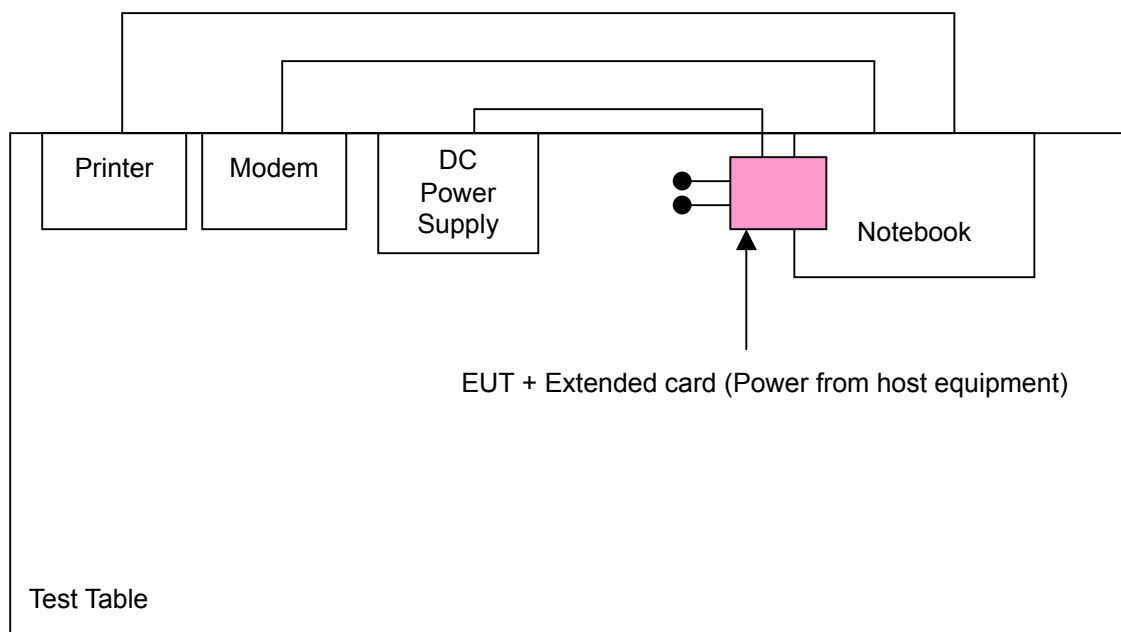
Eight channels are provided to this EUT for normal mode.

Channel	Frequency
1	5180 MHz
2	5200 MHz
3	5220 MHz
4	5240 MHz
5	5260 MHz
6	5280 MHz
7	5300 MHz
8	5320 MHz

Three channels are provided to this EUT for turbo mode.

Channel	Frequency
1	5210 MHz
2	5250 MHz
3	5290 MHz

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST



3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT configure mode	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
-	√	√	√	Note 1	Antenna 4 (gain: 2.00)

Where PLC: Power Line Conducted Emission

RE<1G RE: Radiated Emission below 1GHz

RE≥1G: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

Note 1: Conducted RF measurement is independent of antenna.

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, XYZ Axis 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 8	5	OFDM	BPSK	6
802.11a	1 to 8	5	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, XYZ Axis 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 8	5	OFDM	BPSK	6
802.11a	1 to 8	5	OFDM	BPSK	6
802.11a	1 to 8	5	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, XYZ Axis 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 8	5	OFDM	BPSK	6
802.11a Turbo	1 to 3	1, 3	OFDM	BPSK	12

**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 8	1, 8	OFDM	BPSK	6
802.11a Turbo	1 to 3	1, 3	OFDM	BPSK	12

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is an 802.11a Wireless MiniPCI Card. 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	PP05L	16484462992	E2K24CLNS
2	PRINTER	EPSON	LQ-300+	DCGY054147	FCC DoC Approved
3	MODEM	ACEEX	1414V/3	0401008269	IFAXDM1414
4	DC POWER SUPPLY	Topward	6603D	700637	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.2 shielded cable without core
3	1.2 shielded cable without core
4	NA

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

4. TEST TYPES AND RESULTS (5150 ~ 5350MHz Band)

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 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 ROHDE & SCHWARZ	ESCS30	100288	Nov. 06, 2005
RF signal cable Woken	5D-FB	Cable-HyC02-01	Jan. 09, 2006
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Jan. 20, 2006
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jan. 20, 2006
Software ADT	ADT_Cond_V3	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 3.
 3. The VCCI Site Registration No. is C-2047.



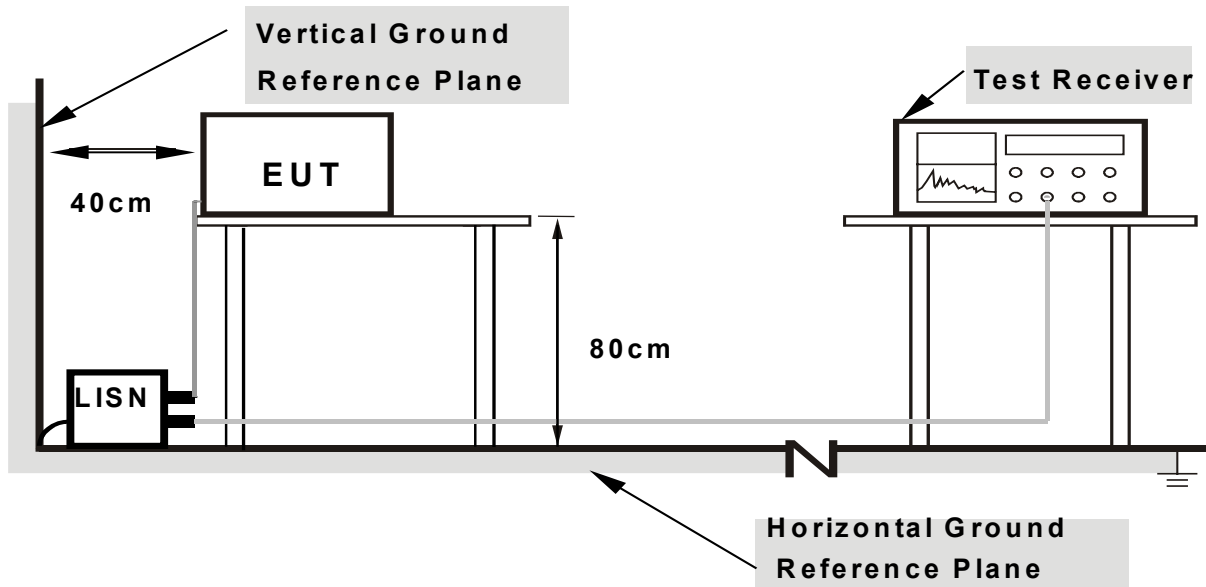
4.1.3 TEST PROCEDURES

- 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) 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

- Connected the EUT into Notebook via a extended card and placed on the testing table.
- The Notebook systems run a test program (provided by manufacturer) to enable EUT under transmission/receiving condition continuously at specific channel frequency.
- The Notebook sent "H" messages to its screen.
- The notebook system sent "H" messages to modem.
- The notebook system sent "H" messages to printer, and the printer printed them on paper.
- Steps c ~ e were repeated.

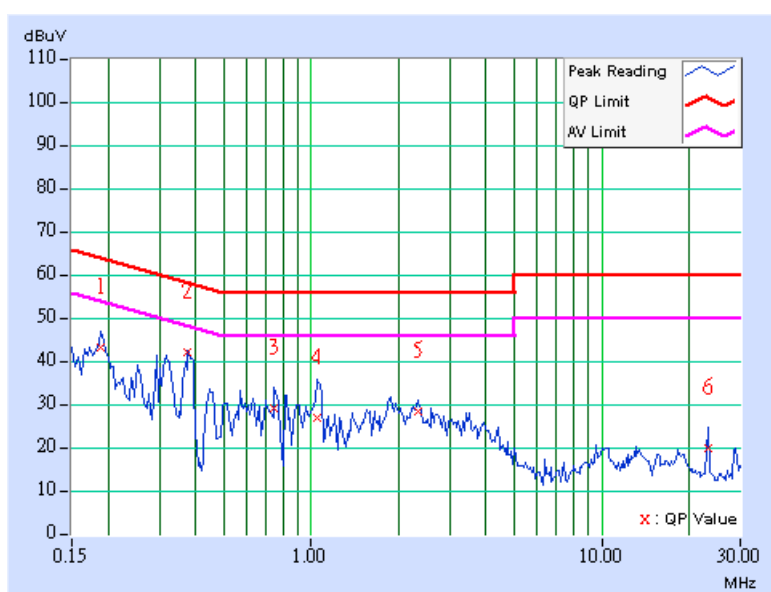
4.1.7 TEST RESULTS

Conducted Worst-Case Data

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	PHASE	Line 1
CHANNEL	Channel 5	6dB BANDWIDTH	9 kHz
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

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	0.189	0.10	42.52	-	42.62	-	64.08	54.08	-21.46	-
2	0.377	0.10	41.07	-	41.17	-	58.35	48.35	-17.18	-
3	0.746	0.16	28.37	-	28.53	-	56.00	46.00	-27.47	-
4	1.051	0.20	26.21	-	26.41	-	56.00	46.00	-29.59	-
5	2.320	0.20	27.59	-	27.79	-	56.00	46.00	-28.21	-
6	23.277	1.00	18.94	-	19.94	-	60.00	50.00	-40.06	-

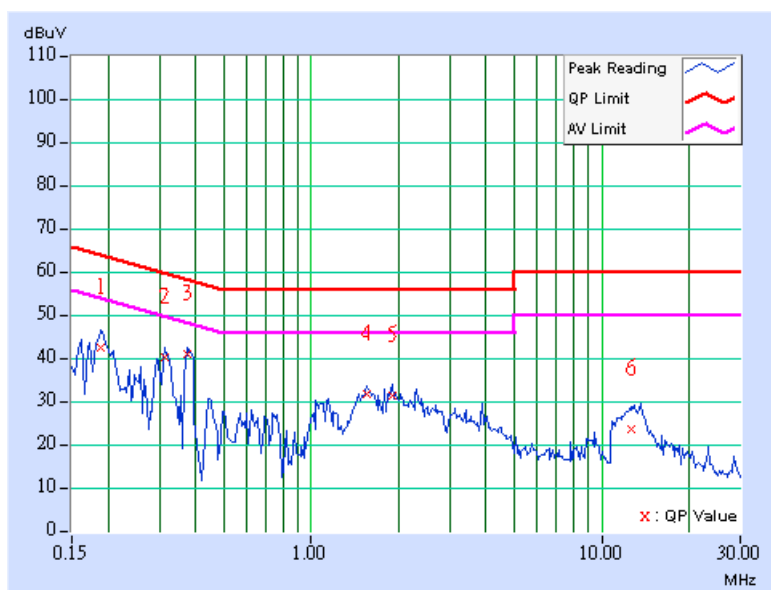
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value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



EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	PHASE	Line 2
CHANNEL	Channel 5	6dB BANDWIDTH	9 kHz
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.10	42.16	-	42.26	-	64.08	54.08	-21.82	-
2	0.314	0.10	39.78	-	39.88	-	59.86	49.86	-19.98	-
3	0.377	0.10	40.83	-	40.93	-	58.35	48.35	-17.42	-
4	1.563	0.20	31.36	-	31.56	-	56.00	46.00	-24.44	-
5	1.895	0.20	30.98	-	31.18	-	56.00	46.00	-24.82	-
6	12.656	0.45	23.19	-	23.64	-	60.00	50.00	-36.36	-

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





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
Test Receiver ROHDE & SCHWARZ	ESIB7	100188	Dec. 19, 2005
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Nov. 21, 2005
BILOG Antenna SCHWARZBECK	VULB9168	9168-157	Jan. 22, 2006
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-407	Jan. 16, 2006
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA 9170241	Feb. 23, 2006
Preamplifier Agilent	8449B	3008A01961	Nov. 09, 2005
Preamplifier Agilent	8447D	2944A10629	Nov. 09, 2005
RF signal cable HUBER+SUHNER	SUCOFLEX 104	218182/4	Feb. 17, 2006
RF signal cable HUBER+SUHNER	SUCOFLEX 104	218194/4	Feb. 17, 2006
Software ADT.	ADT_Radiated_V5.14	NA	NA
Antenna Tower ADT.	AT100	AT93021702	NA
Turn Table ADT.	TT100.	TT93021702	NA
Controller ADT.	SC100.	SC93021702	NA

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 1.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The IC Site Registration No. is IC4924-2.



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.

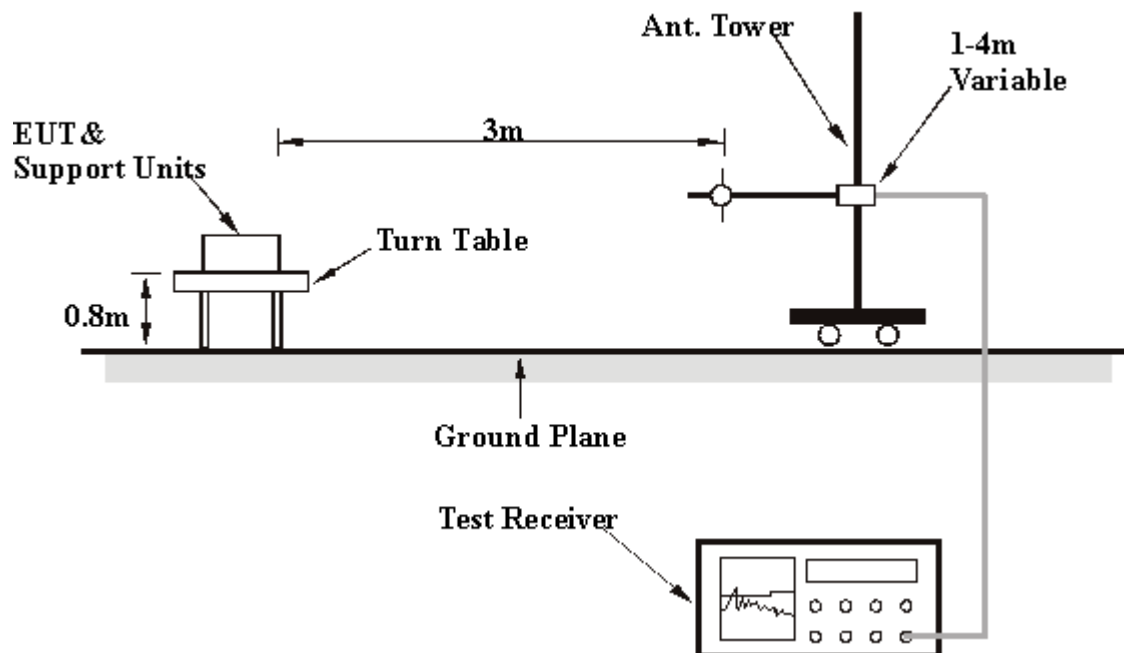
NOTE:

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

Below 1GHz Worst-Case Data

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	Below 1000MHz
CHANNEL	Channel 5	DETECTOR FUNCTION	Quasi-Peak
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	113.59	29.62 QP	43.50	-13.88	1.50 H	241	17.48	12.14
2	160.24	29.15 QP	43.50	-14.35	1.75 H	319	14.51	14.63
3	199.12	36.11 QP	43.50	-7.39	1.25 H	352	24.91	11.20
4	230.22	39.88 QP	46.00	-6.12	1.25 H	346	27.60	12.29
5	265.21	40.75 QP	46.00	-5.25	1.25 H	331	27.30	13.45
6	298.26	37.41 QP	46.00	-8.59	1.00 H	343	23.10	14.30
7	333.25	42.76 QP	46.00	-3.24	1.00 H	205	27.68	15.08
8	379.90	33.09 QP	46.00	-12.91	1.00 H	280	16.93	16.16
9	414.89	31.83 QP	46.00	-14.17	1.00 H	283	14.81	17.02
10	465.43	31.78 QP	46.00	-14.22	1.75 H	223	13.66	18.12
11	607.33	29.80 QP	46.00	-16.20	2.00 H	43	8.80	21.00
12	665.65	30.11 QP	46.00	-15.89	1.25 H	355	8.32	21.79

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.94	23.48 QP	40.00	-16.52	1.00 V	328	9.80	13.68
2	64.99	27.01 QP	40.00	-12.99	1.00 V	148	14.12	12.90
3	133.03	30.10 QP	43.50	-13.40	1.00 V	166	16.38	13.72
4	265.21	31.83 QP	46.00	-14.17	1.25 V	271	18.38	13.45
5	333.25	34.75 QP	46.00	-11.25	1.25 V	268	19.67	15.08
6	399.34	31.54 QP	46.00	-14.46	1.25 V	34	14.92	16.62
7	603.45	32.17 QP	46.00	-13.83	1.00 V	79	11.23	20.94
8	667.60	31.19 QP	46.00	-14.81	1.50 V	250	9.37	21.82

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

802.11a OFDM modulation

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 1	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5150.00	50.05 PK	74.00	-23.95	1.90 H	231	11.13	38.92
1	#5150.00	40.21 AV	54.00	-13.79	1.90 H	231	1.29	38.92
2	*5180.00	100.49 PK			1.90 H	231	61.52	38.97
2	*5180.00	90.65 AV			1.90 H	231	51.68	38.97
3	6906.00	55.31 PK	68.30	-12.99	1.11 H	23	11.35	43.96
4	10360.00	59.43 PK	68.30	-8.87	1.31 H	204	10.37	49.06

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	62.24 PK	74.00	-11.76	1.60 V	341	23.32	38.92
1	#5150.00	51.78 AV	54.00	-2.22	1.60 V	341	12.86	38.92
2	*5180.00	108.10 PK			1.60 V	341	69.13	38.97
2	*5180.00	96.96 AV			1.60 V	341	57.99	38.97
3	6906.00	55.82 PK	68.30	-12.48	1.37 V	240	11.86	43.96
4	10360.00	58.64 PK	68.30	-9.66	1.30 V	212	9.58	49.06

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.

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 4	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5240.00	100.58 PK			1.52 H	58	61.46	39.12
1	*5240.00	90.13 AV			1.52 H	58	51.01	39.12
2	6986.00	54.83 PK	68.30	-13.47	1.32 H	29	10.61	44.22
3	10480.00	64.13 PK	68.30	-4.17	1.31 H	206	14.87	49.26

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5240.00	108.12 PK			1.26 V	255	69.00	39.12
1	*5240.00	97.01 AV			1.26 V	255	57.89	39.12
2	6986.00	55.88 PK	68.30	-12.42	1.54 V	40	11.66	44.22
3	10480.00	65.23 PK	68.30	-3.07	1.95 V	238	15.97	49.26

- 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.

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 5	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5260.00	105.73 PK			1.20 H	243	66.56	39.17
1	*5260.00	96.51 AV			1.20 H	243	57.34	39.17
2	7013.00	54.14 PK	68.30	-14.16	1.26 H	28	9.87	44.27
3	10520.00	61.50 PK	68.30	-6.80	1.07 H	309	12.15	49.35

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	*5260.00	110.81 PK			1.39 V	69	71.64	39.17
1	*5260.00	99.72 AV			1.39 V	69	60.55	39.17
2	7013.00	54.53 PK	68.30	-13.77	2.14 V	238	10.26	44.27
3	10520.00	65.48 PK	68.30	-2.82	1.30 V	246	16.13	49.35

- 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.

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 8	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	6Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5320.00	100.83 PK			1.19 H	132	61.52	39.31
1	*5320.00	91.09 AV			1.19 H	132	51.78	39.31
2	#5350.00	48.42 PK	74.00	-25.58	1.19 H	132	9.08	39.34
2	#5350.00	38.68 AV	54.00	-15.32	1.19 H	132	-0.66	39.34
3	7093.00	53.62 PK	68.30	-14.68	1.42 H	39	9.26	44.36
4	#10640.00	59.41 PK	74.00	-14.59	1.22 H	309	9.75	49.66
4	#10640.00	47.05 AV	54.00	-6.95	1.22 H	309	-2.61	49.66

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	108.21 PK			1.52 V	67	68.90	39.31
1	*5320.00	97.90 AV			1.52 V	67	58.59	39.31
2	#5350.00	60.07 PK	74.00	-13.93	1.52 V	67	20.73	39.34
2	#5350.00	49.08 AV	54.00	-4.92	1.52 V	67	9.74	39.34
3	7093.00	55.18 PK	68.30	-13.12	1.42 V	39	10.82	44.36
4	#10640.00	64.03 PK	74.00	-9.97	1.46 V	243	14.37	49.66
4	#10640.00	52.08 AV	54.00	-1.92	1.46 V	243	2.42	49.66

- 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.

802.11a Turbo OFDM modulation (Antenna 4)

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 1	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	12Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#5150.00	50.92 PK	74.00	-23.08	1.21 H	42	12.00	38.92
1	#5150.00	41.71 AV	54.00	-12.29	1.21 H	42	2.79	38.92
2	*5210.00	99.06 PK			1.21 H	42	60.03	39.03
2	*5210.00	89.85 AV			1.21 H	42	50.82	39.03
3	6946.00	54.83 PK	68.30	-13.47	1.22 H	27	10.74	44.09
4	10420.00	60.21 PK	68.30	-8.09	1.53 H	271	11.03	49.18

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	60.15 PK	74.00	-13.85	1.42 V	255	21.23	38.92
1	#5150.00	51.28 AV	54.00	-2.72	1.42 V	255	12.36	38.92
2	*5210.00	103.75 PK			1.42 V	255	64.72	39.03
2	*5210.00	93.20 AV			1.42 V	255	54.17	39.03
3	6946.00	53.91 PK	68.30	-14.39	1.25 V	37	9.82	44.09
4	10420.00	61.07 PK	68.30	-7.23	1.42 V	249	11.89	49.18

- 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.

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 2	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	12Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5250.00	101.17 PK			1.29 H	42	62.02	39.15
1	*5250.00	91.06 AV			1.29 H	42	51.91	39.15
2	7000.00	53.48 PK	74.00	-20.52	1.27 H	360	9.22	44.26
2	7000.00	44.91 AV	54.00	-9.09	1.27 H	360	0.65	44.26
3	10500.00	60.17 PK	68.30	-8.13	1.25 H	141	10.88	49.29

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	*5250.00	105.31 PK			1.43 V	256	66.16	39.15
1	*5250.00	95.13 AV			1.43 V	256	55.98	39.15
2	7000.00	56.29 PK	74.00	-17.71	1.25 V	57	12.03	44.26
2	7000.00	49.39 AV	54.00	-4.61	1.25 V	57	5.13	44.26
3	10500.00	63.63 PK	68.30	-4.67	1.71 V	265	14.34	49.29

- 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.

EUT	802.11a Wireless MiniPCI Card	MEASUREMENT DETAIL	
MODEL	WMIA-139AG	FREQUENCY RANGE	1 ~ 40 GHz
CHANNEL	Channel 3	DETECTOR FUNCTION	Peak(PK) Average (AV)
MODULATION TYPE	BPSK	ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH, 991hPa
TRANSFER RATE	12Mbps	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY	Match Tsui		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5290.00	101.55 PK			1.82 H	35	62.29	39.26
1	*5290.00	91.34 AV			1.82 H	35	52.08	39.26
2	#5350.00	49.23 PK	74.00	-24.77	1.82 H	35	9.89	39.34
2	#5350.00	39.11 AV	54.00	-14.89	1.82 H	35	-0.23	39.34
3	7053.00	53.64 PK	68.30	-14.66	1.35 H	32	9.32	44.32
4	10580.00	62.97 PK	68.30	-5.33	1.45 H	215	13.42	49.55

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	*5290.00	110.70 PK			1.01 V	142	71.44	39.26
1	*5290.00	96.40 AV			1.01 V	142	57.14	39.26
2	#5350.00	59.89 PK	74.00	-14.11	1.01 V	142	20.55	39.34
2	#5350.00	49.34 AV	54.00	-4.66	1.01 V	142	10.00	39.34
3	7053.00	55.73 PK	68.30	-12.57	1.34 V	60	11.41	44.32
4	10580.00	63.69 PK	68.30	-4.61	1.34 V	247	14.14	49.55

- 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 BAND EDGES MEASUREMENT

4.3.1 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	Aug. 12, 2005

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

4.3.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss 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.

4.3.3 EUT OPERATING CONDITION

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

4.3.4 TEST RESULTS

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****Channel 1 (5180MHz)**

The band edge emission plot on page 83 shows 41.81dBc 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 108.10dBuV/m (Peak), so the maximum field strength in restrict band is $108.10 - 41.81 = 66.29$ dBuV/m which is under 74dBuV/m limit.

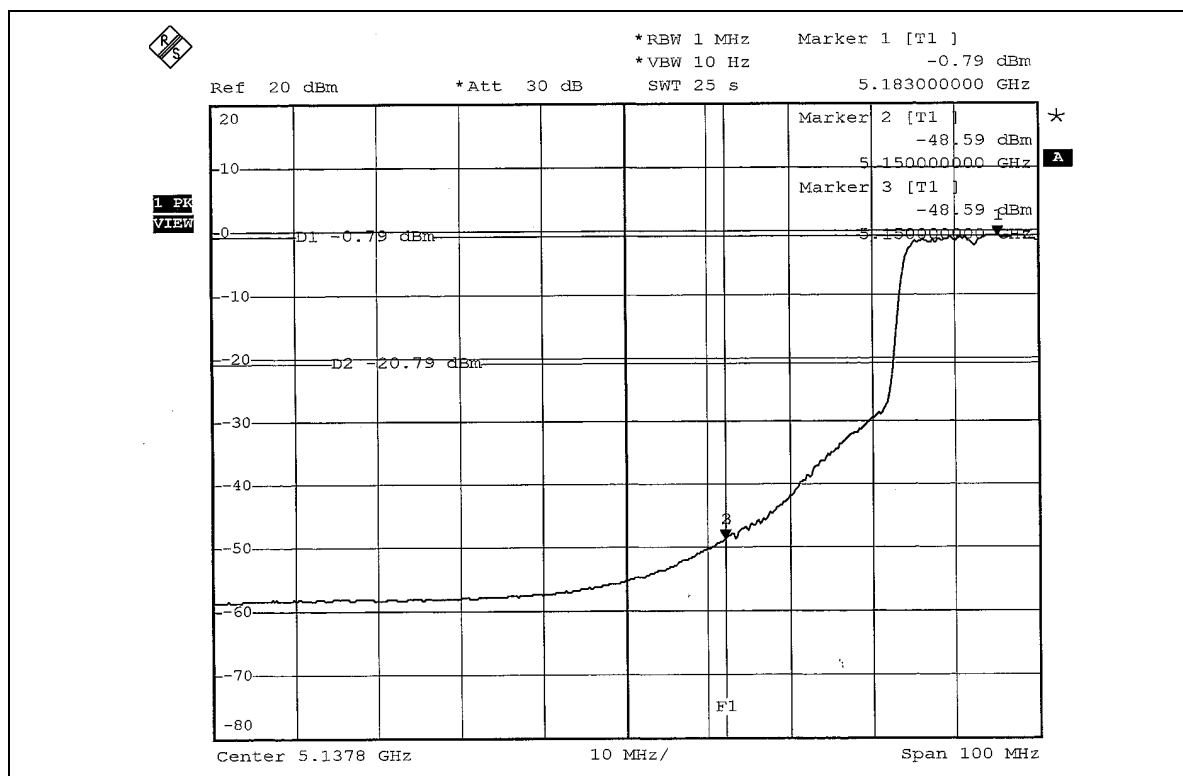
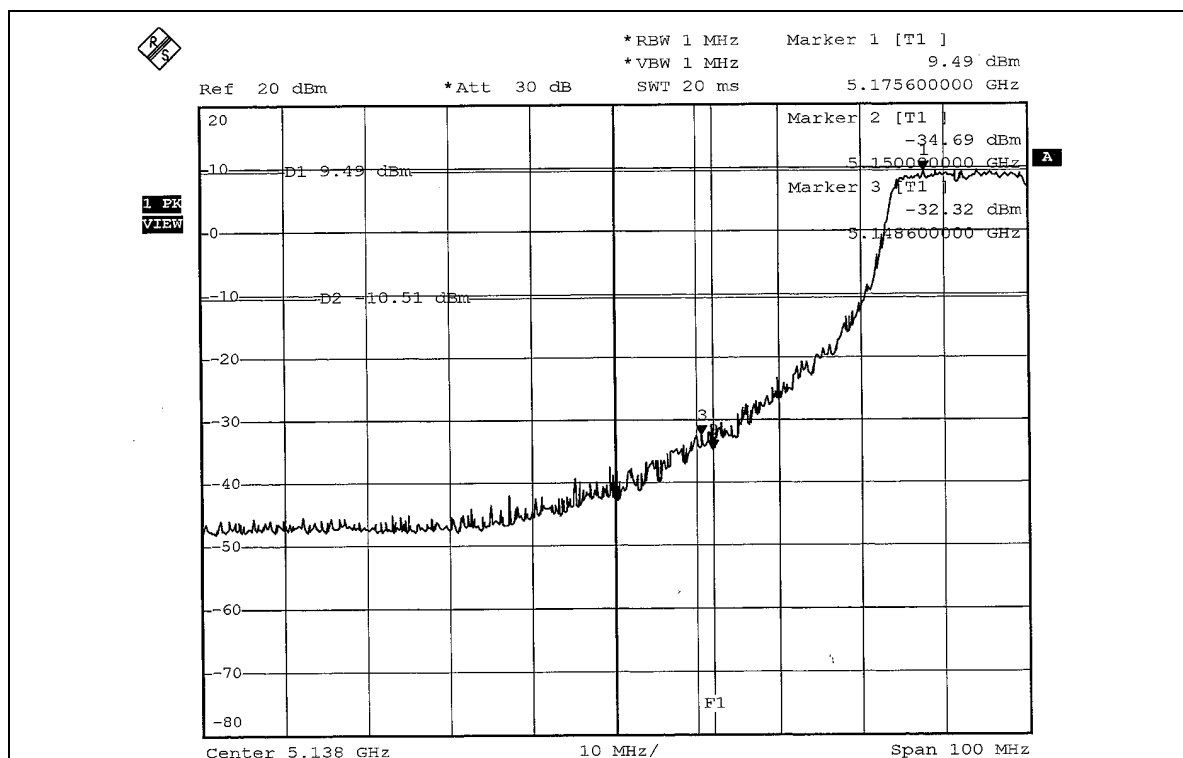
The band edge emission plot on page 83 shows 47.80dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 96.96dBuV/m (Average), so the maximum field strength in restrict band is $96.96 - 47.80 = 49.16$ dBuV/m which is under 54dBuV/m limit.

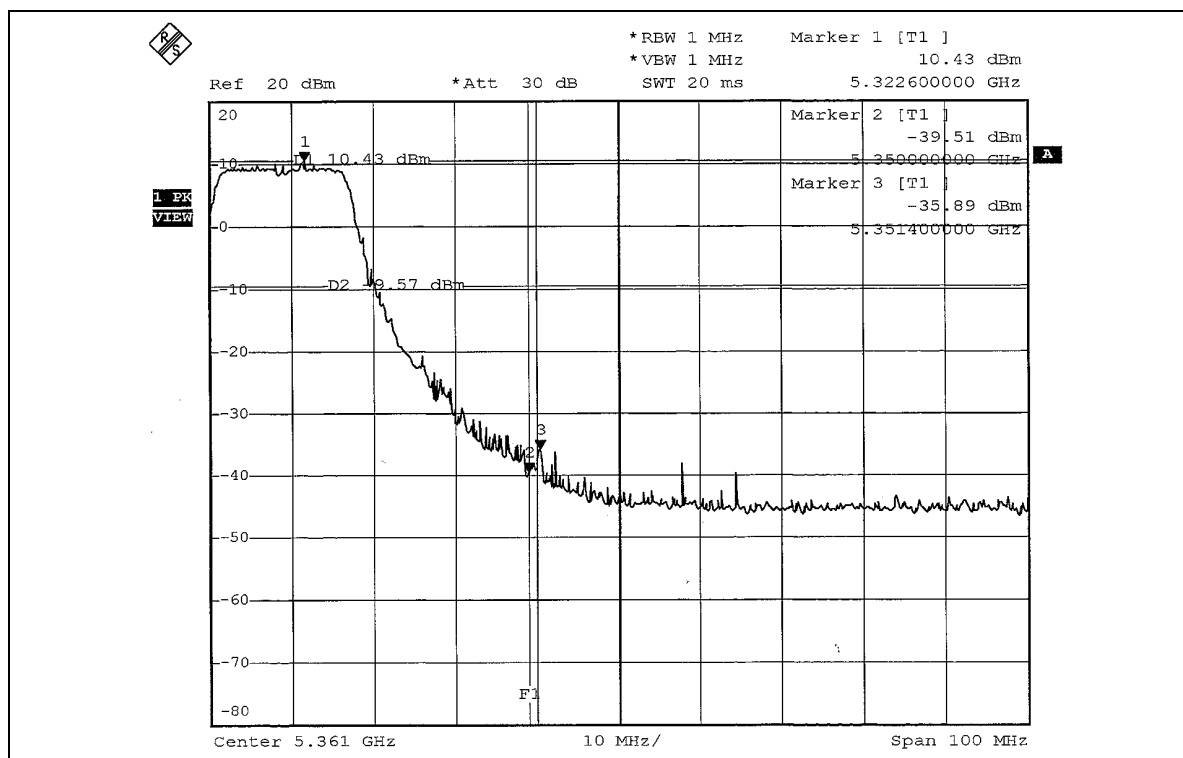
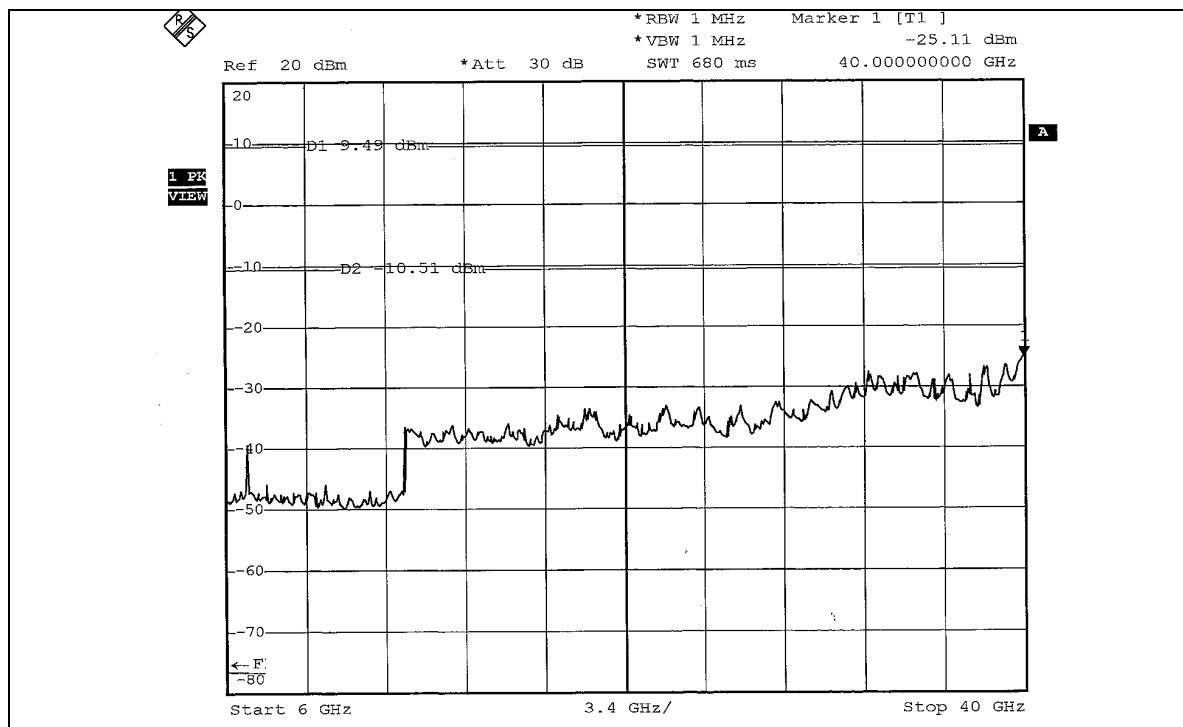
Channel 8 (5320MHz)

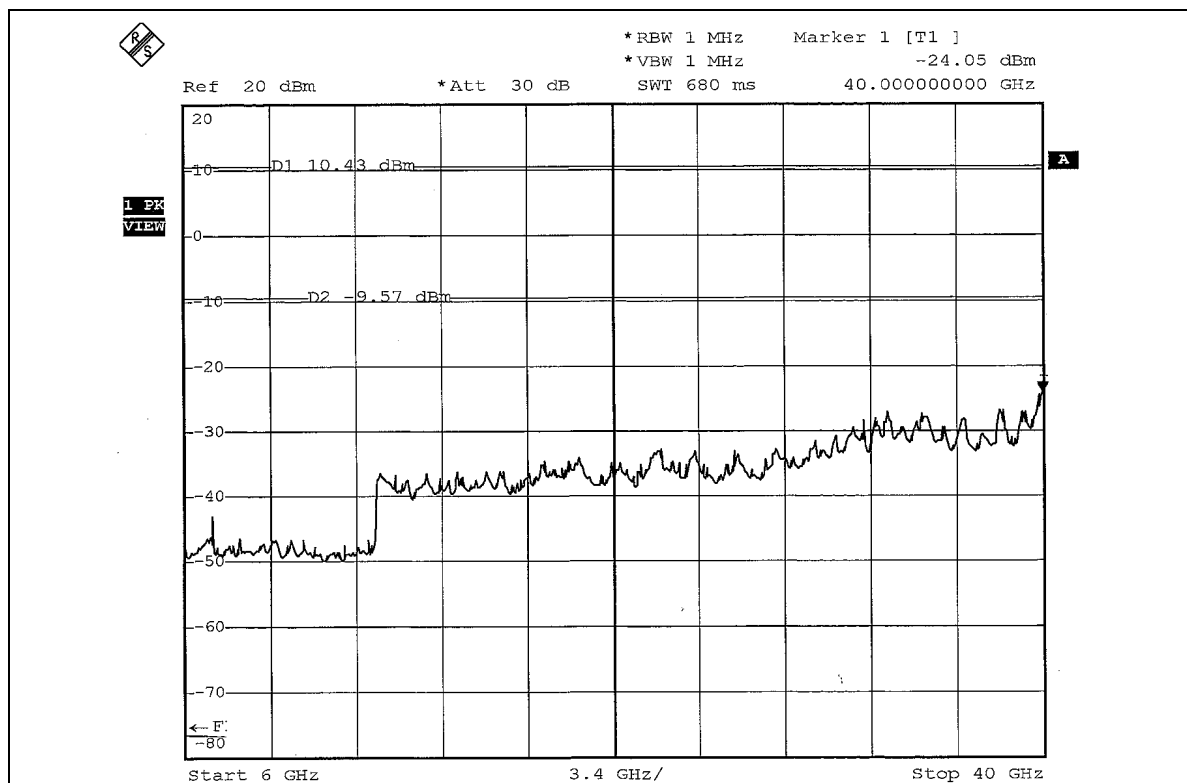
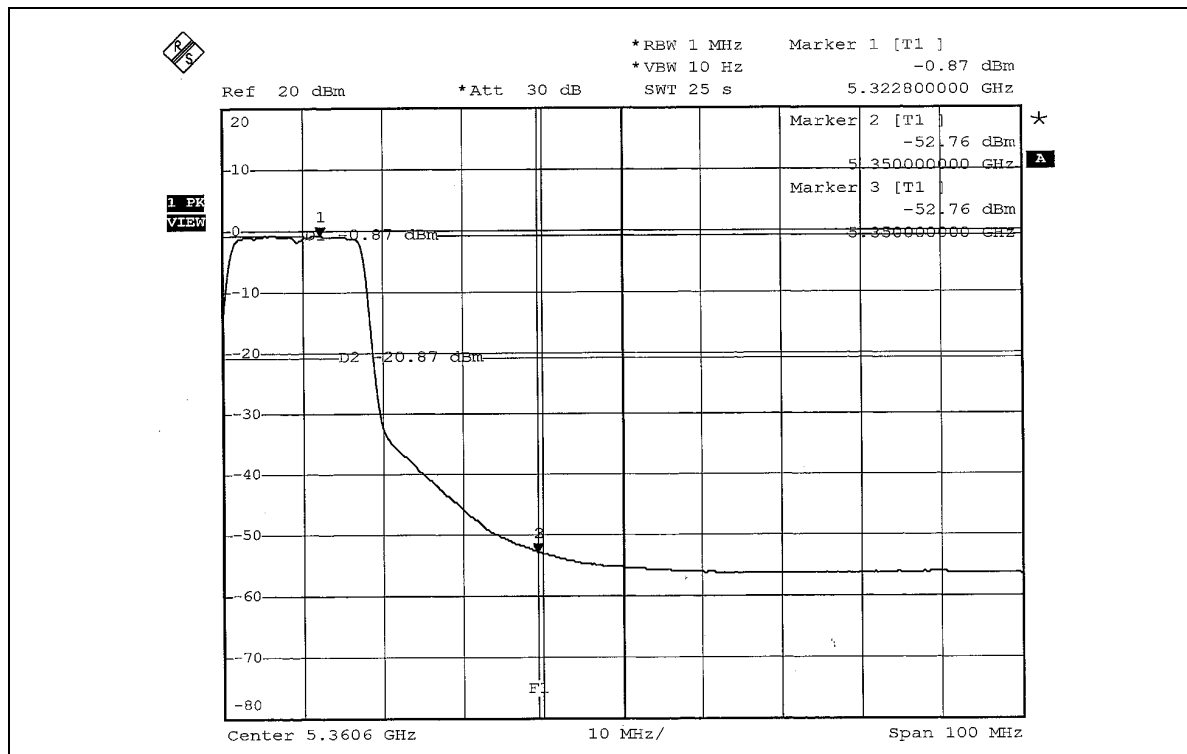
The band edge emission plot on page 84 shows 46.32dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 108.21dBuV/m (Peak), so the maximum field strength in restrict band is $108.21 - 46.32 = 61.89$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on page 85 shows 51.89dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 97.90dBuV/m (Average), so the maximum field strength in restrict band is $97.90 - 51.89 = 46.01$ dBuV/m which is under 54dBuV/m limit.

802.11a OFDM modulation







**802.11a Turbo OFDM modulation****Channel 1 (5210MHz)**

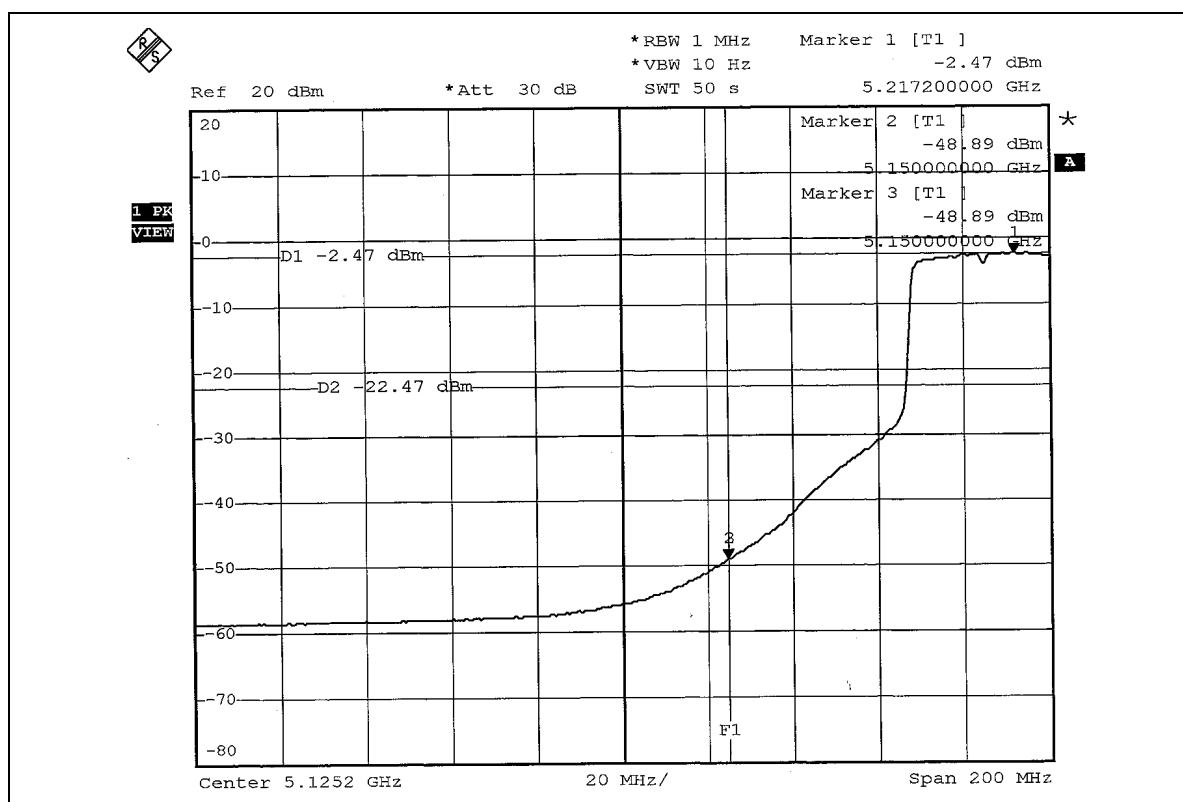
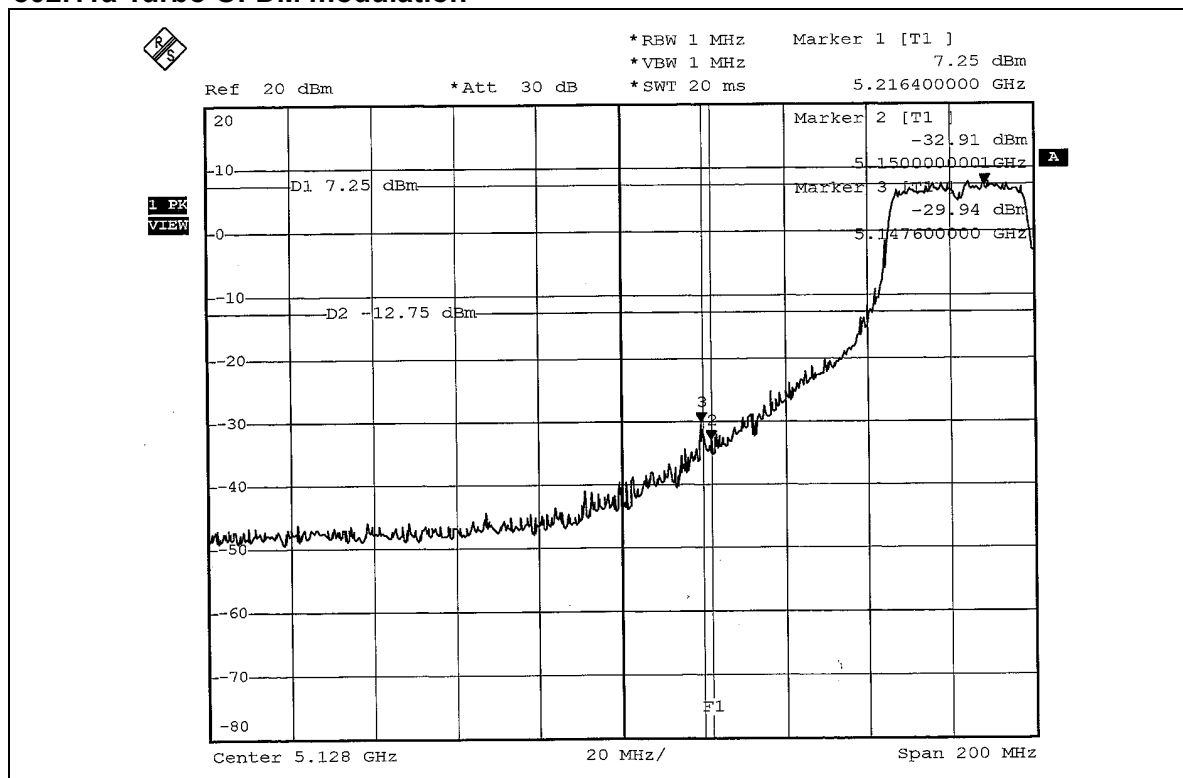
The band edge emission plot on page 35 shows 37.19dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 103.75dBuV/m (Peak), so the maximum field strength in restrict band is $103.75 - 37.19 = 66.56$ dBuV/m which is under 74dBuV/m limit.

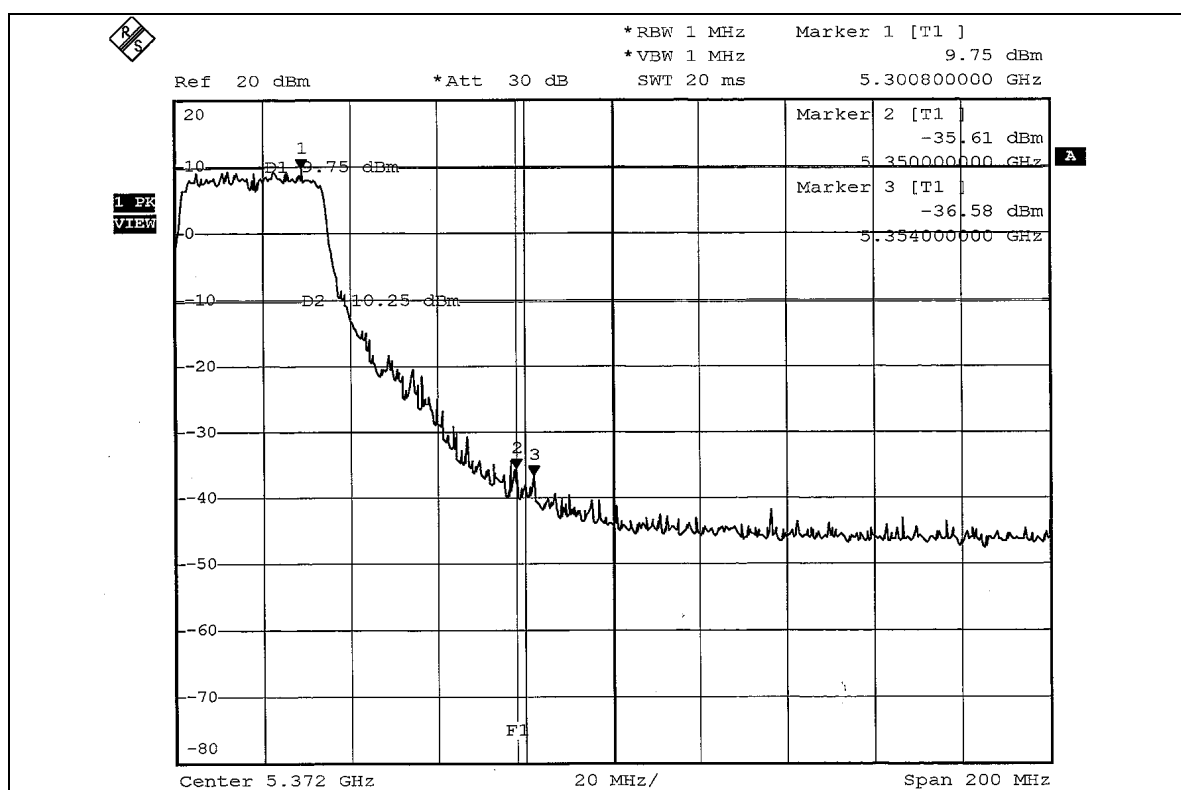
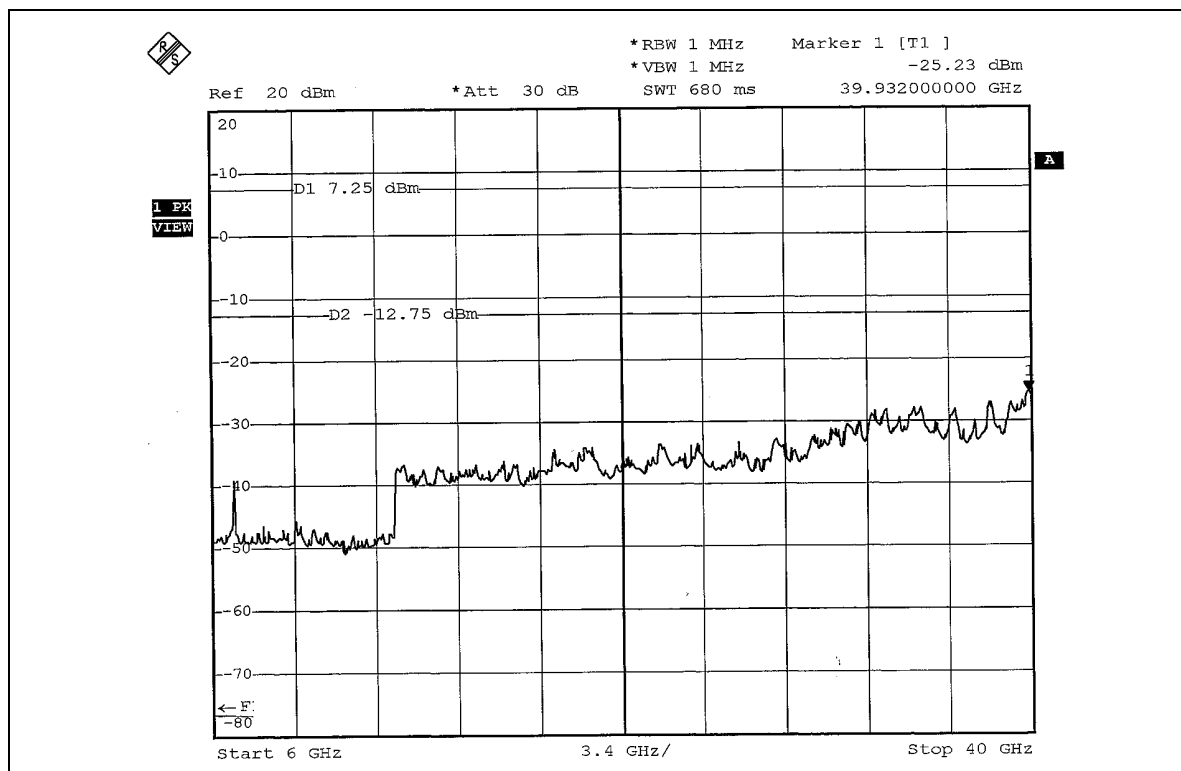
The band edge emission plot on page 35 shows 46.42dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 93.20dBuV/m (Average), so the maximum field strength in restrict band is $93.20 - 46.42 = 46.78$ dBuV/m which is under 54dBuV/m limit.

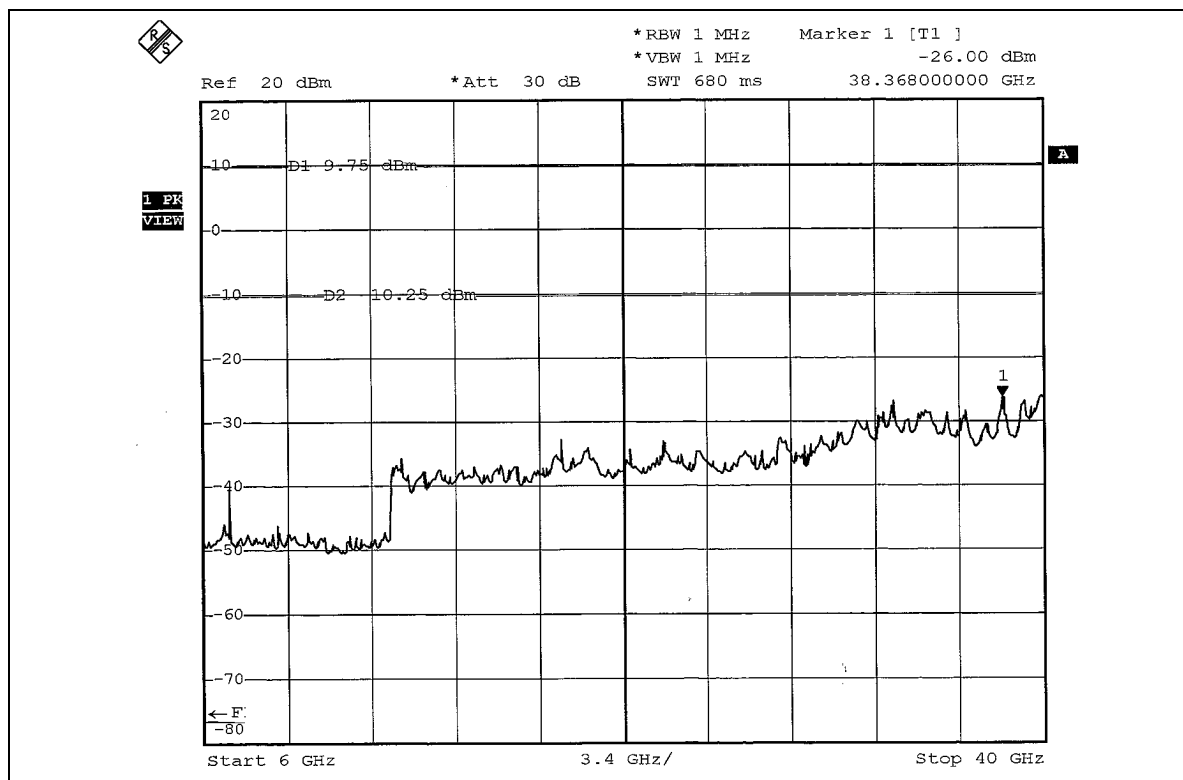
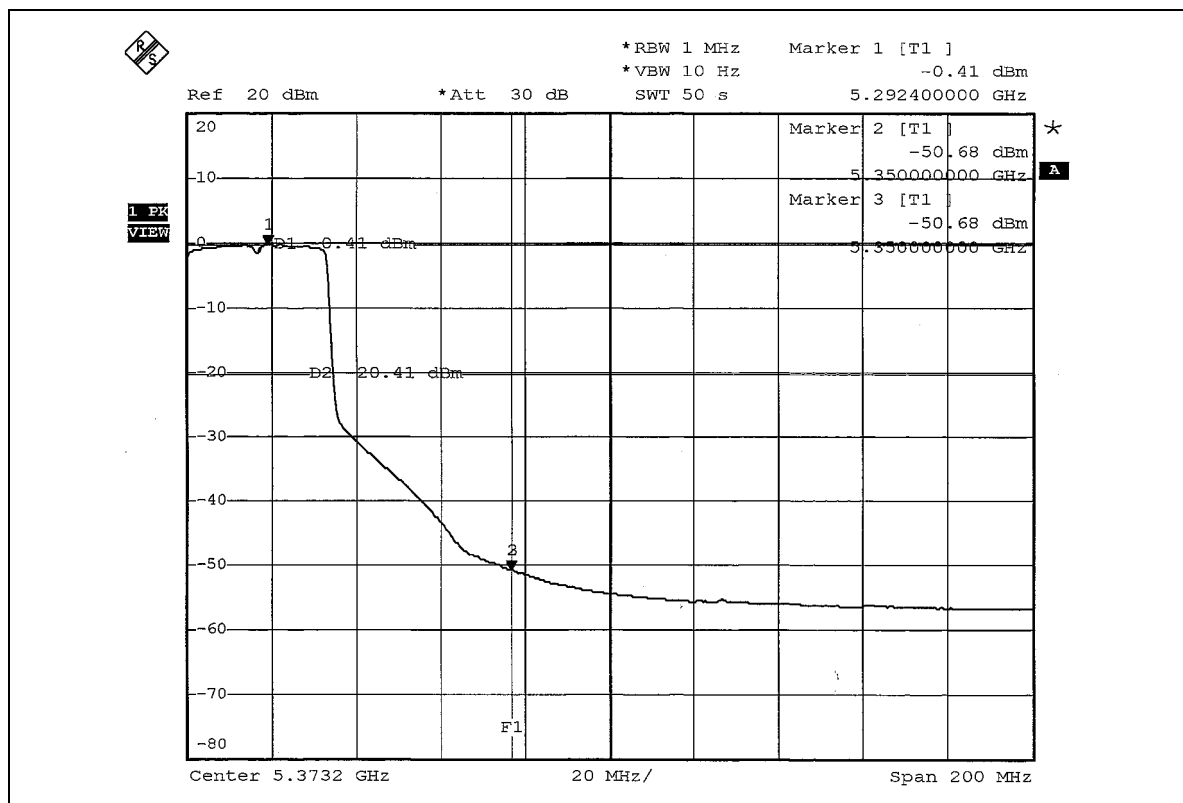
Channel 3 (5290MHz)

The band edge emission plot on the pages 36 shows 45.36dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 3 is 110.70dBuV/m (Peak), so the maximum field strength in restrict band is $110.70 - 45.36 = 65.34$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the pages 37 shows 50.27dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 3 is 96.40dBuV/m (Average), so the maximum field strength in restrict band is $96.40 - 50.27 = 46.13$ dBuV/m which is under 54dBuV/m limit.

802.11a Turbo OFDM modulation







4.4 ANTENNA REQUIREMENT

4.4.1 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.

4.4.2 ANTENNA CONNECTED CONSTRUCTION

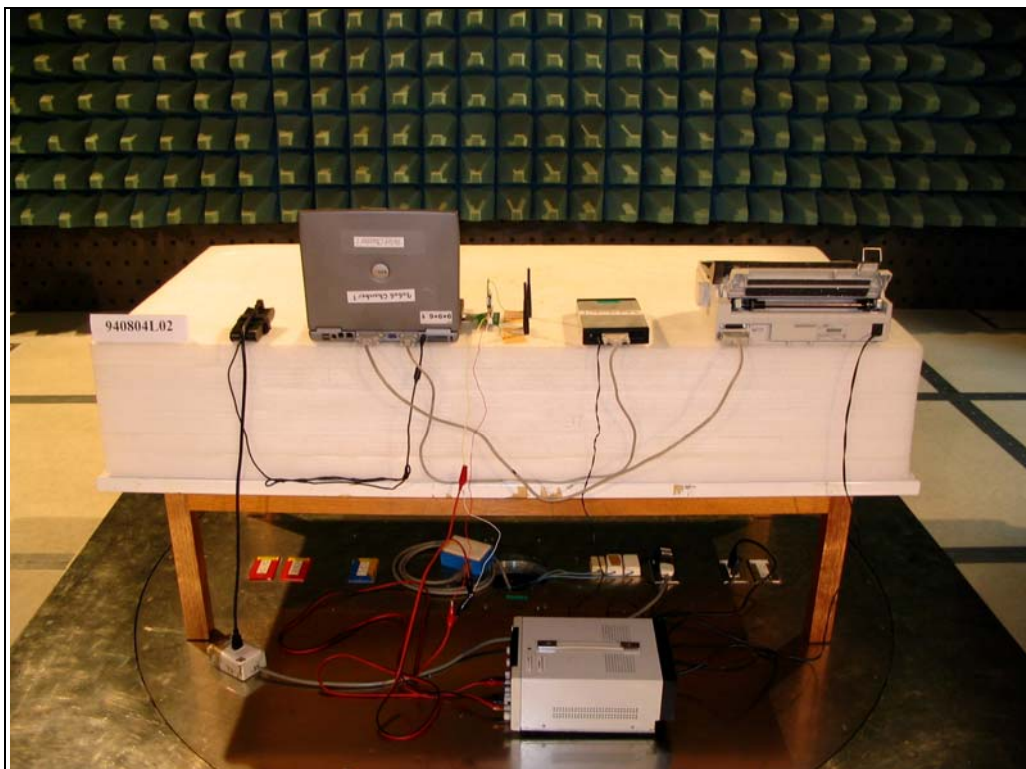
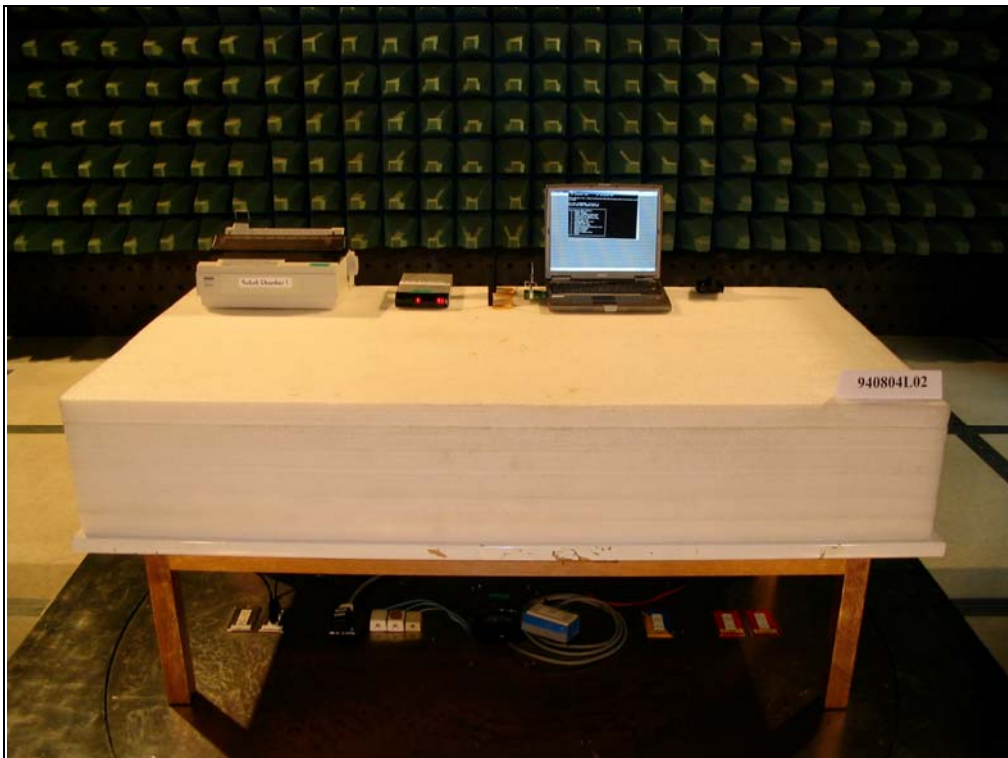
The antenna used in this product is Dipole antenna with UFL connector. The maximum Gain of the antenna is 2.0dBi.

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST



RADIATED EMISSION TEST





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:

USA	FCC, NVLAP, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, DGT
Netherlands	Telefication
Singapore	PSB , GOST-ASIA(MOU)
Russia	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. If you have any comments, please feel free to contact us at the following:

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