



FCC TEST REPORT

REPORT NO.: RF910310R02

MODEL NO.: DWL-650

(the others model please refer to page 6)

RECEIVED: March 10, 2002

TESTED: March 18 ~ March 19 , 2002

APPLICANT: D-LINK CORPORATION

ADDRESS: No. 8, Li Hsing Rd VII, Science-Based Industrial Park,
Hsinchu, Taiwan, R. O. C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chiapau Tsun, Linko, Taipei,
Taiwan, R.O.C.

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0528
ILAC MRA



Lab Code: 200102-0



Table of Contents

1	CERTIFICATION	4
2	SUMMARY OF TEST RESULTS.....	5
3	GENERAL INFORMATION	6
3.1	GENERAL DESCRIPTION OF EUT	6
3.2	DESCRIPTION OF TEST MODES	7
3.3	GENERAL DESCRIPTION OF APPLIED STANDARDS	7
3.4	DESCRIPTION OF SUPPORT UNITS.....	8
4	TEST TYPES AND RESULTS	9
4.1	CONDUCTED EMISSION MEASUREMENT	9
4.1.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	9
4.1.2	TEST INSTRUMENTS	9
4.1.3	TEST PROCEDURES.....	10
4.1.4	TEST SETUP	10
4.1.5	EUT OPERATING CONDITIONS.....	11
4.1.6	TEST RESULTS.....	12
4.2	RADIATED EMISSION MEASUREMENT	18
4.2.1	LIMITS OF RADIATED EMISSION MEASUREMENT.....	18
4.2.2	TEST INSTRUMENTS	19
4.2.3	TEST PROCEDURES.....	20
4.2.4	TEST SETUP	21
4.2.5	EUT OPERATING CONDITIONS.....	21
4.2.6	TEST RESULTS.....	22
4.3	6dB BANDWIDTH MEASUREMENT	27
4.3.1	LIMITS OF 6dB BANDWIDTH MEASUREMENT	27
4.3.2	TEST INSTRUMENTS	27
4.3.3	TEST PROCEDURE	28
4.3.4	TEST SETUP	28
4.3.5	EUT OPERATING CONDITIONS.....	28
4.3.6	TEST RESULTS.....	29
4.4	MAXIMUM PEAK OUTPUT POWER	33
4.4.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT	33
4.4.2	TEST INSTRUMENTS	33
4.4.3	TEST PROCEDURES.....	34
4.4.4	TEST SETUP	34
4.4.5	EUT OPERATING CONDITIONS.....	34



4.4.6	TEST RESULTS.....	35
4.5	POWER SPECTRAL DENSITY MEASUREMENT	36
4.5.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT	36
4.5.2	TEST INSTRUMENTS	36
4.5.3	TEST PROCEDURE	37
4.5.4	TEST SETUP	37
4.5.5	EUT OPERATING CONDITIONS.....	37
4.5.6	TEST RESULTS.....	38
4.6	BAND EDGES MEASUREMENT	42
4.6.1	LIMITS OF BAND EDGES MEASUREMENT	42
4.6.2	TEST INSTRUMENTS	42
4.6.3	TEST PROCEDURE	42
4.6.4	EUT OPERATING CONDITION.....	43
4.6.5	TEST RESULTS.....	43
4.7	ANTENNA REQUIREMENT.....	46
4.7.1	STANDARD APPLICABLE	46
4.7.2	ANTENNA CONNECTED CONSTRUCTION.....	46
5	PHOTOGRAPHS OF THE TEST CONFIGURATION	47
6	INFORMATION ON THE TESTING LABORATORIES.....	49



1 CERTIFICATION

PRODUCT : IEEE 802.11b WLAN Low Cost PC Card
MODEL NO. : DWL-650
(the others model, please refer to page 6)
APPLICANT : D-LINK CORPORATION
BRAND NAME : D-Link
(the others brand, please refer to page 6)
STANDARDS : 47 CFR Part 15, Subpart C (Section 15.247),
ANSI C63.4-1992, Canada RSS 210,
New Zealand RFS 29

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility from Mar. 18 to Mar. 19, 2002, The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions herein specified.

TESTED BY: Bruce Shiau , DATE: Mar. 22, 2002
Bruce Shiau

CHECKED BY: Demi Chen , DATE: Mar. 22, 2002
Demi Chen

APPROVED BY: Alan Lane , DATE: Mar. 22, 2002
Dr. Alan Lane
Manager

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
Standard Section	Test Type and Limit	Result	REMARK
15.207	AC Power Conducted Emission Limit: 48dBuV	PASS	Meet the requirement of limit Minimum passing margin is -9.43dBuV at 2.105MHz
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit
15.247(c)	Transmitter Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -11.0dBuV at 132.00MHz
15.247(d)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit
15.247(c)	Band Edge Measurement Limit: 20 dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	IEEE 802.11b WLAN Low Cost PC Card
MODEL NO.	DWL-650
POWER SUPPLY	5.0VDC from host equipment
MODULATION TYPE	BPSK, QPSK, CCK
RADIO TECHNOLOGY	DSSS
TRANSFER RATE	1/2/5.5/11/22Mbps
FREQUENCY RANGE	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11
OUTPUT POWER	13.41dBm
ANTENNA TYPE	Inverted F Antenna
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

- There are ten Model names were provided in this EUT. They are identical except for their model name and brand name.

MODEL NAME	BRAND NAME
24202	Target
AOI-701U	AOPEN
DW-650L	D-Link
DWL-650	D-Link
SOHO-WL16PL	Cameo
SOLO-WL16P	Cameo
Trust PN110W Wireless Network	Trust
WL-650L	W-Link
WLC-100	Cellvision
WL-PCM	LINDEN

- For a more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Eleven channels are provided in this EUT.

Channel	Frequency	Channel	Frequency
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

NOTE:

1. Below 1 GHz, the channel 1, 6, and 11 were pre-tested in chamber. The channel 11, worst case one, was chosen for final test.
2. Above 1 GHz, the channel 1, 6, and 11 were tested individually.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a IEEE 802.11b WLAN Low Cost PC Card. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR 47 Part 15, Subpart C. (15.247)

ANSI C63.4 : 1992, Canada RSS 210, New Zealand RFS 29

All tests 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	DELL	PP01L	TW-09C748-12800-19O-B220	FCC DoC APPROVED
2	PRINTER	HP	2225C+	3123S97230	DSI6XU2225
3	MODEM	ACEEX	1414	980020510	IFAXDM1414

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.2m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core.
3	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.

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

4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.45 – 30	48	-

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class 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
ROHDE & SCHWARZ Test Receiver	ESCS30	834115/016	Mar. 3, 2003
ROHDE & SCHWARZ Artificial Mains Network (For EUT)	ESH3-Z5	847265/023	Jan. 10, 2003
* ROHDE & SCHWARZ 4-wire ISN	ENY41	838119/028	Dec. 10, 2002
* ROHDE & SCHWARZ 2-wire ISN	ENY22	837497/018	Dec. 10, 2002
EMCO L.I.S.N. (For peripherals)	3825/2	9504-2359	July 10, 2002
Software	Cond-V2L	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C03.01	July 11, 2002
Terminator (For EMCO LISN)	NA	E1-01-300	Feb. 20, 2003
Terminator (For EMCO LISN)	NA	E1-01-301	Feb. 20, 2003
Shielded Room	Site 3	ADT-C03	NA
VCCI Site Registration No.	Site 3	C-274	NA

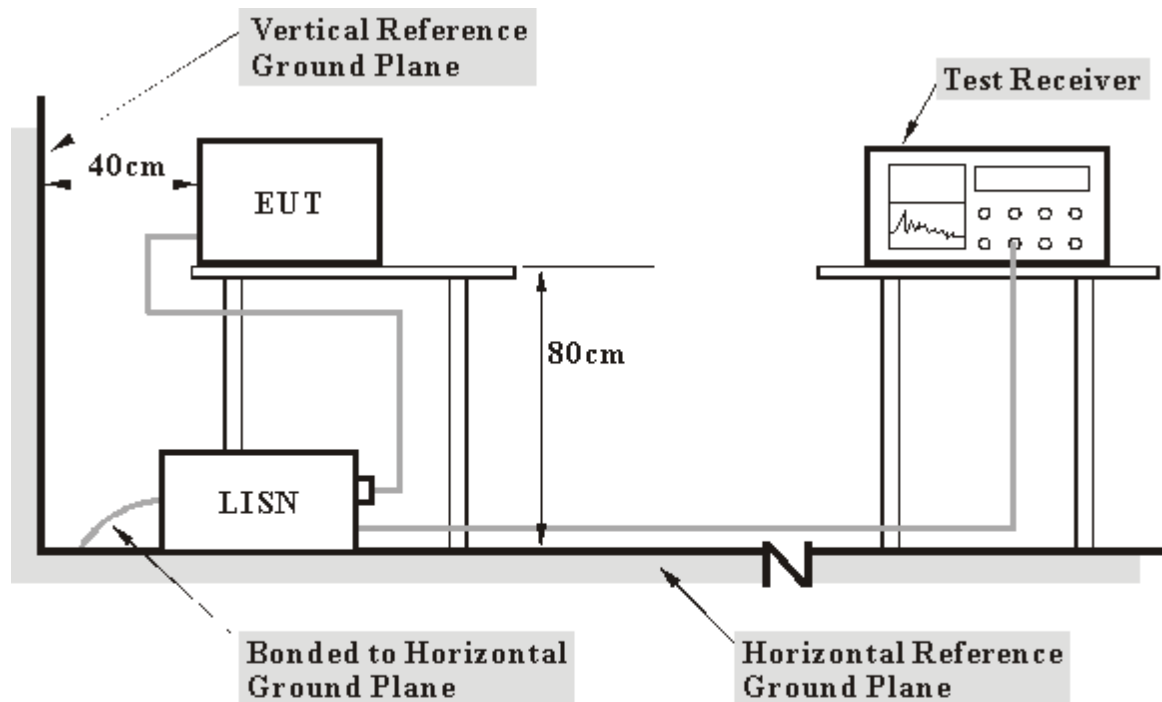
NOTE: 1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. “*”: These equipment are used for conducted telecom port test only (if tested).

4.1.3 TEST PROCEDURES

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 450 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

4.1.4 TEST SETUP



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

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



4.1.5 EUT OPERATING CONDITIONS

- a. Connected the EUT to a computer system placed on a testing table.
- b. The computer system ran a test program to enable EUT under transmission/receiving condition continuously at specific channel frequency.
- c. The computer system sent "H" messages to its screen.
- d. The computer system sent "H" messages to modem.
- e. The computer system sent "H" messages to printer and the printer prints them on paper.

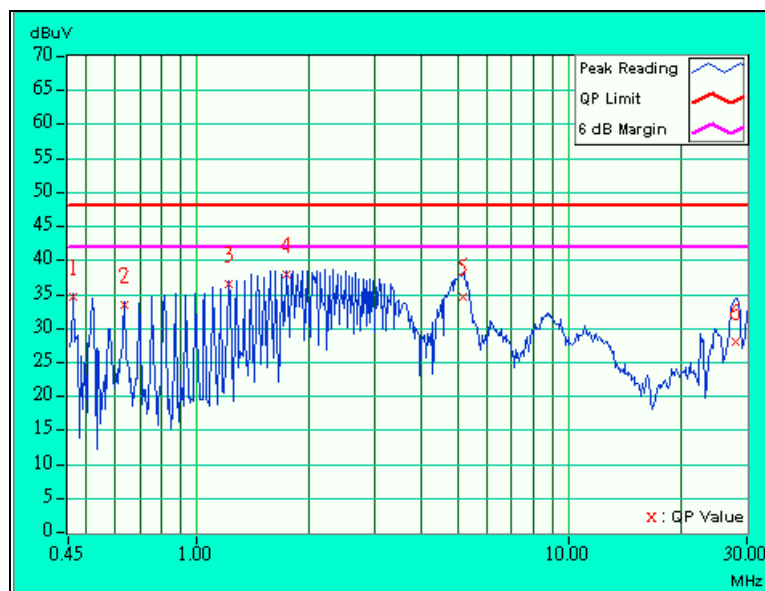
4.1.6 TEST RESULTS

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 1	6dB BANDWIDTH	10 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60%RH, 1005 hPa	TESTED BY: Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.466	0.10	33.44	-	33.54	-	48.00	-	-14.46	-
2	0.638	0.10	32.32	-	32.42	-	48.00	-	-15.58	-
3	1.219	0.10	35.31	-	35.41	-	48.00	-	-12.59	-
4	1.742	0.10	36.79	-	36.89	-	48.00	-	-11.11	-
5	5.168	0.34	33.57	-	33.91	-	48.00	-	-14.09	-
6	27.859	1.16	26.79	-	27.95	-	48.00	-	-20.05	-

NOTE:

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.

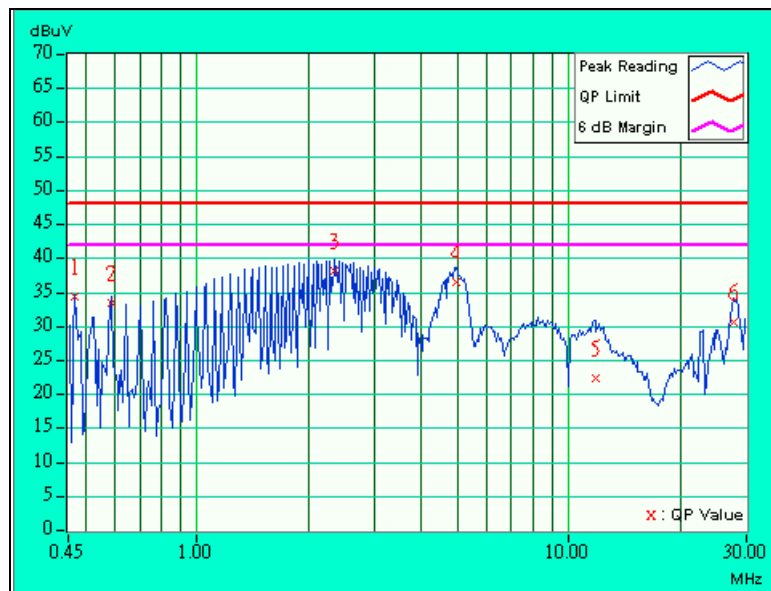


EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 1	6dB BANDWIDTH	10 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60%RH, 1005 hPa	TESTED BY: Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.470	0.10	33.50	-	33.60	-	48.00	-	-14.40	-
2	0.587	0.10	32.70	-	32.80	-	48.00	-	-15.20	-
3	2.340	0.13	37.28	-	37.41	-	48.00	-	-10.59	-
4	4.977	0.32	35.84	-	36.16	-	48.00	-	-11.84	-
5	11.762	0.47	21.55	-	22.02	-	48.00	-	-25.98	-
6	27.777	0.80	29.82	-	30.62	-	48.00	-	-17.38	-

NOTE:

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.

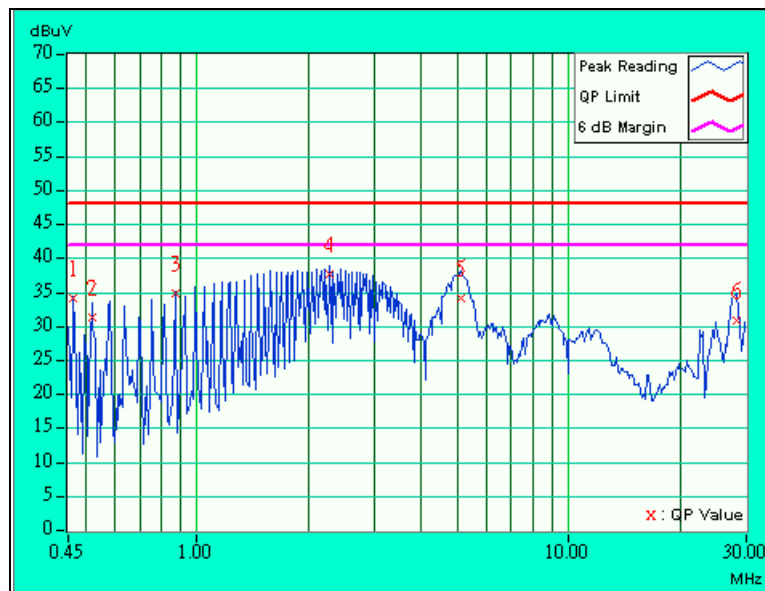


EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 6	6dB BANDWIDTH	10 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60%RH, 1005 hPa	TESTED BY: Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.466	0.10	32.99	-	33.09	-	48.00	-	-14.91	-
2	0.520	0.10	30.21	-	30.31	-	48.00	-	-17.69	-
3	0.872	0.10	33.64	-	33.74	-	48.00	-	-14.26	-
4	2.270	0.13	36.47	-	36.60	-	48.00	-	-11.40	-
5	5.117	0.34	33.03	-	33.37	-	48.00	-	-14.63	-
6	28.379	1.17	29.68	-	30.85	-	48.00	-	-17.15	-

NOTE:

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.

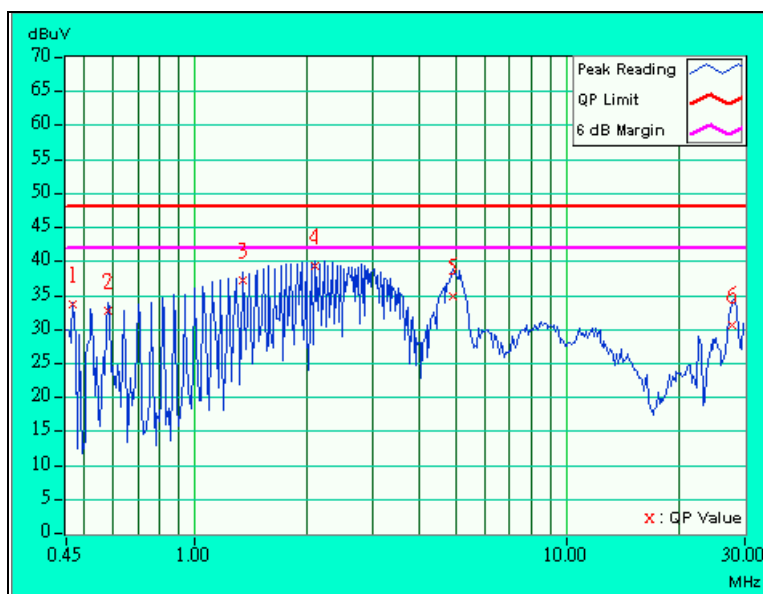


EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 6	6dB BANDWIDTH	10 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60%RH, 1005 hPa	TESTED BY: Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (Uv)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.470	0.10	32.99	-	33.09	-	48.00	-	-14.91	-
2	0.583	0.10	31.85	-	31.95	-	48.00	-	-16.05	-
3	1.344	0.10	36.54	-	36.64	-	48.00	-	-11.36	-
4	2.105	0.11	38.46	-	38.57	-	48.00	-	-9.43	-
5	4.910	0.32	34.14	-	34.46	-	48.00	-	-13.54	-
6	27.785	0.80	29.94	-	30.74	-	48.00	-	-17.26	-

NOTE:

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.

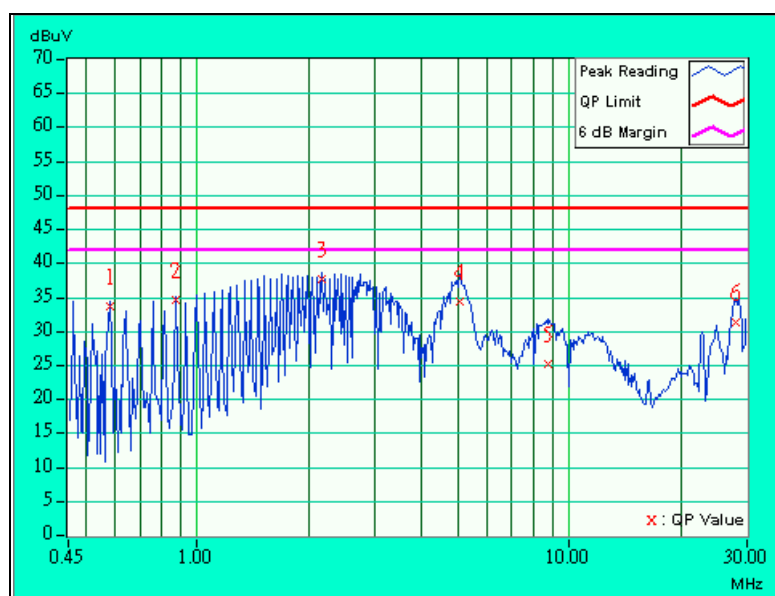


EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 11	6dB BANDWIDTH	10 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60%RH, 1005 hPa	TESTED BY: Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.583	0.10	32.59	-	32.69	-	48.00	-	-15.31	-
2	0.876	0.10	33.46	-	33.56	-	48.00	-	-14.44	-
3	2.156	0.12	36.65	-	36.77	-	48.00	-	-11.23	-
4	5.066	0.34	33.17	-	33.51	-	48.00	-	-14.49	-
5	8.793	0.46	23.96	-	24.42	-	48.00	-	-23.58	-
6	28.078	1.16	30.29	-	31.45	-	48.00	-	-16.55	-

NOTE:

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.

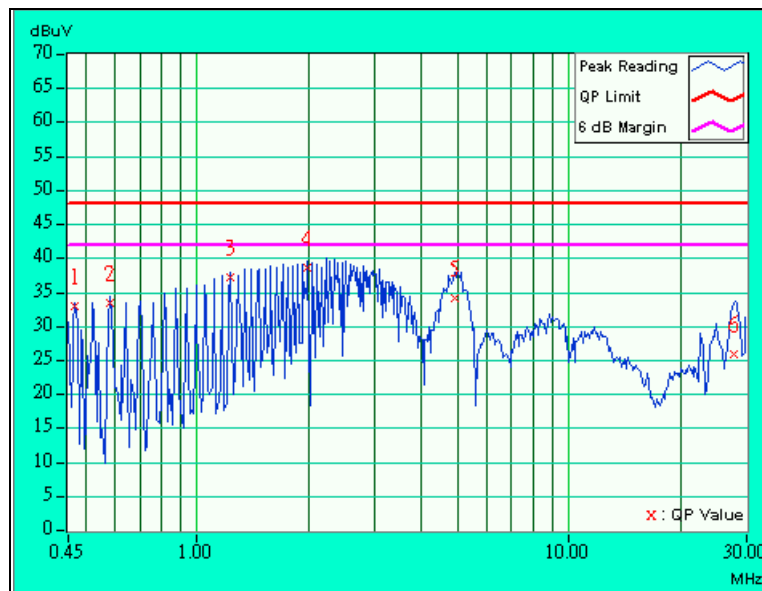


EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 11	6dB BANDWIDTH	10 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60%RH, 1005 hPa	TESTED BY: Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.470	0.10	32.22	-	32.32	-	48.00	-	-15.68	-
2	0.583	0.10	32.56	-	32.66	-	48.00	-	-15.34	-
3	1.227	0.10	36.33	-	36.43	-	48.00	-	-11.57	-
4	1.984	0.10	37.87	-	37.97	-	48.00	-	-10.03	-
5	4.902	0.32	33.27	-	33.59	-	48.00	-	-14.41	-
6	27.805	0.80	25.12	-	25.92	-	48.00	-	-22.08	-

NOTE:

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.





4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field Strength of Fundamental	
	uV/m	dBuV/m
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

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 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* HP Spectrum Analyzer	8590L	3544A01176	May 7, 2002
* HP Preamplifier	8447D	2944A08485	May 7, 2002
* HP Preamplifier	8449B	3008A01201	Dec. 06, 2002
* HP Preamplifier	8449B	3008A01292	Aug. 21, 2002
* ROHDE & SCHWARZ TEST RECEIVER	ESMI	839013/007 839379/002	Jan. 27, 2003
SCHWARZBECK Tunable Dipole Antenna	VHA 9103 UHA 9105	E101051 E101055	Nov. 23, 2002
* CHASE BILOG Antenna	CBL6112A	2221	Aug. 2, 2002
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	July 6, 2002
* EMCO Horn Antenna	3115	9312-4192	April 15, 2002
* EMCO Turn Table	1060	1115	NA
* SHOSHIN Tower	AP-4701	A6Y005	NA
* Software	AS61D4	NA	NA
* ANRITSU RF Switches	MP59B	M35046	Aug. 2, 2002
* TIMES RF cable	LMR-600	CABLE-ST5-01	Aug. 2, 2002
Open Field Test Site	Site 5	ADT-R05	July 28, 2002
VCCI Site Registration No.	Site 5	R-1039	NA
Site Registration No.	FCC: 90422 Canada IC: IC 3789 VCCI : R-1039		

NOTE: 1. The measurement uncertainty is less than +/- 3.0dB, which is calculated as per the NAMAS document NIS81.

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

3. "*" = These equipment are used for the final measurement.

4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz.



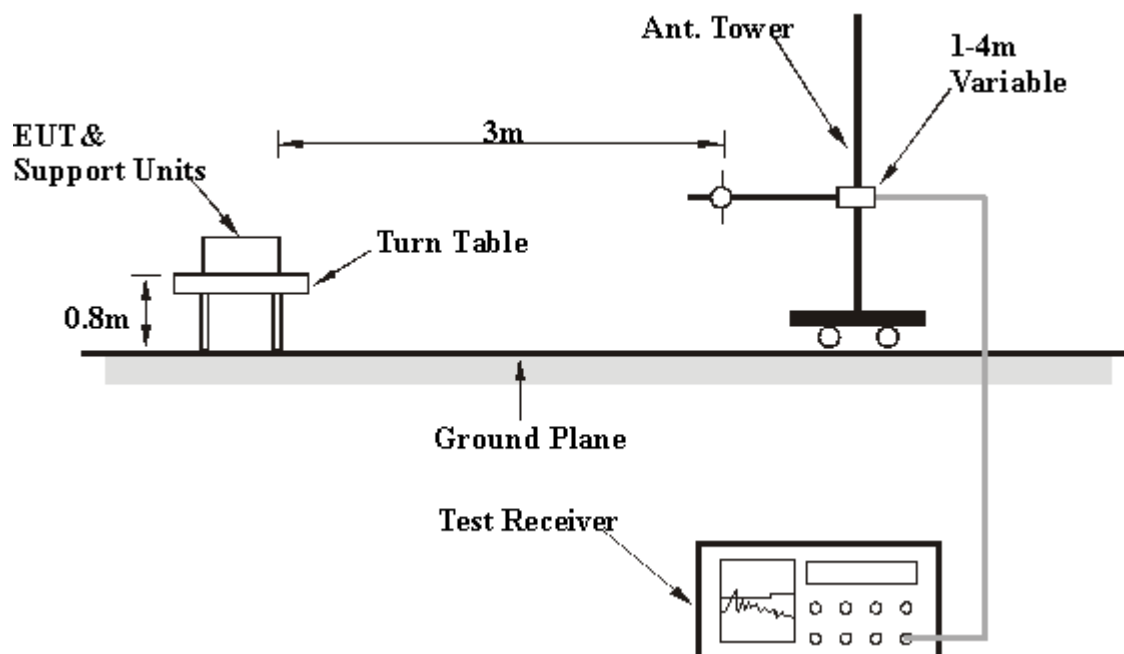
4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. 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 10 dB 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 10 dB 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 300 Hz for Average detection (AV) at frequency above 1GHz.

4.2.4 TEST SETUP



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

4.2.5 EUT OPERATING CONDITIONS

Same as 4.1.5.

4.2.6 TEST RESULTS

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 11	FREQUENCY RANGE	30-1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	20 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	396.00	33.0 QP	46.00	-13.00	1.20H	11	14.82	15.96	2.22	0.00	-18.18
2	440.00	31.4 QP	46.00	-14.60	1.21H	175	12.71	16.32	2.38	0.00	-18.69
3	528.00	30.7 QP	46.00	-15.30	1.93H	310	10.48	17.62	2.60	0.00	-20.22
4	660.00	31.4 QP	46.00	-14.60	1.19H	61	9.11	19.25	3.05	0.00	-22.29
5	748.00	28.4 QP	46.00	-17.60	1.07H	72	5.00	20.14	3.26	0.00	-23.40
6	792.00	31.4 QP	46.00	-14.60	1.07H	170	7.49	20.60	3.31	0.00	-23.91
7	836.00	32.0 QP	46.00	-14.00	1.13H	130	8.01	20.54	3.45	0.00	-23.99

NOTE:

1. Emission level = Raw value - Correction Factor
2. Correction Factor = Pre-Amp. Factor - Ant. Factor - Cable loss
(Pre-Amp. Factor = 0, when a Pre-Amplifier is not used for the test.)
3. Margin value = Emission level - Limit value
4. The other emission levels were very low against the limit.



EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 11	FREQUENCY RANGE	30-1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	20 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	132.00	32.5 QP	43.50	-11.00	1.23V	54	20.21	11.16	1.13	0.00	-12.29
2	220.00	33.0 QP	46.00	-13.00	1.31V	9	21.37	10.12	1.51	0.00	-11.64
3	396.00	32.8 QP	46.00	-13.20	1.26V	206	14.62	15.96	2.22	0.00	-18.18
4	484.00	31.2 QP	46.00	-14.80	1.14V	294	11.77	16.96	2.47	0.00	-19.43
5	528.00	31.4 QP	46.00	-14.60	1.10V	4	11.18	17.62	2.60	0.00	-20.22
6	748.00	30.7 QP	46.00	-15.30	1.13V	294	7.30	20.14	3.26	0.00	-23.40

NOTE:

1. Emission level = Raw value - Correction Factor
2. Correction Factor = Pre-Amp. Factor - Ant. Factor - Cable loss
(Pre-Amp. Factor = 0, when a Pre-Amplifier is not used for the test.)
3. Margin value = Emission level - Limit value
4. The other emission levels were very low against the limit.

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 1	FREQUENCY RANGE	Above 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	2038.00	50.0 PK	74.00	-24.00	1.09H	16	54.84	25.20	4.86	34.90	4.84
2	*2413.00	94.2 PK	-	-	2.17H	44	62.00	27.11	5.10	0.00	-32.21
3	*2413.00	87.2 AV	-	-	2.17H	44	55.00	27.11	5.10	0.00	-32.21
4	2580.00	50.4 PK	74.00	-23.60	2.00H	279	52.43	27.75	5.14	34.91	2.03
5	4076.00	47.0 PK	74.00	-27.00	1.17H	202	44.61	30.13	6.78	34.52	-2.39
6	4824.00	46.5 PK	74.00	-27.50	1.15H	234	42.48	31.43	7.23	34.63	-4.02

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	2038.00	50.2 PK	74.00	-23.80	1.28V	84	55.04	25.20	4.86	34.90	4.84
2	*2413.00	94.2 PK	-	-	1.33V	77	62.00	27.11	5.10	0.00	-32.21
3	*2413.00	88.2 AV	-	-	1.33V	77	56.00	27.11	5.10	0.00	-32.21
4	2580.00	48.0 PK	74.00	-26.00	1.24V	79	50.03	27.75	5.14	34.91	2.03
5	4076.00	45.4 PK	74.00	-28.60	1.17V	206	43.01	30.13	6.78	34.52	-2.39
6	4824.00	47.0 PK	74.00	-27.00	1.28V	19	42.98	31.43	7.23	34.63	-4.03

NOTE:

1. Emission level = Raw value - Correction Factor
2. Correction Factor = Pre-Amp. Factor - Ant. Factor - Cable loss
(Pre-Amp. Factor = 0, when a Pre-Amplifier is not used for the test.)
3. Margin value = Emission level - Limit value
4. " * " : Fundamental frequency
5. The other emission levels were very low against the limit.

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 6	FREQUENCY RANGE	Above 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	2063.00	49.0 PK	74.00	-25.00	1.00H	313	53.53	25.41	4.96	34.90	4.53
2	*2437.00	93.4 PK	-	-	1.19H	25	61.00	27.33	5.08	0.00	-32.41
3	*2437.00	86.6 AV	-	-	1.19H	25	54.20	27.33	5.08	0.00	-32.41
4	4126.00	46.5 PK	74.00	-27.50	1.27H	207	44.04	30.32	6.70	34.56	-2.46
5	4874.00	47.2 PK	74.00	-26.80	1.45H	202	43.15	31.47	7.21	34.63	-4.05

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	2063.00	50.3 PK	74.00	-23.70	1.08V	331	54.83	25.41	4.96	34.90	4.53
2	*2437.00	92.8 PK	-	-	1.57V	132	60.40	27.33	5.08	0.00	-32.40
3	*2437.00	86.4 AV	-	-	1.57V	132	54.00	27.33	5.08	0.00	-32.40
4	4126.00	46.7 PK	74.00	-27.30	1.31V	9	44.24	30.32	6.70	34.56	-2.46
5	4874.00	46.2 PK	74.00	-27.80	1.57V	307	42.15	31.47	7.21	34.63	-4.05

NOTE:

1. Emission level = Raw value - Correction Factor
2. Correction Factor = Pre-Amp. Factor - Ant. Factor - Cable loss.
(Pre-Amp. Factor = 0, when a Pre-Amplifier is not used for the test.)
3. Margin value = Emission level - Limit value
4. " * " : Fundamental frequency
5. The other emission levels were very low against the limit.

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
MODE	Channel 11	FREQUENCY RANGE	Above 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 70 % RH, 1050 hPa	TESTED BY: Gary Chang	

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	2088.00	50.7 PK	74.00	-23.30	1.14H	12	54.96	25.62	5.02	34.90	4.26
2	*2463.00	93.2 PK	-	-	1.73H	359	60.80	27.33	5.08	0.00	-32.40
3	*2463.00	86.8 AV	-	-	1.73H	359	54.40	27.33	5.08	0.00	-32.40
4	2485.00	49.2 PK	74.00	-24.80	1.51H	239	51.51	27.54	5.06	34.90	2.31
5	4176.00	48.0 PK	74.00	-26.00	1.48H	295	45.49	30.41	6.68	34.58	-2.51
6	4924.00	47.0 PK	74.00	-27.00	1.44H	339	42.90	31.51	7.21	34.62	-4.10

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)	Antenna Factor (dB)	Cable Factor (dB)	Pre-Amp. Factor (dB)	Correction Factor (dB)
1	2088.00	49.5 PK	74.00	-24.50	1.31V	352	53.76	25.62	5.02	34.90	4.26
2	*2463.00	94.1 PK	-	-	1.15V	3	61.70	27.33	5.08	0.00	-32.40.
3	*2463.00	87.4 AV	-	-	1.15V	3	55.00	27.33	5.08	0.00	-32.40.
4	2491.00	48.7 PK	74.00	-25.30	1.26V	185	51.01	27.54	5.06	34.90	2.31
5	4176.00	46.8 PK	74.00	-27.20	1.37V	30	44.29	30.41	6.68	34.58	-2.51
6	4924.00	46.2 PK	74.00	-27.80	1.33V	95	42.10	31.51	7.21	34.62	-4.10

NOTE:

1. Emission level = Raw value - Correction Factor
2. Correction Factor = Pre-Amp. Factor - Ant. Factor - Cable loss
(Pre-Amp. Factor = 0, when a Pre-Amplifier is not used for the test.)
3. Margin value = Emission level - Limit value
4. " * " : Fundamental frequency
5. The other emission levels were very low against the limit.

4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	July 17, 2002

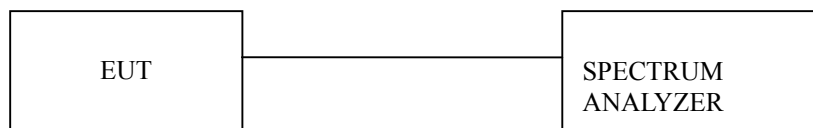
NOTE:

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
- 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

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

4.3.4 TEST SETUP



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

4.3.5 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

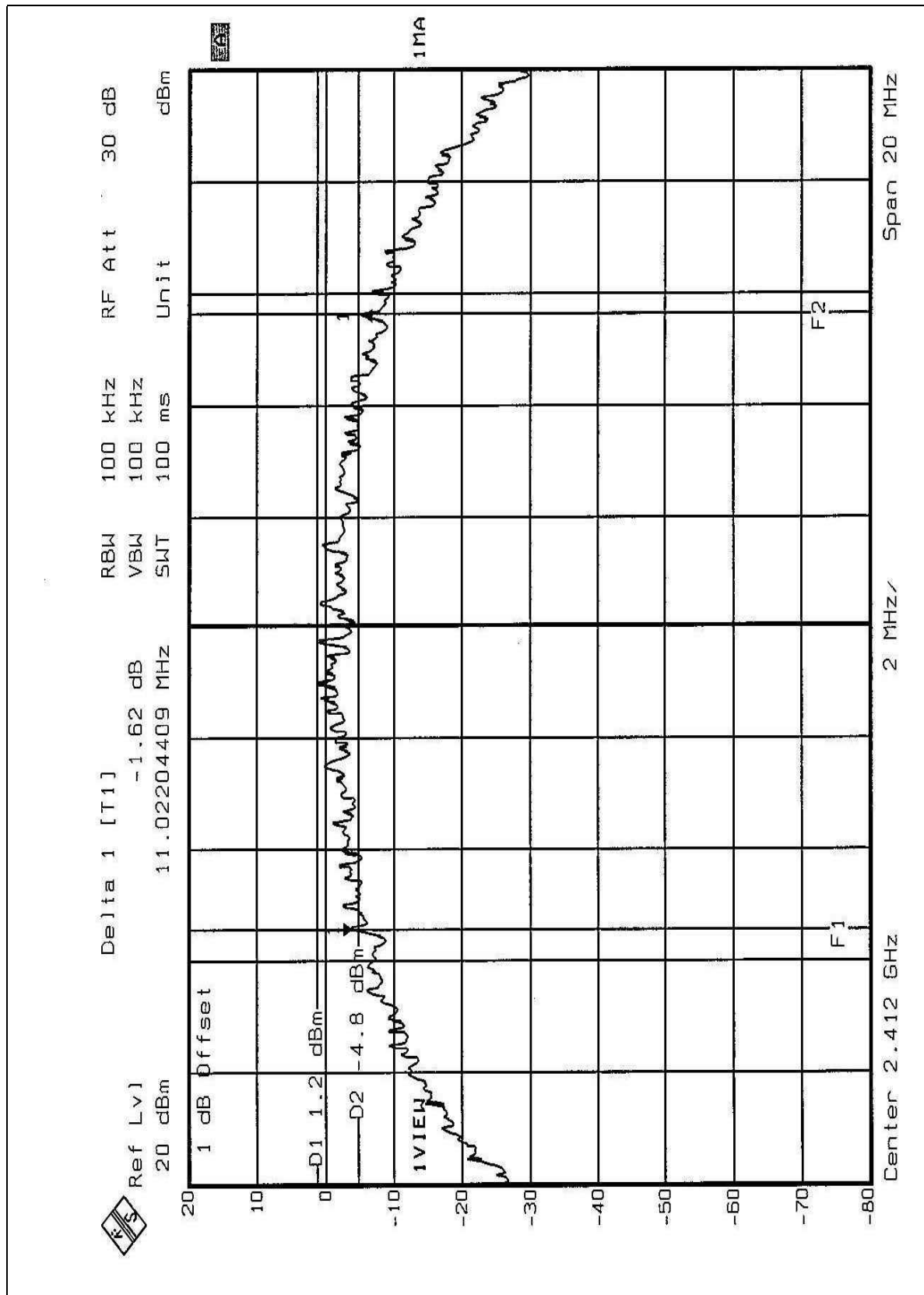


4.3.6 TEST RESULTS

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	22 deg. C, 55%RH, 1005 hPa
TESTED BY: Steven Lu			

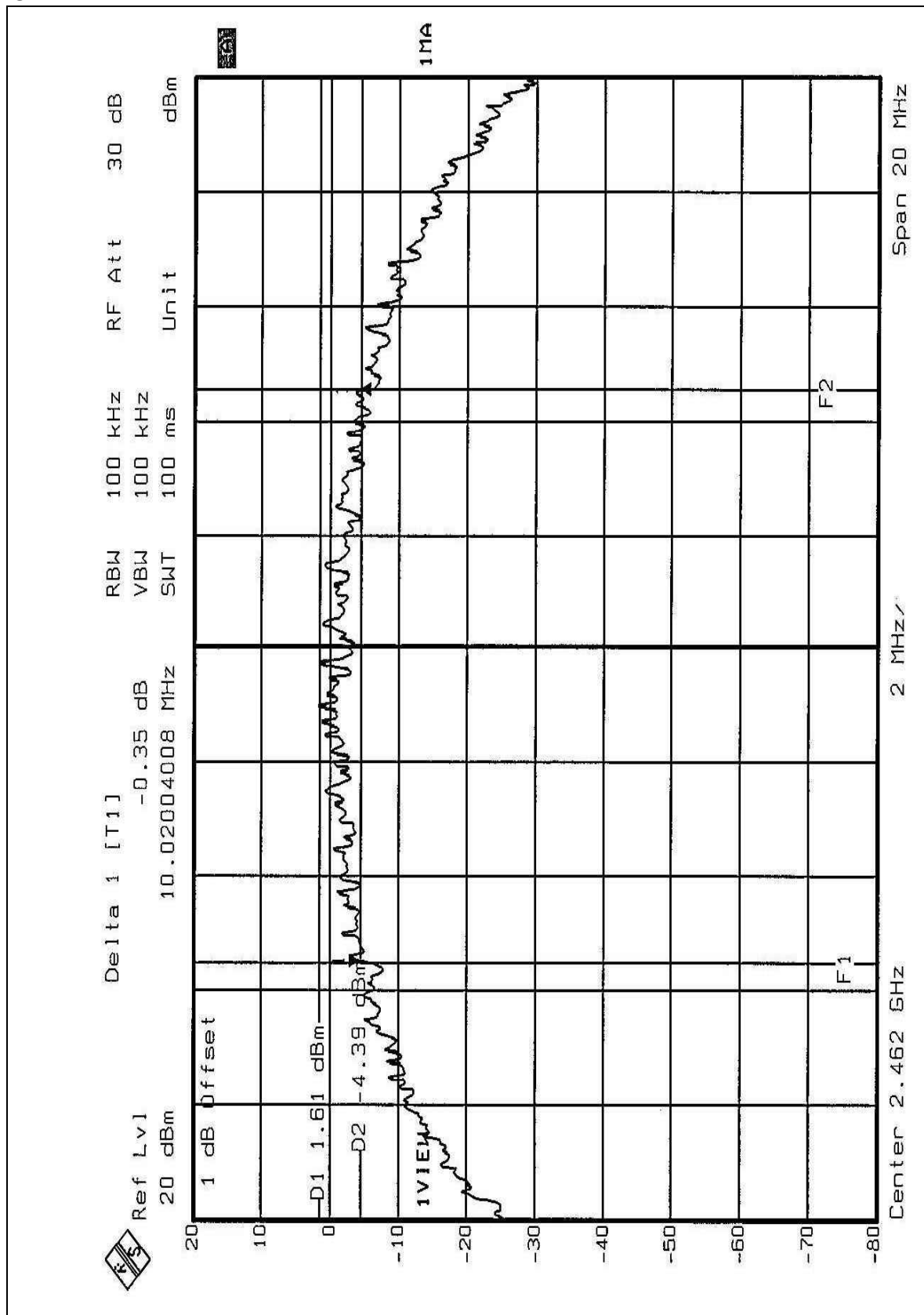
CHANNEL	CHANNEL FREQUENCY (MHz)	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
1	2412	11.02	0.5	PASS
6	2437	10.02	0.5	PASS
11	2462	10.02	0.5	PASS

CH1



Delta 1 [T1]
 -0.02 dB
 10.02004008 MHz
 Ref Lvl
 20 dBm
 1 dB Offset
 D1 2.23 dBm
 D2 -3.77 dBm
 1VIEW
 F1
 F2
 Center 2.437 GHz
 2 MHz/
 Span 20 MHz
 RF Att
 30 dB
 Unit
 dBm
 1MA

CH11



4.4 MAXIMUM PEAK OUTPUT POWER

4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SINGLE CHANNEL POWER METER	NRVS	100026	Feb. 21, 2003
PEAK POWER SENSOR	NRV-Z32	100013	Feb. 21, 2003

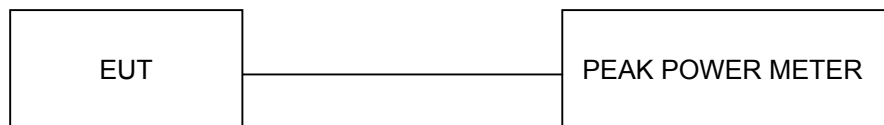
NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
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 PROCEDURES

The transmitter output was connected to the peak power meter.

4.4.4 TEST SETUP



4.4.5 EUT OPERATING CONDITIONS

Same as Item 4.3.5

4.4.6 TEST RESULTS

EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	22 deg. C, 55%RH, 1005 hPa
TESTED BY: Steven Lu			

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	12.19	30	PASS
6	2437	13.41	30	PASS
11	2462	12.26	30	PASS



4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	July 17, 2002

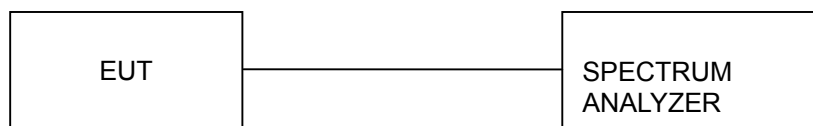
NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
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 PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time=span/3kHz. The power spectral density was measured and recorded. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

4.5.4 TEST SETUP



4.5.5 EUT OPERATING CONDITIONS

Same as 4.3.5

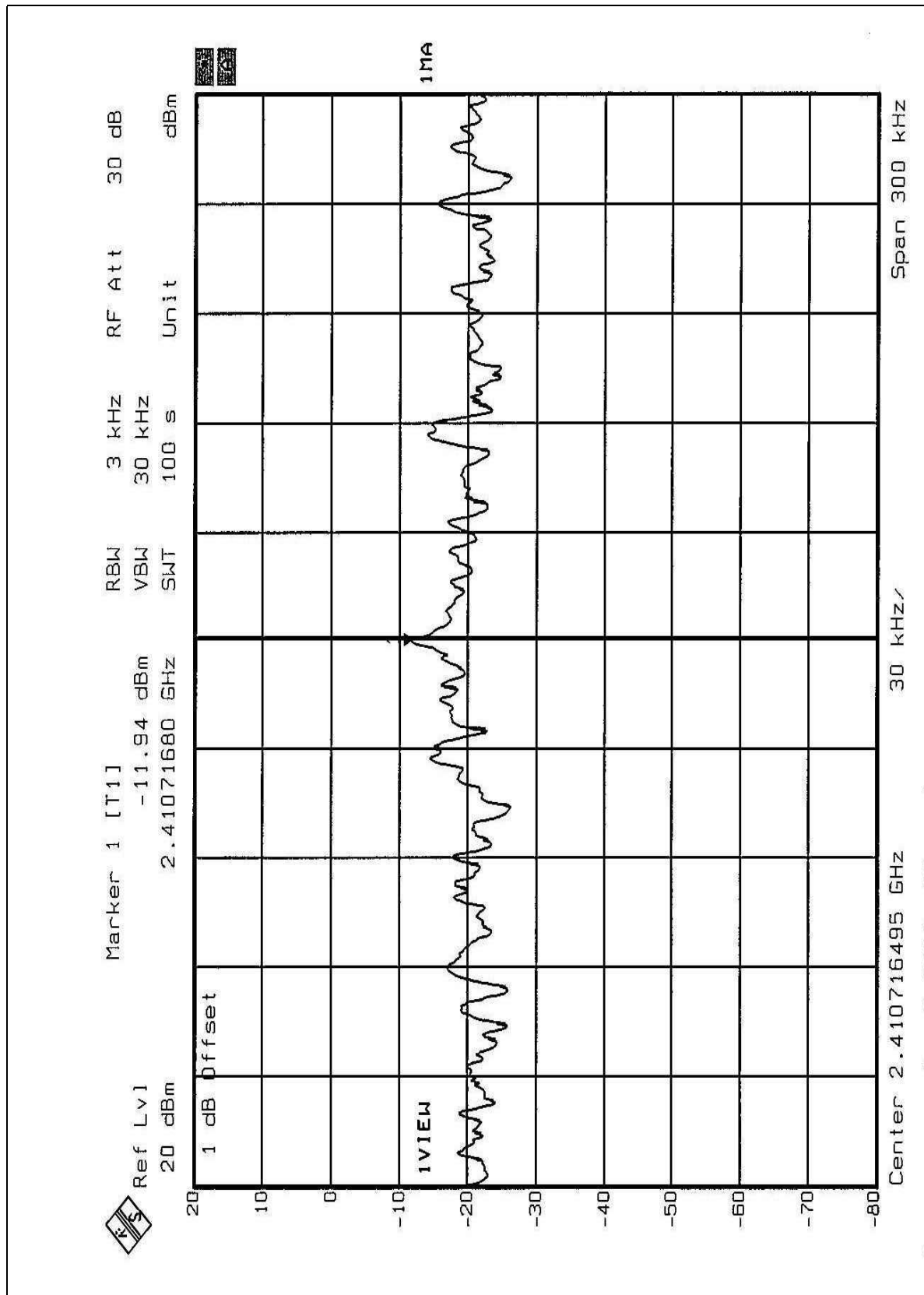


4.5.6 TEST RESULTS

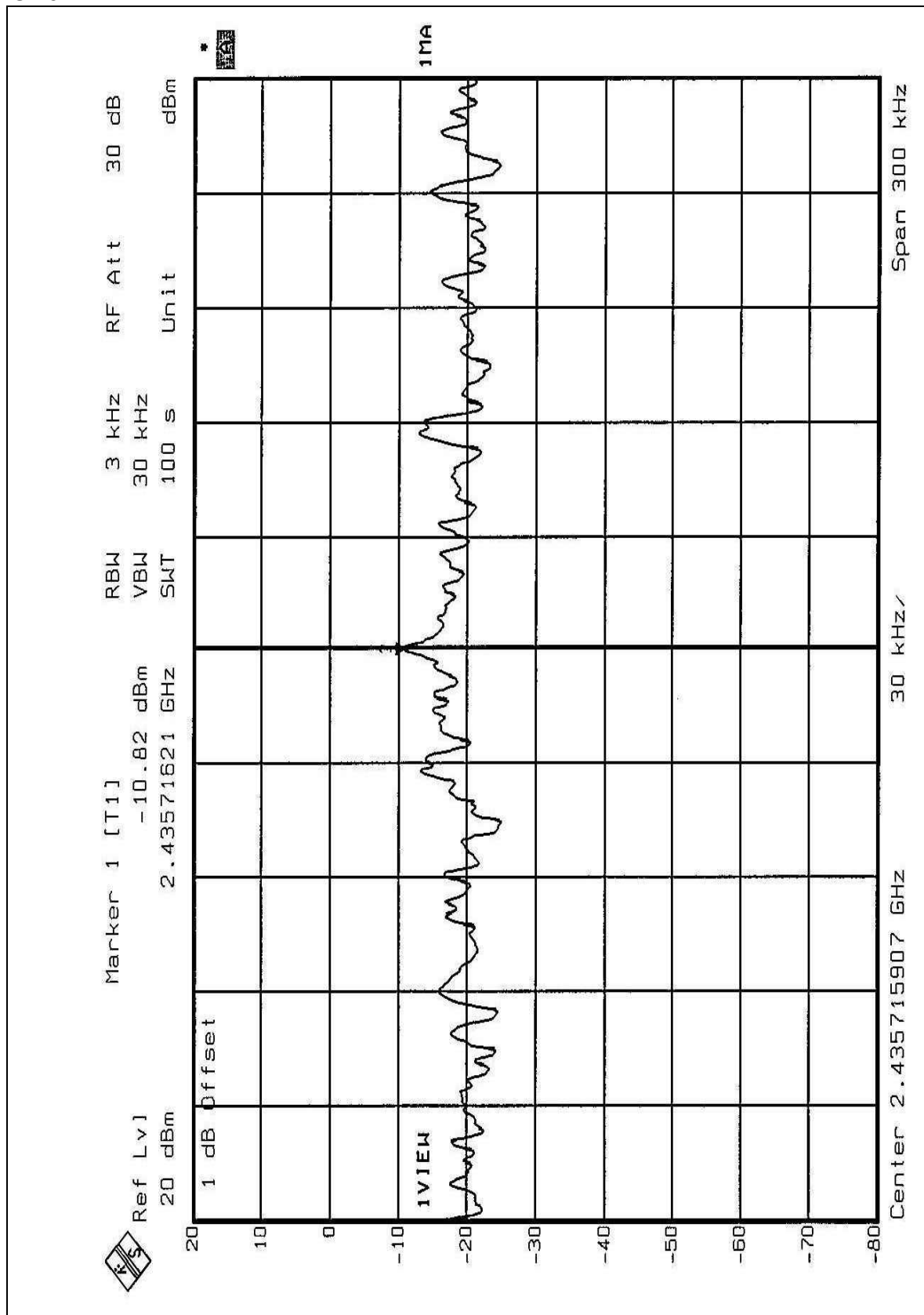
EUT	IEEE 802.11b WLAN Low Cost PC Card	MODEL	DWL-650
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	22 deg. C, 55%RH, 1005 hPa
TESTED BY: Steven Lu			

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3 KHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2412	-11.94	8	PASS
6	2437	-10.82	8	PASS
11	2462	-11.44	8	PASS

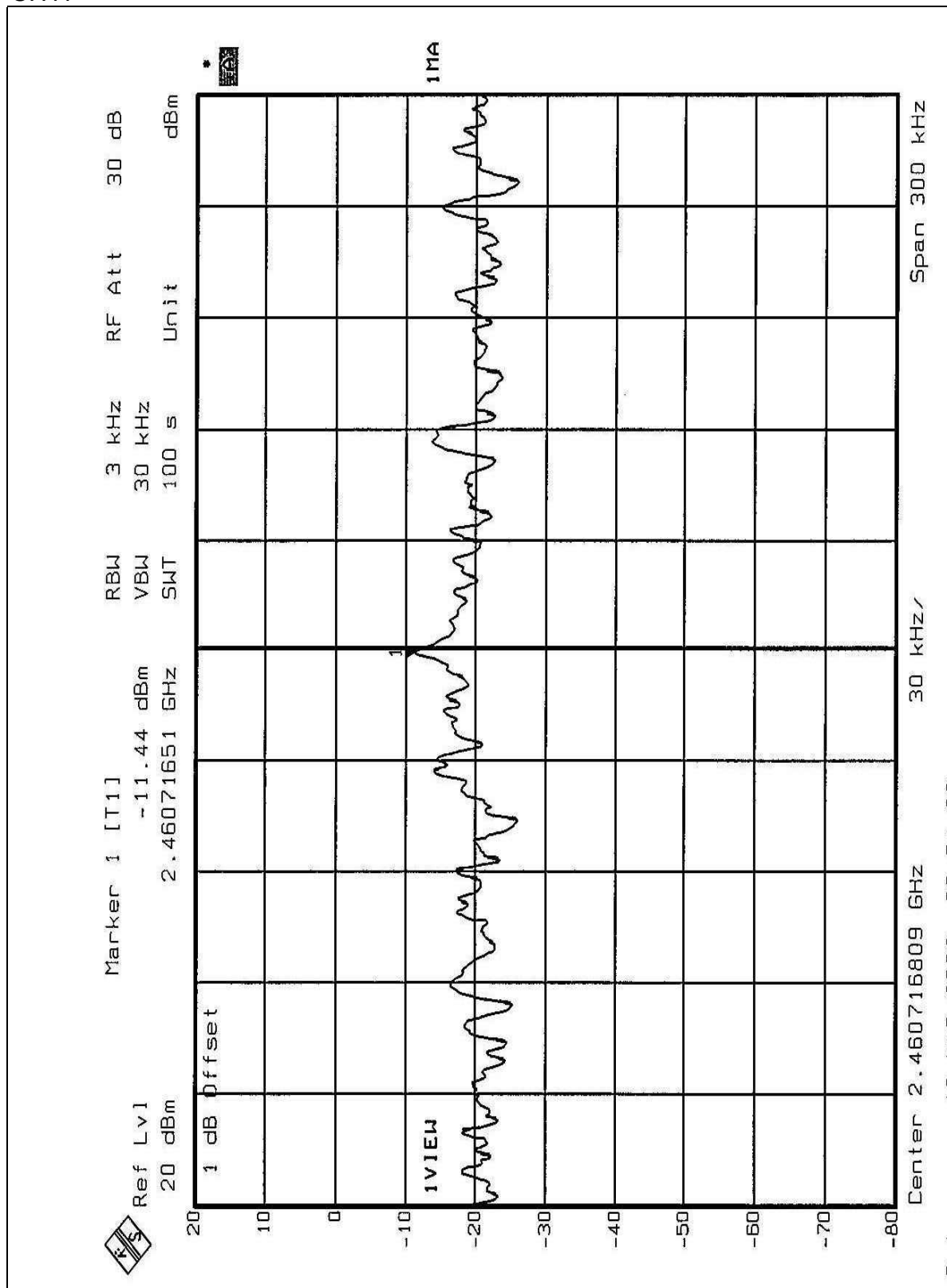
CH1



CH6



CH11



4.6 BAND EDGES MEASUREMENT

4.6.1 LIMITS OF BAND EDGES MEASUREMENT

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

4.6.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	July 17, 2002

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
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

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



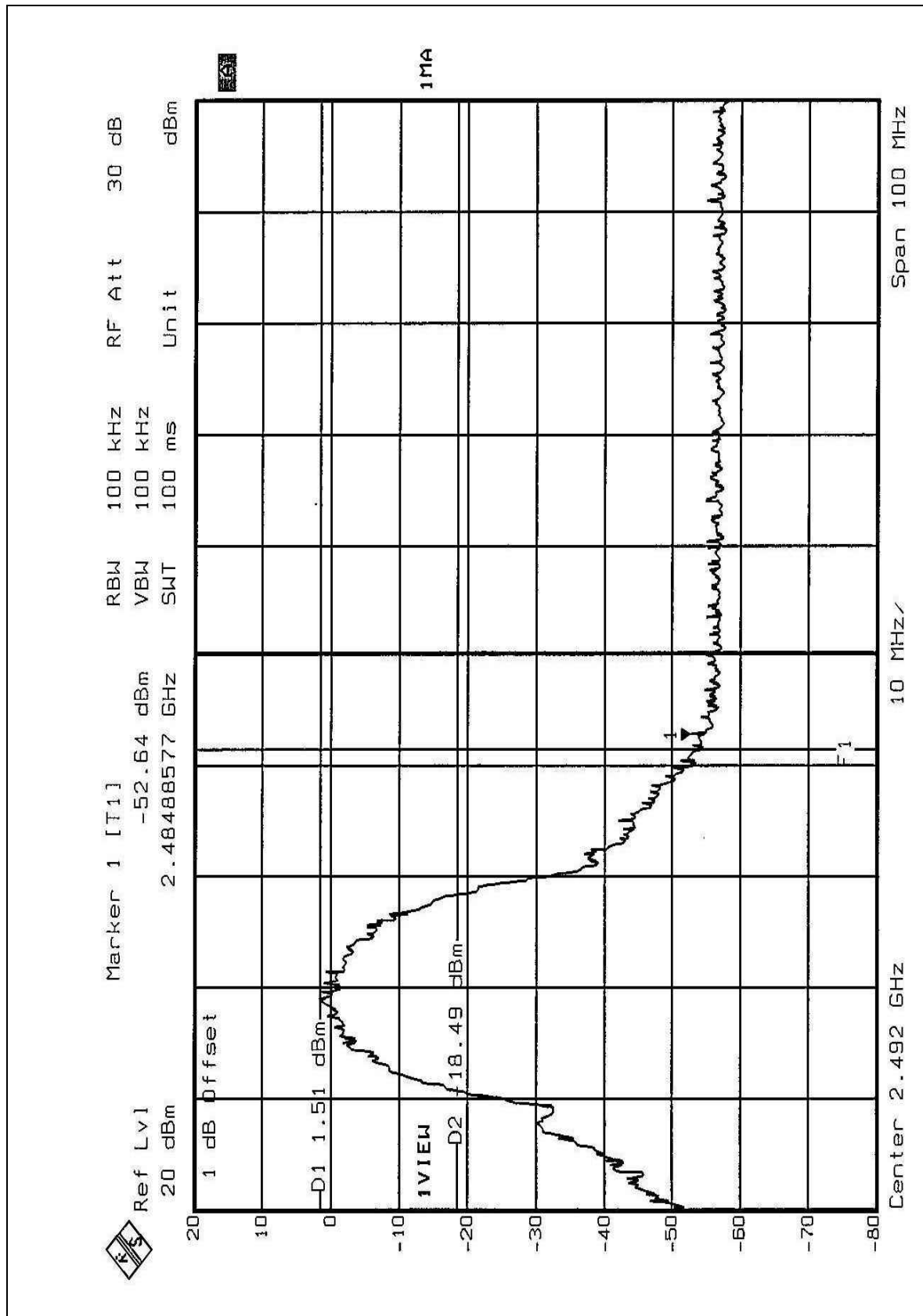
4.6.4 EUT OPERATING CONDITION

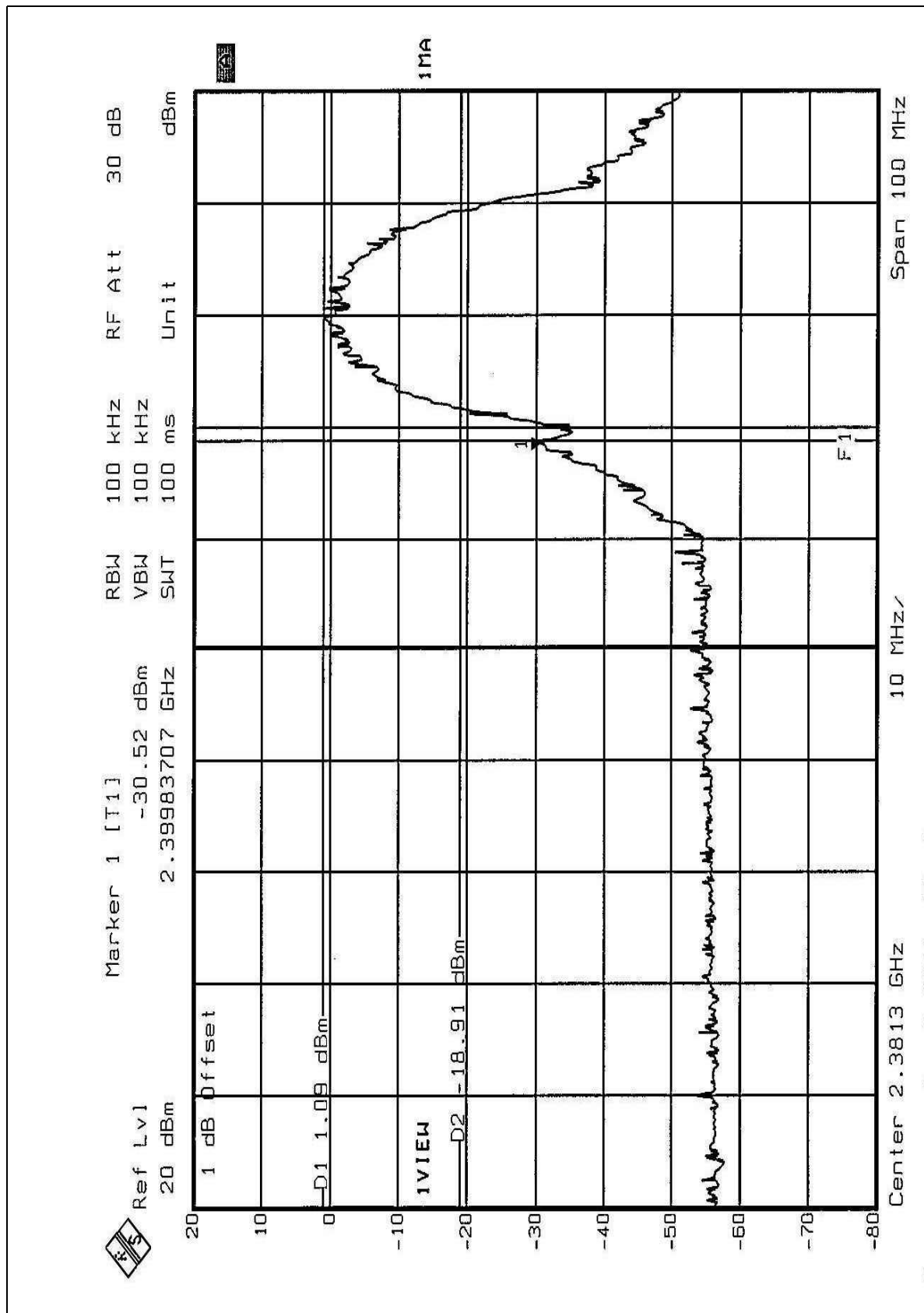
Same as Item 4.3.5

4.6.5 TEST RESULTS

The spectrum plots are attached on the following 2 pages. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.247(C).

NOTE: The band edge emission plot on the following 2 pages shows 54.15dB delta between carrier maximum power and local maximum emission in restrict band (2.4848GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.6 (Page 26) is 87.4dBuV/m, so the maximum field strength in restrict band is $87.4 - 54.15 = 33.25$ dBuV/m which is under 54 dBuV/m limit.







4.7 ANTENNA REQUIREMENT

4.7.1 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 15.247 (b), 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.

4.7.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Inverted F Antenna. There is no antenna connector. And the maximum Gain of this antenna is only -2dBi.

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 and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
New Zealand	MoC
Norway	NEMKO
R.O.C.	BSMI, DGT, CNLA

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.

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Tel: 886-35-935343

Fax: 886-35-935342

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Fax: 886-2-26093184

Lin Kou RF&Telecom Lab

Tel: 886-3-3270910

Fax: 886-3-3270892

Email: service@mail.adt.com.tw

Web Site: www.adt.com.tw

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