FCC TEST REPORT

REPORT NO.: RF920422R02
MODEL NO.: DWL-120+
RECEIVED: Apr. 22, 2003
TESTED: May 9 ~ May 16, 2003

APPLICANT: D-Link Corporation

ADDRESS: No.8,Li-Hsin VII Road, Science Based Industrial Park, Hsin-Chu, 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

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1 CERTIFICATION

PRODUCT :	Enhanced 2.4GHz Wireless USB Adapter
BRAND NAME :	D-Link
MODEL NO. :	DWL-120+
APPLICANT :	D-Link Corporation
STANDARDS :	47 CFR Part 15, Subpart C (Section 15.247) ANSI C63.4-1992

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility from May 9 ~ May 16, 2003, 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.

CHECKED BY: Rennie Wang, **DATE:** May 23, 2003

Rennie Wang

APPROVED BY: for, **DATE:** May 23, 2003

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	PASS	Meet the requirement of limit Minimum passing margin is –16.89dBuV at 0.17MHz
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 –3.20dBuV at 7386.00MHz
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	Enhanced 2.4GHz Wireless USB Adapter
MODEL NO.	DWL-120+
POWER SUPPLY	5VDC from host equipment
MODULATION TYPE	BPSK, QPSK, CCK, PBCC
RADIO TECHNOLOGY	DSSS
TRANSFER RATE	1/2/5.5/11/22Mbps
FREQUENCY RANGE	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11
OUTPUT POWER	17.31dBm
ANTENNA TYPE	Dipole antenna
DATA CABLE	1m (Shielded)
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. For 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 to 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. Transfer rate with 22Mbps, the worst case, was chosen for final test.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a Enhanced 2.4GHz Wireless USB Adapter. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 15, Subpart C. (15.247)
ANSI C63.4 : 1992

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	EPSON	LQ-300+	DCGY017096	FCC DoC Approved
3	MODEM	ACEEX	1414	980020569	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 OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	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
ROHDE & SCHWARZ Test Receiver	ESCS30	847793/022	Mar. 10, 2004
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	828075/003	July 23, 2003
ROHDE & SCHWARZ 200-A Four-line V-Network	ENV4200	830326/018	Oct. 30, 2003
* ROHDE & SCHWARZ 4-wire ISN	ENY41	838119/028	Nov. 29, 2003
* ROHDE & SCHWARZ 2-wire ISN	ENY22	837497/018	Nov. 29, 2003
EMCO-L.I.S.N. (for peripheral)	3825/2	90031627	July 23, 2003
Software	Cond-V2M1	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C05.01	July 19, 2003
LYNICS Terminator (For EMCO LISN)	0900510	E1-01-305	Feb. 23, 2004
LYNICS Terminator (For EMCO LISN)	0900510	E1-01-306	Feb. 23, 2004

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. "*": These equipment are used for conducted telecom port test only (if tested).
3. The test was performed in ADT Shielded Room No. 5.
4. The VCCI Site Registration No. is C-1093.

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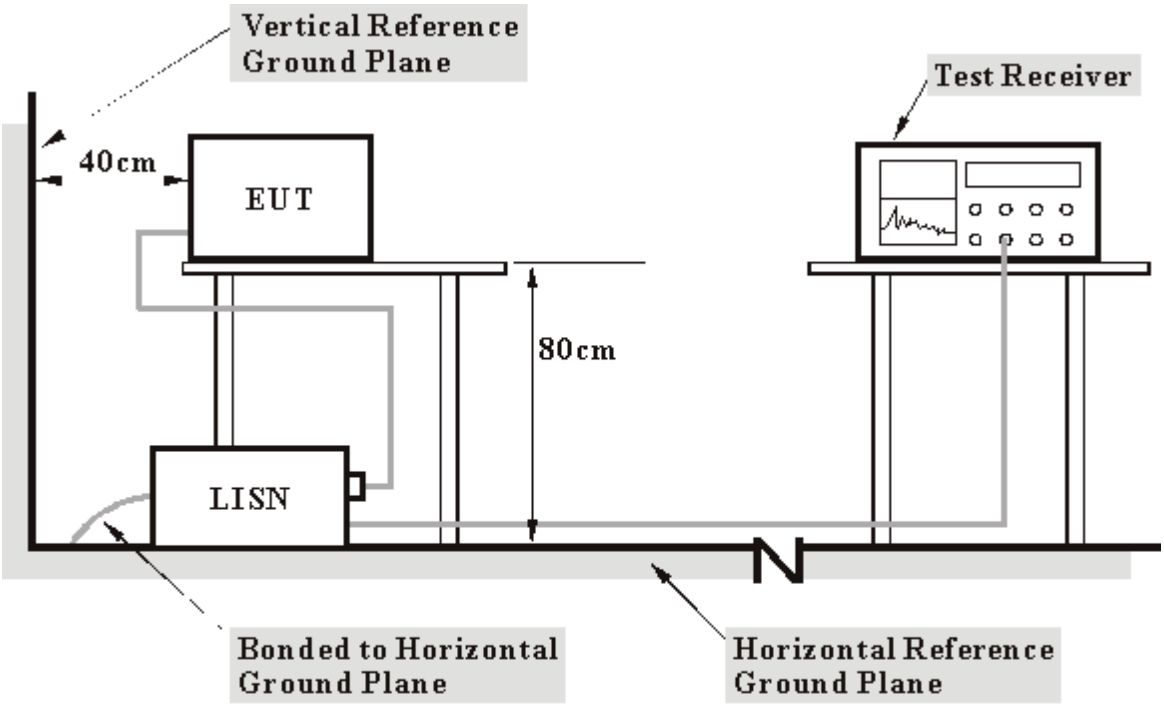
4.1.3 TEST PROCEDURES

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 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

4.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.
2. 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.

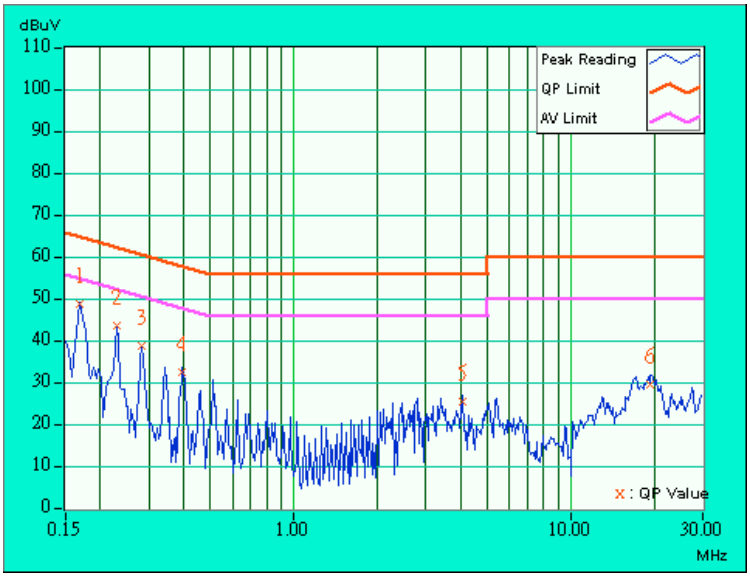
4.1.6 TEST RESULTS

EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 1	**6dB BANDWIDTH**	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60%RH, 991 hPa	**TESTED BY**: Gary Chang	

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	0.170	0.10	47.99	-	48.09	-	64.98	54.98	-16.89	-
2	0.228	0.10	42.52	-	42.62	-	62.52	52.52	-19.90	-
3	0.283	0.10	37.75	-	37.85	-	60.73	50.73	-22.88	-
4	0.396	0.10	31.65	-	31.75	-	57.93	47.93	-26.18	-
5	4.047	0.40	24.58	-	24.98	-	56.00	46.00	-31.02	-
6	19.391	1.06	28.70	-	29.76	-	60.00	50.00	-30.24	-

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.

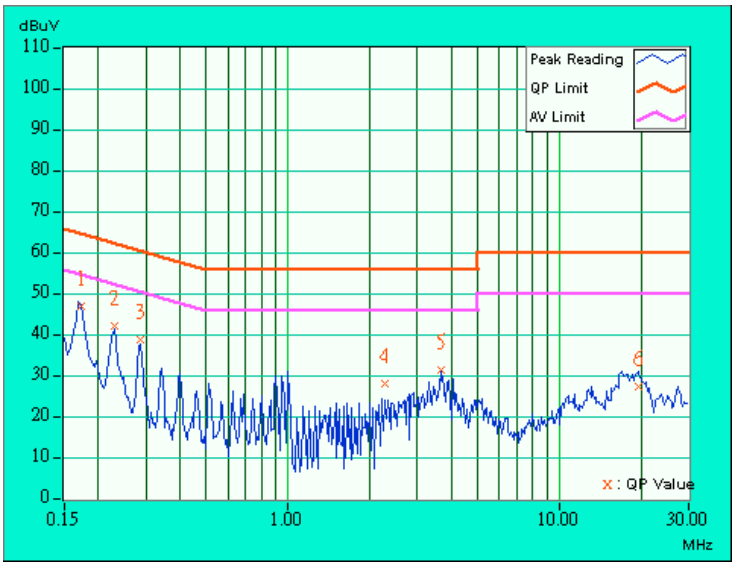


EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 1	**6dB BANDWIDTH**	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**PHASE**	Neutral (N)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60%RH, 991 hPa	**TESTED BY**: Gary Chang	

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	0.173	0.10	46.19	-	46.29	-	64.79	54.79	-18.50	-
2	0.228	0.10	41.36	-	41.46	-	62.52	52.52	-21.06	-
3	0.287	0.10	38.19	-	38.29	-	60.62	50.62	-22.33	-
4	2.284	0.21	27.54	-	27.75	-	56.00	46.00	-28.25	-
5	3.648	0.28	30.53	-	30.81	-	56.00	46.00	-25.19	-
6	19.602	0.78	26.74	-	27.52	-	60.00	50.00	-32.48	-

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.

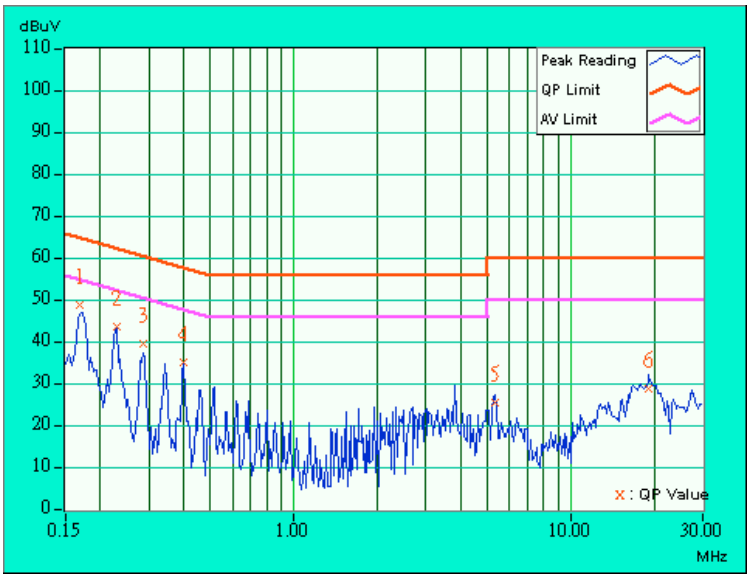


EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 6	**6dB BANDWIDTH**	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60%RH, 991 hPa	**TESTED BY**: Gary Chang	

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	0.170	0.10	47.97	-	48.07	-	64.98	54.98	-16.91	-
2	0.228	0.10	42.50	-	42.60	-	62.52	52.52	-19.92	-
3	0.287	0.10	38.57	-	38.67	-	60.62	50.62	-21.95	-
4	0.400	0.10	33.99	-	34.09	-	57.85	47.85	-23.76	-
5	5.305	0.44	24.63	-	25.07	-	60.00	50.00	-34.93	-
6	19.223	1.05	27.85	-	28.90	-	60.00	50.00	-31.10	-

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.

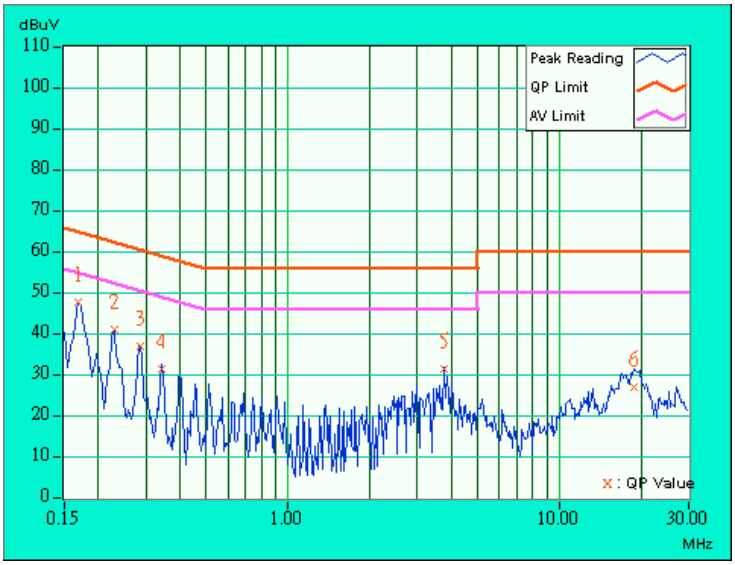


EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 6	**6dB BANDWIDTH**	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**PHASE**	Neutral (N)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60%RH, 991 hPa	**TESTED BY**: Gary Chang	

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	0.170	0.10	46.91	-	47.01	-	64.98	54.98	-17.97	-
2	0.228	0.10	40.50	-	40.60	-	62.52	52.52	-21.92	-
3	0.287	0.10	36.25	-	36.35	-	60.62	50.62	-24.27	-
4	0.341	0.10	30.83	-	30.93	-	59.17	49.17	-28.24	-
5	3.770	0.29	30.84	-	31.13	-	56.00	46.00	-24.87	-
6	18.922	0.74	26.47	-	27.21	-	60.00	50.00	-32.79	-

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.

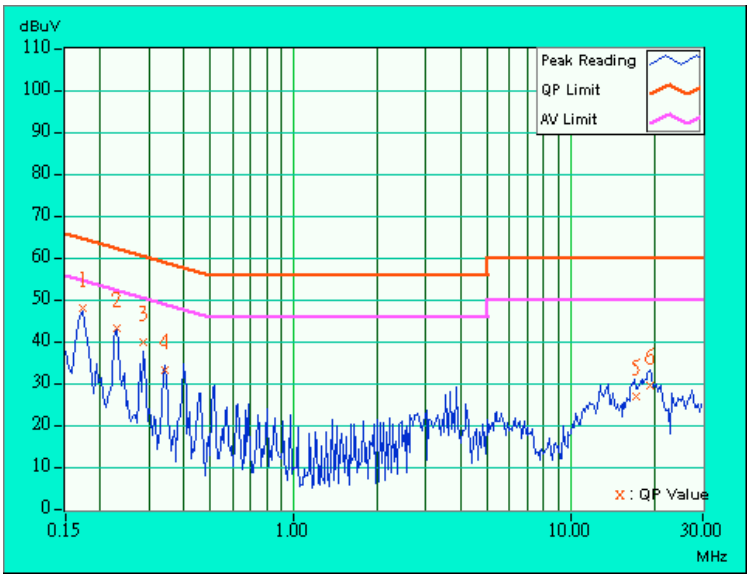


EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 11	**6dB BANDWIDTH**	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60%RH, 991 hPa	**TESTED BY**: Gary Chang	

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	0.173	0.10	47.23	-	47.33	-	64.79	54.79	-17.46	-
2	0.228	0.10	42.28	-	42.38	-	62.52	52.52	-20.14	-
3	0.287	0.10	38.84	-	38.94	-	60.62	50.62	-21.68	-
4	0.341	0.10	32.40	-	32.50	-	59.17	49.17	-26.67	-
5	17.214	0.93	25.84	-	26.77	-	60.00	50.00	-33.23	-
6	19.316	1.06	28.60	-	29.66	-	60.00	50.00	-30.34	-

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.

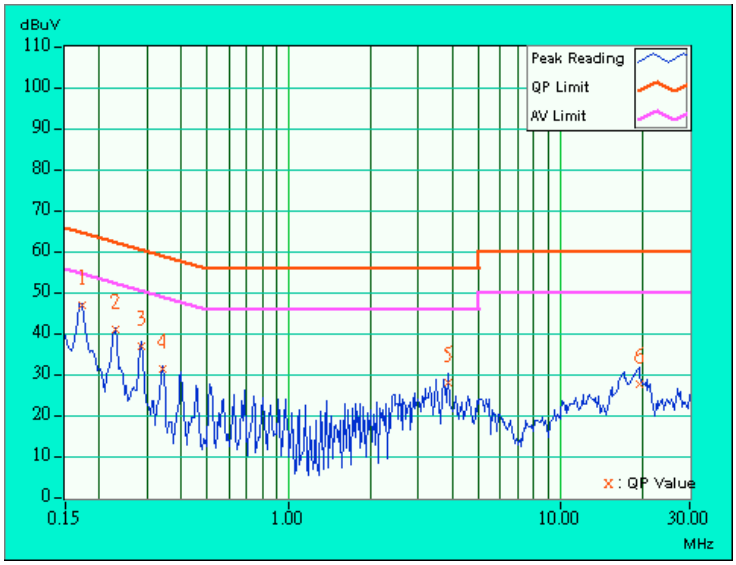


EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 11	**6dB BANDWIDTH**	9 kHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**PHASE**	Netural (N)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60%RH, 991 hPa	**TESTED BY**: Gary Chang	

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	0.173	0.10	46.17	-	46.27	-	64.79	54.79	-18.52	-
2	0.228	0.10	40.50	-	40.60	-	62.52	52.52	-21.92	-
3	0.287	0.10	36.34	-	36.44	-	60.62	50.62	-24.18	-
4	0.341	0.10	30.79	-	30.89	-	59.17	49.17	-28.28	-
5	3.887	0.29	27.38	-	27.67	-	56.00	46.00	-28.33	-
6	19.547	0.77	26.92	-	27.69	-	60.00	50.00	-32.31	-

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

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 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* HP Spectrum Analyzer	8590L	3544A01176	May 13, 2004
* HP Preamplifier	8447D	2944A08485	May 01, 2004
* HP Preamplifier	8449B	3008A01201	Dec. 01, 2003
* HP Preamplifier	8449B	3008A01292	Aug. 07, 2003
* Spectrum Analyzer	8593E	3926A04191	Mar. 24, 2004
* Test Receiver	ESI7	838496/016	Feb. 23, 2004
SCHAFFNER Tunable Dipole Antenna SCHWARZBECK Tunable Dipole Antenna	VHBA 9123 UHA 9105	459 977	Nov. 22, 2003
* CHASE BILOG Antenna	CBL6112A	2221	Aug. 02, 2003
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	July 03, 2003
* EMCO Horn Antenna	3115	9312-4192	Mar. 23, 2004
* EMCO Turn Table	1060	1115	NA
* SHOSHIN Tower	AP-4701	A6Y005	NA
* Software	ADT_Radiated_V5.09	NA	NA
* ANRITSU RF Switches	MP59B	M35046	Jul. 11. 2003
* TIMES RF cable	LMR-600	CABLE-ST5-01	Jul. 11. 2003

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. "*" = These equipment are used for the final measurement.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The test was performed in ADT Open Site No. 5.
5. The VCCI Site Registration No. is R-1039.

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.

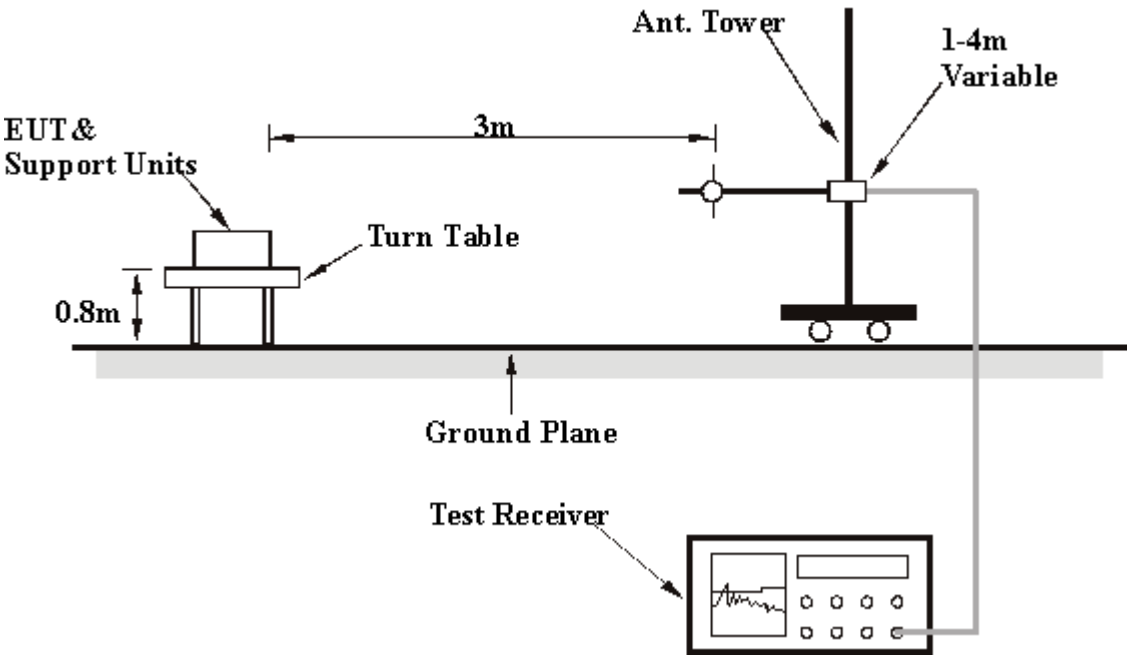
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 11	**FREQUENCY RANGE**	Below 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25 deg. C, 60 % RH, 991 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)	Correction Factor (dB/m)
3	144.01	31.5 QP	43.50	-12.00	1.08 H	219	19.60	11.90
4	240.01	33.0 QP	46.00	-13.00	1.31 H	167	18.30	14.70
5	264.00	32.3 QP	46.00	-13.70	1.37 H	115	15.70	16.70
6	288.01	34.9 QP	46.00	-11.10	1.45 H	57	18.20	16.60
7	307.78	29.1 QP	46.00	-16.90	1.43 H	247	12.10	16.90
8	351.98	28.5 QP	46.00	-17.50	1.51 H	61	10.80	17.70
9	483.98	28.0 QP	46.00	-18.00	1.12 H	116	7.30	20.70
10	528.01	31.6 QP	46.00	-14.40	1.62 H	123	10.40	21.10
11	748.00	30.5 QP	46.00	-15.50	1.43 H	263	6.40	24.10
12	836.00	31.1 QP	46.00	-14.90	1.22 H	224	6.00	25.00

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

EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 11	**FREQUENCY RANGE**	Below 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25 deg. C, 60 % RH, 991 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)	Correction Factor (dB/m)
1	120.01	30.1 QP	43.50	-13.40	1.14 V	107	16.60	13.50
2	144.00	34.3 QP	43.50	-9.20	1.54 V	40	22.40	11.90
3	176.00	21.1 QP	43.50	-22.40	1.11 V	143	10.40	10.60
4	240.00	34.6 QP	46.00	-11.40	1.18 V	117	20.00	14.70
5	263.73	25.1 QP	46.00	-20.90	1.48 V	67	8.40	16.70
6	351.96	26.3 QP	46.00	-19.70	1.05 V	136	8.60	17.70
7	384.00	32.8 QP	46.00	-13.20	1.22 V	42	14.10	18.70
8	439.97	27.9 QP	46.00	-18.10	1.51 V	145	8.20	19.60
9	528.02	30.0 QP	46.00	-16.00	1.40 V	19	8.90	21.10
10	615.53	30.4 QP	46.00	-15.60	1.23 V	248	7.70	22.70
11	748.00	29.9 QP	46.00	-16.10	1.34 V	36	5.80	24.10

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

EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 1	**FREQUENCY RANGE**	Above 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60 % RH, 991 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)	Correction Factor (dB/m)
1	*2412.00	108.4 PK			1.65 H	200	77.30	31.10
1	*2412.00	99.0 AV			1.65 H	200	67.90	31.10
2	4824.00	52.3 PK	74.00	-21.70	1.54 H	20	14.90	37.50
2	4824.00	39.4 AV	54.00	-14.60	1.54 H	20	1.90	37.50
3	7236.00	52.7 PK	74.00	-21.30	2.00 H	246	11.20	41.50
3	7236.00	41.4 AV	54.00	-12.60	2.00 H	246	-0.10	41.50
4	9648.00	56.1 PK	74.00	-17.90	1.09 H	114	12.40	43.70
4	9648.00	47.9 AV	54.00	-6.10	1.09 H	114	4.20	43.70

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	*2412.00	102.8 PK			1.75 V	21	71.70	31.10
1	*2412.00	92.3 AV			1.75 V	21	61.20	31.10
2	4824.00	55.7 PK	74.00	-18.30	1.39 V	207	18.20	37.50
2	4824.00	39.0 AV	54.00	-15.00	1.39 V	207	1.50	37.50
3	7236.00	60.1 PK	74.00	-13.90	1.86 V	157	18.50	41.50
3	7236.00	49.7 AV	54.00	-4.30	1.86 V	157	8.20	41.50
4	9648.00	57.2 PK	74.00	-16.80	1.32 V	22	13.50	43.70
4	9648.00	49.1 AV	54.00	-4.90	1.32 V	22	5.40	43.70

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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

EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 6	**FREQUENCY RANGE**	Above 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60 % RH, 991 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)	Correction Factor (dB/m)
1	*2437.00	107.0 PK			1.64 H	63	75.90	31.10
1	*2437.00	96.7 AV			1.64 H	63	65.60	31.10
2	4874.00	54.3 PK	74.00	-19.70	1.01 H	65	16.70	37.60
2	4874.00	38.9 AV	54.00	-15.10	1.01 H	65	1.30	37.60
3	7311.00	54.3 PK	74.00	-19.70	1.56 H	142	12.50	41.80
3	7311.00	43.7 AV	54.00	-10.30	1.56 H	142	1.90	41.80
4	9748.00	56.7 PK	74.00	-17.30	1.17 H	51	12.90	43.70
4	9748.00	48.1 AV	54.00	-5.90	1.17 H	51	4.30	43.70

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	*2437.00	107.2 PK			1.79 V	212	76.10	31.10
1	*2437.00	96.8 AV			1.79 V	212	65.70	31.10
2	4874.00	57.5 PK	74.00	-16.50	1.00 V	79	19.90	37.60
2	4874.00	41.0 AV	54.00	-13.00	1.00 V	79	3.40	37.60
3	7311.00	56.7 PK	74.00	-17.30	1.77 V	184	15.00	41.80
3	7311.00	44.5 AV	54.00	-9.50	1.77 V	184	2.70	41.80
4	9748.00	58.3 PK	74.00	-15.70	1.52 V	45	14.60	43.70
4	9748.00	49.9 AV	54.00	-4.10	1.52 V	45	6.10	43.70

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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

EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
MODE	Channel 11	**FREQUENCY RANGE**	Above 1000 MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Peak(PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 60 % RH, 991 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)	Correction Factor (dB/m)
1	*2462.00	105.9 PK			1.65 H	78	74.70	31.20
1	*2462.00	96.0 AV			1.65 H	78	64.80	31.20
2	4924.00	54.0 PK	74.00	-20.00	1.33 H	52	16.30	37.60
2	4924.00	42.6 AV	54.00	-11.40	1.33 H	52	4.90	37.60
3	7386.00	55.5 PK	74.00	-18.50	1.74 H	76	13.40	42.00
3	7386.00	42.9 AV	54.00	-11.10	1.74 H	76	0.80	42.00
4	9848.00	55.2 PK	74.00	-18.80	1.61 H	146	11.40	43.80
4	9848.00	46.1 AV	54.00	-7.90	1.61 H	146	2.30	43.80

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	*2462.00	107.5 PK			1.78 V	41	76.30	31.20
1	*2462.00	97.9 AV			1.78 V	41	66.70	31.20
2	4924.00	56.0 PK	74.00	-18.00	1.14 V	271	18.30	37.60
2	4924.00	41.6 AV	54.00	-12.40	1.14 V	271	3.90	37.60
3	7386.00	60.2 PK	74.00	-13.80	1.68 V	251	18.10	42.00
3	7386.00	50.8 AV	54.00	-3.20	1.68 V	251	8.70	42.00
4	9848.00	59.5 PK	74.00	-14.50	1.39 V	104	15.70	43.80
4	9848.00	49.6 AV	54.00	-4.40	1.39 V	104	5.80	43.80

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
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

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 24, 2003

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

4.3.3 TEST PROCEDURE

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

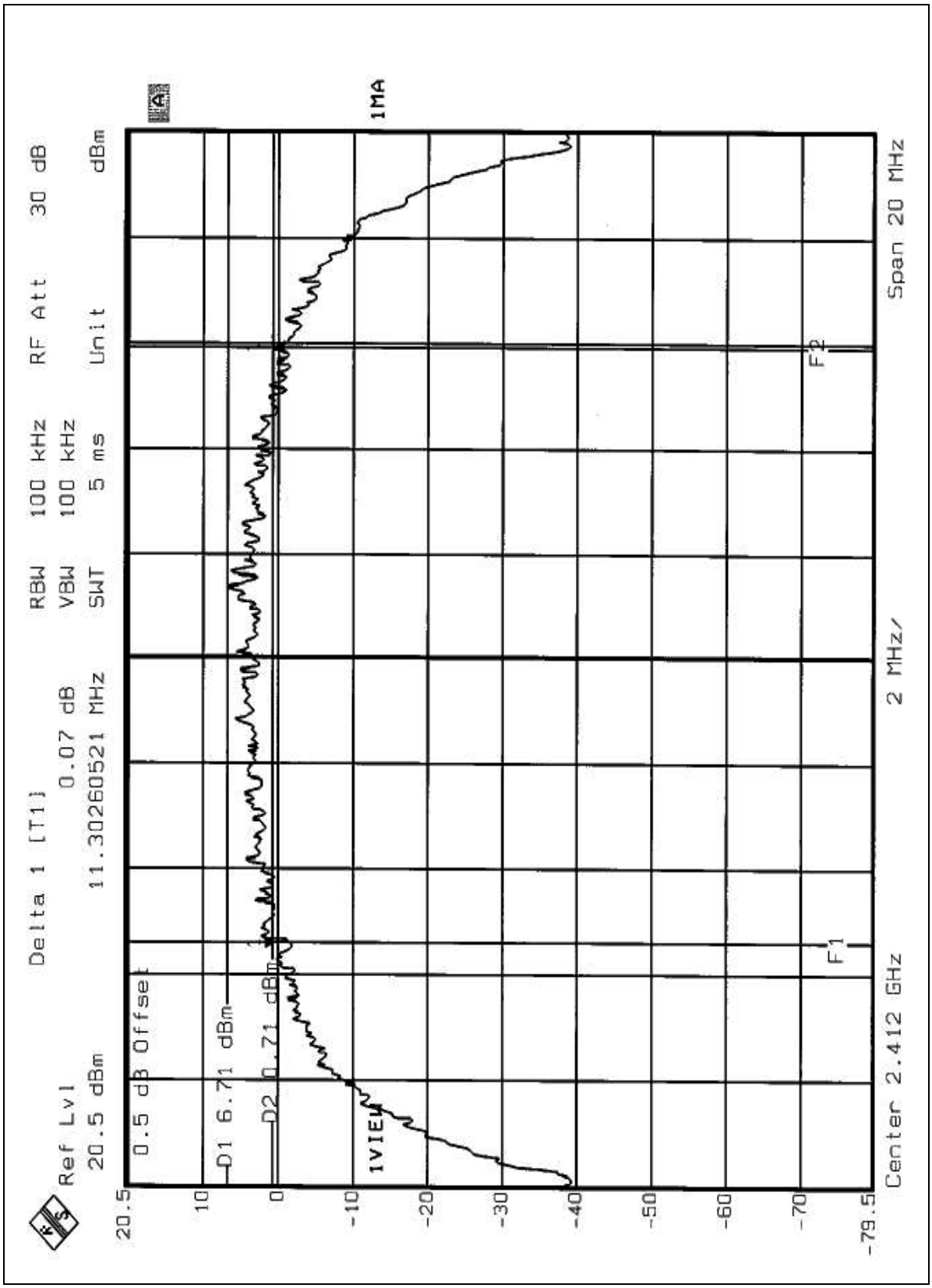
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.6 TEST RESULTS

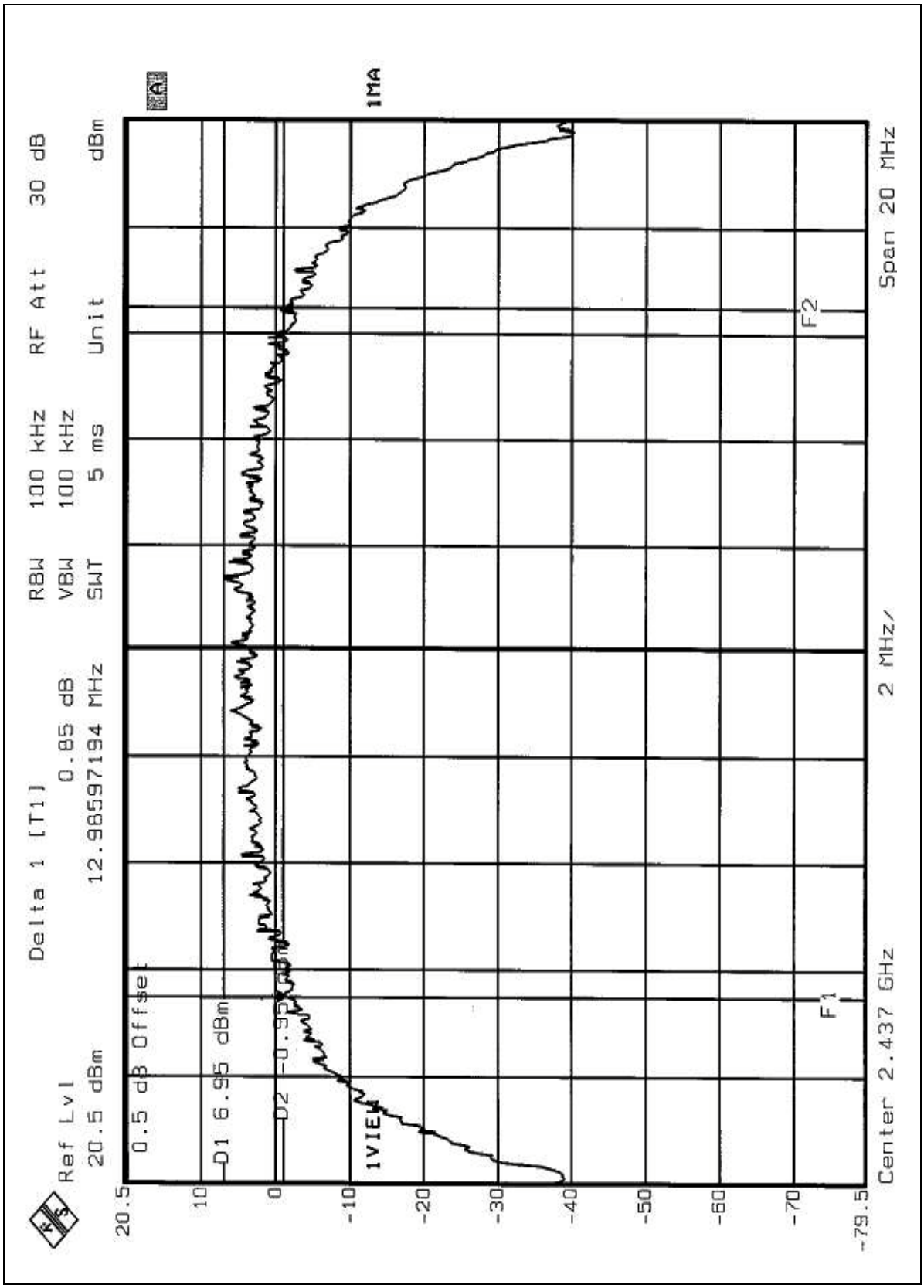
EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	25 deg. C, 67%RH, 991 hPa
TESTED BY: Ansen Lei			

CHANNEL	CHANNEL FREQUENCY (MHz)	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
1	2412	11.30	0.5	PASS
6	2437	12.99	0.5	PASS
11	2462	11.62	0.5	PASS

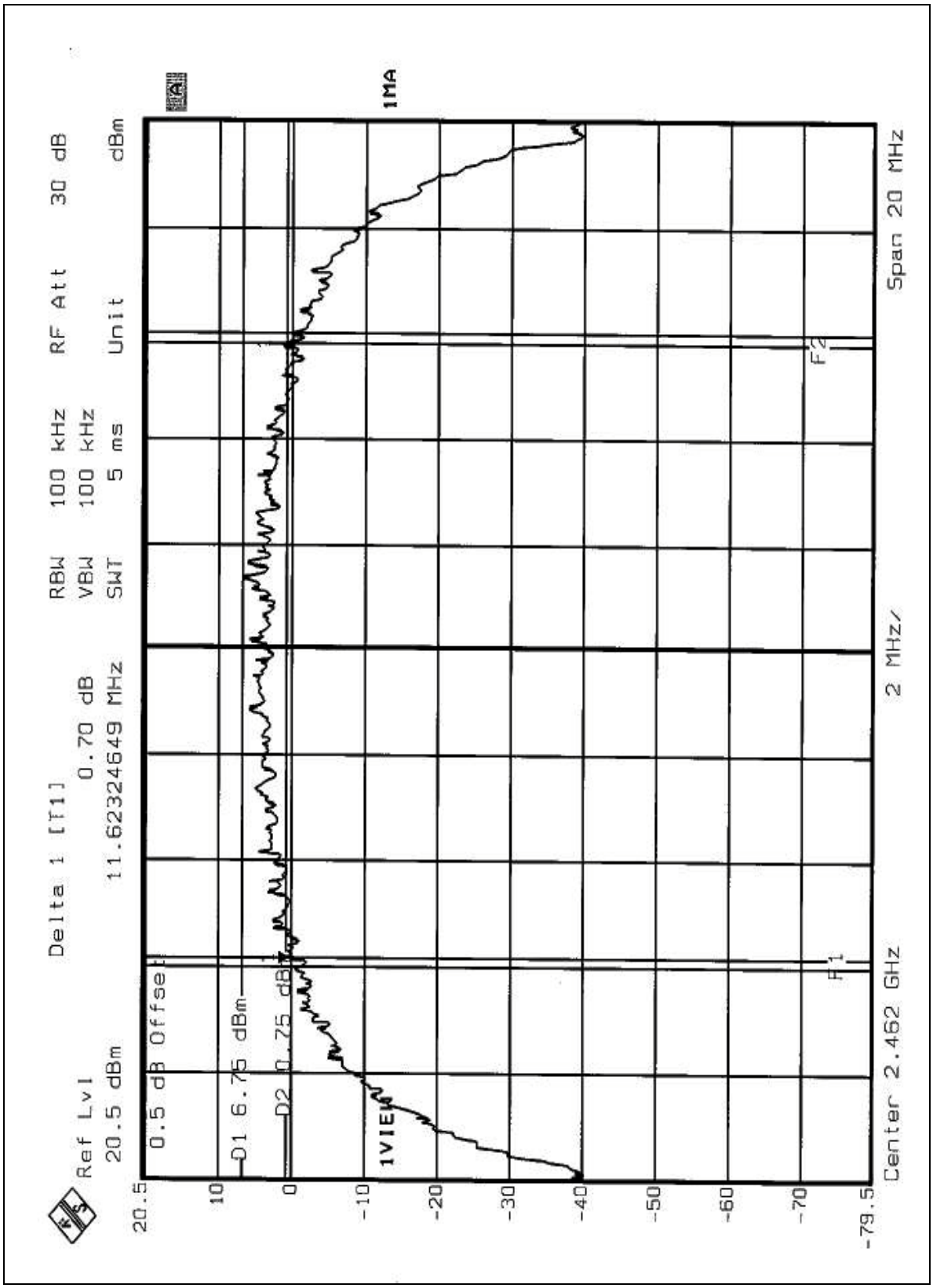
CH1


Ref Lvl
20.5 dBm
0.5 dB Offset
D1 6.71 dBm
D2 0.71 dBm
Delta 1 [T1]
0.07 dB
11.30260521 MHz
RBW 100 kHz
VBW 100 kHz
SWT 5 ms
RF Att 30 dB
Unit dBm
1MA
1VIEW
F1
F2
Center 2.412 GHz
2 MHz/
Span 20 MHz
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5

CH6


Ref Lvl
20.5 dBm
0.5 dB Offset
D1 6.95 dBm
D2 -0.95 dBm
Delta 1 [T1]
0.85 dB
12.98597194 MHz
RBW 100 kHz
VBW 100 kHz
SWT 5 ms
RF Att 30 dB
Unit dBm
1MA
1VIEW
F1
F2
Center 2.437 GHz
2 MHz/
Span 20 MHz
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5

CH11


Ref Lvl
20.5 dBm
0.5 dB Offset
D1 6.75 dBm
D2 0.75 dB
Delta 1 [T1]
0.70 dB
11.62324649 MHz
RBW 100 kHz
VBW 100 kHz
SWT 5 ms
RF Att 30 dB
Unit dBm
1MA
1VIEW
F2
F1
Center 2.462 GHz
2 MHz/
Span 20 MHz
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5

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

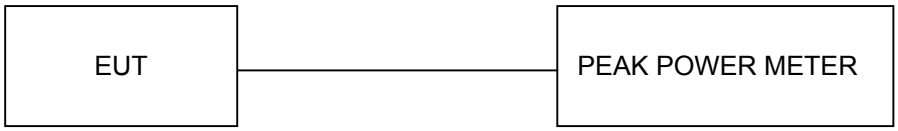
Description & Manufacturer	Model No.	Serial No.	Calibrated Until
POWER METER	E4416A	GB41291118	Jul. 30, 2003
PEAK POWER SENSOR	E9327A	US40440722	Jul. 30, 2003

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

4.4.3 TEST PROCEDURES

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	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	25 deg. C, 67%RH, 991 hPa
TESTED BY: Ansen Lei			

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	17.31	30	PASS
6	2437	17.18	30	PASS
11	2462	17.26	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

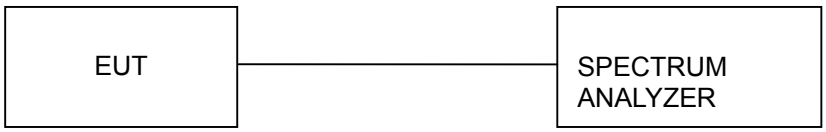
Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	July 24, 2003

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

4.5.3 TEST 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

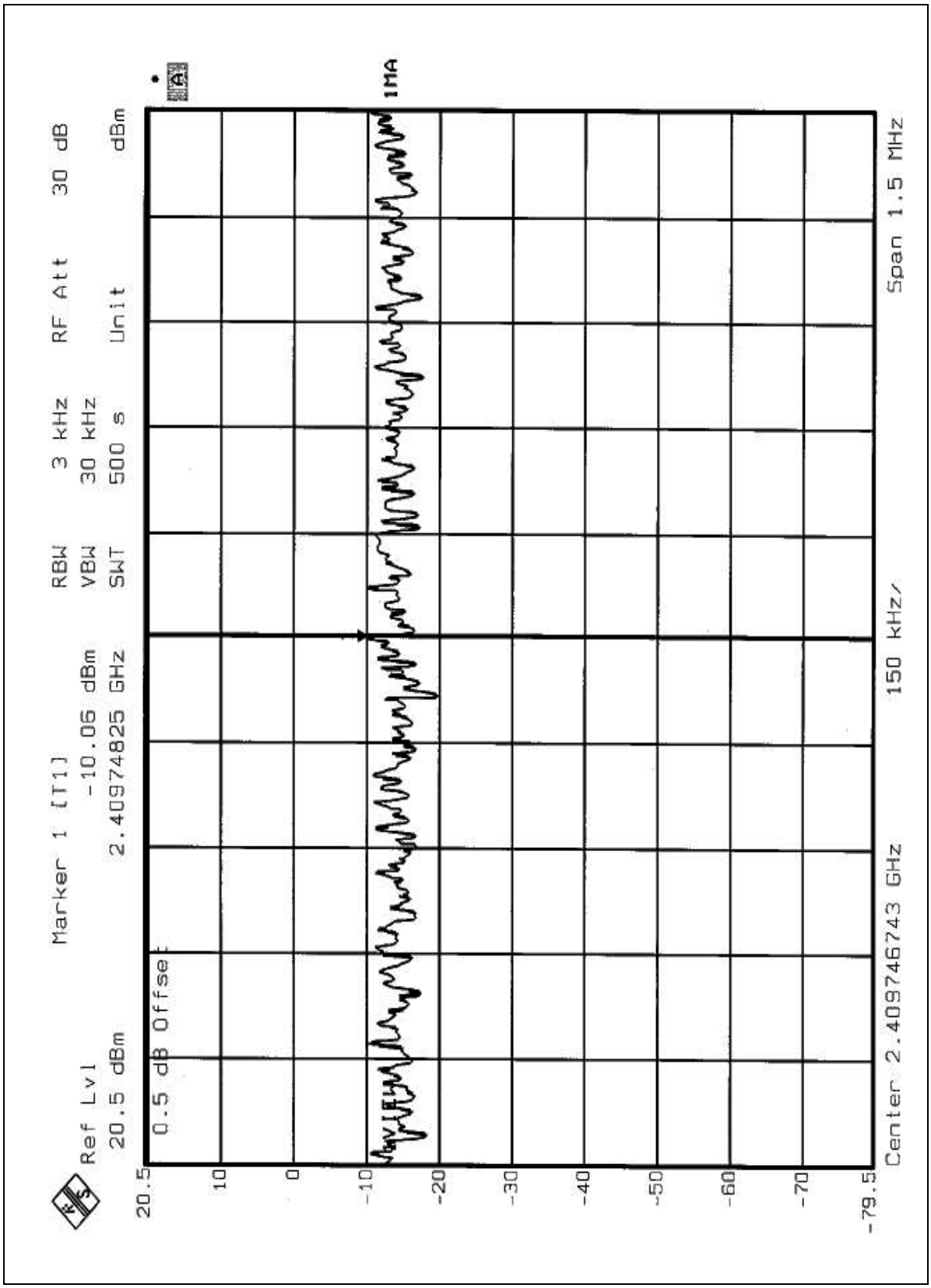
Same as 4.3.5

4.5.6 TEST RESULTS

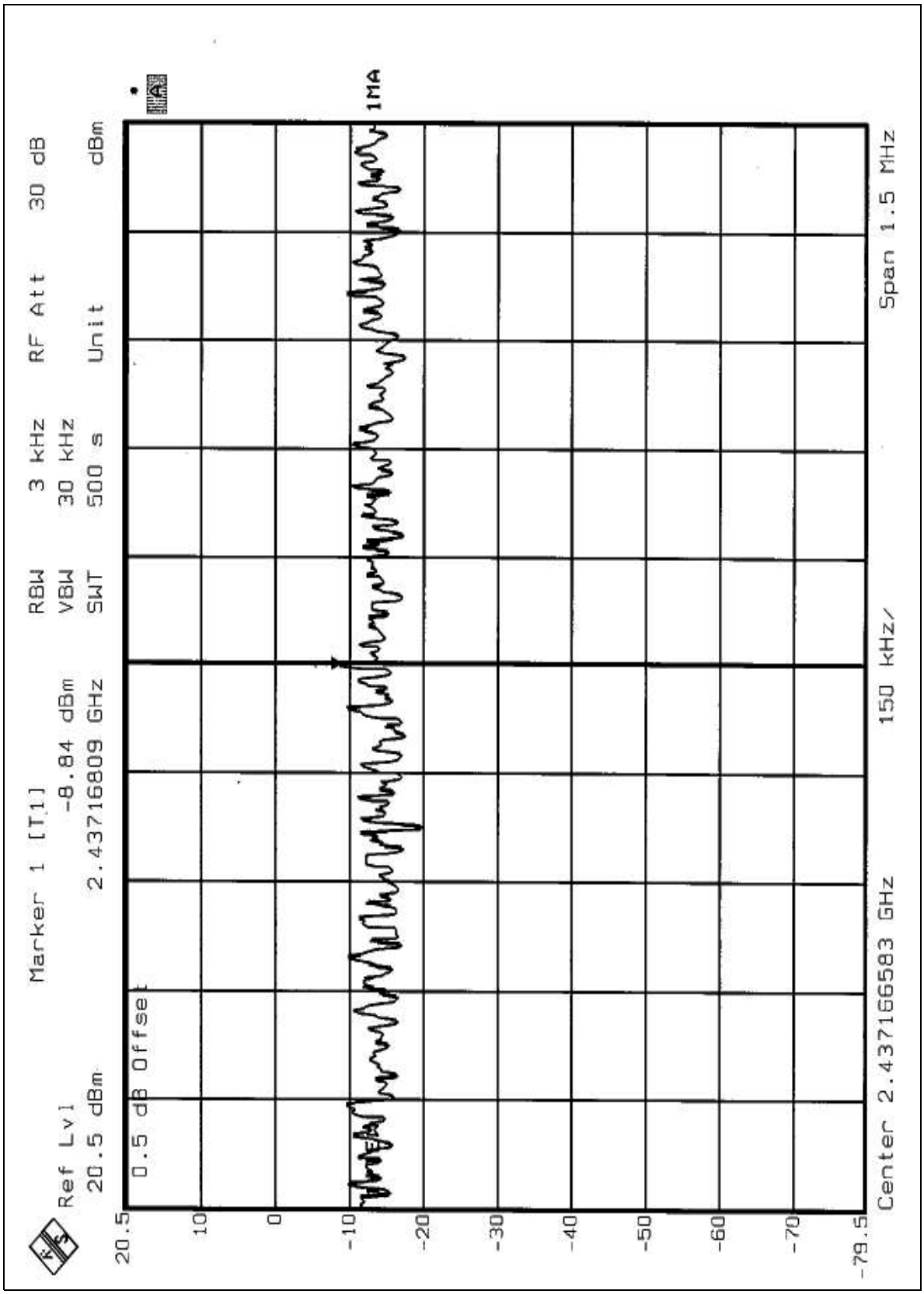
EUT	Enhanced 2.4GHz Wireless USB Adapter	**MODEL**	DWL-120+
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	25 deg. C, 67%RH, 991 hPa
TESTED BY: Ansen Lei			

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3 KHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2412	-10.06	8	PASS
6	2437	-8.84	8	PASS
11	2462	-9.87	8	PASS

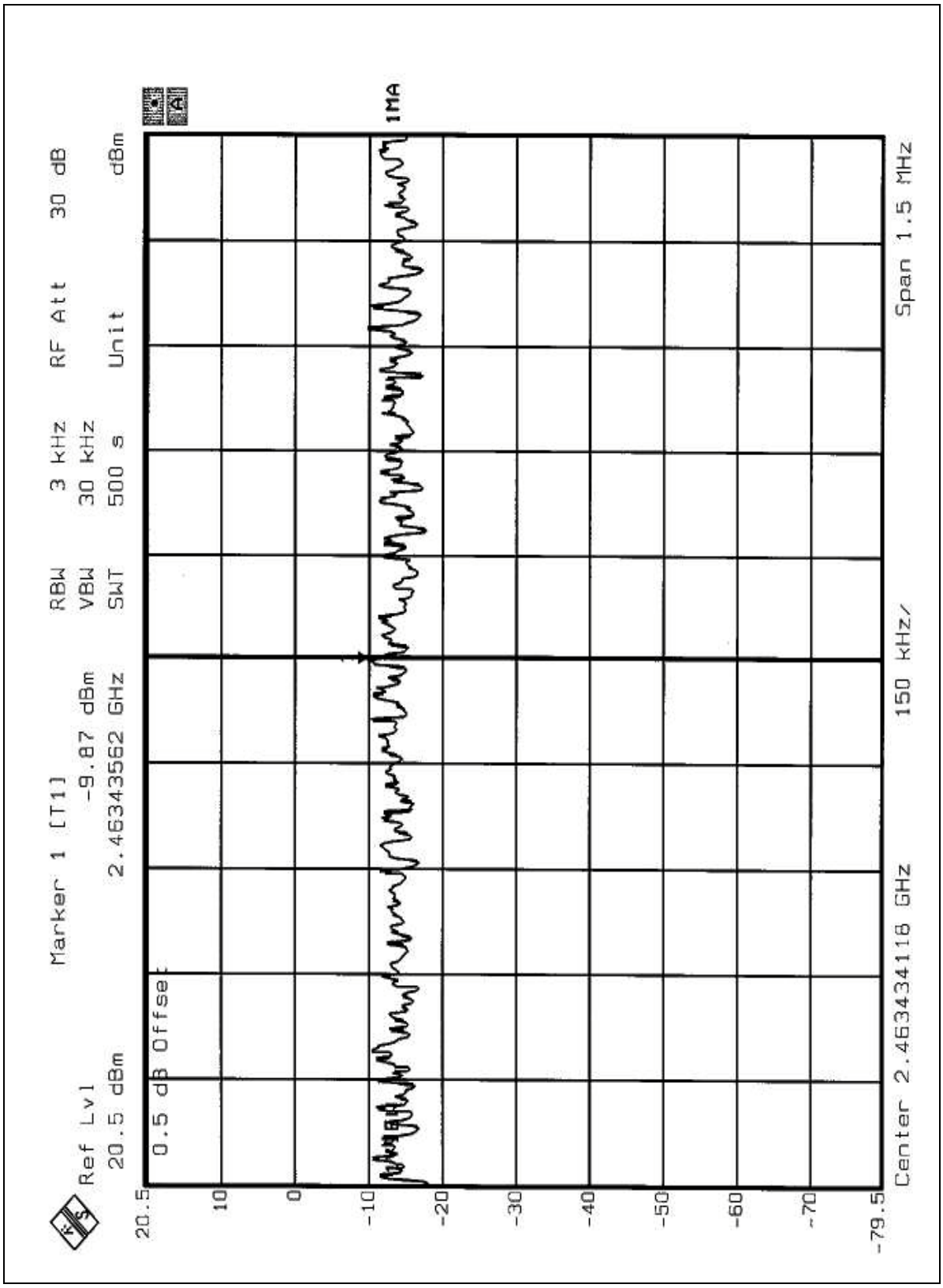
CH1


Ref Lvl
20.5 dBm
0.5 dB Offset
Marker 1 [T1]
-10.06 dBm
2.4097825 GHz
RBW 3 kHz
VBW 30 kHz
SWT 500 s
RF Att 30 dB
Unit dBm
1MA
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.409746743 GHz
150 kHz/
Span 1.5 MHz

CH6


Ref Lvl
20.5 dBm
0.5 dB Offset
Marker 1 [T1]
-8.84 dBm
2.43716809 GHz
RBW 3 kHz
VBW 30 kHz
SWT 500 s
RF Att 30 dB
Unit dBm
1MA
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.43716583 GHz
150 kHz/
Span 1.5 MHz

CH11


Ref Lvl
20.5 dBm
0.5 dB Offset
Marker 1 [T1]
-9.87 dBm
2.46343562 GHz
RBW 3 kHz
VBW 30 kHz
SWT 500 s
RF Att 30 dB
Unit dBm
1MA
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.46343118 GHz
150 kHz/
Span 1.5 MHz

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 24, 2003

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

4.6.3 TEST PROCEDURE

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.

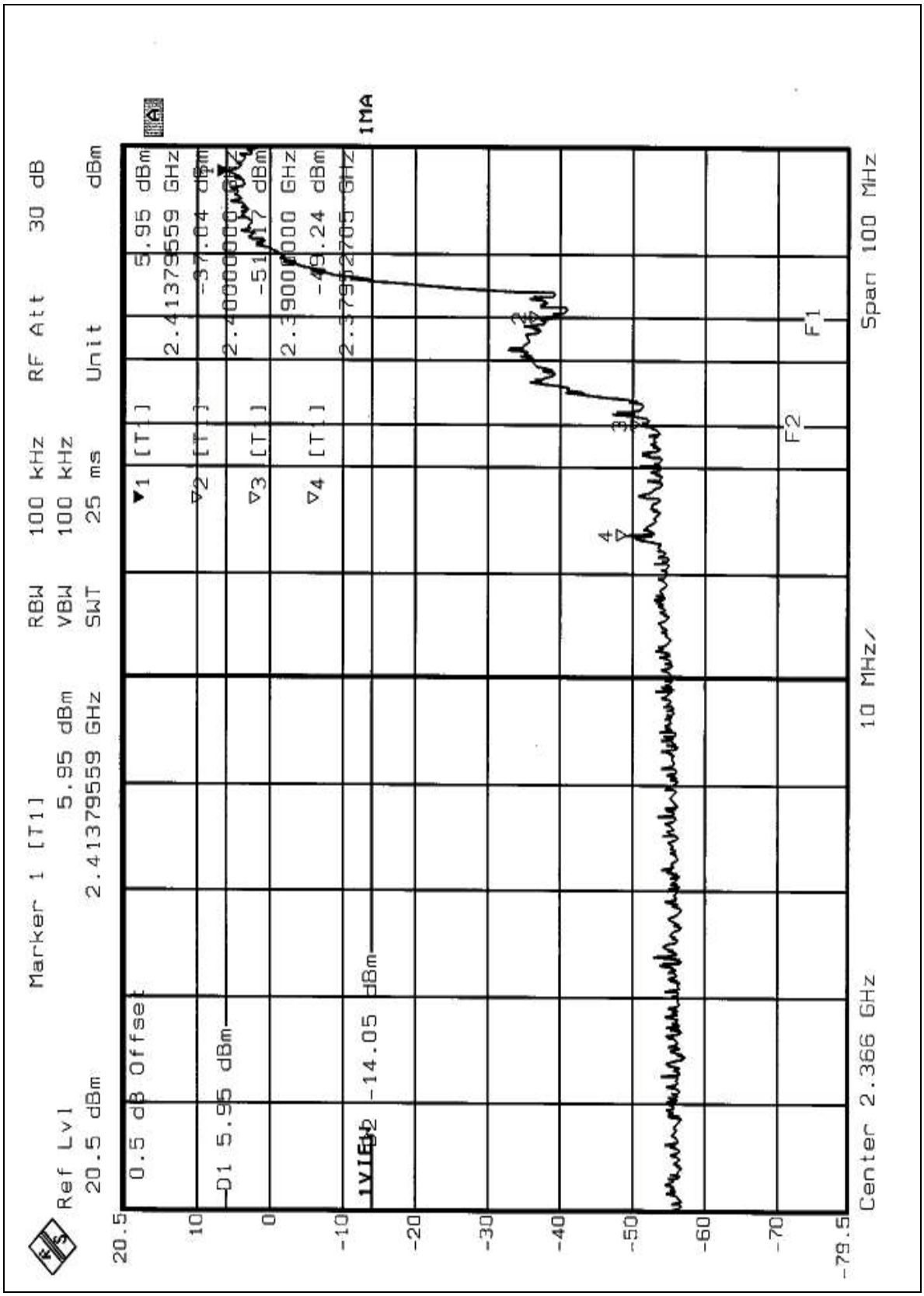
4.6.4 EUT OPERATING CONDITION

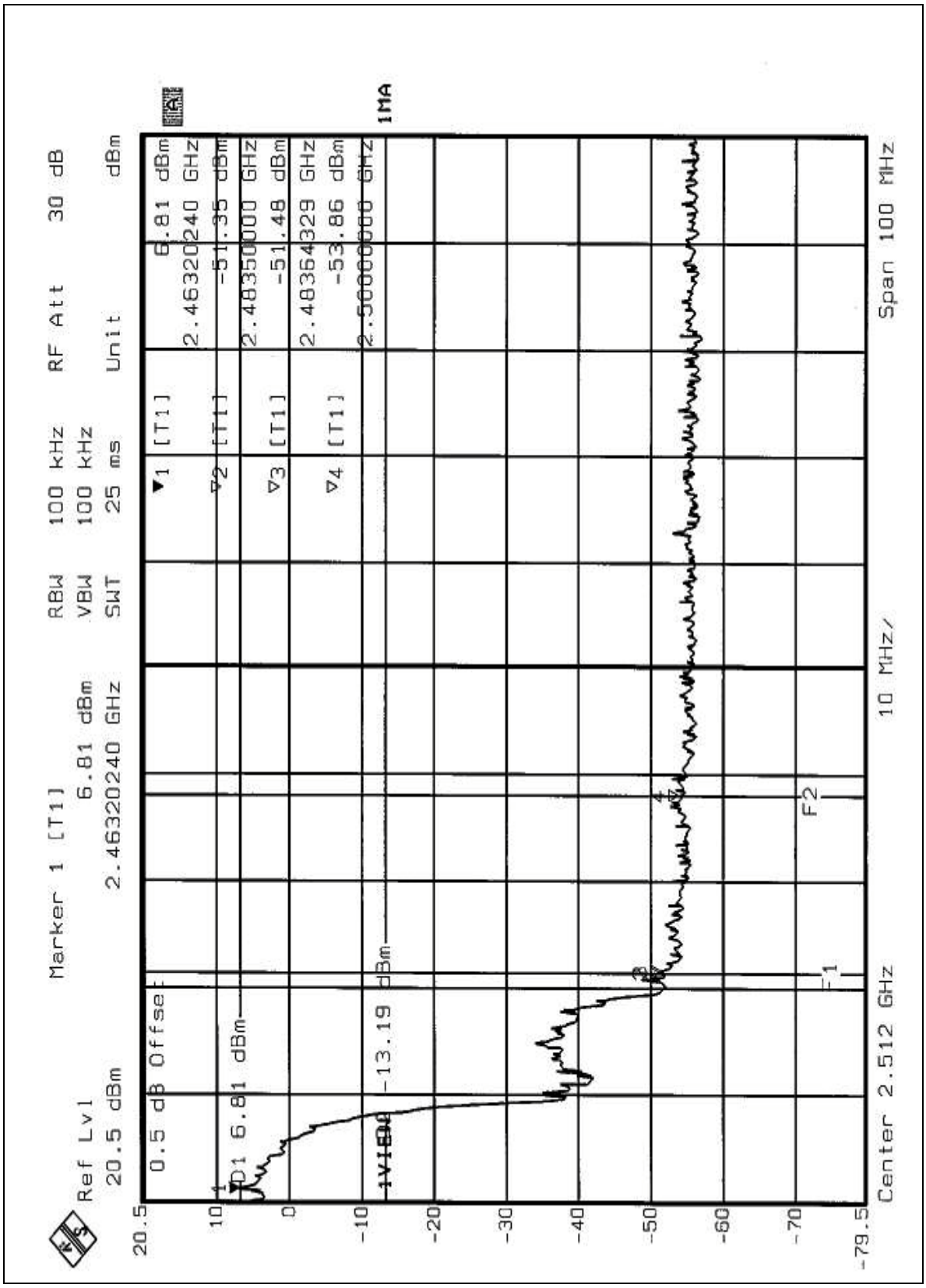
Same as Item 4.3.5

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 55.19dB / 58.16dB delta between carrier maximum power and local maximum emission in restrict band (2.3795GHz / 2.4835GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.6 (Page 24) is 99.0dBuV/m, so the maximum field strength in restrict band is 99.0-55.19=43.81 dBuV/m which is under 54 dBuV/m limit.


Ref Lvl
20.5 dBm
0.5 dB Offset
D1 5.95 dBm
Marker 1 [T1]
5.95 dBm
2.41379559 GHz
RBW 100 kHz
VBW 100 kHz
SWT 25 ms
RF Att 30 dB
Unit dBm
1MA
-14.05 dBm
Center 2.366 GHz
10 MHz/
Span 100 MHz
F1
F2


Ref Lvl
20.5 dBm
0.5 dB Offset
D1 6.81 dBm
Marker 1 [T1]
6.81 dBm
2.4632024 0 GHz
RBW 100 kHz
VBW 100 kHz
SWT 25 ms
RF Att 30 dB
Unit dBm
▼1 [T1] 6.81 dBm 2.46320240 GHz
▽2 [T1] -51.35 dBm 2.48350000 GHz
▽3 [T1] -51.48 dBm 2.48364329 GHz
▽4 [T1] -53.86 dBm 2.50000000 GHz
1MA
1VIEW -13.19 dBm
F1
F2
Center 2.512 GHz
10 MHz/
Span 100 MHz
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5

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.

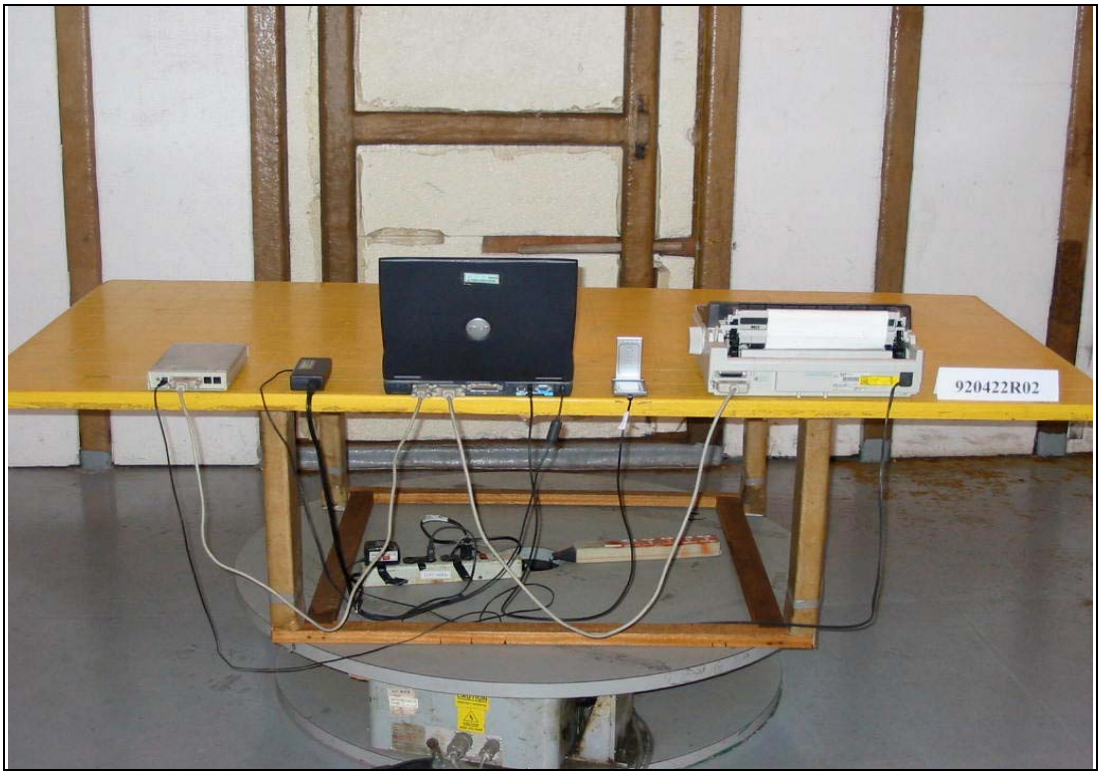
4.7.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Dipole Antenna without antenna connector. And the maximum Gain of this antenna is only 1dBi.

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