



TEST REPORT

GemTek Technology Co., Ltd.

Model Names **WL-280**
WL-281
WL-282
WL-283

Tested at September 27, 2000

According **47CFR Part 15B / 15C (15.247)**

Issued for

GemTek Technology Co., Ltd.

No. 1, Jen Ai Road., Hsinchu Industrial Park, Hukou,
Hsinchu, Taiwan, R.O.C.

PREPARED BY: **ADVANCE DATA TECHNOLOGY CORPORATION**



Accredited Laboratory

11F, NO.1, SEC.4, NAN-KING EAST RD.,
TAIPEI, TAIWAN, R.O.C.

This test report consists of 84 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of our laboratory. It should not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. government. The test result in the report only applies to the tested sample.



REPORT NO : RF89090403
PRODUCT : 11Mbps Wireless LAN USB Terminal Device
MODEL NO : WL-280, WL-281, WL-282, WL-283
BRAND NAME : GemTek
SERIAL NO : N/A
CLIENT : GemTek Technology Co., Ltd.
ADDRESS : No.1, Jen Ai Rd., Hsin Chu Industrial Park, Hu Kou, Hsin Chu 303, Taiwan R.O.C.
ISSUED BY : Advance Data Technology Corporation (Adt Corp.)
OFFICE ADDRESS : 11F, No. 1, Sec. 4, Nan-King East Rd., Taipei, Taiwan, R.O.C.
LABORATORY ADDRESS : NO. 13-1, Lane 19, Wen Shan 3rd St., Kweishan, Taoyuan, TAIWAN, R.O.C.
TEST STANDARD : 47CFR Part 15, Subpart C (15.247) & Subpart B
TEST DATE : September 27, 2000
TEST RESULT : Pass

This test report consists of 84 pages in total. This test report is the property of ADT Corp. and shall not be reproduced except in full, without the written consent of ADT. ADT hereby returns all rights in data to the client for legal use by the client. The test results contained in this report apply only to the samples tested.



Accredited Laboratory



TABLE OF CONTENTS

1 CERTIFICATION..... 6

2 SUMMARY OF TEST RESULTS 7

3 DECLARATION OF COMPLIANCE WITH SUBPART B..... 8

4 GENERAL INFORMATION..... 9

 4.1 GENERAL DESCRIPTION OF EUT.....9

 4.2 DESCRIPTION OF TEST MODE.....10

 4.3 TEST METHODOLOGY.....10

 4.4 SUPPORT UNITS LIST..... 11

 4.5 CONFIGURATION OF SYSTEM UNDER TEST 11

5 GENERAL INFORMATION OF TEST LAB..... 12

 5.1 TEST LAB.....12

 5.2 CALIBRATION INTERVAL.....12

6 TEST PROCEDURES AND TEST RESULTS..... 13

 6.1 CONDUCTED EMISSION MEASUREMENT13

 6.1.1 Test Instruments.....13

 6.1.2 Test Procedure13

 6.1.3 Test Setup14

 6.1.4 Photograph of Test Setup.....15

 6.1.5 EUT Operating condition16

 6.1.6 Climate Condition.....16

 6.2 6DB BANDWIDTH MEASUREMENT23

 6.2.1 Test Instruments.....23

 6.2.2 Test Procedure23

 6.2.3 Test Setup23

 6.2.4 EUT Operating Condition23

 6.2.5 Climate Condition.....24

 6.2.6 Test Results24

 6.3 MAXIMUM PEAK POWER OUTPUT28

 6.3.1 Test Instruments.....28

 6.3.2 Test Procedures28

 6.3.3 Test Setup29



6.3.4 EUT Operating Condition29

6.3.5 Climate Condition.....29

6.3.6 Test Result.....29

6.4 RF EXPOSURE.....30

6.4.1 Test Instrument30

6.4.2 Classification.....30

6.4.3 RF exposure limit.....31

6.4.4 Calculation Procedures31

6.4.5 RF Exposure Distances.....32

6.5 RADIATED EMISSION MEASUREMENT33

6.5.1 Test instruments33

6.5.2 Test Procedures34

6.5.3 Test Setup35

6.5.4 Photograph of Test Setup36

6.5.5 EUT Operating Condition37

6.5.6 Climate Condition.....37

6.5.7 Test Results38

6.6 POWER SPECTRAL DENSITY MEASUREMENT.....47

6.6.1 Test Instruments.....47

6.6.2 Test Procedure47

6.6.3 Test Setup47

6.6.4 EUT Operating Condition47

6.6.5 Climate Condition.....48

6.6.6 Test Result.....48

6.7 BAND EDGES MEASUREMENT52

6.7.1 Test Instruments52

6.7.2 Test Procedure52

6.7.3 Test Setup52

6.7.4 EUT Operating condition53

6.7.5 Climate Condition.....53

6.7.6 Test Results53

6.8 PROCESSING GAIN OF A DIRECT SEQUENCE SPREAD SPECTRUM MEASUREMENT56

6.8.1 Test Instruments and Support Units56

6.8.2 Method of Measurement56

6.8.3 Test Setup58

6.8.4 Test Procedures59



6.8.5 *EUT Operating condition*60
6.8.6 *Climate Condition*.....60
6.8.7 *Test Results*.....61

7 ANTENNA REQUIREMENT..... 77
7.1 STANDARD APPLICABLE77
7.2 ANTENNA CONNECTED CONSTRUCTION.....77

8 EUT PHOTOS 78



1 CERTIFICATION

Issue Date: September 29, 2000

PRODUCT : 11 Mbps Wireless LAN USB Terminal Device
MODEL NO : WL-280, WL-281, WL-282, WL-283
FCC ID : MXF-WL280
SPEC. : 2.4 ~ 2.4835 GHz, 11 Channels,
13 dBm output power max.
CLIENT : GemTek Technology Co., Ltd.
TEST STANDARD : FCC 47CFR Part 15, Subpart C (Section 15.247)
& Subpart B, ANSI C63.4-1992

We, **ADVANCE DATA TECHNOLOGY CORPORATION**, hereby certify that one sample of the designated sample has been tested in our facility. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate representation of the measurements of the sample's EMI characteristics and the energy emitted under the conditions herein specified.

TESTED BY: Ellis Wu **DATE:** Sep. 29, 2000
Ellis Wu
PREPARED BY: Demi Chen **DATE:** Sep. 29, 2000
Demi Chen
APPROVED BY: Alan Lane **DATE:** Sep. 29, 2000
Dr. Alan Lane, Manager



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

47 CFR Part 15, Subpart C			
PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)	TEST RESULT
15.107	AC Power Conducted Emissions Spec.: 48 dBuV	Yes	Minimum passing margin is -8.36 dBuV At 22.56884 MHz
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Spec.: min. 500 kHz	Yes	9.47 MHz > 500 kHz
15.247(b)	Maximum Peak Output Power Spec.: max. 30 dBm	Yes	13.71 dBm < 30 dBm
15.247(c)	Transmitter Radiated Emissions Spec.: Table 15.209	Yes	Minimum passing margin is -2.6 dBuV At 528.07 MHz
15.247(d)	Power Spectral Density Spec.: max. 8dBm	Yes	-11.43 dBm < 8 dBm
15.247(c)	Band Edge Measurement	Yes	N/A
15.247(e)	Processing Gain of Direct Sequence Spread Spectrum System Spec.: min. 10 dB	Yes	11.4dB 10dB



3 DECLARATION OF COMPLIANCE WITH SUBPART B

The digital circuits and receiver portion of the EUT has been tested in ADT. The test result has been verified to comply with FCC Part 15, Subpart B, Class B – Computing Devices (FCC DoC). The engineering test report can be provided upon FCC requests.



4 GENERAL INFORMATION

4.1 General Description of EUT

Product	: 11Mbps Wireless LAN USB Terminal Device
Model No	: WL-280, WL-281, WL-282, WL-283
Power Supply	: 5 VDC from notebook
Modulation Type	: DBPSK(1Mbps)/DQPSK(2Mbps)/CCK(5.5/11Mbps)
Data Rate	: 11/5.5/2/1 Mbps
Operating Frequency	: 2.4 - 2.4835 GHz
Number of Channel	: 11
Channel Spacing	: 5 MHz
Transmit Power	: 13 dBm
Associated devices	: N/A

Note: 4 model names are provided. The only difference between them is the housing which is made by plastic material. This device is connected with PC through USB connector, and communicated with Access Point of wireless LAN system.

The other detailed information, please refer to user's manual.



4.2 Description of Test mode

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		

Channel 1, 6 and 11 were chosen for testing.

4.3 Test Methodology

These tests were conducted on a sample of EUT for the evaluation in compliance with FCC CFR47 Part 15, Subpart C (15.247)

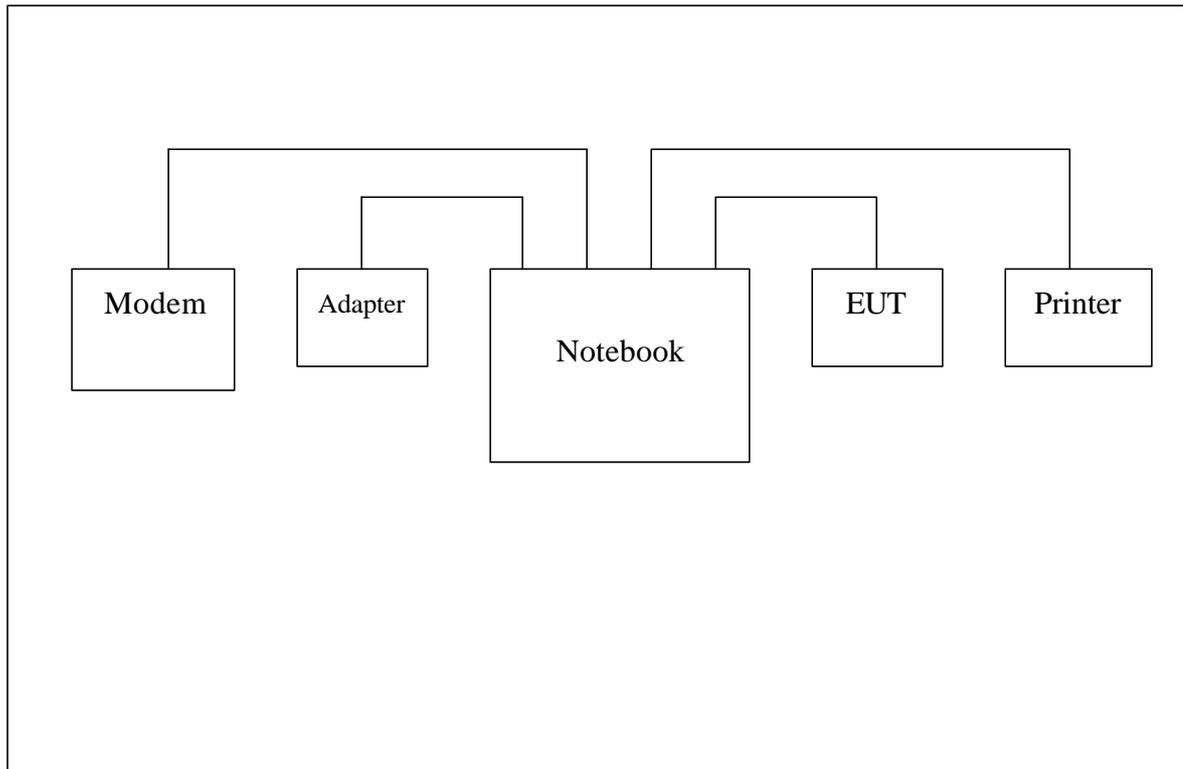
Both conducted and radiated emissions measurements were conducted in accordance with ANSI C63.4:1992.

It is not necessary to test four models because the plastic housing introduces no deviation on the radiation nature.

4.4 Support Units List

No	Product	Brand	Model No.	Serial No.	I/O Cable
1.	NOTEBOOK	DELL	PPX	99125	Nonshielded (1.8m)
2.	PRINTER	HP	2225C	2442S63076	Shielded (1.2m)
3.	MODEM	ACCEX	1414	980020531	Shielded (1.2m)

4.5 Configuration of System Under Test





5 GENERAL INFORMATION OF TEST LAB

5.1 Test Lab.

Advance Data Technology Corporation (NVLAP Certified)

R & TTE Certification Division

No. 13-1, Lane 19, Wen Shan 3rd St., Kweishan, Taoyuan, Taiwan, R.O.C.

Site Registration Number: 90422

5.2 Calibration Interval

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



6 TEST PROCEDURES AND TEST RESULTS

6.1 Conducted Emission Measurement

6.1.1 Test Instruments

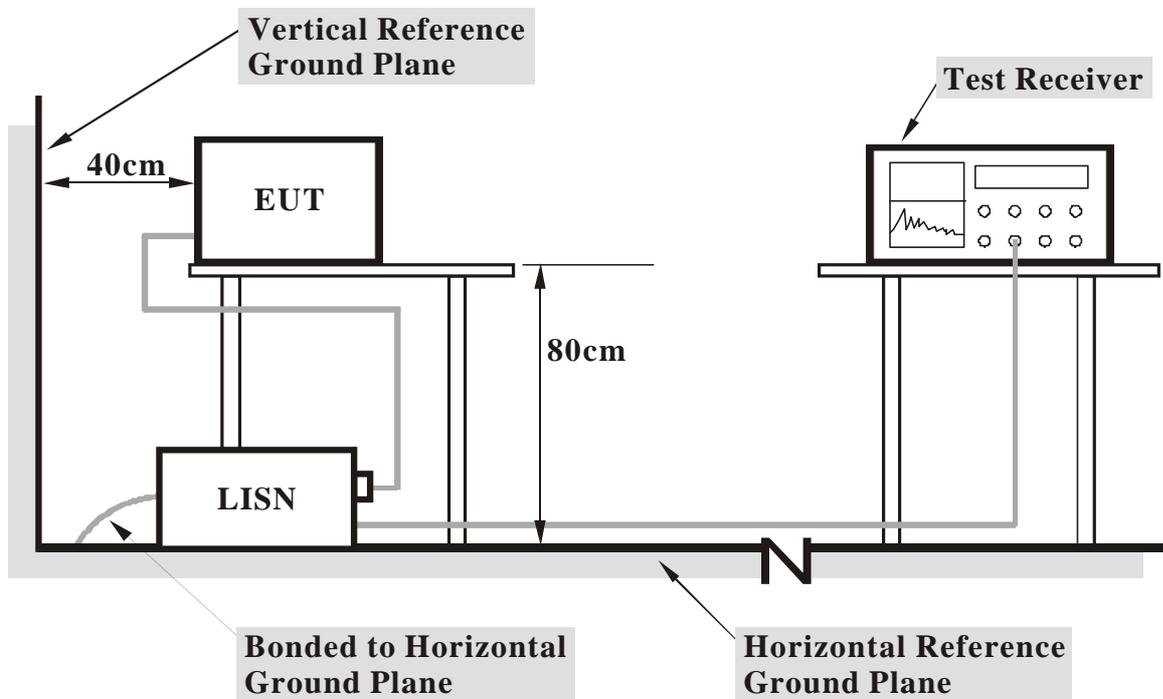
Description & Manufacturer	Model No.	Serial No.	Calibrated Until
ROHDE & SCHWARZ Test Receiver	ESH3	893495/006	July 26, 2001
ROHDE & SCHWARZ Spectrum Monitor	EZM	893787/013	July 14, 2001
ROHDE & SCHWARZ Artificial Mains Network	ESH3-Z5	892107/003	July 9, 2001
EMCO L.I.S.N.	3825/2	9504-2359	July 9, 2001
Shielded Room	Site 2	ADT-C02	NA

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

6.1.2 Test Procedures

1. Place the EUT at 0.4 meter away from the conduction wall of the shielded room.
2. Connect the EUT to the power mains through a Line Impedance Stabilization Network (LISN).
3. Connect the other support units to the other LISN too.
4. Make sure the 50 / 50 H coupling impedance is provided to the measurement instrument by the LISNs.
5. Measure the maximum conducted interference on both lines of the power mains connected to the EUT, within frequency range 450KHz ~ 30MHz.
6. The emission level under limit by 10dB is not needed to be reported.

6.1.3 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.

6.1.4 Photograph of Test Setup





6.1.5 EUT Operating condition

The software provided by customer enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

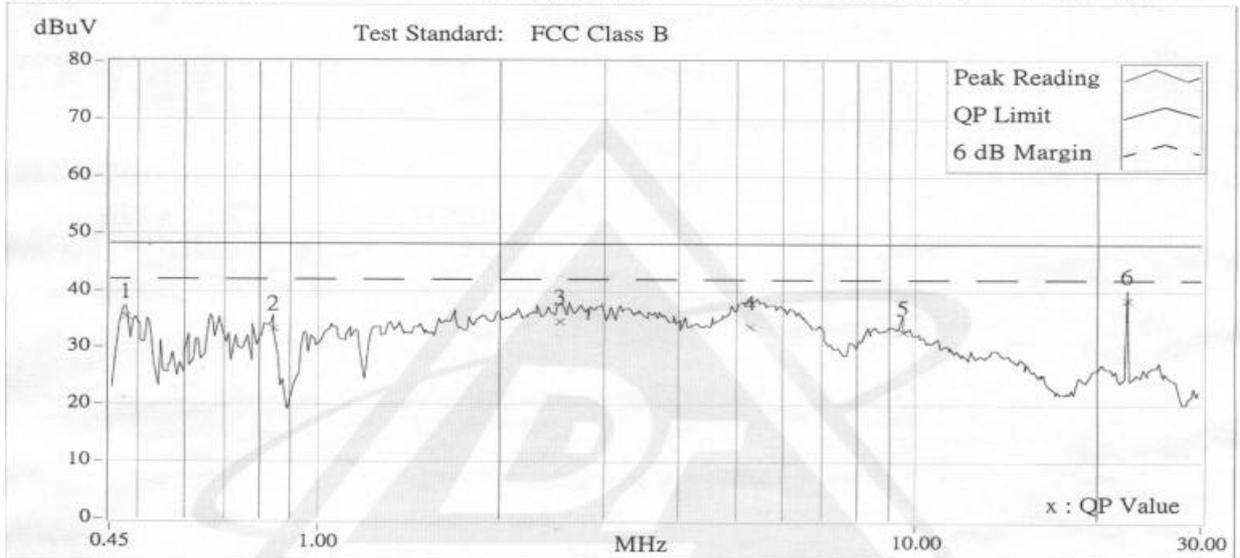
6.1.6 Climate Condition

The temperature and related humidity: 25 and 60%.



Brand / Model : WL-280
 Remark : CH 1
 Tested by : STEVEN

Location: Conduction 2 Date: 2000/9/11 Time: PM 06:59:46 Phase: L1



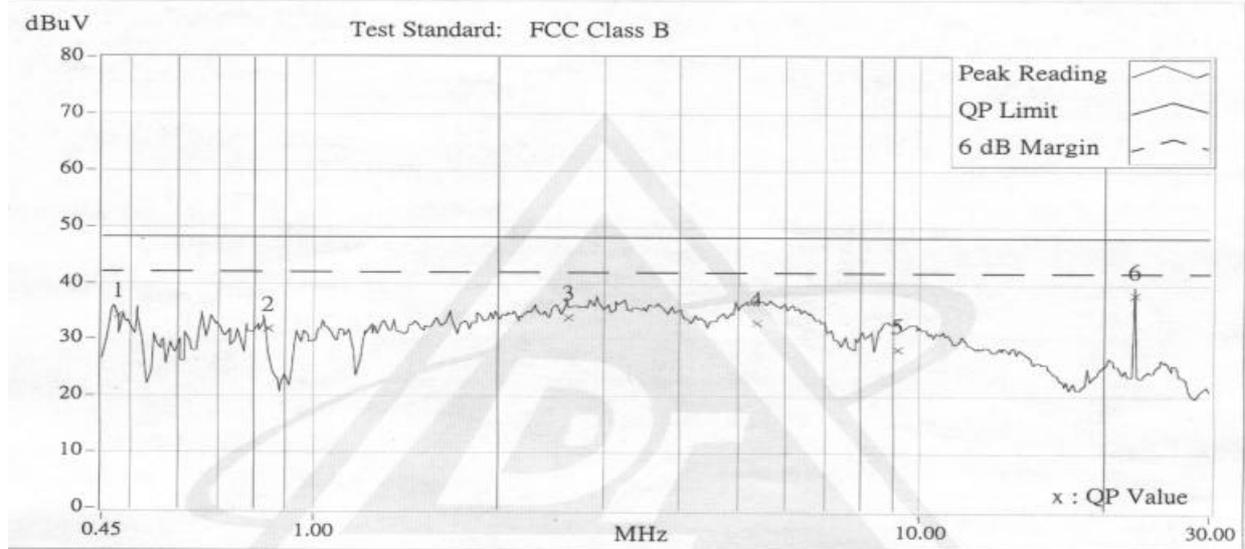
No.	Frequency MHz	Corr. Factor dB	Reading dBuV QP	Emission dBuV QP	Limit dBuV QP	Margins dB QP
1	0.47891	0.20	35.43	35.63	48.00	-12.37
2	0.84257	0.20	33.22	33.42	48.00	-14.58
3	2.54403	0.25	34.63	34.88	48.00	-13.12
4	5.26096	0.46	33.63	34.09	48.00	-13.91
5	9.50690	0.68	32.86	33.54	48.00	-14.46
+6	22.56848	1.25	38.33	39.58	48.00	-8.42

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



Brand / Model : WL-280
 Remark : CH 1
 Tested by : STEVEN

Location: Conduction 2 Date: 2000/9/11 Time: PM 06:38:11 Phase: N



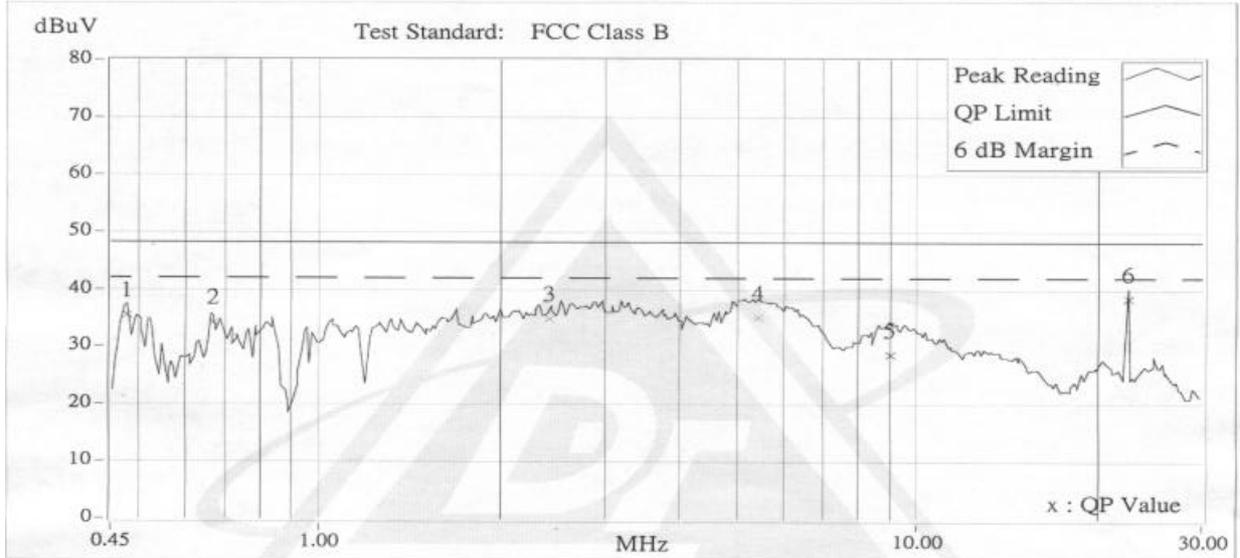
No.	Frequency MHz	Corr. Factor dB	Reading dBuV QP	Emission dBuV QP	Limit dBuV QP	Margins dB QP
1	0.47802	0.20	34.15	34.35	48.00	-13.65
2	0.84081	0.20	31.87	32.07	48.00	-15.93
3	2.62786	0.26	34.03	34.29	48.00	-13.71
4	5.36886	0.45	33.09	33.54	48.00	-14.46
5	9.22880	0.57	28.25	28.82	48.00	-19.18
+6	22.57001	1.15	38.21	39.36	48.00	-8.64

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



Brand / Model : WL-280
 Remark : CH 6
 Tested by : STEVEN

Location: Conduction 2 Date: 2000/9/11 Time: PM 07:09:44 Phase: L1



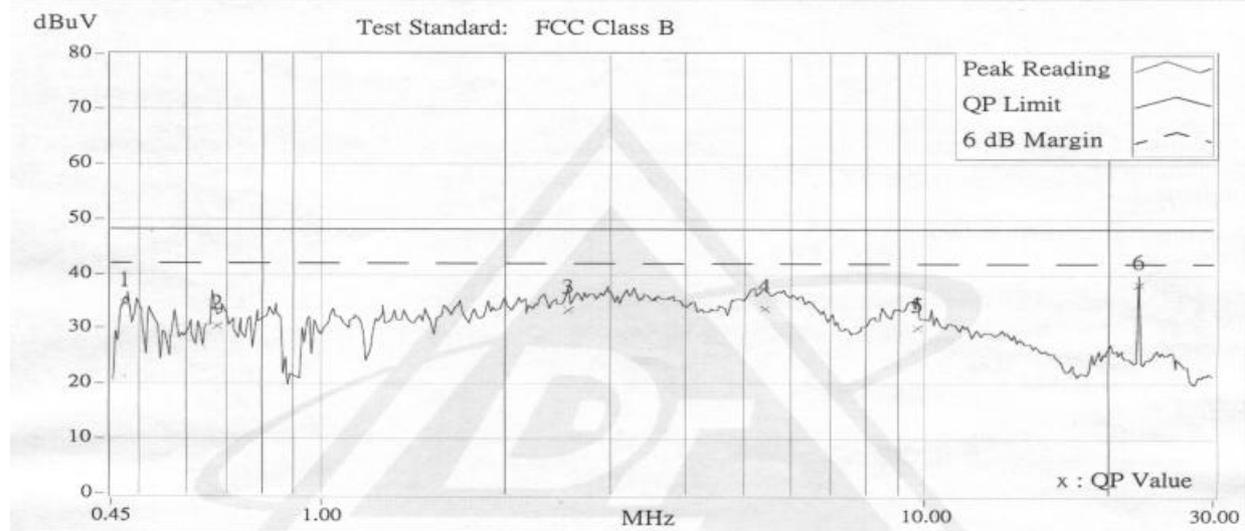
No.	Frequency MHz	Corr. Factor dB	Reading dBuV QP	Emission dBuV QP	Limit dBuV QP	Margins dB QP
1	0.47978	0.20	35.47	35.67	48.00	-12.33
2	0.66868	0.20	34.10	34.30	48.00	-13.70
3	2.43369	0.24	34.73	34.97	48.00	-13.03
4	5.43623	0.47	35.06	35.53	48.00	-12.47
5	9.05727	0.65	28.75	29.40	48.00	-18.60
+6	22.56884	1.25	38.37	39.62	48.00	-8.38

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



Brand / Model : WL-280
 Remark : CH 6
 Tested by : STEVEN

Location: Conduction 2 Date: 2000/9/11 Time: PM 07:15:23 Phase: N



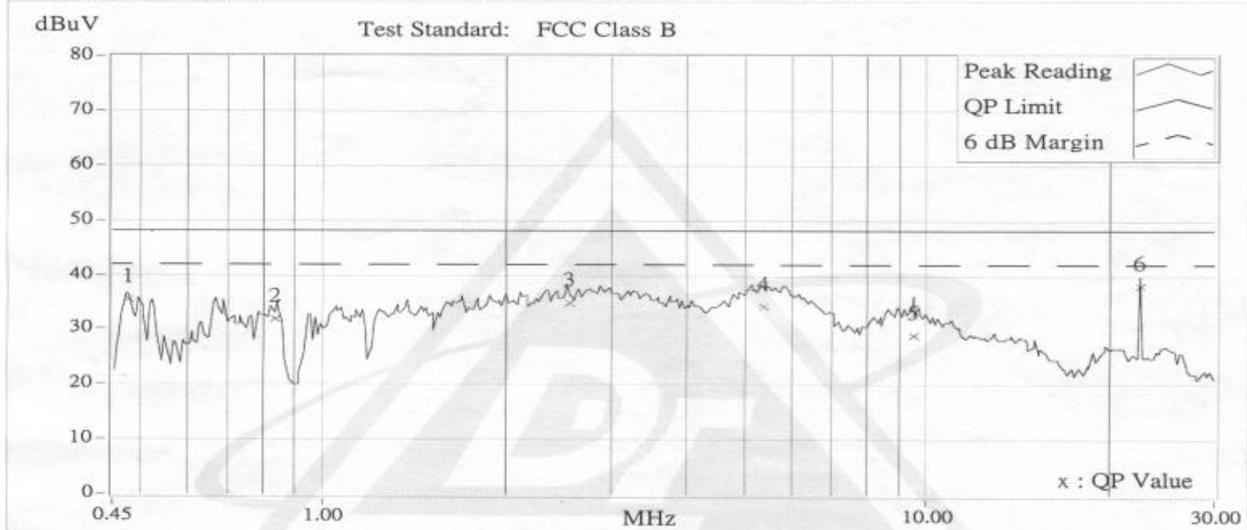
No.	Frequency MHz	Corr. Factor dB	Reading dBuV QP	Emission dBuV QP	Limit dBuV QP	Margins dB QP
1	0.47604	0.20	34.57	34.77	48.00	-13.23
2	0.67282	0.20	30.26	30.46	48.00	-17.54
3	2.56528	0.26	33.34	33.60	48.00	-14.40
4	5.44591	0.45	33.60	34.05	48.00	-13.95
5	9.69405	0.59	30.02	30.61	48.00	-17.39
+6	22.57019	1.15	38.11	39.26	48.00	-8.74

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



Brand / Model : WL-280
 Remark : CH 11
 Tested by : STEVEN

Location: Conduction 2 Date: 2000/9/11 Time: PM 07:25:30 Phase: L1



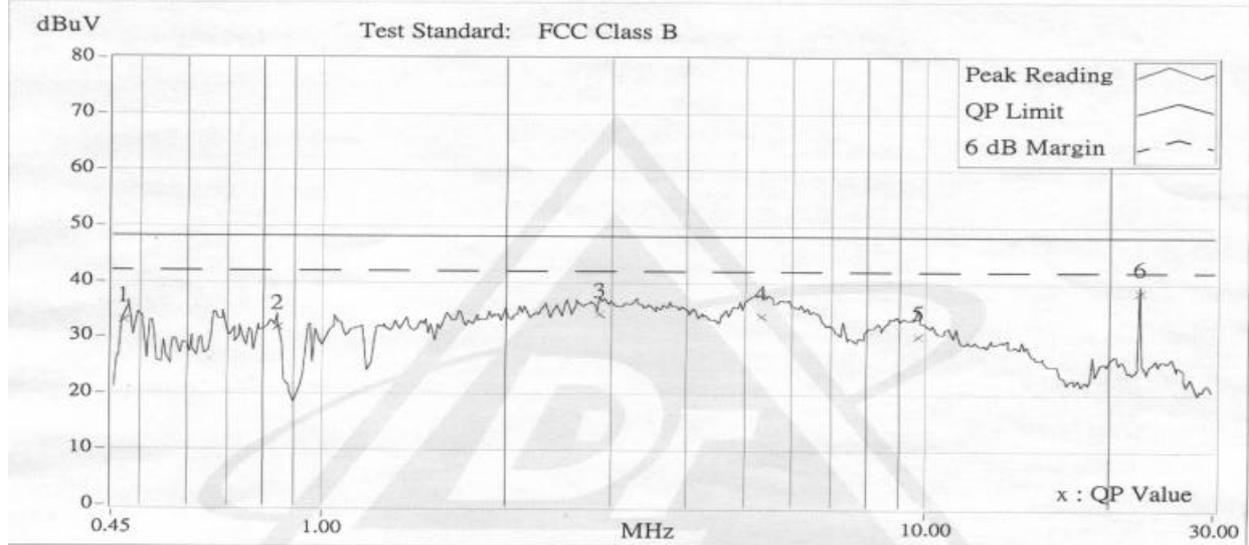
No.	Frequency MHz	Corr. Factor dB	Reading dBuV QP	Emission dBuV QP	Limit dBuV QP	Margins dB QP
1	0.47868	0.20	35.55	35.75	48.00	-12.25
2	0.83500	0.20	31.96	32.16	48.00	-15.84
3	2.55208	0.26	34.73	34.99	48.00	-13.01
4	5.37414	0.47	34.26	34.73	48.00	-13.27
5	9.52533	0.68	28.99	29.67	48.00	-18.33
+6	22.57045	1.25	38.13	39.38	48.00	-8.62

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



Brand / Model : WL-280
 Remark : CH 11
 Tested by : STEVEN

Location: Conduction 2 Date: 2000/9/11 Time: PM 07:20:23 Phase: N



No.	Frequency MHz	Corr. Factor dB	Reading dBuV QP	Emission dBuV QP	Limit dBuV QP	Margins dB QP
1	0.47251	0.20	32.94	33.14	48.00	-14.86
2	0.84276	0.20	31.98	32.18	48.00	-15.82
3	2.88261	0.29	34.28	34.57	48.00	-13.43
4	5.34180	0.44	33.96	34.40	48.00	-13.60
5	9.69160	0.59	30.49	31.08	48.00	-16.92
+6	22.56968	1.15	38.23	39.38	48.00	-8.62

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

6.2 6dB Bandwidth Measurement

6.2.1 Test Instruments

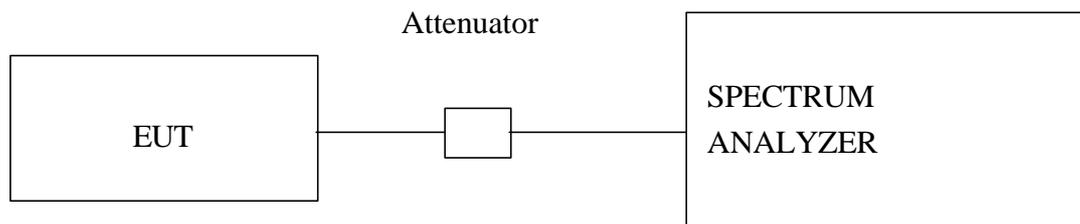
Description & Manufacturer	Model No.	Serial No.	Calibrated Until
ROHDE & SCHWARZ TEST RECEIVER	ESMI	846839/018 848926/005	Dec. 03, 2000
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7475A	2641V27755	N/A

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

6.2.2 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 100 kHz RBW and 100 kHz VBW. The 6 dB bandwidth was measured and recorded.

6.2.3 Test Setup



6.2.4 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



6.2.5 Climate Condition

The temperature and related humidity: 18 and 78%

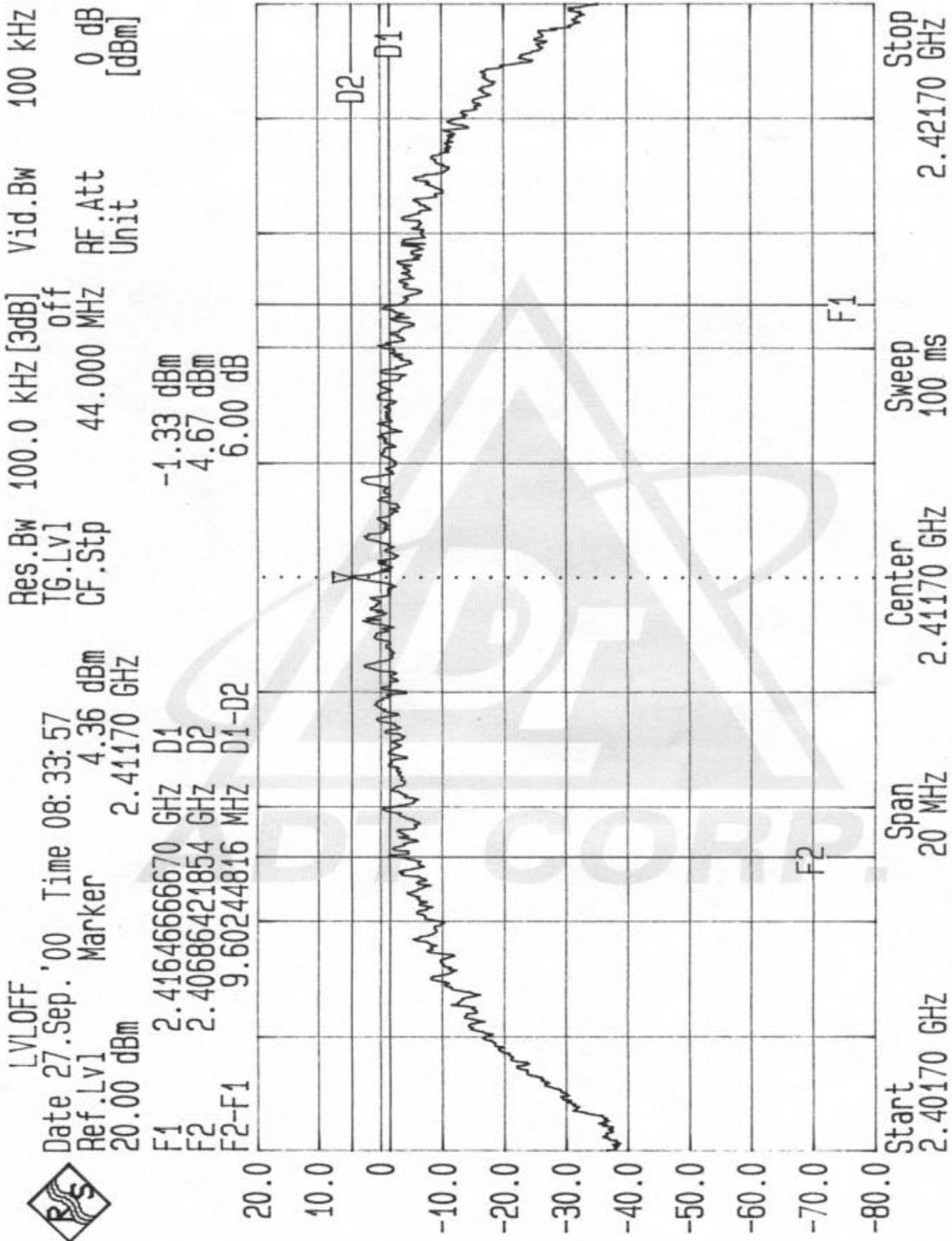
6.2.6 Test Results

CHANNEL	CHANNEL FREQUENCY (MHz)	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
1	2412	9.60	0.5	PASS
6	2437	10.33	0.5	PASS
11	2462	9.47	0.5	PASS

The spectrum plots of test result are attached as below.

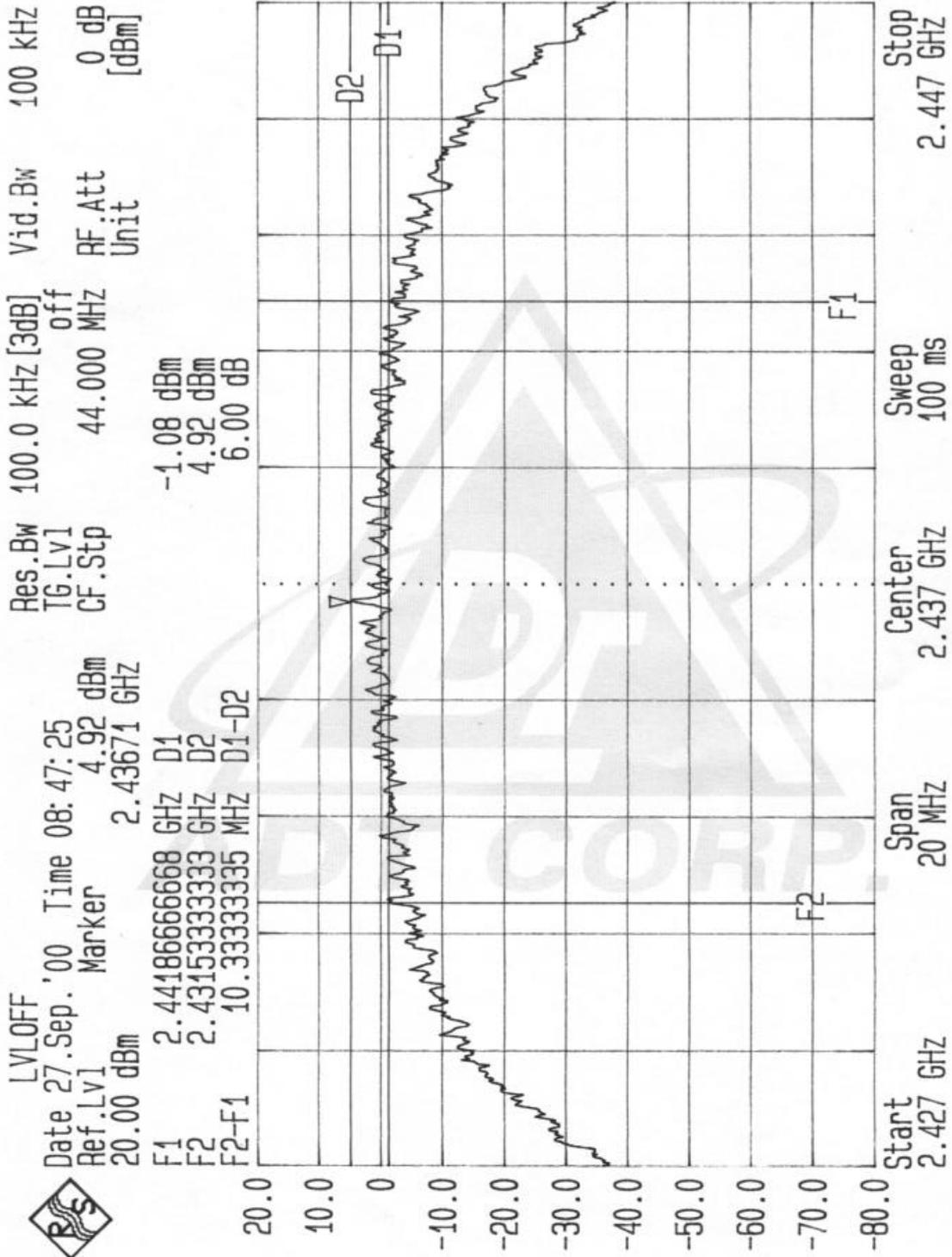


CH1





CH6





CH11

