

MEASUREMENT REPORT

of

WIRELESS LAN PCMCIA CARD

Applicant : LANTECH Computer Company

Model No. : 8800-510 / 8800-511 / 8800-512

EUT : WLAN PCMCIA Card

FCC ID : L8G8800001

Report No. : L2715129

Tested by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440

2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C.

CERTIFICATION

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (1992) as a reference. All test were conducted by **Training Research Co., Ltd.**, 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with the technical requirements set forth in the FCC Rules Part 15 Subpart C Section 15.247.

Applicant : LANTECH Computer Company

Model No. : 8800-510 / 8800-511 / 8800-512

EUT : WLAN PCMCIA Card

FCC ID : L8G8800001

Report No. : L2715129

Test Date : March 25th 2002

Prepared by:

Eric Wong
Eric Wong

Approved by:

Frank Tsai
Frank Tsai

Tested by :

Training Research Co., Ltd.

TEL: 886-2-26935155

FAX: 886-2-26934440

2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C.

Tables of Contents

I. GENERAL	4
1.1 Introduction	5
1.2 Description of EUT	5
1.3 Description of Support Equipment	6
1.4 Configuration of System Under Test	8
1.5 Verify the Frequency and Channel	9
1.6 Test Procedure	10
1.7 Location of the Test Site	10
1.8 General Test Condition	10
II. Section 15.101(a) : Equipment Authorization of Unintentional Radiators	11
III. Section 15.203 : Antenna Requirement.....	12
IV. Section 15.207 : Power Line Conducted Emissions for AC Powered Units	13
4.1 Test Condition & Setup	13
4.2 List of Test Instruments	13
4.3 Test Configuration	14
4.4 Test Result of Conducted Emissions	15
V. Section 15.247(a) : Technical Description of the EUT	18
VI. Section 15.247(a)(2) : Bandwidth for Direct Sequence System	19
6.1 Test Condition & Setup	19
6.2 Test Instruments Configuration	19
6.3 List of Test Instruments	19
6.4 Test Result of Bandwidth	20
VII. Section 15.247(b) : Power Output	24
7.1 Test Condition & Setup	24
7.2 List of Test Instruments	25
7.3 Test Result	26
VIII. Section 15.247(c) : Spurious Emissions (Radiated)	32
8.1 Test Condition & Setup	32
8.2 List of Test Instruments	33
8.3 Test Instruments Configuration	34
8.4 Test Result of Spurious Radiated Emissions	35
8.5 Test Result of Bandedge.....	42
IX. Section 15.247(d) : Power Spectral Density	45
9.1 Test Condition & Setup	45
9.2 Test Instruments Configuration	45
9.3 List of Test Instruments	45

Test Report ----- **4/50**

9.4 Test Result of Power Spectral Density	46
Appendix A: Set Up Procedure	50

. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a Wireless Access PCMCIA Card certification in accordance with Part 2 Subpart J and Part 15 Subpart A and C of the Commission's Rules and Regulations.

1.2 Description of EUT

EUT : WLAN PCMCIA Card
Model No. : 8800-510 / 8800-511 / 8800-512
Granted FCC ID : L8G8800001
Frequency Range : 2.412 GHz ~ 2.462GHz
Support Channel : 11 Channel
Modulation Skill : DBPSK, DQPSK, CCK
Antenna Type : DUAL-WINGTM antenna
Interface : PCMCIA Type II
Power Type : By PCMCIA slot of the client's device
Applicant : LANTECH Computer Company
3/F, No.347,349 Yang-Kuang St., Nei-Hu Dist.,
114 Taipei, Taiwan, R.O.C.

1.3 Description of Support Equipment

In order to construct the minimum testing, following equipment were used as the support units.

Notebook : **IBM COMPUTER INC.**

Type No. : 08N1180

Serial No. : 11SO8K6451ZFX0820AJOLB

FCC ID : DoC Approved

AC Adaptor : **ASTEC INC. (China)**

Model No. : 02K6654

Serial No. : 11SO2K6654Z1Z0Z40325LE

FCC ID : DoC Approved

Power Core : Non-shielded, Plastic hoods, with ferrite bead

Power type : 100 ~ 240VAC, 50 ~ 60Hz, 1.2A-0.5A / 16VDC, 4.5A

Monitor : **HP 15' Color Monitor**

Model No. : D2827A

Serial No. : KR91161717

FCC ID : C5F7NFCMC1518X

檢磁 : 3872B039

Power type : 100 ~ 240 VAC / 50 ~ 60 Hz, Switching

Power cord : Shielded, 1.83m long, No ferrite core

Data cable : Shielded, 1.46m long, with two ferrite cores

Walkman : **Aiwa**

Model No. : PR-4550

Power type : 2 X AA batteries

Headset w/Mic : **MIC**

Model No. : MIC-03

Power type : Power by computer

Data Cable : Non-shielded, 1.6m length, No ferrite core

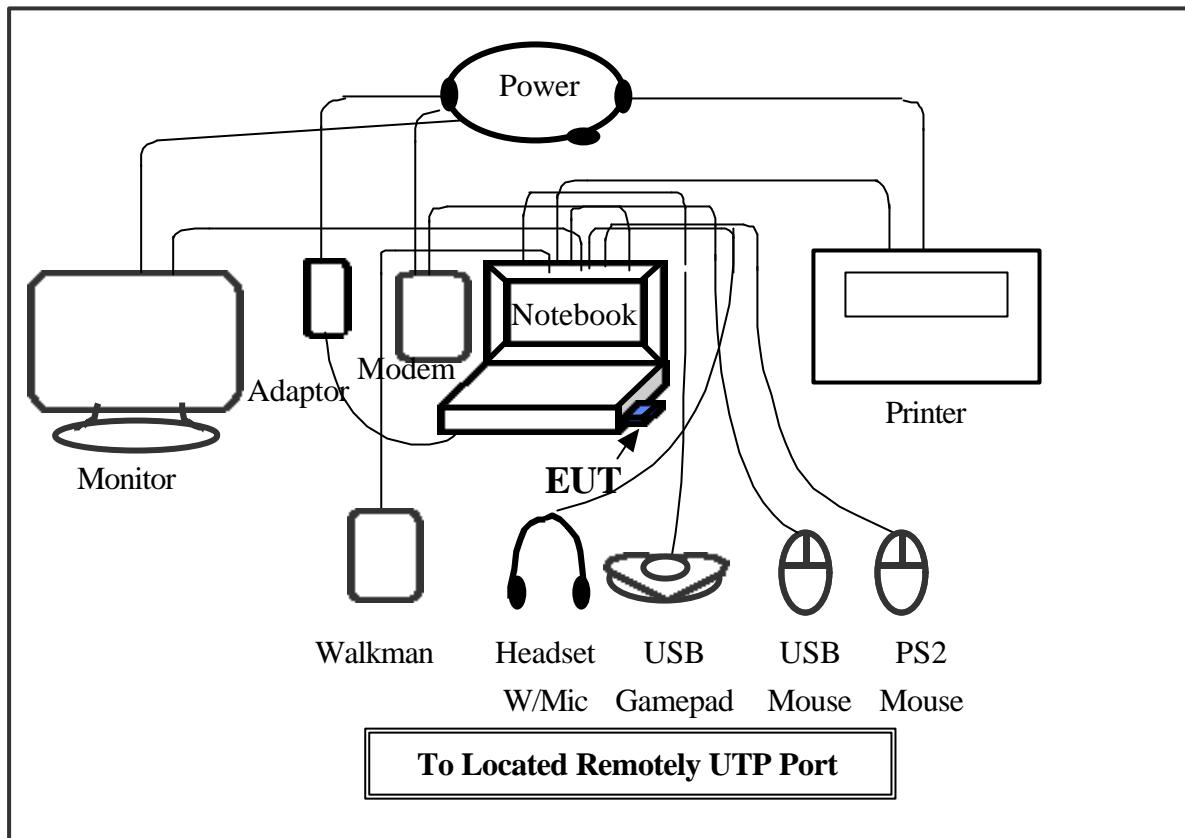
USB Gamepad : **Padix**
Model No. : QF-606U
Serial No. : None
FCC ID : DoC Approval
Power type : Powered by PC
Power Cable : Shielded, 1.5m long, No ferrite bead data cable

USB Mouse : **Logitech**
Model No. : M-BA47
Serial No. : LZE92250027
FCC ID : DoC Approved
檢磁 : 4872A220
Power type : Powered by Computer
Power Cable : Shielded, 1.5m long, Plastic hoods, No ferrite bead

PS2 Mouse : **Genius**
Model No. : HT-121A
Serial No. : None
FCC ID : DoC Approval
Power type : Powered by PC
Power Cable : Shielded, 1.5m long, No ferrite bead data cable

Modem : **Acer Communication & Multimedia Inc**
Model No. : AcerModem 56K Surf
Serial No. : None
FCC ID : DoC Approval
Power type : Powered by AC Adapter (120VAC 60Hz / 9VAC 800mA)

1.4 Configuration of System Under Test



The tests below are carried out the EUT transmitter set at high power in TDD mode. The EUT was inserted into the PCMCIA slot of notebook computer. The EUT is forced in selection of output power level and channel number.

The setting up procedure was recorded in <Appendix A>.

Notebook:

- *DC IN Jack --- an external power adaptor
- *VGA Port --- a monitor
- *Line Jack --- connected a Modem
- *USB A Port --- a gamepad
- *USB B Port --- a mouse (USB)
- *PS2 Port --- a mouse
- *Parallel Port --- HP Deskjet Color 640C printer
- *MIC. Jack --- a Walkman
- *SPK. Jack --- a Headset w/ microphone

(Each port on notebook is connected with suitable device)

1.5 Verify the Frequency and Channel

Channel	Frequency (GHz)
1	2.412
2	2.417
3	2.422
4	2.427
5	2.432
6	2.437
7	2.442
8	2.447
9	2.452
10	2.457
11	2.462

Note:

1. This is for confirming that all frequencies are in 2.412GHz to 2.462GHz.
2. Section 15.31(m): Measurements on intentional radiators or receivers shall be performed at three frequencies for operating frequency range over 10 MHz.
(The locations of these frequencies one near the top, one near the middle and one near the bottom.)
3. After test, the EUT operating frequencies are in 2.412GHz to 2.462GHz. So all the items as followed in testing report are need to test these three frequencies:
Top: Channel – 1; Middle: Channel – 6; Bottom: Channel – 11.

1.6 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in ANSI C63.4 (1992) and the pre-setup was written on Appendix A, the detail setup was written on each test item.

1.7 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter, Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd. 1F, No. 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C.* Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at *Training Research Co., Ltd.*

No. 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.8 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions, which the EUT was considered likely to encounter in normal use were investigated.

In test, they were set in high power and continuously transmitting mode that controlled by notebook computer. The Ch01, Ch06 and Ch11 of EUT were all tested. The setting up procedure is recorded on Appendix A.

II. Section 15.101(a): Equipment authorization of unintentional radiators

The EUT equipped with a PCMCIA interface and should be operated with the notebook computer, was categorized to *Class B personal computers and peripherals* as cannot be operated stand-alone. The authorization requires Certification and the items required such as Sect.15.107 (Conducted limits) and Sect.15.109 (Radiated emission limits) is same as Sect.15.207 and 15.247(C) we'd performed respectively. We dropped this part, as the result will be repeated as the part we mentioned above.

III. Section 15.203: Antenna requirement

The EUT has the external fixed DUAL-WINGTM antennas. The external antenna is designed exclusively for the EUT to ensure that no antenna other than that furnished by the responsible party shall be used with the device, and also none of the modification shall be made inside except use of tools to disassemble the case of the EUT. In addition, there is no external antenna or connector employed. The antenna requirement stated in Sect.15.203 is inapplicable to this EUT, and shall be considered sufficient to comply with the provisions in such section.

IV. Section 15.207: Power Line Conducted Emissions for AC Powered Units

4.1 Test Condition & Setup

The power line conducted emission measurements were performed in an anechoic chamber. The EUT was assembled on a wooden table, which is 80 centimeters high, was placed 40 centimeters from the backwall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and Line Impedance Stabilization Networks (LISNs). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer (or EMI receiver) was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPER quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 450 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 2.4.

There is a test condition apply in this test item, the test procedure description as the following:

1. EUT transmit only:

Using the PCMCIA slot of notebook computer and software to control the EUT. Then making access to the mode of continuous transmission and setting the testing channel. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

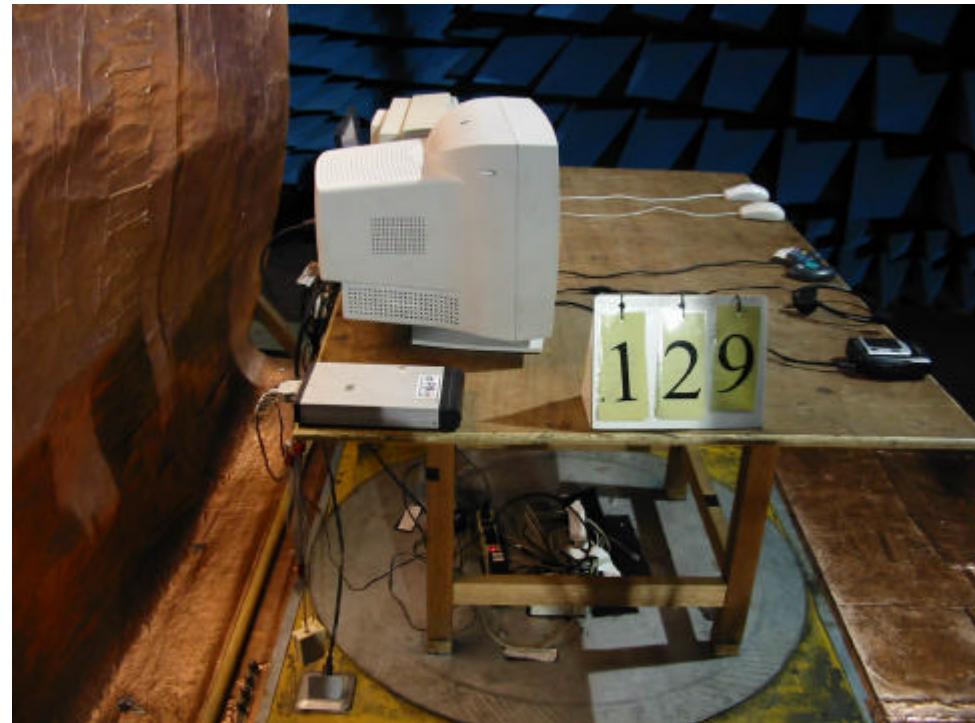
The setting up procedure is recorded on <Appendix A>.

4.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
LISN (EUT)	LISN-01	TRC	9912-03,04	12/09/01	12/09/02
LISN (Support E.)	LISN-01	TRC	9912-05	01/04/02	01/04/03
Switch/Control Unit (< 30MHz)	3488A	HP	N/A	11/20/01	11/20/02
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/01	11/20/02

4.3 Test configuration

Conducted Emissions Test Placement



4.4 Test Result of Conducted Emissions

EUT station transmit only

The following table shows a summary of the highest emissions of power line conducted emissions on the LIVE and NETURAL conductors of the EUT power cord.

Table 1 Power Line Conducted Emissions (Channel 1, Transmitter Mode)

Power Connected Emissions				FCC	Class B
Conductor	Frequency (KHz)	Peak Amplitude (dB μ V)	QP Amplitude (dB μ V)	Limit (dB μ V)	Margin (dB)
Line 1	538.00	40.22	---	48.00	-7.78
	556.00	40.23	---	48.00	-7.77
	582.00	40.69	---	48.00	-7.31
	593.00	42.00	---	48.00	-6.00
	615.00	43.78	---	48.00	-4.22
	633.00	42.04	---	48.00	-5.96
	719.00	40.43	---	48.00	-7.57
	754.00	40.36	---	48.00	-7.64
	778.00	40.64	---	48.00	-7.36
	916.00	40.91	---	48.00	-7.09
Line 2	527.00	41.35	---	48.00	-6.65
	582.00	43.78	---	48.00	-4.22
	608.00	45.19	---	48.00	-2.81
	628.00	42.14	---	48.00	-5.86
	714.00	39.98	---	48.00	-8.02
	773.00	40.05	---	48.00	-7.95
	874.00	40.18	---	48.00	-7.82
	1535.00	40.32	---	48.00	-7.68
	1583.00	40.53	---	48.00	-7.47
	2580.00	40.15	---	48.00	-7.85

NOTE:

1. Margin = Peak Amplitude - Limit
2. A "+" sign in the margin column means the emission is OVER the Class B Limit
and "-" sign of means UNDER the Class B limit

Table 2 Power Line Conducted Emissions (Channel 6, Transmitter Mode)

Power Connected Emissions				FCC Class B	
Conductor	Frequency (KHz)	Peak Amplitude (dB μ V)	QP Amplitude (dB μ V)	Limit (dB μ V)	Margin (dB)
-Line 1	542.00	40.61	---	48.00	-7.39
	560.00	39.21	---	48.00	-8.79
	575.00	41.75	---	48.00	-6.25
	590.00	43.52	---	48.00	-4.48
	612.00	43.59	---	48.00	-4.41
	624.00	43.36	---	48.00	-4.64
	709.00	40.30	---	48.00	-7.70
	808.00	40.15	---	48.00	-7.85
	880.00	39.62	---	48.00	-8.38
	910.00	40.16	---	48.00	-7.84
Line 2	483.00	40.16	---	48.00	-7.84
	518.00	39.99	---	48.00	-8.01
	560.00	42.12	---	48.00	-5.88
	582.00	43.92	---	48.00	-4.08
	601.00	43.30	---	48.00	-4.70
	615.00	43.80	---	48.00	-4.20
	633.00	45.26	---	48.00	-2.74
	754.00	41.37	---	48.00	-6.63
	788.00	40.62	---	48.00	-7.38
	828.00	39.91	---	48.00	-8.09

*The reading amplitudes are all under limit.

Table 3 Power Line Conducted Emissions (Channel 11, Transmitter Mode)

Power Connected Emissions				FCC	Class B
Conductor	Frequency (KHz)	Peak Amplitude (dB μ V)	QP Amplitude (dB μ V)	Limit (dB μ V)	Margin (dB)
Line 1	545.00	40.12	---	48.00	-7.88
	601.00	44.41	---	48.00	-3.59
	620.00	43.80	---	48.00	-4.20
	692.00	40.77	---	48.00	-7.23
	754.00	40.52	---	48.00	-7.48
	803.00	40.92	---	48.00	-7.08
	874.00	40.89	---	48.00	-7.11
	904.00	40.44	---	48.00	-7.56
	1003.00	39.76	---	48.00	-8.24
	1207.00	40.15	---	48.00	-7.85
Line 2	553.00	42.02	---	48.00	-5.98
	579.00	44.25	---	48.00	-3.75
	593.00	44.32	---	48.00	-3.68
	620.00	42.65	---	48.00	-5.35
	680.00	40.62	---	48.00	-7.38
	754.00	41.02	---	48.00	-6.98
	783.00	40.81	---	48.00	-7.19
	818.00	40.69	---	48.00	-7.31
	1249.00	40.75	---	48.00	-7.25
	1516.00	40.41	---	48.00	-7.59

*The reading amplitudes are all under limit.

V. Section 15.247 (a): Technical description of the EUT

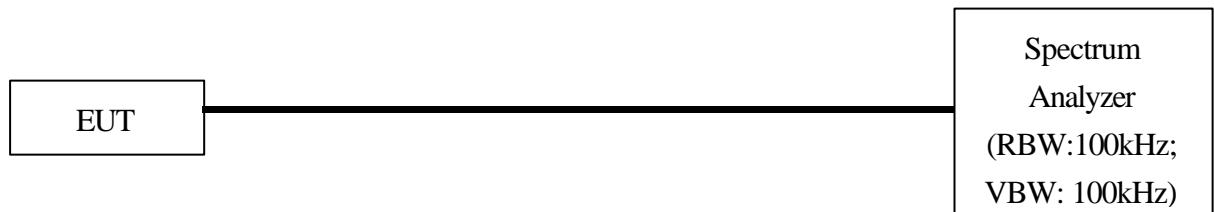
Based on the Section 2.1, *Direct Sequence System* is a spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high-speed code sequence dominates the “modulating function” and is the direct cause of the wide spreading of the transmitted signal. In the Exhibit H, operational description demonstrates the operation principles of the Baseband processor employed by the EUT, shows that which is a complete DSSS baseband processor and meets the definition of the *Direct sequence spread spectrum system*.

VI. Section 15.247(a)(2): Bandwidth for Direct Sequence System.

6.1 Test Condition & Setup

The transmitter bandwidth measurements were performed by the contact manner. The EUT was set to transmit continuously, also various channels were investigated to find the maximum occupied bandwidth.. The output of the EUT was connected to the spectrum analyzer. The bandwidth of the fundamental frequency is observed by the spectrum analyzer with 100kHz RBW and 100kHz VBW.

6.2 Test Instruments Configuration



Test Configuration of Bandwidth for Direct Sequence System

P.S.: Notebook computer to control the EUT at maximal power output and channel Number and set antenna kit

5.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8592A	H P	3003AD1401	01/02/02	01/02/03

6.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth : 11.10 MHz

The min. 6 dB BW at least : 500 KHz

Bandwidth of Channel 6

Bandwidth : 11.10 MHz

The min. 6 dB BW at least : 500 KHz

Bandwidth of Channel 11

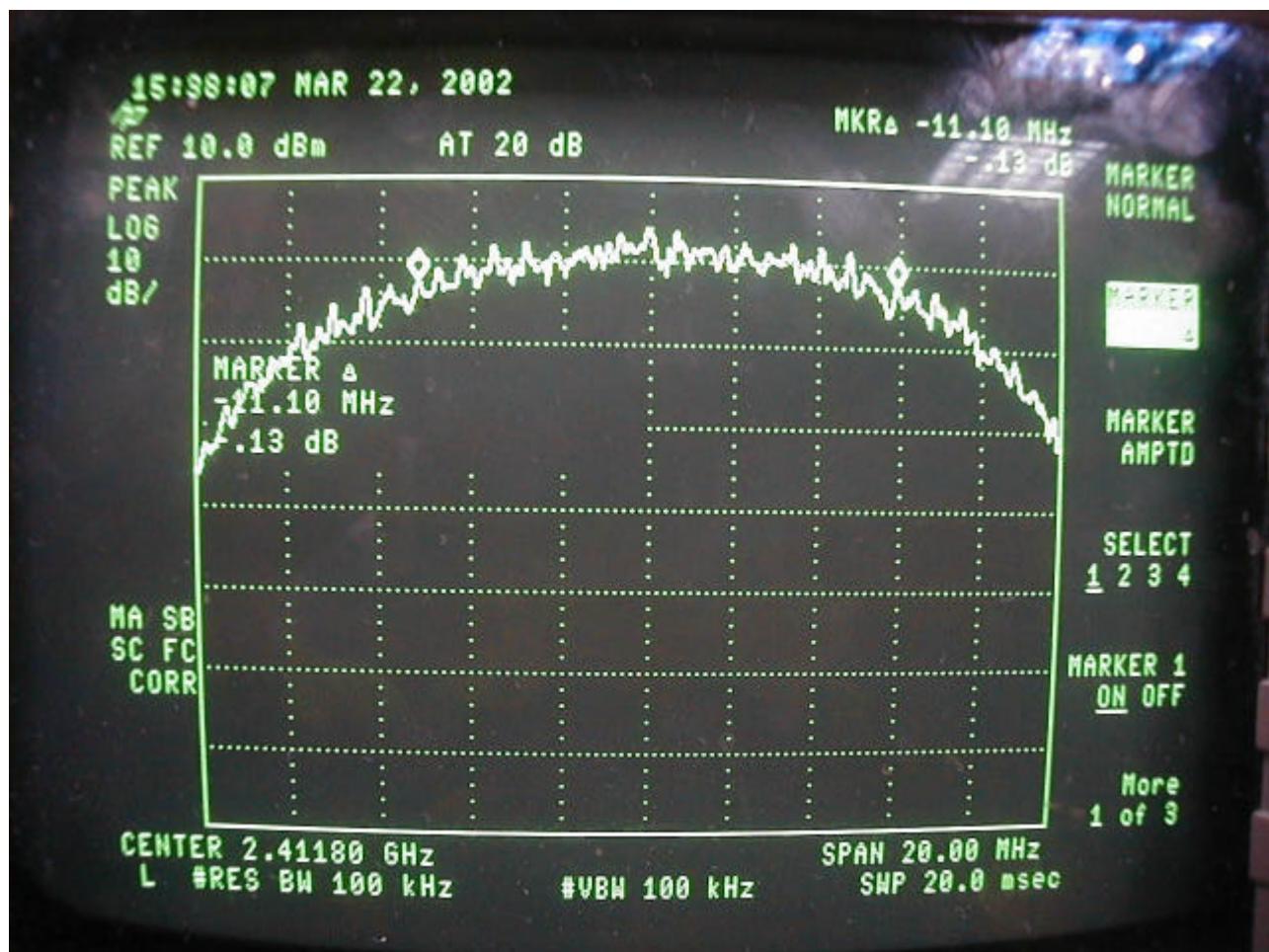
Bandwidth : 11.50 MHz

The min. 6 dB BW at least : 500 KHz

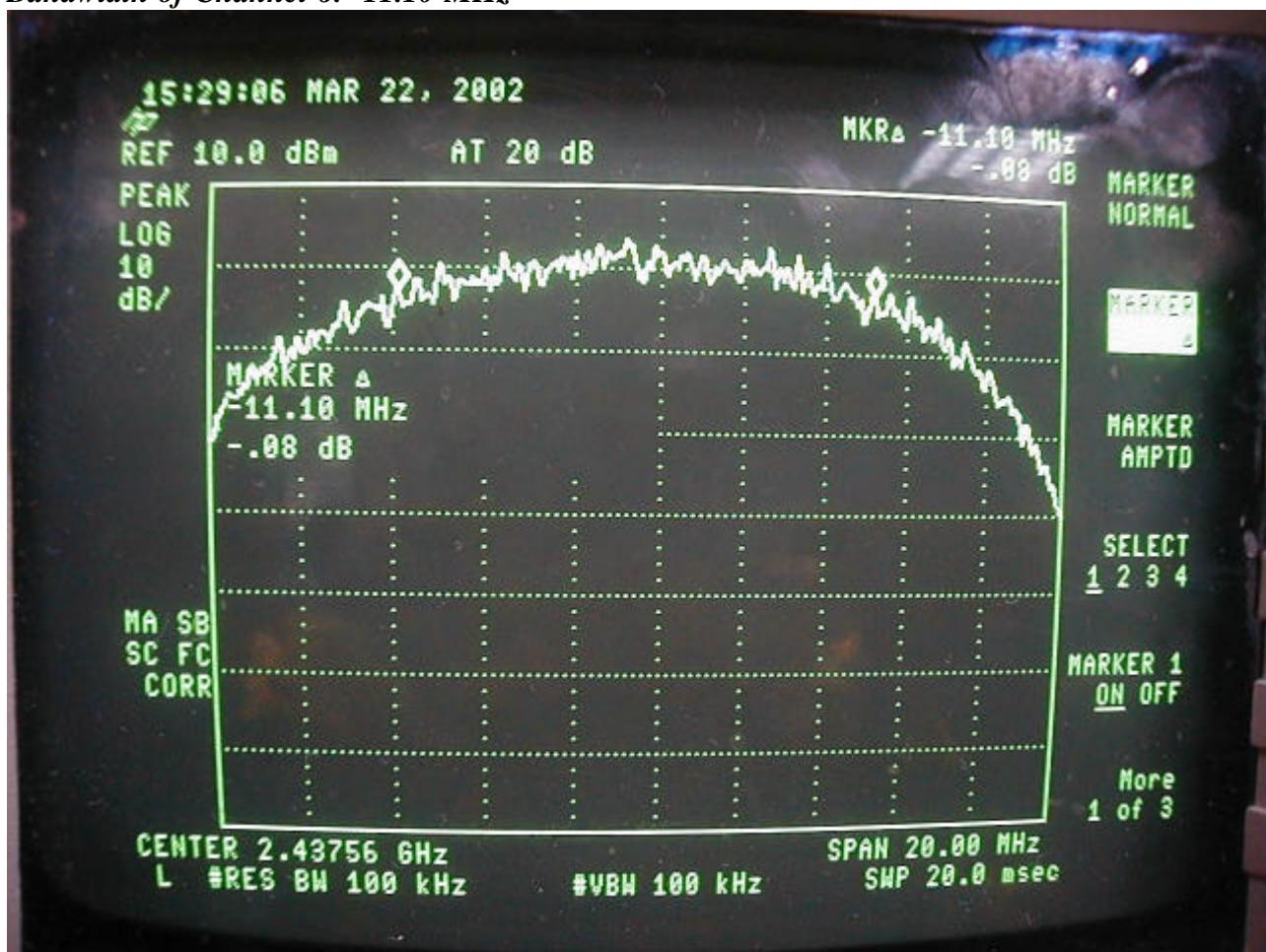
Note:

1. The data in the above table are summarizing the following attachment spectrum analyzer hard copy. According to the guidance, we'd made the measurement with the spectrum analyzer's resolution bandwidth ($RBW=100kHz$) and set the $span>>RBW$. The results show the measured 6dB bandwidth comply with the minimum 500kHz requirement.
2. The attachments show these on the following pages.

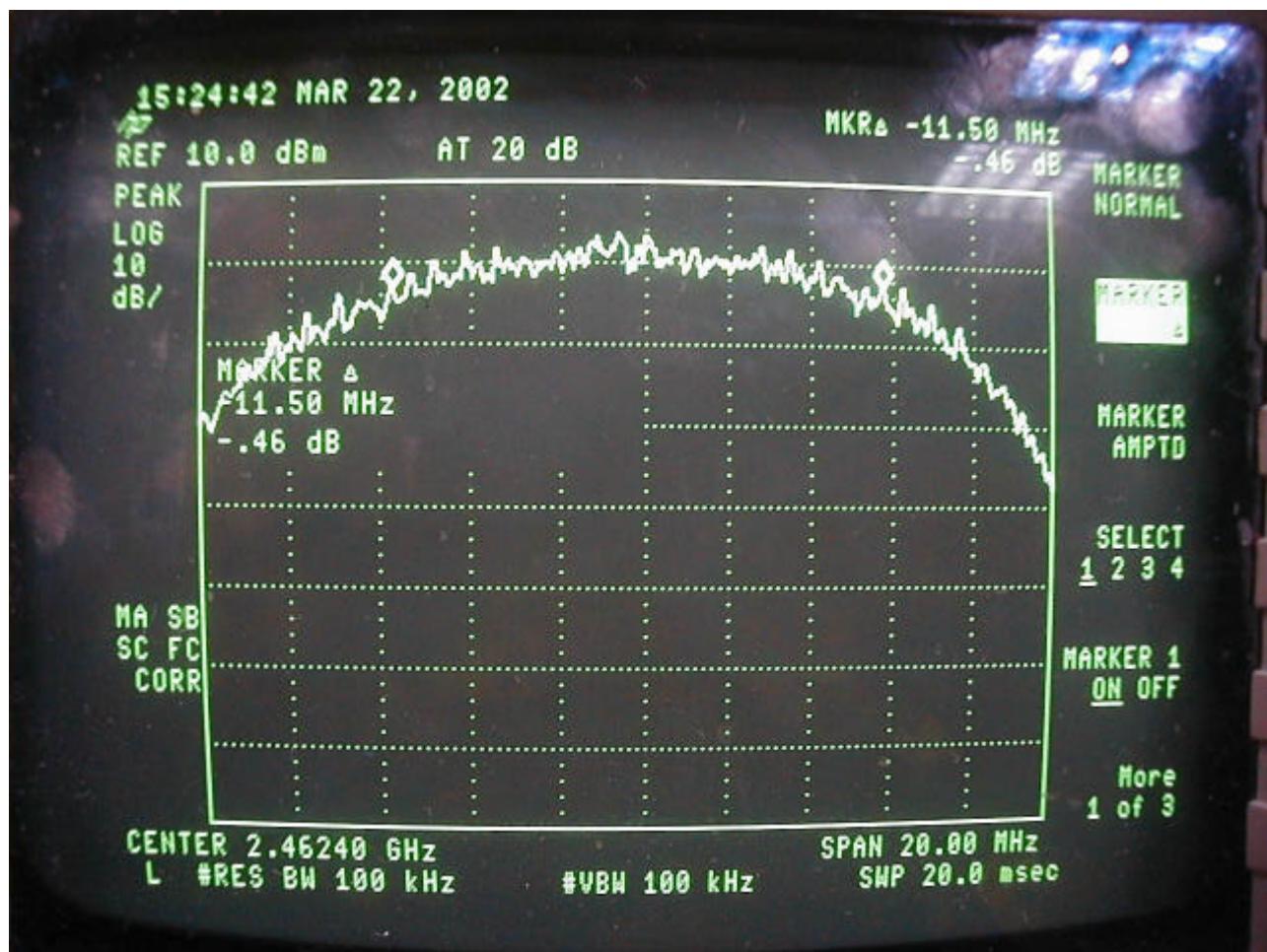
Bandwidth of Channel 1: 11.10 MHz



Bandwidth of Channel 6: 11.10 MHz



Bandwidth of Channel 11: 11.50 MHz



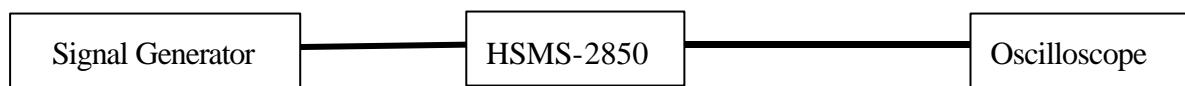
VII. Section 15.247(b): Power Output

7.1 Test Condition & Setup

A:



B:



1. The output of the transmitter terminated by Schottkey Detector Diode (Hewlett- Packard HSMS-2850)
2. The output of the Shottkey Diode Detector connected to the vertical channel of an oscilloscope. The observed trace of the oscilloscope shall be recorded as "A".
3. The combination of the diode detector and the oscilloscope capable of faithfully reproducing the envelope of peaks and duty cycle of the transmitter output signal.
4. The transmitter replaced by a signal generator. The output frequency of the signal made equal to the center of the frequency range occupied by the transmitter and unmodulated.
5. The output of the signal generator raised to reach the peak of trace "A" named X.
6. The signal generator output level XmW is the transmitter output peak power. Recording the following.

7.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.
Oscilloscope	54600A	H P	3227A07030
Signal Generator	83711A	H P	3429A00434
Shottkey Diode	HSMS-2850	Mini-Circuits	N/A
6dB Attenuator	BW-S6W2	Mini-Circuits	N/A

7.3 Test Result

Formula:

$$\text{Signal generator} + \text{Antenna gain} + |\text{Cable loss}| = \text{Output peak power}$$

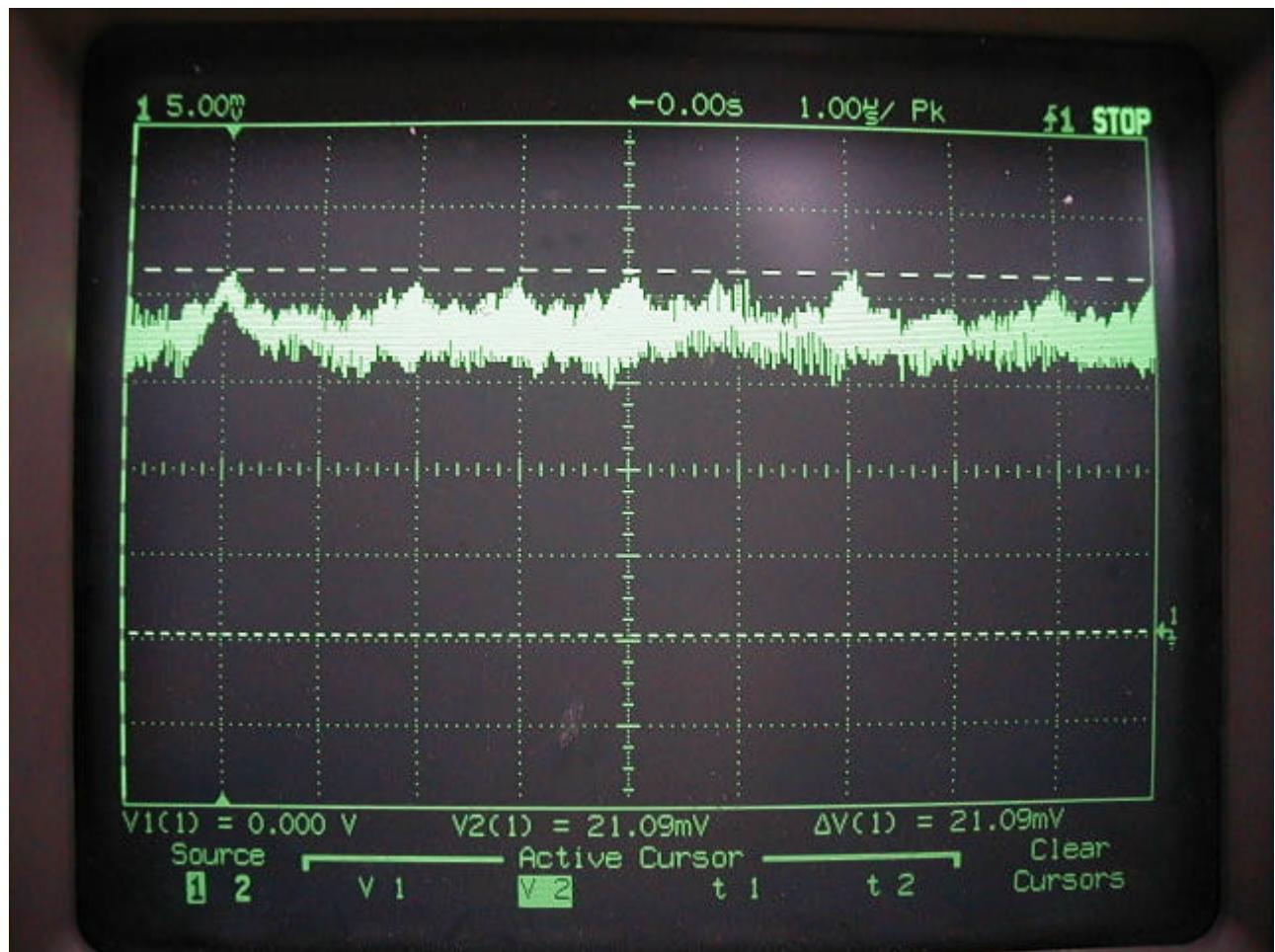
Channel	Signal Generator	Antenna Gain	Cable Loss	Limit	Output peak power	
	dBm	dBi	dBm	(DTS)	dBm	mW
CH1	15.4	1.0	-1.16	100mW	16.56	45.29
CH6	14.1	1.0	-1.16	100mW	15.26	33.57
CH11	13.6	1.0	-2.01	100mW	15.61	36.39

Note:

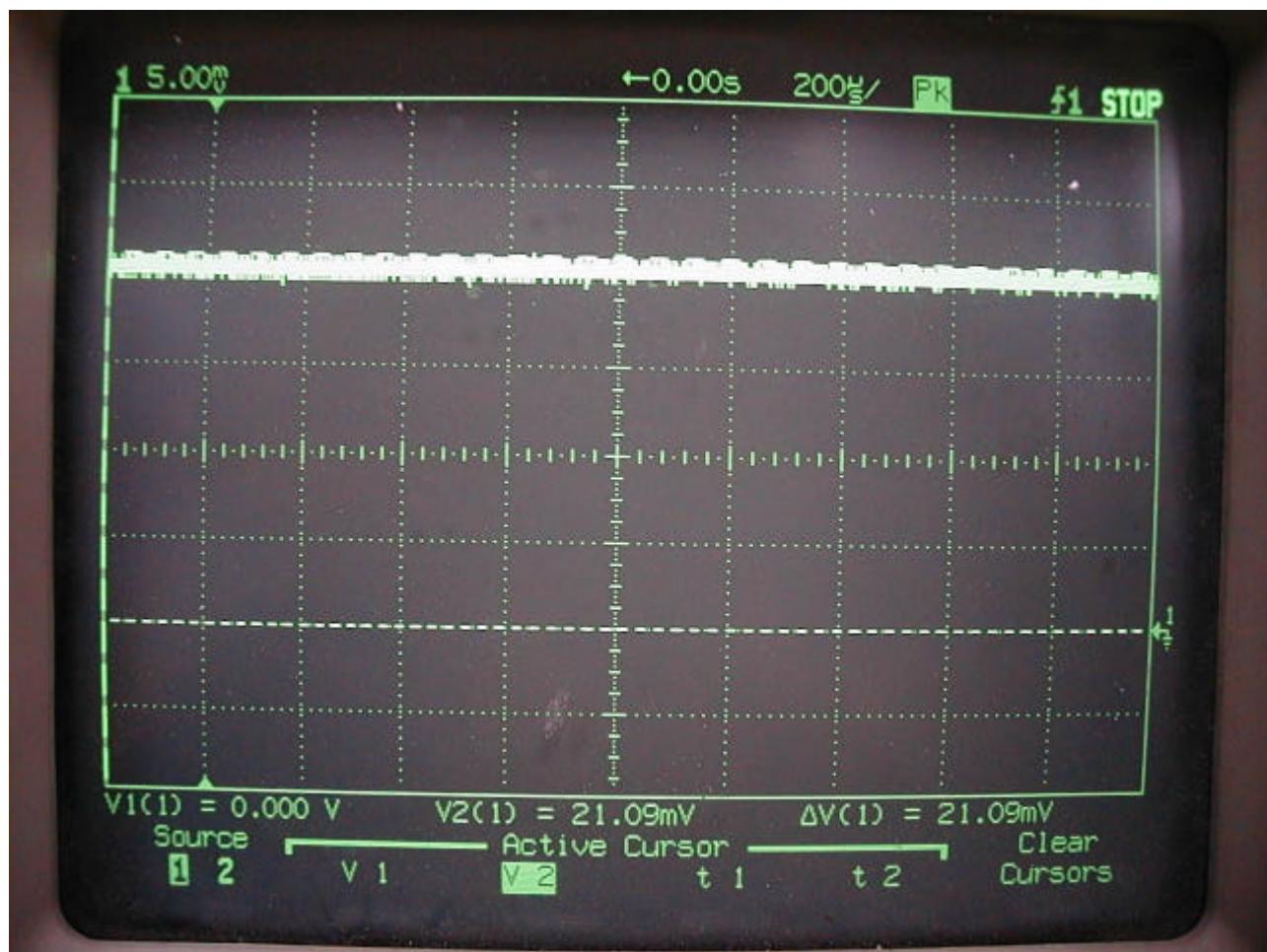
The limit is vary according to the equipment class, listed below:

1. Digital Transmission System (DTS): 100mW
2. Spread Spectrum Transmitter (DSS): 1W

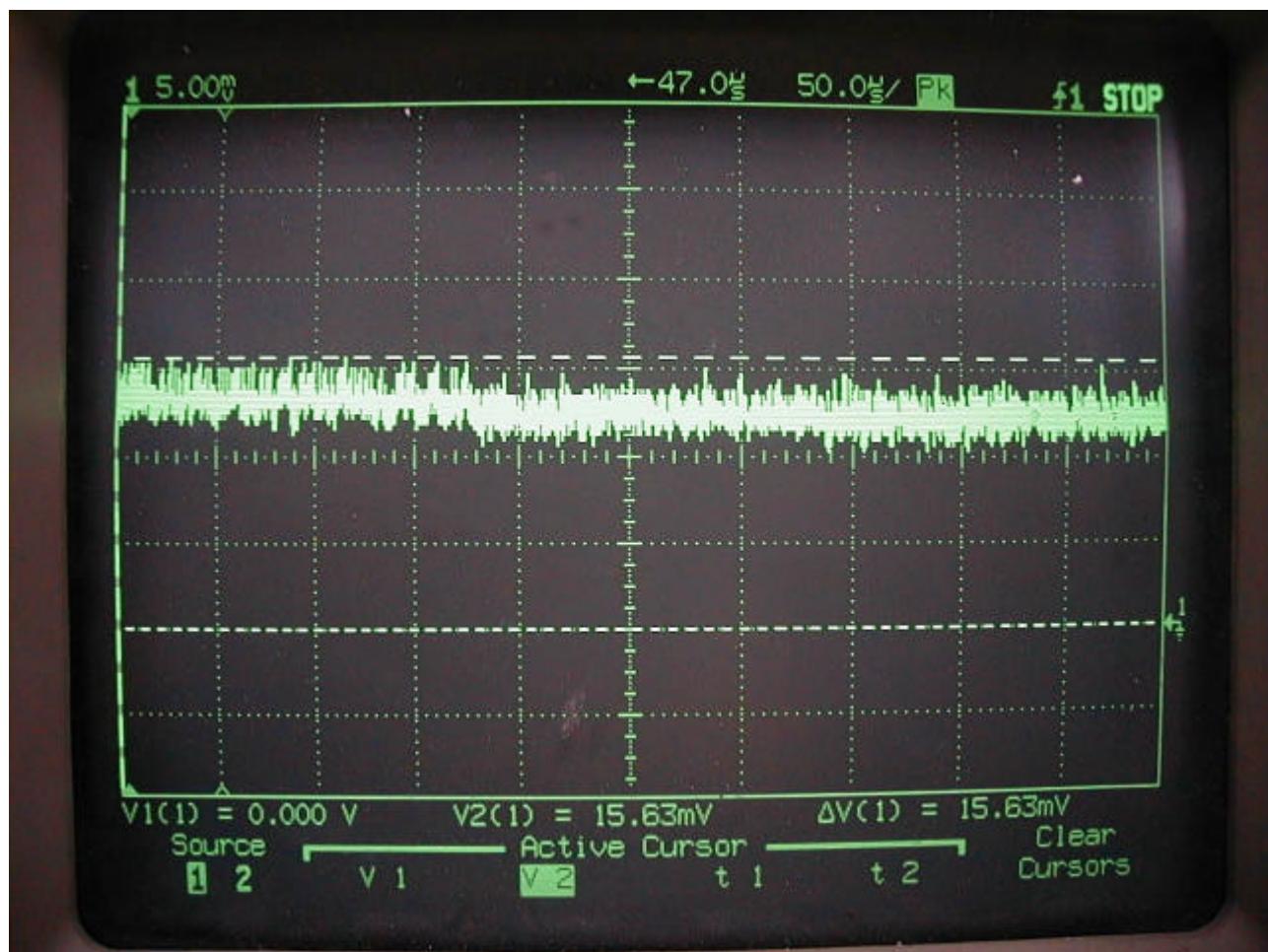
The Hardcopy of the oscilloscope (w/EUT) (Ch.1)



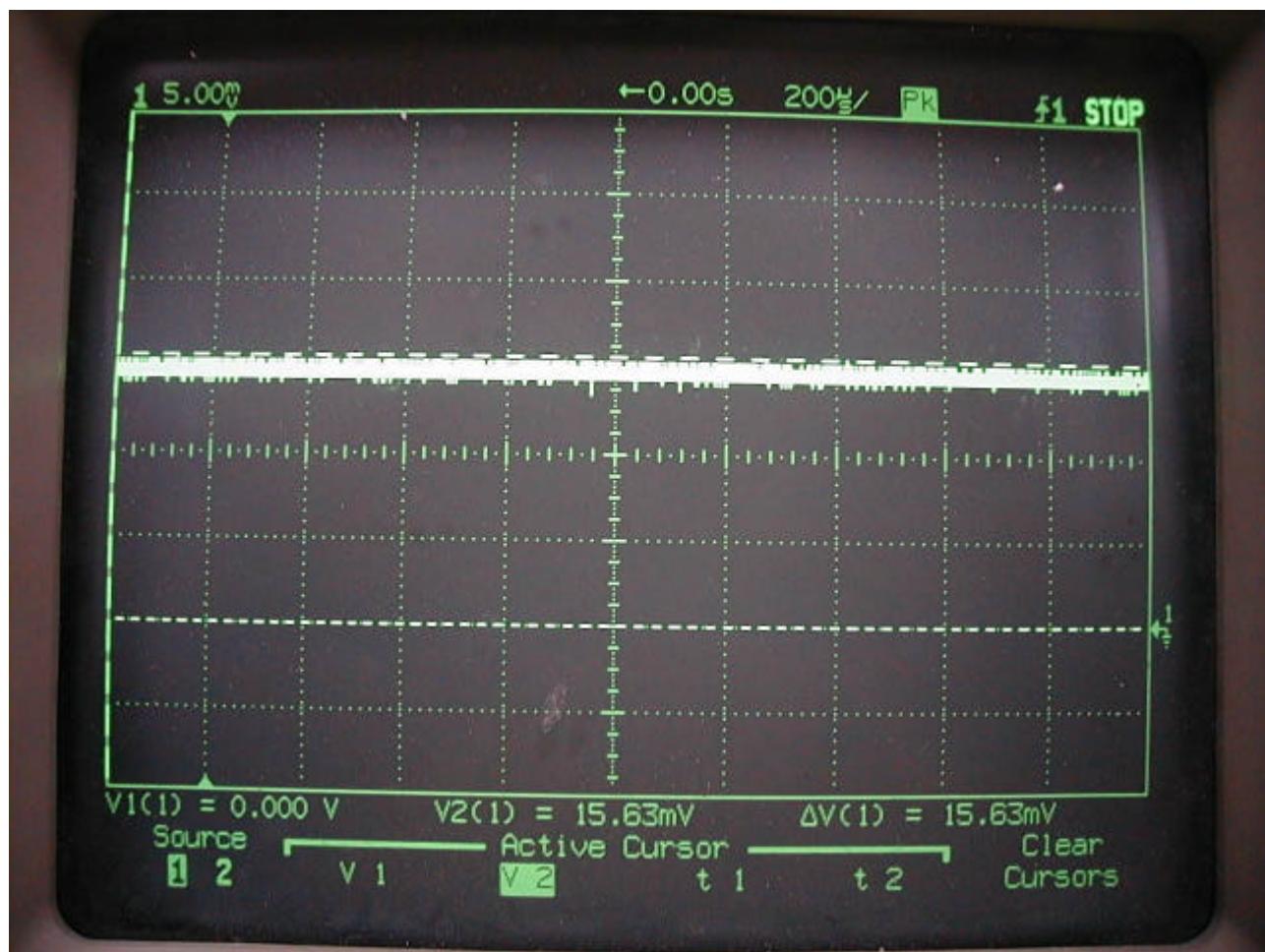
The Hardcopy of the oscilloscope (w/Signal Generator) (Ch.1)



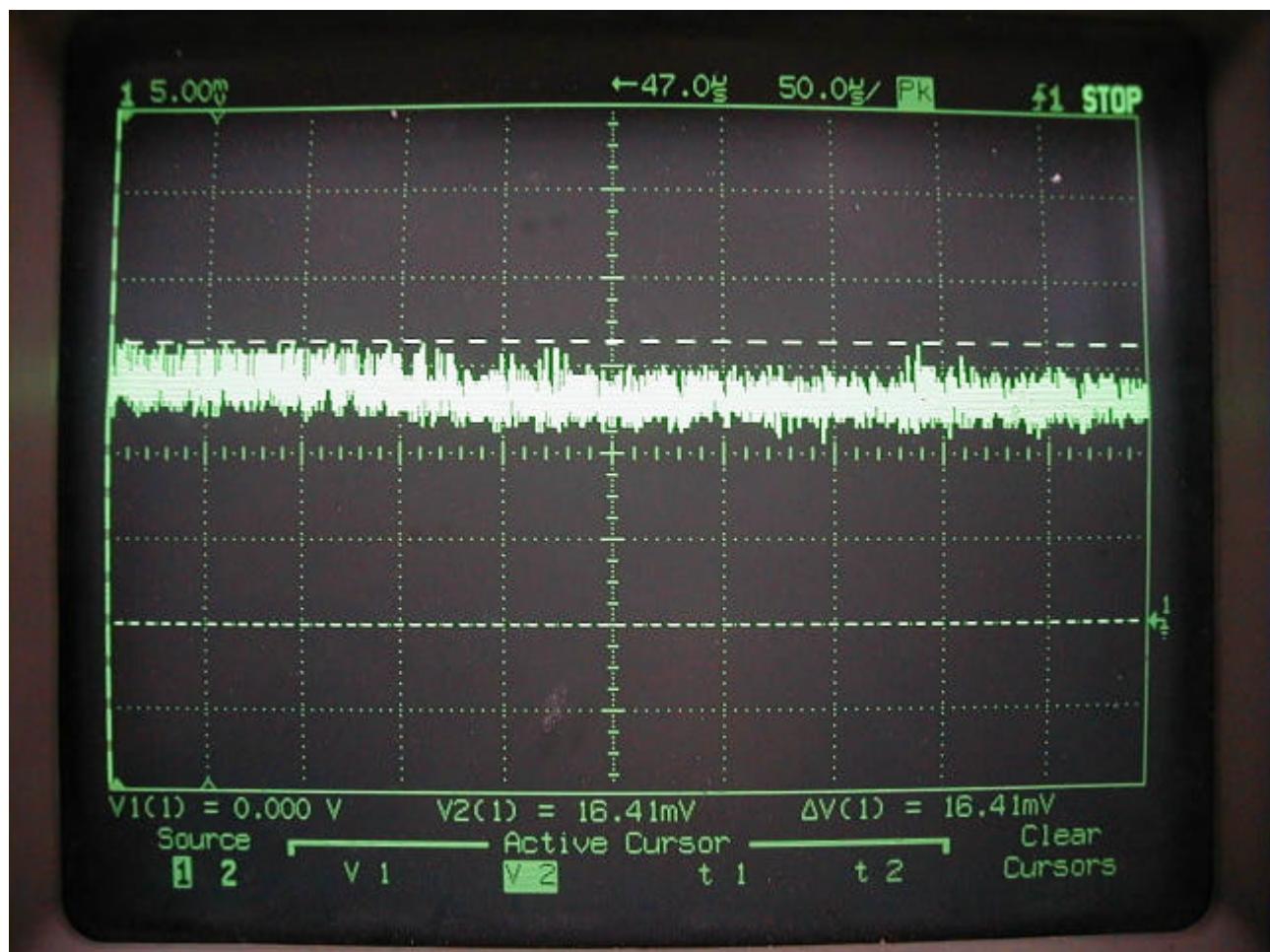
The Hardcopy of the oscilloscope (w/EUT) (Ch.6)



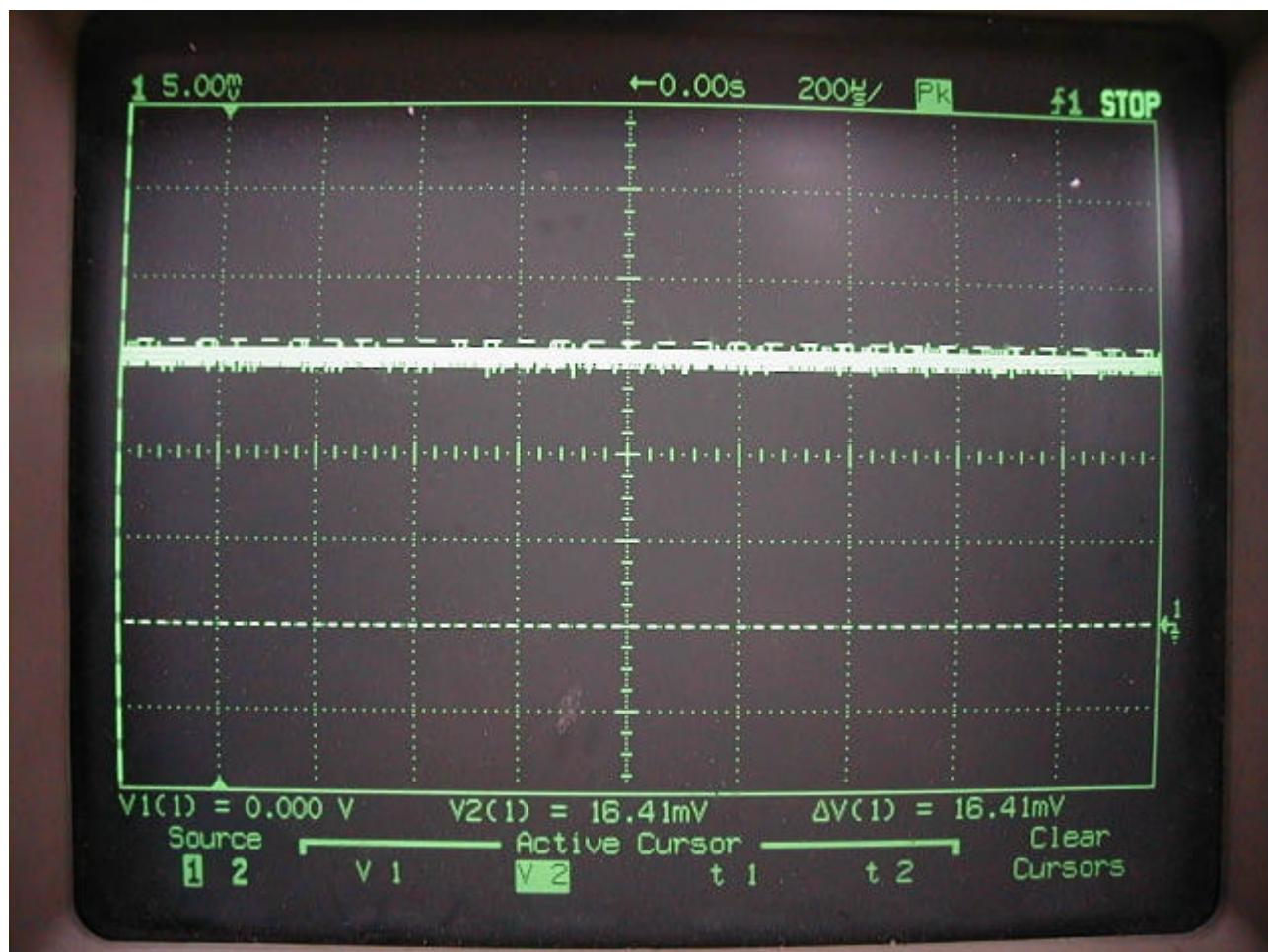
The Hardcopy of the oscilloscope (w/Signal Generator) (Ch.6)



The Hardcopy of the oscilloscope (w/EUT) (Ch.11)



The Hardcopy of the oscilloscope (w/Signal Generator) (Ch.11)



VIII. Section 15.247 (C): Spurious Emissions (Radiated)

8.1 Test Condition & Setup

We'd performed the test by the *radiated emission* skill: The EUT was placed in an anechoic chamber, and set the EUT transmitting continuously and scanned at 3-meter distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration, which produced the highest emissions was noted so it could be reproduced later during the final tests. For the measurement above 1GHz, according to the guidance we'd set the spectrum analyzer's 6dB bandwidth RBW to 1MHz.

This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

Final radiation measurements were made on a three-meter, anechoic chamber. The EUT system was placed on a nonconductive turntable, which is 0.8 meters height, top surface 1.0 x 1.5 meter.

The spectrum was examined from 30 MHz to 1000 MHz using an Hewlett Packard 85460A EMI Receiver, Schaffner whole range Bi-Log antenna (Model No.: CBL6141A) is used to measure frequency from 30 MHz to 1GHz. The final test is used the spectrum HP 85460A and spectrum was examined from 1GHz to 18GHz using an Hewlett Packard 8564E Spectrum Analyzer, EMC0 Horn Antenna (Model 3115) for 1G ~ 18GHz.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. There are two spectrum analyzers use on this testing, HP 85460A for frequency 30MHz to 1000MHz, and 8564E for frequency 1GHz to 18GHz. No post-detector video filters were used in the test. The spectrum analyzer's 6dB bandwidth was set to 120KHz (spectrum was examined from 30 MHz to 1000 MHz), the spectrum analyzer's 6 dB bandwidth was set to 1 MHz (spectrum was examined from 1GHz to 18GHz) and the analyzer was operated in the maximum hold mode. There is a test condition apply in this test item, the test procedure description as the following:

Using the PCMCIA interface of Notebook computer and software to control the EUT through Ethernet hub. Then making access to the mode of continuous transmission. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

With the transmitter operating from a AC source and using the internal of EUT, radiates spurious emissions falling within the restricted bands of 15.209 were measured at operating frequencies corresponding to upper, middle and bottom channels in the 2400 ~ 2483.5 MHz band.

The actual field intensity in decibels referenced to 1 microvolt per meter (dB μ V/m) is determined by algebraically adding the measured reading in dB μ V, the antenna factor (dB), and cable loss (dB) at the appropriate frequency. Since the EUT was set to transmit continuously, no *duty cycle* is present.

For frequency between 30MHz to 1000MHz

FIa (dB μ V/m) = FIr (dB μ V) – Correction Factors

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

For frequency between 1 GHz to 18 GHz

FIa (dB μ V/m) = FIr (dB μ V) + Correction Factor

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

The setting up procedure is recorded on Appendix A.

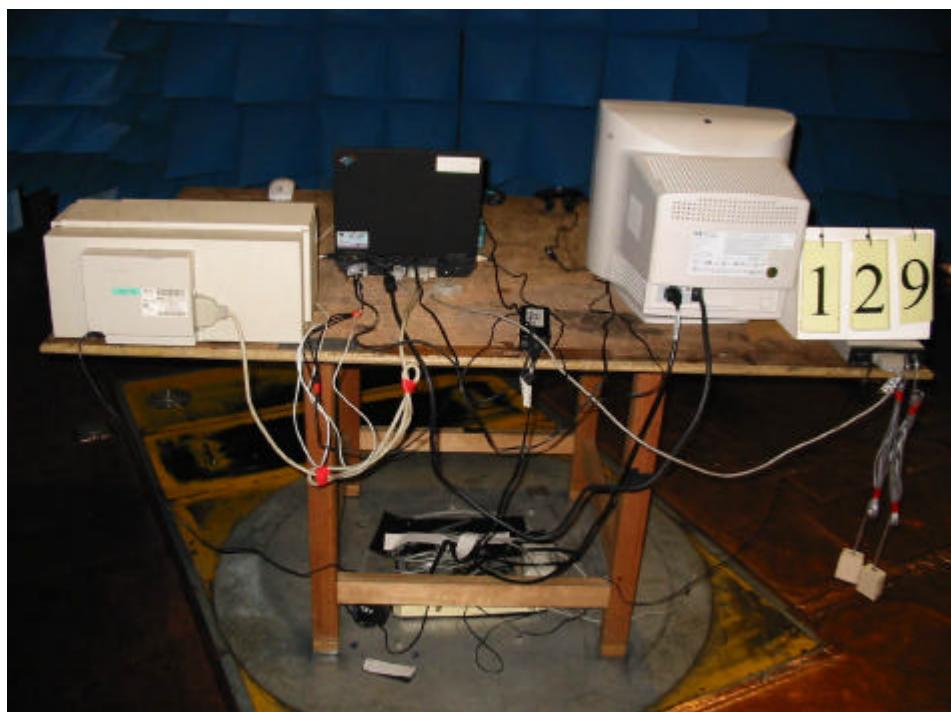
8.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last	Due
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
Bi-log Antenna	CBL6141A	Schaffner	4206	03/09/02	03/09/03
Switch/Control Unit (> 30MHz)	3488A	HP	N/A	11/20/01	11/20/02
Auto Switch Box (> 30MHz)	ASB-01	TRC	9904-01	11/20/01	11/20/02
Spectrum Analyzer	8564E	HP	US36433002	08/01/01	08/01/02
Microwave Preamplifier	83051A	HP	3232A00347	08/01/01	08/01/02
Horn Antenna	3115	EMCO	9704 – 5178	08/01/01	08/01/02
Anechoic Chamber (cable calibrated together)				05/20/01	05/20/02

8.3 Test Instruments Configuration



Front View of the Test Configuration



Rear View of the Test Configuration

The test configuration for frequency between 1GHz to 18GHz is same as above.

8.4 Test Result of Spurious Radiated Emissions

EUT's transmit only

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarizations, EUT orientation, etc. are recorded on the following.

FCC ID : L8G8800001

EUT : WLAN PCMCIA Card

Test Conditions: Testing room : Temperature : 21 ° C Humidity : 64 % RH
 Testing site : Temperature : 24 ° C Humidity : 72 % RH

Table 5 Radiated Emissions for 30MHz – 1GHz [CH 1, Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)			Limit (dBmV/m)	Margin (dB)
43.010	6.70	2.44	92	-18.30	25.00	40.00	-15.00
144.010	11.35	2.43	100	-14.99	26.34	43.50	-17.16
288.010	15.16	1.00	28	-16.55	31.71	46.00	-14.29
360.020	14.39	1.00	49	-19.29	33.68	46.00	-12.32
576.030	5.73	1.00	26	-24.77	30.50	46.00	-15.50
748.000	14.00	1.00	15	-28.30	42.30	46.00	-3.70

Note:

1. Margin = Corrected Amplitude – Limit.
2. Peak Amplitude – Correction Factors = Corrected Amplitude

Table 6 Radiated Emissions For 30MHz 1GHz [CH 1, Vertical]

<i>Radiated Emission</i>				<i>Correction Factors</i>	<i>Corrected Amplitude</i>	<i>FCC Class B (3 m)</i>	
<i>Frequency (MHz)</i>	<i>Amplitude (dBmV/m)</i>	<i>Ant. H. (m)</i>	<i>Table (°)</i>			<i>(dB)</i>	<i>(dBmV/m)</i>
43.010	12.51	1.00	35	-17.55	30.06	40.00	-9.94
144.010	10.69	0.99	5	-14.33	25.02	43.50	-18.48
199.210	8.08	1.00	68	-14.10	22.18	43.50	-21.32
504.020	8.88	1.01	93	-23.52	32.40	46.00	-13.60
576.020	11.86	0.99	148	-25.18	37.04	46.00	-8.96
748.000	12.14	2.42	28	-28.19	40.33	46.00	-5.67

Table 7 Open Field Radiated Emissions For 1GHz 18GHz [Channel 1, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)		Peak	Average	Limit		Margin (dB)
							Peak	Ave.	
4.076	55.08	1.00	52	-5.64	49.44	---	74.0	---	-24.56
*4.824	36.40	1.00	83	3.91	55.61	40.31	74.0	53.9	-13.59
7.236	41.55	1.00	153	9.72	51.27	---	74.0	---	-22.73

Table 8 Open Field Radiated Emissions For 1GHz 18GHz [Channel 1, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)		Peak	Average	Limit		Margin (dB)
							Peak	Ave.	
2.038	56.59	1.00	34	-8.67	47.92	---	74.0	---	-26.08
4.079	56.25	1.00	139	-5.64	50.61	---	74.0	---	-23.39
*4.824	35.96	1.00	67	3.91	54.61	39.87	74.0	53.9	-14.03
6.114	39.39	1.00	119	9.72	49.11	---	74.0	---	24.89
7.236	40.22	1.00	234	9.72	57.61	49.94	74.0	53.9	-3.96

Note:

1. Margin = Corrected - Limit.
2. The “ * “ means restricted bands.
3. The EUT utilizes a *permanently attached antenna*. In addition the spurious RF conducted emissions levels do comply with the 20dBc limit both at its bandedges and other spurious emissions.
4. As stated in Section 15.35(b), for any frequencies above 1000MHz, radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. As the results of our test, the peak amplitudes are already below the FCC limit. Thus the average amplitudes of the rest are omitted.
5. **Above emissions of 10GHz, they are all under the limits of 20dB in Test Site.**

Table 9 Radiated Emissions for 30MHz 1GHz [CH 6, Horizontal]

<i>Radiated Emission</i>				<i>Correction Factors</i>	<i>Corrected Amplitude</i>	<i>FCC Class B (3 m)</i>	
<i>Frequency (MHz)</i>	<i>Amplitude (dBmV/m)</i>	<i>Ant. H. (m)</i>	<i>Table (°)</i>			<i>(dB)</i>	<i>(dBmV/m)</i>
43.010	7.36	2.45	141	-18.30	25.66	40.00	-14.34
144.010	11.09	2.45	129	-14.99	26.08	43.50	-17.42
288.020	15.04	1.00	108	-16.55	31.59	46.00	-14.41
360.880	10.34	1.00	151	-19.30	29.64	46.00	-16.36
576.020	5.96	1.00	1	-24.77	30.73	46.00	-15.27
748.000	13.95	1.00	64	-28.30	42.25	46.00	-3.75

Table 10 Radiated Emissions for 30MHz 1GHz [CH 6, Vertical]

<i>Radiated Emission</i>				<i>Correction Factors</i>	<i>Corrected Amplitude</i>	<i>FCC Class B (3 m)</i>	
<i>Frequency (MHz)</i>	<i>Amplitude (dBmV/m)</i>	<i>Ant. H. (m)</i>	<i>Table (°)</i>			<i>(dB)</i>	<i>(dBmV/m)</i>
43.010	11.87	1.00	69	-17.55	29.42	40.00	-10.58
199.240	8.34	2.44	50	-14.10	22.44	43.50	-21.06
398.230	6.68	0.99	24	-20.37	27.05	46.00	-18.95
504.030	9.11	0.99	86	-23.52	32.63	46.00	-13.37
576.030	11.72	1.00	151	-25.18	36.90	46.00	-9.10
748.000	11.93	2.45	27	-28.19	40.12	46.00	-5.88

Table 11 Open Field Radiated Emissions for 1GHz 18GHz [Channel 6, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude		FCC Class B (3m)	
Frequency (GHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)		Peak	Average	Limit	Margin (dB)
Peak	Ave.							
4.126	53.91	1.00	168	-5.64	48.27	---	74.0	---
*4.874	47.70	1.00	113	3.91	51.61	---	74.0	53.9
6.189	37.05	1.00	82	9.72	46.77	---	74.0	---
*7.311	59.95	1.00	207	9.72	50.23	---	74.0	53.9

Table 12 Open Field Radiated Emissions for 1GHz 18GHz [Channel 6, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude		FCC Class B (3m)	
Frequency (GHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)		Peak	Average	Limit	Margin (Db)
Peak	Ave.							
2.063	59.20	1.00	95	-8.67	50.53	---	74.0	---
4.126	55.58	1.00	52	-5.64	49.94	---	74.0	---
*4.874	49.70	1.00	113	3.91	53.61	---	74.0	53.9
6.189	40.05	1.00	12	9.72	49.77	---	74.0	---
*7.311	43.69	1.00	9	9.72	53.41	---	74.0	53.9

Table 13 Radiated Emissions for 30MHz 1GHz [CH11, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dBmV/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)			Limit (dBmV/m)	Margin (dB)
43.010	7.43	2.44	54	-18.30	25.73	40.00	-14.27
144.010	11.49	2.44	100	-14.99	26.48	43.50	-17.02
248.880	13.35	1.00	112	-16.11	29.46	46.00	-16.54
288.020	15.09	1.00	24	-16.55	31.64	46.00	-14.36
360.010	14.25	1.00	26	-19.29	33.54	46.00	-12.46
748.000	13.65	1.00	35	-28.30	41.95	46.00	-4.05

Table 14 Radiated Emissions for 30MHz 1GHz [CH 11, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dBmV/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)			Limit (dBmV/m)	Margin (dB)
43.010	11.26	1.00	15	-17.55	28.81	40.00	-11.19
144.010	11.02	1.00	26	-14.33	25.35	43.50	-18.15
398.600	6.23	1.00	20	-20.39	26.62	46.00	-19.38
504.020	8.36	1.00	92	-23.52	31.88	46.00	-14.12
576.020	11.74	1.00	153	-25.18	36.92	46.00	-9.08
748.000	12.35	2.44	20	-28.19	40.54	46.00	-5.46

Table 15 Open Field Radiated Emissions For 1GHz 18GHz [Channel 11, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude		FCC Class B (3m)	
Frequency (GHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)		Peak	Average	Limit	Margin (dB)
Peak	Ave.							
4.176	54.88	1.00	41	-5.64	48.94	---	74.0	---
*4.944	34.50	1.00	9	3.91	55.11	38.41	74.0	53.9
6.264	40.05	1.00	24	9.72	49.77	---	74.0	---
*7.416	41.72	1.00	137	9.72	51.44	---	74.0	53.9

Table 16 Open Field Radiated Emissions For 1GHz 18GHz [Channel 11, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude		FCC Class B (3m)	
Frequency (GHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)		Peak	Average	Limit	Margin (dB)
Peak	Ave.							
2.088	58.84	1.00	94	-8.67	50.17	---	74.0	---
4.176	54.58	1.00	43	-5.64	48.94	---	74.0	---
*4.944	47.70	1.00	3	3.91	51.61	---	74.0	53.9
6.264	40.05	1.00	57	9.72	49.77	---	74.0	---
*7.416	41.72	1.00	167	9.72	51.44	---	74.0	53.9

8.5 Test Result of the Bandedge

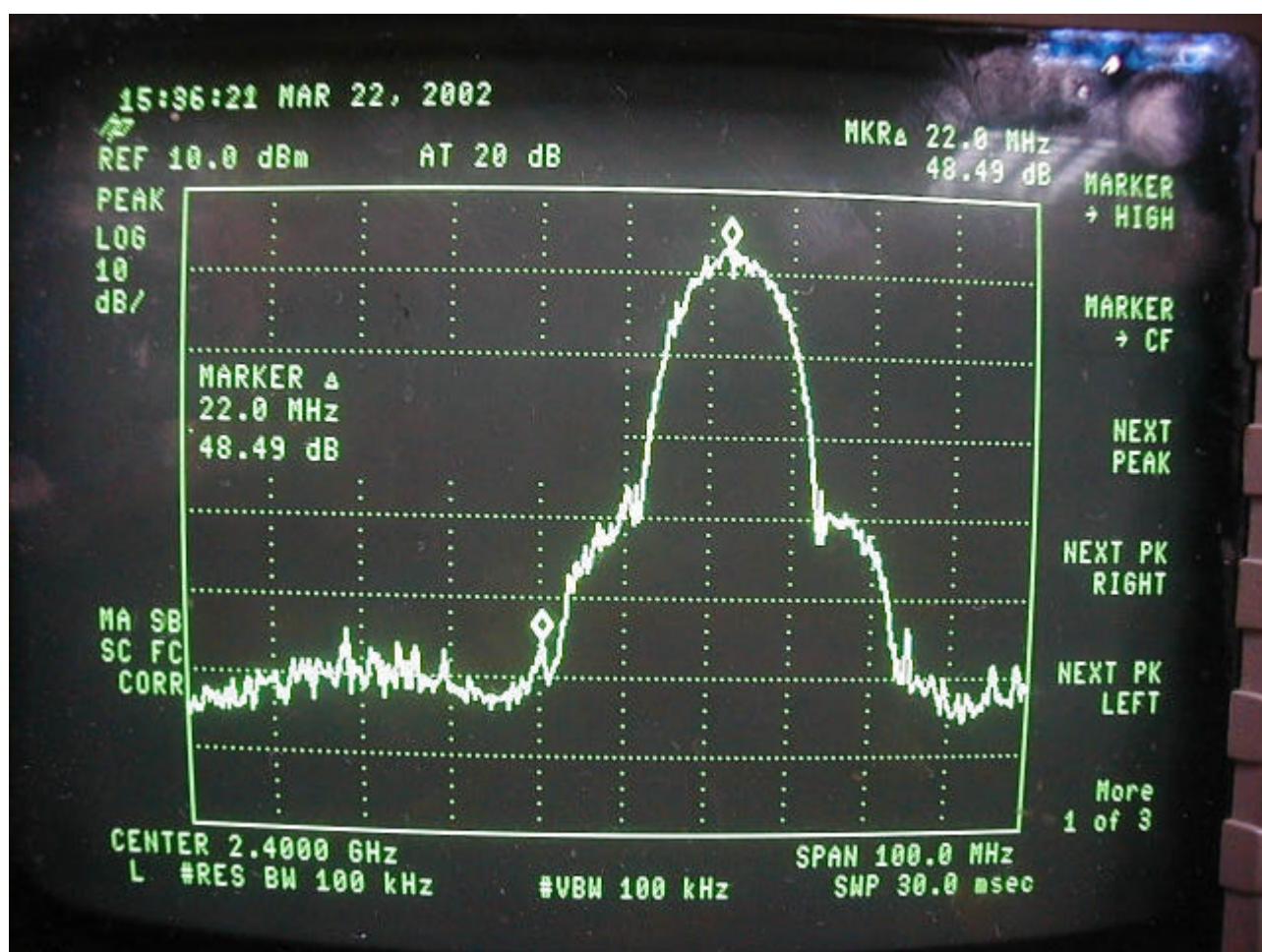
If any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either *at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a)*,

We perform this section by the *conducted* manner, the RBW is set to 100kHz and VBW>RBW. We'd made the observation *up to 10th harmonics and the criterion is all the harmonic/spurious emissions must be 20dB below the highest emission level measured*. If the emissions fall in the restricted bands stated in the Part15.205(a) must also *comply with the radiated emission limits specified in Part15.209(a)*.

The following pages show our observations referring to the channel 1 and 11 respectively.

Test Condition & Setup: same as 3.1

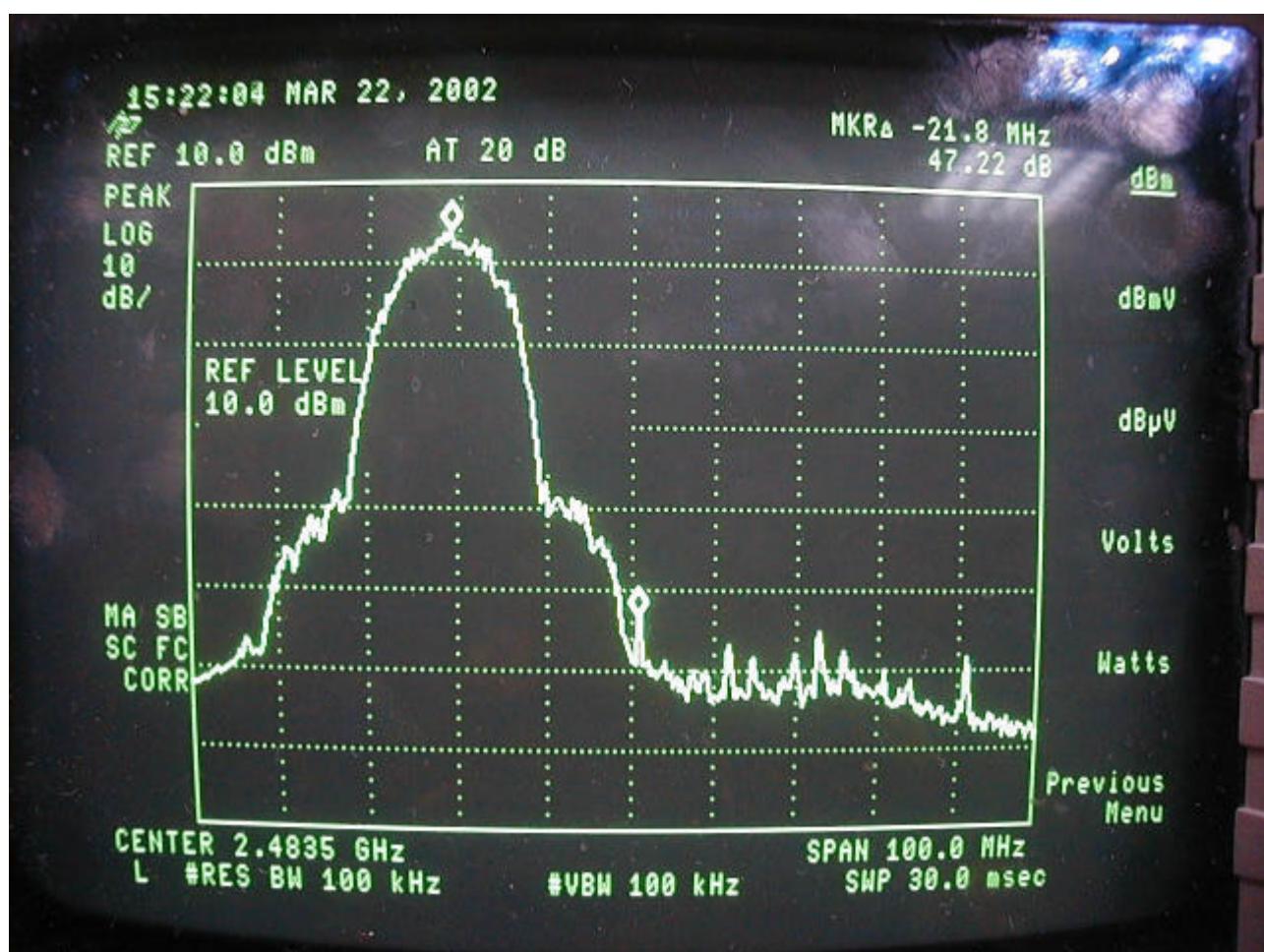
Channel 1



#This is the hard copy of our bandedge measurement of channel 1.

1. The lump right by the fundamental side is already 20dB below the highest emission level.
2. The spectrum plot extended inside the restriction band is also below -50dBm (57dBuV).

Channel 11



#This is the hard copy of our bandedge measurement of channel 11.

1. The lump right by the fundamental side is already 20dB below the highest emission level.
2. The spectrum plot extended inside the restriction band is also below -50dBm (57dBuV).

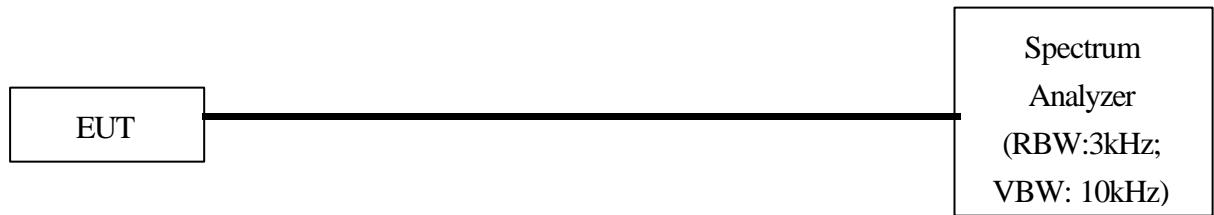
IX. Section 15.247(d): Power Spectral Density

9.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power in TDD mode. A LAN port from a notebook computer connect to the EUT. The EUT is needed to force selection of output power level and channel number. While testing, the EUT was set to transmit continuously and to be tested by the contact manner with the spectrum analyzer.

The attachments below show our observation.

9.2 Test Instruments Configuration



Test Configuration of Power Spectral Density

P.S.: Notebook computer to control the EUT at maximal power output and channel Number and set antenna kit

9.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8592A	H P	3003AD1401	01/02/02	01/01/03

9.4 Test Result of Power spectral density

The following table shows a summary of the highest power spectral density.

FCC ID : L8G8800001
EUT : WLAN PCMCIA Card

<i>Channel</i>	<i>Frequency (GHz)</i>	<i>Ppr (dBuV)</i>	<i>Cable Loss (dB)</i>	<i>Ppq (dBm)</i>	<i>Limit (dB)</i>	<i>Margin (dB)</i>
CH 01	2.411	-10.17	-1.80	-8.37	8.00	-16.37
CH 06	2.436	-10.46	-1.85	-8.61	8.00	-16.61
CH 11	2.461	-10.77	-1.93	-8.84	8.00	-16.84

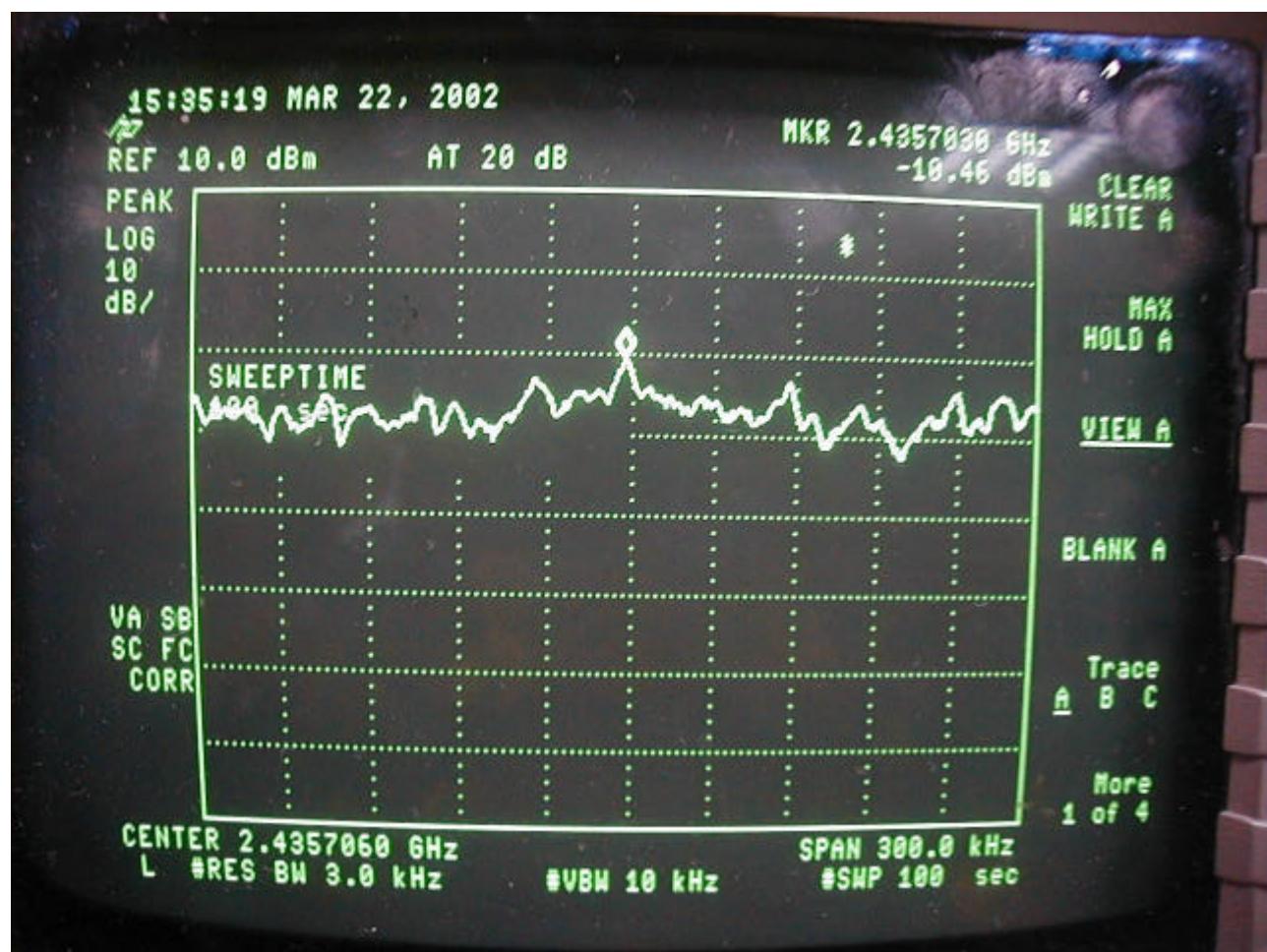
Note:

1. The attachment follow by this page and there is no page number.
2. Ppr: spectrum read power density (using peak search mode),
Ppq: actual peak power density in the spread spectrum band.
3. $Ppq = Ppr + |Cable\ Loss|$

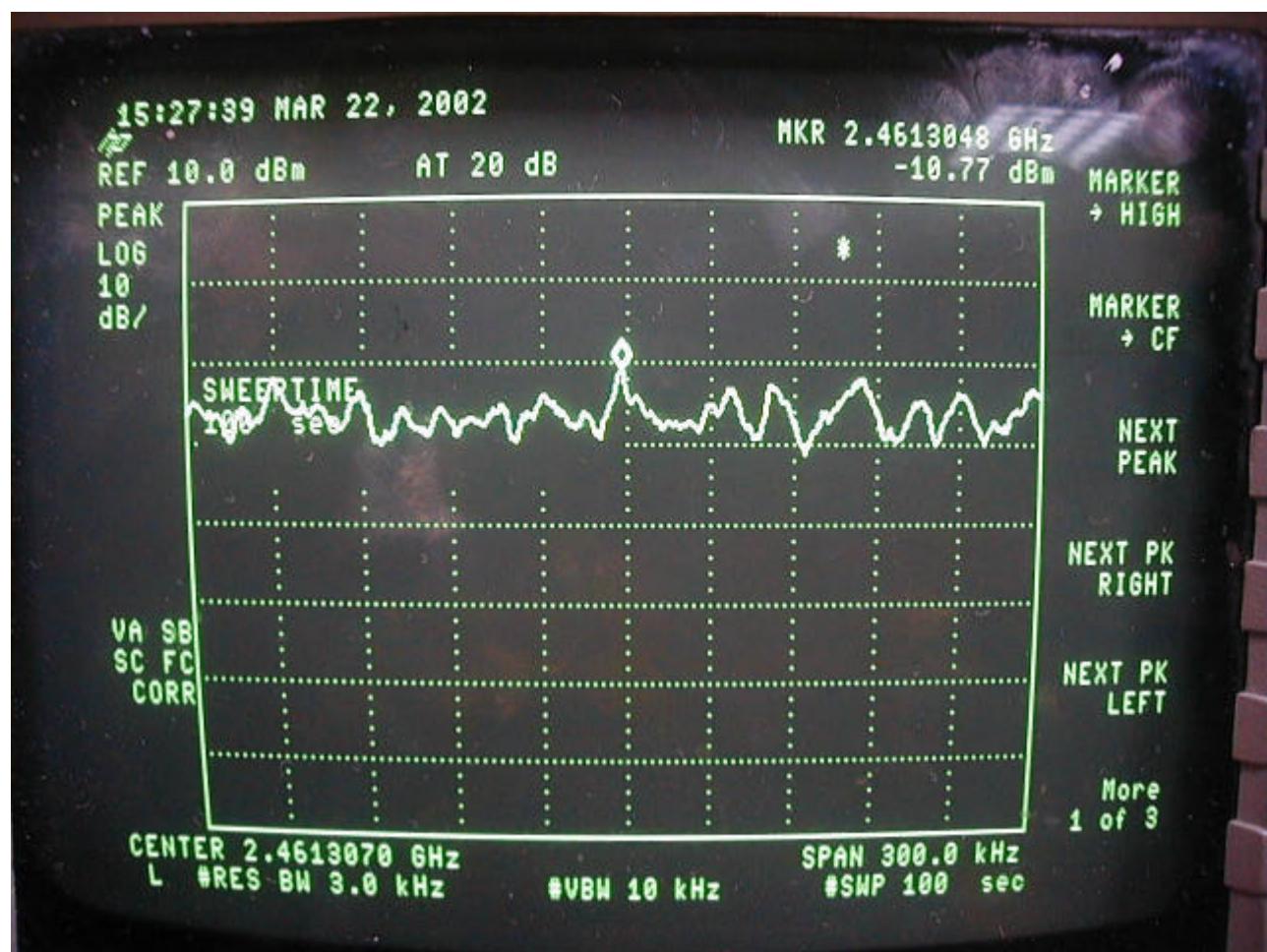
Channel 01



Channel 06



Channel 11



Appendix A

Setting up Procedure

1. The EUT inserted into the PCMCIA slot of the notebook computer. Using the PCMCIA port of Notebook Computer and software to control the wireless LAN PCMCIA card.
2. Use the software that is given by the customer and operated in the windows to control the EUT's continuous transmission.
3. Then making access to the mode of continuous transmission and set testing channel.