MEASUREMENT REPORT of WIRELESS LAN COMPACTFLASH CARD

Applicant : ASUSTeK COMPUTER INC.

Model No. : WL-110

EUT : ASUS SpaceLink WL110 WLAN CompactFlash Card

FCC ID : MSQWLCFCWL110

Report No. : A5415047

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	**:**	ASUSTeK COMPUTER INC.
Model No.	**:**	WL-110
EUT	**:**	ASUS SpaceLink WL110 WLAN CompactFlash Card
FCC ID	**:**	MSQWLCFCWL110
Report No.	**:**	A5415047
Test Date	**:**	March 6th, 2002

Prepared by: _____ **Approved by:** _____

Eric Wong *Frank Tsai*

Tested by :

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Ⅰ. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a wireless access CompactFlash 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	:	ASUS SpaceLink WL110 WLAN CompactFlash Card
Model No.	:	WL-110
Granted FCC ID	:	MSQWLCFCWL110
Frequency Range	:	2.412 GHz ~ 2.462GHz
Support Channel	:	11 Channel
Modulation Skill	:	DBPSK, DQPSK, CCK
Interface	:	CompactFlash Type II
Power Type	:	By CompactFlash slot of the client’ s device
Applicant	:	ASUSTek COMPUTER INC. 4/F, No. 150, Li-Te Rd., Peitou, 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

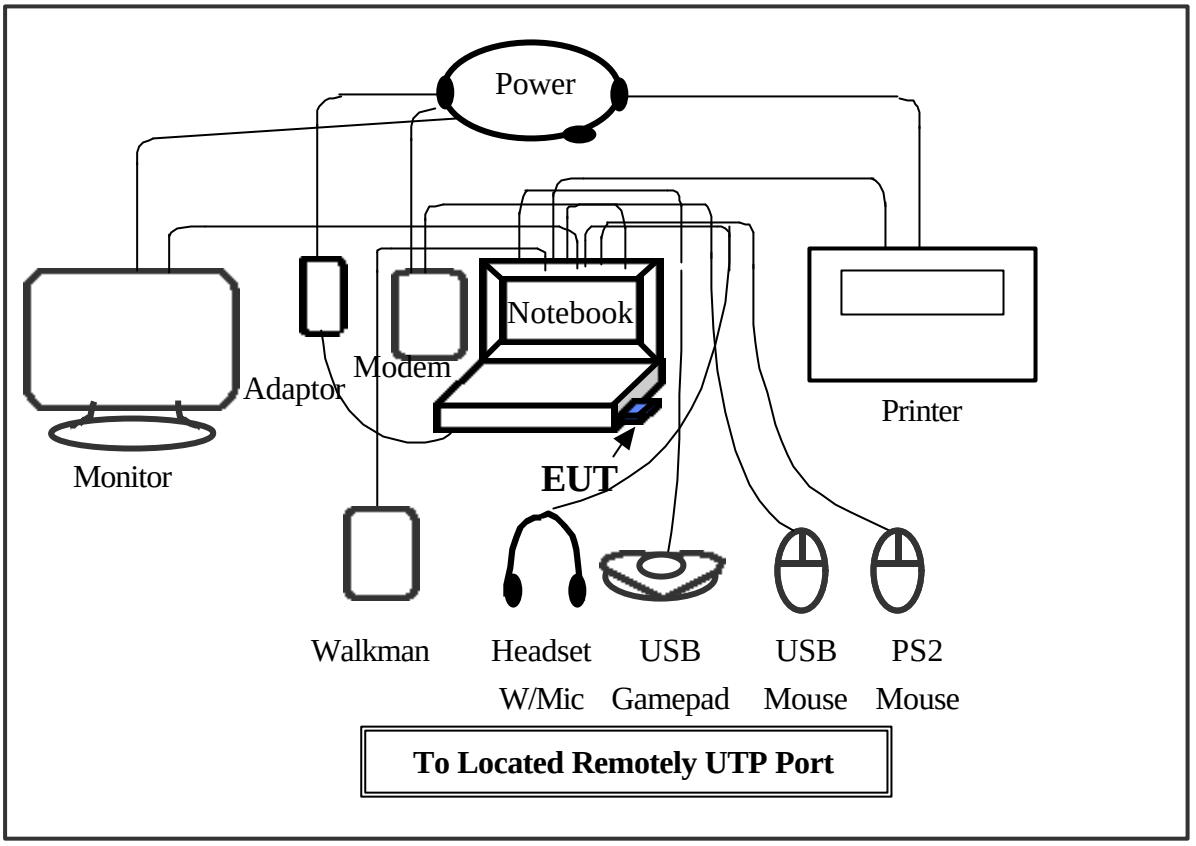
USB Mouse	**:**	**Logitech**
Model No.	:	M-BA47
Serial No.	:	LZE92250027
FCC ID	:	DoC Approved
檢磁	:	4872A220
Power type	:	Powered by Computer
Power Cable	:	Shielded, 1.5m long, Plastic hoods, No ferrite bead

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

CF Adapter	**:**	**WeiKeng**
Model No.	:	A0B000002
Serial No.	:	None
FCC ID	:	DoC Approval
Power type	:	Powered by PCMCIA slot

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 through a CF-PCMCIA adapter. The EUT is needed to force 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

Th e EUT equipped with a PCMCIA interface (after adapting the CF-PCMCIA adapter) and should be operated with the notebook computer (or device equipped with CF slot like PDA etc.), 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 an integrated antenna permanently attached on the PCB. In addition, there is no external antenna or connector employed. The antenna requirement stated in Sect.15.203 is inapplicable to this EUT.

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 (dBμV)*	*QP Amplitude (dBμV)*	*Limit (dBμV)*	*Margin (dB)*
Line 1	480.00	42.30	---	48.00	-5.70
	493.00	41.09	---	48.00	-6.91
	597.00	41.14	---	48.00	-6.86
	612.00	41.33	---	48.00	-6.67
	744.00	41.12	---	48.00	-6.88
	764.00	44.09	---	48.00	-3.91
	798.00	43.67	---	48.00	-4.33
	813.00	43.50	---	48.00	-4.50
	916.00	41.74	---	48.00	-6.26
	2660.00	42.37	---	48.00	-5.63
Line 2	477.00	42.15	---	48.00	-5.85
	486.00	43.82	---	48.00	-4.18
	615.00	43.57	---	48.00	-4.43
	628.00	43.17	---	48.00	-4.83
	654.00	42.51	---	48.00	-5.49
	697.00	43.65	---	48.00	-4.35
	714.00	42.22	---	48.00	-5.78
	739.00	42.83	---	48.00	-5.17
	783.00	43.74	---	48.00	-4.26
	2650.00	43.56	---	48.00	-4.44

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 (dBμV)*	*QP Amplitude (dBμV)*	*Limit (dBμV)*	*Margin (dB)*
Line 1	452.00	42.66	---	48.00	-5.34
	486.00	42.25	---	48.00	-5.75
	633.00	41.59	---	48.00	-6.41
	658.00	42.39	---	48.00	-5.61
	680.00	42.42	---	48.00	-5.58
	744.00	43.57	---	48.00	-4.43
	778.00	43.27	---	48.00	-4.73
	808.00	44.37	---	48.00	-3.63
	833.00	41.87	---	48.00	-6.13
	2710.00	43.02	---	48.00	-4.98
Line 2	489.00	42.52	---	48.00	-5.48
	508.00	42.52	---	48.00	-5.48
	628.00	43.47	---	48.00	-4.53
	663.00	43.42	---	48.00	-4.58
	680.00	43.09	---	48.00	-4.91
	729.00	42.90	---	48.00	-5.10
	759.00	43.65	---	48.00	-4.35
	783.00	44.12	---	48.00	-3.88
	808.00	44.23	---	48.00	-3.77
	935.00	42.34	---	48.00	-5.66

****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 μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	457.00	41.45	---	48.00	-6.55
	480.00	41.37	---	48.00	-6.63
	612.00	42.33	---	48.00	-5.67
	658.00	41.43	---	48.00	-6.57
	684.00	42.14	---	48.00	-5.86
	749.00	41.02	---	48.00	-6.98
	788.00	44.55	---	48.00	-3.45
	818.00	42.80	---	48.00	-5.20
	922.00	42.47	---	48.00	-5.53
	2660.00	42.37	---	48.00	-5.63
Line 2	457.00	43.25	---	48.00	-4.75
	483.00	43.75	---	48.00	-4.25
	505.00	42.93	---	48.00	-5.07
	586.00	42.72	---	48.00	-5.28
	624.00	43.54	---	48.00	-4.46
	663.00	42.55	---	48.00	-5.45
	705.00	43.09	---	48.00	-4.91
	754.00	43.56	---	48.00	-4.44
	793.00	43.72	---	48.00	-4.28
	2660.00	42.39	---	48.00	-5.61

****The reading amplitudes are all under limit.***

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

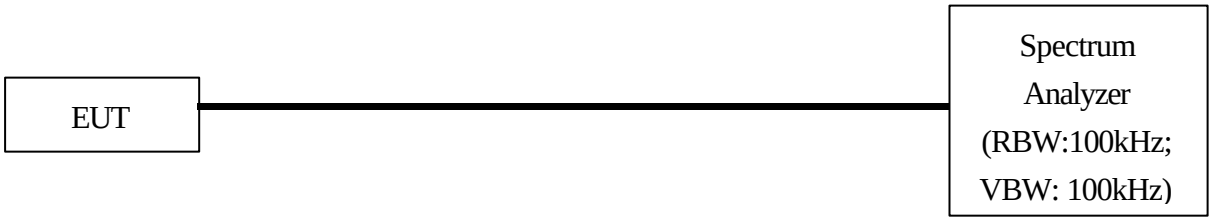
Based on the Section 2.1, *Direct Sequence System* is a spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted 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	01/01/03

6.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth	:	12.15 MHz
The min. 6 dB BW at least	:	500 KHz

Bandwidth of Channel 6

Bandwidth	:	12.15 MHz
The min. 6 dB BW at least	:	500 KHz

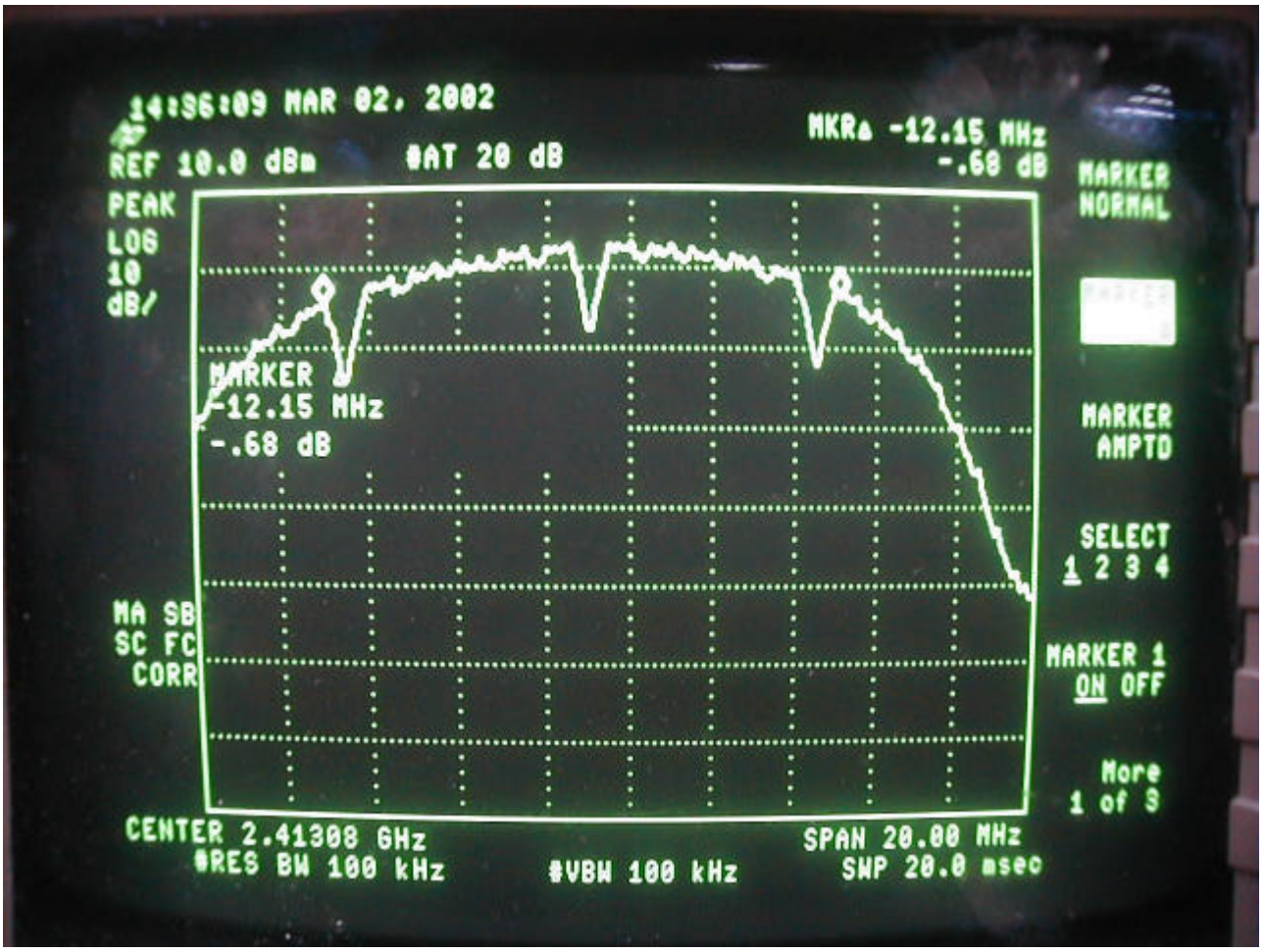
Bandwidth of Channel 11

Bandwidth	:	12.14 MHz
The min. 6 dB BW at least	:	500 KHz

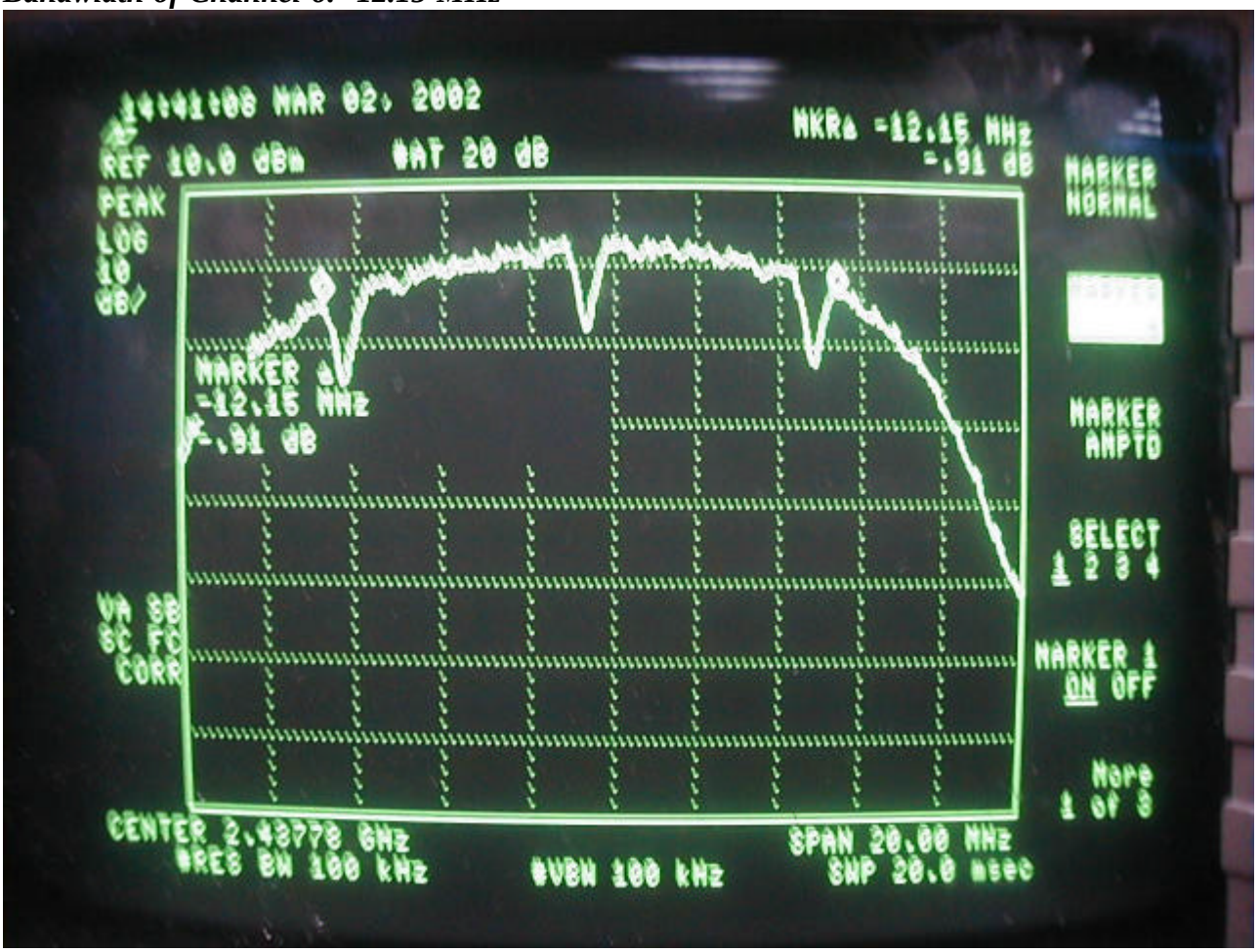
Note:

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.

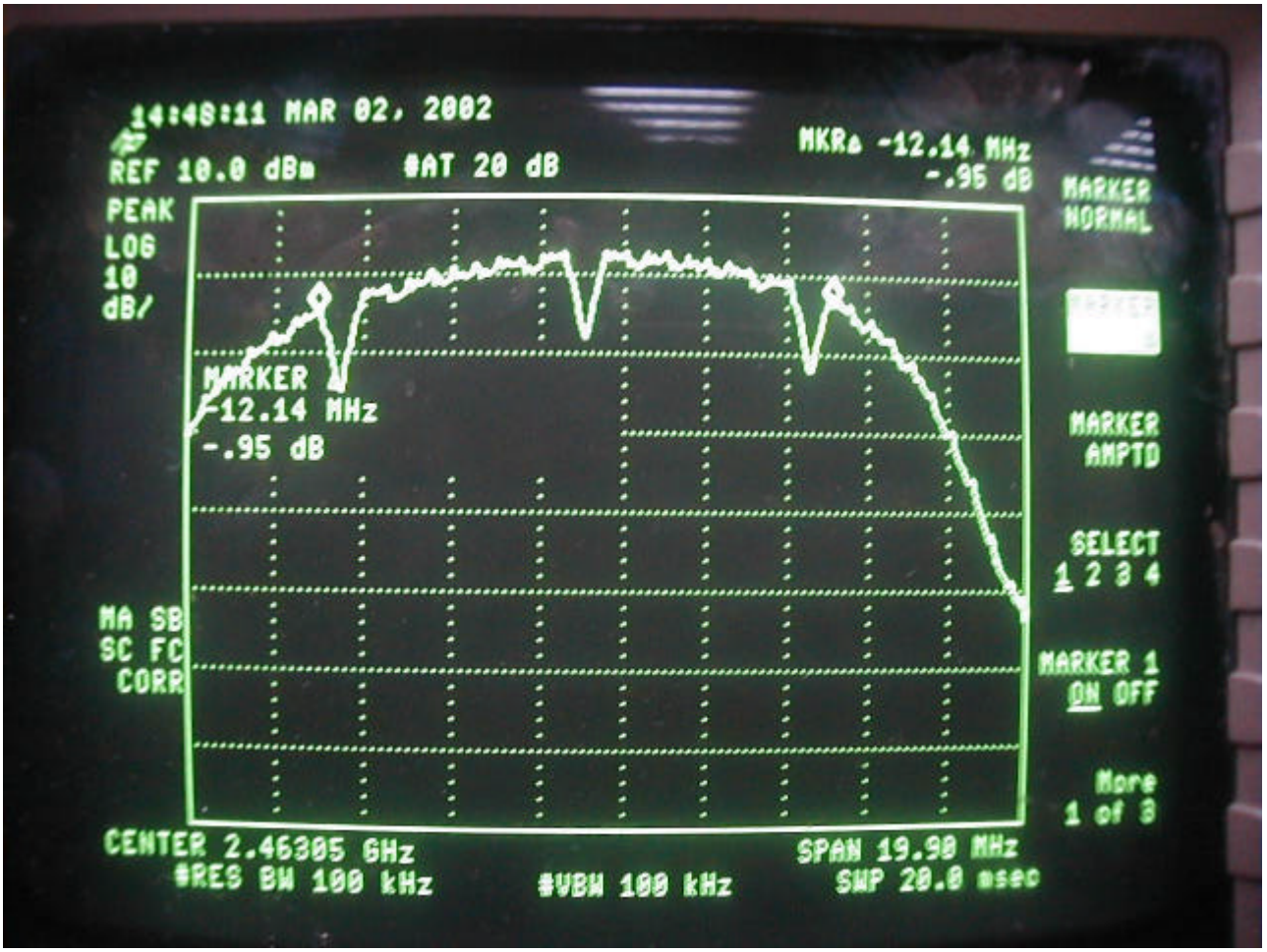
Bandwidth of Channel 1: 12.15 MHz



Bandwidth of Channel 6: 12.15 MHz



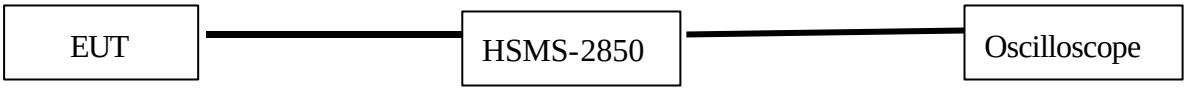
Bandwidth of Channel 11: 12.14 MHz



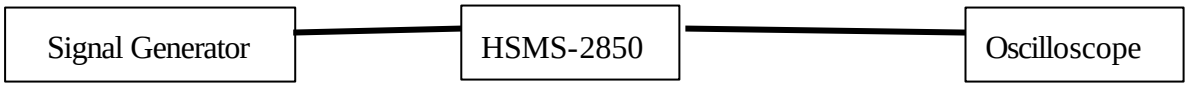
VII. Section 15.247(b): Power Output

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 Shocttkey 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	
Signal Generator	83711A	H P	3429A00434
Shocttkey Diode	HSMS-2850	H P	

7.3 Test Result

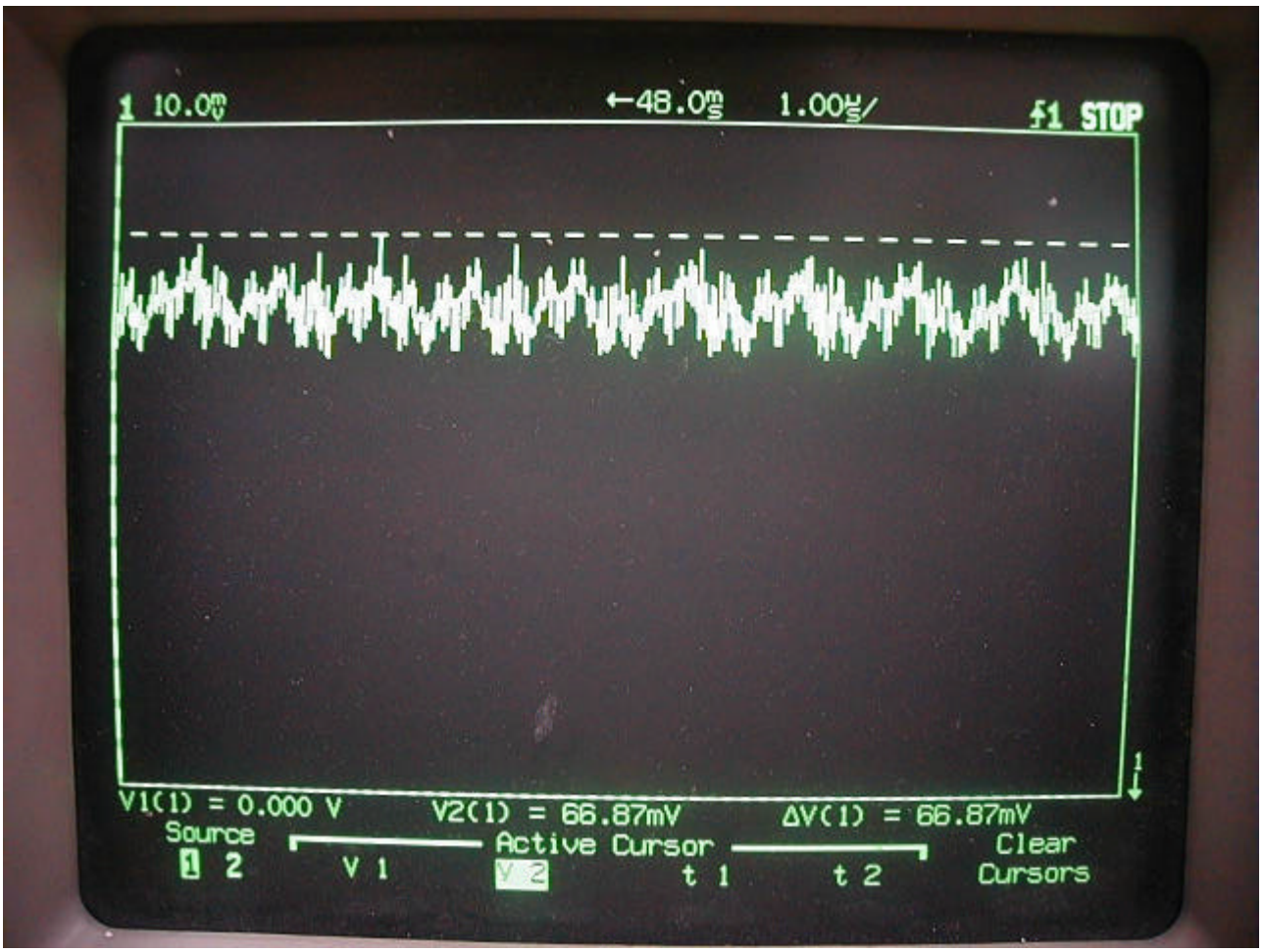
Formula:
Signal generator + Antenna gain + Cable loss = Output peak power

Channel	Signal Generator	Antenna Gain	Cable Loss	Limit	Output peak power	
	dBm	dBi	dBm	(DTS)	dBm	mW
CH1	15.11	1.5	-0.63	100mW	15.98	39.63
CH6	15.13	1.5	-0.65	100mW	15.98	39.63
CH11	15.13	1.5	-0.67	100mW	15.96	39.45

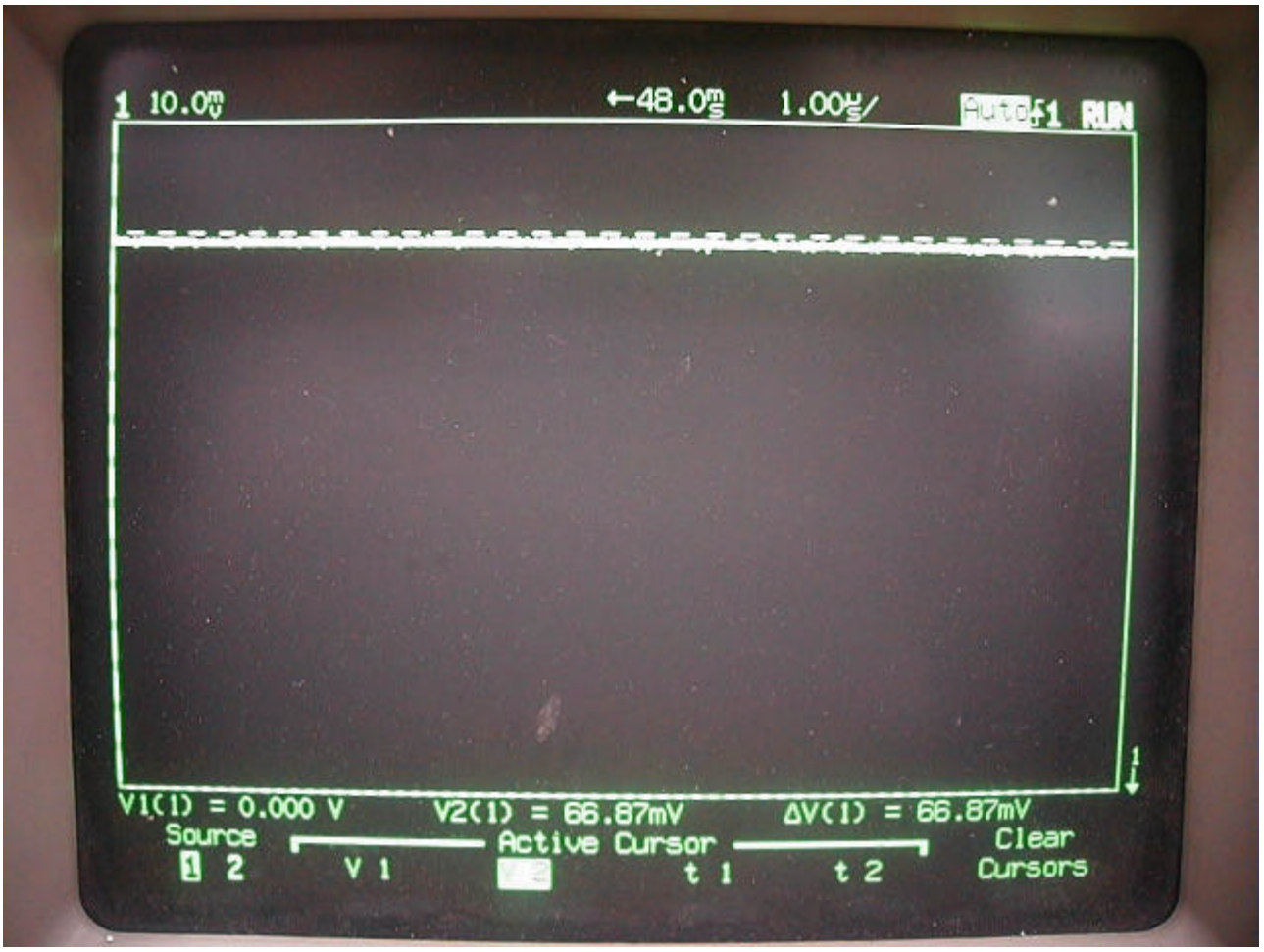
Note:
The limit is vary according to the equipment class, listed below:

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

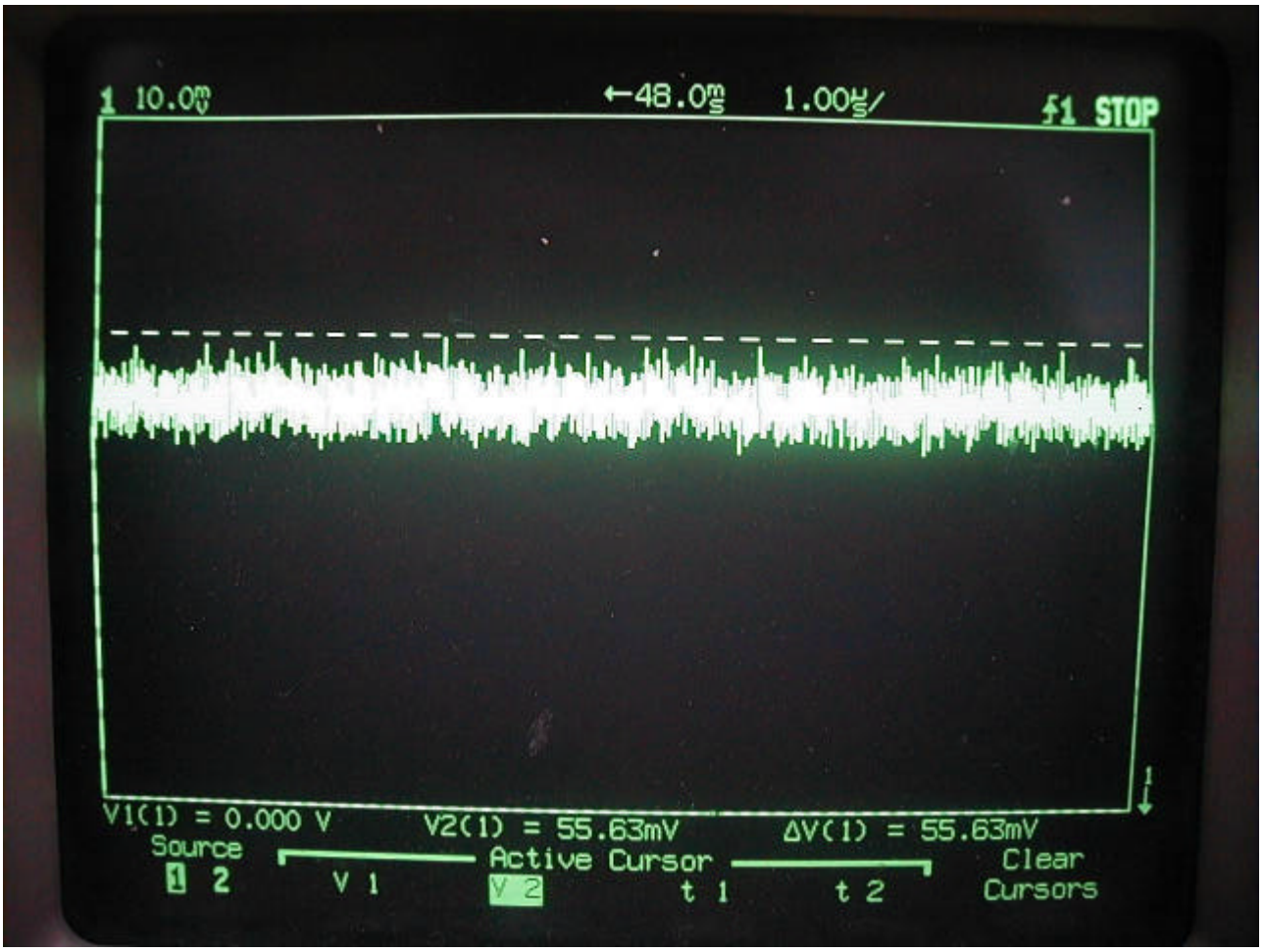
The Hardcopy of the oscilloscope (w/EUT) (Ch.1)



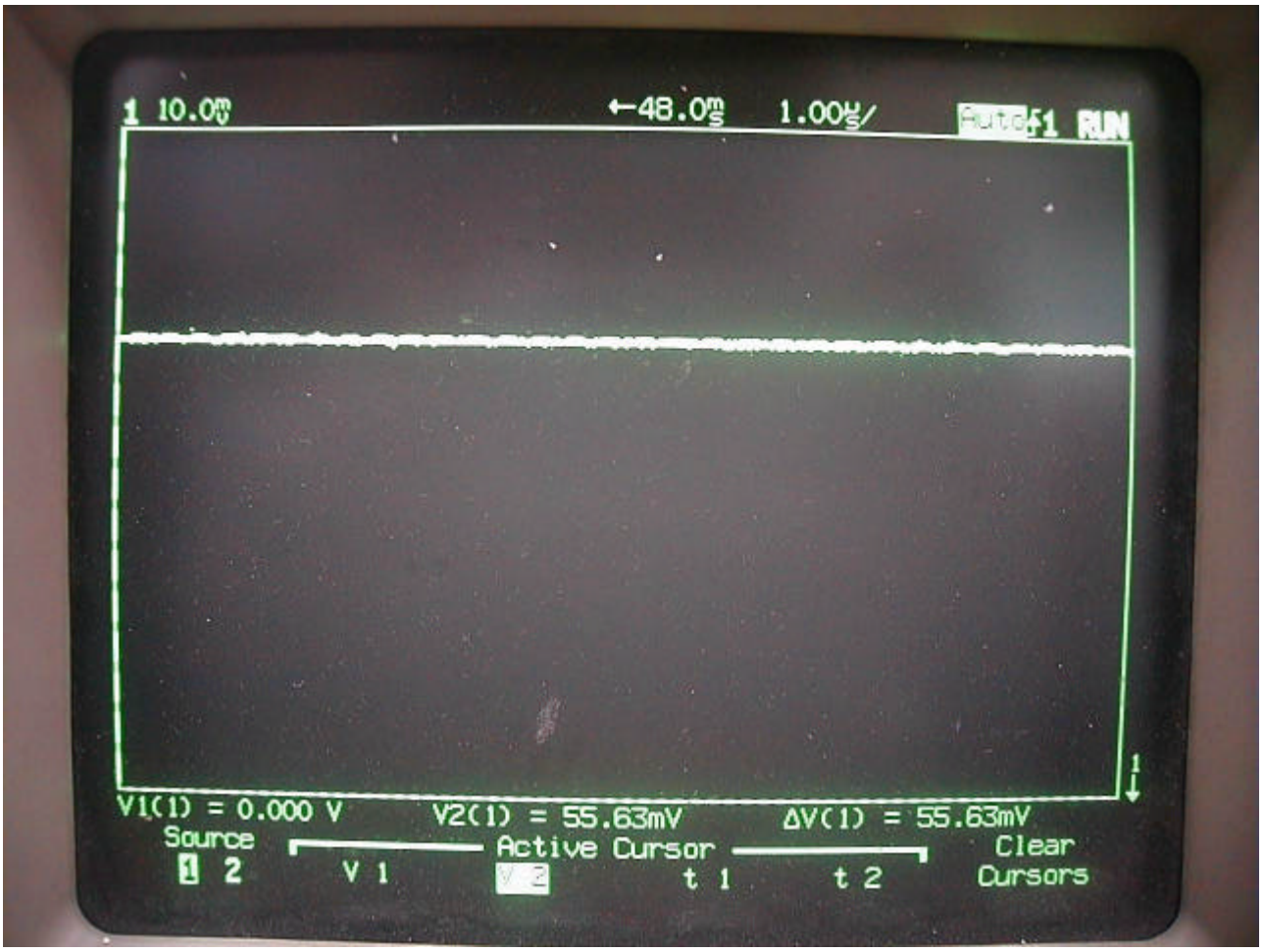
The Hardcopy of the oscilloscope (w/Signal Generator) (Ch.1)



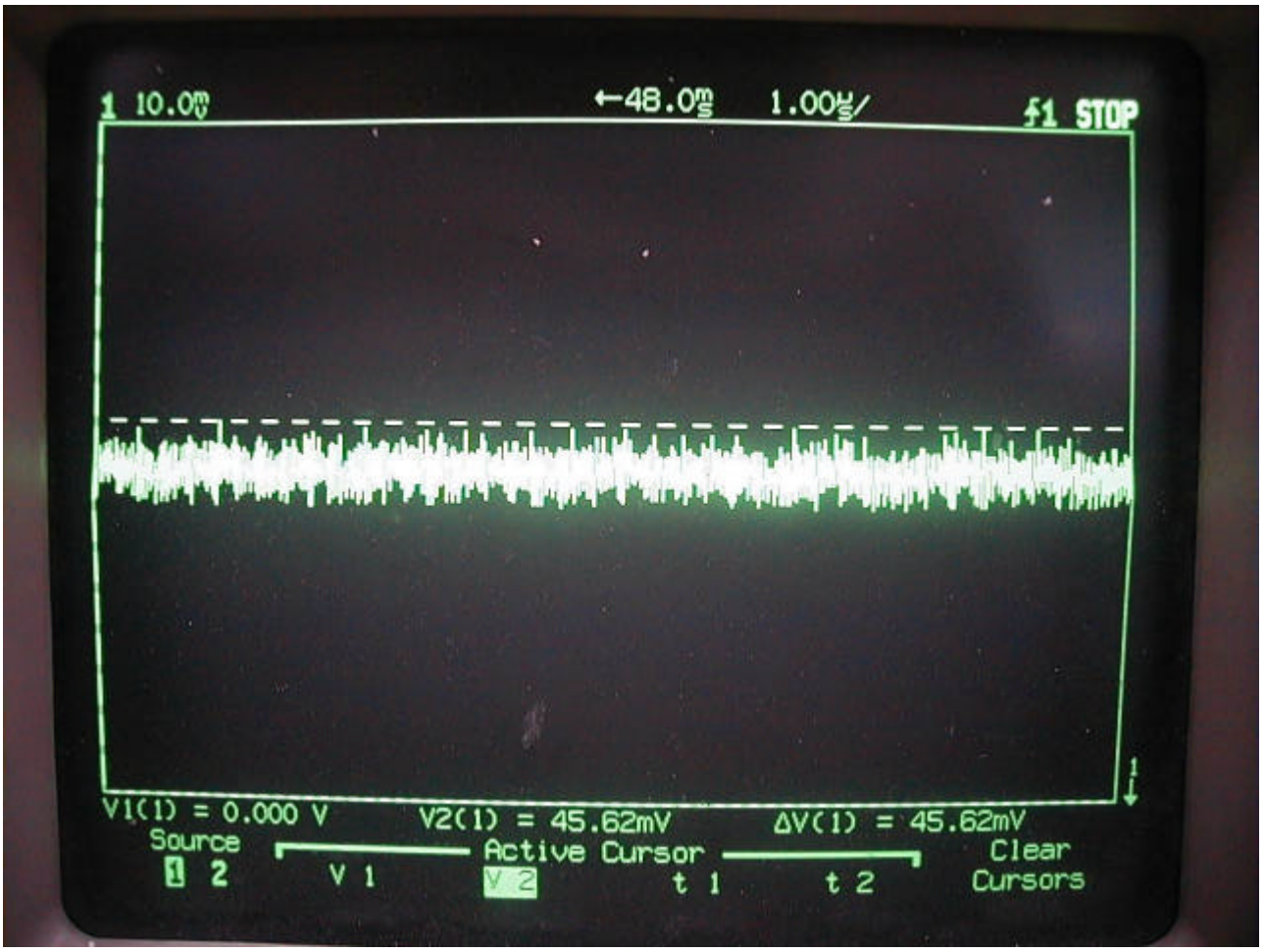
The Hardcopy of the oscilloscope (w/EUT) (Ch.6)



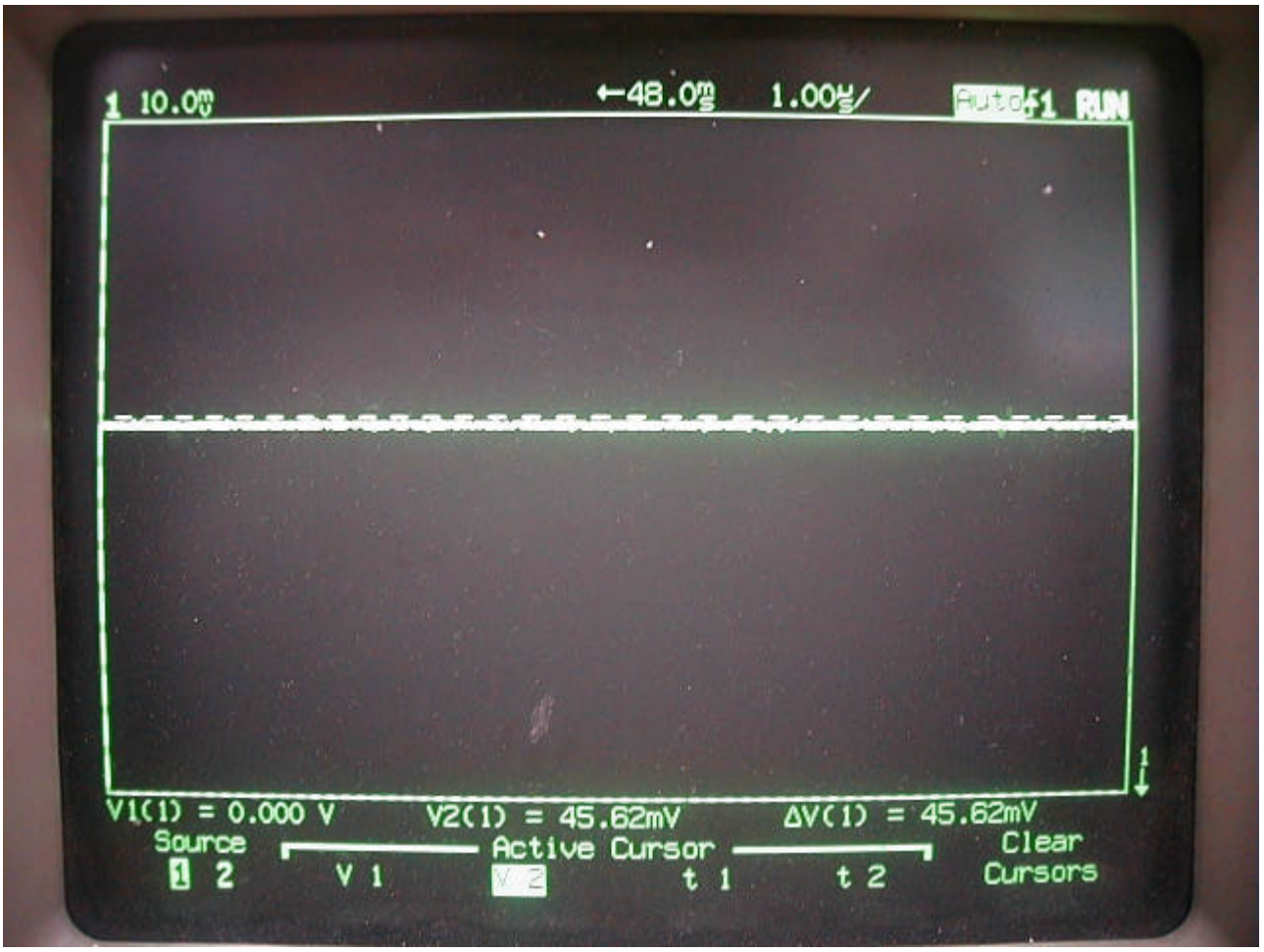
The Hardcopy of the oscilloscope (w/Signal Generator) (Ch.6)



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, EMCO 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 (dBμV/m) is determined by algebraically adding the measured reading in dBμV, 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 (dBuV/m) = FIr (dBμV) – 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 (dBμV/m) = FIr (dBμV) + Correction Factor

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

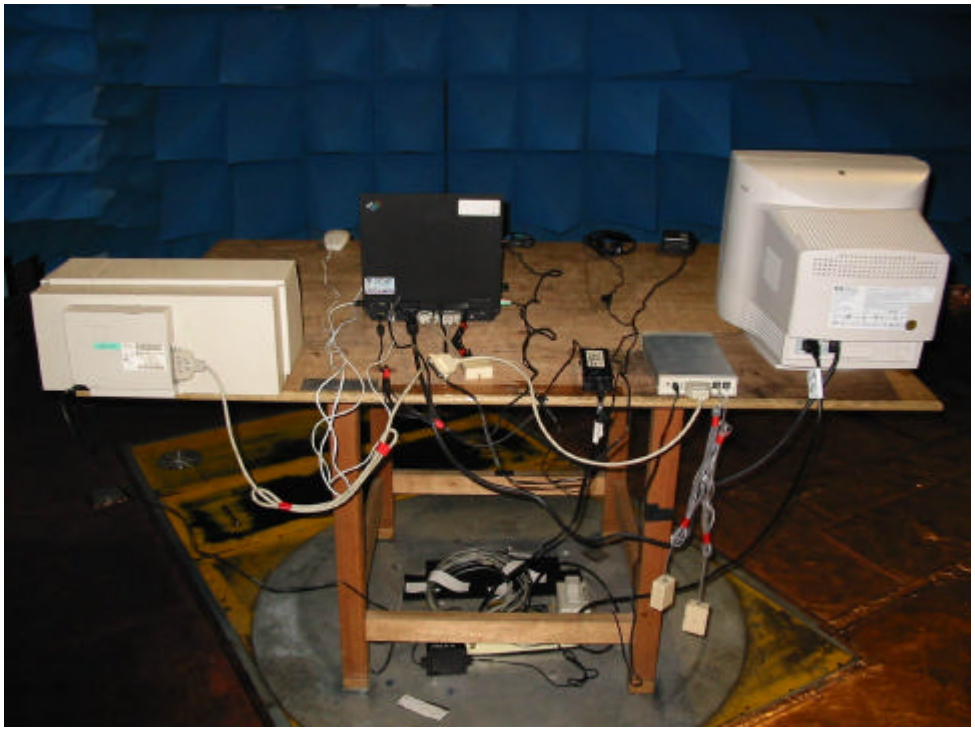
The setting up procedure is recorded on Appendix A.

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

<u>The test configuration for frequency between 1GHz to 18GHz is same as above.</u>

8.4 Test Result of Spurious Radiated Emissions

EUT's transmit only

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

FCC ID : MSQWLCFCWL110

EUT : ASUSTeK SpaceLink WL110 WLAN CompactFlash 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 (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
144.010	12.54	1.00	126	-15.22	27.76	43.50	-15.74
196.620	10.86	1.00	128	-14.05	24.91	43.50	-18.59
248.880	15.85	1.00	112	-16.53	32.38	46.00	-13.62
374.000	5.14	1.00	57	-20.16	25.30	46.00	-20.70
432.050	6.06	1.00	61	-21.68	27.74	46.00	-18.26
561.360	2.88	3.95	114	-25.17	28.05	46.00	-17.95

Note:

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

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

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
96.000	20.54	1.00	97	-11.46	32.00	43.50	-11.50
144.010	13.38	1.00	29	-14.56	27.94	43.50	-15.56
248.880	13.66	1.00	26	-16.60	30.26	46.00	-15.74
360.880	7.61	1.00	34	-19.59	27.20	46.00	-18.80
432.050	9.50	1.00	144	-21.71	31.21	46.00	-14.79
561.360	4.67	1.00	108	-25.96	30.63	46.00	-15.37

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.074	45.10	1.00	284	3.91	41.19	---	74.0	53.9	-32.81
*4.822	49.60	1.00	76	9.72	39.88	---	74.0	53.9	-34.12

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.074	46.77	1.00	138	3.91	42.86	---	74.0	53.9	-31.14
*4.822	47.60	1.00	81	9.72	37.88	---	74.0	53.9	-36.12

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]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
144.010	14.31	2.43	128	-15.22	29.53	43.50	-13.97
196.620	10.95	1.00	124	-14.05	25.00	43.50	-18.50
248.880	15.45	1.00	110	-16.53	31.98	46.00	-14.02
282.640	7.05	1.00	148	-16.79	23.84	46.00	-22.16
374.000	5.51	1.00	34	-20.16	25.67	46.00	-20.33
561.360	3.15	3.92	112	-25.17	28.32	46.00	-17.68

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

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
96.000	20.56	1.00	87	-11.46	32.02	43.50	-11.48
120.010	11.55	1.00	152	-13.78	25.33	43.50	-18.17
144.010	13.35	1.00	73	-14.56	27.91	43.50	-15.59
360.880	7.53	1.00	32	-19.59	27.12	46.00	-18.88
432.050	9.29	1.00	147	-21.71	31.00	46.00	-15.00
561.360	4.21	1.00	105	-25.96	30.17	46.00	-15.83

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.118	45.60	1.00	66	3.91	43.37	---	74.0	53.9	-30.63
*4.876	50.43	1.00	81	9.72	40.71	---	74.0	53.9	-33.29
6.197	47.43	1.00	96	9.72	37.71	---	74.0	---	-36.29

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.118	46.93	1.00	24	3.91	43.02	---	74.0	53.9	-30.98
*4.876	47.93	1.00	194	9.72	38.21	---	74.0	53.9	-35.79

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

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
147.460	12.54	2.43	120	-15.14	27.68	43.50	-15.82
248.880	15.90	1.00	122	-16.53	32.43	46.00	-13.57
336.040	9.77	1.00	107	-18.81	28.58	46.00	-17.42
374.000	5.37	1.00	53	-20.16	25.53	46.00	-20.47
432.050	5.78	1.00	58	-21.68	27.46	46.00	-18.54
641.560	2.12	1.00	109	-26.23	28.35	46.00	-17.65

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

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
96.000	20.45	1.00	83	-11.46	31.91	43.50	-11.59
120.010	11.71	1.00	139	-13.78	25.49	43.50	-18.01
144.010	12.56	1.00	76	-14.56	27.12	43.50	-16.38
196.620	7.27	2.44	16	-14.24	21.51	43.50	-21.99
432.050	9.09	1.00	147	-21.71	30.80	46.00	-15.20
561.370	4.18	1.00	103	-25.96	30.14	46.00	-15.86

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.919	49.77	1.00	86	3.91	45.86	---	74.0	53.9	-28.14
6.252	47.43	1.00	9	9.72	37.71	---	74.0	---	-36.29

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

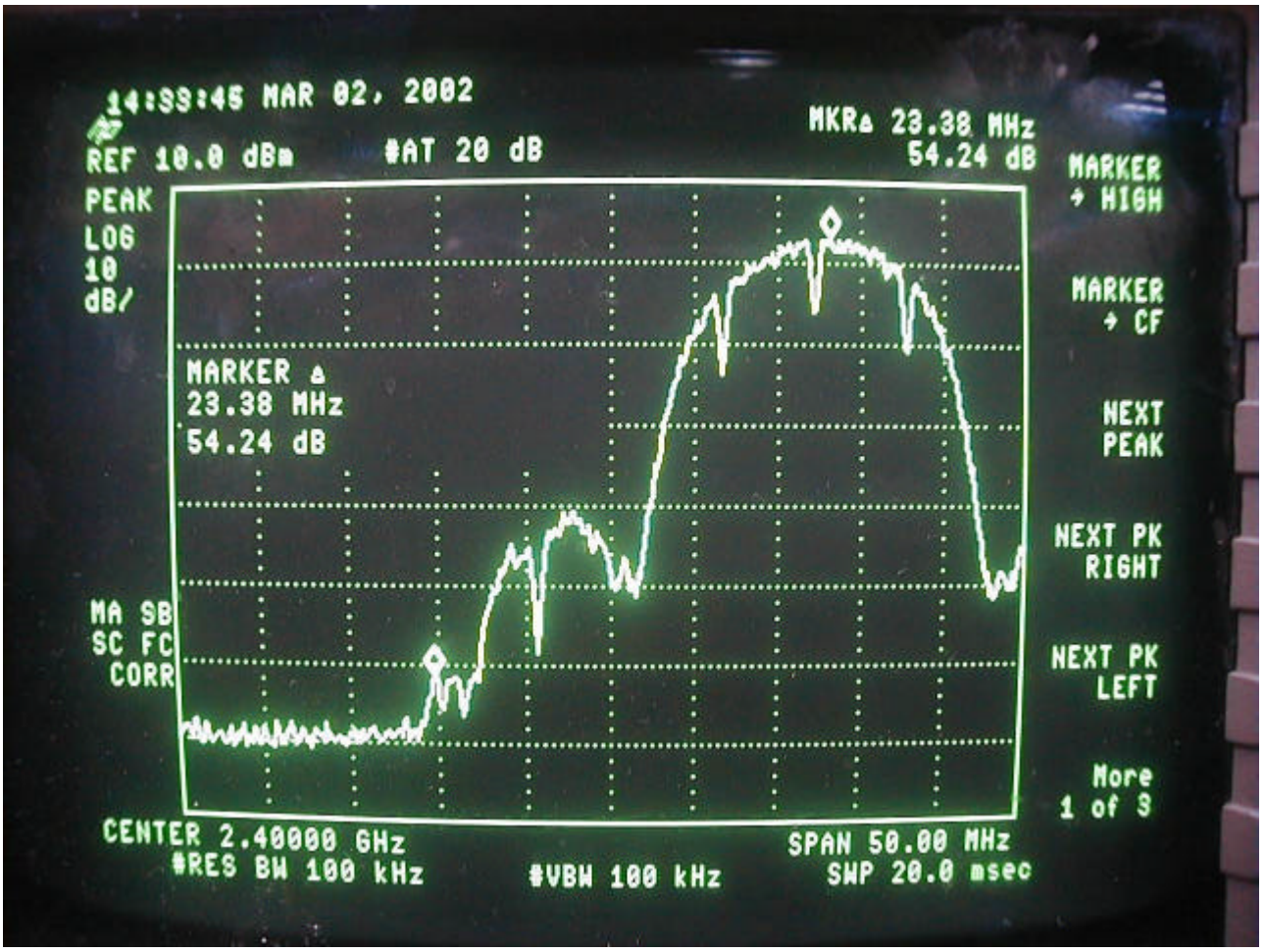
Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.172	46.10	1.00	94	3.91	42.19	---	74.0	53.9	-31.81
*4.919	49.77	1.00	43	3.91	45.86	---	74.0	53.9	-28.14
6.252	47.43	1.00	3	9.72	37.71	---	74.0	---	-36.29

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 id § 15.209(a), whichever results in the lesser attenuation.

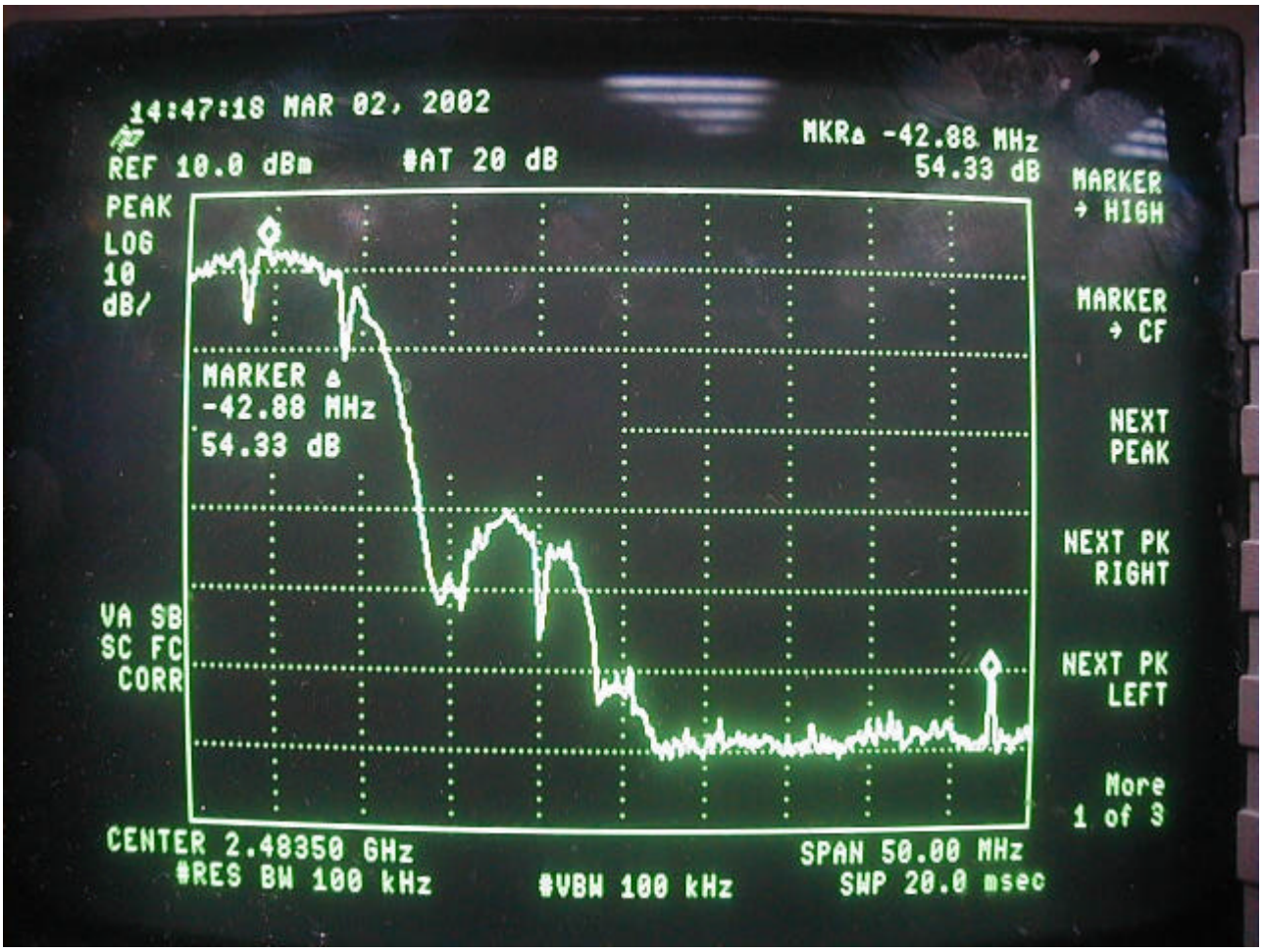
Test Condition & Setup: same as 3.1

Channel 1



#This is the hard copy of our bandedge measurement of channel 1. The spectrum plot extended to the 2390MHz (restriction band) is below 10dBuV. By involving our correction factor 35.6dB(1/m), the field strength should be also below 45.6dBuV/m. According to the Sect.15.205, The EUT comply with all the spurious emission below 54dbuV/m.

Channel 11



#This is the hard copy of our bandedge measurement of channel 11. The spectrum plot extended to the 2483.5MHz (restriction band) is below 10dBuV. By involving our correction factor 35.6dB(1/m), the field strength should be also below 45.6dBuV/m. According to the Sect.15.205, The EUT comply with all the the spurious emission below 54dbuV/m.

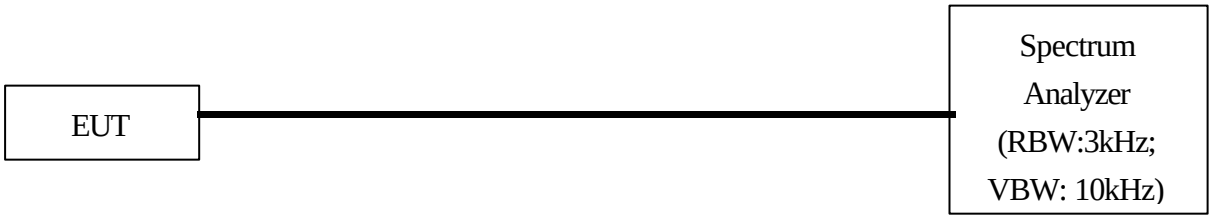
IX. Section 15.247(d): Power Spectral Density

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 out of .

FCC ID : MSQWLCFCWL110

Channel	*Frequency (GHz)*	*Ppr (dBuV)*	*CF (dB)*	*Ppq (dBm)*	*Limit (dB)*	*Margin (dB)*
CH 01	2.413	-10.15	1.80	-11.95	8.00	-19.95
CH 06	2.438	-10.16	1.85	-12.01	8.00	-20.01
CH 11	2.463	-10.18	1.93	-12.11	8.00	-20.11

Note:

1. The attachment follow by this page and there is no page number.
2. Ppr: spectrum read power density (using peak search mode), CF: correct factor, Ppq: actual peak power density in the spread spectrum band.
3. Ppq = Ppr + CF
4. Effective Radiation Power (E.R.P.) = $(E\ d)^2 / 30G$

"E" is the measured maximum field strength in V/m utilizing the maximum hold mode RBW (3KHz)

"G" is the numeric gain of the transmitting antenna over an isotropic radiator (1.00).

"d" is the distance in meters from which the field strength was measured (3M).

Example: the Max Radiation Emission = 39.64 + (35.60) = 87.33 dBμV/m

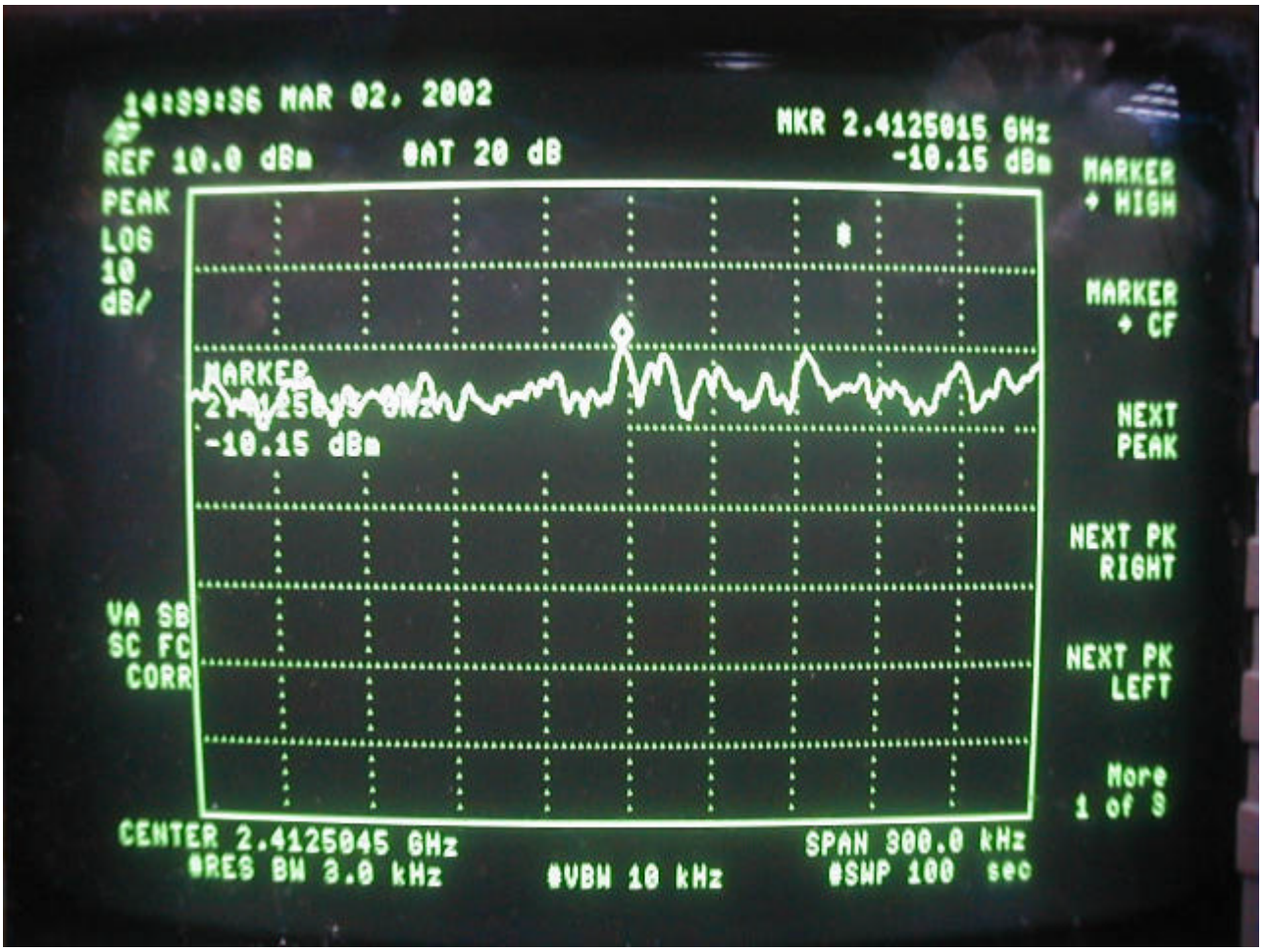
$10^{(87.33/20)} \times 10^{-6} = 0.011028$ V

E.R.P. = $(0.023254 \times 3)^2 / 30 = 0.162226$ mW

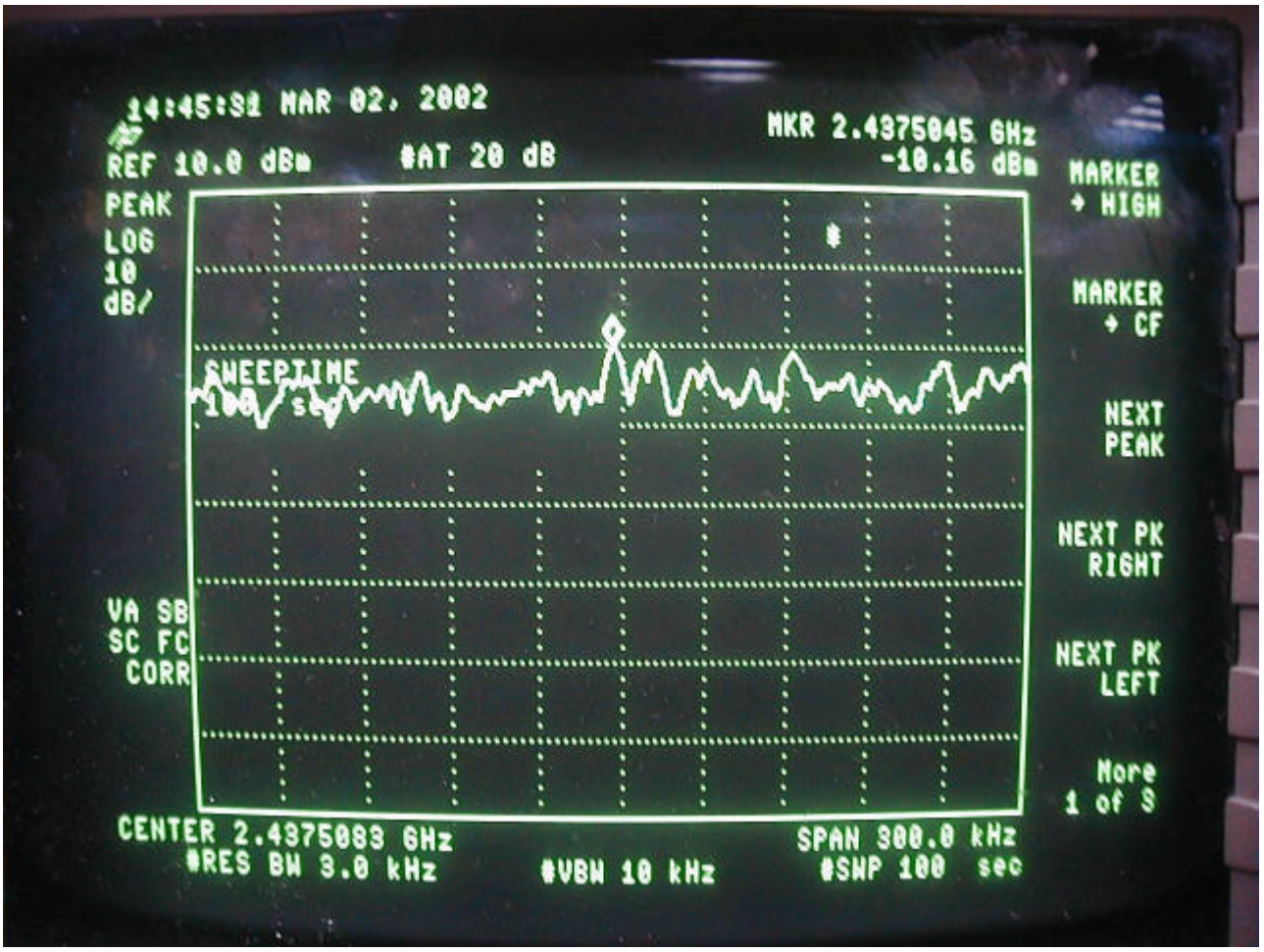
= 10 x log (0.162226 mW/1mW)

= -7.90 dBm

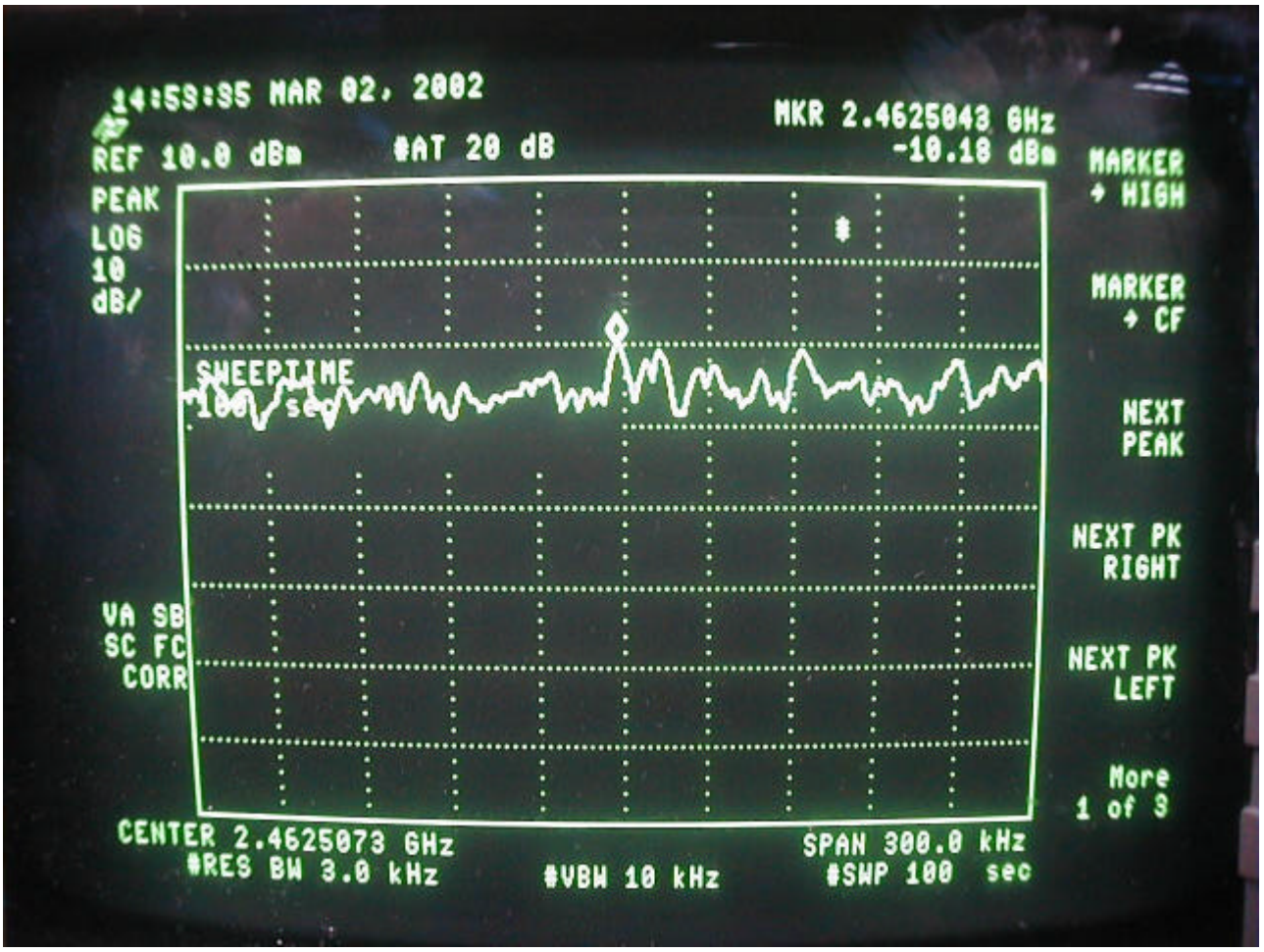
Channel 01


14:39:36 MAR 02, 2002
REF 10.0 dBm
ATT 20 dB
MKR 2.4125015 GHz
-10.15 dBm
PEAK
LOG
10
dB/
MARKER
-10.15 dBm
VA SB
SC FC
CORR
MARKER
→ HIGH
MARKER
→ CF
NEXT
PEAK
NEXT PK
RIGHT
NEXT PK
LEFT
More
1 of 3
CENTER 2.4125045 GHz
RES BW 3.0 kHz
VBW 10 kHz
SPAN 300.0 kHz
SWP 100 sec

Channel 06


14:45:31 MAR 02, 2002
REF 10.0 dBm
#AT 20 dB
MKR 2.4375045 GHz
-10.16 dBm
PEAK
LOG
10
dB/
SWEEPTIME
100 sec
VA SB
SC FC
CORR
MARKER
→ HIGH
MARKER
→ CF
NEXT
PEAK
NEXT PK
RIGHT
NEXT PK
LEFT
More
1 of 3
CENTER 2.4375083 GHz
#RES BW 3.0 kHz
#VBW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Channel 11


14:58:35 MAR 02, 2002
MKR 2.4625043 GHz
REF 10.0 dBm
#AT 20 dB
-10.18 dBm
MARKER → HIGH
PEAK
LOG
10
dB/
MARKER → CF
SWEEPTIME
100 sec
NEXT PEAK
NEXT PK RIGHT
VA SB
SC FC
CORR
NEXT PK LEFT
More 1 of 3
CENTER 2.4625073 GHz
SPAN 300.0 kHz
#RES BW 3.0 kHz
#VBW 10 kHz
#SWP 100 sec

Appendix A

Setting up Procedure

1. The EUT inserted into the PCMCIA slot of the notebook computer through a CF-PCMCIA adapter. Using the PCMCIA port of Notebook Computer and software to control the wireless LAN CompactFlash 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.