

MEASUREMENT REPORT of *Wireless LAN Cardbus Adapter*

Applicant : Edimax Technology Co., Ltd.
Model No. : See appendix-A
EUT : Wireless LAN Cardbus Adapter
FCC ID : NDD9571060301
Report No. : E3015133

Tested by :

Training Research Co., Ltd.

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

No. 255, Nanyang Street, Shijr, 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.*, 255 Nanyang Street, Shijr, 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 B (Declaration of Conformity) and Subpart C Section 15.247.**

Applicant : EDIMAX TECHNOLOGY CO., LTD.
Applicant address : No. 7, Lane 116, Wu-Kung Second Rd., Wu-Ku Industrial Park, Taipei Hsien, Taiwan, R.O.C.
Product Name : Wireless LAN Cardbus Adapter
Model Name : See appendix-A
FCC ID : NDD9571060301
Report No. : E3015133
Test Date : March 15, 2003

Prepared by: 
Jack Tsai

Approved by: 
Frank Tsai

Conditions of issue :

- (1) **This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.**
- (2) **This report must not be used by the client to claim product endorsement by NVLAP or any agency of U.S. Government.**

★ NVLAP LAB CODE: 200174-0

Federal Communications Commission **Declaration of Conformity (DoC)**

For the Following Equipment:

Product name : EDIMAX TECHNOLOGY CO., LTD.

Model name : See appendix-A

Trade name : See appendix-A

Is herewith confirmed and found to comply with the requirements of CFR 47 part15 Subpart B - Unintentional Radiators regulation. The results of electromagnetic mission evaluation are shown in the **report number : E3015133**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation

<i>Manufacturer</i>	<i>USA local representative</i>
Company name: EDIMAX TECHNOLOGY CO., LTD.	To be determined
Computer address: 7, Lane 116, Wu-Kung Second Rd., Wu-Ku Industrial Park, Taipei Hsien, Taiwan	
ZIP / Postal code 248	
Contact person: Arthur Shen	
Title: R & D Manager	
Internet e-mail address: arthur.shen@edimax.com.tw	
Tel / Fax: +886-2-77396602 / +886-2-77396887	

Tables of Contents

I. GENERAL	6
1.1 Introduction	6
1.2 Description of EUT	6
1.3 Test method	6
1.4 Description of Support Equipment	7
1.5 Configuration of System Under Test	9
1.6 Verify the Frequency and Channel	11
1.7 Test Procedure	12
1.8 Location of the Test Site	12
1.9 General Test Condition	12
II. Section 15.101(a) : Equipment Authorization of Unintentional Radiators	13
III. Section 15.203 : Antenna Requirement	14
IV. Section 15.207 : Power Line Conducted Emissions for AC Powered Units	15
4.1 Test Condition & Setup	15
4.2 List of Test Instruments	15
4.3 Test Result of Conducted Emissions	16
Table 1 Conducted emissions of Channel 01	16
Table 2 Conducted emissions of Channel 06	17
Table 3 Conducted emissions of Channel 11	17
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
Channel 01	21
Channel 06	22
Channel 11	23

VII. Section 15.247(b) : Power Output 24

 7.1 Test Condition & Setup 24

 7.2 List of Test Instruments 24

 7.3 Test Result 25

VIII. Section 15.247(c) : Spurious Emissions (Radiated) 26

 8.1 Test Condition & Setup 26

 8.2 List of Test Instruments 27

 8.3 Test Result of Spurious Radiated Emissions 28

 Table 4 Radiated emissions of Horizontal for 30MHz to 1GHz 28

 Table 5 Radiated emissions of Vertical for 30MHz to 1GHz 28

 Table 6 Above 1GHz radiated emissions of Horizontal of CH1 29

 Table 7 Above 1GHz radiated emissions of Vertical of CH1 29

 Table 8 Above 1GHz radiated emissions of Horizontal of CH6 30

 Table 9 Above 1GHz radiated emissions of Vertical of CH6 30

 Table 10 Above 1GHz radiated emissions of Horizontal of CH11 31

 Table 11 Above 1GHz radiated emissions of Vertical of CH11 31

 8.4 Test Result of Bandedge..... 32

 Channel 01 33

 Channel 11 34

IX. Section 15.247(d) : Power Spectral Density 35

 9.1 Test Condition & Setup 35

 9.2 Test Instruments Configuration 35

 9.3 List of Test Instruments 35

 9.4 Test Result of Power Spectral Density 36

 Channel 01 37

 Channel 06 38

 Channel 11 39

Appendix A: Brand name and Modem name List 40

. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of applicant in support that the *PC Card* certification in accordance with Part 2 Subpart J and Part 15 Subpart A, B and C of the Commission's Rules and Regulations.

1.2 Description of EUT

EUT : Wireless LAN Cardbus Adapter
Model No. : See appendix-A
Granted FCC ID : NDD9571060301
Frequency Range : 2.412 GHz ~ 2.462GHz
Support Channel : 11 Channel
Modulation Skill : DBPSK, DQPSK, CCK
Power Type : By the PCMCIA of Notebook

1.3 Test method

1. Insert the EUT into the PCMCIA interface of the notebook computer
2. Using the notebook computer and software provided by the manufacturer to control EUT. The software is operated under the Windows to control the EUT in the continuous transmission mode.
3. Set different channel being tested and repeat the procedures above.
 - (a) Radiated for intentional test:
making EUT to the mode of continuous transmission
 - (b) Conducted and Radiated for unintentional test:
making EUT to the linking (Rx/Tx) mode with far support equipments

1.4 Description of Support Equipment

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

Notebook : **IBM Think Pad X20**

Model No. : 2662-11T

Serial No. : FX-1192200/09

FCC ID : N/A, Doc Approved

檢磁 : 3892B565

Adaptor : **IBM**

Model No. : PA2450U

Serial No. : 02K6654

FCC ID : N/A, Doc Approved

Power type : I/P: 100 ~ 240vac, 50 ~ 60 Hz, 0.5A ~ 1.2A; O/P: 16Vdc, 4.5A

Power cord : Non-shielded, 1.80m long, Plastic, with ferrite core

Notebook PC : **ASUSTek Computer**

Model No. : AB00F

Serial No. : 24NP016361

FCC ID : DoC Approved

BSMI : 41016012

Power type : 100 ~ 240VAC, 1A 50/60 Hz, Switching

Adaptor of Notebook : **LITE-ON Electronics, Inc.**

Model No. : PA-1530-01

Serial No. : 00151184

FCC ID : Doc Approved

檢磁 : 3882B259

Power cable : Non-shielded, 1.72m length, Plastic hood, No ferrite core
(Between power adaptor and AC power source)

Power cable : Shielded, 1.48m length, Plastic hood, with ferrite core
(Between power adaptor and notebook)

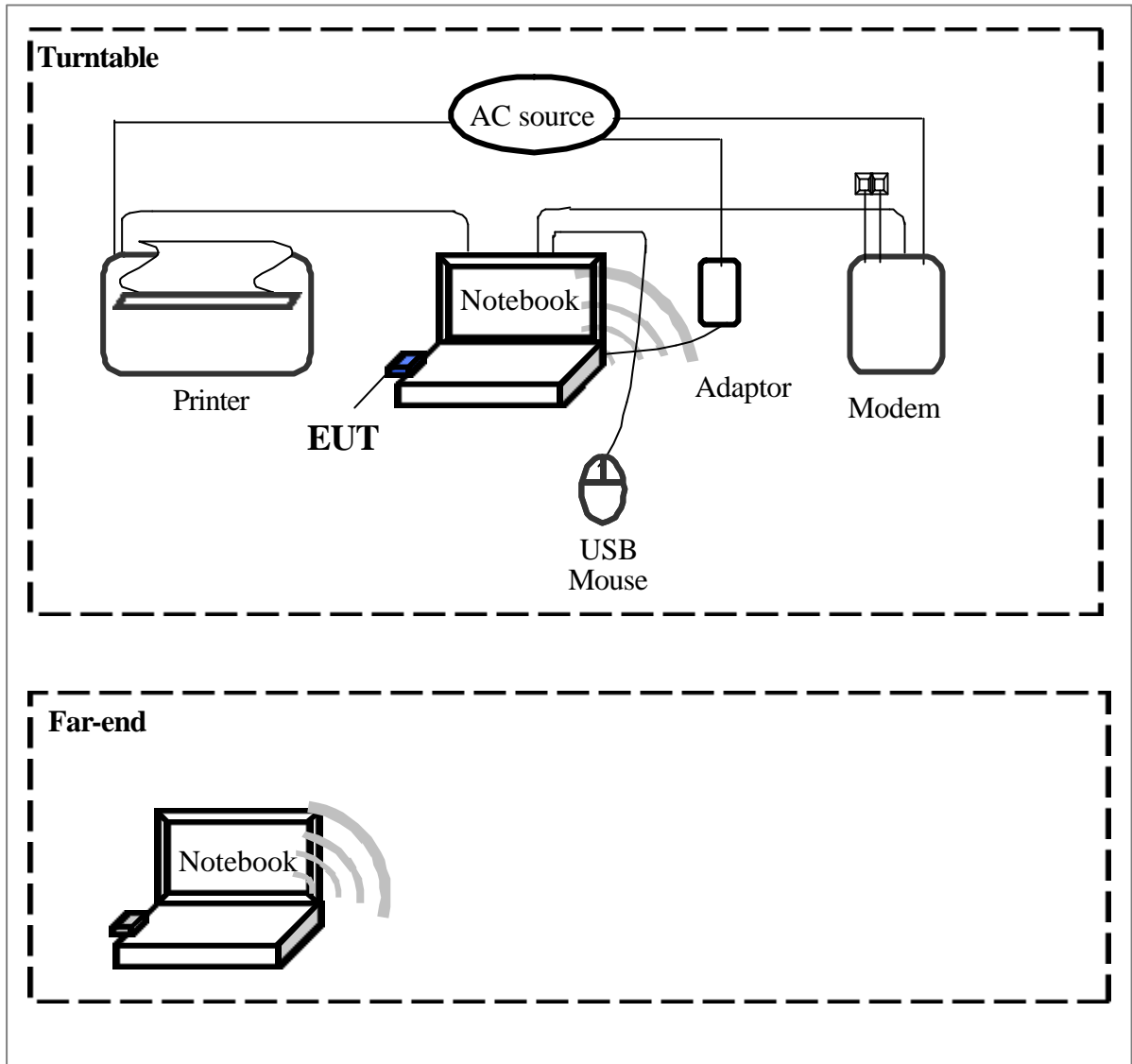
Fax/Modem : **Aceex**
Model No. : DM-1414
Serial No. : 9010582
FCC ID : IFAXDM1414
Power type : 110 VAC / 50 ~ 60 Hz, Switching
Power Cord : Non-shielded, 1.90m long, Plastic hoods, and no ferrite bead
Data Cable : RS-232 Shielded, 1.30m long, Metal hoods , No bead
RJ-11Cx2 Non-shielded, 7' long, Plastic hoods, No bead

Printer : **HP**
Model No. : C6464A
Serial No. : TH16LEB5PK
FCC ID : N/A, DoC Approved
檢磁 : 3892H381
Power type : Switching adaptor
Power cord : Non-shielded, 173cm long, No ferrite core
(between adaptor and AC source)
Non-shielded, 180cm long, with ferrite core
(between printer and adaptor)
Data cable : Shielded, 1.70m long, No ferrite core

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

1.5 Configuration of System Under Test

(Conducted and Radiated for unintentional)

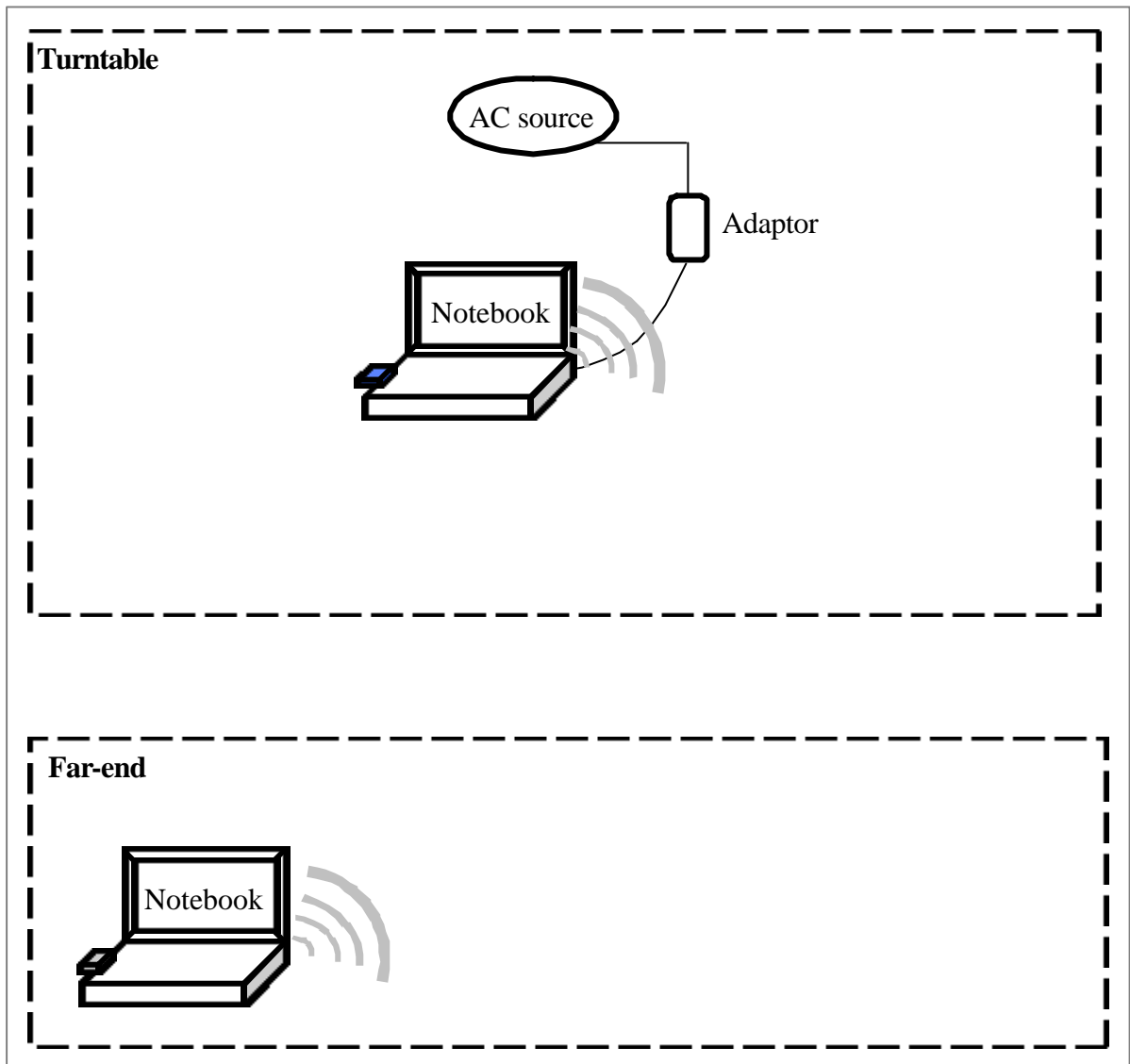


The setting up procedure was recorded in <1.3> test method.

Connections of Computer:

- *Parallel Port --- a printer
- *Serial Port --- an external modem
- *USB Port --- a USB mouse
- *PCMCIA Interface --- **EUT**

(Radiated of intentional)



The tests below are carried out the EUT transmitter set at high power in TDD mode. The EUT is needed to force selection of output power level and channel number.

The setting up procedure was recorded in <1.3> test method.

1.6 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.

1.7 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 <1.3>, the detail setup was written on each test item.

1.8 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. 255 Nanyang Street, Shijr, 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. 255 Nanyang Street, Shijr, 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.

1.9 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 computer. The ch01, ch06 and ch11 of EUT were all tested. The setting up procedure is recorded on <1.3> test method.

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

The EUT equipped with a PCMCIA interface and should be operated with the computer. It was categorized to *Class B personal computers and peripherals* as cannot be operated stand-alone. The authorization requires **Declaration of Conformity (DoC)** 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).

III. Section 15.203: Antenna requirement

The EUT has an integrated antenna permanently attached on the PCB, the antenna inside the housing. 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 150 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 applies in this test item, the test procedure description as the following: EUT transmit only:

Using the LAN port of notebook computer and software to control the EUT. The setting up procedure is recorded on <1.3>. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

4.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Calibration Date	
				Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/28/02	06/28/03
RF Filter Section	85460A	H P	3448A00217	06/28/02	06/28/03
LISN (EUT)	LISN-01	TRC	9912-03,04	06/04/02	06/04/03
LISN (Support E.)	LISN-01	TRC	9912-05	07/15/02	07/15/03
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/02	11/20/03

The level of confidence of 95%, the uncertainty of measurement of conducted emission is ± 2.02 dB.

4.3 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.

Test Conditions: Testing room : Temperature : 25 °C Humidity : 73 % RH

Table 1 Test mode: Channel 1

<i>Power Connected Emissions</i>					<i>FCC Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBmV)</i>	<i>QP (dBmV)</i>	<i>Average (dBmV)</i>	<i>QP-limit (dBmV)</i>	<i>AVG-limit (dBmV)</i>	<i>Margin (dB)</i>
Line 1	195.00	48.80	---	---	64.71	54.71	-5.91
	255.00	41.95	---	---	63.00	53.00	-11.05
	320.00	38.56	---	---	61.14	51.14	-12.58
	394.00	29.43	---	---	59.03	49.03	-19.60
	513.00	28.00	---	---	56.00	46.00	-18.00
	10240.00	33.21	---	---	60.00	50.00	-16.79
Line 2	191.00	44.71	---	---	64.83	54.83	-10.12
	257.00	37.78	---	---	62.94	52.94	-15.16
	320.00	34.96	---	---	61.14	51.14	-16.18
	384.00	31.43	---	---	59.31	49.31	-17.88
	575.00	24.43	---	---	56.00	46.00	-21.57
	10950.00	31.68	---	---	60.00	50.00	-18.32

NOTE:

- (1)Margin = Amplitude – Limit, **The reading amplitudes are all under 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 Test mode: Channel 6

<i>Power Connected Emissions</i>					<i>FCC Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBmV)</i>	<i>QP (dBmV)</i>	<i>Average (dBmV)</i>	<i>QP-limit (dBmV)</i>	<i>AVG-limit (dBmV)</i>	<i>Margin (dB)</i>
Line 1	191.00	50.32	---	---	64.83	54.83	-4.51
	255.00	41.71	---	---	63.00	53.00	-11.29
	323.00	38.13	---	---	61.06	51.06	-12.93
	384.00	32.56	---	---	59.31	49.31	-16.75
	513.00	27.07	---	---	56.00	46.00	-18.93
	10830.00	33.56	---	---	60.00	50.00	-16.44
Line 2	193.00	45.77	---	---	64.77	54.77	-9.00
	255.00	37.99	---	---	63.00	53.00	-15.01
	320.00	34.06	---	---	61.14	51.14	-17.08
	384.00	28.34	---	---	59.31	49.31	-20.97
	513.00	25.51	---	---	56.00	46.00	-20.49
	10730.00	31.54	---	---	60.00	50.00	-18.46

Table 3 Test mode: Channel 11

<i>Power Connected Emissions</i>					<i>FCC Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBmV)</i>	<i>QP (dBmV)</i>	<i>Average (dBmV)</i>	<i>QP-limit (dBmV)</i>	<i>AVG-limit (dBmV)</i>	<i>Margin (dB)</i>
Line 1	191.00	50.03	---	---	64.83	54.83	-4.80
	255.00	39.69	---	---	63.00	53.00	-13.31
	320.00	37.97	---	---	61.14	51.14	-13.17
	384.00	33.58	---	---	59.31	49.31	-15.73
	452.00	29.68	---	---	57.37	47.37	-17.69
	10630.00	33.92	---	---	60.00	50.00	-16.08
Line 2	193.00	46.80	---	---	64.77	54.77	-7.97
	255.00	38.58	---	---	63.00	53.00	-14.42
	320.00	34.63	---	---	61.14	51.14	-16.51
	384.00	31.02	---	---	59.31	49.31	-18.29
	639.00	23.27	---	---	56.00	46.00	-22.73
	10630.00	31.32	---	---	60.00	50.00	-18.68

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

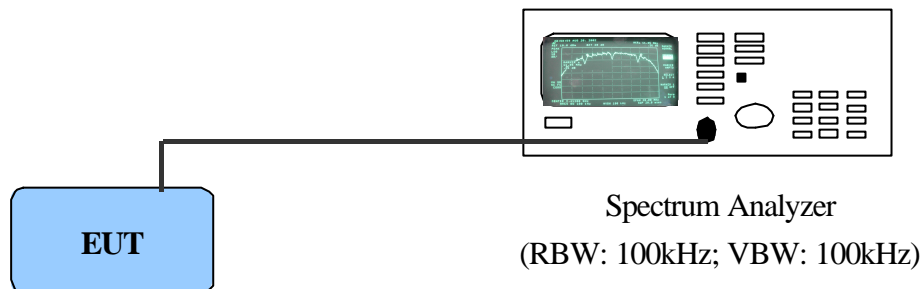
Based on the Section 2.1, *Direct Sequence System* is a spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the “modulating function” and is the direct cause of the wide spreading of the transmitted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

6.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8564E	HP	US36433002	08/01/02	08/01/03

6.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth : 9.50 MHz
The min. 6 dB BW at least : 500 KHz

Bandwidth of Channel 6

Bandwidth : 9.53 MHz
The min. 6 dB BW at least : 500 KHz

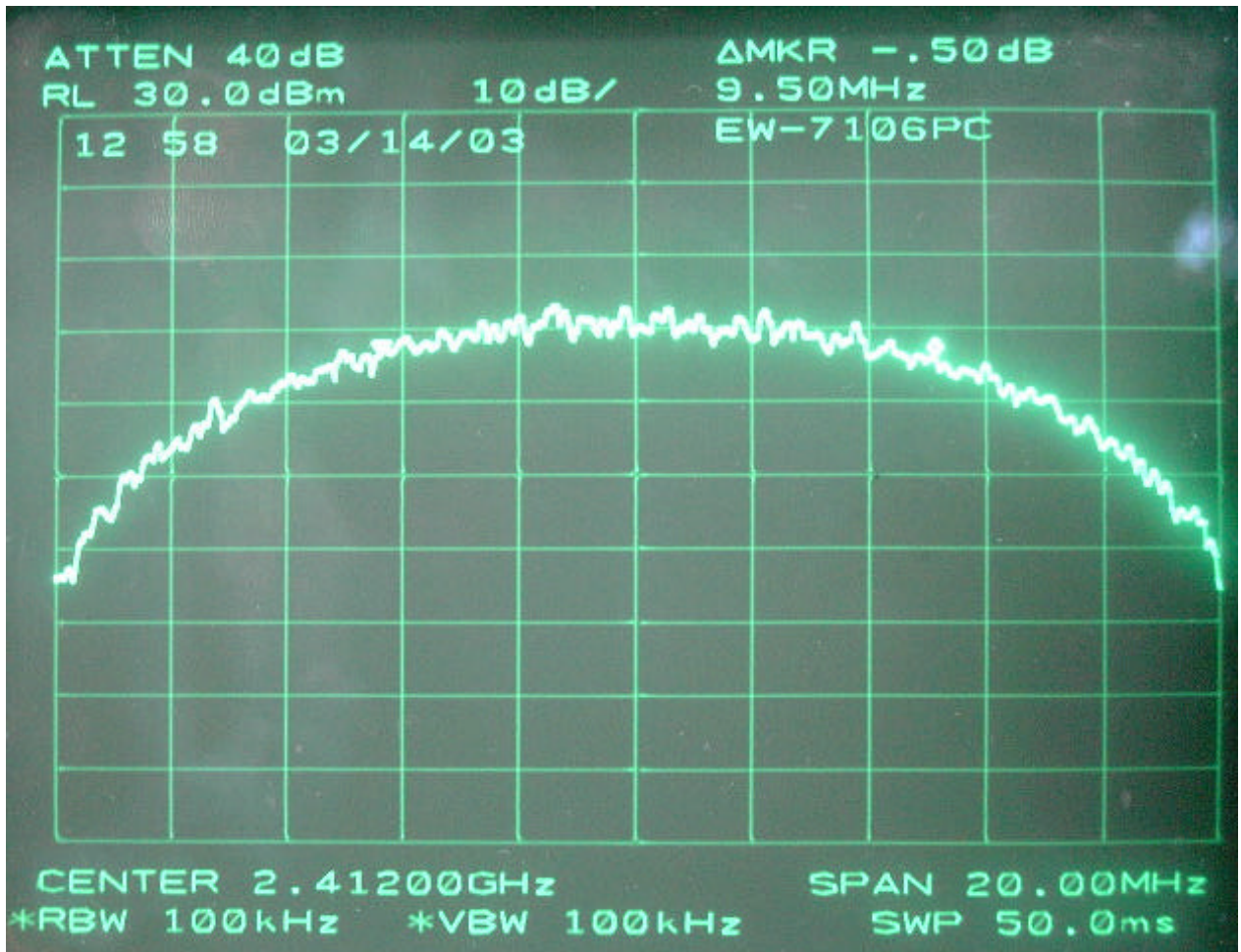
Bandwidth of Channel 11

Bandwidth : 9.53 MHz
The min. 6 dB BW at least : 500 KHz

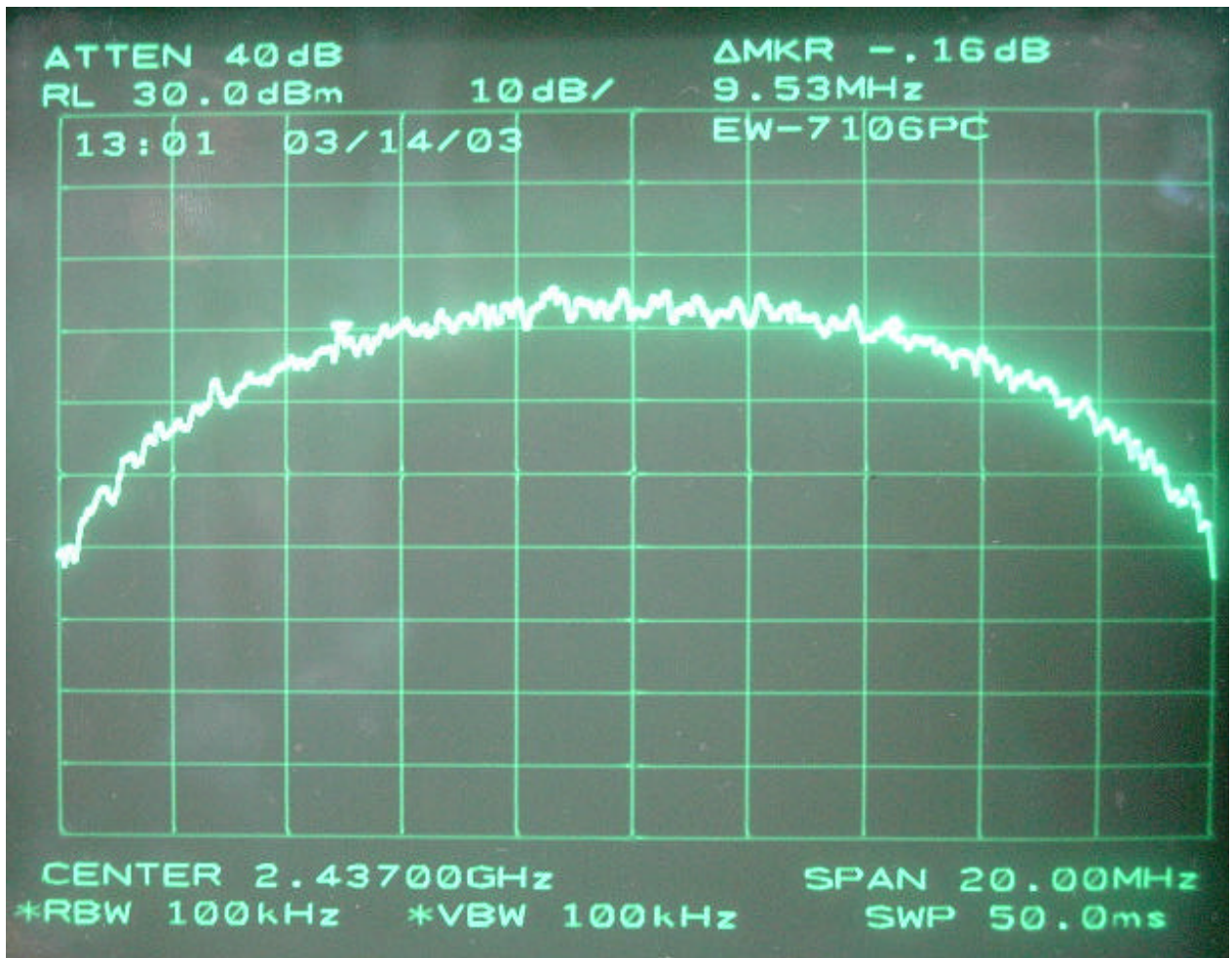
Note:

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 $span \gg RBW$. The results show the measured 6dB bandwidth comply with the minimum 500kHz requirement.
2. The attachments show these on the following pages.

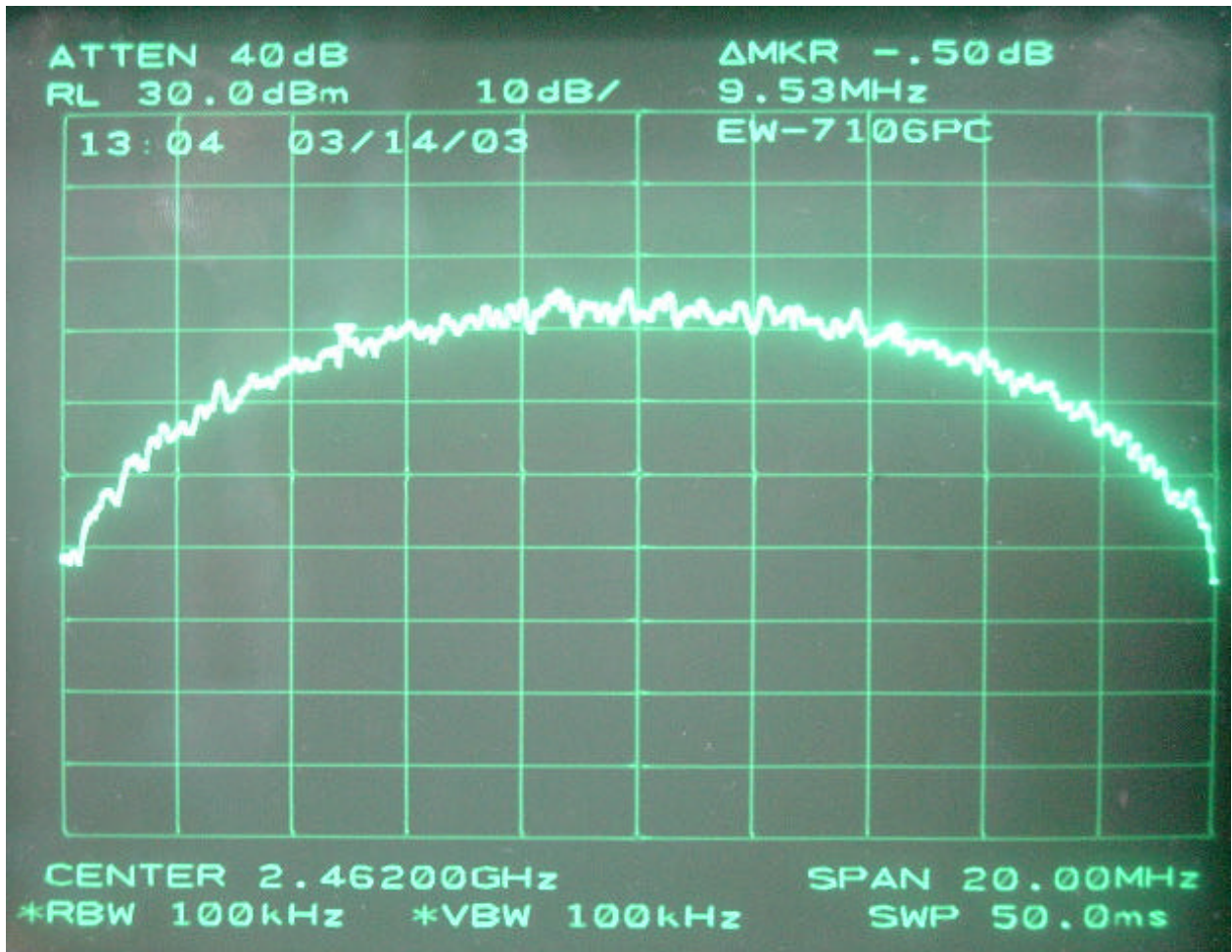
Bandwidth of Channel 1: 9.50 MHz



Bandwidth of Channel 6: 9.53 MHz

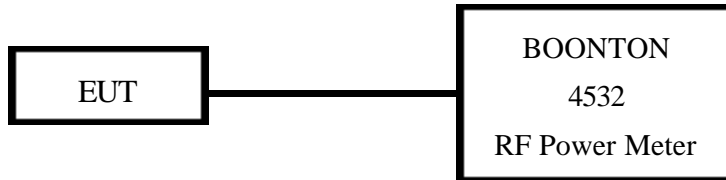


Bandwidth of Channel 11: 9.53 MHz



VII. Section 15.247(b): Power Output

7.1 Test Condition & Setup



1. The output of the transmitter is connected to the BOONTON RF Power Meter.
2. The calibration is performed before every test. The values of the output power of the EUT will shown in the dBm directly are the transmitter output peak power. Recording as follows.

7.2 List of Test Instruments

<u>Instrument Name</u>	<u>Model No.</u>	<u>Brand</u>	<u>Serial No.</u>
RF Power Meter	4532	BOONTON	117501

7.3 Test Result

<p>Formula: Signal generator + Cable loss = Output peak power</p>

Channel	Signal Generator	Cable Loss	Limit	Output peak power	
	dBm	dBm	(DTS)	dBm	mW
CH 1	13.76	0.6	100mW	14.36	27.290
CH 6	13.56	0.6	100mW	14.16	26.062
CH 11	13.20	0.6	100mW	13.80	23.989

Note:

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

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