

MEASUREMENT REPORT

of

Wireless PC Card 32-bit CardBus

Applicant : Netgear Inc.
Product Name : Wireless PC Card 32-bit CardBus
Model Name : WG511V2H1
FCC ID : PY3WG511V2H1
Report No. : N1015950

Tested by :

Training Research Co., Ltd.

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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 : Netgear Inc
Applicant address : 4500 Great America Parkway, Santa Clara, CA 9054, USA
Product Name : Wireless PC Card 32-bit CardBus
Model Name : WG511V2H1
FCC ID : PY3WG511V2H1
Report No. : N1015950
Test Date : 2004/8/23 to 2004/9/3

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.**
- (3) **This test report, measurements made by TRC are traceable to the NIST only Conducted and Radiated Method.**

★ NVLAP LAB CODE: 200174-0

Federal Communications Commission
Declaration of Conformity
(DoC)

For the Following Equipment:

Product name : Wireless PC Card 32-bit CardBus
Model name : WG511V2H1
Trade name : NETGEAR

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 : N1015950

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

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I . GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of applicant in support that the 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

FCC ID : PY3WG511V2H1
Model Name : WG511V2H1
Product Description : Wireless PC Card 32-bit CardBus
Frequency Range : 2.412 GHz ~ 2.462GHz
Support Channel : 11 Channels
Modulation Skill : DBPSK, DQPSK, CCK, OFDM
Power Type : Power by PCMCIA interface of client's device

1.3 Test method

1. Insert the EUT into the PCMCIA bus of the notebook computer and fix it
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, the test is performed under the specific conditions.
3. Set different data rate and channel (CH01/CH06/CH11) being tested and repeat the procedures above.
 - (3.1) Radiated for Intentional test:
making EUT to the mode of continuous transmission
 - (3.2) Conducted test 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
BSMI	:	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
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	:	EPSON
Model No.	:	B241A
Serial No.	:	FAPY155090
FCC ID	:	N/A, DoC Approved
BSMI	:	R33126
Power type	:	Switching adaptor
Power cord	:	Non-shielded, 180cm long, No ferrite core
Data cable	:	Shielded, 1.70m long, No ferrite core

USB Gamepad : Rockfire

Model No. : QF-337uv
Serial No. : 10600545, KR91379759
FCC ID : None (CE approval)
BSMI : 3862A574
Power type : By computer
Data Cable : Shielded, 1.81m long, Plastic, with ferrite core

Mouse : IBM

Model No. : M-SAU-IBM6
Serial No. : 23-221359
FCC ID : Doc Approved
BSMI : 4872A231
Power type : By PC
Power cord : Shielded, 1.88m length, Plastic hood, No ferrite core

Notebook : 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 PC : LITE-ON Electronics, Inc.

Model No. : PA-1530-01
Serial No. : 00151184
FCC ID : Doc Approved
BSMI : 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)

WLAN Card : Gemtek Technology Co., Ltd.

Model No. : C911003
FCC ID : MXF-C911003

Adaptor of PC : LITE-ON Electronics, Inc.

Model No. : PA-1530-01

Serial No. : 00151184

FCC ID : Doc Approved

BSMI : 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)

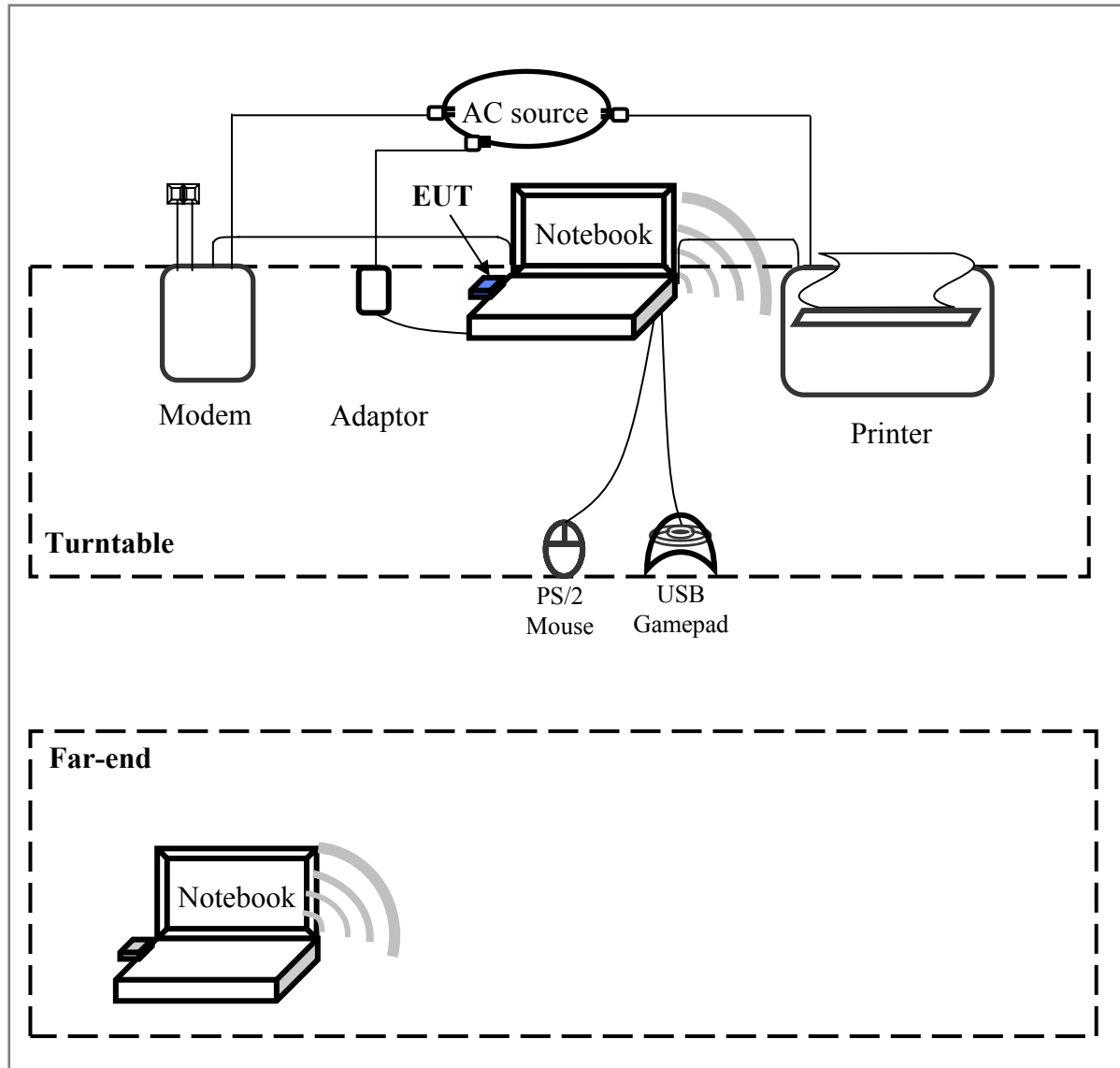
WLAN Card : Gemtek Technology Co., Ltd.

Model No. : C911003

FCC ID : MXF-C911003

1.5 Configuration of System Under Test

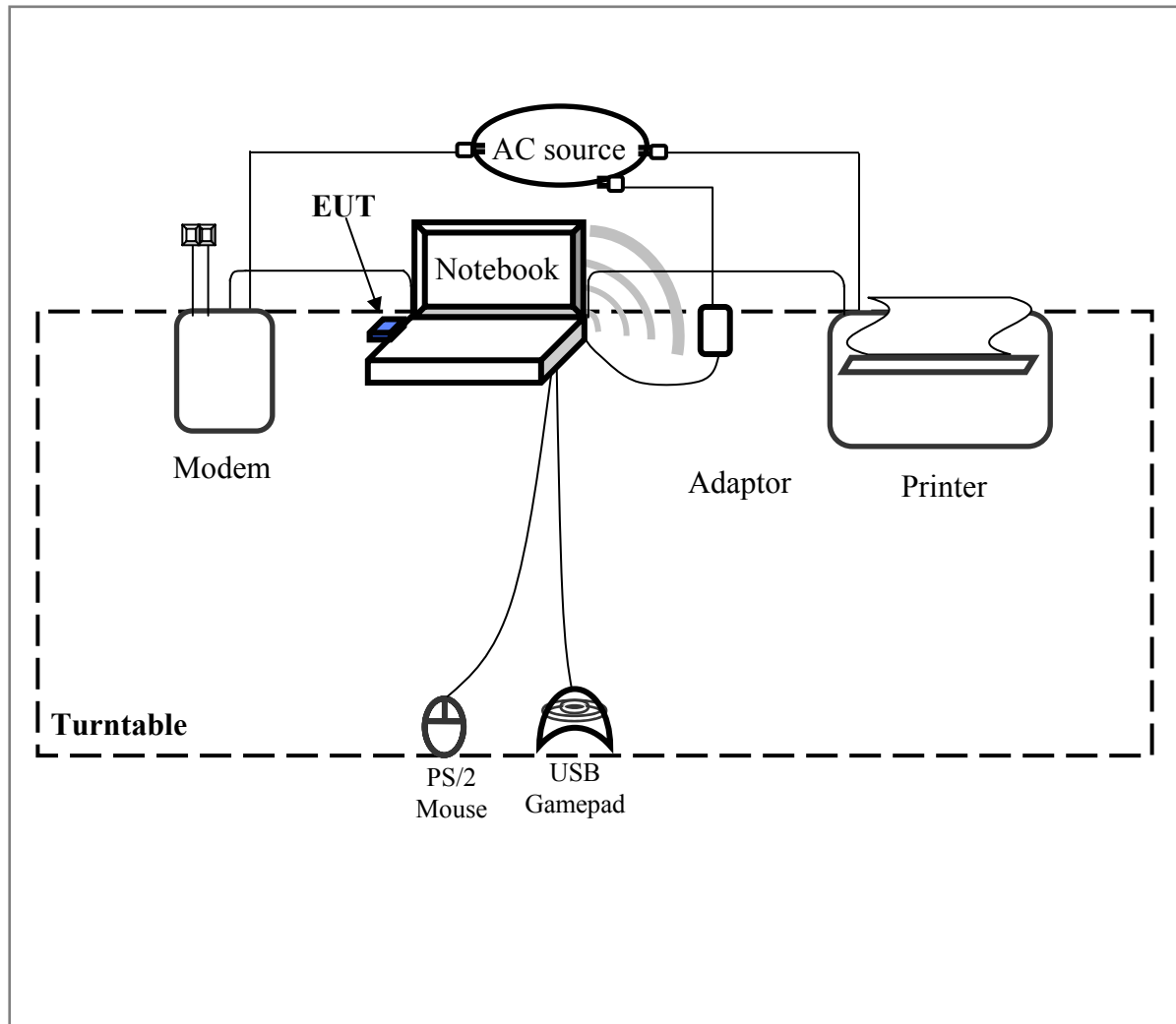
1.5.1 Conducted and Radiated for Unintentional



Connections of Computer:

- *Parallel Port --- a printer
- *Serial Port --- an external modem
- *PS/2 Port --- a P/2 mouse
- *USB Port --- a USB gamepad
- *PCMCIA Port --- **EUT**

1.5.2 Radiated of Intentional



The tests below are carried with the EUT transmitter set at high power in TDD mode. The EUT is forced to select of output power level and channel number by PC.

The setting up procedure was recorded in 1.3 test method.

1.6 Verify the Frequency and Channel

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

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: Ch – 1; Middle: Ch – 6; Bottom: Ch – 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 test method, 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 (FCC 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 Protocol Control Information 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 Section15.109 (Radiated emission limits) is same as Section15.207 and 15.247(C).

III. Section 15.203: Antenna requirement

The EUT has an integrated antenna permanently attached on the PCB, which 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.

The antenna specification of list as below:

Antenna Type	:	Patch Antenna
Antenna Gain	:	2.03dBi (Max.)

VI. 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 CISPR quasi-peak and average 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 150KHz to 30MHz. 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 <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	Brand	Serial No.	Calibration Date
				Next time
EMI Receiver	8546A	HP	3520A00242	08/05/05
RF Filter Section	85460A	HP	3448A00217	08/05/05
LISN (EUT)	LISN-01	TRC	99-05	09/21/04
LISN (Support E.)	LISN-01	TRC	9912-03, 04	10/21/04
Pre-amplifier	15542 ZFL-500	Mini – Circuits	0 0117	05/20/05
6dB Attenuator	MCL BW-S6W2	Mini – Circuits	9915 – Conducted	05/20/05
10dB Attenuator	A5542 VAT010	Mini – Circuits	0215 – Conducted	05/20/05
Coaxial Cable (2 meter)	A30A30-0058-50FS-2M	Jyebao	SMA-08	05/20/05
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	Jyebao	SMA-09	05/20/05
Coaxial Cable (20 meter)	RG-214/U	Jyebao	NP-01	05/20/05
Coaxial Cable (20 meter)	RG-214/U	Jyebao	NP-02	05/20/05
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	05/20/05

4.3 Test Result of Power Line Conducted Emissions

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. Show as follows.

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

Test mode: RX mode

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	167.000	49.12	---	---	65.51	55.51	-6.39
	206.000	45.22	---	---	64.40	54.40	-9.18
	277.000	41.52	---	---	62.37	52.37	-10.85
	387.000	44.52	---	---	59.23	49.23	-4.71
	598.000	39.83	---	---	56.00	46.00	-6.17
	876.000	41.70	---	---	56.00	46.00	-4.30
	1256.000	41.12	---	---	56.00	46.00	-4.88
	1645.000	39.24	---	---	56.00	46.00	-6.76
	2222.000	38.06	---	---	56.00	46.00	-7.94
	2610.000	36.43	---	---	56.00	46.00	-9.57
Line 2	201.000	49.24	---	---	64.54	54.54	-5.30
	384.000	45.26	---	---	59.31	49.31	-4.05
	604.000	40.23	---	---	56.00	46.00	-5.77
	759.000	38.53	---	---	56.00	46.00	-7.47
	867.000	42.04	---	---	56.00	46.00	-3.96
	1256.000	41.42	---	---	56.00	46.00	-4.58
	1645.000	40.26	---	---	56.00	46.00	-5.74
	2115.000	38.30	---	---	56.00	46.00	-7.70
	2610.000	36.83	---	---	56.00	46.00	-9.17
	3349.000	36.12	---	---	56.00	46.00	-9.88

NOTE:

- (1)Margin = Peak 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

Test mode: IEEE 802.11b, Channel 1

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	218.000	47.76	---	---	64.06	54.06	-6.30
	384.000	44.49	---	---	59.31	49.31	-4.82
	867.000	41.56	---	---	56.00	46.00	-4.44
	1256.000	41.14	---	---	56.00	46.00	-4.86
	1629.000	39.47	---	---	56.00	46.00	-6.53
	2243.000	37.42	---	---	56.00	46.00	-8.58
Line 2	220.000	48.55	---	---	64.00	54.00	-5.45
	384.000	43.75	---	---	59.31	49.31	-5.56
	598.000	40.03	---	---	56.00	46.00	-5.97
	867.000	41.49	---	---	56.00	46.00	-4.51
	1256.000	41.70	---	---	56.00	46.00	-4.30
	1645.000	40.56	---	---	56.00	46.00	-5.44

Test mode: IEEE 802.11b, Channel 6

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	175.000	50.98	---	---	65.29	55.29	-4.31
	195.000	50.96	---	---	64.71	54.71	-3.75
	384.000	44.76	---	---	59.31	49.31	-4.55
	884.000	41.35	---	---	56.00	46.00	-4.65
	1269.000	41.54	---	---	56.00	46.00	-4.46
	1645.000	39.64	---	---	56.00	46.00	-6.36
Line 2	174.000	51.78	---	---	65.31	55.31	-3.53
	214.000	48.20	---	---	64.17	54.17	-5.97
	391.000	43.47	---	---	59.11	49.11	-5.64
	598.000	40.21	---	---	56.00	46.00	-5.79
	876.000	41.54	---	---	56.00	46.00	-4.46
	1269.000	41.82	---	---	56.00	46.00	-4.18

Test mode: IEEE 802.11b, Channel 11

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	158.000	52.25	---	---	65.77	55.77	-3.52
	210.000	50.58	---	---	64.29	54.29	-3.71
	384.000	43.91	---	---	59.31	49.31	-5.40
	598.000	40.03	---	---	56.00	46.00	-5.97
	876.000	41.59	---	---	56.00	46.00	-4.41
	1243.000	40.54	---	---	56.00	46.00	-5.46
Line 2	159.000	51.95	---	---	65.74	55.74	-3.79
	210.000	47.20	---	---	64.29	54.29	-7.09
	391.000	44.97	---	---	59.11	49.11	-4.14
	876.000	41.52	---	---	56.00	46.00	-4.48
	1243.000	41.45	---	---	56.00	46.00	-4.55
	1629.000	40.28	---	---	56.00	46.00	-5.72

Test mode: IEEE 802.11g, Channel 1

<i>Power Connected Emissions</i>					<i>Class B</i>		
<i>Conductor</i>	<i>Frequency (KHz)</i>	<i>Peak (dBμV)</i>	<i>QP (dBμV)</i>	<i>Average (dBμV)</i>	<i>QP-limit (dBμV)</i>	<i>AVG-limit (dBμV)</i>	<i>Margin (dB)</i>
Line 1	172.000	50.12	---	---	65.37	55.37	-5.25
	205.000	47.55	---	---	64.43	54.43	-6.88
	387.000	45.13	---	---	59.23	49.23	-4.10
	604.000	39.66	---	---	56.00	46.00	-6.34
	876.000	41.82	---	---	56.00	46.00	-4.18
	1269.000	40.89	---	---	56.00	46.00	-5.11
Line 2	174.000	50.72	---	---	65.31	55.31	-4.59
	212.000	47.73	---	---	64.23	54.23	-6.50
	387.000	44.01	---	---	59.23	49.23	-5.22
	876.000	42.04	---	---	56.00	46.00	-3.96
	1256.000	41.56	---	---	56.00	46.00	-4.44
	1645.000	40.10	---	---	56.00	46.00	-5.90

Test mode: IEEE 802.11g, Channel 6

Power Connected Emissions					Class B		
Conductor	Frequency (KHz)	Peak (dBμV)	QP (dBμV)	Average (dBμV)	QP-limit (dBμV)	AVG-limit (dBμV)	Margin (dB)
Line 1	177.000	50.05	---	---	65.23	55.23	-5.18
	206.000	50.17	---	---	64.40	54.40	-4.23
	387.000	44.40	---	---	59.23	49.23	-4.83
	876.000	41.52	---	---	56.00	46.00	-4.48
	1256.000	40.89	---	---	56.00	46.00	-5.11
	1645.000	40.06	---	---	56.00	46.00	-5.94
Line 2	172.000	51.21	---	---	65.37	55.37	-4.16
	387.000	45.13	---	---	59.23	49.23	-4.10
	592.000	40.63	---	---	56.00	46.00	-5.37
	876.000	42.18	---	---	56.00	46.00	-3.82
	1269.000	40.75	---	---	56.00	46.00	-5.25
	1645.000	40.26	---	---	56.00	46.00	-5.74

Test mode: IEEE 802.11g, Channel 11

Power Connected Emissions					FCC Class B		
Conductor	Frequency (KHz)	Peak (dBμV)	QP (dBμV)	Average (dBμV)	QP-limit (dBμV)	AVG-limit (dBμV)	Margin (dB)
Line 1	171.000	50.58	---	---	65.40	55.40	-4.82
	210.000	47.06	---	---	64.29	54.29	-7.23
	391.000	44.29	---	---	59.11	49.11	-4.82
	867.000	41.49	---	---	56.00	46.00	-4.51
	1269.000	40.44	---	---	56.00	46.00	-5.56
	1629.000	40.01	---	---	56.00	46.00	-5.99
Line 2	171.000	51.58	---	---	65.40	55.40	-3.82
	218.000	46.54	---	---	64.06	54.06	-7.52
	387.000	45.24	---	---	59.23	49.23	-3.99
	598.000	40.10	---	---	56.00	46.00	-5.90
	876.000	41.96	---	---	56.00	46.00	-4.04
	1269.000	41.24	---	---	56.00	46.00	-4.76

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

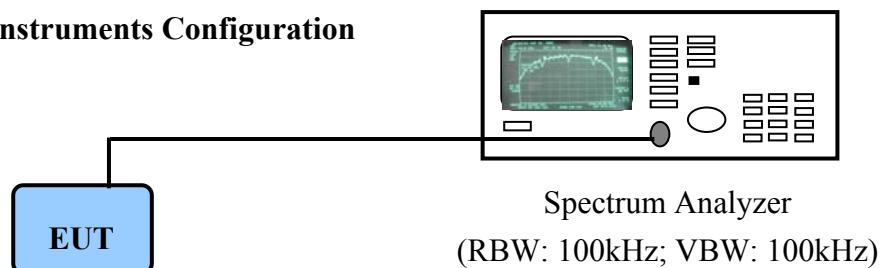
Based on the Section 2.1, *Direct Sequence System* is a spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the “modulating function” and is the direct cause of the wide spreading of the transmitted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



P.S.: PC 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	MS2665C	ANRITSU	6200175476	09/30/03	09/30/04

6.4 Test Result of Bandwidth

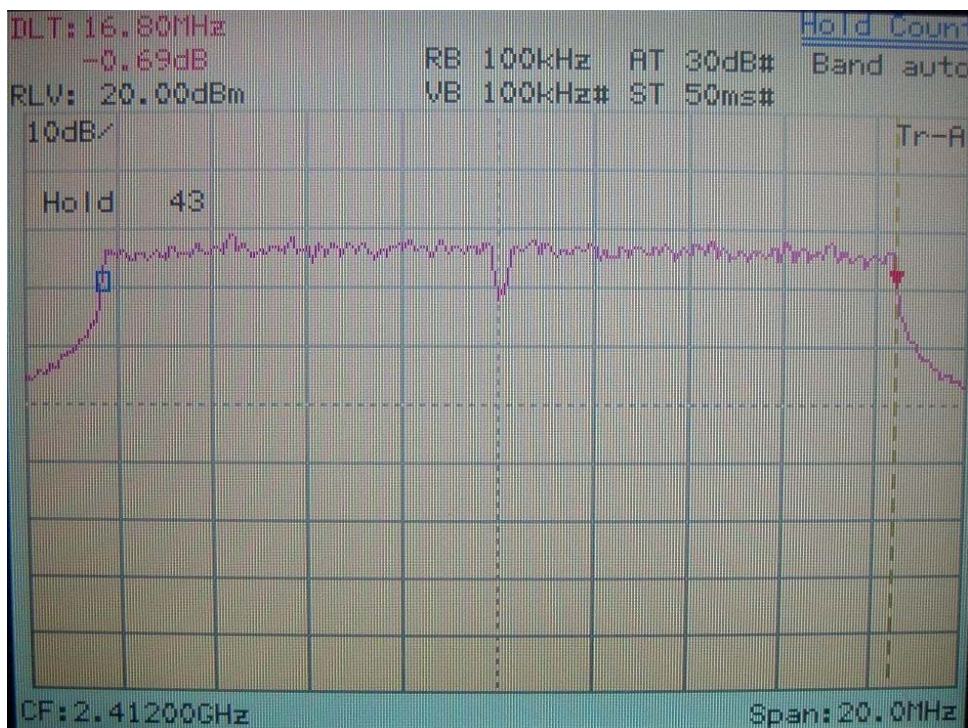
Channel	802.11b	802.11g
01	10.56 MHz	16.80 MHz
06	10.40 MHz	16.80 MHz
11	10.48 MHz	16.84 MHz

- 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.

6dB Bandwidth of Channel 1 (The minimum 6dB BW at least 500kHz)



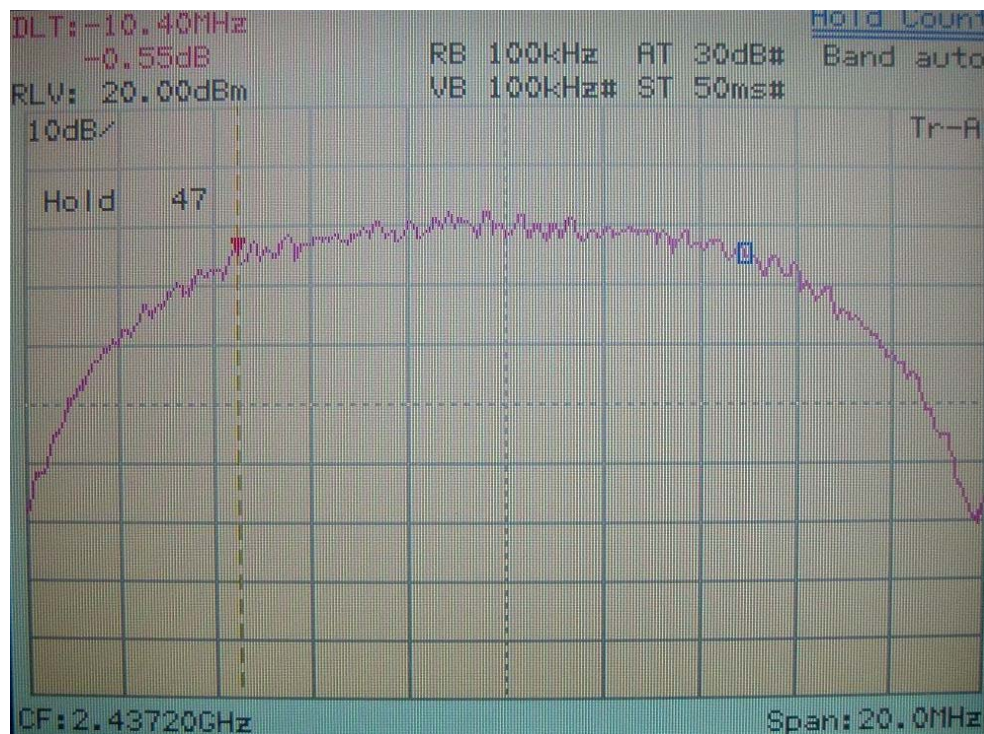
IEEE 802.11b



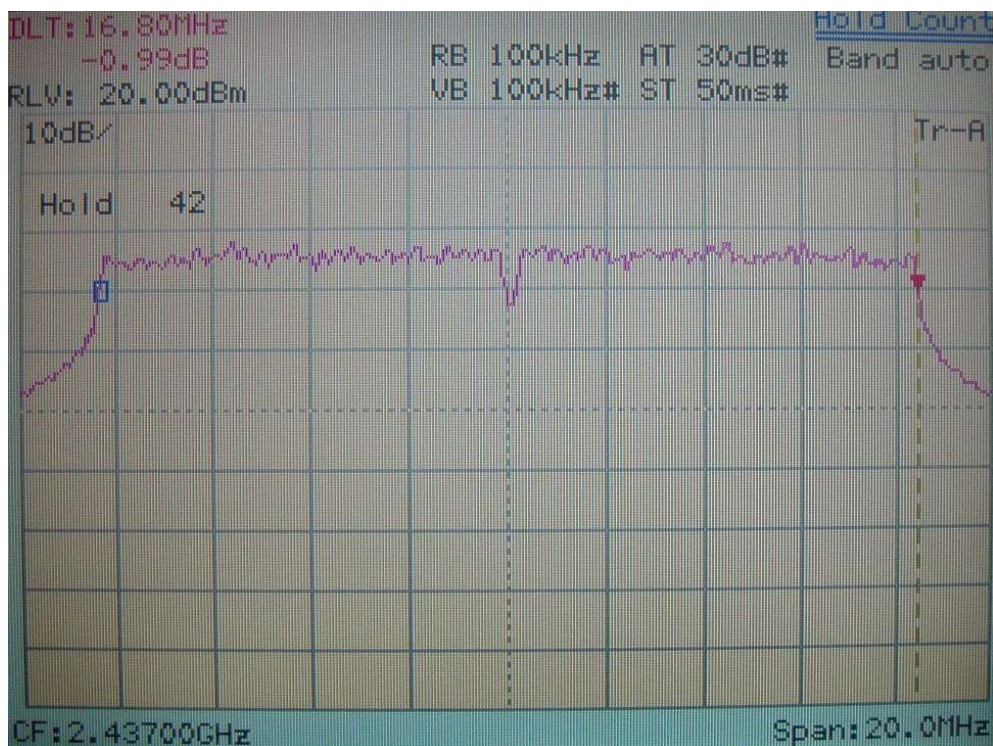
IEEE 802.11g

6dB Bandwidth of Channel 6 (The minimum 6dB BW at least 500kHz)

IEEE 802.11b

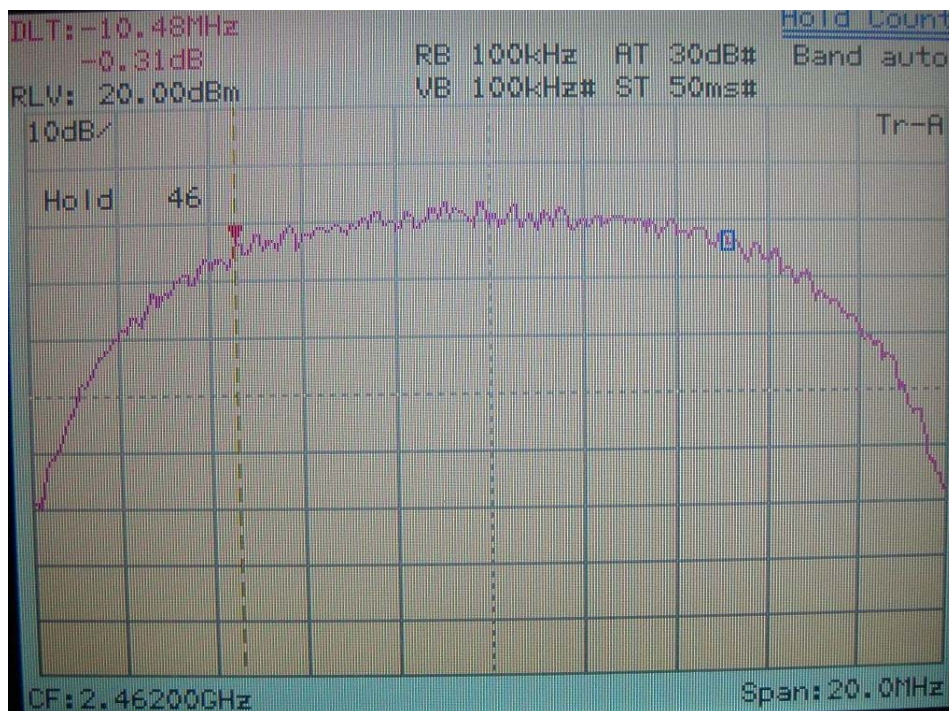


IEEE 802.11g



6dB Bandwidth of Channel 11 (The minimum 6dB BW at least 500kHz)

IEEE 802.11b



IEEE 802.11g

