MEASUREMENT REPORT
of
WIRELESS LAN

Class II Permissive Change

Applicant	**:**	Acer Incorporated
Model No.	**:**	MPCI-101
EUT	**:**	MPCI-101 Wireless LAN Module
Granted FCC ID	**:**	HLZMPCI-101
Report No.	**:**	A021596

Test 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 : Acer Incorporated

Model No. : MPCI-101

EUT : MPCI-101 Wireless LAN Module

Granted FCC ID:HLZMPCI-101

Report No. : A021596

Test Date : January 15, 2001

Prepared by: *Jack Tsai*

Approved by: *Frank Tsai*

Test by :

Training Research Co., Ltd.

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Tables of Contents

Ⅰ. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a wireless lan 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 **:** MPCI-101 Wireless LAN Module

Model No. **:** MPCI-101

Granted FCC ID **:** HLZMPCI-101

Reason of Class II Permissive Change: Change New Notebook PC for ACER Inc. Model:2009 and new antenna (See Appendix B)

Frequency Range **:** 2.412 ~ 2.462 GHz

Support Channel **:** 11 Channel

Modulation Skill **:** DBPSK, DQPSK, CCK

Style Interface **:** MINI-PCI

Power Type **:** By Notebook PC

Applicant **:** Acer Incorporated
21 F, No. 88, Sec. 1, Hsin Tai Wu Rd., Hsi-Chih,
Taipei Hsien 221, 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 **:** **Acer Inc.**
Model No. : 2009
Serial No. : 814Q01S0704900051M, 814Q01S0704900066M
Power Type : 100~240VAC / 50~60Hz, 1.0A, Switching
FCC ID : Doc Apprpved.
Power cord (DC Jack to body of power):Non-shielded, 180cm long, Plastic hood, ferrite core (nearly DC Jack)
Power cord (AC source to body of power):Non-shielded, 180cm long, Plastic hood, No ferrite core

USB Floppy **:** **Acer Inc.**
Model No. : YD-8U10
Serial No. : 8U10 S0010005
Power type : By PC
Data Cable : Shielded, 55 cm long, Metal hood, No ferrite core

Microphone	**:**	**KOKA**
Model No.	:	DM-515
Power type	:	Dynamic
Data Cable	:	Non-shielded, 3m long, Plastic hood, No ferrite core
Monitor	**:**	**HP 15' Color Monitor**
Model No.	:	D2827A
Serial No.	:	KR91161716
FCC ID	:	C5F7NFCMC1518X
檢磁	:	3872B039
Power type	:	110 ~ 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
Speaker	**:**	**Genius**
Model No.	:	SP-220
Data cable	:	Non-shielded, 1.6 m
Power type	:	Powered by PC
USB Mouse	**:**	**Logitech**
Model No.	:	M-BA47
Serial No.	:	LZE92250027
FCC ID	:	Doc Approved
檢磁	:	4872A220
Power type	:	Powered by PC
Power Cable	:	Shielded, 1.5m long, Plastic hoods, No ferrite bead
Mouse	**:**	**HP**
Model No.	:	M-S34
Serial No.	:	LZB90714106
FCC ID	:	DZL211029
檢磁	:	4862A011
Power type	:	By PC
Power cord	:	Non-shielded, 1.88m long, No ferrite core

1.4 Configuration of System Under Test

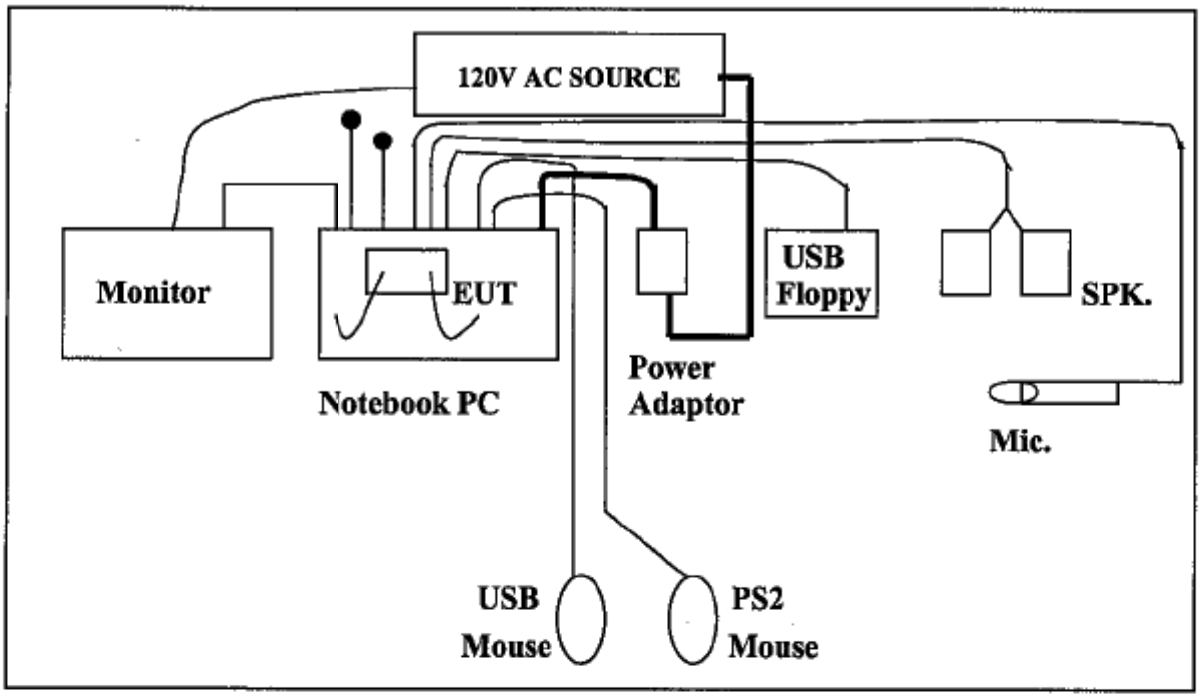


Fig. 1 Configuration of system under test

The tests below are run with the EUT transmitter set at high power in TDD mode .The EUT build in mini-pci port of notebook computer .The EUT is needed to force selection of output power level and channel number.

The setting up procedure was recorded in Appendix A.

Connections:

Notebook PC:

*Monitor port --- a monitor with 1.46m long of data cable
*Lan port --- via a 100cm non-shielded RJ45 cable to a terminator
*Telecom line port --- via a 7 feets non-shielded RJ11 cable to a terminator
*Microphone port --- a printer with 1.3m length data cable
*Speaker port --- a pair speakers with 1.6m length data cable
*Mouse port --- a mouse with 1.88m length data cable
*USB port A --- a floppy with 55 cm length data cable
*USB port B --- a mouse with 1.5m long, shielded and no ferrite bead data cable
*DC jack --- via a 180cm non-shielded power cable to an external power adaptor
(Each port on PC is connected with suitable device)

EUT: (Build in notebook pc)

*Two antenna port --- via the 15cm and the 20 cm length fixed on notebook pc

1.5 Verify the Frequency and Channel

1.5.1 Verify the Frequency Pairs

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 sure 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 was 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 15.207: Power Line Conducted Emissions for AC Powered Units

2.1 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 mini-pci port of notebook PC and software to control the EUT.
   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).

The setting up procedure is recorded on Appendix A.

2.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF Filter Section	85460A	H P	3448A00217	10/18/00	10/18/01
LISN (EUT)	LISN-01	TRC	9912-03,04	12/09/00	12/09/01
LISN (Support E.)	LISN-01	TRC	9912-05	01/04/00	01/04/01
Switch/Control Unit (< 30MHz)	3488A	HP	N/A	11/20/00	11/20/01
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/01

2.3 Test configuration

Conducted Emissions Test Placement

2.4 Test Result of Conducted Emissions

2.4.1 EUT station transmit only

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

Table 1 Power Line Conducted Emissions (Channel 1)

Power Connected Emissions			*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	480.00	37.83	48.00	-10.17
	624.00	31.71	48.00	-16.29
	833.00	31.37	48.00	-16.63
	904.00	31.07	48.00	-16.93
	1241.00	31.53	48.00	-16.47
	1657.00	31.27	48.00	-16.73
	1803.00	31.09	48.00	-16.91
	5250.00	31.46	48.00	-16.54
	5390.00	31.53	48.00	-16.47
	5490.00	33.37	48.00	-14.63
LINE 2	483.00	38.92	48.00	-9.08
	624.00	33.04	48.00	-14.96
	1241.00	32.25	48.00	-15.75
	1448.00	33.04	48.00	-14.96
	1668.00	32.23	48.00	-15.77
	1725.00	31.93	48.00	-16.07
	1803.00	32.16	48.00	-15.84
	5250.00	32.08	48.00	-15.92
	5390.00	34.68	48.00	-13.32
	5650.00	33.34	48.00	-14.66

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)

Power Connected Emissions			*FCC Class B*	
Conductor	*Frequency (KHz)*	*Peak Amplitude (dB μV)*	*Limit (dB μV)*	*Margin (dB)*
Line 1	483.00	39.20	48.00	-8.80
	624.00	32.48	48.00	-15.52
	904.00	31.16	48.00	-16.84
	1249.00	30.92	48.00	-17.08
	1448.00	31.45	48.00	-16.55
	1526.00	30.90	48.00	-17.10
	1725.00	30.57	48.00	-17.43
	2000.00	30.75	48.00	-17.25
	5190.00	32.09	48.00	-15.91
	5460.00	34.06	48.00	-13.94
LINE 2	483.00	38.39	48.00	-9.61
	624.00	32.34	48.00	-15.66
	692.00	31.82	48.00	-16.18
	898.00	32.56	48.00	-15.44
	1106.00	31.68	48.00	-16.32
	1249.00	32.22	48.00	-15.78
	1448.00	31.95	48.00	-16.05
	1725.00	32.32	48.00	-15.68
	5320.00	34.47	48.00	-13.53
	5610.00	32.16	48.00	-15.84

Table 3 Power Line Conducted Emissions (Channel 11)

Power Connected Emissions			*FCC Class B*	
Conductor	*Frequency (KHz)*	*Peak Amplitude (dB μV)*	*Limit (dB μV)*	*Margin (dB)*
Line 1	483.00	38.11	48.00	-9.89
	624.00	31.71	48.00	-16.29
	904.00	30.41	48.00	-17.59
	1041.00	31.00	48.00	-17.00
	1241.00	30.73	48.00	-17.27
	1593.00	31.96	48.00	-16.04
	1657.00	31.04	48.00	-16.96
	2350.00	30.30	48.00	-17.70
	5320.00	33.64	48.00	-14.36
	5530.00	30.69	48.00	-17.31
LINE 2	483.00	38.17	48.00	-9.83
	624.00	34.34	48.00	-13.66
	692.00	32.01	48.00	-15.99
	904.00	32.26	48.00	-15.74
	1249.00	31.99	48.00	-16.01
	1448.00	32.29	48.00	-15.71
	1803.00	32.79	48.00	-15.21
	4950.00	31.88	48.00	-16.12
	5320.00	35.46	48.00	-12.54
	5530.00	34.66	48.00	-13.34

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

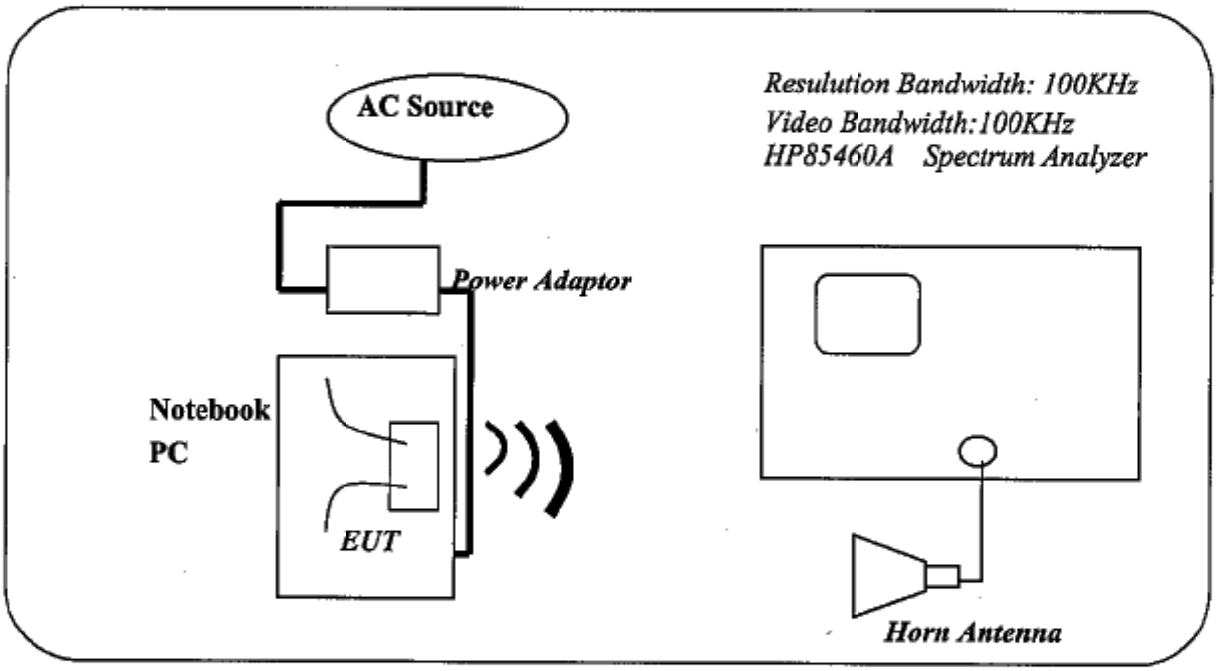
3.1 Test Condition & Setup

The transmitter bandwidth measurements were performed in an anechoic chamber. The EUT was placed on a wooded table, which is 0.8 meters height. The EUT was set to transmit continuously. Various channels were also investigated to find the maximum occupied bandwidth. The minimum 6 dB bandwidth shall be at least 500 KHz.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 KHz. Set the span>> RBW. The detector function was set to peak and hold mode to clearly observe the components.

Setting up procedure is written on Appendix A.

3.2 Test Instruments Configuration



P.S.A mini-pci port from notebook computer to control the EUT at maximal power output and channel
Number.

Fig 10. Test Configuration of bandwidth for direct sequence system

3.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF FilterSection	85460A	H P	3448A00217	10/18/00	10/18/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

3.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth	:	9.38 MHz
The min. 6 dB BW at least	:	500 KHz

Bandwidth of Channel 6

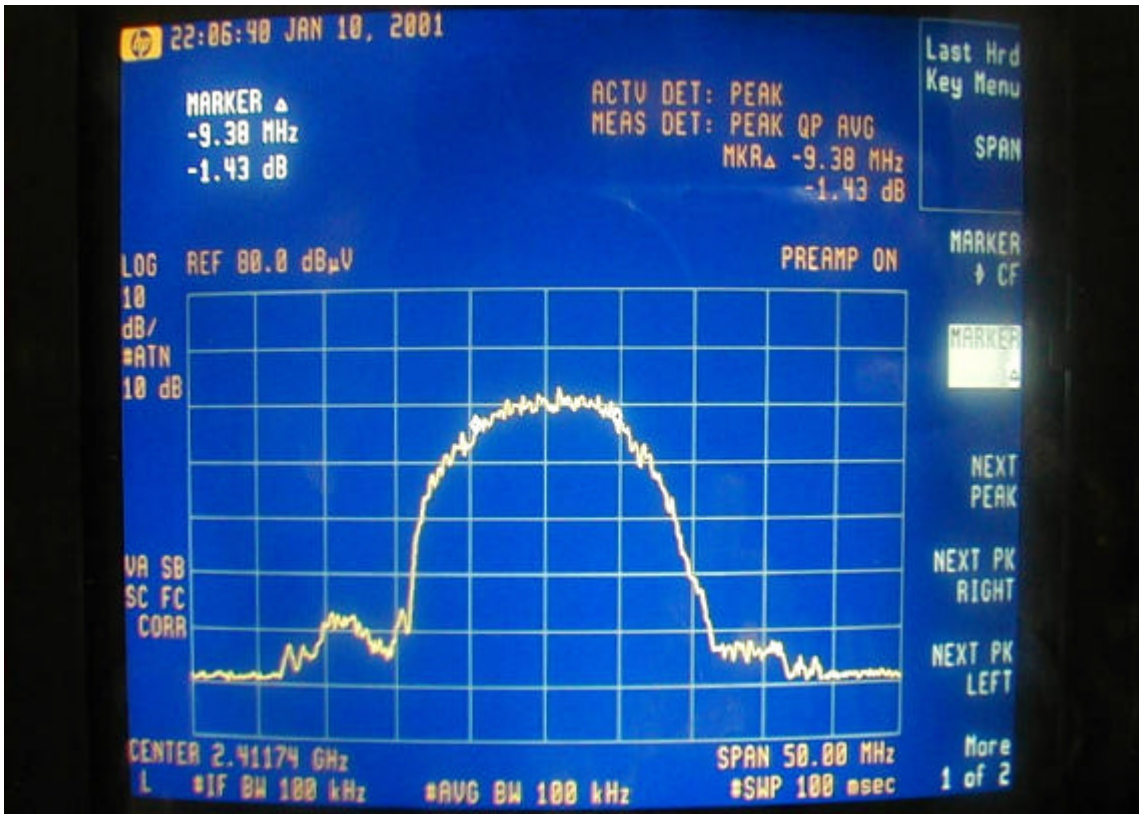
Bandwidth	:	10.13 MHz
The min. 6 dB BW at least	:	500 KHz

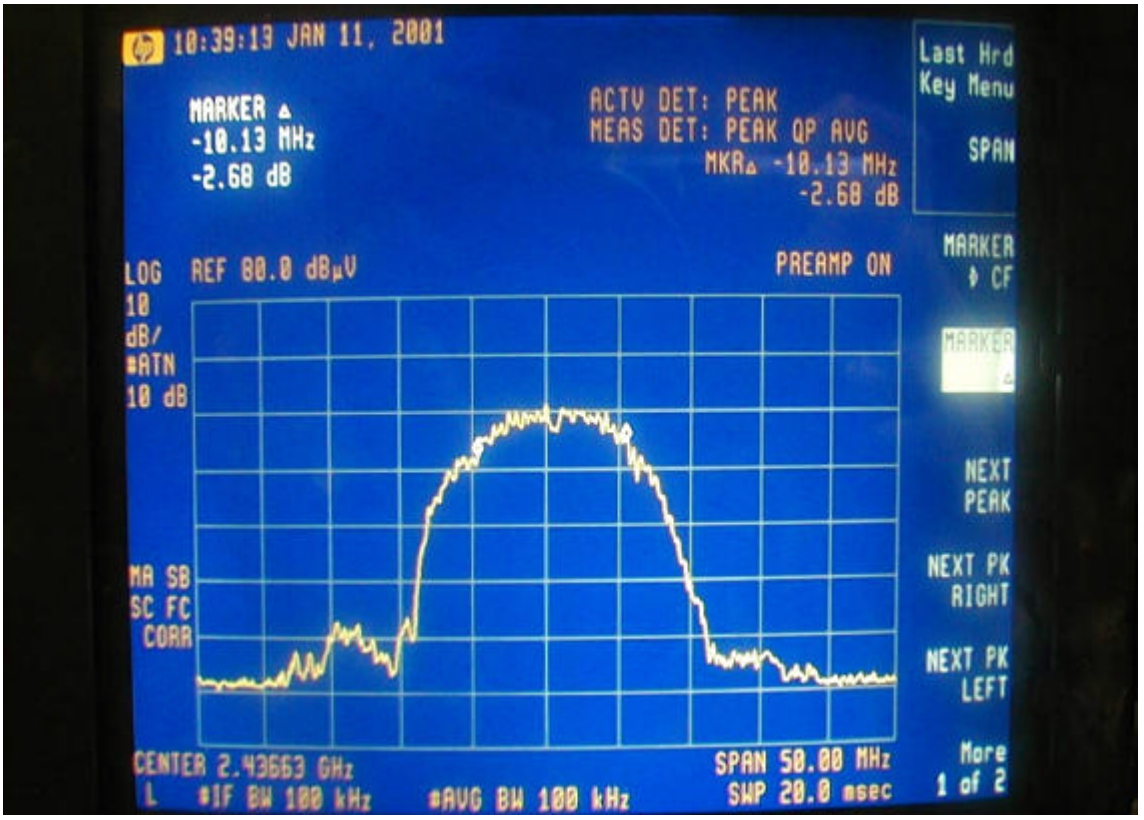
Bandwidth of Channel 11

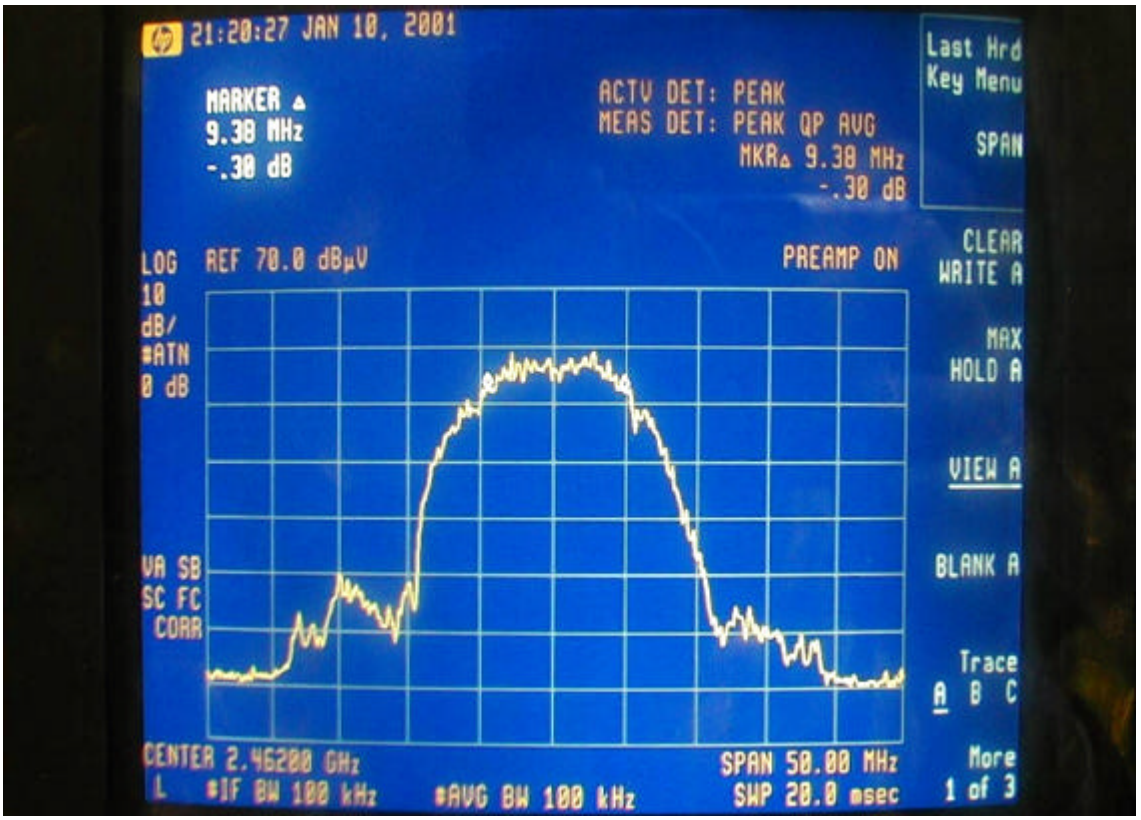
Bandwidth	:	9.38 MHz
The min. 6 dB BW at least	:	500 KHz

Note:

1. The data in the above table are summarizing the following attachment spectrum analyzer hard copy.
2. The attachments follow page.


22:06:40 JAN 10, 2001
MARKER Δ
-9.38 MHz
-1.43 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -9.38 MHz
-1.43 dB
Last Hrd Key Menu
SPAN
MARKER → CF
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
LOG
10 dB/
#ATN 10 dB
REF 80.0 dBµV
PREAMP ON
VA SB
SC FC
CORR
CENTER 2.41174 GHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 50.00 MHz
#SWP 100 msec


10:39:13 JAN 11, 2001
MARKER Δ
-10.13 MHz
-2.68 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -10.13 MHz
-2.68 dB
Last Hrd Key Menu
SPAN
MARKER → CF
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
LOG
10 dB/
#ATN 10 dB
REF 80.0 dBµV
PREAMP ON
MA SB
SC FC
CORR
CENTER 2.43663 GHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 50.00 MHz
SWP 20.0 msec


21:20:27 JAN 10, 2001
MARKER Δ
9.38 MHz
-.30 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 9.38 MHz
-.30 dB
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
CLEAR WRITE A
MAX HOLD A
VIEW A
BLANK A
VA SB
SC FC
CORR
Trace
A B C
CENTER 2.46200 GHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 50.00 MHz
SWP 20.0 msec
More
1 of 3

Ⅳ. Section 15.247(B) : Power Output

4.1 Test Condition & Setup

The EUT was placed in an anechoic chamber 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 that produced the highest emissions was noted so it could be reproduced later during the final tests. 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 1GHz to 40GHz using a Hewlett Packard Spectrum Analyzer 8564E, EMCO whole range Horn antenna (Model No.: 3115) is used to measure frequency from 1GHz to 18GHz. The final test is used the spectrum HP 8564E. 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. The spectrum analyzer HP8564E used on this testing for frequency 1GHz to 18GHz. No post-detector video filters were used in the test. Set the RB= 3 MHz, VB = 3MHz and the span = 5 MHz. 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:

(1) EUT transmit only:

Using the mim-pci port of notebook PC and software to control the EUT. 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 antenna at notebook pc , Radiates spurious emissions falling within the restricted bands of 15.209 were measured at operating frequencies corresponding to low, mid and high 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.

4.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8564E	H P	US36433002	08/13/00	08/13/01
Microwave Preamplifier	83051A	H P	3232A00347	08/13/00	08/13/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

4.3 Test Result of Fundamental Emissions

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

Table 4 Open Field Fundamental Emissions

Channel	*Frequency (MHz)*	*A.P. (H/V)*	*A.H. (M)*	*Table (degree)*	*Amplitude (dBmV/m)*	*CF (dB)*	*Duty Cycle (dB)*	*Corrected Amplitude (dBmV/m) Excluded Duty Cycle*	*Corrected Amplitude (dBmV/m) Included Duty Cycle*	*E.I.R.P. Included Duty Cycle*	
										m W	*dB m*
01	2.412	H	1.00	264	99.21	-8.67	-9.64	98.24	107.88	18.413	12.651
	2.412	V	1.00	19	101.71	-8.67	-9.64	100.74	110.38	32.743	15.151
06	2.437	H	1.00	317	99.46	-8.67	-9.64	98.49	108.13	19.504	12.901
	2.437	V	1.00	120	99.92	-8.67	-9.64	98.95	108.59	21.683	13.361
11	2.462	H	1.00	57	98.00	-8.67	-9.64	97.03	106.67	13.935	11.441
	2.462	V	1.00	164	100.95	-8.67	-9.64	99.98	109.62	27.487	14.391

Note:

1. A.P. means antenna polarization, horizontal and vertical.
2. A.H. means antenna height.
3. Table means turntable turning position.
4. Corrected Factor (C. F.) = Cable Loss + Antenna Factor – Amplified Gain
   Corrected Amplitude (Included Duty Cycle) = Peak Amplitude – Corrected Factor
   Corrected Amplitude (Excluded Duty Cycle) = Peak Amplitude – Corrected Factor + Duty Cycle
5. Amplitude means the fundamental emission measured.
6. Conducted output power "P", $P = (E\ d)^2 / 30G$
7. Since G = 1, P = EIRP

E is the measured maximum field strength in V/m utilizing the maximum hold mode RBW (3MHz)
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 = 110.38 dBμV/m

$10^{(110.38/20)} \times 10^{-6} = 0.330370$ V

E.I.R.P. = $(0.330370 \times 3)^2 / 30$

= 32.743 mW

= 10 x log (32.743 mW / 1 mW)

= 15.151 dBm

Ⅴ. Section 15.247 (C)(2): Spurious Emissions (Radiated)

5.1 Test Condition & Setup

The EUT was placed in an anechoic chamber 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. 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 1 GHz to 18 GHz using an Hewlett Packard 8564E Spectrum Analyzer, EMCO Horn Antenna (Model 3115) for 1 G ~ 18 GHz.

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 1 GHz to 18 GHz. No post-detector video filters were used in the test. The spectrum analyzer's 6 dB bandwidth was set to 120 KHz (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 1 GHz 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:

(1) EUT transmit only:

Using the mini-pci port of notebook PC and software to control the EUT. Then making access to the mode of continuous transmission. Three channels is 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 & external antenna, radiates spurious emissions falling within the restricted bands of 15.209 were measured at operating frequencies corresponding to low, mid and high 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.

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.

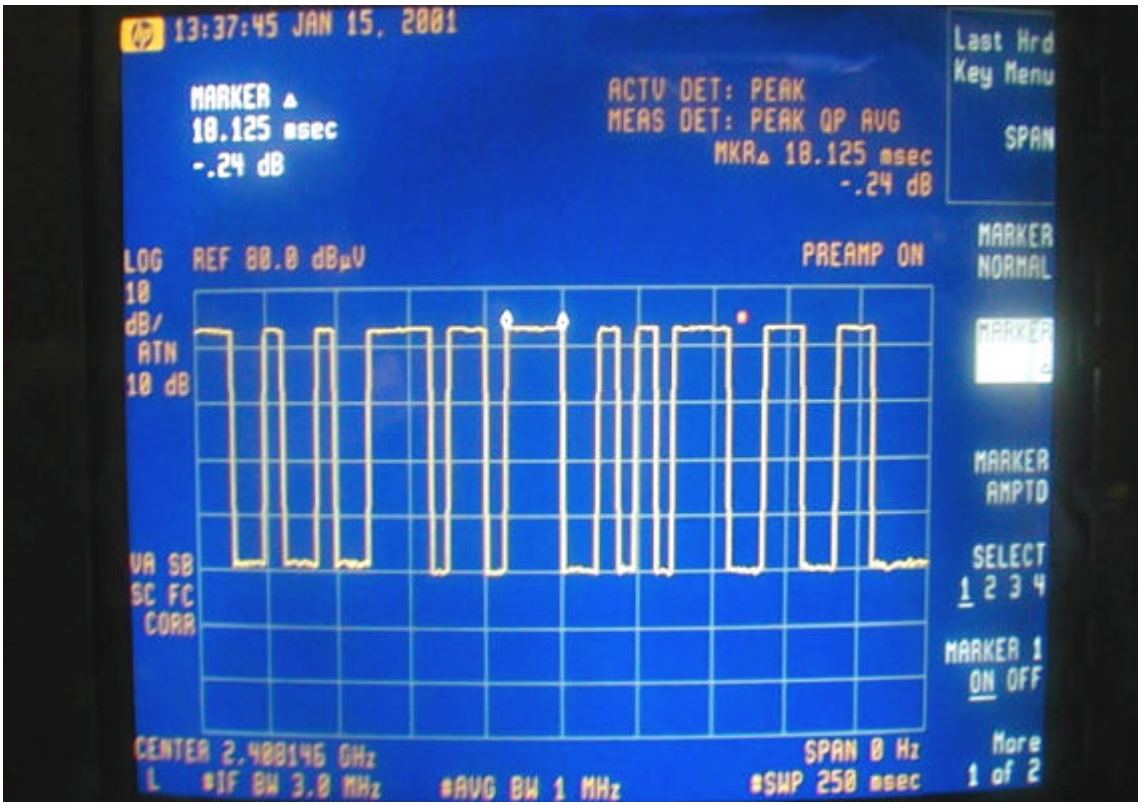
5.2 List of Test Instruments

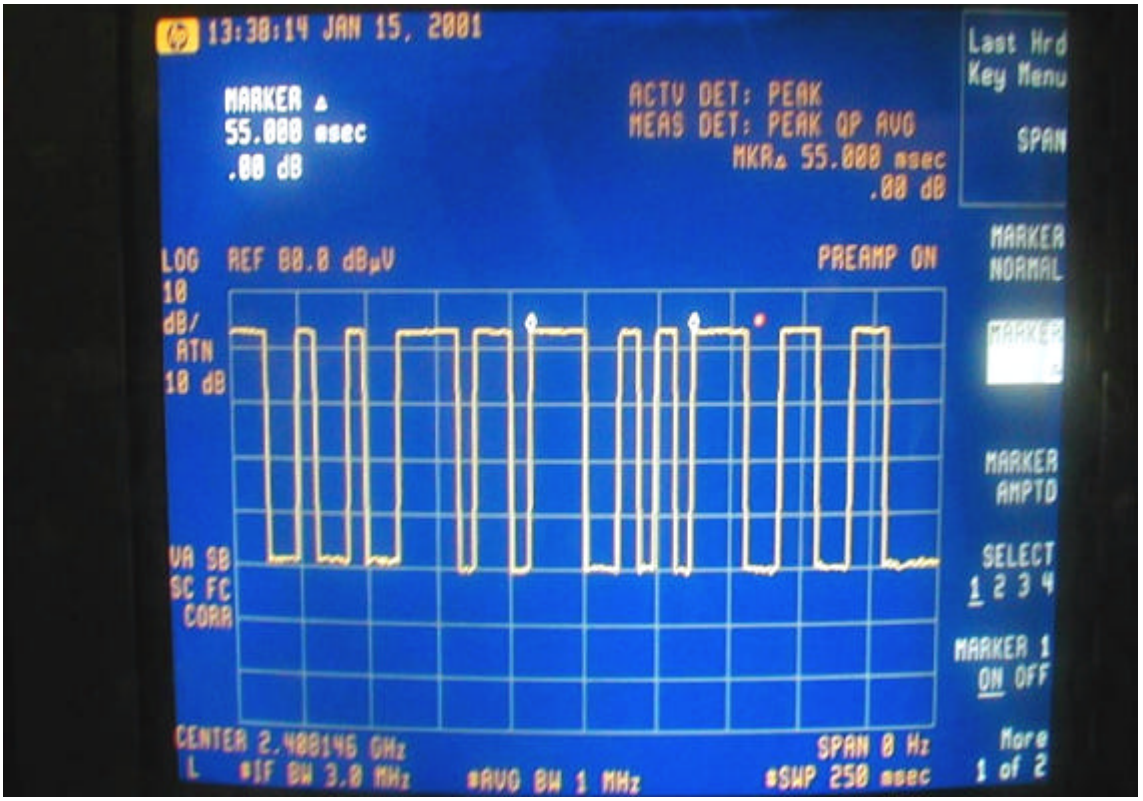
Instrument Name	Model No	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF Filter Section	85460A	H P	3448A00217	10/18/00	10/18/01
Switch/Control Unit (> 30MHz)	3488A	H P	N/A	11/20/00	11/20/01
Auto Switch Box (> 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/01
Spectrum Analyzer	8564E	H P	US36433002	08/13/00	08/13/01
Microwave Preamplifier	83051A	H P	3232A00347	08/13/00	08/13/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

5.2.1 Duty Cycle Factor Measurement

The duty cycle factor measurement is performed in a shield enclosure. The test condition and setup is as same as paragraph Ⅲ. Set the RB = 1MHz, VB=1MHz, and span = 0 MHz. Link the EUT, then get the Time of duty and cycle as follow page.

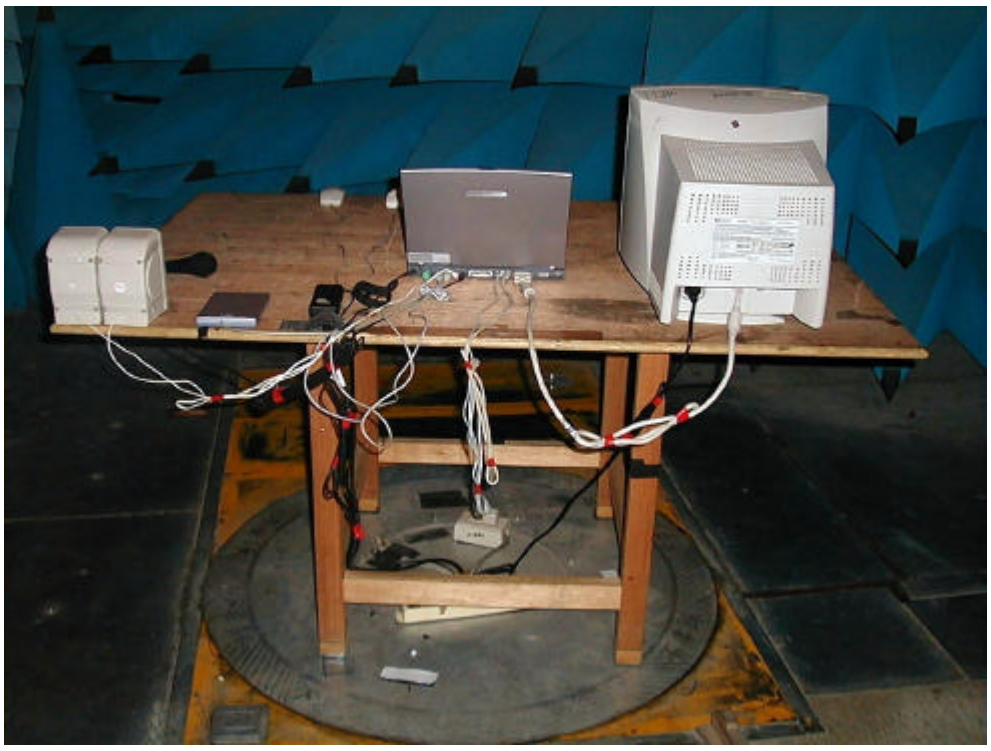
The duty cycle factor = 20 log (T_{duty} / T_{cycle}) = 20 log (18.125/55.000) = – 9.642


13:37:45 JAN 15, 2001
MARKER Δ
18.125 msec
-.24 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 18.125 msec
-.24 dB
Last Hrd Key Menu
SPAN
MARKER NORMAL
LOG 10 dB/ ATN 10 dB
REF 80.0 dBµV
PREAMP ON
MARKER AMPTD
SELECT 1 2 3 4
MARKER 1 ON OFF
VA SB SC FC CORR
More 1 of 2
CENTER 2.400146 GHz
SPAN 0 Hz
L #IF BW 3.0 MHz
#AVG BW 1 MHz
#SWP 250 msec


13:38:14 JAN 15, 2001
MARKER Δ
55.000 msec
.00 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 55.000 msec
.00 dB
Last Hrd Key Menu
SPAN
MARKER NORMAL
LOG 10 dB/ ATN 10 dB
REF 80.0 dBµV
PREAMP ON
MARKER AMPTD
SELECT 1 2 3 4
MARKER 1 ON OFF
VA SB SC FC CORR
More 1 of 2
CENTER 2.400146 GHz
SPAN 0 Hz
L #IF BW 3.0 MHz
#AVG BW 1 MHz
#SWP 250 msec

5.3 Test Instruments Configuration

Pig 1 Front View of the Test Configuration



Pig 2 Rear View of the Test Configuration

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

5.4 Test Result of Second Harmonic

Set the spectrum RB= 3 MHz, VB = 3MHz and span = 5MHz. The correction factors of the second harmonic is the second harmonic must lower 20 dB than the fundamental.

FCC ID : HLZMPCI-101
EUT : MPCI-101 Wireless LAN Module

Table 5 Second Harmonic Attendation

Channel	*Fundamental (MHz)*	*Fundamental (dBmV/m)*	*2nd Harmonic (GHz)*	*2nd Harmonic (dBmV/m)*	*Result (F/H dB)*	*Limit (dB)*	*Margin (dB)*
Ch 01	2.412	110.38	4.822	45.08	65.30	20.00	45.30
Ch 06	2.437	108.59	4.865	43.90	64.69	20.00	44.69
Ch 11	2.462	109.62	4.919	41.92	67.70	20.00	47.70

Note:

1. The 2nd Harmonic is comply with 15.209.
2. Result = Fundamental – 2nd Harmonic must over 20 dB and comply with 15.209.

5.5 Test Result of Spurious Radiated Emissions

5.5.1 Base and handset station 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 : HLZMPCI-101
EUT : MPCI-101 Wireless LAN Module

Test Conditions: Testing room : Temperature : 26 ° C Humidity : 73 % RH
Testing site : Temperature : 31 ° C Humidity : 75 % RH

Table 6 Open Field 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)*
195.024	14.56	1.00	121	-13.09	27.65	43.50	-15.85
260.031	12.93	1.00	137	-15.73	28.66	46.00	-17.34
299.976	12.69	1.00	26	-16.58	29.27	46.00	-16.73
455.058	9.83	2.46	67	-20.61	30.44	46.00	-15.56
699.808	5.15	1.00	32	-25.07	30.22	46.00	-15.78
***							

Note:

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

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

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
1.199	44.20	1.00	308	-8.67	35.53	54.00	-18.47
4.822	33.16	1.00	57	3.91	37.07	54.00	-16.93
7.238	31.35	1.00	116	9.72	41.07	54.00	-12.93
***							

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected

Table 8 Open Field 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)*
399.830	10.22	1.00	28	-19.23	29.45	46.00	-16.55
455.057	13.03	2.45	18	-20.80	33.83	46.00	-12.17
499.850	15.04	1.00	112	-21.78	36.82	46.00	-9.18
528.065	12.23	1.00	127	-22.39	34.62	46.00	-11.38
552.568	7.98	1.00	76	-24.09	32.07	46.00	-13.93
559.800	1.39	2.45	43	-24.12	25.51	46.00	-20.49
***							

Table 9 Open Field Radiated Emissions For 1GHz 18GHz [CH 1, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
1.199	33.73	1.00	54	-8.67	25.06	54.00	-28.94
4.822	41.17	1.00	136	3.91	45.08	54.00	-8.92
5.093	34.82	1.00	271	3.91	38.73	54.00	-15.27
7.238	36.68	1.00	309	9.72	46.40	54.00	-7.60
***							

Table 10 Open Field 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)*
299.825	14.18	1.00	23	-16.56	30.74	46.00	-15.26
349.830	10.71	1.00	125	-18.24	28.95	46.00	-17.05
357.543	14.45	1.00	62	-18.26	32.71	46.00	-13.29
487.560	12.09	1.00	54	-21.08	33.17	46.00	-12.83
552.570	10.39	1.00	40	-23.03	33.42	46.00	-12.58
699.813	6.20	1.00	10	-25.07	31.27	46.00	-14.73
***							

Table 11 Open Field Radiated Emissions For 1GHz 18GHz [CH 6, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.865	32.82	1.00	78	3.91	36.73	54.00	-17.27
7.313	30.68	1.00	61	9.72	40.40	54.00	-13.60
***							

Table 12 Open Field 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)*
399.835	10.29	1.01	36	-19.23	29.52	46.00	-16.48
499.785	15.08	1.02	119	-21.79	36.87	46.00	-9.13
528.066	11.28	1.08	115	-22.39	33.67	46.00	-12.33
550.015	4.81	2.45	7	-24.04	28.85	46.00	-17.15
699.715	5.13	1.02	120	-25.29	30.42	46.00	-15.58
***							

Table 13 Open Field Radiated Emissions For 1GHz 18GHz [CH 6, Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
1.199	46.50	1.00	227	-8.67	37.83	54.00	-16.17
4.865	39.99	1.00	164	3.91	43.90	54.00	-10.10
5.103	34.49	1.00	209	3.91	38.40	54.00	-15.60
7.313	36.35	1.00	34	9.72	46.07	54.00	-7.93
***							

Table 14 Open Field Radiated Emissions For 30MHz 1GHz [CH 11, 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)*
240.029	19.03	1.00	110	-15.09	34.12	46.00	-11.88
300.103	15.04	1.00	137	-16.59	31.63	46.00	-14.37
357.546	14.65	1.00	65	-18.26	32.91	46.00	-13.09
600.353	6.71	1.00	124	-23.25	29.96	46.00	-16.04
700.306	6.82	1.00	4	-25.07	31.89	46.00	-14.11
845.102	4.65	1.00	73	-27.21	31.86	46.00	-14.14
***							

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

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBm V/m)*	*Limit (dBm V/m)*	*Margin (dB)*
4.919	31.32	1.00	37	3.91	35.23	54.00	-18.77
7.389	30.01	1.00	128	9.72	39.73	54.00	-14.27
***							

Table 16 Open Field 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)*
357.543	15.82	1.00	3	-18.00	33.82	46.00	-12.18
455.056	12.45	2.45	3	-20.80	33.25	46.00	-12.75
500.281	10.97	1.00	105	-21.79	32.76	46.00	-13.24
600.360	7.98	2.45	35	-23.56	31.54	46.00	-14.46
845.102	4.16	1.00	61	-27.46	31.62	46.00	-14.38
***							

Table 17 Open Field Radiated Emissions For 1GHz 18GHz [CH 11, Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	(dBm V/m)	Limit (dBm V/m)	Margin (dB)
4.919	38.01	1.00	57	3.91	41.92	54.00	-12.08
5.093	32.87	1.00	164	3.91	36.78	54.00	-17.22
7.389	32.36	1.00	129	9.72	42.08	54.00	-11.92
***							

Ⅵ. Section 15.247(d): Power Spectral Density

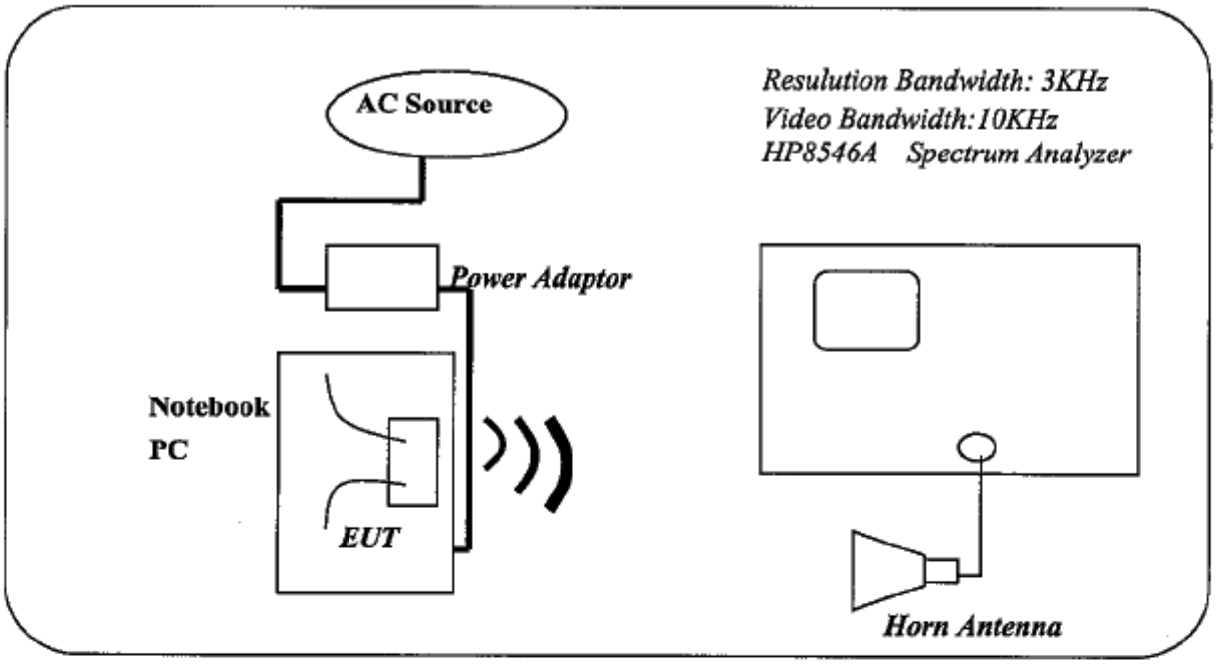
6.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power in TDD mode .A mini-pci port from a notebook computer to the EUT. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. A horn antenna was connected with the spectrum analyzer.

The EUT is tested in open field site. Put EUT on the middle of a wooden table. Set spectrum analyzer RBW = 3 KHz, VBW > RBW (e.g. VBW = 10 KHz), Span = 2 MHz. Turn around the table to find maximum emission. Then set the Span = 300 KHz and sweep time = 100 sec . Peak the maximum emission again. The peak level measured must be no greater than + 8dBm.

The setting up procedure is recorded on Appendix A.

6.2 Test Instruments Configuration



P.S.A mini-pci port from notebook computer to control the EUT at maximal power output and channel
Number.

Fig 12. Test Configuration of power spectral density

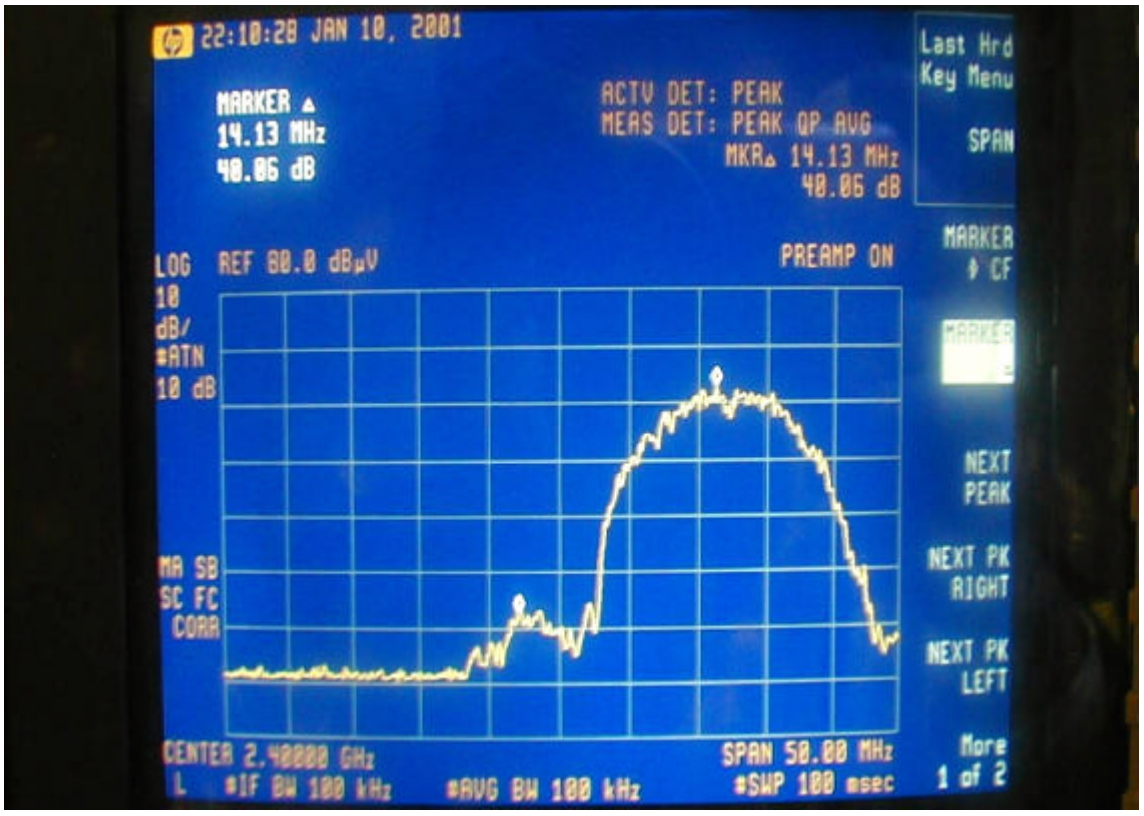
6.3 List of Test Instruments

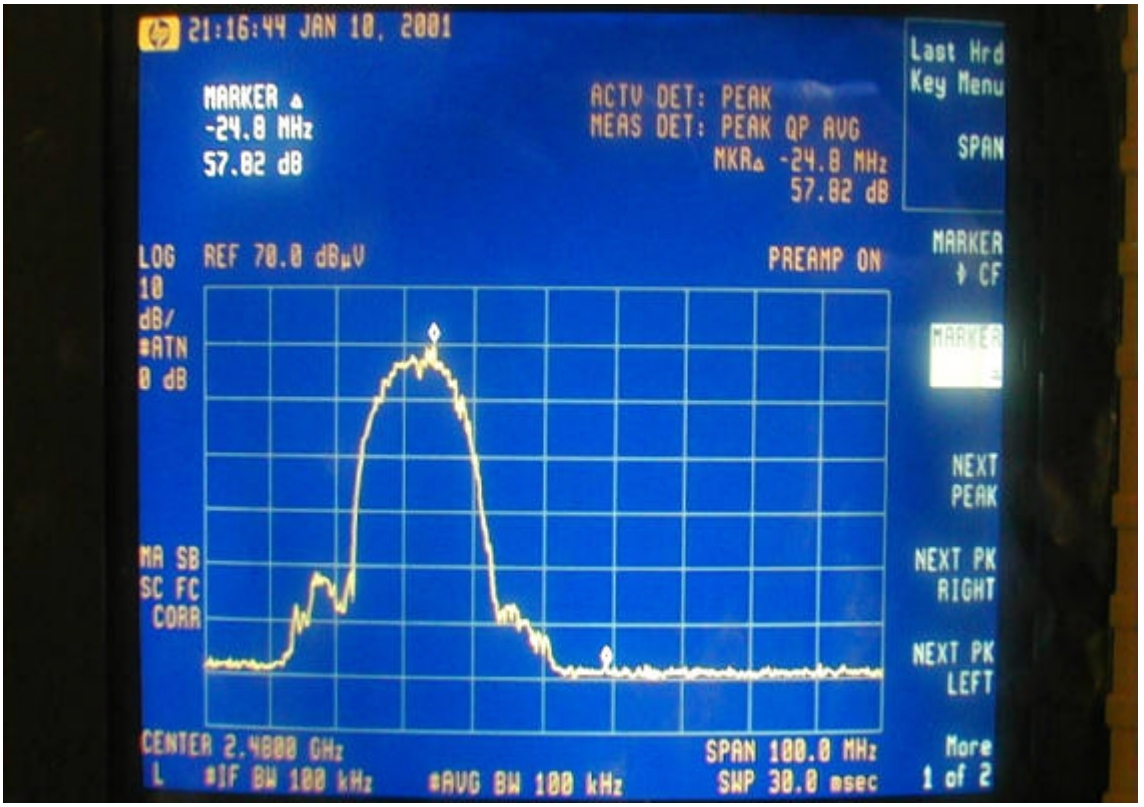
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/18/00	10/18/01
RF FilterSection	85460A	H P	3448A00217	10/18/00	10/18/01
Horn Antenna	3115	EMCO	9704 – 5178	08/15/00	08/15/01

6.4 Required of Carrier frequency

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


22:10:28 JAN 10, 2001
MARKER ▲
14.13 MHz
40.86 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR▲ 14.13 MHz
40.86 dB
Last Hrd Key Menu
SPAN
MARKER → CF
LOG
10
dB/
#ATN
10 dB
REF 80.0 dBµV
PREAMP ON
MA SB
SC FC
CORR
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
CENTER 2.40000 GHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 50.00 MHz
#SWP 100 msec


21:16:44 JAN 10, 2001
MARKER ▲
-24.8 MHz
57.82 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR▲ -24.8 MHz
57.82 dB
Last Hrd Key Menu
SPAN
MARKER → CF
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
MA SB
SC FC
CORR
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
CENTER 2.4800 GHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 100.0 MHz
SWP 30.0 msec

6.5 Test Result of Power spectral density.

The following table shows a summary of the highest power out of UT.

FCC ID : HLZMPCI-101

EUT : MPCI-101 Wireless LAN Module

Channel	*Frequency (MHz)*	*Ppr (dBuV)*	*CF (dB)*	*Ppq (dBm)*	*Limit (dB)*	*Margin (dB)*
CH 01	2412	47.22	35.60	-12.41	8.00	-20.41
CH 06	2437	47.84	35.60	-11.79	8.00	-19.79
CH 11	2462	45.40	35.60	-14.23	8.00	-22.23

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).

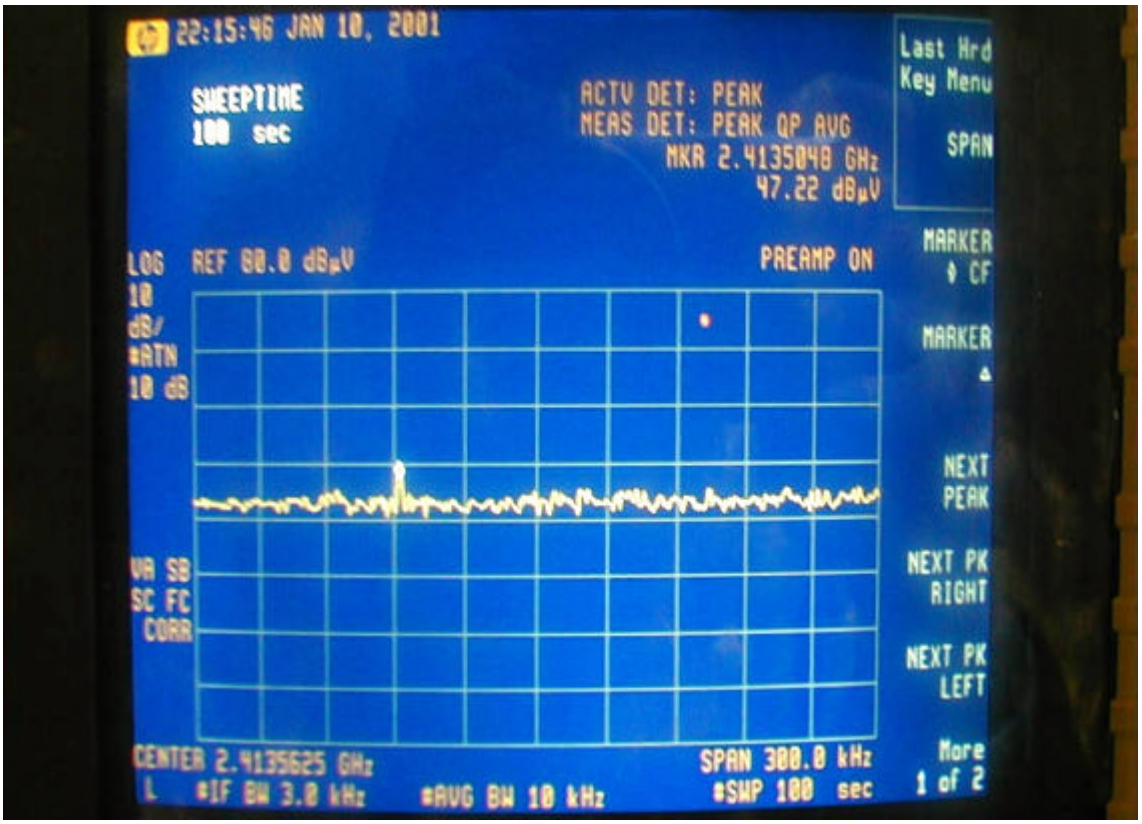
Example: the Max Radiation Emission = 47.84 + (35.60) = 83.44 dBμV/m

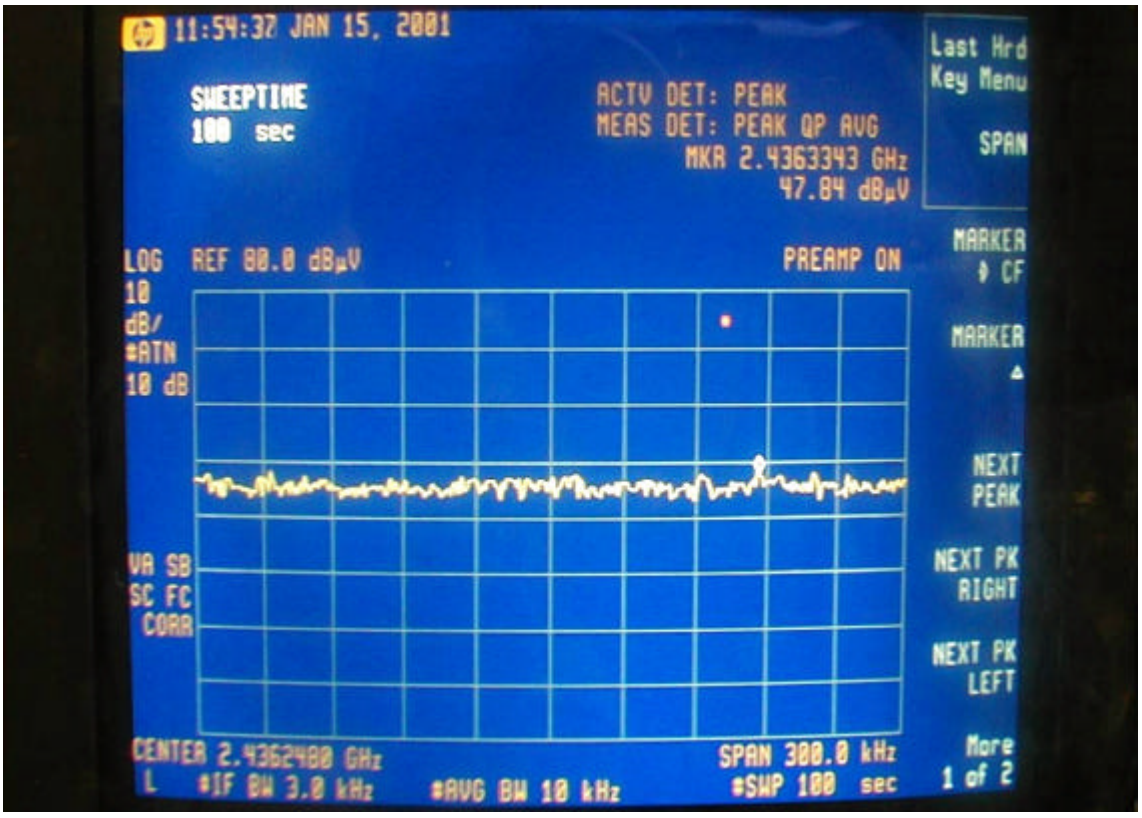
$10^{(83.44/20)} \times 10^{-6} = 0.014859$ V

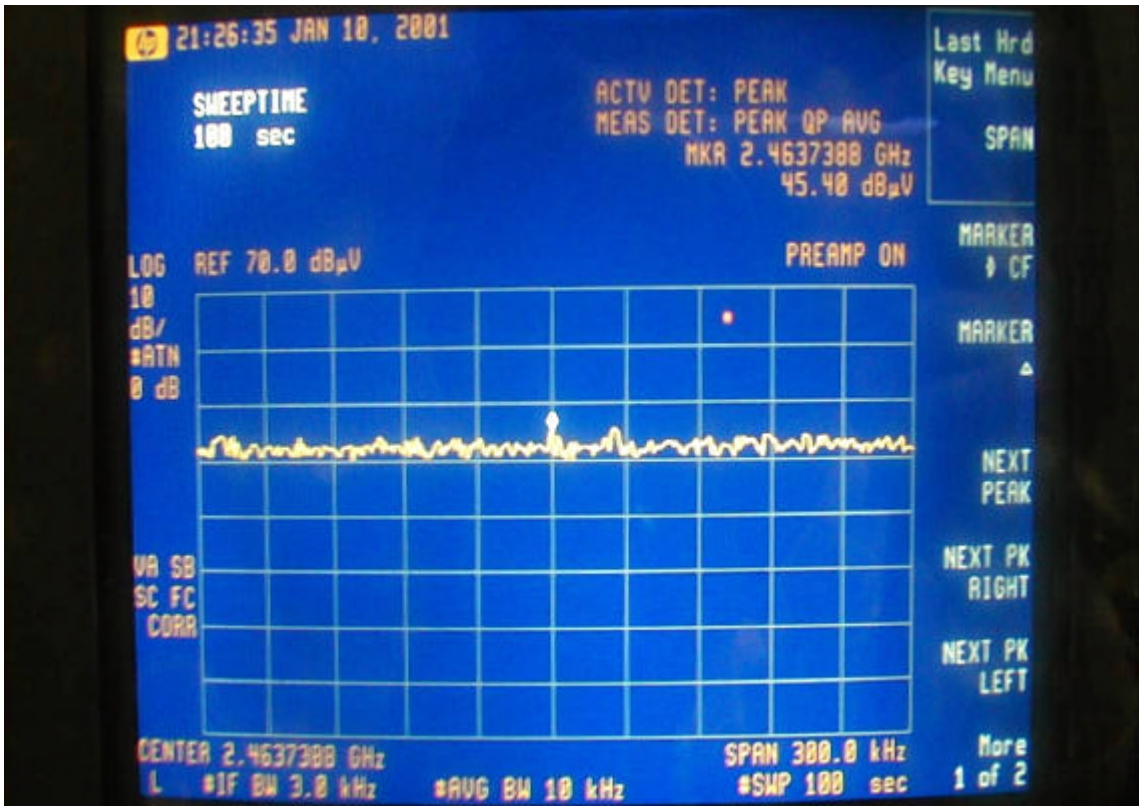
E.R.P. = $(0.014859 \times 3)^2 / 30 = 0.066240$ mW

= 10 x log (0.066240 mW/1mW)

= -11.79 dBm


22:15:46 JAN 10, 2001
SWEEPTIME
100 sec
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4135048 GHz
47.22 dBµV
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
10 dB
REF 80.0 dBµV
PREAMP ON
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
VA SB
SC FC
CORR
CENTER 2.4135625 GHz
#IF BW 3.0 kHz
#AVG BW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec


11:54:37 JAN 15, 2001
SWEEPTIME
100 sec
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4363343 GHz
47.84 dBµV
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
10 dB
REF 80.0 dBµV
PREAMP ON
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
VA SB
SC FC
CORR
CENTER 2.4362480 GHz
#IF BW 3.0 kHz
#AVG BW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec


21:26:35 JAN 10, 2001
SWEEPTIME
100 sec
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4637388 GHz
45.40 dBµV
Last Hrd Key Menu
SPAN
MARKER
MARKER
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
VA SB
SC FC
CORR
CENTER 2.4637388 GHz
#IF BW 3.0 kHz
#AVG BW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Ⅶ Section 15.247(e): Processing Gain

7.1 Test Method & Setup

The test method attach in the docket 97-114 appendix C Jamming Test setup that we found there were couple disadvantage as list in the follow:

(1) It can not simulate the real world condition

(2) Most of the hand held device (include notebook computer) there is no ground connection to the earth, especially the RF front end ground.

(3) The Coaxial and internal RF module will leak the signal that even you connect very high value attenuator .(shielding effective is low in the 2.4 GHz)

(4) There was very high uncertainty of measurement result and it is depended how you connect EUT, testing facility, wire and cable for BER measurement, power supply… all of this can affect the testing result.

(5) Move out the antenna and Matching pad are inconvenient for the testing and need more sample.

Base on the above reason we modify the original jamming test setup figure 1,and use two fully anechoic chambers to isolate test EUT and reference EUT.

Test procedure is simulated normal jamming setup, the block diagram and photograph as below.

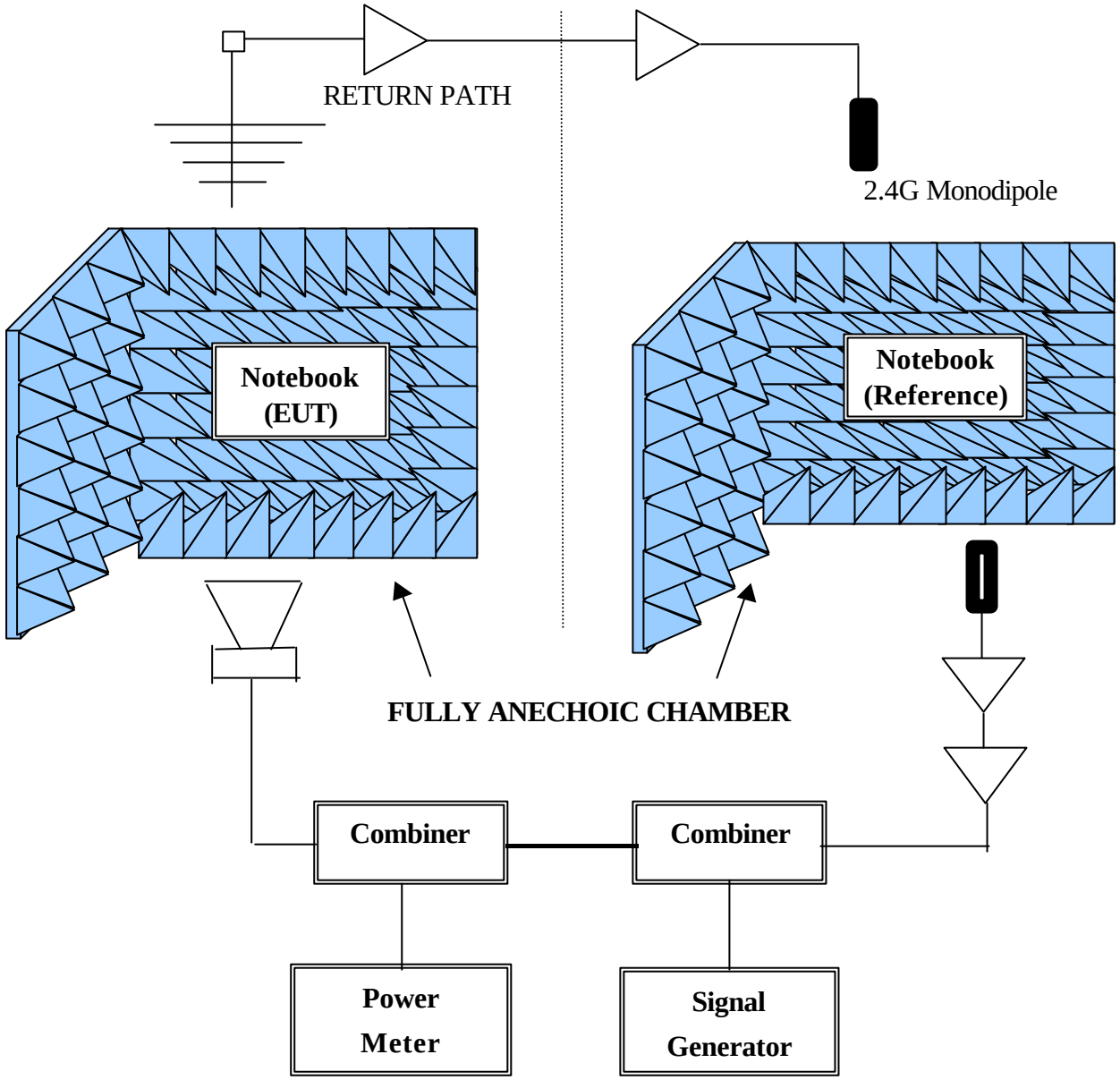
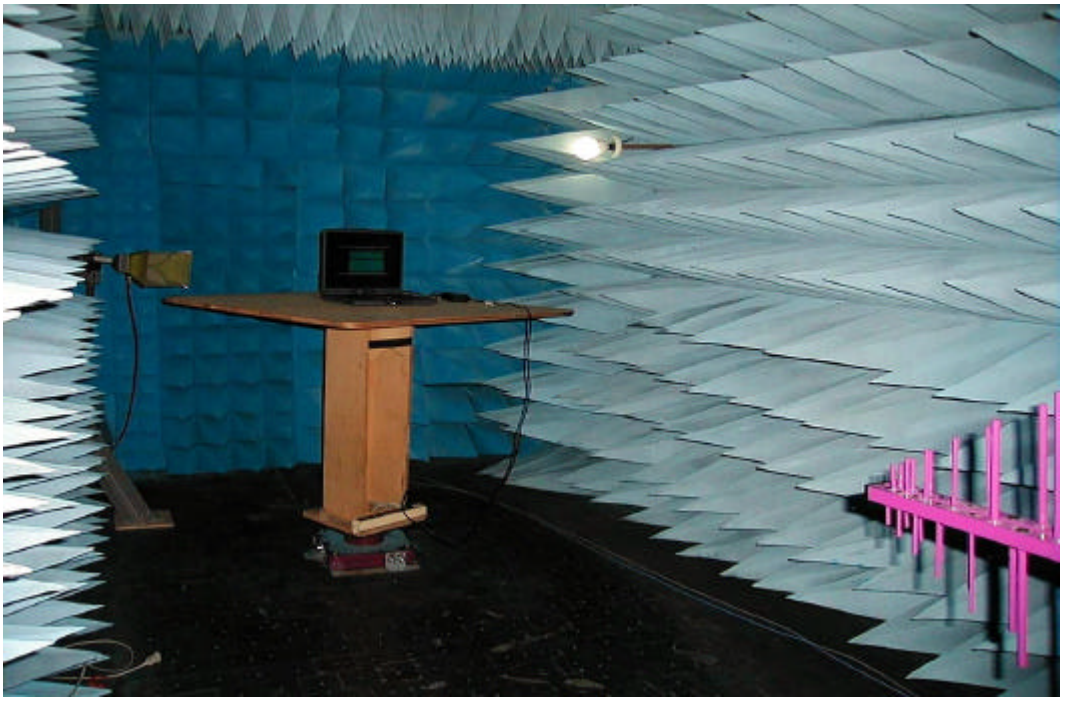


Figure (1)

EQUIPMENT LIST FOR TESTING PROCESSING GAIN

EQUIPMENT NAME	MANUFACTURE	MODEL NUMBER
ANTENNA	TRC	2.4GHz Mono Dipole
HORN	The Elector-Mechaniss	3115
COMBINER	MINI-CIRCULTS	15542 ZAPD-4
POWER METER	HP	436A
AMPLIFIER	MINI-CIRCUITS	ZFL-2500M
SIGNAL GENERATOR	HP	86480
ANTENNUATOR	MINI-CIRCULTS	SAT-30
BI-LOG	Schaffner	CBL6141A



TESTED EUT

REFERENCE EUT

7.2 Bit Error Rate (BER)

(1) Test Background and procedure

This section is depended on different chip set and modulation technique (CCK, DQPSK, DBPSK) must be according to the manufacture specification.

The test criteria for meeting the minimal processing gain is such that it take the theoretical calculated SNR for the processing gain is subtracted, yielding the CW Jammer to signal ratio J/S. It is determined that for BER of 10^-8 the SNR equal:

13 dB @ 1 Mbit/s

15 dB @ 2 Mbit/s

15 dB @ 5.5 Mbit/s

18 dB @ 11 Mbit/s

Two type of measurement correction are allowed for as described in FCC document.

The first taking into account 2 dB implementation loss and the second correction allows for deleting the 20% worst case.

7.3 List of Test Instruments

Instrument Name	Model No	Brand	Serial No.	Last time	Next time
Signal Generator	8648D	HP	3613A00117	05/19/1999	05/19/2001
Power Meter	436A	HP	1930A05580	09/11/2000	09/11/2001
Bi-log Antenna	CBL6141A	Schaffner	4151		

7.4 Test Procedure

The test block diagram in the figure (1) and the procedure as below.

(1) Install DOS Test toll into two notebook computers (E.U.T. and Reference)

(2) Set the Reference notebook computer as "Ping Pong Initiator" and the E.U.T. notebook computer as "Ping Pong Responder".

(3) Generated the Log File in the Reference notebook computer and send the test file.

(4) Ensure that CW Jammer generator RF out put is disabled and measure the power at the power meter port using the power meter. This is the relative signal power, S_r.

(5) Disable Transmitter, and set CW Jammer generator RF output frequency equal to the carrier frequency and enable generator output Set reference CW Jammer power level at power meter port 8.4 dB below S_r (minimum J/S, or 10 dB processing gain reference level).Note the power level setting on the generator, this is the reference CW Jammer power setting, J_r.

(6) Disable CW Jammer generator, re-establish link. PER test should be operating essentially error-free.

(7) Enable CW Jammer at the reference power level and verify that the PER test indicates a per of less than 10^-8

(8) Alternatively, adjust the CW Jammer level to that which causes 10^-8 PER and verify that the S/J is less than 8.4dB.

(9) Repeat step 7 for uniform steps in frequency increments of 50kHz across the receiver passband with the CW Jammer. In this case the receiver passband is $\pm$5.0MHz.

The number of points where the PER fail to achieve 8% (is higher than 8%) is determined and if this is above 20% of the total, the test is failed otherwise it is passed.

The margin by which the radio passes the test (for information purposes) can be determined from the average of the remaining points' PERs scaled on the PER curve above.

7.5 Test Result of Processing Gain

Table 18 Processing Gain [Channel 10, CCK, 2.45200GHz to 2.45400GHz]

Jammer Frequency (MHz)	Signal Level S (dBm)	Signal Generator RF Output J (dBm)	Mj (J/S)	Process Gain (dB)
2452.00	-51.80	-49.16	2.64	22.64
2452.05	-51.80	-49.20	2.60	22.60
2452.10	-51.80	-49.10	2.70	22.70
2452.15	-51.80	-49.55	2.25	22.25
2452.20	-51.80	-49.73	2.07	22.07
2452.25	-51.80	-50.13	1.67	21.67
2452.30	-51.80	-50.13	1.67	21.67
2452.35	-51.80	-50.55	1.25	21.25
2452.40	-51.80	-50.72	1.08	21.08
2452.45	-51.80	-50.70	1.10	21.10
2452.50	-51.80	-51.02	0.78	20.78
2452.55	-51.80	-51.24	0.56	20.56
2452.60	-51.80	-51.46	0.34	20.34
2452.65	-51.80	-51.68	0.12	20.12
2452.70	-51.80	-51.86	-0.06	19.94
2452.75	-51.80	-51.94	-0.14	19.86
2452.80	-51.80	-52.09	-0.29	19.71
2452.85	-51.80	-52.37	-0.57	19.43
2452.90	-51.80	-52.50	-0.70	19.30
2452.95	-51.80	-52.54	-0.74	19.26
2453.00	-51.80	-52.80	-1.00	19.00
2453.05	-51.80	-52.77	-0.97	19.03
2453.10	-51.80	-52.96	-1.16	18.84
2453.15	-51.80	-53.08	-1.28	18.72
2453.20	-51.80	-53.27	-1.47	18.53
2453.25	-51.80	-53.40	-1.60	18.40
2453.30	-51.80	-53.51	-1.71	18.29
2453.35	-51.80	-53.70	-1.90	18.10
2453.40	-51.80	-53.60	-1.80	18.20
2453.45	-51.80	-53.75	-1.95	18.05
2453.50	-51.80	-53.87	-2.07	17.93
2453.55	-51.80	-54.00	-2.20	17.80
2453.60	-51.80	-54.12	-2.32	17.68
2453.65	-51.80	-54.00	-2.20	17.80
2453.70	-51.80	-53.93	-2.13	17.87
2453.75	-51.80	-53.87	-2.07	17.93
2453.80	-51.80	-53.96	-2.16	17.84
2453.85	-51.80	-53.92	-2.12	17.88
2453.90	-51.80	-53.83	-2.03	17.97
2453.95	-51.80	-53.78	-1.98	18.02
2454.00	-51.80	-53.84	-2.04	17.96

Table 19 Processing Gain [Channel 10, CKK, 2.45405GHz to 2.45625GHz]

Jammer Frequency (MHz)	Signal Level S (dBm)	Signal Generator RF Output J (dBm)	Mj (J/S)	Process Gain (dB)
2454.05	-51.80	-53.67	-1.87	18.13
2454.10	-51.80	-53.70	-1.90	18.10
2454.15	-51.80	-53.80	-2.00	18.00
2454.20	-51.80	-53.92	-2.12	17.88
2454.25	-51.80	-53.93	-2.13	17.87
2454.30	-51.80	-53.90	-2.10	17.90
2454.35	-51.80	-53.90	-2.10	17.90
2454.40	-51.80	-53.83	-2.03	17.97
2454.45	-51.80	-53.75	-1.95	18.05
2454.50	-51.80	-53.92	-2.12	17.88
2454.55	-51.80	-53.72	-1.92	18.08
2454.60	-51.80	-53.71	-1.91	18.09
2454.65	-51.80	-53.76	-1.96	18.04
2454.70	-51.80	-53.94	-2.14	17.86
2454.75	-51.80	-53.70	-1.90	18.10
2454.80	-51.80	-53.75	-1.95	18.05
2454.85	-51.80	-53.73	-1.93	18.07
2454.90	-51.80	-53.65	-1.85	18.15
2454.95	-51.80	-53.70	-1.90	18.10
2455.00	-51.80	-53.65	-1.85	18.15
2455.05	-51.80	-53.66	-1.86	18.14
2455.10	-51.80	-53.58	-1.78	18.22
2455.15	-51.80	-53.57	-1.77	18.23
2455.20	-51.80	-53.55	-1.75	18.25
2455.25	-51.80	-53.58	-1.78	18.22
2455.30	-51.80	-53.48	-1.68	18.32
2455.35	-51.80	-53.55	-1.75	18.25
2455.40	-51.80	-53.66	-1.86	18.14
2455.45	-51.80	-53.60	-1.80	18.20
2455.50	-51.80	-53.55	-1.75	18.25
2455.55	-51.80	-53.50	-1.70	18.30
2455.60	-51.80	-53.42	-1.62	18.38
2455.65	-51.80	-53.28	-1.48	18.52
2455.70	-51.80	-53.18	-1.38	18.62
2455.75	-51.80	-53.24	-1.44	18.56
2455.80	-51.80	-53.22	-1.42	18.58
2455.85	-51.80	-53.20	-1.40	18.60
2455.90	-51.80	-53.21	-1.41	18.59
2455.95	-51.80	-53.18	-1.38	18.62
2456.00	-51.80	-52.45	-0.65	19.35
2456.05	-51.80	-52.96	-1.16	18.84
2456.10	-51.80	-52.59	-0.79	19.21
2456.15	-51.80	-52.69	-0.89	19.11
2456.20	-51.80	-52.79	-0.99	19.01
2456.25	-51.80	-52.32	-0.52	19.48

Table 20 Processing Gain [Channel 10, CCK, 2.45630GHz to 2.45850GHz]

Jammer Frequency (MHz)	Signal Level S (dBm)	Signal Generator RF Output J (dBm)	Mj (J/S)	Process Gain (dB)
2456.30	-51.80	-52.25	-0.45	19.55
2456.35	-51.80	-52.63	-0.83	19.17
2456.40	-51.80	-52.84	-1.04	18.96
2456.45	-51.80	-52.51	-0.71	19.29
2456.50	-51.80	-52.85	-1.05	18.95
2456.55	-51.80	-51.98	-0.18	19.82
2456.60	-51.80	-52.71	-0.91	19.09
2456.65	-51.80	-52.21	-0.41	19.59
2456.70	-51.80	-52.10	-0.30	19.70
2456.75	-51.80	-52.54	-0.74	19.26
2456.80	-51.80	-52.30	-0.50	19.50
2456.85	-51.80	-52.75	-0.95	19.05
2456.90	-51.80	-52.80	-1.00	19.00
2456.95	-51.80	-52.00	-0.20	19.80
2457.00	-51.80	-50.45	1.35	21.35
2457.05	-51.80	-53.36	-1.56	18.44
2457.10	-51.80	-52.44	-0.64	19.36
2457.15	-51.80	-52.73	-0.93	19.07
2457.20	-51.80	-52.36	-0.56	19.44
2457.25	-51.80	-50.20	1.60	21.60
2457.30	-51.80	-50.40	1.40	21.40
2457.35	-51.80	-50.31	1.49	21.49
2457.40	-51.80	-50.44	1.36	21.36
2457.45	-51.80	-50.06	1.74	21.74
2457.50	-51.80	-53.16	-1.36	18.64
2457.55	-51.80	-53.79	-1.99	18.01
2457.60	-51.80	-53.12	-1.32	18.68
2457.65	-51.80	-53.06	-1.26	18.74
2457.70	-51.80	-52.95	-1.15	18.85
2457.75	-51.80	-53.38	-1.58	18.42
2457.80	-51.80	-52.70	-0.90	19.10
2457.85	-51.80	-53.92	-2.12	17.88
2457.90	-51.80	-53.68	-1.88	18.12
2457.95	-51.80	-53.68	-1.88	18.12
2458.00	-51.80	-54.87	-3.07	16.93
2458.05	-51.80	-53.73	-1.93	18.07
2458.10	-51.80	-53.71	-1.91	18.09
2458.15	-51.80	-53.69	-1.89	18.11
2458.20	-51.80	-53.80	-2.00	18.00
2458.25	-51.80	-53.50	-1.70	18.30
2458.30	-51.80	-53.55	-1.75	18.25
2458.35	-51.80	-53.54	-1.74	18.26
2458.40	-51.80	-53.58	-1.78	18.22
2458.45	-51.80	-53.50	-1.70	18.30
2458.50	-51.80	-53.58	-1.78	18.22

Table 21 Processing Gain [Channel 10, CCK, 2.45855GHz to 2.46075GHz]

Jammer Frequency (MHz)	Signal Level S (dBm)	Signal Generator RF Output J (dBm)	Mj (J/S)	Process Gain (dB)
2458.55	-51.80	-53.61	-1.81	18.19
2458.60	-51.80	-53.72	-1.92	18.08
2458.65	-51.80	-53.74	-1.94	18.06
2458.70	-51.80	-53.80	-2.00	18.00
2458.75	-51.80	-53.87	-2.07	17.93
2458.80	-51.80	-53.90	-2.10	17.90
2458.85	-51.80	-53.88	-2.08	17.92
2458.90	-51.80	-53.74	-1.94	18.06
2458.95	-51.80	-53.81	-2.01	17.99
2459.00	-51.80	-53.92	-2.12	17.88
2459.05	-51.80	-53.84	-2.04	17.96
2459.10	-51.80	-53.70	-1.90	18.10
2459.15	-51.80	-53.68	-1.88	18.12
2459.20	-51.80	-53.92	-2.12	17.88
2459.25	-51.80	-53.90	-2.10	17.90
2459.30	-51.80	-53.89	-2.09	17.91
2459.35	-51.80	-53.80	-2.00	18.00
2459.40	-51.80	-53.79	-1.99	18.01
2459.45	-51.80	-53.80	-2.00	18.00
2459.50	-51.80	-53.65	-1.85	18.15
2459.55	-51.80	-53.73	-1.93	18.07
2459.60	-51.80	-53.82	-2.02	17.98
2459.65	-51.80	-53.87	-2.07	17.93
2459.70	-51.80	-53.80	-2.00	18.00
2459.75	-51.80	-53.70	-1.90	18.10
2459.80	-51.80	-53.62	-1.82	18.18
2459.85	-51.80	-53.65	-1.85	18.15
2459.90	-51.80	-53.60	-1.80	18.20
2459.95	-51.80	-53.58	-1.78	18.22
2460.00	-51.80	-53.57	-1.77	18.23
2460.05	-51.80	-53.53	-1.73	18.27
2460.10	-51.80	-53.42	-1.62	18.38
2460.15	-51.80	-53.37	-1.57	18.43
2460.20	-51.80	-53.31	-1.51	18.49
2460.25	-51.80	-53.25	-1.45	18.55
2460.30	-51.80	-53.19	-1.39	18.61
2460.35	-51.80	-53.10	-1.30	18.70
2460.40	-51.80	-53.00	-1.20	18.80
2460.45	-51.80	-52.92	-1.12	18.88
2460.50	-51.80	-52.87	-1.07	18.93
2460.55	-51.80	-52.78	-0.98	19.02
2460.60	-51.80	-52.69	-0.89	19.11
2460.65	-51.80	-52.72	-0.92	19.08
2460.70	-51.80	-52.76	-0.96	19.04
2460.75	-51.80	-52.52	-0.72	19.28

Table 22 Processing Gain [Channel 10, CCK, 2.46080GHz to 2.46200GHz]

Jammer Frequency (MHz)	Signal Level S (dBm)	Signal Generator RF Output J (dBm)	Mj (J/S)	Process Gain (dB)
2460.80	-51.80	-52.43	-0.63	19.37
2460.85	-51.80	-52.20	-0.40	19.60
2460.90	-51.80	-52.15	-0.35	19.65
2460.95	-51.80	-52.07	-0.27	19.73
2461.00	-51.80	-51.60	0.20	20.20
2461.05	-51.80	-51.58	0.22	20.22
2461.10	-51.80	-51.52	0.28	20.28
2461.15	-51.80	-51.43	0.37	20.37
2461.20	-51.80	-51.40	0.40	20.40
2461.25	-51.80	-51.34	0.46	20.46
2461.30	-51.80	-51.30	0.50	20.50
2461.35	-51.80	-51.15	0.65	20.65
2461.40	-51.80	-50.98	0.82	20.82
2461.45	-51.80	-50.72	1.08	21.08
2461.50	-51.80	-50.52	1.28	21.28
2461.55	-51.80	-49.72	2.08	22.08
2461.60	-51.80	-49.50	2.30	22.30
2461.65	-51.80	-48.30	3.50	23.50
2461.70	-51.80	-48.50	3.30	23.30
2461.75	-51.80	-48.35	3.45	23.45
2461.80	-51.80	-48.30	3.50	23.50
2461.85	-51.80	-48.30	3.50	23.50
2461.90	-51.80	-48.30	3.50	23.50
2461.95	-51.80	-47.95	3.85	23.85
2462.00	-51.80	-47.90	3.90	23.90

Test Result: Processing Gain: 18.05 dB

Note: GP = (S/No) + Mj + Lsys

= 18dB + Mj + 2dB

Appendix A

Setting up Procedure

1. The EUT build in Mini-PCI interface of notebook PC. Using the Mini –PCI port of Notebook PC and software to control the wireless lan module.
2. Use the software that is given by the customer and operated in the windows (Processing gain test) and DOS (Other test item) to control the EUT's continuous transmission.
3. Then making access to the mode of continuous transmission and set testing channel.

Appendix B

Antenna Spec.

T2 Antenna Sample Spec.

By Patrick Lee

Date:01/16/01

啓碁科技股份有限公司
新竹市東大路二段 110 號 6F
Acer NeWeb Corporation
6F,110 Sec. 2, Tung Ta Road,
Hsinchu 300, Taiwan, R.O.C.
TEL:03-5428000
FAX:03-5420098

Antenna Spec.

a. Average gain and peak gain

a.1 802.11b in elevation angle θ = 0 azimuth plane

	Average Gain (dBi)			Peak Gain (dBi)		
	2.4GHz	2.45GHz	2.5GHz	2.4GHz	2.45GHz	2.5GHz
Main	≧-5	≧-5	≧-5	≦3	≦3	≦3
Aux	≧-6	≧-6	≧-6	NA	NA	NA

a.2 802.11b in elevation angle -30° < θ <30° azimuth plane

	Average Gain (dBi)			Peak Gain (dBi)		
	2.4GHz	2.45GHz	2.5GHz	2.4GHz	2.45GHz	2.5GHz
Main	≧-4	≧-4	≧-4	NA	NA	NA
Aux	≧-5	≧-5	≧-5	NA	NA	NA

a.3 bluetooth in elevation angle -30° < θ <30° azimuth plane

	Average Gain (dBi)			Peak Gain (dBi)		
	2.4GHz	2.45GHz	2.5GHz	2.4GHz	2.45GHz	2.5GHz
Aux	≧-4	≧-4	≧-4	≦3	≦3	≦3

b. VSWR < 2 from 2.4GHz to 2.5 GHz for 802.11b and bluetooth

Appendix C

The antenna of the device is fixed inside the notebook computer, the user can not remove it freely without any tools from outside the device. This is comply with the FCC rules part 15.203

Appendix D

RF Exposure Calculations

From FCC 1.1310 table 1A, the maximum permissible RF exposure for an uncontrolled environment is $1mW/cm^2$. The Electric field generated for a $1mW/cm^2$ exposure (S) is calculated as follows:

$S = E^2 / Z$

Where:

S = Power density

E = Electric field

Z = Impedance.

$E = \sqrt{S \times Z}$

$1mW/cm^2 = 10 W/m^2$

The impedance of free space is 337 ohms, where E and H fields are perpendicular.

Thus:

$E = \sqrt{10 \times 377} = 61.4$ V/m which is equivalent to $1mW/cm^2$

Using the relationship between Electric field E, Power in watts P, and distance in meters d, the corresponding

Antenna numeric gain G and the transmitter output power and solving for d,

$$d = \frac{\sqrt{P_{eak} \times 30 \times G}}{E}$$

The Numeric gain G of antenna with a gain specified in dB is determined by:

$G = Log^{-1}$ (dB gain/10)

$G = Log^{-1}$ (3.0/10) = 1.995

Notice in Installation Manual:

While installing and operating this transmitter and antenna combination the radio frequency exposure limit of $1mW/cm^2$ may be exceeded at distances close to the antennas installed. Therefore, the user must maintain a minimum distance of 20 cm from the antenna at all time.

The table in follow page identifies the distances where the $1mW/cm^2$ exposure limits may be exceeded during continuous transmission using the internal antenna

Antenna Type	Gain (dBi)	Gain Numeric	Peak Output Power (mW)	Calculated RF Exposure Separation Distance (cm)	Minimum RF Exposure Separation Distance (cm)
Dipole	3.0	1.995	32.743	1.142	20

Measurement of MPE
Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Filed Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
300-1500	--	--	f/300	30
1500-100,000	--	--	5	30
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30
Test Result of EUT			0.0201	30

Setting up Procedure: (See Appendix A)
Picture of Test :

Instrument Name	Model No	Brand	Serial No.	Last time	Next time
EM Radiation Monitor	EMC-20	WG	Y-0026	05/11/2000	05/11/2001
E-Field Sensor 3GHz	TYP-8	WG	Z-0001	05/08/2000	05/08/2001