

# FCC TEST REPORT

for

## 47 CFR, Part 15, Subpart C

Equipment : 4 PORT ADSL ROUTER/  
4 PORT ADSL ROUTER plus Wireless

Model No. : FC-AL2014P/FC-AL2014PW

FCC ID. : RENFC-AL2014PW

Filing Type : Certification

Applicant : **FU CHAN HIGH PILE CO., LTD**  
FL. 1, NO. 1, LANE 89, LIEN-CHEN RD., CHUNG-HO  
CITY, TAIPEI HSIEN, TAIWAN, R.O.C.

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### ***SPORTON International Inc.***

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

## Table of Contents

<b>History of this test report .....</b>	<b>ii</b>
<b>CERTIFICATE OF COMPLIANCE.....</b>	<b>1</b>
<b>1. General Description of Equipment under Test.....</b>	<b>2</b>
1.1. Applicant.....	2
1.2. Manufacturer .....	2
1.3. Basic Description of Equipment under Test .....	2
1.4. Feature of Equipment under Test .....	3
<b>2. Test Configuration of Equipment under Test.....</b>	<b>4</b>
2.1. Test Manner .....	4
2.2. Description of Test System .....	4
2.3. Connection Diagram of Test System .....	6
<b>3. Test Software .....</b>	<b>7</b>
<b>4. General Information of Test.....</b>	<b>8</b>
4.1. Test Voltage .....	8
4.2. Standard for Methods of Measurement.....	8
4.3. Test in Compliance with .....	8
4.4. Frequency Range Investigated .....	8
4.5. Test Distance .....	8
<b>5. Report of Measurements and Examinations .....</b>	<b>9</b>
5.1. List of Measurements and Examinations .....	9
5.2. 6dB Bandwidth .....	10
5.3. Peak Output Power .....	13
5.4. Power Spectral Density .....	14
5.5. Test of Conducted Emission .....	17
5.6. Test of Radiated Emission .....	24
5.7. Band Edges Measurement.....	39
5.8. Antenna Requirements .....	41
5.9. RF Exposure .....	42
<b>6. EMI Suppression Component List.....</b>	<b>44</b>
<b>7. Antenna Factor &amp; Cable Loss .....</b>	<b>45</b>
<b>8. List of Measuring Equipments Used .....</b>	<b>46</b>
<b>9. Uncertainty of Test Site .....</b>	<b>47</b>



# CERTIFICATE OF COMPLIANCE

for

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FL. 1, NO. 1, LANE 89, LIEN-CHEN RD., CHUNG-HO CITY,  
TAIPEI HSIEN, TAIWAN, R.O.C.

**HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** and the equipment under test was **passed** all test items required in FCC Part 15 subpart C, relative to the equipment under test. Testing was carried out on Jul. 16, 2003 at **SPORTON International Inc.** LAB.



Alex Chen  
Manager

**SPORTON International Inc.**

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

## **1. General Description of Equipment under Test**

### **1.1. Applicant**

FU CHAN HIGH PILE CO., LTD  
FL. 1, NO. 1, LANE 89, LIEN-CHEN RD., CHUNG-HO CITY, TAIPEI HSIEN, TAIWAN, R.O.C.

### **1.2. Manufacturer**

Same as 1.1

### **1.3. Basic Description of Equipment under Test**

Equipment	: 4 PORT ADSL ROUTER/4 PORT ADSL ROUTER plus Wireless
Model No.	: FC-AL2014P/FC-AL2014PW
FCC ID.	: RENFC-AL2014PW
Trade Name	: FU CHAN
USB Cable	: Non-Shielded, 1.8m
TP Cable x 4	: Non-Shielded, 1m
Telephone Line	: Non-Shielded, 3m
Power Supply Type	: Linear
AC Power Input	: Wall-Mount, 2pin
DC Power Cable	: Non-Shielded, 2m

**1.4. Feature of Equipment under Test**

Product Feature & Specification	
1. Host/Radio Interface	DSSS
2. Type of Modulation	BPSK, QPSK, CCK, PBCC
3. Number of Channels	USA/Canada: 11
4. Frequency Band	2.4~2.4835 GHz
5. Carrier Frequency of each channel	2412+(n-1)*5, n= Channel NO.
6. Bandwidth of each channel	11MHz
7. Maximum Output Power to Antenna	12dBm~15dBm
8. IF & L.O. frequency	
9. Type of Antenna Connector (Ex: SMA,TNC, MCX, MMCX, UFC.....etc)	SMA
10. Antenna Type / Class and Gain	PIFA Antenna / 2.0dBi
11. Function Type	Transceiver
12. Power Rating (DC/AC, Voltage)	DC 3.3 V ± 5%
13. Duty Cycle	100%
14. Basic function of product	Data Transmission

## **2. Test Configuration of Equipment under Test**

### **2.1. Test Manner**

- a. The EUT has been associated with notebook and peripherals pursuant to ANSI C63.4-1992 and configuration operated in a manner, which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included remote DYNA MITE CO, COMPAQ Notebook, VIEWSONIC Monitor, LOGITECH PS/2 Keyboard, LOGITECH USB Mouse, Epson Printer and EUT for EMI test.
- c. The following test modes were performed for EMI test:
  - Mode 1: CH01 ( 2412MHz )
  - Mode 2: CH06 ( 2437MHz )
  - Mode 3: CH11 ( 2462MHz )
- b. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 24835MHz.

### **2.2. Description of Test System**

Support Unit 1. -- Monitor (VIEWSONIC) --for local workstation

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP063
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- PS/2 Keyboard (LOGITECH) --for local workstation

FCC ID	: N/A
Model No.	: Y-SJ17
Serial No.	: SP0054
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

## Support Unit 3. -- USB Mouse (LOGITECH) –for local workstation

FCC ID : N/A  
Model No. : M-BE58  
Serial No. : SP0041  
Data Cable : Shielded, 1.7m  
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

## Support Unit 4. -- Printer (EPSON) –for local workstation

FCC ID : N/A  
Model No. : STYLUS COLOR S680  
Power Supply Type : Linear  
Power Cord : Non-Shielded  
Serial No. : SP0048  
Data Cable : Shielded, 1.35m  
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

## Support Unit 5. -- Notebook (COMPAQ) –for local workstation

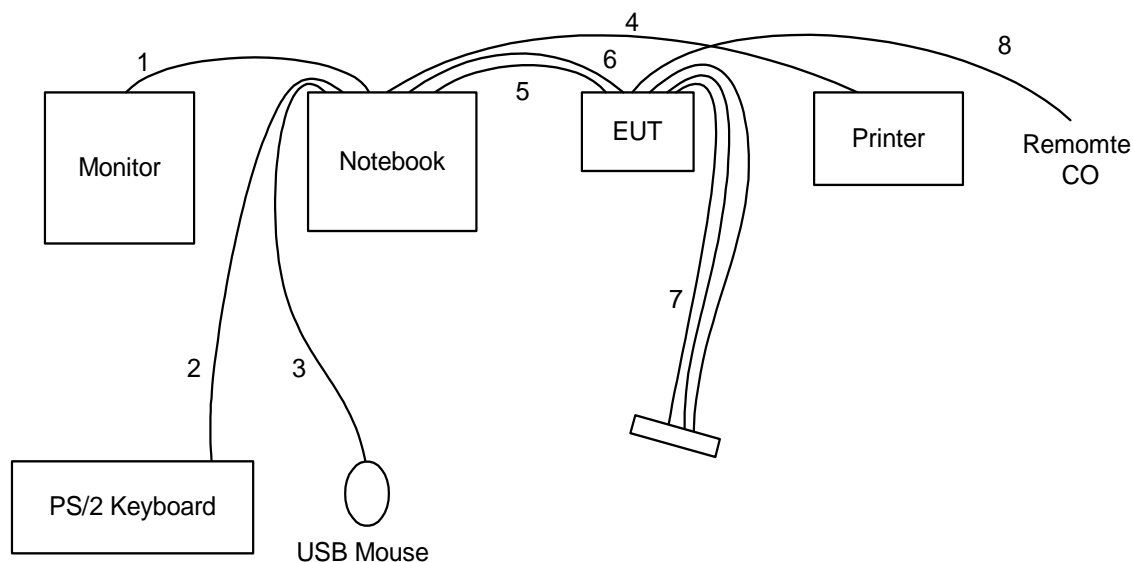
FCC ID : N/A  
Model No. : PRESARIO 1500  
Power Supply Type : Switching  
Power Cord : Non-Shielded  
Serial No. : SP0036  
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

## Support Unit 6. – CO (DYNA MITE) - for remote workstation

FCC ID : N/A  
Model No. : Premier  
Serial No. : SP0033  
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.



2.3. Connection Diagram of Test System



1. The I/O cable is connected from Notebook to the support unit 1.
2. The I/O cable is connected from Notebook to the support unit 2.
3. The I/O cable is connected from Notebook to the support unit 3.
4. The I/O cable is connected from Notebook to the support unit 4.
5. The USB cable is connected from Notebook to the EUT.
6. The TP cable is connected from Notebook to the EUT.
7. These are loop-back TP cables.
8. The Telephone line is connected from EUT to the remote CO.

### **3. Test Software**

An executive program, EMCTEST.EXE under WIN XP, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows:

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the hard disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- f. Repeat the steps from c to d.

At the same time, the EUT keep transmitting signals at fixed frequency.

## **4. General Information of Test**

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,  
Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C.  
TEL : 886-3-327-3456  
FAX : 886-3-318-0055  
Test Site No : CO01-HY, 03CH03-HY

### **4.1. Test Voltage**

110V/60Hz

### **4.2. Standard for Methods of Measurement**

ANSI C63.4-1992

### **4.3. Test in Compliance with**

FCC Part 15, Subpart C 15.247

### **4.4. Frequency Range Investigated**

- a. Conduction: from 150 KHz to 30 MHz
- b. Radiation: from 30 MHz to 24835MHz

### **4.5. Test Distance**

The test distance of radiated emission from antenna to EUT is 3 M.

**5. Report of Measurements and Examinations**

**5.1. List of Measurements and Examinations**

FCC Rule	Description of Test	Result
<u>15.247(a)(2)</u>	6dB Bandwidth	Pass
<u>15.247(b)</u>	Maximum Peak Output Power	Pass
<u>15.247(d)</u>	Power Spectral Density	Pass
15.207	Conducted Emission	Pass
15.209	Radiated Emission	Pass
<u>15.247(c)</u>	100kHz Bandwidth of Frequency Band Edges	Pass
<u>15.203</u>	Antenna Requirement	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass

**5.2. 6dB Bandwidth**

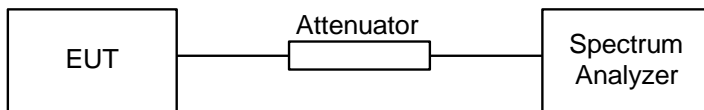
5.2.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.2.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

5.2.3. Test Setup Layout :



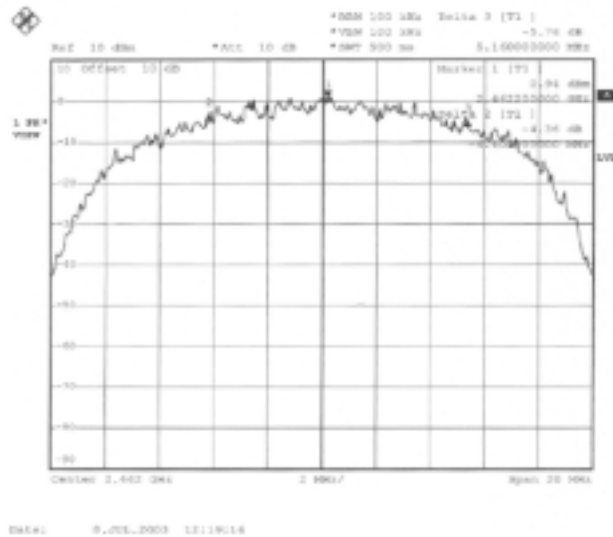
5.2.4. Test Result : The spectrum analyzer plots are attached as below

- Temperature : 26°C
- Relative Humidity : 65 %

Channel	Frequency ( MHz )	6dB Emission bandwidth ( MHz )	Limits ( MHz )	Plot Ref. No.
1	2412	9.64	0.5	1
6	2437	9.56	0.5	2
11	2462	9.56	0.5	3



Plot3(Channel 11) :



Comments : 6dB Emission bandwidth>500kHz

**5.3. Peak Output Power**

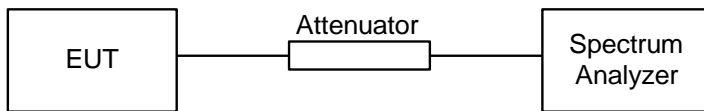
5.3.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.3.2. Test Procedure :

The antenna port ( RF output ) of the EUT was connected to the input ( RF input ) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

5.3.3. Test Setup Layout :



5.3.4. Test Result : See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 65 %
- Antenna Gain: 2 dBi

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limits (Watt/dBm )
1	2412	13.16	20.70141349	1W/30 dBm
6	2437	12.15	16.40589773	1W/30 dBm
11	2462	11.14	13.00169578	1W/30 dBm

- Comments : Maximum Peak Output Power < 30dBm ( 1Watt)



**5.4. Power Spectral Density**

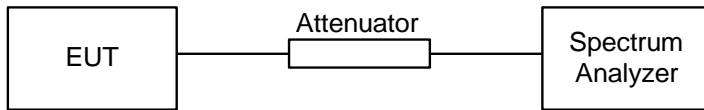
5.4.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.4.2. Test Procedure :

1. The transmitter output was connected to spectrum analyzer through an attenuator.
2. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=span/3KHz.
3. The power spectral density was measured and recorded.
4. The Sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

5.4.3. Test Setup Layout :

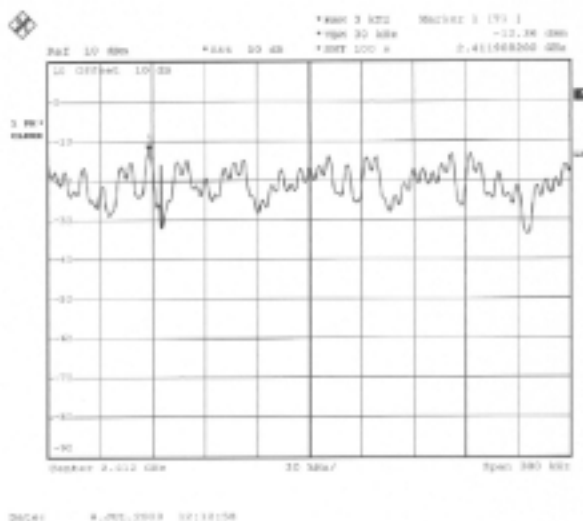


5.4.4. Test Result : See spectrum analyzer plots below

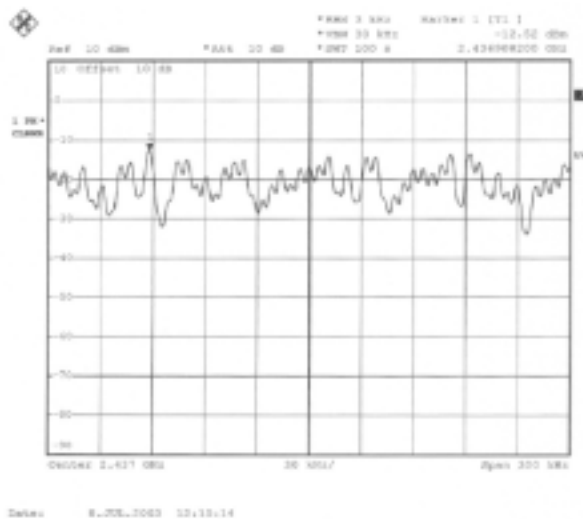
- Temperature: 26°C
- Relative Humidity: 65 %

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
1	2412	-12.36	8	1
6	2437	-12.52	8	2
11	2462	-13.57	8	3

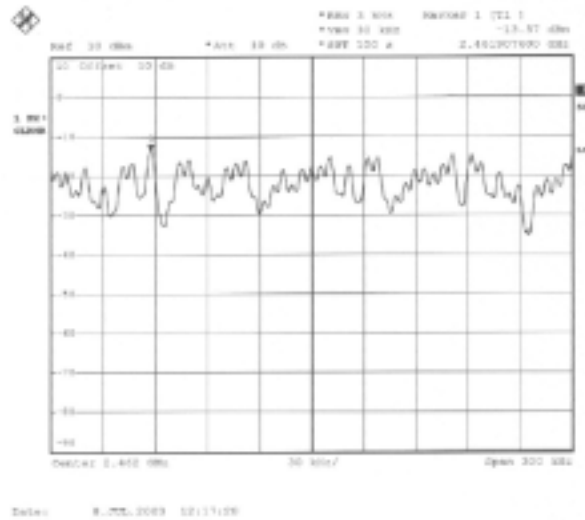
Plot1(Channel 1):



Plot2(Channel 6):



Plot3(Channel 11):



## 5.5. Test of Conducted Emission

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz and return leads of the EUT according to the methods defined in ANSI C63.4-1992 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

### 5.5.1. Major Measuring Instruments :

• Test Receiver	(R&S ESCS 30)
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

### 5.5.2. Test Procedures :

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 KHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5.5.3. Test Result of Conducted Emission :

- Test Mode: Mode 1
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 27.1°C
- Relative Humidity: 59 %
- Test Date: 2003-7-16

**The test was passed at the minimum margin that marked by a frame in the following data**


```

Site      : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 LINE
EUT       : 4 PORT ADSL ROUTER
EUT       : 4PORT ADSL ROUTER plus Wireless
POWER     : 110V/60Hz
Model     : FC-AL2014P/FC-AL2014PW
Memo      : TX CH01
    
```

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.167	56.19	-8.92	65.11	56.07	0.10	0.02	QP
2	0.167	27.21	-27.90	55.11	27.09	0.10	0.02	Average
3	0.193	31.17	-22.75	53.92	31.05	0.10	0.02	Average
4	0.193	55.76	-8.16	63.92	55.64	0.10	0.02	QP
5	0.221	53.99	-8.79	62.78	53.86	0.10	0.03	QP
6	0.221	26.04	-26.74	52.78	25.91	0.10	0.03	Average
7	0.314	24.77	-25.08	49.85	24.61	0.10	0.06	Average
8	0.314	46.68	-13.17	59.85	46.52	0.10	0.06	QP
9	0.363	38.06	-20.60	58.66	37.89	0.10	0.07	QP
10	0.363	27.56	-21.10	48.66	27.39	0.10	0.07	Average
11	0.456	22.78	-23.99	46.77	22.60	0.10	0.08	Average
12	0.456	32.07	-24.70	56.77	31.89	0.10	0.08	QP

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL  
 EUT : 4 PORT ADSL ROUTER  
 EUT : 4PORT ADSL ROUTER plus Wireless  
 POWER : 110V/60Hz  
 Model : FC-AL2014P/FC-AL2014PW  
 Memo : TX CH01

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.161	28.93	-26.40	55.41	28.01	0.10	0.02	Average
2	0.161	57.33	-8.08	65.41	57.21	0.10	0.02	QP
3	0.193	57.69	-6.22	63.91	57.57	0.10	0.02	QP
4	0.193	32.19	-21.72	53.91	32.07	0.10	0.02	Average
5	0.228	56.18	-6.34	62.52	56.05	0.10	0.03	QP
6	0.228	27.68	-24.84	52.52	27.55	0.10	0.03	Average
7	0.272	25.78	-25.28	51.06	25.63	0.10	0.05	Average
8	0.272	54.60	-6.46	61.06	54.45	0.10	0.05	QP
9	0.313	24.64	-25.25	49.89	24.48	0.10	0.06	Average
10	0.313	51.74	-8.15	59.89	51.58	0.10	0.06	QP
11	0.369	43.26	-15.26	58.52	43.09	0.10	0.07	QP
12	0.369	25.50	-23.02	48.52	25.33	0.10	0.07	Average
13	0.538	15.14	-30.86	46.00	14.96	0.10	0.08	Average
14	0.538	39.64	-16.36	56.00	39.46	0.10	0.08	QP
15	0.611	39.60	-16.40	56.00	39.42	0.10	0.08	QP
16	0.611	16.75	-29.25	46.00	16.57	0.10	0.08	Average

Test Engineer:   
 John Huang

- Test Mode: Mode 2
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 27.1°C
- Relative Humidity: 59 %
- Test Date: 2003-7-16


**The test was passed at the minimum margin that marked by a frame in the following data**

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 LINE  
 EUT : 4 PORT ADSL ROUTER  
 EUT : 4PORT ADSL ROUTER plus Wireless  
 POWER : 110V/60Hz  
 Model : FC-AL2014P/FC-AL2014PW  
 Memo : TX CH06

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	56.11	-9.15	65.26	55.99	0.10	0.02	QP
2	0.164	27.95	-27.31	55.26	27.83	0.10	0.02	Average
3	0.192	30.79	-23.16	53.95	30.67	0.10	0.02	Average
4	0.192	55.80	-8.15	63.95	55.68	0.10	0.02	QP
5	0.234	53.03	-9.28	62.31	52.90	0.10	0.03	QP
6	0.234	25.73	-26.58	52.31	25.60	0.10	0.03	Average
7	0.267	24.42	-26.79	51.21	24.27	0.10	0.05	Average
8	0.267	51.11	-10.10	61.21	50.96	0.10	0.05	QP
9	0.346	41.07	-17.99	59.06	40.90	0.10	0.07	QP
10	0.346	29.02	-20.04	49.06	28.85	0.10	0.07	Average
11	0.480	20.63	-25.71	46.34	20.45	0.10	0.08	Average
12	0.480	31.71	-24.63	56.34	31.53	0.10	0.08	QP

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL  
 EUT : 4 PORT ADSL ROUTER  
 EUT : 4PORT ADSL ROUTER plus Wireless  
 POWER : 110V/60Hz  
 Model : FC-AL2014P/FC-AL2014PW  
 Memo : TX CH06

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.161	29.01	-26.40	55.41	28.89	0.10	0.02	Average
2	0.161	57.41	-8.00	65.41	57.29	0.10	0.02	QP
3	0.193	57.67	-6.24	63.91	57.55	0.10	0.02	QP
4	0.193	32.02	-21.89	53.91	31.90	0.10	0.02	Average
5	0.224	56.36	-6.31	62.67	56.23	0.10	0.03	QP
6	0.224	27.77	-24.90	52.67	27.64	0.10	0.03	Average
7	0.267	26.24	-24.97	51.21	26.09	0.10	0.05	Average
8	0.267	54.77	-6.44	61.21	54.62	0.10	0.05	QP
9	0.313	51.70	-8.19	59.89	51.54	0.10	0.06	QP
10	0.313	25.05	-24.84	49.89	24.89	0.10	0.06	Average
11	0.369	25.57	-22.95	48.52	25.40	0.10	0.07	Average
12	0.369	43.36	-15.16	58.52	43.19	0.10	0.07	QP
13	0.558	38.95	-17.05	56.00	38.77	0.10	0.08	QP
14	0.558	15.96	-30.04	46.00	15.78	0.10	0.08	Average
15	0.611	15.74	-30.26	46.00	15.56	0.10	0.08	Average
16	0.611	39.50	-16.50	56.00	39.32	0.10	0.08	QP

Test Engineer:   
 John Huang



- Test Mode: Mode 3
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 27.1°C
- Relative Humidity: 59 %
- Test Date: 2003-7-16

**The test was passed at the minimum margin that marked by a frame in the following data**

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 LINE  
 EUT : 4 PORT ADSL ROUTER  
 EUT : 4PORT ADSL ROUTER plus Wireless  
 POWER : 110V/60Hz  
 Model : FC-AL2014P/FC-AL2014PW  
 Memo : TX CH11

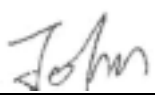
	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	56.19	-9.07	65.26	56.07	0.10	0.02	QP
2	0.164	27.95	-27.31	55.26	27.83	0.10	0.02	Average
3	0.188	30.66	-23.46	54.12	30.54	0.10	0.02	Average
4	0.188	56.02	-8.10	64.12	55.90	0.10	0.02	QP
5	0.226	53.44	-9.16	62.60	53.31	0.10	0.03	QP
6	0.226	26.21	-26.39	52.60	26.08	0.10	0.03	Average
7	0.267	27.16	-24.05	51.21	27.01	0.10	0.05	Average
8	0.267	51.01	-10.20	61.21	50.86	0.10	0.05	QP
9	0.294	48.56	-11.85	60.41	48.41	0.10	0.05	QP
10	0.294	24.02	-26.39	50.41	23.87	0.10	0.05	Average
11	0.346	29.02	-20.04	49.06	28.85	0.10	0.07	Average
12	0.346	40.33	-18.73	59.06	40.16	0.10	0.07	QP

**FCC TEST REPORT**

Report No. : F341604

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL  
 EUT : 4 PORT ADSL ROUTER  
 EUT : 4PORT ADSL ROUTER plus Wireless  
 POWER : 110V/60Hz  
 Model : FC-AL2014P/FC-AL2014PW  
 Memo : TX CH11

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.169	57.88	-7.11	64.99	57.76	0.10	0.02	QP
2	0.169	28.44	-26.55	54.99	28.32	0.10	0.02	Average
3	0.188	32.14	-22.00	54.14	32.02	0.10	0.02	Average
4	0.188	57.95	-6.19	64.14	57.83	0.10	0.02	QP
5	0.223	56.42	-6.29	62.71	56.29	0.10	0.03	QP
6	0.223	27.96	-24.75	52.71	27.83	0.10	0.03	Average
7	0.240	27.23	-24.87	52.10	27.09	0.10	0.04	Average
8	0.240	55.86	-6.24	62.10	55.72	0.10	0.04	QP
9	0.305	52.46	-7.65	60.11	52.30	0.10	0.06	QP
10	0.305	26.09	-24.02	50.11	25.93	0.10	0.06	Average
11	0.549	14.95	-31.05	46.00	14.77	0.10	0.08	Average
12	0.549	39.88	-16.12	56.00	39.70	0.10	0.08	QP
13	0.630	39.05	-16.95	56.00	38.87	0.10	0.08	QP
14	0.630	13.94	-32.06	46.00	13.76	0.10	0.08	Average

Test Engineer:   
 John Huang

## 5.6. Test of Radiated Emission

Radiated emissions from 30 MHz to 24.835 GHz were measured according to the methods defines in ANSI C63.4-1992. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

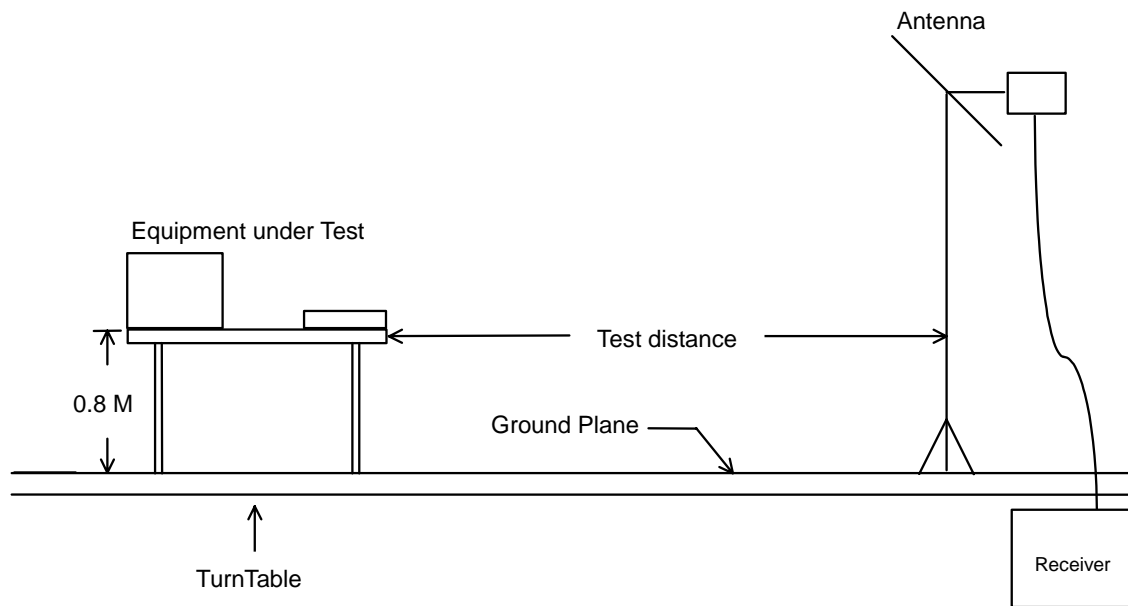
### 5.6.1. Major Measuring Instruments

- Amplifier (MITEQ AFS44)
  - RF Gain 40 dB
  - Signal Input 100 MHz to 26.5 GHz
  
- Amplifier (HP 8447D)
  - RF Gain 30 dB
  - Signal Input 100 KHz to 1.3 GHz
  
- Spectrum analyzer (R&S FSP40)
  - Attenuation 10 dB
  - Start Frequency 1 GHz
  - Stop Frequency 25 GHz
  - Resolution Bandwidth 1 MHz
  - Video Bandwidth 1 MHz
  - Signal Input 9 KHz to 40 GHz
  
- Test Receiver (SCHAFFNER SCR3501)
  - Resolution Bandwidth 120 KHz
  - Frequency Band 9 K – 1 GHz
  - Quasi-Peak Detector ON for Quasi-Peak Mode  
OFF for Peak Mode

**5.6.2. Test Procedures**

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
5. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

5.6.3. Typical Test Setup Layout of Radiated Emission



5.6.4. Test Result of Radiated Emission

- Test Mode: Mode 1
- Test Distance: 3 M
- Temperature: 26 °C
- Relative Humidity: 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-7-11

**The test was passed at the minimum margin that marked by the frame in the following test record**

■ Spurious Emission

Site : site  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	101.820	35.15	-8.35	43.50	51.04	9.41	1.69	26.99	Peak	---	---
2	159.330	34.84	-8.66	43.50	51.32	8.16	2.12	26.76	Peak	---	---
3	250.050	38.20	-7.80	46.00	50.85	11.34	2.61	26.60	Peak	---	---
4 !	295.140	40.19	-5.81	46.00	52.55	11.41	2.83	26.60	Peak	---	---
5 !	299.730	41.71	-4.29	46.00	54.10	11.36	2.85	26.60	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 !	300.000	41.29	-4.71	46.00	53.68	11.36	2.85	26.60	Peak	---	---
2 !	374.200	41.24	-4.76	46.00	50.96	13.82	3.50	27.04	Peak	---	---
3 !	397.300	42.55	-3.45	46.00	51.68	14.54	3.51	27.18	Peak	---	---
4 !	500.200	42.77	-3.23	46.00	50.63	16.03	3.81	27.70	QP	230	204
5 !	749.400	43.35	-2.65	46.00	48.01	18.39	4.95	28.00	QP	259	35

**FCC TEST REPORT**

**Report No. : F341604**

Site : site  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 !	31.890	35.04	-4.96	40.00	46.83	14.29	1.02	27.10	Peak	---	---
2 !	43.500	34.24	-5.76	40.00	50.84	9.28	1.22	27.10	Peak	---	---
3	124.770	35.92	-7.58	43.50	50.71	10.25	1.86	26.90	Peak	---	---
4	159.330	37.18	-6.32	43.50	53.66	8.16	2.12	26.76	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	300.000	36.35	-9.65	46.00	48.74	11.36	2.85	26.60	Peak	---	---
2	374.200	35.98	-10.02	46.00	45.70	13.82	3.50	27.04	Peak	---	---
3 !	500.200	42.45	-3.55	46.00	50.31	16.03	3.81	27.70	Peak	---	---
4 !	749.400	42.84	-3.16	46.00	47.50	18.39	4.95	28.00	Peak	---	---

Site : 03CH03-NY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

Site : 03CH03-NY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1588.000	52.90	-21.10	74.00	58.58	27.56	4.80	38.04	Peak	---	---
2	1588.000	39.84	-14.16	54.00	45.52	27.56	4.80	38.04	Average	---	---
3	2036.000	55.62	-18.38	74.00	57.71	30.56	5.48	38.13	Peak	---	---
4	2036.000	51.03	-2.97	54.00	53.12	30.56	5.48	38.13	Average	100	170

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH01 2412MHz  
 : F341604

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured



■ Field strength of fundamental and harmonics

Frequency ( MHz )	Antenna Polarity	Cable Factor ( dB/m )	Cable Loss ( dB )	Reading ( dBuV )	Limits ( dBuV/m )	Emission ( uV/m )	Level ( dBuV/m )	Margin ( uV/m )	Detect ( dB )	Mode
2414.000	H	30.18	5.98	66.31	-	-	102.47	132892.36		Peak
2414.000	H	30.18	5.98	58.29	-	-	94.45	52783.72		A.V.
2412.000	V	30.18	5.98	73.91	-	-	110.07	318786.56		Peak
2412.000	V	30.18	5.98	68.41	-	-	104.57	169238.82		A.V.
4824.000	V/H						-			Peak, A.V.
7236.000	V/H						-			Peak, A.V.
9648.000	V/H						-			Peak, A.V.
12060.000	V/H						-			Peak, A.V.
14472.000	V/H						-			Peak, A.V.
16884.000	V/H						-			Peak, A.V.
19296.000	V/H						-			Peak, A.V.
21708.000	V/H						-			Peak, A.V.
24120.000	V/H						-			Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer: Murray  
Murray Lu

- Test Mode: Mode 2
- Test Distance: 3 M
- Temperature: 26 °C
- Relative Humidity: 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-7-11

The test was passed at the minimum margin that marked by the frame in the following test record

■ Spurious Emission

Site : site  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	101.820	35.90	-7.60	43.50	51.79	9.41	1.69	26.99	Peak	---	---
2	124.770	34.44	-9.06	43.50	49.23	10.25	1.86	26.90	Peak	---	---
3	250.050	33.59	-12.41	46.00	46.24	11.34	2.61	26.60	Peak	---	---
4	299.730	36.46	-9.54	46.00	48.85	11.36	2.85	26.60	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	396.600	35.87	-10.13	46.00	45.02	14.52	3.51	27.18	Peak	---	---
2	500.200	38.74	-7.26	46.00	46.60	16.03	3.81	27.70	Peak	---	---
3	749.400	44.00	-2.00	46.00	48.66	18.39	4.95	28.00	QP	354	39
4	912.500	35.42	-10.58	46.00	38.18	19.47	5.53	27.76	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	43.500	34.95	-5.05	40.00	51.55	9.28	1.22	27.10	Peak	---	---
2	124.770	35.89	-7.61	43.50	50.68	10.25	1.86	26.90	Peak	---	---
3	250.050	34.23	-11.77	46.00	46.00	11.34	2.61	26.60	Peak	---	---
4	299.730	36.13	-9.87	46.00	48.52	11.36	2.85	26.60	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	500.200	36.80	-9.20	46.00	44.66	16.03	3.81	27.70	Peak	---	---
2	749.400	40.19	-5.81	46.00	44.85	18.39	4.95	28.00	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	2062.000	56.09	-17.91	74.00	58.18	30.53	5.51	38.13	Peak	---	---
2	2062.000	49.44	-4.56	54.00	51.53	30.53	5.51	38.13	Average	---	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1046.000	50.16	-23.84	74.00	59.10	25.02	3.98	37.94	Peak	---	---
2	1046.000	35.06	-18.94	54.00	44.00	25.02	3.98	37.94	Average	---	---
3	1588.000	52.89	-21.11	74.00	58.57	27.56	4.80	38.04	Peak	---	---
4	1588.000	39.44	-14.56	54.00	45.12	27.56	4.80	38.04	Average	---	---
5	2062.000	57.26	-16.74	74.00	59.35	30.53	5.51	38.13	Peak	---	---
6	2062.000	52.31	-1.69	54.00	54.40	30.53	5.51	38.13	Average	100	89

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH06 2437MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	4124.000	59.75	-14.25	74.00	58.27	31.47	8.46	38.45	Peak	---	---
2	4125.400	52.33	-1.67	54.00	50.04	31.48	8.46	38.45	Average	---	---

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

■ Field strength of fundamental and harmonics

Frequency ( MHz )	Antenna Polarity	Cable Factor	Reading Loss	Limits ( dBuV )	Emission ( dBuV/m )	Level ( uV/m )	Margin ( dB )	Detect Mode	
2436.000	H	30.15	6.01	65.91	-	-	102.07	126911.21	Peak
2436.000	H	30.15	6.01	58.95	-	-	95.11	56950.82	A.V.
2436.000	V	30.15	6.01	73.89	-	-	110.05	318053.37	Peak
2436.000	V	30.15	6.01	67.03	-	-	103.19	144377.66	A.V.
4874.000	V/H						-		Peak, A.V.
7311.000	V/H						-		Peak, A.V.
9748.000	V/H						-		Peak, A.V.
12185.000	V/H						-		Peak, A.V.
14622.000	V/H						-		Peak, A.V.
17059.000	V/H						-		Peak, A.V.
19496.000	V/H						-		Peak, A.V.
21933.000	V/H						-		Peak, A.V.
24370.000	V/H						-		Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer: Murray  
Murray Lu

- Test Mode: Mode 3
- Test Distance: 3 M
- Temperature: 26 °C
- Relative Humidity: 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-7-11

The test was passed at the minimum margin that marked by the frame in the following test record

■ Spurious Emission

Site : site  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	101.820	37.65	-5.85	43.50	53.54	9.41	1.69	26.99	Peak	---	---
2	124.770	34.51	-8.99	43.50	49.30	10.25	1.86	26.90	Peak	---	---
3	250.050	33.34	-12.66	46.00	45.99	11.34	2.61	26.60	Peak	---	---
4	295.140	33.55	-12.45	46.00	45.91	11.41	2.83	26.60	Peak	---	---
5	299.730	36.31	-9.69	46.00	48.70	11.36	2.85	26.60	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	300.000	36.30	-9.70	46.00	48.69	11.36	2.85	26.60	Peak	---	---
2	396.600	38.53	-7.47	46.00	47.68	14.52	3.51	27.18	Peak	---	---
3	500.200	39.03	-6.97	46.00	46.89	16.03	3.81	27.70	Peak	---	---
4	749.400	43.50	-2.50	46.00	48.16	18.39	4.95	28.00	QP	354	254

Site : site  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	90.210	31.11	-12.39	43.50	47.00	0.00	1.45	27.02	Peak	---	---
2	124.770	30.95	-12.55	43.50	45.74	10.25	1.06	26.90	Peak	---	---
3	299.730	31.85	-14.15	46.00	44.24	11.36	2.85	26.60	Peak	---	---

Site : site  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	500.200	36.83	-9.17	46.00	44.69	16.03	3.81	27.70	Peak	---	---
2	749.400	39.87	-6.13	46.00	44.53	18.39	4.95	28.00	Peak	---	---
3	954.500	32.40	-13.52	46.00	34.64	19.60	5.00	27.64	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	2086.000	56.80	-17.20	74.00	58.88	30.51	5.54	38.13	Peak	---	---
2	2086.000	49.01	-4.19	54.00	51.09	30.51	5.54	38.13	Average	---	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1588.000	51.77	-22.23	74.00	57.45	27.56	4.80	38.04	Peak	---	---
2	1588.000	39.74	-14.26	54.00	45.42	27.56	4.80	38.04	Average	---	---
3	2086.000	58.53	-15.47	74.00	60.61	30.51	5.54	38.13	Peak	---	---
4	2086.000	53.80	-0.20	54.00	55.88	30.51	5.54	38.13	Average	200	154

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : 4PORT ADSL ROUTER (PLUS WIRELESS)  
 Power : 110V/60Hz  
 MODEL : FC-AL2014P/FC-AL2014PW  
 MEMO : TX CH11 2462MHz  
 : F341604

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured



■ Field strength of fundamental and harmonics

Frequency ( MHz )	Antenna Polarity	Cable Factor	Cable Loss	Reading ( dBuV )	Limits ( dBuV/m )	Emission ( uV/m )	Level ( dBuV/m )	Margin ( uV/m )	Detect ( dB )	Mode
2462.000	H	30.13	6.04	64.20	-	-	100.37	104351.81		Peak
2462.000	H	30.13	6.04	53.64	-	-	89.81	30938.55		A.V.
2462.000	V	30.13	6.04	73.68	-	-	109.85	310813.59		Peak
2462.000	V	30.13	6.04	66.05	-	-	102.22	129121.93		A.V.
4924.000	V/H						-			Peak, A.V.
7386.000	V/H						-			Peak, A.V.
9848.000	V/H						-			Peak, A.V.
12310.000	V/H						-			Peak, A.V.
14772.000	V/H						-			Peak, A.V.
17234.000	V/H						-			Peak, A.V.
19696.000	V/H						-			Peak, A.V.
22158.000	V/H						-			Peak, A.V.
24620.000	V/H						-			Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer: Murray  
Murray Lu

**5.7. Band Edges Measurement**

5.7.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.7.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100 KHz bandwidth from band edge.
3. The band edges was measured and recorded.

5.7.3. Test Result :

- Test Result in lower band (Channel 1) : PASS
- Test Result in higher band(Channel 11) : PASS

5.7.4. Note on Band edge Emission

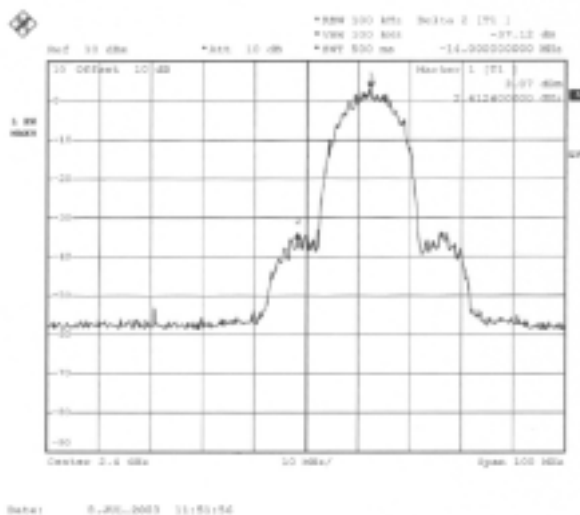
The band edge emission plot on page 61. shows 58.59dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

Polarity	The emission of carrier power strength (dB $\mu$ V/m)	The maximum field strength in restrict band (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
H	100.37	43.18	74.00	-30.82	Peak
H	89.81	32.62	54.00	-21.38	Average
V	109.85	52.66	74.00	-21.34	Peak
V	102.22	45.03	54.00	-8.97	Average

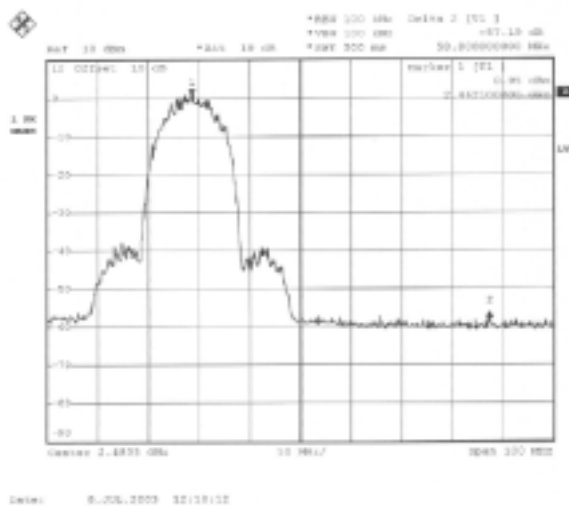
\* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

The spectrum analyzer plots are attached as below :

Plot1 (Channel 1) :



Plot2 (Channel 11) :



Comments : All emissions in any 100kHz bandwidth outside the band edge are attenuated more than 20dB from the carrier.

## **5.8. Antenna Requirements**

The EUT use a undetachable antenna via SMA-reversed external connector. It is considered meet antenna requirement of FCC.

### **5.8.1. Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **5.8.2. Antenna Connected Construction**

The maximum Gain antenna used in this product is dipole antenna. The antenna connector type is MMCX. The coaxial cable of the antenna is fixed to the antenna.

**5.9. RF Exposure**

FCC Rules and Regulations Part 1.1307,1.1310,2.1091,2.1093:

RF Exposure Compliance

5.9.1. Limit For Maximum Permissible Exposure (MPE)

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S ( minutes )
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F=frequency in MHz

\*Plane-wave equivalent power density

5.9.2. MPE Calculations

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (mW/cm}^2\text{)} = \frac{E^2}{3770}$$

- E = Electric field (V/m)
- P = Peak output power (mW)
- G = Antenna numeric gain (numeric)
- d = Separation distance (m)

Because the EUT is belong to General Population/ Uncontrolled Exposure. So the Limit of Power Density is 1.0 mW/cm<sup>2</sup>. We can change the formula to:

$$d = \sqrt{\frac{30 \times P \times G}{3770}}$$

Channel NO.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power ( W )	Calculated RF Exposure Separation Distance ( m )	Minimum RF Exposure Separation Distance ( m )
Channel 1	2.00	1.58	13.16	0.0207	0.0162	0.20
Channel 6	2.00	1.58	12.15	0.0164	0.0144	0.20
Channel 11	2.00	1.58	11.14	0.0130	0.0128	0.20

5.9.3. FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.

## **6. EMI Suppression Component List**

1. Make good ground panel connection on bottom layer of PCB.  
(As the Internal photo No.4)
  
2. Add shielded on RF module to GND.  
(As the Internal photo No.6)

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.01	1000	24.30	3.49
35	13.63	1.04	2000	31.10	4.70
40	11.11	1.09	3000	29.60	5.67
45	10.59	1.24	4000	30.80	6.56
50	6.47	1.43	5000	34.20	7.59
55	5.83	1.39	6000	33.30	8.80
60	5.18	1.59	7000	37.80	9.46
65	4.81	1.41	8000	39.40	10.26
70	4.43	1.43	9000	38.40	10.53
75	5.10	1.55	10000	38.90	11.73
80	5.91	1.56	11000	41.10	12.25
85	7.33	1.62	12000	42.70	13.56
90	8.74	1.41	13000	39.90	13.58
95	9.05	1.81	14000	43.70	13.76
100	9.36	1.68	15000	43.40	14.30
110	9.65	1.73	16000	40.90	15.16
120	9.97	1.79	17000	44.40	15.88
130	10.51	1.93	18000	47.10	16.09
140	10.32	2.06	19000	37.60	16.98
150	9.42	2.09	20000	37.30	16.21
160	8.09	2.12	21000	37.00	20.13
170	7.43	2.12	22000	38.00	19.24
180	7.60	2.12	23000	38.70	19.64
190	7.43	2.21	24000	38.60	20.54
200	7.26	2.29	25000	38.90	20.14
220	9.11	2.42	14000	24.30	3.49
240	10.88	2.54	15000	31.10	4.70
260	11.75	2.66	16000	29.60	5.67
280	11.55	2.76	17000	30.80	6.56
300	11.36	2.85	18000	34.20	7.59
320	12.03	3.10	19000	33.30	8.80
340	12.69	3.36	20000	37.80	9.46
360	13.33	3.49	21000	39.40	10.26
380	14.00	3.50	22000	38.40	10.53
400	14.63	3.51	23000	38.90	11.73
450	15.33	3.55	24000	41.10	12.25
500	16.03	3.81	25000	42.70	13.56
550	16.65	4.05			
600	17.29	4.23			
650	17.64	4.63			
700	18.00	4.74			
750	18.39	4.95			
800	18.79	5.06			
850	19.10	5.18			
900	19.42	5.40			
950	19.58	5.91			
1000	19.75	5.58			



## 8. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9 KHz – 2.75 GHz	Dec. 12, 2002	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Jan. 07, 2003	Conduction (CO01-HY)
50 ohm BNC type Terminal	NOBLE	50ohm	TM013	50 ohm	Apr. 24, 2003	Conduction (CO01-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2003	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHz	Aug. 07, 2002	Radiation (03CH03-HY)
Receiver	SCHAFFNER	SCR 3501	417	9 KHz – 1GHz	Feb. 20, 2003	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Oct. 21, 2002	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz – 2GHz	Dec. 21, 2002	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Jan. 02, 2003	Radiation (03CH03-HY)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	Radiation (03CH03-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 10, 2003	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	Radiation (03CH03-HY)
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted
Power sensor	R&S	NRV-Z55	100049	DC~40GHz	May 28, 2003	Conducted
Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	May 28, 2003	Conducted
AC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	May 27, 2003	Conducted
Temp. and Humidity	KSON	THS-C3L	612	N/A	Oct. 02, 2002	Conducted
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted

Calibration Interval of instruments listed above is one year.

### 9. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	±0.54
combined standard uncertainty $U_e(y)$	normal	±2.7
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±5.4

$U = \{((1/2)^2+(0.3/2)^2+(2^2+0.5^2+2^2+0.25^2+2^2)/3+(0.54)^2/2)\}^{1/2}=2.2$  for 10m test distance

$U = \{((1/2)^2+(0.3/2)^2+(2^2+3^2+2^2+0.25^2+2^2)/3+(0.54)^2/2)\}^{1/2}=2.7$  for 3m test distance

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	0.2
combined standard uncertainty $U_e(y)$	normal	±1.66
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±3.32

$U = \{(0.3/2)^2 + (2^2+1.5^2+0.2^2)/3+(0.2)^2/2\}^{1/2}=1.66$