

# **FCC TEST REPORT**

**for**

## **47 CFR, Part 15, Subpart C**

Equipment : Wireless Router

Model No. : XRW205/XR215

FCC ID. : REUXRW205

Filing Type : Certification

Applicant : **XINETRON Co., LTD.**  
4F, No. 171, Sec. 2, Tatung Road, Hsinchih, 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.

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### History of this test report

Original Report Issue Date: Jun. 11, 2003

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

# CERTIFICATE OF COMPLIANCE

for

## 47 CFR, Part 15, Subpart C

Equipment : Wireless Router

Model No. : XRW205/XR215

FCC ID. : REUXRW205

Filing Type : Certification

Applicant : **XINETRON Co., LTD.**

4F, No. 171, Sec. 2, Tatung Road, Hsinchih, Taipei Hsien,  
Taiwan, R.O.C.

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 2001** 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 May 30, 2003 at **SPORTON International Inc.** LAB.

  
K. J. Lin  
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

XINETRON Co., LTD.

4F, No. 171, Sec. 2, Tatung Road, Hsinchih, Taipei Hsien, Taiwan, R.O.C.

### 1.2. Manufacturer

Same as 1.1

### 1.3. Basic Description of Equipment under Test

Equipment : Wireless Router  
Model No. : XRW205/XR215  
FCC ID. : REUXRW205  
Trade Name : XINETRON  
TP Cable : Non-Shielded, 13m  
TP Cable x 3 : Non-Shielded, 1m  
Power Supply Type : Linear  
AC Power Input : Wall-Mount, 2pin  
DC Power Cable : Non-Shielded, 1.8m

### 1.4. Feature of Equipment under Test

Standard	IEEE 802.11b
Signal Type	DSSS (Direct Sequence Spread Spectrum)
Modulation	QPSK / BPSK / CCK
Host Interface	PCMCIA
Antenna	External Dipole Antenna
Data Encryption	64/128-bit WEP encryption
Frequency band	2.4 GHz
Channel	11 Channels (US, Canada) 13 Channels (Europe) 14 Channels (Japan)
Data Rate	Up to 11 Mbps(with Automatic Scale Back)
Transmit Power Output	19 dBm (Typ.)
Receive Sensitivity	-83 dBm (Typ.)
Compatibility	Windows 98/2000/ME/NT/XP
LED Indicators	Link Status
Power	3.3V DC, 500mA Tx, 230mA Rx (Merry King / MWD48-1201200)
Dimensions	89 x 54 x 5 mm
Weight	39g

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

### **2.1. Test Manner**

- a. The EUT has been associated with notebook and peripherals pursuant to ANSI C63.4-2001 and configuration operated in a manner, which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included remote workstation, COMPAQ Notebook, LOGITECH PS/2 Keyboard, LOGITECH USB Mouse, Epson Printer, VIEWSONIC Monitor and EUT for EMI test. The remote workstation included HP PC, LOGITECH PS/2 Keyboard, HP Printer and ACEEX Modem.
- 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 24620MHz.

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

Support Unit 1. -- PS/2 Keyboard (LOGITECH) --for local and remote 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 2. -- 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 3. -- 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 4. -- 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 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. -- Personal Computer (HP) --for remote workstation

FCC ID : N/A  
Model No. : VECTRA VL420 DT  
Power Supply Type : Switching  
Power Cord : Non-Shielded  
Serial No. : SP0214  
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

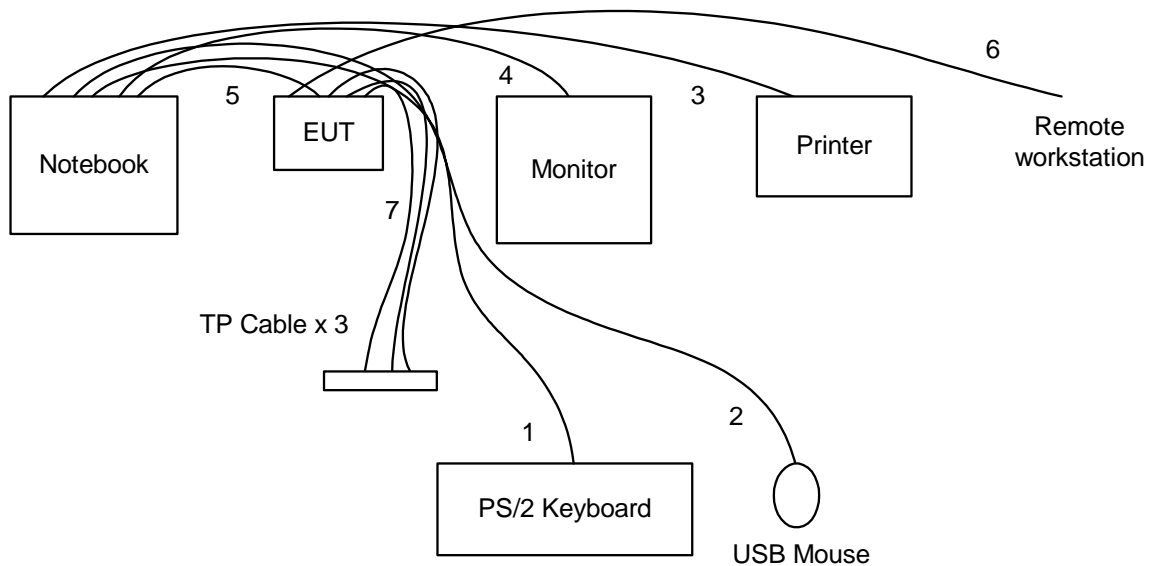
## Support Unit 7. -- Printer (HP) --for remote workstation

FCC ID : B94C2642X  
Model No. : DJ 400  
Power Supply Type : Linear  
Power Cord : Non-Shielded  
Serial No. : SP0048  
Data Cable : Shielded, 1.35m

## Support Unit 8. -- Modem (ACEEX) --for remote workstation

FCC ID : IFAXDM1414  
Model No. : DM1414  
Serial No. : SP0054  
Data Cable : Shielded, 1.15m

### 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 TP cable is connected from Notebook to the EUT.
6. The TP cable is connected from EUT to the remote workstation.
7. These are loop-back TP cables.



### **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**

115V/60Hz

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

ANSI C63.4-2001 for conducted power line test and radiated emission test,  
**FCC 97-114** for test of 6dB Bandwidth  
**FCC 97-114** for test of Maximum Peak Output Power  
**FCC 97-114** for test of 100kHz Bandwidth of Frequency Band Edges  
**FCC 97-114** for test of Power Spectral Density

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

FCC Part 15, Subpart C

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

- a. Conduction: from 150 KHz to 30 MHz
- b. Radiation: from 30 MHz to 24620MHz

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

## 5.2. 6dB Bandwidth

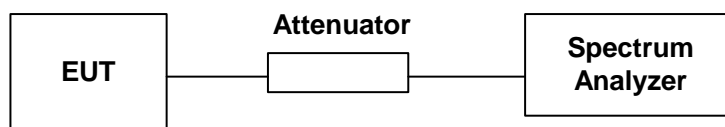
### 5.2.1. Measuring Instruments :

As described in chapter 6 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 :

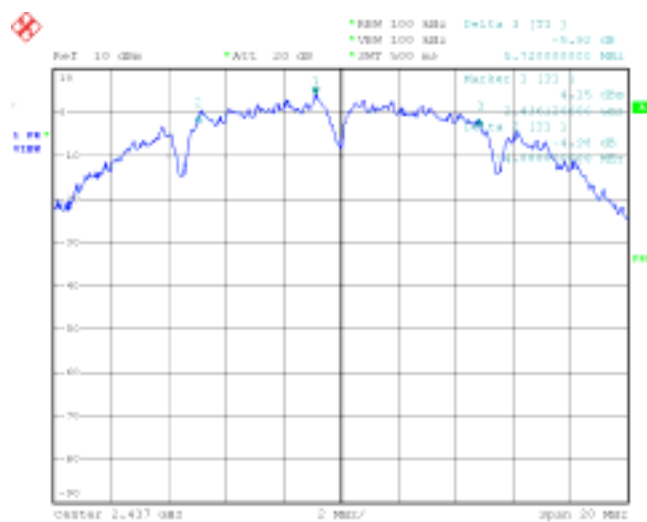


### 5.2.4. Test Result : The spectrum analyzer plots are attached as below

- Temperature : 24°C
- Relative Humidity : 62 %

Channel	Frequency ( MHz )	6dB Emission bandwidth ( MHz )	Limits ( MHz )	Plot Ref. No.
1	2412	9.80	0.5	1
6	2437	9.80	0.5	2
11	2462	9.80	0.5	3

Plot2(Channel 6) :



DATE: 30.MAY.2003 02:55:07

### 5.3. Peak Output Power

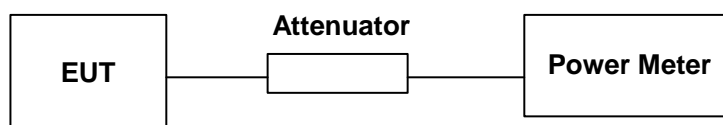
#### 5.3.1. Measuring Instruments :

As described in chapter 6 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 : 62 %
- Antenna Gain: 0.68 dBi

Channel	Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (mW)	Limits (Watt/dBm )
1	2412	13.36	21.67704105	1W/30 dBm
6	2437	13.12	20.51162179	1W/30 dBm
11	2462	12.63	18.32314422	1W/30 dBm

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

## 5.4. Power Spectral Density

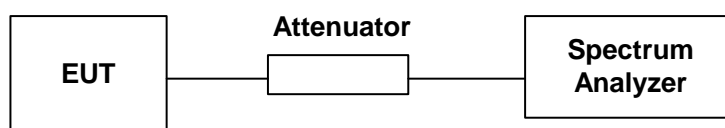
### 5.4.1. Measuring Instruments :

As described in chapter 6 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 :

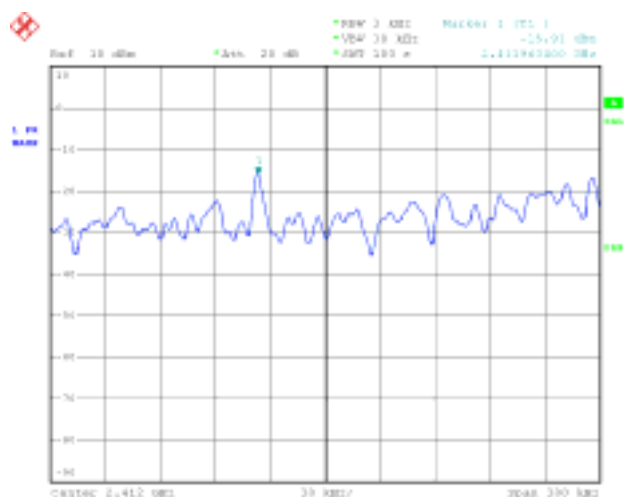


### 5.4.4. Test Result : See spectrum analyzer plots below

- Temperature : 26°C
- Relative Humidity : 62 %

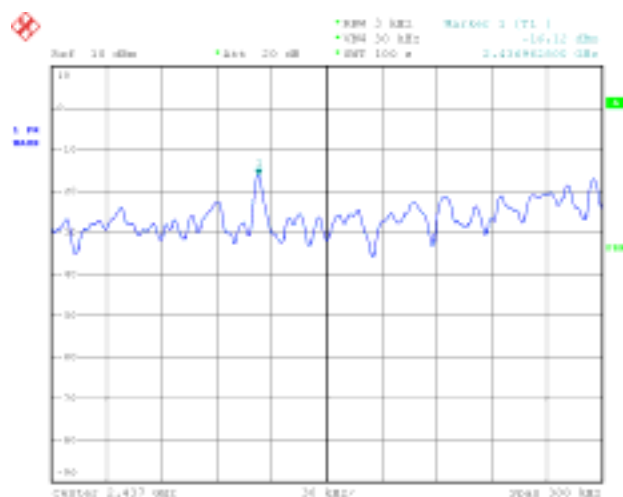
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
1	2412	-15.91	8	1
6	2437	-16.12	8	2
11	2462	-16.58	8	3

Plot1(Channel 1):



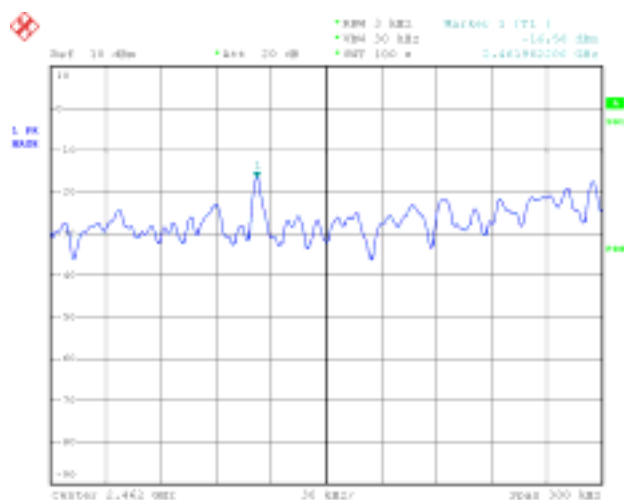
Date: 30.MAY.2003 03:55:27

Plot2(Channel 6):



Date: 30.MAY.2003 03:07:35

Plot3(Channel 11):



Date: 30.MAY.2003 03:09:52



## 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 C63.4-2001 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: 26°C
- Relative Humidity: 62 %
- Test Date: 2003-05-30


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 : Wireless Router  
 Power : 110V/60Hz  
 Memo : TX CH01 2412MHz  
 : F352305

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.193	23.89	-30.02	53.91	23.75	0.10	0.04	Average
2	0.193	55.38	-8.53	63.91	55.24	0.10	0.04	QP
3	0.267	22.67	-28.54	51.21	22.52	0.10	0.05	Average
4	0.267	52.15	-9.06	61.21	52.00	0.10	0.05	QP
5	0.363	26.21	-22.45	48.66	26.05	0.10	0.06	Average
6	0.363	50.76	-7.90	58.66	50.60	0.10	0.06	QP
7	0.466	48.56	-8.02	56.58	48.39	0.10	0.07	QP
8	0.466	21.94	-24.64	46.58	21.77	0.10	0.07	Average
9	0.690	20.51	-25.49	46.00	20.33	0.10	0.08	Average
10	0.690	38.04	-17.96	56.00	37.86	0.10	0.08	QP
11	1.080	19.89	-26.11	46.00	19.69	0.10	0.10	Average
12	1.080	37.05	-18.95	56.00	36.85	0.10	0.10	QP

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL  
 EUT : Wireless Router  
 Power : 110V/60Hz  
 Memo : TX CH01 2412MHz  
 : F352305

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.190	27.27	-26.75	54.02	27.13	0.10	0.04	Average
2	0.190	54.80	-9.22	64.02	54.66	0.10	0.04	QP
3	0.287	50.09	-10.52	60.61	49.94	0.10	0.05	QP
4	0.287	24.47	-26.14	50.61	24.32	0.10	0.05	Average
5	0.408	46.71	-10.98	57.69	46.55	0.10	0.06	QP
6	0.408	29.78	-17.91	47.69	29.62	0.10	0.06	Average
7	1.139	18.56	-27.44	46.00	18.35	0.10	0.11	Average
8	1.139	28.91	-27.09	56.00	28.70	0.10	0.11	QP
9	1.753	25.19	-20.81	46.00	24.96	0.10	0.13	Average
10	1.753	33.56	-22.44	56.00	33.33	0.10	0.13	QP
11	2.610	26.98	-29.02	56.00	26.68	0.14	0.16	QP
12	2.610	12.63	-33.37	46.00	12.33	0.14	0.16	Average

Test Engineer :   
 Jay Zhong

**FCC TEST REPORT**

Report No. : F352305

- Test Mode: Mode 2
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 62 %
- Test Date: 2003-05-30


**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 : Wireless Router  
Power : 110V/60Hz  
Memo : TX CH06 2437MHz  
: F352305

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.180	27.13	-27.36	54.49	26.99	0.10	0.04	Average
2	0.180	56.02	-8.47	64.49	55.88	0.10	0.04	QP
3	0.336	26.40	-22.90	49.30	26.25	0.10	0.05	Average
4	0.336	51.29	-8.01	59.30	51.14	0.10	0.05	QP
5	0.505	23.04	-22.96	46.00	22.87	0.10	0.07	Average
6	0.505	47.41	-8.59	56.00	47.24	0.10	0.07	QP
7	1.070	12.46	-33.54	46.00	12.26	0.10	0.10	Average
8	1.070	37.29	-18.71	56.00	37.09	0.10	0.10	QP
9	1.210	13.27	-32.73	46.00	13.06	0.10	0.11	Average
10	1.210	36.64	-19.36	56.00	36.43	0.10	0.11	QP
11	1.880	18.54	-27.46	46.00	18.30	0.10	0.14	Average
12	1.880	30.03	-25.97	56.00	29.79	0.10	0.14	QP

Site : C001-HY  
Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL  
EUT : Wireless Router  
Power : 110V/60Hz  
Memo : TX CH06 2437MHz  
: F352305

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.190	27.32	-26.72	54.04	27.18	0.10	0.04	Average
2	0.190	54.98	-9.06	64.04	54.84	0.10	0.04	QP
3	0.297	25.93	-24.40	50.33	25.78	0.10	0.05	Average
4	0.297	49.88	-10.45	60.33	49.73	0.10	0.05	QP
5	0.396	29.52	-18.42	47.94	29.36	0.10	0.06	Average
6	0.396	47.06	-10.88	57.94	46.90	0.10	0.06	QP
7	0.535	22.36	-23.64	46.00	22.19	0.10	0.07	Average
8	0.535	41.39	-14.61	56.00	41.22	0.10	0.07	QP
9	0.948	28.22	-27.78	56.00	28.02	0.10	0.10	QP
10	0.948	19.17	-26.83	46.00	18.97	0.10	0.10	Average
11	1.750	31.86	-24.14	56.00	31.63	0.10	0.13	QP
12	1.750	23.17	-22.83	46.00	22.94	0.10	0.13	Average

Test Engineer :   
Jay Zhong

**SPORTON International Inc.**

TEL : 886-2-2696-2468

FAX : 886-2-2696-2255

FCC ID. : REUXRW205

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Issued Date : Jun. 11, 2003

- Test Mode: Mode 3
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 62 %
- Test Date: 2003-05-30


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 : Wireless Router  
 Power : 110V/60Hz  
 Memo : TX CH11 2462MHz  
 : F352305

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.176	27.25	-27.42	54.67	27.11	0.10	0.04	Average
2	0.176	56.07	-8.60	64.67	55.93	0.10	0.04	QP
3	0.346	28.27	-20.79	49.06	28.11	0.10	0.06	Average
4	0.346	51.14	-7.92	59.06	50.98	0.10	0.06	QP
5	0.424	27.66	-19.71	47.37	27.50	0.10	0.06	Average
6	0.424	49.84	-7.53	57.37	49.68	0.10	0.06	QP
7	0.529	22.85	-23.15	46.00	22.68	0.10	0.07	Average
8	0.529	46.63	-9.37	56.00	46.46	0.10	0.07	QP
9	1.110	13.87	-32.13	46.00	13.66	0.10	0.11	Average
10	1.110	37.40	-18.60	56.00	37.19	0.10	0.11	QP
11	1.810	19.66	-26.34	46.00	19.43	0.10	0.13	Average
12	1.810	29.97	-26.03	56.00	29.74	0.10	0.13	QP

Site : C001-HY  
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL  
 EUT : Wireless Router  
 Power : 110V/60Hz  
 Memo : TX CH11 2462MHz  
 : F352305

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.177	26.77	-27.86	54.63	26.63	0.10	0.04	Average
2	0.177	55.37	-9.26	64.63	55.23	0.10	0.04	QP
3	0.259	23.19	-28.27	51.46	23.04	0.10	0.05	Average
4	0.259	51.01	-10.45	61.46	50.86	0.10	0.05	QP
5	0.367	31.35	-17.22	48.57	31.19	0.10	0.06	Average
6	0.367	47.86	-10.71	58.57	47.70	0.10	0.06	QP
7	0.494	22.62	-23.48	46.10	22.45	0.10	0.07	Average
8	0.494	43.48	-12.62	56.10	43.31	0.10	0.07	QP
9	1.050	28.17	-27.83	56.00	27.97	0.10	0.10	QP
10	1.050	17.08	-28.92	46.00	16.88	0.10	0.10	Average
11	1.830	35.20	-20.80	56.00	34.97	0.10	0.13	QP
12	1.830	24.79	-21.21	46.00	24.56	0.10	0.13	Average

Test Engineer : 

Jay Zhong

## 5.6. Test of Radiated Emission

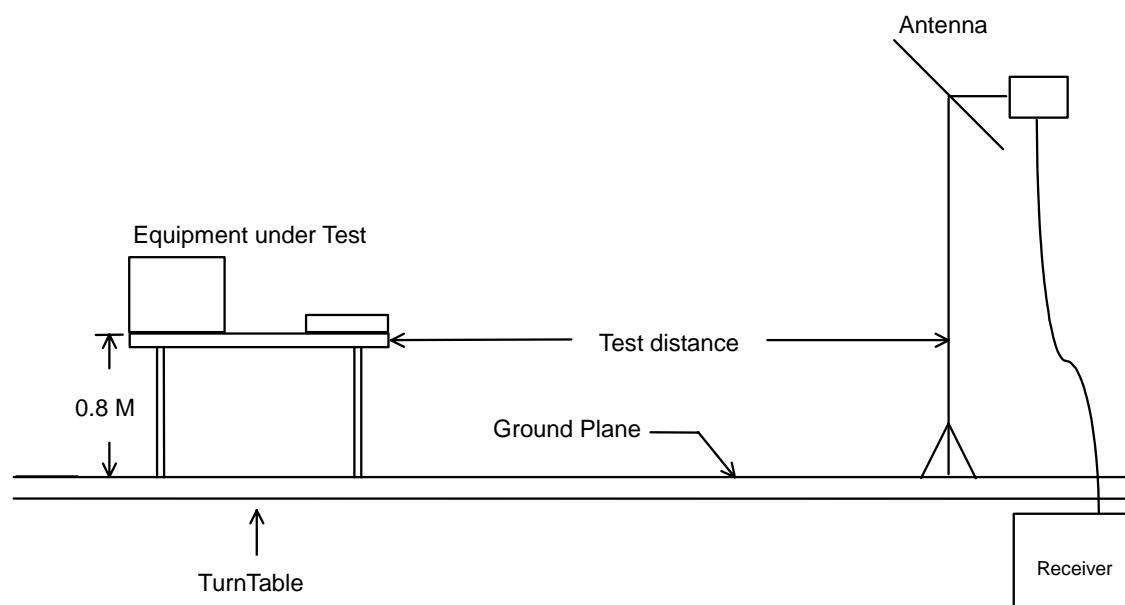
Radiated emissions from 30 MHz to 24.62 GHz were measured according to the methods defines in ANSI C63.4-2001. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 4.6.3. The interface cables and equipment positions were varied within 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	24 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: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-05-26

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

■ Spurious Emission

- For 30MHz to 1GHz

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz

	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	30.540	33.19	-6.81	40.00	44.34	14.93	1.02	27.10	Peak	---	---
2	126.930	33.24	-10.26	43.50	47.61	10.38	2.14	26.89	Peak	---	---
3	143.940	34.02	-9.48	43.50	48.63	9.93	2.28	26.82	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz

	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	374.200	33.96	-12.04	46.00	43.19	13.82	3.99	27.04	QP	---	---
2	397.300	36.71	-9.29	46.00	45.28	14.54	4.07	27.18	Peak	---	---
3	500.200	39.14	-6.86	46.00	46.17	16.03	4.64	27.70	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz

	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 !	65.370	35.19	-4.81	40.00	55.97	4.76	1.53	27.07	Peak	100	155
2	116.940	36.06	-7.44	43.50	51.05	9.88	2.06	26.93	Peak	---	---
3 !	122.340	37.97	-5.53	43.50	52.66	10.12	2.10	26.91	Peak	---	---



Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz

	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	374.200	40.39	-5.61	46.00	49.62	13.82	3.99	27.04	Peak	---	---
2	461.000	39.24	-6.76	46.00	46.84	15.47	4.43	27.50	Peak	---	---
3	500.200	39.98	-6.02	46.00	47.01	16.03	4.64	27.70	Peak	---	---

• For above 1GHz

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH01 2412MHz  
 : F352305

■ Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin	Detect	
Polarity	Factor	Loss							
( MHz )	( dB/m )	( dB )	( dBuV )	(dBuV/m)	( uV/m)	( dBuV/m )	( uV/m )	( dB ) Mode	
2412.000	H	30.18	5.98	65.16	-	-	101.32	116412.60	Peak
2412.000	H	30.18	5.98	59.65	-	-	95.81	61730.53	A.V.
2412.000	V	30.18	5.98	73.80	-	-	109.96	314774.83	Peak
2412.000	V	30.18	5.98	65.95	-	-	102.11	127497.01	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 :



Jay Zhong

- Test Mode: Mode 2
- Test Distance: 3 M
- Temperature: 26 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-05-26

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

- Spurious Emission
- For 30MHz to 1GHz

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz

	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 !	83.730	36.58	-3.42	40.00	54.70	7.14	1.77	27.03	Peak	100	154
2	99.930	36.51	-6.99	43.50	52.25	9.36	1.90	27.00	Peak	---	---
3	124.770	37.37	-6.13	43.50	51.89	10.25	2.13	26.90	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz

	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	374.200	33.46	-12.54	46.00	42.69	13.82	3.99	27.04	QP	---	---
2	396.600	38.17	-7.83	46.00	46.76	14.52	4.07	27.18	Peak	---	---
3 !	500.200	40.27	-5.73	46.00	47.30	16.03	4.64	27.70	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz

	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	98.850	35.03	-8.47	43.50	50.85	9.29	1.89	27.00	Peak	---	---
2	105.060	34.88	-8.62	43.50	50.40	9.51	1.95	26.98	Peak	---	---
3	115.860	34.17	-9.33	43.50	49.19	9.85	2.07	26.94	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz

	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	374.200	42.47	-3.53	46.00	51.70	13.82	3.99	27.04	Peak	---	---
2	461.000	37.33	-8.67	46.00	44.93	15.47	4.43	27.50	Peak	---	---
3	500.200	37.21	-8.79	46.00	44.24	16.03	4.64	27.70	Peak	---	---

• For above 1GHz

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH06 2437MHz  
 : F352305

■ Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin	Detect	
Polarity	Factor	Loss							
( MHz )	( dB/m )	( dB )	( dBuV )	(dBuV/m)	( uV/m)	( dBuV/m )	( uV/m )	( dB )	
								Mode	
2436.000	H	30.15	6.01	62.89	-	-	99.05	89639.62	Peak
2436.000	H	30.15	6.01	57.62	-	-	93.78	48865.24	A.V.
2436.000	V	30.15	6.01	76.37	-	-	112.53	423155.51	Peak
2436.000	V	30.15	6.01	68.36	-	-	104.52	168267.41	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 :



Jay Zhong

- Test Mode: Mode 3
- Test Distance: 3 M
- Temperature: 26 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-05-26

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

■ Spurious Emission

- For 30MHz to 1GHz

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz

	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	83.730	36.77	-3.23	40.00	54.89	7.14	1.77	27.03	Peak	100	150
2	90.210	36.20	-7.30	43.50	52.59	8.80	1.83	27.02	Peak	---	---
3	116.940	36.95	-6.55	43.50	51.94	9.88	2.06	26.93	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz

	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	374.200	33.76	-12.24	46.00	42.99	13.02	3.99	27.04	QP	---	---
2	397.300	39.73	-6.27	46.00	40.30	14.54	4.07	27.18	Peak	---	---
3	500.200	37.27	-8.73	46.00	44.30	16.03	4.64	27.70	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz

	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	99.930	35.08	-8.42	43.50	50.82	9.36	1.90	27.00	Peak	---	---
2	110.730	35.38	-8.12	43.50	50.63	9.68	2.03	26.96	Peak	---	---
3	124.770	34.58	-8.92	43.50	49.10	10.25	2.13	26.90	Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz

	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	374.200	42.39	-3.61	46.00	51.62	13.82	3.99	27.04	Peak	---	---
2	461.000	37.45	-8.55	46.00	45.05	15.47	4.43	27.50	Peak	---	---
3	500.200	36.82	-9.18	46.00	43.85	16.03	4.64	27.70	Peak	---	---

- For above 1GHz

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz  
 : F352305

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-10094-0417 VERTICAL  
 EUT : Wireless Router  
 Power : AC 110V / 60Hz  
 MODEL : XRW205/XR215  
 MEMO : TX CH11 2462MHz  
 : F352305

■ Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin	Detect	
Polarity	Factor	Loss							
( MHz )	( dB/m )	( dB )	( dBuV )	(dBuV/m)	( uV/m )	( dBuV/m )	( uV/m )	( dB )	
								Mode	
2460.000	H	30.13	6.04	63.50	-	-	99.67	96272.00	Peak
2460.000	H	30.13	6.04	57.84	-	-	94.01	50176.46	A.V.
2460.000	V	30.13	6.04	76.08	-	-	112.25	409732.11	Peak
2460.000	V	30.13	6.04	68.29	-	-	104.46	167109.06	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 :



Jay Zhong



## 5.7. Band Edges Measurement

### 5.7.1. Measuring Instruments :

As described in chapter 6 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

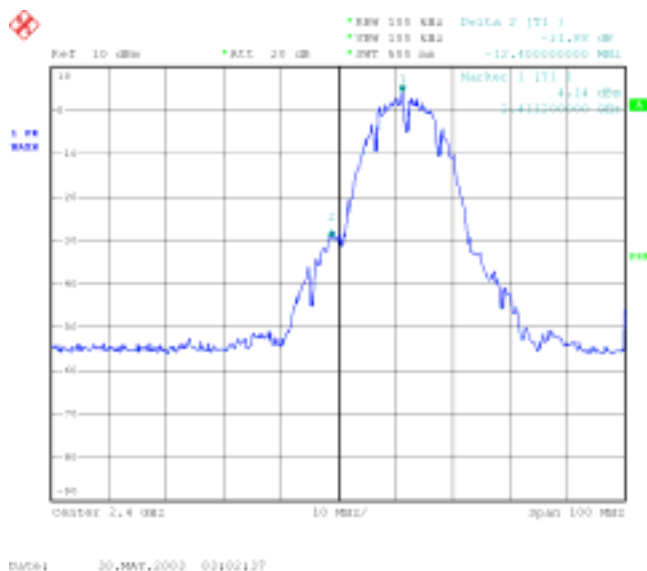
The band edge emission plot on page 62. shows 59.83dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

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	99.67	43.32	74.00	-30.68	Peak
H	94.01	37.66	54.00	-16.34	Average
V	112.25	55.90	74.00	-18.10	Peak
V	104.46	48.11	54.00	-5.87	Average

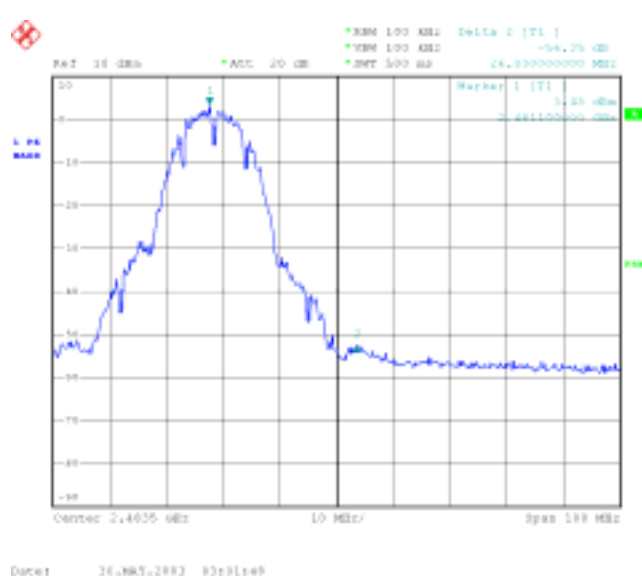
\* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

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 U.FL 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 U.FL. 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	0.68	1.17	13.36	0.0217	0.0142	0.20
Channel 6	0.68	1.17	13.12	0.0205	0.0138	0.20
Channel 11	0.68	1.17	12.63	0.0183	0.0131	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. Power input by pass 222p to GND.  
(As the Internal photo No.5)
2. Connected I/O GND to panel GND.  
(As the Internal photo No.6)
3. Core (Sporton LF-65) is colled by power core (one coll).  
(As the External photo No.4)

## 7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.00	1000	24.30	3.89
35	13.63	1.08	2000	31.10	5.41
40	11.11	1.18	3000	29.60	6.92
45	10.59	1.24	4000	30.80	8.24
50	6.47	1.30	5000	34.20	9.22
55	5.83	1.38	6000	33.30	10.25
60	5.18	1.44	7000	37.80	11.61
65	4.81	1.52	8000	39.40	11.78
70	4.43	1.59	9000	38.40	12.59
75	5.10	1.68	10000	38.90	13.84
80	5.91	1.75	11000	41.10	14.64
85	7.33	1.77	12000	42.70	14.12
90	8.74	1.83	13000	43.90	16.01
95	9.05	1.85	14000	43.70	13.76
100	9.36	1.90	15000	43.40	14.30
110	9.65	2.01	16000	40.90	15.16
120	9.97	2.06	17000	44.40	15.88
130	10.51	2.16	18000	47.10	16.09
140	10.32	2.24	19000	37.60	16.98
150	9.42	2.34	20000	37.30	16.21
160	8.09	2.42	21000	37.00	20.13
170	7.43	2.56	22000	38.00	19.24
180	7.60	2.62	23000	38.70	19.64
190	7.43	2.67	24000	38.60	20.54
200	7.26	2.76	25000	38.90	20.14
220	9.11	2.92	14000	43.70	13.76
240	10.88	3.09	15000	43.40	14.30
260	11.75	3.23	16000	40.90	15.16
280	11.55	3.38	17000	44.40	15.88
300	11.36	3.51	18000	47.10	16.09
320	12.03	3.63	19000	37.60	16.98
340	12.69	3.73	20000	37.30	16.21
360	13.33	4.03	21000	37.00	20.13
380	14.00	4.00	22000	38.00	19.24
400	14.63	4.09	23000	38.70	19.64
450	15.33	4.31	24000	38.60	20.54
500	16.03	4.64	25000	38.90	20.14
550	16.65	5.09			
600	17.29	5.49			
650	17.64	5.82			
700	18.00	5.94			
750	18.39	6.16			
800	18.79	6.58			
850	19.10	6.72			
900	19.42	6.81			
950	19.58	7.10			
1000	19.75	7.41			

## 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. 22, 2002	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)
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170154	15GHz~40GHz	May 09, 2003	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 Chamber	KSON	THS-C3L	612	N/A	Oct. 02, 2002	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

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

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

### 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

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