Test Report

Product Name : Wireless VPN Router

Model No.: DI-824VUP, DI-824VUP+

FCC ID.: KA2TW1130

Applicant : D-Link Corporation

Address : 2F, No 233-2 , Pao-Chiao Road , Hsin-Tien , Taipei , Taiwan , R.O.C.

Date of Receipt : Dec 23, 2003

Date of Test : Feb 19, 2004

Report No. : 03CH102FI

The test results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Test Report Certification

Test Date : Feb 19, 2004
Report No. : 03CH102FI

Accredited by NIST (NVLAP)
NVLAP Lab Code: 200347-0

Product Name	:	Wireless VPN Router
Applicant	:	D-Link Corporation
Address	:	2F, No 233-2 , Pao-Chiao Road , Hsin-Tien , Taipei , Taiwan , R.O.C.
Manufacturer	:	Advance Multimedia Internet Technology
Model No.	:	DI-824VUP, DI-824VUP+
FCC ID.	:	KA2TW1130
Rated Voltage	:	AC 120V/60Hz
Trade Name	:	D-Link
Measurement Standard	:	FCC CFR Title 47 Part 15 Subpart C: 2003
Measurement Procedure	:	ANSI C63.4: 2001
Test Result	:	Complied

NVLAP Lab Code : 200347-0

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(Carol Tsai)

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(Kevin Wang)

TABLE OF CONTENTS

Description Page

1. GENERAL INFORMATION 4
1.1. EUT Description 4
1.2. Operational Description 5
1.3. Tested System Datails 6
1.4. Configuration of tested System 7
1.5. EUT Exercise Software 7
1.6. Test Facility 8

2. Conducted Emission 9
2.1. Test Equipment 9
2.2. Test Setup 9
2.3. Limits 9
2.4. Test Procedure 10
2.5. Test Result of Conducted Emission 11

3. Peak Power Output 23
3.1. Test Equipment 23
3.2. Test Setup 23
3.3. Limits 23
3.4. Test Result of Peak Power Output 24

4. Radiated Emission 26
4.1. Test Equipment 26
4.2. Test Setup 26
4.3. Limits 27
4.4. Test Procedure 27
4.5. Test Result of Radiated Emission 28

5. Band Edge 40
5.1. Test Equipment 40
5.2. Test Setup 40
5.3. Limits 42
5.4. Test Procedure 42
5.5. Test Result of Band Edge 43

6. Occupied Bandwidth 49
6.1. Test Equipment 49
6.2. Test Setup 49
6.3. Limits 49
6.4. Test Result of Occupied Bandwidth 50

7. Power Density 52
7.1. Test Equipment 52
7.2. Test Setup 52
7.3. Limits 52
7.4. Test Result of Power Density 53

8. EMI Reduction Method During Compliance Testing 55

Attachment 1: EUT Test Photographs
Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	:	Wireless VPN Router
Trade Name	:	D-Link
FCC ID.	:	KA2TW1130
Model No.	:	DI-824VUP, DI-824VUP+
Frequency Range	:	2412MHz to 2462MHz
Channel Number	:	11
Data Speed (IEEE 802.11b)	:	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Data Speed (IEEE 802.11g)	:	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps
Type of Modulation	:	Digitally Modulation Spread Spectrum
Antenna Type	:	Connector (Reverse SMA)
Antenna Gain	:	2dBi
Channel Control	:	Auto
Power Adapter	:	D-Link, JTA0302B Cable Out: Non-shielded, 1.8m

Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1:	2412 MHz	Channel 5:	2432 MHz	Channel 9:	2452 MHz
Channel 2:	2417 MHz	Channel 6:	2437 MHz	Channel 10:	2457 MHz
Channel 3:	2422 MHz	Channel 7:	2442 MHz	Channel 11:	2462 MHz
Channel 4:	2427 MHz	Channel 8:	2447 MHz		

Note:

1. This device is a 2.4GHz Wireless VPN Router included a 2.4GHz receiving function, a 2.4GHz transmitting function.
2. Regarding to the different construction of the EUT, the model number were shown in the table as following:

Model Number	Marketing
DI-824VUP	America
DI824VUP+	Worldwide

3. Regards to the frequency band operation; the highest rate that was included the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.
4. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
5. This device is a composite device in accordance with Part 15 regulations. The function receiving was measured and made a test report that the report number is 03CH102F under Declaration of Conformity.

1.2. Operational Description

EUT is a Wireless VPN Router with 11 channels. This device provided four kinds of transmitting speed 1, 2, 5.5 and 11Mbps for IEEE 802.11b and eight kinds of transmitting speed 6, 9, 12, 18, 24, 36, 48 and 54Mbps for IEEE 802.11g. The device of RF carrier is DQPSK, DBPSK and CCK.

The device adapts Digitally Modulation Spread Spectrum modulation. The Connector antenna was soldered on PCB provides diversity function to improve the receiving function.

This Wireless VPN Router, compliant with IEEE 802.11b and IEEE 802.11g, is a high-efficiency Wireless LAN adapter. It allows your computer to connect to a wireless network and to share resources, such as files or printers without being bound to the network wires. Operation in 2.4GHz Direst Sequence Spread Spectrum (DSSS) radio transmission for IEEE 802.11b and Orthogonal Frequency Division Multiplexing (OFDM) for IEEE 802.11g, the Wireless VPN Router Wired Equivalent Protection (WEP) algorithm is used. In addition, its standard compliance ensures that it can communicate with any IEEE 802.11b and IEEE 802.11g network.

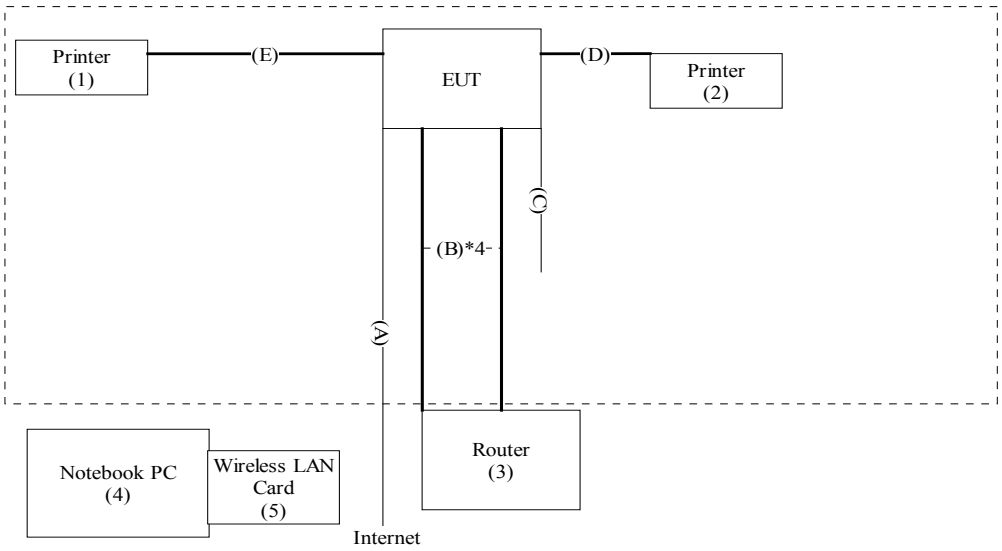
1.3. Tested System Datails

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
(1)	Printer	EPSON	P230A	CPEY017688	DoC	Non-shielded, 0.7m
(2)	Printer	EPSON	EPSON STYLUS C60	DR3K035814	DoC	Non-shielded, 0.7m
(3)	Router	D-Link	DFL-100	N/A	DoC	Non-shielded, 1.8m
(4)	Notebook PC	DELL	Latitude 600	N/A	DoC	Non-shielded, 1.7m, a ferrite core bonded
(5)	Wireless LAN Card (For IEEE 802.11b)	AboCom	WLC030	--	DoC	--
	IEEE 820.11a/11g Wireless PC Card (For IEEE 802.11g)	D-Link	LD-WL54AG/CB	--	DoC	--

Signal Cable Type		Signal cable Description
A.	LAN Cable	Non-shielded, 10m
B.	LAN Cable	Non-shielded, 3m, 4 Pcs
C.	RS232 Cable	Non-shielded, 1.5m
D.	USB Cable	Shielded, 1.5m
E.	Printer Cable	Shielded, 1.2m

1.4. Configuration of tested System



1.5. EUT Exercise Software

(1) Setup the EUT and simulators as shown on 1.4

(2) Turn on the power of all equipment.

(3) Notebook PC reads data from disk.

(4) Data will be transmitting through EUT.

(5) The transmitted status will be shown on the monitor.

(6) Repeat the above procedure 1.5.3 to 1.5.5

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: November 3, 1998 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2

September 30, 2003 Accreditation on NVLAP
NVLAP Lab Code: 200347-0

NVLAP Lab Code : 200347-0

Site Name: Quietek Corporation

Site Address: No.75-1, Wang-Yeh Valley, Yung-Hsing,
Chiung-Lin, Hsin-Chu County,
Taiwan, R.O.C.
TEL : 886-3-592-8858 / FAX : 886-3-592-8859
E-Mail: service@quietek.com

2. Conducted Emission

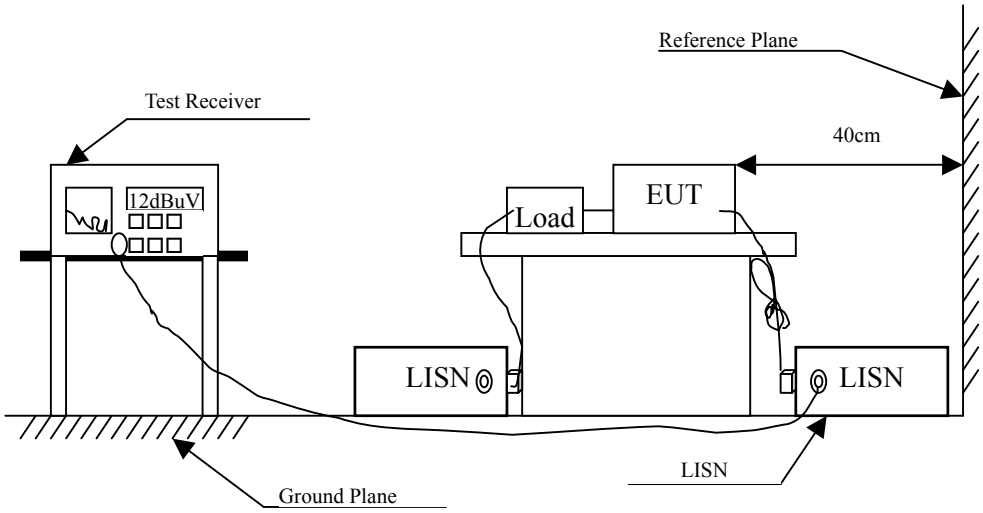
2.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2003	
2	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2004	Peripherals
3	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2004	EUT
4	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2004	
5	No.2 Shielded Room			N/A	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks : In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2001 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Test Result of Conducted Emission

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Channel 1 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.172	-0.01	0.11	48.36	48.46	64.87
	0.290	0.02	0.16	37.80	37.98	60.54
	0.580	0.03	0.23	34.58	34.84	56.00
	1.048	0.04	0.28	33.16	33.49	56.00
	2.386	0.13	0.36	37.54	38.03	56.00
*	27.158	0.39	0.59	44.50	45.48	60.00
Average						
	0.172	-0.01	0.11	38.60	38.70	54.86
	0.290	0.02	0.16	31.10	31.28	50.52
	0.580	0.03	0.23	27.00	27.26	46.00
	1.048	0.04	0.28	25.80	26.13	46.00
	2.386	0.13	0.36	30.60	31.09	46.00
*	27.158	0.39	0.59	41.90	42.88	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Channel 1 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.175	0.05	0.11	48.42	48.58	64.73
	0.292	0.02	0.16	41.86	42.04	60.47
	0.700	0.01	0.25	32.82	33.08	56.00
	1.054	0.04	0.28	35.64	35.97	56.00
	2.225	0.12	0.35	38.42	38.89	56.00
*	27.158	0.39	0.59	44.60	45.58	60.00
Average						
	0.175	0.05	0.11	40.40	40.56	54.72
	0.292	0.02	0.16	37.70	37.88	50.47
	0.700	0.01	0.25	25.40	25.66	46.00
	1.054	0.04	0.28	30.20	30.53	46.00
	2.225	0.12	0.35	32.80	33.27	46.00
*	27.158	0.39	0.59	42.10	43.08	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Channel 6 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.174	0.05	0.11	45.00	45.16	64.78
	0.469	0.02	0.21	35.64	35.87	56.54
	0.646	0.03	0.24	34.20	34.46	56.00
	1.057	0.04	0.28	33.86	34.19	56.00
	2.176	0.11	0.35	38.70	39.16	56.00
*	26.486	0.35	0.59	44.56	45.50	60.00
Average						
	0.174	0.05	0.11	37.40	37.56	54.77
	0.469	0.02	0.21	29.60	29.83	46.53
	0.646	0.03	0.24	26.40	26.66	46.00
	1.057	0.04	0.28	26.30	26.63	46.00
	2.176	0.11	0.35	32.10	32.56	46.00
*	26.486	0.35	0.59	41.50	42.44	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Channel 6 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.176	0.05	0.11	47.92	48.08	64.68
	0.351	0.02	0.18	37.28	37.48	58.93
	0.881	0.04	0.27	34.84	35.15	56.00
	2.235	0.12	0.36	38.98	39.45	56.00
	3.589	0.23	0.40	32.66	33.29	56.00
*	26.487	0.35	0.59	44.78	45.72	60.00
Average						
	0.176	0.05	0.11	40.10	40.26	54.67
	0.351	0.02	0.18	32.30	32.50	48.94
	0.881	0.04	0.27	28.40	28.71	46.00
	2.236	0.12	0.36	32.80	33.27	46.00
	3.589	0.23	0.40	24.90	25.53	46.00
*	26.487	0.35	0.59	41.70	42.64	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Channel 11 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.175	0.05	0.11	49.08	49.24	64.72
	0.353	0.02	0.18	36.52	36.72	58.90
	0.589	0.03	0.23	34.66	34.92	56.00
	2.533	0.14	0.37	36.72	37.23	56.00
	3.534	0.24	0.40	31.12	31.76	56.00
*	27.159	0.39	0.59	44.54	45.52	60.00
Average						
	0.175	0.05	0.11	38.40	38.56	54.72
	0.353	0.02	0.18	29.30	29.50	48.89
	0.589	0.03	0.23	27.00	27.26	46.00
	2.533	0.14	0.37	27.50	28.01	46.00
	3.534	0.24	0.40	23.10	23.74	46.00
*	27.159	0.39	0.59	41.90	42.88	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Channel 11 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
*	0.177	0.05	0.12	47.46	47.63	64.61
	0.295	0.00	0.16	41.14	41.30	60.40
	1.239	0.04	0.30	28.80	29.14	56.00
	2.417	0.13	0.36	37.90	38.39	56.00
	4.542	0.28	0.42	29.72	30.42	56.00
	23.128	0.13	0.58	39.10	39.80	60.00
Average						
	0.177	0.05	0.12	39.30	39.47	54.63
	0.295	0.00	0.16	37.90	38.06	50.38
	1.239	0.04	0.30	25.40	25.74	46.00
	2.417	0.13	0.36	30.90	31.39	46.00
	4.542	0.28	0.42	21.00	21.70	46.00
*	23.128	0.13	0.58	37.30	38.00	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Channel 1 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.172	-0.01	0.11	48.36	48.46	64.87
	0.290	0.02	0.16	37.80	37.98	60.54
	0.580	0.03	0.23	34.58	34.84	56.00
	1.048	0.04	0.28	33.16	33.49	56.00
	2.386	0.13	0.36	37.54	38.03	56.00
*	27.158	0.39	0.59	44.50	45.48	60.00
Average						
	0.172	-0.01	0.11	38.60	38.70	54.86
	0.290	0.02	0.16	31.10	31.28	50.52
	0.580	0.03	0.23	27.00	27.26	46.00
	1.048	0.04	0.28	25.80	26.13	46.00
	2.386	0.13	0.36	30.60	31.09	46.00
*	27.158	0.39	0.59	41.90	42.88	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Channel 1 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.175	0.05	0.11	48.42	48.58	64.73
	0.292	0.02	0.16	41.86	42.04	60.47
	0.700	0.01	0.25	32.82	33.08	56.00
	1.054	0.04	0.28	35.64	35.97	56.00
	2.225	0.12	0.35	38.42	38.89	56.00
*	27.158	0.39	0.59	44.60	45.58	60.00
Average						
	0.175	0.05	0.11	40.40	40.56	54.72
	0.292	0.02	0.16	37.70	37.88	50.47
	0.700	0.01	0.25	25.40	25.66	46.00
	1.054	0.04	0.28	30.20	30.53	46.00
	2.225	0.12	0.35	32.80	33.27	46.00
*	27.158	0.39	0.59	42.10	43.08	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Channel 6 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.174	0.05	0.11	45.00	45.16	64.78
	0.469	0.02	0.21	35.64	35.87	56.54
	0.646	0.03	0.24	34.20	34.46	56.00
	1.057	0.04	0.28	33.86	34.19	56.00
	2.176	0.11	0.35	38.70	39.16	56.00
*	26.486	0.35	0.59	44.56	45.50	60.00
Average						
	0.174	0.05	0.11	37.40	37.56	54.77
	0.469	0.02	0.21	29.60	29.83	46.53
	0.646	0.03	0.24	26.40	26.66	46.00
	1.057	0.04	0.28	26.30	26.63	46.00
	2.176	0.11	0.35	32.10	32.56	46.00
*	26.486	0.35	0.59	41.50	42.44	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Channel 6 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.176	0.05	0.11	47.92	48.08	64.68
	0.351	0.02	0.18	37.28	37.48	58.93
	0.881	0.04	0.27	34.84	35.15	56.00
	2.235	0.12	0.36	38.98	39.45	56.00
	3.589	0.23	0.40	32.66	33.29	56.00
*	26.487	0.35	0.59	44.78	45.72	60.00
Average						
	0.176	0.05	0.11	40.10	40.26	54.67
	0.351	0.02	0.18	32.30	32.50	48.94
	0.881	0.04	0.27	28.40	28.71	46.00
	2.236	0.12	0.36	32.80	33.27	46.00
	3.589	0.23	0.40	24.90	25.53	46.00
*	26.487	0.35	0.59	41.70	42.64	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. “ * ”, means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Channel 11 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.175	0.05	0.11	49.08	49.24	64.72
	0.353	0.02	0.18	36.52	36.72	58.90
	0.589	0.03	0.23	34.66	34.92	56.00
	2.533	0.14	0.37	36.72	37.23	56.00
	3.534	0.24	0.40	31.12	31.76	56.00
*	27.159	0.39	0.59	44.54	45.52	60.00
Average						
	0.175	0.05	0.11	38.40	38.56	54.72
	0.353	0.02	0.18	29.30	29.50	48.89
	0.589	0.03	0.23	27.00	27.26	46.00
	2.533	0.14	0.37	27.50	28.01	46.00
	3.534	0.24	0.40	23.10	23.74	46.00
*	27.159	0.39	0.59	41.90	42.88	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Wireless VPN Router
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Channel 11 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
*	0.177	0.05	0.12	47.46	47.63	64.61
	0.295	0.00	0.16	41.14	41.30	60.40
	1.239	0.04	0.30	28.80	29.14	56.00
	2.417	0.13	0.36	37.90	38.39	56.00
	4.542	0.28	0.42	29.72	30.42	56.00
	23.128	0.13	0.58	39.10	39.80	60.00
Average						
	0.177	0.05	0.12	39.30	39.47	54.63
	0.295	0.00	0.16	37.90	38.06	50.38
	1.239	0.04	0.30	25.40	25.74	46.00
	2.417	0.13	0.36	30.90	31.39	46.00
	4.542	0.28	0.42	21.00	21.70	46.00
*	23.128	0.13	0.58	37.30	38.00	50.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

3. Peak Power Output

3.1. Test Equipment

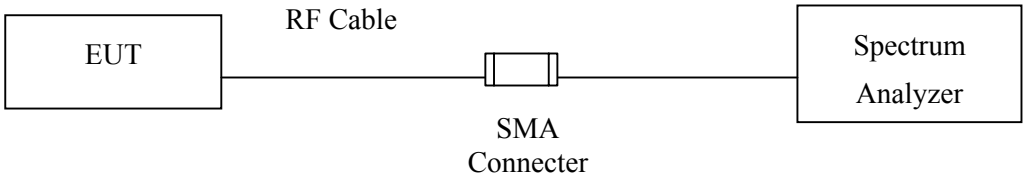
The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2003	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

3.2. Test Setup

Conduction Power Measurement



3.3. Limits

The maximum peak power shall be less 1 Watt.

3.4. Test Result of Peak Power Output

Product : Wireless VPN Router
Test Item : Peak Power Output
Test Site : No.1 OATS
Test Mode : Normal Operation (IEEE 802.11b)

Channel No.	Frequency(MHz)	Measurement	Required Limit	Result
1	2412.0	17.49dBm	1Watt= 30 dBm	Pass
6	2437.0	19.01dBm	1Watt= 30 dBm	Pass
11	2462.0	20.91dBm	1Watt= 30 dBm	Pass

Product : Wireless VPN Router
Test Item : Peak Power Output
Test Site : No.1 OATS
Test Mode : Normal Operation (IEEE 802.11g)

Channel No.	Frequency(MHz)	Measurement	Required Limit	Result
1	2412.0	15.96dBm	1Watt= 30 dBm	Pass
6	2437.0	17.48dBm	1Watt= 30 dBm	Pass
11	2462.0	19.69dBm	1Watt= 30 dBm	Pass

4. Radiated Emission

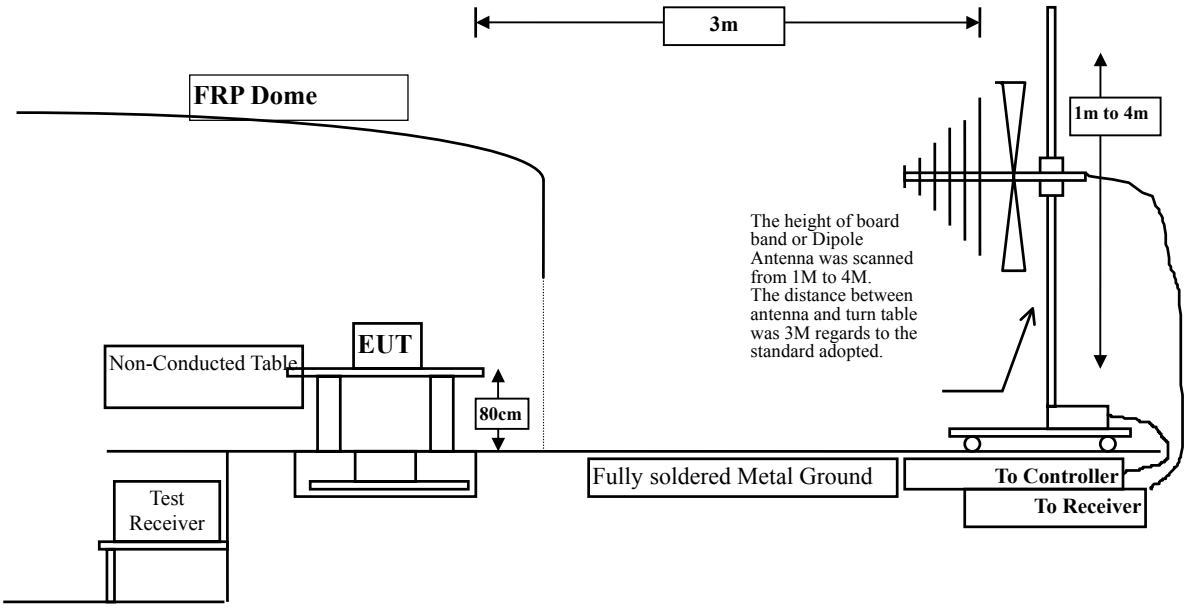
4.1. Test Equipment

The following test equipment are used during the test:

Test Site	Equipment		Manufacturer	Model No. / Serial No.	Last Cal.
OATS # 1	X	Test Receiver	R & S	ESCS 30 / 825442/017	Jan., 2004
	X	Spectrum Analyzer	Advantest	R3261C / 81720266	N/A
	X	Pre-Amplifier	HP	8447D / 2944A09276	N/A
	X	Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2003
OATS # 2		Test Receiver	R & S	ESCS 30 / 836858/023	Jan., 2004
		Spectrum Analyzer	Advantest	R3261C / 81720471	N/A
		Pre-Amplifier	QuieTek	QTK-AMP / AMP1	N/A
		Bilog Antenna	Chase	CBL6112B / 2708	Sep., 2003
OATS # 3		Test Receiver	R & S	ESCS 30 / 825442/014	Jun., 2003
		Spectrum Analyzer	Advantest	R3162 / 91700283	N/A
		Pre-Amplifier	Advantest	BB525C / N/A	N/A
		Bilog Antenna	Schaffner	CBL6112B / 2673	Sep., 2003

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2001 on radiated measurement.
The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field dtrength of harmonics measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.
The frequency range from 30MHz to 10th harminics is checked.

4.5. Test Result of Radiated Emission

Product : Wireless VPN Router
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 1 (IEEE 802.11b)

Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal							
Peak Detector:							
1066.000	2.09	24.18	31.89	50.32	44.70	29.30	74.00
4823.520	4.24	31.31	31.95	38.12	41.72	32.28	74.00
7236.360	5.63	36.54	32.67	38.27	47.77	26.23	74.00
9648.160	7.01	37.98	31.88	37.90	51.02	22.98	74.00
12059.96	8.40	38.59	31.32	37.48	53.15	20.85	74.00
Vertical							
Peak Detector:							
1066.000	2.09	24.18	31.89	51.74	46.12	27.88	74.00
4824.120	4.24	31.31	31.95	39.30	42.90	31.10	74.00
7236.080	5.63	36.54	32.67	40.92	50.42	23.58	74.00
9648.000	7.01	37.98	31.88	37.64	50.76	23.24	74.00
12059.96	8.40	38.59	31.32	37.80	53.47	20.53	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 6 (IEEE 802.11b)

Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal							
Peak Detector:							
1066.000	2.09	24.18	31.89	49.40	43.78	30.22	74.00
4873.640	4.27	31.37	31.95	38.33	42.02	31.98	74.00
7311.160	5.67	36.56	32.60	39.16	48.79	25.21	74.00
9748.040	7.07	38.13	31.66	37.48	51.02	22.98	74.00
12185.52	8.47	38.51	31.21	37.92	53.68	20.32	74.00
Vertical							
Peak Detector:							
1100.000	2.11	24.16	31.89	50.97	45.34	28.66	74.00
4874.240	4.27	31.37	31.95	37.74	41.43	32.57	74.00
7311.280	5.67	36.56	32.60	38.69	48.32	25.68	74.00
9747.960	7.07	38.13	31.66	37.77	51.31	22.69	74.00
12184.96	8.47	38.51	31.21	37.17	52.93	21.07	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11b)

Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal							
Peak Detector:							
1066.000	2.09	24.18	31.89	48.60	42.98	31.02	74.00
4924.160	4.30	31.45	31.96	37.45	41.25	32.75	74.00
7386.400	5.72	36.59	32.51	37.63	47.42	26.58	74.00
9848.080	7.12	38.18	31.48	37.27	51.09	22.91	74.00
12309.80	8.53	38.43	31.10	37.95	53.81	20.19	74.00
Vertical							
Peak Detector:							
1066.000	2.09	24.18	31.89	50.24	44.62	29.38	74.00
4923.920	4.30	31.45	31.96	36.75	40.55	33.45	74.00
7385.760	5.72	36.59	32.51	37.32	47.11	26.89	74.00
9848.080	7.12	38.18	31.48	37.58	51.40	22.60	74.00
12310.12	8.53	38.43	31.10	37.54	53.40	20.60	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 1 (IEEE 802.11g)

Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit		
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal									
Peak Detector:									
1066.000	2.09	24.18	31.89	49.13	43.51	30.49	74.00	0	0
4823.960	4.24	31.31	31.95	37.83	41.43	32.57	74.00	0	0
7235.760	5.63	36.54	32.67	38.78	48.28	25.72	74.00	0	0
9647.520	7.01	37.98	31.88	37.20	50.32	23.68	74.00	0	0
12059.96	8.40	38.59	31.32	36.61	52.28	21.72	74.00	0	0
Vertical									
Peak Detector:									
1066.000	2.09	24.18	31.89	49.92	44.30	29.70	74.00	0	0
4823.920	4.24	31.31	31.95	36.84	40.44	33.56	74.00	0	0
7236.080	5.63	36.54	32.67	38.64	48.14	25.86	74.00	0	0
9648.120	7.01	37.98	31.88	35.92	49.04	24.96	74.00	0	0
12060.12	8.40	38.59	31.32	36.55	52.22	21.78	74.00	0	0

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 6 (IEEE 802.11g)

Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal							
Peak Detector:							
1066.640	2.09	24.18	31.89	49.56	43.94	30.06	74.00
4873.920	4.27	31.37	31.95	37.38	41.07	32.93	74.00
7310.600	5.67	36.56	32.60	38.87	48.50	25.50	74.00
9748.680	7.07	38.13	31.66	38.27	51.81	22.19	74.00
12185.04	8.47	38.51	31.21	37.34	53.10	20.90	74.00
Vertical							
Peak Detector:							
1066.000	2.09	24.18	31.89	50.94	45.32	28.68	74.00
4874.280	4.27	31.37	31.95	37.98	41.67	32.33	74.00
7311.080	5.67	36.56	32.60	38.71	48.34	25.66	74.00
9748.240	7.07	38.13	31.66	37.40	50.94	23.06	74.00
12184.96	8.47	38.51	31.21	37.18	52.94	21.06	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11g)

Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal							
Peak Detector:							
1066.000	2.09	24.18	31.89	48.73	43.11	30.89	74.00
4923.960	4.30	31.45	31.96	34.86	38.66	35.34	74.00
7385.960	5.72	36.59	32.51	37.32	47.11	26.89	74.00
9848.320	7.12	38.18	31.48	37.70	51.52	22.48	74.00
12309.80	8.53	38.43	31.10	36.90	52.76	21.24	74.00
Vertical							
Peak Detector:							
1100.000	2.11	24.16	31.89	50.62	44.99	29.01	74.00
4923.440	4.30	31.45	31.96	37.48	41.28	32.72	74.00
7386.120	5.72	36.59	32.51	36.06	45.85	28.15	74.00
9847.880	7.12	38.18	31.48	37.74	51.56	22.44	74.00
12309.96	8.53	38.43	31.10	36.86	52.72	21.28	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 1 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal								
*	266.680	1.99	11.48	22.60	54.13	45.00	1.00	46.00
	564.470	3.21	21.89	22.60	42.50	45.00	1.00	46.00
	598.420	3.35	21.00	22.60	41.40	43.15	2.85	46.00
	631.400	3.49	19.32	22.60	43.61	43.82	2.18	46.00
	665.350	3.62	18.04	22.60	44.60	43.67	2.33	46.00
	830.250	4.30	24.62	22.60	38.00	44.33	1.67	46.00
Vertical								
	98.870	1.30	16.77	22.60	44.00	39.47	4.03	43.50
	165.800	1.58	20.76	22.60	38.20	37.94	5.56	43.50
*	565.440	3.22	19.94	22.60	44.45	45.00	1.00	46.00
	662.440	3.61	18.11	22.60	41.00	40.12	5.88	46.00
	763.320	4.03	21.56	22.60	40.00	42.99	3.01	46.00
	829.280	4.30	24.59	22.60	35.60	41.89	4.11	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Wireless VPN Router
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 6 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal								
	238.550	1.87	8.32	22.60	49.40	37.00	9.00	46.00
	264.740	1.98	11.23	22.60	54.20	44.81	1.19	46.00
	464.560	2.80	16.07	22.60	48.00	44.27	1.73	46.00
*	565.440	3.22	21.88	22.60	42.48	44.98	1.02	46.00
	663.410	3.62	18.12	22.60	44.20	43.33	2.67	46.00
	830.250	4.30	24.62	22.60	37.80	44.13	1.87	46.00
Vertical								
	83.350	1.24	11.43	22.60	48.60	38.67	1.33	40.00
	167.740	1.58	20.08	22.60	38.00	37.06	6.44	43.50
*	564.470	3.21	20.03	22.60	44.32	44.96	1.04	46.00
	662.440	3.61	18.11	22.60	41.20	40.32	5.68	46.00
	763.320	4.03	21.56	22.60	39.40	42.39	3.61	46.00
	830.250	4.30	24.60	22.60	35.80	42.10	3.90	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Wireless VPN Router
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11b)

	Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal								
*	263.770	1.98	11.10	22.60	54.52	45.00	1.00	46.00
	563.500	3.21	21.90	22.60	41.80	44.31	1.69	46.00
	598.420	3.35	21.00	22.60	41.40	43.15	2.85	46.00
	631.400	3.49	19.32	22.60	42.80	43.01	2.99	46.00
	663.410	3.62	18.12	22.60	44.80	43.93	2.07	46.00
	830.250	4.30	24.62	22.60	37.80	44.13	1.87	46.00
Vertical								
	82.380	1.23	11.24	22.60	48.40	38.27	1.73	40.00
	165.800	1.58	20.76	22.60	37.80	37.54	5.96	43.50
*	563.500	3.21	20.12	22.60	44.27	45.00	1.00	46.00
	662.440	3.61	18.11	22.60	40.00	39.12	6.88	46.00
	762.350	4.02	21.49	22.60	39.00	41.92	4.08	46.00
	830.250	4.30	24.60	22.60	34.40	40.70	5.30	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Wireless VPN Router
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 1 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal								
*	266.680	1.99	11.48	22.60	54.13	45.00	1.00	46.00
	564.470	3.21	21.89	22.60	42.50	45.00	1.00	46.00
	598.420	3.35	21.00	22.60	41.40	43.15	2.85	46.00
	631.400	3.49	19.32	22.60	43.61	43.82	2.18	46.00
	665.350	3.62	18.04	22.60	44.60	43.67	2.33	46.00
	830.250	4.30	24.62	22.60	38.00	44.33	1.67	46.00
Vertical								
	98.870	1.30	16.77	22.60	44.00	39.47	4.03	43.50
	165.800	1.58	20.76	22.60	38.20	37.94	5.56	43.50
*	565.440	3.22	19.94	22.60	44.45	45.00	1.00	46.00
	662.440	3.61	18.11	22.60	41.00	40.12	5.88	46.00
	763.320	4.03	21.56	22.60	40.00	42.99	3.01	46.00
	829.280	4.30	24.59	22.60	35.60	41.89	4.11	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Wireless VPN Router
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 6 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal								
	238.550	1.87	8.32	22.60	49.40	37.00	9.00	46.00
	264.740	1.98	11.23	22.60	54.20	44.81	1.19	46.00
	464.560	2.80	16.07	22.60	48.00	44.27	1.73	46.00
*	565.440	3.22	21.88	22.60	42.48	44.98	1.02	46.00
	663.410	3.62	18.12	22.60	44.20	43.33	2.67	46.00
	830.250	4.30	24.62	22.60	37.80	44.13	1.87	46.00
Vertical								
	83.350	1.24	11.43	22.60	48.60	38.67	1.33	40.00
	167.740	1.58	20.08	22.60	38.00	37.06	6.44	43.50
*	564.470	3.21	20.03	22.60	44.32	44.96	1.04	46.00
	662.440	3.61	18.11	22.60	41.20	40.32	5.68	46.00
	763.320	4.03	21.56	22.60	39.40	42.39	3.61	46.00
	830.250	4.30	24.60	22.60	35.80	42.10	3.90	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Wireless VPN Router
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11g)

	Frequency	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal								
*	263.770	1.98	11.10	22.60	54.52	45.00	1.00	46.00
	563.500	3.21	21.90	22.60	41.80	44.31	1.69	46.00
	598.420	3.35	21.00	22.60	41.40	43.15	2.85	46.00
	631.400	3.49	19.32	22.60	42.80	43.01	2.99	46.00
	663.410	3.62	18.12	22.60	44.80	43.93	2.07	46.00
	830.250	4.30	24.62	22.60	37.80	44.13	1.87	46.00
Vertical								
	82.380	1.23	11.24	22.60	48.40	38.27	1.73	40.00
	165.800	1.58	20.76	22.60	37.80	37.54	5.96	43.50
*	563.500	3.21	20.12	22.60	44.27	45.00	1.00	46.00
	662.440	3.61	18.11	22.60	40.00	39.12	6.88	46.00
	762.350	4.02	21.49	22.60	39.00	41.92	4.08	46.00
	830.250	4.30	24.60	22.60	34.40	40.70	5.30	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

5. Band Edge

5.1. Test Equipment

The following test equipment are used during the test:

RF Conducted Measurement:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2003	

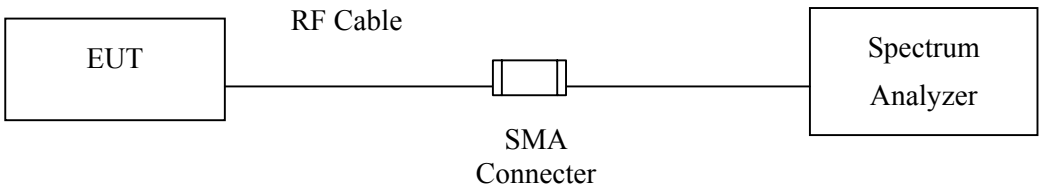
RF Radiated Measurement:

Item		Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	X	Spectrum Analyzer	R & S	FSP40 / 100005	Aug., 2003
2		Pre-Amplifier	HP	8449B / 3008A01123	Feb., 2004
3		Pre-Amplifier	HP	8447D / 2944A09276	N/A
4		Loop Antenna	R & S	HFH2-Z2 / 833799/004	Sep., 2003
5		BiconiLog Antenna	Schwarzbeck	VULB 9166 / 1061	Sep., 2003
6		Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2003
7	X	Horn Antenna	Schwarzbeck	BBHA 9120D / BBHA9120D312	Jul., 2003
8	No.1 OATS				Sep., 2003

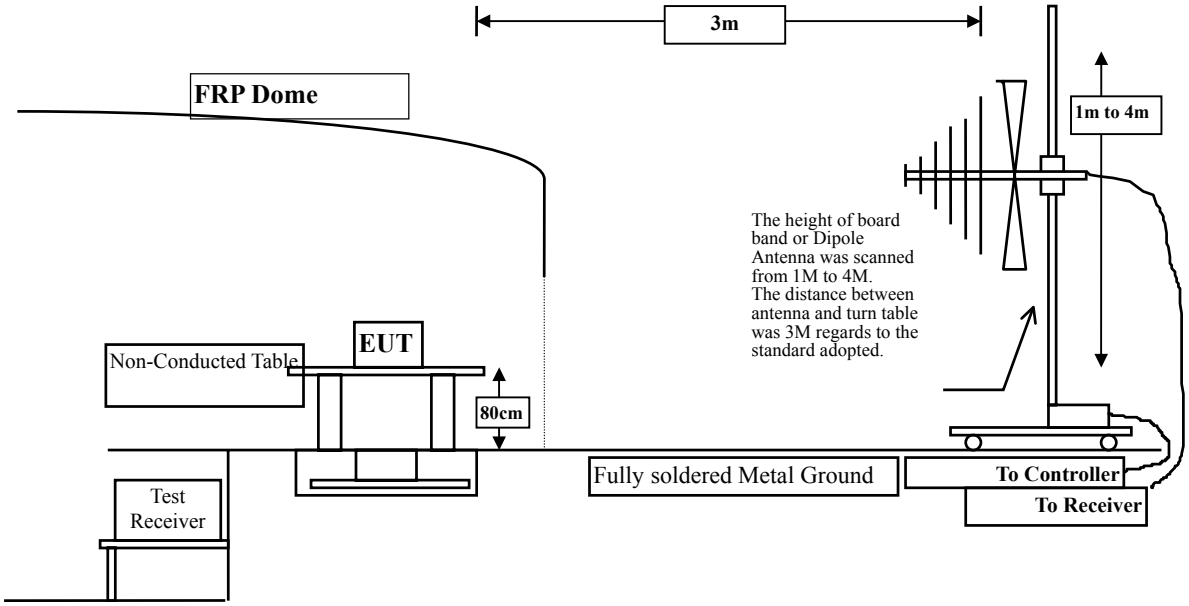
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark “X” test instruments are used to measure the final test results.

5.2. Test Setup

RF Conducted Measurement:



RF Radiated Measurement:



5.3. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2001 on radiated measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.

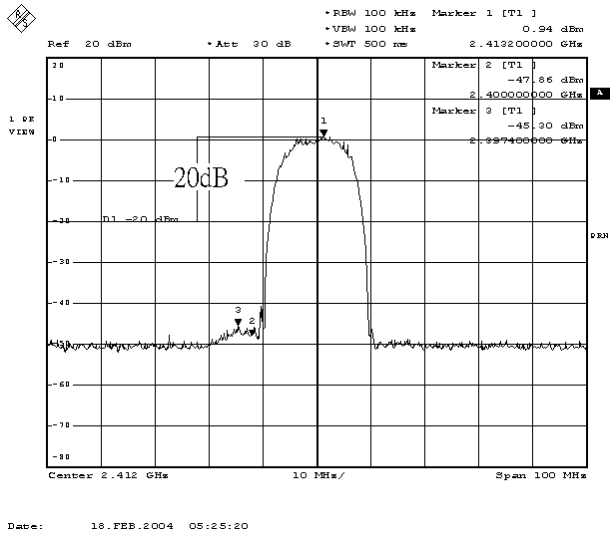
5.5. Test Result of Band Edge

Product : Wireless VPN Router
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 1 (IEEE 802.11b)

RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
1	<2400	>20	Pass

Figure Channel 1:



Product : Wireless VPN Router
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11b)

RF Radiated Measurement: (Peak Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
11(Horizontal)	2487.200	25.71	27.58	2.90	0.00	56.19	74	Pass
11 (Vertical)	2483.800	25.86	27.58	2.90	0.00	56.34	74	Pass

Figure Channel 11: (Horizontal)

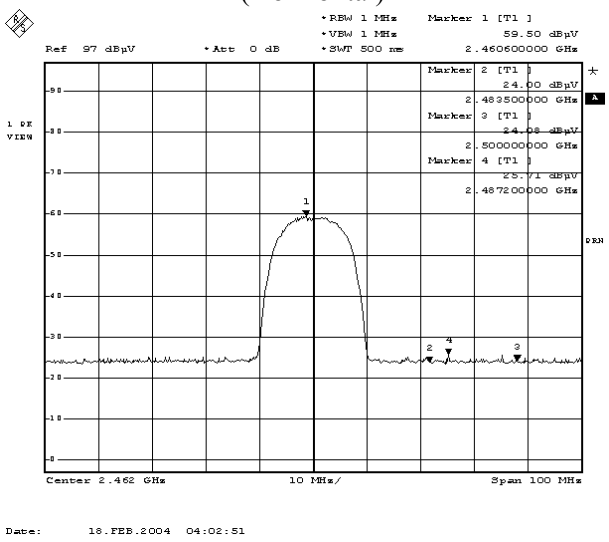
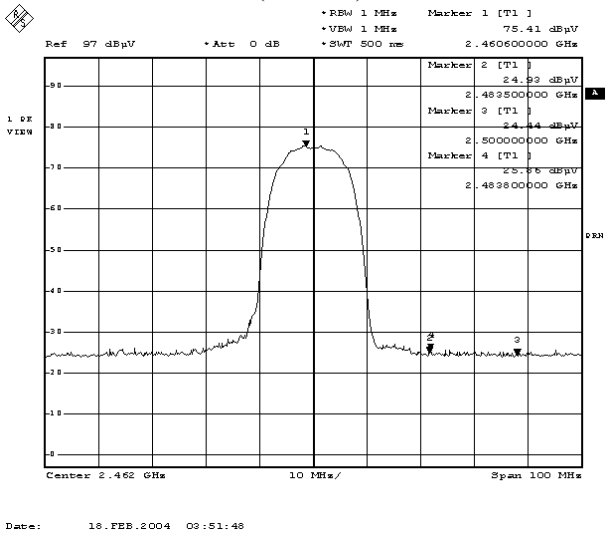


Figure Channel 11: (Vertical)



Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11b)

RF Radiated Measurement: (Average Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
11(Horizontal)	2487.500	13.11	27.58	2.91	0.00	43.60	74	Pass
11 (Vertical)	2492.800	13.58	27.58	2.91	0.00	44.07	74	Pass

Figure Channel 11: (Horizontal)

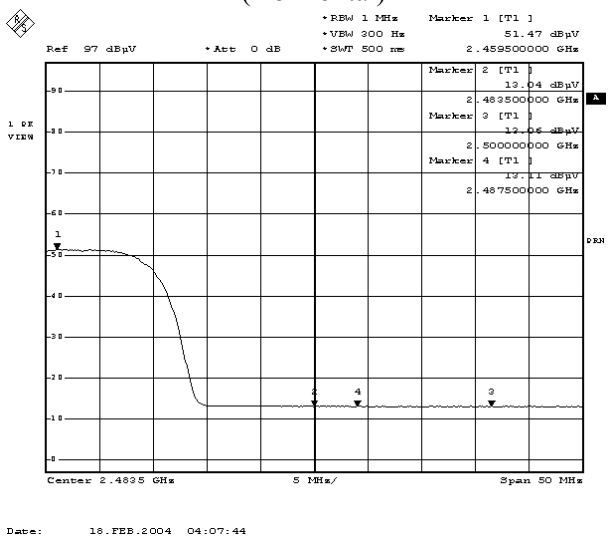
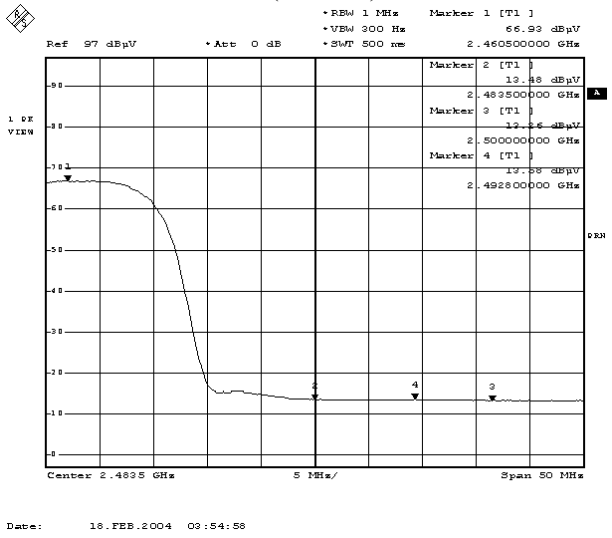


Figure Channel 11: (Vertical)



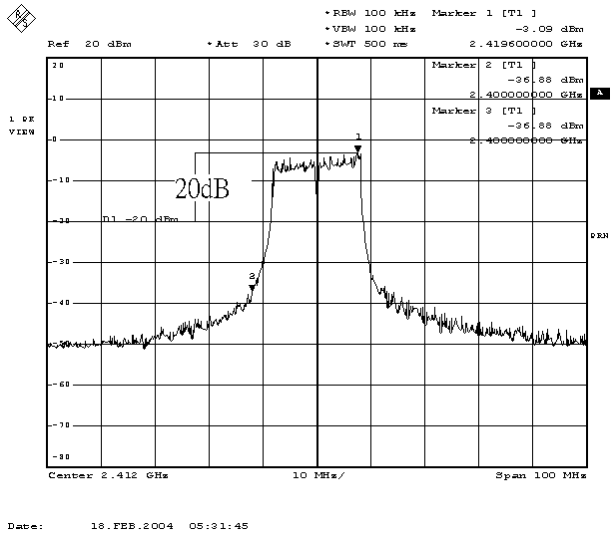
Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 1 (IEEE 802.11g)

RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
1	<2400	>20	Pass

Figure Channel 1:



Product : Wireless VPN Router
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11g)

RF Radiated Measurement: (Peak Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
11(Horizontal)	2485.100	29.50	27.58	2.90	0.00	59.98	74	Pass
11 (Vertical)	2483.600	40.84	27.58	2.90	0.00	71.32	74	Pass

Figure Channel 11: (Horizontal)

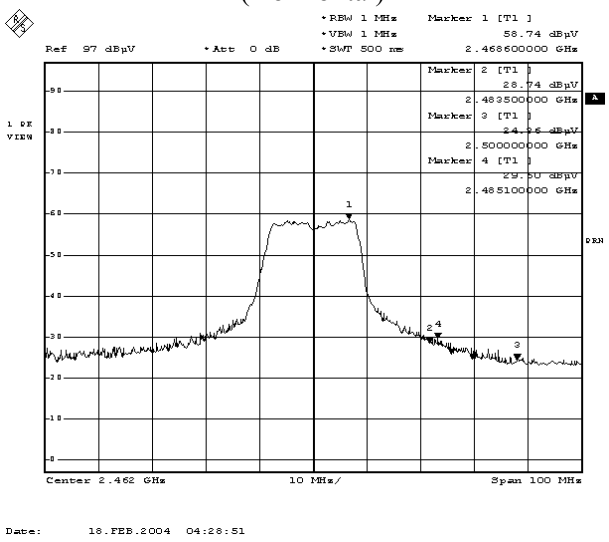
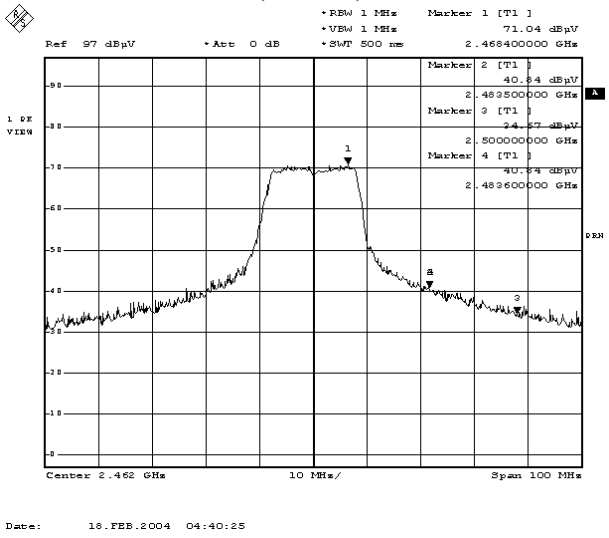


Figure Channel 11: (Vertical)



Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless VPN Router
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 11 (IEEE 802.11g)

RF Radiated Measurement: (Average Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
11(Horizontal)	2487.000	12.70	27.58	2.92	0.00	43.18	74	Pass
11 (Vertical)	2485.100	13.09	27.58	2.90	0.00	43.57	74	Pass

Figure Channel 11: (Horizontal)

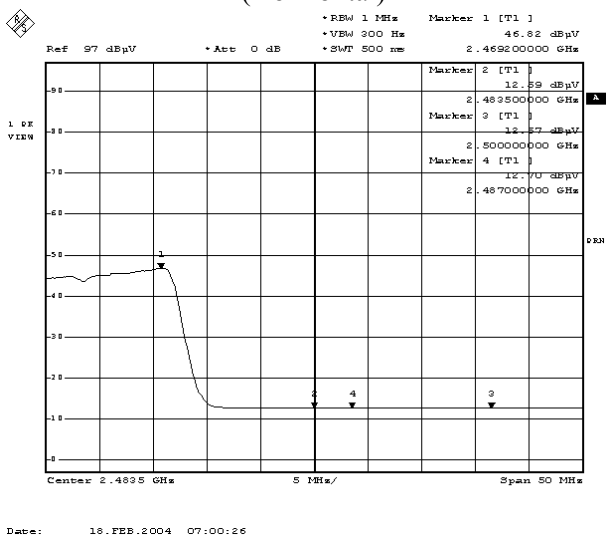
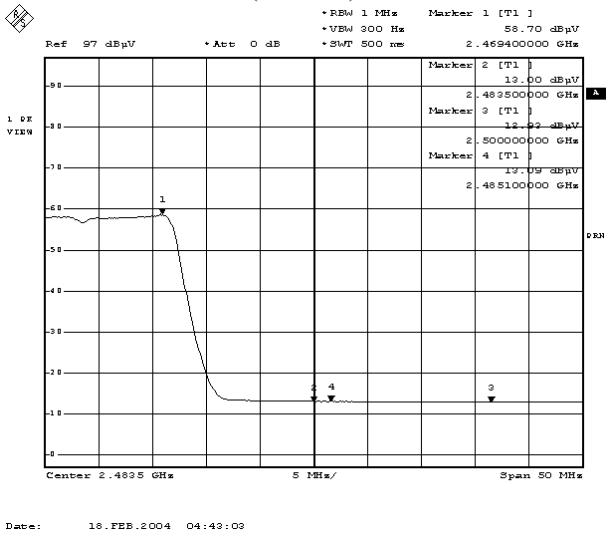


Figure Channel 11: (Vertical)



Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

6. Occupied Bandwidth

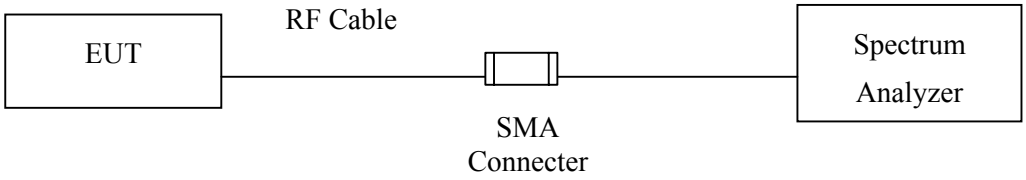
6.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2003	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

6.2. Test Setup



6.3. Limits

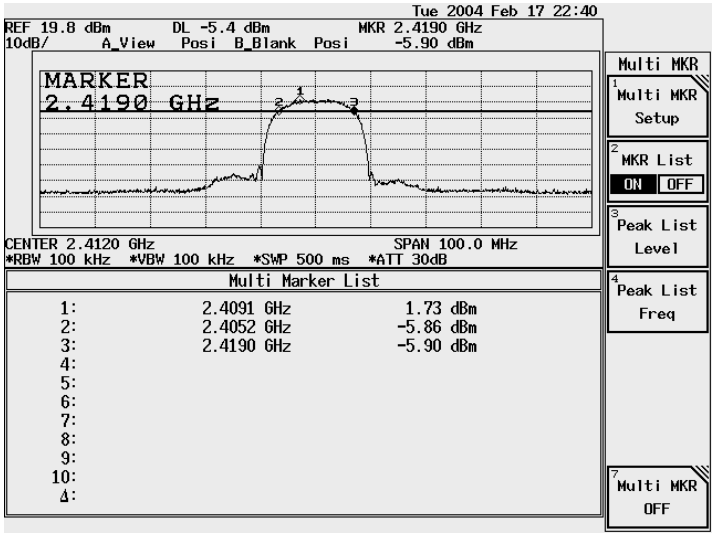
The minimum 6dB bandwidth shall be at least 500kHz.

6.4. Test Result of Occupied Bandwidth

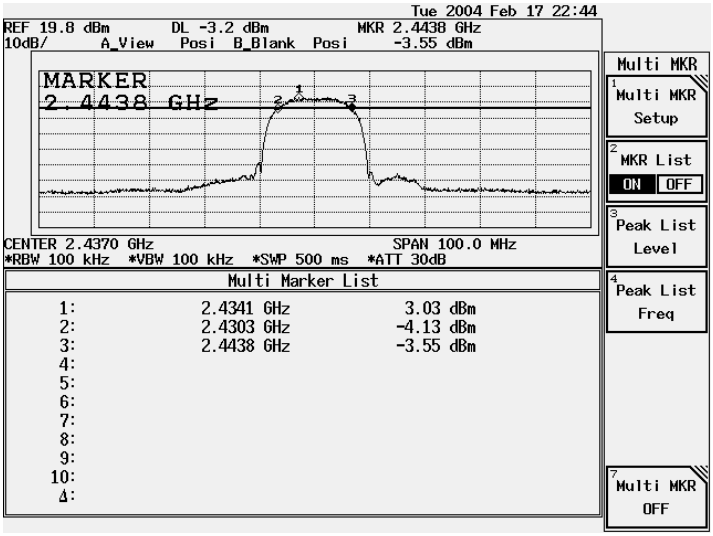
Product : Wireless VPN Router
Test Item : Occupied Bandwidth
Test Site : No.1 OATS
Test Mode : Normal Operation (IEEE 802.11b)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412.0	13800	>500	Pass
6	2437.0	13500	>500	Pass
11	2462.0	13900	>500	Pass

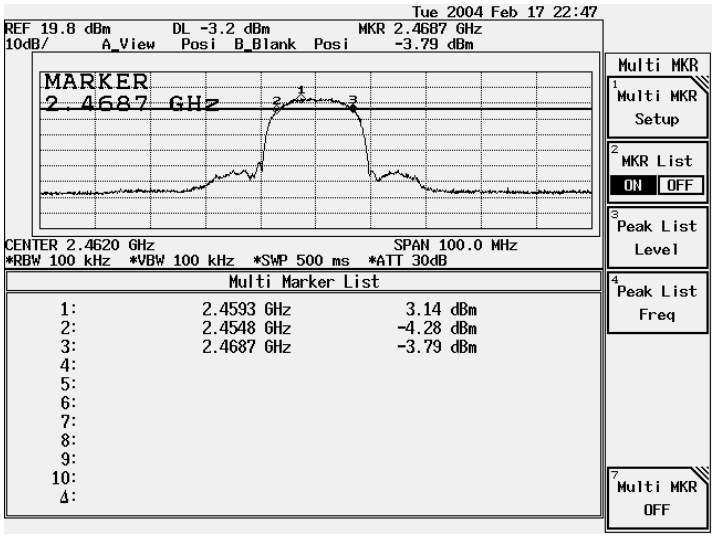
Channel 1:



Channel 6



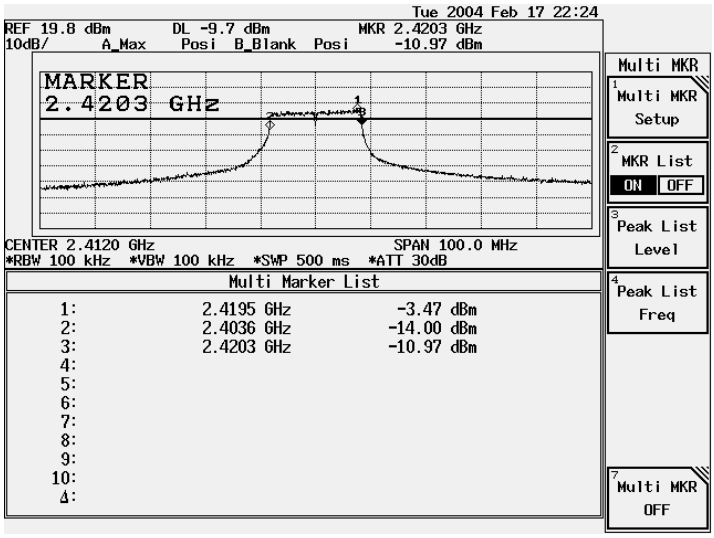
Channel 11:



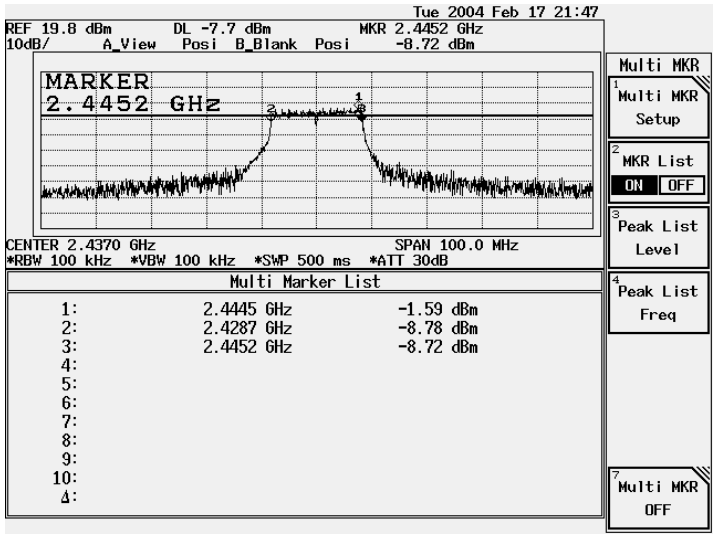
Product : Wireless VPN Router
Test Item : Occupied Bandwidth
Test Site : No.1 OATS
Test Mode : Normal Operation (IEEE 802.11g)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412.0	16700	>500	Pass
6	2437.0	16500	>500	Pass
11	2462.0	16600	>500	Pass

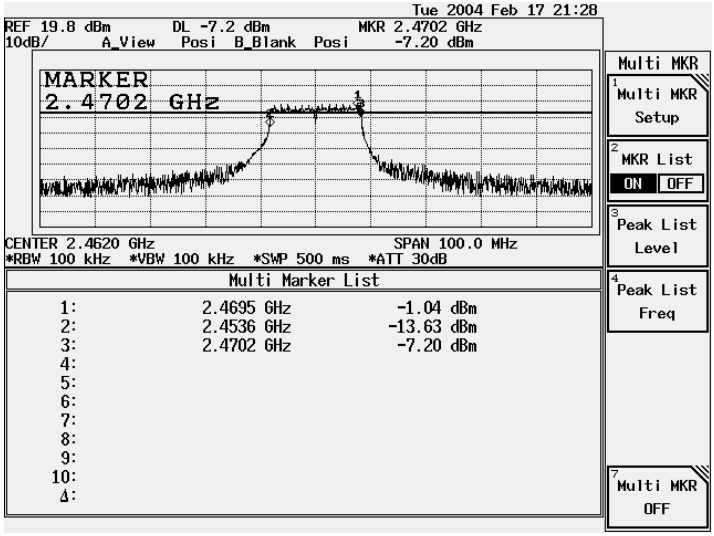
Channel 1:



Channel 6



Channel 11:



7. Power Density

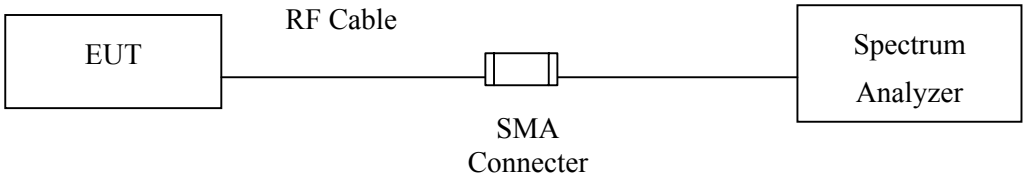
7.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2003	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

7.2. Test Setup



7.3. Limits

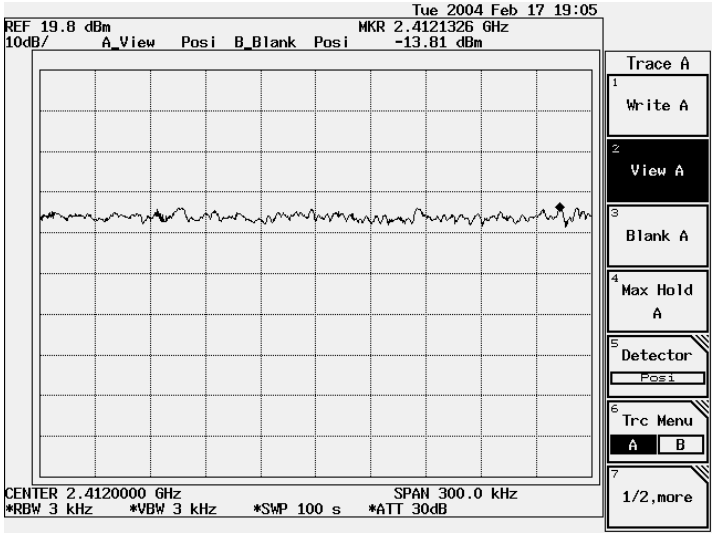
The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

7.4. Test Result of Power Density

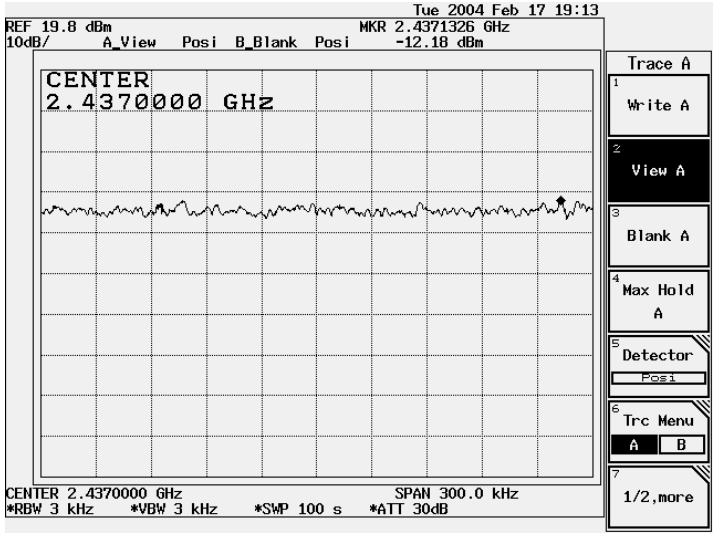
Product : Wireless VPN Router
Test Item : Power Density
Test Site : No.1 OATS
Test Mode : Normal Operation (IEEE 802.11b)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
1	2412.1326	-13.81	< 8dBm	Pass
6	2437.1326	-12.18	< 8dBm	Pass
11	2462.1326	-10.96	< 8dBm	Pass

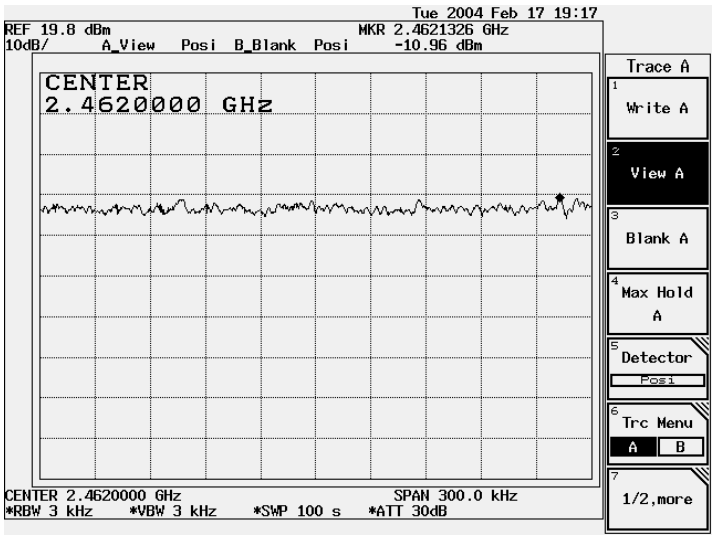
Channel 1:



Channel 6



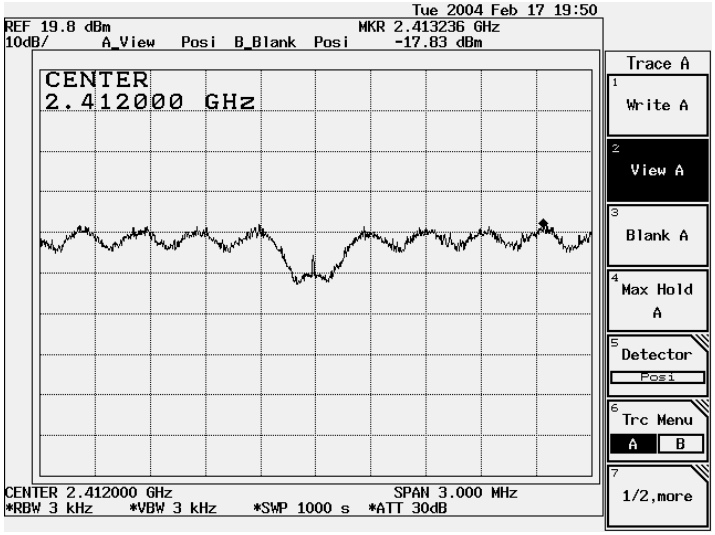
Channel 11:



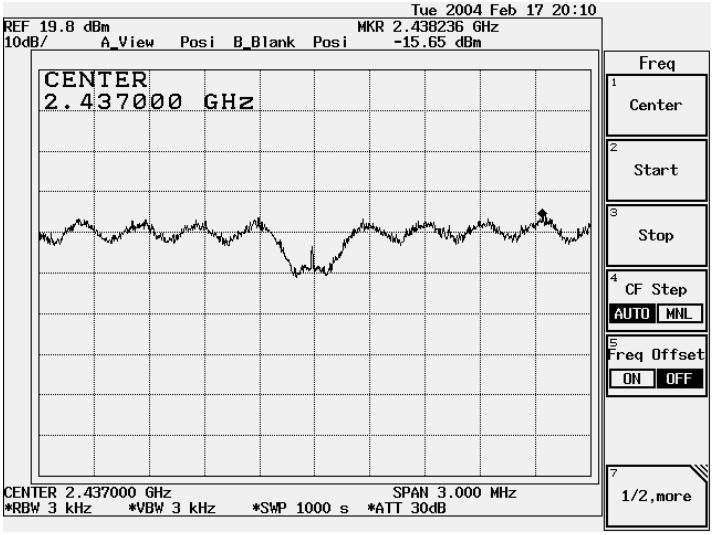
Product : Wireless VPN Router
Test Item : Power Density
Test Site : No.1 OATS
Test Mode : Normal Operation (IEEE 802.11g)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
1	2413.236	-17.83	< 8dBm	Pass
6	2438.236	-15.65	< 8dBm	Pass
11	2463.236	-14.28	< 8dBm	Pass

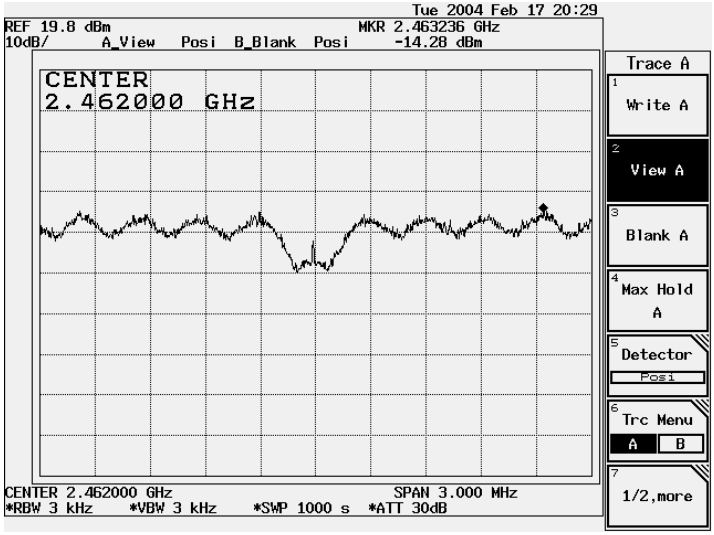
Channel 1:



Channel 6



Channel 11:



8. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs