



Test Report

Product Name : Wireless Lan Access Point

Model No. : DW-1150, DWL-2000, SOHO-WLAP, WEN-2021, 24212, TEW-AP100,
KW-413

FCC ID.: KA2-DW1150

Applicant : D-Link Corporation

Address : No. 8, Li-Hsin VII Road, Science-Based
Industrial Park, Hsin-Chu, Taiwan, R.O.C.

Date of Receipt : July 31, 2001

Date of Test : August 07, 2001

Report No. : 018H004FI

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 : Augut 07, 2001

Report No. : 018H004FI

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

Product Name : Wireless Lan Access Point
Applicant : D-Link Corporation
Address : No. 8, Li-Hsin VII Road, Science-Based Industrial
Park, Hsin-Chu, Taiwan, R.O.C.
Manufacturer : D-Link Corporation
Model No. : DW-1150, DWL-2000, SOHO-WLAP, WEN-2021,
24212, TEW-AP100, KW-413
FCC ID. : KA2-DW1150
Rated Voltage : DC 5V
Trade Name : D-Link
Measurement Standard : FCC Part 15 Subpart C Paragraph 15.247
Measurement Procedure : ANSI C63.4:1992
Test Result : Complied

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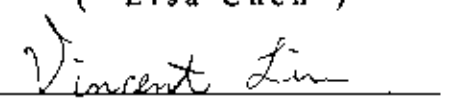
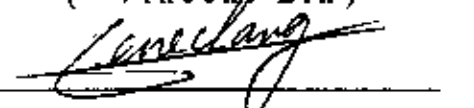
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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	: Wireless Lan Access Point	
Trade Name	: D-Link	
FCC ID.	: KA2-DW1150	
Model No.	: DW-1150, DWL-2000, SOHO-WLAP, WEN-2021, 24212, TEW-AP100, KW-413	
Frequency Range	: 2400MHz to 2483.5MHz	
Channel Number	: 11	
Frequency of Each Channel (Working Frequency)	Channel 01: 2412MHz	Channel 07: 2442MHz
	Channel 02: 2417 MHz	Channel 08: 2447MHz
	Channel 03: 2422 MHz	Channel 09: 2452MHz
	Channel 04: 2427MHz	Channel 10: 2457MHz
	Channel 05: 2432MHz	Channel 11: 2462MHz
	Channel 06: 2437MHz	
Type of Modulation	: Direct Sequence Spread Spectrum	
Selection of Operating Frequency	: Software	
USB Cable	: Shielded, 1.8m	
Power Adapter	: YNG YUH, YP-084	
	Cable Out: Non-shielded, 1.8m	

Note:

1. This device is a 2.4GHz Wireless Lan Access Point with USB interface included a 2.4GHz receiving function, a 2.4GHz transmitting function.
2. 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.
3. Regards to the of the different construction EUT. The model name were shown in the table following:

Model No	Company
DW-1150	D-Link
DWL-2000	D-Link
SOHO-WLAP	D-Link
WEN-2021	W-LINK System Inc.
24212	Target
TEW-AP100	TRENWARE
KW-413	KTI

4. 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 018H004F under Verification.

1.2. EUT Description

EUT is an USB 1.1 interface 2.4GHz wireless LAN with 11 channels. This device provided four kind of transmitting speed 1,2,5.5 and 11Mbps . The device of RF carrier is DQPSK, DB PSK and CCK. The USB port provides the connection to PC for data transmission.

The device was adapted direct sequence spread spectrum modulation. The dual monopole antenna provides diversity function to improve the receiving function. Data can be transmitted by the radio signal connect to the Internet or Local network.

Tested System Details

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

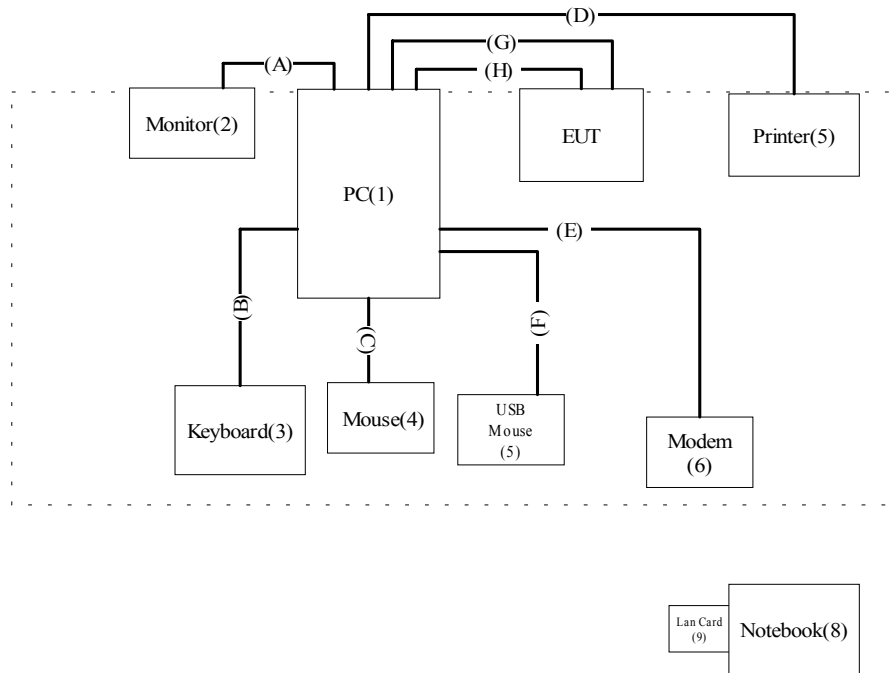
Product	Manufacturer	Model No.	Serial No.	FCC ID
(1) PC	IBM	16W	BNL6767	DoC
(2) Monitor	HITACHI	CM752ET-311	T8E004443	DoC
(3) Keyboard	IBM	KB-9930	0073506	DoC
(4) Mouse	HP	M-S34	LZA71178588	DZL211029
(5) Printer	HP	P1371A	CN02600150	DoC
(6) Modem	ACEEX	2814	960018054	IFAXDM2814
(7) USB Mouse	Logitech	M-UE55	LTC93813284	DoC
(8) Notebook	IBM	Think Pad 570	27L8835	DoC
(9) Wireless Lan Card	W-Link	WEN2012	N/A	DoC

Note:

1. The power cord of The device. (2) 、(5) are Shielded power cord.
2. The power cord of The device. (1) 、(8) are Non-shielded power cord.

Signal Cable Type	Signal Cable Description
A. VGA Cable	Shielded, 1.8m, two ferrite cores bonded.
B. Keyboard Cable	Shielded, 1.8m
C. Mouse Cable	Shielded, 1.8m
D. Printer Cable	Shielded, 1.6m
E. Monitor Cable	Shielded, 1.8m
F. USB Cable	Shielded, 1.2m
G. Lan Cable	Non-shielded, 1.8m.
H. USB Cable	Shielded, 1.8m

1.3. Configuration of tested System



1.4. EUT Exercise Software

- 1.4.1 Setup the EUT and simulators as shown on 1.3.
- 1.4.2 Turn on the power of all equipment.
- 1.4.3 Personal Computer reads data from disk.
- 1.4.4 Data will be transmitted through EUT.
- 1.4.5 The transmission status will be shown on the monitor.
- 1.4.6 Repeat the above procedure 1.4.4 to 1.4.5

1.5. 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, 1998 Accreditation on NVLAP
 NVLAP Lab Code: 200347-0



Site Name: Quietek Corporation

Site Address: N0.75-1, Wang-Yeh Valley, Yung-Hsing,
 Chiung-Lin, Hsin-Chu County,
 Taiwa, R.O.C.

2. Conducted Emission

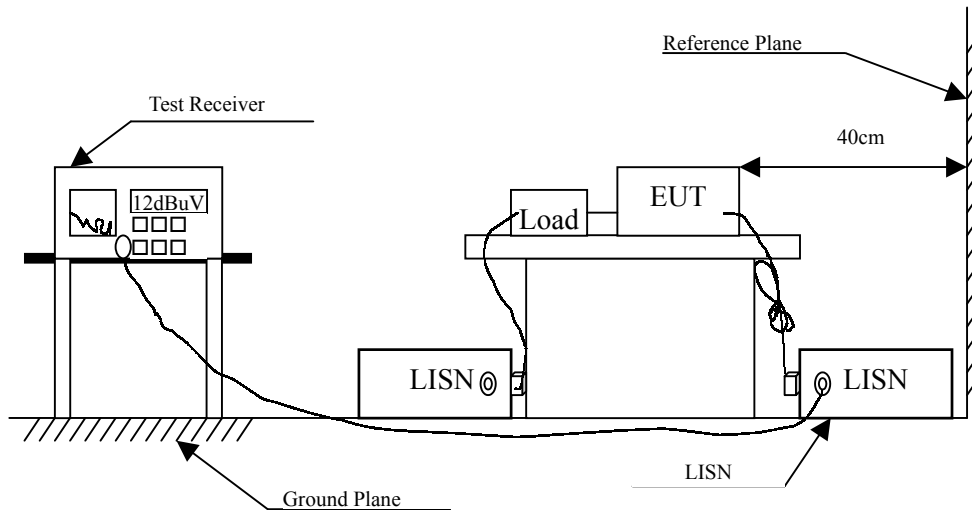
2.1. Test Equipment List

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2001	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2001	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2001	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	N/A	
5	N0.2 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 Paragraph 15.207 (dBuV)		
Frequency MHz	Limits	
	uV	dBuV
0.45 - 30	250	48.0

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 refers 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 C63.4:1992 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.45MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Test Result of Conducted Emission

Product : Wireless Lan Access Point
 Test Item : Conducted Emission Test
 Test Mode : Normal Operation (1Mbps)

Frequency MHz	Cable Loss dB	LISN Factor dB	Reading Level dBuV	Measurement Level dBuV	Limits dBuV
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Line 1

Quasi-Peak:

* 0.477	0.06	0.10	26.60	26.76	48.00
0.761	0.09	0.10	22.40	22.59	48.00
0.931	0.10	0.10	20.00	20.20	48.00
1.273	0.12	0.11	13.50	13.73	48.00
23.321	0.37	0.51	21.00	21.88	48.00
27.501	0.39	0.57	14.30	15.26	48.00

Line 2

Quasi-Peak:

0.450	0.06	0.10	28.40	28.56	48.00
0.610	0.07	0.10	24.90	25.07	48.00
0.786	0.09	0.10	22.50	22.69	48.00
0.967	0.10	0.10	20.00	20.20	48.00
1.199	0.11	0.11	13.40	13.62	48.00
23.384	0.37	0.51	21.20	22.08	48.00

Remarks :

1. “ * ” means that this data is the worst emission level.
2. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : Conducted Emission Test
 Test Mode : Normal Operation (11Mbps)

Frequency	Cable	LISN	Reading Level	Measurement Level	Limits
MHz	Loss	Factor	dBuV	dBuV	dBuV
	dB	dB			

Line 1
Quasi-Peak:

* 0.520	0.07	0.10	26.20	26.37	48.00
0.605	0.07	0.10	25.30	25.47	48.00
0.810	0.09	0.10	21.50	21.69	48.00
1.071	0.10	0.10	17.50	17.71	48.00
1.259	0.11	0.11	13.70	13.92	48.00
23.079	0.37	0.50	21.90	22.78	48.00

Line 2
Quasi-Peak:

0.474	0.06	0.10	27.40	27.56	48.00
0.576	0.07	0.10	25.60	25.77	48.00
0.789	0.09	0.10	22.60	22.79	48.00
0.951	0.10	0.10	20.20	20.40	48.00
1.162	0.11	0.11	14.10	14.32	48.00
23.196	0.37	0.50	20.20	21.08	48.00

Remarks :

1. “ * ” means that this data is the worst emission level.
2. The average measurement was not performed when the peak measured data under the limit of average detection.

3. Peak Power Output

3.1. Test Equipment

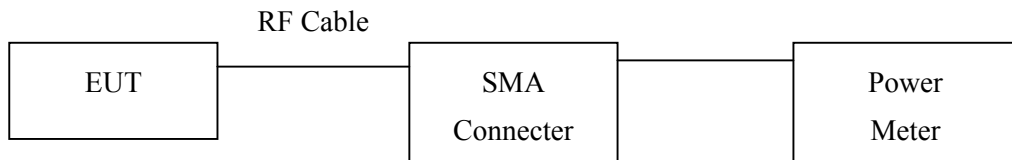
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2001
X	Power Meter	HP	EPM-441A	May, 2001

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
 2. Mark "X" test instruments are used to measure the final test results.

3.2. Test Setup

Conduction Power Measurement



3.3. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

3.4. Minimum Standard

The maximum peak power shall be less 1 Watt.

3.5. Test Result of Peak Power Output

Product : Wireless Lan Access Point
 Test Item : Peak Power Output Data
 Test Site : No.1 OATS
 Test Mode : Normal Operation

Data Speed: 1Mbps

Channel No.	Frequency(MHz)	Measurement	Required Limit	Result
1	2413	7.63 dBm	1 Watt= 30 dBm	Pass
6	2438	7.93 dBm	1 Watt= 30 dBm	Pass
11	2463	8.91 dBm	1 Watt= 30 dBm	Pass

Data Speed: 11Mbps

Channel No.	Frequency(MHz)	Measurement	Required Limit	Result
1	2413	7.54 dBm	1 Watt= 30 dBm	Pass
6	2438	8.05dBm	1 Watt= 30 dBm	Pass
11	2463	8.88 dBm	1 Watt= 30 dBm	Pass

4. RF Exposure Evaluation

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)
LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

4.1. Friis Formula

$$\text{Friis transmission formula: } Pd = (P_{out} * G) / (4 * \pi * r^2)$$

Where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.2. EUT Operation condition

A software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.3. Test Result of RF Exposure Evaluation

Product : Wireless Lan Access Point
 Test Item : RF Exposure Evaluation Data
 Test Site : No.1 OATS
 Test Mode : Normal Operation

4.3.1 Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.6dBi or 1.45in linear scale.

4.3.2 Output Power Into Antenna & RF Exposure Evaluation Distance

Channel	Channel Frequency (MHz)	Output Power to Antenna (dBm)	Minimum Allowable Distance ® From Skin(cm)
1 (1Mbps)	2412	7.63	0.61
1 (11Mbps)	2412	7.54	0.60
6 (1Mbps)	2437	7.93	0.63
6 (11Mbps)	2437	8.05	0.64
11 (1Mbps)	2462	8.91	0.70
11 (11Mbps)	2462	8.88	0.70

The distance r (4th column) calculated from the Friis transmission formula is far shorter than 20 cm separation requirement. So, RF exposure limit warning or SAR test are not required.

5. Radiated Emission

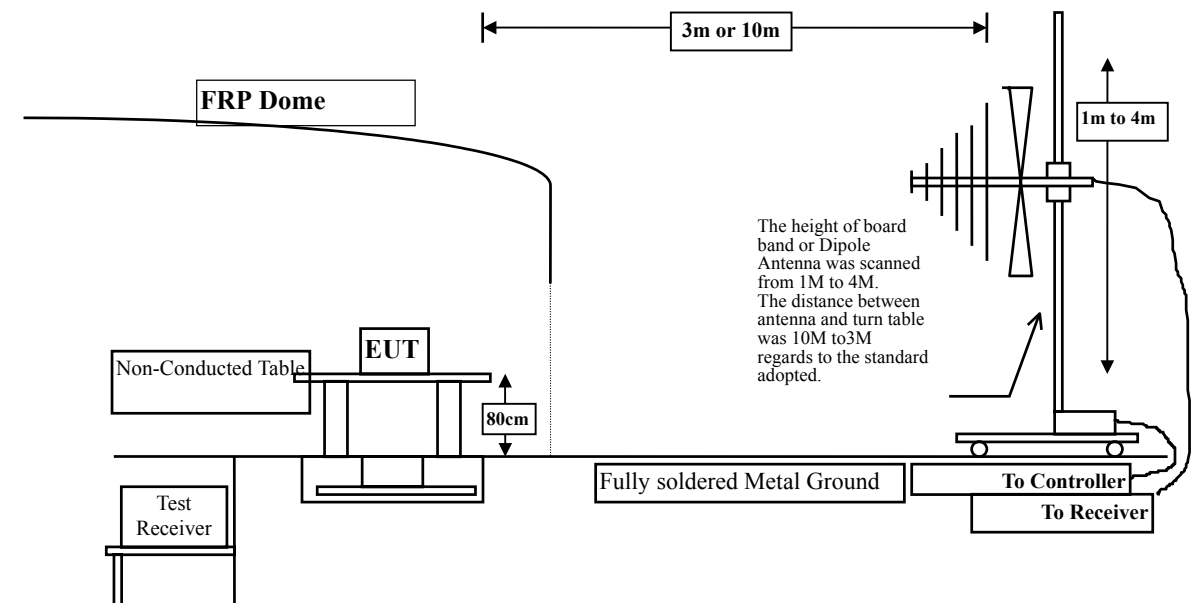
5.1. Test Equipment

The following test equipment are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 1	X Test Receiver	R & S	ESCS 30 / 825442/14	May, 2001
	Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2001
	Pre-Amplifier	HP	8447D/3307A01812	May, 2001
	X Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2000
Site # 1	X Horn Antenna	EM	EM6917 / 103325	May, 2001
	X Test Receiver	R & S	ESCS 30 / 825442/17	May, 2001
Site # 2	Spectrum Analyzer	Advantest	R3261C / 71720609	May, 2001
	Pre-Amplifier	HP	8447D/3307A01814	May, 2001
	X Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2000
	X Horn Antenna	EM	EM6917 / 103325	May, 2001

- 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



Spurious Emissions
(Band Edge Antenna Radiated)

5.3. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

5.4. Limits

► General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	50dB below of the fundamental (dBuV/m @3m)	15.209 Limits (dBuV/m @3m)	General Radiated Limits (dBuV/m @3m)
30-88	40	40	40
88-216	43.5	43.5	43.5
216-960	44	46	46
Above 960	44	54	54

- Remarks :
1. RF Line Voltage (dBuV) = 20 log RF Line 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.

5.5. 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 C63.4:1992 on radiated measurement.

The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength 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 harmonics** is checked.

5.6. Test Result of Radiated Emission

Product : Wireless Lan Access Point
 Test Item : Harmonic Radiated Emission Data
 Test Mode : Channel 1(1Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Peak Detector (Horizontal)

4873.350	6.32	33.56	0.00	19.07	58.95	15.05	74.00
7335.150	8.41	36.34	0.00	18.94	< 63.69	10.31	74.00
9796.850	10.28	37.46	0.00	18.67	< 66.41	7.59	74.00

Average Detector (Horizontal)

4873.940	6.32	33.56	0.00	5.18	45.06	8.94	54.00
7335.650	8.41	36.34	0.00	4.81	< 49.56	4.44	54.00
9796.840	10.28	37.46	0.00	5.41	< 53.15	0.85	54.00

Peak Detector (Vertical)

4820.590	6.27	33.50	0.00	18.39	58.16	15.84	74.00
7241.510	8.32	36.24	0.00	18.33	< 62.89	11.11	74.00
9647.150	10.18	37.43	0.00	18.27	< 65.88	8.12	74.00

Average Detector (Vertical)

4873.790	6.32	33.56	0.00	6.43	46.31	7.69	54.00
7313.600	8.39	36.32	0.00	4.53	< 49.25	4.75	54.00
9752.400	10.25	37.45	0.00	4.90	< 52.60	1.40	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : Harmonic Radiated Emission Data
 Test Mode : Channel 6(1Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Peak Detector (Horizontal)

4877.450	6.32	33.56	0.00	18.63	58.51	15.49	74.00
7312.350	8.38	36.31	0.00	18.69	< 63.37	10.63	74.00
9752.450	10.25	37.45	0.00	18.61	< 66.31	7.69	74.00

Average Detector (Horizontal)

4876.450	6.32	33.56	0.00	5.12	45.00	9.00	54.00
7313.550	8.39	36.32	0.00	4.77	< 49.49	4.51	54.00
9753.650	10.25	37.45	0.00	5.00	< 52.70	1.30	54.00

Peak Detector (Vertical)

4875.300	6.32	33.56	0.00	19.09	58.97	15.03	74.00
7313.700	8.39	36.32	0.00	18.41	< 63.13	10.87	74.00
9752.500	10.25	37.45	0.00	18.60	< 66.30	7.70	74.00

Average Detector (Vertical)

4873.790	6.32	33.56	0.00	6.43	46.31	7.69	54.00
7313.600	8.39	36.32	0.00	4.53	< 49.25	4.75	54.00
9752.400	10.25	37.45	0.00	4.90	< 52.60	1.40	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : Harmonic Radiated Emission Data
 Test Mode : Channel 11(1Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Peak Detector (Horizontal)

4929.158	6.37	33.62	0.00	19.02	59.01	14.99	74.00
7387.250	8.45	36.39	0.00	18.64	< 63.48	10.52	74.00
9848.750	10.33	37.47	0.00	19.54	< 67.34	6.66	74.00

Average Detector (Horizontal)

4929.450	6.37	33.62	0.00	5.75	45.74	8.26	54.00
7387.050	8.43	36.37	0.00	4.90	< 49.71	4.29	54.00
9848.950	10.33	37.47	0.00	5.30	< 53.10	0.90	54.00

Peak Detector (Vertical)

4924.850	6.37	33.62	0.00	19.99	59.98	14.02	74.00
7385.950	8.43	36.37	0.00	18.57	< 63.38	10.62	74.00
9848.350	10.33	37.47	0.00	18.66	< 66.46	7.54	74.00

Average Detector (Vertical)

4924.050	6.37	33.62	0.00	6.93	46.92	7.08	54.00
7385.550	8.43	36.37	0.00	4.82	< 49.63	4.37	54.00
9847.050	10.32	37.47	0.00	5.28	< 53.06	0.94	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : Harmonic Radiated Emission Data
 Test Mode : Channel 1(11Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Peak Detector (Horizontal)

4825.350	6.27	33.50	0.00	18.01	57.78	16.22	74.00
7237.850	8.32	36.24	0.00	18.81	< 63.37	10.63	74.00
9646.550	10.18	37.43	0.00	18.96	< 66.57	7.43	74.00

Average Detector (Horizontal)

4823.350	6.27	33.50	0.00	4.51	44.28	9.72	54.00
7237.050	8.32	36.24	0.00	4.71	< 49.27	4.73	54.00
9647.150	10.18	37.43	0.00	4.86	< 52.47	1.53	54.00

Peak Detector (Vertical)

4826.300	6.27	33.50	0.00	18.43	58.20	15.80	74.00
7236.790	8.32	36.24	0.00	18.91	< 63.47	10.53	74.00
9650.000	10.18	37.43	0.00	18.17	< 65.78	8.22	74.00

Average Detector (Vertical)

4827.410	6.27	33.50	0.00	4.76	44.53	9.47	54.00
7237.700	8.32	36.24	0.00	4.51	< 49.07	4.93	54.00
9651.400	10.18	37.43	0.00	4.77	< 52.38	1.62	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : Harmonic Radiated Emission Data
 Test Mode : Channel 6(11Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Peak Detector (Horizontal)

4877.750	6.32	33.56	0.00	18.92	58.80	15.20	74.00
7315.450	8.39	36.32	0.00	18.76	< 63.48	10.52	74.00
9751.240	10.25	37.45	0.00	19.18	< 66.88	7.12	74.00

Average Detector (Horizontal)

4874.940	6.32	33.56	0.00	5.26	45.14	8.86	54.00
7315.040	8.39	36.32	0.00	5.17	< 49.89	4.11	54.00
9750.940	10.25	37.45	0.00	5.09	< 52.79	1.21	54.00

Peak Detector (Vertical)

4878.200	6.32	33.56	0.00	19.54	59.42	14.58	74.00
7313.900	8.39	36.32	0.00	18.10	< 62.82	11.18	74.00
9751.700	10.25	37.45	0.00	19.06	< 66.76	7.24	74.00

Average Detector (Vertical)

4876.600	6.32	33.56	0.00	5.33	45.21	8.79	54.00
7314.010	8.39	36.32	0.00	4.52	< 49.24	4.76	54.00
9750.400	10.25	37.45	0.00	5.04	< 52.74	1.26	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : Harmonic Radiated Emission Data
 Test Mode : Channel 11(11Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Peak Detector (Horizontal)

4924.551	6.37	33.62	0.00	19.83	59.82	14.18	74.00
7384.947	8.43	36.37	0.00	18.59	< 63.40	10.60	74.00
9848.550	10.33	37.47	0.00	19.11	< 66.91	7.09	74.00

Average Detector (Horizontal)

4923.650	6.37	33.62	0.00	5.81	45.80	8.20	54.00
7386.450	8.43	36.37	0.00	4.94	< 49.75	4.25	54.00
9847.710	10.33	37.47	0.00	5.27	< 53.07	0.93	54.00

Peak Detector (Vertical)

4924.550	6.37	33.62	0.00	19.28	59.27	14.73	74.00
7384.050	8.43	36.37	0.00	19.11	< 63.92	10.08	74.00
9850.050	10.33	37.47	0.00	19.51	< 67.31	6.69	74.00

Average Detector (Vertical)

4923.850	6.37	33.62	0.00	5.77	45.76	8.24	54.00
7386.250	8.43	36.37	0.00	4.84	< 49.65	4.35	54.00
9848.650	10.33	37.47	0.00	5.33	< 53.13	0.87	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Lan Access Point
 Test Item : General Radiated Emission Data
 Test Mode : Channel 1(1Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Horizontal:

100.810	1.31	10.01	26.88	44.60	29.04	14.46	43.50
151.250	1.52	14.26	26.89	42.40	31.28	12.22	43.50
192.960	1.68	12.33	26.91	41.20	28.30	15.20	43.50
251.160	1.92	12.47	26.93	47.80	35.26	10.74	46.00
* 697.360	3.76	20.55	26.33	38.40	36.39	9.61	46.00
716.760	3.84	20.83	26.29	38.00	36.37	9.63	46.00

Vertical:

122.150	1.40	10.60	26.88	45.40	30.51	12.99	43.50
151.250	1.52	14.26	26.89	44.60	33.48	10.02	43.50
251.160	1.92	12.47	26.93	42.20	29.66	16.34	46.00
495.600	2.93	17.20	26.64	43.60	37.08	8.92	46.00
* 694.450	3.74	20.50	26.33	44.00	41.92	4.08	46.00
717.730	3.84	20.85	26.29	40.00	38.39	7.61	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ * ”, means this data is the worst emission level-Amplifier.
3. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier

Product : Wireless Lan Access Point
 Test Item : General Radiated Emission Data
 Test Mode : Channel 6(1Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Horizontal:

100.810	1.31	10.01	26.88	46.60	31.04	12.46	43.50
151.250	1.52	14.26	26.89	42.80	31.68	11.82	43.50
200.720	1.72	12.01	26.91	42.60	29.41	14.09	43.50
254.070	1.94	12.49	26.93	48.00	35.49	10.51	46.00
496.570	2.93	17.22	26.64	39.00	32.51	13.49	46.00
*694.450	3.74	20.50	26.33	40.20	38.12	7.88	46.00

Vertical:

131.850	1.44	11.93	26.89	50.20	36.68	6.82	43.50
176.470	1.62	13.09	26.90	46.00	33.80	9.70	43.50
264.740	1.98	12.59	26.94	43.40	31.03	14.97	46.00
497.540	2.94	17.24	26.64	43.60	37.14	8.86	46.00
*695.420	3.75	20.52	26.33	43.60	41.54	4.46	46.00
874.870	4.49	22.98	26.05	39.40	40.82	5.18	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ * ”, means this data is the worst emission level-Amplifier.
3. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier

Product : Wireless Lan Access Point
 Test Item : General Radiated Emission Data
 Test Mode : Channel 11(1Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Horizontal:

100.810	1.31	10.01	26.88	46.80	31.24	12.26	43.50
151.250	1.52	14.26	26.89	41.00	29.88	13.62	43.50
251.160	1.92	12.47	26.93	45.40	32.86	13.14	46.00
498.510	2.94	17.26	26.64	37.60	31.17	14.83	46.00
* 695.420	3.75	20.52	26.33	40.20	38.14	7.86	46.00
716.760	3.84	20.83	26.29	39.60	37.97	8.03	46.00

Vertical:

144.460	1.49	13.66	26.89	43.20	31.46	12.04	43.50
251.160	1.92	12.47	26.93	42.40	29.86	16.14	46.00
497.540	2.94	17.24	26.64	44.40	37.94	8.06	46.00
* 695.420	3.75	20.52	26.33	43.60	41.54	4.46	46.00
716.760	3.84	20.83	26.29	39.20	37.57	8.43	46.00
746.830	3.96	21.26	26.25	37.00	35.97	10.03	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ * ”, means this data is the worst emission level-Amplifier.
3. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier

Product : Wireless Lan Access Point
 Test Item : General Radiated Emission Data
 Test Site : Chamber
 Test Mode : Channel 1(11Mbps)

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Measurement	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Horizontal:

150.280	1.51	14.30	26.89	42.00	30.92	12.58	43.50
251.160	1.92	12.47	26.93	46.40	33.86	12.14	46.00
497.540	2.94	17.24	26.64	38.20	31.74	14.26	46.00
* 694.450	3.74	20.50	26.33	42.00	39.92	6.08	46.00
716.760	3.84	20.83	26.29	38.60	36.97	9.03	46.00
744.890	3.95	21.23	26.25	33.80	32.73	13.27	46.00

Vertical:

118.270	1.38	10.19	26.88	46.20	30.88	12.62	43.50
150.280	1.51	14.30	26.89	44.40	33.32	10.18	43.50
249.220	1.92	12.45	26.93	42.60	30.03	15.97	46.00
496.570	2.93	17.22	26.64	44.00	37.51	8.49	46.00
* 693.480	3.74	20.48	26.33	41.60	39.49	6.51	46.00
716.760	3.84	20.83	26.29	38.40	36.77	9.23	46.00
746.830	3.96	21.26	26.25	36.20	35.17	10.83	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ * ”, means this data is the worst emission level-Amplifier.
3. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier

Product : Wireless Lan Access Point
 Test Item : General Radiated Emission Data
 Test Site : Chamber
 Test Mode : Channel 6(11Mbps)

Freq.	Cable	Probe	PreAMP	Reading	Measurement	Margin	Limit
MHz	Loss	Factor	dB	Level	dBuV/m	dB	dBuV/m
	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

Horizontal:

150.280	1.51	14.30	26.89	42.80	31.72	11.78	43.50
251.160	1.92	12.47	26.93	46.20	33.66	12.34	46.00
274.440	2.02	12.68	26.94	41.80	29.56	16.44	46.00
496.570	2.93	17.22	26.64	38.40	31.91	14.09	46.00
* 694.450	3.74	20.50	26.33	42.00	39.92	6.08	46.00
717.730	3.84	20.85	26.29	37.80	36.19	9.81	46.00

Vertical:

127.000	1.42	11.27	26.89	46.80	32.60	10.90	43.50
150.280	1.51	14.30	26.89	42.80	31.72	11.78	43.50
250.190	1.92	12.46	26.93	42.60	30.04	15.96	46.00
497.540	2.94	17.24	26.64	43.80	37.34	8.66	46.00
* 693.480	3.74	20.48	26.33	40.60	38.49	7.51	46.00
746.830	3.96	21.26	26.25	36.40	35.37	10.63	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ * ”, means this data is the worst emission level-Amplifier.
3. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier

Product : Wireless Lan Access Point
 Test Item : General Radiated Emission Data
 Test Site : Chamber
 Test Mode : Channel 11(11Mbps)

Freq.	Cable	Probe	PreAMP	Reading	Measurement	Margin	Limit
MHz	Loss	Factor	dB	Level	dBuV/m	dB	dBuV/m
	dB	dB/m		dBuV			

Horizontal:

150.280	1.51	14.30	26.89	43.20	32.12	11.38	43.50
250.190	1.92	12.46	26.93	46.40	33.84	12.16	46.00
274.440	2.02	12.68	26.94	41.20	28.96	17.04	46.00
495.600	2.93	17.20	26.64	38.80	32.28	13.72	46.00
* 694.450	3.74	20.50	26.33	41.20	39.12	6.88	46.00
717.730	3.84	20.85	26.29	37.60	35.99	10.01	46.00

Vertical:

151.250	1.52	14.26	26.89	45.20	34.08	9.42	43.50
251.160	1.92	12.47	26.93	42.40	29.86	16.14	46.00
274.440	2.02	12.68	26.94	40.00	27.76	18.24	46.00
496.570	2.93	17.22	26.64	44.20	37.71	8.29	46.00
*696.390	3.75	20.54	26.33	41.00	38.96	7.04	46.00
744.890	3.95	21.23	26.25	36.60	35.53	10.47	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ * ”, means this data is the worst emission level-Amplifier.
3. Measurement = Reading Level + Probe Factor + Cable loss-Amplifier

5.7. Test Result of Band Edge

Product : Wireless Lan Access Point
 Test Item : Band Edge Data
 Test Site : No.1 OATS
 Test Mode : Channel 1

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

Figure Channel 1: 1Mbps (Horizontal)

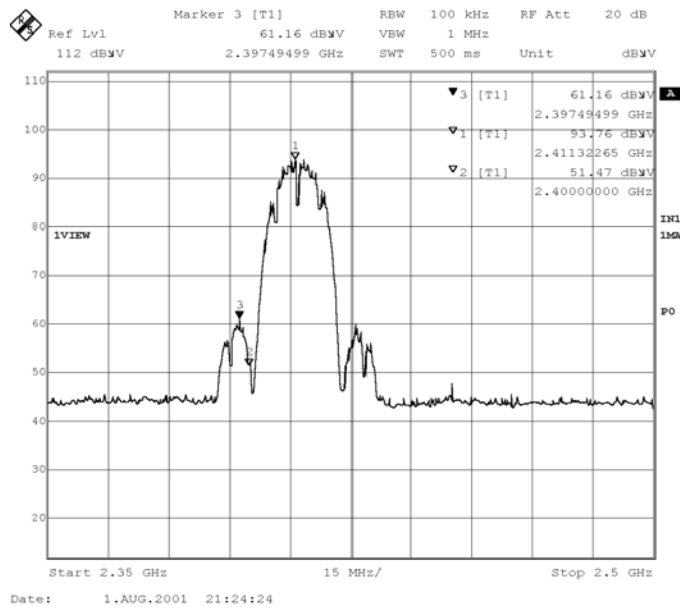
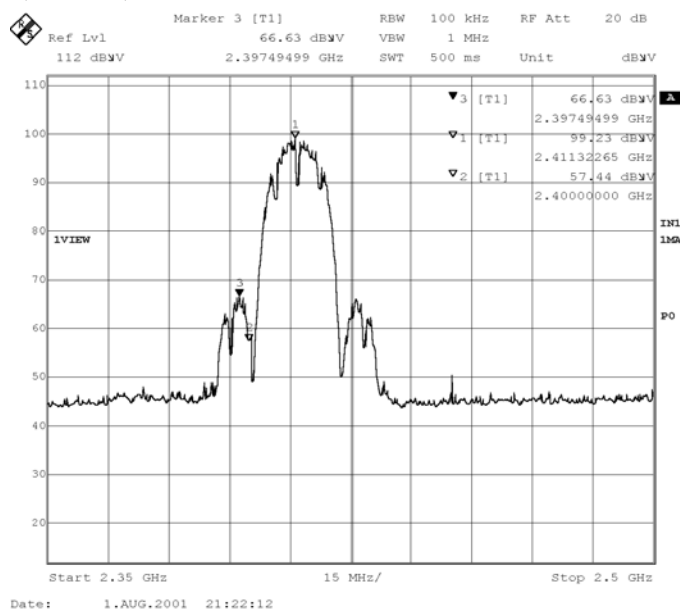


Figure Channel 1: 1Mbps (Vertical)



Product : Wireless Lan Access Point
 Test Item : Band Edge Data
 Test Site : No.1 OATS
 Test Mode : Channel 1

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
1 (11Mbps)	<2400	>20	Pass

Figure Channel 1:11Mbps (Horizontal)

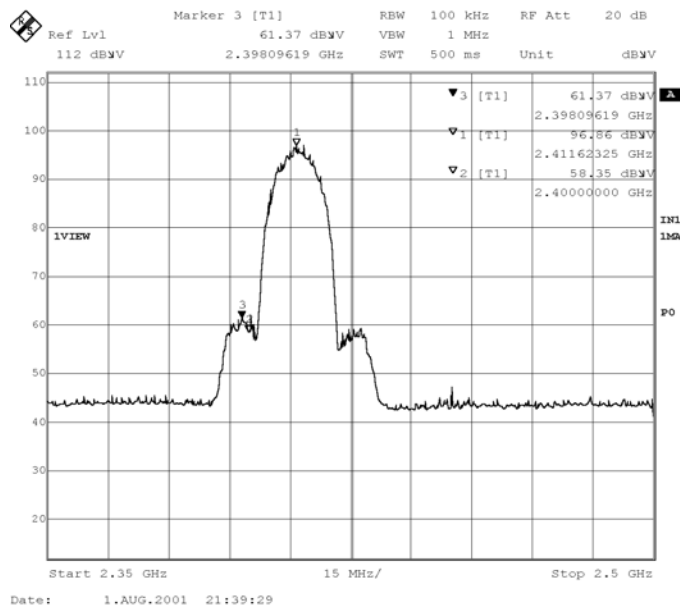
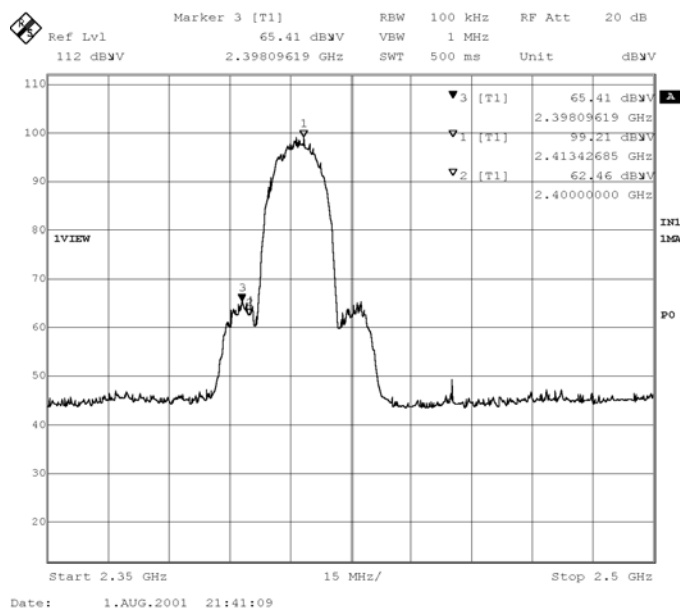


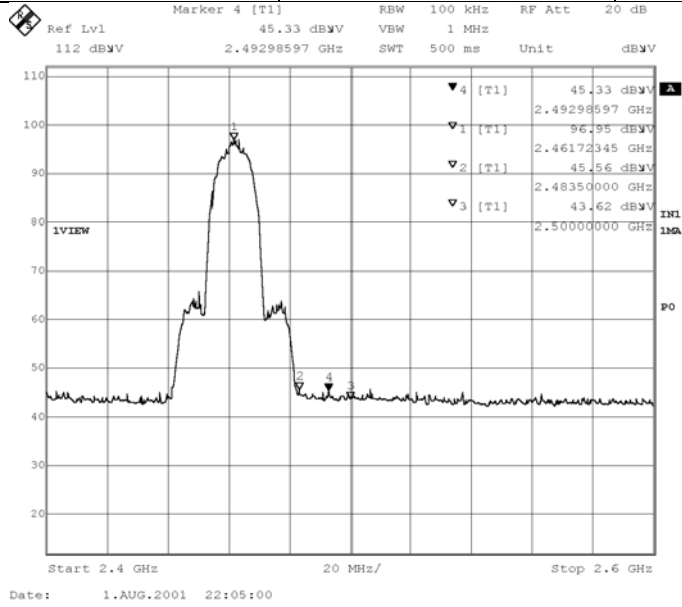
Figure Channel 1:11Mbps (Vertical)



Product : Wireless Lan Access Point
 Test Item : Band Edge Data
 Test Site : No.1 OATS
 Test Mode : Channel 11

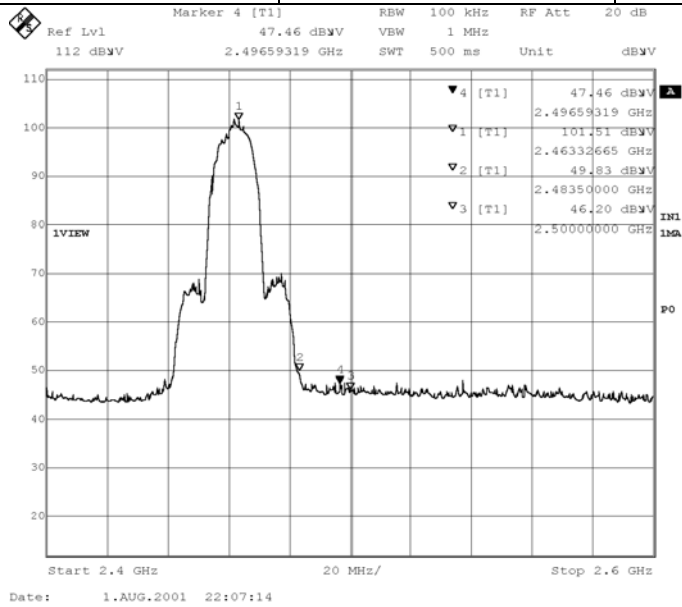
Band Edge-1 Mbps (Horizontal)

Frequency (MHz).	Reading (dBuV)	Measure (dBuV/m)	Result
2484.56	44.6	43.05	Pass



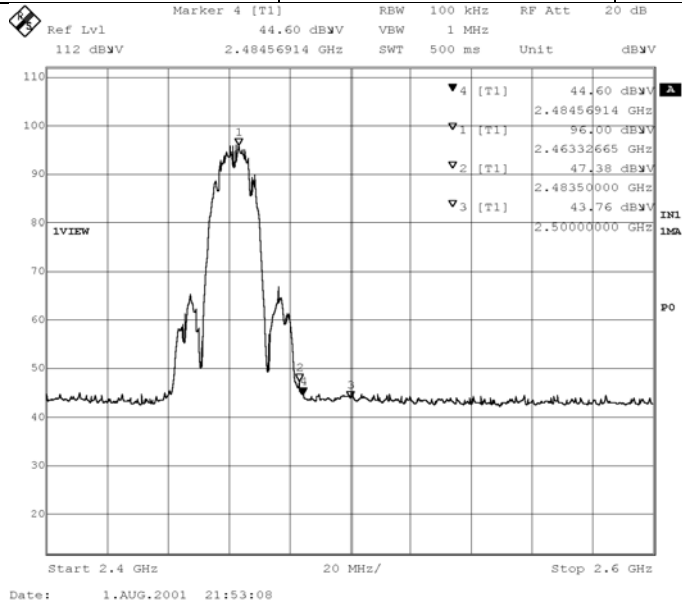
Band Edge-1 Mbps (Vertical)

Frequency (MHz).	Reading (dBuV)	Measure (dBuV/m)	Result
2484.168	50.02	48.47	Pass



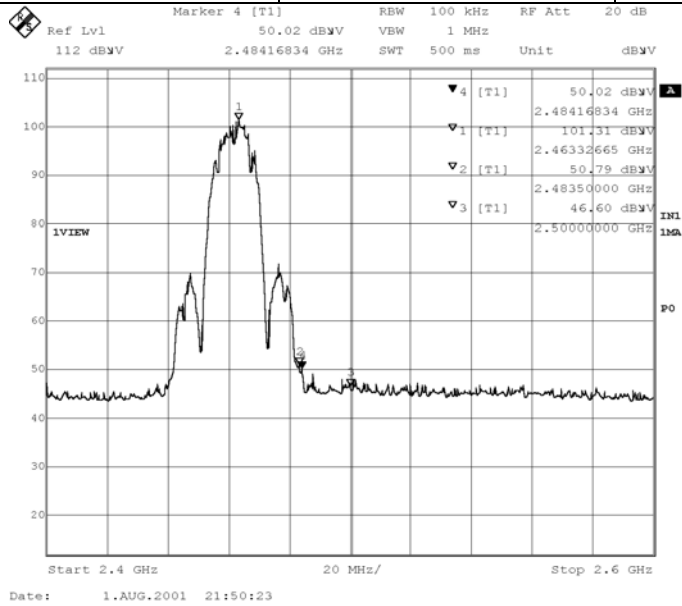
Band Edge-11 Mbps (Horizontal)

Frequency (MHz).	Reading (dBuV)	Measure (dBuV/m)	Result
2492.985	45.33	43.84	Pass



Band Edge-11 Mbps (Vertical)

Frequency (MHz).	Reading (dBuV)	Measure (dBuV/m)	Result
2496.593	47.46	45.97	Pass



6. Occupied Bandwidth

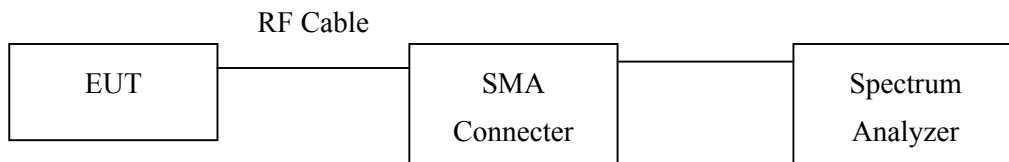
6.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2001
X	Horn Antenna	EM	EM6917 / 103325	May, 2001

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
 2. Mark "X" test instruments are used to measure the final test results.

6.2. Test Setup



6.3. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

6.4. Standard Requirement

The minimum bandwidth shall be at least 500kHz.

6.5. Test Result of Occupied Bandwidth

Product : Wireless Lan Access Point
 Test Item : Occupied Bandwidth Data
 Test Site : No.1 OATS
 Test Mode : Channel 1

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1 (1Mbps)	2417	10080	>500	Pass
1 (11Mbps)	2418	11040	>500	Pass

Figure Channel 1: 1Mbps

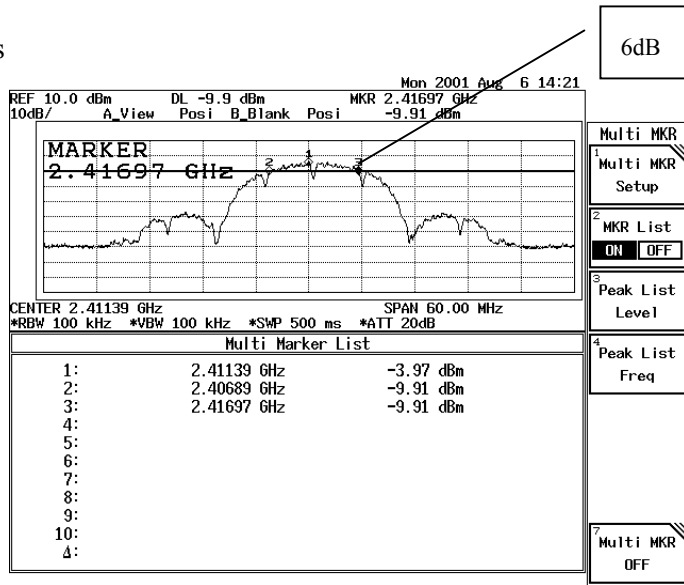
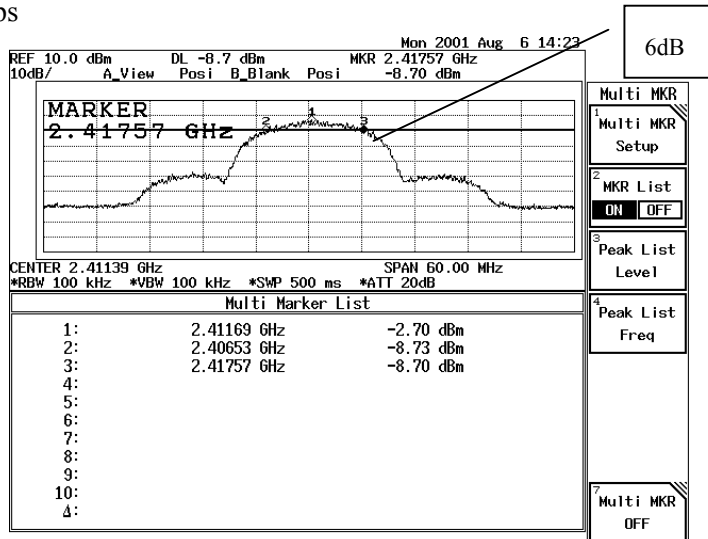


Figure Channel 1: 11Mbps



Product : Wireless Lan Access Point
 Test Item : Occupied Bandwidth Data
 Test Site : No.1 OATS
 Test Mode : Channel 6

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6 (1Mbps)	2443	11040	>500	Pass
6 (11Mbps)	2443	11520	>500	Pass

Figure Channel 6: 1Mbps

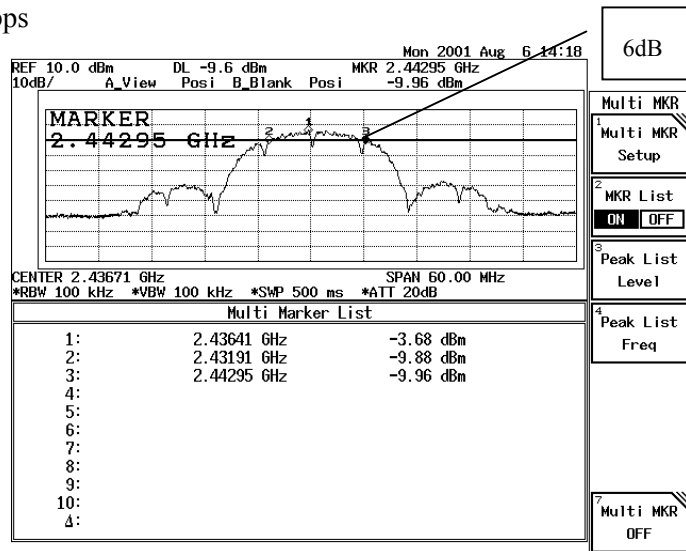
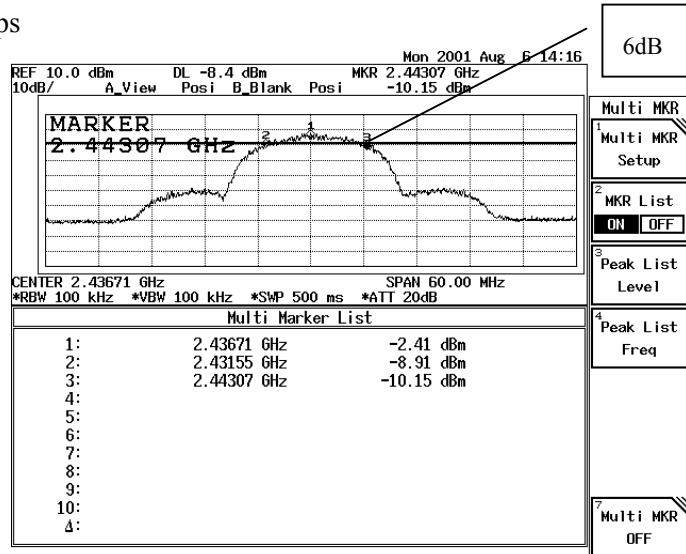


Figure Channel 6: 11Mbps



Product : Wireless Lan Access Point
 Test Item : Occupied Bandwidth Data
 Test Site : No.1 OATS
 Test Mode : Channel 11

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11 (1Mbps)	2468	10980	>500	Pass
11 (11Mbps)	2468	11160	>500	Pass

Figure Channel 11: 1Mbps

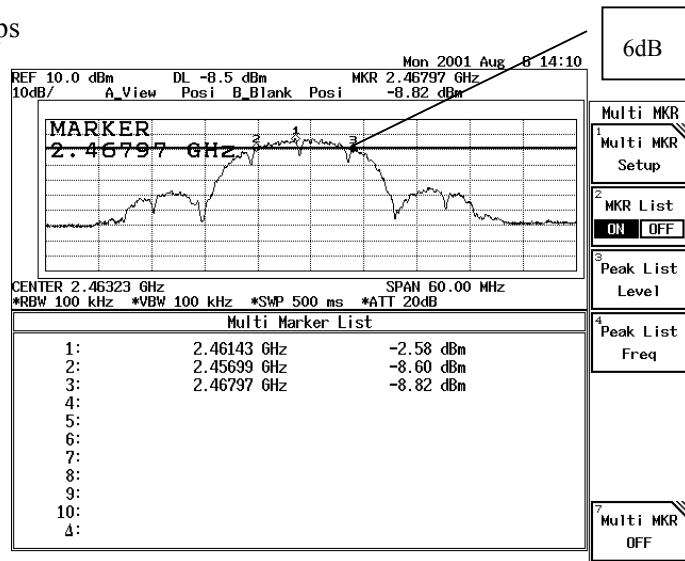
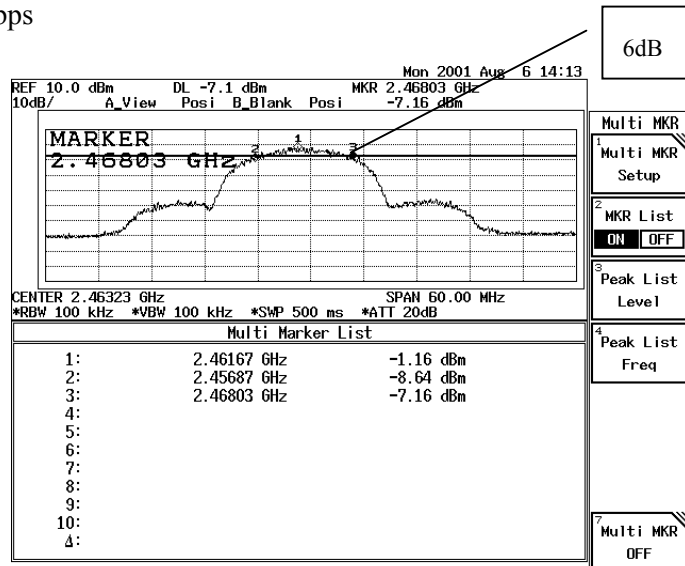


Figure Channel 11: 11Mbps



7. Transmitter Power Density

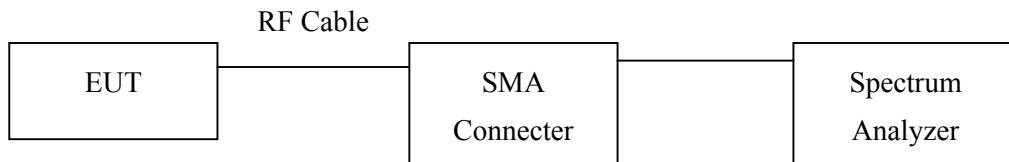
7.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2001
X	Attenuator	HP		May, 2001
X	Horn Antenna	EM	EM6917 / 103325	May, 2001

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
 2. Mark "X" test instruments are used to measure the final test results.

7.2. Test Setup



7.3. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

7.4. Standard Requirement

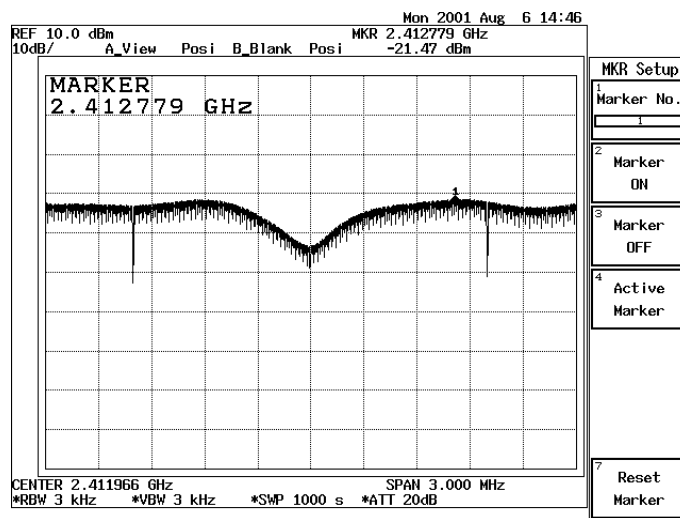
The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

7.5. Test Result of Transmitter Power Density

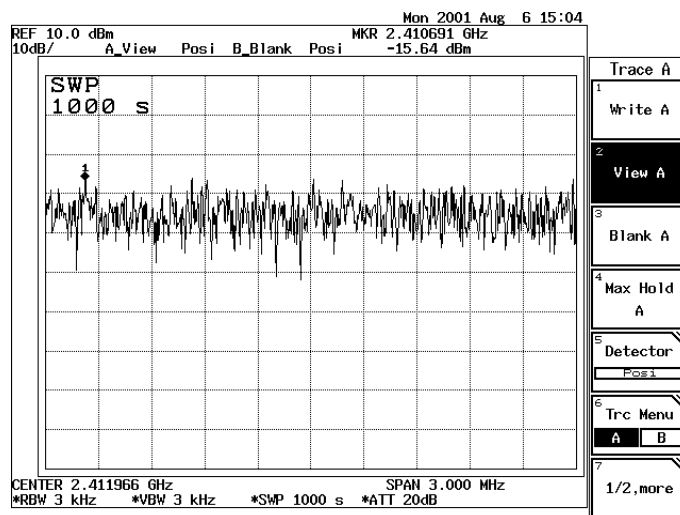
Product : Wireless Lan Access Point
 Test Item : Transmitter Power Density Data
 Test Site : No.1 OATS
 Test Mode : Normal Operation

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
1 (1Mbps)	2412.779	-21.47dBm	< 8dBm	Pass
1 (11Mbps)	2410.691	-15.64dBm	< 8dBm	Pass

1Mbps



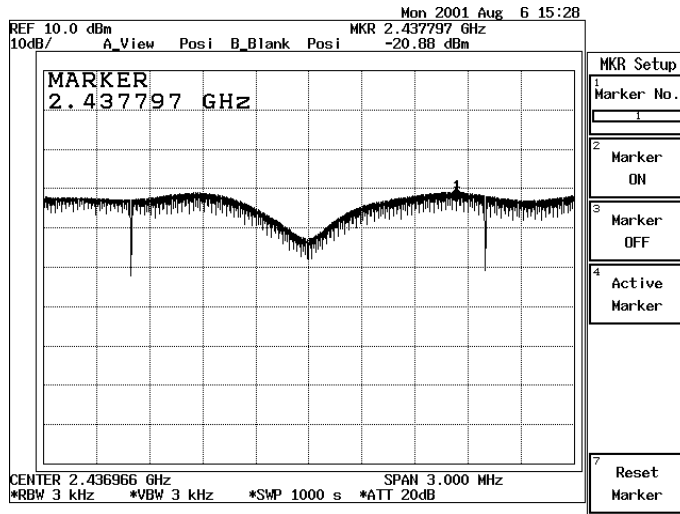
11Mbps



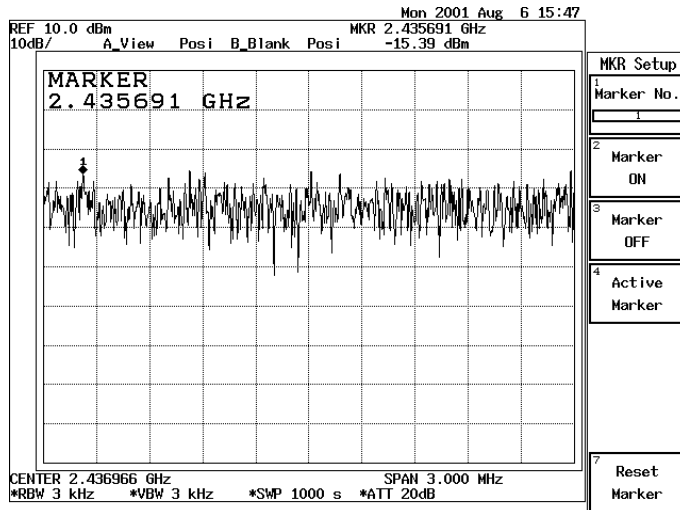
Product : Wireless Lan Access Point
 Test Item : Transmitter Power Density Data
 Test Site : No.1 OATS
 Test Mode : Normal Operation

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6 (1Mbps)	2437.797	-20.88dBm	< 8dBm	Pass
6 (11Mbps)	2435.691	-15.39dBm	< 8dBm	Pass

1Mbps



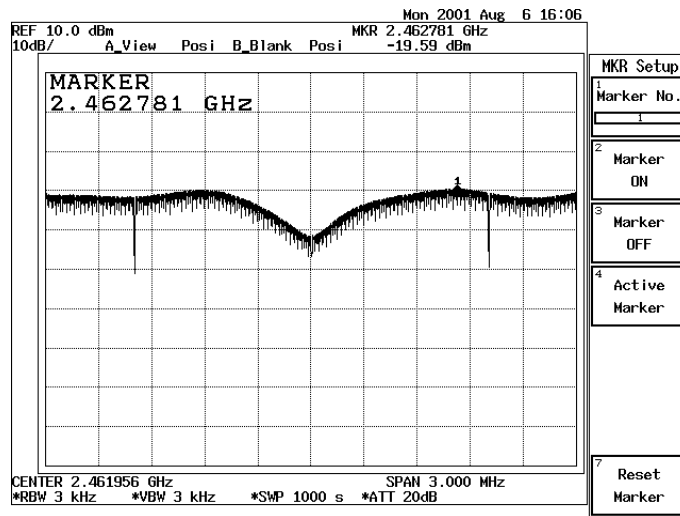
11Mbps



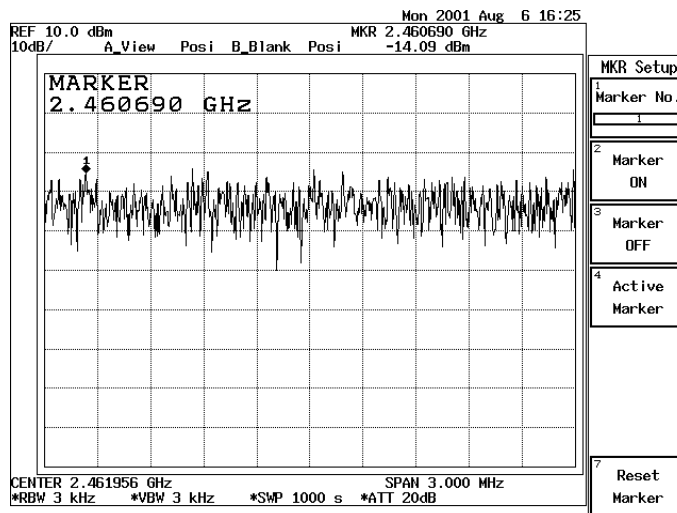
Product : Wireless Lan Access Point
 Test Item : Transmitter Power Density Data
 Test Site : No.1 OATS
 Test Mode : Normal Operation

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11 (1Mbps)	2462.781	-19.59dBm	< 8dBm	Pass
11 (11Mbps)	2460.690	-14.09dBm	< 8dBm	Pass

1Mbps



11Mbps



8. Processing Gain

8.1. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

8.2. Minimum Standard

The processing gain shall be at least 10 dB.

8.3. Method of Measurement

The processing gain of this spread spectrum was measured the CW jamming method. The Section 9.1 illustrates the measurement setup. The output power of the spread spectrum transmitter is fixed and the output power of jammer is adjustable. The frequency of jammer was stepped through the pass band of nominal channel in 50kHz steps. In each frequency step of the jammer, the output power of jammer is adjusted to cause the Bit Error Rate (BER) to be 1.0×10^{-6} . The power levels are recorded to calculate the J/S as shown in Table 1.

8.4. Calculation of Processing Gain:

The processing gain was determined by measuring the jamming margin of the EUT and using the following formula:

$$G_p = (S/N)_o + M_j + L_{sys}$$

Where $(S/N)_o$ is the required signal to noise ratio at the receiver output

M_j is the jammer to signal ratio (J/S)

L_{sys} is the system loss

The $(S/N)_o$ is calculated from:

$$P_e = 1/2 \exp(-1/2(S/N)_o) \quad ; \quad P_e = \text{probability of error (BER)}$$

For the $P_e(\text{BER}) = 1.0 \times 10^{-6}$, the required $(S/N)_o$ is 14.2dB

From Measurement, the minimum J/S(M_j) is -3.4dB

We assume the system loss is 1dB.

Therefore the processing gain is calculated below:

$$G_p = (S/N)_o + M_j + L_{sys} = 14.2 + (-3.4) + 1 = 11.8 \text{ (dB)}$$

8.5. Test Result of Processing Gain

Product : Wireless Lan Access Point
Test Item : Processing Gain Data
Test Site : No.1 OATS
Test Mode : Normal Operation

9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

10. Attachment

Attachment 1: EUT Test Photographs Number of Pages : 3

Attachment 2: EUT Detailed Photographs Number of Pages : 9

Attachment 1 : EUT Test Photographs

Attachment 2 : EUT Detailed Photographs