Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE
FCC PART15 CERTIFICATION

PRODUCT	:	NetDisk Wireless Office
MODEL/TYPE NO	:	NOW-WL
FCC ID	:	Q7UNOW-WL
TRADE NAME	:	XIMETA TECHNOLOGY INC.
APPLICANT	:	XIMETA TECHNOLOGY INC. #301 MYUNGHWA BLDG., 3-11, NONHYUN-DONG, GANGNAM-GU, SEOUL, 135-010, KOREA Attn. : Mr. UKIE CHA / President
FCC CLASSIFICATION	:	DTS Part 15 Digital Transmission System
FCC RULE PART(S)	:	FCC Part 15 Subpart C Section 15.247
FCC PROCEDURE	:	Certification
DATES OF TEST	:	March 24, 2004
DATES OF ISSUE	:	February 26, 2004
TEST REPORT No.	:	BWS-04-RF-0009
TEST LAB.	:	BWS TECH Inc. (Registration No. : 553281)

This Digital Transmission System has been tested in accordance with the measurement procedures specified in ANSI C63.4-2000 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C Section15.247
I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Lee Young-Soo
Chief of Laboratory Division
BWS TECH Inc.

BWS TECH Inc.
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FCC TEST REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

1. General Information

Applicant

Company Name	:	XIMETA TECHNOLOGY INC.
Company Address	:	#301 MYUNGHWA BLDG., 3-11, NONHYUN-DONG, GANGNAM-GU, SEOUL, 135-010, KOREA
Phone/Fax	:	Phone : +82 2 549 3128 Fax : +82 2 3445 2812

Manufacturer

Company Name	:	XIMETA TECHNOLOGY INC.
Company Address	:	#301 MYUNGHWA BLDG., 3-11, NONHYUN-DONG, GANGNAM-GU, SEOUL, 135-010, KOREA
Phone/Fax	:	Phone : +82 2 549 3128 Fax : +82 2 3445 2812

- **EUT Type** : Digital Transmission System
- **Model Number** : NOW-WL
- **FCC Identifier** : Q7UNOW-WL
- **S/N** : Prototype
- **Freq. Range** : 2400MHz ~ 2483.5MHz
- **Channel** : 11 channel
- **Modulation Method** : DSSS (BPSK, QPSK, CCK), OFDM
- **FCC Rule Part(s)** : Part 15 Subpart C Section 15.247
- **Test Procedure** : ANSI C63.4-2000
- **Dates of Tests** : March 24, 2004
- **Place of Tests** : BWS TECH Inc.
  EMC Testing Lab (FCC Registration Number : 553281)
  #294-9, Jungdae-Dong, Kwangju-Si,
  Kyunggi-Do, 464-080, Korea
  TEL: +82 31 762 0124 FAX: +82 31 762 0126
- **Test Report No.** : BWS-04-RF-0009

2. Description of Test Facility

The measurement for radiated emission test were practiced at the open area test site of BWS TECH Inc. Measurement for conducted emission test were practiced at the semi EMC Anechoic Chamber test site of BWS TECH Inc. facility located at #294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission (Registration Number : 553281).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000) was used in determining radiated emissions from the XIMETA TECHNOLOGY INC. NetDisk Wireless Office Model : NOW-WL.

3. Product Information

3.1 Equipment Description

The Equipment Under Test (EUT) is RF transmitter by the XIMETA TECHNOLOGY INC. NetDisk Wireless Office model: NOW-WL (FCC ID : Q7UNOW-WL).

This NetDisk™ User Manual is intended to help you install the product quickly and easily. This NetDisk™ User Manual shows you how to install a NetDisk™ / NetDisk™ Mini onto your Personal Computer or Ethernet Network and begin using it immediately. This NetDisk™ User Manual is intended for users who need to install and support one or more NetDisk™ / NetDisk™ Mini on their Personal Computer or Ethernet Network. This NetDisk™ User Manual assumes the user has a basic understanding of Personal Computers and Networks.

3.2 General Specification

Frequency Range	2400MHz ~ 2483.5MHz
Number of Channel	11 Channel
Modulation Method	DSSS (BPSK, QPSK, CCK) , OFDM
Bit Transmission Rate	DSSS (1Mbps, 2Mbps, 5.5Mbps, 11Mbps) OFDM (6Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps)
Operating Temperature	-20℃ ~ +60℃
Power Requirement	DC 3V, 10mA
Antenna Type	
Antenna Gain	
Size	62mm(L) x 33.7mm(W) x 14.3mm(H)

4. Description of Tests

4.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2000. The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table, which is placed 40cm away from the vertical wall, and 1.5m away from the sidewall of the chamber room. Two LISNs are bonded to the shielded room. The EUT is powered from the PMM LISN and the support equipment is powered from the LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the Spectrum Analyzer to determine the frequency producing the max. Emission from the EUT. The frequency producing the max. Level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.45 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

4.2 Radiated Emission Measurement

Preliminary measurements were made at indoors 3-meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configurations, mode of operation, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using bi-log antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. Above 1GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies, which were selected as bottom, middle, and top frequency in the operating band. Emission level from the EUT with various configurations was examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 3-meter test range using biconical and log periodic, Horn antenna. The output from the antenna was connected, via a preselector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer (for above 25GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission The EUT, support equipment and interconnecting cables were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Varying the mode of operating frequencies of the EUT maximized each emission. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst-case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (20dB/decade) as per section 15.31(f).

Photographs of the worst-case emission test setup can be seen in Appendix A.

5. Test Condition

5.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner, which tends to maximize its emission level in a typical application.

Radiated Emission Test

Preliminary radiated emission tests were conducted using the procedure in ANSI C63.4/2000 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were measured at 3-meter open field test site. To complete the test configuration required by the FCC, the EUT was tested in all three orthogonal planes.

5.2 EUT operation

EUT was tested according to the following operation modes provided by the specifications given by the manufacturer, and reported the worst emissions.

5.3 Peripherals / Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

Type of Peripheral Equipment Used:

Description	Model Name	Serial No.	Manufacturer	FCC ID
EUT	OKA-310T	N/A	Omron Automotive Electronics Korea Co, Ltd	-
Computer	BWS TEST-2	N/A	BWS TECH Inc.	Doc
Monitor	M782	BH68-00440P-08	Samsung	Doc
Printer	STYLUS C60	DR5K004835	EPSON	Doc
Keyboard	KB-0133	B69420KGAP01XU	HP	Doc
Mouse	M-S48a	N/A	COMPAQ	Doc
Mouse	Wheel Mouse 3.0 COMPATIBLE	6190041-0	Microsoft	Doc
Joystick	N/A	S1060120000091	CREATIVE	Doc
Adaptor	UEA325D-0512	312-005599	Unifive Co., Ltd.	-

Type of Cables Used:

Device from	Device to	Type of Cable	Length(m)	Type of shield
PC	Monitor	VIDEO	1.8	Shielded
PC	Keyboard	PS/2	2.1	Unshielded
PC	Mouse	PS/2	1.8	Unshielded
PC	Mouse	Serial	1.5	Unshielded
PC	Joystick	USB	1.8	Unshielded
PC	Printer	Parallel	1.9	Shielded
EUT	PC	Console	1.5	Shielded
EUT	PC	RJ-45	1.5	Shielded
EUT	Hub	RJ-45	20.0	Shielded
EUT	Power	Inlet	2.0	Unshielded

6. TEST RESULTS

Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule	Description of Test	Limit	Result
15.207	Power Line Conducted Emission	Various	Pass
15.247(a)	6dB Bandwidth	More than 500kHz	Pass
15.247(b)	Maximum Peak Output Power	Less than 30dBm	Pass
15.209 15.231	Radiated Emission	Various	Pass
15.247(c)	Conducted Emission & 100kHz Bandwidth of Frequency Band Edges	More than 20dBc	Pass
15.247(d)	Power Spectral Density	Less than 8dBm	Pass
15.203	Antenna Requirement	Less than 6dBi	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure	1mW/Cm^2	Pass

The data collected shows that the XIMETA TECHNOLOGY INC. NetDisk Wireless Office NOW-WL complies with technical requirements of the Part 15.247 of the FCC Rules.

Note : Modification to EUT

The device tested is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified.

6.1 Power Line Conducted Emission

Frequency Range of Test	:	150 kHz to 30 MHz
Test Standard	:	FCC Part15 Subpart C Section 15.207
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Power Line Conducted Emission Test Data

Detector Mode ; CISPR Quasi Peak mode (6dB Bandwidth : 9kHz)

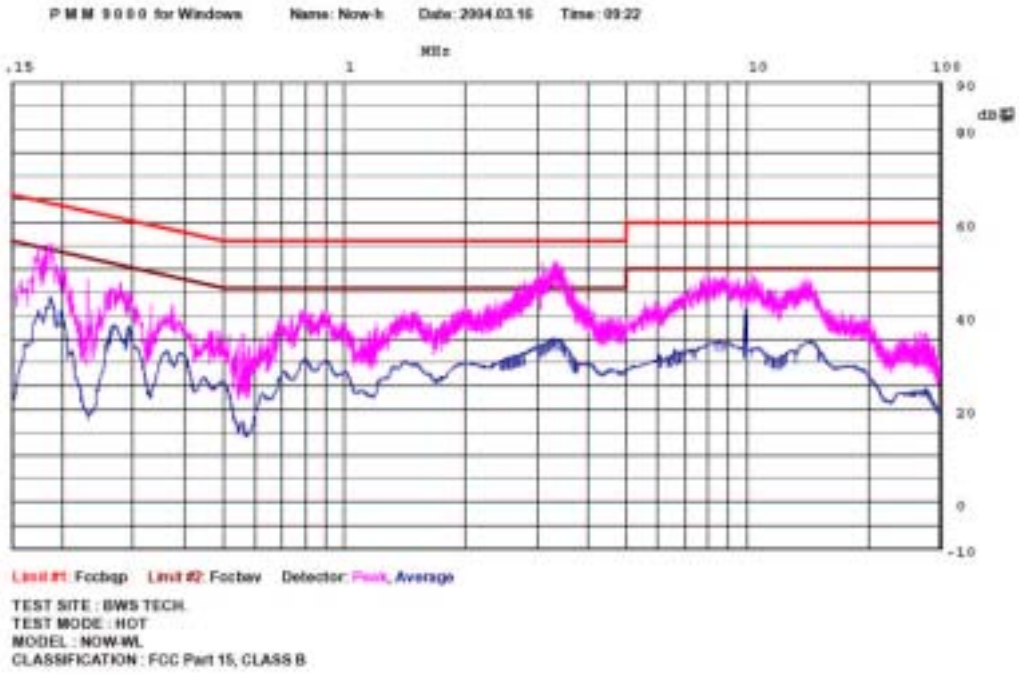
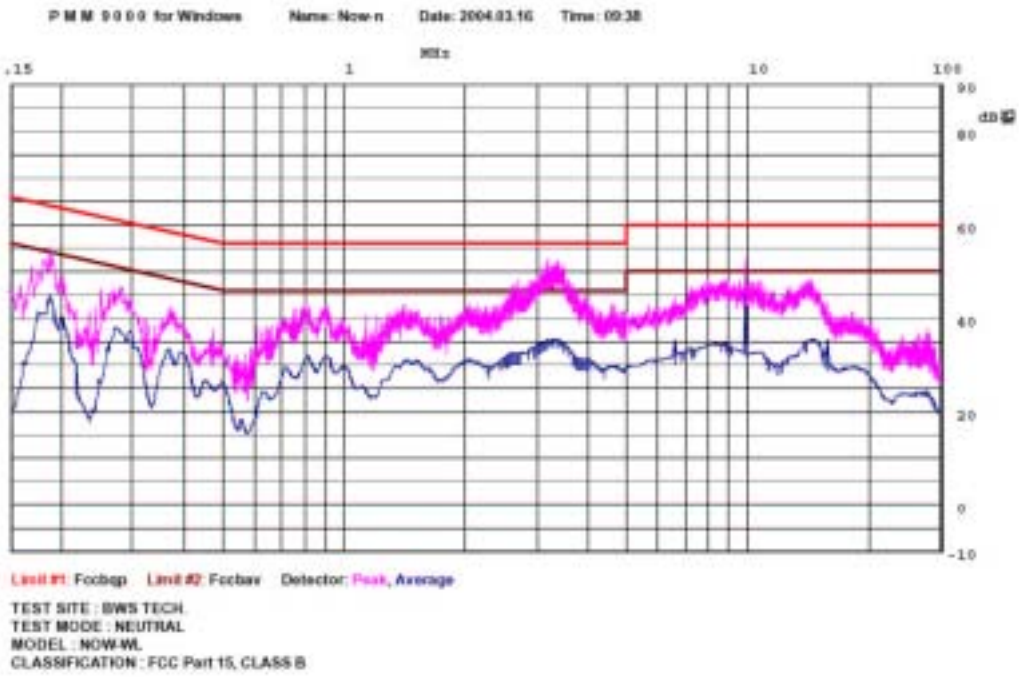
Freq [MHz]	Correcton		Phase [H/N]	Quasi-Peak Mode			Aberage Mode		
	AMN	C.L		Limit	Reading	Emission Level	Limit	Reading	Emission Level
				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.175	0.06	0.03	H	65.30	55.20	55.29	55.30	41.30	41.39
0.187	0.06	0.03	H	65.00	55.50	55.59	55.00	44.20	44.29
0.198	0.06	0.03	H	64.70	50.00	50.09	54.70	40.90	40.99
0.269	0.07	0.16	N	62.70	46.30	46.53	52.70	38.10	38.33
0.292	0.07	0.16	H	62.00	45.20	45.43	52.00	37.70	37.93
0.371	0.08	0.24	N	59.70	42.40	42.72	49.70	33.40	33.72
0.795	0.08	0.30	N	56.00	42.90	43.28	46.00	32.00	32.38
1.402	0.03	0.46	N		43.00	43.49		31.10	31.59
2.669	0.03	0.58	N		48.30	48.91		32.60	33.21
2.970	0.04	0.60	H		48.30	48.94		33.50	34.14
3.341	0.03	0.65	N		52.40	53.08		35.60	36.28
3.633	0.03	0.70	N		47.30	48.03		32.30	33.03
5.830	0.06	0.89	H	60.00	43.10	44.05	50.00	30.30	31.25
7.320	0.04	0.98	H		46.70	47.72		32.90	33.92
8.590	0.06	1.00	H		48.40	49.46		34.50	35.56
9.750	0.07	1.02	N		52.50	53.59		44.90	45.99
10.350	0.07	1.04	H		48.40	49.51		32.90	34.01
14.140	0.07	1.22	N		48.30	49.59		35.60	36.89

NOTES :

1. *H : Hot Line , N :Neutral Line*
2. *Emission Level = Reading + Correction Factor*
3. *Measurements were performed at the AC Power Inlet of the host PC with the EUT plugged in the frequency band of 150kHz ~30MHz*

Tested by ***Choi, Chang-Young***

Plots of Power Line Conducted Emission

Mode	Plot
Hot	
Neutral	

6.2 6dB Bandwidth

Test Standard	:	FCC Part15 Subpart C Section 15.247(a),(2)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

6dB Bandwidth Test Data

Frequency (MHz)	6dB Bandwidth (kHz)		Limit
	802.11b (DSSS)	802.11g (OFDM)	
2412	11730	16670	More than 500kHz
2437	11700	16730	
2462	11230	16730	

NOTES :

1. *Measure 6dB bandwidth of relevant channel using Spectrum Analyzer.*
2. *RBW 100kHz, VBW 100kHz, Sweep Time 50ms.*
3. *6dB less than both bandwidth than maximum peak power.*

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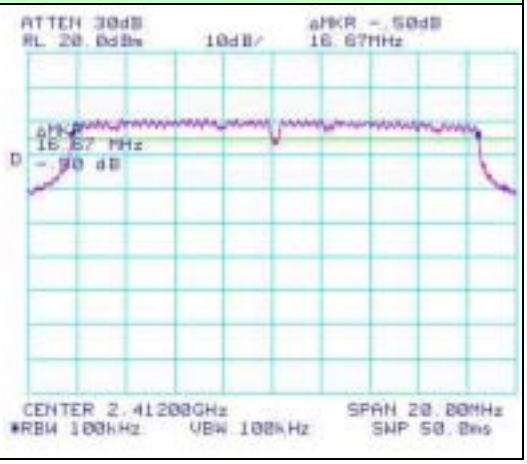
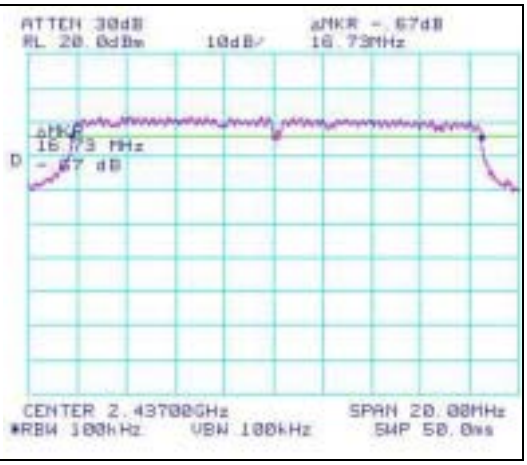
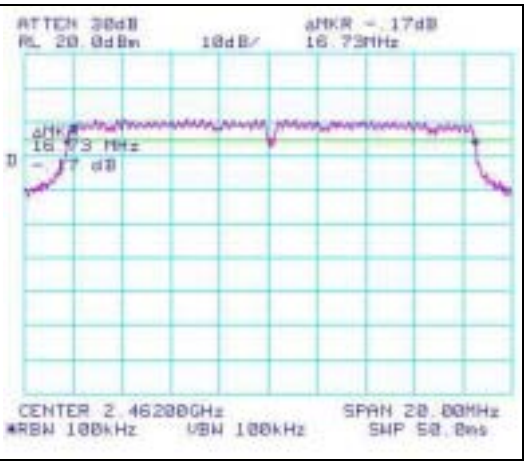
Plots of 6dB Bandwidth

Frequency	802.11b (DSSS)	802.11g (OFDM)
2412MHz		
2437MHz		
2462MHz		

6.3 Maximum Peak Output Power

Test Standard	:	FCC Part15 Subpart C Section 15.247(b),(1)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

Maximum Peak Output Power Test Data

Frequency (MHz)	Maximum Peak Output Power (dBm)		Limit
	802.11b (DSSS)	802.11g (OFDM)	
2412	19.1	20.2	Less than 30dBm
2437	19.5	19.8	
2462	19.0	19.7	

NOTES :

1. Measure Maximum Peak Output of relevant channel using Power Meter.

Tested by ***Choi, Chang-Young***

6.4 Radiated Emission

Test Standard : FCC Part15 Subpart C Section 15.247(c)

Operating Condition : The EUT was operated at transmitting condition continuously during the test.

Temperature/Humidity : 22.0 °C/ 41 %

Radiated Emission Test Data (Below 1GHz)

1. 802.11b Low Channel (2412MHz)

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
53.64	23.90	V	10.13	1.65	40.00	35.69	-4.31
75.78	23.02	V	6.52	1.91	40.00	31.45	-8.55
125.00	16.53	V	13.44	2.44	43.50	32.41	-11.09
150.00	15.83	V	14.98	2.71	43.50	33.51	-9.99
200.00	14.92	H	16.55	3.15	43.50	34.62	-8.88
225.01	14.60	H	16.55	3.33	46.00	34.48	-11.52
250.01	19.32	V	17.29	3.51	46.00	40.12	-5.88
350.00	16.09	H	14.05	4.15	46.00	34.29	-11.71
450.01	21.72	H	16.68	4.77	46.00	43.17	-2.83
500.00	15.82	H	17.61	5.09	46.00	38.52	-7.48
625.01	5.50	H	20.27	5.73	46.00	31.49	-14.51
901.34	10.53	H	23.90	7.16	46.00	41.59	-4.41

2. 802.11b Middle Channel (2437MHz)

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
53.64	19.84	V	10.13	1.65	40.00	31.63	-8.37
75.78	20.69	V	6.52	1.91	40.00	29.12	-10.88
125.00	14.60	V	13.44	2.44	43.50	30.48	-13.02
150.00	13.01	V	14.98	2.71	43.50	30.69	-12.81
200.00	17.54	V	16.55	3.15	43.50	37.24	-6.26
225.01	16.81	H	16.55	3.33	46.00	36.69	-9.31
250.01	18.14	H	17.29	3.51	46.00	38.94	-7.06
350.00	14.56	V	14.05	4.15	46.00	32.76	-13.24
450.01	21.04	H	16.68	4.77	46.00	42.49	-3.51
500.00	17.42	H	17.61	5.09	46.00	40.12	-5.88
625.01	11.29	H	20.27	5.73	46.00	37.28	-8.72
901.34	8.98	H	23.90	7.16	46.00	40.04	-5.96

3. 802.11b High Channel (2462MHz)

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
53.64	20.38	V	10.13	1.65	40.00	32.17	-7.83
75.78	21.90	V	6.52	1.91	40.00	30.33	-9.67
125.00	12.53	V	13.44	2.44	43.50	28.41	-15.09
150.00	10.01	H	14.98	2.71	43.50	27.69	-15.81
200.00	20.33	H	16.55	3.15	43.50	40.03	-3.47
225.01	21.41	H	16.55	3.33	46.00	41.29	-4.71
250.01	19.53	V	17.29	3.51	46.00	40.33	-5.67
350.00	18.58	H	14.05	4.15	46.00	36.78	-9.22
450.01	20.56	H	16.68	4.77	46.00	42.01	-3.99
500.00	15.47	H	17.61	5.09	46.00	38.17	-7.83
625.01	10.44	H	20.27	5.73	46.00	36.43	-9.57
901.34	7.98	H	23.90	7.16	46.00	39.04	-6.96

4. 802.11g Low Channel (2412MHz)

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
53.64	18.90	V	10.13	1.65	40.00	30.69	-9.31
75.78	21.40	V	6.52	1.91	40.00	29.83	-10.17
125.00	9.79	V	13.44	2.44	43.50	25.67	-17.83
150.00	10.81	V	14.98	2.71	43.50	28.49	-15.01
200.00	16.42	H	16.55	3.15	43.50	36.12	-7.38
225.01	19.55	H	16.55	3.33	46.00	39.43	-6.57
250.01	16.69	V	17.29	3.51	46.00	37.49	-8.51
350.00	14.63	H	14.05	4.15	46.00	32.83	-13.17
450.01	17.96	H	16.68	4.77	46.00	39.41	-6.59
500.00	14.76	H	17.61	5.09	46.00	37.46	-8.54
625.01	8.34	H	20.27	5.73	46.00	34.33	-11.67
901.34	4.43	H	23.90	7.16	46.00	35.49	-10.51

5. 802.11g Middle Channel (2437MHz)

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
53.64	17.64	V	10.13	1.65	40.00	29.43	-10.57
75.78	16.74	V	6.52	1.91	40.00	25.17	-14.83
125.00	11.55	V	13.44	2.44	43.50	27.43	-16.07
150.00	12.81	V	14.98	2.71	43.50	30.49	-13.01
200.00	13.79	V	16.55	3.15	43.50	33.49	-10.01
225.01	15.25	H	16.55	3.33	46.00	35.13	-10.87
250.01	14.89	H	17.29	3.51	46.00	35.69	-10.31
350.00	11.63	V	14.05	4.15	46.00	29.83	-16.17
450.01	17.98	H	16.68	4.77	46.00	39.43	-6.57
500.00	14.42	H	17.61	5.09	46.00	37.12	-8.88
625.01	9.44	H	20.27	5.73	46.00	35.43	-10.57
901.34	3.06	H	23.90	7.16	46.00	34.12	-11.88

6. 802.11g High Channel (2462MHz)

Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
53.64	16.70	V	10.13	1.65	40.00	28.49	-11.51
75.78	20.90	V	6.52	1.91	40.00	29.33	-10.67
125.00	9.83	V	13.44	2.44	43.50	25.71	-17.79
150.00	7.81	H	14.98	2.71	43.50	25.49	-18.01
200.00	11.63	H	16.55	3.15	43.50	31.33	-12.17
225.01	16.24	H	16.55	3.33	46.00	36.12	-9.88
250.01	14.69	V	17.29	3.51	46.00	35.49	-10.51
350.00	17.49	H	14.05	4.15	46.00	35.69	-10.31
450.01	18.98	H	16.68	4.77	46.00	40.43	-5.57
500.00	12.79	H	17.61	5.09	46.00	35.49	-10.51
625.01	7.73	H	20.27	5.73	46.00	33.72	-12.28
901.34	5.11	H	23.90	7.16	46.00	36.17	-9.83

NOTES :

1. *All modes of operation were investigated and the worst-case emissions are reported.*
2. *AF = Antenna Factor CL = Cable Loss F/S = Field Strength*
3. *POL H = Horizontal POL V = Vertical*

Tested by ***Choi, Chang-Young***

Radiated Emission Test Data (Above 1GHz)

1. 802.11b Low Channel (2412MHz)

Frequency [GHz]	Reading [dBμV]		Ant.Factor [dB]	Amp Gain [dB]	Cable Loss [dB]	Emission Level [dBμV/m]		Limit [dBμV/m]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1.661	40.49	30.62	24.90	36.70	8.30	36.99	27.12	74.00	54.00	-37.01	-26.88
2.390	49.52	28.40	27.61	35.60	8.80	50.33	29.21	74.00	54.00	-23.67	-24.79
2.484	47.79	26.49	27.70	35.60	8.80	48.69	27.39	74.00	54.00	-25.31	-26.61
2.687	47.20	38.01	27.89	35.50	8.90	48.49	39.30	74.00	54.00	-25.51	-14.70
4.824	21.88	12.89	29.20	34.30	9.60	26.38	17.39	74.00	54.00	-47.62	-36.61
7.236	16.66	7.35	36.01	34.30	12.30	30.67	21.36	74.00	54.00	-43.33	-32.64
9.648	-	-	38.10	34.50	16.20	-	-	74.00	54.00	-	-
12.060	-	-	38.82	34.30	20.70	-	-	74.00	54.00	-	-

2. 802.11b Middle Channel (2437MHz)

Frequency [GHz]	Reading [dBμV]		Ant.Factor [dB]	Amp Gain [dB]	Cable Loss [dB]	Emission Level [dBμV/m]		Limit [dBμV/m]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1.700	42.87	33.93	24.80	36.70	8.30	39.27	30.33	74.00	54.00	-34.73	-23.67
2.390	50.88	29.70	27.61	35.60	8.80	51.69	30.51	74.00	54.00	-22.31	-23.49
2.484	49.69	28.59	27.70	35.60	8.80	50.59	29.49	74.00	54.00	-23.41	-24.51
2.687	52.39	42.40	27.89	35.50	8.90	53.68	43.69	74.00	54.00	-20.32	-10.31
4.874	17.90	8.41	31.29	34.30	9.70	24.59	15.10	74.00	54.00	-49.41	-38.90
7.311	17.60	6.55	36.08	34.30	12.30	31.68	20.63	74.00	54.00	-42.32	-33.37
9.748	-	-	38.19	34.50	16.20	-	-	74.00	54.00	-	-
12.185	-	-	38.64	34.30	20.70	-	-	74.00	54.00	-	-

3. 802.11b High Channel (2462MHz)

Frequency [GHz]	Reading [dBμV]		Ant.Factor [dB]	Amp Gain [dB]	Cable Loss [dB]	Emission Level [dBμV/m]		Limit [dBμV/m]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1.737	41.62	32.92	24.87	36.70	8.40	38.19	29.49	74.00	54.00	-35.81	-24.51
2.390	52.38	31.23	27.61	35.60	8.80	53.19	32.04	74.00	54.00	-20.81	-21.96
2.484	50.84	29.62	27.70	35.60	8.80	51.74	30.52	74.00	54.00	-22.26	-23.48
2.687	51.14	42.39	27.89	35.50	8.90	52.43	43.68	74.00	54.00	-21.57	-10.32
4.924	19.50	9.92	31.38	34.30	9.80	26.38	16.80	74.00	54.00	-47.62	-37.20
7.386	17.90	8.90	36.19	34.30	12.40	32.19	23.19	74.00	54.00	-41.81	-30.81
9.848	-	-	38.24	34.50	16.20	-	-	74.00	54.00	-	-
12.310	-	-	38.51	34.30	20.70	-	-	74.00	54.00	-	-

4. 802.11g Low Channel (2412MHz)

Frequency [GHz]	Reading [dBμV]		Ant.Factor [dB]	Amp Gain [dB]	Cable Loss [dB]	Emission Level [dBμV/m]		Limit [dBμV/m]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1.661	43.88	35.10	24.90	36.70	8.30	40.38	31.60	74.00	54.00	-33.62	-22.40
2.360	46.52	36.61	27.57	35.60	8.80	47.29	37.38	74.00	54.00	-26.71	-16.62
2.390	63.91	42.78	27.61	35.60	8.80	64.72	43.59	74.00	54.00	-9.28	-10.41
2.484	47.86	26.59	27.70	35.60	8.80	48.76	27.49	74.00	54.00	-25.24	-26.51
2.687	50.40	39.18	27.89	35.50	8.90	51.69	40.47	74.00	54.00	-22.31	-13.53
4.824	23.46	13.84	29.20	34.30	9.60	27.96	18.34	74.00	54.00	-46.04	-35.66
7.236	19.40	8.90	36.01	34.30	12.30	33.41	22.91	74.00	54.00	-40.59	-31.09
9.648	-	-	38.10	34.50	16.20	-	-	74.00	54.00	-	-
12.060	-	-	38.82	34.30	20.70	-	-	74.00	54.00	-	-

5. 802.11g Middle Channel (2437MHz)

Frequency [GHz]	Reading [dBμV]		Ant.Factor [dB]	Amp Gain [dB]	Cable Loss [dB]	Emission Level [dBμV/m]		Limit [dBμV/m]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1.700	42.87	33.93	24.80	36.70	8.30	39.27	30.33	74.00	54.00	-34.73	-23.67
2.360	46.82	34.54	27.57	35.60	8.80	47.59	35.31	74.00	54.00	-26.41	-18.69
2.390	49.15	27.96	27.61	35.60	8.80	49.96	28.77	74.00	54.00	-24.04	-25.23
2.484	50.47	29.19	27.70	35.60	8.80	51.37	30.09	74.00	54.00	-22.63	-23.91
2.687	57.14	48.38	27.89	35.50	8.90	58.43	49.67	74.00	54.00	-15.57	-4.33
4.874	20.69	10.28	31.29	34.30	9.70	27.38	16.97	74.00	54.00	-46.62	-37.03
7.311	16.44	6.71	36.08	34.30	12.30	30.52	20.79	74.00	54.00	-43.48	-33.21
9.748	-	-	38.19	34.50	16.20	-	-	74.00	54.00	-	-
12.185	-	-	38.64	34.30	20.70	-	-	74.00	54.00	-	-

6. 802.11g High Channel (2462MHz)

Frequency [GHz]	Reading [dBμV]		Ant.Factor [dB]	Amp Gain [dB]	Cable Loss [dB]	Emission Level [dBμV/m]		Limit [dBμV/m]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
1.737	45.74	35.35	24.87	36.70	8.40	42.31	31.92	74.00	54.00	-31.69	-22.08
2.360	47.33	37.65	27.57	35.60	8.80	48.10	38.42	74.00	54.00	-25.90	-15.58
2.390	49.88	28.67	27.61	35.60	8.80	50.69	29.48	74.00	54.00	-23.31	-24.52
2.484	68.03	46.86	27.70	35.60	8.80	68.93	47.76	74.00	54.00	-5.07	-6.24
2.687	53.65	44.51	27.89	35.50	8.90	54.94	45.80	74.00	54.00	-19.06	-8.20
4.924	21.33	12.42	31.38	34.30	9.80	28.21	19.30	74.00	54.00	-45.79	-34.70
7.386	17.71	9.20	36.19	34.30	12.40	32.00	23.49	74.00	54.00	-42.00	-30.51
9.848	-	-	38.24	34.50	16.20	-	-	74.00	54.00	-	-
12.310	-	-	38.51	34.30	20.70	-	-	74.00	54.00	-	-

NOTES :

1. *All modes of operation were investigated and the worst-case emissions are reported.*
2. *AF = Antenna Factor CL = Cable Loss F/S = Field Strength*
3. *POL H = Horizontal POL V = Vertical*

Tested by ***Choi, Chang Young***

6.5 Conducted Emission

Test Standard	:	FCC Part15 Subpart C Section 15.247(c)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

Conducted Emission Test Data

1. 802.11b Low Channel (2412MHz)

Test Range	Attenuation (dBc)	Plot	Result
30MHz ~ 1GHz	« 20dBc	6.5.1.1	Pass
1GHz ~ 2.3GHz	« 20dBc	6.5.1.2	Pass
2.3GHz ~ 2.4GHz	« 20dBc	6.5.1.3	Pass
2.4835GHz ~ 3GHz	« 20dBc	6.5.1.4	Pass
3GHz ~ 26.5GHz	« 20dBc	6.5.1.5	Pass

2. 802.11b Middle Channel (2437MHz)

Test Range	Attenuation (dBc)	Plot	Result
30MHz ~ 1GHz	« 20dBc	6.5.2.1	Pass
1GHz ~ 2.3GHz	« 20dBc	6.5.2.2	Pass
2.3GHz ~ 2.4GHz	« 20dBc	6.5.2.3	Pass
2.4835GHz ~ 3GHz	« 20dBc	6.5.2.4	Pass
3GHz ~ 26.5GHz	« 20dBc	6.5.2.5	Pass

3. 802.11b High Channel (2462MHz)

Test Range	Attenuation (dBc)	Plot	Result
30MHz ~ 1GHz	« 20dBc	6.5.3.1	Pass
1GHz ~ 2.3GHz	« 20dBc	6.5.3.2	Pass
2.3GHz ~ 2.4GHz	« 20dBc	6.5.3.3	Pass
2.4835GHz ~ 3GHz	« 20dBc	6.5.3.4	Pass
3GHz ~ 26.5GHz	« 20dBc	6.5.3.5	Pass

4. 802.11g Low Channel (2412MHz)

Test Range	Attenuation (dBc)	Plot	Result
30MHz ~ 2.3GHz	« 20dBc	6.5.4.1	Pass
2.3GHz ~ 2.38GHz	« 20dBc	6.5.4.2	Pass
2.38GHz ~ 2.4GHz	« 20dBc	6.5.4.3	Pass
2.4835GHz ~ 3GHz	« 20dBc	6.5.4.4	Pass
3GHz ~ 26.5GHz	« 20dBc	6.5.4.5	Pass

5. 802.11g Middle Channel (2437MHz)

Test Range	Attenuation (dBc)	Plot	Result
30MHz ~ 2.3GHz	« 20dBc	6.5.5.1	Pass
2.3GHz ~ 2.4GHz	« 20dBc	6.5.5.2	Pass
2.4835GHz ~ 3GHz	« 20dBc	6.5.5.3	Pass
3GHz ~ 26.5GHz	« 20dBc	6.5.5.4	Pass

6. 802.11g High Channel (2462MHz)

Test Range	Attenuation (dBc)	Plot	Result
30MHz ~ 2.3GHz	« 20dBc	6.5.6.1	Pass
2.3GHz ~ 2.4GHz	« 20dBc	6.5.6.2	Pass
2.4835GHz ~ 2.5GHz	« 20dBc	6.5.6.3	Pass
2.5GHz ~ 3GHz	« 20dBc	6.5.6.4	Pass
3GHz ~ 26.5GHz	« 20dBc	6.5.6.5	Pass

NOTES :

1. All modes of operation were investigated and the worst-case emissions are reported.

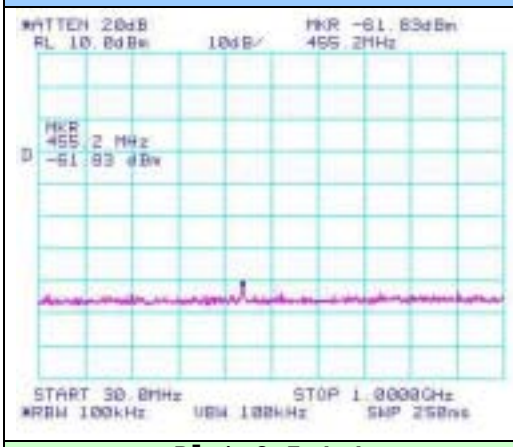
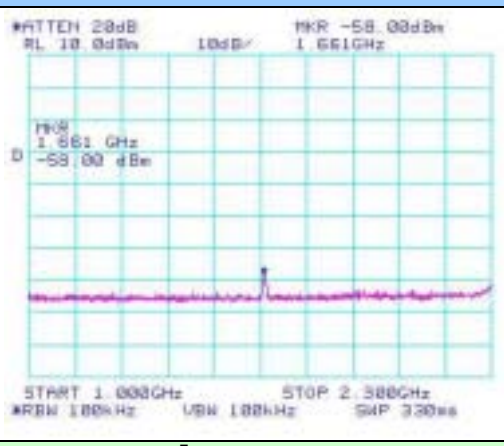
Tested by ***Choi, Chang-Young***

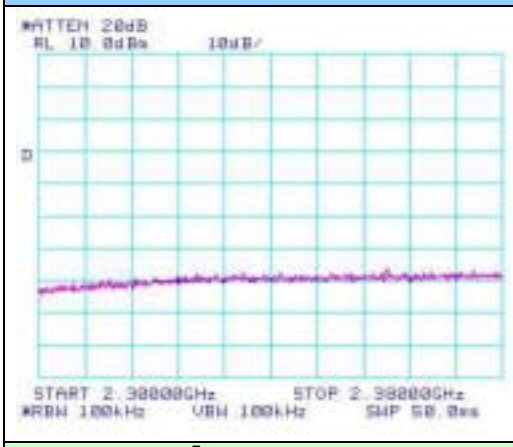
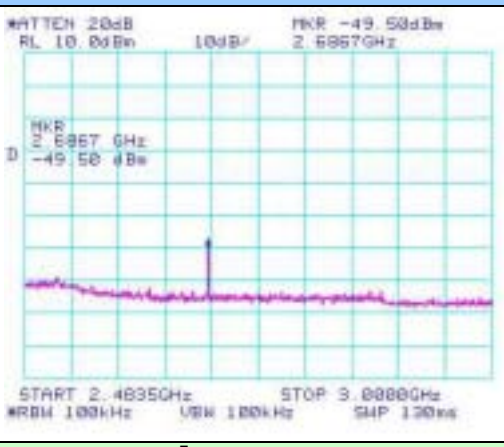
Plots of Conducted Emission

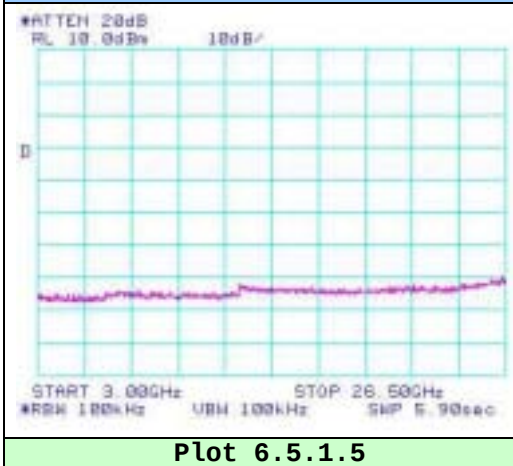
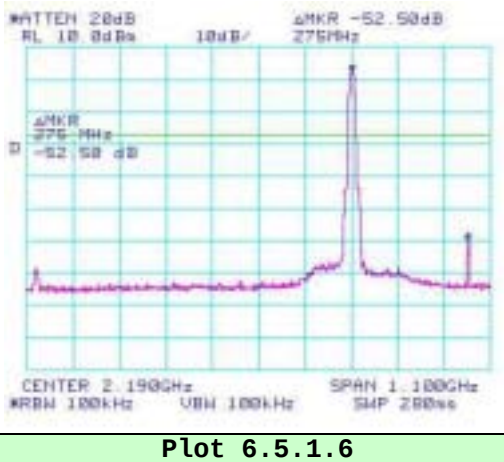
802.11b

Low Channel

2412MHz

30MHz ~ 1GHz	1GHz ~ 2.3GHz
	
Plot 6.5.1.1	Plot 6.5.1.2

2.3GHz ~ 2.4GHz	2.4835GHz ~ 3GHz
	
Plot 6.5.1.3	Plot 6.5.1.4

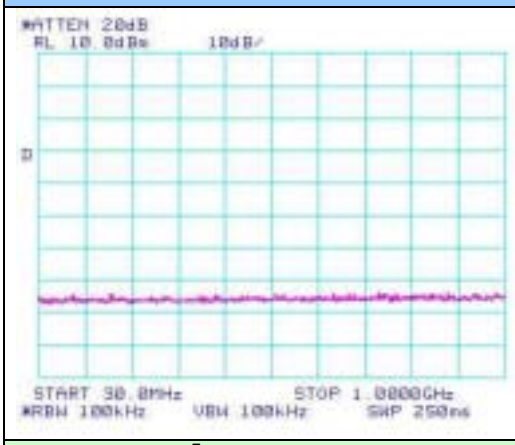
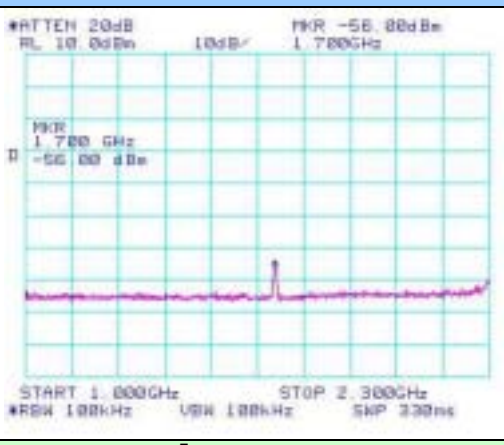
3GHz ~ 26.5GHz	Spurious Emission (Worst-Case)
	
Plot 6.5.1.5	Plot 6.5.1.6

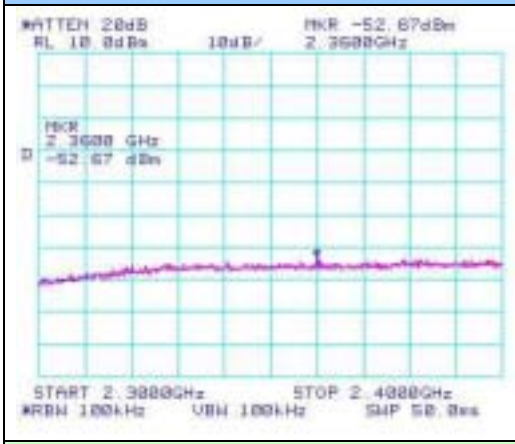
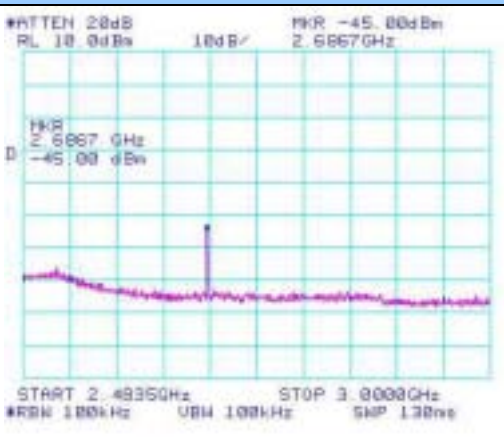
Plots of Conducted Emission

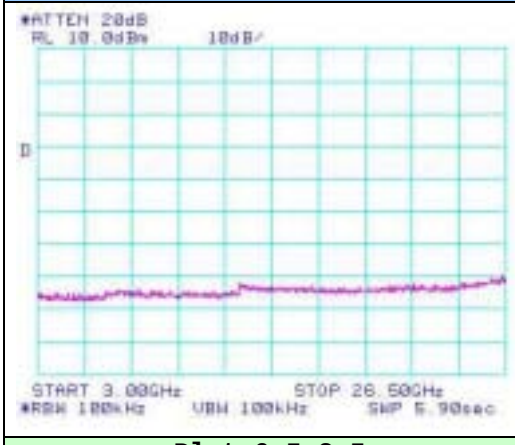
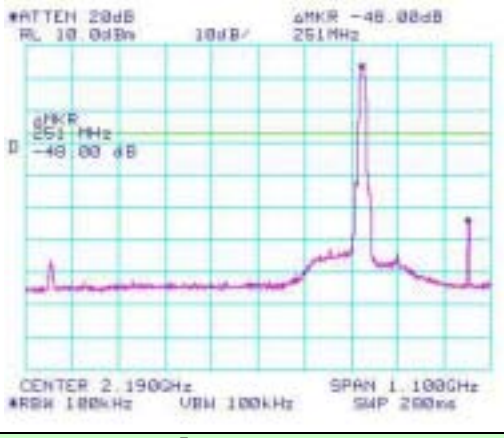
802.11b

Middle Channel

2437MHz

30MHz ~ 1GHz	1GHz ~ 2.3GHz
	
Plot 6.5.2.1	Plot 6.5.2.2

2.3GHz ~ 2.4GHz	2.4835GHz ~ 3GHz
	
Plot 6.5.2.3	Plot 6.5.2.4

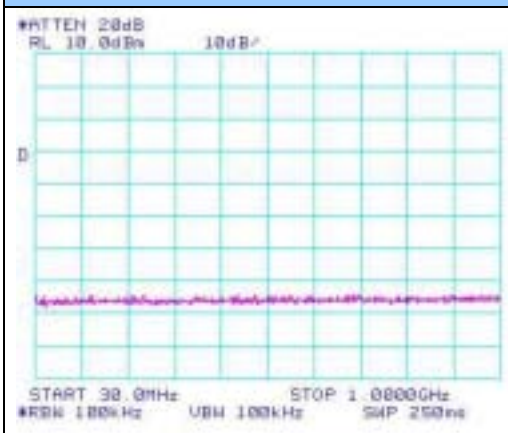
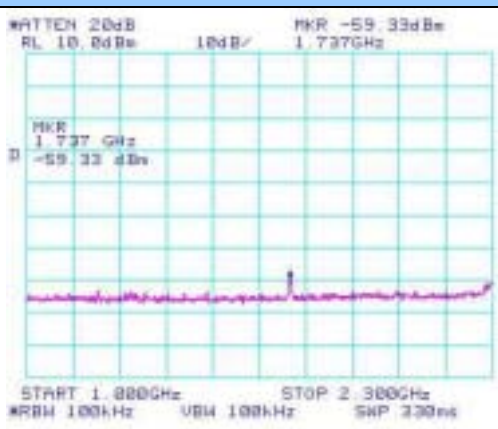
3GHz ~ 26.5GHz	Spurious Emission (Worst-Case)
	
Plot 6.5.2.5	Plot 6.5.2.6

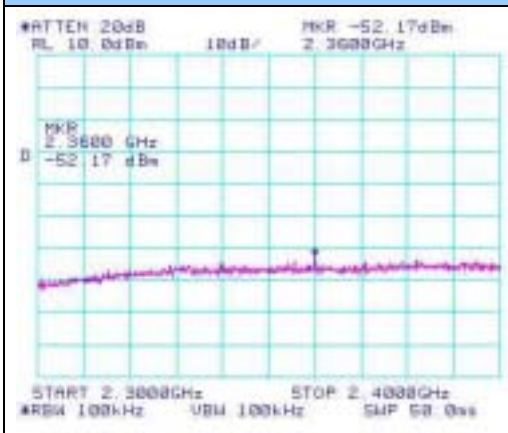
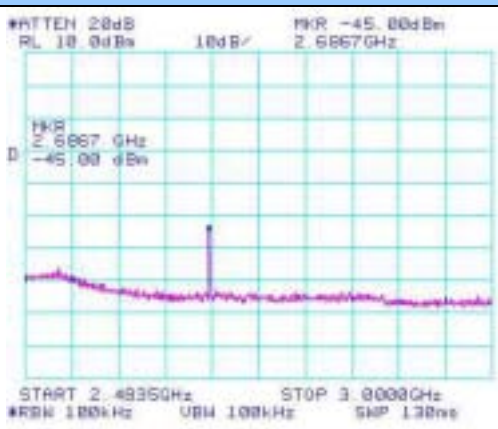
Plots of Conducted Emission

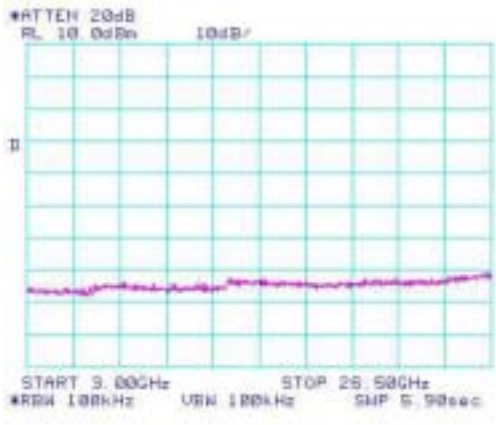
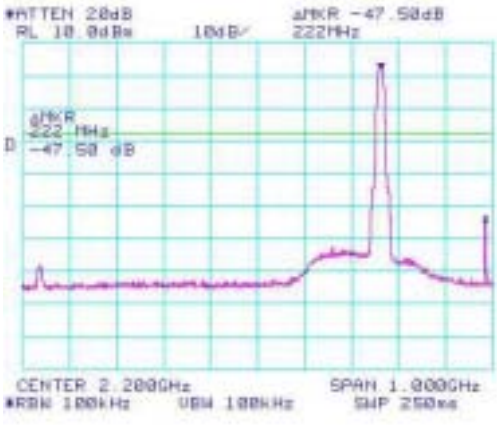
802.11b

High Channel

2462MHz

30MHz ~ 1GHz	1GHz ~ 2.3GHz
	
Plot 6.5.3.1	Plot 6.5.3.2

2.3GHz ~ 2.4GHz	2.4835GHz ~ 3GHz
	
Plot 6.5.3.3	Plot 6.5.3.4

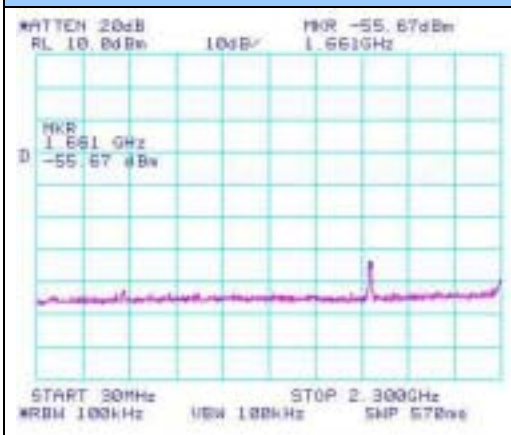
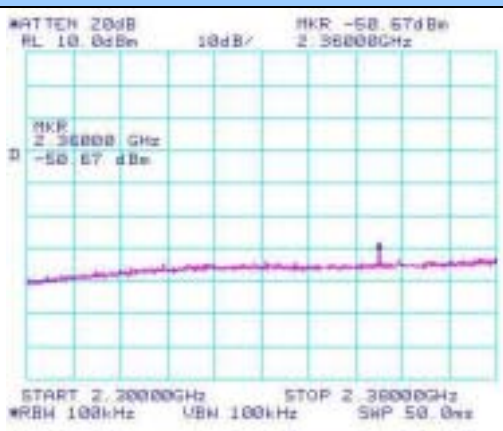
3GHz ~ 26.5GHz	Spurious Emission (Worst-Case)
	
Plot 6.5.3.5	Plot 6.5.3.6

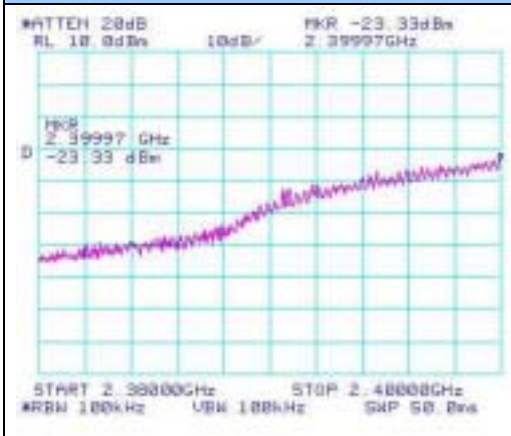
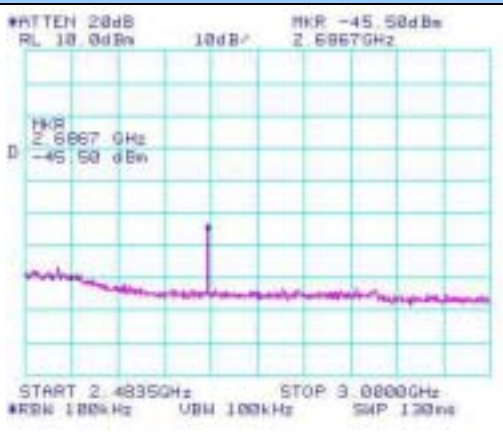
Plots of Conducted Emission

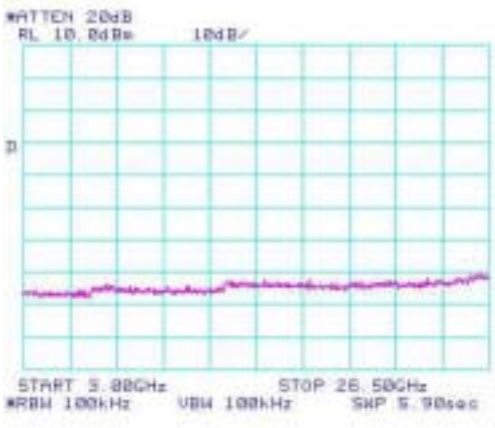
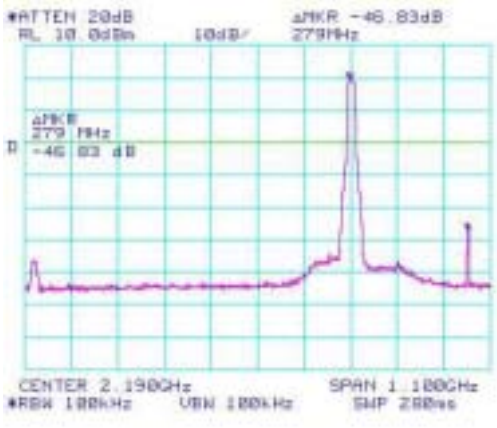
802.11g

Low Channel

2412MHz

30MHz ~ 2.3GHz	2.3GHz ~ 2.38GHz
	
Plot 6.5.4.1	Plot 6.5.4.2

2.38GHz ~ 2.4GHz	2.4835GHz ~ 3GHz
	
Plot 6.5.4.3	Plot 6.5.4.4

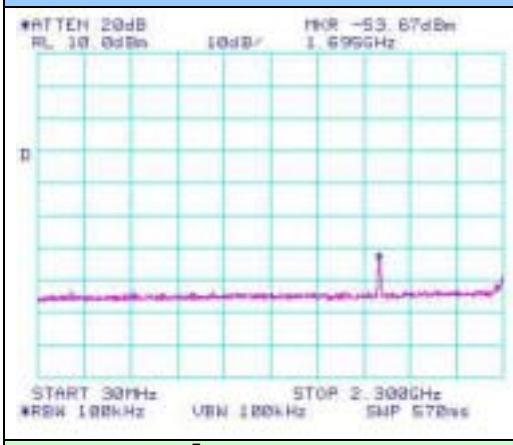
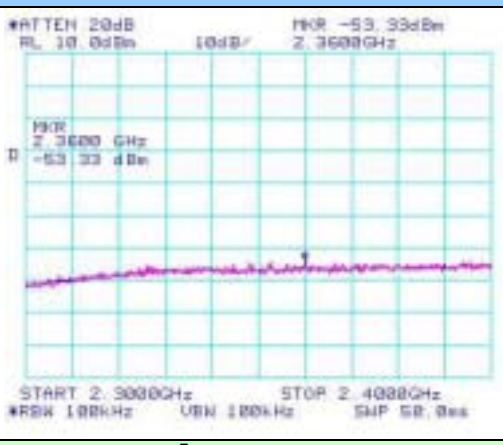
3GHz ~ 26.5GHz	Spurious Emission (Worst-Case)
	
Plot 6.5.4.5	Plot 6.5.4.6

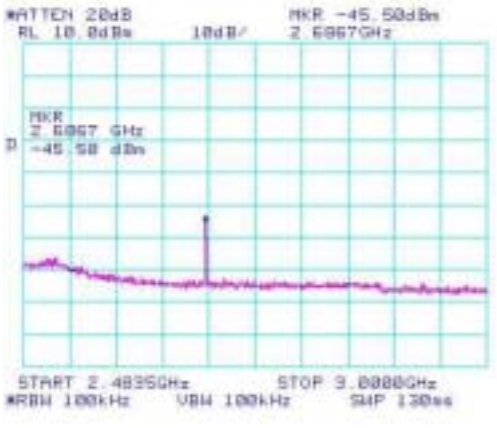
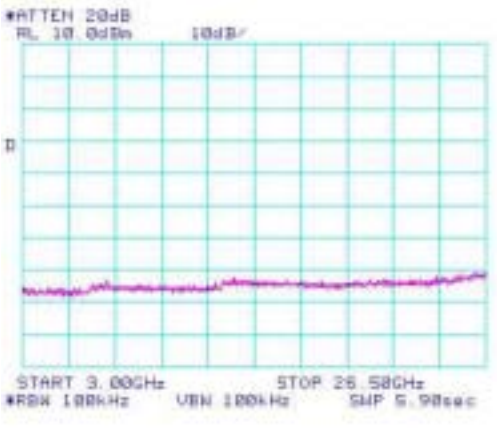
Plots of Conducted Emission

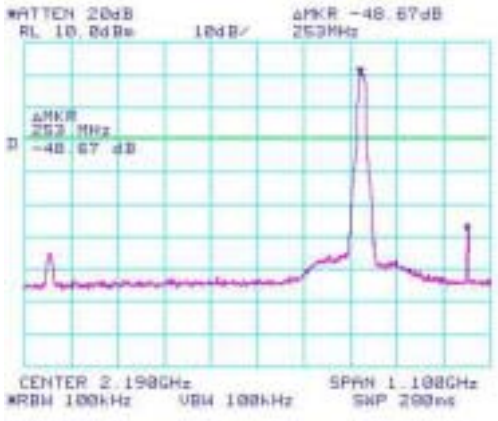
802.11g

Middle Channel

2437MHz

30MHz ~ 2.3GHz	2.3GHz ~ 2.4GHz
	
Plot 6.5.5.1	Plot 6.5.5.2

2.4835GHz ~ 3GHz	3GHz ~ 26.5GHz
	
Plot 6.5.5.3	Plot 6.5.5.4

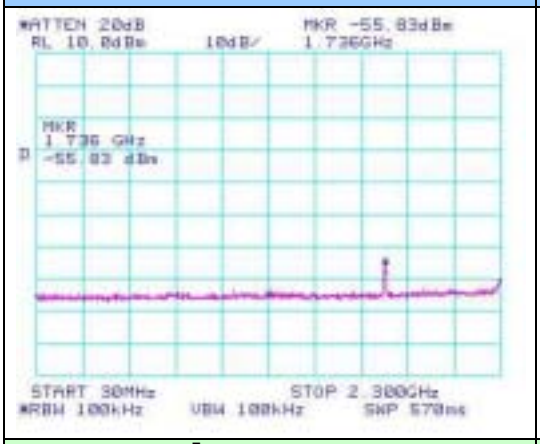
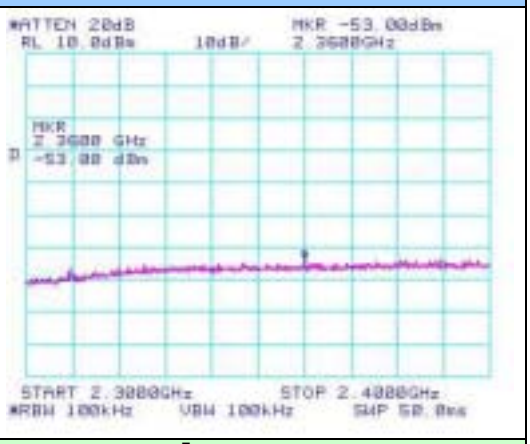
Spurious Emission (Worst-Case)

Plot 6.5.5.5

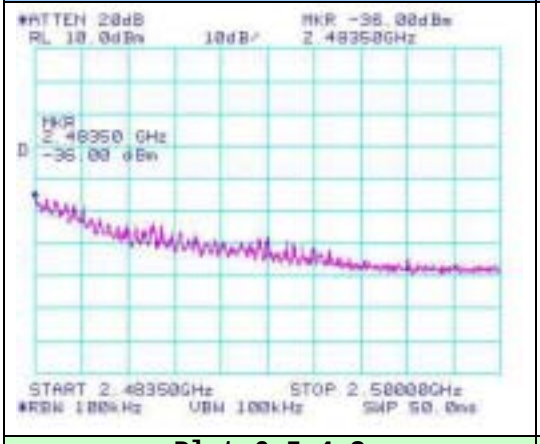
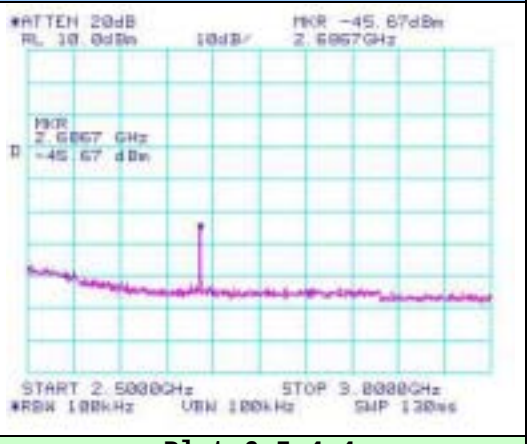
Plots of Conducted Emission

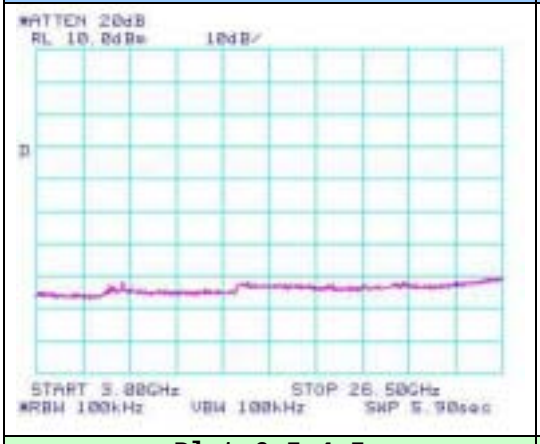
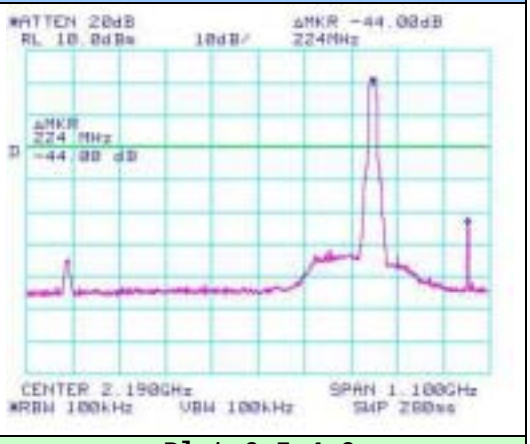
802.11g

High Channel

2462MHz

30MHz ~ 2.3GHz	2.3GHz ~ 2.4GHz
	
Plot 6.5.4.1	Plot 6.5.4.2

2.4835GHz ~ 2.5GHz	2.5GHz ~ 3GHz
	
Plot 6.5.4.3	Plot 6.5.4.4

3GHz ~ 26.5GHz	Spurious Emission (Worst-Case)
	
Plot 6.5.4.5	Plot 6.5.4.6

6.6 100kHz Bandwidth of Frequency Band Edge

Test Standard	:	FCC Part15 Subpart C Section 15.247(c)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

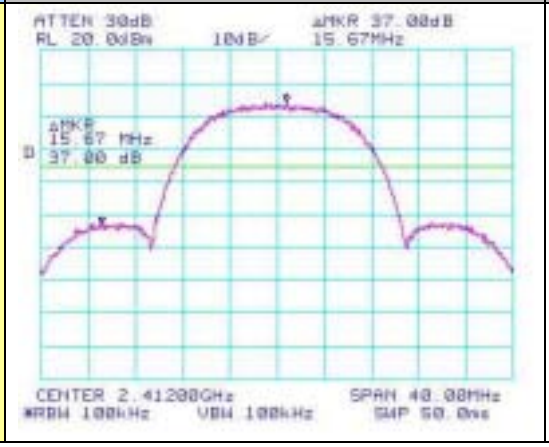
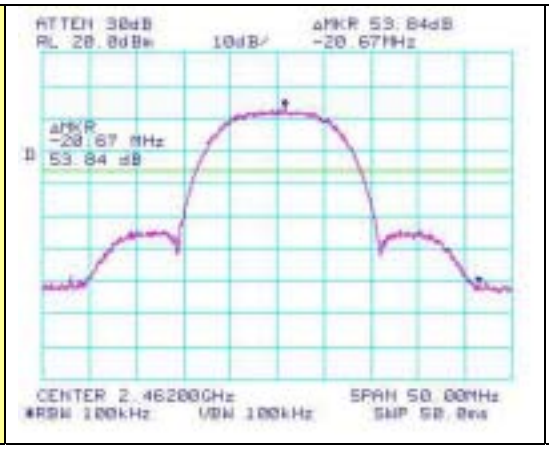
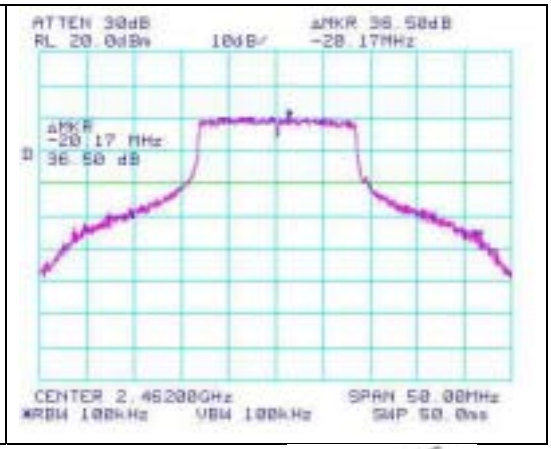
100kHz Bandwidth of Frequency Band Edge Test Data

Frequency (MHz)	Maximum Peak Output Power (dBc)		Limit
	802.11b (DSSS)	802.11g (OFDM)	
2412	37.0	25.2	Less than 20dBc
2462	58.4	26.5	

NOTES :

1. Measure 100kHz bandwidth of Frequency Band Edge of relevant channel using Spectrum Analyzer.

Plots of 100kHz Bandwidth of Frequency Band Edge

Frequency	802.11b (DSSS)	802.11g (OFDM)
2412MHz		
2462MHz		

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6.7 Peak Power Spectral Density

Test Standard	:	FCC Part15 Subpart C Section 15.247(d)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

Peak Power Spectral Density Test Data

Frequency (MHz)	Peak Power Spectral Density (dBm)		Limit
	802.11b (DSSS)	802.11g (OFDM)	
2412	-8.7	-9.0	Less than 8dBm
2437	-6.2	-10.5	
2462	-8.2	-10.7	

NOTES :

1. *Measure Peak Power Spectral of relevant channel using Spectrum Analyzer.*
2. *RBW 3kHz, VBW 3kHz, Span 100kHz*
3. *Test Plot – Next Page*

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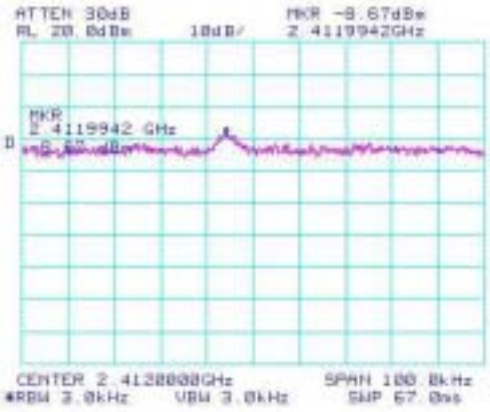
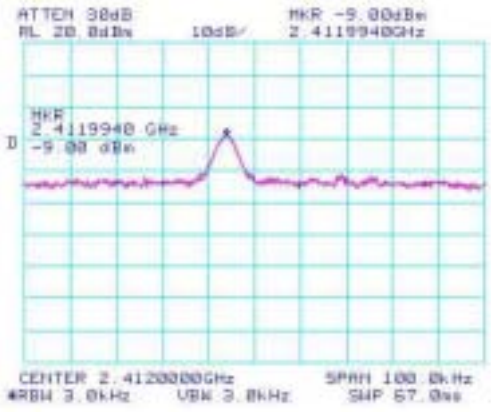
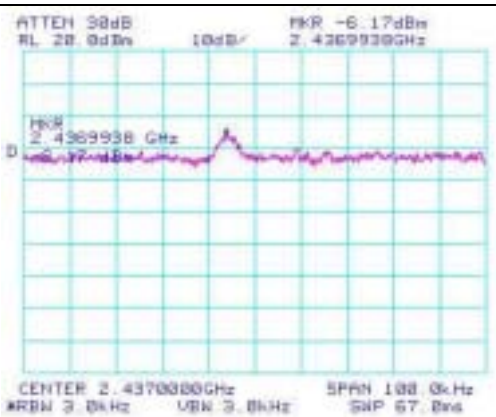
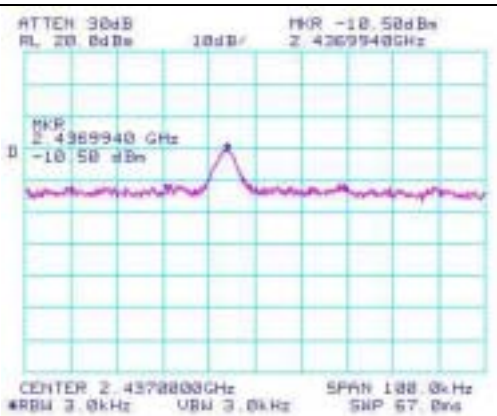
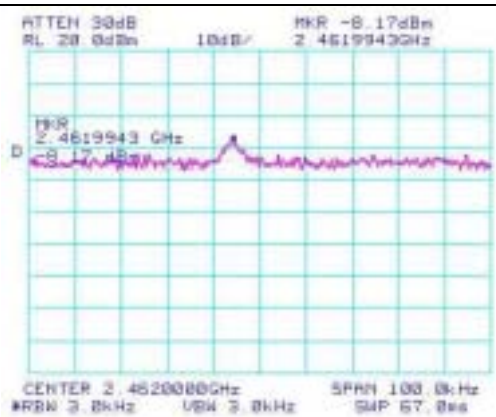
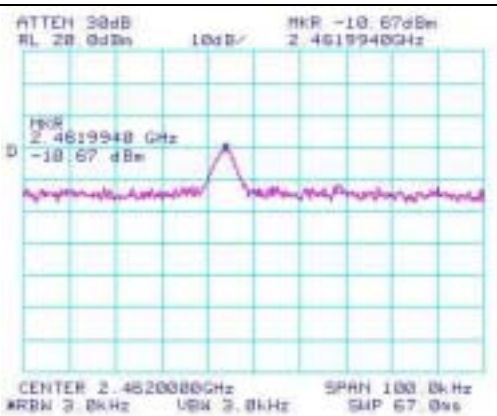
Plots of Peak Power Spectral Density

Frequency	802.11b (DSSS)	802.11g (OFDM)
2412MHz		
2437MHz		
2462MHz		

6.8 RF Exposure Requirement

6.8.1 Method of Measurement

Spread spectrum transmitters operating under section 15.247 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits.

These devices are not exempted from compliance does not exceed the Commission's RF exposure guidelines. Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.

Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits Any other RF exposure related issues that may affect MPE compliance.

6.8.2 Limits

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental 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/cm2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
1500 - 100000	-	-	5	6
(B) Limits for General Population/Uncontrolled Exposure				
1500 - 100000	**-**	**-**	**1.0**	**30**

6.8.3 Test Result

Frequency (MHz)		Output Power (dBm)	Antenna Gain (dBi)	Calculated EIRP (mWatt)	The time averaged power over 30 minutes (Watt)	Laboratory's Recommended Minimum RF Safety Distance r (Cm)	Power Density in mW/cm^2 at Formula When r=20Cm (mW/cm^2)
DSSS 802.11b	2412	19.1	4.0	204.2	204.2	4.03	0.0406
	2437	19.5	4.0	223.9	223.9	4.22	0.0446
	2462	19.0	4.0	199.5	199.5	3.99	0.0397
OFDM 802.11g	2412	20.2	4.0	263.0	263.0	4.58	0.0523
	2437	19.8	4.0	239.9	239.9	4.37	0.0478
	2462	19.7	4.0	234.4	234.4	4.32	0.0467

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi r^2} = \frac{EIRP}{4\pi r^2}$$

P : power input to the antenna in mW
EIRP : Equivalent (effective) isotropic radiated power.
S : power density mW/cm2
G : numeric gain of antenna relative to isotropic radiator
R : distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{EIRP}{4\pi S}}$$

Note :

1. *S = 1.0 mW/cm^2 for Limits for General Population/Uncontrolled Exposures.*
2. *The time averaged power over 30 minutes will be equaled Output Power.*
3. *Minimum calculated separation distance between antenna and persons required : 4.58Cm*
4. *The Power Density at a distance of 20Cm calculated from the formula is far below the limit of 1mW/cm^2.*
5. *So, RF exposure limit warning or SAR test are not required.*

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7. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date
Signal Analyzer	PMM9000	PMM	3100570602	09/09/04
EMC Analyzer	E7403A	HP	US39150108	01/16/05
Spectrum Analyzer	R3261C	ADVANTEST	61720002	08/14/04
Amplifier (0.1MHz-1.3GHz)	8447E	HP	2945A02712	08/14/04
BICONICAL ANTENNA	BC01	PMM	0020J70501	01/16/05
LOG PERIODIC ANTENNA	LP01	PMM	0020J70501	01/16/05
Shield Room (7m x 4m x 4m)	N/A	SEMITECH	000815	N/A
Turn Table	JAC-2	BWS	N/A	N/A
ANTENNA MAST	N/A	BWS	N/A	N/A
Artificial Mains Network	L3-25	PMM	1110K70403	10/02/04
Artificial Mains Network	FCC-LISN-50 -50-2-02	FCC	03074	10/07/04
HORN ANTENNA	BBHA 9120 D	SCHWARZBECK	N/A	06/20/04
HORN ANTENNA	BBHA 9170	SCHWARZBECK	N/A	06/20/04
FREQUENCY COUNTER	R5372	ADVANTEST	41855204	04/28/04
POWER METER	E4418A	HP	GB38272621	04/25/04
POWER SENSOR	8481A	HP	3318A92101	04/25/04
Spectrum Analyzer	8563E	HP	3611A05046	05/13/04