Standards Council of Canada
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Portée d'accréditation 75

TM

Test Report:	6W67465
Applicant:	Virtual Ink Corporation 150 CambridgePark Drive Cambridge, MA 02140
Apparatus:	mimio Wireless Adapter (M/N: DMA-02-03M)
FCC ID:	RWU-DMA0203M
In Accordance With:	FCC Part 15 Subpart C, 15.247 FHSS System and Digitally Modulated Radiators 902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz
Tested By:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Authorized By:	Jin Xu, Wireless Specialist
Date:	November 13, 2006
Total Number of Pages:	32

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	mimio Wireless Adapter (M/N: DMA-02-03M)
Specification:	FCC Part 15 Subpart C, 15.247
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Jason Nixon, Telecom Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

TABLE OF CONTENTS

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

Mimio Wireless Adapter (M/N: DMA-02-03M)

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
3	Wireless adapter	0003
5	Mimio Xi capture bar	0005
Containing	Wireless adapter	0004

The first samples were received on: May 29, 2006

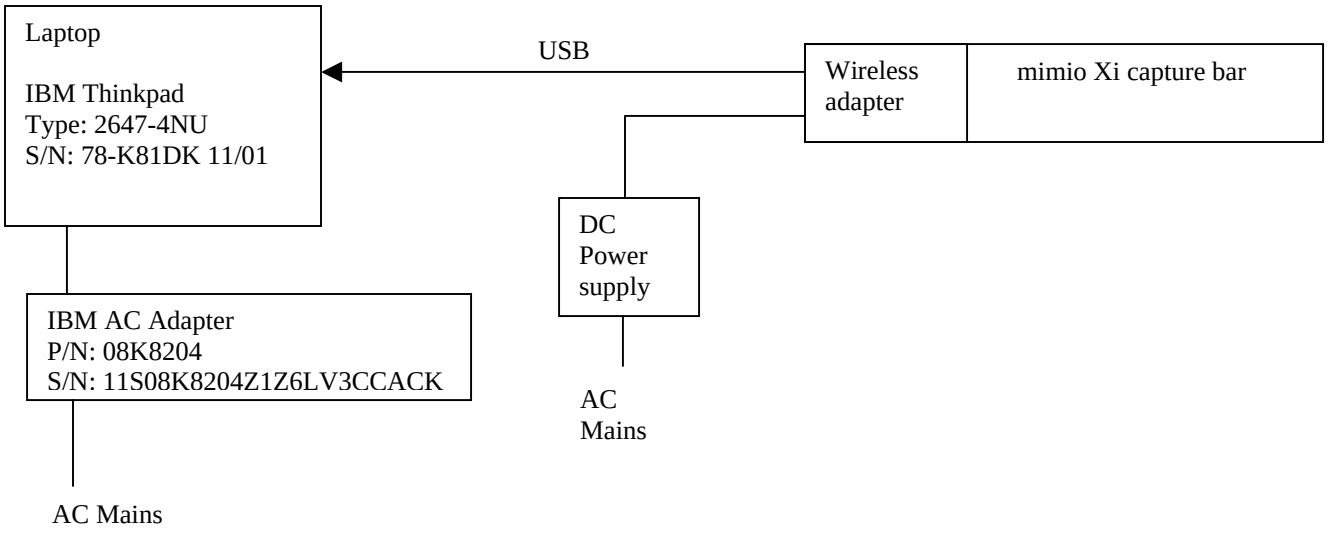
1.3 Theory of Operation

The mimio Xi capture bar is used to capture whatever the stylus pen writes onto a whiteboard. With the wireless adapter installed the mimio Xi can transmit the image to a PC with the USB adapter installed.

1.4 Technical Specifications of the EUT

Manufacturer:	Computime Limited
Operating Frequency:	2402 –2479MHz
Peak Output Power:	0.0012W
Emission Designator	F1D
Rated Power:	1mW
Modulation:	GFSK
Antenna Data:	Integral
Power Source:	7.5VDC, 6xAA batteries or USB

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

FHSS System and Digitally Modulated Radiators

902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSP	FA001920	March 17/07
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 10/07
LISN	EMCO	4825/2	FA001545	Jan. 30/07
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 16/07
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 16/07
International Power Supply	California Inst.	1001WP	FA000995	Jan. 11/07
Transient Limiter	Hewlett-Packard	1194 7A	FA000975	May 18/07
Horn Antenna #1	EMCO	3115	FA000649	Jan. 12/07
Log Periodic Antenna #2	EMCO	3148	FA001355	May 16/07
Biconical (1) Antenna	EMCO	3109	FA000805	May 03/07
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	Aug. 02/07
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	Aug. 02/07
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	Aug. 02/07
5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 3/07

COU – Cal On Use

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Additional Observations

There were no additional observations made during this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.247(a)(1)	Frequency hopping systems	N	
15.247(a)(2)	Systems using digital modulation techniques	Y	PASS
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band	N	
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	N	
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	Y	PASS
15.247(b)(4)	Maximum peak output power	Y	PASS
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	N	
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	PASS
15.247(e)	Power Spectral Density for Digitally Modulated Devices	Y	PASS
15.247(f)	Time of Occupancy for Hybrid Systems	N	

Notes:

Appendix A : Test Results

Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dBmV)

Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Conditions:

Sample Number:	5	**Temperature:**	22
Date:	May 30, 2006	**Humidity:**	30
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Shieled Room

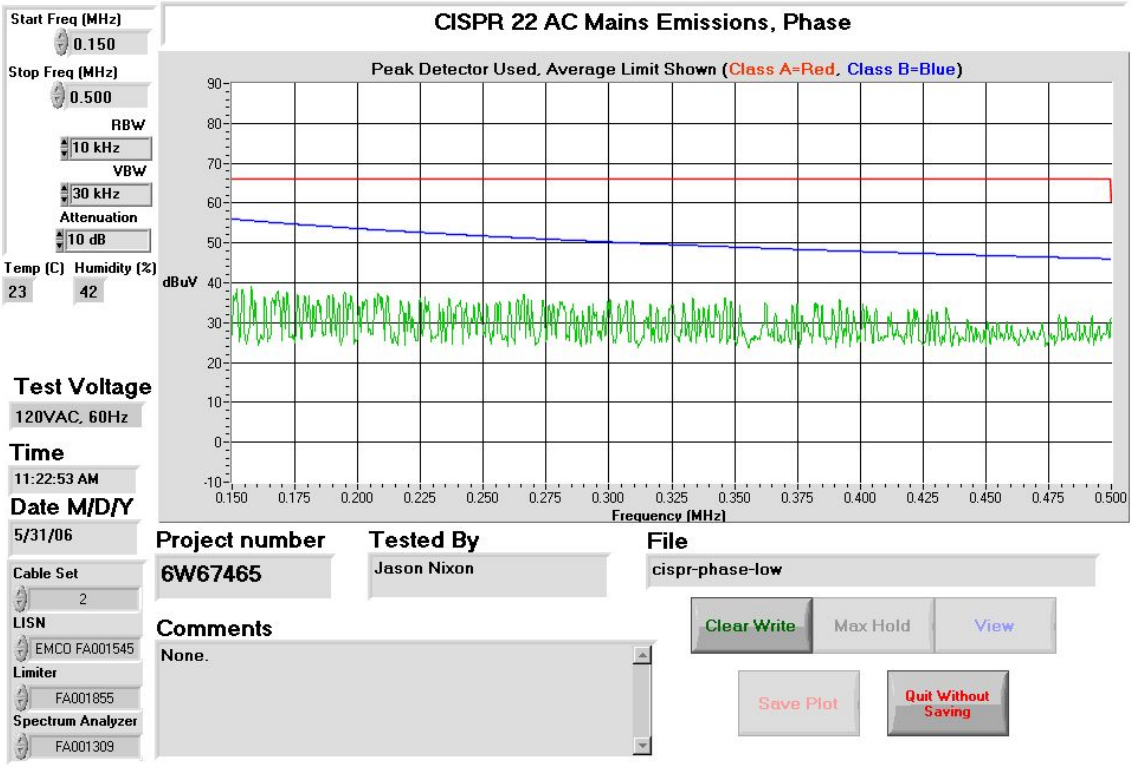
Test Results: See Attached Plots.

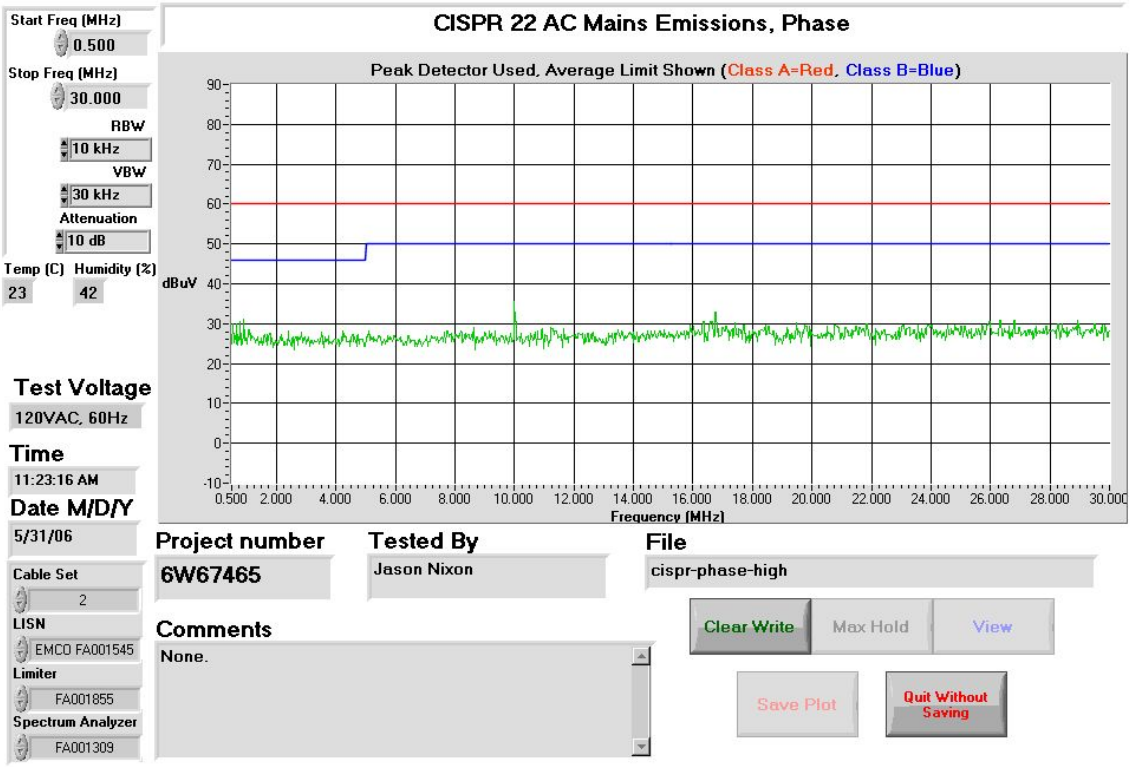
Additional Observations:

The EUT can be power two different ways, through the USB of a computer or through a 7.5VDC power supply both methods were assessed.

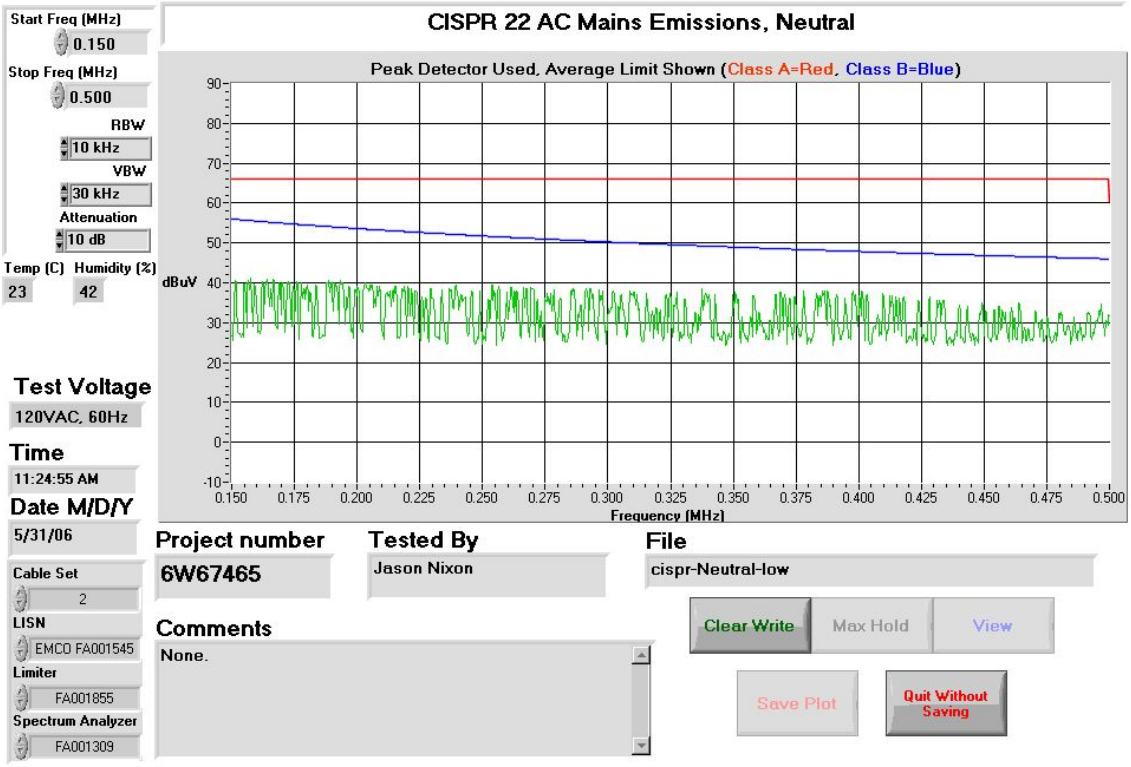
All plots have been corrected with the cable, LISN and transient limiter losses to show compliance with the Average limits.

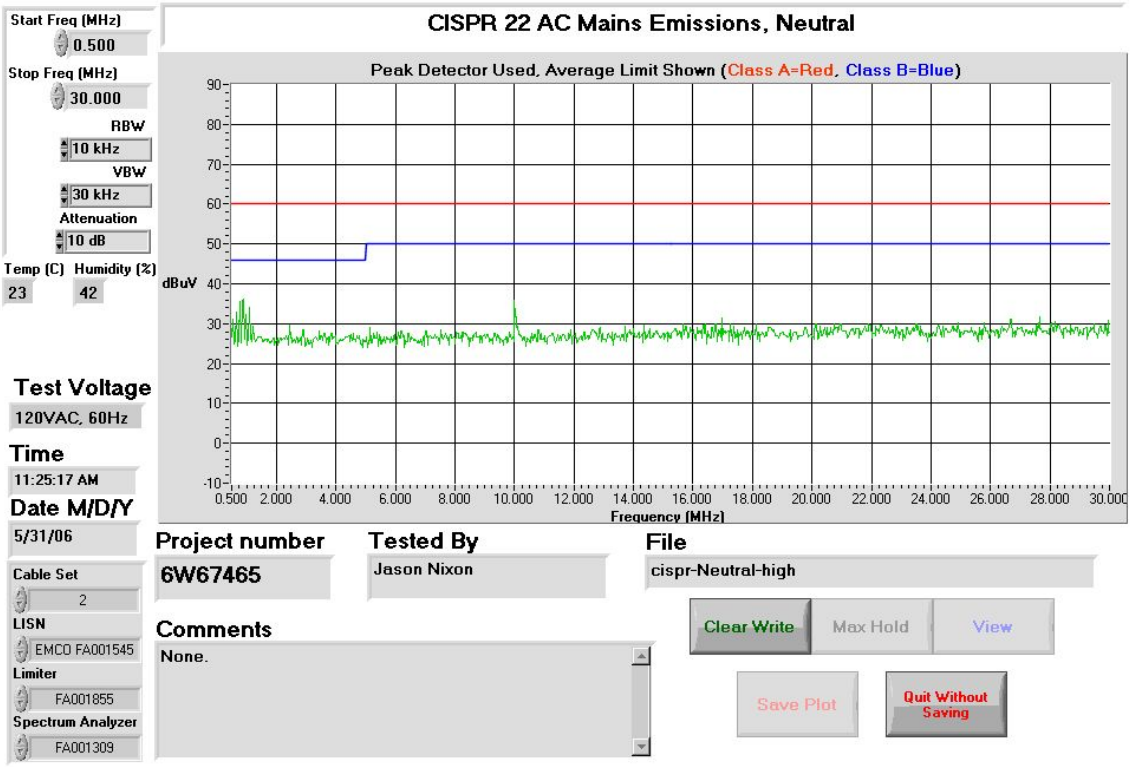
Phase Conductor – USB Powered



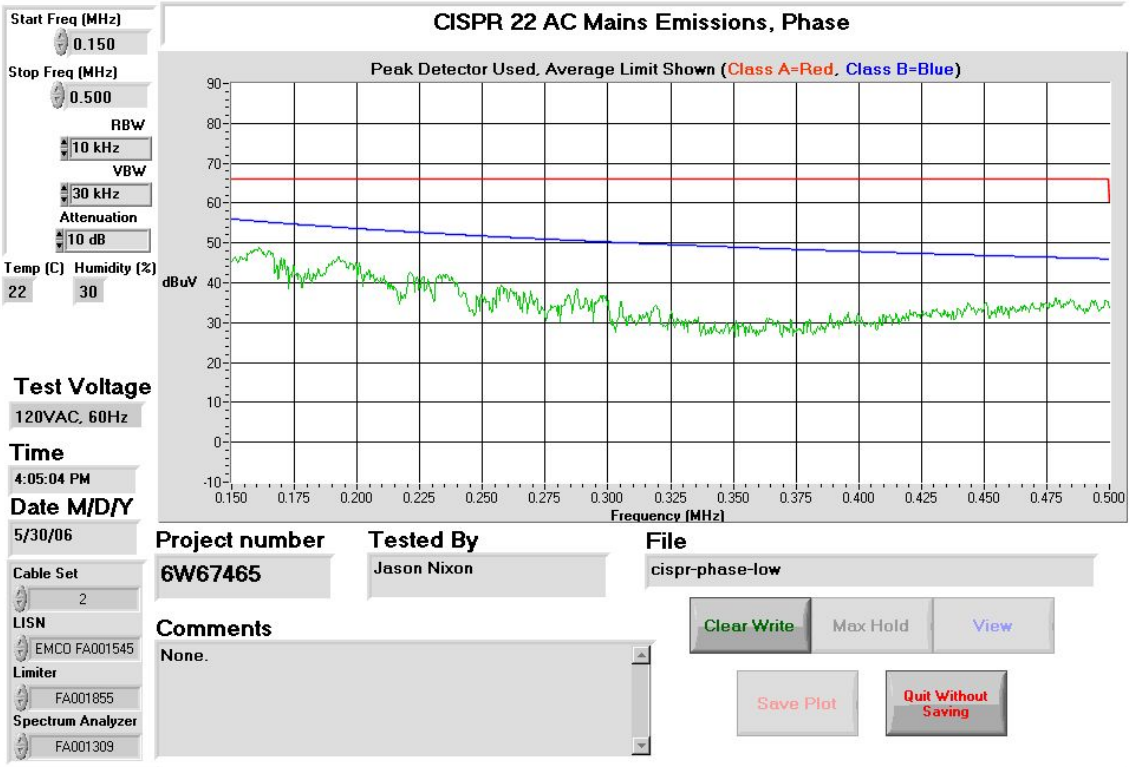


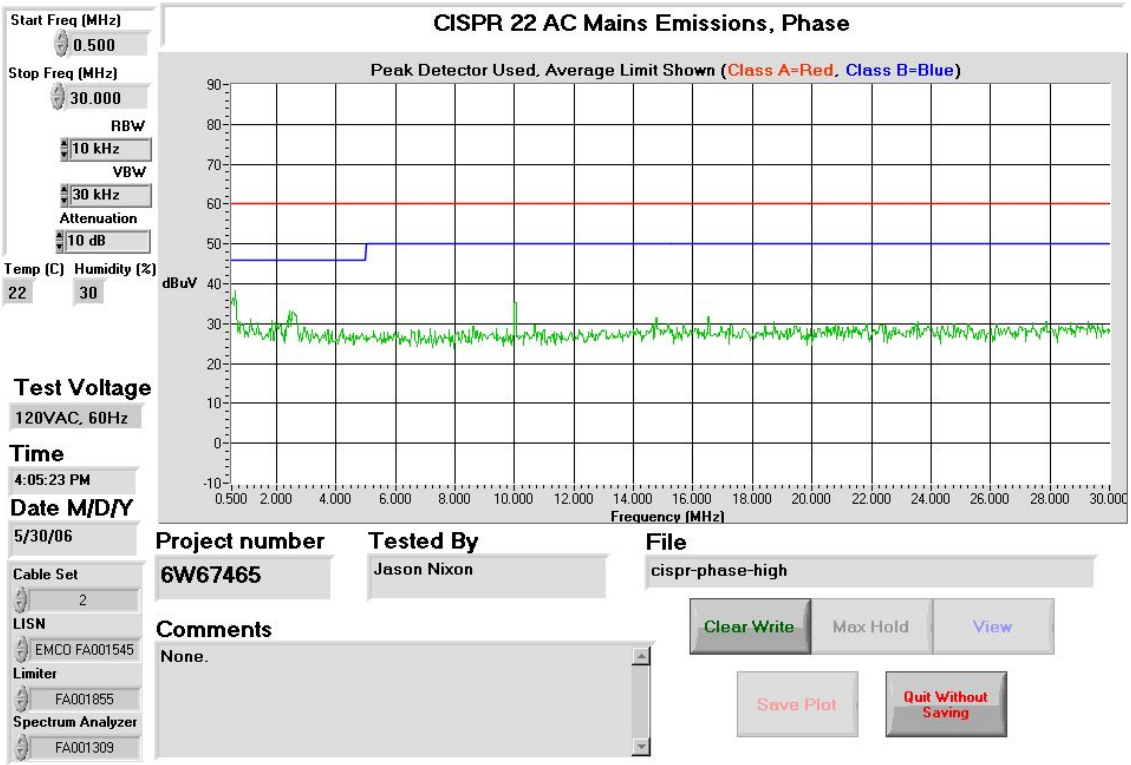
Neutral Conductor – USB Powered



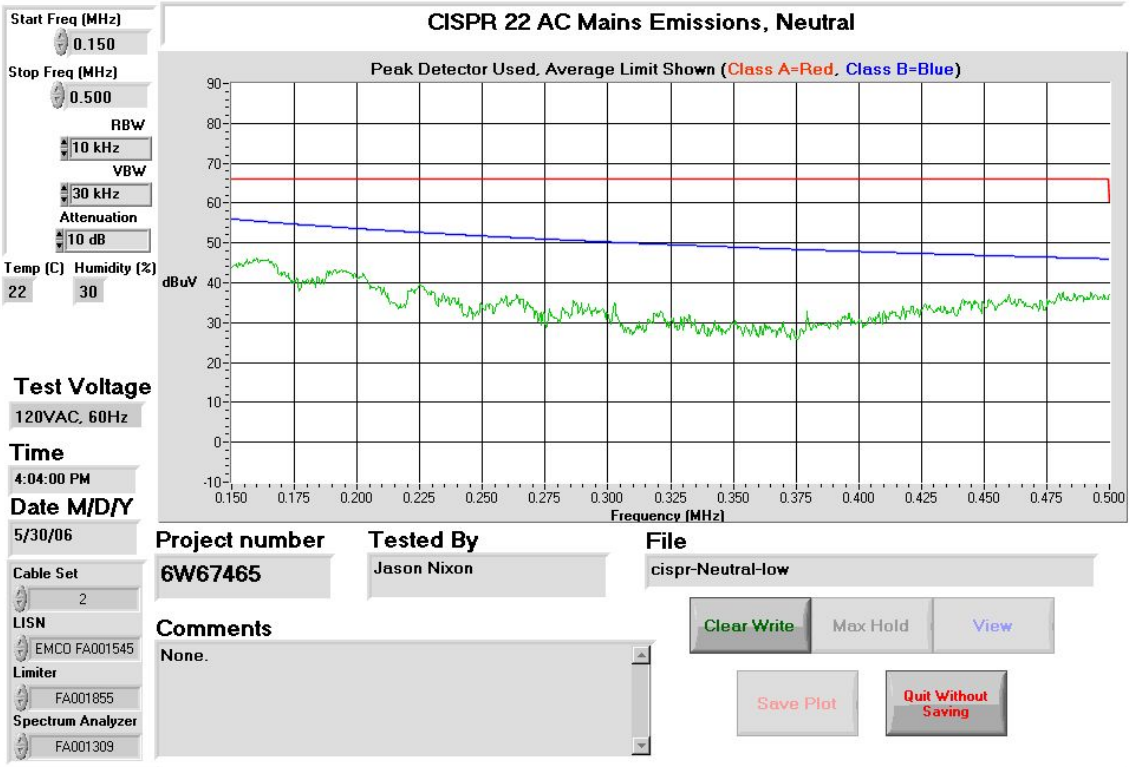


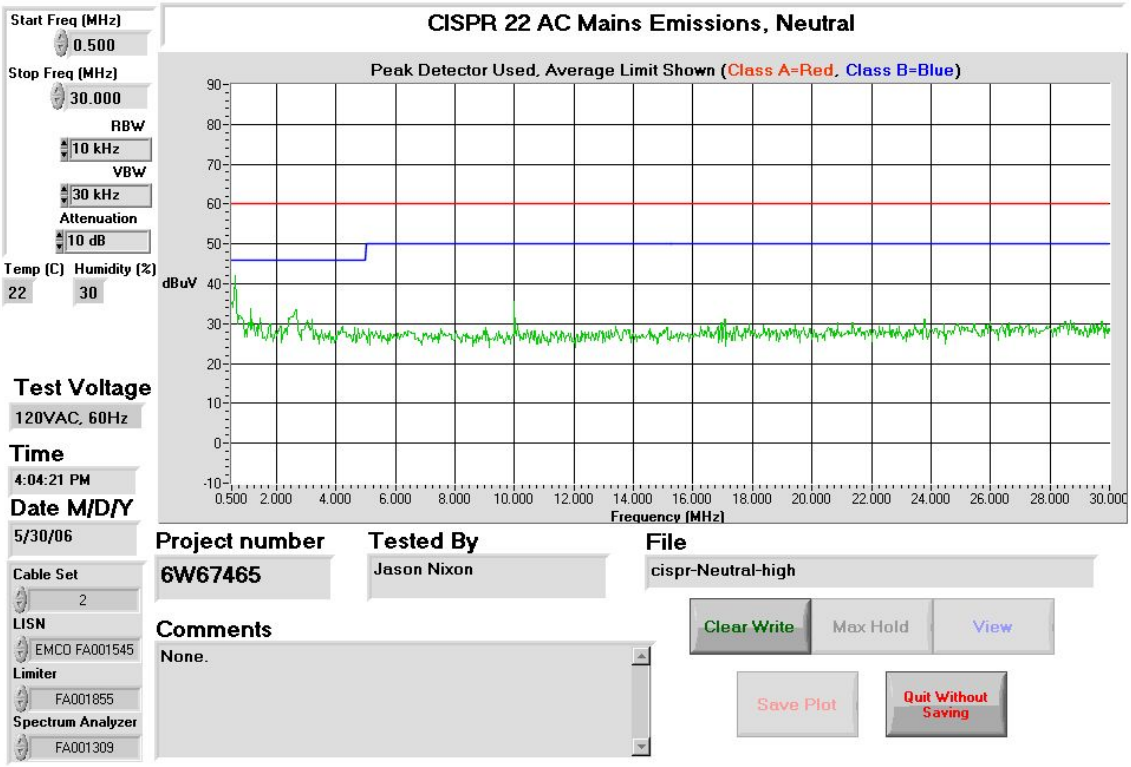
Phase Conductor – 7.5VDC Powered





Neutral Conductor – 7.5VDC Powered





Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvoltsmeter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Conditions:

Sample Number:	5	**Temperature:**	19
Date:	June 1, 2006	**Humidity:**	88
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	OATS

Test Results:

See Attached Table for Results

Additional Observations:

The Spectrum was searched from 30MHz to 25GHz.

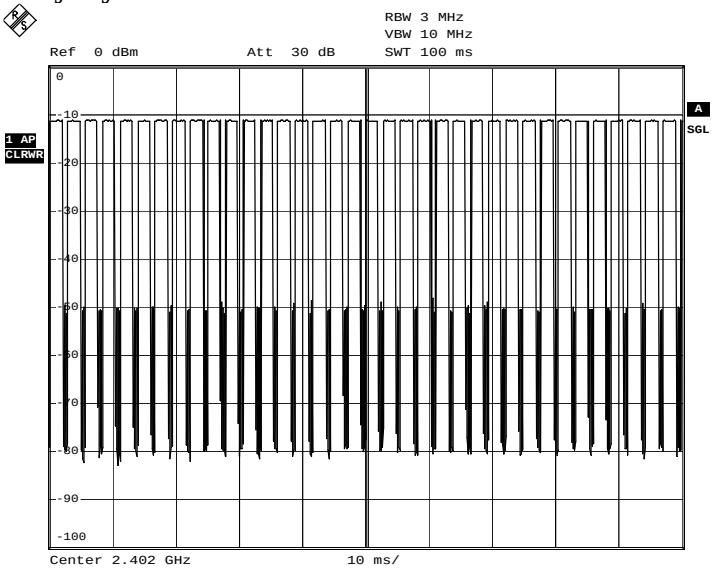
These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axis.

All measurements were performed using a Peak detector with 100kHz RBW/VBW below 1GHz and 1MHz RBW/VBW above 1GHz and were found to be compliant with the average limit.

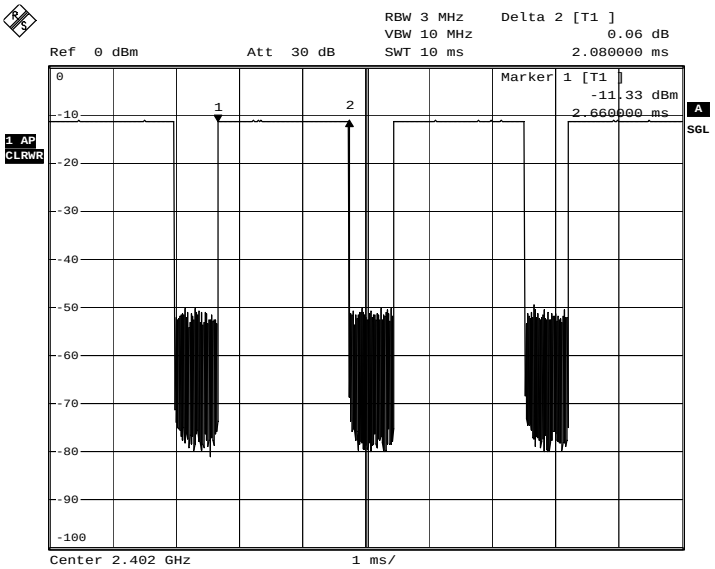
	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4804.0000	Horn1	V	68.3	33.4	54.8	-2.5	8.6	55.6	74.0	18.4	Peak
									53.1	54.0	0.9	Average
2	4804.0000	Horn1	H	67.7	33.5	54.8	-2.5	8.6	55.0	74.0	19.0	Peak
									52.5	54.0	1.5	Average
3	4880.0000	Horn1	V	64.7	33.4	54.5	-2.5	8.6	52.2	74.0	21.8	Peak
									49.7	54.0	4.3	Average
4	4880.0000	Horn1	H	67.0	33.5	54.5	-2.5	8.6	54.6	74.0	19.4	Peak
									52.1	54.0	1.9	Average
5	4958.0000	Horn1	V	65.7	33.4	54.2	-2.5	8.4	53.3	74.0	20.7	Peak
									50.8	54.0	3.2	Average
6	4958.0000	Horn1	H	64.0	33.5	54.2	-2.5	8.4	51.8	74.0	22.2	Peak
									49.3	54.0	4.7	Average

Duty Cycle:



On-time in 100msec

Date: 1.JUN.2006 21:42:41

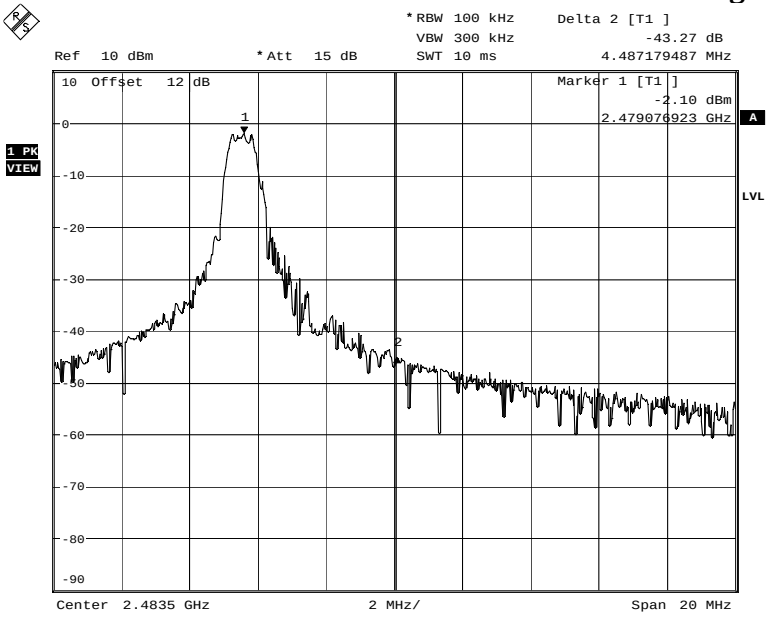


Pulse width

Date: 1.JUN.2006 21:43:33

Duty cycle correction = 20log((36x2.08)/100) = -2.5dB

Delta Marker Measurement for 2.4835MHz Band Edge



Upper Bandedge
Date: 30.MAY.2006 14:49:45

Measured Field Strength for High Channel in 1MHz RBW = 95.2dBuV/m

Delta Marker = -43.27dB

Therefore, Peak Field Strength = 95.2dBuV/m - 43.27dB = 51.93dBuV/m
Limit = 74dBuV/m
Average Field Strength = 51.93dBuV/m – 2.5dB(Duty Cycle) = 49.43dBuV/m
Limit = 54dBuV/m

Clause 15.247(a)(2) Systems using digital modulation techniques

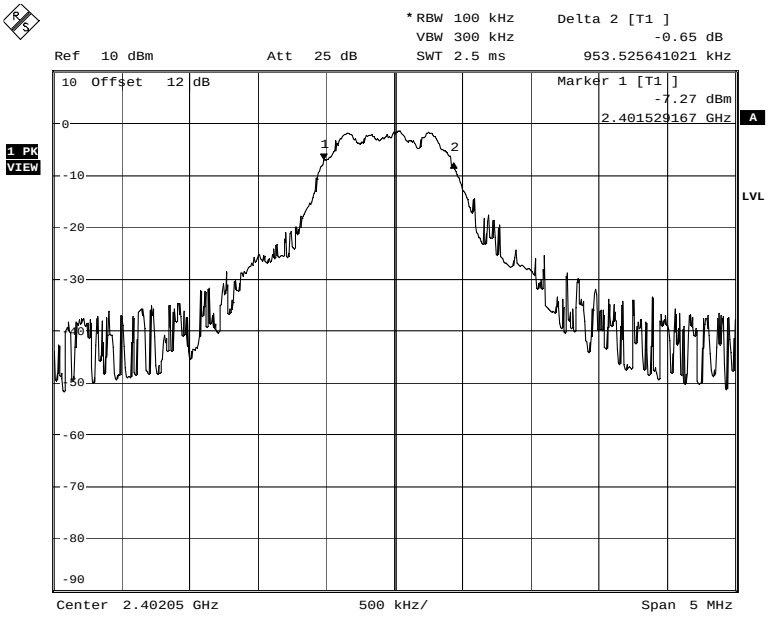
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Conditions:

Sample Number:	5	**Temperature:**	24
Date:	May 29, 2006	**Humidity:**	36
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

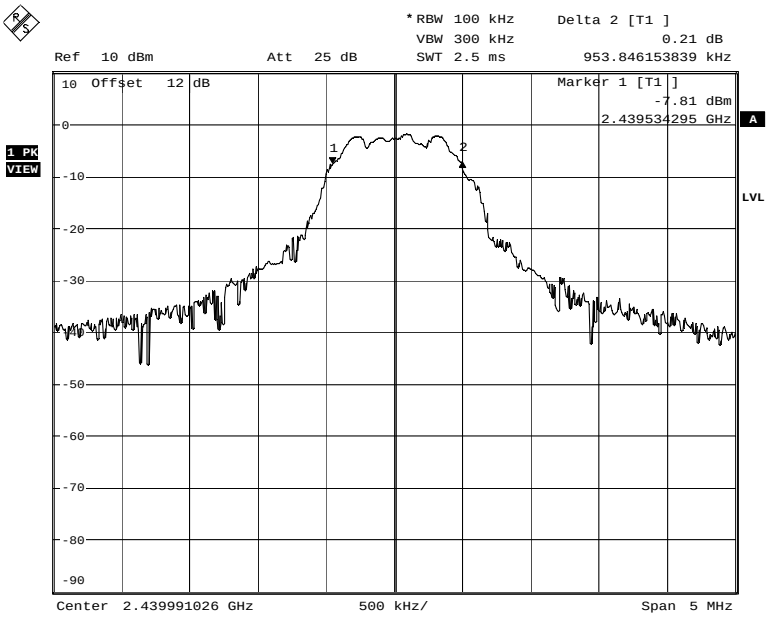
Test Results:

6dB Bandwidth:



6dB Bandwidth - Low Channel

Date: 30.MAY.2006 12:13:34



6dB Bandwidth - Mid Channel

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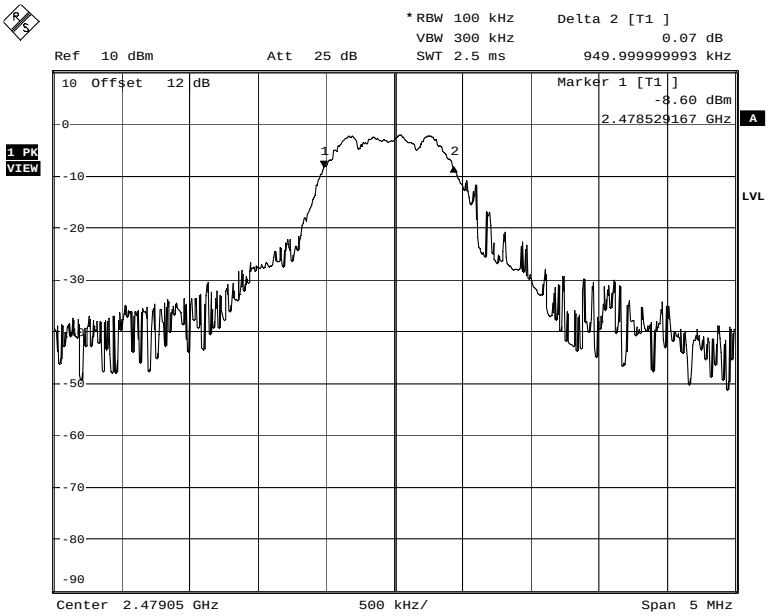


6dB Bandwidth - High Channel

Date: 30.MAY.2006 12:11:46

Clause 15.247(b)(3) Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Conditions:

Sample Number:	5	**Temperature:**	24
Date:	May 29, 2006	**Humidity:**	36
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

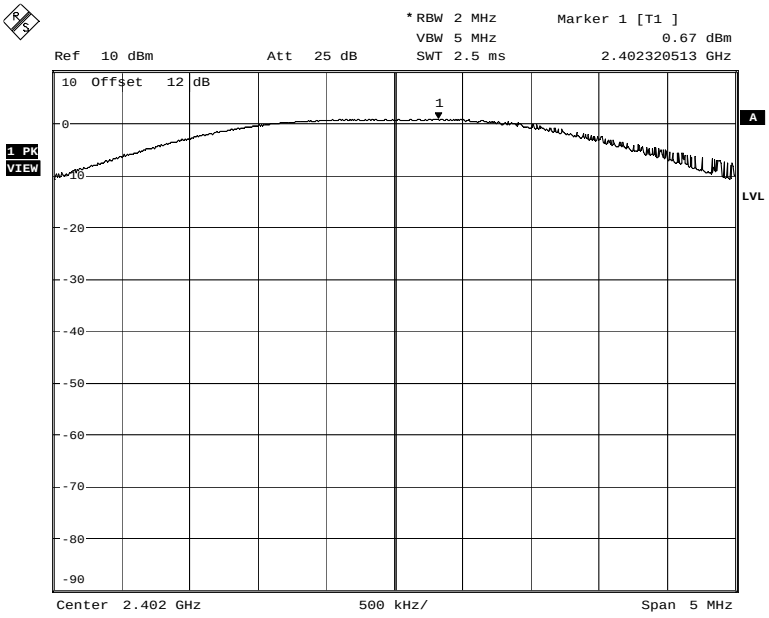
Conducted Output Power:

The output power was measured at +/-15% of the supply voltage and found that there was no change.

Note: The EUT was modified by the manufacturer to perform conducted measurements.

Channel Range	Measured Output Power (W)
Low	0.0012W (0.67dBm)
Mid	0.0011W (0.25dBm)
High	0.0009W (-0.13dBm)

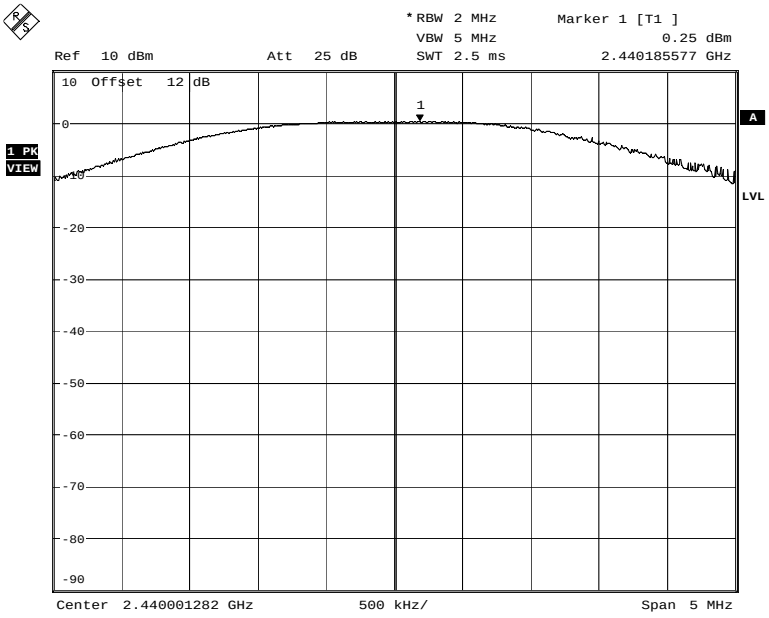
Low Channel:



Output Power - Low Channel

Date: 30.MAY.2006 11:59:23

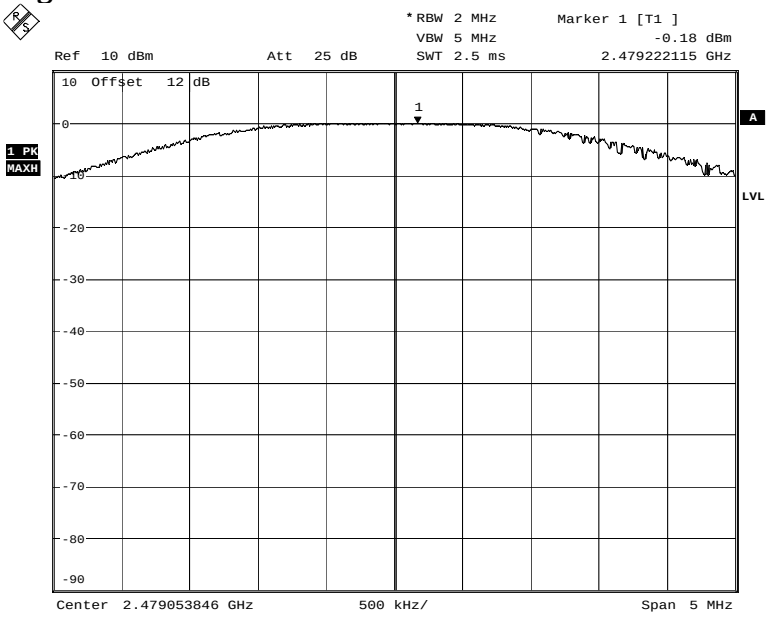
Mid Channel:



Output Power - Mid Channel

Date: 30.MAY.2006 12:01:47

High Channel:



Output Power - High Channel
Date: 30.MAY.2006 12:03:39

Clause 15.247(b)(4) Maximum peak output power

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Conditions:

Sample Number:	5	**Temperature:**	19
Date:	June 1, 2006	**Humidity:**	88
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	OATS

Test Results:

Radiated Output Power:

Ch.	Freq.	Pol V/H	ANT.	Rx dBuV	Cable loss dB	Ant Factor dB/m	F.S. dBuV/m
low	2402.0000	V	Horn1	62.5	4.9	28.8	96.2
	2402.0000	H	Horn1	62.0	4.9	28.8	95.7
mid	2440.0000	V	Horn1	59.3	5.0	28.8	93.1
	2440.0000	H	Horn1	61.2	5.0	28.8	95.0
high	2479.0000	V	Horn1	60.2	5.1	28.8	94.0
	2479.0000	H	Horn1	61.3	5.1	28.8	95.2

Measured value (V/m) = $10^{(FS/20)}$ = 0.064565422V/m

Output Power (W) = $\frac{E^2R^2}{30}$ = 0.00125W (0.97dBm)

Limit = 36dBm

E = Measured Value (V/m)
R = Measurement distance

Additional Observations:

All Measurements were performed at 3m using a 1MHz RBW/VBW.

Clause 15.247(d) Radiated Emissions Not in Restricted Bands

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Conditions:

Sample Number:	5	**Temperature:**	19
Date:	June 1, 2006	**Humidity:**	88
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	OATS

Test Results:

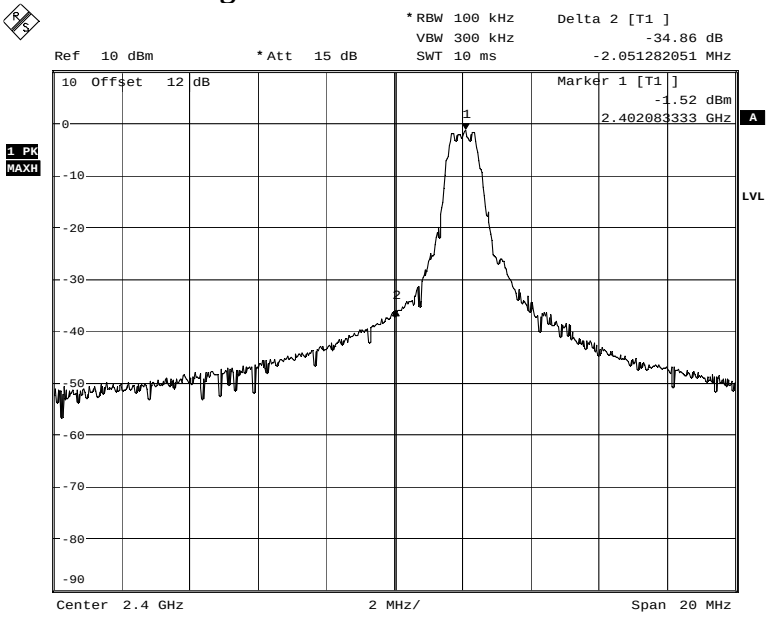
See Attached Table and Plots.

Additional Observations:

The Spectrum was searched from 30MHz to 25GHz and no spurious emissions were detected within 20dB below the limit.

All measurements were performed using a Peak detector with 100kHz RBW/VBW below 1GHz and 1MHz RBW/VBW above 1GHz and were found to be compliant with the average limit.

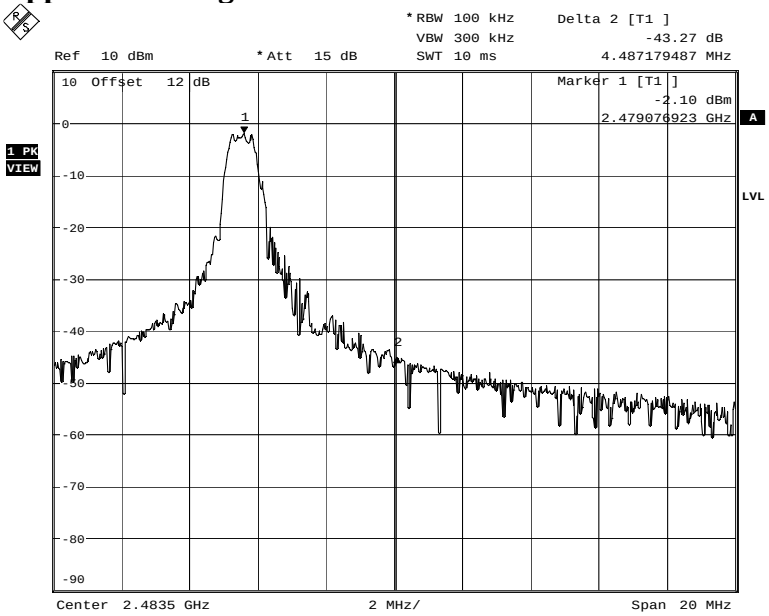
Lower Band Edge:



Lower Bandedge

Date: 30.MAY.2006 14:47:11

Upper Band Edge:



Upper Bandedge

Date: 30.MAY.2006 14:49:45

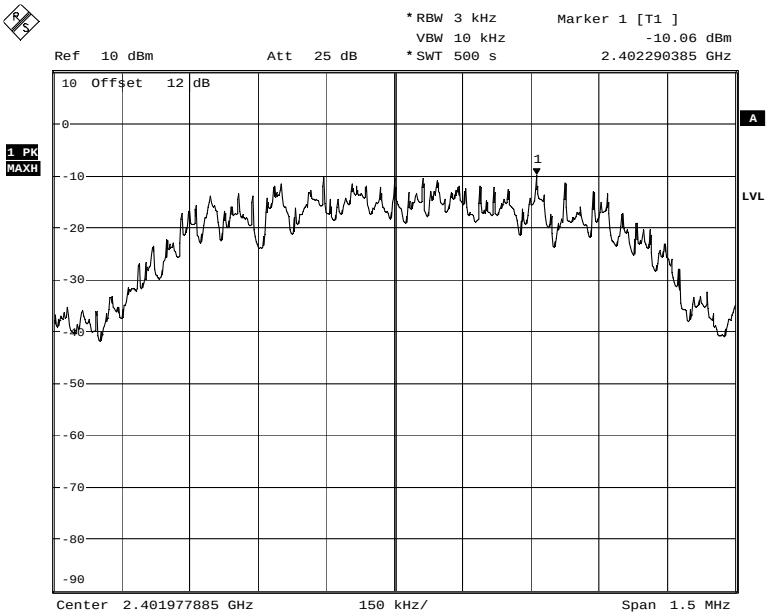
Clause 15.247(e) Power Spectral Density for Digitally Modulated Devices

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Conditions:

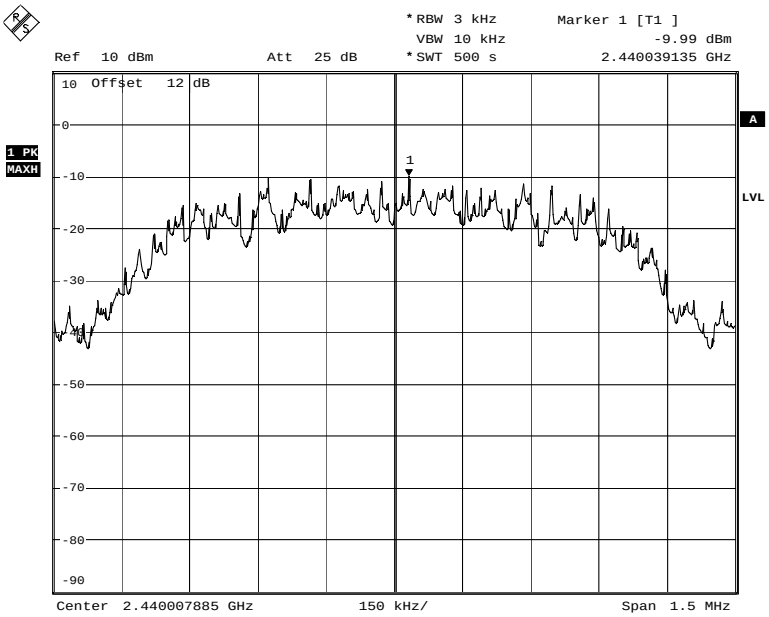
Sample Number:	5	**Temperature:**	24
Date:	May 29, 2006	**Humidity:**	36
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:



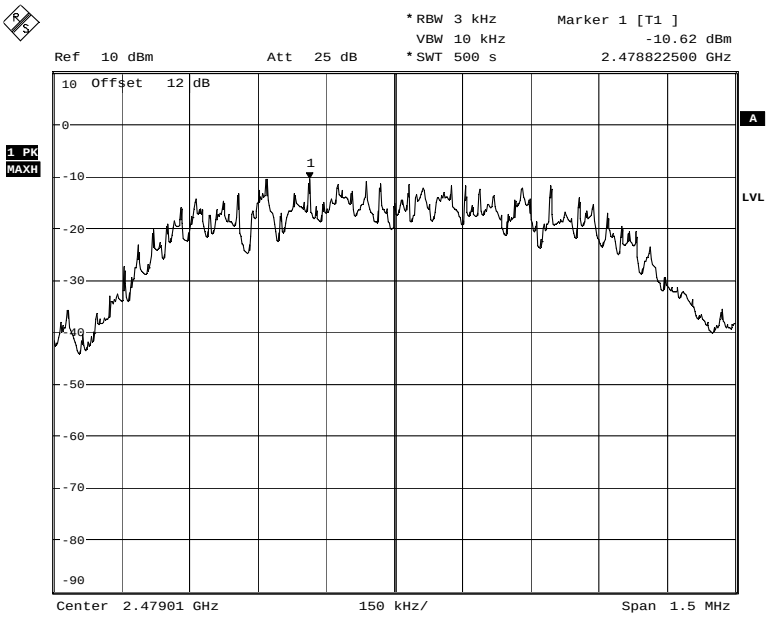
PSD - Low Channel

Date: 30.MAY.2006 13:44:58



PSD - Mid Channel

Date: 30.MAY.2006 14:08:46



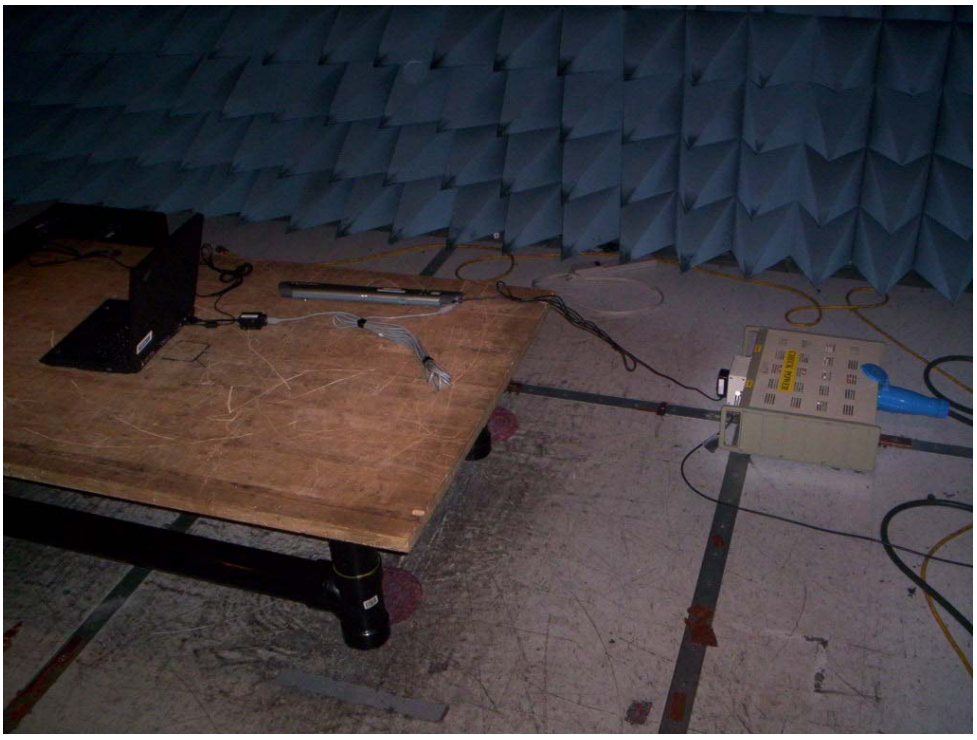
PSD - High Channel

Date: 30.MAY.2006 14:40:58

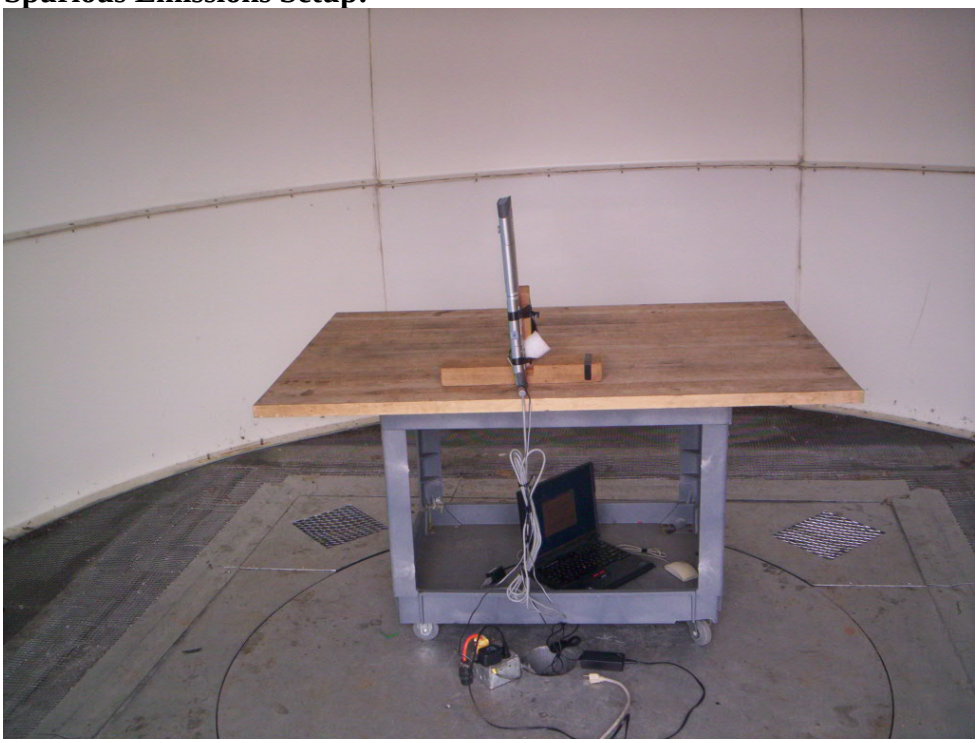
Appendix B : Setup Photographs

Conducted Emissions Setup:
USB Powered

DC Powered

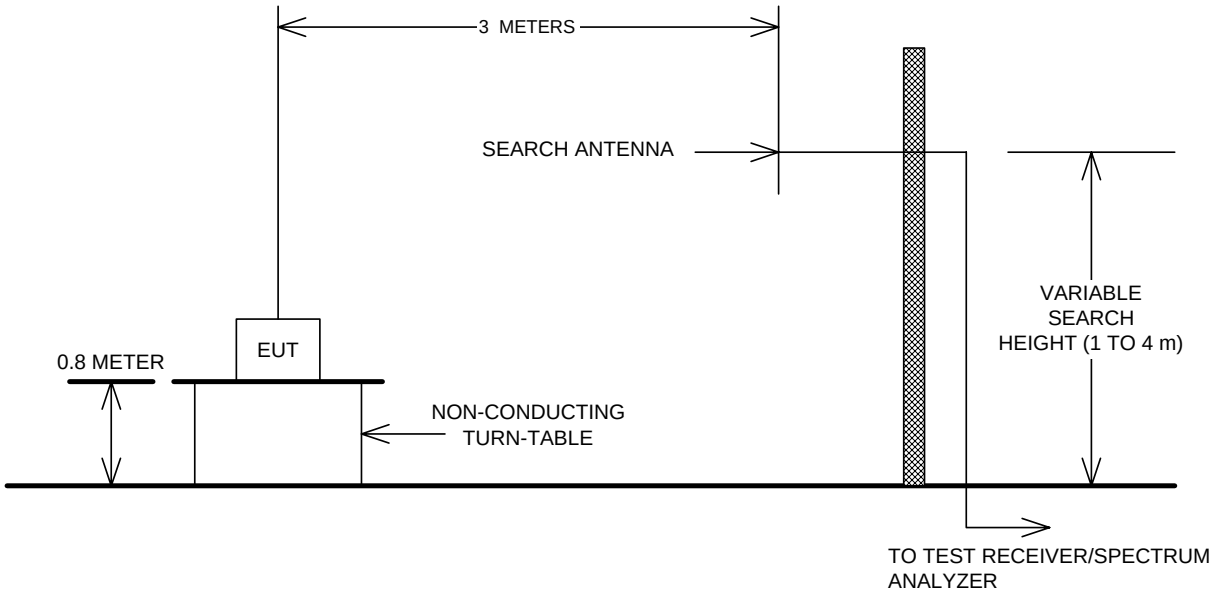


Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions