TEST REPORT

FROM

SIEMIC, INC.
Accessing global markets

FOR

MR2000

(2000 Watt Dimmer)

TO

47 CFR 15.247(f):2005

Test Report Serial No.:
SL06083001-WAT-001

This report supersedes None

Remarks: Equipment complied with the specification [X]
Equipment did not comply with the specification [ ]

This Test Report is Issued Under the Authority of:

.....
Tested by: Kerwinn Corpuz, Test Engineer

.....
Reviewed by: Leslie Bai, Lab Manager

Issue date: 19 September 2006
Manufacturer: The Wattstopper, Inc.

Registration No. 783147 | Registration No. 4842 | Lab Code: KR0032 | RTA No. D23/16V

NVLAP Lab Code: 200729-0

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Executive Summary

The purpose of this test programme was to demonstrate compliance of the The Wattstopper, Inc., MR2000 (2000 Watt Dimmer) against the current 47 CFR 15.247(f):2005. The MR2000 demonstrated compliance with the 47 CFR 15.247(f):2005.

The Wattstopper, Inc. is the applicant and claimed manufacturer of this tested product. For the detailed description of this product, please refer to the MR2000 User Manual.

The equipment under test is a *hybrid system* operating in the 902-928MHz band.

The equipment was tested with the following antenna:
Liberal Industrial Limited, Part Number B13915L088808; 3 dBi Dipole antenna

The test has demonstrated that this unit complies with stipulated standards.

EUT Sample

1 Technical Details

Purpose	Compliance testing of MR2000 with 47 CFR 15.247(f):2005
Applicant / Client	The Wattstopper, Inc. 6212 Corte Del Abeto, Suite 200 Carlsbad, CA 92009
Manufacturer	The Wattstopper, Inc.
Laboratory performing the tests	SIEMIC Labs 2206 Ringwood Avenue San Jose, CA 95131
Test location(s)	SIEMIC Labs 2206 Ringwood Avenue San Jose, CA 95131
Test report reference number	SL06083001-WAT-001
Date EUT received	6 September 2006
Standard applied	47 CFR 15.247(f):2005
Dates of test (from – to)	7 September 2006 to 18 September 2006
No of Units:	1
Equipment Category:	DTS
Trade/Product Name:	MR2000
Type/Model Name/No:	MR2000
Technical Variants:	MR2000
FCC ID No.	Q4BMR2K

2 Tests Required

The product was tested in accordance with the following specifications.
The test results recorded in this Test Report are exclusively referred to the tested sample(s).

Test Standard		Description	Pass / Fail
47 CFR Part 15.247: 2005	RSS 210 Issue6: 2005		
15.203		Antenna Requirement	Pass
15.205	RSS210(A8.5)	Restricted Band of Operation	Pass
15.207(a)	RSSGen(7.2.2)	Conducted Emissions Voltage	Pass
15.247(a)(1)	RSS210(A8.1)	Channel Separation	Pass
15.247(a)	RSS210(A8.1)	Occupied Bandwidth	Pass
15.247(a)(1)	RSS210(A8.1)	Number of Hopping Channels	Pass
15.247(a)(1)	RSS210(A8.1)	Time of Occupancy	Pass
15.247(b)	RSS210(A8.4)	Output Power	Pass
15.247(c)	RSS210(A8.4)	Antenna Gain > 6 dBi	N/A
15.247(d)	RSS210(A8.5)	Conducted Spurious Emissions	Pass
15.209; 15.247(d)	RSS210(A8.5)	Radiated Spurious Emissions	Pass
15.247(e)	RSS210(A8.3)	Power Spectral Density	Pass
15.247(f)	RSS210(A8.3)	Hybrid System Requirement	Pass
15.247(g)	RSS210(A8.1)	Hopping Capability	Pass
15.247(h)	RSS210(A8.1)	Hopping Coordination Requirement	Pass
15.247(i)	RSSGen(5.5)	Maximum Permissible Exposure	Pass
	RSSGen(4.8)	Receiver Spurious Emissions	N/A*
ANSI C63.4: 2003			

Notes: Deviations to above standards are outlined in specific test sections if applicable.
Cable loss and external attenuation are compensated for in the measurement system when applicable.
** FCC Application only.*

3 Antenna Requirement

Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

a) Antenna must be permanently attached to the device.

b) Antenna must use a unique type of connector to attach to the device.

c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

This device requires professional installation which meets the requirement.

Antenna: Liberal Industrial Limited, Part Number B13915L088808; 3 dBi Dipole antenna

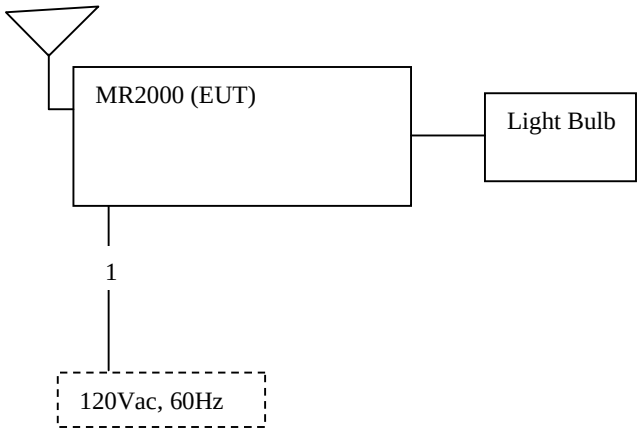
Antenna Sample

4 Measurements, Examinations and Derived Results

4.1 General observations

Equipment serial number(s)		
Module:	Part number:	Serial number:
MR2000	MR2000	none

4.2 Test Configuration



Note: during radiated and conducted emission test, the spectrum analyzer was replaced with an antenna.

EUT Cabling Information:

Cable #	Type of Cable	Connector Type	Length (m)	Shield (Y/N)	Remark
1	AC	Standard 2 prong	1.5	No	This cable was made for test purpose only.

Support Equipment:

Type of Equipment	Manufacturer	Model
100 Watt Light Bulb	PHILIPS	100W

4.3 Test Results

4.3.1 Conducted Emissions Voltage

Requirement(s): 47 CFR §15.207 & RSS-Gen Issue 1(7.2.2)

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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

Procedures:

The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. The power supply for the EUT was fed through a 50Ω/50µH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. All other supporting equipment were powered separately from another mains.

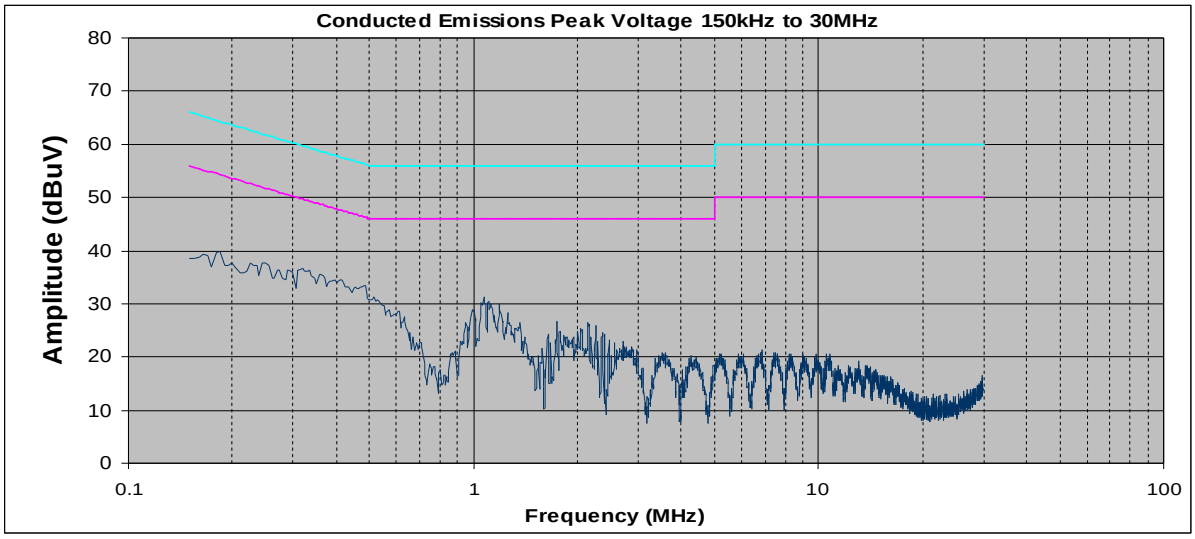
The EUT was switched on and allowed to warm up to its normal operating condition. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver. High peaks, relative to the limit line, were then selected. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Quasi-peak and Average measurements were made. The procedure was then repeated for the PHASE line.

Sample Calculation

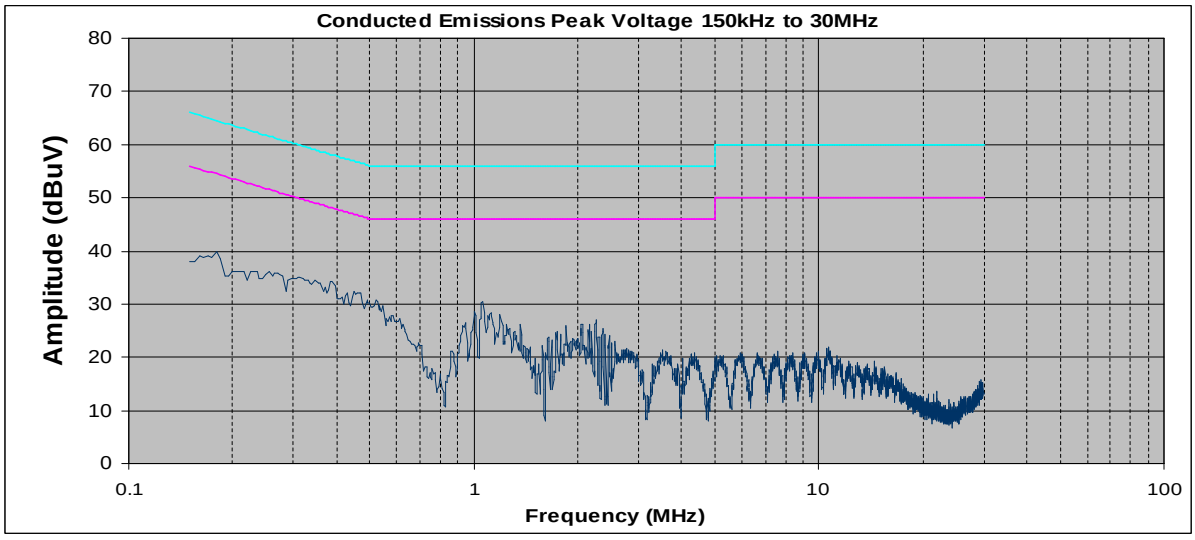
Corrected Reading = EMI Receiver reading + Transducer Factor of LISN + Cable Loss + Transient Limiter (if applicable).

Margin = Corrected Reading – Limit.

Results:



Neutral Plot



Phase Plot

LINE	FREQ (MHz)	Corrected Amplitude (dBµV) PK	Limit (dBµV) QP	Margin (dB) QP	Corrected Amplitude (dBµV) PK	Limit (dBµV) AVG	Margin (dB) AVG
Neutral	0.32	36.6	59.7	-23.1	36.6	49.7	-13.1
Neutral	0.48	33.5	56.3	-22.8	33.5	46.3	-12.8
Neutral	1.07	31.2	56	-24.8	31.2	46	-14.8
Phase	0.18	39.9	64.4	-28.5	39.9	54.4	-14.5
Phase	0.39	34.3	58	-23.7	34.3	48	-13.7
Phase	1.06	30.5	56	-25.5	30.5	46	-15.5

Conducted Emission Table

Note: PK = peak; QP = quasi-peak; AVG = average detector.

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

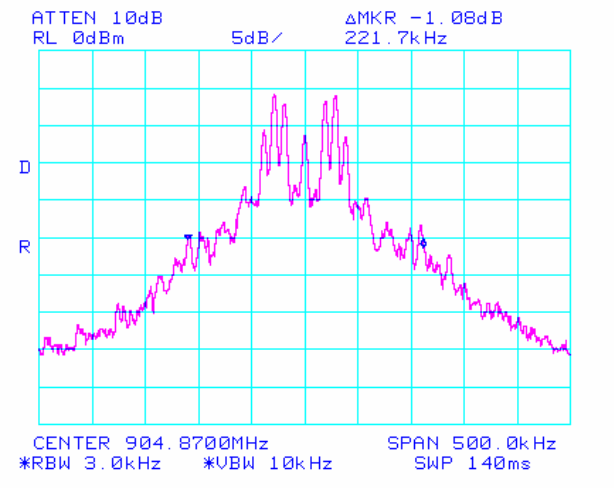
4.3.2 Occupied Bandwidth

Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 Issue 6(A8.1)

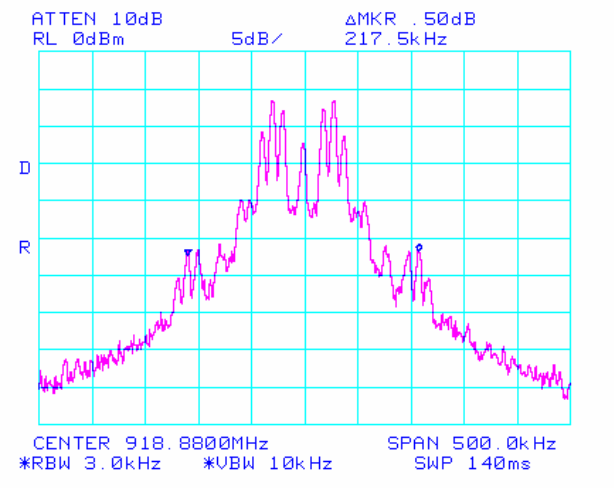
Procedures: The 20dB bandwidths were measured conducted using a spectrum analyzer for the low, mid, and hi channels. 20dB Bandwidth Limit: < 500 kHz.

Results:

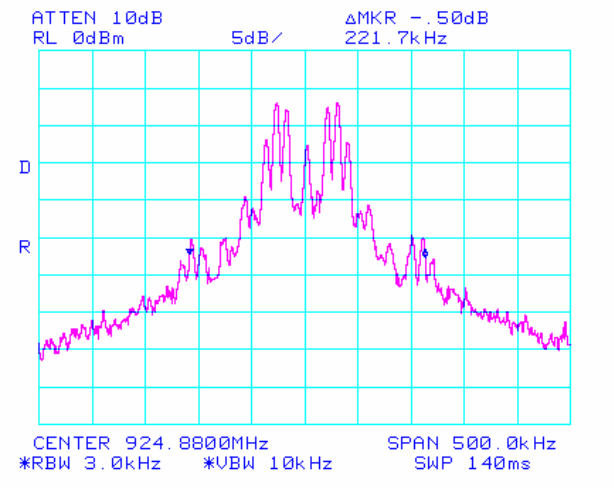
Plot #	Channel frequency (MHz)	Channel	Channel Bandwidth (kHz)
1	904.78	Low	221.7
2	918.88	Mid	217.5
3	924.88	Hi	221.7



Plot 1: 20dB Bandwidth Low



Plot 2: 20dB Bandwidth Mid



Plot 3: 20dB Bandwidth Hi

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

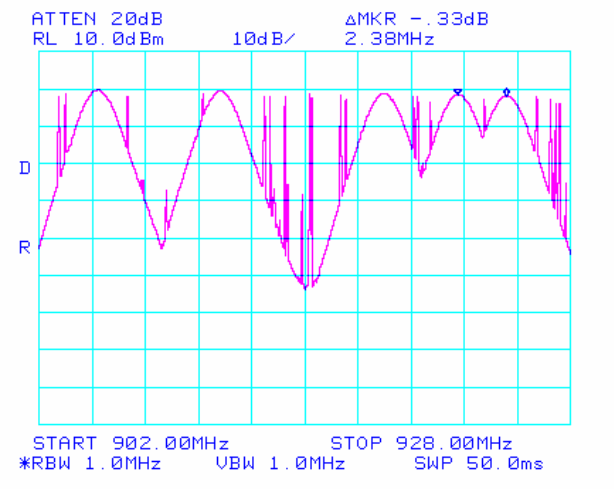
4.3.3 Carrier Frequency Separation

Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 (A8.1)

Procedures: The carrier frequency separation measurement was taken conducted using a spectrum analyzer.

Results:

Plot #	Carrier Frequency Separation (MHz)
4	2.38



Plot 4: Carrier Frequency Separation

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

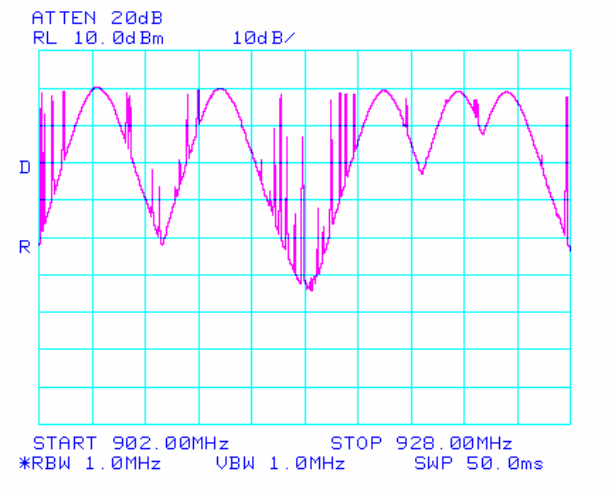
4.3.4 Number of Hopping Channels

Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 (A8.1)

Procedures: The number of hopping channels was measured conducted with a spectrum analyzer.

Results:

Plot #	Number of Hopping Channels
5	5



Plot 5: Number of Hopping Channels

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

4.3.5 Time of Occupancy

Requirement(s): 47 CFR §15.247(f)

Time of occupancy shall not be greater than 0.4 second within a period of 0.4 second multiplied by the number of hopping channels (5) = 2.0 seconds

Procedures: The time of occupancy was measured conducted with a spectrum analyzer.

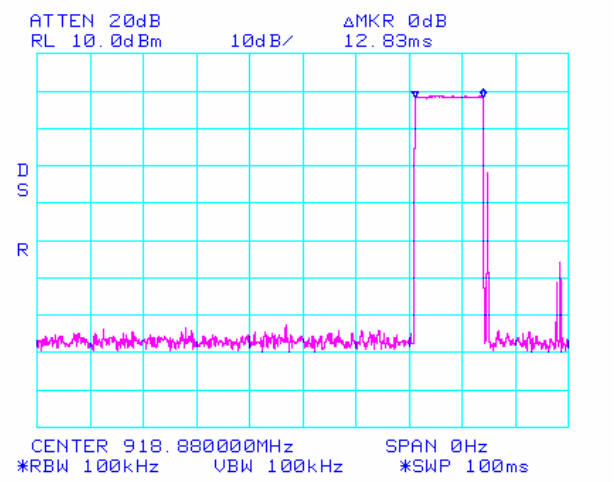
Results:

Plot #	Time of Occupancy (ms)
6 to 7	89.81

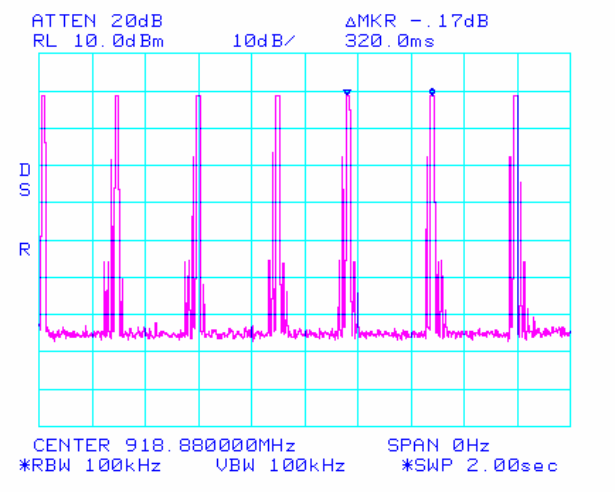
Time of occupancy per period = 12.83ms

Number of periods per 2 seconds = 7 periods

Time of occupancy = 12.83ms * 7 = 89.81ms



Plot 6: Time of occupancy (1 of 2)



Plot 7: Time of occupancy (2 of 2)

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

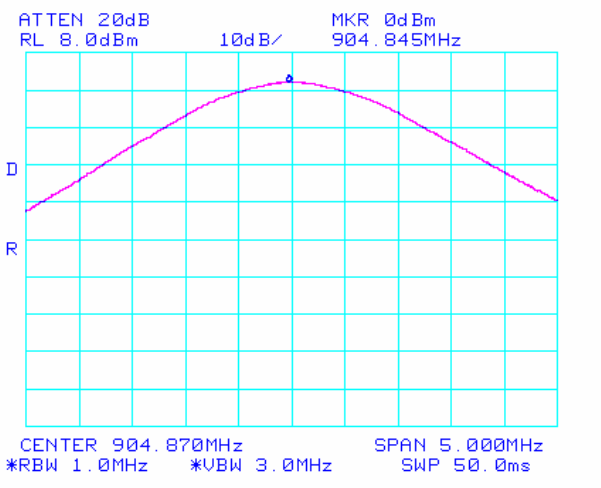
4.3.6 Peak Output Power

Requirement(s): 47 CFR §15.247(b) & RSS-210 (A8.4)

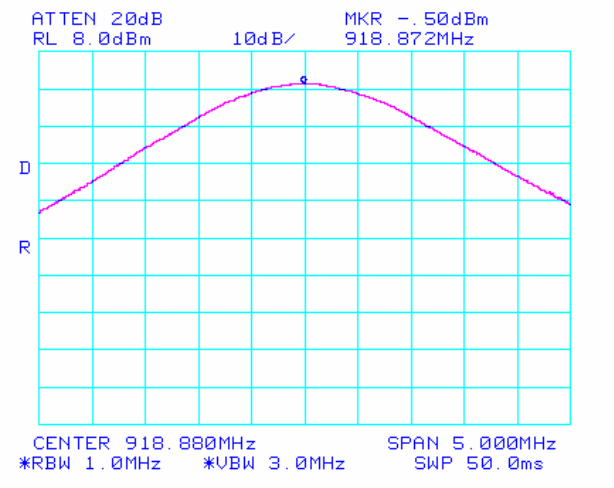
Procedures: The peak output power was measured conducted using a spectrum analyzer for the low, mid, and hi channels.

Results:

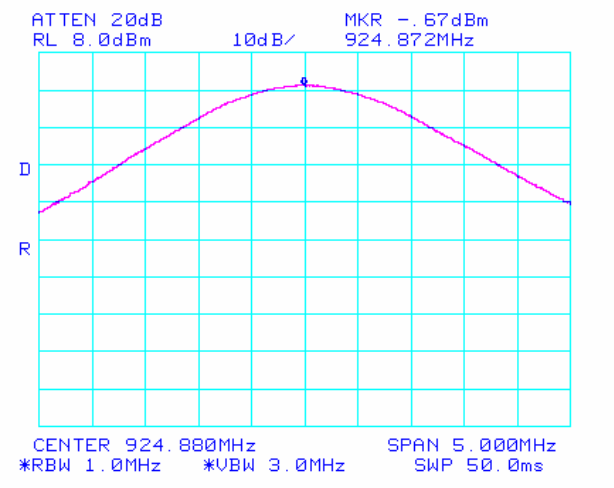
Plot #	Channel Frequency (MHz)	Channel	Peak Power (dBm)	Peak Power (milliWatt)
8	904.78	Low	0	1
9	918.88	Mid	-0.5	0.891
10	924.88	Hi	-0.67	0.857



Plot 8: Peak Power Low



Plot 9: Peak Power Mid



Plot 10: Peak Power Hi

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

4.3.7 Peak Power Spectral Density

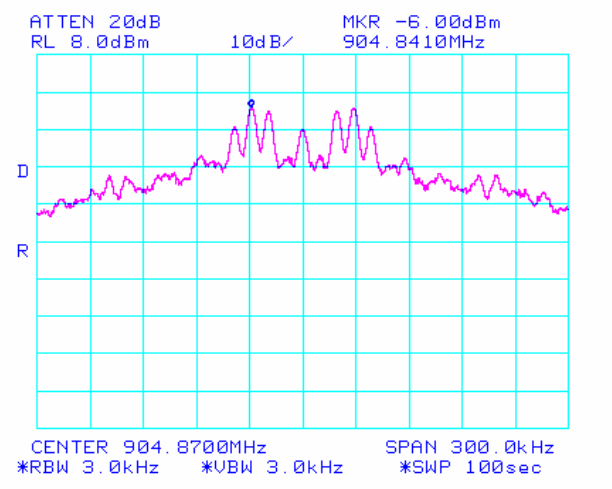
Requirement(s): 47 CFR §15.247(e) & RSS-210 (A8.3)

Procedures: The peak power spectral density measured at the antenna terminal using a spectrum analyzer for the low, mid, and hi channels.

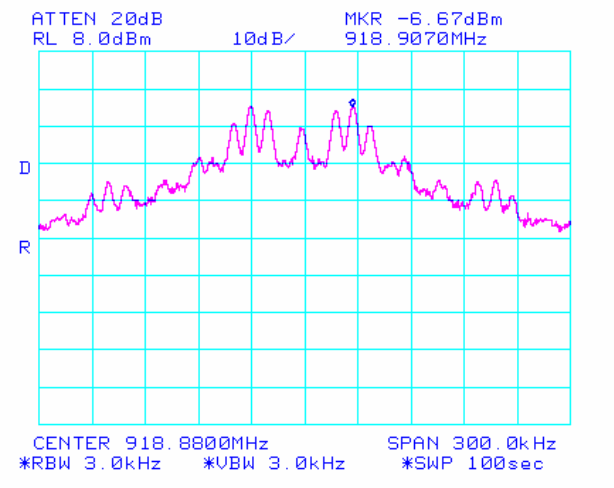
Spectrum Analyzer setting: Bandwidth = 3 kHz; Span = 300 kHz; Sweep Time = 100 sec.

Results:

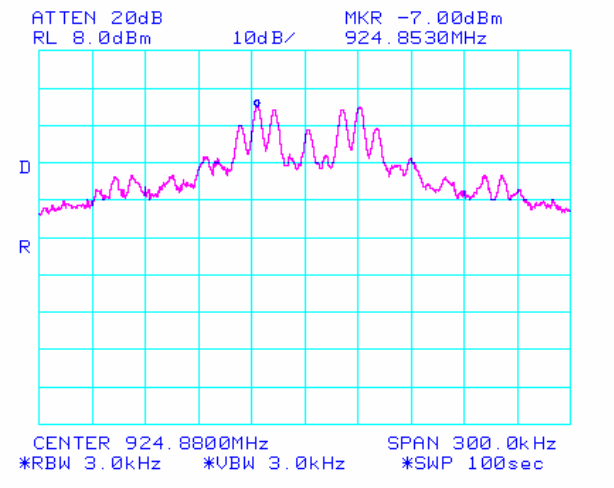
Plot #	Channel Frequency (MHz)	Channel	PPSD (dBm/3 kHz)	Limit (dBm/3 kHz)
11	904.78	Low	-6.0	8
12	918.88	Mid	-6.67	8
13	924.88	Hi	-7.0	8



Plot 11: Peak Power Spectral Density Low



Plot 12: Peak Power Spectral Density Mid



Plot 13: Peak Power Spectral Density Hi

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

4.3.8 Spurious Emissions at Antenna Terminals

Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

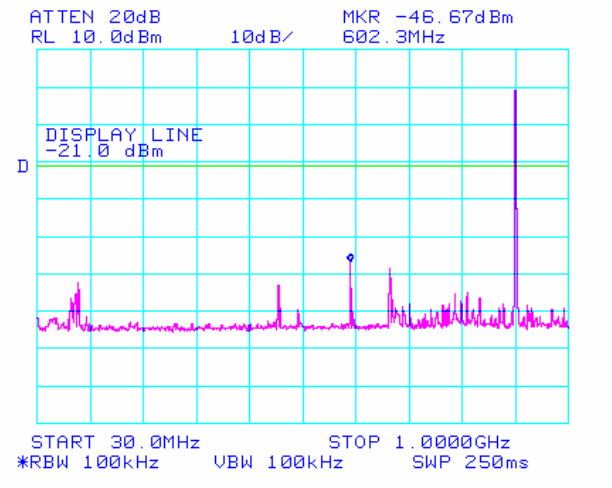
Procedures: The conducted spurious emissions were measured conducted using a spectrum analyzer for the low, mid, and hi channels.

The spurious limit: – 21 dBm

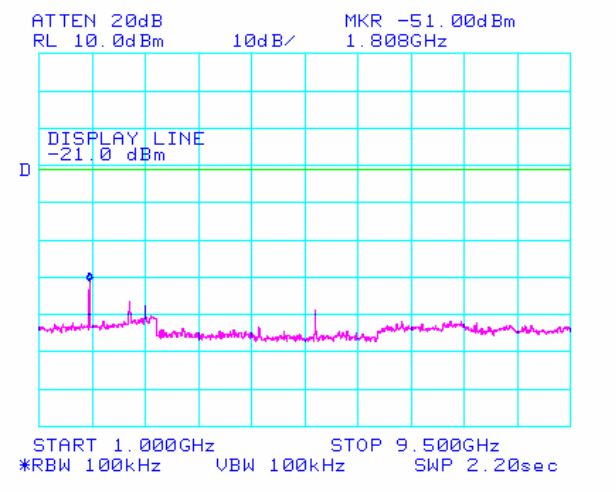
Results:

Plots #	Channel Frequency (MHz)	Channel	Pass/Fail
14 to 15	904.78	Low	Pass
15 to 16	918.88	Mid	Pass
17 to 18	924.88	Hi	Pass

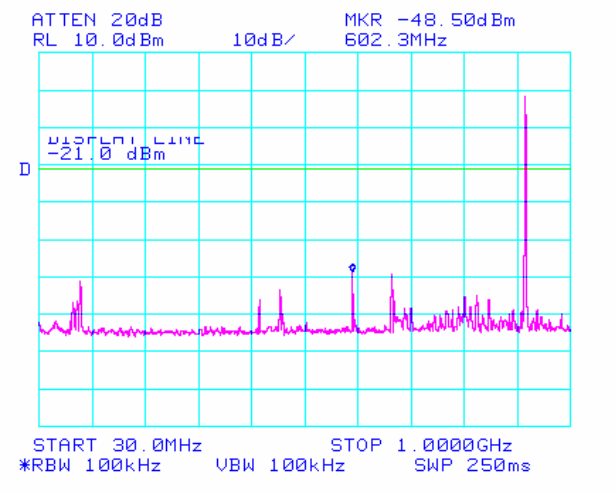
Note: Emission over the limit line in the following plots is the fundamental.



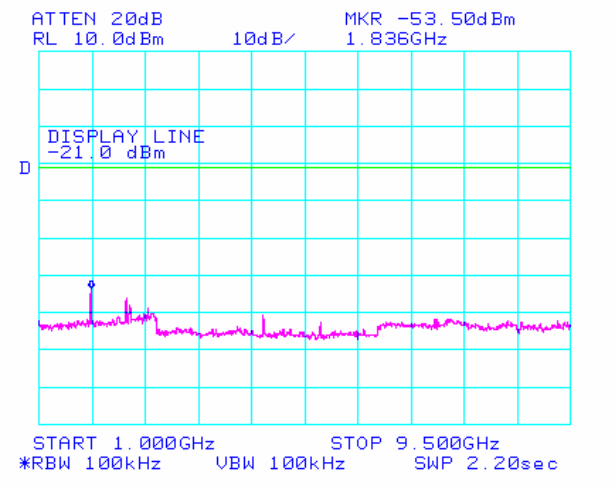
Plot 14: Conducted Spurious Emissions Low 1/2



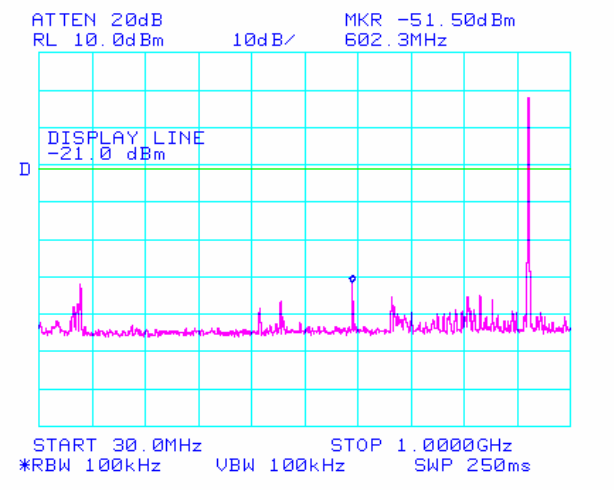
Plot 15: Conducted Spurious Emissions Low 2/2



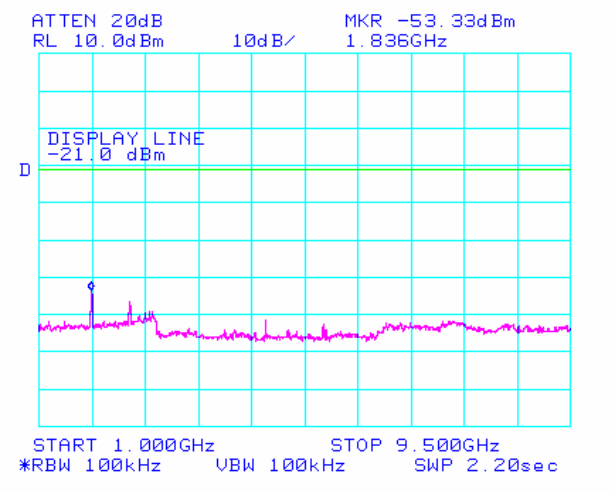
Plot 16: Conducted Spurious Emissions Mid 1/2



Plot 17: Conducted Spurious Emissions Mid 2/2



Plot 18: Conducted Spurious Emissions Hi 1/2



Plot 19: Conducted Spurious Emissions Hi 2/2

Tested By: Kerwinn Corpuz

Date Tested: 7 September 2006

4.3.9 Radiated Spurious Emissions < 1 GHz

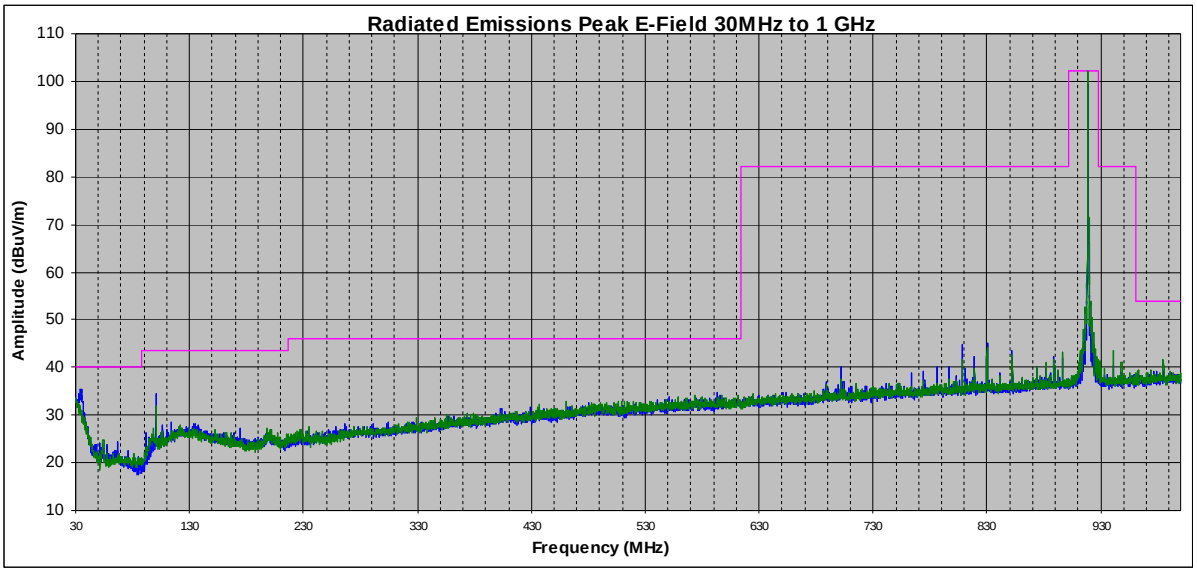
Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

Procedures: Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. Preliminary test were made to Low, Mid and High channel with the worse case protocol reported. Note that while single channel mode is set, the side skirts of the fundamental is the same emissions.

The limit is converted from microvolts/meter to decibel microvolts/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude(dBµV/m) + ACF(dB) + Cable Loss(dB)

Results: Vertical Polarization | Horizontal Polarization | Limit



Radiated Emissions Plot

Frequency	Azimuth	Measure	Antenna Polarity	Antenna Height	Raw Amplitude @ 3m	ACF	CBL loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(MHz)	(degrees)	(Avg/QP/Pk)	(H/V)	(m)	(dBuV/m)	(dBm)	(dBm)	(dBuV/m)	(dBuV/m)	(dBuV/m)
34.46	350	Pk	v	1	17.3	17.48	0.71	35.49	40	-4.51

Note: Emission collected is the worse case using Restricted Band Limit.

Tested By: Kerwinn Corpuz

Date Tested: 18 September 2006

4.3.10 Radiated Spurious Emissions > 1 GHz

Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

Procedures: Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 10Hz video bandwidth. Peak measurement was taken with 1 MHz BW. The EUT was tested at low, mid and high with the highest output power.

Sample Calculation:

EUT Field Strength = Raw Amplitude(dBµV/m) – Amplifier Gain(dB) + Antenna Factor(dB) + Cable Loss(dB) + Filter Attenuation(dB, if used)

Results:

f_o = 0.90478 GHz (Low)

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 1m	Pre Amp	ACF	Cable Loss	Distance Corrected Factor	Duty Cycle	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8097	0	Pk	H	1.1	75.8	32.02	28.30	2.01	9.54	0	64.56	74	-9.44
1.8097	0	Avg	H	1.1	75.2	32.02	28.30	2.01	9.54	17.8	46.16	54	-7.84
2.7146	35	Pk	H	1.1	76.4	32.19	31.13	2.51	9.54	0	68.31	74	-5.69
2.7146	35	Avg	H	1.1	76	32.19	31.13	2.51	9.54	17.8	50.11	54	-3.89
3.6194	40	Pk	H	1.1	58.4	32.37	33.02	2.99	9.54	0	52.50	74	-21.50
3.6194	40	Avg	H	1.1	56.5	32.37	33.02	2.99	9.54	17.8	32.80	54	-21.20
4.5243	65	Pk	H	1.1	55.6	32.49	33.42	3.32	9.54	0	50.30	74	-23.70
4.5243	65	Avg	H	1.1	53.5	32.49	33.42	3.32	9.54	17.8	30.40	54	-23.60
1.8097	280	Pk	V	1	69.2	32.02	27.94	2.01	9.54	0	57.59	74	-16.41
1.8097	280	Avg	V	1	68.7	32.02	27.94	2.01	9.54	17.8	39.29	54	-14.71
2.7146	315	Pk	V	1	68.2	32.19	30.92	2.51	9.54	0	59.91	74	-14.09
2.7146	315	Avg	V	1	67.2	32.19	30.92	2.51	9.54	17.8	41.11	54	-12.89
3.6194	0	Pk	V	1	60.7	32.37	32.65	2.99	9.54	0	54.43	74	-19.57
3.6194	0	Avg	V	1	59.4	32.37	32.65	2.99	9.54	17.8	35.33	54	-18.67
4.5243	315	Pk	V	1	51.9	32.49	33.42	3.32	9.54	0	46.61	74	-27.39
4.5243	315	Avg	V	1	48.9	32.49	33.42	3.32	9.54	17.8	25.81	54	-28.19

f_o = 0.91888 GHz (Mid)

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 1m	Pre Amp	ACF	Cable Loss	Distance Corrected Factor	Duty Cycle	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8377	315	Pk	H	1.1	74.8	32.02	28.45	2.03	9.54	0	63.72	74	-10.28
1.8377	315	Avg	H	1.1	74.5	32.02	28.45	2.03	9.54	17.8	45.62	54	-8.38
2.7566	30	Pk	H	1.1	75.7	32.21	31.31	2.54	9.54	0	67.80	74	-6.20
2.7566	30	Avg	H	1.1	75.4	32.21	31.31	2.54	9.54	17.8	49.70	54	-4.30
3.6755	40	Pk	H	1.1	56.2	32.37	33.14	3.02	9.54	0	50.45	74	-23.55
3.6755	40	Avg	H	1.1	54.2	32.37	33.14	3.02	9.54	17.8	30.65	54	-23.35
4.5944	80	Pk	H	1.1	57.8	32.51	33.50	3.35	9.54	0	52.61	74	-21.39
4.5944	80	Avg	H	1.1	56	32.51	33.50	3.35	9.54	17.8	33.01	54	-20.99
1.8377	260	Pk	V	1	70.1	32.02	28.06	2.03	9.54	0	58.63	74	-15.37
1.8377	260	Avg	V	1	69.5	32.02	28.06	2.03	9.54	17.8	40.23	54	-13.77
2.7566	45	Pk	V	1	67.7	32.21	31.15	2.54	9.54	0	59.64	74	-14.36
2.7566	45	Avg	V	1	67	32.21	31.15	2.54	9.54	17.8	41.14	54	-12.86
3.6755	0	Pk	V	1	59.9	32.37	32.80	3.02	9.54	0	53.81	74	-20.19
3.6755	0	Avg	V	1	58.8	32.37	32.80	3.02	9.54	17.8	34.91	54	-19.09
4.5944	70	Pk	V	1	57.4	32.51	33.51	3.35	9.54	0	52.21	74	-21.79
4.5944	70	Avg	V	1	55.8	32.51	33.51	3.35	9.54	17.8	32.81	54	-21.19

f_o = 0.92488 GHz (High)

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 1m	Pre Amp	ACF	Cable Loss	Distance Corrected Factor	Duty Cycle	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8497	320	Pk	H	1.1	73.9	32.02	28.51	2.03	9.54	0	62.88	74	-11.12
1.8497	320	Avg	H	1.1	73.5	32.02	28.51	2.03	9.54	17.8	44.68	54	-9.32
2.7746	30	Pk	H	1.1	74.2	32.23	31.39	2.55	9.54	0	66.37	74	-7.63
2.7746	30	Avg	H	1.1	73.8	32.23	31.39	2.55	9.54	17.8	48.17	54	-5.83
3.6995	45	Pk	H	1.1	54.4	32.37	33.19	3.03	9.54	0	48.71	74	-25.29
3.6995	45	Avg	H	1.1	52.1	32.37	33.19	3.03	9.54	17.8	28.61	54	-25.39
4.6244	60	Pk	H	1.1	60.1	32.51	33.55	3.36	9.54	0	54.96	74	-19.04
4.6244	60	Avg	H	1.1	59.8	32.51	33.55	3.36	9.54	17.8	36.86	54	-17.14
1.8497	30	Pk	V	1	69.5	32.02	28.11	2.03	9.54	0	58.08	74	-15.92
1.8497	30	Avg	V	1	68.7	32.02	28.11	2.03	9.54	17.8	39.48	54	-14.52
2.7746	35	Pk	V	1	67.6	32.23	31.24	2.55	9.54	0	59.63	74	-14.37
2.7746	35	Avg	V	1	67	32.23	31.24	2.55	9.54	17.8	41.23	54	-12.77
3.6995	45	Pk	V	1	58	32.37	32.87	3.03	9.54	0	51.99	74	-22.01
3.6995	45	Avg	V	1	56.5	32.37	32.87	3.03	9.54	17.8	32.69	54	-21.31
4.6244	50	Pk	V	1	59.8	32.51	33.56	3.36	9.54	0	54.67	74	-19.33
4.6244	50	Avg	V	1	58.2	32.51	33.56	3.36	9.54	17.8	35.27	54	-18.73

Note 1: Duty cycle calcuation: 20 log(dwell time / 100ms) = 20 log(12.83ms / 100ms) = 17.8 dB. Duty Cycle was applied to average measurements.

Note 2: Emissions after 5th harmonic are noise floor.

Tested By: Kerwinn Corpuz

Date Tested: 12 September 2006

5 TEST INSTRUMENTATION

5.1 TEST INSTRUMENTATION

Instrument	Manufacturer	Model	CAL Due Date
Spectrum Analyzer	HP	8568B	04/26/2007
Quasi-Peak Adapter	HP	85650A	04/26/2007
RF Pre-Selector	HP	85685A	04/26/2007
Spectrum Analyzer	HP	8564E	12/29/2006
Power Meter	HP	437B	04/26/2007
Power Sensor	HP	8485A	04/26/2007
Bilog Antenna	Sunol Sciences, Inc.	JB1	09/11/2007
Horn Antenna	Emco	3115	08/17/2007
Horn Antenna	Emco	3115	See Note
Signal Generator	Wiltron	68169B	04/26/2007
Chamber	Lingren	3m	08/21/2007
Pre-Amplifier	HP	8449	05/01/2007
Variac	KRM	AEEC-2090	See Note
Environment Chamber	TestEquity	1007H	10/27/2006
DMM	Fluke	51II	See Note
900 MHz Notch Filter	AWID	N/A	See Note
4GHz High Pass Filter	LORCH Microwave	4HPD-X4000-3R	See Note

APPENDIX A: EUT TEST CONDITIONS

The following is the description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Cable Description
Wattstopper MR2000 Wattstopper MR2000	1. Power cord

EUT Description	:	2000 Watt Dimmer
Model No	:	MR2000
Serial No	:	none

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
	The EUT was controlled via the dimmer switch to enter test modes necessary to complete the testing.

APPENDIX B: External Photos

See Attachment

APPENDIX C: CIRCUIT/BLOCK DIAGRAMS

See Attachment

APPENDIX D: Internal Photos

See Attachment

APPENDIX E: PRODUCT DESCRIPTION

Detail description of this product is shown in the User's Guide.

APPENDIX F: FCC LABEL LOCATION

See Attachment

APPENDIX G: USER MANUAL

See Attachment

END OF REPORT