



LS Research, LLC
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COMPLIANCE TESTING OF:

EmbedTek Light Controller

PREPARED FOR:

EmbedTek, LLC
Attn: Mr. Kent Tabor
1115 Cottonwood Ave
Suite 100
Hartland, WI 53029-8309

TEST REPORT NUMBER:

307467

LSR Job # C-268

TEST DATE(S):

January 3-5,8,&11, 2008

All results of this report relate only to the items that were tested. This report is not to be reproduced, except in full, without written approval of LS Research, LLC.

Table of Contents

Section Index	Description	Page
1	LS Research, LLC in Review	3
2	Signature Page	4
3	Product and General Information	5
4	Introduction	5
5	Product Description	5
6	EUT's Technical Specifications	6
7	Test Requirements	6
8	Summary of Test Report	7
9	Radiated Emissions Test	8-16
10	Conducted Emissions Test, AC Power Line	17-21
11	Band-Edge Measurements	22
Appendix		
A	Test Equipment List	23

1. LS Research, LLC In Review

LS Research, LLC - Accreditations and Listing's

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025 : 2005
with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: 1255.01

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: IC 3088

U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility –Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2)

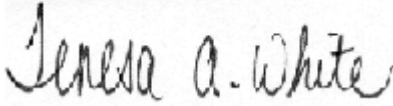
Date of Validation: January 16, 2001

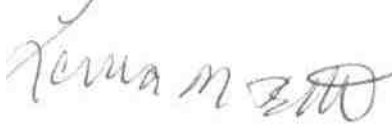
Validated by the European Commission as a U.S. Notified Body operating under the U.S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.


Date of Validation: November 20, 2002

Notified Body Identification Number: 1243

2. Signature Page

Reviewed By:  March 18, 2008
Teresa A. White, Quality Manager Date

Tested By:  March 18, 2008
Laura Bott, EMC Engineer Date

Approved By:  March 18, 2008
Brian E. Petted, VP of Engineering Date

3. Product and General Information

Manufacturer:	EmbedTek, LLC.				
Date(s) of Test:	January 3-5 and 8, 2008				
Test Engineer(s):	√	Laura Bott		Ryan Urness	Ken Boston
Model #:	2WT-2RA-R6				
Serial #:	n/a				
Voltage:	110 VAC				
Operation Mode:	Normal				

4. Introduction

On January 3-5 & 8, 2008 a series of Conducted and Radiated Emission tests were performed on one sample of the Light Controller, Model Number 2WT-2RA-R6, henceforth referred to as the "Equipment Under Test" or "EUT". These tests were performed using the procedures outlined in ANSI C63.4-2003 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.249 (Industry Canada RSS-210, Issue 7, 2007) for a low power transmitter.

All Radiated and Conducted Emission tests were performed upon the EUT to measure the emissions in the frequency bands described in FCC Title 47 CFR Part 15, including 15.35, 15.209, 15.249 and Industry Canada RSS-210, Issue 7, 2007 to determine whether these emissions are below the limits expressed within the standards. These tests were performed in accordance with the procedures described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003). Another document used as a reference for the EMI Receiver specification was the Comite International Special Des Perturbations Radioelectriques (CISPR) Number 16-1, 2003.

5. Product Description

The Model 2WT-2RA-R6 Lighting Controller is a radio transceiver designed to control indoor industrial lights. These controller units are attached to the lights and incorporate two relays that allow remote control of up to two independent ballasts per fixture. The 2-way capabilities of the radio allow it to acknowledge that a command has been received and executed.

These modules are used to make a system consisting of a master device and slave devices. The master device will control the slave device(s) and can send an "on" or "off" signal to each slave device. The slave device will then open the relays for a received "off" signal or close the relays for a received "on" signal. The relays on the slave modules are normally closed (NC).

This frequency hopping radio will be capable of operating on up to 33 channels between 907.1 and 923.3 MHz.

6. EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	902-928 MHz
RF Power in Watts	0.0005 W
Field Strength (and at what distance)	92.5 dB μ V/m
Occupied Bandwidth (99% BW) in kHz	N/A
Type of Modulation	FSK
Emission Designator	F0D
Transmitter Spurious (worst case)	52.7 at 2721 MHz
Frequency Tolerance %, Hz, ppm	N/A
Microprocessor Model # (if applicable)	PIC18F24J10/25J10
EUT will be operated under FCC Rule Part(s)	FCC 15.249
Antenna Information	
Detachable/non-detachable	Non detachable
Type	PCB Loop
Gain (in dBi)	N/A
Portable/Mobile	<input type="checkbox"/> Portable <input checked="" type="checkbox"/> Mobile
Modular Filing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

RF Technical Information:

Type of Evaluation (check one)	<input type="checkbox"/>	SAR Evaluation: Device Used in the Vicinity of the Human Head
	<input type="checkbox"/>	SAR Evaluation: Body-worn Device
	<input checked="" type="checkbox"/>	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: General Public Use Controlled Use
- Duty Cycle used in evaluation: N/A %
- Standard used for evaluation: OET 65
- Measurement Distance: 3 m
- RF Value: 0.042168 V/m A/m W/m²
 Measured Computed Calculated

7. Test Requirements

The above mentioned tests were performed in order to determine the compliance of the Light Controller with limits contained in various provisions of Title 47 CFR, FCC Part 15, including:

15.31	15.205
15.33	15.207
15.35	15.209
15.37	15.249

8. Summary of Test Report

DECLARATION OF CONFORMITY

The Light Controller was found to meet the requirements as described within the specification of Title 47 CFR FCC, Part 15.249, Subpart (a); and Industry Canada RSS-210, Issue 7, 2007, Section 6.2 for a '*Non-Momentarily Operated Transmitting Device*'.

If some emissions are seen to be within 3dB of their respective limits, these levels are within the tolerances of the test equipment and site employed. There is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

The enclosed test results pertain to the sample(s) of the test item listed, and only for the tests performed on the data sheets. Any subsequent modification or changes to the test items could invalidate the data contained herein, and could therefore invalidate the findings of this report.

9. Radiated Emissions Test

9.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15 and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal centered on a flush mounted 2-meter diameter turntable inside the 3 Meter Semi-Anechoic, FCC listed Chamber located at LS Research, LLC, Cedarburg, Wisconsin. The EUT only comprised of a radio, which will sit on top of a fluorescent fixture. For compliance testing, only the radio was placed on the pedestal, and the light fixture was set on the grounded turntable. A type 31 material ferrite was clamped around the bundled power cord, to suppress the low band emissions from the light fixture. Three EUT's were tested, each transmitting a single frequency: 907 MHz (low), 914.7 MHz (mid), and 923.3 MHz (high).

9.2 Test Procedure

Radiated Emissions measurements from 30 - 5000 MHz were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber, and frequencies between 5,000 and 10,000 MHz were tested at 1 meter separation distance in an FCC listed mini chamber. The radiated RF emission levels were manually noted at discrete turntable azimuths and measurement antenna heights, corresponding to peak emission levels at various frequencies. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 5 GHz, and the horn was used with a preamp and 900 MHz high pass filter for the measurements from 5-10 GHz. The maximum radiated RF emissions were found by rotating the EUT 360°, and raising and lowering the antenna between 1 and 4 meters, using both horizontal and vertical antenna polarities.

9.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz). From 5 GHz to 10 GHz, an HP E4407 Spectrum Analyzer and an EMCO Horn Antenna were used

9.4 Test Results

The EUT was found to meet the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.249 for a transmitter (Canada RSS-210, Issue 7, 2007). The frequencies with significant signals were recorded and plotted as shown in the Data Charts and Graphs.

9.5 CALCULATION OF RADIATED EMISSIONS LIMITS:

Field Strength of Fundamental Frequencies:

The fundamental emissions for an intentional radiator in the 902-928 MHz band, operating under FCC part 15.249 limits, must have electric field strength of no greater than 50 mV/m, for the fundamental frequency, when measured at 3 meters, and harmonic field strength of no greater than 500 $\mu\text{V/m}$, when measured at 3 meters. Spurious emissions outside the 902-928 MHz band shall be attenuated by at least 50 dB below the level of the fundamental, or meet the limits expressed in FCC part 15.209 under general emission limits.

Field Strength of Fundamental Frequencies is Limited to 50,000 $\mu\text{V/m}$, or 94 dB $\mu\text{V/m}$.

Field Strength of Harmonic and Spurious Frequencies is Limited by FCC 15.249(c)

The harmonic limit of -50 dBc with respect to the fundamental limit would be:

$$94 \text{ dB}\mu\text{V/m} - 50 \text{ dB} = 44 \text{ dB}\mu\text{V/m},$$

with the exception of where FCC 15.209 allows for a higher limit to be used.

Frequency (MHz)	3 m Limit ($\mu\text{V/m}$)	3 m Limit (dB $\mu\text{V/m}$)
902-928	50,000	94.0
30-88 ; 88-216	159	44.0
216-902 ; 928-960	500	46.0*
960-40,000	500	54.0*

The following table depicts the general radiated emission limits obtained from Title 47 CFR, part 15.209a, for radiated emissions measurements, including restricted band limits as expressed in 47 CFR, part 15.205.

Frequency (MHz)	3 m Limit ($\mu\text{V/m}$)	3 m Limit (dB $\mu\text{V/m}$)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-40,000	500	54.0

Sample conversion from field strength $\mu\text{V/m}$ to dB $\mu\text{V/m}$:

$$\text{dB}\mu\text{V/m} = 20 \log_{10} (\text{3m limit})$$

from 30 - 88 MHz for example: $\text{dB}\mu\text{V/m} = 20 \log_{10} (100)$

$$40.0 \text{ dB}\mu\text{V/m} = 20 \log_{10} (100)$$

For measurements made at 1 meter, a 9.5 dB correction may be invoked.

960 MHz to 40,000 MHz

500 $\mu\text{V/m}$ or 54.0 dB $\mu\text{V/m}$ at 3 meters

$$54.0 + 9.5 = 63.5 \text{ dB}\mu\text{V/m} \text{ at 1 meter}$$

Note: Limits are conservatively rounded to the nearest tenth of a whole number.

Summary of Results and Conclusions

Based on the procedures outlined in this report, and the test results, the EUT meets the emission requirements of Title 47 CFR, FCC Part 15.249, for a frequency modulated transmitter.

The enclosed test results pertain to the samples of the test item listed, and only for the tests performed per the data sheets. Any subsequent modification or changes to the test items could invalidate the data contained herein, and could therefore invalidate the findings of this report.

Radiated Emissions Data Chart
3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: Title 47 CFR 15.249
Frequency Range Inspected: 30 MHz to 1000 MHz

Manufacturer:	Embedtek						
Date(s) of Test:	January 3, 2008						
Test Engineer(s):		Ken Boston	√	Laura Bott		Ryan Urness	Aidi Zainal
Model #:	2WT-2RA-R6						
Serial #:	N/A						
Voltage:	120 VAC						
Operation Mode:	CW Modulated						
Distance:	√	3 Meters				10 Meters	
EUT Power:	√	Single Phase 120 VAC				3 Phase ___ VAC	
		Battery				Other:	
Test Location:	√	3 Meter FCC Listed Semi-Anechoic Chamber				Other:	
EUT Placed On:		40 cm from vertical ground plane				10 cm spacers	
	√	80 cm above ground plane				Other:	
Measurements:		Pre-Compliance			Preliminary		√ Final
Detectors Used:	√	Peak		√	Quasi-Peak		√ Average

Environmental Conditions in the Lab:

Temperature: 20 – 25°C
 Relative Humidity: 30 – 60 %

Test Equipment Used:

EMI Measurement Instrument: HP8546A and Agilent 4407B
 Log Periodic Antenna: EMCO #93146
 Horn Antenna: EMCO #3115
 Biconical Antenna: EMCO 93110
 Pre-Amp: Advanced Microwave WHA6224
 Standard Gain Horn: EMCO 3160-09

The following table depicts the level of significant radiated emissions found:

Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dBμV/m)	Quasi Peak Limit (dBμV/m)	Margin (dB)	Antenna Polarity
253.2	1.00	0	29.8	46	16.2	Horizontal
52	1.00	0	35.5	40	4.5	Vertical
69.01	1.00	349	31.4	40	8.6	Vertical
79.97	1.00	349	32.9	40	7.1	Vertical

Fundamental Emissions Data Chart

Channel	Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dBμV/m)	Quasi Peak Limit (dBμV/m)	Margin (dB)	Antenna Polarity
0	907.1	1.00	276	92.5	94.0	1.5	Vertical
16	914.7	1.00	287	91.4	94.0	2.6	Vertical
33	923.3	1.00	276	92.4	94.0	1.6	Vertical

RADIATED (SPURIOUS) EMISSIONS DATA CHART

The following table depicts the level of significant radiated RF harmonic emissions seen on Channel 0:

Frequency (MHz)	Height (m)	Azimuth (degree)	Avg Reading (dBμ V/m)	Avg Limit (dBμ V/m)	Margin (dB)	Antenna Polarity
1814	1.79	212	42.50	54.00	11.50	Horizontal
2721	1.40	333	52.70	54.00	1.30	Vertical
3628	1.00	0	36.1 ^{*Note2}	54.00	17.90	Horizontal
4535	1.00	0	38.1 ^{*Note2}	54.00	15.90	Vertical
5442	1.00	0	44.72 ^{*Note2}	63.50	18.78	Horizontal
6349	1.00	0	45.60 ^{*Note2}	63.50	17.90	Vertical
7256	1.00	0	47.52 ^{*Note2}	63.50	15.98	Vertical
8163	1.00	0	47.34 ^{*Note2}	63.50	16.16	Vertical
9071	1.00	0	49.16 ^{*Note2}	63.50	14.34	Vertical

The following table depicts the level of significant radiated RF harmonic emissions seen on Channel 16:

Frequency (MHz)	Height (m)	Azimuth (degree)	Avg Reading (dBμ V/m)	Avg Limit (dBμ V/m)	Margin (dB)	Antenna Polarity
1829	1.10	127	42.80	54.00	11.20	Vertical
2744	1.05	0	49.00	54.00	5.00	Horizontal
3658	1.00	0	35.8 ^{*Note 2}	54.00	18.20	Horizontal
4573	1.00	0	37.6 ^{*Note 2}	54.00	16.40	Vertical
5488	1.00	0	46.39 ^{*Note 2}	63.50	17.11	Vertical
6402	1.00	0	45.57 ^{*Note 2}	63.50	17.93	Vertical
7317	1.00	0	47.66 ^{*Note 2}	63.50	15.84	Vertical
8232	1.00	0	48.79 ^{*Note 2}	63.50	14.71	Vertical
9147	1.00	0	50.66	63.50	12.84	Vertical

The following table depicts the level of significant radiated RF harmonic emissions seen on Channel 33:

Frequency (MHz)	Height (m)	Azimuth (degree)	Avg Reading (dBμ V/m)	Avg Limit (dBμ V/m)	Margin (dB)	Antenna Polarity
1846	1.00	3	41.60	54.00	12.40	Horizontal
2769	1.00	0	51.10	54.00	2.90	Vertical
3693	1.00	0	36.00 ^{*Note 2}	54.00	18.00	Vertical
4616	1.00	0	38.1 ^{*Note 2}	54.00	15.90	Horizontal
5539	1.00	0	45.37 ^{*Note 2}	63.50	18.13	Horizontal
6463	1.00	0	45.46 ^{*Note 2}	63.50	18.04	Horizontal
7386	1.00	0	47.66 ^{*Note 2}	63.50	15.84	Vertical
8309	1.00	0	48.25 ^{*Note 2}	63.50	15.25	Vertical
9233	1.00	0	47.77 ^{*Note 2}	63.50	15.73	Vertical

Note 1: A Quasi-Peak Detector was used in measurements below 1 GHz, and an Average Detector was used in measurements above 1 GHz.

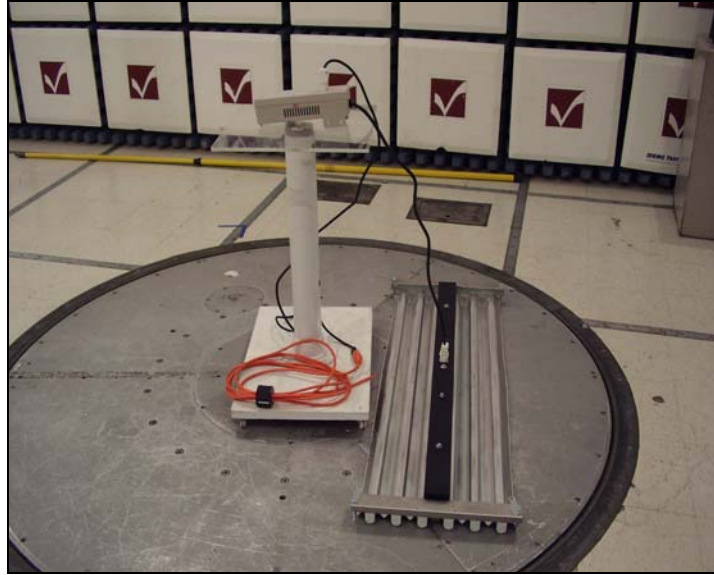
Note 2: Measurement was buried in system noise floor.

Note 3: Measurements from 1 to 5 GHz were taken at a three meter separation distance, and measurements from 5 to 10 GHz were taken at a one meter separation distance.

Note 4: All peak measurements were within 20 dB of the maximum permitted average emission limit.

Photos Taken During Radiated Emission Testing

Setup for the Radiated Emissions Test



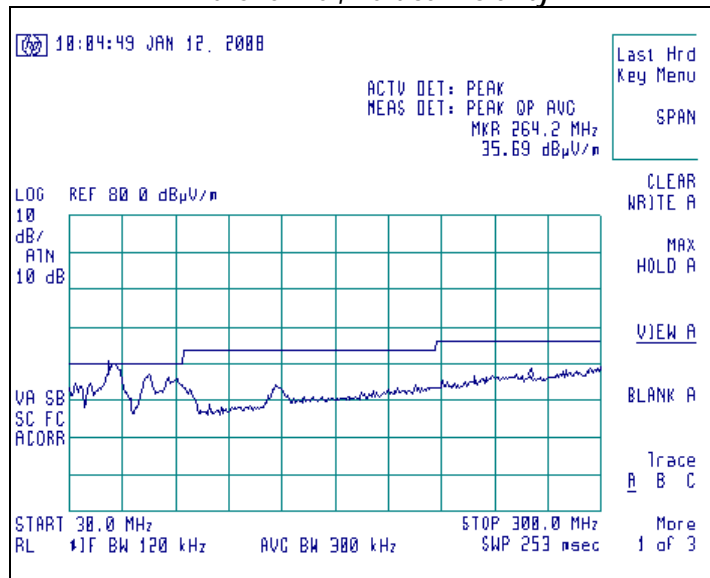
GRAPHS

Screen Captures of Radiated RF Emissions:

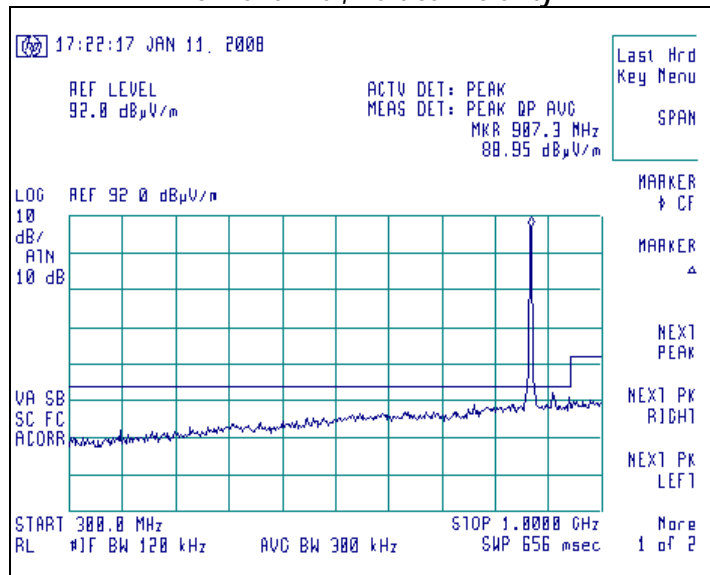
Please note these screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 1, 16, or, 33, low, mid and high respectively, where the sense antenna detects the highest emission levels.

Signature Scan of Peak Radiated Emissions 30-300 MHz Mid Channel, Vertical Polarity

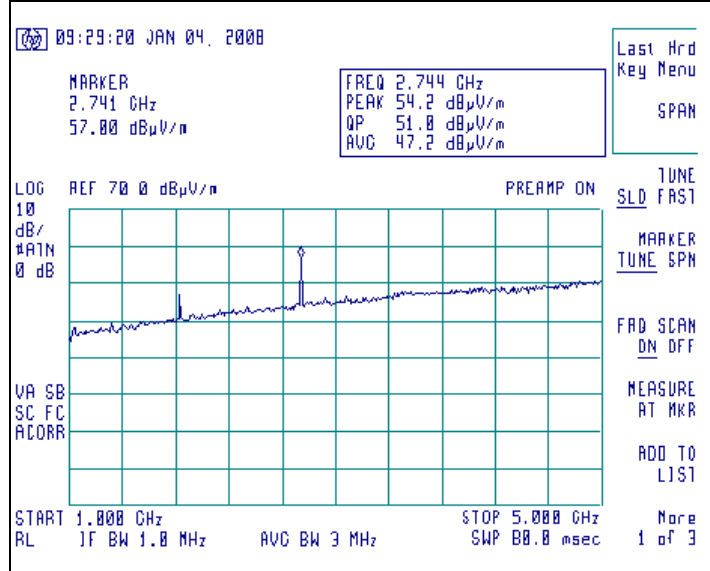


Signature Scan of Peak Radiated Emissions 300-1000 MHz Low Channel, Vertical Polarity

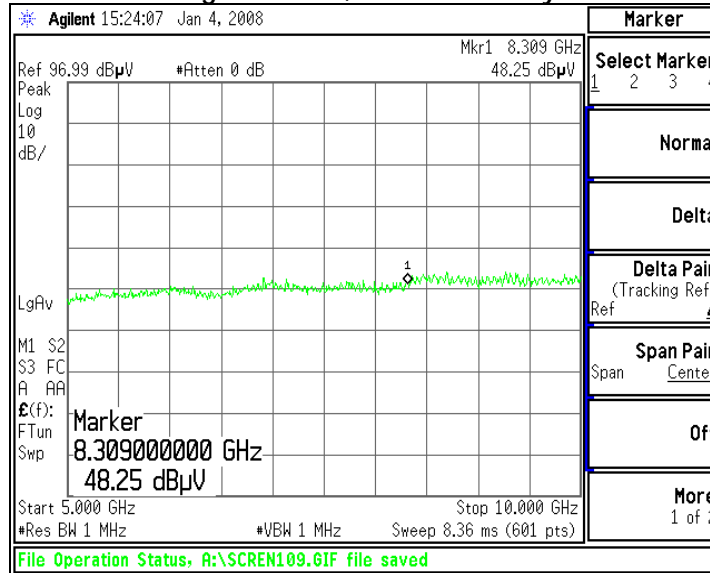


Graphs made during Radiated Emission Testing (continued)

**Signature Scan of Peak Radiated Emissions 1-5 GHz
Mid Channel, Vertical Polarity**



**Signature Scan of Peak Radiated Emissions 5-10 GHz
High Channel, Vertical Polarity**



10. Conducted Emissions Test, AC Power Line

Test Setup

The test area and setup are in accordance with ANSI C63.4-2003 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 7, 2007). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50 Ω (ohm), 50/250 μ H Line Impedance Stabilization Network (LISN). The 120 VAC power supply was fed to the test area via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMC LISN used has the ability to terminate the unused port with a 50 Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

Test Procedure

The EUT was investigated in continuous modulated transmit mode for this portion of the testing. Measurements were made from 150 kHz-30MHz. The Intermediate Frequency Bandwidth was set to 9.0 kHz and the Average Bandwidth to 30 kHz, per CISPR 16-1 (2003), Section 1, Table 1. Plots of peak values were captured and are shown below. Quasi-peak and average signal strength values were measured at discrete frequencies; these are denoted in the table in Section 6.5 of this report.

Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Test Results

The EUT was found to meet the Conducted Emission requirements of FCC Part 15, Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

Measurement of Electromagnetic Conducted Emission

Frequency Range Inspected: 150 KHz to 30 MHz

Manufacturer:	Embedtek				
Date(s) of Test:	January 8, 2008				
Test Engineer:	√	Laura Bott		Ryan Urness	Ken Boston
Model #:	2WT-2RA-R6				
Serial #:	n/a				
Voltage:	120 VAC				
Operation Mode:	Normal				
Test Location:	√	Other: Conducted AC Emissions Bench			Chamber
EUT Placed On:		40cm from Vertical Ground Plane			10cm Spacers
	√	80cm above Ground Plane			Other:
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:	√	Peak	√	Quasi-Peak	√ Average

Environmental Conditions in the Lab:

Temperature: 20 – 25° C
 Atmospheric Pressure: 86 kPa – 106 kPa
 Relative Humidity: 30 – 60%

Test Equipment Utilized:

EMI Receiver: HP 8546A
 LISN: EMCO 3816/2NM
 Transient Limiter: HP 119474A

Frequency (MHz)	Line	Quasi-Peak			Average		
		Q-Peak Reading (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)
0.321	L1	42.500	59.680	17.180	27.100	49.680	22.580
0.403	L1	44.300	57.804	13.504	32.500	47.804	15.304
0.542	L1	46.200	56.000	9.800	34.900	46.000	11.100
1.027	L1	45.100	56.000	10.900	33.500	46.000	12.500
2.481	L1	45.400	56.000	10.600	33.500	46.000	12.500
3.225	L1	43.400	56.000	12.600	31.400	46.000	14.600
7.138	L1	45.000	60.000	15.000	33.200	50.000	16.800
0.217	L2	51.200	62.945	11.745	44.000	52.945	8.945
0.387	L2	45.400	58.134	12.734	32.700	48.134	15.434
0.622	L2	46.100	56.000	9.900	36.000	46.000	10.000
1.041	L2	45.500	56.000	10.500	35.100	46.000	10.900
2.146	L2	44.600	56.000	11.400	34.100	46.000	11.900
3.418	L2	42.700	56.000	13.300	32.300	46.000	13.700
7.218	L2	45.300	60.000	14.700	33.100	50.000	16.900

Notes:

- 1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.
- 2) All other emissions noted were better than 20 dB below the limits
- 3) The EUT exhibited similar emissions in the transmit and receive modes, and across the Low, Mid, and High channels tested.

Calculation of Conducted Emissions Limits

The following table describes the Class B limits for an unintentional radiator. These limits are obtained from Title 47 CFR, Part 15.107 (a) for Conducted Emissions.

Frequency (MHz)	Quasi-Peak Limit (dB μ V)	Average Limit (dB μ V)
0.15 – 0.5	66 – 56 *	56 - 46
0.5 – 5.0	56	46
5.0 – 30.0	60	50

* Decreases with the logarithm of the frequency.

Sample calculation for the limits in the 0.15 to 0.5 MHz:

$$\text{Limit} = -19.12 (\text{Log}_{10} (F [\text{MHz}] / 0.15 [\text{MHz}])) + 66.0 \text{ dB}\mu\text{V}$$

For a frequency of 200 kHz for example:

$$\text{Quasi-Peak Limit (F=200 kHz)} = -19.12 (\text{Log}_{10} (0.2 [\text{MHz}] / 0.15 [\text{MHz}])) + 66.0 \text{ dB}\mu\text{V}$$

$$\text{Quasi-Peak Limit (F=200 kHz)} = 63.6 \text{ dB}\mu\text{V}$$

$$\text{Average Limit (F=200 kHz)} = -19.12 (\text{LOG}_{10} (0.2[\text{MHz}]/0.15[\text{MHz}])) + 56.0 \text{ dB}\mu\text{V}$$

$$\text{Average Limit (F = 200 kHz)} = 53.6 \text{ dB}\mu\text{V}$$

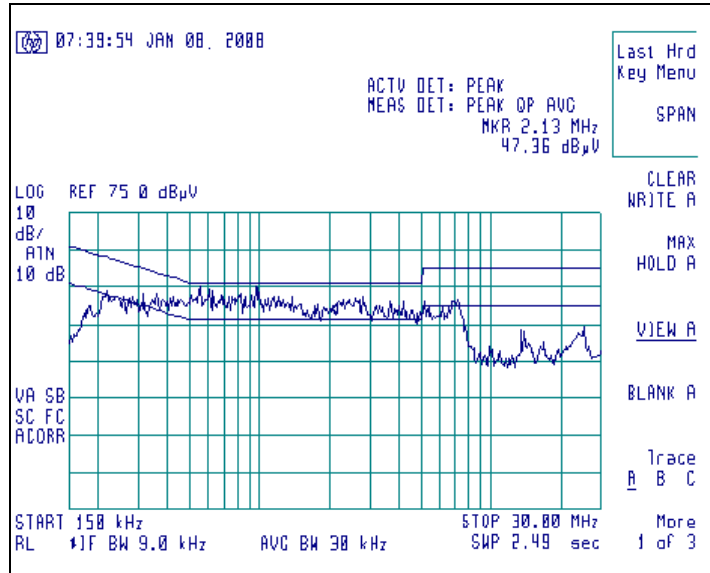
Photo(s) Taken During Conducted Emission Testing

Setup for the Conducted Emissions Test

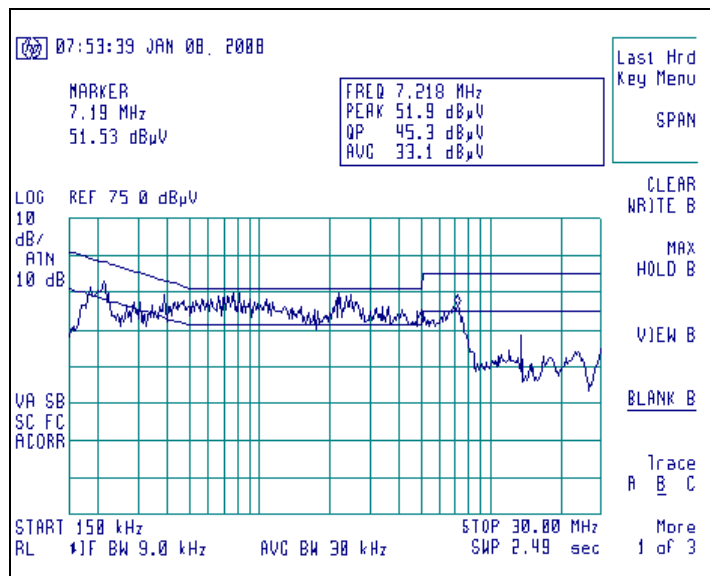


Graphs made during Conducted Emission Testing

Signature Scan of Peak Conducted Emissions on Line 1



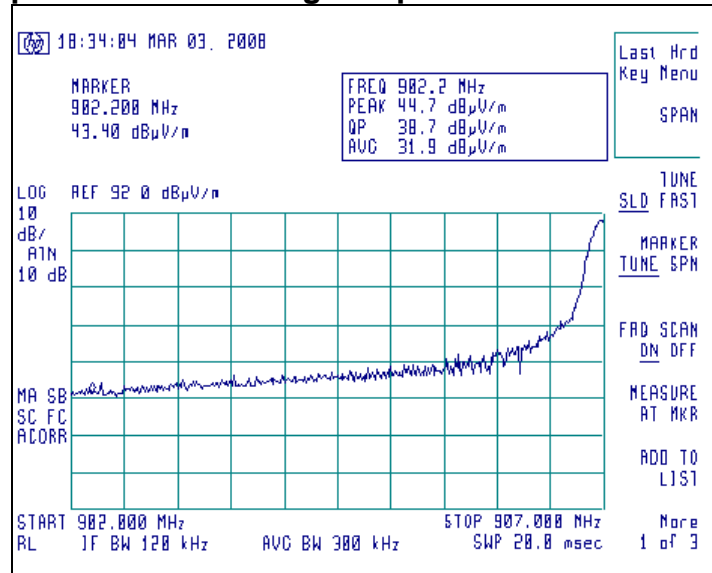
Signature Scan of Peak Conducted Emissions on Line 2



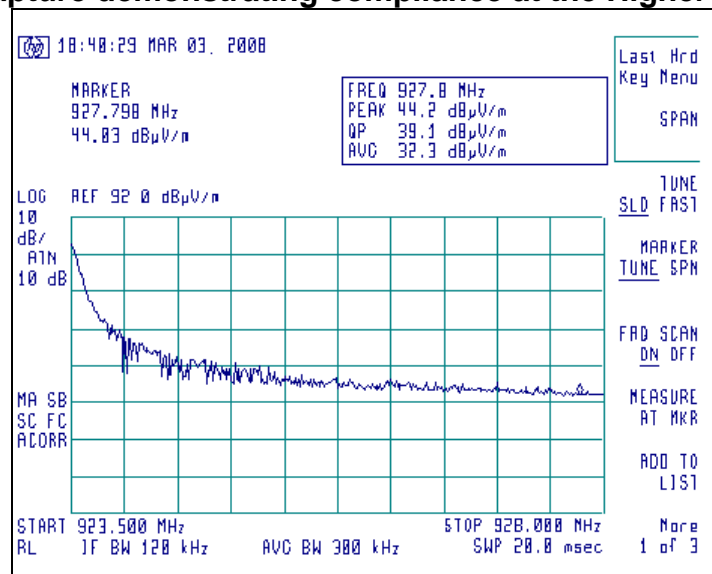
11. Band-Edge Measurements

FCC 15.209(b) and 15.249(d) require a measurement of spurious emission levels, in particular at the band-edges where the intentional radiator operates. The following screen captures demonstrate compliance of the intentional radiator at the 902-928 MHz band-edges. The EUT was operated at the lowest channel, with continuous modulation for the investigation of the lower band-edge, and at the highest channel for the investigation of the higher band-edge.

Screen Capture demonstrating compliance at the Lower Band-Edge



Screen Capture demonstrating compliance at the Higher Band-Edge



APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	12/6/07	12/6/08
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/19/07	9/19/08
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/19/07	9/19/08
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/04/07	12/04/08
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	1/11/07	1/11/08
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/20/07	9/20/08
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/20/07	9/20/08
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	8/17/07	8/17/08
N/A	LSC	Cable	0011	3 Meter 1/2" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

Note 1 - Equipment calibrated within a traceable system.

Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 - Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V