



# ELECTROMAGNETIC COMPATIBILITY (EMC) REPORT

## EMISSIONS

The Designer's Edge

Model L-940

November 22, 2005

Project No.: 05CA33257

Test Report No.: E122809-112205

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Underwriters Laboratories Inc.  
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## REPORT DIRECTORY

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## 1.0 General Information

### 1.1 Scope

Underwriters Laboratories Inc., authorizes the above named company to reproduce this Report, provided it is reproduced in its entirety. The data in this Report reflects only the items tested in the configurations and mode of operations described. All data recorded and photographs represents testing under the worst case conditions permitted by the requirements applied to the product. It is the manufacturer's responsibility to assure that additional production units are manufactured with identical electrical and mechanical components. Any modifications necessary for compliance made during testing must be implemented in all production units for compliance to be maintained.

Underwriters Laboratories Inc., shall have no liability for any deductions, inferences or generalizations drawn from this report. This report shall not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the United States government.

### 1.2 Purpose

Testing was performed to the following regulations:

Emissions Standards used: CFR 47 Part 15 Subpart C 15.231(e)

Except as noted below, all test methods and data contained in this report are covered by NVLAP accreditation.

Exceptions:

None.

## 1.3 Test Results

In Compliance

Not in Compliance

Statements regarding compliance with requirements and criteria in the subsequent sections of this report are opinions and interpretations provided by Underwriters Laboratories Inc. technical staff.

### Transmitter Requirement Summary

Environmental Phenomena	Frequency Range	FCC Section	Test Result
Antenna Requirements	88 – 108 MHz	15.203	The unit is provided with an integral wire antenna
Conducted Emissions, AC Mains	0.15 – 30 MHz	15.207	Not Required (Battery Operated)
Transmit Times	433.9 MHz	15.231(e)	Complies
Spurious Radiated Emissions	30 – 5000 MHz	15.209,15.231(e)	Complies
Fundamental Emissions	433.9 MHz	15.231(e)	Complies
Occupied Bandwidth 20 dB	433.9 MHz	15.231(c)	Complies

## 1.4 Documentation Review/Approval

Project Management:



Daniel Ng  
Associate Lab Supervisor  
International EMC Services  
Department 3014A

Technical Review By:



Bill Barry  
Staff Engineer  
International EMC Services  
Department 3014A

## 2.0 General Product Description

Applicant	:	The Designer's Edge
Manufactured By	:	Same as Applicant
License Holder	:	Not Applicable
Applicant Address	:	11730 NE 12 <sup>th</sup> Street Bellevue, WA 98005
Applicant Contact	:	Mr. Craig Lynch
Model/Type No.	:	L-940
Date of Issue	:	November 22, 2005
File No.	:	E122809
Test Report No.	:	E122809-112205
Project No.	:	05CA33257

### Product Description

The product is a remote control transmitter for a security light. It contains an infrared sensor that, when detecting a person, sends a 434 MHz RF pulse to a receiver which switches power to a light fixture.

### Equipment Size, Mobility, and Identification

Dimensions: 6-1/4 by 2-1/2 by 3-3/4 in.

Mobility:  Fixed  Table-top  Floor-standing  Rack Mount

Serial No: Not provided

### Electrical Ratings

EUT	Voltage [Volts]	Current or Power	Frequency [Hz]	Phase
	9 V	Not provided	DC	NA

### Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below. During all transmitter tests, fresh batteries were used.

Voltage  
9 V

Frequency  
DC

### Clocks/Oscillators

8 MHz, 433.92 MHz

### Equipment Type

Prototype

Pre-Production

Production

## Model Differences

Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.

## Device Modifications

The following modifications were necessary for compliance: None

## EUT and Peripherals

Description	Manufacturer	Model/Part #	Serial Number
Infrared Detector/Transmitter	The Designer's Edge	L-940	Not provided

## Cables

Cable Type	Shield	Length (meters)	Ferrite	Connector	Connection Point 1	Connection Point 2
None provided	--	--	--	--	--	--

## 2.1 Justification of Configuration

The product is provided in one configuration.

## 2.2 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

Spurious emission testing, fundamental/harmonic field strength measurements, and occupied bandwidth measurements were performed with the product configured to continuously transmit a CW signal. The product was operated in its "Test" mode when measuring transmit times which is considered the worst case mode of operation.

### **3.0 Environmental Conditions in Test Lab**

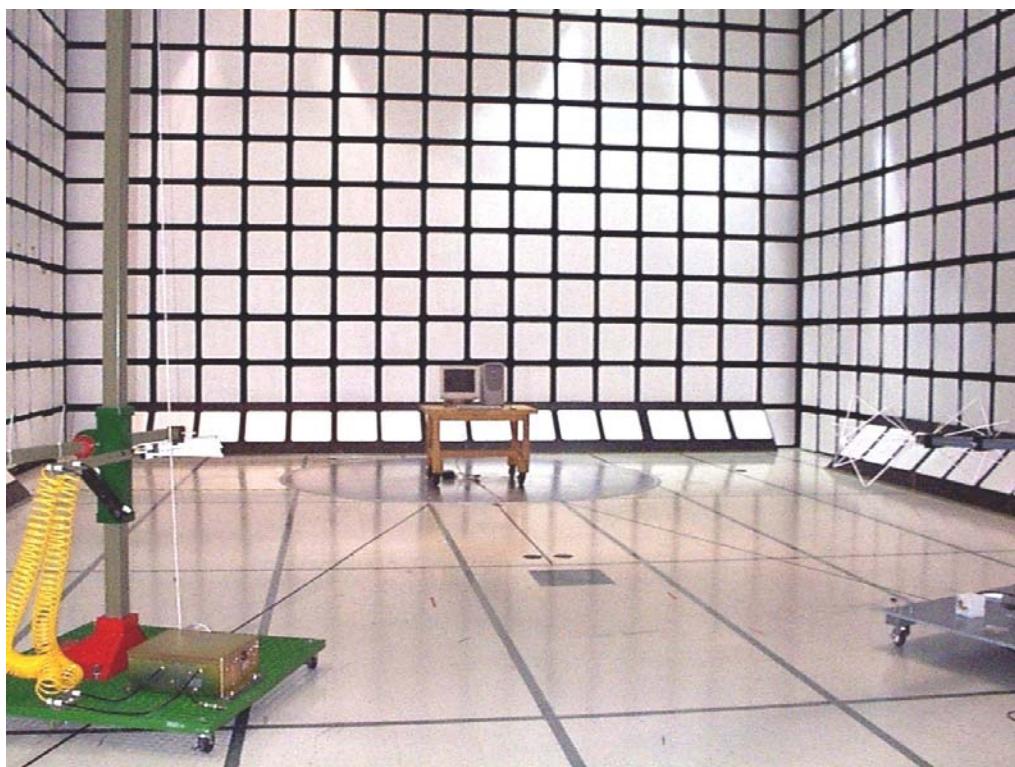
Temperature: 20-25 °C      Atmospheric Pressure: 680-1060 mbar  
Relative Humidity: 30-60%      20.1-31.3 in. Hga

### **4.0 Calibration Details of Equipment Used for Measurement**

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or as recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST), therefore, all test data recorded in this report is traceable to NIST.

## 5.0 Test Facility

Underwriters Laboratories Inc.  
1655 Scott Blvd.  
Santa Clara, CA 95050  
Phone: (408) 876-2905 Fax: (408) 556-6071



## 6.0 Accreditations and Authorizations



NVLAP Lab code: 200252-0

**NVLAP:** Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. The specific scope includes IEC/CISPR 22:1997, Amendment 1:1995, Amendment 2:1997, EN 55022:1998, AS/NZS 1044, CNS 13438:1997, ANSI C63.4, FCC Method - 47 CFR Part 15 Subparts B-E, AS/NZS 3548, AS/NZS CISPR 22, CISPR 14-1, EN 55014-1, CNS 13783-1, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, EN/IEC 61000-3-2, EN/IEC 61000-3-3, AS/NZS 4268, AS 4268.1, AS 4268-2, AS 4771, LP0002, DGT RTTE01, RSS-112, RSS-117, RSS-118, RSS-119, RSS-123, RSS-125, RSS-128, RSS-129, RSS-130, RSS-131, RSS-132, RSS-133, RSS-134, RSS-135, RSS-136, RSS-137, RSS-139, RSS-141, RSS-142, RSS-170, RSS-181, RSS-182, RSS-187, RSS-188, RSS-191, RSS-192, RSS-193, RSS-210, RSS-212, RSS-213, RSS-215, GR-1089-CORE, SBC-TP-76200 Issue 4, and GR-63-CORE testing.



**FCC:** Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland and accepted in a letter dated September 24, 1997 (Ref. No. 31040/SIT 1300F2).



**Industry of Canada:** Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3.  
File #: IC 2704



**VCCI:** Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8.  
Registration Nos.: (Radiated Emissions) R-672, (Conducted Emissions) C-689.



**ICASA:** ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



**NIST/CAB:** Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 89/336/EEC, Article 10 (2). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

**NIST/CAB:** Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

**NIST/CAB:** Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6.

U.S. Identifier Number: US0114

## 7.0 Emissions Test Regulations

The emissions tests were performed according to following regulations:

----- United States -----

CFR 47 Part 15 Subpart C : 2005

Code of Federal Regulations, Part 15, Subpart C, Radio Frequency Devices - Intentional Radiators

## 7.1 Field Strength Calculations

The field strength is calculated by adding the Transducer Factor (Antenna Factor) and Gain/Loss (Cable Loss, Preamp Gain) Factor to the Meter Reading. The basic equation with a sample calculation is as follows:

Field Strength = Meter Reading + Transducer Factor + Gain/Loss

Assume a receiver reading of 53.2 dB $\mu$ V is obtained. The Transducer Factor of 5.1 dB and a Gain/Loss of -31 dB is added, giving a field strength of 27.3 dB $\mu$ V.

$$FS = 53.2 + 5.1 + (-31) = 27.3 \text{ dB}\mu\text{V}$$

Use the following formula to convert dB $\mu$ V to  $\mu$ V:  $x = 10^{(y/20)}$ , where  $x$  is the value in  $\mu$ V and  $y$  is the value in dB $\mu$ V.

$$\text{Level in } \mu\text{V} = 10^{(27.3/20)} = 23.2 \mu\text{V}$$

## 7.2 Measurement Uncertainty

When a measurement is made the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its “true” value.

Test Distance	Probability Distribution	Uncertainty (dB)					
		10m +18 deg	10m -14 deg	3m	10m +18 deg	10m -14 deg	3m
Combined Standard Uncertainty $u_c(y)$	Normal	$\pm 1.24$	$\pm 1.25$	$\pm 1.29$	$\pm 1.14$	$\pm 1.13$	$\pm 1.9$
Expanded uncertainty $U$ (level of confidence = 95%)	Normal (k = 2)	$\pm 2.47$	$\pm 2.49$	$\pm 2.59$	$\pm 2.28$	$\pm 2.27$	$\pm 2.76$

Conducted Voltage Emissions	Probability Distribution
Combined Standard Uncertainty $u_c(y)$	Normal
Expanded uncertainty $U$ (level of confidence = 95%)	Normal (k = 2)

$u_c(y)$  = square root of the sum of squares of the individual standard deviation uncertainties.

$U$  = combined standard uncertainty multiplied by the coverage factor:  $k$ . This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required then  $k=3$  (CL=97%) can be used.

“ISO Guide to the Expression of Uncertainty in Measurements” and ‘NIS81: The Treatment of Uncertainty in EMC Measurements’ were the basis for determining the uncertainty levels of our measurements. Details of those calculations are available upon request.

## 7.3 Measurement Bandwidths

Frequency Range (MHz)	Peak Data BW (kHz)	Quasi-Peak Data BW (kHz)	Average Data BW (kHz)
0.01 - 0.15	1	3	0.2
0.15 - 30	10	9	100
30 - 1000	100	120	120
Above 1000	1000	N/A	1000

## 7.4 Transmit Time

### Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

Date Tested: 10-14-2005

### Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal Next
Spectrum Analyzer	Hewlett-Packard	8566B	8034	7/7/2005	7/7/2006

### Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005	1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
6dB Res Band Display	Hewlett-Packard	85662A	8031	7/7/2005	7/7/2006
Quasi-Peak Detector	Hewlett-Packard	85650A	8030	7/7/2005	7/7/2006
Switch Driver	Hewlett-Packard	11713A	8036	7/7/2005	7/7/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006
Preselector	Hewlett-Packard	85685A	8037	7/7/2005	7/7/2006

### UL Procedure

The EUT is to be activated manually while measuring the fundamental on a spectrum analyzer set to zero span. The transmitter pulse times and delay between pulses are to be measured. In accordance with CFR 47 15.231(e), the pulse time shall not exceed one second and the minimum duration between pulses shall be at least 30 times the pulse time or 10 seconds whichever is more.

### Frequency Range of Measurement

30 MHz to 1 GHz

### Measurement Distance

3 meters

### Test Results

Maximum Pulse Time:	850 ms
Minimum delay between pulses:	25.5 s
Measured delay between pulses:	29.16 s

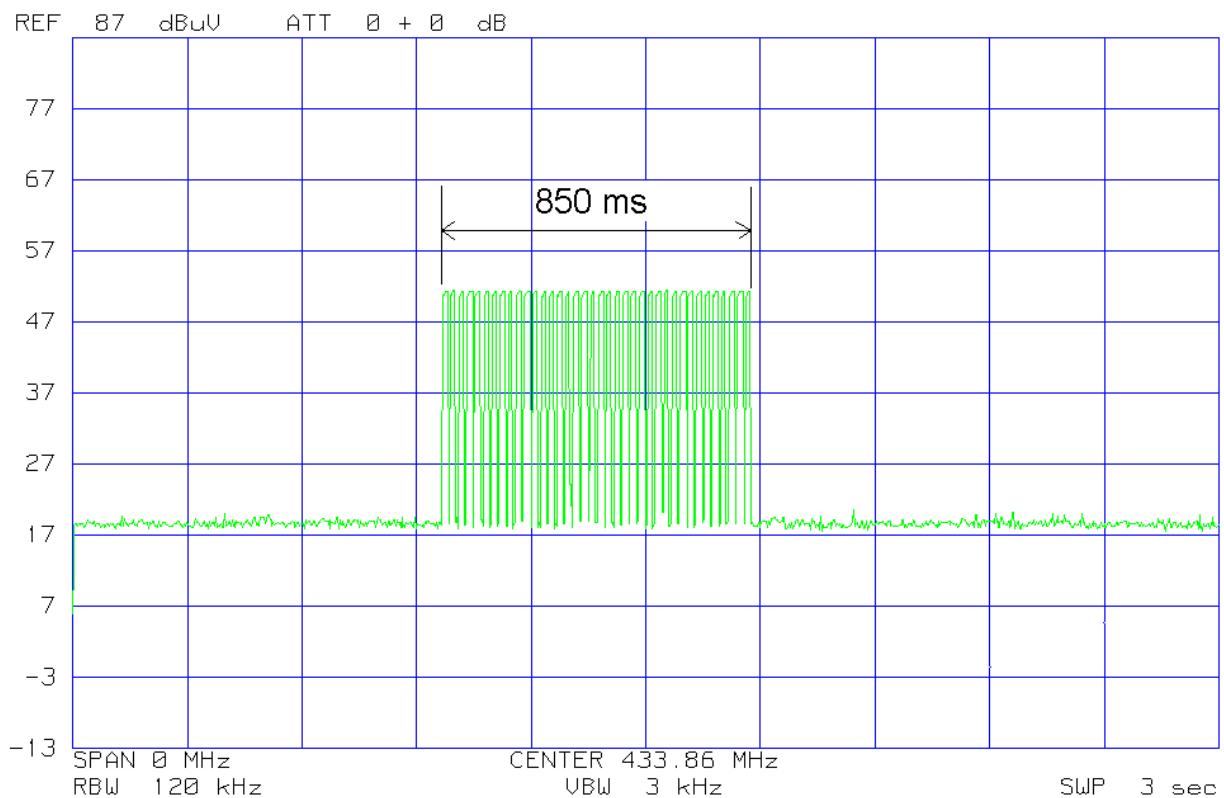
Requirements are MET.

### Remarks

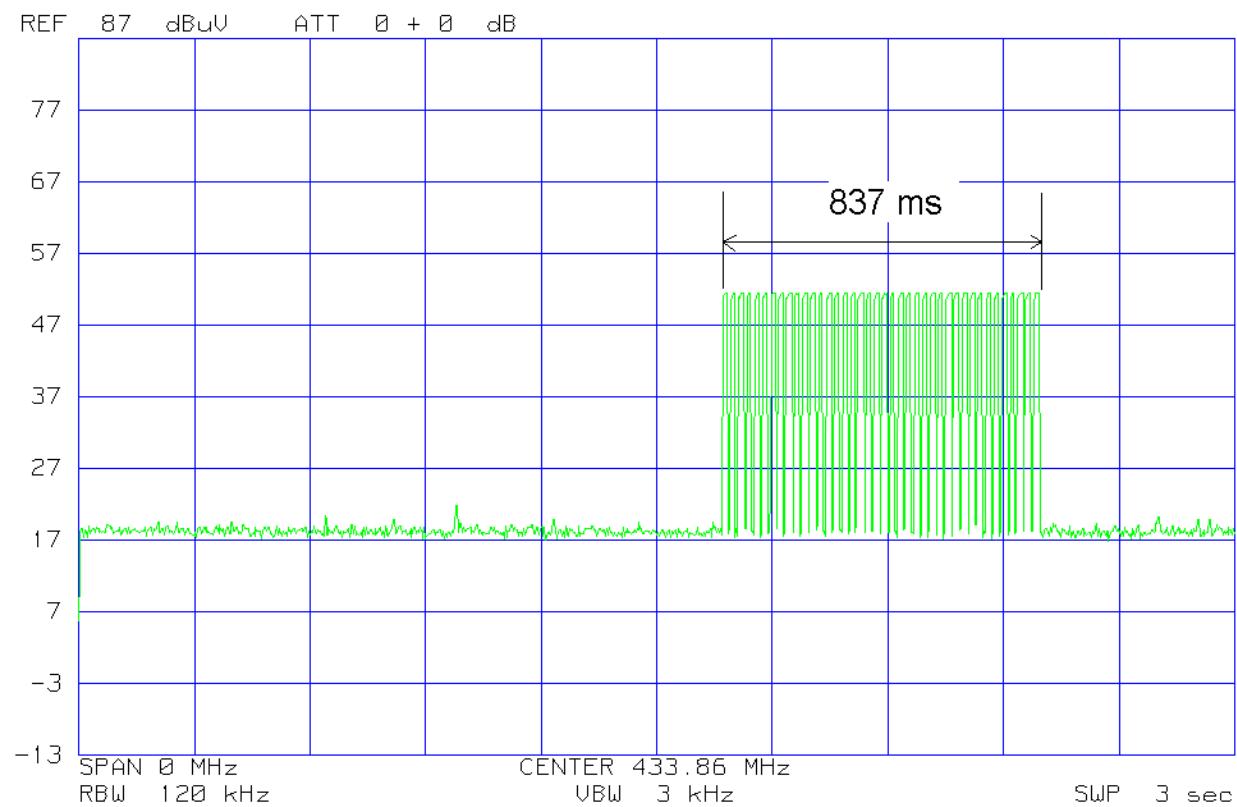
The measurements were made with the transmitter in "Test Mode". This mode resulted in the least amount of time between transmissions. The results are representative of "Automatic" and "Dusk to Dawn" modes. The first pulse is the command for the receiver to turn the light fixture on. The second pulse is the command to turn the light fixture off.

## Test Data

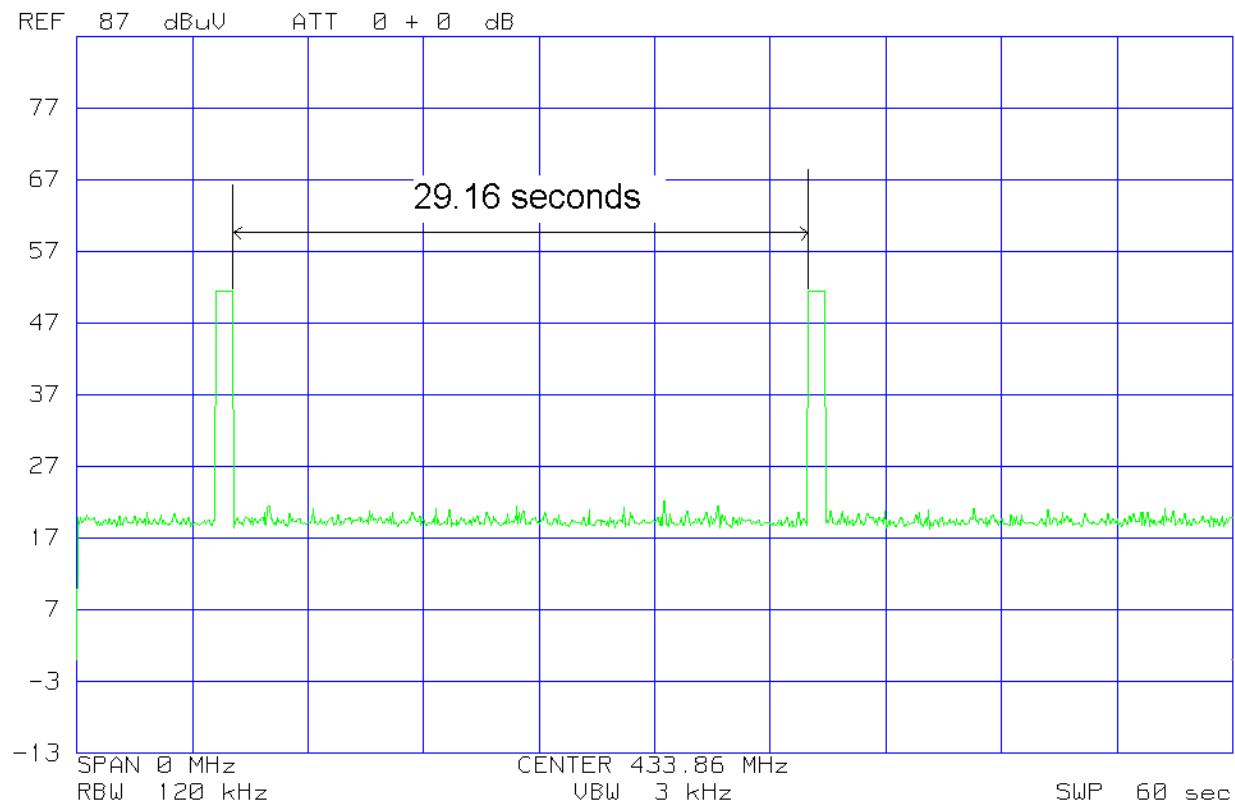
### Time of “ON” Pulse



Time of “OFF” Pulse



**Time between “ON” and “OFF” Pulses**



### Photograph



## 7.5 Radiated Electric Field Spurious Emissions

### Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

### Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal	Next
Spectrum Analyzer	Hewlett-Packard	8566B	8034	7/7/2005		7/7/2006

### Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal	Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005		1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005		1/31/2006
6dB Res Band Display	Hewlett-Packard	85662A	8031	7/7/2005		7/7/2006
Quasi-Peak Detector	Hewlett-Packard	85650A	8030	7/7/2005		7/7/2006
Switch Driver	Hewlett-Packard	11713A	8036	7/7/2005		7/7/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005		5/2/2006
Preselector	Hewlett-Packard	85685A	8037	7/7/2005		7/7/2006

### UL Procedure

3314-LPG-013

### Frequency Range of Measurement

30 MHz to 5 GHz

### Measurement Distance

3 meters

### Test Results

The requirements are:

MET:

minimum margin to the fundamental limit is 10.97 dB at 433.8 MHz

the measured peak value is less than 20 dB above the average limit.

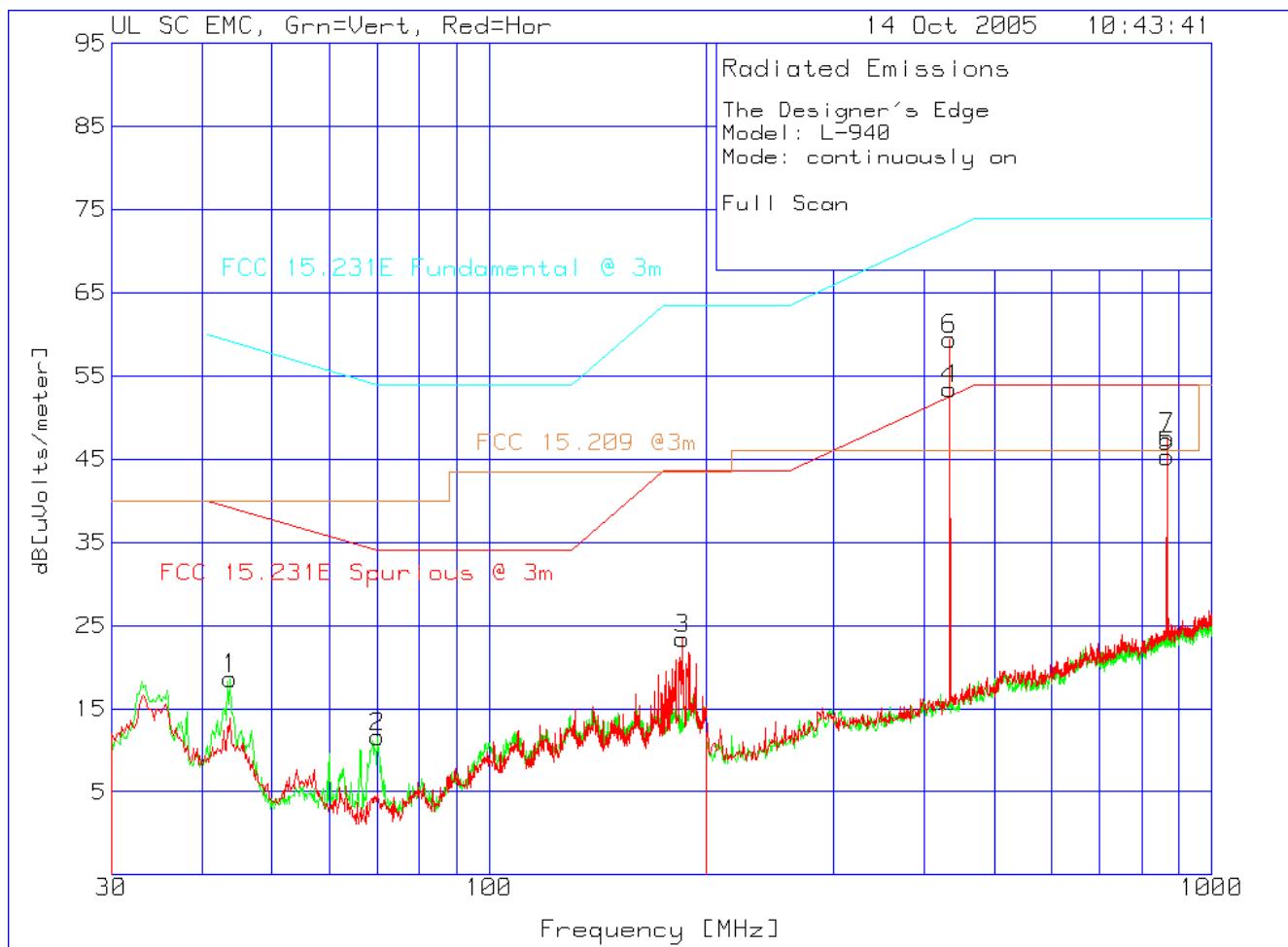
minimum margin to the harmonic limit is 6.5 dB at 867.8 MHz.

minimum margin to the restricted band limit is greater than 10 dB at all measured frequencies.

### Remarks

Testing was performed on sample transmitting CW. A fresh battery was used during the test and it was verified that the signal strength did not diminish when testing was completed. The EUT was mounted as intended. Various swivel positions were evaluated as to which one caused the highest emission. It was determined that highest emissions occurred with the unit horizontally oriented. All testing was performed in this orientation.

## Test Data



The Designer's Edge  
Model: L-940  
Mode: continuously on  
Full Scan

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3
<hr/>								
Range: 1	30 - 200MHz							
1	43.77	38.2 pk	-30.8	11.2	18.6	39.2	59.2	40
	Azimuth:94	Height:99	Vert	Margin [dB]		-20.6	-40.6	-21.4
2	70.12	35.2 pk	-30.3	6.7	11.6	34	54	40
	Azimuth:229	Height:99	Vert	Margin [dB]		-22.4	-42.4	-28.4
<hr/>								
Range: 2	30 - 200MHz							
3	185.21	36.6 pk	-29.1	15.9	23.4	43.5	63.5	43.5
	Azimuth:1	Height:200	Horz	Margin [dB]		-20.1	-40.1	-20.1
<hr/>								
Range: 3	200 - 1000MHz							
4	433.6	64.4 pk	-27.1	16.1	53.4	52.6	72.6	46
	Azimuth:355	Height:100	Vert	Margin [dB]		.8	-19.2	7.4
5	867.2	48.1 pk	-24.8	22	45.3	54	74	46
	Azimuth:104	Height:100	Vert	Margin [dB]		-8.7	-28.7	-.7
<hr/>								
Range: 4	200 - 1000MHz							
6	433.6	69.6 pk	-27.1	16.9	59.4	52.6	72.6	46
	Azimuth:77	Height:200	Horz	Margin [dB]		6.8	-13.2	13.4
7	867.2	49.6 pk	-24.8	22.8	47.6	54	74	46
	Azimuth:172	Height:200	Horz	Margin [dB]		-6.4	-26.4	1.6

LIMIT 1: FCC 15.231E Spurious @ 3m  
LIMIT 2: FCC 15.231E Fundamental @ 3m  
LIMIT 3: FCC 15.209 @3m

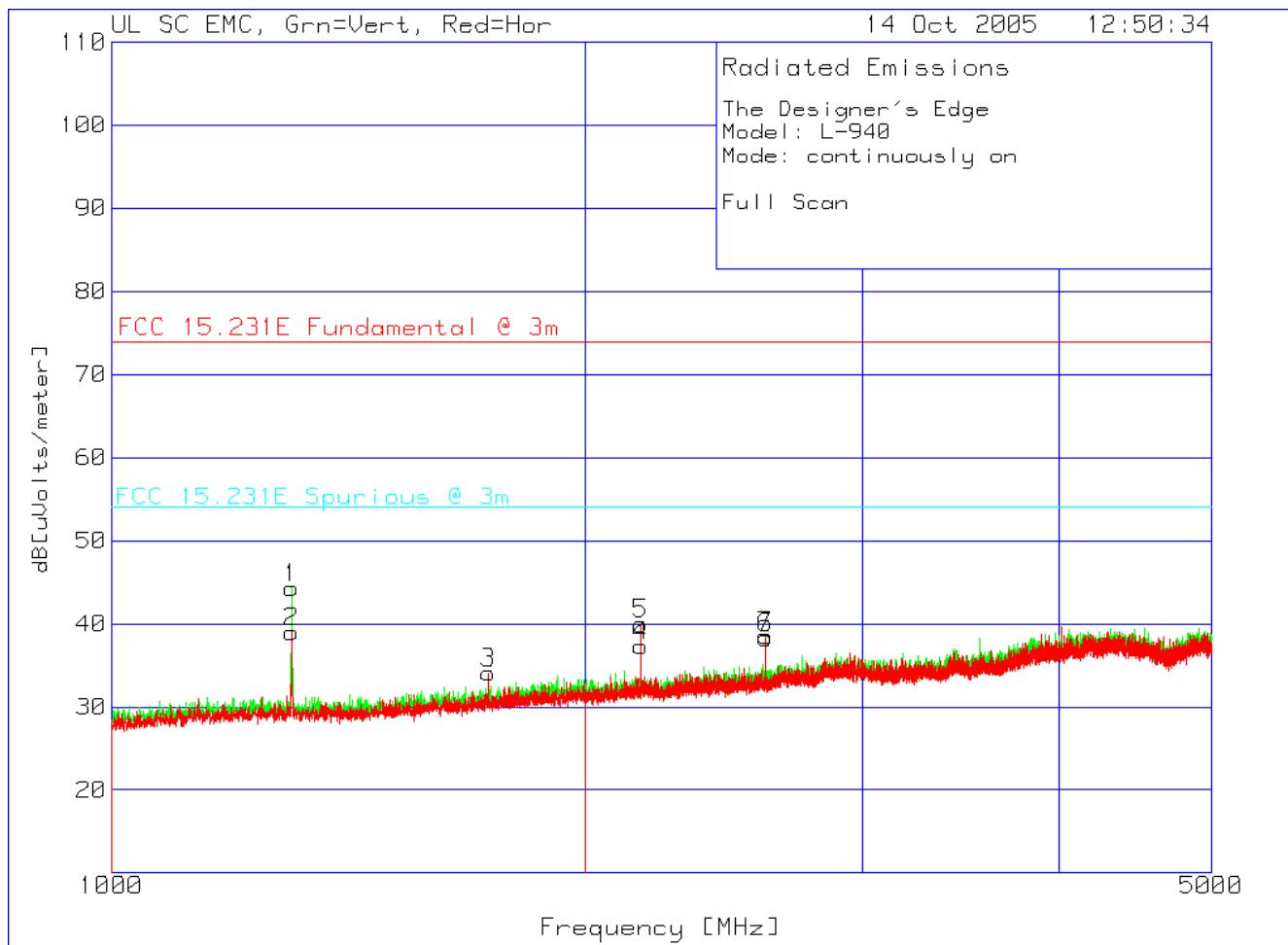
pk - Peak detector  
qp - Quasi-Peak detector

The Designer's Edge  
Model: L-940  
Mode: continuously on  
Full Scan

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	
=====								
Range: 3 200 - 1000MHz								
433.9174	64.42	qp	-27.1	16.1	53.42	52.6	72.6	46
Azimuth: 61	Height:100	Vert		Margin [dB]:	.82	-19.18	7.42	
867.8325	47.3	qp	-24.8	22	44.5	54	74	46
Azimuth: 24	Height:101	Vert		Margin [dB]:	-9.5	-29.5	-1.5	
Range: 4 200 - 1000MHz								
433.9152	71.83	qp	-27.1	16.9	61.63	52.6	72.6	46
Azimuth: 67	Height:162	Horz		Margin [dB]:	9.03	-10.97	15.63	
867.8303	49.45	qp	-24.8	22.8	47.45	54	74	46
Azimuth: 234	Height:200	Horz		Margin [dB]:	-6.55	-26.55	1.45	
433.91	54.82	qp	-27.1	16.9	44.62	52.6	72.6	46
Azimuth: 162	Height:100	Horz		Margin [dB]:	-7.98	-27.98	-1.38	
433.91	70.17	qp	-27.1	16.9	59.97	52.6	72.6	46
Azimuth: 322	Height:152	Horz		Margin [dB]:	7.37	-12.63	13.97	

LIMIT 1: FCC 15.231E Spurious @ 3m  
LIMIT 2: FCC 15.231E Fundamental @ 3m  
LIMIT 3: FCC 15.209 @3m

pk - Peak detector  
qp - Quasi-Peak detector  
av - Average detector



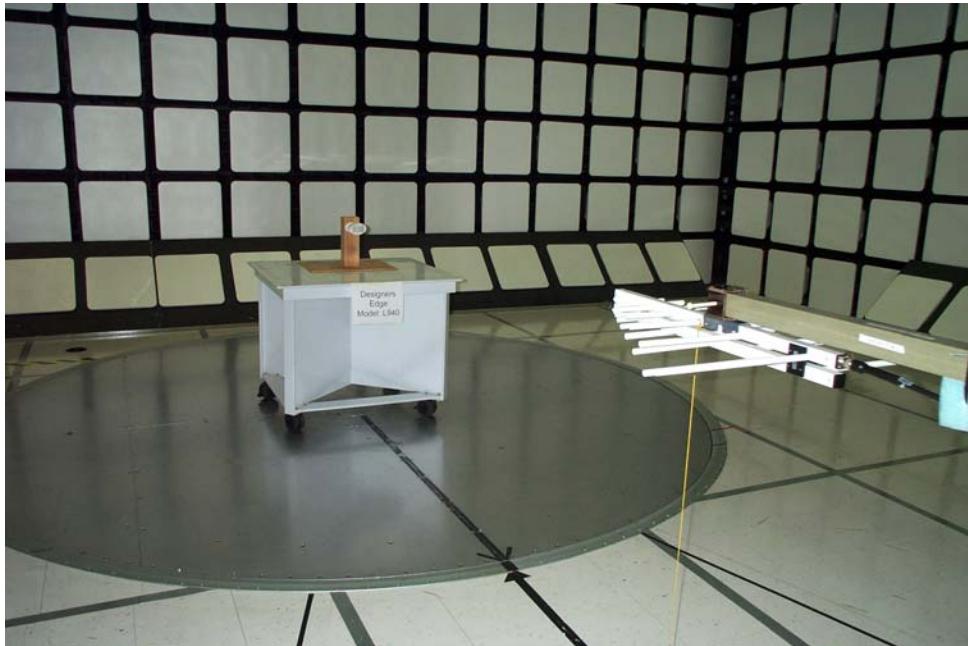
The Designer's Edge  
Model: L-940  
Mode: continuously on  
Full Scan

Test No.	Meter Frequency [MHz]	Gain/Loss Reading [dB(uV)]	Transducer Factor [dB]	Level Factor [dB]	Limit:1 dB [uVolts/meter]	2
<hr/>						
Range: 1 1000 - 2000MHz -----						
1	1301.349	59.6 pk	-40	24.7	44.3	74
	Azimuth:173	Height:106	Vert	Margin [dB]	-29.7	54 -9.7
<hr/>						
Range: 2 2000 - 5000MHz -----						
4	2169.352	47.9 pk	-38.3	27.7	37.3	74
	Azimuth:281	Height:150	Vert	Margin [dB]	-36.7	54 -16.7
7	2603.597	47.2 pk	-37.5	28.8	38.5	74
	Azimuth:166	Height:100	Vert	Margin [dB]	-35.5	54 -15.5
<hr/>						
Range: 3 1000 - 2000MHz -----						
2	1301.349	54.3 pk	-40	24.7	39	74
	Azimuth:318	Height:100	Horz	Margin [dB]	-35	54 -15
3	1736.132	47.6 pk	-39.6	26.1	34.1	74
	Azimuth:196	Height:100	Horz	Margin [dB]	-39.9	54 -19.9
<hr/>						
Range: 4 2000 - 5000MHz -----						
5	2169.352	50.7 pk	-38.3	27.6	40	74
	Azimuth:246	Height:100	Horz	Margin [dB]	-34	54 -14
6	2603.597	47 pk	-37.5	28.8	38.3	74
	Azimuth:303	Height:100	Horz	Margin [dB]	-35.7	54 -15.7

LIMIT 1: FCC 15.231E Fundamental @ 3m  
LIMIT 2: FCC 15.231E Spurious @ 3m

pk - Peak detector  
qp - Quasi-Peak detector  
av - Average detector

## Photographs



## 7.6 Occupied Bandwidth

### Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

### Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal Next
Spectrum Analyzer	Hewlett-Packard	8566B	8034	7/7/2005	7/7/2006

### Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal Next
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Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
6dB Res Band Display	Hewlett-Packard	85662A	8031	7/7/2005	7/7/2006
Quasi-Peak Detector	Hewlett-Packard	85650A	8030	7/7/2005	7/7/2006
Switch Driver	Hewlett-Packard	11713A	8036	7/7/2005	7/7/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006
Preselector	Hewlett-Packard	85685A	8037	7/7/2005	7/7/2006

### UL Procedure

With unit transmitting at 433.9 MHz, the spectrum analyzer is to be placed in a peak-hold mode centered around the 433.9 MHz fundamental. The span of the analyzer is to be large enough to encompass the entire fundamental. The marker on the peak of the envelope, the marker delta function is to be used. One side of the delta is moved 20 dB down from one side of the peak. The other side is to be moved 20 dB down to the other side of the peak. The bandwidth between the delta markers is to be recorded.

### Frequency Range of Measurement

434 MHz

### Measurement Distance

3 meters

### Test Results

Measured bandwidth is: 199 kHz

Maximum bandwidth allowed is 1.08 MHz

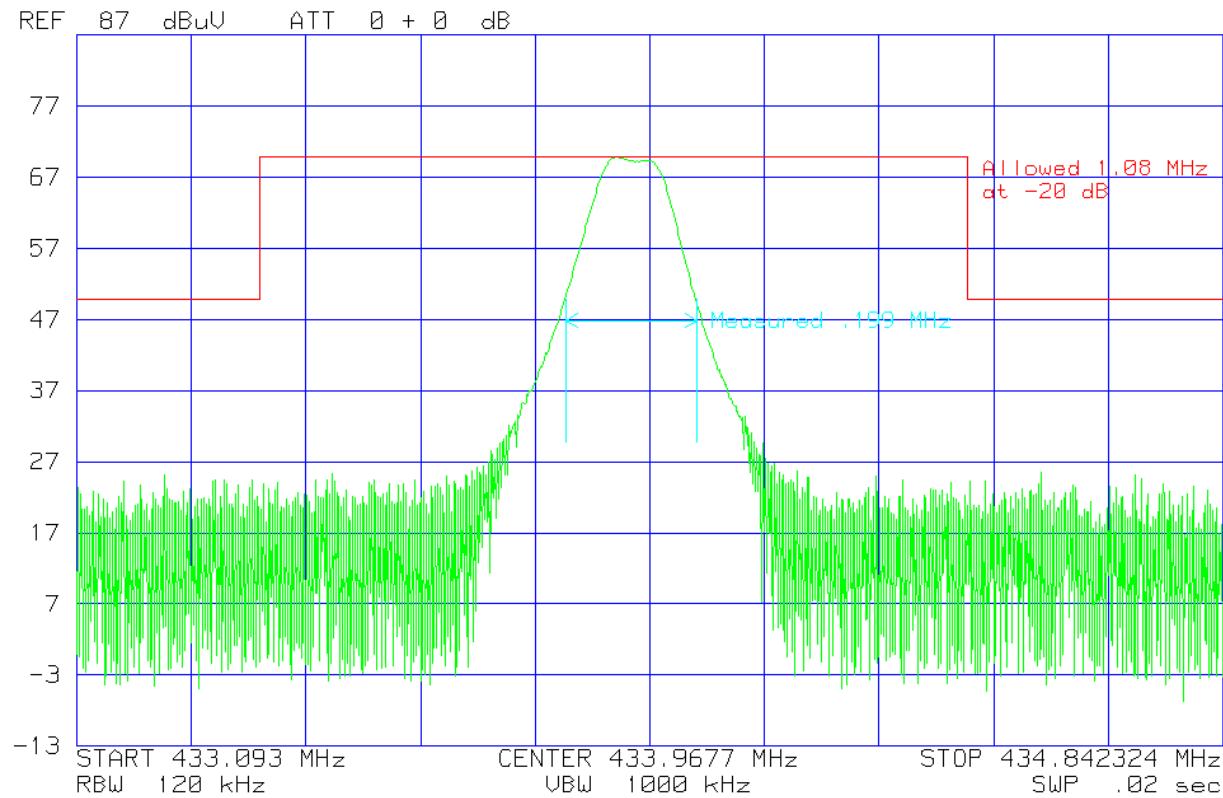
The requirements are:

MET

### Remarks

None.

## Test Data



### Photograph

