L.S. Compliance, Inc.
W66 N220 Commerce Court
Cedarburg, WI 53012
262-375-4400 Fax: 262-375-4248

COMPLIANCE TESTING OF:

CLW-DIM1RF
Stand Alone Wall Box Dimmer RF Module

PREPARED FOR:

Crestron Electronics
Attn.: Mr. Paul Connell
15 Volvo Drive
Rockleigh, NJ 07647

TEST REPORT NUMBER:

304556

TEST DATE(S):

February, March and April, 2005

Table of Contents

1. L. S. Compliance In Review

L.S. Compliance - 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 : 1999
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

Listing of 3 and 10 meter OATS based on Title 47CFR – Part 2.948
FCC Registration Number: 90757

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 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. A2LA Certificate of Accreditation

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

L.S. COMPLIANCE, INC.
Cedarburg, WI

for technical competence in the field of

Electrical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002 (1994).

Presented this 26th day of March 2003.

President
For the Accreditation Council
Certificate Number 1255.01
Valid to January 31, 2005

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

3. A2LA Scope of Accreditation

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

L.S. COMPLIANCE, INC.
W66 N220 Commerce Court
Cedarburg, WI 53012
James Blaha Phone: 262 375 4400

ELECTRICAL (EMC)

Valid to: January 31, 2005 Certificate Number: 1255-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:

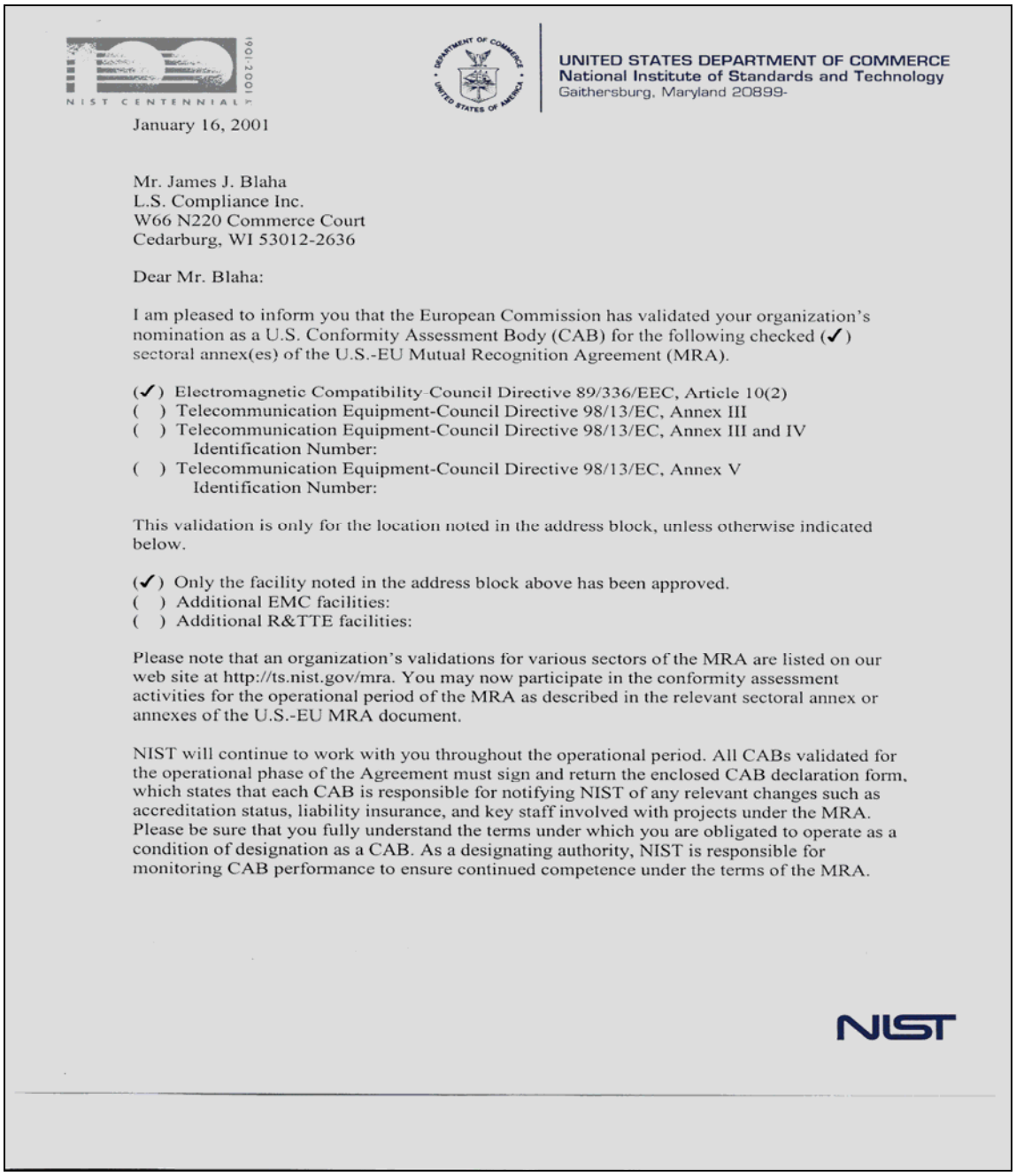
Test	Test Method(s)
Emissions	
Conducted	
Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15, 18 using ANSI C63.4; EN: 55011, 55022, 50081-1, 50081-2; CISPR: 11, 12, 14-1, 22; CNS 13438
Radiated	Code of Federal Regulations (CFR) 47, FCC Method Parts 15, 18 using ANSI C63.4; EN: 55011, 55022, 50081-1, 50081-2; CISPR: 11, 12, 14-1, 22; CNS 13438
Current Harmonics	IEC 61000-3-2; EN 61000-3-2
Voltage Fluctuations & Flicker	IEC 61000-3-3; EN 61000-3-3
Immunity	EN: 50082-1, 50082-2 EN 61000-6-2 CISPR: 14-2, 24
Conducted Immunity	
Fast Transients/Burst	IEC 61000-4-4; EN 61000-4-4
Surge	IEC: 61000-4-5; ENV 50142; EN 61000-4-5
RF Fields	IEC: 61000-4-6; ENV 50141; EN 61000-4-6
Voltage Dips/Interruptions	IEC 61000-4-11; EN 61000-4-11

Roxanne M. Robinson

(A2LA Cert. No. 1255-01) 05/13/03 Page 1 of 2

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

4. Validation Letter – U.S. Competent Body for EMC Directive 89/336/EEC



UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

January 16, 2001

Mr. James J. Blaha
L.S. Compliance Inc.
W66 N220 Commerce Court
Cedarburg, WI 53012-2636

Dear Mr. Blaha:

I am pleased to inform you that the European Commission has validated your organization's nomination as a U.S. Conformity Assessment Body (CAB) for the following checked (✓) sectoral annex(es) of the U.S.-EU Mutual Recognition Agreement (MRA).

(✓) Electromagnetic Compatibility-Council Directive 89/336/EEC, Article 10(2)
( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex III
( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex III and IV
Identification Number:
( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex V
Identification Number:

This validation is only for the location noted in the address block, unless otherwise indicated below.

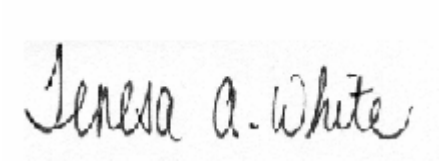
(✓) Only the facility noted in the address block above has been approved.
( ) Additional EMC facilities:
( ) Additional R&TTE facilities:

Please note that an organization's validations for various sectors of the MRA are listed on our web site at http://ts.nist.gov/mra. You may now participate in the conformity assessment activities for the operational period of the MRA as described in the relevant sectoral annex or annexes of the U.S.-EU MRA document.

NIST will continue to work with you throughout the operational period. All CABs validated for the operational phase of the Agreement must sign and return the enclosed CAB declaration form, which states that each CAB is responsible for notifying NIST of any relevant changes such as accreditation status, liability insurance, and key staff involved with projects under the MRA. Please be sure that you fully understand the terms under which you are obligated to operate as a condition of designation as a CAB. As a designating authority, NIST is responsible for monitoring CAB performance to ensure continued competence under the terms of the MRA.

NIST

5. Signature Page



Prepared By: April 8th, 2005

Teresa A. White, Document Coordinator Date

Tested and
Approved By: April 8th, 2005

Kenneth L. Boston, EMC Lab Manager Date
PE #31926 Licensed Professional Engineer
Registered in the State of Wisconsin, United States

6. Product and General Information

Manufacturer:	Crestron Electronics					
Date(s) of Test:	February, March and April of 2005					
Test Engineer(s):		Tom Smith		Abtin Spantman	√	Ken Boston
Model #:	CLW-DIM1RF					
Serial #:	X101357					
Voltage:	115 VAC					
Operation Mode:	Continuous data modulation transmit					

7. Introduction

During February, March and April of 2005, a series of Conducted and Radiated Emission tests were performed on one sample of the Crestron Stand Alone wall box dimmer RF module, Model Number CLW-DIM1RF, Serial Number X101357, here forth 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 15.247 (Industry Canada RSS-210) for a low power transmitter. These tests were performed by Kenneth L. Boston, EMC Lab Manager of L.S. Compliance, Inc. Direct conducted RF measurements for this product were transposed from the Crestron PCB Test Report # 304557 for two reasons. First, the RF section of both the Crestron dimmer and the PCB are identical, and second, a direct connection to the output of the dimmer cannot be accomplished due to the power supply configuration on the A.C. circuit.

All Radiated and Conducted Emission tests were performed upon the EUT to measure the emissions in the frequency bands described in Title 47 CFR, FCC Part 15, including 15.35, 15.209, 15.247 and Industry Canada RSS-210 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 Radioelelectriques (CISPR) Number 16-1, 2003.

All tests were performed at L.S. Compliance, Inc., in Cedarburg, Wisconsin, unless otherwise noted.

8. Product Description

The CLW-DIM1RF is a stand alone wall box dimmer, used in standard 110 VAC residential or commercial wiring applications with load ratings up to 1000 Watts. The CLW-DIM1RF is designed to fit within standard metal or plastic electrical gang boxes and uses standard decorator style faceplates. In addition to providing standard manual switch and dimming functions, the CLW-DIM1RF incorporates an IEEE 802.15.4, which is a 2.4 GHz RF transceiver, allowing remote and automated control of lighting level.

9. Test Requirements

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

15.207	15.247b	15.247e
15.205	15.247c	15.209
15.247a	15.247d	15.31

10. Summary of Test Report

DECLARATION OF CONFORMITY

The Crestron Stand Alone wall box dimmer RF module, Model Number CLW-DIM1RF, Serial Number X101357 was found to **MEET** the requirements as described within the specification of Title 47 CFR FCC, Part 15.247, Subpart C; and Industry Canada RSS-210, 6.2.2 for a Frequency Hopping Spread Spectrum Transmitter.

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.

11. Radiated Emissions Test

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 a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in a continuous modulated TX mode, using power as provided by an internal supply operating from 115 VAC. The unit has the capability to operate on 15 channels, controllable by the manufacturer. The applicable limits apply at a 3 meter distance, and are found on Page 12 of this report. Measurements above 5 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (11), medium (18) and high (25) to comply with FCC Part 15.35. The channels and operating modes were changed using push button selections, configured on the test sample for this purpose.

Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 25,000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. 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 18 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. From 18 GHz to 25 GHz, the EUT was measured at a 1.0 meter separation, using a standard gain Horn Antenna and pre-amplifier.

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 18 GHz, an HP E4407 Spectrum Analyzer and an EMCO Horn Antenna were used. From 18 GHz to 25 GHz, the EUT was measured at a 1.0 meter separation, using a standard gain horn and a pre-amplifier.

Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 for a FHSS transmitter (Canada RSS-210). The frequencies with significant signals were recorded and plotted as shown in the Data Charts and Graphs.

CALCULATION OF RADIATED EMISSIONS LIMITS

The following table depicts the Class B limits for an unintentional radiator. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands.

Frequency (MHz)	μV/m	3 m Limit (dBμV/m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-24,000	500	54.0

Sample conversion from field strength μV/m to dBμV/m:

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

= 40 dBμV/m (from 30-88 MHz)

For measurements made at 0.3 meter, a 20 dB correction has been invoked.

960 MHz to 10,000 MHz

500μV/m or 54.0 dB/μV/m at 3 meters

54.0 + 20 = 74 dB/μV/m at 0.3 meters

For measurements at 1.0 meter, a 9.5 dB correction has been invoked.

54.0 + 9.5 = 63.5 dBμV/m at 1.0 meters.

CISPR 11: Radiated Emissions Data Chart

1 and 3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: Title 47 CFR, Parts 15.247 and 15.205
Frequency Range Inspected: 30 MHz to 25,000 MHz

Manufacturer:	Crestron Electronics								
Date(s) of Test:	February 14th and 15th, 2005								
Test Engineer(s):		Tom Smith		Abtin Spantman	√	Ken Boston			
Model #:	CLW-DIM1RF								
Serial #:	X101357								
Voltage:	115 VAC								
Operation Mode:	continuous data modulation, transmit								
EUT Power:	√	Single Phase 115 VAC		3 Phase ___VAC					
		Battery		Other:					
EUT Placement:	√	80cm pedestal		10cm Spacers					
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS					
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 E4407B
Log Periodic Antenna: EMCO #93146
Horn Antenna: EMCO #3115
Biconical Antenna: EMCO 93110
Pre-Amp: Advanced Microwave WHA6224
Standard Gain Horn: EMCO 3160-09

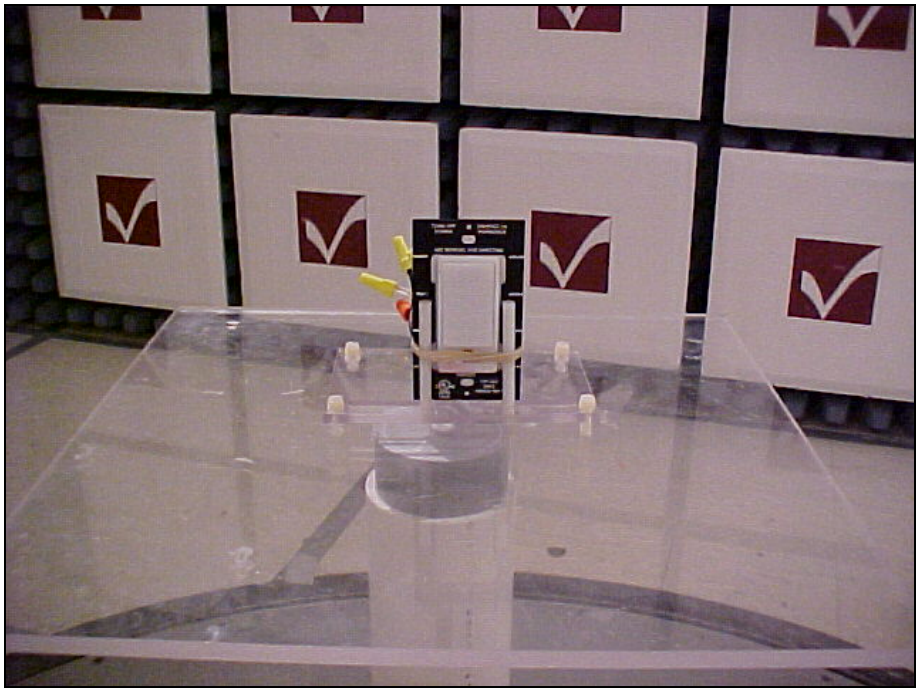
The following table depicts the level of significant radiated emissions found:

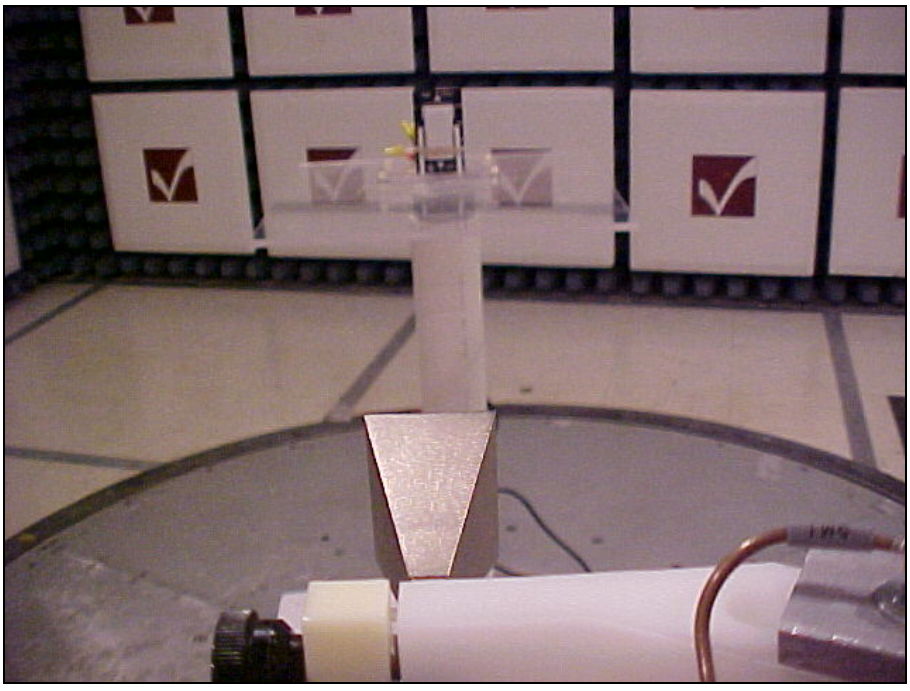
Frequency (MHz)	Antenna Polarity	Channel	Height (meters)	Azimuth (0° - 360°)	EMI Meter Reading (dBμV/m)	15.205 Limit (dBμV/m)	Margin (dB)
37.0	V	11	1.0	170	23.4	40.0	16.6
37.9	V	11	1.0	170	17.8	40.0	22.2
2489.1	V	25	1.13	0	33.6	54.0	20.4
4810	H	11	1.1	30	40.9	54.0	13.1
4880	V	18	1.05	22	40.1	54.0	13.9
4950	V	25	1.02	0	42.2	54.0	11.8
7216.4	V	11	1.0	0	40.3	63.5	23.2
7321.5	V	18	1.0	320	45.5	63.5	18.0
9761.9	H	18	1.0	355	48.1	63.5	15.4
7426.4	V	25	1.0	320	48.5	63.5	15.0
9902	H	25	1.0	355	55.8	63.5	7.7

Note: A Quasi-Peak Detector was used in measurements below 1 GHz, and both Peak and Average Detectors were used in measurements above 1 GHz.
All peak readings were greater than 20 dB below the peak limits.
All other emissions seen were greater than 20 dB below the average limits (>1GHz) or quasi-peak limits (<1GHz).

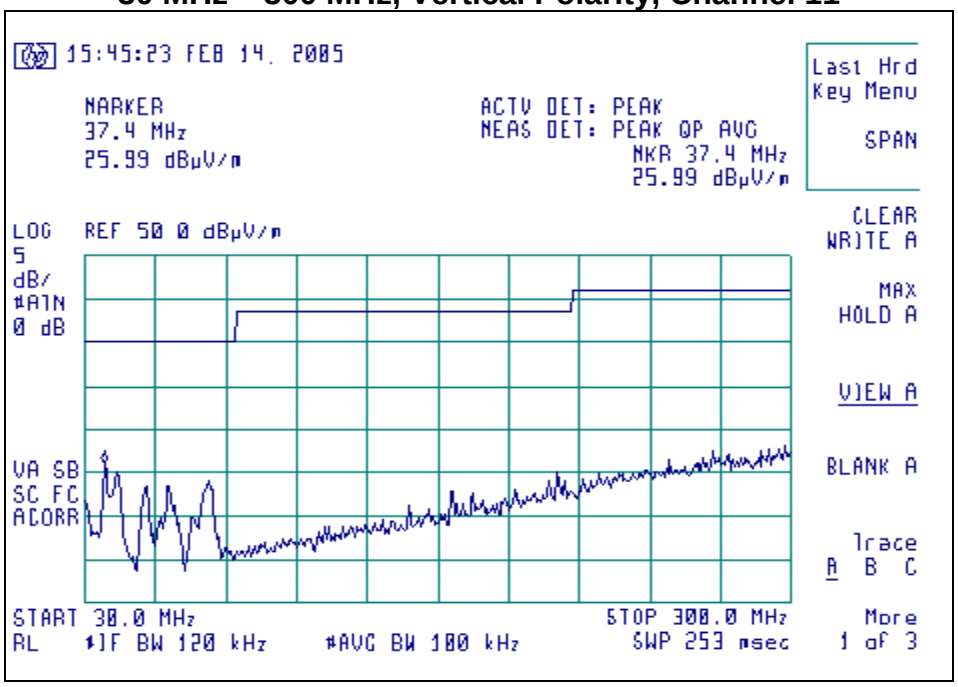
Photos Taken During Radiated Emission Testing

Setup for the Radiated Emissions Test

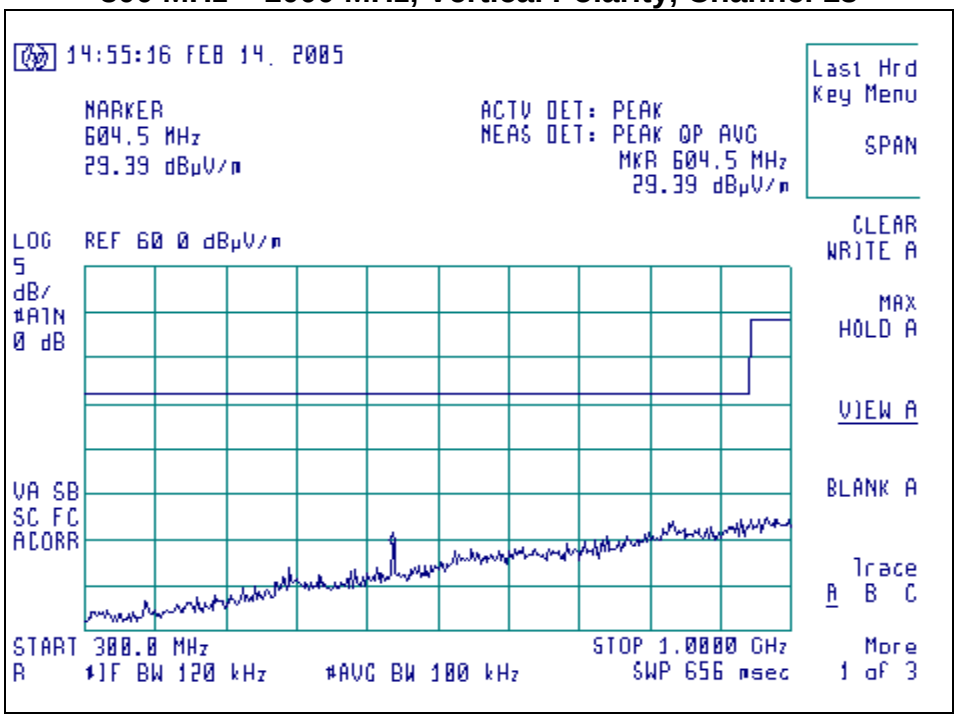




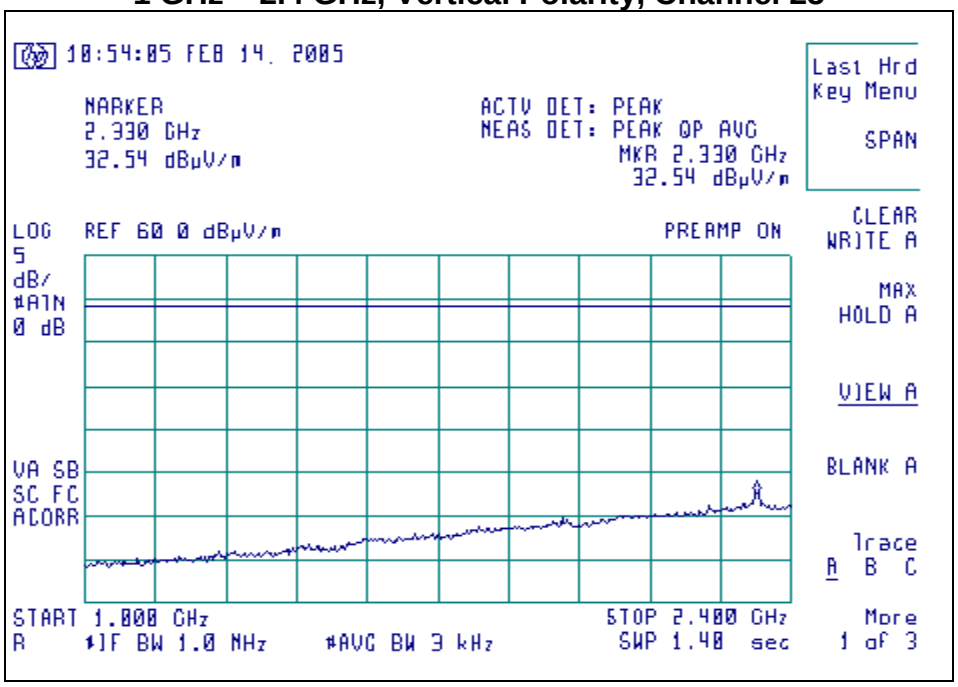
Signature Scan of Peak Radiated Emissions
30 MHz – 300 MHz, Vertical Polarity, Channel 11



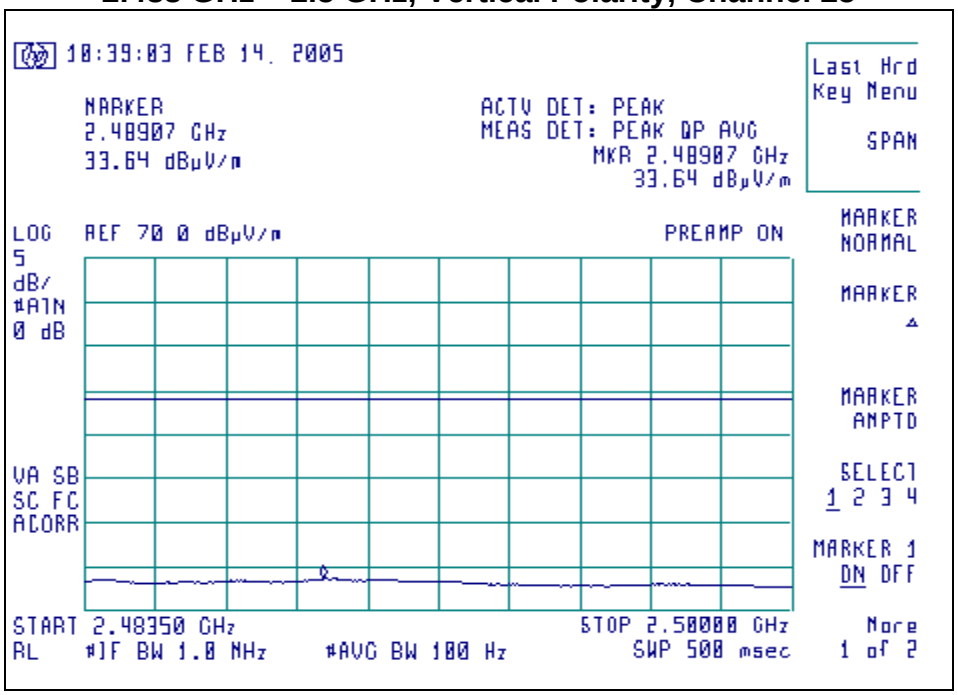
Signature Scan of Peak Radiated Emissions
300 MHz – 1000 MHz, Vertical Polarity, Channel 18



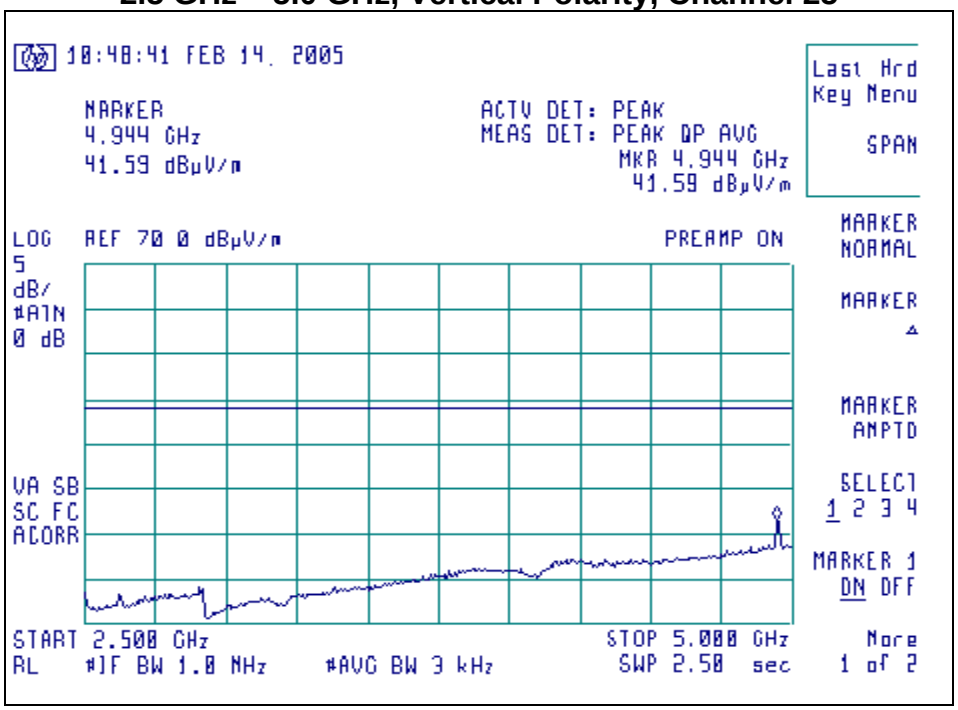
Signature Scan of Peak Radiated Emissions
1 GHz – 2.4 GHz, Vertical Polarity, Channel 25



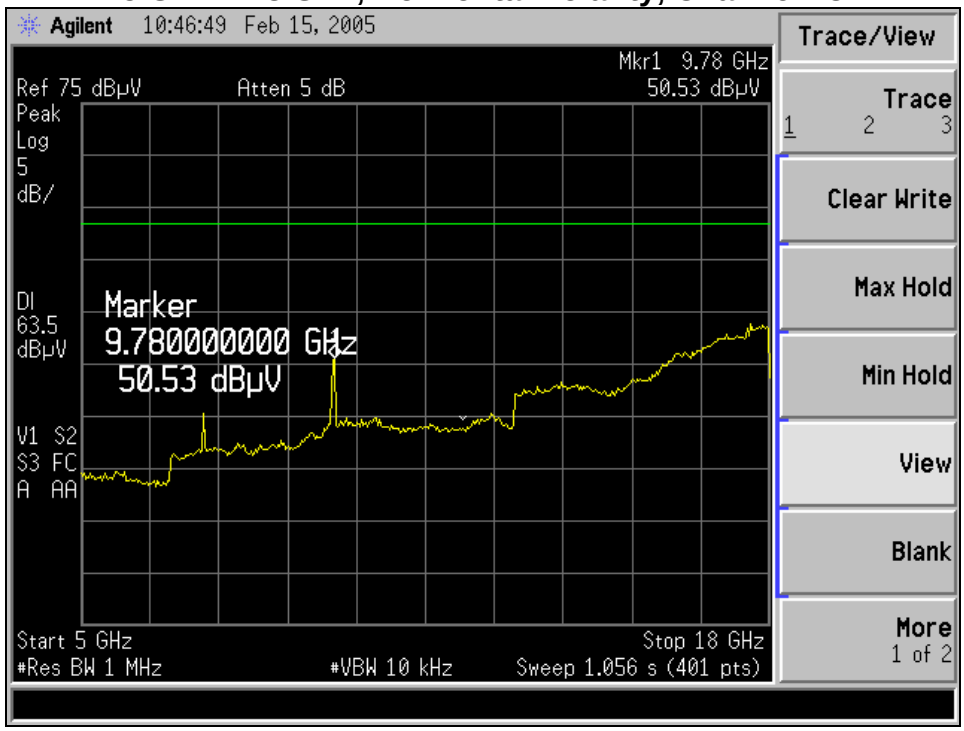
Signature Scan of Peak Radiated Emissions
2.483 GHz – 2.5 GHz, Vertical Polarity, Channel 25



Signature Scan of Peak Radiated Emissions
2.5 GHz – 5.0 GHz, Vertical Polarity, Channel 25

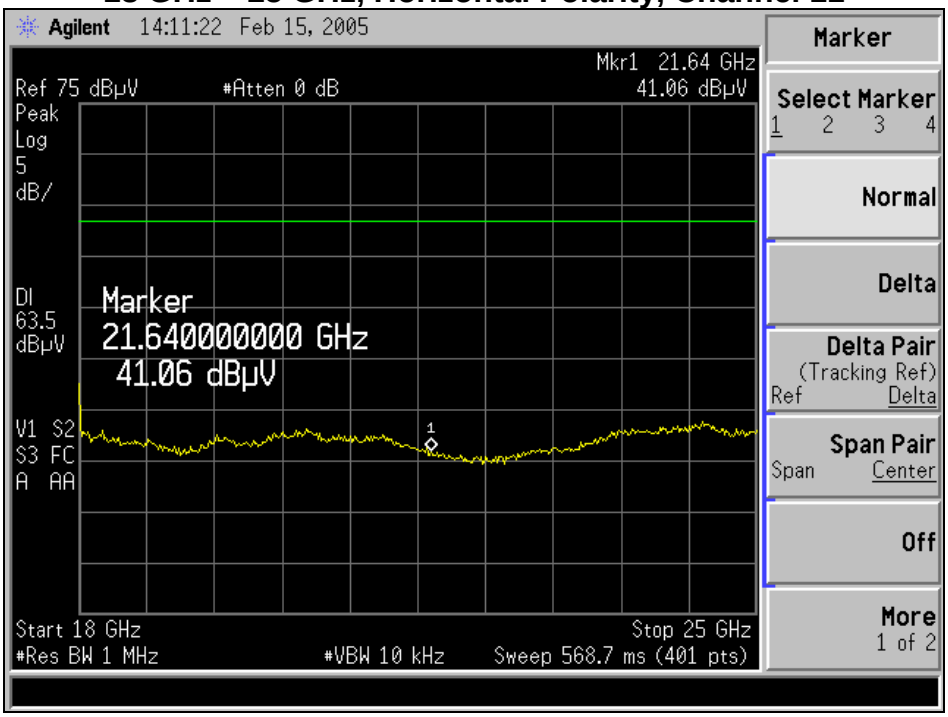


5 GHz – 18 GHz, Horizontal Polarity, Channel 18



5 GHz – 18 GHz, Horizontal Polarity, Channel 25

18 GHz – 25 GHz, Horizontal Polarity, Channel 11



12. Conducted Emissions Test, AC Power Line

Test Setup

The Conducted Emissions test was performed at L.S. Compliance, Inc. in Cedarburg, Wisconsin. 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). 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 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided to the dimmer 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 EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

Test Procedure

The EUT was run in continuous modulated transmit mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (2002), Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

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
In the Shielded Room

Frequency Range inspected: 150 KHz to 30 MHz

Manufacturer:	Crestron Electronics							
Date(s) of Test:	February, March and April of 2005							
Test Engineer:		Tom Smith		Abtin Spantman	√	Ken Boston		
Model #:	CLW-DIM1RF							
Serial #:	X101357							
Voltage:	115 VAC							
Operation Mode:	Normal							
Test Location:	√	Shielded Area				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

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV/m)	Q-Peak Limit (dBµ V/m)	Quasi-Peak Margin (dB)	Average Reading (dBµV/m)	Average Limit (dBµ V/m)	Average Margin (dB)
.155	L1	41.5	65.7	24.2	15.8	55.7	39.9
.150	L1	39.4	64.9	25.5	20.8	54.9	34.1
8.00	L1	40.1	60.0	19.9	32.3	50.0	12.7
.155	L2	42.1	65.7	23.6	15.4	55.7	40.3
.470	L2	32.7	56.5	23.8	16.3	46.5	30.2
8.00	L2	40.0	60.0	20.0	32.0	50.0	13.0

Notes:
1) All other emissions were better than 20 dB below the limits.
2) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle 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 (dBµV)	Average Limit (dBµV)
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:

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

For a frequency of 200 kHz for example:

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

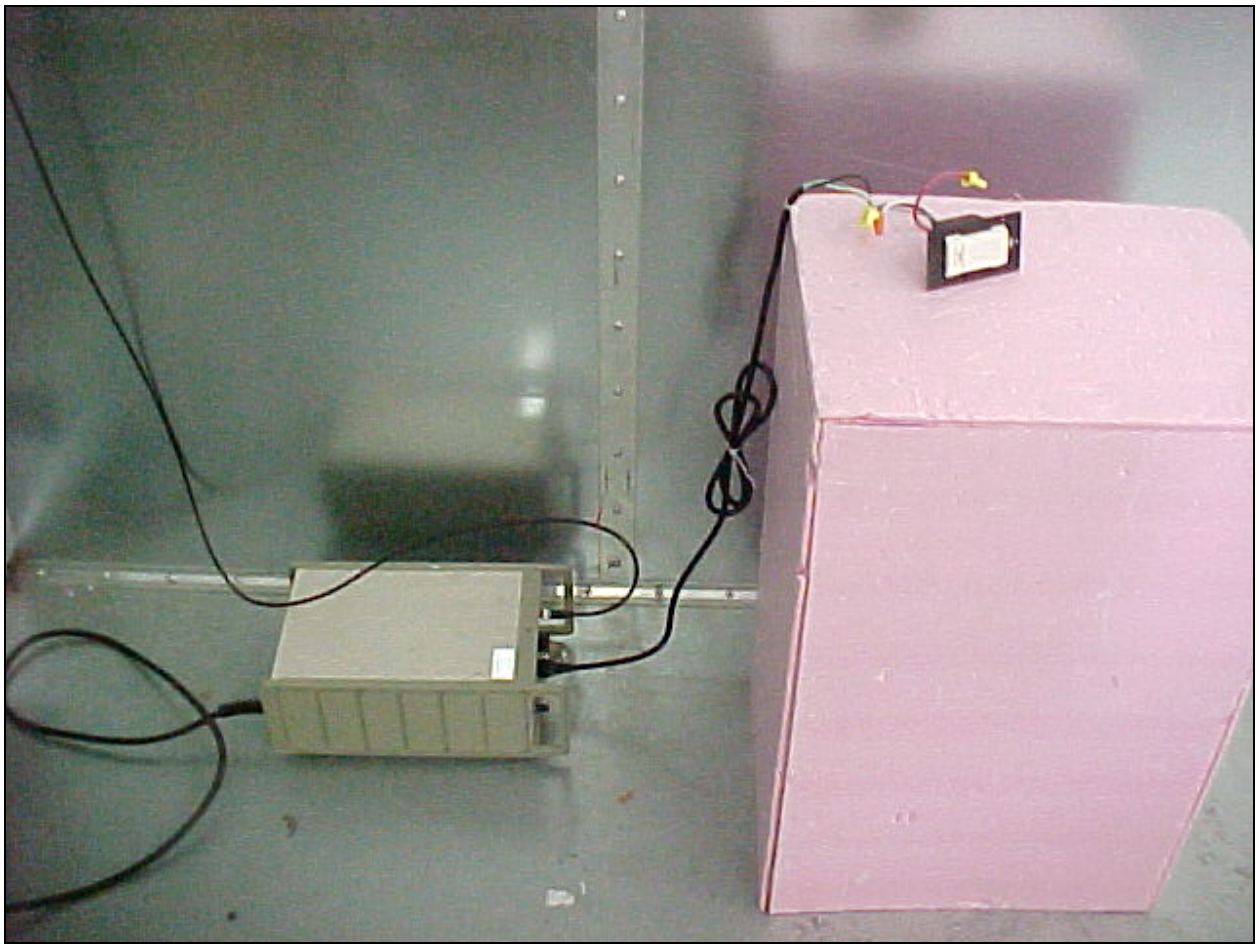
$$\text{Quasi-Peak Limit (F=200kHz)} = 63.6 \text{ dB}\mu\text{V}$$

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

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

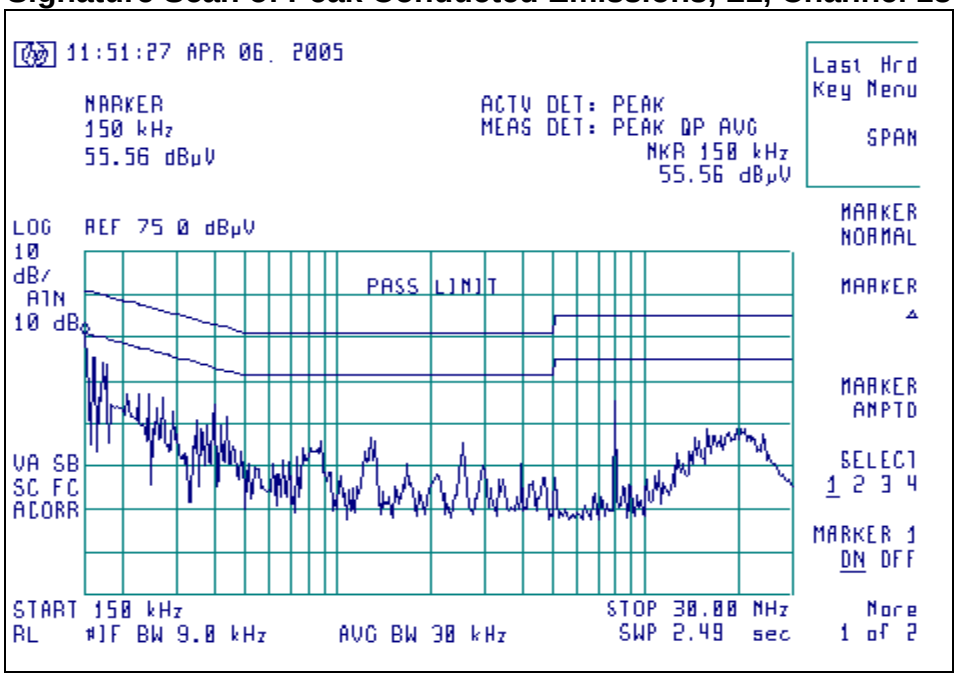
Photo(s) Taken During Conducted Emission Testing

Setup for the Conducted Emissions Test

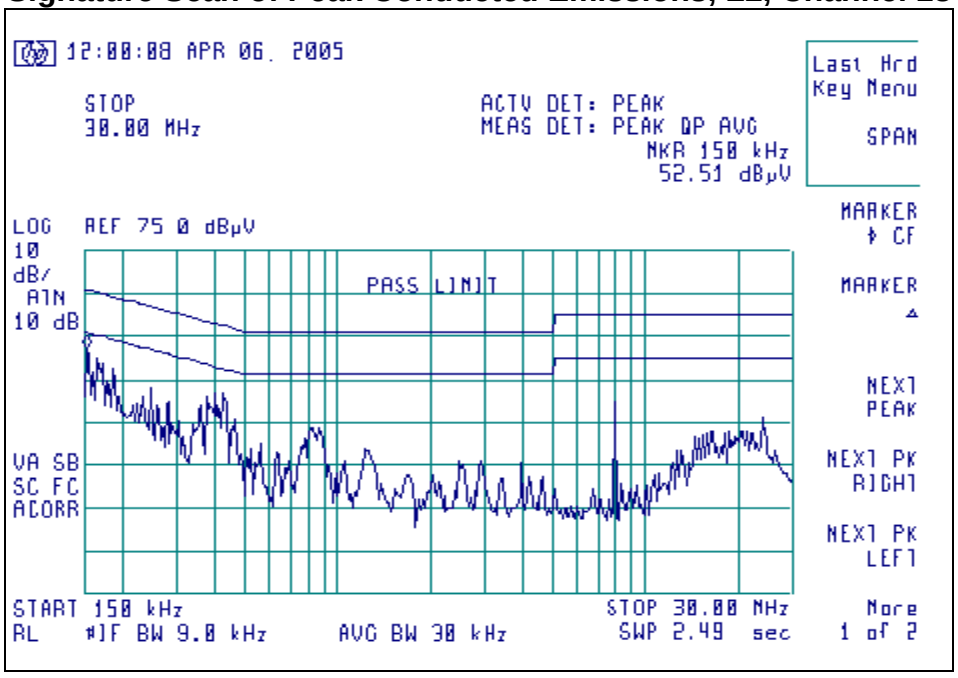


Graphs made during Conducted Emission Testing

Signature Scan of Peak Conducted Emissions, L1, Channel 18



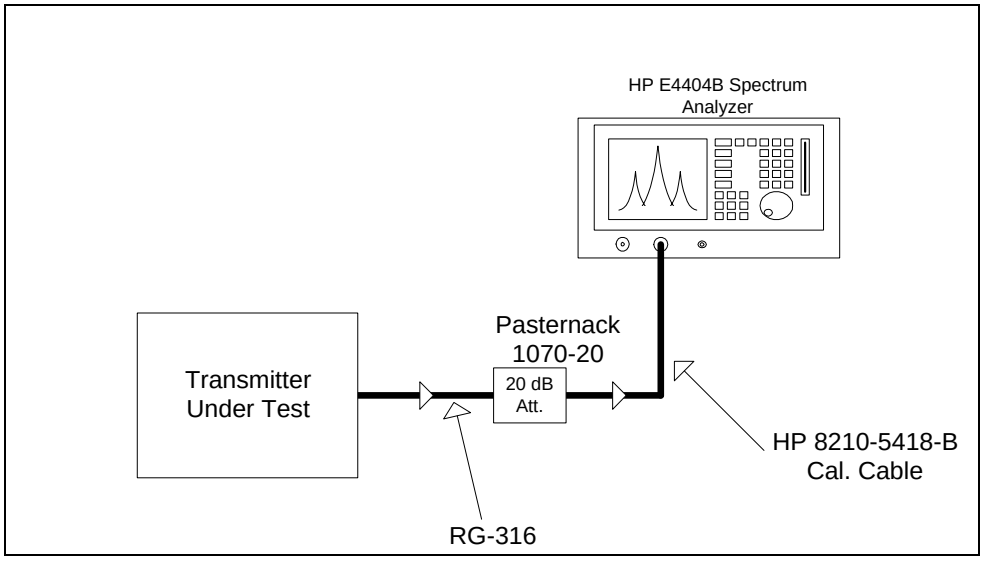
Signature Scan of Peak Conducted Emissions, L2, Channel 18



13. Conducted Emissions Test, Power Output

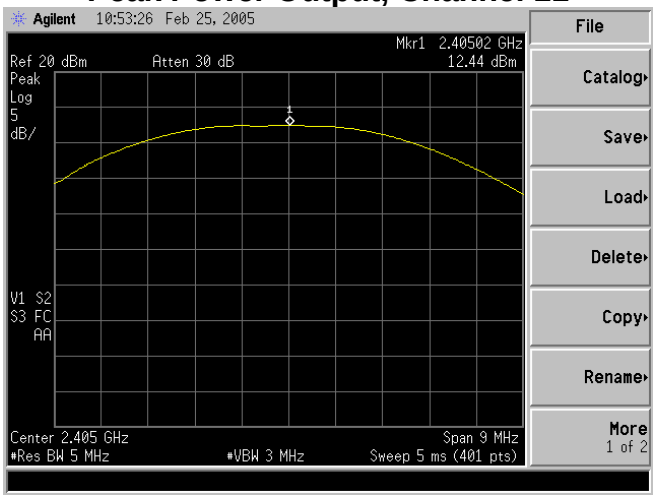
For the FCC Part 15.247b measurement, the output of the Crestron pcb (results of the pcb test used for dimmer product, as the RF circuit is identical) was connected via a short jumper cable created only for this measurement, into the input of the HP E4407B Spectrum Analyzer. The unit was configured to run in a normal transmit mode, while being supplied with the Crestron interface board as a modulation source. The HP receiver was set to a 5 MHz Bandwidth, and the transmit signal was then stored, with the peak signal level stored. This power level was collected for all four channels and can be seen in the chart presented below. Bandwidth for this measurement was 5 MHz, RBW and 3 MHz, VBW.

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
11	2405	30 dBm	12.44	17.56
18	2440	30 dBm	12.20	17.80
25	2475	30 dBm	11.75	18.25

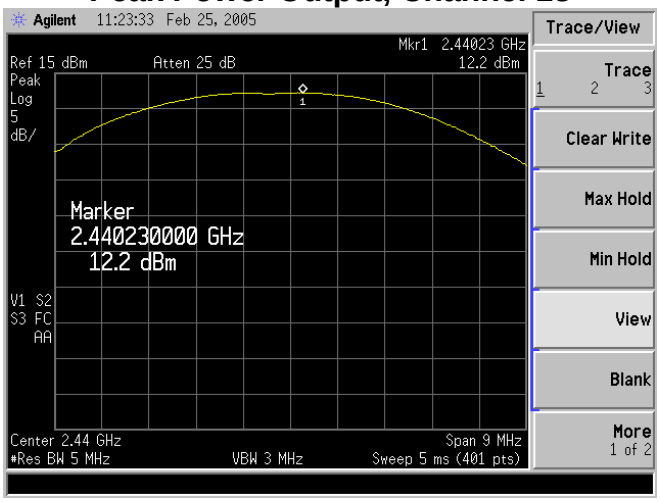


Note: No power output variation was seen when varying the AC voltage to the supplied AC/DC supply from 98 VAC to 132 VAC.

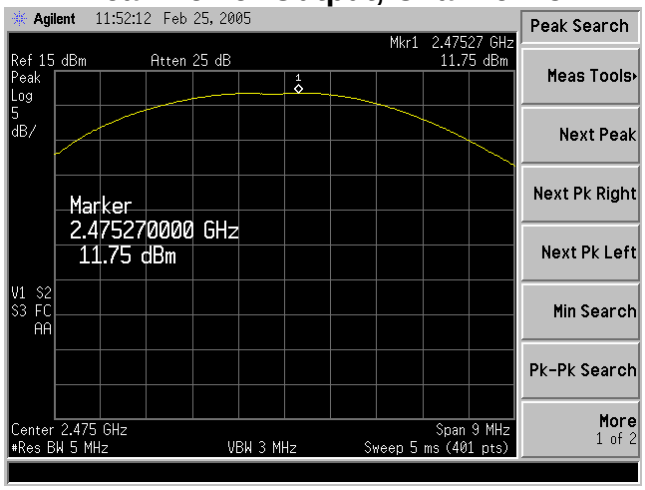
Peak Power Output, Channel 11



Peak Power Output, Channel 18

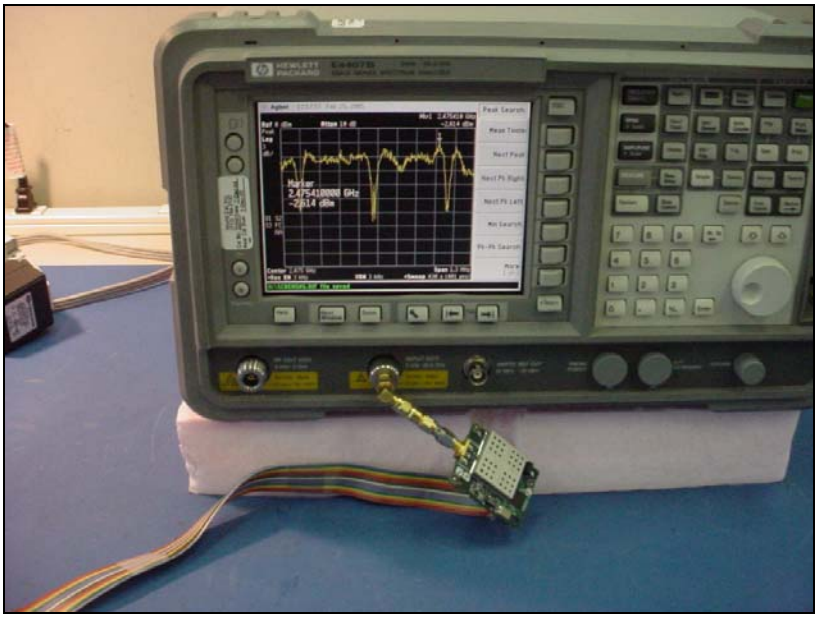


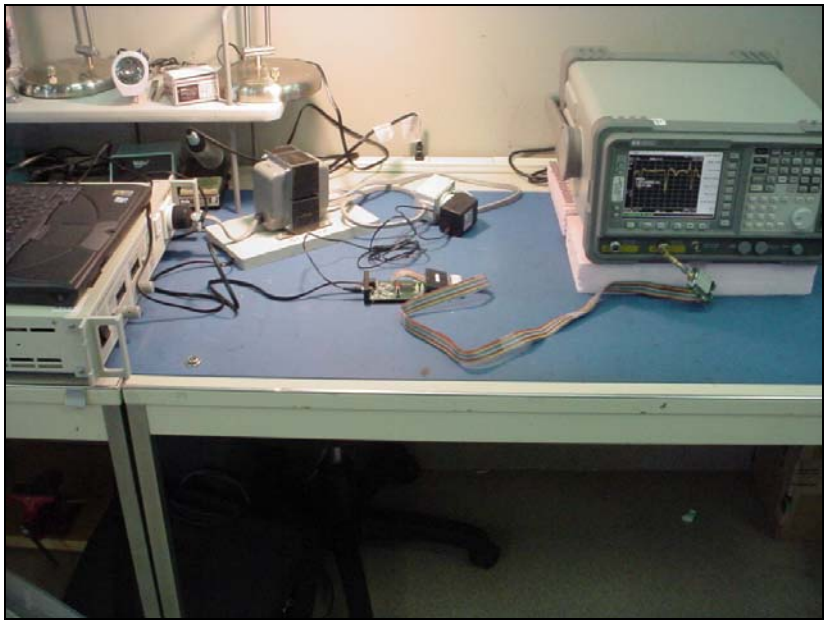
Peak Power Output, Channel 25



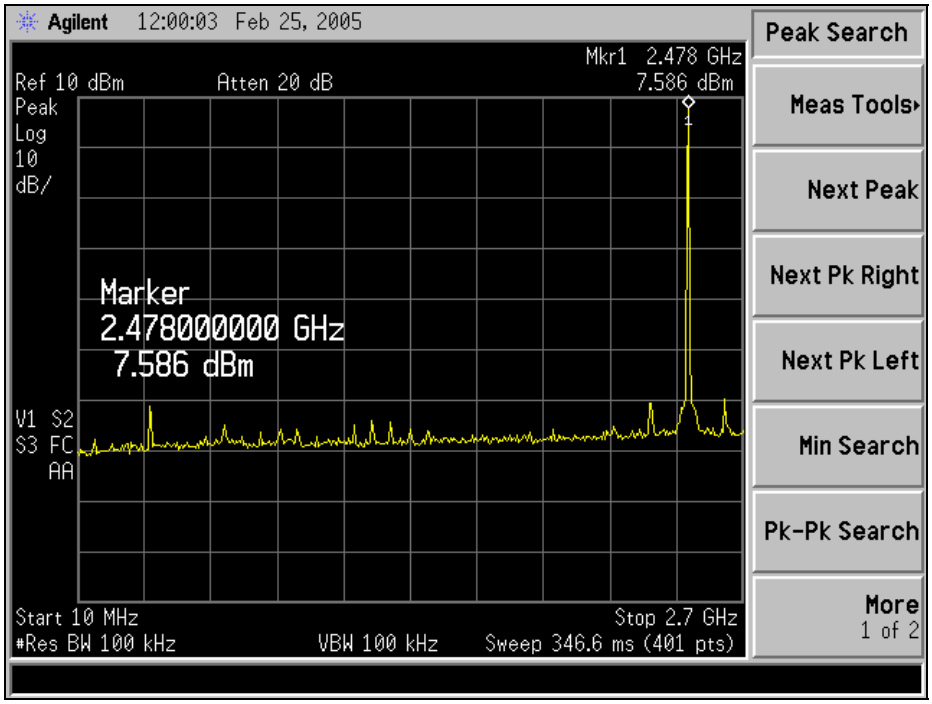
14. Conducted Emissions Test, Spurious Emissions

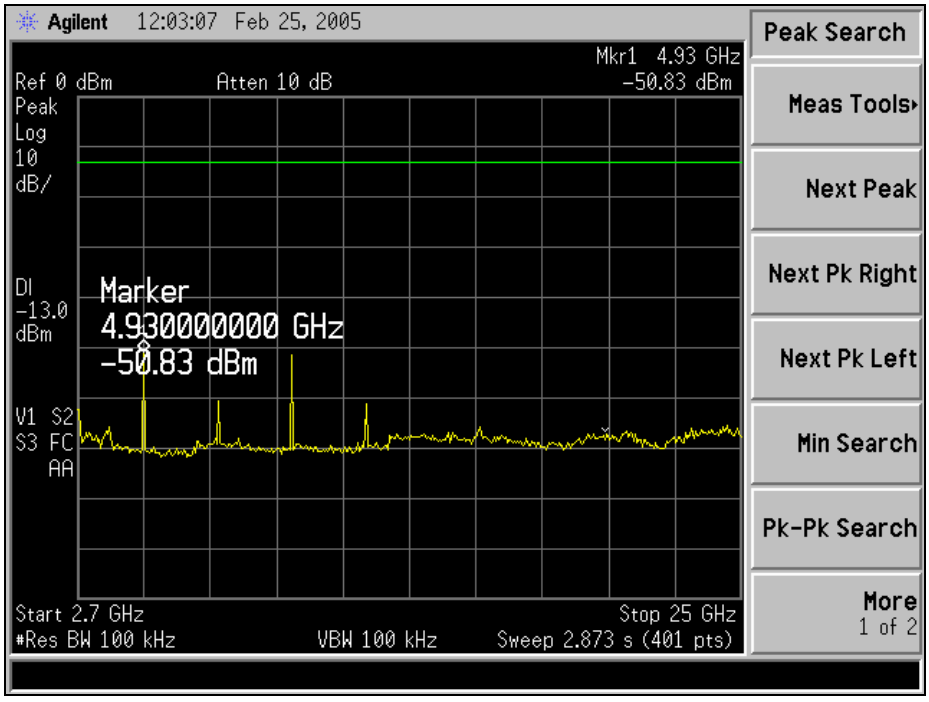
FCC Part 15.247 (c) requires an antenna conducted measurement of conducted harmonic and spurious levels, as reference to the carrier frequency in a 100 kHz bandwidth. For this test, the video transmitter module was directly connected to the HP E4407B Spectrum Analyzer, through a very short Coaxial Cable and a 10 DB Attenuator. Plots were then taken, with any noticeable spurious or harmonic signals identified. No significant levels at any spurious products could be found within -20 dBc of the fundamental of the transmitter. Signals that were observed were greater than 50 dB down. (In the 100 kHz bandwidth)





Plots of Conducted Spurious and Fundamental Levels, Channel 25 Shown



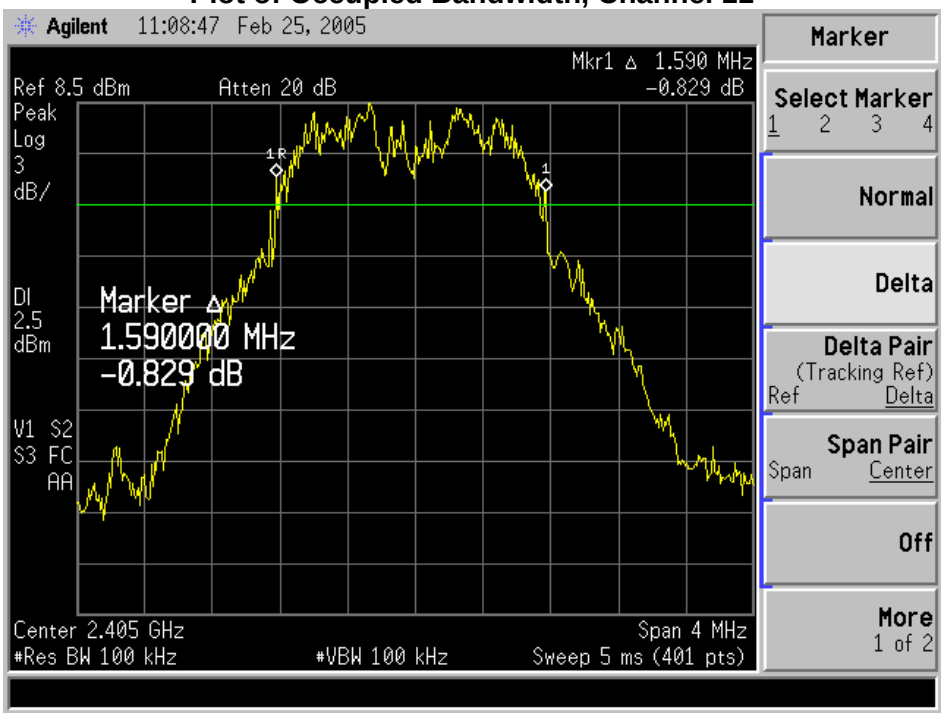


15. Conducted Emissions Test, Occupied Bandwidth

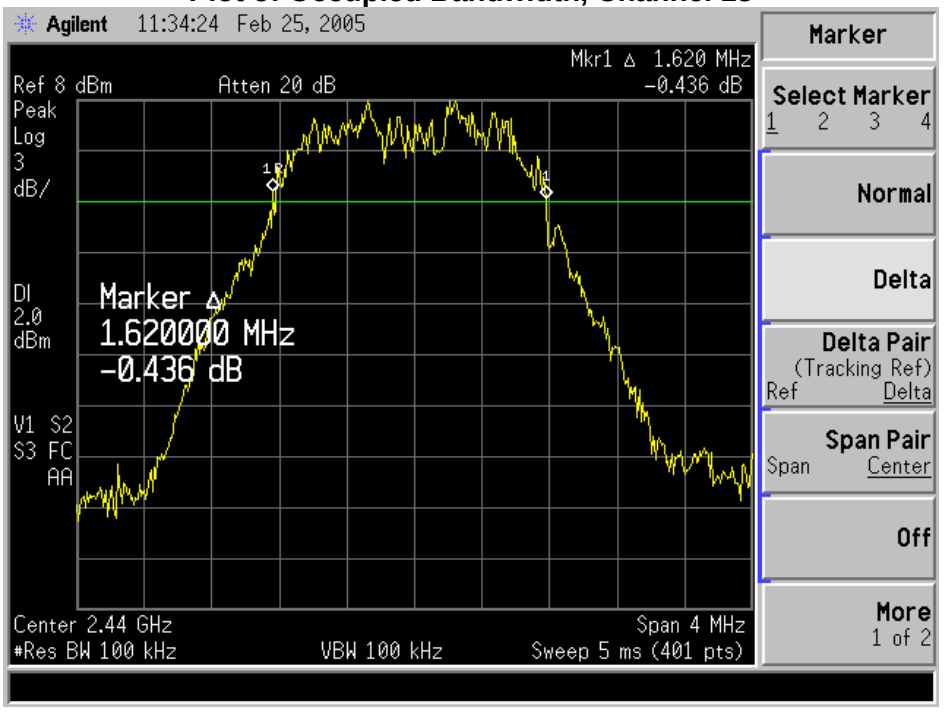
The 6 dB bandwidth requirement found in FCC Part 15.247.a.2 is a minimum of 500 kHz. Direct measurement of the transmitted signal, via a direct cabled connection to the HP E4407B Analyzer, was then used to determine the signal bandwidth. For each of the representative channels, refer to the graphs found in Appendix C. From this data, the bandwidth of channel 11, which is the closest data to the specification limit, is 1590 kHz, which is above the minimum of 500 kHz.

CHANNEL	CENTER FREQ (MHz)	MEASURED 6 dB BW (kHz)	MINIMUM LIMIT (kHz)
11	2405	1590	500
18	2440	1620	500
25	2475	1600	500

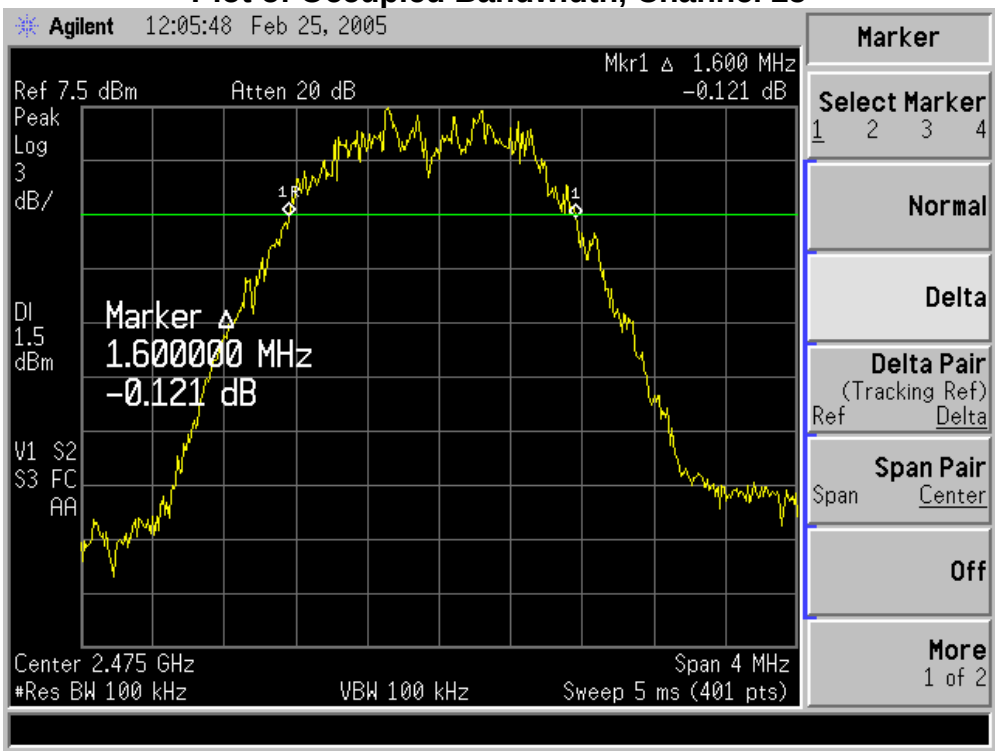
Plot of Occupied Bandwidth, Channel 11



Plot of Occupied Bandwidth, Channel 18



Plot of Occupied Bandwidth, Channel 25

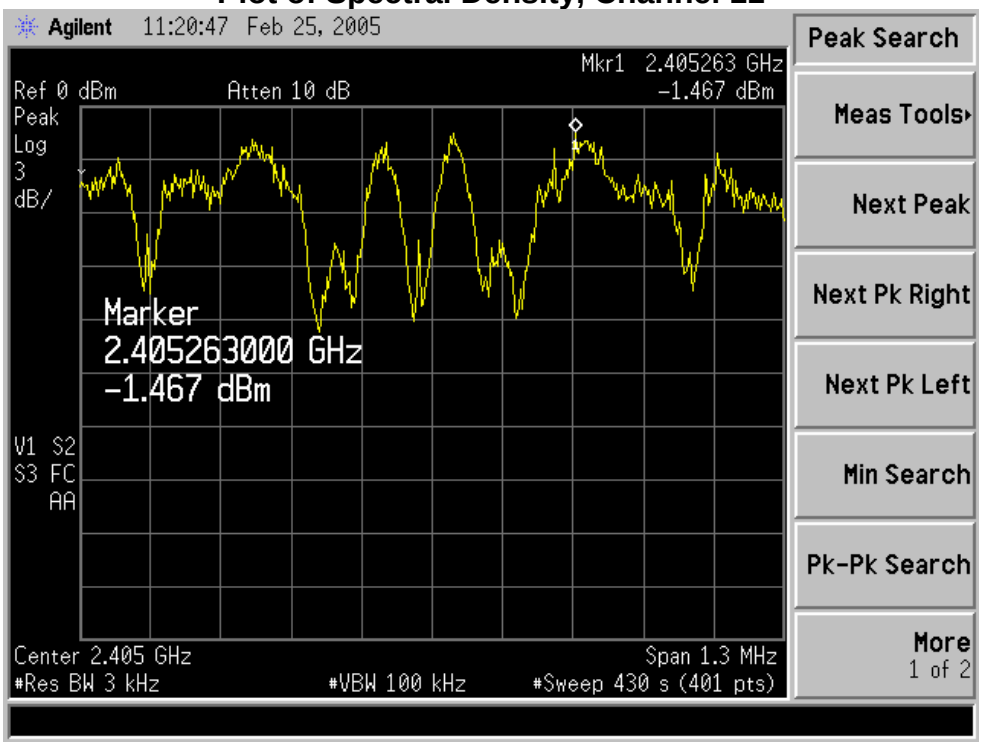


16. Conducted Emissions Test, Spectral Density

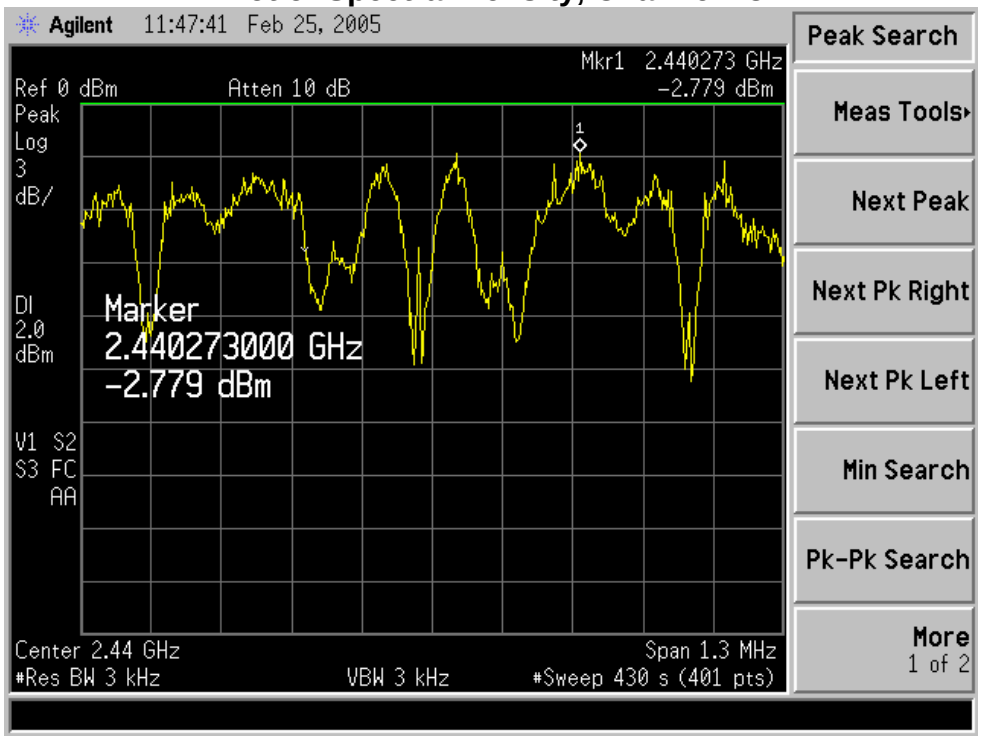
In accordance with FCC Part 15.247(d), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in Section 14. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed using the utility built into the HP Analyzer. The resultant density was then corrected to a 3 kHz bandwidth, and can be determined by inspection of the graphs found in Appendix C. The highest density was found to be no greater than –16.4 dBm, which is under the allowable limit by 24.4 dB.

CHANNEL	CENTER FREQ	MEASURED P	SPEC	MARGIN
11	2405.26	-1.47 dBm	+8.0dBm	9.47
18	2440.27	-2.78 dBm	+8.0dBm	10.78
25	2475.41	-2.61 dBm	+8.0dBm	10.61

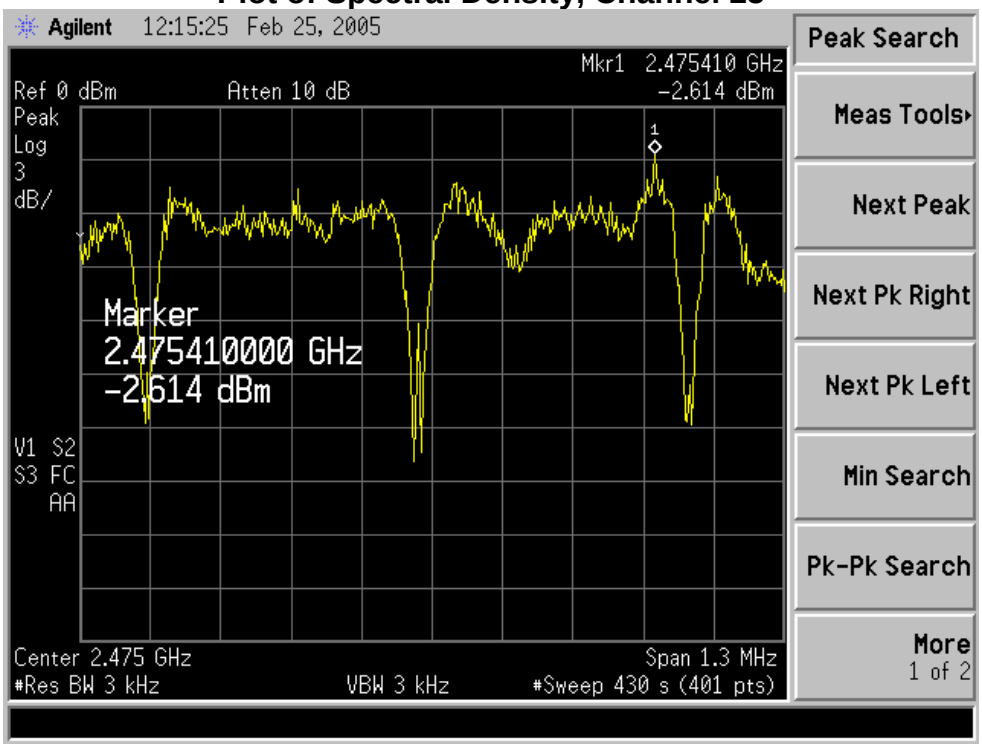
Plot of Spectral Density, Channel 11



Plot of Spectral Density, Channel 18



Plot of Spectral Density, Channel 25



Appendix A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/15/04	9/15/05
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/16/04	9/16/05
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/16/04	9/16/05
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/07/04	12/07/05
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	12/06/04	12/06/05
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/16/04	9/16/05
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/16/04	9/16/05
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0038	1 Meter RG 214 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