

# Verification Test Report

## For a CAP-DEC

**Manufacturer:**

Gorman Redlich Manufacturing Company  
257 West Union Street  
Athens, Ohio 45701  
United States of America

**Laboratory:**

F2 Labs  
16740 Peters Road  
Middlefield, Ohio 44062  
United States of America

The CAP-DEC, model CAP-DEC1, was tested and was found to comply with the requirements of the Federal Communications Commission outlined in the Federal Register CFR 47, Part 15, subpart B:2007 as follows:

- Conducted Emissions, Part 15.107(b), Class A
- Radiated Emissions, Part 15.109(b), Class A
- Radiated Emissions, CISPR 22 Class B, accepted by Part 15.109(g)
- Conducted Emissions, Part 15.107(a), Class B

The product was received on Oct. 20, 2010 and the testing was completed on Oct. 20, 2010.

**Evaluation Conducted By:**

**Michael Toth**  
**EMC Project Engineer**

**Report Reviewed By:**

**Ken Littell**  
**EMC Technical Manager**

**F2 Labs**  
16740 Peters Road  
Middlefield, Ohio 44021  
(440) 632-5541  
Fax: (440) 632-5542

Note: Pass/Fail criteria are based upon the following condition: Where the results are compared to published test standard or manufacturer specified limits, the PASS or FAIL opinion is considered without applying the laboratory stated measurement uncertainty.

This report shall not be duplicated except in full without the written approval of F2 Labs.

Reports noted as a revision replace all previously issued reports and/or antecedent report revisions issued under this job number.

## **Table of Contents**

<b>Exhibit</b>	<b>Title</b>	<b>Page</b>
	Cover Page	1
	Table of Contents	2
I	Engineering Statement	3
II	Measurement Instrument List	5
III	EUT Information and Data	6
IV	EUT Configuration and Cables	8
V	Conducted Data	9
VI	Radiated Data	13
VII	EUT Photos	14
VIII	Modifications	18
IX	Labeling	19

<b>Document Number</b>	<b>Description</b>	<b>Issue Date</b>	<b>Approved By</b>
F2LQ4200-01E	First Issue	Oct. 20, 2010	R. Beattie
F2LQ4200-01E Rev. 1	Increase in radiated emissions uncertainty value due to tabletop setup	Dec. 13, 2011	R. Beattie
F2LQ4200-01E Rev. 2	Class B compliance noted at request of client	May 24, 2012	K. Littell

## **Exhibit I**

### **Engineering Statement**

This report has been prepared on behalf of Gorman Redlich Manufacturing Company to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15 of the FCC Rules using ANSI C63.4 2003 standards. The test results found in this test report relate only to the items tested.

**EQUIPMENT UNDER TEST:**

**CAP-DEC**

Trade Name: Gorman Redlich Manufacturing Company  
Model: CAP-DEC1  
Power Supply: AC/DC

**APPLICABLE RULES:**

CFR 47, Part 15, subpart B

**EQUIPMENT CATEGORY:**

Information Technology Equipment

**MEASUREMENT LOCATION:**

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

**MEASUREMENT PROCEDURE:**

All measurements were performed according to the 2003 version of ANSI C63.4. A list of the measurement equipment can be found in Exhibit II.

**UNCERTAINTY BUDGET:**

- Radiated Emission  
Combined Uncertainty (+ or -) 2.66 dB  
Expanded Uncertainty (+ or -) 4.90 dB
- Conducted Emission  
Combined Uncertainty (+ or -) 1.13 dB  
Expanded Uncertainty (+ or -) 2.26 dB

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

## **Exhibit II**

### **List of Measurement Instrumentation**

**Test Equipment Used:**

<b>Equipment Type</b>	<b>Asset Number</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due Date</b>
Shield Room	CL014	Shielding Resources	3 Meter	001	Oct. 31, 2010
Temp/Hum. Recorder	CL118	Extech	RH520	H005870	Dec. 11, 2010
OATS	CL017	Compliance Labs	N/A	001	Aug. 26, 2011
Spectrum Analyzer	0204	Hewlett Packard	HP8591A	3149A02546	Oct. 26, 2010
Receiver	0145	Rohde & Schwarz	Display, EASI-0-804-8932-52; RF Unit, ESMI-RF 1032-5640-53	84982/015; 849152/005	May 14, 2011
Antenna 1-Chamber	0142	ETS/EMCO	3142B	9811-1330	Oct. 31, 2010
Antenna 2-OATS	0105	Sunol Sciences	JB1	A101101	July 22, 2011
Pre-Amplifier	0197	Hewlett Packard	8447D	1726A01006	Dec. 7, 2010
AC Power System	CL097	California Instruments	PACS-1-CTS	71565	Aug. 13, 2011
AC Power System	CL062	California Instruments	5001iX-CTS	7000-417-1	Aug. 13, 2011
Temp/Hum. Recorder	CL119	Extech	RH520	H005869	Oct. 9, 2010
Spectrum Analyzer	0141	Hewlett Packard	8591E	3520A04145	Sep. 29, 2011
Transient Limiter	CL102	Hewlett Packard	11947A	3107A03325	Dec. 31, 2010
LISN 2	0147	Solar	8028-50-TS-24-BNC	1128	Oct. 28, 2010
LISN 4	0146	Solar	8028-50-TS-24-BNC	1127	Oct. 26, 2010

## **Exhibit III**

### **Equipment Under Test Information and Data**

**TEST ITEM CONDITION:**

The equipment to be tested was received in good condition.

**TESTING ALGORITHM:**

EUT was set up in a normal operation, powered by 120V AC, 60 Hz, and was sending an emergency alert signal to be played audibly. The highest emissions were recorded in the data tables.

**CONDUCTED EMISSION TESTING:**

The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power source. The output of the LISN was connected to the input of the receiver via a transient limiter, and emissions in the range 150 kHz to 30 MHz were measured. The measurements were recorded using the quasi-peak and average detectors as directed by the standard, and the resolution bandwidth during testing was 9 kHz. The raw measurements were corrected to allow for attenuation from the LISN, transient limiter and cables. All data for conducted emissions can be found in Exhibit V.

**RADIATED EMISSION TESTING:**

The EUT was tested at a distance of 10.0 meters. The emissions were maximized by rotating the table and raising/lowering the antenna mounted on a 4.0 meter mast. Cable and peripheral positions were also varied to produce maximum emissions. Both horizontal and vertical field components were measured. The output of the antenna was connected to the input of the receiver and emissions were measured in the range 30 MHz to 1GHz. The values up to 1GHz with a resolution bandwidth of 120 kHz are quasi-peak readings made at 10.0 meters. The measurements above 1GHz with a resolution bandwidth of 1MHz are peak readings at a distance of 10.0 meters. The raw measurements were corrected to allow for antenna factor and cable loss. All data for radiated emissions can be found in Exhibit VI.

**CALCULATION OF DATA:**

RADIATED EMISSIONS - The antenna factors of the biconilog antennas used, and the cable losses are added to the field strength reading recorded from the measurement receiver. The resultant field strength can then be compared to the FCC limits in dBμV/m. The following equation is used to convert to μV/m:

$$E_{\mu V/m} = \text{antilog}(E_{dB\mu V/m} / 20)$$

**SAMPLE OF FIELD STRENGTH CALCULATION:**

$$E_a = V_a + AF + A_e$$

Where  $E_a$  = Field Strength (dBμV/m)

$V_a$  = 20 x log10 (Measure RF voltage, μV)

$A_e$  = Cable Loss Factor, dB

$AF$  = Antenna Factor dB (m-1)

i.e. If the reading is 57.0 dBμV, the antenna factor 8.0 dB, cable loss factor 1.0 dB and Amplifier gain is 25.0 dB, so the field strength will be:

$$\begin{aligned} E_a(\text{dB}\mu\text{V/m}) &= 57 + 8 + 1 + (-25) \\ &= 41 \text{ dB}\mu\text{V/m} \end{aligned}$$

or

$$\begin{aligned} E_a(\mu\text{V/m}) &= 10^{(41/20)} \\ &= 112.20 \mu\text{V/m} \end{aligned}$$

## **Exhibit IV**

### **EUT Configuration and Cables**

**Equipment Under Test (EUT):**

Device	Manufacturer	Model Number	Serial Number
CAP-DEC	Gorman Redlich Manufacturing Company	CAP-DEC1	Proto1

**Accessories (Support Equipment):**

Device	Manufacturer	Model Number	Serial Number
AC/DC Supply	Phihong	PSC12R-090	P01703396A1
	EDAC	EA10523C-120	N/A
	Li Shin International Enterprise Corp.	LSE9802A1240	A20203041765
Monitor	Hitachi	CS555	H2B002476
Encoder/Decoder	Gorman Redlich Manufacturing Company	EAS1	N/A
Keyboard	Compaq		BOAB3OC39FFEKR
Mouse	Tarqus	PAUM01U	0610007389

**Cables:**

Cable Function	Length	Shielded (Yes/No)
AC Mains (3)	N/A	No
Monitor	>3.0 meters	No
Audio Out	>3.0 meters	No
RS232	>3.0 meters	No



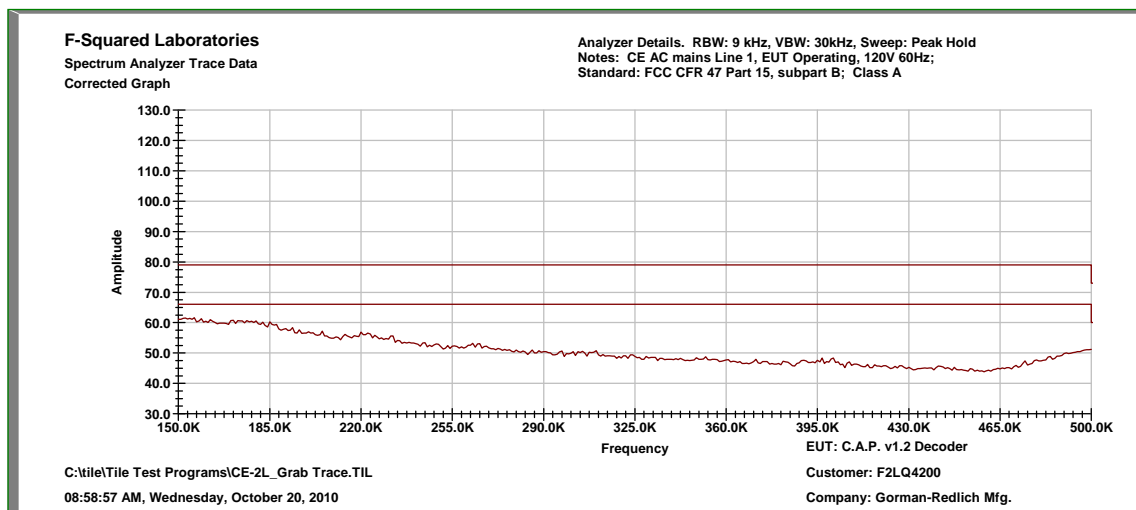
## Exhibit V

### Conducted Data

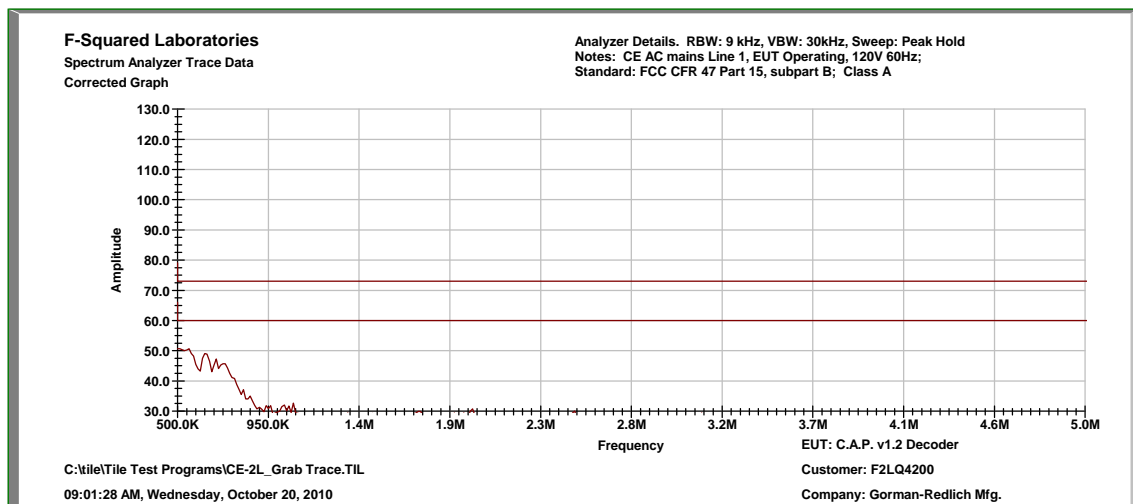
<b>Test Date:</b>	Oct. 20, 2010	<b>Test Engineer:</b>	M. Toth
<b>Standard:</b>	FCC 47 CFR 15, subpart B, clause 107(b)	<b>Air Temperature:</b>	16.9° C
<b>Limit:</b>	Class A*	<b>Relative Humidity:</b>	63%
<b>Pass/Fail:</b>	Pass		

*\*EUT also meets Conducted Emissions, Part 15.107(a), Class B requirements.*

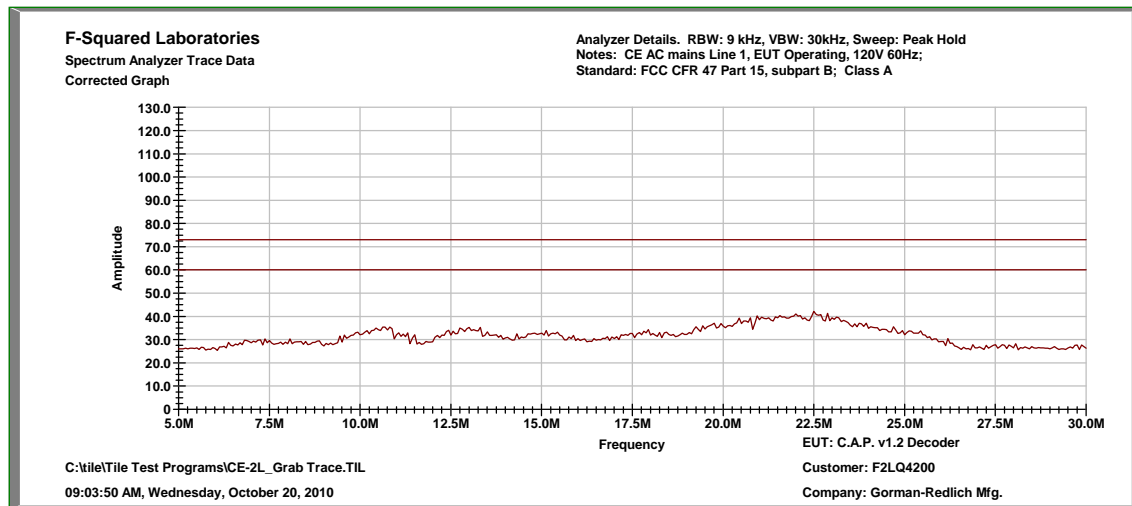
#### Conducted Test – Line 1: 0.15 MHz to 0.5 MHz



#### Conducted Test – Line 1: 0.5 MHz to 5.0 MHz



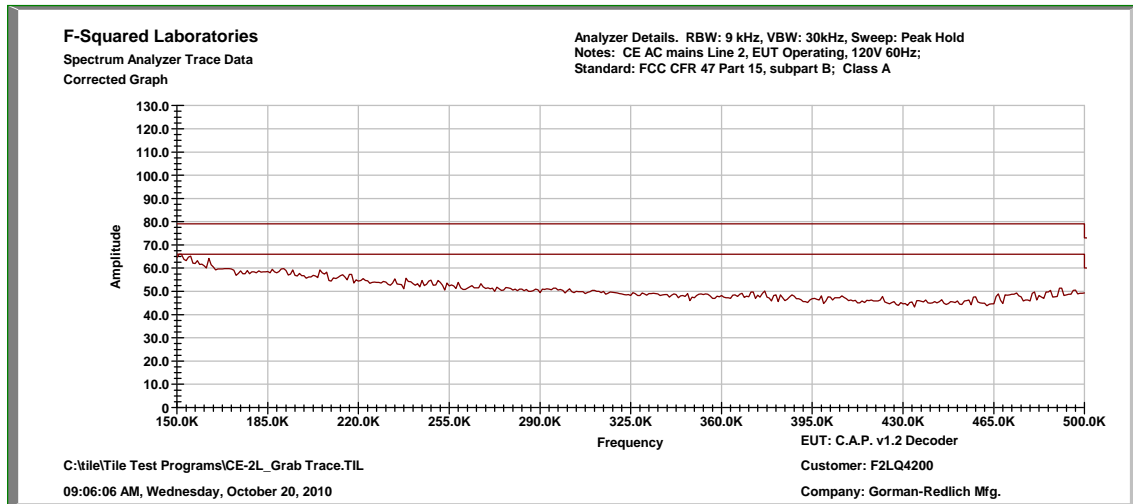
Conducted Test – Line 1: 5.0 MHz to 30.0 MHz



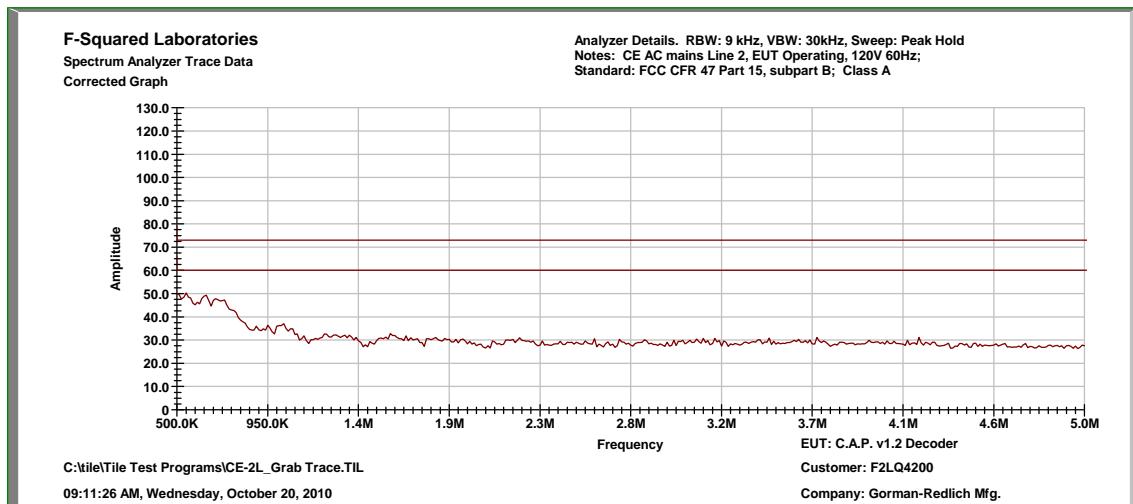
Top Discrete Measurements

No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.15875	Average	21.18	11.0	32.2	66.00	-33.8
2	Line 1	0.1710	Average	23.44	11.0	34.4	66.00	-31.6
3	Line 1	0.55625	Average	18.21	11.0	29.2	60.00	-30.8

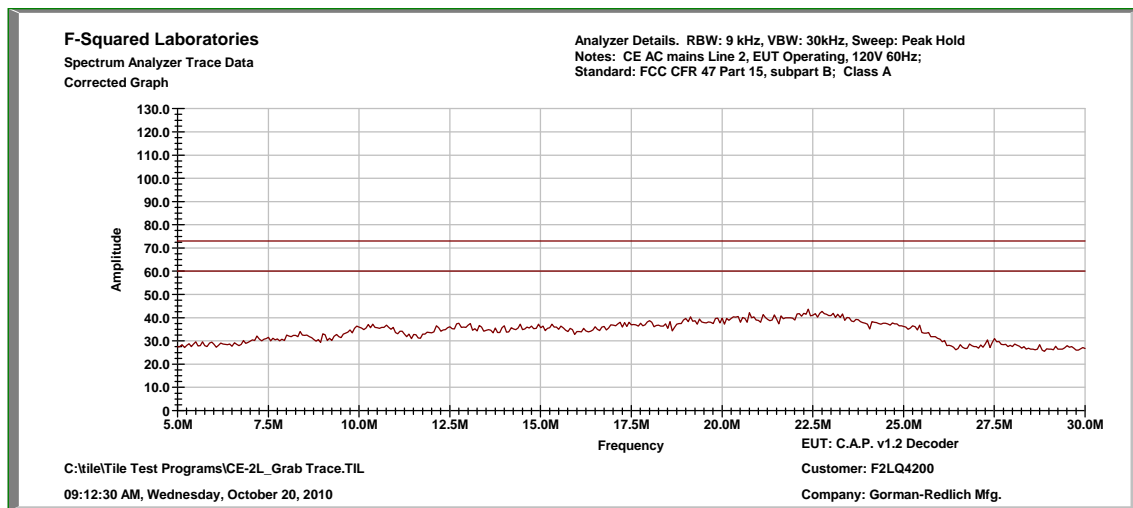
Conducted Test – Line 2: 0.15 MHz to 0.5 MHz



Conducted Test – Line 2: 0.5 MHz to 5.0 MHz



Conducted Test – Line 2: 5.0 MHz to 30.0 MHz



Top 6 Discrete Measurements							
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Limit (dBμV)	Margin (dB)
1	Line 2	0.15175	Average	23.39	11.0	66.0	-31.6
2	Line 2	0.15525	Average	15.64	11.0	66.0	-39.4
3	Line 2	0.16225	Average	10.96	11.0	66.0	-44.0

## Exhibit VI

### Radiated Data

<b>Test Date:</b>	Oct. 20, 2010	<b>Test Engineer:</b>	M. Toth
<b>Standard:</b>	FCC 47 CFR 15, subpart B, clause 109(b)	<b>Air Temperature:</b>	11.4° C
<b>Limit:</b>	Class A*	<b>Relative Humidity:</b>	44%
<b>Distance:</b>	10.0 meters		

*\*EUT also meets Class B limits per CISPR 22, accepted by FCC in 15.109(g).*

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
32.940000	H	1.2	19.6	20.8	39.1	-18.3
34.430000	V	11.8	17.0	28.8	39.1	-10.3
81.150000	V	11.4	9.4	20.8	39.1	-18.3
83.240000	H	15.7	9.0	24.7	39.1	-14.4
115.000000	V	8.1	14.9	23.0	43.5	-20.5
160.330000	H	2.2	14.5	16.7	43.5	-26.8
165.020000	V	6.5	14.9	21.4	43.5	-22.1
284.990000	V	9.9	16.8	26.7	46.4	-19.7
286.160000	H	3.5	16.5	20.0	46.4	-26.4
436.060000	H	3.2	20.8	24.0	46.4	-22.4
436.150000	V	3.4	20.5	23.9	46.4	-22.5
666.040000	V	5.3	25.0	30.3	46.4	-16.1
841.800000	H	6.8	27.0	33.8	46.4	-12.6

PASS ☒

FAIL ☐

**Exhibit VII**

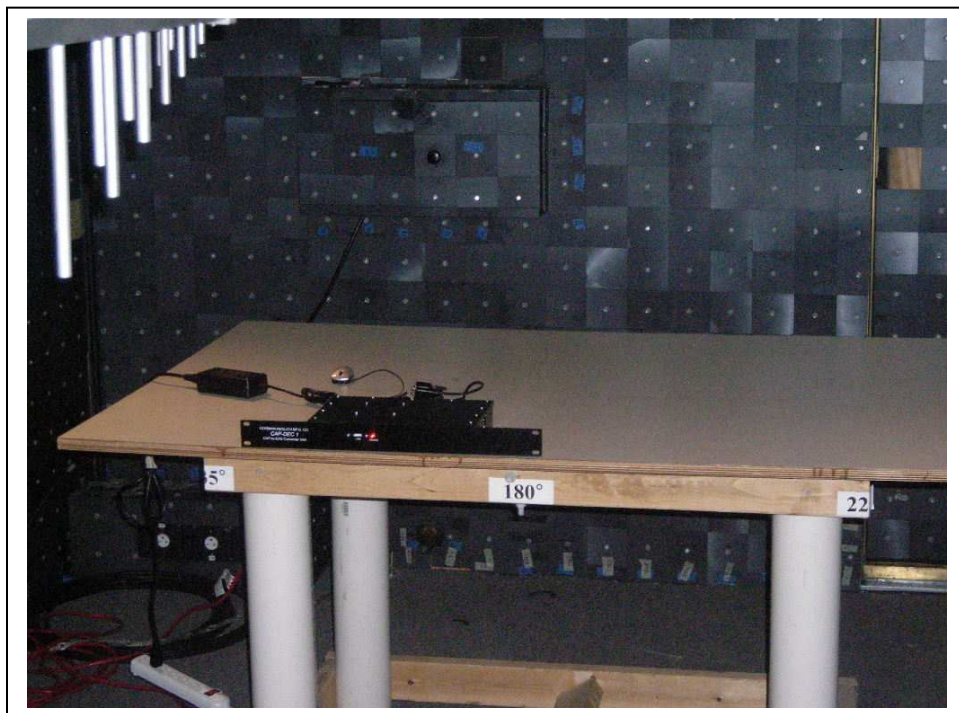


**TEST SET-UP**

**&**

**EUT PHOTOGRAPHS**

### RADIATED TEST – *Pre-scan*



**RADIATED TEST – OATS**





## **CONDUCTED TEST**



**Exhibit VIII**  
**Modifications**

EUT COMPLIES  
WITHOUT MODIFICATIONS

## **Exhibit IX**

### **Labeling of Equipment**

It will be the responsibility of the manufacturer or importer to permanently affix the appropriate label when marketing the equipment.

The label shall be located in a conspicuous location on the device and shall contain the unique identification described in Section 2.954 which reads as follows:

**Identification: Section 2.954**

**Devices subject only to Verification shall be uniquely identified by the responsible party. This identification shall not be of a format which could be confused with the FCC Identifier on certified, notified, type accepted or type approved equipment. The responsible party shall maintain adequate identification records to facilitate positive identification for each device.**

The label shall bear the following statement:

*This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.*