



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

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July 2, 2009

Linear Technology Corporation  
1630 McCarthy Boulevard  
Milpitas, CA 95035-7417

Dear David Ng,

Enclosed is the EMC test report for compliance testing of the Linear Technology Corporation, LTM8031, tested to the requirements of EN 55022 (CISPR 22): 2006 for a Class B Device.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,  
MET LABORATORIES, INC.

Kanesa Pogi  
Documentation Department

Reference: (\Linear Technology Corporation\EMCS81655-EURO)

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**Electromagnetic Compatibility  
Test Report**

for the

**Linear Technology Corporation  
LTM8031**

Tested under

**EN 55022 (CISPR 22): 2006  
For a Class B Device**

**MET Report: EMCS81655-EURO**

July 2, 2009

**Prepared for:**

**Linear Technology Corporation  
1630 McCarthy Boulevard  
Milpitas, CA 95035-7417**

**Prepared by:  
MET Laboratories, Inc.  
33439 Western Ave.  
Union City, California 94587**



## Electromagnetic Compatibility Test Report

For the

**Linear Technology Corporation  
LTM8031**

Tested under

**EN 55022 (CISPR 22): 2006  
For a Class B Device**

**MET Report: EMCS81655-EURO**

Minh Ly  
Test Engineer, Electromagnetic Compatibility Lab

Kanesa Pogi  
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the applicable limits. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of EN 55022 (CISPR 22): 2006 under normal use and maintenance.

Asad Bajwa  
Manager, Electromagnetic Compatibility Lab



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## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	July 2, 2009	Initial Issue.



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## List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB $\mu$ A	Decibels above one <b>microamp</b>
dB $\mu$ V	Decibels above one <b>microvolt</b>
dB $\mu$ A/m	Decibels above one <b>microamp per meter</b>
dB $\mu$ V/m	Decibels above one <b>microvolt per meter</b>
DC	Direct Current
E	Electric Field
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
CISPR	Comite International Special des Perturbations Radioelectriques (International Special Committee on Radio Interference)
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
$\mu$ H	<b>microhenry</b>
$\mu$ F	<b>microfarad</b>
$\mu$ s	<b>microseconds</b>
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
V/m	Volts <b>per meter</b>
VCP	Vertical Coupling Plane



## 1.0 Testing Summary

The following tests specified by EN 55022 were performed with the following results.

Specification	Test Description	Compliance
EN 55022 (CISPR 22): 2006	Radiated Emissions - Class B	Compliant

**Table 1. Summary of EMC EN 55022 (CISPR 22): 2006 Compliance Testing**



## 2.0 Equipment Configuration

### 2.1 Overview

MET Laboratories, Inc. was contracted by Linear Technology Corporation to perform testing on the LTM8031, under Linear Technology Corporation purchase order number 14297T.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Linear Technology Corporation, LTM8031 with the requirements of EN 55022 limits and Methods of Radio Disturbance characteristic of Information Technology Equipment.

The results obtained relate only to the item(s) tested.

<b>Model(s) Tested:</b>	LTM8031
<b>Model(s) Covered:</b>	LTM8031
<b>EUT Specifications:</b>	Primary Power: 3.6V to 36V
	Equipment Emissions Class: B
<b>Evaluated by:</b>	Minh Ly
<b>Date(s):</b>	July 2, 2009

### 2.2 Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St. Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

### 2.3 Measurement Uncertainty

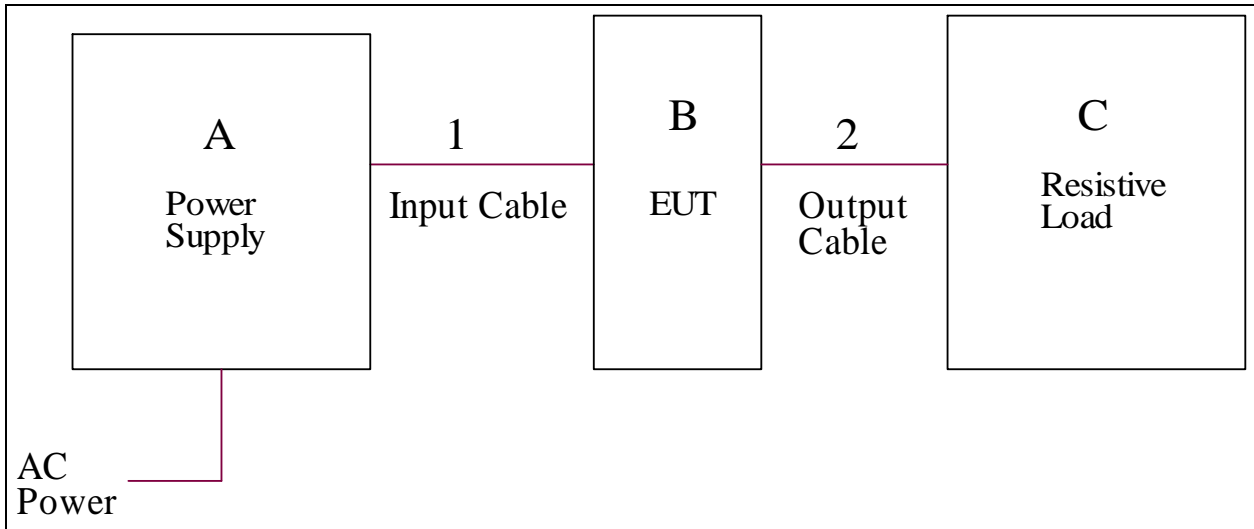
Test Method	Typical Expanded Uncertainty (dB)	K	Confidence Level
Radiated Emissions	±3.45	2	95%
Conducted Emission	±3.75	2	95%
CEV Telecom Port	±2.75	2	95%

Table 2: Uncertainty Calculations Summary

### 2.4 Description of Test Sample

The LTM8031, Equipment Under Test (EUT), is a 36Vin, 1A step down switching power converter. There will be three configurations: (a.) 10Vout (maximum output voltage) (b.) 5Vout (c.) 2.5Vout





**Figure 1. Block Diagram of Test Configuration**



## 2.5 Equipment Configuration

The EUT was set up as outlined in Figure 1. All equipment incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number
B	N/A	Ultralow Noise EMC Compliant 36V, 1A DC/DC $\mu$ Module	LTM8031	LTM8031EV	N/A

Table 3. Equipment Configuration

## 2.6 Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
A	Power Supply	Power Designs	TPS343B	Not required
C	Resistive Load	N/A	N/A	Not required

Table 4. Support Equipment

\* All 'customer supplied' support equipment will include the equipments calibration data. This column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

## 2.7 Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded (Y/N)	Termination Box ID & Port Name
1	Input	2 conductor, 18 AWG (3 conductor, 18 AWG for 2.5Vout Configuration)	1	2	N/A	No	Vin
2	Output	2 conductor, 18 AWG	1	0.05	N/A	No	Vout

Table 5. Ports and Cabling Information



## 2.8 Mode of Operation

The EUT will be continuously powered from 36Vin lab grade power supply. There will be three configurations:

1. 10Vout loaded to 1A
2. 5Vout loaded to 1A
3. 2.5Vout loaded to 1A

The 10Vout case is the maximum output power configuration

## 2.9 Method of Monitoring EUT Operation

- 1) The unit will be drawing between 2.5Watts and 12Watts from the power source, depending upon the configuration.
- 2) The unit will draw no or substantially more power than condition 1.

## 2.10 Configurations

In addition to the EUT, there will be an input power supply, input cable, output cable and output load. The input power supply is a Power Designs TPS343B power supply, configured to source 36V and at least 1A. The input cables are two wires, the output cables are two wires, and the load is a bank of power resistors configured to load the EUT to 1A.

## 2.11 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Linear Technology Corporation upon completion of testing.



### 3.0 Electromagnetic Compatibility Emission Criteria

#### 3.1 Radiated Emission: Limits of Electromagnetic Radiation Disturbance

**Test Method:** EN 55022 (CISPR 22): 2006  
Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.

**Test Requirement(s):** EN 55022, Section 6, Limits for Radiated Disturbances:

For radiated emission in the frequency range 30 MHz - 1 000 MHz, the EUT shall meet the Class B radiated emission limits shown in Table 6.

Frequency Band (MHz)	Class A Quasi-Peak limits 10 m measurement distance (dBµV/m)	Class B Quasi-Peak limits 10 m measurement distance (dBµV/m)
30 to 230	40	30
230 to 1000	47	37

**Table 6. Electromagnetic Radiated Disturbance limits from Clause 6 of EN 55022**

**Test Procedure:** The EUT placed on a 0.8m-high wooden table located inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of EN 55022 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Emissions measured at 3m were normalized using an inverse proportionality factor of 20dB per decade for comparison to the 10 m limit. The physical size of the EUT was taken into account as to avoid near-field effects, which could occur near 30 MHz. See Photograph 1 for a picture of the test setup.

Environmental Conditions for Radiated Emission	
<b>Ambient Temperature:</b>	24 °C
<b>Relative Humidity:</b>	43 %

**Test Results:** The EUT was compliant with the requirement(s) of this section.

**Test Engineer(s):** Minh Ly

**Test Date(s):** 06/11/09

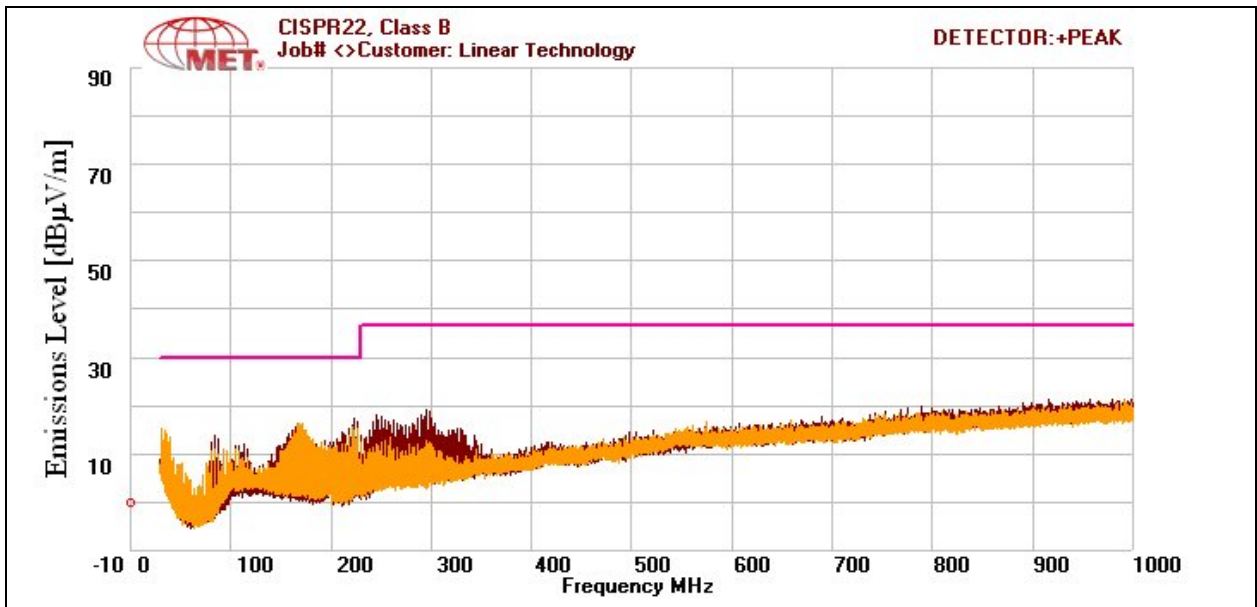


### Radiated Emission: Limits of Electromagnetic Radiation Disturbance, Test Results

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
39.44	V	62	100	9.16	12.18	0	1.498	-10.46	12.378	30	-17.622
83.6	H	65	207	14.79	7.932	0	2.253	-10.46	14.515	30	-15.485
164.84	H	162	173	12.15	10.506	0	3.229	-10.46	15.425	30	-14.575
170.84	V	0	100	12.14	10.766	0	3.279	-10.46	15.725	30	-14.275
217.4	V	89	181	10.67	10.544	0	3.739	-10.46	14.493	30	-15.507
222.16	H	62	140	14.4	10.573	0	3.789	-10.46	18.302	30	-11.698

Table 7. Radiated Emission Test Results, 10V out Configuration

Note: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula:  $20\log(3\text{ m}/10\text{ m})$  as expressed in the 'Distance Correction' column.



= Vertical Polarization  
 = Horizontal Polarization

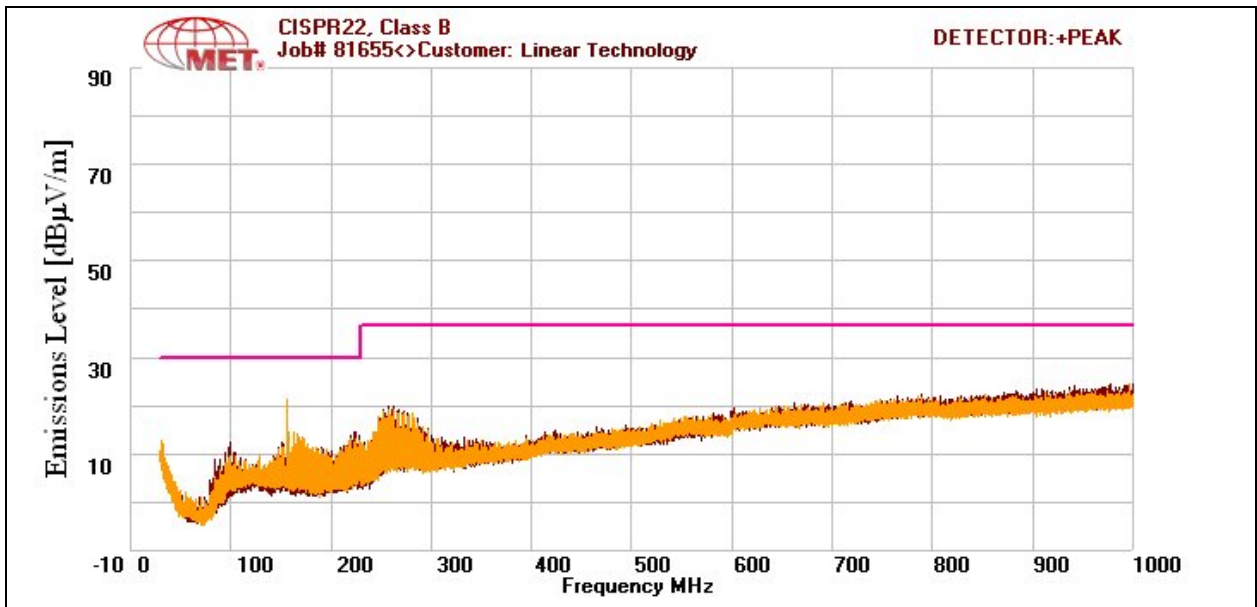


### Radiated Emission: Limits of Electromagnetic Radiation Disturbance, Test Results

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
219.96	V	257	100	8.7	10.698	0	3.77	-10.46	12.708	30	-17.292
223.64	V	256	100	9.06	11.064	0	3.803	-10.46	13.467	30	-16.533
224.32	H	25	139	10.17	10.746	0	3.809	-10.46	14.265	30	-15.735
252.2	V	221	100	8.71	12.832	0	4.01	-10.46	15.092	37	-21.908
276.36	H	142	100	11.04	13.5	0	4.212	-10.46	18.292	37	-18.708
286.64	H	221	100	9.89	13.533	0	4.283	-10.46	17.246	37	-19.754

**Table 8. Radiated Emission Test Results, 5V out Configuration**

Note: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula:  $20\log(3\text{ m}/10\text{ m})$  as expressed in the 'Distance Correction' column.



= Vertical Polarization  
 = Horizontal Polarization

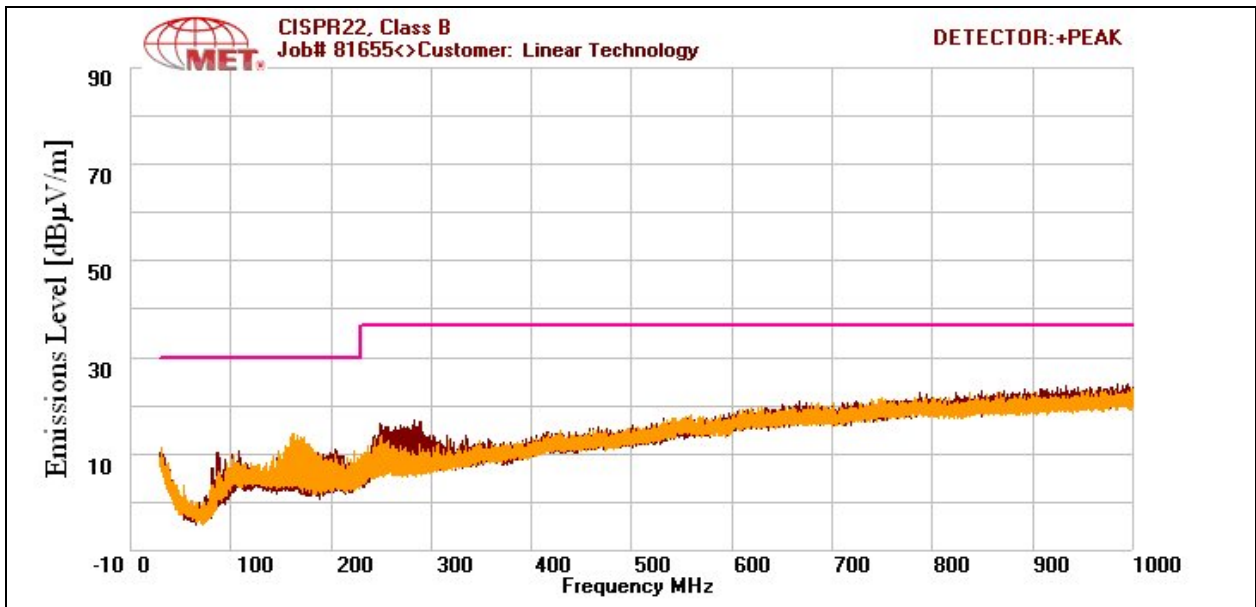


### Radiated Emission: Limits of Electromagnetic Radiation Disturbance, Test Results

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
160.94	V	127	101	9.69	11.062	0	3.198	-10.46	13.49	30	-16.51
162.58	V	172	100	9.75	10.997	0	3.211	-10.46	13.498	30	-16.502
163.7	V	189	100	9.19	10.952	0	3.22	-10.46	12.902	30	-17.098
249.12	H	160	115	9.67	12.83	0	3.984	-10.46	16.024	37	-20.976
256.28	H	151	124	9.04	13.454	0	4.047	-10.46	16.081	37	-20.919
269.48	H	151	114	8.73	13.631	0	4.175	-10.46	16.076	37	-20.924

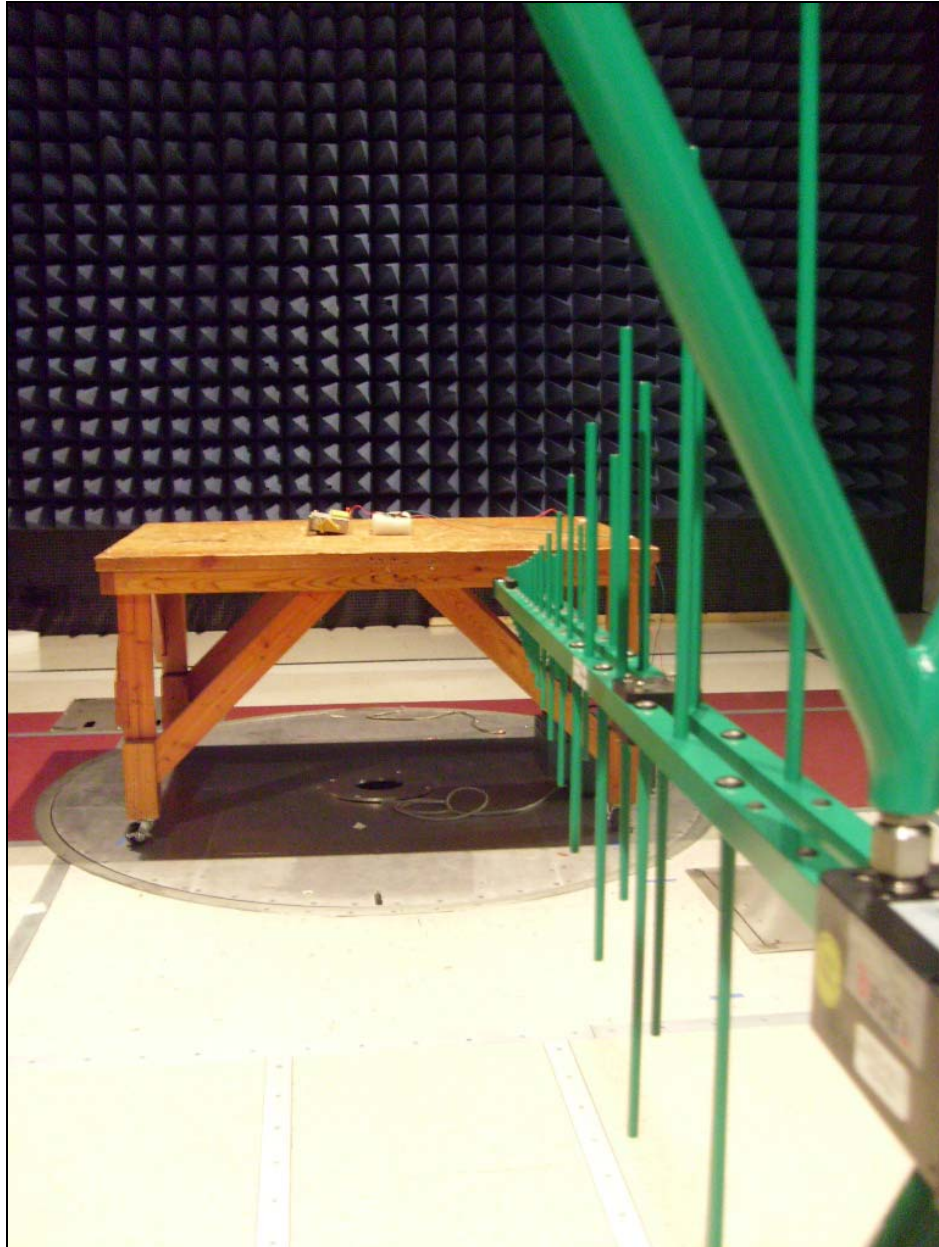
**Table 9. Radiated Emission Test Results, 2.5V out Configuration**

Note: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula:  $20\log(3\text{ m}/10\text{ m})$  as expressed in the 'Distance Correction' column.



= Vertical Polarization  
 = Horizontal Polarization

## Radiated Emission: Limits of Electromagnetic Radiation Disturbance, Test Setup



**Photograph 1. Radiated Emission: Limits of Electromagnetic Radiation Disturbance, Test Setup**





## 4.0 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

Test Name: EN 55022 (CISPR 22):2006 Radiated Emissions Electric Field			Test Date(s): 06/11/09		
MET Asset #	Nomenclature	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2482	5 Meter Chamber	Panashield	5 Meter Semi-Anechoic Chamber	11/22/2008	11/22/2009
1S2421	EMI Test Receiver	Rohde & Schwarz	ESIB7	05/27/2009	05/27/2010
1S2501	EMI Test Receiver	Rohde & Schwarz	ESU40	04/27/2009	04/27/2010
1S2484	Biconilog Antenna	Teseq	CBL6112D	01/27/2009	01/27/2011