

# Test Site Services. Inc.

---

## EMI Test Report

For Agilent Technologies

**Viridia Medical Telemetry Transmitter**

Model M2601A

**Radiated and Conducted Emissions**

**FCC, Part 15C**

**Test # B90433**

Test Site Services, Inc.  
P.O. Box 766  
Marlboro, MA 01752  
U.S.A.  
Phone/Fax: (508) 481-1684

*This report shall not be reproduced, in whole or in part without the written approval of Test Site Services Inc.  
This report must not be used by the recipient to claim product endorsement by NVLAP or any other agency of the U.S. Government*

---

## Table of Contents

GENERAL INFORMATION .....	1
EQUIPMENT UNDER TEST DESCRIPTION .....	3
TEST SUMMARY .....	4
BLOCK DIAGRAM .....	5
BLOCK DIAGRAM DESCRIPTION .....	6
CABLE DESCRIPTION .....	9
SOFTWARE DESCRIPTION .....	10
MODES OF OPERATION .....	11
TEST EQUIPMENT LIST .....	13
APPENDIX A, TEST DATA .....	A1
APPENDIX B, TEST PHOTOGRAPHS .....	B1
APPENDIX C, TEST PROCEDURES .....	C1
APPENDIX D, MEASUREMENT FACILITIES INFORMATION .....	D1

**EMI Test Report**  
**for**  
**Agilent Technologies**

**Test Number** : B90433

**Product Name** : Viridia Medical Telemetry Transmitter

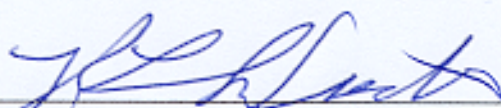
**Regulation** : FCC, Part 15C (U.S.)

**Date** : 11/18/99

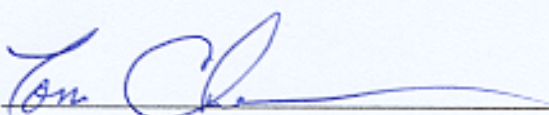
**Report Reviewed  
& Accepted by:**

\_\_\_\_\_  
Agilent Technologies  
3000 Minuteman Rd.  
Andover, MA 01810

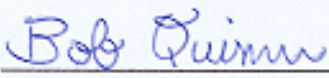
**Report Issued By:**

  
\_\_\_\_\_  
Richard L. Wiedeman, Laboratory Director

**Tested By:**

  
\_\_\_\_\_  
Tom Charron, Test Engineer

**Tested By:**

  
\_\_\_\_\_  
Bob Quinn, Test Engineer

*This test report is not valid without the signatures of Test Site Services, Inc. personnel.*

---

## Administrative Data

**Regulation** : FCC, Part 15C, 15.201b, 15.215, 15.242, Part 2J

**Per** : 15.242c, 15.209, 15.207a

**Test Method** : ANSI C63.4-1992

**Test Type** : Certification

**Manufacturer** : Agilent Technologies

**EUT Type/Model #** : Viridia Medical Telemetry Transmitter / M2601A

**Date(s) of Test** : 11/18/99

**Customer** : Gordon Cook Engineer  
**Personnel** : John Bilodeau Engineer

**TSS Personnel** : R. Wiedeman EMC Engineer  
: Bob Quinn Test Engineer  
: Tom Charron Test Engineer

**Test Location** : Open Area Test Site  
Test Site Services, Inc.  
30 Birch St.  
Milford, MA 01757 U.S.A.

NOTICE	: FCC Rule 2.955 requires that a Verification Report for a Class A Computing Device must be signed by "an Official of the Company responsible for the device". A signature block has been provided on the first page for this purpose.
--------	--

---

## EUT Description

The EUT is a (Viridia Medical Telemetry Transmitter) that monitors ECG and SPO<sub>2</sub> patient levels and transmits data to a central receiver system. It operates on specific frequencies from 590 to 632 MHz. Three units were tested at the low, middle and high end of the band (590.0, 611.0, 632.0 MHz.). These units (one at each frequency) were tested simultaneously in close proximity to each other for a worst case test configuration. The units were tested with optional AC adapters.

A complete description of the EUT may be found on block identifier page one.

The tests were run in a typical configuration including the following support equipment;

- |                       |                                 |
|-----------------------|---------------------------------|
| 1) EUT 1 @ 590.0 MHz. | 4) (3) SPO <sub>2</sub> Sensors |
| 2) EUT 2 @ 611.0 MHz. | 5) (3) ECG Leads                |
| 3) EUT 3 @ 632.0 MHz. | 6) (3) AC Adapters              |

### REASON FOR TEST

Certification per FCC Part 15c, 15.201b, Part 2J

### CHANGES MADE DURING TEST

None

### DEVIATIONS FROM STANDARD TEST METHOD

None

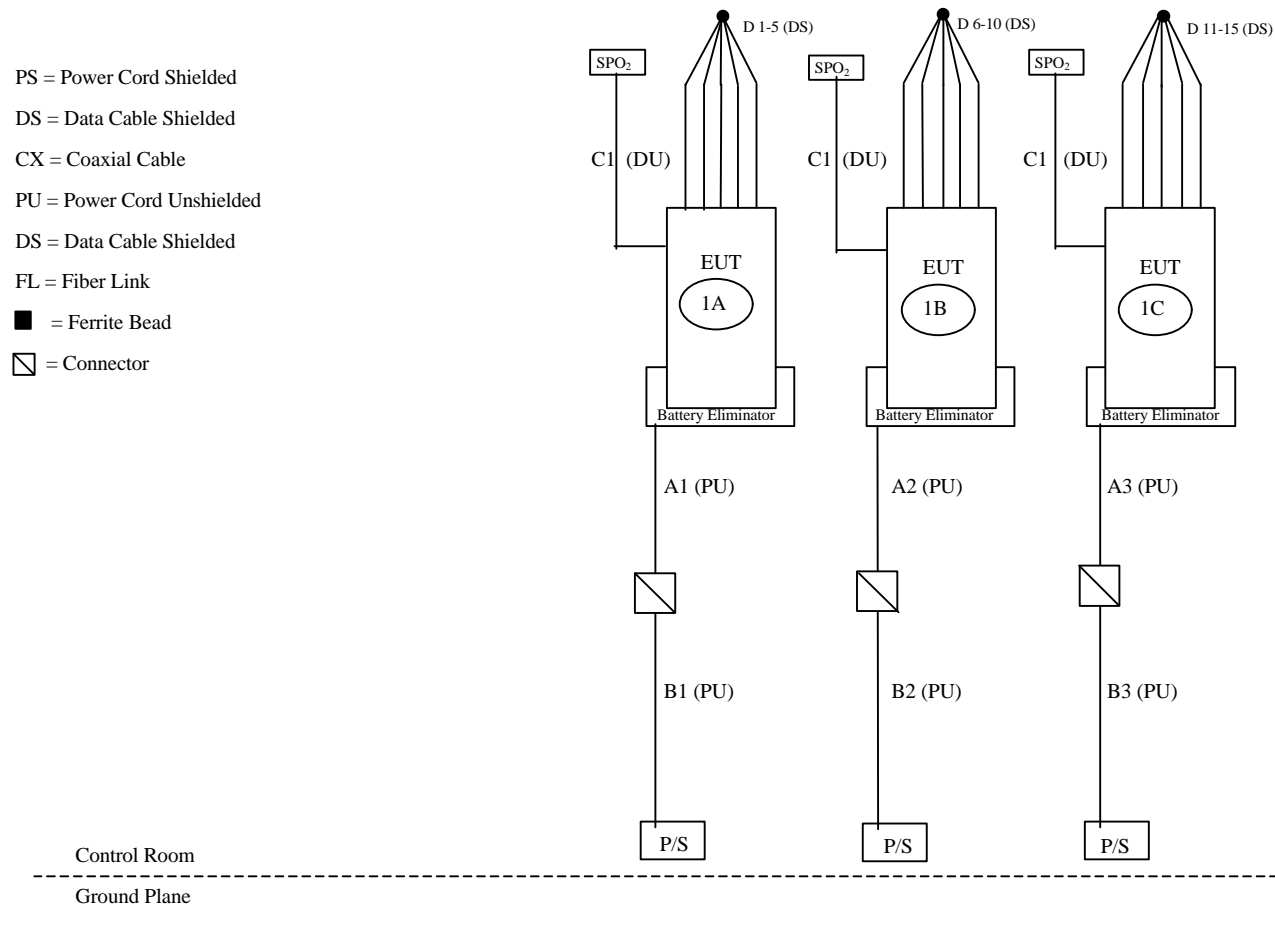
## Test Summary

The Viridia Medical Telemetry Transmitter complied with the FCC Part 15 Subpart C Limits for an intentional radiator when tested in the system configuration defined herein.

The following table indicates the margins (i.e. difference between measurement point and limit) of the six (6) worst case data points:

TEST CLASS	MARGIN TO SPEC (db)	FREQUENCY (Mhz)
<i>(Fundamental Frequencies)</i>	-4.6	590.0
<i>Per 15.242c</i>	-7.9	632.0
	-8.7	611.0
<i>Unwanted Signals</i>	-1.8	1264.00
<i>(including harmonics)</i>	-1.9	2528.00
<i>Per 15.209</i>	-2.0	1896.00
<i>(4.0 MHz. to 6.32 GHz.)</i>	-2.1	1222.00
	-2.9	569.00
	-3.2	2444.00
<i>Conducted Emissions</i>	-20.8	0.450
<i>Per 15.207a</i>	-26.8	1.380
<i>(120 VAC 60 Hz.)</i>	-33.8	19.210
	-35.5	21.990
	-37.8	26.710
	-38.3	14.930

## Block Diagram for Viridia Medical Telemetry Transmitter



---

## EUT Technical Data – Block Identifier 1A

**Description** : Viridia, Medical Telemetry Transmitter

**Manuf/Model** : Agilent Technologies

**Model No.:** :M2601A

**Serial #** : 3933A29920

**FCC/FTZ Ident.** : Application Pending

**Power (Rated)** : 120 VAC 60 Hz. to 10 VDC

**Current** : 300 mA

**Power (Tested)** : 120 VAC 60 Hz. to 10 VDC

**Current** : 300 mA

***Internal Options:***

020

***External Options:***

Class 2 Transformer (Ault Inc.) M/N PA41100300A01RK

SPO2 Sensor (Hewlett Packard) M/N M1191A

ECG Leads

***Frequencies Generated:***

590.00 MHz. 12.8 MHz. 8.00 MHz.

***Comments:***

---

## EUT Technical Data – Block Identifier 1B

**Description** : Viridia, Medical Telemetry Transmitter

**Manuf/Model** : Agilent Technologies

**Model No.:** :M2601A

**Serial #** : 3836A29089

**FCC/FTZ Ident.** : Application Pending

**Power (Rated)** : 120 VAC 60 Hz. to 10 VDC

**Current** : 300 mA

**Power (Tested)** : 120 VAC 60 Hz. to 10 VDC

**Current** : 300 mA

***Internal Options:***

020

***External Options:***

Class 2 Transformer (Ault Inc.) M/N PA41100300A01RK

SPO2 Sensor (Hewlett Packard) M/N M1191A

ECG Leads

***Frequencies Generated:***

611.00 MHz. 12.8MHz. 8.00 MHz.

***Comments:***

---

## EUT Technical Data – Block Identifier 1C

**Description** : Viridia, Medical Telemetry Transmitter

**Manuf/Model** : Agilent Technologies

**Model No.:** :M2601A

**Serial #** : 3836A29124

**FCC/FTZ Ident.** : Application Pending

**Power (Rated)** : 120 VAC 60 Hz. to 10 VDC

**Current** : 300 mA

**Power (Tested)** : 120 VAC 60 Hz. to 10 VDC

**Current** : 300 mA

***Internal Options:***

020

***External Options:***

Class 2 Transformer (Ault Inc.) M/N PA41100300A01RK

SPO2 Sensor (Hewlett Packard) M/N M1191A

ECG Leads

***Frequencies Generated:***

632.00 MHz. 12.8MHz. 8.00 MHz.

***Comments:***

---

## Cable Descriptions

(A1-A3)	<b>Function</b>	:	DC Power
Qty = 3	<b>Type</b>	:	Unshielded
	<b>Length</b>	:	1 foot
	<b># of Conductors</b>	:	0.25 Meter
	<b>Connector Shell</b>	:	Unshielded
	<b>Part Number</b>	:	
	<b>Miscellaneous</b>	:	
(B1-B3)	<b>Function</b>	:	DC Power
Qty = 3	<b>Type</b>	:	Unshielded
	<b>Length</b>	:	3 Meters
	<b># of Conductors</b>	:	2
	<b>Connector Shell</b>	:	Unshielded
	<b>Part Number</b>	:	
	<b>Miscellaneous</b>	:	
(C1-C3)	<b>Function</b>	:	SPO2 Sensor Cable
Qty = 3	<b>Type</b>	:	Unshielded
	<b>Length</b>	:	1 Meter
	<b># of Conductors</b>	:	7
	<b>Connector Shell</b>	:	Unshielded
	<b>Part Number</b>	:	
	<b>Miscellaneous</b>	:	
(D1-D15)	<b>Function</b>	:	ECG Leads
Qty = 15	<b>Type</b>	:	Shielded
	<b>Length</b>	:	1 Meter
	<b># of Conductors</b>	:	2
	<b>Connector Shell</b>	:	Unshielded
	<b>Part Number</b>	:	
	<b>Miscellaneous</b>	:	Transmit Antenna

---

## Test Software Description

TITLE :

PART #/REV. : M2601-10015, Rev. A.03.01

FUNCTION :

REPEAT TIME : Continuous

RUN INSTRUCTIONS : Power on unit, starts automatically.

---

## **OPERATIONAL MODE(s) DURING TEST**

### **OPERATIONAL MODES AVAILABLE:**

Monitor patient ECG and SPO<sub>2</sub> and transmit to central receiver system.

**MODE TESTED:** Same as above

**FUNCTION** : Same as above

**RATIONALE** : Unit only operates in a single mode.

---

## EUT I/O Ports – Cable Configuration

All testing was performed with the following cables/terminators connected to the EUT I/O ports:

EUT I/O Ports (All available by type)	Cable Attached (Yes/No)
ECG	Y
SPO <sub>2</sub>	Y
D.C. Input Power	Y

NOTE: FCC Tests : ONE of each TYPE of PORT must be cabled.

## Test Equipment List

#	Equipment Type	Manufacturer	Model #	Serial #	Cal Date	Cal Due	Used
1	Spectrum Analyzer	Hewlett-Packard	8568B	2207A01917	8/9/99	8/9/00	<b>X</b>
2	Quasi-Peak Adapter	Hewlett-Packard	85650A	2043A00249	8/9/99	8/9/00	<b>X</b>
3	RF Pre-Selector	Hewlett-Packard	85685A	2648A00500	8/9/99	8/9/00	<b>X</b>
4	Spectrum Analyzer	Hewlett-Packard	8566B	2532A02250	5/8/99	5/8/00	
5	Quasi-Peak Adapter	Hewlett-Packard	85650A	2521A00665	5/8/99	5/8/00	
6	RF Pre-Selector	Hewlett-Packard	85685A	2510A00186	5/8/99	5/8/00	
7	Spectrum Analyzer	Hewlett-Packard	8595E	3337A00415	5/27/99	5/27/00	<b>X</b>
8	Comb Generator	Com Power	CG-520	20129	5/18/99	5/18/00	
9	RF Probe	Fischer	F-33-1	367	1/14/99	1/14/00	
10	RF Pre-Amplifier	Hewlett-Packard	8447D	1937A02850	5/24/99	5/24/00	
11	Pre-Amplifier	Hewlett-Packard	8449B	3008A00952	5/27/99	5/27/00	
12	Biconical Antenna	Schwarzbeck	BBA9106	0101	5/11/99	5/11/00	<b>X</b>
13	Biconical Antenna	Schwarzbeck	BBA9106	0102	5/11/99	5/11/00	
14	Log Periodic Antenna	Schwarzbeck	UHALP9107	9107718	6/1/99	6/1/00	<b>X</b>
15	Log Periodic Antenna	Schwarzbeck	UHALP9107	0103	6/1/99	6/1/00	
16	Mag Loop Antenna	EMCO	6502	9307-2841	6/1/99	6/1/00	
17	Horn Antenna	EMCO	3115	9308-4132	10/17/99	10/17/00	<b>X</b>
18	Active Monopole Ant.	EMCO	3301B	9510-3625	5/29/99	5/29/00	<b>X</b>
19	Tuned Dipole Antenna	Comp Design	A100	445	1/18/99	1/18/00	<b>X</b>
20	Tuned Dipole Antenna	Comp Design	A100	494	8/25/99	8/25/00	
21	LISN 3x24 A	Solar	8012-50-24	0103	9/15/98	9/15/99	
22	LISN 4 x 25 A	Schwarzbeck	NNLA8120	8120458A	8/21/99	8/21/99	
23	LISN 4 x 100 A	Schwarzbeck	NNLA8121	8121237	1/21/99	1/21/00	<b>X</b>
24	LISN 3 x 25 A	EMCO	3825/2	8904-1483	7/9/99	7/9/00	
25	Antenna Mast	EMCO			Daily	Daily	<b>X</b>
26	Mast Controller	EMCO	1050	1267	Daily	Daily	<b>X</b>
27	Turntable	Macton			Daily	Daily	<b>X</b>
27	Turntable Controller	EMCO	101762	8908-1290	Daily	Daily	<b>X</b>

---

## **Appendix A**

# **TEST DATA**

Biconical\_A  
Log Periodic A

[illegible]

58.9

TestType: Certification

RADIATED EMISSIONS E FIELD  
Data by Test Site Services Co

EUT : AGILENT  
: MEDICAL TELEMETRY TRANSMITTER  
: M/N M2601A  
: 590, 611, 632 MHz. Units

Engineer : R Wiedeman  
Technician : B QUINN

Antenna Ht : 1-4 Meters  
Antenna Sep : 3 Meters

Test: B90433  
Date: 11/18/99  
Power: 120 VAC 60 Hz.  
Spec: FCC 15.242c, 15.209

Receiver BW : 1 MHz

Antennas Used:  
Horn\_A

NOTES: CHECKED UP TO 10TH HARMONIC

Temperature: 71 F  
Rel. Humidity: 42 %

[illegible]

Note: BB = BroadBand                      Polarization: H = Horizontal                      Ambient Check:

Note: RBW = Reduced Bandwidth ( kHz)

Note: MWA = Mixed With Ambient  
Note: No signals observed above: 5499.0 MHz

Note: Moved Cables at Worst Case Frequencies

V = Vertical

Note; VBW=VideoBand Width

1938.4	<u>72.3</u>
--------	-------------

---

72.3

TSS B90433



Test Type: Certification

### CONDUCTED EMISSIONS (LISN)

Data by Test Site Services Co

Page 1

EUT : Agilent TELEMETRY TRANSMITTER  
: 611 MHz UNIT ONLY  
: M/N M2601A  
: FCC 15.207a

Engineer : R. Wiedeman  
Tech : B QUINN

Test : B90433  
Date : 11/24/99  
Power : 120 VAC 60 Hz  
Spec : FCC 15.207a

Receiver BW : 200 Hz from 10 kHz - 150 kHz  
: 9 kHz from 150 kHz - 30 MHz

Temperature: 74 F  
Relative Humidity: 58 %

LISN : Schwarzbeck  
8120

[illegible][illegible][illegible]

Note : BB = Broad Band.

Note : RBW = Reduced Band Width.

Note : MWA = Mixed With Amb

Note : FCC Margins Reflect Data Taken With Reference Distance = 40cm from Vertical Wall for All Measurements.

Note : FCC Margins Reflect Data Taken at 120 VAC 60 Hz

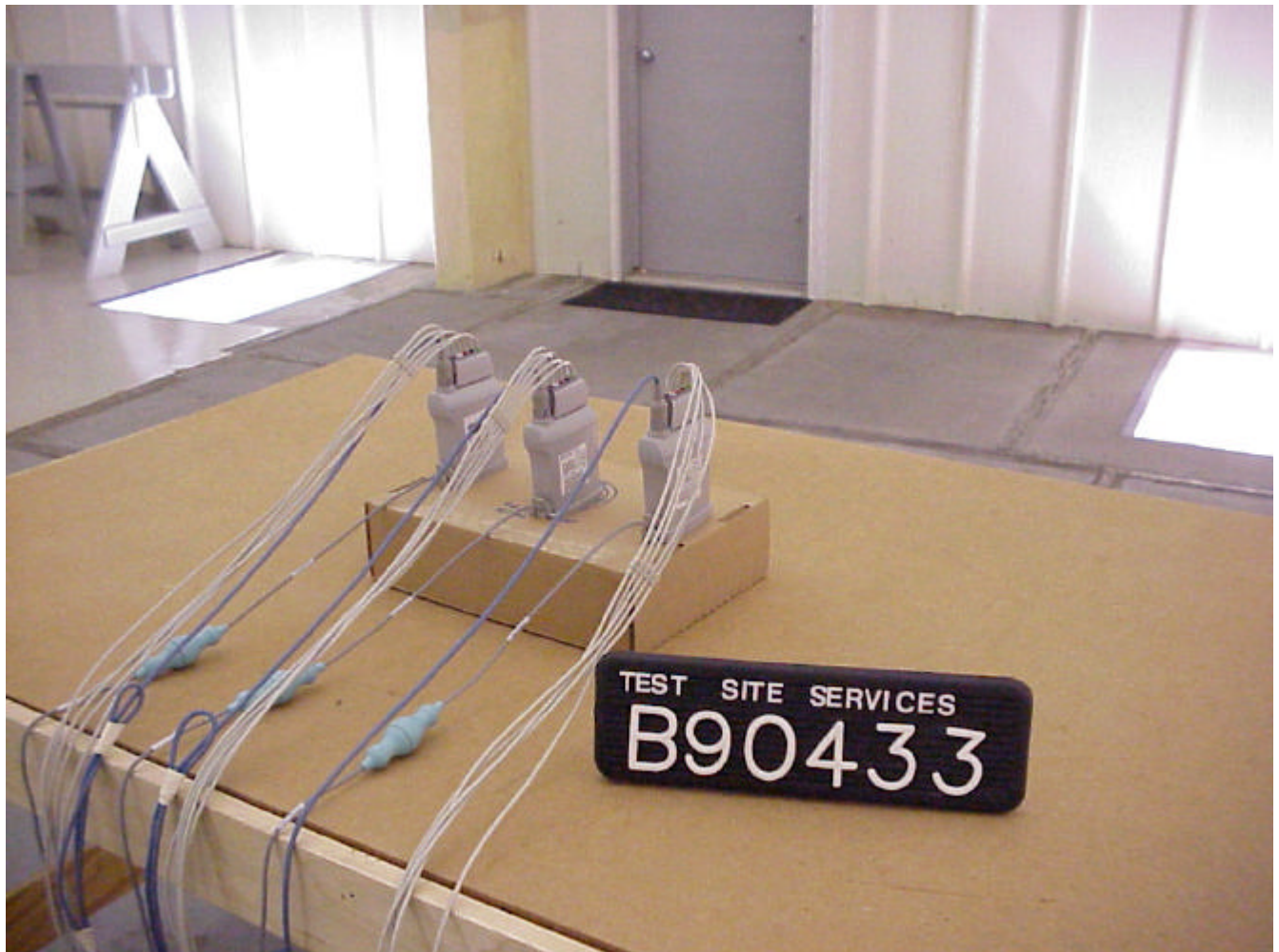
---

## **Appendix B**

# **TEST PHOTOGRAPHS**

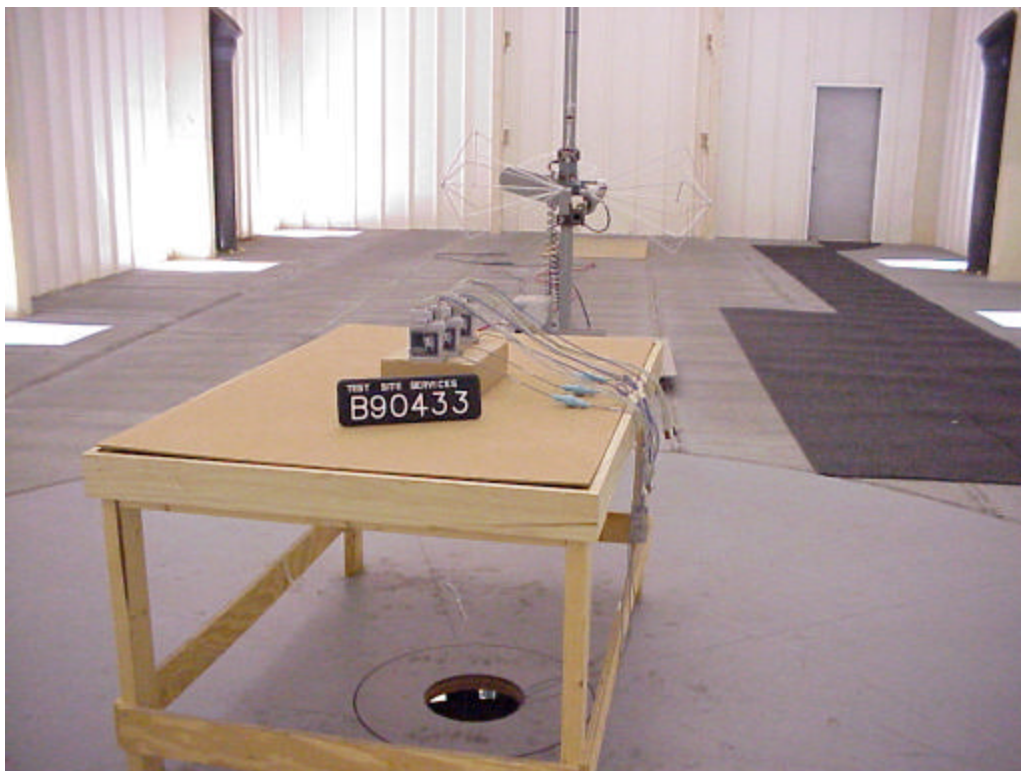
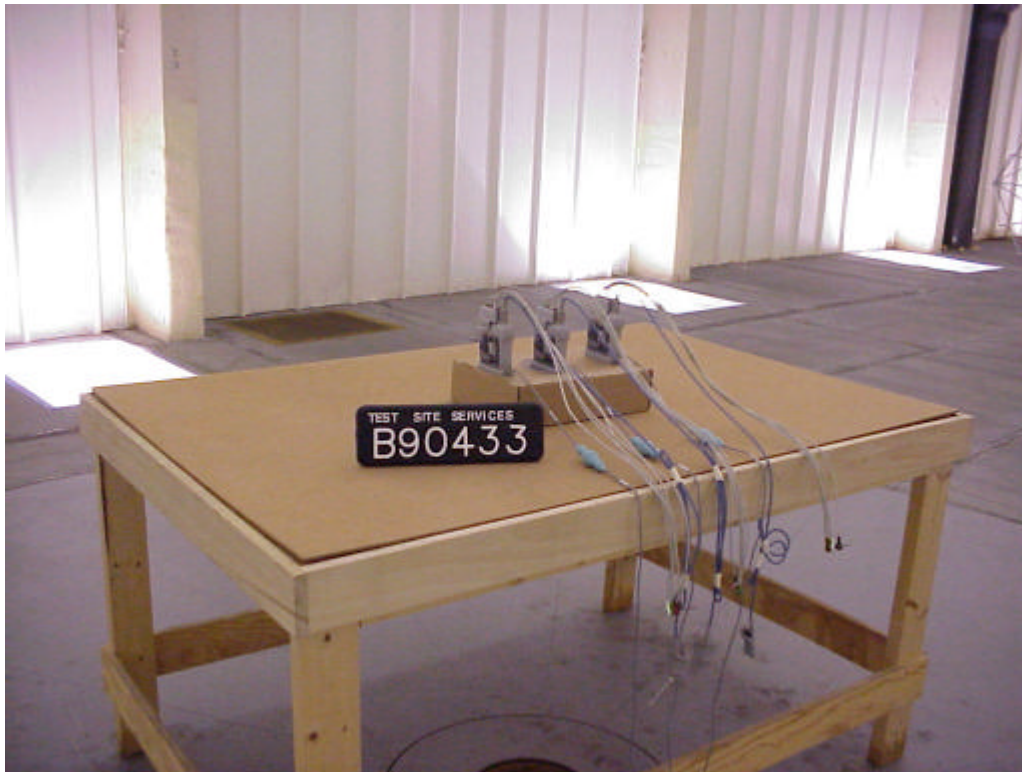
**RADIATED EMISSIONS PHOTOGRAPHS**

---

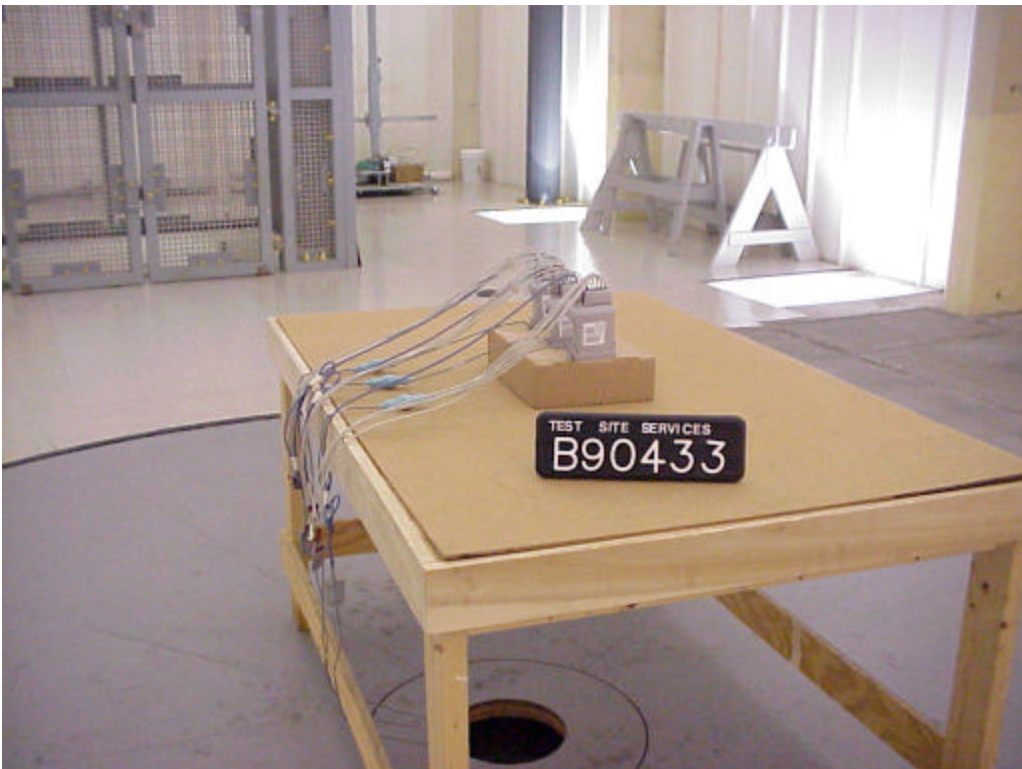
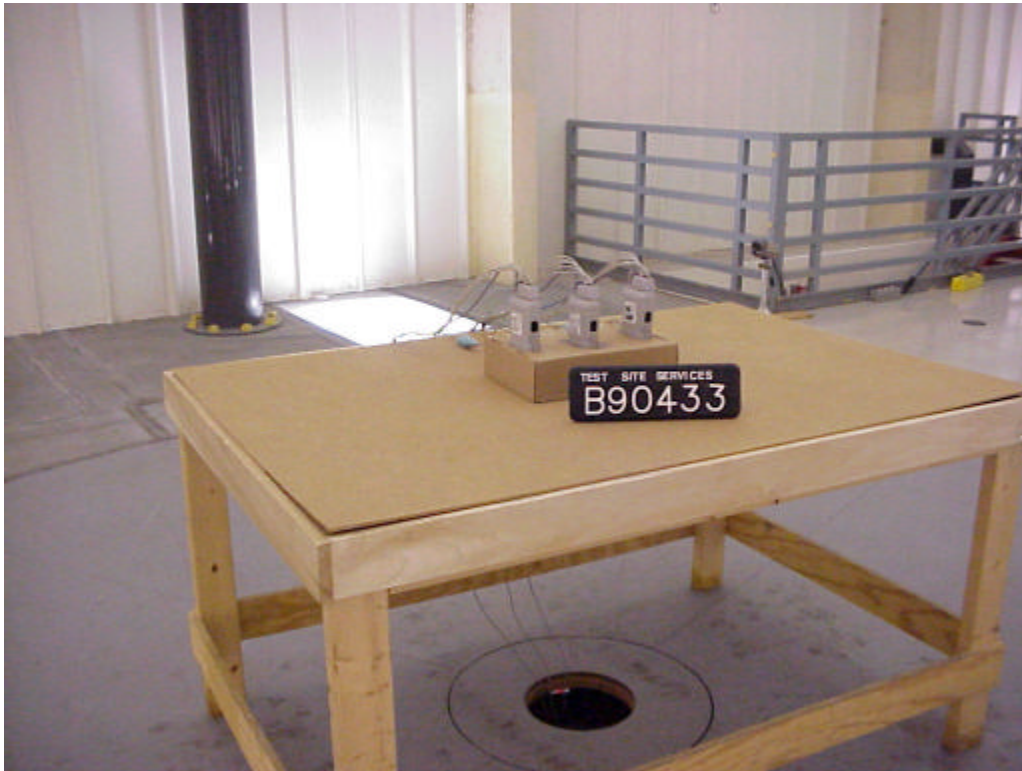


## RADIATED EMISSIONS PHOTOGRAPHS

---

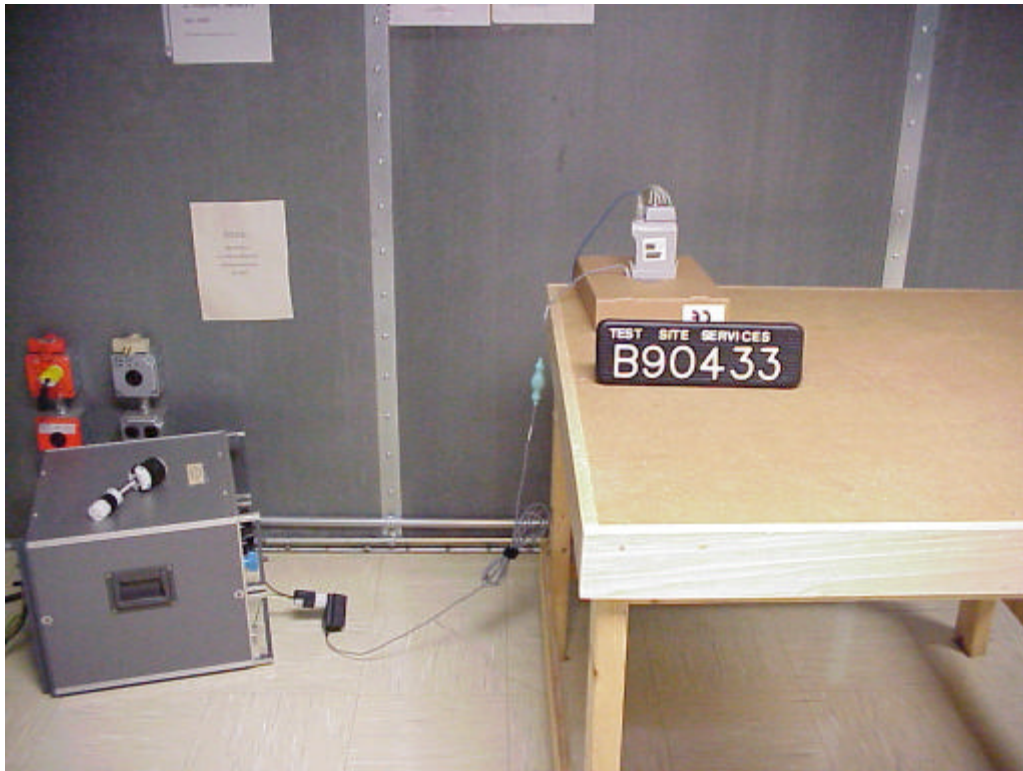


**RADIATED EMISSIONS PHOTOGRAPHS**



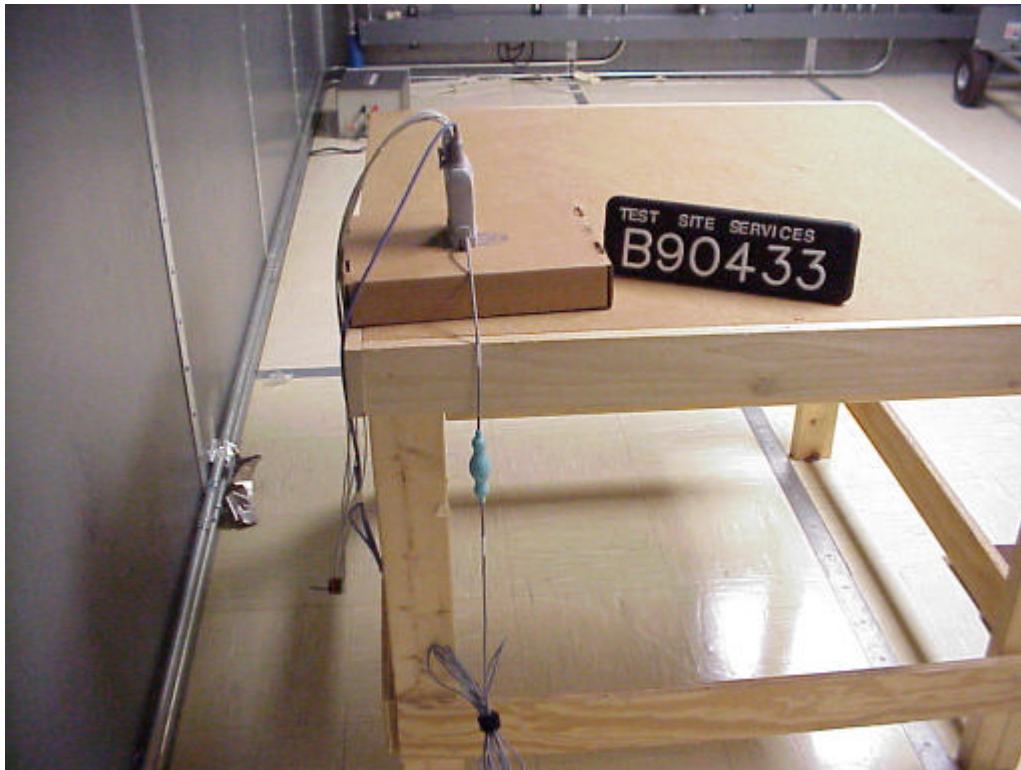
**CONDUCTED EMISSIONS PHOTOGRAPHS**

---



**CONDUCTED EMISSIONS PHOTOGRAPHS**

---



---

## **Appendix C**

# **TEST PROCEDURES**

---

## Test Procedures - EMI Operational Description

### GENERAL

For each emission signal, maximum level is achieved for both horizontal and vertical polarizations as well as (0-360) degrees turntable rotation.

Antenna Test Distances are selected at either 3, 10 or 30 meters separation from the EUT in accordance with applicable specification requirements.

Antenna Scan Heights are varied from 1-4 meters at Antenna Test Distances of 3, 10 and 30 meters.

### FCC RADIATED EMISSIONS (E-FIELD)

EMI test procedures are performed in accordance with the requirements of ANSI C63.4 (1992). Measurements are initially obtained using broad band antennas and PEAK detection. In addition, cables are manipulated to maximize emissions within constraints of a typical system configuration. All measured data within 3 db of the Radiated Limits are retaken using Tuned Dipole Antennas (Roberts Type) and QUASI-PEAK (CISPR) Detection. Each EUT is powered from a 60Hz AC source.

### FCC CONDUCTED EMISSIONS

EMI test procedures are performed in accordance with the requirements ANSI C63.4 (1992). Measurements are initially obtained with PEAK Detection. In addition, cables are manipulated to maximize emissions within constraints of a typical system configuration. All measured data within 3 db of the Conducted Limits are retaken using QUASI-PEAK (CISPR) Detection. Each EUT is powered from a 60Hz AC source.

### CISPR22/EN55022 RADIATED EMISSIONS (E FIELD)

EMI test procedures are operated in accordance with the requirements of the CISPR22 (1993) and EN55022 (1987) Documents. Measurements are initially obtained with PEAK Detection. In addition, cables are manipulated to maximize emissions within constraints of a typical system configuration. All measured data within 3 db of the Radiated Limits are retaken using QUASI-PEAK (CISPR) detection. Each EUT is powered from a 50Hz AC source.

### CISPR22/EN55022 CONDUCTED EMISSIONS

EMI test procedures are operated in accordance with the requirements of the CISPR22 (1993) and EN55022 (1987) Documents. Measurements are initially obtained with PEAK Detection. In addition, cables are arranged per the specification within constraints of a typical system configuration. All measured data exceeding 3 db below the Conducted QP Limit are retaken using QUASI-PEAK (CISPR) Detection. All measured data exceeding 2 db below the Conducted AVERAGE Limit are retaken using AVERAGE (CISPR) Detection. Each EUT is powered from a 50Hz AC source.

---

## **Appendix D**

# **MEASUREMENT FACILITIES INFORMATION**

---

## DESCRIPTION of MEASUREMENT FACILITIES

The Open Area Test Site (OATS) is composed of a building and associated ground screen with a control room underneath.

The building is a TUFF-SPAN enclosure constructed of fiberglass reinforced plastic materials which provide above-ground weather protection. These materials are non conductive, non magnetic and RF transparent. They do not impact the surrounding electromagnetic environment and are corrosion resistant. The enclosure size permits Ten Meter Radiated Measurements within its confines and utilizes a remote controlled Macton Turntable Assembly. The conductive turntable is 16 feet in diameter and capable of moving a 10,000 pound load a full 360 degrees of rotation. It is flush-mounted to the ground screen and edge bonded circumferentially to the ground screen with beryllium copper "fingers". The ground screen is constructed of welded wire mesh lying directly on top of a concrete-over-steel foundation. The screen is extended beyond the building itself to provide 30 meter measurement capability when needed. There are no reflecting objects within the required obstruction free oval area.

The control room is located beneath the ground screen level with stairwell access to the ground plane area. An elevator is located beyond the ground screen and provides access to the control room, shipping dock and ground screen areas for large sized EUT's. Primary power cabling to the EUT is fed through a hole in the center of the table along with necessary EUT/Support Equipment interface cabling. A remote controlled EMCO Antenna Mast Assembly is located on the ground screen. It provides the operator with adjustable antenna height over the 1 meter through 4 meter range as well as allowing both horizontal and vertical polarizations at any height.

A conducted emissions measurement area is located in a shielded room and consists of a conductive (galvanized sheet metal) wall 20' wide x 8' high with a metal floor bonded to the wall. AC Power is supplied through receptacles located on the vertical wall. Each receptacle is adequately filtered using Shielded Room EMI Power Line Filters (Rayproof 1B42 Units) which provide 100 db attenuation over the 14KHz to 10GHz frequency range. The shielded room itself is bonded directly to earth ground.

Additionally, both the control room/shielded rooms and ground plane area have heating, air conditioning and relative humidity controlled environments.

---

## Capability

Test Site Service's open area Test Sites have been evaluated in accordance with ANSI C63.4 procedures and found to be in compliance with ANSI C63.4-(1992) Site Attenuation and LISN requirements.

In addition, Test Site Services is Assessed and Approved annually by a European Competent Body to assure competence in testing products for CE Mark Compliance (Emissions and Immunity).

All of Test Site Service's measurement facilities meet the technical requirements for qualification testing of products to FCC, CISPR, IEC, VCCI, BSMI and other International Standards.

---

## Accreditation / Approval

- FCC Registered
- VCCI Registered
- BSMI Accreditation
- NVLAP Accredited
- AUSTEL Listed
- New Zealand Approved (Ministry of Commerce)
- Competent Body Assessment / Approval (Technology International, UK)
- Sub-Accredited by Hewlett-Packard (Mass. Medical Environmental Test Lab.)
- NARTE certified EMC Engineers / Personnel

**PO BOX 766**  
**MARLBORO, MA 01752**  
**(508)634-3444**

Thank you for choosing to use the Test Site Services EMC test facilities to test your product. Client satisfaction is very important to Test Site Services. To help serve you fully and continue to make improvements in our service, we need your feedback and comments on the service we performed for you today. We would appreciate your taking a few moments to complete this questionnaire.

1. Did scheduling meet your needs \_\_\_\_\_
2. Test operator support \_\_\_\_\_
3. Personnel attitude \_\_\_\_\_
4. Efficiency of test process \_\_\_\_\_
5. Work completed in a timely manner \_\_\_\_\_
6. Report received in a timely manner \_\_\_\_\_
7. Report content and clarity \_\_\_\_\_
8. Overall rating \_\_\_\_\_
9. Additional Comments:

Completed By: \_\_\_\_\_

*Please return to:      Lab Manager      or      Richard L. Wiedeman*  
*(At Test Site)      President*  
*Test Site Services, Inc.*  
*PO Box 766*  
*Marlboro, MA 01752*