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# Radiated Emissions Part 24 Test Report
# Lab Project Number- 02NOR010

# MPAM-CR (Wide-Range HCPA/MPEM)

**Revision: 01**

**Date: May 23, 2002**

**Prepared for**: Nortel Networks Inc.

**Author:** Shankara Malwes
EMC Test Technologist

**Approved by:** Glen Moore, EMC Manager; Matthew P. Buxton, PI Laboratory Manager

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## Summary

## Sanmina-SCI Canada

Product Integrity Laboratory
5151-47th Street, N.E. Calgary Alberta T3J 3R2
Accreditation Numbers: FCC 101386
IC 46405-3978
Standards Council of Canada Accredited Laboratory No. 440

Performed For: Thomas Wong
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EUT Description: MPAM-CR (Wide-Range HCPA/MPEM)
Model: Wide-Range MPEM and HPCA, CRPA
Serial Number: Refer Table 2 of the project test plan in Appendix D

| Appendix | Core Standard | Reference Standard | Sanmina Test Case | Description & Range | Deviation From Standard | Deviation From Test Plan | Pass / Fail |
|---|---|---|---|---|---|---|---|
| B | FCC Part24 | ANSI C63.4:2001 | RE02-10M-2002-021 | Spurious Radiated Emissions 30MHz-1GHz | No | No | Pass |
| C | FCC Part24 | ANSI C63.4:2001 | RE03-10M-2002-007 | Spurious Radiated Emissions 1GHz – 10 GHz | No | Yes | Pass |

Note: Test Plan deviations are listed in Appendix A.

Test Result: The product presented for testing complied with test requirements shown above.

Tested By: June/10/02
Shankara Malwes
EMC Technologist

Checked By: Signature Valid
Glen Moore
EMC Manager

Digitally signed by Glen Moore
DN: cn=Glen Moore, o=Sanmina-SCI, ou=Product Integrity, c=CA
Date: 2002.06.06 14:27:20 -07'00'

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## Table of Contents

SUMMARY ..... 2
REGISTER OF REVISIONS ..... 4
1. INTRODUCTION ..... 4
1.1 Purpose ..... 4
1.2 Abbreviations and Definitions ..... 4
1.3 References ..... 4
2. TEST LOG ..... 4
3. EUT ..... 5
3.1 Configuration ..... 5
3.1.1 CONFIGURATION DEVIATIONS ..... 7
3.2 Power ..... 8
3.2.1 POWER DEVIATIONS ..... 8
3.3 Cables ..... 8
3.3.1 CABLE LIST DEVIATIONS ..... 9
3.4 EUT Frequencies ..... 9
3.4.1 FREQUENCY LIST DEVIATIONS ..... 9
3.5 Mode of Operation ..... 9
3.5.1 MODE OF OPERATION DEVIATION ..... 9
3.6 Pass / Fail Criteria ..... 10
4. SUPPORT EQUIPMENT ..... 11
APPENDICES ..... 12
APPENDIX A: TEST DEVIATION LOG ..... 13
APPENDIX B: MTRM 1900MHZ RADIATED EMISSIONS 30MHZ – 1GHZ RESULTS ..... 16
APPENDIX C: MTRM 1900MHZ RADIATED EMISSIONS 1 – 20GHZ RESULTS ..... 25
APPENDIX D: TEST PLAN ..... SUPPLEMENTARY DOCUMENT
APPENDIX E: SUPPLEMENTARY INFORMATION ..... SUPPLEMENTARY DOCUMENT
END OF DOCUMENT ..... 35

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## REGISTER OF REVISIONS

| Issue | Date | Description of Revisions |
|---|---|---|
| Rev.1 | 23 May 2002 | Initial Release |
| | | |

# 1. INTRODUCTION

### 1.1 PURPOSE

The purpose of this report is to describe testing and results for Radiated Emissions on Nortel's MPAM-CR (Wide-Range MPEM and HPCA, CRPA) as performed in reference to FCC Part 24 Subpart E limits.

### 1.2 ABBREVIATIONS AND DEFINITIONS

None

### 1.3 REFERENCES

ANSI C63.4-2001
FCC CFR 47 Part 24
Sanmina-SCI Radiated Emissions 30MHz-1GHz (Automated) Test Method E001R6
Sanmina-SCI Radiated Emissions 1GHz – 18GHz (Manual) EMC Test Method E006R3
Sanmina-SCI Radiated Emissions 30MHz – 20GHz Signal Substitution Method Revision:01

# 2. TEST LOG

| Appendix | Test Case | Start | End |
|---|---|---|---|
| Date Received: 28th Apr 2002 | | | |
| B | Radiated Emissions 30MHz – 1GHz FCC Part 24 | 16 May 02 | 16 May 02 |
| C | Radiated Emissions 30MHz – 20GHz FCC Part 24 Signal Substitution | 16 May 02 | 17 May 02 |
| Date Shipped: Not shipped | | | |

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# 3. EUT

## 3.1 CONFIGURATION

The EUT was placed on the wooden palette located in the center of the turntable in the 10M chamber. Cabling was routed through a cable rack in an attempt to maximize the emissions. The EUT was configured with 3x1900MFRMs named MFRM#1, 2 and 3. All the MFRM Antenna ports connected to bulkhead in the center of the turntable and terminated with a 50-ohm attenuator load in the support room under the 10M chamber.

For more detailed EUT configuration and setup refer to Appendix F of the Project test plan in Section 3.4.1.2 and section 4.2 of the Project test plan draft document number xxxxxx, Stream 00, Issue 01, dated 21 Apr 2002.

**Table 1 –Description of EUT**

| | |
|---|---|
| **Name** | MPAM-CR |
| **Model Number** | Wide-Range MPEM and HPCA, CRPA |
| **Revision Number** | Not provided |
| **Serial Number** | Refer to the Table 2 |
| **Physical Description** | The MPAM-CR consists of three subassemblies mounted in an open, floor-standing frame, all gray in color. Each MFRM has green lights on the front panel and four ports on the back (Ant, Div Ant, RF In, & RF Out). The rack was placed on a 10cm high wooden pallet in the center of the 10M-chamber turntable. |
| **Classification** | Floor standing |
| **Size** | Not provided |
| **Weight** | Not provided |
| **Power** | -48V DC, 15 Amps in each feed. The 3MFRM powers were connected to the B-Hubble connector. For more details Refer Appendix E Table 11,of the Project test plan in Section 2.2 |
| **Functional Description** | The cost reduced MPAM was tested as part of a Metrocell Multi carrier BTS.The cellular and PCS communication uses CDMA Technology and operates at 1900MHz. The basic system provides a complete, one carrier cell site that may be configured for indoor or outdoor applications.<br><br>For more detailed description please Refer to the section 1.3 of the Project test plan draft document Number: xxxxxx, stream 00, issue 01 dated 21 Apr 2002. |

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**Table 2 – EUT Description List**

The following equipment was provided by the customer and was verified by Sanmina-SCI.

| Module | Module Description | PEC | Serial Number (Unique Identifier) | Verified |
|---|---|---|---|---|
| DPM | 1900 DPM #4 | NTGS53JA | NNTM7400000G | ☒ |
| | 1900 DPM #5 | NTGS53KA | NNTM7400000C | ☒ |
| | 1900 DPM #6 | NTGS53LA | NNTM7400000L | ☒ |
| MTRM | 1900 MTRM#4 | NTGY10AA AD | NNTM537X6W0B | ☒ |
| | 1900 MTRM#5 | NTGY10AA AD | NNTM535TGUM2 | ☒ |
| | 1900 MTRM#6 | NTGY10AA AD | NNTM535TGUU8 | ☒ |
| MPAM #4 | MPAM#4 | NPGY80AZ P1 | NNTM537YT0X1 | ☒ |
| | MCPA | NTGY81AC N1 | NNTM74PE080F | ☒ |
| | MPEM | ACTT MPEM | ACTT00000049 | ☒ |
| | HPCA | ASTEC HPCA | ADPL0800000E | ☒ |
| MPAM #5 | MPAM #5 | NPGY80AZ P1 | NNTM537YT115 | ☒ |
| | MCPA | NTGY81AC N1 | NNTM74PE080C | ☒ |
| | MPEM | ACTT MPEM | NNTM533GQN48 | ☒ |
| | HPCA | ASTEC HPCA | ADPL0800000J | ☒ |
| MPAM #6 | MPAM #6 | NPGY80AZ P1 | NNTM537YT0Y2 | ☒ |
| | MCPA | NTGY81AC N1 | NNTM74PE0809 | ☒ |
| | MPEM | ACTT MPEM | NNTM533GQN6A | ☒ |
| | HPCA | NTGY82CA N5 | ASENAE000046 | ☒ |

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| Module | Module Description | PEC | Serial Number (Unique Identifier) | Verified |
|---|---|---|---|---|
| FRAME | FRAME | NTGS65AA 06 | DEVP01010848 | ☒ |
| FAN | FAN#4 | NTGY60AA 02 | SNMN5300K5F5 | ☒ |
| | FAN#5 | NTGY60AE 01 | NNTM532VW839 | ☒ |
| | FAN#6 | NTGY60AE 01 | NNTM532VW88E | ☒ |

Note: Special considerations for each test case are noted in the appropriate appendices.

### 3.1.1 CONFIGURATION DEVIATIONS

None

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### 3.2 Power

B – Hubble: 15 Amps each feed
Line 1 -48V DC through LISN B1
Line 2 +48V DC through LISN B2
Line 3 -48V DC through LISN B3
Line 4 +48V DC through LISN B4

3.2.1 POWER DEVIATIONS

None

### 3.3 CABLES

**Table 3 – Cable List**

The customer provided the following list of cables and they were verified by Sanmina-SCI.

| No | Description | Routing From | Routing to | Length (m) | Connector Type | Shield Type | Back shell Material | Verified |
|---|---|---|---|---|---|---|---|---|
| 1 | 50Ω RF Cable # 1 | 1900MFRM #4 Main Ant D6 port through #1 bulkhead connector | 30dB, 150 watts, attenuator and to 50Ω term | ~22 | N-Type | Braid /Foil | Metal | ☒ |
| 2 | 50Ω RF Cable # 2 | 1900MFRM #5 Main Ant D6 port through #2 bulkhead connector | 150 watts, attenuator load term | ~22 | N Type | Braid /Foil | Metal | ☒ |
| 3 | 50Ω RF Cable # 4 | 1900MFRM #6 Main Ant D6 port through #4 bulkhead connector | 40dB, 500 watt, attenuator and to 50Ω term | ~22 | N-Type | Braid /Foil | Metal | ☒ |
| 4 | 50Ω RF Cable # 5 | 1900MFRM #4 Div Ant port through #5 bulkhead connector | 150 watts, attenuator load term | ~22 | N-Type | Braid /Foil | Metal | ☒ |

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| No | Description | Routing From | Routing to | Length (m) | Connector Type | Shield Type | Back shell Material | Verified |
|---|---|---|---|---|---|---|---|---|
| 5 | 50Ω RF Cable # 7 | 1900MFRM #5 Div Ant port through #7 bulkhead connector | 150 watts, attenuator and to 50Ω term | ~22 | N-Type | Braid /Foil | Metal | ☒ |
| 6 | 50Ω RF Cable # 8 | 1900MFRM #6 Div Ant port through #8 bulk head connector | 150 watts, attenuator load term | ~22 | N-Type | Braid /Foil | Metal | ☒ |
| 7 | 2 Shielded Power Cable | Line 1 and Line 2 of B-Hubble connector | 1900 MFRM# 4,5 Power I/P | ~8.0 | N-Type | Braid /Foil | Metal | ☐ |
| 8 | 1 Shielded Power Cable | Line 3 and Line 4 of B-Hubble connector | 1900 MFRM# 6 Power I/P | ~8.0 | N-Type | Braid /Foil | Metal | ☐ |

**Note:** "☒" means verified and "☐" not verified

### 3.3.1 CABLE LIST DEVIATIONS

None

## 3.4 EUT FREQUENCIES

For a detailed list of frequencies refer to the Appendix. D, Table 2 and 3 of the project test plan draft document number: xxxxxx, Stream 00, Issue 01, dated 21 Apr 02. Also Refer to the section 7.2.1 in the test plan.

### 3.4.1 FREQUENCY LIST DEVIATIONS

Frequencies of the EUT were not verified by Sanmina-SCI.

## 3.5 MODE OF OPERATION

Refer to the Appendix. D in section 4.4 of the Project test plan draft document number xxxxxx, Stream 00, Issue 01, dated 21 Apr 2002.

### 3.5.1 MODE OF OPERATION DEVIATION

The customer operated the EUT and reported no operation deviations reported by the client.

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### 3.6 PASS / FAIL CRITERIA

The pass/fail criteria are defined as the limits specified in FCC CFR Part 24 Subpart E. The standard limits are described in each appendix of this report.

**Pass Criteria:**
The EUT is considered to pass the FCC Part 24 Spurious Emissions Test if the measured level is less than or equal to the applicable limit –13dBm.

**Fail Criteria:**
The EUT is considered to Fail the FCC Part 24 Spurious Emissions Test if the measured level is greater than or equal to the applicable limit –13dBm.

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## 4. SUPPORT EQUIPMENT

The following modules were used as support equipment and verified by Sanmina-SCI. The equipment was isolated from the EUT in the shielded enclosure below the test site and was used to excite the EUT and monitor the alarm status of the EUT.

**Table 5 – Support Equipment**

| Module | Module Description | PEC | Serial Number (Unique Identifier) | Verified |
|---|---|---|---|---|
| Upper Shelf | CEM in Slot 1 | NTGS60BA 80 | NNTM5357YCHB | ☒ |
| | CEM in Slot 2 | NTGS60BA 78 | NNTM5357H4BF | ☒ |
| | CEM in Slot 3 | NTGS60BA 73 | NNTM533M1365 | ☒ |
| | CEM in Slot 7 | NTGS60BA 76 | NNTM53406QTY | ☒ |
| | CEM in Slot 8 | NTGS60BA 77 | NNTM5340832L | ☒ |
| | CEM in Slot 9 | NTGS60BA 73 | NNTM533MUMDQ | ☒ |
| Bottom Shelf | | | | ☒ |
| | GPSTM slot2 | NTBW50AA P4 | NNTM74TW0010 | ☒ |
| | CM Slto4 | NTGS40AA 97 | NNTM5357CGFT | ☒ |
| | CM slot5 | NTGS40AA 34 | NNTM533MPBB8 | ☒ |
| | CORE slot6 | NTGS30AA 37 | NNTM533MNG78 | ☒ |
| | CORE slot7 | NTGS30AA 40 | NNTM533MUF16 | ☒ |
| SHELF | | NTGS20AA 09 | SNMN53002T2K | ☒ |
| FRAME | | NTGS45BA 12 | SNMN53002UGJ | ☒ |
| BRAKER PANEL | | NTGS47AB 05 | SNMN53002PE8 | ☒ |

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# APPENDICES

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# APPENDIX A: TEST DEVIATION LOG

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| Deviation Number | Time & Date | Reference | Deviation from Standard (Y/N) | Description and Justification of Deviation | Core Standard Affected | Approval |
|---|---|---|---|---|---|---|
| | | | | | | |

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# APPENDIX B: MTRM 1900MHZ RADIATED EMISSIONS 30MHZ – 1GHZ RESULTS

## B.1. Test Basis

FCC CFR 47 Part 24
ANSI C63.4

## B.2. Test Specifications

| FCC Part 24 Subpart E | | |
|---|---|---|
| **Frequency** | **ERP Limit** | **Peak Limit @ 10 meters*** |
| **MHz** | **dBm** | **dBμV/m** |
| 30MHz – 1 GHz | -13 | 73.90 |

* Theoretical field strength based on a dipole

## B.3. Test Procedure

Sanmina-SCI Radiated Emissions 30MHz-1GHz (Automated) Test Method E001R6
Radiated Emissions Signal Substitution Method 30MHz-20GHz Revision 1.0.
The EUT was scanned for emissions, field strength measurements were made on the EUT, and for any signals detected signal substitution was performed.

## B.4. Measurement Uncertainty

The estimated uncertainty for the Radiated Emissions Signal substitution test from 30MHz – 1GHz is +2.15/-2.19 dB. The corresponding expanded uncertainty is +4.29/- 4.37 dB.

## B.5. Deviations

**From Standard**

None.

**From Method**

Substitutions were referenced to automated compliance peak data.

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## B.6. Test Results

### FCC Part 24
### Peak Scan 30MHz – 1GHz (Horizontal Polarization)

Sanmina Product Integrity Laboratory V2.5

**Project Name:** CR MPAM
**Model:** MPAM 1900MHz Single Carrier
**Comments:** Horizontal Scan Compliance Data
**Tester:** Shankara Malwes
**Test ID:** RE02-10M-2002-021

Standard: FCC Part 24 | Measurement Distance: 10 meters

| Antenna | Start Frequency | Stop Frequency | Frequency | AF | CL | Detector | Pk Measured Value | Corrected Value | Theoretical Limit | Theoretical Margin |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | MHz | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| 2261 RX BiCon Hpol | 30 | 1000 | 40.45 | 13.30 | -24.55 | Peak | **26.14** | 14.89 | 73.90 | 59.01 |
| 2261 RX BiCon Hpol | 30 | 1000 | 120.00 | 11.75 | -24.21 | Peak | **37.46** | 24.99 | 73.90 | 48.91 |
| 2261 RX BiCon Hpol | 30 | 1000 | 135.00 | 11.71 | -24.32 | Peak | **40.84** | 28.22 | 73.90 | 45.68 |
| 2261 RX BiCon Hpol | 30 | 1000 | 471.86 | 17.16 | -24.33 | Peak | **43.51** | 36.34 | 73.90 | 37.56 |

Corrected Value: Measured Value + AF + CL  AF: Antenna Factors & CL: Cable Loss

Notes:
Positive Margin indicates a pass

### Peak Scan 30MHz – 1GHz (Vertical Polarization)

Sanmina Product Integrity Laboratory V2.5

**Project Name:** CR MPAM
**Model:** MPAM 1900MHz Single Carrier
**Comments:** Vertical Scan Compliance Data
**Tester:** Shankara Malwes
**Test ID:** RE02-10M-2002-021

Standard: FCC Part 24 | Measurement Distance: 10 meters

| Antenna | Start Frequency | Stop Frequency | Frequency | AF | CL | Detector | Pk Measured Value | Corrected Value | Theoretical Limit | Theoretical Margin |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | MHz | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| 2261 RX BiCon Vpol | 30 | 1000 | 176.95 | 9.99 | -24.12 | Peak | **39.67** | 25.54 | 73.90 | 48.36 |
| 2261 RX BiCon Vpol | 30 | 1000 | 383.38 | 15.64 | -23.96 | Peak | **34.36** | 26.03 | 73.90 | 47.87 |
| 2261 RX BiCon Vpol | 30 | 1000 | 471.85 | 17.74 | -24.33 | Peak | **42.69** | 36.10 | 73.90 | 37.80 |

Corrected Value: Measured Value + AF + CL  AF: Antenna Factors & CL: Cable Loss

Notes:
Positive Margin indicates a pass

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## Substitution Data 30MHz – 1GHz

Sanmina Product Integrity Laboratory V2.5

**Project Name:** CR MPAM
**Model:** MPAM 1900MHz Single Carrier
**Comments:** Substitution Data at 10M distance
**Tester:** Shankara Malwes
**Test ID:** RE02-10M-2002-021

| Frequency (MHz) | Polarization (V/H) | Uncorrected Peak level | Uncorrected Substitution measure level | Signal Generator level (source) dBuV | Cable factor | Antenna Gain | Effective Radiated Power (E.R.P.) | E.R.P Limit | Margin |
|---|---|---|---|---|---|---|---|---|---|
| | | dBuV/m | dBuV/m | dBm | dB | dB | dBm | dBm | dB |
| 40.45 | H | 26.14 | 26.60 | -75.30 | -0.79 | 1.10 | **-74.99** | -13 | 61.99 |
| 120.00 | H | 37.46 | 37.73 | -67.40 | -1.34 | 1.80 | **-66.94** | -13 | 53.94 |
| 135.00 | H | 40.84 | 40.87 | -62.70 | -1.43 | 2.00 | **-62.13** | -13 | 49.13 |
| 471.86 | H | 43.51 | 43.69 | -36.20 | -2.67 | 3.10 | **-35.77** | -13 | 22.77 |
| | | | | | | | | | |
| 176.95 | V | 39.65 | 39.69 | -43.90 | -1.63 | 1.20 | **-44.33** | -13 | 31.33 |
| 383.38 | V | 34.21 | 34.17 | -46.30 | -2.41 | 1.20 | **-47.51** | -13 | 34.51 |
| 471.85 | V | 42.59 | 42.37 | -37.60 | -2.67 | 2.30 | **-37.97** | -13 | 24.97 |

Effective Radiate Power (E.R.P) = Signal Generator + Cable Factor + Antenna Gain

Note: Positive Margin indicates a Pass.

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### B.7. Measurement Equipment

Radiated Emissions 30MHz – 1GHz

| Description | Type/Model | Manufacturer | Serial # | Cal Due | Cal Date |
|---|---|---|---|---|---|
| **10m ANECHOIC CHAMBER** | | | | | |
| Bilog Antenna | CBL 6111B | Chase | 40500566 | 12 Mar 03 | 12 Mar 02 |
| Mast Controller | 2090 | EMCO | 40500188 | N/A | N/A |
| Multi Device Controller TT1 (Turntable) | 2090 | EMCO | 40500197 | N/A | N/A |
| RF Cable west range | Ferrite bead loaded cable | Suhner Succoflex | 40500650 | 17 Apr 03 | 17 Apr 02 |
| RF Cable from Bulkhead to LNA | Succoflex 103 | Suhner Succoflex | 35200/3 | 17 Apr 03 | 17 Apr 02 |
| Adjustable Dipole Antenna Set | 3121C | EMCO | 9611-1233 | 04 Mar 2003 | 04 Mar 2002 |
| **CONTROL ROOM** | | | | | |
| ESMI | 1032.5510.23 | Rohde & Schwarz | 40500153/154 | 11 Jan 03 | 11 Jan 02 |
| Amplifier | HP-8447F OPT H64 | Hewlett Packard | 40500228 | 17 Apr 03 | 17 Apr 02 |
| Switch Matrix Controller | SMC-002 | TDL | 40500189 | N/A | N/A |

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| VERIFICATION EQUIPMENT | | | | | |
|---|---|---|---|---|---|
| RefRad | 4630B | EMCO | 40500257 | 25 Apr 03 | 25 Apr 02 |
| RefRad (Kit) | Balun A | NA | NA | N/A | N/A |
| RefRad (Kit) | 40cm Dipole | NA | NA | N/A | N/A |
| RefRad Fixture | NA | Sanmina | RefRad Fixture #1 | N/A | N/A |
| Signal Generator 10MHz – 40GHz | SMP04 | Rohde & Schwarz | 40500125 | 27 Mar 03 | 27 Mar 02 |
| Cable from RX antenna to 3M center bulk head in 10M Chamber | 104 | Succoflex | 116558/4 | 18 Apr 03 | 18 Apr 02 |
| Cable from 3M center bulk head to Control room | 104 | Succoflex | 40500627 | 18 Apr 03 | 18 Apr 02 |
| Cable from Control room bulk head TO Signal Generator | 104 | Succoflex | 40500626 | 18 Apr 03 | 18 Apr 02 |

### B.8. Deviations from Normal Operating Mode

Client operated the EUT during the test and reported no deviations in its normal operating mode.

### B.9. Test Setup Special Considerations

Refer to section 3.4.1.2 and 4.4 of the project test plan draft copy document number xxxxxx, issue 01 dated 21 Apr 02 for more detailed description of the setup configuration and details.

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### B.10. Sample Calculation

Emission Level = Measured Level + Correction Factors
Margin = Limit – Emission Level

ERP Limit = $P_{dBm}$ – (43 + 10Log(P))

Example

P=20w

ERP Limit

= 43dBm – (43 + 10Log(20)) = -13dBm

Peak Limit = 120 + 20Log(SQRT (49.2 * P) / D)

Example

P= -13dBm = 0.00005w

D= 10m

Peak Limit

= 120 + 20Log(SQRT (49.2 * 0.00005) / 10)

= 79.3 dBuV/m

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### B.11. Test Data and Pictures

Test data and pictures for Radiated Emissions appear following this page.

### B.12. Test Results

The EUT is in compliance with the limits as specified in the standard FCC Part 24 Subpart E.

### B.13. Signature

Signature/Date: June/10/02
Name: Shankara Malwes
Function: EMC Technologist

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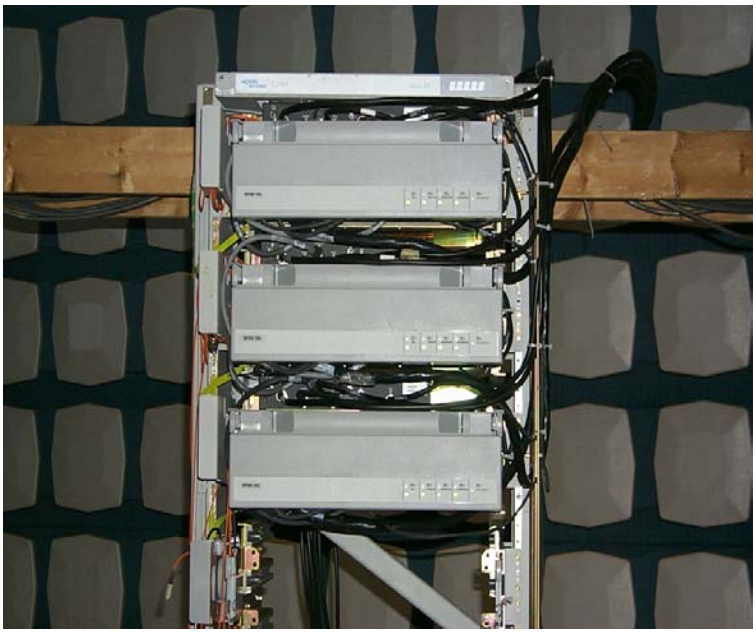

Picture 1: Front view of the EUT towards the Antenna

Picture 2: Left side of the EUT

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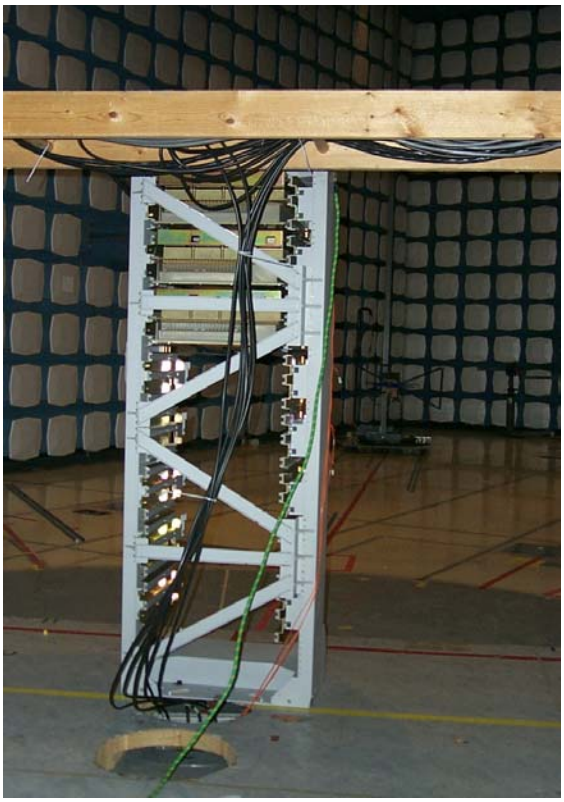

Picture 3: Back view of the EUT

Picture 4: Right side of the EUT

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# APPENDIX C: MTRM 1900MHZ RADIATED EMISSIONS 1 – 20GHZ RESULTS

## C.1. Test Basis

**Standards**

Core Standard: FCC CFR 47 Part 24, Subpart E.

Reference Standard: ANSI C63.4

## C.2. Test Specifications

Applicable Limits:

FCC Part 24 Subpart E Radiated Electric Field @ 3m West Site

| FCC Part 24 | | |
|---|---|---|
| **Frequency** | **ERP Limit** | **Peak Limit @ 3 meters*** |
| **MHz** | **dBm** | **dBμV/m** |
| 1GHz – 20GHz | -13 | 84.3 |

* Theoretical field strength based on a dipole

## C.3. Test Procedure

The EUT was scanned for emissions, field strength measurements were made on the EUT, and for any signals detected signal substitution was performed.
Sanmina-SCI Radiated Emissions 1GHz – 18GHz (Manual) Test Method E006R3.
Radiated Emissions Signal Substitution Method 30MHz-20GHz.

## C.4. Measurement Uncertainty

The estimated uncertainty for the Radiated Emissions Signal substitution test from 1GHz – 20GHz is +/-2.74 dB. The corresponding expanded uncertainty is +/- 5.49 dB.

## C.5. Deviations

**From Standard**
None

**From Test Plan**
None

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## C.6. Test Results

### FCC Part 24

### Peak Scan 1GHz - 20GHz (Horizontal Polarization)

Sanmina Product Integrity Laboratory V2.5

**Project Name:** CR MPAM
**Model:** MPAM 1900MHz Single Carrier
**Comments:** Horizontal Scan Compliance Data

**Tester:** Shankara Malwes
**Test ID:** RE03-10M-2002-007

| Standard | FCC Part 24 | 3 meters |
|---|---|---|

| Antenna | Start Frequency | Stop Frequency | Frequency | AF | CL + LNA | Detector | Pk Measured Value | Corrected Value | Theoretical Limit | Theoretical Margin |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | MHz | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| 3115 Hpol | 1000 | 2700 | 2028.86 | 29.38 | -61.87 | Peak | 94.32 | 61.82 | 84.35 | 22.53 |
| 3115 Hpol | 2700 | 5950 | 3867.55 | 34.03 | -58.44 | Peak | 94.33 | 69.92 | 84.35 | 14.43 |
| 3115 Hpol | 2700 | 5950 | 3867.40 | 34.03 | -58.44 | Peak | 93.75 | 69.34 | 84.35 | 15.01 |
| 3160-06 | 5950 | 8200 | 7815.06 | 30.00 | -51.37 | Peak | 72.37 | 51.00 | 84.35 | 33.35 |
| 3160-07 | 8200 | 10000 | 9768.93 | 33.50 | -48.84 | Peak | 70.80 | 55.46 | 84.35 | 28.89 |
| 3160-07 | 10000 | 12500 | 11887.95 | 33.60 | -48.60 | Peak | 72.51 | 57.51 | 84.35 | 26.84 |
| 3160-08 | 13000 | 15000 | 13536.86 | 37.10 | -48.10 | Peak | 73.37 | 62.37 | 84.35 | 21.98 |
| 3160-08 | 15000 | 18000 | 15629.91 | 37.20 | -46.93 | Peak | 73.63 | 63.90 | 84.35 | 20.45 |
| 3160-08 | 15000 | 18000 | 17403.48 | 37.20 | -46.23 | Peak | 74.72 | 65.69 | 84.35 | 18.66 |
| 3160-09 | 18000 | 20000 | 19537.51 | 40.30 | -84.31 | Peak | 112.65 | 68.64 | 84.35 | 15.71 |

Corrected Value: Measured Value + AF + CL + LNA. AF: Antenna Factors & CL: Cable Loss & LNA: Amplifier

Notes:
(1) Positive Margin indicates a pass
(2) Corrected Value was measured by FSEK Virtual Instrument with all factors loaded

Note: The levels shown in the table are the noise floor of the measurement system.

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## Peak Scan 1GHz – 20GHz (Vertical Polarization)

Sanmina Product Integrity Laboratory V2.5

**Project Name:** CR MPAM
**Model:** MPAM 1900MHz Single Carrier
**Comments:** Vertical Scan Compliance Data

**Tester:** Shankara Malwes
**Test ID:** RE03-10M-2002-007

| Standard | FCC Part 24 | 3 meters |
|---|---|---|

| Antenna | Start Frequency | Stop Frequency | Frequency | AF | CL + LNA | Detector | Pk Measured Value | Corrected Value | Theoretical Limit | Theoretical Margin |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | MHz | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| 3115 Vpol | 1000 | 2700 | 1886.59 | 28.37 | -62.24 | Peak | 102.75 | 68.88 | 84.35 | 15.47 |
| 3115 Vpol | 2700 | 5950 | 2028.62 | 28.89 | -61.88 | Peak | 103.05 | 70.07 | 84.35 | 14.28 |
| 3160-06 | 5950 | 8200 | 7735.15 | 30.00 | -51.54 | Peak | 74.08 | 52.54 | 84.35 | 31.81 |
| 3160-07 | 8200 | 10000 | 9668.27 | 33.47 | -48.94 | Peak | 71.08 | 55.61 | 84.35 | 28.74 |
| 3160-07 | 10000 | 12500 | 11722.06 | 33.59 | -48.54 | Peak | 72.33 | 57.38 | 84.35 | 26.97 |
| 3160-08 | 13000 | 15000 | 13675.86 | 37.10 | -47.96 | Peak | 73.27 | 62.41 | 84.35 | 21.94 |
| 3160-08 | 15000 | 18000 | 15849.76 | 37.20 | -46.60 | Peak | 73.27 | 63.87 | 84.35 | 20.48 |
| 3160-08 | 15000 | 18000 | 17583.57 | 37.22 | -46.39 | Peak | 74.04 | 64.87 | 84.35 | 19.48 |
| 3160-09 | 18000 | 20000 | 19537.99 | 40.30 | -84.31 | Peak | 112.35 | 68.34 | 84.35 | 16.01 |

Corrected Value: Measured Value + AF + CL + LNA. AF: Antenna Factors & CL: Cable Loss & LNA: Amplifier

Notes:
(1) Positive Margin indicates a pass
(2) Corrected Value was measured by FSEK Virtual Instrument with all factors loaded

Note: The levels shown in the table are the noise floor of the measurement system

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in part without permission of the testing body.

## Substitution Data 1GHz – 20GHz

Sanmina Product Integrity Laboratory V2.5

**Project Name:** CR MPAM
**Model:** MPAM 1900MHz Single Carrier
**Comments:** Substitution Data at 3M distance
**Tester:** Shankara Malwes
**Test ID:** RE03-10M-2002-007

| Frequency (MHz) | Polarization (V/H) | Emission level | Corrected Substitution measure level | Signal Generator level (source) dBuV | Cable factor | Antenna Gain | Effective Radiated Power (E.R.P.) | E.R.P Limit | Margin |
|---|---|---|---|---|---|---|---|---|---|
| | | dBuV/m | dBuV/m | dBm | dB | dB | dBm | dBm | dB |
| 2028.86 | H | 61.82 | 61.92 | -36.20 | -5.70 | 7.13 | **-34.77** | -13 | 21.77 |
| 3867.55 | H | 69.92 | 69.62 | -27.50 | -8.09 | 7.95 | **-27.64** | -13 | 14.64 |
| 3867.40 | H | 69.34 | 69.49 | -27.60 | -8.09 | 7.95 | **-27.74** | -13 | 14.74 |
| 7815.06 | H | 51.00 | 51.12 | -53.50 | -11.79 | 10.10 | **-55.19** | -13 | 42.19 |
| 9768.93 | H | 55.46 | 55.24 | -50.30 | -13.42 | 10.68 | **-53.05** | -13 | 40.05 |
| 11887.95 | H | 57.51 | 56.89 | -47.90 | -15.11 | 10.07 | **-52.94** | -13 | 39.94 |
| 13536.86 | H | 62.41 | 62.37 | -37.10 | -16.32 | 12.52 | **-40.90** | -13 | 27.90 |
| 15629.91 | H | 63.90 | 63.96 | -38.90 | -17.25 | 11.96 | **-44.19** | -13 | 31.19 |
| 17403.48 | H | 65.69 | 65.37 | -36.30 | -17.09 | 11.77 | **-41.62** | -13 | 28.62 |
| 19537.51 | H | 68.64 | 68.36 | -26.00 | -19.71 | 12.90 | **-32.81** | -13 | 19.81 |
| | | | | | | | | | |
| 1886.59 | V | 68.88 | 68.82 | -29.70 | -5.50 | 7.08 | **-28.12** | -13 | 15.12 |
| 2028.62 | V | 70.07 | 69.18 | -28.60 | -5.70 | 7.14 | **-27.16** | -13 | 14.16 |
| 7735.15 | V | 52.54 | 52.21. | -46.00 | -11.73 | 9.96 | **-47.76** | -13 | 34.76 |
| 9668.27 | V | 55.61 | 55.59 | -47.80 | -13.49 | 10.47 | **-50.83** | -13 | 37.83 |
| 11722.06 | V | 57.38 | 57.10 | -47.40 | -15.05 | 10.53 | **-51.91** | -13 | 38.91 |
| 13675.86 | V | 62.37 | 62.44 | -40.00 | -16.34 | 12.61 | **-43.73** | -13 | 30.73 |
| 15849.76 | V | 63.87 | 63.93 | -40.00 | -17.27 | 12.54 | **-44.73** | -13 | 31.73 |
| 17583.57 | V | 64.87 | 64.60 | -37.60 | -17.47 | 11.17 | **-43.90** | -13 | 30.90 |
| 19537.99 | V | 68.34 | 68.51 | -26.00 | -19.73 | 12.90 | **-32.84** | -13 | 19.84 |

Effective Radiate Power (E.R.P) = Signal Generator + Cable Factor + Antenna Gain

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### C.7. Measurement Equipment

| Description | Type/Model | Manufacturer | Serial # | Cal Due | Cal Date |
|---|---|---|---|---|---|
| **10m ANECHOIC CHAMBER** | | | | | |
| Standard Gain Horn Antenna 1GHz-2.7GHz (TX) | 3115 | EMCO | 40500087 | 19 N0v 2002 | 19 N0v 2001 |
| Standard Gain Horn 2.7GHz-5.95GHz | 3115 | EMCO | 40500087 | 19 N0v 2002 | 19 N0v 2001 |
| Standard Gain Horn 5.95GHz-8.2GHz | 3160-06 | EMCO | 40500176 | N/A | N/A |
| Standard Gain Horn 8.2GHz-12.5GHz | 3160-07 | EMCO | 40500177 | N/A | N/A |
| Standard Gain Horn 12.5GHz-18GHz | 3160-08 | EMCO | 40500178 | N/A | N/A |
| Standard Gain Horn 18GHz-20GHz | 3160-09 | EMCO | 40500180 | N/A | N/A |
| Standard Gain Horn 2.6GHz-3.95GHz (substitution test) | 3160-04 | EMCO | 40500175 | N/A | N/A |
| Standard Gain Horn 3.95GHz-5GHz (Substitution test) | 3160-05 | EMCO | 40500174 | N/A | N/A |
| High pass filter | 11SH10-3860 | K&L | 1/19900-010 | N/A | N/A |
| Spectrum Analyzer 9KHz –40GHz | FSEK | Rohde & Schwarz | 40500210 | 12 Mar 03 | 12 Mar 02 |
| Step Attenuator/Switch | HP11713A | HP | 40500014/ 40500276 | N/A | N/A |
| DC Power Supply for LNA | LXO 30-2 | Xantrex | 40500211 | N/A | N/A |
| Miteq LNA | JSD000121 | Miteq | 830620 in box | 24 Apr 03 | 24 Apr 02 |
| HPIB Extender | HP37204 | HP | 40500195 | N/A | N/A |
| Cable from Antenna to LNA | 101PEA | Succoflex | 1713/1PEA | 18 Apr 03 | 18 Apr 02 |

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| | | | | | |
|---|---|---|---|---|---|
| **CONTROL ROOM** | | | | | |
| Win 2000 PC with FSEK Manual control software loaded | N/A | N/A | N/A | N/A | N/A |
| Signal Generator 10MHz – 40GHz | SMP04 | Rohde & Schwarz | 40500125 | 27 Mar 03 | 27 Mar 02 |
| HPIB Extender | HP37204 | HP | 40500193 | N/A | N/A |
| Mast Controller | 2090 | EMCO | 40500184 | N/A | N/A |
| Multi Device Controller TT1 (Turntable) | 2090 | EMCO | 40500197 | N/A | N/A |
| **VERIFICATION EQUIPMENT** | | | | | |
| Standard Gain Horn Antenna (TX) | 3115 | EMCO | 40500090 | 19 N0v 2002 | 19 N0v 2001 |
| Signal Generator 10MHz – 40GHz | SMP04 | Rohde & Schwarz | 40500125 | 27 Mar 03 | 27 Mar 02 |
| Cable from RX antenna to 3M center bulk head in 10M Chamber | 104 | Succoflex | 116558/4 | 18 Apr 03 | 18 Apr 02 |
| Cable from 3M center bulk head to Control room | 104 | Succoflex | 40500627 | 18 Apr 03 | 18 Apr 02 |
| Cable from Control room bulk head TO Signal Generator | 104 | Succoflex | 40500626 | 18 Apr 03 | 18 Apr 02 |

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### C.8. Deviations from Normal Operating Mode

The Customer operated the EUT during the test and reported no deviations in its normal operating mode.

### C.9. Test Setup Special Considerations

Test was conducted at 3m-distance west range and System was operational as per customer instructions

### C.10. Sample Calculation

Emission Level = Measured Level + Correction Factors
Margin = Limit – Emission Level
Effective Radiated Power (ERP) = signal generator + cable factor + Antenna Gain

### C.11. Test Data and Pictures

Test data and pictures for Radiated Emission appear following this page.

### C.12. Test Results

The EUT is in compliance with the limits as specified in the standard FCC Part 24 Subpart E.

### C.13. Signature

Signature/Date: June 10/02
Name: Shankara Malwes
Function: EMC Technologist

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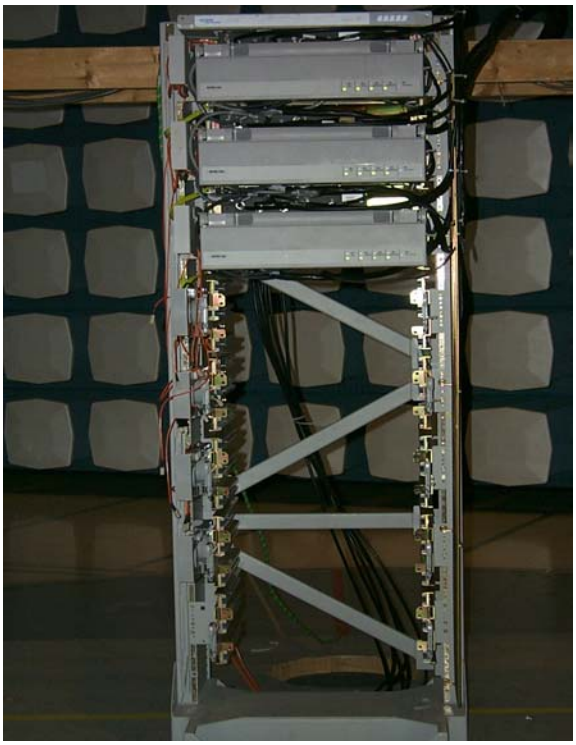
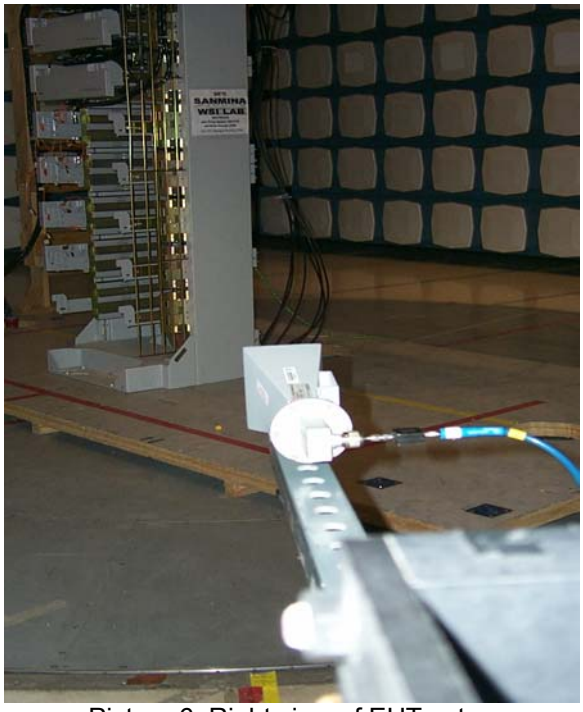


Picture 5: Front view of EUT setup




Picture 6: Right view of EUT setup

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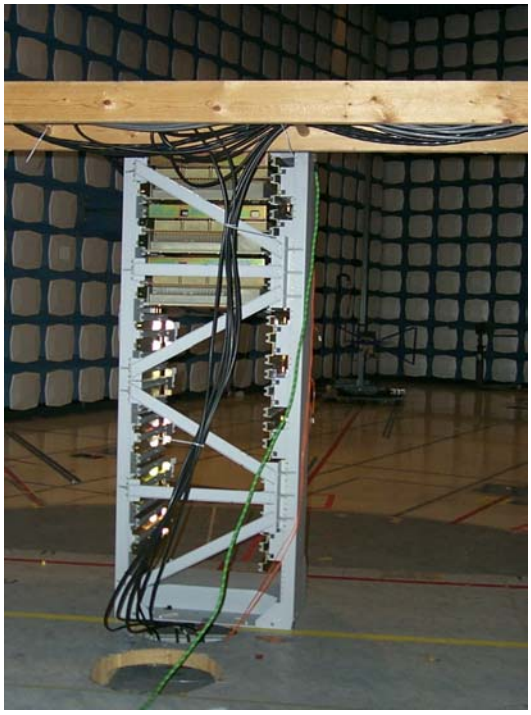
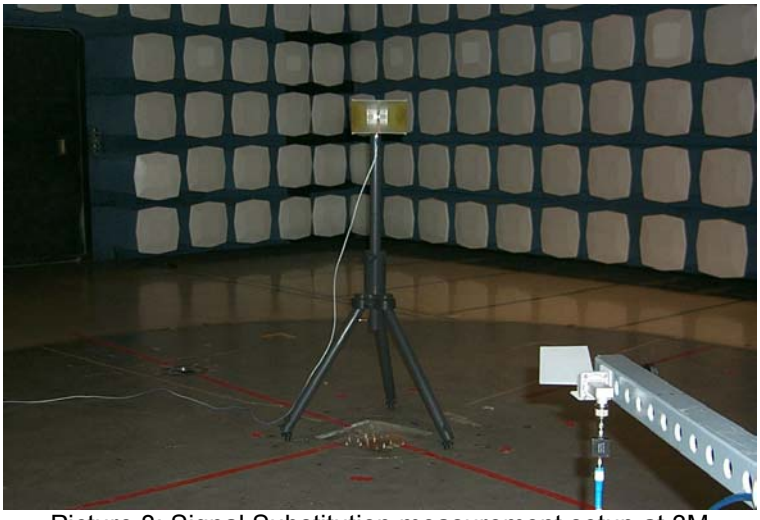


Picture 7: Back view of EUT



Picture 8: Signal Substitution measurement setup at 3M

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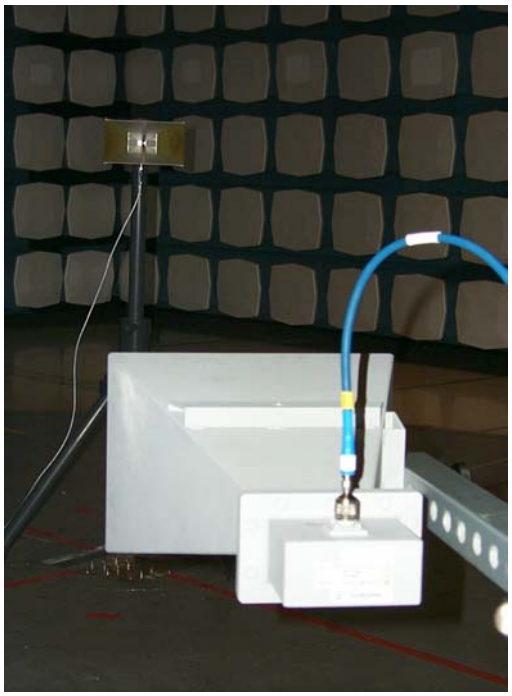

Picture 9: Signal Substitution measurement setup at 3M

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# END OF DOCUMENT

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