



SANMINA - SCI

Product Integrity Laboratory

5151-47th Street, NE
Calgary, Alberta
T3J 3R2
Tel: (403) 295 5134
Fax : (403) 295 4091

Radiated Emissions Test Report 30MHz – 10GHz

Lab Project Number- 02NOR005
CDMA MCBTS 800MHz MTRM Testing

Revision: 1.0

Date: March 19, 2002

Prepared for: Nortel Networks

Author: Shankara Malwes

| | | |
|---------------------|---|--|
| Approved by: | Duane Friesen, CET EMC Technical Advisor | Matthew P. Buxton PI Laboratory Manager |
|---------------------|---|--|

PI Project Number: 02NOR005

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SANMINA-SCI

Test Report

02NOR005

CDMA MCBTS 800MHz MTRM

Summary**Sanmina Canada ULC**

Product Integrity Laboratory

5111-47th Street, N.E. Calgary Alberta T3J 3R2

Accreditation Numbers: FCC 101386
IC 46405-3978

Performed For: Nortel Networks Inc.
5111 47th Street N.E.
Calgary, Alberta T3J 3R2

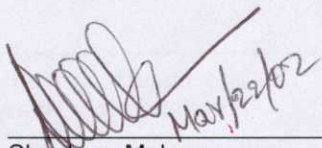
EUT Name: CDMA MCBTS MTRM 800MHz
Model: NTGY12CB

Test Result Summary

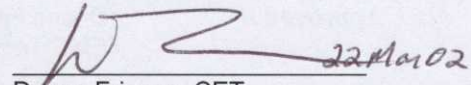
| Appendix | Core Standard | Sanmina Test Case | Description & Range | Deviation From Standard | Deviation From Test Plan | Pass / Fail | Notes |
|----------|---------------|-------------------|--|-------------------------|--------------------------|-------------|-------|
| | FCC Part 15B | | Radiated Emissions 30MHz-1GHz | | | | |
| B | | Method No. 2.0A | Radiated Emissions 30MHz - 1GHz | Yes | No | Pass | None |
| | FCC Part 22 | | Spurious Radiated Emissions 30MHz-1GHz | | | | |
| C | | Method No. 2.0A | Radiated Emissions 30MHz - 1GHz | No | No | Pass | None |
| | | Method No. 34 | Substitution Measurement | No | No | Pass | None |
| | FCC Part 22 | | Spurious Radiated Emissions 1GHz-10GHz | No | | | |
| D | | Method No. 29 | Radiated Emissions 1GHz - 10GHz | No | No | Pass | None |
| | | Method No. 34 | Substitution Measurement | No | No | Pass | None |

* Note: Deviations are listed in Appendix A.

Tested By:


Shankara Malwes
EMC Lab Technologist

Checked By:


Duane Friesen, CET
EMC Technical Advisor

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March 19, 2002



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REGISTER OF REVISIONS

Table 1 –Table of Revisions

| Issue | Date | Description of Revisions |
|-------|----------------|--------------------------|
| 1.0 | March 19, 2002 | Initial Release |

1. INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the test results conducted on the CDMA MCBTS 800 MTRM.

1.2 ABBREVIATIONS AND DEFINITIONS

No abbreviations or definitions are defined in the test plan.

1.3 REFERENCES

Testing on the CDMA MCBTS 800 MTRM product was conducted in accordance with the guidelines of the FCC CFR 47 Part 15, Part 22 and Part 2.

2. TEST LOG

Table 2 –Table of Testing

| Appendix | Test Case | Start | End |
|--------------------------|---|---------|---------|
| Date Received: 01March02 | | | |
| B | Radiated Emissions (30MHz – 1GHz) – CDMA MCBTS MTRM FCC 15B | 04Mar02 | 05Mar02 |
| D | Radiated Emissions (1GHz – 10GHz) – CDMA MCBTS MTRM FCC Part 22 | 05Mar02 | 06Mar02 |
| D | Radiated Emissions (1GHz – 10GHz) – CDMA MCBTS MTRM Substitution Test | 06Mar02 | 08Mar02 |
| C | Radiated Emissions (30MHz – 1GHz) – CDMA MCBTS MTRM Substitution Test FCC Part 22 | 11Mar02 | 12Mar02 |
| Date Shipped: N/A | | | |

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3. EUT

3.1 CONFIGURATION

Refer to section 3 and 4 of the project test plan, and each specific appendix of this test report for more details on the configuration of the EUT. The test setup is defined in the test plan as Fig.1 and Fig.2.

Table 3 –Description of EUT

| | |
|-------------------------------|---|
| Name | CDMA Metro Cell BTS MTRM 800MHz |
| Model # | NTGY12CB |
| Revision # | N/A |
| Physical Description | A Metro Cell BTS Radio Rack with 3 MFRM units. Two of the units were powered through –48V dc from the A Hubble connector, and 1 was powered from the B Hubble connector. The MFRM Customer Alarm cable was routed through the wooden cable tray and was unterminated. |
| Size | N/A |
| Weight | N/A |
| Power | 3 feeds of –48VDC (Maximum Current draw: 100 A in total) |
| Functional Description | The EUT had 3 MFRMs set to operate on one carrier/one frequency. The carrier frequency was different for each MFRM. All MFRMs were set to operate on the same sector. |

The module list in Table 4 was provided by Nortel Networks. Verification by Sanmina-SCI was not requested.

Refer to section 5.1 of the project test plan for a more detailed description of the module list and frames.

Table 4 - Module List and Frames

| Qty | Module Description | PEC | Product Code | Verified |
|-----|--------------------|-------------|--------------|--------------------------|
| | MTRM modules | | | <input type="checkbox"/> |
| 1 | MTRM 1 | NTGY10ZA Q7 | NNTM533GQ4G2 | <input type="checkbox"/> |
| 1 | MTRM 2 | NTGY10ZA Q7 | NNTM533GQ4H3 | <input type="checkbox"/> |
| 1 | MTRM 3 | NTGY10ZA Q7 | NNTM533GQ4DY | <input type="checkbox"/> |
| | MPAM modules | | | <input type="checkbox"/> |
| 1 | MPAM 1 | NTGY70AB 09 | NNTM532P648E | <input type="checkbox"/> |
| 1 | MPAM 2 | NTGY70AB 09 | NNTM532P674D | <input type="checkbox"/> |
| 1 | MPAM 3 | NTGY70AB 09 | NNTM532P646C | <input type="checkbox"/> |
| | DPM modules | | | <input type="checkbox"/> |
| 1 | DPM 1 | NTGS89DB 02 | CLVWMM1005UC | <input type="checkbox"/> |
| 1 | DPM 2 | NTGS89DB 06 | CLVWPP201RZY | <input type="checkbox"/> |
| 1 | DPM 3 | NTGS89DB 06 | CLVWMM1009AF | <input type="checkbox"/> |

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| Qty | Module Description | PEC | Product Code | Verified |
|-----|----------------------|-------------|--------------|--------------------------|
| | Fan Assembly Modules | | | <input type="checkbox"/> |
| 1 | FAM 1 | NTGY60AE 01 | NNTM532VW89F | <input type="checkbox"/> |
| 1 | FAM 2 | NTGY60AE 01 | NNTM532VW84A | <input type="checkbox"/> |
| 1 | FAM 3 | NTGY60AE 01 | NNTM532VW87D | <input type="checkbox"/> |
| 1 | Radio Rack | NTGS65AA 06 | DEVP01010848 | <input type="checkbox"/> |

Note: ☒ Indicates the Module has been checked by Sanmina-SCI.

3.1.1 CONFIGURATION DEVIATIONS

None

3.2 POWER

Refer to section 2.2 of the project test plan for a more detailed description of power requirements.

- 2 MFRMs were powered through –48V DC from lines 1 and 2 of the A-side Hubble connector.
- 1 MFRM was powered from lines 1 and 2 of the B-side Hubble connector.

3.2.1 POWER DEVIATIONS

None

3.3 CABLES

Refer to sections 3.2 and 5.3 of the project test plan for more detailed descriptions of the cable interconnect and cables used during testing.

Table 5 – Cable List

| Cable | From | To |
|---------------------------|---------------------------|---------------------------------|
| Ground cable | DR frame chassis | Anti-chamber ground |
| Ground cable | RR frame chassis | 10M turntable ground |
| DC Power cables (DR) | Anti-chamber power supply | DR frame in anti-chamber |
| DC Power cables (MFRM) | MFRM 1,2,3 | 10M turntable Hubble connectors |
| GPS Antenna Cable | Anti-chamber GPS feed | DR frame in anti-chamber |
| T1/E1 Cable | DR T1/E1 connector | Shorted back to DR frame |
| Customer Alarm Cable (DR) | Customer Alarm connector | Shorted back to DR |
| Customer Alarm Cable (RR) | Customer Alarm connector | Shorted back to RR |
| MFRM Main Antenna (TX) | MFRM 1,2,3 | Dummy loads in anti-chamber |
| MFRM Receive ports (Rx) | MFRM 1,2,3 | 50 ohm terminated on each MFRM |
| MFRM Fiber Optic cables | MFRM 1,2,3 | DR frame in anti-chamber (CORE) |

Note: Table 5 was provided by Nortel Networks. Verification by Sanmina-SCI was not requested.

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The cables listed in table 6 were used to support the CDMA MCBTS MTRM system. Verification by Sanmina-SCI was not requested.

Table 6 – Support Cables

| Equipment Description | Quantity | PEC Code | Test Setup Used In | Cable Length |
|------------------------------|----------|-----------------|--------------------|--------------|
| RS-232 Communication Cable | 1 | N/A | All | N/A |
| Ground cable | 2 | NTGS7094 | All | 3m |
| System DC power cables | 2 | Supplied by Lab | All | N/A |
| MFRM DC power cables | 3 | NTGS8082 | All | 7m |
| Ethernet cable (PC) (rolled) | 1 | N/A | All | N/A |
| RF load cables | 3 | N/A | All | N/A |
| T1/E1 backhaul cable | 1 | NTGS3517 | All | 15m |
| Customer Alarm Cables | 2 | NTGS3518 | All | 30m |

Note: Engineering test cables are not included.

CABLE LIST DEVIATIONS

None

3.4 EUT FREQUENCIES

The frequencies listed in tables 7 and 8 are the frequencies employed in the CDMA Metro Cell base station. Verification by Sanmina-SCI was not requested.

Table 7 - 800 MHz MFRM Frequencies

| Signal | Frequency | Units |
|------------------|-----------|-------|
| Transmit Band | 869 – 894 | MHz |
| Receive Band | 824 – 849 | MHz |
| RF LO Range | 750 - 776 | MHz |
| RF LO Resolution | 30 | KHz |
| Carrier Spacing | 1.26 | MHz |
| Tx IF LO | 108.7488 | MHz |
| Rx IF (Center) | 73.5792 | MHz |
| Tx IF (Center) | 118.5792 | MHz |
| 26Fc | 31.9488 | MHz |
| 32Fc | 39.3216 | MHz |
| 52Fc | 63.8976 | MHz |
| 64Fc | 78.6432 | MHz |
| 520Fc | 638.9760 | MHz |

Fc = CDMA single channel spreading rate = 1.2288 MHz

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Table 8 - 800 MHz MFRM Frequencies for other Modules

| Signal | Frequency | Units |
|------------------------|-------------------|----------------------|
| CORE (1Fc) | 1.2288 | MHz |
| CORE (8Fc) | 9.8304 | MHz |
| CORE (32Fc) | 39.3216 | MHz |
| CORE (52Fc) | 63.9876 | KHz |
| CORE (520 Fc) | 638.9760 | MHz |
| CORE (Oscillator) | 20 | MHz |
| GPSTM (8Fc) | 9.8304 | MHz |
| GPSTM | 10 | MHz |
| GPSTM (Even Second) | 31.9488 | 50nS neg pulse 2 sec |
| GPSTM (GPS L1 Carrier) | 15.7542 +/- 1.023 | MHz |
| 52Fc | 63.9876 | MHz |
| 64Fc | 78.6432 | MHz |
| 520Fc | 638.9760 | MHz |
| CM (IML) | 3.5 | MHz |
| CM (IMC) | 20 | MHz |
| CM (TDM I/F) | 39.3216 | MHz |
| CEM/XCEM 8Fc | 9.8304 | MHz |
| CEM/XCEM 8Fc | 9.8304 | MHz |
| CEM/XCEM 32Fc | 39.3216 | MHz |
| CEM/XCEM 52Fc | 63.8976 | MHz |
| CEM/XCEM 520Fc | 638.9760 | MHz |
| CEM CPU clock | 40 | MHz |
| XCEM CPU clock | 33, 133 & 200 | MHz |

3.4.1 FREQUENCY LIST DEVIATIONS

None.

3.5 **MODE OF OPERATION**

Refer to section 4.4 of the project test plan for a detailed description of the mode of operation for the CDMA MCBTS MTRM. The EUT and was monitored by the client during testing.

3.5.1 MODE OF OPERATION DEVIATION

None

3.6 **PASS / FAIL CRITERIA**

The pass/fail criteria is defined as the limits in the applicable standards. The standard limits and described in each appendices.

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4. SUPPORT EQUIPMENT

The modules and frames listed in table 9 were used to support the CDMA MCBTS MTRM and were located outside the test area during testing. Verification by Sanmina-SCI was not requested.

Table 9 – Support Modules

| Module Description | | Quantity | PEC Code | Serial Number |
|-------------------------------|------|----------|-------------|---------------|
| GPS Module | GPS | 1 | NTGS50AA 05 | NNTM74TM22EK |
| Control Module | CM | 1 | NTGS40AA 34 | NNTM533MNQ1A |
| Configuration Resource Module | CORE | 1 | NTGS30AA 40 | NNTM533MUF16 |
| Channel Element Module | CEM | 3 | | |
| CEM 1 | | | NTGS60BA 74 | NNTM5340693R |
| CEM 2 | | | NTGS60BA 56 | NNTM533MORG4 |
| CEM 3 | | | NTGS60BA 77 | NNTM534083J4 |
| Enhanced Control Module | ECM | 1 | NT7C25BA | |
| Digital Rack | DR | 1 | NTGS45BA 12 | SNMN53004234 |

The test equipment listed in table 10 was used to support the CDMA MCBTS MTRM system. Verification by Sanmina-SCI was not requested.

Table 10 – Support Equipment

| Equipment Description | Quantity | Test Setup Used In |
|------------------------------------|----------|--------------------|
| Digital Multimeter | 1 | All |
| Computer & cable (c/w Vortex 10.1) | 1 | All |
| Code Domain Analyzer | 1 | All |
| Power Meter | 1 | All |
| RF Dummy Loads (150 W) | 3 | All |

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APPENDICES

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APPENDIX A: TEST PLAN DEVIATION LOG

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| Deviation Number | Time & Date | Reference to Test Plan | Deviation from Standard (Y/N) | Description and Justification of Deviation | Core Standard Affected | Approval |
|------------------|-------------|------------------------|-------------------------------|---|------------------------|------------------|
| 1 | N/A | Section 2.1 | Yes | Upper test frequency limited to 1GHz per customer test plan | FCC CFR 47 Part 15 | As per test plan |
| | | | | | | |

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**APPENDIX B: Radiated Emissions 30MHz-1GHz Part 15****B.1. Test Basis**

FCC Part 15 Class B

B.2. Test Specifications

| FCC Part 15 Class B | |
|---------------------|--|
| Frequency | Quasi-Peak Limit @ 10 meters in dB μ V/m |
| 30MHz – 88 MHz | 29.6 |
| 88MHz – 216MHz | 33.1 |
| 216MHz – 960 MHz | 35.6 |
| 960MHz – 1GHz | 43.5 |

B.3. Test Procedure

EMC Test Method No. 2.0A, Radiated Emissions Automated Method 30MHz – 1GHz Rev 2.0

B.4. Measurement Uncertainty

The estimated uncertainty for the radiated emissions test is +2.07/-2.11 dB. The corresponding expanded uncertainty is +4.14/-4.22 dB.

B.5. Deviations**From Standard**

At the request of the customer, the EUT was not tested pursuant to Part 15 above 1GHz.

From Test Plan

None.

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**B.6. Test Results Summary****FCC Part 15 Class B****Peak Scan 30MHz – 1GHz (Horizontal Polarization) @ 10M**

| Emission Frequency | QP Measured level | Correction Factors | Corrected Quasi-peak Emission level | FCC 15B Limit | FCC 15B Margin |
|--------------------|-------------------|--------------------|-------------------------------------|---------------|----------------|
| MHz | dBμV | dB/m | dBμV/m | dBμV/m | dB |
| 92.4313 | 29.15 | -16.00 | 13.15 | 33.10 | 19.95 |
| 97.3911 | 27.38 | -15.10 | 12.28 | 33.10 | 20.82 |
| 114.6179 | 38.93 | -12.42 | 26.51 | 33.10 | 6.59 |
| 114.6127 | 39.77 | -12.42 | 27.35 | 33.10 | 5.75 |
| 119.6885 | 39.03 | -12.23 | 26.80 | 33.10 | 6.30 |
| 157.2842 | 37.00 | -13.98 | 23.02 | 33.10 | 10.08 |
| 191.6808 | 36.09 | -14.63 | 21.46 | 33.10 | 11.64 |
| 235.9118 | 38.30 | -12.84 | 25.46 | 35.60 | 10.14 |
| 314.5518 | 40.86 | -9.53 | 31.33 | 35.60 | 4.27 |
| 383.3749 | 35.35 | -8.31 | 27.04 | 35.60 | 8.56 |
| 471.8619 | 39.95 | -6.50 | 33.45 | 35.60 | 2.15 |
| 858.7666 | 30.65 | -1.16 | 29.49 | 35.60 | 6.11 |

Note: Positive Margin indicates a Pass.**Peak Scan 30MHz – 1GHz (Vertical Polarization) @ 10M**

| Emission Frequency | Measured level | Correction Factors | Corrected Quasi-peak Emission level | FCC 15B Limit | FCC 15B Margin |
|--------------------|----------------|--------------------|-------------------------------------|---------------|----------------|
| MHz | dBμV | dB/m | dBμV/m | dBμV/m | dB |
| 66.9881 | 39.79 | -18.88 | 20.91 | 29.50 | 8.59 |
| 72.5760 | 38.04 | -18.63 | 19.41 | 29.50 | 10.09 |
| 314.5688 | 38.75 | -9.13 | 29.62 | 35.60 | 5.98 |
| 471.8615 | 35.02 | -5.76 | 29.26 | 35.60 | 6.34 |
| 858.7208 | 31.11 | -1.46 | 29.65 | 35.60 | 5.95 |

Note: Positive Margin indicates a Pass.

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**B.7. Measurement Equipment**

Radiated Emissions 30MHz – 1GHz

| Description | Model / S/N | Asset Number | Cal Due | Used Y/N |
|----------------------------|-----------------|---------------|--------------|-------------------------------------|
| ESMI Test Receiver/Display | Rohde & Schwarz | 40500119 | 09 Mar, 2002 | <input checked="" type="checkbox"/> |
| RF Metal C Cable | N/A | N/A | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Mast Controller | 2090 | 40500184 | N/A | <input checked="" type="checkbox"/> |
| Multi device controller | 2090 | 40500183 | N/A | <input checked="" type="checkbox"/> |
| HP Amplifier | 8447F OPT H64 | 40500228 | 01 Dec, 2002 | <input checked="" type="checkbox"/> |
| RF Cable | 116568/4 | 40500621 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| TDL Switch Matrix | SMC-002 | 40500189 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Cable | 115757/4 | 40500623 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Cable | N/A | N/A | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Cable | CBL-1 | 40500625 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Ref Rad | 4630B | 40500257 | N/A | <input checked="" type="checkbox"/> |
| Ref Rad (Kit) | Balun A | N/A | N/A | <input checked="" type="checkbox"/> |
| Ref Rad (Kit) | 40cm Dipole | N/A | N/A | <input checked="" type="checkbox"/> |
| Bilog Antenna | CBL-6111B | 40500566/2701 | 26 Apr, 2002 | <input checked="" type="checkbox"/> |

B.8. Deviations from Normal Operating Mode

Nortel Networks operated the EUT during testing and reported no deviations from its normal operating mode.

B.9. Test Setup Special Considerations

Refer to section 4.2 and 4.5 of the project test plan for a more detailed description of the setup configuration and details.

B.10. Sample Calculation

Emission Level = Measured Level + Correction Factors

Margin = Limit – Emission Level

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**B.11. Test Data and Pictures**

Pictures and data sheets for Radiated Emissions appear following this page.

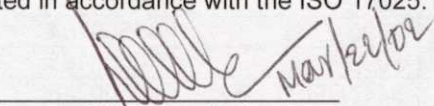
B.12. Signature

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Signature/Date:

Name:

Function:

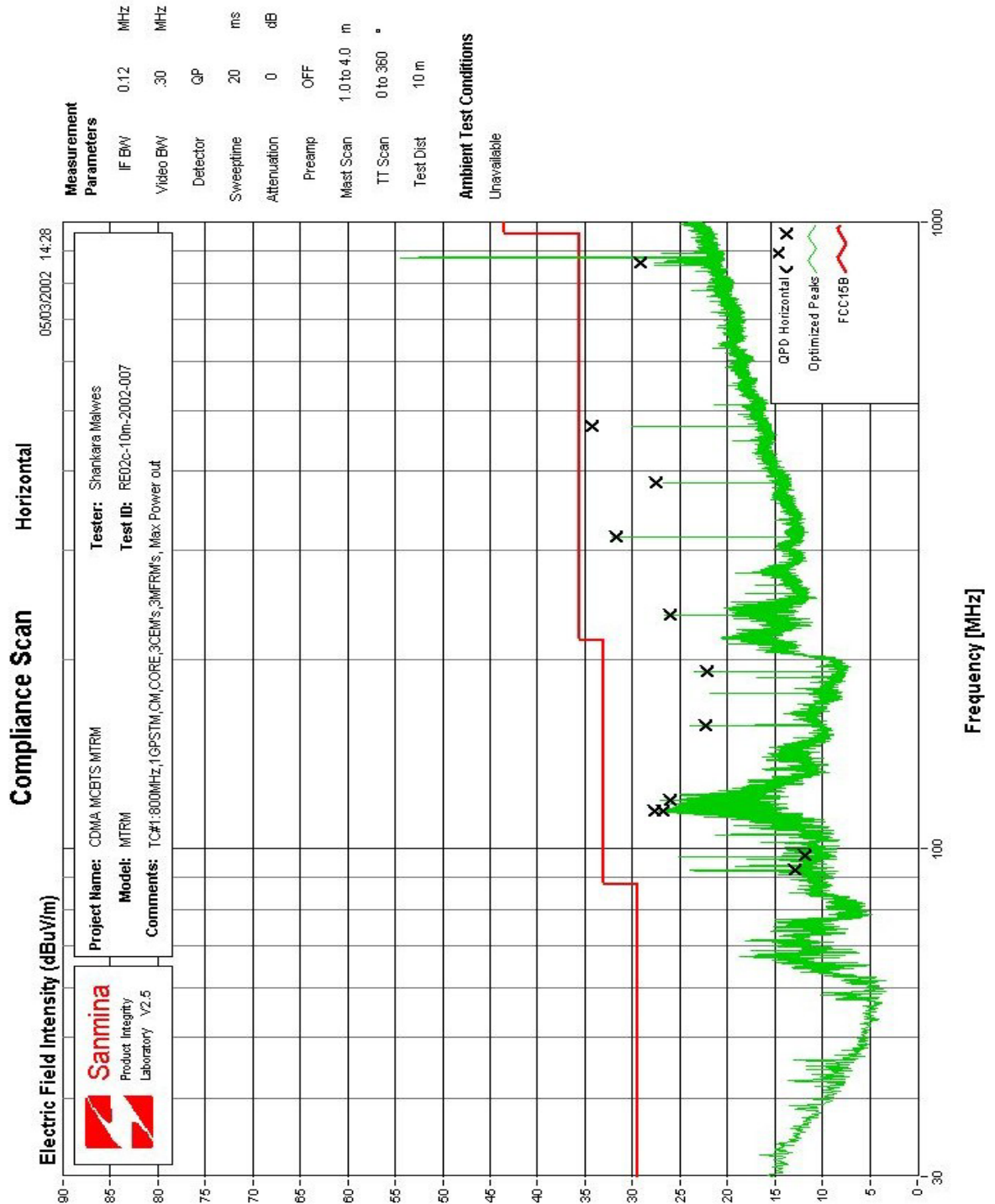

Shankara Malwes
EMC Lab Technologist

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Horizontal Compliance Plot



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Horizontal Compliance Data Table

05/03/2002 14:28

Horizontal

Compliance Scan Peaks

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| | | |
|--|---|---|
|  Sanmina Product Integrity Laboratory V2.5 | Project Name: CDMA MCBTS MTRM Model: MTRM Comments: TC#1:800MHz,1GFSM,CM,CORE,3CEW's,3MFRM's,Max Power out | Tester: Shankara Malwies Test ID: RED2c-10m-2002-007 |
| | | |
| | | |

| Pre-Compliance | | | Verified Compliance Scan | | | | | | | | | |
|--------------------------|-------------------------|-------------|--------------------------|--------------------------|----------------------------|-----------------------|--------------------|---------------------|--------------------------|---------------------------|--|--|
| Emission Frequency (MHz) | Emission Level (dBuV/m) | Peak Status | Emission Frequency (MHz) | QP Measured Level (dBuV) | QP Emission Level (dBuV/m) | FCC15B Limit (dBuV/m) | FCC15B Margin (dB) | QP Mast Height (cm) | QP Turntable Angle (deg) | Correction Factors (dB/m) | | |
| 92.3493 | 23.98 | Freq Adjust | 92.4313 | 29.15 | 13.15 | 33.10 | 19.95 | 398.6 | 130.0 | -16.00 | | |
| 97.1546 | 25.15 | Verify | 97.3911 | 27.38 | 12.28 | 33.10 | 20.82 | 331.7 | 232.7 | -15.10 | | |
| 113.2525 | 23.41 | Adjacent | | | | | | | | | | |
| 114.2136 | 26.81 | Verify | 114.6179 | 38.93 | 26.51 | 33.10 | 6.59 | 297.3 | 126.3 | -12.42 | | |
| 115.0545 | 27.20 | Verify | 114.6127 | 39.77 | 27.35 | 33.10 | 5.75 | 323.3 | 149.5 | -12.42 | | |
| 116.0156 | 26.46 | Adjacent | | | | | | | | | | |
| 116.4961 | 25.66 | Adjacent | | | | | | | | | | |
| 116.8565 | 25.49 | Adjacent | | | | | | | | | | |
| 117.4572 | 25.11 | Adjacent | | | | | | | | | | |
| 117.8176 | 26.08 | Adjacent | | | | | | | | | | |
| 118.4182 | 24.99 | Adjacent | | | | | | | | | | |
| 118.7766 | 24.23 | Adjacent | | | | | | | | | | |
| 119.2592 | 27.12 | Verify | 119.6885 | 39.03 | 26.80 | 33.10 | 6.30 | 314.5 | 118.7 | -12.23 | | |
| 119.7397 | 23.33 | Adjacent | | | | | | | | | | |
| 120.2202 | 24.76 | Adjacent | | | | | | | | | | |
| 120.7008 | 24.22 | Adjacent | | | | | | | | | | |
| 121.5417 | 24.81 | Adjacent | | | | | | | | | | |
| 122.0222 | 24.96 | Adjacent | | | | | | | | | | |
| 157.4616 | 23.91 | Verify | 157.2842 | 37.00 | 23.02 | 33.10 | 10.08 | 240.9 | 199.8 | -13.98 | | |
| 191.8399 | 23.49 | Verify | 191.6808 | 36.09 | 21.46 | 33.10 | 11.64 | 276.5 | 268.6 | -14.63 | | |
| 236.1491 | 26.59 | Verify | 235.9118 | 38.30 | 25.46 | 35.60 | 10.14 | 227.7 | 220.3 | -12.84 | | |
| 314.8365 | 32.19 | Verify | 314.5518 | 40.96 | 31.33 | 35.60 | 4.27 | 125.2 | 203.8 | -9.63 | | |
| 363.5528 | 26.72 | Verify | 363.3749 | 35.35 | 27.04 | 35.60 | 8.56 | 118.0 | 190.8 | -8.31 | | |
| 471.9711 | 30.11 | Verify | 471.8619 | 39.95 | 33.45 | 35.60 | 2.15 | 100.0 | 157.3 | -6.50 | | |
| 854.3560 | 27.60 | Adjacent | | | | | | | | | | |
| 858.6808 | 27.63 | Freq Adjust | 858.7666 | 30.85 | 29.49 | 35.60 | 6.11 | 192.4 | 324.6 | -1.16 | | |
| 875.7397 | 53.36 | Carrier | | | | | | | | | | |
| 876.1001 | 53.31 | Carrier | | | | | | | | | | |
| 876.3404 | 53.02 | Adjacent | | | | | | | | | | |
| 876.5806 | 53.25 | Carrier | | | | | | | | | | |
| 876.8209 | 54.47 | Carrier | | | | | | | | | | |
| 877.1813 | 51.80 | Carrier | | | | | | | | | | |
| 877.7820 | 50.80 | Carrier | | | | | | | | | | |
| 878.0222 | 51.78 | Carrier | | | | | | | | | | |
| 878.5028 | 52.52 | Carrier | | | | | | | | | | |
| 878.7430 | 50.23 | Carrier | | | | | | | | | | |

Notes:

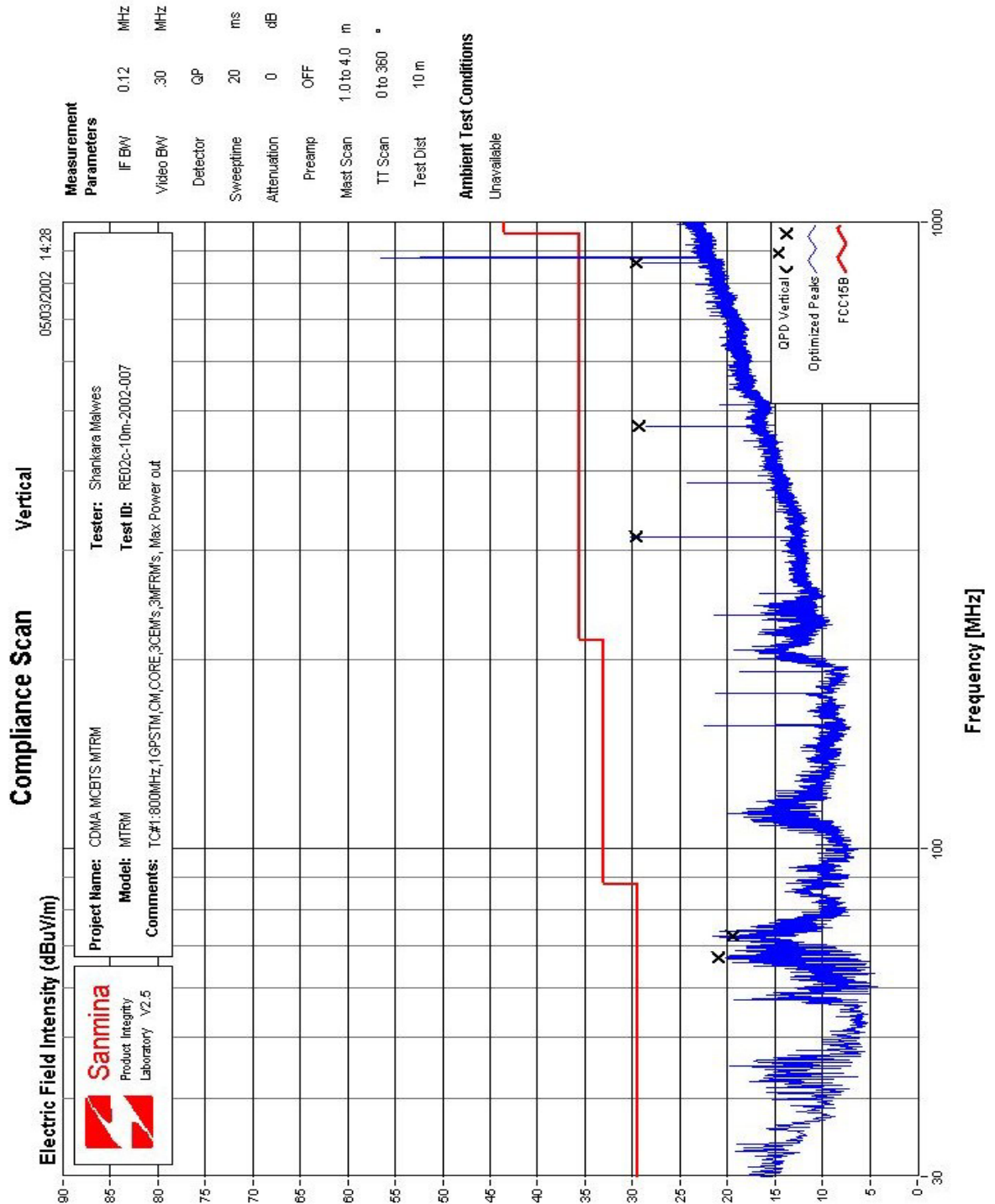
1. Positive Margin indicates a pass
2. Correction factors include all factors between the receiving antenna and the receiver including the antenna
3. Emissions more than 10 dB below the margin are not selected
4. EUT faces front towards the antenna, 10.6° wrt turntable zero

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Vertical Compliance Plot



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Vertical Compliance Data Table

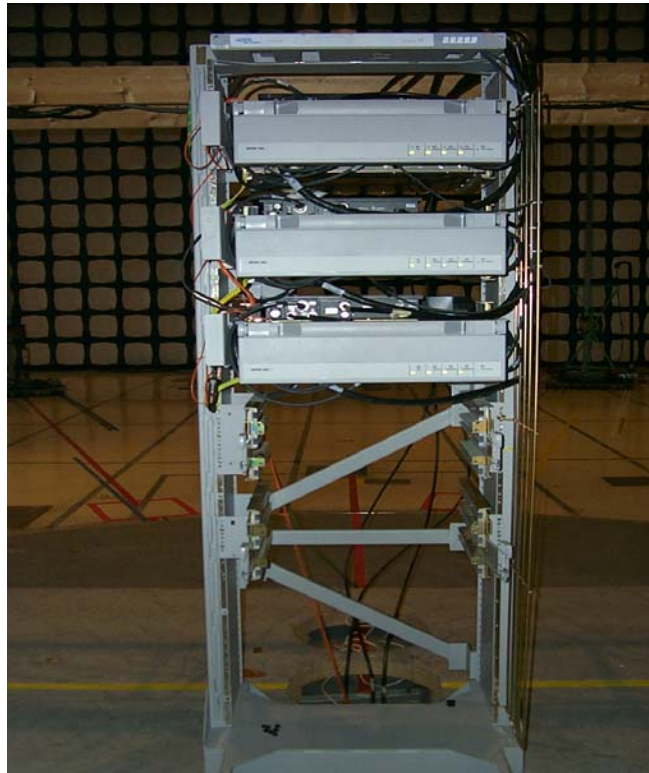
[illegible]

Notes:

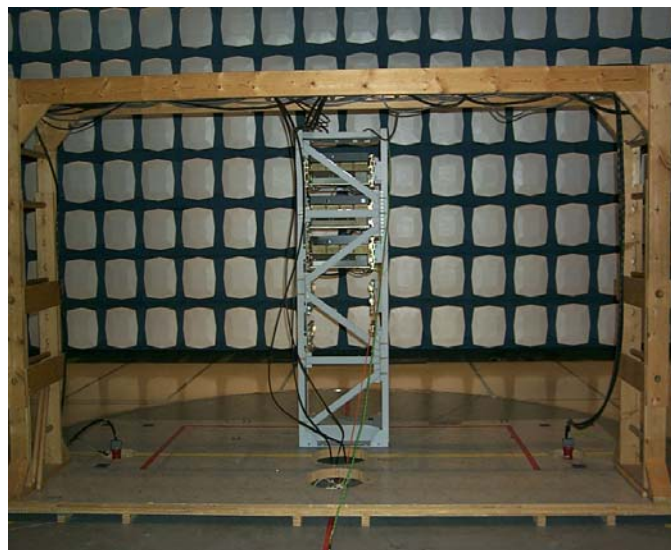
1. Positive Margin indicates a pass
2. Correction factors include all factors between the receiving antenna and the receiver including the antenna
3. Emissions more than 10 dB below the margin are not selected
4. EUT faces front towards the antenna, 10 dB wrt turntable zero

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Picture 1. Front view of the EUT.



Picture 2. Back View of EUT

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Picture 3. Left side view of EUT.



Picture 4. Support Equipment.

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**APPENDIX C: Radiated Emissions 30MHz-1GHz Part 22****C.1. Test Basis**

FCC Part 22

C.2. Test Specifications

| FCC Part 22 | | |
|---------------|------------|-------------------------|
| Frequency | ERP Limit | Peak Limit @ 10 meters* |
| | dBm | dBμV/m |
| 30MHz – 1 GHz | -13 | 73.90 |

* Theoretical field strength based on a dipole

C.3. Test Procedure

EMC Test Method No. 2.0A, Radiated Emissions Automated Method 30MHz – 1GHz Rev 2.0

EMC Test Method No. 11, Substitution Method

C.4. Measurement Uncertainty

The estimated uncertainty for the Radiated Emissions Automated Method from 30MHz – 1GHz is +2.07/ -2.11 dB. The corresponding expanded uncertainty is + 4.14 / - 4.22 dB.

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.

C.5. Deviations**From Standard**

There were no deviations from the standard.

From Test Plan

None.

From Test Method

Substitutions were referenced to pre compliance peak data. Common steps between Method 11 and Method 2.0A were not duplicated in the performance of Method 11, at the request of the client.

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C.6. Test Results

FCC Part 22

Peak Scan 30MHz – 1GHz (Horizontal Polarization)



Project Name: CDMA MCBTS MTRM 800 **Tester:** Shankara Malwes
Model: CDMA MCBTS MTRM 800 **Test ID:** RED2-10M-2002-005
Comments: CDMA MCBTS MTRM 800MHz, Digital Rack located under 10 meter chamber - Horizontal

| | | | | |
|----------|-------------|---------------------|----|--------|
| Standard | FCC Part 22 | Measurement Distanc | 10 | Meters |
|----------|-------------|---------------------|----|--------|

| Antenna | Frequency | AF | CF | Detector | Peak Measured | Corrected Value | Theoretical Limit | Theoretical Margin |
|--------------------|-----------|-------|--------|----------|---------------|-----------------|-------------------|--------------------|
| | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| 2701 RX BiCon Hpol | 92.343 | 9.50 | -25.14 | Peak | 40.02 | 24.38 | 73.90 | 49.52 |
| 2701 RX BiCon Hpol | 97.1546 | 9.90 | -25.10 | Peak | 40.32 | 25.12 | 73.90 | 48.78 |
| 2701 RX BiCon Hpol | 114.2136 | 12.50 | -24.88 | Peak | 39.20 | 26.82 | 73.90 | 47.08 |
| 2701 RX BiCon Hpol | 119.2592 | 12.60 | -24.89 | Peak | 39.41 | 27.12 | 73.90 | 46.78 |
| 2701 RX BiCon Hpol | 157.4616 | 10.50 | -24.40 | Peak | 37.88 | 23.98 | 73.90 | 49.92 |
| 2701 RX BiCon Hpol | 191.9399 | 9.30 | -23.95 | Peak | 38.09 | 23.44 | 73.90 | 50.46 |
| 2701 RX BiCon Hpol | 236.149 | 10.70 | -23.46 | Peak | 39.41 | 26.65 | 73.90 | 47.25 |
| 2701 RX BiCon Hpol | 314.8365 | 13.50 | -23.03 | Peak | 41.72 | 32.19 | 73.90 | 41.71 |
| 2701 RX BiCon Hpol | 383.55 | 14.90 | -23.22 | Peak | 35.04 | 26.72 | 73.90 | 47.18 |
| 2701 RX BiCon Hpol | 471.9711 | 16.90 | -23.41 | Peak | 36.61 | 30.10 | 73.90 | 43.80 |
| 2701 RX BiCon Hpol | 858.68 | 20.60 | -21.77 | Peak | 28.79 | 27.62 | 73.90 | 46.28 |

Corrected Value = Measured Value + CF + AF
 AF= Antenna Factor & CF= Correction Factors (LNA Gain + Cable Loss)

Notes:
 Positive Margin Indicates a Pass

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Peak Scan 30MHz – 1GHz (Vertical Polarization)



Project Name: CDMA MCBTS MTRM 800 **Tester:** Shankara Malwes
Model: CDMA MCBTS MTRM 800 **Test ID:** RE02-10M-2002-005
Comments: CDMA MCBTS MTRM 800MHz, Digital Rack located under 10 meter chamber - Vertical

Standard FCC Part 22 Measurement Distance 10 Meters

| Antenna | Frequency | AF | CF | Detector | Peak Measured | Corrected Value | Theoretical Limit | Theoretical Margin |
|--------------------|-----------|-------|--------|----------|---------------|-----------------|-------------------|--------------------|
| | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| 2701 RX BiCon Vpol | 66.88 | 6.70 | -25.58 | Peak | 39.00 | 20.12 | 73.90 | 53.78 |
| 2701 RX BiCon Vpol | 72.4 | 6.80 | -25.41 | Peak | 40.09 | 21.48 | 73.90 | 52.42 |
| 2701 RX BiCon Vpol | 314.8365 | 13.90 | -23.03 | Peak | 39.28 | 30.15 | 73.90 | 43.75 |
| 2701 RX BiCon Vpol | 471.9711 | 17.70 | -23.41 | Peak | 34.25 | 28.54 | 73.90 | 45.36 |
| 2701 RX BiCon Vpol | 858.68 | 20.30 | -21.77 | Peak | 30.47 | 29.00 | 73.90 | 44.90 |

Corrected Value = Measured Value + CF + AF
 AF=Antenna Factor & CF = Correction Factor (LNA Gain + Cable)

Notes:
 Positive Margin Indicates a Pass

Substitution Data 30MHz – 1GHz



Project Name: CDMA MCBTS MTRM 800MHz **Tester:** Shankara Malwes
Model: CDMA MCBTS MTRM 800MHz **Test ID:** RE02-10M-2002-005
Comments: CDMA MCBTS MTRM. Digital Rack located under 10 meter chamber - Substitution Method

| Frequency | Polarization (V/H) | Uncorrected Peak Measure level | Uncorrected Substitution measure level | Signal Generator | Cable factor | Antenna Gain | Effective Radiated Power (E.R.P.) | E.R.P Limit | Margin |
|-----------|--------------------|--------------------------------|--|------------------|--------------|--------------|-----------------------------------|-------------|--------|
| MHz | | dBuV | dBuV | dBm | dB | dB | dBm | dBm | dB |
| 92.34 | H | 40.02 | 40.33 | -76.00 | -2.12 | 1.72 | -76.40 | -13 | 63.40 |
| 97.15 | H | 40.32 | 40.48 | -74.70 | -2.12 | 1.79 | -75.03 | -13 | 62.03 |
| 114.21 | H | 39.20 | 39.23 | -75.70 | -2.63 | 1.67 | -76.66 | -13 | 63.66 |
| 119.26 | H | 39.41 | 39.51 | -74.70 | -2.63 | 1.61 | -75.72 | -13 | 62.72 |
| 157.46 | H | 37.88 | 37.91 | -76.90 | -3.11 | 1.43 | -78.58 | -13 | 65.58 |
| 191.94 | H | 38.09 | 38.40 | -74.90 | -3.11 | 1.46 | -76.55 | -13 | 63.55 |
| 236.15 | H | 39.41 | 39.80 | -70.90 | -3.54 | 1.55 | -72.89 | -13 | 59.89 |
| 314.84 | H | 41.72 | 41.54 | -65.40 | -4.20 | 1.45 | -68.15 | -13 | 55.15 |
| 383.55 | H | 35.04 | 35.80 | -73.20 | -4.50 | 1.33 | -76.37 | -13 | 63.37 |
| 471.97 | H | 36.61 | 36.80 | -71.70 | 5.06 | 1.52 | -65.12 | -13 | 52.12 |
| 858.68 | H | 28.79 | 28.65 | -66.70 | -6.80 | 1.50 | -72.00 | -13 | 59.00 |
| 66.88 | V | 39.00 | 39.00 | -71.00 | -1.80 | 1.46 | -71.34 | -13 | 58.34 |
| 72.40 | V | 40.09 | 40.00 | -77.90 | -2.00 | 1.44 | -78.46 | -13 | 65.46 |
| 314.83 | V | 39.28 | 39.26 | -67.90 | -4.10 | 1.45 | -70.55 | -13 | 57.55 |
| 471.97 | V | 34.25 | 34.80 | -72.40 | -5.06 | 1.52 | -75.94 | -13 | 62.94 |
| 858.80 | V | 30.47 | 30.47 | -64.90 | -6.80 | 1.50 | -70.20 | -13 | 57.20 |

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

Note: Positive Margin indicates a Pass.

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**C.7. Measurement Equipment**

Radiated Emissions 30MHz – 1GHz

| Description | Model / S/N | Asset Number | Cal Due | Used Y/N |
|------------------------------|------------------------|--------------|--------------|-------------------------------------|
| ESMI Test Receiver/Display | Rohde & Schwarz | 40500119 | 09 Mar, 2002 | <input checked="" type="checkbox"/> |
| RF Metal C Cable | N/A | N/A | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Mast Controller | 2090 | 40500184 | N/A | <input checked="" type="checkbox"/> |
| Multi device controller | 2090 | 40500183 | N/A | <input checked="" type="checkbox"/> |
| HP Amplifier | 8447F OPT H64 | 40500228 | 01 Dec, 2002 | <input checked="" type="checkbox"/> |
| RF Cable | 116568/4 | 40500621 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| TDL Switch Matrix | SMC-002 | 40500189 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Cable | 115757/4 | 40500623 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Cable | N/A | N/A | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Cable | CBL-1 | 40500625 | 17 Dec, 2002 | <input checked="" type="checkbox"/> |
| Bilog Antenna | CBL-6111B | 40500566 | 12 Oct, 2002 | <input checked="" type="checkbox"/> |
| Signal Generator 10MHz-40GHz | Rohde & Schwarz SMP-04 | 40500125 | 29 Mar, 03 | <input checked="" type="checkbox"/> |
| Cable | Sucoflex 104 | 40500626 | N/A | <input checked="" type="checkbox"/> |
| Cable | Sucoflex 104 | 40500627 | N/A | <input checked="" type="checkbox"/> |
| Cable | Sucoflex 104 | 40500628 | N/A | <input checked="" type="checkbox"/> |

C.8. Deviations from Normal Operating Mode

Nortel Networks operated the EUT during testing and reported no deviations in its normal operating mode.

C.9. Test Setup Special Considerations

Refer to section 4.2 and 4.5 of the project test plan for a more detailed description of the setup configuration and details.

C.10. Sample Calculation

Corrected Value = Peak Measured Value + Correction Factor + Antenna Factor

Margin = ERP Limit – ERP

Theoretical Margin = Theoretical Limit – Corrected Value

ERP Limit = $P_{dBm} - (43 + 10\log(P_w))$

Example

$P=20w$

ERP Limit

$= 43dBm - (43 + 10\log(20)) = -13dBm$

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Theoretical Limit = $120 + 20\log(\text{SQRT}(49.2 * P_w) / D)$

Example

$P = -13\text{dBm} = 0.00005\text{w}$

$D = 10\text{m}$

Theoretical Limit

$= 120 + 20\log(\text{SQRT}(49.2 * 0.00005) / 10)$

$= 73.9 \text{ dBuV/m}$

C.11. Pictures

Pictures for Radiated Emissions appear following this page.

C.12. Signature

Signature/Date:

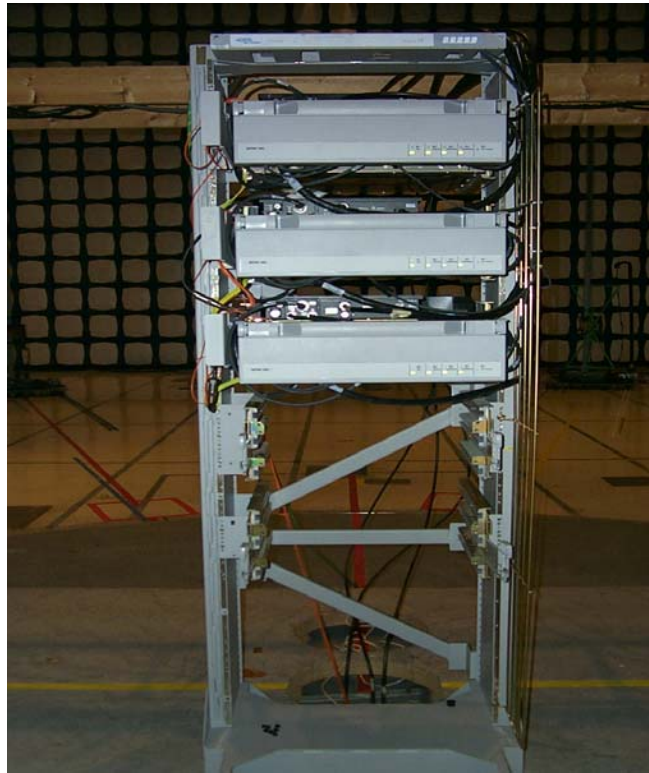
Name:

Function:

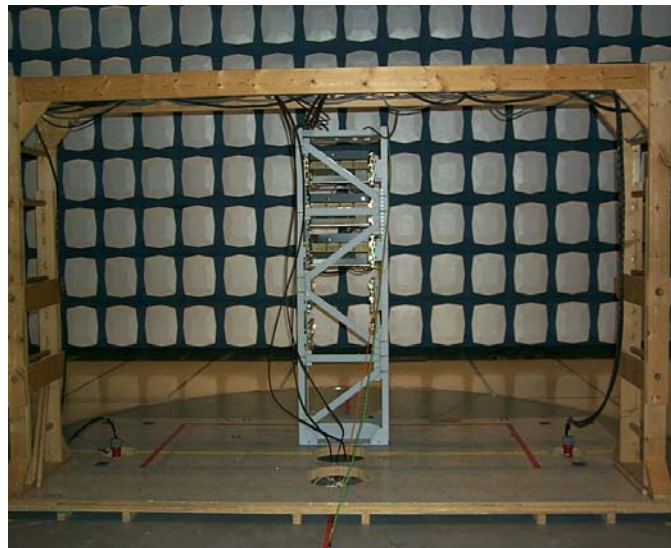
Shankara Malwes
EMC Technologist

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Picture 5. Front view of the EUT.



Picture 6. Back View of EUT.

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Picture 7. Left side view of EUT.



Picture 8. Support Equipment.

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**APPENDIX D: Radiated Emissions 1GHz-10GHz Part 22****D.1. Test Basis**

FCC Part 22

D.2. Test Specifications

| FCC Part 22 | | |
|--------------|-----------|-------------------------|
| Frequency | ERP Limit | Peak Limit @ 10 meters* |
| | dBm | dBμV/m |
| 1GHz – 10GHz | -13 | 73.90 |

* Theoretical field strength based on a dipole

D.3. Test Procedure

EMC Test Method No. 29, Revision 2 Radiated Emissions Manual Method 1GHz – 20GHz

EMC Test Method No. 11, Substitution Method

D.4. Measurement Uncertainty

The estimated uncertainty for Method No. 29, Radiated Emissions manual Method 1GHz – 20GHz is +2.52/-2.56. The corresponding expanded uncertainty is +5.05/-5.11 dB.

The estimated uncertainty for the Radiated Emissions Signal substitution test from 1GHz – 10GHz is +/-2.74 dB. The corresponding expanded uncertainty is +/- 5.49 dB.

D.5. Deviations**From Standard**

There were no deviations from the standard.

From Test Plan

None.

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D.6. Test Results

FCC Part 22

Peak Scan 1GHz - 10GHz (Horizontal Polarization)

|  | Project Name: CDMA MCBTS MTRM Tester: Shankara Malwes Model: CDMA MCBTS MTRM 800MHz Test ID: RE03-10M-2002-002 Comments: Digital Rack located under 10 meter chamber - Horizontal | | | | | | | | | |
|---|--|---------------------|----------------------------|-------|----------|----------|---------------------|-----------------|-------------------|--------------------|
| Standard | FCC PART 22 | | | | | | 10 meters | | | |
| Antenna | Band Start Frequency | Band Stop Frequency | Peak Frequency within Band | AF | CL + LNA | Detector | Peak Measured Value | Corrected Value | Theoretical Limit | Theoretical Margin |
| | MHz | MHz | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| EM-6952 Hpol | 1000 | 2000 | 1989.98 | 32.33 | -62.89 | Peak | 84.55 | 53.99 | 73.90 | 19.91 |
| EM-6952 Hpol | 2000 | 2600 | 2543.49 | 35.41 | -62.28 | Peak | 84.22 | 57.35 | 73.90 | 16.55 |
| EM-6952 Hpol | 2600 | 3000 | 2911.02 | 35.48 | -61.70 | Peak | 74.71 | 48.50 | 73.90 | 25.40 |
| EM-6952 Hpol | 3000 | 4000 | 3689.84 | 37.83 | -60.58 | Peak | 73.78 | 51.03 | 73.90 | 22.87 |
| EM-6952 Hpol | 4000 | 5000 | 4599.1983 | 39.66 | -60.01 | Peak | 73.90 | 53.55 | 73.90 | 20.35 |
| EM-6952 Hpol | 5000 | 6000 | 5834.57 | 42.77 | -58.19 | Peak | 71.82 | 56.40 | 73.90 | 17.50 |
| EM-6952 Hpol | 6000 | 7000 | 6024.048 | 43.10 | -57.91 | Peak | 72.57 | 57.76 | 73.90 | 16.14 |
| EM-6952 Hpol | 7000 | 8000 | 7226.453 | 44.16 | -56.09 | Peak | 73.01 | 61.08 | 73.90 | 12.82 |
| EM-6952 Hpol | 8000 | 9000 | 8635.27 | 44.18 | -54.56 | Peak | 72.37 | 61.99 | 73.90 | 11.91 |
| EM-6952 Hpol | 9000 | 10000 | 9299.35 | 44.96 | -53.91 | Peak | 71.57 | 62.62 | 73.90 | 11.28 |

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


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

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Peak Scan 1GHz – 10GHz (Vertical Polarization)

|  | <div> <div> Project Name: CDMA MCBTS MTRM Model: CDMA MCBTS MTRM 800MHz Comments: Digital Rack located under 10 meter chamber - Vertical </div> <div> Tester: Shankara Malwes Test ID: RE03-10M-2002-002 </div> </div> | | | | | | | | | |
|---|--|---------------------|----------------------------|-------|----------|----------|---------------------|-----------------|-------------------|--------------------|
| Standard | FCC PART 22 | 10 meters | | | | | | | | |
| Antenna | Band Start Frequency | Band Stop Frequency | Peak Frequency within Band | AF | CL + LNA | Detector | Peak Measured Value | Corrected Value | Theoretical Limit | Theoretical Margin |
| | MHz | MHz | MHz | dB/m | dB | | dBuV | dBuV/m | dBuV/m | dB |
| EM-6952 Vpol | 1000 | 2000 | 1985.97 | 32.30 | -62.94 | Peak | 85.01 | 54.36 | 73.90 | 19.54 |
| EM-6952 Vpol | 2000 | 2600 | 2460.52 | 35.44 | -62.32 | Peak | 85.35 | 58.47 | 73.90 | 15.43 |
| EM-6952 Vpol | 2600 | 3000 | 2613.62 | 35.72 | -62.20 | Peak | 81.45 | 54.97 | 73.90 | 18.93 |
| EM-6952 Vpol | 3000 | 4000 | 3505.01 | 37.51 | -60.77 | Peak | 74.77 | 51.51 | 73.90 | 22.39 |
| EM-6952 Vpol | 4000 | 5000 | 4798.34 | 39.62 | -59.88 | Peak | 73.02 | 52.76 | 73.90 | 21.14 |
| EM-6952 Vpol | 5000 | 6000 | 5396.793 | 41.33 | -59.00 | Peak | 72.49 | 54.81 | 73.90 | 19.09 |
| EM-6952 Vpol | 6000 | 7000 | 6088.1763 | 43.31 | -57.78 | Peak | 72.01 | 57.54 | 73.90 | 16.36 |
| EM-6952 Vpol | 7000 | 8000 | 7560.315 | 45.49 | -55.85 | Peak | 72.00 | 61.64 | 73.90 | 12.26 |
| EM-6952 Vpol | 8000 | 9000 | 8623.00 | 43.92 | -54.86 | Peak | 71.58 | 60.64 | 73.90 | 13.26 |
| EM-6952 Vpol | 9000 | 10000 | 9110.22 | 45.30 | -54.40 | Peak | 71.24 | 62.14 | 73.90 | 11.76 |

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

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

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Substitution Data 1GHz – 10GHz



Project Name: CDMA MCBTS MTRM 800MHz
Model: CDMA MCBTS MTRM 800MHz
Comments: CDMA MCBTS MTRM. Digital Rack located under 10 meter chamber - Substitution Method

Tester: Shankara Malwes
Test ID: RE03-10M-2002-002

| Frequency MHz | Polarization (V/H) | Corrected Peak Measure level dBuV | Corrected Substitution measure level dBuV | Signal Generator dBm | Cable factor dB | Antenna Gain dBi | Effective Radiated Power (E.R.P.) dBm | E.R.P Limit dBm | Margin dB |
|------------------|-----------------------|---|---|----------------------------|-----------------------|------------------------|---|-----------------------|--------------|
| 1989.98 | H | 53.99 | 53.86 | -50.90 | -6.81 | 7.00 | -50.71 | -13 | 37.71 |
| 2543.49 | H | 57.35 | 57.21 | -47.00 | -6.58 | 7.60 | -45.98 | -13 | 32.98 |
| 2911.02 | H | 48.50 | 48.16 | -48.50 | -7.06 | 8.10 | -47.46 | -13 | 34.46 |
| 3689.84 | H | 51.03 | 51.37 | -48.20 | -7.97 | 8.10 | -48.07 | -13 | 35.07 |
| 4599.20 | H | 53.55 | 53.74 | -47.90 | -8.94 | 9.70 | -47.14 | -13 | 34.14 |
| 5834.57 | H | 56.40 | 56.37 | -44.20 | -10.18 | 8.90 | -45.48 | -13 | 32.48 |
| 6024.05 | H | 57.76 | 57.44 | -43.10 | -10.35 | 9.00 | -44.45 | -13 | 31.45 |
| 7226.45 | H | 61.08 | 61.12 | -35.60 | -11.44 | 10.30 | -36.74 | -13 | 23.74 |
| 8635.27 | H | 61.99 | 61.95 | -35.10 | -12.60 | 10.00 | -37.70 | -13 | 24.70 |
| 9299.35 | H | 62.62 | 62.64 | -34.50 | -13.19 | 9.30 | -38.39 | -13 | 25.39 |
| 1985.97 | V | 54.36 | 54.68 | -47.40 | -6.81 | 7.50 | -46.71 | -13 | 33.71 |
| 2460.52 | V | 58.47 | 58.76 | -43.10 | -6.52 | 7.80 | -41.82 | -13 | 28.82 |
| 2613.62 | V | 54.97 | 55.03 | -48.50 | -6.71 | 7.90 | -47.31 | -13 | 34.31 |
| 3505.01 | V | 51.51 | 51.46 | -48.20 | -7.78 | 8.30 | -47.68 | -13 | 34.68 |
| 4798.34 | V | 52.76 | 52.89 | -47.90 | -9.15 | 9.30 | -47.75 | -13 | 34.75 |
| 5396.79 | V | 54.81 | 54.83 | -44.20 | -9.78 | 9.10 | -44.88 | -13 | 31.88 |
| 6088.18 | V | 57.54 | 57.45 | -43.10 | -10.41 | 9.20 | -44.31 | -13 | 31.31 |
| 7560.32 | V | 61.64 | 61.18 | -35.60 | -11.74 | 9.70 | -37.64 | -13 | 24.64 |
| 8623.00 | V | 60.64 | 60.69 | -35.10 | -12.60 | 10.00 | -37.70 | -13 | 24.70 |
| 9110.22 | V | 62.14 | 62.13 | -34.50 | -13.00 | 9.20 | -38.30 | -13 | 25.30 |

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

Notes:

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

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**D.7. Measurement Equipment**

Radiated Emissions 1GHz – 10GHz

| Description | Model / S/N | Asset Number | Cal Due | Used Y/N |
|-------------------------------|------------------------|---------------|--------------|-------------------------------------|
| EMI Test Receiver (ESI)* | Rohde & Schwarz | 40500143 | 02 Apr, 2002 | <input checked="" type="checkbox"/> |
| Log periodic Antenna | EM6592-314 | 40500395 | Jun 21, 2002 | <input checked="" type="checkbox"/> |
| Mast Controller | 2090 | 40500184 | N/A | <input checked="" type="checkbox"/> |
| Multi device controller | 2090 | 40500183 | N/A | <input checked="" type="checkbox"/> |
| LNA Amplifier | JSD00121 | S/N 838621 | N/A | <input checked="" type="checkbox"/> |
| Cable Hi-Freq Antenna | Sucoflex101PEA | S/N 1713/1PEA | 04 Feb, 03 | <input checked="" type="checkbox"/> |
| HPIB Extender | HP | 40500192 | N/A | <input checked="" type="checkbox"/> |
| Power Supply | LXO.30.2 XANTREX | 40500211 | N/A | <input checked="" type="checkbox"/> |
| Attenuator switch | HP11713A | 40500014 | N/A | <input checked="" type="checkbox"/> |
| Signal Generator 10MHz-40GHz | Rohde & Schwarz SMP-04 | 40500125 | 29 Mar, 03 | <input checked="" type="checkbox"/> |
| Adjustable Dipole Antenna Set | 3121C | 9611-1233 | Mar 4, 2003 | <input checked="" type="checkbox"/> |
| Horn Antenna | 3115 | 40500087 | Nov 19, 2002 | <input checked="" type="checkbox"/> |
| Cable | Sucoflex 104 | 40500626 | N/A | <input checked="" type="checkbox"/> |
| Cable | Sucoflex 104 | 40500627 | N/A | <input checked="" type="checkbox"/> |
| Cable | Sucoflex 104 | 40500628 | N/A | <input checked="" type="checkbox"/> |

*ESI used as an equivalent instrument to the FSEK.

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**D.8. Deviations from Normal Operating Mode**

Nortel Networks operated the EUT during testing and reported no deviations in its normal operating mode.

D.9. Test Setup Special Considerations

Refer to section 4.2 and 4.5 of the project test plan for more detailed description of the setup configuration and details

D.10. Sample Calculation

Corrected Value = Peak Measured Value + Correction Factor + Antenna Factor

Margin = ERP Limit – ERP

Theoretical Margin = Theoretical Limit – Corrected Value

D.11. Pictures

Pictures for Radiated Emissions appear following this page.

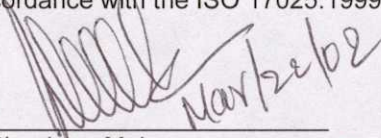
D.12. Signature

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Signature/Date:

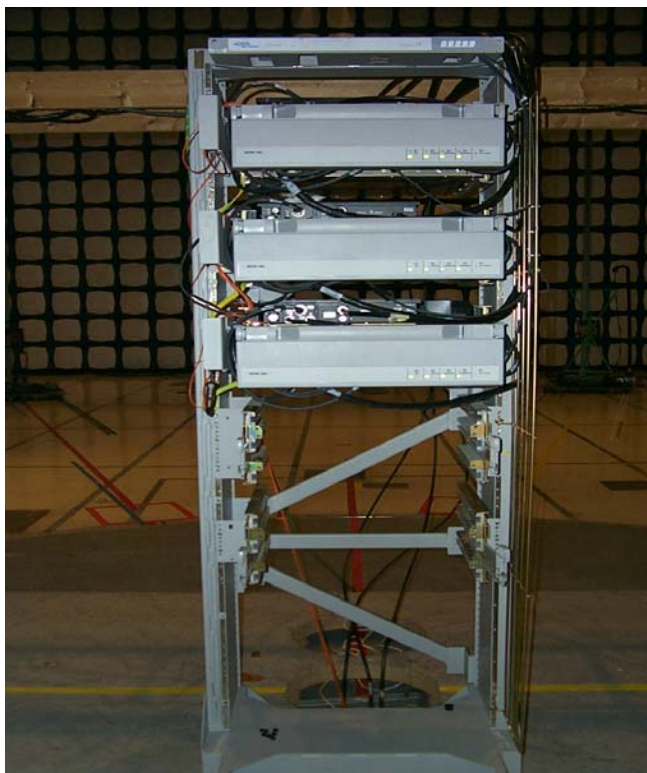
Name:

Function:

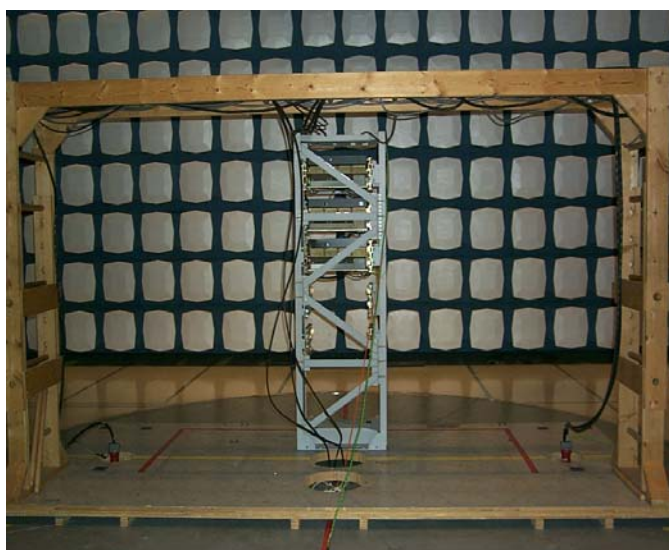

Shankara Malwes
EMC Lab Technologist

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Picture 9. Front view of the EUT.



Picture 10. Back View of EUT

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Picture 11. Left side view of EUT.



Picture 12. Support Equipment

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APPENDIX E: TEST PLAN

Note: The following test plan was provided by Nortel Networks. Test plan page numbers are relevant to the test plan only, and do not reflect the page numbers for this test report.

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CDMA BTS Development

CDMA MCBTS MTRM

Product Integrity Test Support Plan

Document Number: NTGY12CB CRP2 PI Support Plan
Stream: 00 Issue: 02
Document Status: Final
Issue date: March 7, 2002
Security Status: Proprietary
Author: Michael Rovers

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Product: NTGY12CB

During the development phase of the product, this document will reside in LiveLink as follows:

Project: MTRM - 800 MHz

Directory: <http://livelink-ott.ca.nortel.com/livelink/livelink>

Modification access during the development phase to this document is limited to the members writing the System Integration Plan.

Revision History

| Stream/Issue | Revision Date | Author/Editor | Comments |
|--------------|---------------|----------------|----------|
| 00/01 | Feb 21, 2002 | Michael Rovers | |
| 00/02 | Mar 7, 2002 | Michael Rovers | |
| | | | |

Quality Records

Key Reviewers

The following reviewers of Nortel Networks Wireless development group have reviewed this document.

| Name | Function | Department | Approval Date | Date |
|------------------|-----------------------------|------------|---------------|------|
| Arif Kurji | Project Development Manager | 2U61 | | |
| Marin Sampaleanu | Technical Advisor | 2U00 | | |
| Thomas Wong | FCC Prime | 2U40 | | |
| Steve Embree | Project Coordinator | 2J61 | | |

Ratifiers

The following people have approved this document for release and distribution within Nortel Networks.

| Name | Function | Department | Approval Date | Date |
|------------------|-----------------------------|------------|---------------|------|
| Arif Kurji | Project Development Manager | 2U61 | | |
| Marin Sampaleanu | Technical Advisor | 2U00 | | |
| Thomas Wong | FCC Prime | 2U40 | | |

Contributors

The following people have contributed to the development of the MFRM 800MHz System Integrity Test Plan.

| Name | Function | Department |
|------------------|-----------------------------|------------|
| Arif Kurji | Project Development Manager | 2U61 |
| Marin Sampaleanu | Technical Advisor | 2U00 |
| Thomas Wong | FCC Prime | 2U40 |
| Steve Embree | Project Coordinator | 2J61 |

References

| Nortel Documentation | | |
|----------------------|---|---------|
| Document ID | Title | Version |
| 411-2133-203 | Metro Cell Pre Installation Manual | S 03.03 |
| 411-2133-941 | CDMAToolbox 2.1 User Guide | S 01.07 |
| 08-0254 | Indoor Metro Cell Radio Rack Handling & Securing | 03.03 |
| 18-0257 | Indoor Metro Cell External Cabling Interface Routing and Connection | 03.04 |
| 18-0788 | Indoor CDMA Metro Cell BTS – MFRM Install | 02.01 |
| 22-0255 | Indoor Metro Cell Power Up | 03.08 |
| 24-1919 | CDMA Metro Cell File Creation and Downloading | 03.07 |

Table 1 Nortel Reference Documentation

| Standards Documentation | | |
|-------------------------------|--|---------|
| Document ID | Title | Version |
| FCC Part 15, Subpart B | Federal Communications Commission, Electromagnetic Interference | |
| FCC Part 22, Subpart C & H | Federal Communications Commission, Electromagnetic Interference | |
| | | |
| | | |

Table 2 Standards Reference Documentation

800 MHz MCBTS Frequencies

The frequencies listed in the tables below are the frequencies employed in the CDMA Metro Cell base station.

| Signal | Frequency | Units |
|------------------|-----------|-------|
| Transmit Band | 869 – 894 | MHz |
| Receive Band | 824 – 849 | MHz |
| RF LO Range | 750 - 776 | MHz |
| RF LO Resolution | 30 | KHz |
| Carrier Spacing | 1.26 | MHz |
| Tx IF LO | 108.7488 | MHz |
| Rx IF (Center) | 73.5792 | MHz |
| Tx IF (Center) | 118.5792 | MHz |
| 26Fc | 31.9488 | MHz |
| 32Fc | 39.3216 | MHz |
| 52Fc | 63.8976 | MHz |
| 64Fc | 78.6432 | MHz |
| 520Fc | 638.9760 | MHz |

Fc = CDMA single channel spreading rate = 1.2288 MHz

Table 3 800 MHz MFRM Frequencies

| Signal | Frequency | Units |
|------------------------|-------------------|----------------------|
| CORE (1Fc) | 1.2288 | MHz |
| CORE (8Fc) | 9.8304 | MHz |
| CORE (32Fc) | 39.3216 | MHz |
| CORE (52Fc) | 63.9876 | KHz |
| CORE (520 Fc) | 638.9760 | MHz |
| CORE (Oscillator) | 20 | MHz |
| GPSTM (8Fc) | 9.8304 | MHz |
| GPSTM | 10 | MHz |
| GPSTM (Even Second) | 31.9488 | 50nS neg pulse 2 sec |
| GPSTM (GPS L1 Carrier) | 15.7542 +/- 1.023 | MHz |
| 52Fc | 63.9876 | MHz |
| 64Fc | 78.6432 | MHz |
| 520Fc | 638.9760 | MHz |
| CM (IML) | 3.5 | MHz |
| CM (IMC) | 20 | MHz |
| CM (TDM I/F) | 39.3216 | MHz |
| CEM/XCEM 8Fc | 9.8304 | MHz |
| CEM/XCEM 8Fc | 9.8304 | MHz |
| CEM/XCEM 32Fc | 39.3216 | MHz |
| CEM/XCEM 52Fc | 63.8976 | MHz |
| CEM/XCEM 520Fc | 638.9760 | MHz |
| CEM CPU clock | 40 | MHz |
| XCEM CPU clock | 33, 133 & 200 | MHz |

Table 4 800 MHz MFRM Frequencies for other Modules

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1.0 Introduction

1.1 Scope

The Product Integrity (PI) testing of the CDMA MCBTS MTRM module is to be jointly executed by the Nortel Production Design Control Group (2U51) and the Sanmina PI testing group in Calgary. The pass/fail criteria for the PI test cases include the MCBTS functionality pass/fail criteria. While in test, correct judgement on functionality pass/fail may need to be taken. Because of these criteria, a properly documented system support plan for PI testing is essential.

Section 2 of this document provides a list of the PI test cases and the power requirements. Section 3 is a short description of the product being tested, the test cases to be performed, system configuration under which the basestation will be evaluated and system cable interconnect. Section 4 lists the specific configuration details to set up the basestation for testing complete with software, number and placement of modules and specific configuration details if required. Section 5 describes the modules, the test equipment, the cables and other miscellaneous equipment required.

1.2 Purpose

The purpose of this document is to define the PI level tests that are to be performed on the CDMA Metro Cell MTRM module and to describe the CDMA Metro Cell BTS setup required to perform the defined PI tests.

1.3 MCBTS Overview

The MCBTS is a complete Multi Carrier Base Station Transceiver Station for cellular and PCS communications using Code Division Multiple Access (CDMA) technology, operating at 800 MHz and 1900 MHz. The basic system provides a complete, one carrier cell site that may be configured for indoor or outdoor applications.

When fully configured, the system supports up to 9 carriers per MCBTS with single carrier radio frequency modules (SRFM) or multiple carrier radio frequency modules (MFRM). The SRFMs or MFRMs may be mounted separately from the main enclosure/cabinet giving them deployment flexibility. They may also be located in close proximity or up to 200m away.

Additionally, the option of providing an on site external back up power cabinet is also provided to the customer. This is in the form of the External Battery Enclosure (EBE) complete with an MBM and may be configured with up to six battery strings.

1.4 Material Not Covered in This Test Plan

This test support plan does not cover all the details of the test cases in the various disciplines of PI Testing. The details of pass/fail criteria, except those test cases that involve system functionality, are also not covered in this document.

2.0 Sanmina PI Test Cases, Power Requirements & Test Results

This section of the document specifically outlines PI the test cases required to test the CDMA MCBTS MTRM, the power requirements to support that testing and expected test results.

2.1 Sanmina Test Cases

Table 5 specifies the PI test cases that are required to test the CDMA MCBTS MTRM.

| Emissions Testing | | |
|-----------------------|--------------------|--|
| Test Standard | Reference Standard | Description & Range |
| FCC Part 15 (Class B) | CISPR Class B | Radiated 30MHz – 1GHz (Vertical & Horizontal) |
| FCC Part 22 | | Radiated 30MHz – 10GHz (Vertical & Horizontal) |

Table 5 PI Test Cases to be performed on the MCBTS MTRM

2.2 MCBTS System Power Requirements

Table 6 specifies the power requirements to support the testing of the CDMA MCBTS MTRM

| | |
|-----------------------------|----------|
| DC Voltage | -48 |
| Number of Feeds | 3 |
| Guage of cable | 6/0 |
| Current Draw | 100 Amps |
| Special Requirements | N/A |

Table 6 Power Requirements to support the CDMA MCBTS MTRM Testing

2.3 Test Summary

Testing on the CDMA MCBTS 800 MTRM product shall be conducted in accordance with guidelines of the Federal Communications Commission Part 22 and Part 2. This equipment also falls under Part 15. All emission measurement techniques are based on ANSI C63.4-2000 document. The test summary section shall indicate whether the MCBTS 800 MHz MTRM product passes or fails to meet the requirements of each applicable test. Margins shall be given with respect to the limits to which the equipment was tested. If the equipment passes with specific modifications or special attributes, ie shielded cables, this information must be included in the summary results. Finally, the test summary will include both hard and soft copy.

3.0 Test Case Overview

The CDMA Metro Cell MTRM module is being tested to verify the complete redesign of the Tx chain, 1X, 2X and 3X switch able SAW filters which were replaced with a single 3X SAW, the elimination of all redundant 3 Sector interface circuitry and the elimination of and cost reduction of components within the LO and Rx sections.

PI testing of the CDMA Metro Cell MTRM module includes EMI/EMC testing only. This test plan describes the EMI/EMC test cases to be performed.

3.1 EMC Tests

The PI testing of the CDMA Metro Cell MTRM module is described from a high level perspective and accompanied with a BTS setup description.

3.1.1 Radiated Emissions Testing (Part 15)

3.1.1.1 Radiated Emissions Test Case Overview

This set of test cases measures the electromagnetic radiation emanating from the MFRMs in the MCBTS RR. The system is configured as per the specifications of this test plan and the chamber doors are closed. A preliminary set of pre-compliance scans is performed to determine the electromagnetic signature and identify frequencies of concern for the unit under test (UUT). A final set of scans is also performed to determine the actual emissions signature. For this testing a manual set of Compliance Scans may also be performed.

3.1.1.2 Radiated Emissions Test Cases

For the Radiated Emissions portion of the test case suite the following test cases will be performed using 800 MHz MFRMs only to a maximum of 3.

| | |
|-------------------------|--------------|
| Horizontal Polarization | 30MHz - 1GHz |
| Vertical Polarization | 30MHz - 1GHz |

Each of these test cases will have the RR located in the 10M chamber and have the DR located in the anti-chamber below the 10M chamber. The Metro Cell RR will be configured to meet the cell site requirements and minimize the effects of EMC radiation.

The following configurations describe the test setup complete with power requirements, grounding requirements, module placement, system cabling and a pictorial representation of the setup. The pass/fail criteria for each test case is the EMC standard to be tested against. The Sanmina EMC testing prime will provide data throughout the testing process in the event the system does not meet the EMC test case specification.

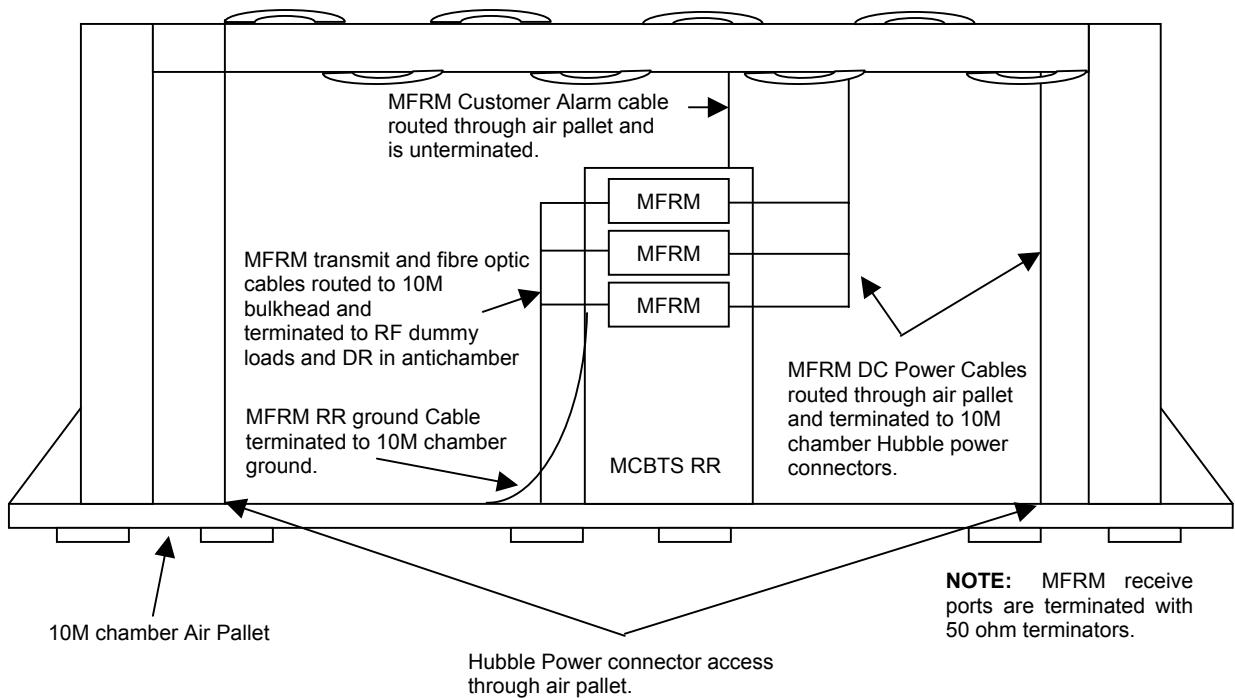


Figure 1 10M RR Test Setup Configuration

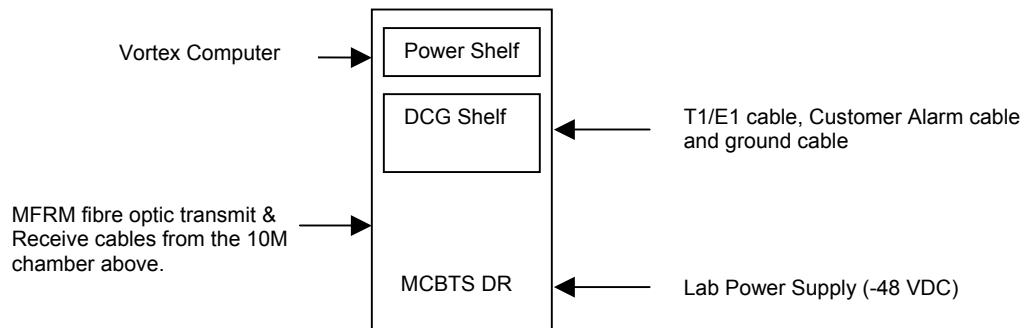


Figure 2 10M Anti-chamber DR Test Setup Configuration

3.1.2 Radiated Emissions Testing (Part 22)

3.1.2.1 Radiated Emissions Test Case Overview

This set of test cases measures the electromagnetic radiation emanating from the MFRMs in the MCBTS RR. The system is configured as per the specifications of this test plan and the chamber doors are closed. A preliminary set of pre-compliance scans is performed to determine the electromagnetic signature and identify frequencies of concern for the unit under test (UUT). A final set of scans is also performed to determine the actual emissions signature. For this testing a manual set of Compliance Scans may also be performed.

3.1.2.2 Radiated Emissions Test Cases

For the Radiated Emissions portion of the test case suite the following test cases will be performed using 800 MHz MFRMs only to a maximum of 3.

| | |
|-------------------------|---------------|
| Horizontal Polarization | 30MHz - 10GHz |
| Vertical Polarization | 30MHz - 10GHz |

Each of these test cases will have the RR located in the 10M chamber and have the DR located in the anti-chamber below the 10M chamber. The Metro Cell RR will be configured to meet the cell site requirements and minimize the effects of EMC radiation.

The configuration for Part 22 testing is the same as the set up for Part 15 testing. The pass/fail criteria for each test case is the EMC standard to be tested against. The Sanmina EMC testing prime will provide data throughout the testing process in the event the system does not meet the EMC test case specification.

3.2 MCBTS System Cable Interconnect

The table below describes the MCBTS cable interconnect scheme.

| Cable | From | To |
|---------------------------|---------------------------|---------------------------------|
| Ground cable | DR frame chassis | Anti-chamber ground |
| Ground cable | RR frame chassis | 10M turntable ground |
| DC Power cables (DR) | Anti-chamber power supply | DR frame in anti-chamber |
| DC Power cables (MFRM) | MFRM 1,2,3 | 10M turntable Hubble connectors |
| GPS Antenna Cable | Anti-chamber GPS feed | DR frame in anti-chamber |
| T1/E1 Cable | DR T1/E1 connector | Shorted back to DR frame |
| Customer Alarm Cable (DR) | Customer Alarm connector | Shorted back to DR |
| Customer Alarm Cable (RR) | Customer Alarm connector | Shorted back to RR |
| MFRM Main Antenna (Tx) | MFRM 1,2,3 | Dummy loads in anti-chamber |
| MFRM Receive ports (Rx) | MFRM 1,2,3 | 50 ohm terminated on each MFRM |
| MFRM Fibre Optic cables | MFRM 1,2,3 | DR frame in anti-chamber (CORE) |

Table 8 MCBTS System Interconnect

4.0 Test Set Up Configuration

4.1 Testbed Configurations Necessary for PI Testing

There is one MCBTS system for the PI testing. The testbed configuration needed for supporting a given PI system is decided by the classes of PI tests performed on it, MCBTS functionality pass/fail criteria associated with those tests, and the data logging requirements. Based on an overview of the functionality pass/fail criteria needed for the various categories of PI tests one testbed has been identified as being sufficient for all tests.

4.1.1 Testbed Configuration

The testbed configuration is meant for EMC/EMI testing. This means there should be instruments to monitor their status such as a power meter and appropriate software. The same test bed will be used throughout this testing.

4.2 MCBTS Setup & Configuration Details

4.2.1 EMC Setup & Configuration Notes (10M Chamber)

4.2.1.1 Radiated Emissions Testing Configuration

The physical set up for Radiated Emissions Testing in the 10M chamber is to have the Metro Cell RR located in the 10M chamber and to have the Metro Cell DR located in the anti-chamber below the 10M chamber. Any interconnect cables will be routed from the 10M chamber to the anti-chamber and terminated at their proper locations.

4.3 MCBTS Software Loads

The version of software to be loaded into the MCBTS is the standard field release of 10.1. The firmware in each of the modules, including the MTRM, is also 10.1 vintage and is given in the Table 9 below.

| MCBTS Metro Cell Load Line Up | | |
|--------------------------------------|------------------|-----------|
| Module | Application Load | Boot Load |
| Global Positioning Module (GPSTM) | 1.88 | N/A |
| Control Module (CM) | 101L23b | 101L23b |
| Channel Element Module (CEM) | 101L21A | 101L21A |
| Configuration Resource Module (CORE) | 101L21A | 101L21A |
| Multi Transmit Receive Module (MTRM) | 101M22A | 101L21A |

Table 9 MCBTS Metro Cell Load Line Up

4.4 Mode of Operation

The MCBTS Metro Cell will be tested in a configuration that duplicates field conditions, as closely as possible, following the installation methods as specified by Nortel Networks Installation Methods (see reference section). To test the CDMA MCBTS MTRM the system under test will be configured as follows:

Side 0 (simplex)
Maximum Output Power = 46.5dBm +/- 0.5dB
OCNS Channels = 6
TPTL = -6.

4.5 BTS setup & Configuration Details

Simplex - Side 0 Channels 201 (Alpha), 242 (Beta), 283 (Gamma)

| | |
|--------------------|--|
| 1 – GPSTM (slot 2) | 3 – CEMs (slots 1, 2, 3) |
| 1 – CM (slot 4) | 3 – MFRMs (upper most three positions in the RR) |
| 1 – CORE (slot 6) | |

Setup & Configuration Notes:

Vortex: Configure the MCBTS for Side 0 operation using the specified channels with 6 OCNS channels, TPTL set to -6, and the modules in the specified slots.

Physical Configuration:

Digital Rack The unused slots in the DCG will have dummy faceplates to maintain air flow and will have EMI covers on the backplane.

The CORE module will have an EMI cover.

The DR will have a frame ground from the DR to the antichamber grounding point.

The DR will have a T1 and a Customer Alarm cable both left coiled up in the bottom of the DR.

Radio Rack The RR will be configured with three MFRMs in the three upper most positions in the RR.

The RR will have a Customer Alarm cable routed through the air pallet cable tray and left unterminated.

The RR will have MFRM RF transmit cables routed through the air pallet cable tray and will be terminated to the 10M turntable bulkhead.

5.0 System Support Equipment for PI Testing

This section of the PI Support Plan outlines the modules, test equipment, cables and miscellaneous items needed to test the CDMA MCBTS MTRM.

5.1 Modules Required for MCBTS MTRM PI Testing

The modules and frame listed in Table 10 are required to test the CDMA MCBTS MTRM. The UUT portion of the MFRM is the MTRM. The MPAM, DPM, FAM and RR are supporting equipment to operate the MTRM.

| Module Description | | Quantity | PEC Code | Serial Number |
|----------------------|------|----------|-------------|---------------|
| MTRM modules | MTRM | 3 | | |
| MTRM 1 | | | NTGY10ZA Q7 | NNTM533GQ4G2 |
| MTRM 2 | | | NTGY10ZA Q7 | NNTM533GQ4H3 |
| MTRM 3 | | | NTGY10ZA Q7 | NNTM533GQ4DY |
| MPAM modules | MPAM | 3 | | |
| MPAM 1 | | | NTGY70AB 09 | NNTM532P648E |
| MPAM 2 | | | NTGY70AB 09 | NNTM532P674D |
| MPAM 3 | | | NTGY70AB 09 | NNTM532P646C |
| DPM modules | DPM | 3 | | |
| DPM 1 | | | NTGS89DB 02 | CLVWMM1005UC |
| DPM 2 | | | NTGS89DB 06 | CLVWPP201RZY |
| DPM 3 | | | NTGS89DB 06 | CLVWMM1009AF |
| Fan Assembly Modules | FAM | 3 | | |
| FAM 1 | | | NTGY60AE 01 | NNTM532VW89F |
| FAM 2 | | | NTGY60AE 01 | NNTM532VW84A |
| FAM 3 | | | NTGY60AE 01 | NNTM532VW87D |
| Radio Rack | RR | 1 | NTGS65AA 06 | DEVP01010848 |

Table 10 List of Modules and Frames Required

5.1 Support Modules Required for MCBTS MTRM PI Testing

The modules and frames listed in Table 11 are required to support the CDMA MCBTS MTRM system that will undergo the PI test cycle.

| Module Description | | Quantity | PEC Code | Serial Number |
|-------------------------------|------|----------|-------------|---------------|
| GPS Module | GPS | 1 | NTGS50AA 05 | NNTM74TM22EK |
| Control Module | CM | 1 | NTGS40AA 34 | NNTM533MNQ1A |
| Configuration Resource Module | CORE | 1 | NTGS30AA 40 | NNTM533MUF16 |
| Channel Element Module | CEM | 3 | | |
| CEM 1 | | | NTGS60BA 74 | NNTM5340693R |
| CEM 2 | | | NTGS60BA 56 | NNTM533MORG4 |
| CEM 3 | | | NTGS60BA 77 | NNTM534083J4 |
| Enhanced Control Module | ECM | 1 | NT7C25BA | |
| Digital Rack | DR | 1 | NTGS45BA 12 | SNMN53004234 |

Table 11 List of Modules and Frames Required

5.2 Test Equipment Required for PI Testing

The test equipment listed in Table 12 is required to support the CDMA MCBTS MTRM system. The equipment listed may not be common for all the tests. As a result there is a column in the table defining the test setup and where each piece of test equipment is used.

| Equipment Description | Quantity | Test Setup Used In |
|------------------------------------|----------|--------------------|
| Digital Multimeter | 1 | All |
| Computer & cable (c/w Vortex 10.1) | 1 | All |
| Code Domain Analyzer | 1 | All |
| Power Meter | 1 | All |
| RF Dummy Loads (150 W) | 3 | All |
| | | |

Table 12 Test Equipment Required

5.3 Cables Required for PI Testing

The cables listed in Table 13 are required to support the CDMA MCBTS MTRM system.

| Equipment Description | Quantity | PEC Code | Test Setup Used In | Cable Length |
|------------------------------|----------|-----------------|--------------------|--------------|
| RS-232 Communication Cable | 1 | N/A | All | N/A |
| Ground cable | 2 | NTGS7094 | All | 3m |
| System DC power cables | 2 | Supplied by Lab | All | N/A |
| MFRM DC power cables | 3 | NTGS8082 | All | 7m |
| Ethernet cable (PC) (rolled) | 1 | N/A | All | N/A |
| RF load cables | 3 | N/A | All | N/A |
| T1/E1 backhaul cable | 1 | NTGS3517 | All | 15m |
| Customer Alarm Cables | 2 | NTGS3518 | All | 30m |

NOTE: N/A cables are engineering test cables.

Table 13 Cables Required

5.4 Miscellaneous Items Required

The miscellaneous items listed in Table 14 are required to support the CDMA MCBTS MTRM system.

| Equipment Description | Quantity |
|--------------------------------|----------|
| Tie wraps | 100 |
| Nut drivers (5/16, 7/16, 9/16) | 1 ea |
| Common screwdriver | 1 |
| Philips screwdriver (No. 2) | 1 |
| Wire cutters | 1 pair |
| Pliers | 1 pair |
| Knife | 1 |
| Electrical tape | 1 roll |
| N Type barrel connectors | 6 |
| 2" dummy faceplates | 11 |
| 4" dummy faceplates (NTGS2007) | 3 |

Table 14 Miscellaneous Items Required



END OF DOCUMENT

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Sanmina-SCI Product Integrity Laboratory, 5151-47th Street N.E. Tel: 403-295-5134, Fax: 403-295-4091