SANMINA-SCI

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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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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: Mar/22/02
Shankara Malwes
EMC Lab Technologist

Checked By: 22Mar02
Duane Friesen, CET
EMC Technical Advisor

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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			☐
1	MTRM 1	NTGY10ZA Q7	NNTM533GQ4G2	☐
1	MTRM 2	NTGY10ZA Q7	NNTM533GQ4H3	☐
1	MTRM 3	NTGY10ZA Q7	NNTM533GQ4DY	☐
	MPAM modules			☐
1	MPAM 1	NTGY70AB 09	NNTM532P648E	☐
1	MPAM 2	NTGY70AB 09	NNTM532P674D	☐
1	MPAM 3	NTGY70AB 09	NNTM532P646C	☐
	DPM modules			☐
1	DPM 1	NTGS89DB 02	CLVWMM1005UC	☐
1	DPM 2	NTGS89DB 06	CLVWPP201RZY	☐
1	DPM 3	NTGS89DB 06	CLVWMM1009AF	☐

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Qty	Module Description	PEC	Product Code	Verified
	Fan Assembly Modules			☐
1	FAM 1	NTGY60AE 01	NNTM532VW89F	☐
1	FAM 2	NTGY60AE 01	NNTM532VW84A	☐
1	FAM 3	NTGY60AE 01	NNTM532VW87D	☐
1	Radio Rack	NTGS65AA 06	DEVP01010848	☐

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

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 dBµV/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	☒
RF Metal C Cable	N/A	N/A	17 Dec, 2002	☒
Mast Controller	2090	40500184	N/A	☒
Multi device controller	2090	40500183	N/A	☒
HP Amplifier	8447F OPT H64	40500228	01 Dec, 2002	☒
RF Cable	116568/4	40500621	17 Dec, 2002	☒
TDL Switch Matrix	SMC-002	40500189	17 Dec, 2002	☒
Cable	115757/4	40500623	17 Dec, 2002	☒
Cable	N/A	N/A	17 Dec, 2002	☒
Cable	CBL-1	40500625	17 Dec, 2002	☒
Ref Rad	4630B	40500257	N/A	☒
Ref Rad (Kit)	Balun A	N/A	N/A	☒
Ref Rad (Kit)	40cm Dipole	N/A	N/A	☒
Bilog Antenna	CBL-6111B	40500566/2701	26 Apr, 2002	☒

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: Mar/22/02
Name: Shankara Malwes
Function: EMC Lab Technologist

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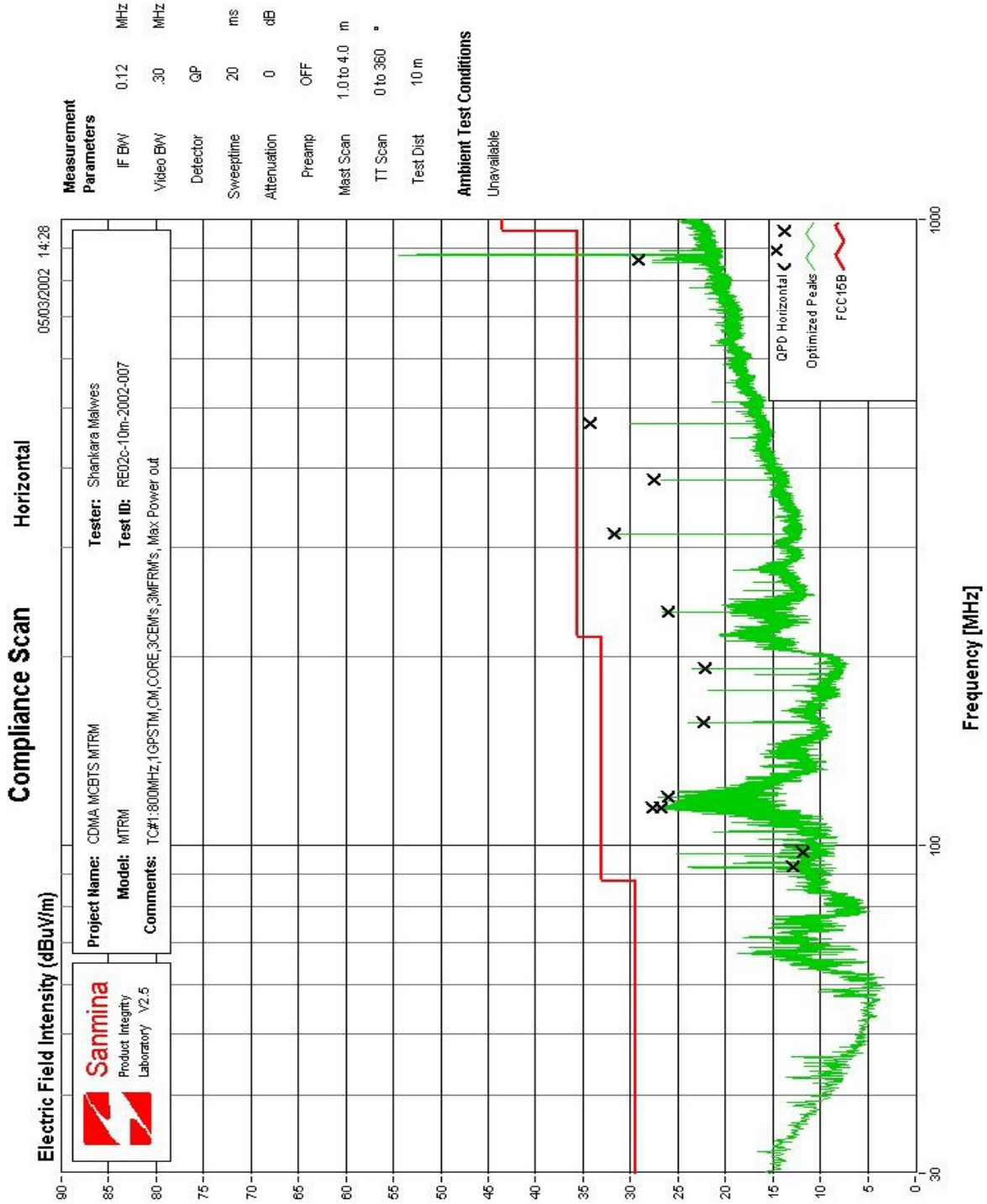
Horizontal Compliance Plot



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Horizontal Compliance Data Table

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Compliance Scan Peaks

Horizontal

05/03/2002 14:28

Sanmina Product Integrity Laboratory V2.5

Project Name: CDMA MCBTS MTRM **Tester:** Shankara Malwes
Model: MTRM **Test ID:** RE02c-10m-2002-007
Comments: TC#1:800MHz,1GPSTM,CM,CORE,3CEM's,3MFRM's, Max Power out

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														
118.7786	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						
191.9399	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	40.86	31.33	35.60	4.27	125.2	203.8	-9.53						
383.5528	26.72	Verify	383.3749	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	30.65	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 recieving antenna and the reciever 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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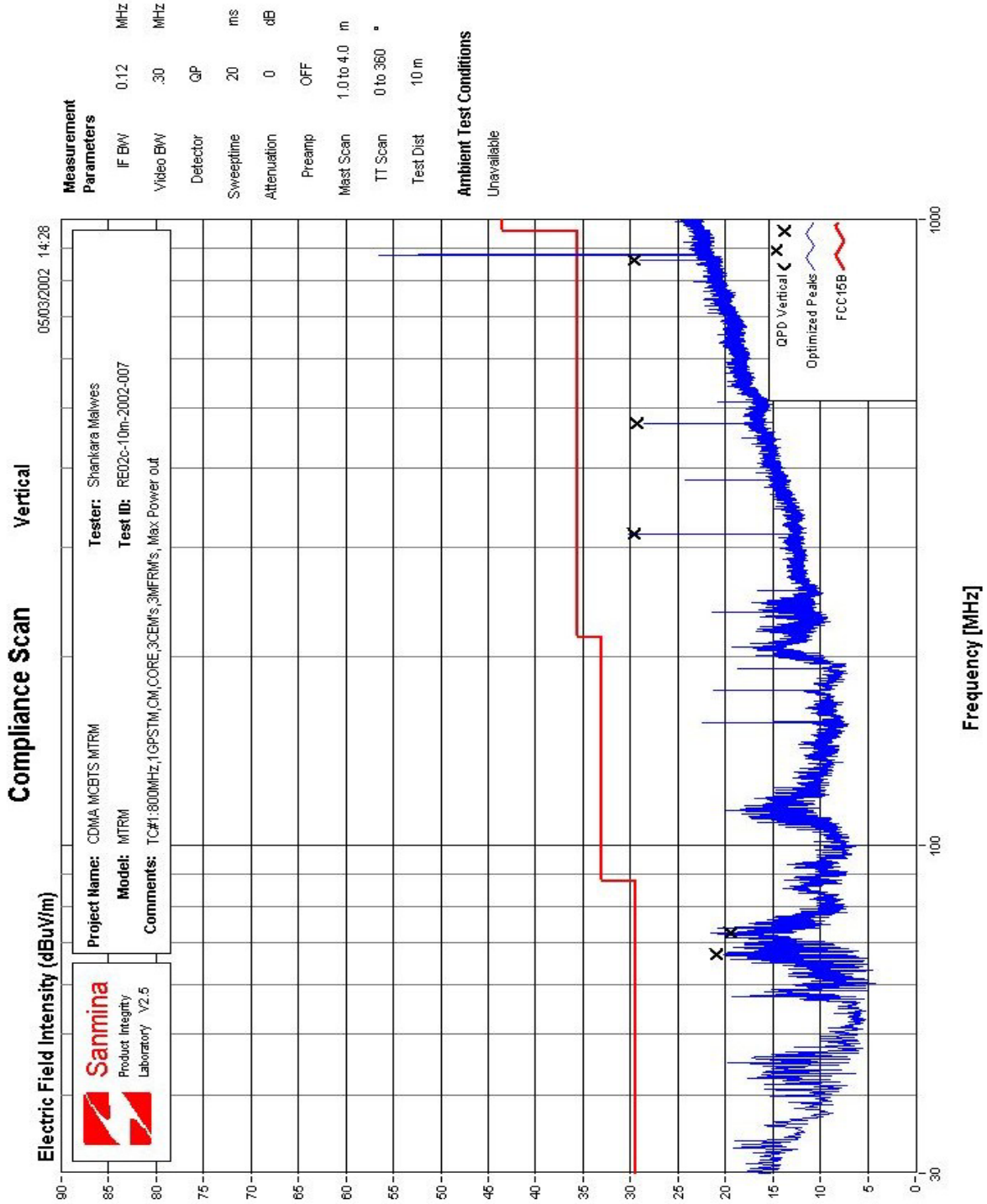
Vertical Compliance Plot



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Vertical Compliance Data Table

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Compliance Scan Peaks

Vertical

05/03/2002 14:28

Sanmina Product Integrity Laboratory V2.5

Project Name: CDMA MCBTS MTRM **Tester:** Shankara Malwes
Model: MTRM **Test ID:** RE02c-10m-2002-007
Comments: TC#1:800MHz,1GPSTM,CM,CORE,3CEM's,3MFRM's, Max Power out

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)
45.0167	19.66	Adjacent								
66.8810	20.13	Verify	66.9881	39.79	20.91	29.50	8.59	199.7	231.0	-18.88
67.2414	19.81	Adjacent								
67.7219	19.80	Adjacent								
71.4461	19.66	Adjacent								
71.9266	19.81	Adjacent								
72.4071	21.48	Freq Adjust	72.5760	38.04	19.41	29.50	10.09	170.4	12.0	-18.63
73.7286	20.75	Adjacent								
314.8365	30.15	Verify	314.5688	38.75	29.62	35.60	5.98	234.8	169.9	-9.13
471.9711	28.49	Verify	471.8615	35.02	29.26	35.60	6.34	185.7	35.9	-5.76
858.8009	29.00	Freq Adjust	858.7208	31.11	29.65	35.60	5.95	100.5	203.7	-1.46
875.7397	56.58	Carrier								
875.9800	55.38	Carrier								
876.3404	55.36	Carrier								
876.7008	55.77	Carrier								
877.3014	52.58	Carrier								
877.5417	54.23	Carrier								
877.7820	52.88	Carrier								
878.0222	52.22	Carrier								
878.5028	50.45	Carrier								
878.7430	50.12	Carrier								
878.9833	49.49	Carrier								
879.2236	48.79	Carrier								

Notes:
1. Positive Margin indicates a pass
2. Correction factors include all factors between the recieving antenna and the reciever 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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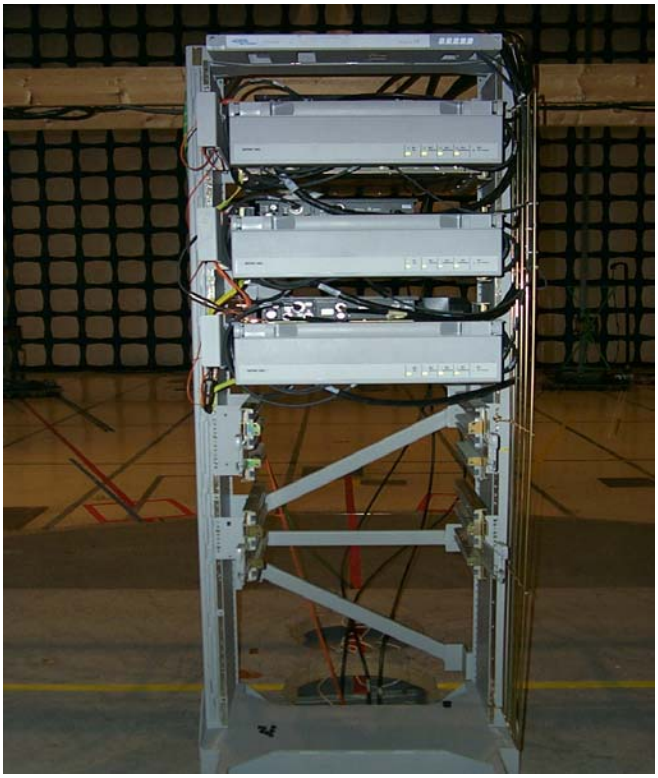
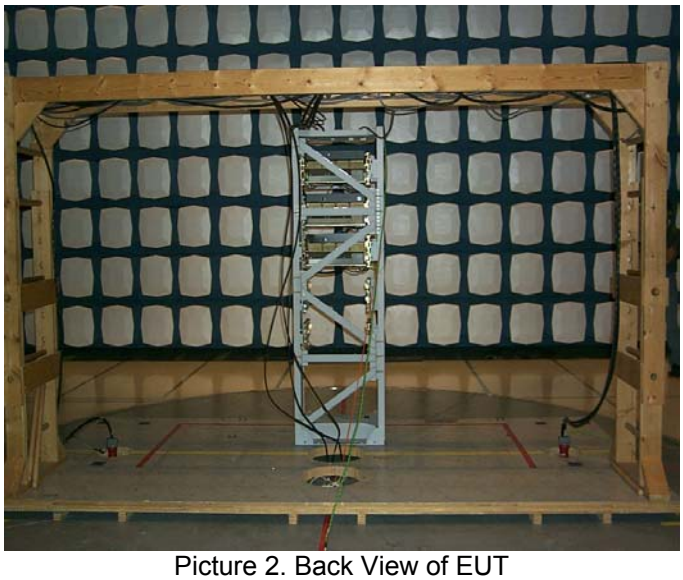
Sanmina-SCI Product Integrity Laboratory, 5151-47th Street N.E. Tel: 403-295-5134, Fax: 403-295-4091



Picture 1. Front view of the EUT.



Picture 2. Back View of EUT

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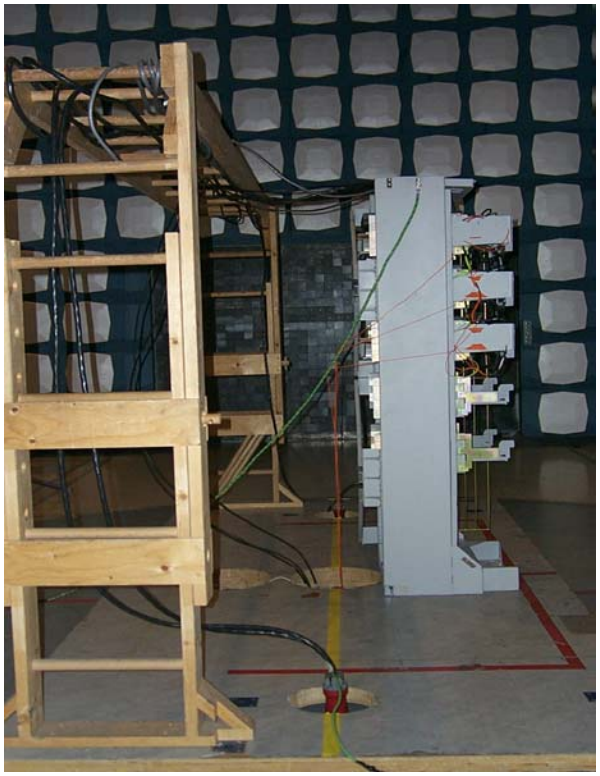

Picture 3. Left side view of EUT.

Picture 4. Support Equipment.

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.

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)

Sanmina Product Integrity Laboratory V2.5

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 - 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

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.

Peak Scan 30MHz – 1GHz (Vertical Polarization)

Sanmina Product Integrity Laboratory V2.5

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 Dista 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

Sanmina Product Integrity Laboratory V2.5

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	☒
RF Metal C Cable	N/A	N/A	17 Dec, 2002	☒
Mast Controller	2090	40500184	N/A	☒
Multi device controller	2090	40500183	N/A	☒
HP Amplifier	8447F OPT H64	40500228	01 Dec, 2002	☒
RF Cable	116568/4	40500621	17 Dec, 2002	☒
TDL Switch Matrix	SMC-002	40500189	17 Dec, 2002	☒
Cable	115757/4	40500623	17 Dec, 2002	☒
Cable	N/A	N/A	17 Dec, 2002	☒
Cable	CBL-1	40500625	17 Dec, 2002	☒
Bilog Antenna	CBL-6111B	40500566	12 Oct, 2002	☒
Signal Generator 10MHz-40GHz	Rohde & Schwarz SMP-04	40500125	29 Mar, 03	☒
Cable	Sucoflex 104	40500626	N/A	☒
Cable	Sucoflex 104	40500627	N/A	☒
Cable	Sucoflex 104	40500628	N/A	☒

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 + 10Log(P_w))

Example

P=20w

ERP Limit

= 43dBm – (43 + 10Log(20)) = -13dBm

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Theoretical Limit = 120 + 20Log(SQRT (49.2 * P_w) / D)

Example

P= -13dBm = 0.00005w

D= 10m

Theoretical Limit

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

= 73.9 dBuV/m

C.11. Pictures

Pictures for Radiated Emissions appear following this page.

C.12. Signature

Signature/Date:	Mar 22/02
Name:	Shankara Malwes
Function:	EMC Technologist

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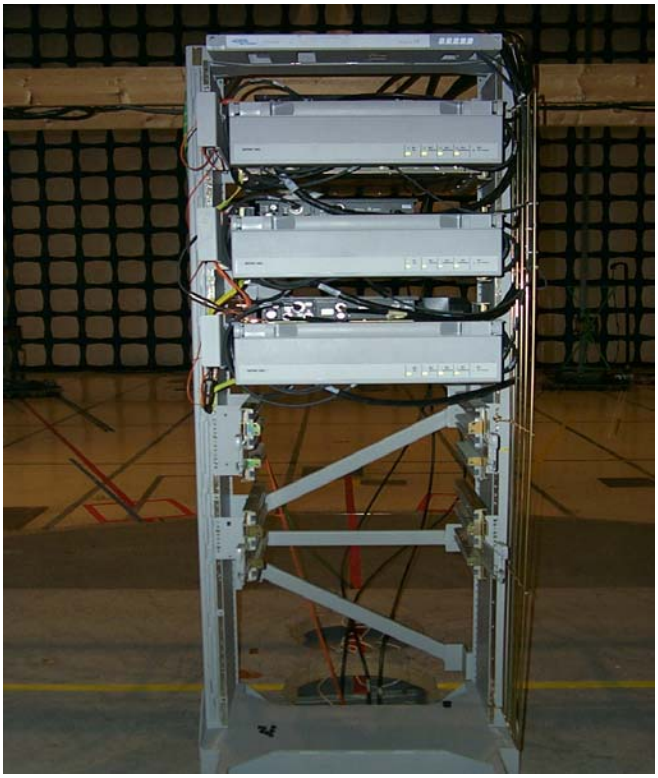
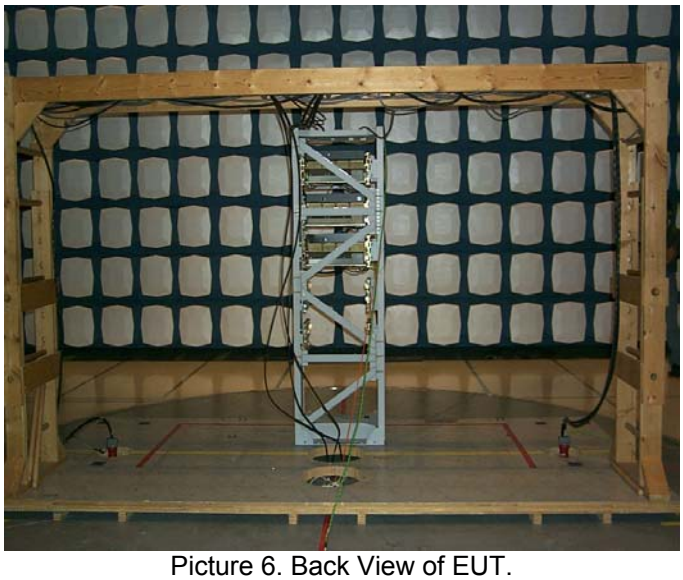


Picture 5. Front view of the EUT.



Picture 6. Back View of EUT.

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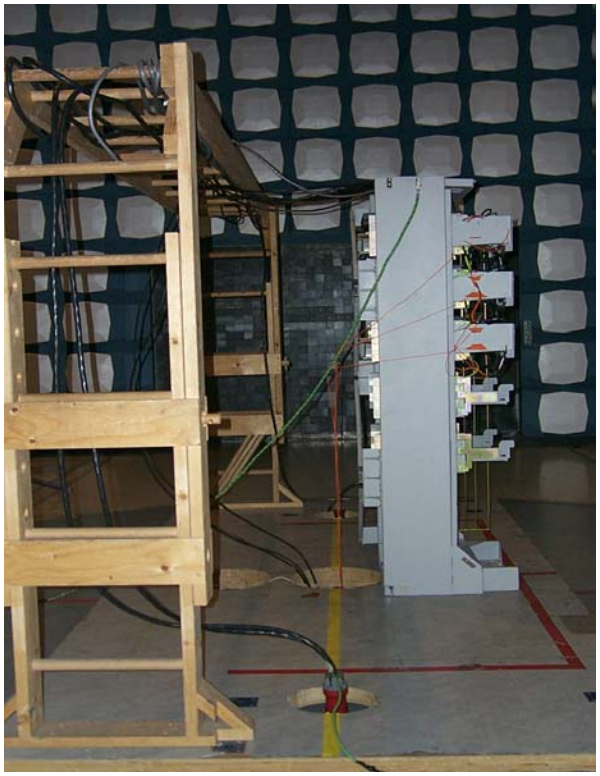

Picture 7. Left side view of EUT.

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)

Sanmina Product Integrity Laboratory V2.5

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

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.

Peak Scan 1GHz – 10GHz (Vertical Polarization)

Sanmina Product Integrity Laboratory V2.5

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 - Vertical

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

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 – 10GHz

Sanmina Product Integrity Laboratory V2.5

Project Name: CDMA MCBTS MTRM 800MHz **Tester:** Shankara Malwes
Model: CDMA MCBTS MTRM 800MHz **Test ID:** RE03-10M-2002-002
Comments: CDMA MCBTS MTRM. Digital Rack located under 10 meter chamber - Substitution Method

Frequency	Polarization (V/H)	Corrected Peak Measure level	Corrected 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	dBi	dBm	dBm	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

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.

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	☒
Log periodic Antenna	EM6592-314	40500395	Jun 21, 2002	☒
Mast Controller	2090	40500184	N/A	☒
Multi device controller	2090	40500183	N/A	☒
LNA Amplifier	JSD00121	S/N 838621	N/A	☒
Cable Hi-Freq Antenna	Sucoflex101PEA	S/N 1713/1PEA	04 Feb, 03	☒
HPIB Extender	HP	40500192	N/A	☒
Power Supply	LXO.30.2 XANTREX	40500211	N/A	☒
Attenuator switch	HP11713A	40500014	N/A	☒
Signal Generator 10MHz-40GHz	Rohde & Schwarz SMP-04	40500125	29 Mar, 03	☒
Adjustable Dipole Antenna Set	3121C	9611-1233	Mar 4, 2003	☒
Horn Antenna	3115	40500087	Nov 19, 2002	☒
Cable	Sucoflex 104	40500626	N/A	☒
Cable	Sucoflex 104	40500627	N/A	☒
Cable	Sucoflex 104	40500628	N/A	☒

*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: Mar/22/02
Name: Shankara Malwes
Function: EMC Lab Technologist

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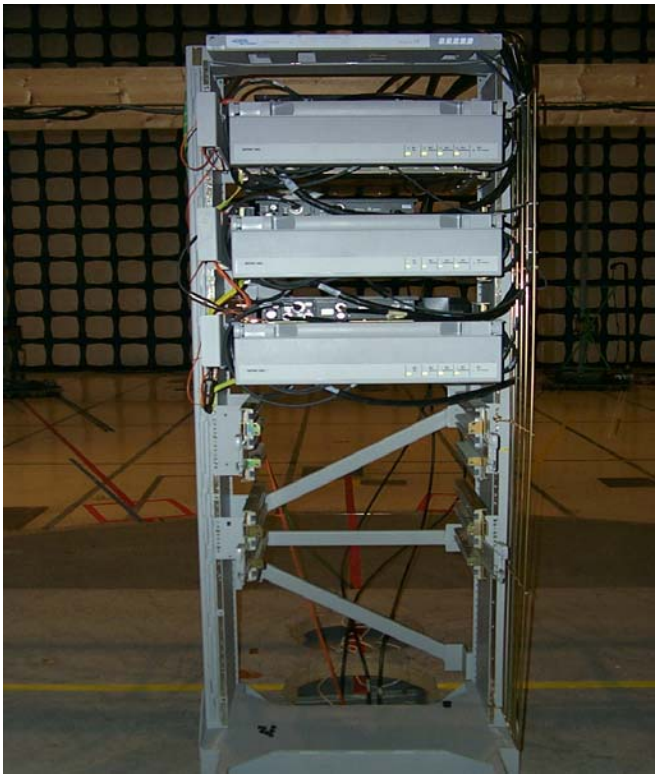
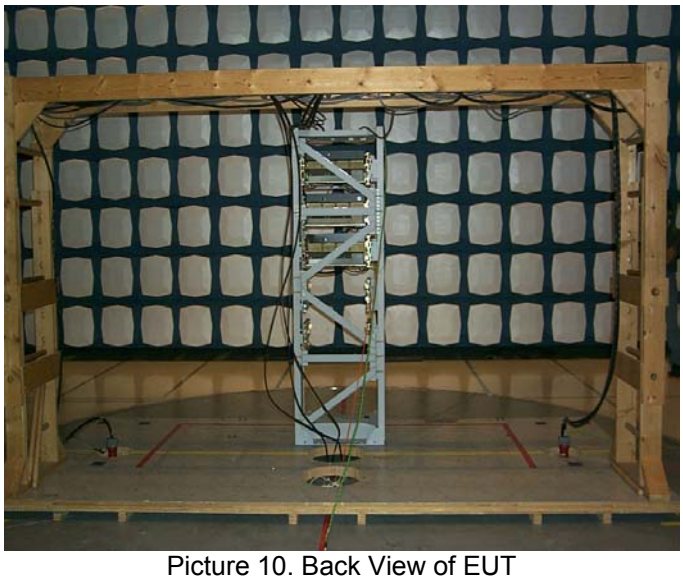


Picture 9. Front view of the EUT.



Picture 10. Back View of EUT

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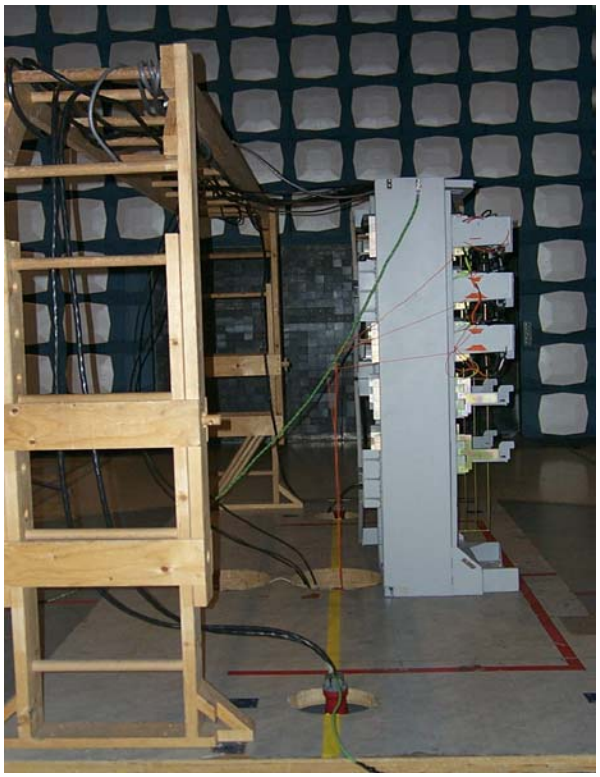

Picture 11. Left side view of EUT.

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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Related Products and Codes:

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		
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Ratifiers

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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.

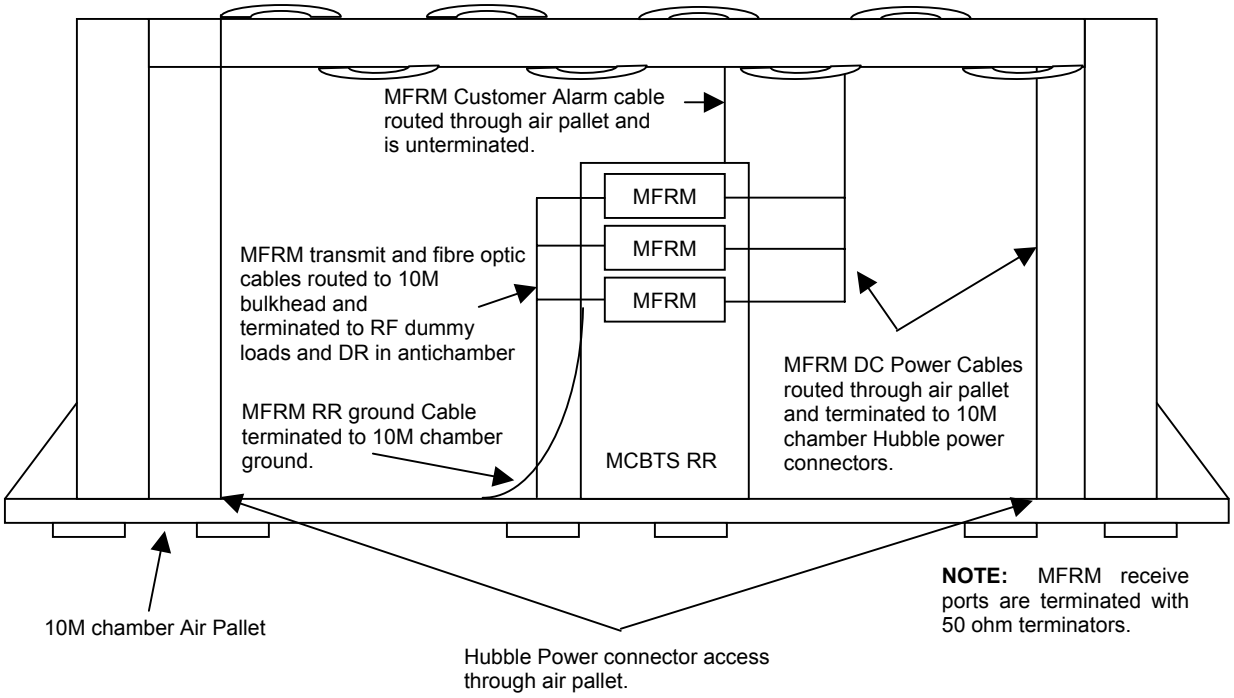

Figure 1 10M RR Test Setup Configuration

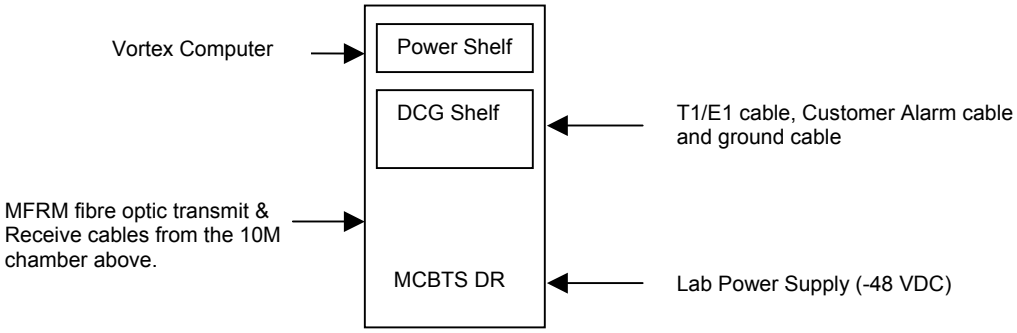

Figure 2 10M Anti-chamber DR Test Setup Configuration

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

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