



## **EXHIBIT 2B**

**Test Report Provided by  
Sanmina-SCI**

**Applicant: Nortel Networks**

**For Class II Permissive Change  
Certification on:**

**AB6NT800MFRM**



**SANMINA-SCI**

*Product Integrity Laboratory*

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**Emissions Report  
Lab Project Number- 80169**

**-48V MTRM- 800MHz Part 22**

**Revision: 2**

**Date: 15 Nov 2002**

**Prepared for:** Nortel Networks Inc.

**Author:** Shankara Malwes  
EMC Test Technologist

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**Approved by:** Glen Moore  
EMC Manager

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## **Summary**

### **Sanmina-SCI Canada**

Product Integrity Laboratory

5151-47<sup>th</sup> Street, N.E. Calgary Alberta T3J 3R2

Accreditation Numbers: FCC 101386

IC 46405-3978; File # IC 3978-2

Standards Council of Canada Accredited Laboratory No. 440

Performed For: Thomas Wong  
Nortel Networks Inc.  
5111-47<sup>th</sup> Street, N.E.  
Calgary Alberta T3J 3R2  
Phone (403) 769-2425

EUT Description: CDMA MCBTS -48V MTRM – 800MHz  
Model: NTGY10DA

Serial Number: NNTM535XDDGG; NNTM535XCH7A; NNTM535XCH58

<b>Appendix</b>	<b>Standards</b>		<b>Description &amp; Range</b>	<b>Deviations</b>		<b>Pass / Fail</b>	<b>Criteria</b>
	<b>Base</b>	<b>Test Basis</b>		<b>From Standard</b>	<b>From Test Plan</b>		
B	ANSI C63.4-2001	FCC Part 22	Radiated Emissions Signal Substitution 30MHz-1GHz	No	Yes	PASS	None
C	ANSI C63.4-2001	FCC Part 22	Radiated Emissions Signal Substitution 1GHz-10GHz	No	Yes	PASS	None

Note: Test Plan deviations are listed in Appendix A.

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

Tested By:

Digitaly signed by  
Shankara Malwes  
DN: cn=Shankara Malwes,  
o=Sanmina-SCI, ou=PI  
Laboratory, o=CA  
Date: 2002.11.15  
18:06:26-07'00'  
Signature  
Not Verified

Shankara Malwes  
EMC Technologist

Checked By:

Digitaly signed by  
Duane Friesen  
DN: cn=Duane Friesen,  
o=Sanmina-SCI, ou=PI  
Laboratory, o=CA  
Date: 2002.11.15  
18:06:26-07'00'  
Reason: I have  
reviewed this document  
Signature  
Not Verified

Duane Friesen C.E.T.  
EMC Technical Advisor

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## Table of Contents

SUMMARY .....	2
REGISTER OF REVISIONS.....	5
Description of Revisions .....	5
1. INTRODUCTION.....	5
1.1 Purpose .....	5
1.2 Abbreviations and Definitions.....	5
1.3 References .....	5
2. TEST LOG.....	6
3. EUT .....	7
3.1 Configuration .....	7
3.1.1 TEST PLAN CONFIGURATION DEVIATIONS.....	9
3.2 Power .....	10
3.2.1 TEST PLAN POWER DEVIATIONS.....	10
3.3 Cables .....	10
3.3.1 TEST PLAN CABLE LIST DEVIATIONS.....	11
3.4 EUT Frequencies .....	11
3.4.1 TEST PLAN FREQUENCY LIST DEVIATIONS .....	12
3.5 Mode of Operation.....	13
3.5.1 TEST PLAN MODE OF OPERATION DEVIATION .....	13
3.6 Pass / Fail Criteria .....	13
4. SUPPORT EQUIPMENT .....	14
APPENDICES.....	15
APPENDIX A: TEST PLAN DEVIATION LOG.....	16
APPENDIX B: MTRM 800MHZ RADIATED EMISSIONS 30MHZ – 1GHZ PART 22.....	18
APPENDIX C: MTRM 800MHZ RADIATED EMISSIONS 1 – 10GHZ PART 22.....	25
END OF DOCUMENT .....	33

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## REGISTER OF REVISIONS

<b>Revision</b>	<b>Date</b>	<b>Description of Revisions</b>
Rev.0	09 Oct, 2002	Initial Release
Rev.1	05 Nov, 2002	Revised front page date and revision number, page 2 Appendix G Criteria, Page 5 in register of revisions added row 2, page 10 added row in Table 3 to the cable list, page 32 section C.5 updated 1 <sup>st</sup> row, page 43 and 51 updated cable factors and ERP columns in substitution results table, page 63 deleted row 4 in section G.5 and in all pages updated the date to Nov 05 2002
Rev.2	15 Nov, 2002	Revised front page date and revision number, deleted 4 rows in Summary table in page 2, page 5 in register of revisions added row 3, in page 6 deleted 4 rows in test log, deleted FCC part 15 references, deleted pages from 18 to 37(FCC Part 15) and 53 to 65 as per customer request.

## 1. INTRODUCTION

### 1.1 PURPOSE

The purpose of this report is to describe testing and results for Radiated Emissions in reference to FCC Part 22 on the Nortel Network's CDMA MCBTS -48V MTRM 800MHz system.

The CDMA -48V MTRM 800MHz Radiated Emissions testing was executed with an MCBTS Indoor system using three 800 MHz MFRM's.

The test outlined may not be inclusive of all testing required by the Core Standards or fulfill the applicable regulatory requirements in their entirety.

### 1.2 ABBREVIATIONS AND DEFINITIONS

EUT	Equipment under test
RE	Radiated Emissions
CE	Conducted emissions
LISN	Line Impedance stabilization network
BIP	Breaker Interface Panel
CAM	Customer Alarm Module
ECM	Enhanced Control Module
DR	Digital Rack
GPS	Global Positioning System

### 1.3 REFERENCES

ANSI C63.4-2001

FCC Part 22

Sanmina-SCI EMC Test Method 11.0 Radiated Emissions Signal Substitution Method 30MHz – 20GHz  
Project test plan draft document number: N/A, Stream: 00, Issue: 01, dated Sept 23, 2002.

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## 2. TEST LOG

Appendix	Test Case	Start	End
Date Received: 08 <sup>th</sup> Sept 2002			
B	Radiated Emissions 30MHz-1GHz FCC Part 22	Sept 25, 02	Sept 25, 02
C	Radiated Emissions 1GHz-10GHz FCC Part 22	Sept 25, 02	Sept 25, 02
Date Shipped: 27 Sept, 2002			

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### **3. EUT**

#### **3.1 CONFIGURATION**

The Radio rack was placed on the wooden palette 10cm above the ground plane, located at the center of the turntable in the 10M chamber. Customer alarm cable and power cables were routed through the cable rack in an attempt to maximize the emissions.

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

Physical Configuration:

The radio rack was contained the following modules.

Three -48V MFRMs were used as EUT in the radio rack and powered from the A-side Hubble with one pair of cables.

Three dummy loads of 100watts were used to terminate the Antenna port of the radios under the 10M chamber and were not part of the EUT.

Three dummy loads of 100watts were used to terminate the Antenna port of the radios under the 10M chamber and were not part of the EUT.

For more detailed EUT configuration and setup refer to the Figure 1, Section 3.1.1.2, 3.1.2 and section 4.0 of the Project test plan draft document number: stream:00, issue: 01 dated 23 Sept 2002.



Table 1 –Description of EUT

<b>Name</b>	MTRM 800MHz
<b>Model Number</b>	NTGY10DA
<b>Revision Number</b>	P4
<b>Serial Number</b>	NNTM535XDDGG; NNTM535XCH7A; NNTM535XCH58
<b>Physical Description</b>	The MTRM Consists of a Printed Circuit Pack with two metal shields on both of its sides. It was located between the DPM and the FRM in the Radio rack. This consists of 8 connector ports in the front of the MTRM underneath the FAM. These 8 connectors named as T1-T8 (T1-PWR/Data in, T2- XDM Test, T3- RX Main In, T4-PWR/Data out, T5 – RX Div In, T6 & T7- RX Main out, T8 – TX Out).
<b>Classification</b>	ITE- Floor standing
<b>Size (meters)</b>	N/A
<b>Weight</b>	N/A
<b>Power</b>	-48Vdc
<b>Functional Description</b>	<p>The MFRM consists of a Multi-carrier Transmit Receive Module (MTRM), a Multi-carrier Power Amplifier Module (MPAM), a Duplexer-preselector Module (DPM) and a Fan Alarm Module (FAM). The MFRM can support 3 carriers on a single sector.</p> <p><b>Forward Link:</b> - Uses different RF carrier frequencies to transmit the CDMA signals generated by the CEM's.</p> <p><b>Reverse Link:</b> - Amplifies, filters and down converts signals received from CDMA mobiles so that the CEM's can convert those signals into received data</p>

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**Table 2 – EUT Description List**

The following equipment was provided by the customer and referenced to the test plan draft document number: N/A, Stream: 00, Issue: 01, dated Sept 23, 2002.

Module Description		Quantity	PEC Code	Serial Number	Verified
MTRM modules	MTRM	3			<input type="checkbox"/>
MTRM 1	-48V		NPGY10DA P4	NNTM535XDDGG	<input type="checkbox"/>
MTRM 2	-48V		NPGY10DA P4	NNTM535XCH7A	<input type="checkbox"/>
MTRM 3	-48V		NPGY10DA P4	NNTM535XCH58	<input type="checkbox"/>
MPAM modules	MPAM	3			<input type="checkbox"/>
MPAM 1 (IOL)	HPCA -48V		NTGY70AB 20	NNTM5381N5HQ	<input type="checkbox"/>
MPAM 2 (IOL)	HPCA -48V		NTGY70AB 20	NNTM5330PC09	<input type="checkbox"/>
MPAM 3 (IOL)	HPCA -48V		NTGY70AB 20	NNTM536MH3DY	<input type="checkbox"/>
DPM modules	DPM	3			<input type="checkbox"/>
DPM 1			NTGS89DB 04	CLWVMM1005Y4	<input type="checkbox"/>
DPM 2			NTGS89DB 04	CLVWPP200BA5	<input type="checkbox"/>
DPM 3			NTGS89DB 04	CLWVCC100DM8	<input type="checkbox"/>
Fan Assembly Modules	FAM	3			
FAM 1			NTGS5651 01	NNTM53586PYC	<input type="checkbox"/>
FAM 2			NTGS5651 01	NNTM53586PR6	<input type="checkbox"/>
FAM 3			NTGY60AE 01	NNTM532VW84A	<input type="checkbox"/>
Radio Rack	RR	1	NTGS65AA 06	DEVP01010848	<input type="checkbox"/>

Note: “” means Verified by Sanmina-SCI and “” means not verified by Sanmina-SCI.

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

### 3.1.1 TEST PLAN CONFIGURATION DEVIATIONS

All Test plan configuration deviations are noted in Appendix A, deviation number 1 and 2.

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### **3.2 POWER**

A – Hubble: ~45 Amps in total  
Line 1 -48V DC through LISN B1  
Line 2 -48V DC Return through LISN B2

Also refer to the section 2.2 of the Project test plan draft document number: stream:00, issue: 01 dated 23 Sept 2002.

#### **3.2.1 TEST PLAN POWER DEVIATIONS**

None

### **3.3 CABLES**

**Table 3 – Cable List**

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

Equipment Description	Quantity	PEC Code	Test Setup Used In	Cable Length	Verified
RS-232 Communication Cable	1	N/A	All	N/A	<input type="checkbox"/>
Ground cables	2	NTGS7094	All	3m	<input type="checkbox"/>
System DC power cables	6	Supplied by Lab	All	N/A	<input type="checkbox"/>
Cable from Hubble to LISNs	8	Supplied by Lab	All	1m	<input checked="" type="checkbox"/>
MFRM DC power cables	6	NTGS8082	All	7m	<input type="checkbox"/>
Ethernet cable (PC) (rolled)	1	N/A	All	N/A	<input type="checkbox"/>
RF load cables	6	N/A	All	N/A	<input type="checkbox"/>
T1/E1 backhaul cable	1	NTGS3517	All	15m	<input type="checkbox"/>
Customer Alarm Cables	2	NTGS3518	All	30m	<input type="checkbox"/>

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**3.3.1 TEST PLAN CABLE LIST DEVIATIONS**

None

**3.4 EUT FREQUENCIES**

**Table 4 – Modules Frequency List**

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

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**Table 5 – 800 MHz MFRM Frequency List**

Signal	800MHz 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

For a detailed list of frequencies Refer to the Tables 3 and 4 of the Project test plan draft document number: stream:00, issue: 01 dated 23 Sept 2002.

### 3.4.1 TEST PLAN FREQUENCY LIST DEVIATIONS

None.

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### **3.5 MODE OF OPERATION**

As defined by Nortel Networks:

The MCBTS Metro cell was 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).

Split

Maximum Output Power = 47.25dBm +/- 0.5dB (800 MHz)

Maximum Output Power = 47.25dBm +/- 0.5dB (1900 MHz)

OCNS Channels = 6

TPTL = -6.

Refer to the section 4.4 of the Project test plan draft document number: stream:00, issue: 01 dated 23 Sept 2002.

#### **3.5.1 TEST PLAN MODE OF OPERATION DEVIATION**

No operation deviations reported by the client.

### **3.6 PASS / FAIL CRITERIA**

The pass/fail criteria is defined as the Radiated Emissions limits specified in FCC Part 22. The standard limits are described in each appendices of this report.

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#### 4. SUPPORT EQUIPMENT

The following equipment were used to support the EUT and not verified by Sanmina-SCI. The support equipment (Digital Rack) was isolated from the Radio rack in the shielded enclosure below the test site and dummy loads were used to terminate the DPM Main ANT Port D6 and Diversity ANT Port.

**Table 7 – Support Equipment used during Radiated Emissions testing**

<b>Module Description</b>		<b>Quantity</b>	<b>PEC Code</b>	<b>Serial Number</b>	<b>Verified</b>
GPST M Slot 2 Bottom Shelf	GPS	1	NTGS50AA P4	NNTM74TW0010	<input type="checkbox"/>
Control Module Slot 4	CM	2	NTGS40AA 97	NNTM5357CGFT	<input type="checkbox"/>
Control Module Slot 5			NTGS40AA 34	NNTM533MPBB8	<input type="checkbox"/>
CORE Slot 6			NTGS40AA 37	NNTM533MNG78	<input type="checkbox"/>
CORE Slot 7			NTGS40AA 40	NNTM533MUF16	<input type="checkbox"/>
Channel Element Module (Upper Shelf)	CEM	6			<input type="checkbox"/>
CEM Slot 1			NTGS60BA 80	NNTM5357YCHB	<input type="checkbox"/>
CEM Slot 2			NTGS60BA 78	NNTM5357H4BF	<input type="checkbox"/>
CEM Slot 3			NTGS60BA 73	NNTM533M1365	<input type="checkbox"/>
CEM Slot 4			NTGS60BA 76	NNTM53406QTY	<input type="checkbox"/>
CEM Slot 5			NTGS60BA 77	NNTM5340832L	<input type="checkbox"/>
CEM Slot 6			NTGS60BA 73	NNTM533MUMDQ	<input type="checkbox"/>
Shelf			NTGS20AA 09	SNMN53002T2K	<input type="checkbox"/>
Frame			NTGS54BA 12	SNMN53002UGJ	<input type="checkbox"/>
Breaker Panel			NTGS47AB 05	SNMN53002PE8	<input type="checkbox"/>
RF Dummy Loads (150 W)		6	N/A	N/A	<input type="checkbox"/>

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## **APPENDICES**

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## **APPENDIX A: TEST PLAN DEVIATION LOG**

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Emissions Test Report

-48V MTRM – 800 MHz

Deviation Number	Time & Date	Reference to Test Plan	Deviation from Standard	Description and Justification of Deviation	Core Standard Affected	Approval
1	12 Sept, 02	Section 3.0 Project Test plan draft document stream:00 Issue:01, Dated 23 Sept, 2002	No	Three unpowered 24V MFRM's remained in the configuration during testing as requested by the client.	FCC Part 22	As per Customer request during the test
2	24 Sept, 02	Section 3.1.1.2 of the Project Test plan draft document stream:00 Issue:01, Dated 23 Sept, 2002	No	Three sets of unpowered 800MHz TRM, DPM, and PAMs remained in the radio rack during testing as opposed to the six powered sets defined in the test plan.  The above EUT configurations as requested to test by the client.	FC Part 22	As per Customer request during the test

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Page 17 of 33

Nov 15, 2002

## APPENDIX B: MTRM 800MHz RADIATED EMISSIONS 30MHz – 1GHz PART 22

### B.1. Reference Standard & Test Basis

Reference Standard	ANSI C 63.4: ITE Radio Disturbance Characteristics.
Test Basis	FCC CFR 47 Part 22:ITE Radio Disturbance Characteristics. Limits and Methods of Measurement
Test Method	Sanmina-SCI Radiated Emissions Signal Substitution Method 30MHz-20GHz Revision 1.0.

### B.2. Test Specifications

FCC Part 22		
Frequency	ERP Limit	Theoretical Peak Limit @ 10 meters*
MHz	dBm	dB $\sigma$ V/m
30MHz – 1 GHz	-13	73.90

\* Theoretical field strength based on a dipole

### B.3. Measurement Uncertainty

Radiated Emissions 30MHz – 1GHz	Measurement Uncertainty	Expanded Uncertainty (K=2)
(dB)	+2.15/-2.19	+4.29/-4.37
Radiated Emissions Signal Substitution 30MHz – 1GHz	Measurement Uncertainty	Expanded Uncertainty (K=2)
	+/-2.74	+/-5.49

### B.4. Deviations

#### From Standard

None.

#### From Method

None.

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**B.5. Measurement Equipment**

Radiated Emissions Signal Substitution 30MHz – 1GHz

Description	Type/Model	Manufacturer	Serial #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>					
Bilog Antenna	CBL 6111B	Chase	40500566	12 Mar 03	12 Mar 02
Mast Controller	2090	EMCO	40500188	N/A	N/A
Multi Device Controller TT1 (Turntable)	2090	EMCO	40500197	N/A	N/A
RF Cable East range	Ferrite bead loaded cable	Suhner Succoflex	40500650	04 Sept 03	04 Sept 02
RF Cable from Bulkhead to LNA	Succoflex 103	Suhner Succoflex	35200/3	04 Sept 03	04 Sept 02
Adjustable Dipole Antenna Set	3121C	EMCO	9611-1233	04 Mar 03	04 Mar 02
<b>CONTROL ROOM</b>					
ESMI	1032.5510.23	Rohde & Schwarz	40500153/15 4	11 Jan 03	11 Jan 02
Amplifier	HP-8447F OPT H64	Hewlett Packard	40500228	04 Sept 03	04 Sept 02
Switch Matrix Controller	SMC-002	TDL	40500189	N/A	N/A

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-48V MTRM – 800MHz

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

#### B.6. Test Setup Special Considerations

None

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### B.7. Test Results Summary

#### FCC Part 22

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

	Project Name: MTRM CR P2 Model: Indoor Metrocel Comments:				Tester: Carlos Celarie Test ID: RB02-10M-2002-040		
Standard	FCC Part 22		Measurement Distance	10	Meters		
Antenna	Frequency	AF	CF	Detector	Measured Value	Corrected Value	Theoretical Limit
	MHz	dB/m	dB		dBuV	dBuV/m	dBuV/m
2261 RX BiCon Hpol	63.9961	6.00	-26.25	Peak	46.73	26.48	73.90
2261 RX BiCon Hpol	147.9959	10.99	-25.51	Peak	44.14	29.62	73.90
2261 RX BiCon Hpol	157.2907	10.38	-25.43	Peak	40.76	25.71	73.90
2261 RX BiCon Hpol	186.5779	8.78	-25.15	Peak	41.98	25.61	73.90
2261 RX BiCon Hpol	202.5935	8.90	-24.99	Peak	41.11	25.02	73.90
2261 RX BiCon Vpol	64.3956	6.40	-26.25	Peak	46.93	27.08	73.90
2261 RX BiCon Vpol	67.5801	7.00	-26.22	Peak	46.6	27.38	73.90
2261 RX BiCon Vpol	151.1838	10.50	-25.48	Peak	42.61	27.63	73.90
2261 RX BiCon Vpol	157.2695	10.60	-25.43	Peak	40.58	25.75	73.90
2261 RX BiCon Vpol	211.2061	10.38	-24.92	Peak	43.45	28.91	73.90
Corrected Value: Measured Value + AF + CF				AF: Antenna Factors & CF: Correction Factors (LNA Gain + Cable Loss)			
Notes: Positive Margin indicates a pass							

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**Substitution Data 30MHz – 1GHz**

		Project Name: MTRM-CR Phase 2		Tester: Jacky Wong		Test ID:		
		Model: MTRM-CR Phase 2						
		Comments: Substitution Measurements						
		FCC Part 22			10M Distance			
Frequency (MHz)	Polarization (V/H)	Uncorrected Substitution	Uncorrected Peak Measure level	Signal Generator	Cable factor	Antenna Gain	Effective Radiated Power (E.R.P.)	E.R.P Limit
		dBuV	dBuV	dBm	dB	dB	dBm	dBm
63.9961	H	46.73	46.90	-65.10	-0.98	1.24	<b>-64.85</b>	-13 51.85
147.9959	H	44.14	41.34	-69.00	-1.50	1.80	<b>-68.70</b>	-13 55.70
157.2907	H	40.76	40.35	-70.20	-1.53	1.73	<b>-70.01</b>	-13 57.01
186.5779	H	41.98	41.70	-71.30	-1.67	1.80	<b>-71.17</b>	-13 58.17
202.5935	H	41.11	40.83	-73.50	-1.74	1.80	<b>-73.44</b>	-13 60.44
64.40	V	46.93	46.62	-68.90	-0.99	1.14	<b>-68.75</b>	-13 55.75
67.58	V	46.60	46.42	-67.10	-1.01	1.15	<b>-66.96</b>	-13 53.96
151.18	V	42.61	42.74	-65.10	-1.51	1.81	<b>-64.80</b>	-13 51.80
157.27	V	40.58	40.53	-69.20	-1.53	1.32	<b>-69.42</b>	-13 56.42
211.21	V	43.45	43.63	-64.50	-1.78	1.21	<b>-65.07</b>	-13 52.07

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

Note: Positive Margin indicates a Pass.

**B.8. Observations**

None.

**B.9. Deviations from Normal Operating Mode**

None

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### **B.10. Sample Calculation**

Emission Level = Measured Level + Correction Factors

Margin = Limit – Emission Level

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

Example

**P=20w**

ERP Limit

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

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

Example

**P= -13dBm = 0.00005w**

**D= 10m**

Peak Limit

$$= 120 + 20\log(\text{SQRT } (49.2 * 0.00005)) / 10 \\ = 73.9 \text{ dBuV/m}$$

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

Example

**P= -13dBm = 0.00005w**

**D= 3m**

Peak Limit

$$= 120 + 20\log((\text{SQRT } (49.2 * 0.00005)) / 3) \\ = 84.3$$

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

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

### **B.12. Signature**

Signature/Date:



Name:

**Shankara Malwes**  
EMC Technologist

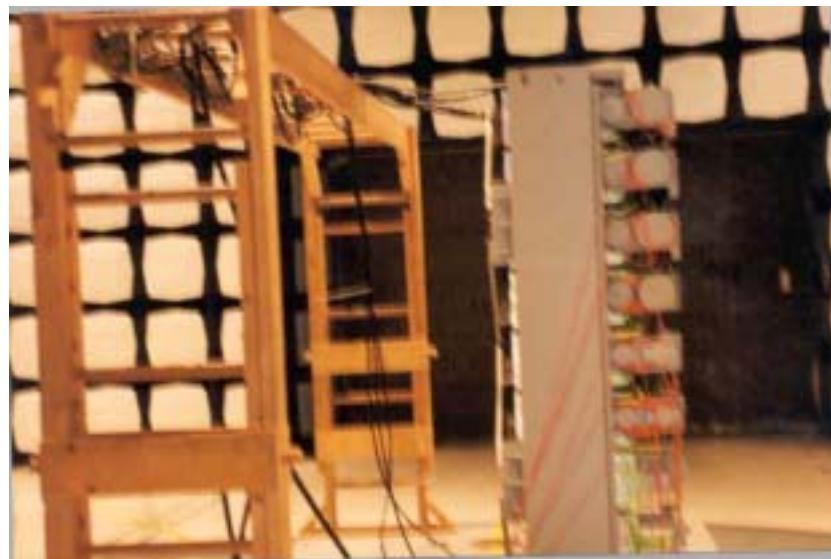
Function:

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Picture 1: Front view of the EUT towards the Antenna



Picture 2: Side of the EUT

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## APPENDIX C: MTRM 800MHz RADIATED EMISSIONS 1 – 10GHz PART 22

### C.1. Reference Standard & Test Basis

Reference Standard	ANSI C 63.4: ITE Radio Disturbance Characteristics.
Test Basis	FCC CFR 47 Part 22:ITE Radio Disturbance Characteristics. Limits and Methods of Measurement
Test Method	Radiated Emissions Manual Method 1GHz-18GHz. EMC Test Method E006R4 Radiated Emissions Signal Substitution Method 30MHz-20GHz. (EMC Test Method 11.0)

### C.2. Test Specifications

FCC Part 22 Radiated Electric Field @ 3m West Site

FCC Part 22		
Frequency MHz	ERP Limit dBm	Theoretical Peak Limit @ 3 meters* dB $\circ$ V/m
1GHz – 10GHz	-13	84.3

\* Theoretical field strength based on a dipole

### C.3. Measurement Uncertainty

Radiated Emissions 1GHz-18GHz (dB)	Measurement Uncertainty	Expanded Uncertainty (K=2)
	+3.48/-3.51	+6.96/-7.02
Radiated Emissions 1GHz-20GHz Signal Substitution (dB)	Measurement Uncertainty	Expanded Uncertainty (K=2)
	+/-2.74	+/-5.49

### C.4. Deviations

#### From Standard

None

#### From Test Plan

All Test Plan deviations are noted in Appendix A, deviation number 1.

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**C.5. Measurement Equipment**

Description	Type/Model	Manufacturer	Serial #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>					
Horn Antenna 1GHz-10GHz (TX)	3115	EMCO	40500087	19 Nov 02	19 Nov 01
Horn Antenna 1GHz-5.95GHz (Rx)	3115	EMCO	40500090	21 Jun 03	21 Jun 02
Standard Gain Horn 5.95GHz-8.2GHz	3160-06	EMCO	40500176	N/A	N/A
Standard Gain Horn 8.2GHz-12.5GHz	3160-07	EMCO	40500177	N/A	N/A
High pass filter	11SH10-3860	K&L	1/19900-010	N/A	N/A
Spectrum Analyzer 9KHz –40GHz	FSEK	Rohde & Schwarz	40500210	12 Mar 03	12 Mar 02
Step Attenuator/Switch	HP11713A	HP	40500014/40500276	N/A	N/A
DC Power Supply for LNA	LXO 30-2	Xantrex	40500211	N/A	N/A
Miteq LNA	JSD000121	Miteq	830620 in box	24 Apr 03	24 Apr 02
HPIB Extender	HP37204	HP	40500195	N/A	N/A
Cable from Antenna to LNA	101PEA	Succoflex	1713/1PEA	18 Apr 03	18 Apr 02

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<b>CONTROL ROOM</b>					
Win 2000 PC with FSEK Manual control software loaded	N/A	N/A	N/A	N/A	N/A
Signal Generator 10MHz – 40GHz	SMP04	Rohde & Schwarz	40500125	27 Mar 03	27 Mar 02
HPIB Extender	HP37204	HP	40500193	N/A	N/A
Mast Controller	2090	EMCO	40500184	N/A	N/A
Multi Device Controller TT1 (Turntable)	2090	EMCO	40500197	N/A	N/A
<b>VERIFICATION EQUIPMENT</b>					
Horn Antenna (TX) 1GHz-18GHz	3115	EMCO	40500088	N/A	N/A
Signal Generator 10MHz – 40GHz	SMP04	Rohde & Schwarz	40500125	27 Mar 03	27 Mar 02
Cable from RX antenna to 3M center bulk head in 10M Chamber	104	Succoflex	116558/4	18 Apr 03	18 Apr 02
Cable from 3M center bulk head to Control room	104	Succoflex	40500627	18 Apr 03	18 Apr 02
Cable from Control room bulk head TO Signal Generator	104	Succoflex	40500626	18 Apr 03	18 Apr 02

#### C.6. Test Setup Special Considerations

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

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### C.7. Test Results Summary

#### FCC Part 22

#### Peak Scan 1GHz - 10GHz (Horizontal Polarization)

 <p>Project Name: MTRM-CR Phase 2 Model: MTRM-CR Phase 2 Comments:</p>	Project Name: MTRM-CR Phase 2		Tester: Shankara Malves							
	Test ID: RB03-10M-2002-011									
Horizontal Polarization										
Standard		FCC Part22			3 meters					
Antenna	Start Frequency	Stop Frequency	Frequency	AF	CL + LNA	Detector	Peak Measured Value	Corrected Value	Theoretical Limit	Theoretical Margin
	MHz	MHz	MHz	dB/m	dB		dB/W	dB/W/m	dB/m	dB
3115-Hpol	1000	2700	1752.41	29.21	-62.51	PK	89.53	55.23	84.30	29.07
3115-Hpol	2700	5950	2635.72	30.90	-60.50	PK	90.83	61.23	84.30	23.07
3115-Hpol	2700	5950	4042.03	34.32	-58.19	PK	74.87	51.00	84.30	33.30
3160-06	5950	8200	7906.26	30.00	-51.18	PK	71.76	50.58	84.30	33.72
3160-07	8200	10000	8784.25	33.40	-50.14	PK	71.86	55.12	84.30	29.19
3160-07	8200	10000	9731.34	33.49	-48.78	PK	70.54	55.25	84.30	29.05
Corrected Value: Measured Value + AF + CL + LNA						AF: Antenna Factors & CL: Cable Loss & LNA: Amplifier				
Notes:										
(1) Positive Margin indicates a pass										
(2) Corrected Value was measured by FSEK Virtual Instrument with all factors loaded										

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**Peak Scan 1GHz – 10GHz (Vertical Polarization)**

 <p>Project Name: MTRM-CR Phase 2 Model: MTRM-CR Phase 2 Comments:</p>							Tester: Shankara Malves	Test ID: RE03-10M-2003-011		
							Vertical Polarization			
Standard		FCC Part22		3 meters						
Antenna	Start Frequency	Stop Frequency	Frequency	AF	CL + LNA	Detector	Peak Measured Value	Corrected Value	Theoretical Limit	Theoretical Margin
	MHz	MHz	MHz	dBm	dB		dBuV	dBuV/m	dBuV/m	dB
3115 Vpol	1000	2700	1756.51	27.87	-62.53	PK	97.24	62.59	84.30	21.71
3115 Vpol	1000	2700	2635.57	30.70	-60.50	PK	100.90	71.10	84.30	13.20
3115 Vpol	2700	5950	5263.99	35.52	-56.26	PK	74.24	53.50	84.30	30.80
3160-06	5950	8200	8062.67	30.00	-50.98	PK	72.05	51.07	84.30	33.23
3160-07	8200	10000	8783.08	33.40	-50.14	PK	70.81	54.07	84.30	30.23
3160-07	8200	10000	9410.62	33.40	-49.25	PK	70.96	55.11	84.30	29.19

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

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

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**Substitution Data 1GHz – 10GHz**

 <b>Sanmina</b> Product Integrity Laboratory V2.5	<b>Project Name:</b> MTRM-CR Phase 2 <b>Model:</b> MTRM-CR Phase 2 <b>Comments:</b> Substitution Measurement Data				<b>Tester:</b> Jacky Wong <b>Test ID:</b>				
	Frequency (MHz)	Polarization (V/H)	Emission level dBuV/m	Corrected Substitution measure level dBuV/m	Signal Generator dBm	Cable factor dB	Antenna Gain dB	Effective Radiated Power (E.R.P.) dBm	E.R.P Limit dB
	1752.41	H	55.23	55.54	-53.60	-5.31	6.95	<b>51.96</b>	-13 38.96
	2635.72	H	61.23	61.42	-48.30	-6.57	7.96	<b>46.91</b>	-13 33.91
	4042.03	H	51.00	51.39	-61.30	-8.27	8.04	<b>61.53</b>	-13 48.53
	7906.26	H	50.58	50.86	-56.50	-11.86	10.60	<b>57.76</b>	-13 44.76
	8784.25	H	55.12	55.13	-51.80	-12.63	10.47	<b>53.96</b>	-13 40.96
	9731.34	H	55.25	55.50	-53.60	-13.50	10.71	<b>56.39</b>	-13 43.39
	1756.51	V	62.59	62.42	-43.70	-5.32	6.95	<b>42.07</b>	-13 29.07
	2635.57	V	71.10	71.39	-36.30	-6.57	7.92	<b>34.95</b>	-13 21.95
	5263.99	V	53.50	53.57	-58.40	-9.52	9.24	<b>58.68</b>	-13 45.68
	8062.67	V	51.07	51.52	-59.90	-12.02	10.63	<b>61.30</b>	-13 48.30
	8783.08	V	54.07	54.60	-53.60	-12.62	8.43	<b>57.79</b>	-13 44.79
	9410.62	V	55.11	55.44	-52.50	-13.24	10.41	<b>55.32</b>	-13 42.32

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

Note: Positive Margin indicates a Pass.

The EUT is in compliance with the limits as specified in the standard FCC Part 22.

**C.8. Observations.**

None

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**C.9. Deviations from Normal Operating Mode**

None

**C.10. Sample Calculation**

Emission Level = Measured Level + Correction Factors

Margin = Limit – Emission Level

Effective Radiated Power (ERP) = signal generator + cable factor + Antenna Gain

**C.11. Test Data and Pictures**

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

**C.12. Signature**

Signature/Date:



Digital signature details:  
Shankara Malwes  
D.N. 10000000000000000000000000000000  
o=Sanmina-sci  
c=CA  
Date: 2002.11.15  
18:09:44 -07'00'

Name:

Shankara Malwes

Function:

EMC Technologist

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Picture 3: Signal Substitution measurement setup at 3M

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**80169**

## **END OF DOCUMENT**

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