



# SANMINA-SCI

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## Radiated Emissions Test Report 30MHz – 18GHz

Lab Project Number- 01NOR013

MTRM 1900MHz (CR) Radio Testing

**Revision: 3.0**

**Date: March 12, 2002**

**Prepared for:** Sanmina Design Solutions on behalf of Nortel Networks

**Author:** Jacky Wong  
EMC Tools Developer

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**Approved by:** Duane Friesen  
Technical Advisor

Matthew Buxton  
PI Laboratory Manager

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**PI Project Number: PI29889**

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Summary

Sanmina-SCI

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

Accreditation Numbers: FCC 101386  
IC 46405-3978

Performed For: Nortel Networks Inc.  
5111 47<sup>th</sup> Street N.E  
Calgary, Alberta T3J 3R2  
Tel: (403) 769-2000

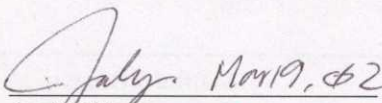
EUT Name: Metrocell Radio Rack with 3MFRM  
Model: MTRM CR 1900MHz

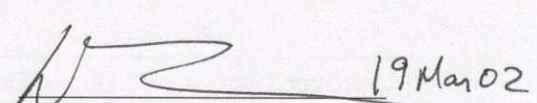
Test Result Summary

Appendix	Core Standard	Sanmina Test Case	Description & Range	Deviation From Standard	Deviation From Test Plan	Pass / Fail	Notes
	FCC Part 24.238		Spurious Radiated Emissions 30MHz-1GHz				
B		Method No. 2.0A	Radiated Emissions 30MHz - 1GHz	None	No*	Pass	None
B		Method No. 2.0	Radiated Emissions 30MHz - 1GHz	None	No*	Pass	None
B		Method No. 11	Substitution Measure	None	No*	Pass	None
	FCC Part 24.238		Spurious Radiated Emissions 1GHz-20GHz				
C		Method No. 29	Radiated Emissions 1GHz - 20GHz	None	No*	Pass	None
C		Method No. 11	Substitution Measure	None	No*	Pass	None

\* Note: Test Plan deviations are listed in Appendix A.

The Pass/Fail column does not imply compliance of the EUT to the core standard in its entirety.

Tested By:   
Jacky Wong  
EMC Tools Developer

Checked By:   
Duane Friesen, CET  
EMC Technical Advisor

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## REGISTER OF REVISIONS

Issue	Date	Description of Revisions
1.0	January 16, 2002	Initial Release
2.0	February 19, 2002	Update Module list Update Cable list Update Equipment list
3.0	March 12, 2002	Corrected Table Unit Modified Data Table Removed Plots

## 1. INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is to describe the tests that will enable Nortel's MTRM 1900MHz CR System to comply with Part 24.238 of the FCC Rules and Regulations for Type Acceptance/Certification prior to market deployment. The system under test was powered by -48VDC.

### 1.2 ABBREVIATIONS AND DEFINITIONS

No abbreviation and definition are defined in the test plan

### 1.3 REFERENCES

Standards, test methods and supporting documentation references are noted in section 1.1 and 1.2 of the test plan.

## 2. TEST LOG

Appendix	Test Case	Start	End
Date Received: 20Dec01			
B	Radiated Emissions (30MHz – 1GHz) – MTRM CR 1900MHz	04Dec01	11Jan02
C	Radiated Emissions (1GHz – 18GHz) – MTRM CR 1900MHz	09Jan02	14Jan02
Date Shipped: N/A			

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### 3. EUT

#### 3.1 CONFIGURATION

Refer to section 2 of the project test plan and each specific appendix for more details on the configuration of the EUT.

**Table 1 –Description of EUT**

<b>Name</b>	MTRM 1900MHz (CR) Radio Testing
<b>Model #</b>	MTRM CR 1900MHz
<b>Revision #</b>	N/A
<b>Physical Description</b>	A Metrocell Radio Rack with 3 MFRM units
<b>Size</b>	N/A
<b>Weight</b>	N/A
<b>Power</b>	2 feeds of –48VDC (current draw: typical 25 A/ feed)
<b>Functional Description</b>	The EUT had each MFRM set to operate on one carrier/one frequency. The carrier frequencies were different for each MFRM. All MFRMs were set to operate on the same sector (beta)

Module List was provided by Nortel Networks.

**Table 2 - Module List**

Qty	Module Description	PEC	Product Code	Verified
1	DPM	NTGS53JA 05	CLWVCC100A04	<input type="checkbox"/>
1	MTRM	NTGY102A Q8	NNTM533GQDVP	<input type="checkbox"/>
1	MPAM	NTGY80AB 03	NNTM533P0V7Y	<input type="checkbox"/>
1	FAM	NTGY60AE 01	NNTM532VW89F	<input type="checkbox"/>
1	DPM	NTGS53JA 05	CLWVPP201TV7	<input type="checkbox"/>
1	MTRM	NTGY107A Q8	NNTM533GQ49U	<input type="checkbox"/>
1	MPAM	NTGY80AB 03	NNTM532TMKGP	<input type="checkbox"/>
1	FAM	NTGY60AE 01	NNTM532VW84A	<input type="checkbox"/>
1	DPM	NTGS53GA 05	CLWVMM10092G	<input type="checkbox"/>
1	MTRM	NTGY10ZA Q8	NNTM533GQ4AV	<input type="checkbox"/>
1	MPAM	NTGY80AB 03	NNTM532P0MP8	<input type="checkbox"/>
1	FAM	NTGY60AE 01	NNTM532VW87D	<input type="checkbox"/>
1	FRAME	NTGS65AA D6	DEVP01010848	<input type="checkbox"/>
1	CONTROL MODULE	NTGS40AA 48	NNTM5357CDFP	<input type="checkbox"/>
1	CORE MODULE	NTGS30AA 47	NNTM5359PMQM	<input type="checkbox"/>

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Qty	Module Description	PEC	Product Code	Verified
1	GPSTM	NTGS50AA 08	NNTM74TM2C35	<input type="checkbox"/>
1	CEM	NTGS60BA 78	NNTM5358DMK5	<input type="checkbox"/>
1	CEM	NTGS60BA 74	NNTM5340693R	<input type="checkbox"/>
1	CEM	NTGS60BA 77	NNTM534083J4	<input type="checkbox"/>

Note: This list was provided by Nortel Networks.

Indicates the Module has been checked by Sanmina-SCI.

### 3.1.1 CONFIGURATION DEVIATIONS

None

### 3.2 POWER

Refer to section 4 of the project test plan for a more detailed description of the power used.

### 3.2.1 POWER DEVIATIONS

None

### 3.3 CABLES

No cables are defined in the test plan.

**Table 3 – Cable List**

Ref.	Description	Model	Qty	Routing	Length (m)	Shield Type	Backshe II Material	Verified
1	EUT power	NTGS8082	2	EUT to – 48DC power supply	9.1	None	None	<input type="checkbox"/>
2	RF Cable	None	7	EUT to Bulkhead	10	None	None	<input type="checkbox"/>
3	Fiber Optic Cable	None	1	Bulkhead to SmartBits	-	Foil	None	<input type="checkbox"/>
4	Alarm Cable	NTGS3518	1	EUT to ground DR	30	None	None	<input type="checkbox"/>

Note: This list was supplied by Nortel Networks. Please refer to Appendix E.3.: Supplementary Information.

Indicates the Cable has been checked by Sanmina-SCI.

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CABLE LIST DEVIATIONS

None

**3.4 EUT FREQUENCIES**

No frequency list was provided prior to testing.

3.4.1 FREQUENCY LIST DEVIATIONS

Refer to section Appendix E: Supplementary Information for frequencies provided by Nortel Networks on March 6, 2002.

**3.6 MODE OF OPERATION**

Refer to section 3 of the project test plan for a more detailed description of the EUT mode of operation.

3.6.1 MODE OF OPERATION DEVIATION

None

**3.7 PASS / FAIL CRITERIA**

No pass/ fail criteria is described in the project test plan.

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#### 4. SUPPORT EQUIPMENT

No support equipment is defined in the test plan.

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## APPENDICES

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## APPENDIX A: TEST PLAN DEVIATION LOG

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- No Deviations were recorded.

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

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## APPENDIX B: MTRM CR 1900MHz Radiated Emissions 30MHz-1GHz Description and Results.

### B.1. Test Basis

FCC Rules Part 2 section 2.1053 and 2.1057  
FCC CFR 47 Part 24 section 24.238

### B.2. Test Specifications

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

\* Theoretical field strength based on a dipole

### B.3. Test Procedure

EMC Test Method No. 2.0A, Radiated Emissions Automated Method 30MHz – 1GHz Rev 2.0  
EMC Test Method No. 11, Substitution Method

### B.4. Measurement Uncertainty

Method 2.0A +2.52 / -2.56  
Method 11 +2.15 / -2.19

### B.5. Deviations

#### From Standard

There were no deviations from the standard.

#### From Test Plan

All Test Plan deviations are noted in Appendix A.

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**B.6. Test Results**

**FCC Part 24**

**Peak Scan 30MHz – 1GHz (Horizontal Polarization)**

	<b>Project Name:</b> 1900MHz MTRM	<b>Tester:</b> Jacky Wong						
	<b>Model:</b> 1900MHz MTRM	<b>Test ID:</b> RE02-10M-2001-030						
<b>Comments:</b> 1900MHz MTRM (X 3). Digital Rack located under 10 meter chamber - Horizontal								
Standard	FCC Part 24	Measurement Distance	10	meters				
Antenna	Frequency	AF	CF	Detector	Peak Measured Value	Corrected Value	Theoretical Limit	Theoretical Margin
	MHz	dB/m	dB		dBuV	dBuV/m	dBuV/m	dB
2261 RX BiCon Hpol	235.92	10.42	-23.27	Peak	41.16	28.30	73.90	45.60
2261 RX BiCon Hpol	314.72	13.20	-22.82	Peak	38.82	29.20	73.90	44.70
2261 RX BiCon Hpol	471.88	17.66	-23.21	Peak	37.25	31.70	73.90	42.20

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

Notes:  
Positive Margin indicates a pass

Note: Positive Margin indicates a Pass.

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

	<b>Project Name:</b> 1900MHz MTRM	<b>Tester:</b> Jacky Wong						
	<b>Model:</b> 1900MHz MTRM	<b>Test ID:</b> RE02-10M-2001-030						
<b>Comments:</b> 1900MHz MTRM (X 3). Digital Rack located under 10 meter chamber - Vertical								
Standard	FCC Part 24	Measurement Distance	10	meters				
Antenna	Frequency	AF	CF	Detector	Peak Measured Value	Corrected Value	Theoretical Limit	Theoretical Margin
	MHz	dB/m	dB		dBuV	dBuV/m	dBuV/m	dB
2261 RX Bicon Vpol	235.93	10.92	-23.27	Peak	35.19	22.83	73.90	51.07
2261 RX Bicon Vpol	314.58	13.66	-22.82	Peak	38.85	29.69	73.90	44.21
2261 RX Bicon Vpol	471.87	17.40	-23.21	Peak	36.28	30.47	73.90	43.43

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

Notes:  
Positive Margin indicates a pass


Note: Positive Margin indicates a Pass.

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Substitution Data 30MHz – 1GHz

	<b>Project Name:</b> 1900MHz MTRM		<b>Tester:</b> Jacky Wong						
	<b>Model:</b> 1900MHz MTRM		<b>Test ID:</b> RE02-10M-2001-030						
	<b>Comments:</b> 1900MHz MTRM (X 3). Digital Rack located under 10 meter chamber - Substitution Method								
Frequency (MHz)	Polarization (V/H)	Uncorrected Peak Measure level dBuV	Uncorrected Substitution measure level dBuV	Signal Generator dBm	Cable factor dB	Antenna Gain dB	Effective Radiated Power (E.R.P.) dBm	E.R.P Limit dBm	Margin dB
235.92	H	41.16	41.32	-63.80	-1.21	1.35	<b>-63.66</b>	-13	50.66
314.72	H	38.82	38.85	-63.80	-1.58	1.30	<b>-60.28</b>	-13	51.08
471.87	H	37.25	38.07	-60.00	-1.83	3.10	<b>-58.73</b>	-13	45.73
235.93	V	35.19	35.35	-65.00	-1.21	1.35	<b>-64.86</b>	-13	51.86
314.58	V	38.85	38.90	-60.00	-1.58	1.30	<b>-60.28</b>	-13	47.28
471.87	V	36.28	36.64	-59.80	-1.83	3.10	<b>-58.53</b>	-13	45.53

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

Note: Positive Margin indicates a Pass.

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Measurement Equipment  
Radiated Emissions 30MHz – 1GHz

Description	Type/Model	Manufacturer	Serial #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>					
Bilog Antenna	2071	Chase	40500566	Oct. 11, 2002	Oct. 11, 2001
Mast Controller	2090	EMCO	40500184	N/A	N/A
Multi Device Controller TT1 (Turntable)	2090	EMCO	40500183	N/A	N/A
RF Cable	Ferrite bead loaded cable	Suhner Succoflex	FBL-1	Dec. 17, 2002	Dec. 17, 2001
RF Cable	106	Suhner Succoflex	9353/6	Dec. 17, 2002	Dec. 17, 2001
RF Cable	104	Suhner Succoflex	115742	Dec. 17, 2002	Dec. 17, 2001
RF Cable	104	Suhner Succoflex	116567/4	Dec. 17, 2002	Dec. 17, 2001
RF Cable	104	Suhner Succoflex	11576/4	Dec. 17, 2002	Dec. 17, 2001
<b>SUPPORT ROOM</b>					
ESMI	1032.5510.23	Rohde & Schwarz	40500119	Mar. 09, 2002	Feb. 09, 2001
Amplifier	HP-8447F OPT H64	Hewlett Packard	40500228	Mar. 04, 2002	Mar. 04, 2001
Switch Matrix Controller	SMC-002	TDL	40500189	Mar. 04, 2002	Mar. 04, 2001
<b>VERIFICATION EQUIPMENT</b>					
RefRad	4630B	EMCO	40500315	N/A	N/A
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

#### B.7. Deviations from Normal Operating Mode

No deviations from the normal operating mode in the project test plan, are noted in Appendix A of the Test Report.

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**B.8. Test Setup Special Considerations**

None.

**B.9. Sample Calculation**

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

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

Example

$$P = 20\text{w}$$

ERP Limit

$$= 43\text{dBm} - (43 + 10\text{Log}(20)) = -13\text{dBm}$$

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

Example

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

$$D = 10\text{m}$$

Peak Limit

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

**B.10. Test Data and Pictures**

Pictures for Radiated Emissions appear following this page.

**B.11. Signature**

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

Signature/Date:

Name:

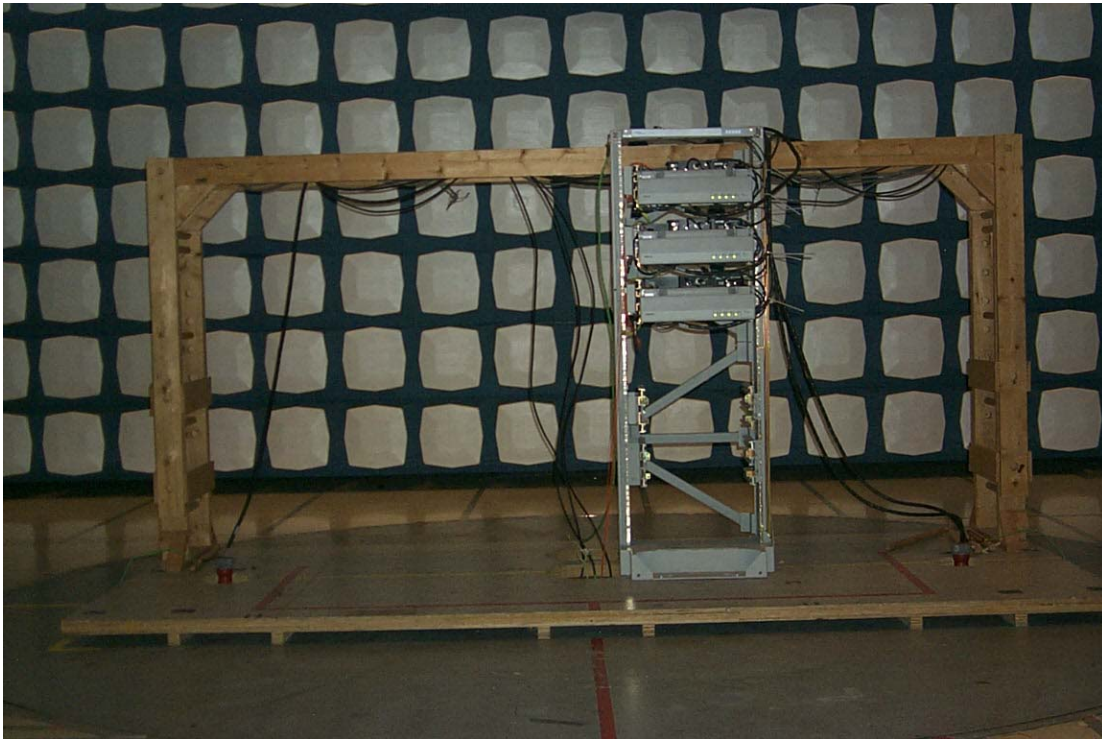
Jacky Wong

Function:

EMC Tools Developer

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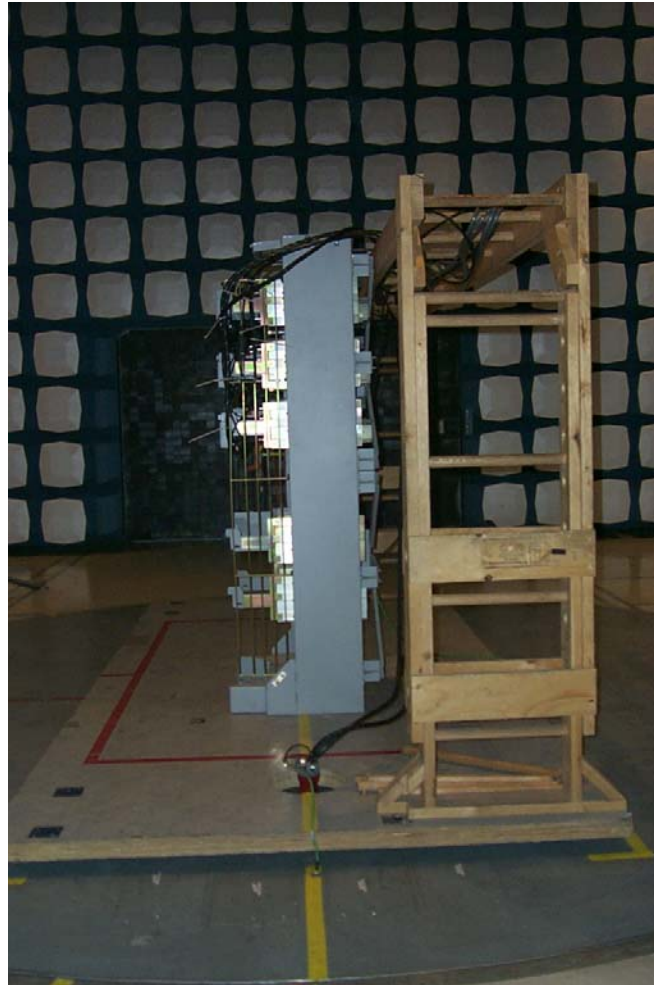


Photograph 1. MTRM CR 1900MHz (Front side of EUT)

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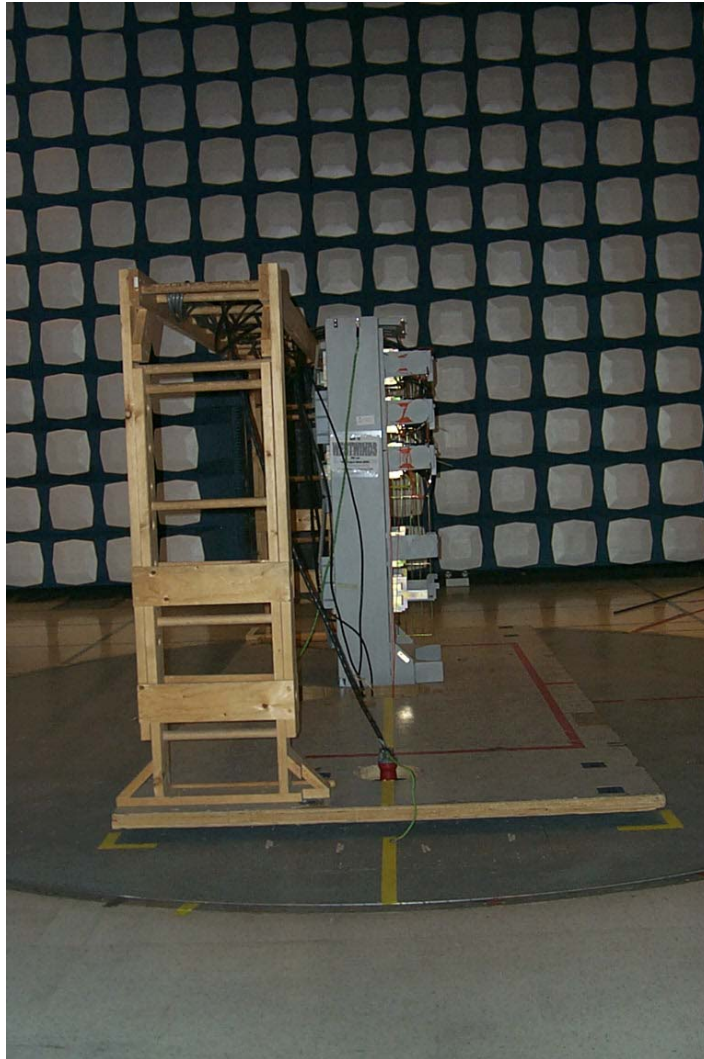
Photograph 2. MTRM CR 1900MHz (Right side of EUT)

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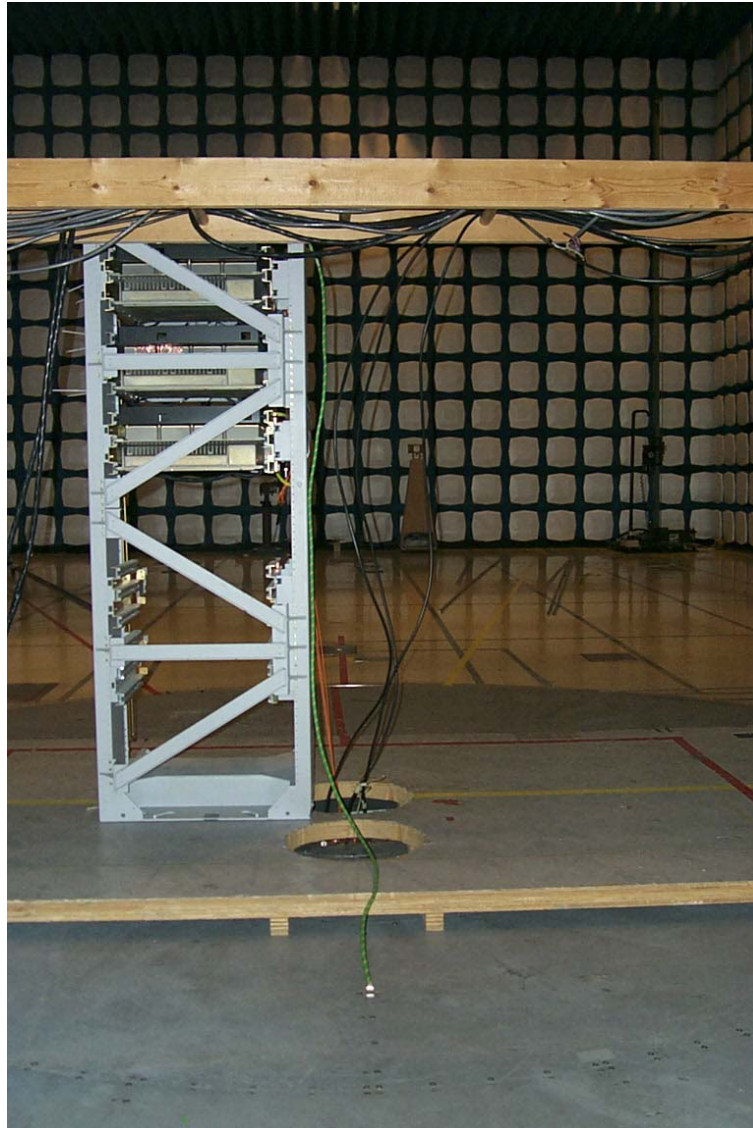




Photograph 3. MTRM CR 1900MHz (Left side of EUT)

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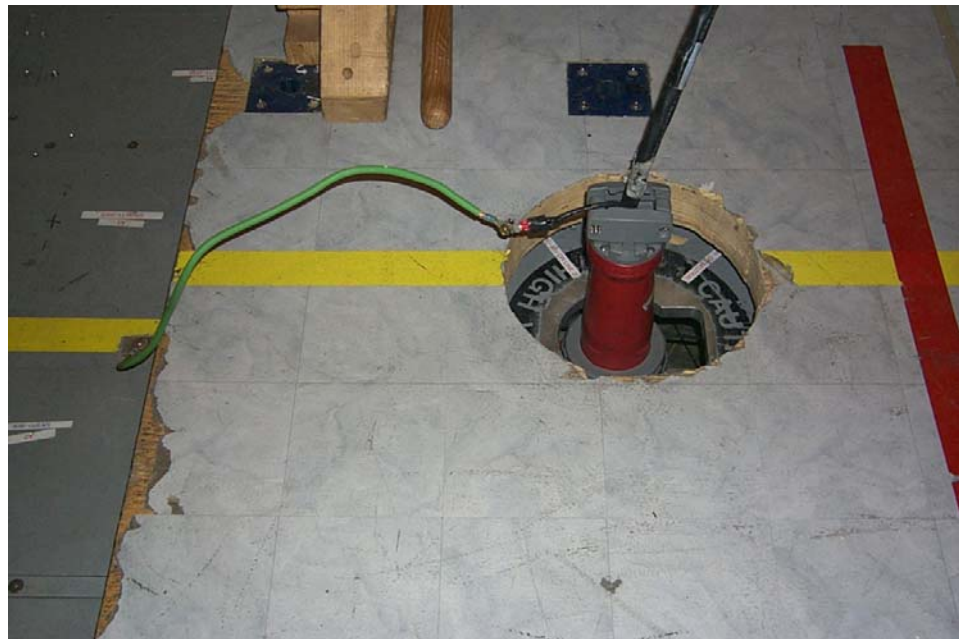
Photograph 4. MTRM CR 1900MHz (Back side of EUT)

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Photograph 4. MTRM CR 1900MHz (Right side of power supply)



Photograph 5. MTRM CR 1900MHz (Left side of power supply)

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## APPENDIX C: MTRM CR 1900MHz. Radiated Emissions 1GHz-18GHz Description and Results

### C.1. Test Basis

FCC Rules Part 2 section 2.1053 and 2.1057

### C.2. Test Specifications

FCC Part 24		
Frequency	ERP Limit	Peak Limit @ 10 meters
MHz	dBm	dBμV/m
1GHz – 18GHz	-13	73.90

\* Theoretical field strength based on a dipole

### C.3. Test Procedure

EMC Test Method No. 29, Radiated Emissions Manual Method 1GHz – 20GHz  
EMC Test Method No. 11, Substitution Method

### C.4. Measurement Uncertainty

Method 29 +2.52 / -2.56  
Method 11 + / -2.74

### C.5. Deviations

#### From Standard

There were no deviations from the standard.

#### From Test Plan

All Test Plan deviations are noted in Appendix A.

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C.6. Test Results

FCC Part 24

Peak Scan 1GHz - 18GHz (Horizontal Polarization)

	<b>Project Name:</b> 1900MHz MTRM		<b>Tester:</b> Jacky Wong							
	<b>Model:</b> 1900MHz MTRM		<b>Test ID:</b> RE03-10M-2002-001							
<b>Comments:</b> 1900MHz MTRM (X 3). Digital Rack located under 10 meter chamber - Horizontal										
Standard		FCC PART 24		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	1966.07	32.18	-62.92	Peak	83.96	53.22	73.90	20.68
EM-6952 Hpol	2000	2600	2497.10	35.38	-62.23	Peak	83.81	56.96	73.90	16.94
EM-6952 Hpol	2600	3000	2607.04	35.42	-62.11	Peak	81.10	54.41	73.90	19.49
EM-6952 Hpol	3000	4000	3875.76	38.35	-60.49	Peak	73.67	51.54	73.90	22.36
EM-6952 Hpol	4000	5000	4913.01	40.16	-59.66	Peak	73.15	53.65	73.90	20.25
EM-6952 Hpol	5000	6000	5813.64	42.73	-58.39	Peak	72.90	57.24	73.90	16.66
EM-6952 Hpol	6000	7000	6661.03	43.00	-56.83	Peak	71.58	57.75	73.90	16.15
EM-6952 Hpol	7000	8000	7751.52	44.49	-55.67	Peak	71.64	60.46	73.90	13.44
EM-6952 Hpol	8000	9000	8817.00	44.69	-54.48	Peak	70.42	60.63	73.90	13.27
EM-6952 Hpol	9000	10000	9689.40	44.91	-53.75	Peak	70.23	61.39	73.90	12.51
EM-6952 Hpol	10000	11000	10946.06	47.07	-53.49	Peak	70.78	64.35	73.90	9.55
EM-6952 Hpol	11000	12000	11627.28	47.16	-54.00	Peak	72.40	65.56	73.90	8.34
EM-6952 Hpol	12000	13000	12747.41	48.50	-54.06	Peak	72.38	66.82	73.90	7.08
3160-08	13000	14000	13565.16	37.10	-54.33	Peak	72.72	55.49	73.90	18.41
3160-08	14000	15000	14056.49	37.10	-54.46	Peak	72.92	55.56	73.90	18.34
3160-08	15000	16000	15503.04	37.20	-54.19	Peak	73.48	56.49	73.90	17.41
3160-08	16000	17000	16963.64	37.20	-53.53	Peak	72.76	56.43	73.90	17.47
3160-08	17000	18000	17440.92	37.20	-54.09	Peak	73.67	56.78	73.90	17.12

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 FSEK Virtual Instrument with all factors loaded

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Peak Scan 1GHz – 18GHz (Vertical Polarization)



**Project Name:** 1900MHz MTRM  
**Model:** 1900MHz MTRM  
**Comments:** 1900MHz MTRM (X 3). Digital Rack located under 10 meter chamber - Vertical  
**Tester:** Jacky Wong  
**Test ID:** RE03-10M-2002-001

Standard FCC PART 24 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	1986.84	32.30	-62.93	Peak	83.98	53.35	73.90	20.55
EM-6952 Vpol	2000	2600	2578.97	35.72	-62.25	Peak	84.17	57.63	73.90	16.27
EM-6952 Vpol	2600	3000	2601.00	35.72	-62.01	Peak	81.49	55.20	73.90	18.70
EM-6952 Vpol	3000	4000	3871.74	38.54	-60.52	Peak	74.38	52.40	73.90	21.50
EM-6952 Vpol	4000	5000	4627.25	39.38	-60.05	Peak	73.95	53.28	73.90	20.62
EM-6952 Vpol	5000	6000	5807.61	42.75	-58.44	Peak	73.43	57.73	73.90	16.17
EM-6952 Vpol	6000	7000	6814.80	42.84	-56.74	Peak	71.52	57.62	73.90	16.28
EM-6952 Vpol	7000	8000	7743.48	44.53	-55.71	Peak	71.64	60.46	73.90	13.44
EM-6952 Vpol	8000	9000	8981.99	45.42	-54.40	Peak	70.71	61.74	73.90	12.16
EM-6952 Vpol	9000	10000	9679.35	44.82	-53.63	Peak	70.27	61.46	73.90	12.44
EM-6952 Vpol	10000	11000	10809.64	46.91	-53.20	Peak	70.50	64.21	73.90	9.69
EM-6952 Vpol	11000	12000	11615.22	47.18	-53.95	Peak	72.87	66.10	73.90	7.80
EM-6952 Vpol	12000	13000	12435.15	48.63	-53.76	Peak	71.67	66.54	73.90	7.36
3160-08	13000	14000	13551.09	37.10	-54.14	Peak	72.23	55.19	73.90	18.71
3160-08	14000	15000	14909.08	37.10	-53.75	Peak	71.77	55.12	73.90	18.78
3160-08	15000	16000	15486.96	37.20	-53.82	Peak	72.82	56.20	73.90	17.70
3160-08	16000	17000	16297.34	37.20	-53.14	Peak	72.84	56.90	73.90	17.00
3160-08	17000	18000	17422.83	37.20	-53.81	Peak	73.51	56.90	73.90	17.00

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 FSEK Virtual Instrument with all factors loaded

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Substitution Data 1GHz – 18GHz

	<b>Project Name:</b> 1900MHz MTRM	<b>Tester:</b> Jacky Wong
	<b>Model:</b> 1900MHz MTRM	<b>Test ID:</b> RE03-10M-2002-001
<b>Comments:</b> 1900MHz MTRM (X 3). Digital Rack located under 10 meter chamber - Substitution Method		

Frequency (MHz)	Polarization (V/H)	Corrected 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 dBm	Margin dB
3875.76	H	51.54	51.17	-55.00	-1.55	7.95	<b>-48.60</b>	-13	35.60
5813.64	H	57.24	57.07	-49.00	-2.00	8.96	<b>-42.04</b>	-13	29.04
7751.52	H	60.46	60.50	-44.00	-2.31	10.05	<b>-36.26</b>	-13	23.26
9689.94	H	61.39	61.06	-45.50	-2.62	10.30	<b>-37.82</b>	-13	24.82
11627.28	H	65.56	65.67	-40.00	-3.36	10.47	<b>-32.89</b>	-13	19.89
13565.16	H	55.49	55.30	-52.00	-2.99	12.84	<b>-42.15</b>	-13	29.15
15503.04	H	56.49	56.51	-50.00	-2.96	11.51	<b>-41.45</b>	-13	26.45
17440.92	H	56.78	56.31	-50.00	-3.55	13.50	<b>-40.05</b>	-13	27.05
3871.74	V	52.40	52.18	-54.50	-1.55	8.00	<b>-48.05</b>	-13	35.05
5807.61	V	57.73	57.54	-51.00	-2.00	9.16	<b>-43.84</b>	-13	30.84
7743.48	V	60.46	60.30	-44.20	-2.31	10.04	<b>-36.47</b>	-13	23.47
9679.35	V	61.46	61.87	-45.00	-2.59	10.36	<b>-37.23</b>	-13	24.23
11615.22	V	66.10	66.36	-39.50	-3.41	10.72	<b>-32.19</b>	-13	19.19
13551.09	V	55.19	55.04	-54.00	-3.00	12.66	<b>-44.34</b>	-13	31.34
15486.96	V	56.20	56.64	-51.00	-2.99	11.20	<b>-42.79</b>	-13	29.79
17422.83	V	56.90	56.69	-49.00	-3.62	12.29	<b>-40.33</b>	-13	27.33

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 1GHz – 18GHz

Description	Type/Model	Manufacturer	Serial #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>					
Antenna	EM6592-314	Electro-metrics	40500395	June 21, 2002	N/A
Horn Antenna	3160-08	EMCO	45000178	N/A	N/A
Mast Controller	2090	EMCO	9711-1266	N/A	N/A
Multi Device Controller TT1 (Turntable)	2090	EMCO	40500183	N/A	N/A
RF Cable	Ferrite bead loaded cable	Suhner Succoflex	FBL-1	Dec. 19, 2002	Dec. 19, 2001
RF Cable	106	Suhner Succoflex	9353/6	Dec. 19, 2002	Dec. 19, 2001
RF Cable	104	Suhner Succoflex	115742	Dec. 19, 2002	Dec. 19, 2001
RF Cable	104	Suhner Succoflex	116567/4	Dec. 19, 2002	Dec. 19, 2001
RF Cable	104	Suhner Succoflex	11576/4	Dec. 19, 2002	Dec. 19, 2001
<b>SUPPORT ROOM</b>					
Spectrum Analyzer 9KHz – 40GHz	FSEK	Rohde & Schwarz	40500210	Feb 15, 2002	N/A
Signal Generator 10MHz – 40GHz	SMP	Rohde & Schwarz	4500125	Mar 27, 2003	N/A
Amplifier	JSD00121	MITEQ	S/N 838621	N/A	N/A
Switch Matrix Controller	SMC-002	TDL	40500189	Mar. 04, 2002	Mar. 04, 2001
<b>VERIFICATION EQUIPMENT</b>					
Horn Antenna	3115	EMCO	40500087	Nov 19, 2002	Nov 19, 2001
Adjustable Dipole Antenna	3121C	EMCO	9611-1233	April 4, 2002	N/A
Quick Box	QBOX-ESD1	EMC	N/A	N/A	N/A

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

No deviations from the normal operating mode in the project test plan are noted in Appendix A of the Test Report.

**C.9. Test Setup Special Considerations**

None.

**C.10. Sample Calculation**

Emission Level = Measured Level + Antenna Factor + Cable Loss + LNA Gain

Margin = Limit – Emission Level

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

\* Negative VE numbers indicate gain.

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

Pictures for Radiated Emissions 1 – 18GHz are following this page.

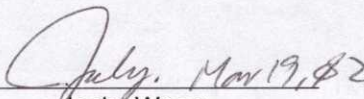
**C.12. Signature**

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

Signature/Date:

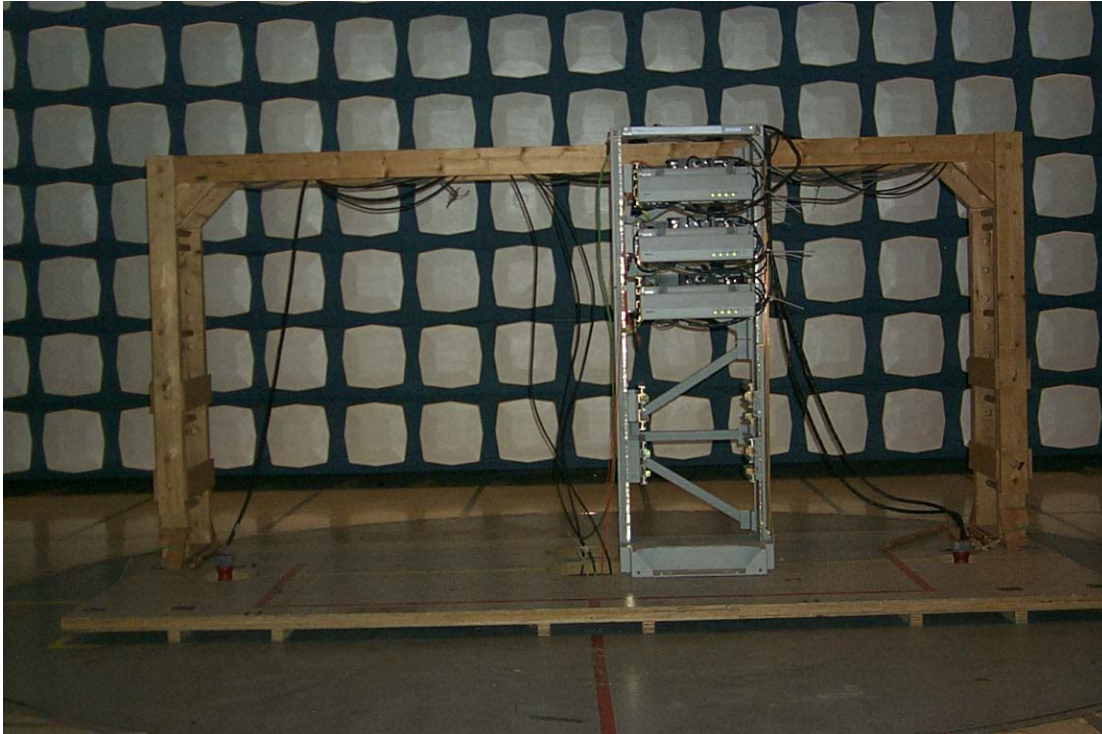
Name:

Function:

  
Jacky Wong  
EMC Tools Developer

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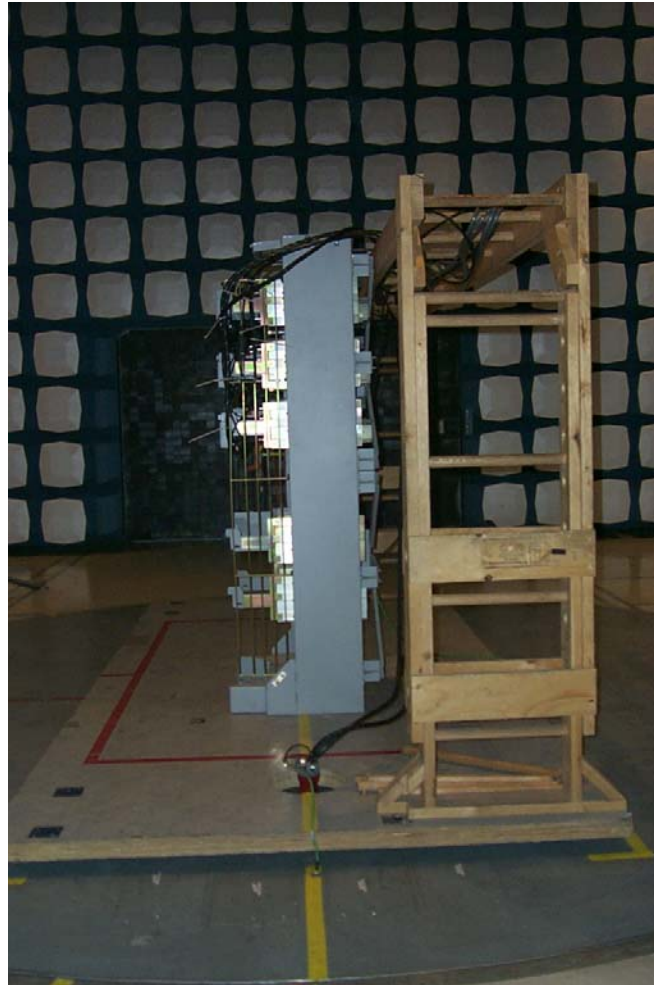


Photograph 1. MTRM CR 1900MHz (Front side of EUT)

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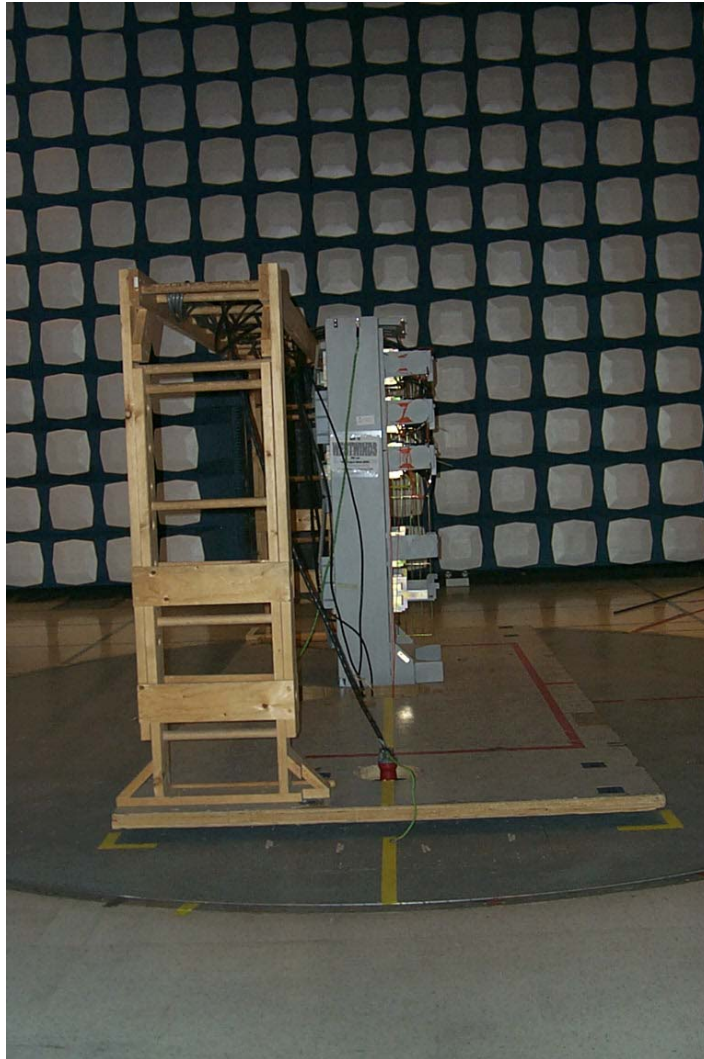
Photograph 2. MTRM CR 1900MHz (Right side of EUT)

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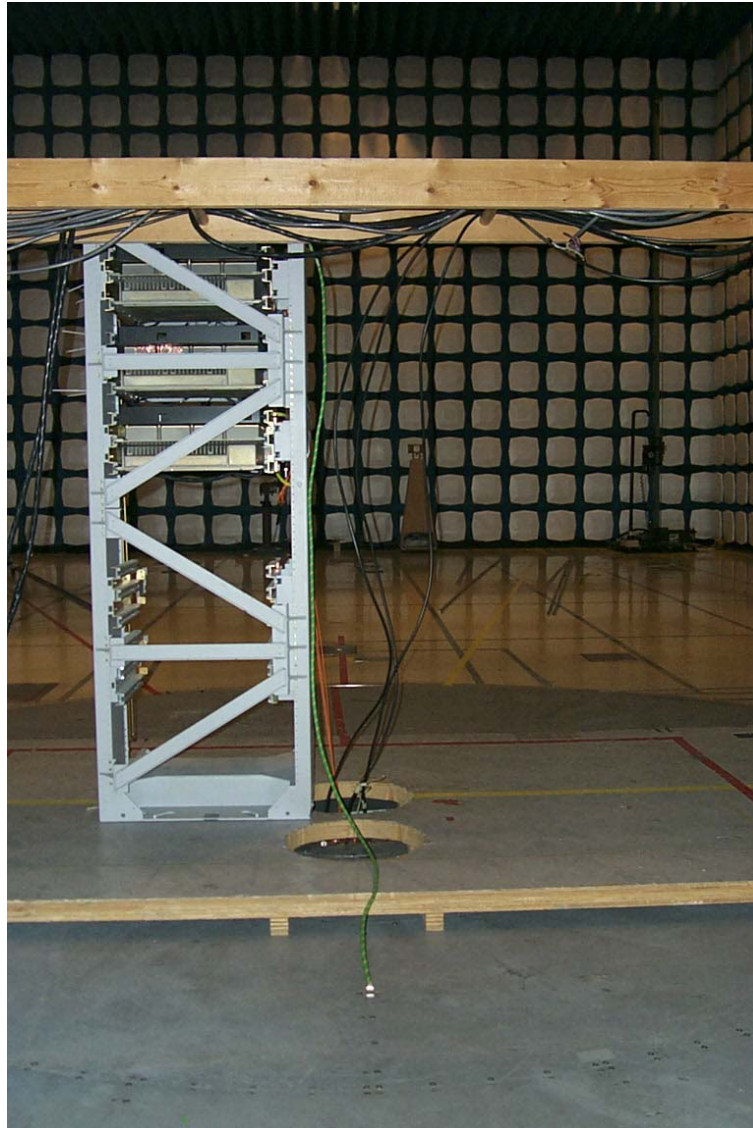




Photograph 3. MTRM CR 1900MHz (Left side of EUT)

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Photograph 4. MTRM CR 1900MHz (Back side of EUT)

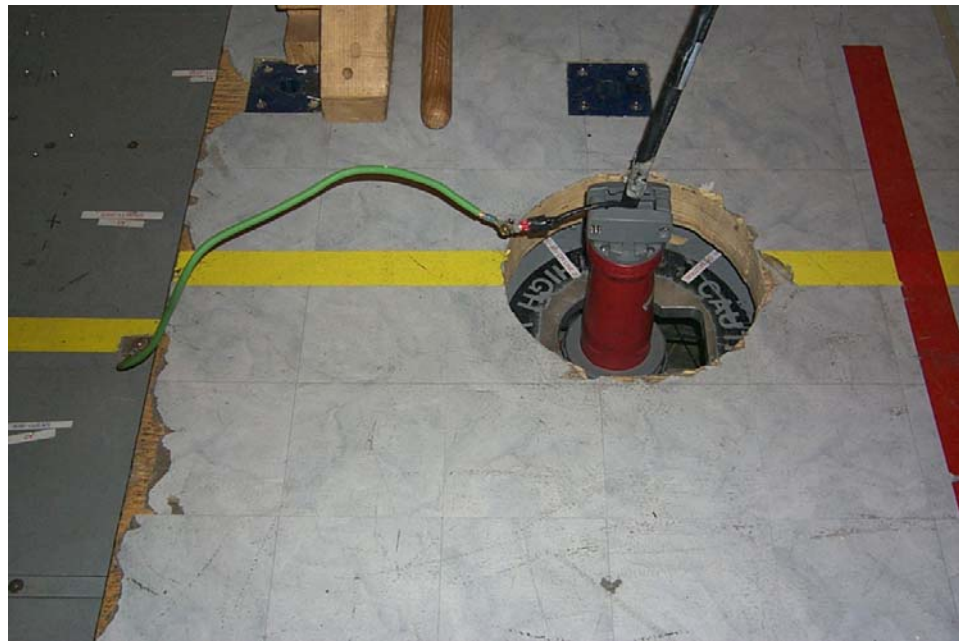
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Photograph 4. MTRM CR 1900MHz (Right side of power supply)



Photograph 5. MTRM CR 1900MHz (Left side of power supply)

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## APPENDIX D: TEST PLAN

Note: The headers, footers, and total number of pages displayed in the footer of the following the test plan pages are relevant to total number of pages for the test report only.

---

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## MTRM 1900 (CR) Radio testing

### Test Plan

#### Document information

Version: 0.2

Status: Draft

Issued : January 8, 2002

#### 1. Test scope

This test plan provides testing information for the test lab. This test is part of the regulatory testing of the MTRM CR. The test will be performed on the Metrocell Radio rack. Initially the test for the 1900 MHz product will be performed.

##### 1.1 Measurements required

The field strength of the spurious radiation as per FCC part 2.1053  
Frequency spectrum to be investigated as per FCC part 2.1057

##### 1.2 Emission limits

As per FCC part 24.238

#### 2. Test configuration

- 2.1 A Metrocell radio rack with 3 MFRM units will be tested. Only the radio rack will be installed in the anechoic chamber. The digital rack will be installed outside (basement) of the test chamber.
- 2.2 Digital Rack will have a complete digital shelf (12 CEM /XCEM, 2CM, 2 CORE and 1 or 2 GPSTM ). The serial numbers of the equipment under test (EUT) and the rest of the modules will be available before the completion of the test.

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### 3. System setting and system software

The EUT will have each MFRM set to operate on one carrier/one frequency. The carrier frequencies will be different for each MFRM. All MFRMs will be set to operate on the same sector (beta).

The system software used during the test is based on the 10.x load

### 4. POWER Requirements

VOLTAGE DC -48 DC

NUMBER OF FEEDS: 2

CURRENT DRAW (AMPS) : typical 25 A/feed

LISN: in place

### 5. Deliverables

The test lab will provide the official test report for the test performed according to this test plan.

---

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## APPENDIX E: SUPPLEMENTARY INFORMATION

The following supplementary information was provided by Nortel Networks after the release of the original test report.

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**E.1. Supplementary Information provided by Nortel Networks March 1, 2002**

**Subject:** FW: MFRM 1900 MHz CR P1 report

-----Original Message-----

**From:** Thomas Wong [mailto:thomaswg@nortelnetworks.com]

**Sent:** Friday, March 01, 2002 4:18 PM

**To:** 'jacky.wong@sanmina.com'

**Subject:** MFRM 1900 MHz CR P1 report

Jacky,

The report I would like to modify are:

(A) Fill in the key frequencies information in your report section 3.4

<<int freq MFRM.pdf>>

You only need to copy the 1900 MHz MFRM key frequency to the report and NOT the other modules.

(B) Add the Peak Scan plots for 30 MHz to 1 GHz (both V and H) in Appendix B.

(C) Improve the terminology and units that Sanmina used in the substitution method that we talked about.

(D) Since the test setup for both 30 MHz to 1 GHz and 1 GHz to 18 GHz is the same. We don't need to have both set of pictures in the reports. The report is really big in size right now.

<<FCC report for filing>>

Since the report is too big (8Mbyte) for filling (the ATCB expects only 4Mbytes for the complete filing), I am talking to Keys to find a solutions. Therefore, you don't need to send the update report to me right the way. I am going to let you know when I need it.

Thanks.

*Thomas Wong  
CDMA/TDMA Regulatory Prime  
5050-40th St. N.E. Calgary, Alberta, T3J 4P8  
Tel: 403-769-2425 (ESN 758-2425)  
email: thomaswg@nortelnetworks.com*

***The Contents of this Email are Nortel Networks Confidential***

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E.2. Attachment to the supplementary information provided by Nortel Networks March 1, 2002

Signal	Frequency	Units
Transmit Band	1930-1990	MHz
Receive Band	1850-1910	MHz
RF LO Range	1776-1836	MHz
RF LO Resolution	50	MHz
Carrier Spacing	1.25	MHz
Tx IF LO	143.7696	MHz
Rx IF (Center)	73.6	MHz
Tx IF (Center)	153.6	MHz
26Fc	31.9488	MHz
32Fc	39.3216	MHz
52Fc	63.8976	MHz
64Fc	78.6432	MHz
520Fc	638.9760	MHz

Table: Key Frequencies for MFRM

Note: Fc = CDMA single channel spreading rate = 1.2288 MHz

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**E.3. Supplementary information provided by Nortel Networks February 4, 2002**

-----Original Message-----

**From:** Steve Embree [mailto:sembree@nortelnetworks.com]

**Sent:** Monday, February 04, 2002 2:58 PM

**To:** 'Keys Low'

**Cc:** Arif Kurji; Marin Sampaleanu

**Subject:** Equipment list for 1900 FCC testing

Hi Keys,

Here's the equipment list for the 1900 MTRM FCC testing completed Jan 14/02. I need to get the duplexer information. The Duplexer are under test in the 10 meter chamber. I'll get Mike to get the serial numbers when the chamber is open. If you require more information let me know. You should be able to get a good start on the lab report. The Lab report is becoming important.

<<MFRM's 1900\_FCC\_equipment.xls>>

Best regards,

Steve Embree

Project Management, Wireless Access Development

**Phone:** 403 769 4181, [ESN 758 4181](tel:403-758-4181)

**Mobile:** 403 510 2274

**Fax:** 403 769 7680

**E-mail:** [sembree@nortelnetworks.com](mailto:sembree@nortelnetworks.com)

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**END OF DOCUMENT**

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