Project:	**04CA02341**
File:	**MC2371**
Report:	**050010**
Date:	**January 25, 2005**
Model:	**M8485Se/M8490Se printer with MP 9310 RFID reader** (FCC ID: MMF8485SESM)

Test Report

On

Electromagnetic Compatibility Testing

Sato America

Charlotte, NC USA

Test Report Details:

Tests Performed By:	**Underwriters Laboratories Inc.** **12 Laboratory Drive** **Research Triangle Park, NC 27709**
Tests Performed For:	**Sato Corporation** **1-207, Onari-cho, Omiya-ku, Saitama-shi** **Saitama, Japan 330-0852**
Applicant Contact:	**Mr. Tatsumi Inui** **Senior Manager** **+81 (0) 48-663-8109 (Japan)** **+81(0) 48-651-6770 (Japan) - FAX**
Test Report Number:	**050010**
Test Report Date:	**January 25, 2005**
Product Type:	**Printer with RFID tag reader**
Model Number:	**M8485Se/M8490Se Printer with MP 9310 RFID reader**
Sample Serial Number:	**unserialized, pre-production sample**
Sample Tag Number:	**0643859-001**
EUT Category:	**Transmitter - Low Powered**
EUT Type:	**Table Top**
Sample Receive Date:	**January 17, 2005**
Testing Start Date:	**January 19, 2005**
Date Testing Complete:	**January 21, 2005**

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, A2LA, or any agency of the US government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA certificates provided at the end of this report.

Summary of Testing:

Test #	Test Name Test Requirement/Specification	Comply	Does Not Comply	See Remark
1	Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field 47 CFR Part 15, Subpart B / 47 CFR Part 15, Subpart B, Class B Canada ICES-003 / Canada ICES-003, Class B	X	-	
2	Radiated Emissions - Spurious Emissions 47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C Section 15.247 Canada RSS-210 Issue 5, Amendment / Canada RSS-210 Issue 5, Amendment, Section 6.2.2(o)	X	-	
3	Conducted Disturbance Emissions - Voltage 47 CFR Part 15, Subpart B / CISPR 22:1997 Class B 47 CFR Part 15, Subpart C / CISPR 22:1997 Class B Canada ICES-003 / Canada ICES-003, Class B	X	-	

Remarks:

1) This is regarded as a composite device. The printer portion is considered a Class B digital device, although it is unlikely to be used in a residential area. The RFID transceiver portion is considered an intentional radiator subject to FCC Part 15.247 and RSS-210 Section 6.2.2(o).

2) The antenna is permanently attached by mounting hardware inside the printer with an opening for the printer to read RFID tags. A unique connector is not used.

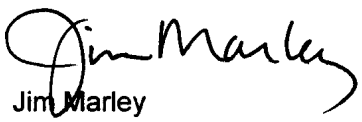
3) Conducted Emissions meets CISPR 22 Class B limits required for all new equipment. This product may continue to be sold after July 2005.

4) Transmitter-Specific Data: Data specific to the SAMSys 9310 RFID transmitter module was measured prior to testing within the printer and is included in the SAMSys 9310 test report. These items are:
   a. Conducted Spurious Emissions
   b. Occupied Bandwidth
   c. Conducted Power
   d. Channel Spacing
   e. Number of Channels
   f. RF Exposure

Conclusion:

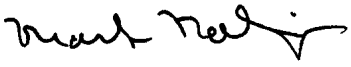
The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

Prepared By:



Jim Marley
NARTE EMC Engineer
EMC-002278-NE
+1 (919) 549-1408

Reviewed By:



Mark Nolting
NARTE EMC Test Lab Engineer
ATL-0340-E
+1 (919) 549-1584

Test Facilities:

Test Location A) 10-Meter Anechoic Chamber (Industry Canada - IC 2953, NVLAP - 200246-0, VCCI - R-722)

Constructed by Lindgren RF Enclosures, this room consists of a 17.9 by 12 by 8.3 m (inside clearance) shielded room lined with TDK absorber material. The walls, floor (conducting ground plane) and ceiling are constructed of double sided galvanized sheet steel supported by 19 mm thick particle board. The interior walls and ceiling are covered with 10 by 10 cm, 4.6 mm thick ferrite tiles and partially covered with polystyrene absorber cones. Removable floor tiles and cones covering the floor between the EUT and antenna are provided when RF immunity testing is performed.

Room is provided with a 4.0 m diameter embedded turntable and a 1.2 by 2.1 m and 2.4 by 2.4 m double knife edge doors for access. Also, the room is fed electrical EUT power via permanently installed filters and is provided with a permanently mounted video surveillance camera. A remotely controllable antenna mast is located in the room for positioning the measuring antenna from 1 to 4 m above the ground plane.

Test Location B) Compact Anechoic Chamber

Constructed by Lindgren RF Enclosures, this room consists of a 6 by 3 by 2.9 m (inside clearance) shielded room lined with TDK absorber material. The walls, floor, and ceiling are constructed of double sided galvanized sheet steel supported by 19 mm thick particle board. The interior walls and ceiling are covered with 10 by 10 cm, 4.6 mm thick ferrite tiles and partially covered with polystyrene absorber cones. Removable floor tiles and cones cover the floor between the EUT and antenna.

Room is provided with a 1.2 by 2.1 m double knife edge door for access. Also, the room is fed electrical EUT power via permanently installed filters and is provided with a video camera.

Test Location C) RF Shielded Room (VCCI - C-744, NVLAP - 200246-0)

Constructed by Lindgren RF Enclosures, this room consists of a 7.3 by 4.3 by 2.7 m (inside clearance) shielded room. The walls, floor (conducting ground plane) and ceiling are constructed of double sided galvanized sheet steel supported by 19 mm thick particle board. Room is provided with a 1.2 by 2.1m double knife edge door for access. Also, the room is fed electrical EUT power via permanently installed filters and is provided with a portable video surveillance camera.

Test Location D) Ground Reference Plane # 1 (VCCI - C-742, NVLAP - 200246-0)

Horizontal floor ground reference plane constructed of double sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.0 m. It is located and bonded next to one vertical wall of the Control Room and is, therefore, provided with a 3.0 by 3.6 m vertical ground reference plane constructed of the same material. Power filters and LISNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

Test Location E) Ground Reference Plane # 2 (VCCI - C-743, NVLAP - 200246-0)

Horizontal floor ground reference plane constructed of double sided galvanized sheet steel supported by 19 mm particle board and measures 4.3 by 5.2 m. It is located and bonded next to one vertical wall of the RFD Shielded Room and is, therefore, provided with a 4.3 by 2.8 m vertical ground reference plane constructed of the same material. Power filters and LISNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

Test Location F) Ground Reference Plane # 3

Horizontal floor ground reference plane constructed of galvanized sheet steel measuring 3.0 by 3.6 m x 2.5mm thick.

Test Location G) Ground Reference Plane # 4 (Automotive)

Horizontal floor ground reference plane constructed of double-sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.0 m.

Test Location I) Harmonic Current Test Area - Located in front of Standard Source Impedance Power Supply.

Test Location J) Magnetic Field Ground Reference Plane

Horizontal floor ground reference plane constructed of 1.5 mm thick aluminum measuring 3.6 by 2.4 m.

Test Location P) Ground Reference Plane # 5

Horizontal floor ground reference plane constructed of double-sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.0 m.

Test Location R) Ground Reference Plane # 6

Ground reference plane constructed of galvanized sheet steel measuring 3.0 m x 3.6 m x 2.5 mm thick. CDNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

Test Location Q) CISPR 12 Outdoor Site

30 meter diameter non-reflective area located behind the UL-RTP EMC Lab. Test area is used for CISPR 12 testing.

Test Location X) Other - As described in the Comments Section of Test Results.

EUT Information:

Equipment Used During Test:

Use*	Product Type	Manufacturer	Model	Comments
EUT	Printer	Sato	M8485Se	Model tested.
EUT	Printer	Sato	M8490Se	Similar model not tested. Only print head differences.
EUT	RFID	SAMSys	MP9310	
EUT	Antenna	-	-	-2.5 dB gain antenna integrated into printer.
ACC	Laptop Computer	-	-	Standard Laptop computer used to communicate to printer/RFID reader.

* Use = EUT - Equipment Under Test, ACC - Accessory (Not Subjected to Test), or SIM - Simulator (Not Subjected to Test)

Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	Enclosure	N/E	No	No	
1	AC Mains	AC	No	No	
2	Printer Port	I/O	No	Yes	I/O between laptop and printer.
3	Antenna	N/E	No	No	

* AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
PMC = Process Measurement and Control Port

EUT Internal Operating Frequencies:

Frequency (MHz)*	Description
902	ISM band low frequency
928	ISM band high frequency

Power Interface:

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	120	-	-	60	1	Power to printer.
1	120	-	-	60	1	

EUT Operation Modes:

Mode #	Description
1	RF output power off, otherwise product operating normally (for unintentional emissions measurements).
2	RF output power on (for radiated spurious measurements).

EUT Configuration Modes:

Mode #	Description
1	Printer with RFID reader connected to laptop.
2	Printer with RFID standalone (conducted emissions only).

Test 1: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

Test Requirement: 47 CFR Part 15, Subpart B
Canada ICES-003

Test Specification: 47 CFR Part 15, Subpart B, Class B
Canada ICES-003, Class B

Test Procedure:

The test was performed in accordance with the Test Requirement and Specification and configured as noted in the Test Setup. The EUT was placed inside the anechoic chamber and connected to the proper power supply source. A peak measurement was first made by scanning the entire test frequency range and maximizing the EUT emissions by rotating the EUT and raising the antenna height from 1 to 4 meters above the ground reference plane. Then, a measurement was taken for all peak emissions to verify each were below the Test Limits. In each case, all cables and equipment were adjusted and EUT orientation and antenna height were varied for maximum emissions.

Radiated Disturbance Limits for Class B Equipment
at a measuring distance of 3m.

Frequency Range MHz	Quasi-Peak Limits μV/m	Quasi-Peak Limits dBμV/m
30 to 88	100	40.00
88 to 216	150	43.52
216 to 960	200	46.02
Above 960	500	53.97

Test Deviations:

None

Test Setup: Only the following ports were tested. See EUT Information for details.

Test Item	Port #	Port Name	EUT Operation Mode	EUT Configuration	Power Interface
A	0	Enclosure	1 (RF Off)	1	1

Test 1 - Results: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

Test Results Summary:

Test Item	Test Location	Humidity (%)	Temperature (ºC)	Pressure (kPa)	Pass/Fail (P/F)	Date Completed	Comment #
A	A	24	24	102	P	1/19/05	

The EUT was considered to **Pass** the Requirements.

Comments:

Comment #	Description

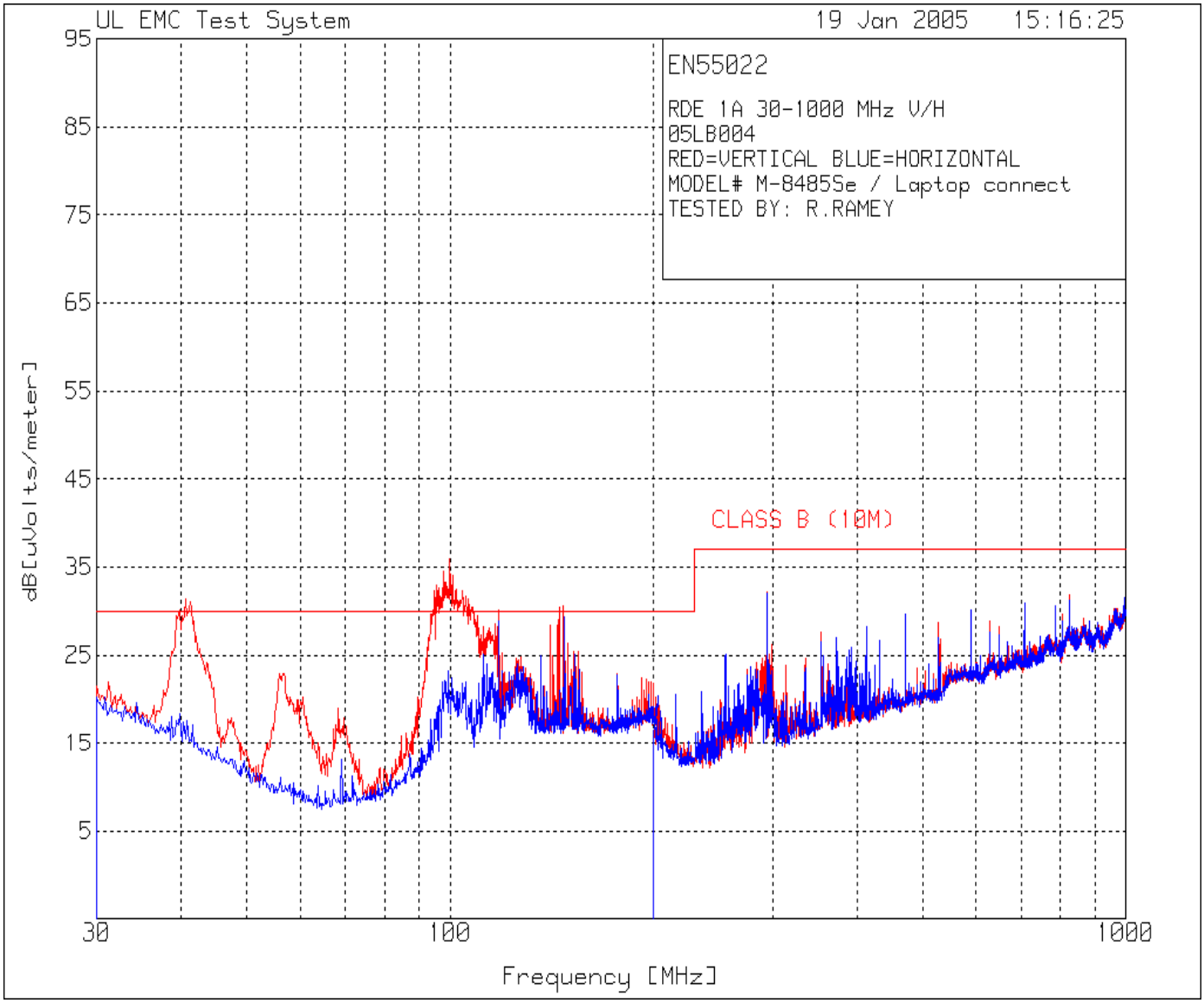
Test 1 - Test Equipment Used: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0025	Biconical Antenna, 30 to 300 MHz	Schaffner, EMC	VBA6106A	3/22/04	3/31/05
AT0030	Log periodic Antenna, 200 MHz to 1000 MHz	Schaffner, EMC	3160-07	2/9/04	2/28/05
ATA084	Attenuator 6 dB, 2 GHz	Pasternack	PE7002-6	3/11/04	3/31/05
ATA085	Attenuator 6 dB, 2 GHz	Pasternack	PE7002-6	3/11/04	3/31/05
ATA106	19 ft, N - N	Amplifier Research	Low Loss coaxial cable	3/11/04	3/31/05
ATA124	RF Amplifier, 1 to 1000 MHz	Miteq	AM-3A-000110-N	3/11/04	3/31/05
ATA125	RF Amplifier, 1 to 1000 MHz	Miteq	AM-3A-000110-N	3/11/04	3/31/05
ATA132	45ft. N-Male to N-Male	UL	Coaxial Cable	3/11/04	3/31/05
ATA140	RG214 Ferrite Cable	EMC Eupen	N/A	3/11/04	3/31/05
ATA143	Cable, 6ft., N-male to N-male	Micro-Coax	N/A	8/25/04	2/28/05
ATA167	RG214 Ferrite Cable	EMC Eupen	N/A	3/11/04	3/31/05
ATA168	Cable, 6ft., N-male to N-male	Micro-Coax	N/A	1/9/04	1/31/05
HI0034	Environmental Indicator	Cole-Palmer	99760-00	10/14/04	10/31/05
SAR003	EMC Receiver	Rohde & Schwarz	1088.7490K40	12/02/04	12/31/05

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

Test 1, Item A - Peak Plot (Amplitude in dBuV/m):

Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field



Test 1, Item A - Frequency Table:

Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Antenna Factor [dB]	Field Strength [dBuV/m]	Limit:1
Range: 1 30 - 205MHz					
40	37.61 qp	-28.6	14.2	23.21	30
Azimuth: 360	Height:102	Vert		Margin [dB]:	-6.79
40.6857	37.44 qp	-28.6	13.8	22.64	30
Azimuth: 360	Height:202	Vert		Margin [dB]:	-7.36
98.3464	41.03 qp	-28.5	10.9	23.43	30
Azimuth: 235	Height:101	Vert		Margin [dB]:	-6.57
99.8949	41.26 qp	-28.5	11	23.76	30
Azimuth: 235	Height:101	Vert		Margin [dB]:	-6.24
105.5	39.34 qp	-28.5	11.8	22.64	30
Azimuth: 235	Height:101	Vert		Margin [dB]:	-7.36
117.938	42.68 qp	-28.5	13.3	27.48	30
Azimuth: 178	Height:103	Vert		Margin [dB]:	-2.52
137.6102	34.18 qp	-28.4	14.5	20.28	30
Azimuth: 188	Height:108	Vert		Margin [dB]:	-9.72
145.1603	31.71 qp	-28.4	14.6	17.91	30
Azimuth: 178	Height:108	Vert		Margin [dB]:	-12.09
147.017	26.02 qp	-28.3	14.6	12.32	30
Azimuth: 280	Height:108	Vert		Margin [dB]:	-17.68
147.017	25.26 qp	-28.3	14.6	11.56	30
Azimuth: 147	Height:108	Horz		Margin [dB]:	-18.44

LIMIT 1: CLASS B (10M)

pk - Peak detector
qp - Quasi-Peak detector
av - average detector

Test 1, Item A - Test Set-Up Photo:

Radiated Disturbance Emissions

Test 1, Item A - Test Set-Up Photo:

Radiated Disturbance Emissions

Test 2: Radiated Emissions - Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C
Canada RSS-210

Test Specification: 47 CFR Part 15, Subpart C Section 15.247
Canada RSS-210 Issue 5, Section 6.2.2(o)

Test Procedure:

The test was performed in accordance with the Test Requirement and Specification and configured as noted in the Test Setup. The EUT was placed inside the anechoic chamber with a fresh battery installed or operating at nominal voltage. A peak measurement was first made by scanning the entire test frequency range and maximizing the EUT emissions by rotating the EUT and raising the antenna height from 1 to 4 meters above the ground reference plane. Then, a measurement was taken for all significant peak emissions to verify each were below the Test Limits.

Radiated Disturbance Limits for Frequency Hopping Spread Spectrum Transmitters - Section 15.247

Fundamental Frequency (MHz)	Hopping Channels (Number)	Permissible Output Power			Permissible Spurious Emissions		
		(milliwatts)	(dBm)	(dBuV/m at 3 meters)*	(milliwatts)	(dBm)	(dBuV/m at 3 meters)*
902 – 928	25 to 49	250	24	119.2	25	14	99.2
	50 or more	1000	30	125.2	100	20	105.2
	DSSS	1000	30	125.2	100	20	105.2
2400 – 2483	15 to 74	125	21	116.2	12.5	11	96.2
	75 or more	1000	30	125.2	100	20	105.2
	DSSS	1000	30	125.2	100	20	105.2
5725 – 5850	75 or more	1000	30	125.2	100	20	105.2
	DSSS	1000	30	125.2	100	20	105.2

*Conversion for 0 dBi gain antenna. Add transmit antenna gain to limit, but not more than 6 dB.

Output Power Adjustment:
Other than fixed point-to-point applications, power adjustment for antenna gain are as follows:

Gain of 6 dBi or less	No reduction in conducted power is required
Gain greater than 6 dBi	Reduce the maximum output power by 1 dB for each 1 dB of antenna gain above 6 dBi

Test Deviations:

None

Test Setup: Only the following ports were tested. See EUT Information for details.

Test Item	Port #	Port Name	EUT Operation Mode	EUT Configuration	Power Interface
A	0	Enclosure	2 (RF On)	1	1

Test 2 - Results: Radiated Emissions - Spurious Emissions

Test Results Summary:

Test Item	Test Location	Humidity (%)	Temperature (ºC)	Pressure (kPa)	Pass/Fail (P/F)	Date Completed	Comment #
A	A	31	25	101	P	1/21/05	1

The EUT was considered to **Pass** the Requirements.

Comments:

Comment #	Description
1	Spurious Emissions measurements satisfy FCC Part 15 Subpart B unintentional emissions above 1 GHz.

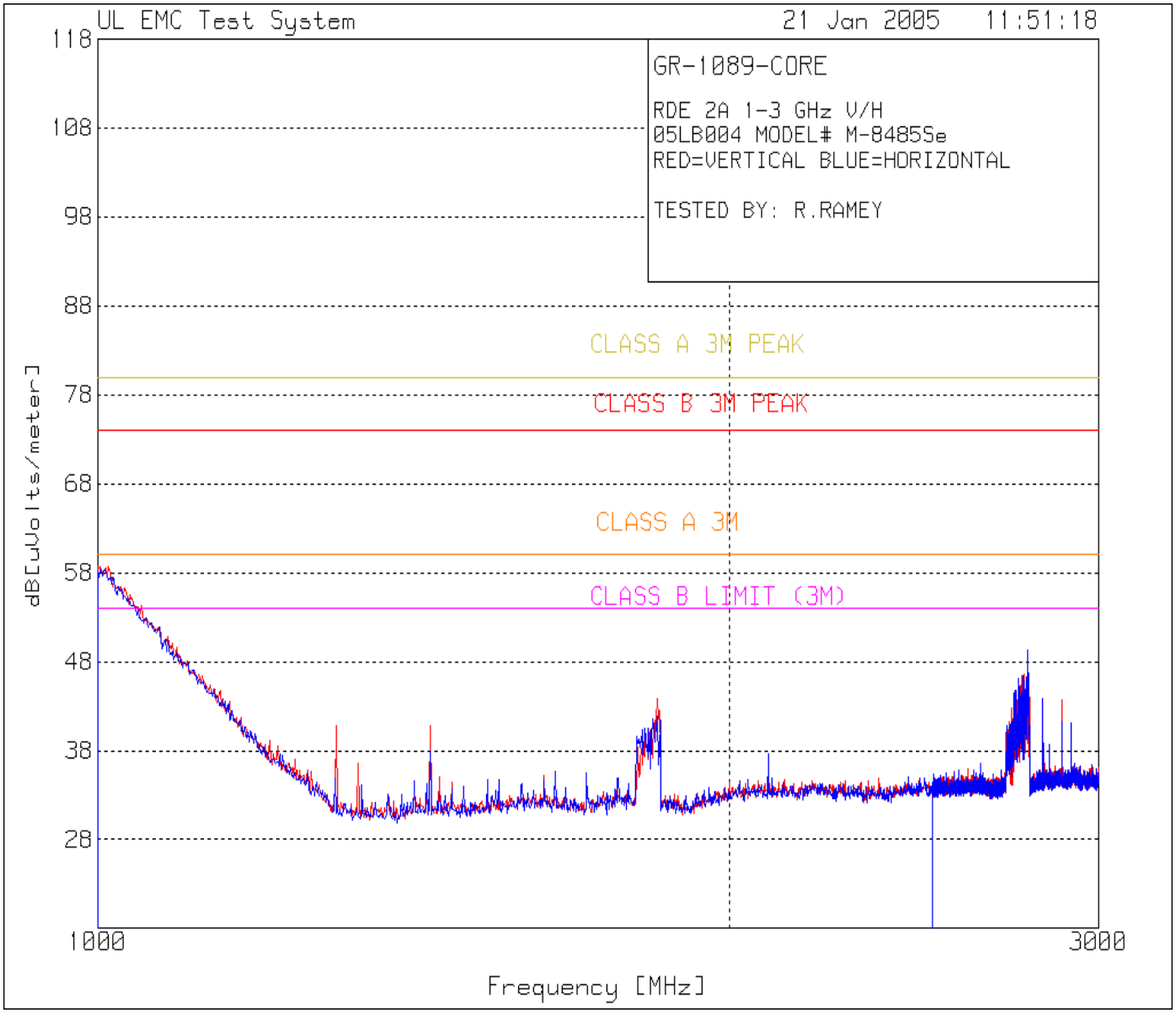
Test 2 - Test Equipment Used: Radiated Emissions - Spurious Emissions

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0026	Horn Antenna, 1 to 18 GHz	EMC Test Systems	3115	6/8/04	6/31/05
ATA096	50 ft, N male - N male	Micro-Coax	Coaxial Cable	6/25/04	2/28/05
ATA143	Cable, 6ft., N-male to N-male	Micro-Coax	N/A	8/25/04	2/28/05
ATA144	Amplifier, 0.1 to 18 GHz	Miteq	AFS42-00101800-2	3/11/04	3/31/05
ATA152	27 ft. N male - N male low loss cable	Micro-Coax	UFB293C-0-3149-50504	2/21/04	2/29/05
ATA185	High-pass filter, 1.1 GHz cutoff, SMA-Male to SMA-Female	Mini-circuits	VHF-1320	11/29/04	11/30/05
ATA187	High-pass filter, 3 GHz cutoff	Mini-circuits	VHF-2275	11/29/04	11/30/05
HI0034	Environmental Indicator	Cole-Palmer	99760-00	10/14/04	10/31/05
SAR003	EMC Receiver	Rohde & Schwarz	1088.7490K40	12/02/04	12/31/05

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

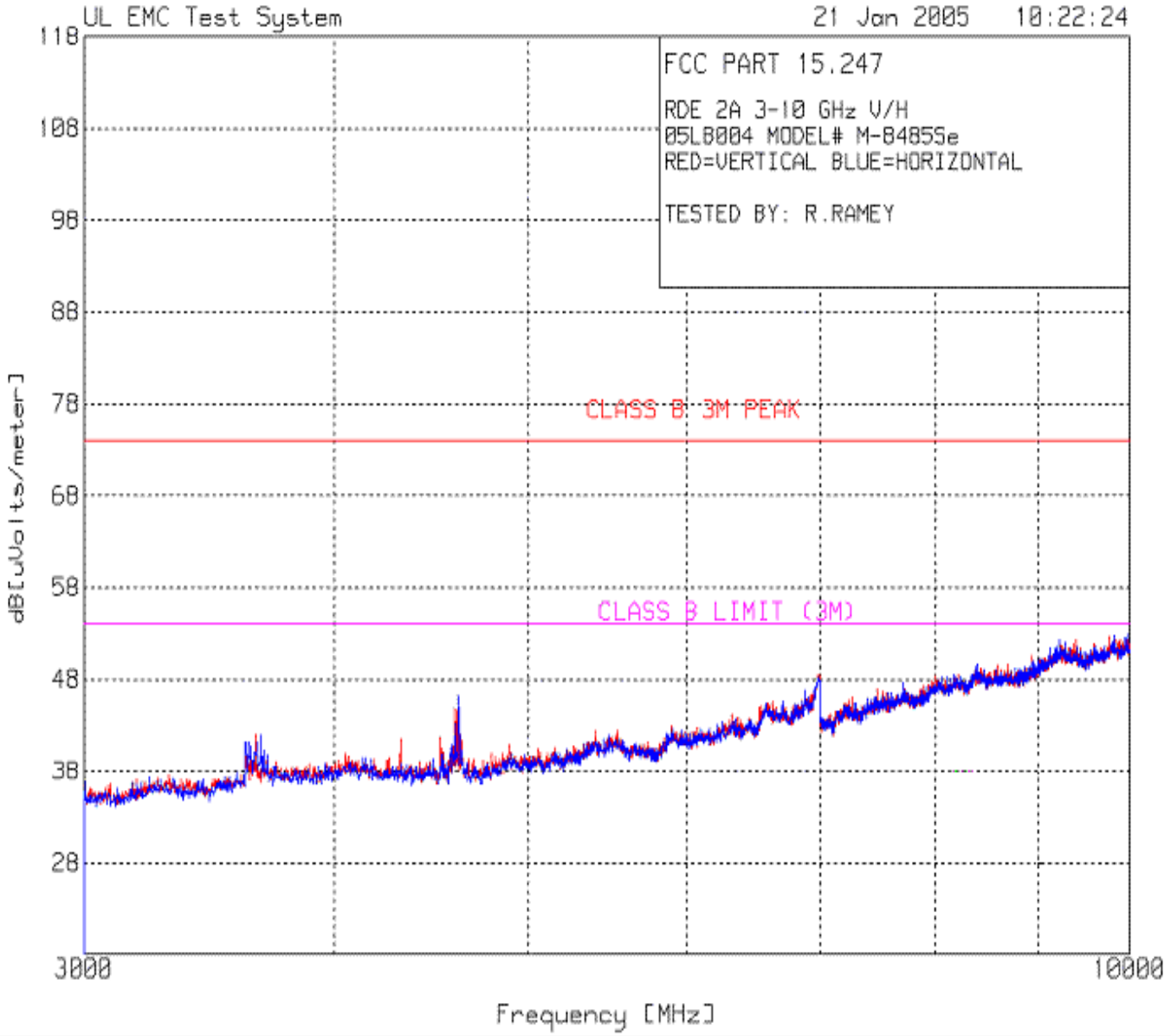
Test 2, Item A - Peak Plot:

Radiated Emissions - Spurious Emissions



Test 2, Item A - Peak Plot:

Radiated Emissions - Spurious Emissions



Test 2, Item A - Frequency Table:

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Antenna Factor [dB]	Field Strength [dBuV/m]	Limit:1	2
Range: 1 1000 - 2500MHz							
1	1298.799	45.93 pk	-29.8	24.7	40.83	74	54
		Height:101 Vert		Margin [dB]		-33.17	-13.17
2	1439.94	46.89 pk	-31.1	25	40.79	74	54
		Height:150 Vert		Margin [dB]		-33.21	-13.21
3	1848.348	48.27 pk	-31.2	26.7	43.77	74	54
		Height:150 Vert		Margin [dB]		-30.23	-10.23
Range: 2 2500 - 3000MHz							
6	2880.293	45.13 pk	-31	29.6	43.73	74	54
		Height:101 Vert		Margin [dB]		-30.27	-10.27
Range: 4 2500 - 3000MHz							
4	2772.924	49.35 pk	-31	29.2	47.55	74	54
		Height:150 Horz		Margin [dB]		-26.45	-6.45
5	2821.774	45.52 pk	-31	29.4	43.92	74	54
		Height:100 Horz		Margin [dB]		-30.08	-10.08
Range: 2 3000 - 10000MHz							
2	3653.551	40.12 pk	-29.7	31.5	41.92	74	54
		Height:101 Vert		Margin [dB]		-32.08	-12.08
4	4596.532	40.93 pk	-28.6	32.4	44.73	74	54
		Height:101 Vert		Margin [dB]		-29.27	-9.27
Range: 4 3000 - 10000MHz							
1	3611.537	39.71 pk	-29.9	31.4	41.21	74	54
		Height:100 Horz		Margin [dB]		-32.79	-12.79
3	3676.892	39.98 pk	-29.6	31.6	41.98	74	54
		Height:100 Horz		Margin [dB]		-32.02	-12.02
5	4615.205	42.2 pk	-28.5	32.5	46.2	74	54
		Height:150 Horz		Margin [dB]		-27.8	-7.8
6	6991.33	36.31 pk	-23.3	35.3	48.31	74	54
		Height:100 Horz		Margin [dB]		-25.69	-5.69
Range: 2 8000 - 10000MHz							
7	8188.73	34.13 pk	-19.4	37.1	51.83	74	54
		Height:150 Vert		Margin [dB]		-22.17	-2.17
Range: 4 8000 - 10000MHz							
8	8342.114	33.88 pk	-19.4	37.3	51.78	74	54
		Height:100 Horz		Margin [dB]		-22.22	-2.22

LIMIT 1: CLASS B 3M PEAK
LIMIT 2: CLASS B LIMIT (3M)

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Test 3: Conducted Disturbance Emissions - Voltage

Test Requirement: 47 CFR Part 15, Subpart B
Canada ICES-003

Test Specification: CISPR 22:1997 Class B

Test Procedure:

The test was performed in accordance with the Test Requirement and Specification and configured as noted in the Test Setup. The EUT was connected to the proper supply source via a Line Impedance Stabilization Network (LISN). The Measuring Receiver was connected to the Port under test via the LISN. A peak measurement was first made at the test point across the test frequency range over a one minute test period. Then, Quasi-Peak or Average measurements were taken and recorded under Discrete Data. This was repeated for each conductor of the test port except for equipment grounding.

Conducted Disturbance Emission Limits For
Mains Terminals of Class B Equipment

Frequency MHz	Quasi-Peak Limit dB μV	Average Limit dB μV
0.15 - 0.50	66 to 56*	56 to 46*
0.50 - 5	56	46
5 - 30	60	50

* Limit decreases linearly with the logarithm of the frequency

Test Deviations:

None

Test Setup: Only the following ports were tested. See EUT Information for details.

Test Item	Port #	Port Name	EUT Operation Mode	EUT Configuration	Power Interface
A	1	AC Mains	2 (RF On)	2	1

Test 3 - Results: Conducted Disturbance Emissions - Voltage

Test Results Summary:

Test Item	Test Location	Humidity (%)	Temperature (ºC)	Pressure (kPa)	Pass/Fail (P/F)	Date Completed	Comment #
A	D	31	25	101	P	1/21/05	1

The EUT was considered to **Pass** the Requirements.

Comments:

Comment #	Description
1	Also covers FCC Part 15, Subpart C Conducted Emissions requirement.

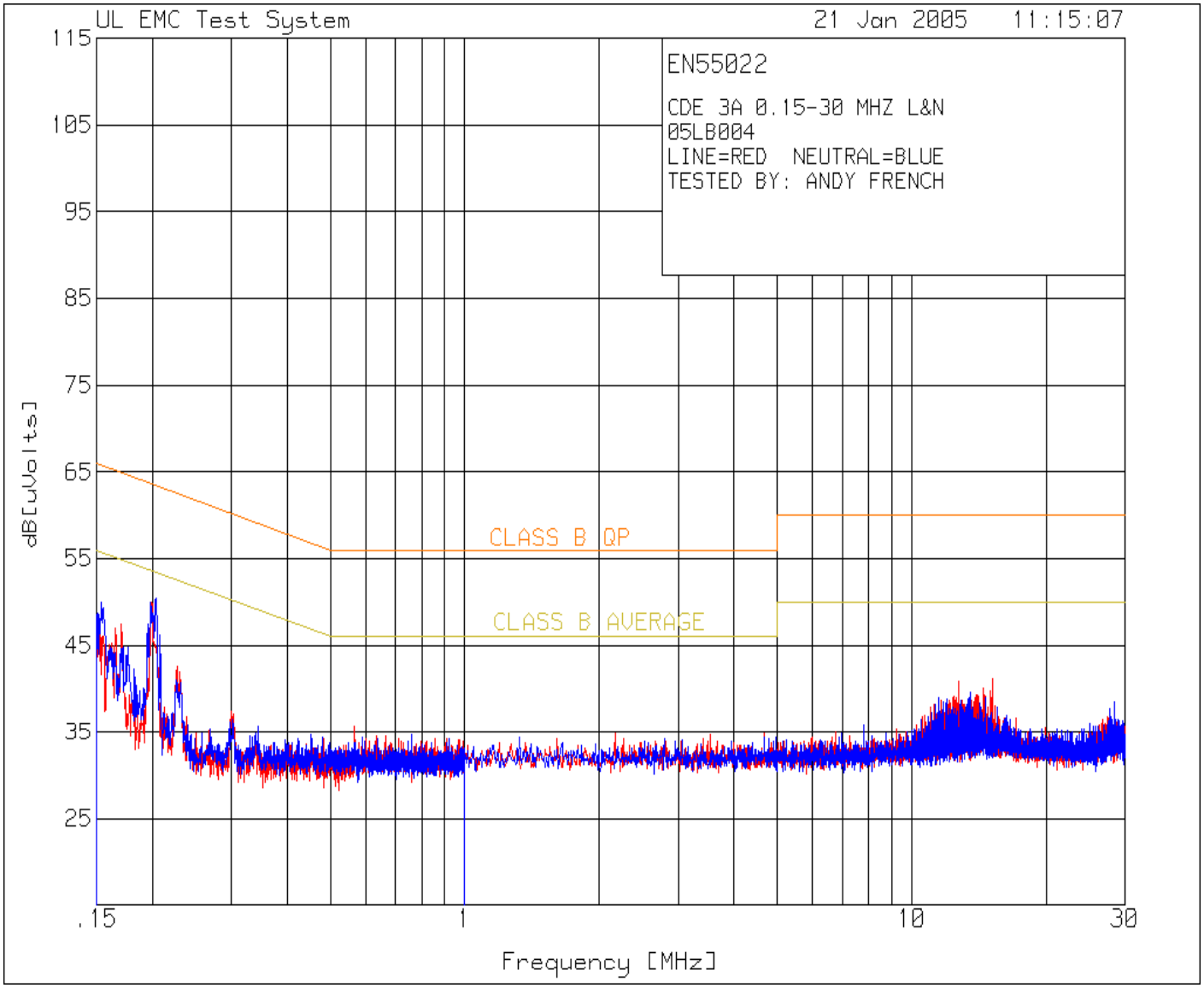
Test 3 - Test Equipment Used: Conducted Disturbance Emissions - Voltage

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
ATA013	20 ft Cable, BNC - BNC	UL	RG-223	2/18/04	2/28/05
ATA027	LISN, 150 kHz to 30 MHz	Solar Electronics	9629-50-TS-25	6/30/04	6/30/05
ATA028	LISN, 150 kHz to 30 MHz	Solar Electronics	9629-50-TS-25	6/16/04	6/30/05
ATA056	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM-7600	3/29/04	3/31/05
HI0034	Environmental Indicator	Cole-Palmer	99760-00	10/14/04	10/31/05
SAR001	Spectrum Analyzer / Receiver	Hewlett-Packard	8572A	2/2/04	2/28/05

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

Test 3, Item A - Peak Plot (Amplitude in dBuV):

Conducted Disturbance Emissions - Voltage



Test 3, Item A - Frequency Table (Peak Emissions):

Conducted Disturbance Emissions - Voltage

CDE 3A 0.15-30 MHZ L&N
05LB004
LINE=RED NEUTRAL=BLUE
TESTED BY: ANDY FRENCH

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level	Limit:1	2	3	4
					dB[uVolts]				
Range 1 .15 - 1MHz									
1	.19928	39.4 pk	10.5	.1	50			63.6	53.6
				Margin [dB]				-13.6	-3.6
2	.17039	36.9 pk	10.5	.1	47.5			64.9	54.9
				Margin [dB]				-17.4	-7.4
3	.22689	32 pk	10.5	.1	42.6			62.6	52.6
				Margin [dB]				-20	-10
4	.30017	26.8 pk	10.5	.1	37.4			60.2	50.2
				Margin [dB]				-22.8	-12.8
Range 2 1 - 30MHz									
6	15.14146	30.2 pk	10.8	.1	41.1			60	50
				Margin [dB]				-18.9	-8.9
Range 3 .15 - 1MHz									
5	.20353	39.9 pk	10.5	.1	50.5			63.5	53.5
				Margin [dB]				-13	-3

LIMIT 1: NONE
LIMIT 2: NONE
LIMIT 3: CLASS B QP
LIMIT 4: CLASS B AVERAGE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Note: Range 1 and Range 2 denotes “Line” conductor.
Range 3 and Range 4 denotes “Neutral” conductor.

Test 3, Item A - Frequency Table (Average Emissions):

Conducted Disturbance Emissions - Voltage

CDE 3A 0.15-30 MHZ L&N
05LB004
LINE=RED NEUTRAL=BLUE
TESTED BY: ANDY FRENCH

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts]	Limit:1	2	3	4
Range 1 .15 - 1MHz								
.2006	35.52 av	10.5	.1	46.12			63.6	53.6
				Margin [dB]:			-17.48	-7.48
Range 3 .15 - 1MHz								
.1993	35.39 av	10.5	.1	45.99			63.6	53.6
				Margin [dB]:			-17.61	-7.61

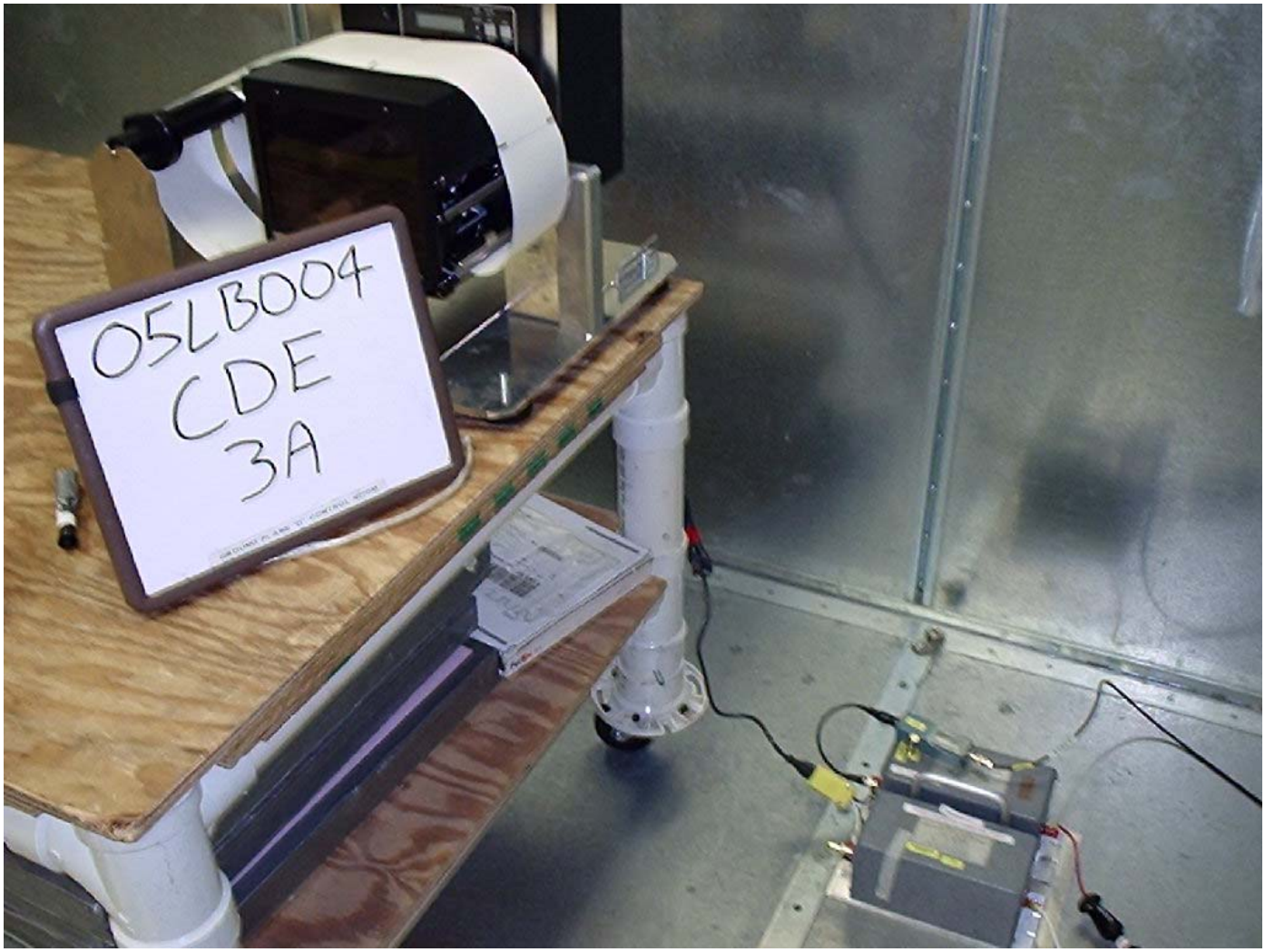
LIMIT 1: NONE
LIMIT 2: NONE
LIMIT 3: CLASS B QP
LIMIT 4: CLASS B AVERAGE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Note: Range 1 and Range 2 denotes “Line” conductor.
Range 3 and Range 4 denotes “Neutral” conductor.

Test 3, Item A - Test Set-Up Photo:

Conducted Disturbance Emissions - Voltage



Accreditation Certificates:

National Institute of Standards and Technology NVLAP® National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

Scope of Accreditation

Revised Scope 12/10/2004 — Page: 1 of 4

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS — **NVLAP LAB CODE 200246-0**

UNDERWRITERS LABORATORIES, INC.
12 Laboratory Drive
Research Triangle Park, NC 27709
Mr. Rick A. Titus
Phone: 847-272-8800 x43281 Fax: 847-509-6321
E-Mail: Rick.A.Titus@us.ul.com
URL: http://www.ul.com

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993) with Amendments A1 (1997) & A2 (1999)
12/CIS14b	AS/NZS 1044 (1995)
12/CIS14c	CNS 13783-1
12/CIS22	IEC/CISPR 22 (1997) and EN 55022 (1998): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)

June 30, 2005 — *Effective through*

For the National Institute of Standards and Technology

National Institute of Standards and Technology NVLAP® National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

Scope of Accreditation

Revised Scope 12/10/2004 — Page: 2 of 4

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS — **NVLAP LAB CODE 200246-0**

UNDERWRITERS LABORATORIES, INC.

NVLAP Code	*Designation / Description*
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/EM02a	IEC 61000-3-2, Edition 2.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A)
12/EM03b	IEC 61000-3-3, Edition 1.1(2002-03) & EN 61000-3-3, A1(2001): EMC - Part 3-3: Limits - Limitations of voltage changes, voltage flucuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connections
12/FCC15b	ANSI C63.4 (2001) with FCC Method - 47 CFR Part 15, Subpart B: Unintentional Radiators
12/T51	AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment
Immunity Test Methods:	
12/I01	IEC 61000-4-2, Edition 2.1 (2001) including Amds. 1 & 2 and EN 61000-4-2: Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3, Edition 2.0 (2002-03) and EN 61000-4-3: Radiated Radio-Frequency Electromagnetic Field Immunity Test

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National Institute of Standards and Technology NVLAP® National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
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Scope of Accreditation

Revised Scope 12/10/2004 — Page: 3 of 4

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS — **NVLAP LAB CODE 200246-0**

UNDERWRITERS LABORATORIES, INC.

NVLAP Code	*Designation / Description*
12/I03	IEC 61000-4-4 (1995) + Amd. 1 (2000) & Amd. 2 (2001) and EN 61000-4-4: Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5, Edition 1.1 (2001-04) and EN 61000-4-5: Surge Immunity Test
12/I05	IEC 61000-4-6, Edition 2.0 (2003-05) and EN 61000-4-6: Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
12/I06	IEC 61000-4-8, Edition 1.1 (2001) and EN 61000-4-8: Power Frequency Magnetic Field Immunity Test
12/I07	IEC 61000-4-11, Edition 1.1 (2001-03) and EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
Safety Test Methods:	
12/T41a	AS/NZS 60950 (2000): Safety of Information Technology Equipment (including Amdt1)
12/T50	AS/NZS 3260 (1993) + Supplement 1 (1996): Safety of Information Technology Equipment Including Electrical Business Equipment
Telecommunications Test Methods:	
12/1089d	GR-1089-CORE, Issue 3 (April 2002): EMC and Electrical Safety - Generic Criteria for Network Telecommunications Equipment (sections: 2.1.2.1, 2.1.2.2, 2.1.4, 2.2, 3.2, 3.3, 4.6.2, 4.6.5, 4.6.7 - 4.6.17, 4.7, 5.2, 5.3.1, 5.4, 6, 7.2 - 7.7, 8, and 9.2 - 9.12)

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For the National Institute of Standards and Technology

National Institute of Standards and Technology NVLAP® National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

Scope of Accreditation

Revised Scope 12/10/2004 — Page: 4 of 4

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS — **NVLAP LAB CODE 200246-0**

UNDERWRITERS LABORATORIES, INC.

NVLAP Code	*Designation / Description*
12/76200a	SBC-TP-76200, Issue 4 (May 2003): Network Equipment Power, Grounding, Environmental, and Physical Design Requirements (sections: 6.1B, 7.1, 7.2, 7.3, 7.4, and 10.1 - 10.4B)
12/GR63a	GR-63-CORE, Issue 2 (April 2002): NEBS (TM) Requirements: Physical Protection (sections: 2, 3, 4.1, 4.2.3, 4.3, 4.4.1, 4.4.3, 4.4.4, 4.5, 4.6, and 4.7)

June 30, 2005 — *Effective through*

For the National Institute of Standards and Technology

Measurement Uncertainty Statement

Test	Expanded Estimate of Uncertainty (k = 2, for 95% of a normal distribution)	Units
Radiated Disturbance Emissions:		
• 3 and 10 meter measurement distances	+/- 3.8 dB	Volts/meter
• 1 meter measurement distance	+/- 2.3 dB	Volts/meter
Conducted Disturbance Emissions (9 kHz – 30 MHz):	+/- 3.4 dB	Volts
Electrostatic Discharge	+/- 2.2 %	Volts
Radiated RF Immunity (Chamber):	+/- 2.7 dB	Volts/meter
Electrical Fast Transients/Bursts Immunity	+/- 4.6 %	Volts
Surge Immunity	+/- 4.6 %	Volts
Conducted RF Immunity	+/- 2.8 dB	Volts
Power Frequency Magnetic Field Immunity	+/-13.6 %	Amps/meter
Voltage Dips and Short Interrupts	+/-4.2 %	Volts
Radiated RF Immunity (Tri-plate)	+/-3.2 %	Volts/meter
Disturbance Power (30 – 300 MHz)	+/-3.5%	Volts

CISPR 16-4:2000 Statement

The UL-RTP estimate of expanded measurement uncertainty listed above for Conducted Disturbance (+/- 3.4 dB), Disturbance Power (+/- 3.5 dB), and Radiated Disturbance (+/-3.8 dB) are less than the Values of U_{cispr} as listed in Table 1 of CISPR 16-4. Therefore:

- Compliance is deemed to occur if no measured disturbance reported exceeds the disturbance limits.
- Non-compliance is deemed to occur if any measured disturbance reported exceeds the disturbance limits.