Project:	**00RT3974**
File:	**MC1239**
Report:	**000149**
Date:	**March 02, 2000**
Model:	**9200100**

Test Report

On

Electromagnetic Compatibility Testing

Sensor Devices, Inc.

Madison, AL USA

Test Report Details:

Tests Performed By:	**Underwriters Laboratories Inc.** **12 Laboratory Drive** **Research Triangle Park, NC 27709**
Tests Performed For:	**Sensor Devices, Inc.** **106 Mystic Way** **Madison, AL 35757 USA**
Applicant Contact:	**Mr. Mike Sutherlin** **(256) 797-0255** **- FAX**
Test Report Number:	**000149**
Test Report Date:	**March 02, 2000**
Product Type:	**eScan Low-Powered Transmitter**
Model Number:	**9200100**
Sample Serial Number:	
Sample Tag Number:	**S00LB058**
EUT Category:	**Special**
EUT Type:	**Hand Held**
Sample Receive Date:	**February 21, 2000**
Testing Start Date:	**February 21, 2000**
Date Testing Complete:	**February 21, 2000**

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 or any agency of the US government.

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Summary of Testing:

Test #	Test Name / Test Requirement/Specification	Comply	Does Not Comply	See Remark
1	Radiated Disturbance Emissions - 0.01 to 30 MHz Electric Field 47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C, Section 15.209	X	-	
2	Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field 47 CFR Part 15, Subpart C / 47 CFR Part 15, Subpart C, Section 15.209	X	-	

Remarks:

1) Initial scan at the EUT's transmit frequency was performed with the EUT horizontal and the EUT vertical on the test table. From these scans it was determined that the strongest field strength was measured with the EUT horizontal. The remaining measurements were performed with the EUT lying horizontal on the measurement table.

Conclusion:

The EUT was determined to **comply** with FCC Part 15 Section 15.209. This data can also be considered applicable to Canadian Standard RSS-210 Sections 4.6.1 and 13.0.

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.

Project Engineer:

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Reviewed By:

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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 (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 1.5 m diameter embedded turntable and 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 permanently mounted video surveillance 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. Located 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. The horizontal and vertical planes are continuously bonded along their entire length. 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. Located 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. The horizontal and vertical planes are continuously bonded along their entire length. 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 double sided galvanized sheet steel supported by 19 mm particle board and measures 3.6 by 3.6 m. Power filters and LISNs, when required, are placed on top of and bonded to the horizontal floor ground reference plane.

Test location G) 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 H) Outdoor Ground Reference Plane

Horizontal floor ground reference plane constructed of 1.5 mm thick aluminum measuring 3.6 by 3 m and located next to the outside wall of the EMC lab rear entrance.

Test Location I) Harmonic Current Test Area

Located on Lab floor in front of Standard Source Impedance Power Supply.

Test Location X) Other

If needed, as described in the Comments Section of Test Results.

EUT Information:

EUT Description:

The Equipment Under Test, Sensor Devices model 9200100, is a low-powered transmitter that functions as a metal detector built into a flashlight. The intended market for this device is for law enforcement. When the metal detector is activated, it emits a non-modulated field at approximately 466 kHz. If metal is in proximity to the detector a change in current is detected by the sensing circuit. An LED is illuminated and an audible tone is emitted from the detector.

During operation the field produced is continuous and non-modulated, so the average field strength is assumed to be equal to the peak strength observed.

Use*	Product Type	Manufacturer	Model	Comments
EUT	Metal Detector / Flashlight	Sensor Devices	eScan 9200100	

* 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	No external cables

* 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
0.46	Transmit frequency
4	Digital Clock

Power Interface:

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	9	-	-	DC	1	
1	9	-	-	DC	1	Note: A fresh battery was installed prior to measurement

EUT Operation Modes:

Mode #	Description
1	EUT lying horizontal on table.
2	EUT vertical on table (flashlight lens down and transmitter up)

EUT Configuration Modes:

Mode #	Description
1	EUT transmitter alone on table - constantly transmitting

Test 1: Radiated Disturbance Emissions - 9 kHz to 30 MHz

Test Requirement: 47 CFR Part 15 Subpart C

Test Specification: 47 CFR Part 15 Subpart C Section 15.209

Test Procedure:

All testing was performed in UL's 10 meter semi-anechoic chamber. The chamber meets the FCC's site attenuation criteria for use as an alternative measurement site. The EUT was tested per ANSI C63.4:1992 test method placed on a non-conductive 1m x 1.5m table 80 cm above the ground plane. The receive antennas used was a loop antenna mounted on an antenna mast. The turntable was rotated from 0 to 360 to determine the worst-case emissions angle for each frequency. The antenna mast was raised and lowered between 1 and 4 meters above the ground plane to determine the worst-case antenna height.

The loop antenna was positioned in each of three axes (X, Y, and Z) and peak scans were taken for each test configuration. Because the EUT emits a continuous unmodulated signal when operated, peak data was recorded and it is assumed that the average or quasi-peak measurement would be equal to the peak measurement.

In an attempt to match the measurement distances as close as possible at our facility, initial scans of the transmit frequency were made at a 10 meter distance. Due to the low level of the signal, no emission was observed above the noise floor of the receiving analyzer. Then the receive antenna was moved to a distance of the 3 meters from the EUT and the signal was observed. All data was taken with the antenna placed 3 meters from the EUT.

A 40 dB/decade adjustment was made to the signal for measurements below 30 MHz per Section 15.31(f)(2). Magnetic field to electric field conversion is made assuming the impedence of free space (377Ω).

Radiated Emissions Limit below 30 MHz - General Requirements - Section 15.209

Frequency Range (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (m)
0.009 to 0.049	2400/F (kHz)	20*log(2400/F(kHz))	300
0.049 to 1.705	24000/F (kHz)	20*log(24000/F(kHz))	30
1.705 to 30	30	29.5	30

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	1	1
B	0	Enclosure	2	1	1

Test 1 - Results: Radiated Disturbance Emissions - 0.01 to 30 MHz Electric Field

Test Results Summary:

Test Item	Test Location	Humidity (%)	Temperature (ºC)	Pressure (kPa)	Pass/Fail (P/F)	Date Completed	Comment #
A	A	48	22.0	100.1	P	2/21/00	
B	A	48	22.0	100.1	P	2/21/00	

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

Comments:

Comment #	Description

Test 1 - Test Equipment Used: Radiated Disturbance Emissions - 0.01 to 30 MHz Electric Field

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0001	Loop Antenna, 30 Hz to 1 MHz	Electro-Metrics	EM-6871	10/13/99	10/31/00
AT0006	Loop Antenna, 10 kHz to 30 MHz	Electro-Metrics	EM-6879	10/27/99	10/31/00
ATA034	52ft Cable, N - N	UL	HELIAX	8/28/99	8/31/00
ATA038	33ft Cable, N - N	EMC Technologist	RG-214	7/30/99	7/31/00
ATA048	25dB Amp, 0.1 to 1300 MHz	Hewlett-Packard	8447D/10	4/30/99	4/30/00
HI0034	Temp/Humid. Indicator	Cole - Palmer	99760-00	12/20/99	12/31/00
SAR001	EMI Receiver	Hewlett Packard	8572A	12/14/99	12/31/00

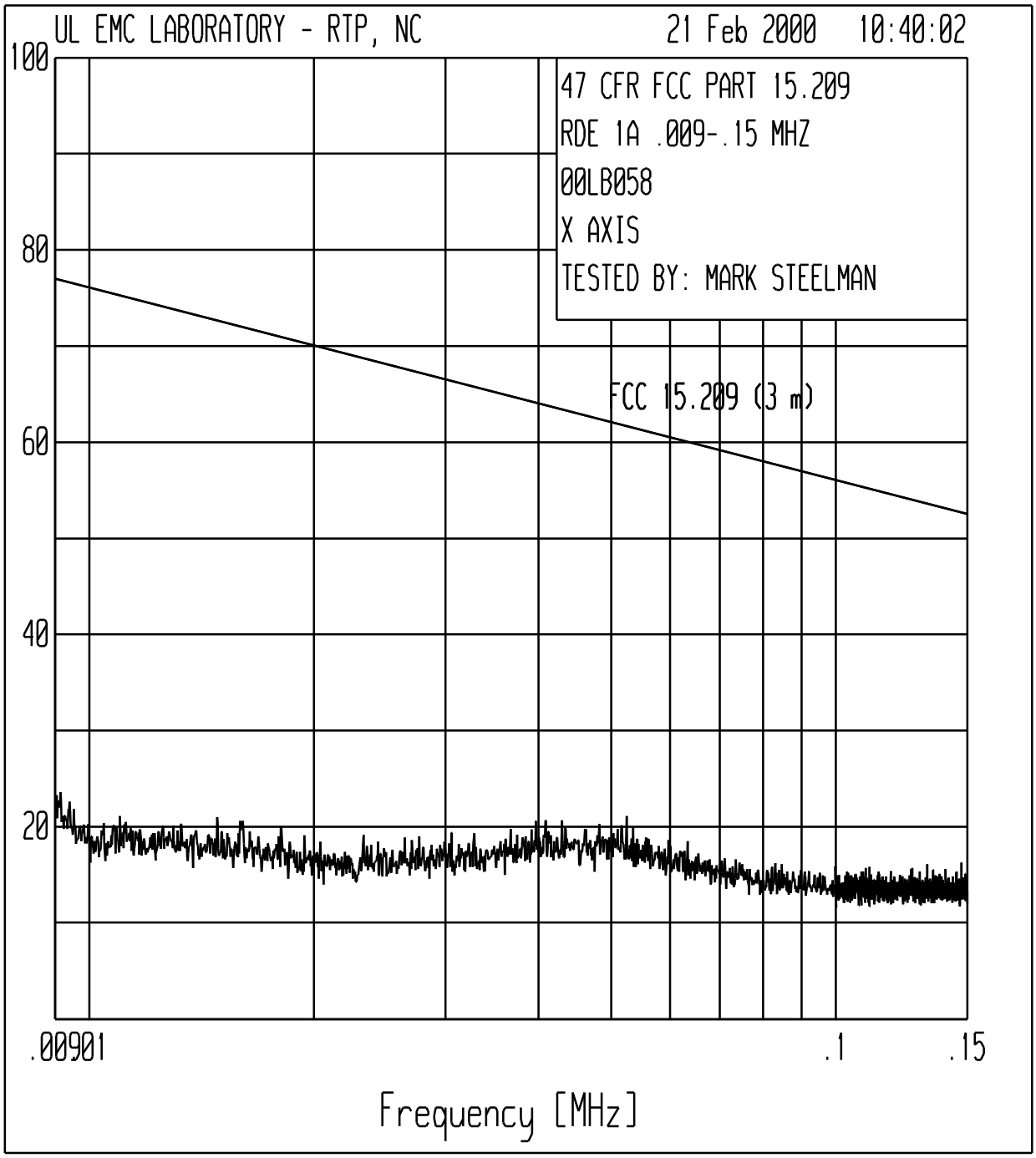
The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

Test 1, Item A - Discrete Data: Radiated Disturbance Emissions - 0.01 to 30 MHz Electric Field

Test Item	Detector Type* (P/Q/A)	Antenna Polarity (H/V)	Measured Frequency (MHz)	Measured Value (dBµV)	Equipment Correction (dB/m)	Distance Interpolation (dB)	Impedence of Free Space (dBV/A)	Corrected Value (dBµV/m)	Specified Limit** (dBµV/m)	Spec Margin (dB)	See Comment #
A	P	X	0.4673	33.2	-18.7	-80	51.7	-13.8	14.2	-28.0	
A	P	X	0.9346	13.1	-18.7	-40	51.7	6.1	28.2	-22.1	Noise Floor
A	P	X	1.4019	2.4	-11.2	-40	51.7	2.9	24.7	-21.8	Noise Floor
A	P	X	1.8692	2.8	-12.1	-40	51.7	2.0	29.5	-27.5	Noise Floor
A	P	X	2.3365	3.6	-12.8	-40	51.7	2.5	29.5	-27.0	Noise Floor
A	P	X	2.8038	3.9	-13.1	-40	51.7	2.5	29.5	-27.0	Noise Floor
A	P	Y	0.4659	29.6	-18.7	-80	51.7	-17.4	14.2	-31.6	
A	P	Y	0.9350	13.3	-18.7	-40	51.7	6.3	28.2	-21.9	Noise Floor
A	P	Y	1.3977	3.1	-11.4	-40	51.7	3.6	24.7	-21.1	Noise Floor
A	P	Y	1.8636	3.2	-12.5	-40	51.7	2.4	29.5	-27.1	Noise Floor
A	P	Y	2.3295	2.7	-12.9	-40	51.7	1.6	29.5	-27.9	Noise Floor
A	P	Y	2.7954	3.8	-13.1	-40	51.7	2.4	29.5	-27.1	Noise Floor
A	P	Z	0.4652	25.8	-18.7	-80	51.7	-21.2	14.2	-35.4	
A	P	Z	0.9304	13.2	-18.7	-40	51.7	6.2	28.2	-22.0	Noise Floor
A	P	Z	1.3956	3.1	-11.4	-40	51.7	3.6	24.7	-21.1	Noise Floor
A	P	Z	1.8608	3.3	-12.5	-40	51.7	2.5	29.5	-27.0	Noise Floor
A	P	Z	2.3260	3.9	-12.9	-40	51.7	2.8	29.5	-26.7	Noise Floor
A	P	Z	2.7912	3.1	-13.1	-40	51.7	1.7	29.5	-27.8	Noise Floor

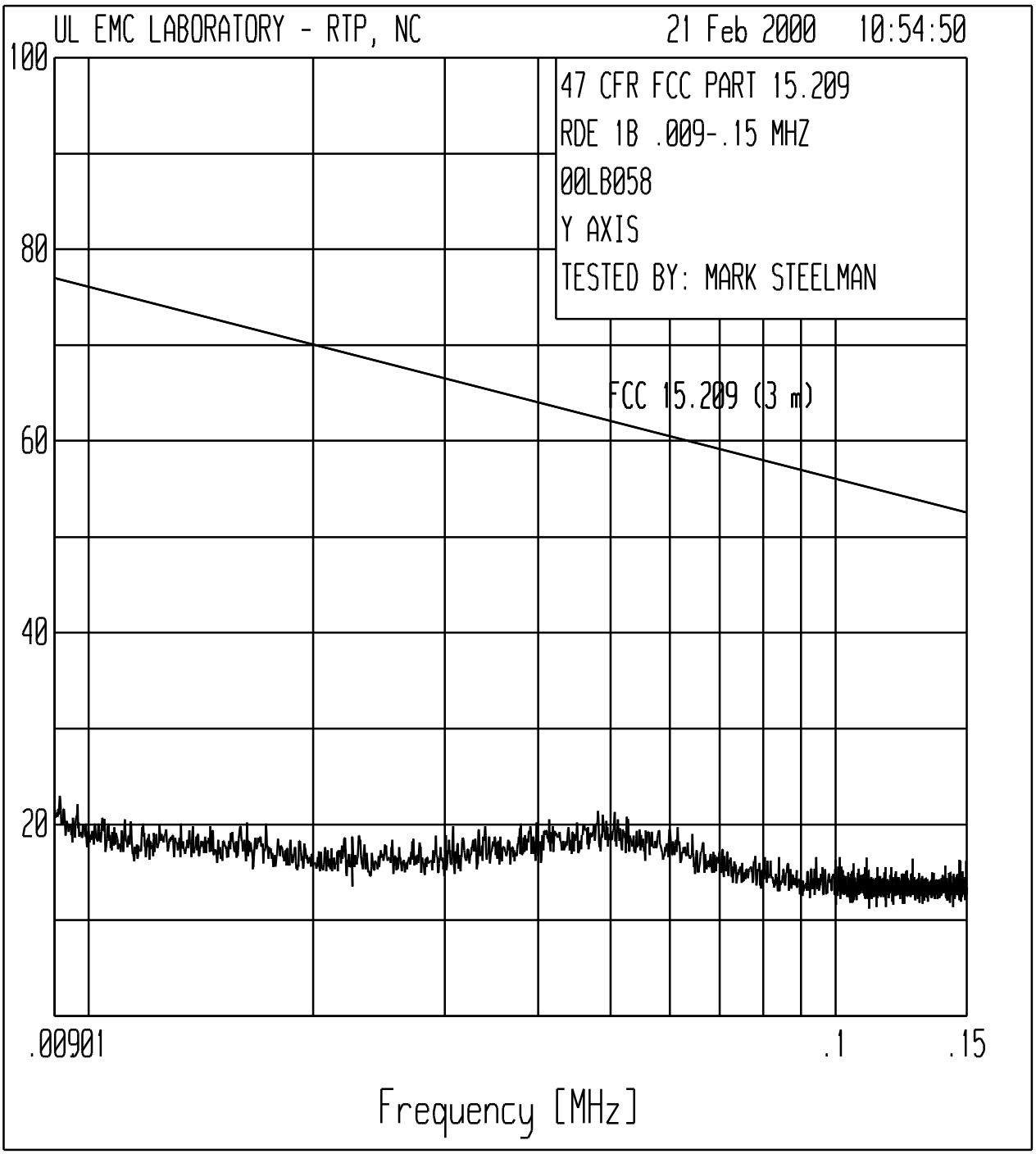
* P = Peak, Q = Quasi-Peak, A = Average.
** The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.
Sample Calculation: Corrected Value = Measured Value + Equipment Correction + Distance Interpolation + Impedence of Free Space
Equipment Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB ,if used)

Test 1, EUT Horizontal - X axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



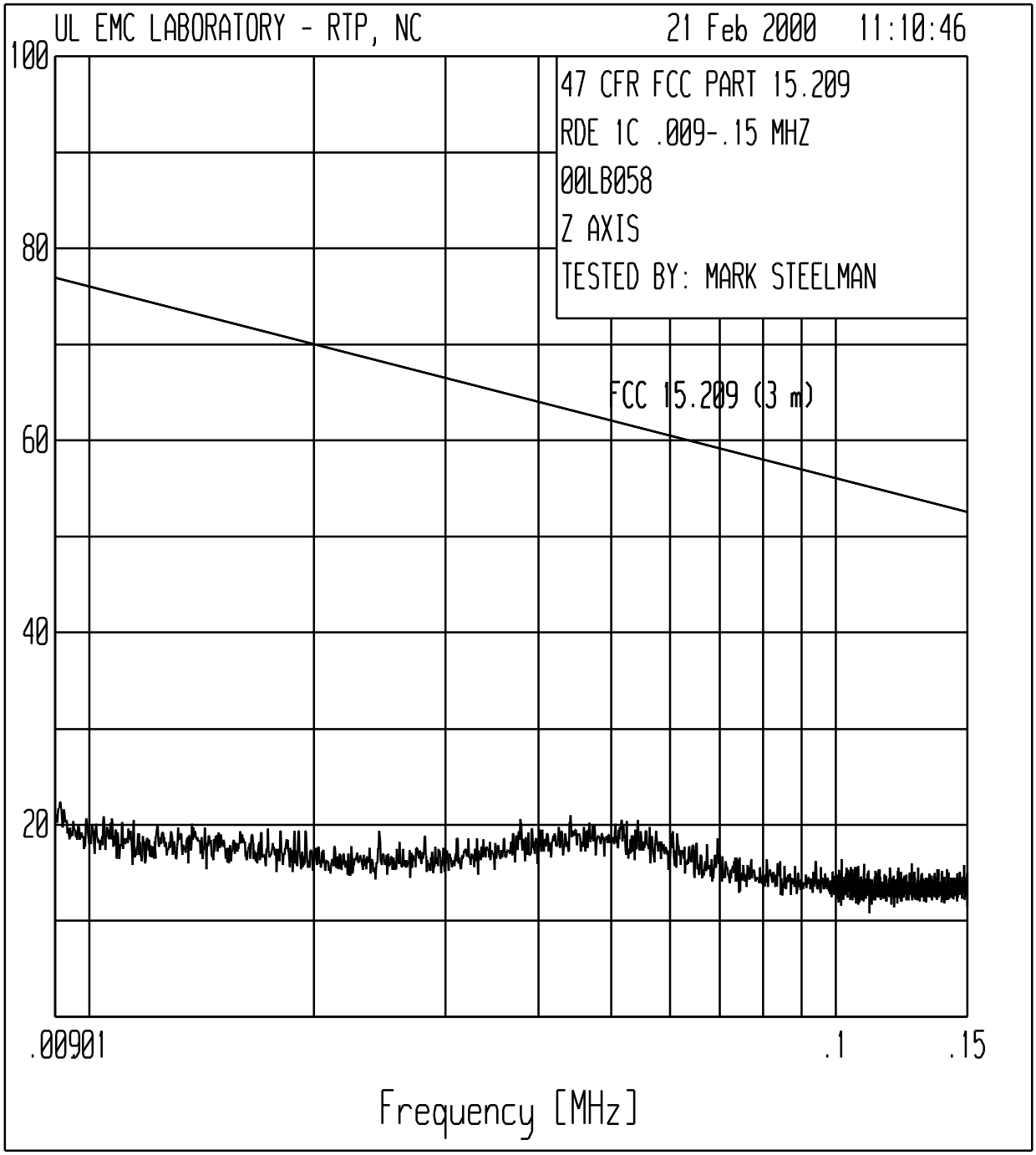
Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - X axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



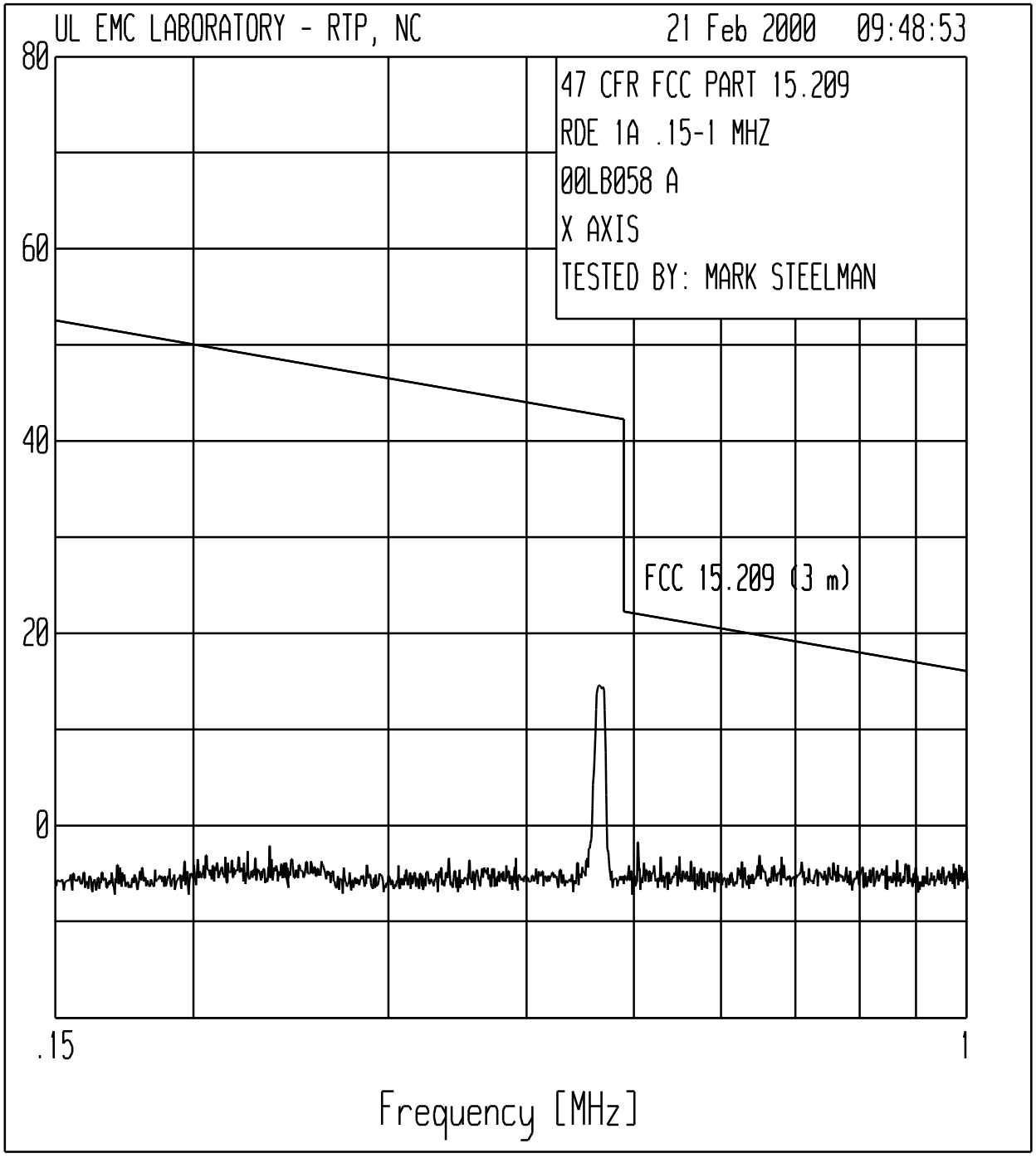
Graph Units are dBuA/m representing magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - Z axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



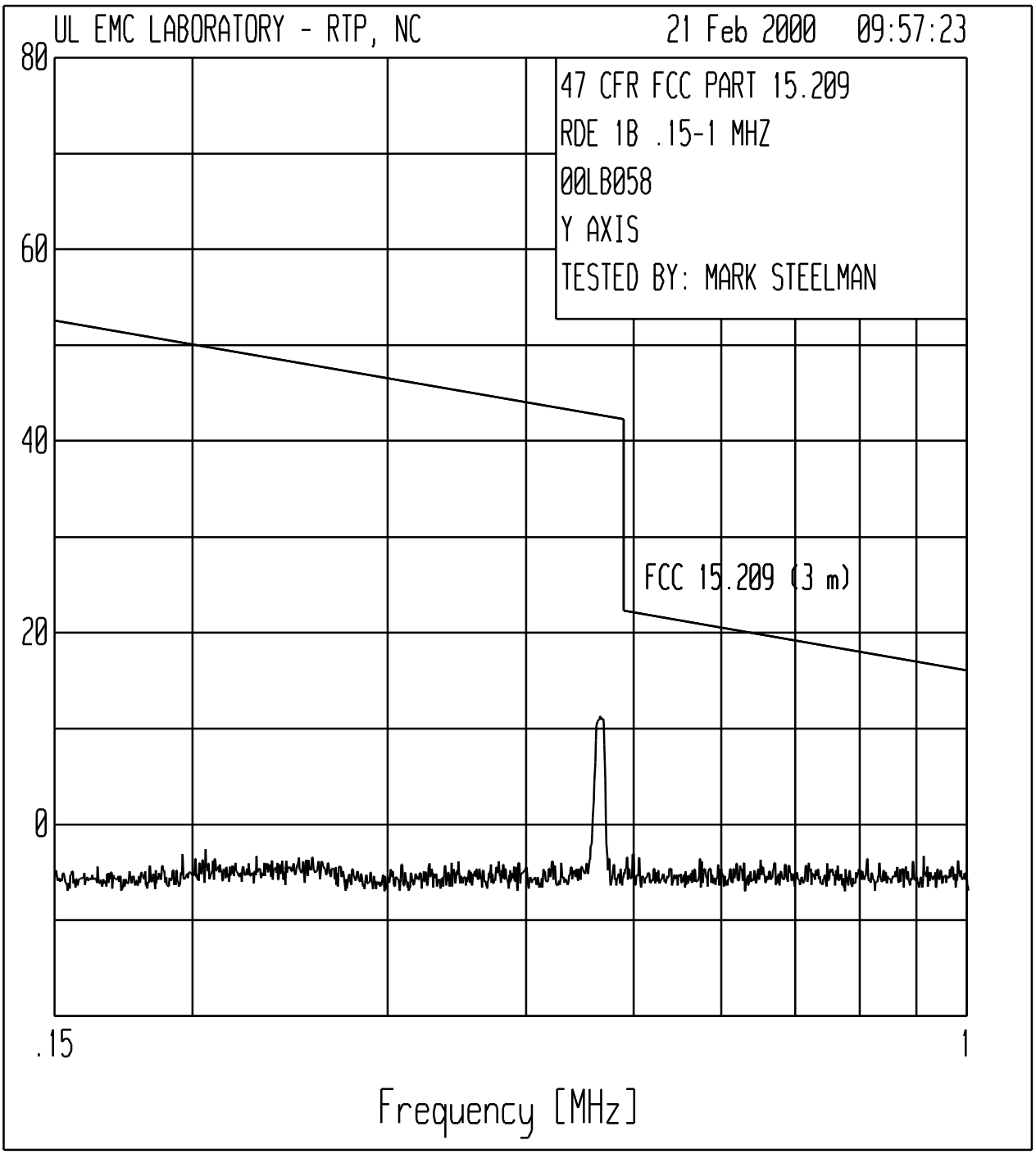
Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - X axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



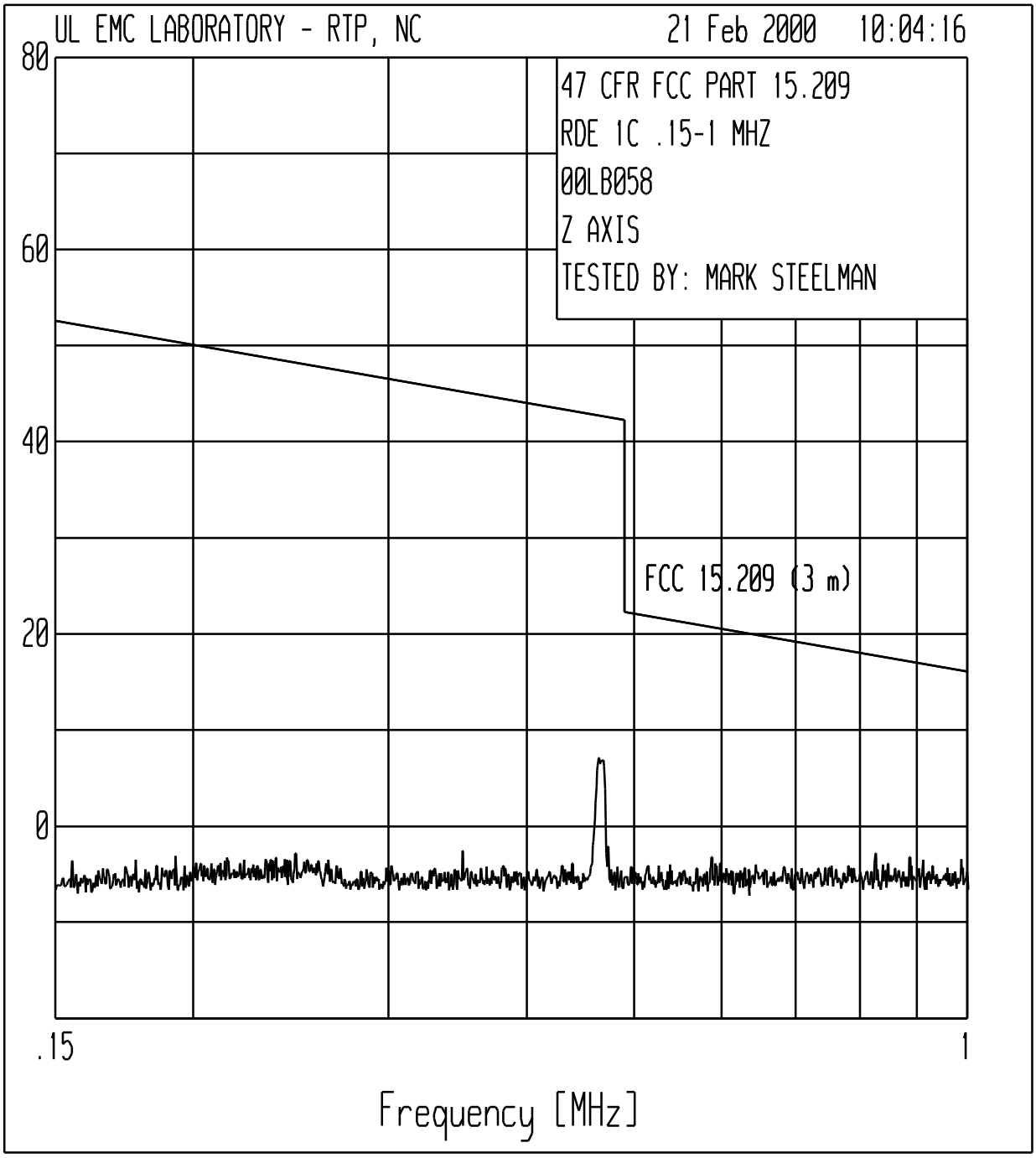
Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - Y axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



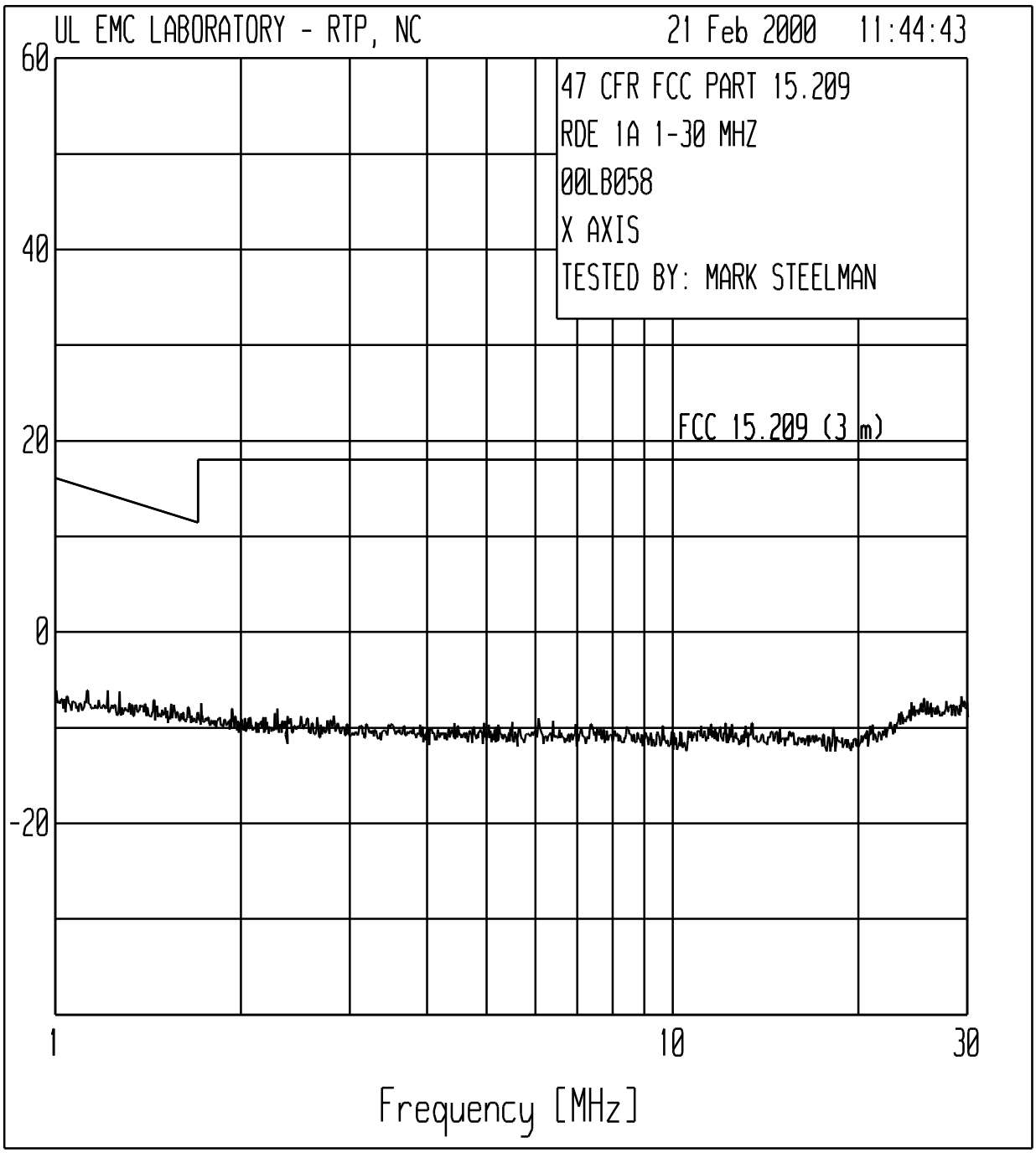
Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m to 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, Item EUT Horizontal - Z axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



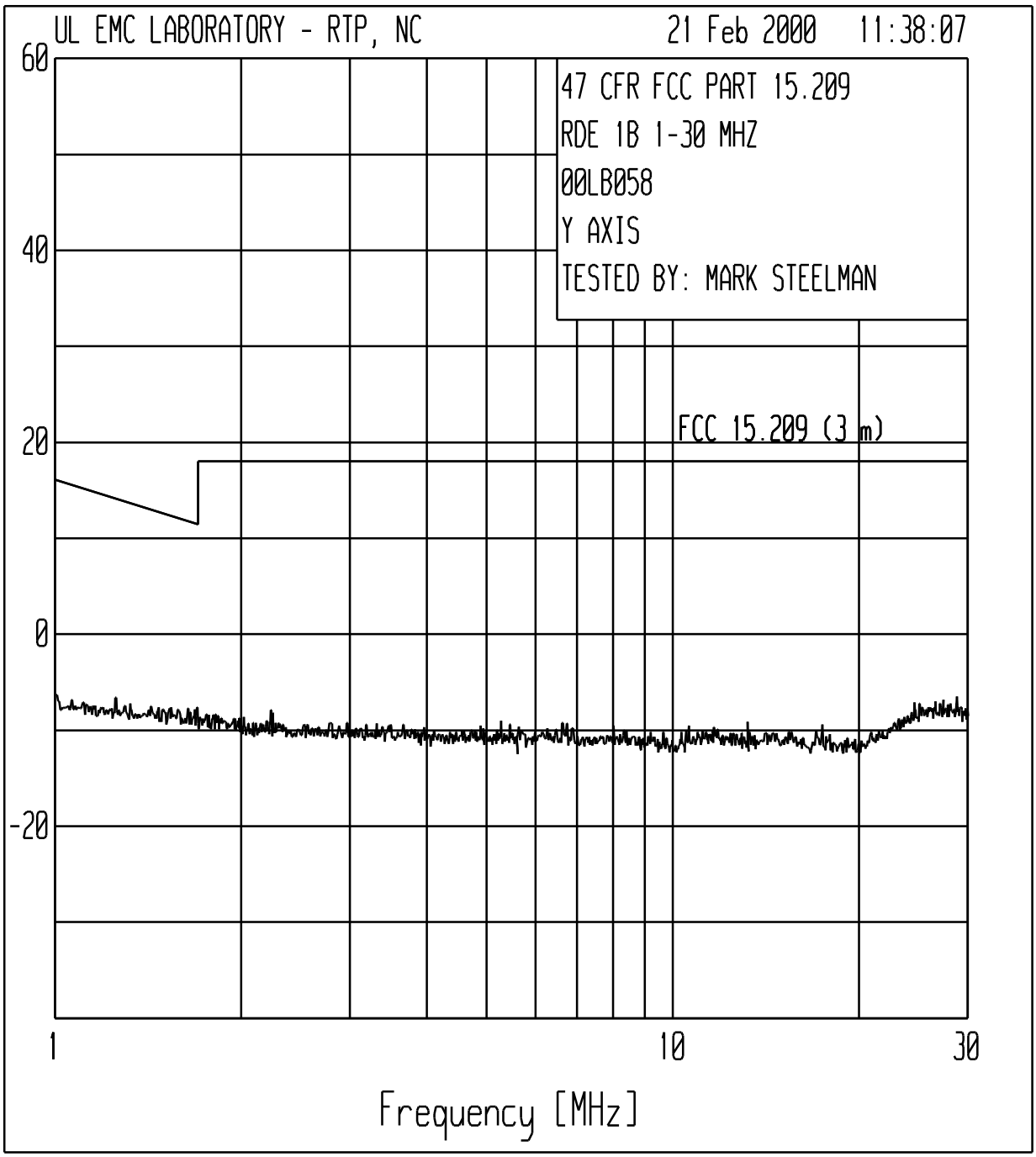
Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m to 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - X axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



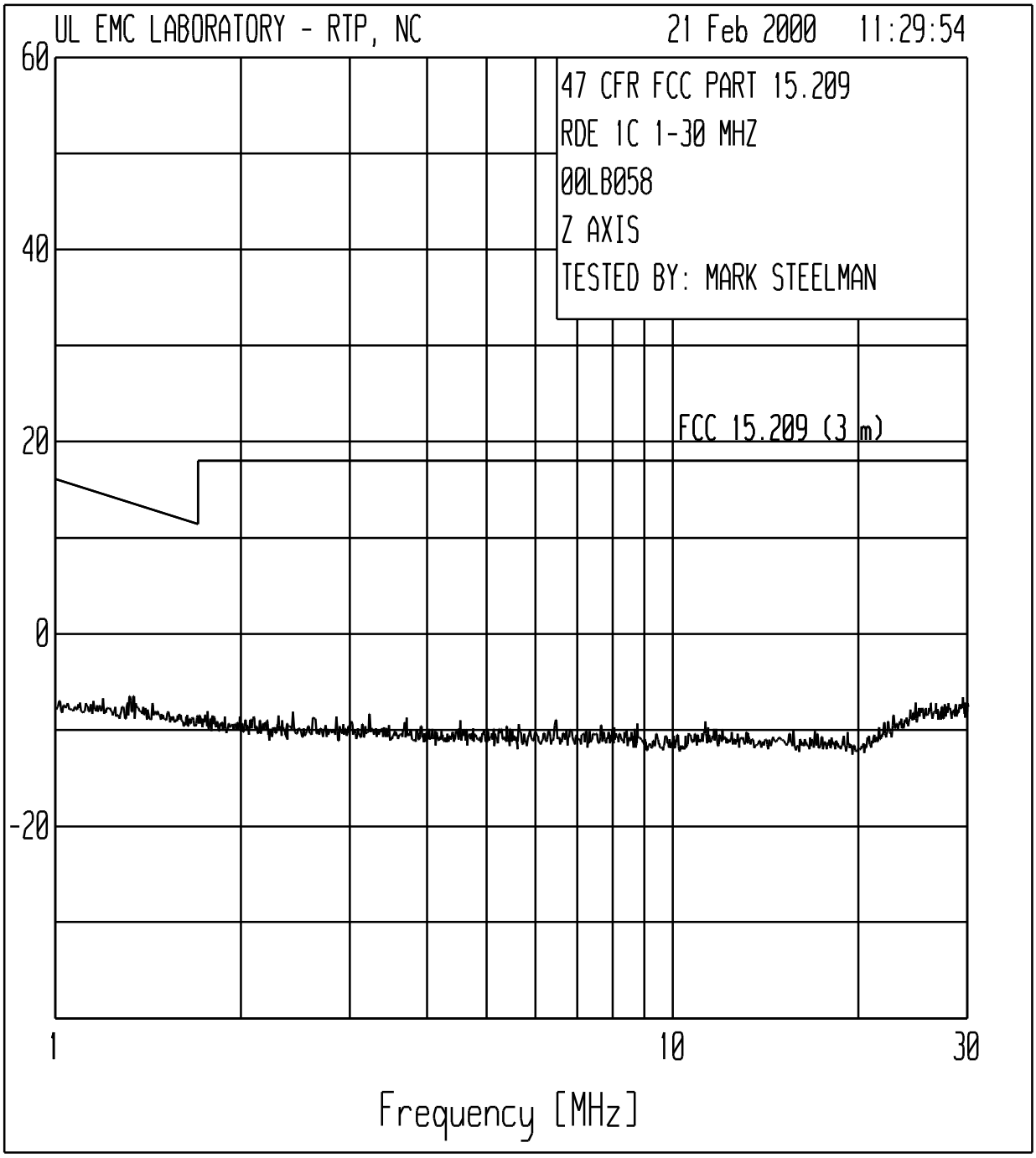
Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m to 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - X axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m to 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Horizontal - Y axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz

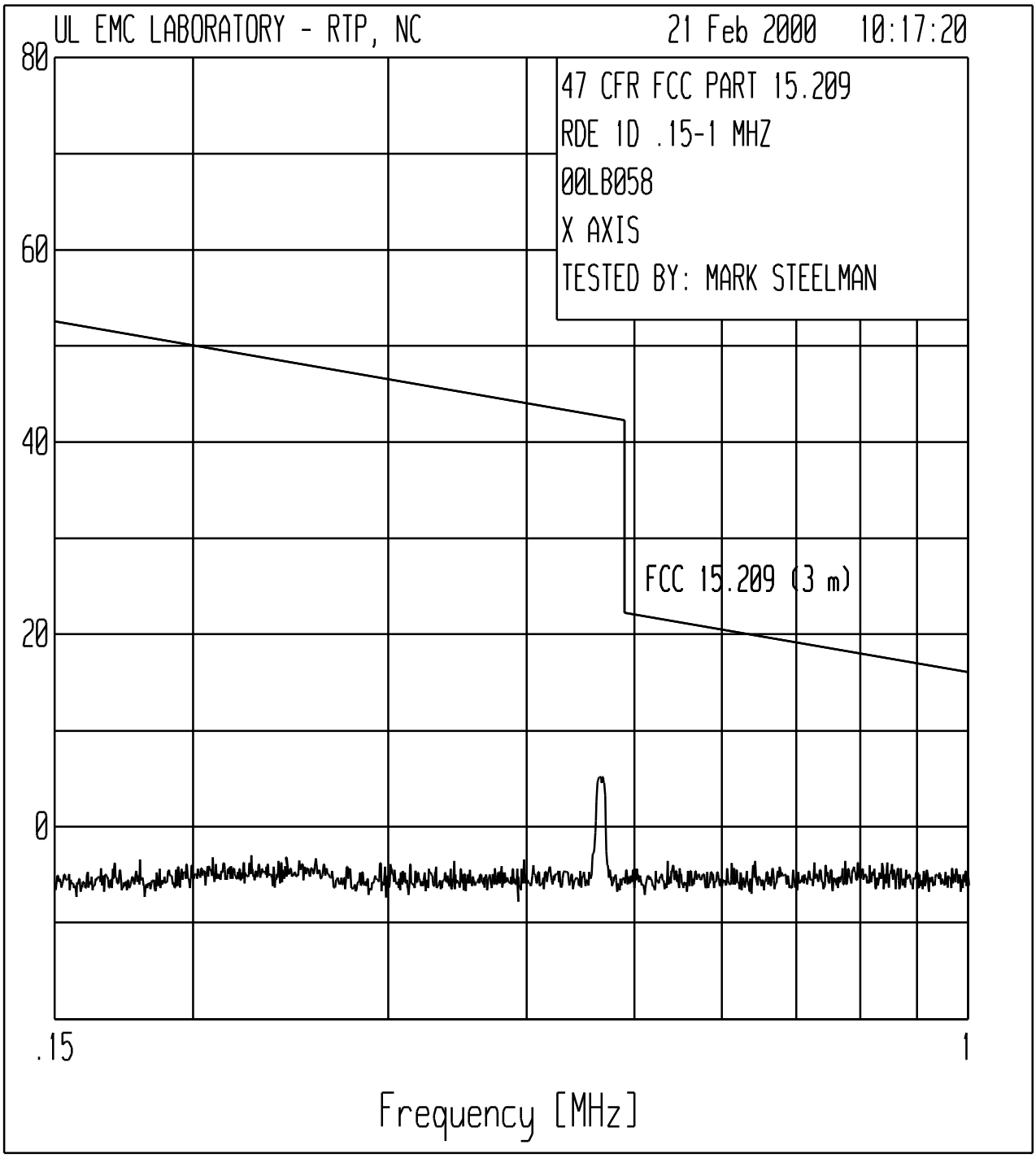


Graph Units are dBuA/m representing corrected magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m to 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test Item	Detector Type* (P/Q/A)	Antenna Polarity (H/V)	Measured Frequency (MHz)	Measured Value (dBµV)	Equipment Correction (dB/m)	Distance Interpolation (dB)	Impedence of Free Space (dBV/A)	Corrected Value (dBµV/m)	Specified Limit** (dB µV/m)	Spec Margin (dB)	See Comment #
B	P	X	0.4666	23.9	-18.7	-80	51.7	-23.1	14.2	-37.3	
B	P	X	0.9331	12.6	-18.7	-40	51.7	5.6	28.2	-22.6	Noise Floor
B	P	Y	0.4650	14.1	-18.7	-80	51.7	-32.9	14.2	-47.1	Noise Floor
B	P	Y	0.9300	13.4	-18.7	-40	51.7	6.4	28.2	-21.8	Noise Floor
B	P	Z	0.4673	28.5	-18.7	-80	51.7	-18.5	14.2	-32.7	
B	P	Z	0.9340	12.8	-18.7	-40	51.7	5.8	28.2	-22.4	Noise Floor

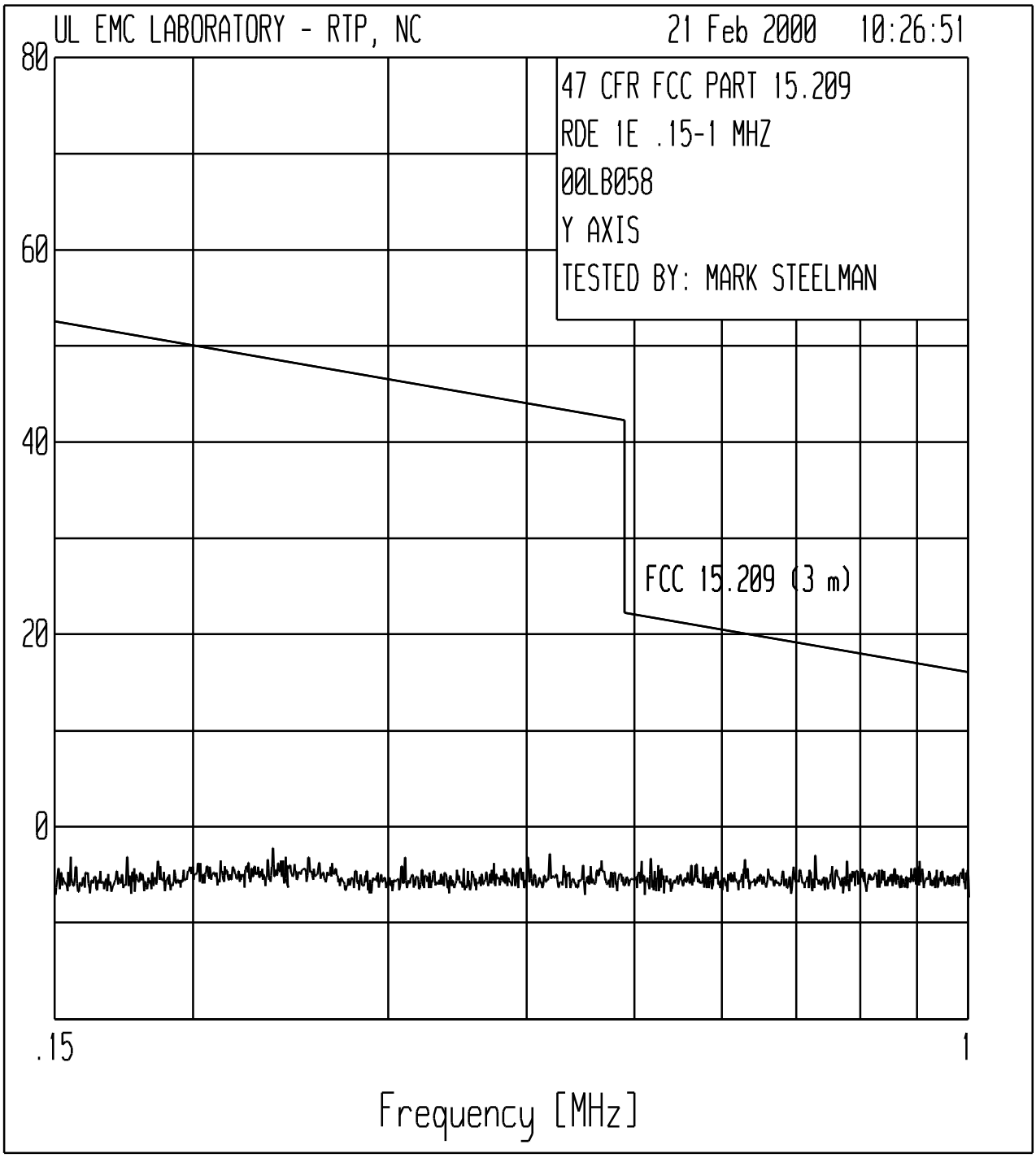
* P = Peak, Q = Quasi-Peak, A = Average.
** The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.
Sample Calculation: Corrected Value = Measured Value + Equipment Correction + Distance Interpolation + Impedence of Free Space
Equipment Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB ,if used)

Test 1, EUT Vertical - X axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



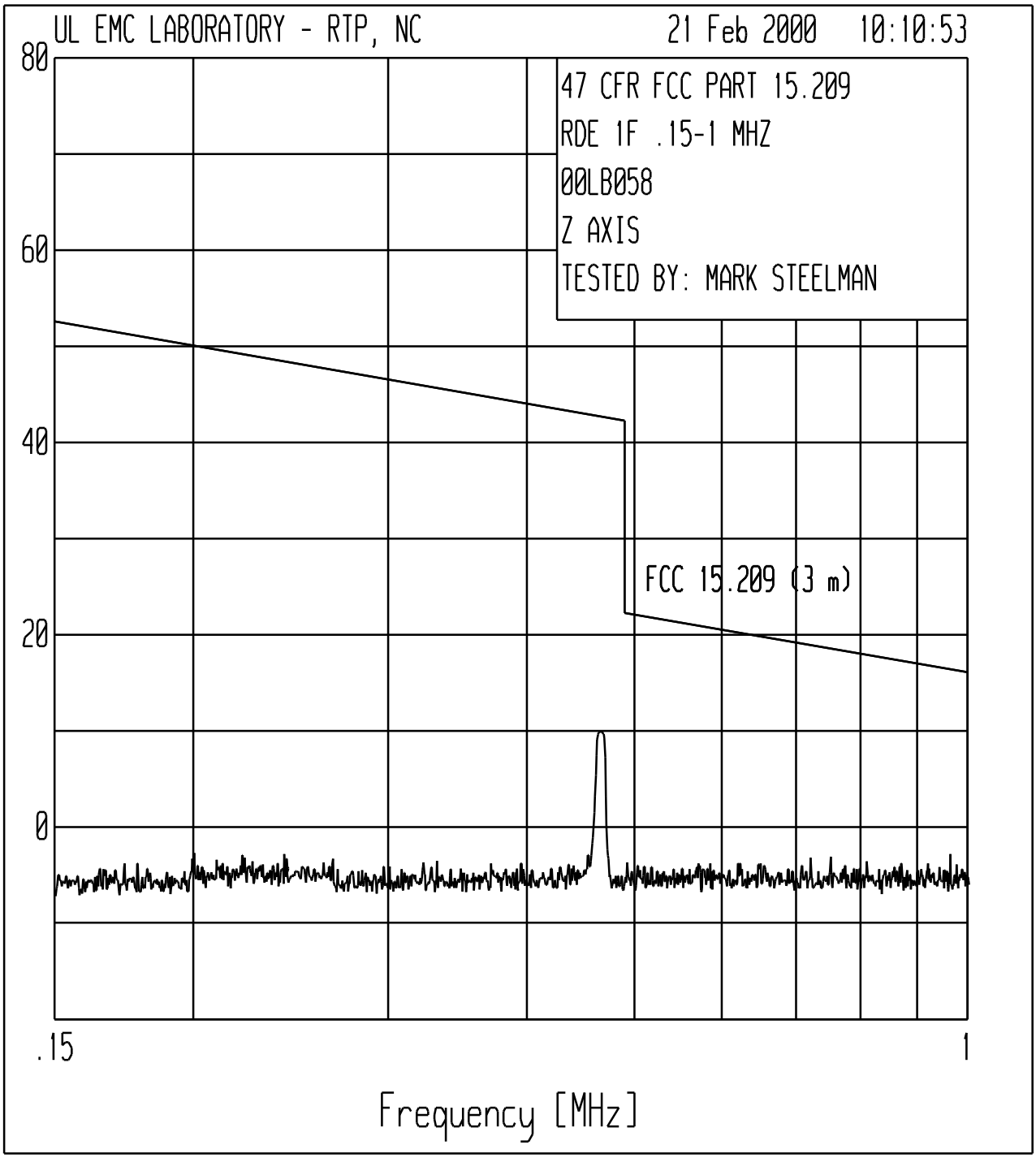
Graph Units are dBuA/m representing magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Vertical - Y axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



Graph Units are dBuA/m representing magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 1, EUT Vertical - Z axis - Peak Plot: Radiated Disturbance Emissions - 0.01 to 30 MHz



Graph Units are dBuA/m representing magnetic field strength at measurement distance of 3 meters. Antenna factor and cable loss factors are applied, but 300m-to-3m or 30m-to-3m distance factor and Magnetic Field-to-Electric Field conversion factor are not included in graph.

Test 2: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

Test Requirement: 47 CFR Part 15, Subpart C

Test Specification: 47 CFR Part 15, Subpart C, Section 15.209

Test Procedure:

All testing was performed in UL's 10 meter semi-anechoic chamber. The chamber meets the FCC's site attenuation criteria for use as an alternative measurement site. The EUT was tested per ANSI C63.4:1992 test method placed on a non-conductive 1m x 1.5m table 80 cm above the ground plane. The receive antennas used were a biconical antenna from 30-300 MHz and a log-periodic antenna from 300-1000 MHz. The turntable was rotated from 0 to 360 to determine the worst-case emissions angle for each frequency. The antenna mast was raised and lowered between 1 and 4 meters above the ground plane to determine the worst-case antenna height. Both Vertical and Horizontal antenna polarities were investigated.

Radiated Emissions Limit above 30 MHz - General Requirements - Section 15.209

Frequency Range (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (m)
30 to 88	100	40.0	3
88 to 216	150	43.5	3
216 to 960	200	46.0	3
above 960	500	54.0	3

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	1	1

Test 2 - 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	48	22.0	100.1	P	2/21/00	1

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

Comments:

Comment #	Description
1	No EUT frequencies were observed in this frequency range. The plots and frequencies reported represent the measurement noise floor.

Test 2 - Test Equipment Used: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0021	Biconical Antenna, 20 to 300 MHz	Chase	VBA6106A	4/2/99	4/30/00
AT0022	Log Periodic Antenna, 200 to 1000 MHz	Chase	UPA6109	4/2/99	4/30/00
ATA034	52ft Cable, N - N	UL	HELIAX	8/28/99	8/31/00
ATA038	33ft Cable, N - N	EMC Technologist	RG-214	7/30/99	7/31/00
HI0034	Temp/Humid. Indicator	Cole - Palmer	99760-00	12/20/99	12/31/00
SAR001	EMI Receiver	Hewlett Packard	8572A	12/14/99	12/31/00

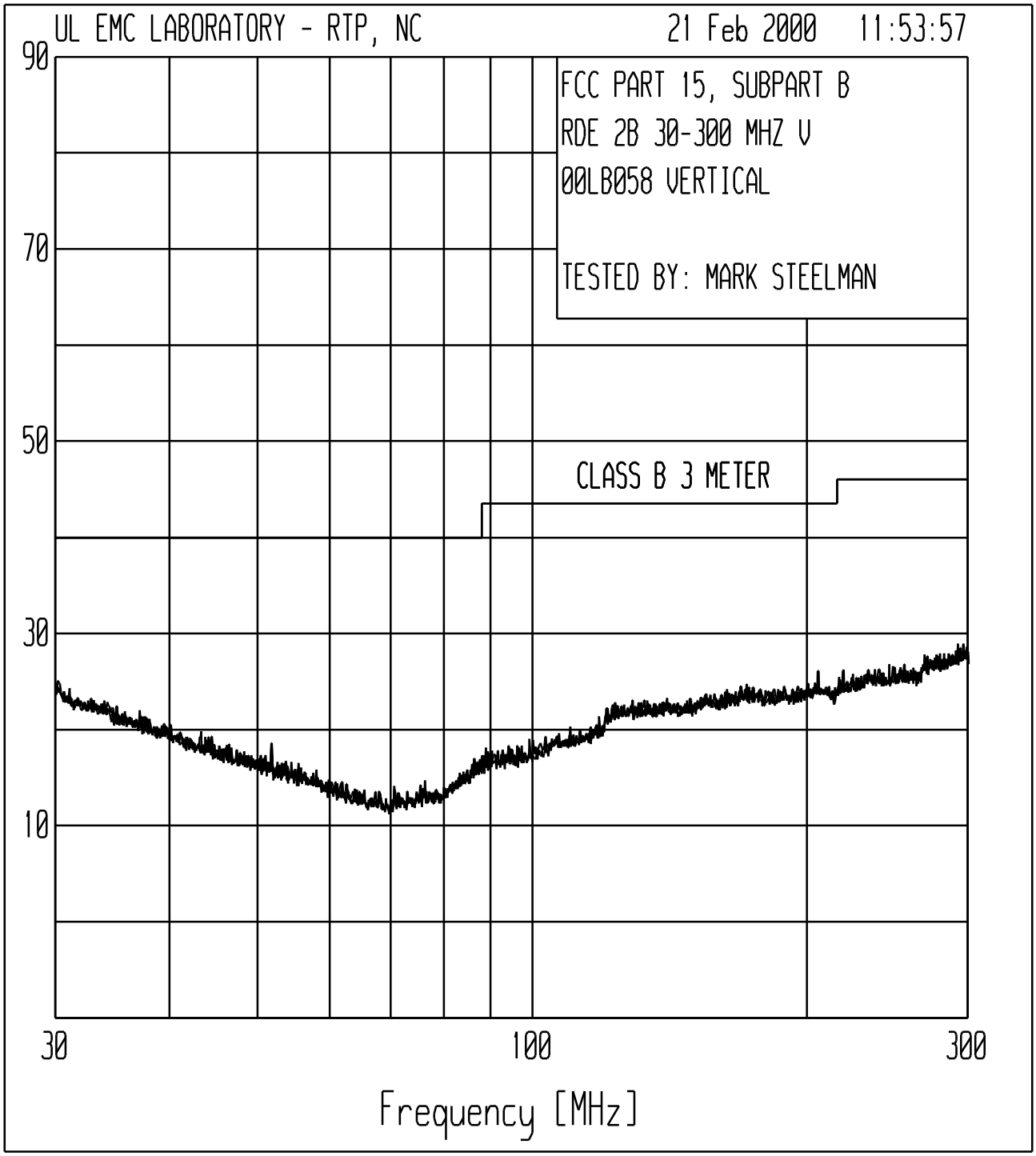
The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

Test 2, Item A - Discrete Data: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field

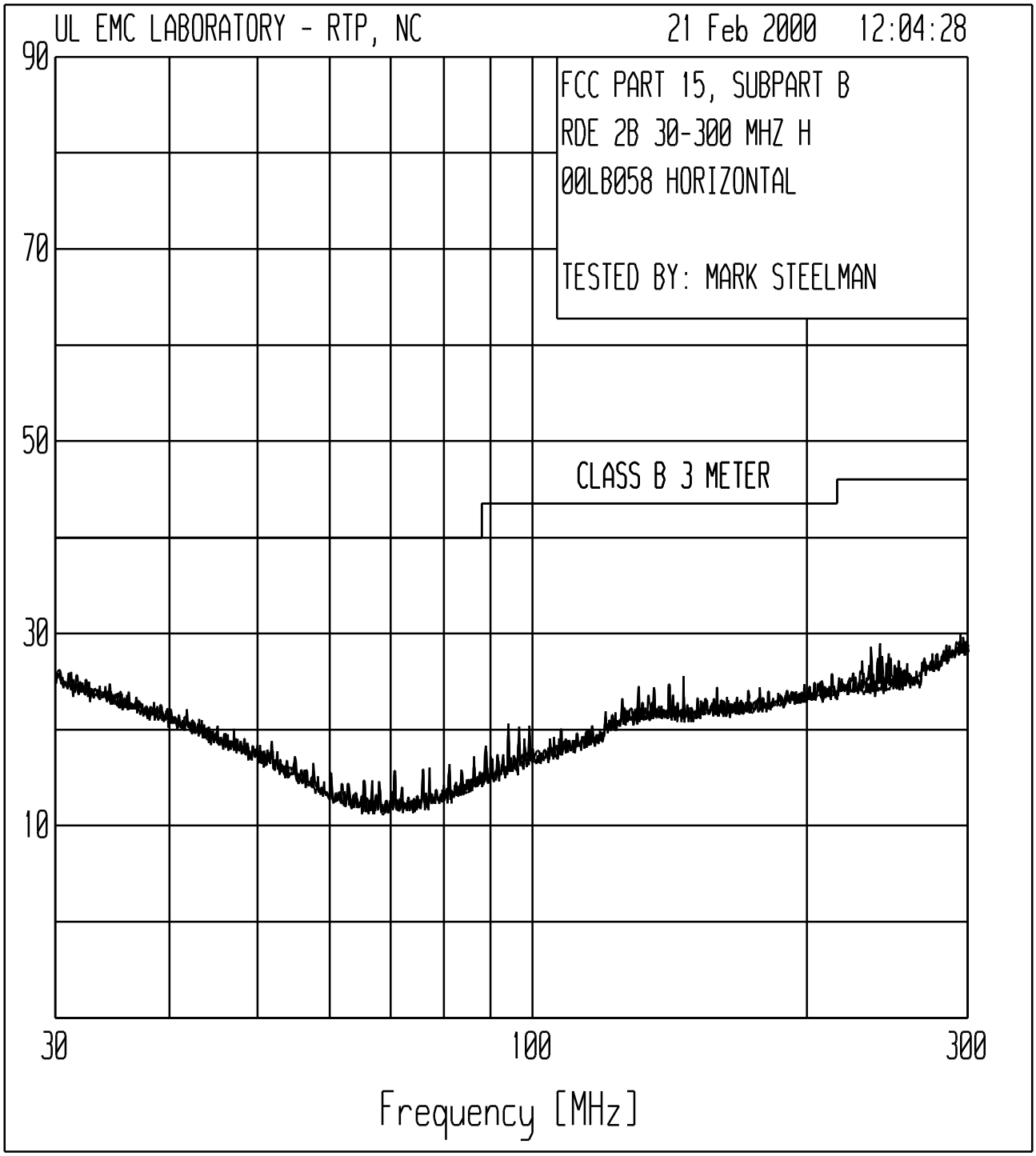
Test Item	Detector Type* (P/Q/A)	Antenna Polarity (H/V)	Antenna Distance (m)	Measured Frequency (MHz)	Measured Value (dBµV)	Equipment Correction (dB/m)	Corrected Value (dBµV/m)	Specified Limit** (dB µV/m)	Spec Margin (dB)	See Comment #
A	P	V	3	30.068	5.9	18.3	24.2	40.0	-15.8	Noise Floor
A	P	V	3	271.556	6.2	20.5	26.7	46.0	-19.3	Noise Floor
A	P	V	3	844.197	7.5	27.8	35.3	46.0	-10.7	Noise Floor
A	P	H	3	94.177	9.5	11.1	20.6	43.5	-22.9	Noise Floor
A	P	H	3	146.456	9.5	16.1	25.6	43.5	-17.9	Noise Floor
A	P	H	3	543.889	11.3	23.4	34.7	46.0	-11.3	Noise Floor

* P = Peak, Q = Quasi-Peak, A = Average.
** The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.
Sample Calculation: Corrected Value = Measured Value + Equipment Correction
Equipment Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB ,if used)

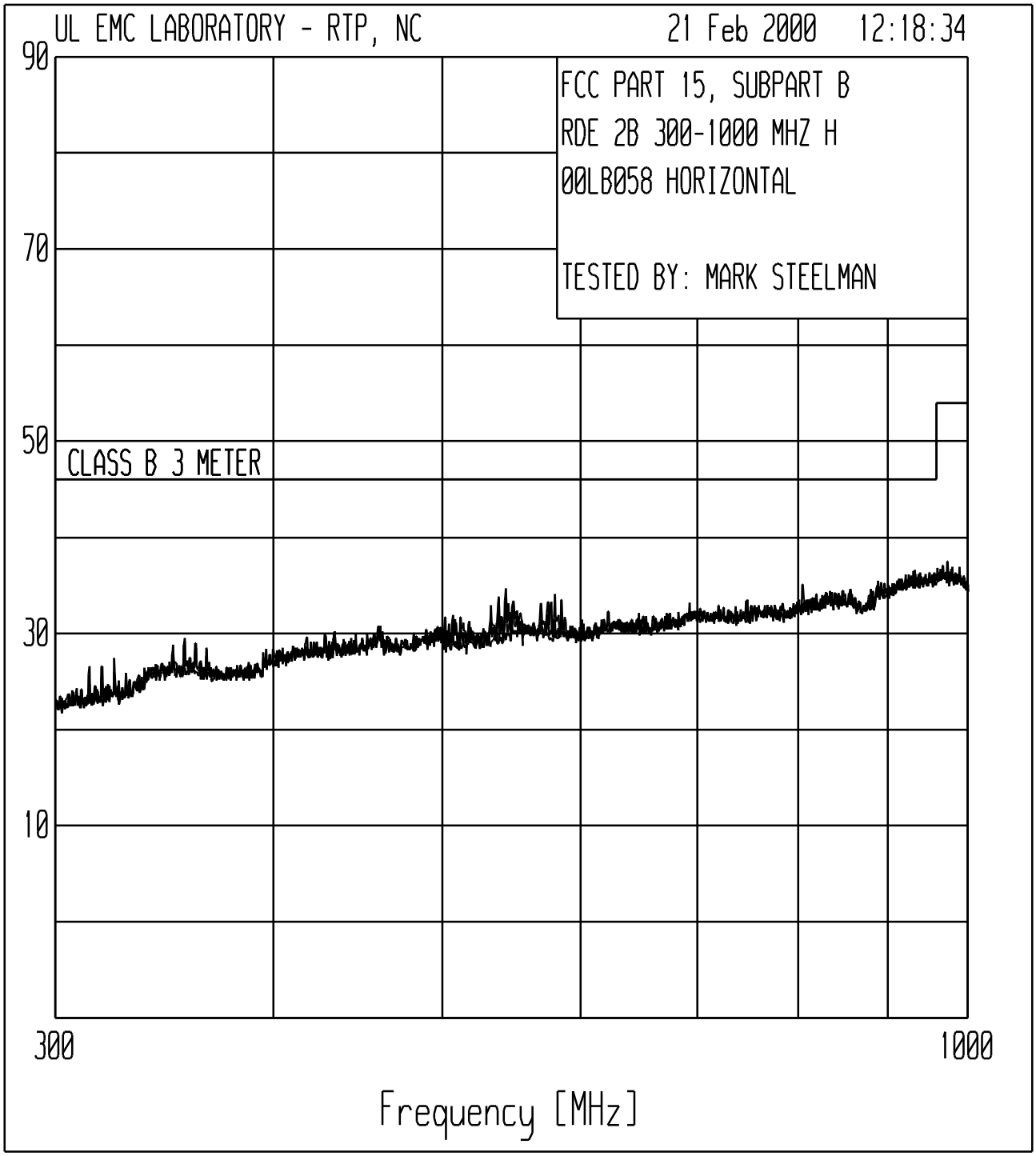
Test 2, Item A - Peak Plot: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field



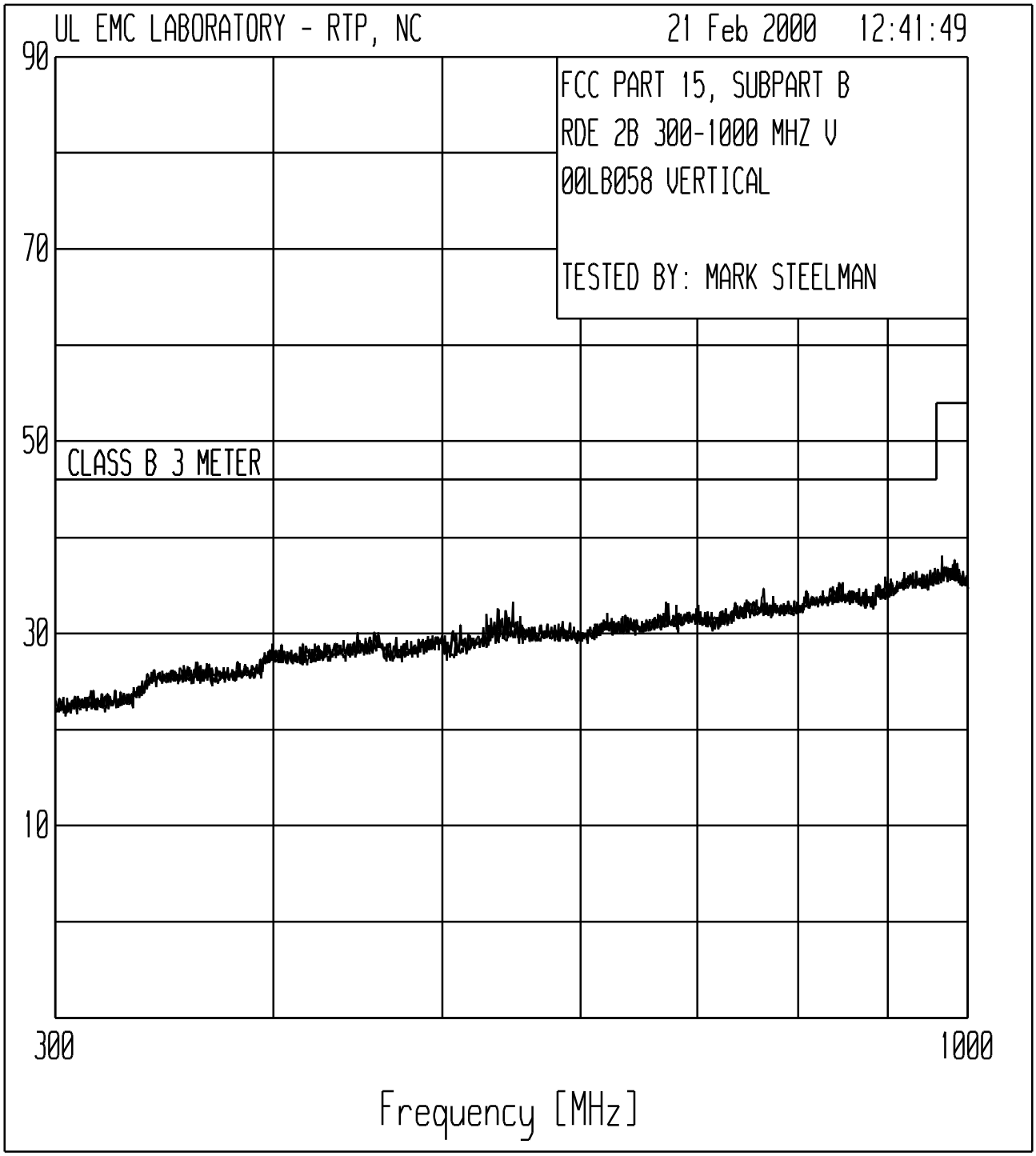
Test 2, Item A - Peak Plot: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field



Test 2, Item A - Peak Plot: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field



Test 2, Item A - Peak Plot: Radiated Disturbance Emissions - 30 to 1000 MHz Electric Field



Appendix A: Accreditation Certificate

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

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Scope of Accreditation

Page: 1 of 1

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: 847-509-6219
E-Mail: titusr@ul.com
URL: http://www.ul.com

NVLAP Code	*Designation / Description*
International Special Committee on Radio Interference (CISPR) Methods	
12/CIS22	IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment
Federal Communications Commission (FCC) Methods	
12/F01	FCC Method - 47 CFR Part 15 - Digital Devices
12/F01a	Conducted Emissions, Power Lines, 450 KHz to 30 MHz
12/F01b	Radiated Emissions
Australian Standards referred to by clauses in ACA Technical Standards	
12/T51	AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

June 30, 2000
Effective through

For the National Institute of Standards and Technology

NVLAP 01S (11-95)

Measurement Uncertainty Statement

The limits and test levels have been set taking into account the measurement uncertainty contributions from the test equipment and facilities which meet the accuracy limits stated in the relevant basic standard. In the case of emissions tests, the measured value shall be compared directly with the limits. If the measured value is equal to or less than the limit the product sample is deemed to pass the test. (REF: prEN 50222:1997). The measured value does not need to be adjusted by the measurement uncertainty to determine compliance.

Example of Measurement of field strength between 30 dBuV/m and 60 dBuV/m over the frequency range 30 MHz to 300 MHz (biconical) In UL Anechoic Chamber @ 10m

Expanded Std Uncertainty 3.71 dB

Example of Measurement of field strength between 30 dBuV/m and 60 dBuV/m over the frequency range 300 MHz to 1000 MHz (log) In UL Anechoic Chamber @ 10m

Expanded Std Uncertainty 3.19 dB

Example of Measurement of conducted voltage, signal strength between 30 dBuV/m and 50 dBuV/m over the frequency range 150 kHz to 30 MHz

Expanded Std Uncertainty 2.16 dB

Appendix A: Accreditation Certificate

Industry Canada Industrie Canada

Certification and Engineering Bureau
1241 Clyde Avenue
Ottawa, Ontario
K2C 1Y3

Tel. No. (613) 952-3650
Fax. No. (613) 952-1088

December 11, 1997

Jodine E. Smyth
Underwriters Laboratory Inc.
333 Pfingsten Road
Northbrook, Illinois 60062-2096

Our File: 46390-2953
Submission: 20309 O

Dear Ms. Smyth,

The Bureau has received your test report for the Alternate Test Site located at Reasearch Triangle Park, North Carolina, dated December 5, 1997. I have reviewed the report and find it complies with RSP 100, Issue 7, section 3.3 Description of Open Area Test Site.

The site is acceptable to Industry Canada for the performance of radiated measurements. Please reference the file number " IC 2953 " in the body of all test reports containing measurements made on this site. This reference number is the indication of Industry Canada's acceptance of your site.

Whenever major construction or repairs to the site are completed, a re-submission of the site attenuation characteristics will be required.

Yours sincerely,

Brian Kasper

Brian Kasper
Head, EMC and Standards
Certification and Engineering Bureau

Canada