FCC
Electromagnetic Compatibility
Test Report

For

3M™ Model 8800 Detection System

Security Systems Division
Library Systems
St. Paul, MN 55144-1000

12 July 2004

Report Number F0404002

Prepared By:

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CERTIFICATE OF COMPLIANCE

USA STANDARD 47 CODE OF FEDERAL REGULATIONS

Radiated Emissions (FCC Part 15, Subpart B, Class A)
Conducted Emissions (FCC Part 15, Subpart B, Class A)
Radiated Emissions (FCC Part 15, Subpart C)
Conducted Emissions (FCC Part 15, Subpart C)

MANUFACTURER'S NAME:	3M Company Security Systems Division Library Systems St. Paul, MN 55144-1000
NAME OF EQUIPMENT:	Detection System
MODEL NUMBER:	8800
SERIAL NUMBER	Test Sample (TS) 1
TEST REPORT NUMBER:	F0404002
DATE:	12 July 2004

As the responsible EMC Project Engineer, I hereby declare that the equipment tested, as specified in the test report, at the 3M Product Safety EMC Laboratory is in compliance with 47 CFR, Part 15, Subpart B and Subpart C. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

Signatory: Roger Kuhn

Roger D. Kuhn
EMC Laboratory – Project Leader

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1.0 TEST SUMMARY

Test Report Number:	F0404002
Requester:	Ed Goff
Company:	3M Security Systems Division Library Systems Building 209 St. Paul, MN 55144
Telephone Number:	651 – 737-4736
Test Dates:	Initial Testing and Diagnostics: 8 April 2004 to 28 June 2004 – various dates Certification Testing: 29, 30 June, 1,6,7,8,9 July 2004
Equipment Under Test	Model 8800 Detection System
Date Of Receipt:	7 April 2004
Test Environment	Temperature: 20 to 30 degrees C Relative Humidity: 30 to 70 % RH
Test Results:	Passed the following tests: Conducted Emissions: FCC Part 15 Subpart B Class A; Radiated Emissions: FCC Part 15 Subpart B Class A; Conducted Emissions: FCC Part 15 Subpart C; Radiated Emissions: FCC Part 15 Subpart C;
Modifications:	See 2.5 Modifications to the EUT
Test Location:	3M Product Safety EMC Laboratory Building 76 410 Fillmore Ave. St. Paul, MN 55144-1000

2.0 INTRODUCTION

2.1 Scope

This report contains results describing the conformance of the Equipment Under Test (EUT) to FCC Part 15, Subpart B, "Class A" rules for unintentional radiators and FCC Part 15, Subpart C rules for intentional radiators.

This report is the confidential property of the client and applies only to the specific item tested under the stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. This report shall not be reproduced without the written approval of the testing laboratory. When approval has been granted, the report shall be reproduced in its entirety.

The appropriate testing standards and references that were used are contained in Section 3.0. Worst-case test data, test configuration, and photographs (worst case configuration) are provided in the Appendices. Equipment and documentation labeling information is contained in Section 7.0.

Subsequent tests are necessary from time to time on equipment taken at random from production. Re-testing of the EUT is also required when the EMC profile has been changed or is suspected of being changed.

The 3M Product Safety EMC Laboratory is recognized under the United States Department of Commerce National Institute of Standards and Technology's National Voluntary Laboratory Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQ Q92-1987) as suppliers of test results. Accreditation by the National Voluntary Laboratory Accreditation Program is awarded for specific services, listed on the Scope of Accreditation for: Electromagnetic Compatibility and Telecommunications, FCC, under Lab Code 200033. A complete copy of the Scope of Accreditation is available upon request. The FCC Site Registration Number is 93334.

The NVLAP accreditation or this test report does not in any way constitute or imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

2.2 EUT Description and Operation

The Equipment Under Test (EUT) is the 3M™ Model 8800 Detection System, Serial Number, Test Sample 1. The system can be configured for a single corridor - Model 8801 (2 Lattices) or a dual corridor – Model 8802 (3 Lattices). The system tested was configured for each of the models and the worst-case emissions for both configurations is shown in this report.

The 3M Detection System Model 8800 series is intended for use in detecting books that have not been checked out by library patrons. The system is typically placed at the exit point of a library such that patrons must walk through it when exiting the building or facility, and provides an audio and visual alarm if unchecked materials are detected.

The system must be installed as specified in the **Model 8800 Series Contractors Package**, and is intended for use in an indoor library environment. It has not been evaluated for other uses or locations.

The reader has a transmit frequency of 13.56 MHz. And a power output level of 4.00 watts (36 dBm) as measured into a 50-ohm load. The output of the Reader goes into a splitter board that divides the power to the antenna within each lattice.

The EUT has an integral antenna with an area of 10 square feet (0.928 square meters) enclosed within each lattice

All tests were made using an input of 120 V RMS, 60 Hz, and single-phase power. The EUT was tested as normally install into a library and exercising all functions. The Reader was set to the fastest read time and was detecting tags during all testing.

2.3 Block Diagram

The Block diagram is a separate exhibit.

2.4 Part List

The Parts List is a separate exhibit.

2.5 Modifications to the EUT

The following EMC modifications of the EUT were necessary to meet the emission requirements of the test standards.

Equipment	Modifications	Where	Material	Turns
Counter Display Cable	Changed to Shielded Twisted Pairs	Shield grounded at Control Board Case or Blackplane		
Counter Display Cable	Common Mode Choke	At the Control Board	Steward 28A2024-0A0	1 Turns
9 Conductor Cable	Common Mode Choke	At the Control Board	Steward 28A2025-0A0	1 Turns
Coax Cable	Common Mode Choke	At the Reader Board	Steward 28A2025-000	2 Turns
Power Supply Cable	Shield Power Supply Cable and ground at both ends	To Backplane		
Power Supply Cable	Common Mode Choke	At the Power Supply on wires only	Steward 28A0392-0A0	1 Turns
Power Cable to Reader	Common Mode Choke	At the Reader	Steward 28A2029-0A0	2 Turns
RS232 Cable	Ground Shield at Both Ends	To Backplane		
Control Cable between Lattices	Common Mode Choke	At the PC Board in Lattice B	Steward 28A2024-0A0	1 Turns

2.5 Modifications to the EUT (continued)

Equipment	Modifications	Where	Material	Turns
Antenna	Insulate antenna wires	From metal parts or where antenna wires cross		
Reader Box Cover	Make better Electrical Contact	On All Sides of Cover	Better Box Tolerances or EMI Gasket	

2.6 Measurement Uncertainty

The data and test results referenced in this report are true and accurate. However, there may be deviations within the calibration limits of the test equipment and facilities that can account for a nominal measurement deviation of ± 2 dB. Furthermore, EUT component and manufacturing process variables may result in additional deviation. The calculated confidence level is 95 %.

3.0 APPLICABLE DOCUMENTS

The following documents were used as reference for the limits and test procedures specified herein.

CFR 47	Part 15 Radio Frequency Devices	2002
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 KHz to 40 GHz.	2000
CISPR 16-1	Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus	1998
CISPR 16-2	Specification for radio disturbance and immunity measuring apparatus and methods Part 2: Methods of measurements of disturbances and immunity	1996

4.0 CONDUCTED EMISSIONS

Conducted emissions testing was performed in accordance with ANSI C63.4. The limits are prescribed in FCC Part 15, Subpart B and in FCC Part 15, Subpart C.

4.1 Test Procedure

The EUT was placed in a shielded chamber for the tests and tested while exercising all functions with a dummy load attached to the Reader output terminal (See ANSI C63.4-1992 Paragraph 13.1.3.1).

A Line Impedance Stabilization Network (LISN) with a 50 Ohm / 50 microHenry characteristic impedance was used to isolate the EUT and give accurate and repeatable readings. An EMI test receiver was used for the emissions measurements in the range from 150 KHz to 30 MHz. Initial sweep measurements were taken with the receiver in continuous frequency overview mode utilizing peak level signal detection. Acceptance analysis was preformed on the initial measurements to determine which discrete frequencies to maximize. These frequencies were remeasured utilizing quasi-peak detection. Measurement results were automatically calculated via software running the EMI receiver. The final quasi-peak measurements recorded were determined by the following formula:

Result (dBµV) = receiver reading (dBµV) + LISN CF (dB) + cable loss (dB)

4.2 Test Criteria

The FCC Part 15, Subpart B, "Class A" conducted limits are given below.

Frequency (MHz)	Limit Quasi-Peak (dBµV)	Limit Average (dBµV)
0.15 to 0.5	79	66
0.5 to 30.0	73	60

The lower limit shall apply at the transition frequency.

The FCC Part 15, Subpart C conducted limits are given below.

Frequency (MHz)	Limit Quasi-Peak (dBµV)	Limit Average (dBµV)
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.0	56	46
5.0 to 30.0	60	50

The lower limit shall apply at the transition frequency.

4.3 Test Results

The EUT met conducted emission requirements for FCC Part 15, Subpart B, "Class A" and met FCC Part 15, Subpart C. All the conducted emissions test data is shown in Appendix A. The worst-case peak and quasi-peak emissions were as follows:

Frequency (MHz)	Limit (dBµV)	L1- Line Q-P (dBµV)	L2 - Neutral Q-P (dBµV)	Passing Margin (dB)
0.221	62.8	44.3	44.4	18.4
13.5602	60.0	33.4	32.4	26.6

FCC Part 15, Subpart C limit is shown.

5.0 RADIATED EMISSIONS

Radiated emissions testing was performed in accordance with ANSI C63.4. The limits are prescribed in FCC Part 15, Subpart B and in FCC Part 15, Subpart C.

5.1 Frequency Stability

The Frequency Stability testing was preformed in accordance with ANSI C63.4 and FCC Part 15 to insure that the intentional radiator frequency stability was within the allowable limits for input power and temperature variations.

5.1.1 Test Procedure

The Frequency Stability was measured using the radiated signals from the EUT so that the measurement equipment would not load the radio frequency circuits. An EMI receiver was used for the frequency stability measurements. The Reader was put into a continuous output mode through instructions from the host computer (test mode of operation). 1) The frequency was measured while the input AC power to the External Power Supply was varied over the required input voltage range. 2) The frequency was also measured while the ambient air temperature was varied over the required ambient temperature range (at startup, 2 minutes, 5 minutes, and 10 minutes).

5.1.2 Test Criteria

The FCC Part 15, Subpart C for Frequency Stability Limits versus Supply Voltage is given below.

Carrier Frequency (MHz)	Voltage Range (% of Nominal Supply)	Max. Frequency Change (%)
13.56	85 % to 115 %, (102 to 138 V RMS)	+/- 0.01 %

The FCC Part 15, Subpart C for Frequency Stability Limits versus Temperature is given below.

Carrier Frequency (MHz)	Temperature Range (Degrees C)	Max. Frequency Change (%)
13.56	-20 to +50	+/- 0.01 %

5.1.3 Test Results

The EUT met the FCC Part 15, Subpart C Frequency Stability requirement. Test data is shown in Appendix B.

Carrier Frequency Stability versus Supply Voltage

Carrier Frequency (MHz)	Lowest Frequency (MHz)	Highest Frequency (MHz)	Frequency Change (%)
13.5598	13.5597	13.5598	+/- 0.0010 %

Carrier Frequency Stability versus Temperature

Carrier Frequency (MHz)	Lowest Frequency (MHz)	Highest Frequency (MHz)	Frequency Change (%)
13.5598	13.5595	13.5601	+/- 0.0025 %

5.2 Emission Bandwidth

The EUT was placed in an anechoic chamber and the Emission Bandwidth testing was preformed in accordance with ANSI C63.4 and FCC Part 15, Paragraph 15.225. The Emission Bandwidth measurements were made to determine the intentional radiator frequency and determine the level of electromagnetic energy radiated at that frequency and at the band edges from the EUT.

5.2.1 Test Procedure

A measurement antenna (loop) was positioned at a distance of 5 meters (to insure far field measurements) from the center of the EUT. An EMI receiver was used for the emissions measurements. Initial sweep measurements were taken with the receiver in continuous frequency overview mode utilizing peak level signal detection. The intentional radiator frequency and band edge frequencies utilizing quasi-peak detection were then maximized. Maximizing a frequency involves finding the angle of the highest emission levels by rotating the EUT 360 degrees (sampling at least every 4 degrees). Then the antenna, which was fixed at 1-meter height, was rotated until the highest emissions levels found. Measurement results were automatically calculated via software running the EMI receiver. The final quasi-peak measurements recorded were determined by the following formula:

Result (dBµV/m) = receiver level (µV) + antenna factor (dB/m) + cable loss (dB) - preamp gain (dB) + lineal conversion (dB).

5.2.2 Test Criteria

The FCC Part 15 Subpart C, Paragraph 15.225 Carrier Frequency Limits are given below.

Lower Band Edge (MHz)	Upper Band Edge (MHz)
13.553	13.567

The FCC Part 15, Subpart C radiated limits are given below.

Frequency (MHz)	Distance (m)	Field Strength (dBµV/m)
1.705 to 13.110	10	48.62
13.110 to 13.410	10	59.58
13.410 to 13.553	10	69.55
13.553 to 13.567	10	103.00
13.567 to 13.710	10	69.55
13.710 to 14.010	10	59.58
14.010 to 30.000	10	48.62

Note: A 40 dB/decade extrapolation factor was used per 15.31.

5.2.3 Test Results

The EUT met the FCC Part 15, Subpart C Emission Bandwidth requirements. The intentional radiator frequency was within the allowed band and all maximized quasi-peak measurements for the EUT were below the quasi-peak limits. The test scan is shown in Appendix C.

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (Degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.5602[1]	83.7	103.00	19.30	221	V / Y-30 CCW
13.553[2]	43.7	69.55	25.85	221	V / Y-30 CCW
13.567[2]	44.6	69.55	24.95	221	V / Y-30 CCW

1 - Intentional Radiator Frequency

2 - Band edges measured with a receiver bandwidth setting of 1 KHz. Per ANSI C63.4 Paragraph 13.1.7.

5.3 Spurious Emissions (12.5 to 30 MHz.)

The EUT was placed in an anechoic chamber and the Spurious Emissions testing was preformed in accordance with ANSI C63.4 and FCC Part 15, Subpart C. The Spurious Emission measurements were made to determine the level of electromagnetic energy radiated from the EUT.

5.3.1 Test Procedure

A measurement antenna (loop) was positioned at a distance of 5 meters (to insure far field measurements) from the center of the EUT. An EMI receiver was used for the emissions measurements. Initial sweep measurements were taken with the receiver in continuous frequency overview mode utilizing peak level signal detection. Acceptance analysis of these sweeps was used to determine which discrete frequencies, other than the intentional radiator frequency and band edge frequencies, were to be maximized. Maximizing a frequency involves finding the angle of the highest emission levels by rotating the EUT 360 degrees (sampling at least every 4 degrees). Then the antenna, which was fixed at 1-meter height, was rotated until the highest emissions levels found. Final measurements were taken utilizing quasi-peak detection. Measurement results were automatically calculated via software running the EMI receiver. The final measurements recorded were determined by the following formula:

Result (dBµV/m) = receiver level (µV) + antenna factor (dB/m) + cable loss (dB) - preamp gain (dB) + lineal conversion (dB).

5.2.2 Test Criteria

The FCC Part 15, Subpart C radiated limits are given below.

Frequency (MHz)	Distance (m)	Field Strength (dBµV/m)
1.705 to 13.110	10	48.62
13.110 to 13.410	10	59.58
13.410 to 13.553	10	69.55
13.553 to 13.567	10	103.00
13.567 to 13.710	10	69.55
13.710 to 14.010	10	59.58
14.010 to 30.000	10	48.62

Note: A 40 dB/decade extrapolation factor was used per 15.31.

5.3.3 Test Results

The EUT met the FCC Part 15, Subpart C Spurious Emissions (12.5 to 30 MHz.) requirements. All maximized quasi-peak measurements for the EUT were below the quasi-peak limits. Test data is shown in Appendix D. The worst-case quasi-peak emission was as follows:

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.5485	60.5	69.55	9.05	221	V / Y-30 CCW

5.4 Radiated Emissions (30 to 40000 MHz)

The EUT was placed in an anechoic chamber and the Spurious Emissions testing was preformed in accordance with ANSI C63.4, FCC Part 15, Subpart B "Class A", and FCC Part 15, Subpart C. The Radiated Emission measurements were made to determine the level of electromagnetic energy radiated from the EUT.

5.4.1 Test Procedure

A measurement antenna was positioned at a distance of 3 meters from the center of the EUT. An EMI receiver was used for the emissions measurements in the range of 30 MHz to 1000 MHz (the upper limit of measurement is determined by Paragraph 15.33). Initial sweep measurements were taken with the receiver in continuous frequency overview mode utilizing peak level signal detection. Acceptance analysis of these sweeps was made to determine which discrete frequencies were to be maximized. Maximizing a frequency involves finding the angle of the highest emission levels by rotating the EUT 360 degrees (sampling at least every 4 degrees) and varying antenna height between 1 and 4 meters at the angle of highest emissions levels found**.** Final measurements were taken utilizing quasi-peak detection. Measurement results were automatically calculated via software running the EMI receiver. The final measurements recorded were determined by the following formula:

Result (dBµV/m) = receiver level (µV) + antenna factor (dB/m) + cable loss (dB) - preamp gain (dB) + lineal conversion (dB).

5.4.2 Test Criteria

The FCC Part 15, Subpart C radiated limits are given below.

Frequency (MHz)	Distance (m)	Field Strength (dBµV/m)
30 to 88	10	29.54
88 to 216	10	33.06
216 to 960	10	35.56
960 to 40000	10	43.52

The FCC Part 15, Subpart B, "Class A" radiated limits are given below. The lower limit shall apply at the transition frequency.

Frequency (MHz)	Distance (m)	Field Strength (dBµV/m)
30 to 88	10	39.08
88 to 216	10	43.52
216 to 960	10	46.44
960 to 1000	10	49.54
1000 to 40000	3	59.5 and 79.5*

* Per 15.35(B)

5.4.3 Test Results

The EUT met the FCC Part 15, Subpart C and the FCC Part 15, Subpart B, "Class A" Radiated Emissions (30 to 40000MHz.) requirements. All maximized quasi-peak measurements for the EUT were below the quasi-peak limits. Test data is shown in Appendix E. The worst-case quasi-peak emission was as follows:

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna (Meters/Polarity)
298.308	34.8	35.56[1]	0.76	103	1.0/H

1 - This is a harmonic of the intentional radiator; therefore the lower limit level (FCC Part 15 Subpart C) is shown.

6.0 LIST OF TEST EQUIPMENT

The following test equipment was used to perform the indicated tests. All of the test equipment was calibrated by an accredited calibration laboratory or by the manufacturer. All calibration intervals are one year. All equipment calibrations, test procedures, and the test facility are traceable to the standards of the National Institute of Standards and Technology (NIST). The test facility site attenuation verification results fall within the normalized site attenuation (NSA) criteria for open area test sites using volumetric measurements.

CONDUCTED EMISSIONS

EMCO LISN, Model 3825-2, Serial No. 1039 (cal due date: 08 Sep 04)
Solar High Pass Filter, Model 8131 - 5.0 (cal due date: 28 Sep 04)
Rohde & Schwarz EMI Receiver, Model ESBI 52, S/N 835387/003 (cal due date: 09 Sep 04)
Rohde & Schwarz EMI Receiver Display, Serial No. 835518/001 (cal due date: 09 Sep 04)
Rohde & Schwarz ES-K1, ES-K2, & ES-K12 EMI Software, Version 1.60

FREQUENCY STABILITY

Advantest Spectrum Analyzer, Model R3271A, S/N: J002333 (cal due date: 04 Sep 2004)
Thermotron Environmental Chamber, Model SM-16C-L/H, Serial No. 21291-S (cal due date: 14 Nov 2004)
Honeywell Truline Chart Recorder, Serial No. N/A, (cal due date: 14 Nov 2004)
Fluke 87 DMM, Serial No. 46500848 (cal due date: 08 Oct 2004)
HP 6032A DC Power Supply, Serial No. 2933A-05485, cal due date: N/A

RADIATED EMISSIONS

ElectroMetrics Large Loop Antenna. Model ALR25M, S/N 603 (cal due date: 08 Sep 04)
EMCO Biconilog Antenna, Model 3143, Serial No. 1111 (cal due date: 09 Sep 04)
HP Pre-Amplifier, Model 8447D, Serial No. 2944A08064 (cal due date: 09 Sep 04)
Rohde & Schwarz EMI Receiver, Model ESBI 52, S/N 835387/003 (cal due date: 09 Sep 04)
Rohde & Schwarz EMI Receiver Display, Serial No. 835518/001 (cal due date: 09 Sep 04)
Rohde & Schwarz ES-K1, ES-K2, & ES-K12 EMI Software, Version 1.60

TEST FACILITY

Lindgren Semi-Anechoic Chamber, Model 11867A, serial No. 01211 (verification due date: 31 March 2006).

The radiated and conducted emission measurements were performed in our Anechoic Chamber located at 3M Building 76, 410 Fillmore Street, St. Paul, MN. Details concerning the site are on file with the FCC laboratory Division in Columbia Maryland.

The Facility Registration Number is 93334, 31-March - 2003.

7.0 LABELING INFORMATION

The FCC (Federal Communications Commission) requires the following labeling information. Since the equipment has intentional and unintentional radiators, it must be labeled as a digital device and as an intentional radiator.

Labels on the Product

The following statement shall be placed in a conspicuous location on the device:

> This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
>
> FCC ID: _____

Labels in the Manuals

The following statement shall be placed in a prominent location in the text of the user manual:

> NOTE: This equipment has been tested and found to comply with the limits for a "Class A" digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
>
> FCC ID: _____
>
> NO MODIFICATIONS. Modifications to this device shall not be made without the written consent of 3M, Incorporated. Unauthorized modifications may void the authority granted under Federal Communications Commission Rules permitting the operation of this device.

Appendix A

Conducted Emissions Test Data

CONDUCTED EMISSIONS

3M EMC Lab

TEST REPORT # F0404002

EUT MODEL # 8800 EUT SERIAL # TS #1

DESCRIPTION Detection System

FREQUENCY (MHz)	PEAK (dBµV)		QUASI-PEAK (dBµV)				Average (dBµV)			
	L1 Line	L2 Neutral	L1 Line	L2 Neutral	Limit	Passing Margin (dB)	L1 Line	L2 Neutral	Limit	Passing Margin (dB)
0.155	43.7	44.3	37.8	39.0	65.7	26.7			55.7	
0.221	47.6	47.5	44.3	44.4	62.8	18.4			52.8	
0.3665	36.0	35.2	33.4	33.3	58.6	25.2			48.6	
2.000	10.8	10.7	3.2	3.2	56.0	52.8			46.0	
5.9711	14.4	14.6	6.4	6.7	60.0	53.3			50.0	
13.5602	34.3	33.4	33.4	32.4	60.0	26.6			50.0	

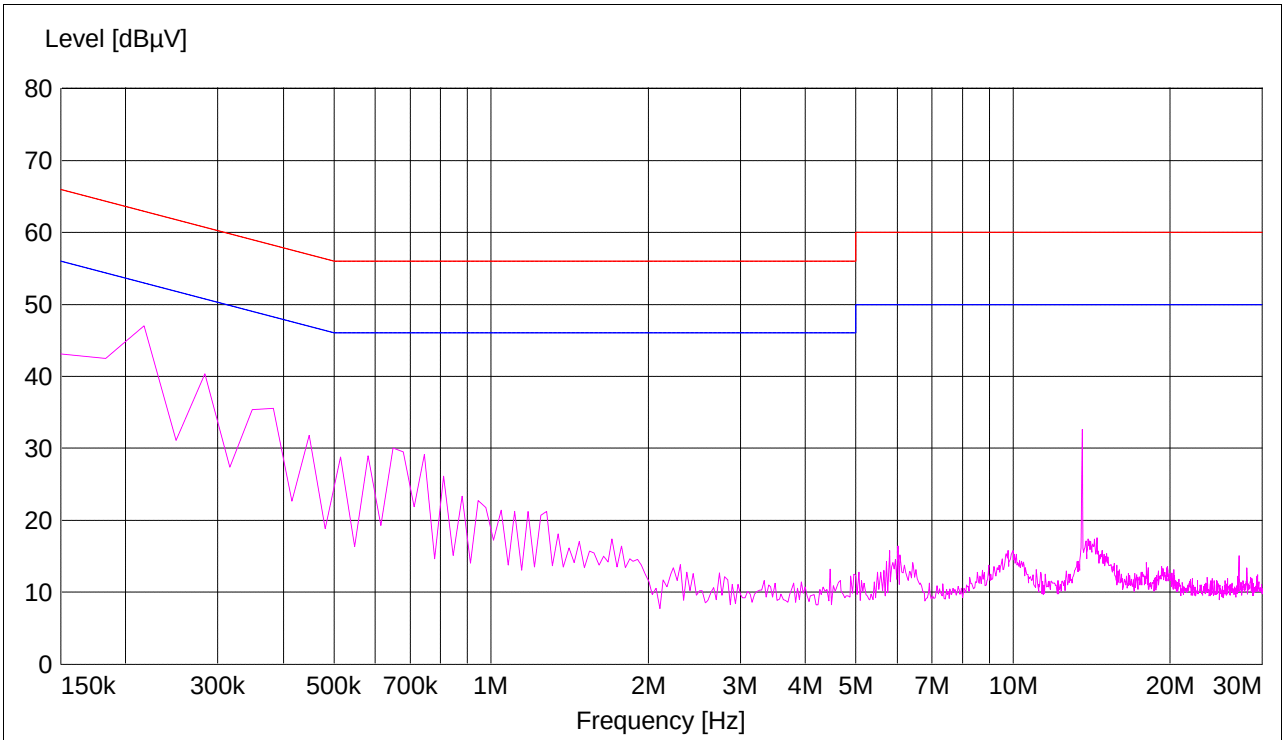
Note: All Quasi-peak reading were below the Average Limit so no Average Readings were taken.

Signatory: Bruce R. Jungwirth

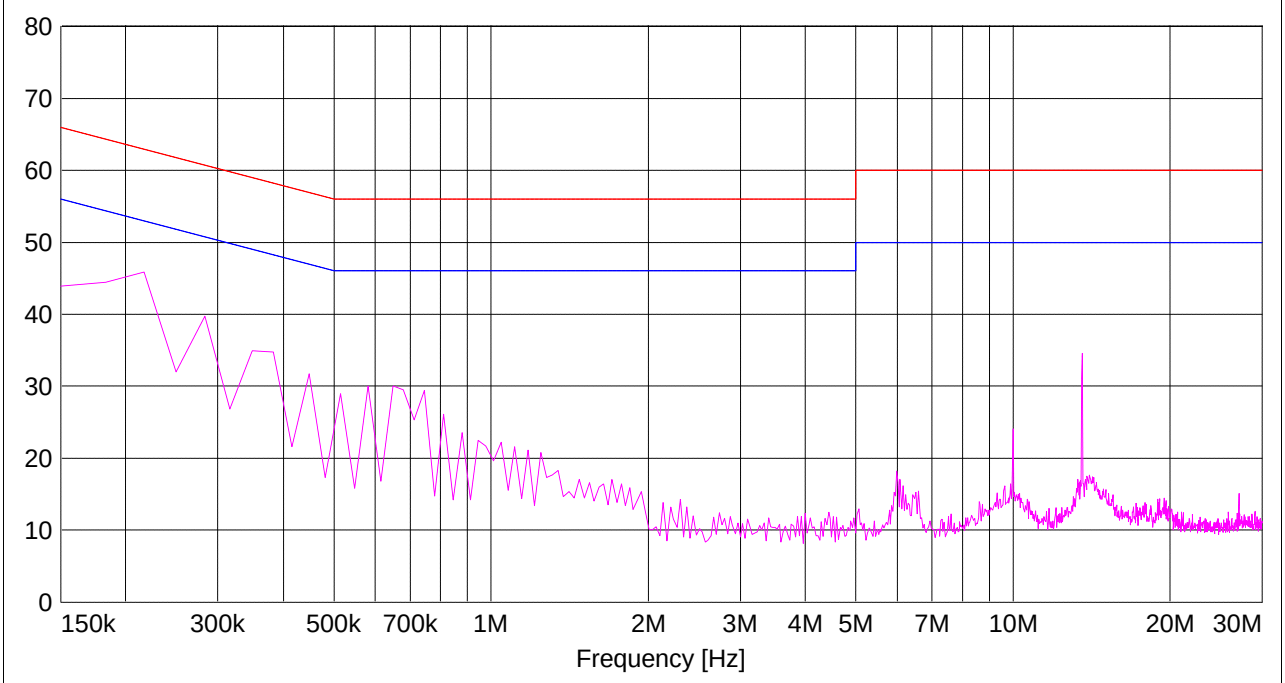
Test Engineer: Bruce R Jungwirth Date: 9 July 2004

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 12 July 2004



MES 8800 7/9 sc1 L1 Cond. Sweep L1 - Peak MaxHold
LIM Conducted Limit - QP FCC & EN55022 - Class B
LIM Conducted Limit - AV FCC & EN55022 - Class B



MES 8800 7/9 sc1 L2 Cond. Sweep L2 - Peak MaxHold
LIM Conducted Limit - QP FCC & EN55022 - Class B
LIM Conducted Limit - AV FCC & EN55022 - Class B

Model 8802

Appendix B

Frequency Stability Test Data

Frequency Stability

3M EMC Lab

SHEET 1 OF 1

TEST REPORT # F0404002

EUT MODEL # 8800 EUT SERIAL # TS #1

DESCRIPTION Detection System

Frequency Stability vs Supply Voltage

	Time		
	2 min	5 min	10 min
Voltage (VDC)	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**
24.00	13.5598	13.5598	13.559764
20.40 (85%)	13.559786	13.559779	13.559793
27.60 (115%)	13.559786	13.559779	13.559793

Frequency Stability vs Temperature

	Time				
	1 min	2 min	5 min	10 min	30 min
Temperature (°C)	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**
22.8 (Ambient)	N/A	13.5598	13.5598	13.559764	N/A
+55	N/A	13.559607	13.559586	13.559579	13.559586
-20	13.560021	13.560007	13.560043	13.560021	N/A

Signatory: Steven D. Wytaske

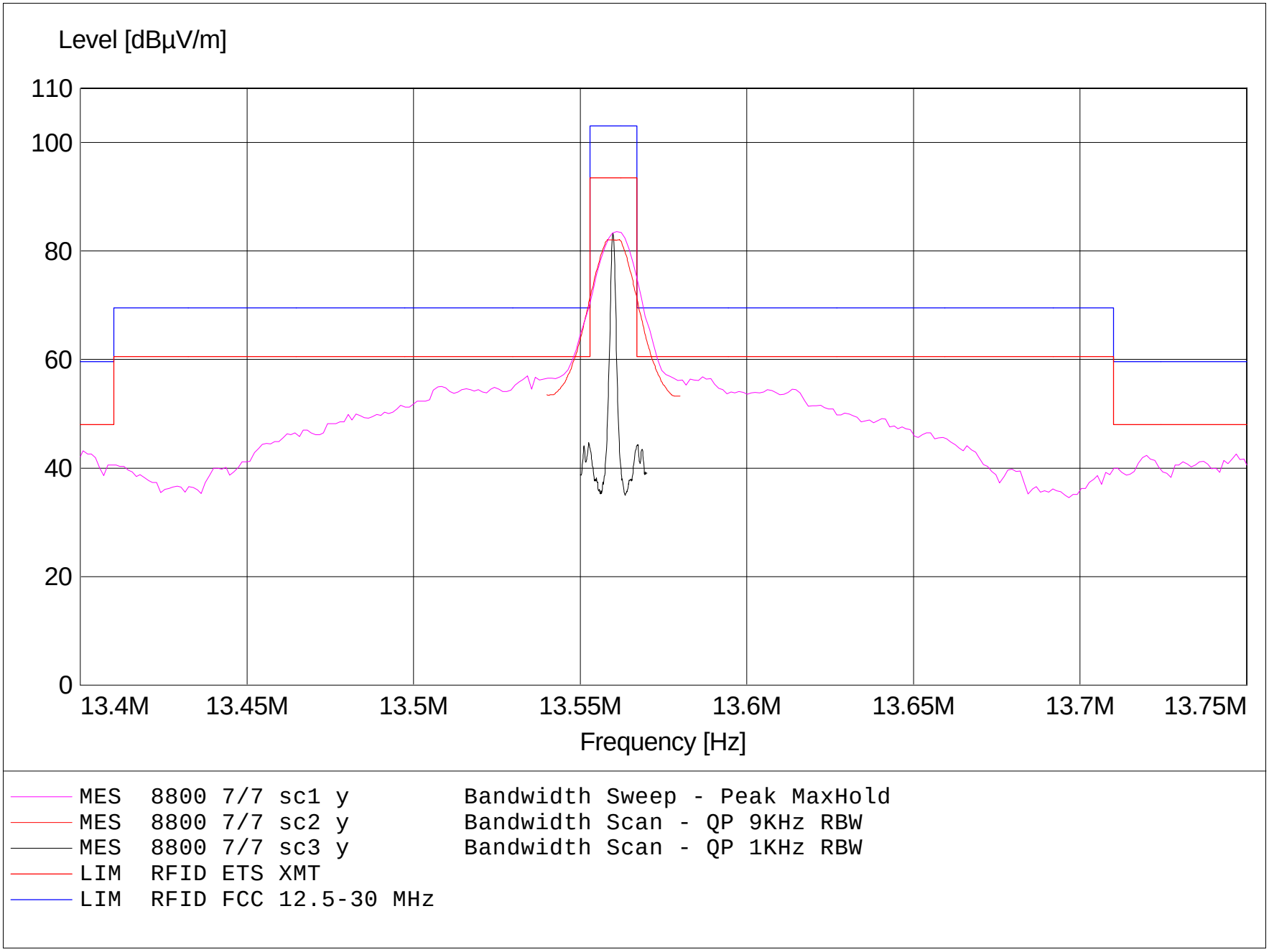
Test Engineer: Steven D. Wytaske Date: 6 July 2004

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 12 July 2004

Appendix C

Emission Bandwidth


Level [dBµV/m]
110
100
80
60
40
20
0
13.4M
13.45M
13.5M
13.55M
13.6M
13.65M
13.7M
13.75M
Frequency [Hz]
MES 8800 7/7 sc1 y
MES 8800 7/7 sc2 y
MES 8800 7/7 sc3 y
LIM RFID ETS XMT
LIM RFID FCC 12.5-30 MHz
Bandwidth Sweep - Peak MaxHold
Bandwidth Scan - QP 9KHz RBW
Bandwidth Scan - QP 1KHz RBW

Model 8802

Appendix D

Spurious Emissions

SPURIOUS EMISSIONS

3M EMC Lab

TEST REPORT # F0404002

EUT MODEL # 8800 EUT SERIAL # TS #1

DESCRIPTION Detection System

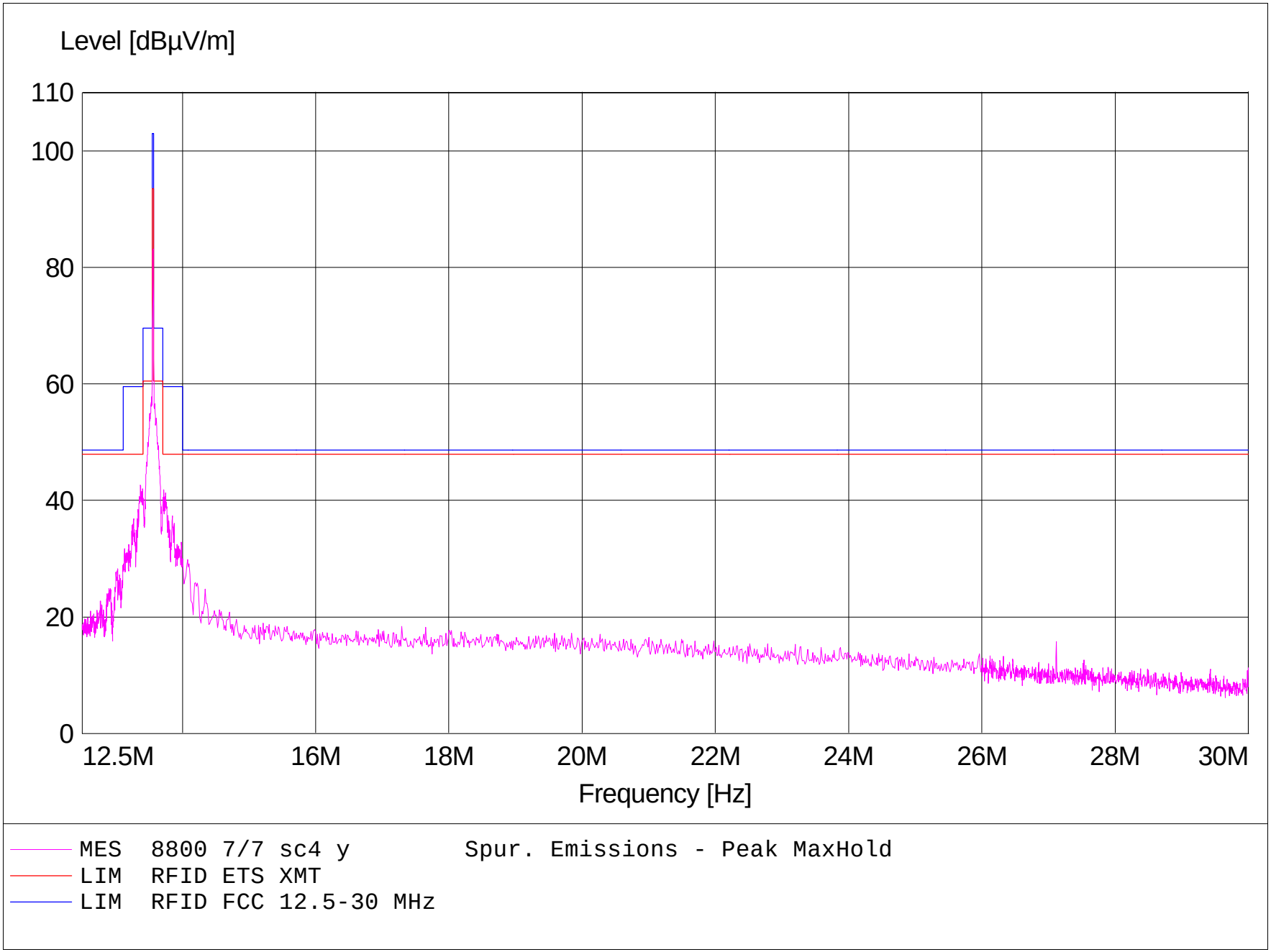
FREQ. (MHz)	MAXIMIZED QP SIGNAL H/V	MAXIMIZED QP SIGNAL (dBµV/m)*	LIMIT LINE (dBµV/m)	PASSING MARGIN (dB)	MAXIMIZED POSITION TURNTABLE (°)	MAXIMIZED POSITION ANTENNA (M)	REMARKS
No Ring							
13.567	V	44.6	69.6	25.0	221	1.0	Antenna was a -30 degrees from the Y-axis CCW.
13.5485	V	60.5	69.6	9.1	221	1.0	Antenna was a -30 degrees from the Y-axis CCW.
27.1204	V	26.0	48.6	22.6	221	1.0	Antenna was a -30 degrees from the Y-axis CCW.

Signatory: Bruce R. Jungwirth

Test Engineer: Bruce R Jungwirth Date: 7 July 2004

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 12 July 2004


Level [dBµV/m]
110
100
80
60
40
20
0
12.5M
16M
18M
20M
22M
24M
26M
28M
30M
Frequency [Hz]
MES 8800 7/7 sc4 y Spur. Emissions - Peak MaxHold
LIM RFID ETS XMT
LIM RFID FCC 12.5-30 MHz

Model 8802

Appendix E

Radiated Emissions

RADIATED EMISSIONS

3M EMC Lab

TEST REPORT # F0404002

EUT MODEL # 8800 EUT SERIAL # TS #1

DESCRIPTION Detection System

FREQ. (MHz)	MAXIMIZED QP SIGNAL H/V	MAXIMIZED QP SIGNAL (dBµV/m)*	LIMIT LINE (dBµV/m)	PASSING MARGIN (dB)	MAXIMIZED POSITION TURNTABLE (°)	MAXIMIZED POSITION ANTENNA (M)	REMARKS
36.494	V	15.2	39.1	23.9	50	1.3	BB Noise
54.277	V	22.2	29.5	7.3	270	1.07	1 + BB Noise
81.354	V	22.9	29.5	6.6	90	1.24	1
189.832	V	24.4	33.1	8.7	183	1.0	1
244.071	V	27.2	35.6	8.4	218	2.6	1
298.308	H	34.8	35.6	0.8	103	1.0	1
515.26	H	32.3	35.6	3.3	318	1.5	1
596.626	H	34.1	35.6	1.5	322	1.0	1
854.260	H	32.4	35.6	3.2	333	1.0	1

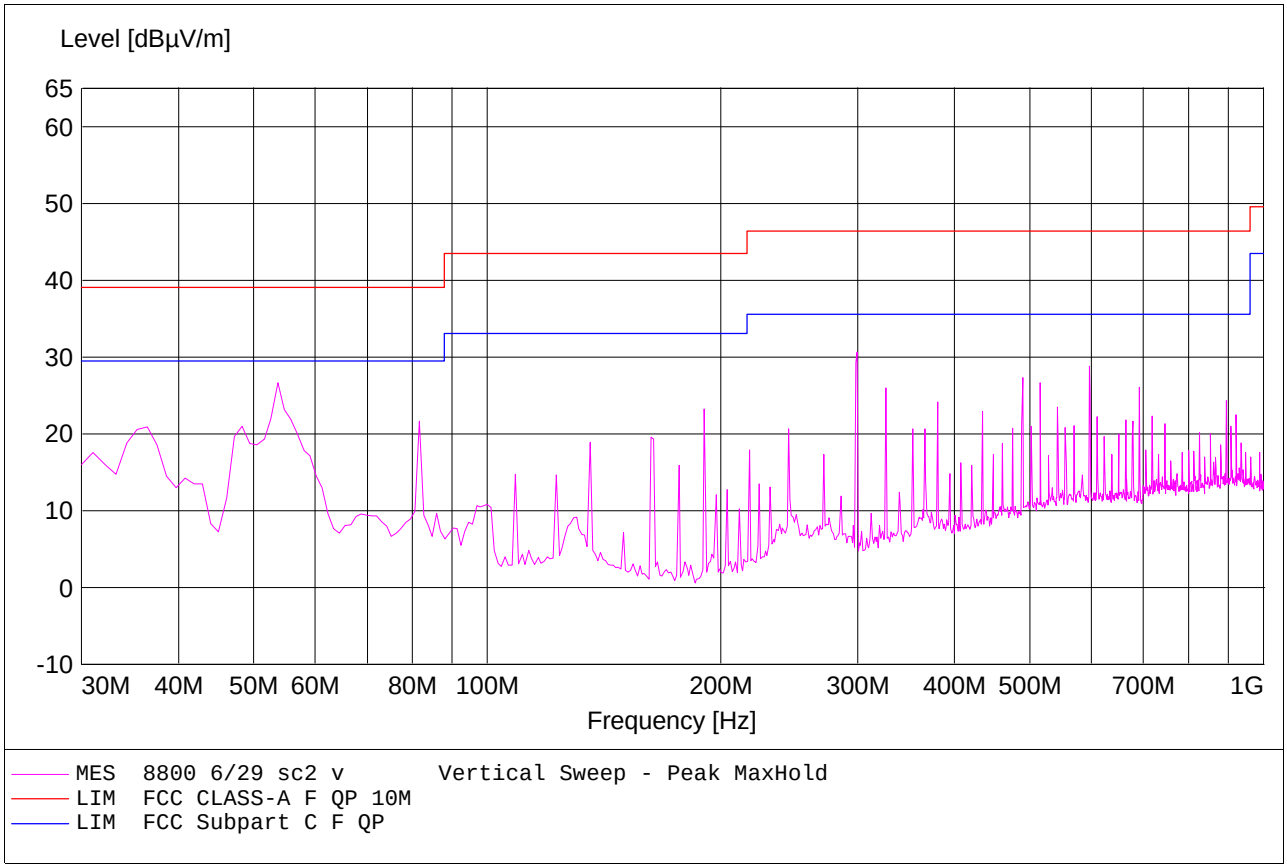
Note 1 - This is a harmonic of the intentional radiator, so the Subpart C limit is used.

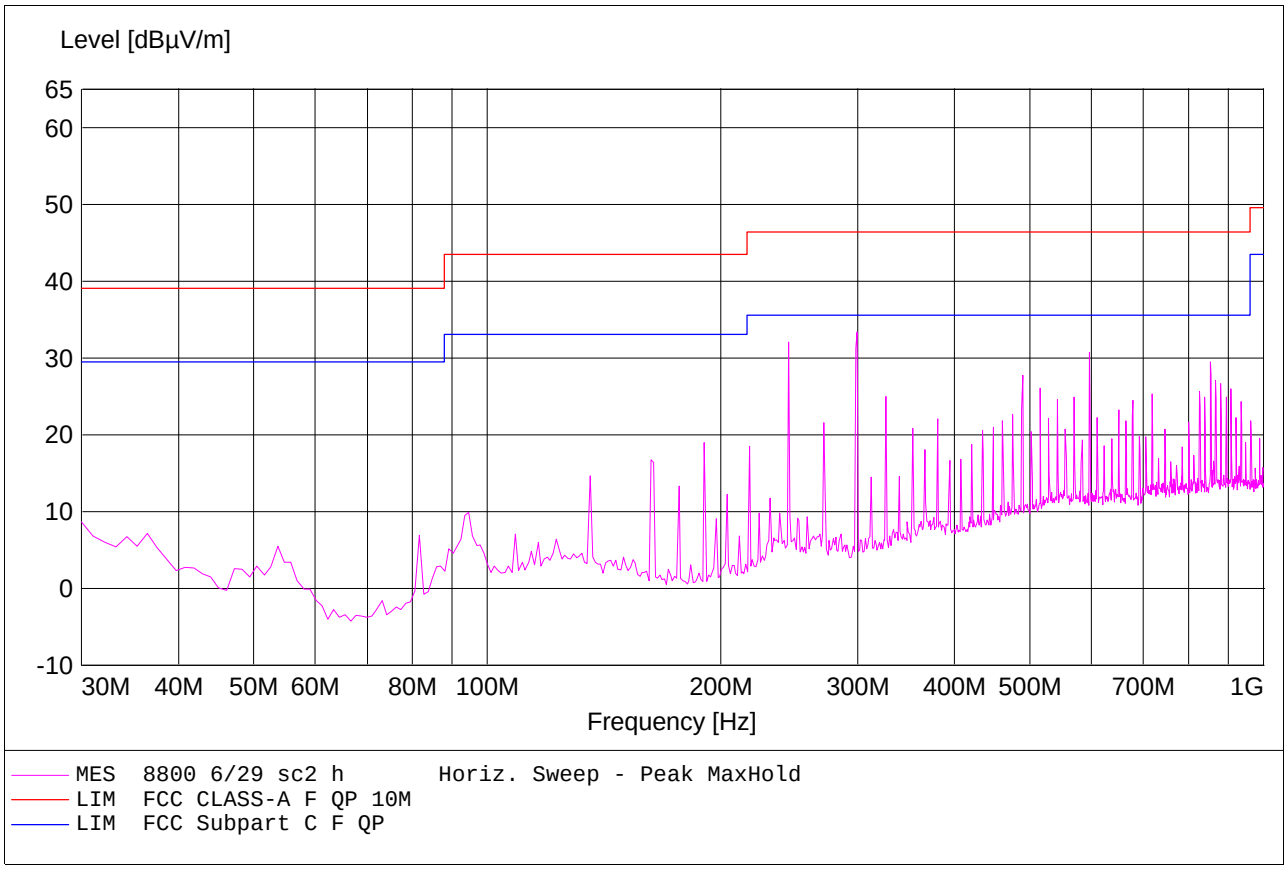
Signatory: Bruce R. Jungwirth

Test Engineer: Bruce R Jungwirth Date: 6 July 2004

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 12 July 2004


Level [dBµV/m]
65
60
50
40
30
20
10
0
-10
30M
40M
50M
60M
80M
100M
200M
300M
400M
500M
700M
1G
Frequency [Hz]
MES 8800 6/29 sc2 v
Vertical Sweep - Peak MaxHold
LIM FCC CLASS-A F QP 10M
LIM FCC Subpart C F QP

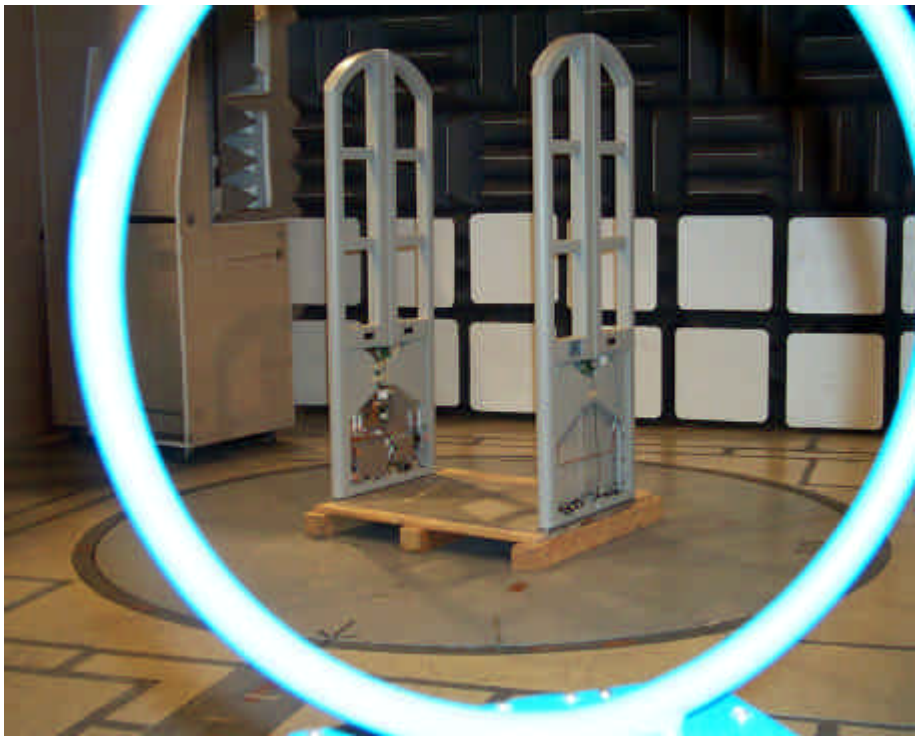

Level [dBµV/m]
65
60
50
40
30
20
10
0
-10
30M
40M
50M
60M
80M
100M
200M
300M
400M
500M
700M
1G
Frequency [Hz]
MES 8800 6/29 sc2 h
Horiz. Sweep - Peak MaxHold
LIM FCC CLASS-A F QP 10M
LIM FCC Subpart C F QP

Model 8801

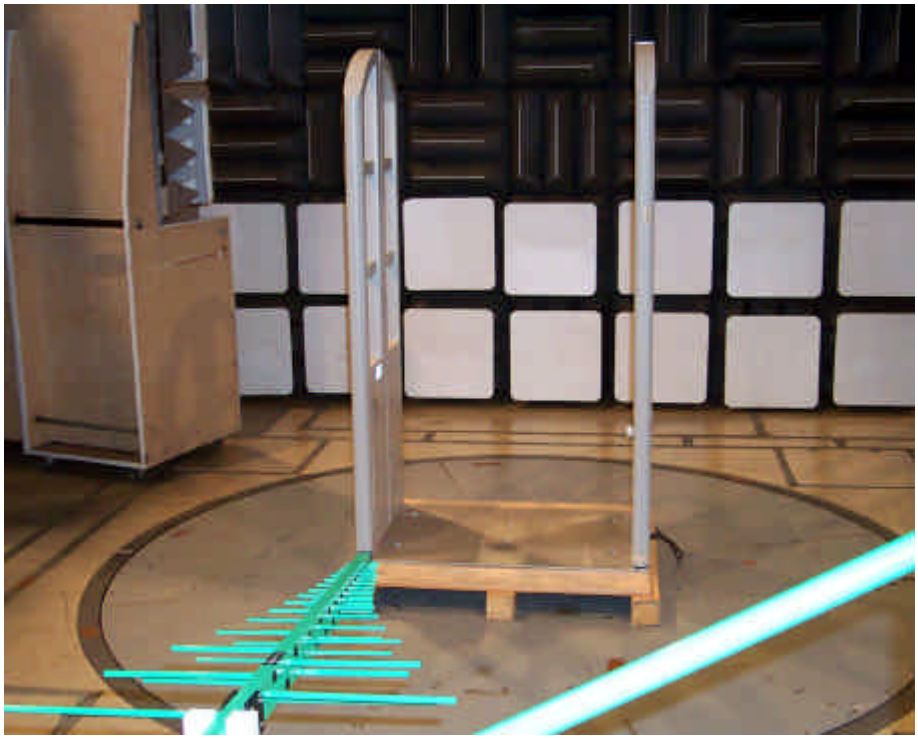
Appendix F

Photographs

Conducted Emissions



Bandwidth and Spurious Emissions



Radiated Emissions (30-1000 MHz)

End of Report