FCC
Electromagnetic Compatibility
Test Report

For

Model 770
3M™ RFID Tracking Pad

Security Systems Division
St. Paul, MN 55144-1000

20 June 2003

Report Number F0503002

Prepared By:

CR-SEMS Product Safety
Building 76-1-01
410 East Fillmore Avenue
St. Paul, Minnesota 55144-1000

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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 St. Paul, MN 55144-1000
NAME OF EQUIPMENT:	3M™ RFID Tracking Pad
MODEL NUMBER:	770
SERIAL NUMBER	40022
TEST REPORT NUMBER:	F0503002
DATE:	20 June 2003

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 Test Engineer

Table Of Contents

1.0 Test Summary

Test Report Number:	F0503002
Requester:	Ed Goff
Company:	3M Security Systems Division Building 209 St. Paul, MN 55144
Telephone Number:	651 – 737-4736
Test Dates:	30 May 2003 and 2, 3, 4, 5, 6, 10 and 11 June 2003
Equipment Under Test	Model 770 3M™ RFID Tracking Pad
Date Of Receipt:	28 May 2003
Test Environment	Temperature: 20 to 30 degrees C Relative Humidity: 30 to 70 % RH
Test Results:	Passed the following tests: 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
Modifications:	Modifications were required (See Paragraph 2.4)
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 770 3M™ RFID Tracking Pad, Serial Number 40022.

The 3M™ RFID Tracking Pad Model 770 is designed and tested for use with other equipment and software to read and/or program 3M™ RFID Tags. These tags are used to identify files, folders, and other items such as books. When used in conjunction with 3M software, the unit can track, monitor, and assist in locating various items equipped with 3M RFID Tags.

The product has not been tested or proven safe for other uses.

The reader has a transmit frequency of 13.56 MHz. And a power output level of 1.000 watts (30 dBm). The reader was set at 4 reads per second.

The EUT employs an antenna with an area of 36.00 square inches (0.023 square meters). The antenna is a separate self-contained unit that is connected to the reader via a 10-foot coax cable employing SMA connectors. The EUT can also have 2 – 20 foot extension cable connected depending on the installation configuration.

Tests were run on:

1. Model 770 3M™ RFID Tracking Pad consisting of a reader pad, the antenna, an RS-232 cable and the power supply.
2. Model 770 3M™ RFID Tracking Pad with a 20 foot coax antenna extension cable (30 foot total)
3. Model 770 3M™ RFID Tracking Pad with 2 - 20 foot coax antenna extension cables (50 foot total)

All tests were made with an input power of 120 VAC, 60 Hz.

2.3 Modifications to the EUT

The following modifications of the EUT were necessary to meet the test standards:

Equipment	Modifications	Where	Material	Turns
DC Power	Common Mode Choke	DC Power Cord at the Reader	Steward 28A2024-0A0 (or Equivalent)	4 Turns
RS-232 Cable	Common Mode Choke	RS-232 Cable at the Reader	Steward 28A2024-0A0 (or Equivalent)	3 Turns
Coax Cable	Common Mode Choke	Antenna Coax at the Reader	Steward 25B0392-0A0 (or Equivalent)	1 Turns

2.4 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 micro Henry 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 0.50	79	66
0.50 to 30.0	73	60

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 quasi-peak emissions were as follows:

Frequency (MHz)	Limit (dBµV)	L1- Line Q-P (dBµV)	L2 - Neutral Q-P (dBµV)	Passing Margin (dB)
0.307	60.1	47.8	38.9	12.3

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.

Carrier Frequency Stability versus Supply Voltage

Carrier Frequency (MHz)	Lowest Frequency (MHz)	Highest Frequency (MHz)	Frequency Change (%)
13.5601	13.5599	13.5602	+/- 0.0015 %

Carrier Frequency Stability versus Temperature

Carrier Frequency (MHz)	Lowest Frequency (MHz)	Highest Frequency (MHz)	Frequency Change (%)
13.5601	13.5599	13.5602	+/- 0.0015 %

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 30.00	10	48.62
13.553 to 13.567	10	99.08

Note: A 40 dB/decade extrapolation factor was use 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 B.

Model 770 3M™ RFID Tracking Pad

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.560[1]	66.8	99.08	32.28	325	V / X+20
13.553[2]	36.3	48.62	12.32	325	V / X+20
13.567[2]	35.7	48.62	12.92	325	V / X+20

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

Model 770 3M™ RFID Tracking Pad with (1 ea) 20 foot Antenna Extension Cable

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.560[1]	66.0	99.08	33.08	345	V / X+20
13.553[2]	35.4	48.62	13.22	345	V / X+20
13.567[2]	35.0	48.62	13.62	345	V / X+20

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

Model 770 3M™ RFID Tracking Pad with (2ea) 20 foot Antenna Extension Cables

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.560[1]	65.8	99.08	33.28	335	V / X+20
13.553[2]	33.8	48.62	14.82	335	V / X+20
13.567[2]	33.4	48.62	15.22	335	V / X+20

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 (dB µV/m)
1.705 to 30.00	10	48.62
13.553 to 13.567	10	99.08

Note: A 40 dB/decade extrapolation factor was use 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 C. The worst-case quasi-peak emission was as follows:

Model 770 3M™ RFID Tracking Pad

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.5485	48.3	48.62	0.32	325	V / X+20

Model 770 3M™ RFID Tracking Pad with (1 ea) 20 foot Antenna Extension Cable

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.5485	47.1	48.62	1.52	345	V / X+20

Model 770 3M™ RFID Tracking Pad with (2ea) 20 foot Antenna Extension Cables

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Passing Margin (dB)	Turntable (degrees)	Antenna Orientation/Angle (Polarity/degrees)
13.5485	45.5	48.62	3.12	335	V / X+20

5.4 Radiated Emissions (30 to 1000 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 2000 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 (peak and average detectors were used above 1000 MHz). 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 D. 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)
67.790	24.6	29.54[1]	4.96	124	1.0/V

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

Note: There were no digital signals above our baseline noise floor.

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: 19 June 03)
Solar High Pass Filter, Model 8131 - 5.0 (cal due date: 13 Aug 03)
HP RF Limiter, Model 11867A, Serial No. 01211 (cal due date: 13 Aug 03)
Rohde & Schwarz EMI Receiver, Model ESBI 52, S/N 835387/003 (cal due date: 02 July 03)
Rohde & Schwarz EMI Receiver Display, Serial No. 835518/001 (cal due date: 02 July 03)
Rohde & Schwarz ES-K1, ES-K2, & ES-K12 EMI Software, Version 1.60

Frequency Stability/Power Output

Advantest Spectrum Analyzer, Model R3272A, Serial No. J00233 (cal due date: 19 June 03)
Envirotronics Environmental Chamber, Model EH40-2-3-RF, Serial No. 11942753 (cal due date: 30 Nov 03)

Radiated Emissions

ElectroMetrics Loop Antenna. Model ALR25M, Serial No. 603 (cal due date: 20 June 03)
EMCO Biconilog Antenna, Model 3143, Serial No. 1111 (cal due date: 18 June 03)
Rohde & Schwarz EMI Receiver, Model ESBI 52, S/N 835387/003 (cal due date: 02 July 03)
Rohde & Schwarz EMI Receiver Display, Serial No. 835518/001 (cal due date: 02 July 03)
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: 28 Apr 03)

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, registered: 31-March - 2000.

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

CONDUCTED EMISSIONS

3M EMC Lab

TEST REPORT # F0503002

EUT MODEL # 770 EUT SERIAL # 40022

DESCRIPTION 3M™ RFID Tracking Pad

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)
0.205	45.1	41.2	41.5	38.5	63.4	21.9			53.4	
0.307	50.2	41.4	47.8	38.9	60.1	12.3			50.1	
0.409	33.8	33.4	30.3	30.3	57.7	27.4			47.7	
0.511	33.4	37.9	30.6	36.5	56.0	19.5			46.0	
1.023	24.6	28.9	21.8	26.9	56.0	19.1			46.0	
3.491	37.0	36.5	36.1	35.8	56.0	19.9			46.0	
16.426	34.4	38.5	30.5	34.4	60.0	25.6			50.0	
20.126	37.1	36.7	32.1	32.6	60.0	27.4			50.0	
27.120[1]	43.7	43.8	38.0	38.1	60.0	21.9			50.0	

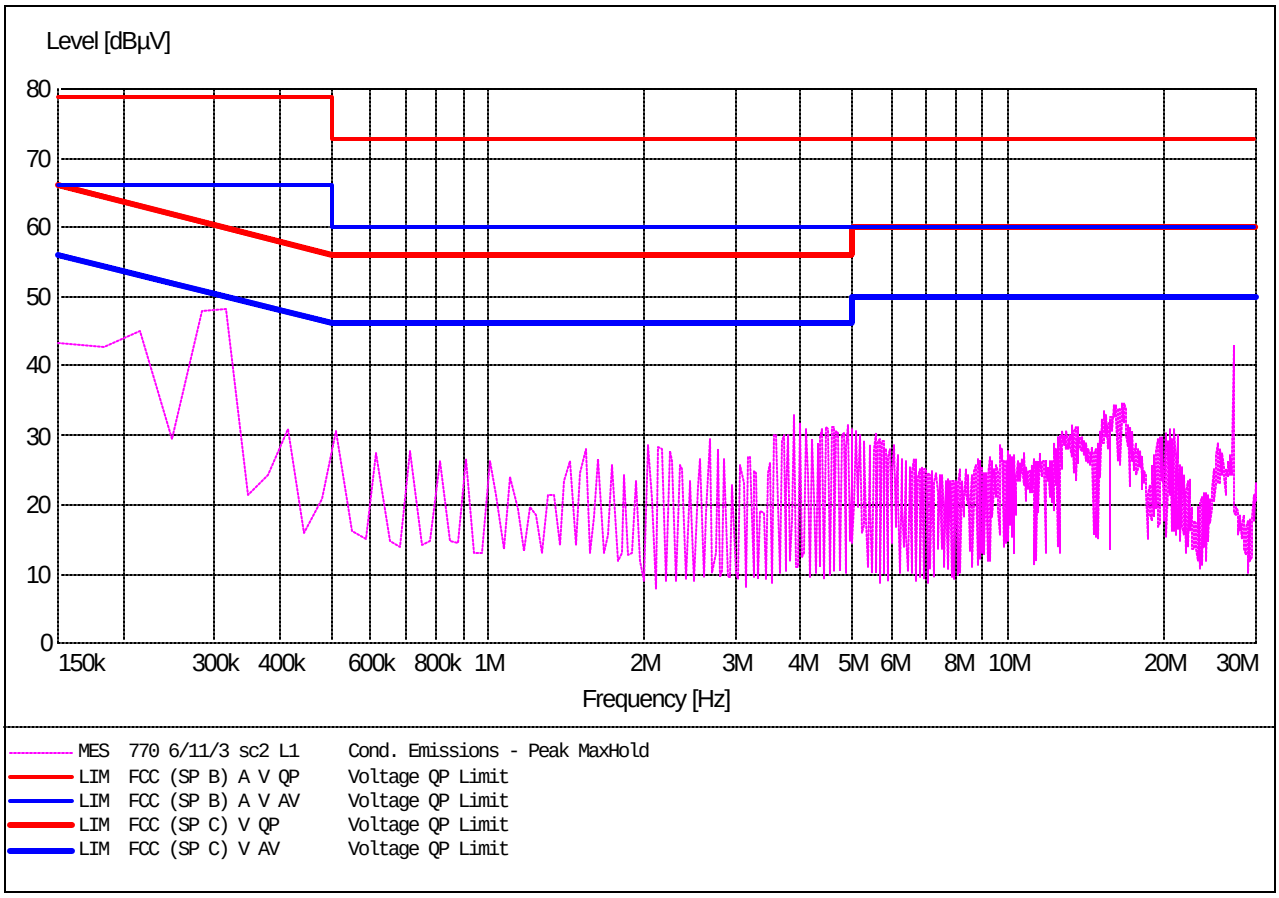
[1] - This is a harmonic of the intentional radiator

Signatory: Bruce Jungwirth

Test Engineer: Bruce L. Jungwirth Date: 11 June 2003

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 20 June 2003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4M
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6M
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30M
Frequency [Hz]
MES 770 6/11/3 sc2 L1 Cond. Emissions - Peak MaxHold
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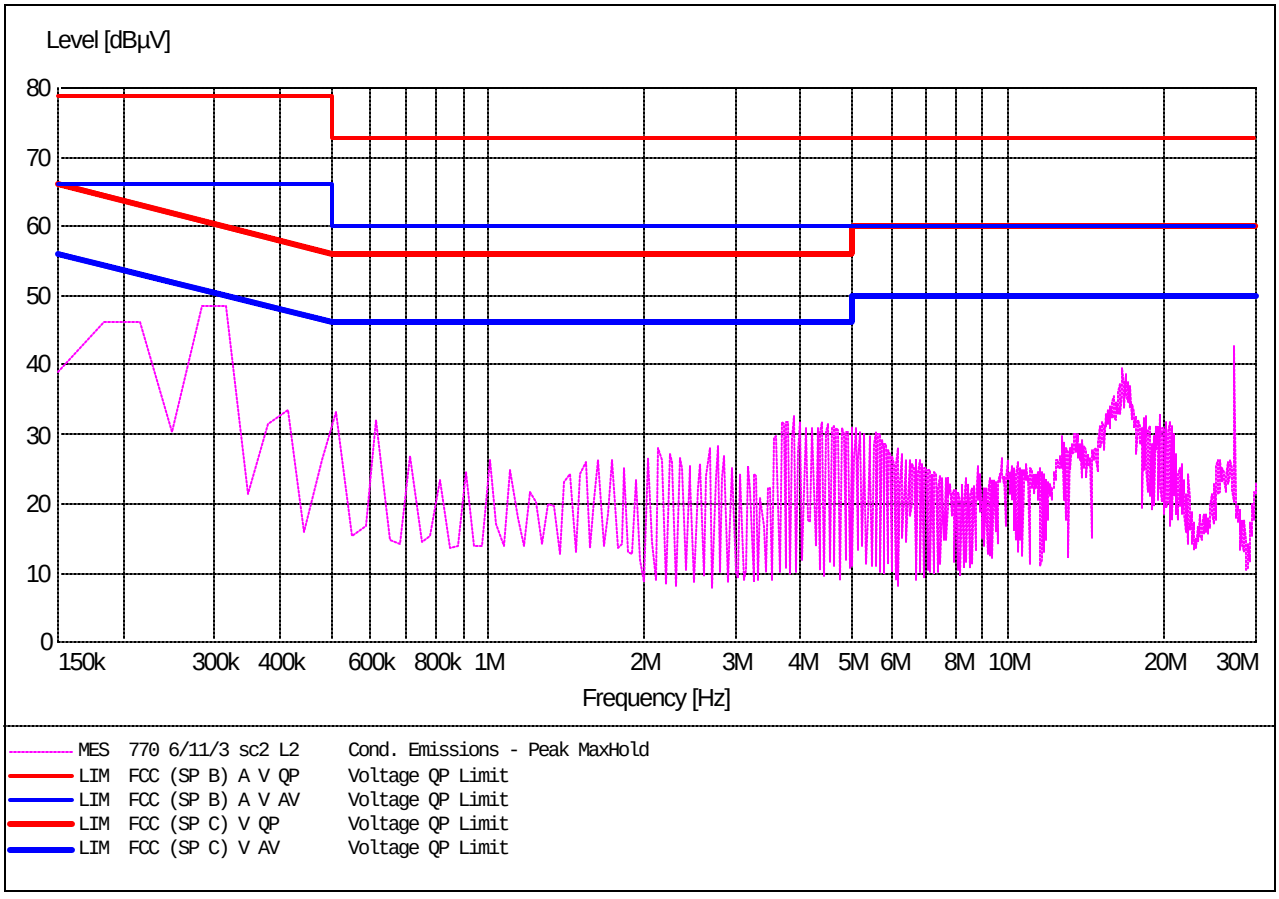
LIM FCC (SP C) V AV Voltage QP Limit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300k
400k
600k
800k
1M
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3M
4M
5M
6M
8M
10M
20M
30M
Frequency [Hz]
MES 770 6/11/3 sc2 L2 Cond. Emissions - Peak MaxHold
LIM FCC (SP B) A V QP Voltage QP Limit
LIM FCC (SP B) A V AV Voltage QP Limit
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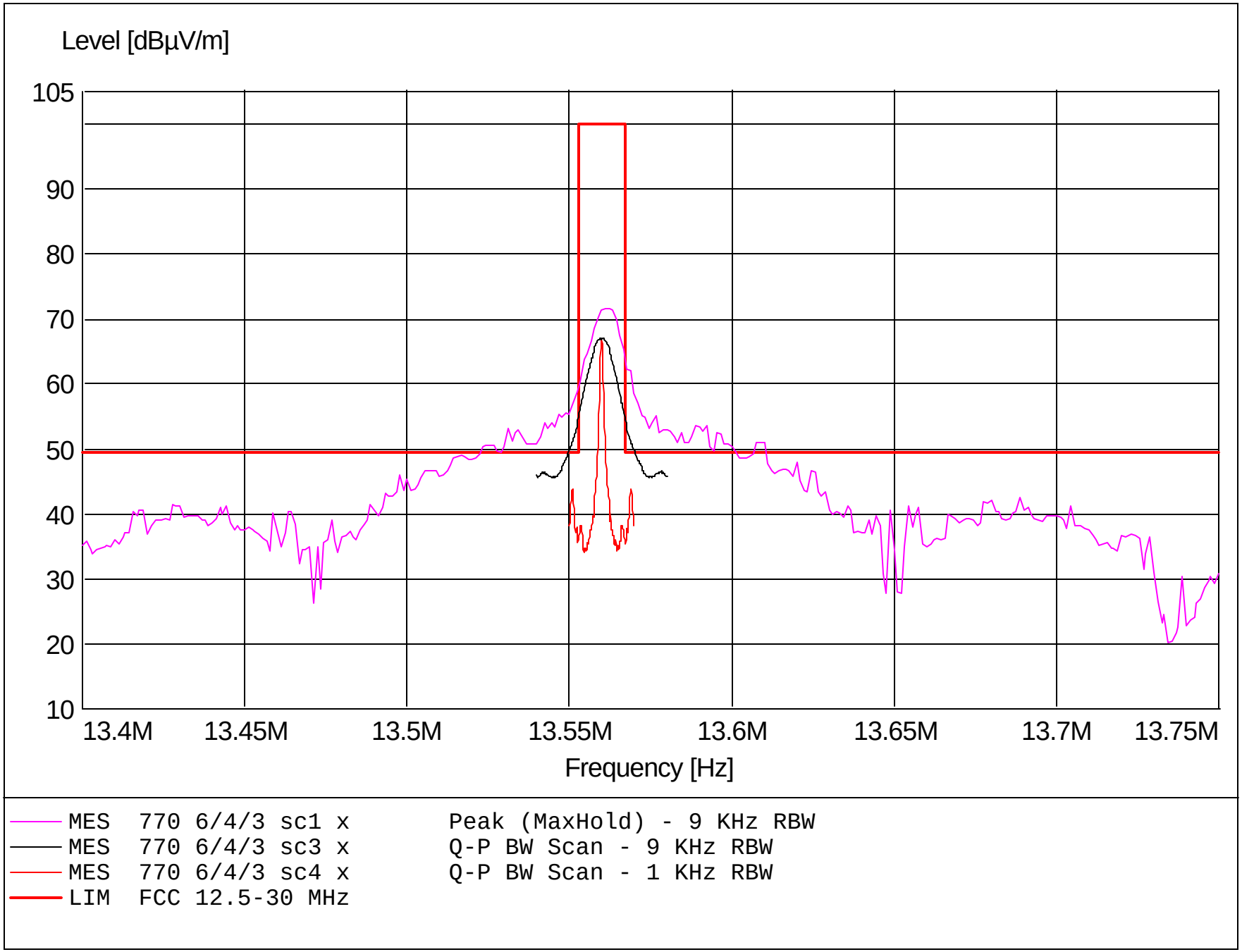
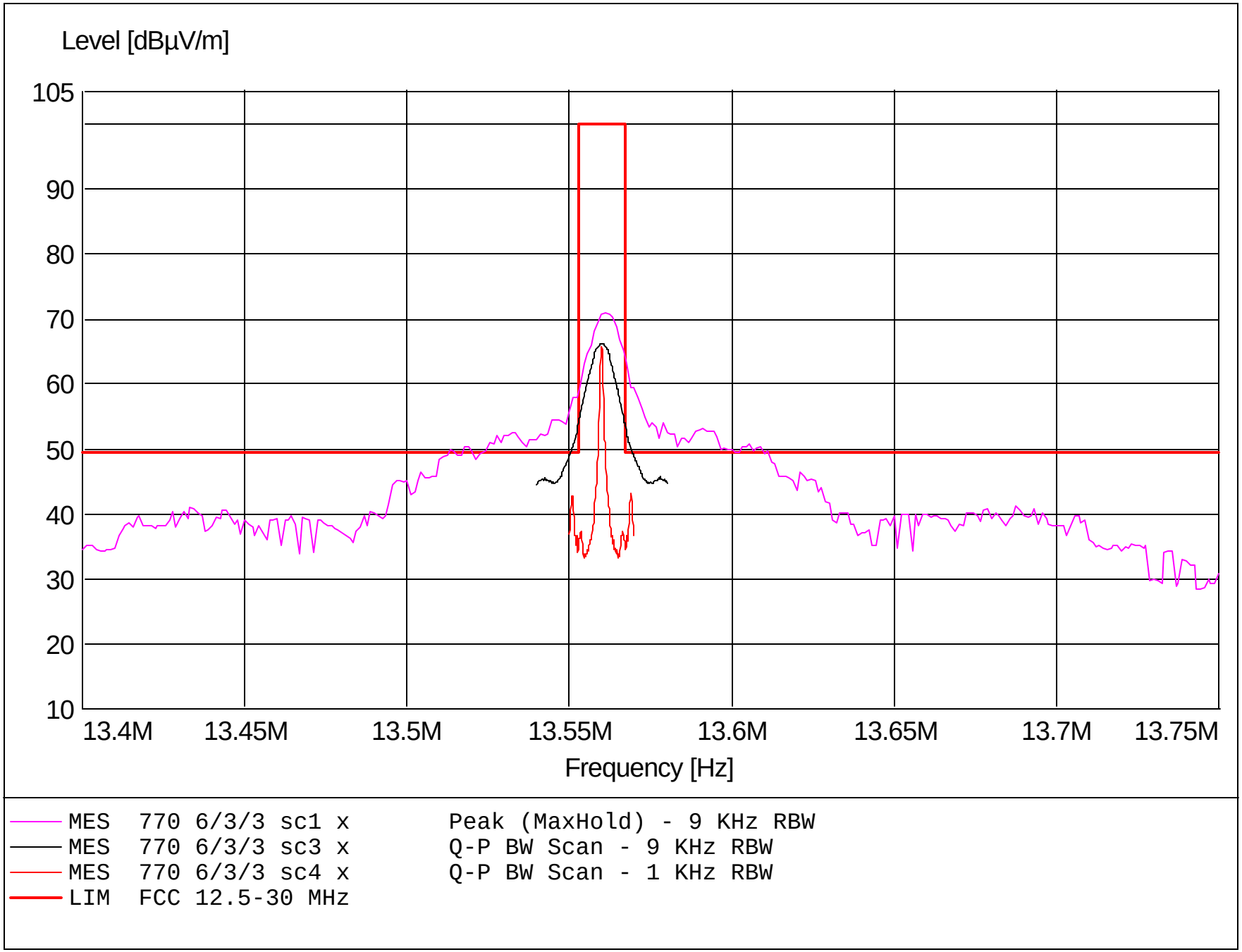
Appendix B

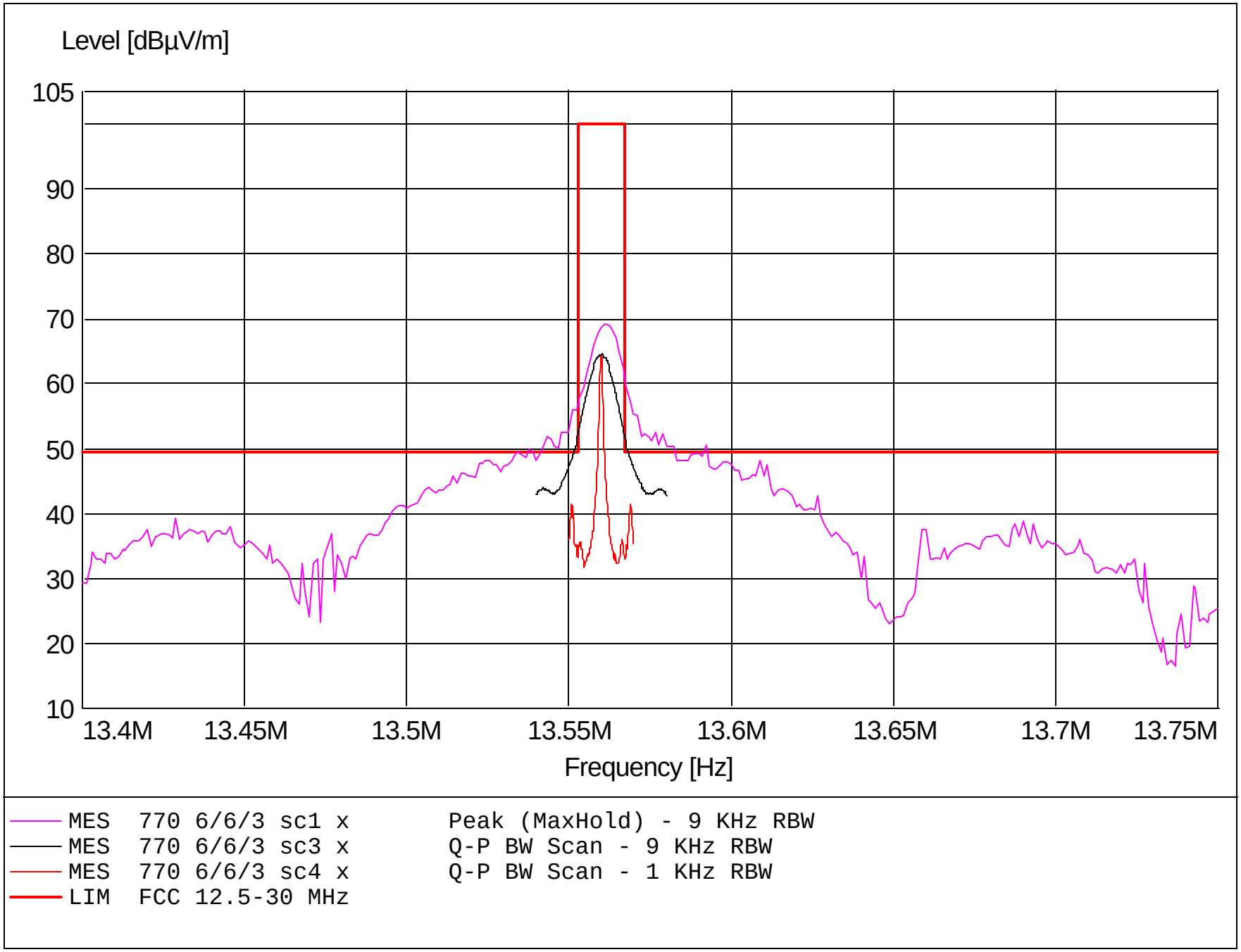
Emission Bandwidth



3M™ RFID Tracking Pad with no extension cables



3M™ RFID Tracking Pad with 1 - 20 foot extension cable



3M™ RFID Tracking Pad with 2 - 20 foot extension cables

Appendix C

Spurious Emissions
(12.5 to 30 MHz.)

SPURIOUS EMISSIONS

3M EMC Lab

TEST REPORT # F0503002

EUT MODEL # 770 EUT SERIAL # 40022

DESCRIPTION 3M™ RFID Tracking Pad with no extension cables

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
13.5485	V	48.3	48.6	0.3	325	1.0	Antenna was at +20 (CW) degrees from the X-axis.
13.5715	V	47.9	48.6	0.7	325	1.0	Antenna was at +20 (CW) degrees from the X-axis.
27.1204	V	17.3	48.6	31.3	273	1.0	Antenna was at +20 (CW) degrees from the X-axis.

Signatory: Bruce Jungwirth

Test Engineer: Bruce R Jungwirth Date: 11 June 2003

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 20 June 2003

SPURIOUS EMISSIONS

3M EMC Lab

SHEET 1 OF 1

TEST REPORT # F0503002

EUT MODEL # 770 EUT SERIAL # 40022

DESCRIPTION 3M™ RFID Tracking Pad with 1 - 20 foot extension cable

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
13.5485	V	47.1	48.6	1.5	345	1.0	Antenna was at +20 (CW) degrees from the X-axis.
13.5715	V	47.0	48.6	1.6	345	1.0	Antenna was at +20 (CW) degrees from the X-axis.
27.1204	V	16.8	48.6	31.8	203	1.0	Antenna was at +20 (CW) degrees from the X-axis.

Signatory: Bruce Jungwirth

Test Engineer: Bruce R Jungwirth Date: 11 June 2003

Signatory: Roger Kuhn

Reviewed by: Roger D. Kuhn Date: 20 June 2003

SPURIOUS EMISSIONS

3M EMC Lab

TEST REPORT # F0503002

EUT MODEL # 770 EUT SERIAL # 40022

DESCRIPTION 3M™ RFID Tracking Pad with 2 - 20 foot extension cables

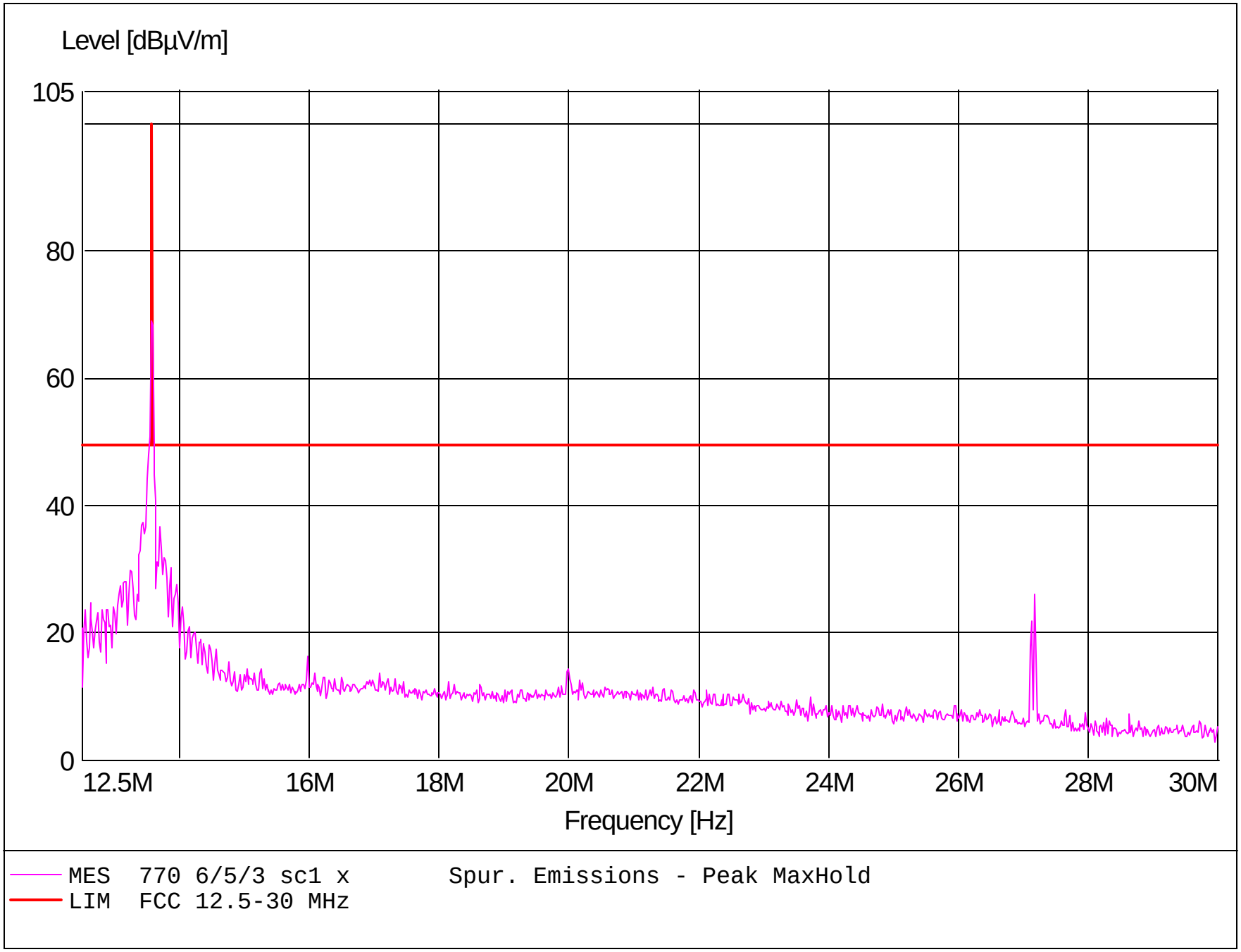
FREQ. (MHz)	MAXIMIZED QP SIGNAL H/V	MAXIMIZED QP SIGNAL (dBµV/m)*	LIMIT LINE (dBµV/m)	PASSING MARGIN (dB)	MAXIMIZED POSITION TURNTABLE (°)	MAXIMIZED POSITION ANTENNA (M)	REMARKS
13.5485	V	45.5	48.6	3.1	335	1.0	Antenna was at +20 (CW) degrees from the X-axis.
13.5715	V	45.3	48.6	3.3	335	1.0	Antenna was at +20 (CW) degrees from the X-axis.
27.1204	V	18.0	48.6	30.6	280	1.0	Antenna was at +20 (CW) degrees from the X-axis.

Signatory: Bruce Jungwirth

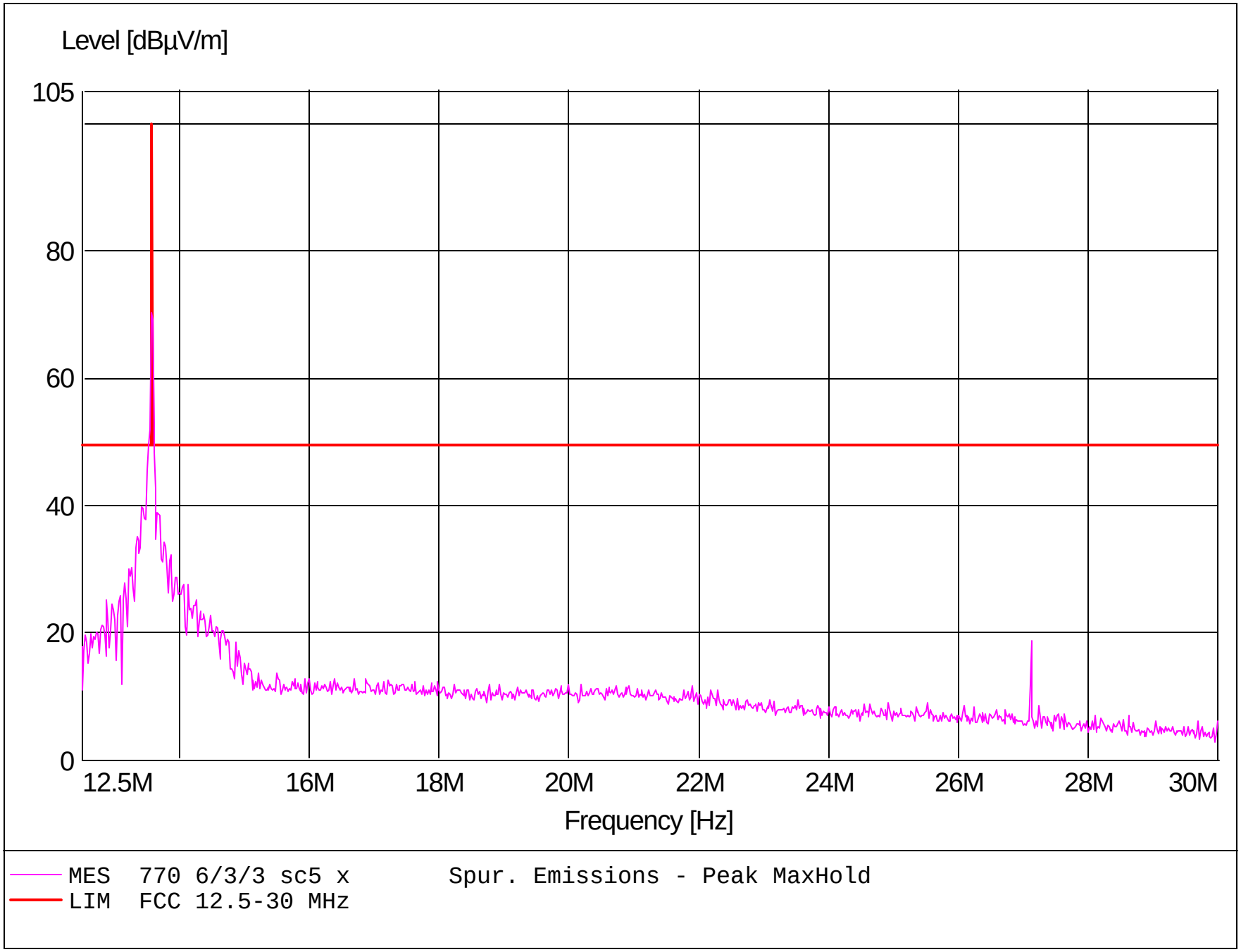
Test Engineer: Bruce R Jungwirth Date: 11 June 2003

Signatory: Roger Kuhn

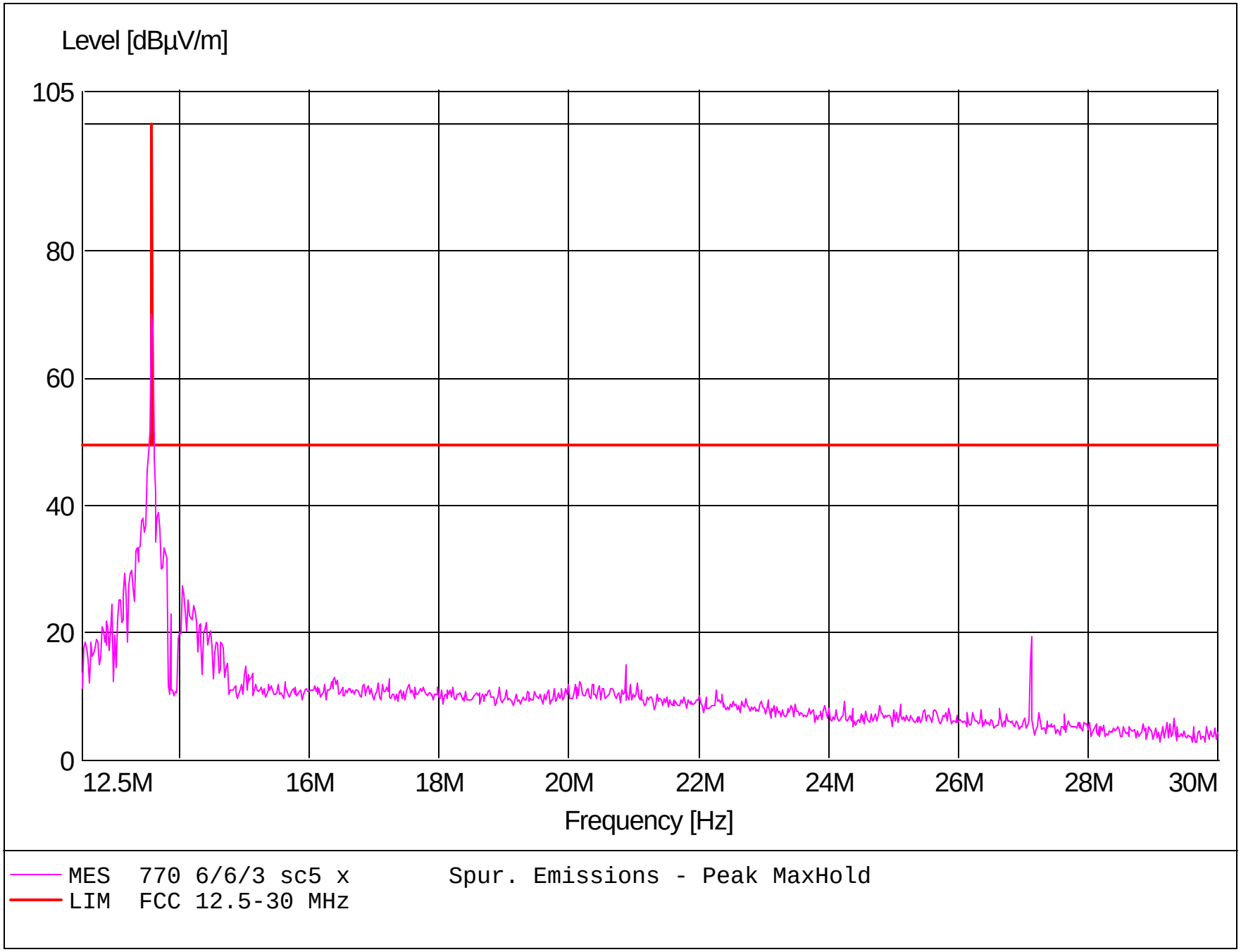
Reviewed by: Roger D. Kuhn Date: 20 June 2003



3M™ RFID Tracking Pad with no extension cables



3M™ RFID Tracking Pad with 1 - 20 foot extension cable



3M™ RFID Tracking Pad with 2 - 20 foot extension cables

Appendix D

Radiated Emissions

RADIATED EMISSIONS

3M EMC Lab

TEST REPORT # F0503002

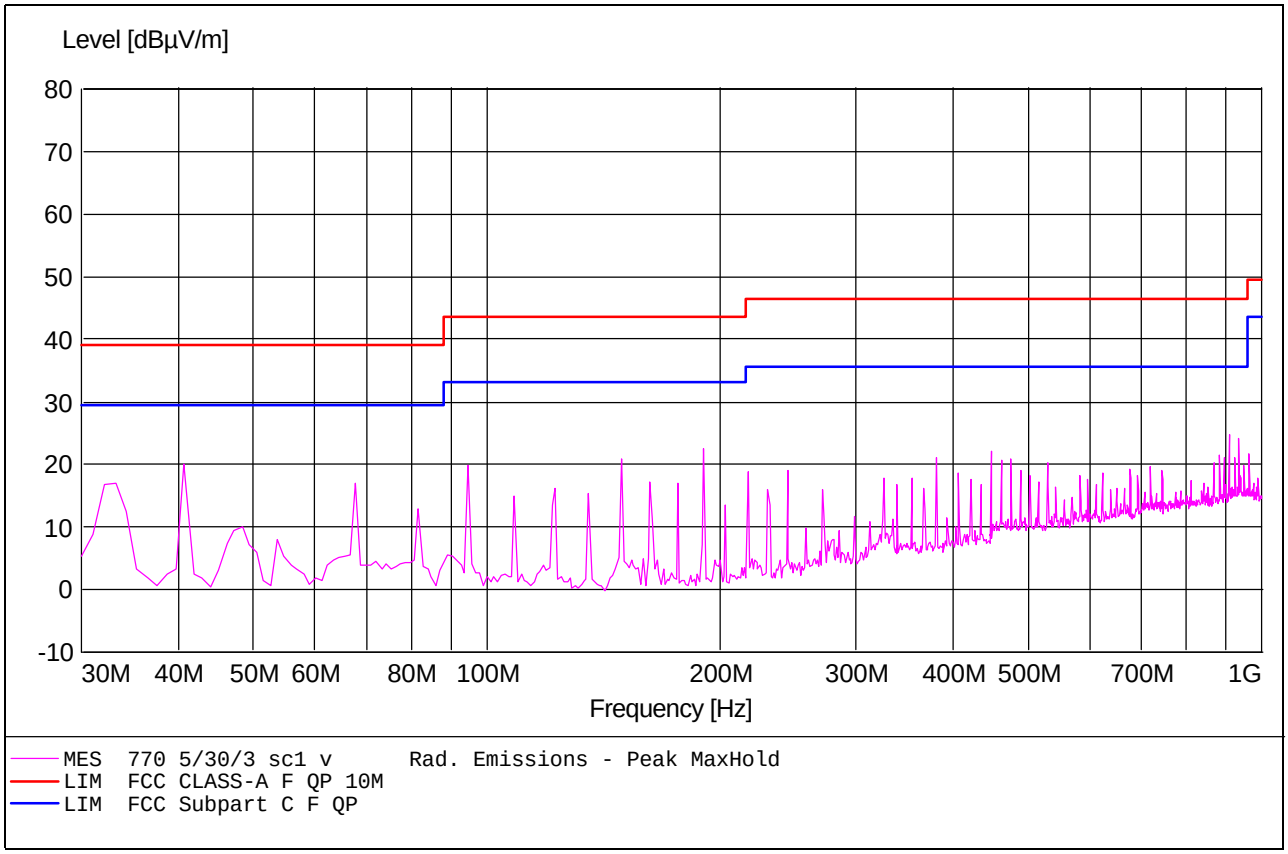
EUT MODEL # 770 EUT SERIAL # 40022

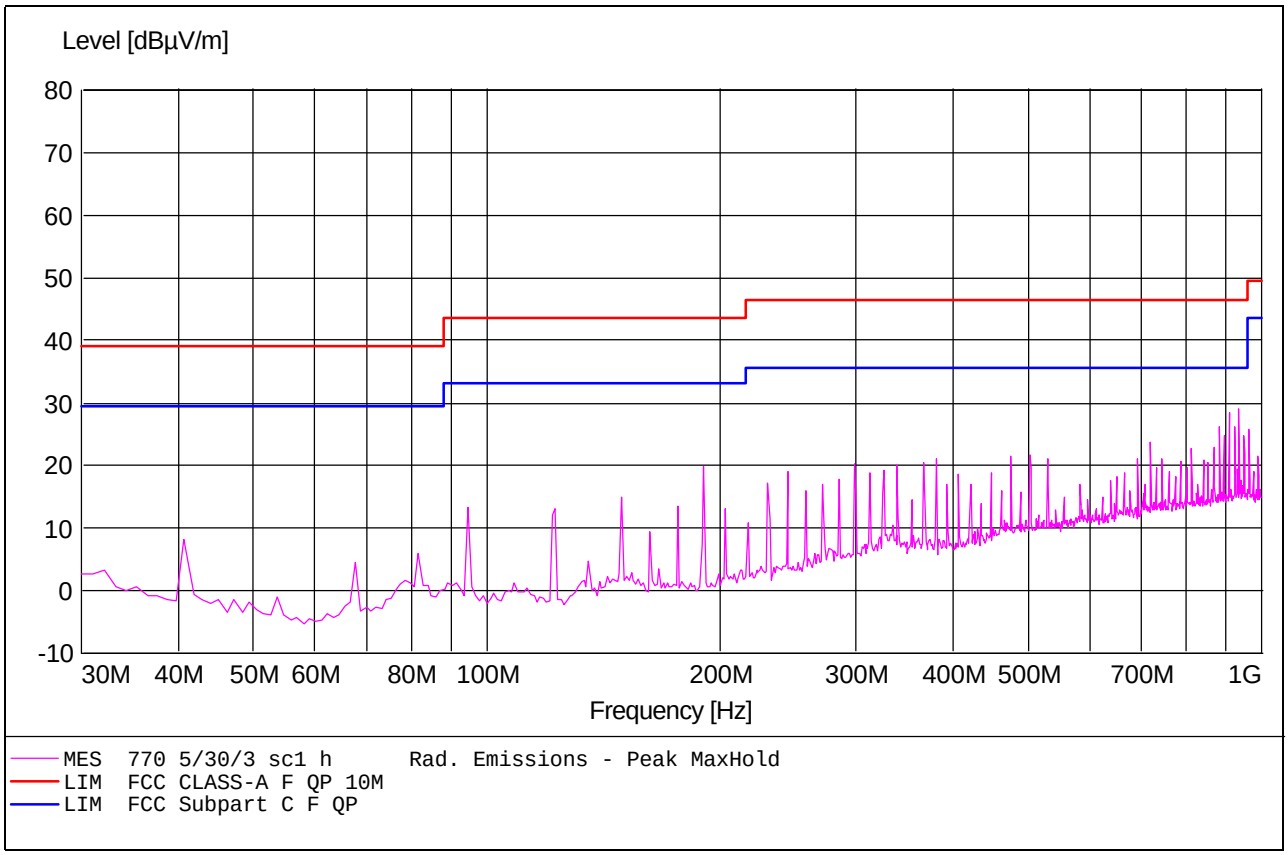
DESCRIPTION 3M™ RFID Tracking Pad

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
40.677	V	19.1	29.54	10.44	182	1.0	Transmitter Harmonic
67.790	V	24.6	29.54	4.94	124	1.0	Transmitter Harmonic
94.914	V	18.7	33.06	14.36	270	1.0	Transmitter Harmonic
149.153	V	20.8	33.06	12.26	25	1.0	Transmitter Harmonic
189.831	V	21.6	33.06	11.46	43	1.0	Transmitter Harmonic
447.472	V	20.5	35.56	15.06	265	1.0	Transmitter Harmonic
718.671	H	21.5	35.56	14.06	181	1.0	Transmitter Harmonic
908.506	H	29.3	35.56	6.26	191	1.0	Transmitter Harmonic
935.624	H	27.9	35.56	7.66	45	1.0	Transmitter Harmonic

Test Engineer: Signatory: Bruce Jungwirth Bruce R Jungwirth Date: 2 June 2003

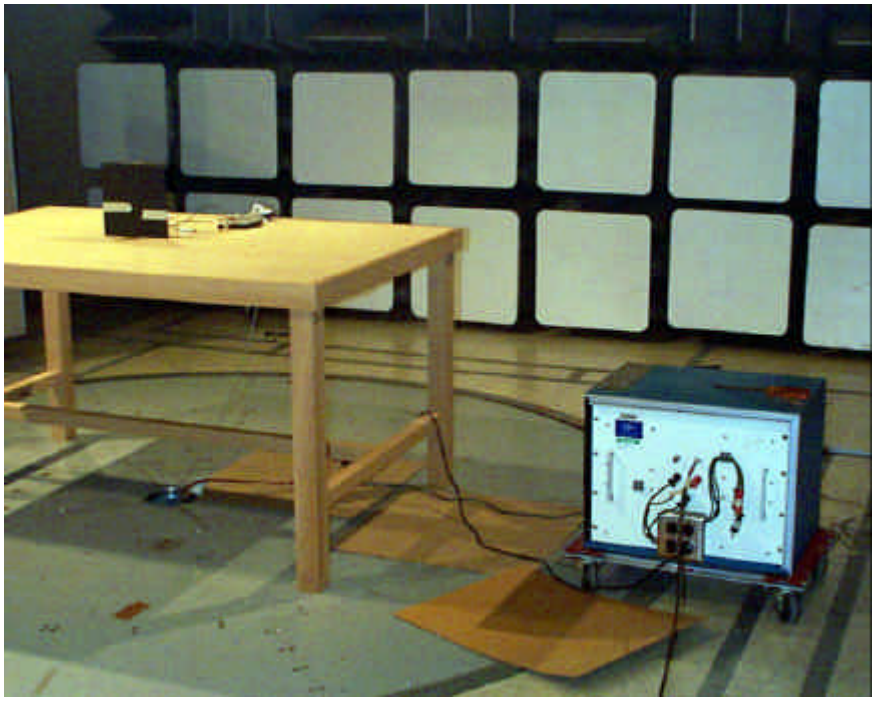
Reviewed by: Signatory: Roger Kuhn Roger D. Kuhn Date: 20 June 2003


Level [dBµV/m]
80
70
60
50
40
30
20
10
0
-10
30M
40M
50M
60M
80M
100M
200M
300M
400M
500M
700M
1G
Frequency [Hz]
MES 770 5/30/3 sc1 v Rad. Emissions - Peak MaxHold
LIM FCC CLASS-A F QP 10M
LIM FCC Subpart C F QP

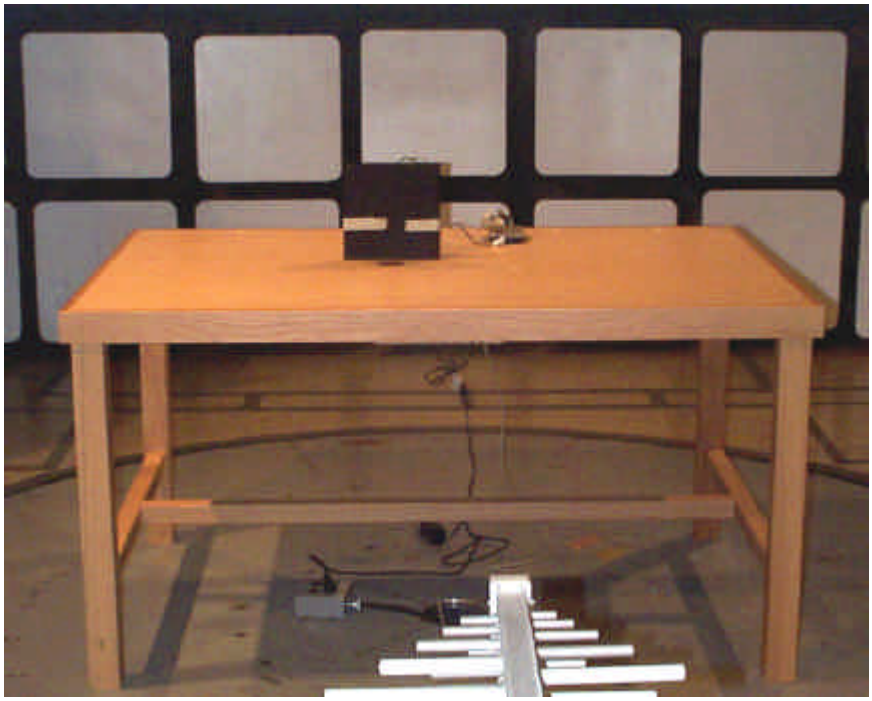

Level [dBµV/m]
80
70
60
50
40
30
20
10
0
-10
30M
40M
50M
60M
80M
100M
200M
300M
400M
500M
700M
1G
Frequency [Hz]
MES 770 5/30/3 sc1 h Rad. Emissions - Peak MaxHold
LIM FCC CLASS-A F QP 10M
LIM FCC Subpart C F QP

Appendix E

Photographs



Conducted Emissions



Radiated Emissions

Bandwidth and Spurious Emissions

End of Report