

**FCC  
Electromagnetic Compatibility  
Test Report**

**For**

**3M™ SelfCheck™ System C – Series C1  
Model 877**

**FCC ID: DGFSSD877  
Class II Change**


**3M Safety and Security Systems Division  
Library Systems  
St. Paul, MN 55144-1000**

20 February 2007

Report Number F1206002

Prepared By:

3M Product Safety  
EMC Laboratory  
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  
Safety and Security Systems Division  
Library Systems  
St. Paul, MN 55144-1000

NAME OF EQUIPMENT: SelfCheck™ System C-Series C1

MODEL NUMBER: 877

SERIAL NUMBER: None

FCC ID NUMBER: DGFSSD877

TEST REPORT NUMBER: F1206002

DATE: 20 February 2007

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.

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Robert E. Heller  
Senior EMC Engineer

|                |                |                  |              |
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## 1.0 TEST SUMMARY

Test Report Number: F1206002

Requester: Seth Liefert

Company: 3M  
Safety and Security Systems Division  
Library Systems  
Building 209  
St. Paul, MN 55144

Telephone Number: 651 – 736-6939

Test Dates: 14 Dec.2006, 26,31 Jan, 6,7,8 Feb 2007

Equipment Under Test 3M™ Selfcheck Model 877

Date Of Receipt: 11 Dec. 2006

Condition upon receipt Device was in good working condition

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: Modifications were required (See Paragraph 2.5)

Test Location: 3M Product Safety EMC Laboratory  
Building 76  
410 Fillmore Ave.  
St. Paul, MN 55144-1000

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## 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. 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.

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## 2.2 EUT Description and Operation

The Equipment Under Test (EUT) is the 3M™ Model 877 SelfCheck™ Sestem C-Series C1, Serial Number None.

The 3M SelfCheck System C-Series C1 Model 877 is intended for use by library Patrons in checking RFID-tagged books back into a library with minimal assistance by library staff. The system is offered in versions suitable for installation into fire-rated or, non-fire-rated partition walls.

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

The reader has a transmit frequency of 13.5596 MHz. and a power output level of 4.0 watts (36 dBm) as measured into a 50-ohm load.

The EUT has an integral antenna with an area of 203 square inches (0.131 square meters). The antenna is mounted in the underside of the chute and is connected to the reader via a coax cable employing SMA connectors.

All tests were made using an input of 120 V RMS, 60 Hz, and single-phase power. The EUT was tested with an EMC program exercising all functions. The Reader was set to the fastest read time and was reading tags during all testing.

Class II Change.

This report covers a Class II Change to the Model 877. The original data was submitted to the FCC under Report Number F1205004. The change to the EUT includes a redesign of the tuning unit of the antenna, and the modifications needed to meet the emissions requirements of CFR 47part 15. All other information supplied with original Grant application remains unchanged.

|                |                |                  |              |
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### 2.3 Block Diagram and schematic

(Submitted as separate exhibits).

### 2.4 Parts List

| <u>Description</u>  | <u>Manufacturer</u>             | <u>Model / Type</u> | <u>Remark</u> |
|---------------------|---------------------------------|---------------------|---------------|
| PC                  | HP                              | DM329#ABA           |               |
| Printer             | Ithaca                          | M280                |               |
| Monitor             | 3M Touchsystems                 | 11-81371-505        |               |
| Antenna             | 3M                              | 78-8126-8373-4      |               |
| Appliance Coupler   | Schurter                        | 4740.6000           |               |
| <b>COMMON BOX</b>   |                                 |                     |               |
| 24 VDC Power Supply | Lambda                          | ZWS75PF-24          |               |
| Linefilter          | Corcom                          | 6ED1                |               |
| RFID Reader         | 3M                              | 78-8123-9800-2      |               |
| DC LED indicator    | Lighting Components<br>& Design | L75R-G24-2212T      |               |

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## 2.5 Modifications to the EUT

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

1. Ferrite – Steward # 28A2025-0A0 ( or equivalent ) 2 turn on coax cable at Reader output of Common Box
2. Ferrite – Steward # 25A2029-0A0 ( or equivalent ) 2 turn on RS232 cable at Common Box end
3. Ferrite – Steward # 28A0392-0A0 ( or equivalent ) 1 turn on Mouse cable at Computer end
4. Ferrite – Steward # HFA150066-0A0 ( or equivalent ) 1 turn on 24 VDC cable to reader at reader connector end (inside common box)
5. Attach Reader output connector ground to common box. Note: Remove paint to bare metal on common box
6. Tape all seams of Reader box using conductive copper tape or equivalent
7. Use shielded cable from RS232 connector to Reader (inside Common box) and ground shield to Common box

## 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  $\pm 2$  dB. Furthermore, EUT component and manufacturing process variables may result in additional deviation. The calculated confidence level is 95 %.



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### 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  | 2004 |
| 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. | 2003 |
| CISPR 16-1   | Specification for radio disturbance and immunity measuring apparatus and methods<br>Part 1: Radio disturbance and immunity measuring apparatus                       | 1998 |
| CISPR 16-2   | Specification for radio disturbance and immunity measuring apparatus and methods<br>Part 2: Methods of measurements of disturbances and immunity                     | 1996 |
| CISPR 16-4-1 | Uncertainties in Standardized EMC Tests  | 2005 |

|                |                |                  |               |
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## 4.0 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.

### 4.1 Frequency Stability

The Frequency Stability testing was performed 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.

#### 4.1.1 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.

#### 4.1.2 Test Criteria

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

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

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

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

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#### 4.1.3 Test Results

The EUT met the FCC Part 15, Subpart C Frequency Stability requirement.

##### Carrier Frequency Stability versus Supply Voltage

| <u>Carrier Frequency</u><br><u>(MHz)</u> | <u>Lowest</u><br><u>Frequency (MHz)</u> | <u>Highest</u><br><u>Frequency (MHz)</u> | <u>Frequency</u><br><u>Change</u><br><u>(%)</u> |
|--|---|--|---|
| 13.5596                                  | 13.5596                                 | 13.5597                                  | +/- 0.0007 %                                    |

##### Carrier Frequency Stability versus Temperature

| <u>Carrier Frequency</u><br><u>(MHz)</u> | <u>Lowest</u><br><u>Frequency</u><br><u>(MHz)</u> | <u>Highest</u><br><u>Frequency (MHz)</u> | <u>Frequency</u><br><u>Change</u><br><u>(%)</u> |
|--|---|--|---|
| 13.5596                                  | 13.5594   | 13.5597                                  | +/- 0.0022 %                                    |

| Frequency Stability Test Results |               |         |         |
|----------------------------------|---------------|---------|---------|
| Temperature                      | Input Voltage |         |         |
|                                  | 102 VAC       | 120 VAC | 138 VAC |
| -20° C                           | 13.5596       | 13.5596 | 13.5596 |
| 0° C                             | 13.5597       | 13.5597 | 13.5597 |
| 23° C                            | 13.5596       | 13.5596 | 13.5596 |
| 50° C                            | 13.5596       | 13.5594 | 13.5596 |
| 55° C                            | 13.5594       | 13.5594 | 13.5594 |

#### 4.2 Emission Bandwidth

The EUT was placed in an anechoic chamber and the Emission Bandwidth testing was performed 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.

|                |                |                  |               |
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#### 4.2.1 Test Procedure

The EUT was placed in the center of the turn table and the 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 (dB $\mu$ V/m) = receiver level ( $\mu$ V) + antenna factor (dB/m) + cable loss (dB) – preamp gain (dB) + lineal conversion (dB).

#### 4.2.2 Test Criteria

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

|                          |                          |
|--------------------------|--------------------------|
| Lower Band Edge<br>(MHz) | Upper Band Edge<br>(MHz) |
| 13.553                   | 13.567                   |

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

| Frequency<br>(MHz) | Test Distance<br>(Meters) | Field Strength<br>(dB $\mu$ V/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.

|                |                |                  |               |
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#### 4.2.3 Test Results

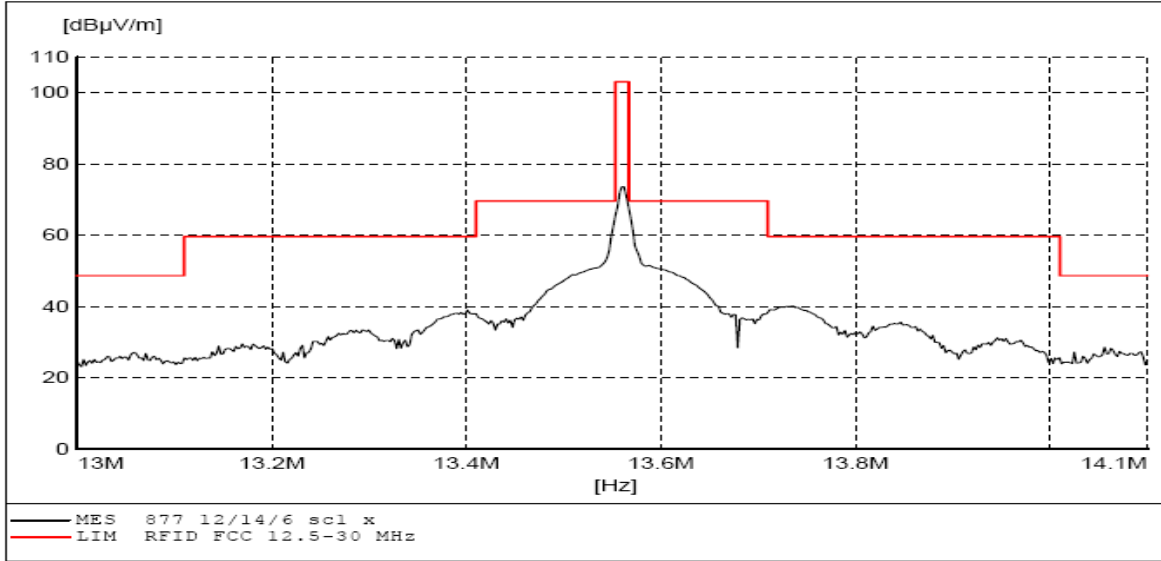
The EUT met the FCC Part 15, Subpart C Emission Bandwidth requirements. The intentional radiator frequency was within the allowed band and all maximized quasi-peak measurements for the EUT were below the quasi-peak limits.

| 3M™ SelfCheck™ Model 877 |          |                   |                   |                     |                     |  |
|--------------------------|----------|-------------------|-------------------|---------------------|---------------------|--|
| Frequency (MHz)          | BW (kHz) | QP Level (dBμV/m) | QP Limit (dBμV/m) | Passing Margin (dB) | Turntable (degrees) | Antenna Orientation/Angle (Polarity/degrees) |
| 13.5596 <sup>1</sup>     | 9        | 73.04             | 103               | 29.96               | 315                 | 15 ° CW from X-axis                          |
| 13.553 <sup>2</sup>      | 1        | 28.18             | 69.55             | 41.37               | 315                 | 15 ° CW from X-axis                          |
| 13.567 <sup>2</sup>      | 1        | 28.20             | 69.55             | 41.35               | 315                 | 15 ° CW from X-axis                          |
| 13.5485                  | 9        | 50.00             | 69.55             | 19.55               | 315                 | 15 ° CW from X-axis                          |
| 13.5715                  | 9        | 49.44             | 69.55             | 20.11               | 315                 | 15 ° CW from X-axis                          |
|                          |          |                   |                   |                     |                     |  |

1 – Intentional Radiator Frequency

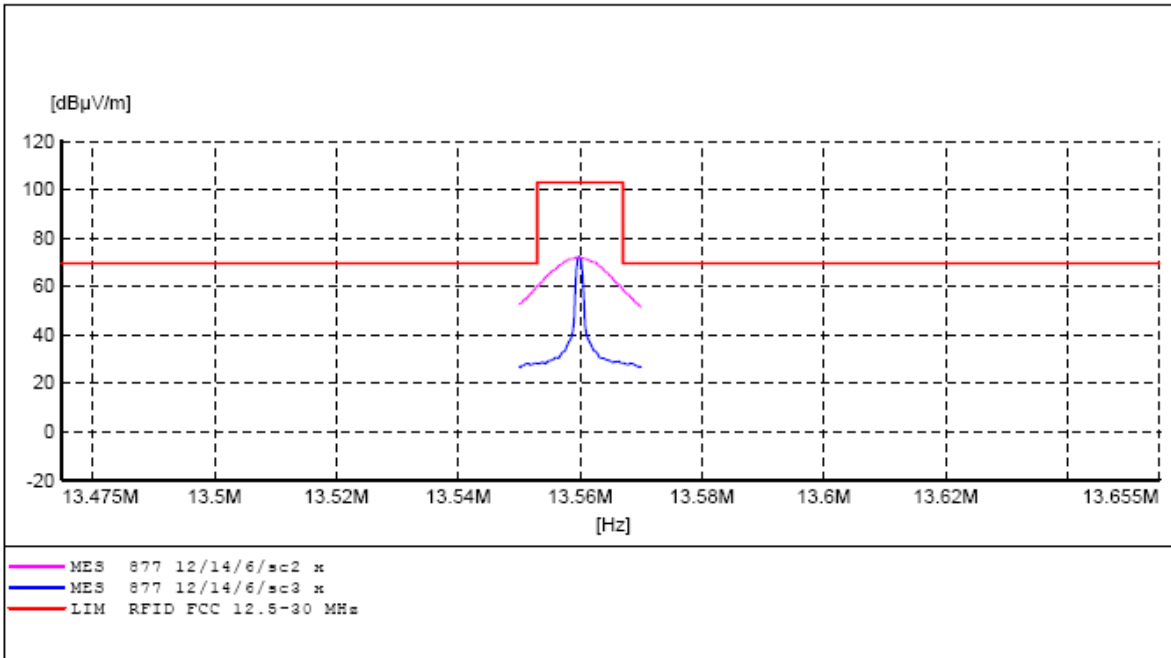
2 – Band edges measured with a receiver bandwidth setting of 1 KHz. Per ANSI C63.4 Paragraph 13.1.7.

|                |                |                  |               |
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Max Peak Plot 9 KHz BW

Peak Emissions



Violet QP Plot 9 KHz BW

Blue QP Plot 1 KHz BW  
Emissions Bandwidth

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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**TEST SETUP**  
Emissions Bandwidth

|                |                |                  |               |
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### 4.3 Spurious Emissions (12.5 to 30 MHz.)

The EUT was placed in an anechoic chamber and the Spurious Emissions testing was performed 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.

#### 4.3.1 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 (dB $\mu$ V/m) = receiver level ( $\mu$ V) + antenna factor (dB/m) + cable loss (dB) – preamp gain (dB) + lineal conversion (dB).

#### 4.3.2 Test Criteria

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

| Frequency (MHz)  | Test Distance (Meters) | Field Strength (dB $\mu$ V/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 use per 15.31.



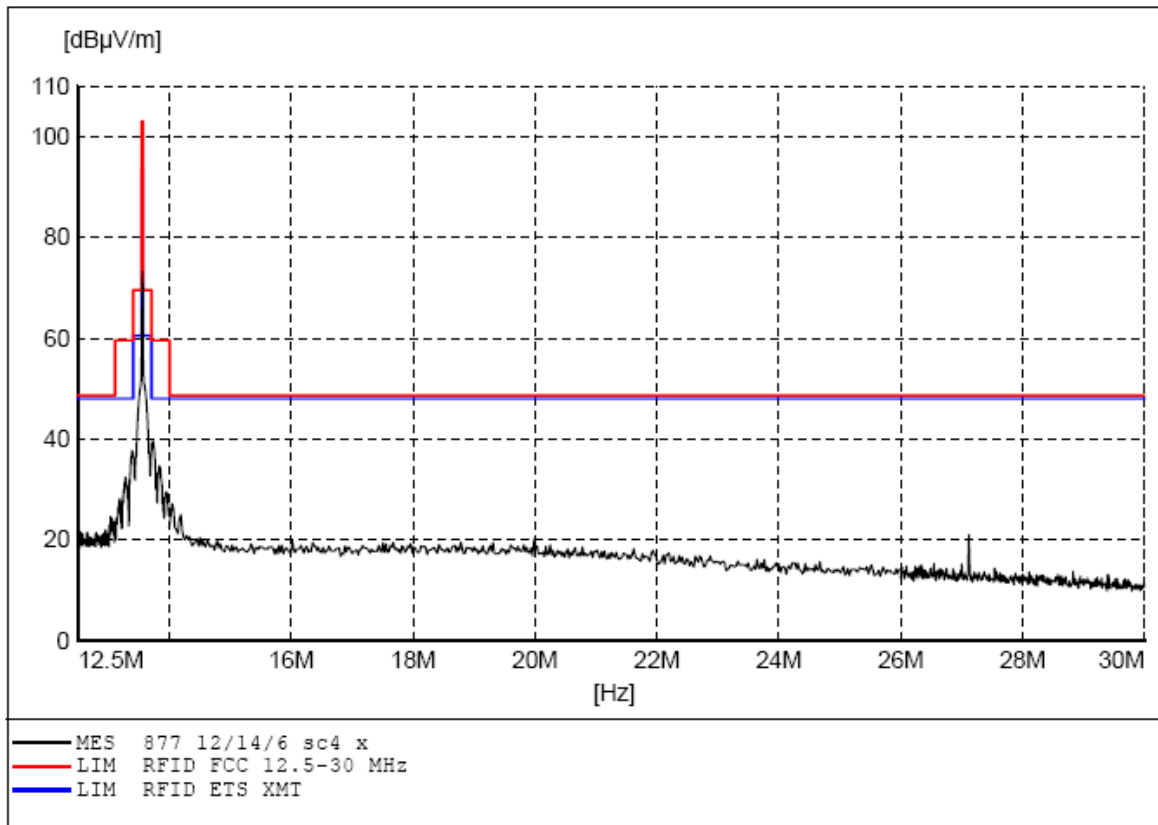
|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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### 4.3.3 Test Results

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. The worst-case quasi-peak emissions were as follows:

| Frequency (MHz)      | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Passing Margin (dB) | Turntable (degrees) | Antenna Orientation/Angle (Polarity/degrees) |
|----------------------|----------------------|----------------------|---------------------|---------------------|--|
| 13.5485              | 50.0                 | 69.55                | 19.55               | 315                 | X+15° CW                                     |
| 27.1192 <sup>1</sup> | 19.06                | 48.62                | 29.56               | 315                 | X+15° CW                                     |

<sup>1</sup> Second Harmonic.



|                |                |                  |               |
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**TEST SETUP**  
Spurious Emissions 12 to 30 MHz

|                |                |                  |               |
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#### 4.4 Radiated Emissions (30 to 10000 MHz)

The EUT was placed in an anechoic chamber and the Digital & Spurious Emissions testing was performed 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.

##### 4.4.1 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 10000 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 (dB $\mu$ V/m) = receiver level ( $\mu$ V) + antenna factor (dB/m) + cable loss (dB) – preamp gain (dB) + lineal conversion (dB).

##### 4.4.2 Test Criteria

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

| Frequency<br>(MHz) | Distance<br>(m) | Field Strength<br>(dB $\mu$ V/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                            |

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

| Frequency<br>(MHz) | Distance<br>(m) | Field Strength<br>(dB $\mu$ V/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)

#### 4.4.3 Test Results

The EUT met the FCC Part 15, Subpart C and the FCC Part 15, Subpart B, "Class A" Radiated Emissions (30 to 10000MHz.) requirements. All maximized measurements for the EUT were below the limits. No emissions were detected above 5 GHz. The worst-case quasi-peak emissions were as follows:

| Frequency<br>(MHz) | Level<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Passing<br>Margin<br>(dB) | Turntable<br>(degrees) | Antenna<br>(Meters/Polarity) |
|--------------------|-------------------------|-------------------------|---------------------------|------------------------|------------------------------|
| 555.95             | 33.98                   | 35.56 <sup>1</sup>      | 1.58                      | 167                    | 1.0/V                        |
| 71.987             | 21.96                   | 39.08                   | 17.12                     | 35                     | 1.0/V                        |

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

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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## RADIATED EMISSIONS

**3M EMC Lab**

TEST REPORT # F1206002 SHEET 1 OF 1  
 EUT MODEL # 877 EUT SERIAL # no s/n  
 DESCRIPTION SelfCheck System C-Series

| FREQ.<br>(MHz) | MAXIMIZED<br>QP SIGNAL |                | LIMIT<br>LINE<br>(dB $\mu$ V/m) | PASSING<br>MARGIN<br>(dB) | MAXIMIZED POSITION     |                     | REMARKS               |
|----------------|------------------------|----------------|---------------------------------|---------------------------|------------------------|---------------------|-----------------------|
|                | H/V                    | (dB $\mu$ V/m) |                                 |                           | TURNTABLE<br>(degrees) | ANTENNA<br>(meters) |                       |
| 40.671         | V                      | 15.60          | 29.54                           | 13.94                     | 128                    | 1.0                 | Harmonic <sup>1</sup> |
| 461.028        | V                      | 33.26          | 35.56                           | 2.3                       | 181                    | 1.0                 | Harmonic <sup>1</sup> |
| 555.95         | V                      | 33.98          | 35.56                           | 1.58                      | 167                    | 1.0                 | Harmonic <sup>1</sup> |
| 583.074        | V                      | 29.26          | 35.56                           | 6.3                       | 177                    | 1.0                 | Harmonic <sup>1</sup> |
| 732.226        | H                      | 28.90          | 35.56                           | 6.66                      | 161                    | 1.0                 | Harmonic <sup>1</sup> |
| 62.074         | V                      | 18.11          | 39.08                           | 20.97                     | 65                     | 1.0                 | 2                     |
| 71.987         | V                      | 21.96          | 39.08                           | 17.12                     | 35                     | 1.0                 | 2                     |
| 106.292        | V                      | 20.74          | 43.52                           | 22.78                     | 100                    | 1.1                 | 2                     |
| 144.002        | V                      | 24.96          | 43.52                           | 18.56                     | 80                     | 1.0                 | 2                     |
| 432.034        | V                      | 28.16          | 46.44                           | 18.28                     | 18                     | 1.0                 | 2                     |
| 707.775        | V                      | 21.24          | 46.44                           | 25.20                     | 140                    | 1.0                 | 2                     |

1 Harmonic of Intentional Radiator. Subpart C Limit used.

2 Digital Signal, Subpart B Limit.

Test Engineer: Bruce Jungwirth

Date: 6 Feb. 2007

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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## RADIATED EMISSIONS 1 – 5 GHz

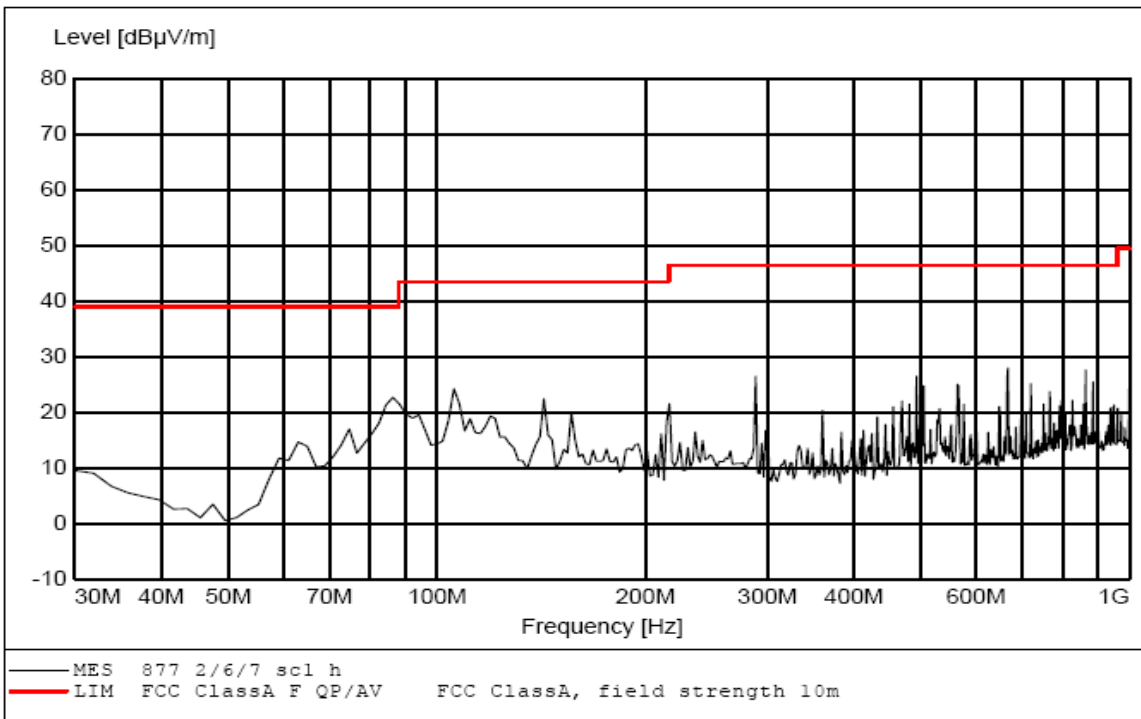
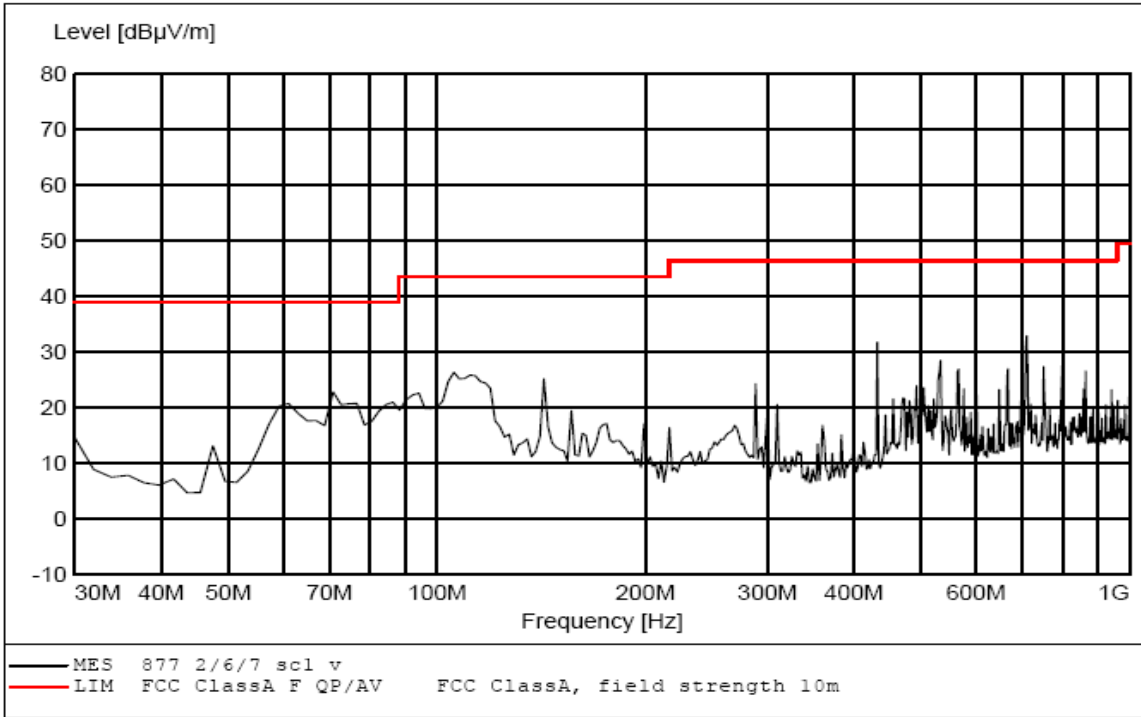


TEST REPORT # F1206002 SHEET 1    OF    1  
 EUT MODEL # 877 EUT SERIAL # None  
 DESCRIPTION SelfCheck System C-Series

| FREQ.<br>(GHz) | MAXIMIZED<br>AVG SIGNAL |              | LIMIT<br>LINE<br>(dBµV/m) | PASSING<br>MARGIN<br>(dB) | MAXIMIZED<br>PEAK SIGNAL |          | LIMIT<br>LINE<br>(dBµV/m) | PASSING<br>MARGIN<br>(dB) | TURN<br>TABLE<br>(degrees) | ANTENNA<br>HEIGHT<br>(m) |
|----------------|-------------------------|--------------|---------------------------|---------------------------|--------------------------|----------|---------------------------|---------------------------|----------------------------|--------------------------|
|                | H/V                     | (dBµV/<br>m) |                           |                           | H/V                      | (dBµV/m) |                           |                           |                            |                          |
| 1.6649         | V                       | 48.56        | 54                        | 5.44                      | V                        | 51.25    | 74                        | 22.75                     | 271                        | 1.48                     |
| 1.99803        | V                       | 42.53        | 54                        | 11.47                     | V                        | 48.49    | 74                        | 25.51                     | 271                        | 1.25                     |
| 2.3308         | V                       | 37.85        | 54                        | 16.15                     | V                        | 45.16    | 74                        | 28.84                     | 22                         | 1.0                      |
| 3.9757         | V                       | 31.0         | 54                        | 23.0                      | V                        | 47.51    | 74                        | 26.49                     | 286                        | 1.0                      |
|                |                         |              |                           |                           |                          |          |                           |                           |                            |                          |
|                |                         |              |                           |                           |                          |          |                           |                           |                            |                          |

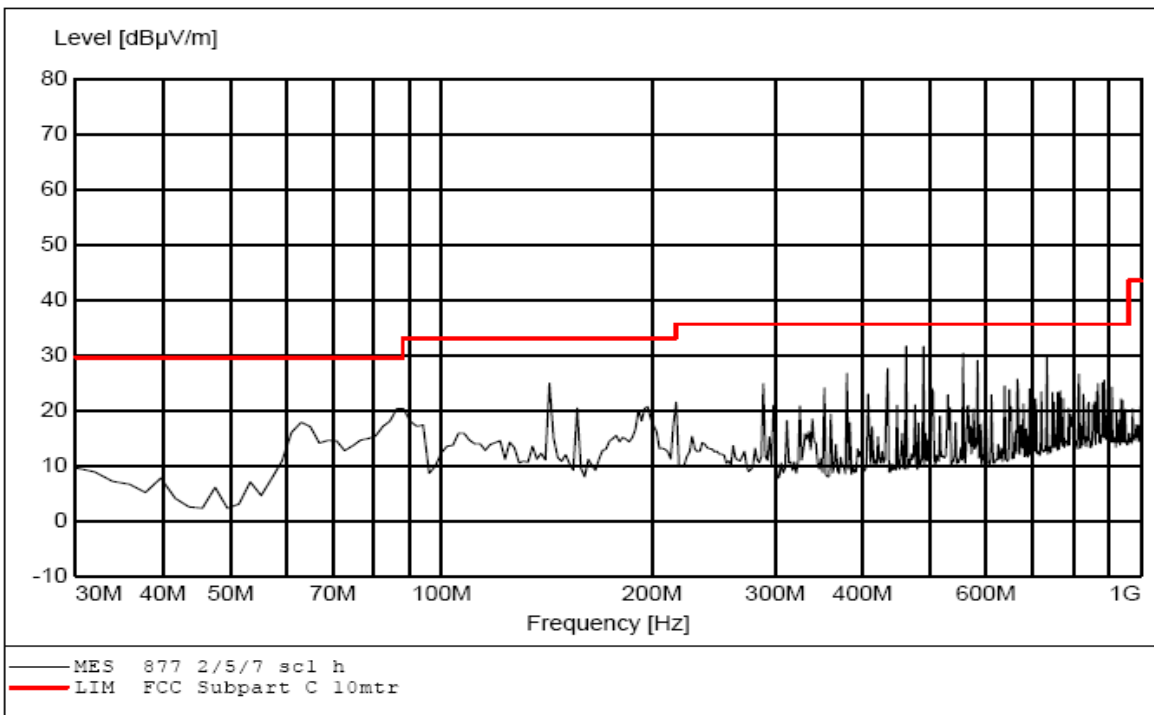
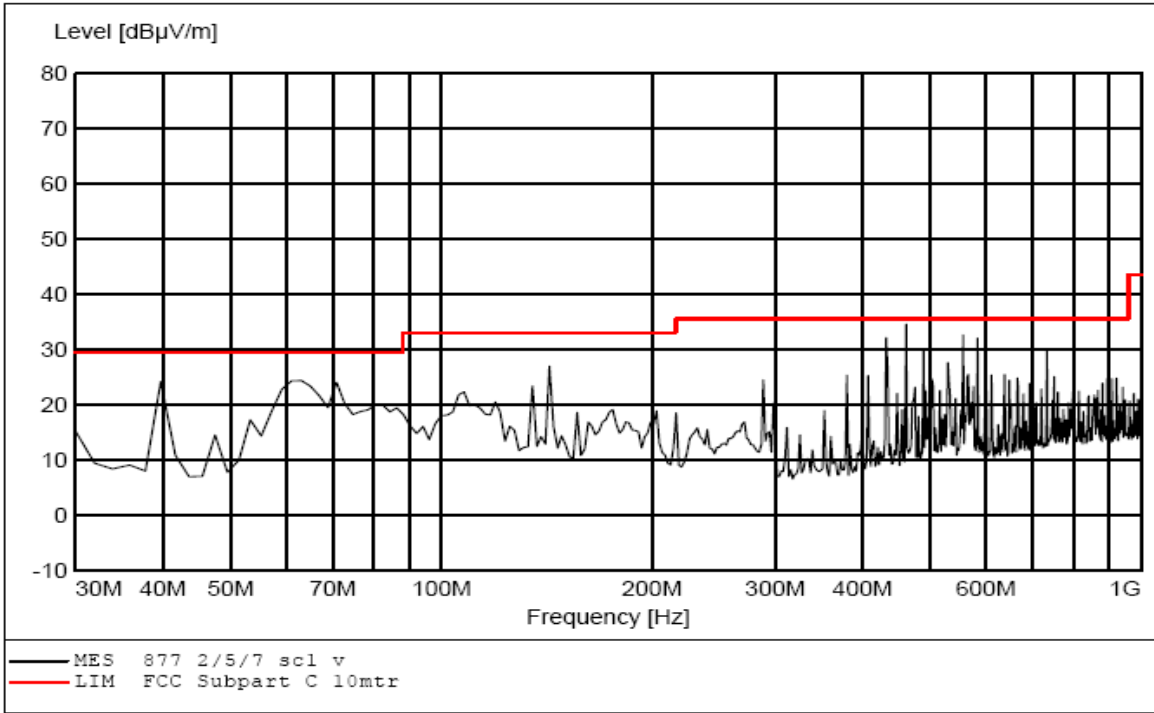
Test Engineer: Bruce Jungwirth

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
| <b>3M</b>      | Model 877      | Report: F1206002 | <b>3M</b>     |
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Digital Radiated Emissions 30 to 1000 MHz

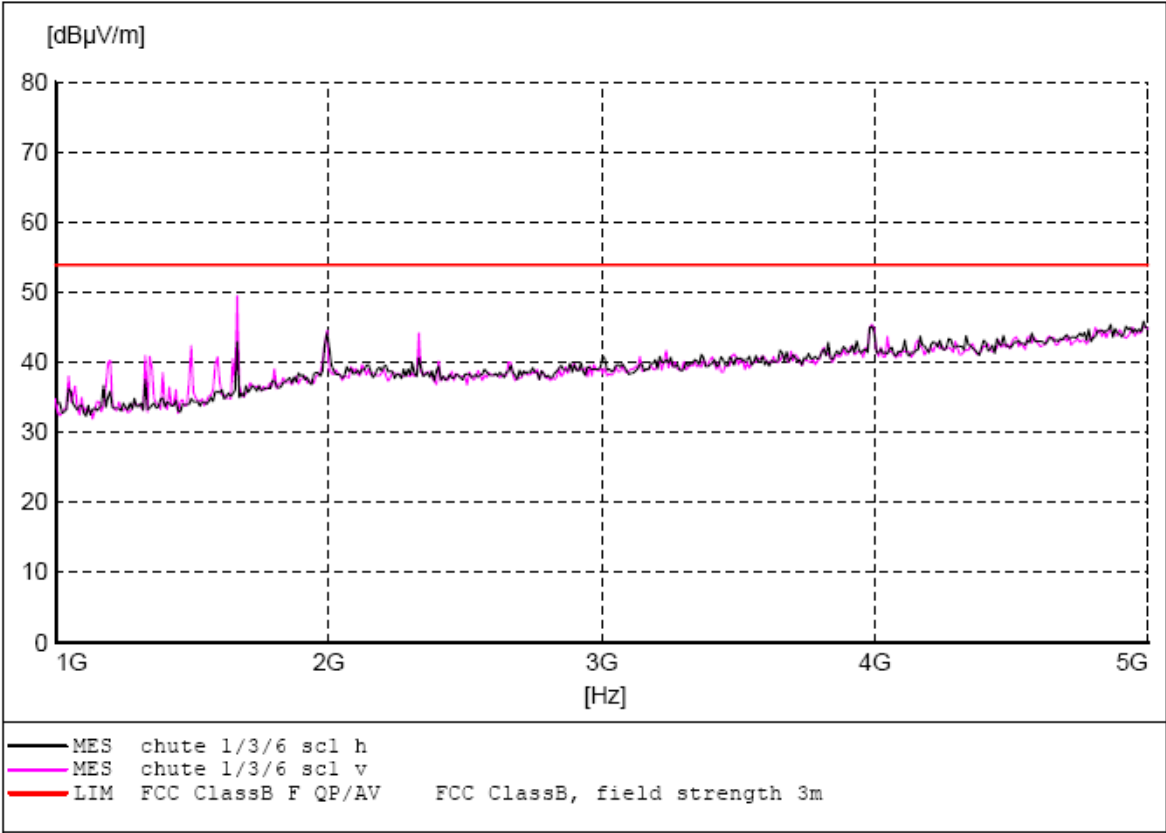
|                |                |                  |               |
|----------------|----------------|------------------|---------------|
| <b>3M</b>      | Model 877      | Report: F1206002 | <b>3M</b>     |
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Spurious Emissions 30 to 1000 MHz



|                |                |                  |               |
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Radiated Emissions 1 to 5 GHz

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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**TEST SETUP**  
Radiated and Spurious Emissions 30 to 1000 MHz

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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**TEST SETUP**  
Radiated Emissions 1 to 10 GHz

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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## 5.0 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.

### 5.1 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 performed on the initial measurements to determine which discrete frequencies to maximize. These frequencies were re-measured 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 (dB $\mu$ V) = receiver reading (dB $\mu$ V) + LISN CF (dB) + cable loss (dB)

### 5.2 Test Criteria

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

| Mains Terminal Disturbance Limits |                        |                     |
|-----------------------------------|------------------------|---------------------|
| Frequency (MHz)                   | Quasi-Peak(dB $\mu$ V) | Average(dB $\mu$ V) |
| 0.15 to 0.50                      | 79                     | 66                  |
| 0.50 to 30.0                      | 73                     | 60                  |

The lower limit shall apply at the transition frequency.

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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The FCC Part 15, Subpart C limits are given below. The lower limit shall apply at the transition frequency.

| Mains Terminal Disturbance Limits |   |   |
|-----------------------------------|---|---|
| Frequency (MHz)                   | Quasi-Peak (dB $\mu$ V)                   | Average (dB $\mu$ V)                      |
| 0.15 to 0.50                      | 66 to 56<br>(decreasing with log of freq) | 56 to 46<br>(decreasing with log of freq) |
| 0.50 to 5.0                       | 56  | 46  |
| 5.0 to 30.0                       | 60  | 50  |

### 5.3 Test Results

The EUT met conducted emission requirements for FCC Part 15, Subpart B, "Class A" and met FCC Part 15, Subpart C. The worst-case quasi-peak emissions were as follows:

| 3M™ SelfCheck™ Mode 877 |                    |                 |                 |                     |
|-------------------------|--------------------|-----------------|-----------------|---------------------|
| Frequency (MHz)         | Limit (dB $\mu$ V) | L1 (dB $\mu$ V) | L2 (dB $\mu$ V) | Passing Margin (dB) |
| 13.5596 <sup>1</sup>    | 60                 | 48.15           | 49.28           | 10.72               |

<sup>1</sup> Intentional radiator frequency  
FCC Part 15, Subpart C limit is shown

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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## CONDUCTED EMISSIONS



TEST REPORT # F1206002 SHEET 1 OF 1  
 EUT MODEL # 877 EUT SERIAL # no s/n  
 DESCRIPTION SelfCheck System C-Series

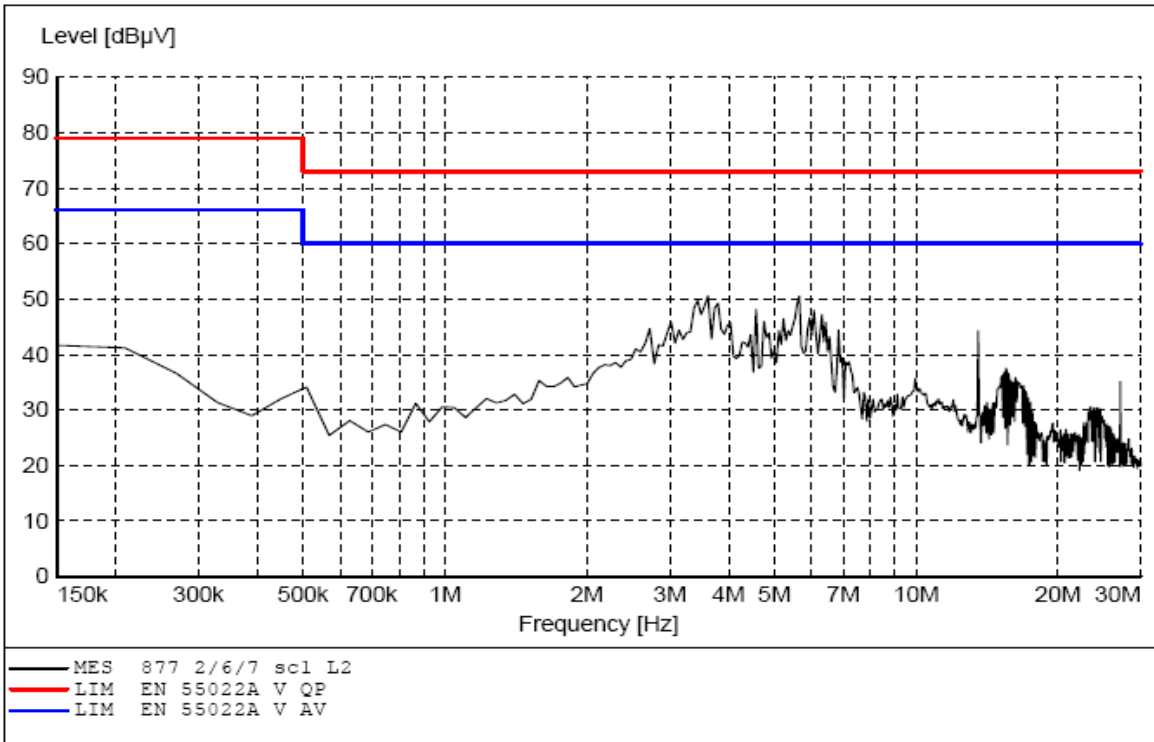
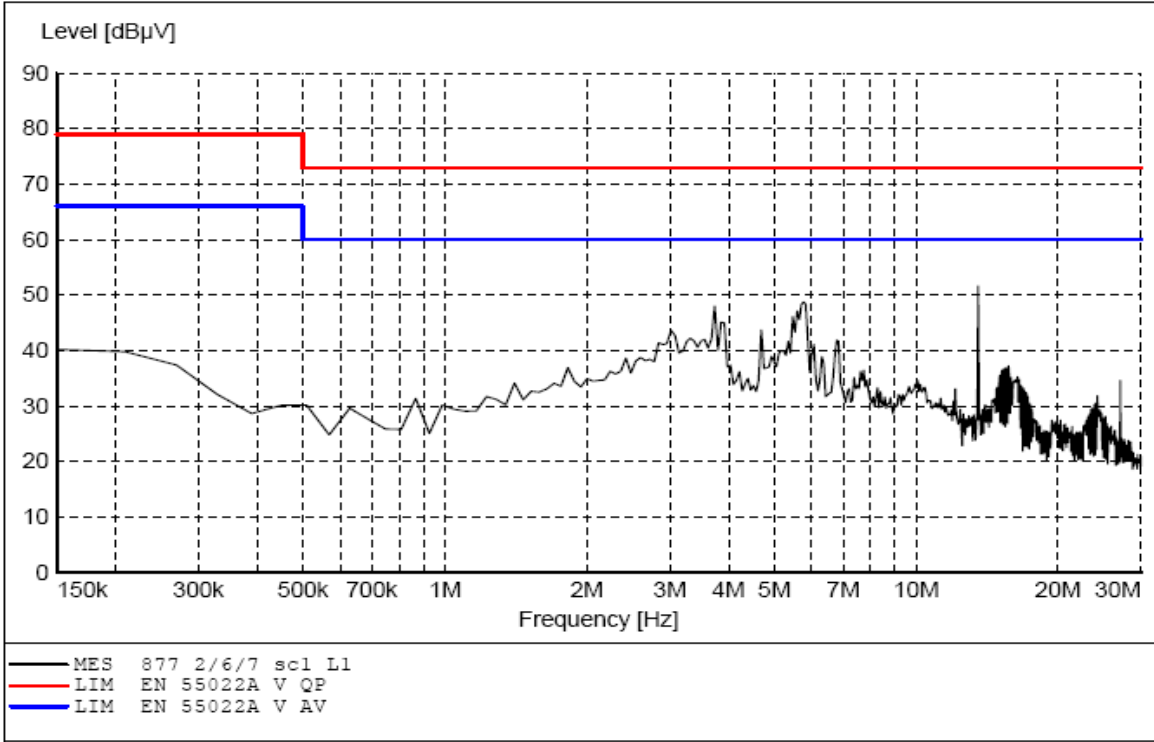
| FREQUENCY<br>(MHz) | PEAK<br>(dBµV) |            | QUASI-PEAK<br>(dBµV) |            |                 |       | AVERAGE<br>(dBµV) |             |                 |      |
|--------------------|----------------|------------|----------------------|------------|-----------------|-------|-------------------|-------------|-----------------|------|
|                    | L1<br>Line     | L2<br>Neut | L1<br>Line           | L2<br>Neut | Limit           | Pass  | L1<br>Line        | L2<br>Neut. | Limit           | Pass |
| 2.6641             |                |            | 32.82                | 32.97      | 73              | 40.03 |                   |             | 60              |      |
| 3.0879             |                |            | 34.28                | 34.56      | 73              | 38.44 | -                 | -           | 60              | -    |
| 3.6337             |                |            | 32.85                | 33.24      | 73              | 39.76 | -                 | -           | 60              | -    |
| 4.5588             |                |            | 29.29                | 29.29      | 73              | 43.71 | -                 | -           | 60              | -    |
| 5.6302             |                |            | 29.00                | 29.77      | 73              | 43.23 | -                 | -           | 60              | -    |
| 13.5596            |                |            | 48.15                | 49.28      | 60 <sup>1</sup> | 10.72 | 39.71             | 41.1        | 50 <sup>1</sup> | 8.90 |
| 27.1198            |                |            | 33.24                | 34.17      | 60 <sup>1</sup> | 25.83 | -                 | -           | 50 <sup>1</sup> | -    |
|                    |                |            |                      |            |                 |       | -                 | -           |                 | -    |

<sup>1</sup>Subpart C Limit

Test Engineer: Bruce Jungwirth

Date: 6 Feb 2007

|                |                |                  |               |
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**TEST SETUP**  
Conducted Emissions



|                |                |                  |               |
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## **7.0 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: 12 Sep 07)  
Solar High Pass Filter, Model 8131 - 5.0 (cal due date: 30 Jun 07)  
Rohde & Schwarz EMI Receiver, Model ESIB 40, S/N 100235 (cal due date: 12 Sep 07)  
Rohde & Schwarz ESIB 40 Firmware Version 4.32.3

### **FREQUENCY STABILITY**

Advantest Spectrum Analyzer, Model R3272A, Serial No. J00233 (cal due date: 11 Sep 07)  
Thermotron Environmental Chamber, Model SM-3SS, SN: 19972-S (cal due date: 27 June 07)

### **RADIATED EMISSIONS**

ElectroMetrics Large Loop Antenna. Model ALR25M, Serial No. 603 (cal due date: 11 Sep 07)  
Schaffner Biconilog Antenna, Model CBL6112B, Serial No. 27491 (cal due date: 11 Sep 07)  
HP Pre-Amplifier, Model 8447D, Serial No. 2944A08064 (cal due date: 12 Sep 07)  
Rohde & Schwarz EMI Receiver, Model ESIB 40, S/N 100235 (cal due date: 12 Sep 07)  
Rohde & Schwarz ESIB 40 Firmware Version 4.32.3

### **TEST FACILITY**

Lindgren Semi-Anechoic Chamber, Model 11867A, serial No. 01211 (verification due date: 29 Aug 07)

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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## 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: **DMFSSD877**

### 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: **DMFSSD877**

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.

|                |                |                  |               |
|----------------|----------------|------------------|---------------|
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## 8.0 SIGNATURES

This page contains the secured digital signatures of the parties deemed responsible for reviewing and approving the contents of this report:

**TEST ENGINEER:** \_\_\_\_\_ **DATE:** 20 February 2007

Bruce Jungwirth  
3M EMC Laboratory

**APPROVER:** \_\_\_\_\_ **DATE:** 20 February 2007

Robert E. Heller  
3M EMC Laboratory

Last page of the report.