# DELTA Test Report

TEST Reg. no. 19

## Measurements of radio frequency interference, mains harmonic current and mains flicker from 750 nonautomatic weighing indicator with AC / DC adapter according to EU and FCC specifications

## Performed for Cardinal Scale Manufacturing Co.

DANAK-198718
Project no.: A530338-02-1
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including 2 annexes

12 April 2007

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| | |
|---|---|
| Title | Measurements of radio frequency interference, mains harmonic current and mains flicker from 750 nonautomatic weighing indicator with AC / DC adapter according to EU specifications |
| Test object | 750 nonautomatic weighing indicator<br>AC / DC adapter |
| Report no. | DANAK-198718 |
| Project no. | A530338-02-1 |
| Test period | 21 March 2007 |
| Client | Cardinal Scale Manufacturing Co.<br>203 East Daugherty<br>P.O. Box 151<br>Webb City, MO 64870<br>USA<br><br>Tel.: +1 417 673 4631<br>Fax: +1 417 673 5001 |
| Contact person | Mr Stephen Langford<br>E-mail: slangford@cardet.com |
| Manufacturer | Cardinal Scale Manufacturing Co. |
| Specifications | EN 55022:1998 Class B (CISPR 22:1997, Class B)<br>EN 61000-3-2:2000<br>EN 61000-3-3:1995+A1 |
| Results | The AC mains conducted emission and radiated electromagnetic field from the test objects were below the Class B limits of EN 55022:1998 (CISPR22:1997), when a ferrite Kitagawa TFC 20-10-10 or similar is mounted on the AC / DC adapter's cable.<br><br>The test objects were found to be in compliance with the requirements of EN 61000-3-2:2000.<br><br>The test objects were found to be in compliance with the requirements of EN 61000-3-3:1995+A1. |
| Test personnel | Henrik Egeberg Nielsen |

Date 12 April 2007

Project manager

Jens Hovgård
Specialist, M.Sc.E.E.
DELTA

Responsible

Jørgen Duvald Christensen
Senior Technology Specialist, EMC
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# 1. Summary of test results

The results of the emission tests can be summarised as follows:

| **Tests** | **Test standards** | **Results** |
|---|---|---|
| Radiated electromag-netic field | EN 55022:1998 (CISPR 22:1997), Class B | Passed |
| Conducted emission, AC mains | EN 55022:1998 (CISPR 22:1997), Class B | Passed |
| Mains harmonic current emission | EN 61000-3-2:2000 | Compliant |
| Induced mains voltage fluctuations and flicker | EN 61000-3-3:1995+A1 | Compliant |

Abbreviations

| | | |
|---|---|---|
| Passed | : | The requirements are met. Test was performed. |
| Not done | : | No test was performed. |
| N/A | : | Not applicable. |
| Not relevant | : | The test was not relevant for the test object. |
| Compliant | : | The requirements are met. No test was performed |

The given results are obtained with a ferrite Kitagawa TFC 20-10-10 mounted on the AC / DC adapter's cable in the connector end.

The given results are based on a shared risk principle with respect to the measurement uncertainty.

The test results relate only to the objects tested.

# 2. Test objects and auxiliary equipments

## 2.1 Test object(s)

**Test object 2.1.1**

| | |
|---|---|
| Name of test object | 750 nonautomatic weighing indicator |
| Model / type | Model 750 |
| Part no. | - |
| Serial no. | E03807-0384 |
| FCC ID | - |
| Manufacturer | Cardinal Scale Manufacturing Co. |
| Supply voltage | 12 VDC / internal 6 pc. AA batteries |
| Comments | None |

**Test object 2.1.2**

| | |
|---|---|
| Name of test object | AC / DC adapter |
| Model / type | ADS6818-1812-B 1210 |
| Part no. | 6800-1047 |
| Serial no. | - |
| FCC ID | - |
| Manufacturer | Cardinal / Detecto |
| Supply voltage | Input: 100 - 240 VAC, 50 / 60 Hz<br>Output: 12 VDC, 1.0 A |
| Comments | A Kitagawa TFC 20-10-10 ferrite was mounted on the cable in the connector end. |

## 2.2 Auxiliary equipment

**Auxiliary equipment 2.2.1**

| | |
|---|---|
| Name of auxiliary equipment | Load receptor with load cell |
| Model / type | Load cell: TSP C3 20 kg |
| Part no. | - |
| Serial no. | Load cell: T5346002 |
| FCC ID | - |
| Manufacturer | Cardinal Scale Manufacturing Co. |
| Supply voltage | None |
| Comments | None |

# 3. General test conditions

## 3.1 Test setup

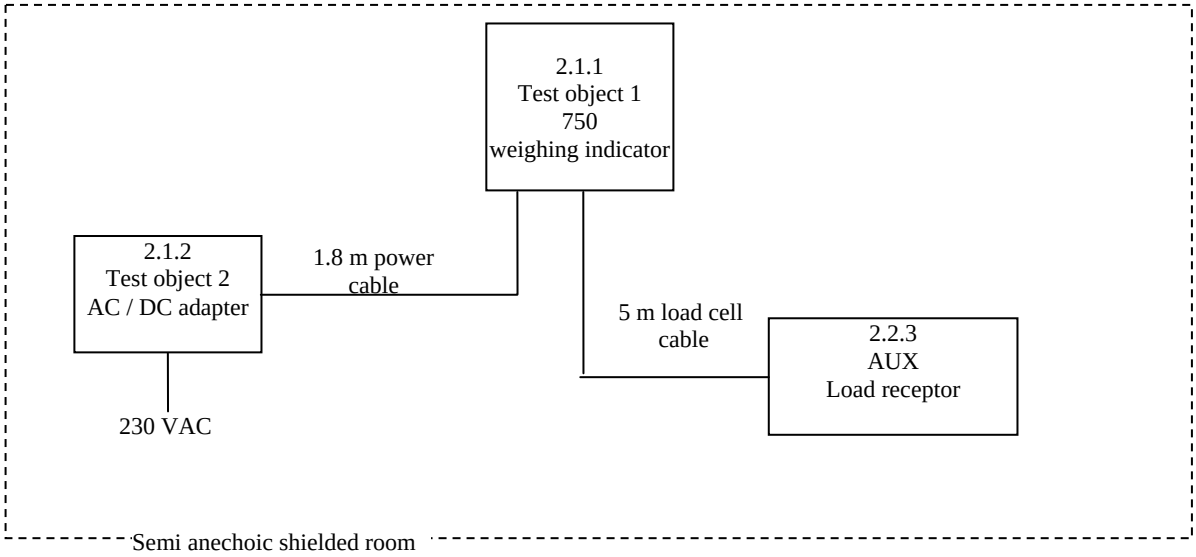



Fig. 1 Test setup. 230 VAC mains supply including test objects, all cables and peripheral equipment.

# 4. Tests and results

## 4.1 Conducted emission, AC mains

| | **Requirements** |
|---|---|
| Specification | EN 55022:1998 (CISPR 22:1997)<br>Class B |
| Test method | EN 55022:1998 (CISPR 22:1997) |
| Frequency range | 0.15 - 30 MHz |
| Limit:<br>(quasi-peak) | 0.15 - 0.50 MHz: 66 - 56 dBµV<br>(decreasing lin. with the logarithm of freq.)<br>0.50 - 5 MHz: 56 dBµV<br>5 - 30 MHz: 60 dBµV |
| Limit:<br>(average) | 0.15 - 0.50 MHz: 56 - 46 dBµV<br>(decreasing lin. with the logarithm of freq.)<br>0.50 - 5 MHz: 46 dBµV<br>5 - 30 MHz: 50 dBµV |
| | |
| Test record sheets | Annex 1 |

**Results**

The AC mains conducted emission was within the specified limits.

**Climatic conditions**

22 ºC and 26 % RH.

**Supply voltage**

230 VAC to AC power adapter.

**Comments**

None.

## 4.2 Radiated electromagnetic field

| | **Requirements** |
|---|---|
| Specification | EN 55022:1998 (CISPR 22:1997)<br>Class B |
| Test method | EN 55022:1998 (CISPR 22:1997) |
| Measuring distance | 10 m |
| Frequency range | 30 - 1000 MHz |
| Limit:<br>(quasi-peak) | 30 - 230 MHz: 30 dBµV / m<br>230 - 1000 MHz: 37 dBµV / m |
| | |
| Test record sheets and photos | Annex 2 |

**Results**

The radiated electromagnetic field was within the specified limits.

**Climatic conditions**

22 °C and 26 % RH.

**Supply voltage**

230 VAC to AC power adapter.

**Comments**

None.

## 4.3 Mains harmonic current emission

| | Requirements |
|---|---|
| Specification | EN 61000-3-2:2000 |
| EUT class | A |

**Equipment class**

According to the specification, the test object is defined as Class A equipment.

**Power consumption of test objects**

4 W.

**Supply voltage**

230 VAC to AC power adapter.

**Results**

According to Section 7 of the specification, no limits apply to equipment with power consumption ≤ 75 W, other than lighting equipment. The power consumption was measured to 4 W. Therefore, the test object complies with the requirements without test.

**Comments**

None.

## 4.4 Induced mains voltage fluctuations and flicker

| | **Requirements** |
|---|---|
| Specification | EN 61000-3-3:1995 + A1 |

**Type of operation**

Continuous.

**Power consumption of test objects**

4 W.

**Power fluctuations**

Not measured.

**Supply voltage**

230 VAC to AC power adapter.

**Results**

According to Section 6 of the specification, tests shall not be made on equipment which is unlikely to produce significant voltage fluctuations or flicker (including inrush current). The power consumption was measured to 4 W. Based upon DELTA's experience and experimental results, this power value is too low to produce significant voltage fluctuations or flicker. Therefore, the test objects comply with the requirements without test.

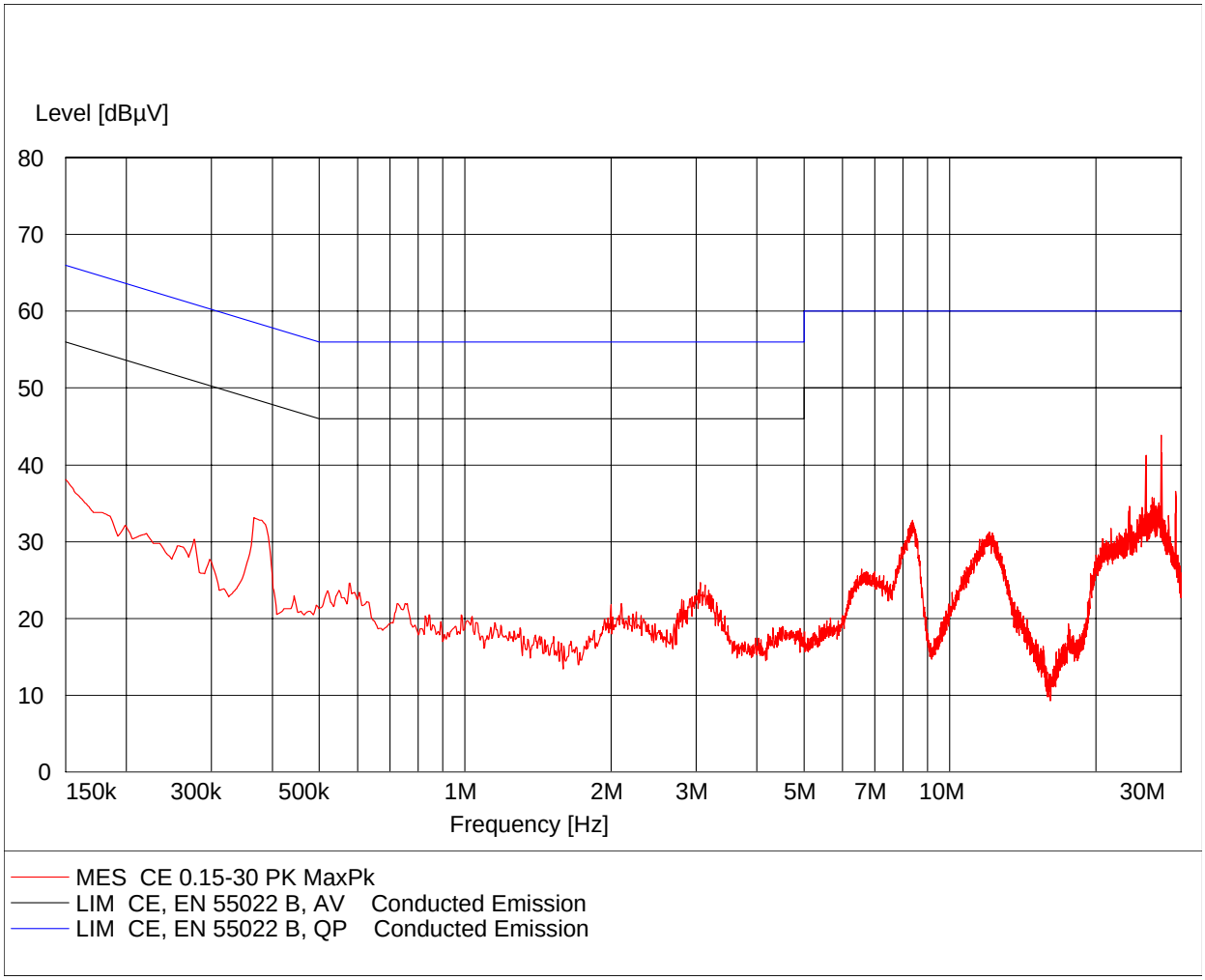
## 5. List of instruments

| NO. | INSTRUMENT | MANUFACTURER | TYPE |
|---|---|---|---|
| 29859 | AC SOURCE W. HARMONIC / FLICKER OPTION | HEWLETT-PACKARD | 6842A |
| 29889 | RF CURRENT PROBE, 10 kHz - 100 MHz, FOR ROOM 5 | TEGAM | 91550-1 |
| 29461 | ARTIFICIAL MAINS NETWORK | ROHDE & SCHWARZ | ESH2-Z5 |
| 29797 | BILOG ANTENNA, 30 - 2000 MHz | CHASE ELECTRICS LTD | CBL 6111A |
| 29861 | EMI-SOFTWARE Ver. 1.60 | ROHDE & SCHWARZ | ES-K1, PART: 1026.6790.02 |
| 29916 | AUTOMATIC TEST RECEIVER, 9 kHz - 2.75 GHz | ROHDE & SCHWARZ | ESCS 30 1102.4500.30 |
| 49421 | IMPULSE VOLTAGE LIMITER | ROHDE & SCHWARZ | ESH3/Z2 |

# Annex 1

## Test record sheets and photo regarding conducted emission, AC mains

```
EUT:                    Model 750
Manufacturer:           Cardinal
Operating Condition:    Line no.: Neutral. Voltage: 230 VAC
Test Site:              EMC-5
Operator:               HEN - A530338-02-1
Test Specification:     EN 55022 class B
Comment:                Sheet 5
Start of Test:          2007-03-21
```



EUT: Model 750
Manufacturer: Cardinal
Operating Condition: Line no.: Line 1. Voltage: 230VAC
Test Site: EMC-5
Operator: HEN - A530338-02-1
Test Specification: EN 55022 class B
Comment: Sheet 6
Start of Test: 2007-03-21

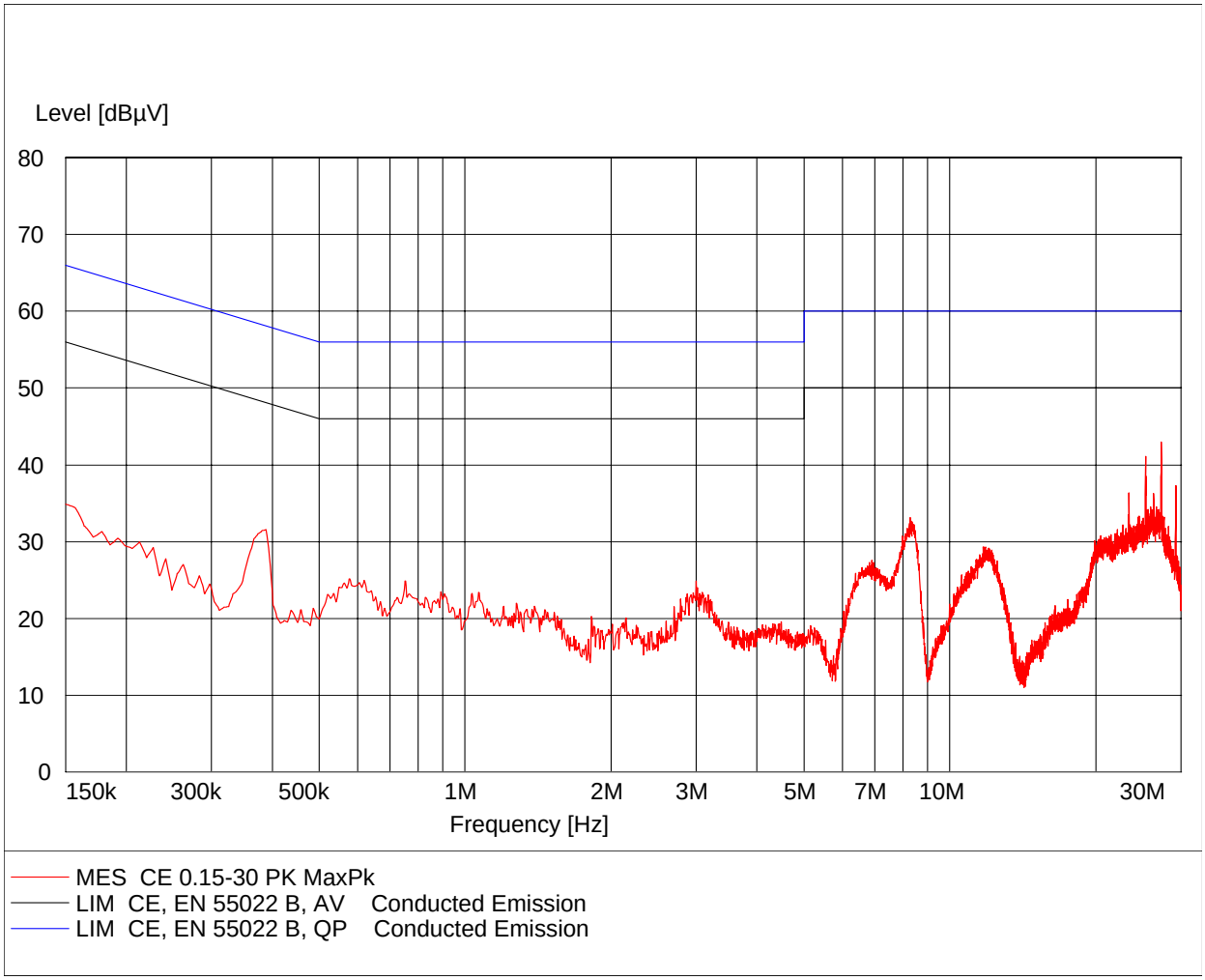



Photo A1.1 Test setup regarding conducted electromagnetic field measurement.

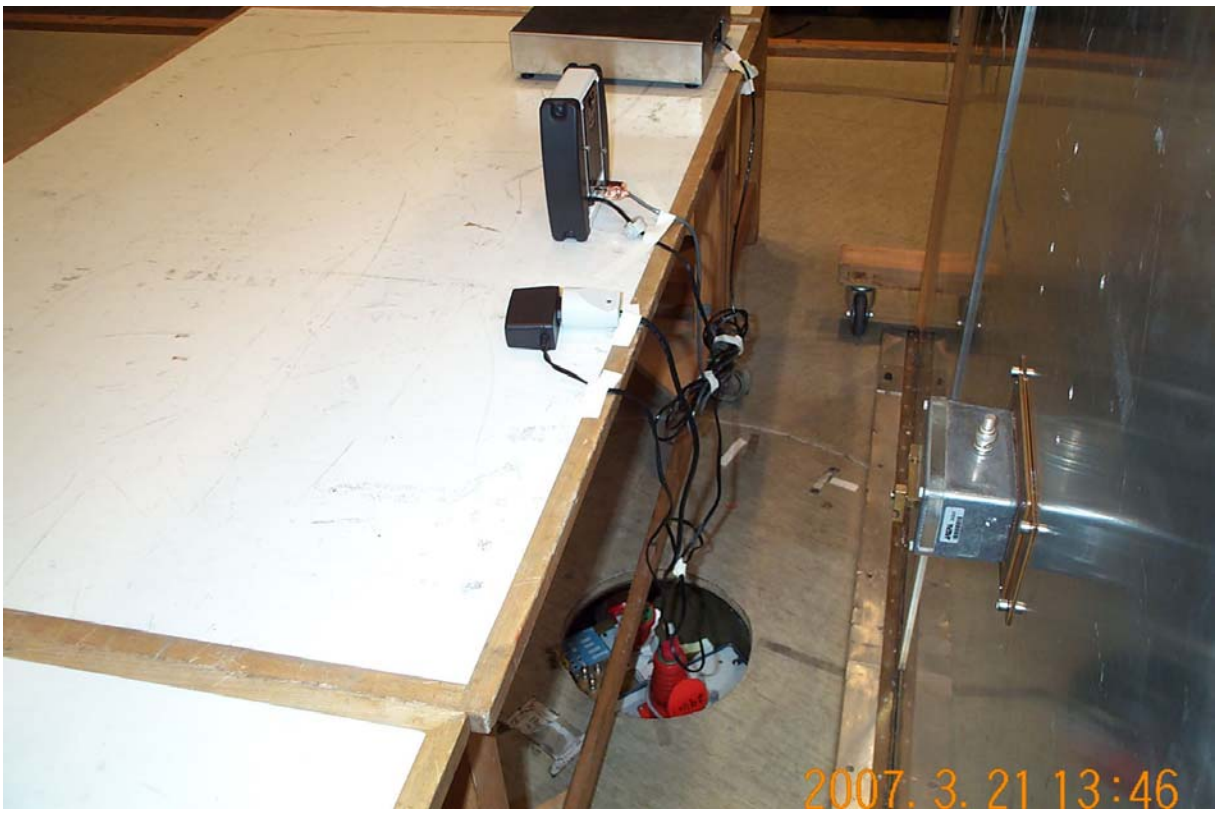
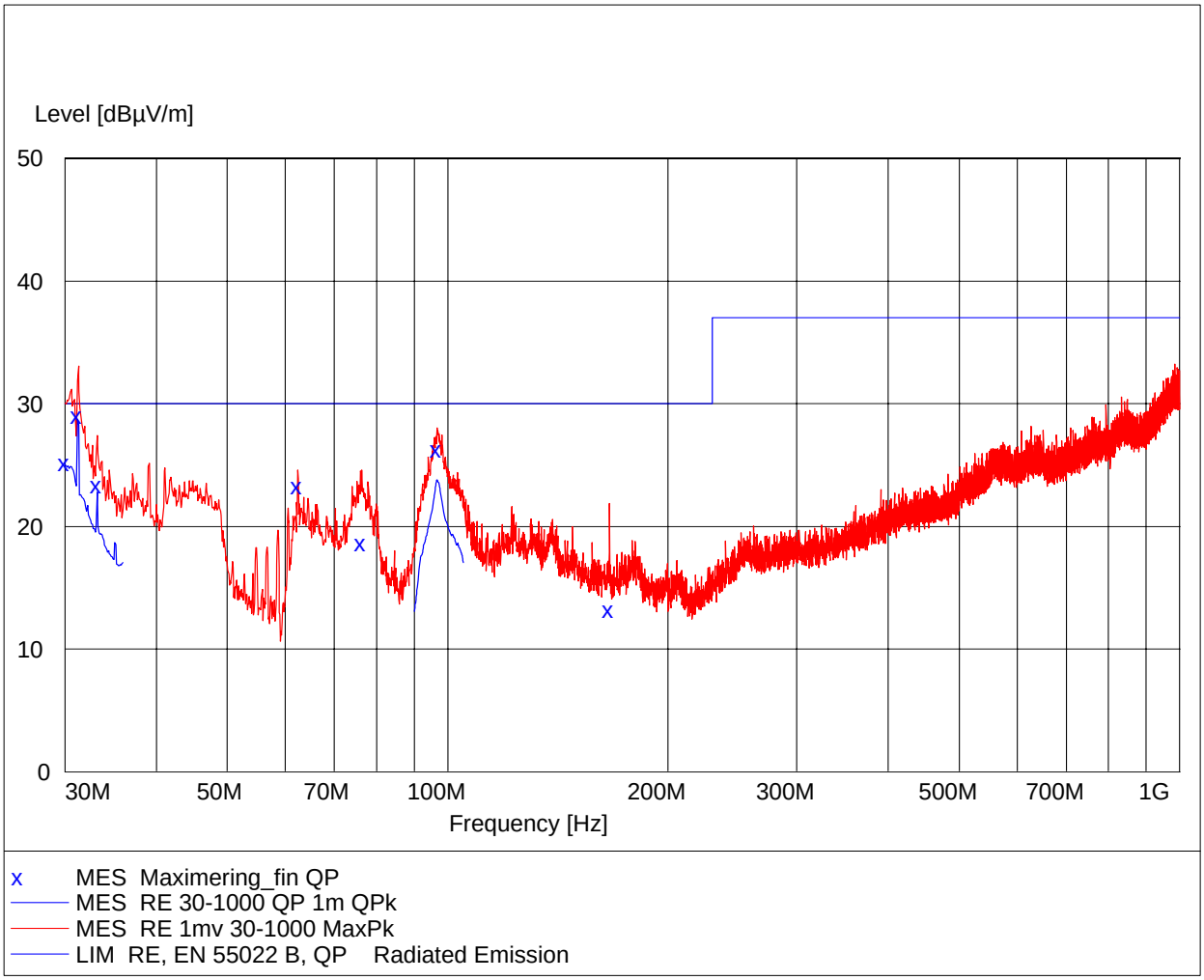



Photo A1.2 Test setup regarding conducted electromagnetic field measurement.

# Annex 2

## Test record sheets and photos regarding radiated electromagnetic field

EUT: Model 750
Manufacturer: Cardinal
Operating Condition: Ant. 1 m vertical. Voltage: 230 VAC
Test Site: EMC-5
Operator: HEN - A530338-02-1
Test Specification: EN 55022 class B
Comment: Sheet 3
Start of Test: 2007-03-21




**MEASUREMENT RESULT: "Maximering_fin QP"**

2007-03-21 13:17

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Height cm | Azimuth deg | Polarisation |
|---|---|---|---|---|---|---|---|
| 30.000000 | 25.20 | 19.6 | 30.0 | 4.8 | 109.0 | 310.00 | VERTICAL |
| 31.200000 | 29.00 | 18.9 | 30.0 | 1.0 | 111.0 | 333.00 | VERTICAL |
| 33.200000 | 23.40 | 17.9 | 30.0 | 6.6 | 110.0 | 325.00 | VERTICAL |
| 62.400000 | 23.30 | 6.3 | 30.0 | 6.7 | 259.0 | 38.00 | VERTICAL |
| 76.300000 | 18.70 | 8.3 | 30.0 | 11.3 | 400.0 | 4.00 | VERTICAL |
| 96.700000 | 26.30 | 11.3 | 30.0 | 3.7 | 146.0 | 120.00 | VERTICAL |
| 166.300000 | 13.20 | 11.2 | 30.0 | 16.8 | 113.0 | 229.00 | VERTICAL |

EUT: Model 750
Manufacturer: Cardinal
Operating Condition: Ant. 4 m horizontal. Voltage: 230 VAC
Test Site: EMC-5
Operator: HEN - A530338-02-1
Test Specification: EN 55022 class B
Comment: Sheet 4
Start of Test: 2007-03-21

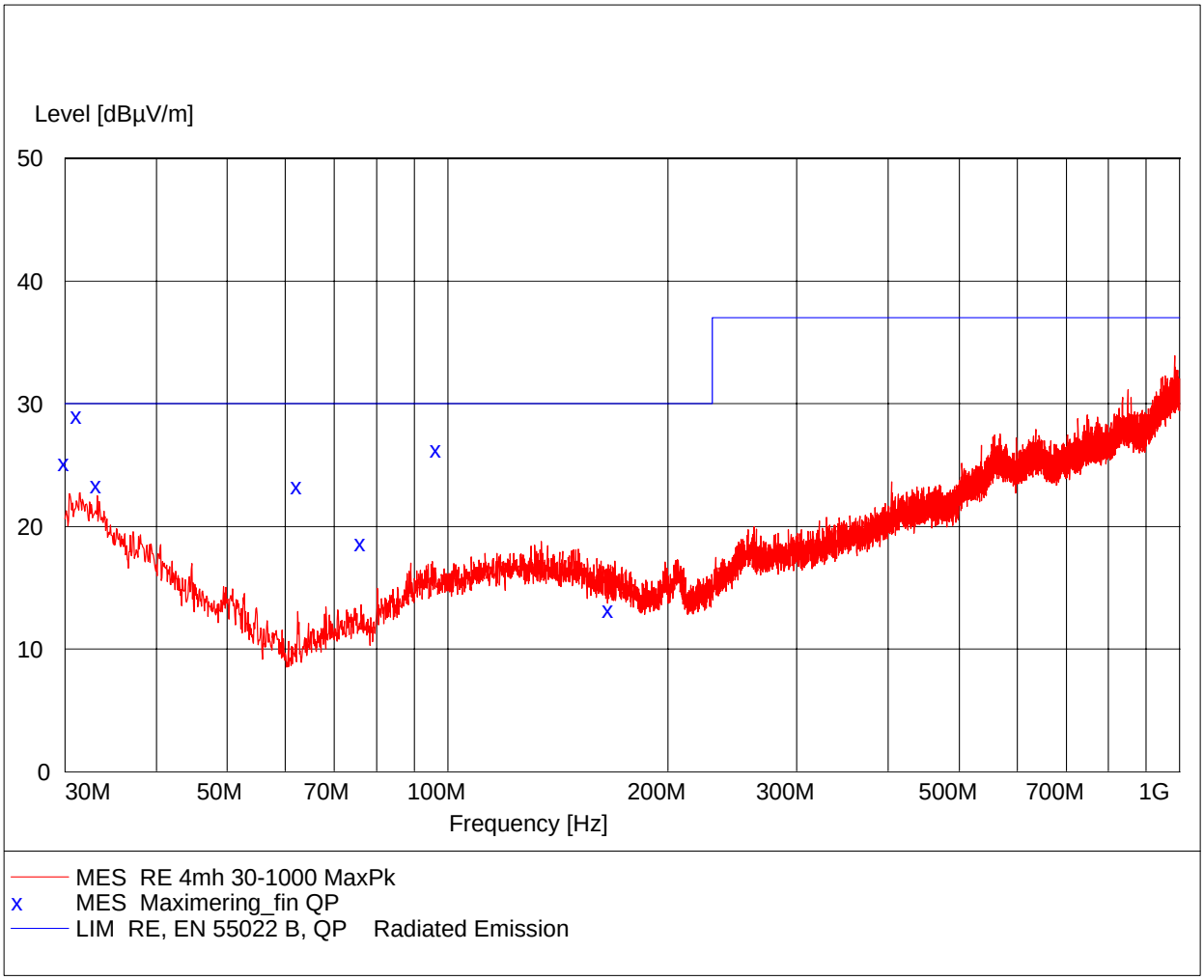



Photo A2.1 Test setup regarding radiated electromagnetic field measurement.
Supply: 230 VAC.

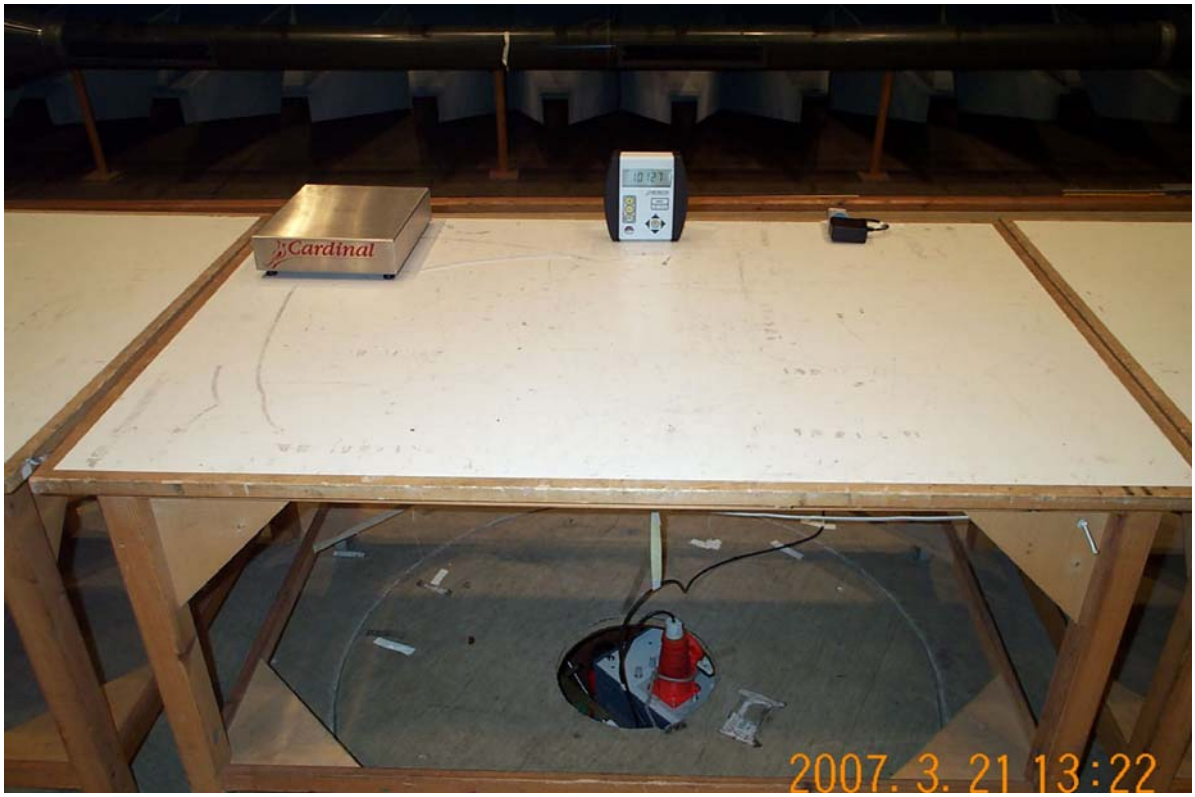



Photo A2.2 Test setup regarding radiated electromagnetic field measurement.
Supply: 230 VAC.


Photo A2.3 Test setup regarding radiated electromagnetic field measurement.
Supply: 230 VAC.