Test Report

DANAK
Reg. no. 19

Emission tests to FCC and IC requirements of ElectroMet Control Unit

Performed for Alert Metalguard ApS

DANAK-197951 Rev. A
Project no.: A502954-2
Page 1 of 12
5 annexes

29 June 2005

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Title	Emission tests to FCC and IC requirements of ElectroMet Control Unit
Test object	ElectroMet Control Unit
ID	FCC ID:S8OMDET3380 IC: 5849A-MDET3380
Report no.	DANAK-197951 Rev. A
Project no.	A502954-2
Test period	29 to 31 March 2005
Client	Alert Metalguard ApS Carl Jacobsens Vej 16, Opg. 11, 3. sal 2500 Valby Denmark Tel.: +45 3646 7171
Contact person	Mr. Verner Falkenberg
Manufacturer	Alert Metalguard ApS
Specifications	FCC:47 CFR Part 15, Subpart C - Intentional Radiators IC: RSS-210, Section 6.2 Non-Momentarily Operated Devices
Results	The equipment under test is in compliance with the requirements.
Test personnel	Karsten Kruse Jensen Bjørn Larsen Vagn Sylvest
Date	29 June 2005
Responsible	Vagn Sylvest Project Manager - EMC DELTA

This revision A replaces previously issued report DANAK-197951 dated 26 May 2005.
The revision has been made due to the following corrections:
Page 2 FCC ID: S8OMEDET3380 has been changed to S8OMDET3380
IC: 5849A-MEDET3380 has been changed to 5849A-MDET3380.

Table of contents

1. Summaries

1.1 Technical report summary

The tests reported in this document have been performed to demonstrate compliance with the requirements of FCC Part 15, Section 15.207 "Conducted limits" and FCC Part 15, Section 15.209 "Radiated emission limits, general requirements".

Furthermore, the tests reported in this document have been performed to demonstrate compliance with the requirements of IC requirement RSS-210, section 6.6 Transmitter AC Wireline Conducted Emissions and section 6.2 Non-Momentarily Operated Devices.

The receiver can only tune to frequencies below 30 MHz and is therefore exempt from complying with technical requirements.

This report contains measurement data from tests performed at DELTA, Hørsholm, Denmark, a DANAK accredited test laboratory with reference number 19.

The laboratory is listed by FCC under the registration number 90529.

The laboratory is listed by Industry Canada under the reference IC 4187-5.

1.1.1 Applicable test methods

The methods and procedures have been applied as specified in:

- ANSI C63.4:2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
- RSS-212 Test Facilities and Test Methods for Radio Equipment

1.2 Summary of tests

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

Tests of Intentional Radiator	Key references to requirement	Common FCC and IC status
Conducted emission, AC mains	FCC 15.207 IC RSS-210, 6.6	Passed
Radiated electromagnetic field emission	FCC15.209 IC RSS-210, 6.2.1	Passed
Emission in restricted bands	FCC15.205 IC RSS-210, 6.3	Passed

Abbreviations

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

The test results relate only to the objects tested.

2. Test objects

2.1 Test object - Control unit - ElectroMet

Category	Inductive RF system, 78-89,9 kHz
Manufacturer	Alert Metalguard ApS
Model / type	ElectroMet
Article no.	9031095110
Serial no.(PCB)	050208
Supply voltage	120 VAC
Operational mode	Normal

2.2 Test object - Antenna Test loop 1

Manufacturer	Alert Metalguard ApS
Model / type	49 x 171 cm single loop (0.83 m square)

This antenna was used as receiver antenna.

2.3 Test object - Antenna Test loop 3

Manufacturer	Alert Metalguard ApS
Model / type	15 x 150 cm double loop (0.45 m square)

2.4 Test object - Antenna Test loop 4

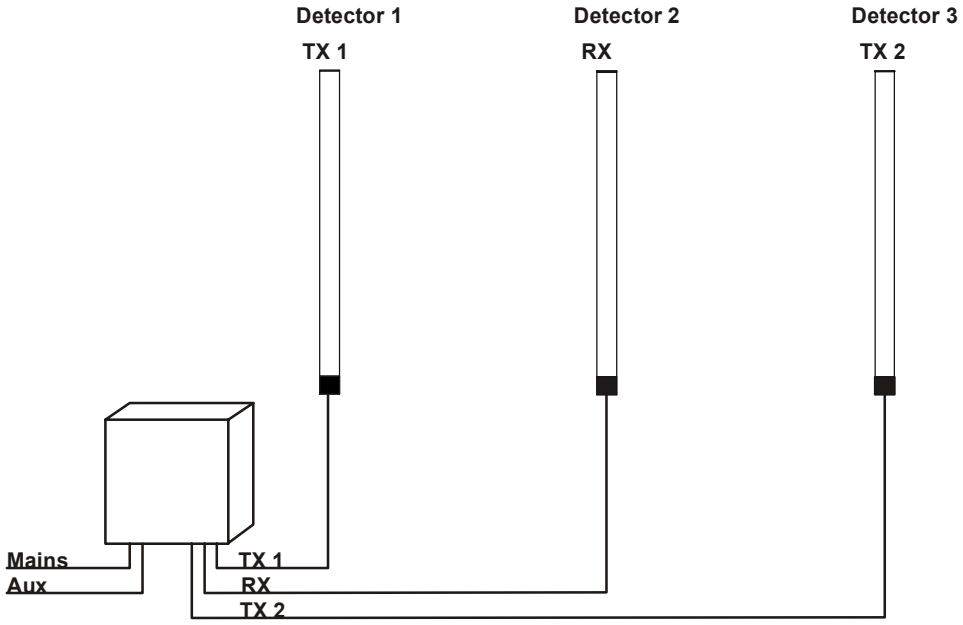
Manufacturer	Alert Metalguard ApS
Model / type	15 x 150 cm double loop (0.45 m square)

3. General test conditions

3.1 Test set-up

The system is transmitting a CW signal. When a large metal part, like for example a bag internally covered with alu-foil to prevent detection of electronic security marks on goods, then the special signal pattern generated is extracted from the receive signal. An alarm can be generated.

The transmitting frequency is determined by x-tals for frequencies in the interval 78 to 86.4 kHz.



←---------- System under test ----------→

The system can have one or two transmit antennas. During test two transmit antennas were used. A receiver antenna was also attached. The receive antenna can be identical to the Tx antennas or different.

4. Test and results

4.1 Conducted emission, AC mains

	Requirements		
Specification	FCC Rules and Regulations Part 15.207 IC RSS-210 Sect 6.6 (Business environment)		
Test set-up	ANSI C63.4:2003		
Frequency range	0.15-30 MHz		
		Quasi-peak	Average
FCC: Limit:	0,15 – 0,5 MHz 0.5 – 5 MHz 5 – 30 MHz:	66 to 56 * 56 60 dBµV	56 to 46* 46 50 dBµV
IC: Limit: (quasi-peak)	0,45 – 1.705 MHz 1.705 – 30 MHz	60 dBµV 69.5 dBµV	
	Note: When in compliance with FCC requirements the IC requirements are also fulfilled.		
* Decreases with logarithm of frequency.			
Test set-up Test record sheets			*Annex 2* *Annex 3*

Results

The module is in compliance with the requirements.

Comments

None.

4.2 General field strength limits below 30 MHz

	Requirements	
Specification	FCC Rules and Regulations Part 15.209 IC RSS-210 Table 7	
Test set-up	ANSI C63.4:2003	
Measuring distance	Below 490 kHz: 300m; above: 30 m *)	
Frequency range	9 kHz to 30 MHz	
Limits:	0.009-0.490 MHz 0.490-1.705 MHz 1.705-30 MHz	2400/F(kHz)µV/m 24000/F(kHz)µV/m 30 µV/m
Measurement uncertainty (2 σ) <1 GHz		2.6 dB
Below 1 GHz the limits apply to measurements performed using a quasi-peak detector.		
Test set-up Test record sheets (Explotratory*)*		*Annex 2* *Annex 5*

*) For measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Results

The emission was within the specified limits.

Note

Measurements were performed at a distance of 30 m. The limits were scaled using the square of an inverse linear distance extrapolation factor (40 dB/decade).

4.3 General field strength limits above 30 MHz

	Requirements	
Specification	FCC Rules and Regulations Part 15, Subpart C IC RSS-210 Table 3	
Test set-up	ANSI C63.4:2003	
Measuring distance	3 m	
Frequency range	30-1000 MHz	
Limits: As specified in 15.209(a)	30-88 MHz: 88-216 MHz: 216-960 MHz: Above 960 MHz:	40 dBµV/m 43.5 dBµV/m 46 dBµV/m 54 dBµV/m
Measurement uncertainty (2 σ) <1 GHz		2.6 dB
Below 1 GHz the limits apply to measurements performed using a quasi-peak detector.		
Test set-up Test record sheets		*Annex 2* *Annex 4*

Results

The emission was within the specified limits.

Spurious emission 30 - 1000 MHz in tabular form:
(For spectral plots see *Annex 4*)

Spurious freq. MHz	Polarisation	QPeak dBµV/m	dB below QP limit	Note
36.6	V	16.5	23.5	
100.4	V	13.6	29.9	
152.1	V	15.7	27.8	
299.6	V	14.9	31.1	
503.6	H	20.0	26.0	
827.1	H	24.7	21.3	

(R) means frequency in restricted band as defined in §15.205 and RSS-210 table 2

4.4 Occupied bandwidth

The limits of the transmission band are reached when only spurious emission can be measured.

Occupied bandwidth: The carrier is a pure sinus. It measures as the bandwidth of the measuring receiver, like 30 Hz.

The EUT is in compliance with the requirement(s).

4.5 Peak output field strength

Results with antennas in worst case configuration, which is where all loops, Tx and measuring loop, all are parallel, on the same centre axis. Distance is 30 m

Tx frequency: 86.4 kHz Measuring distance: 30 m						
Measured dBµV	Antenna corr. factor dB	Measured dBµV/m	Limit @ 300 m dBµV/m	Corr. factor 300->30 m dB	Corrected limit @ 30 m dBµV/m	Margin to limit dB
31	19.5	50.5	28.9	40	68	18.4

Result

The EUT is in compliance with the requirement.

Comments

Exploratory measurements showed that other frequencies than the carrier was 40 dB or more below the carrier. Therefore only the carrier was measured on the 30 m OATS.

Evaluation in this report is based on the inverse linear distance extrapolation factor (40 dB/decade).

The transmitter carrier shall be in compliance with the general requirements to radiated emission. It shall not transmit within restricted bands, the lower of which covers the band 90 – 110 kHz.

Measurements of the transmitter were performed on a 30 m OATS. Frequencies for the measurement were selected based on an exploratory measurement performed in a 10 m semi anechoic chamber.

The exploratory measurements were performed in December 2003 when the unit was tested for compliance to European requirements. The unit under test now is unchanged from the one tested at that time.

See plots in *Annex 5*.

Annex 1

List of instruments

(1 page)

LIST OF INSTRUMENTS

NO.	DESCRIPTION	MANUFACTURER	TYPE NO.	CAL. EXPIRES
29332	ACTIVE LOOP ANTENNA	ROHDE & SCHWARZ	HFH-Z2	2005-05-11
29337	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2-Z5	2006-01-06
29460	MANUAL TEST RECEIVER 10 kHz-30 MHz	ROHDE & SCHWARZ	ESH2	2006-01-05
29680	IMPULSE VOLTAGE LIMITER	ROHDE & SCHWARZ	ESH3/Z2	2006-01-05
29797	BILOG ANTENNA, 30-1000 MHz	CHASE ELECTRICS LTD	CBL 6111A	2005-11-20
29861	EMI-SOFTWARE Ver. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02	ONLY CAL. IF REQUIRED
29916	AUTOMATIC TEST RECEIVER, 9 kHz-2.75 GHz	ROHDE & SCHWARZ	ESCS 30 1102.4500.30	2006-01-05

Annex 2

Photos

(3 pages)

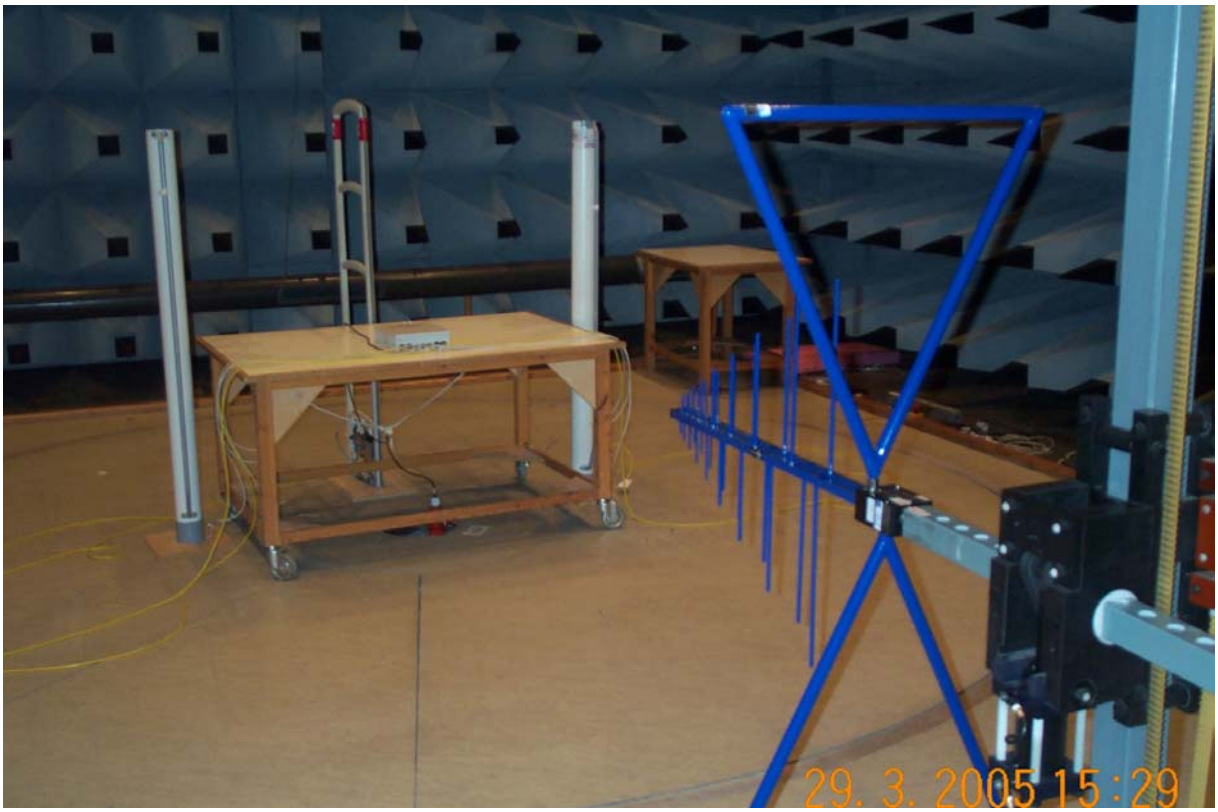


Photo 1 Radiated emission 30-1000 MHz.

Photo 2 Radiated emission 30-1000 MHz.

Photo 3 Conducted emission, 0.15 - 30 MHz.

Photo 4 Radiated emission. 30 m OATS.

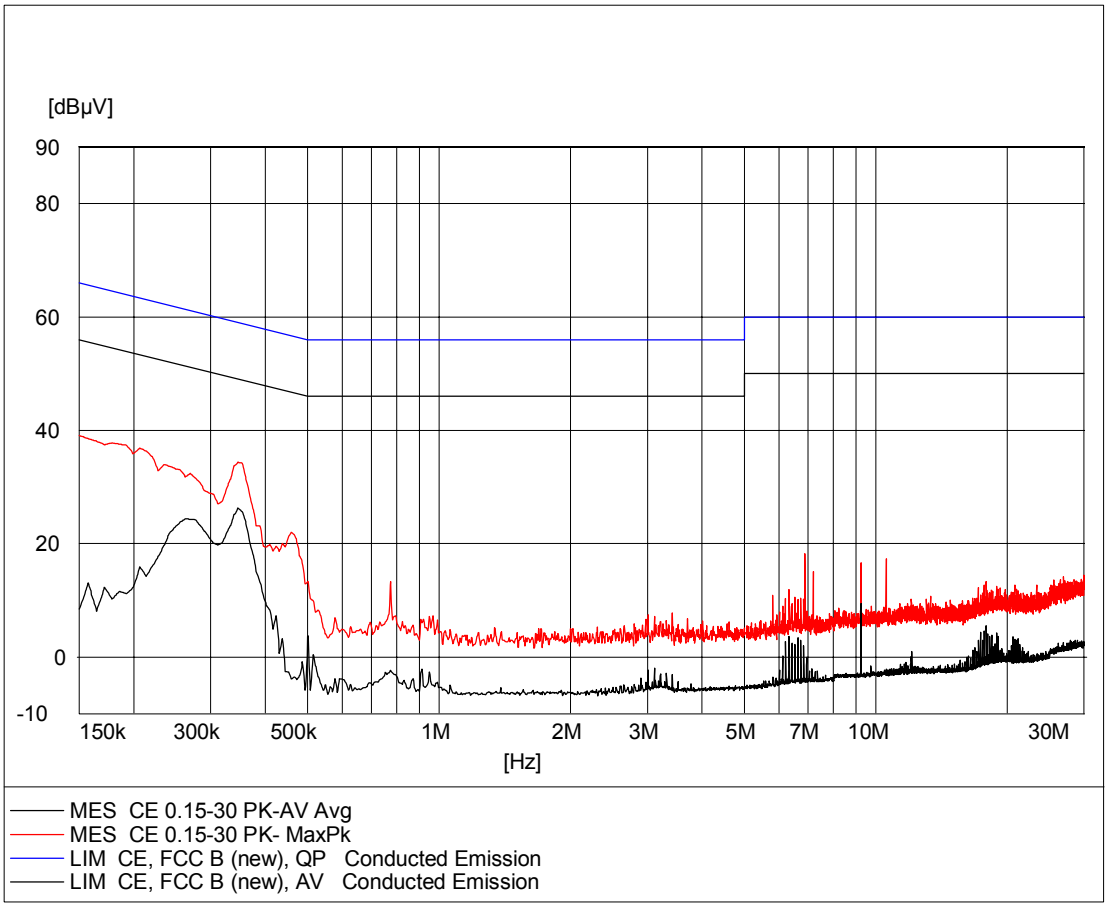
Photo 5 Radiated emission. 30 m OATS.

Annex 3

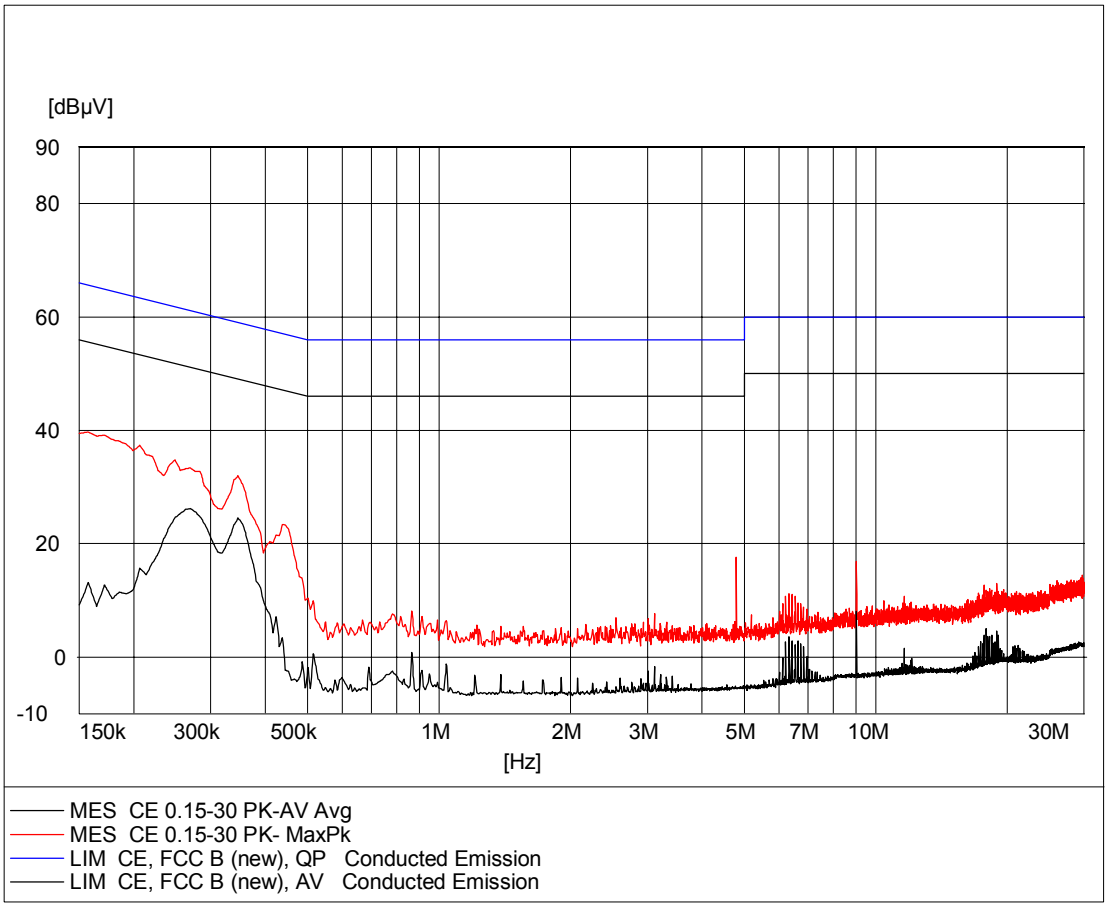
Test record sheets regarding conducted emission

(2 pages)

```
EUT:                    Electromet
Manufacturer:           Alert MetalGuard
Operating Condition:    Line: Neutral.  Voltage: 115 VAC
Test Site:              EMC-5
Operator:               BLa - A502943
Test Specification:     FCC Cl B
Comment:                Sheet 5
Start of Test:          2005-03-31
```



```
EUT:                    Electromet
Manufacturer:           Alert MetalGuard
Operating Condition:    Line:Line 1.  Voltage: 115 VAC
Test Site:              EMC-5
Operator:               KKJ - A502943
Test Specification:     FCC Cl B
Comment:                Sheet 6
Start of Test:          2005-03-31
```

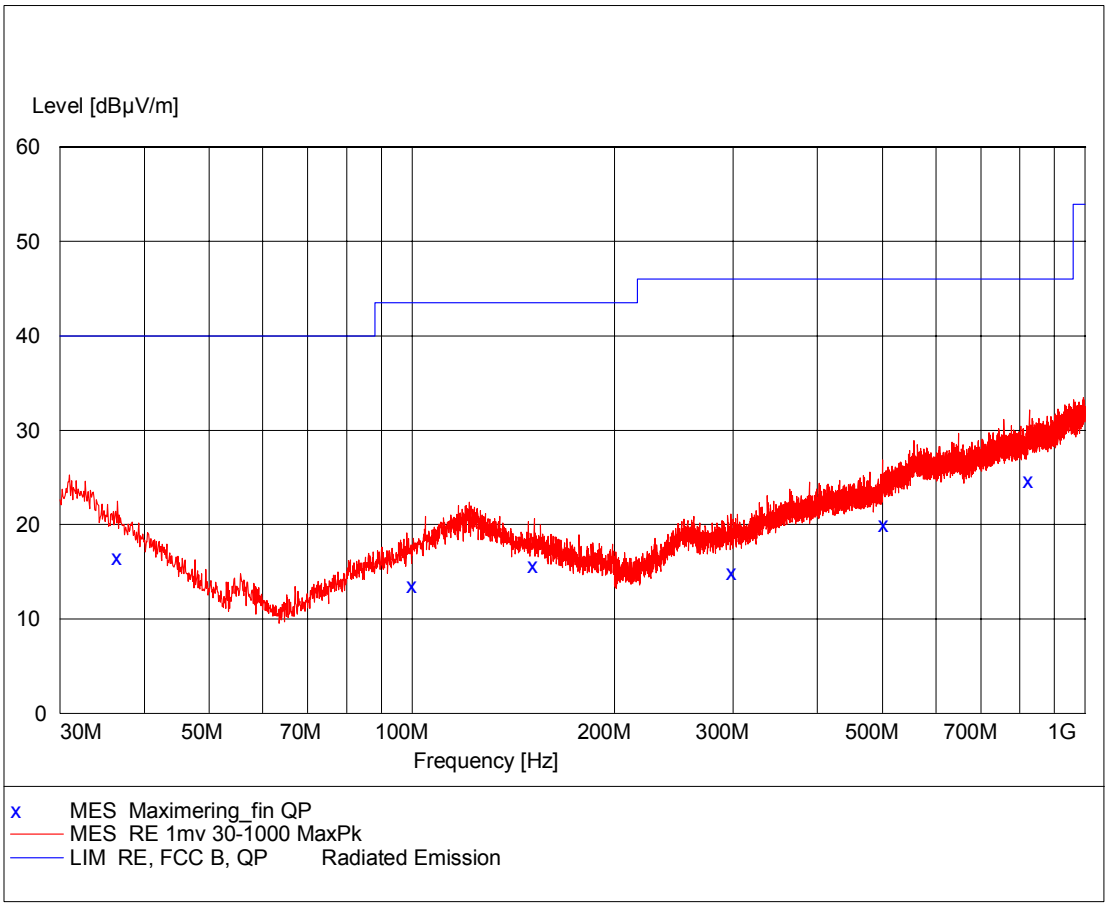


Annex 4

Test record sheets regarding radiated emission

(2 pages)

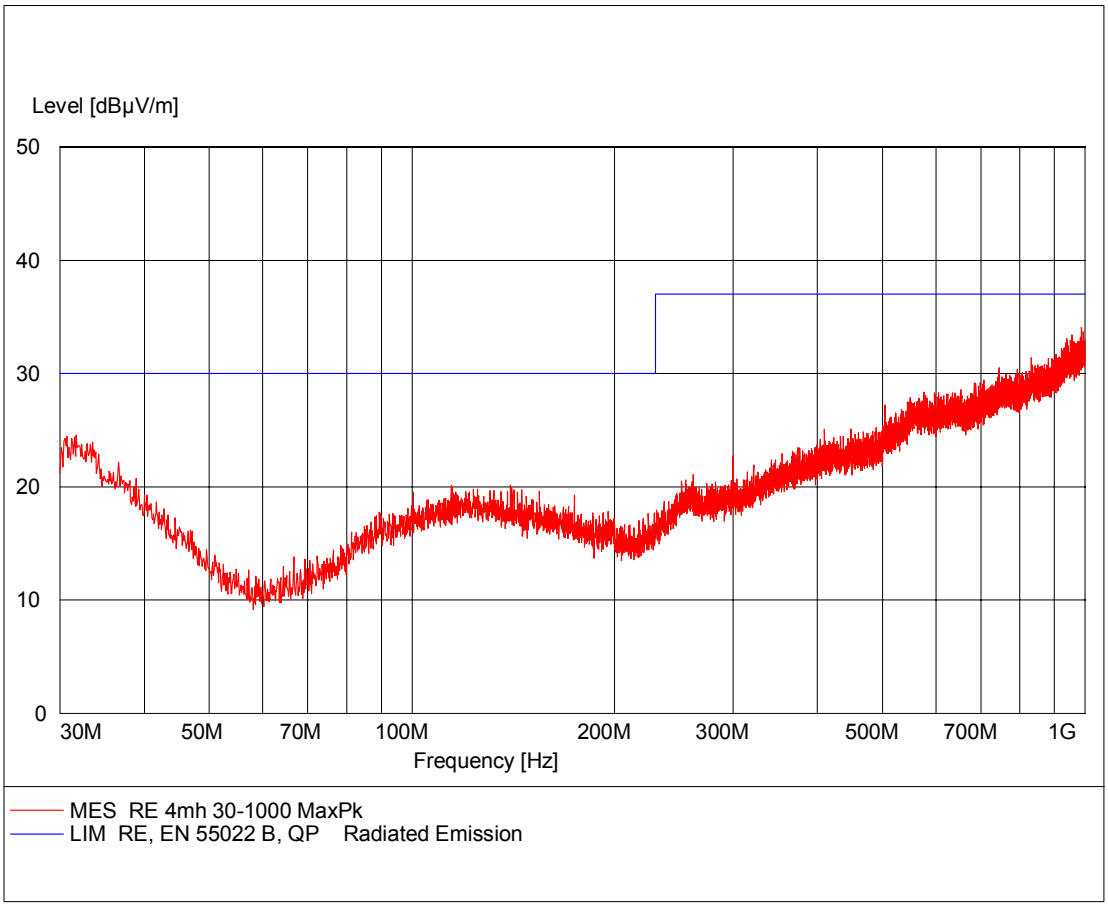
EUT: Electromet 3.3-1
Manufacturer: Alert MetalGuard
Operating Condition: Ant 1 meter vertical: 120 VAC
Test Site: EMC-5
Operator: BLa - A502954
Test Specification: FCC B
Comment: Sheet 3
Start of Test: 2005-03-29



MEASUREMENT RESULT: "Maximering_fin QP"
2005-03-29 16:21

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
36.600000	16.50	17.6	40.0	23.5	112.0	164.00	VERTICAL
100.400000	13.60	13.2	43.5	29.9	112.0	358.00	VERTICAL
152.100000	15.70	13.6	43.5	27.8	112.0	225.00	VERTICAL
299.600000	14.90	16.3	46.0	31.1	323.0	4.00	VERTICAL
503.600000	20.00	21.7	46.0	26.0	350.0	6.00	HORIZONTAL
827.100000	24.70	27.4	46.0	21.3	137.0	309.00	HORIZONTAL

```
EUT:                  Electromet 3.3-1
Manufacturer:         Alert MetalGuard
Operating Condition:  Ant 4 meter horizontal:  120  VAC
Test Site:            EMC-5
Operator:             BLa - A502954
Test Specification:   FCC B
Comment:              Sheet 4
Start of Test:        2005-03-29
```



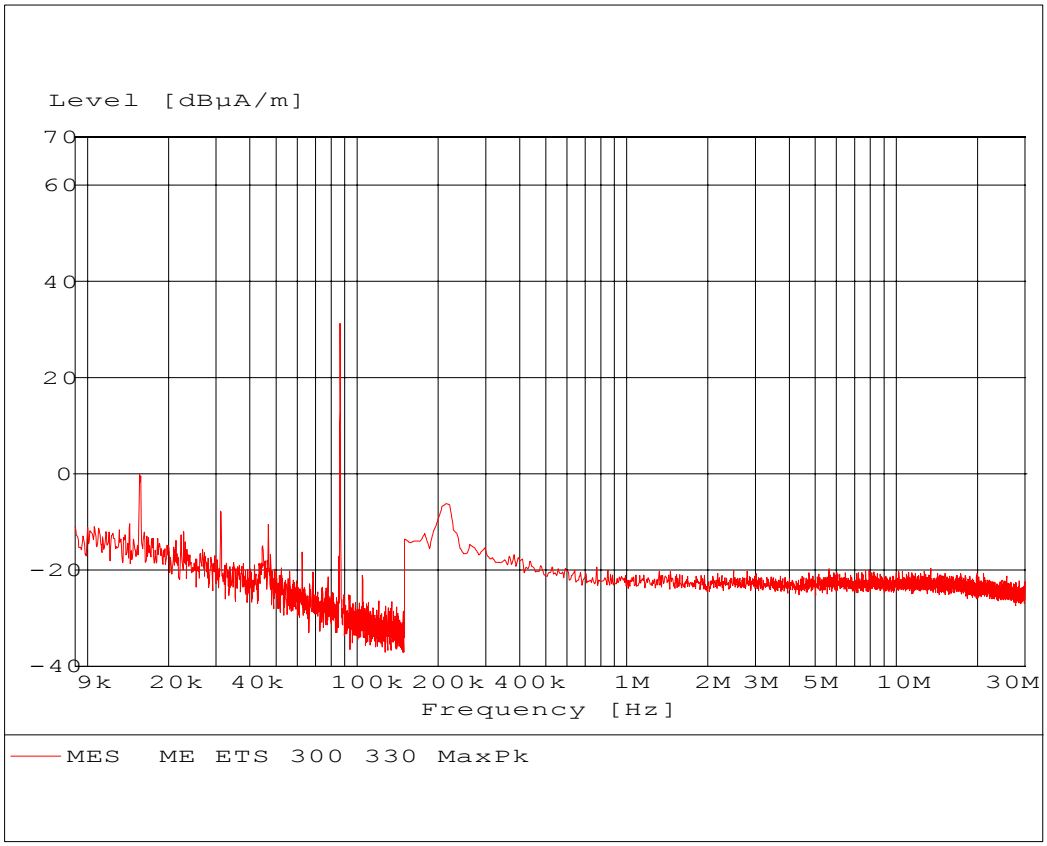
Annex 5

Exploratory plots

(3 pages)

Photo 6 Test set-up during exploratory measurements

EUT:	Control unit-1
Manufacturer:	Alert Metalguard ApS
Operating Condition:	Ant. 0 deg. 230 VAC
Test Site:	EMC-5
Operator:	HEN - E501700
Test Specification:	EN 300 330
Comment:	Sheet 13
Start of Test:	2003-12-17



EUT:	Control unit-1
Manufacturer:	Alert Metalguard ApS
Operating Condition:	Ant. 90 deg. 230 VAC
Test Site:	EMC-5
Operator:	HEN - E501700
Test Specification:	EN 300 330
Comment:	Sheet 14
Start of Test:	2003-12-17