Report for Excelsys

on

EMC Measurements for 4Xgen

Purchase Order:

Project Number EMT07J026 Rev. B

Rev	Date	Comment
A	April 2007	Change in DoC content
B	May 2007	Added Immunity Section

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Cork,
May 2007

EMT is a TÜV Appointed Laboratory

Executive Summary

The EUT looks like meeting the EMC requirements of the product standard EN 61000-6-2:2005 and EN 61000-6-3:2001.

1.1. Emissions

Test	Standard and year	Result	Comment
Harmonic Emissions	EN61000-3-2 (2000)	Pass	
Conducted Emissions	EN55022 (2001)	Pass	
Radiated Emissions	EN55022 (2001)	Pass	

1.2. Immunity

Test	Standard and year	Result	Comment
Low Frequency			
Mains Dips	EN61000-4-11	Pass	
High Frequency			
ESD	EN61000-4-2 (2001)	Pass	
Radiated	EN61000-4-3 (2002)	Pass	
EFT	EN61000-4-4 (2002)	Pass	
Surge	EN61000-4-5 (2001)	Pass	
Conducted	EN61000-4-6 (2001)	Pass	
Magnetic Field Immunity	EN61000-4-8	N/A	

1.3. Declaration of Conformity.

The intention of these tests is such that following statement can be added to the DoC.

This equipment complies with the EMC directive 89/336/EC.

Conformity was demonstrated by the following standards.

EN 61000-6-2:2005: Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-3:2001: Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments and Amendment A11:2004 to EN 61000-6-3:2001

EN 61000-3-2:2000
EN 61000-3-3:1995 + A1:2001 to EN 61000-3-3:1995

Equipment classification: Residential and Industrial

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2. Introduction

2.1. Time and Place

The measurements took place at the laboratories and the test sites of ElectroMagnetic Technologies Ltd., (EMT), Inniscarra, Co. Cork, during March/April/May 2007.

2.2. Climatic Conditions

Temperature	17°C
Relative Humidity	55%
Pressure	1010hPa

2.3. Calibration

All EMT equipment is regularly calibrated and full details can be traced through the serial number of each device.

2.4. Present

Tom O'Brien	ElectroMagnetic Technologies Ltd.

2.5. Equipment Under Test (EUT)

4Xgen	AC to 48V DC power supply
Comprising	4 modules and resistive load.

The results of this report refer only to the item tested.

2.6. Manufacturer

Excelsys Ltd
Little Island
Cork
Ireland

2.7. Reproductions

This report shall not be reproduced, except in full, without the written permission of EMT.

Emission measurements

3. Low Frequency Emissions

3.1. Harmonic Emissions.

3.1.1. Test equipment

Keytech CE master (S/N 9608254)

The limits for harmonic emission are specified in EN 61000-3-2

3.1.2. Measurements

Harmonic	Level	Harmonic	Level
1	2.95A	2	0.04%
3	5.00%	4	0.04%
5	3.30%	6	0.00%
7	0.50%	8	0.01%
9	1.50%	10	0.02%
11	1.40%	12	0.02%
13	1.60%	14	0.02%
15	0.50%	-	-

3.1.3. Comments

The EUT meets the requirements of EN61000-3-2 as called out in EN61000-6-3

3.2. Voltage Fluctuations

The limits for voltage fluctuations are specified in EN 61000-3-3

The rating of the EUT is a constant drain when operating.

3.2.1. Comments

The EUT meets the requirements of EN61000-3-3 as called out in EN61000-6-3

4. Conducted Emissions

4.1. Test Facilities and Equipment

EMT laboratories, Inniscarra, Co. Cork
Rohde and Schwarz FSP 30 Spectrum Analyser (S/N 100025)
Chase LISN ALN2070A (S/N 1016)
Hewlett Packard 8447F amplifier. (S/N 3113A06542)
Rohde and Schwarz ESHS 30 Measurement receiver (S/N 826003-003)

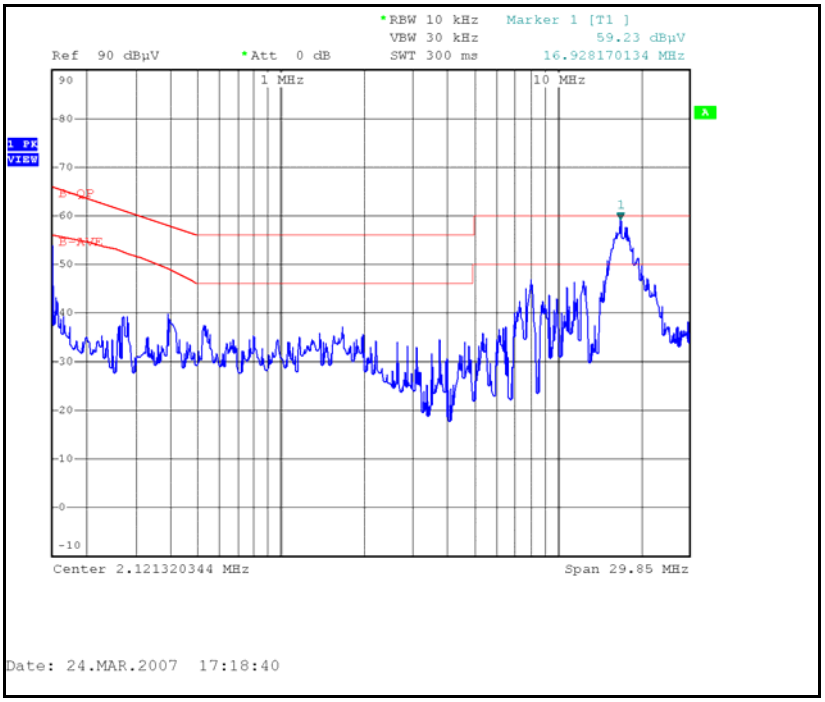
4.2. Test Method & Limits

Tests were performed in accordance with the conducted emissions aspect of EN 55022 (Class B)

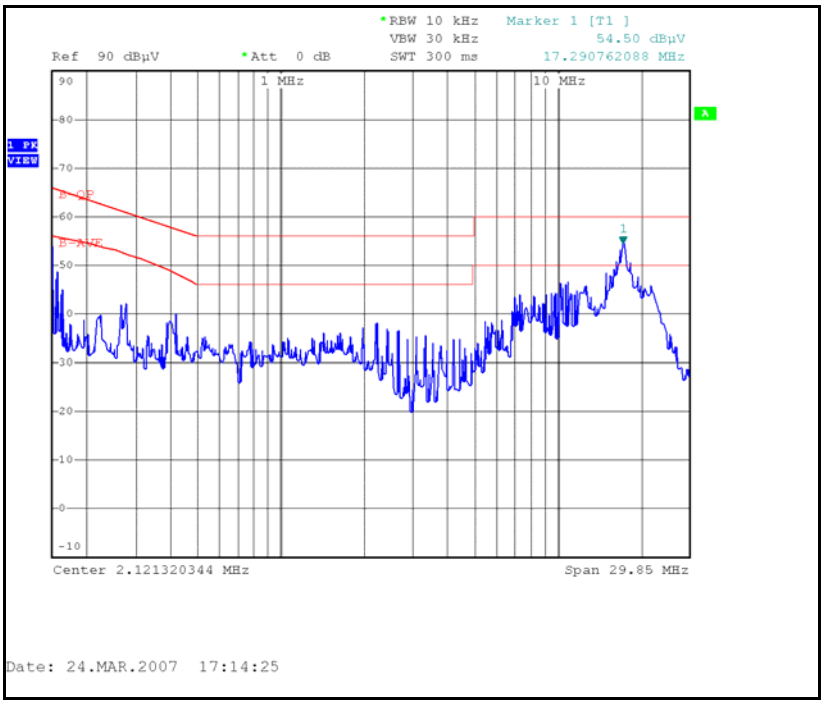
4.3. Conducted Emissions measurements

An RF scan was first taken with the Advantest and the ESHS 30 measurement receiver was used to check out the QP and Average readings taken of the highest points. The peaks on the plot are peak levels and the limits are for a Quasi Peak and an Average measurement. QP and Average measurements cannot be greater than a peak measurement.

4.3.1. Mains Conducted Emissions Measurements



Graph 1 Line 1 peak conducted emission



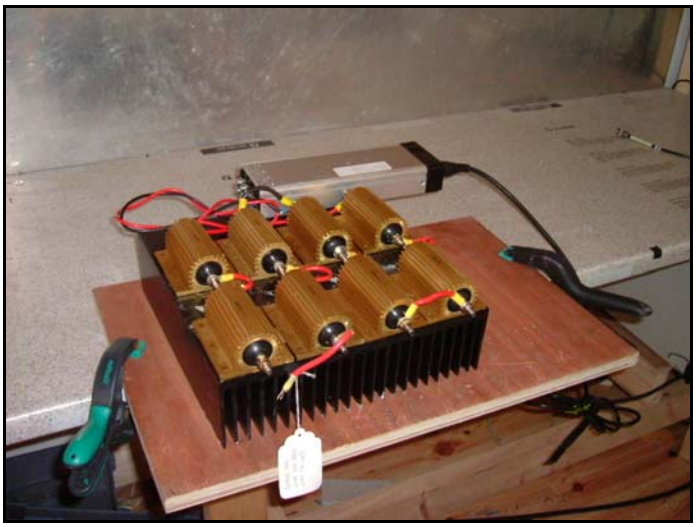
Graph 2 Line 2 peak conducted emission

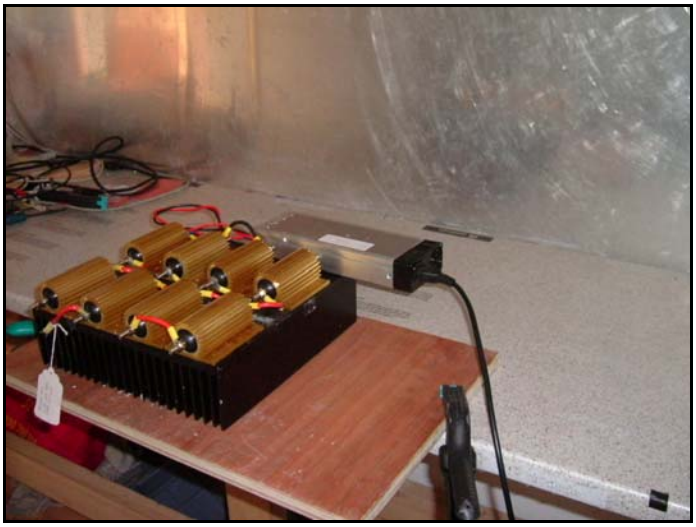
Frequency (MHz)	L1 dBµV		Signal type	L2 dBµV		Limit
	QP.	Avg.		QP.	Avg.	
16.9MHz to 17.3MHz		38.5	BB		34	50dBuV

4.4. Conclusion

The EUT meets the requirements of EN61000-6-3 Residentail limits.

4.5. Conducted Emissions photographs





5. Radiated Emissions tests.

5.1. Test Equipment

EMT 3m site in Inniscarra, Co. Cork.
Biconical Antenna -Eaton 94455-1 (S/N 1220)
Log periodic Antenna - EMCO 3146 (S/N 9210-3462)
Advantest Spectrum Analyser R3361A (S/N 11730606)
Rhode and Schwarz ESVS 30 receiver (S/N 826006/004)
Hewlett Packard 8447F amplifier. (S/N 3113A06542)
10m UHF cable with ferrites (S/N EMT#008)

5.2. Measurements

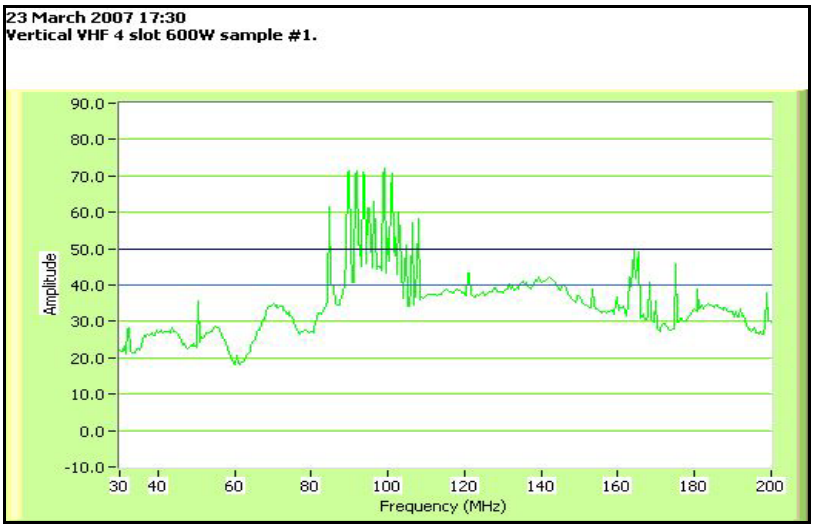
Tests were performed in accordance with the radiated emissions aspect of EN55022 (Class B). Limits at 3m are 10dB above those at 10m.

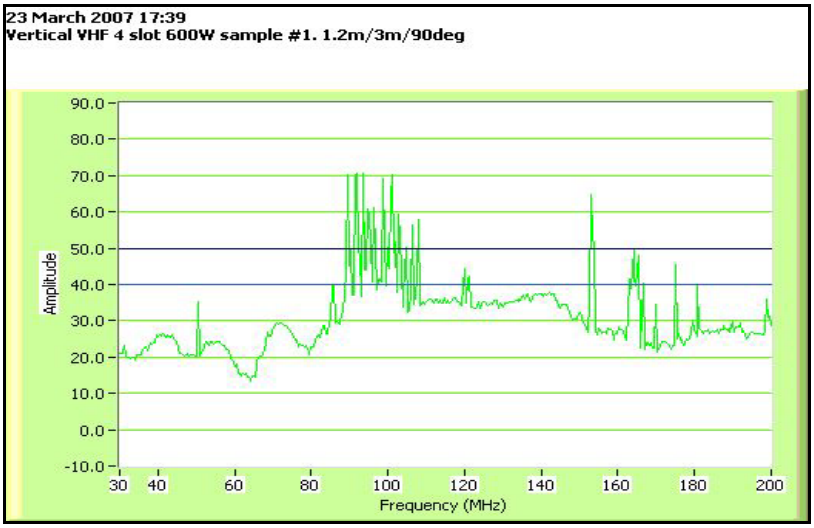
The major interference was broadband noise and the highest level measured was just under the quasi peak limits, either lower or at most equal to peak levels. The peak measurement is not a requirement per the standard. All the other signals over the limit lines are from local radio transmitters.

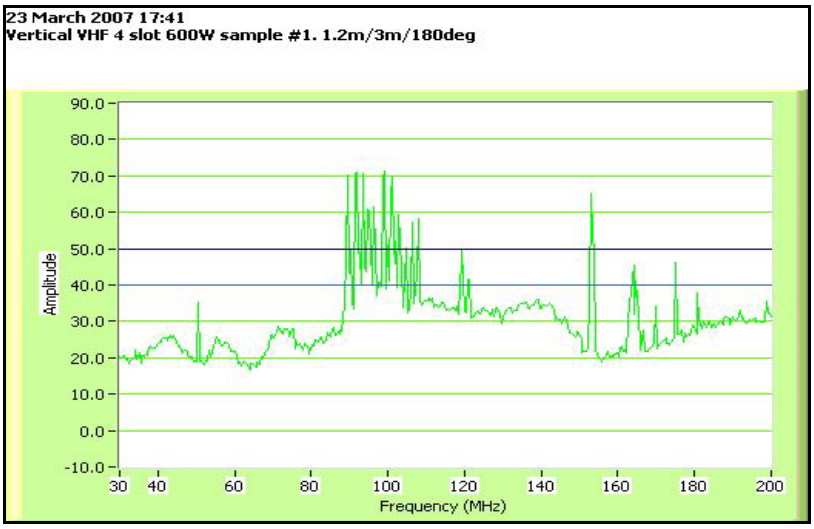
NB = Narrowband
BB = Broadband

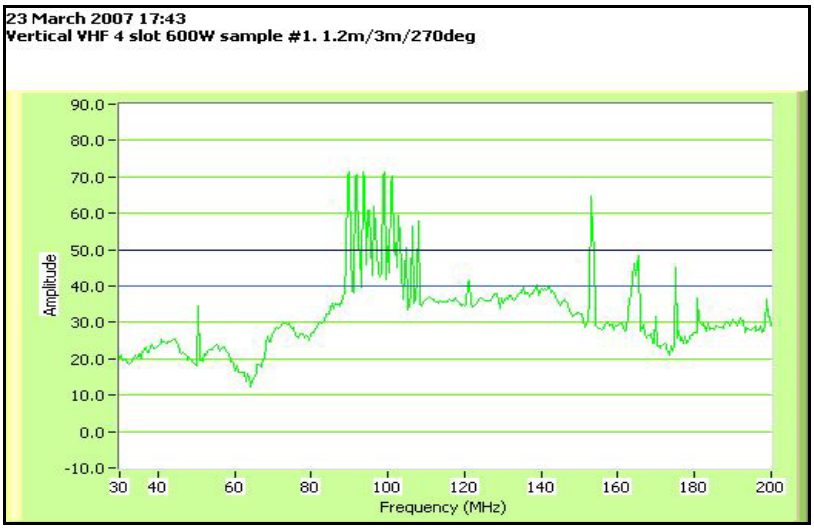
Frequency (MHZ)	Level dBuV/m		Signal type	Angle / Height	Δ Limit (worst)
	Hor.	Vert.			
142.3		38.5	BB	0° / 1.2	1.5 below
142.3		36.5	BB	180° / 1.2	3.5 below

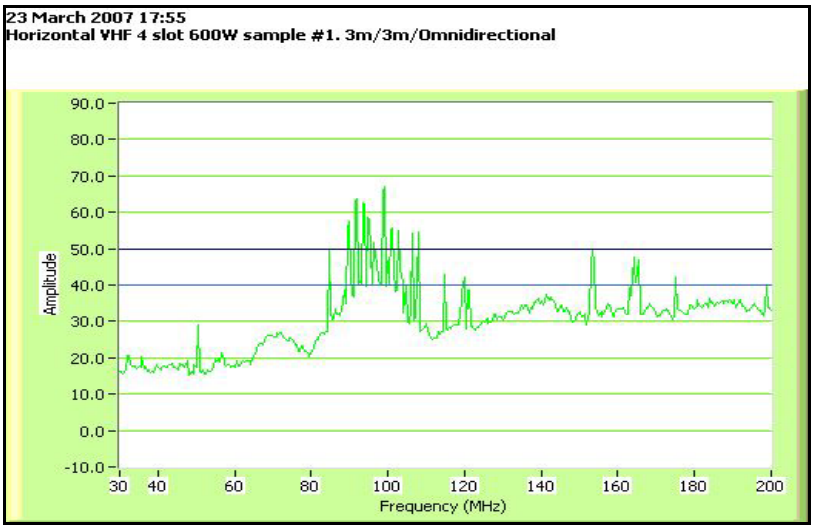
Figure 1 QP Radiated emissions at 3m distance.

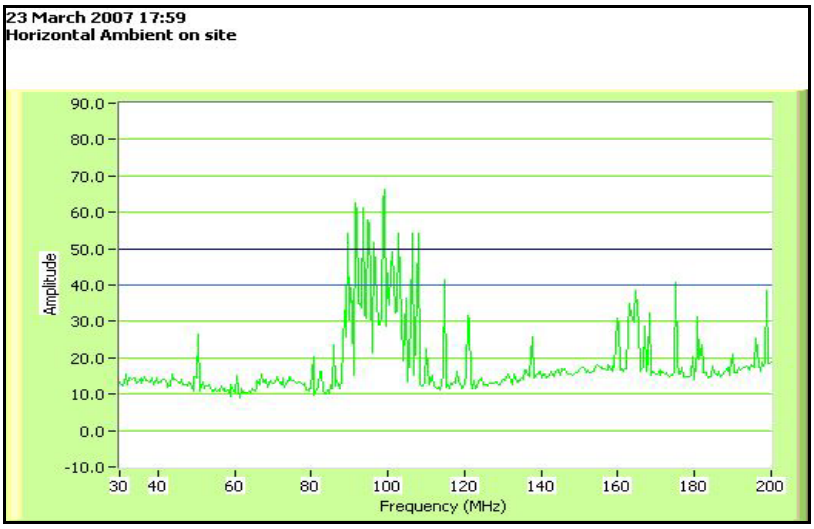

23 March 2007 17:30
Vertical VHF 4 slot 600W sample #1.
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30 40 60 80 100 120 140 160 180 200
Frequency (MHz)

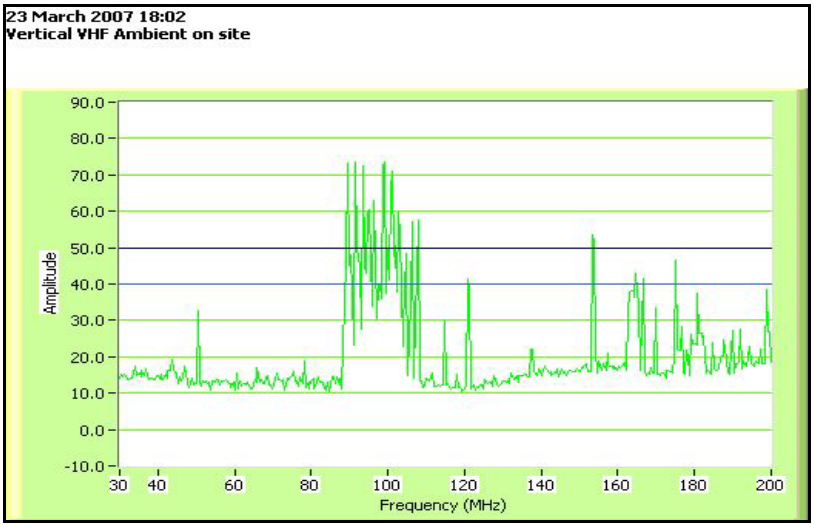

23 March 2007 17:39
Vertical VHF 4 slot 600W sample #1. 1.2m/3m/90deg
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30 40 60 80 100 120 140 160 180 200
Frequency (MHz)

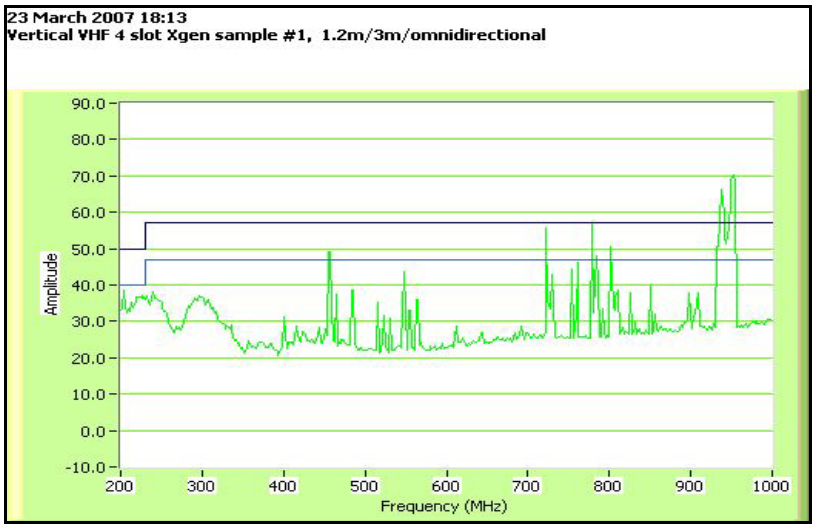

23 March 2007 17:41
Vertical VHF 4 slot 600W sample #1. 1.2m/3m/180deg
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30 40 60 80 100 120 140 160 180 200
Frequency (MHz)

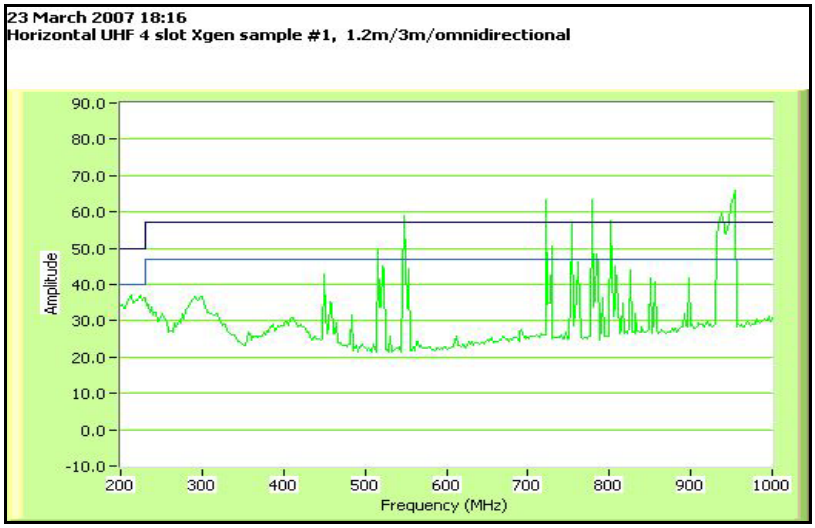

23 March 2007 17:43
Vertical VHF 4 slot 600W sample #1. 1.2m/3m/270deg
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30
40
60
80
100
120
140
160
180
200
Frequency (MHz)

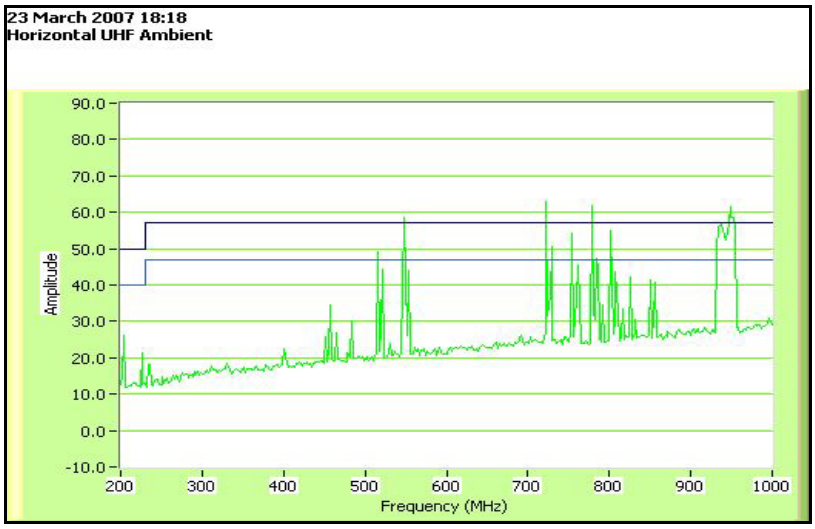

23 March 2007 17:55
Horizontal VHF 4 slot 600W sample #1. 3m/3m/Omnidirectional
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30
40
60
80
100
120
140
160
180
200
Frequency (MHz)

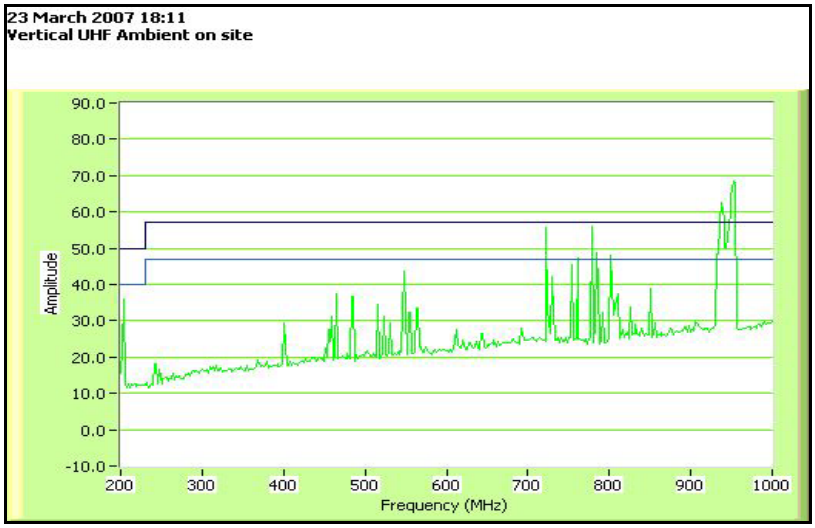

23 March 2007 17:59
Horizontal Ambient on site
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30
40
60
80
100
120
140
160
180
200
Frequency (MHz)


23 March 2007 18:02
Vertical VHF Ambient on site
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
30
40
60
80
100
120
140
160
180
200
Frequency (MHz)


23 March 2007 18:13
Vertical VHF 4 slot Xgen sample #1, 1.2m/3m/omnidirectional
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
200
300
400
500
600
700
800
900
1000
Frequency (MHz)


23 March 2007 18:16
Horizontal UHF 4 slot Xgen sample #1, 1.2m/3m/omnidirectional
Amplitude
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
200
300
400
500
600
700
800
900
1000
Frequency (MHz)

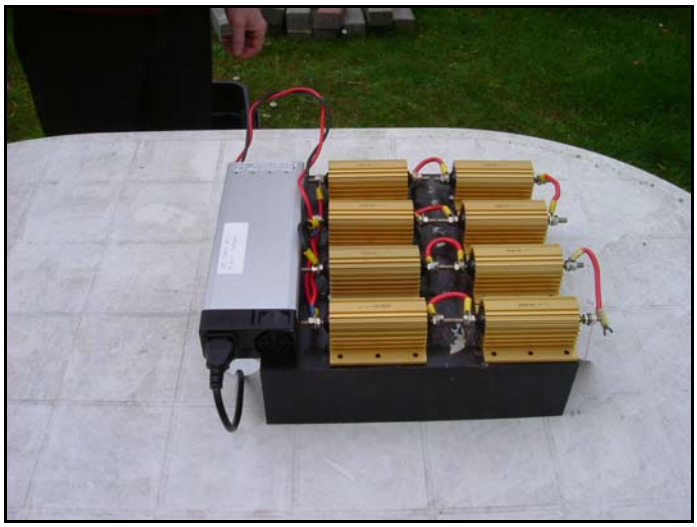


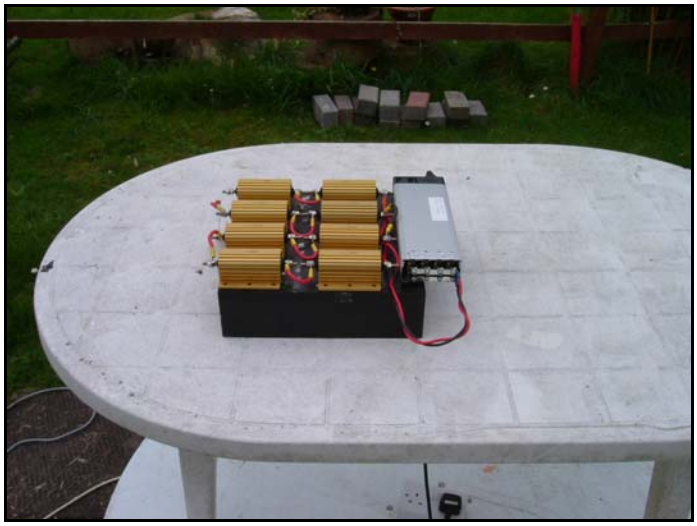


5.3. Conclusion

With the above modifications the EUT meets the requirements of EN55022 for residential environment.

5.4. Photographs





Low Frequency Immunity Tests

6. Low Frequency Immunity

6.1. Test Equipment

Schaffner Best Plus Transient Generator (S/N 3097-021)

6.2. Measurements

Tests were performed in accordance with the voltage dips and short interruptions standard EN61000-4-11 with limits defined in EN61000-6-2

6.3. EUT set up for immunity tests

6.3.1. Voltage dips and short interruptions

Voltage	Time	Criterion met
0%	10mS	A
40%	200mS	B
70%	20ms	B
0%	5S	B

Figure 2 Voltage dips

6.3.2. Result

The EUT meets the requirements of EN 61000-4-11 as called out in EN 61000-6-2

High Frequency Immunity Tests

7. High Frequency Immunity Testing

7.1. Surge Testing

7.1.1. Surge Test Equipment

EMT Laboratories, Inniscarra, Co. Cork
Keytech CE master Immunity Test system (S/N 9608254)
Agilent 54616B Oscilloscope (S/N US37340193)

7.1.2. Surge Testing Test Method

Tests were performed in accordance with IEC 61000-4-5 referred to by EN 61000-6-2.

Performance criteria allow the EUT to deviate from normal operation during application of the interference, but the unit must resume normal operation in the original state after application of the interference.

The scope was used to check the output of the test generator.

Levels of interference are ±2kV Line 1 and 2 to Earth and ±1kV Line1 to Line2 (Live to neutral).

7.1.3. AC Mains Surge Testing

Voltage	Coupling	No of pulses	Angle 0°, 90°, 270°	Effect
±2kV	L_1 to PE	5	at each angle	None
±2kV	L_2 to PE	5	at each angle	None
±1kV	L_2 to L_1	5	at each angle	None
±2kV	L_2 to L_1 to PE	5	at each angle	None

Table 1 Surge immunity results

7.1.4. Comments

The EUT meets the requirements of EN 61000-6-2

7.2. Fast Transient/Burst

7.2.1. Test Equipment

EMT Laboratories, Inniscarra, Co. Cork
Agilent 54616B Oscilloscope (S/N US37340193)
Keytech CE master Immunity Test system (S/N 9608254)

7.2.2. Test Method, Interference Levels & Performance Criteria

Tests were performed in accordance with the basic standard EN61000-4-4 referred to by EN61000-6-2

Performance criteria allow the EUT to deviate from normal operation during application of the interference, but the unit must resume normal operation in the original state after application of the interference.

EUT	Voltage	Coupling	No of pulses	Effect
L	±2kV	Direct	60 secs	None
L & E	±2kV	Direct	60 secs	None
N	±2kV	Direct	60 secs	None
N & E	±2kV	Direct	60 secs	None
N & L	±2kV	Direct	60 secs	None
L & N & E	±2kV	Direct	60 secs	None

Figure 3 Input power cable.

7.2.3. Comments

The EUT meets the requirements of EN61000-6-2

7.3. Conducted Immunity

7.3.1. Test Equipment

EMT Laboratories, Inniscarra, Co. Cork
EMT Coupling-Decoupling Network (EMT009)
HP 8648A Signal Generator (S/N 3625U0058)
Prodigit Energy monitor 2000MU (S/N 19123)
Agilent 54616B Oscilloscope (S/N US37340193)
Hewlett Packard 34401A multimeter (S/N US36024455)

7.3.2. Conducted Immunity test method

The test method used was direct injection onto the mains cord. This test method is described in EN61000-4-6 and the limits are defined in EN61000-6-2

The test comprised setting up the cable to have 150Ω termination at both ends and then injecting a signal into either the direct coupler or the electromagnetic clamp. The power level on the 8648A AM frequency generator needed to get 10V on the cable was noted for each frequency. The power cable was now attached to the injection box and the noted levels applied to the RF port.

Level	Modulation	Range	Frequency	Dwell time
10V	80%	150kHz to 80 MHz	1kHz	2.8 sec

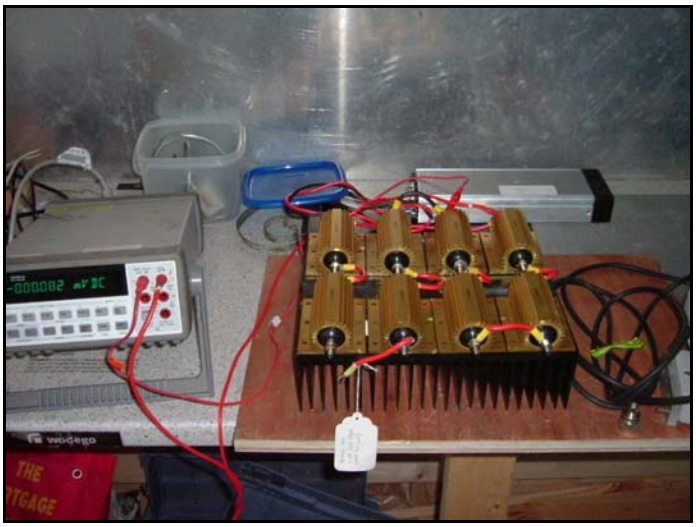
7.3.3. Conducted Immunity Test results

The EUT was checked for the voltage on the output at 29.004 to 29.018V and the input wattage was checked at 670 to 677 Watts. Occasionally the wattage went to 702W but later checking showed that this was only a momentary reading and no change was noted on the input as permanent and caused by the RF on the mains voltage.

7.3.4. Comments

The EUT meets the requirements of EN61000-4-6 as called out in EN61000-6-2, industrial environment.

7.3.5. Photographs



7.4. Radiated Immunity

7.4.1. Test Equipment

EMT Laboratories, Inniscarra, Co. Cork.
HP 8648A Signal Generator (S/N 3625U0058)
Biconical Antenna -Eaton 94455-1 (S/N 1220)
Bi log antenna (ex RFT)
Hewlett Packard 34401A multimeter (S/N US36024455)
Rohde & Schwarz SMR 20 (S/N 1017150)
Horn antenna 0.8 to 1.5GHz (S/N EMT003)
Horn antenna 1.5 to 5GHz (S/N EMT002)
Amplifier Research 5W 800MHz-4.2GHz amplifier (S/N 306664)
Amplifier Research 30W 25MHz-1GHz amplifier (S/N 17976)
Radisense Field Probe (S/N 03D00370SNO-06)
Fluke Multimeter 79 series (S/N 94727)

7.4.2. Test Method, Interference Levels & Performance Criteria

This test is performed in accordance with the basic standard EN61000-4-3 referred to by EN 61000-6-2

This is a substitution method and the levels were determined by first radiating the isotropic antenna after placing it in the same position as the EUT would be during the tests. After noting the power required to give RF levels of 10/m at the EUT, the isotropic antenna was removed and replaced with the EUT.

The antenna was placed in Vertical and Horizontal mode and the EUT was at 0°and 90°.

Level	Modulation	Range	Frequency	Dwell time
10V	80%	80 MHz to 2.5GHz	1kHz	2.8 sec

7.4.3. Results

No disturbance was noted on the meter.

7.4.4. Comments

The EUT meets the requirements of EN 61000-6-2

7.4.5. Photographs

7.5. Electrostatic Discharge

7.5.1. Test Equipment

EMT Laboratories, Inniscarra, Co. Cork.
Schaffner NSG432 ESD Gun (S/N 6909006)

7.5.2. Test Method

Tests were performed in accordance with IEC 61000-4-2 referred to by EN 61000-6-2

Performance criteria allow the EUT to deviate from normal operation during application of the interference, but the unit must resume normal operation in the original state prior to application of the interference.

Levels of interference are ±4kV Contact Discharge, applied to the points indicated on the picture. The metal case of the EUT allows only that contact discharge be applied

7.5.3. Comments

30 pulses of + and – polarity were applied at all points

7.5.4. Results

The EUT meets the requirements of EN 61000-6-2

7.5.5. Photograph of Electrostatic Discharge Testing

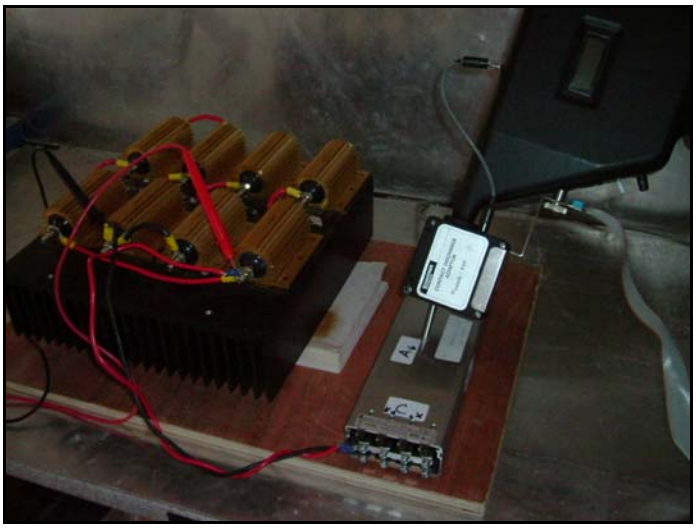


Figure 4 Points of contact discharge

END OF REPORT