

**Report on the EMC Testing**

**For**

**Abcot UK Ltd.**

**On**

**Elektra 12C Combination Boiler**

**Report No. TRA-030968-36-00A**

**4<sup>th</sup> April 2016**

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**REPORT ON THE EMC TESTING OF A  
ABCOT UK LTD.  
ELEKTRA 12C COMBINATION BOILER  
WITH RESPECT TO SPECIFICATION  
EN 61000-3-11:2000  
EN 61000-3-12:2011**

TEST DATE: 15<sup>th</sup> March 2016

Written by: ..... K.Ingram  
EMC Test Engineer

Approved by: ..... Neil Roche  
Department Manager - EMC

Date: 4<sup>th</sup> April 2016

**Distribution:**

Copy 1: Element  
Copy 2: Abcot UK Ltd.  
Copy 3: Not Applicable

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[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

## 1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	4 <sup>th</sup> April 2016	Original

## 2 Summary

TEST REPORT NUMBER:	TRA-030968-36-00A
PURPOSE OF TEST:	Electromagnetic Compatibility – Emissions
TEST SPECIFICATION:	EN 61000-3-11:2000 EN 61000-3-12:2011
DEVIATIONS FROM SPECIFICATION:	Not Applicable (refer to individual sections)
EQUIPMENT UNDER TEST (EUT):	Elektra 12C Combination Boiler
EUT SERIAL NUMBER:	166-04231
TEST RESULT:	Measured As Compliant Given any modifications stated in the relevant section of this report.
MANUFACTURER/AGENT:	Abcot UK Ltd.
ADDRESS:	Green Acres Oakley Green Road Windsor SL4 4QS
CLIENT CONTACT:	Mr. Balvinder Nagi ☎ 0208 998 2024 ✉ abcotuk@yahoo.com
ORDER NUMBER:	None Provided (Verbal)
TEST DATE:	14 <sup>th</sup> March 2016
TESTED BY:	K.Ingram, Element

**Note:** Specification EN 61000-3-11:2000 & EN 61000-3-12:2011 falls outside the laboratories 0026N UKAS scope of accreditation.

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## 4 Introduction

This report TRA-030968-36-00A presents the results of the EMC testing on a Abcot UK Ltd., Elektra 12C Combination Boiler to specifications EN 61000-3-11:2000 and EN 61000-3-12:2011.

The testing was carried out for Abcot UK Ltd. by Element, an independent test house, at their EMC test facility located at:

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Element Malvern<br>100 Frobisher Business Park<br>Leigh Sinton Road<br>Malvern<br>Worcestershire<br>WR14 1BX<br>UK       | <input type="checkbox"/> Element Skelmersdale<br>Unit 1<br>Pendle Place<br>Skelmersdale<br>West Lancashire<br>WN8 9PN<br>UK            |
| <input type="checkbox"/> Element Wimborne<br>74-78 Condor Close<br>Woolsbridge Industrial Park<br>Three Legged Cross<br>Wimborne<br>Dorset<br>BH21 6SU<br>UK | <input type="checkbox"/> Element Hull<br>Unit E<br>South Orbital Trading Park<br>Hedon Road<br>Hull<br>East Yorkshire<br>HU9 1NJ<br>UK |

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test and measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Element's own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

It is Element policy to always use the latest version of any applicable base test standards. Where a product specification calls up a superseded dated revision or an undated basic standard, the latest version will be used. This may be a deviation to the product standard if dated references have been used.

Throughout this report EUT denotes equipment under test.

## 5 Normative References

- IEC 60050(161)\*, International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic Compatibility'
- IEC 60725\*, Considerations on reference impedances for use in determining the disturbance characteristics of household appliances and similar electrical equipment.
- IEC 61000-3-3, Electromagnetic compatibility (EMC) – Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current  $\leq 16$  A.
- IEC 60038\*, IEC standard voltages
- IEC 60050-161\*, International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility
- IEC 61000-2-2\*, Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems
- IEC 61000-2-4\*, Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances
- IEC 61000-3-2, Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase)
- IEC 61000-4-7\*, Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto

\*Indicates a specification or standard or specific amendment that is not listed on the Element UKAS scope of accreditation.

## 6 Equipment Under Test

### 6.1 EUT Identification

- Name: Elektra 12C Combination Boiler
- Serial Number: 166-04231
- Model Number: 12C
- Software Revision: N/A
- Build Level / Revision Number: Production

Incorporating the following external cables / test ports;

	Type	Description	Outdoor Cable Y / N	Test Length	Max Installation Length
1	Mains	3 Core Unshielded	N	1.5m	Not known

### 6.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

*Not Applicable – No support/monitoring equipment required*

### 6.3 EUT Mode of Operation

#### 6.3.1 Emissions

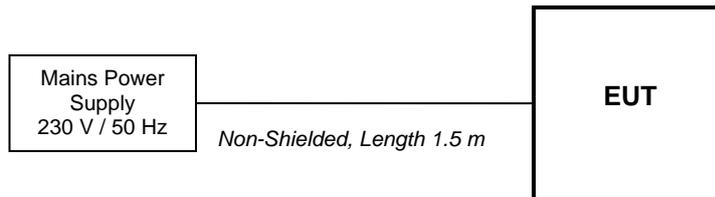
The combination boiler was 230V, 50Hz powered and continually operated by running hot water and energising the heating circuit.

### 6.4 EUT Description

The EUT is a 12.1kV electric combination boiler used in domestic central heating systems. It is designed to supply central heating by water circulating through pipes and to supply on-demand hot water.

## 7 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified.



## 8 Test Standard Selection

### 8.1 Basic Test Standard Selection

<i>Basic Test Standard</i>	<i>Applicable</i>	<i>Notes</i>
EN 61000-3-11:2000* - Voltage Fluctuations and Flicker	☒	1
EN 61000-3-12:2011* - Harmonic Current Emissions	☒	1

*Notes:*

[1] Tests marked with an asterisk\* in the Normative References Section indicate a dated specification or specific amendment which falls outside the laboratories UKAS scope of accreditation, but are within the laboratories scope of competence.

## 9 Voltage Fluctuations and Flicker as per EN 61000-3-11:2000

### 9.1 General

This test deals with the limitation voltage fluctuations and flicker impressed on the public supply system.

This test is applicable to electrical and electronic equipment having a rated input current from 16 A up to and including 75 A, which is intended to be connected to public low-voltage distribution systems having nominal system voltages of between 220 V and 250 V, line-to-neutral at 50 Hz, and which is subject to conditional connection.

The following limits apply:

- the value of Pst shall not be greater than 1.0;
- the value of Plt shall not be greater than 0.65;
- the value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms;
- the relative steady-state voltage change, dc, shall not exceed 3.3 %;
- the maximum relative voltage change dmax, shall not exceed
  - 4 % without additional conditions;
  - 6 % for equipment which is:
    - switched manually, or
    - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
  - 7 % for equipment which is
    - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
    - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

### 9.2 Voltage Fluctuations and Flicker Test Parameters

EUT Exemptions:  Meets the requirements of EN 61000-3-3

EUT Phase:  Single Phase  
 Three Phase

EUT Operation Voltage: 230V ac

EUT Operation Frequency:  50 Hz  
 60 Hz

Test Procedure Applied:  Clause 6.2 Procedure  
 Clause 6.3 Test

Test Impedance ( $Z_{test}$ ):   $0.25 + j 0.25 \Omega$   
  $0.15 + j 0.15 \Omega$

Pst (t = 10 minutes):  Applicable

Plt (t = 2 x10 minutes):  Applicable

$D_{max}$  Limit (see mitigating note below):  4 %  6 %  7 %

Deviation from Basic Test Standard: None

#### Note(s):

- 1) The  $D_{max}$  limit was chosen after evaluation of the frequency in EUT switching operations, as declared by the manufacturer whilst in use.
- 2) The EUT cycling on/off period and repetition interval of the peak in-rush measurement for  $D_{max}$  test data was chosen after evaluation as 50 seconds on, 30 seconds off for 24 intervals.

### 9.3 Voltage Fluctuations and Flicker Test Results

#### 9.3.1 General Information - Flicker

Test Settings		
Class	Voltage	
Mode	Normal - 4%	
Minimum Current	3A	
PST	10.00 minutes	
PLT	2 PSTs	
Equipment Under Test		
Brand	Elektra	
Model	12 C	
Serial	70303	
Impedance Network ID	N/A	
Test Conditions		
	User Entered	Measured
Rated Voltage	230.000 V	229.545 V
Rated Current	50.000 A	N/A
Rated Frequency	50.000 Hz	50.000 Hz
Rated Power	12.000 kW	N/A
D max	0.0198% (Limit: 4%)	
T max	0.0000 s (Limit: 0.5 s)	
DC max	0.0071% (Limit: 3.3%)	
<b>Results</b>	<b>Phase1: PASS</b>	

#### 9.3.2 Flicker Results

Flicker Test Results								
PST no.	Status	DC (%)	Dmax (%)	Tmax (s)	PST	PST Lim	PLT	PLT Lim
1	Phase1: PASS	0.00706	0.019467	0	0.08226	1	0.08226	N/A
2	Phase1: PASS	0.00706	0.019825	0	0.08226	1	0.08226	0.65

## 9.3.3 General Information - Inrush

Test Settings		
Class	Voltage	
Mode	Normal - 4%	
Minimum Current	3A	
PST	N/A - Inrush Test Only	
PLT	N/A - Inrush Test Only	
Equipment Under Test		
Brand	Elektra	
Model	12 C	
Serial	70303	
Impedance Network ID	N/A	
Test Conditions		
	User Entered	Measured
Rated Voltage	230.000 V	229.799 V
Rated Current	50.000 A	N/A
Rated Frequency	50.000 Hz	50.000 Hz
Rated Power	12.000 kW	N/A
D max	N/A - Inrush Test Only	
T max	N/A - Inrush Test Only	
DC max	N/A - Inrush Test Only	
Inrush Test	0.3237% (Limit: 4%)	
<b>Results</b>	<b>Phase1: PASS</b>	

9.3.4 Inrush Result Test Data  $d_{max}$ 

IEC61000-3-11:2001 Flickermeter >16A			
Inrush Current Results			
Test Number	Dmax (%)	Running Average (%)	Status
1	0.329065	0.329065	OK
2	0.42206	0.329065	Highest
3	0.304723	0.316894	OK
4	0.304866	0.312885	OK
5	0.308466	0.31178	OK
6	0.341094	0.317643	OK
7	0.352848	0.32351	OK
8	0.304019	0.320726	OK
9	0.257981	0.320726	Lowest
10	0.336254	0.322667	OK
11	0.308299	0.32107	OK
12	0.367856	0.325749	OK
13	0.330877	0.326215	OK
14	0.32959	0.326496	OK
15	0.293505	0.323959	OK
16	0.258052	0.319251	OK
17	0.371933	0.322763	OK
18	0.298369	0.321238	OK
19	0.344896	0.32263	OK
20	0.306171	0.321716	OK
21	0.361907	0.323831	OK
22	0.342941	0.324787	OK
23	0.273395	0.322339	OK
24	0.352013	0.323688	OK

Key
Above Limit
Lowest Dmax
Highest Dmax

## 10 Harmonic Current Emissions as per EN 61000-3-12:2011

### 10.1 General

This test deals with the limitation of harmonic currents injected into the public supply system.

This test is applicable to electronic/electrical equipment with a rated input current exceeding 16 A and up to and including 75 A per phase, intended to be connected to public low-voltage a.c. distribution systems of the following types:

- nominal voltage up to 240 V, single-phase, two or three wires;
- nominal voltage up to 690 V, three-phase, three or four wires;
- nominal frequency 50 Hz or 60 Hz.

The following exemptions exist for which no limits are specified:

- Equipment intended to be connected only to private low-voltage systems interfacing with the public supply only at the medium- or high-voltage level.

### 10.2 Harmonic Current Emissions Test Parameters

EUT Exemptions:	<input type="checkbox"/> Connected to private systems
EUT Measurement Height:	<input checked="" type="checkbox"/> 0.8 m Insulated Table <input type="checkbox"/> 0.1 m Insulated Support/Pallet Mounted
EUT Phase:	<input checked="" type="checkbox"/> Single Phase <input type="checkbox"/> Three Phase
EUT Operation Voltage:	230V ac
EUT Operation Frequency:	<input checked="" type="checkbox"/> 50 Hz <input type="checkbox"/> 60 Hz
Measurement Duration:	20 Minutes
Harmonic Current Repeatability:	<input checked="" type="checkbox"/> $\pm 5$ % of the Applicable Limit
Harmonic Current Limits Applied:	<input checked="" type="checkbox"/> Table 2 Limits <input type="checkbox"/> Table 3 Limits <input type="checkbox"/> Table 4 Limits <input type="checkbox"/> Table 5 Limits
Minimum Short Circuit Ratio ( $R_{scc}$ ):	<input checked="" type="checkbox"/> 33 <input type="checkbox"/> 66 <input type="checkbox"/> 120 <input type="checkbox"/> 250 <input type="checkbox"/> $\geq 350$
Deviation from Basic Test Standard:	None

### 10.3 Harmonic Current Emissions Test Results

#### 10.3.1 General Information

Test Settings		
Table Used	Table 2	
Mode	Measure	
IRef used	43.747 A	
Short Circuit Ratio (Rsce)	33	
Minimum Required Rsce	33	
Equipment Under Test		
Brand	Elektra	
Model	12 C	
Serial	70303	
Impedance Network ID	N/A	
Test Conditions		
	User Entered	Measured
Rated Voltage	230.000 V	229.570 V
Rated Current	50.000 A	43.747 A
Rated Frequency	50.000 Hz	50.000 Hz
Rated Power	12.000 kW	10.042 kW
Additional Test Information		
Measured Power Factor	999.918 m	
Max Current THD	0.01%	
Max THC	0.0000A	
Max Power	10.051 kW	
Max F.Current	43.769 A	
Average F.Current	43.736 A	
Minimum Current	3A	
Test Duration	20.0 minutes	
<b>Results</b>		<b>PASS</b>

## 10.3.2 Harmonic Results

IEC61000-3-12:2011 Fluctuating Harmonics >16A							
Extra Test Information							
	Average	Peak			Limit		
THC (A)	0	0			10.061742		
PWHC (A)	0	0			10.061742		
Voltage Crest Factor	1.412945	1.413916			1.40 to 1.42		
Current Crest Factor	1.415019	1.41814			N/A		
Harmonics Results 1/1							
Harmonic	Status	Avg (A)	Avg L(A)	Avg %ofL	Peak (A)	Peak L(A)	Peak %ofL
1	PASS	43.73626	No Limit	N/A	43.76923	No Limit	N/A
2	PASS	0	3.499736	0	0	5.249604	0
3	PASS	0.274307	9.449288	2.902939	0.277389	14.17393	1.957033
4	PASS	0	1.749868	0	0	2.624802	0
5	PASS	0.15745	4.680897	3.36367	0.160595	7.021346	2.287242
6	PASS	0	1.166579	0	0	1.749868	0
7	PASS	0.197385	3.149763	6.266647	0.200943	4.724644	4.253082
8	PASS	0	0.874934	0	0	1.312401	0
9	PASS	0.132386	1.662375	7.963638	0.135345	2.493562	5.427758
10	PASS	0	0.699947	0	0	1.049921	0
11	PASS	0.087959	1.356148	6.485959	0.09091	2.034222	4.469011
12	PASS	0	0.583289	0	0	0.874934	0
13	PASS	0.089942	0.874934	10.279893	0.092674	1.312401	7.061373
14	PASS	0	No Limit	N/A	0	No Limit	N/A
15	PASS	0.043546	No Limit	N/A	0.046113	No Limit	N/A
16	PASS	0	No Limit	N/A	0	No Limit	N/A
17	PASS	0.054377	No Limit	N/A	0.05744	No Limit	N/A
18	PASS	0	No Limit	N/A	0	No Limit	N/A
19	PASS	0.066611	No Limit	N/A	0.070115	No Limit	N/A
20	PASS	0	No Limit	N/A	0	No Limit	N/A
21	PASS	0.03831	No Limit	N/A	0.040863	No Limit	N/A
22	PASS	0	No Limit	N/A	0	No Limit	N/A
23	PASS	0.054402	No Limit	N/A	0.057773	No Limit	N/A
24	PASS	0	No Limit	N/A	0	No Limit	N/A
25	PASS	0.046803	No Limit	N/A	0.050404	No Limit	N/A
26	PASS	0	No Limit	N/A	0	No Limit	N/A
27	PASS	0.010792	No Limit	N/A	0.024414	No Limit	N/A
28	PASS	0	No Limit	N/A	0	No Limit	N/A
29	PASS	0.044374	No Limit	N/A	0.047569	No Limit	N/A
30	PASS	0	No Limit	N/A	0	No Limit	N/A
31	PASS	0.025957	No Limit	N/A	0.03051	No Limit	N/A
32	PASS	0	No Limit	N/A	0	No Limit	N/A
33	PASS	0.024258	No Limit	N/A	0.028731	No Limit	N/A
34	PASS	0	No Limit	N/A	0	No Limit	N/A
35	PASS	0.041435	No Limit	N/A	0.045653	No Limit	N/A
36	PASS	0	No Limit	N/A	0	No Limit	N/A
37	PASS	0.000087	No Limit	N/A	0.003901	No Limit	N/A
38	PASS	0	No Limit	N/A	0	No Limit	N/A
39	PASS	0.025571	No Limit	N/A	0.028575	No Limit	N/A
40	PASS	0	No Limit	N/A	0	No Limit	N/A

IEC61000-3-12:2011 Fluctuating Harmonics >16A				
Source Results 1/1				
Harmonic	Status	Peak (V)	Average (V)	Limit (V)
1	PASS	229.57	229.52	No Limit
2	PASS	0.006648	0.00015	0.45914
3	PASS	0.012279	0.001041	2.0661
4	PASS	0	0	0.45914
5	PASS	0.05028	0.045523	0.91828
6	PASS	0	0	0.45914
7	PASS	0.11283	0.10885	0.68871
8	PASS	0.002008	0	0.45914
9	PASS	0.056746	0.05319	0.45914
10	PASS	0	0	0.45914
11	PASS	0.002014	0.000003	0.22957
12	PASS	0.002021	0.000002	0.22957
13	PASS	0.031831	0.026762	0.22957
14	PASS	0.002022	0.000001	0.22957
15	PASS	0.003788	0.000025	0.22957
16	PASS	0	0	0.22957
17	PASS	0.039041	0.035162	0.22957
18	PASS	0.003792	0.000034	0.22957
19	PASS	0.00384	0.000014	0.22957
20	PASS	0	0	0.22957
21	PASS	0.032991	0.02727	0.22957
22	PASS	0.002049	0.000003	0.22957
23	PASS	0.013715	0.001674	0.22957
24	PASS	0	0	0.22957
25	PASS	0.002054	0	0.22957
26	PASS	0	0	0.22957
27	PASS	0.022667	0.00645	0.22957
28	PASS	0.002053	0.000005	0.22957
29	PASS	0.0106	0.000793	0.22957
30	PASS	0.002073	0.000002	0.22957
31	PASS	0.022527	0.005687	0.22957
32	PASS	0.00394	0.000038	0.22957
33	PASS	0.008948	0.000472	0.22957
34	PASS	0	0	0.22957
35	PASS	0.01378	0.001524	0.22957
36	PASS	0.003018	0.000002	0.22957
37	PASS	0.002087	0.000014	0.22957
38	PASS	0	0	0.22957
39	PASS	0.003075	0.000045	0.22957
40	PASS	0	0	0.22957

## 11 Test Equipment List – Element Malvern

The following test equipment was used:

<i>Type of Equipment</i>	<i>Maker/Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>Element Number</i>	<i>Actual Equipment Used</i>
Absorbing Clamp	Chase	MDS-21	902008	L030	<input type="checkbox"/>
Current Probe	Eaton	91550-1	2822	L159	<input type="checkbox"/>
Helmholtz Coils	ELEMENT	N/A	None	L160	<input type="checkbox"/>
Function Generator	Thurlby Thandar	TG 210	13344	L181	<input type="checkbox"/>
Multimeter	Isotech	IDM91	00606606	L190	<input type="checkbox"/>
3 Phase V-Network LISN	Schwarzbeck	NSLK8128	8128151	L207	<input type="checkbox"/>
Amplifier	Amplifier Research	100W1000M1	13504	L208	<input type="checkbox"/>
Variac	Claude Lyons	N/A	None	L225	<input type="checkbox"/>
Current Injection Probe	Solar	9144-IN	935708	L234	<input type="checkbox"/>
EMI Test Receiver	Rohde & Schwarz	ESHS20	837960/003	L237	<input type="checkbox"/>
2 Line V-Network LISN	Rohde & Schwarz	ESHS3-Z5	839135/013	L238	<input type="checkbox"/>
Signal Generator	Marconi	2042	119562/021	L254	<input type="checkbox"/>
Current Injection Probe	Solar	9108-IN	943050	L256	<input type="checkbox"/>
Current Injection Probe	Solar	9120-IN	943049	L257	<input type="checkbox"/>
4 Channel Digitizing Oscilloscope	Tektronix	TDS460A	B020781	L258	<input type="checkbox"/>
Signal Generator	Marconi	2022D	119224/023	L264	<input type="checkbox"/>
Current Injection Probe	Solar	9120-IN	956416	L269	<input type="checkbox"/>
Capacitive Coupling Clamp	Schaffner	CDN 125	560	L270	<input type="checkbox"/>
Bi-Log Antenna	Chase	CBL6112	2098	L274	<input type="checkbox"/>
RF Power Sensor	Marconi	6920	3498	L283	<input type="checkbox"/>
Directional Coupler	Amplifier Research	DC6180	17854	L285	<input type="checkbox"/>
2 Line V-Network LISN	Rohde & Schwarz	ESHS3-Z5	837469/010	L289	<input type="checkbox"/>
Bi-Log Antenna	Chase	CBL6111	1945	L290	<input type="checkbox"/>
Amplifier	Amplifier Research	75A250	19164	L315	<input type="checkbox"/>
High Impedance Voltage Probe 1.5 k $\Omega$	Element	N/A	None	L316	<input type="checkbox"/>
Signal Generator	Marconi	2023	112224/036	L320	<input type="checkbox"/>
Micro Anechoic Chamber	EMV	MAC 4	MAC4-1009	L323	<input type="checkbox"/>
ESD Gun	Schaffner	NSG435	1780	L327	<input type="checkbox"/>
CDN (3 wire)	MEB	M3	12866	L328	<input type="checkbox"/>
CDN (3 wire)	MEB	M3	12867	L329	<input type="checkbox"/>
CDN (Coaxial)	MEB	S1/50	12269	L330	<input type="checkbox"/>
CDN (9 way)	MEB	S9	12353	L331	<input type="checkbox"/>
CDN (25 way)	MEB	S25	12396	L332	<input type="checkbox"/>
CDN (1 wire)	MEB	M1	None	L338	<input type="checkbox"/>
Attenuator 6 dB 75 W	Bird	8308-060-N	None	L349	<input type="checkbox"/>
EMI Test Receiver	Rohde & Schwarz	ESVS 10	844594/003	L352	<input type="checkbox"/>
EMI Test Receiver	Rohde & Schwarz	ESHS 10	844077/019	L353	<input type="checkbox"/>
CDN (3 $\phi$ )	MEB	M5/25A	12250	L354	<input type="checkbox"/>
CDN (3 wire)	MEB	M3	12893	L355	<input type="checkbox"/>
CDN (2 wire)	MEB	M2	12103	L356	<input type="checkbox"/>
CDN (2 wire)	MEB	M2	12102	L357	<input type="checkbox"/>

<b>Type of Equipment</b>	<b>Maker/Supplier</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Element Number</b>	<b>Actual Equipment Used</b>
Directional Coupler	Amplifier Research	DC6180	20735	L380	<input type="checkbox"/>
Current Probe	AH Systems	BCP-200/529	101	L391	<input type="checkbox"/>
Current Probe	AH System	BCP200/529	102	L392	<input type="checkbox"/>
EMI Test Receiver	Rohde & Schwarz	ESVS 20	838804/005	L415	<input type="checkbox"/>
Variac	Claude Lyons	715-E	None	L428	<input type="checkbox"/>
Best	Schaffner	Best	200121-001SC	L429	<input type="checkbox"/>
Bi-Log Antenna	Schaffner	CBL6112B	2761	L431	<input type="checkbox"/>
Amplifier	Amplifier Research	250W1000	301802	L442	<input type="checkbox"/>
Mainframe Test Generator	Schaffner	NSG2050	200130-240AR	L447	<input type="checkbox"/>
EFT/B Network Plug-In	Schaffner	PNW2225	200140-045SC	L448	<input type="checkbox"/>
Impulse (Surge 1.2/50 µs) Network Plug-In	Schaffner	PNW2055	200123-05SC	L449	<input type="checkbox"/>
Isotropic Electric Field Probe	Amplifier Research	FP6001	302516	L459	<input type="checkbox"/>
3 Phase Dropout / Variation Simulator	EM Test	PFS 503/32A	010105	L460	<input type="checkbox"/>
Horn Antenna	Amplifier Research	AT4002	303849	L461	<input type="checkbox"/>
Directional Coupler	Amplifier Research	DC7144	303690	L462	<input type="checkbox"/>
Amplifier	Amplifier Research	50S1G4A	303824	L464	<input type="checkbox"/>
Passive Loop Antenna	Solar	7334-1	032313	L479	<input type="checkbox"/>
RF Power Meter	Rohde & Schwarz	NRVD	100312/002	L483	<input type="checkbox"/>
RF Power Sensor	Rohde & Schwarz	URV5-Z2	100317	L484	<input type="checkbox"/>
RF Power Sensor	Rohde & Schwarz	URV5-Z2	100318	L485	<input type="checkbox"/>
Signal Generator	Hewlett Packard	8648B	3642U00976	L551	<input type="checkbox"/>
Microwave Pre-Amplifier	Agilent	8449B	3008A016	L572	<input type="checkbox"/>
Receiver / Analyser	Rohde & Schwarz	ESIB 7	100182	L630	<input type="checkbox"/>
Large Vehicle Chamber	Element	N/A	None	L650	<input type="checkbox"/>
Multimeter	AVO	M2007	M21875957	L655	<input type="checkbox"/>
RF Power Meter	Rohde & Schwarz	NRP	100002	L684	<input type="checkbox"/>
RF Power Sensor	Rohde & Schwarz	NRP-Z11	100007	L685	<input type="checkbox"/>
Receiver / Analyser	Rohde & Schwarz	ESIB 40	100241	L691	<input type="checkbox"/>
Signal Generator	Hewlett Packard	8648A	3430U00302	L694	<input type="checkbox"/>
ESD Gun	Schaffner	NSG438	620	L697	<input type="checkbox"/>
RF Power Meter	Anritsu	ML2488A	6K00005228	L703	<input type="checkbox"/>
RF Power Sensor	Anritsu	MA2472D	033730	L706	<input type="checkbox"/>
Probe	Narda	2304/03 & 2300/90.10	L - 004 & L - 0010	L707	<input type="checkbox"/>
Power Amplifier	ETM	200W LSBAND	None	L712	<input type="checkbox"/>
RF Chamber (Comm 1)	Panashield	G72131	A	L717	<input type="checkbox"/>
RF Chamber (Comm 2)	Panashield	G72231	B	L718	<input type="checkbox"/>
Field Probe Kit	Amplifier Research	FL7006 & F17000	0323372, 322106,313101	L721	<input type="checkbox"/>
X Wing Antenna	Teseq/Schaffner	CBL6144	22875	L722	<input type="checkbox"/>
Field Probe Kit	Amplifier Research	FL7018	0325185	L742	<input type="checkbox"/>
Power Amplifier	Teseq	CBA9481	T43626	L752	<input type="checkbox"/>
X Wing Antenna	Teseq/Schaffner	CBL6144	26445	L765	<input type="checkbox"/>
AC Power Source Profline 5 kVA	Schaffner	NSG1007	54544	L767	<input type="checkbox"/>
Flicker Impedance Unit	Schaffner	CCN1000	71976	L768	<input type="checkbox"/>

<b>Type of Equipment</b>	<b>Maker/Supplier</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Element Number</b>	<b>Actual Equipment Used</b>
PC with integrated Data Acquisition Card	National instruments	N/A	None	L769	<input type="checkbox"/>
V-Surge Verification Jig	Element	N/A	None	L780	<input type="checkbox"/>
Directional Coupler	Werlatone	C3908-10	81386	L786	<input type="checkbox"/>
MIL Chamber 4	Element	N/A	None	L853	<input type="checkbox"/>
RF Sensor	Element	N/A	None	L867	<input type="checkbox"/>
Log Periodic Antenna	Rohde & Schwarz	HL050	100530	L869	<input type="checkbox"/>
Comm 2 4 m U/F Cable	Rosenberger	FB293C1040005050	70558-01	L871	<input type="checkbox"/>
Power Amplifier	Amplifier Research	75A220	95060001	L883	<input type="checkbox"/>
Oscilloscope	Tektronix	TDS3054	B016498	L885	<input type="checkbox"/>
High Power Biconical	Schwarzbeck	VHBD 9134-4	9134-4-015	L887	<input type="checkbox"/>
Comm 2 4 m RX Cable	Rosenberger	FB293C1040005050	70558-02	L888	<input type="checkbox"/>
Comm 1 6 m AMN Cable	Rosenberger	FB293C1060005050	70559-02	L889	<input type="checkbox"/>
Comm 1 4 m U/F Cable	Rosenberger	FB293C1040005050	70558-03	L890	<input type="checkbox"/>
Comm 1 4 m RX Cable	Rosenberger	FB293C1040005050	70558-04	L891	<input type="checkbox"/>
Comm 2 6 m AMN Cable	Rosenberger	FB293C1060005050	70559-01	L892	<input type="checkbox"/>
Signal Generator	Rohde & Schwarz	SMC100A	102083	L895	<input type="checkbox"/>
RF Power Meter	Amplifier Research	PM 2002	302851	L900	<input type="checkbox"/>
RF Power Sensor	Amplifier Research	PH2000	303723	L901	<input type="checkbox"/>
RF Power Sensor	Amplifier Research	PH2000	303714	L902	<input type="checkbox"/>
Surface DC Voltmeter	AlphaLab Inc	SVM2	1061	L906	<input type="checkbox"/>
Bi-Log Antenna	Chase	CBL6111	None	L912	<input type="checkbox"/>
EM Clamp	Schaffner	KEMZ 801	15796	L913	<input type="checkbox"/>
Power Amplifier	Teseq	CBA1G-1000	T44125	L914	<input type="checkbox"/>
Attenuator 6 dB 75 W	Bird	75-A-MFN-06	0022483	L916	<input type="checkbox"/>
Attenuator 6 dB 75 W	Bird	75-A-MFN-06	0097113	L917	<input type="checkbox"/>
Directional Coupler	Werlatone	C3908-10	98778	L920	<input type="checkbox"/>
RF Sensor	Element	N/A	None	L922	<input type="checkbox"/>
Programmable Function Waveform Generator	Rigol	DG1022	DG1D141701719	L925	<input type="checkbox"/>
Receiver / Analyser	Rohde & Schwarz	ESR7	101056	L927	<input type="checkbox"/>
ISN ST08	Teseq	ISN ST08	32634	L933	<input type="checkbox"/>
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101738	L938	<input type="checkbox"/>
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101740	L939	<input type="checkbox"/>
Receiver	Rohde & Schwarz	ESU26	100447	L940	<input type="checkbox"/>
LISN	Chase	MN2050B	1203	L944	<input type="checkbox"/>
Unshielded ISN/CDN	Teseq	T800	34436	L945	<input type="checkbox"/>
Multimeter	Fluke	177	24890284	L947	<input type="checkbox"/>
Comb Generator	COM-Power Corp	CGO-5100B	331020	L951	<input type="checkbox"/>
RF Power Meter	Rohde & Schwarz	NRVD	828110/030	L957	<input type="checkbox"/>
EMC Test Simulator	Teseq	NSG 3040	2053	L952	<input type="checkbox"/>
Programmable AC Source	Chroma	61512	615120000567	L1010	<input checked="" type="checkbox"/>
Precision Power Analyser	N4L - Kinetiq	PPA5531	166-04231	L1011	<input checked="" type="checkbox"/>
RF Current Probe	Rohde & Schwarz	ESH2-Z1	891 923/24	H026	<input type="checkbox"/>
T2 Balanced ISN	Fischer FCC	T2-02-09	20467	H483	<input type="checkbox"/>
T2 Balanced ISN	Fischer FCC	T2-02-09	20468	H484	<input type="checkbox"/>

<b>Type of Equipment</b>	<b>Maker/Supplier</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Element Number</b>	<b>Actual Equipment Used</b>
T8 Balanced ISN	Fischer FCC	T8-02-09	None	H485	<input type="checkbox"/>
T4 Balanced ISN	Fischer FCC	T4-02-09	20450	H486	<input type="checkbox"/>
T4 Balanced ISN	Fischer FCC	T4-02-09	20451	H487	<input type="checkbox"/>
Shielded ISN	Fischer FCC	ST08	26589	H655	<input type="checkbox"/>
3-Phase Coupling Network	Schaffner	CDN131/133	111	RCDN133	<input type="checkbox"/>
ESD Gun	Schaffner	NSG435	000642	RES1	<input type="checkbox"/>
Spectrum Analyser	Anritsu	MS2601B	MT54360	RSA09	<input type="checkbox"/>
Impulse (Surge 1.2/50 $\mu$ s & 10/500 $\mu$ s) Hybrid Generator	Schaffner	NSG651	189	R801-5-1	<input type="checkbox"/>
CDN Surge 16 A AC 3-wire	Schaffner	CDN110	269	R801-5-2	<input type="checkbox"/>
Current Injection Probe	Comtest	9114-1N	935709	UH64	<input type="checkbox"/>
ESD Gun	Schaffner	NSG435	1622	UH85	<input type="checkbox"/>
Current Injection Probe	Solar	9120-1N	956419	UH86	<input type="checkbox"/>
Power Amplifier	Amplifier Research	100W1000M1	18816	UH103	<input type="checkbox"/>
ISN T400	Schaffner	ISN T400	16594	UH150	<input type="checkbox"/>
ISN T200	Schaffner	ISN T200	16164	UH153	<input type="checkbox"/>
RF Sensor	Element	N/A	None	UH382	<input type="checkbox"/>
Fast Transient Generator	Schaffner	NSG2025-1	170	UH383	<input type="checkbox"/>
Receiver / Analyser	Rohde & Schwarz	ESU 26	100081	UH377	<input type="checkbox"/>

## **12 EMC Modifications**

No modifications were performed during this assessment.

### 13 Conclusion

The EUT meets the performance requirements of the specification, when tested in a system configuration described in section 0 of this report.

Note should be taken of any modifications listed in the relevant section of this report.

The EUT achieved the following performance criteria during the test programme.

#### EMISSIONS

<i>Test Standard</i>	<i>Test Order</i>	<i>Pass</i>	<i>Fail</i>	<i>N/A</i>
EN 61000-3-11:2000 - Voltage Fluctuations and Flicker	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EN 61000-3-12:2011 - Harmonic Current Emissions	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 14 Measurement Uncertainty

### Transient testing:

Where a specification tolerance exists, the figure displayed is the calibration figure expanded by the calibration uncertainty. The worst case tolerance is then calculated and compared to the allowed specification tolerance.

#### Static Discharge (EN 61000-4-2)

Tolerance Parameter	Test Equipment Inventory Number					Allowed Tolerance
	ESD6	ESD1	R0061	RFG273	UH01	
Negative Discharge Current at 2 kV (First Peak)	5.90 %	5.90 %	7.15 %	12.30 %	6.46 %	15 %
Negative Discharge Current at 8 kV (First Peak)	12.68 %	12.68 %	6.37 %	12.99 %	7.37 %	15 %
Negative Discharge Current at 2 kV	14.37 %	14.37 %	14.90 %	11.72 %	18.60 %	30 %
Negative Discharge Current at 8 kV	16.09 %	16.09 %	9.87 %	13.05 %	9.67 %	30 %
Negative Discharge Voltage	2.32 %	1.86 %	2.52 %	2.64 %	3.31 %	5 %
Negative Rise Time at 2 kV	13.40 %	15.78 %	14.24 %	17.46 %	8.36 %	25 %
Negative Rise Time at 8 kV	16.20 %	10.41 %	16.20 %	17.46 %	6.54 %	25 %
Positive Discharge Current at 2 kV (First Peak)	9.85 %	7.78 %	8.53 %	11.55 %	6.32 %	15 %
Positive Discharge Current at 8 kV (First Peak)	11.58 %	10.42 %	7.56 %	12.61 %	6.01 %	15 %
Positive Discharge Current at 2 kV	14.90 %	18.13 %	12.78 %	13.84 %	11.78 %	30 %
Positive Discharge Current at 8 kV	16.09 %	16.09 %	17.02 %	16.23 %	10.53 %	30 %
Positive Discharge Voltage	2.65 %	1.99 %	2.62 %	4.03 %	2.32 %	5 %
Positive Rise Time at 2kV	14.80 %	15.50 %	15.36 %	16.22 %	9.82 %	25 %
Positive Rise Time at 8kV	13.96 %	8.63 %	18.44 %	14.99 %	6.96 %	25 %

Tolerance Parameter	Test Equipment Inventory Number				Allowed Tolerance
	L327	L085	RFG639	L697	
Negative Discharge Current at 2 kV (First Peak)	6.90 %	10.56 %	11.27 %	7.28 %	15 %
Negative Discharge Current at 8 kV (First Peak)	12.30 %	6.25 %	13.52 %	8.28 %	15 %
Negative Discharge Current at 2 kV	24.72 %	13.43 %	17.90 %	20.73 %	30 %
Negative Discharge Current at 8 kV	7.78 %	15.43 %	25.23 %	10.93 %	30 %
Negative Discharge Voltage	2.65 %	1.99 %	4.96 %	2.52 %	5 %
Negative Rise Time at 2 kV	9.90 %	22.78 %	15.64 %	17.46 %	25 %
Negative Rise Time at 8 kV	10.18 %	22.36 %	13.12 %	20.68 %	25 %
Positive Discharge Current at 2 kV (First Peak)	7.45 %	12.82 %	13.10 %	6.53 %	15 %
Positive Discharge Current at 8 kV (First Peak)	10.42 %	8.62 %	11.05 %	6.15 %	15 %
Positive Discharge Current at 2 kV	22.37 %	12.72 %	15.55 %	6.14 %	30 %
Positive Discharge Current at 8 kV	11.92 %	12.72 %	23.77 %	13.84 %	30 %
Positive Discharge Voltage	2.01 %	4.03 %	5.33 %	3.97 %	5 %
Positive Rise Time at 2 kV	10.18 %	23.90 %	15.64 %	19.98 %	25 %
Positive Rise Time at 8 kV	6.96 %	23.48 %	14.24 %	20.54 %	25 %

#### Voltage Surge (EN 61000-4-5)

Tolerance Parameter	Test Equipment Inventory Number					Allowed Tolerance
	UH159	UH42	L449	RFG639	L429	
Voltage, Positive Waveform	8.11 %	6.22 %	9.71 %	4.55 %	5.74 %	10 %
Voltage, Negative Waveform	8.06 %	6.43 %	9.64 %	5.72 %	5.15 %	10 %
Duration, Positive Waveform	4.90 %	7.11 %	7.32 %	27.63 %	11.63 %	20 %
Duration, Negative Waveform	5.14 %	8.35 %	5.47 %	27.43 %	10.81 %	20 %
Voltage Front Time, Positive Waveform	29.92 %	19.35 %	10.48 %	26.73 %	22.76 %	30 %
Voltage Front Time, Negative Waveform	16.14 %	16.79 %	12.88 %	24.77 %	16.79 %	30 %
Current, Positive Waveform	6.39 %	6.39 %	9.50 %	7.17 %	6.09 %	10 %
Current Duration	6.50 %	6.50 %	19.40 %	9.84 %	19.89 %	20 %
Current Front Time	19.43 %	19.43 %	11.97 %	11.35 %	13.39 %	20 %
Current Undershoot	Inside Tolerance	Inside Tolerance	Inside Tolerance	Inside Tolerance	Outside Tolerance	30 % of Peak Current

Tolerance Parameter	Test Equipment Inventory Number				Allowed Tolerance
	EMT3	UH415	R801-5-1/2	L952	
Voltage, Positive Waveform	6.27%	4.59%	4.44%	4.59%	10%
Voltage, Negative Waveform	6.67%	5.91%	4.24%	5.91%	10%
Duration, Positive Waveform	19.16%	14.15%	27.22%	14.15%	20%
Duration, Negative Waveform	19.55%	13.87%	26.20%	13.87%	20%
Voltage Front Time, Positive Waveform	17.93%	11.51%	31.61%	27.88%	30%
Voltage Front Time, Negative Waveform	16.96%	11.51%	29.66%	27.88%	30%
Current, Positive Waveform	4.34%	4.34%	7.84%	8.25%	10%
Current Duration	19.25%	19.25%	7.98%	2.50%	20%
Current Front Time	10.58%	10.58%	11.04%	2.90%	20%
Current Undershoot	Inside Tolerance	Inside Tolerance	Inside Tolerance	Inside Tolerance	30% of Peak Current

#### Electrical Fast Transients (EN 61000-4-4)

Tolerance Parameter	Test Equipment Inventory Number					Allowed Tolerance
	L448	UH161	L429	RFG639	EMT5	
Positive Voltage	2.21%	11.92%	19.78%	5.40%	23.56%	20%
Negative Voltage	2.48%	12.94%	15.24%	5.83%	19.09%	20%
Source Impedance	11.91%	1.00%	20.21%	4.56%	27.91%	30%
Pulse Parameters (5ns)	7.16%	5.22%	7.52%	7.42%	7.21%	30%
Pulse Parameters (50ns)	19.13%	3.08%	24.38%	9.69%	18.29%	30%
Burst Parameters	2.32%	1.03%	2.32%	1.99%	2.32%	10%

**Electrical Fast Transients (EN 61000-4-4)**

Tolerance Parameter	Test Equipment Inventory Number					Allowed Tolerance
	RFG271	UH383	L952			
Positive Voltage	16.61 %	23.56 %	8.71 %			20 %
Negative Voltage	21.43 %	19.09 %	5.07 %			20 %
Source Impedance	21.05 %	27.91 %	19.79 %			30 %
Pulse Parameters (5ns)	20.92 %	7.21 %	16.27 %			30 %
Pulse Parameters (50ns)	11.06 %	18.29 %	6.05 %			30 %
Burst Parameters	2.32 %	2.32 %	1.00 %			10 %

**Voltage Dips and Interruptions (EN 61000-4-11)**

Tolerance Parameter	Test Equipment Inventory Number					Allowed Tolerance
	L429	L952	EMT1	RFG639	L415	
Switching Time at 90 °	1.7952 µs	1.7442 %	2.2542 %	1.7952 %	4.08 %	5 µs Max
Switching Time at 270 °	1.9584 µs	1.7544 %	2.244 %	1.377 %	4.08 %	5 µs Max
Voltage Change with Load (70 % dip)	2.64 %	1.77 %	1.74 %	1.7 %	1.8 %	5 % Max
Voltage Change with Load (40 % dip)	3.07 %	4.04 %	1.74 %	1.7 %	1.8 %	5 % Max
Worst Case Phase Shift	3.384 %	5.65 °	3.15 °	3.15 °	3.15 °	±10 °

**Emissions and Immunity testing (non-transient):**

All uncertainties listed are standard uncertainties multiplied by a coverage factor K = 2.00 for to give a 95 % confidence level.

**Conducted Emissions Including Discontinuous Emissions**

- [1] Conducted Emissions 9 kHz to 150 kHz = **3.7 dB**  
 [2] Conducted Emissions 150 kHz to 30 MHz = **3.4 dB**

**Disturbance Power Emissions**

- [1] Disturbance Power 30 MHz to 300 MHz = **2.3 dB**

**Radiated Emissions (E-Field)**

- [1] Radiated Emissions 30 MHz to 1 GHz using CBL6111/2 Bilog Antenna = **4.6 dB**  
 [2] Radiated Emissions 1 GHz to 6 GHz using HL050 Log Periodic Antenna = **5.1 dB**  
 [3] Radiated Emissions 6 GHz to 26 GHz using HL050 Log Periodic Antenna = **5.2 dB**

**Radiated Emissions (H-Field)**

- [1] Radiated Emissions 150 kHz to 30 MHz using 2 m Van Veen Loop Antenna = **2.1 dB**  
 [2] Radiated Emissions 150 kHz to 30 MHz using CISPR 16 Loop Antenna = **2.2 dB**

**Conducted Immunity CDN Testing**

- [1] Re-establishment of pre-calibrated field = **1.6 dB**  
 [2] Limiting of injected level using monitor coil = **2.1 dB**

**Conducted Immunity Clamp Testing**

- [1] Re-establishment of pre-calibrated field = **3.4 dB**  
 [2] Limiting of injected level using monitor coil = **2.6 dB**

**Radiated Immunity 80 MHz to 3 GHz**

- [1] Re-establishment of pre-calibrated field level = **2.12 dB**  
 [2] Dynamic feedback calibrated field level = **2.16 dB**

**Radiated Immunity 3GHz to 6GHz**

- [1] Re-establishment of pre-calibrated field level = **2.23 dB**  
 [2] Dynamic feedback calibrated field level = **2.26 dB**

**Power Frequency magnetic Field**

- [1] Magnetic field immunity up to 1 kA/m DC to 400 Hz = **0.7 dB**

**Spurious Emissions up to 18GHz**

- [1] Uncertainty in test result = **4.75 dB**

**Cable Calibrations**

- [1] Cable calibration up to 18 GHz = **0.4 dB**

**Mains Harmonics and Flicker**

- [1] DMax = **3.4 %**  
 [2] Flicker (Psc, Dc, Dt) = **3.5 %**  
 [3] Harmonics = **1.54 %**

**EN 55024 Sound Pressure Measurement**

[1] Method 1 – Zero Loss Acoustic Coupler = **1.2 dB**

[2] Method 2 – Reference Level comparison = **1.5 dB**

**EN 55103-1 Magnetic Field Emissions 13.3 cm Loop**

[1] Uncertainty in test result = **2.4 dB**

**EN 55103-2 Magnetic Field Immunity 13.3 cm Loop**

[1] Re-establishment of pre-calibrated field level = **10.74 %**

**EN 55015 Insertion Loss**

[1] Uncertainty in test result = **1.7 dB**

**EN 55032 C4.1.6.4 Current Clamp Measurements**

[1] Uncertainty in test result = **2.01 dB**

**EN 55032 C4.1.6.3 Current Clamp Measurements**

[1] Uncertainty in test result = **2.44 dB**

**EN 55032 Capacitive Voltage Probe Measurements**

[1] Uncertainty in test result = **1.9 dB**

**EN 55032 Tuner Port Emissions**

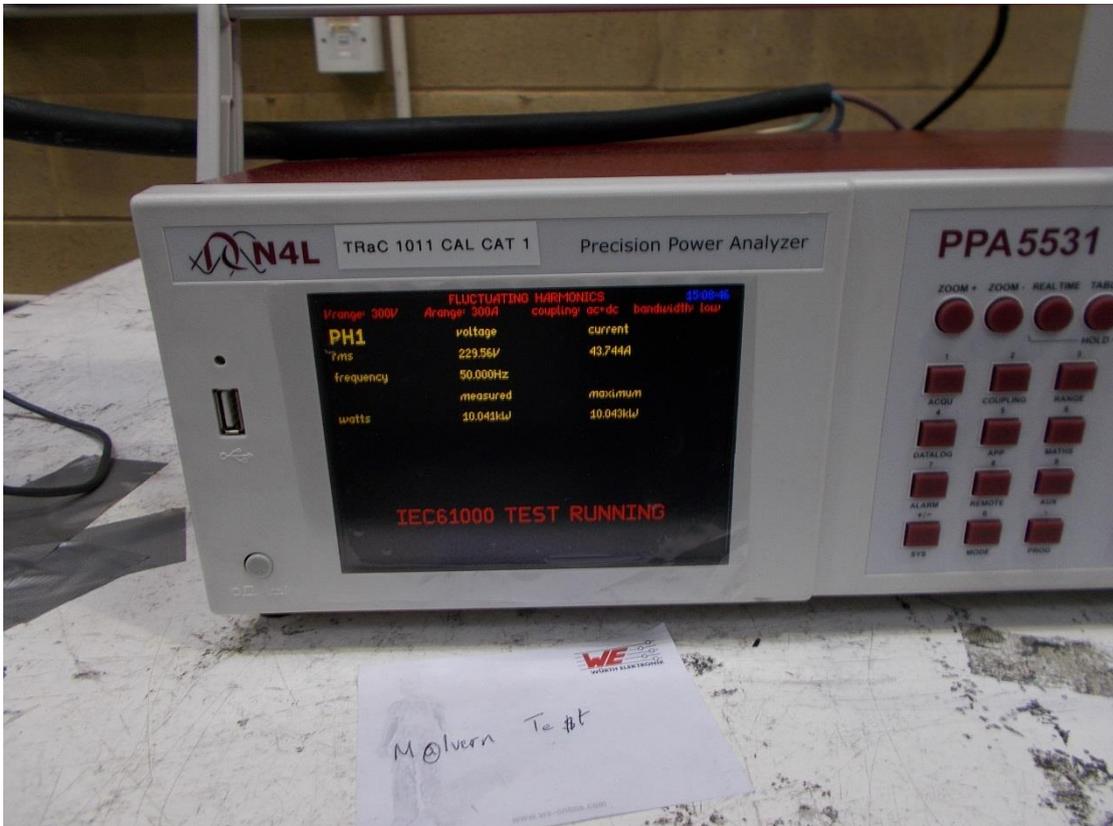
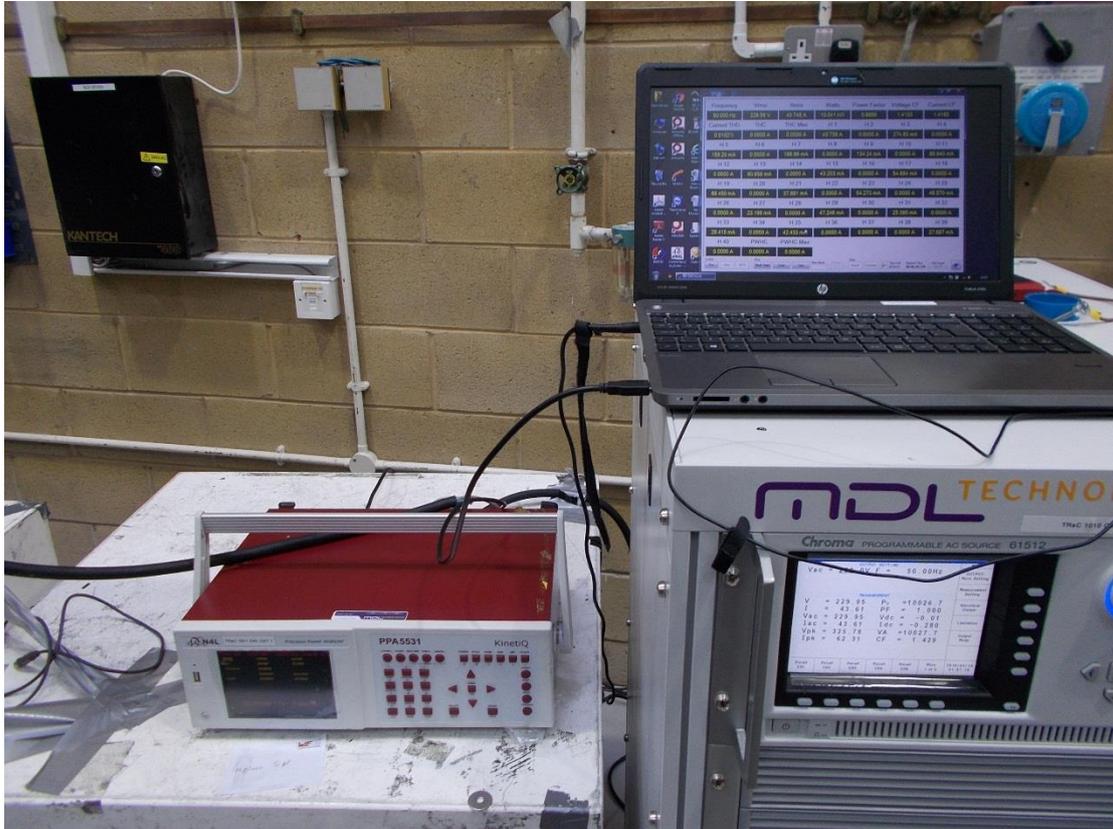
[1] Uncertainty in test result = **1.48 dB**

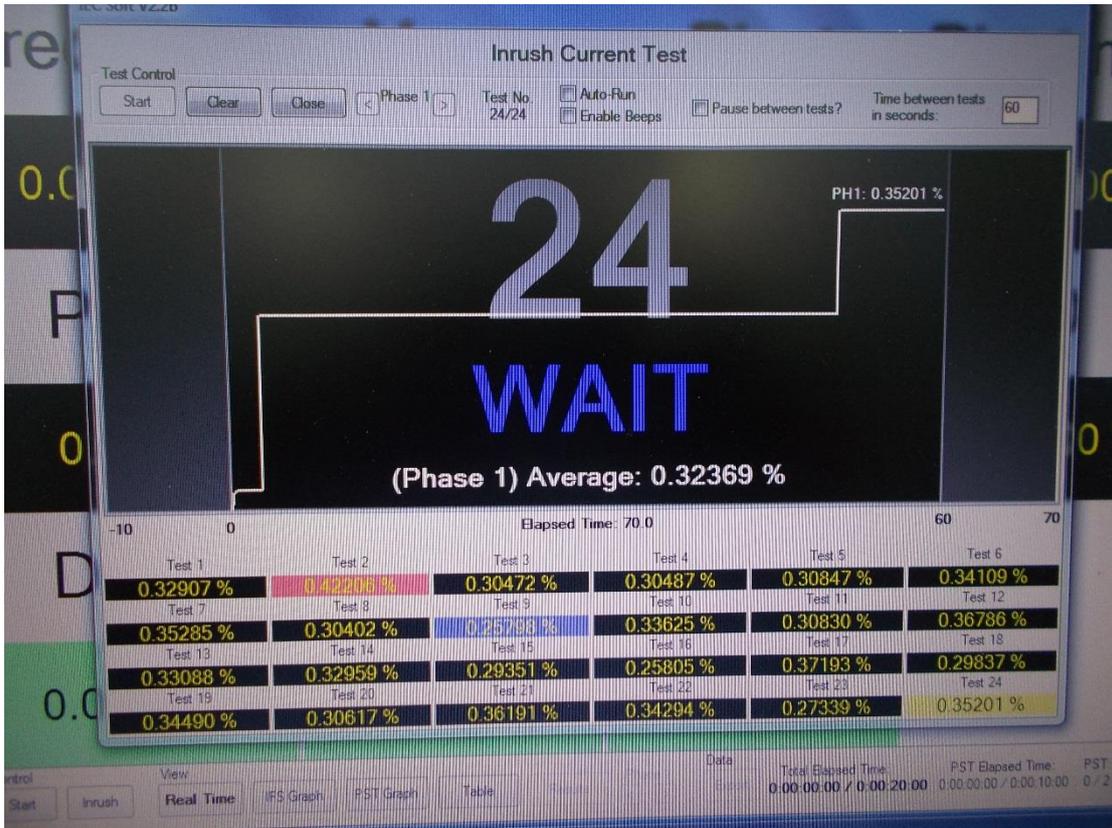
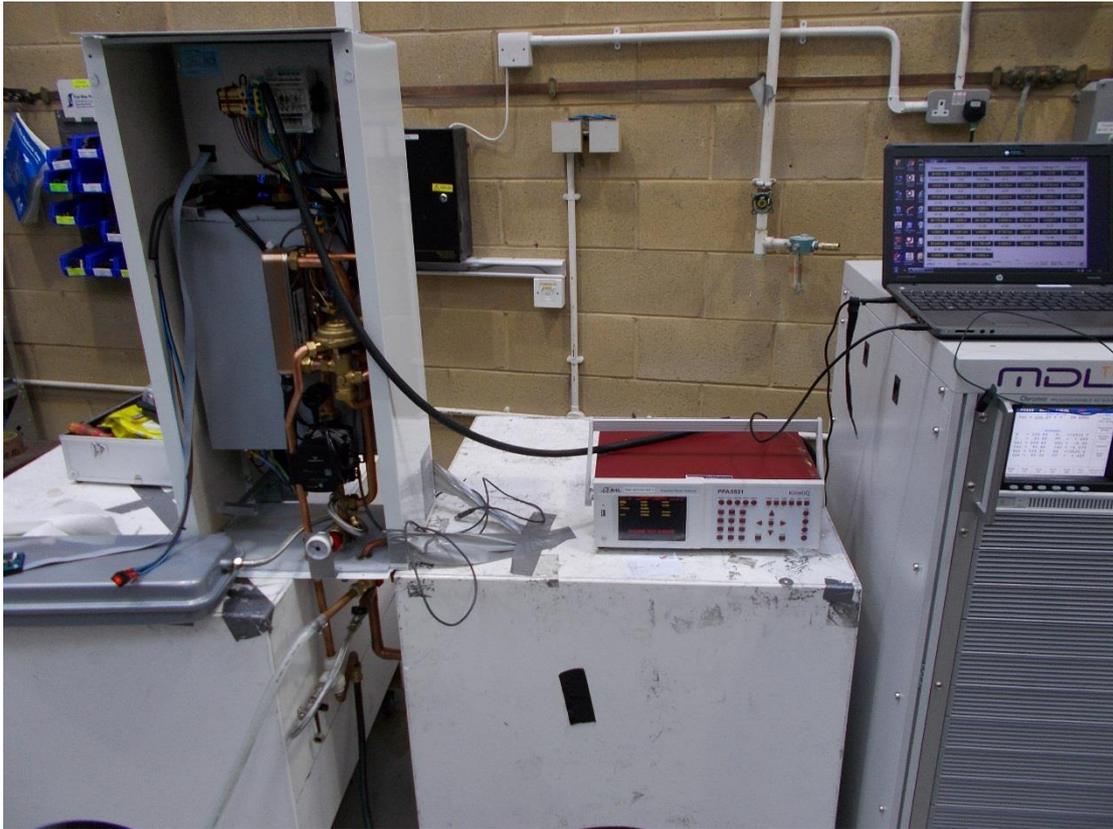
**EN 55032 RF Modulator Ports**

[1] Uncertainty in test result = **1.33 dB**

## 15 APPENDIX A – PHOTOGRAPHS

### *Harmonic Current Emissions / Voltage Fluctuations and Flicker*





End of report.