

REPORT ON THE EMC TESTING

FOR

360 VISION TECHNOLOGY LTD

ON

**PREDATOR CCTV CAMERA, 24VAC LINEAR PSU AND
12VDC VISION RS485 DISTRIBUTION UNIT**

DOCUMENT NO. TRA-005584-35-00A

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**REPORT ON THE EMC TESTING OF A
360 Vision Technology Ltd
Predator CCTV camera, 24Vac Linear PSU and 12Vdc Vision RS485 Distribution unit
WITH RESPECT TO SPECIFICATION
EN50130-4:1995 +A1:1998 +A2:2003, EN55022:2006 +A1:2007, EN55024:1998 +A1:2001
+A2:2003 and EN61000-6-3:2007**

TEST DATE: 26 April - 9 May 2011



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1 Summary

TEST REPORT NUMBER: TRA-005584-35-00A

PURPOSE OF TEST: Electromagnetic Compatibility – Emissions and Immunity

TEST SPECIFICATION: EN50130-4:1995 +A1:1998 +A2:2003, EN55022:2006 +A1:2007, EN55024:1998 +A1:2001 +A2:2003 and EN61000-6-3:2007

EQUIPMENT UNDER TEST (EUT): Predator CCTV camera, 24Vac Linear PSU and 12Vdc Vision RS485 Distribution unit

EUT SERIAL NUMBER: Predator camera - 1104212-5331
RS485 distribution unit - 1012416-3504

TEST RESULT: Measured As Compliant
Given any modifications and with reference to any measurement uncertainty values listed in the relevant sections of this report.

MANUFACTURER/AGENT: 360 Vision Technology Ltd

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TEST DATE: 26 April - 9 May 2011

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3 Introduction

This report TRA-005584-35-00A presents the results of the EMC testing on a 360 Vision Technology Ltd, Predator CCTV camera, 24Vac Linear PSU and 12Vdc Vision RS485 Distribution unit to specification EN50130-4:1995 +A1:1998 +A2:2003, EN55022:2006 +A1:2007, EN55024:1998 +A1:2001 +A2:2003 and EN61000-6-3:2007.

The testing was carried out for 360 Vision Technology Ltd by TRaC Global Ltd., an independent test house, at their EMC test facility located at Skelmersdale, Lancashire, England.

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

It is TRaC Global Ltd. 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 Where a product specification calls up a superseded dated revision or an undated basic standard, the latest version will be used.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.

4 Normative References

- EN61000-4-2:1995 +A1:1998 +A2:2001 - *EMC Immunity, Electrostatic Discharge*
- EN61000-4-2:2009 - *EMC Immunity, Electrostatic Discharge*
- EN61000-4-3:2002 +A1:2002 - *Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio-frequency, electromagnetic field immunity test*
- EN61000-4-3:2006 +A2:2010 - *Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio-frequency, electromagnetic field immunity test*
- EN61000-4-4:2004 +A1:2010 - *Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrical fast transient/burst immunity test*
- EN61000-4-5:2006 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test*
- EN61000-4-6: 2007 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to conducted disturbances, induced by radio-frequency fields*
- EN61000-4-6:2009 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to conducted disturbances, induced by radio-frequency fields*
- EN61000-4-11:2004 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Voltage Dips and Interruptions and Voltage Variations*
- EN61000-4-8:1994 +A1:2001 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity Power Frequency Magnetic Field*
- EN61000-4-8:2010* *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity Power Frequency Magnetic Field*
- EN61000-4-9:1994 +A1:2001 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Pulse Magnetic Field*
- EN61000-4-10:1994* +A1:2001* *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Damped Oscillatory Magnetic Field*
- EN61000-4-12:1995 *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Oscillatory Waves*
- EN61000-4-12:2006* *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Oscillatory Waves*
- EN61000-4-16:1998* +A1:2004* *Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Conducted Common Mode Disturbances*
- EN55011:2007 +A2:2007 *Industrial, scientific and medical (ISM) radio frequency equipment – Radio disturbance characteristics – Limits and methods of measurement*
- EN55011:2009 +A1:2010 *Industrial, scientific and medical (ISM) radio frequency equipment – Radio disturbance characteristics – Limits and methods of measurement*
- EN55022:2006 +A1:2007 *Information technology equipment - Radio disturbance characteristics – Limits and methods of measurement*
- EN55024:1998 +A1:2001, +A2:2003 *Information technology equipment – Immunity Characteristics - Limits and methods of measurement*
- EN55024:2010 *Information technology equipment – Immunity Characteristics - Limits and methods of measurement*
- EN55016-1-4:2004* – *Specification for radio disturbance and immunity measuring apparatus and methods – Radiated Disturbances*
- EN55016-1-4:2007* +A1:2008* +A2:2009* – *Specification for radio disturbance and immunity measuring apparatus and methods – Radiated Disturbances*
- EN55016-1-4:2010* – *Specification for radio disturbance and immunity measuring apparatus and methods – Radiated Disturbances*
- EN55016-1-2:2004* +A2:2006* – *Specification for radio disturbance and immunity measuring apparatus and methods – Conducted disturbances*
- EN61000-3-2:2006 +A2:2009 – *Limits for Harmonic Current Emissions (Equipment input current up to and including 16A/phase)*
- EN61000-3-3:2008 – *Limitation of voltage changes, voltage fluctuations and flicker in the public supply network*
- EN61000-3-11:2000* - *Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection*
- EN61000-3-12:2005* - *Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*
- EN61000-6-3:2007 – *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light industrial environments*
- EN50130-4:1995 +A1:1998 +A2:2003 – *Alarm systems – Part 4: Electromagnetic compatibility – Product family standard: Immunity requirements for components of fire, intruder and social alarm systems*

* - indicates a specification or standard or specific amendment that is not listed on the TRaC Global Ltd. UKAS scope of accreditation.

5 Equipment Under Test

5.1 EUT Identification

- Name: Predator CCTV camera, 24Vac Linear PSU and 12Vdc Vision RS485 Distribution unit
- Serial Number: Predator camera - 1104212-5331
RS485 distribution unit - 1012416-3504
- Model Number: Predator camera - Predator
24Vac PSU - Predator PSU
RS485 distribution unit - Vision RS485 4 camera distribution unit
- Software Revision: Predator camera - 130411_1703.ELF
- Build Level / Revision Number: Not Applicable

5.2 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.

Support Equipment 1

Model; Vision keyboard

Type; Vision keyboard

Serial number; 1104421-5458

Support Equipment 2

Model; TM-1500E (CV)

Type; JVC Monitor

Serial number; 13037081

5.3 EUT Mode of Operation

5.3.1 Emissions

During the emissions testing the predator camera was in a tour mode which moves it in two planes of movement. While in the tour mode the camera had its wiper running and IR lights on. The distribution unit was distributing data between the camera and support equipment 1.

5.3.2 Immunity

During the immunity testing the predator camera was in a tour mode which moves it in two planes of movement. While in the tour mode the camera had its wiper running and IR lights on. The distribution unit was distributing data between the camera and support equipment 1.

5.4 EUT Monitoring

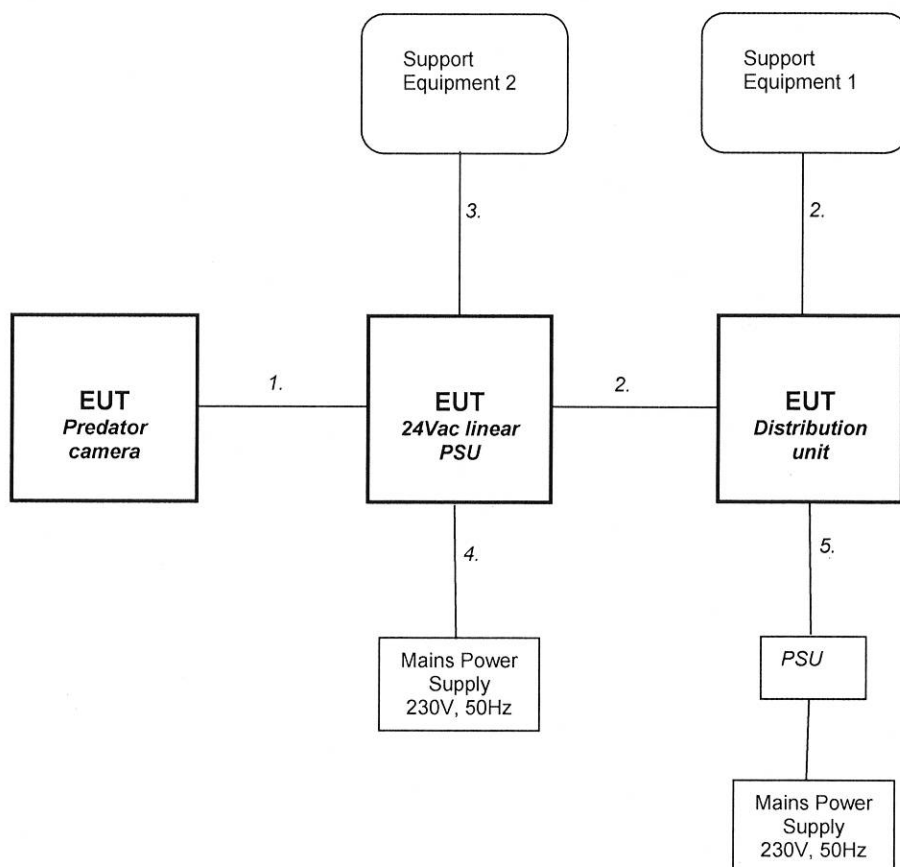
During the immunity testing the camera was monitored visually for movement through its axis, wiper movement and continuous IR lamp operation. Support equipment 2 was also viewed for any degradation of live feed picture. The communication LED's on the distribution unit was monitored for continuous activity.

5.5 EUT Description

The EUT is a CCTV camera system. With a multi point distribution unit used to control up to four separate cameras.

6 Block Diagram

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



Cable index

1. Camera power/comms/video cable, multi-core, unshielded, length 3m
2. Communication cable, Twisted pair, unshielded, length 1.7m
3. Video cable, BNC, shielded, length 3m
4. Mains power cable, 3 core, unshielded, length 2m
5. DC power cable, 2 core, unshielded, length 2m

7 Test Standard Selection

7.1 Product Standard

The following product standard was used as the basis of the test levels required and has been deemed the most appropriate product standard to apply to the Predator CCTV camera, 24Vac Linear PSU and 12Vdc Vision RS485 Distribution unit, or has been requested by the manufacturer:

EN61000-6-3:2007 – *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light industrial environments*
 EN50130-4:1995 +A1:1998 +A2:2003 – *Alarm systems – Part 4: Electromagnetic compatibility – Product family standard: Immunity requirements for components of fire, intruder and social alarm systems*
 EN55022:2006 +A1:2007 *Information technology equipment - Radio disturbance characteristics – Limits and methods of measurement*
 EN55024:1998 +A1:2001, +A2:2003 *Information technology equipment – Immunity Characteristics - Limits and methods of measurement*

7.2 Basic Test Standard Selection

Basic Test Standard	Applicable		Notes
EN61000-4-2:2009 – Electrostatic Discharge	<input checked="" type="checkbox"/>		
EN61000-4-3:2006 +A2:2010 – Radiated Immunity	<input checked="" type="checkbox"/>		
EN61000-4-4:2004 +A1:2010 – Electrical Fast Transients	<input checked="" type="checkbox"/>		
EN61000-4-5:2006 – Voltage Surge	<input checked="" type="checkbox"/>		
EN61000-4-6:2009 – Conducted Radio Frequency Immunity	<input checked="" type="checkbox"/>		
EN61000-4-8:2010 – Power Frequency Magnetic Field	<input type="checkbox"/>		Note 3&4
EN61000-4-9:1994 +A1:2001 – Pulse Magnetic Field	<input type="checkbox"/>		Note 1
EN61000-4-10:1994 +A1:2001 – Damped Oscillatory Magnetic Fields	<input type="checkbox"/>		Note 1&4
EN61000-4-11:2004 – Voltage Dips and Short Interruptions	<input checked="" type="checkbox"/>		
	Class A	Class B	
EN55022:2006 +A1:2007 – Radiated Electromagnetic Emissions	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
EN55022:2006 +A1:2007 – Conducted Electromagnetic Emissions	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
EN55011:2009 +A1:2010 – Radiated Electromagnetic Emissions	<input type="checkbox"/>	<input type="checkbox"/>	
EN55011:2009 +A1:2010 – Conducted Electromagnetic Emissions	<input type="checkbox"/>	<input type="checkbox"/>	
EN61000-3-2:2006 +A2:2009 – Mains Harmonics	<input type="checkbox"/>		Note 2
EN61000-3-3:2008 – Voltage Fluctuations and Flicker	<input type="checkbox"/>		Note 2

Notes:

[1] Not applicable, not required in specification EN50130-4:1995 +A1:1998 +A2:2003, EN55022:2006 +A1:2007, EN55024:1998 +A1:2001 +A2:2003 and EN61000-6-3:2007.

[2] Not applicable, EUT consumes <75W and is unlikely to cause flicker.

[3] Not applicable, EUT contains no devices susceptible to magnetic fields.

[4] 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. However, TRaC are UKAS accredited for the superseded version of the specification.

8 Specification Based Performance Criteria

EN55024 Performance Criteria

The test results may be classified on the basis of the operating conditions and the functional specifications of the equipment under test, according to the following performance criteria:

- A. The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
- B. The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
- C. Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

EN50130-4 Performance Criteria

Performance criteria for electrostatic discharge, Fast burst transients, Voltage surges and voltage dips and interrupts is detailed below;

There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the application of the discharges is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Performance criteria for Radiated Immunity is detailed below;

There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators occurs at a field strength of 3V/m.

For components of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at 10V/m, providing:

- a) there is no permanent damage or change to the EUT (eg no corruption of memory or changes to programmable settings etc)
- b) at 3V/m, any deterioration of the picture is so minor that the system could still be used
- c) there is no observable deterioration of the picture at 1V/m.

Performance criteria for conducted immunity is detailed below;

There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators occurs at $U_0 = 130 \text{ dB}\mu\text{V}$.

For components of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of picture is allowed at $U_0 = 140 \text{ dB}\mu\text{V}$, providing:

- a) there is no permanent damage or change to the EUT (eg no corruption of memory or changes to programmable settings etc)
- b) at $U_0 = 130 \text{ dB}\mu\text{V}$, any deterioration of the picture is no minor that the system could still be used
- c) there is no observable deterioration of the picture at $U_0 = 120 \text{ dB}\mu\text{V}$.

8.1 Manufacturer Based Performance Criteria

The manufacturer has not supplied any specific criteria and therefore any performance loss noted during testing will be given in the relevant test result section.

9 Electrostatic Discharge as per EN61000-4-2:2009

9.1 General

This test simulates human body static discharge that equipment may be subject to. The test also includes discharges that may occur in the vicinity of the equipment thereby setting up a rapidly fluctuating short term electric field.

Two types of discharge are used – Air and Contact. Air discharges are applied to points that are classified as insulating surfaces and contact discharges are applied directly with no air interface on to conducting metallic surfaces of the EUT.

Where an EUT is defined as a class II apparatus then contact points will be connected to ground using two 470kΩ resistors to provide a leakage path to ground so as to prevent charge build up.

The test setup used complies with all the dimension requirements set out in EN61000-4-2:2009. The discharge generator is UKAS calibrated as such.

9.2 ESD Test Parameters

Energy Storage Capacitor	150pF
Discharge Resistance	330Ω
Output Voltage	Up to 8kV – Contact Discharge Up to 15kV – Air Discharge
Discharge Rise Time	0.7 – 1ns
Deviation From Basic Test Standard	None

Testing will only be carried out (unless otherwise stated so in this section) if the following environmental conditions are met:

Ambient temperature in the range 15°C - 35°C
Relative humidity in the range 30% - 60%
Atmospheric pressure in the range 860mbar – 1060mbar

9.3 ESD Discharge Levels

The following test voltages were used for contact and air discharge:

Air Discharge	±2kV	<input checked="" type="checkbox"/>	Contact	±2kV	<input checked="" type="checkbox"/>
	±4kV	<input checked="" type="checkbox"/>	Discharge	±4kV	<input checked="" type="checkbox"/>
	±6kV	<input type="checkbox"/>		±6kV	<input type="checkbox"/>
	±8kV	<input checked="" type="checkbox"/>		±8kV	<input type="checkbox"/>
	±15kV	<input type="checkbox"/>			

- ☐ A minimum of ten discharges at each polarity and at each test voltage were applied.
☒ A minimum of 50 discharges at each point with a minimum of 4 test points as per EN55024:1998 +A1:2001, +A2:2003 section 4.2.1(a) were applied.

9.4 EUT Test Results

For pass/fail criteria definitions please see section 8 of this report. Where a departure from the pass/fail criteria is given for a specific test then this will be noted in this section after the results table.

Air Discharge:

Test levels applied are identified in the previous section.

	<i>EUT Test Points</i>	<i>Performance Criteria Achieved</i>	<i>Performance Criteria Required</i>
1	Enclosure of liner PSU	A	B
2	Enclosure of distribution unit PSU	A	B
3	Camera lens cover	A	B
4	Light lens covers	A	B

Contact Discharge:

Test Levels applied are identified in the previous section.

	<i>EUT Test Points</i>	<i>Performance Criteria Achieved</i>	<i>Performance Criteria Required</i>
1	Horizontal Coupling Plane (HCP)	A	B
2	Vertical Coupling Plane (VCP)	A	B
3	Enclosure of camera (base, arms, top, light enclosure, camera enclosure)	A	B
4	Enclosure of distribution unit	A	B

Note;

The equipment met the performance requirements of EN50130-4 as defined in section 8.

9.5 Test Equipment

The following test equipment was used:

<i>Type of Equipment</i>	<i>Maker/ Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>TRaC Number</i>	<i>Actual Equipment Used</i>
ESD Gun	Schaffner	NSG435	258	UH01	<input type="checkbox"/>
ESD Gun	Schaffner	NSG435	1622	UH85	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>
ESD Gun	Schaffner	NSG432-15	838	L152	<input type="checkbox"/>
ESD Plug-In	Schaffner	402-568	9043	L212	<input type="checkbox"/>
ESD Gun	Schaffner	NSG435	1780	L327	<input type="checkbox"/>
ESD Gun	Schaffner	NSG438	620	L697	<input type="checkbox"/>

10 Radiated Immunity as per EN61000-4-3:2006 + A2:2010

10.1 General

This test simulates the threat imposed by operating the equipment in the vicinity of intentional transmitters both fixed and mobile.

The specification calls up a uniform field test area, TRaC Global Ltd meet the field uniformity requirements set out in EN61000-4-3:2006 +A2:2010 in the frequency range 80MHz to 2.7GHz.

A computer controlled pre-calibrated level is applied to the antenna and the frequency is swept across the range of test at a predefined step size and time.

In order to achieve a test level confidence of 95% the actual field strength used during testing is raised by the level set out in the uncertainty budget for this test. The actual field strength reported in this section does not include this factor.

The test setup used complies with all the dimension requirements set out in EN61000-4-3:2006 +A2:2010.

10.2 Radiated Immunity Test Parameters

Frequency Range	<input checked="" type="checkbox"/> 80MHz – 1GHz <input checked="" type="checkbox"/> 1GHz – 2.7GHz <input type="checkbox"/> 1.4GHz – 2GHz (3V/m) <input type="checkbox"/> 2GHz – 2.7GHz (1V/m)
Modulation type	<input checked="" type="checkbox"/> Amplitude – Sine Wave <input checked="" type="checkbox"/> Modulated keyed carrier – 1Hz Square Wave
Amplitude Modulation Frequency	<input checked="" type="checkbox"/> 1000Hz <input type="checkbox"/> 400Hz
Dwell Time per momentary frequency	<input type="checkbox"/> 1second <input type="checkbox"/> 2seconds <input checked="" type="checkbox"/> 3seconds <input type="checkbox"/> 4seconds
Test Voltage	<input type="checkbox"/> 1V/m <input type="checkbox"/> 3V/m <input checked="" type="checkbox"/> 10V/m <input type="checkbox"/> 20V/m
Note: See frequency range above for any additional information on test levels applied in each range.	
Step Increment	1% of the momentary frequency
Antenna Polarisations	Horizontal and Vertical
Number of EUT Faces Tested	<input checked="" type="checkbox"/> 4 Faces <input type="checkbox"/> 6 Faces
Deviation from Basic Test Standard	None

10.3 Radiated Immunity Test Frequencies

A full list of frequency points is given here in MHz, the exact frequencies used will be dependant upon the test range selected in the table above.

80.000	125.185	195.891	306.532	479.664	750.584	1625.357	2539.469
80.800	126.437	197.850	309.597	484.461	758.089	1641.610	2564.864
81.608	127.701	199.828	312.693	489.305	765.670	1658.026	2590.513
82.424	128.978	201.826	315.820	494.198	773.327	1674.606	2616.418
83.248	130.268	203.845	318.978	499.140	781.060	1691.353	2642.582
84.081	131.571	205.883	322.168	504.132	788.871	1708.266	2669.008
84.922	132.886	207.942	325.390	509.173	796.760	1725.349	2695.698
85.771	134.215	210.021	328.644	514.265	804.727	1742.602	2700.000
86.629	135.557	212.121	331.930	519.408	812.775	1760.028	2000.000
87.495	136.913	214.243	335.249	524.602	820.902	1777.629	2020.000
88.370	138.282	216.385	338.602	529.848	829.111	1795.405	2040.200
89.253	139.665	218.549	341.988	535.146	837.402	1813.359	2060.602
90.146	141.061	220.734	345.408	540.498	845.776	1831.492	2081.208
91.047	142.472	222.942	348.862	545.903	854.234	1849.807	2102.020
91.958	143.897	225.171	352.350	551.362	862.777	1868.305	2123.040
92.878	145.336	227.423	355.874	556.875	871.404	1886.988	2144.271
93.806	146.789	229.697	359.433	562.444	880.118	1905.858	2165.713
94.744	148.257	231.994	363.027	568.068	888.920	1924.917	2187.371
95.692	149.740	234.314	366.657	573.749	897.809	1944.166	2209.244
96.649	151.237	236.657	370.324	579.487	906.787	1963.608	2231.337
97.615	152.749	239.024	374.027	585.281	915.855	1983.244	2253.650
98.591	154.277	241.414	377.767	591.134	925.013	2000.000	2276.187
99.577	155.820	243.828	381.545	597.046	934.263	2020.000	2298.948
100.573	157.378	246.266	385.360	603.016	943.606	2040.200	2321.938
101.579	158.952	248.729	389.214	609.046	953.042	2060.602	2345.157
102.595	160.541	251.216	393.106	615.137	962.572	2081.208	2368.609
103.621	162.146	253.729	397.037	621.288	972.198	2102.020	2392.295
104.657	163.768	256.266	401.008	627.501	981.920	2123.040	2416.218
105.703	165.406	258.828	405.018	633.776	991.739	2144.271	2440.380
106.760	167.060	261.417	409.068	640.114	1000.000	2165.713	2464.784
107.828	168.730	264.031	413.158	646.515	1400.000	2187.371	2489.432
108.906	170.418	266.671	417.290	652.980	1414.000	2209.244	2514.326
109.995	172.122	269.338	421.463	659.510	1428.140	2231.337	2539.469
111.095	173.843	272.031	425.678	666.105	1442.421	2253.650	2564.864
112.206	175.581	274.752	429.934	672.766	1456.846	2276.187	2590.513
113.328	177.337	277.499	434.234	679.494	1471.414	2298.948	2616.418
114.462	179.111	280.274	438.576	686.289	1486.128	2321.938	2642.582
115.606	180.902	283.077	442.962	693.151	1500.989	2345.157	2669.008
116.762	182.711	285.908	447.391	700.083	1515.999	2368.609	2695.698
117.930	184.538	288.767	451.865	707.084	1531.159	2392.295	2700.000
119.109	186.383	291.654	456.384	714.155	1546.471	2416.218	
120.300	188.247	294.571	460.948	721.296	1561.936	2440.380	
121.503	190.129	297.517	465.557	728.509	1577.555	2464.784	
122.718	192.031	300.492	470.213	735.794	1593.331	2489.432	
123.945	193.951	303.497	474.915	743.152	1609.264	2514.326	

Additional spot frequencies due to equipment related harmonics / declared EUT sensitive frequencies: None

10.4 EUT Test Results

For pass/fail criteria definitions please see section 8 of this report. Where a departure from the pass/fail criteria is given for a specific test then this will be noted in this section after the results table.

Test levels applied are identified in the previous section.

Performance Criteria Achieved	Performance Criteria Required
A	A

Note;

The equipment met the performance requirements of EN50130-4 as defined in section 8.

10.5 Test Equipment

The following test equipment was used:

<i>Type of Equipment</i>	<i>Maker/ Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>TRaC Number</i>	<i>Actual Equipment Used</i>
Signal Generator	Marconi	2022D	119164/030	UH02	<input type="checkbox"/>
Bi-Cone Elements	Schwarzbeck	VHBA 9123	None	UH29	<input type="checkbox"/>
Antenna	AR	15342	AT1080	UH65	<input checked="" type="checkbox"/>
Signal Generator	Marconi	2022D	119215/058	UH75	<input type="checkbox"/>
Signal Generator	Marconi	2022D	119224/035	UH89	<input type="checkbox"/>
Directional Coupler	AR	DC3010	17472	UH94	<input type="checkbox"/>
Directional Coupler	AR	DC6180	17671	UH95	<input checked="" type="checkbox"/>
100W Amplifier	AR	100W1000M1	18816	UH103	<input type="checkbox"/>
Signal Generator	Marconi	2023	112224/040	UH105	<input type="checkbox"/>
Anechoic Chamber	EMV	MAC 4	MAC4-1008	UH106	<input type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
RF Sensor	TRaC	None	None	UH118	<input type="checkbox"/>
Isotropic Electric Field Probe	AR	FP6001	302515	UH164	<input type="checkbox"/>
Directional Coupler	AR	DC7144	303761	UH165	<input checked="" type="checkbox"/>
1-4GHZ Amplifier	AR	50S1G4A	303825	UH167	<input checked="" type="checkbox"/>
250W Amplifier	AR	250W1000A	303347	UH168	<input checked="" type="checkbox"/>
Horn Antenna	AR	AT4002A	303850	UH169	<input checked="" type="checkbox"/>
150W Amplifier	AR	150L	10005	UH174	<input type="checkbox"/>
RF Sensor	Pro Hunter	None	None	UH258	<input type="checkbox"/>
RF Power Meter	Rhode & Schwarz	NRP	100511	UH259	<input checked="" type="checkbox"/>
RF Power Sensor	Rhode & Schwarz	NRP-Z11	100002	UH260	<input checked="" type="checkbox"/>
RF Power Meter	Rhode & Schwarz	NRP	100001	UH266	<input type="checkbox"/>
RF Power Sensor	Rhode & Schwarz	NRP-Z11	100004	UH267	<input type="checkbox"/>
Signal Generator	Rhode & Schwarz	SML03	102268	UH297	<input checked="" type="checkbox"/>
RF Sensor	TRaC	None	None	UH382	<input type="checkbox"/>
RF Chamber 1	Rainford EMC	31241	472-CH1-001	UH387	<input type="checkbox"/>
RF Chamber 2	Rainford EMC	31144	472-CH2-001	UH388	<input type="checkbox"/>
Immunity Chamber 3	Rainford EMC	31781	472-CH3-001	UH389	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>

11 Electrical Fast Transients as per EN61000-4-4:2004 +A1:2010

11.1 General

This test applies very fast low energy transients on to the specific line under test. This simulates inductive load switching either directly coupled from equipment on the same supply line or capacitively coupled between cable bundles.

Coupling is achieved directly via the Coupling Decoupling Network (CDN) incorporated within the interference generator, or applied via a capacitive clamp with a distributed capacitance of 150pF.

The test setup used complies with all the dimension requirements set out in EN61000-4-4:2004 +A1:2010. The test generator is UKAS calibrated as such.

11.2 Fast Burst Transient Test Parameters

Pulse Rise Time	5ns
Pulse Duration	50ns
Pulse Repetition Frequency	5kHz
Test Burst Duration	15ms
Test Burst Period	300ms
Dwell	1 minute per test level
Polarity	Positive and Negative
Deviation From Basic Test Standard	None

For mains testing the following coupling points are used:

	Applicable
• Live, Neutral and Earth simultaneously (L1, L2, L3, N and E in the case of three phase systems)	<input checked="" type="checkbox"/>
• Neutral only	<input type="checkbox"/>
• Earth only	<input type="checkbox"/>
• Live only (L1, L2 and L3 individually in the case of three phase systems)	<input type="checkbox"/>

11.3 Fast Transient Test Levels

The following test voltages were used if applicable as per the cable group type:

AC Supply	±500V	<input checked="" type="checkbox"/>	DC Supply	±500V	<input type="checkbox"/>
Line	±1000V	<input checked="" type="checkbox"/>	Line	±1000V	<input type="checkbox"/>
	±2000V	<input checked="" type="checkbox"/>		±2000V	<input type="checkbox"/>
	±4000V	<input type="checkbox"/>		±4000V	<input type="checkbox"/>
	Not Applicable	<input type="checkbox"/>		Not Applicable	<input checked="" type="checkbox"/>
Signal	±500V	<input checked="" type="checkbox"/>			
Lines	±1000V	<input checked="" type="checkbox"/>			
	±2000V	<input type="checkbox"/>			
	±4000V	<input type="checkbox"/>			
	Not Applicable	<input type="checkbox"/>			

11.4 EUT Test Results

For pass/fail criteria definitions please see section 8 of this report. Where a departure from the pass/fail criteria is given for a specific test then this will be noted in this section after the results table.

Test levels applied are identified in the previous section.

	EUT test points – Direct Application	Performance Criteria Achieved	Performance Criteria Required
1	Liner PSU mains input	A	B
2	Distribution PSU mains input	A	B

	EUT test points – Capacitive Clamp Application	Performance Criteria Achieved	Performance Criteria Required
1	Camera cable (both ends)	B	B

Note; during the positive transients the camera re-sets and goes through its calibration procedure. Self recovers after the test.

Note;

The equipment met the performance requirements of EN50130-4 as defined in section 8.

11.5 Test Equipment

The following test equipment was used:

Type of Equipment	Maker/ Supplier	Model Number	Serial Number	TRaC Number	Actual Equipment Used
Fast Transient Generator	Schaffner	NSG1025	390	UH09	<input type="checkbox"/>
Coupling Clamp	Schaffner	CDN 125	272	UH30	<input type="checkbox"/>
Coupling Clamp (Transients)	Schaffner	CDN 125	N/A	UH98	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
RF Sensor	TRaC	None	None	UH118	<input type="checkbox"/>
EFT/B Network Plug-In	Schaffner	PNW2225	200140-042SC	UH161	<input checked="" type="checkbox"/>
Mainframe	Schaffner	NSG2050	200130/556AR	UH170	<input checked="" type="checkbox"/>
RF Sensor	TRaC	None	None	UH382	<input type="checkbox"/>
Fast Transient Generator	Schaffner	NSG2025-1	170	UH383	<input type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>
Coupling Clamp	Schaffner	CDN 125	560	L270	<input type="checkbox"/>
Mainframe	Schaffner	NSG2050	200130-240AR	L447	<input type="checkbox"/>
Transient Plug-In	Schaffner	PNW2225	200140-045SC	L448	<input type="checkbox"/>

12 Voltage Surge Testing as per EN61000-4-5:2006

12.1 General

This test applies a high energy voltage surge on to the selected line under test. This simulates the surge created on the mains and also capacitively coupled on to signal cables during an electrical storm.

- Coupling to dc and mains is achieved directly via the Coupling Decoupling Network (CDN) incorporated within the interference generator.
- Coupling on shielded signal lines is achieved directly as per the specification using the 2Ω source impedance of the generator only using a 20m length of cable.
- Coupling to non-shielded signal lines is achieved directly using a 40Ω CDN giving a $40\Omega + 2\Omega = 42\Omega$ source impedance.

The test setup used complies with all the dimension requirements set out in EN61000-4-5:2006. The test generator is UKAS calibrated as such.

12.2 Voltage Surge Test Parameters

Pulse Rise Time	1.2μs
Pulse Duration	50μs
Pulse Repetition Frequency	Maximum of 1 per minute
Phase angles (for mains tests)	0°, 90°, 180°, 270°
Polarity	Positive and Negative
Number of Discharges	Five per polarity per phase angle per voltage
Deviation From Basic Test Standard	None

For mains testing the following coupling points are used:

- Live to Earth only (L1, L2 and L3 individually to E in the case of three phase systems)
- Neutral to Earth only
- Live to Neutral
- The following combinations in the case of three phase systems (L1-L2, L2-L3, L1-L3, L1-N, L2-N, L3-N)

12.3 Voltage Surge Test Levels

The following test voltages were used if applicable as per the cable group type:

AC Supply	±500V	<input checked="" type="checkbox"/>	AC Supply	±500V	<input checked="" type="checkbox"/>
Line –	±1000V	<input checked="" type="checkbox"/>	Line –	±1000V	<input checked="" type="checkbox"/>
Common	±2000V	<input checked="" type="checkbox"/>	Differential	±2000V	<input type="checkbox"/>
Mode	±4000V	<input type="checkbox"/>	Mode	±4000V	<input type="checkbox"/>
	Not Applicable	<input type="checkbox"/>		Not Applicable	<input type="checkbox"/>
DC Supply	±500V	<input type="checkbox"/>	DC Supply	±500V	<input type="checkbox"/>
Line –	±1000V	<input type="checkbox"/>	Line –	±1000V	<input type="checkbox"/>
Common	±2000V	<input type="checkbox"/>	Differential	±2000V	<input type="checkbox"/>
Mode	±4000V	<input type="checkbox"/>	Mode	±4000V	<input type="checkbox"/>
	Not Applicable	<input checked="" type="checkbox"/>		Not Applicable	<input checked="" type="checkbox"/>
Signal /	±500V	<input type="checkbox"/>			
Control Lines	±1000V	<input type="checkbox"/>			
	±2000V	<input type="checkbox"/>			
	±4000V	<input type="checkbox"/>			
	Not Applicable	<input checked="" type="checkbox"/>			

12.4 EUT Test Results

For pass/fail criteria definitions please see section 8 of this report. Where a departure from the pass/fail criteria is given for a specific test then this will be noted in this section after the results table.

Test levels applied are identified in the previous section.

	<i>EUT test points – Mains/DC supply cables</i>	<i>Performance Criteria Achieved</i>	<i>Performance Criteria Required</i>
1	Liner PSU mains input	A	B
2	Distribution unit mains input	A	B

	<i>EUT test points – Signal/Control Cables</i>	<i>Performance Criteria Achieved</i>	<i>Performance Criteria Required</i>
1	Not Applicable	N/A	B

Note;

The equipment met the performance requirements of EN50130-4 as defined in section 8.

12.5 Test Equipment

The following test equipment was used:

<i>Type of Equipment</i>	<i>Maker/ Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>TRaC Number</i>	<i>Actual Equipment Used</i>
Combination Wave Generator	Schaffner	CWG4-100	931520	UH42	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
RF Sensor	TRaC	None	None	UH118	<input type="checkbox"/>
CDN	Hiltest	CDN208	972420	UH138	<input type="checkbox"/>
Impulse (Surge) Network Plug-In	Schaffner	PNW2055	200130-556AR	UH159	<input type="checkbox"/>
Mainframe	Schaffner	NSG2050	200130/556AR	UH170	<input type="checkbox"/>
RF Sensor	TRaC	None	None	UH382	<input type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>
Mainframe	Schaffner	NSG2050	200130-240AR	L447	<input type="checkbox"/>
Surge Plug-In	Schaffner	PNW2055	200123-05SC	L449	<input type="checkbox"/>
V-Surge Verification Jig	TRaC	None	None	L780	<input type="checkbox"/>

13 Conducted RF Immunity as Per EN61000-4-6:2009

13.1 General

This test simulates the threat imposed by operating the equipment in the vicinity of intentional transmitters both fixed and mobile. It simulates the main coupling method for longer wavelengths (3.75m – 2000m) that couple onto cables that interface with the EUT.

Two coupling methods are used depending upon the type of cable under test:

Clamp

Coupling / Decoupling Network (CDN)

A computer controlled pre-calibrated level is applied to the coupling interface and the frequency is swept across the range of test at a predefined step size and time.

In order to achieve a test level confidence of 95% the actual field strength used during testing is raised by the level set out in the uncertainty budget for this test. The actual field strength reported in this section does not include this factor.

The test setup used complies with all the dimension requirements set out in EN61000-4-6:2009.

13.2 Conducted Immunity Test Parameters

Frequency Range	<input type="checkbox"/> 150kHz – 80MHz <input checked="" type="checkbox"/> 150kHz – 100MHz <input type="checkbox"/> 150kHz – 230MHz
Modulation type	<input checked="" type="checkbox"/> Amplitude – Sine Wave <input checked="" type="checkbox"/> Keyed carrier (1Hz)
Amplitude Modulation Frequency	<input checked="" type="checkbox"/> 1000Hz <input type="checkbox"/> 400Hz
Dwell Time per momentary frequency	<input type="checkbox"/> 1second <input type="checkbox"/> 2seconds <input checked="" type="checkbox"/> 3seconds <input type="checkbox"/> 4seconds
Test Voltage Mains Supply Cables	<input type="checkbox"/> 3Vrms <input checked="" type="checkbox"/> 10Vrms <input type="checkbox"/> 20Vrms
Test Voltage DC Supply Cables	<input type="checkbox"/> 3Vrms <input type="checkbox"/> 10Vrms <input type="checkbox"/> 20Vrms
Test Voltage Signal/Control Cables	<input type="checkbox"/> 3Vrms <input checked="" type="checkbox"/> 10Vrms <input type="checkbox"/> 20Vrms
Step Increment	1% of the momentary frequency
Deviation from Basic Test Standard	None

13.3 Conducted RF Immunity Test Frequencies

A full list of frequency points is given here in MHz; the exact frequencies used will be dependant upon the test range selected in the table above.

0.150	0.313	0.654	1.366	2.852	5.957	12.439	25.975	54.243	113.273
0.152	0.316	0.661	1.380	2.881	6.016	12.563	26.235	54.786	114.406
0.153	0.320	0.667	1.393	2.910	6.076	12.689	26.498	55.333	115.550
0.155	0.323	0.674	1.407	2.939	6.137	12.816	26.763	55.887	116.705
0.156	0.326	0.681	1.421	2.968	6.198	12.944	27.030	56.446	117.872
0.158	0.329	0.687	1.436	2.998	6.260	13.073	27.300	57.010	119.051
0.159	0.333	0.694	1.450	3.028	6.323	13.204	27.573	57.580	120.242
0.161	0.336	0.701	1.464	3.058	6.386	13.336	27.849	58.156	121.444
0.162	0.339	0.708	1.479	3.089	6.450	13.470	28.128	58.738	122.658
0.164	0.343	0.715	1.494	3.120	6.515	13.604	28.409	59.325	123.885
0.166	0.346	0.723	1.509	3.151	6.580	13.740	28.693	59.918	125.124
0.167	0.349	0.730	1.524	3.182	6.646	13.878	28.980	60.517	126.375
0.169	0.353	0.737	1.539	3.214	6.712	14.016	29.270	61.122	127.639
0.171	0.356	0.744	1.555	3.246	6.779	14.157	29.562	61.734	128.915
0.172	0.360	0.752	1.570	3.279	6.847	14.298	29.858	62.351	130.204
0.174	0.364	0.759	1.586	3.312	6.915	14.441	30.157	62.975	131.506
0.176	0.367	0.767	1.602	3.345	6.985	14.586	30.458	63.604	132.821
0.178	0.371	0.775	1.618	3.378	7.054	14.731	30.763	64.240	134.150
0.179	0.375	0.782	1.634	3.412	7.125	14.879	31.070	64.883	135.491
0.181	0.378	0.790	1.650	3.446	7.196	15.028	31.381	65.532	136.846
0.183	0.382	0.798	1.667	3.481	7.268	15.178	31.695	66.187	138.215
0.185	0.386	0.806	1.683	3.515	7.341	15.330	32.012	66.849	139.597
0.187	0.390	0.814	1.700	3.550	7.414	15.483	32.332	67.517	140.993
0.189	0.394	0.822	1.717	3.586	7.488	15.638	32.655	68.192	142.403
0.190	0.398	0.831	1.734	3.622	7.563	15.794	32.982	68.874	143.827
0.192	0.402	0.839	1.752	3.658	7.639	15.952	33.312	69.563	145.265
0.194	0.406	0.847	1.769	3.695	7.715	16.112	33.645	70.259	146.717
0.196	0.410	0.856	1.787	3.732	7.792	16.273	33.981	70.961	148.185
0.198	0.414	0.864	1.805	3.769	7.870	16.435	34.321	71.671	149.667
0.200	0.418	0.873	1.823	3.807	7.949	16.600	34.664	72.388	151.163
0.202	0.422	0.882	1.841	3.845	8.029	16.766	35.011	73.112	152.675
0.204	0.426	0.890	1.860	3.883	8.109	16.933	35.361	73.843	154.202
0.206	0.431	0.899	1.878	3.922	8.190	17.103	35.715	74.581	155.744
0.208	0.435	0.908	1.897	3.961	8.272	17.274	36.072	75.327	157.301
0.210	0.439	0.917	1.916	4.001	8.355	17.446	36.433	76.080	158.874
0.212	0.444	0.927	1.935	4.041	8.438	17.621	36.797	76.841	160.463
0.215	0.448	0.936	1.954	4.081	8.523	17.797	37.165	77.609	162.067
0.217	0.453	0.945	1.974	4.122	8.608	17.975	37.536	78.385	163.688
0.219	0.457	0.955	1.994	4.163	8.694	18.155	37.912	79.169	165.325
0.221	0.462	0.964	2.014	4.205	8.781	18.336	38.291	79.961	166.978
0.223	0.466	0.974	2.034	4.247	8.869	18.520	38.674	80.761	168.648
0.226	0.471	0.984	2.054	4.289	8.957	18.705	39.061	81.568	170.334
0.228	0.476	0.993	2.075	4.332	9.047	18.892	39.451	82.384	172.038
0.230	0.480	1.003	2.095	4.376	9.137	19.081	39.846	83.208	173.758
0.232	0.485	1.013	2.116	4.419	9.229	19.272	40.244	84.040	175.496
0.235	0.490	1.024	2.137	4.464	9.321	19.464	40.647	84.880	177.251
0.237	0.495	1.034	2.159	4.508	9.414	19.659	41.053	85.729	179.023
0.239	0.500	1.044	2.180	4.553	9.508	19.856	41.464	86.586	180.813
0.242	0.505	1.055	2.202	4.599	9.603	20.054	41.878	87.452	182.622
0.244	0.510	1.065	2.224	4.645	9.699	20.255	42.297	88.327	184.448
0.247	0.515	1.076	2.246	4.691	9.796	20.457	42.720	89.210	186.292
0.249	0.520	1.087	2.269	4.738	9.894	20.662	43.147	90.102	188.155
0.252	0.526	1.097	2.292	4.786	9.993	20.869	43.579	91.003	190.037
0.254	0.531	1.108	2.315	4.833	10.093	21.077	44.014	91.913	191.937
0.257	0.536	1.119	2.338	4.882	10.194	21.288	44.455	92.832	193.857
0.259	0.541	1.131	2.361	4.931	10.296	21.501	44.899	93.761	195.795
0.262	0.547	1.142	2.385	4.980	10.399	21.716	45.348	94.698	197.753
0.264	0.552	1.153	2.409	5.030	10.503	21.933	45.802	95.645	199.731
0.267	0.558	1.165	2.433	5.080	10.608	22.152	46.260	96.602	201.728
0.270	0.563	1.177	2.457	5.131	10.714	22.374	46.722	97.568	203.745
0.273	0.569	1.188	2.482	5.182	10.821	22.598	47.189	98.543	205.783
0.275	0.575	1.200	2.506	5.234	10.930	22.824	47.661	99.529	207.840
0.278	0.580	1.212	2.531	5.286	11.039	23.052	48.138	100.524	209.919
0.281	0.586	1.224	2.557	5.339	11.149	23.282	48.619	101.529	212.018
0.284	0.592	1.237	2.582	5.392	11.261	23.515	49.106	102.545	214.138
0.286	0.598	1.249	2.608	5.446	11.373	23.750	49.597	103.570	216.280
0.289	0.604	1.261	2.634	5.501	11.487	23.988	50.093	104.606	218.442
0.292	0.610	1.274	2.661	5.556	11.602	24.228	50.594	105.652	220.627
0.295	0.616	1.287	2.687	5.611	11.718	24.470	51.099	106.708	222.833
0.298	0.622	1.300	2.714	5.668	11.835	24.715	51.610	107.775	225.061
0.301	0.629	1.313	2.741	5.724	11.954	24.962	52.127	108.853	227.312
0.304	0.635	1.326	2.769	5.781	12.073	25.212	52.648	109.942	229.585
0.307	0.641	1.339	2.796	5.839	12.194	25.464	53.174	111.041	230.000
0.310	0.648	1.352	2.824	5.898	12.316	25.718	53.706	112.151	

Additional spot frequencies due to equipment harmonics / declared EUT sensitive frequencies: None.

13.4 EUT Test Results

For pass/fail criteria definitions please see section 8 of this report. Where a departure from the pass/fail criteria is given for a specific test then this will be noted in this section after the results table.

Test levels applied are identified in the previous section.

	<i>EUT test points – Mains/DC supply cables</i>	<i>Coupling Method</i>	<i>Performance Criteria Achieved</i>	<i>Performance Criteria Required</i>
1	Liner PSU mains input	M3	A	A
2	Distribution PSU mains input	M2	A	A

	<i>EUT test points – Signal/Control Cables</i>	<i>Coupling Method</i>	<i>Performance Criteria Achieved</i>	<i>Performance Criteria Required</i>
1	Camera Cable (both ends)	Clamp	A	A

Note;

The equipment met the performance requirements of EN50130-4 as defined in section 8.

13.5 Test Equipment

The following test equipment was used:

<i>Type of Equipment</i>	<i>Maker/ Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>TRaC Number</i>	<i>Actual Equipment Used</i>
Signal Generator	Marconi	2022D	119164/030	UH02	<input type="checkbox"/>
Two Line V-Network	Rohde & Schwarz	ESH3-Z5	863906/018	UH05	<input type="checkbox"/>
Current Probe	Comtest	9145-1	9145-14	UH63	<input type="checkbox"/>
Signal Generator	Marconi	2022D	119215/058	UH75	<input type="checkbox"/>
Signal Generator	Marconi	2022D	119224/035	UH89	<input type="checkbox"/>
75W Amplifier	AR	75A250	18951	UH104	<input checked="" type="checkbox"/>
Signal Generator	Marconi	2023	112224/040	UH105	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
CDN 3-wire	MEB	M3	12869	UH114	<input type="checkbox"/>
CDN 3-wire	MEB	M3	12868	UH117	<input checked="" type="checkbox"/>
RF Sensor	TRaC	N/A	None	UH118	<input type="checkbox"/>
Current Probe	AH System	BCP200/529	103	UH130	<input type="checkbox"/>
Current Probe	AH System	BCP200/529	104	UH134	<input type="checkbox"/>
CDN M2	MEB	M"	12109	UH135	<input checked="" type="checkbox"/>
ISN T200	Schaffner	ISN T2XX	16164	UH153	<input type="checkbox"/>
CRFS ISN Adaptor Set	Schaffner	ADTXXX	None	UH154	<input type="checkbox"/>
RF Sensor	Pro Hunter	None	None	UH258	<input type="checkbox"/>
RF Power Sensor	Rohde & Schwarz	NRP-Z11	100002	UH260	<input type="checkbox"/>
RF Power Meter	Rohde & Schwarz	NRP	100511	UH259	<input type="checkbox"/>
Injection Clamp	Solar	9144-1N	078015	UH364	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>

14 Voltage Dips and Short Interruptions as per EN61000-4-11:2004

14.1 General

This test simulates short duration dips and interruptions that the equipment may be subjected to when connected to the public utility supply.

The test setup used complies with all the dimension requirements set out in EN61000-4-11:2004. The test generator is UKAS calibrated as such.

14.2 Voltage Dips Test Levels

The following test voltages were used if applicable as per the cable group type:

Phase Shift	<input checked="" type="checkbox"/> 0° <input type="checkbox"/> 45° <input type="checkbox"/> 90° <input type="checkbox"/> 135° <input type="checkbox"/> 180° <input type="checkbox"/> 270° <input type="checkbox"/> 315° <input type="checkbox"/> Not applicable dc powered
Reduction	<input type="checkbox"/> 30% reduction for 10ms <input type="checkbox"/> 60% reduction for 100ms <input type="checkbox"/> 60% reduction for 200ms <input type="checkbox"/> >95% reduction for 10ms <input checked="" type="checkbox"/> 30% reduction for 10ms, 20ms, 100ms and 200ms <input checked="" type="checkbox"/> 60% reduction for 10ms, 20ms, 100ms and 200ms <input checked="" type="checkbox"/> 100% reduction for 10ms, 20ms and 100ms <input type="checkbox"/> 100% reduction for 20ms
Interruption	<input checked="" type="checkbox"/> 100% interruption for 5s
Reduction repetition rate	<input checked="" type="checkbox"/> 10s
Number of reductions/interruptions	<input checked="" type="checkbox"/> 3 <input type="checkbox"/> 5
Deviation From Basic Test Standard	None

14.3 EUT Test Results

For pass/fail criteria definitions please see section 8 of this report. Where a departure from the pass/fail criteria is given for a specific test then this will be noted in this section after the results table.

Test levels applied are identified in the previous section.

Applicable	Mains Supply Cable – Voltage Reductions	Performance Criteria Achieved	Performance Criteria Required
<input type="checkbox"/>	30% reduction for 10ms		
<input type="checkbox"/>	60% reduction for 100ms		
<input type="checkbox"/>	60% reduction for 200ms		
<input type="checkbox"/>	>95% reduction for 10ms		
<input checked="" type="checkbox"/>	30% reduction for 10ms, 20ms, 100ms and 200ms	A	B
<input checked="" type="checkbox"/>	60% reduction for 10ms, 20ms, 100ms and 200ms	A	B
<input checked="" type="checkbox"/>	100% reduction for 10ms, 20ms and 100ms	A	B
<input type="checkbox"/>	100% reduction for 20ms		

Applicable	Mains Supply Cable – Voltage Interruptions	Performance Criteria Achieved	Performance Criteria Required
<input checked="" type="checkbox"/>	100% reduction for 5s	B	C

Note; The EUT powers down for each voltage interruption, self recovers after the test.

Note;

The equipment met the performance requirements of EN50130-4 as defined in section 8.

14.4 Test Equipment

The following test equipment was used:

Type of Equipment	Maker/ Supplier	Model Number	Serial Number	TRaC Number	Actual Equipment Used
Variable Transformer	RS Components	8A	207-914	UH34	<input type="checkbox"/>
3 phase Variac	TRaC	None	None	UH80	<input type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
Dropout/Variation Network Plug-in	Schaffner	PNW2003	200138-005SC	UH160	<input checked="" type="checkbox"/>
Mainframe	Schaffner	NSG2050	200130/556AR	UH170	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>
Mainframe	Schaffner	NSG2050	200130-240AR	L447	<input type="checkbox"/>
Dropout/ Variations Plug-In	Schaffner	PNW2003	200135-008SC	L450	<input type="checkbox"/>

15 Radiated Emissions as per EN55022:2006 + A1:2007 – Class B

15.1 General

This test measures radiated electromagnetic emissions that may emanate from EUT enclosures and cables. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

Method 1 – Testing at Ringwood

The test setup used complies with all the dimension requirements set out in EN55022:2006 +A1:2007. The open area test site (OATS) meets the site attenuation measurements required by CISPR16-1-4:2004.

An initial scan is carried out in a screened room in order to establish a frequency list that is attributable to the EUT. Any emissions measurements that fall within 20dB μ V/m of the limit line are then maximised on the OATS by rotating the equipment through 360° and raising/lowering the antenna through 1-4m height for each frequency of interest.

Method 2 – Testing at Malvern / Skelmersdale

The test setup used complies with all the dimension requirements set out in EN55022:2006 +A1:2007. The semi-anechoic chamber used meets the site attenuation measurements required by CISPR16-1-4:2004.

An initial scan is carried out in order to establish a frequency list that is attributable to the EUT. Any emissions measurements that fall within 20dB μ V/m of the limit line are then maximised by rotating the equipment through 360° and raising/lowering the antenna through 1-4m height for each frequency of interest

15.2 Radiated Emission Test Parameters

Frequency Range	<input checked="" type="checkbox"/> 30MHz – 1GHz <input type="checkbox"/> 1GHz – 2GHz <input type="checkbox"/> 2GHz – 5GHz <input type="checkbox"/> 5GHz – 6GHz	<input checked="" type="checkbox"/> N/A – Max EUT Freq Used <108MHz <input checked="" type="checkbox"/> N/A – Max EUT Freq Used <500MHz <input checked="" type="checkbox"/> N/A – Max EUT Freq Used <1GHz
Measurement Bandwidth	<input checked="" type="checkbox"/> 120kHz (Measurements \leq 1GHz) <input type="checkbox"/> 1MHz (Measurements \geq 1GHz)	
Video Bandwidth (measurements >1GHz)	<input type="checkbox"/> 3MHz (Peak Detector) <input type="checkbox"/> <3MHz (Average Detector)	
Detectors	Peak (\leq 1GHz scan / \geq 1GHz Final Measurements) Average (\geq 1GHz Final Measurements) Quasi-peak (\leq 1GHz Final Measurements)	
Quasi-peak Detector Dwell	Minimum 2s per Frequency Point	
Frequency Step Size	50kHz (Measurements <1GHz)	
Antenna Height	1 – 4 Metres	
EUT to Antenna Distance	<input type="checkbox"/> 1m <input checked="" type="checkbox"/> 3m <input type="checkbox"/> 10m <input type="checkbox"/> 30m	
EUT Measurement Height	<input checked="" type="checkbox"/> 0.8m Insulated Table <input type="checkbox"/> 0.1m Insulated Support/Pallet	

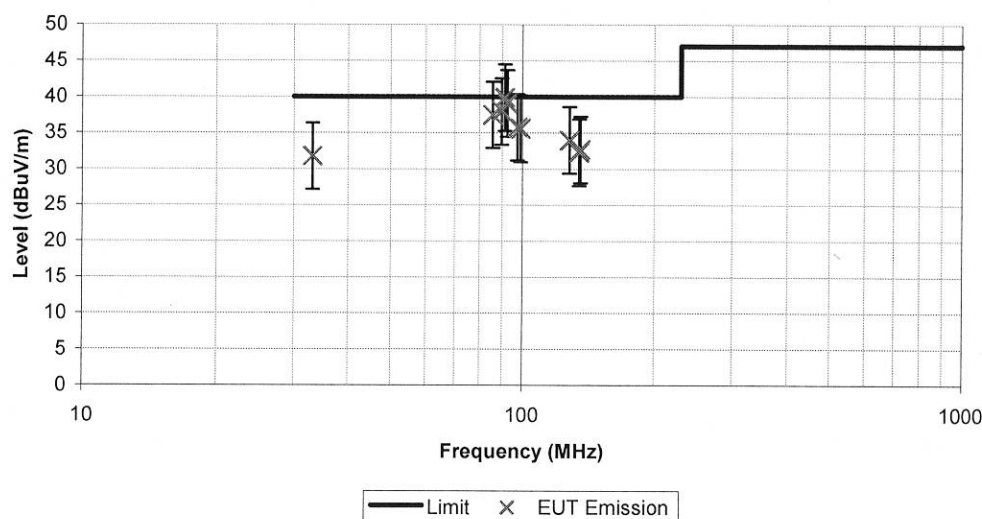
15.3 Test Equipment

The following test equipment was used:

Type of Equipment	Maker/ Supplier	Model Number	Serial Number	TRaC Number	Actual Equipment Used
Bi-Log Antenna 30MHz - 2GHz	Chase	CBL6112	2098	L274	<input type="checkbox"/>
Bi-Log Antenna 30MHz - 1GHz	Chase	CBL6111	1945	L290	<input type="checkbox"/>
UHF Receiver 20 - 1000MHz	Rhode & Schwarz	ESVS10	837948/003	L317	<input type="checkbox"/>
RFS Chamber (MAC)	EMV	MAC 4	MAC4-1009	L323	<input type="checkbox"/>
UHF Receiver 20 - 1000MHz	Rhode & Schwarz	ESVS10	844594/003	L352	<input type="checkbox"/>
UHF Receiver 20 - 1000MHz	Rhode & Schwarz	ESVS20	838804/005	L415	<input type="checkbox"/>
Bi-Log Antenna 30MHz - 2GHz	Schaffner	CBL6112B	2761	L431	<input type="checkbox"/>
RFS Chamber (Comm 1)	TRaC	-	-	L717	<input type="checkbox"/>
RFS Chamber (Comm 2)	TRaC	-	-	L718	<input type="checkbox"/>
UHF Receiver 20 - 1000MHz	Rhode & Schwarz	ESVS10	825892/006	UH04	<input type="checkbox"/>
2 Line V-network	Rhode & Schwarz	ESH3-Z5	863906/018	UH05	<input type="checkbox"/>
Log Periodic Antenna	Schwarzbeck	UHALP 9108	AC2404C/1	UH28	<input type="checkbox"/>
Clamp	Schwarzbeck	MDS21	932354	UH32	<input type="checkbox"/>
E-Field Pre-scan Cable	TRaC	None	None	UH72	<input type="checkbox"/>
Bi-Log Antenna 30MHz - 2GHz	Chase	CBL6112B	2803	UH93	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
UHF Receiver 20 - 1000MHz	Rhode & Schwarz	ESVS10	841431/014	UH186	<input type="checkbox"/>
Bi-Log Antenna	York	CBL611/A	1618	UH191	<input type="checkbox"/>
Bi-Cone Antenna	AH Systems	2101-3	396	UH193	<input type="checkbox"/>
LISN	Rhode & Schwarz	ESH3- Z5.831.5	8407 31/015	UH195	<input type="checkbox"/>
Receiver / Analyser	Rhode & Schwarz	ESU 26	100081	UH377	<input checked="" type="checkbox"/>
Log Periodic Antenna 0.85 – 26.5GHz	Rhode & Schwarz	HL050	100457	UH385	<input type="checkbox"/>
RF Chamber 1	Rainford EMC	31241	472-CH1-001	UH387	<input type="checkbox"/>
RF Chamber 2	Rainford EMC	31144	472-CH2-001	UH388	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>
2 Line V-network	Rhode & Schwarz	ENV216	101027	UH396	<input type="checkbox"/>

15.4 EUT Test Results

Radiated Emissions - Class B 3m measuring distance



Frequency (MHz)	Level (dB μ V/m)	Limit	Antenna Polarisation	Angle (°)	Notes	Margin (dB)
33.15	31.8	40.0	Vertical	108		8.2
85.70	37.5	40.0	Vertical	50	*	2.5
89.80	38.0	40.0	Vertical	90	*	2.0
91.25	39.9	40.0	Vertical	91	*	0.1
92.35	39.1	40.0	Vertical	100	*	0.9
97.50	35.8	40.0	Vertical	33	*	4.2
99.10	35.6	40.0	Vertical	66	*	4.4
128.00	34.0	40.0	Vertical	100		6.0
134.70	32.3	40.0	Vertical	10		7.7
135.45	32.7	40.0	Vertical	70		7.3

Error bars shown on the above graph represent measurement uncertainty for this test, for each frequency point, the EUT is said to either:

- Pass
- Pass within limits of uncertainty
- Fail within limits of uncertainty
- Fail

In the notes section represents a measurement performed at 3m that has been transposed for display on the graph to a measurement distance of 10m. This is performed when the noise floor at the frequency of interest is too high to take a measurement at 10m

* In the notes section highlights a pass within limits of uncertainty.

16 Conducted Emissions as per EN55022:2006 + A1:2007 – Class B

16.1 General

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

The test setup used complies with all the dimension requirements set out in EN55022:2006 +A1:2007.

16.2 Conducted Emission Test Parameters

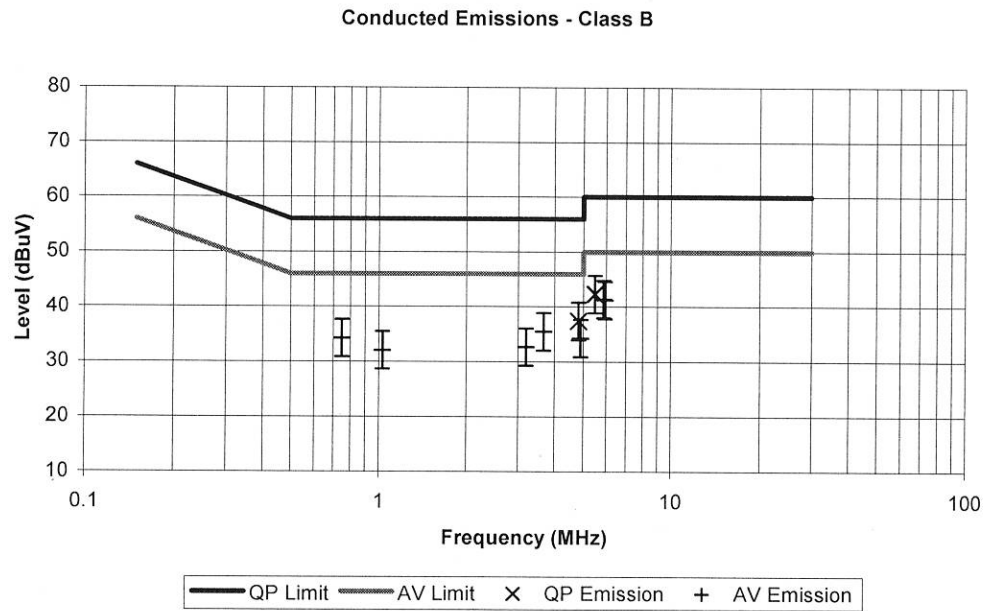
Frequency Range	150kHz – 30MHz
Frequency Step Size	5kHz
Measurement Bandwidth	9kHz
Detectors	Peak (scan) Quasi-peak (Final Measurements) Average (Final Measurements)
Quasi-peak Detector Dwell	Minimum 2s per frequency point
EUT Measurement Height	<input checked="" type="checkbox"/> 0.8m Insulated Table <input type="checkbox"/> 0.1m Insulated Support/Pallet Mounted

16.3 Test Equipment

The following test equipment was used:

Type of Equipment	Maker/ Supplier	Model Number	Serial Number	TRaC Number	Actual Equipment Used
3-Phase LISN/AMN	Schwarzbeck	NSKL8128	8128151	L207	<input type="checkbox"/>
Receiver	Rhode & Schwarz	ESHS20	837960/003	L237	<input type="checkbox"/>
LISN/AMN	Rhode & Schwarz	ESHS3-Z5	839135/013	L238	<input type="checkbox"/>
LISN/AMN	Rhode & Schwarz	ESHS3-Z5	837469/010	L289	<input type="checkbox"/>
Receiver	Rhode & Schwarz	ESHS10	844077/019	L353	<input type="checkbox"/>
Receiver	Rhode & Schwarz	ESHS10	830051/001	UH03	<input type="checkbox"/>
LISN/AMN	Rhode & Schwarz	ESH3-Z5	863906/018	UH05	<input type="checkbox"/>
Current Probe	Comtest	9145-1	946612	UH63	<input type="checkbox"/>
LISN/AMN	Schwarzbeck	NSLK8128	164	UH76	<input type="checkbox"/>
Receiver	Rhode & Schwarz	ESPC	843756/007	UH101	<input type="checkbox"/>
Temp/Humid/Barometer	RS Comp	None	None	UH110	<input type="checkbox"/>
ISN T200	Schaffner	ISN T2XX	16164	UH153	<input type="checkbox"/>
Receiver	Rhode & Schwarz	ESHS10	841429/012	UH187	<input checked="" type="checkbox"/>
LISN	Rhode & Schwarz	ESH3-Z5.831.5	8407 31/015	UH195	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH391	<input checked="" type="checkbox"/>
Temp/Humid/Barometer	Innovative	888R05	None	UH392	<input type="checkbox"/>

16.4 EUT Test Results Linear PSU and Predator camera



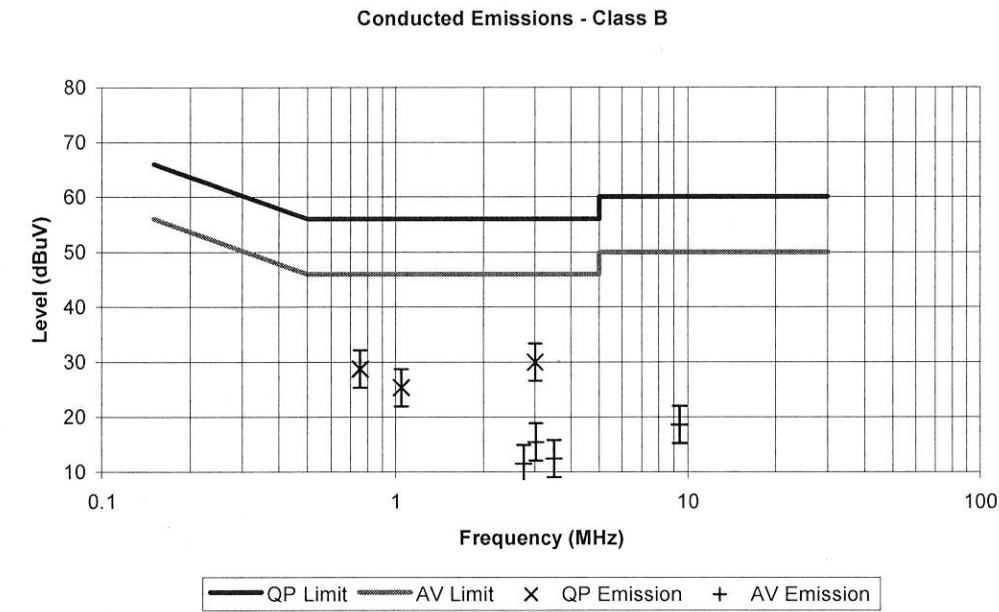
Frequency (MHz)	Quasi Peak Level (dB μ V)	Average Level (dB μ V)	Quasi Peak Limit (dB μ V)	Average Limit (dB μ V)	Notes
0.75		34.3		46	
1.03		32.1		46	
3.19		32.7		46	
3.665		35.5		46	
4.9		34.3		46	
5.93		41.2		46	
4.815	37.4		56		
5.48	42.3		60		
5.86		41.4		50	

Error bars shown on the above graph represent measurement uncertainty for this test, for each frequency point, the EUT is said to either:

- Pass
- Pass within limits of uncertainty
- Fail within limits of uncertainty
- Fail

* In the notes section highlights a pass within limits of uncertainty

16.5 EUT Test Results distribution unit PSU



Frequency (MHz)	Quasi Peak Level (dB μ V)	Average Level (dB μ V)	Quasi Peak Limit (dB μ V)	Average Limit (dB μ V)	Notes
1.04499	25.36		56		
3.02		15.49		46	
9.4		18.61		50	
0.755	28.78		56		
3.005	30		56		
2.74		11.54		46	
3.495		12.46		46	

Error bars shown on the above graph represent measurement uncertainty for this test, for each frequency point, the EUT is said to either:

- Pass
- Pass within limits of uncertainty
- Fail within limits of uncertainty
- Fail

* In the notes section highlights a pass within limits of uncertainty

17 EMC Modifications

The following EMC modifications were incorporated in the equipment during testing, in the order detailed below giving reference to the associated test.

Any modifications carried out during the emissions testing are listed below:

No.	Modification	Reason for modification
1	2x 0.47 μ F 'Y' capacitors fitted at the mains input terminal to the liner PSU	Failing conducted emissions

Any modifications carried out during the immunity testing are listed below:

No.	Modification	Reason for modification
1	10nf capacitor fitted across pins 4 and 5 on com 3 board 000-0154-02	Failing conducted and radiated immunity
2	10nf capacitor fitted across pins 4 and 5 on com 13 board 000-0155-03	Failing conducted and radiated immunity

Upon completion of each modification, consideration was given to the previously conducted test(s). The modification(s) carried out were deemed not to have invalidated previous results.

Note: Opinions made above, fall outside the TRaC Global Ltd. UKAS scope of laboratory accreditation, and are based entirely on rationale and assumption obtained from technical information, competence and experience, deemed correct at the time of test.

18 Conclusion

The EUT meets the performance requirements of the specification, when tested in a system configuration described in section 5 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>Class</i>		<i>Pass</i>	<i>Pass Within Limits of Uncertainty</i>
EN55022:2006 +A1:2007 – Radiated Electromagnetic Emissions	1	A <input type="checkbox"/>	B <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EN55022:2006 +A1:2007 – Conducted Electromagnetic Emissions	3 / 11	A <input type="checkbox"/>	B <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
EN55011:2009 +A1:2010 – Radiated Electromagnetic Emissions		A <input type="checkbox"/>	B <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EN55011:2009 +A1:2010 – Conducted Electromagnetic Emissions		A <input type="checkbox"/>	B <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

IMMUNITY

<i>Basic Test Standard</i>	<i>Test Order</i>	<i>Applicable</i>	<i>Performance Criteria Required</i>	<i>Performance Criteria Achieved</i>
EN61000-4-2:2009 – Electrostatic Discharge	10 / 12	<input checked="" type="checkbox"/>	B	A
EN61000-4-3:2006 +A2:2010 – Radiated Immunity	4 / 9	<input checked="" type="checkbox"/>	A	A
EN61000-4-4:2004 +A1:2010 – Electrical Fast Transients	6	<input checked="" type="checkbox"/>	B	B
EN61000-4-5:2006 – Voltage Surge	5	<input checked="" type="checkbox"/>	B	A
EN61000-4-6:2009 – Conducted Radio Frequency Immunity	2 / 8	<input checked="" type="checkbox"/>	A	A
EN61000-4-8:2010 – Power Frequency Magnetic Field		<input type="checkbox"/>		
EN61000-4-9:1994 +A1:2001 – Pulse Magnetic Field		<input type="checkbox"/>		
EN61000-4-10:1994 +A1:2001 – Damped Oscillatory Magnetic Fields		<input type="checkbox"/>		
EN61000-4-11:2004 – Voltage Dips and Short Interruptions	7	<input checked="" type="checkbox"/>	See Relevant Test Section	

19 Measurement Uncertainty

Static Discharge

Tolerance Parameter	TRaC UH01	TRaC UH85	TRaC L697	TRaC L327	TRaC RESD1	Specification Tolerance
Negative Discharge Current at 2kV	13.40%	11.18%	24.95%	14.98%	11.31%	30%
Negative Discharge Current at 8kV	28.10%	11.96%	24.03%	14.06%	6.85%	30%
Negative Discharge Voltage	3.76%	2.95%	5.97%	3.33%	3.20%	10%
Negative Rise Time at 2kV	7.24%	1.58%	9.69%	4.52%	4.12%	17.7%
Negative Rise Time at 8kV	6.06%	2.17%	3.81%	1.34%	3.18%	17.7%
Positive Discharge Current at 2kV	19.70%	11.18%	13.55%	10.70%	10.08%	30%
Positive Discharge Current at 8kV	28.10%	11.96%	20.09%	15.24%	6.97%	30%
Positive Discharge Voltage	4.35%	2.95%	6.28%	3.71%	2.52%	10%
Positive Rise Time at 2kV	3.72%	5.81%	5.58%	11.57%	1.51%	17.7%
Positive Rise Time at 8kV	6.06%	5.81%	12.40%	12.04%	1.07%	17.7%

Voltage Surge (1.2/50µs)

Tolerance Parameter	TRaC UH42	TRaC L449	TRaC UH159	TRaC L429	TRaC RBest1	Specification Tolerance
Positive Voltage	5.78%	10.37%	7.99%	6.88%	6.13%	10%
Negative Voltage	6.43%	7.33%	8.42%	6.88%	5.34%	10%
Positive Duration	14.50%	12.86%	3.54%	6.29%	19.22%	20%
Negative Duration	12.45%	-16.66µs	3.73%	5.88%	19.02%	20% / +10, -25µs
Positive Front Time	19.83%	16.97%	19.21%	25.80%	10.67%	30%
Negative Front Time	18.96%	18.57%	18.50%	27.50%	12.14%	30%
Peak Current	9.10%	9.76%	9.76%	9.10%	7.71%	10%
Duration (8/20µs)	13.47%	5.26%	14.67%	9.46%	11.14%	10%
Front Time (8/20µs)	7.14%	10.00%	28.12%	9.67%	8.58%	10%
Current Undershoot	Outside Tolerance	Inside Tolerance	Inside Tolerance	Outside Tolerance	Inside Tolerance	30% of Peak Current

Transients (5/50ns)

Tolerance Parameter	TRaC L448	TRaC UH161	TRaC L429	TRaC UH9	TRaC RBest1	Specification Tolerance
Positive Voltage	3.31%	9.37%	7.25%	5.92%	7.71%	10%
Negative Voltage	4.55%	7.03%	4.59%	5.26%	8.80%	10%
Source impedance (positive waveform)	8.07%	7.67%	14.53%	6.45%	8.80%	20%
Source impedance (negative waveform)	N/A	N/A	N/A	N/A	N/A	20%
Pulse Parameters (positive waveform)	4.87%	13.82%	22.08%	19.51%	9.83%	30%
Pulse Parameters (negative waveform)	4.06%	8.90%	12.19%	18.69%	8.07%	30%
Burst Parameters	1.00%	1.00%	1.00%	1.00%	1.00%	10%

Voltage Dips and Short Interruptions

Tolerance Parameter	TRaC UH160	TRaC L450	TRaC L429	TRaC RBest1	Specification Tolerance
Event Duration	1.00%	1.00%	1.00%	1.00%	10%
Repetition Time	1.00%	1.00%	1.00%	1.00%	10%
Supply Regulation	<5µs	<5µs	<5µs	<5µs	<5µs
Phase Delay	2.98%	2.98%	2.98%	2.98%	10%
Switching time at 90 degrees	3.9µs	2.95µs	2.42µs	2.78µs	1-5µs
Switching time at 270 degrees	3.9µs	3.04µs	2.12µs	2.89µs	1-5µs

All uncertainties listed are standard uncertainties multiplied by a coverage factor of $k=1.64$ for tests with given levels and $k=2.00$ for all other tests to give a 95% confidence level.

Conducted Emissions

[1] Conducted Emissions 9kHz to 150kHz = **3.7dB**

[2] Conducted Emissions 150kHz to 30MHz = **3.4dB**

Radiated Emissions

[1] Radiated Emissions 30MHz to 1GHz using Chase Bilog CBL6112 Antenna = **4.6dB**

[2] Radiated Emissions 1GHz to 6GHz using R&S Log Periodic Antenna = **5.5dB**

[3] Radiated Emissions 1GHz to 6GHz using EMCO 3115 Horn Antenna = **5.9dB**

Conducted Immunity

[1] Re-establishment of pre-calibrated field = **1.6dB**

[2] Limiting of injected level using monitor coil = **2.1dB**

Radiated Immunity

[1] Re-establishment of pre-calibrated field level = **1.74dB**

[2] Dynamic feedback calibrated field level = **1.77dB**

Power Frequency Magnetic Field

[1] Magnetic field immunity up to 1000A/m DC-400Hz = **1.7dB**

Spurious Emissions

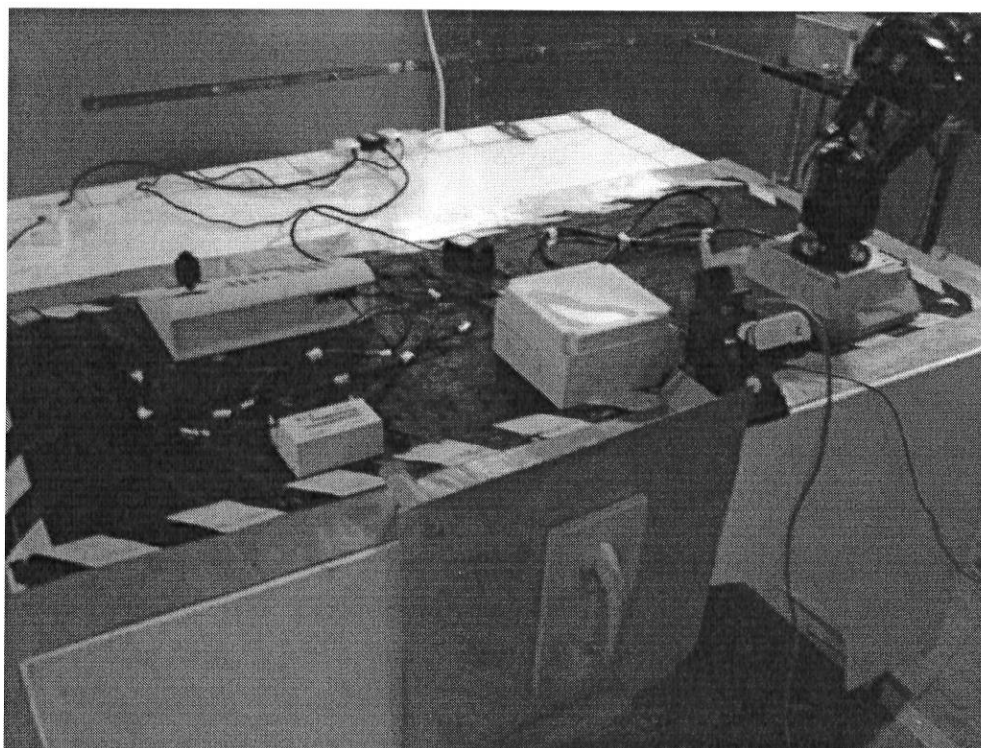
[1] Uncertainty in test result = **4.75dB**

Cable Calibrations

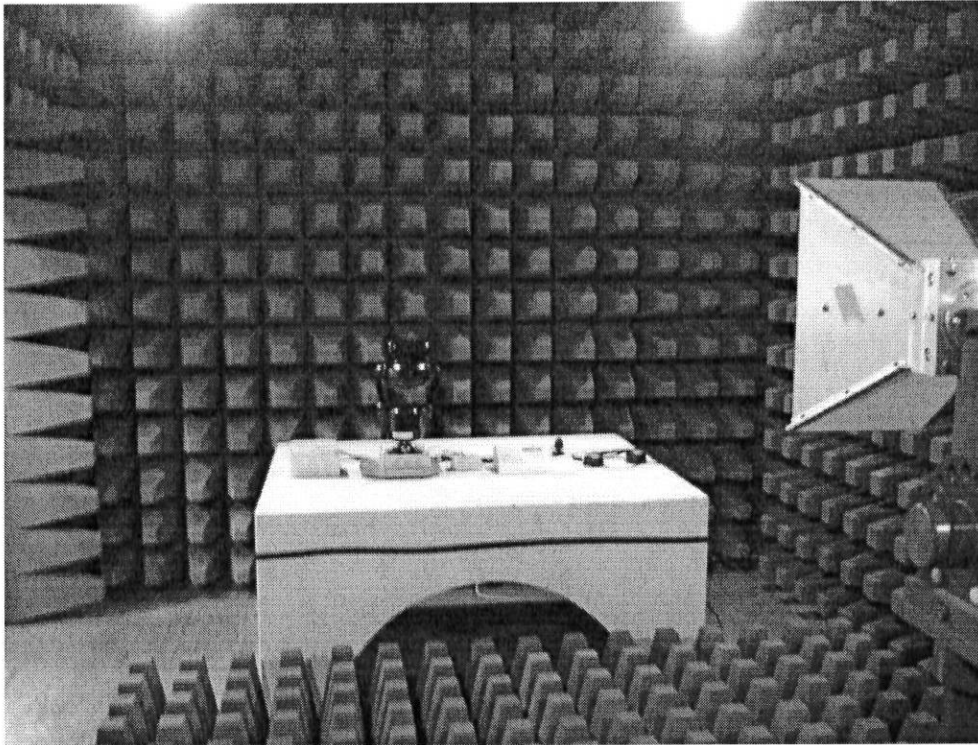
[1] Cable calibration up to 18GHz = **0.4dB**

20 APPENDIX A – PHOTOGRAPHS

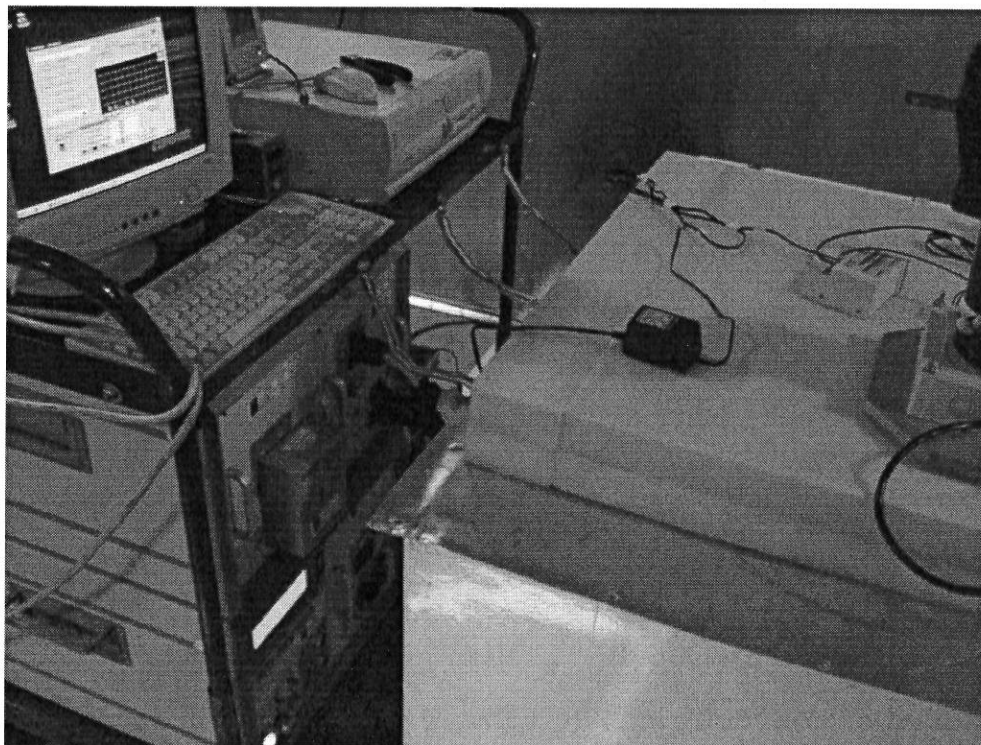
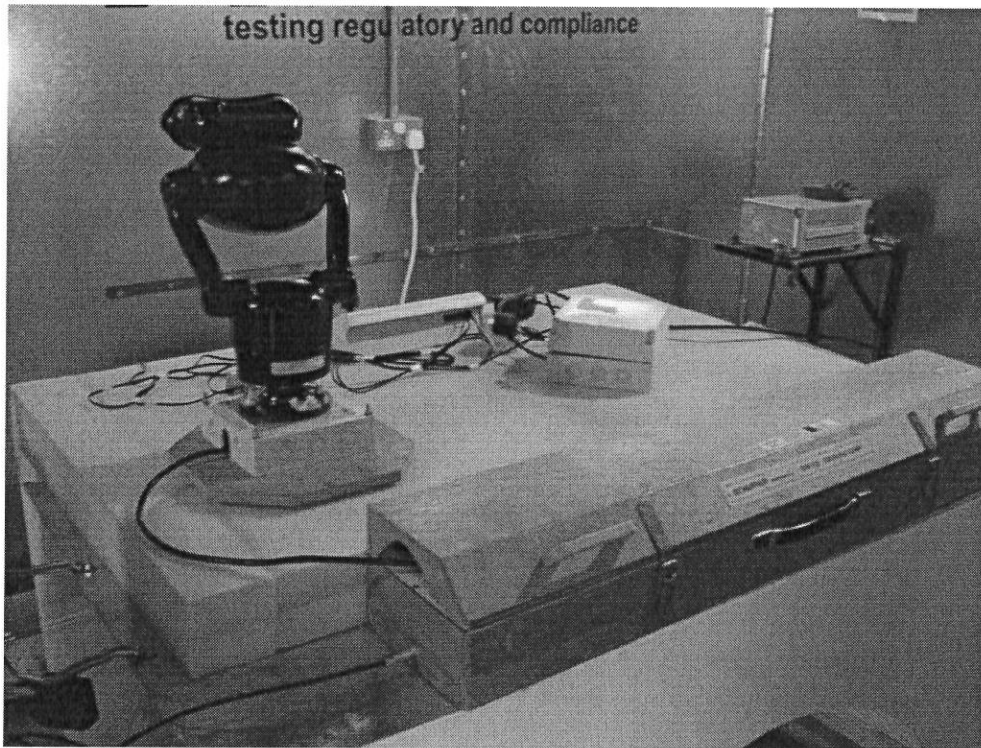
Electrostatic Discharge



Radiated Immunity



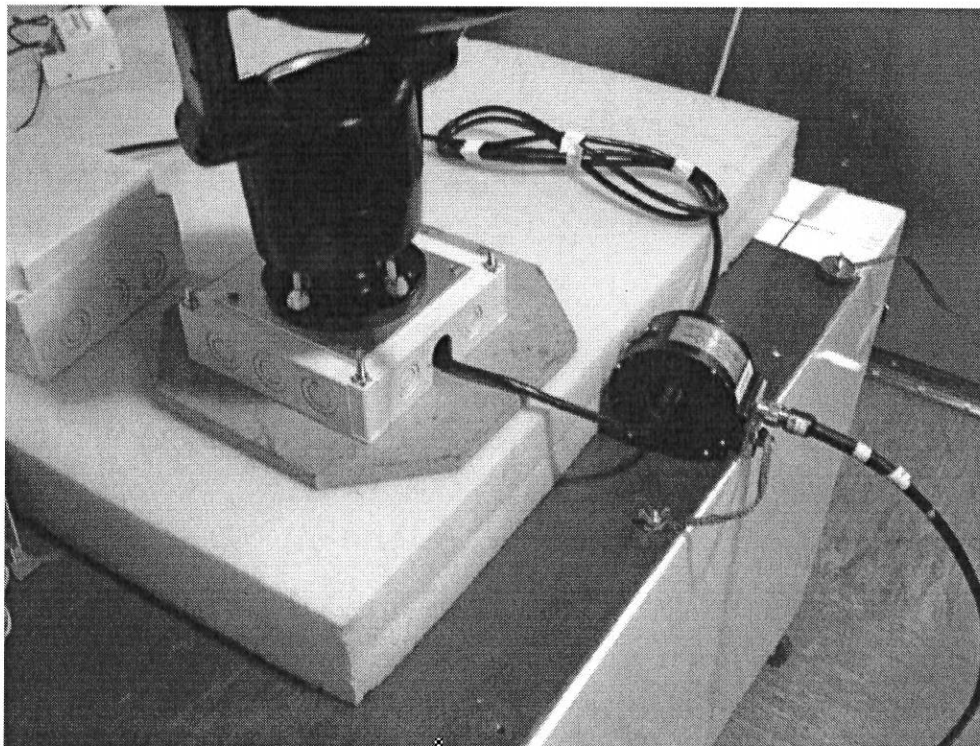
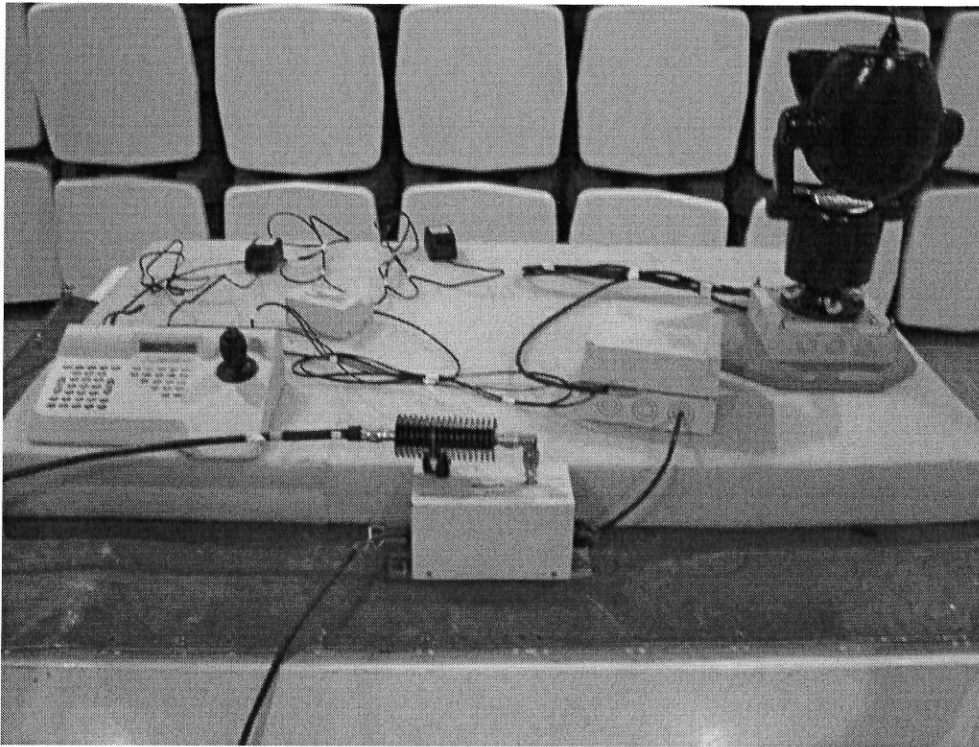
Electrical Fast Transients



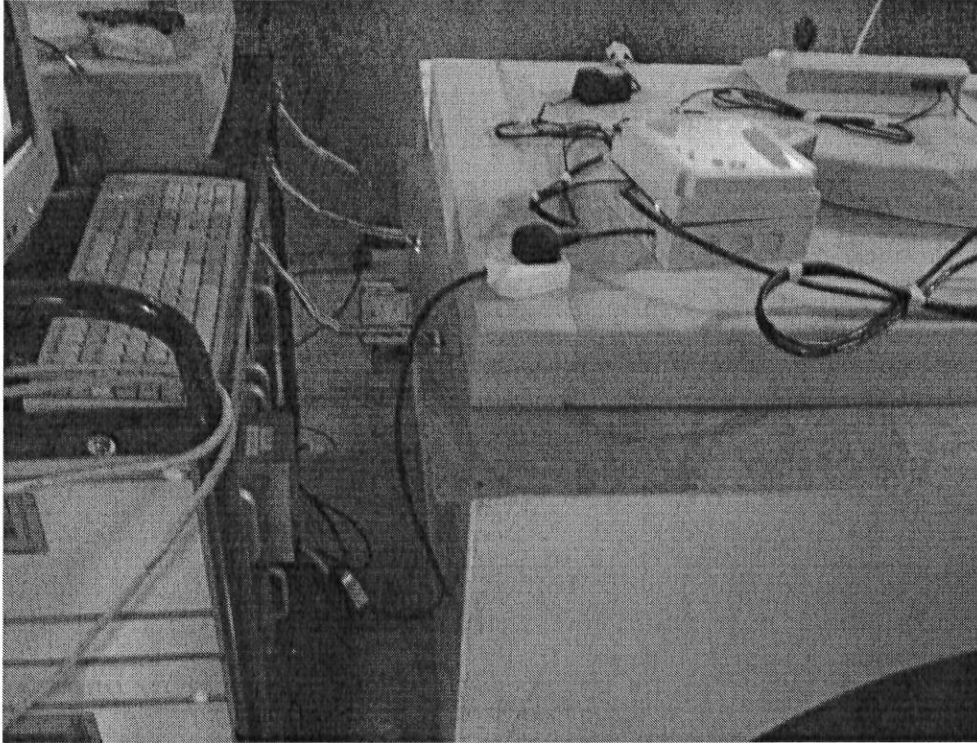
Voltage Surge



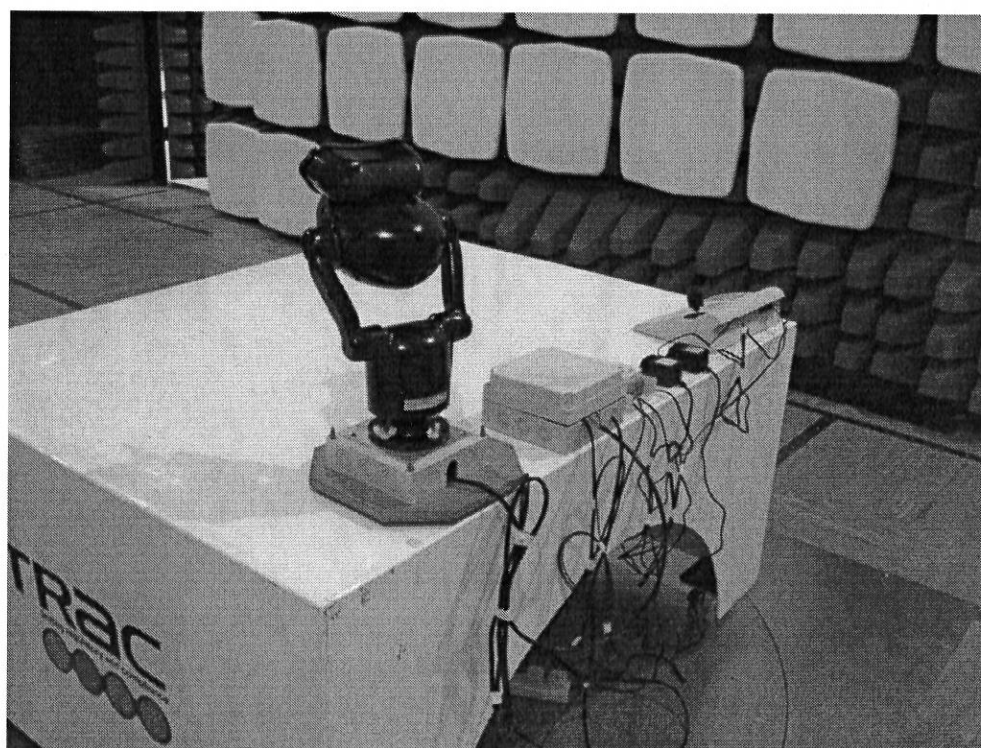
Conducted Radio Frequency Immunity



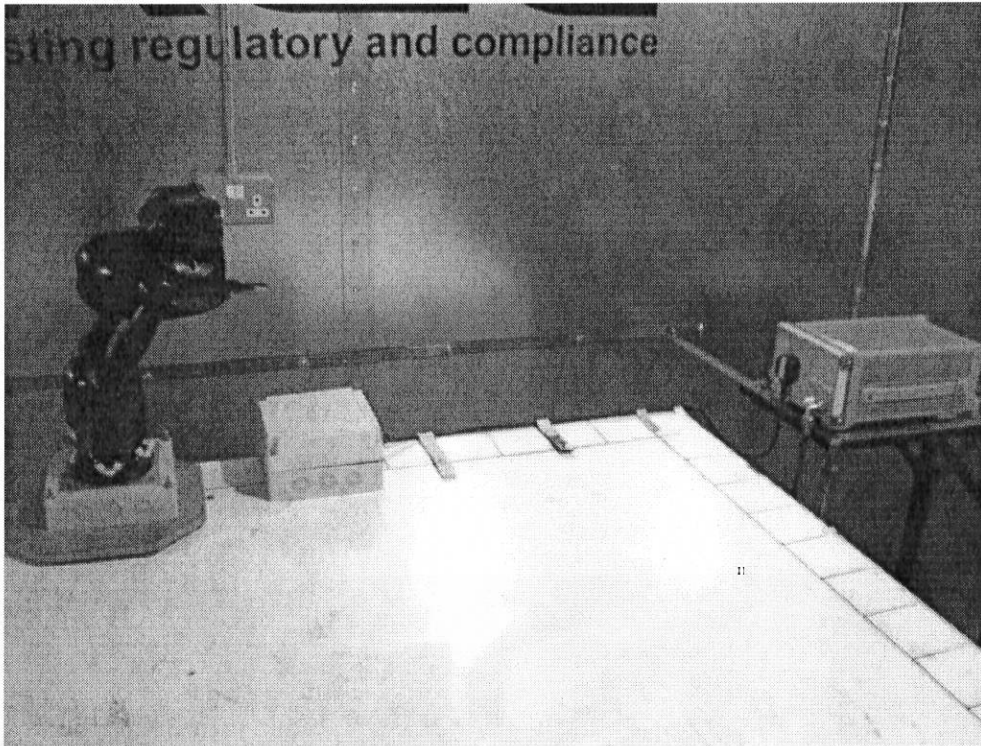
Voltage Dips and Interruptions



Radiated Emissions



Conducted Emissions





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