T R A C O P O W E R
Model: TCL24-112DC
EMC – Test Report

EUT:	TRACOPOWER Model: TCL24-112DC
Serial No.:	N/A
Manufacturer No.:	020PSM162
Manufacturer:	Convertec Ltd. Whitemill Industrial Estate Wexford Republic of Ireland
Tester:	Kevin Burke, Convertec
Date:	12/01/2011

It should be noted, that combining two or more CE compliant finished appliances does not automatically produce a compliant system. The manufacturer of an apparatus or a fixed installation as defined in the "Guide for the EMC Directive 2004/108EC, 21. May 2007" is responsible for the EMC-compliance of the final apparatus.

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1 Conducted Input Emissions Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: 31043355496
Customer Spec: CS-020PSM162.doc
Date: 12/01/2011
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

Notes:

- EUT tested under normal operating conditions of 24V DC input at full load (12V/2A Resistive). DC input supplied by 2x12V batteries.
- Emissions measured using Agilent E7402A analyzer and PMM LISN. Tested to CISPR 16 -1-2:2003 Class B limits.
- Transient limiter used to protect Agilent E7402A, with appropriate correction factors applied.
- Tests carried out in a shielded room.

1.1 Test Setup

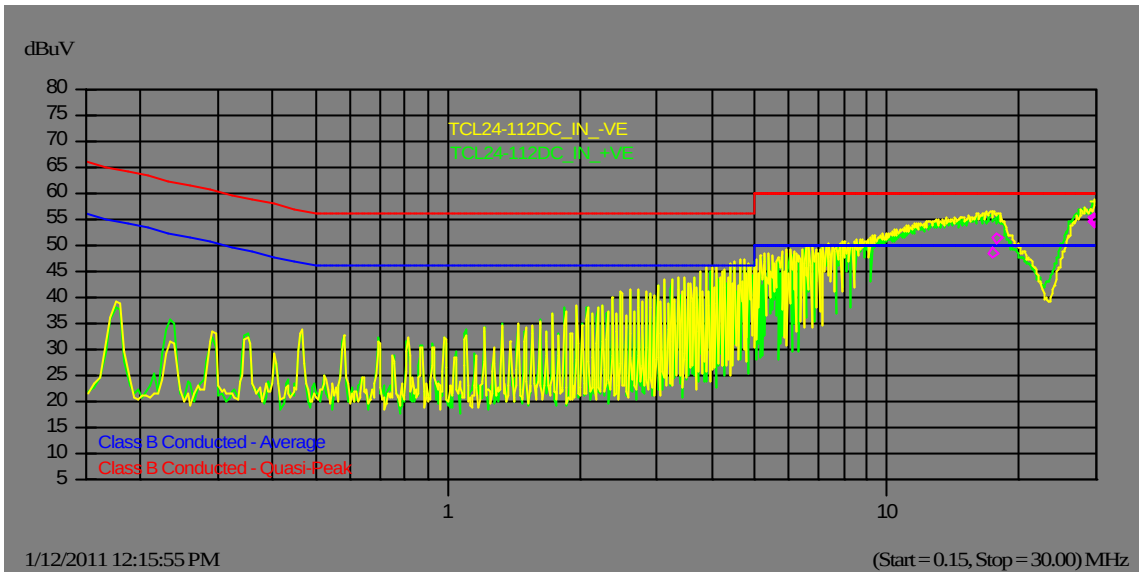
Test Equipment Settings:

Start Freq.	Stop Freq.	Step	Pk Time	Qpk Time	Avg Time
150kHz	30MHz	5kHz	50ms	500ms	50ms

Test Setup:

1.2 Conducted Input Emissions Results

Input +VE and –VE lines to PE.



Remarks:
Yellow and green lines represent peak measurements. Quasi peak and average measurements are retested if the peak measurement is too close to the quasi peak limit (<6dB). Quasi peak measurements were retested at key points (pink diamonds) and values are shown below.

According to IEC61204-3 : 2000-11 for a DC input (<60V) class B limits may be necessary. According to the generic standard IEC61000-6-3-2006 a DC input is regarded as a DC power port and has limits that are higher than the AC mains limits shown above.

Frequency MHz	Peak dBuV	Avg dBuV	QP dBuV	Pk-QP Limit dB	Avg-Avg Limit dB	QP-QP Limit dB
17.493	48.6	37.2	44.3	-11.4	-12.8	-15.7
17.872	51.3	43.5	47.3	-8.7	-6.5	-12.7
29.684	55.2	43.1	49.8	-4.8	-6.9	-10.2
29.794	54.5	44.0	50.1	-5.5	-6.0	-9.9

PASS

2 Conducted Output Emissions Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: 31043355496
Customer Spec: CS-020PSM162.doc
Date: 12/01/2011
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

Notes:

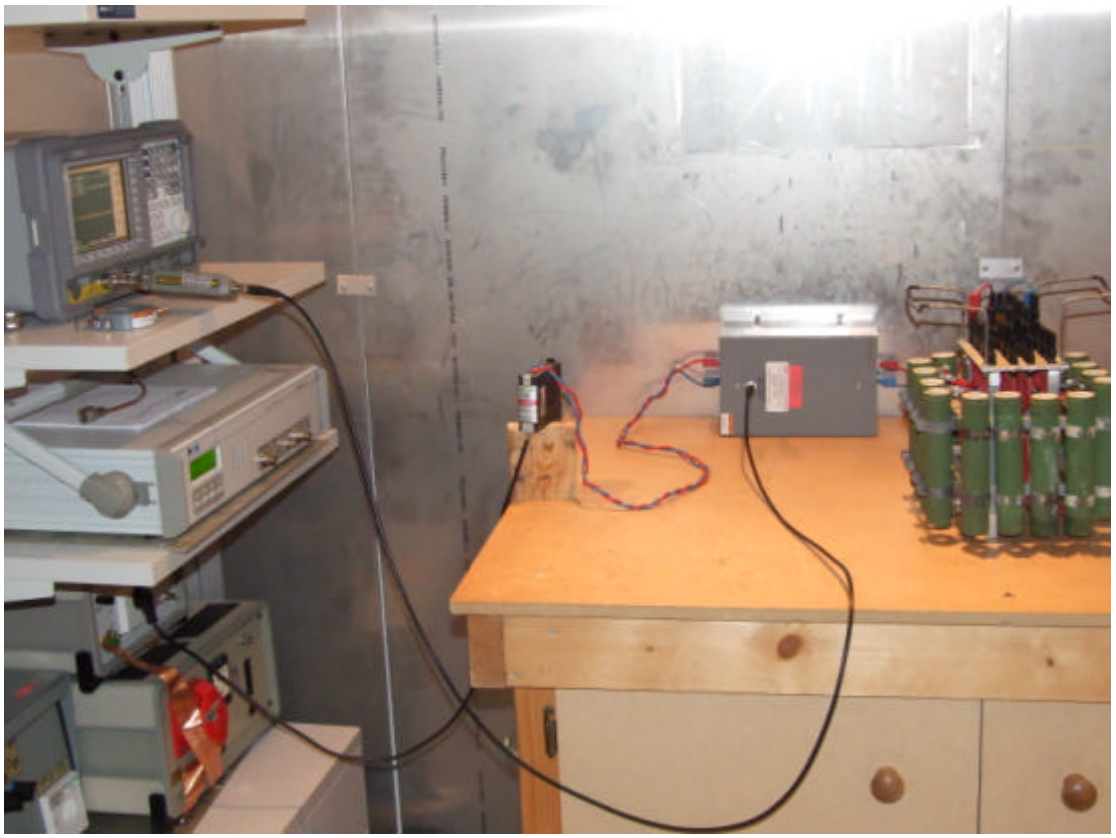
- EUT tested under normal operating conditions of 24V DC input at full load (12V/2A Resistive). DC input supplied by 2x12V batteries.
- Emissions measured using Agilent E7402A analyzer and PMM LISN on the input and FCC LISN on the output. Tested to CISPR 16 -1-2:2003 Class B limits
- Transient limiter used to protect Agilent E7402A, with appropriate correction factors applied for limiter and output LISN.
- Tests carried out in a shielded room

2.1 Test Setup

Test Equipment Settings:

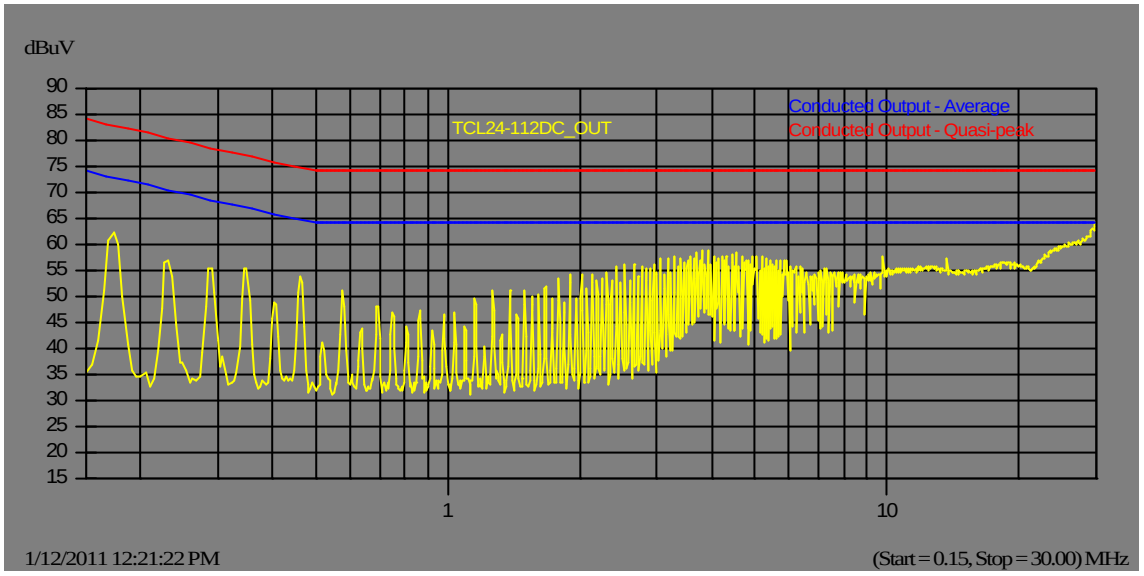
Start Freq.	Stop Freq.	Step	Pk Time	Qpk Time	Avg Time
150kHz	30MHz	5kHz	50ms	500ms	50ms

Test Setup:



2.2 Conducted Output Emissions Results

Output lines to PE.



PASS

3 Radiated Emissions Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: 31043355496
Customer Spec: CS-020PSM162.doc
Date: 12/01/2011
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

For an apparatus to comply with EMC radiated emissions requirements as set down in CISPR 16-2-3, free field measurements need to be performed. A test method similar to that described in IEC61204-3 (for low-voltage power supplies) section 6.4.2 shall be used here instead of free field measurements. This test is designed to give a good indication of whether an EUT will pass free field measurements or not. The absorber clamp used in this method is replaced by a Fischer high frequency current probe (Model: F-33-1). The limits used are set by comparison with open field measurements and are compensated by 20dB per frequency decade. Two limit lines are indicated; Fis_a and Fis_b, and the results may be interpreted as follows:

- Below limit line Fis_b: Limits are kept
- Below limit line Fis_a: Limits probably kept
- Above limit line Fis_a: Limits most likely not kept

Final Compliance can only be established by free field measurements in accordance to the relevant standard applicable to the apparatus or enclosure in which the power supply is used

Notes:

- EUT tested under normal operating conditions of 24V DC input at full load (12V/2A Resistive). DC input supplied by 2x12V batteries.
- Emissions measured using receiver Agilent E7402A analyzer and PMM LISN and FCC RF current probe.
- RF current probe kept a distance of 10cm from input/output
- Tests carried out in shielded room
- Tested to CISPR 16 -2-3:2003 Class B limits

3.1 Test Setup

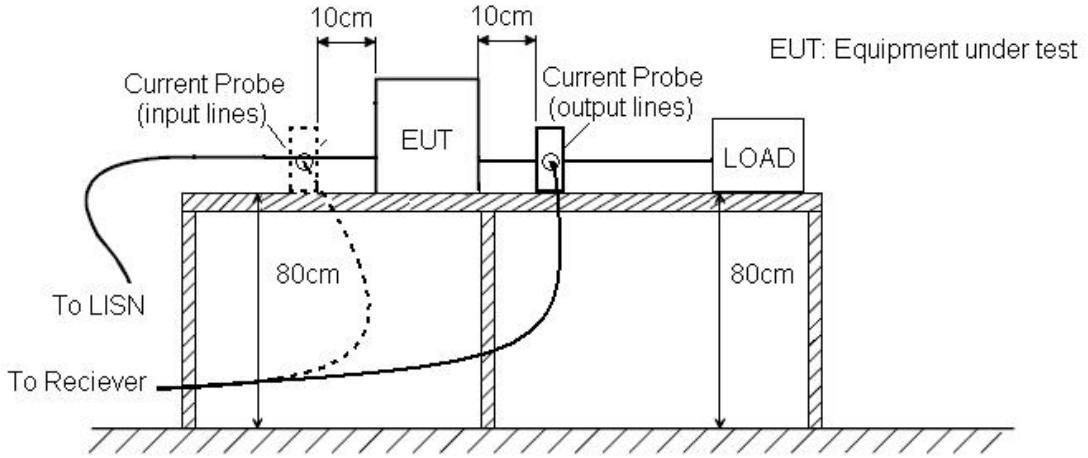


Figure 1. Test set-up for measurement of disturbance power similar to IEC61204-3

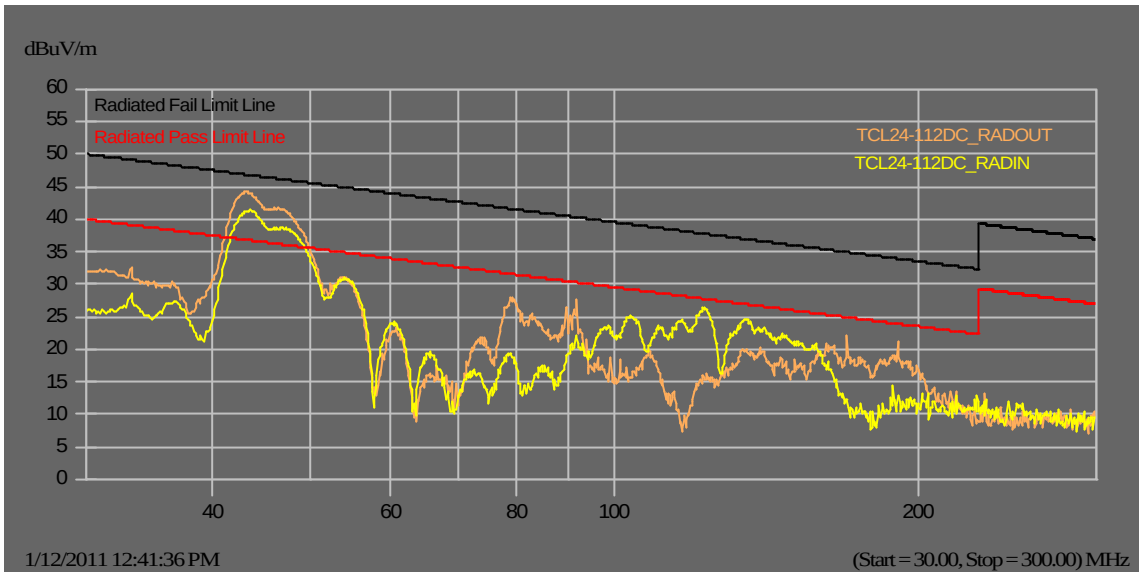
Test Equipment Settings:

Start Freq.	Stop Freq.	Step	Pk Time
30MHz	300MHz	100kHz	10ms

Test Setup: The following shows the setup used for input lines, the setup used for the output lines is the same with the clamp on the output lines.

3.2 Radiated Emissions Results

Input and Output Lines:



PASS

4 Harmonic Current Emissions Test

Not required for a DC input.

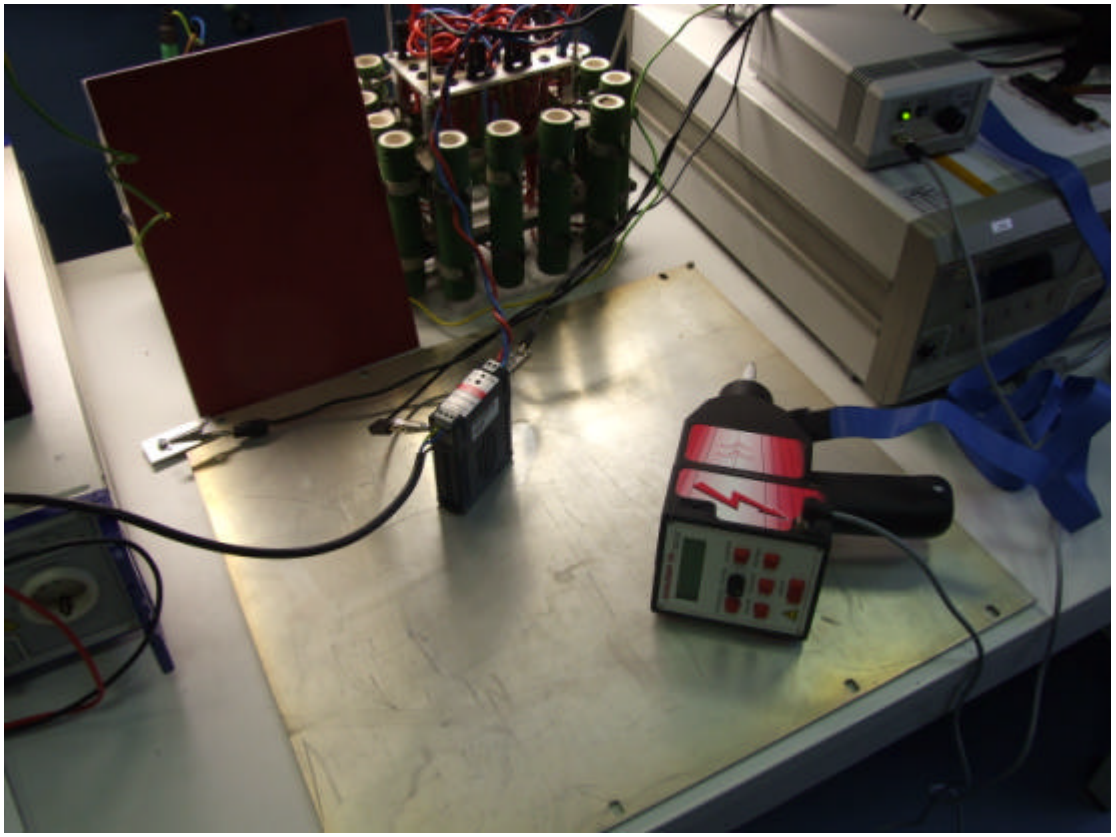
5 Electrostatic Discharge Test

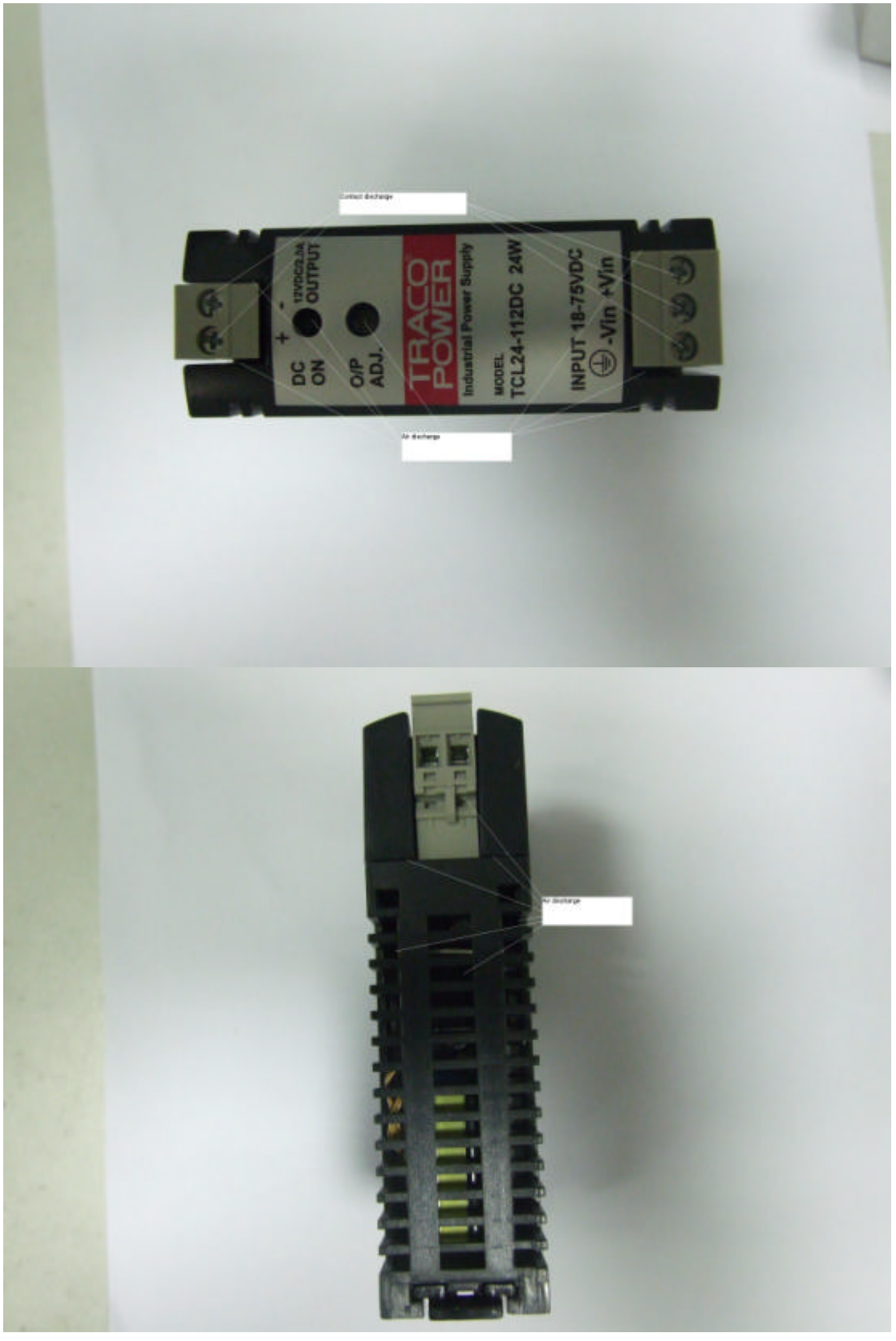
Equipment Under Test: TCL24-112DC
EUT Serial No.: 31043355496
Customer Spec: CS-020PSM162.doc
Date: 12/01/2011
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-2: 2000

Notes:

- EUT tested under approx. normal operating conditions of 23.5V DC input at full load (12V/2A Resistive). DC input supplied by 2x12V batteries.
- Since the EUT input and output is isolated from PE, a 470K HV resistor was placed between the input –ve to PE and the output –ve and PE to provide a discharge path between spikes. The horizontal plate was also connected to PE via a 470K HV resistor.
- Air and contact discharges were applied to various points indicated by the photos below.
- The test voltages were increased (1,2,4 and 6kV) up to the required limits of 8kV/4kV (air/contact).
- 10 positive and negative single discharges were applied to each test point.
- A time interval of 1s was used.
- The ESD generator was held perpendicular to the test-point wherever possible for repeatability of results.
- In the case of contact discharges, the tip touched the EUT test point before the discharge was applied.
- In the case of air discharges, the trigger was engaged at 20cm and the tester moved quickly toward the test point until a spark occurred.

5.1 Set up




TRACO POWER
Industrial Power Supply
MODEL
TCL24-112DC 24W
INPUT 18-75VDC
-Vin +Vin
OUTPUT
DC ON
O/P ADJ.


LISTED
IND. CONT. EQ.
39DA
1. Read instruction manual
2. Do not use without earth (PE)
3. Class I equipment
Risk of electrical shock.
Capacitors store hazardous energy.
Do not remove cover until 5 minutes
after disconnecting the mains.


31043355498
50317001

5.2 ESD Results

	Contact Testpoints	Air Testpoints
EUT: 020PSM162	PASS	PASS

Conclusion:
Meets Classification B

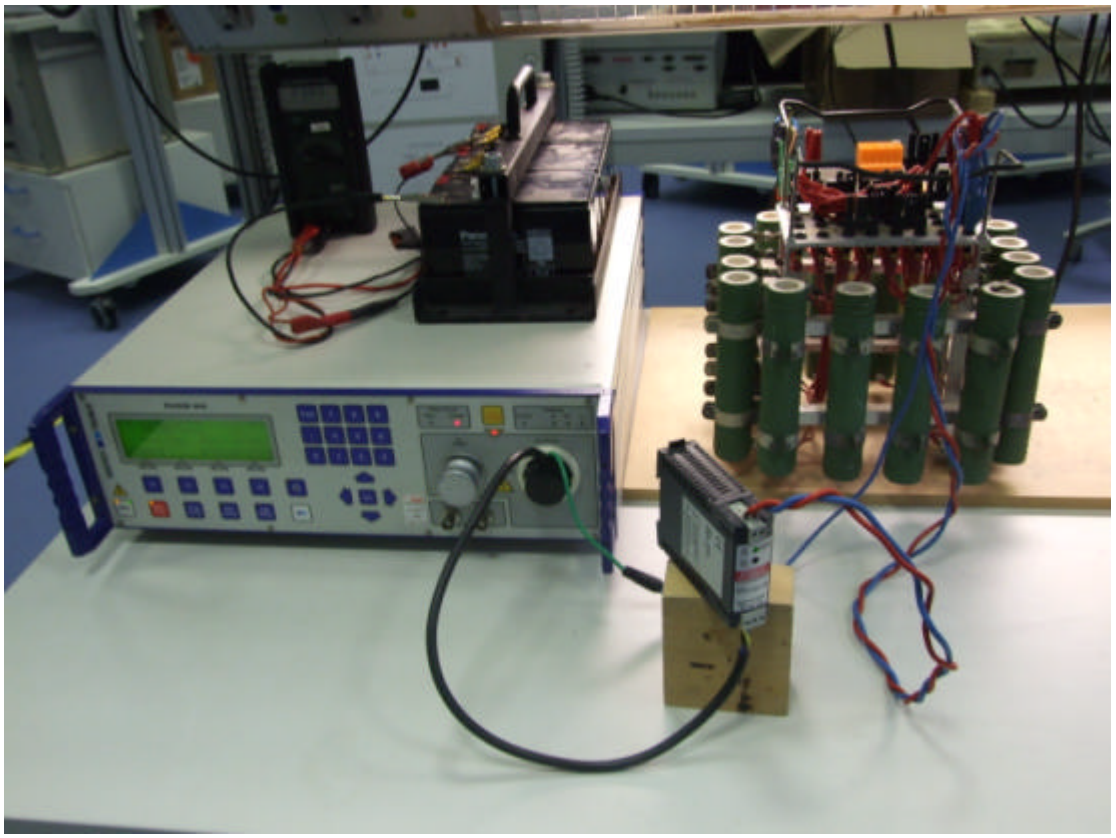
6 Surge Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: 31043355496
Customer Spec: CS-020PSM162.doc
Date: 12/01/2011
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-5: 2005

Notes:

- EUT tested under approx. normal operating conditions of 23.5V DC input at full load (12V/2A Resistive). DC input supplied by 2x12V batteries.
- Used Haefely Surge generator PSURGE 4010
- Voltage test level: +/- 1kV Line-Line, +/- 2kV Line-Earth (installation class 3)
- No. of Surges per set: 5 tests and 5 tests Negative repeated 4 times each.
- Interval Between Surges: 10s

6.1 Test Setup



6.2 Surge Results

	L+VE to L-VE	L+VE to PE	L-VE to PE
EUT: 020PSM162	PASS	PASS	PASS

Conclusion:
Meets Classification B

PASS

7 Fast Transient Test (Burst)

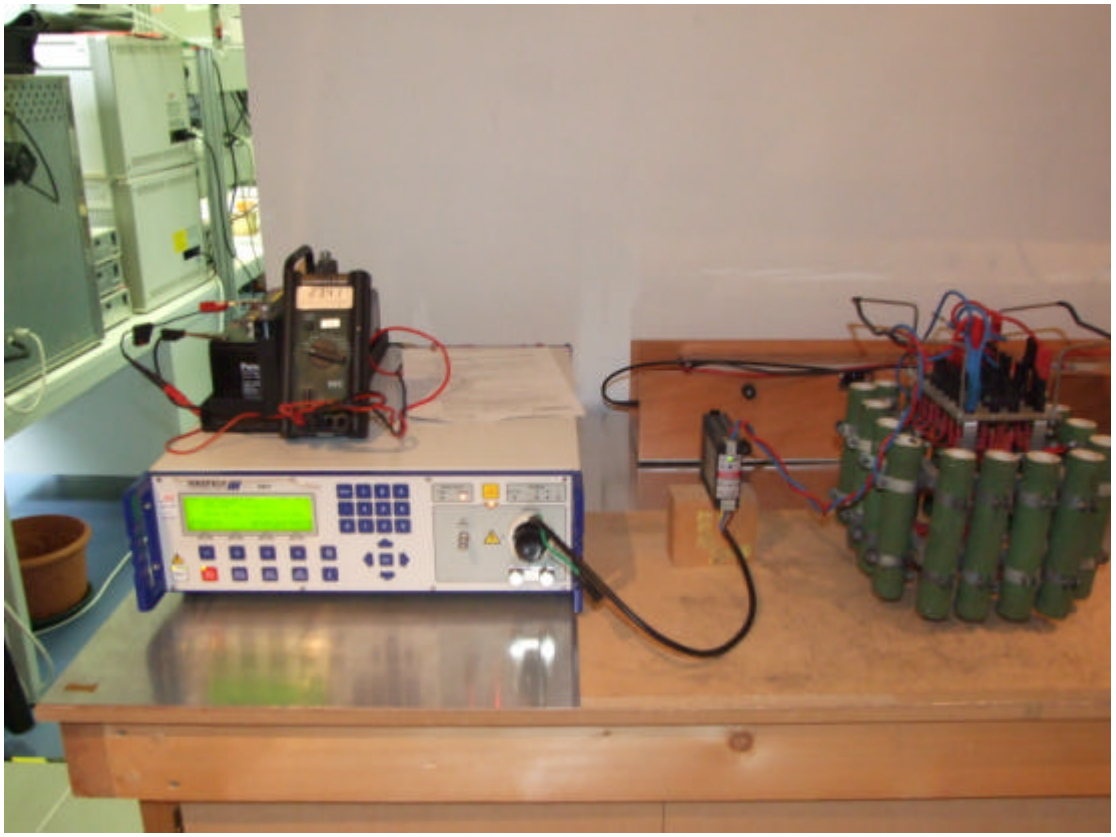
Equipment Under Test: TCL24-112DC
EUT Serial No.: 31043355496
Customer Spec: CS-020PSM162.doc
Date: 12/01/2011
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-4: 2004

Notes:

- EUT tested under approx. normal operating conditions of 23.4V DC input at full load (12V/2A Resistive). DC input supplied by 2x12V batteries.
- Units tested to IEC61000-4-4 test level 3
- Used Haefely Burst tester PEFT 4010
- Voltage test level: +/-2Kv
- Burst Duration: 0.75ms
- Repition rate: 100kHz
- Burst Period: 300ms
- Individual test time: 1 min
- Polarity: Positive and Negative

The output lines were also tested as above to +/-1kV with the Haefely clamp IP4A.

7.1 Test Setup



7.2 Burst Results

EUT: 020PSM162	+VE-G	-VE-G	PE-G	+VE, -VE-G	+VE,PE-G	-VE,PE-G	+VE, -VE,PE-G	Outputs - G
Positive	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Negative	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Positive	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Negative	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Conclusion:
Meets Classification B

PASS

8 Voltage Dips and Short Interruptions

Not required for a DC input.

9 Conducted RF Immunity Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: N/A
Customer Spec: CS-020PSM162.doc
Date: 08/02/2011
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-6:2004

Notes:

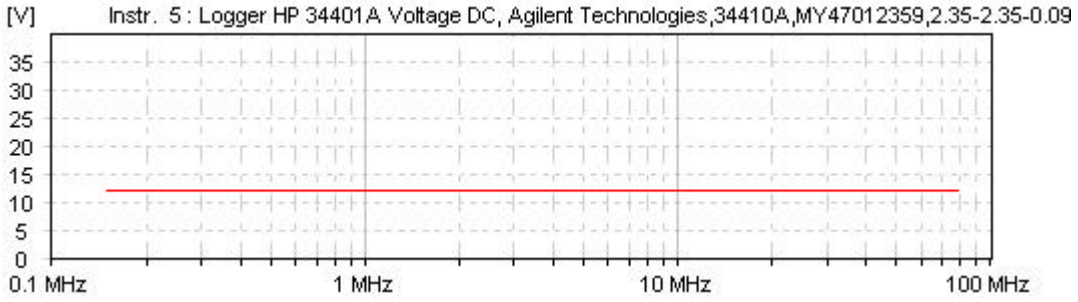
- EUT tested under normal operating conditions of 24VDC input at full load (12V/2A Resistive)
- Test carried out using test generator “EM Test CWS 500N”, Coupling/Decoupling network “EM Test CDN M2/M3”, an attenuator “EM Test ATT6/75” and CDN M2
- and measurement instrument “HP 34401A”
- Units tested to IEC61000-4-6 test level 3

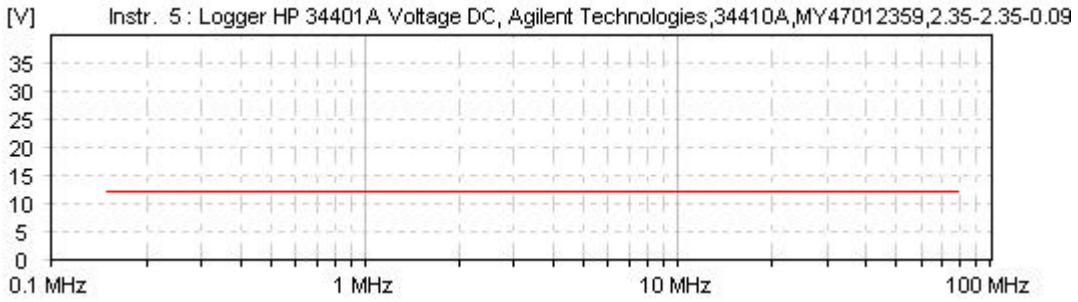
9.1 Test Setup

Test Equipment Settings:

Frq. start [MHz]	Level start [V]	Frq. stop [MHz]	Level stop [V]	Frq. step	td [s]	tp [s]	Modulation
0.150	10.0	80.000	10.0	1.0 %	0.5	0.0	AM 1kHz 80%

9.2 Conducted RF Immunity Results





Conclusion:
Meets Classification A (Ref. Section 9, IEC 61000-4-3)
Test Results were evaluated in relation to the Customer Specification CS-020PSM162.doc and the UUT was considered to have PASSED the tests.

PASS

10 Radiated RF Immunity Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: N/A
Customer Spec: CS-020PSM162.doc
Date: 08/02/2011
Standard: IEC61000-4-3: 2004

Notes:

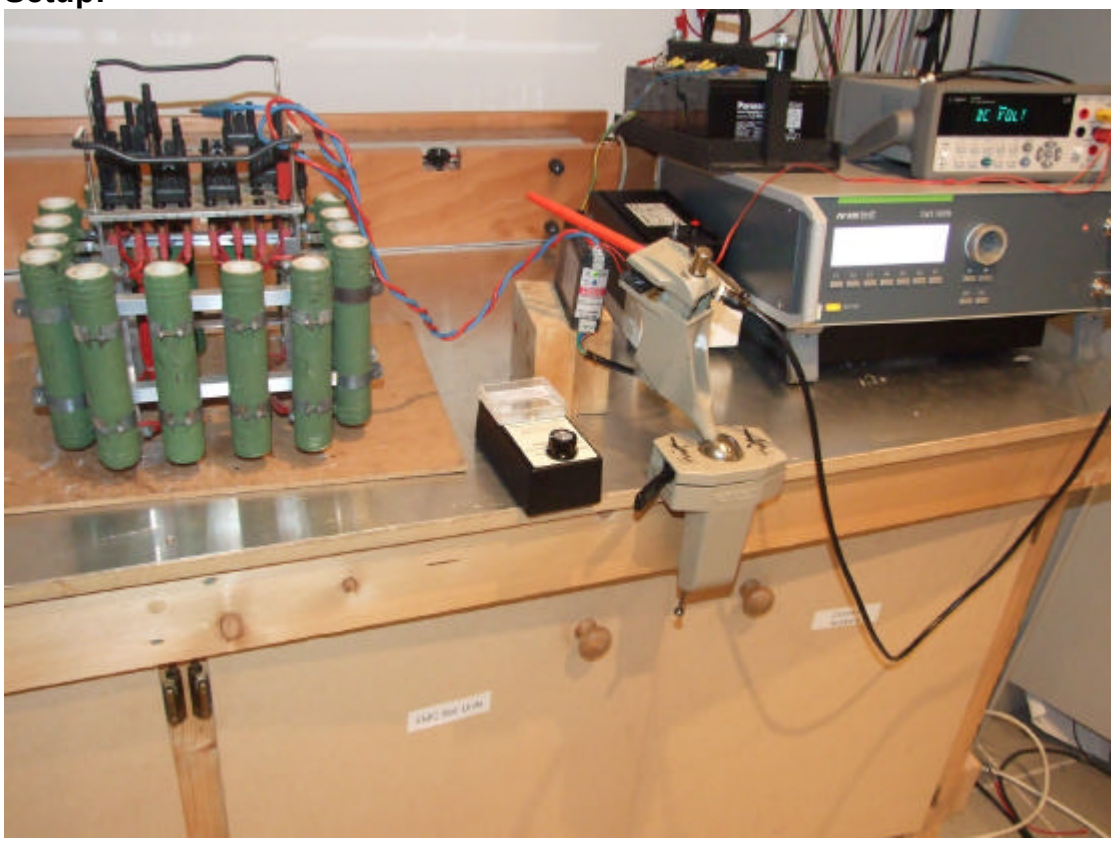
- EUT tested under normal operating conditions of 24VDC input at full load (12V/2A Resistive)
- Test carried out using test generator “EM Test CWS 500N”, E-field probe and measurement instrument “HP 34401A”
- Units tested to IEC61000-4-6 test level 3

10.1 Test Setup

Test Equipment Settings:

Frq. start [MHz]	Level start [V]	Frq. stop [MHz]	Level stop [V]	Frq. step	td [s]
80.0	20.0	1000.0	20.0	1.0 %	1

Test Setup:



10.2 Radiated RF Immunity Result's .

During the immunity test the unit must work as intended.There was no degradation of performance.

Conclusion:
Meets Classification A (Ref. Section 9, IEC 61000-4-3)
Test Results were evaluated in relation to the Customer Specification CS-020PSM162.doc and the UUT was considered to have PASSED the tests.

PASS

11 Power Frequency Magnetic Field Immunity Test

Equipment Under Test: TCL24-112DC
EUT Serial No.: N/A
Customer Spec: CS-020PSM162.doc
Date: 08/02/2011
Standard: IEC61000-4-8: 2001

Notes:

- EUT tested under normal operating conditions of 24VDC input at full load (24V/2.5A Resistive)
- Test carried out using test generator “Chroma Programmable Source model 61604”, Air Core Coil 1 Meter by 1 Meter with 100Turns of 1.32 Magnet wire.
- Measurement instrument “HP 34401A”and “TTI 1906 Multimeter”
- Units tested to IEC61000-4-8 Magnetic field test level 5
- Units were tested continuously in each orientation with 100A Magnetic field strength
- Units were tested for 5 Sec in each orientation with 1000A Magnetic field

11.1 Test Setup

11.2 Power Magnetic Results

50Hz Field

	Continues Level 5 (100A)	5 Sec Level 5 (1000A)
EUT: 020PSM162	PASS	PASS

60Hz Field

	Continues Level 5 (100A)	5 Sec Level 5 (1000A)
EUT: 020PSM162	PASS	PASS

Summary

Regulation	Class/Test Level	Result	Comments
IEC61000-6-3: 2006 + CISPR 16-1-2: 2003 + CISPR 16-2-3: 2003			
Conducted Input (0.15-30MHz)	Class B	PASS	
Conducted Output (0.15-30MHz)	Class B	PASS	
Radiated (30-300MHz)	Class B	PASS	
IEC61000-6-3: 2006 + IEC 61000-3-2: 2005			
Harmonic Current Emissions	Class A	N/A	
IEC61000-6-2: 2005 + IEC 61000-4-2: 2000			
Electrostatic Discharge			
-Air Discharge	+/-2/4/6/8kV (Class B)	PASS	
-Contact Discharge	+/-2/4kV (Class B)	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-5: 2005			
Surge			
-DC Supply	+/- 1kV (ClassB) +VE to -VE	PASS	
	+/- 2kV (ClassB) +VE to PE	PASS	
	+/- 2kV (ClassB) –VE to PE	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-4: 2004			
Fast Transient (Burst)			
-DC Supply	+/- 2kV (ClassB) Between all lines	PASS	
Outputs	+/- 1kV (ClassB) Between all lines	PASS	
IEC61000-6-2:2005 + IEC 61000-4-11:2004			
Voltage Dips			
-DC Supply	100%-0% (b)	N/A	
	100%-40% (b)	N/A	
	100%-70% (b)	N/A	
	100%-80% (b)	N/A	
Short Interruptions (100%-0% for: 0.1s, 0.2s, 0.5s, 1s, 2s and 5s)	(b)	N/A	
IEC61000-6-2: 2005 + IEC61000-4-6:2004 Conducted RF Immunity	Class A	PASS	
IEC61000-4-3: 2004 Radiated RF Immunity	Class A	PASS	
IEC61000-4-8:2001 Power Frequency Magnetic Field	Level 5	PASS	

10 List of Equipment Used:

Description	**Model No.**	**Manufacturer**	**Serial No.**
Test Signal Analyzer	E7402A	AGILENT	MY45119210
LISN 1	PMM L2-16	PMM	1230L00301
LISN 2	FCC-801-M2-50A	FCC	3035
RF Current Probe	F-33-1	FCC	759
Transient Limiter	11947A	Agilent	3107A03645
Precision Power Meter	LMG95	Zimmer	10790709
DC Source (2x12V)	n/a	n/a	n/a
ESD Gun	SESD 200	Schloder	142261
Surge Generator	PSURGE 4010	Haefely	583 334-63
Burst generator	PEFT 4010	Haefely	080 981-08
Dropout & Variation Simulator	NSG 1003	Schaffner	106
Electronic Load	6314/63106	Chroma	63145803
High Power Resistors	n/a	n/a	n/a
Multimeter	M2008	BBC	M24119181
High frequency generator	CWS 500N	EM Test	V0847104427
Coupling/Decoupling Network	CDN M2/M3	EM Test	1108-34
Multimeter	34410A	Agilent	MY47012359
Multimeter	Hit 23S	Metra	NE4126
Multimeter	1906	TTI	240746
AC Programmable Source	61604	Chorma	616040001067
Oscilloscope	TDS1002	Tektronix	C016388
Cables	**Type**	**Length**	**Comments**
Mains Supply Cable	3-wire	1m (2m for Test 2, radiated)	Unshielded
DC Lines Cable	2-wire	1m	Unshielded