

TRACOPOWER

Model: TOP 100-103 EMC – Test Report

EUT: TRACOPOWER Model: TOP 100-103

Serial No.: 20830102164

Manufacturer No.: 100HPP180

Manufacturer: Convertec Ltd.
Whitemill Industrial Estate
Wexford
Republic of Ireland

Tester: Colin Doyle, Convertec

Date: 19/12/2008

This product is not an apparatus as referred to in the “Guide for the EMC Directive 2004/108EC, 21. May 2007”, but a component. 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 is responsible for the EMC-compliance of the final apparatus.

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1 EMC Setup Instructions

To test for EMC compliance on the TOP 100 series units, the units should be mounted on a conductive metal base plate of at least 1mm thickness that extends at least 20mm from all sides as in figure 1(b). The unit must be screwed down on top of 4 metal pillars, which must form a good electrical connection to the base plate. The pillars should be 6mm minimum height and 6.3mm maximum diameter (see figure 1). For safety class I compliance, the base plate should have a good electrical connection to safety earth. For safety class II compliance, no connection to safety earth should be made but the unit should still have a good electrical connection to the base plate via the metal pillars as before. Please see figures 1 (a) & (b) for reference.

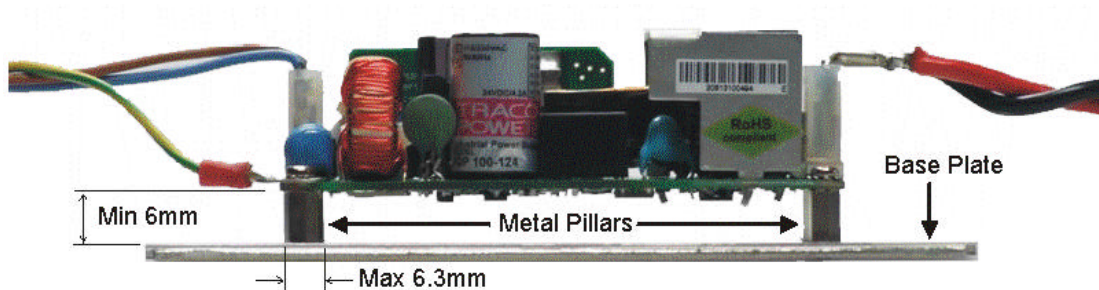


Figure 1(a) TOP 100 Series, EMC setup – Elevation

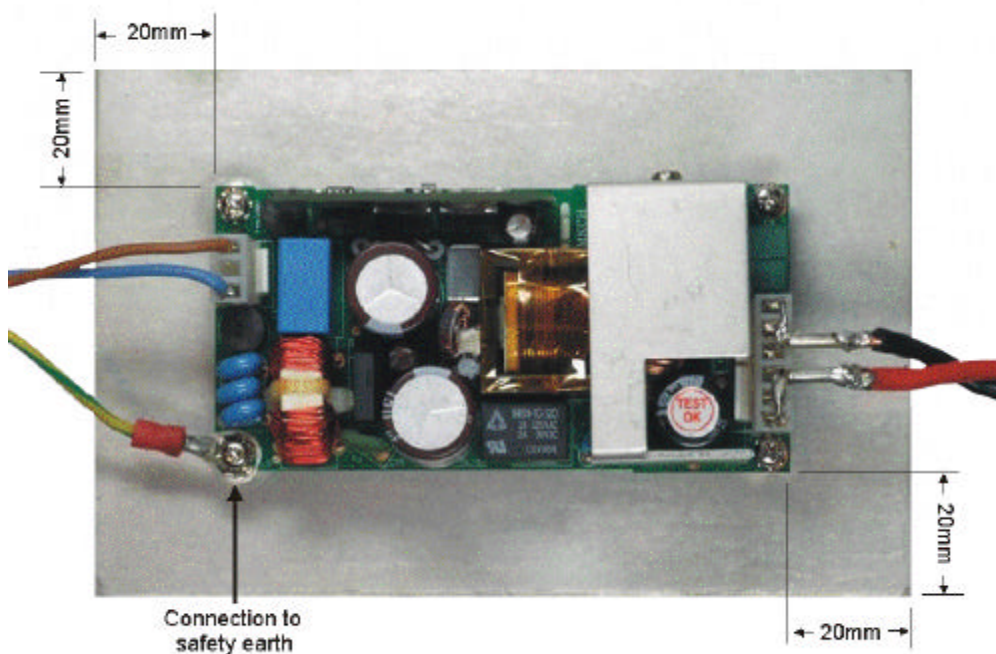


Figure 1(b) TOP 100 Series, EMC setup - Plan

2 Conducted Input Emissions Test

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (3.3V/20A Resistive)
- Emissions measured using PMM 8000 analyzer and PMM LISN
- Tested to CISPR 16 -1-2:2003 Class B limits
- Transient limiter used to protect PMM 8000, with appropriate correction factors applied
- EUT attached to a small conductive plane in a shielded room
- Tests carried out with and without safety earth connected

2.1 Test Setup

Test Equipment Settings:

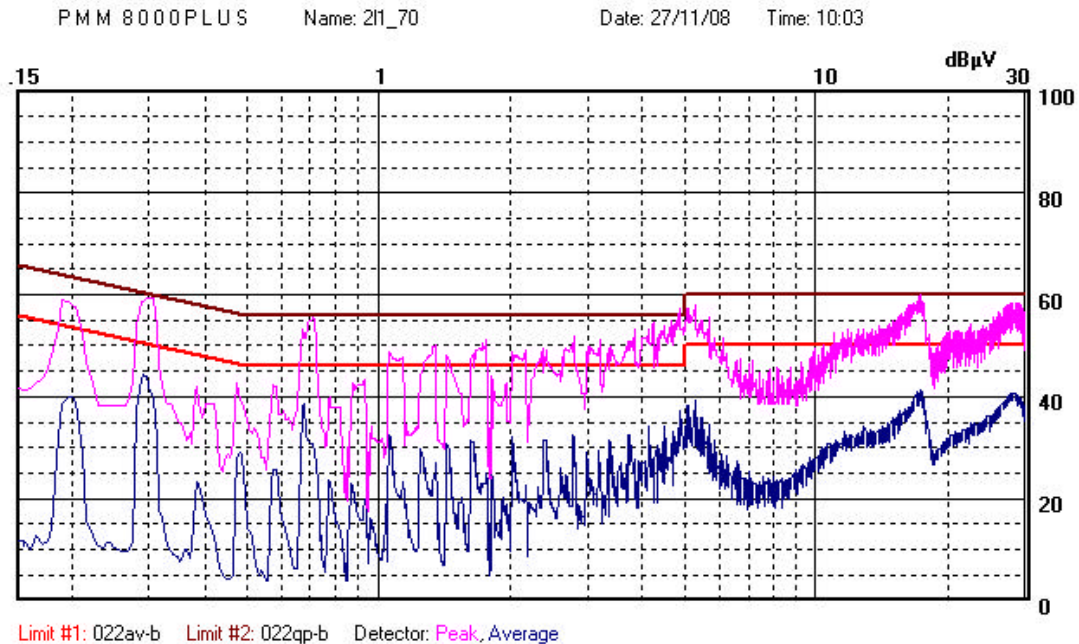
Start Freq.	Stop Freq.	Step	Pk Time	Qpk Time	Avg Time
150kHz	30MHz	5kHz	50ms	500ms	50ms

Test Setup:

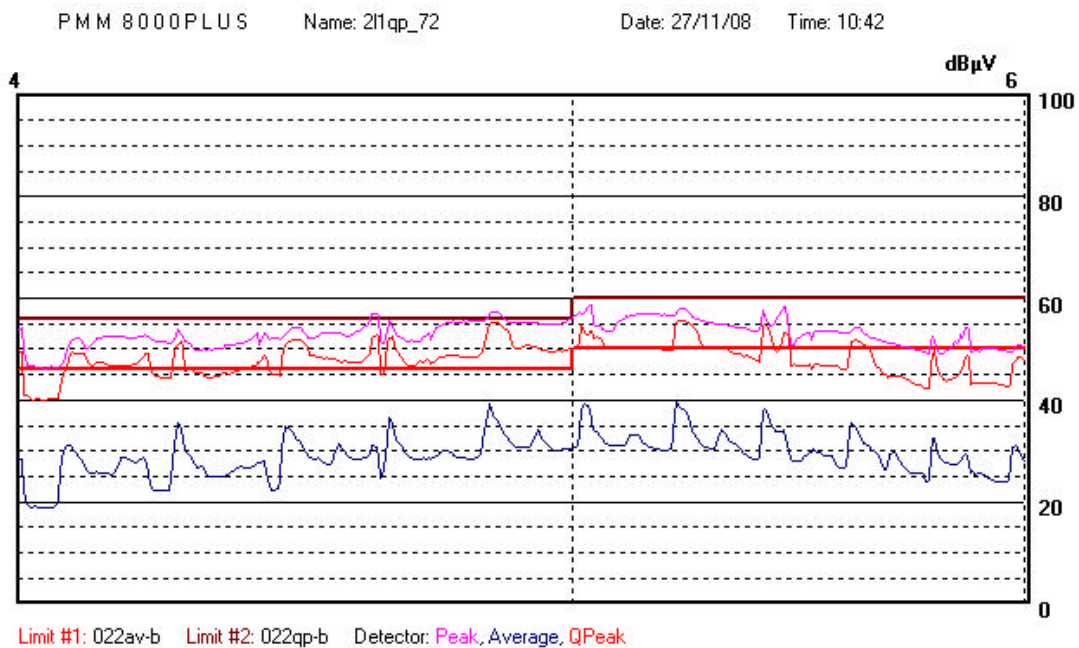


2.2 Conducted Input Emissions Results

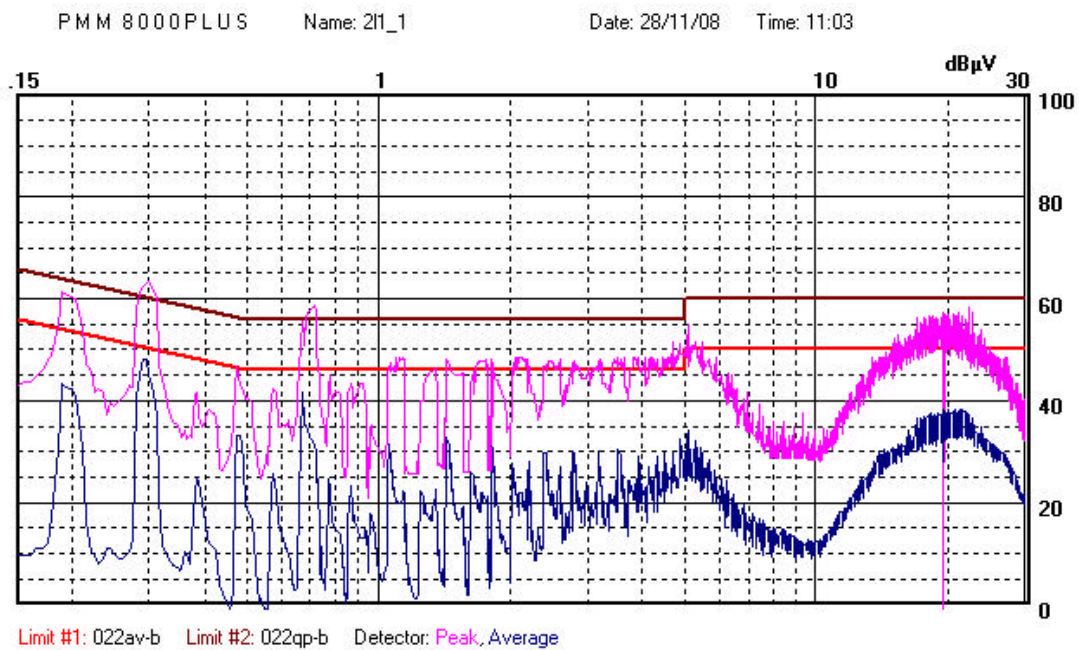
L1 – With safety earth connected:



As the peak measurement exceeds the limits at ~5MHz, a Quasi-peak measurement was taken from 4MHz to 6MHz as follows:

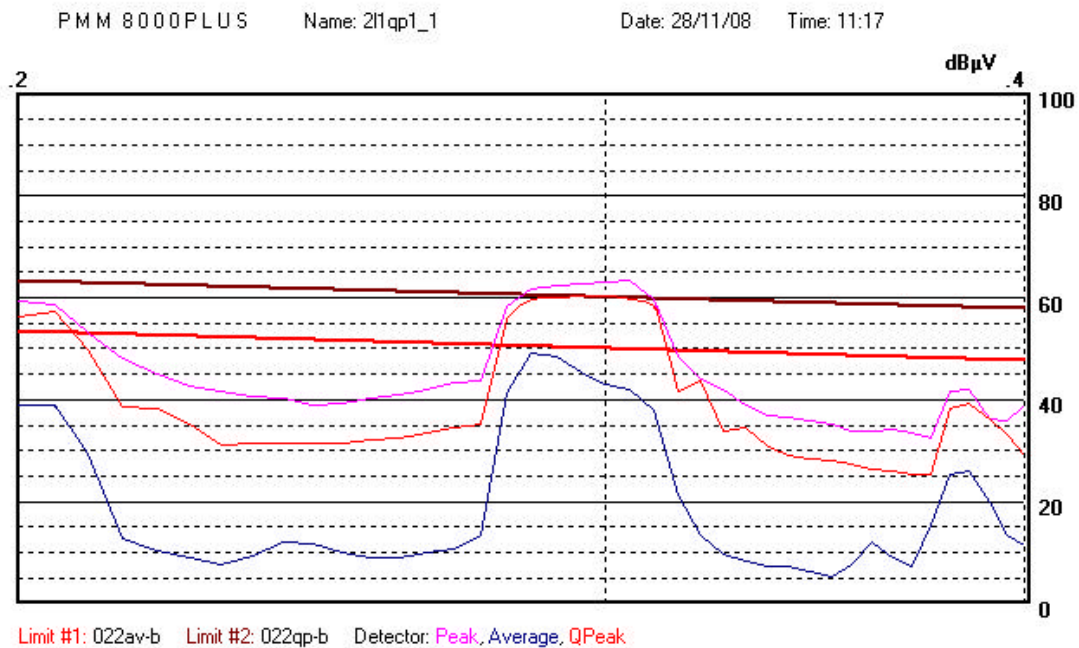


L1 – Without safety earth connected:

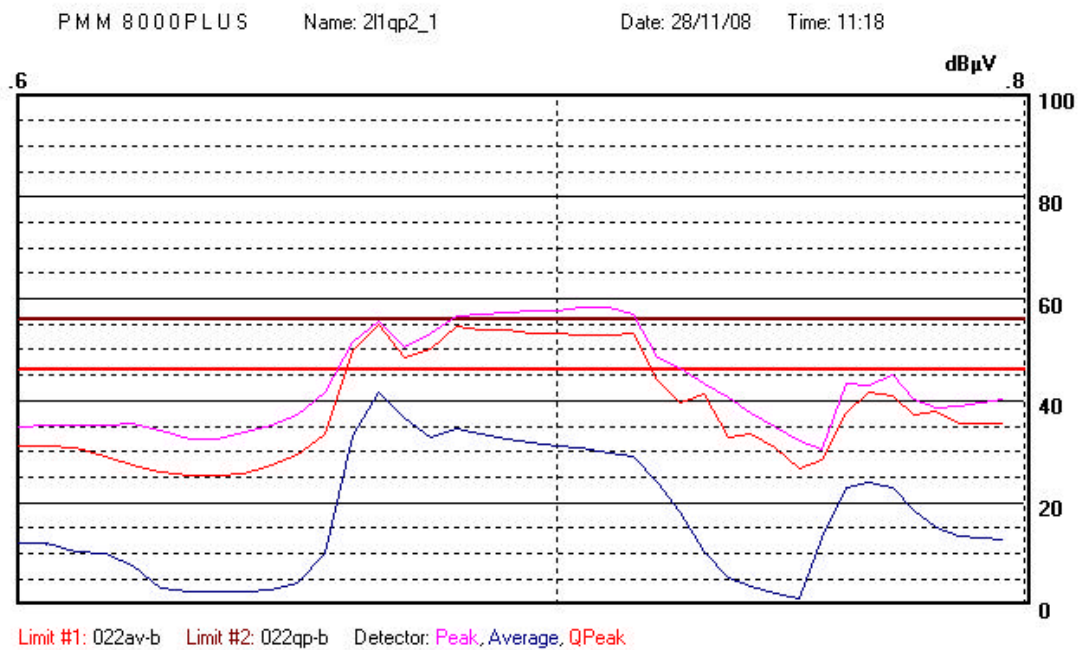


Quasi-peak measurements were taken from 200kHz to 400kHz and from 600kHz to 800kHz as follows:

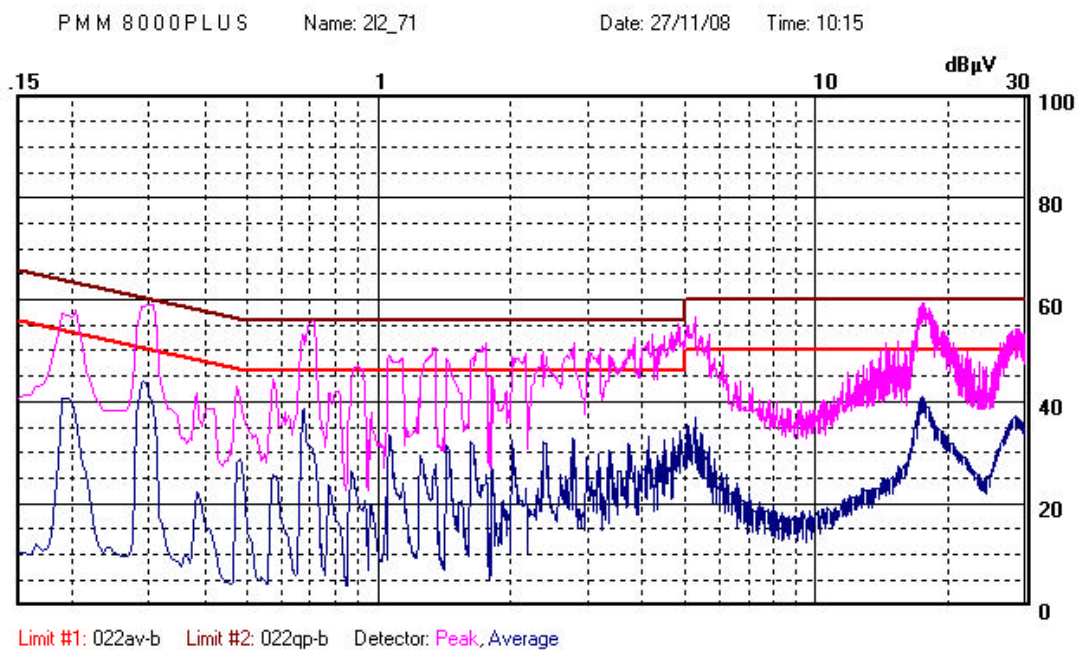
200kHz-400kHz:



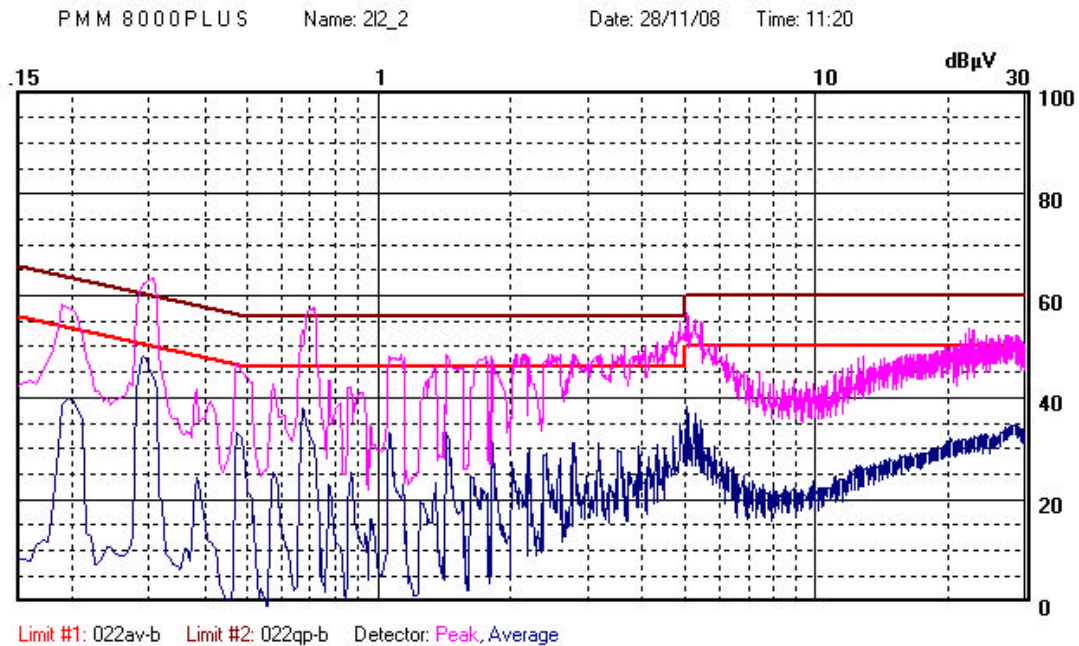
600kHz-800kHz:



L2 – With safety earth connected:

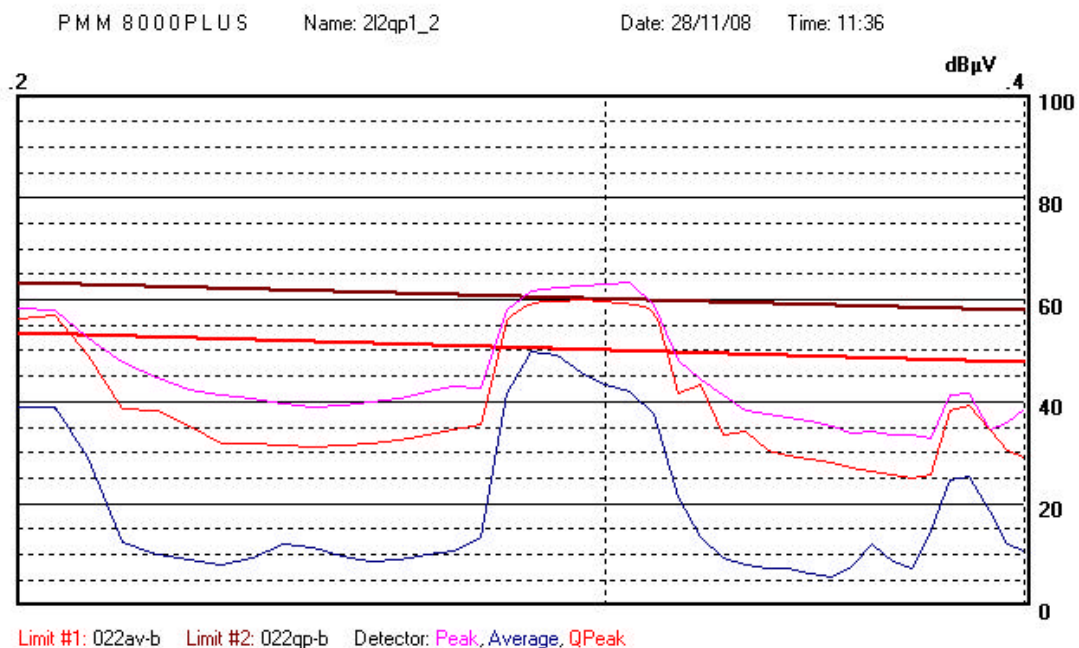


L2 – Without safety earth connected:

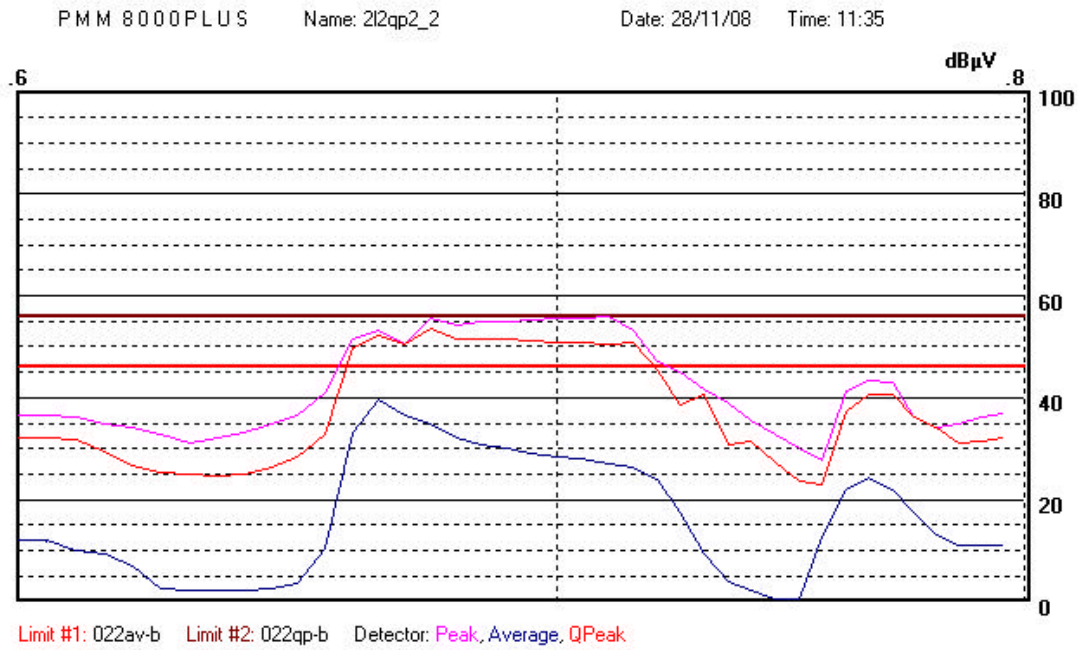


Quasi-peak measurements were taken from 200kHz to 400kHz and from 600kHz to 800kHz as follows:

200kHz-400kHz:



600kHz-800kHz:



PASS

3 Conducted Output Emissions Test

Equipment Under Test: TOP 100-103
EUT Serial No: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standards: IEC61000-6-3: 2006 referring to CISPR 16-1-2: 2003

Notes:

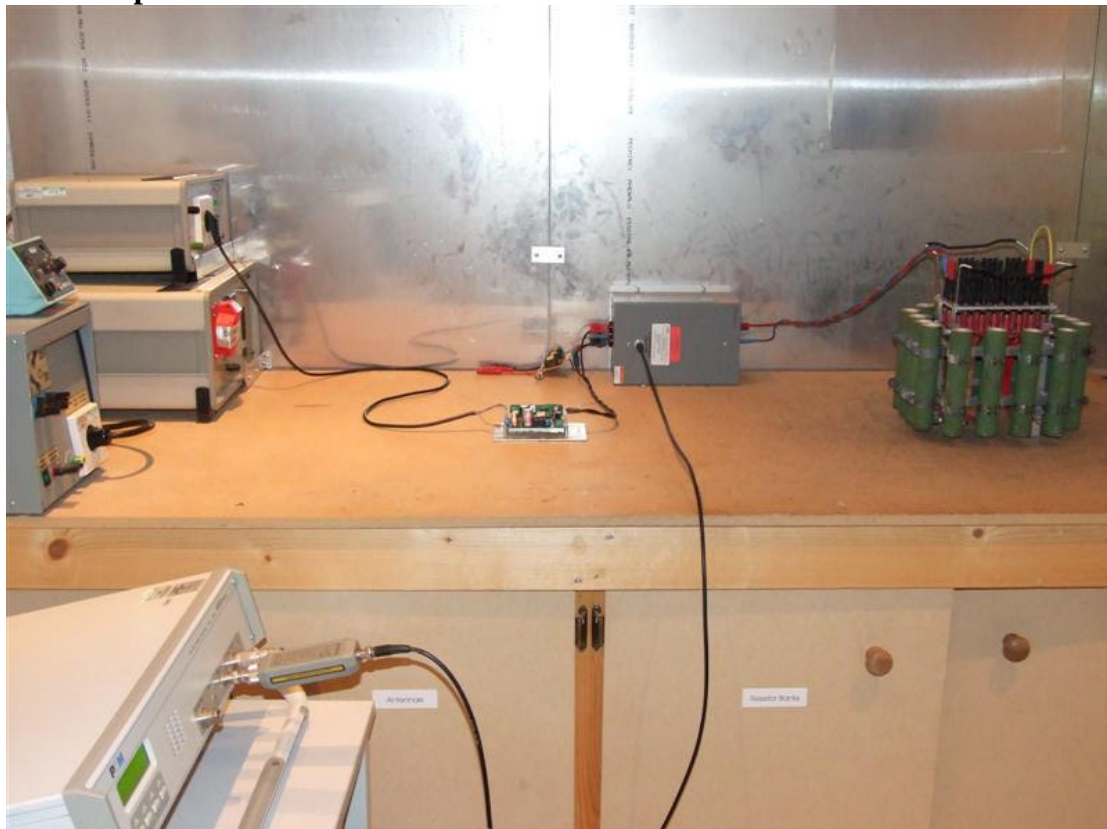
- EUT tested under normal operating conditions of 230V 50Hz input at full load (3.3V/20A Resistive)
- Emissions measured using PMM 8000 analyzer and FCC LISN
- Tested to CISPR 16 -1-2:2003 Class B limits
- Transient limiter used to protect PMM 8000, with appropriate correction factors applied
- Appropriate correction factor also applied for output LISN
- EUT attached to a small conductive plane in a shielded room
- Tests carried out with and without safety earth connected

3.1 Test Setup

Test Equipment Settings:

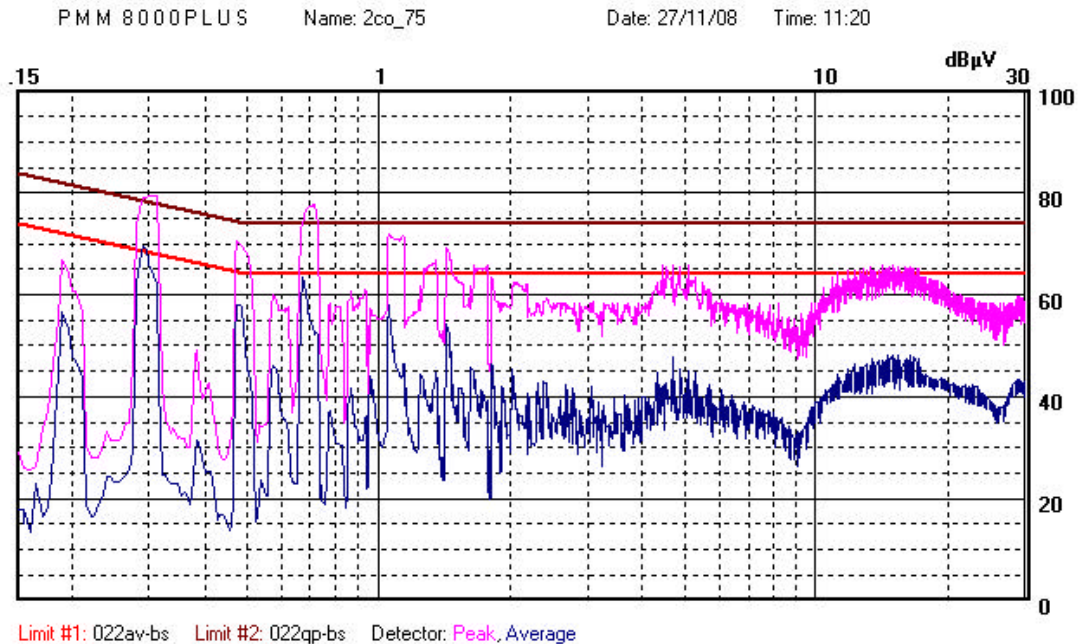
Start Freq.	Stop Freq.	Step	Pk Time	Avg Time
150kHz	30MHz	5kHz	50ms	50ms

Test Setup:

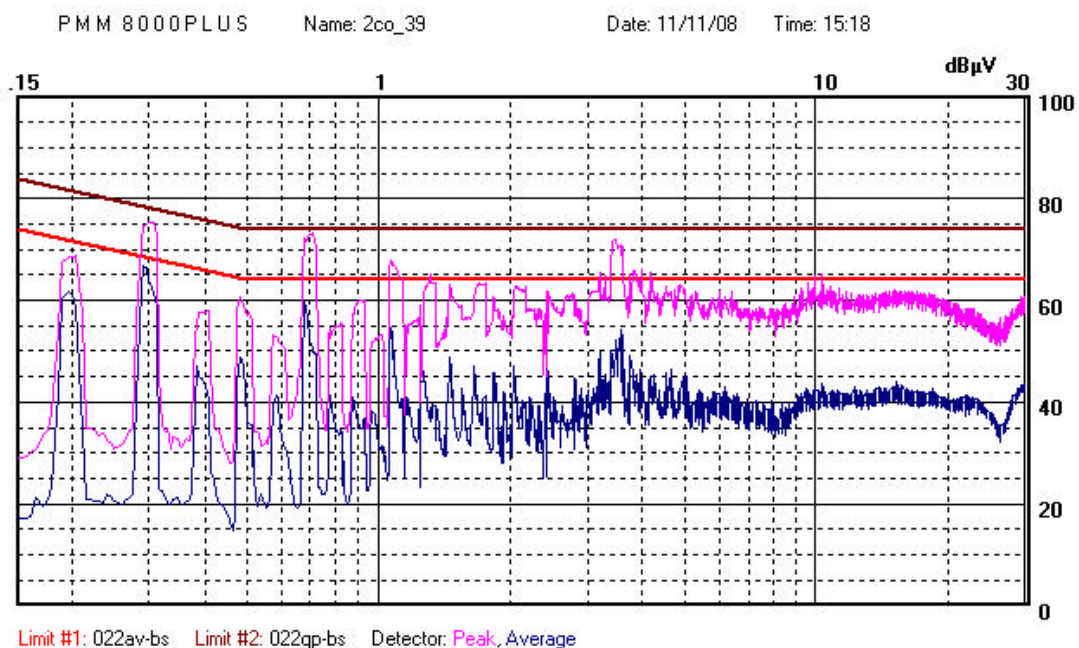


3.2 Conducted Output Emissions Results

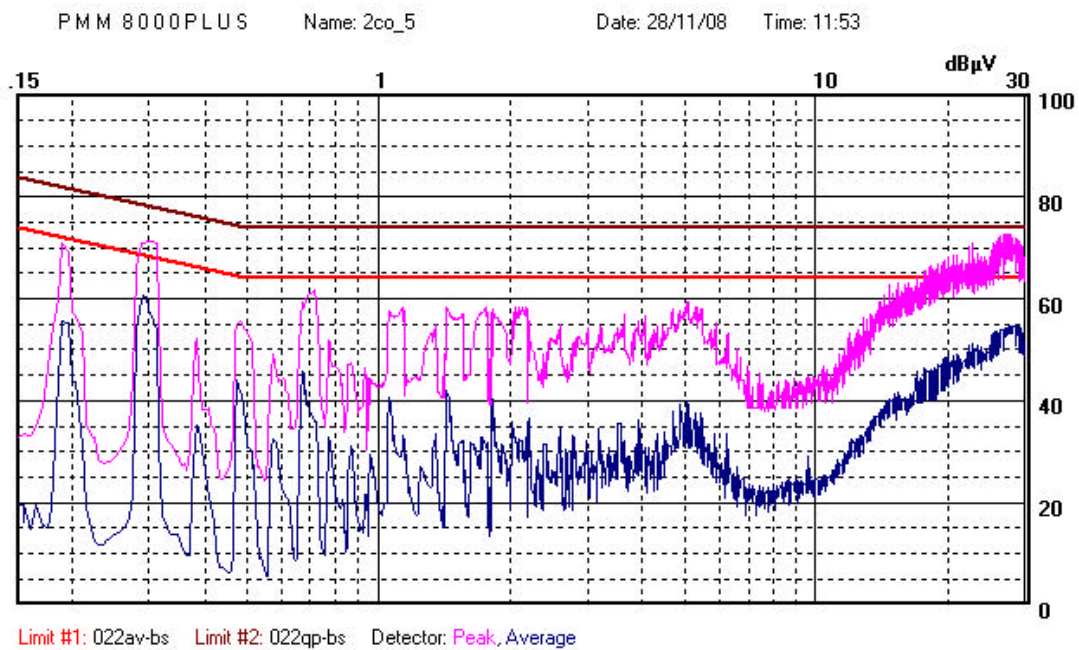
With safety earth connected:



When an extra 100nF capacitance is added from each of the output lines to primary earth the following results can be achieved:



Without safety earth connected:



Conclusion: Pass achievable with safety earth if an extra 100nF capacitance is added from the output lines to primary earth. EUT passes without safety earth connection.

PASS ACHIEVABLE

4 Radiated Emissions Test

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standards: IEC61000-6-3:2006 referring to CISPR 16-2-3:2003

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 230V 50Hz input at full load (3.3V/20A Resistive)
- Emissions measured using receiver "PMM 8000 plus EMI Test Signal Analyzer" 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

4.1 Test Setup

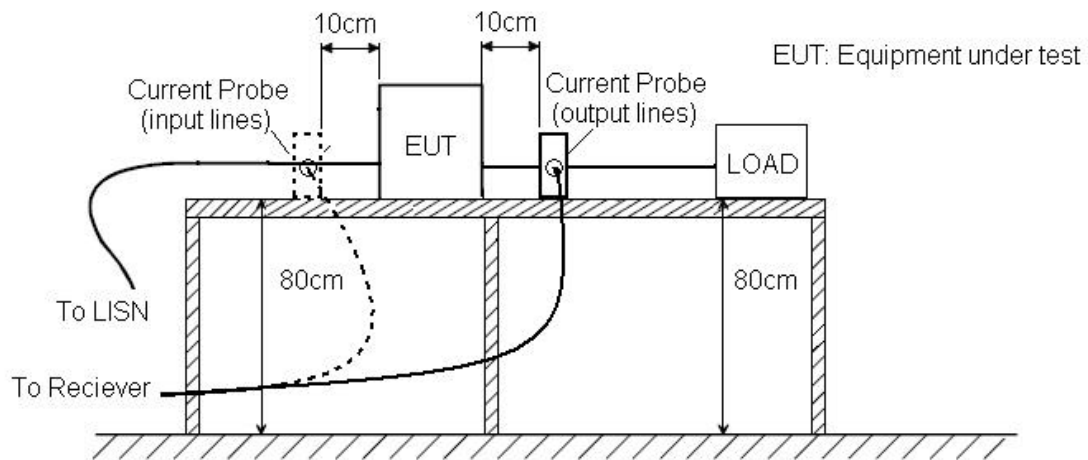
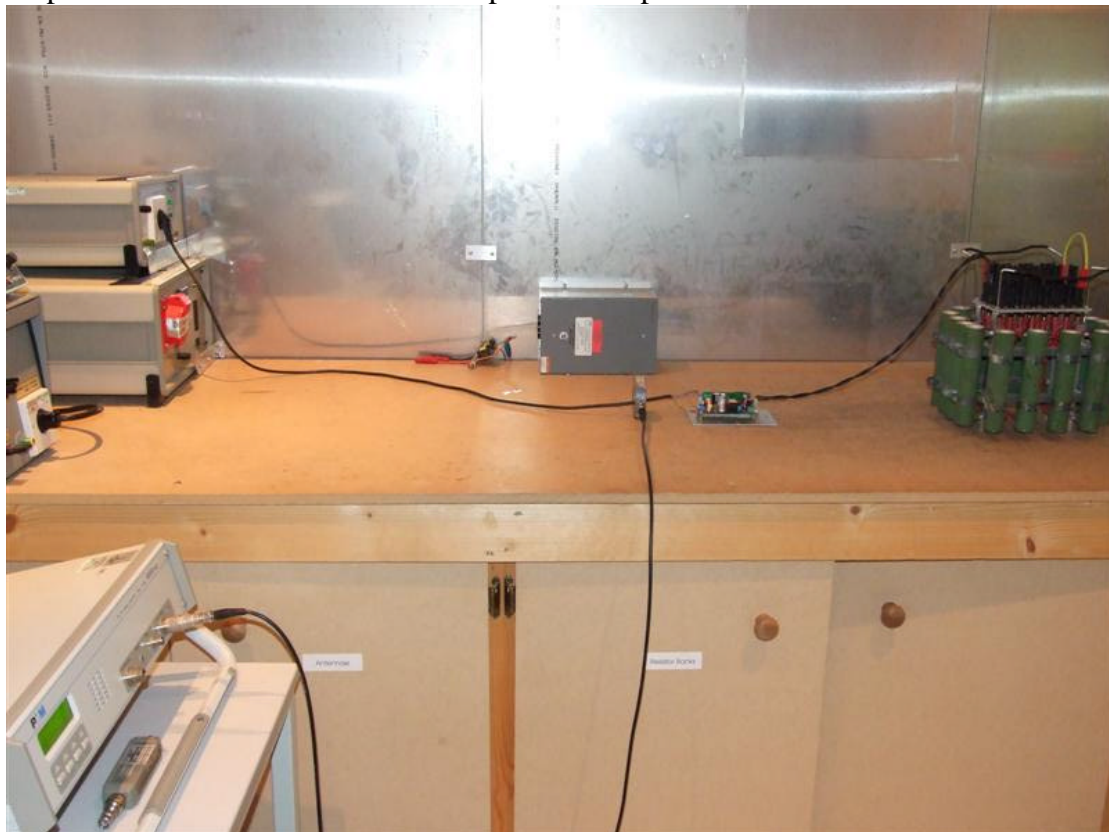


Figure 1. Test set-up for measurement of disturbance power similar to IEC61204-3

Test Equipment Settings:

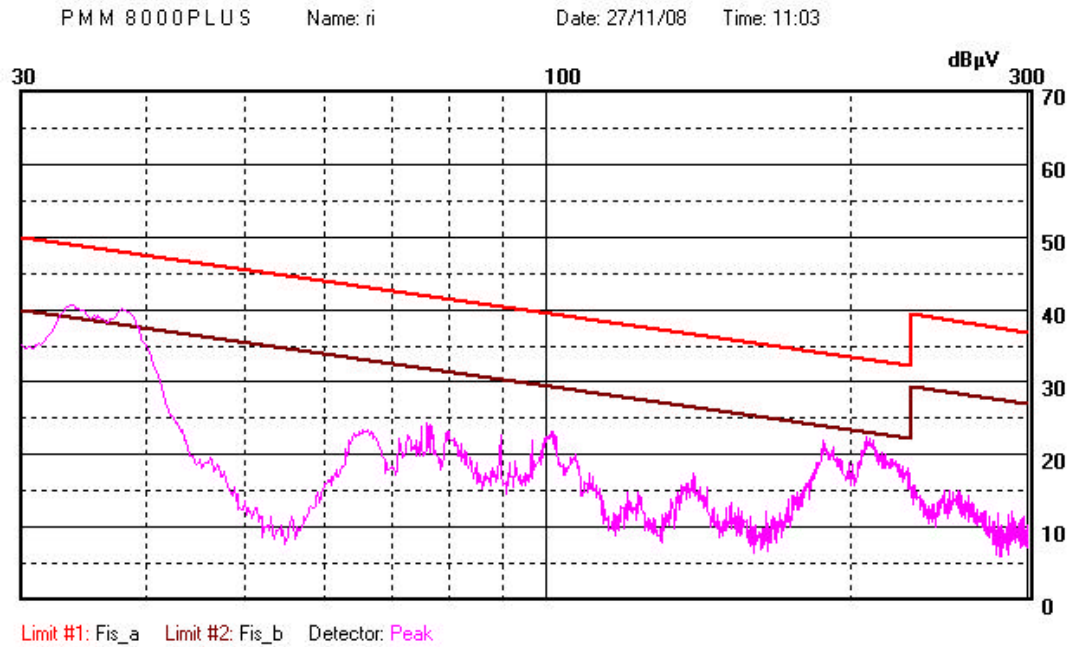
Start Freq.	Stop Freq.	Step	Pk Time
30MHz	300MHz	100kHz	10ms

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.

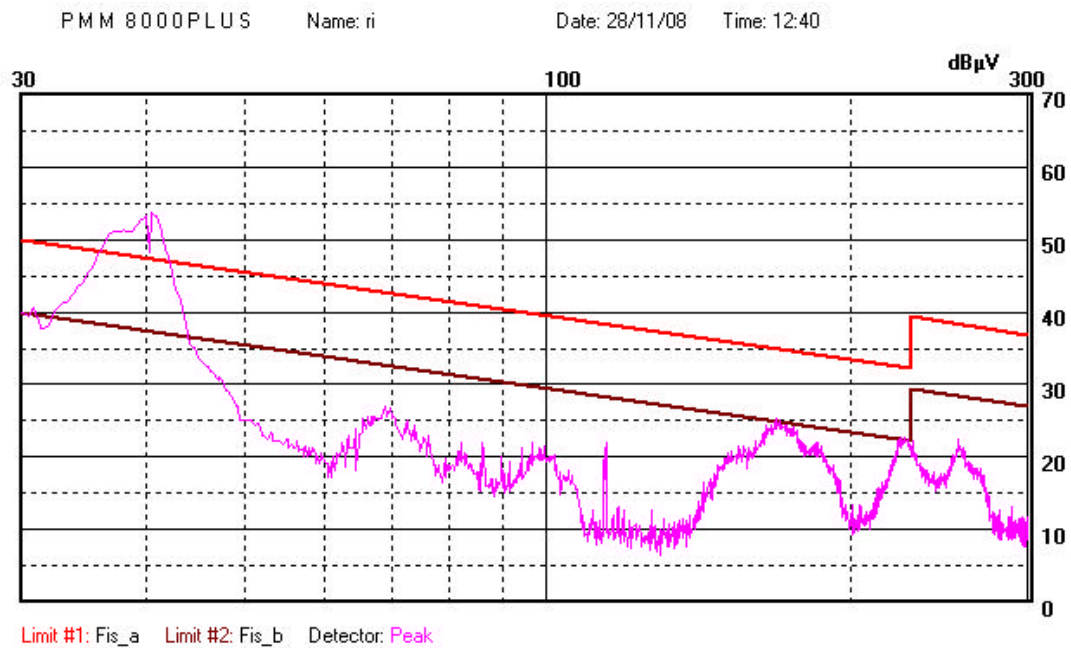


4.2 Radiated Emissions Results

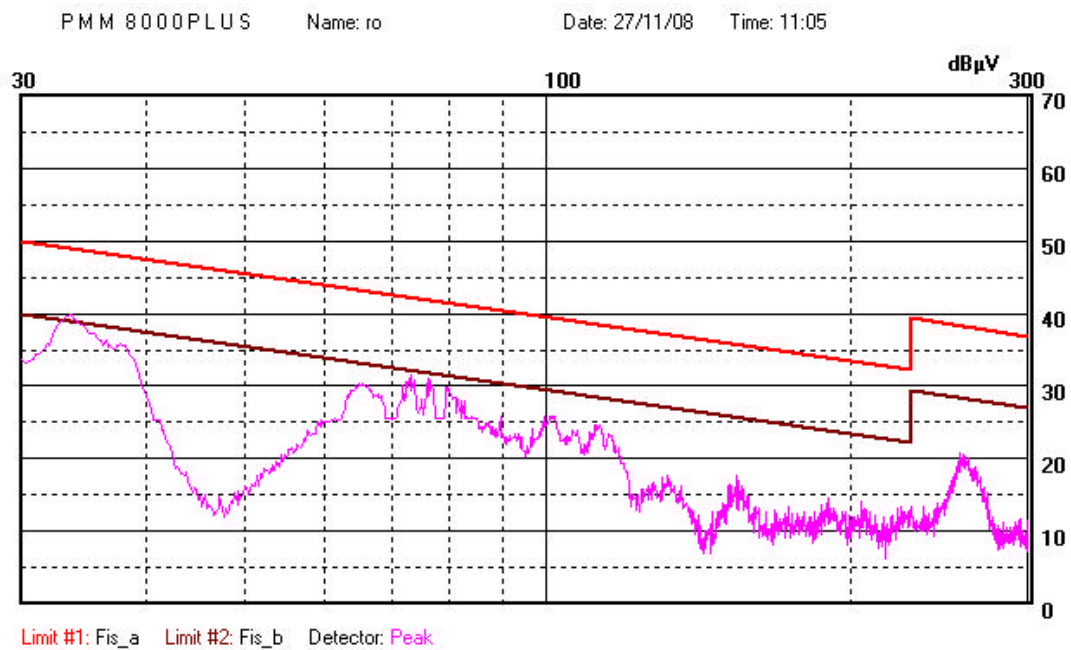
Input Lines with safety earth connected:



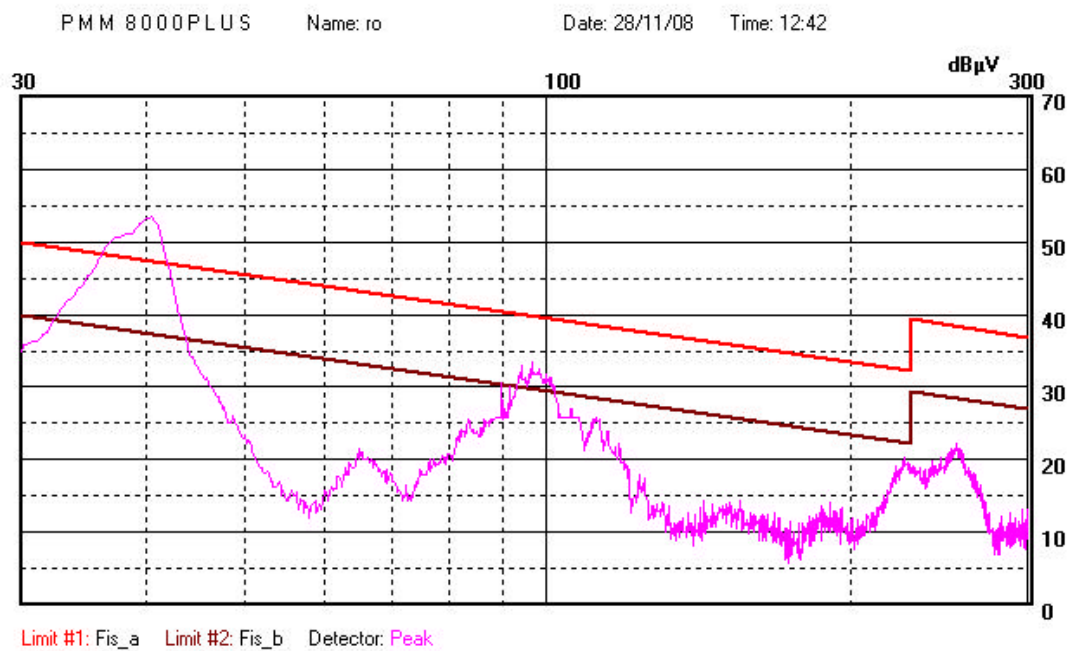
Input Lines without safety earth connected:



Output Lines with safety earth connected:



Output Lines without safety earth connected:



Conclusion: Most likely to pass with safety earth connected. Most likely to fail without safety earth connected.

LIKELY FAIL

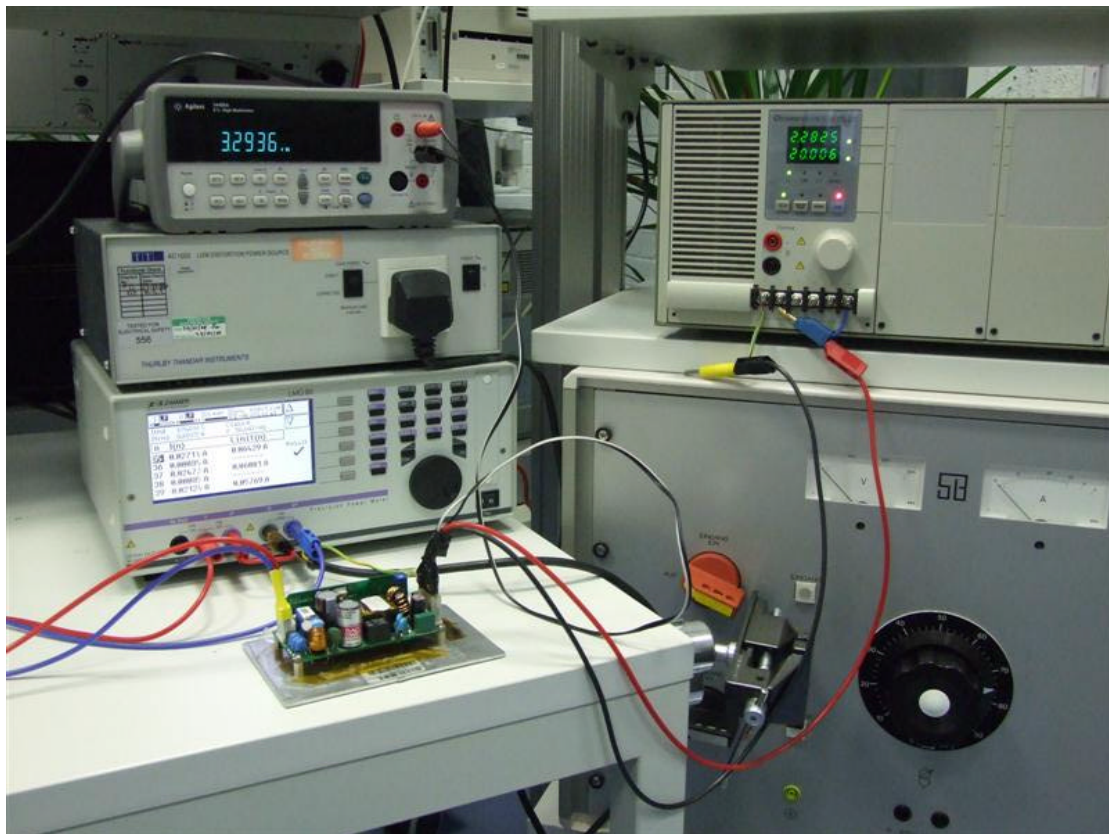
5 Harmonic Current Emissions Test

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standard: IEC61000-6-3: 2006 referring to IEC 61000-3-2: 2005

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (3.3V/20A Resistive)
- EUT powered by low-distortion AC Voltage Source, TTI AC-1000
- Harmonic Limits measured using LMG 95 Power Meter
- Tested to IEC61000-3-2 Table 1 Class A

5.1 Test Set-Up:



5.2 Harmonic Emissions Results

n	Harmonic Limit	Measured Values
3	2.3	0.322
5	1.14	0.29
7	0.77	0.247
9	0.4	0.198
11	0.33	0.149
13	0.21	0.107
15	0.15	0.076
17	0.1324	0.063
19	0.1184	0.06
21	0.1071	0.059
23	0.0978	0.055
25	0.09	0.048
27	0.0833	0.039
29	0.0776	0.033
31	0.0726	0.03
33	0.0682	0.029
35	0.0643	0.029
37	0.0608	0.026
39	0.0577	0.023

PASS

6 Electrostatic Discharge Test

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-2: 2000

Notes:

- It is assumed that for an open frame unit post-installation, that no part of the EUT will be accessible to persons during normal use.
- Therefore no ESD tests were carried out in accordance with IEC 61000-4-2: 2000 section 8.3.1 Direct application of discharges to the EUT which states that:

“Unless stated otherwise in the generic, product-related or product-family standards, the static electricity discharges shall be applied only to those points and surfaces of the EUT which are accessible to persons during normal use”

6.1 ESD Results

PASS

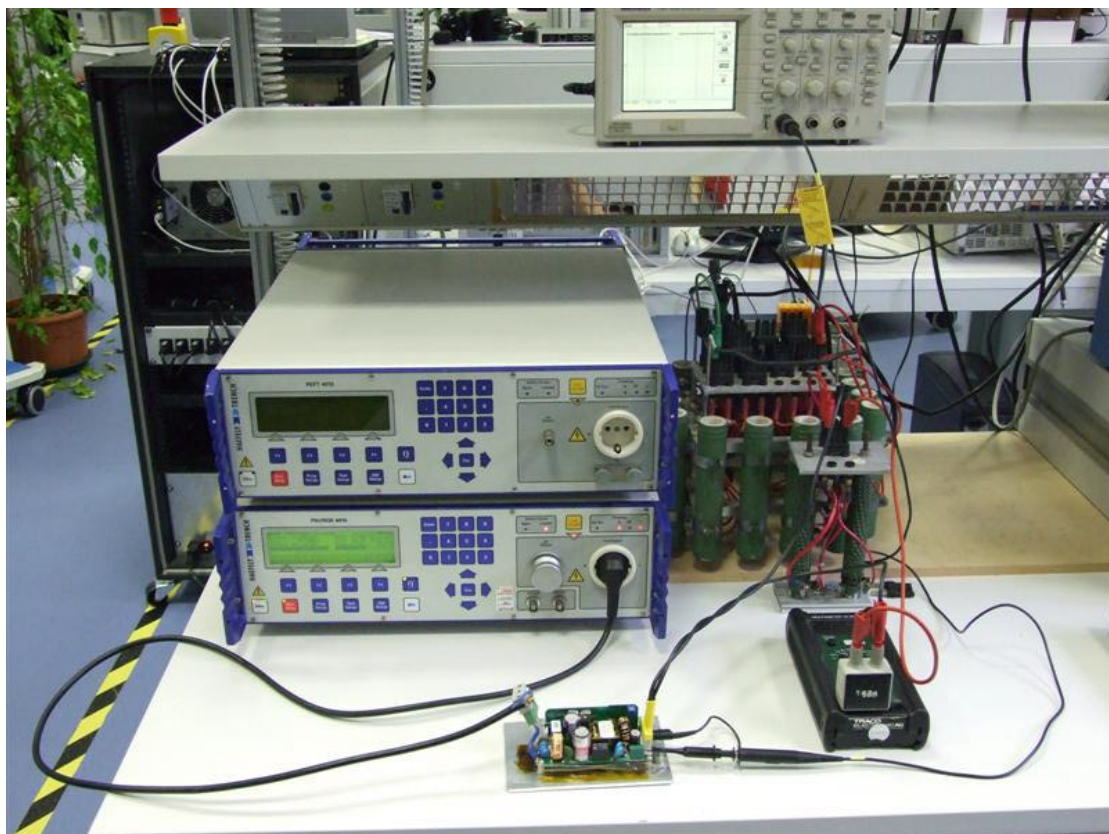
7 Surge Test

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-5: 2005

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (3.3V/20A Resistive)
- 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 Positive at 0, 90, 180, and 270 and 5 tests Negative at 0, 90, 180, and 270
- Interval Between Surges: 10s

7.1 Test Setup



7.2 Surge Results

	L to N	L to PE	N to PE
EUT: 20830102164	PASS	PASS	PASS

Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-5)

Only Class B performance criteria are required as per Table 6, IEC 61204-3

PASS

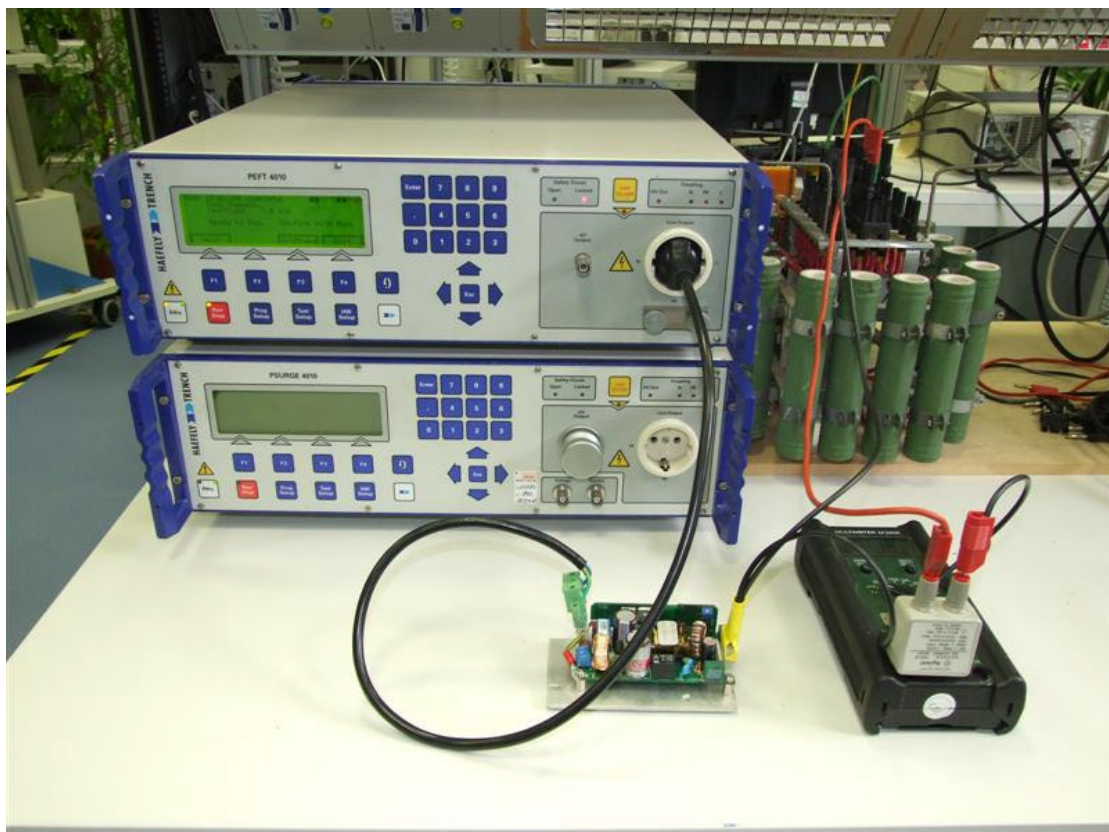
8 Fast Transient Test (Burst)

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standard: IEC61000-6-2: 2005 referring to IEC 61000-4-4: 2004

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (3.3V/20A Resistive)
- Units tested to IEC61000-4-4 test level 3
- Used Haefely Burst tester PEFT 4010
- Voltage test level: $\pm 2\text{Kv}$
- Burst Duration: 0.75ms
- Repetition rate: 100kHz
- Burst Period: 300ms
- Individual test time: 1 min
- Polarity: Positive and Negative

8.1 Test Setup



8.2 Burst Results

EUT: 20830102164	L-G	N-G	PE-G	L,N-G	L,PE-G	N,PE-G	L,N,PE-G
Positive	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Negative	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Conclusion:

Meets Classification A (Ref. Section 9, IEC 61000-4-5)

Only Class B performance criteria are required as per Table 6, IEC 61204-3

PASS

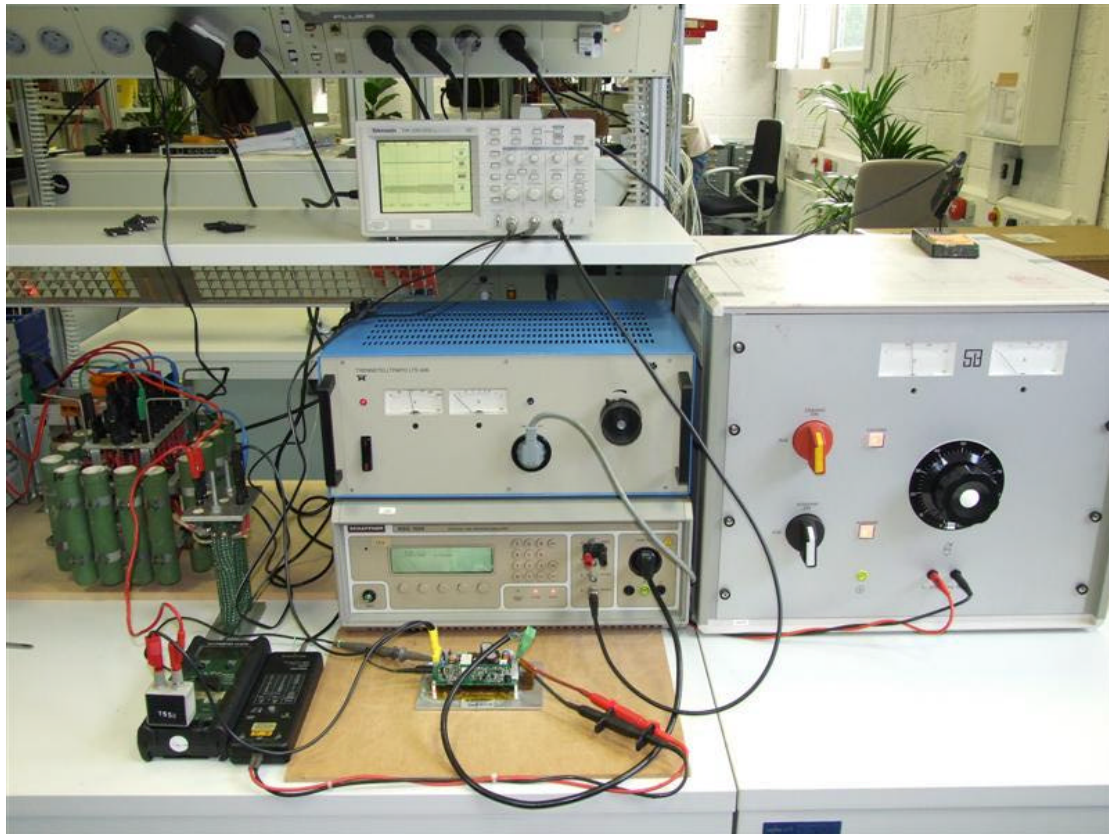
9 Voltage Dips and Short Interruptions

Equipment Under Test: TOP 100-103
EUT Serial No.: 20830102164
Customer Spec: CS-100HPPseries_PROPOS.doc
Date: 19/12/2008
Standard: IEC61000-6-2:2005 referring to IEC 61000-4-11:2004

Notes:

- EUT tested under normal operating conditions of 230V 50Hz input at full load (3.3V/20A Resistive)
- Test carried out using 2 Variacs and dropout simulator NSG 1003
- Tested according to class 3 IEC61000-4-11
- Units tested with highest and lowest nominal voltage (240V/115V) in accordance with IEC61000-4-11 section 5
- Interval between dropouts and short interruptions was 10s
- Phase angle was set to 0°, 90°, 180° and 270° for each voltage level tested
- Dropouts were tested from 100%-80% for 250 Mains cycles in accordance with IEC61000-4-11 table 2
- Dropouts were tested from 100%-70% for 25 Mains cycles in accordance with IEC61000-4-11 table 2
- Dropouts were tested from 100%-40% for 10 Mains cycles in accordance with IEC61000-4-11 table 2
- Dropouts were tested from 100%-0% for 1 Mains cycle in accordance with IEC61000-4-11 table 2
- 3 dropouts and 3 short interruptions were carried out per test
- Short interruptions tests were carried out at 100% to 0% for 0.1s, 0.2s, 0.5s, 1s, 2s, and 5s durations
- Short interruptions were done at worst case 0° phase angle

9.1 Test Setup



9.2 Voltage Dips & Short Interruptions Results

Voltage Dips

240VAC				
Phase Angle:	0	90	180	270
100%-0%	Class A	Class A	Class A	Class A
100%-40%	Class B	Class B	Class B	Class B
100%-70%	Class A	Class A	Class A	Class A
100%-80%	Class A	Class A	Class A	Class A
115VAC				
Phase Angle:	0	90	180	270
100%-0%	Class A	Class A	Class A	Class A
100%-40%	Class B	Class B	Class B	Class B
100%-70%	Class B	Class B	Class B	Class B
100%-80%	Class A	Class A	Class A	Class A

Short Interruptions

100%-0%	0.1s	0.2s	0.5s	1s	2s	5s
115VAC	Class B	Class B	Class B	Class B	Class B	Class B
240VAC	Class B	Class B	Class B	Class B	Class B	Class B

Conclusion:

- In accordance with Class B, IEC61000-4-11 section 9 (b)

PASS

10 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*	*See page 10
Radiated (30-300MHz)	Class B	LIKELY FAIL	
IEC61000-6-3: 2006 + IEC 61000-3-2: 2005			
Harmonic Current Emissions	Class A	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-2: 2000			
EUT will be inaccessible to persons during normal use		PASS	
IEC61000-6-2: 2005 + IEC 61000-4-5: 2005			
Surge			
-AC Supply	+/- 1kV (ClassB) L-N	PASS	
	+/- 2kV (ClassB) L-PE	PASS	
	+/- 2kV (ClassB) N-PE	PASS	
IEC61000-6-2: 2005 + IEC 61000-4-4: 2004			
Fast Transient (Burst)			
-AC Supply	+/- 2kV (ClassB)	PASS	
	Between all lines		
IEC61000-6-2:2005 + IEC 61000-4-11:2004			
Voltage Dips			
-AC Supply	100%-0% (Class A)	PASS	
	100%-40% (Class B)	PASS	
	100%-70% (Class B)	PASS	
	100%-80% (Class A)	PASS	
Short Interruptions (100%-0% for: 0.1s, 0.2s, 0.5s, 1s, 2s and 5s)	Class B	PASS	

11 List of Equipment Used:

Description	Model No.	Manufacturer	Serial No.
Test Signal Analyzer	PMM 8000PLUS	PMM	0100J91001
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
Low-Distortion AC Source	AC1000	Thurlby Thandar Instruments	151093
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
Multimeter	Hit 23S	Metra	NE4126
Oscilloscope	TDS1002	Tektronix	C016388
Cables	Type	Length	Comments
Mains Supply Cable	3-wire	1m	Unshielded
DC Lines Cable	2-wire	1m	Unshielded