

EMC TEST REPORT

Reference No. : WT10114592R1-U-E-E

Applicant : Shanghai Mingwei Electronic Co., Ltd.

Address : No.1, Fengpu west Road, Nanqiao, Fengxian District, Shanghai, China.

Equipment Under Test (EUT) :

Product Name : Switching Power Supply

Model No : HS-350-5,HS-350-7.5,HS-350-12,HS-350-13.5
HS-350-15,HS-350-24,HS-350-27,HS-350-48

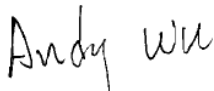
Standards : EN 55022: 2006 +A1: 2007

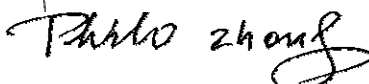
EN 55024: 1998+A1: 2001+A2: 2003

EN 61000-3-2: 2006+A1:2009+A2:2009

EN 61000-3-3: 2008

Date of Test : November 12,2010~May 24, 2011

Project Engineer : Andy wu 

Reviewed By : Philo.Zhong 

Test Result :	PASS *
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Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,
Shenzhen 518105, China

Tel :+86-755-27553488

Fax:+86-755-27553868

* The sample detailed above has been tested to the requirements of Council Directives 2004/108/EC. The test results have been reviewed against the Directives above and found to meet their essential requirements.

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1 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	EN 55022:2006 +A1:2007	EN 55022:2006 +A1:2007	Class B	PASS
Radiation Emission, 30MHz to 1000MHz	EN 55022:2006 +A1:2007	EN 55022:2006 +A1:2007	Class B	PASS
Harmonic Emission, 100Hz to 2kHz	EN 61000-3-2:2006+A1:2009 +A2:2009	EN 61000-3-2:2006+A1:2009 +A2:2009	Clause 7 of EN61000-3-2	PASS
Flicker Emission on AC	EN 61000-3-3 :2008	EN 61000-3-3 :2008	Clause 5 of EN61000-3-3	PASS
ESD	EN 55024 : 1998 +A1:2001+A2:2003	EN 61000-4-2:2009	Contact Air	PASS
Radiated Immunity (80MHz to 1GHz)	EN 55024 : 1998 +A1:2001+A2:2003	EN 61000-4-3:2006	3V/m, 80%, 1kHz, Amp. Mod.	PASS
Electrical Fast Transients (EFT) on AC	EN 55024 : 1998 +A1:2001+A2:2003	EN 61000-4-4:2004	AC±1.0kV DC±0.5kV	PASS
Surge Immunity on AC	EN 55024 : 1998 +A1:2001+A2:2003	EN 61000-4-5:2006	±1kV D.M.† ±2kV C.M.‡	PASS
Injected Currents on AC, 150kHz to 80MHz	EN 55024 : 1998 +A1:2001+A2:2003	EN61000-4-6:2009	3Vrms(emf), 80%, 1kHz Amp. Mod.	PASS
Power-frequency magnetic field	EN 55024 : 1998 +A1:2001+A2:2003	EN 61000-4-8:2010	3A/m	N/A
Voltage Dips and Interruptions on AC	EN 55024 : 1998 +A1:2001+A2:2003	EN 61000-4-11:2004	<5 % U _T * for 0.5per <5 % U _T * for 250per 70 % U _T * for 25per	PASS

Remark:

A.M. Amplitude Modulation.

P.M. Pulse Modulation.

N/A. Indicates that the test is not applicable.

† D.M. – Differential Mode.

‡ C.M. – Common Mode.

● U_T is the nominal supply voltage

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3 General Information

3.1 Client Information

Applicant : Shanghai Mingwei Electronic Co., Ltd.
Address of Applicant : No.1, Fengpu west Road, Nanqiao, Fengxian District,
Shanghai, China.

Manufacturer : Shanghai Mingwei Electronic Co., Ltd.
Address of Manufacturer: No.1, Fengpu west Road, Nanqiao, Fengxian District,
Shanghai, China.

3.2 General Description of E.U.T.

Product Name : Switching Power Supply
Model No. : HS-350-5,HS-350-7.5,HS-350-12,HS-350-13.5
HS-350-15,HS-350-24,HS-350-27,HS-350-48
Model difference: The models have the same schematic and PCB layout except
for the output volatage and current.The model HS-350-27 is
the test sample, the final test datas were shown in this test
report.

3.3 Details of E.U.T.

Technical Data: Input: AC 90~132V/180~264V , 47~63Hz , 350W

3.4 Description of Support Units

The EUT has been tested as an independent unit. All the tests were performed in the condition
of AC 230V/50Hz.

3.5 Standards Applicable for Testing

The customer requested EMC tests for a Switching Power Supply. The standards used were EN55022, EN61000-3-2, EN61000-3-3 for emissions & EN55024 for immunity.

Table 1 : Tests Carried Out Under EN 55022: 2006+A1:2007

Standard		Status
EN 55022:2006+A1:2007	Radiation Emission, 30MHz to 1000MHz	√
EN 55022:2006+A1:2007	Mains Terminal Disturbance Voltage, 150KHz to 30MHz	√

Table 2 : Tests Carried Out Under EN 61000-3-2: 2006+A1:2009+A2:2009& EN 61000-3-3: 2008

EN 61000-3-2: 2006+A1:2009+A2:2009	Harmonics Emissions on AC	√
EN 61000-3-3: 2008	Flicker Emissions on AC	√

Table 3 : Tests Carried Out Under EN 55024:1998+A1:2001+A2: 2003

Standard		Status
EN 61000-4-2:2009	Electro-static discharge	√
EN 61000-4-3:2006	Radio frequency EM fields (80MHz to 1GHz)	√
EN 61000-4-4:2004	Fast transients	√
EN 61000-4-5:2006	Surges	√
EN 61000-4-6: 2009	Radio frequency continuous conducted (150kHz to 80MHz)	√
EN 61000-4-8:2010	Power-frequency magnetic field (50Hz)	×
EN 61000-4-11:2004	Voltage dips & interruptions	√

√

Indicates that the test is applicable

×

Indicates that the test is not applicable

3.6 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A**

Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A, Aug .03, 2010.

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, June 24, 2008.

3.7 Test Location

All the tests were performed at:-

Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd.,Songgang Street, Baoan District, Shenzhen, China.

4 Equipment Used during Test

Equipment Name	Model	Equipm ent No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY4511 4943	9K-26.5GHz	2010-8-3	2011-8-3	WWM20 100587	±1dB
Test Receiver	ROHDE&SCH WARZ/ ESPI	101155	9KHz-3GHz	2010-8-3	2011-8-3	WWM20 100588	±1dB
Test Receiver	ROHDE&SCH WARZ/ ESCI	100947	9KHz-3GHz	2010-8-3	2011-8-3	WWM20 100589	±1dB
Digital Power Analyzer	Em Test AG/Switzerland / DPA 500	V074510 3095	Power:2000VA Vol-range:0-300V Freq_range:10-80Hz	2010-8-3	2011-8-3	WWD20 101078	Voltage distinguish: 0.025% Power:freq distinguish: 0.02Hz
Power Source	Em Test AG/Switzerland /ACS 500	V074510 3096	Vol-range:0-300V Freq_range:10-80Hz	2010-8-3	2011-8-3	WWD20 101078	Voltage distinguish: 0.025% Power:freq distinguish: 0.02Hz
Electrostatic Discharge Simulator	Em Test AG/Switzerland / DITO	V074510 3094	Contact discharge: 500V-10KV Air discharge: 500V-16.5KV	2010-8-3	2011-8-3	WWM20 100586	7.5A Current Will be changed in Vm=1.5V
RF Generator	TESEQ GmbH/NSG407 0	25781	Fraq-range: 9K-1GHz RF voltage: -60dB to 10dB	2010-8-3	2011-8-3	WWM20 100590	Power_freq distinguish: 0.1Hz Rfelectricity distinguish:0.1dB
ALL Modules Generator	SCHAFFNER/ 6150	34579	Voltage:200V-4.4KV Cuttent:100A-2.2KA	2010-8-3	2011-8-3	WWM20 100591	Voltage:±10% Pulse Cuttent:±10%
AC Power Supply	Beijing hengyuan/ DTDGC-4	W20080 20	Voltage: 0-250V Current: 0-20A	2010-8-3	2011-8-3	WWM20 100592	ACV:0.06% ACA:0.15%
Trilog Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK/ VULB9163	336	25-3000MHz	2009-8-20	2010-8-19	XDdj200 9-2658	±1dB
Two-Line V- Network	ROHDE&SCH WARZ/ ENV216	100115	9KHz-3GHz	2010-8-3	2011-8-3	WWC20 100909	±10%
Absorbing Clamp	ROHDE&SCH WARZ/ MDS-21	100205	impandance 50 ohm Loss:17dB	2010-8-3	2011-8-3	WWC20 100901	±1dB
V-LISN	SCHWARZBECK MESS-ELEKTRONIK/ NSLK 8128	8128-259	9KHz-3GHz	2010-8-3	2011-8-3	WWC20 100903	±10%

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Equipment Name	Model	Equipment No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Attenuator 6dB	TESEQ GmbH/ ATN6050	25376	Attenuator 6dB	2010-8-3	2011-8-3	WWC20100904	Attenuation:0.2dB
Magnetic Field Probe 100cm ²	Narda safety TEST Solutions/ ELT-400	M-1070	Test freq range: 1-400KHz	2010-8-3	2011-8-3	WWD20101072	1-10 Hz:16.2% 10-120Hz:2.2% 120-400Hz:4.7%
Voltage Probe	SCHWARZBECK MESS-ELEKTRONIK/ TK 9420	9420-328	9K-30MHz	2010-8-3	2011-8-3	WWC20100905	Insertion Loss:<±0.5dB
Loop Antenna	Laplace/ RF300	9057	Diameter:2m	2010-8-3	2011-8-3	WWD20101079	U=2Db,K=2
CDN M-Type	TESEQ GmbH/ CDN M016	25112	Voltage correct factor: 9.5dB	2010-8-3	2011-8-3	WWC20100906	1.5K-80MHz:±1dB 80-230MHz:-2--+3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	Freq_range: 0.15-1000MHz	2010-8-3	2011-8-3	WWC20100902	0.3-400MHz:±4dB Other freq:±5dB
Attenuator		61115-001-0024	9KHz-30MHz	2010-8-3	2011-8-3	WWC20100910	
Capacitive Coupling Clamp	SCHAFFNER/ CDN 8014	25311	Max.permissible burst voltage:8KV Typical coupling capacitance:100pF	2010-8-3	2011-8-3	WWC20100907	Urel:1.5%,k=2
Signal and Data Line Coupling Network	SCHAFFNER/ CDN 117	25627	1.2/50µS	2010-8-3	2011-8-3	WWC20100908	Urel:1.0%,k-2
Audio Generator	GIINSTEK/ GAG-809	EH831261	Freq range: 10Hz-1MHz Output Resistance: 600Ω	2010-8-3	2011-8-3	WWS20100845	Freq: ±(3%+1Hz)
Digital Multimeters	FLUKE/15B	98760784	Voltage:AC/DC 4mV-1000V Current:AC/DC40mA-10A Resistor:400Ω-40MΩ	2010-8-3	2011-8-3	DBS2010-736	DCV Urel=0.1% ACV Urel=0.2% DCA Urel=0.2% ACA Urel=0.2% OHM Urel=0.2% K=2
Digital Multimeters	FLUKE/15B	98750790	Voltage:AC/DC 4mV-1000V Current:AC/DC40mA-10A Resistor:400Ω-40MΩ	2010-8-3	2011-8-3	DBS2010-735	DCV Urel=0.1% ACV Urel=0.2% DCA Urel=0.2% ACA Urel=0.2% OHM Urel=0.2% K=2
Thermometer	KTJ/TA218B	TA218B	TemperatureRange: -10°C to 60°C Humidity Range: 25%RH to 98%RH	2010-8-3	2011-8-3	RSD20103126	Humidity: U=3%RH(K=2) Temperature: U=1°C(K=2)

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Equipment Name	Model	Equipment No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Thermometer	KTJ/TA218B	TA218B	Temperature Range: -10°C to 60°C Humidity Range: 25%RH to 98%RH	2010-8-3	2011-8-3	RSD20103127	Humidity: U=3%RH(K=2) Temperature: U=1°C(K=2)
Broad-Band Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK/BBHA 9120D	667	1-18GHz	2010-7-15	2011-7-15	2PB10000125-0001	f<10GHz: ±1dB 10GHz<f<18GHz: ±1.5dB
Broadband Preamplifier 0.5-18 GHz	SCHWARZBECK MESS-ELEKTRONIK/BBV 9718	9718-147	0.5-18GHz	2010-7-19	2011-7-19	2PB10000125-0002	±1.2dB
Oscilloscope	TDS3032B	B401960	0-300MHz	2010-11-8	2011-11-8	DZ2010231523988	Vertical deflection: +0.4% Scanning time: +0.3%

5 Emission Test Results

5.1 Mains Terminals Disturbance Voltage, 150kHz to 30MHz

Test Requirement:	EN 55022 Class B
Test Method:	EN 55022 Class B
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

5.1.1 E.U.T. Operation

Operating Environment:

Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	1012 mbar

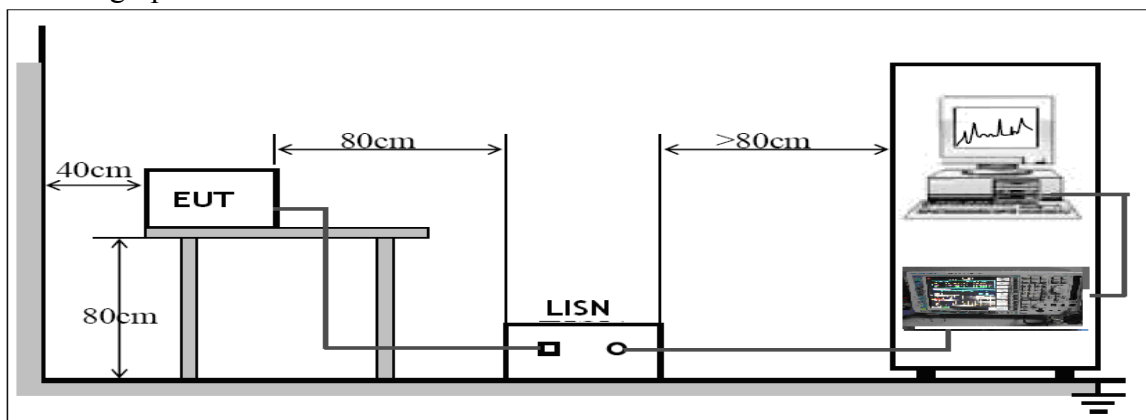
EUT Operation :

Compliance test was performed in full load mode.

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.1.2 Conducted Test Setup

The conducted emission tests were performed using the setup accordance with the EN 55022:2006+A1:2007, The specification used in this report was the EN 55022:2006+A1:2007 Paragraph 5 limits.



5.1.3 Measurement Data

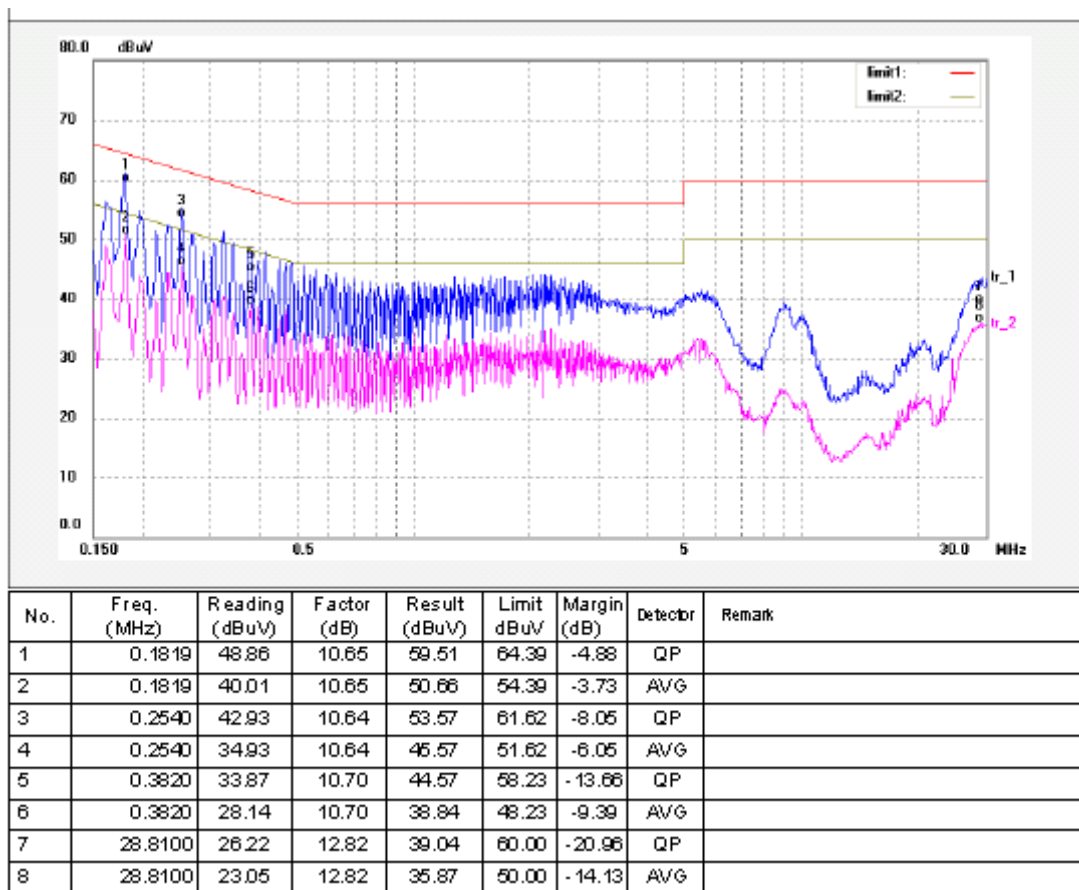
An initial pre-scan was performed on the live and neutral lines.

No further quasi-peak or average measurements were performed since no peak emissions were detected within 10dB line below the average limit.

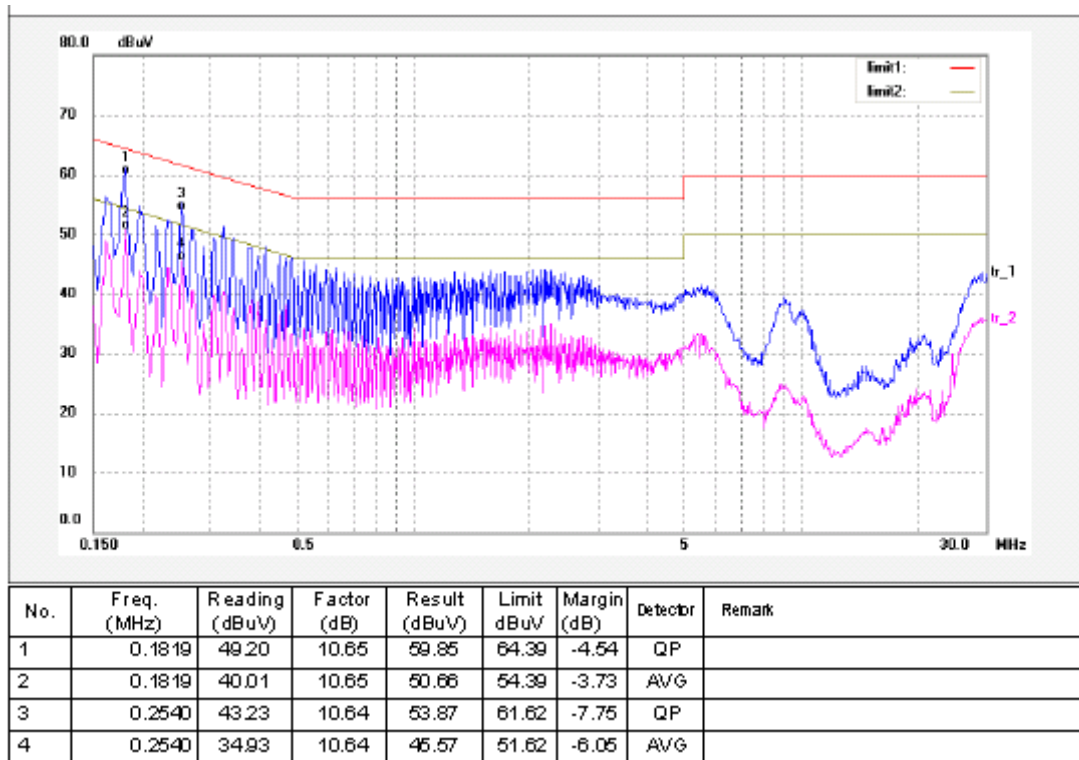
Please refer to the following peak scan graph for reference.

5.1.4 Conducted Emissions Test Data

Live Line



Neutral Line



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5.1.5 Photograph– Mains Terminal Disturbance Voltage on AC Test Setup



5.2 Radiation Emission Data

Test Requirement:	EN 55022 Class B
Test Method:	EN 55022 Class B
Test Result:	PASS
Frequency Range:	30MHz to 1000MHz
Class/Severity:	Class B
Detector:	Peak for pre-scan (120KHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

5.2.1 E.U.T. Operation

Operating Environment:	
Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	1012 mbar

EUT Operation :
Compliance test was performed in full load mode.

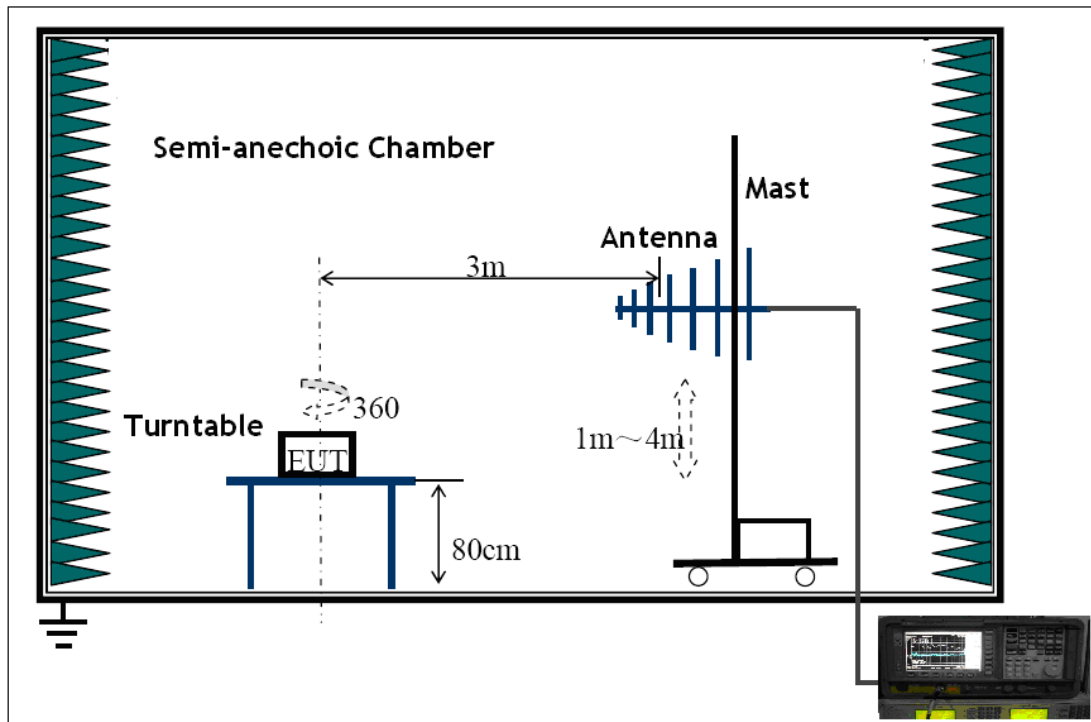
5.2.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is ± 5.03 dB.

5.2.3 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the EN 55022:2006+A1:2007, The specification used in this report was the EN 55022:2006+A1:2007 Paragraph 6 limits.



5.2.4 Spectrum Analyzer Setup

According to EN55022 Class B Rules, the system was tested to 1000 MHz.

Start Frequency.....	30 MHz
Stop Frequency.....	1000 MHz
Sweep Speed	Auto
IF Bandwidth.....	120KHz
Video Bandwidth.....	100KHz
Quasi-Peak Adapter Bandwidth.....	120 KHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	100KHz

5.2.5 Test procedure

For the radiated emissions test, maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within +/-4 dB μ V of specification limits), and are distinguished with a "Qp" in the data table.

The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

5.2.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB μ V means the emission is 7dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

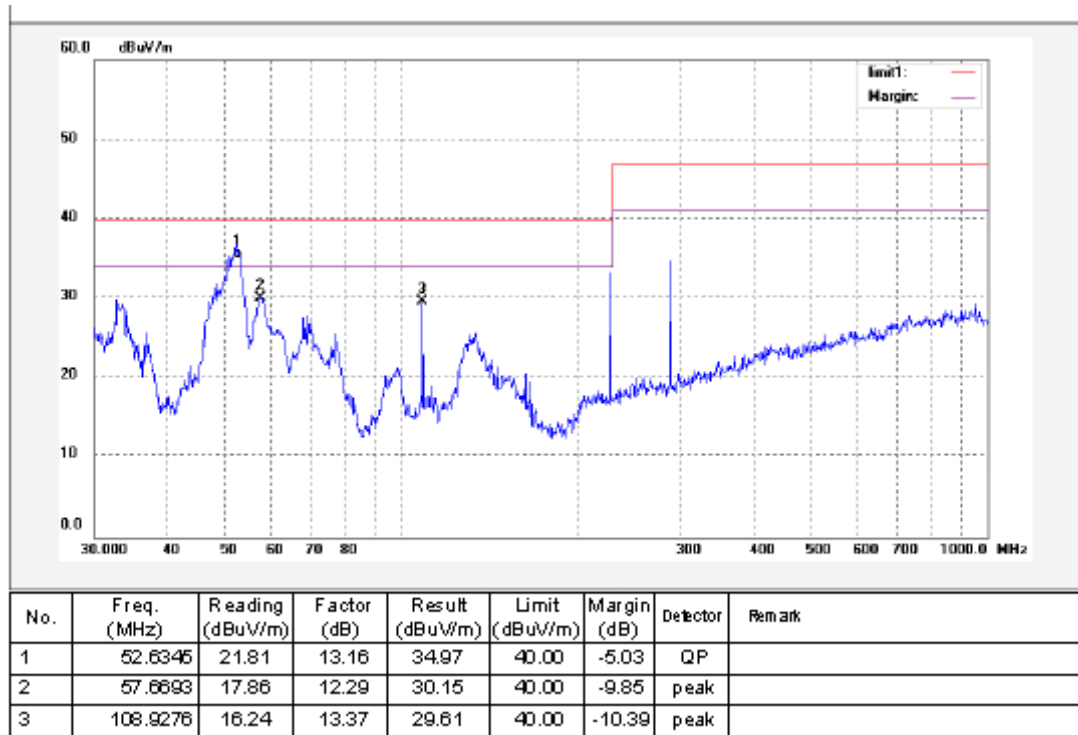
$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

5.2.7 Summary of Test Results

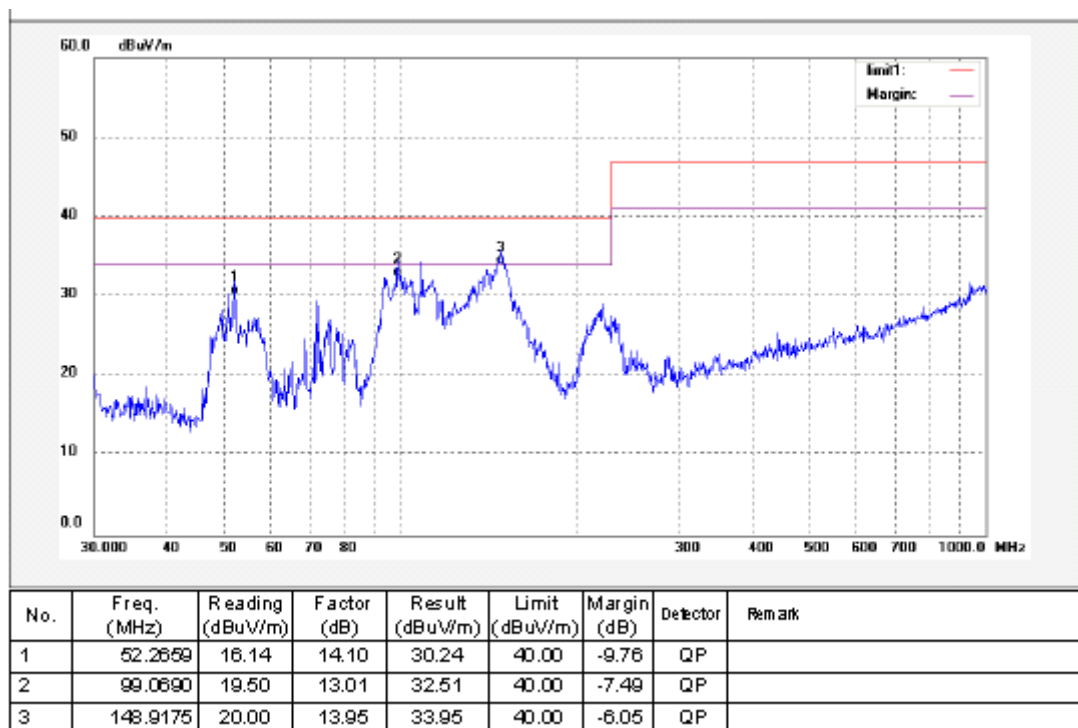
According to the data in section 5.2.8, the EUT complied with the EN55022 Class B standards.

5.2.8 Radiated Emissions Test Data

Antenna Polarization: Vertical



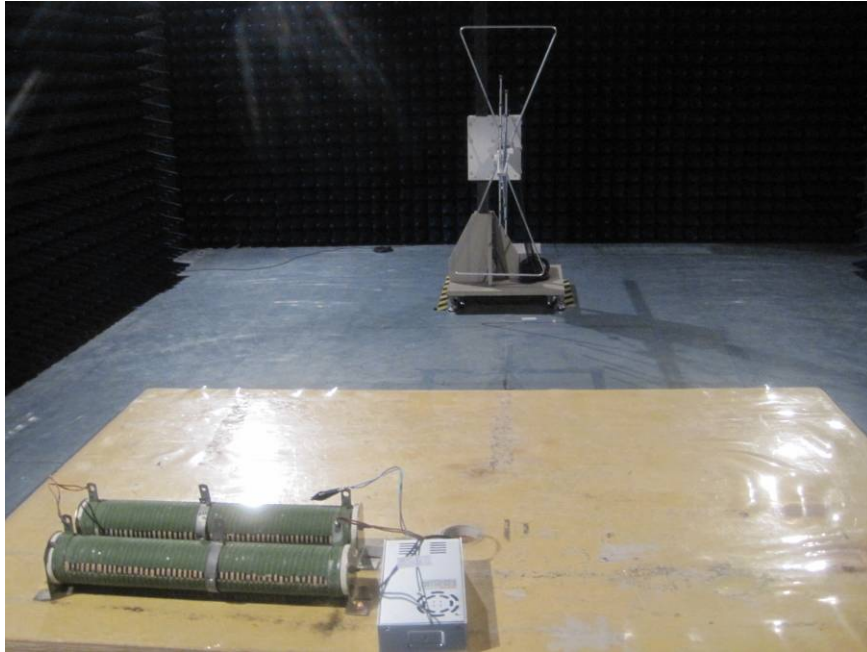
Antenna Polarization: Horizontal



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5.2.9 Photograph – Radiation Emission Test Setup



5.3 Harmonics Test Results

Test Requirement: EN61000-3-2
Test Method: EN61000-3-2
Frequency Range: 100Hz to 2kHz
Test Result: Pass

For further details, please refer to Clause 7, Note 1 of EN61000-3-2 which states:-

“For the following categories of equipment limits are not specified in this edition of the standard.

Note 1: Equipment with a rated power of 75W or less, other than lighting equipment.”

5.3.1 E.U.T. Operation

Operating Environment:

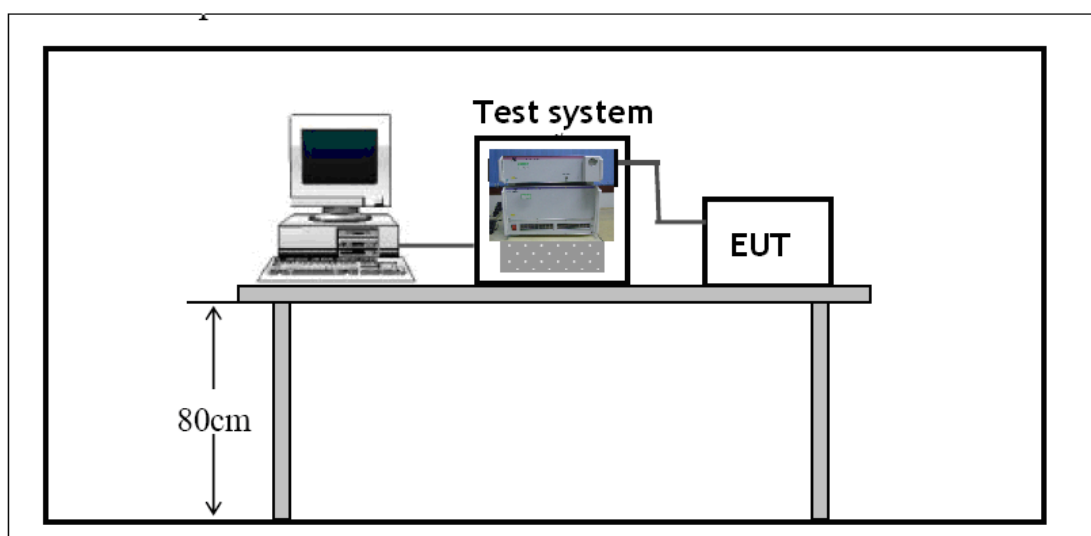
Temperature: 25.5 °C
Humidity: 51 % RH
Barometric Pressure: 1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

5.3.2 Test Setup

The Harmonics Test setup accordance with the EN 61000-3-2, The Specification used in this report was the EN61000-3-2 Paragraph 3 limits.



5.3.3 Test result

Standard used:	EN/IEC 61000-3-2 Ed.3 Short cyclic Equipment class A <= 150% of the limit
Observation time:	150s
Windows width:	10 periods - (EN/IEC 61000-4-7 Edition 2002)
E. U. T.:	HS-350-27

Test Result	
E. U. T.:	PASS
Power Source:	PASS

Power and THD results

True power P:	422.3W	Apparent power S:	599.8VA
Reactiv power Q:	426var	Power factor:	0.704
THD (U):	0.002	THD (I):	0.979
Crest Factor (U):	1.411	Crest Factor (I):	2.695

(Date)

(Sign)

E. U. T. Result

Check harmonics 2..40 [exception odd 21..39]:

Harmonic(s) > 150%:		
Order (n):		None
Harmonic(s) with average > 100%:		
Order (n):		None

Check odd harmonics 21..39:

All Partial Odd Harmonics below partial limits.		
Harmonic(s) > 150%:		
Order (n):		None
Harmonic(s) with average > 150%:		
Order (n):		None

Power Source Result

First dataset out of limit:		
DS (time):		None
Harmonic(s) out of limit:		
Order (n):		None

Average harmonic current results

Hn	leff [A]	leff [%]	Limit [A]	Result
1	1.896	100.000		
2	10.159E-3	0.536	1.08	PASS
3	1.527	80.517	2.30	PASS
4	8.850E-3	0.467	430.00E-3	PASS
5	957.553E-3	50.496	1.14	PASS
6	6.351E-3	0.335	300.00E-3	PASS
7	454.810E-3	23.984	770.00E-3	PASS
8	4.216E-3	0.222	230.00E-3	PASS
9	176.613E-3	9.314	400.00E-3	PASS
10	3.060E-3	0.161	184.00E-3	PASS
11	68.667E-3	3.621	330.00E-3	PASS
12	2.090E-3	0.110	153.33E-3	PASS
13	18.442E-3	0.973	210.00E-3	PASS
14	1.380E-3	0.073	131.43E-3	PASS
15	60.169E-3	3.173	150.00E-3	PASS
16	1.208E-3	0.064	115.00E-3	PASS
17	63.329E-3	3.340	132.35E-3	PASS
18	1.362E-3	0.072	102.22E-3	PASS
19	53.783E-3	2.836	118.42E-3	PASS
20	1.230E-3	0.065	92.00E-3	PASS
21	41.279E-3	2.177	160.71E-3	PASS
22	964.976E-6	0.051	83.64E-3	PASS
23	35.156E-3	1.854	146.74E-3	PASS
24	1.002E-3	0.053	76.66E-3	PASS
25	43.868E-3	2.313	135.00E-3	PASS
26	818.605E-6	0.043	70.77E-3	PASS
27	39.205E-3	2.067	124.99E-3	PASS
28	891.615E-6	0.047	65.71E-3	PASS
29	35.388E-3	1.866	116.39E-3	PASS
30	995.926E-6	0.053	61.33E-3	PASS
31	35.559E-3	1.875	108.87E-3	PASS
32	1.302E-3	0.069	57.50E-3	PASS
33	28.627E-3	1.510	102.27E-3	PASS
34	856.199E-6	0.045	54.12E-3	PASS
35	16.037E-3	0.846	96.44E-3	PASS
36	951.068E-6	0.050	51.11E-3	PASS
37	10.906E-3	0.575	91.21E-3	PASS
38	720.790E-6	0.038	48.42E-3	PASS
39	10.130E-3	0.534	86.53E-3	PASS
40	860.899E-6	0.045	46.00E-3	PASS

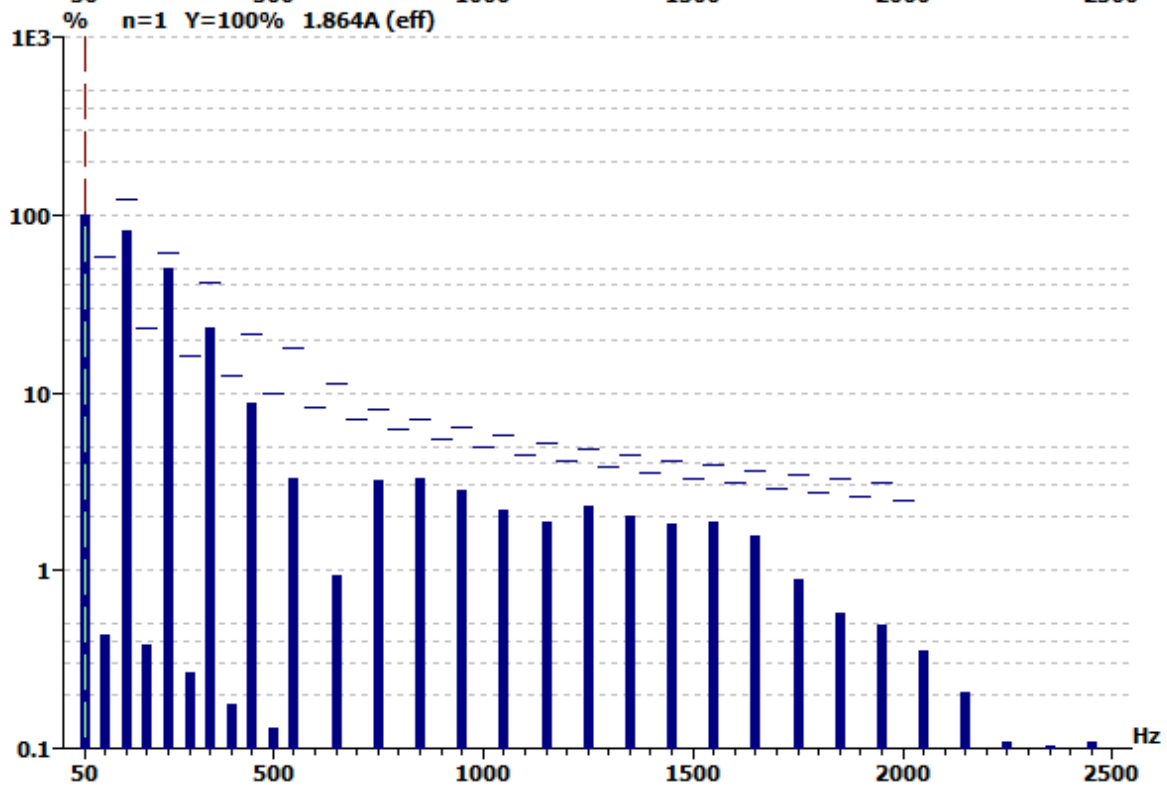
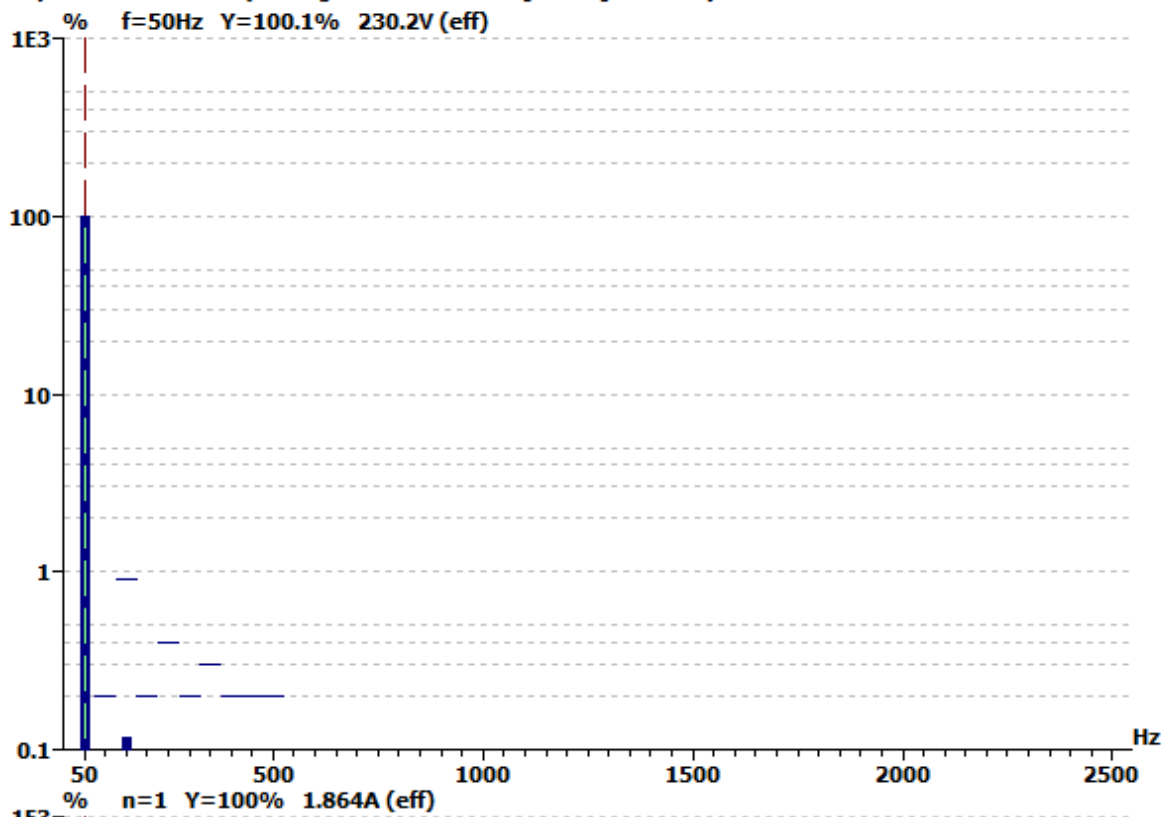
Maximum harmonic current results

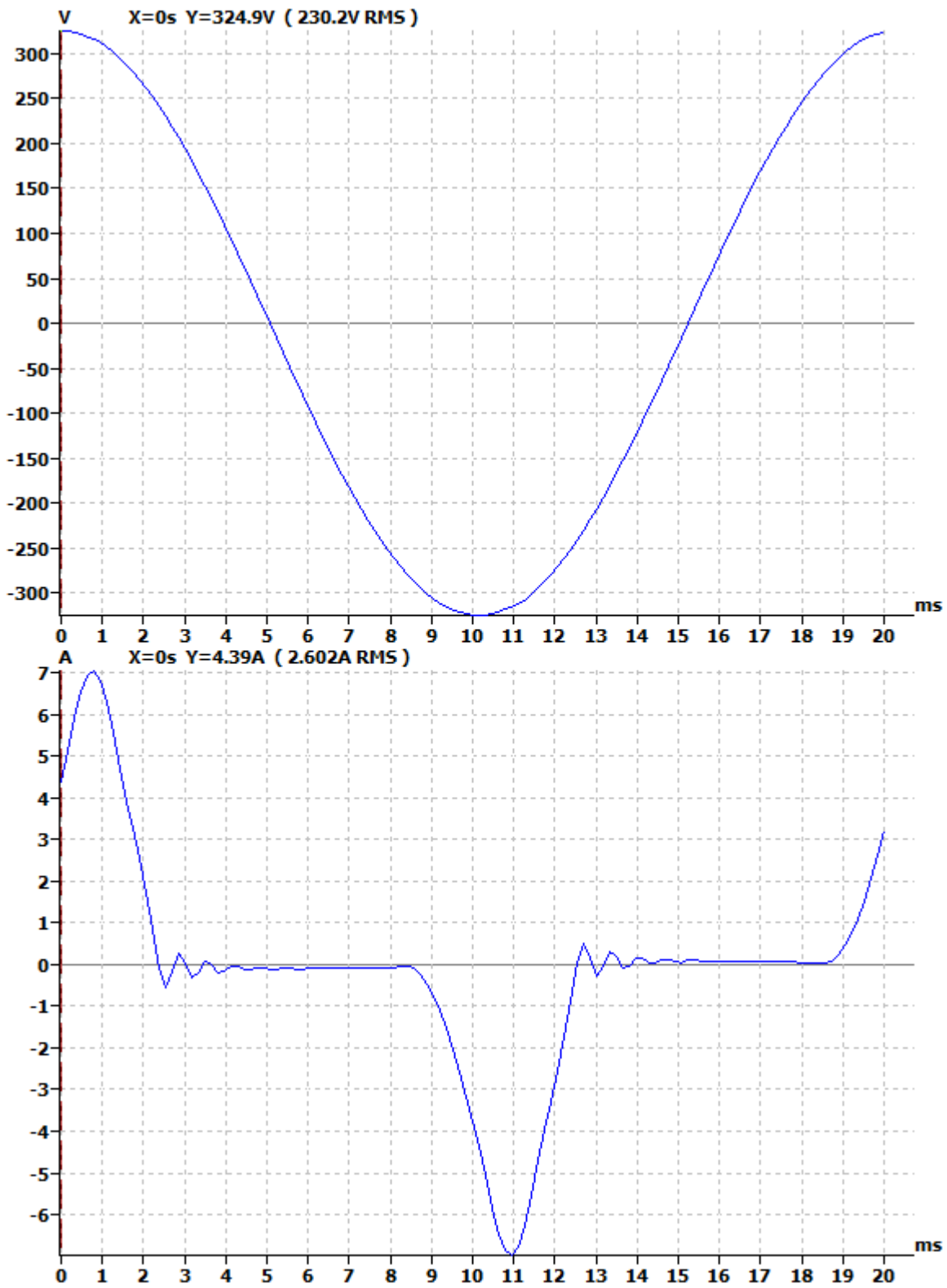
Hn	leff [A]	leff [%]	Limit [A]	Result
1	1.917	100.000		
2	12.067E-3	0.629	1.62	PASS
3	1.545	80.575	3.45	PASS
4	10.556E-3	0.551	645.00E-3	PASS
5	971.483E-3	50.672	1.71	PASS
6	7.645E-3	0.399	450.00E-3	PASS
7	464.625E-3	24.234	1.15	PASS
8	5.199E-3	0.271	345.00E-3	PASS
9	182.952E-3	9.543	600.00E-3	PASS
10	3.848E-3	0.201	276.00E-3	PASS
11	71.497E-3	3.729	495.00E-3	PASS
12	2.550E-3	0.133	229.99E-3	PASS
13	20.332E-3	1.060	315.00E-3	PASS
14	1.652E-3	0.086	197.15E-3	PASS
15	60.921E-3	3.178	225.00E-3	PASS
16	1.441E-3	0.075	172.50E-3	PASS
17	64.364E-3	3.357	198.52E-3	PASS
18	1.873E-3	0.098	153.33E-3	PASS
19	54.475E-3	2.841	177.63E-3	PASS
20	1.494E-3	0.078	138.00E-3	PASS
21	41.709E-3	2.176	160.71E-3	PASS
22	1.136E-3	0.059	125.46E-3	PASS
23	35.502E-3	1.852	146.74E-3	PASS
24	1.205E-3	0.063	114.99E-3	PASS
25	44.378E-3	2.315	135.00E-3	PASS
26	920.027E-6	0.048	106.16E-3	PASS
27	40.114E-3	2.092	124.99E-3	PASS
28	1.029E-3	0.054	98.57E-3	PASS
29	36.474E-3	1.902	116.39E-3	PASS
30	1.203E-3	0.063	92.00E-3	PASS
31	36.318E-3	1.894	108.87E-3	PASS
32	1.598E-3	0.083	86.25E-3	PASS
33	29.386E-3	1.533	102.27E-3	PASS
34	1.023E-3	0.053	81.18E-3	PASS
35	16.773E-3	0.875	96.44E-3	PASS
36	1.121E-3	0.058	76.66E-3	PASS
37	11.193E-3	0.584	91.21E-3	PASS
38	820.763E-6	0.043	72.63E-3	PASS
39	10.792E-3	0.563	86.53E-3	PASS
40	974.936E-6	0.051	69.00E-3	PASS

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	230.17	100.072		
2	79.66E-3	0.035	0.2	PASS
3	294.13E-3	0.128	0.9	PASS
4	12.59E-3	0.005	0.2	PASS
5	167.98E-3	0.073	0.4	PASS
6	10.93E-3	0.005	0.2	PASS
7	128.25E-3	0.056	0.3	PASS
8	8.00E-3	0.003	0.2	PASS
9	127.66E-3	0.056	0.2	PASS
10	17.97E-3	0.008	0.2	PASS
11	42.32E-3	0.018	0.1	PASS
12	16.90E-3	0.007	0.1	PASS
13	101.81E-3	0.044	0.1	PASS
14	15.87E-3	0.007	0.1	PASS
15	169.99E-3	0.074	0.1	PASS
16	8.86E-3	0.004	0.1	PASS
17	134.07E-3	0.058	0.1	PASS
18	13.48E-3	0.006	0.1	PASS
19	99.74E-3	0.043	0.1	PASS
20	12.97E-3	0.006	0.1	PASS
21	106.28E-3	0.046	0.1	PASS
22	15.21E-3	0.007	0.1	PASS
23	127.47E-3	0.055	0.1	PASS
24	9.96E-3	0.004	0.1	PASS
25	32.29E-3	0.014	0.1	PASS
26	20.23E-3	0.009	0.1	PASS
27	82.09E-3	0.036	0.1	PASS
28	18.81E-3	0.008	0.1	PASS
29	134.60E-3	0.059	0.1	PASS
30	13.32E-3	0.006	0.1	PASS
31	84.60E-3	0.037	0.1	PASS
32	20.51E-3	0.009	0.1	PASS
33	67.95E-3	0.030	0.1	PASS
34	16.15E-3	0.007	0.1	PASS
35	62.41E-3	0.027	0.1	PASS
36	20.39E-3	0.009	0.1	PASS
37	61.72E-3	0.027	0.1	PASS
38	17.98E-3	0.008	0.1	PASS
39	77.81E-3	0.034	0.1	PASS
40	20.38E-3	0.009	0.1	PASS

No partial calculation (average odd harmonics [21..39] < 100%)





5.4 Flicker Test

Test Requirement:	EN 61000-3-3: 2008
Test Method:	EN 61000-3-3: 2008
Test Result	PASS

5.4.1 E.U.T. Operation

Operating Environment:

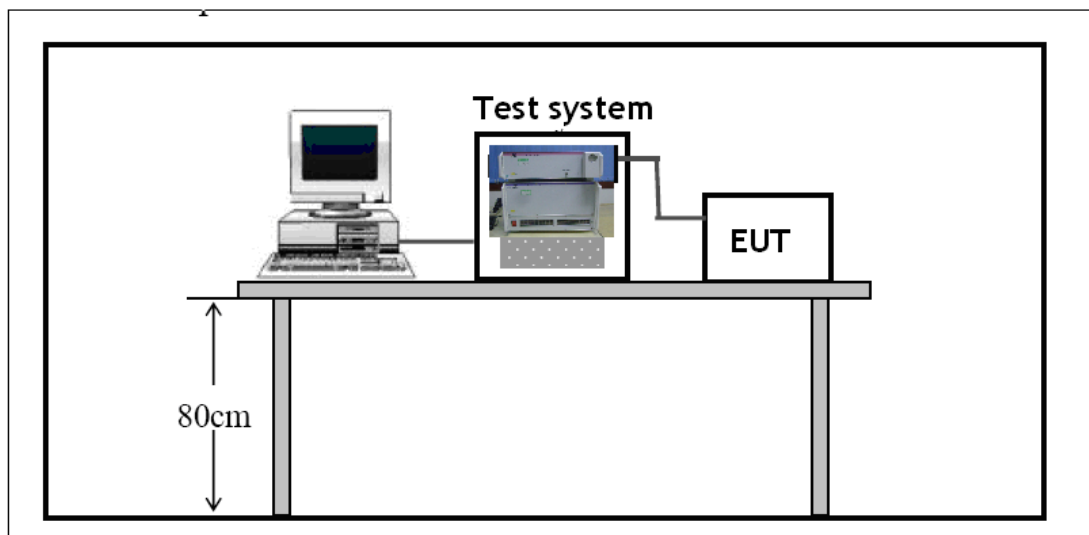
Temperature:	25.5 °C
Humidity:	51 % RH
Barometric Pressure:	1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

5.4.2 Test Setup

The Flicker Test setup accordance with the EN 61000-3-3, The Specification used in this report was the EN61000-3-3 Paragraph 5 limits.



5.4.3 Test Data

Standard used:	EN/IEC 61000-3-3 Flicker
Short time (Pst):	10 min
Observation time:	10 min (1 Flicker measurement)
Flickermeter:	230V / 50Hz
Flicker Impedance:	Zref (IEC 60725)

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.004	3.30	PASS
dmax [%]	0.189	4.00	PASS
dt [s]	0.000	0.50	PASS

5.4.4 Photograph- Harmonic and Flicker Test Setup



6 Immunity Test Results

6.1 Performance Criteria Description

Criterion 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.

Criterion 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.

Criterion C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

For further details, please refer to EN55024.

6.2 ESD

Test Requirement:	EN55024
Test Method:	EN61000-4-2
Test Result:	PASS
Discharge Impedance:	330 Ω / 150 pF
Discharge Voltage:	Air Discharge: +/- 8 kV Contact Discharge: +/- 4 kV HCP & VCP: +/- 4 kV
Polarity:	Positive & Negative
Number of Discharge:	Minimum 10 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

6.2.1 E.U.T. Operation

Operating Environment:

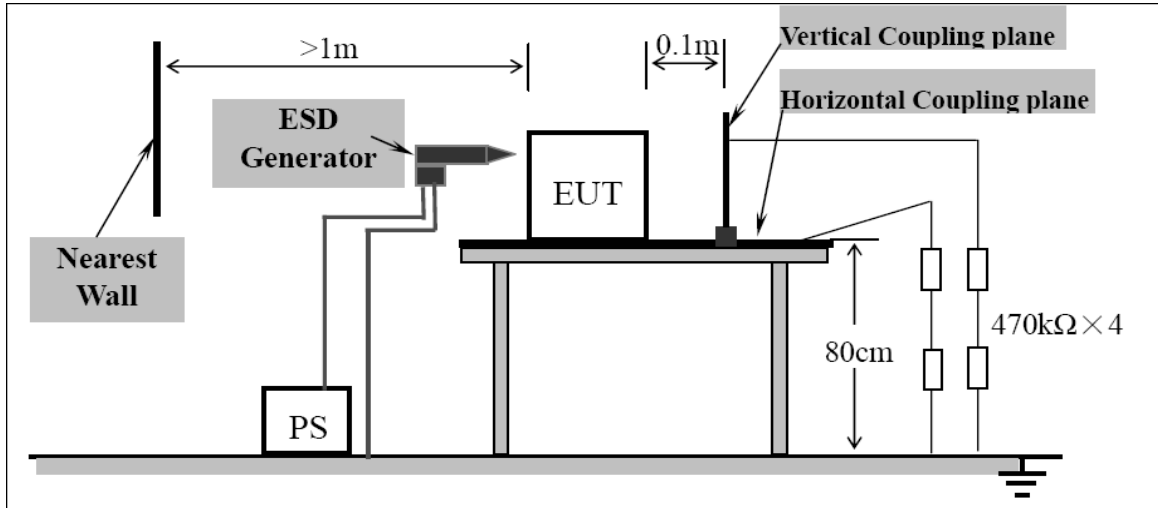
Temperature :	25.5 °C
Humidity :	51 % RH
Barometric Pressure :	1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

6.2.2 ESD Test Setup

The ESD Test setup accordance with the EN 61000-4-2, The Specification used in this report was the EN 55024 Paragraph 4.2 requirements.



6.2.3 Direct Application Test Results

Observations : Test points : 1. All Exposed Surface & Seams;
2. All metallic part

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
8	+/-	1	N/A	B
4	+/-	2	B	N/A

Results

B: Degradation in the performance of the E.U.T. was observed.

N/A: Not applicable.

6.2.4 Indirect Application Test Results

Observations : Test points : 1. All sides.

Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
4	+/-	1	B	B

Results

B: Degradation in the performance of the E.U.T. was observed.

6.2.5 Photograph - ESD Test Setup



6.3 Radiated Immunity

Test Requirement:	EN55024
Test Method:	EN61000-4-3
Frequency Range:	80MHz–1GHz
Face Under Test:	Three Mutually Orthogonal Faces
Severity:	3V/m, 1kHz, 80% Amp. Mod. from 80MHz to 1GHz
Test Result:	PASS

6.3.1 E.U.T. Operation

Operating Environment:

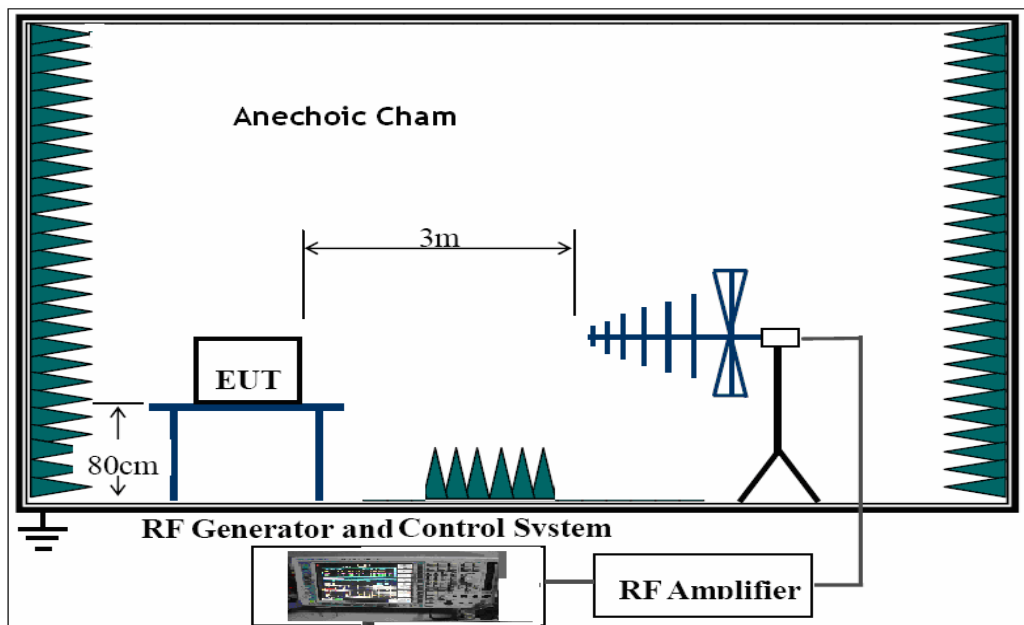
Temperature:	25.5°C
Humidity:	51 % RH
Barometric Pressure:	1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

6.3.2 Radiated Immunity Test Setup

The Radiated Immunity test setup accordance with the EN 61000-4-3, The Specification used in this report was the EN 55024 Paragraph 4.2.3 requirements.



6.3.3 Test Results

Frequency	Level	Modulation	EUT Face	Result / Observations
80MHz-1GHz	3V/m	1kHz, 80%, Amp. Mod.	X Y Z	During test and after test, the EUT was normal (A).

Remarks:

AM : Amplitude Modulation.

PM : Pulse Modulation.

X : EUT as per photograph in section 6.3.4 of this report.

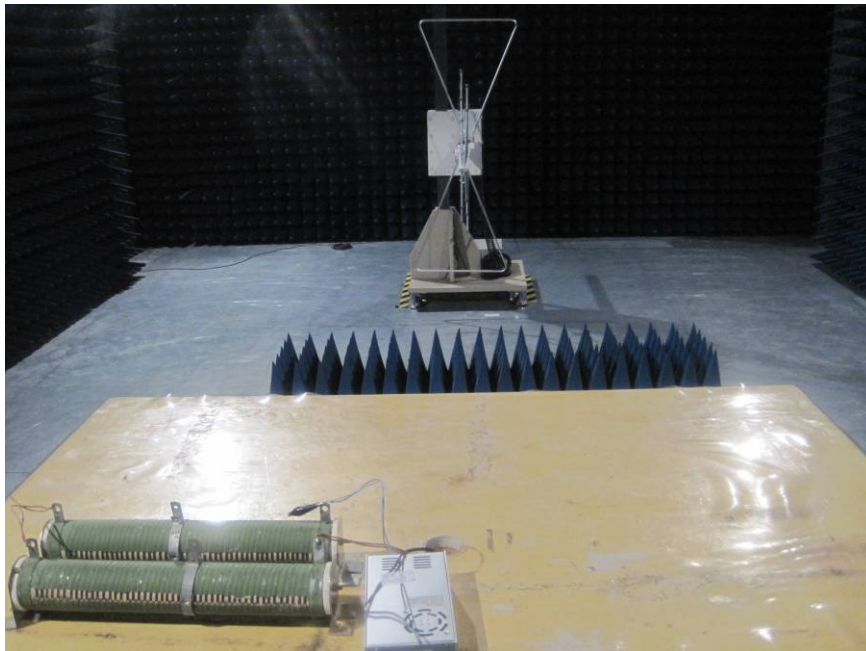
Y : As X, but rotate EUT by 90° clockwise.

Z : As Y, but rotate EUT by 90° vertically.

Results

A : No degradation in the performance of the E.U.T. was observed.

6.3.4 Photograph - Radiated Immunity Test Setup



6.4 Electrical Fast Transients (EFT)

Test Requirement: EN 55024
 Test Method: EN 61000-4-4
 Test Result: PASS
 Test Level: 1.0kV on AC
 Polarity: Positive & Negative
 Repetition Frequency: 5kHz
 Burst Duration: 300ms
 Test Duration: 2 minutes per level & polarity

6.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C
 Humidity: 51 % RH
 Barometric Pressure: 1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

6.4.2 Test Results On AC Cable

Lead under Test	Level (±kV)	Coupling Direct/Clamp	EUT operating mode	Observations (Performance Criterion)
AC Live to Neutral to PE	±1.0	Direct	full load	B

Results

B: Degradation in the performance of the E.U.T. was observed.

6.4.3 Photograph - EFT Test Setup For EUT On AC Cable



6.5 Surge

Test Requirement: EN 55024
 Test Method: EN 61000-4-5
 Test Result: PASS
 Test level: $\pm 1\text{kV}$ Live to Neutral, $\pm 2\text{kV}$ Live to PE, $\pm 2\text{kV}$ Neutral to PE
 Interval: 60s between each surge
 No. of surges: 5 positive, 5 negative at 0° , 90° , 180° , 270° .

6.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5°C
 Humidity: 51 % RH
 Barometric Pressure: 1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

6.5.2 Test Results

Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	$\pm$	L-N	/	/
2	1kV	$\pm$	L-N	B	/
3	2kV	$\pm$	L-PE, N-PE	B	/
4	4kV	$\pm$	L-N, L-PE, N-PE	/	/

Results

B: Degradation in the performance of the E.U.T. was observed.

6.5.3 Photograph -Surge Test Setup



6.6 Conducted Immunity 0.15MHz to 80MHz

Test Requirement: EN 55024
 Test Method: EN 61000-4-6
 Test Result: PASS
 Frequency Range: 0.15MHz to 80MHz
 Test level: 3V rms (unmodulated emf into 150 Ω)
 Modulation: 80%, 1kHz Amplitude Modulation.

6.6.1 E.U.T. Operation

Operating Environment:
 Temperature: 25.5°C
 Humidity: 51% RH
 Barometric Pressure: 1012 mbar

EUT Operation:
 Compliance test was performed in full load mode.

6.6.2 Test Results AC mains of EUT

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Observation (Performance Criterion)
150kHz to 80MHz	3Wire AC Supply Cable	3Vrms	80%, 1kHz Amp. Mod.	1%	1s	During test and after test,EUT was normal (A).

Results

A: No degradation in the performance of the E.U.T. was observed.

6.6.3 Photograph -Conducted Immunity Test Setup On AC Cable



6.7 Voltage Dips and Interruptions

Test Requirement: EN 55024
 Test Method: EN 61000-4-11
 Test Result: PASS
 Test Level(Voltage reduction): <5% & <5% & 70 % of U_T (Supply Voltage)
 No. of Dips / Interruptions: 1 per Level at 20ms intervals

6.7.1 E.U.T. Operation

Operating Environment:

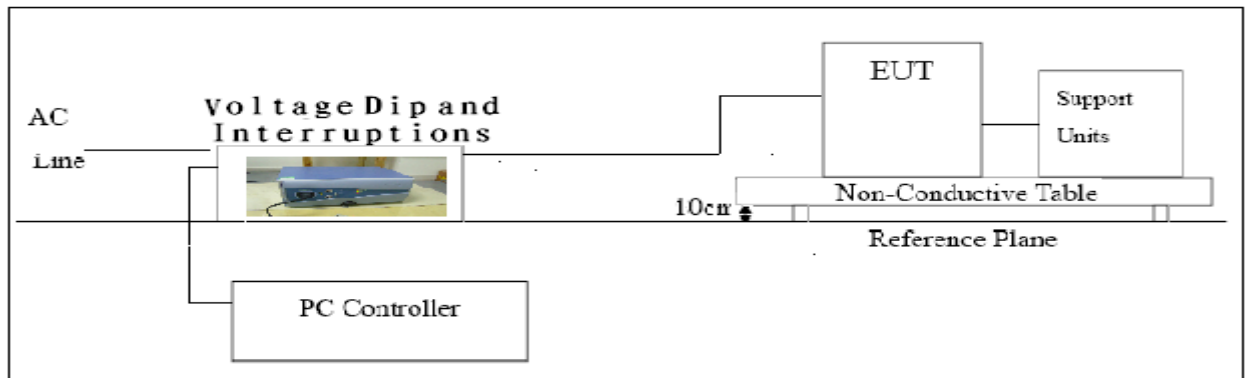
Temperature: 25.5 °C
 Humidity: 51% RH
 Barometric Pressure: 1012 mbar

EUT Operation:

Compliance test was performed in full load mode.

6.7.2 Voltage Dips and Interruptions Test Setup

The Voltage dips and Interruptions Test setup accordance with the EN 61000-4-11, the Specification used in this report was the EN 55024 Paragraph 4.2.6 requirements.



6.7.3 Measurement Data

EUT operating mode	Dropout % U_T	Phase	Duration of dropout in Periods	No of dropout	Time between dropout	Observations (Performance Criterion)
full load	95	0°	0.5	3	10ms	B
ditto	95	0°	250	3	5000ms	C
ditto	30	0°	25	3	500ms	C

Results

B : During test, This was within the minimum performance criteria set by the applicant.
 Please refer to section 6.1 of this report for further details.

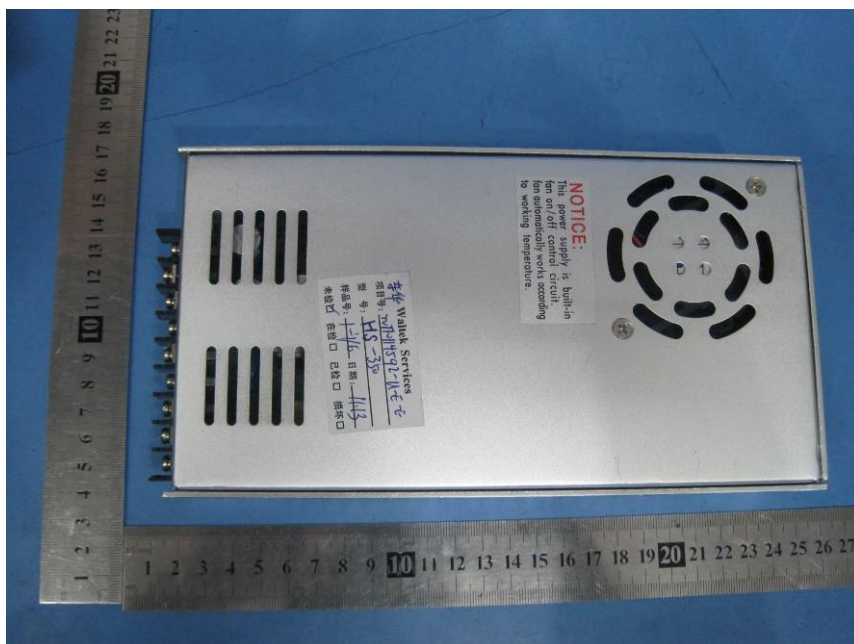
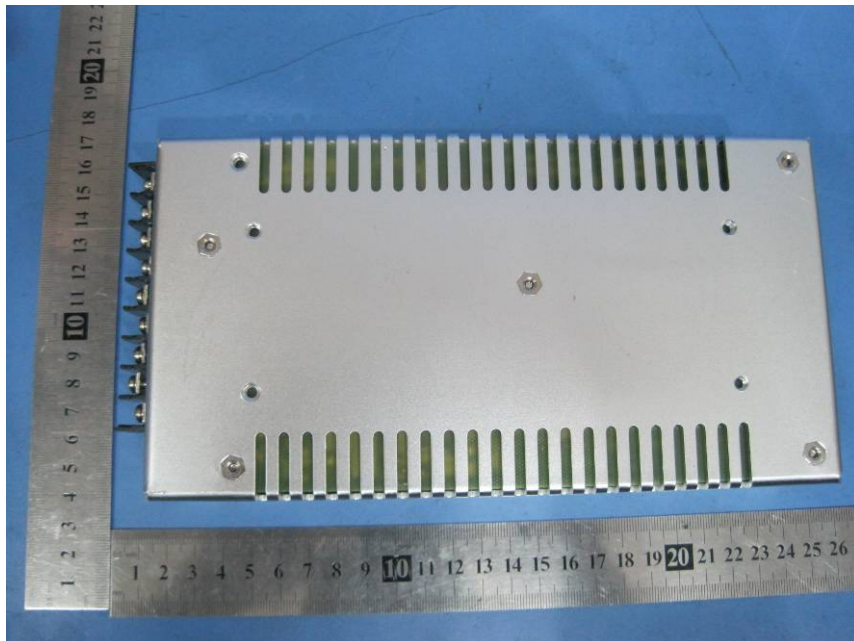
6.7.4 Photograph - Voltage Dips and Interruptions Test Setup



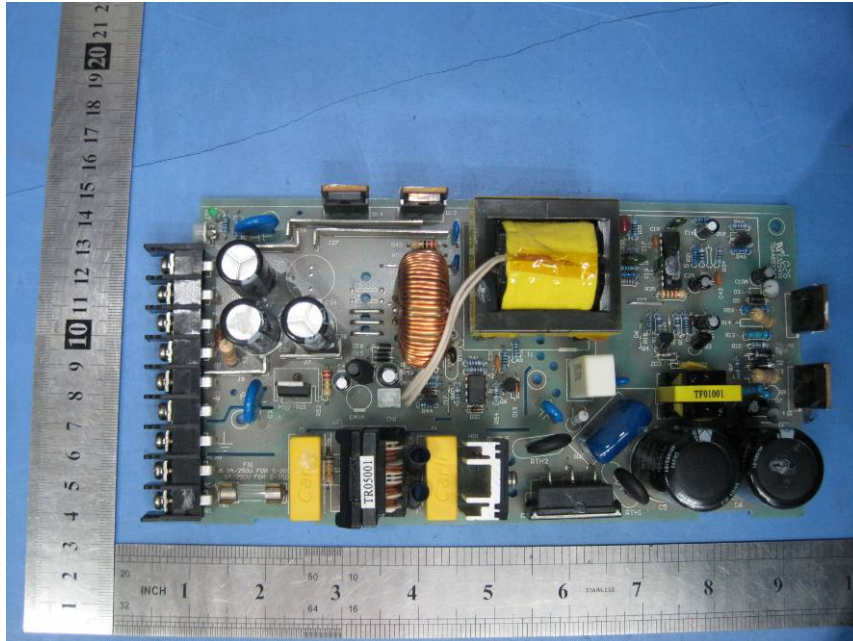
7 Photographs - Constructional Details

7.1 EUT-Appearance View

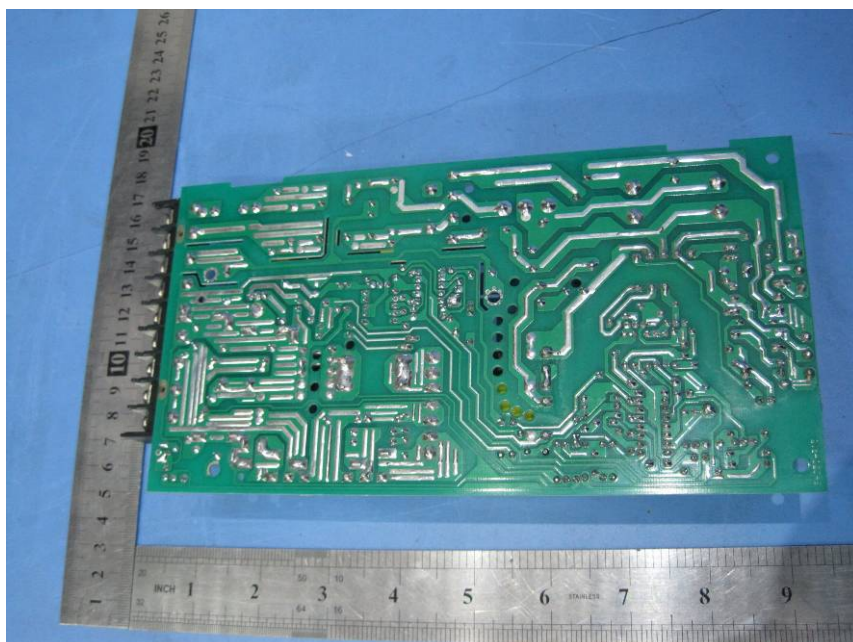




7.2 PCB - Top View



7.3 PCB - Bottom View



8 CE Label

1. The CE conformity marking must consist of the initials 'CE' taking the following form:
If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
It must have the same height as the initials 'CE'

Proposed Label Location on EUT
EUT Front View/proposed CE Mark Location

