



CE EMC TEST REPORT

for

ES3510MA-DC

MODEL: ES3510MA-DC

Test Report Number:
KS101108A01-ET

Issued to:

Accton Technology Corporation

**1 Creation 3rd, Science-based Industrial Park, Hsinchu
300, Taiwan R.O.C**

Issued by:

Compliance Certification Services Inc.

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Issued Date: November 15, 2010



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Revision History

Rev.		Issue Report No.		Revisions	Effect Page	Revised By
00		KS101108A01		Initial Issue	ALL	Hadiif.Hoo



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1 TEST CERTIFICATION

Product Name:	ES3510MA-DC	
Model No.:	ES3510MA-DC	
Brand Name:	Edgecore TW	
Applicant:	Accton Technology Corporation	
Address :	1 Creation 3 rd ,Science-based Industrial Park,Hsinchu 300,Taiwan R.O.C	
Manufacturer:	Accton Technology Corporation	
Address :	1 Creation 3 rd ,Science-based Industrial Park,Hsinchu 300,Taiwan R.O.C	
Tested Date:	From November 9, 2010 to November 14, 2010	
Applicable Standards:	EN 55022:2006+A1:2007, Class A	EN 55024:1998+A1: 2001 + A2:2003
	AS/NZS CISPR 22: 2006 Class A	EN 61000-4-2: 2009
	EN 61000-3-2:2006 Class A	EN 61000-4-3:2006/A1:2008
	EN 61000-3-3:2008	EN 61000-4-4:2004
		EN 61000-4-5:2006
		EN 61000-4-6:2007
		EN 61000-4-8:1993/A1:2001
		EN 61000-4-11:2004

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Hadiif.Hoo
EMC Manager
Compliance Certification Service Inc.

Reviewed by:

Dohnny.Lu
EMC Section Manager
Compliance Certification Service Inc.



2 TEST RESULT SUMMARY

EMISSION			
Standard	Item	Result	Remarks
EN55022:2006+A1:2007 AS/NZS CISPR 22: 2006 Class A	Conducted (Main Port)	PASS	Meet Class A limit
	Conducted (Telecom port)	PASS	Meet Class A limit
	Radiated (Below 1GHz)	PASS	Meet Class A limit
	Radiated (Above 1GHz)	PASS	Meet Class A limit
EN 61000-3-2 :2006	Harmonic current emissions	N/A	
EN 61000-3-3:2008	Voltage fluctuations & flicker	N/A	

IMMUNITY 【 EN 55024:1998+A1: 2001 + A2:2003 】			
Standard	Item	Result	Remarks
EN 61000-4-2: 2009	ESD	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-3:2006/A1:2008	RS	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-4:2004	EFT	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-5:2006	Surge	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-6:2007	CS	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-8:1993/A1:2001	PFMF	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-11:2004	Voltage dips & voltage variations	N/A	

- Note:** 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.



3 EUT DESCRIPTION

Product Name	ES3510MA-DC
Brand Name	Edgecore TW
Model Number	ES3510MA-DC
Applicant	Accton Technology Corporation
Housing material	Metal case
EUT Type	☐ Engineering Sample. ☒ Product Sample, ☐ Mass Product Sample.

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1). DC Port	1	1
2). RJ45 Port	10	10
3). Console Port	1	1
4). OPTICAL FIBER Port	2	2



4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration modes are as the following:

Mode 1:Full system

After the preliminary scan, the following test mode was found to produce the final emission level.

Mode 1:Full system

4.2. EUT SYSTEM OPERATION

1. Start up the EUT, make sure it worked normally.
2. Connect the EUT with the two support notebook.
3. Set the IP address of the two notebook, go through the EUT ping with the two notebook.
4. Start testing after ping each other successfully.

Note: Test program is self-repeating throughout the test.



5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

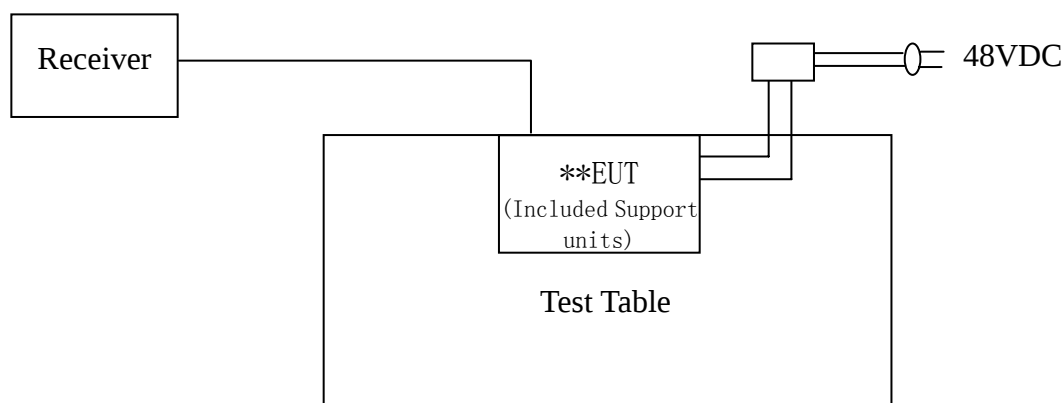
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	Notebook	M285	00043-422-091-33 6	DoC	LEO	Line cable: Un-Shielded 1.8m LAN cable: Un-Shielded 10m	Shielded, 1.8m
2	Notebook	2672	998W21C	DoC	IBM	Line cable: Un-Shielded 1.8m LAN cable: Un-Shielded 10m	Shielded, 1.8m

Note:

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST





6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at
No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF
USA	A2LA
China	CNAS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Japan	VCCI
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site,
<http://www.ccsrf.com>



6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	0.15MHz~30MHz	± 3.43 dB

Measurement	Polarity	Frequency	Uncertainty
Radiated emissions (below 1GHz)	H	30MHz ~ 200MHz	+/- 4.72dB
		200MHz ~1000MHz	+/- 4.72dB
	V	30MHz ~ 200MHz	+/- 4.83dB
		200MHz ~1000MHz	+/- 4.70dB
Radiated emissions (above 1GHz)	H	1000MHz ~5000MHz	+/- 3.92dB
		5000MHz ~6000MHz	+/- 3.94dB
	V	1000MHz ~5000MHz	+/- 3.92dB
		5000MHz ~6000MHz	+/- 3.93dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Consistent with industry standard (e.g. CISPR 22: 2005, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

**6.3.1. LIST OF TEST EQUIPMENT**

Conducted Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI TEST RECEIVER	R&S	ESCI3	100781	04/29/2011
V (V-LISN)	Schwarzbeck	NNLK 8129	8129-143	04/29/2011
LISN (EUT)	FCC	FCC-LISN-50/250-5 0-2-02	SN:05012	04/29/2011
TRANSIENT LIMITER	SCHAFFNER	CFL9206	1710	04/29/2011
Test Software	EZ-EMC			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Impedance Stabilization Network				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI TEST RECEIVER	R&S	ESCI3	100781	04/29/2011
V (V-LISN)	Schwarzbeck	NNLK 8129	8129-143	04/29/2011
LISN (EUT)	FCC	FCC-LISN-50/250 -50-2-02	SN:05012	04/29/2011
CISPR22 FOUR BALANCED PAIRS ISN	FCC	FCC-TLISN-T8-02	20165	04/29/2011
CISPR22 TWO BALANCED PAIRS ISN	FCC	FCC-TLISN-T4-02	20383	04/29/2011
CISPR22 TWO BALANCED PAIRS ISN	FCC	FCC-TLISN-T2-02	20439	04/29/2011
RF Current Probe	FCC	F-65A	147	05/08/2011
TRANSIENT LIMITER	SCHAFFNER	CFL9206	1710	04/29/2011
Test Software	EZ-EMC			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

**Radiated Emission (Test Site A (10m chamber) for 30MHz-1GHz)**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESI26	100068	05/26/2011
Bilog Antenna	Sunol	JB1	A110204	06/24/2011
Pre-Amplifier	Anritsu	MH648A	M64192	05/28/2011
System Controller	Sunol	SC99V	121501-1	N.C.R.
Turn Table	Sunol	FM3022HS	N/A	N.C.R.
Antenna Mast	Sunol	TWR 99-4	121501-3	N.C.R.
Test Software	EZ-EMC			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Radiated Emission (3M Semi Anechoic Chamber (977) For 1 GHz -18GHz)

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	05/26/2011
EMI Test Receiver	R&S	ESPI3	101026	04/29/2011
Pre-Amplifier	MINI	ZFL-1000VH2	d041703	06/30/2011
Pre-Amplifier	Miteq	NSP4000-NF	870629	06/30/2011
Bilog Antenna	Sunol	JB1	A110204-2	06/24/2011
Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	05/07/2011
Turn Table	CT	CT123	4165	N.C.R
Antenna Tower	CT	CTERG23	3256	N.C.R
Controller	CT	CT100	95637	N.C.R
Test Software	EZ-EMC			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2.N.C.R = No Calibration Request.

Power Harmonics & Voltage Fluctuation and Flicker

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic & Flicker Tester	SCHAFFNER	CCN 1000-1	72585	04/29/2011
AC Power Source	SCHAFFNER	NSG 1007-3-240	58233	04/29/2011

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

**Electrostatic Discharge**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Simulator	EM TEST	DITO	V0936105118	04/16/2011

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Radiated susceptibility

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	R&S	SML 3	100564	03/25/2011
E-Field Sensor	SCHAFFNER	EMC-20 TYP-8	AI-0057 AM-0032	06/07/2011
Amplifier Research (80~1000MHz 150w)	AR Worldwide	150W1000M1	320947	05/06/2011
Amplifier Research (0.8~3GHz 60w)	AR Worldwide	60S1G3M1	320468	05/06/2011
Dual Directional Coupler (0.8~4.2GHz 400w)	AR Worldwide	DC7144A	313672	04/22/2011
Dual Directional Coupler (80~1000MHz 400w)	AR Worldwide	DC6180	302211	04/22/2011
RF POWER METER	BOONTON	4232A-01	1614	05/26/2011
POWER SENSOR	BOONTON	51011-EMC	34148	05/26/2011
POWER SENSOR	BOONTON	51011-EMC	34149	05/26/2011
Bilog Antenna	SCHAFFNER	CBL6144	1006	05/26/2011
Horn Antenna	AR Worldwide	AT4002A	321468	05/26/2011
RF Test System Controller	AR Worldwide	SC1000M3	321777	N.C.R.
CCD	GnbH Hmerau	CE-SYS	19709529	N.C.R.

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Electrical fast transient/burst

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Transients/Burst/Surge Test system	SCHAFFNER	BEST EMC V2.7	200132-001SC	04/29/2011
ELECTRICAL FAST TRANSIENT/BURST CAPACITANCE CLAMP	3Ctest	EFT-4000	N.C.R.	N.C.R.

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.



Surge				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Transients/Burst/Surge Test system	SCHAFFNER	BEST EMC V2.7	200132-001SC	04/29/2011
Signal Line Coupling Network	SCHAFFNER	CDN-117	17396	N.C.R.
Signal Line Coupling Network	SCHAFFNER	CDN-118	SL 400-187	N.C.R.
Coupling Accessory GAS Arrestor	SCHAFFNER	INA170	SL403-107	N.C.R.
Coupling Accessory GAS Arrestor with 0.1 μ F	SCHAFFNER	INA171	SL403-108	N.C.R.
R-Box 4x100 Ω	SCHAFFNER	INA172	SL403-109	N.C.R.
Short Circuit plug	SCHAFFNER	INA173	403-110	N.C.R.
capacitance (0.5 μ F)	SCHAFFNER	INA174	SL403-209	N.C.R.
R-Box 4x160 Ω	SCHAFFNER	INA175	SL403-474	N.C.R.

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Conducted susceptibility				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
RF Generator	SCHAFFNER	NSG2070	1042	04/29/2011
EM-Koppelzange	SCHAFFNER	KEMZ 801	17629	N.C.R.
Attenuator	SCHAFFNER	INA 2070-1	2042	05/06/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN M216	16399	04/29/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN M316	16935	04/29/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN M316	16939	04/29/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN M316	16940	04/29/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN T400	16918	04/29/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN T002	19000	04/29/2011
CDN (Coupling and Decoupling Network)	SCHAFFNER	CDN A800	17890	04/29/2011
Signal Line Coupling Decoupling Network	FCC	FCC-801-S4-USB	SN:05028	04/29/2011



Signal Line Coupling Decoupling Network	FCC	FCC-801-T8-RJ45	SN:04026	04/29/2011
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NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Power frequency magnetic field				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Induction Coil Interface	SCHAFFNER	INA2141 INA702	6004 200149-078SC	04/29/2011
Induction Coil	SCHAFFNER	INA702	200149-078SC	04/29/2011
AC Power Source	SCHAFFNER	NSG 1007-3-240	58233	04/29/2011
EMF Tester (Electromagnetic Field)	TES	TES-1390	010800365	05/06/2011
Clamp meter	FLUKE	36	78210055	05/26/2011

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

Voltage dips and interruption				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Transients/Burst/Surge Test system	SCHAFFNER	BEST EMC V2.7	200132-001SC	04/29/2011

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.



7 EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

See list of test equipment of this test report.



7.1.3. TEST PROCEDURES

Procedure of Preliminary Test

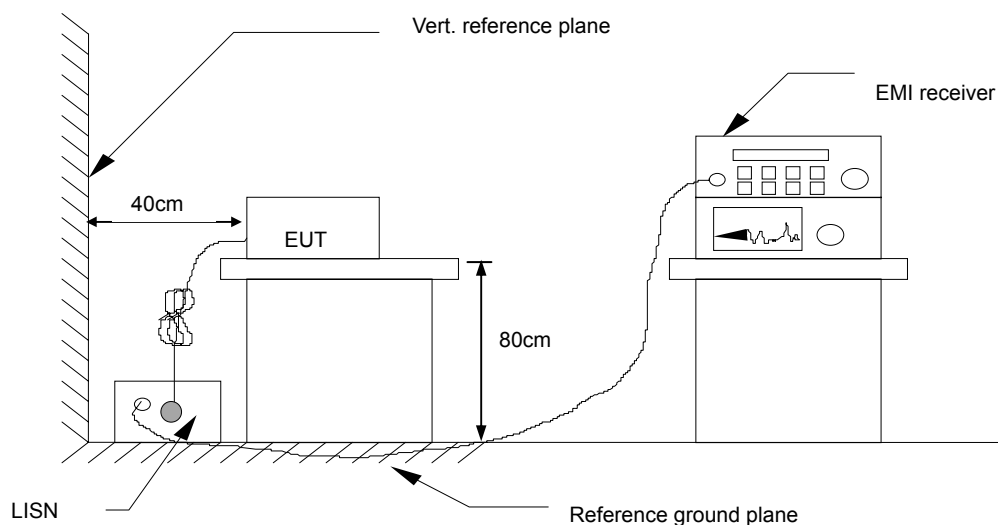
- The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.



7.1.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
x.xx	52.61	10.35	62.96	66.00	-3.04	A	L1

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
L1 = Hot side
L2 = Neutral side

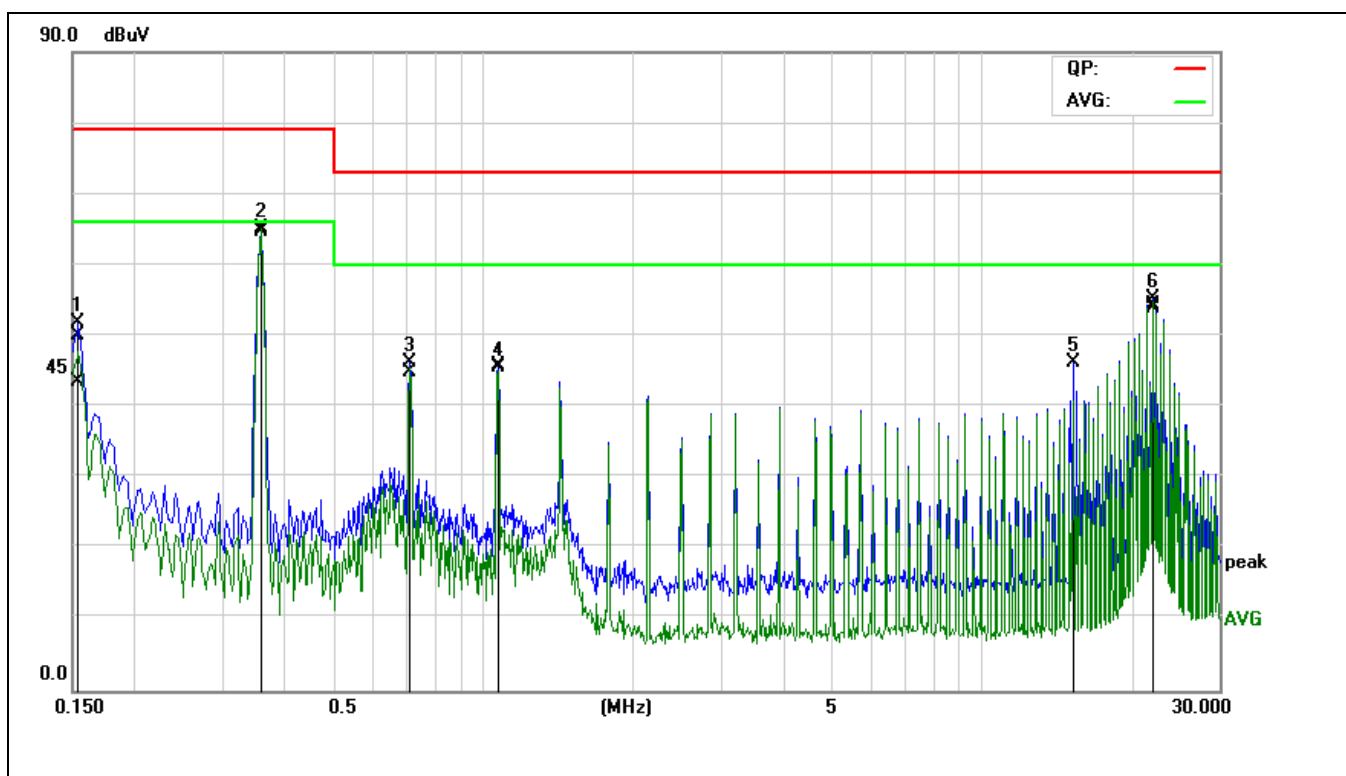
Calculation Formula

Margin (dB) = Result (dBuV) – Limit (dBuV)



7.1.6. TEST RESULTS

Job No.:	KS101108A01	Date:	2010-11-9
Company:	ACCTON	Time:	15:07:52
Standard:	EN55022 CLASS A	Temp.(°C)/Hum.(%):	22 (°C)/48%
Test item:	Conduction test	Test By:	Bruce.dong
Line:	L1	Test Voltage:	DC 48V
Model:	ES3510MA-DC	Description:	Mode 1:Full system



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1531	39.96	33.44	10.04	50.00	43.48	79.00	66.00	-29.00	-22.52	Pass
2*	0.3570	54.35	52.61	10.35	64.70	62.96	79.00	66.00	-14.30	-3.04	Pass
3	0.7133	33.87	33.86	10.94	44.81	44.80	73.00	60.00	-28.19	-15.20	Pass
4	1.0722	34.62	34.84	11.02	45.64	45.86	73.00	60.00	-27.36	-14.14	Pass
5	15.2835	34.98	31.91	11.34	46.32	43.25	73.00	60.00	-26.68	-16.75	Pass
6	22.1633	42.48	42.02	11.83	54.31	53.85	73.00	60.00	-18.69	-6.15	Pass

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

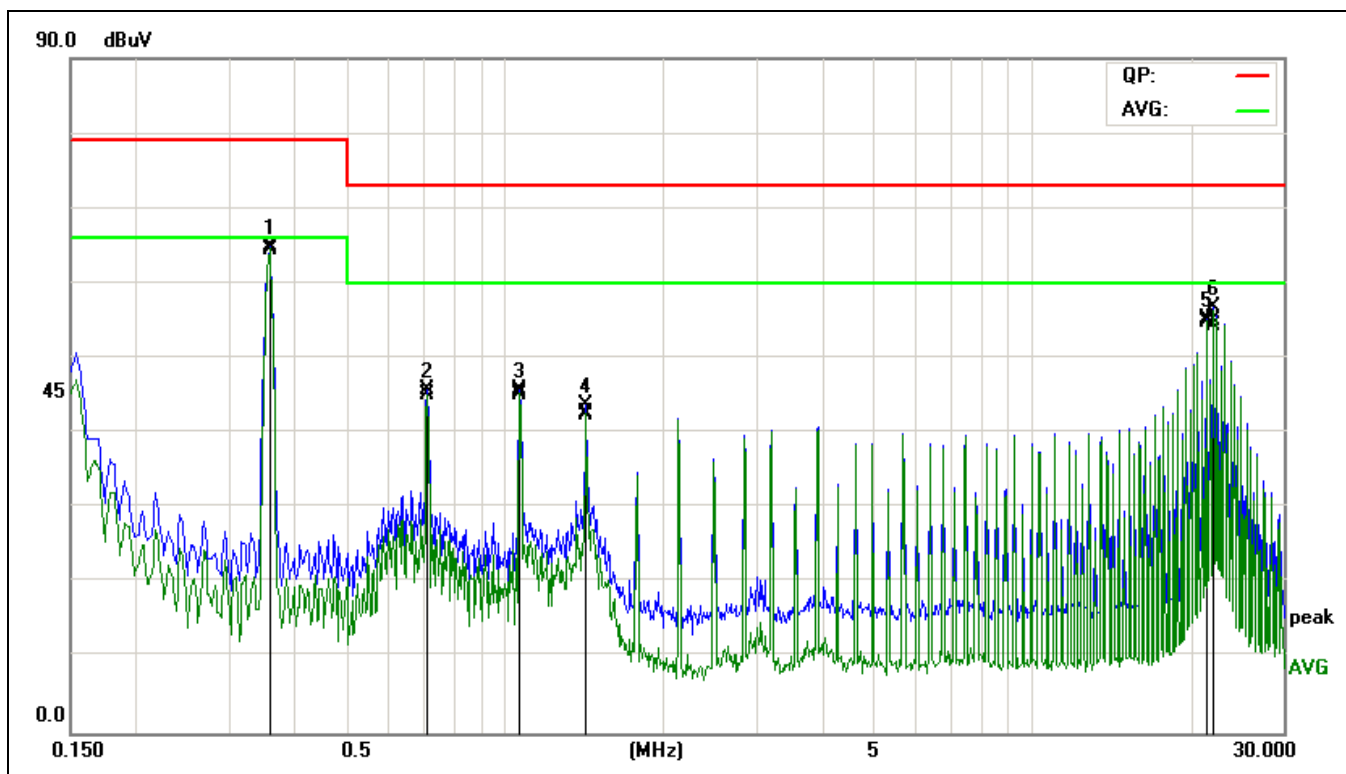
2. Factor (dB) = cable loss + Insertion loss of LISN+ Insertion loss of TRANSIENT LIMITER
(The TRANSIENT LIMITER included 10 dB ATTENUATION)

Amptd dBuV= Uncorrected Analyzer/Receiver reading + Factor (dB)

Margin (dB) = Amptd (dBuV) – Limit (dBuV)



Job No.:	KS101108A01	Date:	2010-11-9
Company:	ACCTON	Time:	15:03:07
Standard:	EN55022 CLASS A	Temp.(°C)/Hum.(%):	22 (°C)/48 %
Test item:	Conduction test	Test By:	Bruce.dong
Line:	L2	Test Voltage:	DC 48V
Model:	ES3510MA-DC	Description:	Mode 1:Full system



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.3565	54.40	52.66	10.14	64.54	62.80	79.00	66.00	-14.46	-3.20	Pass
2	0.7142	35.01	34.96	10.15	45.16	45.11	73.00	60.00	-27.84	-14.89	Pass
3	1.0718	34.81	35.02	10.24	45.05	45.26	73.00	60.00	-27.95	-14.74	Pass
4	1.4277	32.16	32.17	10.36	42.52	42.53	73.00	60.00	-30.48	-17.47	Pass
5	21.4249	43.02	42.90	11.80	54.82	54.70	73.00	60.00	-18.18	-5.30	Pass
6	22.1328	43.17	42.57	11.87	55.04	54.44	73.00	60.00	-17.96	-5.56	Pass

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

2. Factor (dB) = cable loss + Insertion loss of LISN+ Insertion loss of TRANSIENT LIMITER
(The TRANSIENT LIMITER included 10 dB ATTENUATION)

Amptd dBuV= Uncorrected Analyzer/Receiver reading + Factor (dB)

Margin (dB) = Amptd (dBuV) – Limit (dBuV)



7.2. CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

7.2.1. LIMITS

For Class A Equipment

FREQUENCY (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	97 ~ 87	84 ~ 74	53 ~ 43	40 ~ 30
0.5 ~ 30.0	87	74	43	30

NOTE: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

For Class B Equipment

FREQUENCY (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 ~ 74	74 ~ 64	40 ~ 30	30 ~ 20
0.5 - 30.0	74	64	30	20

NOTE: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

7.2.2. TEST INSTRUMENTS

See list of test equipment of this test report.



7.2.3. TEST PROCEDURE

- Selecting ISN for unscreened cable or a current probe for screened cable to take measurement.
- The port of the EUT was connected to the remote side support equipment through the ISN/Current Probe and communication in normal condition.
- Making a overall range scan by using the test receiver controlled by controller and record at least six highest emissions for showing in the test report.
- Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- In case of measuring on the screened cable, the current limit shall be applied; otherwise the voltage limit should be applied.
- The following test modes was scanned during the preliminary test:

Modes:

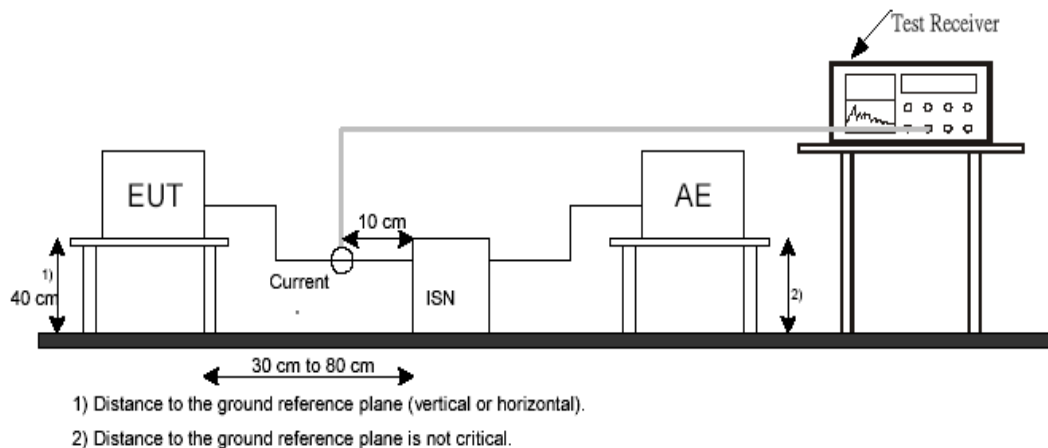
1	10M (Ping)
2	100M (Ping)

- After the preliminary scan, we found the following test mode(s) producing the highest emission level and test data of the worst case was recorded.

100M (Ping)



7.2.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.5. DATA SAMPLE

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
xx.xx	47.51	10.46	57.97	74.00	-16.03	A

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading

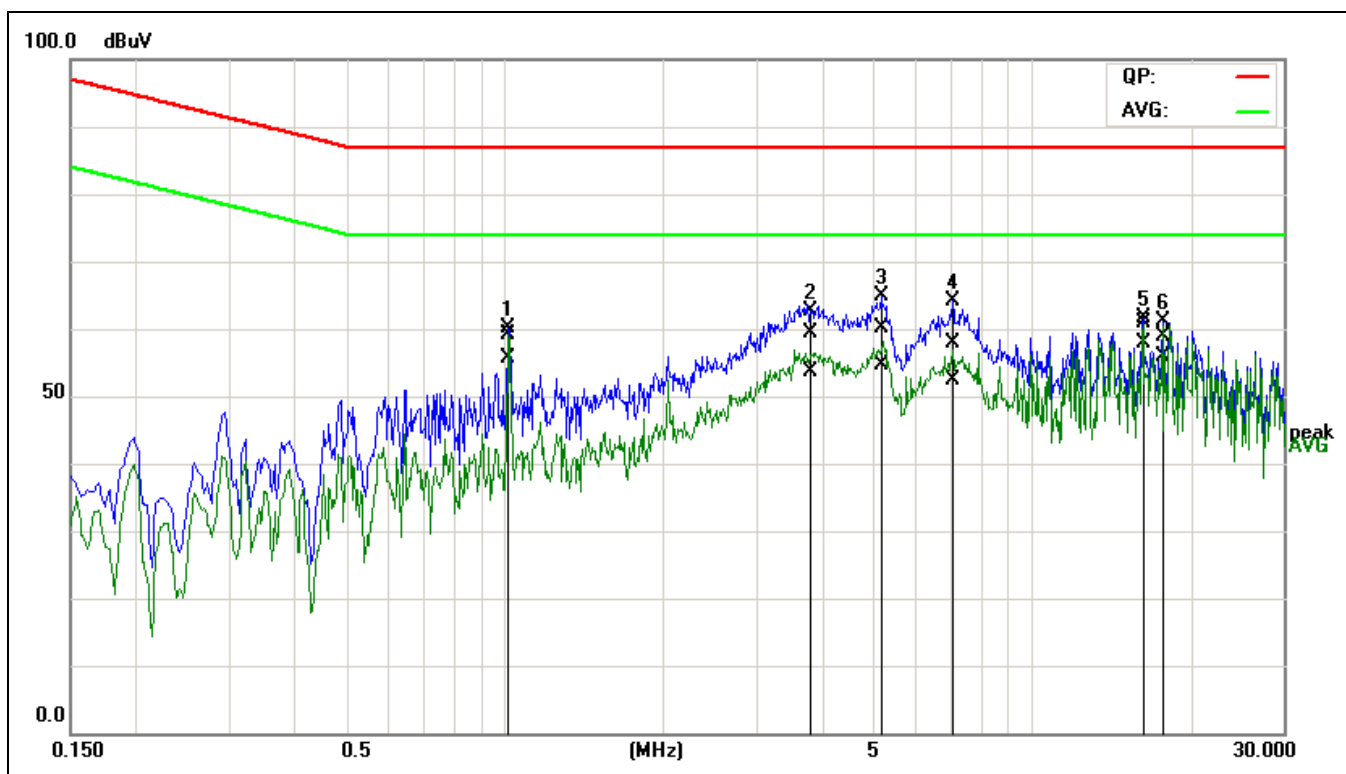
Calculation Formula

Margin (dB) = Result (dBuV) – Limit (dBuV)



7.2.6. TEST RESULTS

Job No.:	KS101108A01	Date:	2010-11-9
Company:	ACCTON	Time:	15:35:52
Standard:	EN55022 CLASS A	Temp.(°C)/Hum.(%):	22 (°C)/48%
Test item:	ISN test	Test By:	Ken.yao
Model:	ES3510MA-DC	Test Voltage:	DC 48V
Description:	LAN:100Mbps		



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	1.0258	48.44	45.00	10.64	59.08	55.64	87.00	74.00	-27.92	-18.36	Pass
2	3.8334	48.75	43.07	10.61	59.36	53.68	87.00	74.00	-27.64	-20.32	Pass
3	5.1954	49.38	43.97	10.64	60.02	54.61	87.00	74.00	-26.98	-19.39	Pass
4	7.0708	47.29	41.91	10.52	57.81	52.43	87.00	74.00	-29.19	-21.57	Pass
5*	16.2275	50.42	47.51	10.46	60.88	57.97	87.00	74.00	-26.12	-16.03	Pass
6	17.6918	48.32	45.40	10.48	58.80	55.88	87.00	74.00	-28.20	-18.12	Pass

Note:

Factor (dB) = cable loss + Insertion loss of ISN

Amptd dBuV = Uncorrected Analyzer/Receiver reading + Factor (dB)

Margin (dB) = Amptd (dBuV) – Limit (dBuV)



7.3. RADIATED EMISSION MEASUREMENT

7.3.1. LIMITS

Below 1GHz

FREQUENCY (MHz)	dBuV/m (At 10m)	
	Class A	Class B
30 ~ 230	40	30
230 ~ 1000	47	37

Above 1GHz

Frequency (MHz)	Class A (dBuV/m) (At 3m)		Class B (dBuV/m) (At 3m)	
	Average	Peak	Average	Peak
1000 ~ 3000	56	76	50	70
3000 ~ 6000	60	80	54	74

NOTE: The lower limit shall apply at the transition frequencies.

According to EN55022: 2006 + A1: 2007 clause 6.2, the measurement frequency range shown in the following table:

Highest frequency generated or used within the EUT or on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Less than 108	1000
108-500	2000
500-1000	5000
Above 1000	5 times of the highest frequency or 6GHz, whichever is less

7.3.2. TEST INSTRUMENTS

See list of test equipment of this test report.



7.3.3. TEST PROCEDURE

Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical usage as per EN 55022.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 3 or 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 6000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Set the spectrum analyzer/ Receiver in the following setting as:
 - Below 1GHz:
RBW=100kHz / VBW=100kHz / Sweep=AUTO
 - Above 1GHz::
 - (a) Peak: RBW=VBW=1MHz / Sweep=AUTO
 - (b) Average: RBW=1MHz / VBW=10Hz / Sweep=AUTO
- The test mode(s) described in Item 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.



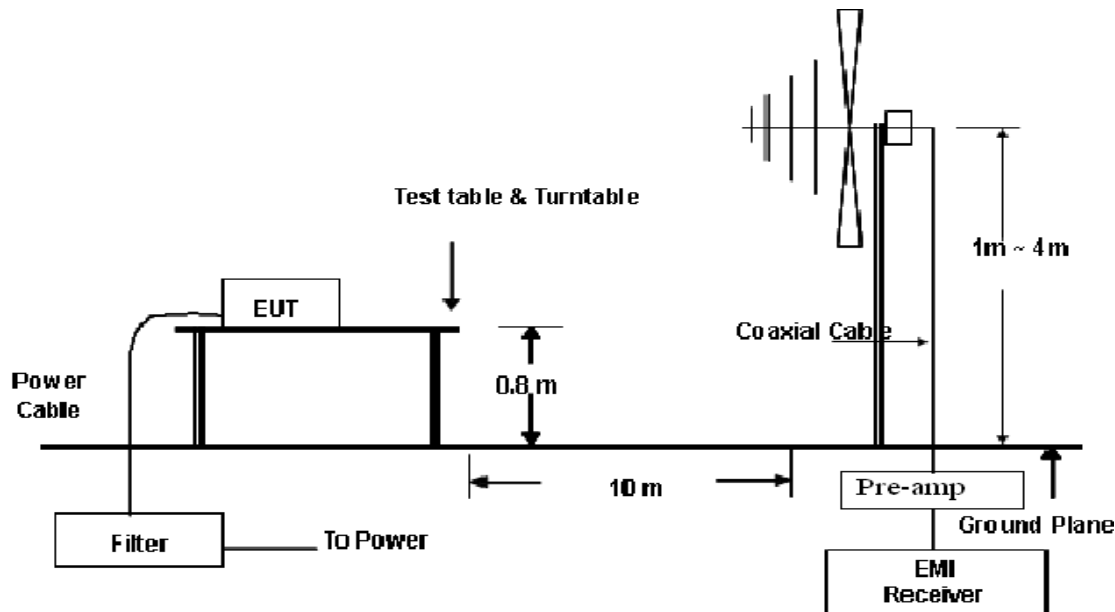
Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. Below 1GHz the Q.P. reading and above 1GHz the Peak and Average reading are presented.
- The test data of the worst-case condition(s) was recorded.

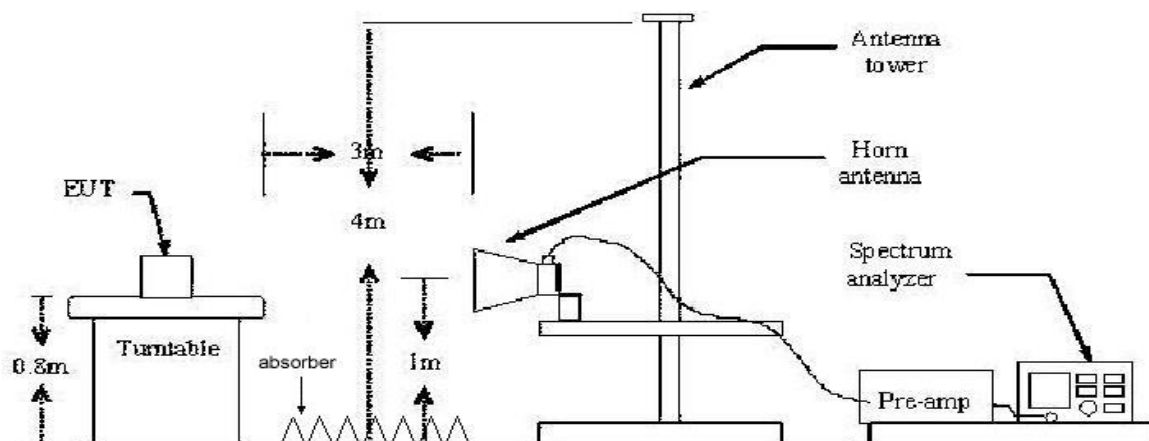


7.3.4. TEST SETUP

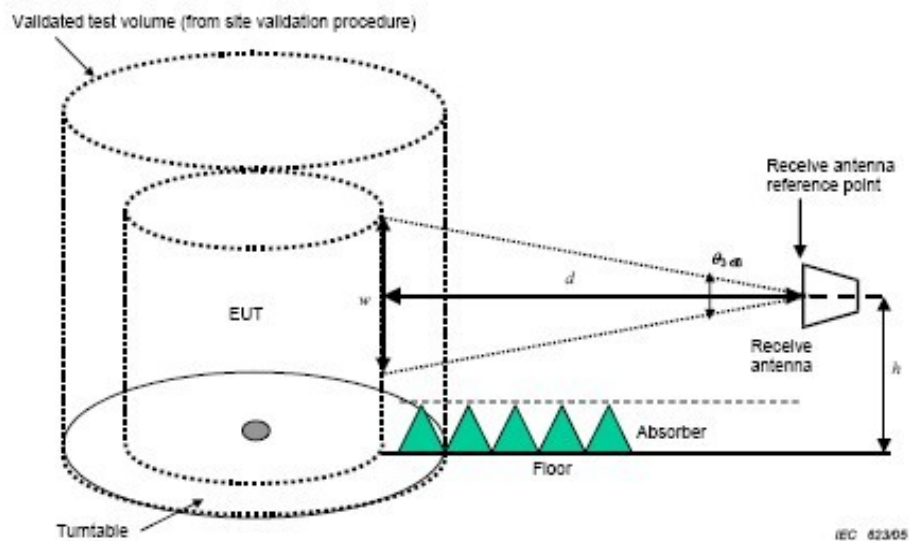
Below 1GHz



Above 1GHz



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



Measurement method above 1GHz

$$w = 2 \times d \times \tan (0,5 \times \theta_{3 \text{ dB}})$$

Frequency (GHz)	d (m)	$\theta_{3 \text{ dB}}$	w (m)
1	3	67	3.97
2	3	42	2.30
4	3	41	2.24
6	3	33	1.78
8	3	32	1.72



7.3.5. DATA SAMPLE

Below 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
XX.XX	48.57	-13.57	35.00	40.00	-5.00	Q	V

Above 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
XX.XX	51.90	-1.24	50.66	56.00	-5.34	A	V

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Antenna Factor + Cable Loss - Amplifier Gain
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
H = Antenna Polarization: Horizontal
V = Antenna Polarization: Vertical

Calculation Formula

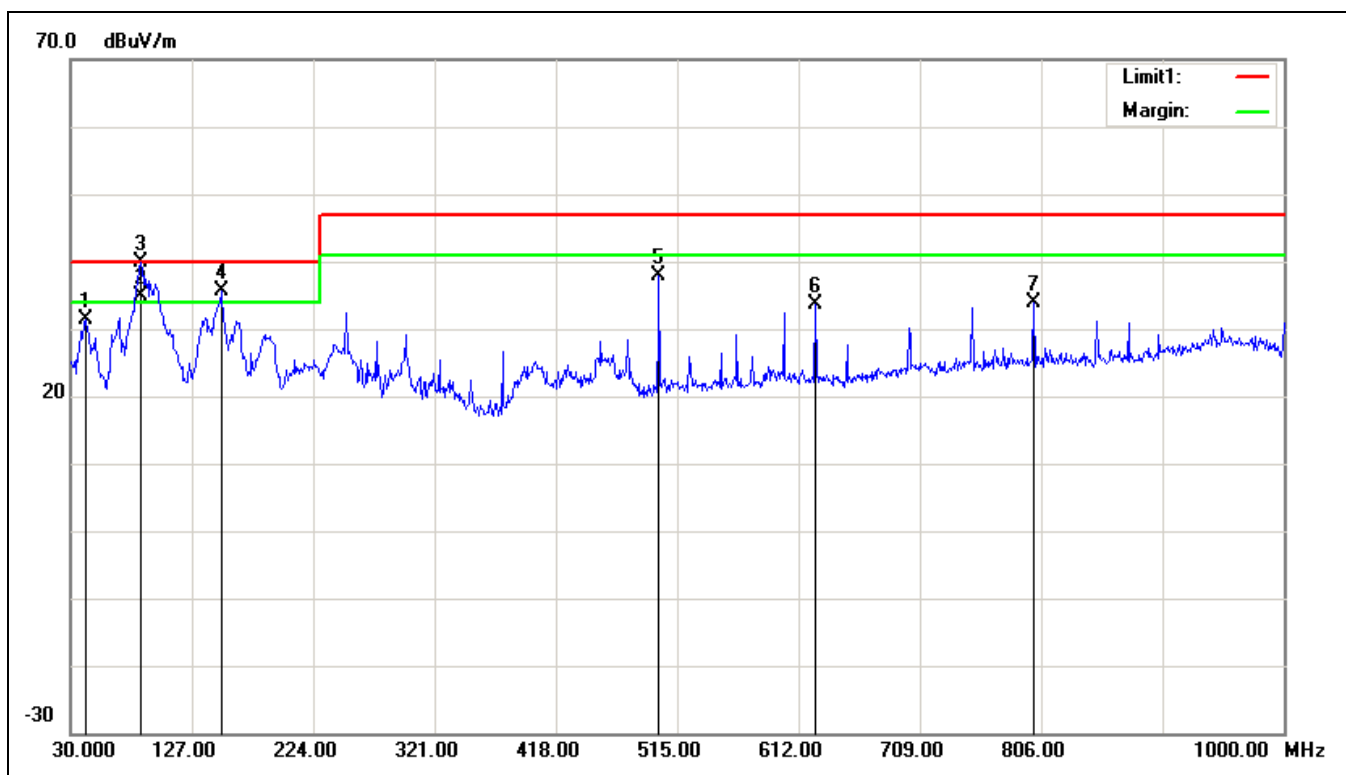
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)



7.3.6. TEST RESULTS

Below 1GHz

Job No.:	KS101108A01	Ant.Polar.:	Vertical
Standard:	EN55022 Class A	Test Distance:	10m
Test item:	Radiation Test	Power:	DC 48V
Temp.(C)/Hum.(%RH):	26(C)/60%RH	Date:2010-11-10	Time:3:53:18
Company:	ACCTON	Test By:	jarry.xu
Model:	ES3510MA-DC	Description:	Mode 1

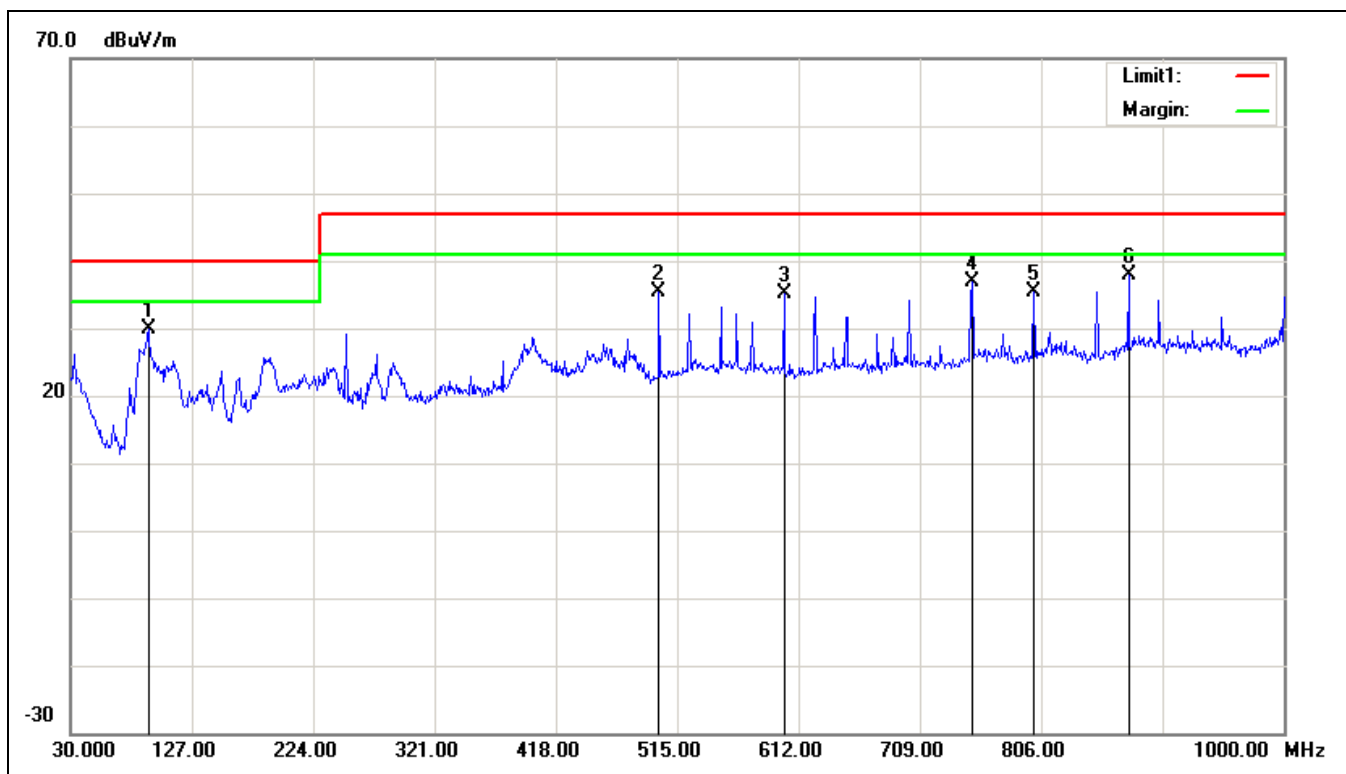


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree ()	Remark
1	41.6400	41.37	-9.97	31.40	40.00	-8.60	200	359	peak
2	86.1400	48.57	-13.57	35.00	40.00	-5.00	199	0	QP
3	86.2600	53.36	-13.58	39.78	40.00	-0.22	200	359	peak
4	150.2800	42.87	-7.22	35.65	40.00	-4.35	182	359	peak
5	500.4500	39.82	-1.88	37.94	47.00	-9.06	100	165	peak
6	625.5800	33.24	0.27	33.51	47.00	-13.49	327	361	peak
7	800.1800	30.62	3.36	33.98	47.00	-13.02	200	151	peak

Note: 1. The other emission levels were very low against the limit.
2. P= Peak Reading; Q= Quasi-peak Reading.



Job No.:	KS101108A01	Ant.Polar.:	Horizontal
Standard:	EN55022 Class A	Test Distance:	10m
Test item:	Radiation Test	Power:	DC 48V
Temp.(C)/Hum.(%RH):	26(C)/60%RH	Date:2010-11-10	Time:4:10:19
Company:	ACCTON	Test By:	jarry.xu
Model:	ES3510MA-DC	Description:	Mode 1



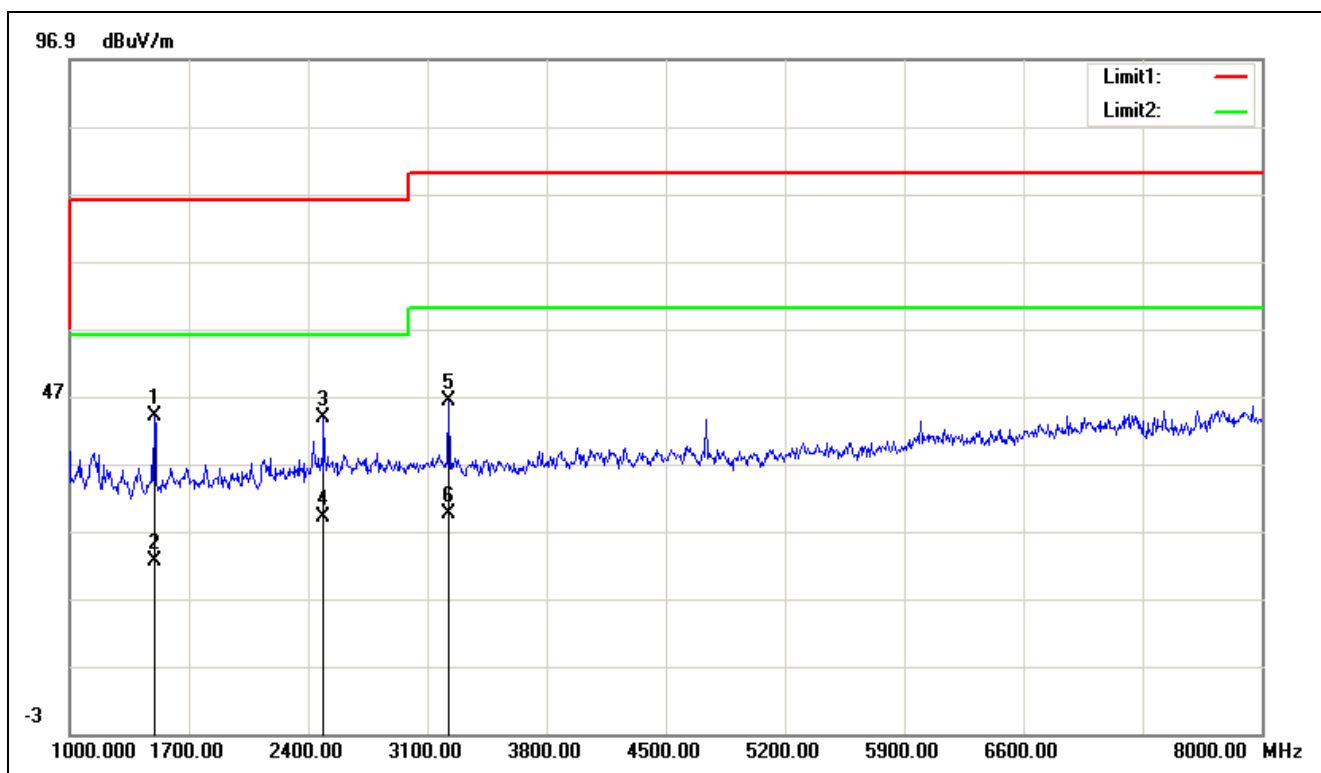
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	()	
1	92.0800	44.37	-14.46	29.91	40.00	-10.09	400	184	peak
2	500.4500	39.51	-4.06	35.45	47.00	-11.55	200	90	peak
3	600.3600	37.39	-2.27	35.12	47.00	-11.88	200	113	peak
4	750.7100	37.05	-0.11	36.94	47.00	-10.06	100	260	peak
5	800.1800	34.40	0.88	35.28	47.00	-11.72	100	326	peak
6	875.8400	36.11	1.86	37.97	47.00	-9.03	100	283	peak

Note: 1. The other emission levels were very low against the limit.
2. P= Peak Reading; Q= Quasi-peak Reading.



Above 1GHz

Job No.:	KS101108A01	Ant.Polar.:	Vertical
Standard:	EN 55022 Class A	Test Distance:	3m
Test item:	Radiation Test	Power:	DC 48V
Temp.(°C)/Hum.(%RH):	21(°C)/46%RH	Date:2010/11/11	Time: 06:30:55
Company:	ACCTON	Test By:	Mario
Model:	ES3510MA-DC	Description:	Mode 1

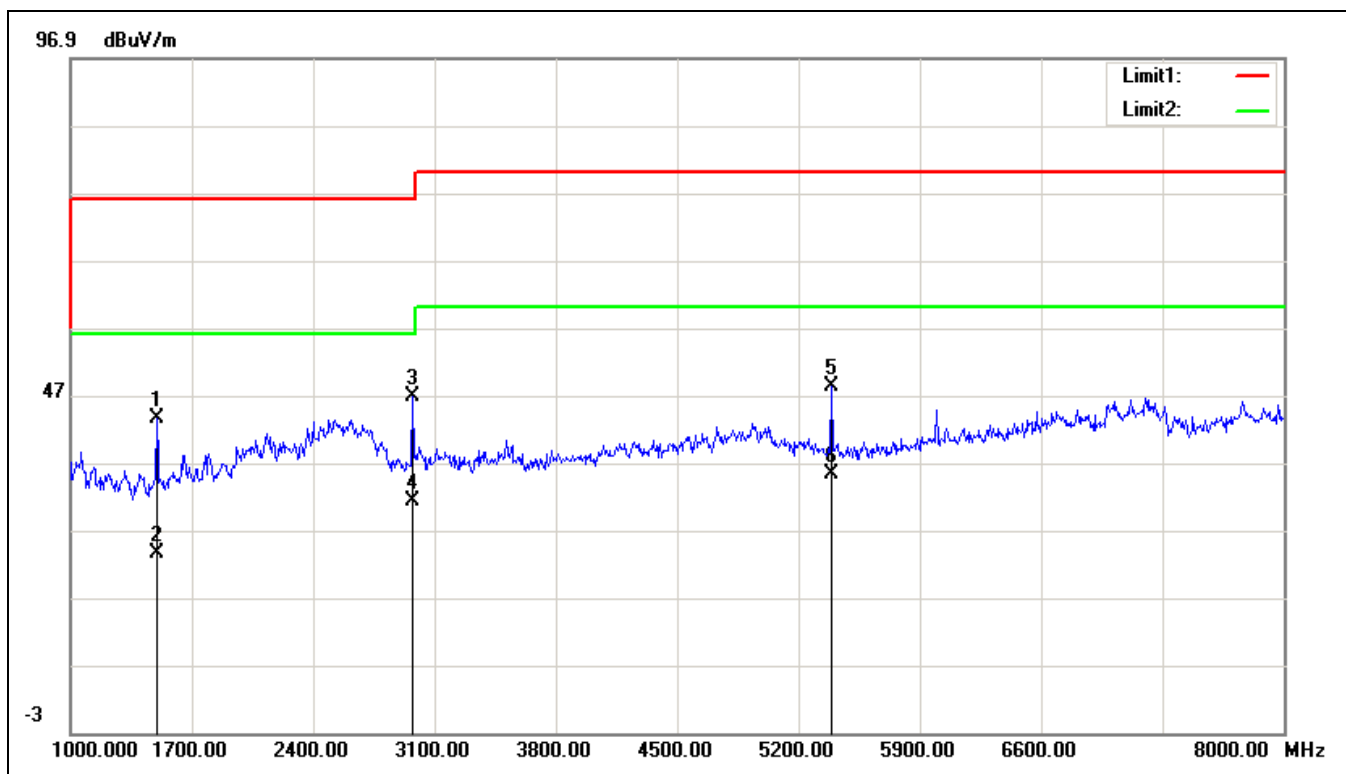


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1497.000	61.04	-16.95	44.09	76.00	-31.91	100	153	peak
2	1497.000	39.46	-16.95	22.51	56.00	-33.49	100	151	AVG
3	2491.000	56.93	-13.08	43.85	76.00	-32.15	100	173	peak
4	2491.000	42.17	-13.08	29.09	56.00	-26.91	100	164	AVG
5	3226.000	57.58	-11.40	46.18	80.00	-33.82	100	231	peak
6	3226.000	40.92	-11.40	29.52	60.00	-30.48	100	225	AVG

Note: 1. The other emission levels were very low against the limit.
2. P= Peak Reading; A= Average Reading.



Job No.:	KS101108A01	Ant.Polar.:	Horizontal
Standard:	EN 55022 Class A	Test Distance:	3m
Test item:	Radiation Test	Power:	DC 48V
Temp.(°C)/Hum.(%RH):	21(°C)/46%RH	Date:2010/11/11	Time: 06:37:14
Company:	ACCTON	Test By:	Mario
Model:	ES3510MA-DC	Description:	Mode 1



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	
1	1497.000	60.44	-16.95	43.49	76.00	-32.51	100	170	peak
2	1497.000	40.52	-16.95	23.57	56.00	-32.43	100	168	AVG
3	2974.000	58.75	-11.91	46.84	76.00	-29.16	100	159	peak
4	2974.000	43.09	-11.91	31.18	56.00	-24.82	100	153	AVG
5	5389.000	54.75	-6.35	48.40	80.00	-31.60	100	194	peak
6	5389.000	41.72	-6.35	35.37	60.00	-24.63	100	192	AVG

Note: 1. The other emission levels were very low against the limit.
2. P= Peak Reading; A= Average Reading.



7.4. HARMONICS CURRENT MEASUREMENT

7.4.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

(a) Limits for Class A equipment

Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current A
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8 ≤ n ≤ 40	0.23x8/n
11	0.33		
13	0.21		
15 ≤ n ≤ 39	0.15x15/n		

(b) Limits for Class B equipment

For Class B equipment, the harmonics of the input current shall not exceed the values given in Table that is the limit of Class A multiplied by a factor of 1,5.

(c) Limits for Class C equipment

Harmonics Order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda^*$
5	10
7	7
9	5
11 < n < 39 (odd harmonics only)	3

* λ is the circuit power factor

(c) Limits for Class D equipment

Harmonics Order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
11 < n < 39 (odd harmonics only)	3.85/n	See limit of Class A

NOTE: 1. Class A and Class D are classified according to item 7.4.3.

2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting



equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

7.4.2. TEST INSTRUMENTS

See list of test equipment of this test report.

7.4.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- The classification of EUT is according to section 5 of EN 61000-3-2.
- The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

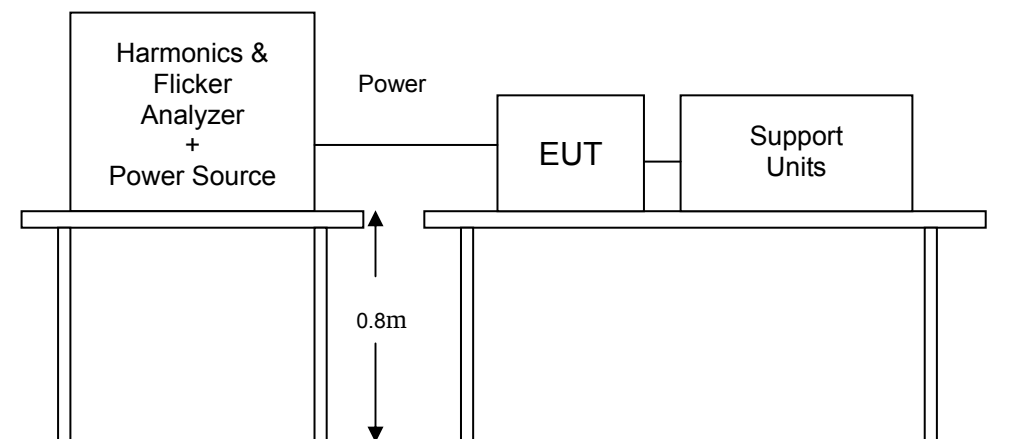
Class B: Portable tools; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

7.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



7.4.5. TEST RESULTS

N/A: The EUT doesn't meet the requirements of the standard.



7.5. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.5.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

The following limits apply:

- the value of Pst shall not be greater than 1,0;
- the value of Plt shall not be greater than 0,65;
- the value of d(t) during a voltage change shall not exceed 3,3 % for more than 500 ms;
- the relative steady-state voltage change, dc, shall not exceed 3,3 %;
- the maximum relative voltage change, dmax, shall not exceed;

a) 4 % without additional conditions;

b) 6 % for equipment which is:

- switched manually, or
- switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

NOTE The cycling frequency will be further limited by the Pst and Plt limit.

For example: a dmax of 6 % producing a rectangular voltage change characteristic twice per hour will give a Plt of about 0.65.

c) 7 % for equipment which is:

- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
- switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

Pst and Plt requirements shall not be applied to voltage changes caused by manual switching.

7.5.2. TEST INSTRUMENTS

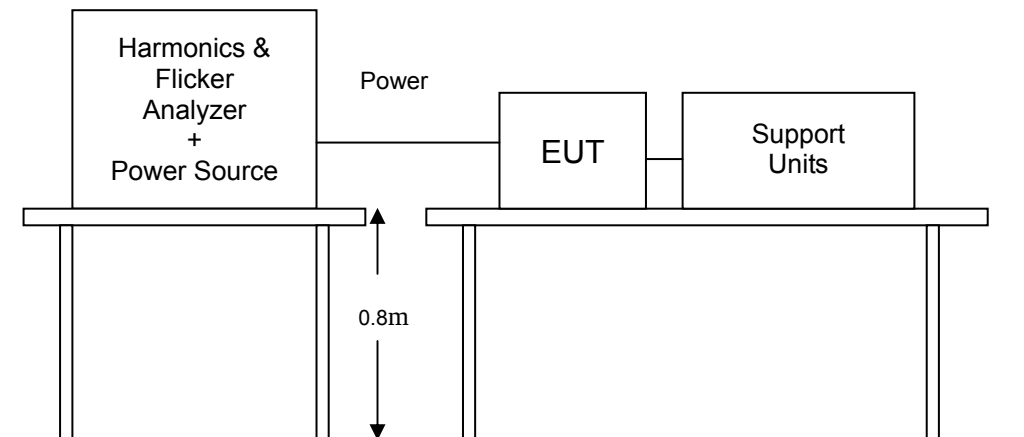
See list of test equipment of this test report.

7.5.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.



7.5.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.5.5. TEST RESULTS

N/A: The EUT doesn't meet the requirements of the standard.



8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 55024: 1998 + A1: 2001 + A2: 2003	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	EN 61000-4-2	Electrostatic Discharge – ESD: 8KV air discharge, 4kV Contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power Port: 1kV DC Power Port: 0.5kV Signal Ports and Telecommunication Ports: 0.5kV Performance Criterion B
	EN 61000-4-5	Surge Immunity Test: 1.2/50 μ s Open Circuit Voltage, 8/20 μ s Short Circuit Current, AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV DC Power Port ~ line to earth: 0.5kV Signal Ports and Telecommunication Ports ~ line to ground: 1kV Performance Criterion B
	EN 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	EN 61000-4-8	Power frequency magnetic field immunity test 50 Hz, 1A/m Performance Criterion A
	EN 61000-4-11	Voltage Dips: AC 50Hz i) >95% reduction for 0.5 period, Performance Criterion B ii) 30% reduction for 25 period, Performance Criterion C Voltage Interruptions: >95% reduction for 250 period Performance Criterion C



8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Criteria A:	The apparatus shell continues to operate as intended without operator intervention. 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. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria B:	After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria C:	Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.



8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 2 ; 4 ; 8 kV (Direct) Contact Discharge: 2 ; 4 kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 10 times at each test point for each polarity Contact Discharge: min. 200 times in total
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

See list of test equipment of this test report.



8.3.3. TEST PROCEDURE

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **Horizontal Coupling Plane (HCP)**. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b) Air discharges at slots and apertures and insulating surfaces:

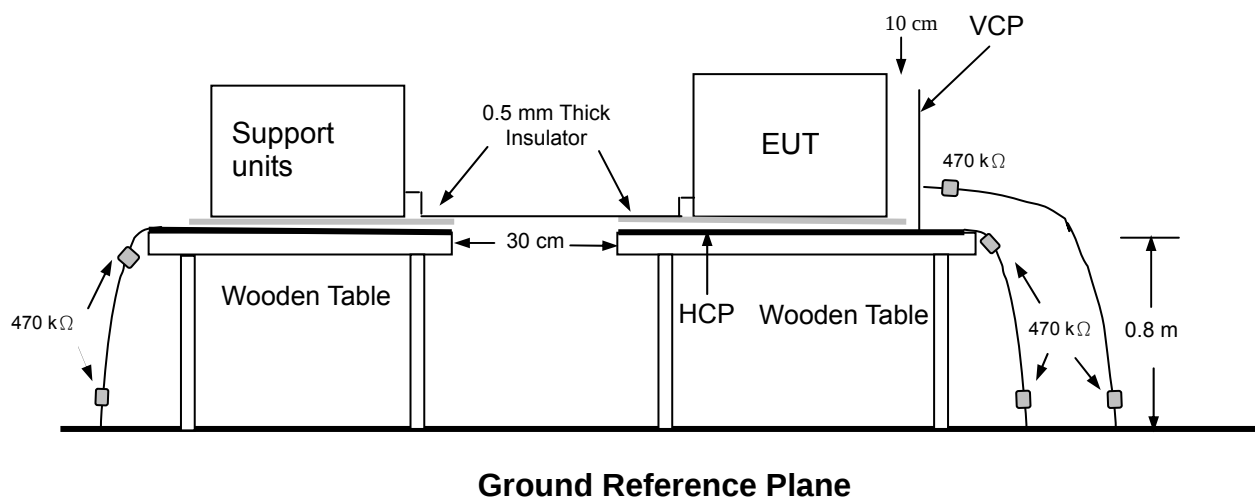
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



8.3.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k Ω total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

**8.3.5. TEST RESULTS**

Temperature	21°C	Humidity	43% RH
Pressure	1021mbar	Tested By	Sun
Required Passing Performance		Criterion B	

Air Discharge							
Test Points	Test Levels			Results			
	± 2 KV	± 4 KV	± 8 KV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☒	☒	☐	☒ A ☐ B	Note
Back	☒	☒	☒	☒	☐	☒ A ☐ B	Note
Left	☒	☒	☒	☒	☐	☒ A ☐ B	Note
Right	☒	☒	☒	☒	☐	☒ A ☐ B	Note
Top	☒	☒	☒	☒	☐	☒ A ☐ B	Note
Bottom	☐	☐	☐	☐	☐	☐ A ☐ B	Note

Contact Discharge						
Test Points	Test Levels		Results			
	± 2 KV	±4 KV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☒	☐	☒ A ☐ B	Note
Back	☒	☒	☒	☐	☒ A ☐ B	Note
Left	☒	☒	☒	☐	☒ A ☐ B	Note
Right	☒	☒	☒	☐	☒ A ☐ B	Note
Top	☒	☒	☒	☐	☒ A ☐ B	Note
Bottom	☒	☒	☒	☐	☒ A ☐ B	Note

Please refer to ESD test photo on next page for detail discharge point

Discharge To Horizontal Coupling Plane						
Side of EUT	Test Levels		Results			
	± 2 KV	± 4 KV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☒	☐	☒ A ☐ B	Note
Back	☒	☒	☒	☐	☒ A ☐ B	Note
Left	☒	☒	☒	☐	☒ A ☐ B	Note
Right	☒	☒	☒	☐	☒ A ☐ B	Note

Discharge To Vertical Coupling Plane						
Side of EUT	Test Levels		Results			
	± 2 KV	± 4 KV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☒	☐	☒ A ☐ B	Note
Back	☒	☒	☒	☐	☒ A ☐ B	Note
Left	☒	☒	☒	☐	☒ A ☐ B	Note
Right	☒	☒	☒	☐	☒ A ☐ B	Note

NOTE:

The testing performed is from lowest level up to the highest level as required by standard, but only



highest level is shown on the report.

NR: No Requirement

☒ Meet criteria A: Operate as intended during and after the test

☐ Meet criteria B: Operate as intended after the test

☐ Meet criteria C: Loss/Error of function

☐ Additional Information

☐ EUT stopped operation and could / could not be reset by operator at _____ kV.

☒ No false alarms or other malfunctions were observed during or after the test.

Remark:

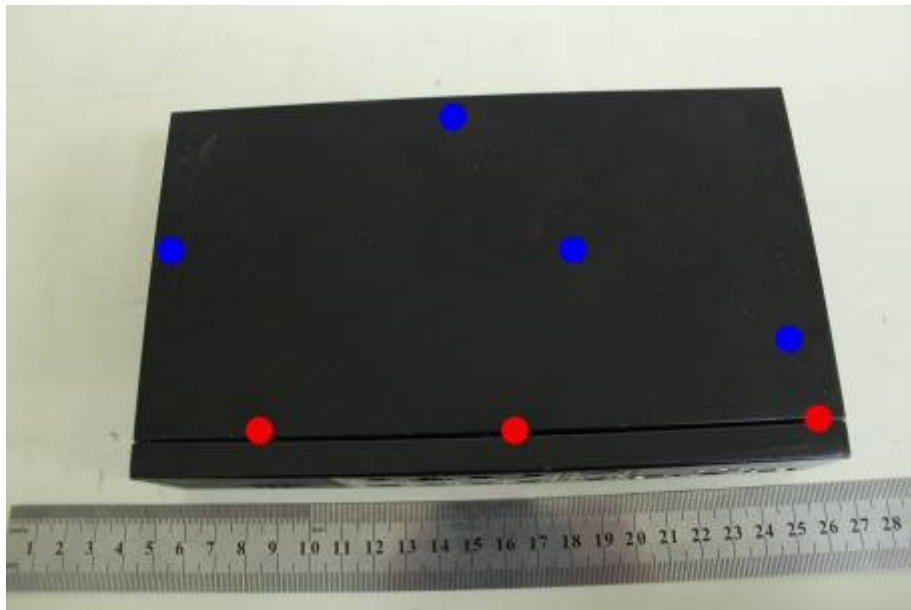
The Contact discharges were applied at least total 200 discharges at a minimum of four test points.



The Photo for Discharge Points of EUT







Red dot —Air Discharged
Blue Dot —Contact Discharged



8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

8.4.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Frequency Range:	80 MHz ~1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5m

8.4.2. TEST INSTRUMENT

See list of test equipment of this test report.

8.4.3. TEST PROCEDURE

The test procedure was in accordance with EN 61000-4-3

a) The testing was performed in a fully anechoic chamber. The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters.

b) All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	3 V/m Level 2
2. Radiated Signal	AM80% Modulated with 1kHz
3. Scanning Frequency	80MHz - 1000MHz
4 Dwell Time	3 Seconds
5. Frequency step size Δf :	1%
6. The rate of Swept of Frequency	1.5×10^{-3} decades/s

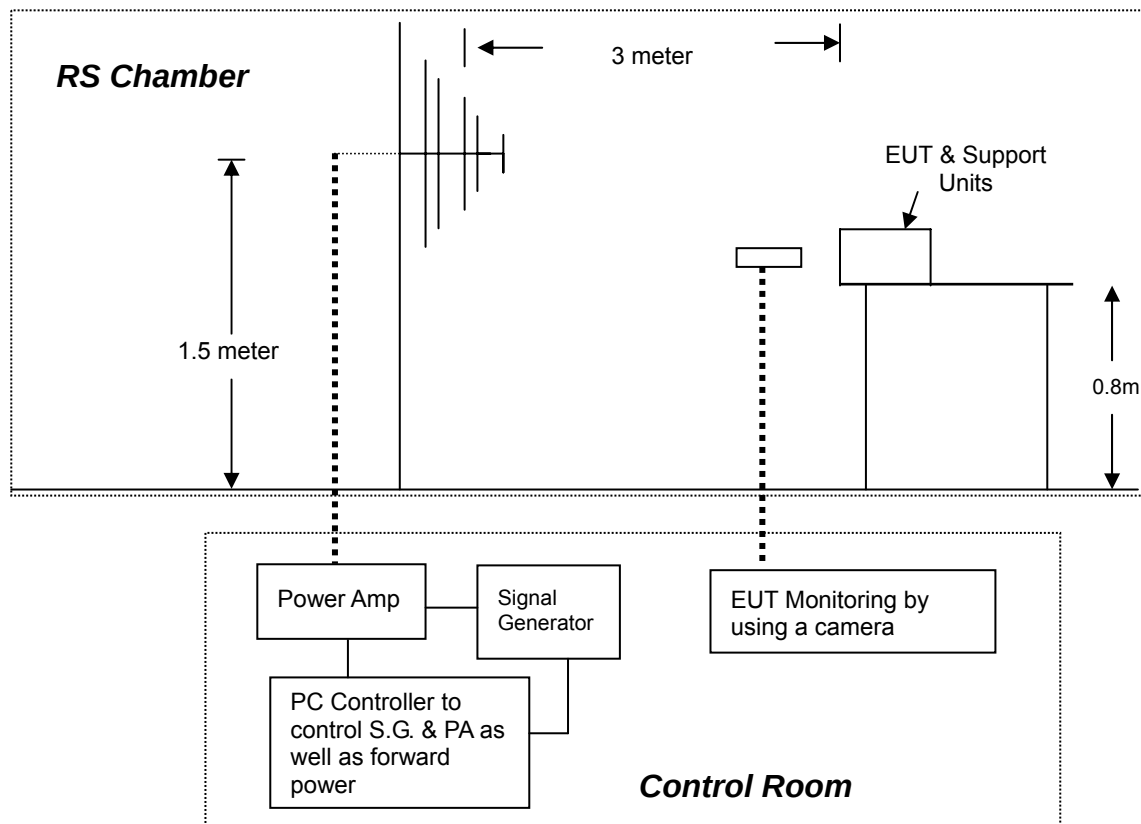
c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

d) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

e) In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.



8.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.



8.4.5. TEST RESULTS

Temperature	21°C	Humidity	43% RH
Pressure	1022mbar	Dwell Time	3 sec.
Tested By	Dohnny.lu	Required Passing Performance	Criterion A

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Observation	Result
80 ~ 1000	V&H	0	3	☒ A ☐ B	Note	PASS
80 ~ 1000	V&H	90	3	☒ A ☐ B	Note	PASS
80 ~ 1000	V&H	180	3	☒ A ☐ B	Note	PASS
80 ~ 1000	V&H	270	3	☒ A ☐ B	Note	PASS

NOTE:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

☒ Meet criteria A: Operate as intended during and after the test

☐ Meet criteria B: Operate as intended after the test

☐ Meet criteria C: Loss/Error of function

☐ Additional Information

☐ There was no observable degradation in performance.

☐ EUT stopped operation and could / could not be reset by operator at _____ V/m at frequency _____ MHz.

☒ No false alarms or other malfunctions were observed during or after the test.



8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard: EN 61000-4-4

Test Voltage: AC Power Port: 1kV ;DC Power Port: 0.5kV
Signal Ports and Telecommunication Ports: 0.5kV

Polarity: Positive & Negative

Impulse Frequency: 5 kHz

Impulse Wave-shape: 5/50 ns

Burst Duration: 15 ms

Burst Period: 300 ms

Test Duration: Not less than 1 min.

8.5.2. TEST INSTRUMENT

See list of test equipment of this test report.

8.5.3. TEST PROCEDURE

a) The EUT is placed on a table that is 0.8 meter height. A ground reference plane is placed on the table, and uses a 0.1m insulation between the EUT and ground reference plane. The minimum area of the ground reference plane is 1m*1m, and 0.65mm thick min, and projected beyond the EUT by at least 0.1m on all sides.

b) Test on I/O and communication ports:

The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT with burst noise for 1minute.

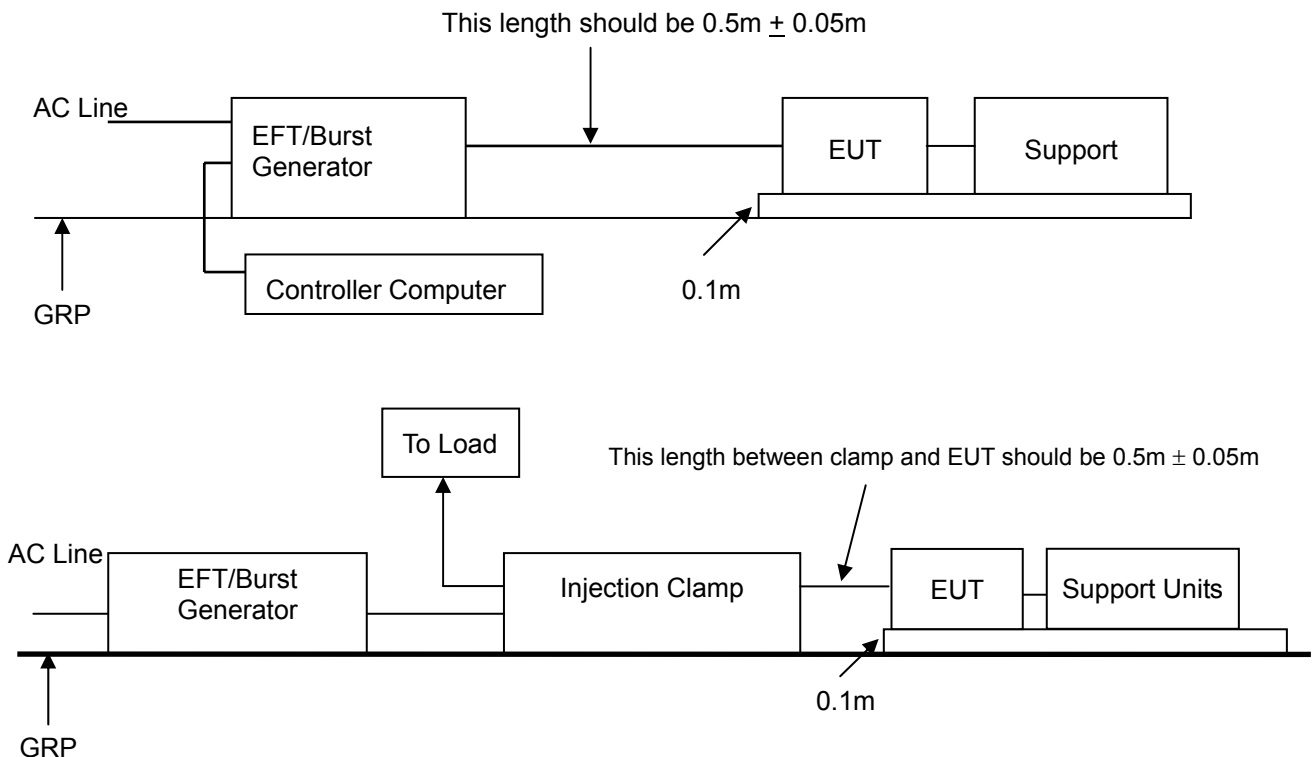
c) Test on power supply ports:

The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.

Each of the Line and Neutral conductors is impressed with burst noise for 1 minute. The length of the signal and power lines between the coupling device and the EUT is 0.5m.



8.5.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.1m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

**8.5.5. TEST RESULTS**

Temperature	23°C	Humidity	43% RH
Pressure	1020mbar	Tested By	Sun
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
Positive	+/-	0.5	☒ A ☐ B	Note	PASS
Negative	+/-	0.5	☒ A ☐ B	Note	PASS
Positive-Negative	+/-	0.5	☒ A ☐ B	Note	PASS
Ground	+/-	0.5	☒ A ☐ B	Note	PASS
Positive –Ground	+/-	0.5	☒ A ☐ B	Note	PASS
Negative –Ground	+/-	0.5	☒ A ☐ B	Note	PASS
Positive-Negative –Ground	+/-	0.5	☒ A ☐ B	Note	PASS
RJ45 cable	+/-	0.5	☒ A ☐ B	Note	PASS
RJ11 cable	+/-		☐ A ☐ B	Note	N/A

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

☒ Meet criteria A : Operate as intended during and after the test

☐ Meet criteria B : Operate as intended after the test

☐ Meet criteria C : Loss/Error of function

☐ Additional Information

☐ EUT stopped operation and could / could not be reset by operator at _____ kV of
Line _____.

☒ No false alarms or other malfunctions were observed during or after the test.



8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current
Test Voltage:	AC Power Port~ line to line: 1kV, line to ground: 2Kv DC Power Por: 0.5Kv
Surge Input/Output:	AC Power Line: L-N / L-PE / N-PE Telecommunication line: T-Ground / R-Ground
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0° / 90° / 180° / 270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

8.6.2. TEST INSTRUMENT

See list of test equipment of this test report.

8.6.3. TEST PROCEDURE

a) For EUT power supply:

The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

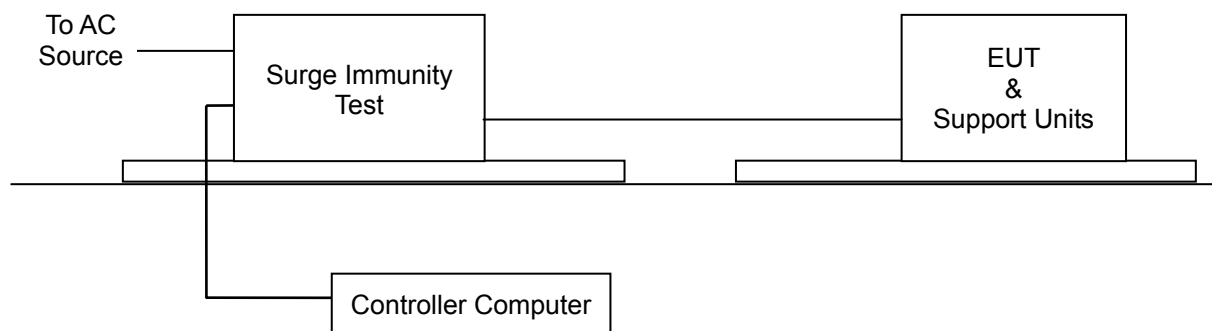
The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.



8.6.4. TEST SETUP



- For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.

8.6.5. TEST RESULTS

Temperature	25°C	Humidity	43% RH
Pressure	1020mbar	Tested By	Sun
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
Positive-Negative	+/-	0.5	☒ A ☐ B	Note	PASS
Positive - Ground	+/-	0.5	☒ A ☐ B	Note	PASS
Negative - Ground	+/-	0.5	☒ A ☐ B	Note	PASS
RJ45 cable	+/-	1	☒ A ☐ B	Note	PASS
R - Ground	+/-		☐ A ☐ B	Note	
T - Ground	+/-		☐ A ☐ B	Note	

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

☒ Meet criteria A : Operate as intended during and after the test

☐ Meet criteria B : Operate as intended after the test

☐ Meet criteria C : Loss/Error of function

☐ Additional Information

☐ EUT stopped operation and could / could not be reset by operator at _____ kV of Line _____.

☒ No false alarms or other malfunctions were observed during or after the test.



8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

Basic Standard: EN 61000-4-6

Frequency Range: 0.15 MHz ~ 80 MHz

Field Strength: 3 Vrms

Modulation: 1kHz Sine Wave, 80%, AM Modulation

Frequency Step: 1 % of preceding frequency value

Coupled cable: Power Mains, Unshielded; RJ45 Line, Unshielded

Coupling device: CDN- M3 (3 wires) DC Power

8.7.2. TEST INSTRUMENT

See list of test equipment of this test report.



8.7.3. TEST PROCEDURE

a) The EUT are placed on a table that is 0.8 meter height, and a Ground reference plane on the table, EUT are placed upon table and use a 10cm insulation between the EUT and Ground reference plane.

The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

b) For Signal Ports and Telecommunication Ports

The disturbance signal is through a coupling and decoupling networks (CDN) or EM-clamp device couples to the signal and Telecommunication lines of the EUT.

c) For Input DC and AC Power Ports

The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

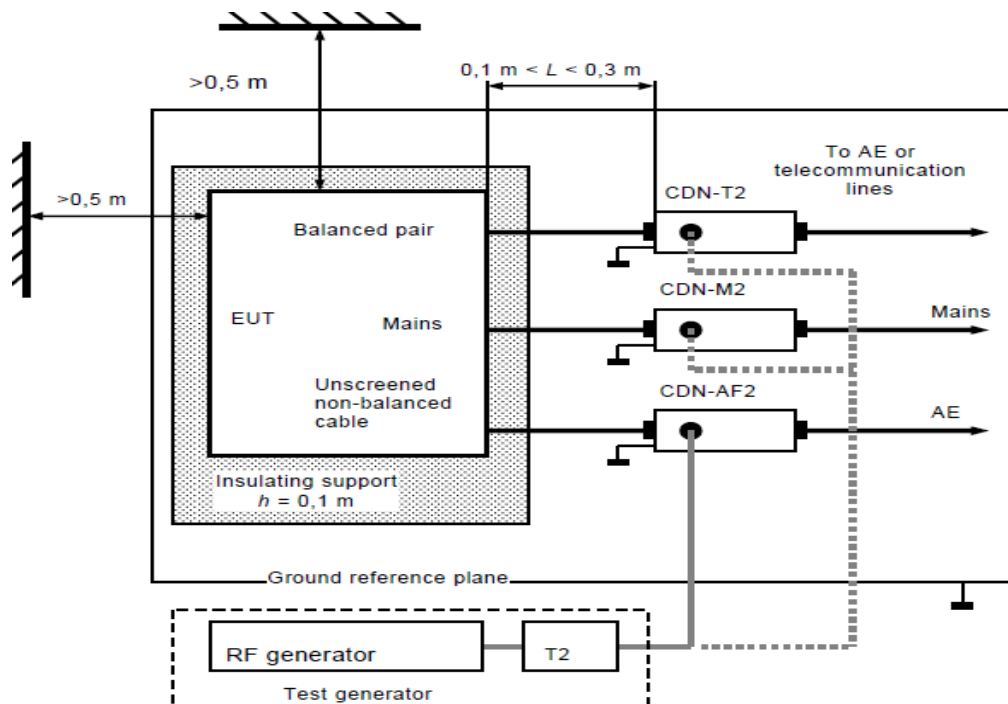
Used CDN-M2 for two wires or CDN-M3 for three wires.

d) All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	130dBuV(3V) Level 2
2. Radiated Signal	AM 80% Modulated with 1kHz
3. Scanning Frequency	0.15MHz – 80MHz
4 Dwell Time	3 Seconds
5. Frequency step size Δf :	1%
6. The rate of Swept of Frequency	1.5 x 10 ⁻³ decades/s



8.7.4. TEST SETUP



Note: 1. The EUT is setup 0.1m above Ground Reference Plane
2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

**8.7.5. TEST RESULTS**

Temperature	24°C	Humidity	41% RH
Pressure	1021mbar	Tested By	Sun
Required Passing Performance		Criterion A	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Power Line	CDN-M3	☒ A ☐ B	Note	PASS
0.15 ~ 80	3	LAN(10m)	T4	☒ A ☐ B	Note	PASS
0.15 ~ 80	3	LINE(10m)		☐ A ☐ B	Note	

Note:

The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

☒ Meet criteria A: Operate as intended during and after the test

☐ Meet criteria B: Operate as intended after the test

☐ Meet criteria C: Loss/Error of function

☐ Additional Information

☐ EUT stopped operation and could / could not be reset by operator at _____dBuV(V) at Frequency_____MHz.

☒ No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.



8.8. POWER FREQUENCY MAGNETIC FIELD

8.8.1. TEST SPECIFICATION

Basic Standard: EN 61000-4-8

Frequency Range: 50Hz

Field Strength: 1 A/m

Observation Time: 1 minute

Inductance Coil: Rectangular type, 1mx1m

8.8.2. TEST INSTRUMENT

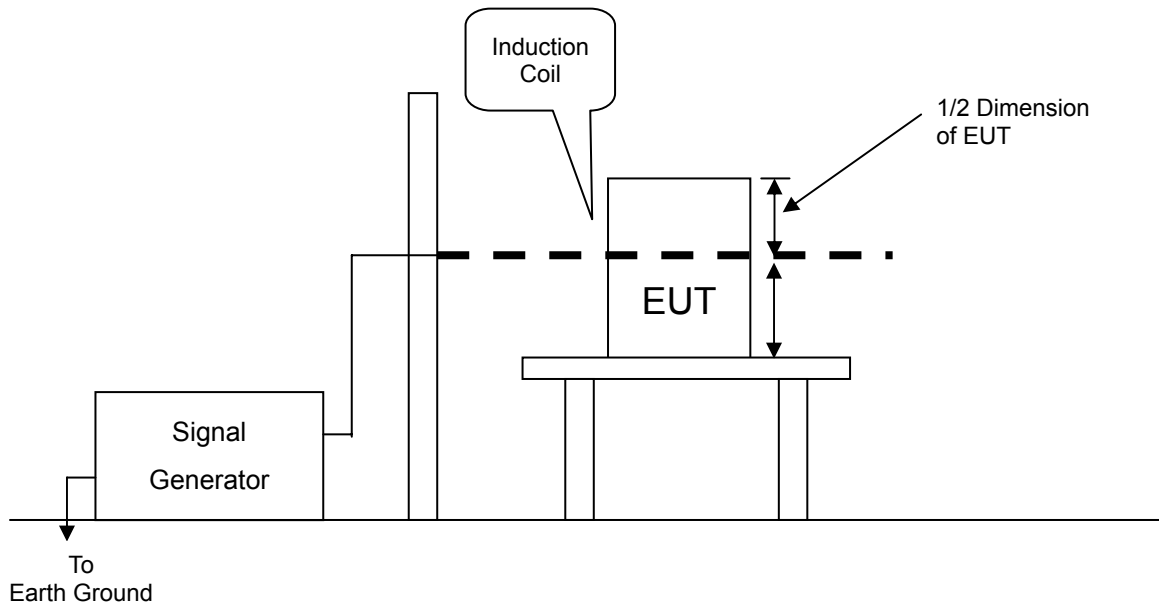
See list of test equipment of this test report.

8.8.3. TEST PROCEDURE

- a. The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.
- b. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- c. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- d. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.



8.8.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.



8.8.5. TEST RESULTS

Temperature	24°C	Humidity	44% RH
Pressure	1021mbar	Tested By	Sun
Required Passing Performance		Criterion A	

DIRECTION	Frequency (Hz)	Field Strength (A/m)	Performance Criterion	OBSERVATION	RESULTS
X	50	1	A	Note	Pass
Y	50	1	A	Note	Pass
Z	50	1	A	Note	Pass

Note:

☒ Meet criteria A: Operate as intended during and after the test

☐ Meet criteria B: Operate as intended after the test

☐ Meet criteria C: Loss/Error of function

☐ Additional Information

☐ EUT stopped operation and could / could not be reset by operator at _____ kV of Line _____ .

☒ No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.



8.9. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS

8.9.1. TEST SPECIFICATION

Basic Standard: EN 61000-4-11

Test duration time: Minimum three test events in sequence

Interval between event: Minimum 10 seconds

Phase Angle: 0° / 45° / 90° / 135° / 180° / 225° / 270° / 315° / 360°

Test cycle: 3 times

8.9.2. TEST INSTRUMENT

See list of test equipment of this test report.

8.9.3. TEST PROCEDURE

a) The EUT and its load are placed on a wood table which is 0.8 meter above a metal ground plane measured 1m*1m min. And 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The power cord shall be used the shortest power cord as specified by the manufacturer.

b) For Voltage Dips/ Interruptions test:

The selection of test voltage is based on the rated power range. If the operation range is large than 20% of lower power range, both end of specified voltage shall be tested. Otherwise, the typical voltage specification is selected as test voltage.

The EUT is connected to the power mains through a coupling device that directly couples to the Voltage Dips and Interruption Generator.

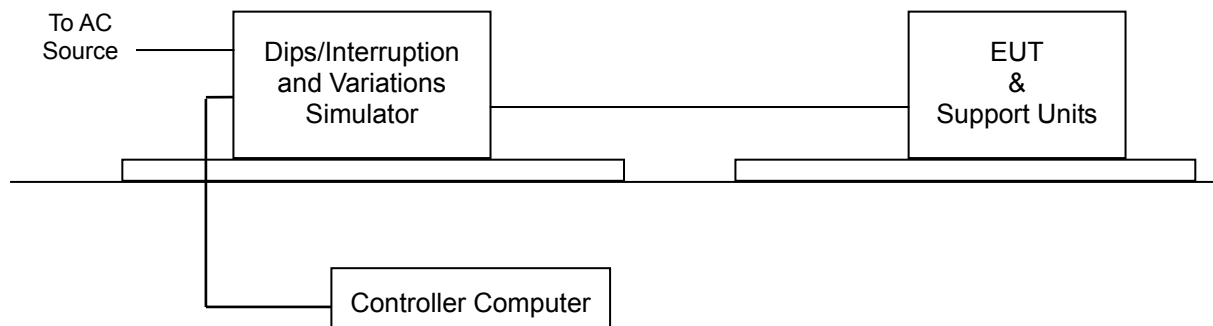
The EUT shall be tested for 30% voltage dip of supplied voltage and duration 25 Periods, for 95% voltage dip of supplied voltage and duration 0.5 Periods with a sequence of three voltage dips with intervals of 10 seconds, and for 95% voltage interruption of supplied voltage and duration 250 Periods with a sequence of three voltage interruptions with intervals of 10 seconds.

Voltage phase shifting are shall occur at 0°/45°/90°/135°/180°/225°/270°/315°/360° of the voltage.

c) Recording the test result in test record form.



8.9.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



8.9.5. TEST RESULTS

N/A: The EUT doesn't meet the requirements of the standard.



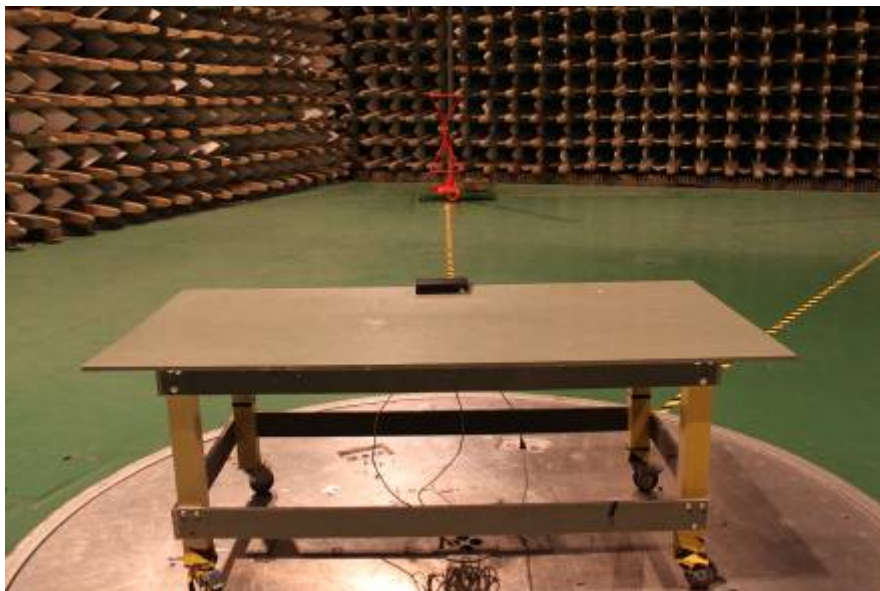
9 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST





RADIATED EMISSION TEST





ESD Test



RS Test





EFT Test





Surge Test



CS TEST





PFMF TEST





APPENDIX 1 - PHOTOGRAPHS OF EUT

Please refer to another file named photographs of EUT.