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Report No.: SZEM130100047001
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TEST REPORT

Application No.: SZEM1301000470IT
Applicant/Manufacturer/Factory: Shenzhen Sopto Technology Co., LTD
Address of Applicant/Manufacturer/Factory: RM222, Block 1, Energy Industrial Zone, Qianhai Road, Nanshan District, Shenzhen, China
Equipment Under Test (EUT):
EUT Name: Fiber Optical Transceiver
Model No.: SFP, SFP-T, SFP+, CSFP, QSFP+, XFP ♣
♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade mark: SOPTO
Standards: EN 55022:2010
EN 55024:2010
EN 61000-3-2:2006+A1:2009+A2:2009
EN 61000-3-3:2008
Date of Receipt: 2013-01-28
Date of Test: 2013-02-26 to 2013-03-21
Date of Issue: 2013-03-26

Test Result :	PASS*
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* In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2004/108/EC are considered.



Jack Zhang
EMC Laboratory Manager



The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

2 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission, (30MHz to 1GHz) §	EN 55022:2010	EN 55022:2010	Class B	PASS
Conducted Emission (150kHz to 30MHz)	EN 55022:2010	EN 55022:2010	Class B	PASS
Harmonic Emission on AC, 50Hz	EN 61000-3-2:2006 +A1:2009+A2:2009	EN 61000-3-2:2006 +A1:2009+A2:2009	Class A	PASS
Flicker Emission on AC	EN 61000-3-3:2008	EN 61000-3-3:2008	Clause 5 of EN 61000-3-3	PASS
ESD	EN 55024:2010	EN 61000-4-2:2009	Contact ± 4 kV Air $\pm 2,4,8$ kV	PASS
Radiated Immunity, 80MHz to 1 GHz	EN 55024:2010	EN 61000-4-3:2006 +A1:2008+A2:2010	3V/m 80%, 1kHz, AM	PASS
Electrical Fast Transients (EFT) on AC	EN 55024:2010	EN 61000-4-4:2004 +A1:2010	AC ± 1.0 kV	PASS
Surge Immunity on AC	EN 55024:2010	EN 61000-4-5:2006	± 1 kV D.M.† ± 2 kV C.M. ‡	PASS
Injected Currents on AC, 150kHz to 80MHz	EN 55024:2010	EN 61000-4-6:2009	3Vrms (emf), 80%, 1kHz Amp. Mod.	PASS
Voltage Dips and Interruptions on AC	EN 55024:2010	EN 61000-4-11:2004	0 % U_T^* for 0.5per 0 % U_T^* for 250per 70 % U_T^* for 25per	PASS

* U_T is the nominal supply voltage

† D.M. – Differential Mode

‡ C.M. – Common Mode

§ If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. (Refer to EN 55022:2010 clause 6.2 Conditional testing procedure)

Model No.: SFP, SFP-T, SFP+, CSFP, QSFP+, XFP

Only the model SFP was tested, since the electrical circuit design, layout, component used and internal wiring were identical for the above samples, with only difference being the model name.



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4 General Information

4.1 Details of E.U.T.

Power Supply: Supply by switch
Test voltage: AC 230V 50Hz

4.2 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.
PC	DELL	DCSM
LCD-displaying	DELL	SP2208WFPt
KEYBOARD	DELL	SK-8115
MOUSE	Lenovo	MO28UOL
PC	IBM	8172
LCD-displaying	Lenovo	L1711pC
KEYBOARD	IBM	SK-8115
MOUSE	Lenovo	MO28UOA
PC	Lenovo	6234
CRT-DISPLAYING	Lenovo	L17711pC
KEYBOARD	Lenovo	KU-0225
MOUSE	Lenovo	MO28UOA
PC	DELL	DCMTLF
KEYBOARD	DELL	SK-8115
MOUSE	Microsoft	1113
CRT-DISPLAYING	DELL	E173FPb
PC	IBM	8184
CRT-DISPLAYING	IBM	6737-66N/A
KEYBOARD	IBM	KB-0225
MOUSE	IBM	MO28UOL
Coder	HengTong ELECTRON	HT4000
Printer	Canon	BJC-1000SP

Power Supply (AC cable 20cm; DC cable 90cm; unshielded Input: AC 80-265V 50/60Hz 0.4A Output: DC 5V 2A)	Supply client	N/A
Ethernet Media Converter	Supply by client	SPM-ET2X-PX
Manageable Media Converter Fiber/T Transceiver	Supply by client	SPM-IMT23-PXL
Optical cable (310cm)	Supply by client	N/A
LAN (150cm unshielded)	Supply by SGS	N/A
Switch (AC cable: 150cm unshielded Input: AC 100-240V 50/60Hz)	Supply by client	CSC-2960

4.3 Standards Applicable for Testing

The standards used were EN 55022, EN 61000-3-2, EN 61000-3-3 and EN 55024.

Table 1 : Tests Carried Out Under EN 55022:2010

Standard		Status
EN 55022:2010	Radiated Emissions	√
EN 55022:2010	Conducted Emissions on AC	√
EN 55022:2010	Conducted Emissions on Telecommunication Ports	×

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

Standard		Status
EN 61000-3-2:2006+A1:2009+A2:2009	Harmonic Emissions on AC	×
EN 61000-3-3:2008	Flicker Emissions on AC	√



Table 3 : Tests carried out under EN 55024:2010

Standard		Status
EN 61000-4-2:2009	Electrostatic discharge immunity test	√
EN 61000-4-3:2006+A1:2008+A2:2010	Radiated, radio-frequency electromagnetic field electromagnetic field immunity test	√
EN 61000-4-4:2004+A1:2010	Electrical fast transients/burst immunity test	√
EN 61000-4-5:2006	Surge immunity test	√
EN 61000-4-6:2009	Immunity to conducted disturbances, induced by radio-frequency fields	√
EN 61000-4-8:2010	Power-frequency magnetic field immunity test	×
EN 61000-4-11:2004	Voltage dips, short interruptions and voltage variations immunity tests	√

× Indicates that the test is not applicable

√ Indicates that the test is applicable

Note The EUT does not contain any component which is susceptible from the magnetic field.

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch E&E Lab,

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.



4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**
CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.
- **VCCI**
The 3m Semi-anechoic chamber, Full-anechoic Chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2197, G-416, T-1153 and C-2383 respectively.
- **FCC – Registration No.: 556682**
SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen 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 No.: 556682.
- **Industry Canada (IC)**
The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1.

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Monitoring of EUT for All Immunity Test

Visual: Monitored the Communication status of the EUT.

Audio: None.

5 Equipment List

RE in Chamber					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2013-06-10
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	2013-05-17
3	EMI Test software	AUDIX	E3	SEL0050	N/A
4	Coaxial cable	SGS	N/A	SEL0028	2013-05-29
5	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2013-10-24
6	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2013-05-17
7	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2013-10-24
8	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2013-10-24
9	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2013-10-24
10	Band filter	Amindeon	Asi 3314	SEL0094	2013-05-17
11	Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2013-10-24

Harmonics / Flicker test					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	AC Power Source	California Instruments	5001ix	SEL0052	2013-05-17
2	Power Analyzer	California Instruments	PACS-1	SEL0051	2013-05-17
3	CTS 3.0 Software	California Instruments	N/A	SEL0087	N/A



Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2013-06-10
2	LISN	Rohde & Schwarz	ENV216	SEL0152	2013-10-24
3	LISN	ETS-LINDGREN	3816/2	SEL0021	2013-05-17
4	8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	EMC0120	2013-11-10
5	4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	EMC0121	2013-11-10
6	2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2013-11-10
7	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2013-05-17
8	Coaxial Cable	SGS	N/A	SEL0025	2013-05-29

ESD					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	ESD Simulator	SCHAFFNER	NSG 438	SEL0035	2014-03-15
2	ESD Ground Plane	SGS(3m*3m)	N/A	SEL0004	N/A

EFT, Surge, Voltage dips and Interruption, Power-frequency Magnetic Field					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	EMC Immunity Test System	Thermo ELECTRON	EMCPro Plus	SEL0007	2013-10-24
2	ProPLUS Capacitive Clamp	Thermo ELECTRON	N/A	SEL0008	N/A
3	MAGNETIC FIELD IMMUNITY LOOP	FCC	F-1000-4-8/9/10-L-1M	SEL0010	2013-10-24
4	High speed signal Surge CDN	EMC PARTNER	CDN-UTP	EMC2060	2013-05-15

Radiated Immunity					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	Fully Anechoic Room	ChangZhou ZhongYu	854	SEL0169	2013-06-10
2	Signal Generator	Rohde & Schwarz	SML03	SEL0068	2013-05-17
3	RF Amplifier 30M-1GHz	Amplifier Research	250W1000A	SEL0066	2013-10-24
4	RF Amplifier 0.8-3.0GHz	Amplifier Research	60S1G3	SEL0065	2013-10-24
5	Power Meter	Rohde & Schwarz	NRVD	SEL0069	2013-05-17
6	Power Sensor	Rohde & Schwarz	URV5-Z2	SEL0071	2013-05-17
7	Power Sensor	Rohde & Schwarz	URV5-Z2	SEL0072	2013-05-17
8	Software EMC32	Rohde & Schwarz	EMC32-S	SEL0082	N/A
9	Log-periodic Antenna	Amplifier Research	AT1080	SEL0073	N/A
10	Antenna Tripod	Amplifier Research	TP1000A	SEL0074	N/A
11	High Gain Horn Antenna (0.8-5GHz)	Amplifier Research	AT4002A	SEL0075	N/A

Conducted Immunity					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	RF-Generator	SCHAFFNER	NSG 2070	SEL0039	2013-10-24
2	Coupling/Decoupling Network	SCHAFFNER	CDN M016	SEL0040	2013-10-24
3	EM CLAMP	SCHAFFNER	KEMZ 801	SEL0041	2013-10-24

General used equipment					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0102 to SEL0103	2013-10-24
2	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0101	2013-10-24
3	Barometer	ChangChun	DYM3	SEL0088	2013-05-17



6 Emission Test Results

6.1 Radiated Emissions, 30MHz to 1GHz

Test Requirement:	EN 55022
Test Method:	EN 55022
Frequency Range:	30MHz to 1GHz
Measurement Distance:	3m
Class:	Class B
Limit:	40.0 dB μ V/m between 30MHz & 230MHz 47.0 dB μ V/m between 230MHz & 1000MHz
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 45% RH Atmospheric Pressure: 1015 mbar

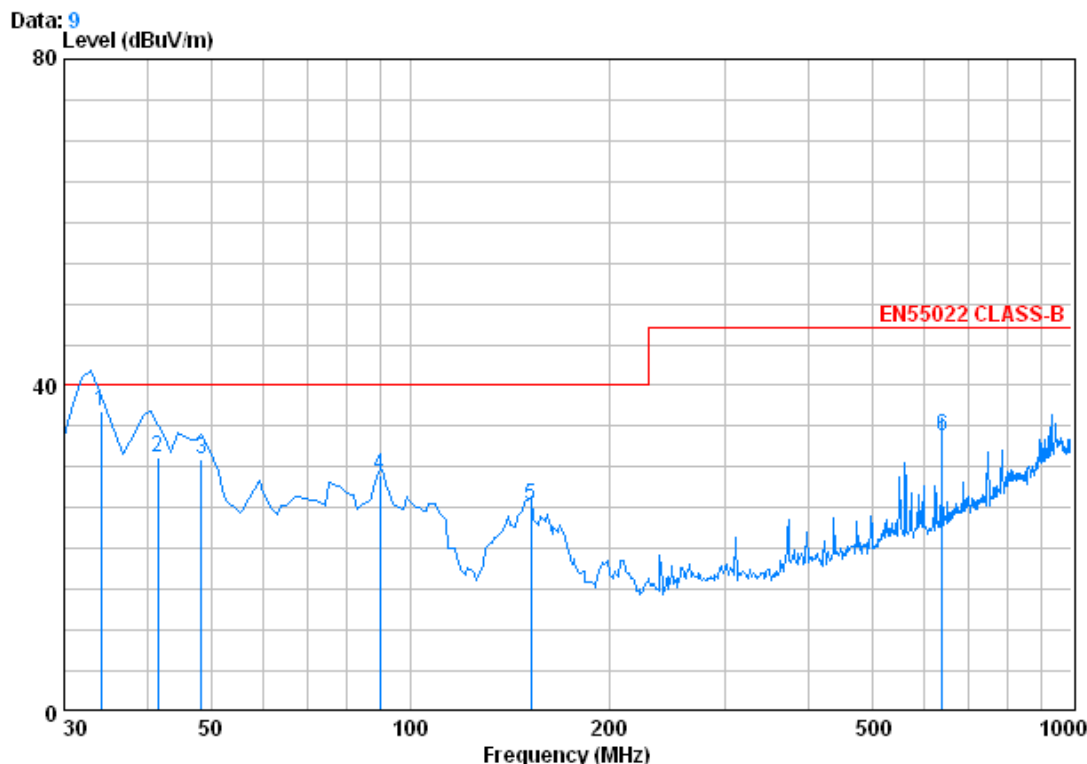
EUT Operation: Test the EUT in Communicate with PC & optical fiber port, build the connection between the EUT and internet through optical fiber port, keep linking with file server, connect the EUT and PC by RJ45, keep data exchanging.

6.1.2 Measurement Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities.



Vertical:



Condition : EN55022 CLASS-B 3m 3142C NEW VERTICAL

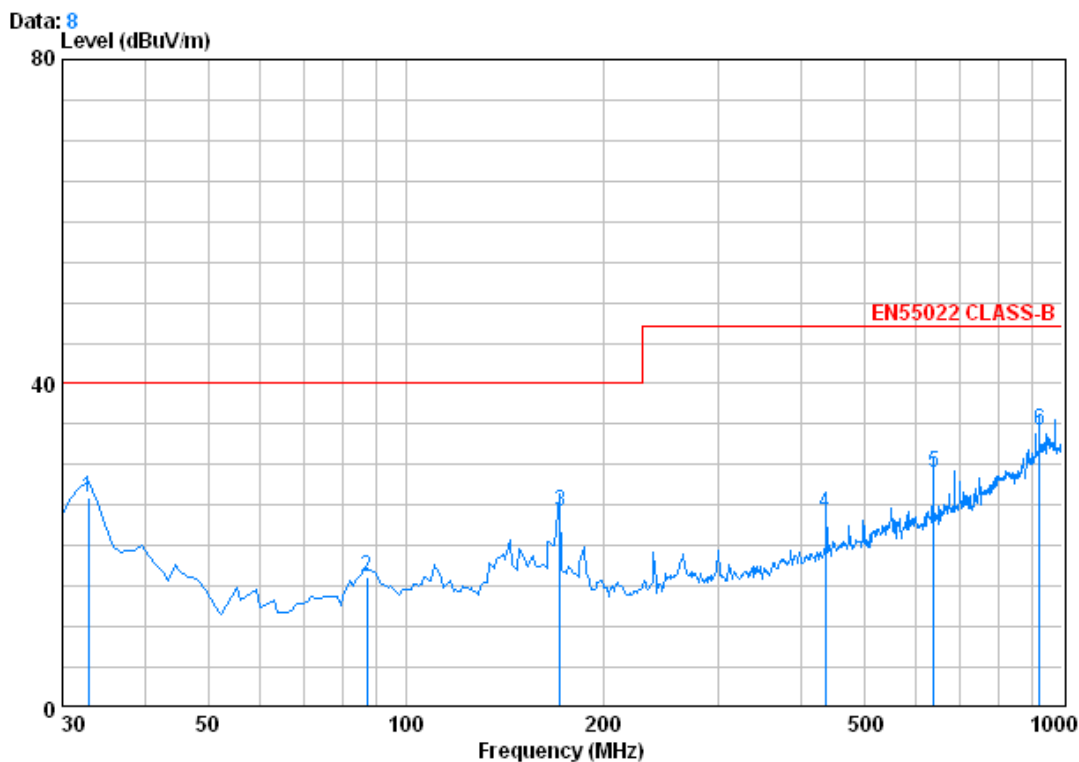
Job No. : 0470IT

Mode : Communicate with PC & Optical fiber port

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit	Over
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 0	34.144	0.60	14.58	27.34	49.00	36.83	40.00	-3.17
2	41.600	0.63	10.81	27.31	47.00	31.13	40.00	-8.87
3	48.430	0.77	8.18	27.29	49.24	30.90	40.00	-9.10
4	90.140	1.10	6.05	27.21	49.01	28.96	40.00	-11.04
5	152.220	1.32	9.43	26.90	41.49	25.34	40.00	-14.66
6	637.220	2.78	15.75	27.49	42.86	33.90	47.00	-13.10



Horizontal:



Condition : EN55022 CLASS-B 3m 3142C NEW HORIZONTAL

Job No. : 0470IT

Mode : Communicate with PC & Optical fiber port

		CableAntenna			Preamp		Read		Limit	Over
	Freq	Loss	Factor	Factor	Level	Level	Level	Line	Limit	
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m			dB
1	32.910	0.60	15.60	27.35	37.11	25.96	40.00	-14.04		
2	87.230	1.10	5.99	27.22	36.36	16.23	40.00	-23.77		
3	171.620	1.36	8.73	26.81	41.00	24.27	40.00	-15.73		
4	436.430	2.36	12.23	27.35	36.79	24.02	47.00	-22.98		
5	637.220	2.78	15.75	27.49	37.90	28.94	47.00	-18.06		
6	924.340	3.63	20.73	26.64	36.46	34.18	47.00	-12.82		



6.2 Conducted Emissions Mains Terminals, 150kHz to 30MHz

Test Requirement:	EN 55022
Test Method:	EN 55022
Frequency Range:	150kHz to 30MHz
Class / Severity:	Class B
Limit	
0.15M-0.5MHz	66dB(dB μ V)-56dB(dB μ V) quasi-peak, 56dB(dB μ V)-46dB(dB μ V) average
0.5M-5MHz	56dB(dB μ V) quasi-peak, 46dB(dB μ V) average
5M-30MHz	60dB(dB μ V) quasi-peak, 50dB(dB μ V) average
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)
	Quasi-Peak if maximised peak within 6dB of Quasi-Peak limit

6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 45% RH Atmospheric Pressure: 1015 mbar

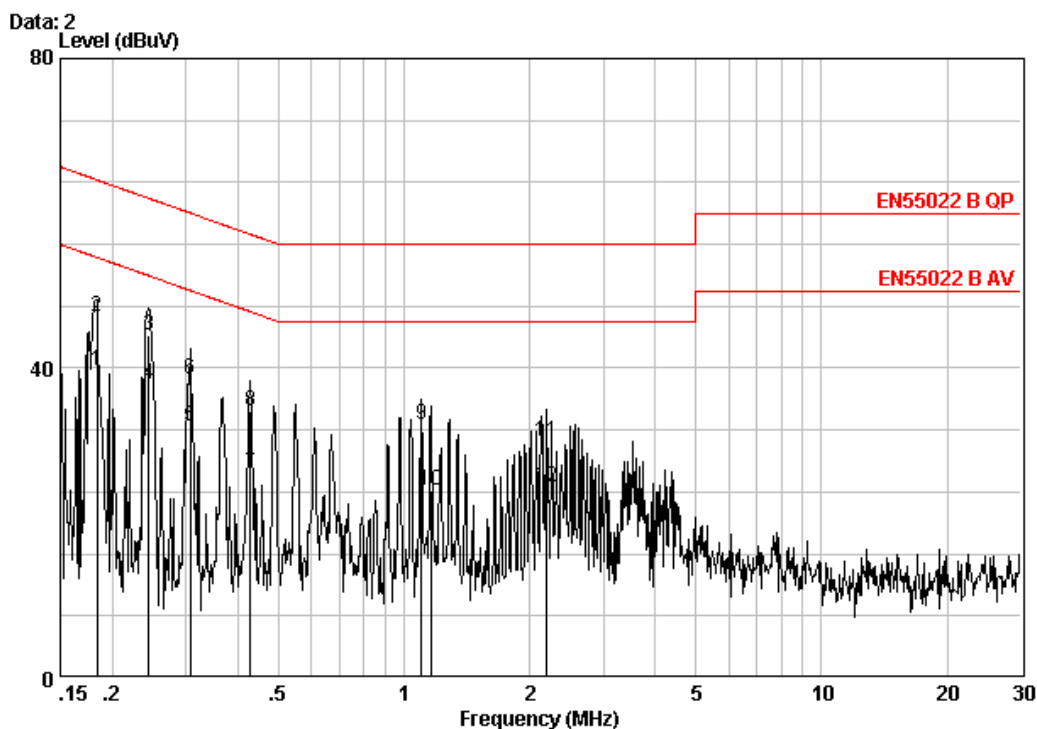
EUT Operation: Test the EUT in Communicate with PC & optical fiber port, build the connection between the EUT and internet through optical fiber port, keep linking with file server, connect the EUT and PC by RJ45, keep data exchanging.

6.2.2 Measurement Data

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

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:

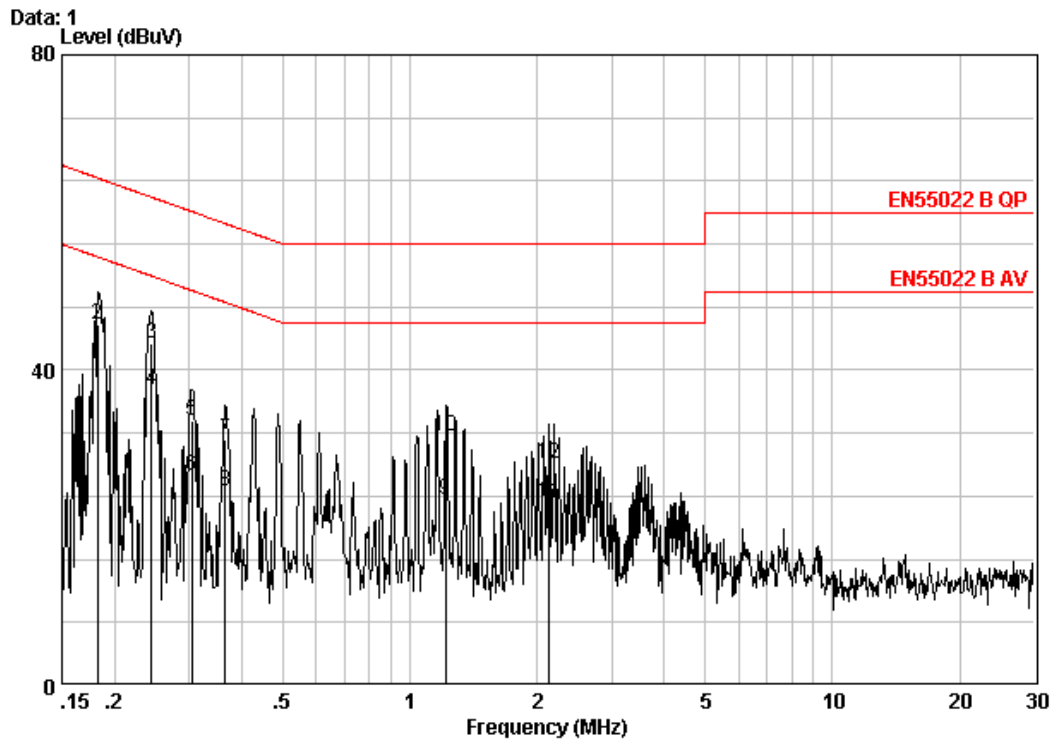


Site : Shielding Room
Condition : EN55022 B QP CE LINE
Job No. : 0470IT
Mode : Communicate with PC & Optical fiber port

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.18346	0.02	9.70	30.06	39.78	54.33	-14.55	Average
2	0.18346	0.02	9.70	36.99	46.71	64.33	-17.62	QP
3	0.24422	0.02	9.70	34.51	44.23	61.95	-17.73	QP
4	0.24422	0.02	9.70	28.13	37.85	51.95	-14.11	Average
5	0.30671	0.01	9.71	22.84	32.56	50.06	-17.50	Average
6	0.30671	0.01	9.71	28.84	38.56	60.06	-21.50	QP
7	0.42825	0.01	9.80	16.59	26.40	47.29	-20.89	Average
8	0.42825	0.01	9.80	24.58	34.39	57.29	-22.90	QP
9	1.100	0.02	9.80	22.95	32.77	56.00	-23.23	QP
10	1.160	0.02	9.80	14.27	24.09	46.00	-21.91	Average
11	2.201	0.02	9.81	20.78	30.61	56.00	-25.39	QP
12	2.201	0.02	9.81	14.82	24.65	46.00	-21.35	Average



Neutral Line:



Site : Shielding Room
Condition : EN55022 B QP CE NEUTRAL
Job No. : 0470IT
Mode : Communicate with PC & Optical fiber port

		Cable	LISN	Read		Limit	Over	
	Freq	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.18249	0.02	9.70	30.14	39.86	54.37	-14.51	Average
2	0.18249	0.02	9.70	36.10	45.82	64.37	-18.55	QP
3	0.24422	0.02	9.70	33.57	43.28	61.95	-18.67	QP
4	0.24422	0.02	9.70	27.83	37.54	51.95	-14.41	Average
5	0.30509	0.01	9.71	23.78	33.50	60.10	-26.61	QP
6	0.30509	0.01	9.71	16.78	26.50	50.10	-23.60	Average
7	0.36531	0.01	9.77	21.44	31.22	58.61	-27.39	QP
8	0.36531	0.01	9.77	14.79	24.57	48.61	-24.04	Average
9	1.216	0.02	9.80	13.70	23.52	46.00	-22.48	Average
10	1.216	0.02	9.80	21.68	31.50	56.00	-24.50	QP
11	2.133	0.02	9.81	13.28	23.11	46.00	-22.89	Average
12	2.133	0.02	9.81	18.23	28.06	56.00	-27.94	QP



6.3 Harmonics Test Results

Test Requirement: EN 61000-3-2
Test Method: N/A: See Remark Below
Frequency Range: 100Hz to 2kHz

There is no need for Harmonics test to be performed on this product (rated power is less than 75W) in accordance with EN 61000-3-2:2006+A1:2009+A2:2009.

For further details, please refer to Clause 7, Note 1 of EN 61000-3-2 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."

6.4 Flicker Test Result

Test Requirement: EN 61000-3-3
Test Method: EN 61000-3-3
Measurement Time: 10 mins
Class / Severity: Clause 5 of EN 61000-3-3

6.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 45% RH Atmospheric Pressure: 1015 mbar

EUT Operation: Test the EUT in Communicate with PC & optical fiber port, build the connection between the EUT and internet through optical fiber port, keep linking with file server, connect the EUT and PC by RJ45, keep data exchanging.

6.4.2 Measurement Data



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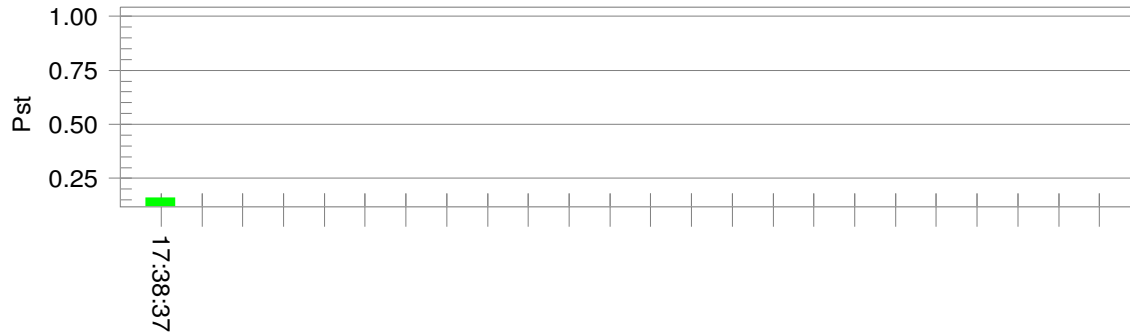
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Test Result: Pass

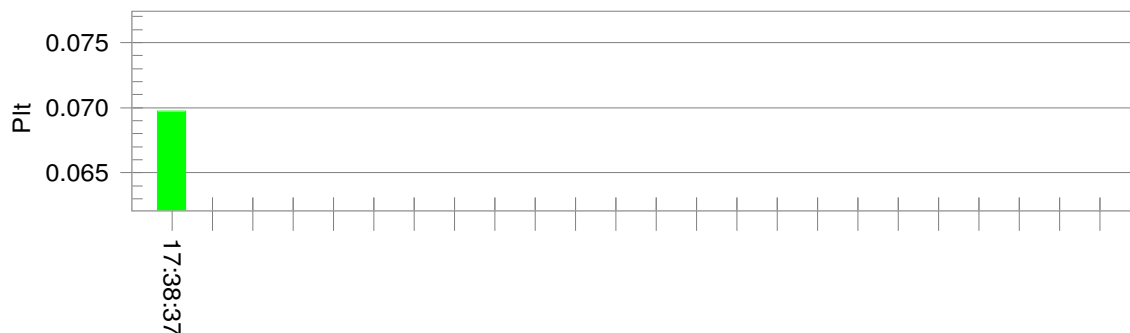
Status: Test Completed

Pst_i and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.20		
Highest dt (%):	0.00	Test limit (%):	3.30 Pass
Time(mS) > dt:	0.0	Test limit (mS):	500.0 Pass
Highest dc (%):	0.00	Test limit (%):	3.30 Pass
Highest dmax (%):	0.00	Test limit (%):	4.00 Pass
Highest Pst (10 min. period):	0.160	Test limit:	1.000 Pass

7 Immunity Test Results

7.1 Performance Criteria Description in Clause 7 of EN 55024

Criterion A: The equipment shall continue 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 equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

7.2 ESD

Test Requirement:	EN 55024
Test Method:	EN 61000-4-2
Performance Criterion:	B
Discharge Impedance:	330 Ω / 150 pF
Discharge Voltage:	Air Discharge: 2,4,8 kV
	Contact Discharge: 4 kV
	VCP, HCP: 4 kV
Polarity:	Positive & Negative
Number of Discharge:	Minimum of four test points (a minimum of 50 discharges at each point)
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

7.2.1 E.U.T. Operation

Operating Environment:	
Temperature:	25.0 °C
Humidity:	55 % RH
Atmospheric Pressure:	1020 mbar
EUT Operation:	Test the EUT in Communicate with PC & optical fiber port mode.

7.2.2 Test Results

Direct Application Test Results

Observations:	Test Point:
	1. All insulated enclosure and seams.
	2. All accessible metal parts of the enclosure.

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

Indirect Application Test Results

Observations:	Test Point:	1. All sides.
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Indirect Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
4	+/-	1	A	A

Results:

A:	No degradation in the performance of the EUT was observed.
B:	Communication is off while testing on the metallic parts, but it can recover automatically.
N/A:	Not applicable (not requested by Standard).



7.3 Radiated Immunity

Test Requirement: EN 55024
Test Method: EN 61000-4-3
Performance Criterion: A
Frequency Range: 80MHz to 1GHz
Antenna Polarisation: Vertical and Horizontal
Severity: 3V/m 80%, 1kHz Amplitude Modulated

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 45% RH Atmospheric Pressure: 1012 mbar

EUT Operation: Test the EUT in Communicate with PC & optical fiber port mode.

7.3.2 Test Results

Frequency	Level	Modulation	EUT Face	Result / Observations
80MHz-1GHz	3V/m	1kHz, 80% Amp. Mod, 1% increment	Front/ Back	A
			Right/ Left	A
			Top/ Underside	A

Remarks:

A: No degradation in the performance of the EUT was observed.



7.4 Electrical Fast Transients (EFT)

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

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 50 % RH Atmospheric Pressure: 1015 mbar

EUT Operation: Test the EUT in Communicate with PC & optical fiber port mode.

7.4.2 Test Results On AC Supply:

Lead under Test	Level (±kV)	Coupling Direct/Clamp	EUT operating mode	Observations (Performance Criterion)
Live, Neutral, Earth	1.0	Direct	Communicate with PC & optical fiber port mode	(A)

A: No loss of function was observed.





7.5 Surge

Test Requirement: EN 55024
Test Method: EN 61000-4-5
Performance Criterion: B
Test Level: $\pm 1\text{kV}$ Live to Neutral
 $\pm 2\text{kV}$ Live to Earth or Neutral to Earth
Polarity: Positive & Negative
Interval: 60s between each surge
No. of surges: 5 positive, 5 negative at 0° , 90° , 180° , 270° .

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0°C Humidity: 50 % RH Atmospheric Pressure: 1015 mbar

EUT Operation: Test the EUT in Communicate with PC & optical fiber port mode.

7.5.2 Test Results:



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Pulse No	Line-Line	Level (kV)	Surge Interval	Phase (deg)	Observation (Performance Criterion)
1-5	L-N	+1	60s	0°	(A)
6-10	L-N	-1	60s	0°	(A)
11-15	L-N	+1	60s	90°	(A)
16-20	L-N	-1	60s	90°	(A)
21-25	L-N	+1	60s	180°	(A)
26-30	L-N	-1	60s	180°	(A)
31-35	L-N	+1	60s	270°	(A)
36-40	L-N	-1	60s	270°	(A)
41-45	L-PE	+2	60s	0°	(A)
46-50	L-PE	-2	60s	0°	(A)
51-55	L-PE	+2	60s	90°	(A)
56-60	L-PE	-2	60s	90°	(A)
61-65	L-PE	+2	60s	180°	(A)
66-70	L-PE	-2	60s	180°	(A)
71-75	L-PE	+2	60s	270°	(A)
76-80	L-PE	-2	60s	270°	(A)
81-85	N-PE	+2	60s	0°	(A)
86-90	N-PE	-2	60s	0°	(A)
91-95	N-PE	+2	60s	90°	(A)
96-100	N-PE	-2	60s	90°	(A)
101-105	N-PE	+2	60s	180°	(A)
106-110	N-PE	-2	60s	180°	(A)
111-115	N-PE	+2	60s	270°	(A)
116-120	N-PE	-2	60s	270°	(A)
121-125	L-N-PE	+2	60s	0°	(A)
126-130	L-N-PE	-2	60s	0°	(A)
131-135	L-N-PE	+2	60s	90°	(A)
136-140	L-N-PE	-2	60s	90°	(A)
141-145	L-N-PE	+2	60s	180°	(A)
146-150	L-N-PE	-2	60s	180°	(A)
151-155	L-N-PE	+2	60s	270°	(A)
156-160	L-N-PE	-2	60s	270°	(A)

A: No loss of performance.



7.6 Conducted Immunity 0.15MHz to 80MHz

Test Requirement: EN 55024
Test Method: EN 61000-4-6
Performance Criterion: A
Frequency Range: 0.15MHz to 80MHz
Test level: 3V rms on AC Ports (unmodulated emf into 150 Ω)
Modulation: 80%, 1kHz Amplitude Modulation

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C Humidity: 56 % RH Atmospheric Pressure: 1012 mbar

EUT Operation: Test the EUT in Communicate with PC & optical fiber port mode.

7.6.2 Test Results:

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Observation (Performance Criterion)
150kHz to 80MHz	3 Wire AC Supply Cable	3Vrms	80%, 1kHz Amp. Mod.	1%	2s	(A)

A: No Loss of Function



7.7 Voltage Dips and Interruptions

Test Requirement: EN 55024
Test Method: EN 61000-4-11
Performance Criterion: >95%VD, 0.5period: B; >95%VI, 250periods: C;
30%VD, 25periods: C
Test Level: 0% of U_T (Supply Voltage) for 0.5 Periods
0% of U_T (Supply Voltage) for 250 Periods
70 % of U_T (Supply Voltage) for 25 Periods
No. of Dips / Interruptions: 3 per Level

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 50 % RH Atmospheric Pressure: 1015 mbar

EUT Operation: Test the EUT in Communicate with PC & optical fiber port mode.

7.7.2 Test Results:

EUT operating mode	Test Level % U_T	Phase	Duration of dropout in Periods	No of dropout	Time between dropout	Observations (Performance Criterion)
Communicate with PC & optical fiber port mode	0	0°&180°	0.5	3	10s	(A)
Communicate with PC & optical fiber port mode	0	0°&180°	250	3	10s	(B)
Communicate with PC & optical fiber port mode	70	0°&180°	25	3	10s	(A)

A: No Loss of Function

B: The switch power shut down, and it can recover automatically after test.

8 Photographs

8.1 Radiated Emission Test Setup



8.2 Conducted Emission Test Setup



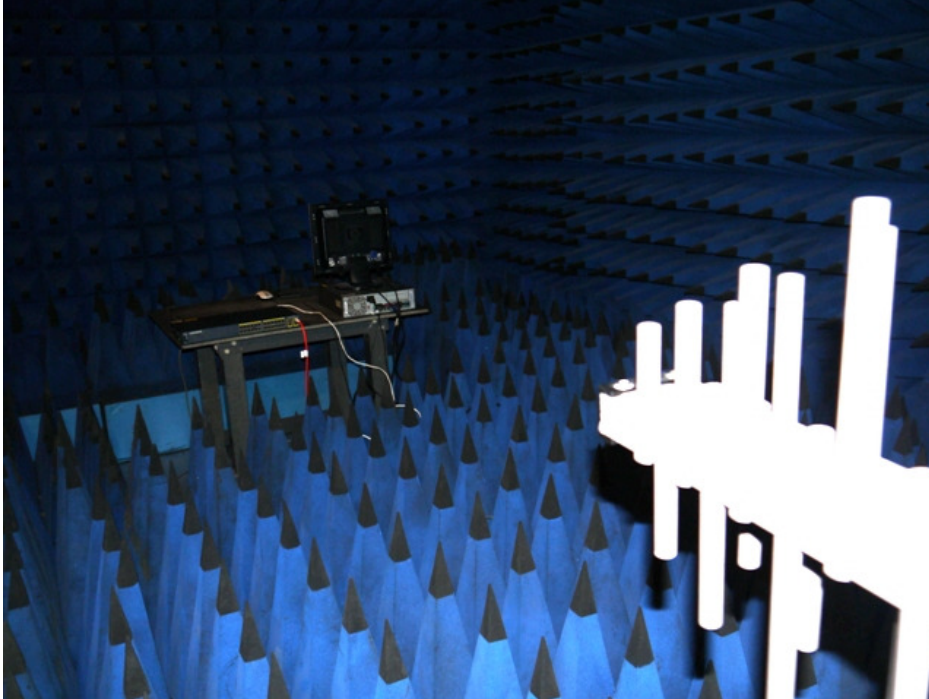
8.3 Flicker Setup



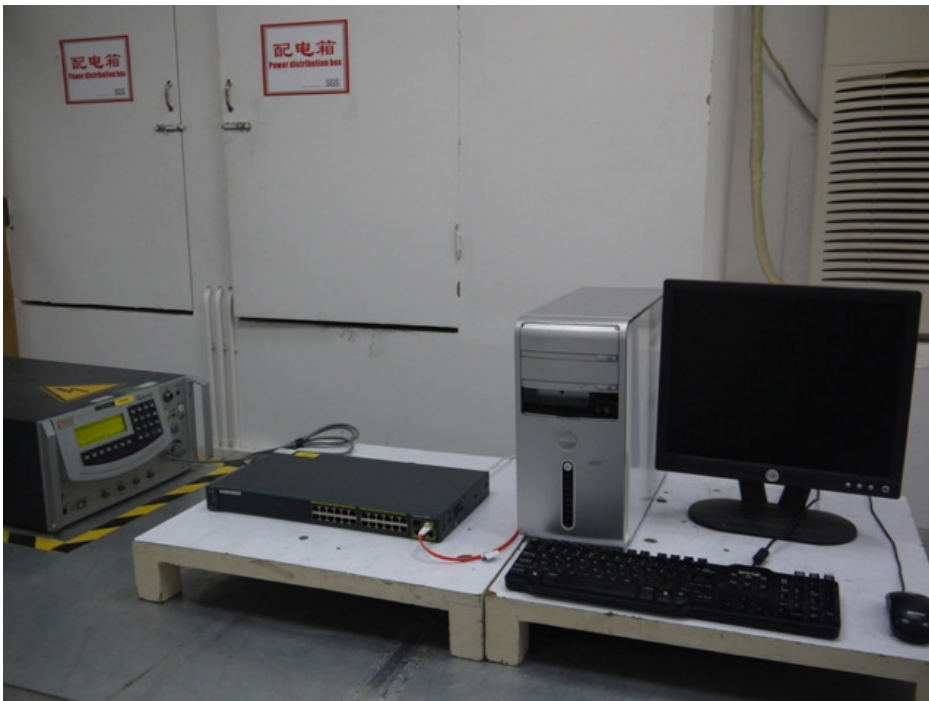
8.4 ESD Test Setup



8.5 Radiated Immunity Test Setup



8.6 EFT, Surge and Voltage dips Test Setup



8.7 Conducted Immunity Test Setup



8.8 EUT Constructional Details

