CE EMC
TEST REPORT

for

AV500 Powerline Adapter; AV600 Powerline Adapter

MODEL: PL7500; PL7600

Test Report Number:
T150624D16-E

Issued to:

NETIS SYSTEMS CO., LTD

4F & 5F, R&D Building, Oriental Cyberport, High-Tech Industrial Park, Nanshan, Shenzhen, China

Issued by:

Compliance Certification Services Inc.

Xindian Lab.

No.163-1, Jhongsheng Rd., Xindian Dist.,
New Taipei City, 23151 Taiwan.
TEL: 886-2-22170894

FAX: 886-2-22171029

Issued Date: July 29, 2015

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		July 29, 2015		Initial Issue	ALL	Eva Fan

TABLE OF CONTENTS

1 TEST CERTIFICATION

Product:	AV500 Powerline Adapter; AV600 Powerline Adapter
Model:	PL7500; PL7600
Brand:	netis
Applicant:	**NETIS SYSTEMS CO., LTD** 4F & 5F, R&D Building, Oriental Cyberport, High-Tech Industrial Park, Nanshan, Shenzhen, China
Manufacturer:	**Shenzhen Netcore Industrial Ltd.** 4F & 5F, R&D Building, Oriental Cyberport, High-Tech Industrial Park, Nanshan, Shenzhen, China
Tested:	July 1, 2015 ~ July 23, 2015
Applicable Standards:	**EN 50561-1: 2013** **EN 55022: 2010 / AC: 2011** **EN 61000-3-2: 2014** **EN 61000-3-3: 2013** **EN 50412-2-1: 2005 / AC: 2009** IEC 61000-4-2: 2008 IEC 61000-4-3: 2006 + A1: 2007 + A2 2010 IEC 61000-4-4: 2012 IEC 61000-4-5: 2014 IEC 61000-4-6: 2013 IEC 61000-4-8: 2009 IEC 61000-4-11: 2004

Deviation from Applicable Standard
None

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements of technical standards specified above under the EMC Directive 2004/108/EC* and 2014/30/EU. 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.
*: Directive 2004/108/EC is repealed with effect form 20 April 2016.

Approved by:

Sam Hu
Assistant Manager

Reviewed by:

Eva Fan
Supervisor of report document dept.

2 TEST RESULT SUMMARY

EMISSION			
Standard	**Item**	**Result**	**Remarks**
EN 50561-1: 2013 EN 55022: 2010 / AC: 2011	Dynamic Power Control at the PLC port	PASS	Meets limits of table 4 of EN50561-1
	Conducted unsymmetrical disturbances at the PLC port	PASS	Meets limits of table 1 of EN50561-1
	Conducted asymmetric disturbances at the PLC port	PASS	Meets limits of table 1 of EN50561-1
	Conducted (Power Port)	PASS	Meet Class B limit of EN 55022
	Conducted (Telecom port)	PASS	Meet Class B limit of EN 55022
	Radiated	PASS	Meet Class B limit of EN 55022
EN 50561-1 2013	Dynamic frequency exclusion	PASS	The EUT with dynamic notch filters function
EN 61000-3-2: 2014	Harmonic current emissions	PASS	Meet Class A limit
EN 61000-3-3: 2013	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY【 EN 50412-2-1: 2005 / AC: 2009 】			
Standard	**Item**	**Result**	**Remarks**
IEC 61000-4-2: 2008	ESD	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010	RS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4: 2012	EFT	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-5: 2014	Surge	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6: 2013	CS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-8: 2009	PFMF	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11: 2004	Voltage dips & voltage variations	PASS	Meets the requirements of **Voltage Dips:** 1) 30% reduction Performance Criterion A 2) 60% reduction Performance Criterion A **Voltage Interruptions:** 1) >95% reduction Performance Criterion C

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	AV500 Powerline Adapter; AV600 Powerline Adapter
Brand Name	netis
Model	PL7500; PL7600
Applicant	NETIS SYSTEMS CO., LTD
Housing material	Plastic
Identify Number	T150624D16
Received Date	June 24, 2015
EUT Power Rating	100-240VAC, 50/60Hz, 0.03A
AC Power During Test	230VAC / 50Hz

Model Differences

Product	Model	Difference	Tested (Check)
AV500 Powerline Adapter	PL7500	The software is different.	☒
AV600 Powerline Adapter	PL7600		☐

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. LAN Port	1	1

Note: Client consigns only one model sample to test (Model Number: PL7500).

4 TEST METHODOLOGY

4.1. DECISION OF 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:

Dynamic Power Control at the PLC port:

1	**With user data transmission Mode**

Conducted unsymmetrical disturbances at the PLC port:

1	**Without user data transmission Mode**
2	**With user data transmission Mode**

Conducted asymmetric disturbances at the PLC port:

1	**With user data transmission Mode**

Conduction Mode (Power port):

1	**Normal Mode**

Conduction Modes (Telecom port):

1	**10Mbps**
2	**100Mbps**

Radiation Mode:

1	**Normal Mode**

4.2. EUT SYSTEM OPERATION

1. All peripherals connect EUT to test.

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

5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

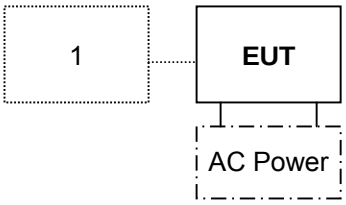
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Peripherals Devices:

No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Brand Name	Data Cable	Power Cord
1	Server PC	T3500	FX36VBX	DOC BSMI: R33002	DELL	Unshielded, 20m	Unshielded, 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 CCSrf Taiwan Xindian Lab. at No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.

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 and CISPR 16-1-5.

6.2. ACCREDITATIONS

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

Taiwan	TAF
USA	A2LA

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

Canada	Industry Canada
Norway	Nemko
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 (Power port)	0.15MHz ~ 30MHz	± 1.59
Conducted emissions (Telecom port)	0.15MHz ~ 30MHz	± 2.91
Radiated emissions	30MHz ~ 1000MHz	± 4.12

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.

7 EMISSION TEST

7.1. DYNAMIC POWER CONTROL MEASUREMENT

7.1.1. LIMITS OF DYNAMIC POWER CONTROL MEASUREMENT

Maximum PLC transmit signal level between 1.606 5 MHz and 30 MHz

Symmetrical mode insertion loss EUT to AE in dB	10	20	≥ 40
Maximum transmit signal level in dB(μV) (AV)	65	75	95
Maximum transmit signal level in dB(μV) (PK)	75	85	105
NOTE The transmit power management function of an AE should operate in the same way as the EUT otherwise the signal of the AE may dominate and cause erroneous results during measurement.			

7.1.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
Test S/W	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.

7.1.3. TEST PROCEDURES (please refer to measurement standard or CCS SOP PA-031)

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT and AE(as same PLC) being connected to the power mains through a symmetrical splitter and a symmetrical variable attenuator.

b. EUT and AE(as same PLC) are made with two LISNs. Other support units are connected to the power mains through another LISN.

c. The transmit signal level shall be measured at all PLC transmission frequencies, with a symmetrical insertion loss between EUT and AE of 10 dB, 20 dB, 40 dB and 50 dB.

d. The frequency range from 1.6065 MHz to 30 MHz with each symmetrical attenuator, the PLC transmit signal levels will be searched and recorded.

e. Conducted emission test with user data transmission from the PLC port.

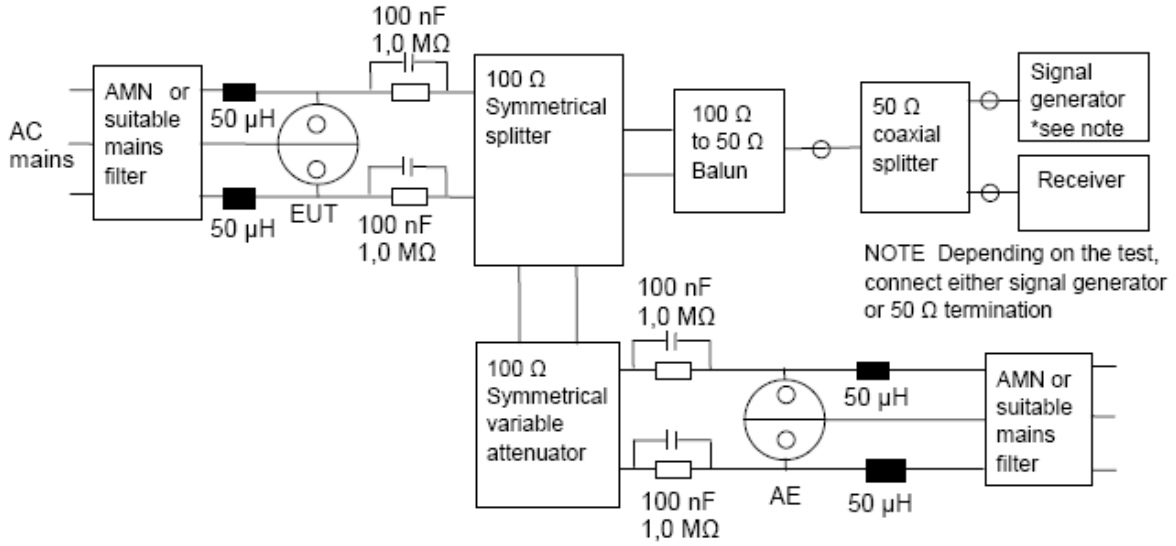
f. Turn on the power of all equipment.

g. Prepare other computer systems (support units B~C) to act as communication partners and placed them outside of testing area.

h. The communication partners run test program “Tgen.exe” to enable EUT under transmission/receiving condition continuously via UTP cables another EUT.

i. Repeat steps g-h.

7.1.4 TEST SETUP



NOTE 1 The insertion power loss between the EUT and the AE is 10 dB to 50 dB adjustable in 10 dB steps.

NOTE 2 The insertion power loss between the EUT and the measurement receiver is nominally 20 dB.

NOTE 3 The insertion power loss between the signal generator and EUT is nominally 20 dB.

NOTE 4 The insertion power loss between the signal generator and the measurement receiver is nominally 6 dB.

NOTE 5 The above losses are determined as a part of the test equipment calibration; the actual figures should be used to correct the instrument readings to determine the levels that apply at the EUT terminals.

Figure 4 — Example test equipment arrangement for measuring PLC transmit signal levels

- **Note 1**: 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)
x.xx	42.95	0.55	43.50	56	-12.50	Q

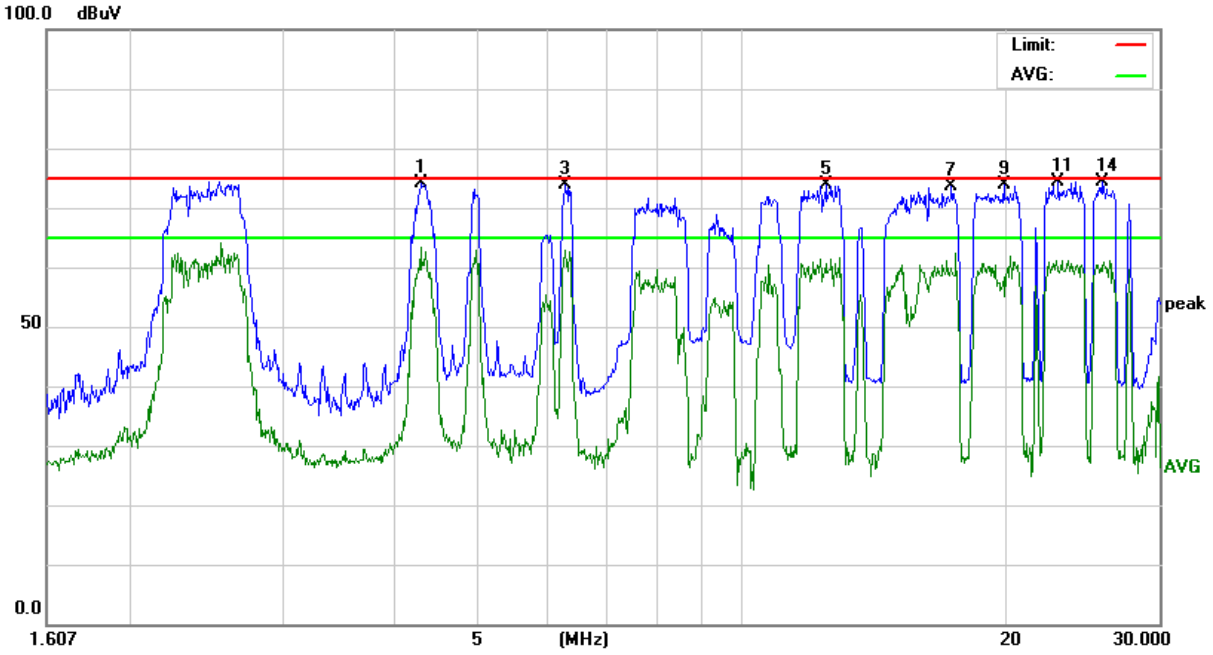
Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss + Pulse Limit
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading

Calculation Formula

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

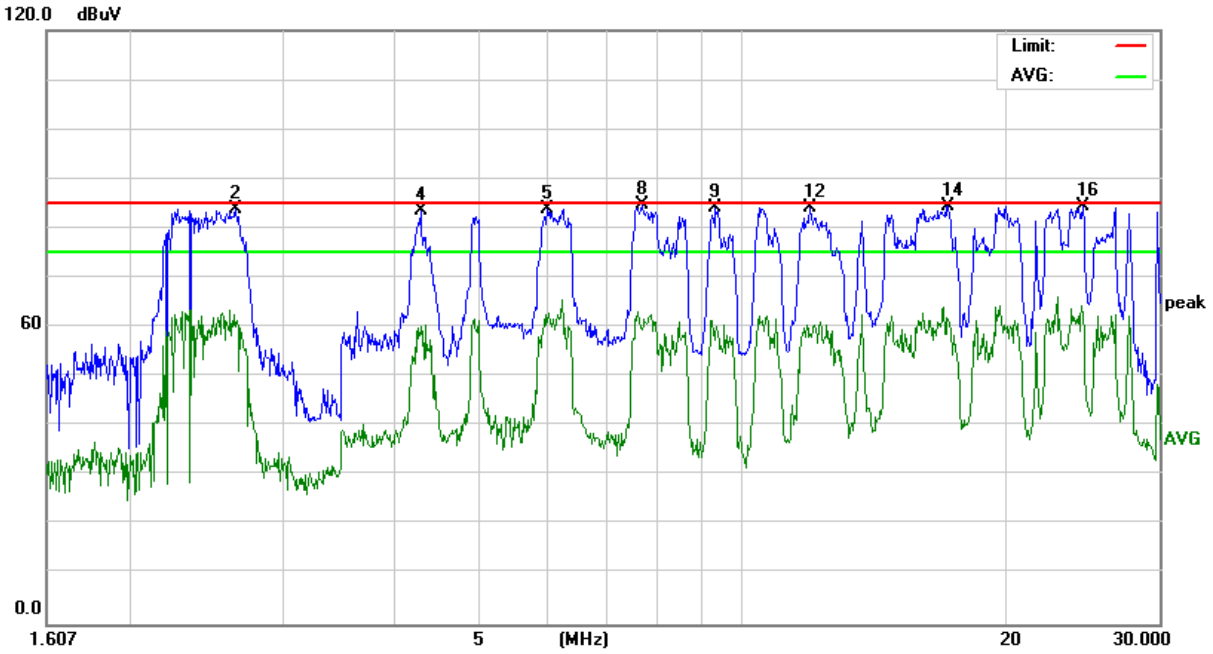
7.1.6 TEST RESULTS

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	Howard Peng	Insertion Power Loss	10dB
Standard	EN 55022 CLASS B		



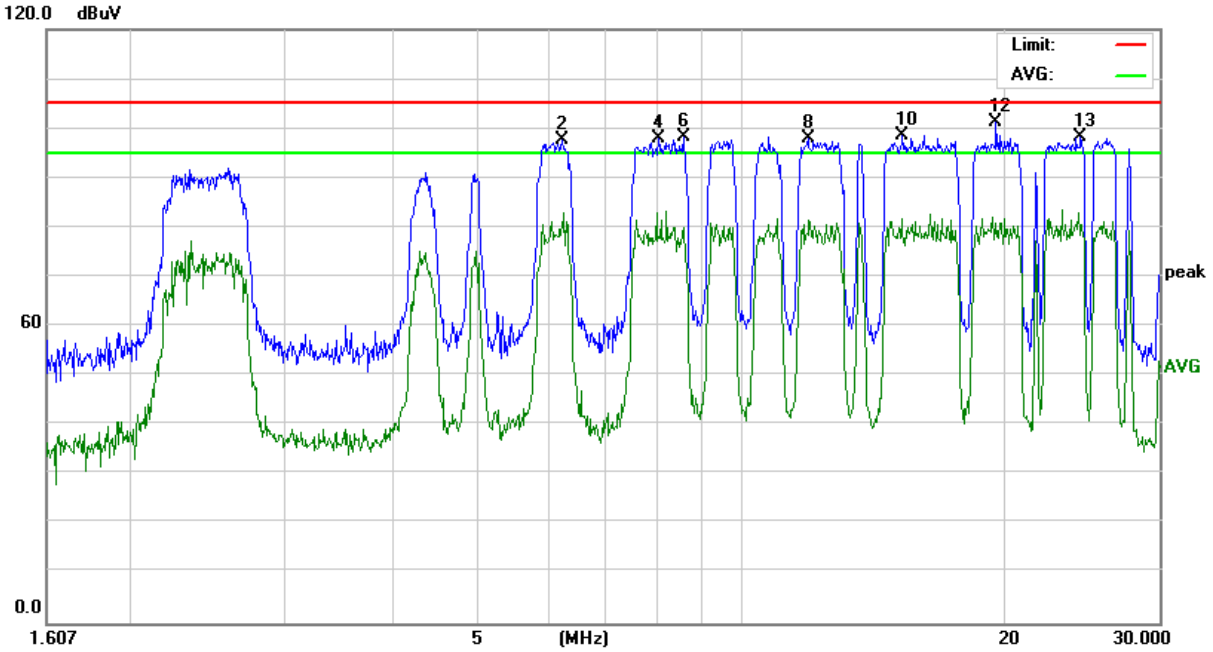
Conducted Emission Readings						
Frequency Range Investigated				1.6065 MHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
4.3145	44.21	29.91	74.12	75.00	-0.88	P
4.3145	29.84	29.91	59.75	65.00	-5.25	A
6.2985	43.95	29.99	73.94	75.00	-1.06	P
6.2985	32.99	29.99	62.98	65.00	-2.02	A
12.4985	43.61	30.33	73.94	75.00	-1.06	P
12.5265	28.82	30.34	59.16	65.00	-5.84	A
17.3625	43.15	30.59	73.74	75.00	-1.26	P
17.3625	28.88	30.59	59.47	65.00	-5.53	A
19.9465	43.24	30.73	73.97	75.00	-1.03	P
19.9825	24.49	30.73	55.22	65.00	-9.78	A
23.0465	43.62	30.87	74.49	75.00	-0.51	P
23.0465	28.60	30.87	59.47	65.00	-5.53	A
25.7385	28.30	31.01	59.31	65.00	-5.69	A
25.8105	43.25	31.01	74.26	75.00	-0.74	P

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	Howard Peng	Insertion Power Loss	20dB
Standard	EN 55022 CLASS B		



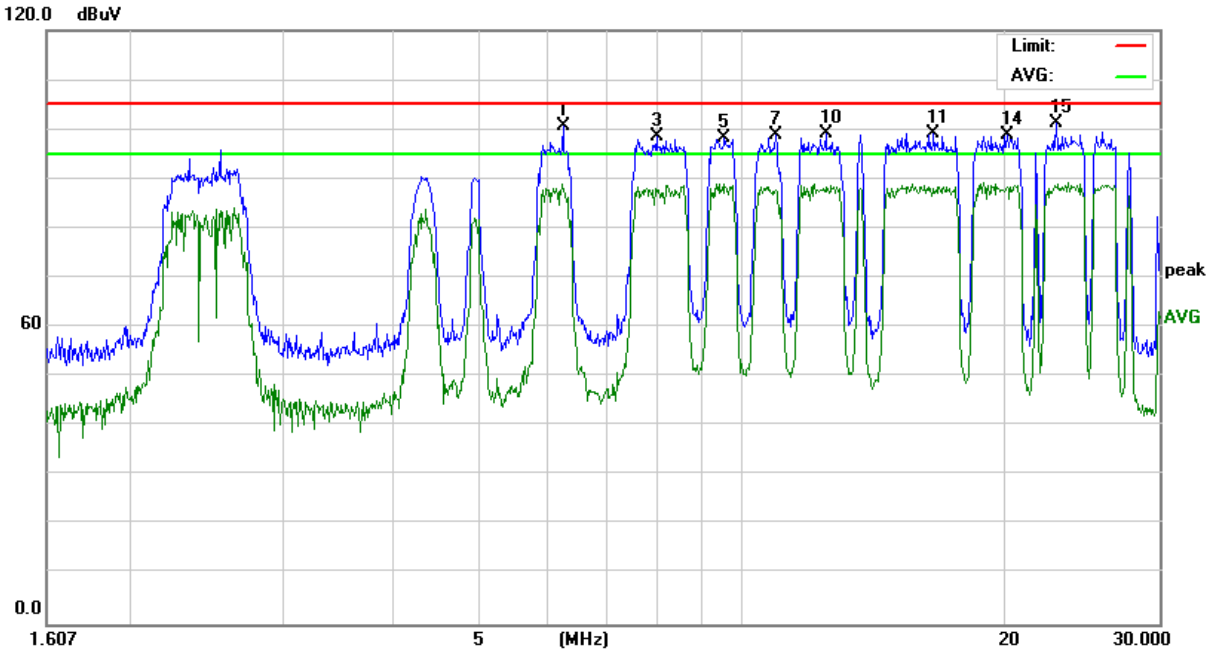
Conducted Emission Readings						
Frequency Range Investigated				1.6065 MHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
2.6385	32.76	29.87	62.63	75.00	-12.37	A
2.6465	54.08	29.87	83.95	85.00	-1.05	P
4.2865	28.56	29.91	58.47	75.00	-16.53	A
4.2985	53.73	29.91	83.64	85.00	-1.36	P
6.0065	53.80	29.98	83.78	85.00	-1.22	P
6.0065	31.36	29.98	61.34	75.00	-13.66	A
7.6905	29.94	30.07	60.01	75.00	-14.99	A
7.6945	54.71	30.07	84.78	85.00	-0.22	P
9.3505	54.13	30.17	84.30	85.00	-0.70	P
9.3505	28.56	30.17	58.73	75.00	-16.27	A
11.9345	27.78	30.31	58.09	75.00	-16.91	A
11.9785	53.78	30.31	84.09	85.00	-0.91	P
17.1865	31.28	30.59	61.87	75.00	-13.13	A
17.2105	53.92	30.59	84.51	85.00	-0.49	P
24.4665	33.46	30.94	64.40	75.00	-10.60	A
24.5345	53.41	30.95	84.36	85.00	-0.64	P

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	Howard Peng	Insertion Power Loss	40dB
Standard	EN 55022 CLASS B		



Conducted Emission Readings						
Frequency Range Investigated				1.6065 MHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
6.2264	48.51	29.99	78.50	95.00	-16.50	A
6.2465	67.74	29.99	97.73	105.00	-7.27	P
8.0584	48.17	30.09	78.26	95.00	-16.74	A
8.0585	67.88	30.09	97.97	105.00	-7.03	P
8.5704	48.50	30.13	78.63	95.00	-16.37	A
8.5945	68.26	30.13	98.39	105.00	-6.61	P
11.8664	48.38	30.30	78.68	95.00	-16.32	A
11.9145	67.59	30.31	97.90	105.00	-7.10	P
15.2104	47.34	30.47	77.81	95.00	-17.19	A
15.2585	68.01	30.47	98.48	105.00	-6.52	P
19.5344	50.13	30.71	80.84	95.00	-14.16	A
19.5345	70.46	30.71	101.17	105.00	-3.83	P
24.4384	67.26	30.94	98.20	105.00	-6.80	P
24.4384	49.23	30.94	80.17	95.00	-14.83	A

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	Howard Peng	Insertion Power Loss	50dB
Standard	EN 55022 CLASS B		



Conducted Emission Readings						
Frequency Range Investigated				1.6065 MHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
6.2585	70.63	29.99	100.62	105.00	-4.38	P
6.2705	57.55	29.99	87.54	95.00	-7.46	A
7.9905	68.44	30.09	98.53	105.00	-6.47	P
8.0225	57.24	30.09	87.33	95.00	-7.67	A
9.5705	67.94	30.19	98.13	105.00	-6.87	P
9.5705	58.81	30.19	89.00	95.00	-6.00	A
10.9465	68.47	30.26	98.73	105.00	-6.27	P
10.9465	57.43	30.26	87.69	95.00	-7.31	A
12.4545	57.07	30.33	87.40	95.00	-7.60	A
12.4745	68.74	30.33	99.07	105.00	-5.93	P
16.6025	68.61	30.54	99.15	105.00	-5.85	P
16.6025	57.55	30.54	88.09	95.00	-6.91	A
20.0145	56.59	30.73	87.32	95.00	-7.68	A
20.0985	68.23	30.73	98.96	105.00	-6.04	P
22.8544	70.28	30.87	101.15	105.00	-3.85	P
22.8544	57.56	30.87	88.43	95.00	-6.57	A

7.2. CONDUCTED UNSYMMETRIC DISTURBANCES AT THE PLC PORT

7.2.1. LIMIT OF CONDUCTED UNSYMMETRIC DISTURBANCES AT THE PLC

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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.

NOTE:

a. Without user data transmission, the unsymmetrical disturbances from the PLC port shall comply with the disturbance limits given above Table between 150 kHz and 30 MHz

b. When user data is being transmitted by the PLC port the disturbances from the PLC port may exceed the disturbance the limits at frequencies between 1.6065 MHz and 30 MHz provided that within all the excluded frequency ranges given in Table A.1 (and Table A.2 if using the methods and procedures).

c. Above 1.6065 MHz only the disturbances within the appropriate excluded frequency ranges need to be compared with the limits.

Table A1

Permanently excluded frequency ranges

1,80 – 2,00	11,275 – 11,4
2,85 – 3,025	13,26 – 13,36
3,40 – 4,00	14,00 – 14,35
4,65 – 4,70	17,9 –17,97
5,25 – 5,45	18,068 – 18,168
5,48 – 5,68	21,00 – 21,45
6,525 – 6,685	21,924 – 22,00
7,00 – 7,30	24,89 – 24,99
8,815 – 8,965	26,96 – 27,41
10,005 – 10,15	28,00 – 29,7

Table A2

dynamically excluded frequency ranges

2,30 – 2,498	11,55 – 12,10
3,20 – 3,40	13,55 – 13,90
3,90 – 4,05	15,05 – 15,85
4,75 – 5,11	17,40 – 17,90
5,75 – 6,20	18,90 – 19,02
7,20 – 7,70	21,45 – 21,85
9,30 – 9,95	25,65 – 26,10

7.2.2. TEST INSTRUMENTS

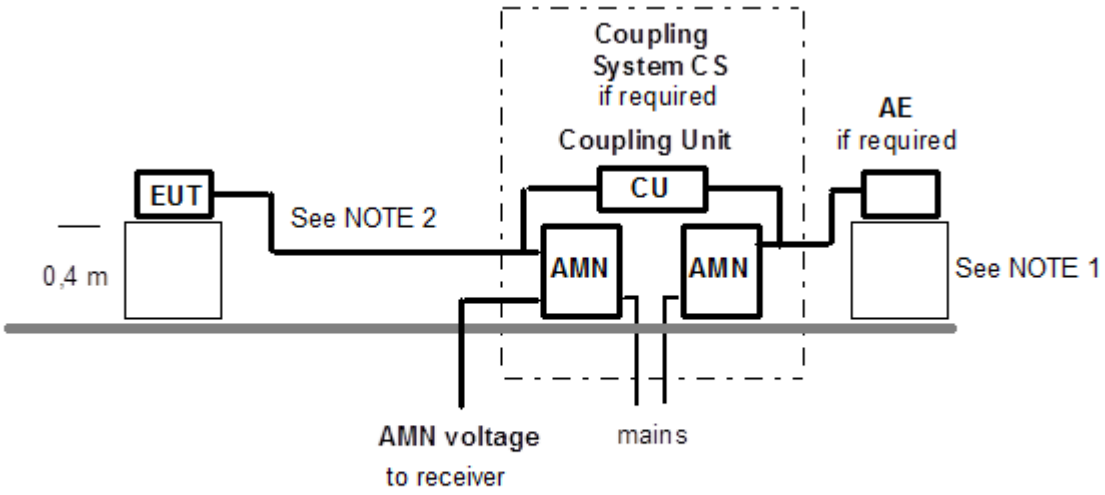
Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
PLC Tester	N/A	CCS-561S	2014-1	03/18/2016
Signal Generator	R&S	SMC100A	101195	09/28/2015
Test S/W	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.

7.2.3. TEST PROCEDURE

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT and AE(as same PLC) being connected to power mains through a coupling system (CS) which is made with two LISNs. Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 0.15 MHz to 30 MHz was searched. Emission levels under (Limit - 20dB) were not recorded.
d. Conducted emission test with user data transmission from the PLC port.
e. Turn on the power of all equipment.
f. Prepare other computer systems (support units B~C) to act as communication partners and placed them outside of testing area.
g. The communication partners run test program “Tgen.exe” to enable EUT under transmission/receiving condition continuously via UTP cables another EUT.
h. Repeat steps f-g.

7.2.4. TEST SETUP



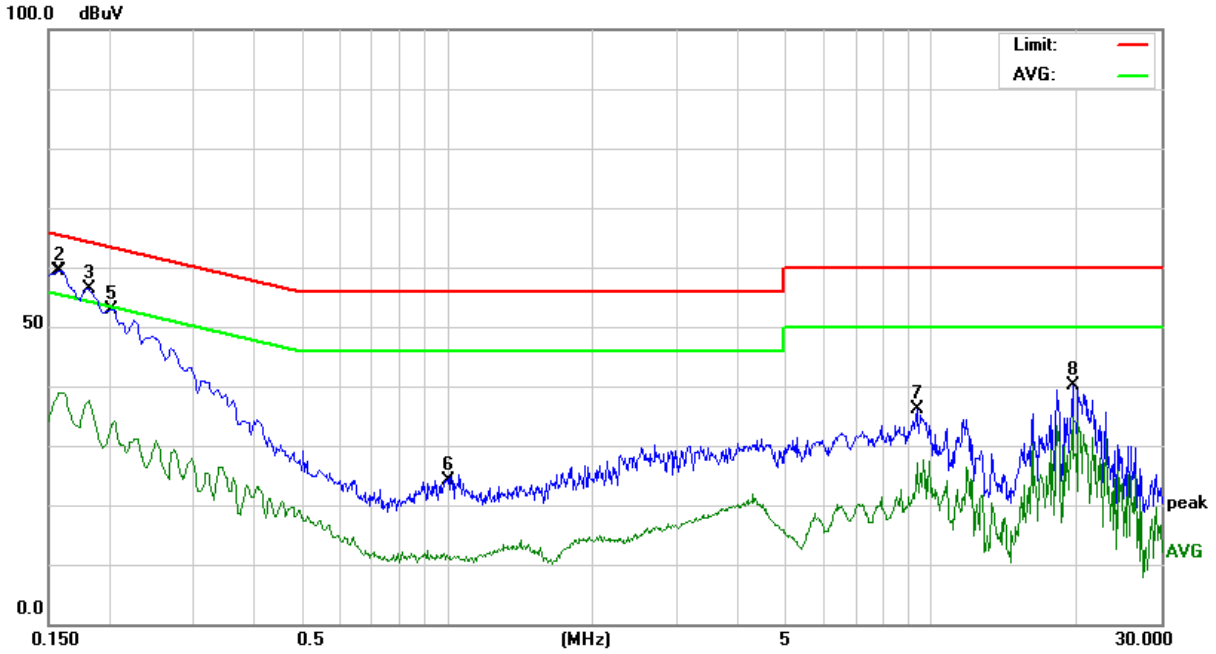
NOTE 1 Distance from AE to the reference ground plane (vertical or horizontal) is not critical.

NOTE 2 Cable length between EUT and CS is 0,8 m (± 0,05 m).

7.2.5. TEST RESULTS

Between 150 kHz ~ 30 MHz

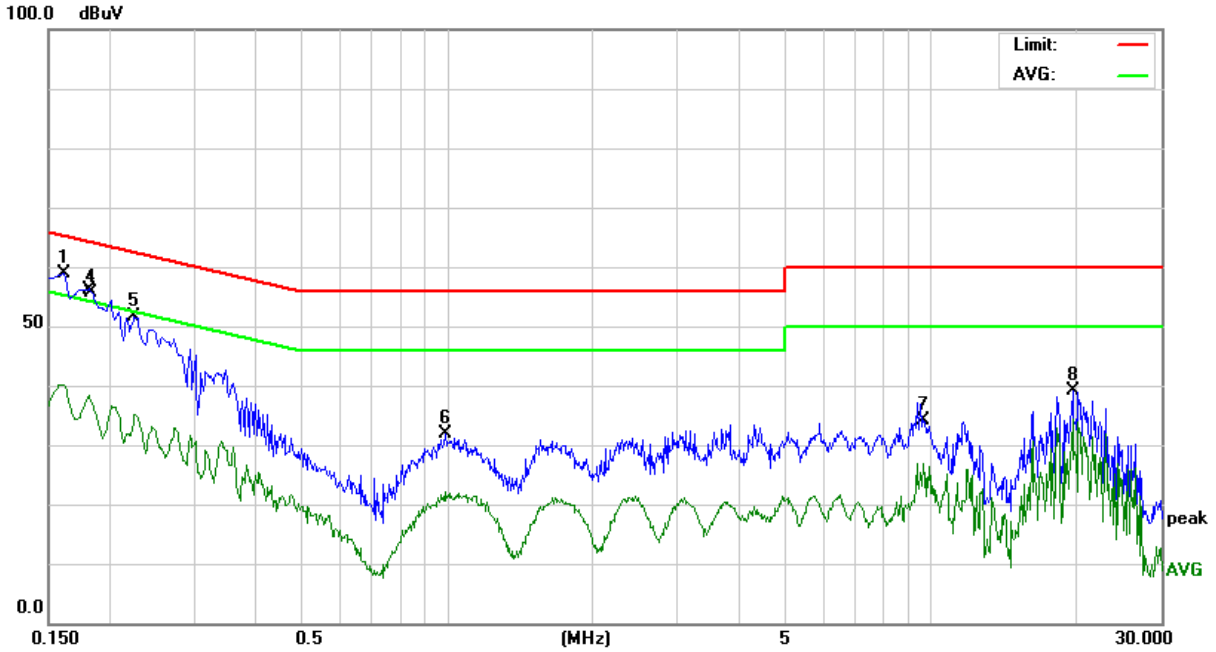
Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	26°C, 59% RH	Test Mode	Mode 1
Tested by	Howard Peng	Phase	L1
Standard	EN 55022 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				1.6065MHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1580	28.89	10.00	38.89	55.56	-16.67	A	L1
0.1590	49.29	10.00	59.29	65.51	-6.22	P	L1
0.1819	46.47	10.02	56.49	64.39	-7.90	P	L1
0.1825	27.25	10.02	37.27	54.37	-17.10	A	L1
0.2020	42.89	10.02	52.91	63.52	-10.61	P	L1
1.0020	14.15	10.10	24.25	56.00	-31.75	P	L1
9.3900	25.55	10.48	36.03	60.00	-23.97	P	L1
19.7099	29.22	10.81	40.03	60.00	-19.97	P	L1

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

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	26°C, 59% RH	Test Mode	Mode 1
Tested by	Howard Peng	Phase	L2
Standard	EN 55022 CLASS B		



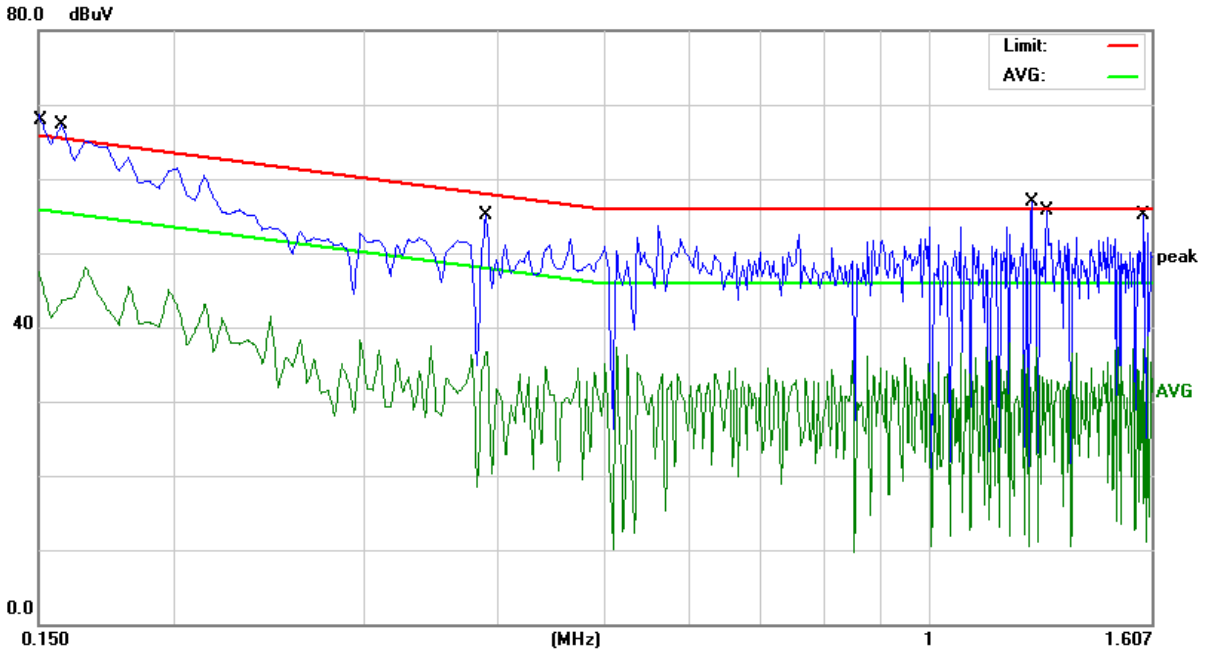
Conducted Emission Readings							
Frequency Range Investigated				1.6065MHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1620	48.87	10.00	58.87	65.36	-6.49	P	L2
0.1620	30.21	10.00	40.21	55.36	-15.15	A	L2
0.1835	27.60	10.02	37.62	54.32	-16.70	A	L2
0.1844	45.60	10.02	55.62	64.28	-8.66	P	L2
0.2260	41.52	10.01	51.53	62.59	-11.06	P	L2
0.9980	21.69	10.10	31.79	56.00	-24.21	P	L2
9.6940	23.70	10.49	34.19	60.00	-25.81	P	L2
19.7099	28.42	10.81	39.23	60.00	-20.77	P	L2

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

7.2.6. TEST RESULTS

Between 150 kHz ~ 1.6065 MHz

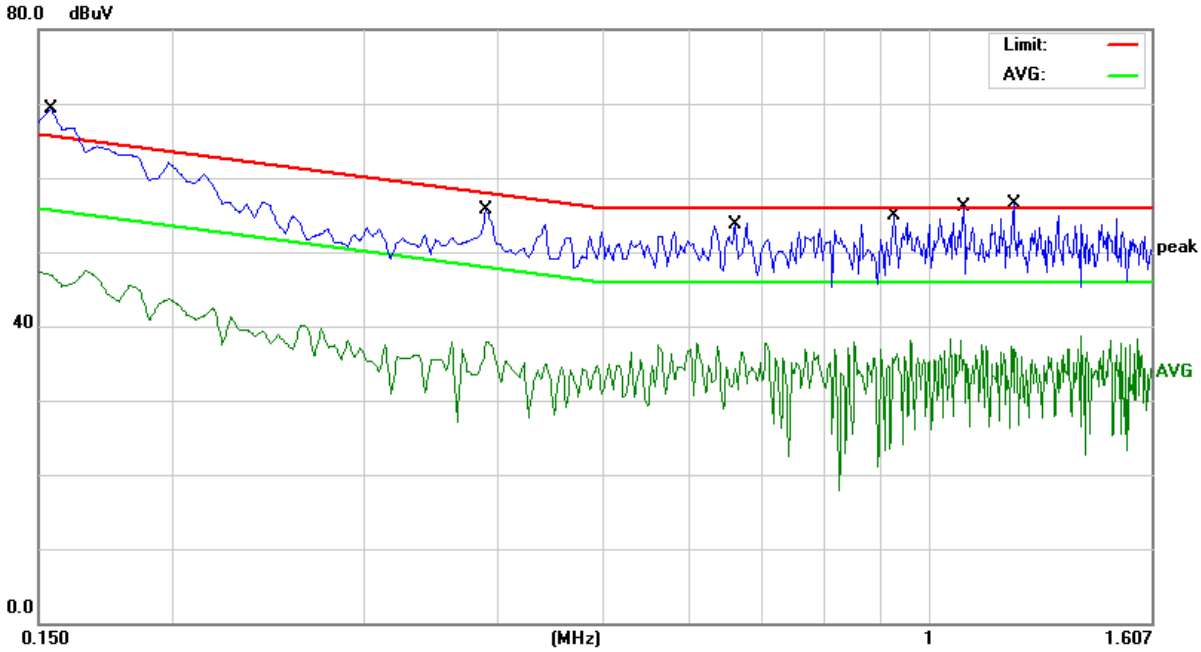
Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Phase	L1
Standard	EN 55022 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 1.6065 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1511	53.15	10.00	63.15	65.93	-2.78	Q	L1
0.1511	34.97	10.00	44.97	55.93	-10.96	A	L1
0.1580	51.77	10.00	61.77	65.56	-3.79	Q	L1
0.1580	34.21	10.00	44.21	55.56	-11.35	A	L1
0.3899	35.15	10.03	45.18	58.06	-12.88	Q	L1
0.3899	21.22	10.03	31.25	48.06	-16.81	A	L1
1.2460	35.34	10.12	45.46	56.00	-10.54	Q	L1
1.2460	20.11	10.12	30.23	46.00	-15.77	A	L1
1.2860	34.81	10.12	44.93	56.00	-11.07	Q	L1
1.2860	19.90	10.12	30.02	46.00	-15.98	A	L1
1.5820	34.95	10.15	45.10	56.00	-10.90	Q	L1
1.5820	20.20	10.15	30.35	46.00	-15.65	A	L1

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

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Phase	L2
Standard	EN 55022 CLASS B		



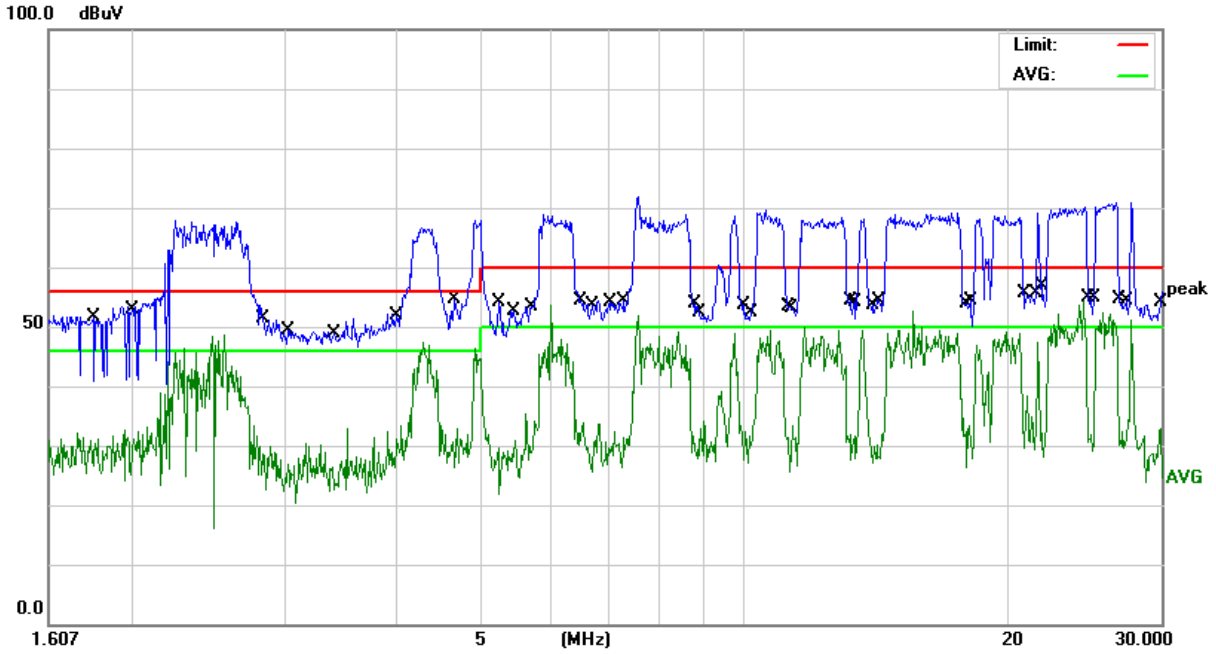
Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 1.6065 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1539	52.27	10.00	62.27	65.78	-3.51	Q	L1
0.1539	34.93	10.00	44.93	55.78	-10.85	A	L1
0.3899	37.09	10.03	47.12	58.06	-10.94	Q	L1
0.3899	22.32	10.03	32.35	48.06	-15.71	A	L1
0.6620	35.38	10.06	45.44	56.00	-10.56	Q	L1
0.6620	21.00	10.06	31.06	46.00	-14.94	A	L1
0.9300	35.84	10.10	45.94	56.00	-10.06	Q	L1
0.9300	21.34	10.10	31.44	46.00	-14.56	A	L1
1.0780	35.75	10.10	45.85	56.00	-10.15	Q	L1
1.0780	20.78	10.10	30.88	46.00	-15.12	A	L1
1.1980	36.12	10.12	46.24	56.00	-9.76	Q	L1
1.1980	21.00	10.12	31.12	46.00	-14.88	A	L1

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

7.2.7. TEST RESULTS

Between 1.6065 kHz ~ 30 MHz

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Phase	L1
Standard	EN 55022 CLASS B		



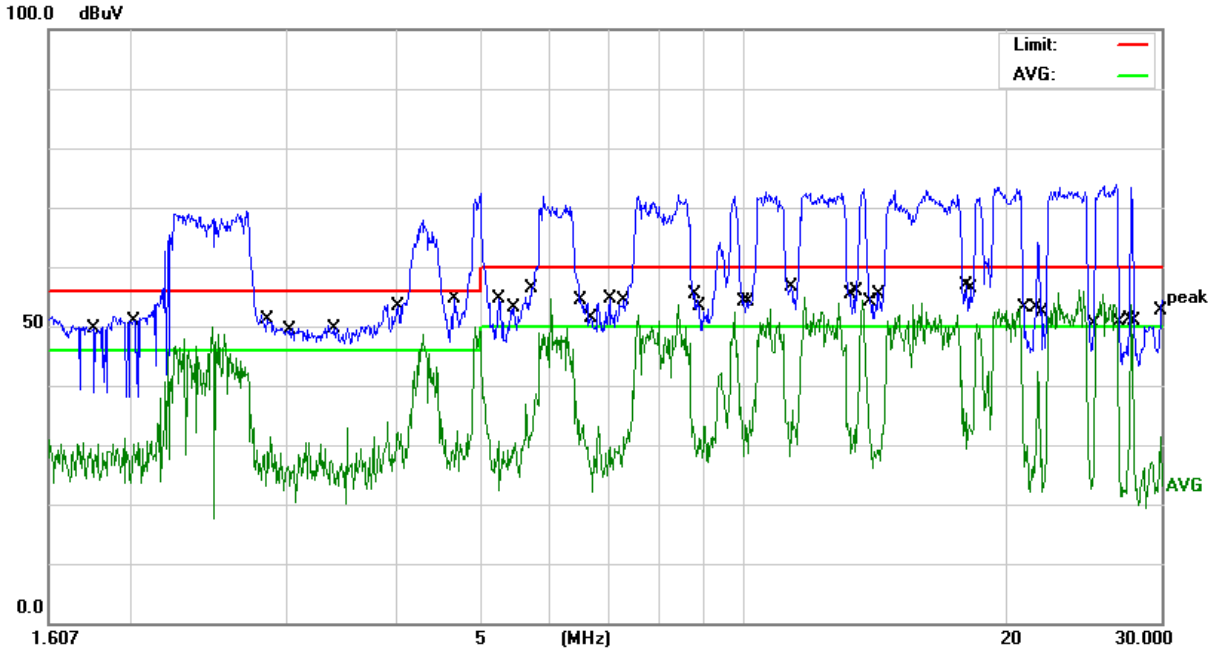
Conducted Emission Readings							
Frequency Range Investigated				1.6065MHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
1.8000	33.82	10.15	43.97	56.00	-12.03	Q	L1
1.8000	13.25	10.15	23.40	46.00	-22.60	A	L1
2.0000	37.07	10.17	47.24	56.00	-8.76	Q	L1
2.0000	16.40	10.17	26.57	46.00	-19.43	A	L1
2.8500	37.28	10.22	47.50	56.00	-8.50	Q	L1
2.8500	16.55	10.22	26.77	46.00	-19.23	A	L1
3.0250	34.80	10.22	45.02	56.00	-10.98	Q	L1
3.0250	14.05	10.22	24.27	46.00	-21.73	A	L1
3.4000	34.44	10.24	44.68	56.00	-11.32	Q	L1
3.4000	14.04	10.24	24.28	46.00	-21.72	A	L1
4.0000	35.68	10.25	45.93	56.00	-10.07	Q	L1
4.0000	15.82	10.25	26.07	46.00	-19.93	A	L1

4.6500	36.73	10.26	46.99	56.00	-9.01	Q	L1
4.6500	17.29	10.26	27.55	46.00	-18.45	A	L1
5.2500	38.39	10.28	48.67	60.00	-11.33	Q	L1
5.2500	17.75	10.28	28.03	50.00	-21.97	A	L1
5.4500	38.36	10.29	48.65	60.00	-11.35	Q	L1
5.4500	17.75	10.29	28.04	50.00	-21.96	A	L1
5.4800	38.47	10.29	48.76	60.00	-11.24	Q	L1
5.4800	17.49	10.29	27.78	50.00	-22.22	A	L1
5.6800	39.76	10.31	50.07	60.00	-9.93	Q	L1
5.6800	18.64	10.31	28.95	50.00	-21.05	A	L1
6.5250	41.12	10.33	51.45	60.00	-8.55	Q	L1
6.5250	19.54	10.33	29.87	50.00	-20.13	A	L1
6.6850	36.96	10.35	47.31	60.00	-12.69	Q	L1
6.6850	16.28	10.35	26.63	50.00	-23.37	A	L1
7.0000	35.52	10.36	45.88	60.00	-14.12	Q	L1
7.0000	14.65	10.36	25.01	50.00	-24.99	A	L1
7.3000	40.57	10.38	50.95	60.00	-9.05	Q	L1
7.3000	19.23	10.38	29.61	50.00	-20.39	A	L1
8.8149	42.24	10.44	52.68	60.00	-7.32	Q	L1
8.8149	20.90	10.44	31.34	50.00	-18.66	A	L1
8.9650	42.18	10.45	52.63	60.00	-7.37	Q	L1
8.9650	21.56	10.45	32.01	50.00	-17.99	A	L1
10.0050	41.33	10.50	51.83	60.00	-8.17	Q	L1
10.0050	19.33	10.50	29.83	50.00	-20.17	A	L1
10.1500	40.03	10.50	50.53	60.00	-9.47	Q	L1
10.1500	18.94	10.50	29.44	50.00	-20.56	A	L1
11.2750	40.52	10.54	51.06	60.00	-8.94	Q	L1
11.2750	18.37	10.54	28.91	50.00	-21.09	A	L1
11.4000	45.65	10.54	56.19	60.00	-3.81	Q	L1
11.4000	15.90	10.54	26.44	50.00	-23.56	A	L1
13.2600	47.07	10.61	57.68	60.00	-2.32	Q	L1
13.2600	16.70	10.61	27.31	50.00	-22.69	A	L1
13.3600	47.45	10.61	58.06	60.00	-1.94	Q	L1
13.3600	17.99	10.61	28.60	50.00	-21.40	A	L1
14.0000	43.73	10.62	54.35	60.00	-5.65	Q	L1
14.0000	16.39	10.62	27.01	50.00	-22.99	A	L1
14.3500	45.87	10.63	56.50	60.00	-3.50	Q	L1
14.3500	16.87	10.63	27.50	50.00	-22.50	A	L1
17.9000	43.07	10.74	53.81	60.00	-6.19	Q	L1
17.9000	18.39	10.74	29.13	50.00	-20.87	A	L1
17.9700	48.07	10.75	58.82	60.00	-1.18	Q	L1
17.9700	18.82	10.75	29.57	50.00	-20.43	A	L1
18.0680	45.21	10.75	55.96	60.00	-4.04	Q	L1
18.0680	16.49	10.75	27.24	50.00	-22.76	A	L1
18.1680	46.93	10.77	57.70	60.00	-2.30	Q	L1
18.1680	16.93	10.77	27.70	50.00	-22.30	A	L1

21.0000	46.77	10.85	57.62	60.00	-2.38	Q	L1
21.0000	16.37	10.85	27.22	50.00	-22.78	A	L1
21.4500	45.83	10.86	56.69	60.00	-3.31	Q	L1
21.4500	16.58	10.86	27.44	50.00	-22.56	A	L1
21.9240	46.86	10.88	57.74	60.00	-2.26	Q	L1
21.9240	15.36	10.88	26.24	50.00	-23.76	A	L1
22.0000	41.34	10.88	52.22	60.00	-7.78	Q	L1
22.0000	18.71	10.88	29.59	50.00	-20.41	A	L1
24.8900	45.91	10.97	56.88	60.00	-3.12	Q	L1
24.8900	19.52	10.97	30.49	50.00	-19.51	A	L1
24.9900	46.26	10.97	57.23	60.00	-2.77	Q	L1
24.9900	16.70	10.97	27.67	50.00	-22.33	A	L1
26.9600	43.77	11.04	54.81	60.00	-5.19	Q	L1
26.9600	19.40	11.04	30.44	50.00	-19.56	A	L1
27.4100	45.19	11.05	56.24	60.00	-3.76	Q	L1
27.4100	18.34	11.05	29.39	50.00	-20.61	A	L1
29.7000	33.57	11.15	44.72	60.00	-15.28	Q	L1
29.7000	18.02	11.15	29.17	50.00	-20.83	A	L1

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

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Phase	L2
Standard	EN 55022 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				1.6065MHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
1.8000	39.12	10.15	49.27	56.00	-6.73	Q	L2
1.8000	14.18	10.15	24.33	46.00	-21.67	A	L2
2.0000	40.70	10.17	50.87	56.00	-5.13	Q	L2
2.0000	14.60	10.17	24.77	46.00	-21.23	A	L2
2.8500	36.43	10.22	46.65	56.00	-9.35	Q	L2
2.8500	14.39	10.22	24.61	46.00	-21.39	A	L2
3.0250	39.05	10.22	49.27	56.00	-6.73	Q	L2
3.0250	14.25	10.22	24.47	46.00	-21.53	A	L2
3.4000	38.39	10.24	48.63	56.00	-7.37	Q	L2
3.4000	13.98	10.24	24.22	46.00	-21.78	A	L2
4.0000	39.50	10.25	49.75	56.00	-6.25	Q	L2
4.0000	14.22	10.25	24.47	46.00	-21.53	A	L2
4.6500	40.25	10.26	50.51	56.00	-5.49	Q	L2
4.6500	13.87	10.26	24.13	46.00	-21.87	A	L2

4.7000	43.60	10.27	53.87	56.00	-2.13	Q	L2
4.7000	14.11	10.27	24.38	46.00	-21.62	A	L2
5.2500	44.83	10.28	55.11	60.00	-4.89	Q	L2
5.2500	14.63	10.28	24.91	50.00	-25.09	A	L2
5.4500	43.63	10.29	53.92	60.00	-6.08	Q	L2
5.4500	14.36	10.29	24.65	50.00	-25.35	A	L2
5.4800	40.97	10.29	51.26	60.00	-8.74	Q	L2
5.4800	14.51	10.29	24.80	50.00	-25.20	A	L2
5.6800	46.43	10.31	56.74	60.00	-3.26	Q	L2
5.6800	15.10	10.31	25.41	50.00	-24.59	A	L2
6.5250	43.26	10.33	53.59	60.00	-6.41	Q	L2
6.5250	14.80	10.33	25.13	50.00	-24.87	A	L2
6.6850	41.51	10.35	51.86	60.00	-8.14	Q	L2
6.6850	13.89	10.35	24.24	50.00	-25.76	A	L2
7.0000	40.43	10.36	50.79	60.00	-9.21	Q	L2
7.0000	14.33	10.36	24.69	50.00	-25.31	A	L2
7.3000	46.00	10.38	56.38	60.00	-3.62	Q	L2
7.3000	12.99	10.38	23.37	50.00	-26.63	A	L2
8.8149	45.62	10.44	56.06	60.00	-3.94	Q	L2
8.8149	13.68	10.44	24.12	50.00	-25.88	A	L2
8.9650	39.93	10.45	50.38	60.00	-9.62	Q	L2
8.9650	13.87	10.45	24.32	50.00	-25.68	A	L2
10.0050	45.20	10.50	55.70	60.00	-4.30	Q	L2
10.0050	14.24	10.50	24.74	50.00	-25.26	A	L2
10.1500	44.25	10.50	54.75	60.00	-5.25	Q	L2
10.1500	14.41	10.50	24.91	50.00	-25.09	A	L2
11.2750	48.35	10.54	58.89	60.00	-1.11	Q	L2
11.2750	14.13	10.54	24.67	50.00	-25.33	A	L2
11.4000	44.65	10.54	55.19	60.00	-4.81	Q	L2
11.4000	14.74	10.54	25.28	50.00	-24.72	A	L2
13.2600	46.07	10.61	56.68	60.00	-3.32	Q	L2
13.2600	14.54	10.61	25.15	50.00	-24.85	A	L2
13.3600	46.45	10.61	57.06	60.00	-2.94	Q	L2
13.3600	14.58	10.61	25.19	50.00	-24.81	A	L2
14.0000	42.23	10.62	52.85	60.00	-7.15	Q	L2
14.0000	14.37	10.62	24.99	50.00	-25.01	A	L2
14.3500	44.37	10.63	55.00	60.00	-5.00	Q	L2
14.3500	14.55	10.63	25.18	50.00	-24.82	A	L2
17.9000	48.30	10.74	59.04	60.00	-0.96	Q	L2
17.9000	14.52	10.74	25.26	50.00	-24.74	A	L2
17.9700	48.68	10.75	59.43	60.00	-0.57	Q	L2
17.9700	14.62	10.75	25.37	50.00	-24.63	A	L2
18.0680	43.21	10.75	53.96	60.00	-6.04	Q	L2
18.0680	14.73	10.75	25.48	50.00	-24.52	A	L2
18.1680	43.93	10.77	54.70	60.00	-5.30	Q	L2
18.1680	14.28	10.77	25.05	50.00	-24.95	A	L2

21.0000	45.27	10.85	56.12	60.00	-3.88	Q	L2
21.0000	14.39	10.85	25.24	50.00	-24.76	A	L2
21.4500	44.33	10.86	55.19	60.00	-4.81	Q	L2
21.4500	14.87	10.86	25.73	50.00	-24.27	A	L2
21.9240	44.36	10.88	55.24	60.00	-4.76	Q	L2
21.9240	14.34	10.88	25.22	50.00	-24.78	A	L2
22.0000	47.02	10.88	57.90	60.00	-2.10	Q	L2
22.0000	14.62	10.88	25.50	50.00	-24.50	A	L2
24.9900	43.76	10.97	54.73	60.00	-5.27	Q	L2
24.9900	14.23	10.97	25.20	50.00	-24.80	A	L2
26.9600	42.77	11.04	53.81	60.00	-6.19	Q	L2
26.9600	14.31	11.04	25.35	50.00	-24.65	A	L2
27.4100	43.69	11.05	54.74	60.00	-5.26	Q	L2
27.4100	14.84	11.05	25.89	50.00	-24.11	A	L2
28.0000	41.52	11.08	52.60	60.00	-7.40	Q	L2
28.0000	14.60	11.08	25.68	50.00	-24.32	A	L2
29.7000	40.00	11.15	51.15	60.00	-8.85	Q	L2
29.7000	13.00	11.15	24.15	50.00	-25.85	A	L2

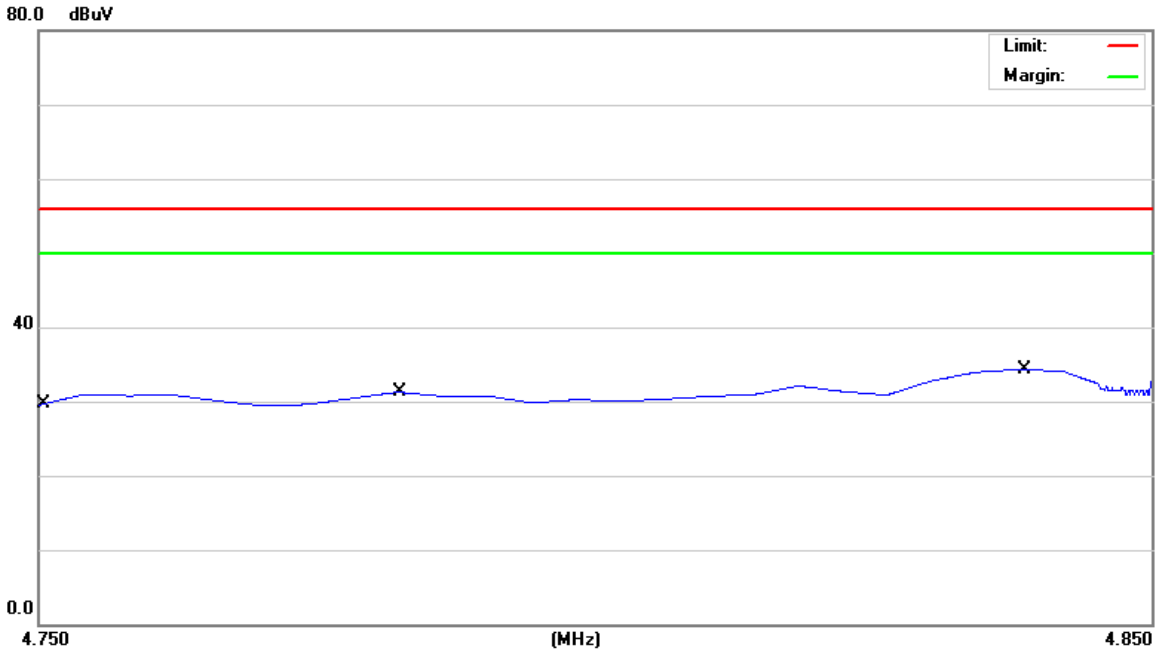
Note: L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

7.2.8. TEST RESULTS

(Cognitive frequency exclusion)

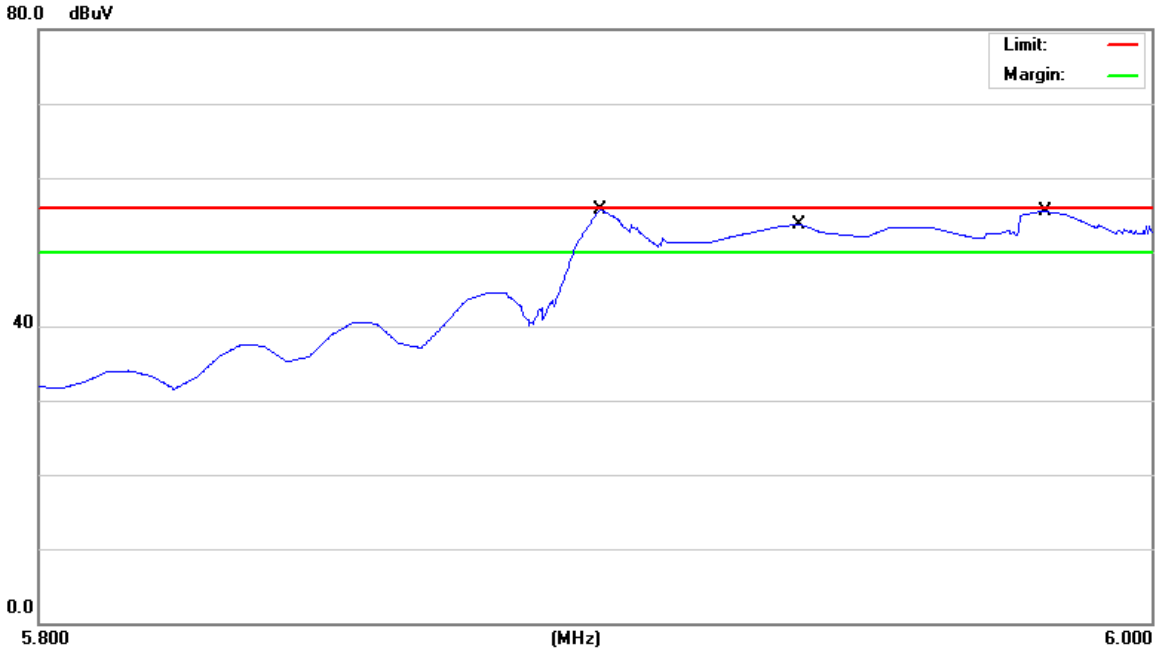
Between 4.75 MHz ~ 4.85 MHz

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng		
Standard	EN 55022 CLASS B		



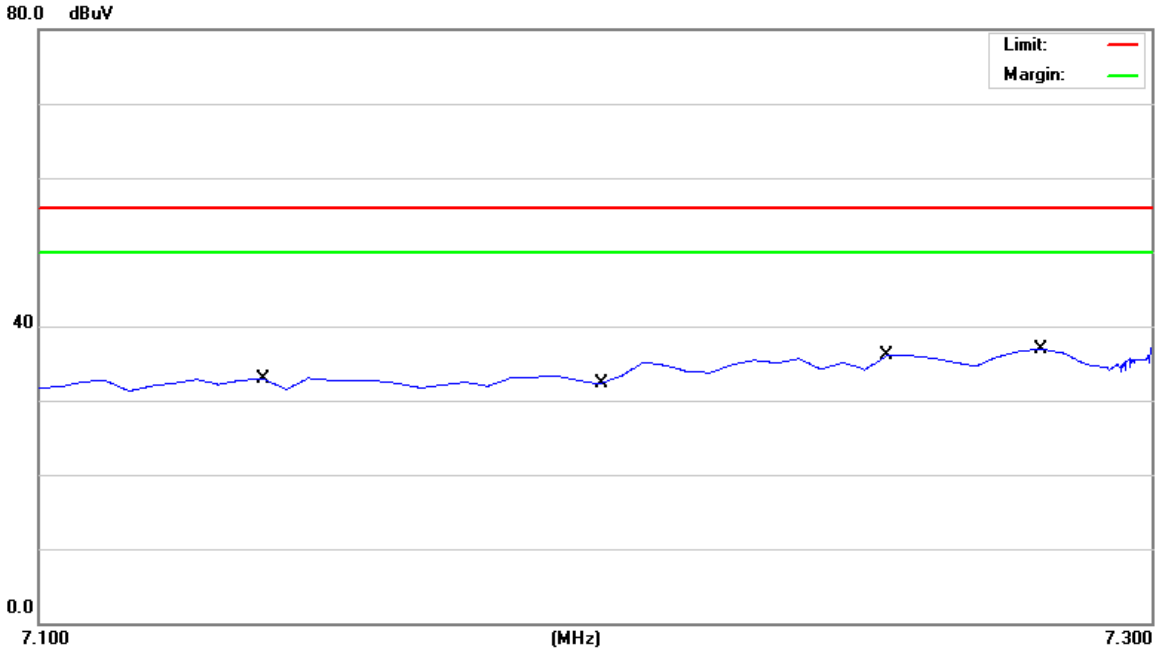
Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
4.7500	**-0.39**	**29.92**	**29.53**	**56.00**	**-26.47**	**A**
4.7823	**1.33**	**29.92**	**31.25**	**56.00**	**-24.75**	**A**
4.8386	**4.39**	**29.92**	**34.31**	**56.00**	**-21.69**	**A**

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Level	-60dB
Standard	EN 55022 CLASS B		



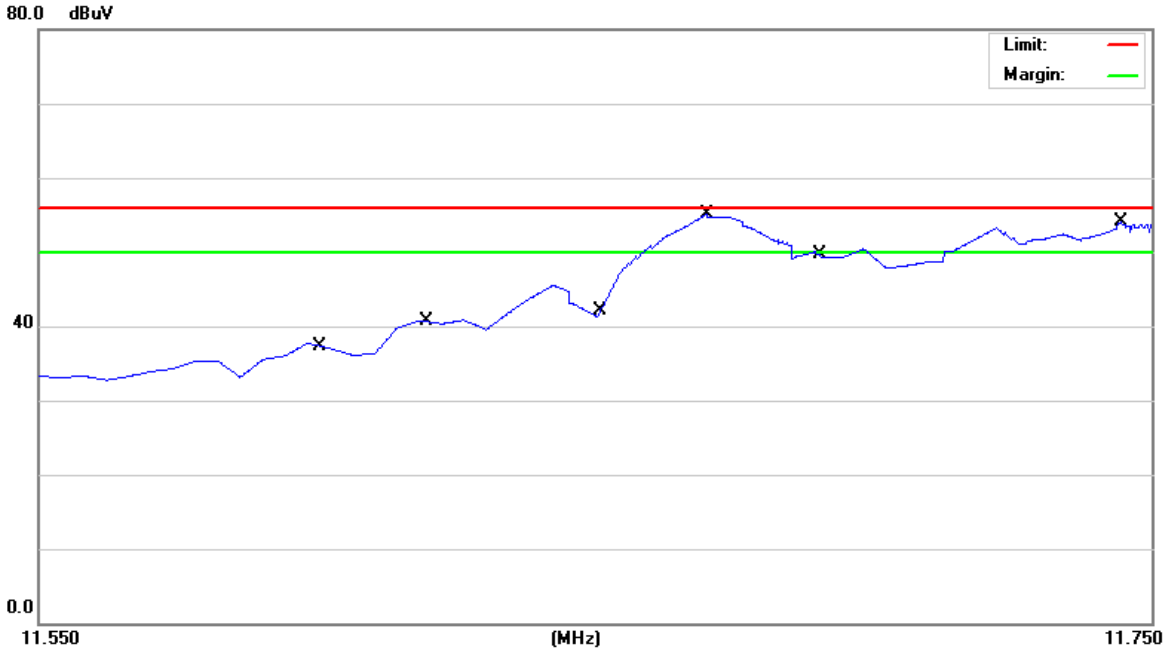
Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
5.9001	**25.76**	**29.97**	**55.73**	**56.00**	**-0.27**	**A**
5.9359	**23.82**	**29.97**	**53.79**	**56.00**	**-2.21**	**A**
5.9807	**25.47**	**29.98**	**55.45**	**56.00**	**-0.55**	**A**

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng		
Standard	EN 55022 CLASS B		



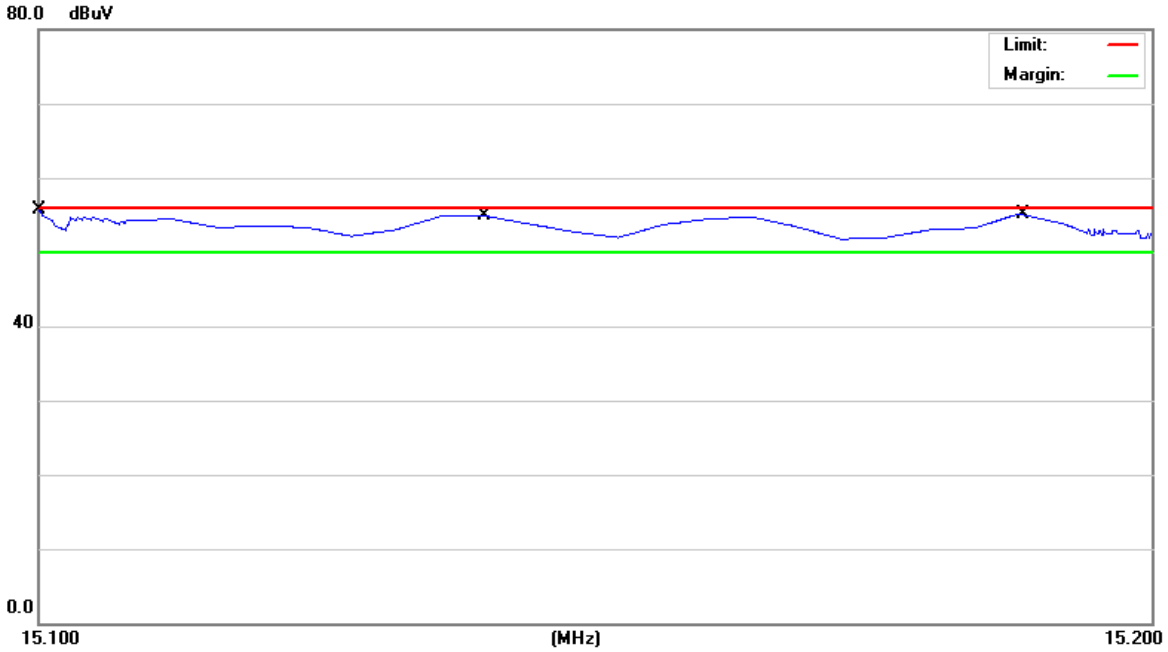
Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
7.1400	**2.83**	**30.04**	**32.87**	**56.00**	**-23.13**	**A**
7.2000	**2.18**	**30.05**	**32.23**	**56.00**	**-23.77**	**A**
7.2520	**6.03**	**30.06**	**36.09**	**56.00**	**-19.91**	**A**
7.2800	**6.90**	**30.06**	**36.96**	**56.00**	**-19.04**	**A**

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Level	-57dB
Standard	EN 55022 CLASS B		



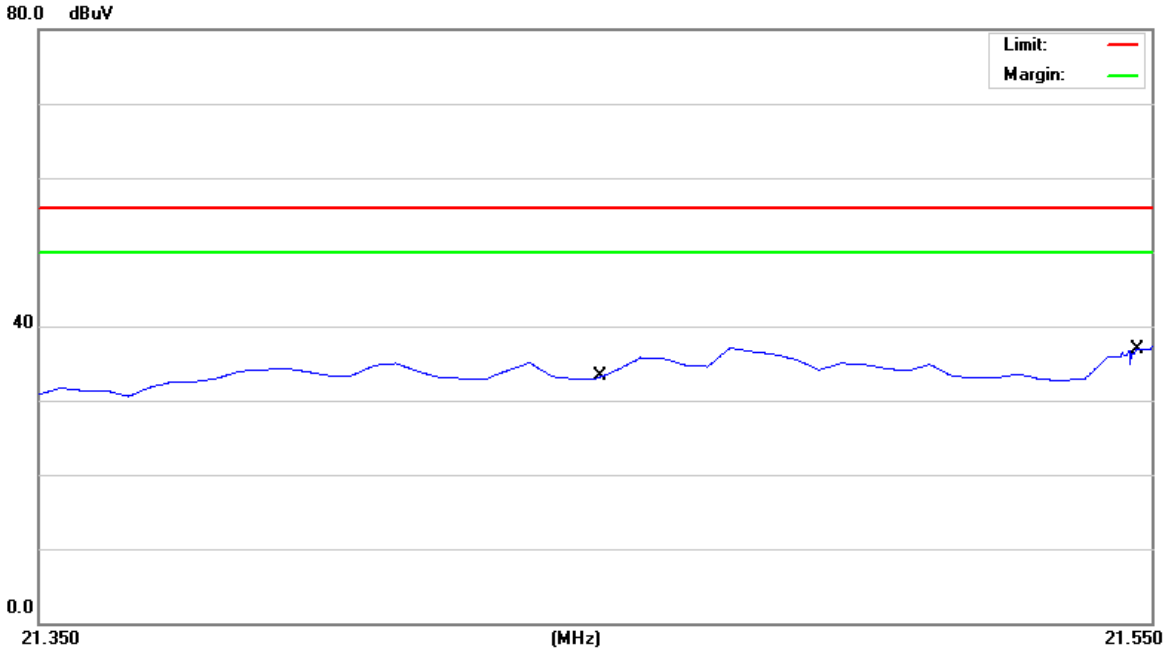
Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
11.6003	**7.06**	**30.29**	**37.35**	**56.00**	**-18.65**	**A**
11.6198	**10.29**	**30.29**	**40.58**	**56.00**	**-15.42**	**A**
11.6500	**11.01**	**30.29**	**41.30**	**56.00**	**-14.70**	**A**
11.6696	**24.81**	**30.29**	**55.10**	**56.00**	**-0.90**	**A**
11.6899	**19.44**	**30.29**	**49.73**	**56.00**	**-6.27**	**A**
11.7446	**23.76**	**30.29**	**54.05**	**56.00**	**-1.95**	**A**

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Level	-59dB
Standard	EN 55022 CLASS B		



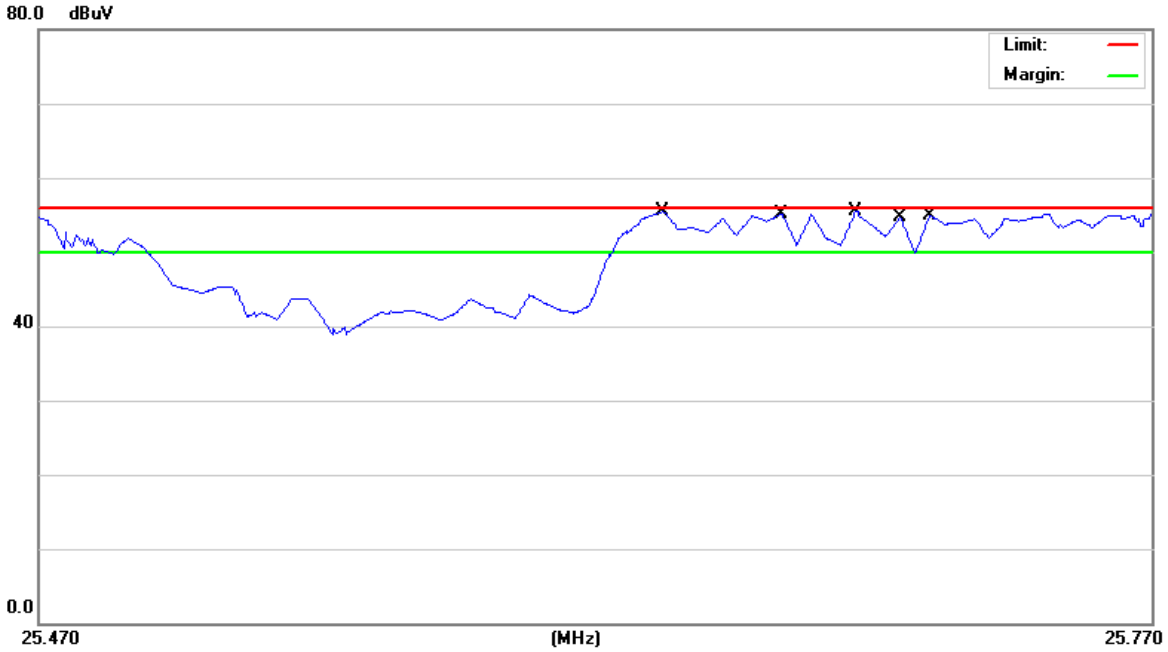
Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
15.0999	**25.19**	**30.47**	**55.66**	**56.00**	**-0.34**	**A**
15.1399	**24.42**	**30.47**	**54.89**	**56.00**	**-1.11**	**A**
15.1884	**24.54**	**30.47**	**55.01**	**56.00**	**-0.99**	**A**

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng		
Standard	EN 55022 CLASS B		



Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
21.4502	**2.23**	**30.79**	**33.02**	**56.00**	**-22.98**	**A**
21.5472	**6.00**	**30.81**	**36.81**	**56.00**	**-19.19**	**A**

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Level	-59dB
Standard	EN 55022 CLASS B		



Conducted Emission Readings						
Frequency Range Investigated				4.75 MHz to 4.85 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
25.6380	**24.49**	**31.00**	**55.49**	**56.00**	**-0.51**	**A**
25.6700	**24.17**	**31.01**	**55.18**	**56.00**	**-0.82**	**A**
25.6900	**24.59**	**31.01**	**55.60**	**56.00**	**-0.40**	**A**
25.7020	**23.67**	**31.01**	**54.68**	**56.00**	**-1.32**	**A**
25.7099	**23.94**	**31.01**	**54.95**	**56.00**	**-1.05**	**A**

7.3. CONDUCTED ASYMMETRIC DISTURBANCES AT THE PLC PORT

7.3.1. LIMIT OF CONDUCTED ASYMMETRIC DISTURBANCES AT THE PLC PORT

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
1.6065 - 5.0	56	46
5.0 - 30.0	60	50

(1) The lower limit shall apply at the transition frequencies.

7.3.2 TEST INSTRUMENTS

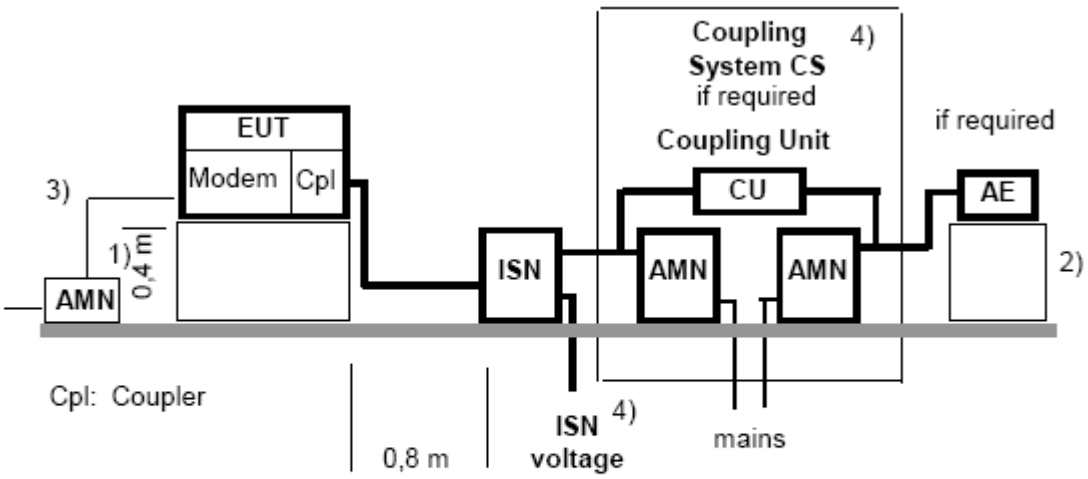
Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
Test S/W	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.

7.3.2. TEST PROCEDURE

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT and AE(as same PLC) being connected to power mains through the ISN and a coupling system (CS) if required, which is made with two LISNs. Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 1.6065 MHz to 30 MHz was searched. Emission levels under (Limit - 20dB) were not recorded
d. Conducted emission test with user data transmission from the PLC port.
e. Turn on the power of all equipment.
f. Prepare other computer systems (support units B~C) to act as communication partners and placed them outside of testing area.
g. The communication partners run test program “Tgen.exe” to enable EUT under transmission/receiving condition continuously via UTP cables another EUT.
h. Repeat steps f-g.

7.3.3. TEST SETUP



NOTE 1 Distance from EUT to the reference ground plane (vertical or horizontal).

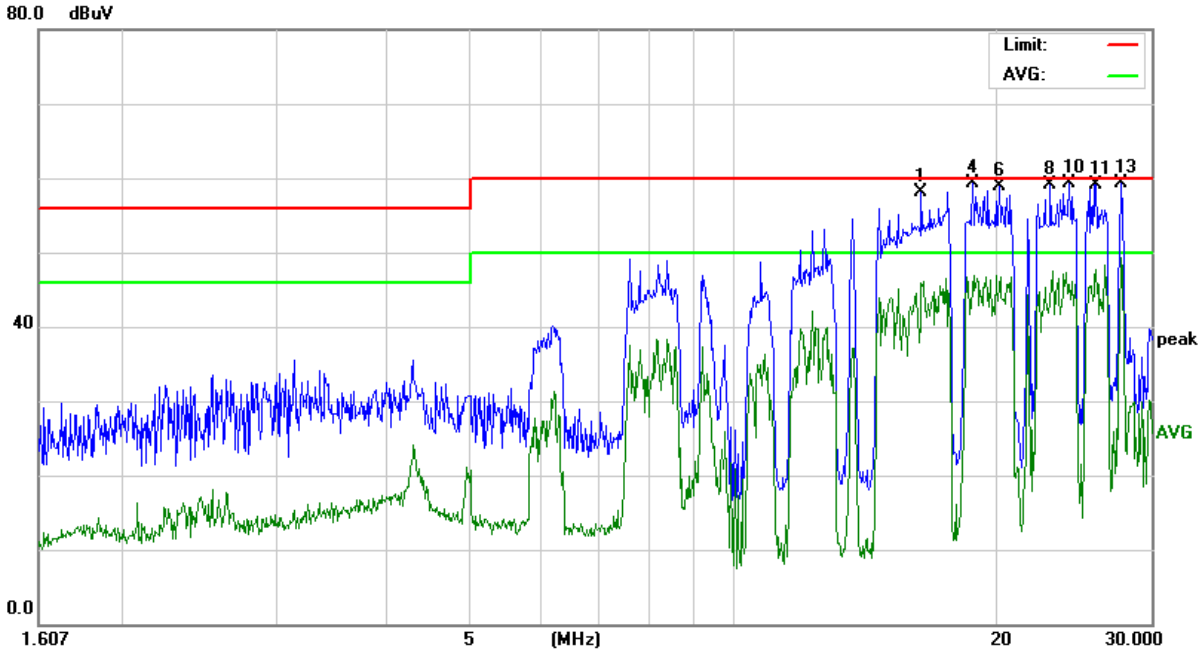
NOTE 2 Distance from AE to the reference ground plane is not critical.

NOTE 3 In case, the EUT has separate power connection to the mains.

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

7.3.4. TEST RESULTS

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	Howard Peng	Standard	EN 55022 CLASS B



Conducted Emission Readings						
Frequency Range Investigated				1.6065 MHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
16.3683	47.50	10.70	58.20	60.00	-1.80	P
16.3683	35.11	10.70	45.81	50.00	-4.19	A
18.6179	33.00	10.78	43.78	50.00	-6.22	A
18.7271	48.55	10.78	59.33	60.00	-0.67	P
20.0313	32.63	10.82	43.45	50.00	-6.55	A
20.0900	48.02	10.82	58.84	60.00	-1.16	P
22.8512	30.89	10.91	41.80	50.00	-8.20	A
22.9853	48.23	10.91	59.14	60.00	-0.86	P
24.0873	33.58	10.94	44.52	50.00	-5.48	A
24.1579	48.27	10.94	59.21	60.00	-0.79	P
25.9159	48.07	11.01	59.08	60.00	-0.92	P
25.9159	36.74	11.01	47.75	50.00	-2.25	A
27.7205	48.17	11.08	59.25	60.00	-0.75	P
27.7205	38.26	11.08	49.34	50.00	-0.66	A

7.4. CONDUCTED EMISSION MEASUREMENT

7.4.1. LIMITS

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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.

7.4.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
Test S/W	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.

7.4.3. TEST PROCEDURES (please refer to measurement standard or CCS SOP PA-031)

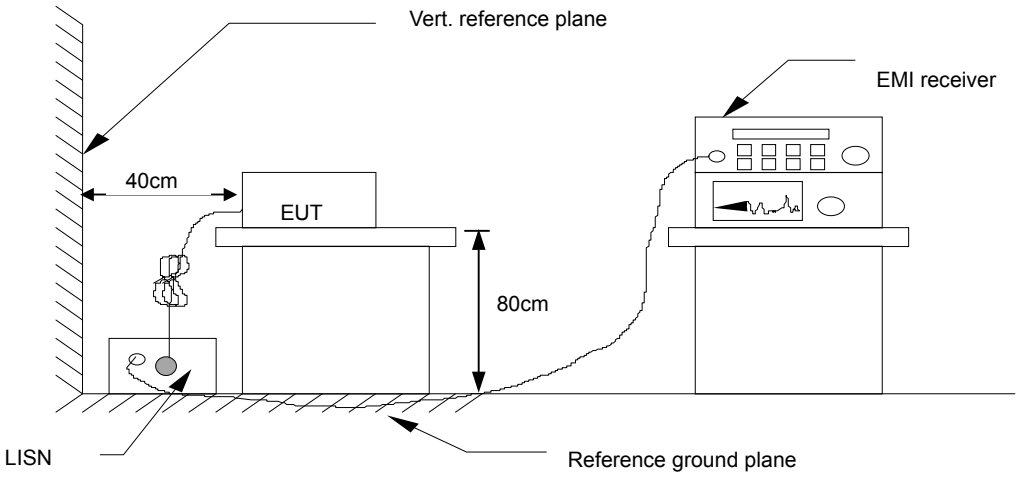
Procedure of Preliminary Test

- 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.

7.4.4. TEST SETUP



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

7.4.5. DATA SAMPLE

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
x.xx	42.95	0.55	43.50	56	-12.50	Q	L1

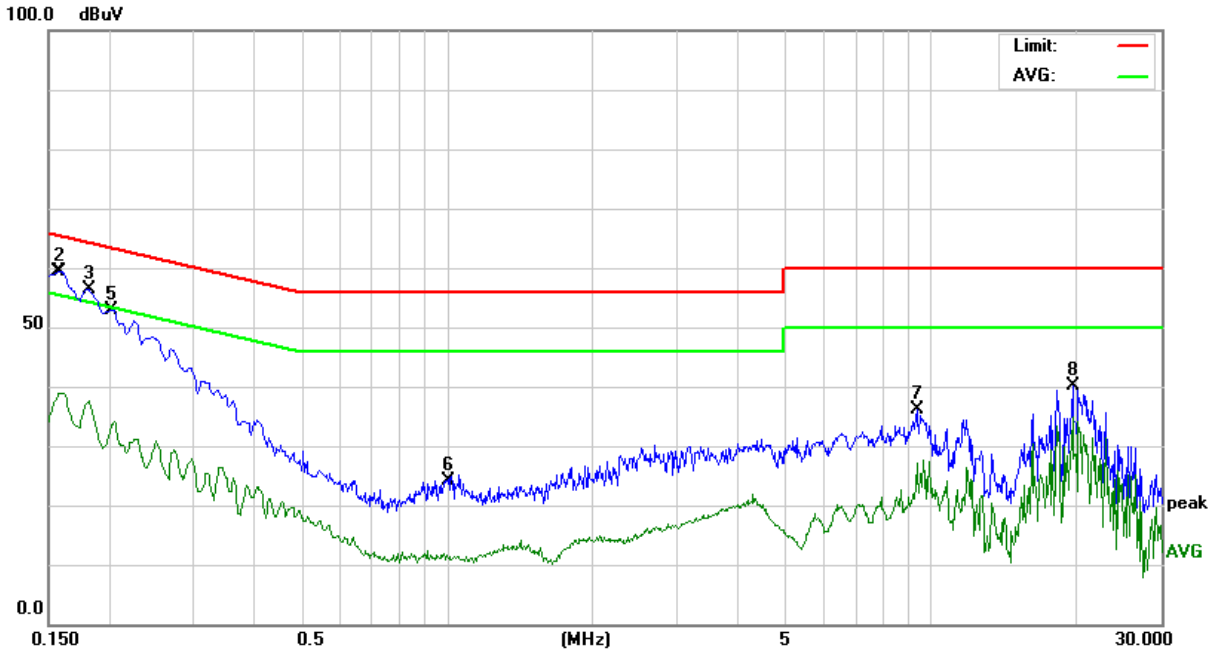
Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss + Pulse Limit
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
L1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

Calculation Formula

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

7.4.6. TEST RESULTS

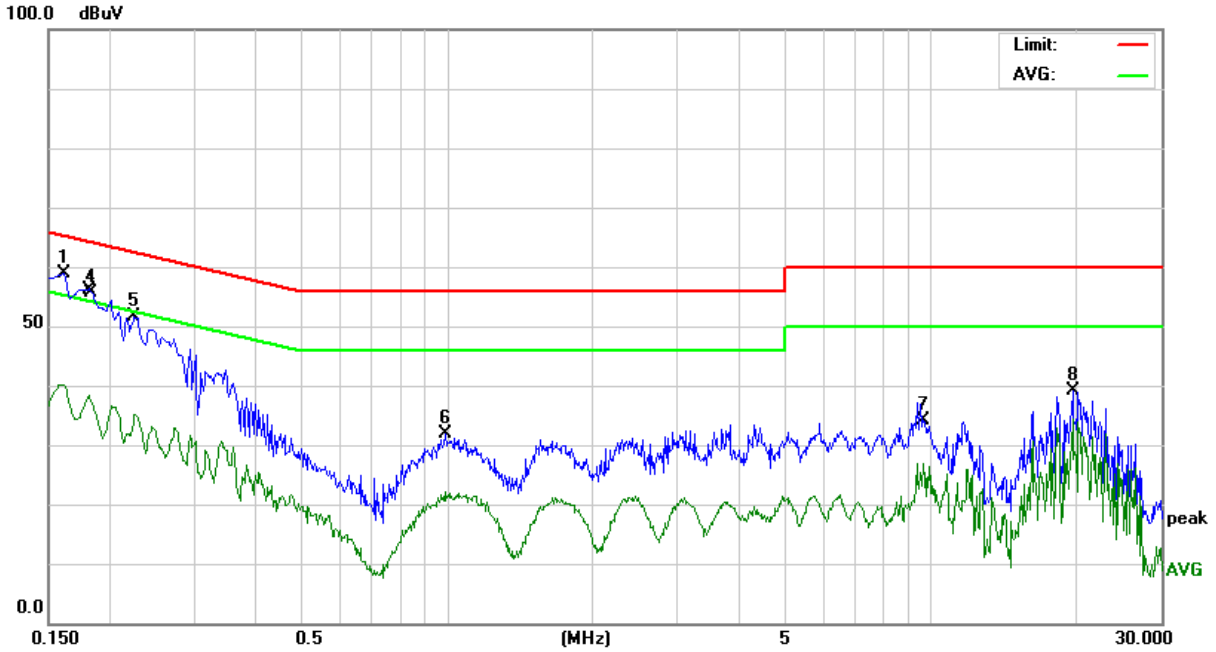
Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	26°C, 59% RH	Test Mode	Mode 1
Tested by	Howard Peng	Phase	L1
Standard	EN 55022 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1580	28.89	10.00	38.89	55.56	-16.67	A	L1
0.1590	49.29	10.00	59.29	65.51	-6.22	P	L1
0.1819	46.47	10.02	56.49	64.39	-7.90	P	L1
0.1825	27.25	10.02	37.27	54.37	-17.10	A	L1
0.2020	42.89	10.02	52.91	63.52	-10.61	P	L1
1.0020	14.15	10.10	24.25	56.00	-31.75	P	L1
9.3900	25.55	10.48	36.03	60.00	-23.97	P	L1
19.7099	29.22	10.81	40.03	60.00	-19.97	P	L1

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

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	26°C, 59% RH	Test Mode	Mode 1
Tested by	Howard Peng	Phase	L2
Standard	EN 55022 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1620	48.87	10.00	58.87	65.36	-6.49	P	L2
0.1620	30.21	10.00	40.21	55.36	-15.15	A	L2
0.1835	27.60	10.02	37.62	54.32	-16.70	A	L2
0.1844	45.60	10.02	55.62	64.28	-8.66	P	L2
0.2260	41.52	10.01	51.53	62.59	-11.06	P	L2
0.9980	21.69	10.10	31.79	56.00	-24.21	P	L2
9.6940	23.70	10.49	34.19	60.00	-25.81	P	L2
19.7099	28.42	10.81	39.23	60.00	-20.77	P	L2

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

7.5. CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

7.5.1. LIMITS

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.

7.5.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESCI	101201	08/31/2015
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127527	08/28/2015
LISN	SCHWARZBECK	NSLK 8127	8127526	08/28/2015
BNC CABLE	EMCI	CFD300-NL	BNC#A8	05/19/2016
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/26/2015
THERMO-HYGRO METER	WISEWIND	201A	No. 02	05/10/2016
Test S/W	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.

7.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-031)

- 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:

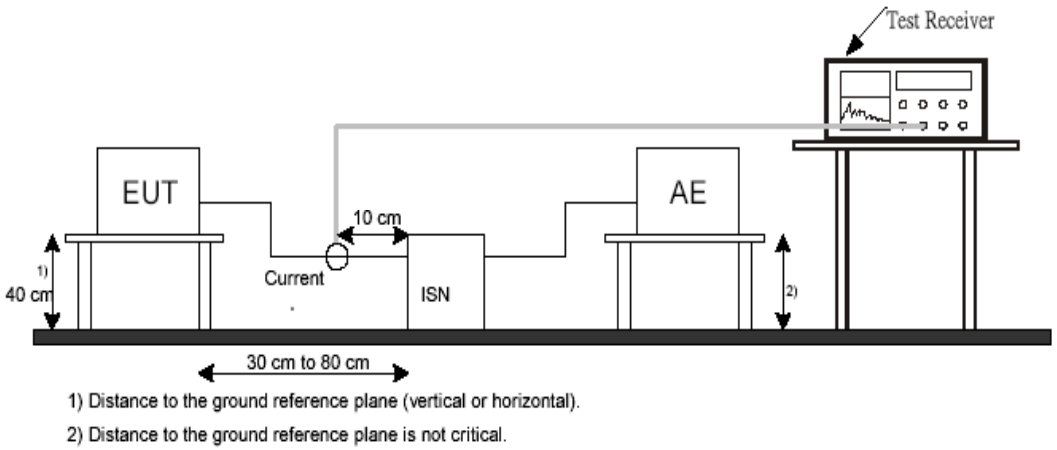
Modes:

1	**10Mbps**
2	**100Mbps**

- 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.

Mode: 2

7.5.4. TEST SETUP



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

7.5.5. DATA SAMPLE

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
x.xx	62.95	0.55	63.50	84	-20.50	Q

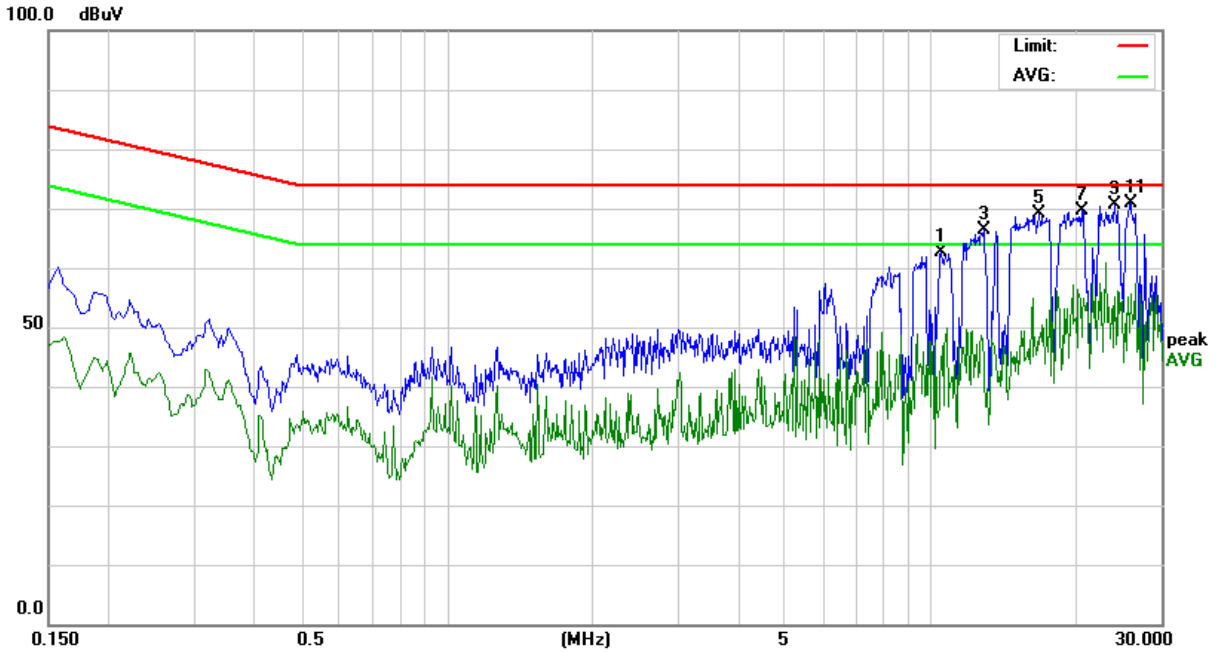
Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss + Pulse Limit
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading

Calculation Formula

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

7.5.6. TEST RESULTS

Model No.	PL7500	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 2
Tested by	Howard Peng	Standard	EN 55022 CLASS B



Conducted Emission Readings						
Frequency Range Investigated				150 kHz to 30 MHz		
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
10.5499	42.88	19.86	62.74	74.00	-11.26	P
10.5499	19.18	19.86	39.04	64.00	-24.96	A
12.8698	46.37	19.89	66.26	74.00	-7.74	P
12.8698	24.07	19.89	43.96	64.00	-20.04	A
16.8379	49.24	19.94	69.18	74.00	-4.82	P
16.8379	29.33	19.94	49.27	64.00	-14.73	A
20.5620	49.58	20.05	69.63	74.00	-4.37	P
20.5620	27.20	20.05	47.25	64.00	-16.75	A
24.0459	50.51	20.15	70.66	74.00	-3.34	P
24.0459	35.38	20.15	55.53	64.00	-8.47	A
25.8779	50.62	20.23	70.85	74.00	-3.15	P
25.8779	35.89	20.23	56.12	64.00	-7.88	A

7.6. RADIATED EMISSION MEASUREMENT

7.6.1. LIMITS

Below 1GHz

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

Above 1GHz

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

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

According to EN55022: 2010 / AC: 2011 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

7.6.2. TEST INSTRUMENTS

Open Area Test Site # H				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCI	101340	04/07/2016
Bilog Antenna	Sunol	JB1	A061711	08/17/2015
Pre-Amplifier	HP	8447D	1937A01554	10/02/2015
CABLE	EMCI	CFD400-E	N-Type#H10	04/08/2016
Thermo-Hygro Meter	Wisewind	201A	No. 03	06/02/2016
Test S/W	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.

7.6.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-031)

Procedure of Preliminary Test

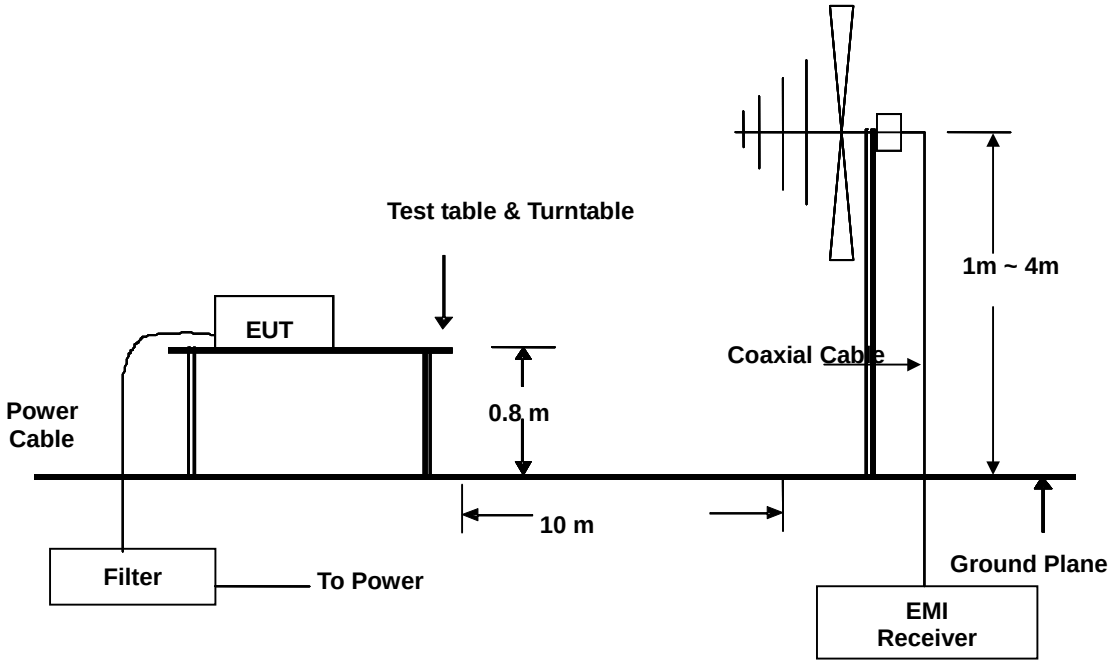
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground 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.
- 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

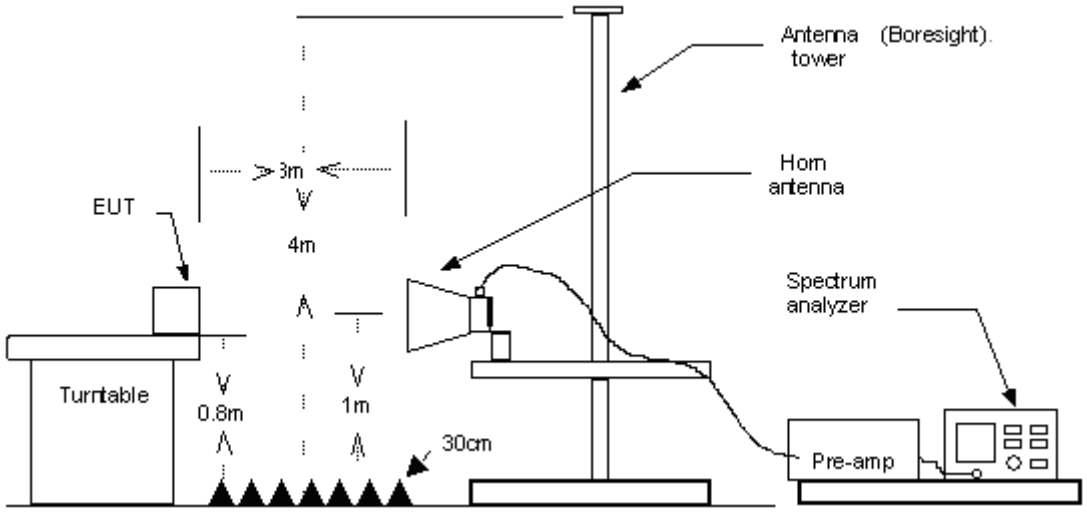
- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning 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.

7.6.4. TEST SETUP

Below 1GHz



Above 1GHz



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

7.6.5. 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)
x.xx	14.0	12.2	26.2	30	-3.8	Q	H

Above 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
x.xx	42.95	0.55	43.50	54	-10.50	A	H

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

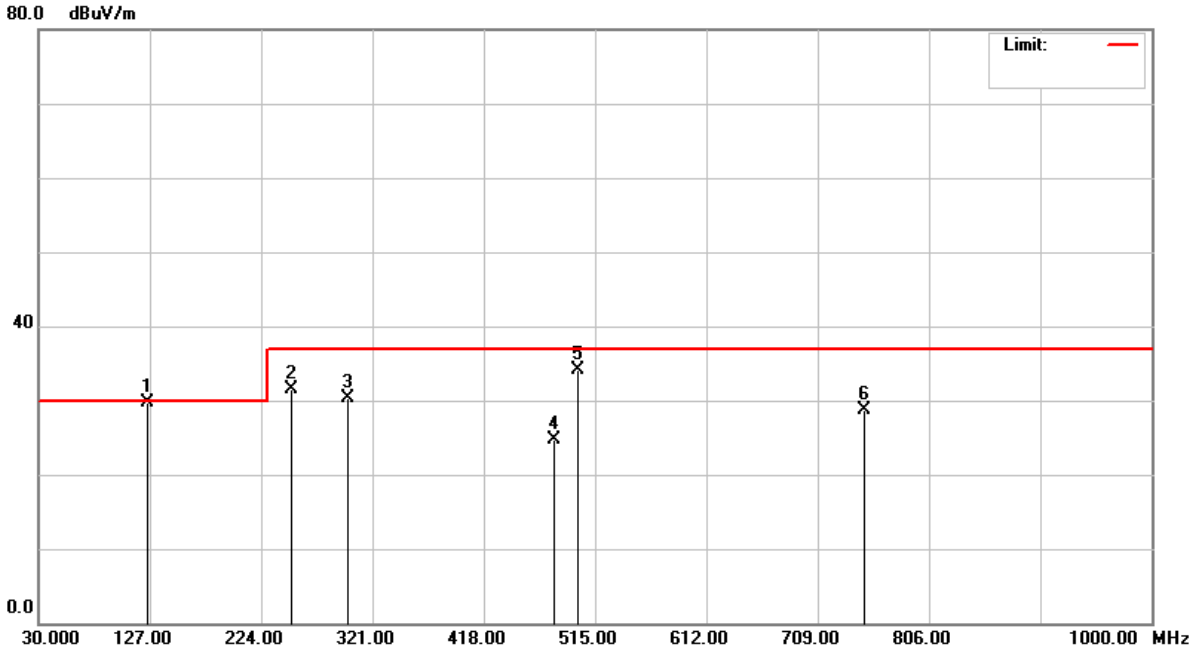
Calculation Formula

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

7.6.6. TEST RESULTS

Below 1GHz

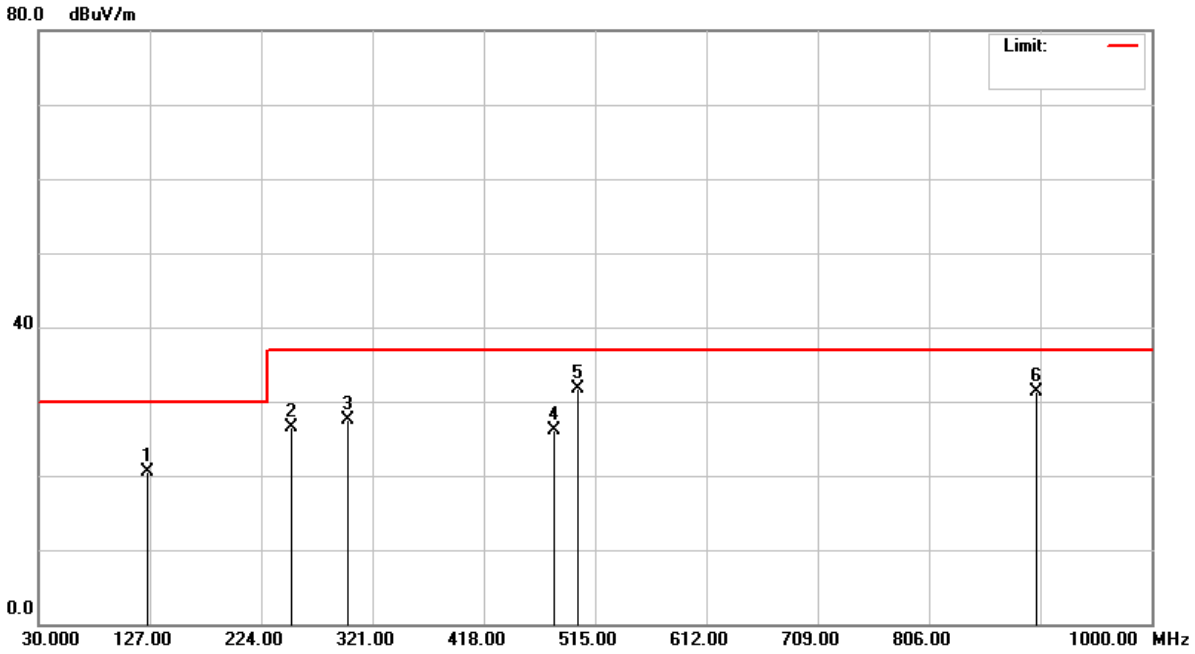
Model No.	PL7500	Test Mode	Mode 1
Environmental Conditions	31°C, 58% RH	6dB Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Howard Peng
Standard	EN 55022 CLASS B		



Radiated Emission Readings									
Frequency Range Investigated				30 MHz to 1000 MHz at 10m					
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
124.9980	42.10	-12.46	29.64	30.00	-0.36	100	222	Q	V
250.3300	44.70	-13.19	31.51	37.00	-5.49	100	56	Q	V
300.0250	41.90	-11.52	30.38	37.00	-6.62	100	96	Q	V
480.0040	31.70	-7.04	24.66	37.00	-12.34	400	147	Q	V
500.0040	40.80	-6.72	34.08	37.00	-2.92	400	205	Q	V
750.0110	31.10	-2.42	28.68	37.00	-8.32	400	205	Q	V

Note: P= Peak Reading; Q= Quasi-peak Reading.

Model No.	PL7500	Test Mode	Mode 1
Environmental Conditions	31°C, 58% RH	6dB Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Howard Peng
Standard	EN 55022 CLASS B		



Radiated Emission Readings									
Frequency Range Investigated				30 MHz to 1000 MHz at 10m					
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
124.9980	32.90	-12.46	20.44	30.00	-9.56	400	250	Q	H
250.0040	39.70	-13.20	26.50	37.00	-10.50	400	159	Q	H
300.0080	39.10	-11.52	27.58	37.00	-9.42	400	63	Q	H
479.9950	33.10	-7.04	26.06	37.00	-10.94	100	277	Q	H
500.0140	38.50	-6.72	31.78	37.00	-5.22	100	286	Q	H
900.0570	32.10	-0.85	31.25	37.00	-5.75	100	302	Q	H

Note: P= Peak Reading; Q= Quasi-peak Reading.

Above 1GHz

Model No.	PL7500	Test Mode	N/A
Environmental Conditions	N/A	6dB Bandwidth	N/A
Antenna Pole	N/A	Antenna Distance	N/A
Highest frequency generated or used	68MHz	Upper frequency	See note
Detector Function	N/A	Tested by	N/A

Note: No applicable, when the highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1 GHz.

7.7. HARMONICS CURRENT MEASUREMENT

7.7.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

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

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
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
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

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.

7.7.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
H/F Measurement System	EMC Partner	HAR1000-1P	189	08/11/2015
Digital Power Meter	Protronix	1201	201091	No Calibration Required
Software	HARCS V4.19			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

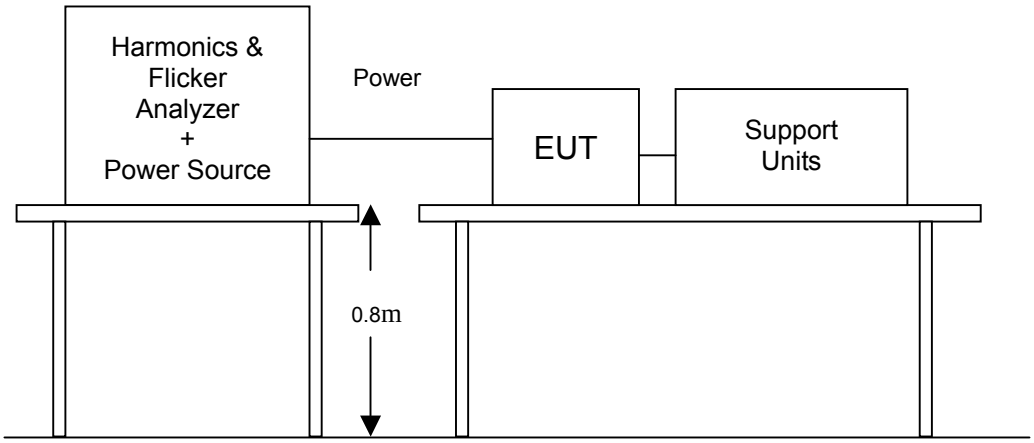
7.7.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-029)

- 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.

7.7.4. TEST SETUP



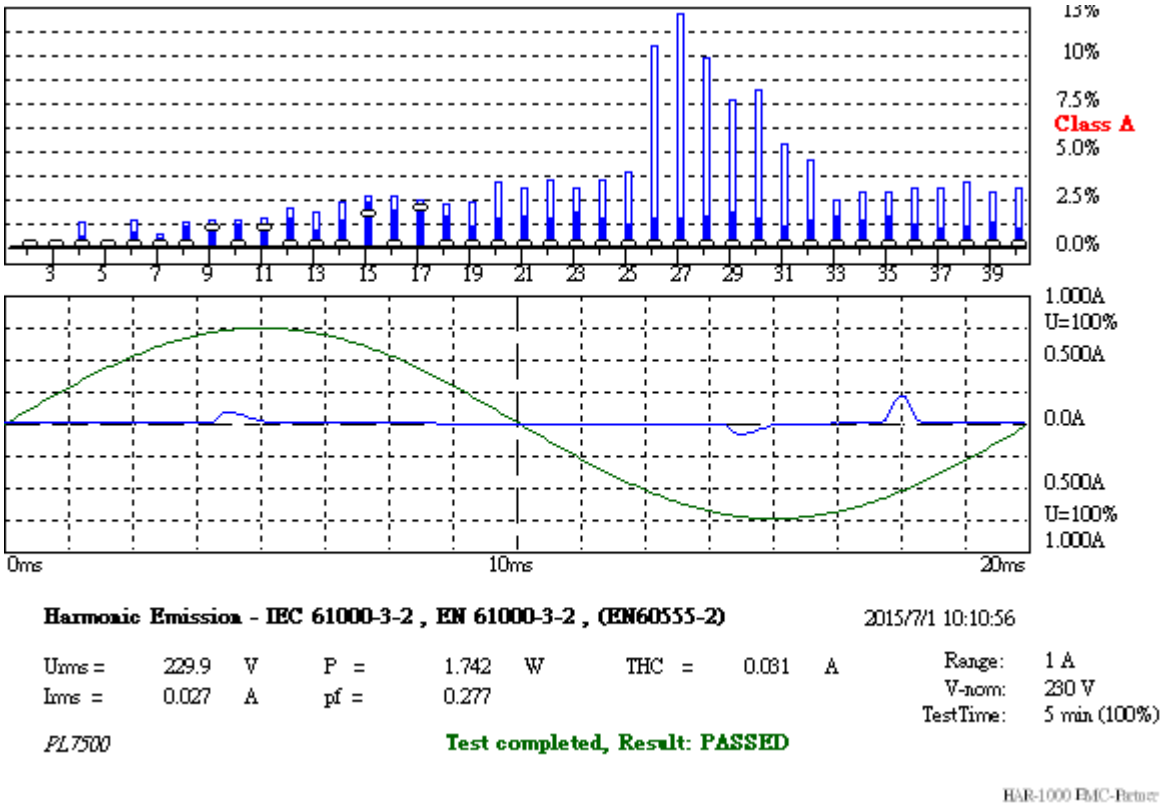
- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.7.5. TEST RESULTS

Power Consumption	1.742W	Test Results	PASS
Environmental Conditions	27°C, 58% RH, 968mbar	Limits	Class ☒ A ☐ B ☐ C ☐ D
Test Mode	Operating	Tested by	Howard Peng

NOTE: Limits classified according to item 7.4.1.

Test result of EN 61000-3-2



Urms =	229.9V	Freq =	50.013	Range:	1 A
Irms =	0.027A	Ipk =	0.212A	cf =	7.768
P =	1.742W	S =	6.287VA	pf =	0.277
THDi =	264 %	THDu =	0.10 %	Class A	

Test - Time : 5min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax% [%]	Imax%L [%]	Limit [A]	Status
1	50	0.0108	0.0113	41.295		0.0179	65.625			
2	100	0.0003	0.0049	18.080	0.4578	0.0132	48.214	1.2207	1.0800	
3	150	0.0103	0.0107	39.063	0.4644	0.0148	54.018	0.6422	2.3000	
4	200	0.0001	0.0049	17.857	1.1355	0.0126	46.205	2.9382	0.4300	
5	250	0.0079	0.0087	31.696	0.7603	0.0151	55.134	1.3224	1.1400	
6	300	0.0003	0.0050	18.304	1.6683	0.0096	35.268	3.2145	0.3000	
7	350	0.0014	0.0056	20.536	0.7293	0.0120	43.750	1.5536	0.7700	
8	400	0.0001	0.0060	21.875	2.6006	0.0066	24.107	2.8660	0.2300	
9	450	0.0086	0.0094	34.375	2.3499	0.0125	45.759	3.1281	0.4000	
10	500	0.0001	0.0050	18.304	2.7200	0.0059	21.429	3.1844	0.1840	
11	550	0.0079	0.0082	30.134	2.4969	0.0117	42.634	3.5326	0.3300	
12	600	0.0003	0.0054	19.643	3.5029	0.0073	26.786	4.7767	0.1533	
13	650	0.0001	0.0041	14.955	1.9473	0.0090	32.813	4.2725	0.2100	
14	700	0.0004	0.0042	15.402	3.2043	0.0074	27.232	5.6657	0.1314	
15	750	0.0059	0.0086	31.473	5.7373	0.0096	35.045	6.3883	0.1500	
16	800	0.0001	0.0054	19.643	4.6705	0.0072	26.339	6.2627	0.1150	
17	850	0.0063	0.0067	24.330	5.0266	0.0078	28.348	5.8567	0.1324	
18	900	0.0000	0.0038	13.839	3.7019	0.0056	20.313	5.4335	0.1022	
19	950	0.0000	0.0029	10.491	2.4224	0.0067	24.330	5.6179	0.1184	
20	1000	0.0000	0.0033	12.054	3.5825	0.0074	27.232	8.0938	0.0920	
21	1050	0.0001	0.0040	14.509	3.7028	0.0081	29.464	7.5195	0.1071	
22	1100	0.0000	0.0031	11.161	3.6488	0.0072	26.339	8.6113	0.0836	
23	1150	0.0001	0.0044	16.071	4.4922	0.0071	25.893	7.2374	0.0978	
24	1200	0.0000	0.0027	10.045	3.5825	0.0065	23.661	8.4388	0.0767	
25	1250	0.0001	0.0024	8.7054	2.6449	0.0084	30.804	9.3587	0.0900	
26	1300	0.0002	0.0026	9.3750	3.6223	0.0183	66.964	25.874	0.0708	
27	1350	0.0002	0.0029	10.714	3.5156	0.0250	91.518	30.029	0.0833	
28	1400	0.0001	0.0024	8.9286	3.7152	0.0161	58.705	24.427	0.0657	
29	1450	0.0001	0.0032	11.607	4.0907	0.0148	54.241	19.116	0.0776	
30	1500	0.0001	0.0021	7.8125	3.4830	0.0125	45.536	20.301	0.0613	
31	1550	0.0001	0.0018	6.4732	2.4387	0.0095	34.821	13.118	0.0726	
32	1600	0.0000	0.0019	6.9196	3.2906	0.0064	23.438	11.146	0.0575	
33	1650	0.0000	0.0025	9.1518	3.6702	0.0040	14.509	5.8187	0.0682	
34	1700	0.0000	0.0018	6.4732	3.2707	0.0038	13.839	6.9925	0.0541	
35	1750	0.0000	0.0024	8.7054	3.7028	0.0045	16.295	6.9309	0.0643	
36	1800	0.0000	0.0013	4.9107	2.6272	0.0038	14.063	7.5232	0.0511	
37	1850	0.0000	0.0012	4.4643	2.0074	0.0044	16.071	7.2266	0.0608	
38	1900	0.0000	0.0012	4.4643	2.5210	0.0039	14.286	8.0673	0.0484	
39	1950	0.0000	0.0016	6.0268	2.8564	0.0040	14.509	6.8766	0.0577	
40	2000	0.0000	0.0010	3.5714	2.1230	0.0034	12.277	7.2977	0.0460	

Definitions of Abbreviations

Urms	***	Actual total Voltage in Volt RMS
Irms	***	Actual total Current in Ampere RMS
Ipk	***	Actual Peak value of the Current in Ampere
cf	***	Actual Crest Factor (Ipk/Irms)
P	***	Actual Active Power in Watt
S	***	Actual Apparent Power in VA (Urms*Irms)
pf	***	Actual Power Factor (P/S)
THDi	***	Actual Total Harmonic Current Distortion in %
THDu	***	Actual Total Harmonic Voltage Distortion in %
THC	***	Actual Total Harmonic Current in Ampere
PHC	***	Actual Partial Harmonic Current in Ampere

Individual measurements for 2nd to 40th order:

Iavg		Average value of the Individual Harmonic Current in Ampere RMS
Irms	***	Actual Individual Harmonic Current in Ampere RMS
Irms%	***	Actual Individual Harmonic Current in percentage of the actual total RMS Current
Irms%L	***	Actual Individual Harmonic Current in percentage of the applicable Limit
Imax		Maximum Individual Harmonic Current in Ampere RMS
Imax%		Maximum Individual Harmonic Current in percentage of the actual total RMS Current
Imax%lim		Maximum Individual Harmonic Current in percentage of the applicable Limit
Limit Irms		Individual Limit (100%) for the selected Class in Ampere RMS

7.8. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.8.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.8.2. TEST INSTRUMENTS

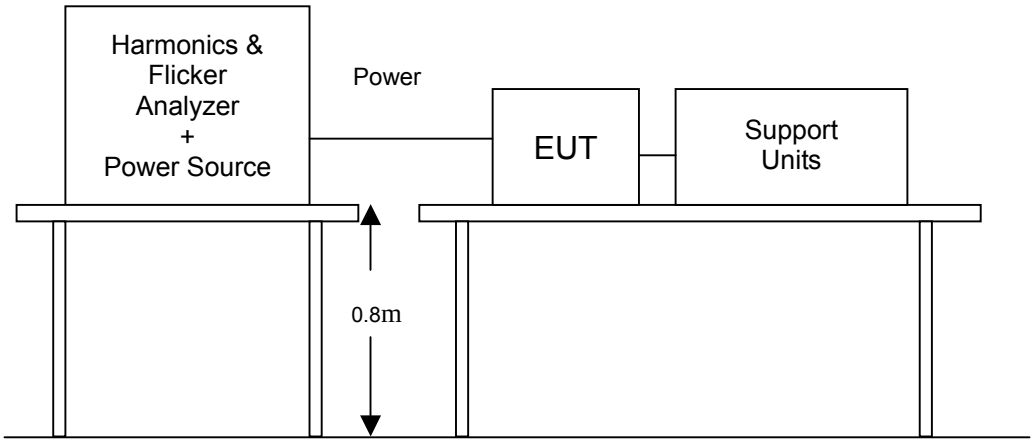
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
H/F Measurement System	EMC Partner	HAR1000-1P	189	08/11/2015
Digital Power Meter	Protronix	1201	201091	No Calibration Required
Software	HARCS V4.19			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.8.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-030)

- 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.

7.8.4. TEST SETUP



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

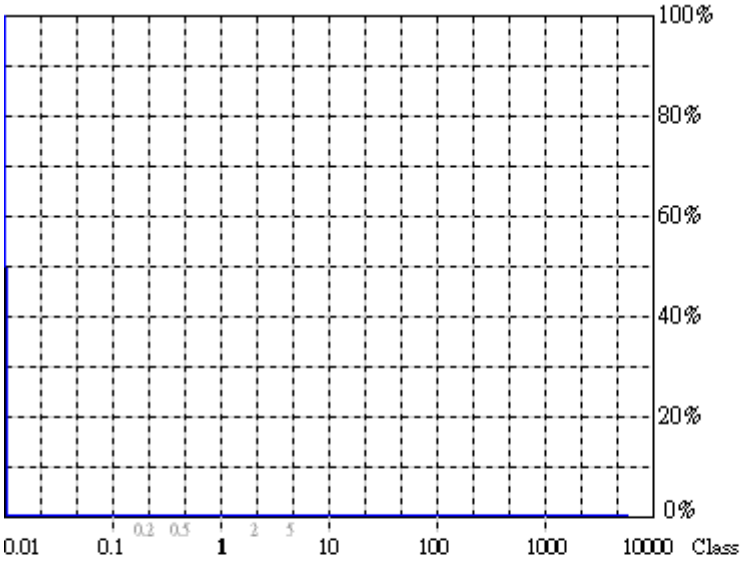
7.8.5. TEST RESULTS

Observation Period (Tp)	30mins	**Test Mode**	Operating
Environmental Conditions	27°C, 58% RH, 968mbar	**Tested by**	Howard Peng

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
P_{st}	0.07	1.0	PASS
P_{lt}	0.07	0.65	PASS
T_{dt} (ms)	0	500	PASS
d_{max} (%)	0	4%	PASS
dc (%)	0.06	3.3%	PASS

Note: None.

Test result of EN 61000-3-3



Actual Flicker (Fli):	**0.00**
Short-term Flicker (Pst):	**0.07**
Limit (Pst):	1.00
Long-term Flicker (Plt):	**0.07**
Limit (Plt):	0.65
Maximum Relative Volt. Change (dmax):	**0.00%**
Limit (dmax):	4.00%
Relative Steady-state Voltage Change (dc):	**0.06%**
Limit (dc):	3.30%
Maximum Interval exceeding 3.30% (dt):	**0.00ms**
Limit (dt>Lim):	500ms

Flicker Emission - IEC 61000-3-3 , EN 61000-3-3

2015/7/1 10:43:12

Urms =	229.9	V	P =	1.927	W
Irms =	0.024	A	pf =	0.350	

Range:	0.5 A
V-nom:	230 V
TestTime:	30 min (100%)

PL7500

Test completed, Result: PASSED

HAR-1000 EMC-Retest

8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 50421-2-1: 2005 / AC: 2009, CLASS 1, TYPE 2	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, AC / Power Line Port: 1kV, Signal and Control Line: 0.5kV DC I/O Power Port: 0.5kV, Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 μs Open Circuit Voltage, 8/20 μs Short Circuit Current, AC / Power Line Port ~ Line to line: 1 kV, Line to Earth: 2kV DC I/O power Port: Line to Line: 0.5 kV, Line to Earth: 0.5kV Signal Port ~ Lines to ground: 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: AC / Power Line Port: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz DC I/O Power Port: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz Signal and Control Line: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz Performance Criterion A
	IEC 61000-4-8	Power frequency magnetic field immunity test 50 Hz, 3A/m Performance Criterion A
	IEC 61000-4-11	Voltage Dips: i) 30% reduction for 0.5 period, Type1: Performance Criterion B; Type2: Criterion B ii) 60% reduction for 5 period, Type1: Performance Criterion B; Type2: Criterion C Voltage Interruptions: >95% reduction for 250 period Type1: Performance Criterion B; Type2: Criterion C

8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Criteria A:	During and after the test, the EUT shall operate without . protocol failure, . loss of link, . any other loss of functions relevant to the user, . reduction in performance below that declared by the manufacturer. The manufacturer shall choose the most appropriate performance measurement criteria for their apparatus or system e.g. bit error rate, block error rate, throughput, re-transmissions etc.
Criteria B:	Degradation of the performance beyond that as described in criterion A is permitted during the application of the test provided that the normal operation of the EUT is self-recoverable to the condition immediately before the application of the test.
Criteria C:	Degradation of the performance beyond that as described in criterion A is permitted during the application of the test provided that the normal operation of the EUT is self recoverable to the condition immediately before the application of the test or can be restored after the test by the operator.

8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	IEC 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. 20 times in total
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
ESD Generator	Teseq	NSG 437	249	12/15/2015
Aneroid Barometer	Sato	7610-20	89090	10/12/2015
Thermo-Hygro meter	TECPEL	DTM-303	080269	04/19/2016

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

8.3.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-022)

The discharges shall be applied in two ways:

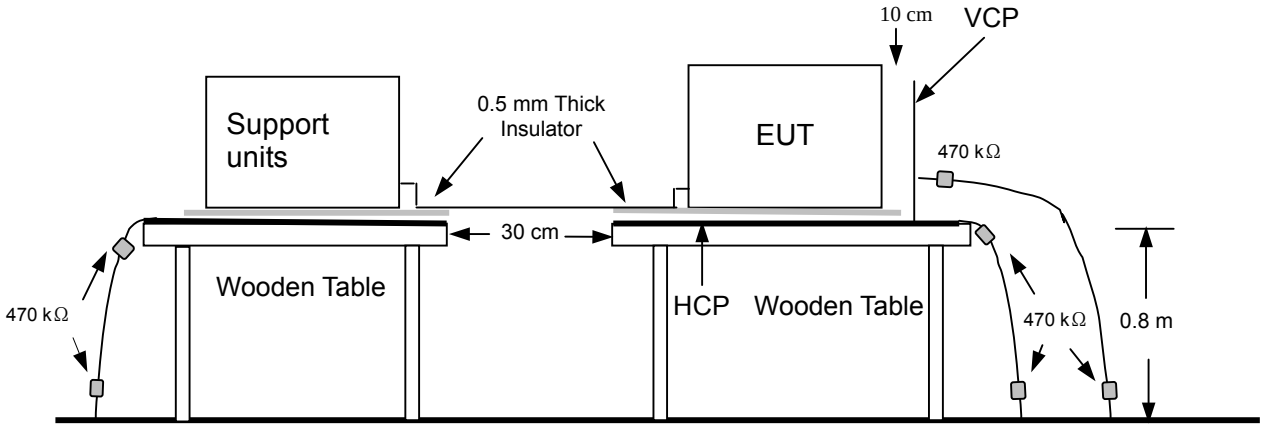
a) Contact discharges to the conductive surfaces and coupling planes:
   The EUT shall be exposed to at least 20 discharges, 10 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 10 indirect discharges to the center of the front edge of the **H**orizontal **C**oupling **P**lane (**HCP**). The remaining three test points shall each receive at least 10 direct contact discharges. If no direct contact test points are available, then at least 20 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 IEC 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 **V**ertical **C**oupling **P**lane (**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



Ground Reference Plane

- 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 **G**round **R**eference **P**lane. 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 **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k ˙ 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	27°C	Humidity	58% RH
Pressure	968mbar	Tested By	Howard Peng
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 ☐1 ☒2
Back	☒	☒	☒	☒	☐	☒A ☐B	Note ☐1 ☒2
Left	☒	☒	☒	☒	☐	☒A ☐B	Note ☐1 ☒2
Right	☒	☒	☒	☒	☐	☒A ☐B	Note ☐1 ☒2
Top	☒	☒	☒	☒	☐	☒A ☐B	Note ☐1 ☒2
Bottom	☒	☒	☒	☒	☐	☒A ☐B	Note ☐1 ☒2

Discharge To Horizontal Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2
Back	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2
Left	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2
Right	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2

Discharge To Vertical Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2
Back	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2
Left	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2
Right	☒	☒	☐	☒	☐	☒A ☐B	Note ☒1 ☐2

NOTE: 1. There was no change compared with initial operation during the test.
2. No discharge point.

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

8.4.1. TEST SPECIFICATION

Basic Standard:	IEC 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

844 RS Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Calibration of Field	N/A	Chamber#RS	80-1000MHz	04/01/2016
Signal Generator	Agilent	N5181A	MY47421336	12/16/2015
Electric Field Probe	AR	FL7006	0338955	06/07/2016
RF Power Meter	Boonton	4242-01-02	14357	03/15/2016
Amplifier	AR	500W1000A	320994	No Calibration Required
Direction Coupler	AR	DC6180A	312189	No Calibration Required
Broadband Antenna	AR	AT1080	311819	No Calibration Required
Thermo-Hygro meter	TFA	N/A	NO.6	11/02/2015
Software	Emcware Ver. 2.6.0.16			

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 required

8.4.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-023)

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

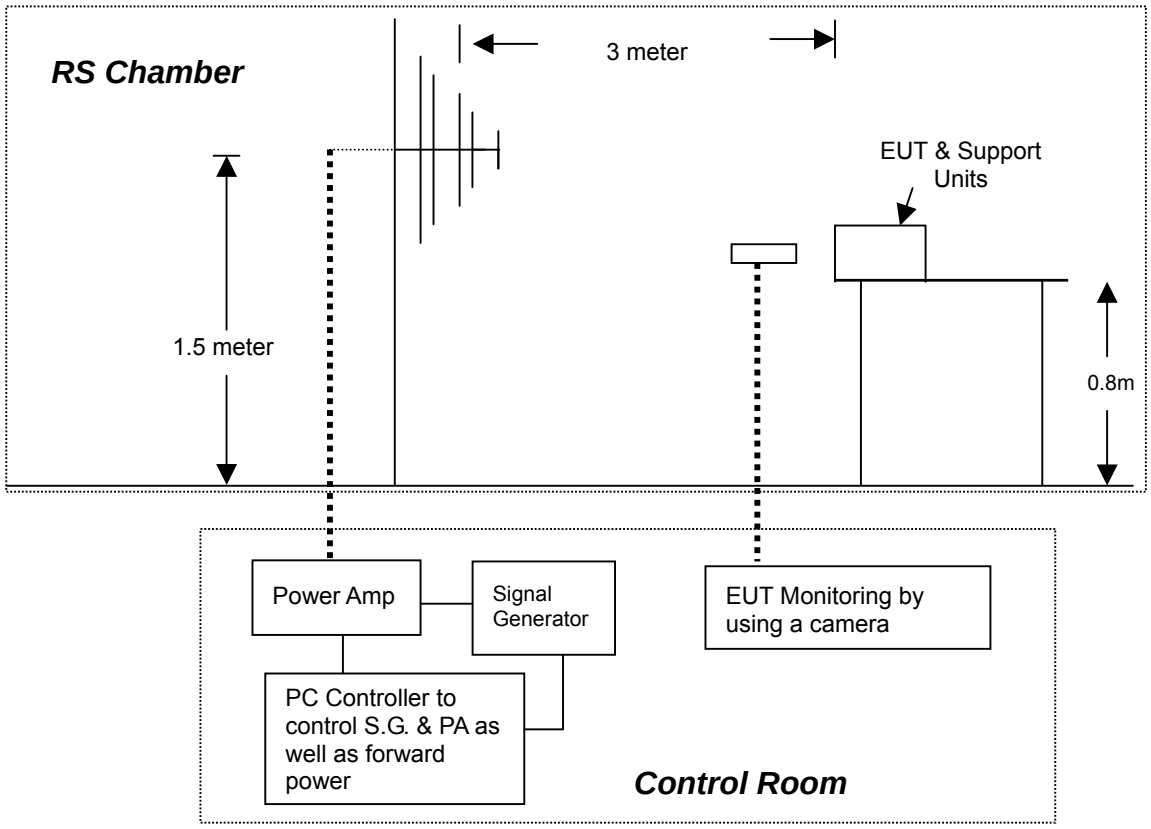
a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

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.

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 IEC 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 IEC 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	27°C	Humidity	58% RH
Pressure	968mbar	Dwell Time	3 sec.
Tested By	Howard Peng	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 ☒1 ☐2	PASS
80 ~ 1000	V&H	90	3	☒A ☐B	Note ☒1 ☐2	PASS
80 ~ 1000	V&H	180	3	☒A ☐B	Note ☒1 ☐2	PASS
80 ~ 1000	V&H	270	3	☒A ☐B	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with the initial operation during the test.

8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	AC Power Port: 1kV 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

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/03/2016
Capacitive Clamp	EMC-Partner	CN-EFT1000	589	07/23/2015
Software	Genecs Ver. 3.27			

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 required

8.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-024)

a) All types of cables, including their length, and the interface port of the EUT to which they were connected.

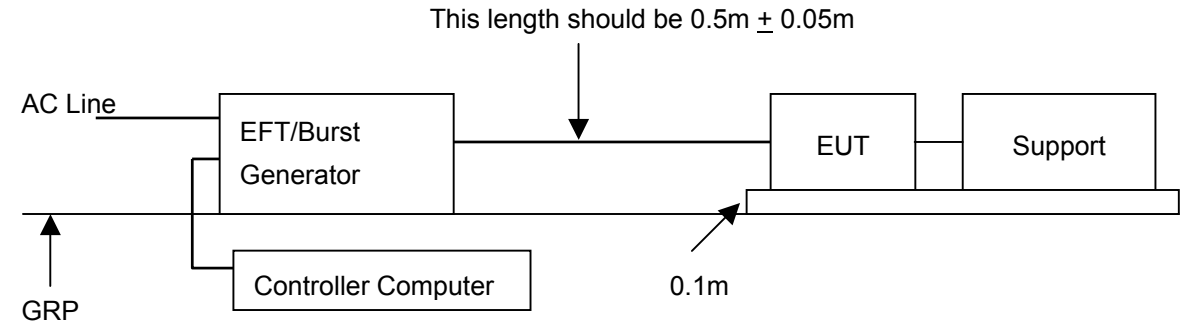
b) Both positive and negative polarity discharges were applied.

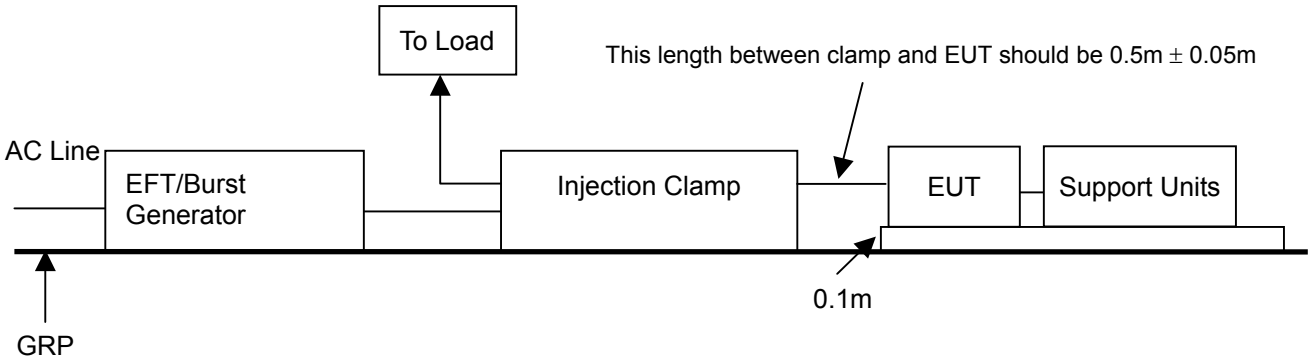
c) The length of the " hot wire " from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter.

d) The duration time of each test sequential was 1 minute.

e) The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

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 IEC 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	27°C	Humidity	58% RH
Pressure	968mbar	Tested By	Howard Peng
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	1	☒A ☐B	Note ☒1 ☐2	PASS
N	+/-	1	☒A ☐B	Note ☒1 ☐2	PASS
L – N	+/-	1	☒A ☐B	Note ☒1 ☐2	PASS
RJ45	+/-	0.5	☒A ☐B	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with initial operation during the test.

8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	AC Power Port~ line to line: 1kV Signal Ports and Telecommunication Ports: 1kV
Surge Input/Output:	AC Power Line: L-N Signal Line: L-G
Generator Source Impedance:	2 ohm between networks 42 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

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/03/2016
CDN	EMC Partner	CDN-UTP8	CDN-UTP8-1505	03/03/2016
Software	Genecs Ver. 3.27			

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 required

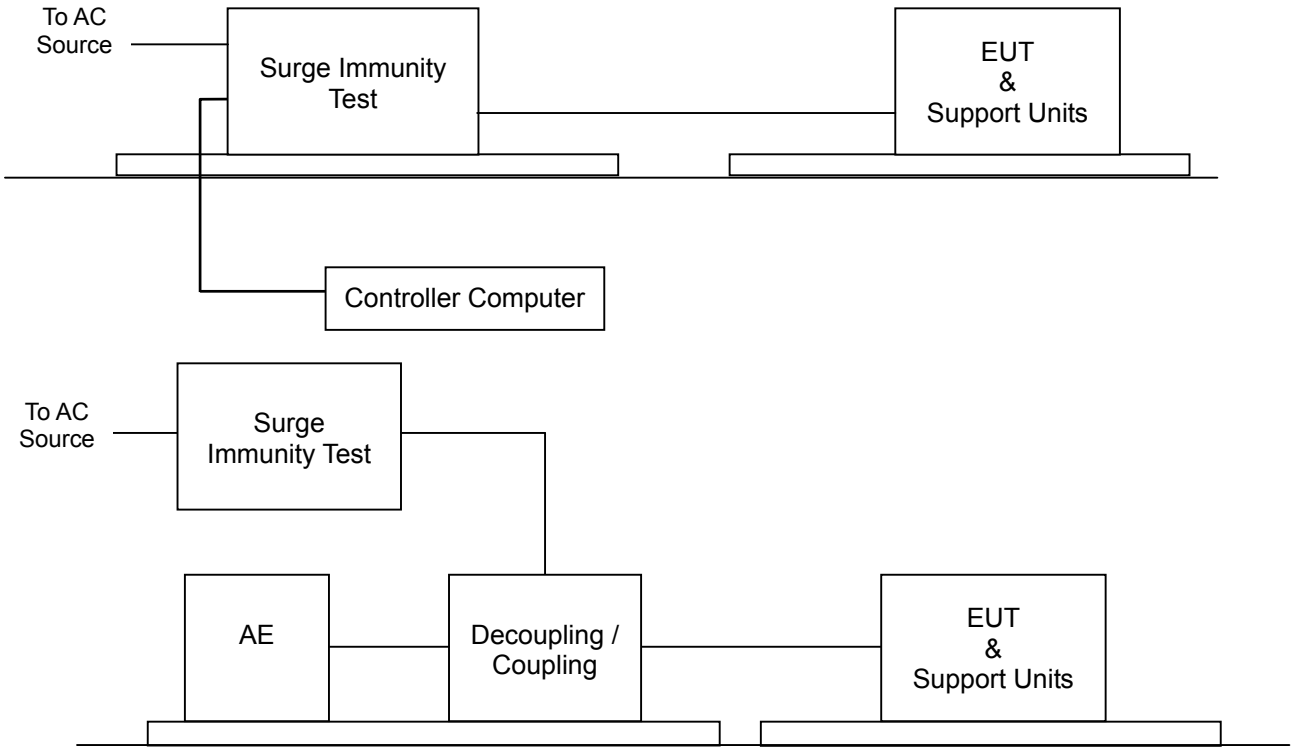
8.6.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-025)

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	27°C	**Humidity**	58% RH
Pressure	968mbar	**Tested By**	Howard Peng
Required Passing Performance		**Criterion B**	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L - N	+/-	1	☒**A** ☐**B**	**Note** ☒**1** ☐**2**	PASS
RJ45	+/-	1	☐**A** ☒**B**	**Note** ☐**1** ☒**2**	PASS

NOTE: 1. There was no change compared with initial operation during the test.
2. During the test, data accessing via LAN port was paused. It could become normal after test stopped.

8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

Basic Standard:	IEC 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-M2 (2 wires); CDN-T4

8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
CWS Generator	EM Test	CWS 500N1.4	P1446143188	03/02/2016
CDN (EUT)	Teseq	CDN M016	35820	06/15/2016
CDN	Teseq	CDN M016	35821	06/08/2016
CDN	Teseq	CDN T400A	25674	01/12/2016
Attenuator	EMCI	SA3NL	10006F	No Calibration Required
Software	icd.control Ver. 5.1.9			

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 required

8.7.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-026)

The EUT shall be tested within its intended operating and climatic conditions.

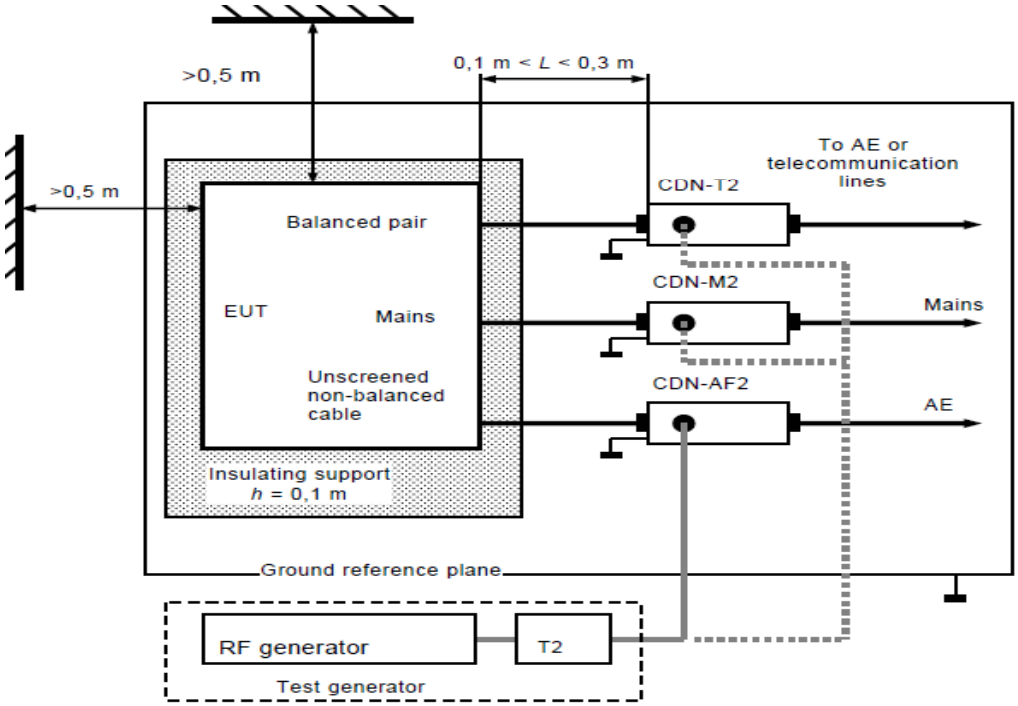
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5×10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

8.7.4. TEST SETUP



Note: 1. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.
2. The EUT clearance from any metallic obstacles shall be at least 0.5m

- 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	27°C	Humidity	58% RH
Pressure	968mbar	Tested By	Howard Peng
Required Passing Performance		Criterion A	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	AC Power Line (0.3m)	CDN-M2	☒A ☐B	Note ☒1 ☐2	PASS
0.15 ~ 80	3	RJ 45 Line (0.3m)	CDN-T4	☒A ☐B	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with initial operation during the test.

8.8. POWER FREQUENCY MAGNETIC FIELD

8.8.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	3A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

8.8.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Induction Coil Interface	Schaffner	INA 2141	6009	No Calibration Required
5KVA Power Source	Teseq	5001IX-208-TSQ	1207A03643	No Calibration Required
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	05/26/2016
Magnetic Field Meter	Sypris	4080	0247	03/30/2016

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 required

8.8.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-027)

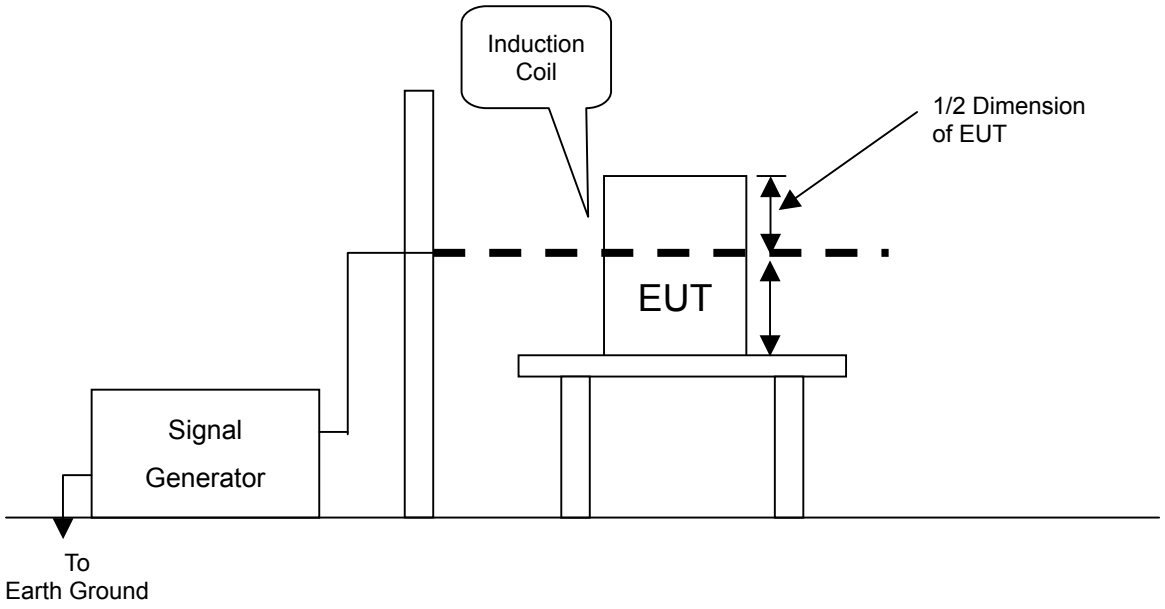
a. The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.

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	27°C	**Humidity**	58% RH
Pressure	968mbar	**Tested By**	Howard Peng
Required Passing Performance		**Criterion A**	

DIRECTION	Field Strength (A/m)	Performance Criterion	OBSERVATION	RESULTS
X	3	A	Note	PASS
Y	3	A	Note	PASS
Z	3	A	Note	PASS

NOTE: There was no change compared with the initial operation during the test.

8.9. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS

8.9.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test duration time:	Minimum three test events in sequence
Interval between event:	Minimum 10 seconds
Phase Angle:	0^o / 180^o
Test cycle:	3 times

8.9.2. TEST INSTRUMENT

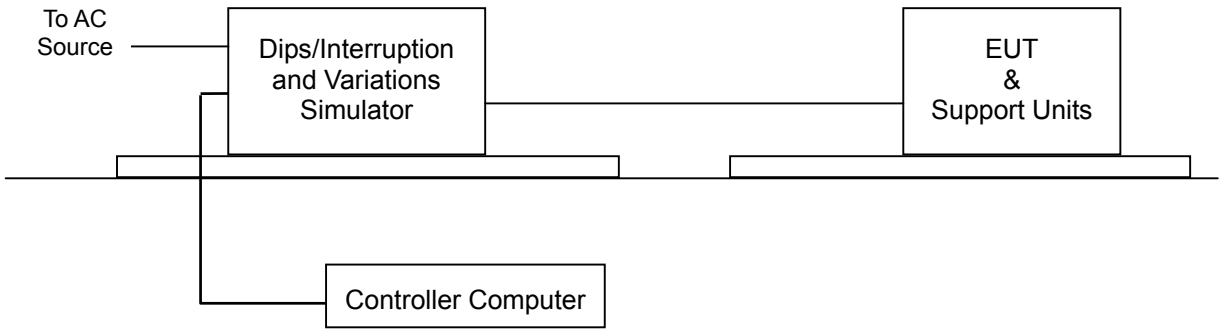
Immunity shielded room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMC Immunity Tester	EMC Partner	TRANSIENT 2000	1117	03/03/2016
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	05/26/2016
Software	Genecs Ver. 3.27			

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 required

8.9.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-028)

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. 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

Temperature	27°C	**Humidity**	58% RH
Pressure	968mbar	**Tested By**	Howard Peng
Required Passing Performance	**Criterion B: 30% reduction 0.5 period** **Criterion C: 60% reduction 5 period & >95% reduction 250 period**		

Test Power: 230Vac, 50Hz				
Voltage (% Reduction)	**Duration (Period)**	**Performance Criterion**	**Observation**	**Test Result**
30	0.5	☒**A** ☐**B** ☐**C**	**Note** ☒**1** ☐**2**	PASS
60	5	☒**A** ☐**B** ☐**C**	**Note** ☒**1** ☐**2**	PASS
>95	250	☐**A** ☒**B** ☐**C**	**Note** ☐**1** ☒**2**	PASS

NOTE: 1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. EUT shut down, but it could recover automatically afterwards.

7 PHOTOGRAPHS OF THE TEST CONFIGURATION

Dynamic Power Control at the PLC TEST

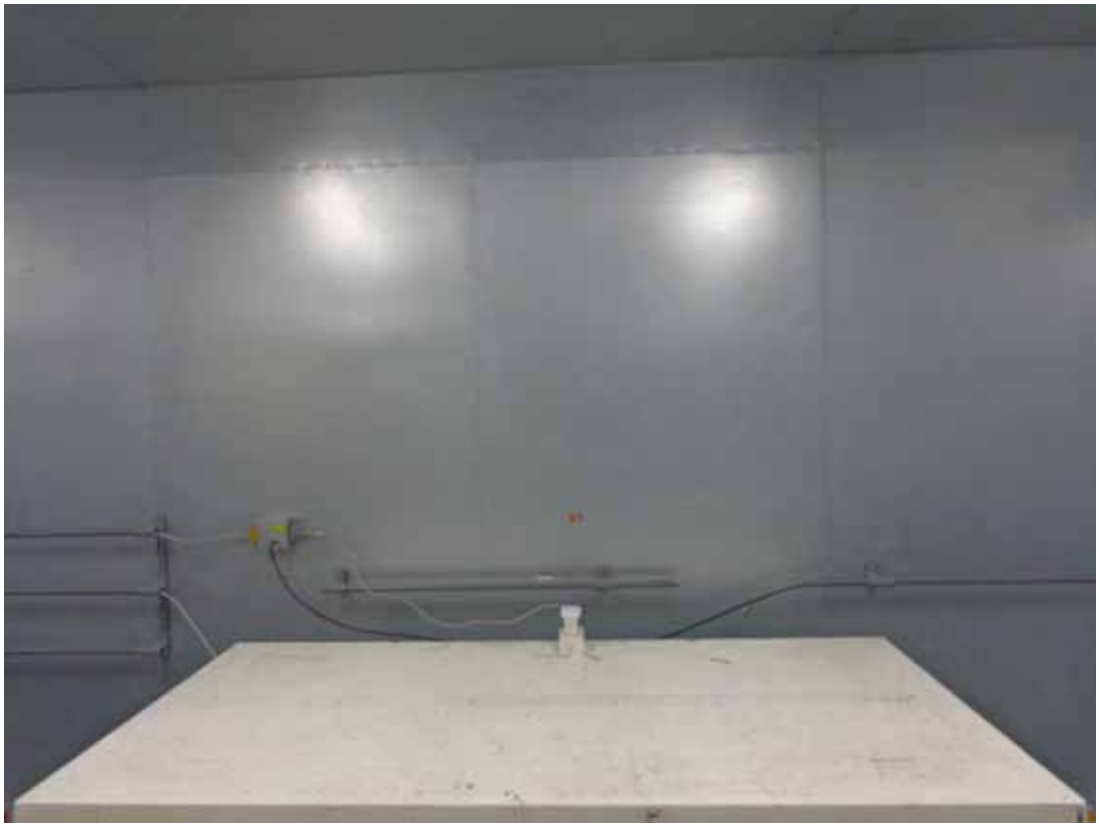
Conducted unsymmetrical disturbances at the PLC TEST

Conducted unsymmetrical disturbances at the PLC TEST
(Cognitive frequency exclusion)

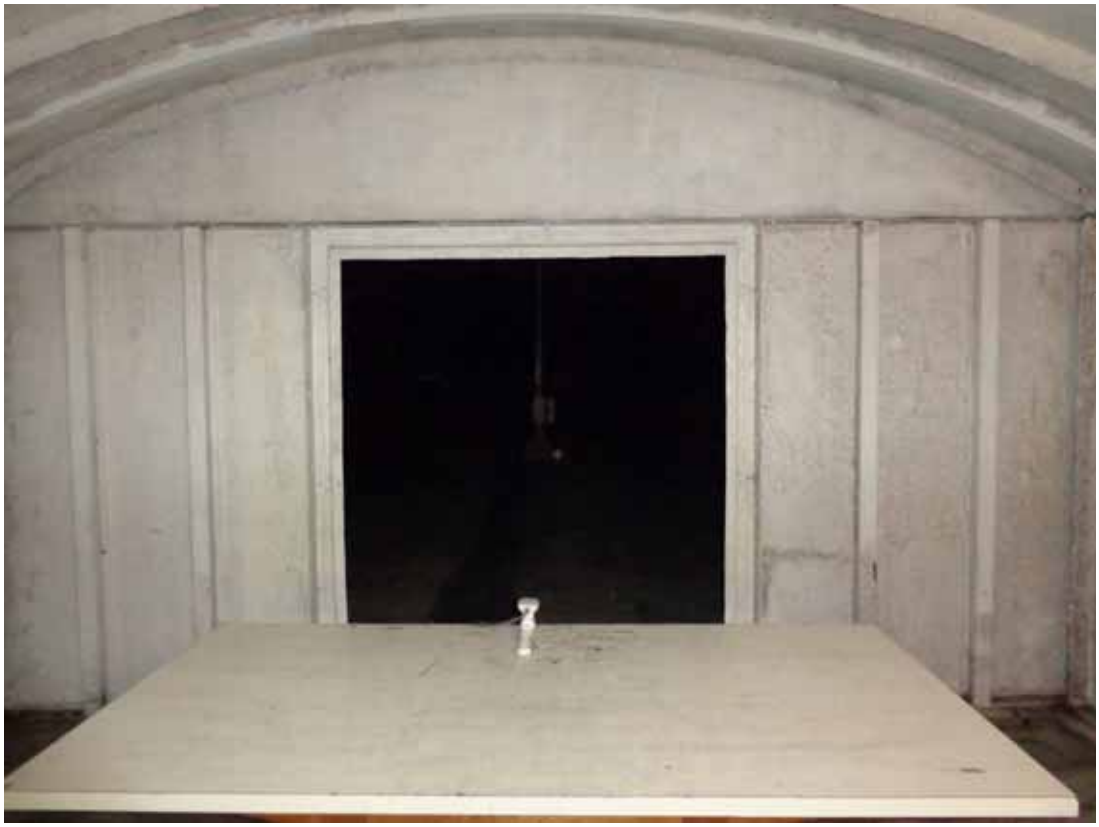
Conducted asymmetric disturbances at the PLC TEST

CONDUCTED EMISSION TEST AT TELECOMMUNICATION PORTS

RJ45 Telecom Port with ISN (10Mbps & 100Mbps)



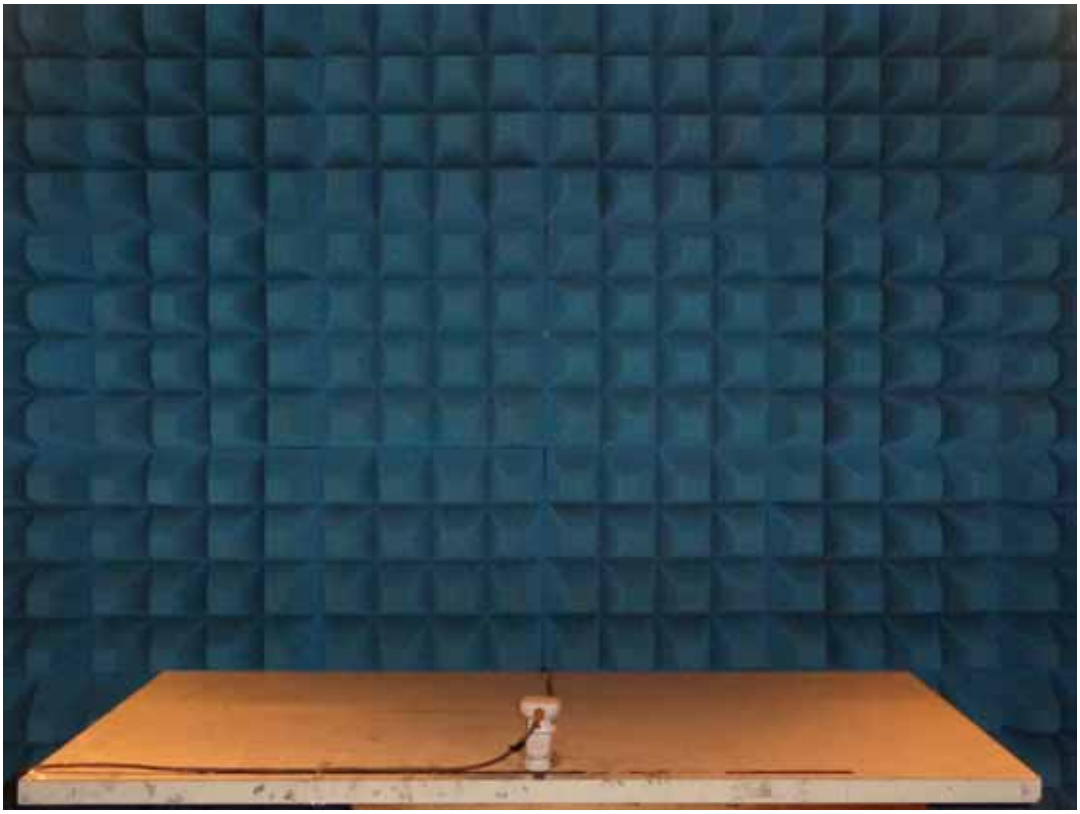
RADIATED EMISSION TEST



Harmonic & Flicker Test

ESD Test

RS Test



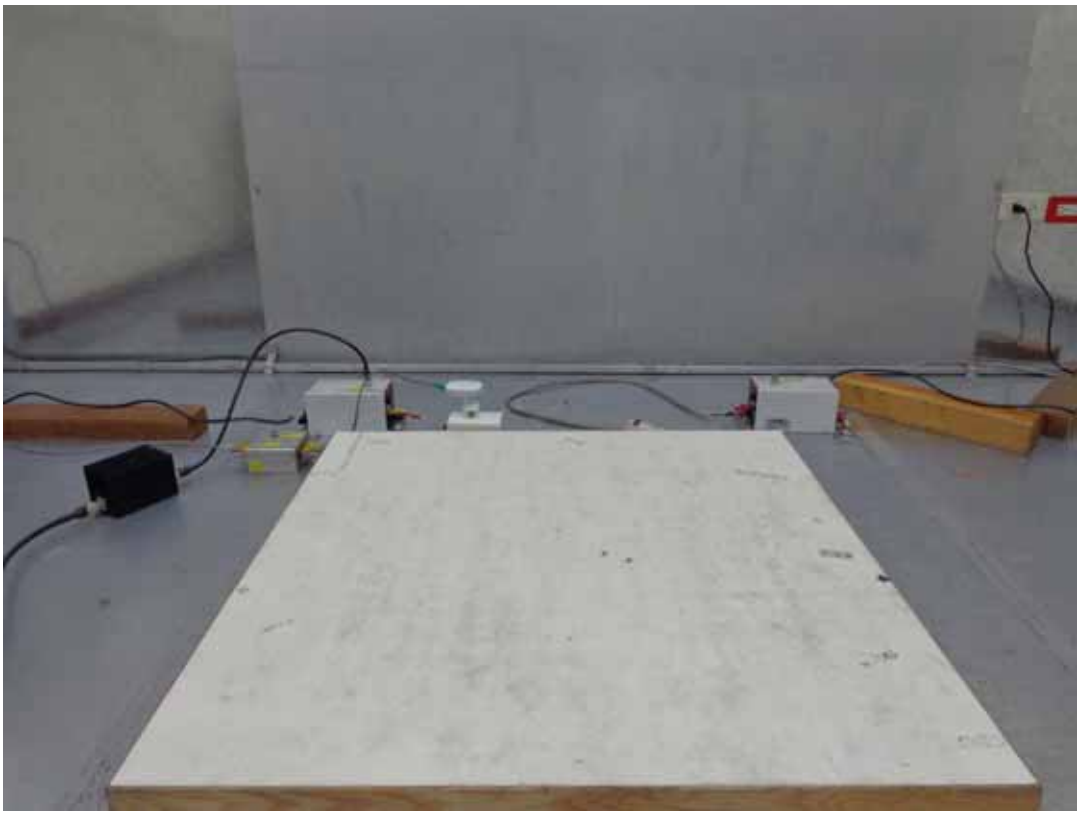
EFT Test

EFT For I/O Test

Surge Test

Surge For I/O Test

CS Test



CS For I/O Test

PFMF Test

Voltage Dips / Interruptions Test