CE EMC
TEST REPORT

for

200M Powerline Adapter

Model: P200

Brand: Tenda

Test Report Number:

C170804Z01-E

Issued for

SHENZHEN TENDA TECHNOLOGY CO.,LTD
6-8 Floor, Tower E3, No.1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China.518052

Issued By:

Compliance Certification Services (Shenzhen) Inc.
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Issued Date: August 10, 2017

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ACCREDITED
Certificate Number: 2861.01

Revision History Of Report

Rev.	Issue Date.	Revisions	Effect Page	Revised By
00	July 14, 2016	Initial Issue	ALL	Sinphy Xie
01	August 10, 2017	Update	ALL	Sinphy Xie

Rev.01:C170804Z01-E

1. The applicable company and standards were updated, after assessment, conducted emission, radiated emission and the EUT photos were updated.
2. The other information about product, please refer to initial report: C160707Z05-E.

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1 TEST CERTIFICATION

Product	200M Powerline Adapter	
Model	P200	
Brand	Tenda	
Tested	July 7~13, 2016 & August 4~9, 2017	
Applicant	**SHENZHEN TENDA TECHNOLOGY CO.,LTD** 6-8 Floor, Tower E3, No.1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China.518052	
Manufacturer	**SHENZHEN TENDA TECHNOLOGY CO.,LTD** 6-8 Floor, Tower E3, No.1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China.518052	
Test Voltage	AC230V/50Hz&AC110V/60Hz	
Applicable Standards	**EN 50561-1: 2013** **EN 55032: 2015 Class B** **EN 61000-3-2: 2014** **EN 61000-3-3: 2013**	**EN 50412-2-1:2005+AC:2009** **EN 55024: 2010+A1: 2015** 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 has been tested by Compliance Certification Services (Shenzhen) Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Service (Shenzhen) Inc.

Reviewed by:

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Service (Shenzhen) Inc.

2 TEST RESULT SUMMARY

EMISSION(EN50561-1:2013 / EN 55032: 2015)			
Standard	**Item**	**Result**	**Remarks**
EN 55032: 2015	Conducted (Main Port)	PASS	Meet Class B limit
	Conducted (Telecom port)	PASS	Meet Class B limit
	Radiated	PASS	Meet Class B limit
EN 50561-1: 2013	PLC port conducted emission	PASS	Meet Class B limit
	PLC port asymmetric disturbances test	PASS	Meet Class B limit
	PLC port unsymmetrical disturbances	PASS	Meet Class B limit
	Dynamic Excluded Frequency Ranges	PASS	Meet Class B limit
	Maximum PLC transmit signal level	PASS	Meet Class B limit
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 / EN 55024: 2010+A1: 2015】			
Standard	**Item**	**Result**	**Remarks**
IEC 61000-4-2: 2008	ESD	PASS	Meets the requirements of Performance Criterion B
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 B
IEC 61000-4-5: 2014	Surge	PASS	Meets the requirements of Performance Criterion B
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	**For EN 50412-2-1:** Voltage Dips: 1) 30% reduction 0.5 periods Performance Criterion: (Type 1: B; Type 2: B) 2) 60% reduction 5 periods Performance Criterion B Performance Criterion: (Type 1: B; Type 2: C) Voltage Interruptions: 1) >95% reduction 250 periods Performance Criterion: (Type 1: B; Type 2: C) **For EN 55024:** Voltage Dips: 1) >95% reduction for 0.5 periods, Performance Criterion B 2) 30% reduction for 25 periods, Performance Criterion C Voltage Interruptions: 1) >95% reduction for 250 periods 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	200M Powerline Adapter
Model	P200
Brand	Tenda
Applicant	SHENZHEN TENDA TECHNOLOGY CO.,LTD
Housing material	Plastic
Identify Number	C170804Z01-E
Received Date	July 7, 2016 & August 4, 2017
EUT Power Rating	AC100-240V 50/60Hz 0.1A
EUT Max. Operating Frequency	400MHz

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. RJ45 Port	1	Notebook

4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

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

The test configuration/ mode is as the following:

Test Mode		
Emission	Conducted emissions (AC Mains Power Port)	**Mode 1:** Standby(AC230V/50Hz) **Mode 2:** Standby(AC110V/60Hz)
	Asymmetric mode conducted emissions	**Mode 1:** RJ45 10Mbps 20% **Mode 2:** RJ45 100Mbps 20%
	Conducted differential voltage emissions	**N/A**
	Radiated emission	**Mode 1:** 100Mbps 20%(AC230V/50Hz) **Mode 2:** 100Mbps 20%(AC110V/60Hz) **Mode 3:** 10Mbps 10%
	PLC port conducted emission	**Mode 1:** 100Mbps 10% **Mode 2:** 10Mbps 10%
	PLC port asymmetric disturbances test	**Mode 1:** 100Mbps 10% **Mode 2:** 10Mbps 10%
	PLC port unsymmetrical disturbances	**Mode 1:** 100Mbps 10% **Mode 2:** 10Mbps 10%
	Dynamic excluded frequency ranges	**Mode 1:** 100Mbps 10% **Mode 2:** 10Mbps 10%
	Maximum PLC transmit signal level	**Mode 1:** 100Mbps 10% **Mode 2:** 10Mbps 10%
	Harmonic current emissions(EN 61000-3-2)	**Mode 1:** 100Mbps 10%
	Voltage fluctuations & flicker (EN 61000-3-3)	**Mode 1:** 100Mbps 10%
Immunity	Immunity (ESD) (IEC 61000-4-2)	**Mode 1:** 100Mbps 10%
	Immunity (RS) (IEC 61000-4-3)	**Mode 1:** 100Mbps 10%
	Immunity (EFT) (IEC 61000-4-4)	**Mode 1:** 100Mbps 10%
	Immunity (Surge) (IEC 61000-4-5)	**Mode 1:** 100Mbps 10%
	Immunity (CS) (IEC 61000-4-6)	**Mode 1:** 100Mbps 10%
	Immunity (PFMF) (IEC 61000-4-8)	**Mode 1:** 100Mbps 10%
	Immunity (DIP) (IEC 61000-4-11)	**Mode 1:** 100Mbps 10%

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

Final Test Mode		
Emission	Conducted emissions (AC Mains Power Port)	**Mode 2**
	Asymmetric mode conducted emissions	**Mode 1** **Mode 2**
	Conducted differential voltage emissions	**N/A**
	Radiated emission	**Below 1GHz** **Mode 1** **Above 1GHz** **Mode 2**
	PLC port conducted emission	**Mode 1**
	PLC port asymmetric disturbances test	**Mode 1**
	PLC port unsymmetrical disturbances	**Mode 1**
	Dynamic excluded frequency ranges	**Mode 1**
	Maximum PLC transmit signal level	**Mode 1**
	Harmonic current emissions(EN61000-3-2)	**Mode 1**
	Voltage fluctuations & flicker (EN 61000-3-3)	**Mode 1**
Immunity	Immunity (ESD) (IEC 61000-4-2)	**Mode 1**
	Immunity (RS) (IEC 61000-4-3)	**Mode 1**
	Immunity (EFT) (IEC 61000-4-4)	**Mode 1**
	Immunity (Surge) (IEC 61000-4-5)	**Mode 1**
	Immunity (CS) (IEC 61000-4-6)	**Mode 1**
	Immunity (PFMF) (IEC 61000-4-8)	**Mode 1**
	Immunity (DIP) (IEC 61000-4-11)	**Mode 1**

Then, the EUT configuration and cable configuration of the above highest emission mode was chosen for all final test items.

4.2. EUT SYSTEM OPERATION

1 Set up the EUT with the auxiliary equipment, notebook and another PLC.
2 The two LAN port connects two notebooks, the other two LAN port through a cable connection. Two notebook's IP Settings within the same network segment, two notebook ping packets to each other. One notebook send packets by the software “TFGEN”, make the network utilization 10Mbps/100Mbps reached 20%.or 10%.
3 Make sure the EUT work normally.

5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

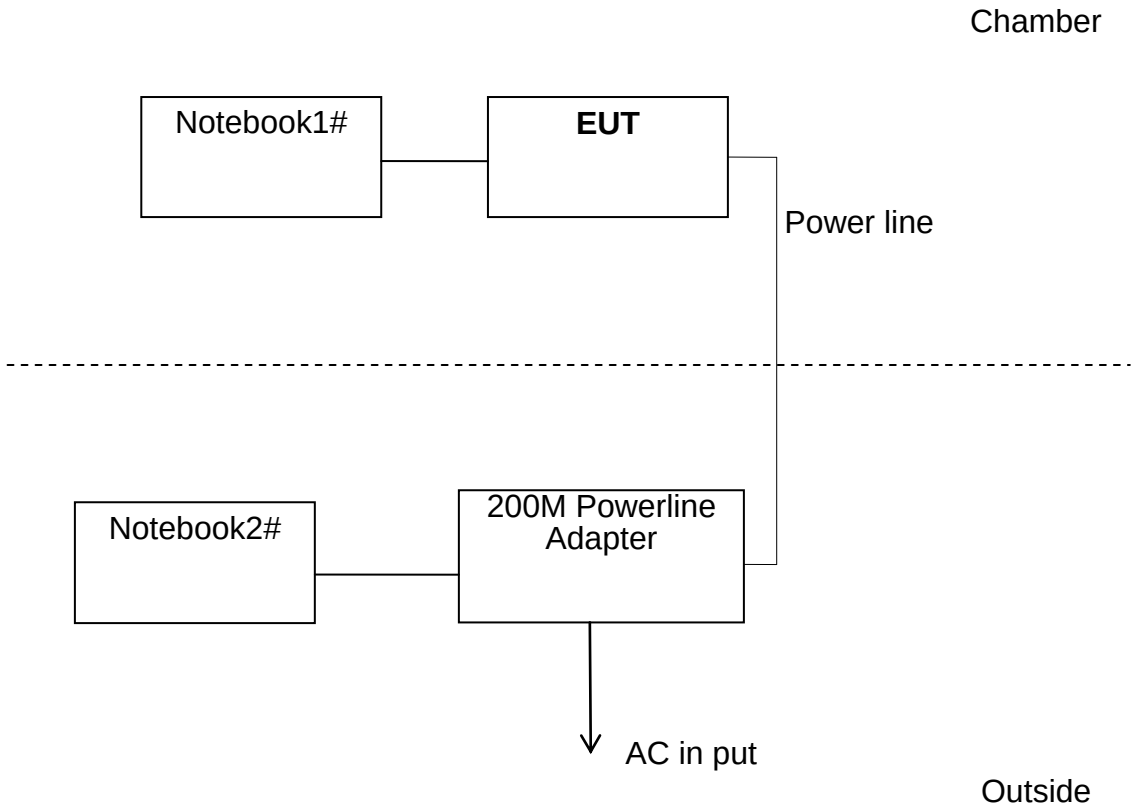
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Peripherals Devices:

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	Notebook1#	E335	R9-WN0KH	DoC	Thinkpad	Unshielded 2.3m	Unshielded 1.20m (AC cable) Shielded 1.90m (DC cable)
2	Notebook2#	E335	R9-WN1EF	DoC	Thinkpad	Unshielded 1.20m	Unshielded 1.10m (AC cable) Shielded 2.00m (DC cable)

Note: *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

5.2. CONFIGURATION OF SYSTEM UNDER TEST



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at **No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China**

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

6.2. ACCREDITATIONS

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

USA	A2LA
China	CNAS

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

USA	FCC
Japan	VCCI (C-4815,R-4320,T-2317, G-10624)
Canada	INDUSTRY CANADA

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccssz.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		9kHz~30MHz	+/-3.2886dB
Conducted Emissions (Telecommunication Ports)		150kHz~30MHz	+/-0.8520dB
Radiated Emission (10m)	Test Site : 10m Chamber (Vertical)	30 MHz ~200 MHz	+/-3.8929dB
		200 MHz ~1000 MHz	+/-3.8922dB
	Test Site : 10m Chamber (Horizontal)	30 MHz ~200 MHz	+/-3.9002dB
		200 MHz ~1000 MHz	+/-3.9037dB
Radiated emissions(3m)	Test Site : 966(2)	30 MHz ~200 MHz	+/-3.8925dB
		200 MHz ~1000 MHz	+/-3.8750dB
		1GHz ~8GHz	+/-5.3115dB
		8GHz~18GHz	+/-5.3496dB

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

Consistent with industry standard 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. CONDUCTED EMISSION MEASUREMENT

7.1.1. 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.
(3) All emanations from a class B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/11/2017	02/10/2018
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/11/2017	02/10/2018
LISN	EMCO	3825/2	8901-1459	02/12/2017	02/11/2018
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/15/2017	02/14/2018
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

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)

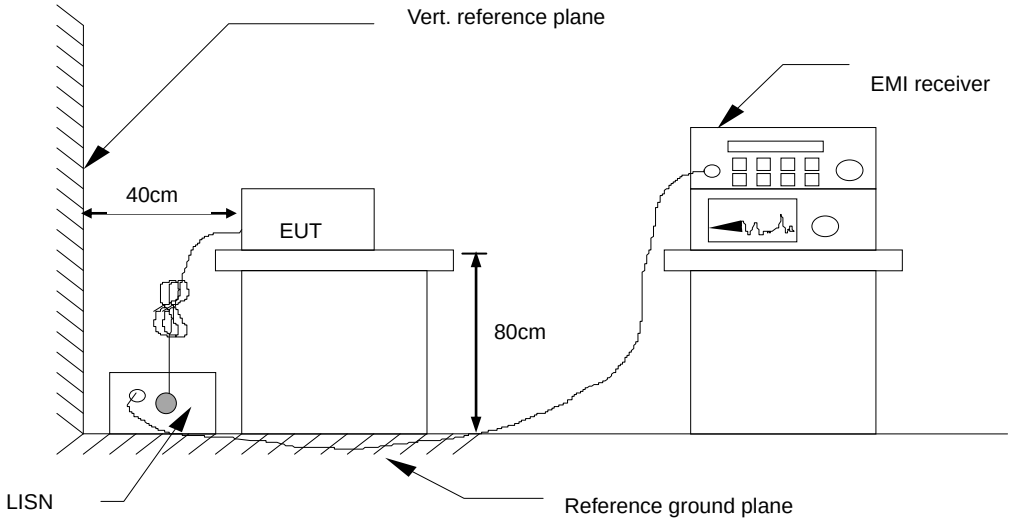
Procedure of Preliminary Test

- 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 55032 (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.
- The EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- All I/O cables were positioned to simulate typical actual usage as per EN 55032.
- The operating ranges of voltage and frequency as specified for the EUT, having regard to the supply voltage and frequency for the intended market of the EUT. Measurement at two nominal voltages of 230 V (±10 V) and 110 V (±10 V), using frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use.
- The test equipment EUT received AC110V/60Hz or AC230V/50Hz 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 150 kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

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

7.1.4. TEST SETUP



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

7.1.5. DATA SAMPLE

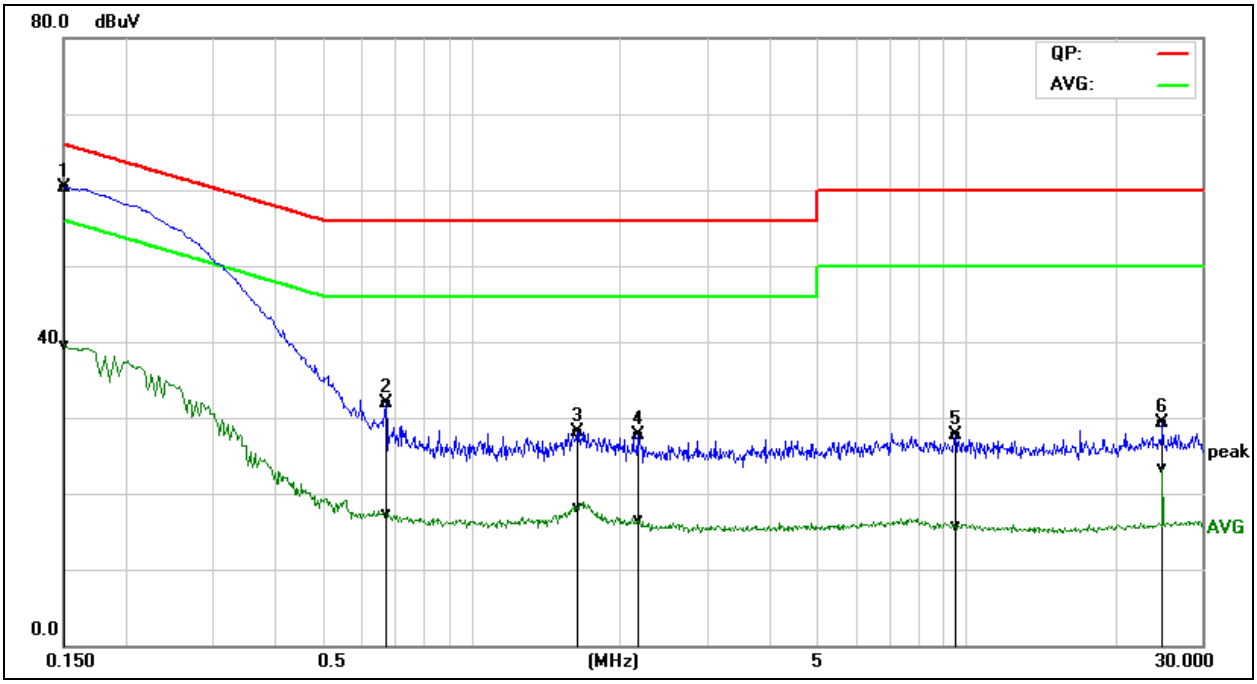
Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	39.78	14.84	9.65	49.43	24.49	64.57	54.58	-15.14	-30.09	Pass

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

7.1.6. TEST RESULTS

Model No.	P200	Test Mode	Mode 2
Environmental Conditions	26°C, 60% RH	RBW,VBW	9kHz
Tested by	Evan Ai	Tested Date	August 4, 2017
Test Voltage	AC110V/60Hz		

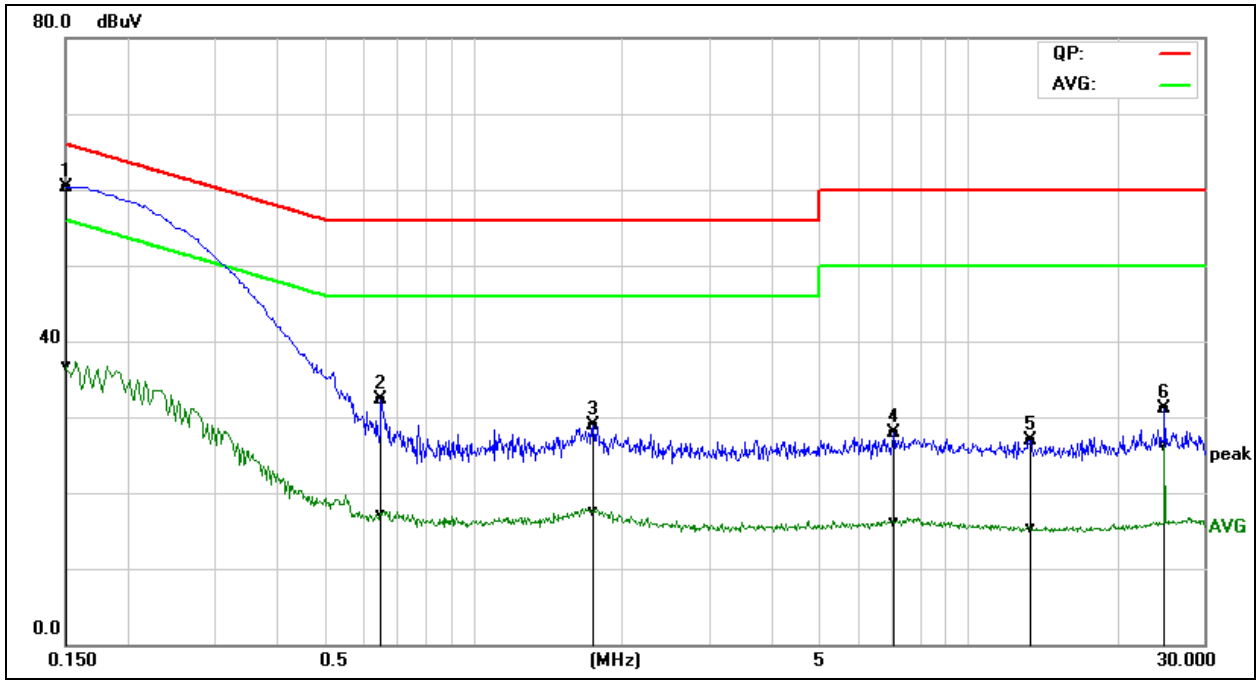
Line



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
0.1500	40.73	19.98	19.62	60.35	39.60	65.99	56.00	-5.64	-16.40	Pass
0.6740	12.21	-2.29	19.60	31.81	17.31	56.00	46.00	-24.19	-28.69	Pass
1.6420	8.49	-1.50	19.65	28.14	18.15	56.00	46.00	-27.86	-27.85	Pass
2.1700	7.96	-3.29	19.72	27.68	16.43	56.00	46.00	-28.32	-29.57	Pass
9.5500	7.54	-4.38	20.10	27.64	15.72	60.00	50.00	-32.36	-34.28	Pass
24.9980	8.78	2.83	20.44	29.22	23.27	60.00	50.00	-30.78	-26.73	Pass

Model No.	P200	Test Mode	Mode 2
Environmental Conditions	26°C, 60% RH	RBW,VBW	9kHz
Tested by	Evan Ai	Tested Date	August 4, 2017
Test Voltage	AC110V/60Hz		

Neutral



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
0.1500	40.88	17.21	19.52	60.40	36.73	65.99	56.00	-5.59	-19.27	Pass
0.6540	12.79	-2.51	19.59	32.38	17.08	56.00	46.00	-23.62	-28.92	Pass
1.7460	9.15	-2.21	19.67	28.82	17.46	56.00	46.00	-27.18	-28.54	Pass
7.0700	8.14	-3.75	19.84	27.98	16.09	60.00	50.00	-32.02	-33.91	Pass
13.3660	6.85	-4.77	20.06	26.91	15.29	60.00	50.00	-33.09	-34.71	Pass
25.0020	10.54	5.37	20.64	31.18	26.01	60.00	50.00	-28.82	-23.99	Pass

7.2. ASYMMETRIC MODE CONDUCTED EMISSIONS MEASUREMENT

7.2.1. 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.*

7.2.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/11/2017	02/10/2018
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/11/2017	02/10/2018
LISN	EMCO	3825/2	8901-1459	02/12/2017	02/11/2018
T-LISN	FCC	FCC-TLISN-T2-PLC	20491	04/20/2017	04/19/2018
ISN	TESEQ	ISN PLC 25-30	24052	03/09/2017	03/08/2018
Current Probe	STODDART AIRCRAFT	91550-1	345-73	02/21/2017	02/20/2018
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/15/2017	02/14/2018
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

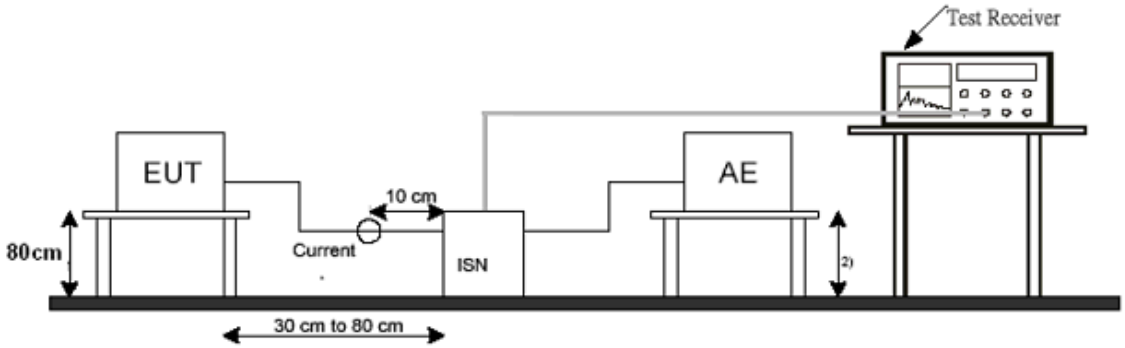
Note:

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 (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 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

7.2.4. TEST SETUP



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

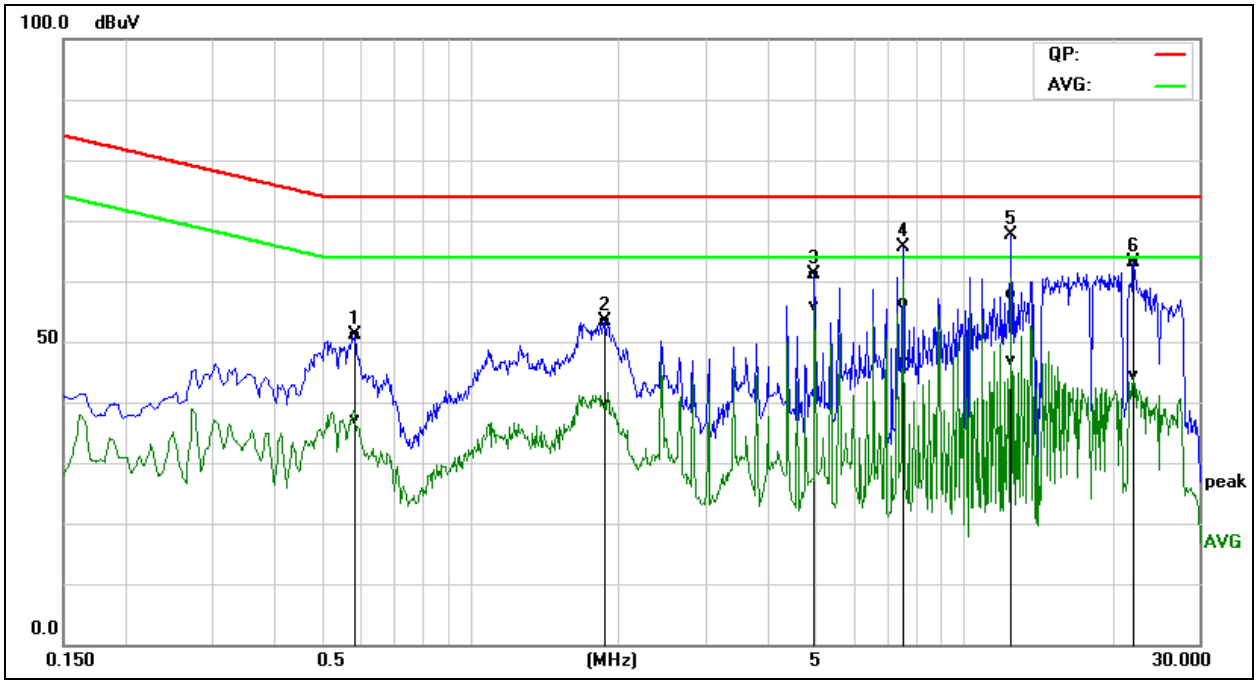
7.2.5. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	74.00	64.00	-29.79	-26.83	Pass

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

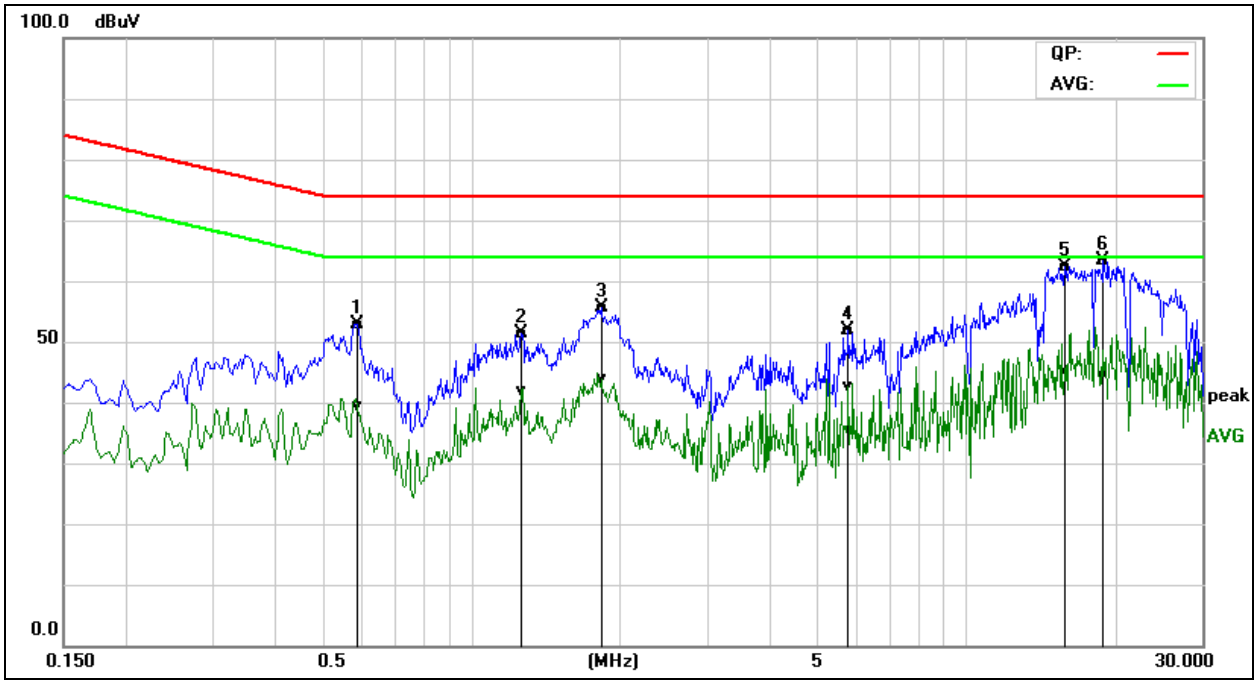
7.2.6. TEST RESULTS

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	22°C, 45% RH	RBW,VBW	9 kHz
Tested by	Evan Ai	Tested Date	August 7, 2017



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
0.5860	31.60	17.66	19.45	51.05	37.11	74.00	64.00	-22.95	-26.89	Pass
1.8740	33.59	19.91	19.71	53.30	39.62	74.00	64.00	-20.70	-24.38	Pass
5.0020	41.21	35.94	19.83	61.04	55.77	74.00	64.00	-12.96	-8.23	Pass
7.5540	36.53	26.73	19.87	56.40	46.60	74.00	64.00	-17.60	-17.40	Pass
12.5020	37.92	26.82	19.98	57.90	46.80	74.00	64.00	-16.10	-17.20	Pass
22.0700	43.08	24.39	20.07	63.15	44.46	74.00	64.00	-10.85	-19.54	Pass

Model No.	P200	Test Mode	Mode 2
Environmental Conditions	22°C, 45% RH	RBW,VBW	9 kHz
Tested by	Evan Ai	Tested Date	August 7, 2017



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
0.5899	33.43	19.92	19.46	52.89	39.38	74.00	64.00	-21.11	-24.62	Pass
1.2660	31.81	22.26	19.67	51.48	41.93	74.00	64.00	-22.52	-22.07	Pass
1.8340	36.01	24.23	19.71	55.72	43.94	74.00	64.00	-18.28	-20.06	Pass
5.7860	31.97	22.69	19.83	51.80	42.52	74.00	64.00	-22.20	-21.48	Pass
15.8620	42.35	25.43	19.93	62.28	45.36	74.00	64.00	-11.72	-18.64	Pass
18.9420	43.27	24.33	20.00	63.27	44.33	74.00	64.00	-10.73	-19.67	Pass

7.3. CONDUCTED DIFFERENTIAL VOLTAGE EMISSIONS MEASUREMENT

7.3.1. LIMITS

Frequency range MHz	Class B limit dB(uV)			Applicability
	Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
30-950	46	46	46	See a)
950-2150	46	54	54	
950-2150	46	54	54	See b)
30-300	46	54	50	See c)
300-1000	46		52	
30-300	46	66	59	See d)
300-1000	46		52	
30-950	46	76	46	See e)
950-2150	46	N/A	54	

A）Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

B）Tuner units (not the LNB) for satellite signal reception.

C）Frequency modulation audio receivers and PC tuner cards.

D）Frequency modulation car radios.

E）Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports. Limits specified for the LO are for the RF modulator carrier signal and harmonics.

The term ‘other’ refers to all emissions other than the fundamental and the harmonics of the LO.

The measurement shall cover the entire frequency range.

The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.

7.3.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/11/2017	02/10/2018
MPEG 2 Measurement Generator	ROHDE&SCHWARZ	DVG	100268	N.C.R	N.C.R
TV-Measender.TV Test Transmitter	ROHDE&SCHWARZ	SFQ	100456	02/12/2017	02/11/2018
Test S/W	FARAD	EZ-EMC/ CCS-03A1			

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.

7.3.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-050)

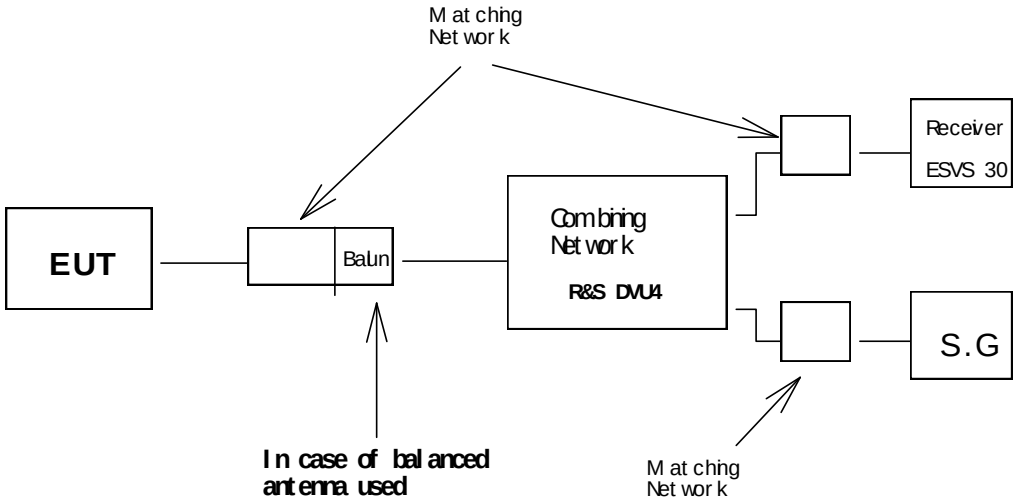
Procedure of Preliminary Test

1. The test item can be in deliver on shielding room. The equipment was set up as per the test configuration to simulate typical actual 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 ANSI C63.4 (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 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. The EUT received AC230V/50Hz power source from the outlet socket. All support equipment, if need, receives AC230V/50Hz power from another socket.
3. With the 75~50Ω matching network when the connected coaxial cable of impedance not matching.
4. The output level of the auxiliary signal generator shall be set to give the value of 70 dB (μV) for TV to the input of the frequency-modulation of television receiver respectively, on a 75Ω impedance. An additional amplifier should be insert at the generator output, if necessary.
5. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
6. The results shall be expressed in the terms of the substitution power in nanowatt (nW), as supplied by the standard signal generator. The specified source impedance of the receiver shall be stated with the results.
7. When measurements are made at the antenna terminals of the equipment under test, an auxiliary signal generator shall be used to feed the equipment under test input with a standard test signal at the receiver tuning frequency (30MHz to 1000MHz).
8. After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
9. 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

10. EUT and support equipment were set up on the wooden table as per step 7 of the preliminary test.
11. The receiver scanned from 30MHz to 1000MHz, recorded the value, the local frequency, amplitude, were recorded in which correction factors were used to calculate the emission level and compare reading to the applicable limit The power at the antenna terminal at any frequency within the range of measurement shall not exceed 2.0 GHz.
12. The test data of the worst-case condition(s) was recorded.

7.3.4. TEST SETUP



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

7.3.5. TEST RESULTS

Not applicable

only apply to：

1. TV broadcast receiver tuner ports with an accessible connector

2. RF modulator output ports

3. FM broadcast receiver tuner ports with an accessible connector

7.4 RADIATED EMISSION MEASUREMENT

7.4.1. LIMITS

Below 1GHz

FREQUENCY (MHz)	Class A limit dB(uV/m)		Class B limit dB(uV/m)	
	10m	3m	10m	3m
30 ~ 230	40	50	30	40
230 ~ 1000	47	57	37	47

Note:

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

(2) Emission level (dBuV/m) = 20 log Emission level (uV/m)

FREQUENCY (MHz)	10m Class B limit dB(uV/m)		3m Class B limit dB(uV/m)	
	Fundamental	Harmonics	Fundamental	Harmonics
30 ~ 230	50	42	60	52
230 ~ 300		42		52
300 ~ 1000		46		46

Note:

(1) Apply for FM receivers.

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

(3) Emission level (dBuV/m) = 20 log Emission level (uV/m)

Above 1GHz

Frequency (GHZ)	Class A dB(uV/m) (At 3m)		Class B dB(uV/m) (At 3m)	
	Average	Peak	Average	Peak
1~3	56	76	50	70
3~6	60	80	54	74

Required highest frequency for radiated measurement

Highest internal frequency(Fx)	Highest measured frequency
Fx ≤ 108 MHz	1 GHz
108 MHz < Fx ≤ 500 MHz	2 GHz
500 MHz < Fx ≤ 1 GHz	5 GHz
Fx > 1 GHz	5 × Fx up to a maximum of 6 GHz
NOTE 1：For FM and TV broadcast receivers, Fx is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies. NOTE 2：Fx is defined in 3.1.18. NOTE 3：For outdoor units of home satellite receiving systems highest measured frequency shall be 18GHz.	

Where Fx is unknown, the radiated emission measurements shall be performed up to 6 GHz.

7.4.2. TEST INSTRUMENT

Below 1GHz

Radiated Emission Test Site (10m Chamber)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100088	02/11/2017	02/10/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100145	02/11/2017	02/10/2018
Amplifier	MITEQ	AM-1604-3000	1093583	02/11/2017	02/10/2018
Amplifier	Mini-Circuits	ZKL-1R5	6511600437	02/11/2017	02/10/2018
Bi-log Antenna	TESEQ	CBL6143A	26039	02/12/2017	02/11/2018
Bi-log Antenna	TESEQ	CBL6143A	32399	02/12/2017	02/11/2018
System-Controller	CCS	CC-C-F	N/A	N.C.R	N.C.R
System-Controller	CCS	CC-C-F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/15/2017	02/14/2018
Test S/W	FARAD	EZ-EMC/ CCS-2Ant			

Above 1GHz

Radiated Emission Test Site 966(2)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02/17/2017	02/16/2018
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
High Noise Amplifier	Agilent	8449B	3008A01838	02/11/2017	02/10/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/11/2017	02/10/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/12/2017	02/11/2018
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/15/2017	02/14/2018
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

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 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.
- The EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- Support equipment, if needed, was placed as per EN 55032.
- All I/O cables were positioned to simulate typical usage as per EN 55032.
- The operating ranges of voltage and frequency as specified for the EUT, having regard to the supply voltage and frequency for the intended market of the EUT. Measurement at two nominal voltages of 230 V (±10 V) and 110 V (±10 V), using frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use.
- The EUT received AC110V/60Hz or AC230V/50Hz 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 3/10 meter away from the EUT as stated in EN 55032. 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 and only Q.P. (For Below 1GHz) or Peak/Average (For Above 1GHz) reading is presented.
- The test data of the worst-case condition(s) was recorded.

7.4.4. TEST SETUP

Below 1GHz

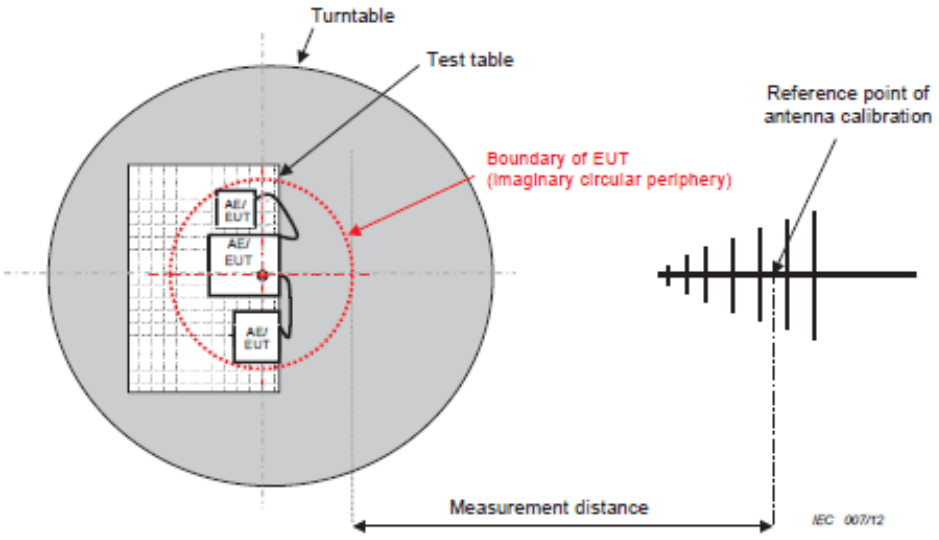


Figure C.1 – Measurement distance

Above 1GHz

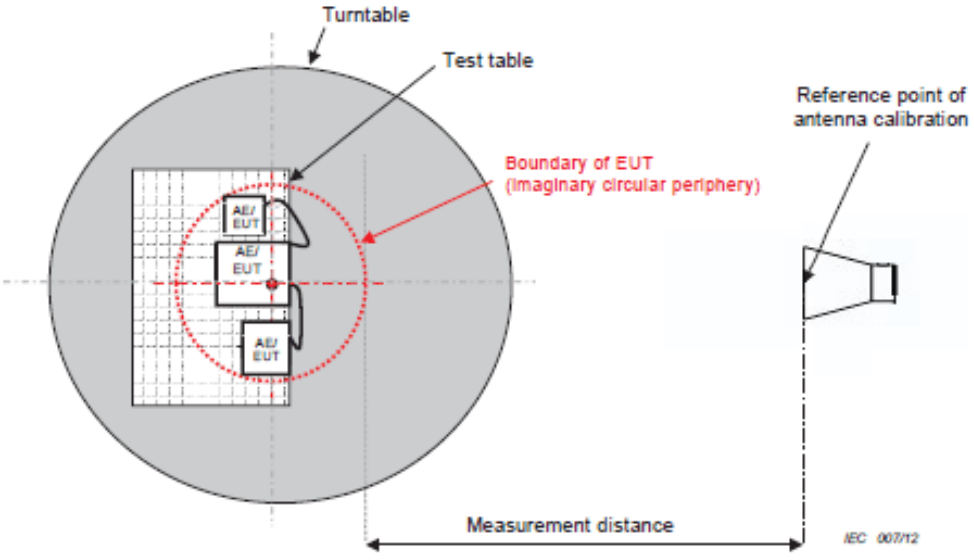


Figure C.1 – Measurement distance

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

7.4.5. DATA SAMPLE

Below 1GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
XXX.XXXX	47.40	-21.61	25.79	30.00	-4.21	QP

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correct Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
QP = Quasi-peak Reading

Above 1GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
XXXX.XXXX	62.09	-11.42	50.67	74.00	-23.33	Peak
XXXX.XXXX	49.78	-11.42	38.36	54.00	-15.64	AVG

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
Peak = Peak Reading
AVG = Average Reading

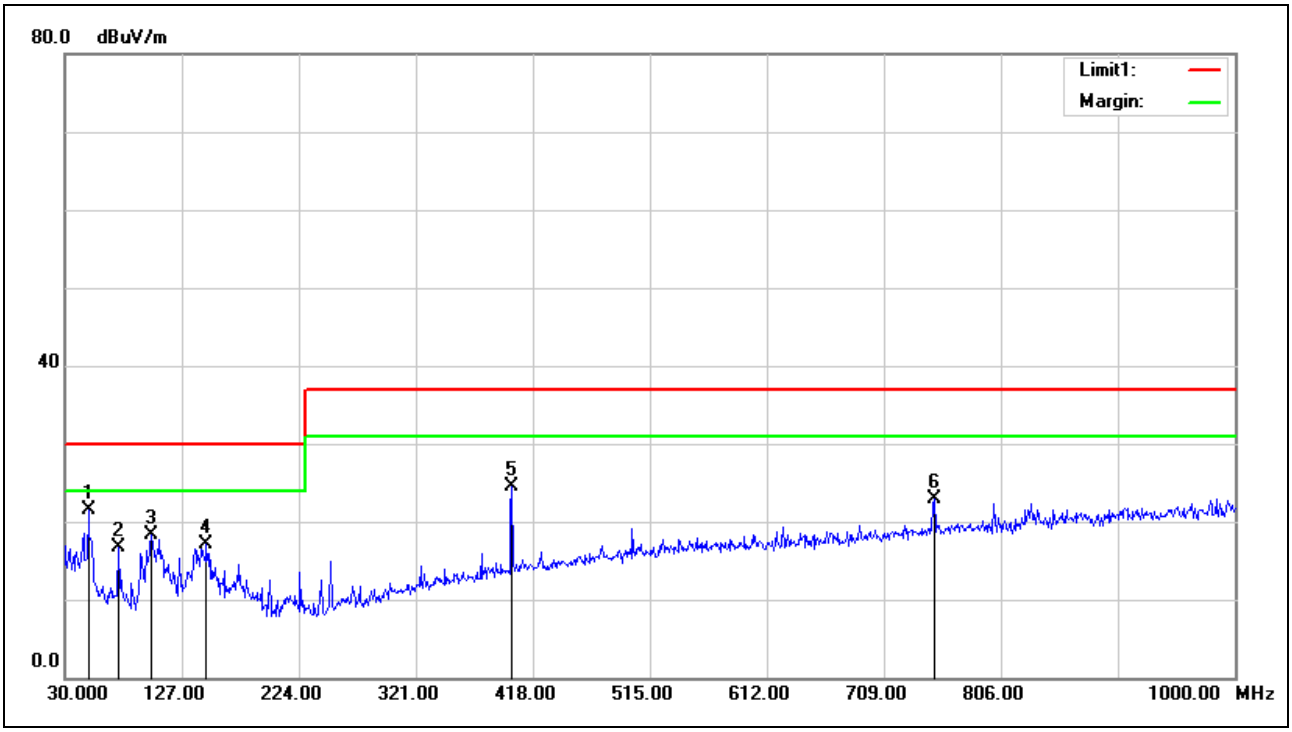
Calculation Formula

Margin (dB) = Result (dBuV/m) – Limits (dBuV/m)
Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)

7.4.6. TEST RESULTS

Below 1GHz

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	22 °C,45% RH	RBW,VBW	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Evan Ai
Tested Date	August 7, 2017	Test Voltage	AC230V/50Hz

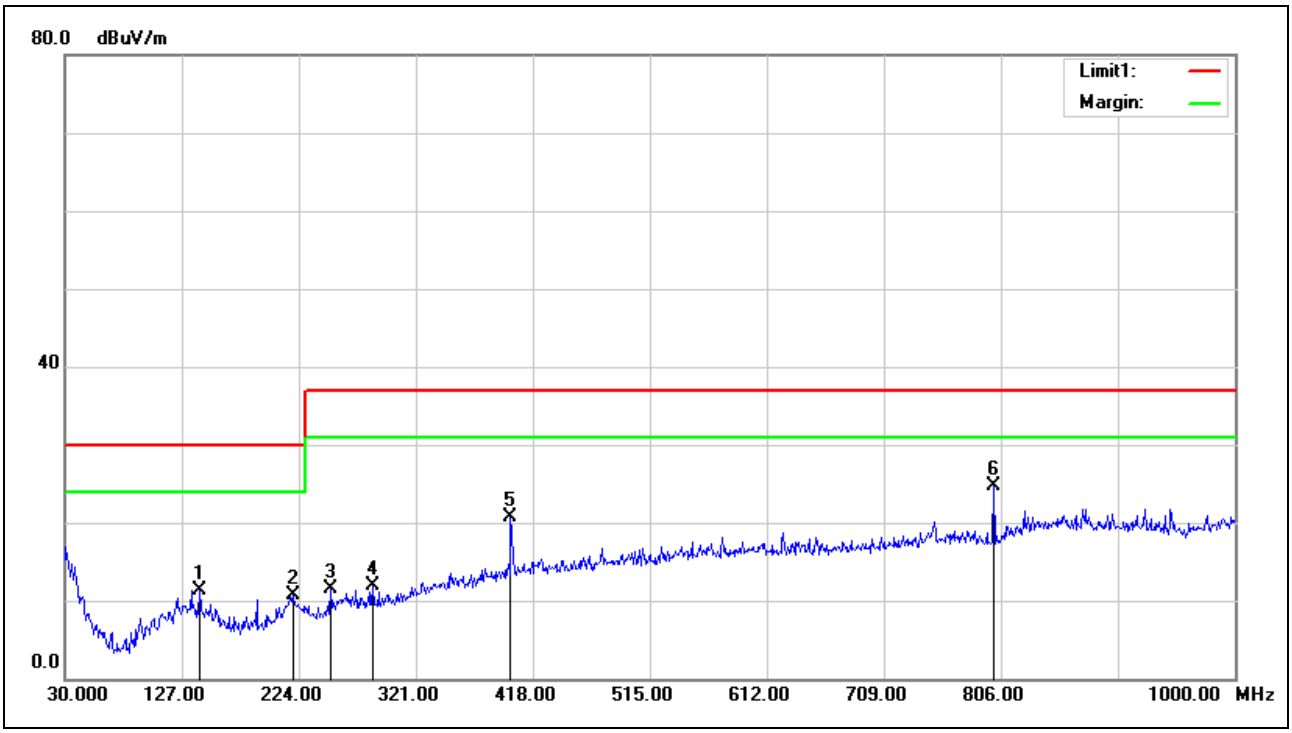


Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
49.4000	48.44	-26.92	21.52	30.00	-8.48	QP
74.6200	48.73	-32.05	16.68	30.00	-13.32	QP
101.7800	47.50	-29.11	18.39	30.00	-11.61	QP
147.3700	44.92	-27.75	17.17	30.00	-12.83	QP
400.5400	46.29	-21.81	24.48	37.00	-12.52	QP
750.7100	38.94	-16.06	22.88	37.00	-14.12	QP

Note:

1. *Q= Quasi-peak Reading.*
2. *The other emission levels were very low against the limit.*

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	22°C,45% RH	RBW,VBW	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Evan Ai
Tested Date	August 7, 2017	Test Voltage	AC230V/50Hz



Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
141.5500	38.78	-27.49	11.29	30.00	-18.71	QP
219.1500	37.05	-26.42	10.63	30.00	-19.37	QP
250.1900	38.39	-26.90	11.49	37.00	-25.51	QP
285.1100	38.12	-26.19	11.93	37.00	-25.07	QP
399.5700	42.64	-21.86	20.78	37.00	-16.22	QP
800.1800	41.70	-17.01	24.69	37.00	-12.31	QP

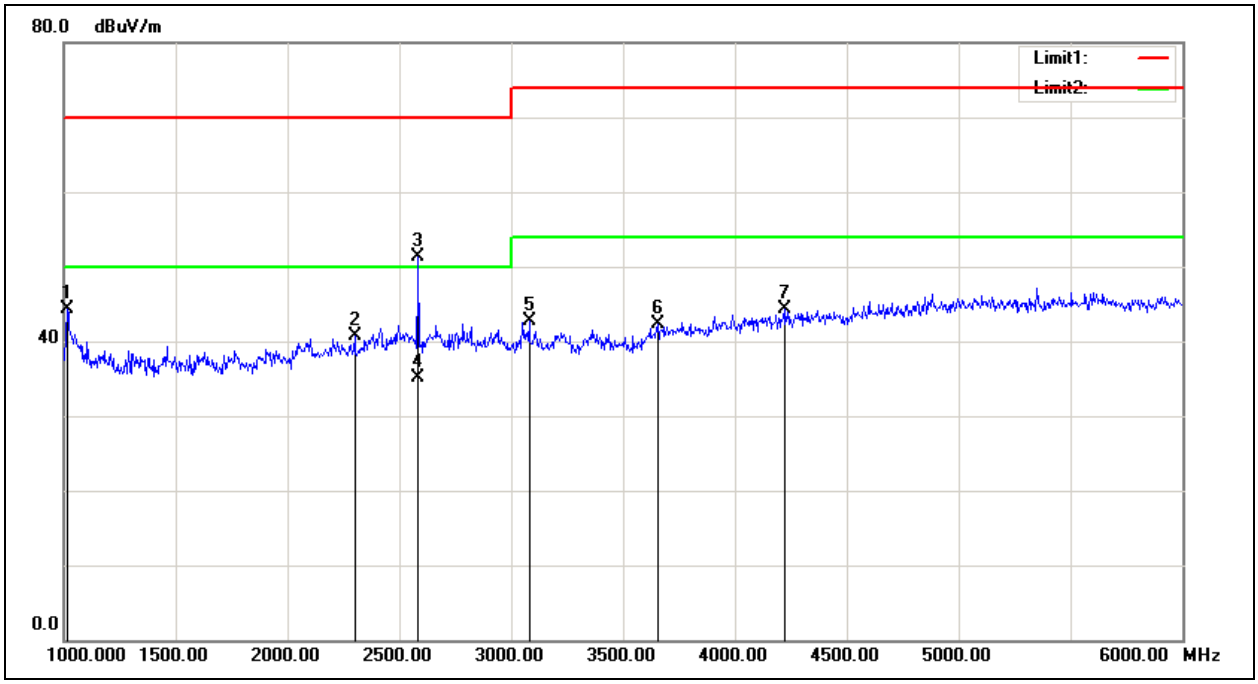
Note:

1. *Q= Quasi-peak Reading.*
2. *The other emission levels were very low against the limit.*

Above 1GHz

Model No.	P200	Test Mode	Mode 2
Environmental Conditions	24°C, 52% RH	RBW,VBW	1MHz
Antenna Pole	Vertical	Antenna Distance	3m
Detector Function	Peak/ AVG	Tested by	Evan Ai
Tested Date	August 7, 2017	Test Voltage	AC110V/60Hz

(The chart below shows the highest readings taken from the final data.)

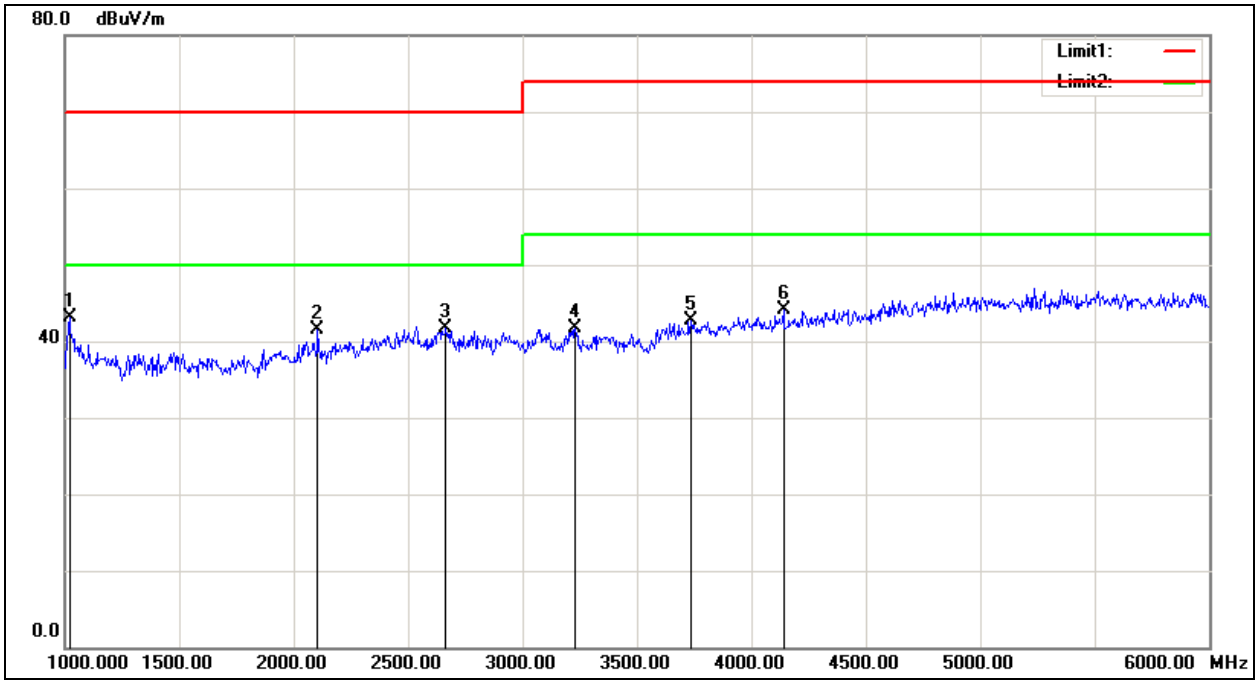


Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1015.000	52.72	-8.50	44.22	70.00	-25.78	Peak
2300.000	44.01	-3.36	40.65	70.00	-29.35	Peak
2585.000	53.42	-2.11	51.31	70.00	-18.69	Peak
2585.000	37.21	-2.11	35.10	50.00	-14.90	AVG
3080.000	43.97	-1.23	42.74	74.00	-31.26	Peak
3655.000	42.17	0.13	42.30	74.00	-31.70	Peak
4220.000	41.88	2.36	44.24	74.00	-29.76	Peak

REMARKS: *1. Peak= Peak Reading; AVG= Average Reading.*
2. The other emission levels were very low against the limit.

Model No.	P200	Test Mode	Mode 2
Environmental Conditions	24°C, 52% RH	RBW,VBW	1MHz
Antenna Pole	Horizontal	Antenna Distance	3m
Detector Function	Peak/ AVG	Tested by	Evan Ai
Tested Date	August 7, 2017	Test Voltage	AC110V/60Hz

(The chart below shows the highest readings taken from the final data.)



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1020.000	51.50	-8.48	43.02	70.00	-26.98	Peak
2105.000	45.83	-4.42	41.41	70.00	-28.59	Peak
2665.000	43.59	-1.96	41.63	70.00	-28.37	Peak
3230.000	42.74	-0.97	41.77	74.00	-32.23	Peak
3735.000	42.29	0.47	42.76	74.00	-31.24	Peak
4140.000	42.00	2.08	44.08	74.00	-29.92	Peak

REMARKS: *1. Peak= Peak Reading; AVG= Average Reading.*
2. The other emission levels were very low against the limit.

7.5. PLC PORT CONDUCTED EMISSION TEST

7.5.1. LIMITS

The EUT shall comply with the Class B limits, using the measurement conditions and the methodology defined in EN 55022 for radiated disturbances.

Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 - 0.50	66 - 56	56 - 46
0.50 – 1.6065	56	46

7.5.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/21/2016	02/20/2017
LISN	EMCO	3825/2	8901-1459	02/21/2016	02/20/2017
Signal Generator	ROHDE&SCHWARZ	SML03	100267	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/21/2016	02/20/2017
AC-Separator	SCHWARZBECK	AC-Separator	006	02/25/2016	02/24/2017
CS 50	SCHWARZBECK	CS 50	CS50-004	02/25/2016	02/24/2017
SPLIT 100 Symmetrical Splitter	SCHWARZBECK	SPLIT 100 Symmetrical Splitter	006	02/25/2016	02/24/2017
SY 9223-50561-1	SCHWARZBECK	SY 9223-50561-1	#5	02/25/2016	02/24/2017
SYMAT Symmetrical	SCHWARZBECK	SYMAT Symmetrical	011	02/25/2016	02/24/2017
ISN PLC	TESTQ	PLT-A	36243	02/21/2016	02/20/2017
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

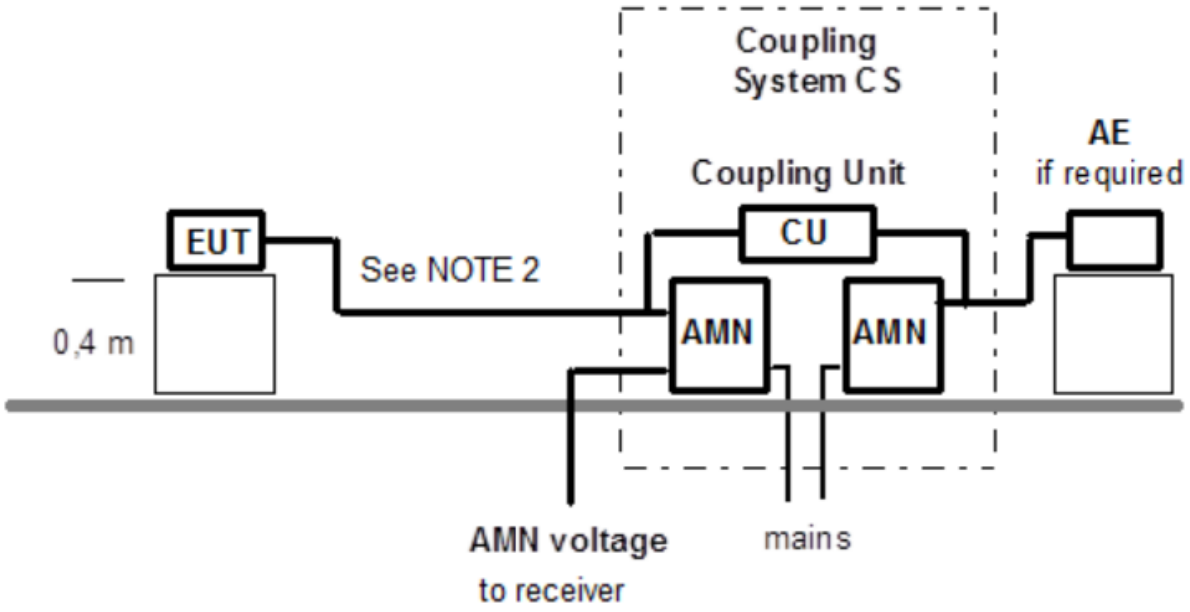
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R = No Calibration Request.

7.5.3. TEST PROCEDURES

- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 1.6065 MHz was searched.
- The test data of the worst-case condition(s) was recorded.

7.5.4. TEST SETUP



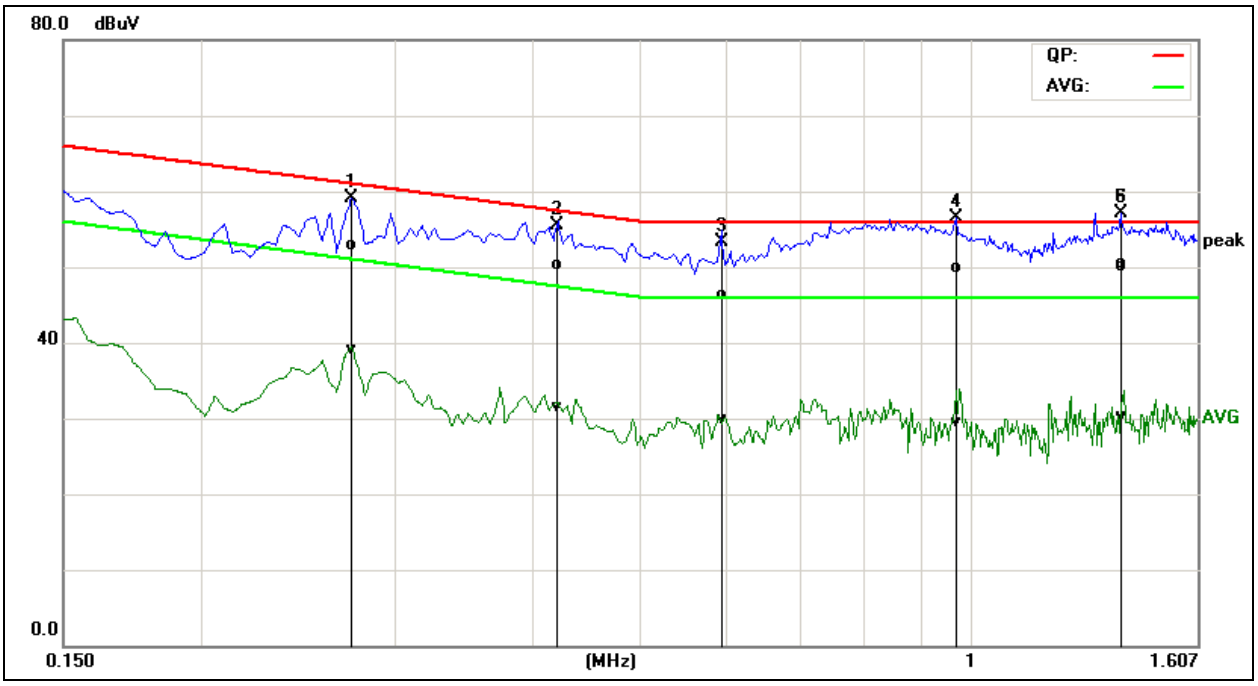
7.5.5. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

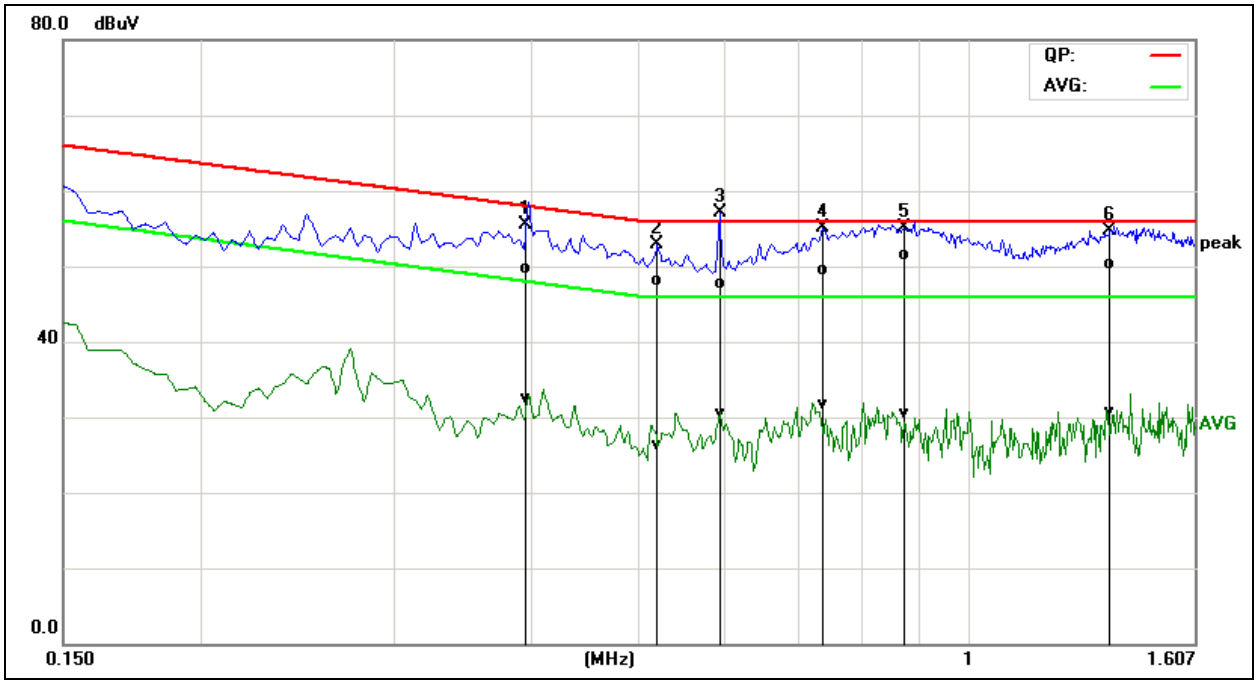
7.5.6. TEST RESULTS

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	RBW,VBW	9kHz
Tested By	Jacksan Luo	Line	L1
Tested Date	July 11, 2016		



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
0.2748	43.17	29.39	9.69	52.86	39.08	60.97	50.97	-8.11	-11.89	Pass
0.4186	40.64	21.92	9.68	50.32	31.60	57.48	47.48	-7.16	-15.88	Pass
0.5974	36.63	20.23	9.73	46.36	29.96	56.00	46.00	-9.64	-16.04	Pass
0.9631	40.09	19.85	9.72	49.81	29.57	56.00	46.00	-6.19	-16.43	Pass
1.3643	40.70	20.65	9.72	50.42	30.37	56.00	46.00	-5.58	-15.63	Pass
1.3634	40.38	20.38	9.72	50.10	30.10	56.00	46.00	-5.90	-15.90	Pass

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	22°C, 45% RH	RBW,VBW	9kHz
Tested By	Jacksan Luo	Line	L 2
Tested Date	July 11, 2016		



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
0.3936	39.96	22.69	9.72	49.68	32.41	57.99	47.99	-8.31	-15.58	Pass
0.5220	38.52	16.56	9.68	48.20	26.24	56.00	46.00	-7.80	-19.76	Pass
0.5943	37.94	20.86	9.68	47.62	30.54	56.00	46.00	-8.38	-15.46	Pass
0.7337	39.72	22.03	9.70	49.42	31.73	56.00	46.00	-6.58	-14.27	Pass
0.8751	41.81	20.70	9.76	51.57	30.46	56.00	46.00	-4.43	-15.54	Pass
1.3379	40.51	20.84	9.79	50.30	30.63	56.00	46.00	-5.70	-15.37	Pass

7.6. PLC PORT ASYMMETRIC DISTURBANCES TEST

7.6.1. LIMITS

Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

7.6.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/21/2016	02/20/2017
LISN	EMCO	3825/2	8901-1459	02/21/2016	02/20/2017
Signal Generator	ROHDE&SCHWARZ	SML03	100267	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/21/2016	02/20/2017
AC-Separator	SCHWARZBECK	AC-Separator	006	02/25/2016	02/24/2017
CS 50	SCHWARZBECK	CS 50	CS50-004	02/25/2016	02/24/2017
SPLIT 100 Symmetrical Splitter	SCHWARZBECK	SPLIT 100 Symmetrical Splitter	006	02/25/2016	02/24/2017
SY 9223-50561-1	SCHWARZBECK	SY 9223-50561-1	#5	02/25/2016	02/24/2017
SYMAT Symmetrical	SCHWARZBECK	SYMAT Symmetrical	011	02/25/2016	02/24/2017
ISN PLC	TESTQ	PLT-A	36243	02/21/2016	02/20/2017
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

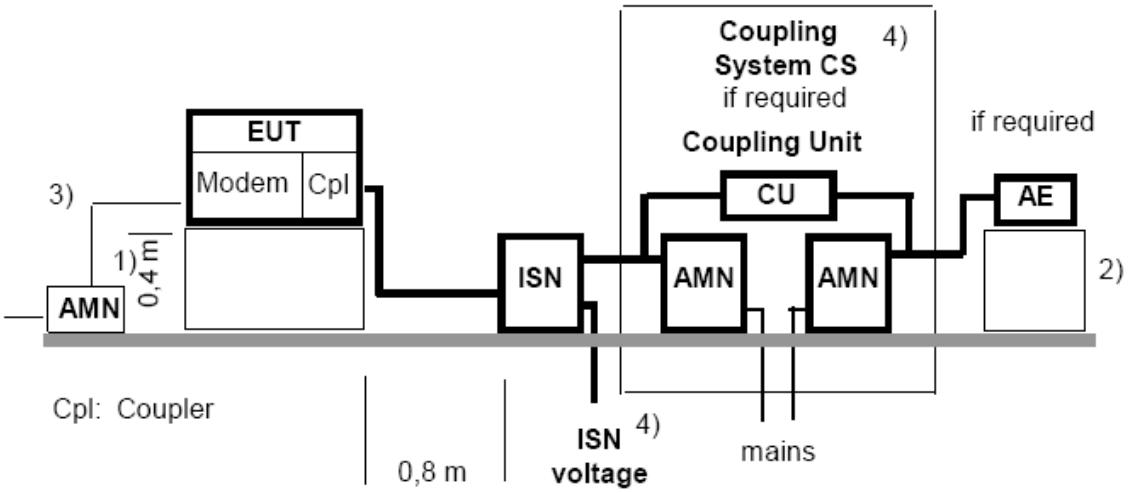
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

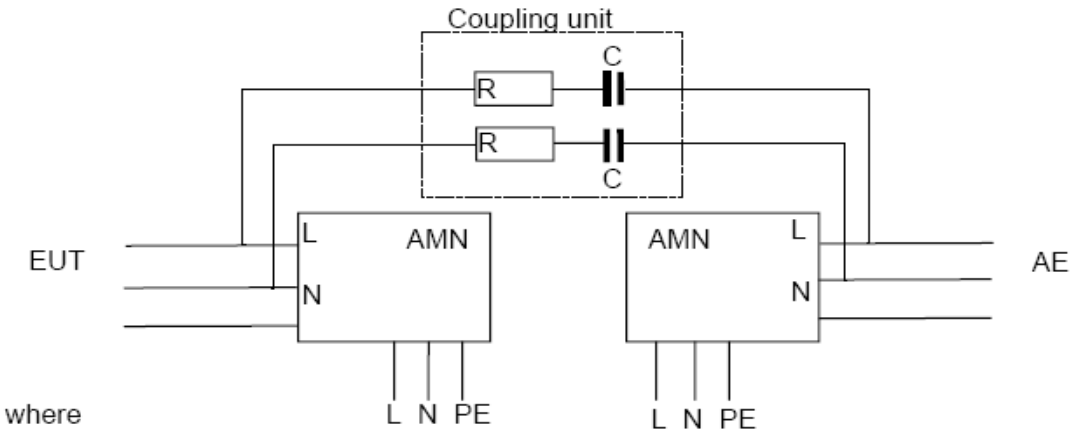
2. N.C.R = No Calibration Request.

7.6.3. TEST PROCEDURES

- The conducted asymmetric disturbances at the PLC port of the EUT shall be measured using the arrangement shown in 7.4.4 (1).
- The insertion loss (symmetric) between the two ports of the coupling system shall be such that the link to the AE works properly and that the EUT transmits at its maximum power level. 7.4.4 (2) shows an example coupling system with a nominal insertion loss of 40 dB.
- The ISN (55dB) shall be bonded directly to the reference ground plane.

7.6.4. TEST SETUP





where

R = 2,5 kΩ;

C = 1 nF.

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

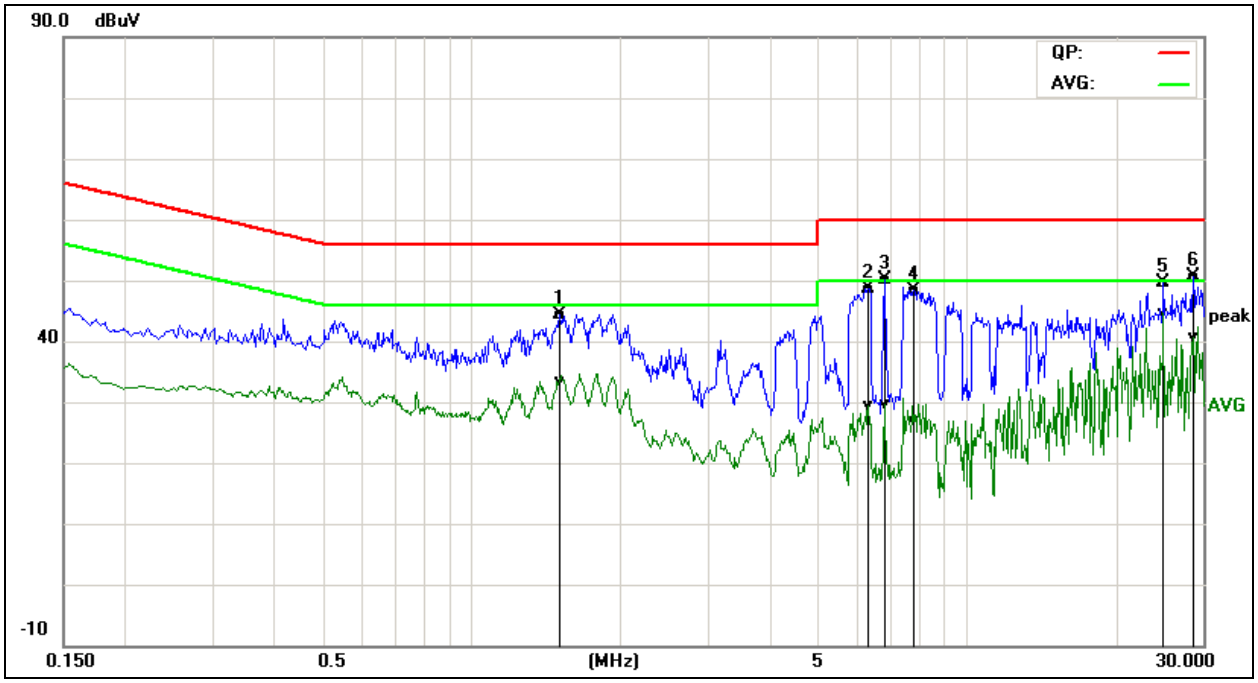
7.6.5. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

7.6.6 TEST RESULTS

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Tested By	Jacksan Luo
Tested Date	July 7, 2016		



Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1.5100	34.79	23.71	9.68	44.47	33.39	56.00	46.00	-11.53	-12.61	Pass
6.3260	38.97	19.66	9.77	48.74	29.43	60.00	50.00	-11.26	-20.57	Pass
6.8140	40.27	19.81	9.78	50.05	29.59	60.00	50.00	-9.95	-20.41	Pass
7.8340	38.66	17.05	9.79	48.45	26.84	60.00	50.00	-11.55	-23.16	Pass
24.9980	39.72	34.64	9.91	49.63	44.55	60.00	50.00	-10.37	-5.45	Pass
28.6860	40.69	30.78	9.94	50.63	40.72	60.00	50.00	-9.37	-9.28	Pass

7.7. PLC PORT UNSYMMETRICAL DISTURBANCES TEST

7.7.1 LIMITS

Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

7.7.2 EXCLUDED FREQUENCY RANGES

Table A.1

No.	Frequency Range (MHz)	No.	Frequency Range (MHz)	No.	Frequency Range (MHz)
1	1.80 – 2.00	8	7.00 – 7.30	15	18.068 – 18.168
2	2.85 – 3.025	9	8.815 – 8.965	16	21.00 – 21.45
3	3.40 – 4.00	10	10.005 – 10.15	17	21.924 – 22.00
4	4.65 – 4.70	11	11.275 – 11.4	18	24.89 – 24.99
5	5.25 – 5.45	12	13.26 – 13.36	19	26.96 – 27.41
6	5.48 – 5.68	13	14.00 – 14.35	20	28.00 – 29.7
7	6.525 – 6.685	14	17.9 –17.97	-	-

7.7.3 TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/21/2016	02/20/2017
LISN	EMCO	3825/2	8901-1459	02/21/2016	02/20/2017
Signal Generator	ROHDE&SCHWARZ	SML03	100267	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/21/2016	02/20/2017
AC-Separator	SCHWARZBECK	AC-Separator	006	02/25/2016	02/24/2017
CS 50	SCHWARZBECK	CS 50	CS50-004	02/25/2016	02/24/2017
SPLIT 100 Symmetrical Splitter	SCHWARZBECK	SPLIT 100 Symmetrical Splitter	006	02/25/2016	02/24/2017
SY 9223-50561-1	SCHWARZBECK	SY 9223-50561-1	#5	02/25/2016	02/24/2017
SYMAT Symmetrical	SCHWARZBECK	SYMAT Symmetrical	011	02/25/2016	02/24/2017
ISN PLC	TESTQ	PLT-A	36243	02/21/2016	02/20/2017
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

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.

7.7.4 TEST RESULTS

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Tested By	Jacksan Luo
Tested Date	July 11, 2016	Line	L1

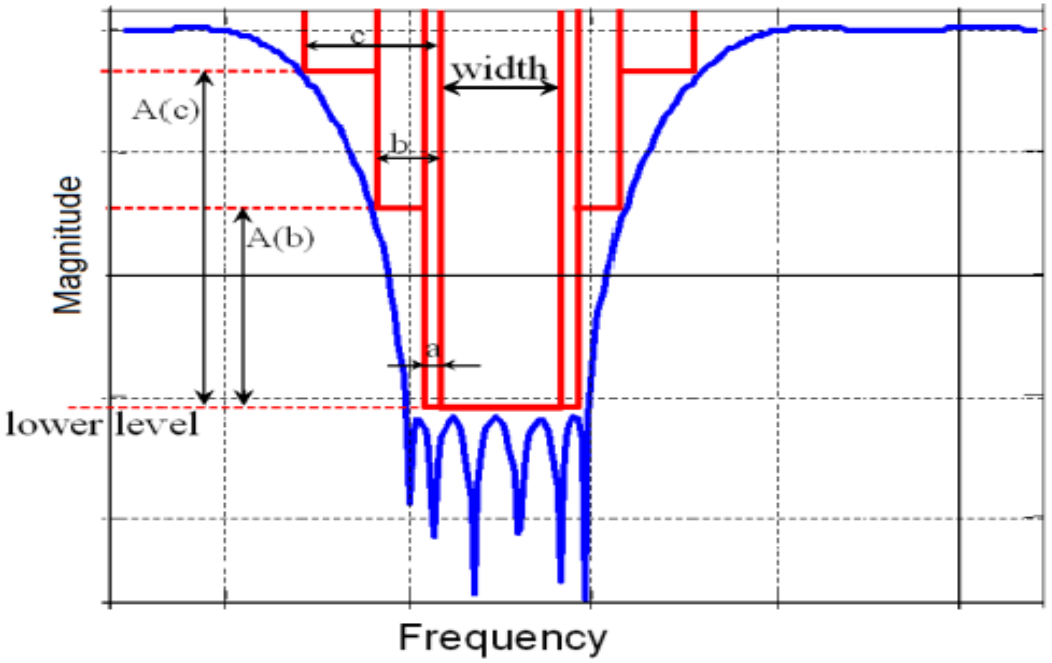
Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1.8520	41.19	19.59	9.71	50.90	29.30	56.00	46.00	-5.10	-16.70	Pass
2.9308	42.72	24.54	9.69	52.41	34.23	56.00	46.00	-3.59	-11.77	Pass
3.4520	41.93	24.55	9.67	51.60	34.22	56.00	46.00	-4.40	-11.78	Pass
4.6978	41.66	26.52	9.64	51.30	36.16	56.00	46.00	-4.70	-9.84	Pass
5.3180	44.15	24.26	9.65	53.80	33.91	60.00	50.00	-6.20	-16.09	Pass
5.5880	42.44	22.73	9.66	52.10	32.39	60.00	50.00	-7.90	-17.61	Pass
6.6490	45.89	20.51	9.71	55.60	30.22	60.00	50.00	-4.40	-19.78	Pass
7.0320	43.47	18.60	9.73	53.20	28.33	60.00	50.00	-6.80	-21.67	Pass
8.8910	45.11	24.84	9.99	55.10	34.83	60.00	50.00	-4.90	-15.17	Pass
10.0410	45.25	24.12	10.15	55.40	34.27	60.00	50.00	-4.60	-15.73	Pass
11.3790	45.62	24.53	10.08	55.70	34.61	60.00	50.00	-4.30	-15.39	Pass
13.2800	46.11	26.50	9.99	56.10	36.49	60.00	50.00	-3.90	-13.51	Pass
14.3040	44.36	25.39	9.94	54.30	35.33	60.00	50.00	-5.70	-14.67	Pass
17.9599	43.88	22.96	9.92	53.80	32.88	60.00	50.00	-6.20	-17.12	Pass
18.0720	42.98	23.96	9.92	52.90	33.88	60.00	50.00	-7.10	-16.12	Pass
21.0120	43.48	24.36	9.92	53.40	34.28	60.00	50.00	-6.60	-15.72	Pass
21.9240	45.27	24.30	9.93	55.20	34.23	60.00	50.00	-4.80	-15.77	Pass
24.8980	43.16	24.72	9.94	53.10	34.66	60.00	50.00	-6.90	-15.34	Pass
27.4040	42.68	16.51	10.02	52.70	26.53	60.00	50.00	-7.30	-23.47	Pass
29.4120	42.52	14.63	10.08	52.60	24.71	60.00	50.00	-7.40	-25.29	Pass

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Tested By	Jacksan Luo
Tested Date	July 8, 2016	Line	L2

Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1.9240	41.58	22.13	9.72	51.30	31.85	56.00	46.00	-4.70	-14.15	Pass
2.8620	42.38	20.60	9.72	52.10	30.32	56.00	46.00	-3.90	-15.68	Pass
3.4284	40.05	20.80	9.72	49.77	30.52	56.00	46.00	-6.23	-15.48	Pass
4.6860	42.57	21.40	9.73	52.30	31.13	56.00	46.00	-3.70	-14.87	Pass
5.2540	42.37	23.20	9.73	52.10	32.93	60.00	50.00	-7.90	-17.07	Pass
5.5240	42.57	23.22	9.73	52.30	32.95	60.00	50.00	-7.70	-17.05	Pass
6.5370	43.67	21.70	9.73	53.40	31.43	60.00	50.00	-6.60	-18.57	Pass
7.2280	44.54	18.54	9.76	54.30	28.30	60.00	50.00	-5.70	-21.70	Pass
8.8710	42.61	21.09	9.99	52.60	31.08	60.00	50.00	-7.40	-18.92	Pass
10.0170	44.05	21.19	10.15	54.20	31.34	60.00	50.00	-5.80	-18.66	Pass
11.2830	43.36	25.90	10.04	53.40	35.94	60.00	50.00	-6.60	-14.06	Pass
13.2840	44.34	25.68	9.86	54.20	35.54	60.00	50.00	-5.80	-14.46	Pass
14.3480	44.13	24.81	9.77	53.90	34.58	60.00	50.00	-6.10	-15.42	Pass
17.9400	42.93	23.31	9.77	52.70	33.08	60.00	50.00	-7.30	-16.92	Pass
18.1040	43.82	23.18	9.78	53.60	32.96	60.00	50.00	-6.40	-17.04	Pass
21.1680	42.88	19.21	9.82	52.70	29.03	60.00	50.00	-7.30	-20.97	Pass
21.9320	42.77	21.84	9.83	52.60	31.67	60.00	50.00	-7.40	-18.33	Pass
24.9460	42.56	19.67	9.84	52.40	29.51	60.00	50.00	-7.60	-20.49	Pass
27.3920	42.48	18.15	9.92	52.40	28.07	60.00	50.00	-7.60	-21.93	Pass
29.4920	41.42	19.95	9.98	51.40	29.93	60.00	50.00	-8.60	-20.07	Pass

7.8. DYNAMIC EXCLUDED FREQUENCY RANGES

7.8.1 LIMITS



Width≥10kHz, lower level = 56 dB(uV) (AV, Resolution bandwidth 9kHz) and

	Width increment on each side of the excluded frequency range kHz	Maximum level above the lower level of the notch (A(x)) dB
Step a	2	0
Step b	10	≤25
Step c	20	≤35

7.8.2 EXCLUDED FREQUENCY RANGES

Table A.2

No.	Frequency Range (MHz)	No.	Frequency Range (MHz)
1	2.30 – 2.498	8	11.55 – 12.10
2	3.20 – 3.40	9	13.55 – 13.90
3	3.90 – 4.05	10	15.05 – 15.85
4	4.75 – 5.11	11	17.40 – 17.90
5	5.75 – 6.20	12	18.90 – 19.02
6	7.20 – 7.70	13	21.45 – 21.85
7	9.30 – 9.95	14	25.65 – 26.10

The test signal modulates 20 individual signals within the HF broadcasting bands

No.	Frequencies (MHz)	No.	Frequencies (MHz)
1	4.75	6	11.65
2	5.9	7	11.69
3	7.2	8	15.1
4	11.6	9	21.45
5	11.62	10	25.67

7.8.3 TEST INSTRUMENTS

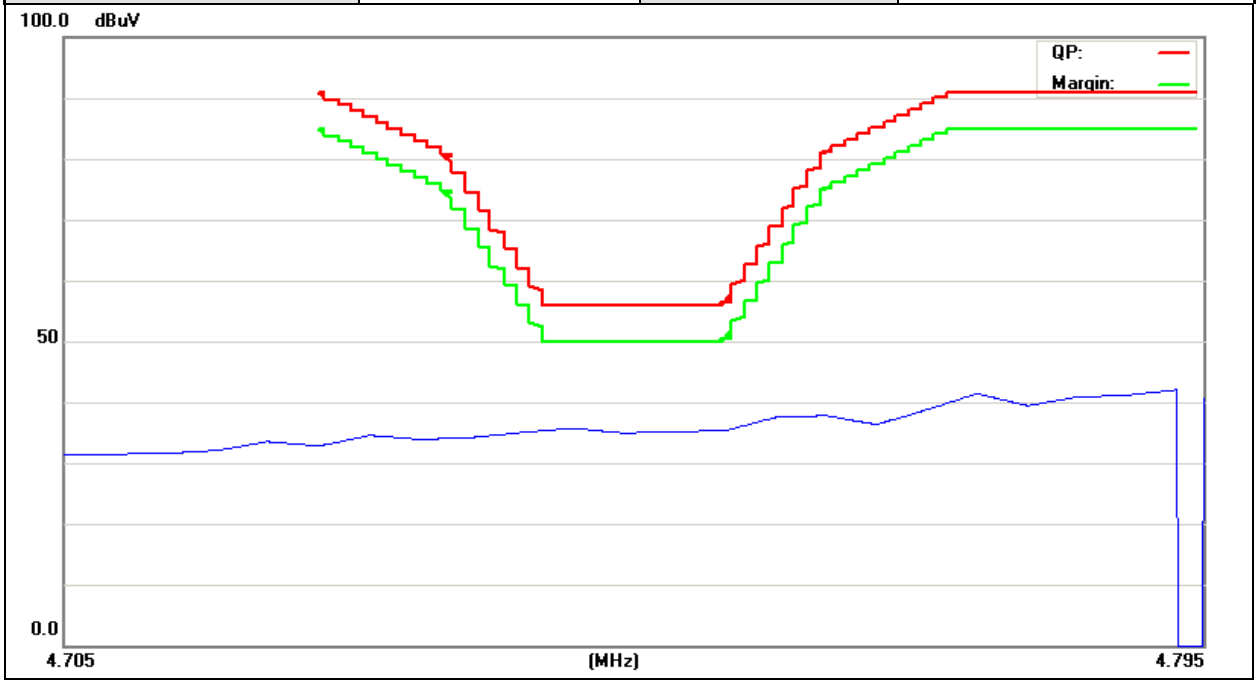
Conducted Emission Test Site					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/21/2016	02/20/2017
LISN	EMCO	3825/2	8901-1459	02/21/2016	02/20/2017
Signal Generator	ROHDE&SCHWARZ	SML03	100267	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/21/2016	02/20/2017
AC-Separator	SCHWARZBECK	AC-Separator	006	02/25/2016	02/24/2017
CS 50	SCHWARZBECK	CS 50	CS50-004	02/25/2016	02/24/2017
SPLIT 100 Symmetrical Splitter	SCHWARZBECK	SPLIT 100 Symmetrical Splitter	006	02/25/2016	02/24/2017
SY 9223-50561-1	SCHWARZBECK	SY 9223-50561-1	#5	02/25/2016	02/24/2017
SYMAT Symmetrical	SCHWARZBECK	SYMAT Symmetrical	011	02/25/2016	02/24/2017
ISN PLC	TESTQ	PLT-A	36243	02/21/2016	02/20/2017
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

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.

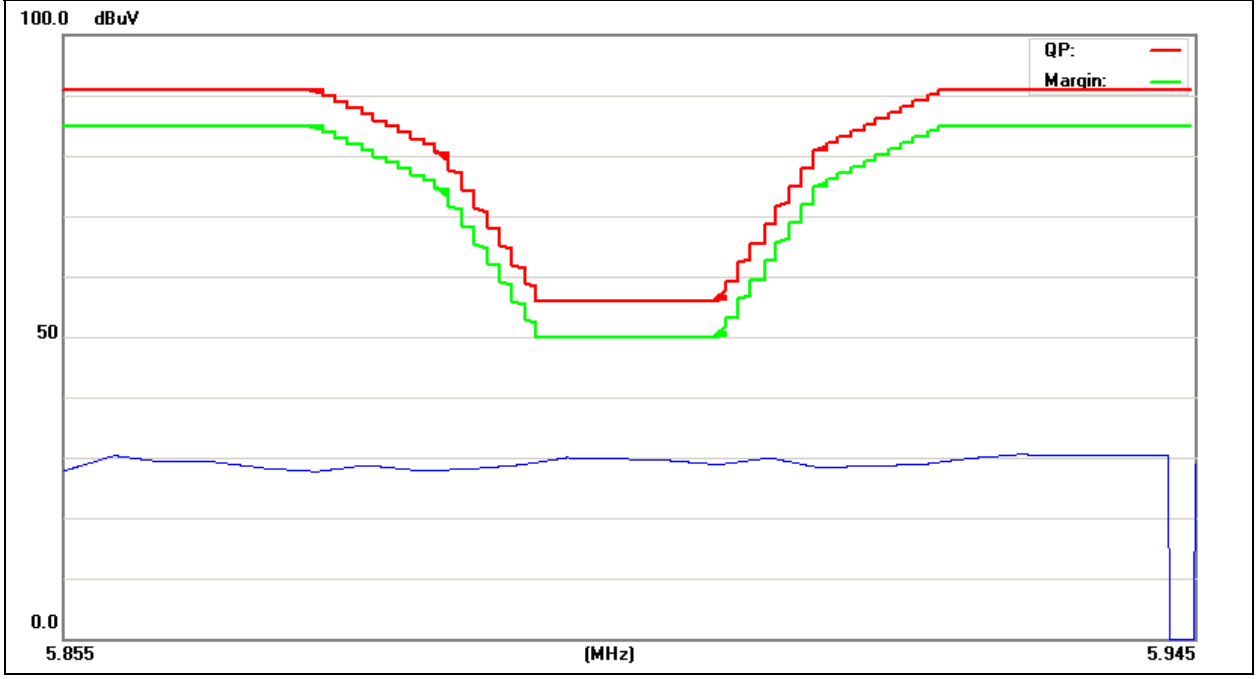
7.8.4 TEST RESULTS

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Tested By	Jacksan Luo
Tested Date	July 11, 2016		

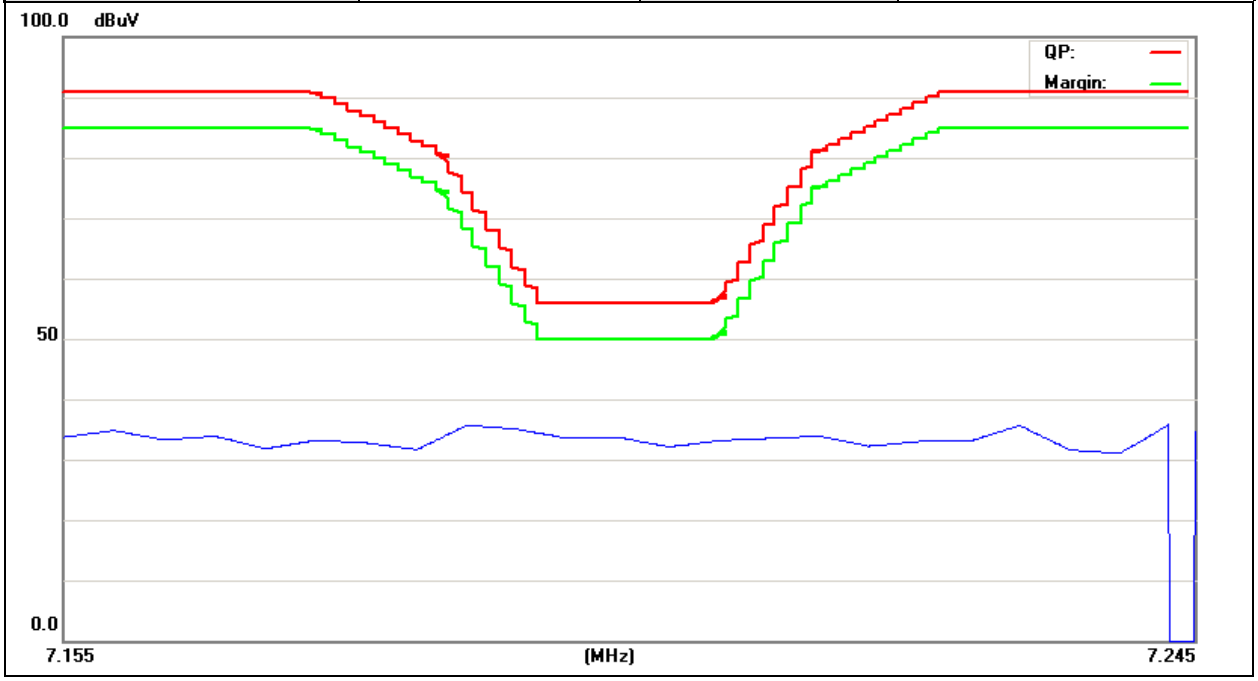
Frequency Range (MHz)	4.75	Test Result:	Pass



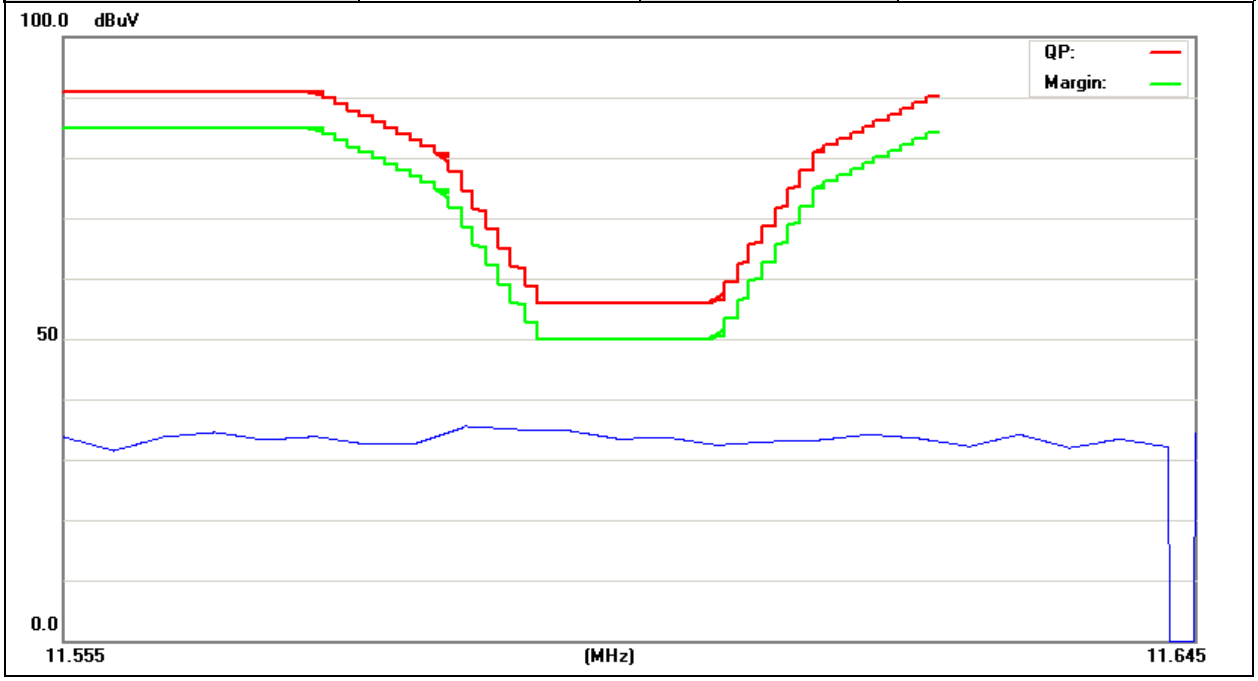
Frequency Range (MHz)	5.9	Test Result:	Pass



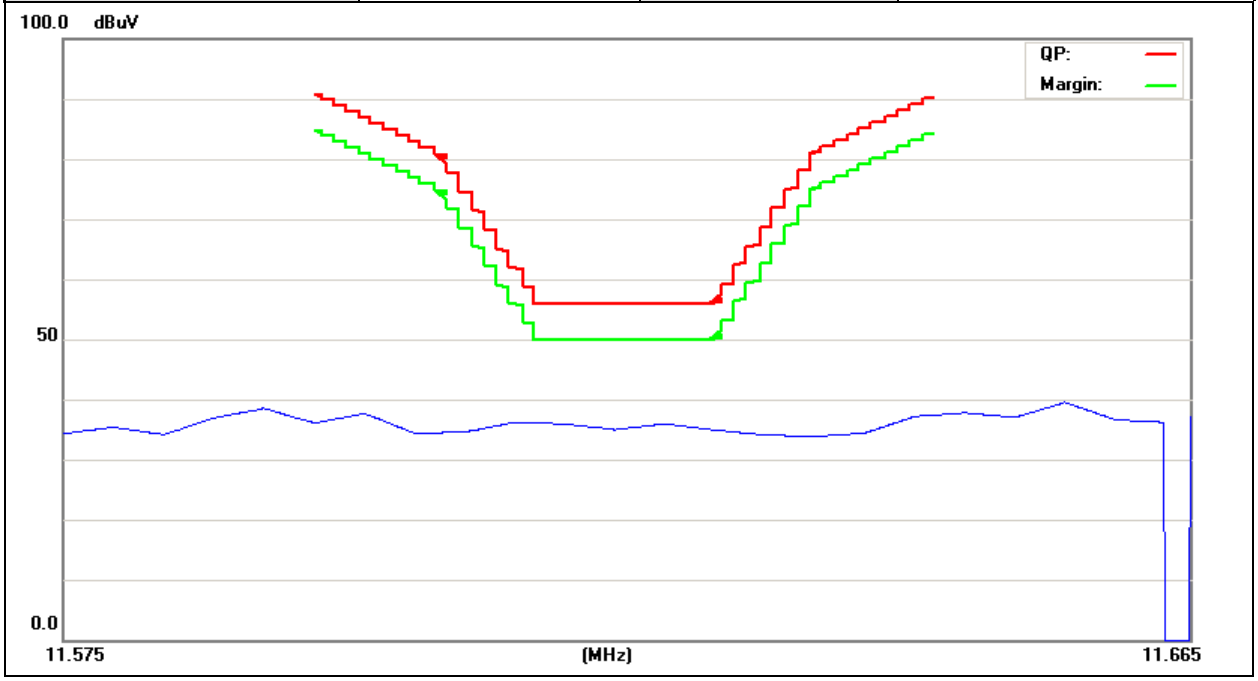
Frequency Range (MHz)	7.2	Test Result:	Pass



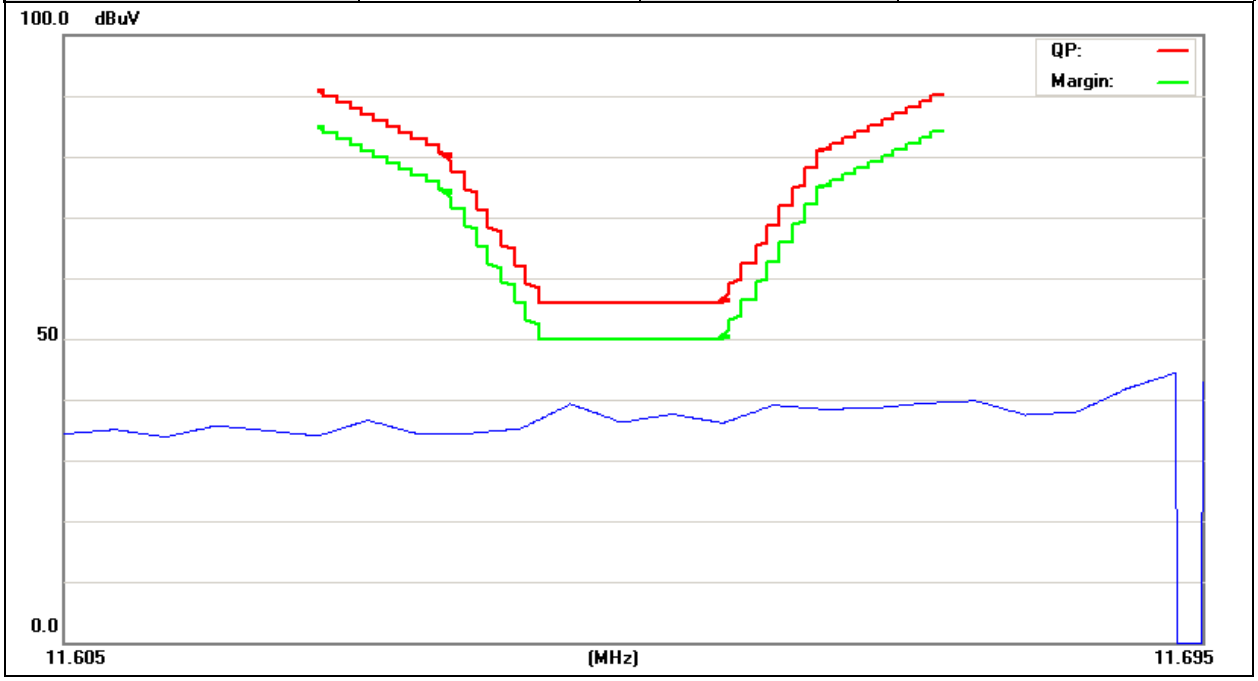
Frequency Range (MHz)	11.6	Test Result:	Pass



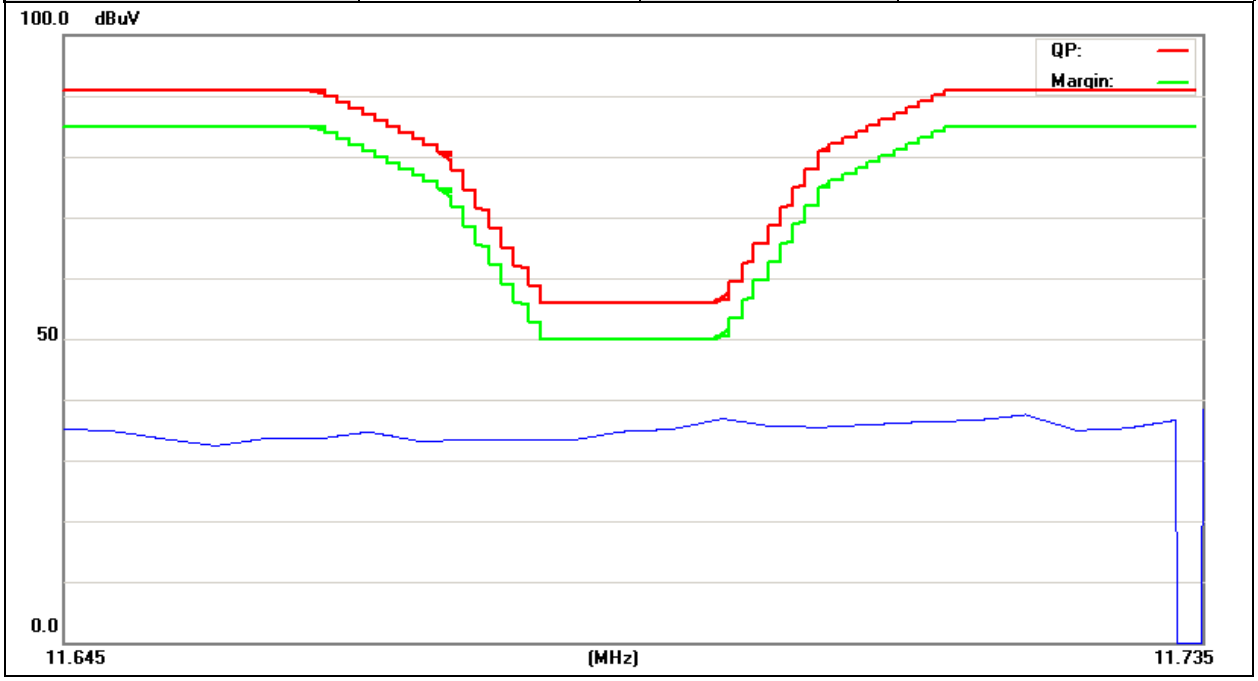
Frequency Range (MHz)	11.62	Test Result:	Pass



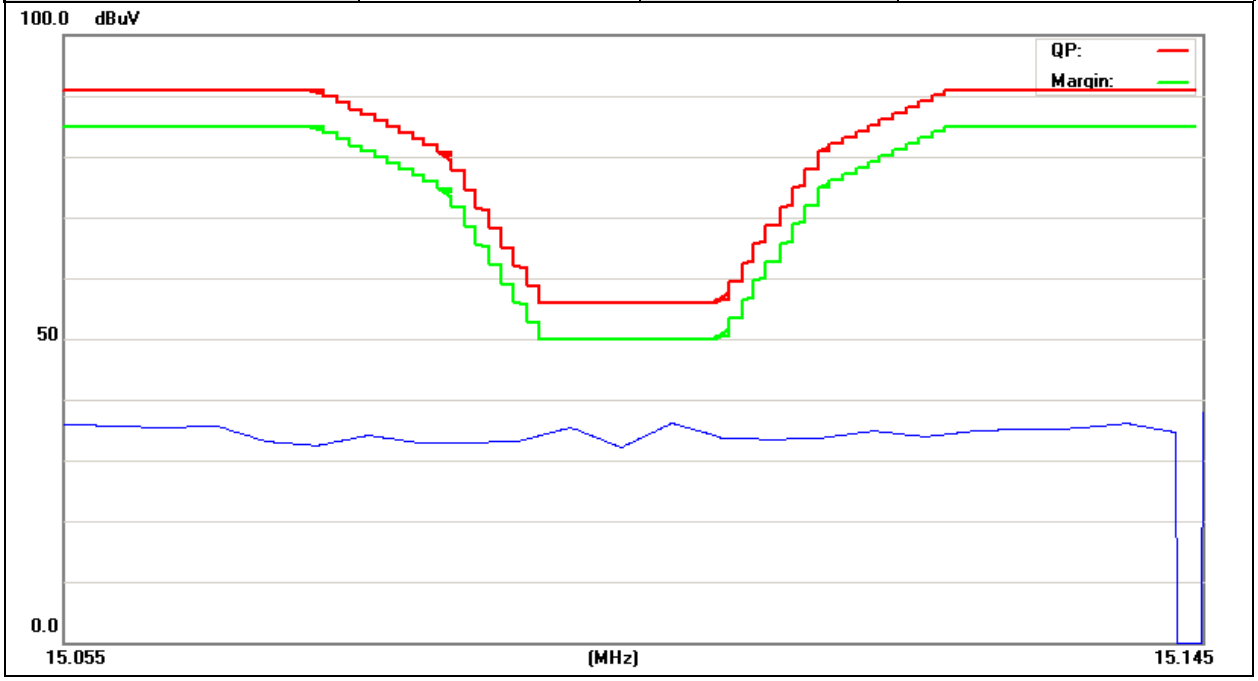
Frequency Range (MHz)	11.65	Test Result:	Pass



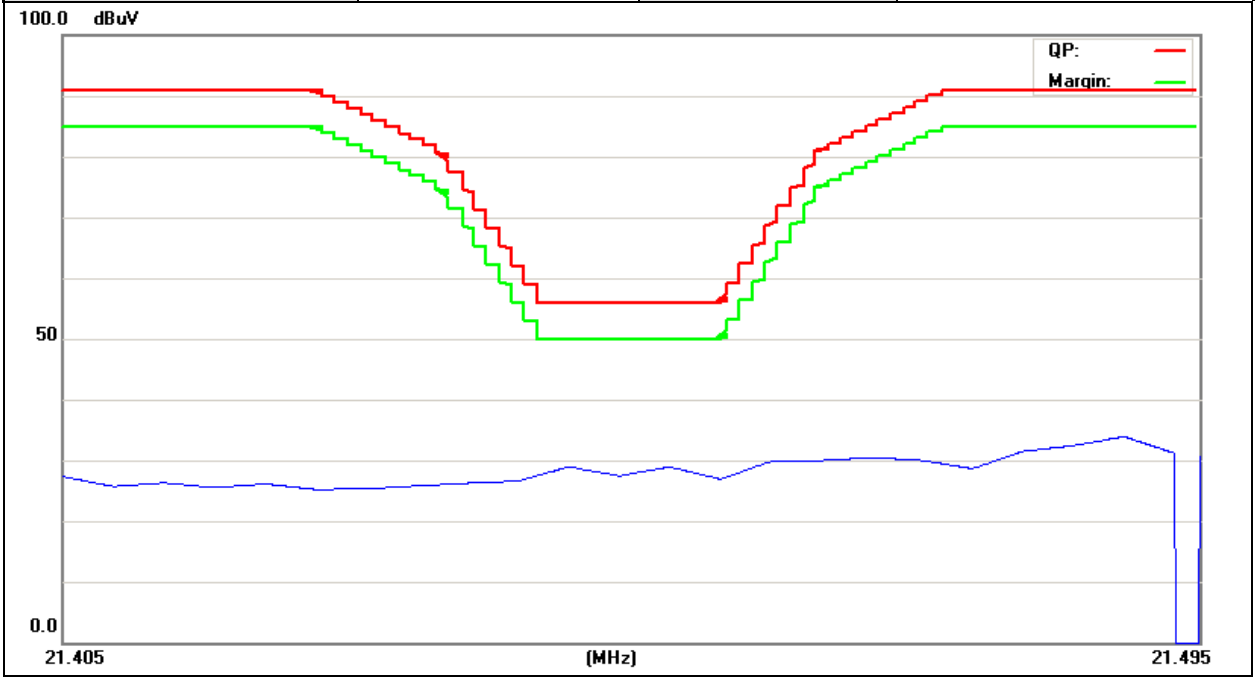
Frequency Range (MHz)	11.69	Test Result:	Pass



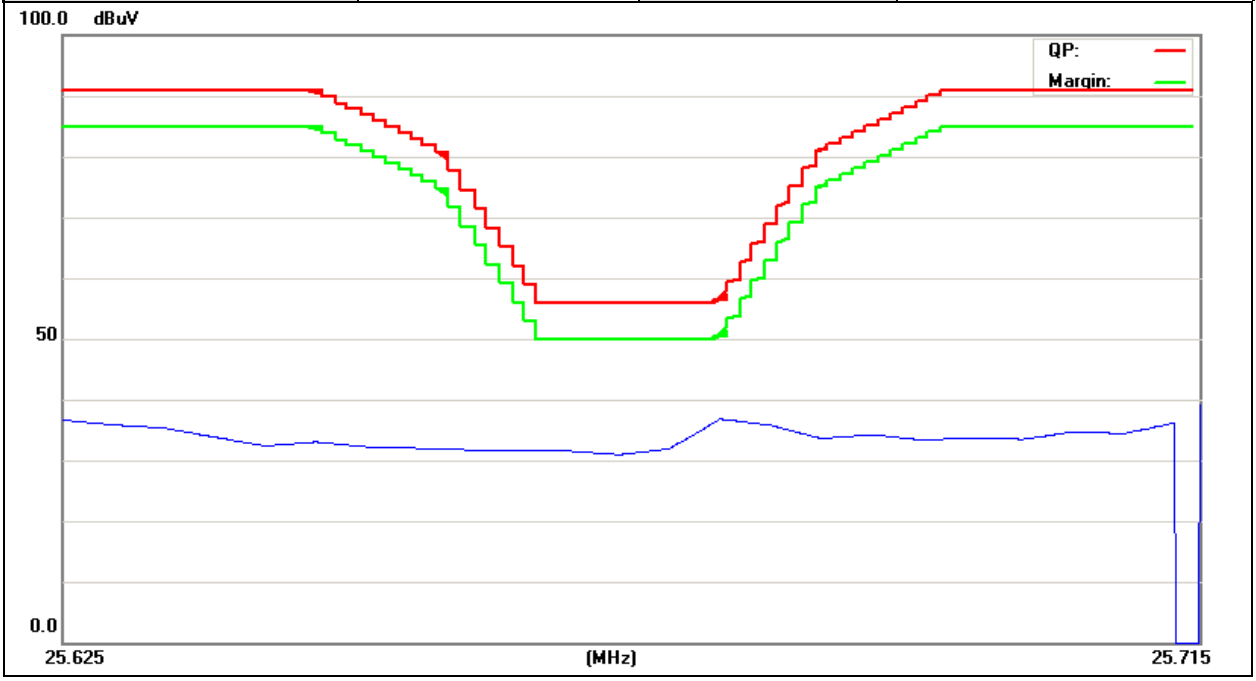
Frequency Range (MHz)	15.1	Test Result:	Pass



Frequency Range (MHz)	21.45	Test Result:	Pass



Frequency Range (MHz)	25.67	Test Result:	Pass



7.9. MAXIMUM PLC TRANSMIT SIGNAL LEVEL

7.9.1. LIMITS

Maximum PLC transmit signal level between 1.6065 MHz and 30 MHz:

Symmetrical mode insertion loss EUT to AE in dB	10	20	≥40	50
Maximum transmit signal level in dB(μV) (AV)	65	75	95	95
Maximum transmit signal level in dB(μV) (PK)	75	85	105	105

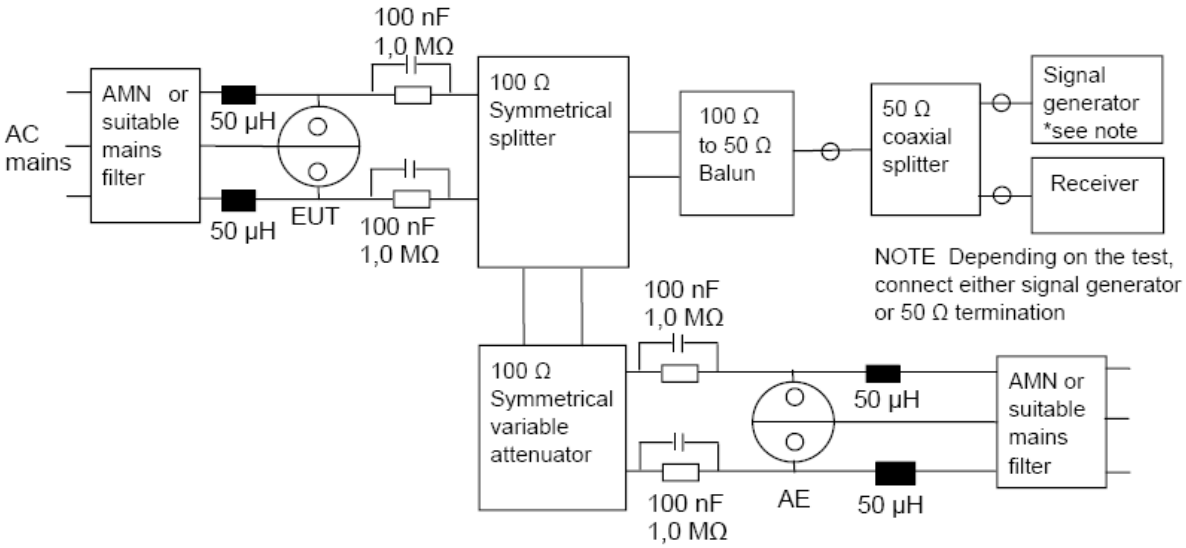
NOTE: The transmit power management function of an AE should operate in the same way as the EUT otherwise the signal of the AE may dominate and cause erroneous results during measurement.

7.9.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2016	02/20/2017
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	02/21/2016	02/20/2017
LISN	EMCO	3825/2	8901-1459	02/21/2016	02/20/2017
Signal Generator	ROHDE&SCHWARZ	SML03	100267	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	02/21/2016	02/20/2017
AC-Separator	SCHWARZBECK	AC-Separator	006	02/25/2016	02/24/2017
CS 50	SCHWARZBECK	CS 50	CS50-004	02/25/2016	02/24/2017
SPLIT 100 Symmetrical Splitter	SCHWARZBECK	SPLIT 100 Symmetrical Splitter	006	02/25/2016	02/24/2017
SY 9223-50561-1	SCHWARZBECK	SY 9223-50561-1	#5	02/25/2016	02/24/2017
SYMAT Symmetrical	SCHWARZBECK	SYMAT Symmetrical	011	02/25/2016	02/24/2017
ISN PLC	TESTQ	PLT-A	36243	02/21/2016	02/20/2017
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

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.

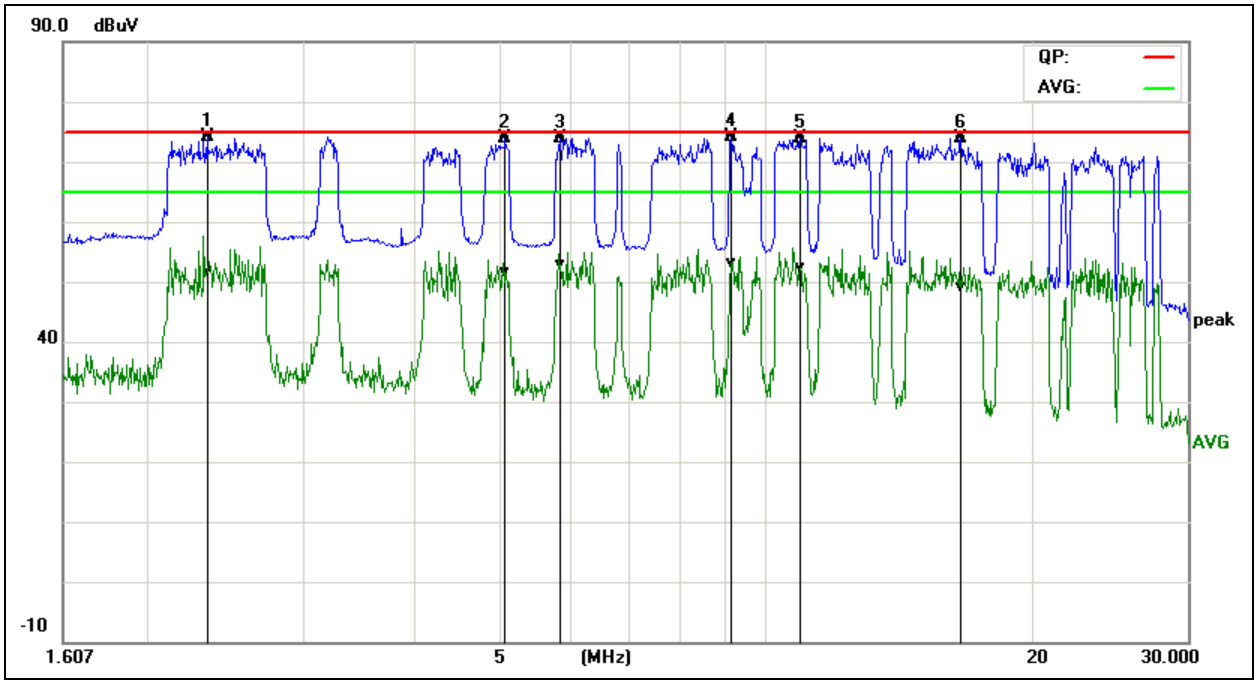
7.9.3. TEST SETUP



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

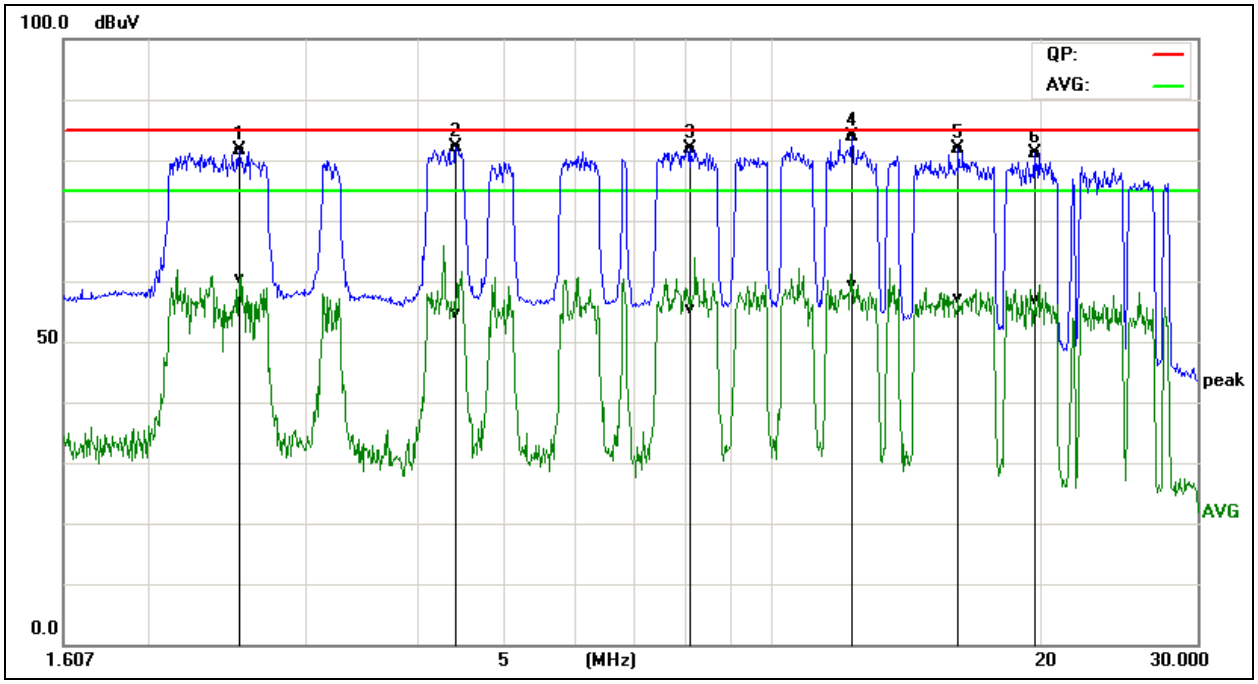
7.9.4. TEST RESULT

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Max Power Level	10dB
Tested by	Jacksan Luo	Tested Date	July 11, 2016



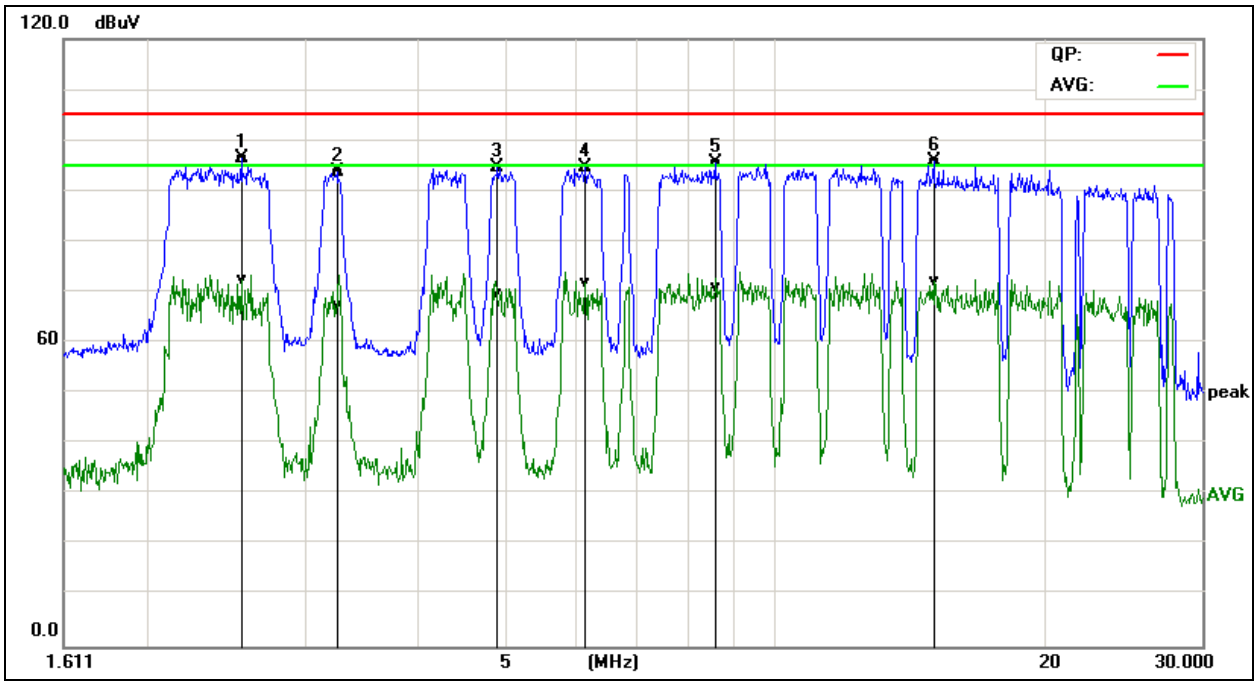
Frequency	Peak Reading	Average Reading	Correction Factor	Peak Result	Average Result	Peak Limit	Average Limit	Peak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
2.3425	54.93	32.72	19.24	74.17	51.96	75.00	65.00	-0.83	-13.04	Pass
5.0784	54.52	32.44	19.28	73.80	51.72	75.00	65.00	-1.20	-13.28	Pass
5.8584	54.58	33.52	19.28	73.86	52.80	75.00	65.00	-1.14	-12.20	Pass
9.1664	54.41	33.41	19.68	74.09	53.09	75.00	65.00	-0.91	-11.91	Pass
10.9584	54.09	32.56	19.85	73.94	52.41	75.00	65.00	-1.06	-12.59	Pass
16.6264	53.74	29.12	20.11	73.85	49.23	75.00	65.00	-1.15	-15.77	Pass

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Max Power Level	20dB
Tested by	Jacksan Luo	Tested Date	July 8, 2016



Frequency	Peak Reading	Average Reading	Correction Factor	Peak Result	Average Result	Peak Limit	Average Limit	Peak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
2.5345	62.44	41.03	19.24	81.68	60.27	85.00	75.00	-3.32	-14.73	Pass
4.4345	62.76	35.43	19.27	82.03	54.70	85.00	75.00	-2.97	-20.30	Pass
8.1264	62.47	35.78	19.49	81.96	55.27	85.00	75.00	-3.04	-19.73	Pass
12.3025	64.14	39.63	19.86	84.00	59.49	85.00	75.00	-1.00	-15.51	Pass
16.2105	61.77	37.13	20.05	81.82	57.18	85.00	75.00	-3.18	-17.82	Pass
19.6865	60.55	36.45	20.55	81.10	57.00	85.00	75.00	-3.90	-18.00	Pass

Model No.	P200	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	Max Power Level	40dB
Tested by	Jacksan Luo	Tested Date	July 8, 2016



Frequency	Peak Reading	Average Reading	Correction Factor	Peak Result	Average Result	Peak Limit	Average Limit	Peak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
2.5385	77.28	53.29	19.24	96.52	72.53	105.00	95.00	-8.48	-22.47	Pass
3.2465	74.44	48.12	19.25	93.69	67.37	105.00	95.00	-11.31	-27.63	Pass
4.9064	75.26	50.61	19.28	94.54	69.89	105.00	95.00	-10.46	-25.11	Pass
6.1545	75.26	52.45	19.28	94.54	71.73	105.00	95.00	-10.46	-23.27	Pass
8.5825	76.05	51.46	19.57	95.62	71.03	105.00	95.00	-9.38	-23.97	Pass
15.0425	76.03	52.18	19.89	95.92	72.07	105.00	95.00	-9.08	-22.93	Pass

7.10. HARMONICS CURRENT MEASUREMENT

7.10.1. 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:

13. *Class A and Class D are classified according to item 7.4.3.*
14. *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.*

7.10.2. TEST INSTRUMENTS

Harmonic Current Measurement (EN 61000-3-2)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Power Source	SCHAFFNER	NSG1007	54789	02/21/2016	02/20/2017
Harmonic & Flicker Tester	SCHAFFNER	CCN1000	72045	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017

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

7.10.3. 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.

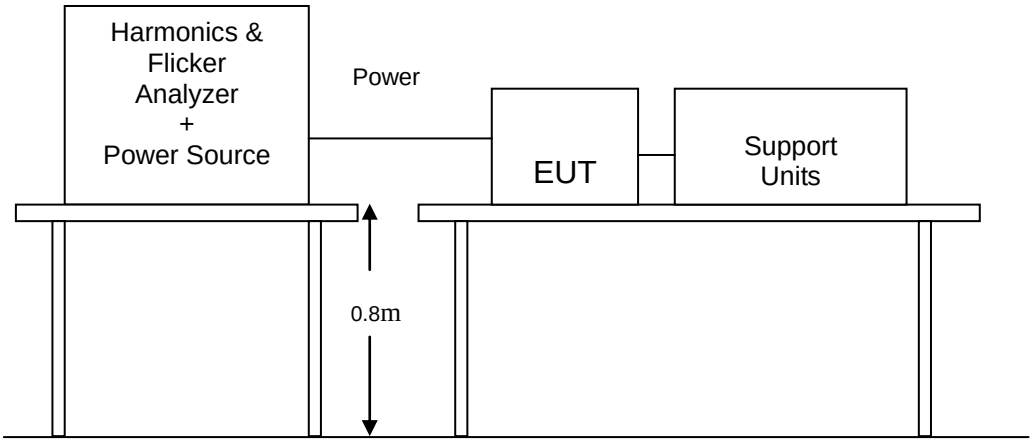
Class B: Portable tools; Arc welding equipment which is not professional equipment.

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.

7.10.4. TEST SETUP



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

7.10.5. TEST RESULTS

POWER CONSUMPTION	5.0W	**Test Results**	PASS
ENVIRONMENTAL CONDITIONS	23°C,55% RH, 1011mbar	**Limits**	Class ☒ A ☐ B ☐ C ☐ D
Test Mode	Mode 1	**Tested by**	Jacksan Luo

NOTE: 1. Limits classified according to item 7.4.3.
2.According to clause 7 of EN 61000-3-2, equipment with a rated power of 75W or less, no limits apply. The test result is only for reference.

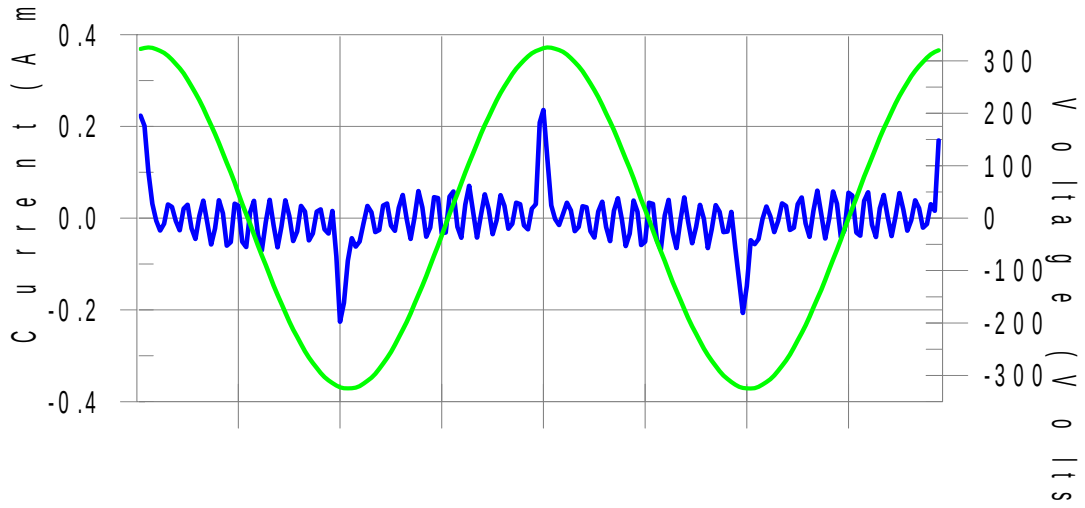
Remark: The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.

Harmonics – Class-A

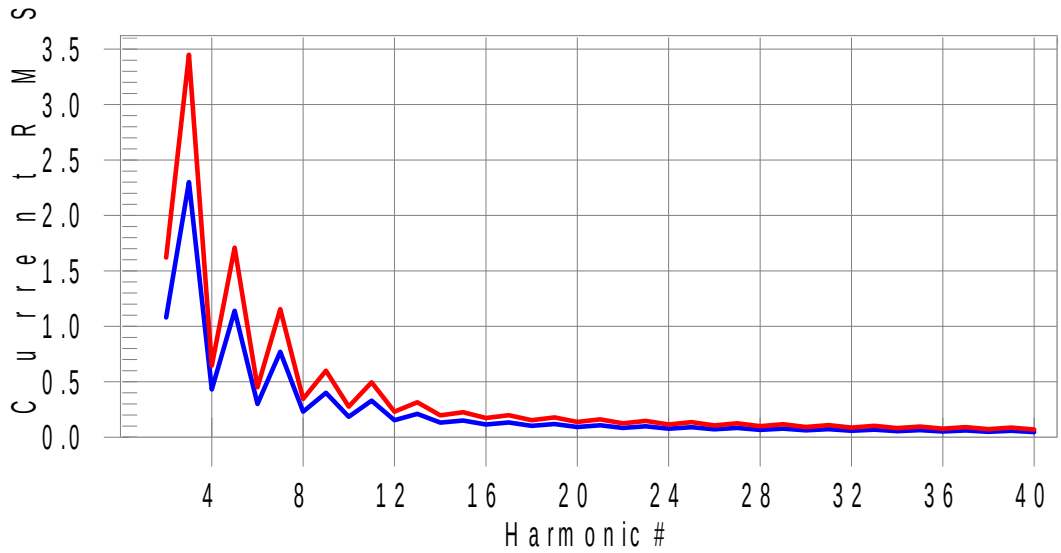
EUT: 200M Powerline Adapter **Tested by: Jacksan Luo**
Test category: Class-A (European limits) **Test Margin: 100**
Test date: 2016/7/12 **Start time: 10:09:37** **End time: 10:19:59**
Test duration (min): 10 **Data file name: H-000377.cts_data**
Comment: P200
Customer: SHENZHEN TENDA TECHNOLOGY CO.,LTD

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass **Worst harmonic was #15 with 6.4% of the limit.**

Current Test Result Summary

EUT: 200M Powerline Adapter **Tested by: Jacksan Luo**
Test category: Class-A (European limits) **Test Margin: 100**
Test date: 2016/7/12 **Start time: 10:09:37** **End time: 10:19:59**
Test duration (min): 10 **Data file name: H-000377.cts_data**
Comment: P200
Customer: SHENZHEN TENDA TECHNOLOGY CO.,LTD

Test Result: Pass **Source qualification: Normal**

THC(A): 0.042 **I-THD(%): 182.3** **POHC(A): 0.009** **POHC Limit(A): 0.251**
Highest parameter values during test:

V_RMS (Volts):	**230.04**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**0.298**	**I_RMS (Amps):**	**0.059**
I_Fund (Amps):	**0.024**	**Crest Factor:**	**5.263**
Power (Watts):	**5.0**	**Power Factor:**	**0.381**

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.002	1.620	N/A	Pass
3	0.018	2.300	0.8	0.020	3.450	0.6	Pass
4	0.001	0.430	N/A	0.001	0.645	N/A	Pass
5	0.017	1.140	1.5	0.017	1.710	1.0	Pass
6	0.001	0.300	N/A	0.001	0.450	N/A	Pass
7	0.016	0.770	2.1	0.016	1.155	1.4	Pass
8	0.001	0.230	N/A	0.001	0.345	N/A	Pass
9	0.014	0.400	3.6	0.015	0.600	2.5	Pass
10	0.001	0.184	N/A	0.001	0.276	N/A	Pass
11	0.013	0.330	3.8	0.013	0.495	2.6	Pass
12	0.001	0.153	N/A	0.001	0.230	N/A	Pass
13	0.011	0.210	5.3	0.011	0.315	3.6	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.010	0.150	6.4	0.010	0.225	4.4	Pass
16	0.001	0.115	N/A	0.001	0.173	N/A	Pass
17	0.008	0.132	6.3	0.009	0.198	4.4	Pass
18	0.001	0.102	N/A	0.001	0.153	N/A	Pass
19	0.007	0.118	6.2	0.008	0.178	4.3	Pass
20	0.001	0.092	N/A	0.001	0.138	N/A	Pass
21	0.006	0.107	6.0	0.007	0.161	4.2	Pass
22	0.001	0.084	N/A	0.001	0.125	N/A	Pass
23	0.006	0.098	5.8	0.006	0.147	4.1	Pass
24	0.001	0.077	N/A	0.001	0.115	N/A	Pass
25	0.005	0.090	N/A	0.005	0.135	N/A	Pass
26	0.001	0.071	N/A	0.001	0.107	N/A	Pass
27	0.004	0.083	N/A	0.005	0.125	N/A	Pass
28	0.001	0.066	N/A	0.001	0.099	N/A	Pass
29	0.004	0.078	N/A	0.004	0.116	N/A	Pass
30	0.001	0.061	N/A	0.001	0.092	N/A	Pass
31	0.003	0.073	N/A	0.003	0.109	N/A	Pass
32	0.001	0.058	N/A	0.001	0.086	N/A	Pass
33	0.002	0.068	N/A	0.002	0.102	N/A	Pass
34	0.001	0.054	N/A	0.001	0.081	N/A	Pass
35	0.002	0.064	N/A	0.002	0.096	N/A	Pass
36	0.001	0.051	N/A	0.001	0.077	N/A	Pass
37	0.001	0.061	N/A	0.001	0.091	N/A	Pass
38	0.001	0.048	N/A	0.001	0.073	N/A	Pass
39	0.001	0.058	N/A	0.001	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass

7.11. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.11.1. 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 3.3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.11.2. TEST INSTRUMENTS

Voltage Fluctuation/Flicker Measurement (EN 61000-3-3)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Power Source	SCHAFFNER	NSG1007	54789	02/21/2016	02/20/2017
Harmonic & Flicker Tester	SCHAFFNER	CCN1000	72045	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017

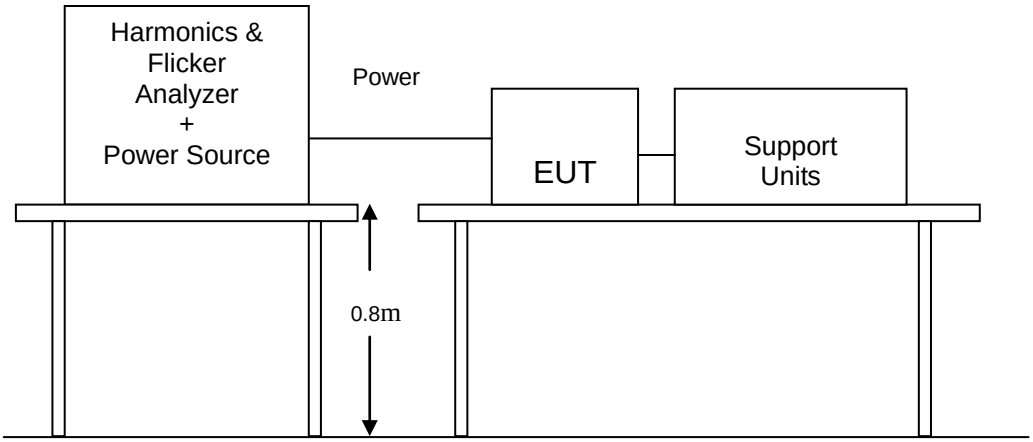
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.11.3. 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 flicker 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.

7.11.4. TEST SETUP



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

7.11.5. TEST RESULTS

Observation Period (Tp)	10mins	**Test Mode**	Mode 1
Environmental Conditions	23°C,55% RH, 1011mbar	**Tested by**	Jacksan Luo

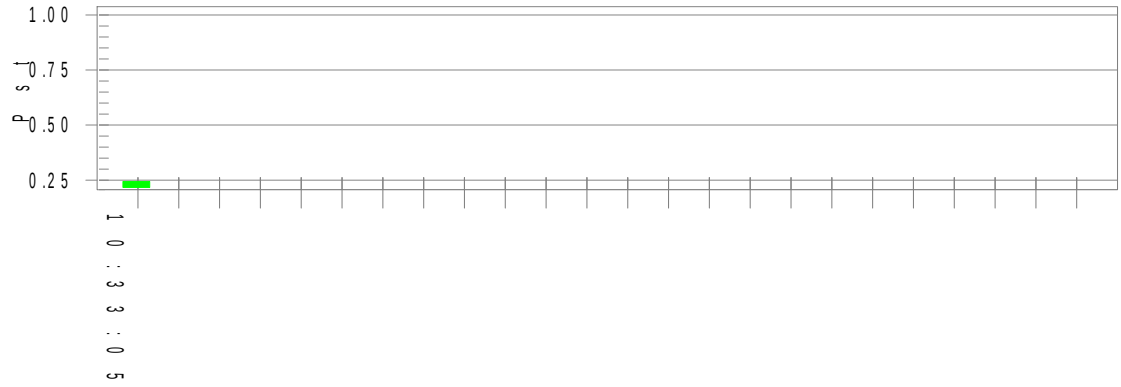
Remark: The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.

Flicker Test Summary

EUT: 200M Powerline Adapter **Tested by: Jacksan Luo**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 2016/7/12 **Start time: 10:22:35** **End time: 10:33:06**
Test duration (min): 10 **Data file name: F-000378.cts_data**
Comment: P200
Customer: SHENZHEN TENDA TECHNOLOGY CO.,LTD

Test Result: Pass **Status: Test Completed**

Pst_i and limit line **European Limits**



Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt):	**229.97**			
Highest dt (%):	**0.00**	**Test limit (%):**	**N/A**	**N/A**
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.04**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.244**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.107**	**Test limit:**	**0.650**	**Pass**

8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 50412-2-1:2005+AC:2009 & EN 55024: 2010+A1: 2015	
	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	**EN 50412-2-1:2005+AC:2009** Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
		EN 55024: 2010+A1: 2015 Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4	**EN 50412-2-1:2005+AC:2009** Electrical Fast Transient/Burst - EFT, AC Power Port: ±1kV DC Power Port: ±0.5kV Signal and control Lines: ±0.5kV Performance Criterion B
		EN 55024: 2010+A1: 2015 Electrical Fast Transient/Burst - EFT, AC Power Port: 1kV DC Power Port: 0.5kV Signal Ports and Telecommunication Ports: 0.5kV Performance Criterion B
	IEC 61000-4-5	**EN 50412-2-1:2005+AC:2009** Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8/20 us Short Circuit Current, 10/700μs Signal and Telecommunication AC Power Port~ line to line: ±1kV, line to earth: ±2kV DC Power Port~ line to line: ±0.5kV, line to earth: ±0.5kV Performance Criterion B
		EN 55024: 2010+A1: 2015 Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8/20 us Short Circuit Current, 10/700μs Signal and Telecommunication AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV DC Power Port ~ line to earth: 0.5kV Signal and Telecommunication Ports ~ line to ground: 1kV Performance Criterion B
	IEC 61000-4-6	**EN 50412-2-1:2005+AC:2009** Conducted Radio Frequency Disturbances Test – CS: 0.15 ~ 80 MHz, 3V, 80% AM, 1kHz, Performance Criterion A

		EN 55024: 2010+A1: 2015 Conducted Radio Frequency Disturbances Test –CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	**EN 50412-2-1:2005+AC:2009** Power frequency magnetic field immunity test 50 Hz, 3A/m Performance Criterion A
		EN 55024: 2010+A1: 2015 Power frequency magnetic field immunity test 50 Hz, 1A/m Performance Criterion A
	IEC 61000-4-11	**EN 50412-2-1:2005+AC:2009** Voltage Dips: 1) 30% reduction 0.5 periods Performance Criterion: (Type 1: B; Type 2: B) 2) 60% reduction 5 periods Performance Criterion B Performance Criterion: (Type 1: B; Type 2: C) Voltage Interruptions: 1) >95% reduction 250 periods Performance Criterion: (Type 1: B; Type 2: C)
		EN 55024: 2010+A1: 2015 Voltage Dips: 1) >95% reduction for 0.5 periods, Performance Criterion B 2) 30% reduction for 25 periods, Performance Criterion C Voltage Interruptions: 1) >95% reduction for 250 periods Performance 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
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
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:	Minimum 10 times at each test point
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

ESD test (IEC 61000-4-2)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Dito ESD Simulator	EM Test	dito	V0809103493	02/21/2016	02/20/2017
Temp. / Humidity Meter	VICTOR	VC230	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017

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 Horizontal Coupling Plane (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.

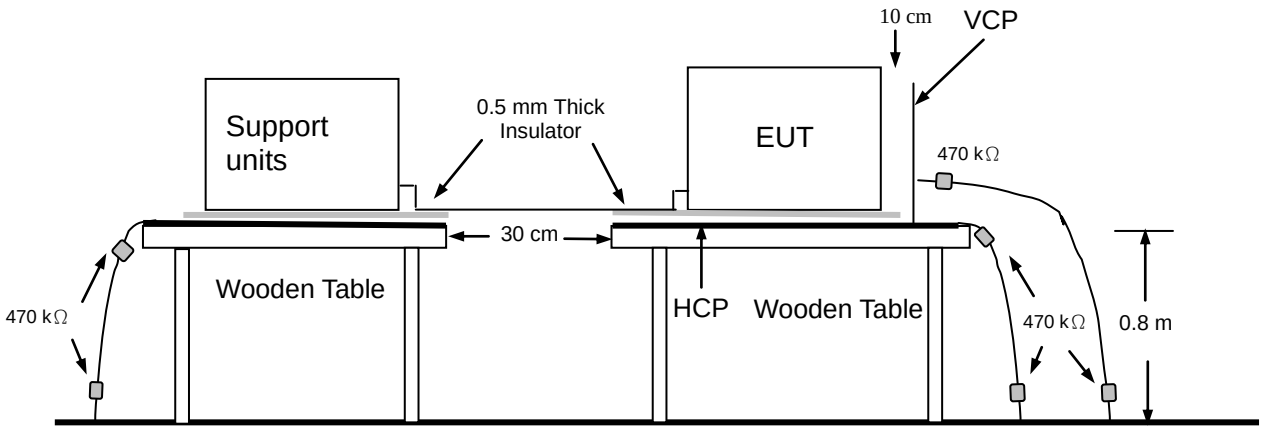
b) Air discharges at slots and apertures and insulating surfaces:

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:

TABLETOP 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	22°C	**Humidity**	56% RH
Pressure	1009mbar	**Tested By**	Jacksan Luo
Test Mode	Mode 1	**Required Passing Performance**	Criterion B
Tested Date	July 12, 2016		

(EN 50412-2-1:2005+AC:2009 / EN 55024: 2010+A1: 2015)

Air Discharge								
Test Points	**Test Levels**			**Results**				
	± 2 kV	**± 4 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**	**Observation**	
Front	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Back	☒	☒	☒	☒	☐	☐A ☒B	Note ☐1	☒2 ☐3
Left	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Right	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Top	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Bottom	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3

Contact Discharge								
Test Points	**Test Levels**			**Results**				
	± 2 kV	**± 4 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**	**Observation**	
Front	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Back	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Left	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Right	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Top	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3
Bottom	☐	☐	☐	☐	☐	☐A ☐B	Note ☐1	☐2 ☒3

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. There were generated flickers on the display during the tested, but can be auto recovered as the events disappear.
3. Means that no discharge point had been occurred during that particular coupling method.

REMARK: *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.*

The Photo for Discharge Points of EUT

Red dot —Air Discharged Points

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

8.4.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
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

Radiated Electromagnetic Field immunity Measurement (IEC 61000-4-3)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Signal Generator	ROHDE&SCHWARZ	SMA100A	100434	02/21/2016	02/20/2017
RF-Switch Network	TESEQ	RF-Switch Network	N/A	N/A	N/A
Power Amplifier	SCHAFFNER	CBA9433	3007	02/21/2016	02/20/2017
Power Amplifier	TESEQ	CBA 3G-050	T44161	02/21/2016	02/20/2017
Directional Coupler	AR	DC6180A	328212	N.C.R	N.C.R
Directional Coupler	AR	DC7144A	327057	N.C.R	N.C.R
Bilog Antenna	SCHAFFNER	CBL6143	5063	02/21/2016	02/20/2017
Stacked Double Log.-Per. Antenna	Schwarzbeck	STLP9149	9149-163	02/21/2016	02/20/2017
Power Meter	TESEQ	PM6006	72784	02/21/2016	02/20/2017
Power Meter	TESEQ	PM6006	72353	02/21/2016	02/20/2017
Electric Field Probe	EST-LINDGREN	HI-6005	00083480	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017

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

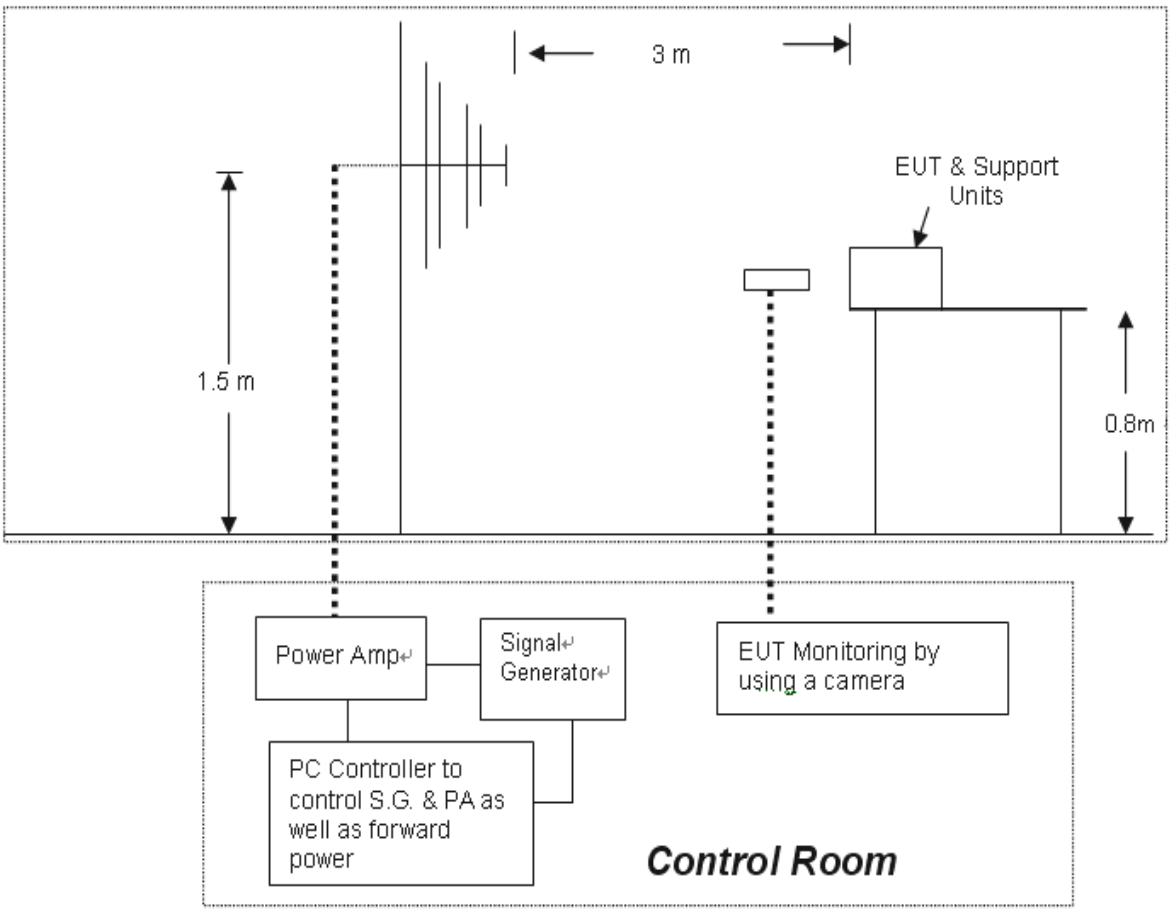
a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

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 x 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	24°C	**Humidity**	55% RH
Pressure	1010mbar	**Dwell Time**	3 sec.
Tested By	Jacksan Luo	**Test Mode**	Mode 1
Tested Date	July 12, 2016	**Required Passing Performance**	Criterion A

(EN 50412-2-1:2005+AC:2009 / EN 55024: 2010+A1: 2015)

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Observation	Result
80 ~ 1000	V&H	Front	3	☒A ☐B	Note	PASS
80 ~ 1000	V&H	Back	3	☒A ☐B	Note	PASS
80 ~ 1000	V&H	Left	3	☒A ☐B	Note	PASS
80 ~ 1000	V&H	Right	3	☒A ☐B	Note	PASS

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

Remark: 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.

8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
Test Voltage:	AC Power Port: ±1kV DC Power Port: ±0.5kV Signal Ports and Telecommunication Ports: ±0.5kV
Polarity:	Positive & Negative
Repetition 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

Fast Transients/Burst test (IEC 61000-4-4)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Fast Transients/Burst Generator	TESEQ	NSG3025	26861	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
fast Transients/Burt Generator CDN	TESEQ	CDN8014	26192	02/21/2016	02/20/2017

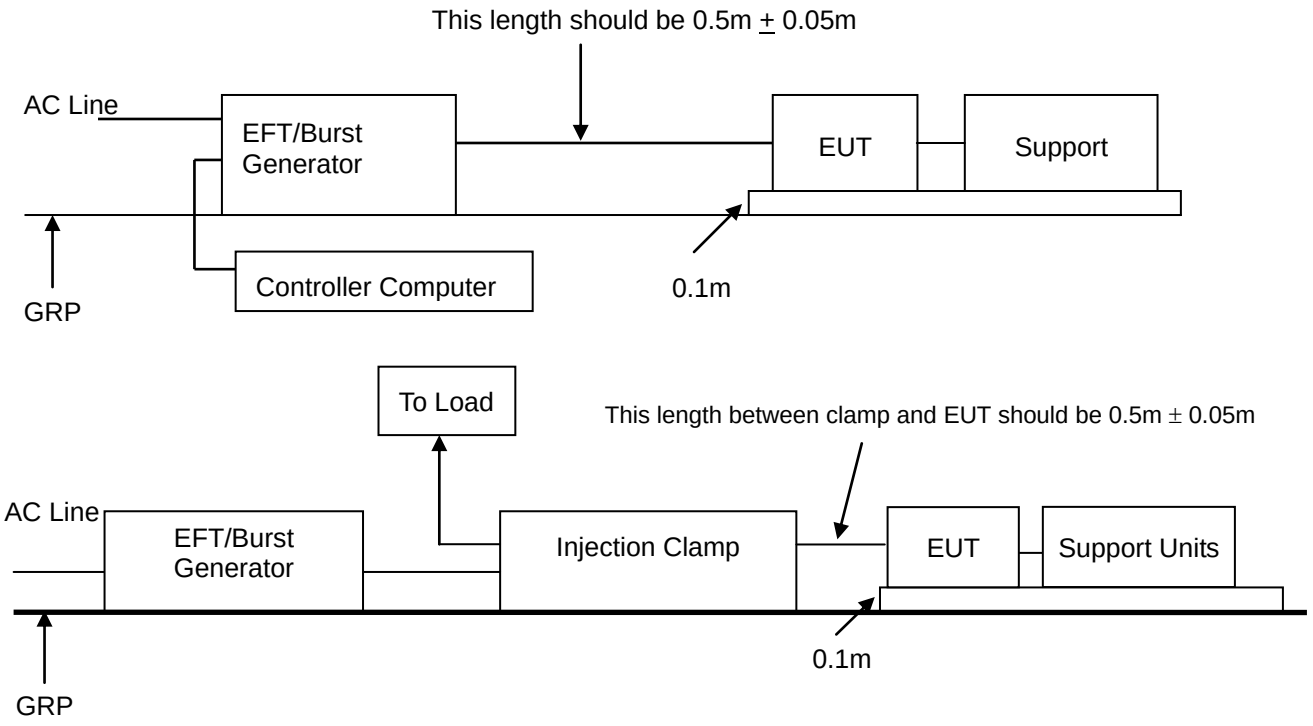
Note:

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) Both positive and negative polarity discharges were applied.
b) 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.
c) The duration time of each test sequential was 1 minute.
d) 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	23°C	**Humidity**	52% RH
Pressure	1012mbar	**Tested By**	Jacksan Luo
Test Mode	Mode 1	**Required Passing Performance**	Criterion B
Test Date	July 12, 2016		

(EN 50412-2-1:2005+AC:2009 / EN 55024: 2010+A1: 2015)

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
LAN	+/	0.5	☒A ☐B	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with initial operation during the test.
2. The loss of function of the EUT during the test and it was recovered by itself operation after the test.

Remark: 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.

8.6. SURGE IMMUNITY TEST

8.6. 1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
Wave-Shape:	**For EN 50412-2-1:** 1.2/50 us Open-circuit voltage 8/20 us Short-circuit current
	For EN 55024: Combination Wave 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current 10/700μs Signal and Telecommunication
Test Voltage:	**For EN 50412-2-1:** AC Power Port~ line to line: ±1kV, line to earth: ±2kV DC Power Port~ line to line: ±0.5kV, line to earth: ±0.5kV
	For EN 55024: AC Power Port~ line to line: 1kV, line to ground: 2kV DC Power Port~ line to earth: 0.5kV Signal and Telecommunication Ports ~ line to ground:1kV
Surge Input / Output:	Power Line: L1-L2 / L1-PE / L2-PE Telecommunication line: T-Ground / R-Ground
Generator Source Impedance:	Power Line:2 ohm between networks 12 ohm between network and ground Telecommunication line: 25/100 ohm
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

Surge(IEC 61000-4-5)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Control Center	Thermo	E103	0605173	N.C.R	N.C.R
Coupler/Decoupler	Thermo	E4551KV	0605180	02/21/2016	02/20/2017
Telecom Wave	Thermo	E502B	0605178	02/21/2016	02/20/2017
Surge Network	Thermo	E510A	0605179	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017
CM-TELCD Telecom Coupler/Decoupler	Thermo	N/A	0604249	N.C.R	N.C.R
Surge Coupling Decoupling Network	TESEQ	CDN HSS-2	34274	02/21/2016	02/20/2017

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.

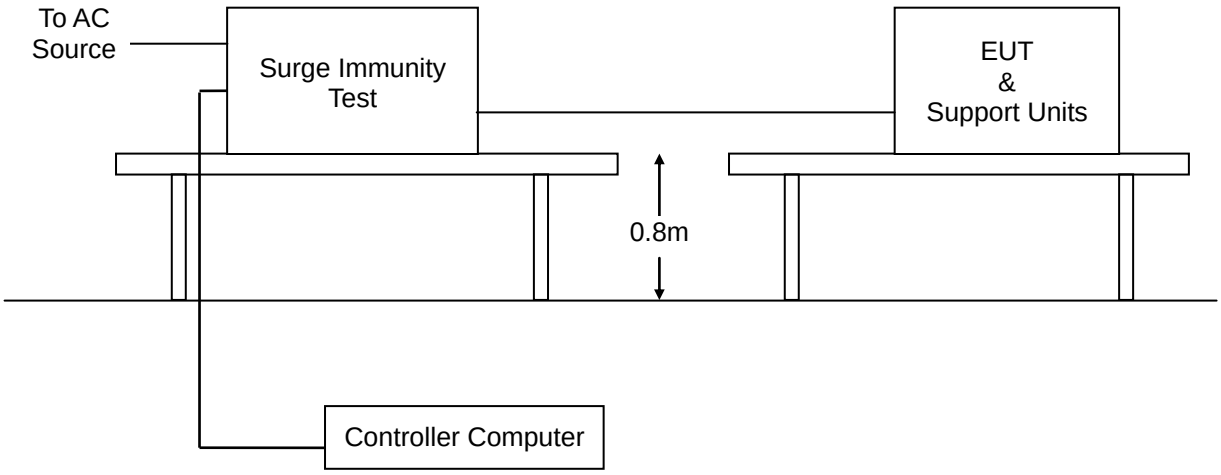
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

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	23°C	**Humidity**	55% RH
Pressure	1011mbar	**Tested By**	Jacksan Luo
Test Mode	Mode 1	**Required Passing Performance**	Criterion B
Test Date	July 12, 2016		

(EN 50412-2-1:2005+AC:2009 / EN 55024: 2010+A1: 2015)

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. The loss of function of the EUT during the test and it was recovered by itself operation after the test.

Remark: 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.

8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 V
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-T8

8.7.2. TEST INSTRUMENT

CS test (IEC 61000-4-6)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Signal Generator	TESEQ	NSG4070	25807	02/21/2016	02/20/2017
Attenuator	TESEQ	ATN6075	25371	02/21/2016	02/20/2017
CDN	TESEQ	CDN M316	24517	02/21/2016	02/20/2017
CDN	TESEQ	CDN T400A	26022	02/21/2016	02/20/2017
CDN	TESEQ	CDN T800	34427	02/21/2016	02/20/2017
CDN	Luthi	CDN801-M1	1795	02/21/2016	02/20/2017
CDN	Luthi	CDN 801-M2	1897	02/21/2016	02/20/2017
CDN	Luthi	CDN801-M3	1882	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017
EM-CLAMP	TESEQ	KEMZ801A	33441	02/21/2016	02/20/2017

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.

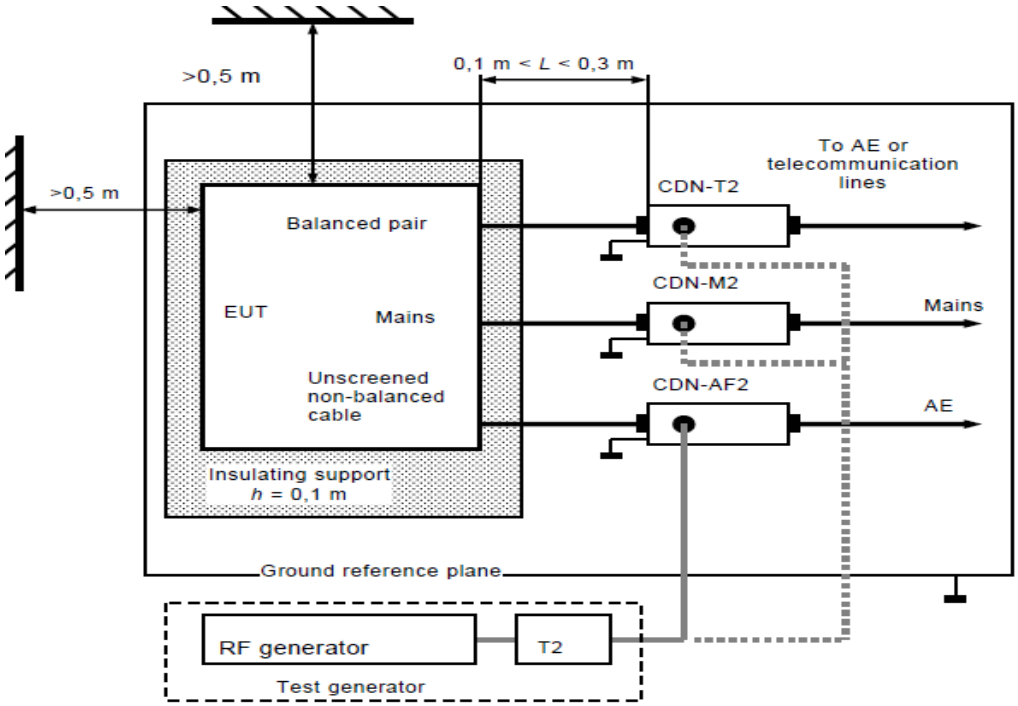
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

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

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

NOTE:

TABLETOP AND FLOOR-STANDING EQUIPMENT

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

8.7.5. TEST RESULTS

Temperature	24°C	**Humidity**	50% RH
Pressure	1009mbar	**Tested By**	Jacksan Luo
Test Mode	Mode 1	**Required Passing Performance**	Criterion A
Test Date	July 12, 2016		

(EN 50412-2-1:2005+AC:2009 / EN 55024: 2010+A1: 2015)

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Power Line	CDN-M2	☒**A** ☐**B**	**Note** ☒**1** ☐**2**	PASS
0.15 ~ 80	3	RJ45(100Mbps)	CDN-T8	☒**A** ☐**B**	**Note** ☒**1** ☐**2**	PASS

NOTE: 1. There was no change compared with initial operation during the test.
2. The loss of function of the EUT during the test and it was recovered by itself operation after the test.

Remark: 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.

8.8. POWER FREQUENCY MAGNETIC FIELD

8.8.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
Frequency Range:	50Hz
Field Strength:	**For EN 55024:** 1 A/m
	For EN 50412-2-1: 3 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

8.8.2. TEST INSTRUMENT

Power Frequency Magnetic Field Immunity (IEC 61000-4-8)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Power Source	SCHAFFNER	NSG1007	54789	02/21/2016	02/20/2017
Harmonic & Flicker Tester	SCHAFFNER	CCN1000	72045	02/21/2016	02/20/2017
Induction Coil Interface	SCHAFFNER	INA-702	711-1115	02/21/2016	02/20/2017
INDUCTION COIL INTERFACE	SCHAFFNER	INA2141	6003	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017

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)

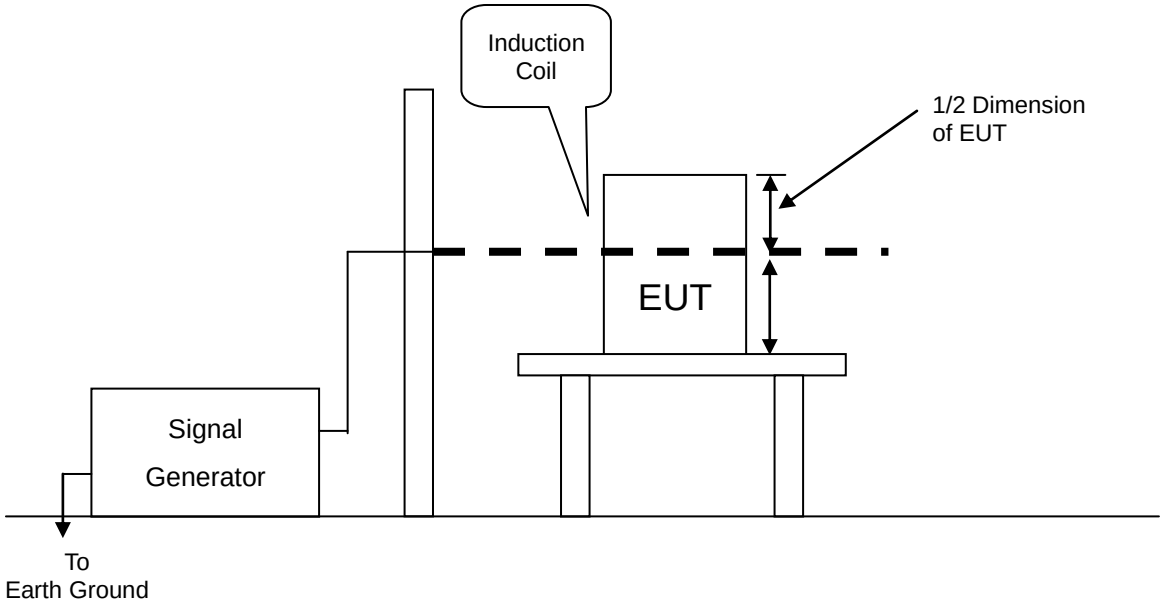
a) The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.

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	23°C	Humidity	53% RH
Pressure	1011mbar	Tested By	Jacksan Luo
Tested Mode	Mode 1	Required Passing Performance	Criterion A
Tested Date	July 12, 2016		

(EN 50412-2-1:2005+AC:2009)

Direction	Field Strength (A/m)	Performance Criterion	Observation	Results
X	3	☒A ☐B	Note ☒1 ☐2	PASS
Y	3	☒A ☐B	Note ☒1 ☐2	PASS
Z	3	☒A ☐B	Note ☒1 ☐2	PASS

(EN 55024: 2010+A1: 2015)

Direction	Field Strength (A/m)	Performance Criterion	Observation	Results
X	1	☒A ☐B	Note ☒1 ☐2	PASS
Y	1	☒A ☐B	Note ☒1 ☐2	PASS
Z	1	☒A ☐B	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with initial operation during the test.
2. The loss of function of the EUT during the test and it was recovered by itself operation after the test.

Remark: 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.

8.9. VOLTAGE DIP & VOLTAGE INTERRUPTIONS

8.9.1. TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test Standard:	EN 50412-2-1: 2005/AC:2009 EN 55024: 2010+A1: 2015
Test duration time:	Minimum three test events in sequence
Interval between event:	Minimum 10 seconds
Phase Angle:	0^o / 45^o / 90^o / 135^o / 180^o / 225^o / 270^o / 315^o / 360^o
Test cycle:	3 times

8.9.2. TEST INSTRUMENT

Voltage Dips &Interruptions(IEC 61000-4-11)					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
Power Source	SCHAFFNER	NSG1007	54789	02/21/2016	02/20/2017
Profline 2100 AC Switching Unit	TESEQ	NSG2200-1	A17820	02/21/2016	02/20/2017
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2016	02/20/2017
Aneroid Barograph	Ningbo Yinzhou Glass Instrument	DYM3	11041305	02/21/2016	02/20/2017

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)

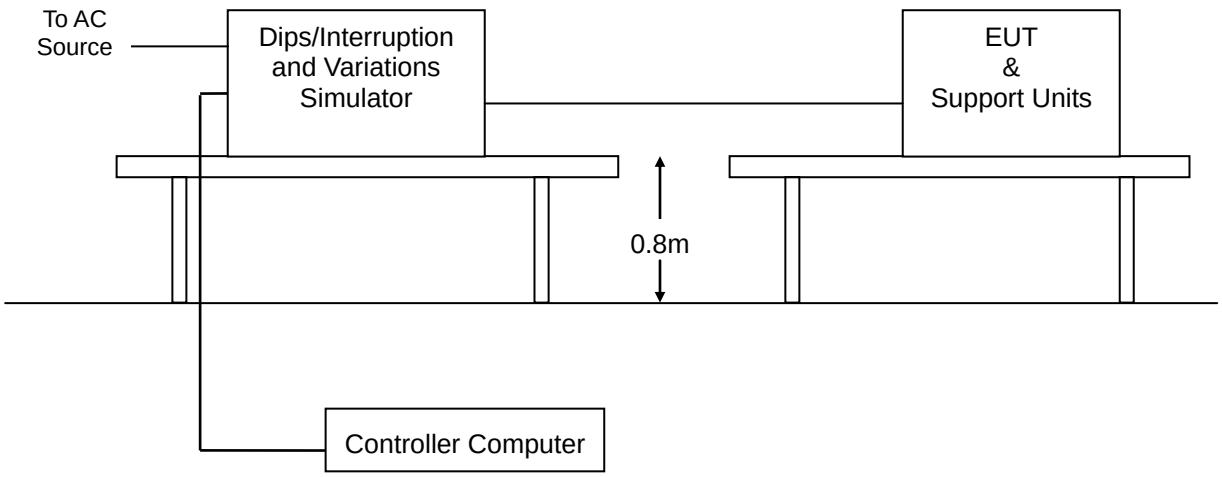
a) The EUT and support units were located on a wooden table, 0.8 m away from ground floor.

b) Setting the parameter of tests and then perform the test software of test simulator.

c) Conditions changes to occur at 0 degree crossover point of the voltage waveform.

d) 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

(EN 50412-2-1:2005+AC:2009)

Temperature	23°C	**Humidity**	54% RH
Pressure	1010mbar	**Tested By**	Jacksan Luo
Test Mode	Mode 1	**Tested Date**	July 12, 2016
Required Passing Performance	***Type 1:*** Criterion B: 30% reduction 0.5 periods & 60% reduction 5 periods & >95% reduction 250 periods ***Type 2:*** Criterion B: 30% reduction 0.5 periods & Criterion C: 60% reduction 5 periods & >95% reduction 250 periods		

Test Power: 230Vac, 50Hz				
Voltage (% Reduction)	**Duration (Period)**	**Performance Criterion**	**Observation**	**Test Result**
30	0.5	☒A ☐B ☐C	Note ☒1 ☐2 ☐3	PASS
60	5	☒A ☐B ☐C	Note ☒1 ☐2 ☐3	PASS
>95	250	☐A ☐B ☒C	Note ☐1 ☐2 ☒3	PASS

(EN 55024: 2010+A1: 2015)

Temperature	23°C	**Humidity**	54% RH
Pressure	1010mbar	**Tested By**	Jacksan Luo
Test Mode	Mode 1	**Tested Date**	July 12, 2016
Required Passing Performance	Criterion B: >95% reduction 0.5 periods Criterion C: 30% reduction 25 periods & >95% reduction 250 periods		

Test Power: 230Vac, 50Hz				
Voltage (% Reduction)	**Duration (Period)**	**Performance Criterion**	**Observation**	**Test Result**
>95	0.5	☒A ☐B ☐C	Note ☒1 ☐2 ☐3	PASS
30	25	☒A ☐B ☐C	Note ☒1 ☐2 ☐3	PASS
>95	250	☐A ☐B ☒C	Note ☐1 ☐2 ☒3	PASS

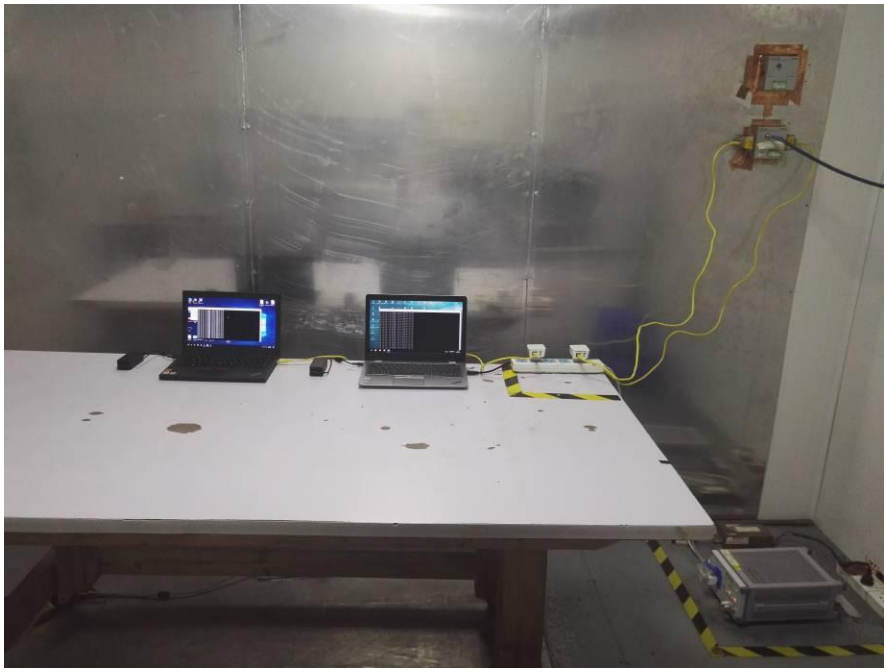
NOTE *1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.*
2.The function stopped during the test, but can be recoverable by itself operation after the test.
3.The function stopped during the test, but can be recoverable manually after the test.

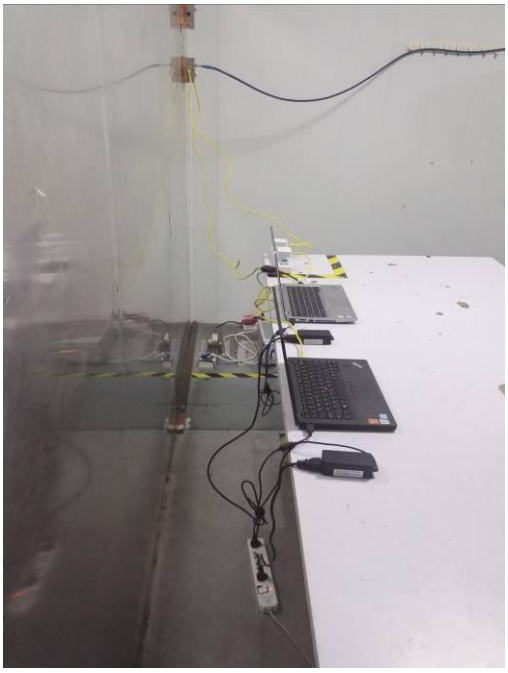
Remark: *The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.*

9 PHOTOGRAPHS OF THE TEST CONFIGURATION

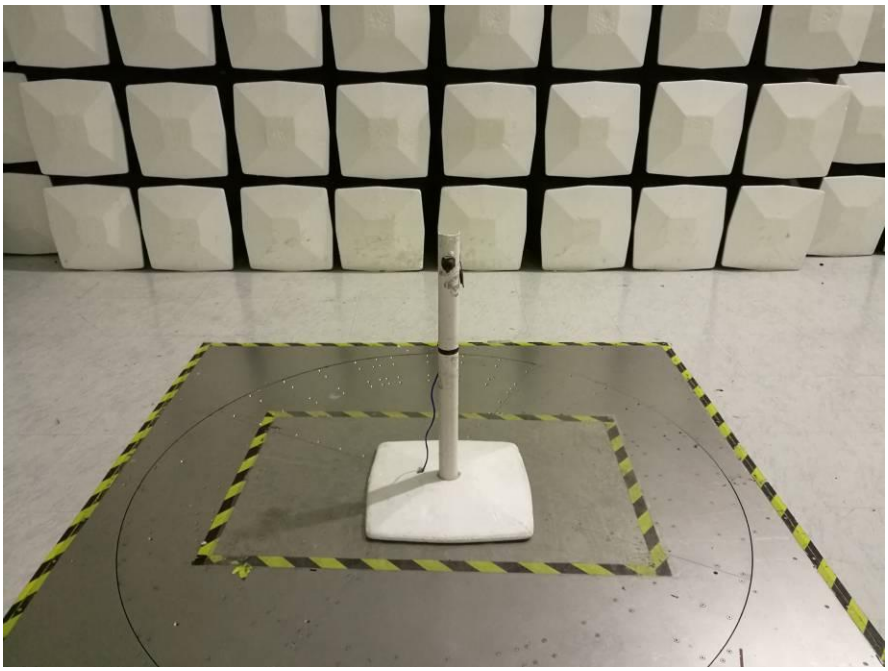
CONDUCTED EMISSION TEST
(AC Main Port)

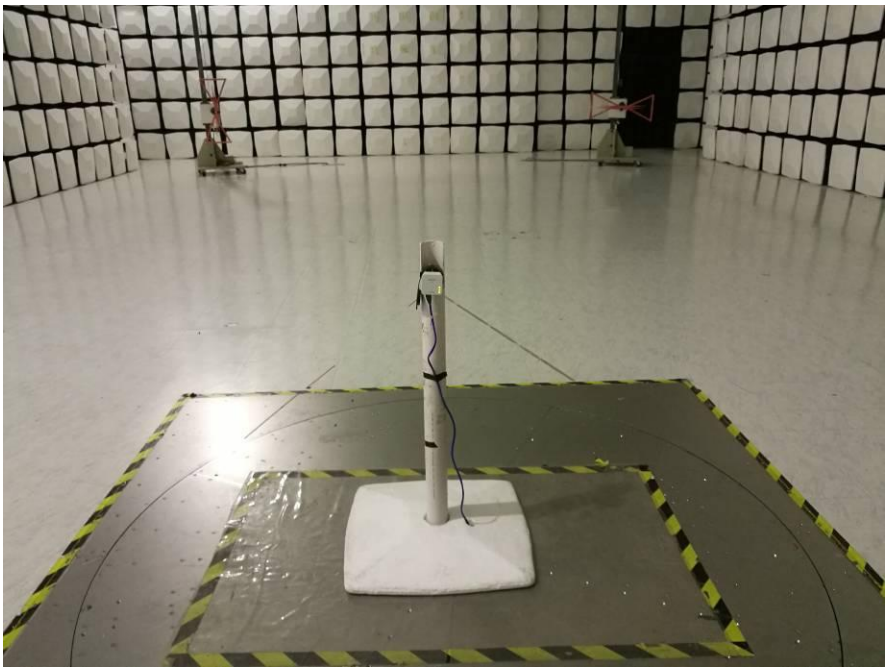
ASYMMETRIC MODE CONDUCTED EMISSIONS TEST





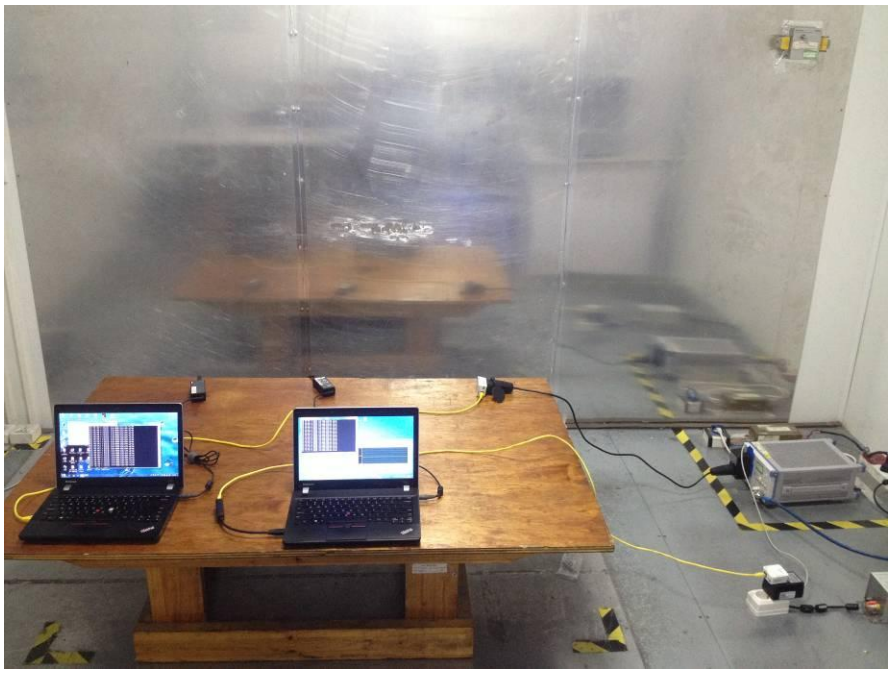
RADIATED EMISSION TEST
Below 1GHz

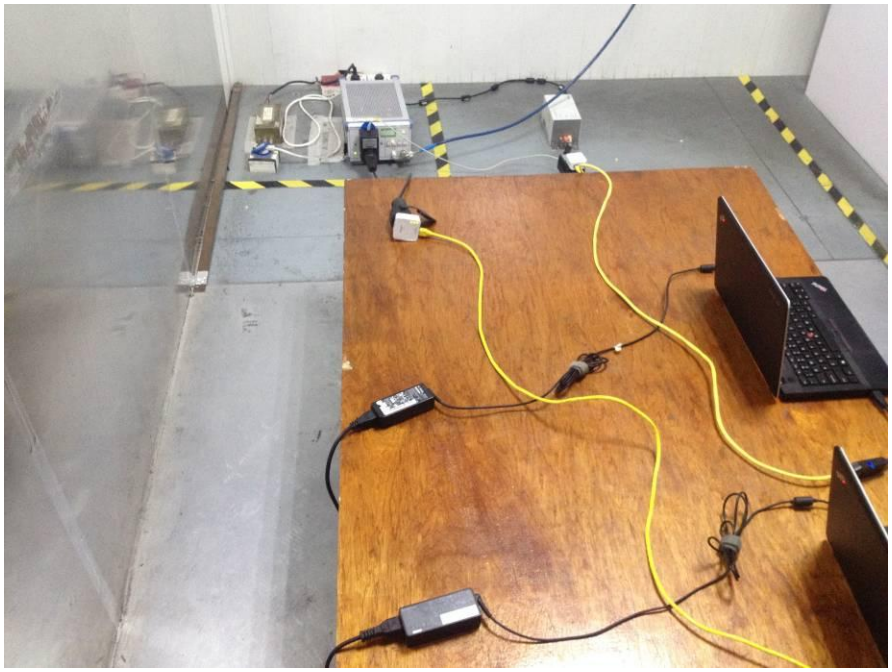




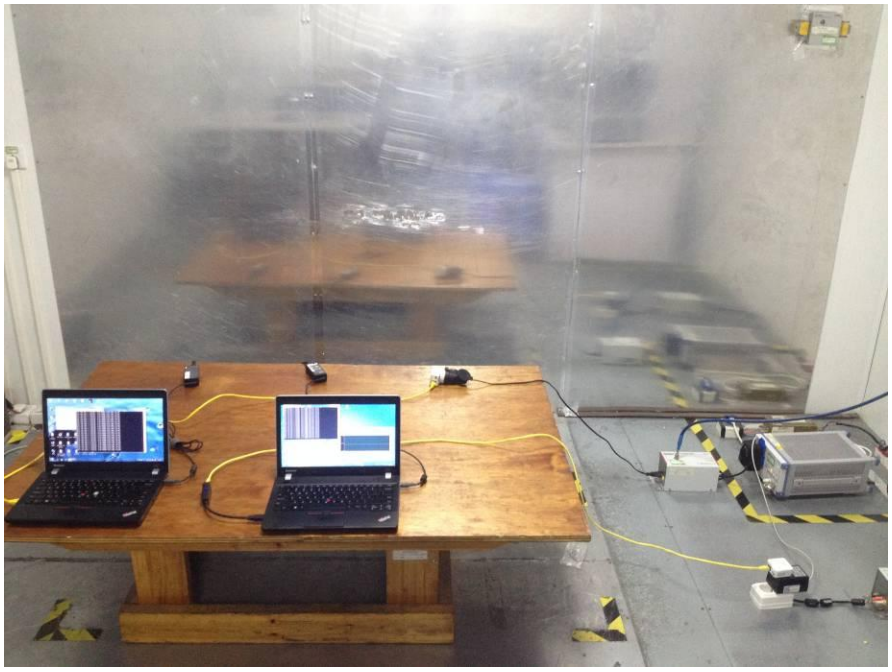
Above 1GHz

PLC PORT CONDUCTED EMISSION TEST

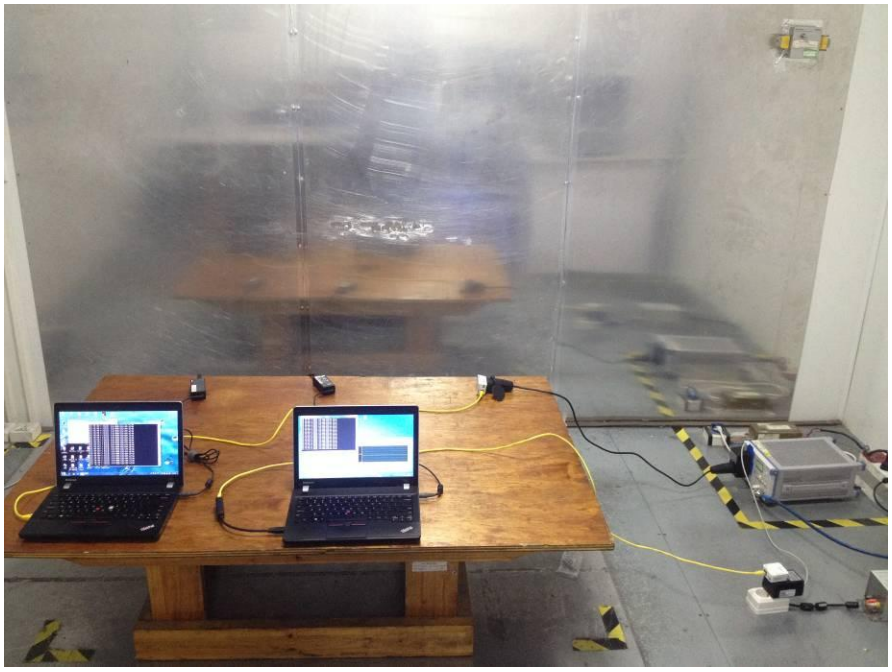


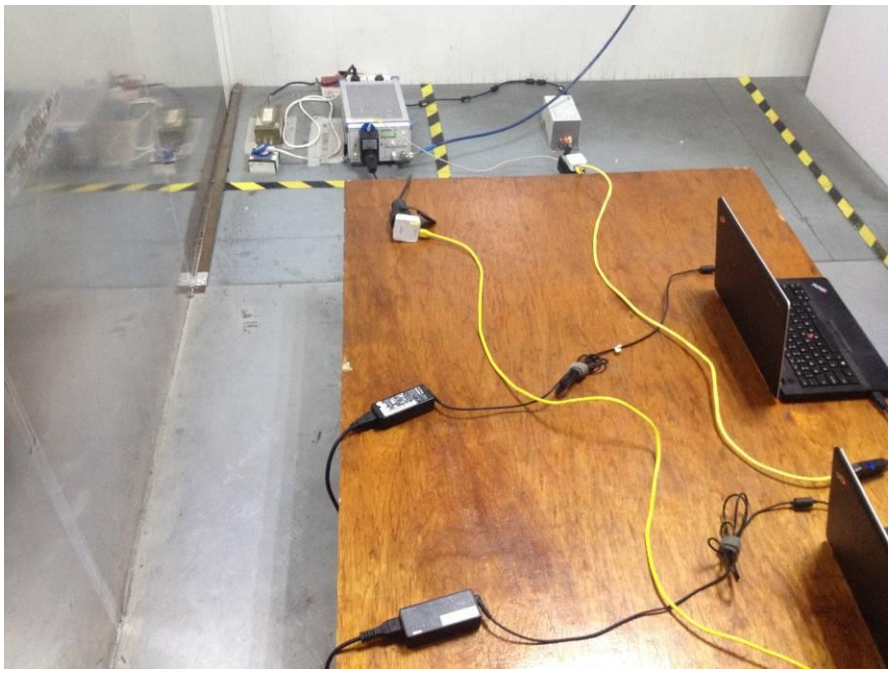


PLC PORT ASYMMETRIC DISTURBANCES TEST

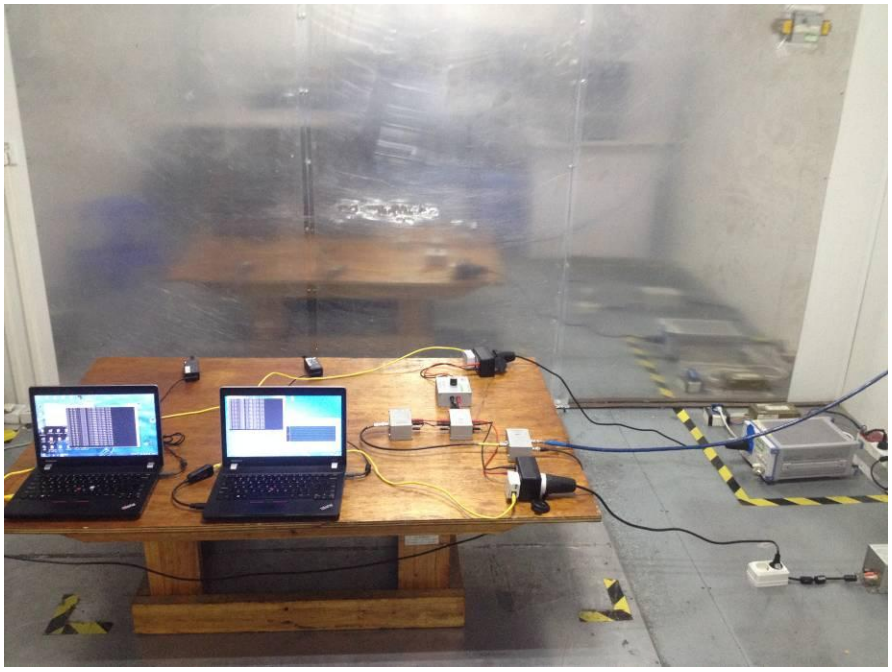


PLC PORT UNSYMMETRICAL DISTURBANCES TEST

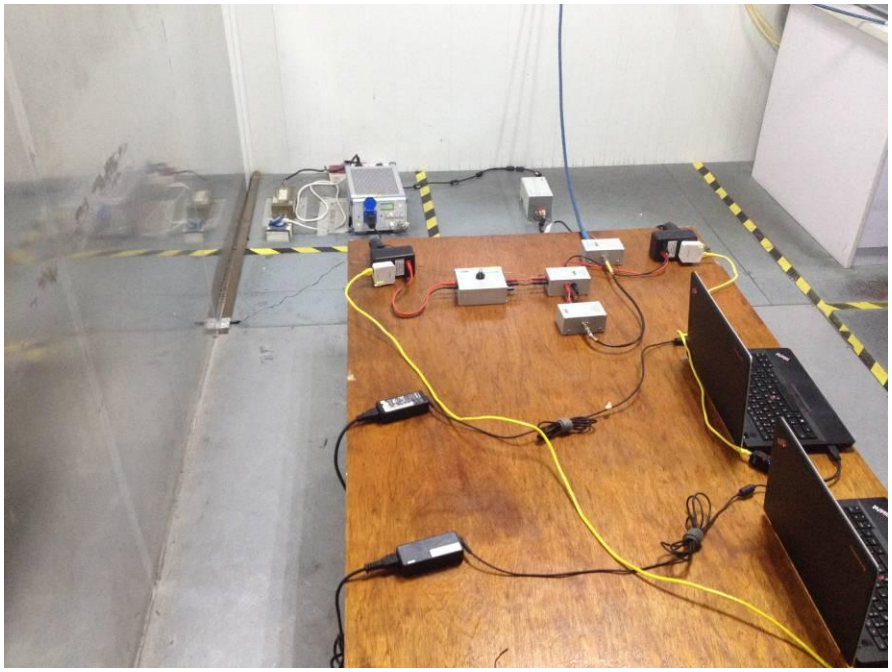




DYNAMIC EXCLUDED FREQUENCY RANGES TEST

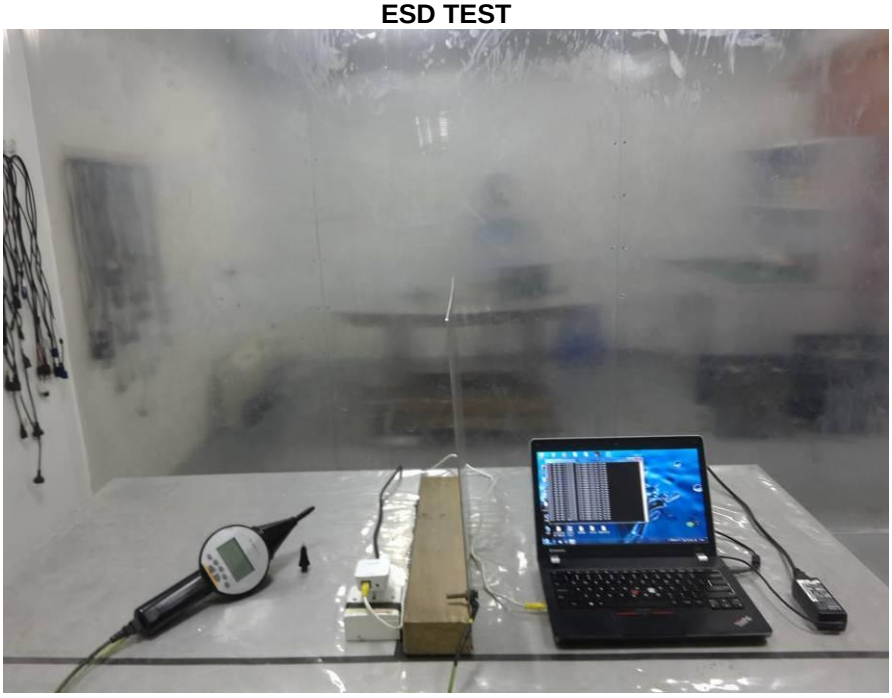


MAXIMUM PLC TRANSMIT SIGNAL LEVEL TEST

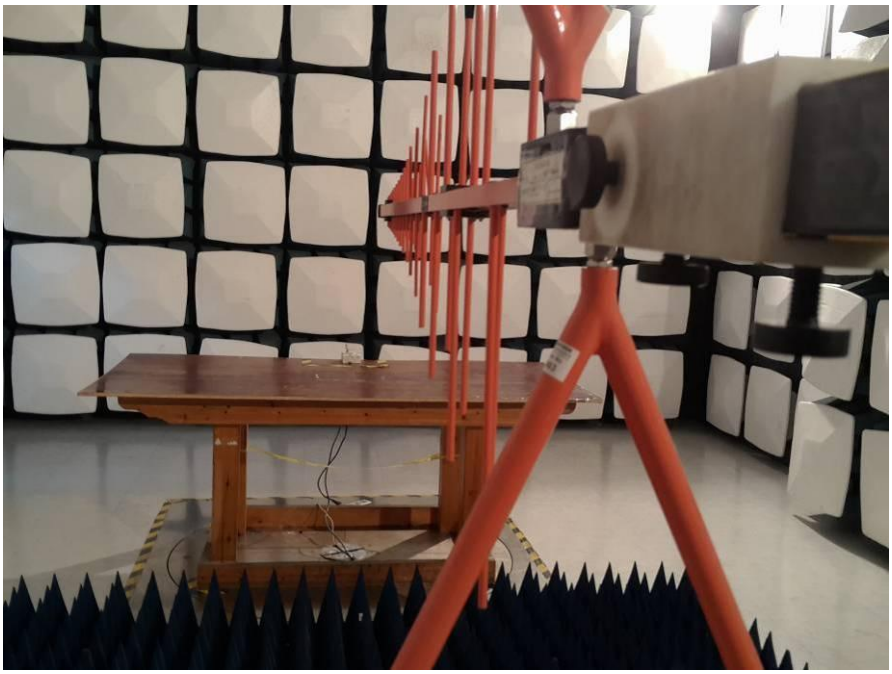


HARMONIC AND FLICKER TEST

ESD TEST



RS TEST



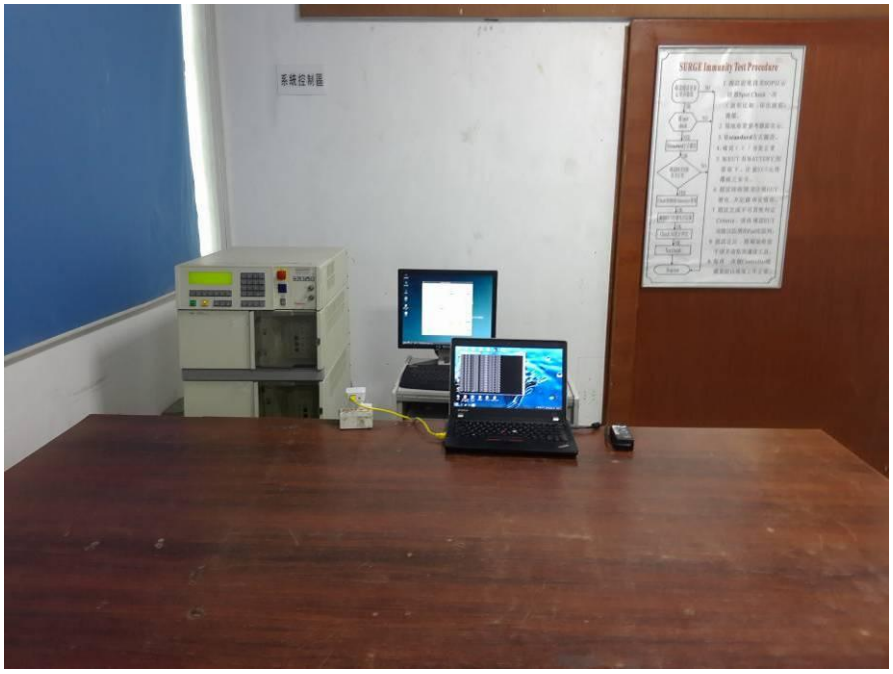
EFT TEST

(Main Port)

(Telecom port)

SURGE TEST

(Main Port)

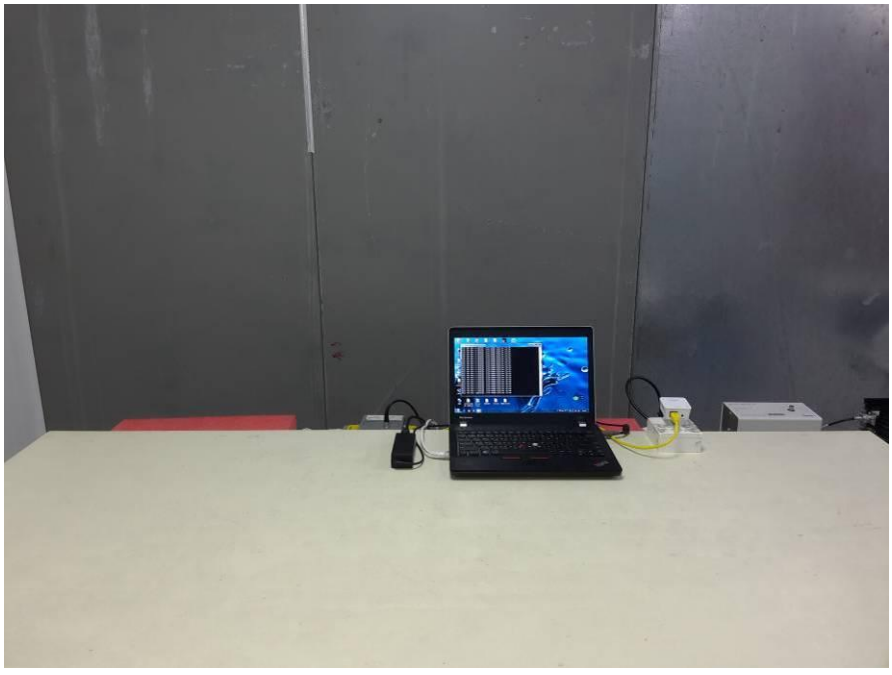


(Telecom port)

CS TEST

(Main Port)

(Telecom port)

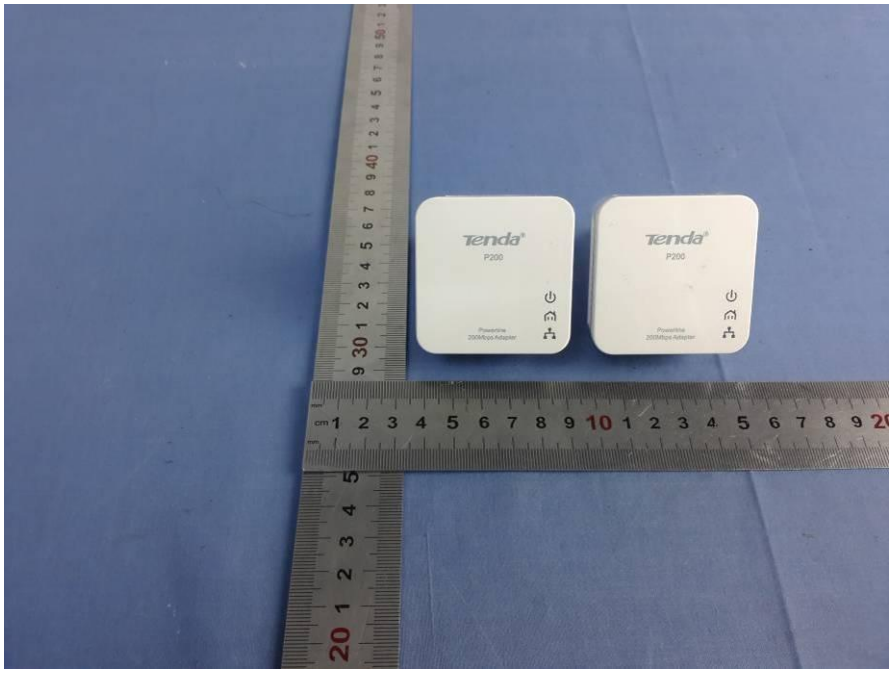


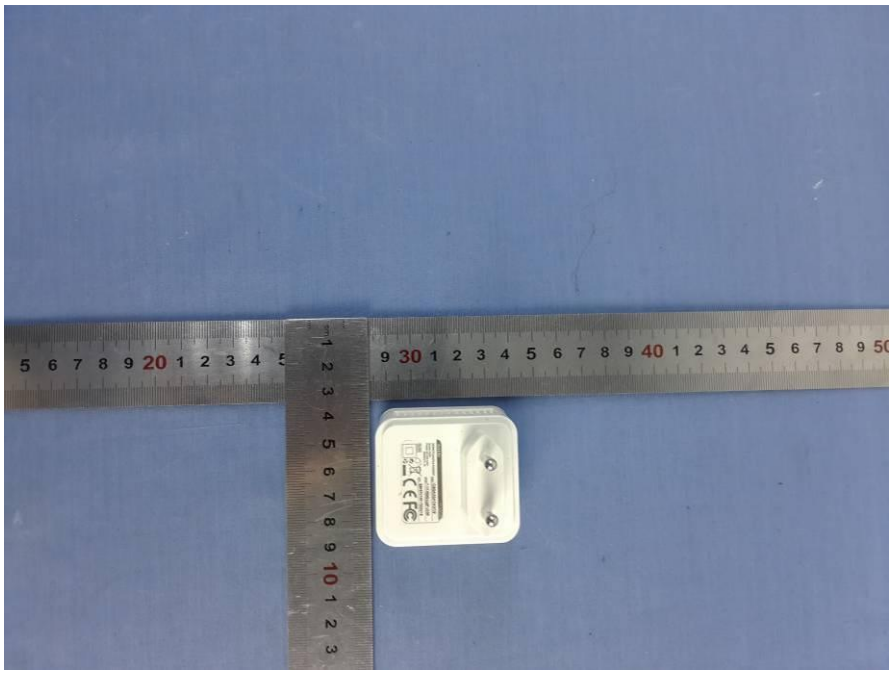
POWER FREQUENCY MAGNETIC FIELD

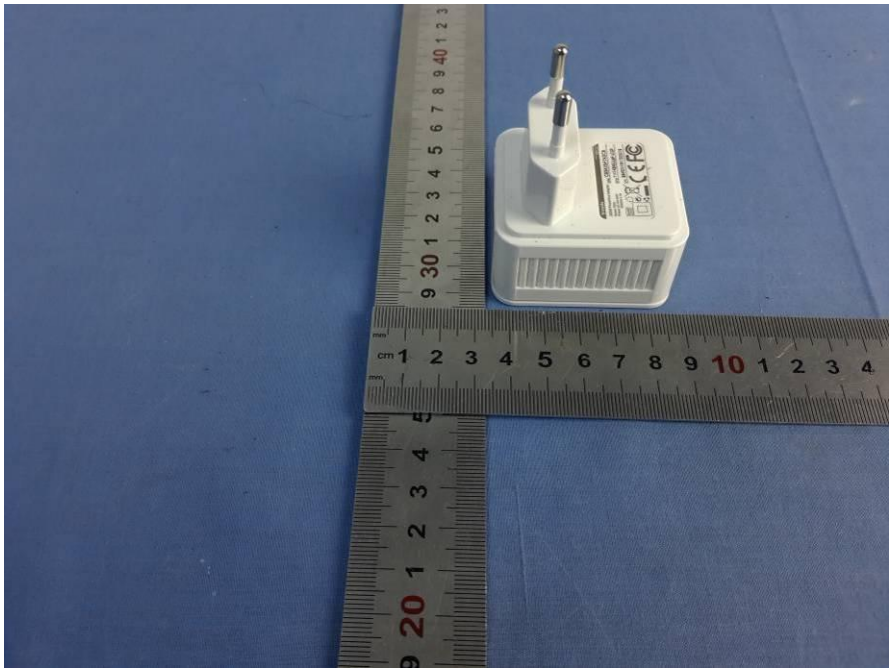
VOLTAGE DIPS TEST

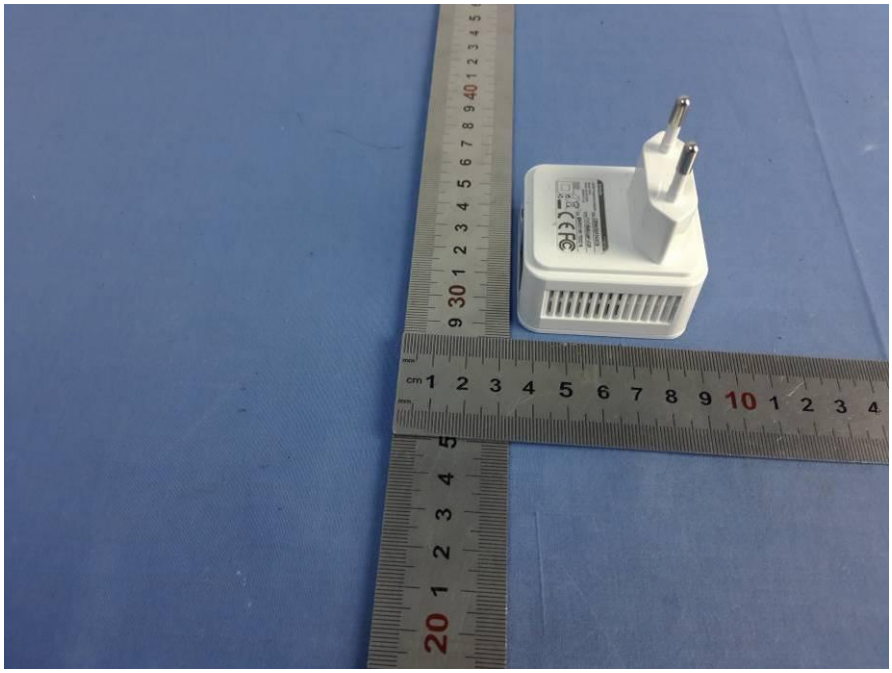
10 APPENDIX I – PHOTOGRAPHS OF EUT

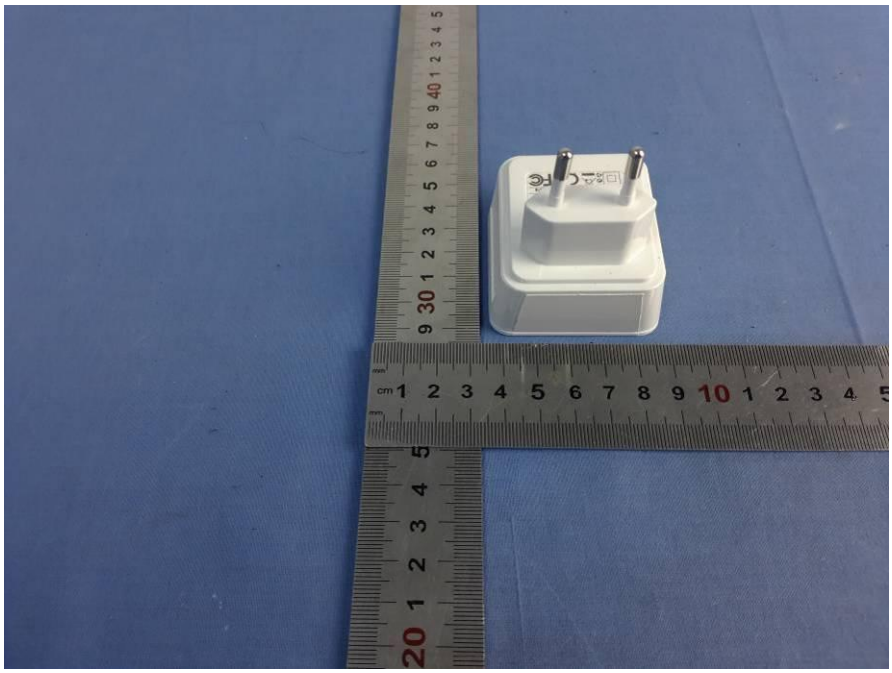
External Photos of EUT

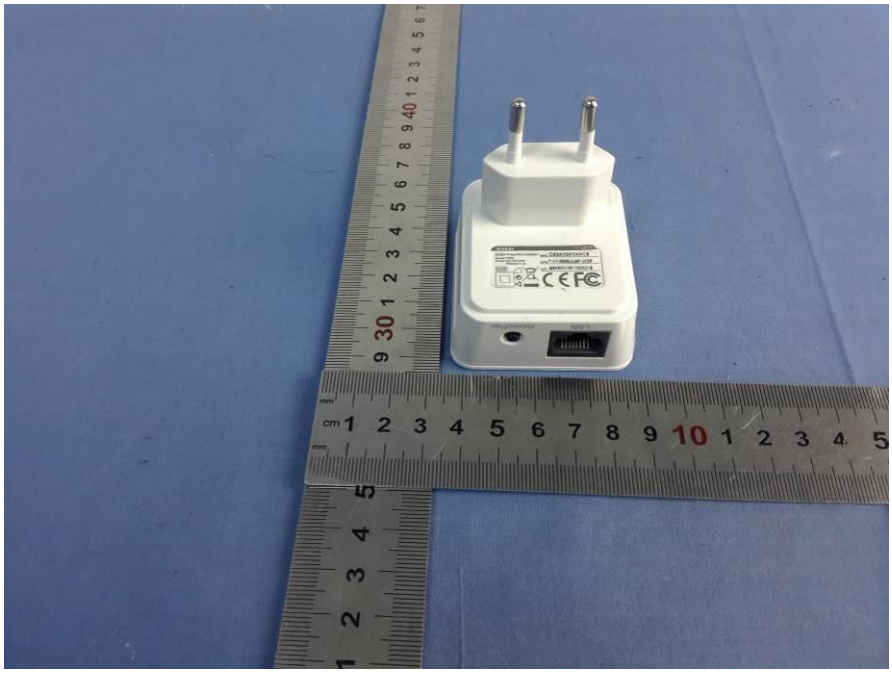












Internal Photos of EUT