



# CE EMC TEST REPORT

for

**Laptop Computer**

**Model: XO-4 HS; XO-4; XO-4 HS Touch; XO-4 Touch**

Test Report Number:  
T130222L03-B-RE

Issued for

Quanta Computer Inc.

No. 188, Wen Hwa 2nd RD., Kuei Shan Hsiang,  
Taoyuan Hsien, Taiwan, R.O.C.

Issued By:

Compliance Certification Services Inc.

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Issued Date: March 6, 2013



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**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 6, 2013	Initial Issue	All	Jill Shiau



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# 1 TEST CERTIFICATION

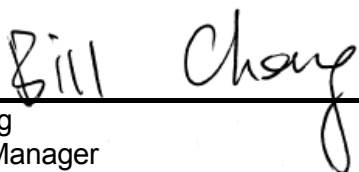
<b>Product:</b>	Laptop Computer
<b>Model:</b>	XO-4 HS; XO-4; XO-4 HS Touch; XO-4 Touch
<b>Brand:</b>	OLPC
<b>Applicant:</b>	<b>Quanta Computer Inc.</b> No. 188, Wen Hwa 2nd RD., Kuei Shan Hsiang, Taoyuan Hsien, Taiwan, R.O.C.
<b>Manufacturer:</b>	<b>Quanta Computer Inc.</b> No. 188, Wen Hwa 2nd RD., Kuei Shan Hsiang, Taoyuan Hsien, Taiwan, R.O.C.
<b>Tested:</b>	February 22 ~ March 4, 2013
<b>Test Voltage:</b>	230VAC, 50Hz
<b>Applicable Standards:</b>	<b>ETSI EN 301 489-1 V1.9.2 2011-09</b> <b>ETSI EN 301 489-17 V2.1.1 2009-05</b> EN 55022: 2010, Class B EN 61000-3-2: 2006 +A1: 2009 + A2: 2009, Class D EN 61000-3-3: 2008 EN 61000-4-2: 2009 EN 61000-4-3: 2006 + A1: 2008 + A2: 2010 EN 61000-4-4: 2004 + A1: 2010 EN 61000-4-5: 2006 EN 61000-4-6: 2009 EN 61000-4-11: 2004

Deviation from Applicable Standard
None

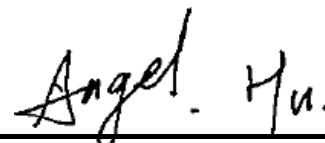
The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily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

**Approved by:**

**Reviewed by:**



Bill Cheng  
Section Manager



Angel Hu  
Section Manager



## 2 TEST RESULT SUMMARY

EMISSION			
Standard	Item	Result	Remarks
EN 55022: 2010	Conducted (Main Port)	PASS	Meet Class B limit
	Conducted (Telecommunication port)	N/A	Not applicable, because the EUT doesn't have LAN port or Modem port.
	Radiated	PASS	Meet Class B limit
EN 61000-3-2: 2006 +A1: 2009 + A2: 2009	Harmonic current emissions	PASS	Meet Class D limit
EN 61000-3-3: 2008	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY			
Standard	Item	Result	Remarks
EN 61000-4-2: 2009	ESD	PASS	Meets the requirements of Performance Criterion B
EN 61000-4-3: 2006+A1: 2008 + A2: 2010	RS	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-4: 2004 + A1: 2010	EFT	PASS	Meets the requirements of Performance Criterion B
EN 61000-4-5: 2006	Surge	PASS	Meets the requirements of Performance Criterion B
EN 61000-4-6: 2009	CS	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-11: 2004	Voltage dips & voltage variations	PASS	Meets the requirements of <b>Voltage Dips:</b> i) 0% residual for 0.5 & 1period, Performance Criterion B ii) 70% residual for 25 period (at 50Hz), Performance Criterion B <b>Voltage Interruptions:</b> i) 0% residual for 250 period (at 50Hz), 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

<b>Product</b>	Laptop Computer		
<b>Model</b>	XO-4 HS; XO-4; XO-4 HS Touch; XO-4 Touch		
<b>Brand</b>	OLPC		
<b>Applicant</b>	Quanta Computer Inc.		
<b>Serial Number</b>	T130222L03		
<b>Identify Date</b>	February 22, 2013		
<b>EUT Power Rating</b>	12VDC, 2.0A / 13.5VDC, 1.85A		
<b>Power Adapter Manufacturer</b>	Bestec	<b>Model</b>	NA0241WAA
			NA0241WEA
			BT-AG250SDF
	Darfon	<b>Model</b>	BX24-1203 (X= U or P)
			BB0J-C
<b>AC Power Adapter Rating</b>	<b>For NA0241WAA; NA0241WAA</b> I/P: 100-240VAC, 1.0A, 50-60Hz O/P: 12VDC, 2.0A		
	<b>For BT-AG250SDF</b> I/P:100-240VAC, 0.4 A, 50-60Hz O/P: 13.5VDC, 1.85A		
	<b>For BX24-1203 (X= U or P)</b> I/P: 100-240VAC, 0.7A, 50-60Hz O/P: 12VDC, 2.0A		
	<b>For BB0J-C</b> I/P: 100-240VAC, 1.0 A, 50-60Hz O/P: 13.5VDC, 1.85A		
<b>AC Power Cable Type</b>	<b>For BT-AG250SDF; BB0J-C</b> Unshielded, 1.8m (Detachable) to Power Adapter		
<b>DC Power Cable Type</b>	Unshielded, 1.8m (Non-Detachable) at Power Adapter		
<b>RF Module Manufacturer</b>	Liteon	<b>Mode</b>	WCBN603MH



<b>Modulation Technique</b>	<p>IEEE 802.11b mode: DSSS (1, 2, 5.5 and 11 Mbps)  IEEE 802.11g mode: OFDM (6, 9, 12, 18, 24, 36, 48 and 54 Mbps)  draft 802.11n Standard-20 MHz Channel mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps)  draft 802.11n Wide-40 MHz Channel mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)  IEEE 802.11a / IEEE 802.11n HT 20 MHz Mode: OFDM (54, 48, 36, 24, 18, 12, 9, 6 Mbps)  draft 802.11n Standard-20 MHz Channel mode: OFDM (6.5, 7.2, 13, 14.4, 14.44, 19.5, 21.7, 26, 28.89, 28.9, 39, 43.3, 43.33 52, 57.78, 57.8, 58.5, 65.0, 72.2, 78, 86.67, 104, 115.56, 117, 130, 144.44 Mbps)  draft 802.11n Wide-40 MHz Channel mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150, 162, 180, 216, 240, 243, 270, 300 Mbps)</p>
<b>Number of Channels</b>	<p>IEEE 802.11b/g mode: 13 Channels  draft 802.11n Standard-20 MHz Channel mode: 13 Channels  draft 802.11n Wide-40 MHz Channel mode: 9 Channels  IEEE 802.11a: 5150 ~ 5350 MHz: 8 Channels  5470 ~ 5725 MHz: 11 Channels  IEEE 802.11n HT 20 MHz Mode: 5150 ~ 5350 MHz: 8 Channels  5470 ~ 5725 MHz: 11 Channels  IEEE 802.11n HT 40 MHz Mode: 5150 ~ 5350 MHz: 8 Channels  5470 ~ 5725 MHz: 11 Channels</p>

**Note:**

1. All the model numbers (list on this report) are identical just for marketing purpose only.
2. For different user, the EUT has two different appearances of keyboard (Please refer to external photographs for detail).
3. Client consigns only one model sample (Model number: XO-4 HS) to test. Therefore testing Lab. just guarantees the units, which have been tested.
4. The difference of Adapter Model: NA0241WAA; NA0241WEA is identical except AC plug type.
5. The difference of Adapter Model: BX24-1203 means of "X" (X= U or P) is identical except AC plug type.
6. Client consigns only one sample to test (model number: BU24-1203). Therefore, the testing Lab. just guarantees the unit, which has been tested.



## 4 TEST METHODOLOGY

### 4.1. DECISION OF FINAL TEST MODE

1. The following test mode was scanned during the preliminary test:

Pre-Test Mode
<b>Mode 1: Data Link</b>

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

Final Test Mode		
Emission	Conducted Emission	<b>Mode 1 (1200 x 900 Resolution)</b>
	Radiated Emission	<b>Mode 1 (1200 x 900 Resolution)</b>
Immunity		<b>Mode 1 (1200 x 900 Resolution)</b>

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

**Remark:** The EUT consumes power from host, which designed with AC power supply of rating 100-240VAC, 50/60Hz. For radiated emission evaluation, 230Vac/50Hz, 120Vac/60Hz, 110Vac/60Hz and 100Vac/50Hz had been covered during the pre-test. The worst radiated emission 30MHz ~ 1GHz was found at 110Vac/60Hz and recorded in the applies test report.

### 4.2. EUT SYSTEM OPERATION

1	Setup the EUT and simulators as shown on 5.2.
2	Turn on the power of all equipment.
3	The module device driver was exercised to play music.
4	Operates the Camera and Wireless LAN functions of EUT.
5	EUT will read data from hard disk and then writes the data into hard disk, same as external Hard Disk.
6	The EMI (File name: TERMINAL) test program was loaded from EUT and executed in "Linux" mode.
7	EUT will sends "H" pattern to monitor, the monitor will show "H" pattern on the screen.
8	Repeat the above procedure (3) to (9).

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





## 5 SETUP OF EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF SUPPORT UNITS

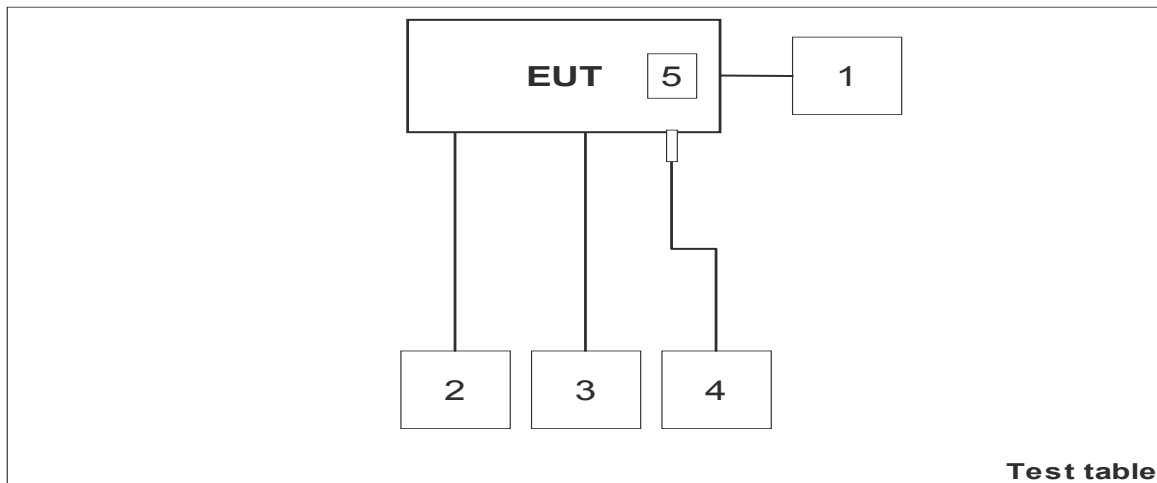
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Trade Name	Data Cable	Power Cord
1	LCD Monitor	U2410	CN-OJ257M-72872-9 9N-OCTL	FCC DoC	DELL	HDMI Cable: Shielded, 1.8m	Unshielded, 1.8m
2	USB Mouse	M100	N/A	FCC DoC	Logitech	Unshielded, 1.8m	N/A
3	USB 2.0 External HDD	WDBACY5000 ABK-PESN	WX81E71TTK29	FCC DoC	WD	Shielded, 1.8m	N/A
4	Multimedia Headset	ClearChat	N/A	FCC DoC	Logitech	Unshielded, 2.0m x 2	N/A
5	SD Card	WARRANT YVOIOIF REMOVED	N/A	N/A	A-DATA	N/A	N/A
6	AP (Remote)	LM-RT210W	12442028770	H8N-RT210 W	LEMEL	N/A	Unshielded, 1.8m

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

### 5.2. CONFIGURATION OF SYSTEM UNDER TEST

1. LCD Monitor	2. USB Mouse	3. USB 2.0 External HDD
4. Multimedia Headset	5. SD Card	6. AP



(Remote)





## **6 FACILITIES AND ACCREDITATIONS**

### **6.1. FACILITIES**

All measurement facilities used to collect the measurement data are located at No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, Taiwan, R.O.C.

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

### **6.2. ACCREDITATIONS**

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

<b>Taiwan</b>	TAF
<b>USA</b>	A2LA

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

<b>Canada</b>	Industry Canada
<b>Norway</b>	Nemko
<b>Japan</b>	VCCI
<b>Taiwan</b>	BSMI
<b>USA</b>	FCC

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



### 6.3. MEASUREMENT UNCERTAINTY

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

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz~30MHz	±2.3876
Conducted telecom emissions	150kHz~30MHz	N/A
Radiated emissions	30~200MHz	±3.7378
	200~1000MHz	±3.7498
	1~8GHz	±4.8572
	8~18GHz	±5.0304

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

*Consistent with industry standard (e.g. CISPR 22: 2006, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.*

*The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than UCISPR which is 3.6dB and 5.2dB respectively. CCS values (called ULab in CISPR 16-4-2) is less than UCISPR 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 A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

**NOTE:**

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

#### 7.1.2. TEST INSTRUMENTS

Conducted Emission Room # 3				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	101300	09/03/2013
LISN	R&S	ENV216	100069	06/18/2013
LISN	FCC	FCC-LISN-50/ 250-16-2-07	06013	11/18/2013
ISN	FCC	FCC-TLISN-T2-02	20587	06/24/2013
ISN	TESEQ	ISN-T8	30842	08/19/2013
Current Probe	FCC	F-35	506	07/01/2013
ISN	FCC	FCC-TLISN-T4-02	20396	07/05/2013
Test S/W	EZ-EMC			

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



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

**Procedure of Preliminary Test**

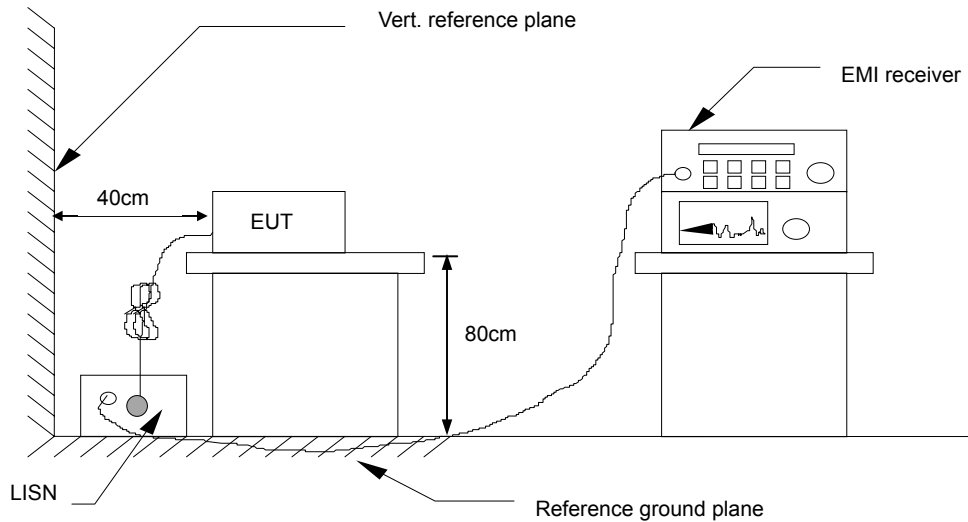
- The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed by AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power by from a second LISN.
- The test program of the EUT was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The worst configuration of EUT and cable of the above highest emission level 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:**

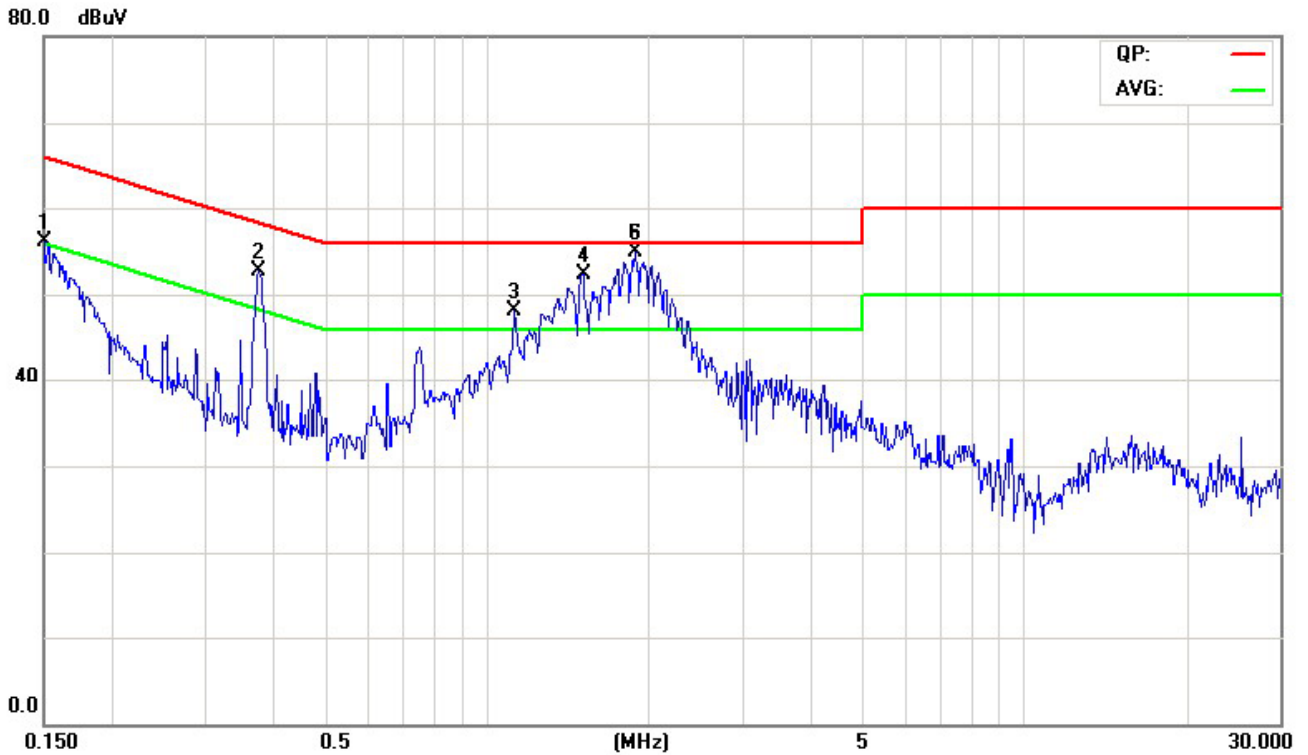
Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correctrion factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak. limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
x.xx	43.95	33	10.00	53.95	43.00	56.00	46.00	-2.05	-3.00	Pass

Frequency (MHz) = Emission frequency in MHz  
 Reading (dBuV) = Uncorrected Analyzer/Receiver reading + Insertion loss of LISN, if it > 0.5 dB  
 Correction Factor (dB) = LISN Factr + Cable Loss  
 Result (dBuV) = Raw reading converted to dBuV and CF added  
 Limit (dBuV) = Limit stated in standard  
 Margin (dB) = Result (dBuV) – Limit (dBuV)



**7.1.6. TEST RESULTS**

<b>Model No.</b>	XO-4 HS	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 57% RH	<b>Test Mode</b>	Mode 1
<b>Tested by</b>	Chieh Cheng	<b>Line</b>	L1

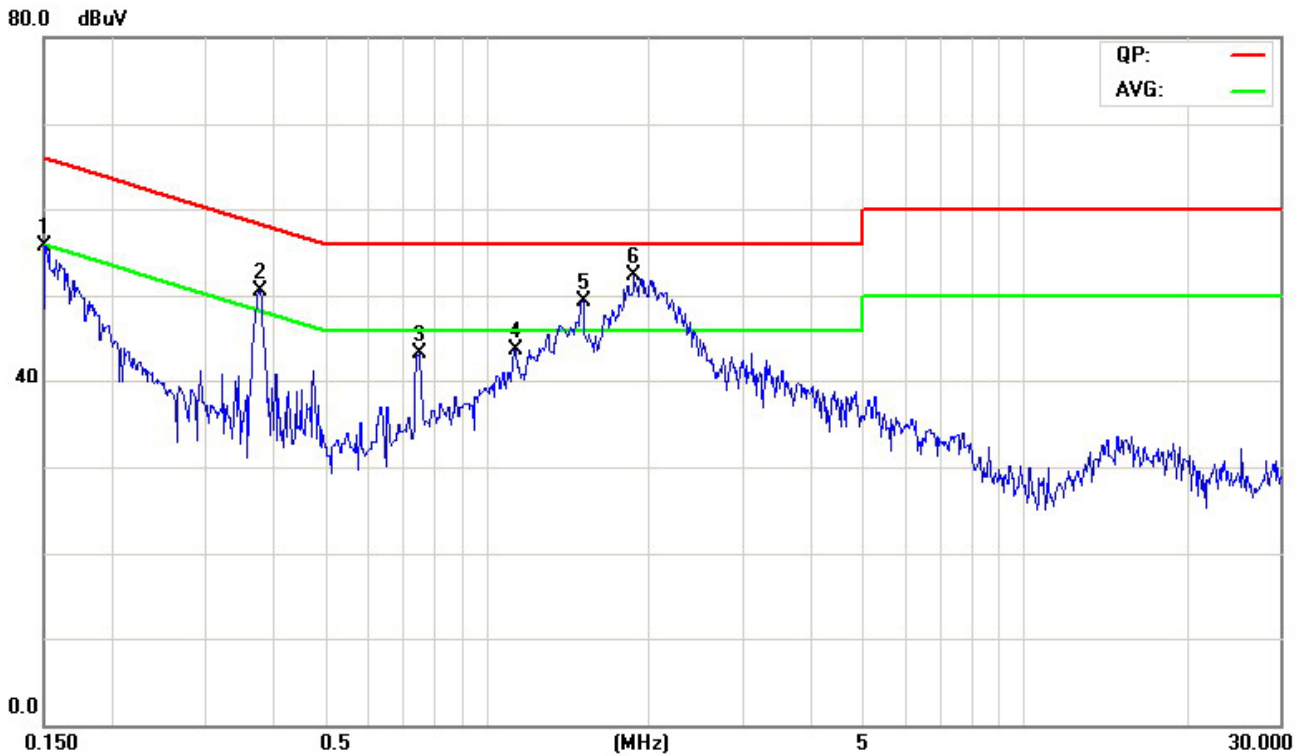


NO.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1500	41.84	20.28	9.68	51.52	29.96	65.99	56.00	-14.47	-26.04	Pass
2*	0.3768	41.86	35.54	9.68	51.54	45.22	58.35	48.35	-6.81	-3.13	Pass
3	1.1308	34.51	30.75	9.75	44.26	40.50	56.00	46.00	-11.74	-5.50	Pass
4	1.5078	38.72	32.27	9.77	48.49	42.04	56.00	46.00	-7.51	-3.96	Pass
5	1.8791	38.90	31.32	9.78	48.68	41.10	56.00	46.00	-7.32	-4.90	Pass
6	1.8824	39.97	33.00	9.78	49.75	42.78	56.00	46.00	-6.25	-3.22	Pass

**REMARKS:** L1 = Line One (Live Line)



<b>Model No.</b>	XO-4 HS	<b>6dB Bandwidth</b>	9 kHz
<b>Environmental Conditions</b>	25°C, 57% RH	<b>Test Mode</b>	Mode 1
<b>Tested by</b>	Chieh Cheng	<b>Line</b>	L2



NO.	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
1	0.1500	42.00	18.84	9.66	51.66	28.50	65.99	56.00	-14.33	-27.50	Pass
2*	0.3779	40.92	34.92	9.66	50.58	44.58	58.32	48.33	-7.74	-3.75	Pass
3	0.7511	30.76	29.72	9.71	40.47	39.43	56.00	46.00	-15.53	-6.57	Pass
4	1.1312	30.45	25.94	9.73	40.18	35.67	56.00	46.00	-15.82	-10.33	Pass
5	1.5069	34.19	29.78	9.75	43.94	39.53	56.00	46.00	-12.06	-6.47	Pass
6	1.8842	36.15	29.00	9.76	45.91	38.76	56.00	46.00	-10.09	-7.24	Pass

**REMARKS:** L2 = Line Two (Neutral Line)





## 7.2. CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

### 7.2.1. LIMITS

For Class A Equipment

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

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

For Class B Equipment

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

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

### 7.2.2. TEST INSTRUMENTS

Conducted Emission Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
N/A				

**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.



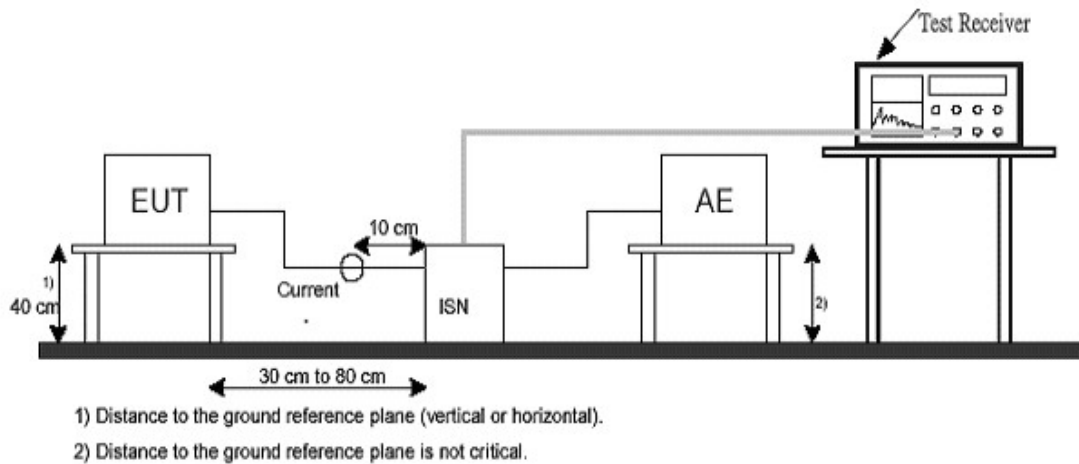
**7.2.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-031)

- Selecting ISN for unshielded cable or a current probe for shielded 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 an 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 shielded cable, the current limit shall be applied; otherwise the voltage limit should be applied.
- The following test mode was scanned during the preliminary test:

**No applicable, because the EUT doesn't have LAN port or Modem port.**



### 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)	Correcrion factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak. limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
x.xx	43.95	33	10.00	53.95	43.00	74.00	64.00	-20.05	-21.00	Pass

Frequency (MHz) = Emission frequency in MHz  
 Reading (dBuV) = Uncorrected Analyzer/Receiver reading + Insertion loss of LISN, if it > 0.5 dB  
 Correction Factor (dB) = ISN Factor + Cable loss  
 Result (dBuV) = Raw reading converted to dBuV and CF added  
 Limit (dBuV) = Limit stated in standard  
 Margin (dB) = Result (dBuV) – Limit (dBuV)

### 7.2.6. TEST RESULTS

**No applicable, because the EUT doesn't have LAN port or Modem port.**



### 7.3. RADIATED EMISSION MEASUREMENT

#### 7.3.1. LIMITS

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

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

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

According to EN 55022: 2010 clause 6.2, the measurement frequency range shown in the following table:

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



**7.3.2. TEST INSTRUMENTS**

<b>Open Area Test Site # 2</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	E4411B	US41062825	08/19/2013
EMI Test Receiver	R&S	ESCS30	847793/012	05/31/2013
Pre-Amplifier	Agilent	8447D	2944A08780	04/17/2013
Bilog Antenna	CHASE	CBL6112A	2307	09/30/2013
Turn Table	Chance Most	CM-T003-1	T807-6	N.C.R
Antenna Tower	Chance Most	CM-A003-1	A807-6	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
RF Switch	Anritsu	MP59B	10953	N.C.R
Test S/W	EZ-EMC			

<b>3 Meter Chamber</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/13/2014
Pre-Amplifier	HP	8449B	3008A00965	04/17/2013
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	05/20/2013
Horn Antenna	EMCO	3115	9602-4659	06/14/2013
Horn Antenna	EMCO	3116	00026370	10/07/2013
Low Loss Cable	Huber+Suhner	104PEA	24815/4PEA	08/08/2013
Low Loss Cable	Huber+Suhner	104PEA	30956/4PEA	04/16/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Bore-Sight Antenna Tower	CCS	CCS-BORESIGHT	001	N.C.R
Test S/W	EZ-EMC			

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



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

**Procedure of Preliminary Test**

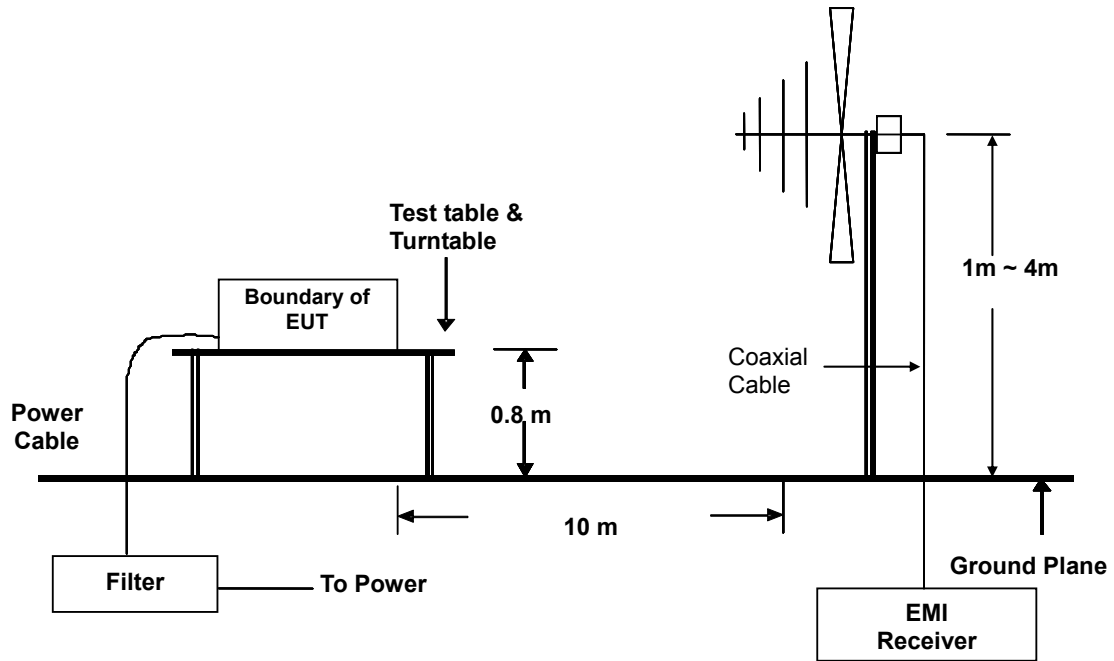
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical usage as per EN 55022.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 3 or 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 6000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters (For Below 1GHz) or 1 meter (For Above 1GHz) 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 worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.

**Procedure of Final Test**

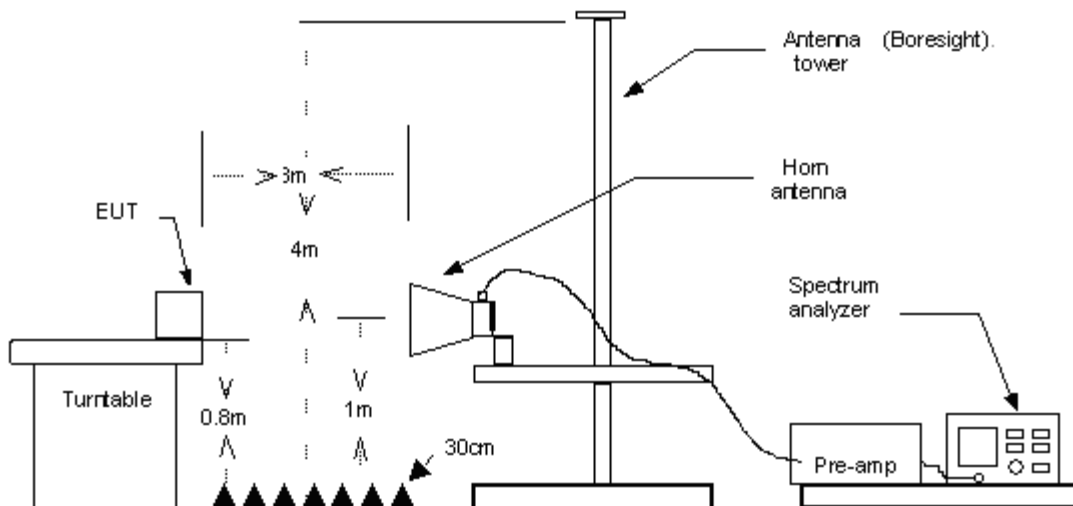
- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recording 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 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.

**7.3.4. TEST SETUP**

**Below 1GHz**



**Above 1GHz**



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



**7.3.5. Data Sample:**

**Below 1GHz**

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
xx.xx	16.49	9.86	26.35	30.00	-3.65	116.00	101.00	QP

**Above 1GHz**

Frequency (MHz)	Reading (dBuV)	Correction Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
xx.xx	66.04	-20.61	45.43	70.00	-24.57	400	158	Peak
xx.xx	56.89	-14.91	41.98	50.00	-8.02	400	351	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)
- Q.P. = Quasi-Peak

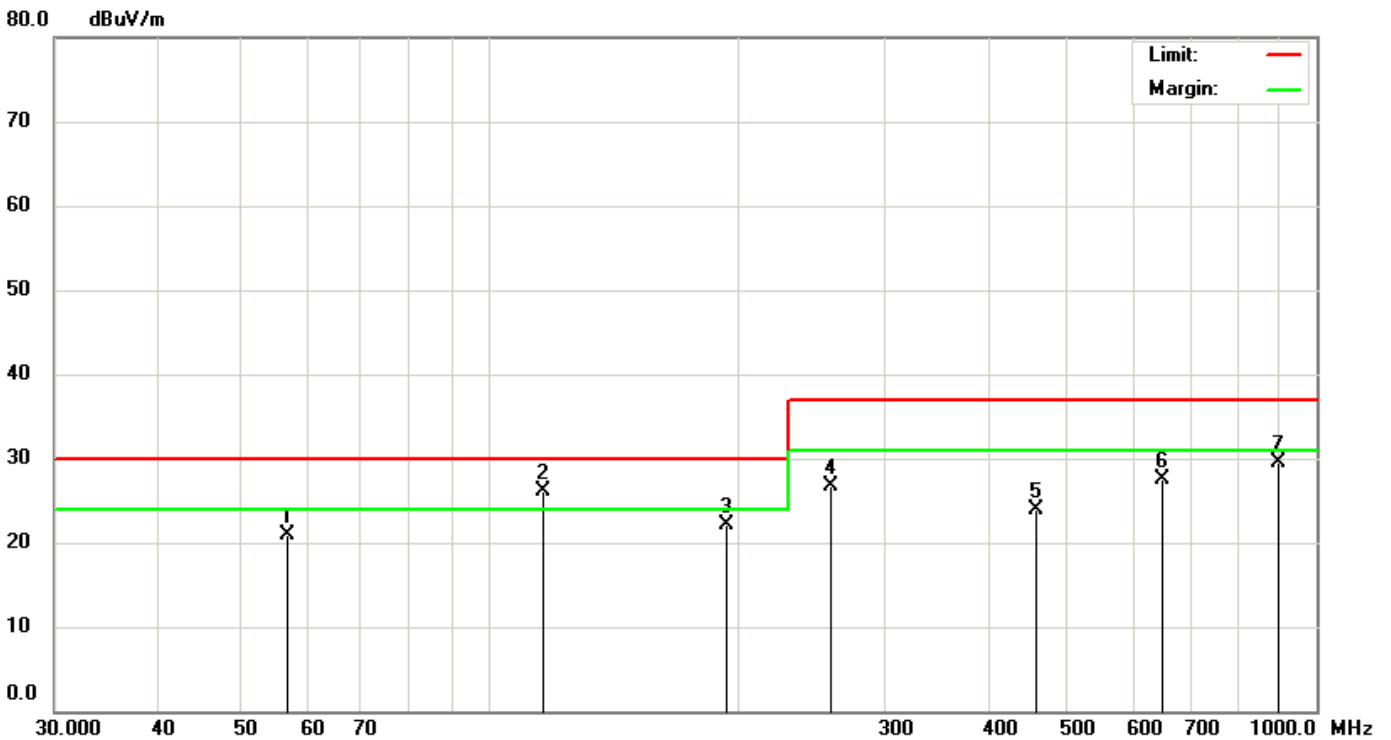




**7.3.6. TEST RESULTS**

**Below 1GHz**

<b>Model No.</b>	XO-4 HS	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	10m
<b>Detector Function:</b>	Quasi-peak.	<b>Tested by</b>	Nelson Tsai

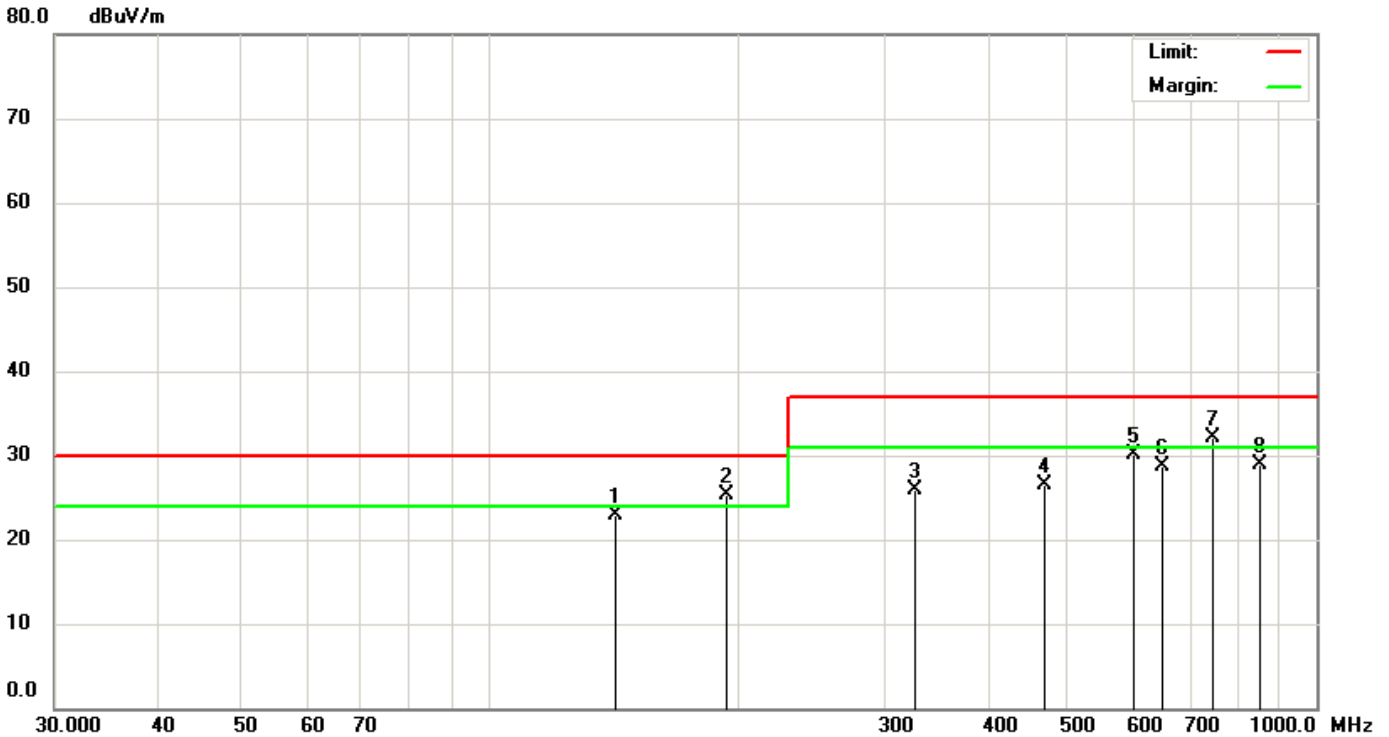


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	57.0000	40.20	-19.29	20.91	30.00	-9.09	100	0	QP
2	116.5800	39.40	-13.30	26.10	30.00	-3.90	100	360	QP
3	192.6000	37.24	-15.17	22.07	30.00	-7.93	100	266	QP
4	258.0000	37.08	-10.28	26.80	37.00	-10.20	100	11	QP
5	457.5000	31.09	-7.15	23.94	37.00	-13.06	300	78	QP
6	648.0000	31.22	-3.71	27.51	37.00	-9.49	261	360	QP
7	896.0000	29.46	-0.01	29.45	37.00	-7.55	175	79	QP

**REMARKS:** The other emission levels were very low against the limit.



<b>Model No.</b>	XO-4 HS	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	26°C, 60% RH	<b>6dB Bandwidth</b>	120 kHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	10m
<b>Detector Function:</b>	Quasi-peak.	<b>Tested by</b>	Nelson Tsai



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	142.5000	37.40	-14.44	22.96	30.00	-7.04	332	241	QP
2	193.8000	40.49	-15.15	25.34	30.00	-4.66	332	0	QP
3	327.0000	35.60	-9.76	25.84	37.00	-11.16	300	358	QP
4	468.5000	33.53	-6.95	26.58	37.00	-10.42	244	177	QP
5	599.3000	34.26	-4.14	30.12	37.00	-6.88	181	9	QP
6	648.0000	32.37	-3.71	28.66	37.00	-8.34	132	332	QP
7	747.5000	33.69	-1.61	32.08	37.00	-4.92	100	327	QP
8	847.5000	29.79	-0.82	28.97	37.00	-8.03	100	89	QP

**REMARKS:** The other emission levels were very low against the limit.



**Above 1GHz**

<b>Model No.</b>	XO-4 HS	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	26°C, 56% RH	<b>Upper frequency</b>	6000MHz
<b>Antenna Pole</b>	Vertical	<b>Antenna Distance</b>	3m
<b>Highest frequency generated or used</b>	1.2GHz	<b>6dB Bandwidth</b>	1 MHz
<b>Detector Function:</b>	Peak/Average	<b>Tested By</b>	Aj Huang

No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree ( ° )	Remark
1	1615.000	67.62	-21.15	46.47	70.00	-23.53	100	194	peak
2	2130.000	64.23	-18.82	45.41	70.00	-24.59	100	124	peak
3	2405.000	66.02	-18.06	47.96	70.00	-22.04	100	227	peak
4	2405.000	55.68	-18.06	37.62	50.00	-12.38	100	227	AVG
5	3785.000	61.80	-12.52	49.28	74.00	-24.72	100	118	peak
6	5410.000	59.02	-9.07	49.95	74.00	-24.05	100	286	peak
7	5695.000	58.90	-8.53	50.37	74.00	-23.63	100	302	peak

- REMARKS:**
1. The other emission levels were very low against the limit.
  2. "--", means the average measurement was not performed when the measured peak data under the limit of average detection.



<b>Model No.</b>	XO-4 HS	<b>Test Mode</b>	Mode 1
<b>Environmental Conditions</b>	26°C, 56% RH	<b>Upper frequency</b>	6000MHz
<b>Antenna Pole</b>	Horizontal	<b>Antenna Distance</b>	3m
<b>Highest frequency generated or used</b>	1.2GHz	<b>6dB Bandwidth</b>	1 MHz
<b>Detector Function:</b>	Peak/Average	<b>Tested By</b>	Aj Huang

No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1615.000	67.62	-21.15	46.47	70.00	-23.53	100	194	peak
2	2130.000	64.23	-18.82	45.41	70.00	-24.59	100	124	peak
3	2405.000	66.02	-18.06	47.96	70.00	-22.04	100	227	peak
4	2405.000	55.68	-18.06	37.62	50.00	-12.38	100	227	AVG
5	3785.000	61.80	-12.52	49.28	74.00	-24.72	100	118	peak
6	5410.000	59.02	-9.07	49.95	74.00	-24.05	100	286	peak
7	5695.000	58.90	-8.53	50.37	74.00	-23.63	100	302	peak

- REMARKS:**
1. The other emission levels were very low against the limit.
  2. "--", means the average measurement was not performed when the measured peak data under the limit of average detection.



## 7.4. HARMONICS CURRENT MEASUREMENT

### 7.4.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment		Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd harmonics		Odd Harmonics only		
3	2.30	3	3.4	2.30
5	1.14	5	1.9	1.14
7	0.77	7	1.0	0.77
9	0.40	9	0.5	0.40
11	0.33	11	0.35	0.33
13	0.21	13	0.30	0.21
15<=n<=39	0.15x15/n	15<=n<=39	3.85/n	0.15x15/n
Even harmonics				
2	1.08			
4	0.43			
6	0.30			
8<=n<=40	0.23x8/n			

- NOTE:** 1. Class A and Class D are classified according to item 4.4.3.  
 2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

### 7.4.2. TEST INSTRUMENTS

Immunity Shielded Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
HARMONICS/FLICKER SYSTEM	EMC-PARTNER	HARMONICS-1000	094	08/26/2013
Test S/W	HARCS Immunity (4.1.9)			

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



**7.4.3. 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.

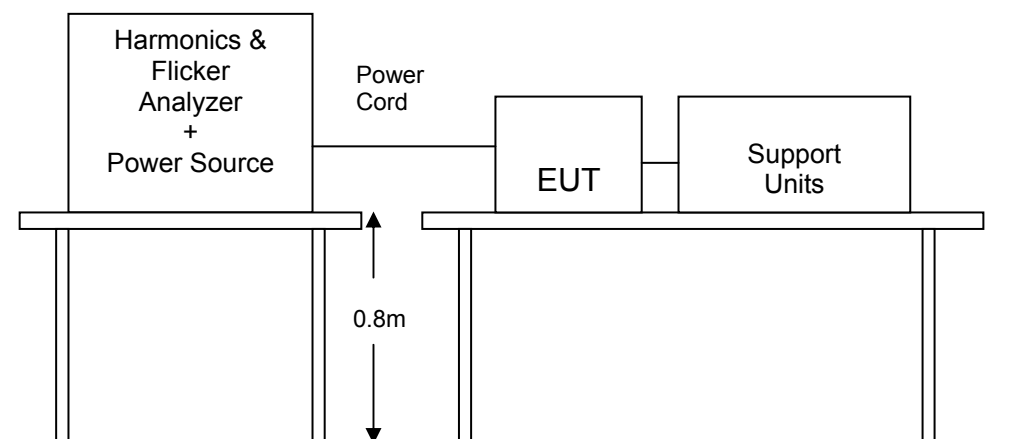
Class B: Portable tools; Arc welding equipment which is not professional equipment.

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.

**7.4.4. TEST SETUP**



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

**7.4.5. TEST RESULTS**

**EUT max Power : 21.33W**

**Note:** According to clause 7 of EN 61000-3-2, equipment with a rated power of 75W or less, no limits apply.



## 7.5. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

### 7.5.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS 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

### 7.5.2. TEST INSTRUMENTS

Immunity Shielded Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
HARMONICS/FLICKER SYSTEM	EMC-PARTNER	HARMONICS-1000	094	08/26/2013
Test S/W	HARCS Immunity (4.1.9)			

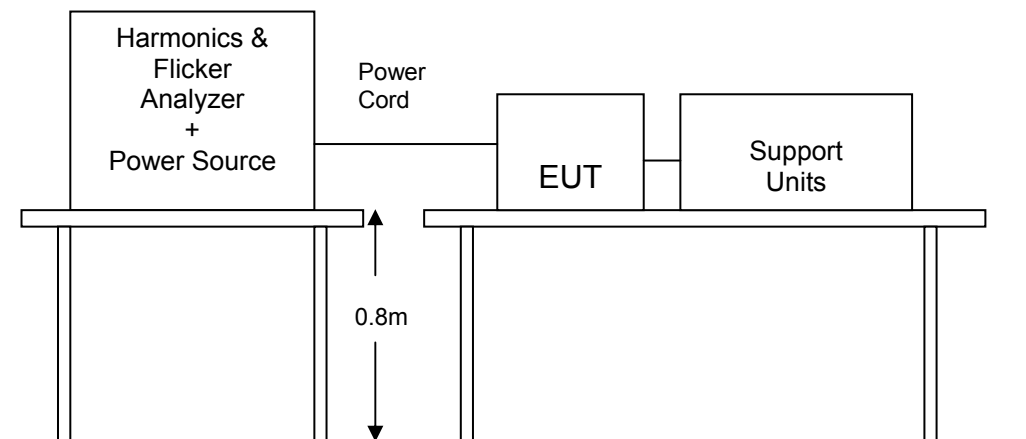
**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



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

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

**7.5.4. TEST SETUP**



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





7.5.5. TEST RESULTS

Observation Period (Tp)	10mins	Test Mode	Mode 1
Environmental Conditions	26°C, 50% RH	Tested by	Nelson Tsai

Power Continuity

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
P <sub>st</sub>	0.072	1.0	PASS
P <sub>lt</sub>	0.072	0.65	PASS
T <sub>dt</sub> (ms)	0	500	PASS
d <sub>max</sub> (%)	0%	4%	PASS
dc (%)	0.01%	3.3%	PASS

Power Switched Manually

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
P <sub>st</sub>	0.072	1.0	PASS
P <sub>lt</sub>	0.072	0.65	PASS
T <sub>dt</sub> (ms)	0	500	PASS
d <sub>max</sub> (%)	0%	4%	PASS
dc (%)	0%	3.3%	PASS

**Note:** d<sub>max</sub> (%) limit classified: 1. 6% for equipment which is switched manually or switched automatically more frequently than twice per day.  
2. 7% for equipment which is attended whilst use or switched on automatically no more than twice per day



OLPC

Date : 2013/3/4 PM 05:18: V4.18

Operator                      Nelson Tsai  
 Unit :                              Laptop Computer  
 Serialnumber :                XO-4 HS  
 Remarks :                      Temp:26 Hum:50 (Power Continuity)

Urms = 230.1V    Freq = 50.000    Range: 0.5 A  
 Irms = 0.157A    Ipk = 0.286A    cf = 1.827  
 P = 21.33W    S = 36.07VA    pf = 0.591

Test - Time :            1 x 10min = 10min ( 100 %)

LIN (Line Impedance Network) :            L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

Limits :    Plt :    0.65            Pst :    1.00  
                       dmax :    4.00 %    dc :    3.30 %  
                       dtLim:    3.30 %    dt>Lim: 500ms

Test completed, Result: PASSED

Plt = 0.072

	Pst	dmax	dc	dt>Lim	Fail
		[%]	[%]	[ms]	
1	0.072	0.000	0.010	0.000	



OLPC

Date : 2013/3/4 PM 05:30: V4.18

Operator Nelson Tsai  
 Unit : Laptop Computer  
 Serialnumber : XO-4 HS  
 Remarks : Temp:26 Hum:50 (Power Switched Manually)

Urms = 230.1V Freq = 50.000 Range: 0.5 A  
 Irms = 0.156A Ipk = 0.286A cf = 1.830  
 P = 21.35W S = 35.95VA pf = 0.594

Test - Time : 1 x 10min = 10min ( 100 %)

LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00  
 dmax : 4.00 % dc : 3.30 %  
 dtLim: 3.30 % dt>Lim: 500ms

Test completed, Result: PASSED

Plt = 0.072

	Pst	dmax	dc	dt>Lim	Fail
		[%]	[%]	[ms]	
1	0.072	0.000	0.000	0.000	



## 8 IMMUNITY TEST

### 8.1. GENERAL DESCRIPTION

Product Standard	ETSI EN 301 489-1 V1.9.2 2011-09; ETSI EN 301 489-17 V2.1.1 2009-05	
	Test Type	Minimum Requirement
<b>Basic Standard, Specification, and Performance Criterion required</b>	IEC 61000-4-2 EN 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3 EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz and 1400 ~ 2700MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4 EN 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power Port: 1kV DC Power Port: 0.5kV Signal Ports and Telecommunication Ports: 0.5kV Performance Criterion B
	IEC 61000-4-5 EN 61000-4-5	Surge Immunity Test: 1.2/50 $\mu$ s or 10/700 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s or 5/320 Short Circuit Current AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV DC Power Port ~ line to earth: 0.5kV Signal Ports and Telecommunication Ports ~ line to ground: 1kV Performance Criterion B
	IEC 61000-4-6 EN 61000-4-6	Conducted Radio Frequency Disturbances Test –CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-11 EN 61000-4-11	<b>Voltage Dips:</b> i) 0% residual for 0.5 & 1period, Performance Criterion B ii) 70% residual for 25 period (at 50Hz), Performance Criterion B <b>Voltage Interruptions:</b> 0% residual for 250 period (at 50Hz), Performance Criterion C



## 8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

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



### 8.3. ELECTROSTATIC DISCHARGE (ESD)

#### 8.3.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-2; ETSI EN301 489-1; ETSI EN301 489-17
<b>Discharge Impedance:</b>	330 ohm / 150 pF
<b>Discharge Voltage:</b>	Air Discharge: 2; 4; 8 kV (Direct) Contact Discharge: 2; 4 kV (Direct/Indirect)
<b>Polarity:</b>	Positive & Negative Air Discharge: min. 10 times at single test point for each negative and positive polarity
<b>Number of Discharge:</b>	Contact Discharge: min. 200 times in total
<b>Discharge Mode:</b>	Single Discharge 1 second minimum

#### 8.3.2. TEST INSTRUMENT

Immunity Shielded Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Simulator	KeyTek	MiniZap-15	1106228	05/09/2013

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

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

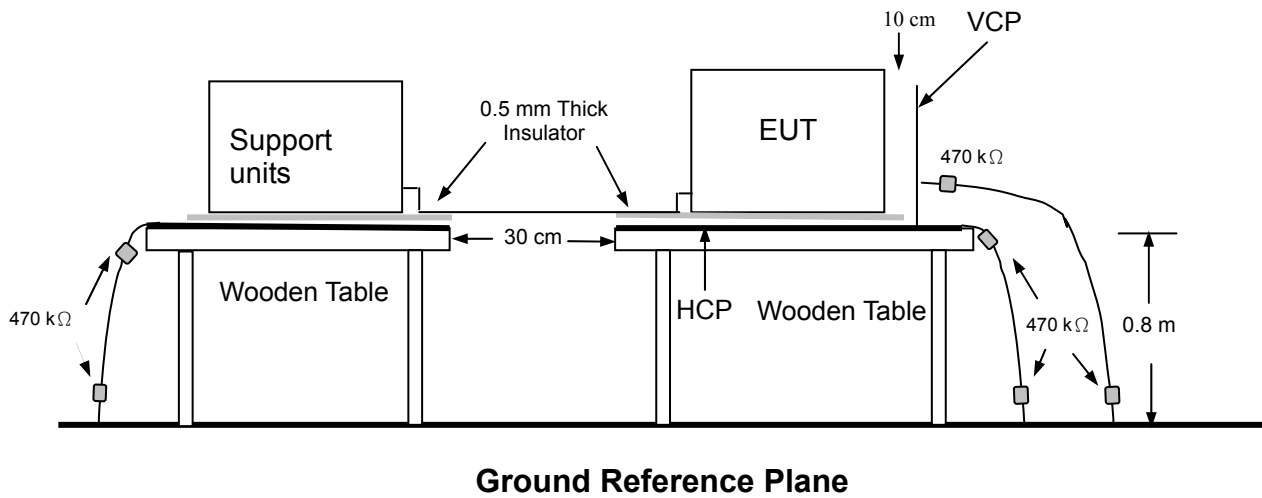
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally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

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

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



### 8.3.4. TEST SETUP



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

#### NOTE:

##### TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 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 EN 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:	24°C	Humidity	48% RH
Pressure	983mbar	Tested by	Nelson Tsai
Required Passing Performance		Criterion B	

Air Discharge												
Test Points	Test Levels						Results					
	± 2 kV	Performance Criterion of testing		± 4 kV	Performance Criterion of testing		± 8 kV	Performance Criterion of testing		Pass	Fail	Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note 1
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note 1
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note 1
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note 1
Top	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	
Bottom	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note 1

For the tested points to EUT, please refer to attached page. (Red arrow mark for Air Discharge)

Contact Discharge												
Test Points	Test Levels						Results					
	± 2 kV	Performance Criterion of testing		± 4 kV	Performance Criterion of testing		± 8 kV	Performance Criterion of testing		Pass	Fail	Observation
Front	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	
Back	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	
Left	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	
Right	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	
Top	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	Note 1
Bottom	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/>	<input type="checkbox"/>	

For the tested points to EUT, please refer to attached page. (Blue arrow mark for Contact Discharge)

Discharge To Horizontal Coupling Plane								
Side of EUT	Test Levels			Results				
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion of testing		Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1

Discharge To Vertical Coupling Plane								
Side of EUT	Test Levels			Results				
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion of testing		Observation
Front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1
Back	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1
Left	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1
Right	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	Note 1

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

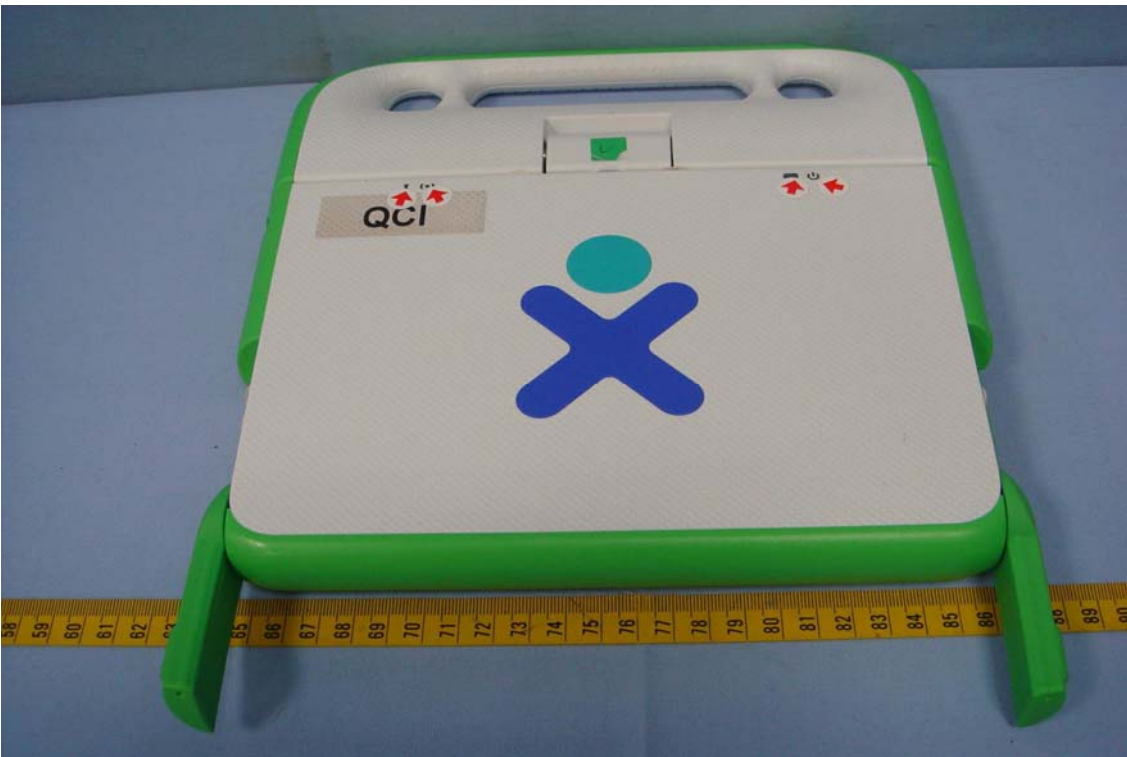


**The Tested Points of EUT**

**Photo 1 of 8**



**Photo 2 of 8**

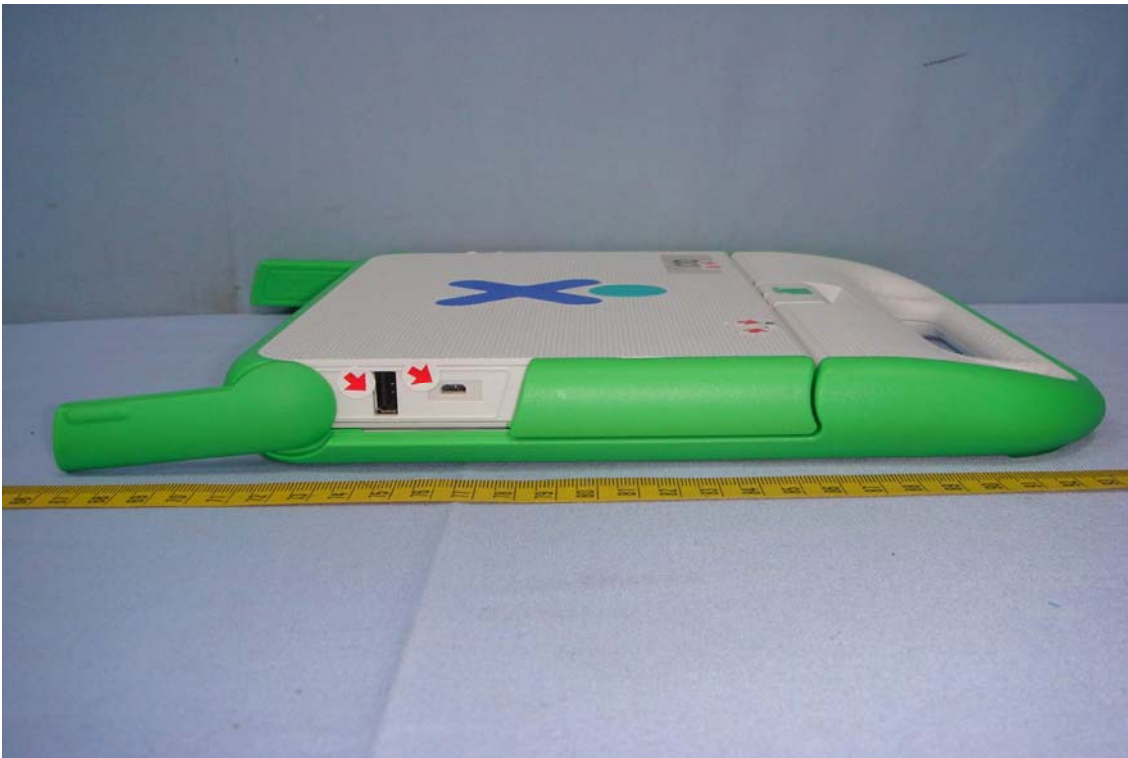




**Photo 3 of 8**



**Photo 4 of 8**

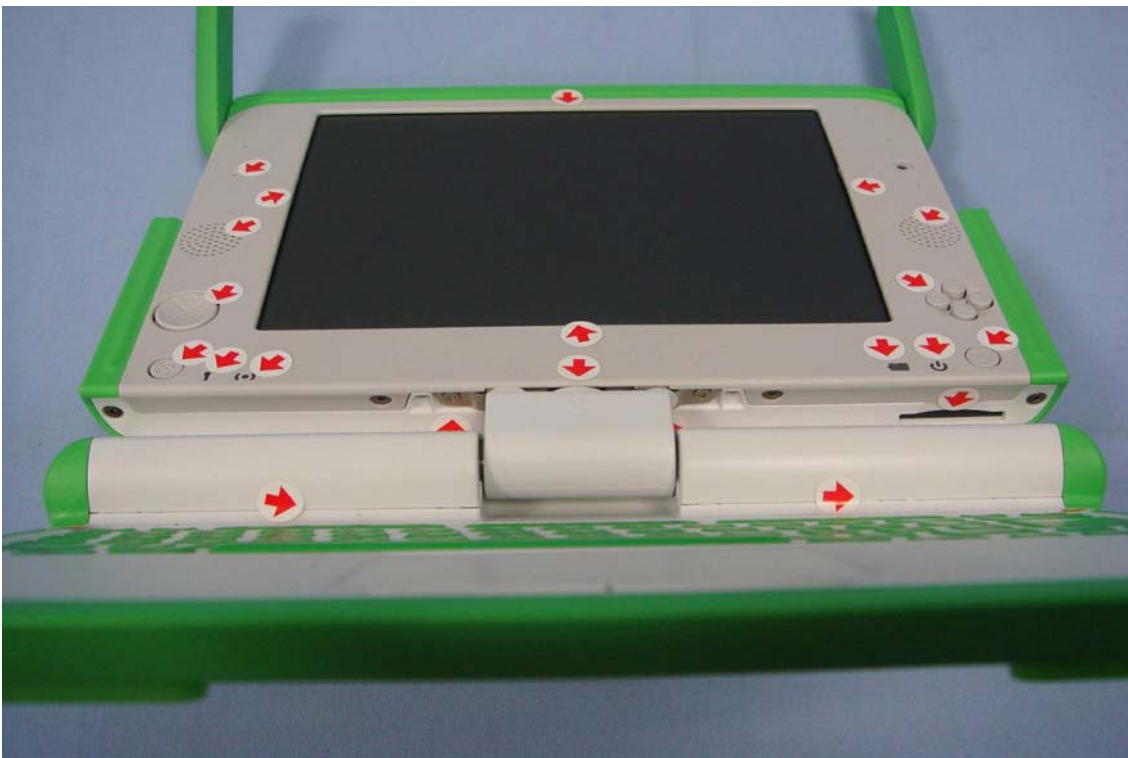




**Photo 5 of 8**



**Photo 6 of 8**



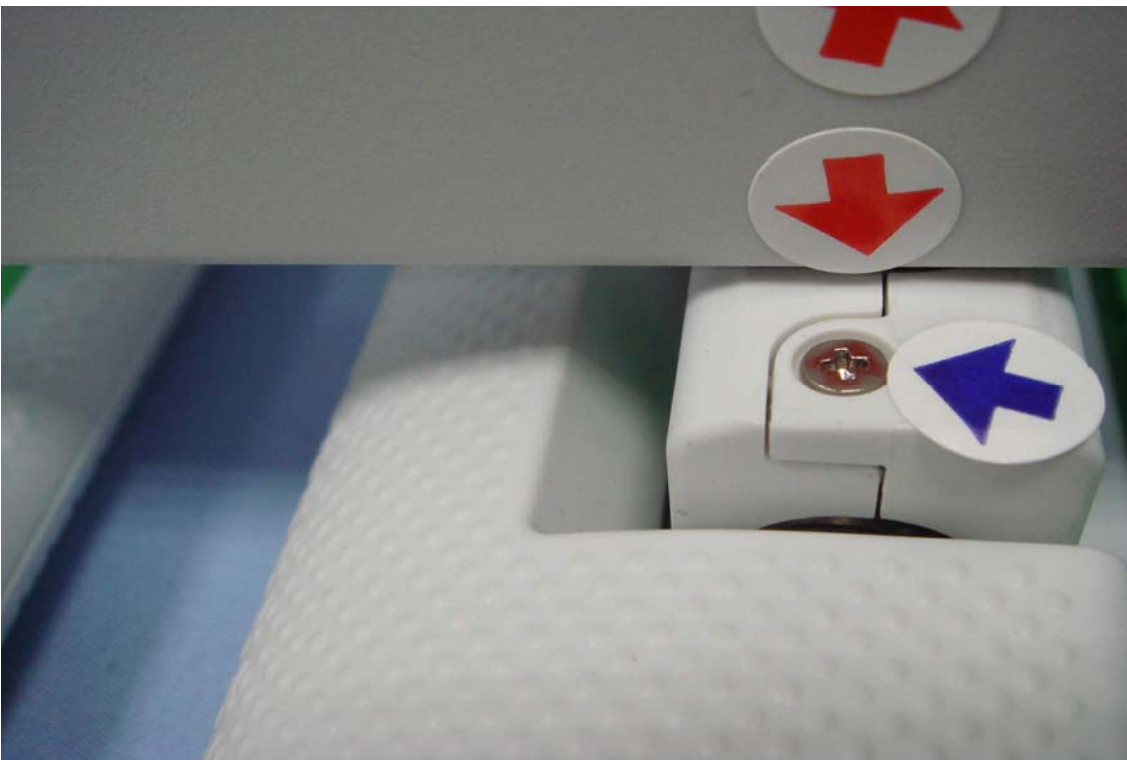




**Photo 7 of 8**



**Photo 8 of 8**





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

#### 8.4.1. TEST SPECIFICATION

**Basic Standard:** EN 61000-4-3; ETSI EN301 489-1; ETSI EN301 489-17

**Frequency Range:** 80 MHz ~1000 MHz, 1400 MHz ~ 2700 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

RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
S.G.	Agilent	8648C	4108A05772	03/13/2013
Power Meter	R&S	NRVD	837794/029	07/23/2013
Power Sensor	R&S	URV5-Z2	835640/015	07/23/2013
Power Sensor	R&S	URV5-Z2	835640/016	07/23/2013
Power Amplifier	ar	150W1000	300300	N.C.R
Power Amplifier	ar	60S1G3M3	0328274	N.C.R
Bilog Antenna	SCHAFFNER	CBL 6140A	1221	N.C.R
Horn Antenna	EMCO	3115	00022257	01/01/2014
Hight Power Directional Coupler	Amplifier Reseach	DC7144A	0330431	N.C.R
Hight Power Directional Coupler	WERLATONE	C3910	7433	N.C.R
Test S/W	SW1006 (V1.22)			

**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



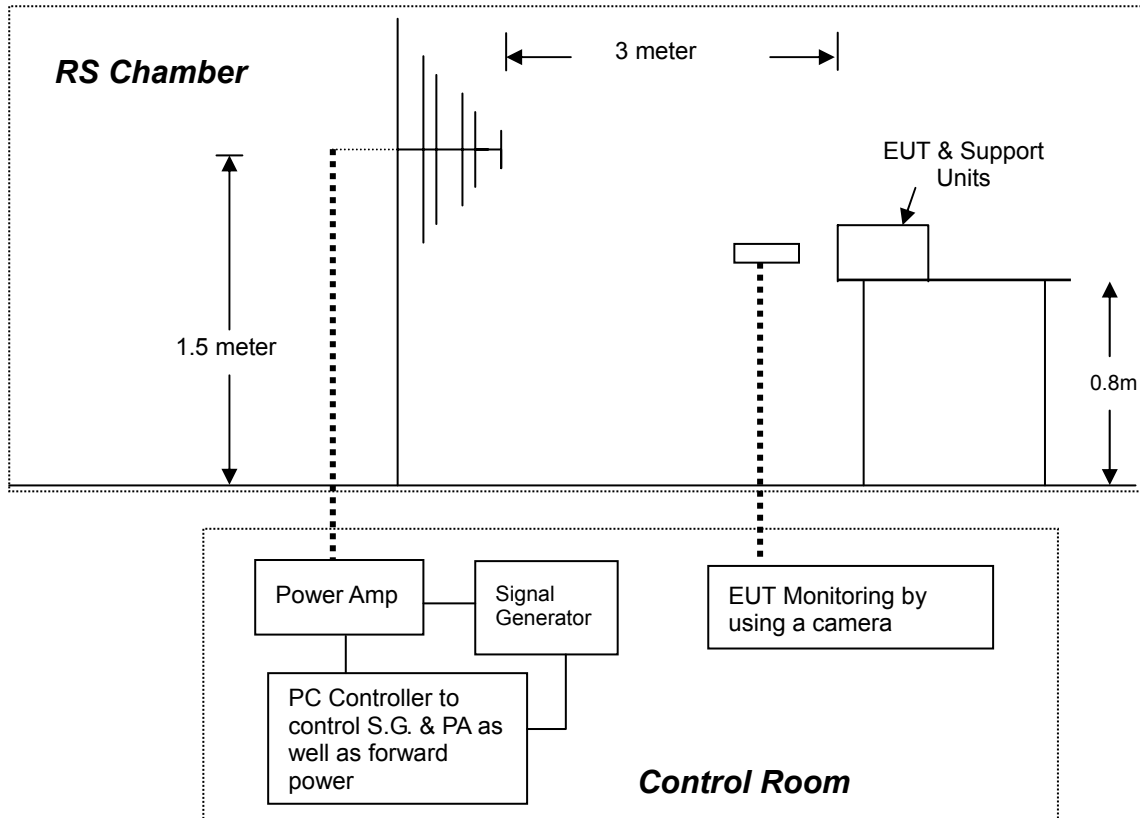
**8.4.3. TEST PROCEDURE** (please refer to measurement standard or CCS SOP PA-023)

The test procedure was in accordance with EN 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 / 1400 MHz to 2700 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  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 field strength level was 3V/m.
- e) 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 EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

**FLOOR STANDING EQUIPMENT**

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





**8.4.5. TEST RESULTS**

<b>Temperature:</b>	24°C	<b>Humidity</b>	48% RH
<b>Pressure</b>	983mbar	<b>Dwell Time</b>	3 sec.
<b>Tested by</b>	Nelson Tsai	<b>Required Passing Performance</b>	<b>Criterion A</b>

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion of Testing	Observation	Result
80 ~ 1000	V&H	0	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
80 ~ 1000	V&H	90	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
80 ~ 1000	V&H	180	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
80 ~ 1000	V&H	270	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
1400 ~ 2700	V&H	0	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
1400 ~ 2700	V&H	90	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
1400 ~ 2700	V&H	180	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
1400 ~ 2700	V&H	270	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS

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



### 8.5. ELECTRICAL FAST TRANSIENT (EFT)

#### 8.5.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-4; ETSI EN301 489-1; ETSI EN301 489-17
<b>Test Voltage:</b>	AC Power Port: 1kV DC Power Port: 0.5kV Signal Ports and Telecommunication Ports: 0.5kV
<b>Polarity:</b>	Positive & Negative
<b>Impulse Frequency:</b>	5 kHz
<b>Impulse Wave-shape:</b>	5/50 ns
<b>Burst Duration:</b>	15 ms
<b>Burst Period:</b>	3 Hz
<b>Test Duration:</b>	Not less than 1 min.

#### 8.5.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC TEST SYSTEM	EMC-PARTNER	TRANSIENT-2000	754	09/02/2013
Clamp	HAEFELY TRENCH	093 506.1	080 421.13	N.C.R
Test S/W	Genecs (2.54)			

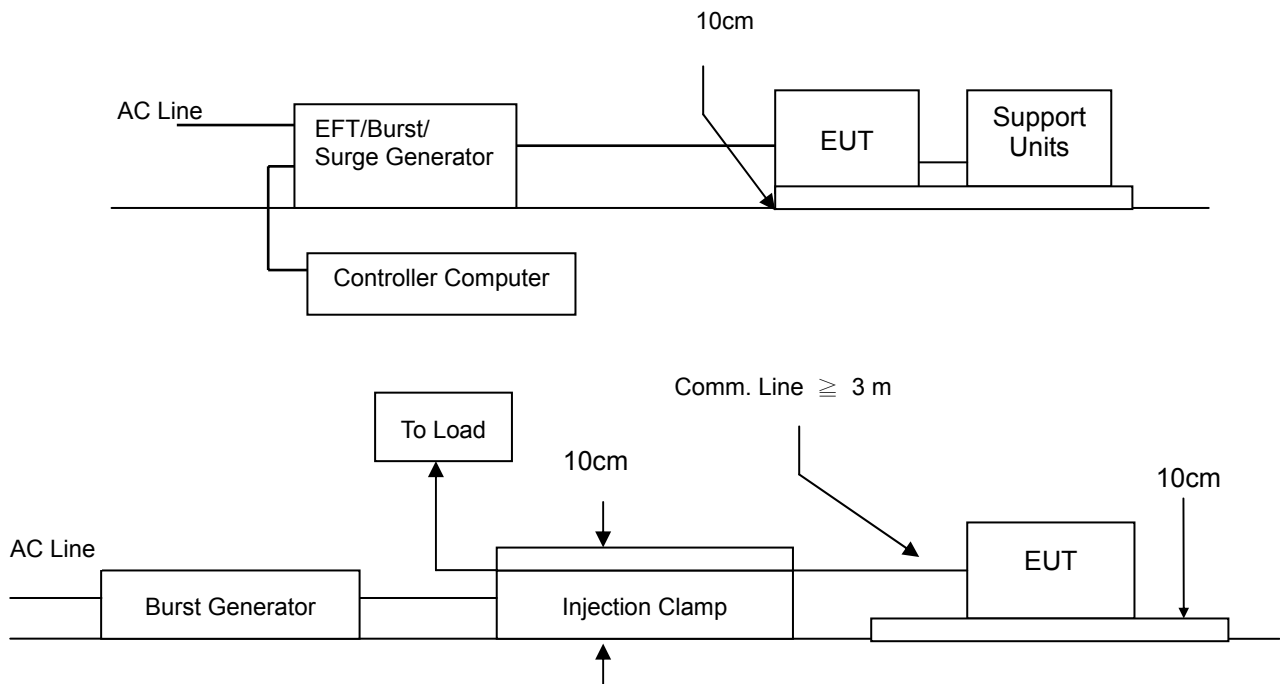
**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. N.C.R.= No Calibration required

#### 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 1 meter.
- c) The duration time of each test sequential was 1 minute.
- d) The transient/burst waveform was in accordance with EN 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 EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.



**8.5.5. TEST RESULTS**

<b>Temperature</b>	24°C	<b>Humidity</b>	48% RH
<b>Pressure</b>	983mbar	<b>Tested by</b>	Nelson Tsai
<b>Required Passing Performance</b>		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion of testing	Observation	Result
L	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
N	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS
L+ N	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS

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



### 8.6. SURGE IMMUNITY TEST

#### 8.6.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-5; ETSI EN301 489-1; ETSI EN301 489-17
<b>Wave-Shape:</b>	Combination Wave 1.2/50 $\mu$ s or 10/700 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s or 5/320 Short Circuit Current
<b>Test Voltage:</b>	AC Power Port ~ line to line: 1kV, line to earth (ground): 2kV DC Power Port ~ line to earth: 0.5kV Signal Ports and Telecommunication Ports ~ line to ground: 1kV
<b>Surge Input/Output:</b>	Power Line: L1-L2 / L1-PE / L2-PE
<b>Generator Source</b>	2 ohm between networks
<b>Impedance:</b>	12 ohm between network and ground
<b>Polarity:</b>	Positive/Negative
<b>Phase Angle:</b>	0 / 90 / 180 / 270
<b>Pulse Repetition Rate:</b>	1 time / min. (maximum)
<b>Number of Tests:</b>	5 positive and 5 negative at selected points

#### 8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Surge Tester	EMC-PARTNER	MIG0603IN2	1501	05/10/2013
CDN	EMC-PARTNER	CDN-UTP8	1503	05/10/2013
Test S/W	GENECS(3.1.7)			

**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.

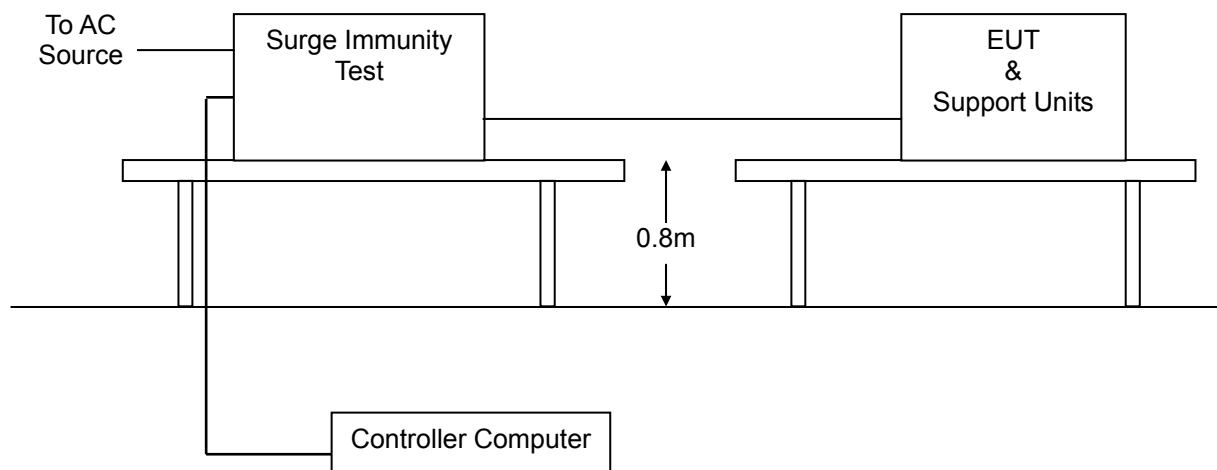
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

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**

<b>Temperature</b>	24°C	<b>Humidity</b>	48% RH
<b>Pressure</b>	983mbar	<b>Tested by</b>	Nelson Tsai
<b>Required Passing Performance</b>		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion of testing	Observation	Result
L - N	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	<b>Note 1</b>	PASS

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



### 8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

#### 8.7.1. TEST SPECIFICATION

**Basic Standard:** EN 61000-4-6; ETSI EN301 489-1; ETSI EN301 489-17  
**Frequency Range:** 0.15 MHz ~ 80 MHz  
**Field Strength:** 3 Vrms  
**Modulation:** 1kHz Sine Wave, 80%, AM Modulation  
**Frequency Step:** 1 % of preceding frequency value  
**Coupled cable:** Power Mains, Unshielded  
**Coupling device:** CDN-M2 (2 wires) for Power Cord

#### 8.7.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
S.G.	Agilent	8648C	4108A05772	03/13/2013
Power Meter	R&S	NRVD	837794/029	07/23/2013
Power Sensor	R&S	URV5-Z2	835640/015	07/23/2013
Power Sensor	R&S	URV5-Z2	835640/016	07/23/2013
Power Amplifier	ar	75A250AM1	306334	N.C.R
CDN	FRANKONIA	CDN-M2	A3002010	09/02/2013
Test S/W	SW1006 (V1.22)			

**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 shall be 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.

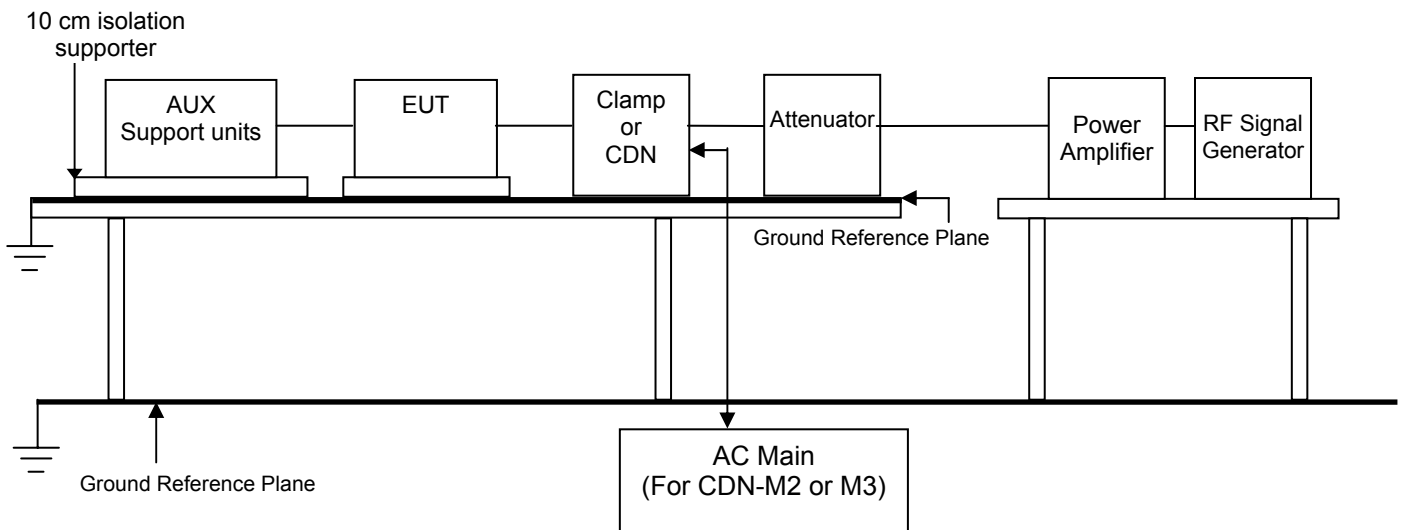
The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was  $1.5 \times 10^{-3}$  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:**

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested was 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**

<b>Temperature</b>	24°C	<b>Humidity</b>	48% RH
<b>Pressure</b>	983mbar	<b>Tested by</b>	Nelson Tsai
<b>Required Passing Performance</b>		Criterion A	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion of testing	Observation	Result
0.15 ~ 80	3	Power Line	CDN-M2	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS

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



### 8.8. VOLTAGE DIP & VOLTAGE INTERRUPTIONS

#### 8.8.1. TEST SPECIFICATION

<b>Basic Standard:</b>	EN 61000-4-11; ETSI EN301 489-1; ETSI EN301 489-17
<b>Test duration time:</b>	Minimum three test events in sequence
<b>Interval between event:</b>	Minimum 10 seconds
<b>Angle:</b>	0~360 degree
<b>Step:</b>	45 degree

#### 8.8.2. TEST INSTRUMENT

Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Dips/Interruption and Variations Simulator	EMC-PARTNER	TRA3000D	0076	05/10/2013
Test S/W	GENECS(3.1.7)			

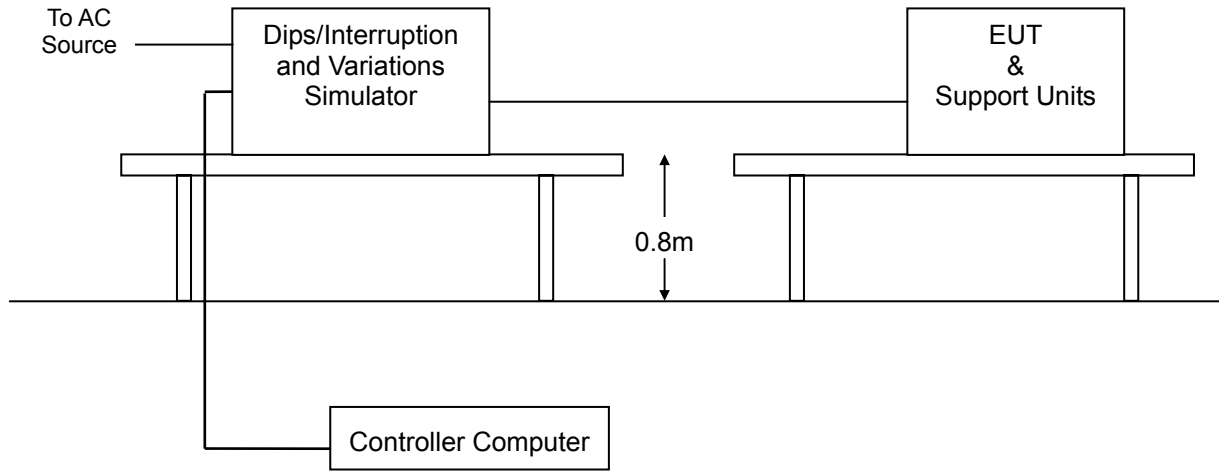
**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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

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



**8.8.4. TEST SETUP**



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

**8.8.5. TEST RESULTS**

<b>Temperature:</b>	24°C	<b>Humidity</b>	48% RH
<b>Pressure</b>	983mbar	<b>Tested by</b>	Nelson Tsai
<b>Required Passing Performance</b>	Voltage Dips: <b>Criterion B: 0% residual 0.5 &amp; 1 period</b> <b>Criterion B: 70% residual 25 period (at 50Hz) &amp;</b> Voltage Interruptions: <b>Criterion C: 0% residual 250 period (at 50Hz)</b>		

Test Power: 230Vac, 50Hz				
Voltage (% residual)	Duration (Period)	Performance Criterion of Testing	Observation	Test Result
0	0.5	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	<b>Note 1</b>	PASS
0	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	<b>Note 1</b>	PASS
70	25	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	<b>Note 1</b>	PASS
0	250	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C	<b>Note 2</b>	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 auto recovered as the events disappear.



## 9 PHOTOGRAPHS OF THE TEST CONFIGURATION

### CONDUCTED EMISSION TEST







**RADIATED EMISSION TEST**

**Below 1GHz**





**Above 1GHz**







**POWER HARMONIC & VOLTAGE FLUCTUATION / FLICKER TEST**







**ELECTROSTATIC DISCHARGE TEST**

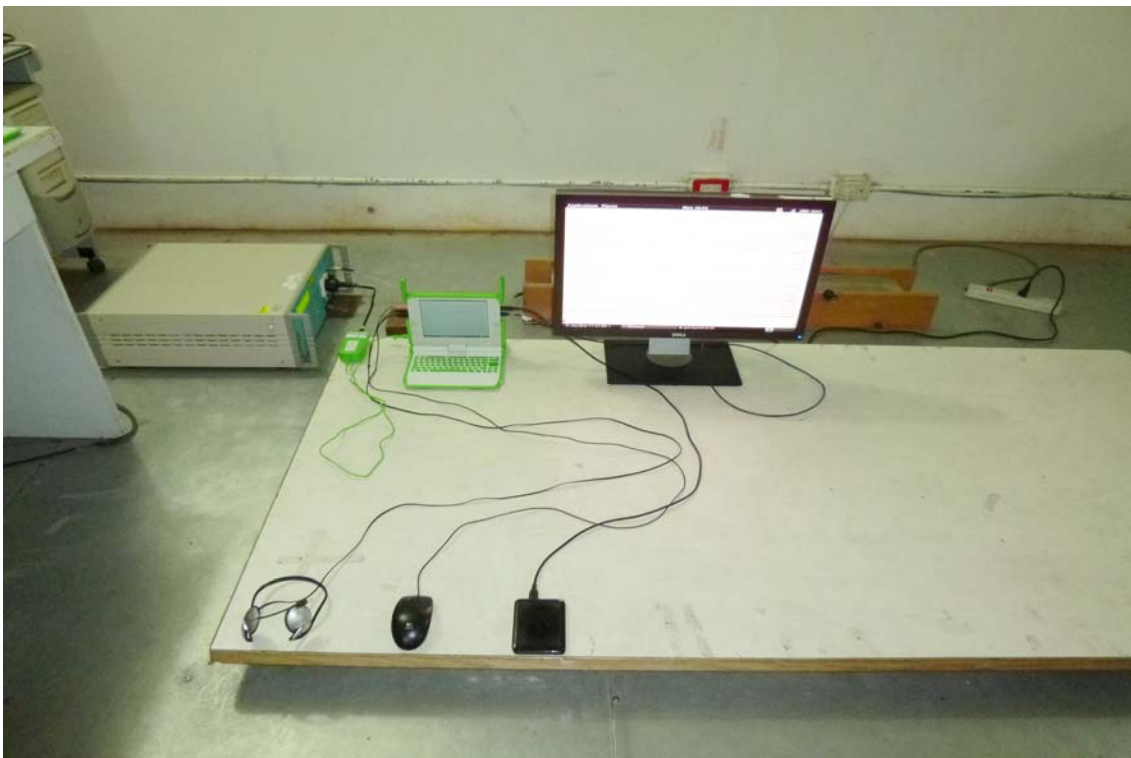




**RADIATED ELECTROMAGNETIC FIELD TEST**



**FAST TRANSIENTS/BURST TEST**





**SURGE IMMUNITY TEST**



**CONDUCTED DISTURBANCE TEST (MAIN PORT)**







**VOLTAGE DIPS / INTERRUPTION TEST**





## **APPENDIX 1: PHOTOGRAPHS OF EUT**

**Refer to T130222L03-B External Photographs.**