



CE EMC TEST REPORT

for

Laptop Computer

MODEL: XO-4 HS; XO-4; XO-4 HS Touch; XO-4 Touch

Test Report Number:
T130222L03-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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Revision History

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



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1 TEST CERTIFICATION

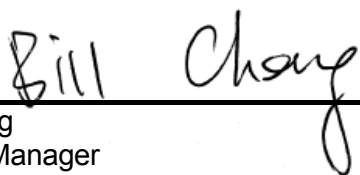
Product:	Laptop Computer
Model:	XO-4 HS; XO-4; XO-4 HS Touch; XO-4 Touch
Brand:	OLPC
Applicant:	Quanta Computer Inc. No. 188, Wen Hwa 2nd RD., Kuei Shan Hsiang, Taoyuan Hsien, Taiwan, R.O.C.
Manufacturer:	Quanta Computer Inc. No. 188, Wen Hwa 2nd RD., Kuei Shan Hsiang, Taoyuan Hsien, Taiwan, R.O.C.
Tested:	February 22 ~ March 4, 2013
Test Voltage:	230VAC, 50Hz
Applicable Standards:	ETSI EN 301 489-1 V1.9.2 2011-09 ETSI EN 301 489-17 V2.1.1 2009-05 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

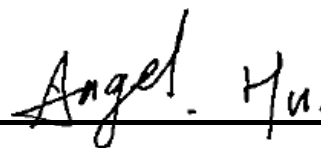
The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily 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
IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010	RS	PASS	Meets the requirements of Performance Criterion A
IEC 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 Voltage Dips: i) 0% residual for 0.5 & 1period, Performance Criterion B ii) 70% residual for 25 period (at 50Hz), Performance Criterion B Voltage Interruptions: 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

Product	Laptop Computer		
Model	XO-4 HS; XO-4; XO-4 HS Touch; XO-4 Touch		
Brand	OLPC		
Applicant	Quanta Computer Inc.		
Serial Number	T130222L03		
Identify Date	February 22, 2013		
EUT Power Rating	12VDC, 2.0A / 13.5VDC, 1.85A		
Power Adapter Manufacturer	Bestec	Model	NA0241WAA
			NA0241WEA
			BT-AG250SDF
	Darfon	Model	BX24-1203 (X= U or P)
			BB0J-C
AC Power Adapter Rating	For NA0241WAA; NA0241WEA I/P: 100-240VAC, 1.0A, 50-60Hz O/P: 12VDC, 2.0A		
	For BT-AG250SDF I/P: 100-240VAC, 0.4 A, 50-60Hz O/P: 13.5VDC, 1.85A		
	For BX24-1203 (X= U or P) I/P: 100-240VAC, 0.7A, 50-60Hz O/P: 12VDC, 2.0A		
	For BB0J-C I/P: 100-240VAC, 1.0 A, 50-60Hz O/P: 13.5VDC, 1.85A		
AC Power Cable Type	For BT-AG250SDF; BB0J-C Unshielded, 1.8m (Detachable) to Power Adapter		
DC Power Cable Type	Unshielded, 1.8m (Non-Detachable) at Power Adapter		
RF Module	QMI	Model	EM113-MV
Number of Channels	IEEE 802.11b/g mode: 13 Channels		
Modulation Technique	IEEE 802.11b mode: 1, 2, 5.5, 11 Mbps		
	IEEE 802.11g mode: 6, 9, 12, 18, 24, 36, 48, 54 Mbps		



I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. HDMI Port	1	1
2. USB 2.0 Port	2	2
3. Audio Port	2	2
4. Memory Card Reader	1	1

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 Adapter Model: BX24-1203 means of "X" (X= U or P) just for marketing purpose only except plug.
5. Client consigns only one sample to test (model number: BU24-1203). Therefore, the testing Lab. just guarantees the unit, which has been tested.
6. The Adapter Model: NA0241WAA and NA0241WEA are identical just for marketing purpose only except plug.
7. Client consigns only one sample to test (model number: NA0241WAA). 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(s) were scanned during the preliminary test:

Pre-Test Mode
Mode 1: Data Link

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

Final Test Mode		
Emission	Conducted Emission	Mode 1 (1200 x 900 Resolution)
	Radiated Emission	Mode 1 (1200 x 900 Resolution)
Immunity		Mode 1 (1200 x 900 Resolution)

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 and 120Vac/60Hz had been covered during the pre-test. The worst radiated emission 30MHz ~ 1GHz was found at 230Vac/50Hz 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 external hard disk and then writes the data into 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 (7).

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



5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

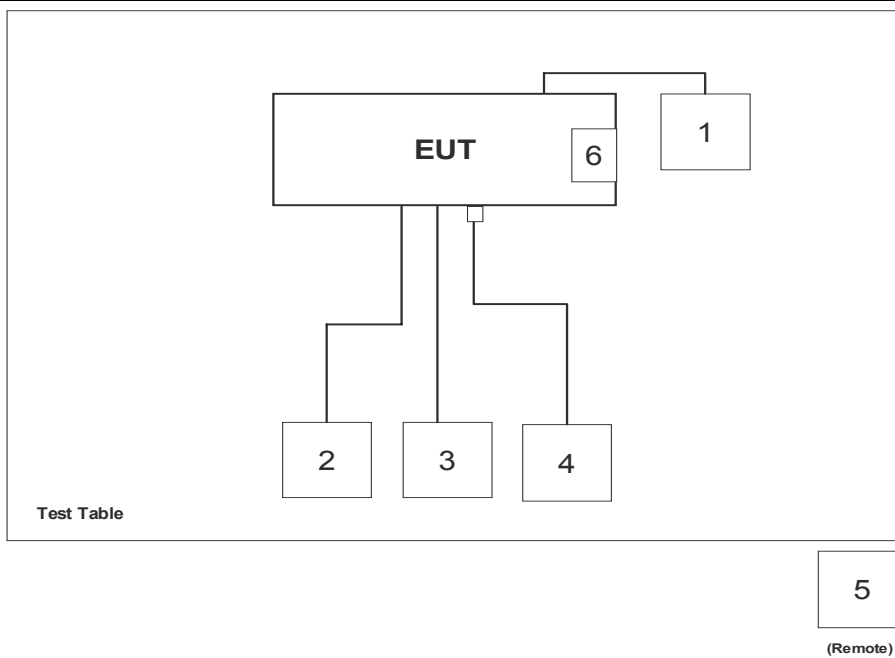
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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	F12-UF	A0100214-43b0015	FCC DoC	TeraSys	Shielded, 1.8m	N/A
4	Multimedia Headset	ClearChat	N/A	FCC DoC	Logitech	Unshielded, 2.0m x2	N/A
5	AP (Remote)	LM-RT210W	12442028770	H8N-RT2 10W	LEMEL	N/A	Unshielded, 1.8m
6	SD Card	WARRANT YVOIOIF REMOVED	N/A	N/A	A-DATA	N/A	N/A

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. AP	6. SD Card





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.

Taiwan	TAF
USA	A2LA

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

Canada	Industry Canada
Norway	Nemko
Japan	VCCI
Taiwan	BSMI
USA	FCC

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



6.3. MEASUREMENT UNCERTAINTY

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

Measurement	Frequency	Uncertainty
Conducted emissions	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 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 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-50/250-1 6-2-07	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

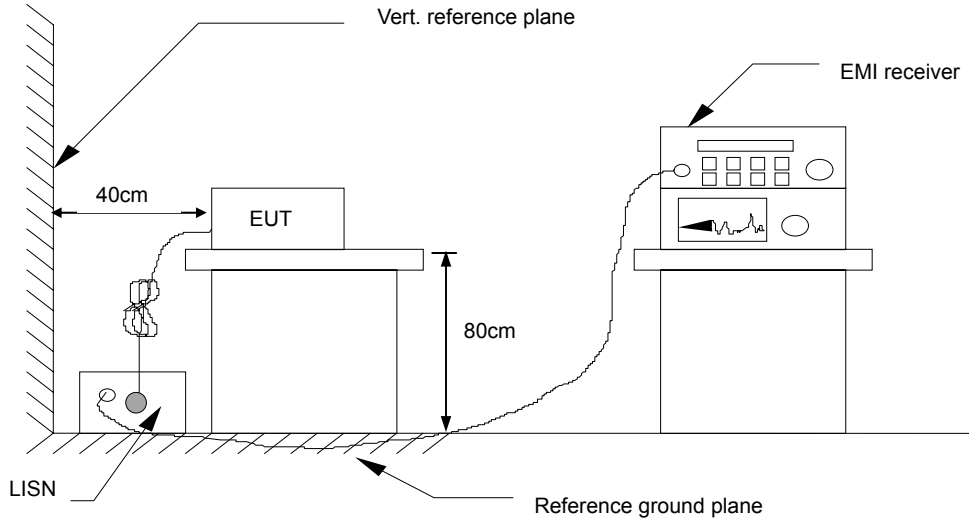
- The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions 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:

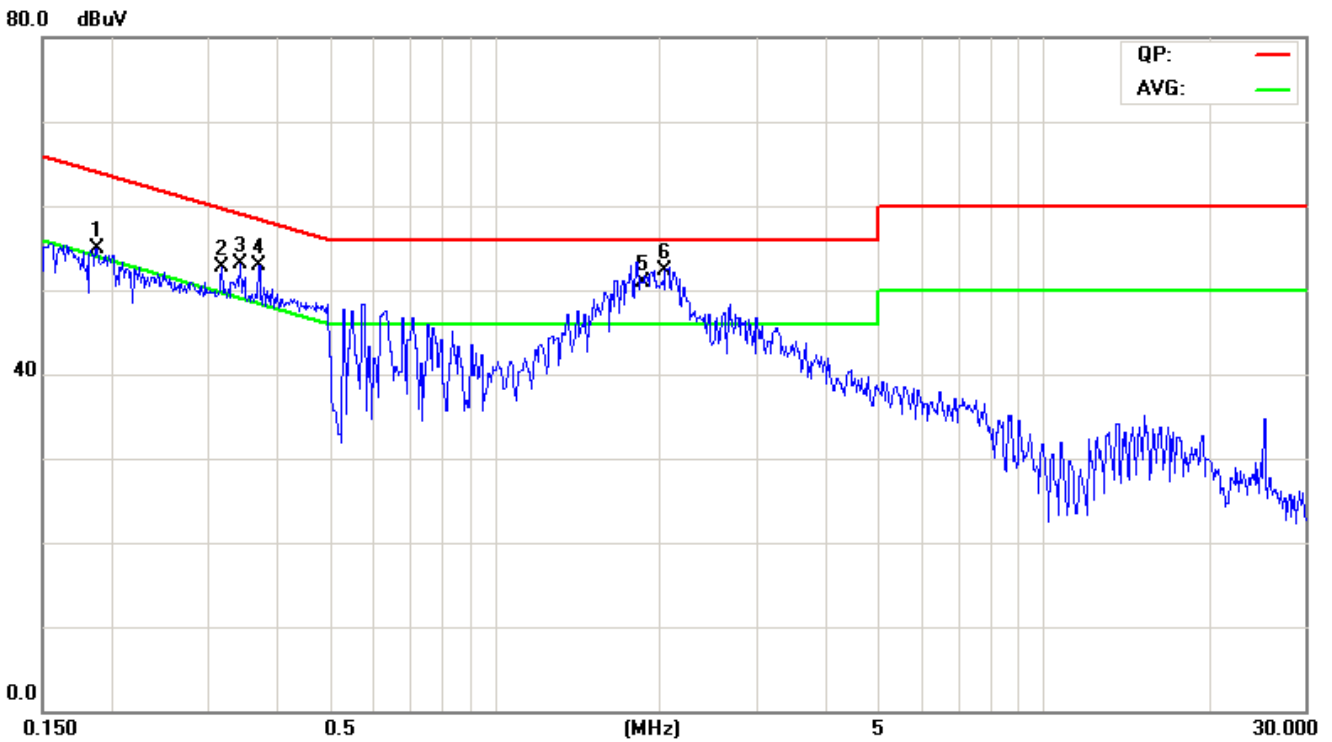
Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correcrtion factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak. limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
x.xx	43.95	33	10.00	53.95	43.00	56.00	46.00	-2.05	-3.00	Pass

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

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

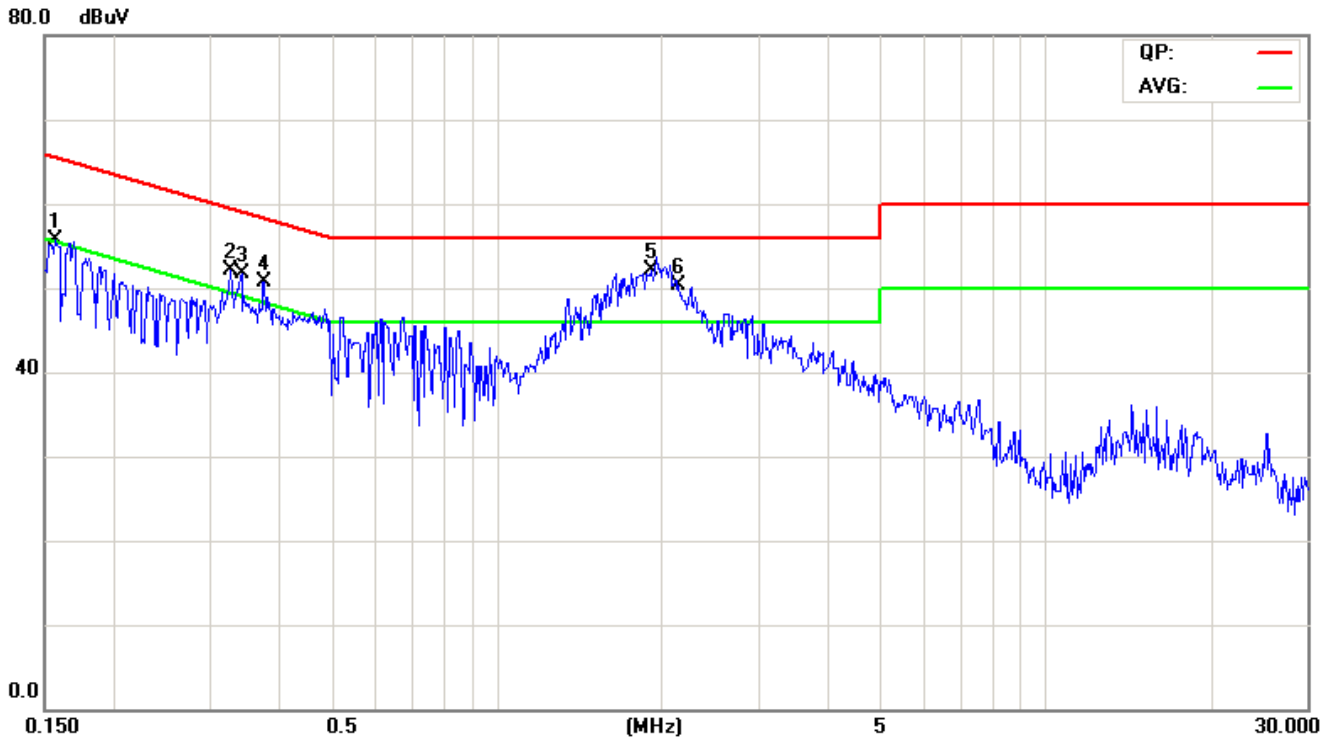


NO.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark (Pass/Fail)
1	0.1884	34.67	14.15	9.66	44.33	23.81	64.10	54.11	-19.77	-30.30	Pass
2	0.3200	31.79	18.15	9.69	41.48	27.84	59.70	49.71	-18.22	-21.87	Pass
3	0.3424	36.25	28.50	9.69	45.94	38.19	59.14	49.14	-13.20	-10.95	Pass
4	0.3704	35.30	16.70	9.68	44.98	26.38	58.49	48.49	-13.51	-22.11	Pass
5	1.8461	36.78	23.80	9.78	46.56	33.58	56.00	46.00	-9.44	-12.42	Pass
6*	2.0163	37.68	25.63	9.78	47.46	35.41	56.00	46.00	-8.54	-10.59	Pass

REMARKS: L1 = Line One (Live Line)



Model No.	XO-4 HS	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 57% RH	Test Mode	Mode 1
Tested by	Chieh Cheng	Line	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 (Pass/Fail)
1	0.1578	37.32	17.36	9.66	46.98	27.02	65.57	55.58	-18.59	-28.56	Pass
2	0.3277	35.30	26.61	9.67	44.97	36.28	59.51	49.51	-14.54	-13.23	Pass
3	0.3443	34.63	26.92	9.67	44.30	36.59	59.10	49.10	-14.80	-12.51	Pass
4	0.3769	34.40	16.04	9.66	44.06	25.70	58.35	48.35	-14.29	-22.65	Pass
5*	1.9134	38.61	25.18	9.76	48.37	34.94	56.00	46.00	-7.63	-11.06	Pass
6	2.1536	34.04	22.50	9.76	43.80	32.26	56.00	46.00	-12.20	-13.74	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.

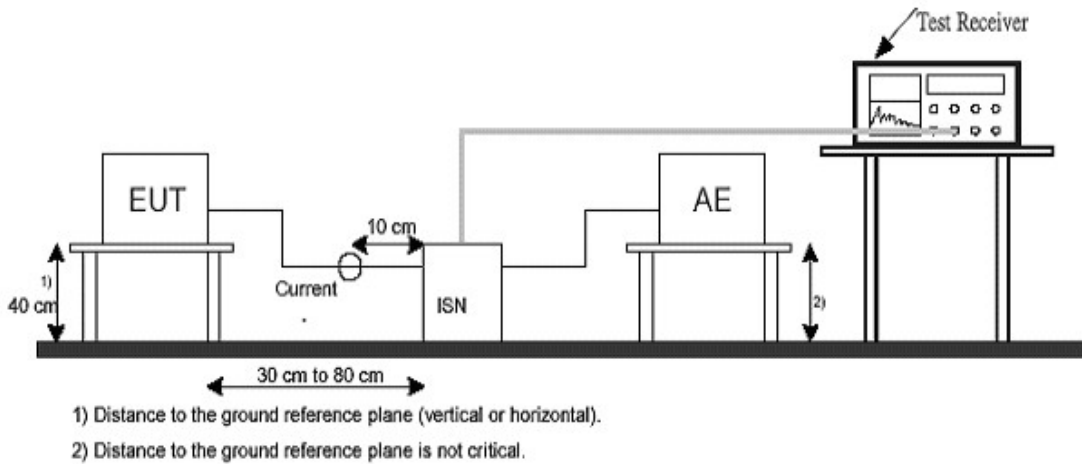


7.2.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-031)

- Selecting ISN for 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.

Not 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

Not 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

Open Area Test Site # 2				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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			

3 Meter Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
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

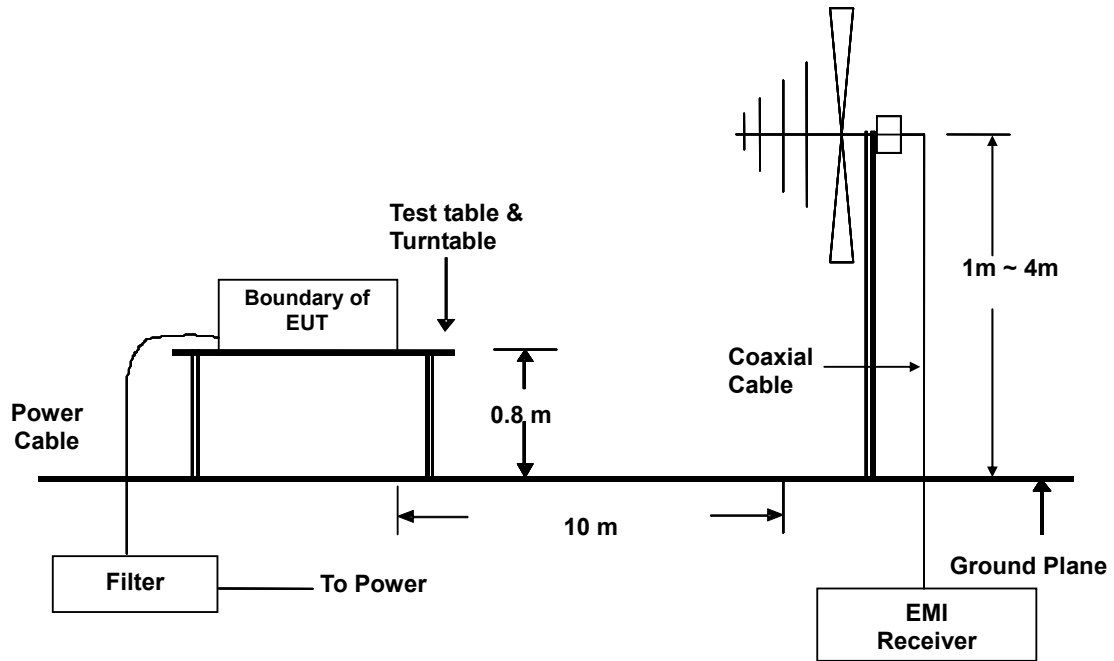
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground 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, antenna position, polarization and turntable position of the above highest emission levels were recorded for the final test.

Procedure of Final Test

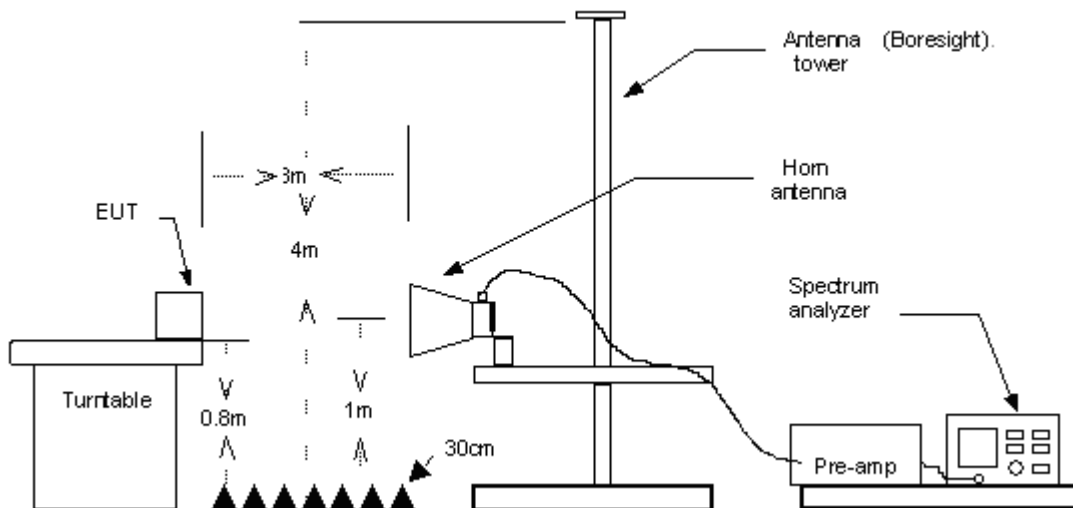
- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- 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/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
XX	54.08	-11.80	42.28	70.00	-27.72	100	185	peak
XX	34.80	-11.80	23.00	50.00	-27.00	100	185	AVG

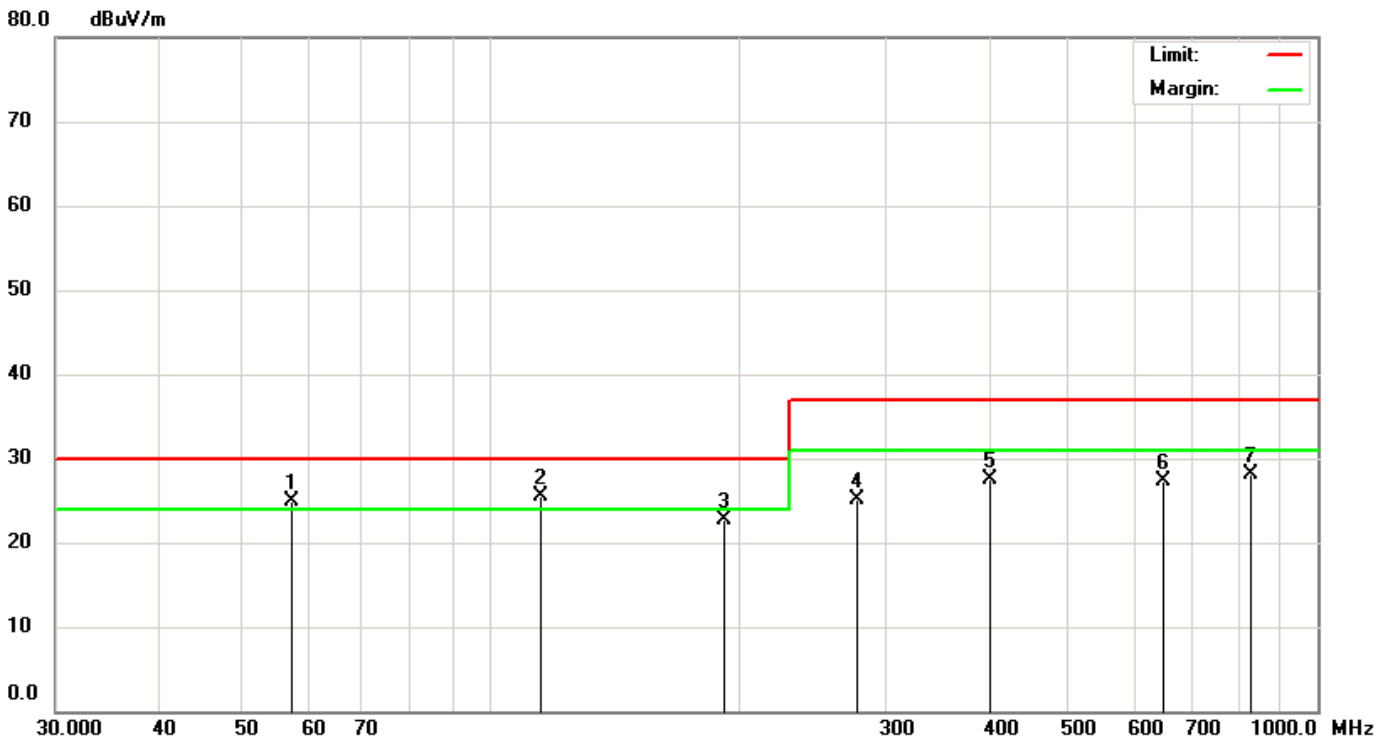
- Frequency (MHz) = Emission frequency in MHz
- Reading (dBuV) = Uncorrected Analyzer / Receiver reading
- Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
- Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
- Limit (dBuV/m) = Limit stated in standard
- Margin (dB) = Result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



7.3.6. TEST RESULTS

Below 1GHz

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

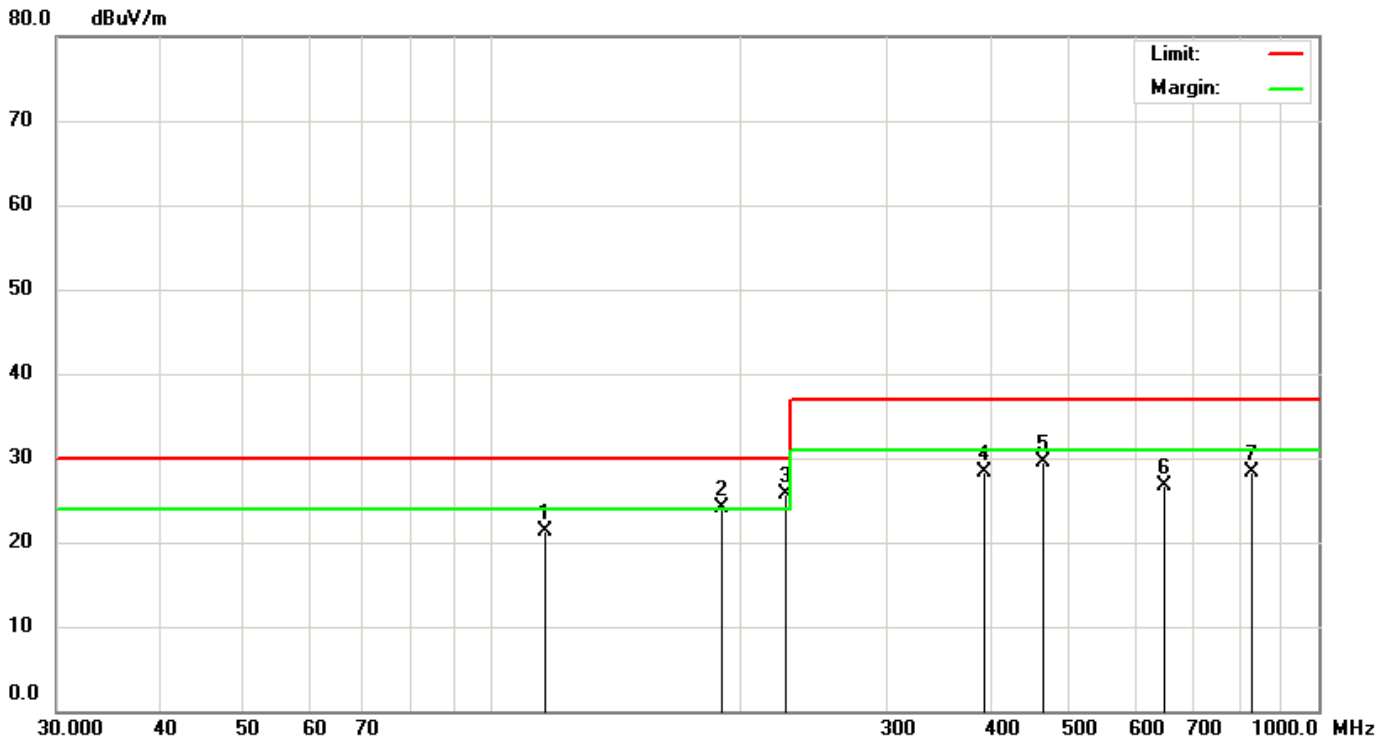


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	57.7000	44.33	-19.36	24.97	30.00	-5.03	100	227	QP
2	114.7200	38.90	-13.44	25.46	30.00	-4.54	100	360	QP
3	192.3000	37.90	-15.19	22.71	30.00	-7.29	100	47	QP
4	277.0000	35.43	-10.39	25.04	37.00	-11.96	100	304	QP
5	401.5000	35.68	-8.12	27.56	37.00	-9.44	289	268	QP
6	648.0000	31.07	-3.71	27.36	37.00	-9.64	260	336	QP
7	831.0000	29.36	-1.16	28.20	37.00	-8.80	184	63	QP

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



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



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	115.8000	34.70	-13.36	21.34	30.00	-8.66	356	129	QP
2	190.6000	39.30	-15.21	24.09	30.00	-5.91	341	142	QP
3	227.0000	39.40	-13.73	25.67	30.00	-4.33	291	93	QP
4	393.5000	36.69	-8.29	28.40	37.00	-8.60	312	105	QP
5	464.5000	36.45	-7.03	29.42	37.00	-7.58	296	6	QP
6	648.0000	30.38	-3.71	26.67	37.00	-10.33	174	359	QP
7	831.0000	29.53	-1.16	28.37	37.00	-8.63	100	49	QP

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



Above 1GHz

Model No.	XO-4 HS	Test Mode	Mode 1
Environmental Conditions	26°C, 56% RH	Upper frequency	6000MHz
Antenna Pole	Vertical	Antenna Distance	3m
Detector Function:	Peak/Average	Tested By	Aj Huang

No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1600.000	68.15	-21.23	46.92	70.00	-23.08	100	189	peak
2	2130.000	65.64	-18.82	46.82	70.00	-23.18	100	194	peak
3	2415.000	66.58	-18.02	48.56	70.00	-21.44	100	102	peak
4	2415.000	55.63	-18.02	37.61	50.00	-12.39	100	102	AVG
5	3845.000	61.68	-12.31	49.37	74.00	-24.63	100	21	peak
6	5405.000	59.41	-9.09	50.32	74.00	-23.68	100	302	peak
7	5760.000	59.00	-8.49	50.51	74.00	-23.49	100	135	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.



Model No.	XO-4 HS	Test Mode	Mode 1
Environmental Conditions	26°C, 56% RH	Upper frequency	6000MHz
Antenna Pole	Horizontal	Antenna Distance	3m
Detector Function:	Peak/Average	Tested By	Aj Huang

No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1430.000	67.23	-21.87	45.36	70.00	-24.64	100	300	peak
2	2135.000	68.06	-18.81	49.25	70.00	-20.75	100	219	peak
3	2135.000	59.32	-18.81	40.51	50.00	-9.49	100	219	AVG
4	3845.000	61.86	-12.31	49.55	74.00	-24.45	100	170	peak
5	5190.000	59.33	-9.97	49.36	74.00	-24.64	100	23	peak
6	5640.000	58.49	-8.58	49.91	74.00	-24.09	100	78	peak
7	5915.000	58.55	-8.35	50.20	74.00	-23.80	100	164	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 (4.10)			

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.

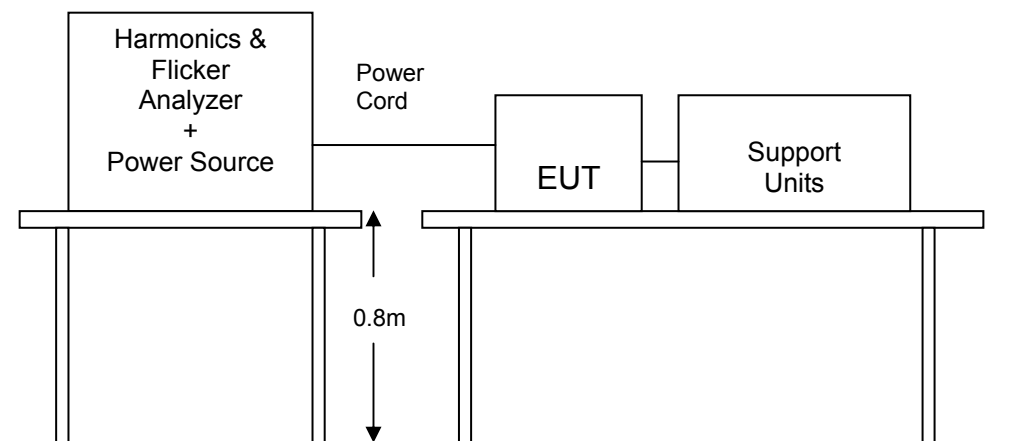
Class B: Portable tools; Arc welding equipment which is not professional equipment.

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 : 24.44W

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 (4.10)			

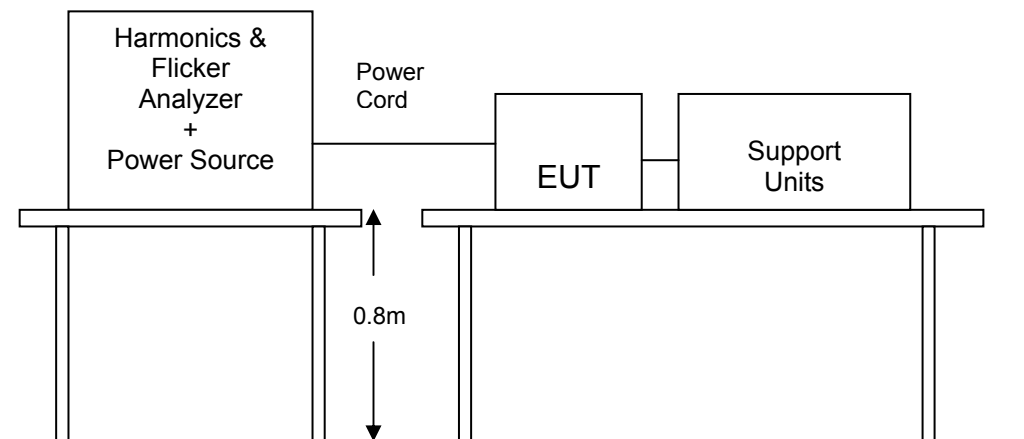
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



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 _{st}	0.072	1.0	PASS
P _{lt}	0.072	0.65	PASS
T _{dt} (ms)	0	500	PASS
d _{max} (%)	0%	4%	PASS
dc (%)	0%	3.3%	PASS

Power Switched Manually

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
P _{st}	0.072	1.0	PASS
P _{lt}	0.072	0.65	PASS
T _{dt} (ms)	0	500	PASS
d _{max} (%)	0%	4%	PASS
dc (%)	0%	3.3%	PASS

Note: d_{max} (%) 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 04:47: V4.18

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

Urms = 230.1V Freq = 50.000 Range: 0.5 A
 Irms = 0.172A Ipk = 0.312A cf = 1.813
 P = 24.44W S = 39.55VA pf = 0.618

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	



OLPC

Date : 2013/3/4 PM 05:03: V4.18

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

Urms = 230.1V Freq = 50.000 Range: 0.5 A
 Irms = 0.165A Ipk = 0.298A cf = 1.801
 P = 23.22W S = 38.03VA pf = 0.610

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
Basic Standard, Specification, and Performance Criterion required	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 us Open Circuit Voltage 8/20 μs 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	Voltage Dips: i) 0% residual for 0.5 & 1period, Performance Criterion B ii) 70% residual for 25 period (at 50Hz), Performance Criterion B Voltage Interruptions: 0% residual for 250 period (at 50Hz), Performance Criterion C



8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

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



8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-2; ETSI EN301 489-1; ETSI EN301 489-17
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 Air Discharge: min. 10 times at single test point for each negative and positive polarity
Number of Discharge:	Contact Discharge: min. 200 times in total
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

Immunity Shielded Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD 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:

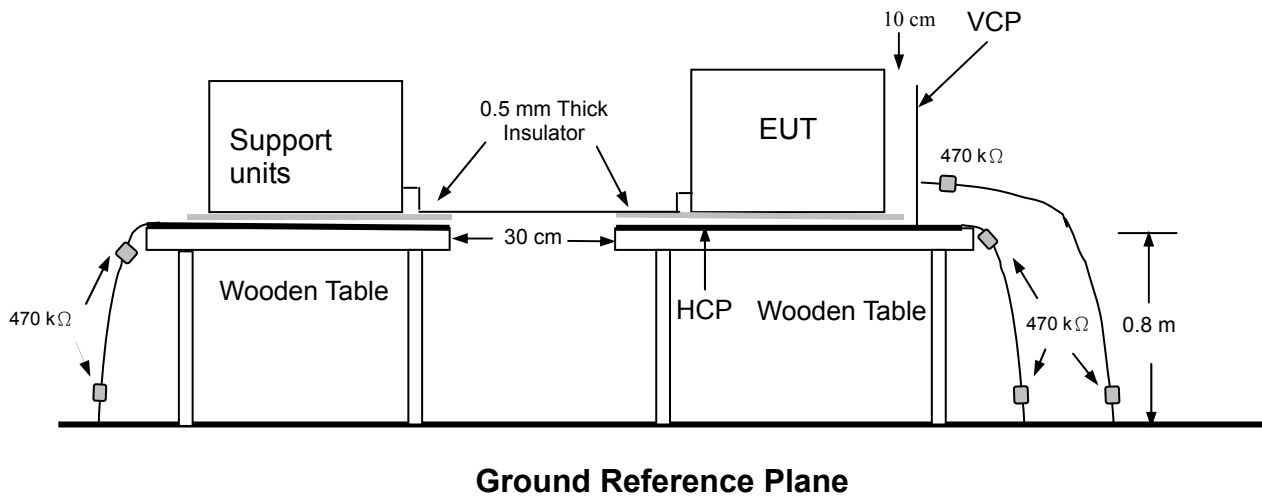
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally 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		± 4 kV	Performance Criterion		± 8 kV	Performance Criterion		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

Contact Discharge												
Test Points	Test Levels						Results					
	± 2 kV	Performance Criterion		± 4 kV	Performance Criterion		± 8 kV	Performance Criterion		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 checked="" 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 and red arrow mark for Air Discharge)

Discharge To Horizontal Coupling Plane								
Side of EUT	Test Levels			Results				
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion		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		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 6

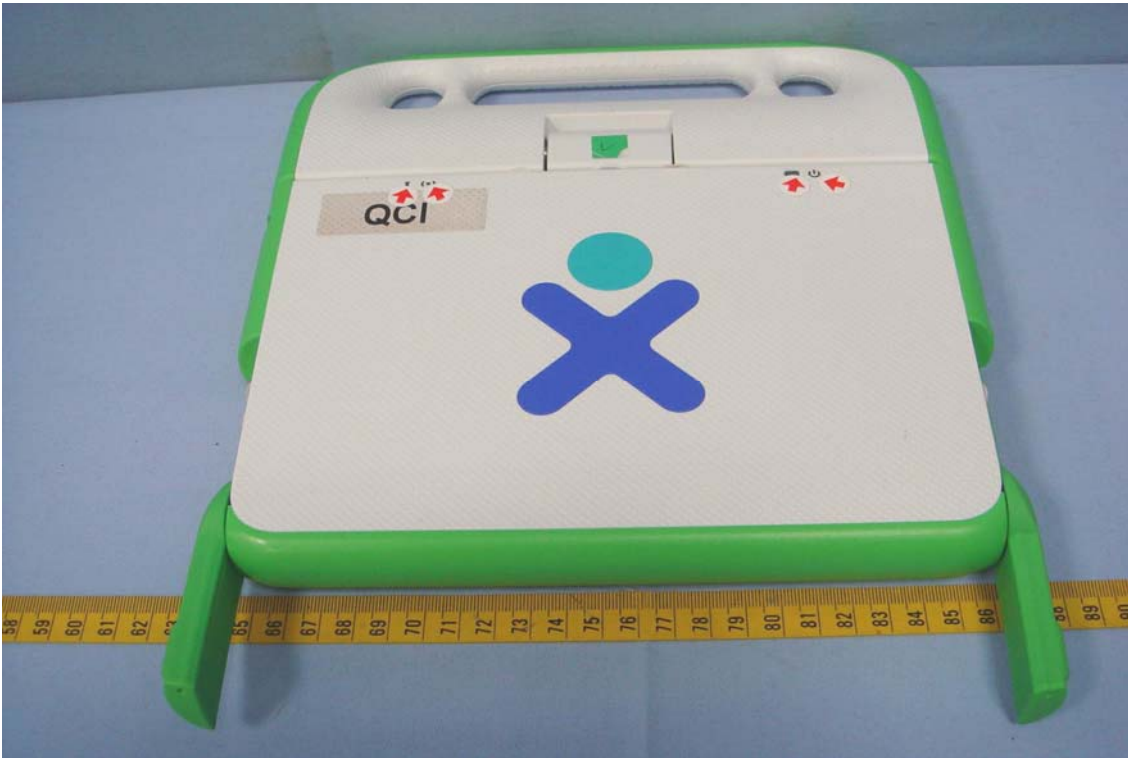


Photo 2 of 6





Photo 3 of 6

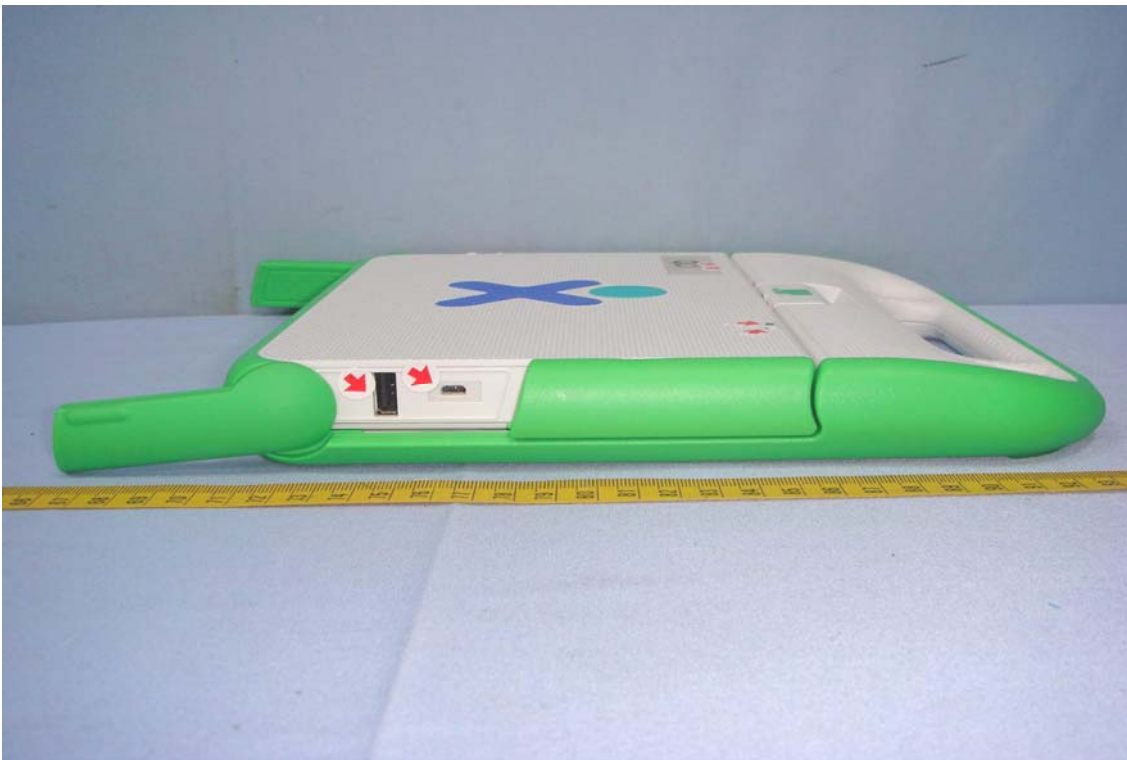


Photo 4 of 6





Photo 5 of 6

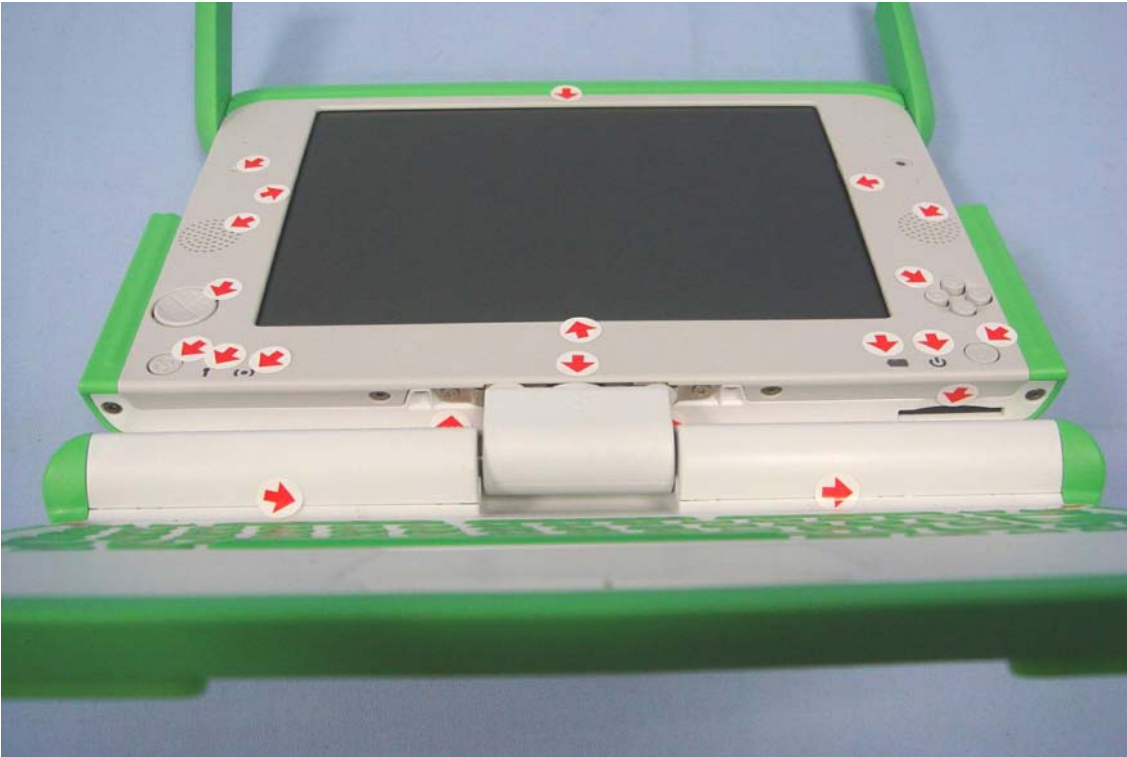


Photo 6 of 6

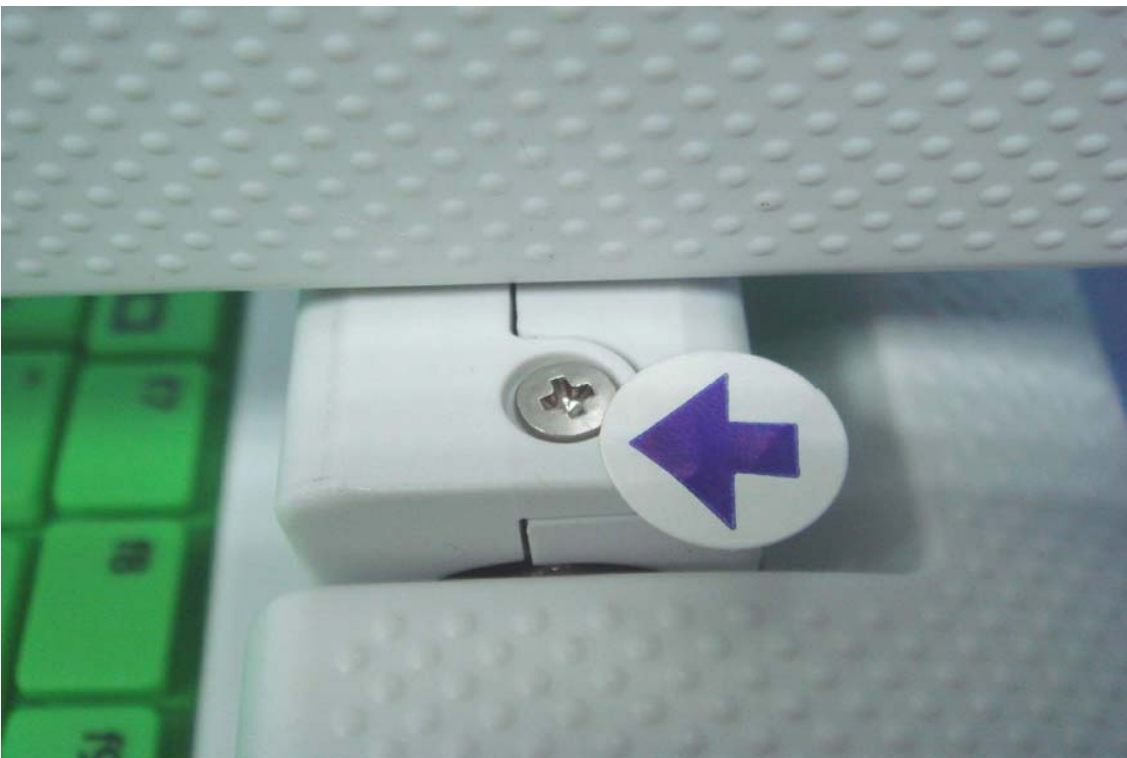




Photo 7 of 8



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

733 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



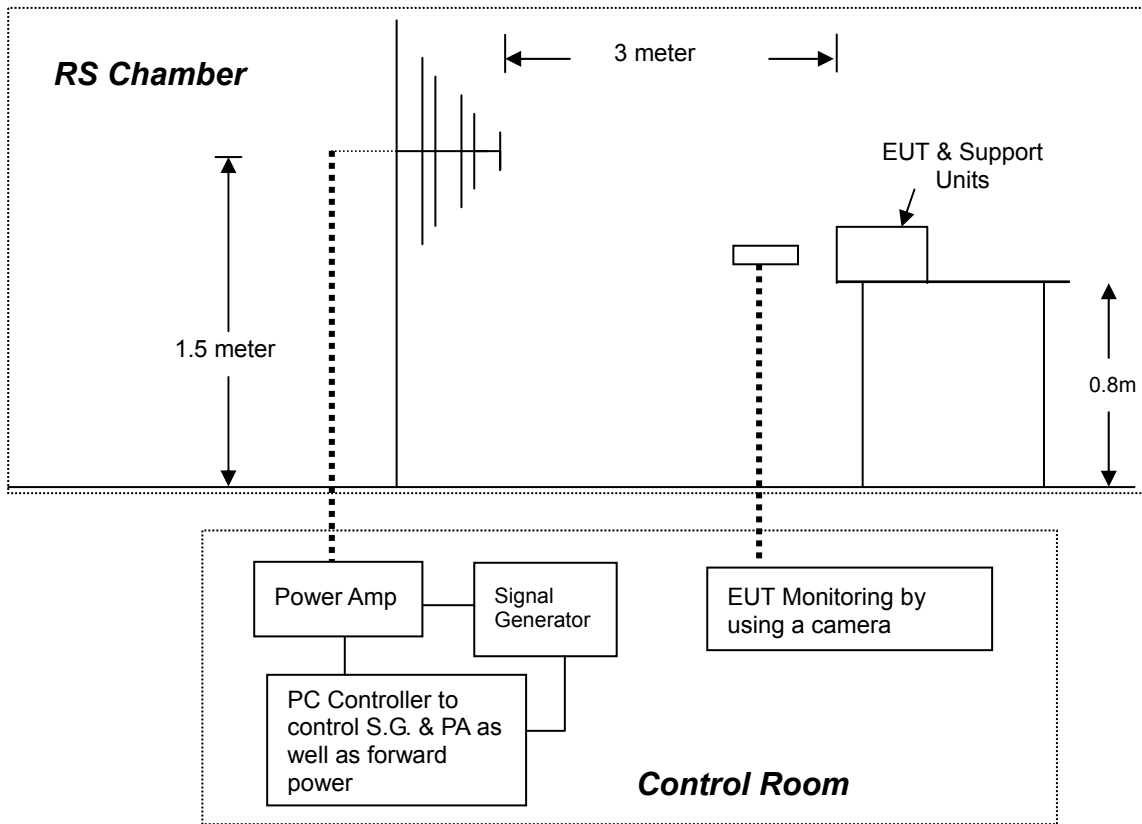
8.4.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-023)

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 ~1000 MHz, 1400 MHz ~ 2700 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.
- c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d) The 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

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

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	Note 1	PASS
80 ~ 1000	V&H	90	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
80 ~ 1000	V&H	180	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
80 ~ 1000	V&H	270	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
1400 ~ 2700	V&H	0	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
1400 ~ 2700	V&H	90	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
1400 ~ 2700	V&H	180	3	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
1400 ~ 2700	V&H	270	3	<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.



8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

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

8.5.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMC 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)			

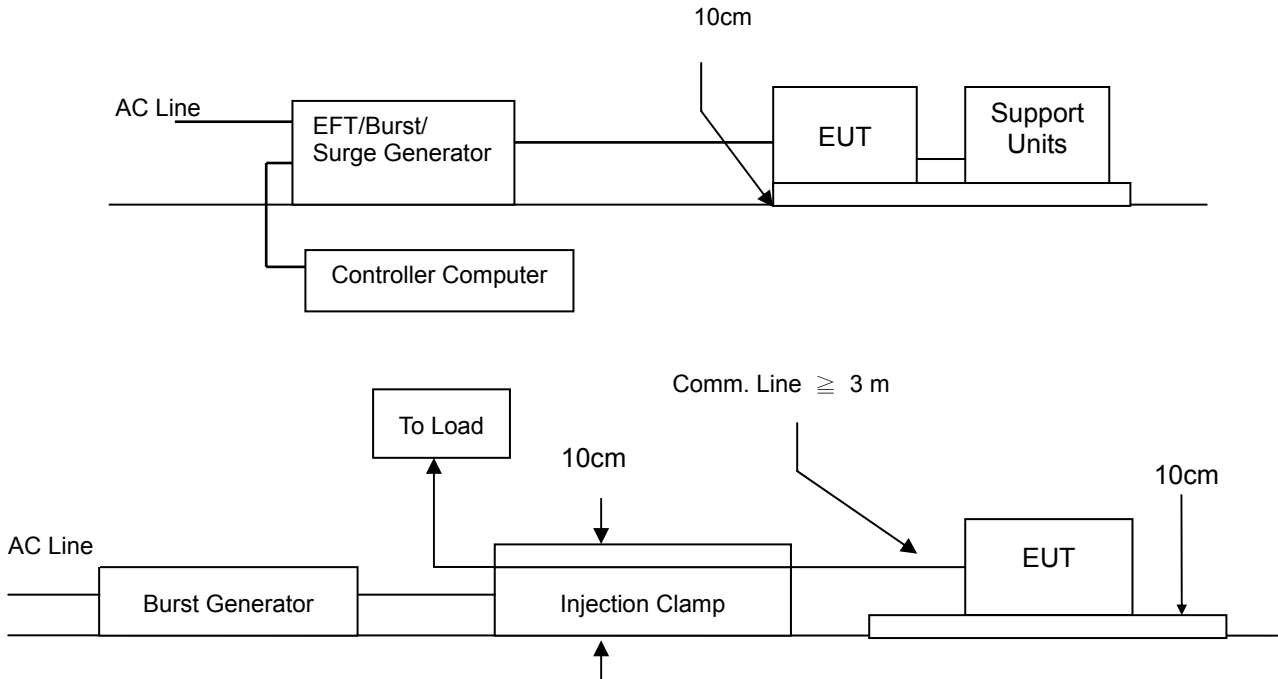
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required

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

Temperature:	24°C	Humidity	48% RH
Pressure	983mbar	Tested by	Nelson Tsai
Required Passing Performance		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	Note 1	PASS
N	+/-	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B	Note 1	PASS
L+ N	+/-	1	<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.



8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-5; ETSI EN301 489-1; ETSI EN301 489-17
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	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
Surge Input/Output:	Power Line: L1-L2 / L1-PE / L2-PE
Generator Source	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 / 90 / 180 / 270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

8.6.2. TEST INSTRUMENT

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.

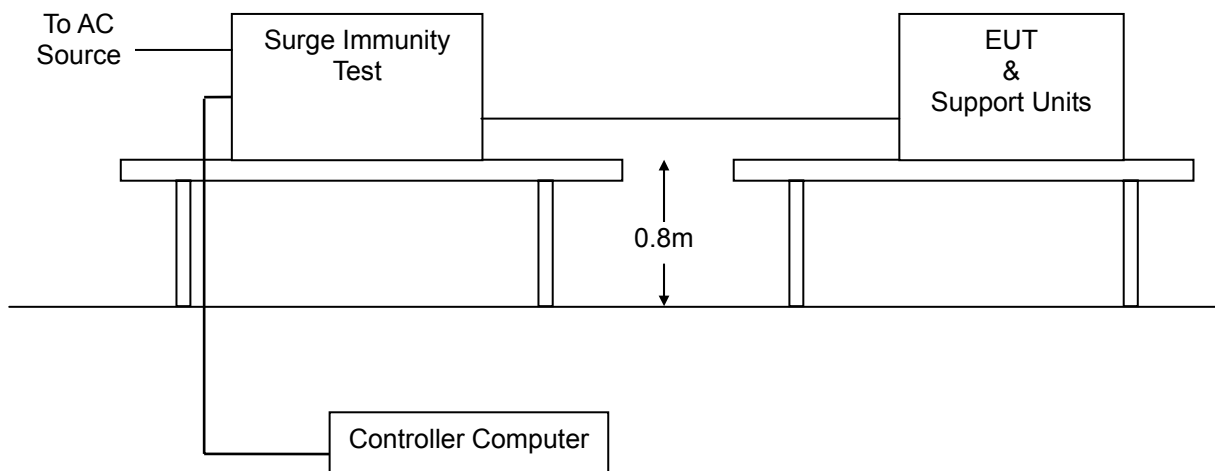
b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

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

Temperature	24°C	Humidity	48% RH
Pressure	983mbar	Tested by	Nelson Tsai
Required Passing Performance	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	Note 1	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.

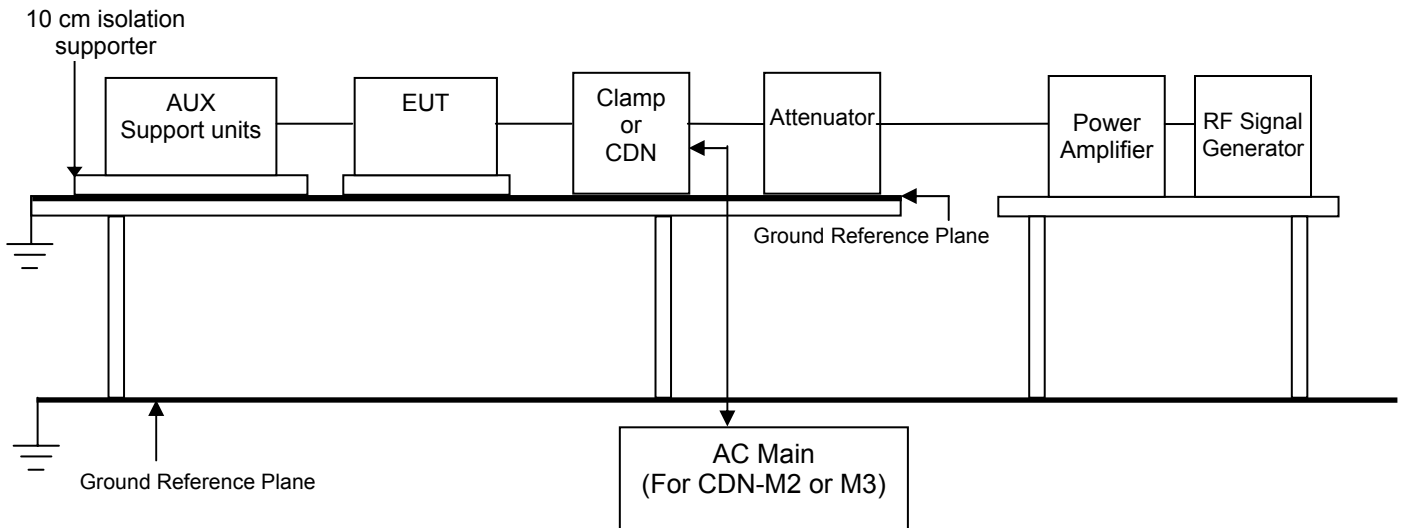
The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The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

Temperature:	24°C	Humidity	48% RH
Pressure	983mbar	Tested by	Nelson Tsai
Required Passing Performance		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

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

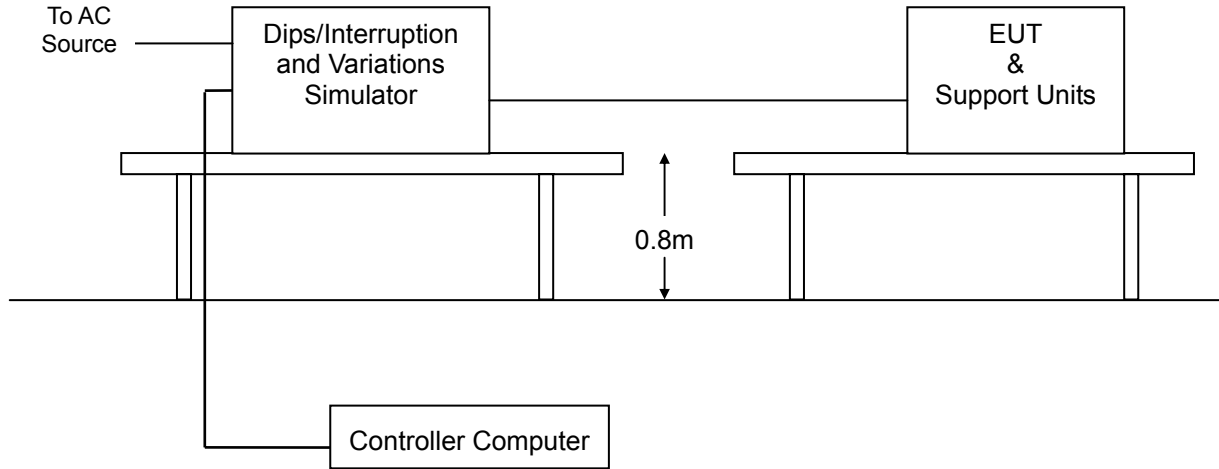
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. N.C.R.= No Calibration required

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

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

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	Note 1	PASS
0	1	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note 1	PASS
70	25	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Note 1	PASS
0	250	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C	Note 2	PASS

- NOTE**
1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
 2. The function stopped during the test, but can be auto recovered as the events disappear.



9 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST





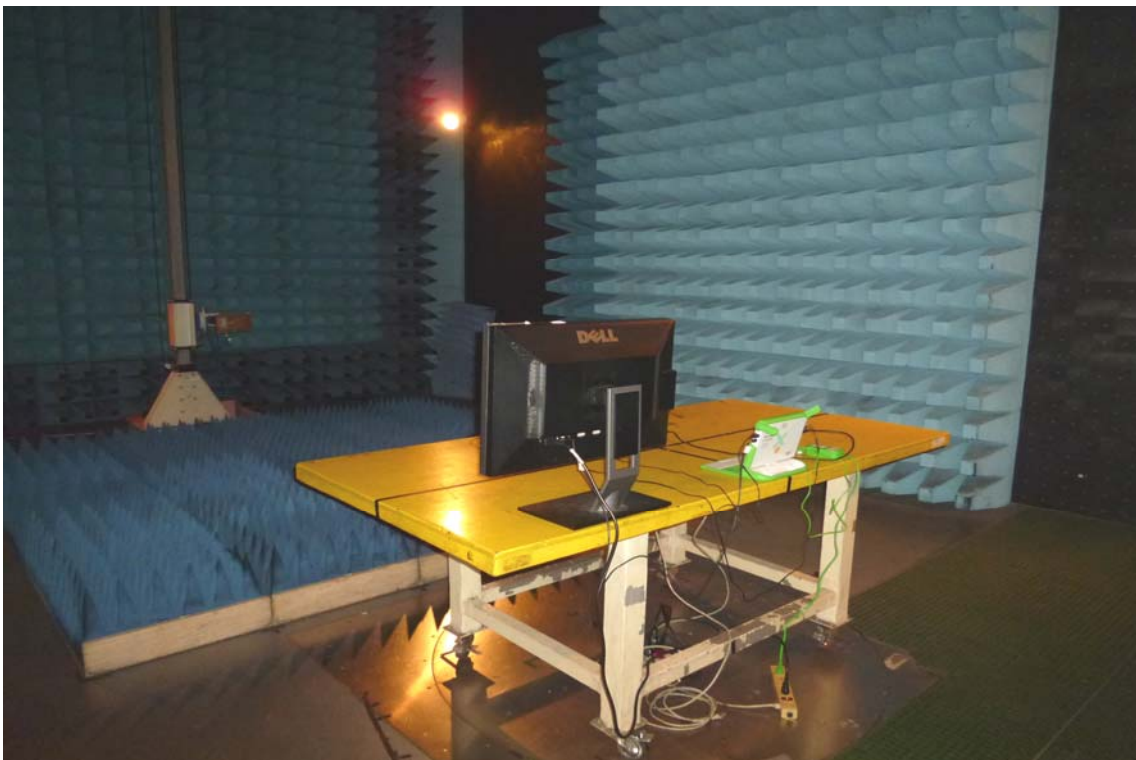
RADIATED EMISSION TEST

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, INDUCED BY RADIO-FREQUENCY FIELDS TEST (Power Line)



VOLTAGE DIPS / INTERRUPTION TEST





APPENDIX 1: PHOTOGRAPHS OF EUT

Refer to T130222L03 External Photographs.