

CE EMC TEST REPORT

REPORT NO.: CE120518D10

MODEL NO.: V322, V322(C), MultSync V322

RECEIVED: May 18, 2012

TESTED: May 22 ~ 28, 2012

ISSUED: May 30, 2012

APPLICANT: TOP VICTORY ELECTRONICS (TAIWAN) CO., LTD.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
CE120518D10	Original release	May 30, 2012



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1 CERTIFICATION

PRODUCT: LCD Monitor

BRAND NAME: NEC

MODEL NO.: V322, V322(C), MultSync V322

APPLICANT: TOP VICTORY ELECTRONICS (TAIWAN) CO., LTD.

TEST ITEM: ENGINEERING SAMPLE

TESTED: May 22 ~ 28, 2012

STANDARDS: **EN 55022: 2010, Class B**

CISPR 22: 2008, Class B

AS/NZS CISPR 22: 2009, Class B

EN 61000-3-2: 2006 +A1:2009 +A2:2009, Class D

EN 61000-3-3: 2008

EN 55024: 2010

IEC 61000-4-2: 2008 ED.2.0

IEC 61000-4-3: 2010 ED.3.2

IEC 61000-4-4: 2011 ED.2.1

IEC 61000-4-5: 2005 ED.2.0

IEC 61000-4-6: 2008 ED.3.0

IEC 61000-4-8: 2009 ED.2.0

IEC 61000-4-11: 2004 ED.2.0

The above equipment (Model: V322) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Celia Chen , DATE: May 30, 2012
(Celia Chen / Senior Specialist)

APPROVED BY : Kenny Meng , DATE: May 30, 2012
(Kenny Meng / Assistant Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Result	Remarks
EN 55022: 2010, Class B	Conducted Test	PASS	Meets Class B Limit Minimum passing margin is –14.51 dB at 0.18906 MHz
CISPR 22: 2008, Class B	Conducted Test (telecom port)	PASS	Meets Class B Limit Minimum passing margin is –5.23 dB at 23.12891 MHz
AS/NZS CISPR 22: 2009, Class B	Radiated Test (30MHz ~ 6GHz)	PASS	Meets Class B Limit Minimum passing margin is –4.08 dB at 371.00 MHz
EN 61000-3-2:2006 +A1:2009 +A2:2009, Class D	Harmonic current emissions	PASS	Meets Class D Limit
EN 61000-3-3: 2008	Voltage fluctuations & flicker	PASS	Meets the requirements.

IMMUNITY (EN 55024:2010)			
Standard	Test Type	Result	Remarks
IEC 61000-4-2:2008 ED.2.0	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-3:2010 ED.3.2	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4:2011 ED.2.1	Electrical fast transient / burst immunity test.	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-5:2005 ED.2.0	Surge immunity test	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-6:2008 ED.3.0	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-8:2009 ED.2.0	Power frequency magnetic field immunity test.	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11:2004 ED.2.0	Voltage dips and short interruptions immunity tests	PASS	Meets the requirements of Voltage Dips: i) >95% reduction - Performance Criterion A ii) 30% reduction – Performance Criterion A Voltage Interruptions: i) >95% reduction – Performance Criterion C

2.1 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:

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz ~ 30MHz	2.41 dB
Conducted emissions at telecom port	150kHz ~ 30MHz	2.7683 dB
Radiated emissions	30MHz~1GHz	3.76 dB
	Above 1GHz	3.36 dB

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	LCD Monitor
MODEL NO.	V322, V322(C), MultiSync V322
POWER SUPPLY	Switching AC I/P: 100-240V~, 50/60Hz Power Cord Non-shielded AC cable (3m)
DATA CABLE SUPPLIED	Shielded D-Sub cable (4m) with two ferrite cores Shielded DVI cable (1.8m) with two ferrite cores Shielded HDMI cable (1.8m)

NOTE:

- The EUT is a LCD Monitor with resolution up to 1920 x 1080 (60Hz).
- The EUT has several models, which are identical to each other except for marketing differences only, as the following:

Brand Name	Model No.	Differentiation
NEC	V322	Marketing Differentiation
	V322(C)	
	MultiSync V322	

During the test, model: **V322** was selected as the representative one and therefore only its test data was recorded in this report.

- The EUT is equipped the following interfaces:

Input		Output
♦ DVI	♦ LAN (10/100Mbps)	♦ RS-232
♦ D-Sub	♦ Video (BNC)	♦ DVI
♦ Display	♦ Audio x 2	♦ Remote (IR control)
♦ RS-232	♦ Remote (IR control)	
♦ HDMI		
Accessory		
Remote controller		

- For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3.2 DESCRIPTION OF TEST MODES

1. The EUT is designed with AC power supply of 100-240Vac, 50/60Hz.
For radiated emission evaluation, 230Vac/50Hz (for EN 55022 & AS/NZS CISPR 22), 120Vac/60Hz (for FCC Part 15), 100Vac/50Hz (for VCCI) had been covered during the pre-test. The worst radiated emission data was founded at **120Vac/60Hz** and recorded in the applied test report.

2. The EUT was pre-testing other interfaces as the following:

Interface	Resolution
DVI	1920 x 1080 (60Hz)
D-Sub	
HDMI signal form PC	
Display	
HDMI signal form DVD	1080p
LAN	-
Composite	-
PIP	-

3. Per evaluation **DVI** produced worst emission level and therefore the EUT was pre-testing under the following resolution & refresh rate modes:

Interface	Resolution
DVI	◆ 1920 x 1080 (60Hz)
	◆ 1680 x 1050 (60Hz)
	◆ 1440 x 900 (60Hz)
	◆ 1280 x 1024 (60Hz)
	◆ 1024 x 768 (60Hz)
	◆ 800 x 600 (60Hz)
	◆ 640 x 480 (60Hz)

The worst emission level was found under following mode:

Interface	Resolution
DVI	1920 x 1080 (60Hz)

4. Therefore EUT was tested under following mode:

For Conducted & Radiated tests:

Test Mode	Interface	Resolution
Mode 1	DVI	1920 x 1080 (60Hz)
Mode 2	HDMI signal form DVD	1080p

For Conducted Emission at Telecommunication port:

Test Mode	Interface	Resolution
Mode 1	LAN (10/ 100Mbps)	-

For Harmonic Flicker & Immunity tests:

Test Mode	Interface	Resolution
Mode 1	DVI	1920 x 1080 (60Hz)

All above test modes were recorded in this report.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a kind of ITE equipment and, according to the specifications of the manufacturers, must comply with the requirements of the following standards:

EN 55022:2010, Class B

CISPR 22:2008, Class B

AS/NZS CISPR 22:2009, Class B

EN 61000-3-2:2006 +A1:2009 +A2:2009, Class D

EN 61000-3-3:2008

EN 55024:2010

IEC 61000-4-2:2008 ED.2.0

IEC 61000-4-3:2010 ED.3.2

IEC 61000-4-4:2011 ED.2.1

IEC 61000-4-5:2005 ED.2.0

IEC 61000-4-6:2008 ED.3.0

IEC 61000-4-8:2009 ED.2.0

IEC 61000-4-11:2004 ED.2.0

Notes: The above IEC basic standards are applied with latest version if customer has no special requirement

3.4 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.

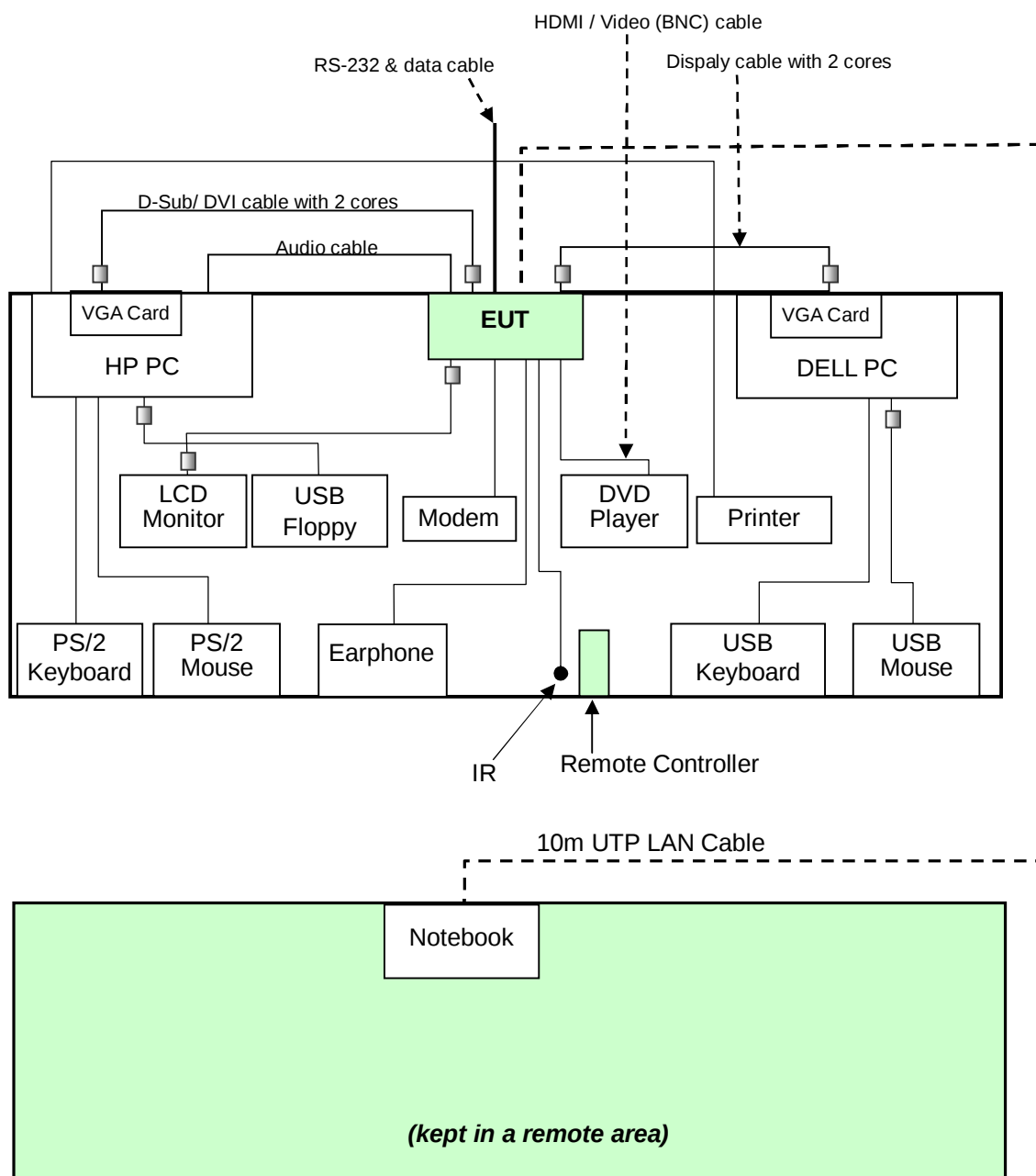
3.4.1 FOR EMISSION TEST

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	HP	dx7300MT	SGH72102NP	FCC DoC Approved
2	VGA CARD	ASUS	ENG440/DI/1G D3	BACVCM038606	FCC DoC Approved
3	PERSONAL COMPUTER	DELL	DCME	FVL2TBX	FCC DoC Approved
4	VGA CARD	ATI	B382	260937008579	FCC DoC Approved
5	24" LCD MONITOR	DELL	U2410	CN082WXD728720CC0KDL	FCC DoC Approved
6	DVD PLAYER	SONY	BDP-S470	3205076	Verification
7	PRINTER	EPSON	LQ-300+	DCGY038846	FCC DoC Approved
8	MODEM	ACEEX	1414	0206026751	IFAXDM1414
9	EXTERNAL USB 1.1 FLOPPY	SONY	MPF82E	50042543	FCC DoC Approved
10	USB KEYBOARD	BTC	5200U	G09302046656	E5XKB5122U
11	USB MOUSE	MICROSOFT	X800898	9241813-30608	FCC DoC Approved
12	PS/2 KEYBOARD	HP	KB-0316	BC3520BGAUJ0UW	FCC DoC Approved
13	PS/2 MOUSE	BTC	M851	N/A	E5XMSM860
14	EARPHONE	PHILIPS	SBC HL145	N/A	N/A
15	IR	NEC	N/A	N/A	N/A
16	NOTEBOOK COMPUTER	DELL	PP04X	6C1VY1S	FCC DoC Approved

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8 m shielded Audio cable; 1.8 m shielded DVI cable with two ferrite cores (provided by client); 4 m shielded D-Sub cable with two ferrite cores (provided by client)
2	N/A
3	1.8 m shielded Display cable with two cores
4	N/A
5	1.8 m shielded DVI cable with two cores
6	1.8 m shielded HDMI cable (provided by client); 1.8 m shielded Video (BNC) cable
7	1.8m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core
8	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.
9	1.5 m shielded cable, terminated with USB connector, with 1 core.
10	1.5 m braid shielded wire, terminated with USB connector via drain wire, w/o core.
11	1.8 m foil shielded wire, terminated with USB connector via drain wire, with 1 core.
12	1.8 m foil shielded wire, terminated with PS/2 connector via metallic frame, w/o core.
13	1.5 m Non shielded wire, terminated with PS/2 connector via drain wire, w/o core.
14	1.2 m wrapped shielded wire, terminated with 3.5mm phone plug via drain wire, w/o core.
15	1.8 m shielded data cable.
16	10 m UTP LAN cable

- NOTE:** (1) All power cords of the above support units are non-shielded (1.8 m).
(2) The support unit 2 was installed in support unit 1 and the support unit 4 was installed in support unit 3.
(3) The support unit 15 was provided by client.
(4) One RS-232 cable (1.8m) was connected to EUT to form an open loop cable.
(5) One shielded data cable (1.8m) was connected to EUT to form an open loop cable.

TEST CONFIGURATION





3.4.2 FOR HARMONICS / FLICKER / IMMUNITY TEST

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	HP	dx7300MT	SGH7500R58	FCC DoC Approved
2	LCD MONITOR	DELL	2408WFP	CN0G293H7426 1874263S	FCC DoC Approved
3	MODEM	ACEEX	1414	0206026745	IFAXDM1414
4	USB KEYBOARD	DELL	SK-8115	CN-0J4635-716 16-63I-076Z	FCC DoC Approved
5	USB MOUSE	HP	M-UAE96	F93A90AN3V42 GPQ	FCC DoC Approved
6	SPEAKER	KINYO	KSP-25	N/A	N/A
7	IR	NEC	N/A	N/A	N/A
8	Notebook PC	DELL	Latitude E6520	GTW55Q1	FCC DoC Approved

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8 m shielded Audio cable; 1.8 m shielded DVI cable with two ferrite cores (provided by client); 4 m shielded D-Sub cable with two ferrite cores (provided by client)
2	1.8 m braid shielded wire, terminated with DVI connector via metallic frame, with two cores
3	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.
4	2.0 m foil shielded wire, terminated with USB connector via drain wire, one core
5	1.8 m shielded wire, terminated with USB connector via drain wire, w/o core.
6	1.0 m wrapped shielded wire, terminated via drain wire, with 3.5 mm phone plug, w/o core
7	1.8 m shielded data cable.
8	10 m UTP LAN cable

NOTE: (1) All power cords of the above support units are non-shielded (1.8 m).
(2) The support unit 7 was provided by client.

The diagram illustrates a remote control system setup. A dashed box at the top represents the remote area, containing a PC, a VGA Card, a Modem, a Speaker, a USB Keyboard, a USB Mouse, an EUT (Electronic Under Test) unit, and a Monitor. The PC is connected to the VGA Card, Modem, and USB Keyboard/Mouse. The EUT is connected to the Speaker and the Monitor. A D-Sub/DVI cable with 2 cores connects the PC to the EUT. An Audio cable connects the PC to the Speaker. A DVI cable with two cores connects the EUT to the Monitor. A 10m UTP LAN Cable connects the PC to a Notebook in the main area. The Notebook is labeled "(kept in a remote area)". An IR (Infrared) remote controller is shown pointing at the EUT.

4 EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: EN 55022

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 of 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.



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4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	100276	Jan. 04, 2012	Jan. 03, 2013
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	100219	Nov. 24, 2011	Nov. 23, 2012
LISN With Adapter (for EUT)	AD10	C10Ada-001	Nov. 24, 2011	Nov. 23, 2012
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Dec. 08, 2011	Dec. 07, 2012
Software	ADT_Cond_V7.3.7	NA	NA	NA
Software	ADT_ISN_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C10.01	Feb. 20, 2012	Feb. 19, 2013
SUHNTER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010773	Feb. 22, 2012	Feb. 21, 2013

- 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. The test was performed in Shielded Room No. 10.
3. The VCCI Site Registration No. C-1852.
4. Tested Date: May 23, 2012.

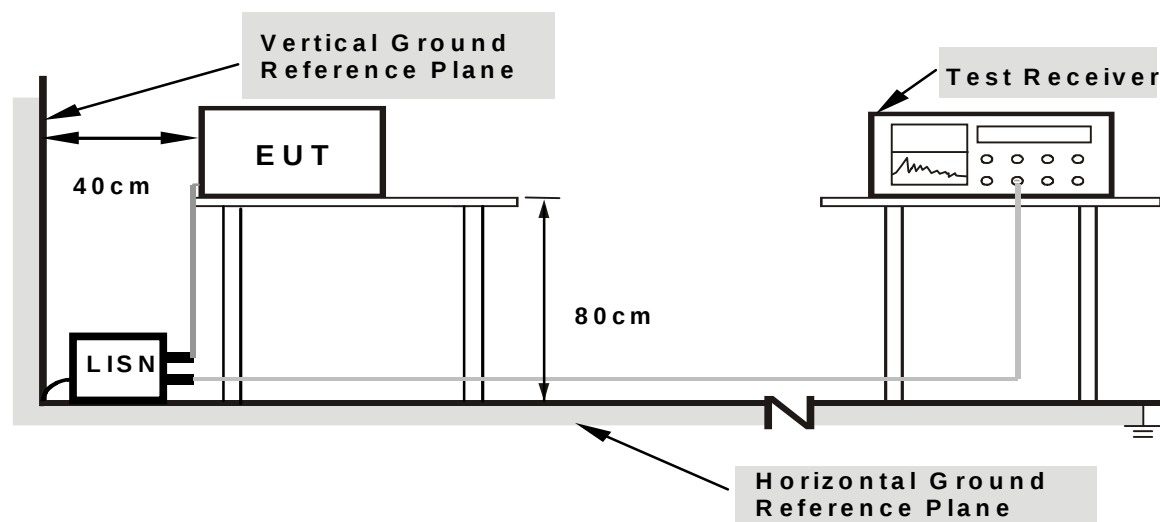
4.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

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

4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. PC ran a test program to enable all functions.
- c. PC read and wrote messages from HDD and USB Floppy.
- d. Server PC (kept in a remote area) sent and received messages to/from EUT via an UTP LAN cable (10m).
- e. PC sent “H” messages to EUT and ext. monitor via EUT then they displayed “H” patterns on their screens simultaneously. **(For Mode 1)**
- f. DVD player sent video messages to EUT and ext. monitor via EUT then they displayed video messages on their screens simultaneously.
(For Mode 2)
- g. PC sent messages to printer and printer printed them out.
- h. PC sent messages to modem via EUT.
- i. PC/DVD player sent audio signal to earphone via EUT and speaker of EUT.
- j. Steps c-j were repeated.

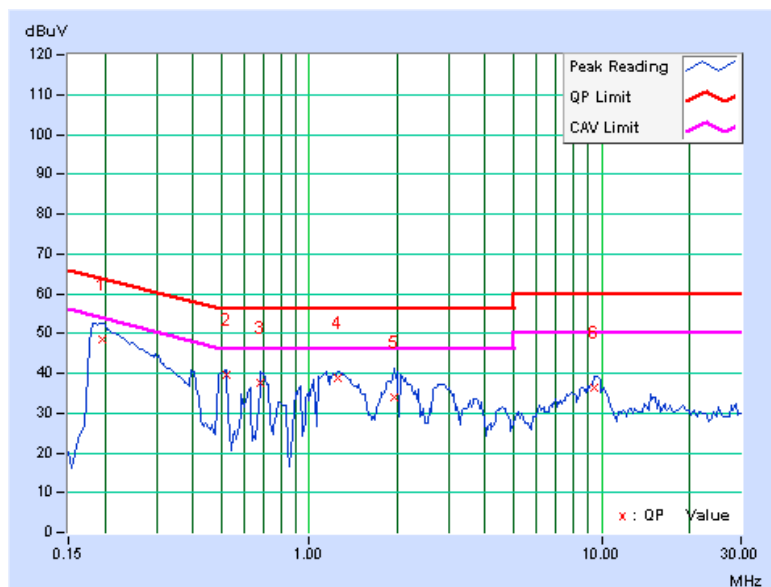
4.1.7 TEST RESULTS (1)

TEST MODE	Mode 1	6DB BANDWIDTH	9 kHz
INPUT POWER	230 Vac, 50 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	23deg. C, 66% RH	TESTED BY: Brad Tung	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19687	0.15	48.21	32.95	48.36	33.10	63.74	53.74	-15.38	-20.64
2	0.52109	0.20	39.52	27.54	39.72	27.74	56.00	46.00	-16.28	-18.26
3	0.68125	0.21	37.35	23.74	37.56	23.95	56.00	46.00	-18.44	-22.05
4	1.25000	0.24	38.61	24.49	38.85	24.73	56.00	46.00	-17.15	-21.27
5	1.94141	0.29	33.81	21.56	34.10	21.85	56.00	46.00	-21.90	-24.15
6	9.46875	0.69	35.73	27.31	36.42	28.00	60.00	50.00	-23.58	-22.00

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

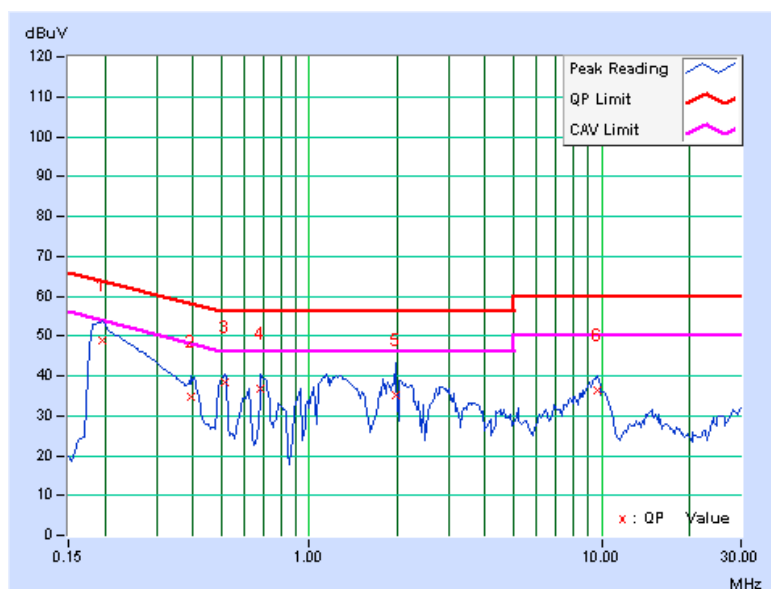


TEST MODE	Mode 1	6dB BANDWIDTH	9 kHz
INPUT POWER	230 Vac, 50 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	23deg. C, 66% RH	TESTED BY:	Brad Tung

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19687	0.15	48.67	36.68	48.82	36.83	63.74	53.74	-14.92	-16.91
2	0.39219	0.19	34.65	23.75	34.84	23.94	58.02	48.02	-23.18	-24.08
3	0.51328	0.20	38.10	29.89	38.30	30.09	56.00	46.00	-17.70	-15.91
4	0.68125	0.21	36.72	23.17	36.93	23.38	56.00	46.00	-19.07	-22.62
5	1.98438	0.28	34.80	22.55	35.08	22.83	56.00	46.00	-20.92	-23.17
6	9.70703	0.60	35.58	28.80	36.18	29.40	60.00	50.00	-23.82	-20.60

REMARKS:

- Q.P. and AV. are abbreviations of quasi-peak and average individually.
- The emission levels of other frequencies were very low against the limit.
- Margin value = Emission level - Limit value
- Correction factor = Insertion loss + Cable loss
- Emission Level = Correction Factor + Reading Value.



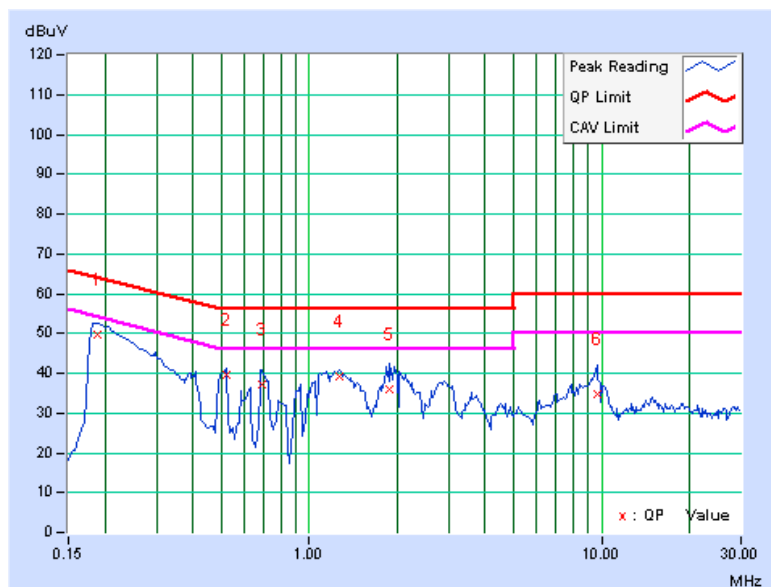
4.1.8 TEST RESULTS (2)

TEST MODE	Mode 2	6DB BANDWIDTH	9 kHz
INPUT POWER	230 Vac, 50 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	23deg. C, 66% RH	TESTED BY: Brad Tung	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18906	0.15	49.42	31.53	49.57	31.68	64.08	54.08	-14.51	-22.40
2	0.52109	0.20	39.52	27.48	39.72	27.68	56.00	46.00	-16.28	-18.32
3	0.68906	0.21	37.07	25.99	37.28	26.20	56.00	46.00	-18.72	-19.80
4	1.26953	0.25	38.84	25.40	39.09	25.65	56.00	46.00	-16.91	-20.35
5	1.89063	0.28	35.88	22.24	36.16	22.52	56.00	46.00	-19.84	-23.48
6	9.64063	0.70	34.18	27.34	34.88	28.04	60.00	50.00	-25.12	-21.96

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

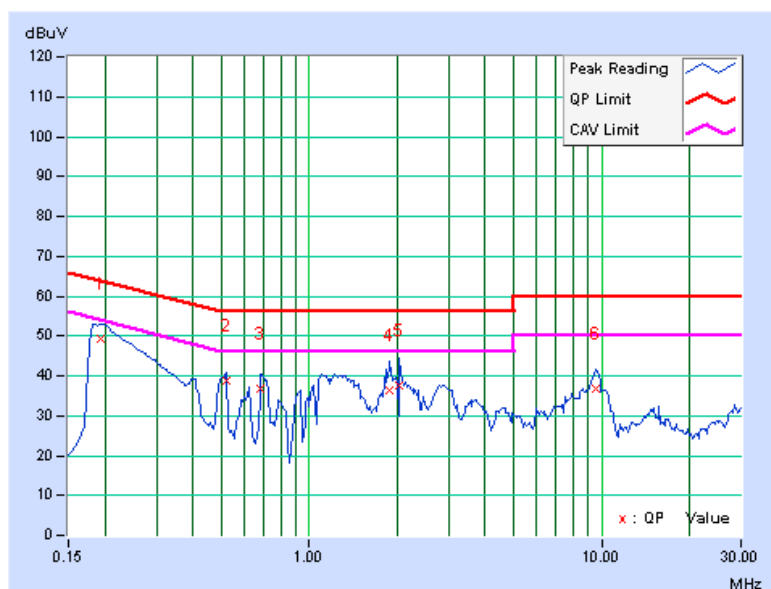


TEST MODE	Mode 2	6dB BANDWIDTH	9 kHz
INPUT POWER	230 Vac, 50 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	23deg. C, 66% RH	TESTED BY:	Brad Tung

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19297	0.15	49.00	34.11	49.15	34.26	63.91	53.91	-14.76	-19.65
2	0.52109	0.20	38.58	26.51	38.78	26.71	56.00	46.00	-17.22	-19.29
3	0.68125	0.21	36.68	23.09	36.89	23.30	56.00	46.00	-19.11	-22.70
4	1.89063	0.27	35.90	22.06	36.17	22.33	56.00	46.00	-19.83	-23.67
5	2.03125	0.28	37.13	23.09	37.41	23.37	56.00	46.00	-18.59	-22.63
6	9.54297	0.59	36.01	28.86	36.60	29.45	60.00	50.00	-23.40	-20.55

REMARKS:

- Q.P. and AV. are abbreviations of quasi-peak and average individually.
- The emission levels of other frequencies were very low against the limit.
- Margin value = Emission level - Limit value
- Correction factor = Insertion loss + Cable loss
- Emission Level = Correction Factor + Reading Value.



4.2 CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

4.2.1 LIMIT OF CONDUCTED COMMON MODE DISTURBANCE AT TELECOMMUNICATION PORTS

**TEST STANDARD: EN 55022
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

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: (1) The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.



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4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	100276	Jan. 04, 2012	Jan. 03, 2013
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	100219	Nov. 24, 2011	Nov. 23, 2012
LISN With Adapter (for EUT)	AD10	C10Ada-001	Nov. 24, 2011	Nov. 23, 2012
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Dec. 08, 2011	Dec. 07, 2012
Software	ADT_Cond_V7.3.7	NA	NA	NA
Software	ADT_ISN_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C10.01	Feb. 20, 2012	Feb. 19, 2013
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010773	Feb. 22, 2012	Feb. 21, 2013
FCC ISN	F-071115-1057-1	20652	Jan. 20, 2012	Jan. 19, 2013

- 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. The test was performed in Shielded Room No. 10.
 3. The VCCI Site Registration No. T-1611.
 4. Tested Date: May 23, 2012.

4.2.3 TEST PROCEDURE

For using ISN:

- a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to ISN directly to reference ground plane.
- b. If voltage measurement is used, measure voltage at the measurement port of the ISN, correct the reading by adding the ISN voltage division factor, and compare to the voltage limit.
- c. If current measurement is used, measure current with the current probe and compare to the current limit.
- d. It is not necessary to apply the voltage and the current limit if the ISN is used. A 50 Ω load has to be connected to the measurement port of the ISN during the current measurement.
- e. The disturbance levels and the frequencies of at least six highest disturbances are recorded from be measured each telecommunication port, which comprises the EUT.

For using a 150 W load to the outside surface of the shield cable:

- a. Break the insulation and connect a 150 Ω resistor from the outside surface of the shield cable to ground, and apply a ferrite tube or clamp between 150 Ω connection and AE.
- b. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AE with the shield cable.
- c. Measure current with a current probe and compare to the current limit. The common mode impedance towards the right of the 150 Ω resistor.
- d. The disturbance levels and the frequencies of at least six highest disturbances are recorded from be measured each telecommunication port, which comprises the EUT.

For using a combination of current probe and capacitive voltage probe:

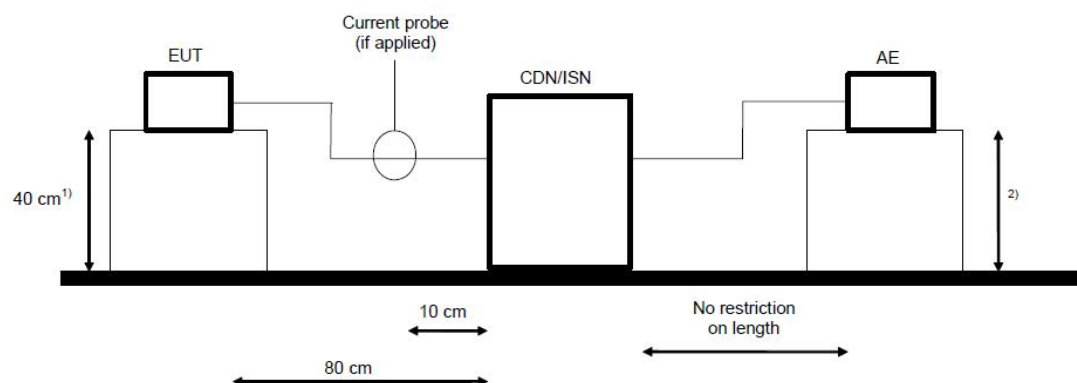
- a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AE with a cable. The cable contains more than four balanced pairs or to unbalanced cable.
- b. Measure current with a current probe and compare to the current limit.
- c. Measure voltage with a capacitive probe and adjust the measured voltage as follows:
 - current margin ≤ 6 dB – subtract the actual current margin from measured voltage;
 - current margin > 6 dB – subtract 6 dB from measured voltage.Compare adjusted voltage with the applicable voltage limit.
- d. Both the measured current and the adjusted voltage shall be below the applicable current and voltage limits.
- e. The disturbance levels and the frequencies of at least six highest disturbances are recorded from be measured each telecommunication port, which comprises the EUT.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP

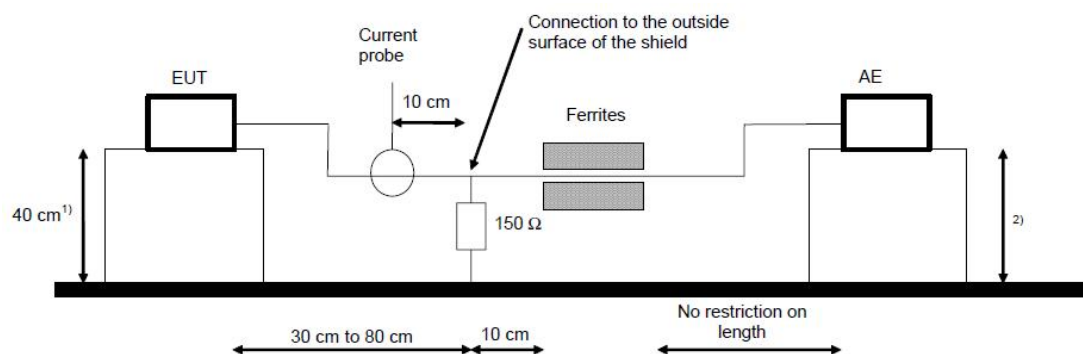
For using ISN:



AE = Associated equipment
EUT = Equipment under test

- 1) Distance to the reference groundplane (vertical or horizontal).
- 2) Distance to the reference groundplane is not critical.

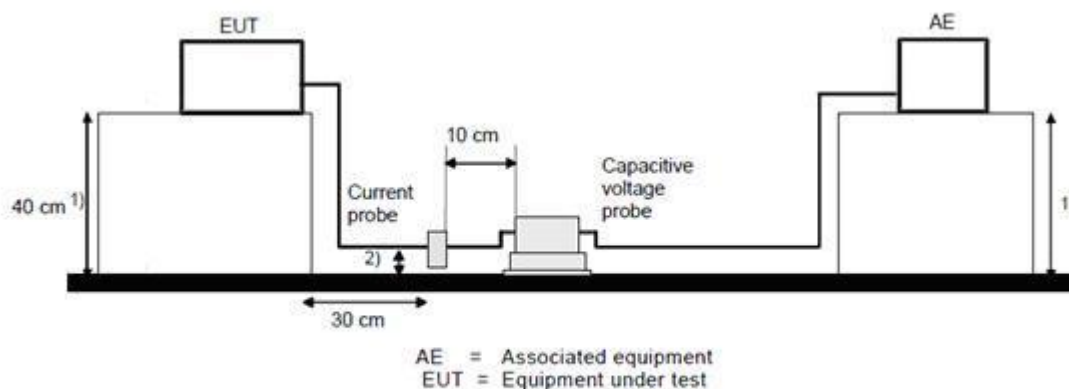
For using a 150 W load to the outside surface of the shield cable:



AE = Associated equipment
EUT = Equipment under test

- 1) Distance to the reference groundplane (vertical or horizontal).
- 2) Distance to the reference groundplane is not critical.

For using a combination of current probe and capacitive voltage probe:



- 1) Distance to the reference groundplane (vertical or horizontal)
- 2) Distance 4 ± 1 cm from the reference groundplane.

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

4.2.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. PC ran a test program to enable all functions.
- c. PC read and wrote messages from HDD and USB Floppy.
- d. EUT run “TfGen.exe” & “ping.exe” (286KB, 10% of transmission rate 10Mbps) then sent/ received messages to/from Server PC (kept in a remote area) via an UTP LAN cable (10m).
- e. EUT run “TfGen.exe” (286KB, 10% of transmission rate 100Mbps) then sent/ received messages to/from Server PC (kept in a remote area) via an UTP LAN cable (10m).
- f. PC sent “H” messages to EUT and ext. monitor via EUT then they displayed “H” patterns on their screens simultaneously.
- g. DVD player sent messages to EUT & ext. monitor via EUT.
- h. PC sent messages to printer and printer printed them out.
- i. PC sent messages to modem via EUT.
- j. PC/DVD player sent audio signal to earphone via EUT and speaker of EUT.
- k. Steps c-k were repeated.

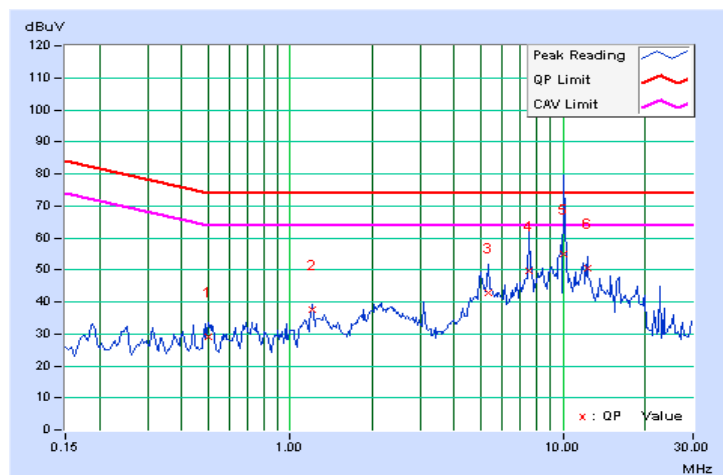
4.2.7 TEST RESULTS

TEST MODE	Mode 1	6dB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	RJ45 TELECOM PORT (10Mbps)
ENVIRONMENTAL CONDITIONS	23deg. C, 66% RH	TESTED BY: Brad Tung	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	A.V.	Q.P.	A.V.
1	0.50156	9.49	19.79	13.36	29.28	22.85	74.00	64.00	-44.72	-41.15
2	1.20059	9.36	28.37	26.45	37.73	35.81	74.00	64.00	-36.27	-28.19
3	5.32813	9.32	33.45	13.09	42.77	22.41	74.00	64.00	-31.23	-41.59
4	7.55469	9.39	40.46	34.94	49.85	44.33	74.00	64.00	-24.15	-19.67
5	10.00000	9.46	45.69	37.17	55.15	46.63	74.00	64.00	-18.85	-17.37
6	12.33594	9.57	40.88	30.29	50.45	39.86	74.00	64.00	-23.55	-24.14

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

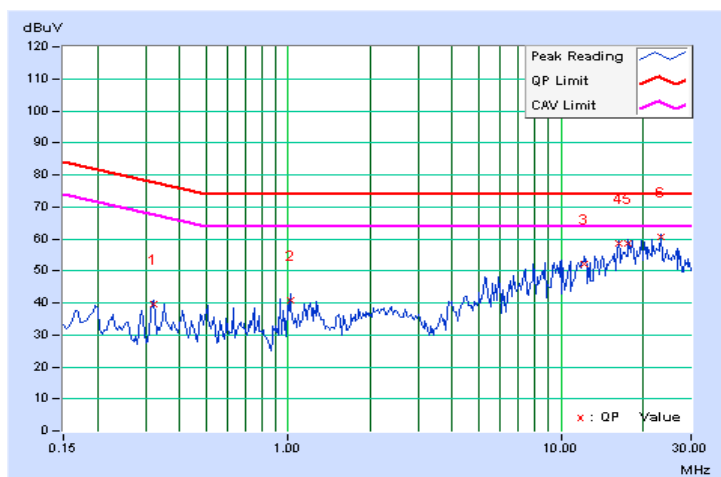


TEST MODE	Mode 1	6dB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	RJ45 TELECOM PORT (100Mbps)
ENVIRONMENTAL CONDITIONS	23deg. C, 66% RH	TESTED BY:	Brad Tung

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	A.V.	Q.P.	A.V.
1	0.32188	9.63	29.89	26.46	39.52	36.09	77.66	67.66	-38.14	-31.57
2	1.02344	9.37	31.53	27.93	40.90	37.30	74.00	64.00	-33.10	-26.70
3	12.19922	9.56	42.52	39.62	52.08	49.18	74.00	64.00	-21.92	-14.82
4	16.23047	9.74	48.68	46.39	58.42	56.13	74.00	64.00	-15.58	-7.87
5	17.69531	9.81	48.95	46.84	58.76	56.65	74.00	64.00	-15.24	-7.35
6	23.12891	10.08	50.46	48.69	60.54	58.77	74.00	64.00	-13.46	-5.23

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



4.3 RADIATED EMISSION MEASUREMENT

4.3.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: EN 55022

FOR FREQUENCY BELOW 1000 MHz

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

FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1 to 3	76	56	70	50
3 to 6	80	60	74	54

- NOTE:** (1) The lower limit shall apply at the transition frequencies.
 (2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
 (3) All emanation 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.

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

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4.3.2 TEST INSTRUMENTS

Frequency Range 30MHz~1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ TEST RECEIVER	ESVS 30	841977/008	Apr. 26, 2012	Apr. 25, 2013
SCHAFFNER BILOG Antenna	CBL6111C	2793	Apr. 03, 2012	Apr. 02, 2013
ADT. Turn Table	TT100	0201	NA	NA
ADT. Tower	AT100	0201	NA	NA
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
ADT RF Switches BOX	EM-H-01-1	1004	Dec. 16, 2011	Dec. 15, 2012
WOKEN RF cable	8D	CABLE-ST10-01	Dec. 16, 2011	Dec. 15, 2012

- 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. The test was performed in Open Site No. 10.
3. The VCCI Site Registration No. R-1625.
4. The Industry Canada Reference No. IC 7450E-10.
5. The FCC Site Registration No. 698148.
6. Tested Date: May 22, 2012.

Frequency Range above 1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum	E4446A	MY46180403	Jun. 22, 2011	Jun. 21, 2012
Agilent Preamplifier	8449B	3008A01201	Feb. 29, 2012	Feb. 28, 2013
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 02, 2012	Mar. 01, 2013
Schwarzbeck Horn Antenna	BBHA-9170	BBHA9170190	Oct. 07, 2011	Oct. 06, 2012
Schwarzbeck Horn Antenna	BBHA-9120-D1	D130	May 18, 2012	May 17, 2013
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
SUHNER RF cable	SF102	Cable-CH6	Aug. 19, 2011	Aug. 18, 2012

- 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. The test was performed in Chamber No. 6.
3. The Industry Canada Reference No. IC 7450E-6.
4. The VCCI Site Registration No. G-257
5. The FCC Site Registration No. 447212.
6. Tested Date: May 22, 2012.

4.3.3 TEST PROCEDURE

<Frequency Range 30MHz ~ 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

NOTE: The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

<Frequency Range above 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna can be varied from one meter-to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

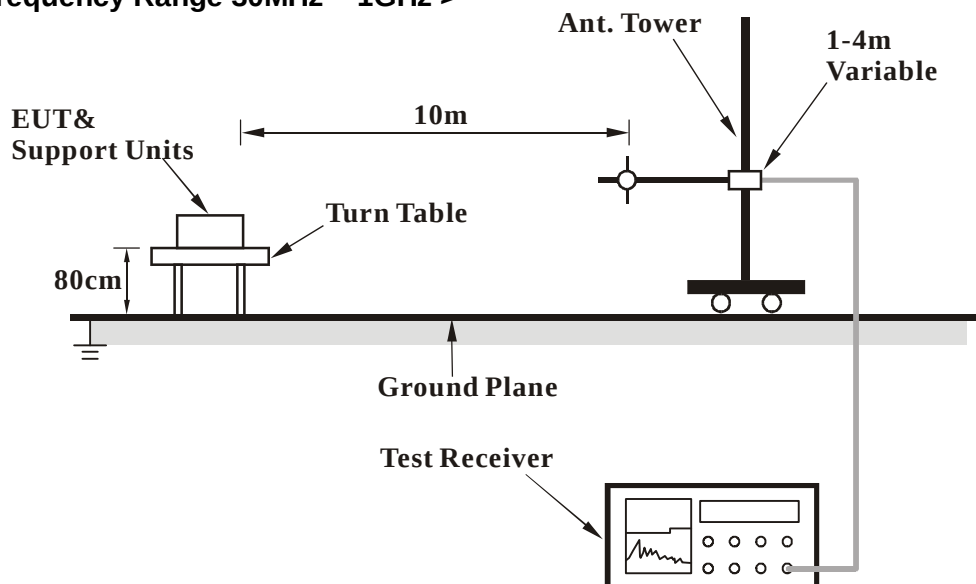
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.

4.3.4 DEVIATION FROM TEST STANDARD

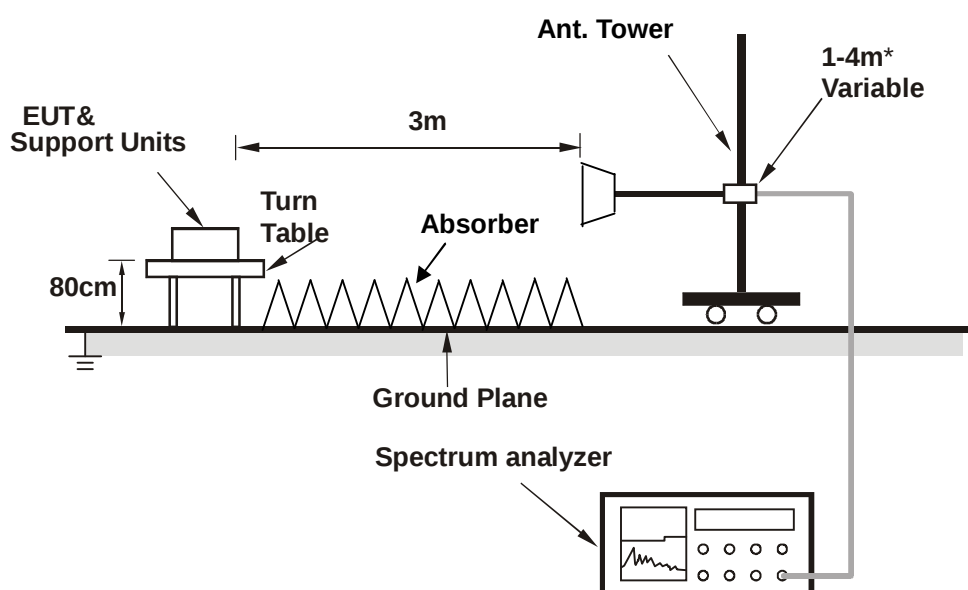
No deviation

4.3.5 TEST SETUP

<Frequency Range 30MHz ~ 1GHz >



<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

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

4.3.6 EUT OPERATING CONDITIONS

Same as item 4.1.6

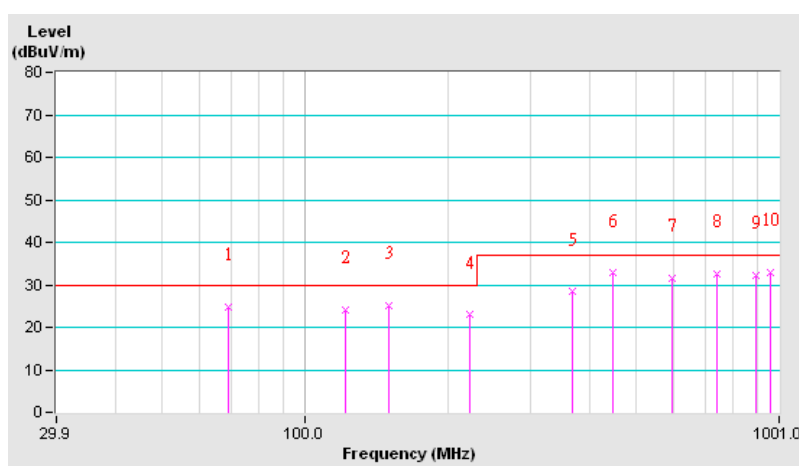
4.3.7 TEST RESULTS (1)

TEST MODE	Mode 1		
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	27deg. C, 76% RH	TESTED BY: Antony Lee	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	68.85	24.82 QP	30.00	-5.18	3.77 H	108	17.13	7.69
2	121.50	24.08 QP	30.00	-5.92	4.00 H	16	10.89	13.19
3	150.24	25.05 QP	30.00	-4.95	4.00 H	200	11.89	13.16
4	222.75	22.91 QP	30.00	-7.09	4.00 H	163	9.52	13.39
5	366.51	28.37 QP	37.00	-8.63	2.77 H	41	9.29	19.08
6	445.50	32.71 QP	37.00	-4.29	2.49 H	155	11.49	21.22
7	594.02	31.54 QP	37.00	-5.46	2.40 H	281	6.68	24.86
8	742.53	32.49 QP	37.00	-4.51	1.56 H	40	5.70	26.79
9	891.50	32.34 QP	37.00	-4.66	1.51 H	231	3.29	29.05
10	961.51	32.83 QP	37.00	-4.17	2.42 H	220	2.68	30.15

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

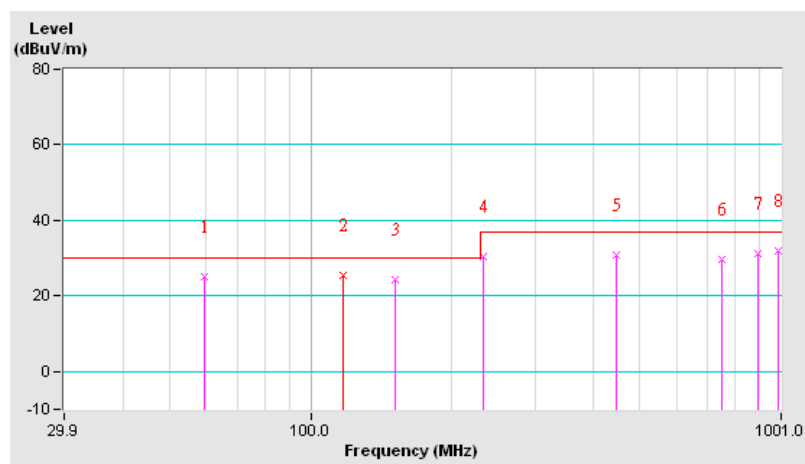


TEST MODE	Mode 1		
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	27deg. C, 76% RH	TESTED BY: Antony Lee	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	59.58	25.07 QP	30.00	-4.93	1.00 V	316	17.53	7.54
2	117.50	25.31 QP	30.00	-4.69	1.00 V	0	12.36	12.95
3	151.25	24.24 QP	30.00	-5.76	1.00 V	149	11.15	13.09
4	233.50	30.31 QP	37.00	-6.69	1.00 V	319	16.10	14.21
5	445.52	30.88 QP	37.00	-6.12	1.00 V	332	9.66	21.22
6	750.03	29.54 QP	37.00	-7.46	2.56 V	179	2.58	26.96
7	891.00	31.17 QP	37.00	-5.83	3.20 V	59	2.12	29.05
8	989.12	31.81 QP	37.00	-5.19	3.06 V	8	1.17	30.64

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





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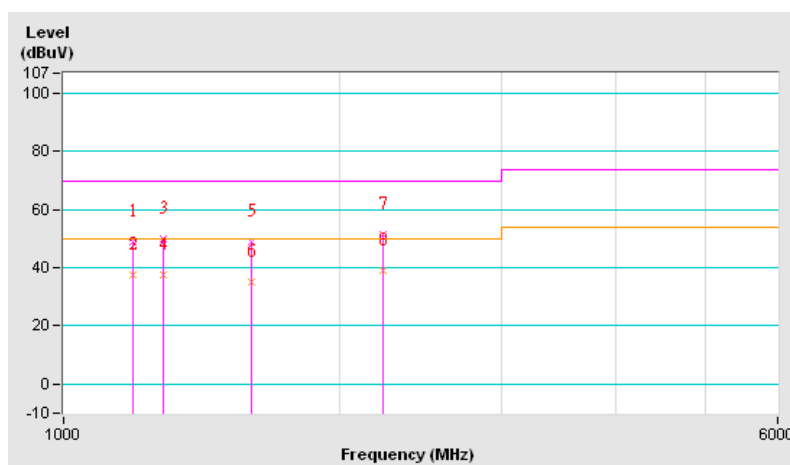
TEST MODE	Mode 1		
FREQUENCY RANGE	1-6 GHz	DETECTOR FUNCTION & BANDWIDTH	Peak/Average, 1MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 78% RH	TESTED BY: Brad Tung	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1191.85	48.97 PK	70.00	-21.03	1.24 H	215	19.92	29.05
2	1191.85	37.40 AV	50.00	-12.60	1.24 H	215	8.35	29.05
3	1283.21	50.03 PK	70.00	-19.97	1.62 H	109	20.53	29.50
4	1283.21	37.48 AV	50.00	-12.52	1.62 H	109	7.98	29.50
5	1599.85	48.84 PK	70.00	-21.16	1.30 H	27	18.34	30.50
6	1599.85	35.29 AV	50.00	-14.71	1.30 H	27	4.79	30.50
7	2225.37	51.36 PK	70.00	-18.64	1.44 H	20	18.86	32.50
8	2225.37	39.02 AV	50.00	-10.98	1.44 H	20	6.52	32.50

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





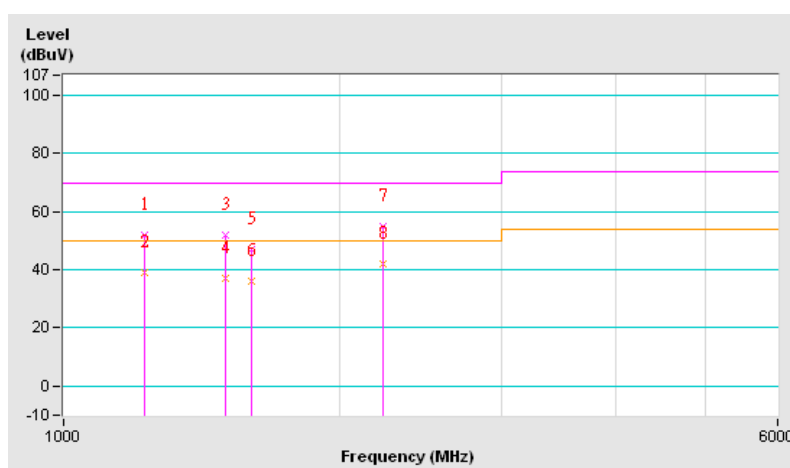
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TEST MODE	Mode 1		
FREQUENCY RANGE	1-6 GHz	DETECTOR FUNCTION & BANDWIDTH	Peak/Average, 1MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 78% RH	TESTED BY: Brad Tung	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1225.18	52.16 PK	70.00	-17.84	1.62 V	33	22.95	29.21
2	1225.18	38.99 AV	50.00	-11.01	1.62 V	33	9.78	29.21
3	1500.21	52.03 PK	70.00	-17.97	1.08 V	44	21.87	30.16
4	1500.21	37.19 AV	50.00	-12.81	1.08 V	44	7.03	30.16
5	1600.06	47.18 PK	70.00	-22.82	1.38 V	306	16.68	30.50
6	1600.06	36.03 AV	50.00	-13.97	1.38 V	306	5.53	30.50
7	2227.51	55.19 PK	70.00	-14.81	1.00 V	12	22.68	32.51
8	2227.51	42.09 AV	50.00	-7.91	1.00 V	12	9.58	32.51

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



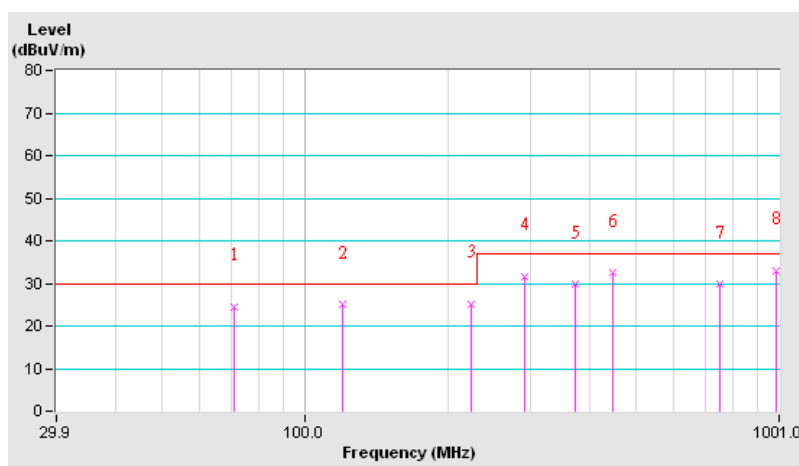
4.3.8 TEST RESULTS (2)

TEST MODE	Mode 2		
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	27deg. C, 76% RH	TESTED BY: Antony Lee	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	70.78	24.49 QP	30.00	-5.51	4.00 H	96	16.70	7.79
2	119.75	25.00 QP	30.00	-5.00	4.00 H	8	11.86	13.14
3	225.00	25.14 QP	30.00	-4.86	4.00 H	17	11.58	13.56
4	291.25	31.53 QP	37.00	-5.47	4.00 H	0	14.85	16.68
5	371.10	29.72 QP	37.00	-7.28	3.44 H	20	10.50	19.22
6	445.23	32.42 QP	37.00	-4.58	3.35 H	287	11.20	21.22
7	750.00	29.74 QP	37.00	-7.26	3.28 H	0	2.79	26.95
8	985.50	32.82 QP	37.00	-4.18	1.00 H	151	2.25	30.57

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





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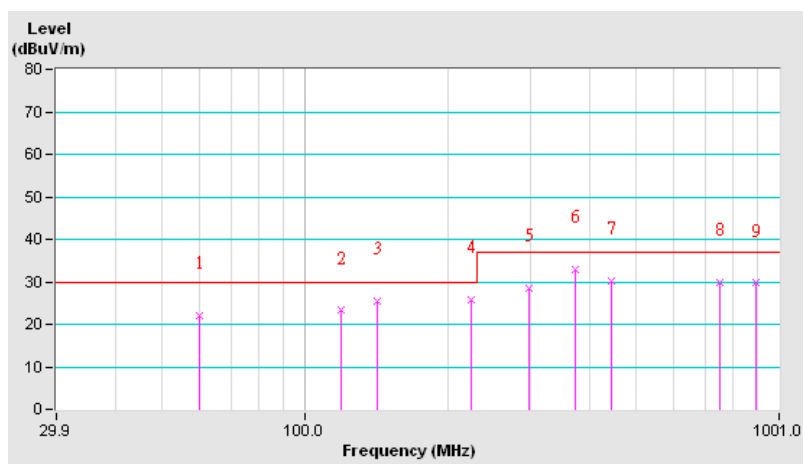
TEST MODE	Mode 2		
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	27deg. C, 76% RH	TESTED BY: Antony Lee	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	59.92	22.05 QP	30.00	-7.95	1.00 V	132	14.58	7.47
2	119.50	23.29 QP	30.00	-6.71	1.00 V	9	10.17	13.12
3	142.25	25.53 QP	30.00	-4.47	1.00 V	272	12.10	13.43
4	225.00	25.80 QP	30.00	-4.20	1.00 V	121	12.24	13.56
5	296.75	28.62 QP	37.00	-8.38	1.00 V	353	11.80	16.82
6	371.00	32.92 QP	37.00	-4.08	1.00 V	129	13.71	19.22
7	443.50	30.30 QP	37.00	-6.70	1.00 V	294	9.13	21.17
8	750.00	29.89 QP	37.00	-7.11	2.42 V	54	2.94	26.95
9	897.25	29.67 QP	37.00	-7.33	3.44 V	177	0.56	29.11

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





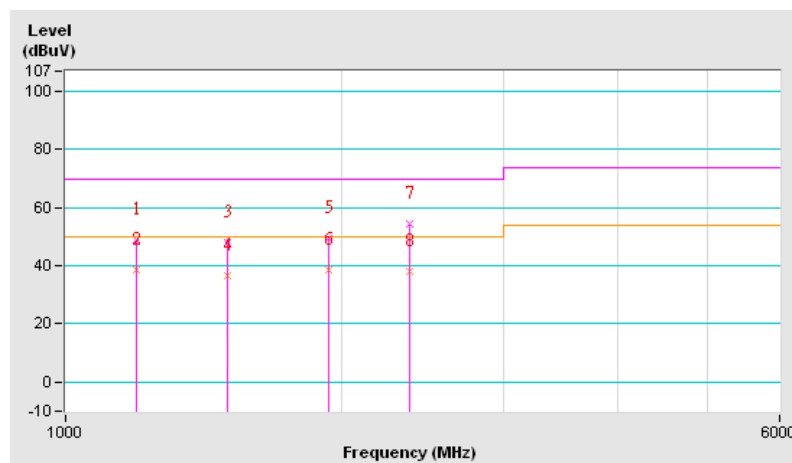
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TEST MODE	Mode 2		
FREQUENCY RANGE	1-6 GHz	DETECTOR FUNCTION & BANDWIDTH	Peak/Average, 1MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 78% RH	TESTED BY: Brad Tung	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1193.05	49.18 PK	70.00	-20.82	1.44 H	125	20.13	29.05
2	1193.05	38.47 AV	50.00	-11.53	1.44 H	125	9.42	29.05
3	1498.85	47.85 PK	70.00	-22.15	1.52 H	9	17.69	30.16
4	1498.85	36.47 AV	50.00	-13.53	1.52 H	9	6.31	30.16
5	1935.12	49.58 PK	70.00	-20.42	1.38 H	217	18.04	31.54
6	1935.12	38.59 AV	50.00	-11.41	1.38 H	217	7.05	31.54
7	2375.05	54.22 PK	70.00	-15.78	1.25 H	77	21.12	33.10
8	2375.05	38.15 AV	50.00	-11.85	1.25 H	77	5.05	33.10

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





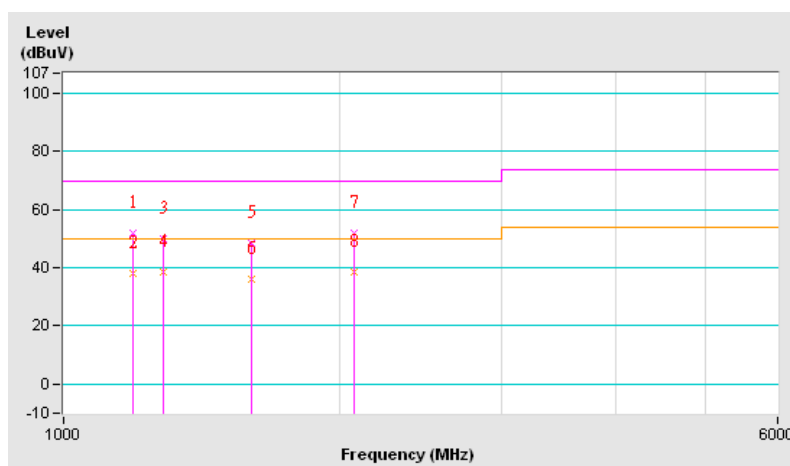
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TEST MODE	Mode 2		
FREQUENCY RANGE	1-6 GHz	DETECTOR FUNCTION & BANDWIDTH	Peak/Average, 1MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 78% RH	TESTED BY: Brad Tung	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1192.06	52.16 PK	70.00	-17.84	1.04 V	27	23.11	29.05
2	1192.06	38.14 AV	50.00	-11.86	1.04 V	27	9.09	29.05
3	1285.47	49.98 PK	70.00	-20.02	1.39 V	67	20.46	29.52
4	1285.47	38.59 AV	50.00	-11.41	1.39 V	67	9.07	29.52
5	1600.15	48.57 PK	70.00	-21.43	1.20 V	132	18.07	30.50
6	1600.15	36.02 AV	50.00	-13.98	1.20 V	132	5.52	30.50
7	2075.94	52.18 PK	70.00	-17.82	1.66 V	82	20.25	31.93
8	2075.94	38.48 AV	50.00	-11.52	1.66 V	82	6.55	31.93

REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



4.4 HARMONICS CURRENT MEASUREMENT

4.4.1 LIMITS OF HARMONICS CURRENT MEASUREMENT

TEST STANDARD: EN 61000-3-2

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

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mAW	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

- NOTE:** 1. Class A and Class D are classified according to section 5 of EN 61000-3-2: 2006.
2. According to section 7 of EN 61000-3-2: 2006, the above limits for all equipment except for lighting equipment are for all applications having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
EMC PARTNER EMC Emission Tester	HAR1000-1P	084	Apr. 10, 2012	Apr. 09, 2013
Software	HARCS	NA	NA	NA

- NOTE:** 1. The test was performed in EMS Room No. 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. According to IEC 61000-4-7: 2002, the time window shall be synchronized with each group of 10 or 12 cycles (200 ms) for power frequency of 50 or 60Hz.
4. Tested Date: May 23, 2012.

4.4.3 TEST PROCEDURE

- a. 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.
- b. The classification of EUT is according to section 5 of EN 61000-3-2: 2006.

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.

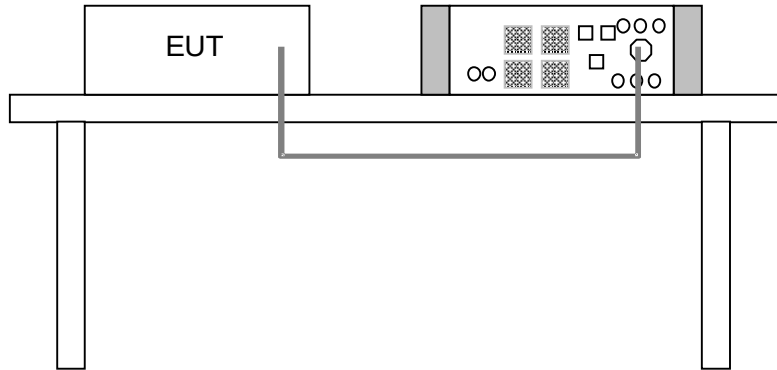
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors.

- c. 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.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



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

4.4.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. PC ran a test program to enable all functions.
- c. PC read and wrote messages from HDD.
- d. Server PC (kept in a remote area) sent and received messages to/from EUT via an UTP LAN cable (10m).
- e. PC sent “full white screen pattern” messages to EUT and ext. monitor via EUT, and then they displayed them on their screens simultaneously.
- f. PC sent message to modem.
- g. PC sent audio signal to speaker of EUT and ext. speaker via EUT.
- h. Steps c-h were repeated.



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4.4.7 TEST RESULTS

TEST MODE	Mode 1		
FUNDAMENTAL VOLTAGE/AMPERE	230.3Vrms/ 0.487Arms	POWER FREQUENCY	50.000Hz
POWER CONSUMPTION	106.85W	POWER FACTOR	0.947
ENVIRONMENTAL CONDITIONS	24deg. C, 70%RH	TESTED BY: Louis Liao	

Harm. Order	Iavg (A)	Iavg Limit (A)	I _{max} (A)	I _{max} Limit (A)	Harm. Order	Iavg (mA/W)	Iavg Limit (mA/W)	I _{max} (mA/W)	I _{max} Limit (mA/W)
1	0.4776	-	0.5645	-	1	4.4698	-	5.2831	-
3	0.0692	2.3000	0.0695	3.4500	3	0.6476	3.4000	0.6504	5.1000
5	0.0279	1.1400	0.0281	1.7100	5	0.2611	1.9000	0.2630	2.8500
7	0.0213	0.7700	0.0217	1.1550	7	0.1993	1.0000	0.2031	1.5000
9	0.0076	0.4000	0.0077	0.6000	9	0.0711	0.5000	0.0721	0.7500
11	0.0000	0.3300	0.0042	0.4950	11	0.0000	0.3500	0.0393	0.5250
13	0.0000	0.2100	0.0021	0.3150	13	0.0000	0.2962	0.0197	0.4442
15	0.0000	0.1500	0.0023	0.2250	15	0.0000	0.2567	0.0215	0.3850
17	0.0000	0.1324	0.0027	0.1985	17	0.0000	0.2265	0.0253	0.3397
19	0.0000	0.1184	0.0030	0.1776	19	0.0000	0.2026	0.0281	0.3039
21	0.0000	0.1071	0.0026	0.1607	21	0.0000	0.1833	0.0243	0.2750
23	0.0000	0.0978	0.0021	0.1467	23	0.0000	0.1674	0.0197	0.2511
25	0.0000	0.0900	0.0015	0.1350	25	0.0000	0.1540	0.0140	0.2310
27	0.0000	0.0833	0.0013	0.1250	27	0.0000	0.1426	0.0122	0.2139
29	0.0000	0.0776	0.0017	0.1164	29	0.0000	0.1328	0.0159	0.1991
31	0.0000	0.0726	0.0017	0.1089	31	0.0000	0.1242	0.0159	0.1863
33	0.0000	0.0682	0.0017	0.1023	33	0.0000	0.1167	0.0159	0.1750
35	0.0000	0.0643	0.0015	0.0964	35	0.0000	0.1100	0.0140	0.1650
37	0.0000	0.0608	0.0012	0.0912	37	0.0000	0.1041	0.0112	0.1561
39	0.0000	0.0577	0.0012	0.0865	39	0.0000	0.0987	0.0112	0.1481

NOTE: Steady state values on AC mains are recorded in the table.

4.5 VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

4.5.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST STANDARD: EN 61000-3-3

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

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
EMC PARTNER EMC Emission Tester	HAR1000-1P	084	Apr. 10, 2012	Apr. 09, 2013
Software	HARCS	NA	NA	NA

NOTE: 1. The test was performed in EMS Room No. 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: May 23, 2012.

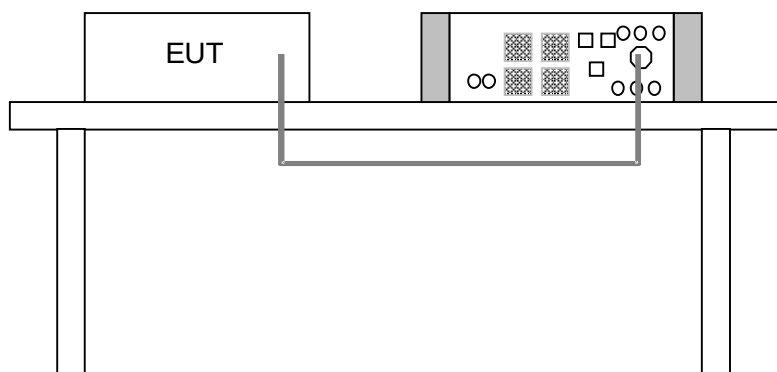
4.5.3 TEST PROCEDURE

- 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.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



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

4.5.6 EUT OPERATING CONDITIONS

Same as item 4.4.6

4.5.7 TEST RESULTS

TEST MODE	Mode 1		
FUNDAMENTAL VOLTAGE/AMPERE	230.3 Vrms/ 0.487 Arms	POWER FREQUENCY	49.987 Hz
OBSERVATION PERIOD (Tp)	10 minutes	POWER FACTOR	0.947
ENVIRONMENTAL CONDITIONS	24deg. C, 70%RH	TESTED BY: Louis Liao	

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARKS
P_{st}	0.072	1.0	Pass
P_{lt}	0.072	0.65	Pass
$T_{d(t)}$ (ms)	0	500	Pass
d_{max} (%)	0	4	Pass
dc (%)	0	3.3	Pass

- NOTE:**
- (1) P_{st} means short-term flicker indicator.
 - (2) P_{lt} means long-term flicker indicator.
 - (3) $T_{d(t)}$ means maximum time that $d(t)$ exceeds 3.3%.
 - (4) d_{max} means maximum relative voltage change.
 - (5) dc means relative steady-state voltage change.

5 IMMUNITY TEST

5.1 GENERAL DESCRIPTION

Product Standard:	EN 55024:2010	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV Air discharge, 4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT AC Power line: 1kV, DC Power line: 0.5kV Signal line: 0.5kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: AC Power Line: line to line 1 kV, line to earth 2kV DC Power Line: line to earth 0.5kV Performance Criterion B Outdoor Signal line: i) 1 kV without primary protectors, Performance Criteria C ii) 4 kV with primary protectors, Performance Criterion C
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 3V, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power Frequency Magnetic Field Test, 50 Hz, 1A/m, Performance Criterion A
	IEC 61000-4-11	Voltage Dips: i) >95% reduction – 0.5 period, Performance Criterion B ii) 30% reduction – 25 period, Performance Criterion C Voltage Interruptions: i) >95% reduction – 250 period, Performance Criterion C

5.2 GENERAL PERFORMANCE CRITERIA DESCRIPTION

According to Clause 7 of EN 55024 standard, the following describes the general performance criteria.

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

Particular performance criteria

The particular performance criteria which are specified in the normative annexes of EN 55024 take precedence over the corresponding parts of the general performance criteria.

Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

5.3 EUT OPERATING CONDITION

- a. Turned on the power of all equipment.
- b. PC ran a test program to enable all functions.
- c. PC read and wrote messages from HDD.
- d. Server PC (kept in a remote area) sent and received messages to/from EUT via an UTP LAN cable (10m).
- e. PC sent "H" messages to EUT and ext. monitor via EUT, and then they displayed them on their screens simultaneously.
- f. PC sent message to modem.
- g. PC sent audio signal to speaker of EUT and ext. speaker via EUT.
- h. Steps c-h were repeated.



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5.4 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

5.4.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge : 2kV/ 4kV/ 8 kV (Direct) Contact Discharge : 2kV/ 4 kV (Direct/ Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: Min. 20 times at each test point Contact Discharge: Min. 200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
KeyTek, ESD Simulator	MZ-15/EC	0504259	May 30, 2011	May 29, 2012

- NOTE:** 1. The test was performed in ESD Room No. 3.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: May 24, 2012.

5.4.3 TEST PROCEDURE

The discharges shall be applied in two ways:

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

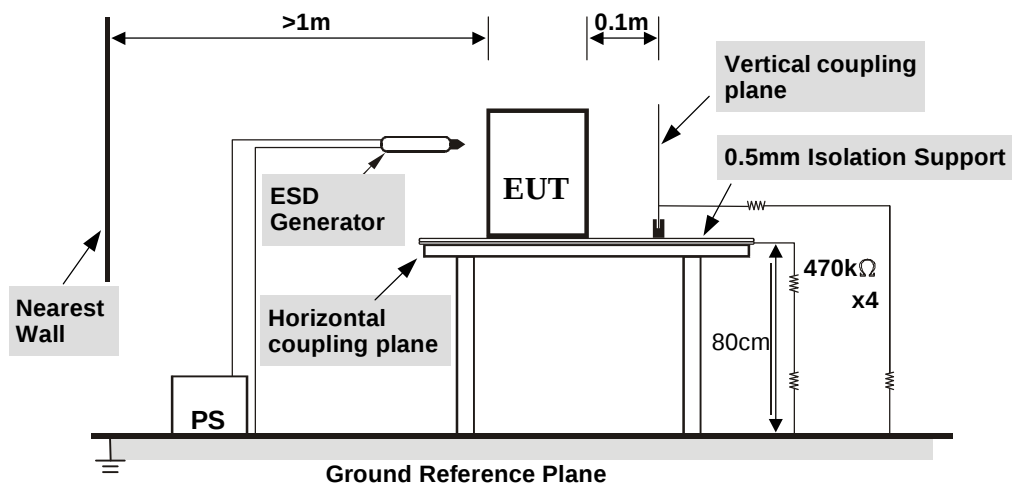
The basic test procedure was in accordance with IEC 61000-4-2:

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. 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.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned horizontally at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** 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.

5.4.4 DEVIATION FROM TEST STANDARD

No deviation

5.4.5 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 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

5.4.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 47%RH, 998hPa	TESTED BY: Todd Chang	

TEST RESULTS OF DIRECT APPLICATION					
Discharge Level (kV)	Polarity	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2	+/-	1 ~ 4	Note (1)	N/A	A
4	+/-	1, 2, 4	Note (1)	N/A	A
4	+/-	3	Note (2)	N/A	B
2, 4	+/-	5 ~ 12	N/A	Note (1)	A
8	+/-	7 ~ 12	N/A	Note (1)	A
8	+/-	5, 6	N/A	Note (2)	B

Description of test point: Please refer to ESD test photo for representative mark only.

TEST RESULTS OF INDIRECT APPLICATION					
Discharge Level (kV)	Polarity	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2	+/-	1 ~ 4	Note (1)	Note (1)	A
4	+/-	1 ~ 4	Note (1)	Note (2)	B

Description of test point:

1. Left side
2. Right side
3. Front side
4. Rear side

NOTE: (1) There was no change compared with initial operation during the test.
 (2) There was lines flicker disturbances on the screen during the test, but self-recoverable after the test.



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5.5 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

5.5.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5 m
Dwell Time:	3 seconds



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5.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Signal Generator	E8257D	MY48050465	Jun. 11, 2011	Jun. 10, 2012
PRANA RF Amplifier	AP32DP280	0811-894	NA	NA
AR RF Amplifier	150W1000M3	306601	NA	NA
AR RF Amplifier	35S4G8AM4	0326094	NA	NA
AR RF Amplifier	100S1G4M3	0329249	NA	NA
AR Controller	SC1000M3	305910	NA	NA
Radisense Electric Field Sensor	CTR1001A RadiSense 6	06D00232SN O-02 06D00232SN O39	Jul. 15, 2011	Jul. 14, 2012
Radisense Electric Field Sensor	CTR1002A	08D00057SN O-07	Jun. 06, 2011	Jun. 05, 2012
BOONTON RF Voltage Meter	4232A	10180	Jun. 14, 2011	Jun. 13, 2012
BOONTON Power Sensor	51011-EMC	34152	Jun. 14, 2011	Jun. 13, 2012
BOONTON Power Sensor	51011-EMC	34153	Jun. 15, 2011	Jun. 14, 2012
AR Log-Periodic Antenna	AT6080	0329465	NA	NA
EMCO BiconiLog Antenna	3141	1001	NA	NA
AR High Gain Antenna	AT4002A	306533	NA	NA
AR High Gain Horn Antenna	AT4010	0329800	NA	NA
CHANCE MOST Full Anechoic Chamber (9x5x3m)	Chance Most	RS-002	Feb. 10, 2012	Feb. 09, 2013
Software	ADT_RS_V7.6	NA	NA	NA

NOTE: 1. The test was performed in RS Room No.2.

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

3. The transmit antenna was located at a distance of 3 meters from the EUT.

4. Tested Date: May 24, 2012.

5.5.3 TEST PROCEDURE

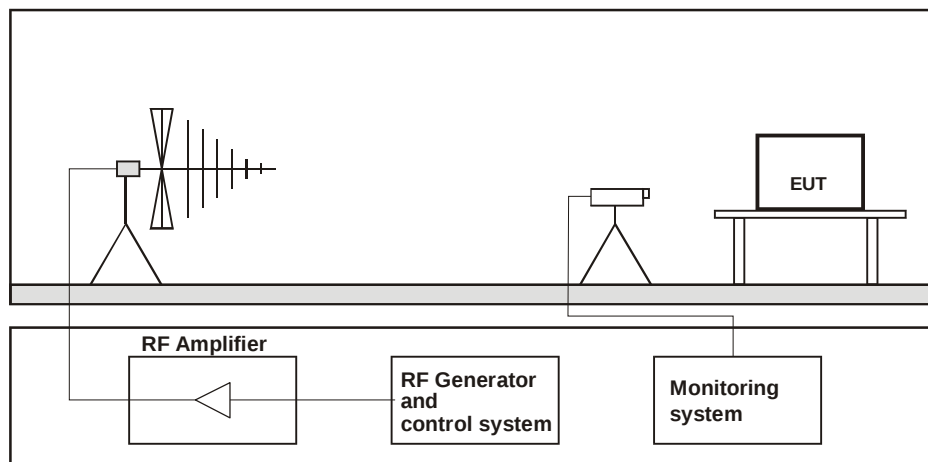
The test procedure was in accordance with IEC 61000-4-3

- The testing was performed in a fully-anechoic chamber.
- The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5s.
- The field strength level was 3V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.5.4 DEVIATION FROM TEST STANDARD

No deviation

5.5.5 TEST SETUP



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

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

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

5.5.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 64%RH	TESTED BY: Todd Chang	

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Performance Criterion
80 - 1000	V & H	0	3	Note	A
	V & H	90	3		
	V & H	180	3		
	V & H	270	3		

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



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5.6 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT)

5.6.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	Power Line : 1 kV Signal/Control Line : 0.5 kV
Polarity:	Positive & Negative
Impulse Frequency:	100 kHz: only for signal lines of xDSL equipment 5 kHz: except for xDSL equipment
Impulse Waveshape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	1 min.

5.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Haefely, EFT Generator	PEFT 4010	154954	Apr. 26, 2012	Apr. 25, 2013
Haefely, Capacitive Clamp	IP4A	155173	NA	NA

- NOTE:** 1. The test was performed in EFT Room
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: May 23, 2012.

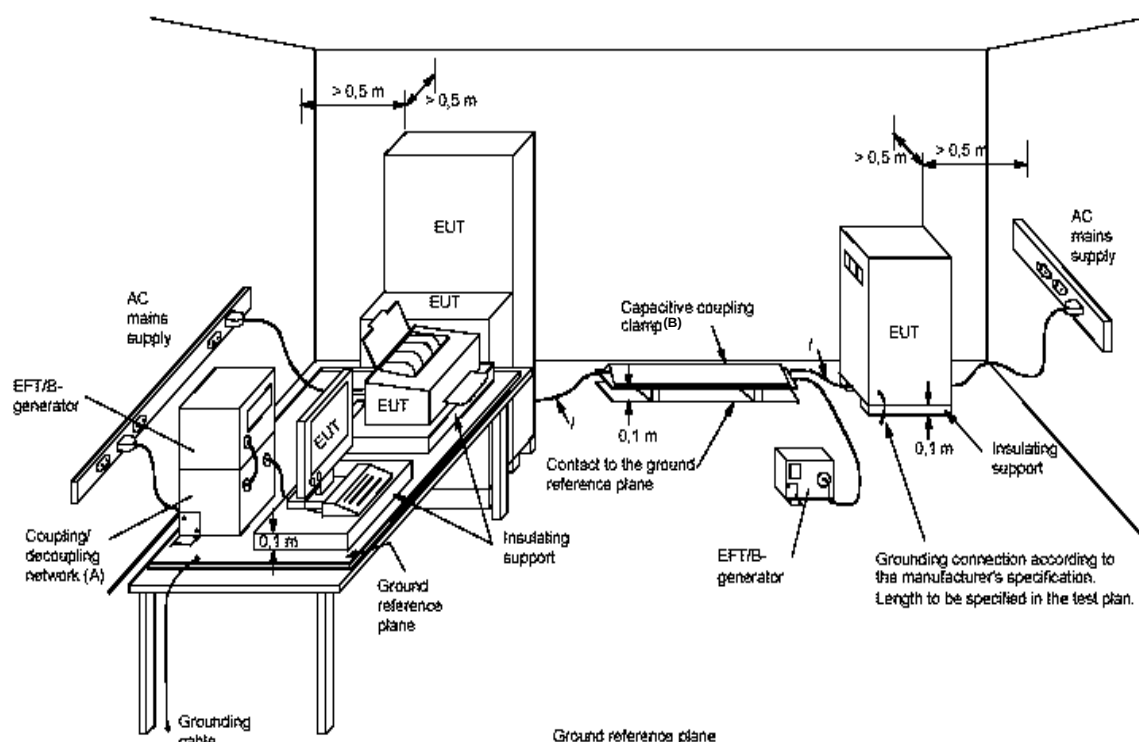
5.6.3 TEST PROCEDURE

- Both positive and negative polarity discharges were applied.
- The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter $\pm$ 0.05 meter.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

5.6.4 DEVIATION FROM TEST STANDARD

No deviation

5.6.5 TEST SETUP



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

l: length between clamp and the EUT to be tested (should be 0.5 ± 0.05 m)

(A): location for supply line coupling

(B): location for signal lines coupling

NOTE:

EUTs, whether stationary floor-mounted or table top, and equipment designed to be mounted in other configurations, shall be placed on a ground reference plane and shall be insulated from it by an insulating support $0,1 \text{ m} \pm 0,01 \text{ m}$ thick. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

5.6.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 67%RH	TESTED BY: Todd Chang	

Test Point	Polarity	Test Level (kV)	Observation	Performance Criterion
L1	+/-	1	Note	A
L2	+/-	1	Note	A
PE	+/-	1	Note	A
L1-L2-PE	+/-	1	Note	A
LAN	+/-	0.5	Note	A
D-Sub	+/-	0.5	Note	A

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

5.7 SURGE IMMUNITY TEST

5.7.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave for power lines 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current 10/700 us Wave for signal lines 10/700 us Open Circuit Voltage
Test Voltage:	Power Line : 0.5kV/ 1 kV/ 2kV
Surge Input/Output:	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 / 20 sec.
Number of Tests:	5 positive and 5 negative at selected points

5.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
KeyTek, Surge Coupler/Decoupler	E-Class Series 100	9508347	Jun. 30, 2011	Jun. 29, 2012
Coupling Decoupling Network	CDN-UTP8	028	Jul. 18, 2011	Jul. 17, 2012
KeyTek I/O Signal Line Coupler/Decoupler	CM-I/OCD	9907177	NA	NA
Surge Cable	WE-4	SU1Cab-001	NA	NA
Surge Adapter WONPRO	WA-9	SU1ADA-002	NA	NA
Software	E500	NA	NA	NA

- NOTE:** 1. The test was performed in Surge Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: May 23, 2012.

5.7.3 TEST PROCEDURE

- a. For EUT power supply:

The surge is to be 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 shall be 2 meters in length (or shorter).

- b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

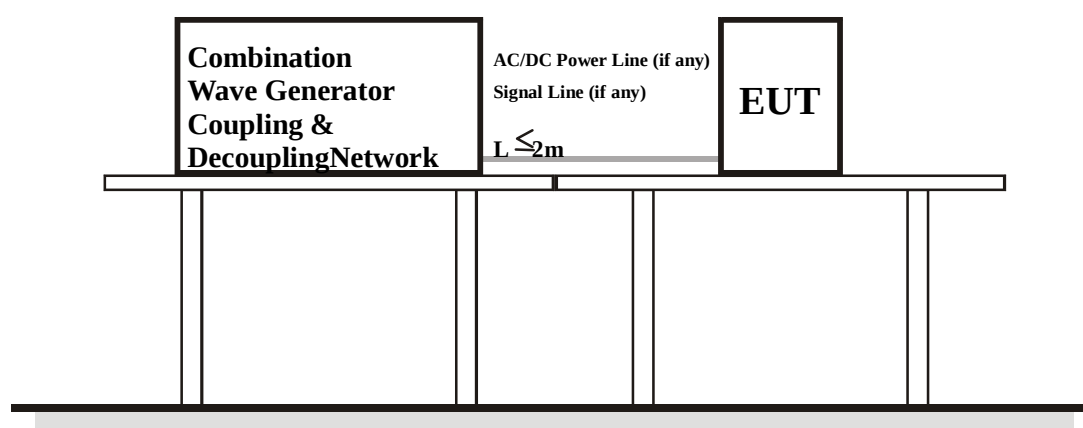
- c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

5.7.4 DEVIATION FROM TEST STANDARD

No deviation

5.7.5 TEST SETUP



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

5.7.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH	TESTED BY: Todd Chang	

Voltage (kV)	Test Point	Polarity	Phase Angle				Performance Criterion
			0°	90°	180°	270°	
0.5, 1	L1-L2	+/-	Note	Note	Note	Note	A
0.5, 1, 2	L1-PE	+/-	Note	Note	Note	Note	A
	L2-PE	+/-	Note	Note	Note	Note	A

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



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5.8 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS)

5.8.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 V _{r.m.s.}
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains, Signal line
Coupling Device:	CDN-M3 (3wires), CDN-T4, EM-Clamp



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5.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Signal Generator	SMY01	841104/033	Nov. 23, 2011	Nov. 22, 2012
Digital Sweep Function Generator	8120	984801	NA	NA
AR Power Amplifier	75A250AM1	312196	NA	NA
FCC Coupling Decoupling Network	FCC-801-M3 -25A	48	Aug. 19, 2011	Aug. 18, 2012
FCC Coupling Decoupling Network	FCC-801-M3 -25A	01022	Feb. 24, 2012	Feb. 23, 2013
FCC Coupling Decoupling Network	FCC-801-M2 -16A	01047	Aug. 19, 2011	Aug. 18, 2012
FISCHER CUSTOM COMMUNICATIONS EM Injection Clamp	FCC-203I	50	NA	NA
FISCHER CUSTOM COMMUNICATIONS Current Injection Clamp	F-120-9A	361	NA	NA
EM TEST Coupling Decoupling Network	CDN M1/32A	306508	Feb. 24, 2012	Feb. 23, 2013
FCC Coupling Decoupling Network	FCC-801-T8	02038	Feb. 24, 2012	Feb. 23, 2013
FCC Coupling Decoupling Network	FCC-801-T4	02031	Feb. 24, 2012	Feb. 23, 2013
FCC Coupling Decoupling Network	FCC-801-T2	02021	Feb. 24, 2012	Feb. 23, 2013
R&S Power Sensor	NRV-Z5	837878/038	Nov. 15, 2011	Nov. 14, 2012
R&S Power Sensor	NRV-Z5	837878/039	Nov. 14, 2011	Nov. 13, 2012
R&S Power Meter	NRVD	837794/040	Nov. 15, 2011	Nov. 14, 2012
Software	ADT_CS_V7 .4.2	NA	NA	NA

- NOTE:** 1. The test was performed in CS Room No. 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: May 28, 2012.

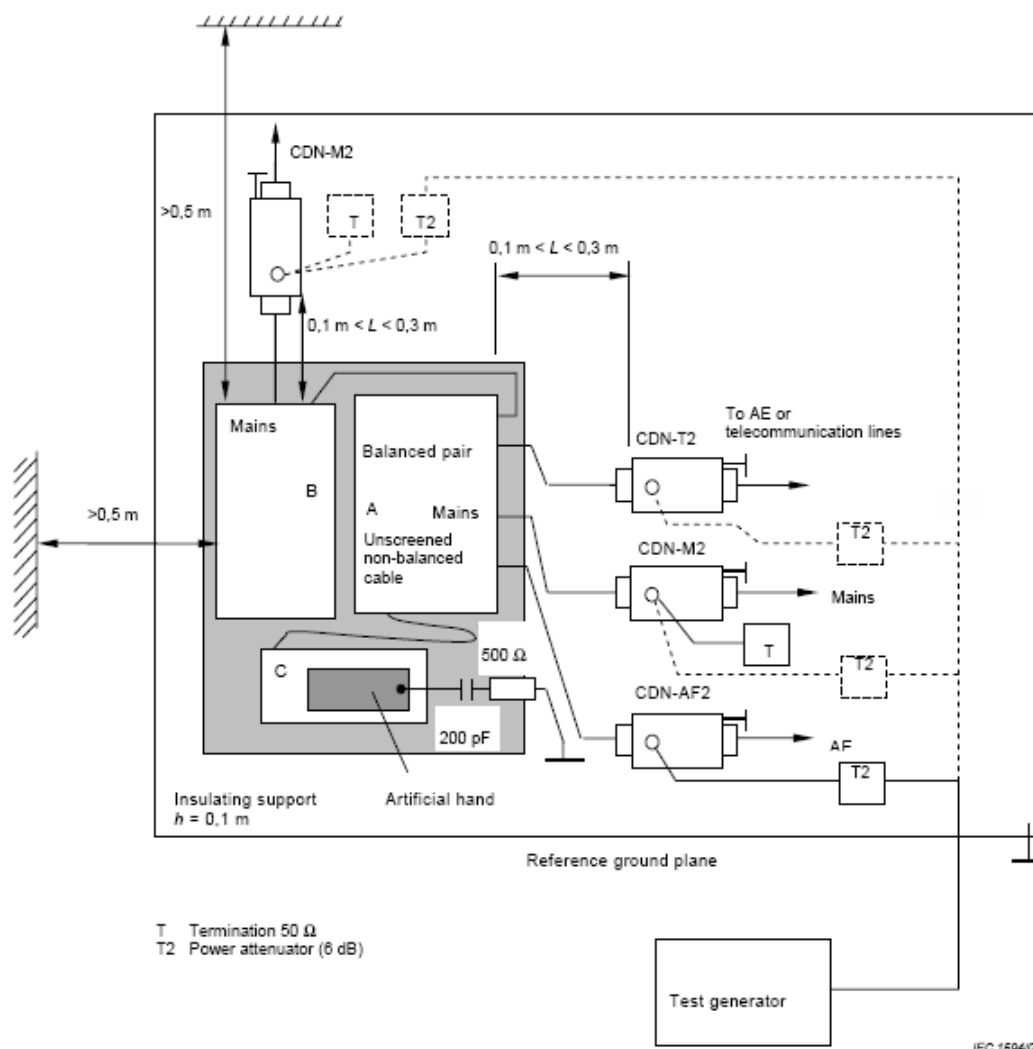
5.8.3 TEST PROCEDURE

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- c. One of the CDNs not used for injection was terminated with 50Ω , providing only one return path. All other CDNs were coupled as decoupling networks.
- d. The frequency range is 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 is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.
- e. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5 s. The sensitive frequencies (e.g. clock frequencies) shall be analyzed separately.
- f. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

5.8.4 DEVIATION FROM TEST STANDARD

No deviation

5.8.5 TEST SETUP



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

- Note:**
1. The EUT clearance from any metallic obstacles shall be at least 0,5 m.
 2. Interconnecting cables (≤ 1 m) belonging to the EUT shall remain on the insulating support.
 3. The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

5.8.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 74%RH	TESTED BY: Ted Huang	

Frequency (MHz)	Field Strength (V _{r.m.s.})	Cable	Injection Method	RETURN PATH	Observation	Performance Criterion
0.15 – 80	3	AC power line	CDN-M3	CDN-M3	Note	A
0.15 – 80	3	LAN	CDN-T4	CDN-M3	Note	A
0.15 – 80	3	D-Sub	EM-Clamp	CDN-M3	Note	A

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

5.9 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

5.9.1 TEST SPECIFICATION

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

5.9.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HAEFELY Magnetic Field Tester	MAG 100.1	083794-06	NA	NA
COMBINOVA Magnetic Field Meter	MFM10	224	Apr. 12, 2012	Apr. 11, 2013

NOTE: 1. The test was performed in EMS Room No. 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: May 23, 2012.

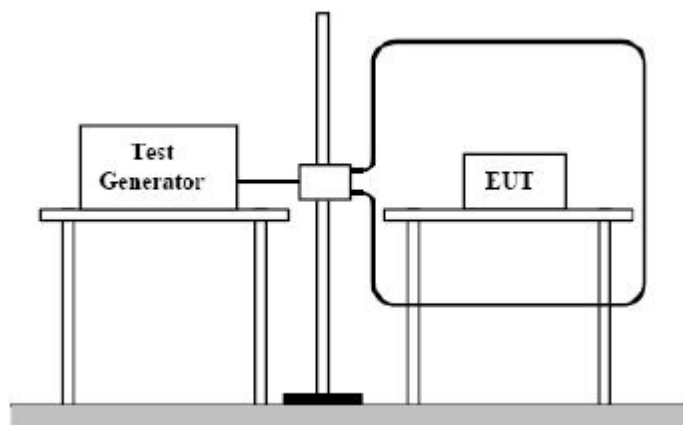
5.9.3 TEST PROCEDURE

- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

5.9.4 DEVIATION FROM TEST STANDARD

No deviation

5.9.5 TEST SETUP



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

NOTE:

TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

5.9.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH	TESTED BY: Todd Chang	

Direction	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	1	Note	A
Y - Axis	1	Note	A
Z - Axis	1	Note	A

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

5.10 VOLTAGE DIP/SHORT INTERRUPTIONS (DIP) IMMUNITY TEST

5.10.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-11
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/180°
Test Cycle:	3 times

5.10.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HAEFELY Mains Interference Simulator	PLINE1610	083690-17	Jun. 02, 2011	Jun. 01, 2012

- NOTE:** 1. The test was performed in EMS Room No. 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: May 23, 2012.

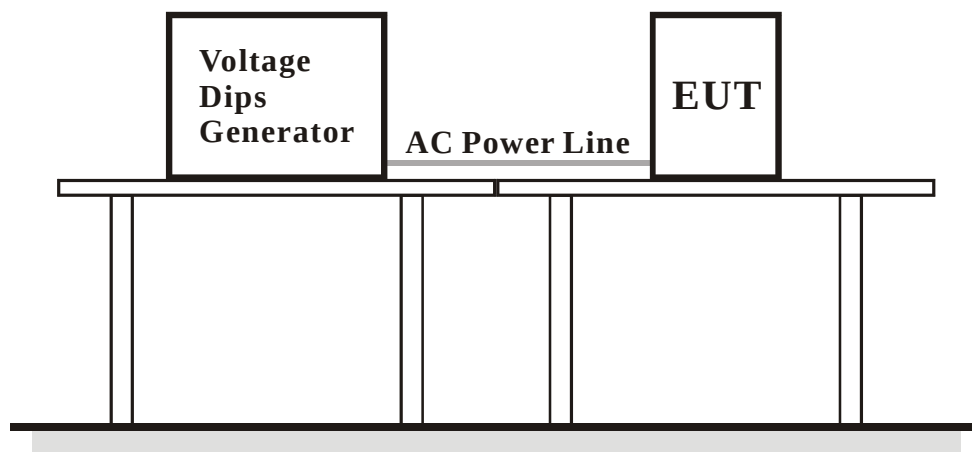
5.10.3 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

5.10.4 DEVIATION FROM TEST STANDARD

No deviation

5.10.5 TEST SETUP



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



A D T

5.10.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230 Vac, 50 Hz & 100 Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27deg. C, 64%RH	TESTED BY: Todd Chang	

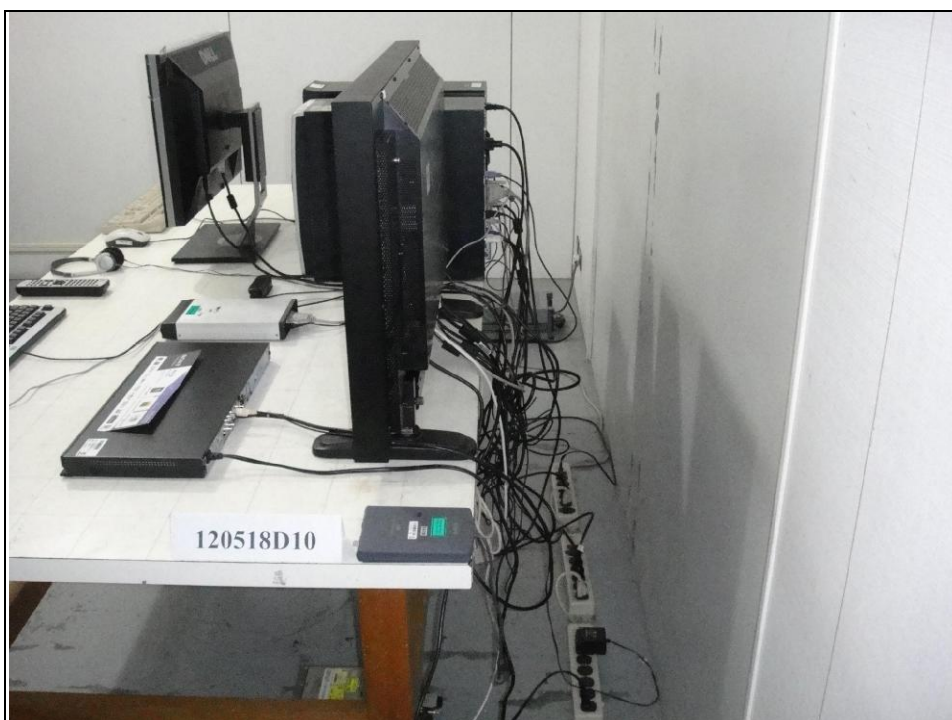
Input Power for testing: 230 Vac, 50 Hz			
VOLTAGE % REDUCTION	PERIODS	OBSERVATION	PERFORMANCE CRITERION
>95	0.5	Note (1)	A
30	25	Note (1)	A
>95	250	Note (2)	C

Input Power for testing: 100 Vac, 50 Hz			
VOLTAGE % REDUCTION	PERIODS	OBSERVATION	PERFORMANCE CRITERION
>95	0.5	Note (1)	A
30	25	Note (1)	A
>95	250	Note (2)	C

NOTES: (1) There was no change compared with the initial operation during the test.
(2) The EUT shut down but could be restored by the operator.

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

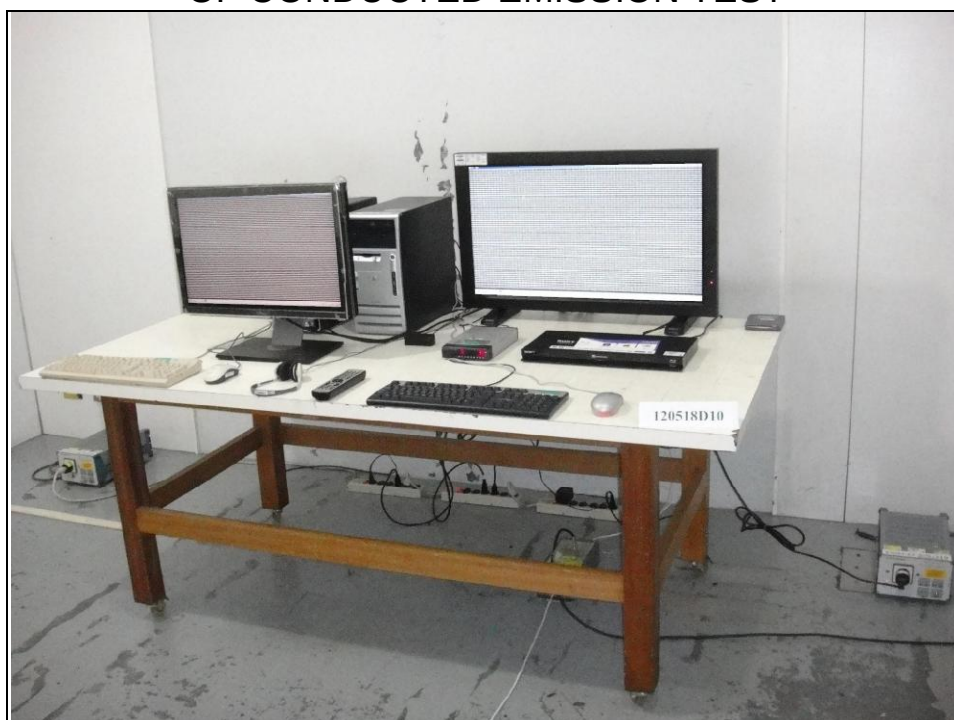
CONDUCTED EMISSION TEST – For Mode 1



CONDUCTED EMISSION TEST – For Mode 2



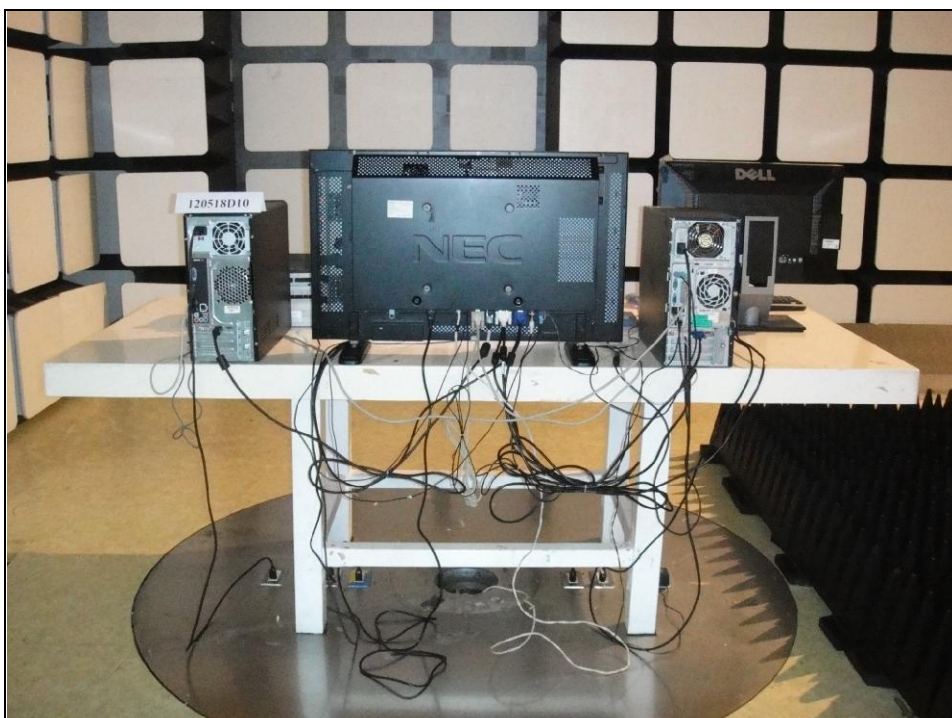
TELECOMMUNICATION PORT - RJ45 OF CONDUCTED EMISSION TEST



RADIATED EMISSION TEST – For Mode 1 Frequency Range 30MHz ~ 1GHz



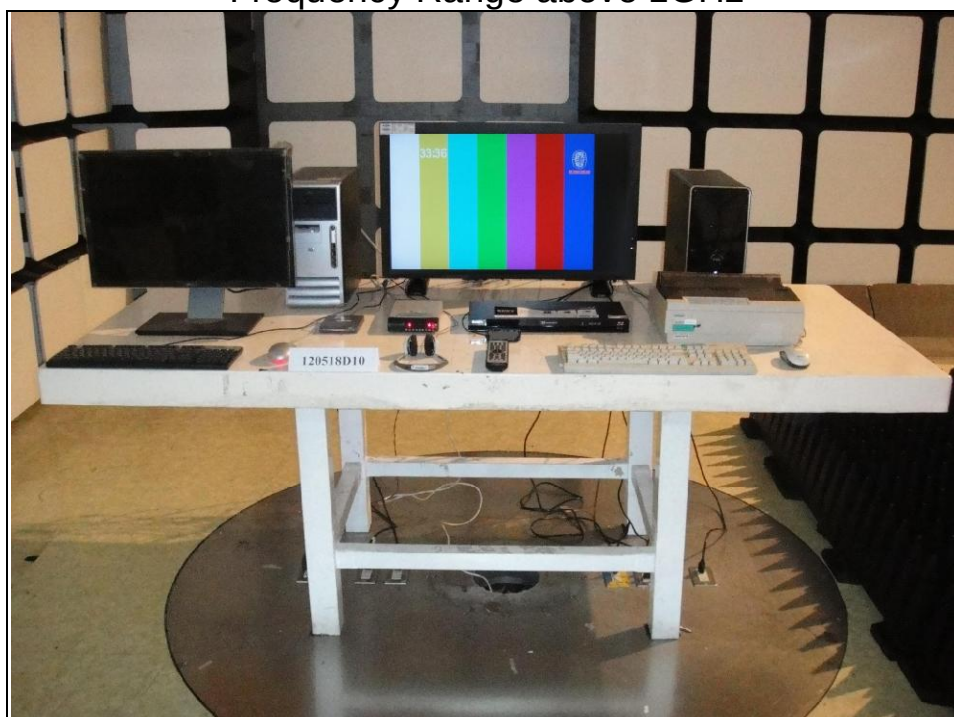
RADIATED EMISSION TEST – For Mode 1 Frequency Range above 1GHz



RADIATED EMISSION TEST – For Mode 2 Frequency Range 30MHz ~ 1GHz



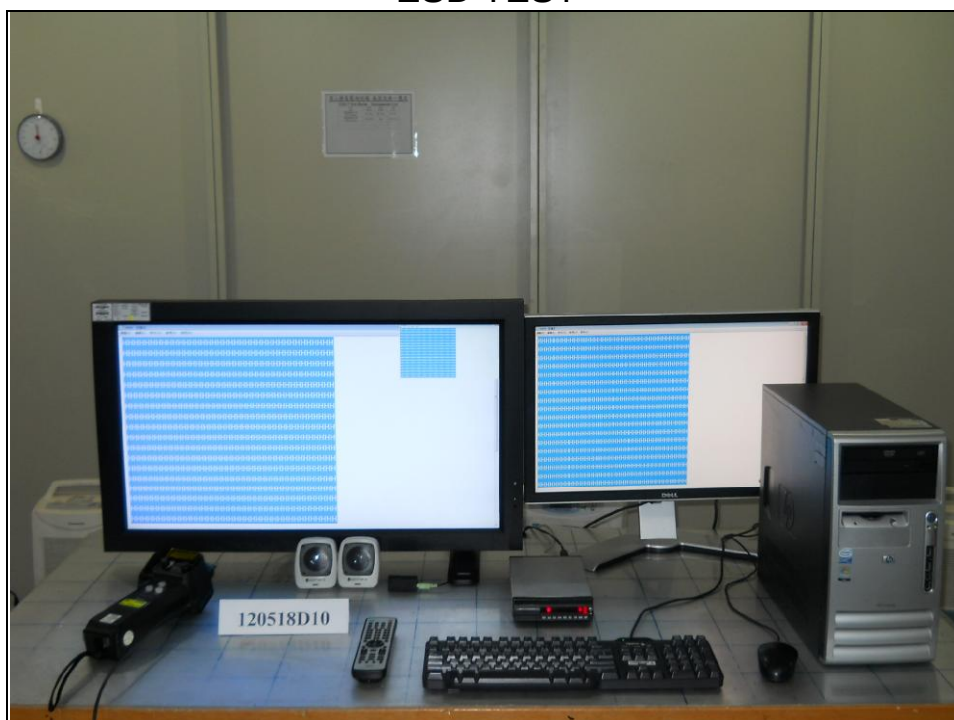
RADIATED EMISSION TEST – For Mode 2 Frequency Range above 1GHz



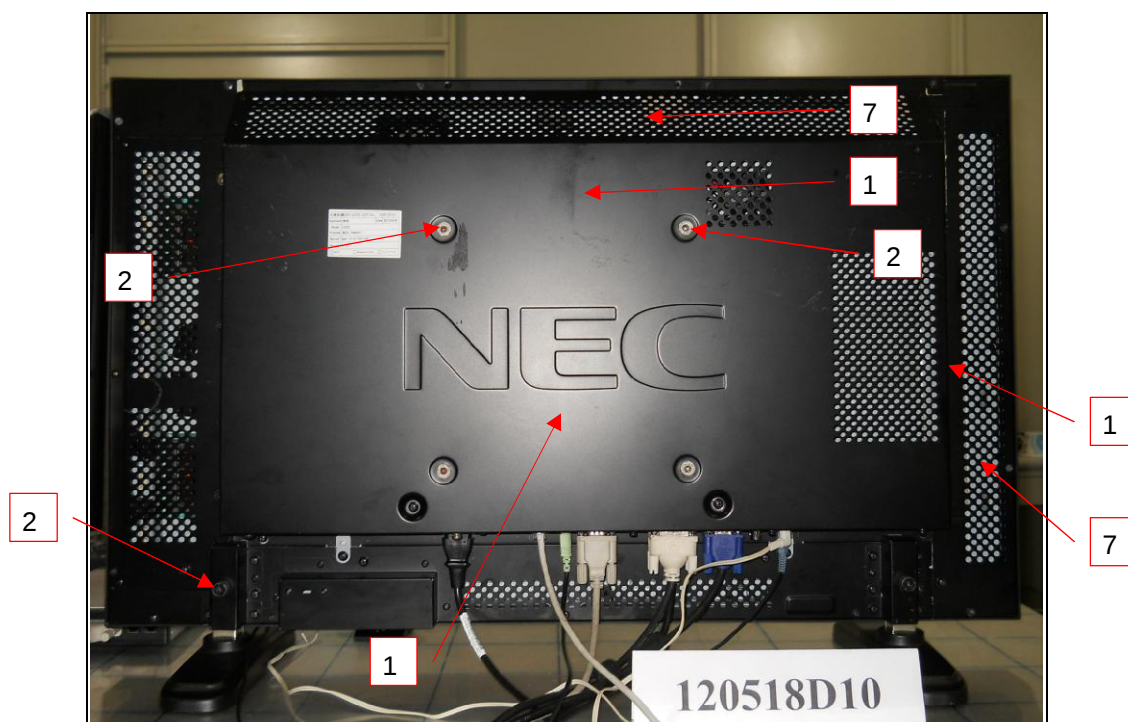
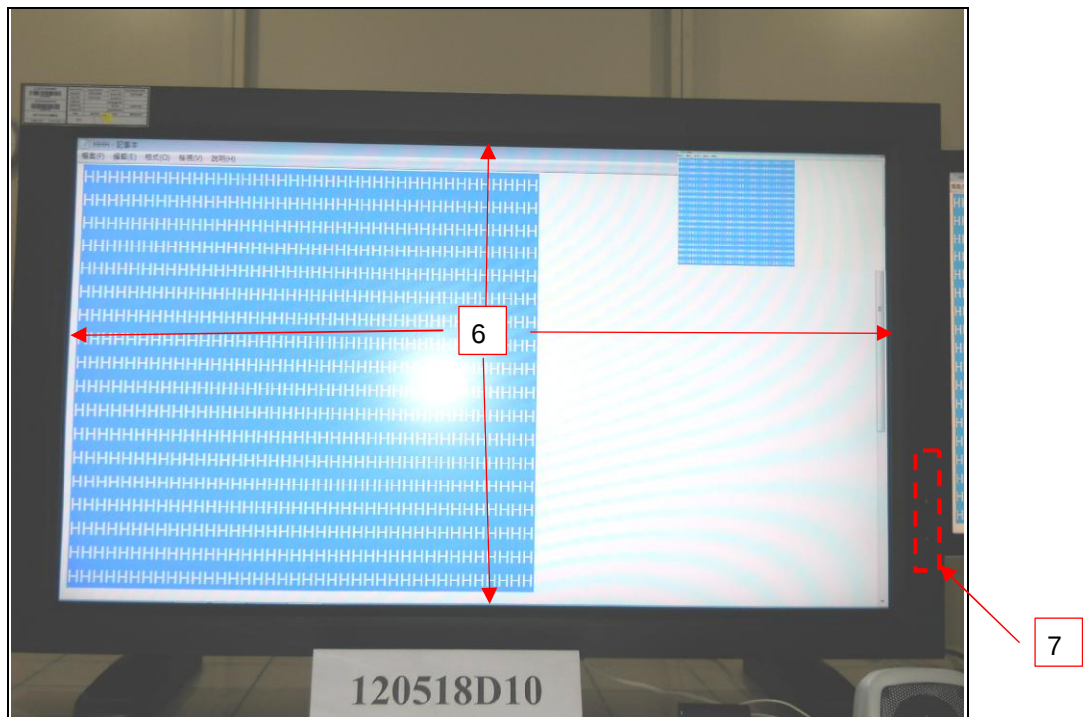
HARMONICS EMISSION TEST & VOLTAGE FLUCTUATIONS AND FLICKER TEST



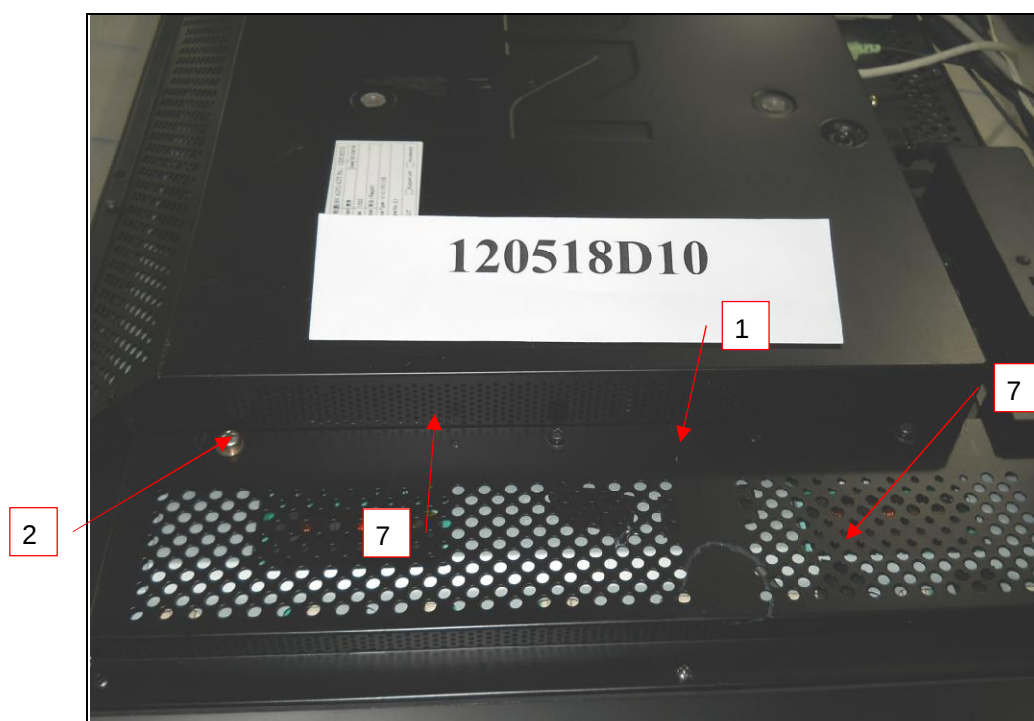
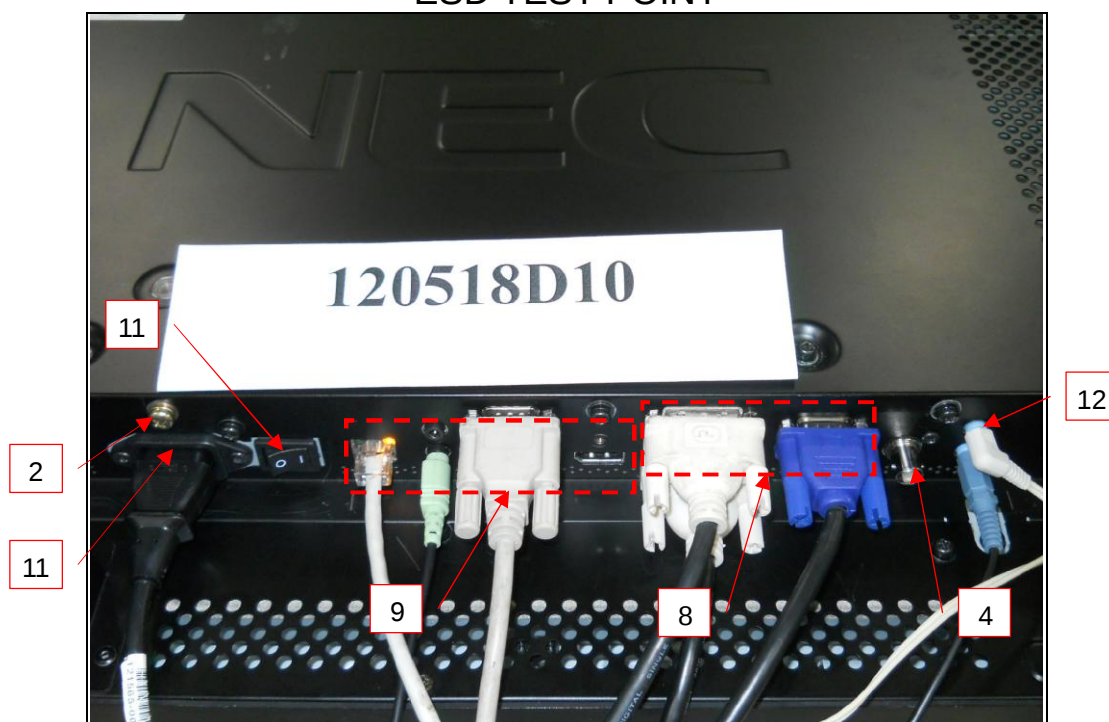
ESD TEST



ESD TEST POINT



ESD TEST POINT



ESD TEST POINT



ESD TEST POINT



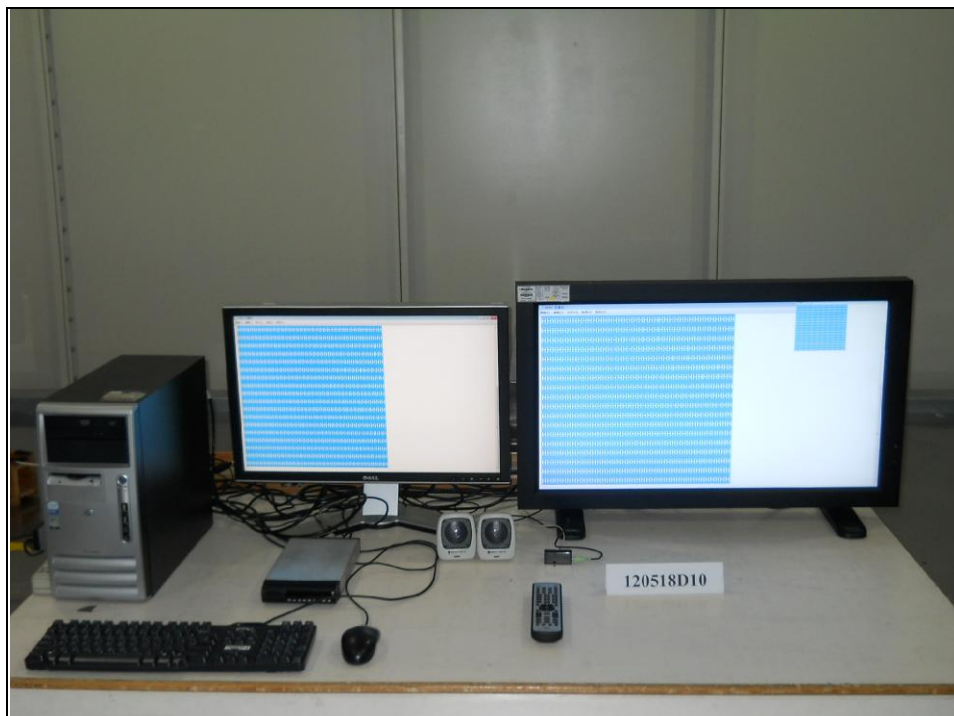
RS TEST



EFT TEST



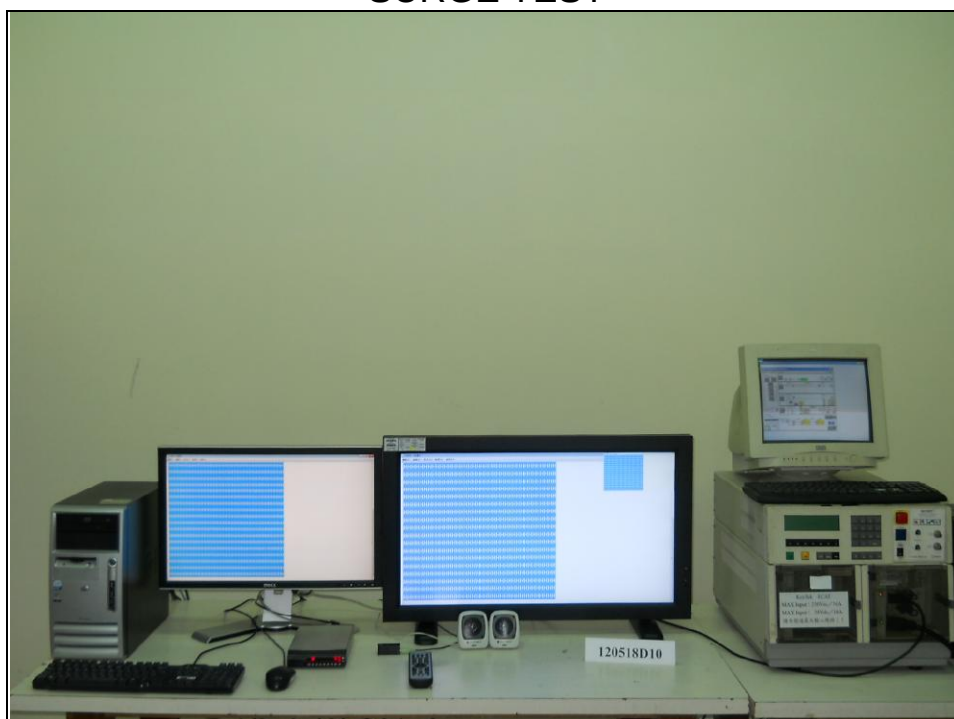
EFT TEST – LAN



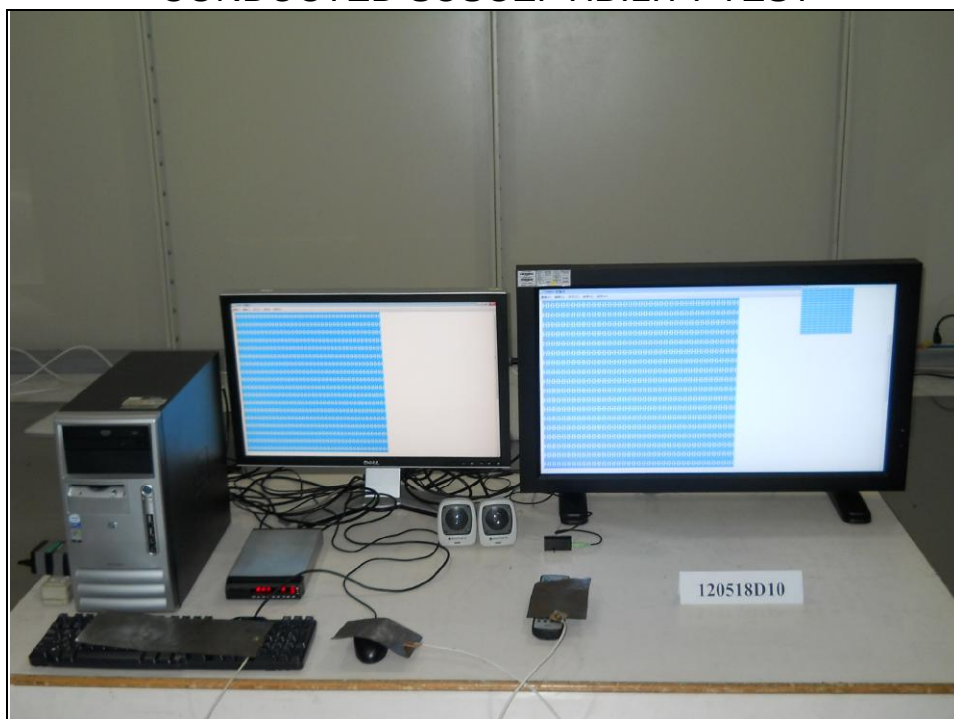
EFT TEST – D-Sub



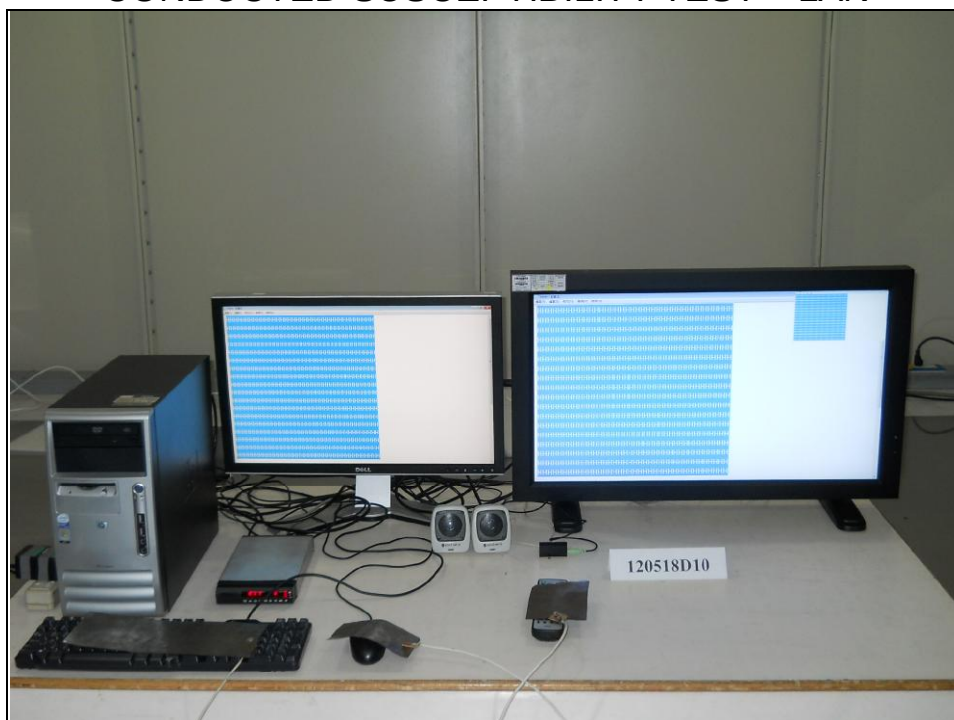
SURGE TEST



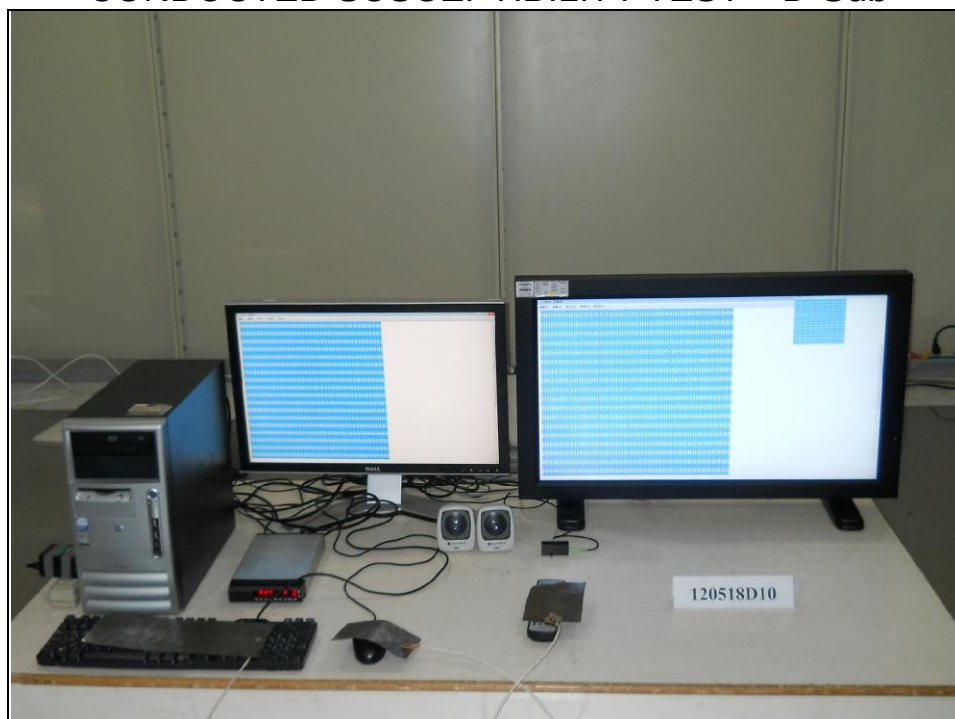
CONDUCTED SUSCEPTIBILITY TEST



CONDUCTED SUSCEPTIBILITY TEST – LAN



CONDUCTED SUSCEPTIBILITY TEST – D-Sub



POWER-FREQUENCY MAGNETIC FIELDS TEST



VOLTAGE DIPS AND INTERRUPTIONS TEST



7 APPENDIX - INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Fax: 886-2-26051924

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Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

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