



CE EMC TEST REPORT

REPORT NO.: CE130808D13

MODEL NO.: WMD-215XN-VX

RECEIVED: Jun. 27, 2013

TESTED: Jul. 1 ~ 4, 2013

ISSUED: Aug. 9, 2013

APPLICANT: Viewell Technology Co., Ltd.

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ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
CE130808D13	Original release	Aug. 9, 2013



1 CERTIFICATION

PRODUCT: Industrial Displays (Chassis LCD)
BRAND NAME: VIEWELL
MODEL NO.: WMD-215XN-VX (X= 0~9 ,A ~ Z or %)
APPLICANT: Viewell Technology Co., Ltd.
TEST SAMPLE: ENGINEERING SAMPLE
TESTED: Jul. 1 ~ 4, 2013
STANDARDS: **EN 55022:2010 +AC:2011, Class B**
CISPR 22:2008, Class B
AS/NZS CISPR 22:2009 +A1:2010, Class B
EN 61000-3-2:2006 +A1:2009 +A2:2009
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 61000-4-4:2012 ED.3.0
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 No.: WMD-215XN-VX) 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 : Sharon Tsui , DATE: Aug. 9, 2013
(Sharon Tsui / Specialist)

APPROVED BY : Kenny Meng , DATE: Aug. 9, 2013
(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 +AC:2011, Class B	Conducted Test	PASS	Meets Class B Limit Minimum passing margin is -7.37 dB at 0.60926 MHz
CISPR 22:2008, Class B	Conducted Test (Telecom port)	N/A	The EUT has no telecom port.
AS/NZS CISPR 22: 2009 +A1:2010, Class B	Radiated Test (30MHz ~ 6GHz)	PASS	Meets Class B Limit Minimum passing margin is -2.41 dB at 742.51 MHz
EN 61000-3-2:2006 +A1:2009+A2:2009	Harmonic current emissions	PASS	The power consumption of EUT is less than 75W and no limits apply
EN 61000-3-3:2008	Voltage fluctuations & flicker	PASS	Meets the requirements.



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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 61000-4-4:2012 ED.3.0	Electrical fast transient / burst immunity test.	PASS	Meets the requirements of Performance Criterion B
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 B

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	+/- 3.43 dB
Radiated emissions	30MHz ~ 1GHz	+/- 4.02 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	Industrial Displays (Chassis LCD)
MODEL NO.	WMD-215XN-VX
POWER SUPPLY	Switching power adapter: Rating: refer to Note below
DATA CABLE SUPPLIED	1.8m shielded D-Sub cable with two ferrite cores 1.6m shielded USB cable (A to A)

NOTE:

- The EUT is an Industrial Displays (Chassis LCD) with resolution is up to 1920 x 1080 and with touch function.
- The “x” in the model no. could be defined as 0~9, A~Z or % for marketing differentiation. During the test, the **model no.: WMD-215XN-VX** was selected as representative model and only its test data was recorded in this report.
- The EUT has the following interfaces:
 - ◆ DC in
 - ◆ D-Sub in
 - ◆ DVI in
 - ◆ USB in (A to A)
- The EUT consumes power from a switching power adapter and the following several different models could be chosen:

Adapter	Brand	Model No.	Rating
1	TPV	ADPC1236	AC I/P: 100-240V, 47/63Hz, 1.3A DC O/P: 12V, 3A Non-shielded AC 3 Pin, 1.8m Non-shielded DC cable (1.0m) with one ferrite core.
2	Adapter	STD-1203	AC I/P: 100-240V, 50/60Hz, 0.8A DC O/P: 12V, 3A Non-shielded AC 3 Pin, 1.8m Non-shielded DC cable (1.5m) with one ferrite core.

- 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 was pre-tested under the following resolution & refresh rate modes:

Description		Pre-tested Mode				
		1	2	3	4	5
Interface	DVI	V	V		V	V
	D-Sub			V		
Resolution	1920 x 1080 (60Hz)	V	V	V		
	1280 x 1024 (75Hz)				V	
	640 x 480 (60Hz)					V
Power Adapter	1 TPV/ ADPC1236	V		V	V	V
	2 Adapter/ STD-1203		V			

The worst emission level was found under **Mode 1**.

2. According as per pre-test result, the final test modes were as the following:

Item	Test mode	Interface	Resolution	Power Adapter
Conducted Test	Mode 1	DVI	1920 x 1080 (60Hz)	Adapter 1
	Mode 2			Adapter 2
Radiated Test	Mode 1			Adapter 1
Harmonic, Flicker & Immunity Tests	Mode 1			Adapter 1

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 +AC:2011, Class B

CISPR 22:2008, Class B

AS/NZS CISPR 22:2009 +A1:2010, Class B

EN 61000-3-2:2006 +A1:2009 +A2:2009

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 61000-4-4:2012 ED.3.0

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

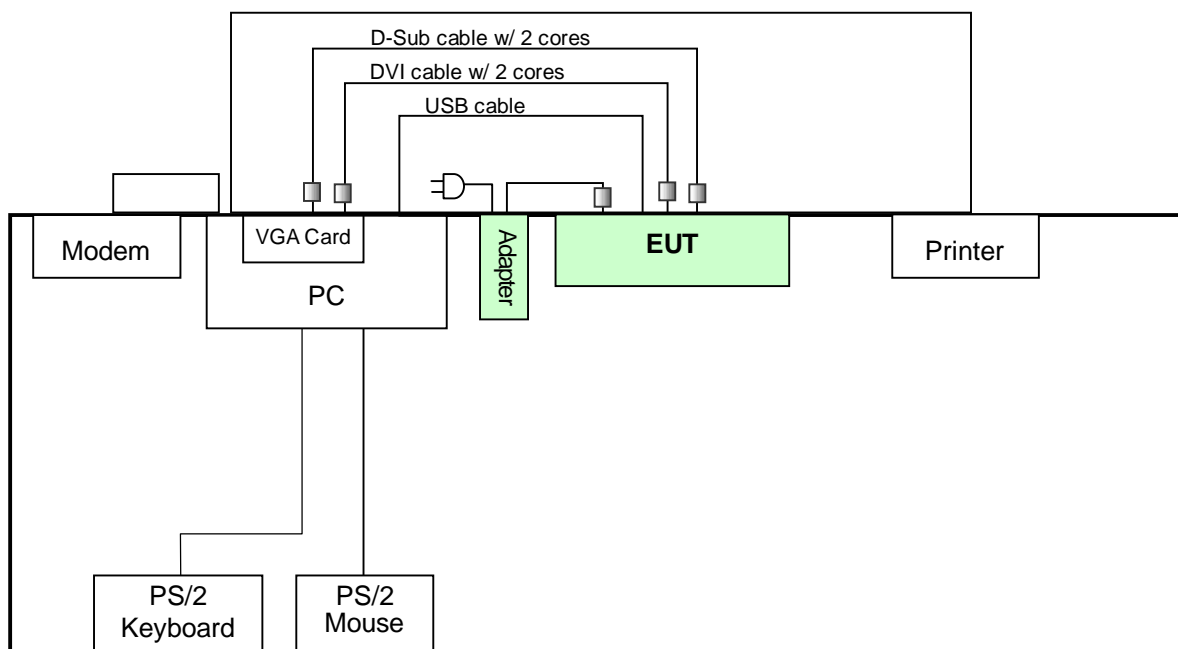
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	HP	dx7300MT	SGH7140B00	FCC DoC Approved
2	VGA CARD	DELL	RV620LE_DVI	CN0F342F7443 192903FLA00	FCC DoC Approved
3	PS/2 KEYBOARD	HP	KB-0316	BC3520BGAUJ 00T	FCC DoC Approved
4	PS/2 MOUSE	BTC	M851	N/A	E5XMSM860
5	PRINTER	EPSON	LQ-300+	DCGY017064	FCC DoC Approved
6	MODEM	ACEEX	1414	980020530	IFAXDM1414

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8 m shielded DVI cable with two ferrite cores
2	N/A
3	1.8 m foil shielded wire, terminated with PS/2 connector via metallic frame, w/o core.
4	1.5 m Non shielded wire, terminated with PS/2 connector via drain wire, w/o core.
5	1.8m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core
6	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.

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.



TEST CONFIGURATION



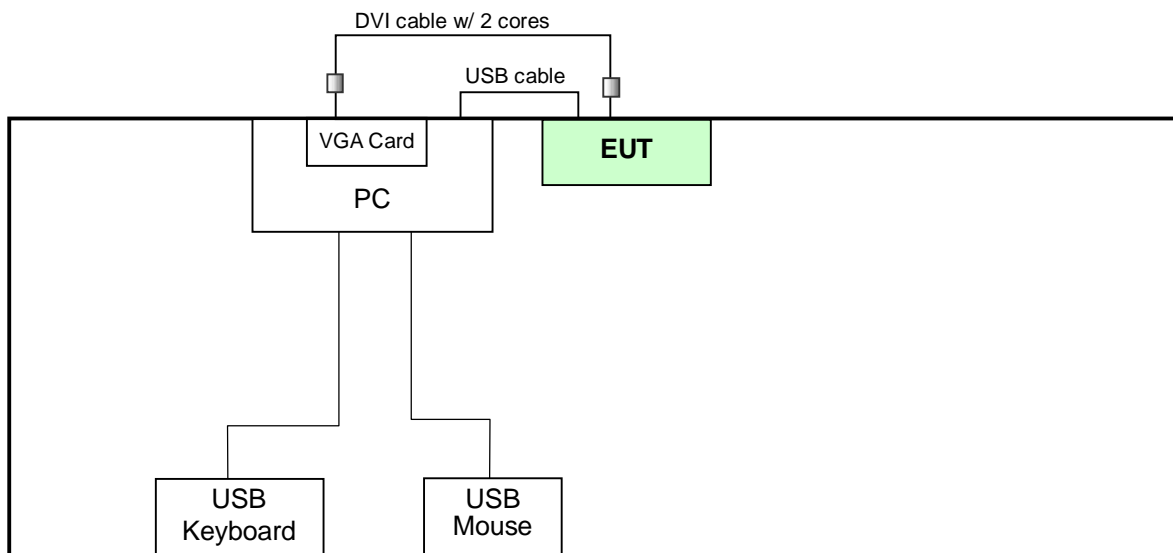
3.4.2 FOR HARMONICS / FLICKER / IMMUNITY TEST

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PERSONAL COMPUTER	HP	dx7300MT	SGH7500R7L	FCC DoC Approved
2	VGA CARD	DELL	X300SE	260631006302	FCC DoC Approved
3	USB Keyboard	DELL	SK8115	CN-0J4635-71616-5 96-0QAU	FCC DoC Approved
4	USB MOUSE	HP	M-UAE96	F93A90AN3V42GO7	FCC DoC Approved

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8 m shielded DVI cable with two ferrite cores
2	N/A
3	1.8 m foil shielded wire, terminated with USB connector via drain wire, w/o core.
4	1.8 m shielded wire, terminated with USB connector via drain wire, w/o core.

NOTE: All power cords of the above support units are non shielded (1.8m).

TEST CONFIGURATION



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.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100290	Dec. 24, 2012	Dec. 23, 2013
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	839135/006	Sep. 24, 2012	Sep. 23, 2013
LISN With Adapter (for EUT)	AD10	C00Ada-001	Sep. 24, 2012	Sep. 23, 2013
EMCO-L.I.S.N. (for peripheral)	3825/2	9204-1964	May 15, 2013	May 14, 2014
Software	ADT_Cond_V7.3.7	NA	NA	NA
Software	ADT_ISN_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C02.01	Jan. 04, 2013	Jan. 03, 2014
LYNICS Terminator (For EMCO LISN)	0900510	E1-011284	Sep. 24, 2012	Sep. 23, 2013
LYNICS Terminator (For EMCO LISN)	0900510	E1-011285	Sep. 24, 2012	Sep. 23, 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. 2.
 3. The VCCI Site Registration No. C-240.
 4. Tested Date: Jul. 1, 2013.

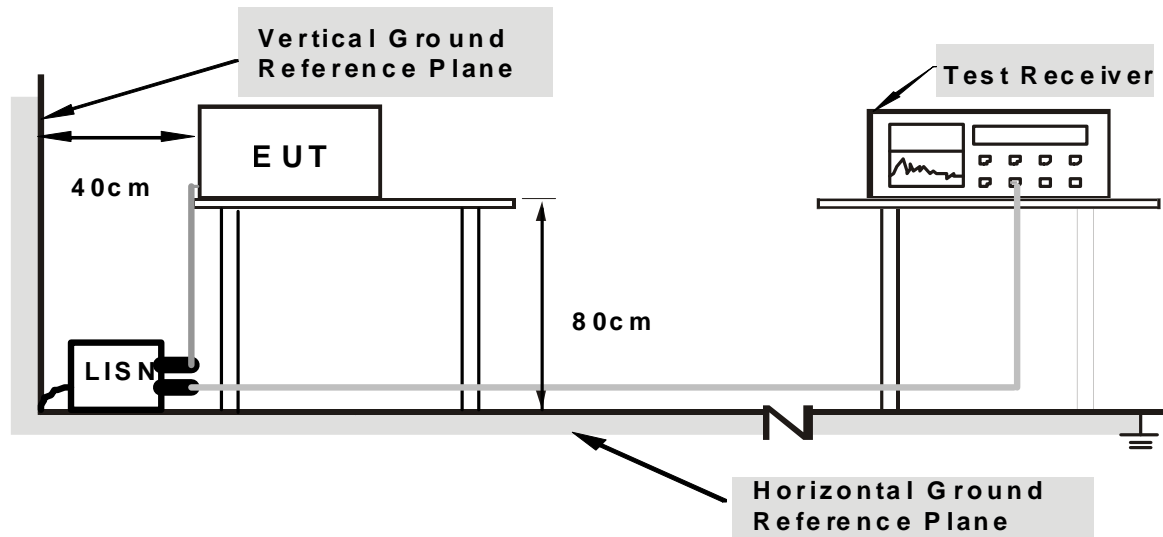
4.1.3 TEST PROCEDURE

- a. 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.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. 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: Support units were connected to second LISN.

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.
- d. PC sent “H” messages to EUT, and then EUT displayed “H” patterns on its screen.
- e. PC sent messages to printer and printer printed them out.
- f. PC sent messages to modem.
- g. Steps c-f were repeated.



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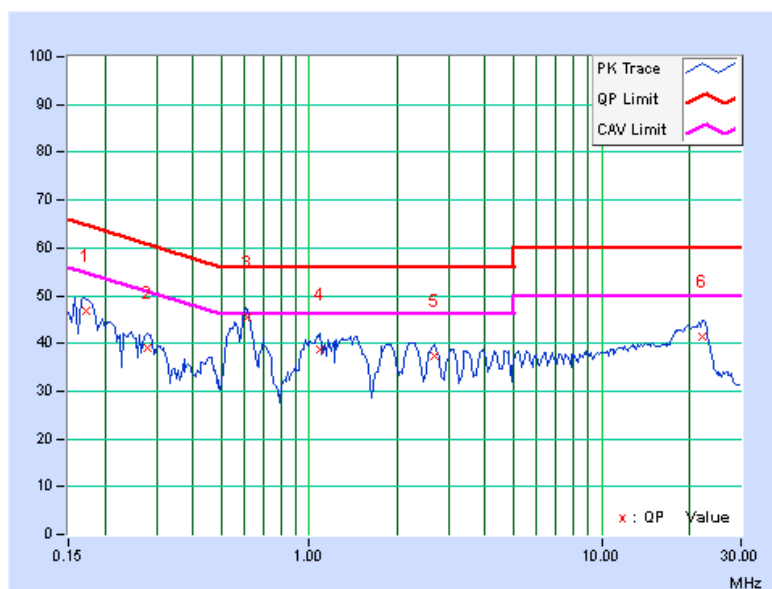
4.1.7 TEST RESULTS (1)

TEST MODE	Mode 1	6DB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	25deg. C, 65% RH	TESTED BY: Dente Chen	

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	0.17334	0.23	46.49	36.83	46.72	37.06	64.80
2	0.27890	0.29	38.68	32.54	38.97	32.83	60.85	50.85	-21.88	-18.02
3	0.61278	0.41	44.90	37.54	45.31	37.95	56.00	46.00	-10.69	-8.05
4	1.08984	0.50	38.13	32.58	38.63	33.08	56.00	46.00	-17.37	-12.92
5	2.66925	0.61	36.66	31.33	37.27	31.94	56.00	46.00	-18.73	-14.06
6	22.23048	1.67	39.65	32.51	41.32	34.18	60.00	50.00	-18.68	-15.82

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





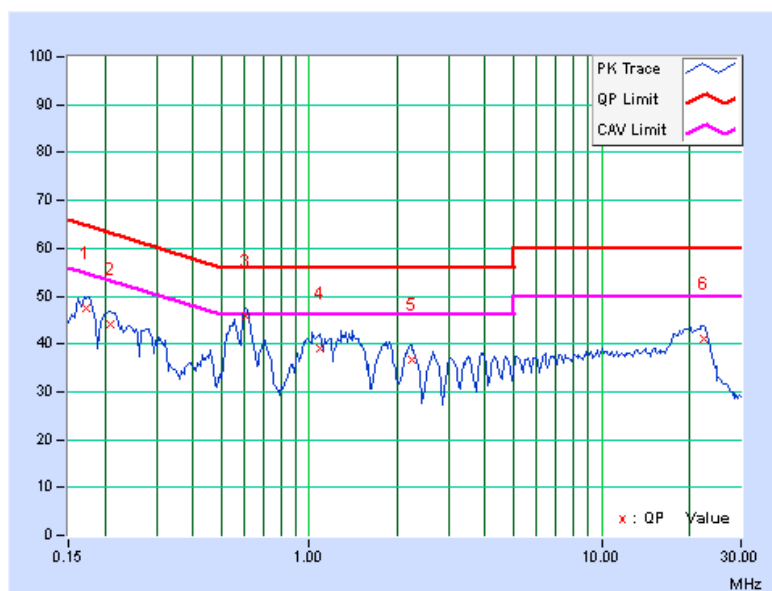
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TEST MODE	Mode 1	6dB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	25deg. C, 65% RH	TESTED BY: Dente Chen	

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
	[MHz]		[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17238	0.11	47.27	36.43	47.38	36.54	64.84	54.84	-17.46	-18.30
2	0.20993	0.11	44.03	34.84	44.14	34.95	63.21	53.21	-19.07	-18.26
3	0.60926	0.15	45.56	38.48	45.71	38.63	56.00	46.00	-10.29	-7.37
4	1.09247	0.19	38.90	33.46	39.09	33.65	56.00	46.00	-16.91	-12.35
5	2.23439	0.28	36.36	31.11	36.64	31.39	56.00	46.00	-19.36	-14.61
6	22.27785	1.36	39.86	33.08	41.22	34.44	60.00	50.00	-18.78	-15.56

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





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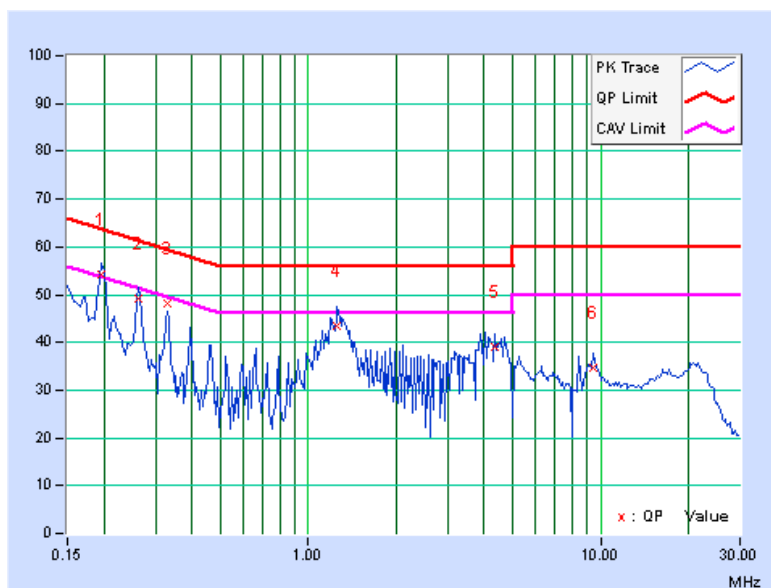
4.1.8 TEST RESULTS (2)

TEST MODE	Mode 2	6DB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	25deg. C, 65% RH	TESTED BY: Dente Chen	

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	0.25	54.01	36.48	54.26	36.73	63.74
2	0.26327	0.28	48.93	33.02	49.21	33.30	61.33	51.33	-12.11	-18.02
3	0.32969	0.32	47.82	30.17	48.14	30.49	59.46	49.46	-11.32	-18.97
4	1.24997	0.51	42.79	35.87	43.30	36.38	56.00	46.00	-12.70	-9.62
5	4.34228	0.70	38.36	33.28	39.06	33.98	56.00	46.00	-16.94	-12.02
6	9.47537	1.05	33.75	30.57	34.80	31.62	60.00	50.00	-25.20	-18.38

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





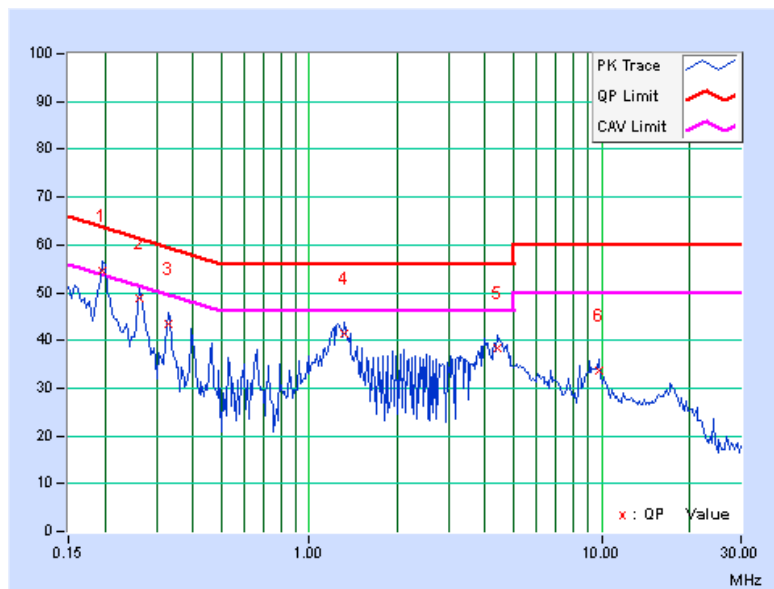
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TEST MODE	Mode 2	6dB BANDWIDTH	9 kHz
INPUT POWER	230Vac, 50 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	25deg. C, 65% RH	TESTED BY: Dente Chen	

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	0.19690	0.11	54.32	38.86	54.43	38.97	63.74	53.74	-9.31
2	0.26325	0.12	48.81	34.80	48.93	34.92	61.33	51.33	-12.40	-16.41
3	0.32968	0.13	43.31	30.69	43.44	30.82	59.46	49.46	-16.02	-18.64
4	1.31897	0.21	41.35	35.88	41.56	36.09	56.00	46.00	-14.44	-9.91
5	4.41557	0.48	37.90	33.97	38.38	34.45	56.00	46.00	-17.62	-11.55
6	9.81678	0.93	32.83	29.11	33.76	30.04	60.00	50.00	-26.24	-19.96

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



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 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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4.2.2 TEST INSTRUMENTS

Frequency Range 30MHz~1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	845552/004	Aug. 15, 2012	Aug. 14, 2013
Schaffner Bilog Antenna	CBL6111D	22262	Mar. 19, 2013	Mar. 18, 2014
ADT. Turn Table	TT100	0205	NA	NA
ADT. Tower	AT100	0205	NA	NA
Software	ADT_Radiate d_V7.6.15.9.2	NA	NA	NA
ADT RF Switches BOX	EMH-011	1001	Nov. 04, 2012	Nov. 03, 2013
WOKEN RF cable	8D	CABLE-ST2-01	Nov. 04, 2012	Nov. 03, 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 Open Site No. 2.
 3. The VCCI Site Registration No. R-237.
 4. The FCC Site Registration No. 90424.
 5. Tested Date: Jul. 1, 2013.



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Frequency Range above 1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum	E4446A	MY51100009	Jun. 21, 2013	Jun. 20, 2014
Agilent Test Receiver	N9038A	MY51210137	Jul. 02, 2013	Jul. 01, 2014
EMCI Preamplifier	EMC0126545	980076	Feb. 27, 2013	Feb. 26, 2014
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Mar. 01, 2013	Feb. 28, 2014
Schwarzbeck Horn Antenna	BBHA-9170	BBHA9170190	Oct. 04, 2012	Oct. 03, 2013
EMCO Horn Antenna	3115	6714	Oct. 25, 2012	Oct. 24, 2013
Max Full. Turn Table	MF7802	MF780208216	NA	NA
Software	ADT_Radiated_V 8.7.07	NA	NA	NA
SUHNER RF cable	SF106-18	Cable-CH10	Aug. 19, 2012	Aug. 18, 2013
SUHNER RF cable	SF102	Cable-CH8-3.6m	Aug. 19, 2012	Aug. 18, 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 3dB beamwidth of the horn antenna is minimum 30 degree (or $w = 1.6m$ at 3m distance) for 1~6 GHz.
 3. The test was performed in Chamber No. 10.
 4. The Industry Canada Reference No. IC 7450E-11.
 5. The VCCI Site Registration No. G427
 6. The FCC Site Registration No. 367016
 7. Tested Date: Jul. 2, 2013.

4.2.3 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:

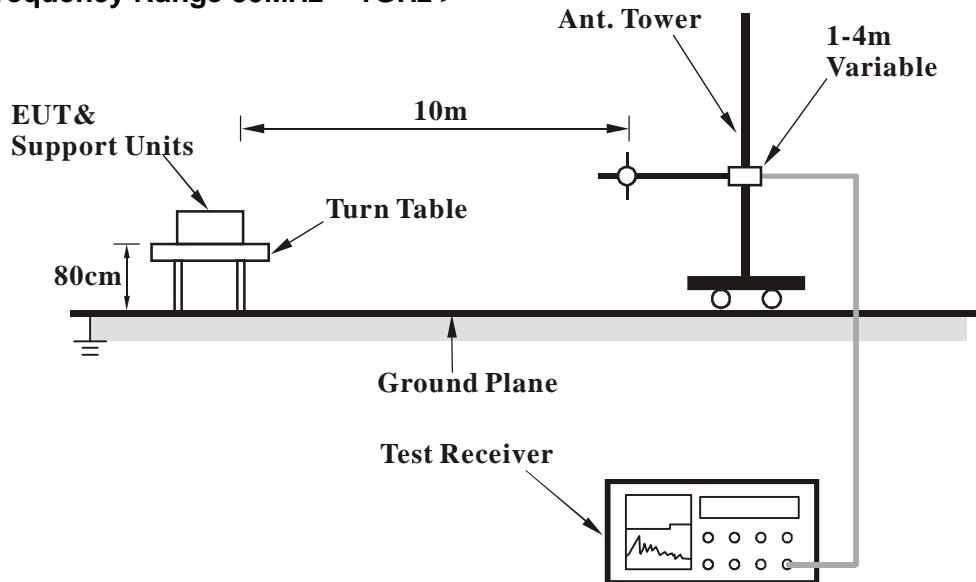
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above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

4.2.4 DEVIATION FROM TEST STANDARD

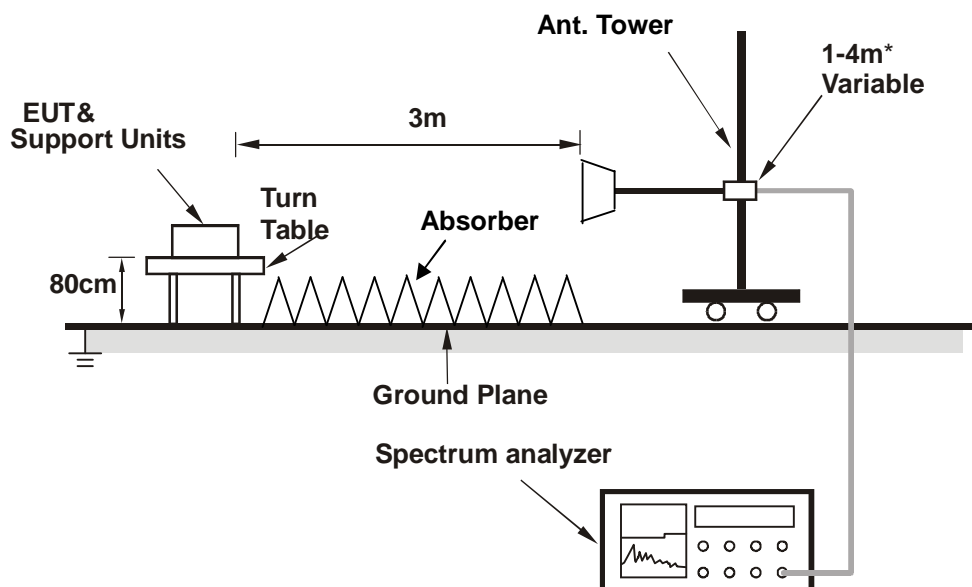
No deviation

4.2.5 TEST SETUP

<Frequency Range 30MHz ~ 1GHz >



<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both.

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

4.2.6 EUT OPERATING CONDITIONS

Same as item 4.1.6

4.2.7 TEST RESULTS

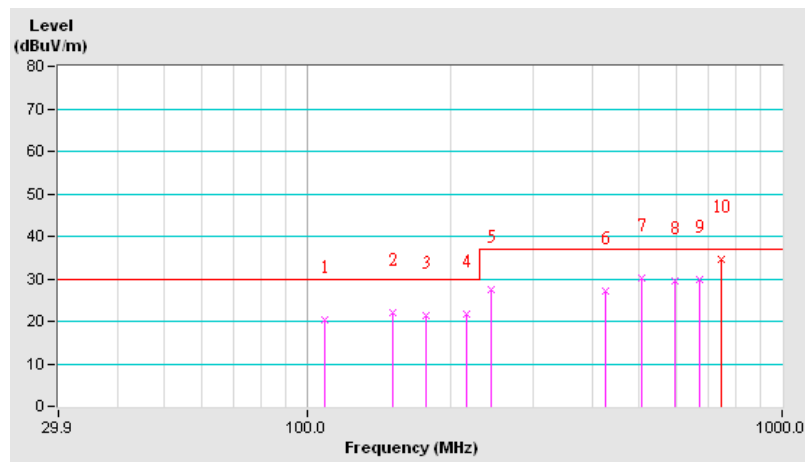
TEST MODE	Mode 1	INPUT POWER	230Vac, 50 Hz
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	31deg. C, 68% RH	TESTED BY: Tim Mai	

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	109.08	20.32 QP	30.00	-9.68	4.00 H	235	7.68	12.64
2	151.80	22.00 QP	30.00	-8.00	4.00 H	73	8.74	13.26
3	177.35	21.42 QP	30.00	-8.58	4.00 H	159	9.72	11.70
4	215.75	21.71 QP	30.00	-8.29	4.00 H	268	9.64	12.07
5	244.00	27.62 QP	37.00	-9.38	3.36 H	68	12.95	14.67
6	426.08	27.09 QP	37.00	-9.91	1.79 H	313	6.72	20.37
7	507.79	30.15 QP	37.00	-6.85	1.46 H	218	8.07	22.08
8	595.48	29.64 QP	37.00	-7.36	1.46 H	168	5.41	24.23
9	669.56	29.98 QP	37.00	-7.02	1.22 H	50	5.21	24.77
10	742.51	34.59 QP	37.00	-2.41	1.51 H	269	7.60	26.99

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value





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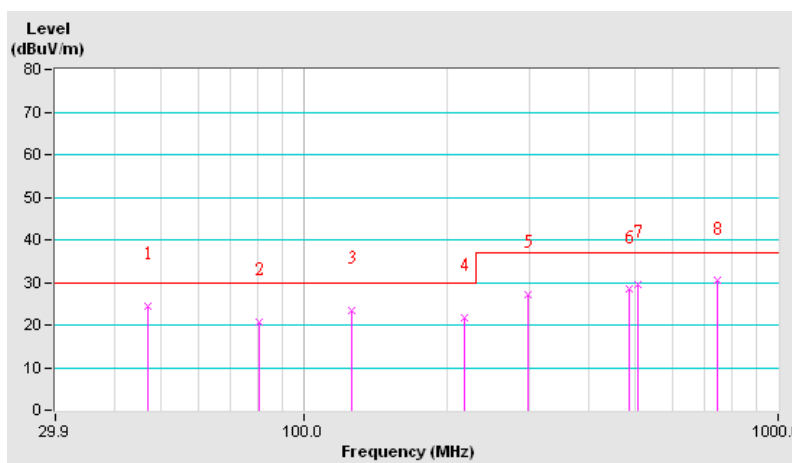
TEST MODE	Mode 1	INPUT POWER	230Vac, 50 Hz
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	31deg. C, 68% RH	TESTED BY: Tim Mai	

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	47.00	24.56 QP	30.00	-5.44	1.00 V	248	14.15	10.41
2	80.21	20.68 QP	30.00	-9.32	1.00 V	162	11.80	8.88
3	126.50	23.41 QP	30.00	-6.59	1.00 V	58	9.67	13.74
4	217.85	21.65 QP	30.00	-8.35	1.00 V	342	9.38	12.27
5	297.10	27.22 QP	37.00	-9.78	1.00 V	0	10.44	16.78
6	485.96	28.35 QP	37.00	-8.65	2.85 V	172	6.87	21.48
7	507.85	29.58 QP	37.00	-7.42	2.79 V	22	7.49	22.09
8	742.51	30.37 QP	37.00	-6.63	3.08 V	19	3.38	26.99

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



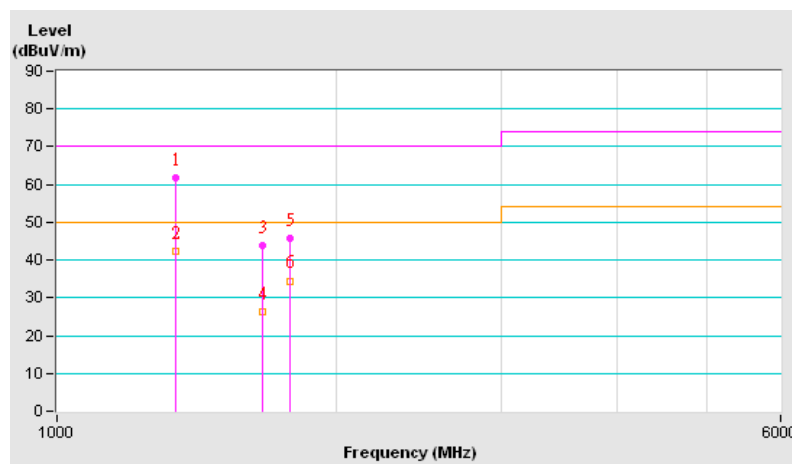
TEST MODE	Mode 1	INPUT POWER	230Vac, 50 Hz
FREQUENCY RANGE	1-6 GHz	DETECTOR FUNCTION & BANDWIDTH	Peak/Average, 1MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 79% RH	TESTED BY: Vincent Chen	

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	1340.56	61.72 PK	70.00	-8.28	1.11 H	105	85.79	-24.07
2	1340.56	42.19 AV	50.00	-7.81	1.11 H	105	66.26	-24.07
3	1662.62	43.83 PK	70.00	-26.17	1.36 H	203	66.28	-22.45
4	1662.62	26.23 AV	50.00	-23.77	1.36 H	203	48.68	-22.45
5	1782.02	45.77 PK	70.00	-24.23	1.07 H	79	67.32	-21.55
6	1782.02	34.48 AV	50.00	-15.52	1.07 H	78	56.03	-21.55

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value





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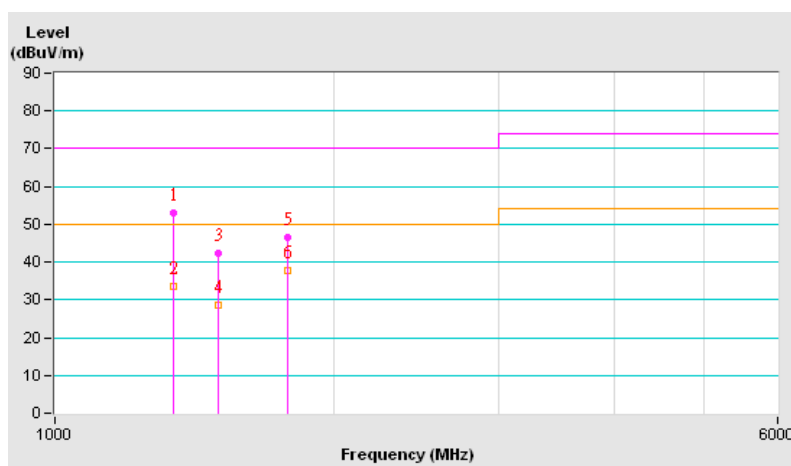
TEST MODE	Mode 1	INPUT POWER	230Vac, 50 Hz
FREQUENCY RANGE	1-6 GHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 79% RH	TESTED BY: Vincent Chen	

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	1340.65	53.06 PK	70.00	-16.94	1.05 V	127	77.13	-24.07
2	1340.65	33.70 AV	50.00	-16.30	1.05 V	127	57.77	-24.07
3	1498.05	42.29 PK	70.00	-27.71	1.61 V	227	65.65	-23.36
4	1498.05	28.57 AV	50.00	-21.43	1.61 V	227	51.93	-23.36
5	1782.04	46.35 PK	70.00	-23.65	1.47 V	310	67.90	-21.55
6	1782.04	37.69 AV	50.00	-12.31	1.47 V	310	59.24	-21.55

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



4.3 HARMONICS CURRENT MEASUREMENT

4.3.1 LIMITS OF HARMONICS CURRENT MEASUREMENT

TEST STANDARD: EN 61000-3-2

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 mAW	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 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.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
EMC PARTNER EMC Emission Tester	HAR1000-1P	084	Apr. 16, 2013	Apr. 15, 2014
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: Jul. 3, 2013

4.3.3 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.

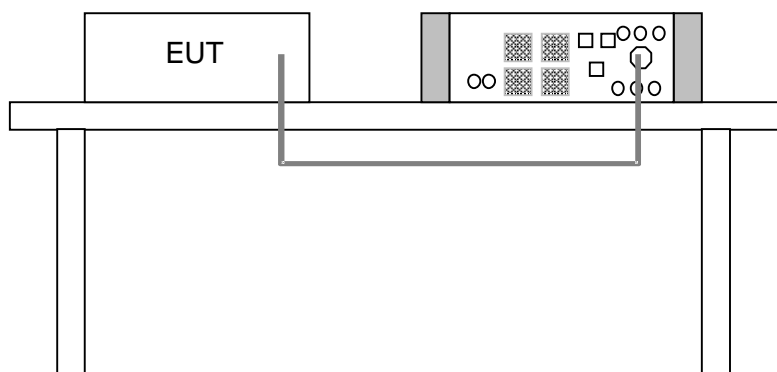
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors.

- 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.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



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

4.3.6 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. PC sent “full white screen pattern” to EUT, and then EUT displayed on its screen.
- e. Steps c-d were repeated.

4.3.7 TEST RESULTS

TEST MODE	Mode 1		
FUNDAMENTAL VOLTAGE/AMPERE	230.3Vrms/ 0.123Arms	POWER FREQUENCY	50.000Hz
POWER CONSUMPTION	10.92W	POWER FACTOR	0.387
ENVIRONMENTAL CONDITIONS	24deg. C, 70%RH	TESTED BY: Aga Lin	

- NOTE :**
1. Limits are not specified for equipment with a rated power of 75W or less (other than lighting equipment).
 2. According to EN 61000-3-2 the manufacturer shall specify the power of the apparatus. This value shall be used for establishing limits. The specified power shall be within +/-10% of the measured power.

4.4 VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

4.4.1 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

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
EMC PARTNER EMC Emission Tester	HAR1000-1P	084	Apr. 16, 2013	Apr. 15, 2014
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: Jul. 3, 2013

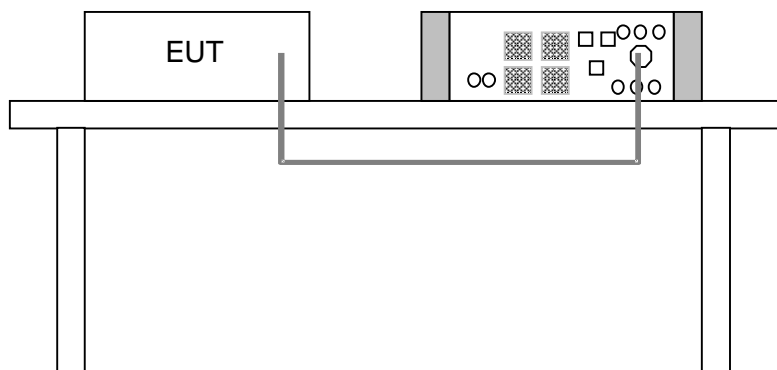
4.4.3 TEST PROCEDURE

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- b. 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.

4.4.4 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

Same as item 4.3.6



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4.4.7 TEST RESULTS

TEST MODE	Mode 1		
FUNDAMENTAL VOLTAGE/AMPERE	230.3Vrms/ 0.123 Arms	POWER FREQUENCY	50.000Hz
OBSERVATION PERIOD (Tp)	10 minutes	POWER FACTOR	0.387
ENVIRONMENTAL CONDITIONS	24deg. C, 70%RH	TESTED BY: Aga Lin	

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 (%)	0.010	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.

5.2 GENERAL PERFORMANCE CRITERIA DESCRIPTION

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

General performance criteria

<p>CRITERION A</p>	<p>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.</p>
<p>CRITERION B</p>	<p>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.</p> <p>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.</p>
<p>CRITERION C</p>	<p>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.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

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. PC sent "H" messages to EUT, and then EUT displayed on its screen.
- e. Steps c-d were repeated.

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/ 8kV (Direct) Contact Discharge : 2kV/ 4kV (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	1203252	Jun. 19, 2013	Jun. 18, 2014

- 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: Jul. 4, 2013

5.4.3 TEST PROCEDURE

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. 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.

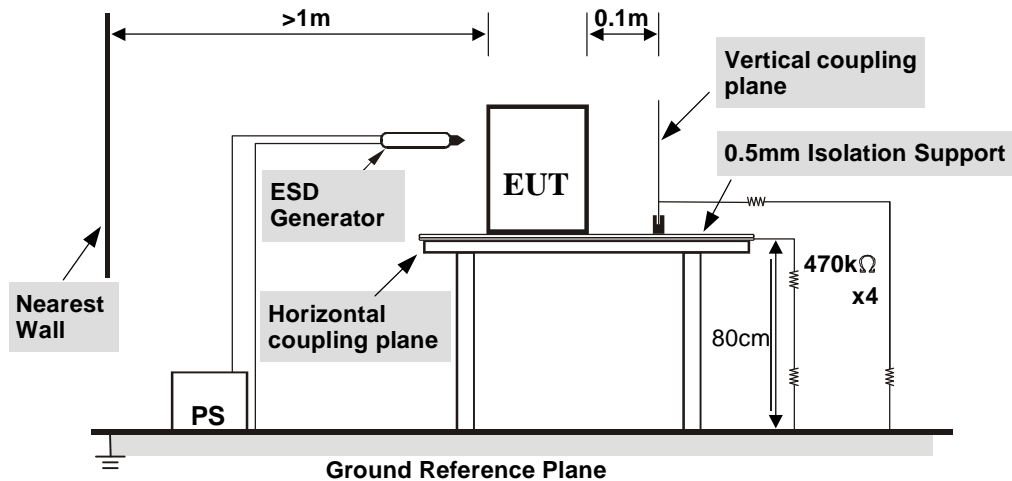
The basic test procedure was in accordance with IEC 61000-4-2:

- 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 (Touch function: Stand by)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 50%RH, 999hPa	TESTED BY: Aga Lin	

TEST RESULTS OF DIRECT APPLICATION					
Discharge Level (kV)	Polarity	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2	+/-	1, 2, 6	Note (1)	N/A	A
4	+/-	1, 2, 6	Note (2)	N/A	B
2, 4	+/-	4, 7, 8	N/A	Note (1)	A
8	+/-	7, 8	N/A	Note (2)	B
2, 4, 8	+/-	3, 5, 9	N/A	Note (1)	A
8	+/-	4	N/A	Note (3)	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 (2)	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) The touch function delayed 1 ~ 3 seconds, but self-recoverable after test.

(3) The EUT reset during the test.

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



5.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Signal Generator	SML03	101364	Aug. 16, 2012	Aug. 15, 2013
AR RF Amplifier	60S1G3	304334	NA	NA
BOONTON RF Meter	4232A	94901	Jul. 05, 2012	Jul. 04, 2013
BOONTON Power Sensor	51011-EMC	32832	Jul. 06, 2012	Jul. 05, 2013
BOONTON Power Sensor	51011-EMC	32807	Jul. 05, 2012	Jul. 04, 2013
FRANKONIA Power Amplifier	FLH-200B	1071	NA	NA
Dell Antenna	NA	NA	NA	NA
AR Log-Periodic Antenna	AT5080	312115	NA	NA
HP-IB Extender	37204	3212U26684	NA	NA
ADVANTEST Spectrum Analyzer	R3261C	81720152	NA	NA
COMTEST Compact Full Anechoic Chamber (7x3x3 m)	CFAC	RS-001	Sep. 29, 2012	Sep. 28, 2013
Software	ADT_RS_V7.6	NA	NA	NA
Radisense Electric Field Sensor	CTR1001A	06D00232SNO39	Jan. 22, 2013	Jan. 21, 2014

- NOTE:**
1. The test was performed in RS 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. The transmit antenna was located at a distance of 3 meters from the EUT.
 4. Tested Date: Jul. 3, 2013

5.5.3 TEST PROCEDURE

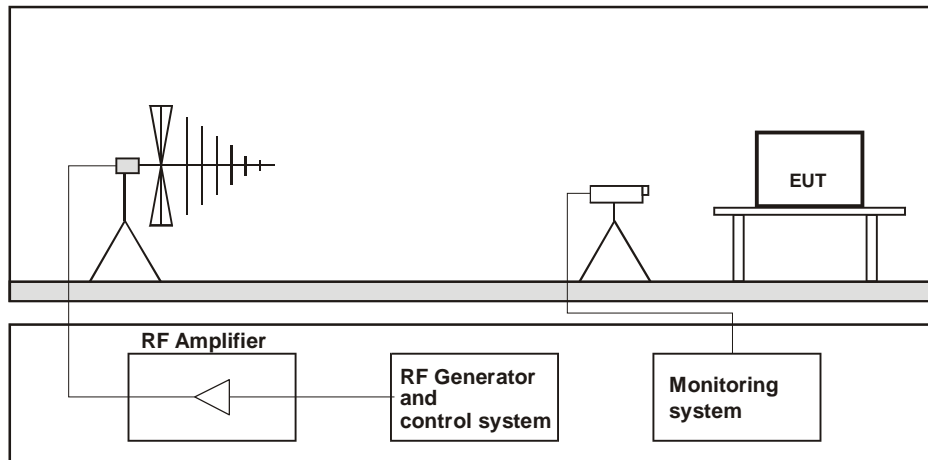
The test procedure was in accordance with IEC 61000-4-3

- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
- c. 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.
- 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.

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 (Touch function: Stand by)	INPUT POWER	230Vac, 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.

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 Line : N/A
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. 18, 2013	Apr. 17, 2014
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: Jul. 3, 2013.

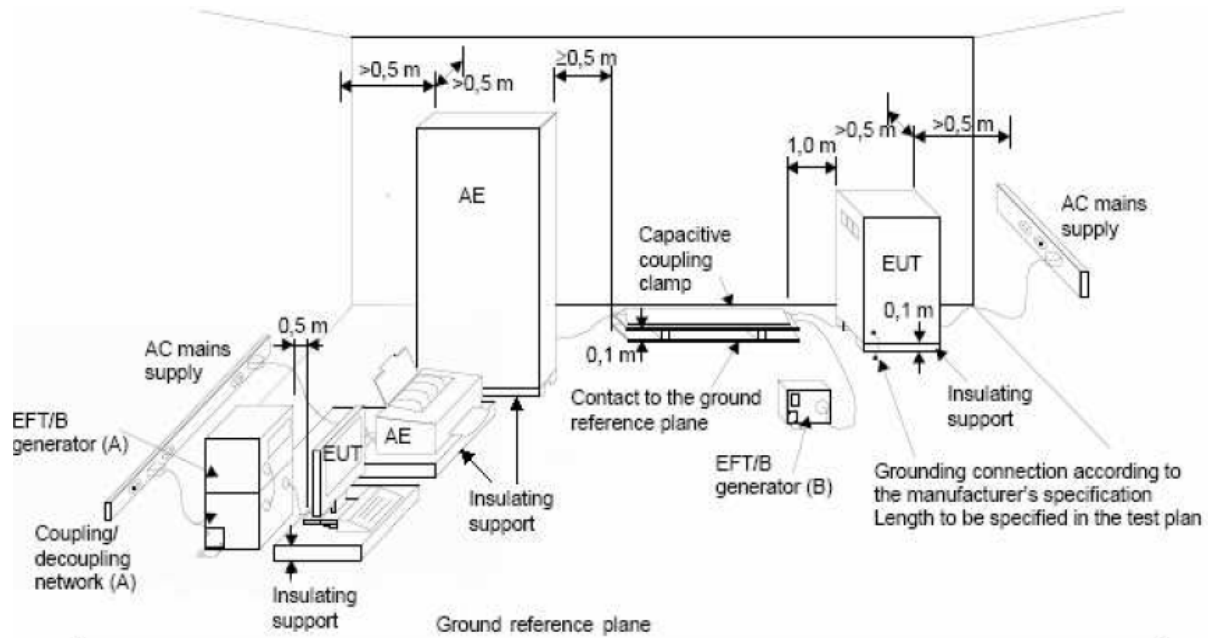
5.6.3 TEST PROCEDURE

- a. Both positive and negative polarity discharges were applied.
- b. The distance between any coupling devices and the EUT should be (0.5 – 0/+0.1) m for table-top equipment testing, and (1.0 ± 0.1) m for floor standing equipment.
- c. The duration time of each test sequential was 1 minute.
- d. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

5.6.4 DEVIATION FROM TEST STANDARD

No deviation

5.6.5 TEST SETUP



NOTE:

- (A) location for supply line coupling
- (B) location for signal lines coupling

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

5.6.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 70%RH	TESTED BY: Aga Lin	

Test Point	Polarity	Test Level (kV)	Observation	Performance Criterion
L1	+/-	1	Note	B
L2	+/-	1	Note	B
PE	+/-	1	Note	B
L1- L2- PE	+/-	1	Note	B

NOTE: The cursor jumped during the test, but self-recoverable after 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 outdoor signal lines 10/700 us Open Circuit Voltage
Test Voltage:	Power Line : 0.5kV/ 1 kV/ 2 kV
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.	CALIBRATION DATE	CALIBRATION UNTIL
KeyTek, Surge Simulator	EMC Pro	9902207	Apr. 29, 2013	Apr. 28, 2014
Surge Cable	WE-4	SU2Cab-001	NA	NA
Surge Adapter WONPRO	WA-9	SU2ADA-002	NA	NA
Coupling Decoupling Network	CDN-UTP8	028	Jul. 18, 2012	Jul. 17, 2013
Software	CEWare32	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: Jul. 4, 2013

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).

For double-insulated products without PE or external earth connections, the test shall be done in a similar way as for grounded products but without adding any additional external grounded connections. If there are no other possible connections to earth, line-to-ground tests may be omitted.

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).

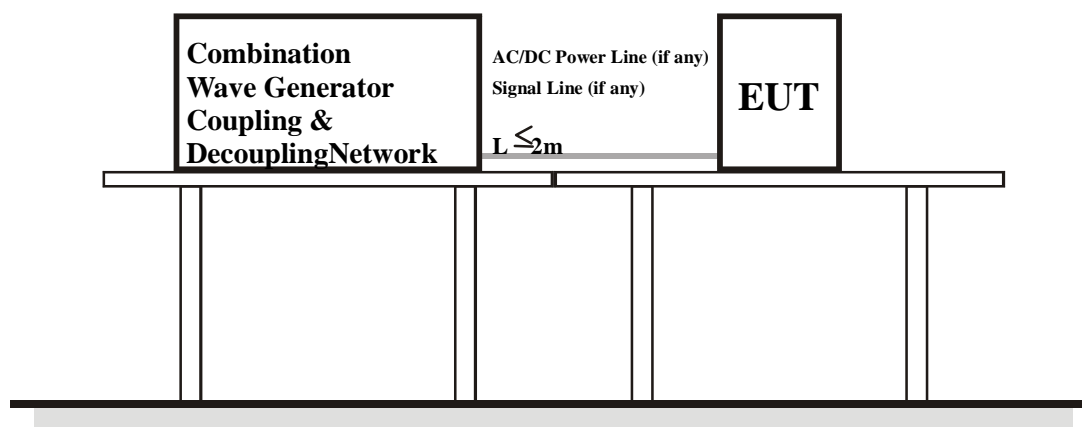
c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

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	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27deg. C, 60%RH	TESTED BY: Michael Cheng	

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 the initial operation during the test.

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
Coupling Device:	CDN-M3



5.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Signal Generator	SMY01	841104/033	Nov. 20, 2012	Nov. 19, 2013
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. 17, 2012	Aug. 16, 2013
FCC Coupling Decoupling Network	FCC-801-M3-25A	01022	Feb. 21, 2013	Feb. 20, 2014
FCC Coupling Decoupling Network	FCC-801-M2-16A	01047	Aug. 17, 2012	Aug. 16, 2013
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. 21, 2013	Feb. 20, 2014
FCC Coupling Decoupling Network	FCC-801-T8	02039	Aug. 17, 2012	Aug. 16, 2013
FCC Coupling Decoupling Network	FCC-801-T4	02031	Feb. 21, 2013	Feb. 20, 2014
FCC Coupling Decoupling Network	FCC-801-T2	02021	Feb. 21, 2013	Feb. 20, 2014
R&S Power Sensor	NRV-Z5	837878/038	Nov. 02, 2012	Nov. 01, 2013
R&S Power Sensor	NRV-Z5	837878/039	Nov. 02, 2012	Nov. 01, 2013
R&S Power Meter	NRVD	837794/040	Nov. 02, 2012	Nov. 01, 2013
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: Jul. 4, 2013

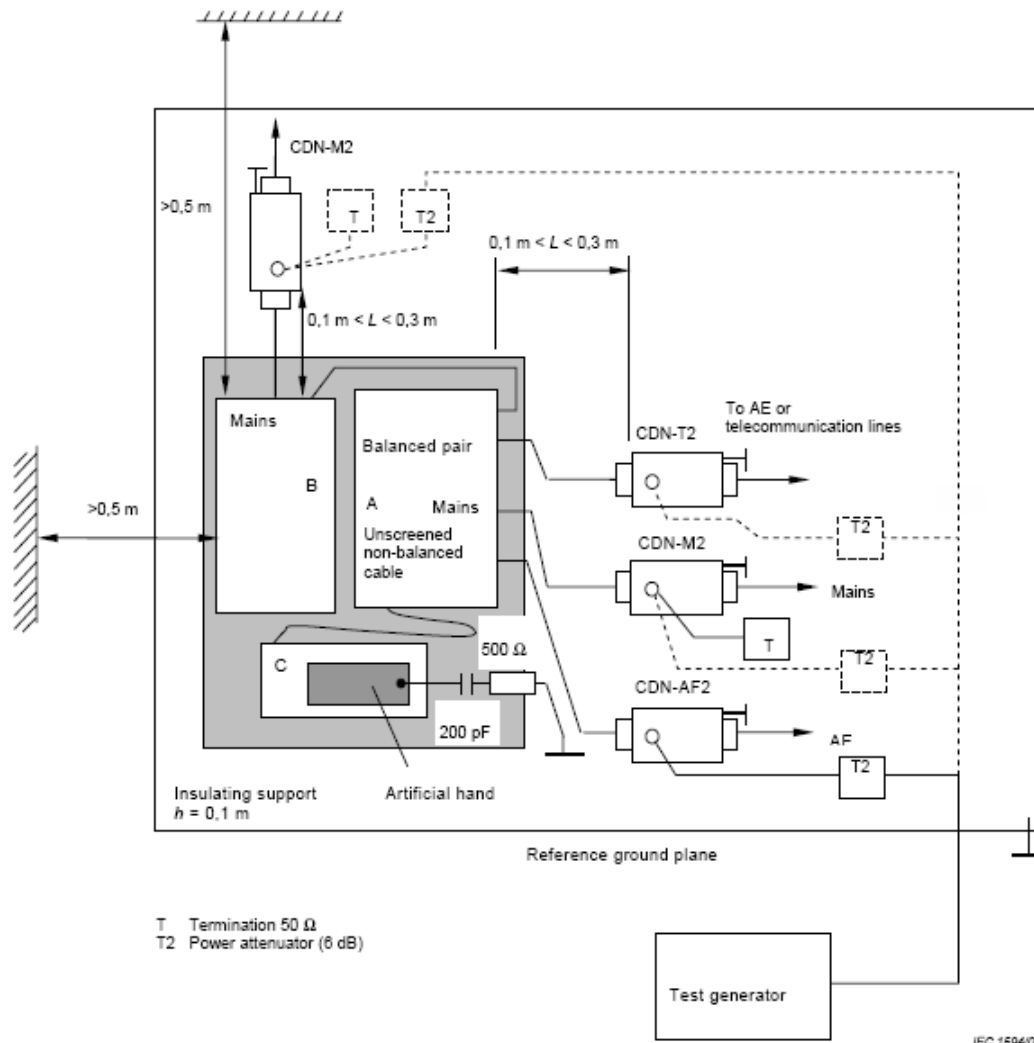
5.8.3 TEST PROCEDURE

- 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 (Touch function: Stand by)	INPUT POWER	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27deg. C, 68%RH		TESTED BY: Aga Lin

FREQUENCY (MHz)	FIELD STRENGTH (V_{r.m.s.})	CABLE	INJECTION METHOD	RETURN PATH	OBSER- VATION	PERFORMANCE CRITERION
0.15 – 80	3	AC power line	CDN-M3	N/A	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. 29, 2013	Apr. 28, 2014

- 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: Jul. 3, 2013

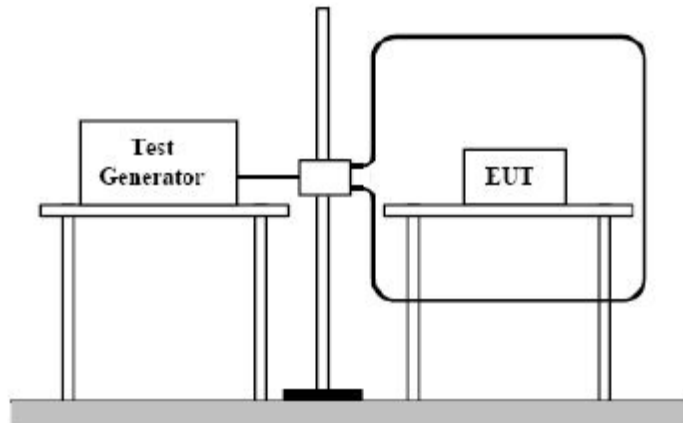
5.9.3 TEST PROCEDURE

- a. The equipment is configured and connected to satisfy its functional requirements.
- b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- c. 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	230Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	24deg. C, 66%RH	TESTED BY: Aga Lin	

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
KeyTek, PQF Generator	EMC Pro	9902207	Apr. 29, 2013	Apr. 28, 2014

- 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: Jul. 4, 2013

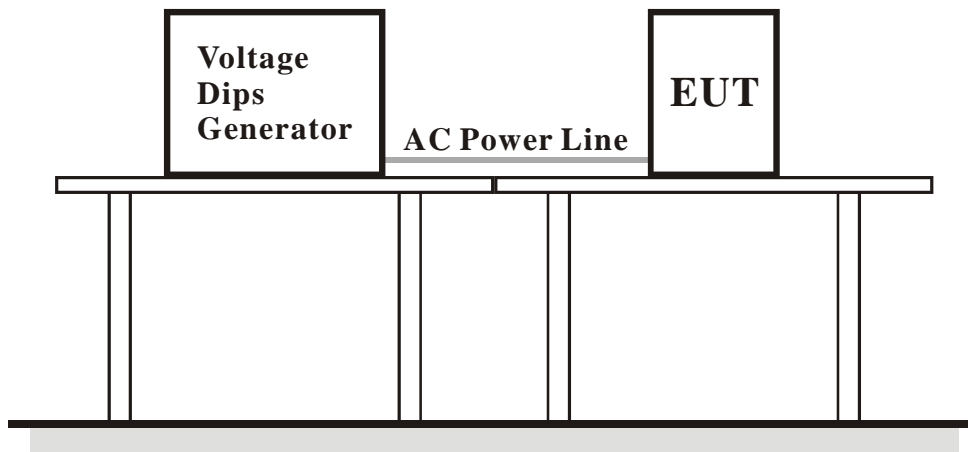
5.10.3 TEST PROCEDURE

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.

5.10.6 TEST RESULTS

TEST MODE	Mode 1	INPUT POWER	230Vac, 50 Hz & 100Vac, 50 Hz
ENVIRONMENTAL CONDITIONS	27deg. C, 60%RH	TESTED BY: Michael Cheng	

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

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

NOTE: (1) There was no change compared with the initial operation during the test.
 (2) The EUT reset during the test.

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

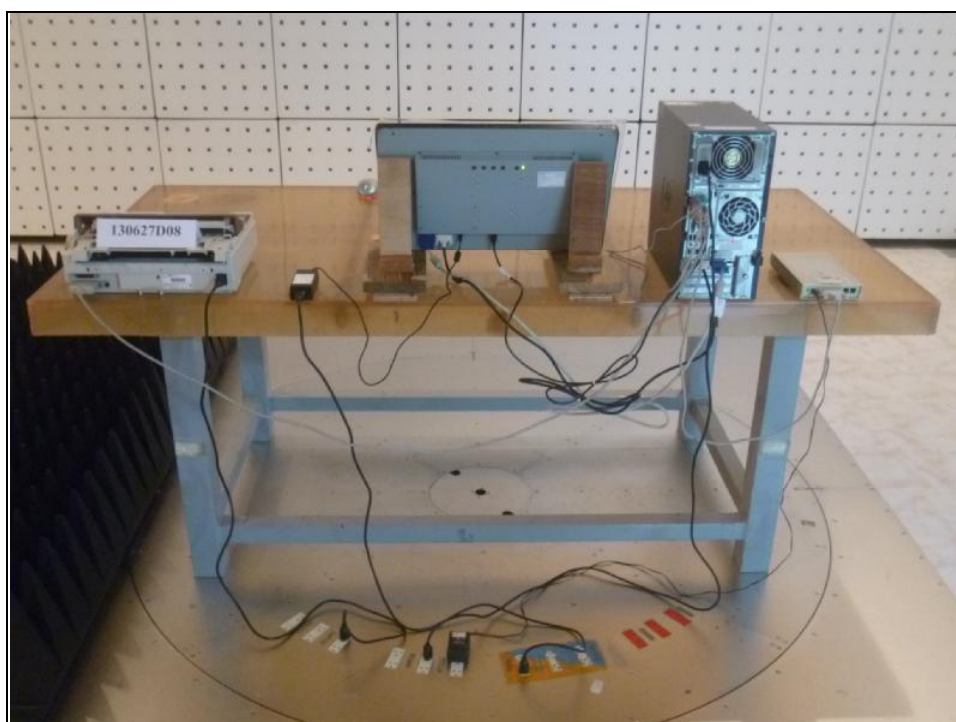
CONDUCTED EMISSION TEST



RADIATED EMISSION TEST (Frequency Range 30MHz ~ 1GHz)



RADIATED EMISSION TEST (Frequency Range above 1GHz)



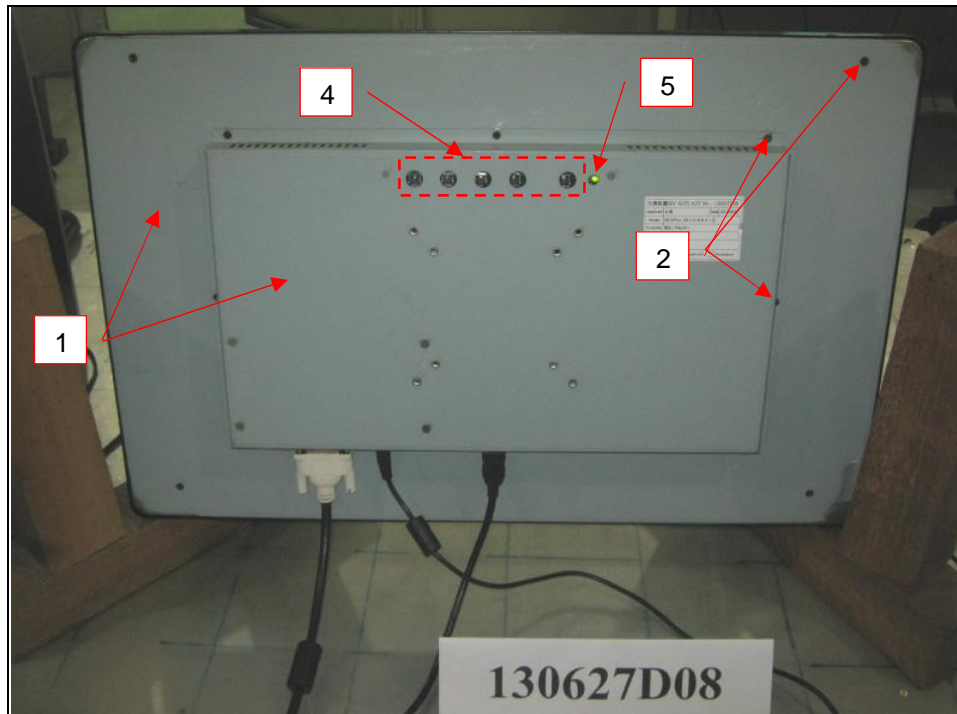
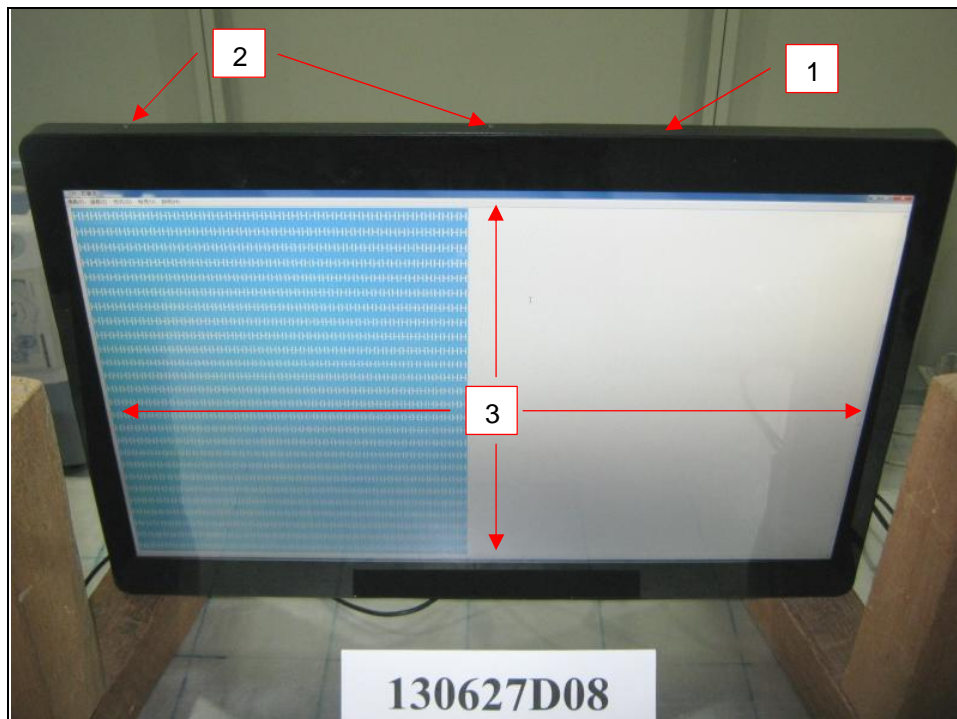
HARMONICS EMISSION TEST & VOLTAGE FLUCTUATIONS AND FLICKER TEST



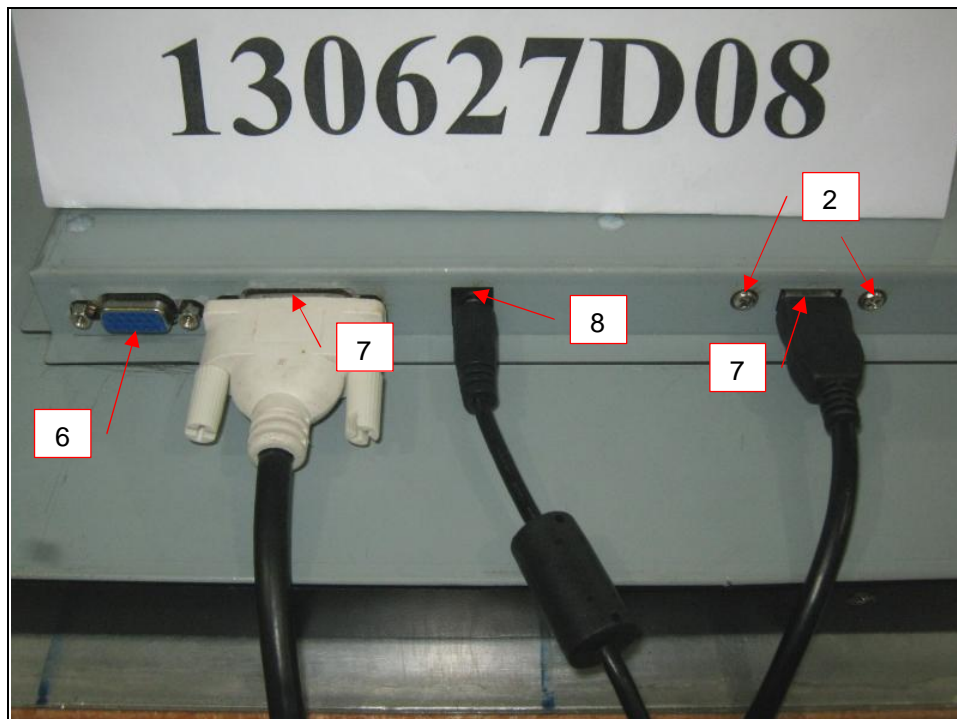
ESD TEST



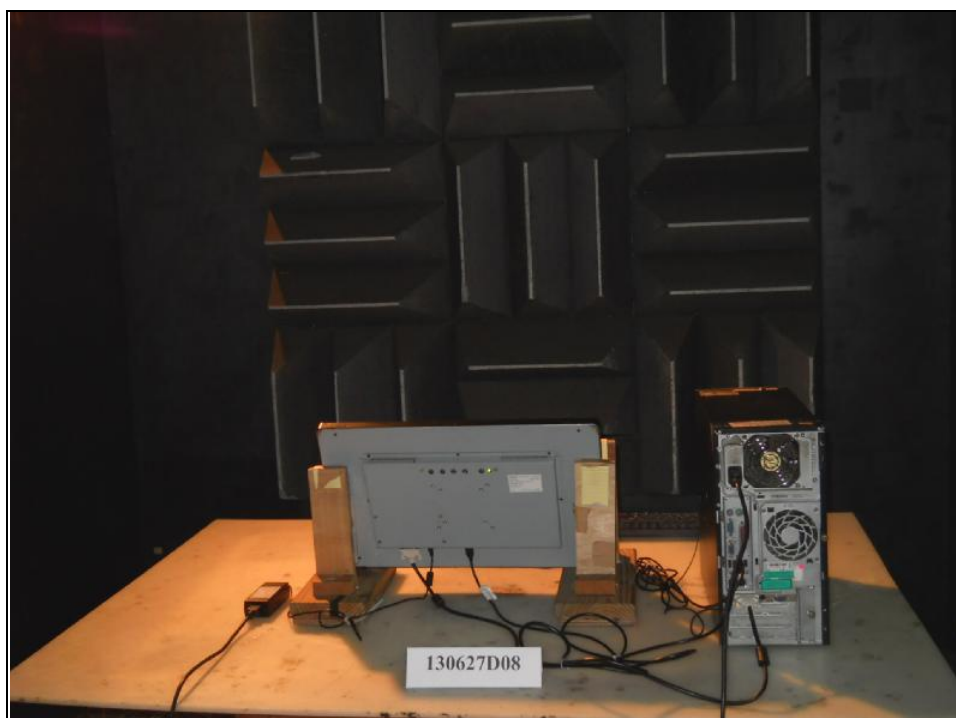
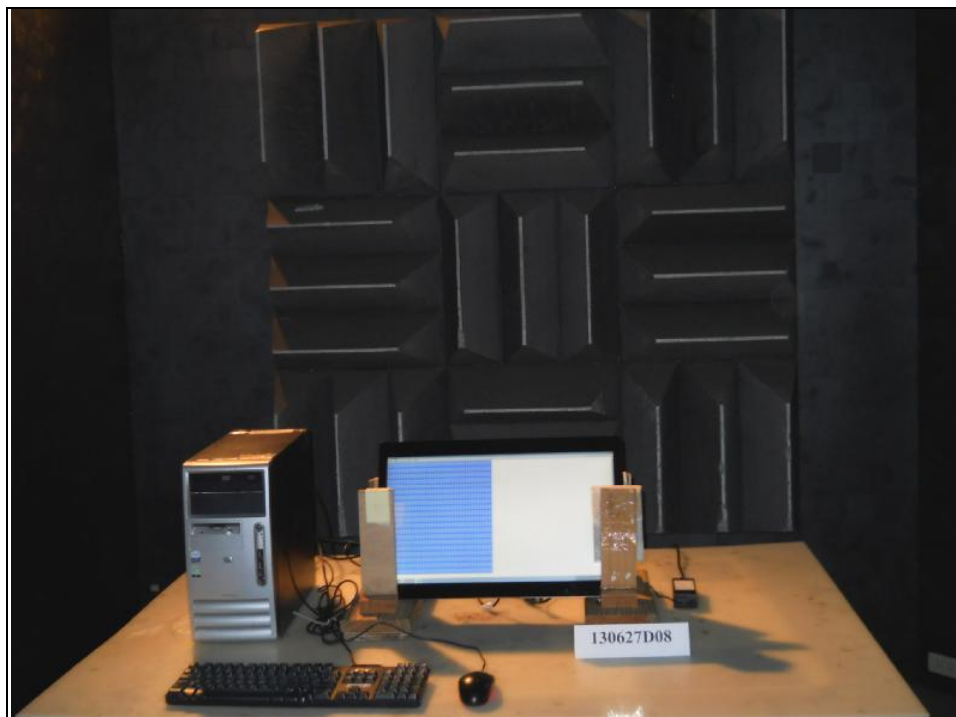
ESD TEST POINT



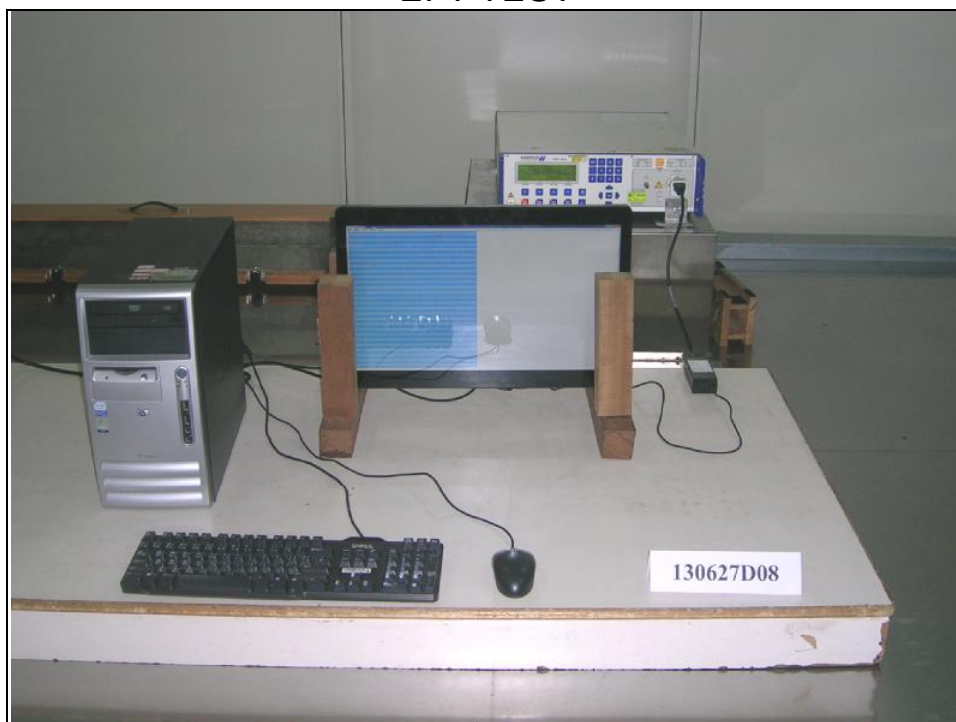
ESD TEST POINT



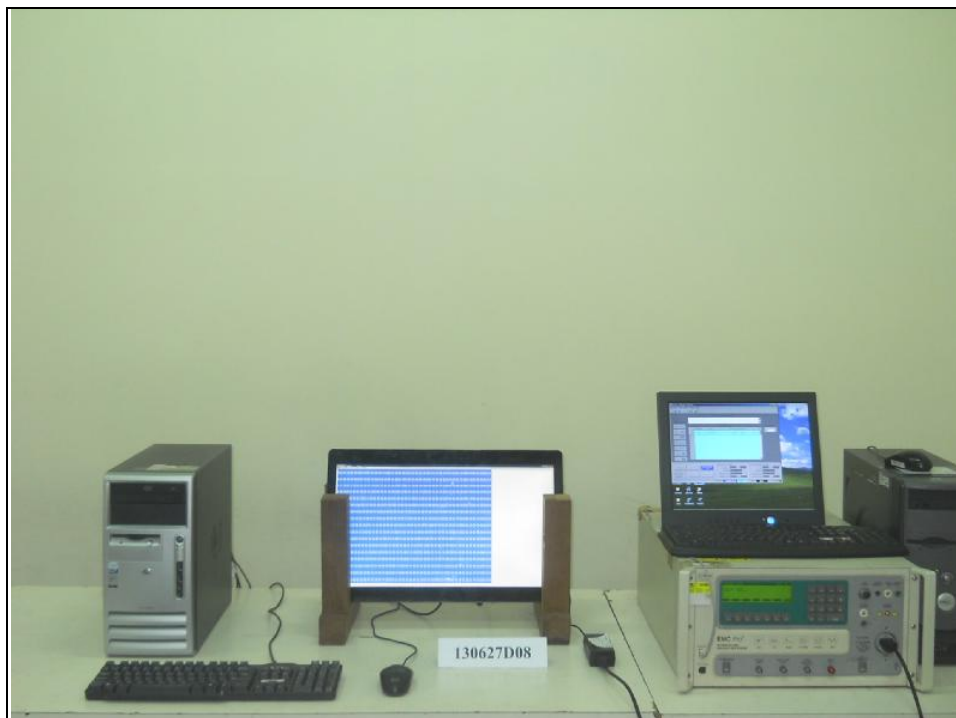
RS TEST



EFT TEST



SURGE TEST



CONDUCTED SUSCEPTIBILITY TEST



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.

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

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