

## CE EMC Test Report

**Report No.:** CE150723C22

**Test Model:** IVH-7700-QRD

**Series Model:** Vecow IVH Series, IVH-7700-QRDM, IVH-XXXXXXXXXXXXXXXXXXXXX  
("X" can be 0-9, A-Z or blank for marketing purpose)

**Received Date:** Jul. 23, 2015

**Test Date:** Aug. 04 ~ Sep. 04, 2015

**Issued Date:** Sep. 04, 2015

**Applicant:** Vecow Co.,Ltd.

**Address:** 12F.,No. 111, Zhongcheng Rd., Tucheng Dist., New Taipei City 23674  
Taiwan (R.O.C.)

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**Lab Address:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, TAIWAN (R.O.C.)



LAB CODE: 200837-0



Testing Laboratory  
2021

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A D T

### Release Control Record

Issue No.	Description	Date Issued
CE150723C22	Original release.	Sep. 04, 2015



**1 Certificate of Conformity**

**Product:** High Performance Fanless In-Vehicle System  
**Brand:** Vecow  
**Test Model:** IVH-7700-QRD  
**Series Model:** Vecow IVH Series, IVH-7700-QRDM, IVH-XXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)  
**Sample Status:** Engineering sample  
**Applicant:** Vecow Co.,Ltd.  
**Test Date:** Aug. 04 ~ Sep. 04, 2015  
**Standards:** **EN 55022:2010 +AC:2011, Class A**  
**EN 61000-3-2:2014, Class A**  
**EN 61000-3-3:2013**  
**EN 55024:2010**  
EN 61000-4-2:2009  
EN 61000-4-3:2006 +A1:2008 +A2:2010  
EN 61000-4-4:2012  
EN 61000-4-5:2006  
EN 61000-4-6:2014  
EN 61000-4-8:2010  
EN 61000-4-11:2004

The above equipment 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 : Suntee Liu , Date: Sep. 04, 2015  
Suntee Liu / Specialist

Approved by : Ken Liu , Date: Sep. 04, 2015  
Ken Liu / Senior Manager

## 2 Summary of Test Results

Emission				
Standard	Clause	Test Item	Result/Remarks	Verdict
EN 55022:2010 +AC:2011	5.1	Mains terminal disturbance voltage	Minimum passing Class A margin is -8.14 dB at 0.16096 MHz	Pass
EN 55022:2010 +AC:2011	5.2	Conducted common mode (asymmetric mode) disturbance at telecommunication ports	Minimum passing Class A margin is -1.05 dB at 2.08936 MHz	Pass
EN 55022:2010 +AC:2011	6.1	Radiated disturbance 30-1000 MHz	Minimum passing Class A margin is -4.42 dB at 85.83 MHz	Pass
EN 55022:2010 +AC:2011	6.2	Radiated disturbance above 1GHz	Minimum passing Class A margin is -16.78 dB at 2999.97 MHz	Pass
EN 61000-3-2:2014	-	Harmonic current emissions	Class A The power consumption of EUT is less than 75W and no limits apply	Pass
EN 61000-3-3:2013	-	Voltage fluctuations and flicker	$P_{st} \leq 1.0$ $d_{max} \leq 4\%$ $P_{it} \leq 0.65$ $d_c \leq 3.3\%$ $T_{max} \leq 500ms$	Pass

Immunity				
EN 55024 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.1	EN 61000-4-2:2009	Electrostatic discharges (ESD)	Performance Criterion B	Pass
4.2.3.2	EN 61000-4-3:2006 +A1:2008 +A2:2010	Continuous radiated disturbances (RS)	Performance Criterion A	Pass
4.2.2	EN 61000-4-4:2004 EN 61000-4-4:2012*	Electrical fast transients (EFT)	Performance Criterion B	Pass
4.2.5	EN 61000-4-5:2006	Surges	Performance Criterion A	Pass
4.2.3.3	EN 61000-4-6:2009 EN 61000-4-6:2014*	Continuous conducted disturbances (CS)	Performance Criterion A	Pass
4.2.4	EN 61000-4-8:2010	Power-frequency magnetic fields (PFMF)	Performance Criterion A	Pass
4.2.6	EN 61000-4-11:2004	Voltage dips and interruptions	Voltage Dips: >95% reduction – 0.5 period, Performance Criterion A 30% reduction – 25 periods, Performance Criterion A Voltage Interruptions: >95% reduction – 250 periods, Performance Criterion C	Pass

\* Both of specific and the latest version of the basic standard are referenced to fulfill the requirements.

Note: There is no deviation to the applied test methods and requirements covered by the scope of this report.

## 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:

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.

Measurement	Expanded Uncertainty (k=2) ( $\pm$ )	Maximum allowable uncertainty ( $\pm$ )
Conducted disturbance at mains port using AMN, 150kHz ~ 30MHz	2.44 dB	3.4 dB ( $U_{\text{CISPR}}$ )
Conducted disturbance at telecommunication port using AAN, 150kHz ~ 30MHz	2.69 dB	5.0 dB ( $U_{\text{CISPR}}$ )
Radiated disturbance, 30MHz ~ 1GHz	4.70 dB	6.3 dB ( $U_{\text{CISPR}}$ )
Radiated disturbance, 1GHz ~ 6GHz	2.29 dB	5.2 dB ( $U_{\text{CISPR}}$ )

## 2.2 Modification Record

There were no modifications required for compliance.



### 3 General Information

#### 3.1 Features of EUT

The tests reported herein were performed according to the method specified by Vecow Co.,Ltd., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

#### 3.2 General Description of EUT

Product	High Performance Fanless In-Vehicle System
Brand	Vecow
Test Model	IVH-7700-QRD
Series Model	Vecow IVH Series, IVH-7700-QRDM, IVH-XXXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)
Model Difference	Refer to Note
Sample Status	Engineering sample
Operating Software	Win 7
Power Supply Rating	24Vdc (adapter)
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. All models are listed as below. Model IVH-7700-QRD is the representative for final test.

Brand	Model	Difference
Vecow	Vecow IVH Series	All models are electrically identical, different model names are for marketing purpose.
	IVH-7700-QRD	
	IVH-7700-QRDM	
	IVH-XXXXXXXXXXXXXXXXXXXXX ("X" can be 0-9, A-Z or blank for marketing purpose)	

2. The EUT tested with following adapter (support unit only).

Brand	MW
Model	GS160A24
Input Power	100-240Vac, 50/60Hz, 2.0A
Output Power	24Vdc, 6.67Am, 160W MAX.
Power Line	1.15m DC cable with 1 core attached on adapter

### 3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT is designed with power adapter of rating 100-240Vac, 50/60Hz.

For radiated emission up to 1GHz evaluation, 230Vac/50Hz (for EN 55022) & 120Vac/60Hz (for FCC Part 15) had been covered during the pre-test. The worst data was recorded in the applied test report.

EUT has been pre-tested under following modes, and mode 6 was the worst case for final test.

Mode	Test Condition
1	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200, 230Vac/50Hz
2	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 1280*1024, DP 1280*1024, 230Vac/50Hz
3	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 800*600, DP 800*600, 230Vac/50Hz
4	LAN 1~2 100Mbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200, 230Vac/50Hz
5	LAN 1~2 10Mbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200, 230Vac/50Hz
6	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200, 120Vac/60Hz

Test modes are presented in the report as below.

Mode	Test Condition
<b>Conducted emission test</b>	
-	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200
<b>Conducted emission at telecom port test</b>	
-	LAN 1 port 10Mbps/100Mbps/1Gbps, DVI 1920*1200, DP 1920*1200
	LAN 2 port 10Mbps/100Mbps/1Gbps, DVI 1920*1200, DP 1920*1200
	LAN 3 port 10Mbps/100Mbps, DVI 1920*1200, DP 1920*1200
	LAN 4 port 10Mbps/100Mbps, DVI 1920*1200, DP 1920*1200
	LAN 5 port 10Mbps/100Mbps, DVI 1920*1200, DP 1920*1200
	LAN 6 port 10Mbps/100Mbps, DVI 1920*1200, DP 1920*1200
The idle mode of conducted emission test at telecom port was pre-tested based on the worst case of link mode. Due to emissions of idle mode being very low compared to link mode, only the link mode data were presented in the test report.	
<b>Radiated emission test</b>	
-	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200
<b>Harmonics, Flicker, Immunity tests</b>	
-	LAN 1~2 1Gbps, LAN 3~6 with camera, DVI 1920*1200, DP 1920*1200

### 3.4 Test Program Used and Operation Descriptions

Emission tests:

- a. EUT sent "H" patterns to monitors and monitors displayed them.
- b. EUT sent "H" patterns to modems.
- c. EUT read and wrote date with HDDs.
- d. EUT sent audio signal to earphone.
- e. EUT sent data to notebooks and cameras through LAN by command PING.

Harmonics, Flicker, Immunity tests:

- a. EUT sent "H" patterns to monitors and monitors displayed them.
- b. EUT sent "H" patterns to modems.
- c. EUT read and wrote date with HDDs and flashes.
- d. EUT sent audio signal to earphone.
- e. EUT sent data to notebooks and cameras through LAN by command PING.

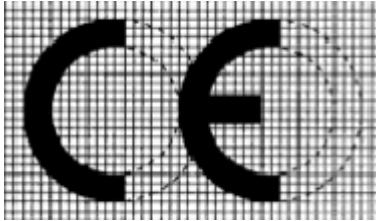
### 3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 3.3 GHz provided by Vecow Co.,Ltd., for detailed internal source, please refer to the manufacturer's specifications.

### 3.6 Miscellaneous

#### ➤ Affix CE marking

The marking must be placed visibly and legibly on the product or, if not possible due to the nature of the product, be affixed to the packaging and the accompanying document. The CE marking shall consist of the initials 'CE' taking the following form:



The various components of the CE marking must have the same vertical dimension, and may not be smaller than 5 mm. If the CE marking is reduced or enlarged, the proportions given in the graduated drawing above must be respected.

When the product is subject to other Directives covering other aspects and which also provide for the 'CE' marking, the accompanying documents must indicate that the product also conforms to those other Directives.

However, when one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking has to indicate conformity only with the Directives applied by the manufacturer. In this case, the particularities of the Directives applied, as published in the Official Journal of the European Union, must be given in the documents, notices or instructions required by the Directives and accompanying such products.

#### ➤ EN 55022 Class A Warning:

Class A ITE is a category of all other ITE which satisfies the class A ITE limits but not the class B ITE limits. The following warning shall be included in the instructions for use:

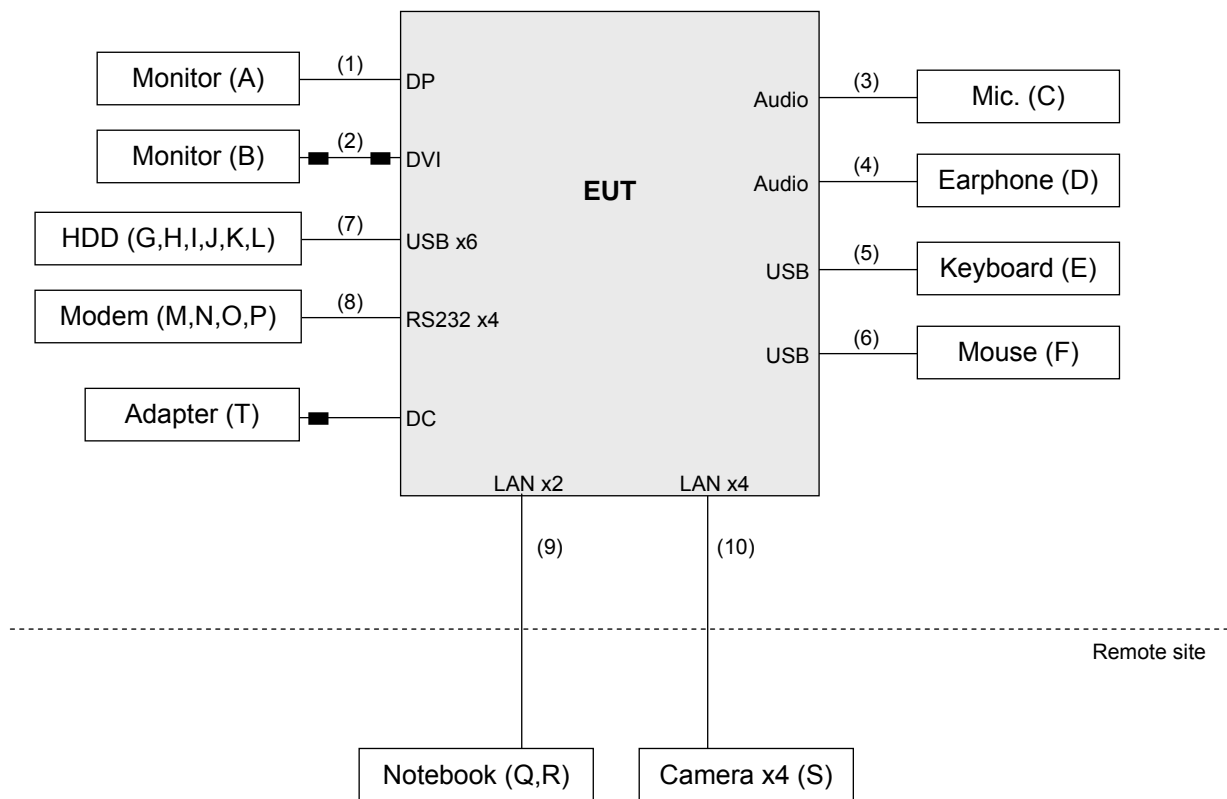
**Warning**

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

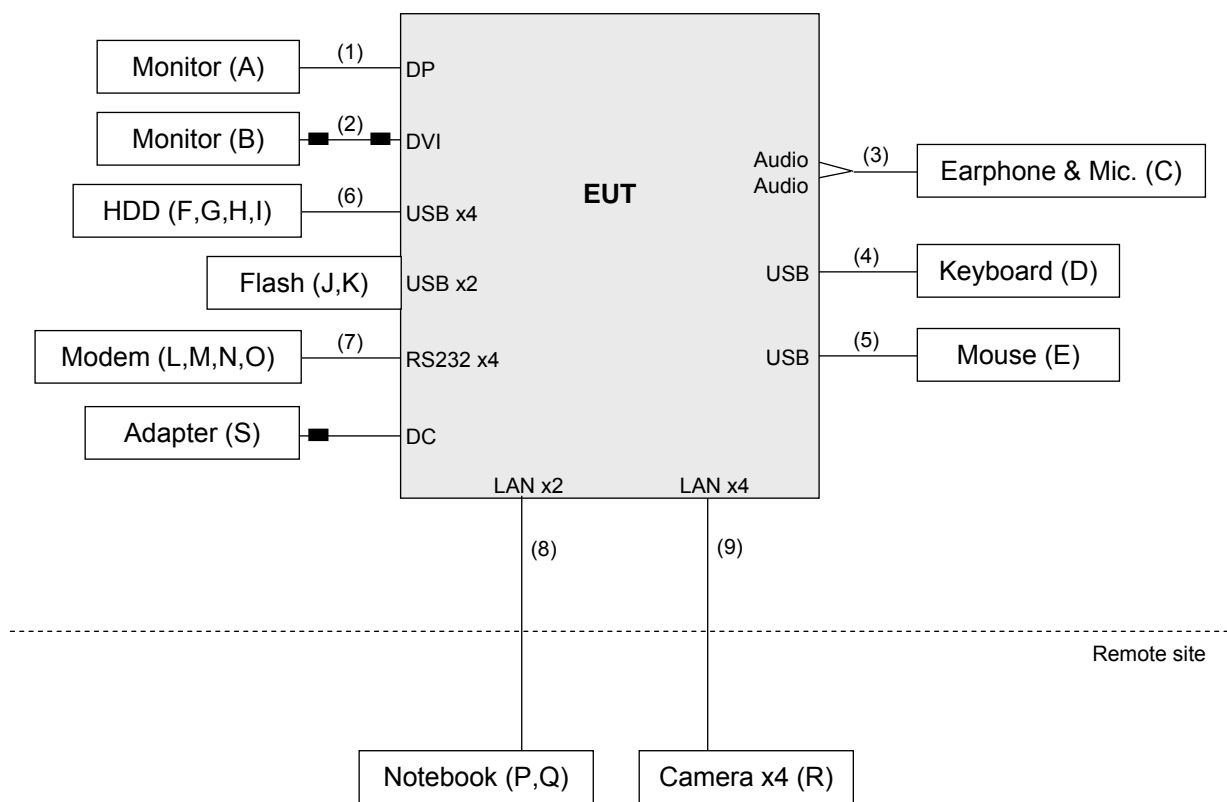
## 4 Configuration and Connections with EUT

### 4.1 Connection Diagram of EUT and Peripheral Devices

Emission tests:



## Immunity tests:



## 4.2 Configuration of Peripheral Devices and Cable Connections

### Emission tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	24" LCD MONITOR	DELL	U2410	CN-0J257M-72872-0A 6-02NL	FCC DoC Approved	-
B.	24" LCD MONITOR	DELL	U2410	CN-0J257M-72872-0A 6-08JL	FCC DoC Approved	-
C.	MICROPHONE	Labtec	LVA7313	NA	NA	-
D.	EARPHONE	PHILIPS	SBC HL150	NA	NA	-
E.	Keyboard	DELL	SK-8115	MY-0DJ325-71619-68 U-1757	FCC DoC Approved	-
F.	MOUSE	DELL	M056U0	349003901	FCC DoC Approved	-
G.	External Hard Disk	WD	WDBACY5000ABL	WX81E71WXC27	FCC DoC Approved	-
H.	External Hard Disk	WD	WDBACY5000ABL -01	WXS1CC1D3606	FCC DoC Approved	-
I.	External Hard Disk	WD	WDBACY5000ABL	WX81E71TTS16	FCC DoC Approved	-
J.	External Hard Disk	TOSHIBA	V63700-B	53E2CFNUTSX4	FCC DoC Approved	-
K.	External Hard Disk	TOSHIBA	V63700-B	43J4T0EFTTS9	FCC DoC Approved	-
L.	External Hard Disk	TOSHIBA	V63700-B	53ERP61GTSX4	FCC DoC Approved	-
M.	MODEM	ACEEX	1414V/3	0401008246	IFAXDM1414	-
N.	MODEM	ACEEX	1414V/3	0401008268	IFAXDM1414	-
O.	MODEM	ACEEX	1414V/3	0401008244	IFAXDM1414	-
P.	MODEM	ACEEX	1414V/3	0401008263	IFAXDM1414	-
Q.	NB	DELL	V3560D	HGZ5RX1	FCC DoC Approved	-
R.	NB	lenovo	20AYA00MTW	MP042EKY	FCC DoC Approved	-
S.	Camera x4	NA	NA	NA	NA	Provided by manufacturer
T.	Adapter	MW	GS160A24	NA	NA	Provided by manufacturer

### Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items Q~S acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Display	1	1.8	Y	0	-
2.	DVI	1	1.8	Y	2	-
3.	Microphone	1	2.2	N	0	-
4.	Earphone	1	1.2	N	0	-
5.	USB	1	1.8	Y	0	-
6.	USB	1	1.8	Y	0	-
7.	USB	6	0.5	Y	0	-
8.	RS232	4	1.2	Y	0	-
9.	RJ45, Cat5e	2	10	N	0	-
10.	RJ45, Cat5e	4	10	N	0	-

Note: The core(s) is(are) originally attached to the cable(s).

**Harmonics, Flicker, Immunity tests:**

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	24" LCD MONITOR	DELL	2407WFPb	CN-0FC255-46633-6 65-07US	FCC DoC Approved	-
B.	24" LCD MONITOR	DELL	2408FPb	CN-0G293H-74261- 874-237S-A00	FCC DoC Approved	-
C.	Earphone & Mic.	PHILIPS	SHM2100	NA	NA	-
D.	Keyboard	DELL	SK-8110	MY-05N456-71679-3 C1-1635	FCC DoC Approved	-
E.	MOUSE	DELL	MS111-P	CN-011D3V-71581-1 CJ-01A8	FCC DoC Approved	-
F.	External Hard Disk	ADATA	HV620	1E3620122267	FCC DoC Approved	-
G.	External Hard Disk	ADATA	HV620	1E3620122271	FCC DoC Approved	-
H.	External Hard Disk	ADATA	HV620	1E3620122277	FCC DoC Approved	-
I.	External Hard Disk	ADATA	HV620	1E3620122297	FCC DoC Approved	-
J.	USB Flash Drive	ADATA	S102	03	FCC DoC Approved	-
K.	USB Flash Drive	ADATA	S102	04	FCC DoC Approved	-
L.	MODEM	ACEEX	1414V/3	0401008257	IFAXDM1414	-
M.	MODEM	ACEEX	1414V/3	0401008260	IFAXDM1414	-
N.	MODEM	ACEEX	1414V/3	0401008241	IFAXDM1414	-
O.	MODEM	ACEEX	1414V/3	0401008262	IFAXDM1414	-
P.	Notebook	DELL	PP02X	T7CRDYR7FVTJM WXWHR22PPMH6	QDS-BRCM1005-D	-
Q.	Notebook	DELL	PP02X	Q6KMKR74WGCTY 8GHHGMTQT4J3	QDS-BRCM1005-D	-
R.	Camera x4	NA	NA	NA	NA	Provided by manufacturer
S.	Adapter	MW	GS160A24	NA	NA	Provided by manufacturer

**Note:**

1. All power cords of the above support units are non-shielded (1.8m).
2. Items P~R acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Display	1	1.8	Y	0	-
2.	DVI	1	1.8	Y	2	-
3.	Earphone	1	1.8	N	0	-
4.	USB	1	1.8	Y	0	-
5.	USB	1	1.8	Y	0	-
6.	USB	4	0.5	Y	0	-
7.	RS232	4	1.2	Y	0	-
8.	RJ45, Cat5e	2	3	N	0	-
9.	RJ45, Cat5e	4	3	N	0	-

Note: The core(s) is(are) originally attached to the cable(s).



## 5 Conducted Disturbance at Mains Ports

### 5.1 Limits

Frequency (MHz)	Class A (dBUV)		Class B (dBUV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.  
 2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

### 5.2 Test Instruments

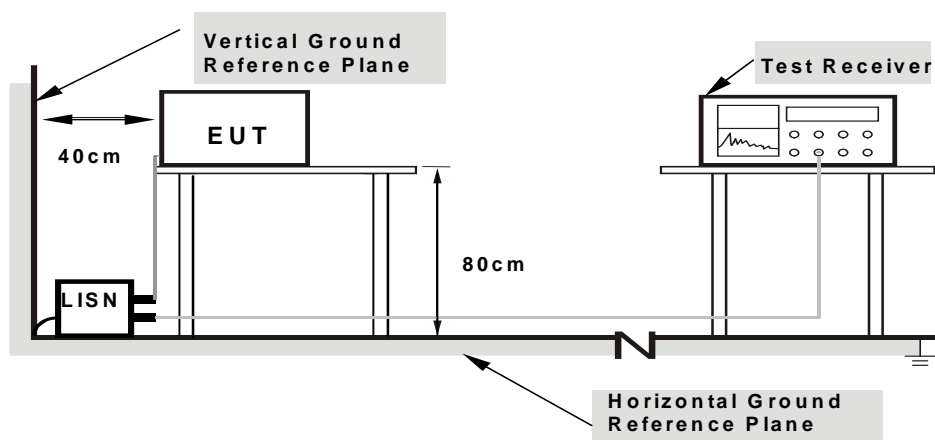
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Notes: 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 HwaYa Shielded Room 1.  
 3. The VCCI Site Registration No. is C-2040.

### 5.3 Test Arrangement

- 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 test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



- Note:**
- Support units were connected to second LISN.
  - Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

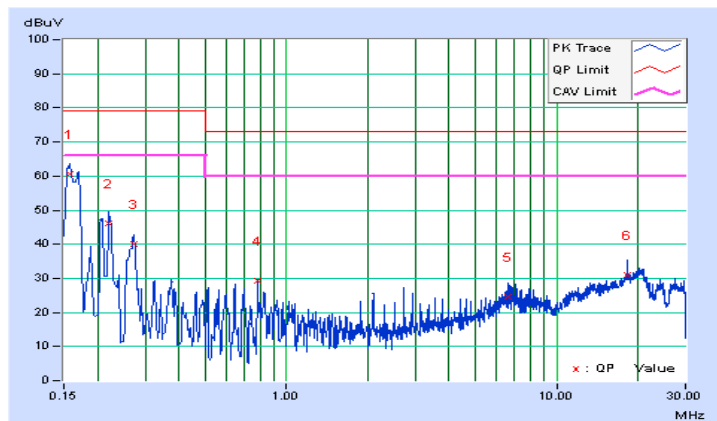
### 5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15782	0.05	60.55	55.06	60.60	55.11	79.00	66.00	-18.40	-10.89
2	0.22038	0.06	46.02	27.31	46.08	27.37	79.00	66.00	-32.92	-38.63
3	0.27120	0.06	40.08	33.47	40.14	33.53	79.00	66.00	-38.86	-32.47
4	0.78342	0.07	29.27	21.90	29.34	21.97	73.00	60.00	-43.66	-38.03
5	6.60932	0.30	24.36	20.92	24.66	21.22	73.00	60.00	-48.34	-38.78
6	18.24548	0.82	30.09	25.02	30.91	25.84	73.00	60.00	-42.09	-34.16

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

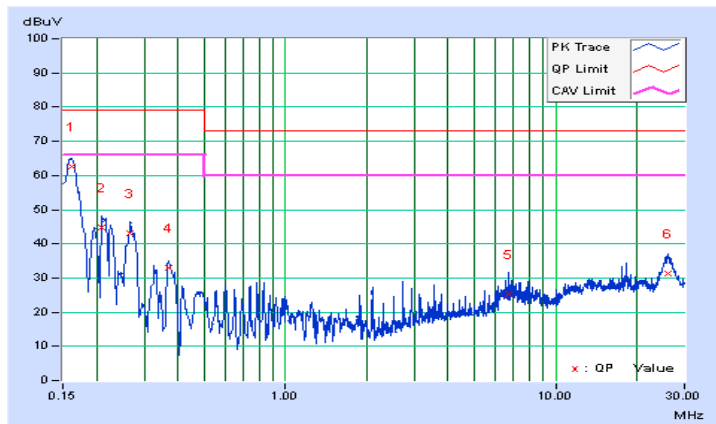


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16096	0.05	62.66	57.81	62.71	57.86	79.00	66.00	-16.29	-8.14
2	0.20893	0.05	44.68	27.45	44.73	27.50	79.00	66.00	-34.27	-38.50
3	0.26730	0.05	43.06	37.25	43.11	37.30	79.00	66.00	-35.89	-28.70
4	0.36913	0.06	32.79	26.63	32.85	26.69	79.00	66.00	-46.15	-39.31
5	6.70316	0.29	25.08	20.42	25.37	20.71	73.00	60.00	-47.63	-39.29
6	26.01074	0.81	30.61	24.06	31.42	24.87	73.00	60.00	-41.58	-35.13

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



## 6 Conducted Disturbance at Telecommunication Ports

### 6.1 Limits

For Class A Equipment

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

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

For Class B Equipment

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

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

### 6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA
ISN	FCC-TLISN-T2-02-09	091393	Nov. 27, 2014	Nov. 26, 2015
ISN	F-071115-1057-1-09	100855	Jul. 30, 2015	Jul. 29, 2016
Capacitive Voltage Probe	F-CVP-1	82	Jul. 07, 2015	Jul. 06, 2016
RF Current Probe	F-33-4	45	Feb. 26, 2015	Feb. 25, 2016

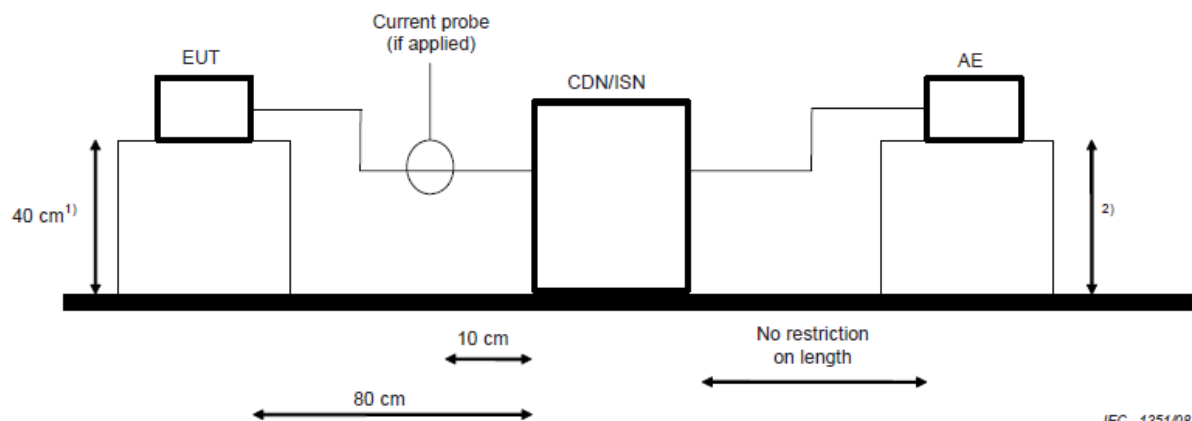
- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Shielded Room 1.
  3. The VCCI Site Registration No. is T-1653.

### 6.3 Test Arrangement

#### Method of Annex C.1.1, Using ISNs:

- 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. A 50  $\Omega$  load has to be connected to the measurement port of the ISN during the current measurement.
- d. It is not necessary to apply the voltage and the current limit if a ISN is used.
- e. The test results of disturbance at telecommunication ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



IEC 1351/08

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.

### 6.4 Supplementary Information

The condition of LAN utilization in excess of 10 % and sustaining that level for a minimum of 250 ms is created by command TFGEN.

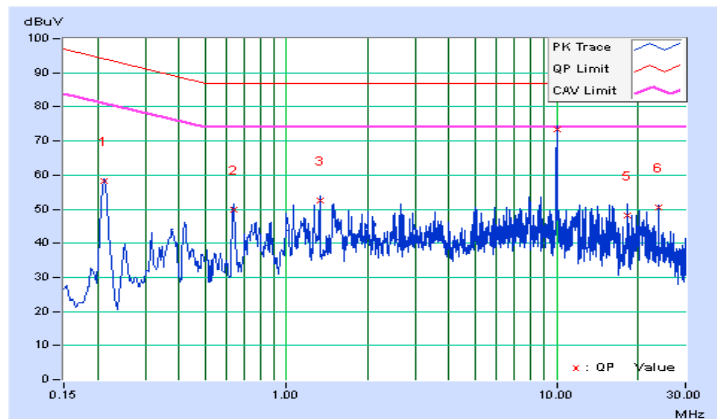
### 6.5 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 1 port with ISN (10Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	48.75	48.11	58.35	57.71	94.10	81.10	-35.75	-23.39
2	0.63520	9.37	40.34	39.37	49.71	48.74	87.00	74.00	-37.29	-25.26
3	1.33082	9.26	43.24	43.04	52.50	52.30	87.00	74.00	-34.50	-21.70
4	10.00000	9.18	64.35	49.84	73.53	59.02	87.00	74.00	-13.47	-14.98
5	18.36669	9.29	38.80	35.42	48.09	44.71	87.00	74.00	-38.91	-29.29
6	23.87197	9.40	41.02	40.84	50.42	50.24	87.00	74.00	-36.58	-23.76

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

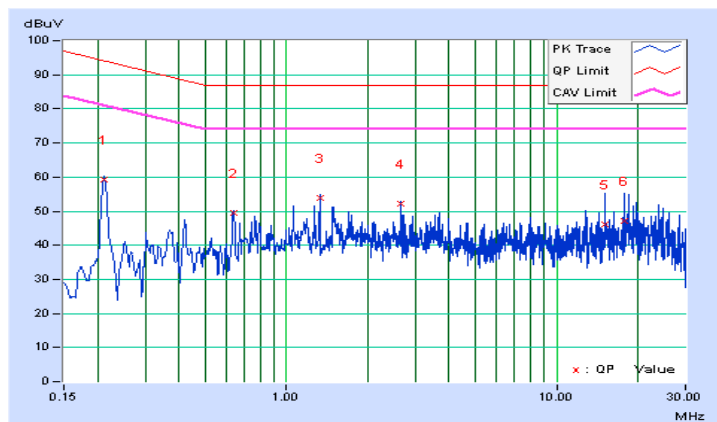


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 1 port with ISN (100Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	49.53	48.67	59.13	58.27	94.10	81.10	-34.97	-22.83
2	0.63520	9.37	40.19	39.00	49.56	48.37	87.00	74.00	-37.44	-25.63
3	1.33082	9.26	44.63	44.39	53.89	53.65	87.00	74.00	-33.11	-20.35
4	2.66022	9.19	43.02	42.22	52.21	51.41	87.00	74.00	-34.79	-22.59
5	15.08229	9.24	36.96	17.99	46.20	27.23	87.00	74.00	-40.80	-46.77
6	17.89358	9.28	37.87	18.42	47.15	27.70	87.00	74.00	-39.85	-46.30

**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



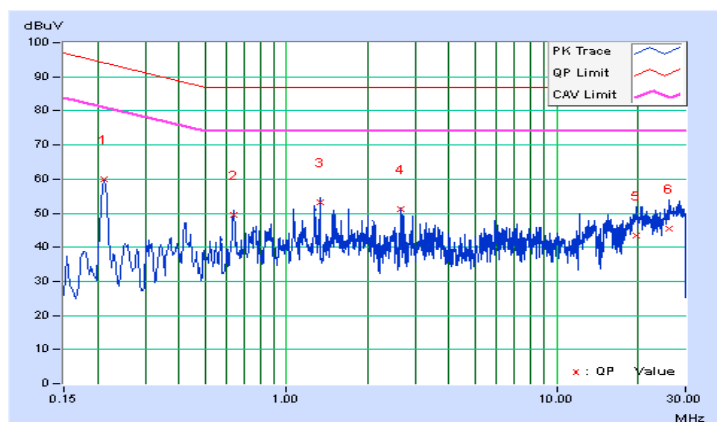


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 1 port with ISN (1Gbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21226	9.60	50.20	49.43	59.80	59.03	94.12	81.12	-34.31	-22.08
2	0.63875	9.37	40.10	38.93	49.47	48.30	87.00	74.00	-37.53	-25.70
3	1.33082	9.26	44.08	43.83	53.34	53.09	87.00	74.00	-33.66	-20.91
4	2.66022	9.19	42.10	41.14	51.29	50.33	87.00	74.00	-35.71	-23.67
5	19.62180	9.30	34.11	22.00	43.41	31.30	87.00	74.00	-43.59	-42.70
6	25.99119	9.46	36.03	22.94	45.49	32.40	87.00	74.00	-41.51	-41.60

**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

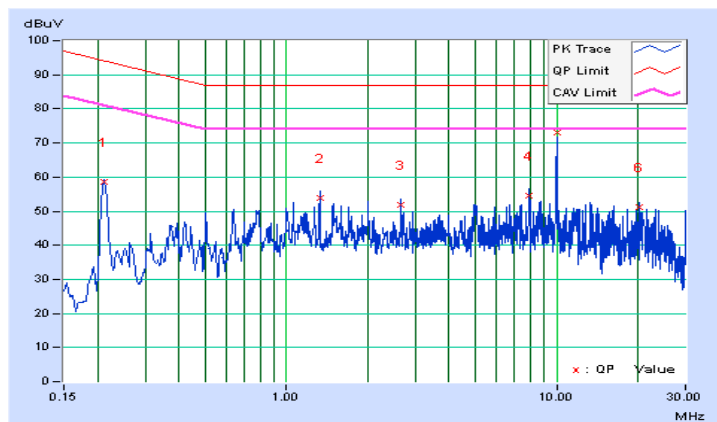


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 2 port with ISN (10Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	49.06	48.30	58.66	57.90	94.10	81.10	-35.44	-23.20
2	1.33082	9.26	44.69	44.37	53.95	53.63	87.00	74.00	-33.05	-20.37
3	2.66022	9.19	42.81	41.93	52.00	51.12	87.00	74.00	-35.00	-22.88
4	7.92308	9.17	45.24	44.02	54.41	53.19	87.00	74.00	-32.59	-20.81
5	10.00000	9.18	63.89	49.64	73.07	58.82	87.00	74.00	-13.93	-15.18
6	20.25913	9.32	41.87	38.52	51.19	47.84	87.00	74.00	-35.81	-26.16

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

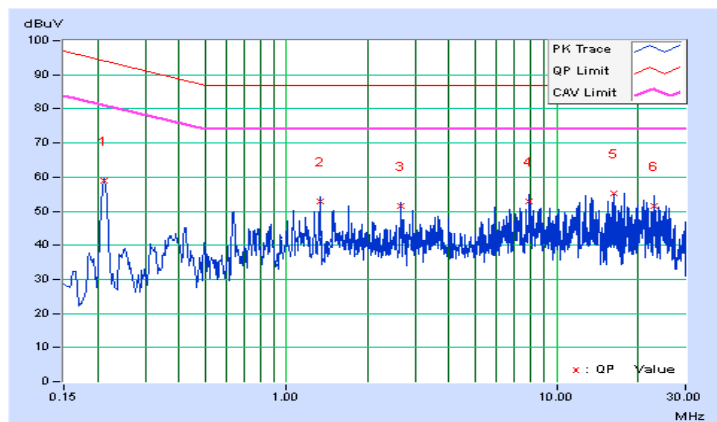


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 2 port with ISN (100Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	49.41	48.78	59.01	58.38	94.10	81.10	-35.09	-22.72
2	1.33082	9.26	43.64	43.40	52.90	52.66	87.00	74.00	-34.10	-21.34
3	2.66022	9.19	42.22	41.27	51.41	50.46	87.00	74.00	-35.59	-23.54
4	7.92308	9.17	43.65	41.45	52.82	50.62	87.00	74.00	-34.18	-23.38
5	16.22792	9.26	45.80	39.75	55.06	49.01	87.00	74.00	-31.94	-24.99
6	23.06651	9.38	42.24	32.97	51.62	42.35	87.00	74.00	-35.38	-31.65

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

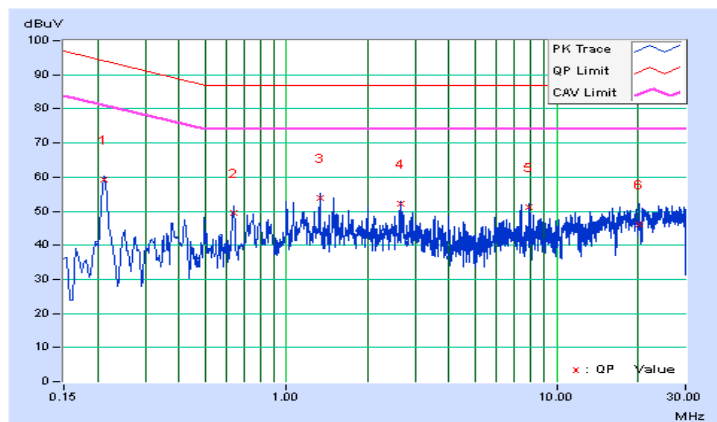


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 2 port with ISN (1Gbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	49.59	48.70	59.19	58.30	94.10	81.10	-34.91	-22.80
2	0.63856	9.37	40.03	38.72	49.40	48.09	87.00	74.00	-37.60	-25.91
3	1.33082	9.26	44.53	44.29	53.79	53.55	87.00	74.00	-33.21	-20.45
4	2.66022	9.19	42.98	42.18	52.17	51.37	87.00	74.00	-34.83	-22.63
5	7.92308	9.17	42.12	40.30	51.29	49.47	87.00	74.00	-35.71	-24.53
6	20.19657	9.31	36.97	31.69	46.28	41.00	87.00	74.00	-40.72	-33.00

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

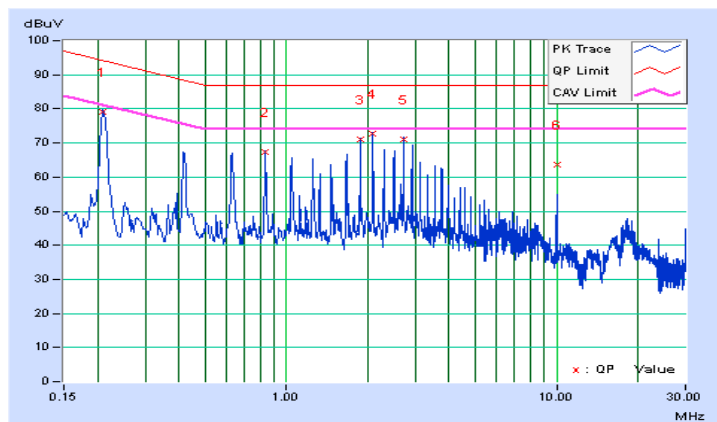


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 3 port with ISN (10Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20893	9.60	69.52	66.41	79.12	76.01	94.25	81.25	-15.12	-5.23
2	0.83425	9.33	58.12	57.88	67.45	67.21	87.00	74.00	-19.55	-6.79
3	1.87822	9.21	61.88	61.78	71.09	70.99	87.00	74.00	-15.91	-3.01
4	2.08756	9.20	63.62	63.60	72.82	72.80	87.00	74.00	-14.18	-1.20
5	2.71496	9.19	61.73	61.33	70.92	70.52	87.00	74.00	-16.08	-3.48
6	10.00000	9.18	54.51	36.28	63.69	45.46	87.00	74.00	-23.31	-28.54

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

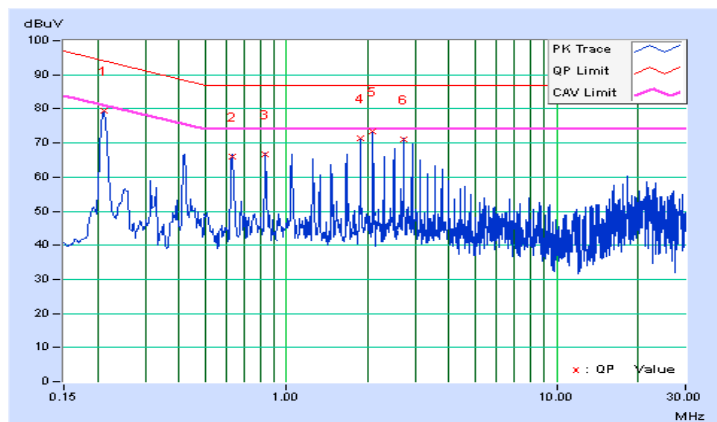


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 3 port with ISN (100Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21010	9.60	69.74	66.30	79.34	75.90	94.20	81.20	-14.86	-5.30
2	0.62689	9.37	56.55	56.50	65.92	65.87	87.00	74.00	-21.08	-8.13
3	0.83425	9.33	57.26	57.10	66.59	66.43	87.00	74.00	-20.41	-7.57
4	1.87922	9.21	62.03	61.61	71.24	70.82	87.00	74.00	-15.76	-3.18
<b>5</b>	<b>2.08936</b>	<b>9.20</b>	<b>64.10</b>	<b>63.75</b>	<b>73.30</b>	<b>72.95</b>	<b>87.00</b>	<b>74.00</b>	<b>-13.70</b>	<b>-1.05</b>
6	2.71496	9.19	61.69	61.58	70.88	70.77	87.00	74.00	-16.12	-3.23

**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

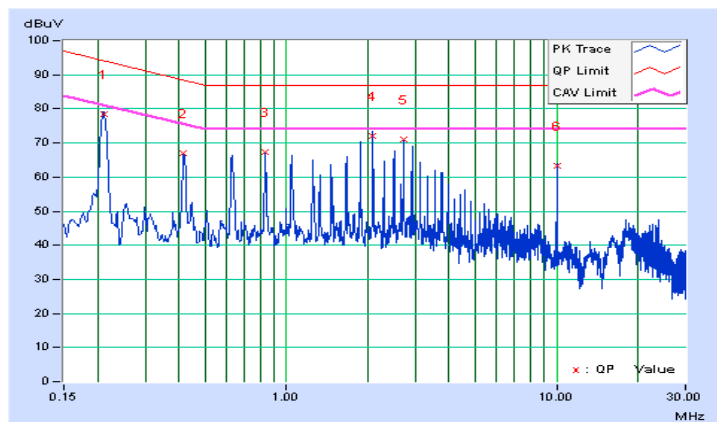


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 4 port with ISN (10Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	68.90	66.19	78.50	75.79	94.10	81.10	-15.60	-5.31
2	0.41670	9.46	57.63	57.56	67.09	67.02	88.51	75.51	-21.43	-8.50
3	0.83425	9.33	58.12	57.90	67.45	67.23	87.00	74.00	-19.55	-6.77
4	2.08936	9.20	62.97	62.64	72.17	71.84	87.00	74.00	-14.83	-2.16
5	2.71496	9.19	61.78	61.56	70.97	70.75	87.00	74.00	-16.03	-3.25
6	10.00000	9.18	54.04	35.82	63.22	45.00	87.00	74.00	-23.78	-29.00

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

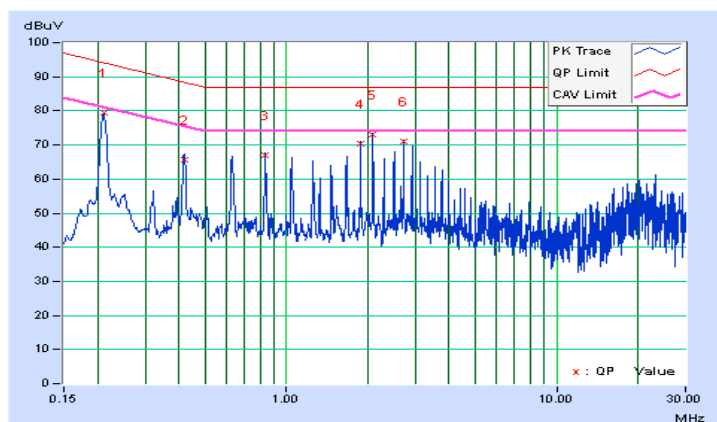


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 4 port with ISN (100Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21059	9.60	69.86	66.42	79.46	76.02	94.18	81.18	-14.72	-5.16
2	0.41979	9.46	56.32	56.06	65.78	65.52	88.45	75.45	-22.68	-9.94
3	0.83425	9.33	57.62	57.51	66.95	66.84	87.00	74.00	-20.05	-7.16
4	1.87822	9.21	61.16	61.08	70.37	70.29	87.00	74.00	-16.63	-3.71
5	2.08936	9.20	63.70	63.67	72.90	72.87	87.00	74.00	-14.10	-1.13
6	2.71496	9.19	61.90	61.84	71.09	71.03	87.00	74.00	-15.91	-2.97

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



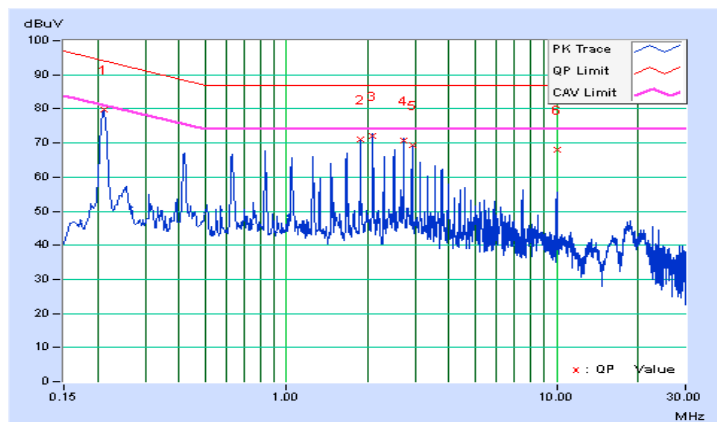


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 5 port with ISN (10Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21059	9.60	70.14	66.73	79.74	76.33	94.18	81.18	-14.44	-4.85
2	1.87822	9.21	61.80	61.67	71.01	70.88	87.00	74.00	-15.99	-3.12
3	2.08936	9.20	62.93	62.56	72.13	71.76	87.00	74.00	-14.87	-2.24
4	2.71496	9.19	61.63	61.41	70.82	70.60	87.00	74.00	-16.18	-3.40
5	2.92219	9.19	60.10	59.74	69.29	68.93	87.00	74.00	-17.71	-5.07
6	10.00000	9.18	58.82	40.46	68.00	49.64	87.00	74.00	-19.00	-24.36

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

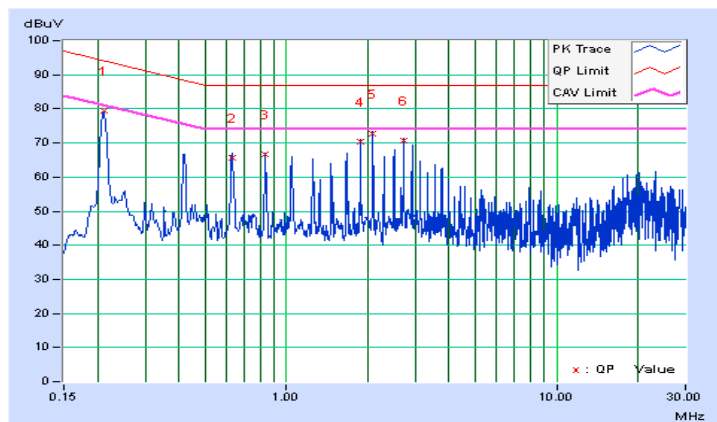


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 5 port with ISN (100Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21059	9.60	69.84	66.41	79.44	76.01	94.18	81.18	-14.74	-5.17
2	0.62689	9.37	56.39	56.23	65.76	65.60	87.00	74.00	-21.24	-8.40
3	0.83425	9.33	57.46	57.40	66.79	66.73	87.00	74.00	-20.21	-7.27
4	1.87822	9.21	61.26	61.22	70.47	70.43	87.00	74.00	-16.53	-3.57
5	2.08736	9.20	63.58	63.56	72.78	72.76	87.00	74.00	-14.22	-1.24
6	2.71496	9.19	61.57	61.53	70.76	70.72	87.00	74.00	-16.24	-3.28

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

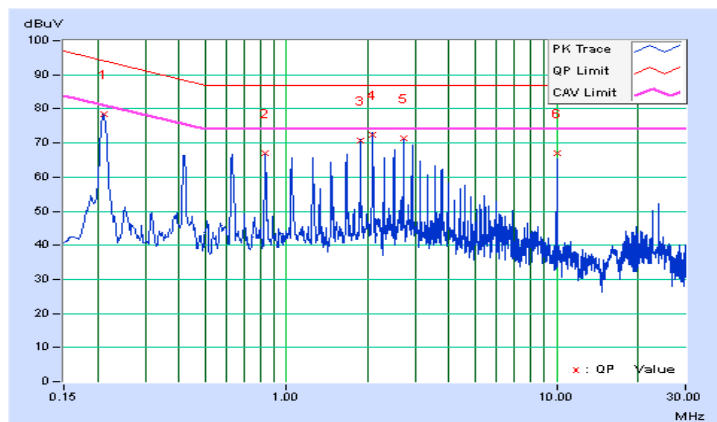


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 6 port with ISN (10Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21256	9.60	68.82	66.15	78.42	75.75	94.10	81.10	-15.68	-5.35
2	0.83425	9.33	57.51	57.77	66.84	67.10	87.00	74.00	-20.16	-6.90
3	1.87822	9.21	61.60	61.56	70.81	70.77	87.00	74.00	-16.19	-3.23
4	2.08936	9.20	63.27	63.02	72.47	72.22	87.00	74.00	-14.53	-1.78
5	2.71496	9.19	62.10	61.91	71.29	71.10	87.00	74.00	-15.71	-2.90
6	10.00000	9.18	57.71	39.36	66.89	48.54	87.00	74.00	-20.11	-25.46

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

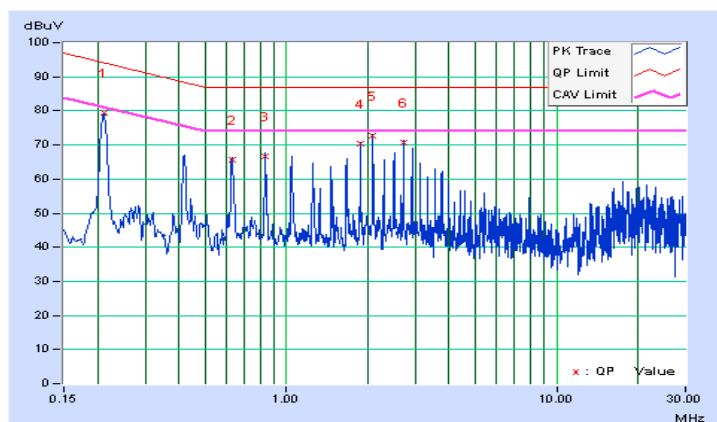


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	20°C, 60%RH
Tested by	Pon Tsai	Test Date	2015/8/4
Test Mode	LAN 6 port with ISN (100Mbps, TFGEN)		

No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.21115	9.60	69.78	66.48	79.38	76.08	94.16	81.16	-14.78	-5.08
2	0.62689	9.37	56.41	56.40	65.78	65.77	87.00	74.00	-21.22	-8.23
3	0.83425	9.33	57.40	57.36	66.73	66.69	87.00	74.00	-20.27	-7.31
4	1.87822	9.21	61.22	61.20	70.43	70.41	87.00	74.00	-16.57	-3.59
5	2.08936	9.20	63.38	63.16	72.58	72.36	87.00	74.00	-14.42	-1.64
6	2.71496	9.19	61.58	61.50	70.77	70.69	87.00	74.00	-16.23	-3.31

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





## 7 Radiated Disturbance up to 1 GHz

### 7.1 Limits

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

- Notes:
1. The lower limit shall apply at the transition frequencies.
  2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 7.2 Test Instruments

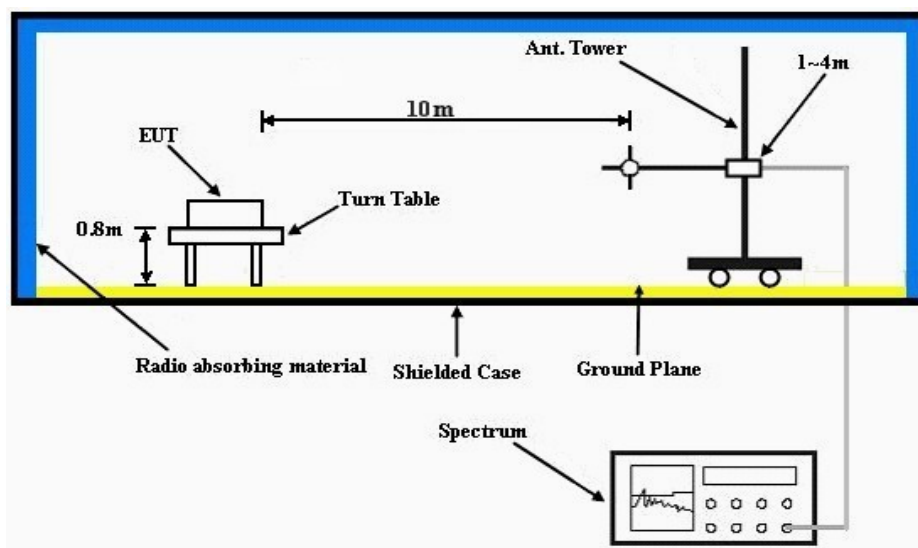
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (V)	ESR	101240	Sep. 29, 2014	Sep. 28, 2015
Test Receiver ROHDE & SCHWARZ (H)	ESR	101264	Dec. 04, 2014	Dec. 03, 2015
BILOG Antenna SCHWARZBECK (V)	VULB9168	9168-149	Feb. 03, 2015	Feb. 02, 2016
BILOG Antenna SCHWARZBECK (H)	VULB9168	9168-154	Feb. 03, 2015	Feb. 02, 2016
Preamplifier Agilent (V)	8447D	2944A10636	Oct. 18, 2014	Oct. 17, 2015
Preamplifier Agilent (H)	8447D	2944A10637	Oct. 18, 2014	Oct. 17, 2015
Preamplifier Agilent	8449B	3008A01959	Oct. 17, 2015	Oct. 17, 2015
RF signal cable Woken (V)	8D-FB	Cable-CH(V)-01	Oct. 24, 2015	Oct. 24, 2015
RF signal cable Woken (H)	8D-FB	Cable-CH(H)-01	Oct. 24, 2015	Oct. 24, 2015
Software BV ADT	BV ADT_Radiated_ V 8.7.07	NA	NA	NA
Antenna Tower (V)	MFA-440	9707	NA	NA
Antenna Tower (H)	MFA-440	970705	NA	NA
Turn Table	DS430	50303	NA	NA
Controller (V)	MF7802	074	NA	NA
Controller (H)	MF7802	08093	NA	NA

- 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 HwaYa Chamber 1.
  3. The FCC Site Registration No. is 477732.
  4. The IC Site Registration No. is IC 7450F-1.
  5. The VCCI Site Registration No. is R-1893.

### 7.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height 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.
- 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



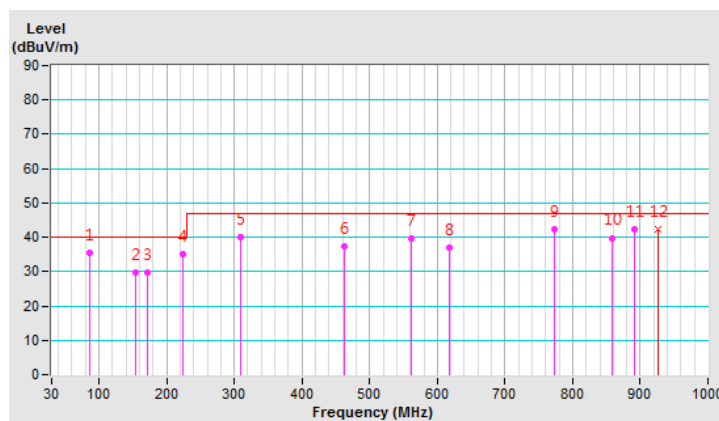
### 7.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Environmental Conditions	20°C, 61%RH	Tested by	Rolan Zheng
Test Date	2015/8/7		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	85.83	35.58 QP	40.00	-4.42	4.00 H	199	55.01	-19.43
2	154.51	29.76 QP	40.00	-10.24	4.00 H	53	43.13	-13.37
3	172.02	29.68 QP	40.00	-10.32	3.50 H	130	43.74	-14.06
4	223.19	35.10 QP	40.00	-4.90	3.50 H	81	50.83	-15.73
5	309.03	39.89 QP	47.00	-7.11	4.00 H	260	51.27	-11.38
6	463.51	37.25 QP	47.00	-9.75	2.00 H	178	45.25	-8.00
7	562.51	39.62 QP	47.00	-7.38	2.00 H	315	45.76	-6.14
8	618.04	37.08 QP	47.00	-9.92	1.50 H	66	41.53	-4.45
9	772.57	42.33 QP	47.00	-4.67	1.00 H	259	43.88	-1.55
10	858.42	39.83 QP	47.00	-7.17	3.50 H	148	40.05	-0.22
11	890.63	42.23 QP	47.00	-4.77	1.00 H	28	41.79	0.44
12	927.09	42.45 QP	47.00	-4.55	1.00 H	245	41.24	1.21

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

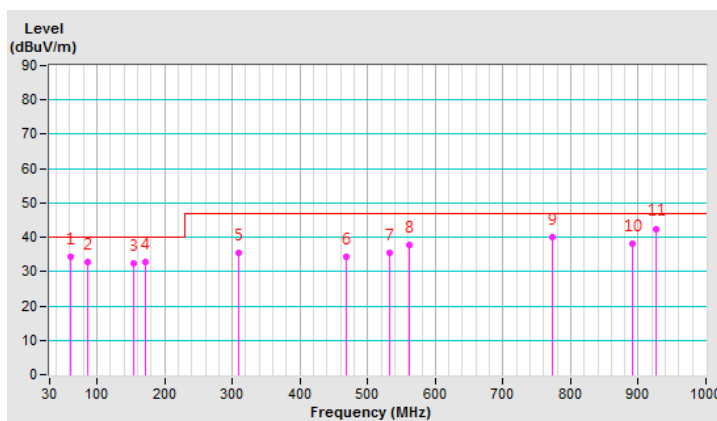


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Environmental Conditions	20°C, 61%RH	Tested by	Rolan Zheng
Test Date	2015/8/7		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	60.07	34.23 QP	40.00	-5.77	2.00 V	48	48.21	-13.98
2	85.83	32.71 QP	40.00	-7.29	2.00 V	340	51.85	-19.14
3	154.51	32.47 QP	40.00	-7.53	2.50 V	325	45.18	-12.71
4	172.02	32.78 QP	40.00	-7.22	2.00 V	344	46.23	-13.45
5	309.03	35.47 QP	47.00	-11.53	4.00 V	124	46.21	-10.74
6	468.75	34.40 QP	47.00	-12.60	1.00 V	309	41.70	-7.30
7	532.19	35.59 QP	47.00	-11.41	1.00 V	319	41.59	-6.00
8	562.51	37.57 QP	47.00	-9.43	3.50 V	325	43.02	-5.45
9	772.57	40.15 QP	47.00	-6.85	4.00 V	262	40.52	-0.37
10	890.63	38.23 QP	47.00	-8.77	3.50 V	164	36.83	1.40
11	927.10	42.48 QP	47.00	-4.52	2.50 V	245	39.93	2.55

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





## 8 Radiated Disturbance above 1 GHz

### 8.1 Limits

Frequency (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Average	Peak	Average	Peak
1 to 3	56	76	50	70
3 to 6	60	80	54	74

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

#### Frequency Range (For unintentional radiators)

Highest frequency generated or used in the EUT or on which the EUT 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

**8.2 Test Instruments**

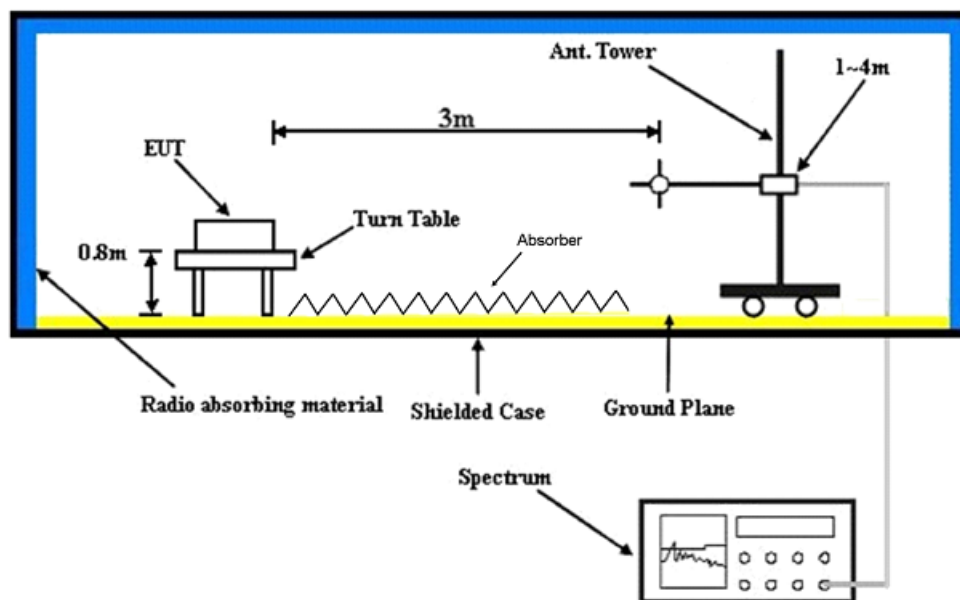
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR7	101471	Feb. 09, 2015	Feb. 08, 2016
Spectrum Analyzer Agilent	E4446A	MY51100039	Aug. 18, 2014	Aug. 17, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-157	Feb. 03, 2015	Feb. 02, 2016
RF signal cable Woken	8D-FB	Cable-CH2-01	Mar. 22, 2015	Mar. 21, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-405	Feb. 06, 2015	Feb. 05, 2016
Preamplifier Agilent (Above 1GHz)	8449B	3008A01961	Oct. 18, 2014	Oct. 17, 2015
RF signal cable ALLTEST	JUNFLON	Cable-CH2-02 (MWX322+MWX221130 28S0295)	Nov. 06, 2014	Nov. 05, 2015
Software BV ADT	BV ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Controller BV ADT	SC100	SC93021702	NA	NA
HORN Antenna SCHWARZBECK	BBHA 9170	148	Feb. 09, 2015	Feb. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 102	Cable-CH1-03-38218	Oct. 25, 2014	Oct. 24, 2015
RF signal cable HUBER+SUHNER	SUCOFLEX 102	Cable-CH1-04-37433	Oct. 25, 2014	Oct. 24, 2015

- 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 HwaYa Chamber 2.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 686814.
5. The IC Site Registration No. is IC 7450F-2.
6. The VCCI Site Registration No. is G-18.
7. The 3dB beamwidth of the horn antenna is minimum 30 degree (or  $w = 1.6m$  at 3m distance) for 1~6 GHz.

### 8.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The spectrum analyzer 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: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



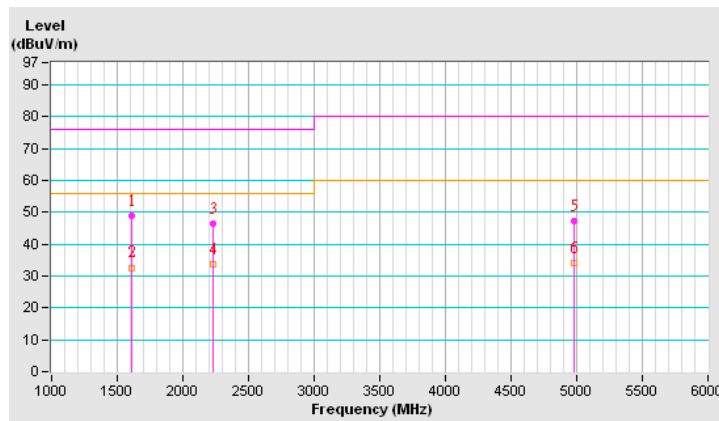
### 8.4 Test Results

Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	26°C, 66%RH
Tested by	Scott Yang	Test Date	2015/8/6

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1609.98	48.96 PK	76.00	-27.04	1.00 H	165	56.08	-7.12
2	1609.98	32.63 AV	56.00	-23.37	1.00 H	165	39.75	-7.12
3	2230.02	46.52 PK	76.00	-29.48	1.52 H	158	52.29	-5.77
4	2230.02	33.65 AV	56.00	-22.35	1.52 H	158	39.42	-5.77
5	4980.15	47.25 PK	80.00	-32.75	2.03 H	54	44.97	2.28
6	4980.15	34.11 AV	60.00	-25.89	2.03 H	54	31.83	2.28

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

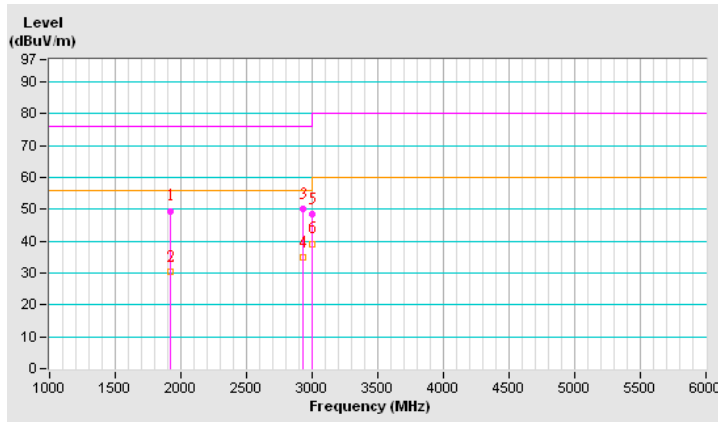


Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230 Vac, 50 Hz (System)	Environmental Conditions	26°C, 66%RH
Tested by	Scott Yang	Test Date	2015/8/6

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1920.02	49.51 PK	76.00	-26.49	1.25 V	66	56.23	-6.72
2	1920.02	30.26 AV	56.00	-25.74	1.25 V	66	36.98	-6.72
3	2932.46	50.27 PK	76.00	-25.73	1.12 V	229	53.66	-3.39
4	2932.46	34.75 AV	56.00	-21.25	1.12 V	229	38.14	-3.39
5	2999.97	48.52 PK	76.00	-27.48	1.00 V	8	51.73	-3.21
<b>6</b>	<b>2999.97</b>	<b>39.22 AV</b>	<b>56.00</b>	<b>-16.78</b>	<b>1.00 V</b>	<b>8</b>	<b>42.43</b>	<b>-3.21</b>

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



## 9 Harmonics Current Measurement

### 9.1 Limits

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

Notes: 1. Class A and Class D are classified according to section 5 of EN 61000-3-2.

2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

### 9.2 Classification of Equipment

The EUT is Class A in accordance with EN 61000-3-2 as follows:

Class A	Class B	Class C	Class D
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.	Portable tools; Arc welding equipment which is not professional equipment.	Lighting equipment.	Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors; Television receivers; Refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

### 9.3 Test Instruments

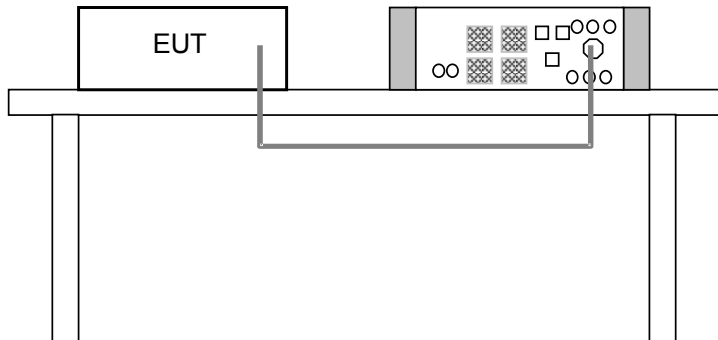
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ 5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 21, 2014	Aug. 20, 2015
Software	Win2100 V4.5.8	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya EMS Room.

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

### 9.4 Test Arrangement

- 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 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.



### 9.5 Test Results

Test Duration (mins)	3	Test Date	2015/8/13
Fundamental Voltage/Ampere	228.29 Vrms/ 0.371 Arms	Power Frequency	50 Hz
Power Consumption	69.5 W	Power Factor	0.848
Environmental Conditions	25 °C, 55% RH	Tested by	Vincent Yang

- 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.

## 10 Voltage Fluctuations and Flicker Measurement

### 10.1 Limits

Test item	Limit	Note
$P_{st}$	1.0	$P_{st}$ : short-term flicker severity.
$P_{lt}$	0.65	$P_{lt}$ : long-term flicker severity.
$T_{max}$ (ms)	500	$T_{max}$ : maximum time duration during the observation period that the voltage deviation $d(t)$ exceeds the limit for $d_c$ .
$d_{max}$ (%)	4	$d_{max}$ : maximum absolute voltage change during an observation period.
$d_c$ (%)	3.3	$d_c$ : maximum steady state voltage change during an observation period.

### 10.2 Test Instruments

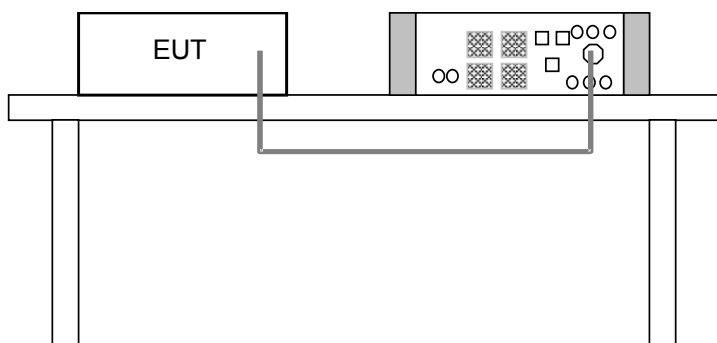
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ 5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 21, 2014	Aug. 20, 2015
Software	Win2100 V4.5.8	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya EMS Room.

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

### 10.3 Test Arrangement

- 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.





#### 10.4 Test Results

Observation ( $T_D$ )	120 min.	Test Date	2015/8/13
Fundamental Voltage/Ampere	228.16 Vrms/ 0.371 Arms	Power Frequency	50 Hz
Power Consumption	69.5 W	Power Factor	0.848
Environmental Conditions	25 °C, 55% RH	Tested by	Vincent Yang

Test Parameter	Measurement Value	Limit	Remarks
$P_{st}$	0.153	1.00	Pass
$P_{lt}$	0.082	0.65	Pass
$T_{max}$ (ms)	0	500	Pass
$d_{max}$ (%)	0.22	4	Pass
$d_c$ (%)	0	3.3	Pass

- Note: (1)  $P_{st}$  means short-term flicker indicator.  
 (2)  $P_{lt}$  means long-term flicker indicator.  
 (3)  $T_{max}$  means accumulated time value of  $d(t)$  with a deviation exceeding 3.3 %.  
 (4)  $d_{max}$  means maximum relative voltage change.  
 (5)  $d_c$  means maximum relative steady-state voltage change.

## 11 General Immunity Requirements

### EN 55024:2010, Immunity requirements

Clause	Reference standard	Table	Test specification	Performance Criterion
4.2.1	EN 61000-4-2 ESD	1.3	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	B
4.2.3.2	EN 61000-4-3 RS	1.2	Enclosure port: 80-1000 MHz, 3V/m, 80% AM (1kHz)	A
4.2.2	EN 61000-4-4 EFT	2.3	Signal ports and telecommunication ports: xDSL equipment: ±0.5kV, 5/50 (T <sub>r</sub> /T <sub>h</sub> ) ns, 100kHz others: ±0.5kV, 5/50 (T <sub>r</sub> /T <sub>h</sub> ) ns, 5kHz	B
		3.3	Input DC power port: ±0.5kV, 5/50 (T <sub>r</sub> /T <sub>h</sub> ) ns, 5kHz	
		4.5	Input AC Power ports: ±1kV, 5/50 (T <sub>r</sub> /T <sub>h</sub> ) ns, 5kHz	
4.2.5	EN 61000-4-5 Surge	2.2	Signal and telecommunication ports (direct to outdoor cables): 10/700 (5/320) (T <sub>r</sub> /T <sub>h</sub> ) μs w/o primary protectors: ±1kV, or with primary protectors fitted: ±4kV	B
		3.2	Input DC power port (direct to outdoor cables): 1.2/50 (8/20) (T <sub>r</sub> /T <sub>h</sub> ) μs Line to earth: ±0.5kV	
		4.4	Input AC Power ports: 1.2/50 (8/20) (T <sub>r</sub> /T <sub>h</sub> ) μs, Line to line: ±1kV Line to earth: ±2kV	
4.2.3.3	EN 61000-4-6 CS	2.1	Signal and telecommunication ports(cable length > 3m): 0.15-80 MHz, 3V, 80% AM (1kHz)	A
		3.1	Input DC power port: 0.15-80 MHz, 3V, 80% AM (1kHz)	
		4.1	Input AC Power ports: 0.15-80 MHz, 3V, 80% AM (1kHz)	
4.2.4	EN 61000-4-8 PFMF	1.1	Enclosure port: 50 or 60 Hz, 1A/m	A
4.2.6	EN 61000-4-11 Dips & Interruptions	4.2	Input AC Power ports: Voltage Dips: >95% reduction – 0.5 period 30% reduction – 25 periods	B C
		4.3	Input AC Power ports: Voltage Interruptions: >95% reduction – 250 periods	C

## 11.1 Performance Criteria

### General Performance Criteria

#### Performance 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.

#### Performance 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 phenomena 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 or 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.

#### Performance 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.

### Product Specific 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.

Function	Performance criteria A	Performance criteria B	Performance criteria C
Read, write and storage of data	During the test storage devices shall maintain normal operation both in read/write and in standby conditions.	During and after the test failures which can be recovered by read and write retries are permissible (temporary delay in processing caused by this process is acceptable). Normal operation of the EUT shall be restored after the test, self-recovery to the conditions immediately prior to the application of the test is accepted where this is a normal means of recovery. In these cases, operator response is permitted to re-initialise an operation.	Failures during test that result in a delay in processing or a system abort, which after testing can be recovered to normal operation by reset or reboot, are permissible.
Data display	During the test, when seen from the normal viewing distance, the EUT shall operate with no change beyond the manufacturer's specification, in flicker, colour, focus and jitter (except for the power frequency magnetic field test).	Screen disturbances during the application of the test are permissible if they self-recover after removal of the external disturbance.	Failures during the test that cannot self-recover after removal of the external disturbance, but which can be recovered after the test to normal operation by reset or reboot are permissible.
Data input	During testing unintended input from an input device is not allowed. During testing input devices shall maintain the specified quality image data.	During testing keyboard/mouse "lock up" is not allowed. For EUT with manually inputted data that can be confirmed by reading the display, errors are permissible during testing if they can be recognised by the operator and easily corrected.	Failures during test that result in a delay in processing or a system abort, which after testing can be recovered to normal operation by reset or reboot, are permissible.
Data printing	During testing printers shall maintain the specified printing quality and normal operation.	During testing no degradation of the printing quality beyond the manufacturer's specification (such as distortion of character(s) or missing pixels) is permissible. A paper feed failure is allowed if after removal of the jammed sheets the job is automatically recovered and there is no loss of printed information.	During testing printing errors or omission of character(s) which require reprinting are permissible. Input/output failures that occur during testing that can be recovered to normal operation after testing by reset or reboot are also permissible.
Data processing	During testing failures which do not influence the specified operation within the product specification, and which do not prevent automatic recovery are permissible.	During testing failures which are recovered automatically but cause temporary delay in processing are permissible.	Failures during testing that - result in a delay in processing after the external disturbance is removed, but which can be recovered after testing to normal operation by a reset or reboot - result in a system abort, which can be recovered to normal operation after testing by reset or reboot, - are followed by alarms and can be recovered to normal operation by the operator's intervention after testing are permissible.

## 12 Electrostatic Discharge Immunity Test (ESD)

### 12.1 Test Specification

<b>Basic Standard:</b>	EN/IEC 61000-4-2
<b>Discharge Impedance:</b>	330 ohm / 150 pF
<b>Discharge Voltage:</b>	Air Discharge: $\pm 2, \pm 4, \pm 8$ kV (Direct) Contact Discharge: $\pm 2, \pm 4$ kV (Direct / Indirect)
<b>Number of Discharge:</b>	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 25 discharges per location (each polarity) and min. 200 times in total
<b>Discharge Mode:</b>	Single Discharge
<b>Discharge Period:</b>	1-second minimum

### 12.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Schaffner ESD generator	NSG 435	6008	Nov. 04, 2014	Nov. 03, 2015

- Notes: 1. The test was performed in Hwa Ya ESD Room 4.  
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 12.3 Test Arrangement

The discharges shall be applied in two ways:

- a. Contact discharges to the conductive surfaces and coupling planes:

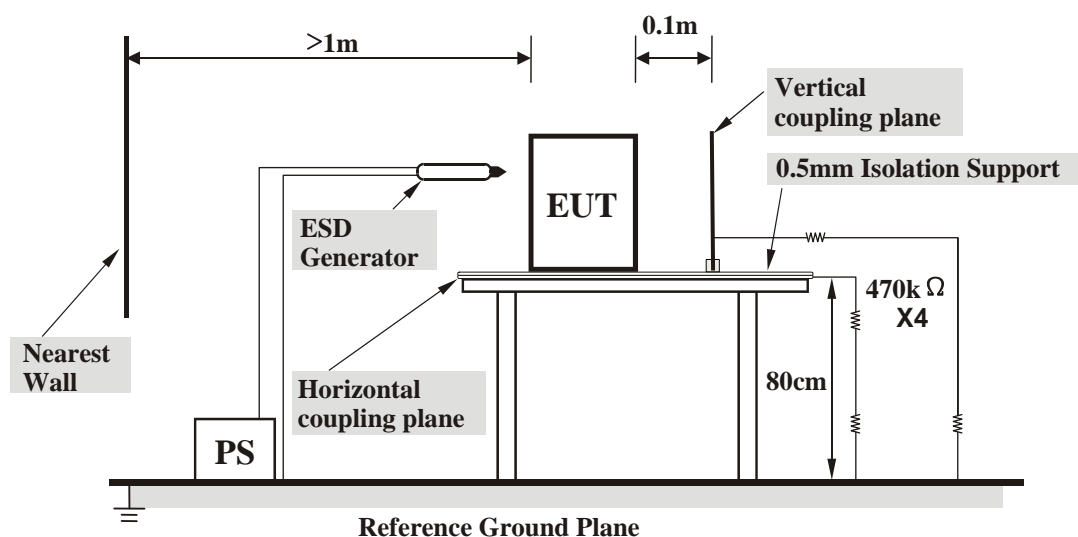
The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points 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 EN/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 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.



#### 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 EN/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.

## 12.4 Test Results

Input Power	24 Vdc	Test Date	2015/8/12
Environmental Conditions	24 °C, 55% RH 984 mbar	Tested by	Tom Tang

### Test Results of Direct Application

Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2	+/-	1-4	Note 1	NA	A
4	+/-	1-4	Note 2	NA	B
2, 4	+/-	5-6	Note 1	NA	A
2, 4	+/-	7-9	NA	Note 1	A
8	+/-	7-9	NA	Note 2	B
2, 4	+/-	10	NA	Note 1	A
8	+/-	10	NA	Note 3	B

Description of test points of direct application: Please refer to following page for representative mark only.

### Test Results of Indirect Application

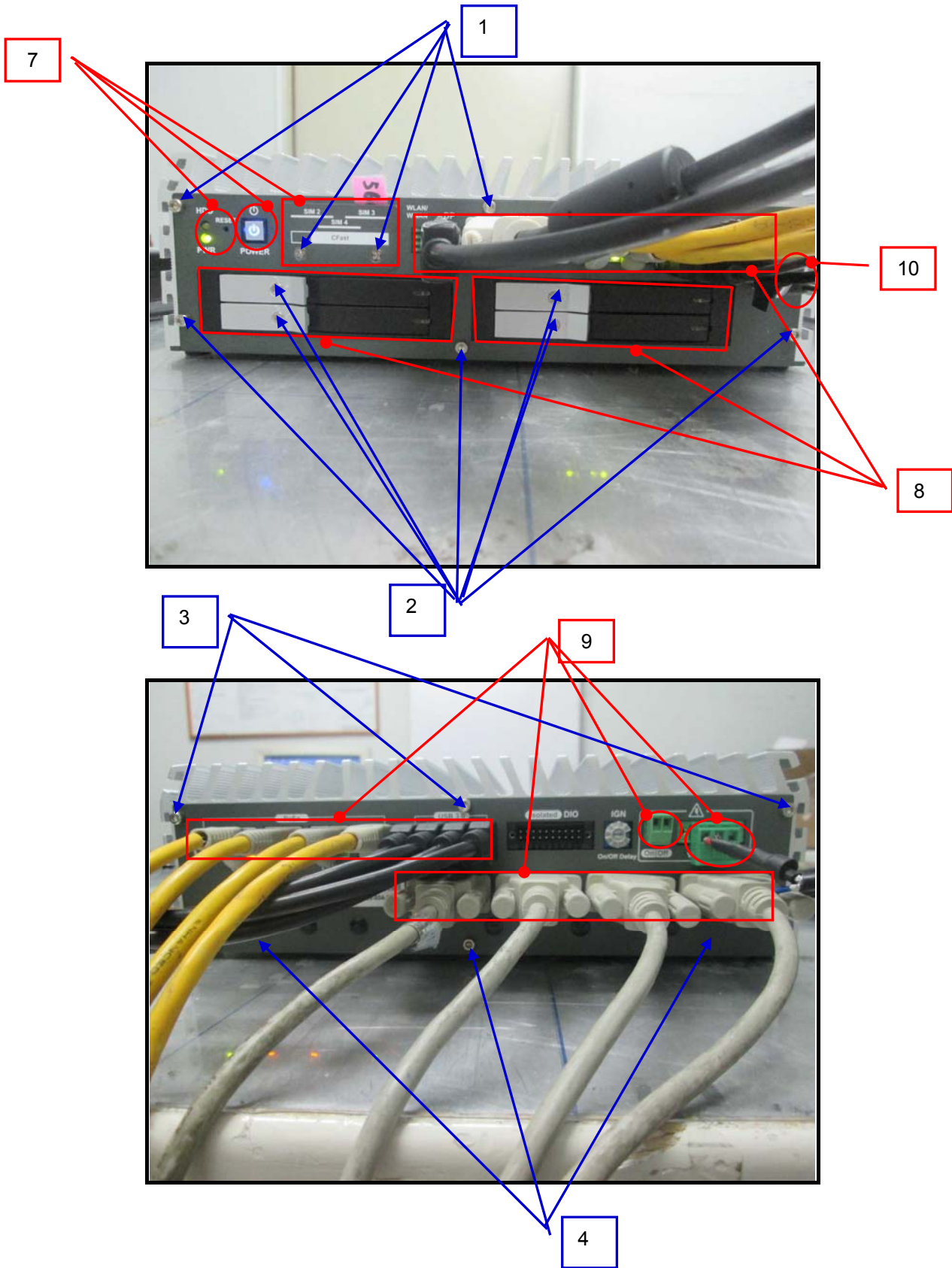
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4	+/-	Four Sides	Note 1	Note 1	A

Description of test points of indirect application:

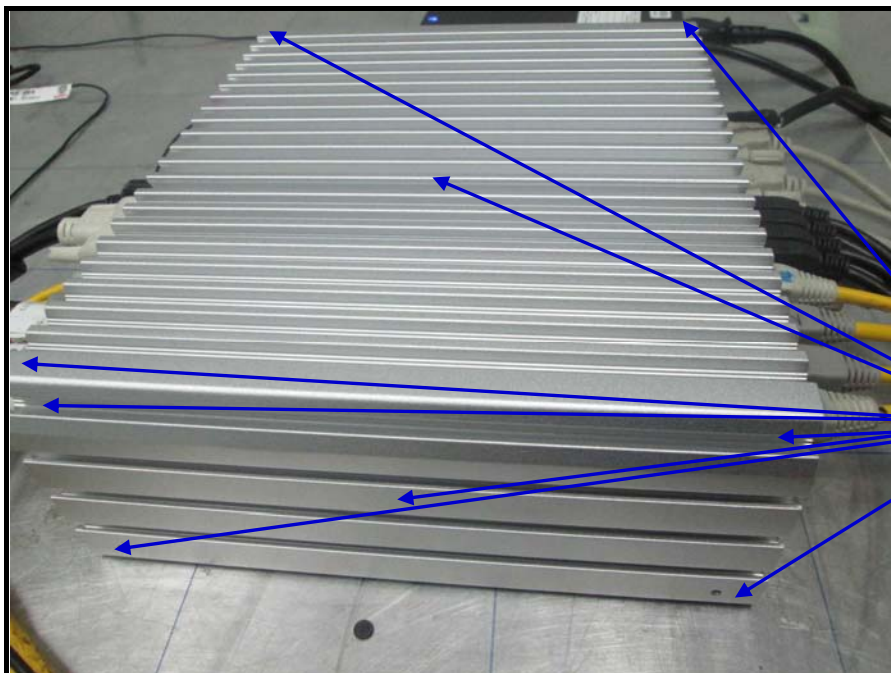
1. Front side                      2. Rear side                      3. Right side                      4. Left side

- Note: 1. The EUT function was correct during the test.  
 2. The screen showed water line during the test, but could self-recover after the test.  
 3. The earphone had disturbance noise during the test, but could self-recover after the test.

### Description of Test Points







5



6

### 13 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

#### 13.1 Test Specification

Basic Standard:	EN/IEC 61000-4-3
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.55m
Dwell Time:	3 seconds

#### 13.2 Test Instruments

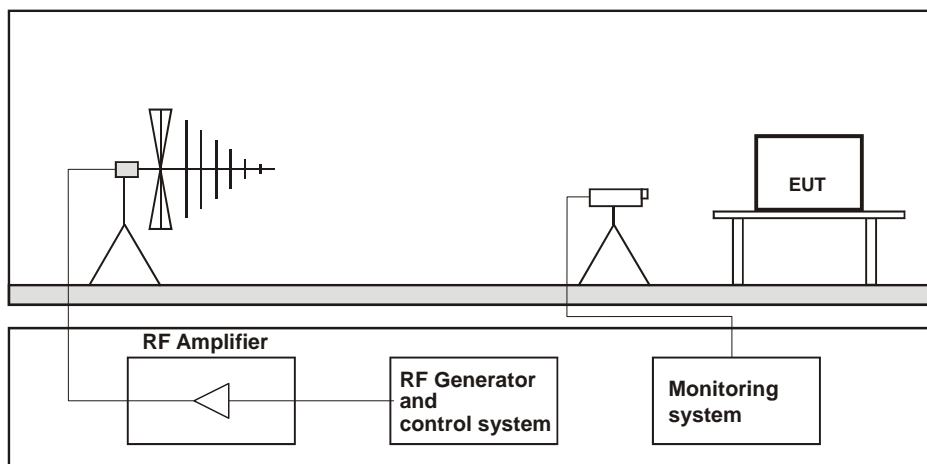
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Power Amp ROHDE & SCHWARZ	BBA 100	101761	NA	NA
Power Amp ROHDE & SCHWARZ	BBA150	101714	NA	NA
Power Sensor ROHDE & SCHWARZ	NRP-Z91	102733	Oct. 13, 2014	Oct. 12, 2015
Power Sensor ROHDE & SCHWARZ	NRP-Z91	102732	Oct. 13, 2014	Oct. 12, 2015
Signal Generator ROHDE & SCHWARZ	SMBV100A	260761	Oct. 14, 2014	Oct. 13, 2015
R&S Software	EMC32 Version 9.15.03	NA	NA	NA
LOG ANTENNA Schwarzbeck	STLP9149	9149-280	NA	NA
LOG ANTENNA Amplifier Research	AT5080ANT	303730	NA	NA
ELECTRIC FIELD PROBE AR	FL7006	0338717	May 19, 2015	May 18, 2016

- Notes:
1. The test was performed in Hwa Ya RS Room 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.

### 13.3 Test Arrangement

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

- The testing was performed in a modified semi-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 field strength level was 3 V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



#### Table-top Equipment

The EUT installed in a representative system as described in section 7 of EN/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.

### 13.4 Test Results

Input Power	24 Vdc	Test Date	2015/8/27
Environmental Conditions	24 °C, 58% RH	Tested by	Andy Chang

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 -1000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note 1	A

Note: 1. The EUT function was correct during the test.

## 14 Electrical Fast Transient/Burst Immunity Test (EFT)

### 14.1 Test Specification

Basic Standard:	EN/IEC 61000-4-4
Test Voltage:	Signal / telecommunication port: $\pm 0.5\text{kV}$ Input DC power port: $\pm 0.5\text{kV}$ Input AC power port: $\pm 1\text{kV}$
Impulse Repetition Frequency:	xDSL telecommunication port: 100kHz others: 5kHz
Impulse Wave Shape:	5/50 ns
Burst Duration:	0.75 ms for 100kHz Repetition Frequency 15 ms for 5kHz Repetition Frequency
Burst Period:	300 ms
Test Duration:	1 min.

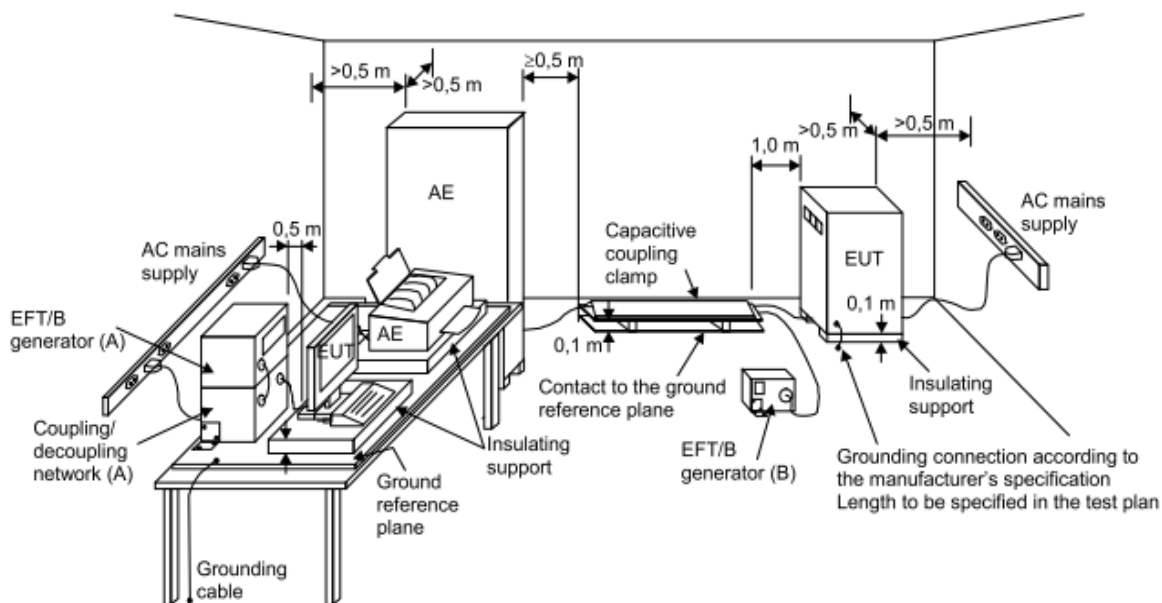
### 14.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMC-Partner EFT Generator	TRA2000 EFT-C1	623	May 14, 2015	May 13, 2016
EMC-Partner Capacitive Coupling clamp	CN-EFT1000	364	May 14, 2015	May 13, 2016
EFT Adapter WONPRO	WA	EF1Ada-001	NA	NA
Software	EMC-Partner GENECS	NA	NA	NA

- Notes: 1. The test was performed in Hwa Ya EFT Room 1.  
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 14.3 Test Arrangement

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



Note:

- location for supply line coupling
- location for signal lines coupling

### 14.4 Supplementary Information

The requirement followed by the manufacturer's specification.

### 14.5 Test Results

Input Power	24 Vdc	Test Date	2015/9/4
Environmental Conditions	24 °C, 65% RH	Tested by	Josh Lin

#### Input DC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5	L1	+/-	Note 1, 2	B
0.5	L2	+/-	Note 1, 2	B
0.5	L1-L2	+/-	Note 1, 2	B

#### Signal / telecommunication port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5	LAN 1	+/-	Note 3	B
0.5	LAN 2	+/-	Note 3	B
0.5	LAN 3	+/-	Note 3	B
0.5	LAN 4	+/-	Note 3	B
0.5	LAN 5	+/-	Note 3	B
0.5	LAN 6	+/-	Note 3	B

- Note: 1. The screen showed water line during the test, but could self-recover after the test.  
 2. The earphone had disturbance noise during the test, but could self-recover after the test.  
 3. The EUT lost of LAN PING during the test, but could self-recover after the test.



Input Power	230 Vac, 50 Hz (System)	Test Date	2015/8/25
Environmental Conditions	24 °C, 65% RH	Tested by	Josh Lin

## Input AC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
1	L1	+/-	Note 1, 2	B
1	L2	+/-	Note 1, 2	B
1	PE	+/-	Note 1, 2	B
1	L1-L2-PE	+/-	Note 1, 2	B

## Signal / telecommunication port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5	LAN 1	+/-	Note 3	B
0.5	LAN 2	+/-	Note 3	B
0.5	LAN 3	+/-	Note 3	B
0.5	LAN 4	+/-	Note 3	B
0.5	LAN 5	+/-	Note 3	B
0.5	LAN 6	+/-	Note 3	B

- Note: 1. The screen showed water line during the test, but could self-recover after the test.  
2. The earphone had disturbance noise during the test, but could self-recover after the test.  
3. The EUT lost of LAN PING during the test, but could self-recover after the test.

## 15 Surge Immunity Test

### 15.1 Test Specification

Basic Standard:	EN/IEC 61000-4-5
Wave-Shape:	Signal / telecommunication port (direct to outdoor cables*): 10/700 $\mu$ s Open Circuit Voltage 5/320 $\mu$ s Short Circuit Current  Input DC power port (direct to outdoor cables*): 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current  Input AC power port: 1.2/50 $\mu$ s Open Circuit Voltage 8/20 $\mu$ s Short Circuit Current
Test Voltage:	Signal and telecommunication ports**: w/o primary protectors: NA, with primary protectors fitted: NA  Input DC power port: Line to earth or ground: NA  Input AC power ports: Line to line: $\pm 0.5, \pm 1$ kV, Line to earth or ground: $\pm 0.5, \pm 1, \pm 2$ kV
AC Phase Angle (degree):	0°, 90°, 180°, 270°
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 positive and 5 negative at selected points

\* This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables.

\*\* For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors fitted. Otherwise the 1 kV test level is applied without primary protection in place.

### 15.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Modular Impulse Generator EMC-Partner	MIG0603IN3 IEC-ANSI	352	Sep. 02, 2014	Sep. 01, 2015
Universal Surge Coupling De-Coupling Network EMC-Partner	CDN-UTP8	011	Sep. 02, 2014	Sep. 01, 2015
Surge Adapter WONPRO	WA	SU1 Ada-001	NA	NA

Notes: 1. The test was performed in Hwa Ya Surge Room 2.

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

### 15.3 Test Arrangement

#### a. Input AC/DC Power ports:

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. Signal and telecommunication ports,

- Unshielded unsymmetrical interconnection lines:

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.

- Unshielded symmetrical interconnections communication lines:

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.

- High speed communications lines

Prior to the test, the correct operation of the port shall be verified; the external connection shall then be removed and the surge applied directly to the port's terminals with no coupling /decoupling network. After the surge, the correct operation of the port shall again be verified.

- Shielded lines:

- Direct application,

The EUT is isolated from ground and the surge is applied to its metallic enclosure; the termination (or auxiliary equipment) at the port(s) under test is grounded. This test applies to equipment with single or multiple shielded cables.

Rules for application of the surge to shielded lines:

- a) Shields grounded at both ends

- The surge injection on the shield.

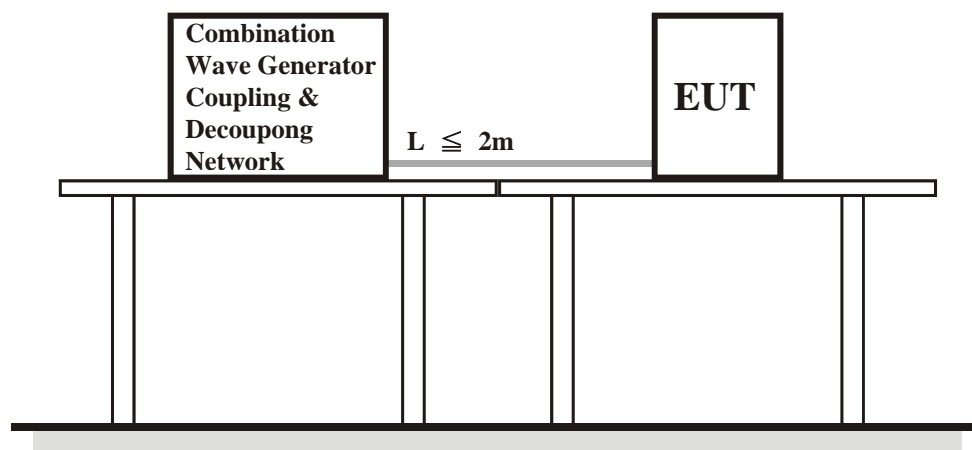
- b) Shields grounded at one end

- If in the installation the shield is connected only at the auxiliary equipment, test shall be done in that configuration but with the generator still connected to the EUT side. If cable lengths allow, the cables shall be on insulated supports 0,1 m above the ground plane or cable tray.

For products which do not have metallic enclosures, the surge is applied directly to the shielded cable.

- Alternative coupling method for testing single cables in a multi-shield configuration,

Surges are applied in close proximity to the interconnection cable under test by a wire. The length of the cable between the port(s) under test and the device attached to the other end of the cable shall be the lesser of: the maximum length permitted by the EUT's specification, or 20 m. Where the length exceeds 1 m, excess lengths of cables shall be bundled at the approximate centre of the cables with the bundles 30 cm to 40 cm in length.



#### 15.4 Supplementary Information

The requirement followed by the manufacturer's specification.

#### 15.5 Test Results

Input Power	230 Vac, 50 Hz (System)	Test Date	2015/8/25
Environmental Conditions	24 °C, 65% RH	Tested by	Josh Lin

Input AC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 1	L1-L2	+/-	Note 1	A
0.5, 1, 2	L1-PE	+/-	Note 1	A
0.5, 1, 2	L2-PE	+/-	Note 1	A

Note: 1. The EUT function was correct during the test.

## 16 Immunity to Conducted Disturbances Induced by RF Fields (CS)

### 16.1 Test Specification

Basic Standard:	EN/IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Voltage Level:	3 V
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

### 16.2 Test Instruments

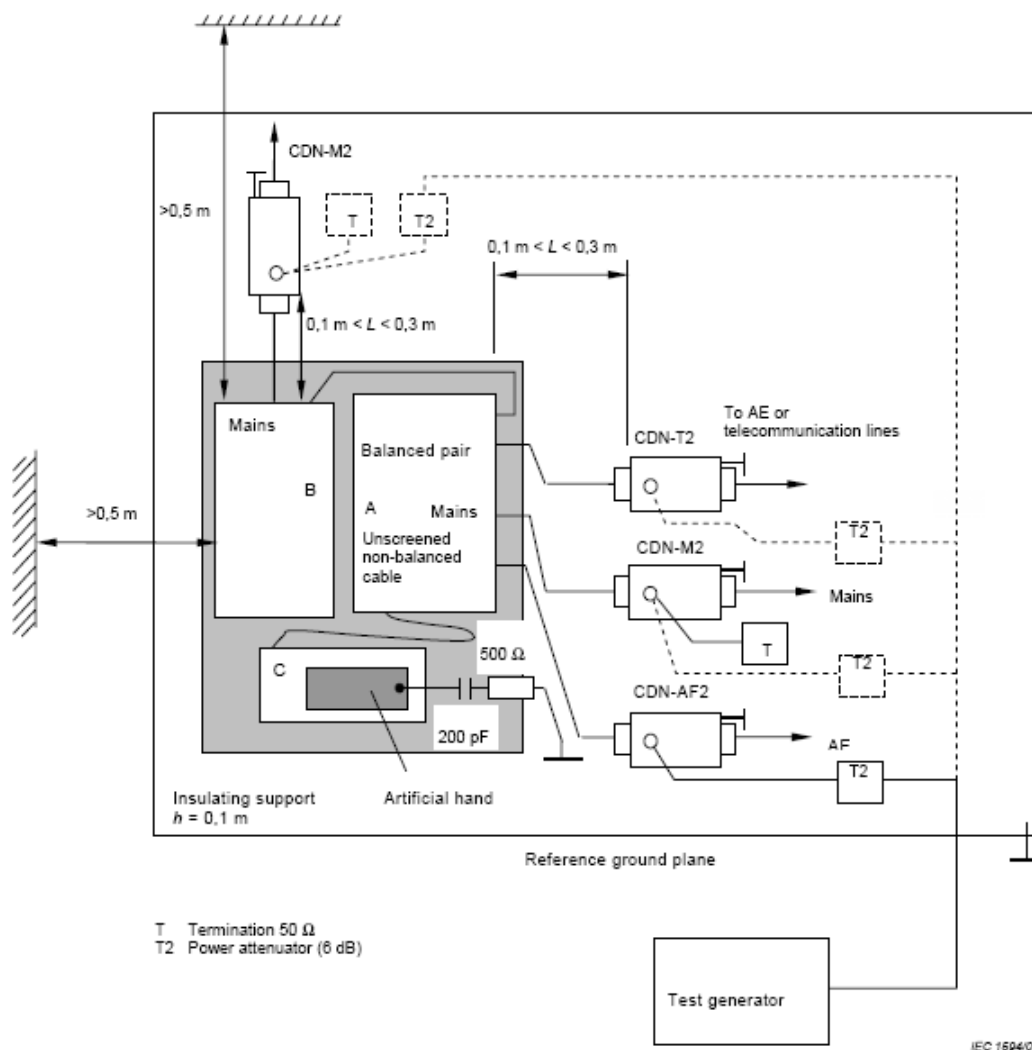
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M1-25A	03030	Apr. 22, 2015	Apr. 21, 2016
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M2-25A	03049	Nov. 07, 2014	Nov. 06, 2015
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M2-25A	03050	Nov. 07, 2014	Nov. 06, 2015
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M3-25A	03056	Nov. 07, 2014	Nov. 06, 2015
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M3-25A	03057	Nov. 07, 2014	Nov. 06, 2015
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-T2	03030	Nov. 07, 2014	Nov. 06, 2015
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-T4	03031	Nov. 07, 2014	Nov. 06, 2015
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	F-090407-1004-1	100923	Jul. 13, 2015	Jul. 12, 2016
EMI Injection Clamp	F203I-23MM	434	Nov. 07, 2014	Nov. 06, 2015
Amplifier Research Power Amplifier	75A250AM2	307804	NA	NA
BOONTON 4232ARF POWER METER	4232A	104302	Nov. 24, 2014	Nov. 23, 2015
R&S Signal Generator	SML01	102148	Nov. 14, 2014	Nov. 13, 2015
Software	ADT_CS_V37	NA	NA	NA
POWER SENSOR	51011-EMC	30028	Nov. 24, 2014	Nov. 23, 2015
POWER SENSOR	51011-EMC	33029	Nov. 24, 2014	Nov. 23, 2015
6dB Attenuator	HFP-575-3/6-N M/F	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya CS Room 1.

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

### 16.3 Test Arrangement

- The EUT shall be tested within its intended operating and climatic conditions.
- An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.
- 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.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.



- Note:
- The EUT clearance from any metallic obstacles shall be at least 0,5 m.
  - Interconnecting cables ( $\leq 1$  m) belonging to the EUT shall remain on the insulating support.

### 16.4 Supplementary Information

The requirement followed by the manufacturer's specification.

**16.5 Test Results**

Input Power	24 Vdc	Test Date	2015/9/3
Environmental Conditions	24 °C, 55% RH	Tested by	Tim Mai

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	3	DC Power	CDN-M2	CDN-T8	Note 1	A
0.15 – 80	3	LAN 1	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 2	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 3	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 4	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 5	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 6	CDN-T8	CDN-M2	Note 1	A

Note: 1. The EUT function was correct during the test.

Input Power	230 Vac, 50 Hz (System)	Test Date	2015/8/13
Environmental Conditions	24 °C, 56% RH	Tested by	Leo Chan

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	3	AC Power	CDN-M3	CDN-T8	Note 1	A
0.15 – 80	3	LAN 1	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 2	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 3	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 4	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 5	CDN-T8	CDN-M2	Note 1	A
0.15 – 80	3	LAN 6	CDN-T8	CDN-M2	Note 1	A

Note: 1. The EUT function was correct during the test.

## 17 Power Frequency Magnetic Field Immunity Test

### 17.1 Test Specification

Basic Standard:	EN/IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	1 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

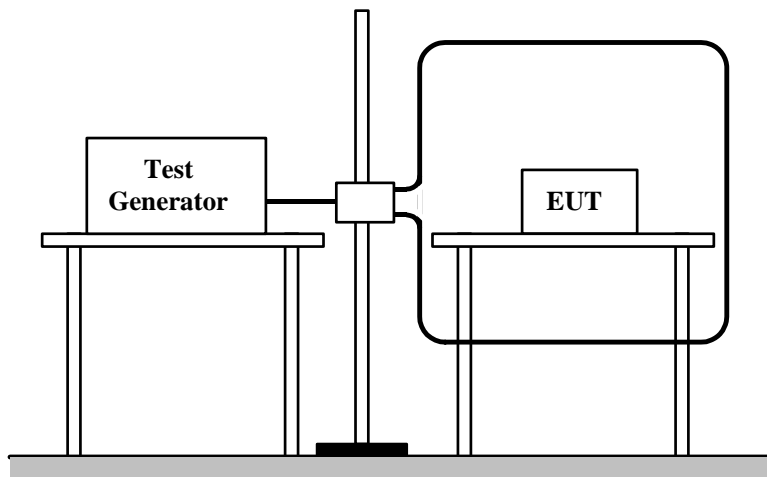
### 17.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
F.W.BELL 4190 Gaussmeter	4190	0743043	Mar. 04, 2015	Mar. 03, 2016
5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 21, 2014	Aug. 20, 2015
Multi turn Magnetic TESEQ	INA702/INA2141	268/1427	Aug. 21, 2014	Aug. 20, 2015

- Notes: 1. The test was performed in Hwa Ya EMS Room.  
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 17.3 Test Arrangement

- 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.



#### Tabletop equipment

The equipment shall be subjected to the test magnetic field (see example as above). The plane of the inductive coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

#### 17.4 Test Results

Input Power	24 Vdc	Test Date	2015/8/13
Environmental Conditions	25 °C, 55% RH	Tested by	Vincent Yang

Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50	1	Note 1	A
Y - Axis	50	1	Note 1	A
Z - Axis	50	1	Note 1	A

Note: 1. The EUT function was correct during the test.

## 18 Voltage Dips and Interruptions

### 18.1 Test Specification

Basic Standard:	EN/IEC 61000-4-11
Test levels:	Voltage Dips: >95% reduction – 0.5 period 30% reduction – 25 periods Voltage Interruptions: >95% reduction – 250 periods
Interval between Event:	Minimum ten seconds
Sync Angle (degrees):	0° / 180°
Test Cycle:	3 times

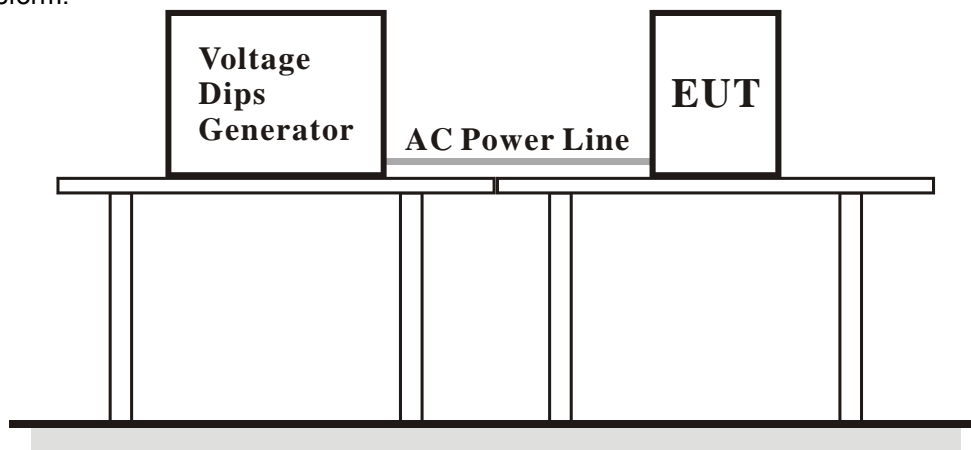
### 18.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ 5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 21, 2014	Aug. 20, 2015
Software	Win2100 V4	NA	NA	NA

- Notes: 1. The test was performed in Hwa Ya EMS Room.  
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 18.3 Test Arrangement

The EUT shall be tested for each selected combination of test levels and duration with a sequence of 3 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 0 degree crossover point of the voltage waveform.



### 18.4 Supplementary Information

The requirement followed by the manufacturer's specification.



**18.5 Test Results**

Input Power	100-240 Vac, 50 Hz (System)	Test Date	2015/8/13
Environmental Conditions	25 °C, 55% RH	Tested by	Vincent Yang

Input Power for testing: 230 Vac, 50 Hz (Nominal input Voltage)					
Voltage Reduction (%)	Duration (period)	Interval (sec)	Times	Observation	Performance Criterion
>95	0.5	10	3	Note 1	A
30	25	10	3	Note 1	A
>95	250	10	3	Note 2	C

Input Power for testing: 240 Vac, 50 Hz (Maximum rated input voltage)					
Voltage Reduction (%)	Duration (period)	Interval (sec)	Times	Observation	Performance Criterion
>95	0.5	10	3	Note 1	A
30	25	10	3	Note 1	A
>95	250	10	3	Note 2	C

Input Power for testing: 100 Vac, 50 Hz (Minimum rated input voltage)					
Voltage Reduction (%)	Duration (period)	Interval (sec)	Times	Observation	Performance Criterion
>95	0.5	10	3	Note 1	A
30	25	10	3	Note 1	A
>95	250	10	3	Note 2	C

- Note: 1. The EUT function was correct during the test.  
 2. The EUT lost of power during the test, and must be recovered manually.

## 19 Pictures of Test Arrangements

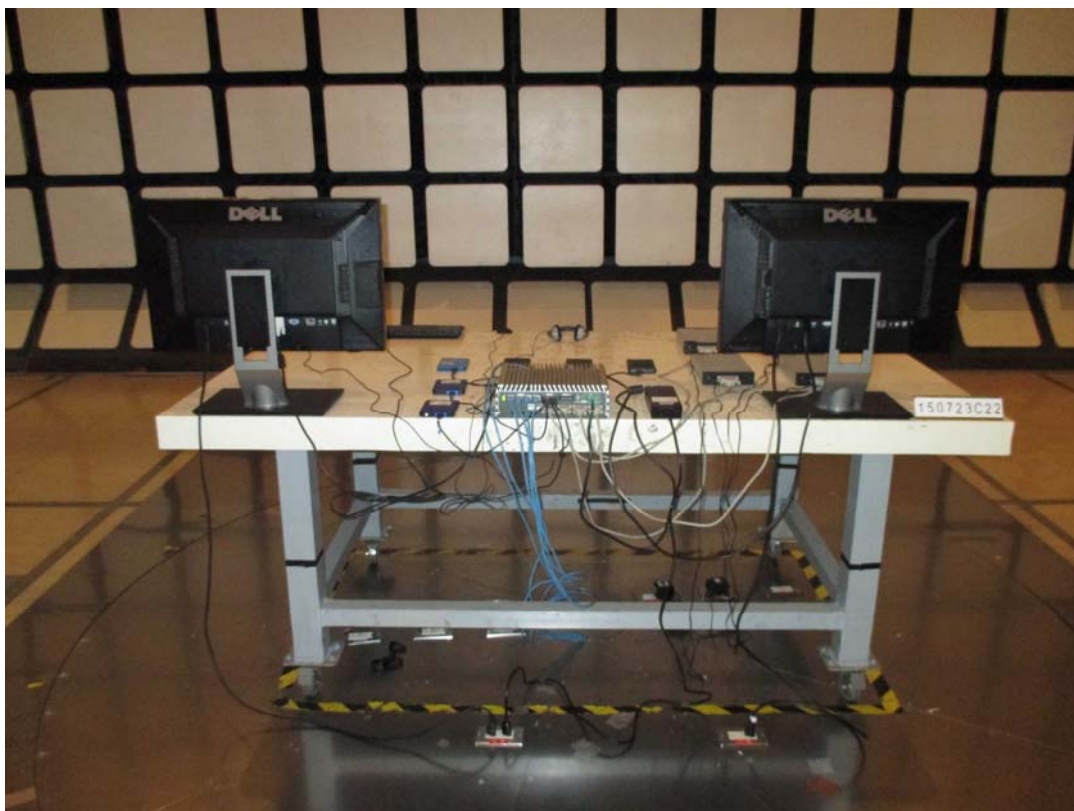
### 19.1 Conducted Disturbance at Mains Ports



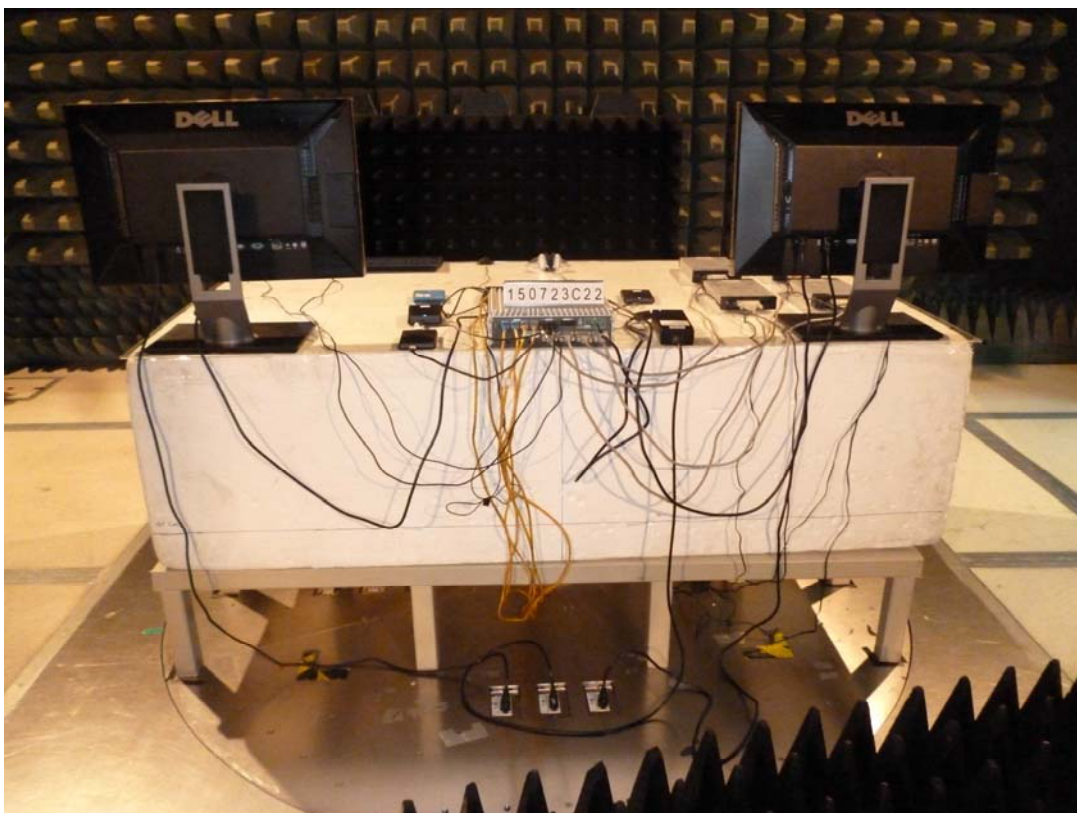
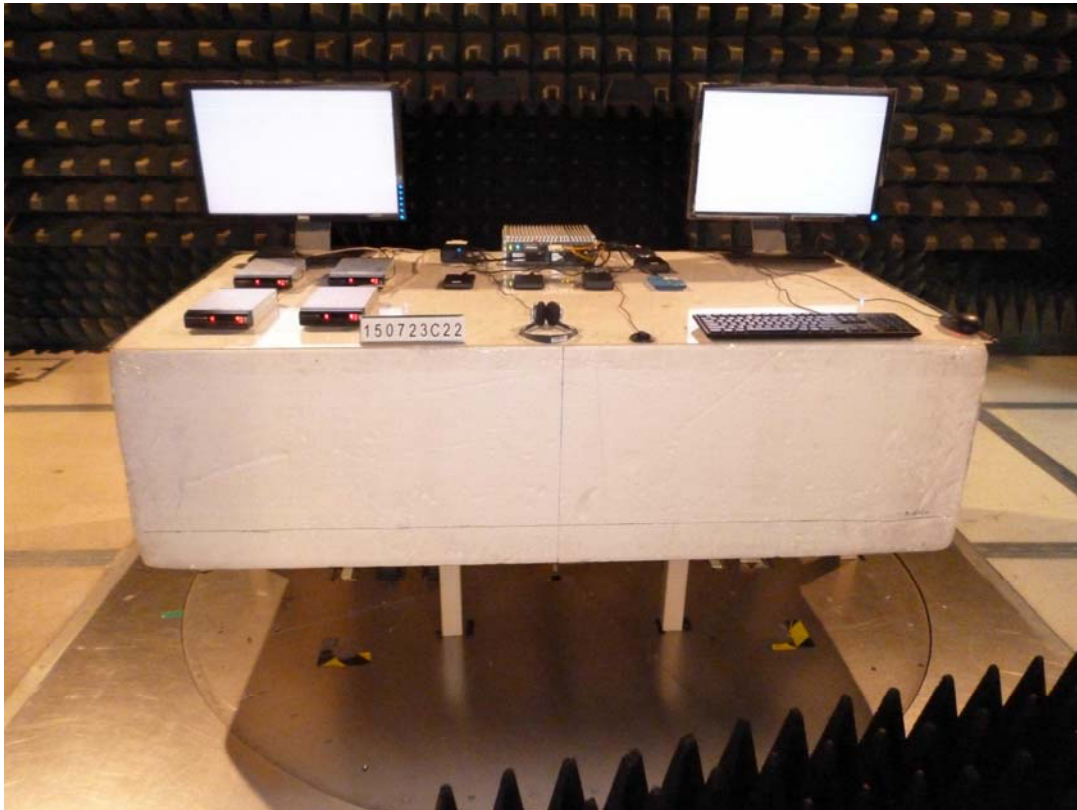
## 19.2 Conducted Disturbance at Telecommunication Ports



### 19.3 Radiated Disturbance up to 1 GHz



#### 19.4 Radiated Disturbance above 1 GHz



### 19.5 Harmonics Current, Voltage Fluctuations and Flicker Measurement



### 19.6 Electrostatic Discharge Immunity Test (ESD)

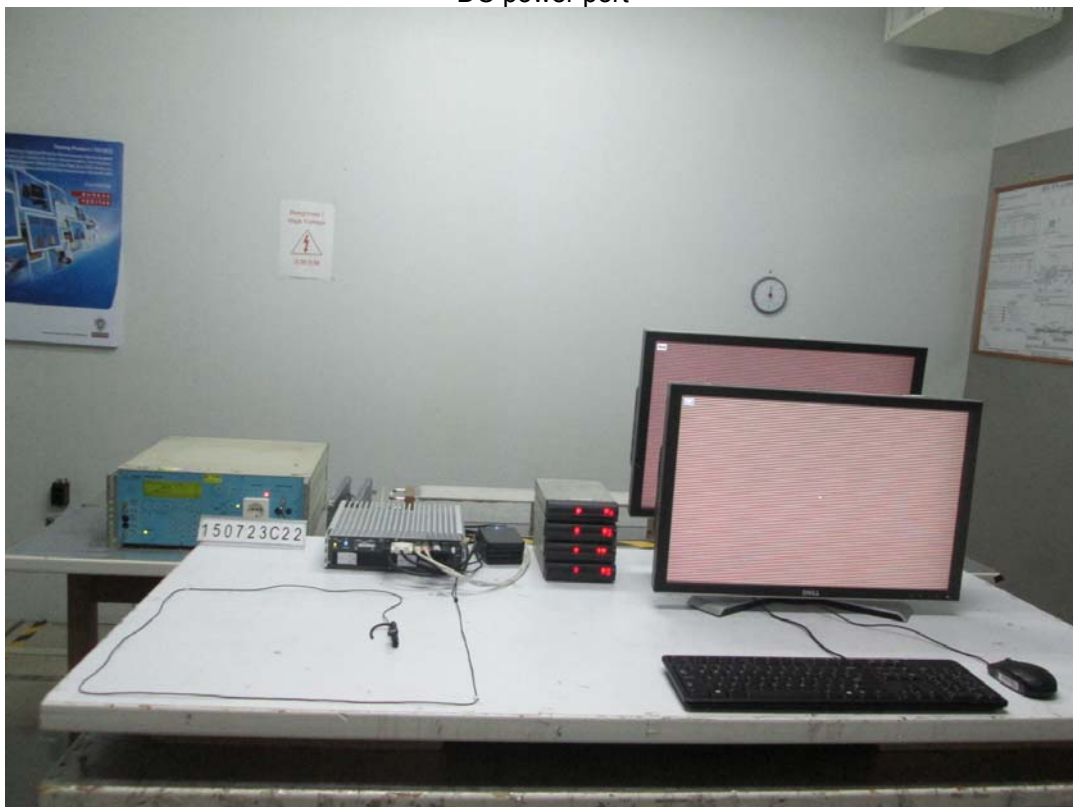


### 19.7 Radio-frequency, Electromagnetic Field Immunity Test (RS)



### 19.8 Electrical Fast Transient/Burst Immunity Test (EFT)

DC power port



LAN 1, 2 port (DC)

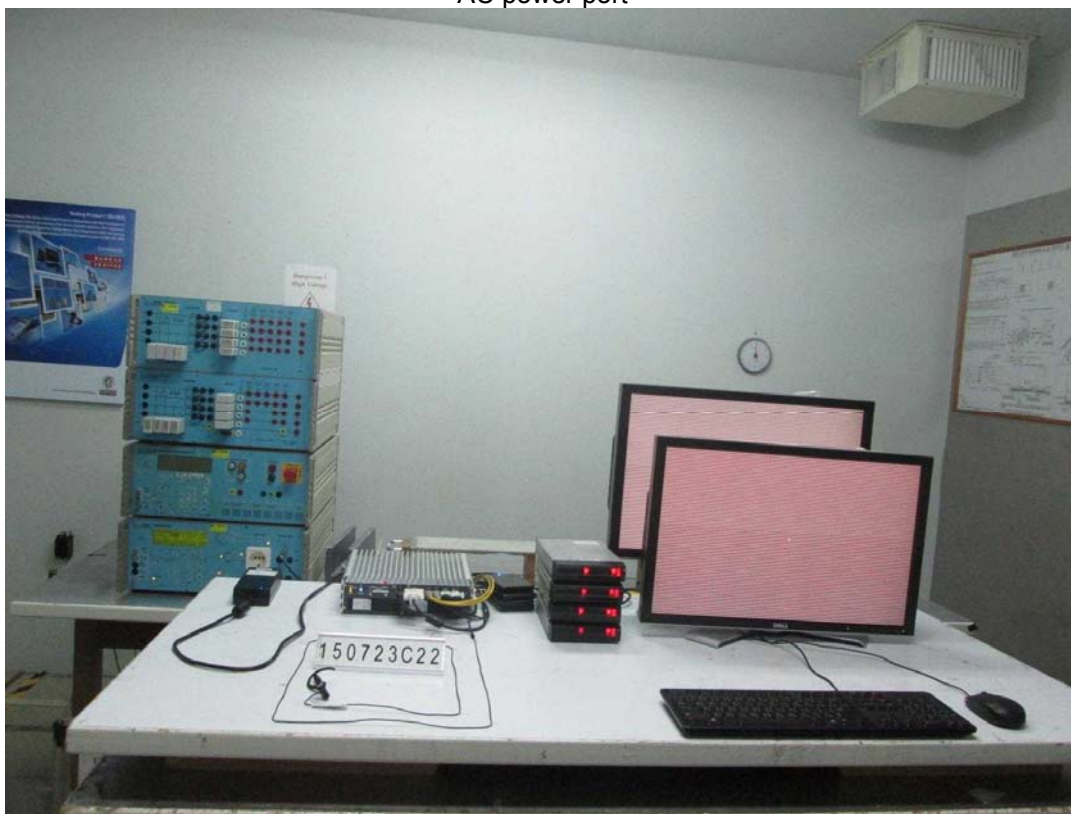


LAN 3, 4, 5, 6 port (DC)





AC power port



LAN 1, 2 port (AC)



LAN 3, 4, 5, 6 port (AC)



### 19.9 Surge Immunity Test

Mains port



### 19.10 Conducted Disturbances Induced by RF Fields (CS)

DC power port



LAN 1, 2 port (DC)



LAN 3, 4, 5, 6 port (DC)



AC power port



LAN 1, 2 port (AC)



LAN 3, 4, 5, 6 port (AC)



### 19.11 Power Frequency Magnetic Field Immunity Test (PFMF)



### 19.12 Voltage Dips and Interruptions





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

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