CE EMC Test Report

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Test Model:	Wedge100S
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Test Date:	Jan. 04 to 18, 2017
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Release Control Record

Issue No.	Description	Date Issued
CE161221E06	Original release.	Feb. 08, 2017

1 Certificate of Conformity

Product:	Ethernet Switch
Brand:	Facebook
Test Model:	Wedge100S
Sample Status:	R&D SAMPLE
Applicant:	Accton Technology Corporation
Test Date:	Jan. 04 to 18, 2017
Standards:	**EN 55032:2012 +AC:2013, Class A** **AS/NZS CISPR 32:2013, Class A** **CISPR 32:2012, Class A** **EN 61000-3-2:2014, Class A** **EN 61000-3-3:2013** **EN 55024:2010+A1:2015** EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0 EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2 EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0 EN 61000-4-5:2014 / IEC 61000-4-5:2014 ED. 3.0 EN 61000-4-6:2014 / IEC 61000-4-6:2013 ED. 4.0 EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0 EN 61000-4-11:2004 / IEC 61000-4-11:2004 ED. 2.0

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 : _____ , **Date:** Feb. 08, 2017
Midoli Peng / Specialist

Approved by : _____ , **Date:** Feb. 08, 2017
Ken Lu / Manager

2 Summary of Test Results

Emission				
Standard	Clause	Test Item	Result/Remarks	Verdict
EN 55032:2012 +AC:2013	A.3	AC Power Line Conducted Emissions	Minimum passing Class A margin is -15.08 dB at 0.19299 MHz	Pass
EN 55032:2012 +AC:2013	A.3	Asymmetric mode conducted emission at wired network ports	Minimum passing Class A margin is -22.20 dB at 1.30078 MHz	Pass
EN 55032:2012 +AC:2013	A.2	Radiated emission 30-1000 MHz	Minimum passing Class A margin is -3.11 dB at 149.99 MHz	Pass
EN 55032:2012 +AC:2013	A.2	Radiated emission above 1GHz	Minimum passing Class A margin is -14.82 dB at 1625.00 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	$P_{st} \leqq 1.0$ $d_{max} \leqq 4\%$ $P_{lt} \leqq 0.65$ $d_c \leqq 3.3\%$ $T_{max} \leqq 500ms$	Pass

Immunity				
EN 55024 Clause	Basic standard	Test Item	Result/Remarks	Verdict
4.2.1	EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharges (ESD)	Performance Criterion B	Pass
4.2.3.2	EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2	Continuous radiated disturbances (RS)	Performance Criterion A	Pass
4.2.2	EN 61000-4-4:2004 EN 61000-4-4:2012* / IEC 61000-4-4:2012 ED. 3.0*	Electrical fast transients (EFT)	Performance Criterion A	Pass
4.2.5	EN 61000-4-5:2006 EN 61000-4-5:2014* / IEC 61000-4-5:2014 ED. 3.0*	Surges	Performance Criterion A	Pass
4.2.3.3	EN 61000-4-6:2009 EN 61000-4-6:2014* / IEC 61000-4-6:2013 ED. 4.0*	Continuous conducted disturbances (CS)	Performance Criterion A	Pass
4.2.4	EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0	Power-frequency magnetic fields (PFMF)	Performance Criterion A	Pass
4.2.6	EN 61000-4-11:2004 / IEC 61000-4-11:2004 ED. 2.0	Voltage dips and interruptions	Voltage Dips: >95% reduction – 0.5 period, Performance Criterion A 30% reduction – 25 periods, Performance Criterion B Voltage Interruptions: >95% reduction – 250 periods, Performance Criterion B	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) (±)	Maximum allowable uncertainty (±)
Conducted emission from AC mains power port using AMN, 150kHz ~ 30MHz	1.83 dB	3.4 dB (U_{cispr})
Asymmetric mode conducted emission using AAN, 150kHz ~ 30MHz	2.98 dB	5.0 dB (U_{cispr})
Radiated emission, 30MHz ~ 1GHz	3.62 dB	6.3 dB (U_{cispr})
Radiated emission, 1GHz ~ 6GHz	3.34 dB	5.2 dB (U_{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 Accton Technology Corporation, for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.2 General Description of EUT

Product	Ethernet Switch
Brand	Facebook
Test Model	Wedge100S
Sample Status	R&D SAMPLE
Operating Software	NA
Power Supply Information	Refer to Note 2
Accessory Device	NA
Data Cable Supplied	NA
I/O Port	QSFP28 x32 RJ45 MGMT x1 RJ45 console x1 Type-A USB2 x1 Facebook 14-pin debug connector x1 RJ485 x3 GPIO x1

Note:

1. The test frequency range was performed up to 6GHz for radiated emission test.
2. The EUT must be supplied with power supplies as below table.

Internal AC Power supply		
Brand	Model	Specification
Bel power	SPAFCBK-14G	Device Type: Slide-in Input AC: 100-240V, 9-4A, 50-60Hz Output DC: 12V/3.3V, 62A/3A
Internal DC Power supply		
Brand	Model	Specification
Accton	Wedge100-PWR-Module	Device Type: Slide-in 12V, 29A

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

The EUT is designed with AC power of rating 100-240Vac, 50-60Hz & DC 12V.

Test modes are presented in the report as below.

Test Condition				
Conducted emission test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power (Left PSU tested)	100Gbps	1Gbps
Mode 2	Bel power	Two power (Right PSU tested)	100Gbps	1Gbps
Mode 3(Note 1)	Bel power	Two power (Left PSU tested)	100Gbps	1Gbps
Mode 4(Note 1)	Bel power	Two power (Right PSU tested)	100Gbps	1Gbps
Note 1 : According to Annex A.1 of EN 55032/CISPR 32, Testing at two nominal voltages of 230 V (±10 V) and 110 V (±10 V), using a frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use. Therefore, the Mode 3~4 which are tested at voltages of 110V/60Hz.				
Conducted emission at telecom port test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power	100Gbps	1Gbps (be tested)
Mode 2	Accton	One power	100Gbps	1Gbps (be tested)
Radiated emission test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power	100Gbps	1Gbps
Mode 2(Note 1)	Bel power	Two power	100Gbps	1Gbps
Mode 3	Accton	One power	100Gbps	1Gbps
Note 1 : According to Annex A.1 of EN 55032/CISPR 32, Testing at two nominal voltages of 230 V (±10 V) and 110 V (±10 V), using a frequency of 50 Hz or 60 Hz, is normally sufficient for an EUT intended for worldwide use. Therefore, the Mode 2 which are tested at voltages of 110V/60Hz.				

Harmonics, Flicker test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power (Left PSU tested)	100Gbps	1Gbps
Mode 2	Bel power	Two power (Right PSU tested)	100Gbps	1Gbps
Immunity - ESD / RS / PFMF test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power	100Gbps	1Gbps
Mode 2	Accton	One power	100Gbps	1Gbps
Immunity - EFT / CS test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power (Left PSU tested)	100Gbps	1Gbps
Mode 2	Bel power	Two power (Right PSU tested)	100Gbps	1Gbps
Mode 3(Note 1)	Accton	One power	100Gbps	1Gbps
Note 1: For EFT test item : only tested signal port				
Immunity – Surge / DIP test				
Test Mode	PSU (Brand)	PSU	Port 1 to 32 For DAC	MGMT
Mode 1	Bel power	Two power (Left PSU tested)	100Gbps	1Gbps
Mode 2	Bel power	Two power (Right PSU tested)	100Gbps	1Gbps

3.4 Test Program Used and Operation Descriptions

For AC Mode Test:

1. Turn on the power of all equipment.
2. Support units A (Laptop) runs “Ping.exe” program to communicate with EUTvia UTP cable.
3. The EUT under transmission/receiving condition of loop back mode.
4. Support unit B (i-pod) is connected to EUT to simulate real connection.
5. Support unit A (Laptop) runs “ Tfgen.exe” program to create LAN utilization via one UTP cable.
6. The EUT is powered by AC power.

For DC Mode Test:

1. Turn on the power of all equipment.
2. Support units A (Laptop) runs “Ping.exe” program to communicate with EUTvia UTP cable.
3. The EUT under transmission/receiving condition of loop back mode.
4. Support unit B (i-pod) is connected to EUT to simulate real connection.
5. Support unit A (Laptop) runs “ Tfgen.exe” program to create LAN utilization via one UTP cable.
6. The EUT is powered by support unit B (DC Power Supply).

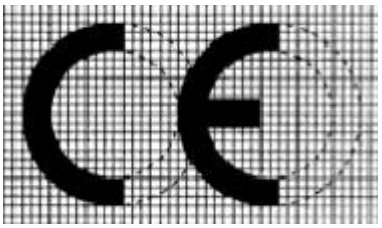
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 14.0625 GHz, provided by Accton Technology Corporation, 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.

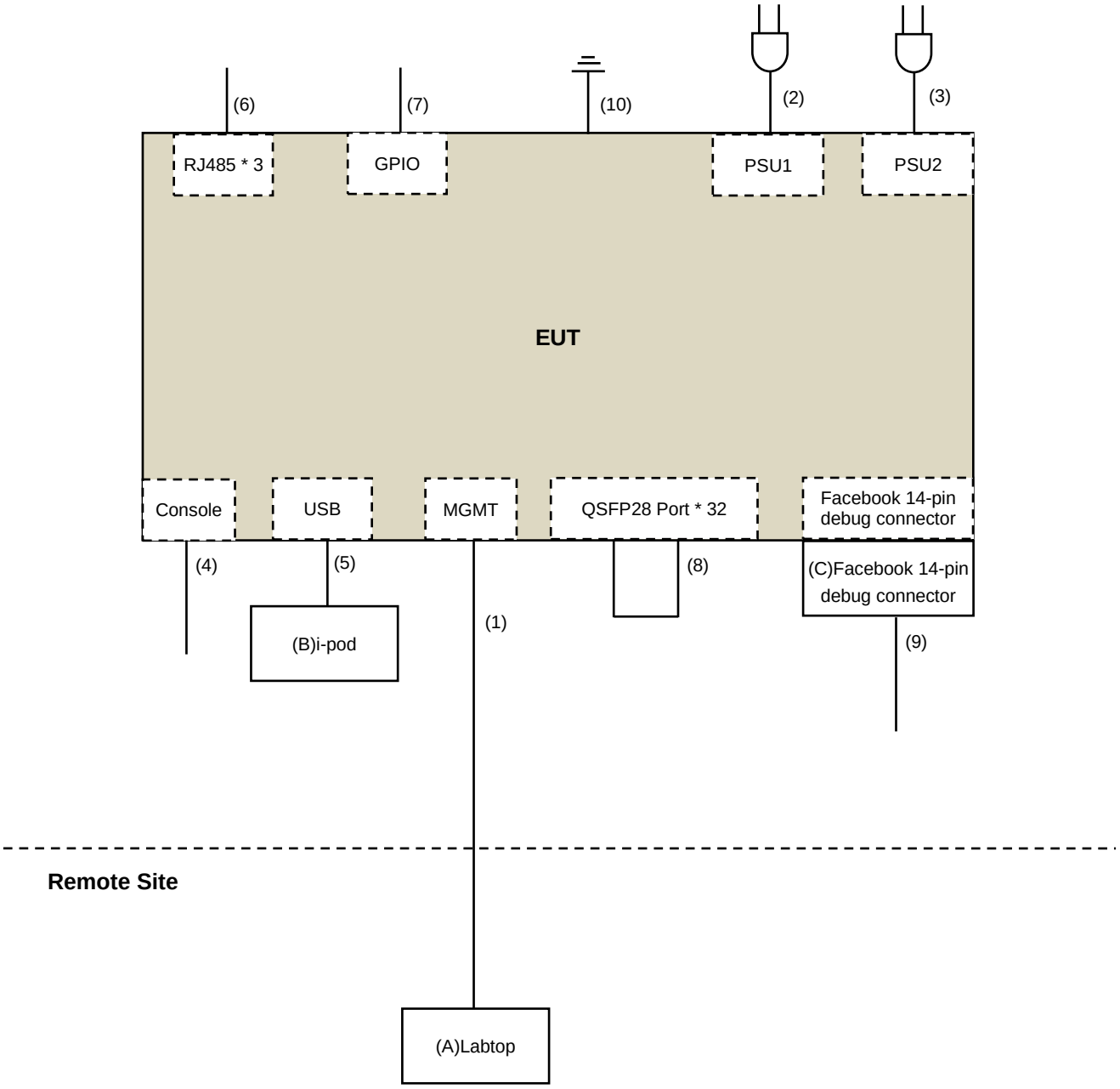
When the product is subject to other Directives covering other aspects and which also provide for the ‘CE’ marking, the accompanying documents must indicate that the product also conforms to those other Directives.

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.

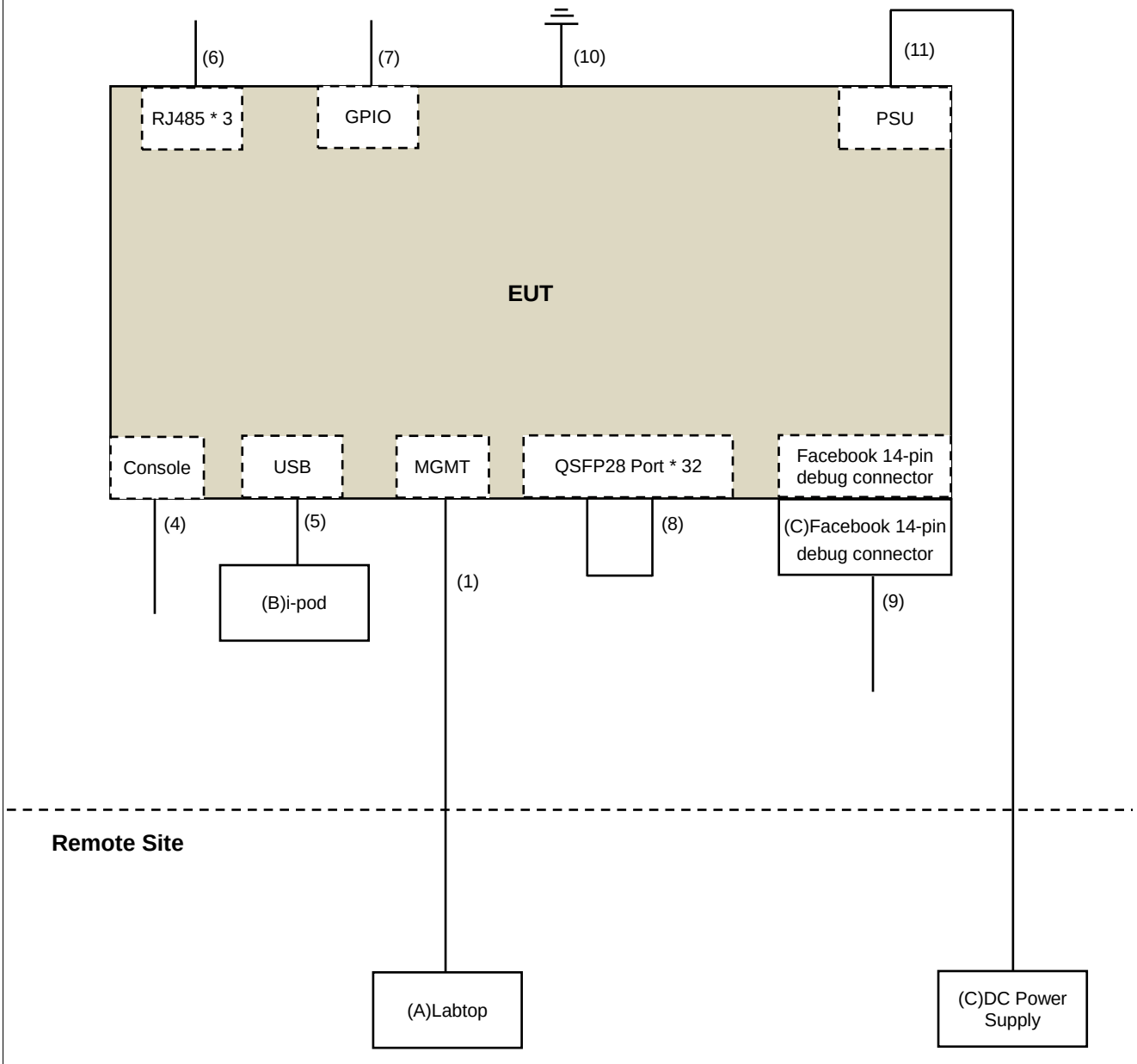
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

For AC Mode Test:



For DC Mode Test:



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Labtop	DELL	PP32LA	HSLB32S	FCC DoC	Provided by Lab
B	i-pod	Apple	MD778TA/A	CC4JMCMXF4T1	NA	Provided by Lab
C	Facebook 14-pin debug connector	NA	NA	NA	NA	Supplied by client
D	DC Power Supply	Agilent	N8758A	US14C4443M	NA	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	RJ-45 Cable	1	10	No	0	Provided by Lab
2	AC cable	1	2.5	Yes	0	Supplied by client
3	AC cable	1	2.5	Yes	0	Supplied by client
4	RJ-45 to RS232	1	1.5	Yes	0	Supplied by client
5	USB Cable	1	0.1	Yes	0	Provided by Lab
6	RJ-45 Cable	3	0.2	No	0	Provided by Lab
7	RJ-45 Cable	1	0.3	No	0	Provided by Lab
8	DAC Cable	16	1	Yes	0	Supplied by client
9	Micro USB to USB Cable	1	1	Yes	0	Supplied by client
10	GND Cable	1	1.8	No	0	Provided by Lab
11	DC cable	2	10	No	0	Provided by Lab

Note: The core is originally attached to the cable.

5 Conducted Emission from the AC Mains Power Port

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100287	Apr. 16, 2016	Apr. 15, 2017
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-523	Oct. 11, 2016	Oct. 10, 2017
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	848773/004	Oct. 26, 2016	Oct. 25, 2017
RF Cable	5D-FB	COACAB-001	May 24, 2016	May 23, 2017
10 dB PAD Mini-Circuits	HAT-10+	CONATT-001	Sep. 13, 2016	Sep. 12, 2017
50 ohms Terminator	50	3	Oct. 26, 2016	Oct. 25, 2017
50 ohms Terminator	N/A	EMC-04	Nov. 02, 2016	Nov. 01, 2017
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. D.
3. The VCCI Con D Registration No. is
4. Tested Date: Jan. 11 to 12, 2017

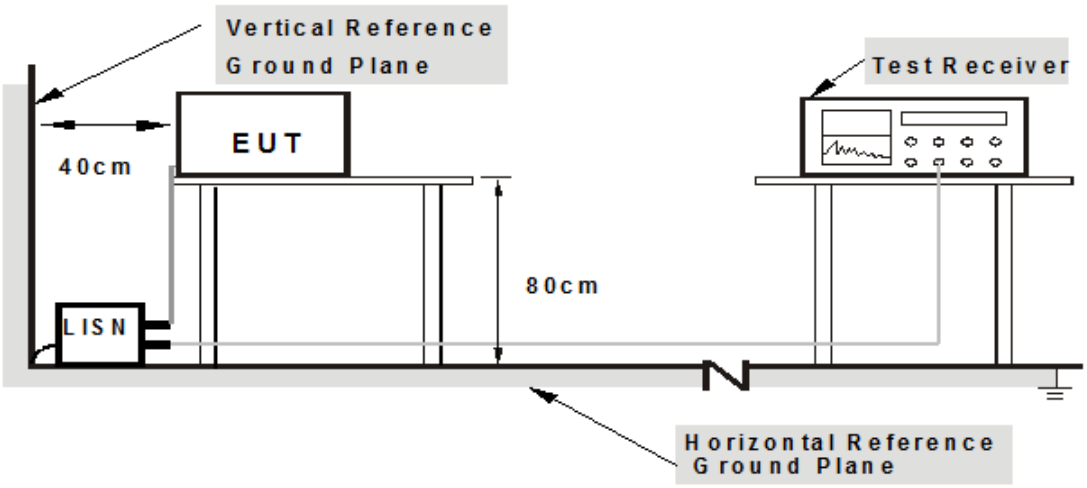
5.3 Test Arrangement

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a Artificial Mains Network (AMN). Other support units were connected to the power mains through another AMN. The two AMNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The 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: 1.Support units were connected to second LISN.

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

5.4 Supplementary Information

There is not any deviation from the test standards for the test method.

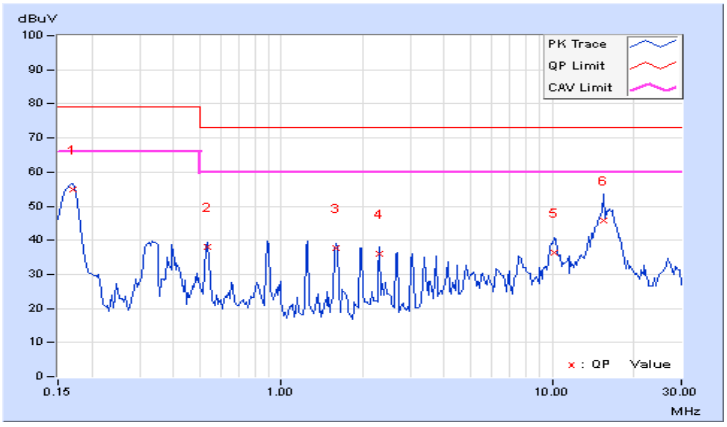
5.5 Test Results (Mode 1)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 1		

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	0.16953	10.30	44.60	37.57	54.90	47.87	79.00	66.00	-24.10	-18.13
2	0.53281	10.38	27.80	26.54	38.18	36.92	73.00	60.00	-34.82	-23.08
3	1.58984	10.45	27.38	19.91	37.83	30.36	73.00	60.00	-35.17	-29.64
4	2.31641	10.42	25.74	17.43	36.16	27.85	73.00	60.00	-36.84	-32.15
5	10.23047	10.65	25.83	19.21	36.48	29.86	73.00	60.00	-36.52	-30.14
6	15.53516	10.84	34.87	24.04	45.71	34.88	73.00	60.00	-27.29	-25.12

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

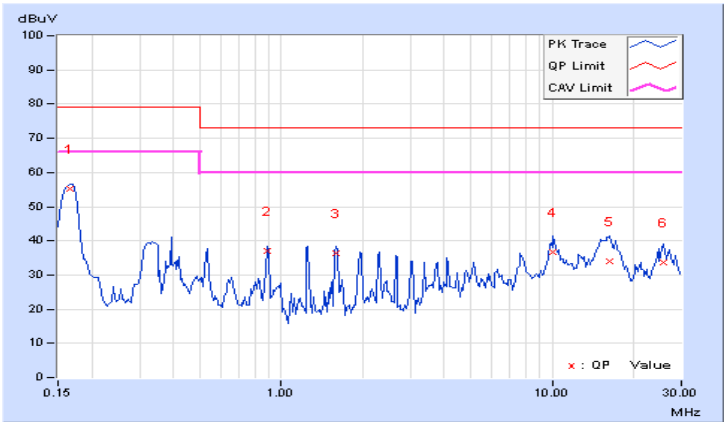


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 1		

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	0.16562	10.36	44.95	39.07	55.31	49.43	79.00	66.00	-23.69	-16.57
2	0.88828	10.53	26.37	22.21	36.90	32.74	73.00	60.00	-36.10	-27.26
3	1.58984	10.55	25.94	18.56	36.49	29.11	73.00	60.00	-36.51	-30.89
4	10.03906	10.67	26.04	19.74	36.71	30.41	73.00	60.00	-36.29	-29.59
5	16.39453	10.89	23.03	12.85	33.92	23.74	73.00	60.00	-39.08	-36.26
6	25.60547	11.09	22.52	15.50	33.61	26.59	73.00	60.00	-39.39	-33.41

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



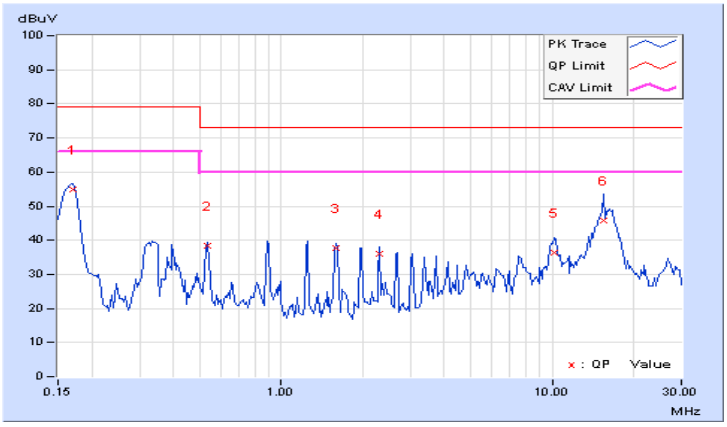
5.6 Test Results (Mode 2)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 2		

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	0.16955	10.30	44.66	37.59	54.96	47.89	79.00	66.00	-24.04	-18.11
2	0.53283	10.38	27.85	26.59	38.23	36.97	73.00	60.00	-34.77	-23.03
3	1.58987	10.45	27.41	19.93	37.86	30.38	73.00	60.00	-35.14	-29.62
4	2.31643	10.42	25.76	17.48	36.18	27.90	73.00	60.00	-36.82	-32.10
5	10.23049	10.65	25.86	19.23	36.51	29.88	73.00	60.00	-36.49	-30.12
6	15.53518	10.84	34.89	24.11	45.73	34.95	73.00	60.00	-27.27	-25.05

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

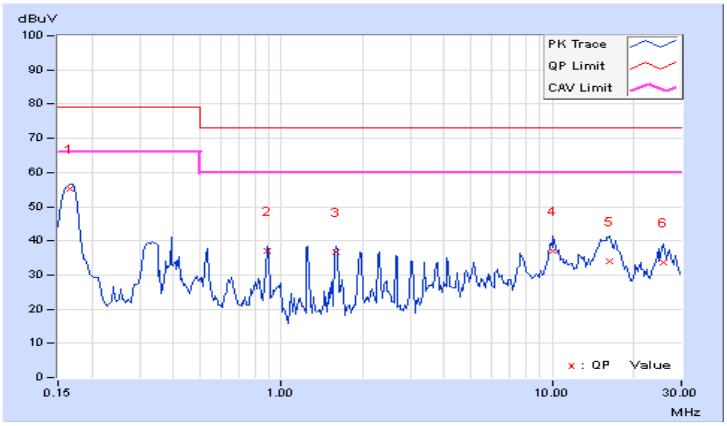


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 2		

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	0.16565	10.36	44.99	39.12	55.35	49.48	79.00	66.00	-23.65	-16.52
2	0.88830	10.53	26.40	22.25	36.93	32.78	73.00	60.00	-36.07	-27.22
3	1.58989	10.55	25.99	18.65	36.54	29.20	73.00	60.00	-36.46	-30.80
4	10.03915	10.67	26.22	19.88	36.89	30.55	73.00	60.00	-36.11	-29.45
5	16.39455	10.89	23.22	12.90	34.11	23.79	73.00	60.00	-38.89	-36.21
6	25.60550	11.09	22.59	15.59	33.68	26.68	73.00	60.00	-39.32	-33.32

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



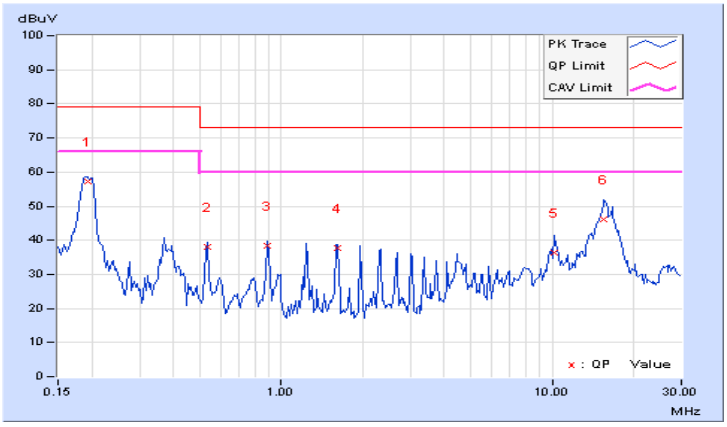
5.7 Test Results (Mode 3)

Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vac, 60Hz	Environmental Conditions	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 3		

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	0.19297	10.29	47.11	40.58	57.40	50.87	79.00	66.00	-21.60	-15.13
2	0.53281	10.38	27.76	27.22	38.14	37.60	73.00	60.00	-34.86	-22.40
3	0.88828	10.47	27.75	25.29	38.22	35.76	73.00	60.00	-34.78	-24.24
4	1.60938	10.45	27.23	19.40	37.68	29.85	73.00	60.00	-35.32	-30.15
5	10.22266	10.65	25.61	18.29	36.26	28.94	73.00	60.00	-36.74	-31.06
6	15.56250	10.84	35.23	24.12	46.07	34.96	73.00	60.00	-26.93	-25.04

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

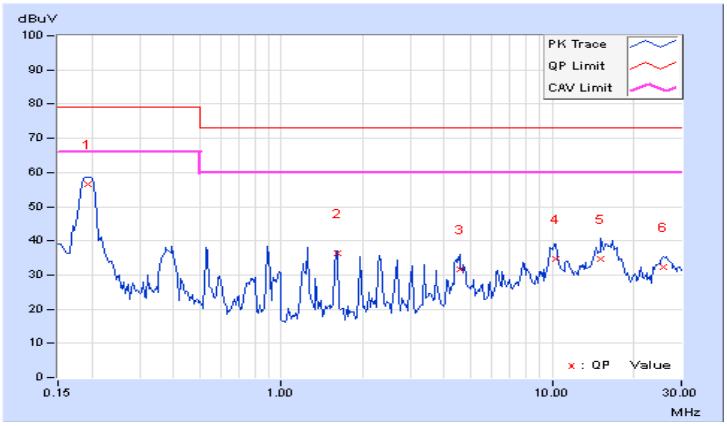


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vac, 60Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 3		

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	0.19297	10.36	46.21	39.87	56.57	50.23	79.00	66.00	-22.43	-15.77
2	1.60938	10.55	25.75	18.23	36.30	28.78	73.00	60.00	-36.70	-31.22
3	4.57031	10.58	21.05	13.35	31.63	23.93	73.00	60.00	-41.37	-36.07
4	10.33594	10.68	23.92	17.27	34.60	27.95	73.00	60.00	-38.40	-32.05
5	15.08203	10.85	23.92	15.74	34.77	26.59	73.00	60.00	-38.23	-33.41
6	25.60156	11.09	21.08	14.73	32.17	25.82	73.00	60.00	-40.83	-34.18

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



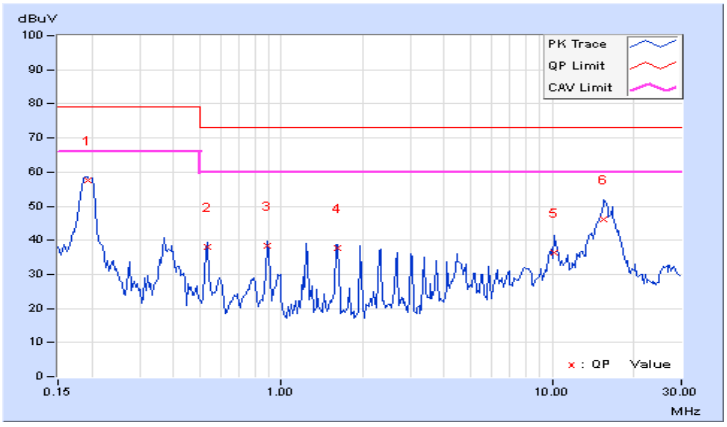
5.8 Test Results (Mode 4)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vac, 60Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 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	**0.19299**	**10.29**	**47.19**	**40.63**	**57.48**	**50.92**	**79.00**	**66.00**	**-21.52**	**-15.08**
2	0.53286	10.38	27.80	27.25	38.18	37.63	73.00	60.00	-34.82	-22.37
3	0.88835	10.47	27.80	25.35	38.27	35.82	73.00	60.00	-34.73	-24.18
4	1.60940	10.45	27.27	19.49	37.72	29.94	73.00	60.00	-35.28	-30.06
5	10.22270	10.65	25.65	18.35	36.30	29.00	73.00	60.00	-36.70	-31.00
6	15.56255	10.84	35.29	24.26	46.13	35.10	73.00	60.00	-26.87	-24.90

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

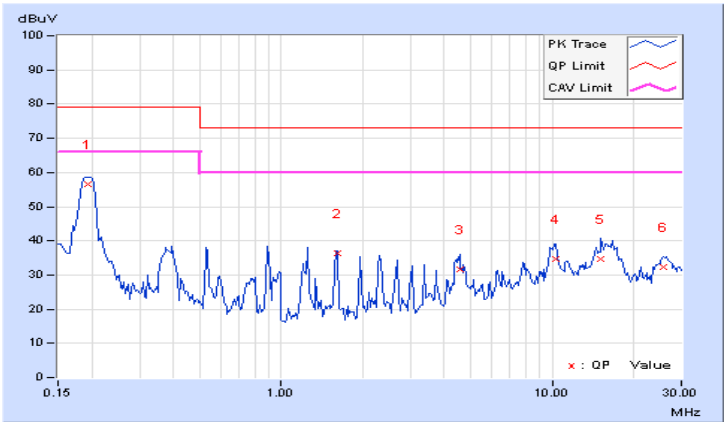


Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110Vac, 60Hz	**Environmental Conditions**	21℃, 65%RH
Tested by	Barry Lee		
Test Mode	Mode 4		

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	0.19300	10.36	46.33	39.91	56.69	50.27	79.00	66.00	-22.31	-15.73
2	1.60940	10.55	25.80	18.29	36.35	28.84	73.00	60.00	-36.65	-31.16
3	4.57035	10.58	21.19	13.40	31.77	23.98	73.00	60.00	-41.23	-36.02
4	10.33600	10.68	23.96	17.30	34.64	27.98	73.00	60.00	-38.36	-32.02
5	15.08210	10.85	23.99	15.79	34.84	26.64	73.00	60.00	-38.16	-33.36
6	25.60160	11.09	21.15	14.75	32.24	25.84	73.00	60.00	-40.76	-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



6 Asymmetric Mode Conducted Emission at Wired Network 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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100287	Apr. 16, 2016	Apr. 15, 2017
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-523	Oct. 11, 2016	Oct. 10, 2017
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	848773/004	Oct. 26, 2016	Oct. 25, 2017
50 ohms Terminator	50	3	Oct. 26, 2016	Oct. 25, 2017
50 ohms Terminator	N/A	EMC-04	Nov. 02, 2016	Nov. 01, 2017
FCC-TLISN-S8-RJ45 FCC ISN	FCC-TLISN-S8-RJ45	20610	July 22, 2016	July 21, 2017
FCC-TLISN-C1-BNC-50 FCC ISN	FCC-TLISN-C1-BNC-50	20609	July 05, 2016	July 04, 2017
ISN ST08-Cat6 TESEQ ISN	ISN ST08	34002	Nov. 29, 2016	Nov. 28, 2017
RF Cable	5D-FB	COACAB-001	May 24, 2016	May 23, 2017
Current Probe CHASE	SMZ 11	18001	Sep. 09, 2016	Sep. 08, 2017
Capacitive Voltage Probe CHASE	CVP 2200	18312	Aug. 31, 2016	Aug. 30, 2017
ISN F-071115-1057-1 FCC ISN	F-071115-1057-1	09053	Aug. 19, 2016	Aug. 18, 2017
Software BVADT	BV ADT_ISN_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2 The test was performed in Shielded Room No. D.
3. The VCCI ISN D Registration No. is
4. Tested Date: Jan. 11, 2017

6.3 Test Arrangement

Method of Using AANs:

a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AAN directly to reference ground plane.

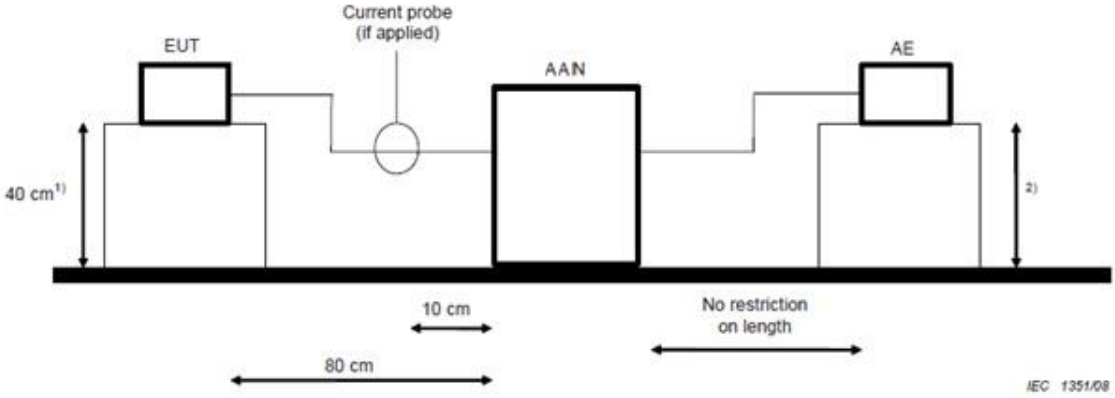
b. If voltage measurement is used, measure voltage at the measurement port of the AAN, correct the reading by adding the AAN voltage division factor, and compare to the voltage limit.

c. If current measurement is used, measure current with the current probe and compare to the current limit. A 50 Ω load has to be connected to the measurement port of the AAN during the current measurement.

d. It is not necessary to apply the voltage and the current limit if a AAN is used.

e. The test results of disturbance at wired network 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.



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.

Method of Using a 150 Ω load to the outside surface of the shield:

a. Break the insulation and connect a 150Ω resistor from the outside surface of the shield to ground.

b. Apply a clamp between 150Ω connection and associated equipment.

c. Current probe shall be placed at 0.1 m from the AAN.

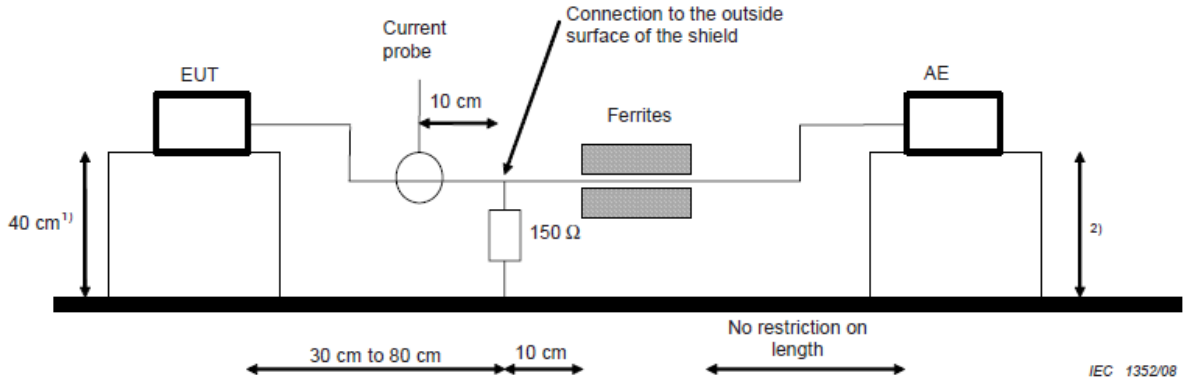
d. Measure current with a current probe and compare to the current limit.

Voltage measurement is also possible either in parallel with the 150 Ω resistor with a high impedance probe. (only for a high impedance probe applied, replaced d. if this is the case)

Voltage measurement by using a "50 Ω to 150 Ω adaptor" described in IEC 61000-4-6 as 150 Ω load, and applying the appropriate correction factor (9,6 dB in case of the "50 Ω to 150 Ω adaptor"). (only for 50 Ω to 150 Ω adaptor applied, replaced d. if this is the case.)

e. The test results of disturbance at wired network 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.



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.

Method of Using a combination of current probe and capacitive voltage probe:

a. Measure current with a current probe.

b. Compare the measured current with the applicable current limit.

c. Measure voltage with a capacitive probe as specified in 5.2.2 of CISPR 16-1-2.

d. Adjust the measured voltage as follows:

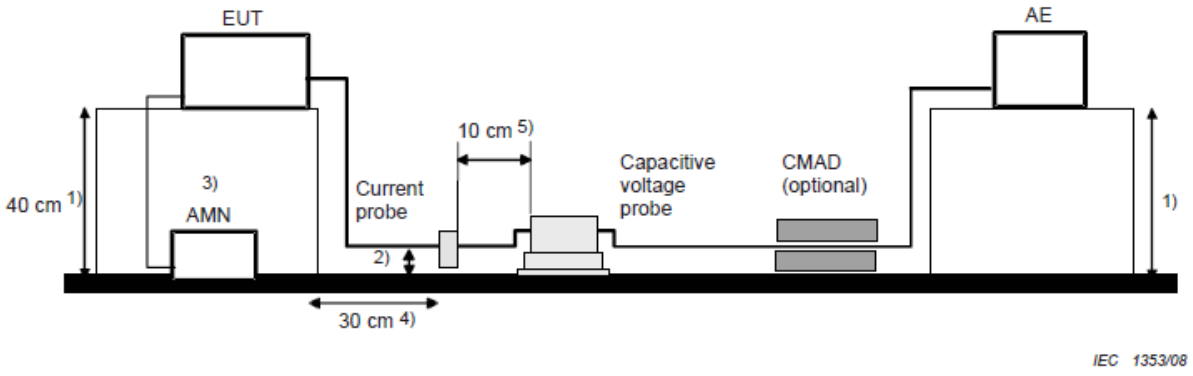
- current margin ≤ 6 dB – subtract the actual current margin from measured voltage;
- current margin > 6 dB – subtract 6 dB from measured voltage.

e. Compare adjusted voltage with the applicable voltage limit

f. Both the measured current and the adjusted voltage shall be below the applicable

g. The test results of disturbance at wired network 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.



AE = Associated equipment
EUT = Equipment under test
CMAD = Common mode Absorbing Device

6.4 Supplementary Information

There is not any deviation from the test standards for the test method.

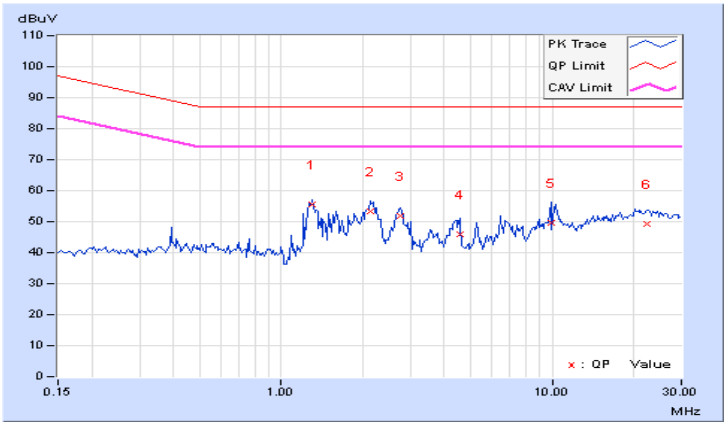
6.5 Test Results (Mode 1)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230Vac, 50Hz	**Environmental Conditions**	25℃, 60%RH
Tested by	Barry Lee		
Test Mode	Mode 1(MGMT port:1Gbps)		

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	**1.30078**	**9.72**	**45.80**	**42.08**	**55.52**	**51.80**	**87.00**	**74.00**	**-31.48**	**-22.20**
2	2.13281	9.64	43.87	38.76	53.51	48.40	87.00	74.00	-33.49	-25.60
3	2.73828	9.62	42.11	36.80	51.73	46.42	87.00	74.00	-35.27	-27.58
4	4.56250	9.59	36.22	29.17	45.81	38.76	87.00	74.00	-41.19	-35.24
5	9.92969	9.64	40.09	34.38	49.73	44.02	87.00	74.00	-37.27	-29.98
6	22.32031	9.84	39.27	33.99	49.11	43.83	87.00	74.00	-37.89	-30.17

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



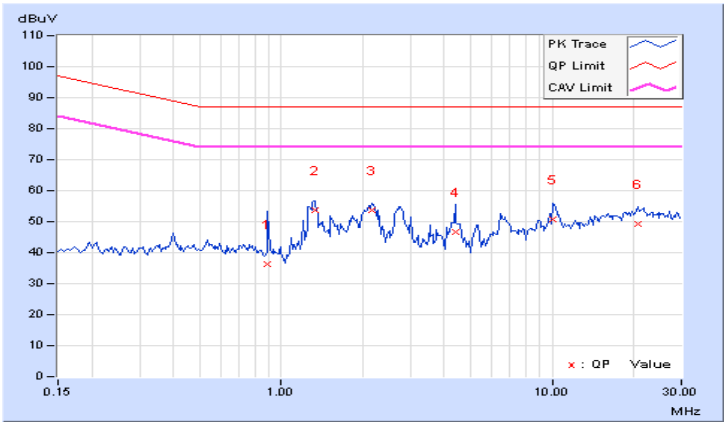
6.6 Test Results (Mode 2)

Frequency Range	150kHz ~ 30MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	DC 12V	**Environmental Conditions**	25℃, 60%RH
Tested by	Barry Lee		
Test Mode	Mode 2(MGMT port:1Gbps)		

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	0.89219	9.76	26.38	20.75	36.14	30.51	87.00	74.00	-50.86	-43.49
2	1.33203	9.72	43.84	41.24	53.56	50.96	87.00	74.00	-33.44	-23.04
3	2.15625	9.64	44.21	39.06	53.85	48.70	87.00	74.00	-33.15	-25.30
4	4.38281	9.59	37.23	30.32	46.82	39.91	87.00	74.00	-40.18	-34.09
5	10.03906	9.64	41.16	35.16	50.80	44.80	87.00	74.00	-36.20	-29.20
6	20.64844	9.80	39.29	34.09	49.09	43.89	87.00	74.00	-37.91	-30.11

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 Emission at Frequencies up to 1GHz

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

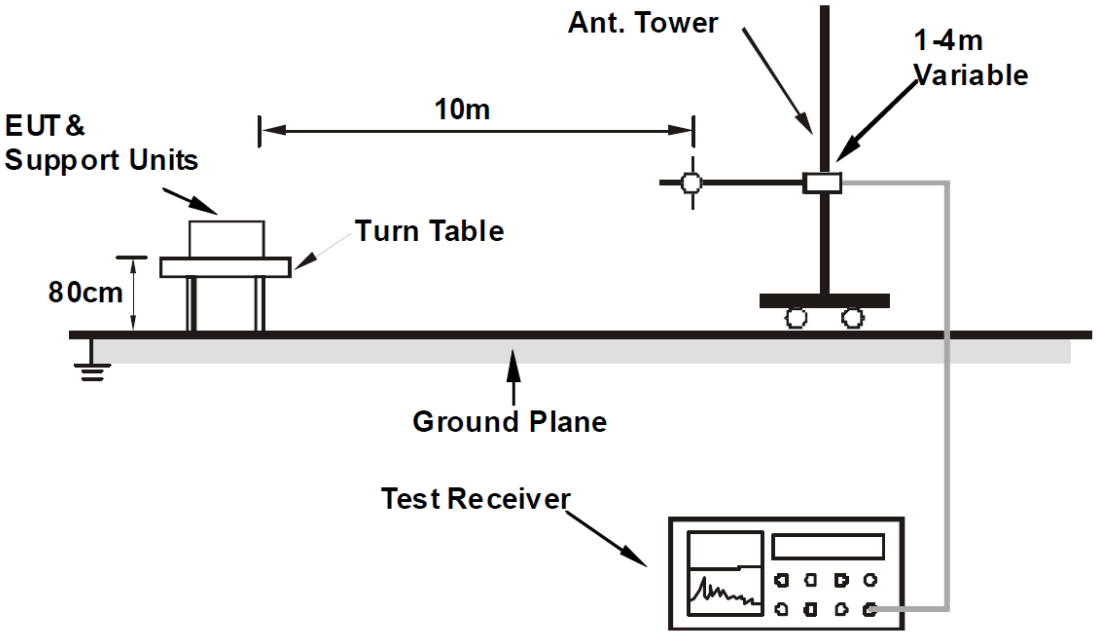
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010125	Apr. 16, 2016	Apr. 15, 2017
	N9038A	MY50010132	June 28, 2016	June 27, 2017
Pre-Amplifier Sonoma	310N	352925	Aug. 29, 2016	Aug. 28, 2017
	310N	352926	Aug. 29, 2016	Aug. 28, 2017
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-359	Dec. 28, 2016	Dec. 27, 2017
	VULB 9168	9168-358	Dec. 16, 2016	Dec. 15, 2017
Fixed attenuator Mini-Circuits	UNAT-5+	CHF-001	Sep. 09, 2016	Sep. 08, 2017
	UNAT-5+	CHF-002	Sep. 09, 2016	Sep. 08, 2017
RF Cable	8D-FB	CHFCAB-001-1 CHFCAB-001-3 CHFCAB-001-4	Sep. 22, 2016	Sep. 21, 2017
		CHFCAB-002-1 CHFCAB-002-3 CHFCAB-002-4	Sep. 22, 2016	Sep. 21, 2017
Software BVADT	ADT_Radiated_V 8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 10m Chamber No. F.
3. The FCC Site Registration No. is 928149.
4. The VCCI Site Registration No. is R-3252.
5. The CANADA Site Registration No. is IC 7450H-1.
6. Tested Date: Jan. 07 to 16, 2017

7.3 Test Arrangement

a. 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.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The 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.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is 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.



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

7.4 Supplementary Information

There is not any deviation from the test standards for the test method.

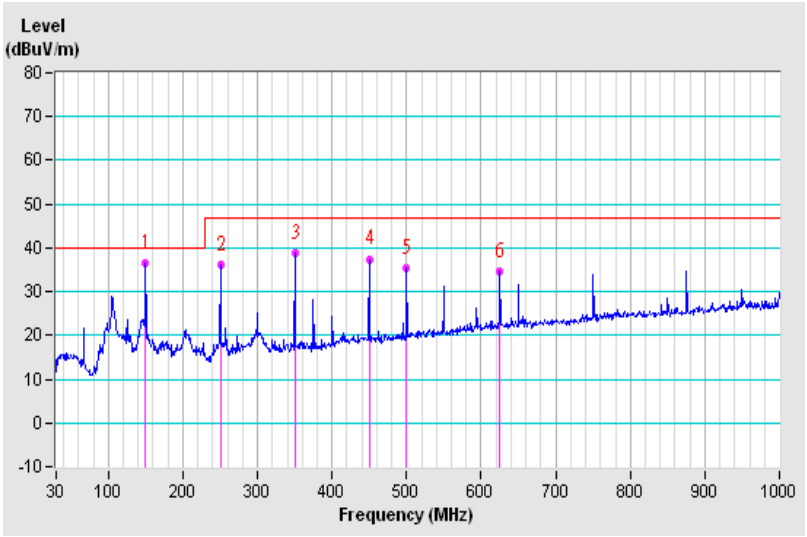
7.5 Test Results (Mode 1)

Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	230Vac, 50Hz	Environmental Conditions	24℃, 68%RH
Tested by	Wythe Lin		
Test Mode	Mode 1		

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	150.01	36.60 QP	40.00	-3.40	4.00 H	149	49.06	-12.46
2	250.02	36.27 QP	47.00	-10.73	4.00 H	34	49.60	-13.33
3	350.00	38.77 QP	47.00	-8.23	3.00 H	90	48.98	-10.21
4	450.01	37.45 QP	47.00	-9.55	2.00 H	290	44.72	-7.27
5	500.01	35.43 QP	47.00	-11.57	2.00 H	169	41.86	-6.43
6	625.02	34.44 QP	47.00	-12.56	1.00 H	286	38.08	-3.64

Remarks:

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

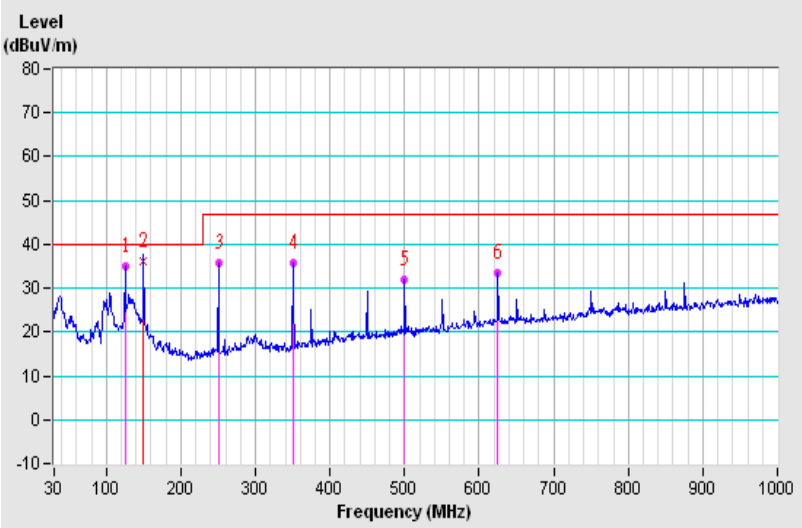


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	230Vac, 50Hz	Environmental Conditions	24℃, 68%RH
Tested by	Wythe Lin		
Test Mode	Mode 1		

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	125.01	35.03 QP	40.00	-4.97	1.00 V	47	49.05	-14.02
2	149.99	36.26 QP	40.00	-3.74	1.00 V	59	48.63	-12.37
3	250.02	35.73 QP	47.00	-11.27	1.00 V	268	49.08	-13.35
4	350.00	35.69 QP	47.00	-11.31	4.00 V	192	45.99	-10.30
5	500.01	32.00 QP	47.00	-15.00	3.00 V	74	38.24	-6.24
6	625.00	33.36 QP	47.00	-13.64	1.00 V	130	36.69	-3.33

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



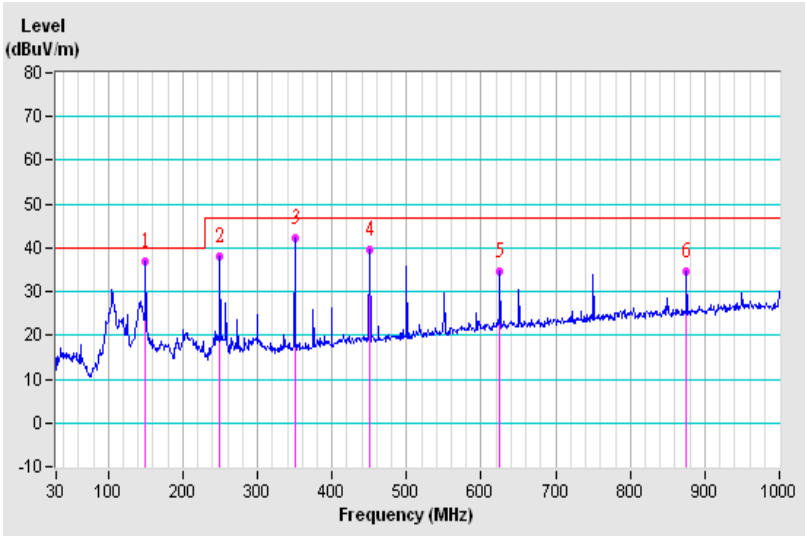
7.6 Test Results (Mode 2)

Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	110Vac, 60Hz	Environmental Conditions	24℃, 68%RH
Tested by	Wythe Lin		
Test Mode	Mode 2		

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	**149.99**	**36.89 QP**	**40.00**	**-3.11**	**4.00 H**	**157**	**49.36**	**-12.47**
2	250.00	38.01 QP	47.00	-8.99	3.00 H	161	51.34	-13.33
3	350.00	42.35 QP	47.00	-4.65	3.00 H	182	52.56	-10.21
4	450.01	39.42 QP	47.00	-7.58	2.00 H	295	46.69	-7.27
5	625.02	34.58 QP	47.00	-12.42	2.00 H	283	38.22	-3.64
6	874.99	34.67 QP	47.00	-12.33	1.00 H	122	34.30	0.37

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

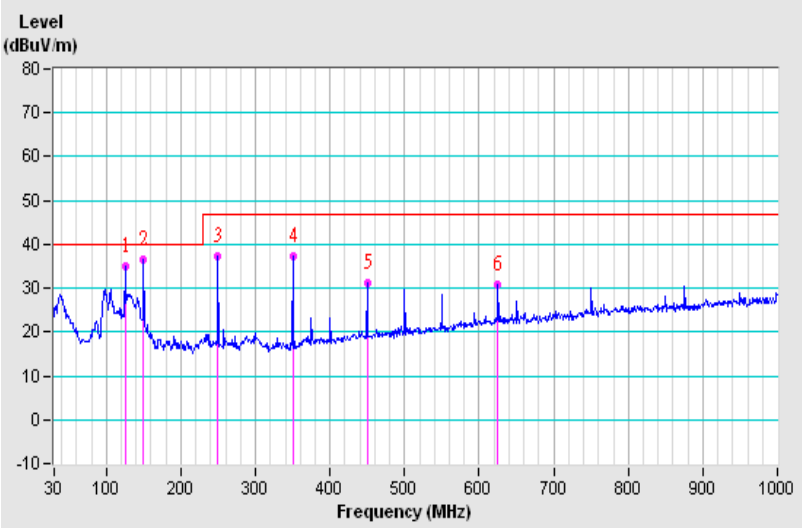


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	110Vac, 60Hz	Environmental Conditions	24℃, 68%RH
Tested by	Wythe Lin		
Test Mode	Mode 2		

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	125.01	35.14 QP	40.00	-4.86	1.00 V	66	49.16	-14.02
2	150.01	36.41 QP	40.00	-3.59	1.00 V	78	48.77	-12.36
3	250.00	37.43 QP	47.00	-9.57	2.00 V	277	50.78	-13.35
4	350.00	37.33 QP	47.00	-9.67	3.00 V	192	47.63	-10.30
5	449.99	31.25 QP	47.00	-15.75	3.00 V	176	38.43	-7.18
6	625.02	30.81 QP	47.00	-16.19	4.00 V	309	34.11	-3.30

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



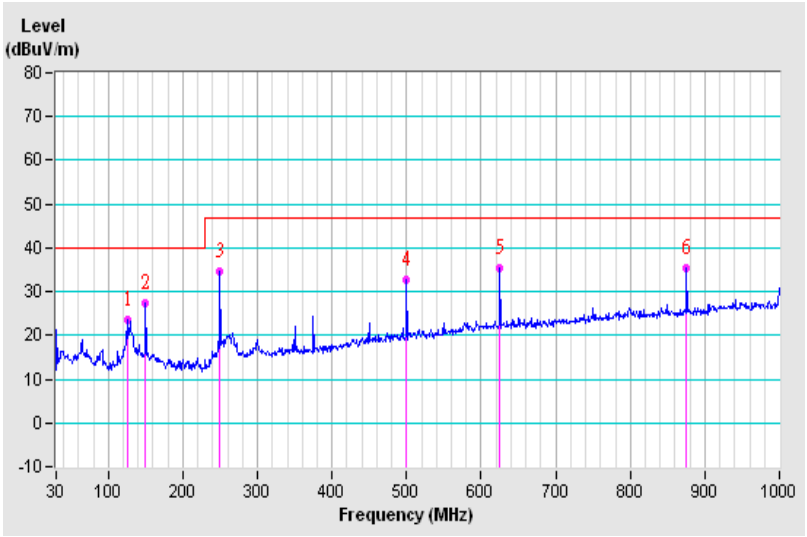
7.7 Test Results (Mode 3)

Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	DC 12V	Environmental Conditions	26℃, 73%RH
Tested by	Jason Huang		
Test Mode	Mode 3		

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	124.99	23.39 QP	40.00	-16.61	4.00 H	176	37.41	-14.02
2	149.99	27.21 QP	40.00	-12.79	4.00 H	171	39.68	-12.47
3	250.00	34.68 QP	47.00	-12.32	3.00 H	19	48.01	-13.33
4	500.01	32.70 QP	47.00	-14.30	2.00 H	62	39.13	-6.43
5	625.02	35.35 QP	47.00	-11.65	2.00 H	140	38.99	-3.64
6	875.02	35.21 QP	47.00	-11.79	1.00 H	258	34.84	0.37

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

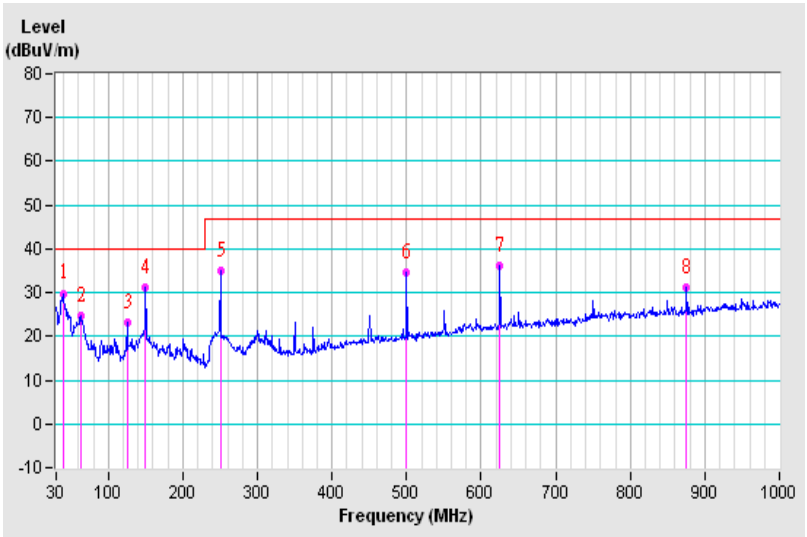


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	DC 12V	Environmental Conditions	26℃, 73%RH
Tested by	Jason Huang		
Test Mode	Mode 3		

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	39.26	29.85 QP	40.00	-10.15	3.00 V	181	43.39	-13.54
2	62.49	24.74 QP	40.00	-15.26	3.00 V	61	38.64	-13.90
3	125.01	23.20 QP	40.00	-16.80	1.00 V	293	37.22	-14.02
4	150.01	31.05 QP	40.00	-8.95	2.00 V	119	43.41	-12.36
5	250.02	35.03 QP	47.00	-11.97	1.00 V	164	48.38	-13.35
6	500.01	34.53 QP	47.00	-12.47	1.00 V	208	40.77	-6.24
7	625.02	36.06 QP	47.00	-10.94	1.00 V	258	39.36	-3.30
8	875.02	31.24 QP	47.00	-15.76	4.00 V	103	30.39	0.85

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 Emission at Frequencies above 1GHz

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010125	Apr. 16, 2016	Apr. 15, 2017
Pre-Amplifier Agilent	8449B	3008A01975	Feb. 27, 2016	Feb. 26, 2017
Horn Antenna SCHWARZBECK	BBHA 9120D	D123	Dec. 15, 2016	Dec. 14, 2017
RF Cable	SUCOFLEX104	RF-104-209	Dec. 09, 2016	Dec. 08, 2017
RF Cable	EMC104-SM-SM -6000	150325	Jan. 16, 2017	Jan. 15, 2018
RF Cable	104 RF cable	131221	Dec. 09, 2016	Dec. 08, 2017
Software BVADT	ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

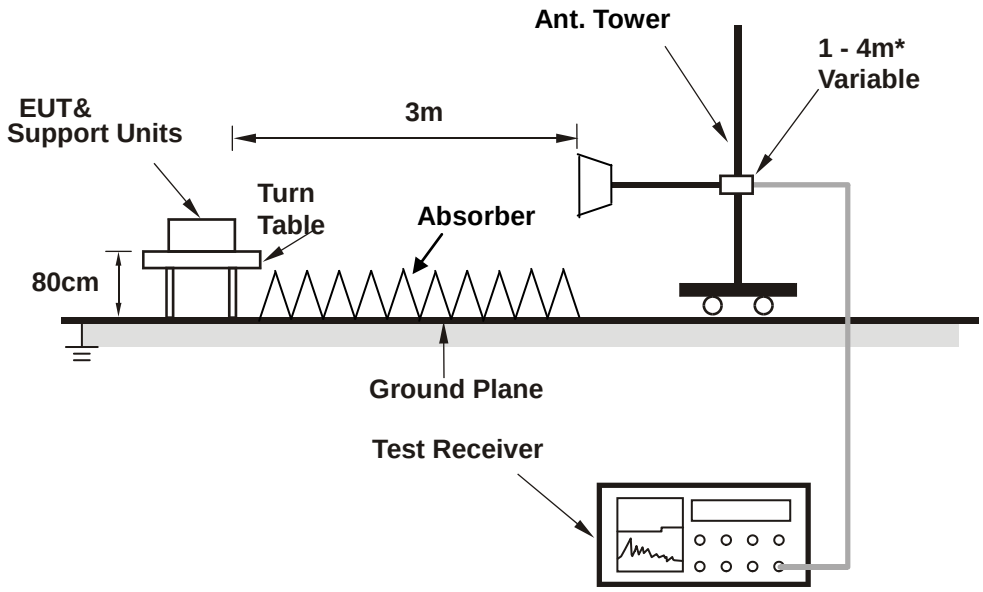
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 10m Chamber No. F.
3. The VCCI Site Registration No. is G-136.
4. The 3dB beamwidth of the horn antenna is minimum 30 degree (or w = 1.6m at 3m distance) for 1~6 GHz.
5. Tested Date: Jan. 16, 2017

8.3 Test Arrangement

a. 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.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The 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.

<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both.
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

8.4 Supplementary Information

There is not any deviation from the test standards for the test method.

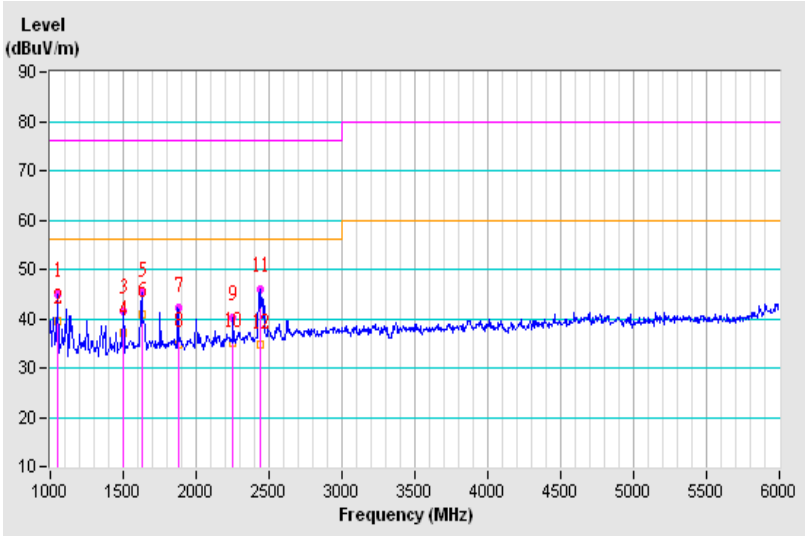
8.5 Test Results (Mode 1)

Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230Vac, 50Hz	Environmental Conditions	23℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 1		

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	1050.00	44.96 PK	76.00	-31.04	1.00 H	24	55.61	-10.65
2	1050.00	39.49 AV	56.00	-16.51	1.00 H	24	50.14	-10.65
3	1500.00	41.45 PK	76.00	-34.55	1.00 H	153	50.50	-9.05
4	1500.00	37.15 AV	56.00	-18.85	1.00 H	153	46.20	-9.05
5	1625.00	45.13 PK	76.00	-30.87	1.00 H	228	53.64	-8.51
6	1625.00	40.82 AV	56.00	-15.18	1.00 H	228	49.33	-8.51
7	1875.00	42.11 PK	76.00	-33.89	1.00 H	154	50.00	-7.89
8	1875.00	34.79 AV	56.00	-21.21	1.00 H	154	42.68	-7.89
9	2250.00	40.19 PK	76.00	-35.81	1.00 H	167	46.76	-6.57
10	2250.00	35.00 AV	56.00	-21.00	1.00 H	167	41.57	-6.57
11	2443.66	45.95 PK	76.00	-30.05	1.00 H	262	51.74	-5.79
12	2443.66	34.64 AV	56.00	-21.36	1.00 H	262	40.43	-5.79

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

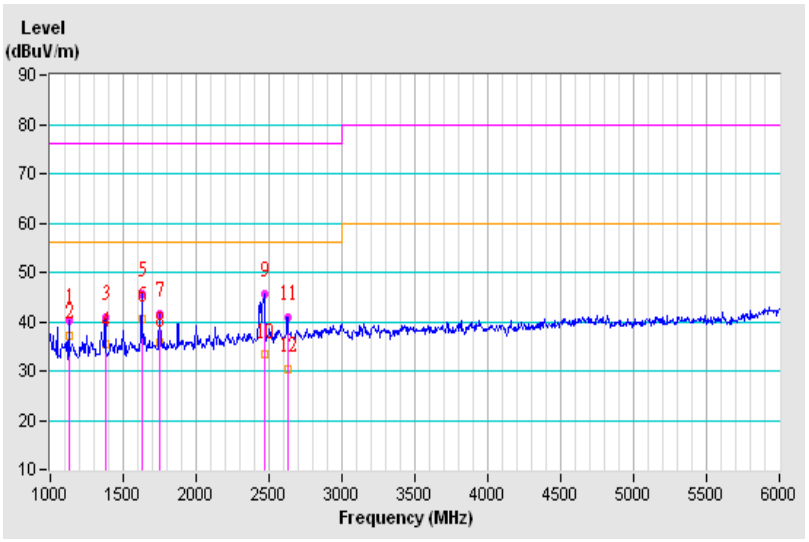


Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230Vac, 50Hz	Environmental Conditions	23℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 1		

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	1125.00	40.25 PK	76.00	-35.75	1.00 V	194	50.58	-10.33
2	1125.00	37.12 AV	56.00	-18.88	1.00 V	194	47.45	-10.33
3	1375.00	40.99 PK	76.00	-35.01	1.00 V	269	50.29	-9.30
4	1375.00	35.49 AV	56.00	-20.51	1.00 V	269	44.79	-9.30
5	1625.00	45.61 PK	76.00	-30.39	1.00 V	156	54.12	-8.51
6	1625.00	40.56 AV	56.00	-15.44	1.00 V	156	49.07	-8.51
7	1750.00	41.57 PK	76.00	-34.43	1.00 V	219	49.71	-8.14
8	1750.00	35.63 AV	56.00	-20.37	1.00 V	219	43.77	-8.14
9	2469.30	45.56 PK	76.00	-30.44	1.00 V	53	51.27	-5.71
10	2469.30	33.23 AV	56.00	-22.77	1.00 V	53	38.94	-5.71
11	2625.00	41.00 PK	76.00	-35.00	1.00 V	160	46.35	-5.35
12	2625.00	30.38 AV	56.00	-25.62	1.00 V	160	35.73	-5.35

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



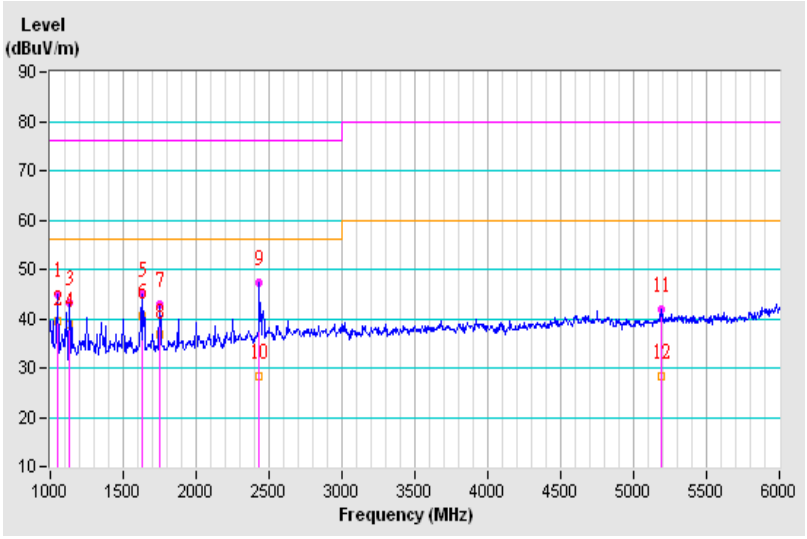
8.6 Test Results (Mode 2)

Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	110Vac, 60Hz	Environmental Conditions	23℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 2		

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	1050.00	44.98 PK	76.00	-31.02	1.00 H	37	55.63	-10.65
2	1050.00	39.35 AV	56.00	-16.65	1.00 H	37	50.00	-10.65
3	1125.00	43.33 PK	76.00	-32.67	1.00 H	125	53.66	-10.33
4	1125.00	38.82 AV	56.00	-17.18	1.00 H	125	49.15	-10.33
5	1625.00	45.01 PK	76.00	-30.99	1.00 H	153	53.52	-8.51
6	1625.00	40.66 AV	56.00	-15.34	1.00 H	153	49.17	-8.51
7	1750.00	42.93 PK	76.00	-33.07	1.00 H	229	51.07	-8.14
8	1750.00	36.65 AV	56.00	-19.35	1.00 H	229	44.79	-8.14
9	2427.18	47.32 PK	76.00	-28.68	1.00 H	281	53.16	-5.84
10	2427.18	28.33 AV	56.00	-27.67	1.00 H	281	34.17	-5.84
11	5189.96	41.89 PK	80.00	-38.11	1.00 H	0	42.44	-0.55
12	5189.96	28.42 AV	60.00	-31.58	1.00 H	0	28.97	-0.55

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

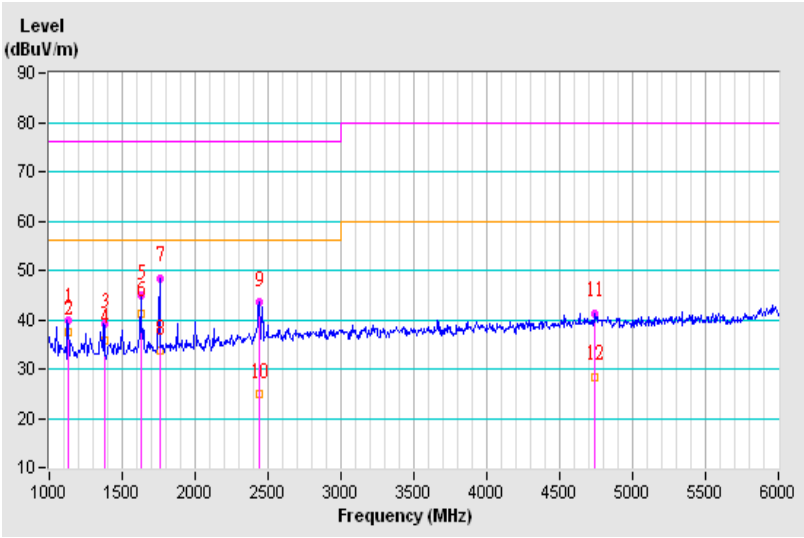


Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	110Vac, 60Hz	Environmental Conditions	23℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 2		

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	1125.00	40.00 PK	76.00	-36.00	1.00 V	91	50.33	-10.33
2	1125.00	37.50 AV	56.00	-18.50	1.00 V	91	47.83	-10.33
3	1375.00	39.04 PK	76.00	-36.96	1.00 V	290	48.34	-9.30
4	1375.00	35.82 AV	56.00	-20.18	1.00 V	290	45.12	-9.30
5	1625.00	44.80 PK	76.00	-31.20	1.00 V	159	53.31	-8.51
6	**1625.00**	**41.18 AV**	**56.00**	**-14.82**	**1.00 V**	**159**	**49.69**	**-8.51**
7	1756.32	48.40 PK	76.00	-27.60	1.00 V	73	56.50	-8.10
8	1756.32	33.60 AV	56.00	-22.40	1.00 V	73	41.70	-8.10
9	2441.83	43.41 PK	76.00	-32.59	1.00 V	56	49.21	-5.80
10	2441.83	24.77 AV	56.00	-31.23	1.00 V	56	30.57	-5.80
11	4741.91	41.29 PK	80.00	-38.71	1.00 V	152	42.55	-1.26
12	4741.91	28.23 AV	60.00	-31.77	1.00 V	152	29.49	-1.26

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



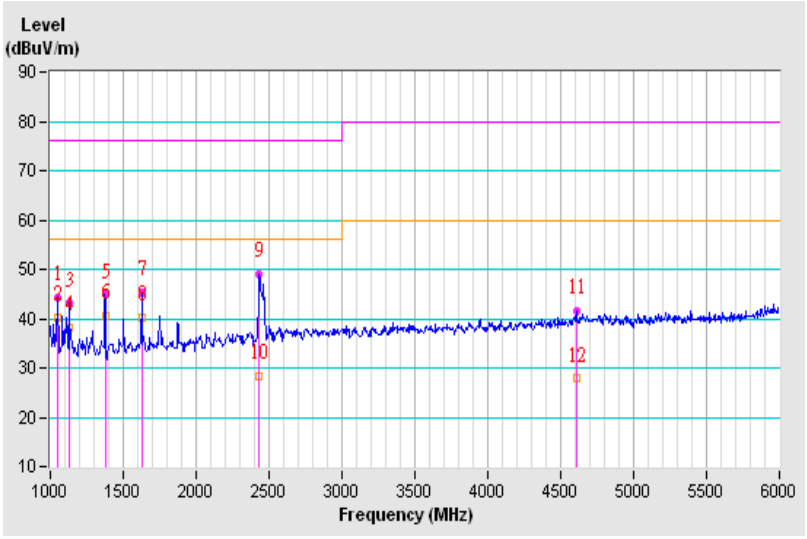
8.7 Test Results (Mode 3)

Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	DC 12V	Environmental Conditions	23℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 3		

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	1050.05	44.23 PK	76.00	-31.77	1.00 H	250	54.88	-10.65
2	1050.05	40.12 AV	56.00	-15.88	1.00 H	250	50.77	-10.65
3	1125.14	43.08 PK	76.00	-32.92	1.00 H	17	53.40	-10.32
4	1125.14	38.16 AV	56.00	-17.84	1.00 H	17	48.48	-10.32
5	1375.00	44.75 PK	76.00	-31.25	1.00 H	329	54.05	-9.30
6	1375.00	40.61 AV	56.00	-15.39	1.00 H	329	49.91	-9.30
7	1625.00	45.33 PK	76.00	-30.67	1.00 H	151	53.84	-8.51
8	1625.00	40.18 AV	56.00	-15.82	1.00 H	151	48.69	-8.51
9	2431.45	49.12 PK	76.00	-26.88	1.00 H	275	54.95	-5.83
10	2431.45	28.33 AV	56.00	-27.67	1.00 H	275	34.16	-5.83
11	4607.62	41.67 PK	80.00	-38.33	1.00 H	245	43.05	-1.38
12	4607.62	27.86 AV	60.00	-32.14	1.00 H	245	29.24	-1.38

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

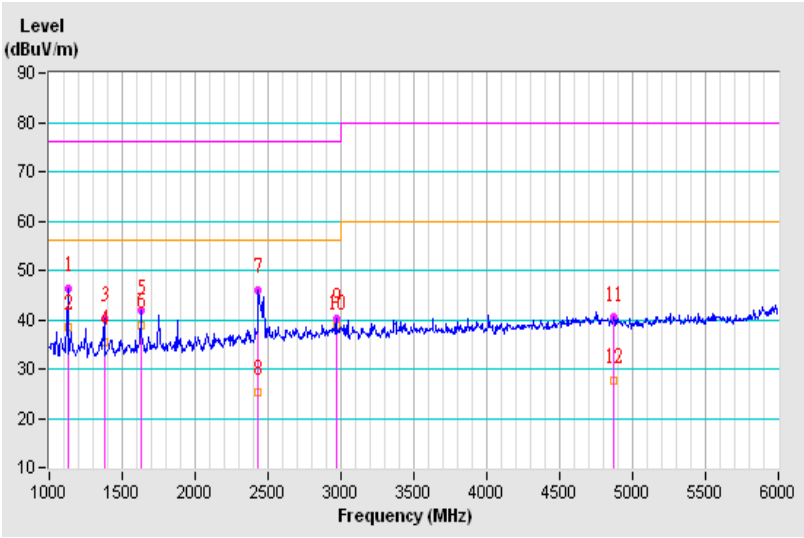


Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	DC 12V	Environmental Conditions	23℃, 71%RH
Tested by	Jason Huang		
Test Mode	Mode 3		

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	1125.00	46.28 PK	76.00	-29.72	1.00 V	117	56.61	-10.33
2	1125.00	38.45 AV	56.00	-17.55	1.00 V	117	48.78	-10.33
3	1375.00	40.30 PK	76.00	-35.70	1.00 V	99	49.60	-9.30
4	1375.00	35.37 AV	56.00	-20.63	1.00 V	99	44.67	-9.30
5	1625.00	41.73 PK	76.00	-34.27	1.00 V	162	50.24	-8.51
6	1625.00	38.80 AV	56.00	-17.20	1.00 V	162	47.31	-8.51
7	2429.62	46.08 PK	76.00	-29.92	1.00 V	72	51.92	-5.84
8	2429.62	25.41 AV	56.00	-30.59	1.00 V	72	31.25	-5.84
9	2968.74	40.05 PK	76.00	-35.95	1.00 V	26	44.76	-4.71
10	2968.74	38.68 AV	56.00	-17.32	1.00 V	26	43.39	-4.71
11	4870.71	40.38 PK	80.00	-39.62	1.00 V	287	41.35	-0.97
12	4870.71	27.77 AV	60.00	-32.23	1.00 V	287	28.74	-0.97

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	
Harmonic Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15≦n≦39	0.15 x 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8≦n≦40	0.23 x 8/n

Limits for Class D equipment		
Harmonic Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15≦n≦39	3.85/n	0.15 x 15/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 and 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.	CALIBRATED DATE	CALIBRATED UNTIL
EMC Emission Tester EMC PARTNER	1000-1P	086	Jan. 26, 2016	Jan. 25, 2017
Software EMC PARTNER	HARCS_V4.2	NA	NA	NA

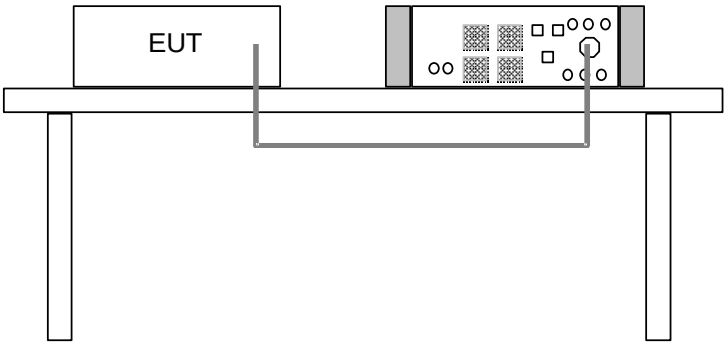
Note:

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 EMS A room.
3 Tested Date: Jan. 04, 2017

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.



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

9.5 Supplementary Information

There is not any deviation from the test standards for the test method.

9.6 Test Results (Mode 1)

Test Duration (mins)	5	Test Mode	Mode 1
Fundamental Voltage/Ampere	229.9Vrms/ 0.467Arms	Power Frequency	50Hz
Power Consumption	87.08W	Power Factor	0.811
Environmental Conditions	23 °C, 64%RH	Tested by	Jay Chan

Harm. Order	Iavg (A)	Iavg Limit (A)	Imax (A)	Imax Limit (A)	Harm. Order	Iavg (A)	Iavg Limit (A)	Imax (A)	Imax Limit (A)
1	0.4658	-	0.4660	-	2	0.0000	1.0800	0.0007	1.6200
3	0.0416	2.3000	0.0416	3.4500	4	0.0000	0.4300	0.0005	0.6450
5	0.0000	1.1400	0.0022	1.7100	6	0.0000	0.3000	0.0005	0.4500
7	0.0066	0.7700	0.0067	1.1550	8	0.0000	0.2300	0.0004	0.3450
9	0.0000	0.4000	0.0046	0.6000	10	0.0000	0.1840	0.0004	0.2760
11	0.0000	0.3300	0.0037	0.4950	12	0.0000	0.1533	0.0003	0.2300
13	0.0000	0.2100	0.0031	0.3150	14	0.0000	0.1314	0.0004	0.1971
15	0.0000	0.1500	0.0010	0.2250	16	0.0000	0.1150	0.0003	0.1725
17	0.0000	0.1324	0.0005	0.1985	18	0.0000	0.1022	0.0004	0.1533
19	0.0000	0.1184	0.0004	0.1776	20	0.0000	0.0920	0.0003	0.1380
21	0.0000	0.1071	0.0013	0.1607	22	0.0000	0.0836	0.0003	0.1255
23	0.0000	0.0978	0.0006	0.1467	24	0.0000	0.0767	0.0004	0.1150
25	0.0000	0.0900	0.0005	0.1350	26	0.0000	0.0708	0.0004	0.1062
27	0.0000	0.0833	0.0010	0.1250	28	0.0000	0.0657	0.0004	0.0986
29	0.0000	0.0776	0.0007	0.1164	30	0.0000	0.0613	0.0004	0.0920
31	0.0000	0.0726	0.0009	0.1089	32	0.0000	0.0575	0.0004	0.0863
33	0.0000	0.0682	0.0006	0.1023	34	0.0000	0.0541	0.0004	0.0812
35	0.0000	0.0643	0.0006	0.0964	36	0.0000	0.0511	0.0004	0.0767
37	0.0000	0.0608	0.0005	0.0912	38	0.0000	0.0484	0.0004	0.0726
39	0.0000	0.0577	0.0007	0.0865	40	0.0000	0.0460	0.0004	0.0690

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

9.7 Test Results (Mode 2)

Test Duration (mins)	5	Test Mode	Mode 2
Fundamental Voltage/Ampere	229.9Vrms/ 0.546Arms	Power Frequency	50Hz
Power Consumption	108.3W	Power Factor	0.863
Environmental Conditions	23 °C, 64%RH	Tested by	Jay Chan

Harm. Order	Iavg (A)	Iavg Limit (A)	Imax (A)	Imax Limit (A)	Harm. Order	Iavg (A)	Iavg Limit (A)	Imax (A)	Imax Limit (A)
1	0.5444	-	0.5477	-	2	0.0000	1.0800	0.0009	1.6200
3	0.0459	2.3000	0.0462	3.4500	4	0.0000	0.4300	0.0005	0.6450
5	0.0000	1.1400	0.0041	1.7100	6	0.0000	0.3000	0.0005	0.4500
7	0.0101	0.7700	0.0103	1.1550	8	0.0000	0.2300	0.0005	0.3450
9	0.0057	0.4000	0.0060	0.6000	10	0.0000	0.1840	0.0005	0.2760
11	0.0000	0.3300	0.0048	0.4950	12	0.0000	0.1533	0.0005	0.2300
13	0.0000	0.2100	0.0030	0.3150	14	0.0000	0.1314	0.0005	0.1971
15	0.0000	0.1500	0.0032	0.2250	16	0.0000	0.1150	0.0005	0.1725
17	0.0000	0.1324	0.0016	0.1985	18	0.0000	0.1022	0.0005	0.1533
19	0.0000	0.1184	0.0020	0.1776	20	0.0000	0.0920	0.0005	0.1380
21	0.0000	0.1071	0.0016	0.1607	22	0.0000	0.0836	0.0005	0.1255
23	0.0000	0.0978	0.0020	0.1467	24	0.0000	0.0767	0.0005	0.1150
25	0.0000	0.0900	0.0020	0.1350	26	0.0000	0.0708	0.0005	0.1062
27	0.0000	0.0833	0.0011	0.1250	28	0.0000	0.0657	0.0005	0.0986
29	0.0000	0.0776	0.0016	0.1164	30	0.0000	0.0613	0.0005	0.0920
31	0.0000	0.0726	0.0011	0.1089	32	0.0000	0.0575	0.0005	0.0863
33	0.0000	0.0682	0.0012	0.1023	34	0.0000	0.0541	0.0005	0.0812
35	0.0000	0.0643	0.0015	0.0964	36	0.0000	0.0511	0.0005	0.0767
37	0.0000	0.0608	0.0014	0.0912	38	0.0000	0.0484	0.0006	0.0726
39	0.0000	0.0577	0.0015	0.0865	40	0.0000	0.0460	0.0006	0.0690

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

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.	CALIBRATED DATE	CALIBRATED UNTIL
EMC Emission Tester EMC PARTNER	1000-1P	086	Jan. 26, 2016	Jan. 25, 2017
Software EMC PARTNER	HARCS_V4.2	NA	NA	NA

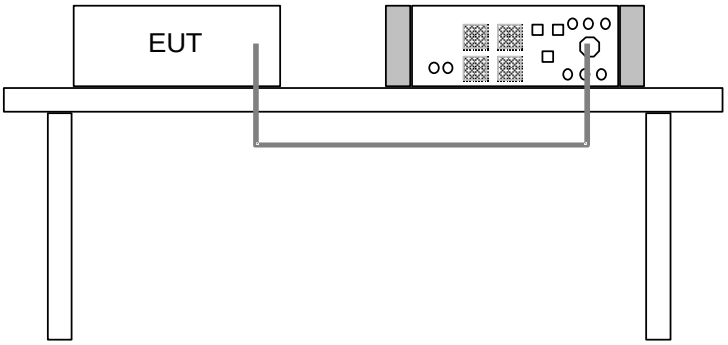
Note:

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 EMS A room.
3 Tested Date: Jan. 04, 2017

10.3 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 most unfavorable sequence of voltage changes under normal operating conditions.

b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.



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

10.4 Supplementary Information

There is not any deviation from the test standards for the test method.

10.5 Test Results (Mode 1)

Observation (T_p)	120 min.	Test Mode	Mode 1
Fundamental Voltage/Ampere	229.9 Vrms / 0.470 Arms	Power Frequency	50 Hz
Power Consumption	87.74W	Power Factor	0.812
Environmental Conditions	23 °C, 64 % RH	Tested by	Jay Chan

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.072	1.00	Pass
P_{lt}	0.072	0.65	Pass
T_{max} (ms)	0.000	500	Pass
d_{max} (%)	0.000	4	Pass
d_c (%)	0.000	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.

10.6 Test Results (Mode 2)

Observation (T_p)	120 min.	Test Mode	Mode 2
Fundamental Voltage/Ampere	229.7 Vrms / 0.549 Arms	Power Frequency	50 Hz
Power Consumption	108.2W	Power Factor	0.857
Environmental Conditions	23 °C, 64 % RH	Tested by	Jay Chan

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.072	1.00	Pass
P_{lt}	0.072	0.65	Pass
T_{max} (ms)	0.000	500	Pass
d_{max} (%)	0.000	4	Pass
d_c (%)	0.010	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+A1:2015, Immunity requirements				
Clause	Reference standard	Table	Test specification	Performance Criterion
4.2.1	EN/IEC 61000-4-2 ESD	1.3	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	B
4.2.3.2	EN/IEC 61000-4-3 RS	1.2	Enclosure port: 80-1000 MHz, 3V/m, 80% AM (1kHz)	A
4.2.2	EN/IEC 61000-4-4 EFT	2.3	Signal ports and telecommunication ports: xDSL equipment: ±0.5kV, 5/50 (T_r/T_h) ns, 100kHz others: ±0.5kV, 5/50 (T_r/T_h) ns, 5kHz	B
		3.3	Input DC power port: ±0.5kV, 5/50 (T_r/T_h) ns, 5kHz	
		4.5	Input AC Power ports: ±1kV, 5/50 (T_r/T_h) ns, 5kHz	
4.2.5	EN/IEC 61000-4-5 Surge	2.2	Signal and telecommunication ports (direct to outdoor cables): 10/700 (5/320) (T_r/T_h) µs w/o primary protectors: ±1kV, or with primary protectors fitted: ±4kV	C
		3.2	Input DC power port (direct to outdoor cables): 1.2/50 (8/20) (T_r/T_h) µs Line to earth: ±0.5kV	B
		4.4	Input AC Power ports: 1.2/50 (8/20) (T_r/T_h) µs, Line to line: ±1kV Line to earth: ±2kV	
4.2.3.3	EN/IEC 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/IEC 61000-4-8 PFMF	1.1	Enclosure port: 50 or 60 Hz, 1A/m	A
4.2.6	EN/IEC 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

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

12.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ESD Simulator NoiseKen	ESS-2002	ESS0625212/244	Apr. 12, 2016	Apr. 11, 2017

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 ESD room A.
3 Tested Date: Jan. 05, 2017

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.

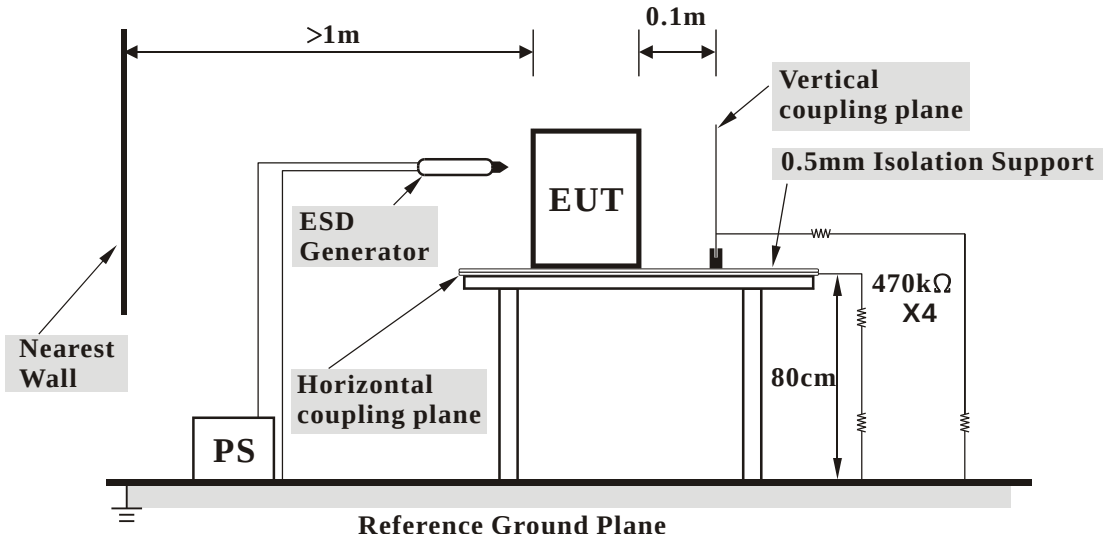
d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

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 **H**orizontal **C**oupling **P**lane 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 **V**ertical **C**oupling **P**lane 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.



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

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. 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 **H**orizontal **C**oupling **P**lane (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.

FLOOR-STANDING EQUIPMENT

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

12.4 Supplementary Information

There is not any deviation from the test standards for the test method.

12.5 Test Results (Mode 1)

Input Power	230 Vac, 50 Hz	Tested by	Terry Liao
Environmental Conditions	23 °C, 49% RH 1010 mbar	Test mode	Mode 1

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4	+/-	1-4, 8-11	Note 1	NA	A
2	+/-	5-7	Note 1	NA	A
4	+/-	5-7	Note 2	NA	B
2, 4, 8	+/-	12-14	NA	Note 1	A

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

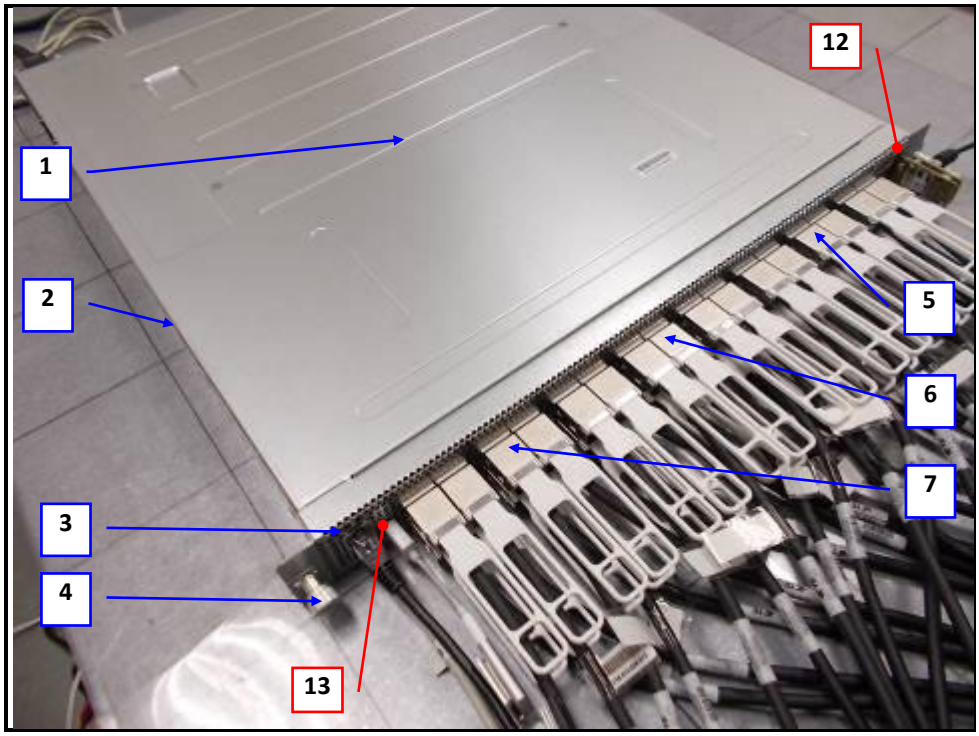
Description of test points of indirect application:

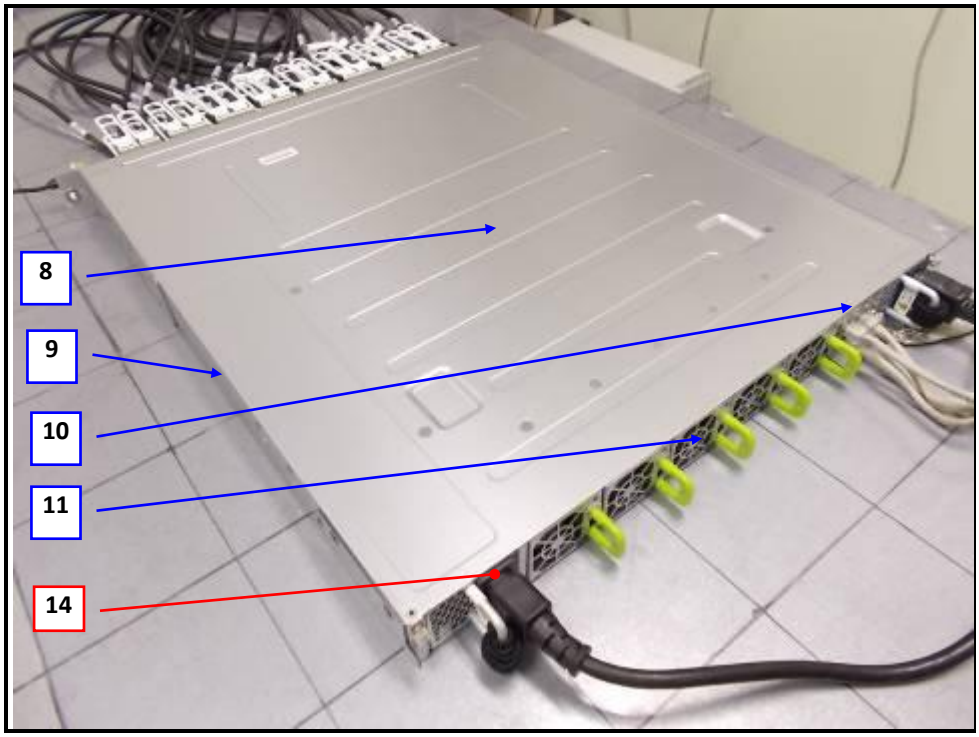
1. Front side 2. Rear side 3. Right side 4. Left side

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

2. The EUT appears a "packet lose" during the test, but it can be self-recoverable after the test.

Description of Test Points





12.6 Test Results (Mode 2)

Input Power	DC 12V	Tested by	Terry Liao
Environmental Conditions	23 °C, 49% RH 1010 mbar	Test mode	Mode 2

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4	+/-	1-4, 8-12	Note 1	NA	A
2	+/-	5-7	Note 1	NA	A
4	+/-	5-7	Note 2	NA	B
2, 4, 8	+/-	13-15	NA	Note 1	A

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

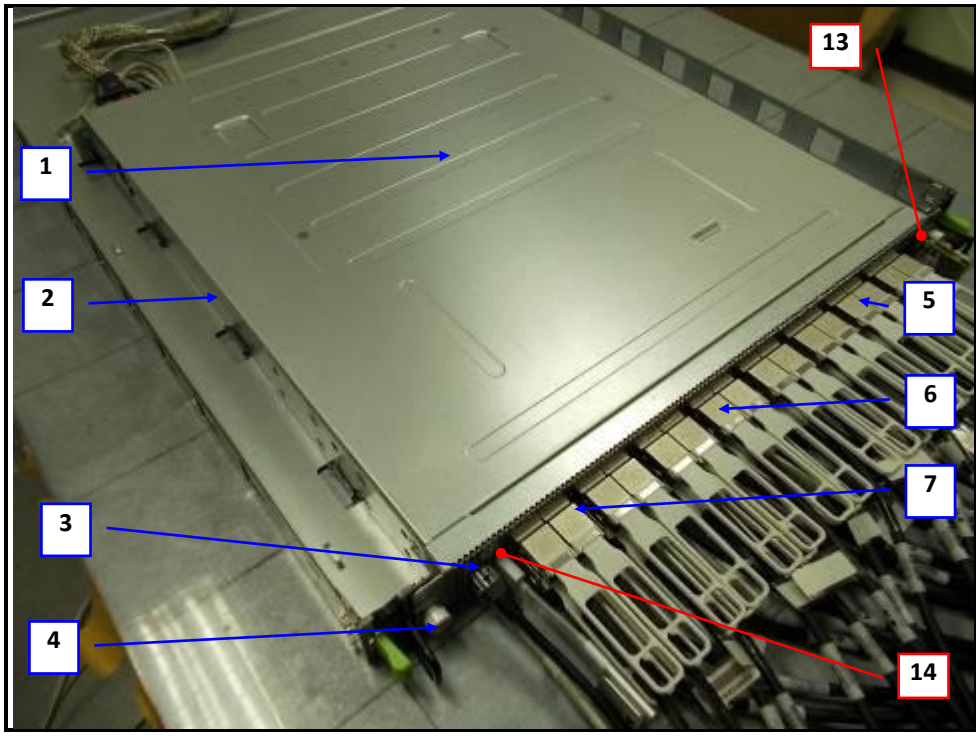
Description of test points of indirect application:

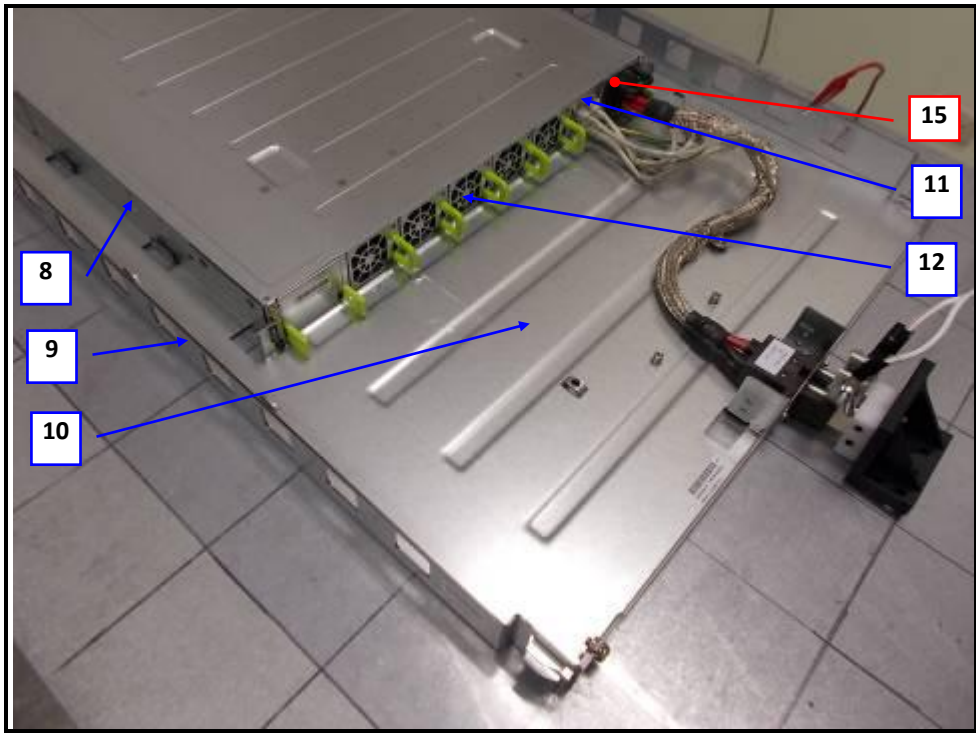
1. Front side 2. Rear side 3. Right side 4. Left side

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

2. The EUT appears a "packet lose" during the test, but it can be self-recoverable after the test.

Description of Test Points





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:	1.5m
Dwell Time:	3 seconds

13.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
RF Voltage Meter BOONTON	4232A- 01	93801	Nov. 30, 2016	Nov. 29, 2017
Signal Generator R&S	SMIQ 03B	102114	Sep. 02, 2016	Sep. 01, 2017
Power Amplifier AR	150W1000M3	311567	NA	NA
Power Amplifier AR	60S1G3M1	306171	NA	NA
LOG ANTENNA AR	AT5080ANT	309740	NA	NA
RS Test Workbench(Software) BVADT	ADT_RS_V7.6.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber Room No. B.
3 The transmit antenna was located at a distance of 2.0 meters from the EUT.
4. Tested Date: Jan. 18, 2017

13.3 Test Arrangement

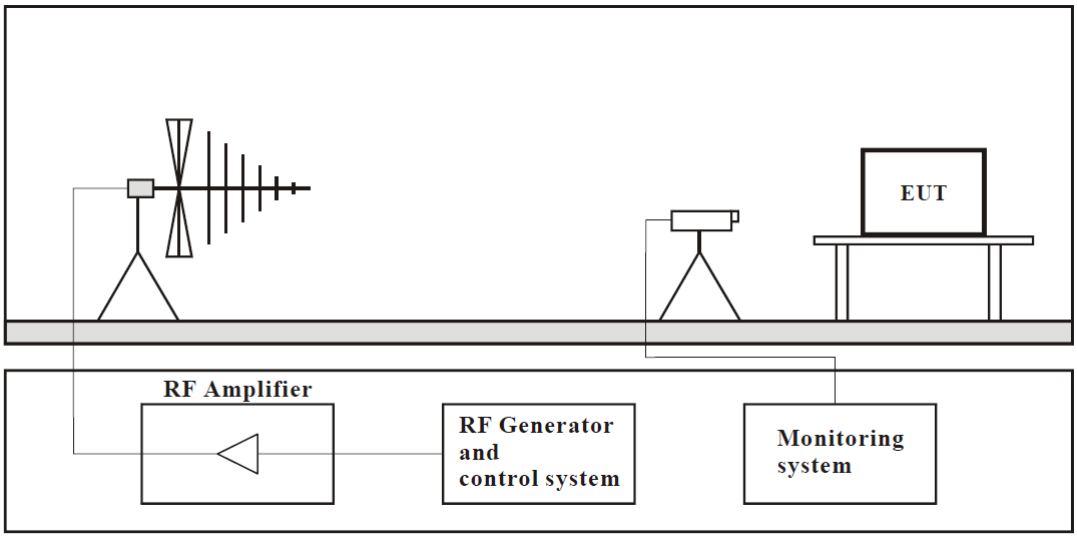
The test procedure was in accordance with EN/IEC 61000-4-3.

a. The testing was performed in a modified semi-anechoic chamber.

b. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The field strength level was 3 V/m.

d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



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

NOTE:

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

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

13.4 Supplementary Information

There is not any deviation from the test standards for the test method.

13.5 Test Results (Mode 1)

Input Power	230 Vac, 50 Hz	Tested by	Kevin Ko
Environmental Conditions	25 °C, 62% RH	Test mode	Mode 1

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

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

13.6 Test Results (Mode 2)

Input Power	DC 12V	Tested by	Kevin Ko
Environmental Conditions	25 °C, 62% RH	Test mode	Mode 2

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 -1000	V&H	0	3	80% AM (1kHz)	Note 1	A
80 -1000	V&H	90	3	80% AM (1kHz)	Note 1	A
80 -1000	V&H	180	3	80% AM (1kHz)	Note 1	A
80 -1000	V&H	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: ±0.5kV Input DC power port: NA Input AC power port: ±1kV
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.	CALIBRATED DATE	CALIBRATED UNTIL
TRANSIENT EMC PARTNER	TRA2000IN6	683	June 07, 2016	June 06, 2017
CN-EFT100 EMC PARTNER	CN-EFT1000	662	Jan. 17, 2017	Jan. 16, 2018
Adapter	NA	SU1ADA-002	NA	NA
Software EMC PARTNER	Test Manger_V2.11	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS room B.
3 Tested Date: Jan. 17 to 18, 2017

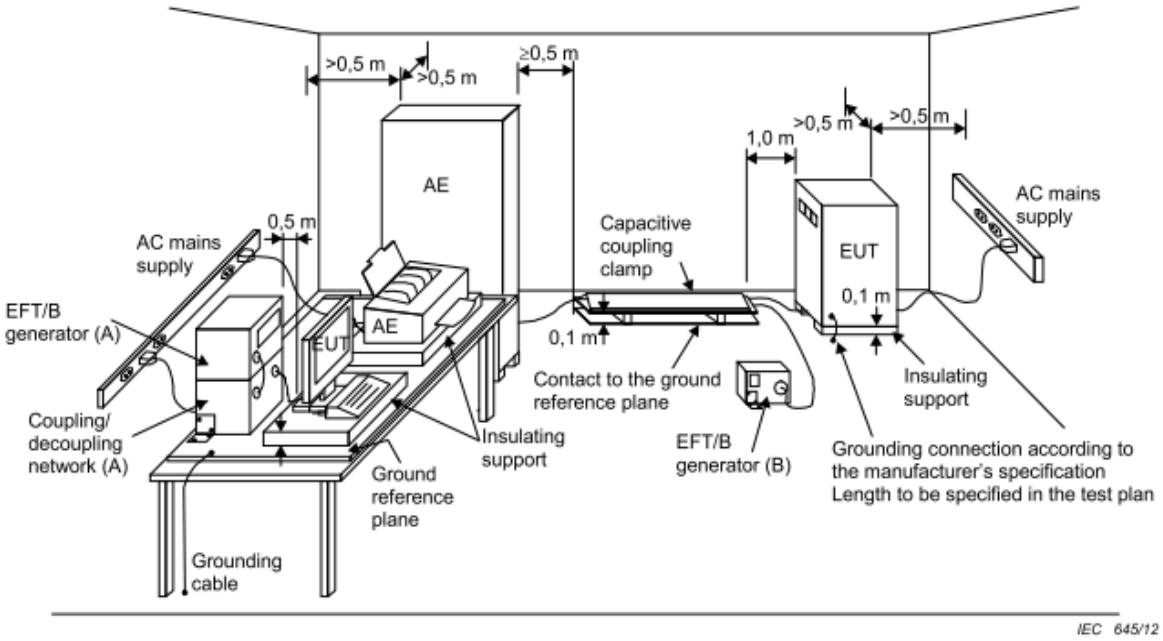
14.3 Test Arrangement

a. Both positive and negative polarity discharges were applied.

b. 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.

c. The duration time of each test sequential was 1 minute.

d. The transient/burst waveform was in accordance with EN/IEC 61000-4-4, 5/50 ns.



NOTE:
(A) location for supply line coupling
(B) location for signal lines coupling

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

14.4 Supplementary Information

There is not any deviation from the test standards for the test method.

14.5 Test Results (Mode 1~2)

Input Power	230 Vac, 50 Hz	Tested by	Jay Chan
Environmental Conditions	21 °C, 59% RH	Test mode	Mode 1~2

Input AC power port

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

Signal / telecommunication port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5	MGMT	+/-	Note 1	A

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

14.6 Test Results (Mode 3)

Input Power	DC 12V	Tested by	Jay Chan
Environmental Conditions	20 °C, 55% RH	Test mode	Mode 3

Signal / telecommunication port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5	MGMT	+/-	Note 1	A

Note: 1. The EUT function was correct during 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 µs Open Circuit Voltage 5/320 µs Short Circuit Current
	Input DC power port (direct to outdoor cables*): 1.2/50 µs Open Circuit Voltage 8/20 µs Short Circuit Current
	Input AC power port: 1.2/50 µs Open Circuit Voltage 8/20 µs 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: ±1kV, Line to earth or ground: ±0.5kV, ±1kV, ±2kV
AC Phase Angle (degree):	0°, 90°, 180°, 270°
Pulse Repetition Rate:	1 time / 20 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.	CALIBRATED DATE	CALIBRATED UNTIL
Unshielded Symmetrical High-speed Interconnection Lines Coupling Decoupling Network 3ctest	CDN 405T8H	ES2761502	July 28, 2016	July 27, 2017
Adapter	NA	SU1ADA-002	NA	NA
TRANSIENT EMC PARTNER	TRA2000IN6	683	June 07, 2016	June 06, 2017
Software EMC PARTNER	Test Manger_V2.11	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS room B.
3 Tested Date: Jan. 17, 2017

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:

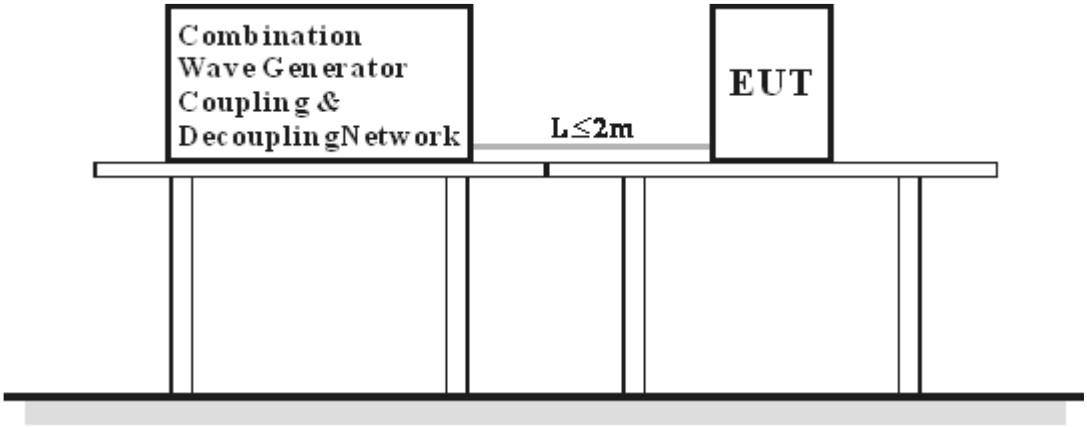
a) Shields grounded at both ends
- The surge injection on the shield.

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.



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

15.4 Supplementary Information

There is not any deviation from the test standards for the test method.

15.5 Test Results (Mode 1~2)

Input Power	230 Vac, 50 Hz	Tested by	Jay Chan
Environmental Conditions	21 °C, 59% RH	Test mode	Mode 1~2

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

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.	CALIBRATED DATE	CALIBRATED UNTIL
Signal Generator R&S	SML 01	102731	Nov. 25, 2016	Nov. 24, 2017
Amplifier AR	75A250AM2	307297	NA	NA
RF Voltage Meter BOONTON	4232A- 01	93801	Nov. 30, 2016	Nov. 29, 2017
LUTHIE EM Injection Clamp	EM-101	35453	May 18, 2016	May 17, 2017
Coupling Decoupling Network M2 FCC	FCC-801-M2-16A	03048	Jan. 04, 2017	Jan. 03, 2018
Coupling Decoupling Network M3 FCC	FCC-801-M3-16A	01023	Jan. 04, 2017	Jan. 03, 2018
Coupling Decoupling Network T2 FCC	FCC-801-T2	02025	Oct. 05, 2016	Oct. 04, 2017
Coupling Decoupling Network T4 FCC	FCC-801-T4	02030	Oct. 05, 2016	Oct. 04, 2017
Coupling Decoupling Network T8 FCC	FCC-801-T8	02036	Oct. 05, 2016	Oct. 04, 2017
ADT CS Test Workbench(Software) BVADT	ADT_CS_7.4.3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chamber Room No. B.
3 Tested Date: Jan. 17, 2017

16.3 Test Arrangement

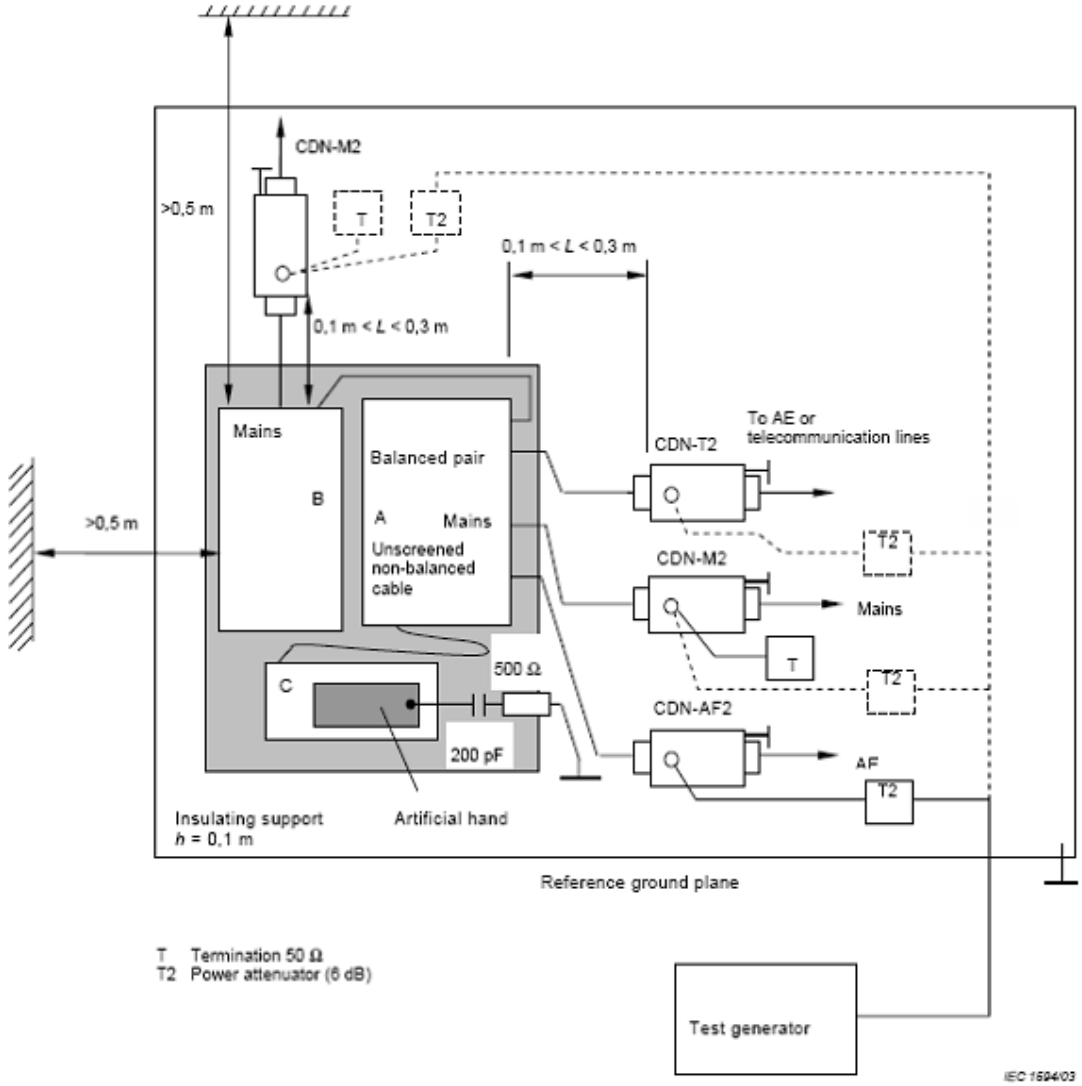
a. The EUT shall be tested within its intended operating and climatic conditions.

b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.

c. One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.

d. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.

e. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.



Note: 1.The EUT clearance from any metallic obstacles shall be at least 0,5 m.
2. Interconnecting cables (≦1 m) belonging to the EUT shall remain on the insulating support.
For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

16.4 Supplementary Information

There is not any deviation from the test standards for the test method.

16.5 Test Results (Mode 1~2)

Input Power	230 Vac, 50 Hz	Tested by	Barry Lee
Environmental Conditions	20 °C, 50% RH	Test mode	Mode 1~2

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	3	Power	CDN-M3	CDN-T8	Note 1	A
0.15 – 80	3	MGMT	CDN-T8	CDN-M3	Note 1	A

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

16.6 Test Results (Mode 3)

Input Power	DC 12V	Tested by	Jay Chan
Environmental Conditions	20 °C, 50% RH	Test mode	Mode 3

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	3	Power	CDN-M2	CDN-T8	Note 1	A
0.15 – 80	3	MGMT	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 coil, 1 m x 1 m (L x W)

17.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Triaxial Elf Magnetic Field Meter BELL	4090	NA	Jan. 27, 2016	Jan. 26, 2017
Power frequency magnetic filed coil 3ctest	TCX30	EC1281401	Mar. 07, 2016	Mar. 06, 2017
Power frequency magnetic filed generator 3ctest	PFMF-1200G	EC0111401	Mar. 07, 2016	Mar. 06, 2017

Note:

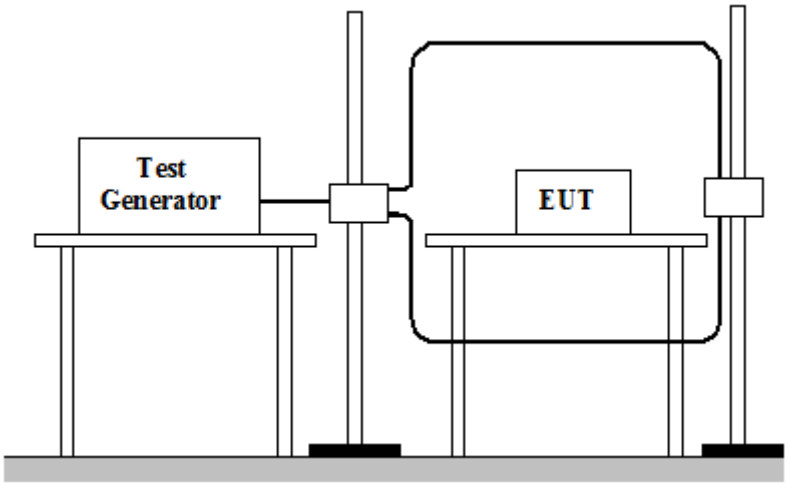
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS room.
3 Tested Date: Jan. 18, 2017

17.3 Test Arrangement

a. The equipment is configured and connected to satisfy its functional requirements.

b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

c. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.



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 Supplementary Information

There is not any deviation from the test standards for the test method.

17.5 Test Results (Mode 1)

Input Power	230 Vac, 50 Hz	Tested by	Kevin Ko
Environmental Conditions	25 °C, 62% RH	Test mode	Mode 1

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.

17.6 Test Results (Mode 2)

Input Power	DC 12V	Tested by	Kevin Ko
Environmental Conditions	25 °C, 62% RH	Test mode	Mode 2

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

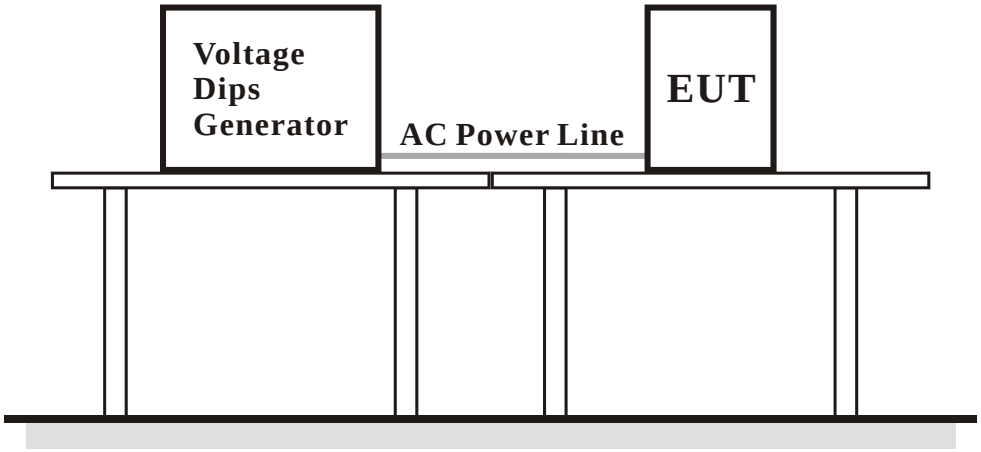
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
TRANSIENT EMC PARTNER	TRA2000IN6	683	June 07, 2016	June 06, 2017
Adapter	NA	SU1ADA-002	NA	NA
Software EMC PARTNER	Test Manger_V2.11	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in EMS room B.
3 Tested Date: Jan. 17, 2017

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 dregee crossover point of the voltage waveform.



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

18.4 Supplementary Information

There is not any deviation from the test standards for the test method.

18.5 Test Results (Mode 1~2)

Input Power	230 Vac / 240 Vac / 100 Vac, 50 Hz	Tested by	Jay Chan
Environmental Conditions	21 °C, 59% RH	Test mode	Mode 1~2

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	B

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	B

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 2	B
>95	250	10	3	Note 2	B

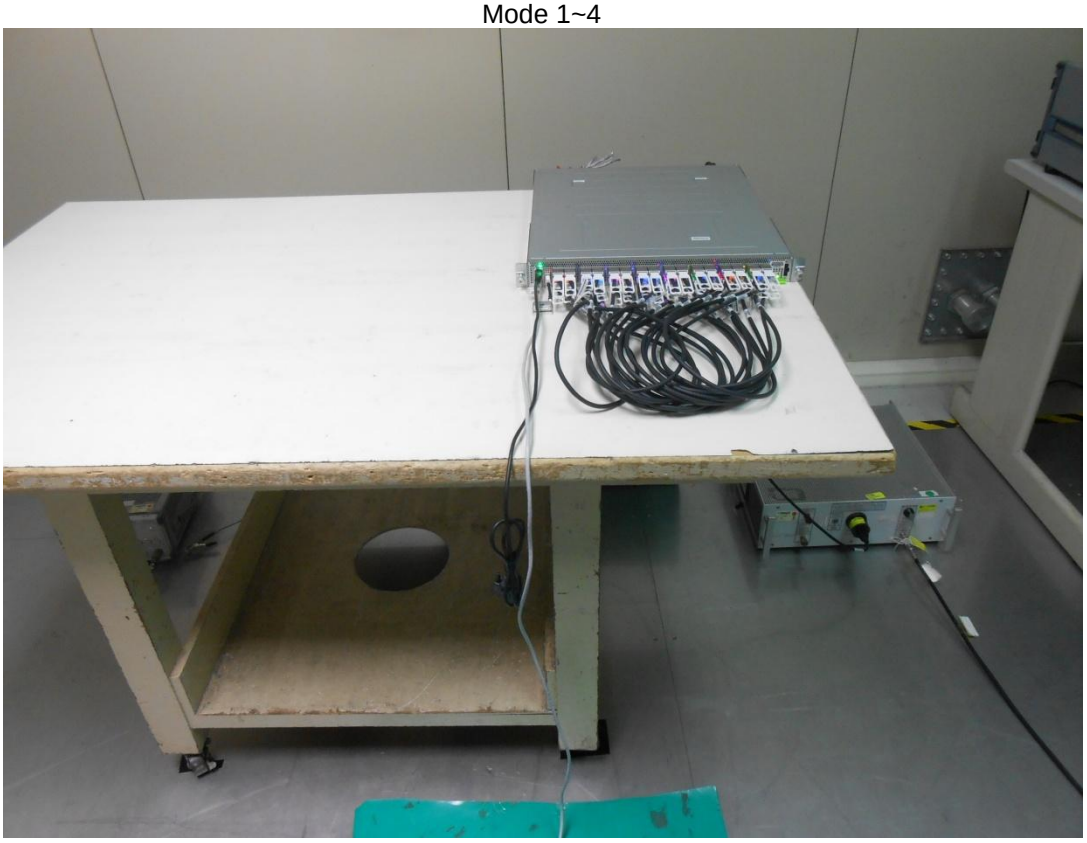
Note: 1. The EUT function was correct during the test.

2. The PSU LED light of EUT appears a “light off” phenomena during the test, but it can be self-recoverable after the test.

19 Pictures of Test Arrangements

19.1 Conducted Emission from the AC Mains Power Port

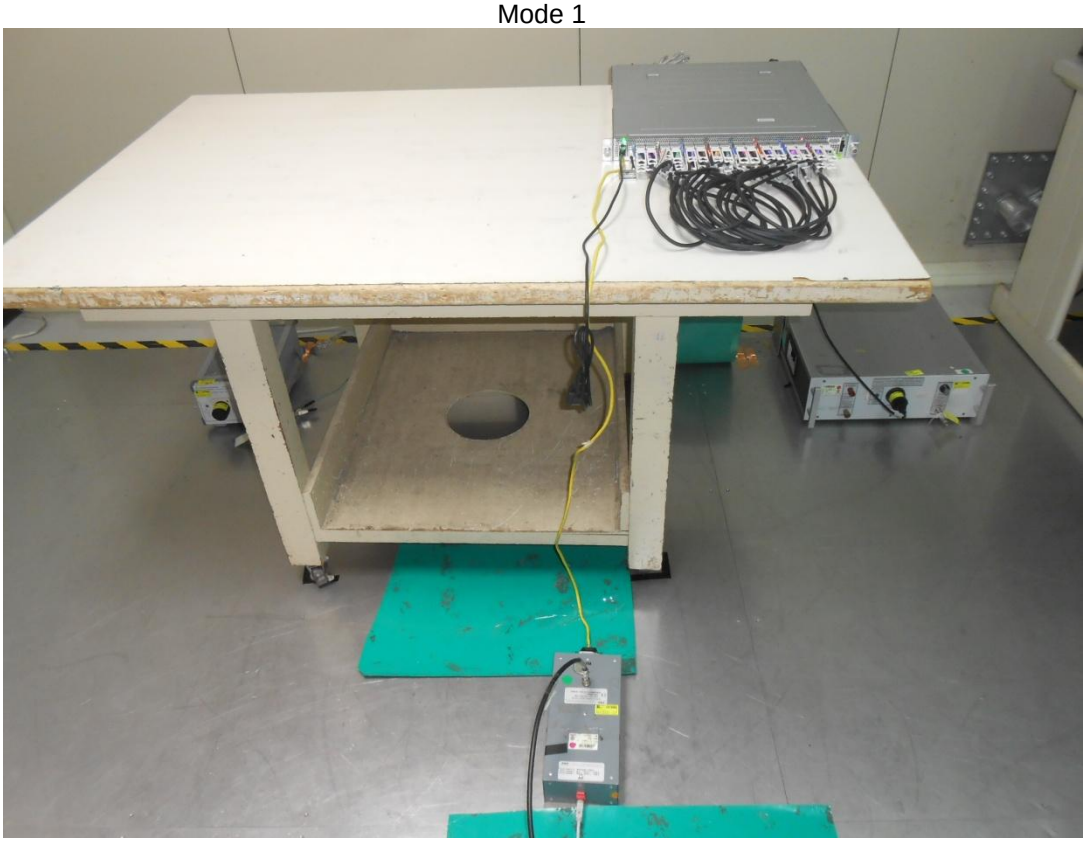
Mode 1~4



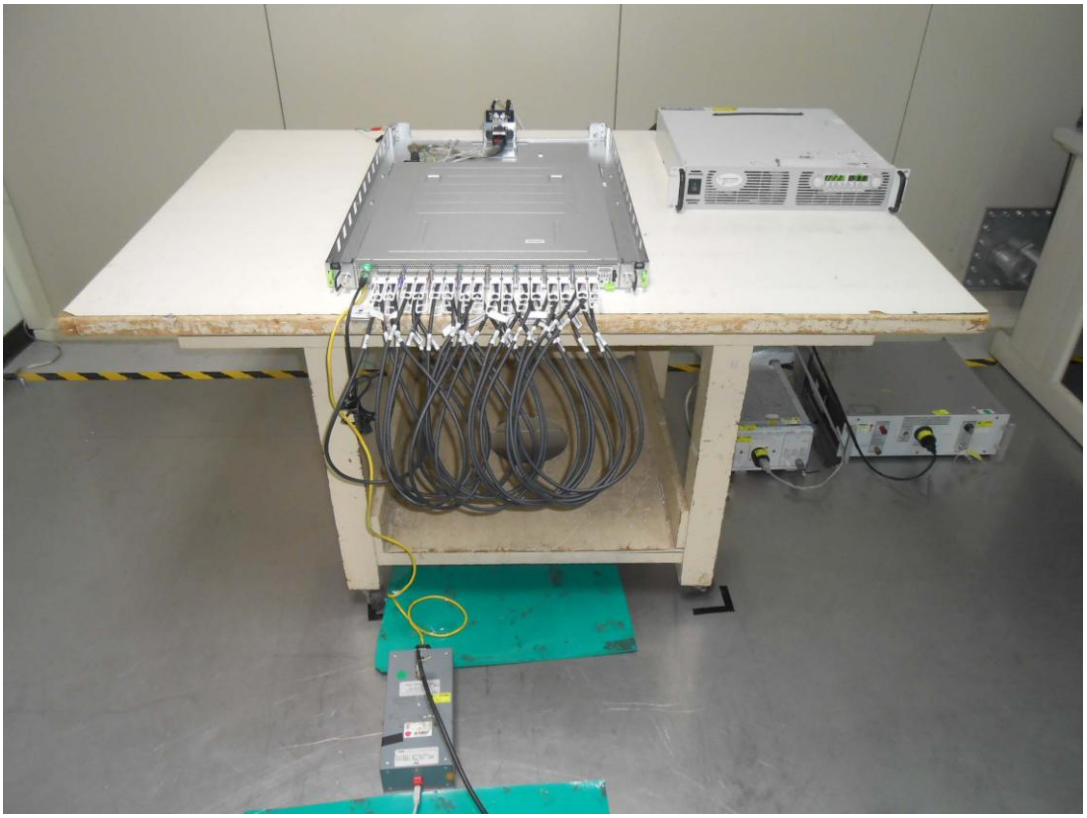


19.2 Asymmetric Mode Conducted Emission at Wired Network Ports

Mode 1

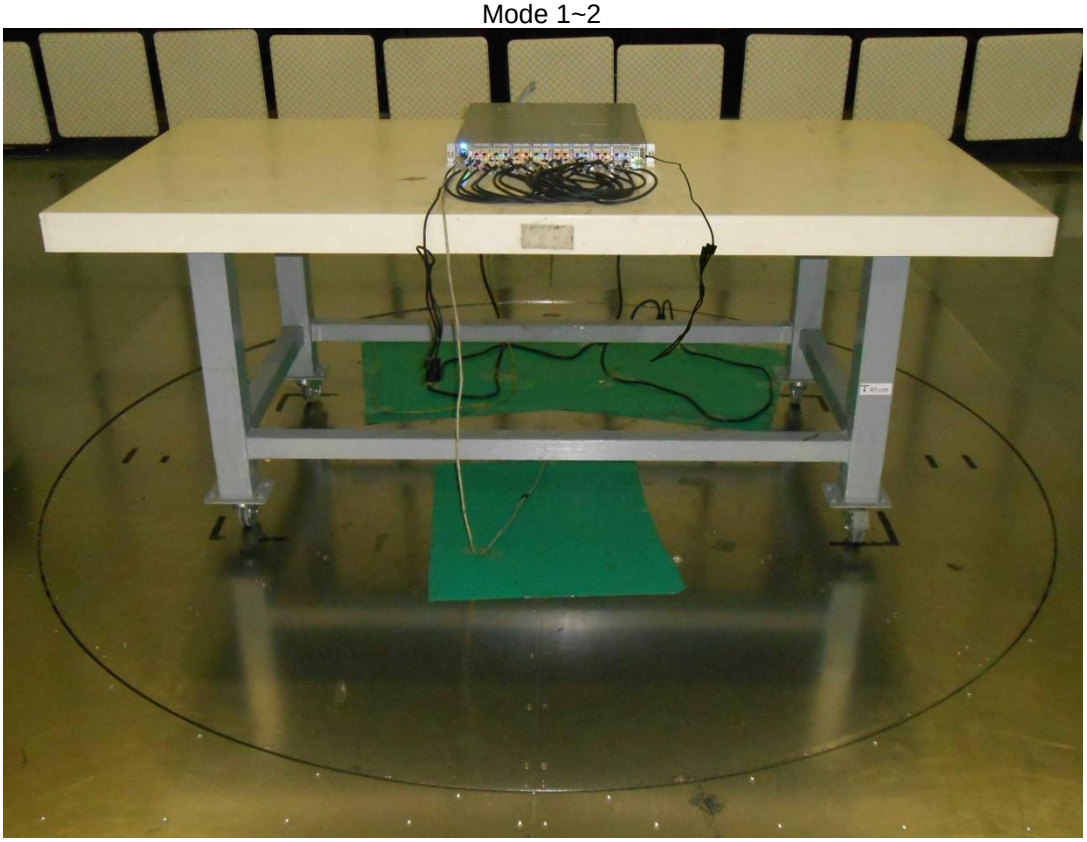


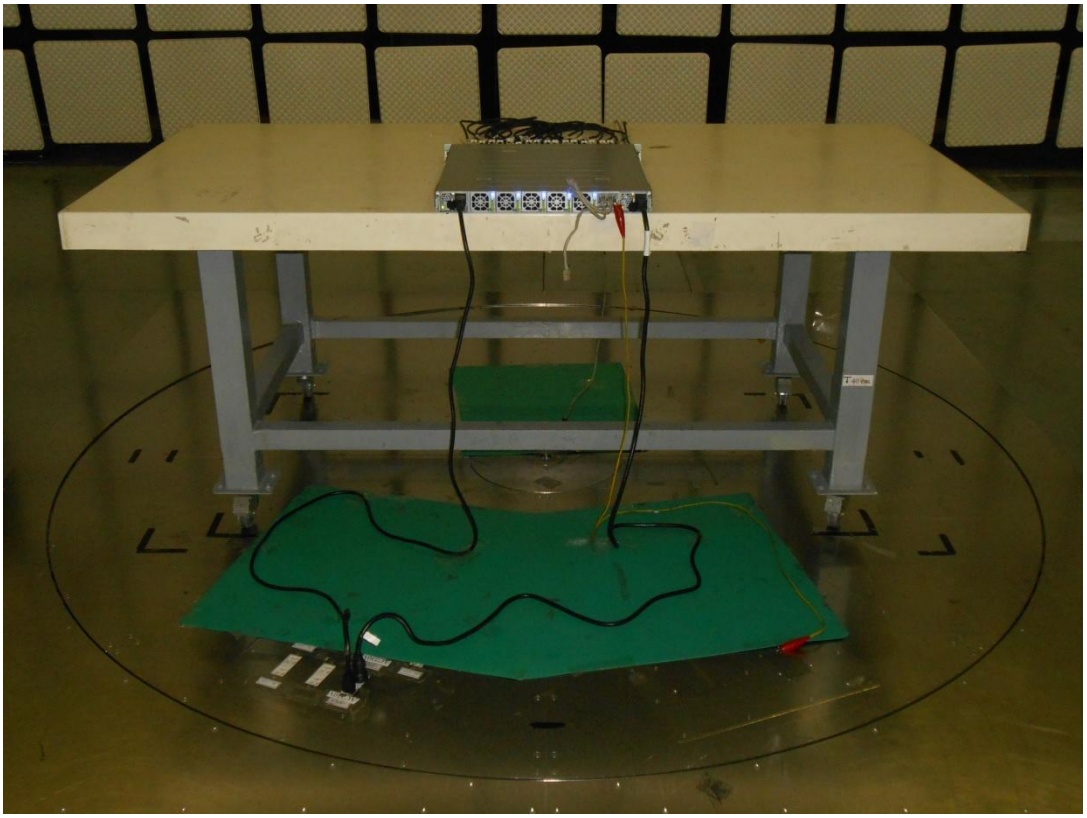
Mode 2



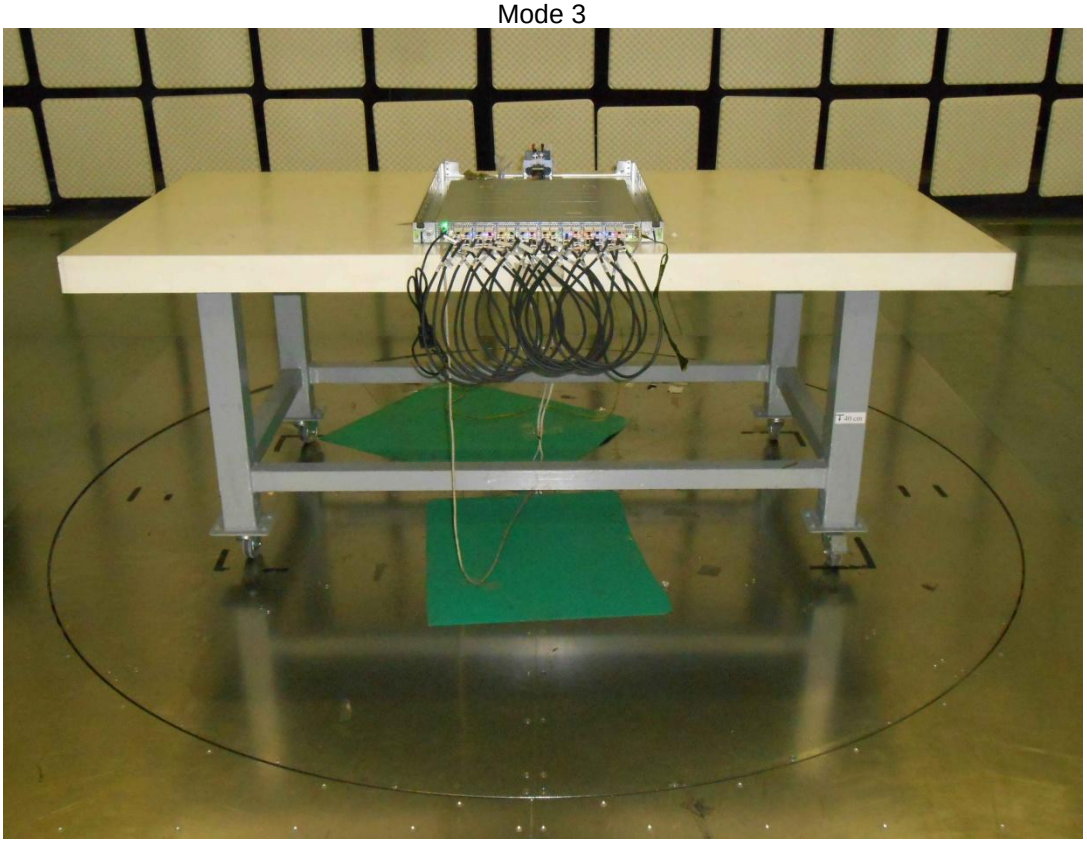
19.3 Radiated Emission at Frequencies up to 1GHz

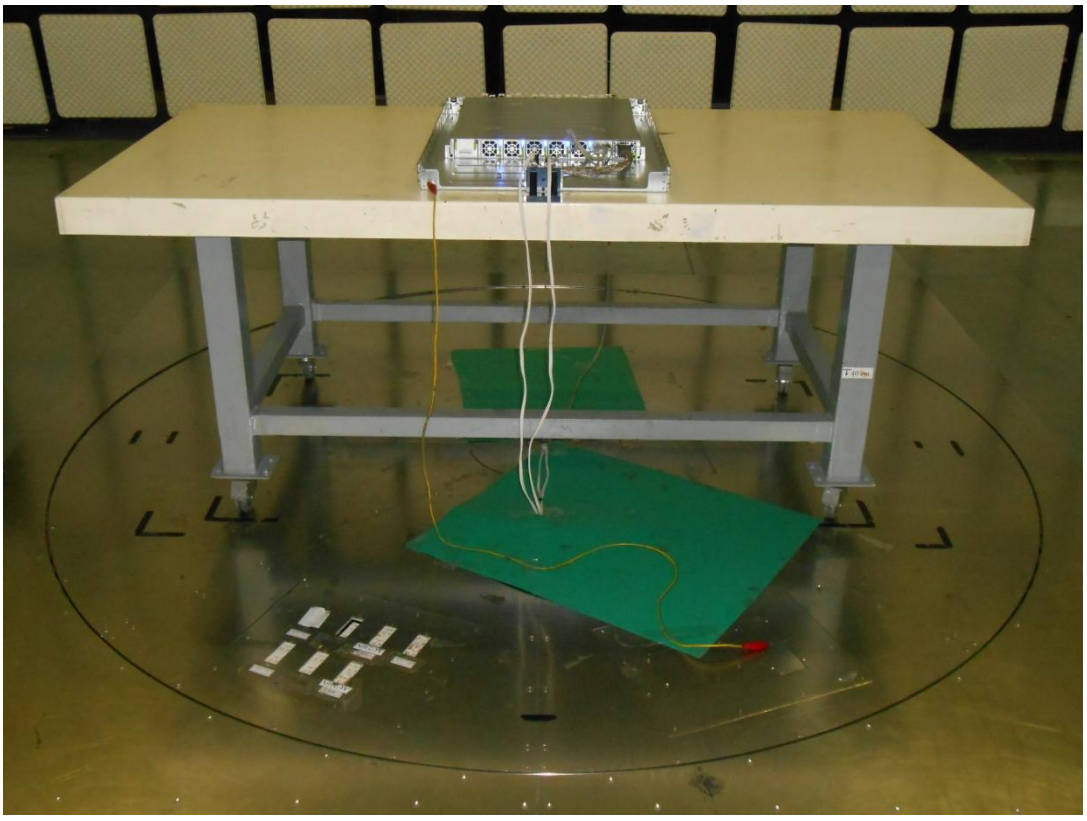
Mode 1~2





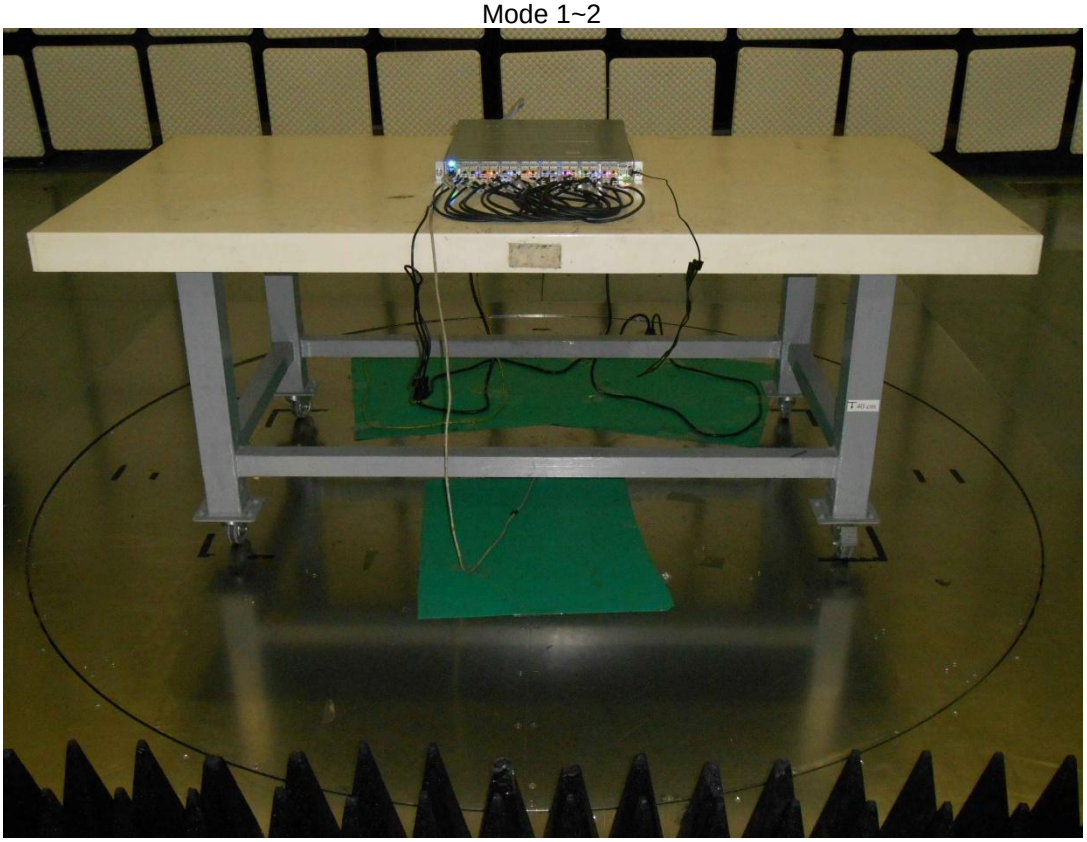
Mode 3

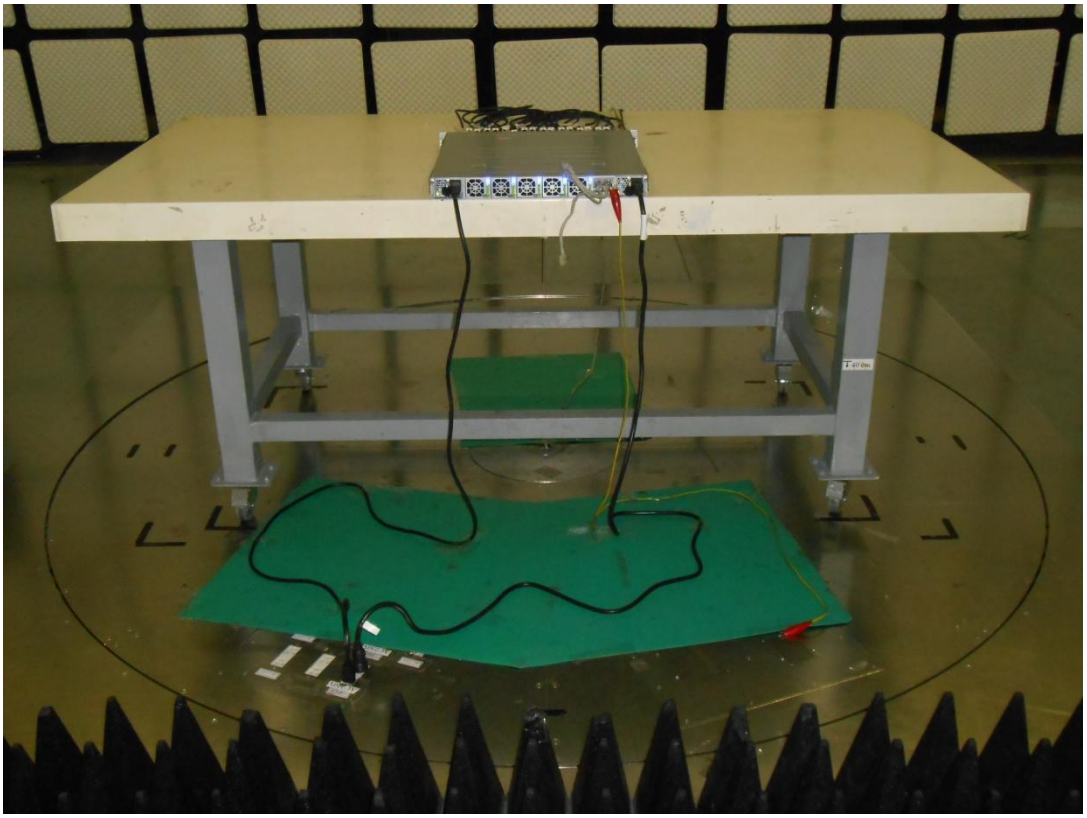




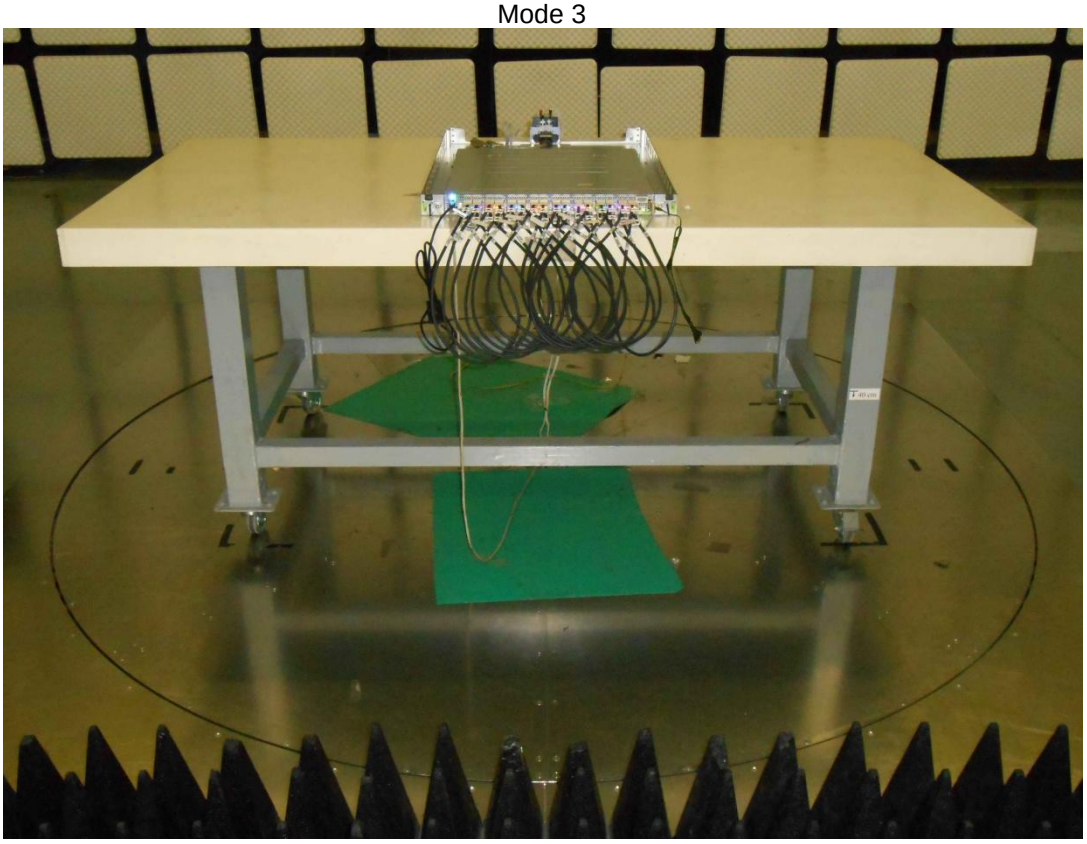
19.4 Radiated Emission at Frequencies above 1GHz

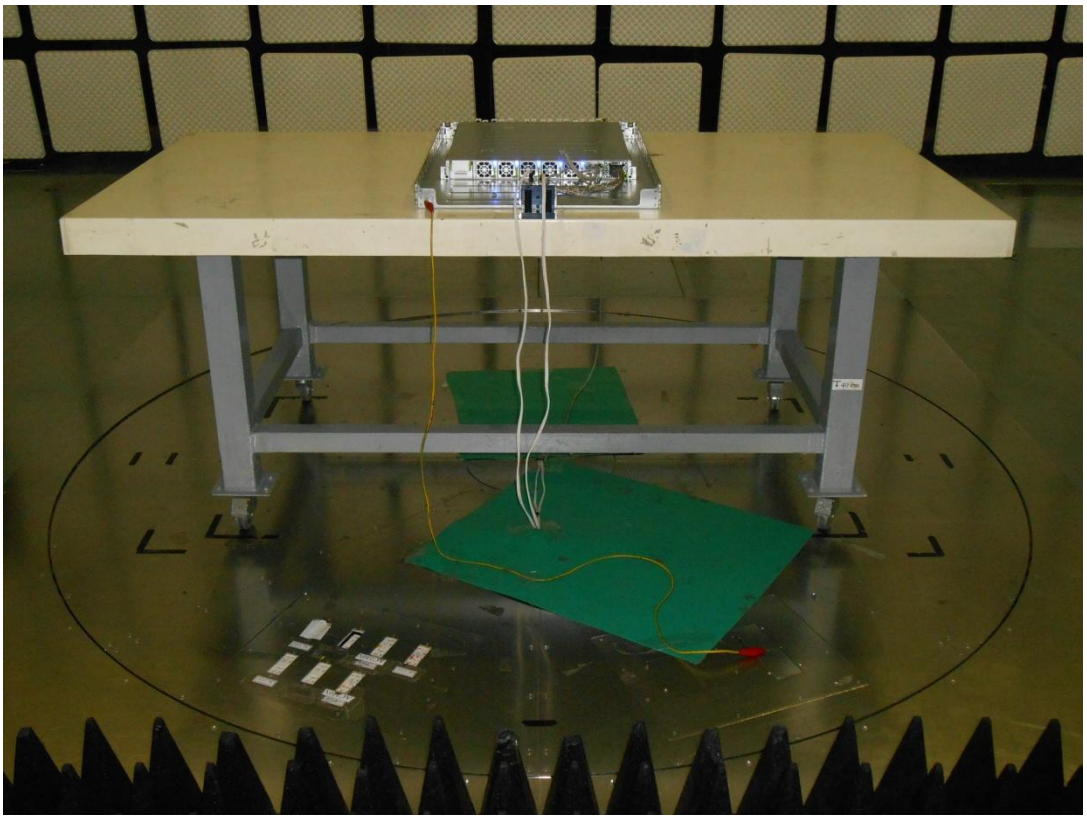
Mode 1~2





Mode 3





19.5 Harmonics Current, Voltage Fluctuations and Flicker Measurement

Mode 1

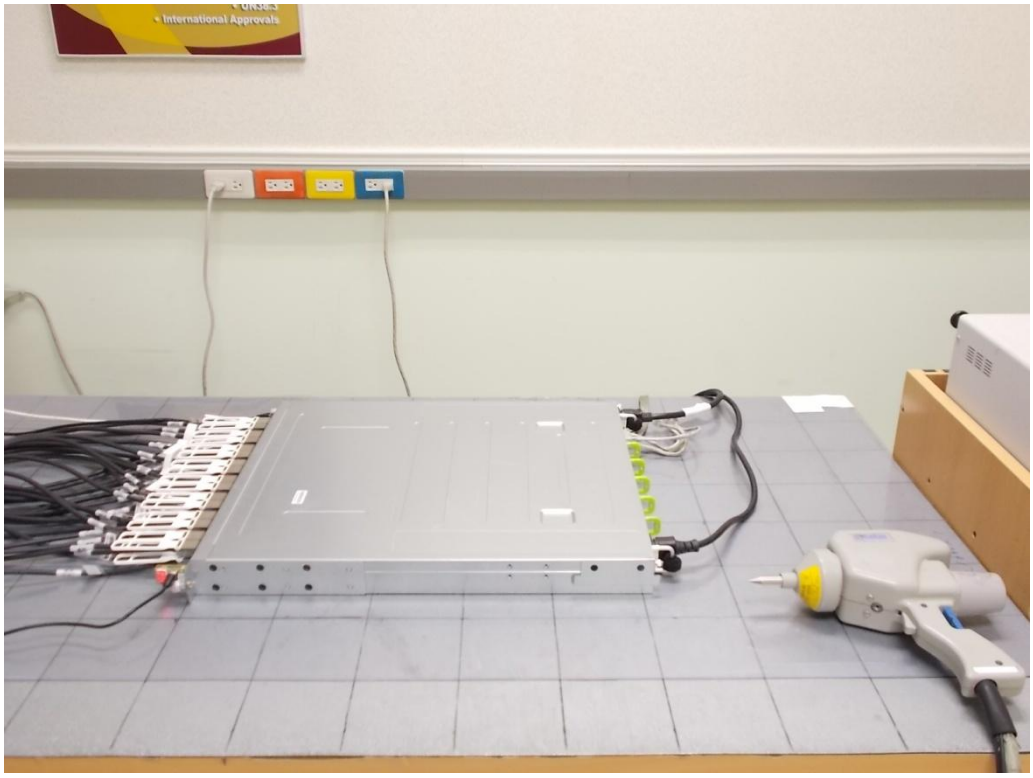


Mode 2

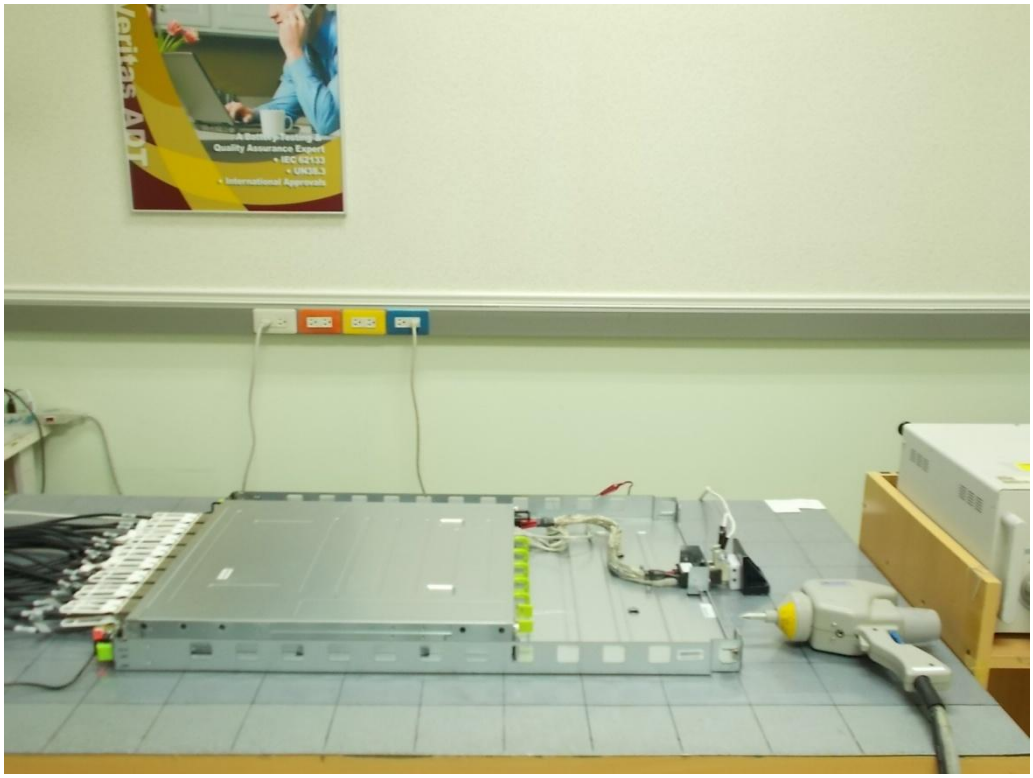


19.6 Electrostatic Discharge Immunity Test (ESD)

Mode 1

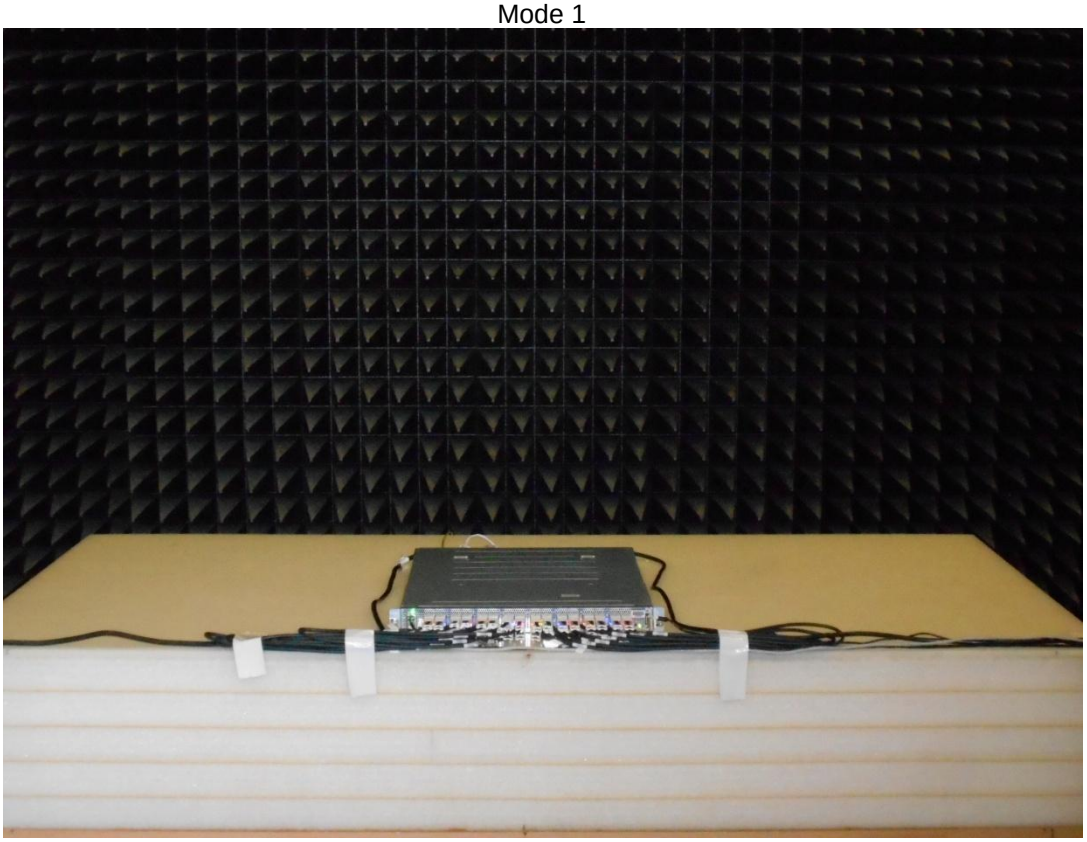


Mode 2

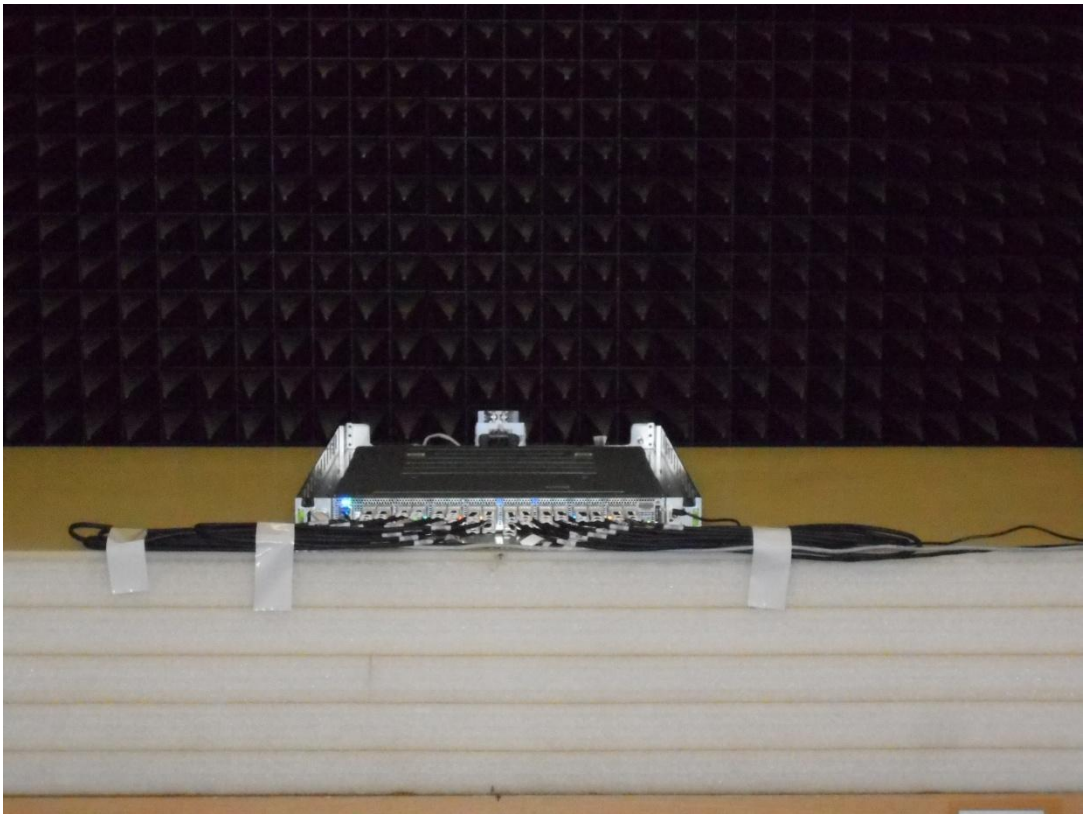


19.7 Radio-frequency, Electromagnetic Field Immunity Test (RS)

Mode 1

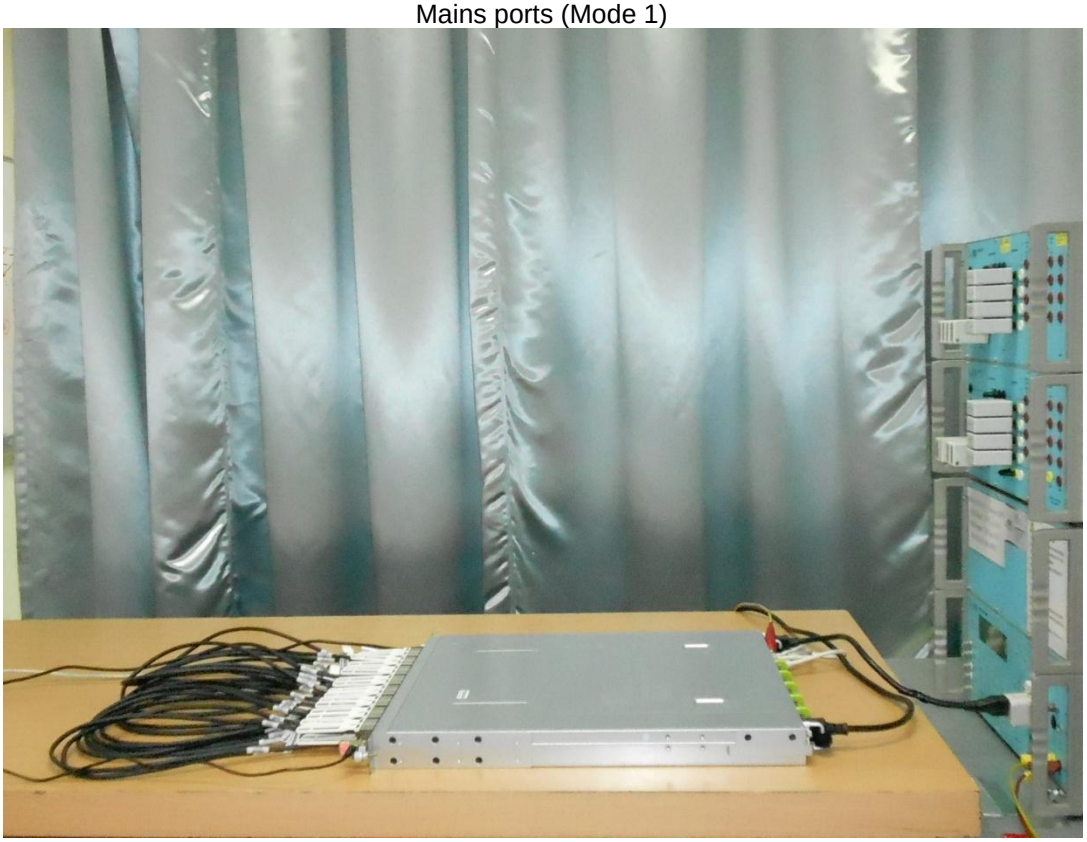


Mode 2

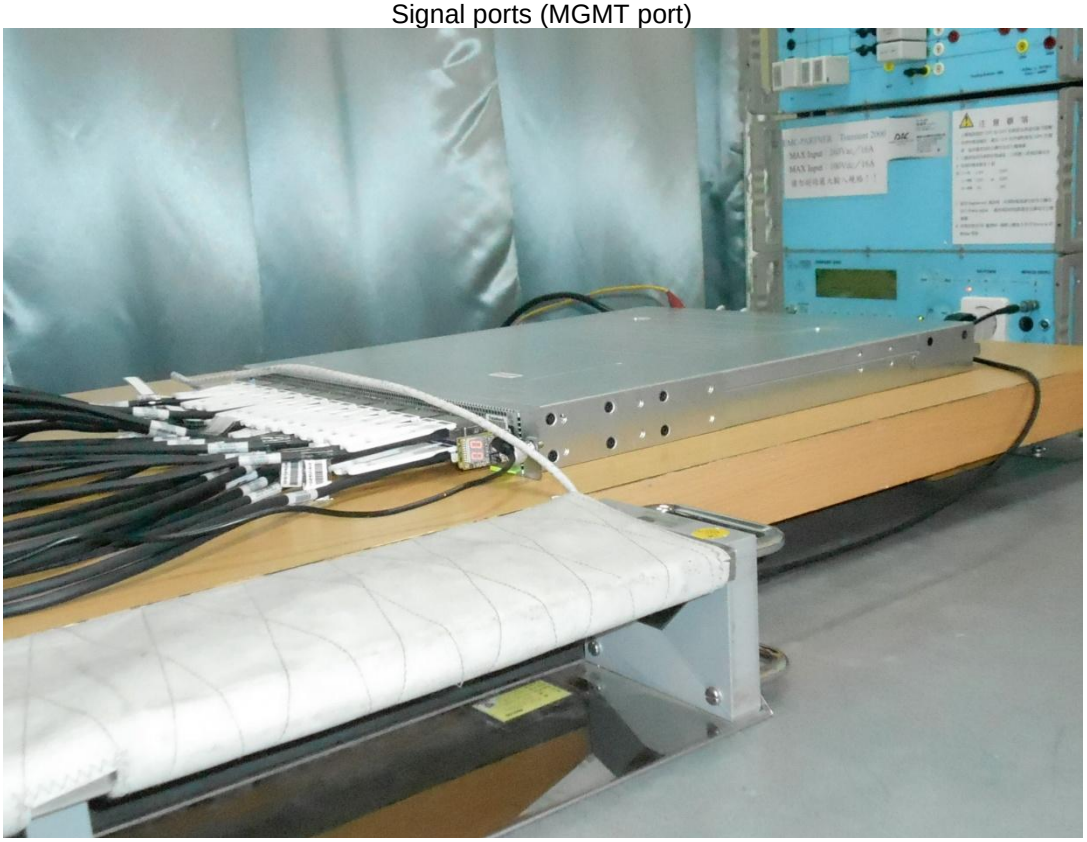


19.8 Electrical Fast Transient/Burst Immunity Test (EFT)

Mains ports (Mode 1)



Signal ports (MGMT port)



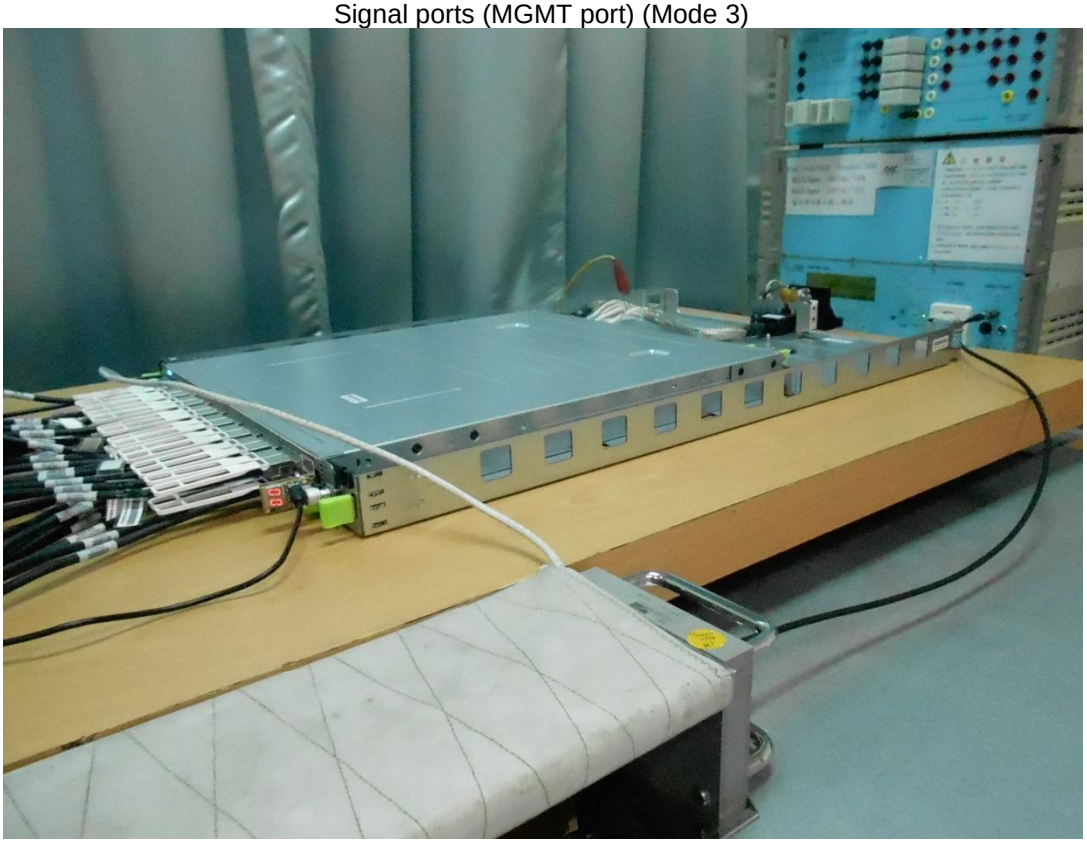
Mains ports (Mode 2)



Signal ports (MGMT port)

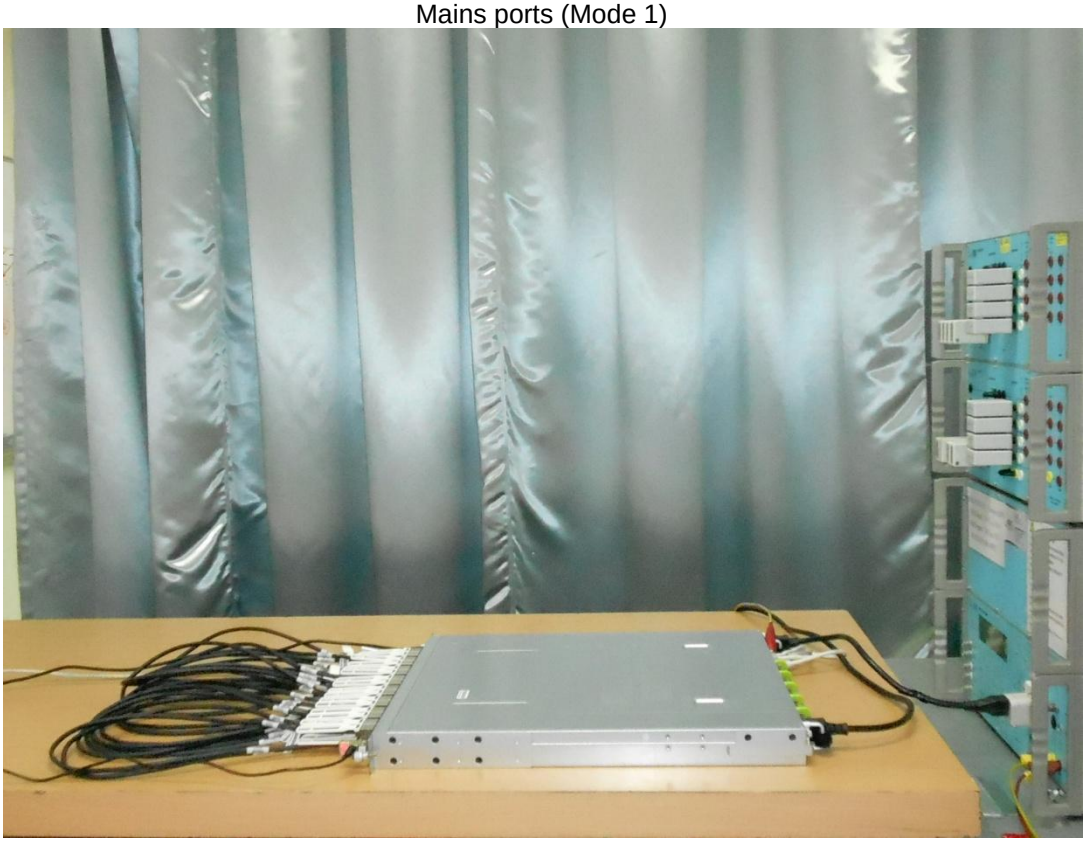


Signal ports (MGMT port) (Mode 3)



19.9 Surge Immunity Test

Mains ports (Mode 1)

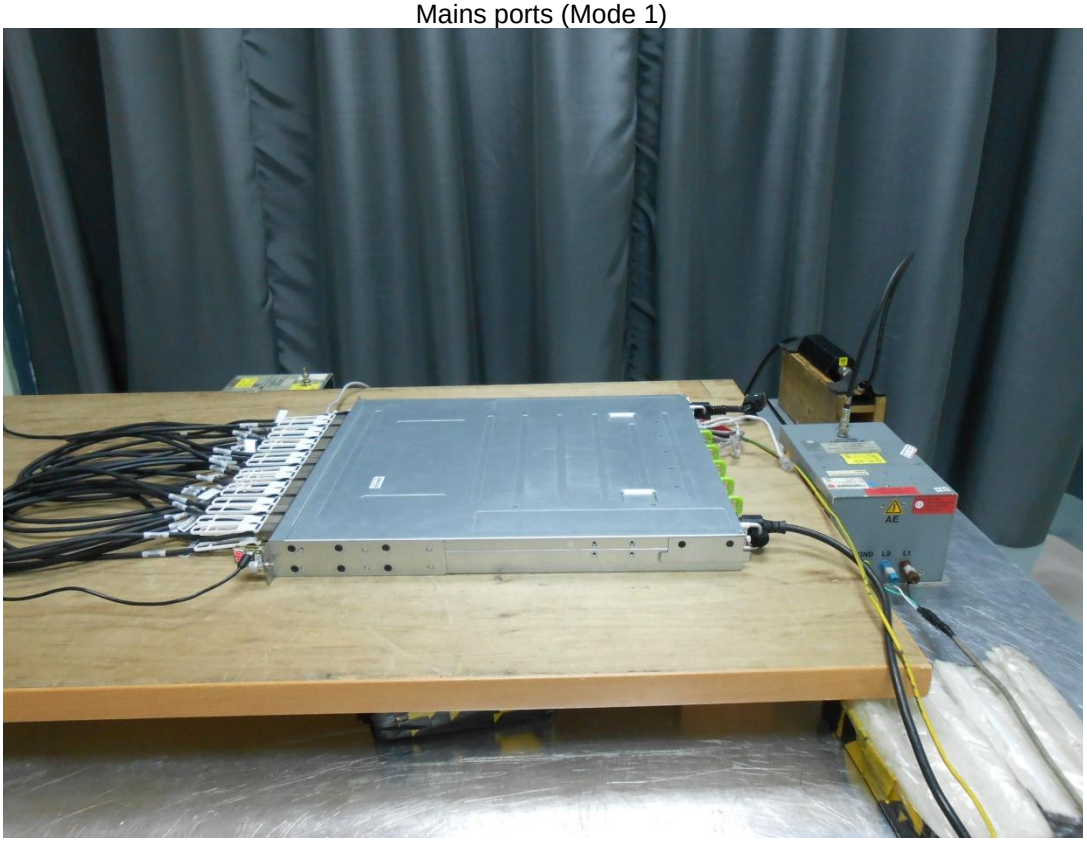


Mains ports (Mode 2)

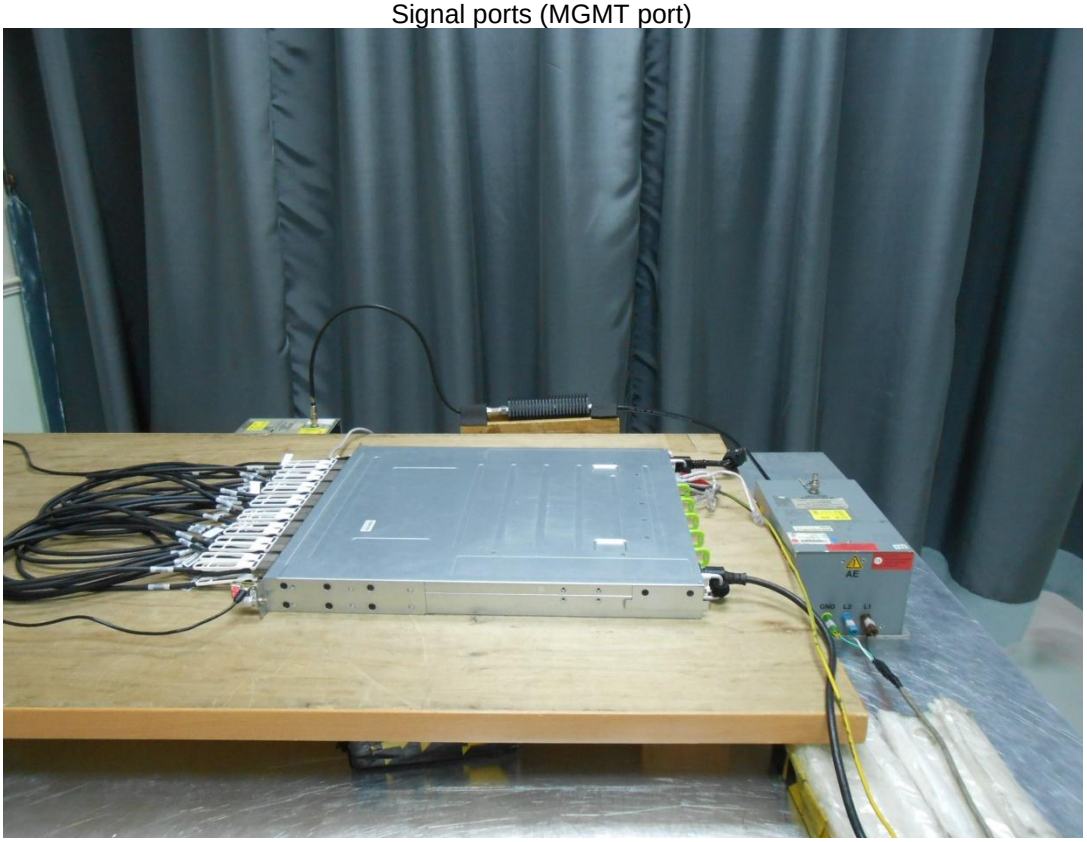


19.10 Conducted Disturbances Induced by RF Fields (CS)

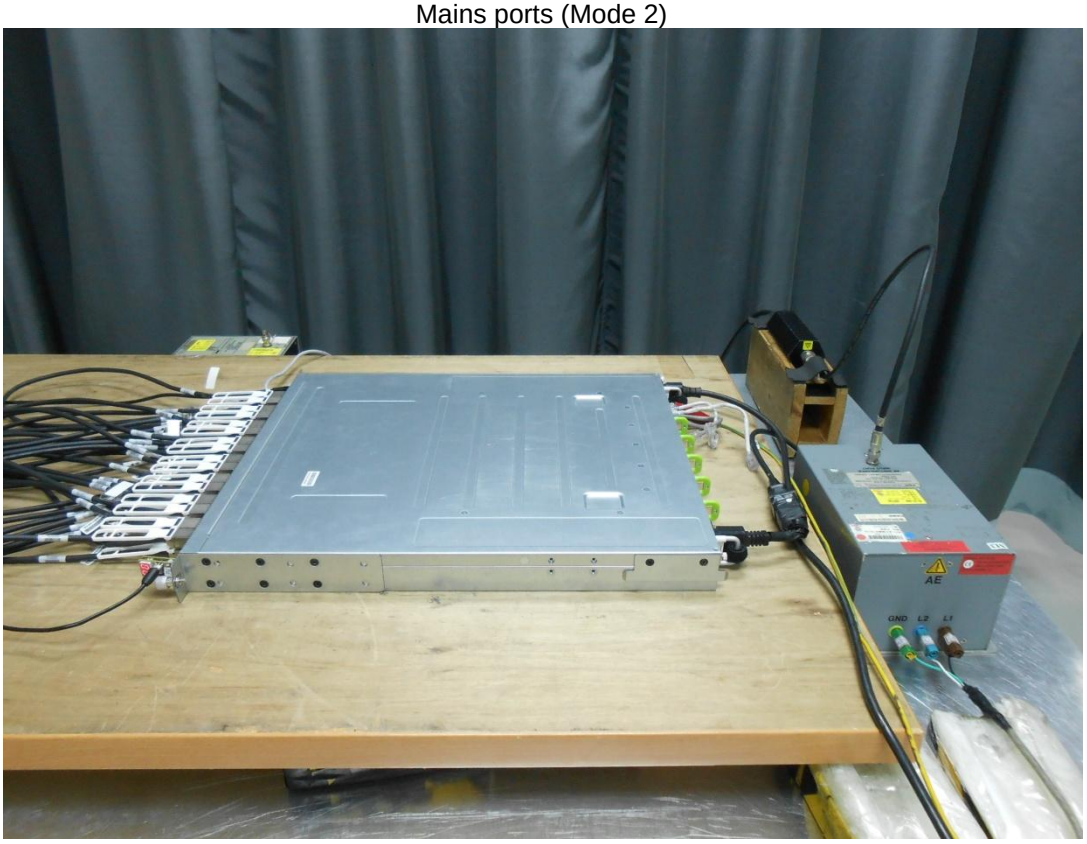
Mains ports (Mode 1)



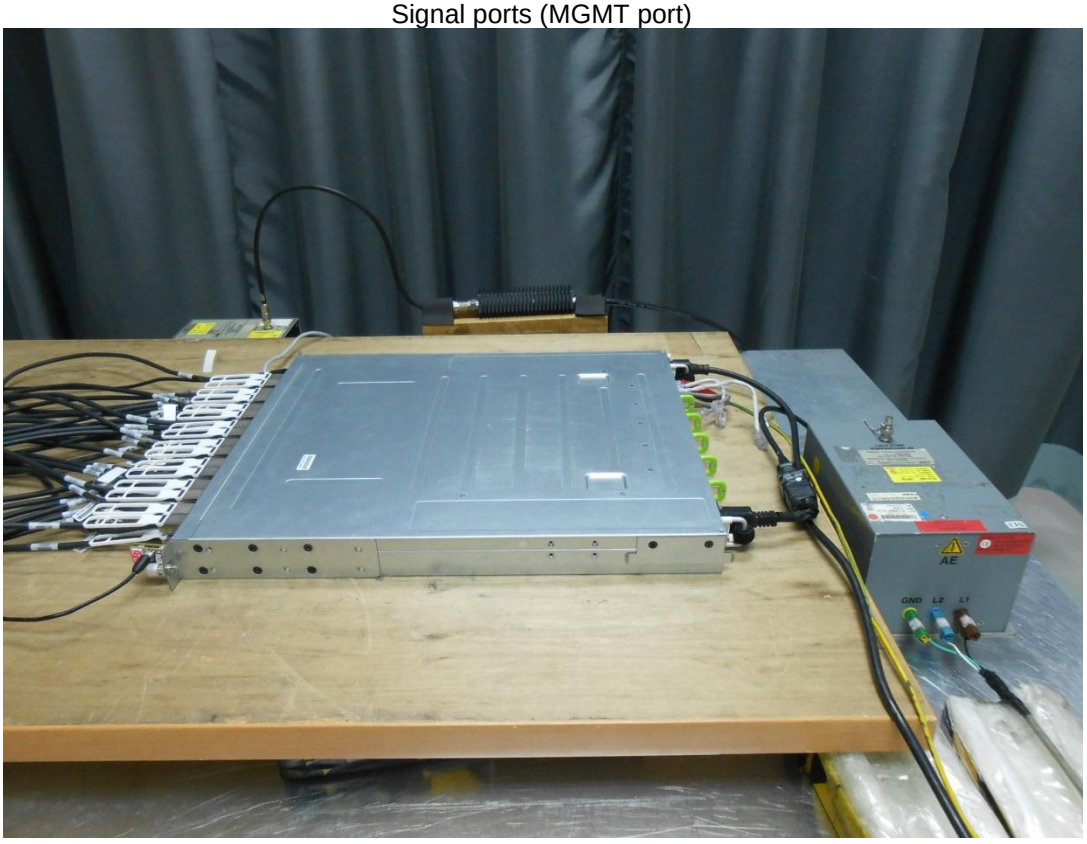
Signal ports (MGMT port)



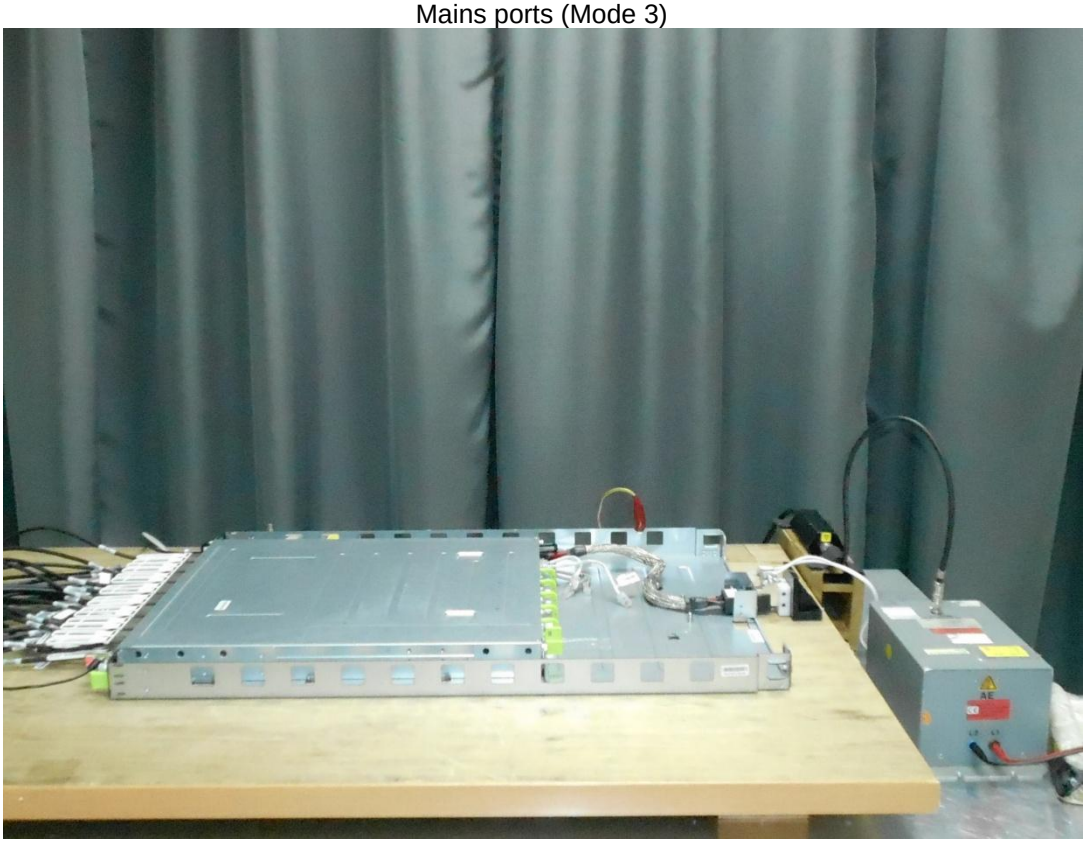
Mains ports (Mode 2)



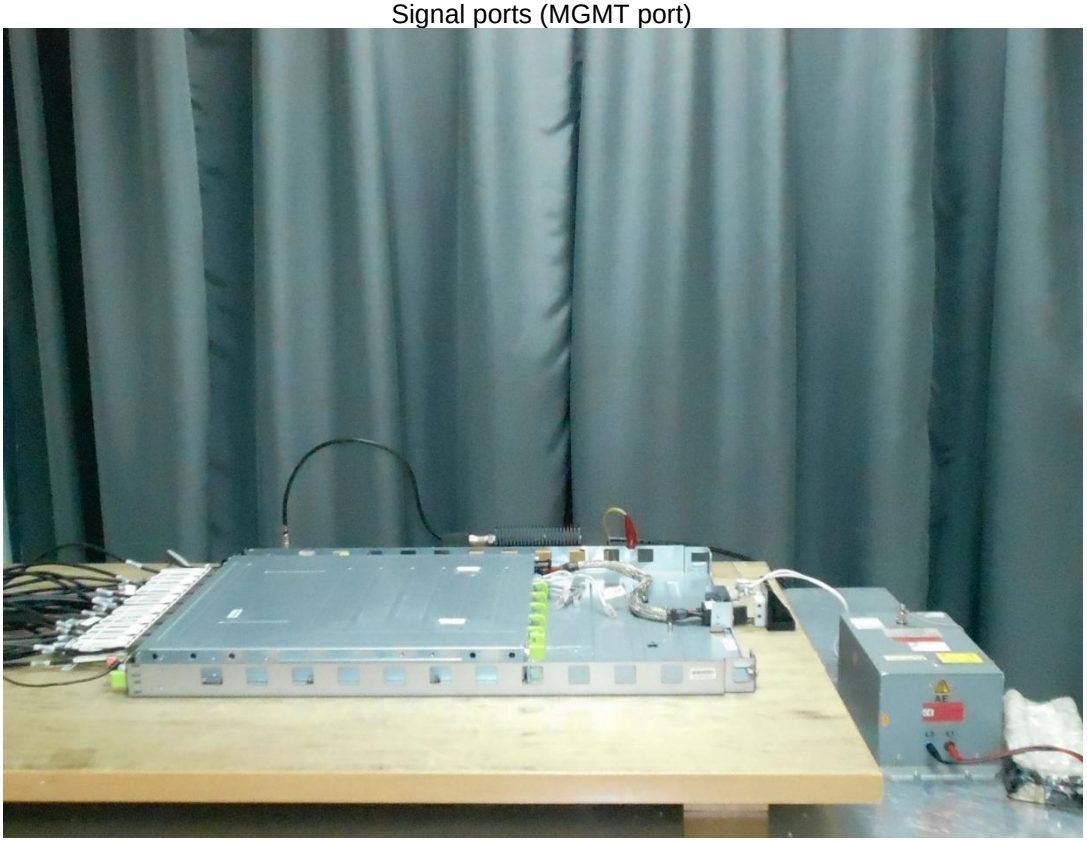
Signal ports (MGMT port)



Mains ports (Mode 3)

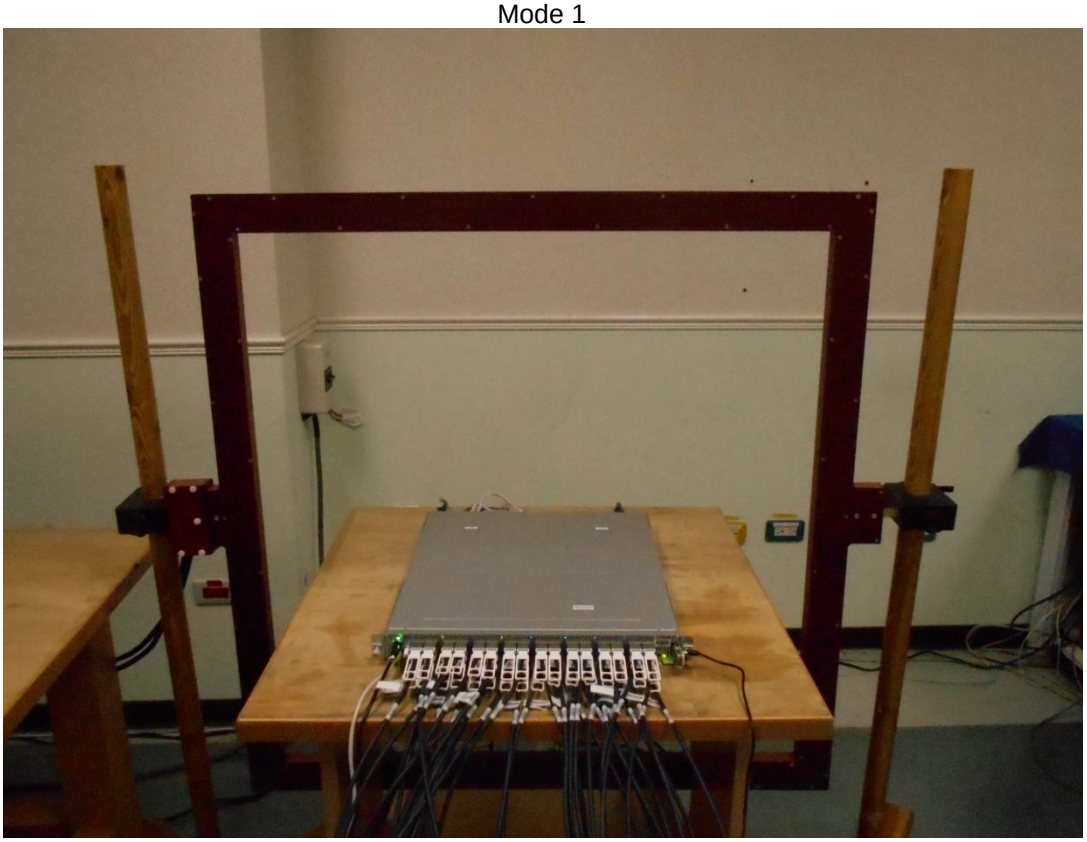


Signal ports (MGMT port)

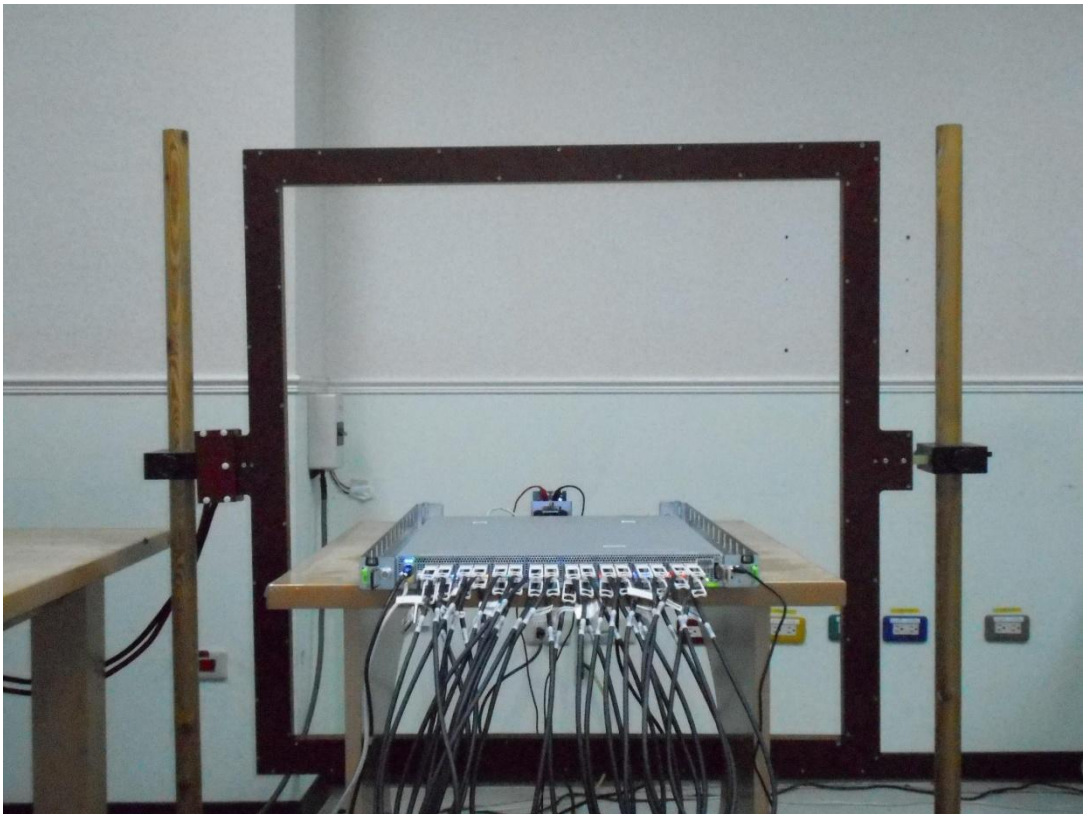


19.11 Power Frequency Magnetic Field Immunity Test (PFMF)

Mode 1

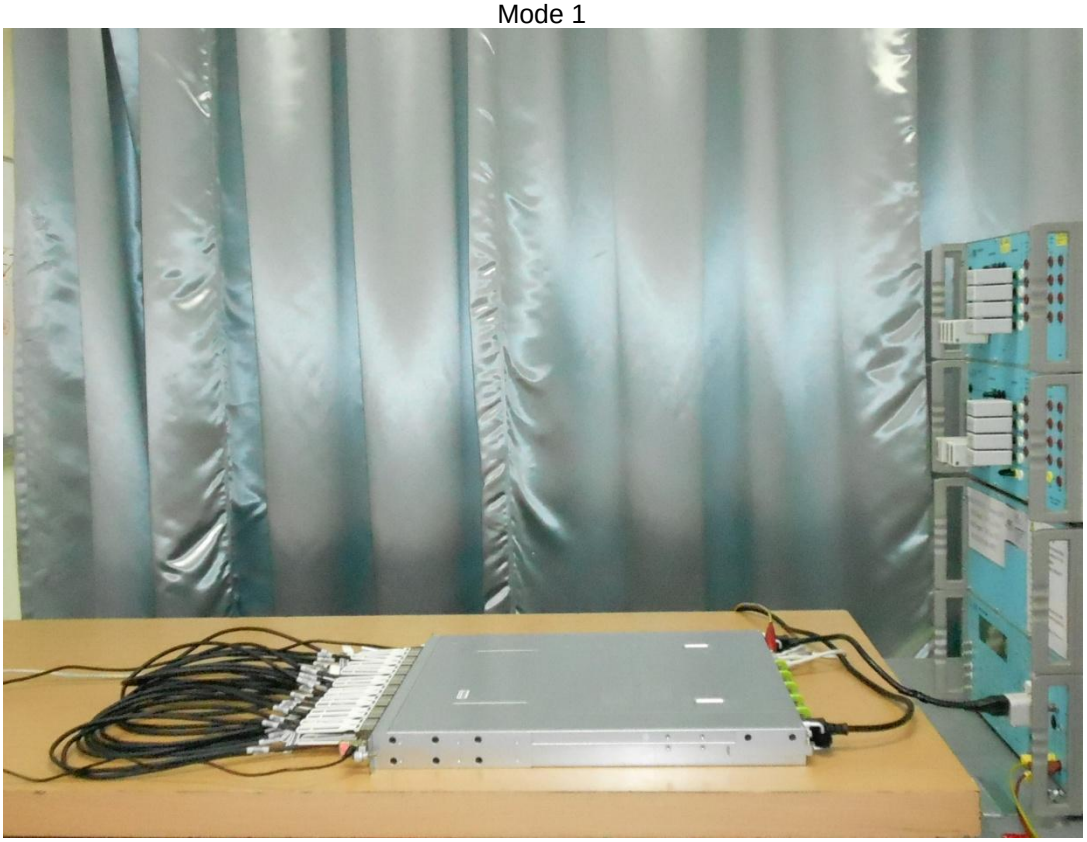


Mode 2

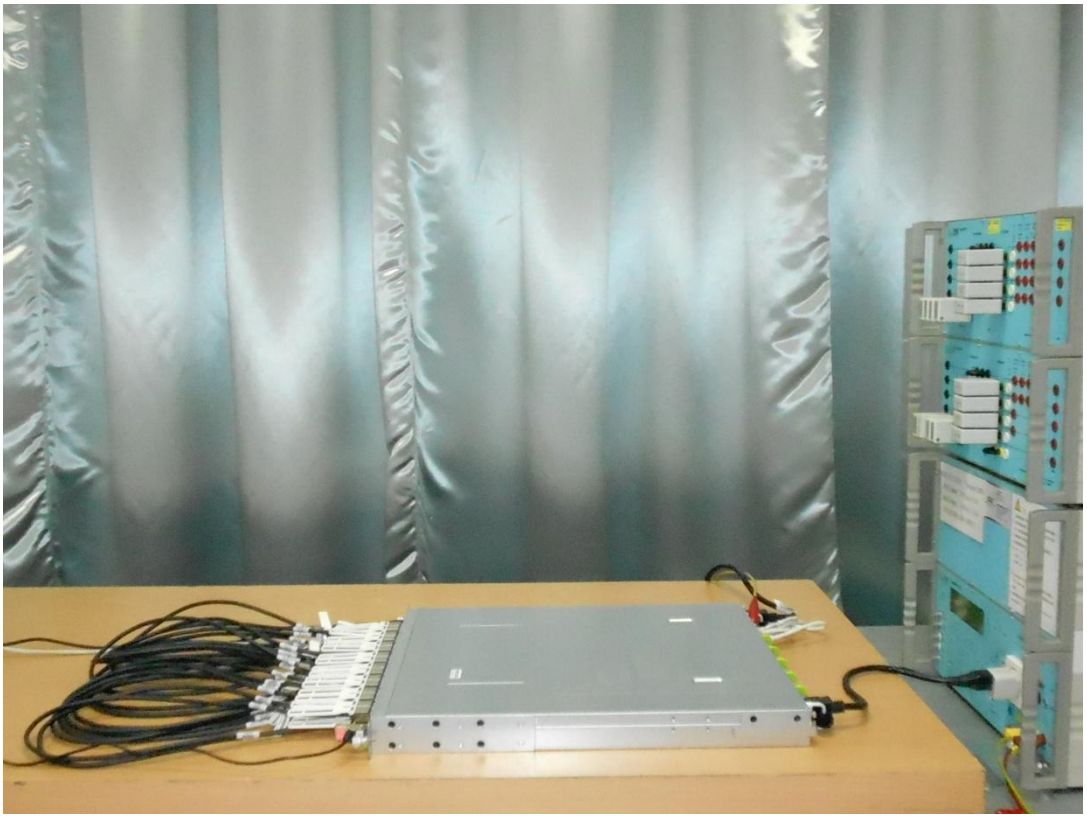


19.12 Voltage Dips and Interruptions

Mode 1



Mode 2



Appendix – Information on the Testing Laboratories

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

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

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
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Email: service.adt@tw.bureauVeritas.com
Web Site: www.bureauVeritas-adt.com

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

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