



CE EMC Test Report

Issued date: Feb. 22, 2022

Project No.: 21Q121604

Product : Network Attached Storage

Model : NAS-873UG

Applicant : MOBOTIX AG.

Address : Kaiserstrasse, Langmeil, Germany

Report No: WD-EE-R-190025-A1

According to

EN 55032: 2015 + A11: 2020, Class A

BS EN 55032: 2015 + A11: 2020

CISPR 32: 2015

AS/NZS CISPR 32: 2015

EN 61000-3-2: 2014

EN 61000-3-3: 2013

BS EN 61000-3-2: 2014

BS EN 61000-3-3: 2013

EN 55035: 2017 + A11: 2020

BS EN 55035: 2017 + A11: 2020

EN 55024: 2010 + A1: 2015

BS EN 55024: 2010 + A1: 2015

IEC 61000-4-2: 2008

IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010

IEC 61000-4-4: 2012

IEC 61000-4-5: 2014 + A1: 2017

IEC 61000-4-6: 2013

IEC 61000-4-8: 2009

IEC 61000-4-11: 2004 + A1: 2017

Authorized Signatory :

/ Ken Huang

Wendell Industrial Co., Ltd
Wendell EMC & RF Laboratory

Add: 5F-1, No. 188, Baoqiao Road, Xindian District, New Taipei City 23145, Taiwan R.O.C.



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History of this test report

Report No.	Issue date	Description
WD-EE-R-190025-A0	Jan. 22, 2019	Changing applicant, model name, product name, brand name and deleting TS-873U test data
WD-EE-R-190025-A1	Feb. 22, 2022	Update EN55032 standard. Add EN55035 standard, British standard and RS & CS test data. *Cancel report no.: WD-EE-R-190025-A0, Issued Date: Jan. 22, 2019

Declaration

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us.



History of supplementary report

Report No.	Issue date	Description
WD-EE-R-190025-A1	Feb. 22, 2022	Original report

Declaration

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us.

1 Certification

Product: Network Attached Storage

Brand Name: MOBOTIX

Model No: NAS-873UG

Applicant: MOBOTIX AG.

Tested: Mar. 24 ~ Apr. 18, 2017 and Jan. 26, 2022

Standard: EN 55032: 2015 + A11: 2020, Class A

BS EN 55032: 2015 + A11: 2020

CISPR 32: 2015

AS/NZS CISPR 32: 2015

EN 61000-3-2: 2014

EN 61000-3-3: 2013

BS EN 61000-3-2: 2014

BS EN 61000-3-3: 2013

EN 55024: 2010 + A1: 2015

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IEC 61000-4-2: 2008

IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010

IEC 61000-4-4: 2012

IEC 61000-4-5: 2014 + A1: 2017

IEC 61000-4-6: 2013

IEC 61000-4-8: 2009

IEC 61000-4-11: 2004 + A1: 2017

The above equipment (Model: NAS-873UG) has been tested by **Wendell EMC & RF Laboratory**, and found compliance with the requirement of the above standards. The test record, data evaluation and 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.

1.1 Summary of Test Result

The EUT has been tested according to the following specifications:

Emission				
Standard	Test Item	Limit	Result	Remark
EN 55032 CISPR 32	Conducted disturbance at mains terminals	Class A	Pass	Meets the requirements
	Conducted disturbance at telecommunication ports test	Class A	Pass	Meets the requirements
	Radiated disturbance	Class A	Pass	Meets the requirements
EN 61000-3-2	Harmonic current emissions	Class A	Pass	The power consumption of EUT is less than 75W and no limits apply
EN 61000-3-3	Voltage fluctuations and flicker	-	Pass	Meets the requirements

Immunity			
Standard	Test Item	Result	Remark
IEC 61000-4-2	Electrostatic discharges (ESD)	Pass	Meets the requirements of Performance Criterion A
IEC 61000-4-3	Continuous radiated disturbances (RS)	Pass	Meets the requirements of Performance Criterion A
IEC 61000-4-4	Electrical fast transients (EFT)	Pass	Meets the requirements of Performance Criterion B
IEC 61000-4-5	Surges	Pass	Meets the requirements of Performance Criterion B
IEC 61000-4-6	Continuous conducted disturbances(CS)	Pass	Meets the requirements of Performance Criterion A
IEC 61000-4-8	Power-frequency magnetic fields (PFMF)	Pass	Meets the requirements of Performance Criterion A
IEC 61000-4-11	Voltage dips and interruptions	Pass	Meets the requirements of Voltage Dips: ✧ >95% reduction – Performance Criterion A ✧ 30% reduction - Performance Criterion B Voltage Interruptions: ✧ >95% reduction - Performance Criterion C

Note: Test record contained in the referenced test report relate only to the EUT sample and test item.

2 Test Configuration of Equipment Under Test

2.1 Test Facility

Conducted disturbance at mains terminals, Conducted disturbance at telecommunication ports Test

W01: 5F-1, No.188, Baoqiao Rd., Xindian Dist., New Taipei City 23145, Taiwan (R.O.C.)

Harmonics and Flicker Tests

W05: 1F-7, No.188, Baoqiao Rd., Xindian Dist., New Taipei City 23145, Taiwan (R.O.C.)

Radiated emission Test (OATS)

W03: No.38-20, Mujiliao, Sanzhi Dist., New Taipei City 252, Taiwan (R.O.C.)

ACCREDITATIONS

The laboratories are accredited and approved by the TAF according to ISO/IEC 17025.

2.2 Measurement Uncertainty

The measurement instrumentation uncertainty consideration contained in CISPR 16-4-2.

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

2.2.1 Conducted Emission test

Test Site	Measurement Freq. Range	dB (U_{lab})	Note
W01	150 kHz ~ 30 MHz	3.19	N/A

2.2.2 Conducted emission at telecom port test

Test Site	Measurement Freq. Range	dB (U_{lab})	Note
W01	150 kHz ~ 30 MHz	3.16	N/A

2.2.3 Radiated Emission test

Test Site	Measurement Freq. Range	Ant	dB (U_{lab})	Note
W03	30 MHz ~ 200 MHz	V	4.29	N/A
	30 MHz ~ 200 MHz	H	3.35	N/A
	200 MHz ~ 1000 MHz	V	3.87	N/A
	200 MHz ~ 1000 MHz	H	3.48	N/A
	1 GHz ~ 3 GHz	V	4.47	N/A
	1 GHz ~ 3 GHz	H	4.44	N/A
	3 GHz ~ 6 GHz	V	4.86	N/A
	3 GHz ~ 6 GHz	H	4.47	N/A

2.2.4 Harmonics Current Measurement

Test Site	Expanded Uncertainty	
W05	Voltage	3.96 V
	Current	1.18 mA
	Power	0.15 Hz

2.2.5 Voltage Fluctuation and Flicker Measurement

Test Site	Expanded Uncertainty	
W05	d_c, d_{max}	11.56 %
	P_{st}, P_{lt}	5.77 %

2.2.6 Immunity Test

Test Site	Item	Expanded Uncertainty		Note
W01	Electrostatic Discharge (ESD)	Voltage	0.05%	N/A
		Timing	5.6%	
	Continuous radiated disturbances (RS)	80MHz – 2.5GHz	3.0dB	80MHz - 1GHz, k=2
	Electrical fast transients (EFT)	Voltage	7.8%	N/A
		Timing	5.1%	
	Surges	Voltage	5.6%	N/A
		Current	4.8%	
		Time	4.7%	
	Continuous conducted disturbances (CS)	CDN	2.0dB	150KHz ~ 230MHz, k=2
		EM Clamp	1.8dB	
	Power-frequency magnetic fields (PFMF)	Magnetic Field Strength	1.0%	N/A
	Voltage dips and interruptions	Voltage	5.2%	N/A
		Time	4.7%	

3 General Information

3.1 Description of EUT

Product	Network Attached Storage
Brand	MOBOTIX
Model No.	NAS-873UG
Applicant	MOBOTIX AG.
EUT Power Rating	(Refer to Note for more details)
Model Differences	N/A
Operating System	N/A
Data Cable Supplied	N/A
Accessory Device	N/A
I/O Port	Please refer to the User's Manual

Note:

- The EUT uses the follow internal power supply:

Power Supply for NAS-873UG	
Brand	DELTA
Model	DPS-250AB-81 A
Input Power	100-240Vac, 5-2.5A, 50-60Hz
Output Power	+12Vdc, 24.2A +5VSB, 2A MAX 250W

- The EUT contains following components.

Item	Brand	Model	Spec.	Qty.
Main board	QNAP	TS-X73U VER1.2	-	1
CPU	AMD	RX-421ND	-	1
RAM	Transcend	D27320-0812	4GB	2
HDD	SEAGATE	ST 1000VN002	-	8
HD Backplane	QNAP	-	-	1
DC Fan	AVC	DS0705B12S	-	1

- The EUT's highest operating frequency is 2.1GHz. Therefore the radiated emission is tested up to 6GHz.

3.2 Description of Test Modes

Test results are presented in the report as below.

Test Result	Test Condition
Conducted emission test	
-	NAS-873UG Full Mode
Conducted emission test at telecom port test	
-	NAS-873UG Full Mode, LAN(10Mbps/100Mbps/1Gpbs)
Radiated emission 30MHz ~ 1GHz test	
-	NAS-873UG Full Mode
Radiated emission above 1GHz test	
-	NAS-873UG Full Mode
Harmonics, Flicker and Immunity test	
-	NAS-873UG Full Mode

3.3 EUT Operating Condition

- Placed the EUT on the test table.
- The EUT connected to server PC / PC via through LAN and Coaxial cable.
- Prepare server PC to act as a communication partner and placed it outside of testing area.
- The EUT was connected to the server PC with LAN cable.
- The communication partner sent data to EUT by command “ping” via LAN.
- The EUT read / write data with Internal HDD and External HDD.
- The PC run test BurnIN.exe to enable all functions.
- The PC sent “color Bar ITU-R BT.1729” signal to monitor and displayed on screen.



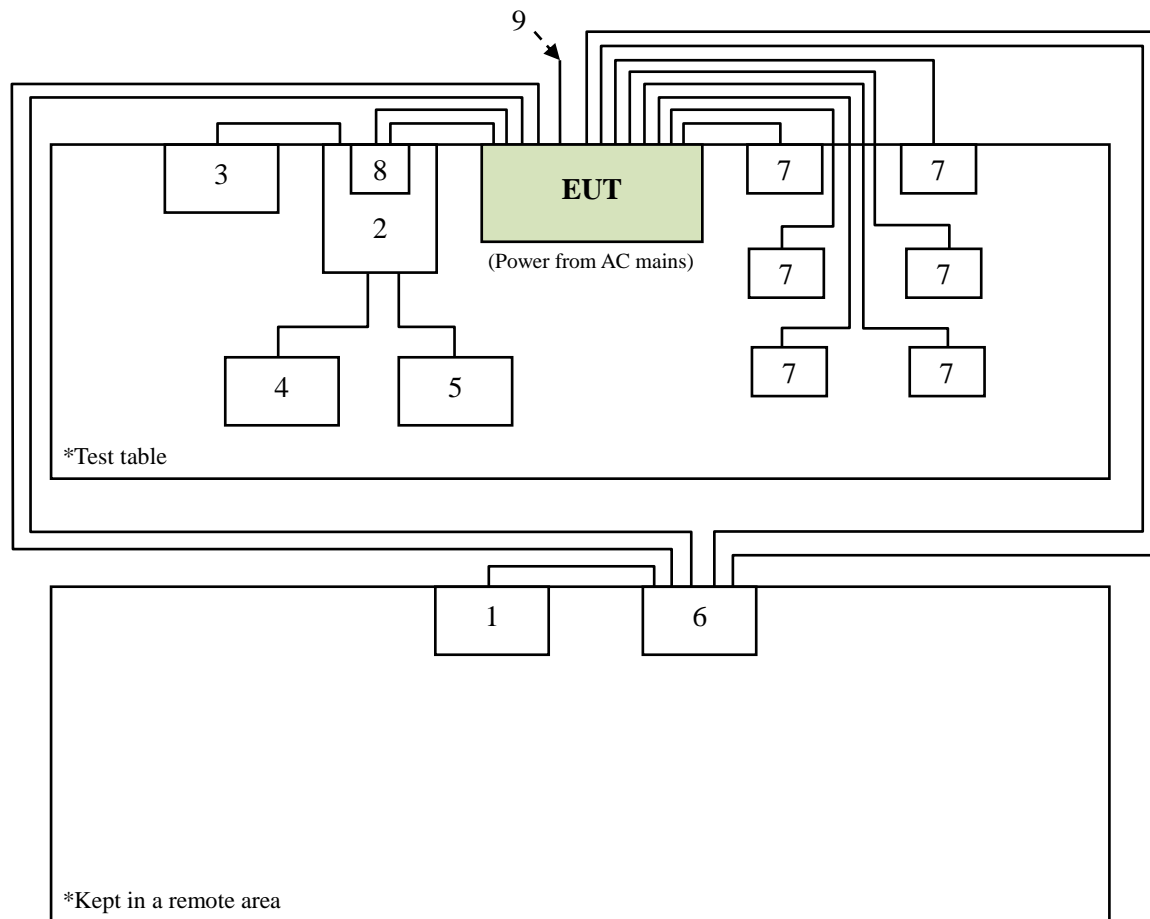
3.4 Description of Support Unit

The EUT has been conducted testing with other necessary accessories or support units.

Item	Equipment	Brand	Model No.	Serial No.	FCC ID	Data Cable	Power Cord	Remark
1	Server PC	DELL	OPTIPLEX 380	2C6742S	FCC DoC Approved	1m non-shielded RJ45 cable	1.8m non-shielded cable	-
2	PC	DELL	D13M	H6K10 A00	FCC DoC Approved	1.5m non-shielded SFP coaxial cable*2	1.8m non-shielded cable	-
3	Monitor	DELL	U2410F	CN-0J257 M-72872-0 54- 0NTL	FCC DoC Approved	1.5m shielded HDMI cable	1.8m non-shielded cable	-
4	Keyboard	DELL	KB4021	N/A	N/A	1.5m non-shielded cable	N/A	-
5	Mouse	DELL	MS111-L	N/A	N/A	1.5m non-shielded cable	N/A	-
6	Switch HUB	D-Link	DGS-1008A	QBIH2DB 002031	FCC DoC Approved	20m non-shielded RJ45 cable	DC: 1.2m non-shielded cable with one core	-
7	External Hard Drive*6	SONY	HD-E1	N/A	FCC DoC Approved	0.3m shielded cable	N/A	-
8	Dual-Port 10GbE SFP+ Network Card	QNAP	LAN-10G2S F-MLX	N/A	N/A	1.5m non-shielded SFP coaxial cable*2	N/A	-
9	Console cable	N/A	N/A	N/A	N/A	0.93m non-shielded cable	N/A	-

Note: 1. The core(s) is(are) originally attached to the cable(s).

3.5 Configuration of System Under Test



4 Emission Test

4.1 Conducted Emission Measurement

4.1.1 Limit of Conducted Emission Measurement

Class A equipment:

Requirements for conducted emissions from the AC mains power ports of Class A equipment			
Frequency (MHz)	Measurement		Class A limits dB(uV/m)
	Coupling device	Detector type/ bandwidth	
0.15 to 0.5	AMN	Quasi Peak / 9 kHz	79
0.5 to 30			73
0.15 to 0.5	AMN	Average / 9 kHz	66
0.5 to 30			60

Class B equipment:

Requirements for conducted emissions from the AC mains power ports of Class B equipment			
Frequency (MHz)	Measurement		Class B limits dB(uV/m)
	Coupling device	Detector type/ bandwidth	
0.15 to 0.5	AMN	Quasi Peak / 9 kHz	66 to 56*
0.5 to 5			56
5 to 30			60
0.15 to 0.5	AMN	Average / 9 kHz	56 to 46*
0.5 to 5			46
5 to 30			50

* Decreases with the logarithm of the frequency.

- Note:**
1. The lower limit shall apply at the transition frequencies.
 2. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
 3. The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correction Factor = Insertion loss of LISN + Cable loss
 Margin Level = Measurement Value – Limit Value

4.1.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-1	Apr. 01, 2017
2	EMI Test Receiver	R&S	ESCI	CT-01-024	Mar. 29, 2017
3	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-2	Apr. 01, 2017
4	Test Cable	HANRUIN	5D-FB	CT-1-069-2	Jul. 29, 2016
5	50ohm Termination	N/A	N/A	CT-1-065-1	Mar. 29, 2017
6	Measurement Software	EZ-EMC	Ver: FA-03A	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

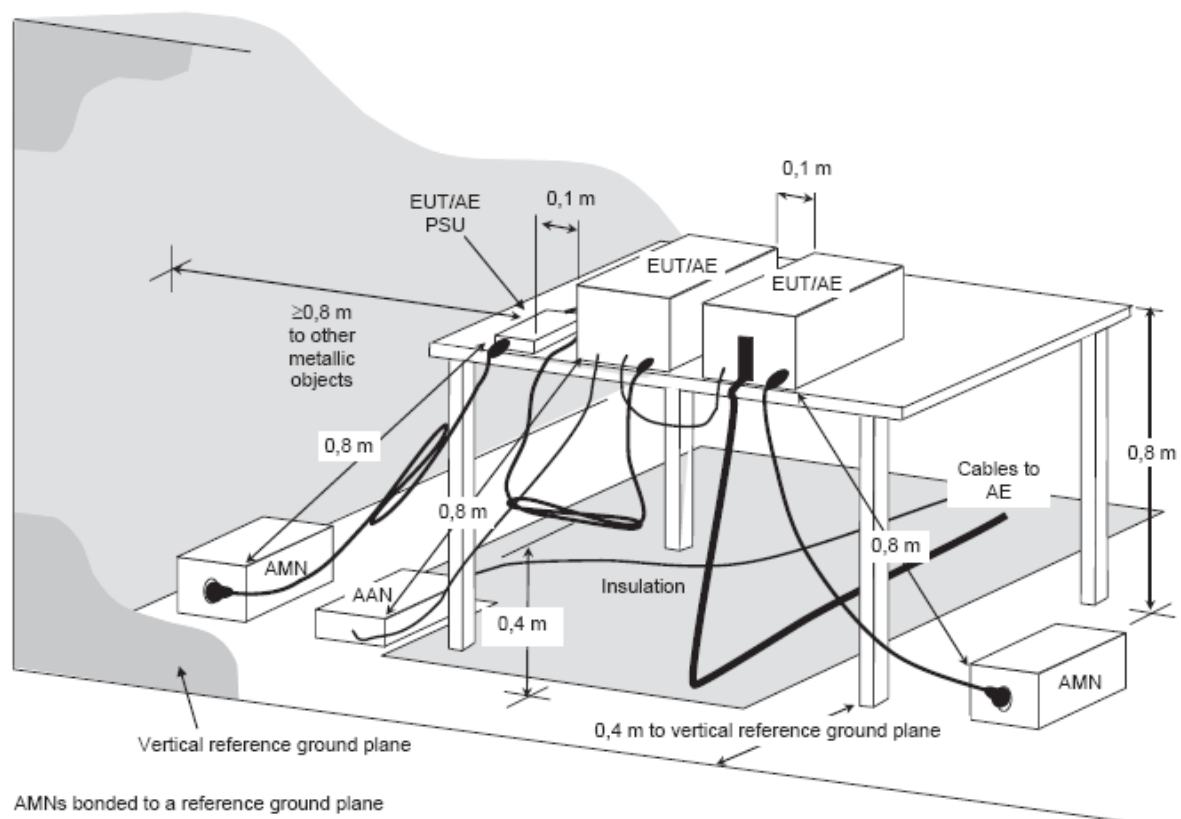
4.1.3 Test Procedure

- a. The EUT was placed 0.8 meter height wooden table from the horizontal ground plane with EUT being connected to power source through a line impedance stabilization network (LISN). The LISN at least be 80 cm from nearest chassis of EUT.
- b. The line impedance stabilization network (LISN) provides 50 ohm/50uH of coupling impedance for the measuring instrument. All other support equipments powered from additional LISN(s).
- c. Interrelating cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle. All I/O cables were positioned to simulate typical usage.
- d. All I/O cables that are not connected to a peripheral shall be bundle in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- e. The EMI test receiver connected to LISN powering the EUT. The actual test configuration, please refer to EUT test photos.
- f. The receiver scanned from 150kHz to 30MHz for emissions in each of test modes. A scan was taken on both power lines, Line and Neutral, recording at least six highest emissions.
- g. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.1.4 Deviation from Test Standard

No deviation

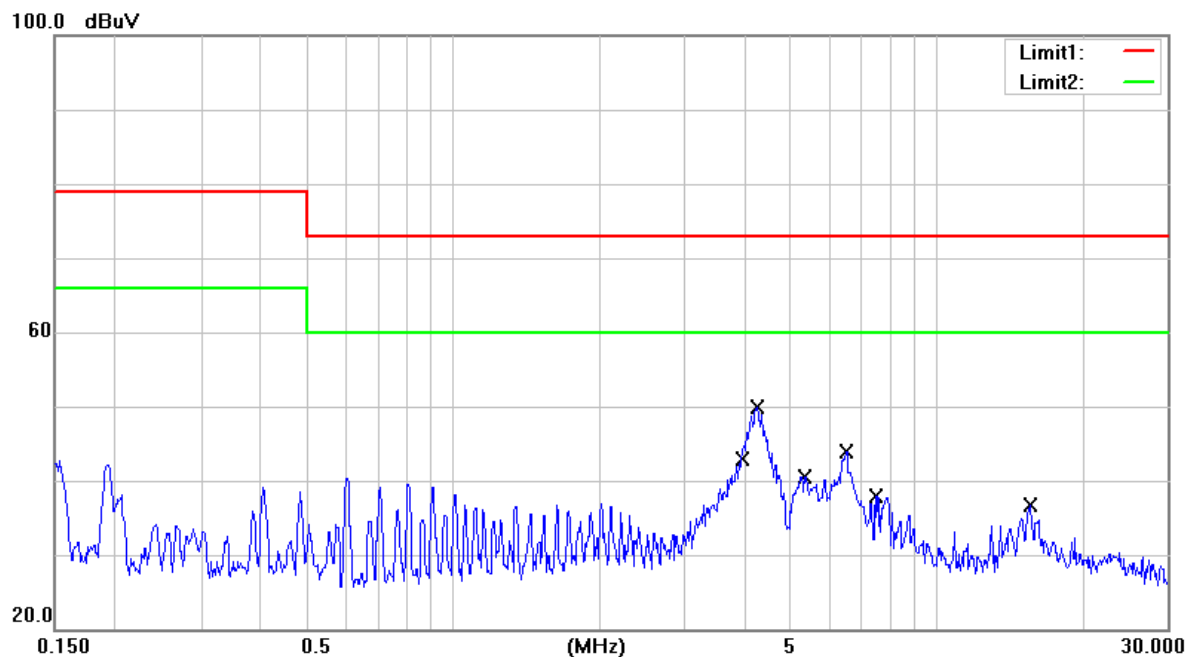
4.1.5 Test Setup



Note: Please refer to 4.1.7 for the actual test configuration.

4.1.6 Test Result

Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Phase	L
Tested by	Eddy Tsai		



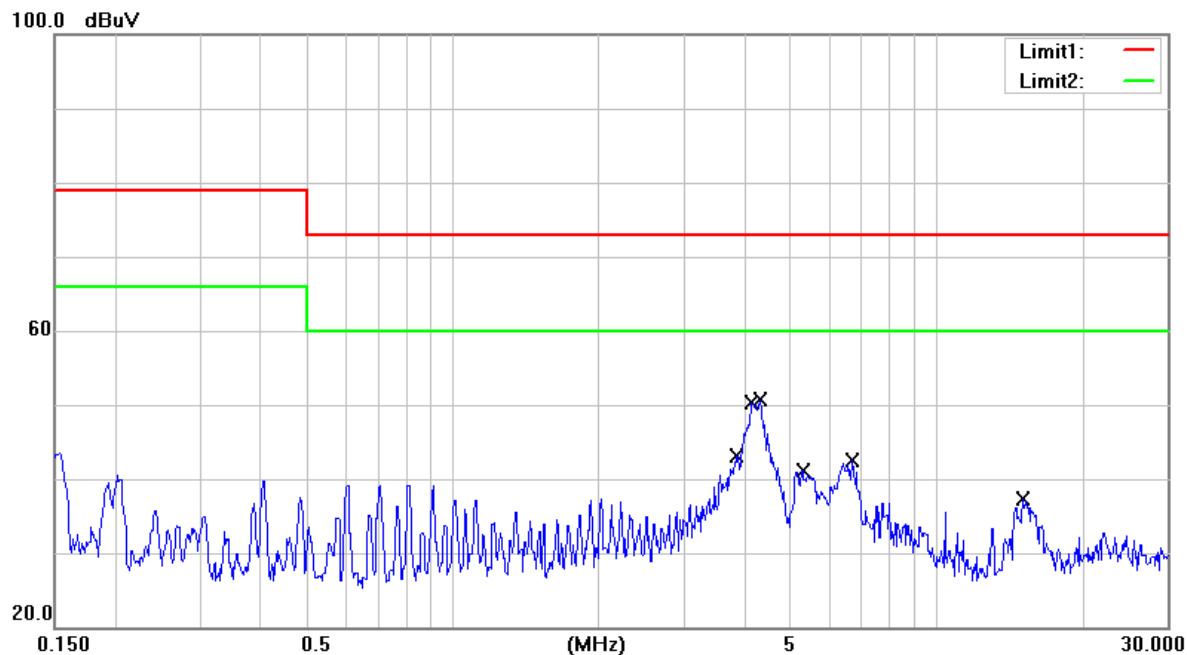
No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	3.8975	27.82	9.68	37.50	73.00	-35.50	QP
2	3.8975	18.39	9.68	28.07	60.00	-31.93	AVG
3	4.2305	35.45	9.68	45.13	73.00	-27.87	QP
4	4.2305	23.44	9.68	33.12	60.00	-26.88	AVG
5	5.3500	25.73	9.69	35.42	73.00	-37.58	QP
6	5.3500	18.91	9.69	28.60	60.00	-31.40	AVG
7	6.5000	26.40	9.70	36.10	73.00	-36.90	QP
8	6.5000	19.45	9.70	29.15	60.00	-30.85	AVG
9	7.5000	18.96	9.70	28.66	73.00	-44.34	QP
10	7.5000	14.11	9.70	23.81	60.00	-36.19	AVG
11	15.5000	22.66	9.71	32.37	73.00	-40.63	QP
12	15.5000	14.79	9.71	24.50	60.00	-35.50	AVG

Remark:

1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



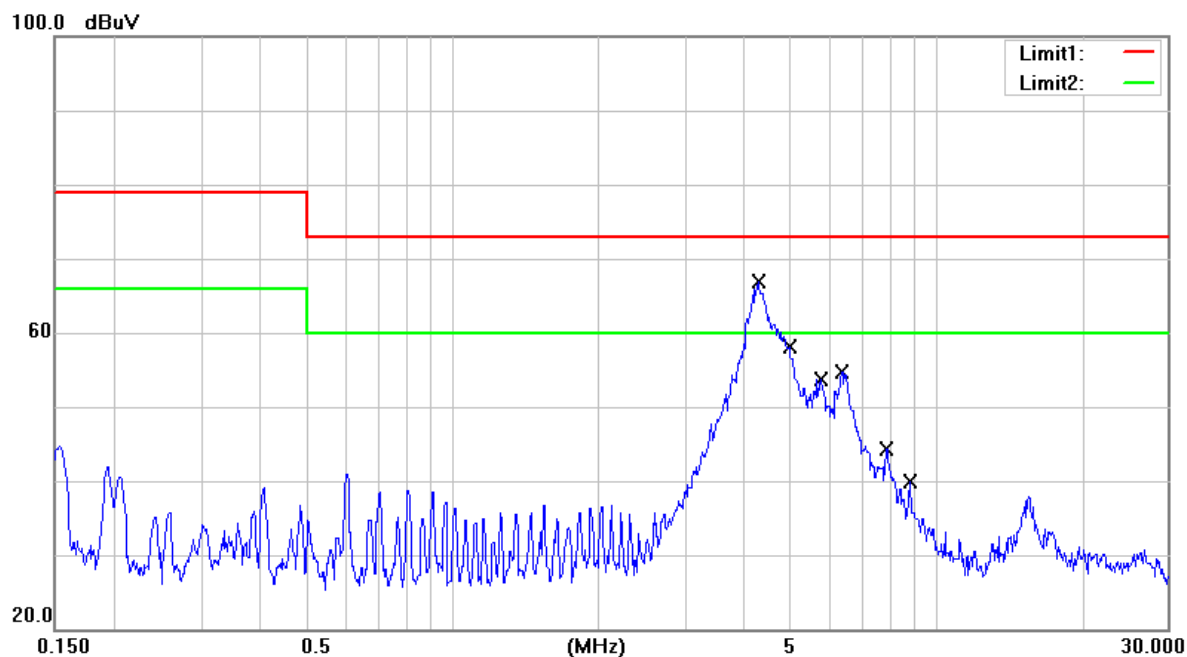
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Phase	N
Tested by	Eddy Tsai		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	3.8615	27.92	9.68	37.60	73.00	-35.40	QP
2	3.8615	19.45	9.68	29.13	60.00	-30.87	AVG
3	4.0865	32.28	9.68	41.96	73.00	-31.04	QP
4	4.0865	21.39	9.68	31.07	60.00	-28.93	AVG
5	4.2980	34.88	9.68	44.56	73.00	-28.44	QP
6	4.2980	23.66	9.68	33.34	60.00	-26.66	AVG
7	5.2750	26.60	9.69	36.29	73.00	-36.71	QP
8	5.2750	21.18	9.69	30.87	60.00	-29.13	AVG
9	6.6750	25.98	9.70	35.68	73.00	-37.32	QP
10	6.6750	18.10	9.70	27.80	60.00	-32.20	AVG
11	15.0500	19.94	9.57	29.51	73.00	-43.49	QP
12	15.0500	8.23	9.57	17.80	60.00	-42.20	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

Test Voltage	110Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Phase	L
Tested by	Eddy Tsai		

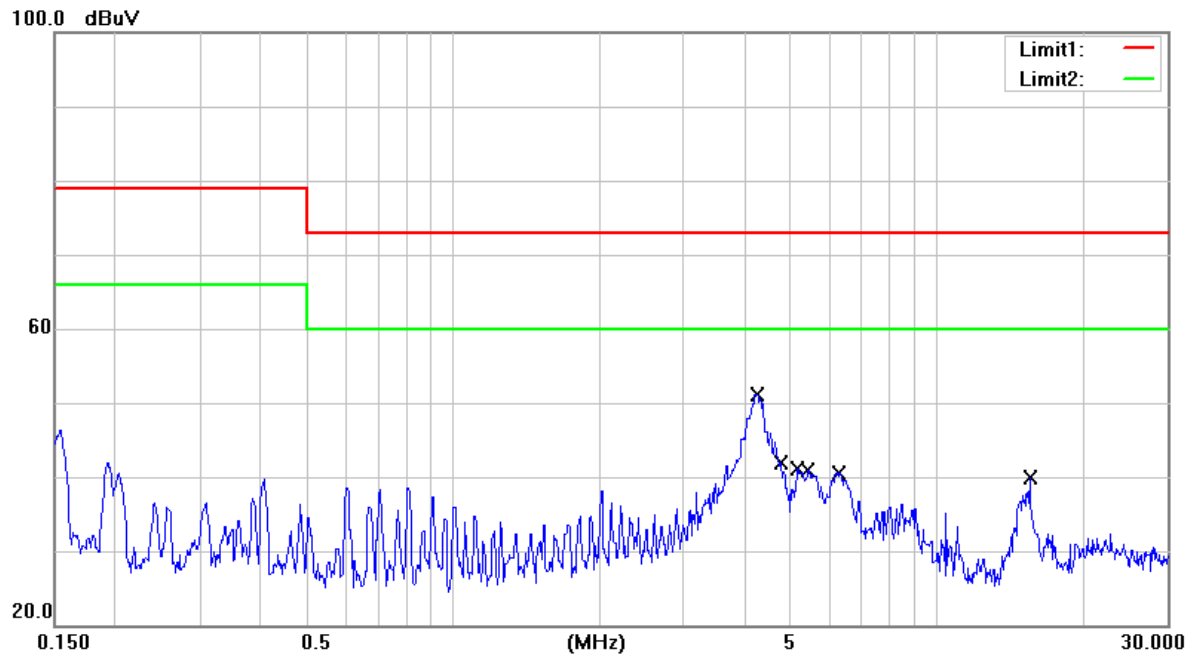


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	4.2530	51.98	9.68	61.66	73.00	-11.34	QP
2	4.2530	39.73	9.68	49.41	60.00	-10.59	AVG
3	5.0250	24.68	9.69	34.37	73.00	-38.63	QP
4	5.0250	19.18	9.69	28.87	60.00	-31.13	AVG
5	5.7500	17.92	9.69	27.61	73.00	-45.39	QP
6	5.7500	12.31	9.69	22.00	60.00	-38.00	AVG
7	6.3750	17.67	9.70	27.37	73.00	-45.63	QP
8	6.3750	12.03	9.70	21.73	60.00	-38.27	AVG
9	7.8750	23.01	9.71	32.72	73.00	-40.28	QP
10	7.8750	10.32	9.71	20.03	60.00	-39.97	AVG
11	8.8000	19.75	9.71	29.46	73.00	-43.54	QP
12	8.8000	10.33	9.71	20.04	60.00	-39.96	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	110Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Phase	N
Tested by	Eddy Tsai		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	4.2440	38.19	9.68	47.87	73.00	-25.13	QP
2	4.2440	26.03	9.68	35.71	60.00	-24.29	AVG
3	4.7660	26.67	9.69	36.36	73.00	-36.64	QP
4	4.7660	20.88	9.69	30.57	60.00	-29.43	AVG
5	5.1500	23.94	9.69	33.63	73.00	-39.37	QP
6	5.1500	17.32	9.69	27.01	60.00	-32.99	AVG
7	5.4250	25.29	9.69	34.98	73.00	-38.02	QP
8	5.4250	19.18	9.69	28.87	60.00	-31.13	AVG
9	6.3000	25.30	9.70	35.00	73.00	-38.00	QP
10	6.3000	19.11	9.70	28.81	60.00	-31.19	AVG
11	15.5000	24.94	9.55	34.49	73.00	-38.51	QP
12	15.5000	14.31	9.55	23.86	60.00	-36.14	AVG

Remark:

1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

4.1.7 Photographs of Test Configuration



4.2 Conducted Emission at Telecommunication Ports Test

4.2.1 Limit of Conducted Emission at Telecommunication Ports Test

Class A equipment:

Requirements for asymmetric mode conducted emissions from Class A equipment			
Frequency (MHz)	Measurement		Class A limits dB(uV/m)
	Coupling device	Detector type/ bandwidth	
0.15 to 0.5	AAN	Quasi Peak / 9 kHz	97 to 87*
0.5 to 30			87
0.15 to 0.5	AAN	Average / 9 kHz	84 to 74*
0.5 to 30			74

* Decreases with the logarithm of the frequency.

Class B equipment:

Requirements for asymmetric mode conducted emissions from Class B equipment			
Frequency (MHz)	Measurement		Class B limits dB(uV/m)
	Coupling device	Detector type/ bandwidth	
0.15 to 0.5	AAN	Quasi Peak / 9 kHz	84 to 74*
0.5 to 30			74
0.15 to 0.5	AAN	Average / 9 kHz	74 to 64*
0.5 to 30			64

* Decreases with the logarithm of the frequency.

- Note:**
1. The lower limit shall apply at the transition frequencies.
 2. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
 3. The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correction Factor = Insertion loss of ISN + Cable loss
 Margin Level = Measurement Value – Limit Value

4.2.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-1	Apr. 01, 2017
2	EMI Test Receiver	R&S	ESCI	CT-01-024	Mar. 29, 2017
3	Impedance Stabilization Network	FCC	F-071115-10 57-1-09	CT-01-027	Apr. 05, 2017
4	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-2	Apr. 01, 2017
5	Test Cable	HANRUIN	5D-FB	CT-1-069-1	Jul. 29, 2016
6	50ohm Termination	N/A	N/A	CT-1-065-2	Mar. 29, 2017
7	Measurement Software	EZ-EMC	Ver: FA-03A	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

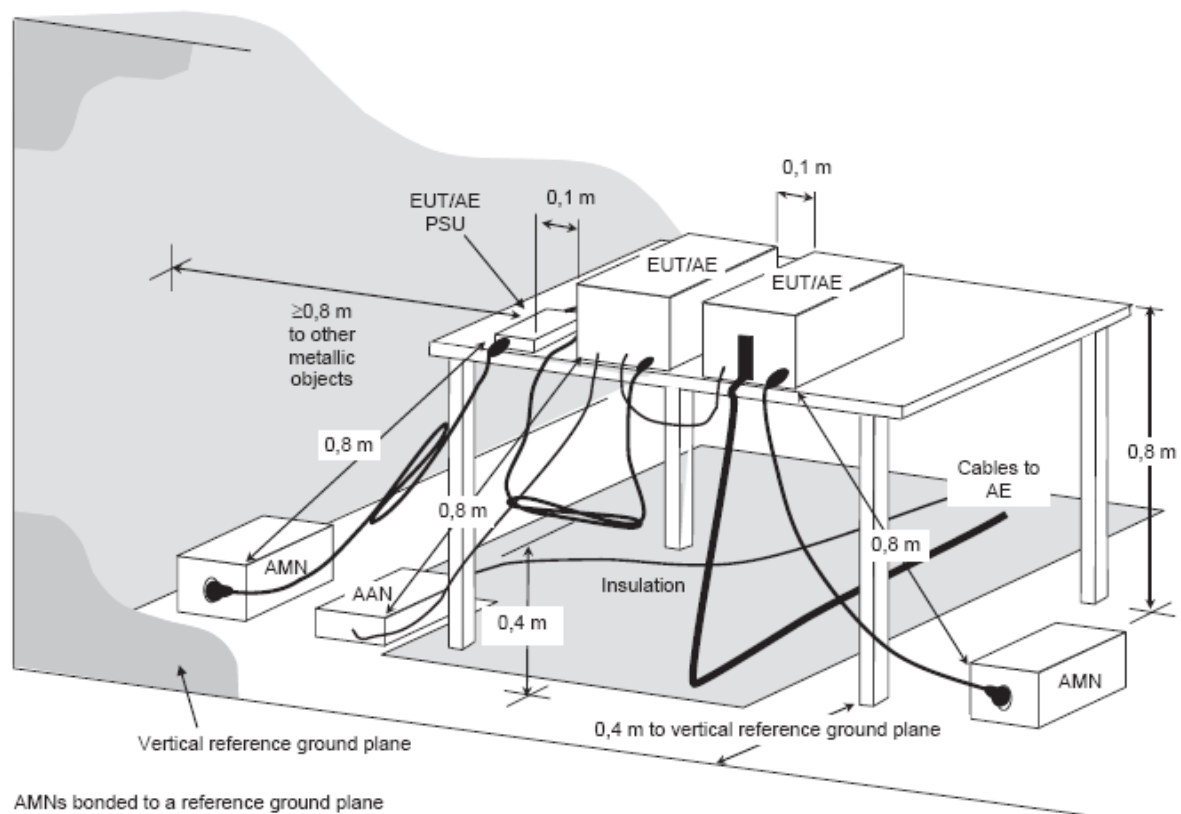
4.2.3 Test Procedure

- a. The EUT was placed 0.4 meter from the horizontal ground plane with EUT being connected to power source through a line impedance stabilization network (LISN). The LISN at least be 80 cm from nearest chassis of EUT.
- b. The line impedance stabilization network (LISN) provides 50 ohm/50uH of coupling impedance for the measuring instrument. All other support equipments powered from additional LISN(s).
- c. Interrelating cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle. All I/O cables were positioned to simulate typical usage.
- d. All I/O cables that are not connected to a peripheral shall be bundle in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- e. ISN at least 80 cm from nearest chassis of EUT. The communication function of EUT was executed in normal condition. ISN was connected between EUT and associated equipment and ISN was connected directly to reference ground plane. The actual test configuration, please refer to EUT test photos.
- f. The receiver scanned from 150kHz to 30MHz for emissions in each of test modes. The test mode included 10Mbps, 100Mbps, 1Gbps and POE mode. Emission frequency and amplitude were recorded, recording at least six highest emissions.
- g. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.2.4 Deviation from Test Standard

No deviation

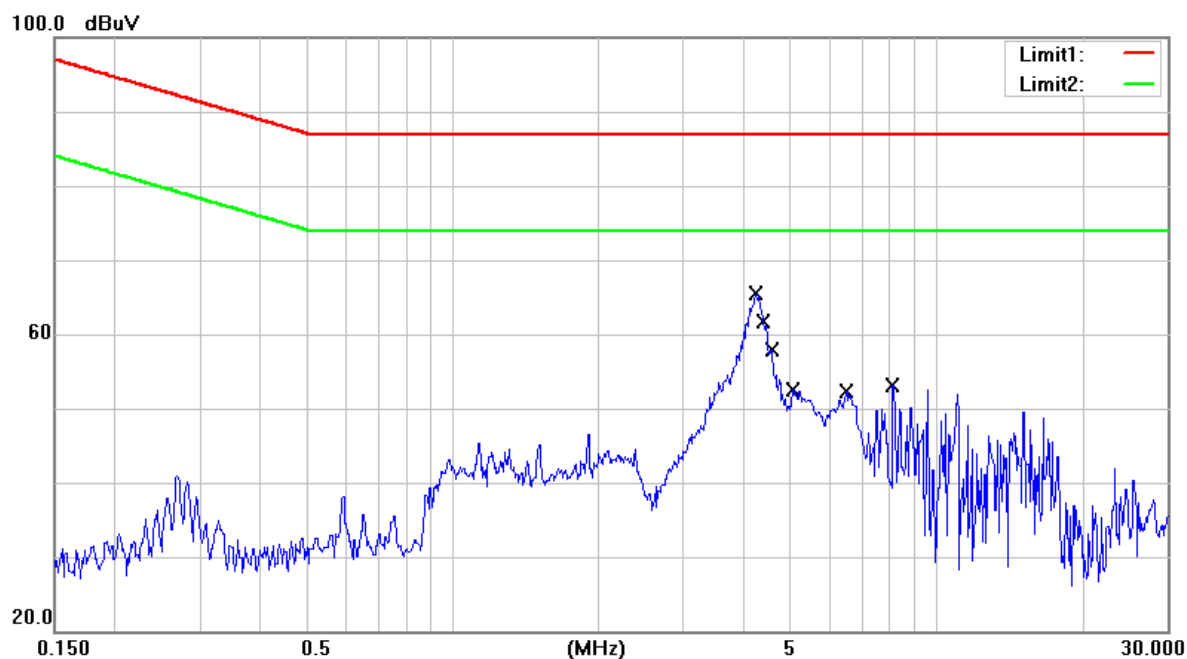
4.2.5 Test Setup



Note: Please refer to the 4.2.7 for the actual test configuration.

4.2.6 Test Result

Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Test Condition	LAN port with ISN (10Mbps)
Tested by	Eddy Tsai		



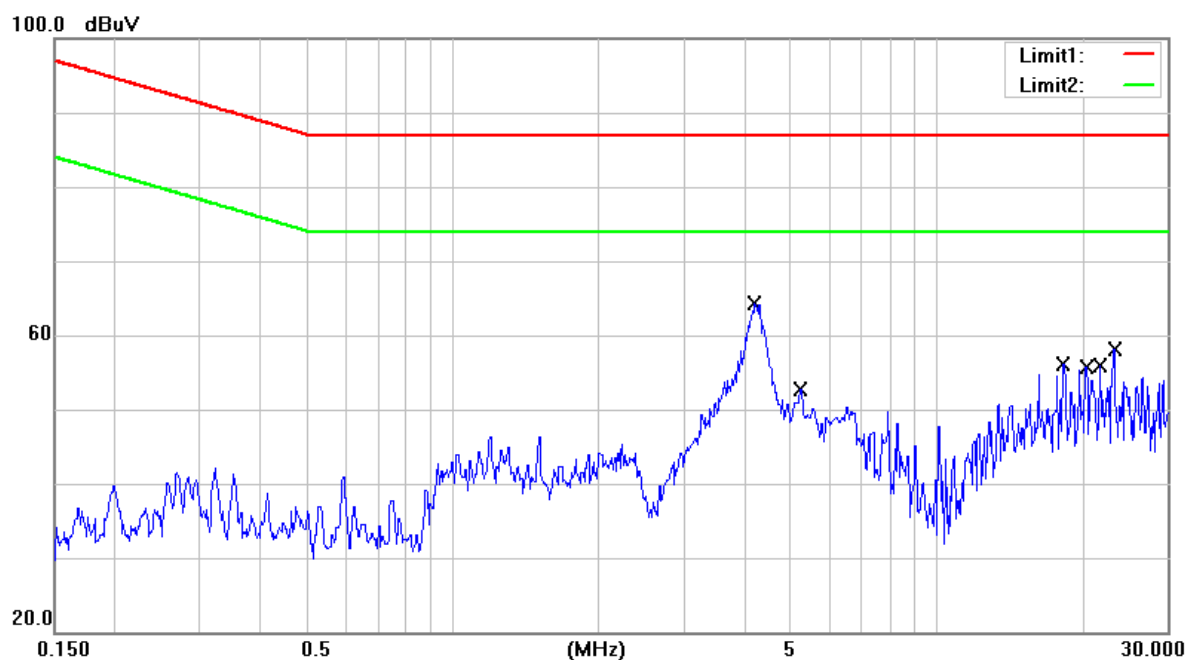
No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	4.2215	51.06	9.05	60.11	87.00	-26.89	QP
2	4.2215	38.93	9.05	47.98	74.00	-26.02	AVG
3	4.4240	45.57	9.05	54.62	87.00	-32.38	QP
4	4.4240	36.00	9.05	45.05	74.00	-28.95	AVG
5	4.5500	42.76	9.04	51.80	87.00	-35.20	QP
6	4.5500	33.84	9.04	42.88	74.00	-31.12	AVG
7	5.0500	36.24	9.04	45.28	87.00	-41.72	QP
8	5.0500	30.04	9.04	39.08	74.00	-34.92	AVG
9	6.5000	36.23	9.04	45.27	87.00	-41.73	QP
10	6.5000	29.50	9.04	38.54	74.00	-35.46	AVG
11	8.1250	38.61	9.04	47.65	87.00	-39.35	QP
12	8.1250	17.63	9.04	26.67	74.00	-47.33	AVG

Remark:

1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of ISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



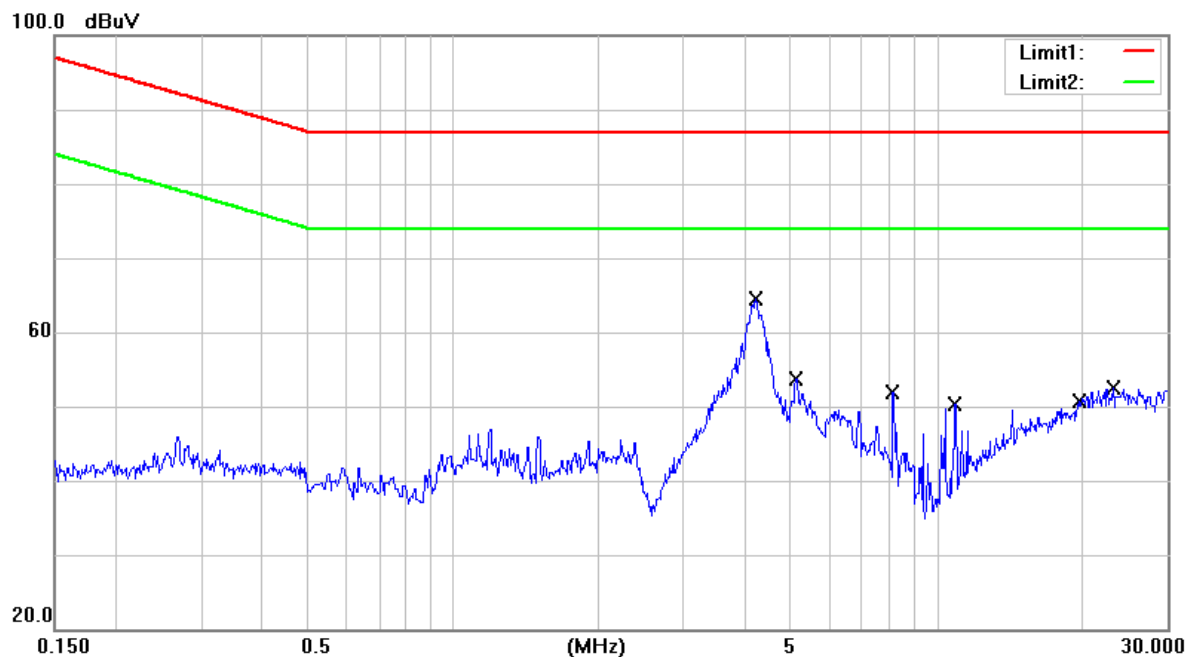
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Test Condition	LAN port with ISN (100Mbps)
Tested by	Eddy Tsai		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	4.1855	51.19	9.05	60.24	87.00	-26.76	QP
2	4.1855	38.16	9.05	47.21	74.00	-26.79	AVG
3	5.2250	36.68	9.04	45.72	87.00	-41.28	QP
4	5.2250	31.06	9.04	40.10	74.00	-33.90	AVG
5	18.2500	36.90	9.13	46.03	87.00	-40.97	QP
6	18.2500	34.41	9.13	43.54	74.00	-30.46	AVG
7	20.2750	34.29	9.16	43.45	87.00	-43.55	QP
8	20.2750	25.54	9.16	34.70	74.00	-39.30	AVG
9	21.6750	34.84	9.19	44.03	87.00	-42.97	QP
10	21.6750	26.87	9.19	36.06	74.00	-37.94	AVG
11	23.1500	33.35	9.22	42.57	87.00	-44.43	QP
12	23.1500	25.15	9.22	34.37	74.00	-39.63	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of ISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

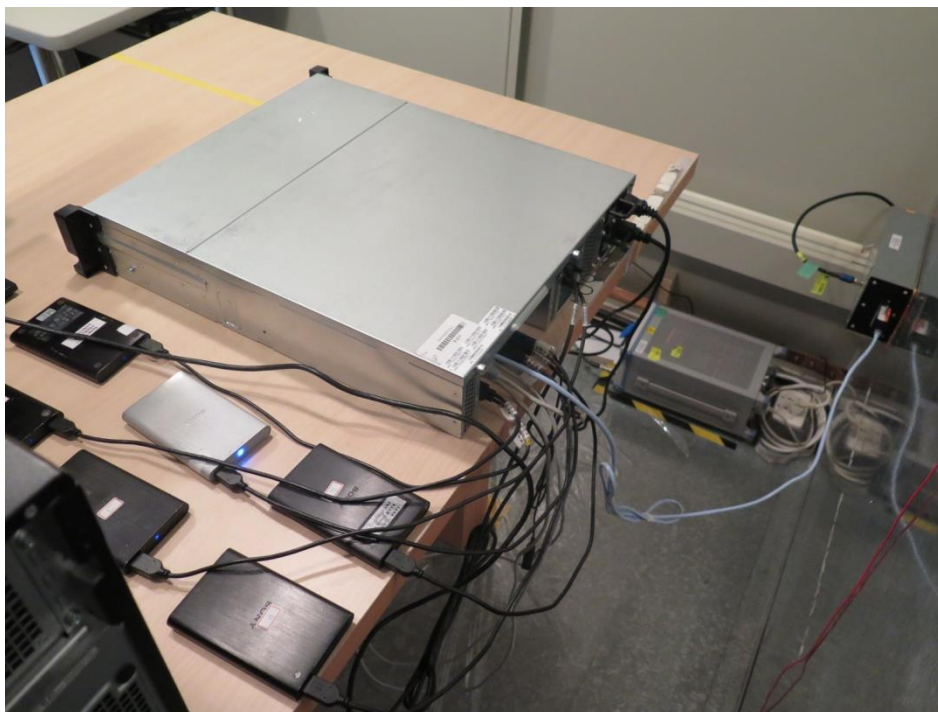
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	23.1°C, 56% RH	6dB Bandwidth	9 kHz
Test Date	2017/04/07	Test Condition	LAN port with ISN (1Gbps)
Tested by	Eddy Tsai		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	4.2125	49.97	9.05	59.02	87.00	-27.98	QP
2	4.2125	37.67	9.05	46.72	74.00	-27.28	AVG
3	5.1250	37.88	9.04	46.92	87.00	-40.08	QP
4	5.1250	30.93	9.04	39.97	74.00	-34.03	AVG
5	8.1250	38.83	9.04	47.87	87.00	-39.13	QP
6	8.1250	24.12	9.04	33.16	74.00	-40.84	AVG
7	10.9250	30.43	9.06	39.49	87.00	-47.51	QP
8	10.9250	21.85	9.06	30.91	74.00	-43.09	AVG
9	19.5250	36.93	9.15	46.08	87.00	-40.92	QP
10	19.5250	31.49	9.15	40.64	74.00	-33.36	AVG
11	23.0750	38.03	9.21	47.24	87.00	-39.76	QP
12	23.0750	32.60	9.21	41.81	74.00	-32.19	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of ISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

4.2.7 Photographs of Test Configuration



4.3 Radiated Emission Measurement

4.3.1 Limits of Radiated Emission Measurement

According to EN55032 table1 - Required highest frequency for radiated measurement:

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz

Remark:

1. F_x : highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.
2. Where F_x is unknown, the radiated emission measurements shall be performed up to 6 GHz.

Class A equipment:

Requirements for radiated emissions at frequencies up to 1 GHz for Class A equipment			
Frequency (MHz)	Measurement		Class A limits dB(uV/m)
	Distance (m)	Detector type/ bandwidth	OATS/SAC
30 to 230	10	Quasi Peak / 120 kHz	40
230 to 1000			47
30 to 230	3		50
230 to 1000			57

Requirements for radiated emissions at frequencies above 1 GHz for Class A equipment			
Frequency (MHz)	Measurement		Class A limits dB(uV/m)
	Distance (m)	Detector type/ bandwidth	FSOATS
1000 to 3000	3	Average / 1 MHz	56
3000 to 6000			60
1000 to 3000		Peak / 1 MHz	76
3000 to 6000			80

Class B equipment:

Requirements for radiated emissions at frequencies up to 1 GHz for Class B equipment			
Frequency (MHz)	Measurement		Class B limits dB(uV/m)
	Distance (m)	Detector type/ bandwidth	OATS/SAC
30 to 230	10	Quasi Peak / 120 kHz	30
230 to 1000			37
30 to 230	3		40
230 to 1000			47

Requirements for radiated emissions at frequencies above 1 GHz for Class B equipment			
Frequency (MHz)	Measurement		Class B limits dB(uV/m)
	Distance (m)	Detector type/ bandwidth	FSOATS
1000 to 3000	3	Average / 1 MHz	50
3000 to 6000			64
1000 to 3000		Peak / 1 MHz	70
3000 to 6000			74

Note: 1. The lower limit shall apply at the transition frequency.
2. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
3. The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain
+ Cable loss (preamplifier to receiver)
Margin Level = Measurement Value - Limit Value

4.3.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	Horn Antenna	Schwarzbeck	BBHA 9120 D	CT-1-001	Apr. 06, 2017
2	Bilog Antenna	Schwarzbeck	VULB 9168	CT-1-002-1	Apr. 05, 2017
3	Test Cable	HARUIN	CFD400NL-LW	CT-1-070	Aug. 02, 2016
4	Preamplifier	EM Electronics Corporation	EM30265	CT-1-013	Aug. 02, 2016
5	Test Cable	HARBOUR	27478 LL142	CT-1-073	Aug. 03, 2016
6	EMI Test Receiver	Agilent	N9038A	CT-1-068	Aug. 02, 2016
7	Measurement Software	Ez-EMC	Ver : FA-03A2 RE	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

4.3.3 Test Procedure

- a. The EUT was placed on the top of a turntable 0.8 meters above the ground at a 3 m or 10 m open area test site. The table was rotated 360 degrees to determine the position of the high radiation emissions.
- b. The height of the test antenna shall vary between 1 m to 4 m. Both vertical and horizontal polarizations of the antenna were set to make the measurement.
- c. The EUT was set up as per the test configuration to simulate typical usage per the user's manual. All I/O cables were positioned to simulate typical usage. The actual test configuration, please refer to EUT test photos.
- d. The initial step in collecting radiated emission data is a Spectrum Mode scanning the measurement frequency range.

Below 1GHz:

Reading in which marked as QP or Peak means measurements by using Spectrum Mode with detector RBW=120kHz.

If the Spectrum Mode measured peak value compliance with and lower than Quasi Peak Limit, the EUT shall be deemed to meet QP Limits.

Above 1GHz:

Reading in which marked as Peak & AVG means measurements by using Spectrum Mode with setting in RBW=1MHz.

If the Spectrum Mode measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak and AVG Limits.

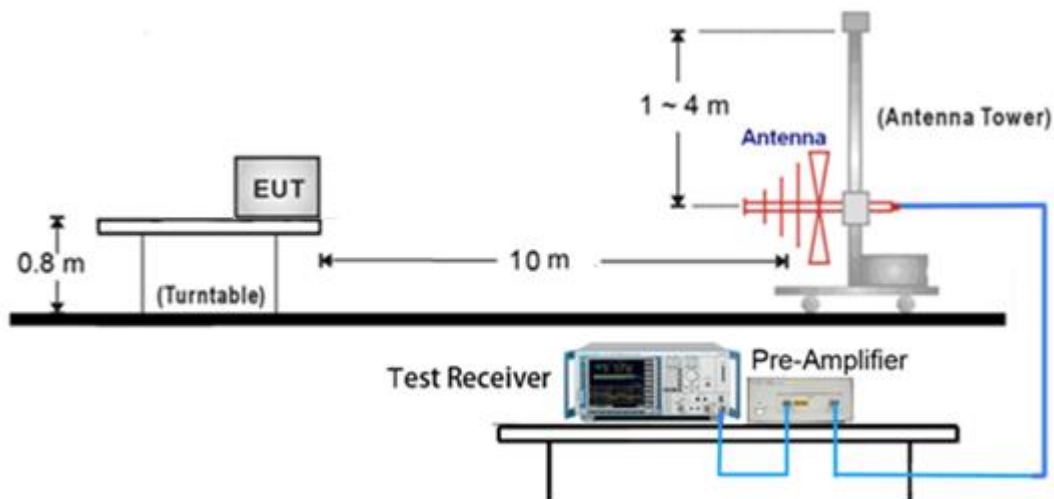
- e. Emission frequency and amplitude were recorded, recording at least six highest emissions. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.3.4 Deviation from Test Standard

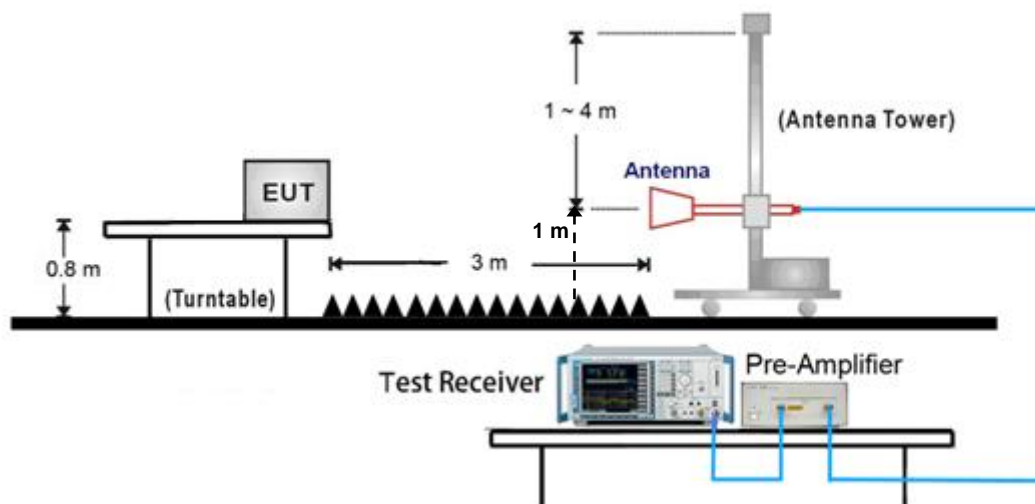
No deviation

4.3.5 Test Setup

< Radiated Emissions Frequency: 30 MHz to 1000 MHz >



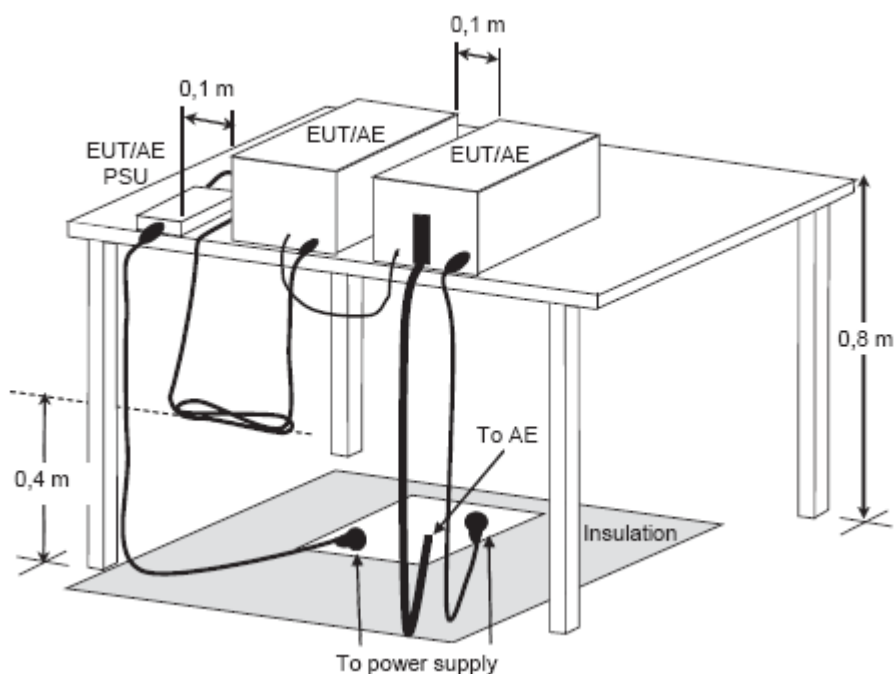
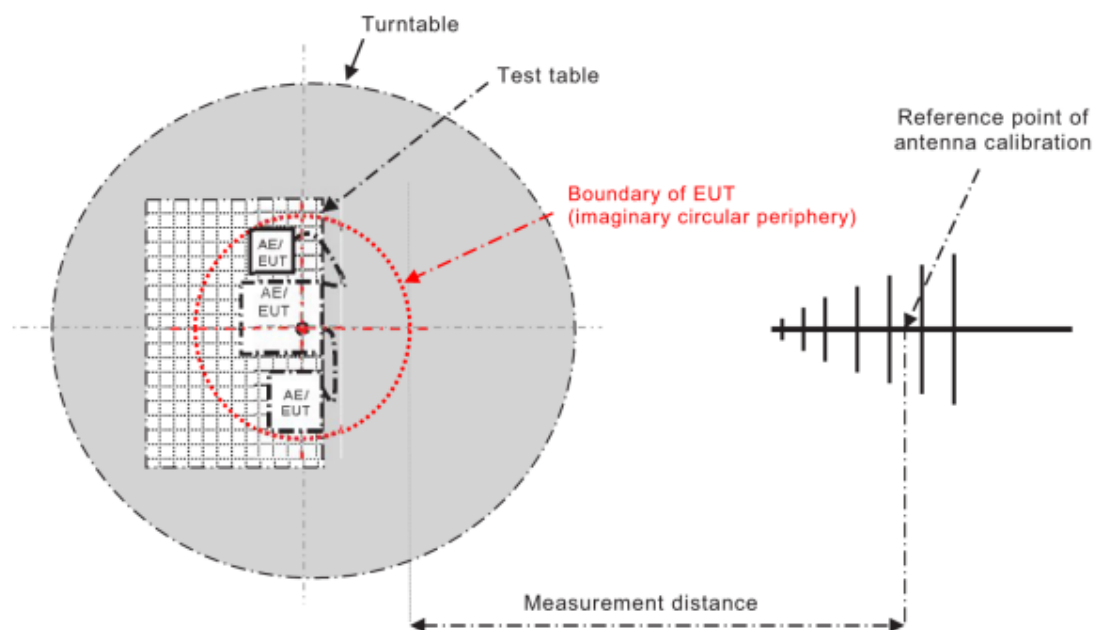
< Radiated Emissions Frequency: above 1GHz >



Note:

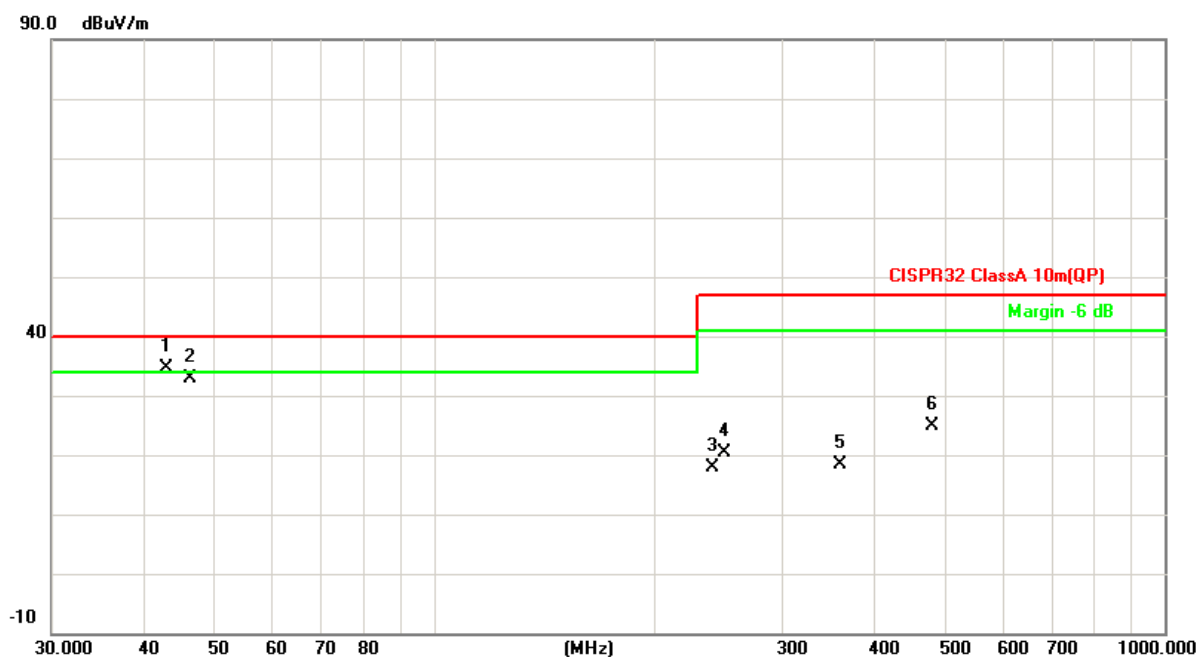
- (1) Please refer to the 4.3.7 for the actual test configuration.
- (2) The formula of measured value as: Test Result = Reading + Correction Factor
- (3) Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain (if use)
 Margin Level = Measurement Value - Limit Value

< EUT placement top view and measurement distance >



4.3.6 Test Result

Test Voltage	230Vac, 50Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	23°C, 56% RH	6dB Bandwidth	120 kHz
Test Date	2017/04/06	Test Distance	10m
Tested by	Eddy Kao	Polarization	Vertical



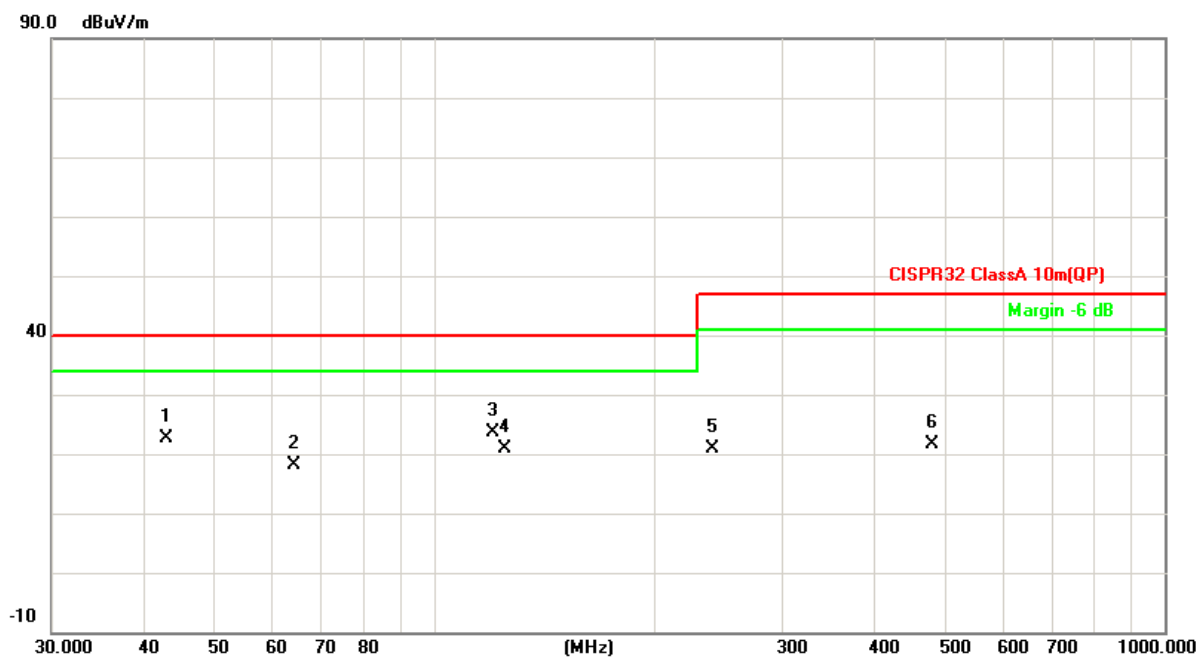
No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	42.9020	52.31	-17.64	34.67	40.00	-5.33	QP	100	309
2	46.2330	50.43	-17.62	32.81	40.00	-7.19	QP	100	355
3	240.0110	40.90	-22.93	17.97	47.00	-29.03	QP	100	291
4	250.0320	42.75	-22.40	20.35	47.00	-26.65	QP	100	218
5	360.1360	37.60	-19.13	18.47	47.00	-28.53	QP	100	316
6	479.9990	40.76	-15.79	24.97	47.00	-22.03	QP	100	287

Remark:

1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	230Vac, 50Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	23°C, 56% RH	6dB Bandwidth	120 kHz
Test Date	2017/04/06	Test Distance	10m
Tested by	Eddy Kao	Polarization	Horizontal

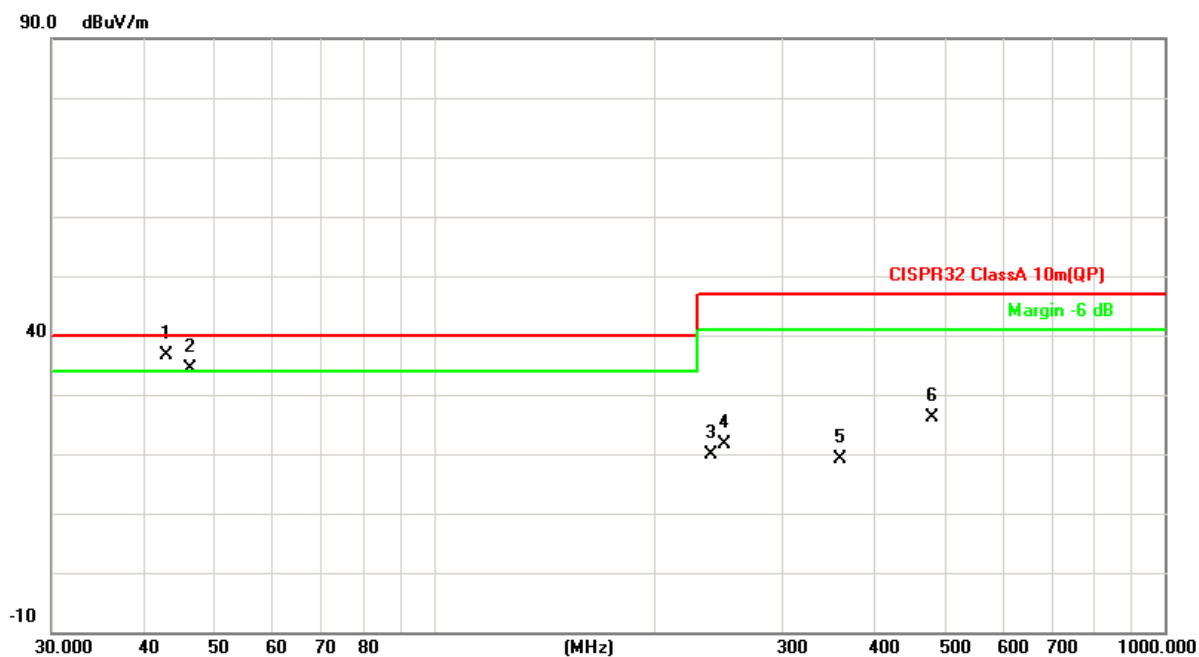


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	42.9900	40.37	-17.63	22.74	40.00	-17.26	QP	400	216
2	64.2340	37.75	-19.69	18.06	40.00	-21.94	QP	400	236
3	119.9890	44.70	-21.16	23.54	40.00	-16.46	QP	400	165
4	124.9380	41.76	-20.90	20.86	40.00	-19.14	QP	400	234
5	240.0130	43.80	-22.93	20.87	47.00	-26.13	QP	400	227
6	480.0410	37.33	-15.79	21.54	47.00	-25.46	QP	400	103

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain
+ Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	110Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	23°C, 56% RH	6dB Bandwidth	120 kHz
Test Date	2017/04/06	Test Distance	10m
Tested by	Eddy Kao	Polarization	Vertical

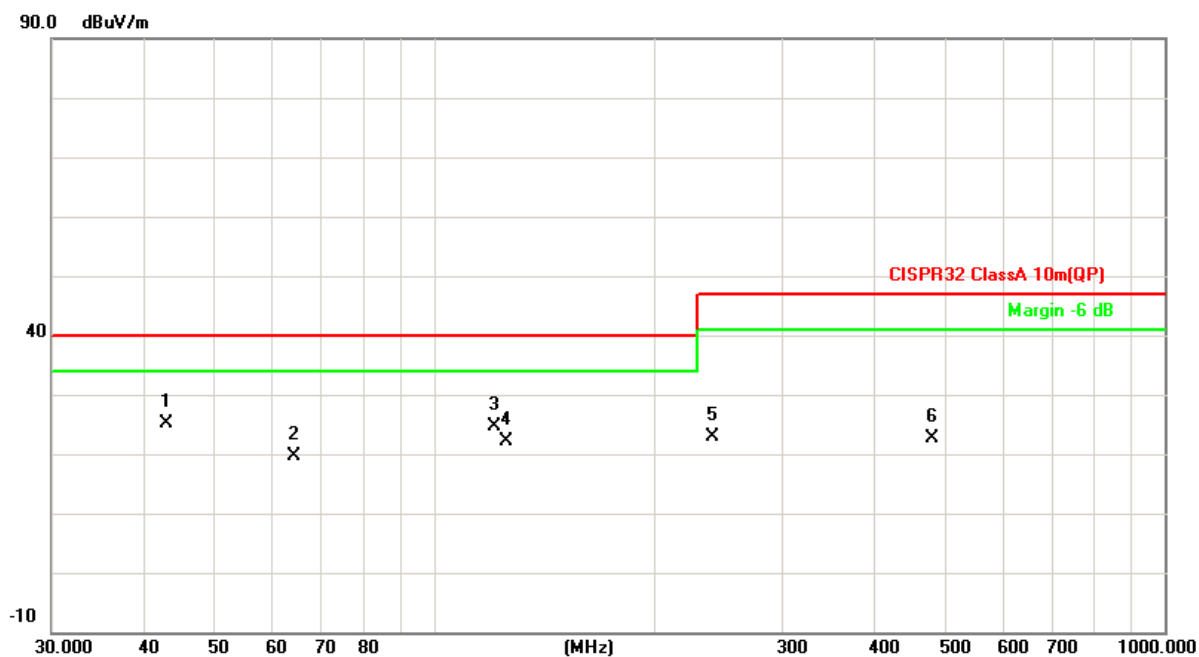


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	42.9020	54.37	-17.64	36.73	40.00	-3.27	QP	100	299
2	46.2020	51.92	-17.62	34.30	40.00	-5.70	QP	100	360
3	239.9800	42.88	-22.93	19.95	47.00	-27.05	QP	100	274
4	249.3300	44.09	-22.43	21.66	47.00	-25.34	QP	100	194
5	359.9849	38.20	-19.13	19.07	47.00	-27.93	QP	100	298
6	480.0080	41.90	-15.79	26.11	47.00	-20.89	QP	100	305

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain
+ Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	110Vac, 60Hz	Frequency Range	30 – 1000 MHz
Environmental Conditions	23°C, 56% RH	6dB Bandwidth	120 kHz
Test Date	2017/04/06	Test Distance	10m
Tested by	Eddy Kao	Polarization	Horizontal

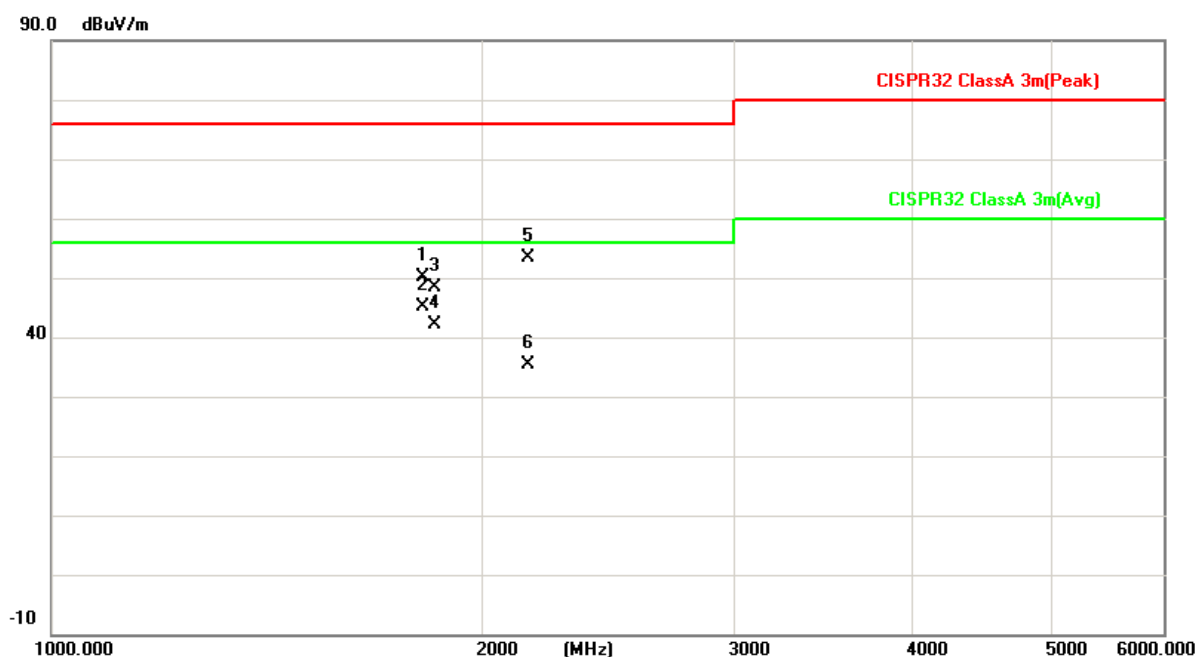


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	42.9900	42.83	-17.63	25.20	40.00	-14.80	QP	400	208
2	64.2340	39.22	-19.69	19.53	40.00	-20.47	QP	400	221
3	120.8540	45.70	-21.11	24.59	40.00	-15.41	QP	400	151
4	125.0100	42.93	-20.89	22.04	40.00	-17.96	QP	400	218
5	240.0040	45.90	-22.93	22.97	47.00	-24.03	QP	400	209
6	479.9720	38.54	-15.79	22.75	47.00	-24.25	QP	400	88

Remark: 1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain
+ Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	230Vac, 50Hz	Frequency Range	1 – 6GHz
Environmental Conditions	23°C, 52% RH	6dB Bandwidth	1MHz
Test Date	2017/03/30	Test Distance	3m
Tested by	Eddy Kao	Polarization	Vertical

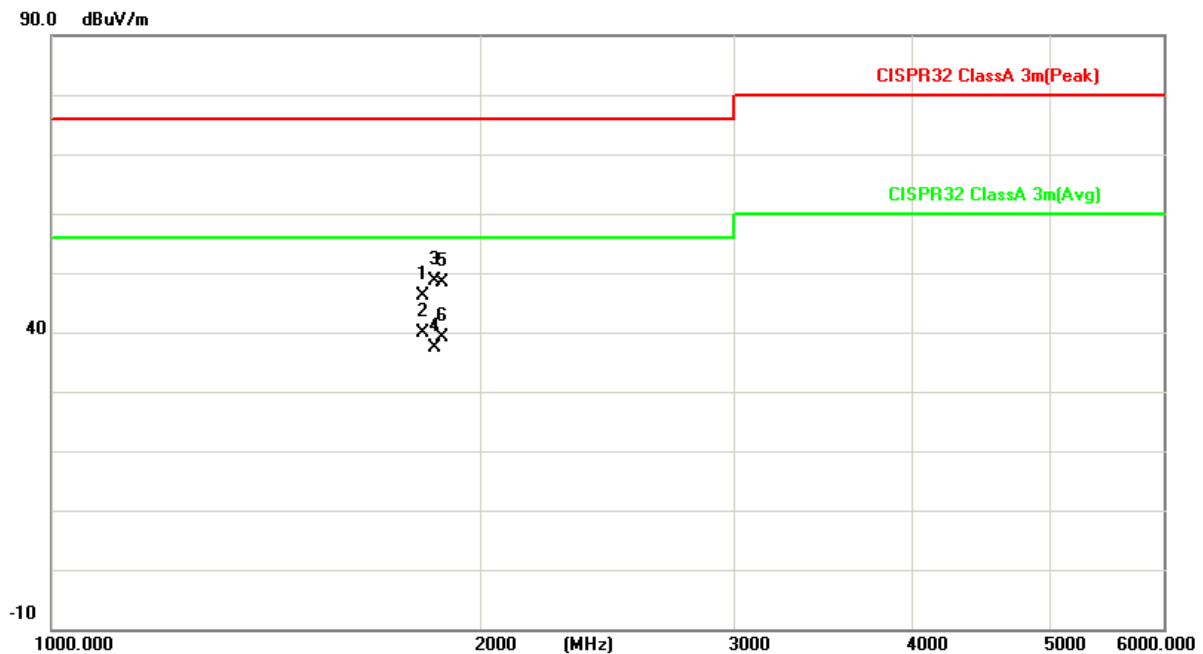


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1817.980	57.60	-7.55	50.05	76.00	-25.95	peak	100	162
2	1817.980	52.70	-7.55	45.15	56.00	-10.85	AVG	100	162
3	1850.230	55.70	-7.35	48.35	76.00	-27.65	peak	100	205
4	1850.230	49.50	-7.35	42.15	56.00	-13.85	AVG	100	205
5	2151.620	59.40	-6.03	53.37	76.00	-22.63	peak	100	75
6	2151.620	41.50	-6.03	35.47	56.00	-20.53	AVG	100	75

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	230Vac, 50Hz	Frequency Range	1 – 6GHz
Environmental Conditions	23°C, 52% RH	6dB Bandwidth	1MHz
Test Date	2017/03/30	Test Distance	3m
Tested by	Eddy Kao	Polarization	Horizontal

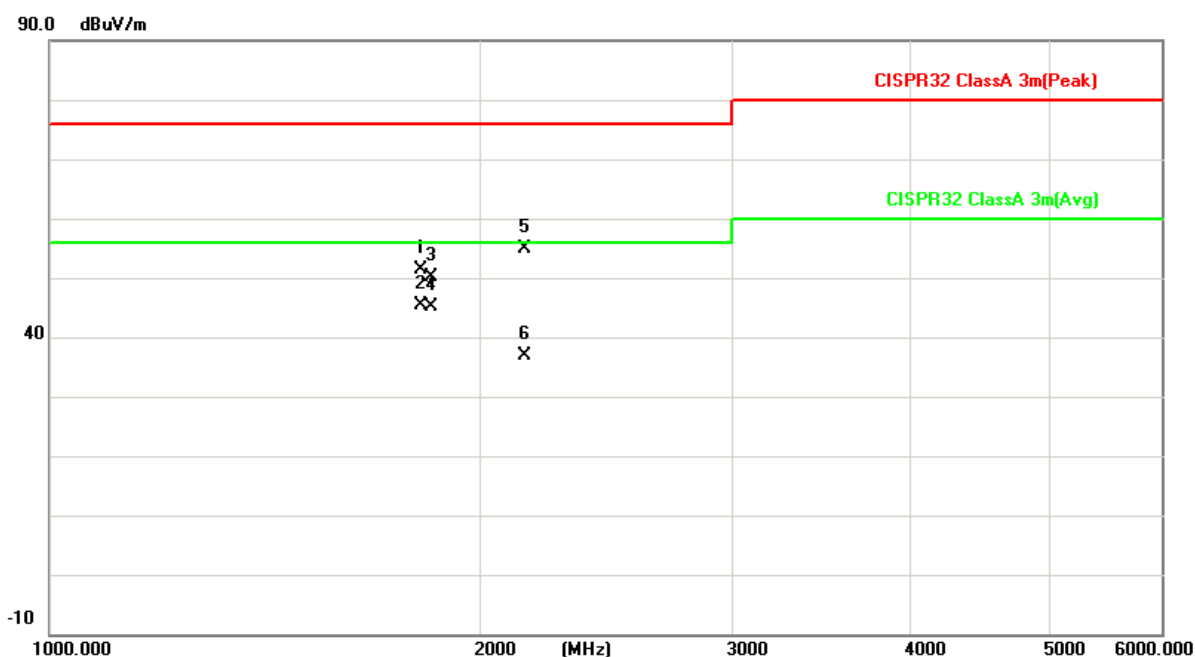


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1817.530	53.80	-7.55	46.25	76.00	-29.75	peak	100	342
2	1817.530	47.50	-7.55	39.95	56.00	-16.05	AVG	100	342
3	1851.620	55.90	-7.34	48.56	76.00	-27.44	peak	100	169
4	1851.620	44.70	-7.34	37.36	56.00	-18.64	AVG	100	169
5	1875.020	55.60	-7.19	48.41	76.00	-27.59	peak	100	195
6	1875.020	46.30	-7.19	39.11	56.00	-16.89	AVG	100	195

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	110Vac, 60Hz	Frequency Range	1 – 6GHz
Environmental Conditions	23°C, 52% RH	6dB Bandwidth	1MHz
Test Date	2017/03/30	Test Distance	3m
Tested by	Eddy Kao	Polarization	Vertical

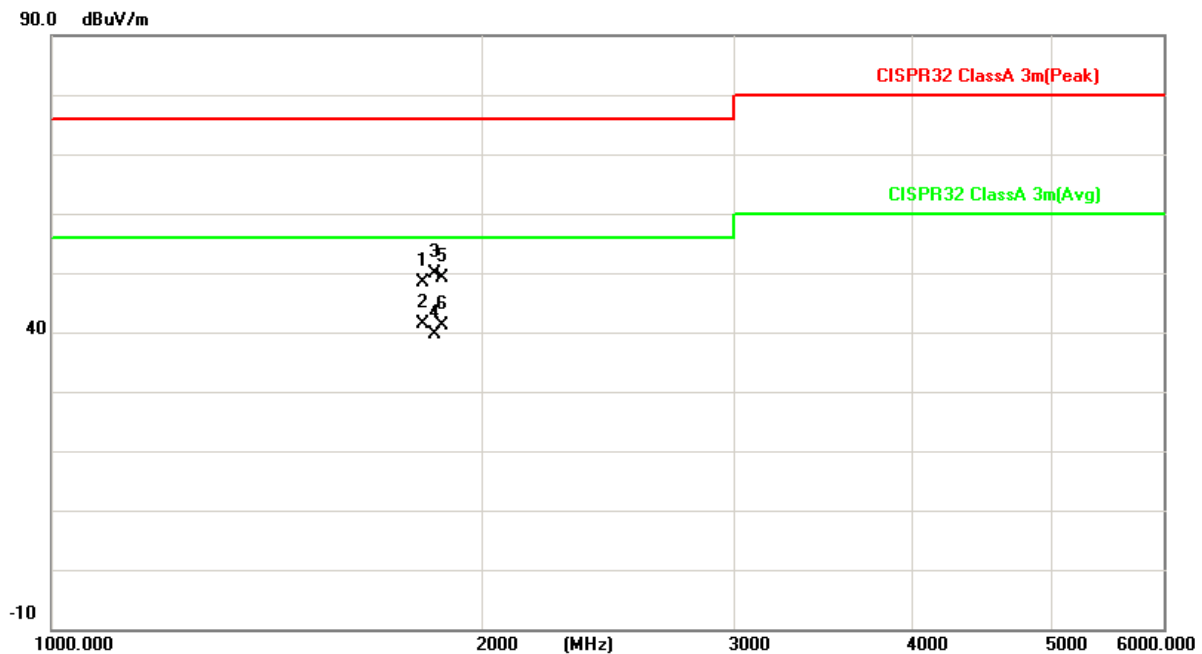


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1818.186	58.83	-7.55	51.28	76.00	-24.72	peak	100	145
2	1818.186	53.03	-7.55	45.48	56.00	-10.52	AVG	100	145
3	1848.841	57.48	-7.35	50.13	76.00	-25.87	peak	100	171
4	1848.841	52.42	-7.35	45.07	56.00	-10.93	AVG	100	171
5	2147.176	60.82	-6.05	54.77	76.00	-21.23	peak	100	50
6	2147.176	43.02	-6.05	36.97	56.00	-19.03	AVG	100	50

Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	110Vac, 60Hz	Frequency Range	1 – 6GHz
Environmental Conditions	23°C, 52% RH	6dB Bandwidth	1MHz
Test Date	2017/03/30	Test Distance	3m
Tested by	Eddy Kao	Polarization	Horizontal

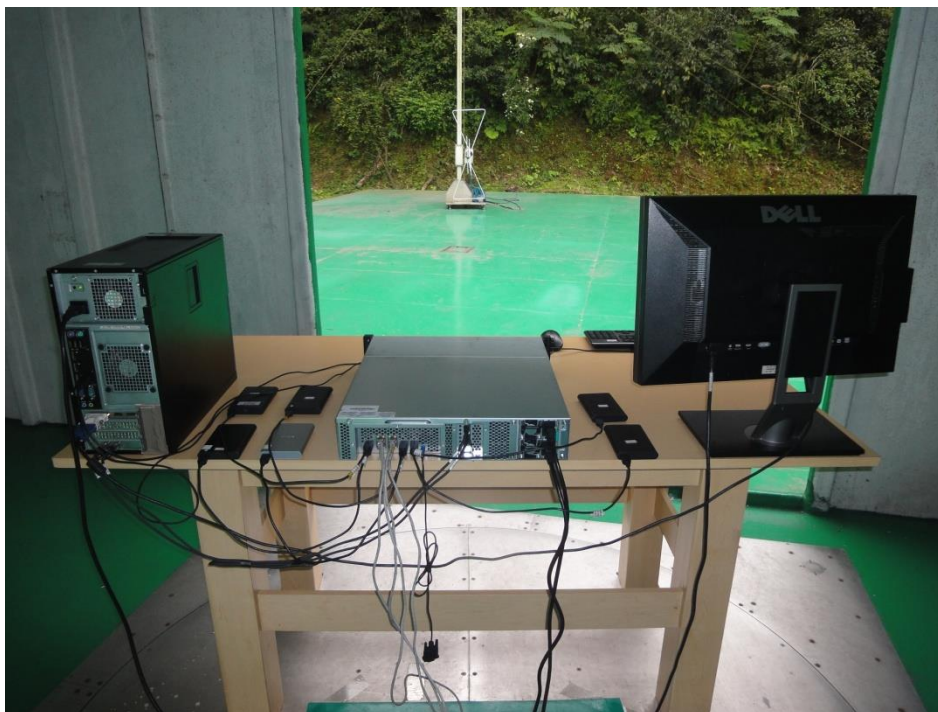


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1818.071	55.97	-7.55	48.42	76.00	-27.58	peak	100	329
2	1818.071	48.96	-7.55	41.41	56.00	-14.59	AVG	100	329
3	1849.156	57.24	-7.35	49.89	76.00	-26.11	peak	100	146
4	1849.156	46.88	-7.35	39.53	56.00	-16.47	AVG	100	146
5	1874.966	56.24	-7.21	49.03	76.00	-26.97	peak	100	208
6	1874.966	48.36	-7.21	41.15	56.00	-14.85	AVG	100	208

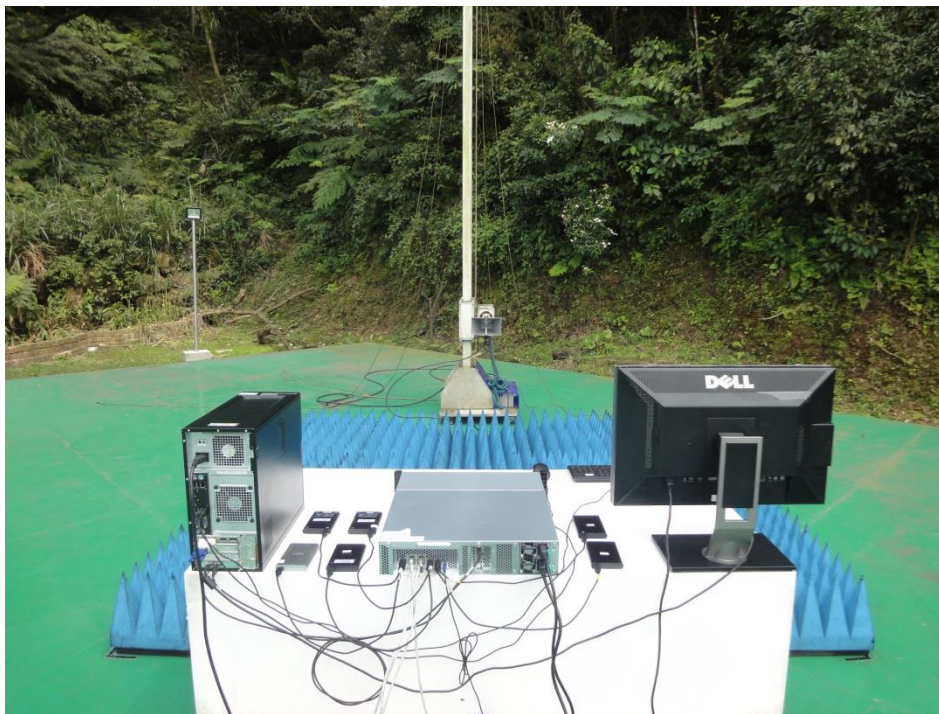
Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain
+ Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

4.3.7 Photographs of Test Configuration

Radiated Emission Test (30MHz~1GHz)



Radiated Emission Test (Above 1GHz)



4.4 Harmonics Current Measurement

4.4.1 Limits of Harmonics Current Measurement

The limits ensure that harmonic disturbance levels do not exceed the compatibility levels defined in IEC 61000-3-2.

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

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt 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	0.15x15/n

- Note:** 1. Class A and Class D are classified according to item 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.

4.4.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	Harmonics & Flicker Analyser	EMC PARTNER	HAR-1000-1P	CT-1-090(1)	Aug. 03, 2016
2	Power Source	EMC PARTNER	PS3-1	CT-1-090a1	Aug. 03, 2016

- Note:** 1. The calibration interval of the above test instruments is 12 months.

4.4.3 Test Procedure

The EUT was placed on the top of a wooden table 0.8 meter above the ground and operated to produce the maximum harmonic under normal operating conditions for each successive harmonic component in turn.

The classification of EUT is according to section 5 of EN 61000-3-2.

The EUT classified as follows:

Class A:

- Balanced three-phase equipment;
- Household appliances excluding equipment identified as Class D;
- Tools excluding portable tools;
- Dimmers for incandescent lamps;
- Audio equipment.

Equipment not specified in one of the three other classes should be considered as Class A equipment.

Note 1: Equipment that can be shown to have a significant effect on the supply system may be reclassified in a future edition of the standard. Factors to be taken into account include:

- Number in use;
- Duration of use;
- Simultaneity of use;
- Power consumption;
- Harmonic spectrum, including phase.

Class B:

- Portable tools;
- Arc welding equipment, which is not professional equipment.

Class C:

- Lighting equipment;

Class D:

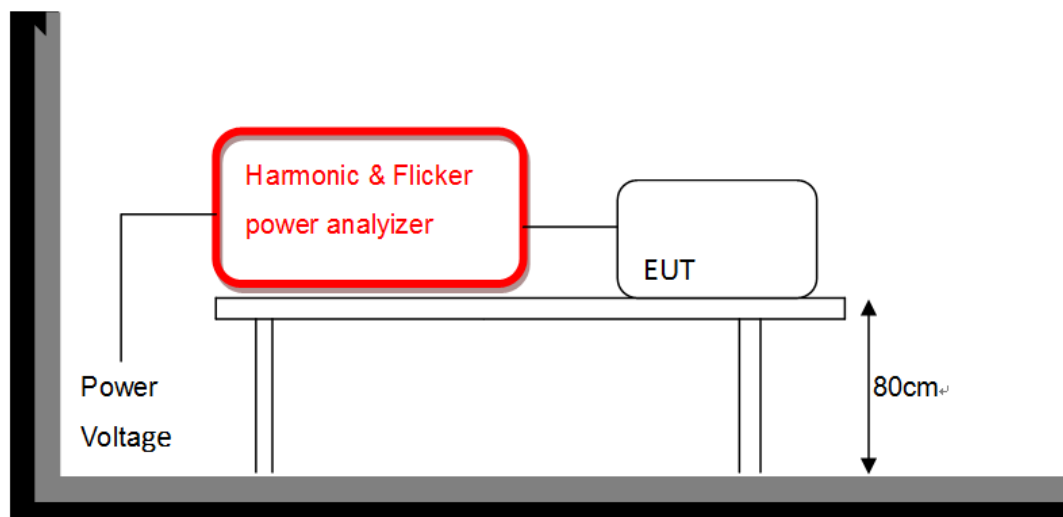
Equipment having a specified power according to 6.2.2 less than or equal to 600W, of the following types:

- Personal computers and personal computer monitors;
- Television receivers.

4.4.4 Deviation from Test Standard

No deviation

4.4.5 Test Setup





4.4.6 Test Result

Supply Voltage / Ampere	229.5 Vrms / 0.481 Arms	Test Date	2017/03/24
Test Duration	5 min	Power Consumption	76.82W
Power Frequency	49.900Hz	Power Factor	0.695
Environmental Conditions	29°C, 54% RH	Tested by	Vincent Lin

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Limit [A]	Vrms [V]	Phase [deg]
1	50	0.4625	0.4619	95.943	-	0.4932	-	229.52	0.00
2	100	0.0183	0.0167	3.4736	1.5485	0.0223	1.0800	0.2209	0.00
3	150	0.1373	0.1365	28.347	5.9337	0.1470	2.3000	0.0736	0.00
4	200	0.0095	0.0092	1.9016	2.1291	0.0104	0.4300	0.0491	0.00
5	250	0.0273	0.0273	5.6795	2.3986	0.0276	1.1400	0.0491	0.00
6	300	0.0087	0.0088	1.8256	2.9297	0.0089	0.3000	0.0245	0.00
7	350	0.0215	0.0214	4.4371	2.7743	0.0226	0.7700	0.0245	0.00
8	400	0.0000	0.0027	0.5578	1.1676	0.0029	0.2300	0.0245	0.00
9	450	0.0101	0.0100	2.0791	2.5024	0.0106	0.4000	0.0245	0.00
10	500	0.0000	0.0023	0.4817	1.2605	0.0029	0.1840	0.0245	0.00
11	550	0.0056	0.0056	1.1663	1.7016	0.0059	0.3300	0.0245	0.00
12	600	0.0001	0.0049	1.0142	3.1844	0.0051	0.1533	0.0245	0.00
13	650	0.0079	0.0079	1.6481	3.7784	0.0081	0.2100	0.0245	0.00
14	700	0.0000	0.0042	0.8621	3.1579	0.0043	0.1314	0.0245	0.00
15	750	0.0000	0.0038	0.7860	2.5228	0.0043	0.1500	0.0245	0.00
16	800	0.0000	0.0029	0.6085	2.5476	0.0033	0.1150	0.0245	0.00
17	850	0.0000	0.0040	0.8367	3.0436	0.0042	0.1324	0.0245	0.00
18	900	0.0000	0.0007	0.1521	0.7165	0.0010	0.1022	0.0000	0.00
19	950	0.0000	0.0015	0.3043	1.2370	0.0024	0.1184	0.0000	0.00
20	1000	0.0000	0.0016	0.3296	1.7249	0.0018	0.0920	0.0000	0.00
21	1050	0.0033	0.0050	1.0396	4.6712	0.0052	0.1071	0.0245	0.00
22	1100	0.0000	0.0021	0.4310	2.4812	0.0023	0.0836	0.0000	0.00
23	1150	0.0053	0.0054	1.1156	5.4905	0.0055	0.0978	0.0245	0.00
24	1200	0.0000	0.0023	0.4817	3.0252	0.0027	0.0767	0.0245	0.00
25	1250	0.0000	0.0023	0.4817	2.5770	0.0024	0.0900	0.0000	0.00
26	1300	0.0000	0.0026	0.5325	3.6223	0.0027	0.0708	0.0245	0.00
27	1350	0.0000	0.0024	0.5071	2.9297	0.0029	0.0833	0.0245	0.00
28	1400	0.0000	0.0035	0.7353	5.3870	0.0038	0.0657	0.0245	0.00
29	1450	0.0000	0.0018	0.3803	2.3600	0.0028	0.0776	0.0245	0.00
30	1500	0.0000	0.0029	0.6085	4.7767	0.0032	0.0613	0.0245	0.00
31	1550	0.0000	0.0015	0.3043	2.0182	0.0029	0.0726	0.0245	0.00
32	1600	0.0000	0.0007	0.1521	1.2738	0.0013	0.0575	0.0245	0.00
33	1650	0.0000	0.0026	0.5325	3.7598	0.0031	0.0682	0.0245	0.00
34	1700	0.0000	0.0016	0.3296	2.9323	0.0023	0.0541	0.0245	0.00
35	1750	0.0000	0.0022	0.4564	3.4180	0.0031	0.0643	0.0245	0.00
36	1800	0.0000	0.0034	0.7099	6.6873	0.0035	0.0511	0.0245	0.00
37	1850	0.0000	0.0029	0.6085	4.8177	0.0033	0.0608	0.0245	0.00
38	1900	0.0000	0.0013	0.2789	2.7731	0.0017	0.0484	0.0245	0.00
39	1950	0.0000	0.0021	0.4310	3.5970	0.0024	0.0577	0.0245	0.00
40	2000	0.0000	0.0027	0.5578	5.8381	0.0031	0.0460	0.0245	0.00

Note:

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

4.4.7 Photographs of Test Configuration



4.5 Voltage Fluctuation and Flicker Measurement

4.5.1 Limit for Voltage Function and Flicker Measurement

Tests Item	Limits	Remark
	IEC/EN 61000-3-3	
P _{st}	1.0, T _p = 10 min.	P _{st} means short-term flicker
P _{lt}	0.65, T _p =2 hr.	P _{lt} means long-term flicker
D _c (%)	3.3%	d _c means relative steady-state voltage change
D _{max} (%)	4%	d _{max} means maximum relative voltage change.
T _d (t)	3.3% / 500 ms	T _d t means maximum time that d _t exceeds 3 %.

4.5.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	Harmonics & Flicker Analyser	EMC PARTNER	HAR-1000-1P	CT-1-090(1)	Aug. 03, 2016
2	Power Source	EMC PARTNER	PS3-1	CT-1-090a1	Aug. 03, 2016

Note: 1. The calibration interval of the above test instruments is 12 months.

4.5.3 Test Procedure

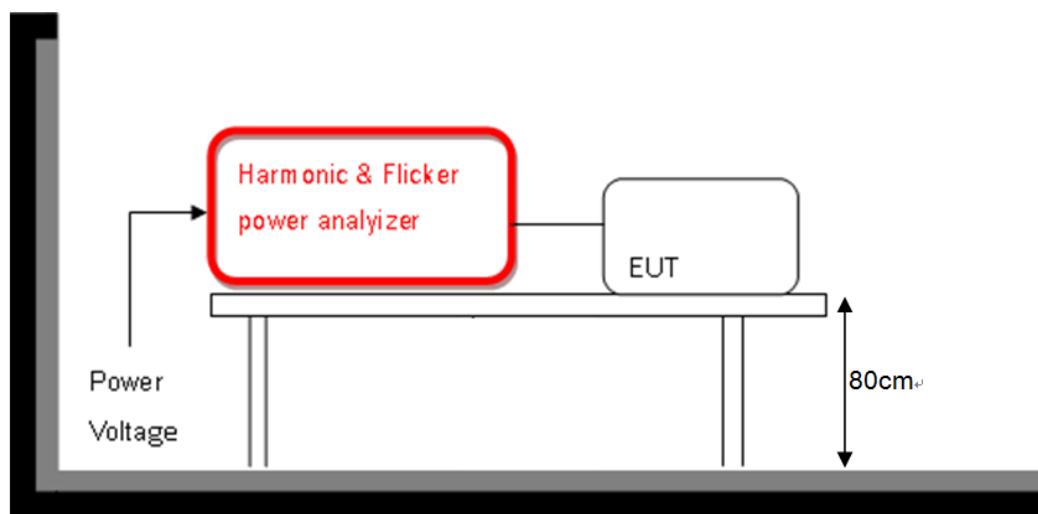
The EUT was placed on the top of a wooden table 0.8 meter above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating condition.

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 min and the observation period for long-term flicker indicator is 2 hours.

4.5.4 Deviation from Test Standard

No deviation

4.5.5 Test Setup



4.5.6 Test Result

Supply Voltage / Ampere	229.5 Vrms / 0.456 Arms	Test Date	2017/03/24
Observation (Tp)	30 min	Environmental Conditions	29°C, 54% RH
Power Frequency	49.922Hz	Tested by	Vincent Lin

Test Parameter	Measurement Value	Test Limit	Remarks
P _{st}	0.07	1.00	Pass
P _{lt}	0.07	0.65	Pass
T _{dt} (ms)	0.00	500	Pass
d _{max} (%)	0.00	4%	Pass
dc (%)	0.02	3.3%	Pass

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

4.5.7 Photographs of Test Configuration



5 Immunity Test

5.1 Standard Description

Standard: EN 55024

Product standard	EN 55024	
Basic Standard and Performance Criterion required	IEC 61000-4-2 (ESD)	±8kV Air discharge ±4kV Contact discharge, Performance Criterion B
	IEC 61000-4-3 (RS)	80 M~ 1000 MHz, 3V/m(rms) , 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-4 (EFT)	Electrical Fast Transient/Burst – EFT: AC Power Port: ±1kV DC Power Port: ±0.5kV Signal Ports and Telecommunication Ports(cable length > 3m): 0.5kV Performance Criterion B
	IEC 61000-4-5 (Surge)	AC power line: line to line ±1 kV, line to earth ±2 kV, DC power line: line to earth ±0.5 kV, Performance Criteria B Outdoor signal line: 1) ±1 kV without primary protectors, Performance Criteria C 2) ±4 kV with primary protectors, Performance Criterion C
	IEC 61000-4-6 (CS)	Signal and Telecommunication Ports(cable length > 3m), AC Power Port; DC Power Port: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8 (PFMF)	50Hz or 60Hz, 1A/m Performance Criterion A
	IEC 61000-4-11 (Dips)	Voltage Dips: >95% reduction, 0.5 period, Performance Criterion B 30% reduction, 25 period, Performance Criterion C Voltage Interruptions: >95% reduction, 250 period, Performance Criterion C

Standard: EN 55035

Product standard	EN 55035	
Basic Standard and Performance Criterion required	IEC 61000-4-2 (ESD)	±4 kV Contact discharge, ±8 kV Air discharge, Performance Criterion B
	IEC 61000-4-3 (RS)	80 M ~ 1000 MHz, 3V/m(rms) , 80% AM (1kHz), 1800 MHz, 2600 MHz, 3500 MHz, 5000 MHz for spot test (Wireless communication device), 3V/m(rms), 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-4 (EFT)	AC Main Power Port: ±1kV, DC Network Power Port (cable length > 3m): ±0.5 kV, Analogue/Digital Data Ports (cable length > 3m): ±0.5 kV, Performance Criterion B
	IEC 61000-4-5 (Surge)	AC Main Power Port: line to line ±1 kV, line to ground ±2 kV, DC Network Power Port (cable length > 3m): line to ground ±0.5 kV, Performance Criteria B Analogue/Digital Data Ports (unshielded symmetrical):line to ground Primary Protection: Intended, ±1 kV and ±4 kV, Primary Protection: Not Intended, ±1 kV, Performance Criteria C Analogue/Digital Data Ports (coaxial or shielded): shielded to ground, ±0.5 kV, Performance Criteria B
	IEC 61000-4-6 (CS)	AC Main Power Port, DC Network Power Port (cable length > 3m), Analogue/Digital Data Ports (cable length > 3m), 0.15 M ~ 10 MHz, 3Vrms, 80% AM, 1kHz, 10 M ~ 30 MHz, 3 - 1Vrms, 80% AM, 1kHz, 30 M ~ 80 MHz, 1Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8 (PFMF)	50Hz or 60Hz, 1 A/m, Performance Criterion A
	IEC 61000-4-11 (Dips)	Voltage Dips: >95% reduction, 0.5 period, Performance Criterion B 30% reduction, 25 period, Performance Criterion C Voltage Interruptions: >95% reduction, 250 period, Performance Criterion C

5.2 Performance Criteria

Standard: EN 55024

According to Clause 7 of EN 55024 standard, the general performance criteria as following:

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

Standard: EN 55035

According to Clause 8 of EN 55035 standard, the general performance criteria as following:

Criteria A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state 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.
Criteria B	<p>During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.</p> <p>After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, 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), or recovery time is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
Criteria C	<p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.</p> <p>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

5.3 Electrostatic Discharge (ESD)

5.3.1 Test Specification

Standard	IEC/EN 61000-4-2
Discharge Impedance	330 ohm / 150 pF
Discharge Voltage	Air Discharge: $\pm 2, \pm 4, \pm 8$ kV (Direct) Contact Discharge: ± 4 kV (Direct/Indirect)
Number of Discharge	Air: Minimum 10 times at each point. Contact: Minimum 25 times at each point and minimum 200 times in total
Discharge Mode	Single Discharge
Discharge Period	1 second minimum

5.3.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	ESD Simulator/ Discharge Gun	NoiseKen	ESS-B3011	CT-1-089	Aug. 06, 2016
2	Digital Thermo-Hygro Meter	N/A	HTC-8	CT-2-047	Mar. 24, 2017
3	Atmosphere pressure meter	N/A	Kat.Nr.45.10 00.01	CT-2-052-1	Aug. 01, 2016

Note: 1. The calibration interval of the above test instruments is 12 months.

5.3.3 Test Procedure

The test generator necessary to perform direct and indirect application of discharge to the EUT in following methods:

a. Contact discharges to the conductive surface and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at positive and negative polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane (HCP). The remaining three test points shall be each receives at least 50 direct contact discharges. If no direct contact test points are available, shall be at least 200 indirect discharges applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5 m × 0.5 m, is placed parallel to, and positioned at a distance 0.1 m from, the EUT, with the discharge electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane, of dimensions 1.6 m × 0.8 m, is placed under the EUT. The generator shall be positioned vertically a distance of 0.1 m from the EUT, with the discharge electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

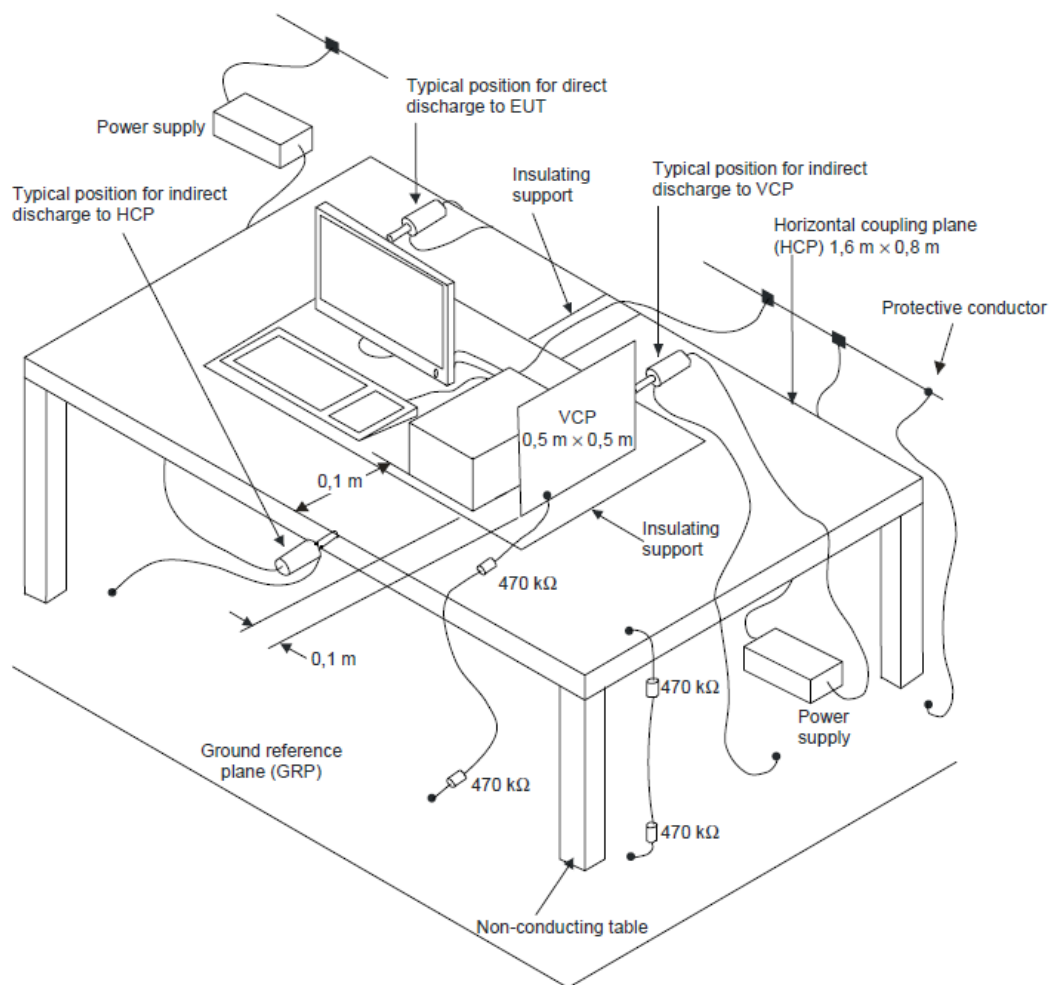
b. Air discharge at apertures and slots and insulating surface:

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 10 single air discharges shall be applied to the selected test point for each such area.

5.3.4 Deviation from Test Standard

No deviation

5.3.5 Test Setup





5.3.6 Test Result

Test Voltage	230Vac, 50Hz	Test Date	2017/04/17
Environmental Conditions	28°C, 53% RH	Pressure	1015 mbar
Tested by	Eddy Kao		

Test Results of Direct Application

Air Discharge				
Test Point	Discharge Level (kV)			Result
	±2	±4	±8	
Front	A	A	A	A
Back	A	A	A	A
Bottom	A	A	A	A

* Test location(s) in which discharge to be applied illustrated by photos shown in next page(s).

Contact Discharge		
Test Point	Discharge Level (kV)	Result
	±4	
Front	A	A
Back	A	A
Left	A	A
Right	A	A
Top	A	A

* Test location(s) in which discharge to be applied illustrated by photos shown in next page(s).

Test Results of Indirect Application

HCP Discharge		
Test Point	Discharge Level (kV)	Result
	±4	
Front	A	A
Back	A	A
Left	A	A
Right	A	A

VCP Discharge		
Test Point	Discharge Level (kV)	Result
	±4	
Front	A	A
Back	A	A
Left	A	A
Right	A	A

Note:

Criteria A: The EUT function was correct during the test.

Description of Test Points

Front

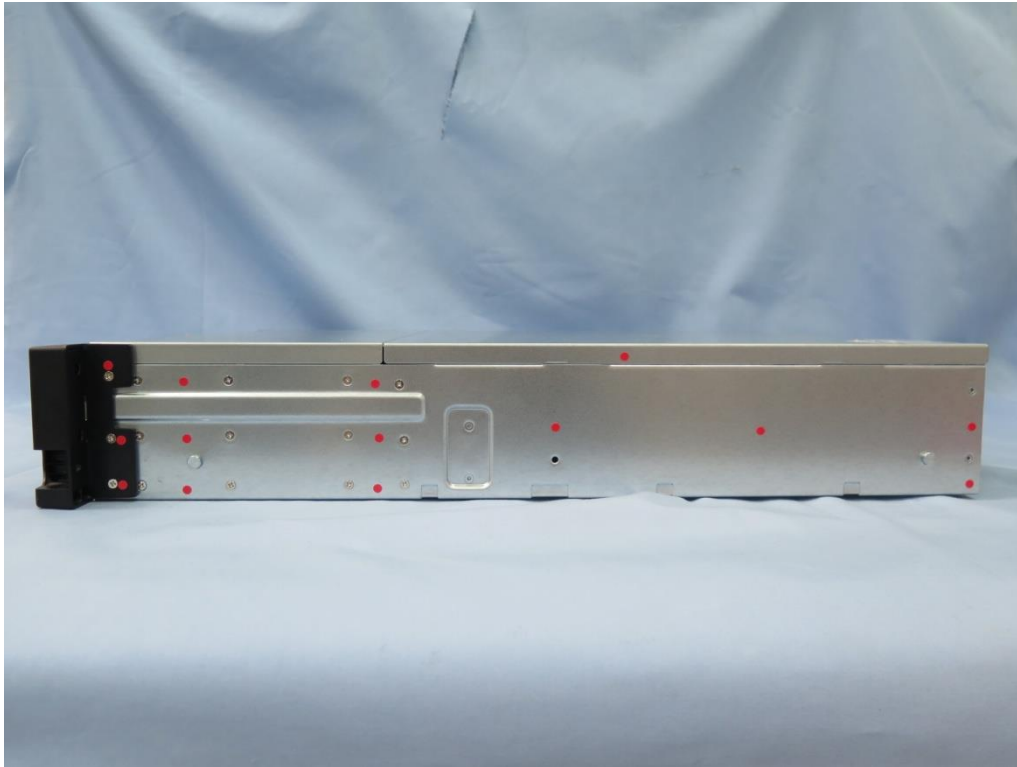


Back

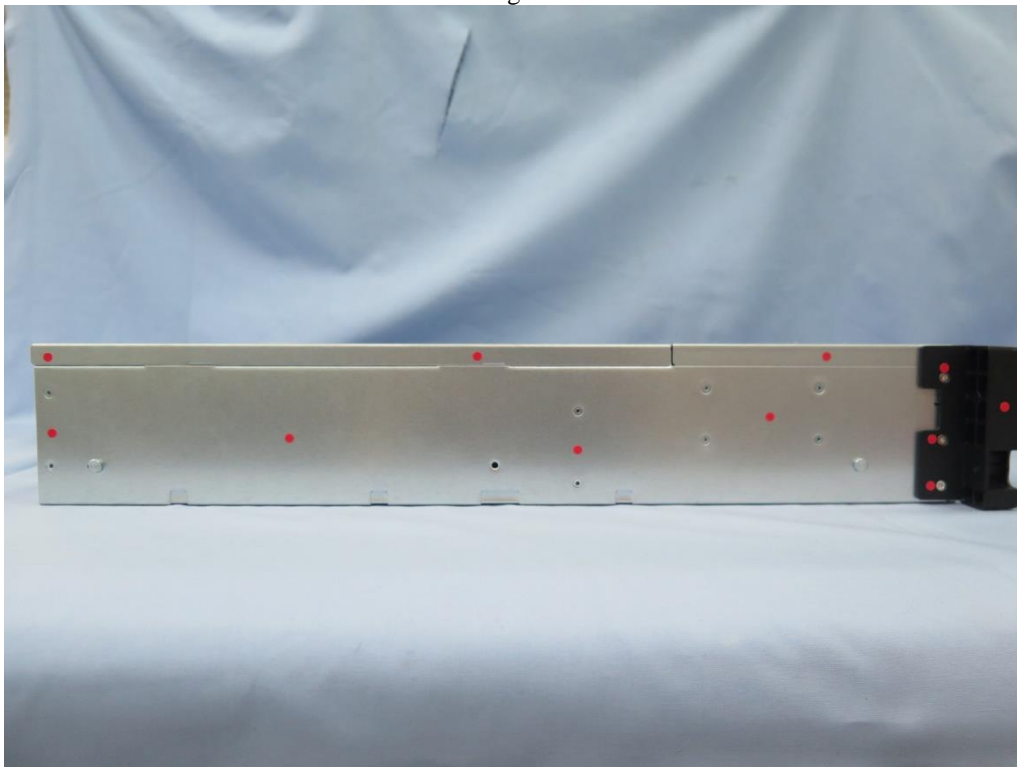


*Red Dot - Contact Discharged
Blue Dot - Air Discharged

Left

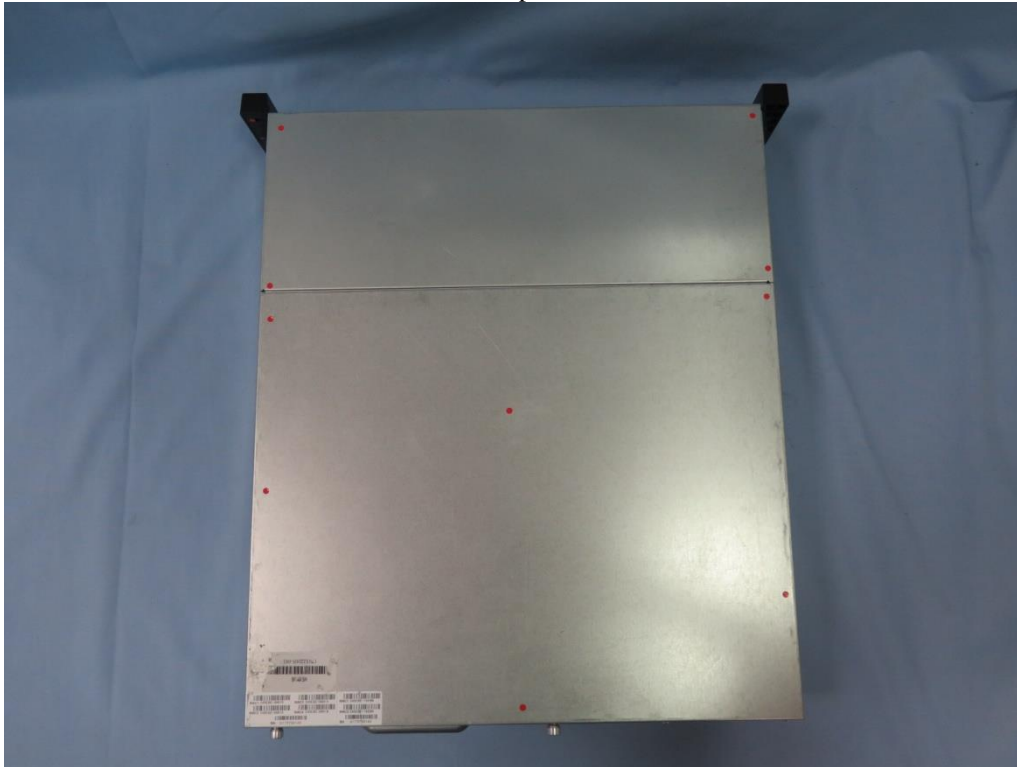


Right

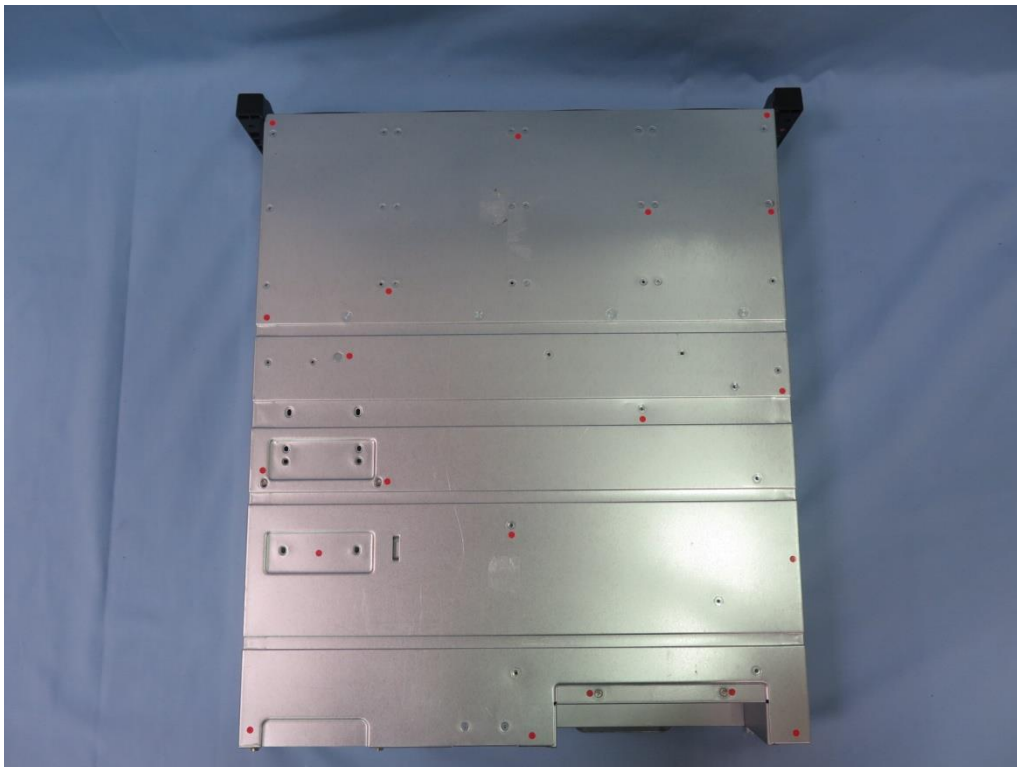


*Red Dot - Contact Discharged
Blue Dot - Air Discharged

Top



Bottom



*Red Dot - Contact Discharged
Blue Dot - Air Discharged

5.3.7 Photographs of Test Configuration



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

5.4.1 Test Specification

Standard: EN 55024

Standard	IEC/EN 61000-4-3
Frequency Range	80 MHz - 1000 MHz
Field Strength	3 V/m
Modulation	80%, AM Modulation, 1 kHz Sine Wave
Frequency Step	1%
Polarity of Antenna	Horizontal and Vertical
Test Distance	3 m
Antenna Height	1.5 m
Dwell Time	3.0 seconds

Standard: EN 55035

Standard	IEC/EN 61000-4-3
Frequency Range	80MHz - 1000MHz 1800MHz, 2600MHz, 3500MHz, 5000MHz for spot test
Field Strength	3 V/m
Modulation	80%, AM Modulation 1 kHz Sine Wave
Frequency Step	1%
Polarity of Antenna	Horizontal and Vertical
Test Distance	3 m
Antenna Height	1.5 m
Dwell Time	3 seconds or not exceed 5 seconds

5.4.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	RadiCentre ® Modular EMC Test Systems	DARE	CTR1004B	CT-1-080	No calibration request
2	RF Signal Generator	DARE	RGN6000B	CT-1-080	Aug. 11, 2021
3	LINEAR POWER RF AMPLIFIER	TESEQ	CBA1G-300 D	CT-1-163	Jul. 18, 2021
4	LINEAR POWER RF AMPLIFIER	OPHIR	5193	CT-1-083	Aug. 11, 2021
5	LINEAR POWER RF AMPLIFIER	OPHIR	5022A	CT-1-084	Aug. 11, 2021
6	Periodic Test-Antenna	Schwarzbeck Mess - Elektronik	STLP 9128 E	CT-1-085	No calibration request
7	Stacked Microwave Log.-Per. Antenna	Schwarzbeck Mess - Elektronik	STLP 9149	CT-1-086	No calibration request
8	Electric Field Probe	FRANKONIA	EFS-10	CT-1-060a1	Aug. 27, 2021
9	Measurement Software	EMC-RS	Ver: 2.02	N/A	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

5.4.3 Test Procedure

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

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

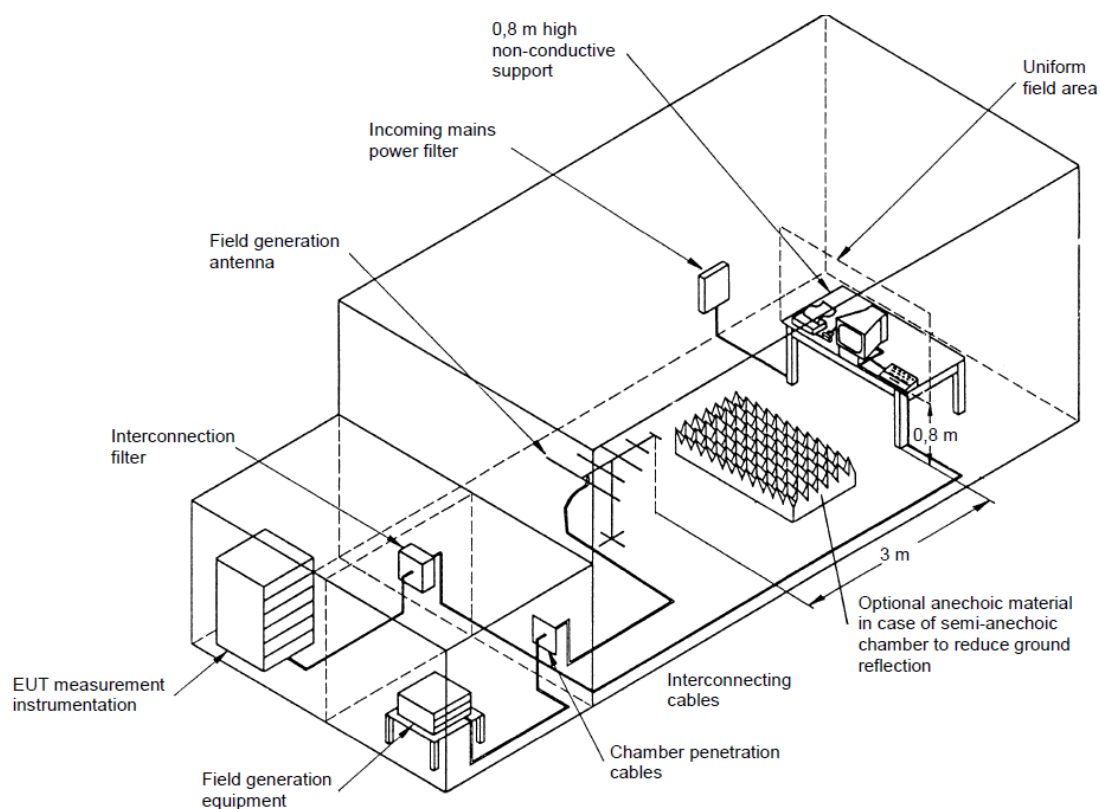
All the scanning conditions are as follows:

	Condition of Test	Remarks
1	Field Strength	3V/m
2	Radiated Signal	AM 80% Modulated with 1kHz
3	Scanning Frequency	80 M- 1000MHz
4	Dwell Time	3.0 Seconds
5	Frequency Step Size Δf	1%

5.4.4 Deviation from Test Standard

No deviation

5.4.5 Test Setup



NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height.

5.4.6 Test Result

Standard: EN 55024

Test Voltage	230Vac, 50Hz	Environmental Conditions	29°C, 54% RH
Tested by	Vincent Lin	Test Date	2017/03/24

Frequency Range (MHz)	Azimuth	Polarity	Field Strength (V/m)	Modulation	Result
80-1000	0	H/V	3	80% AM (1kHz)	A
80-1000	90	H/V	3	80% AM (1kHz)	A
80-1000	180	H/V	3	80% AM (1kHz)	A
80-1000	270	H/V	3	80% AM (1kHz)	A

Note:

Criteria A: The EUT function was correct during the test.

Standard: EN 55035

Test Voltage	230Vac, 50Hz	Environmental Conditions	22°C, 49% RH
Tested by	Guanwei Liao	Test Date	2022/01/26

Frequency Range (MHz)	Azimuth	Polarity	Field Strength (V/m)	Modulation	Result
80-1000	0, 90, 180, 270	H/V	3	80% AM (1kHz)	A
1800	0, 90, 180, 270	H/V	3	80% AM (1kHz)	A
2600	0, 90, 180, 270	H/V	3	80% AM (1kHz)	A
3500	0, 90, 180, 270	H/V	3	80% AM (1kHz)	A
5000	0, 90, 180, 270	H/V	3	80% AM (1kHz)	A

Note:

Criteria A: The EUT function was correct during the test.

5.4.7 Photographs of Test Configuration



5.5 Electrical Fast Transient /Burst Immunity Test (EFT)

5.5.1 Test Specification

Standard: EN 55024

Standard	IEC/EN 61000-4-4
Test Voltage	AC supply lines: ± 1 kV DC Power Port: ± 0.5 kV Signal ports and telecommunication ports: ± 0.5 kV
Polarity	Positive & Negative
Impulse Frequency	xDSL telecommunication port: 100 kHz other: 5kHz
Impulse Wave	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	Not less than 1 min.

Standard: EN 55035

Standard	IEC/EN 61000-4-4
Test Voltage	AC Main Power Port: ± 1 kV, DC Network Power Port ^(Note 1) (cable length > 3m): ± 0.5 kV, Analogue/Digital Data Ports (cable length > 3m): ± 0.5 kV,
Polarity	Positive & Negative
Impulse Frequency	CPE xDSL Ports: 100kHz Other: 5kHz
Impulse Wave	5/50 ns
Burst Duration	15 ms
Burst Period	300 ms
Test Duration	Not less than 1 min.

Note: 1. Applicable only to port which, according to the manufacturer's specification, support cabled lengths greater than 3m.

5.5.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	EMS Generator	Thermo	EMC Pro	CT-1-030	Mar. 30, 2017
2	Clamp	KeyTek	CCL	CT-1-032	Mar. 28, 2017
3	Measurement Software	CEWare32	Ver: 4.1	N/A	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

5.5.3 Test Procedure

The EUT is placed on a table that is 0.8 meter height. A ground reference plane is placed on the table, and uses a 0.1m insulation between the EUT and ground reference plane.

The minimum area of the ground reference plane is 1m*1m, and 0.65mm thick min, and projected beyond the EUT by at least 0.1m on all sides.

For input AC power ports:

The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.

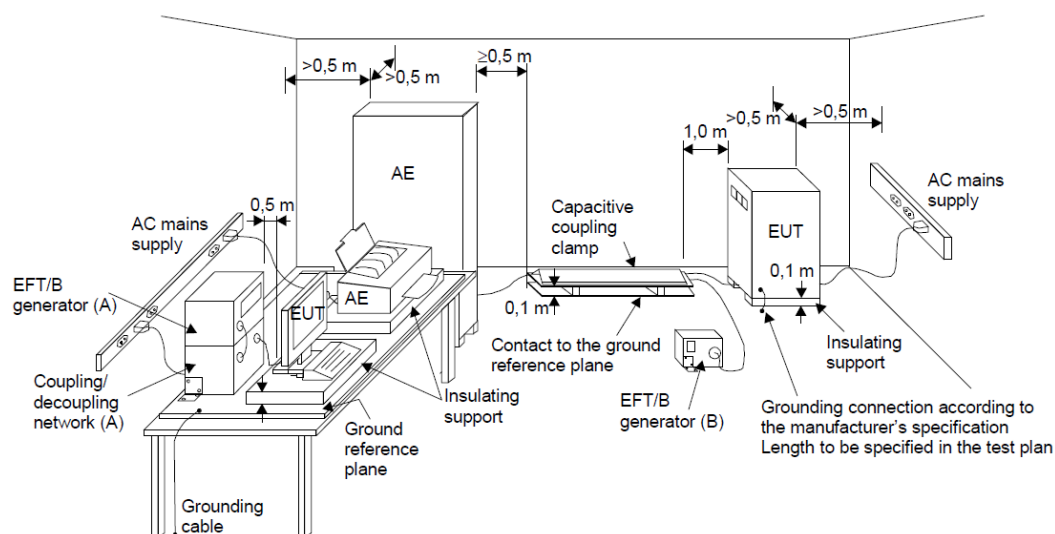
Each of the line conductors is impressed with burst noise for 1 minute.

The length of the power lines between the coupling device and the EUT is 0.5m.

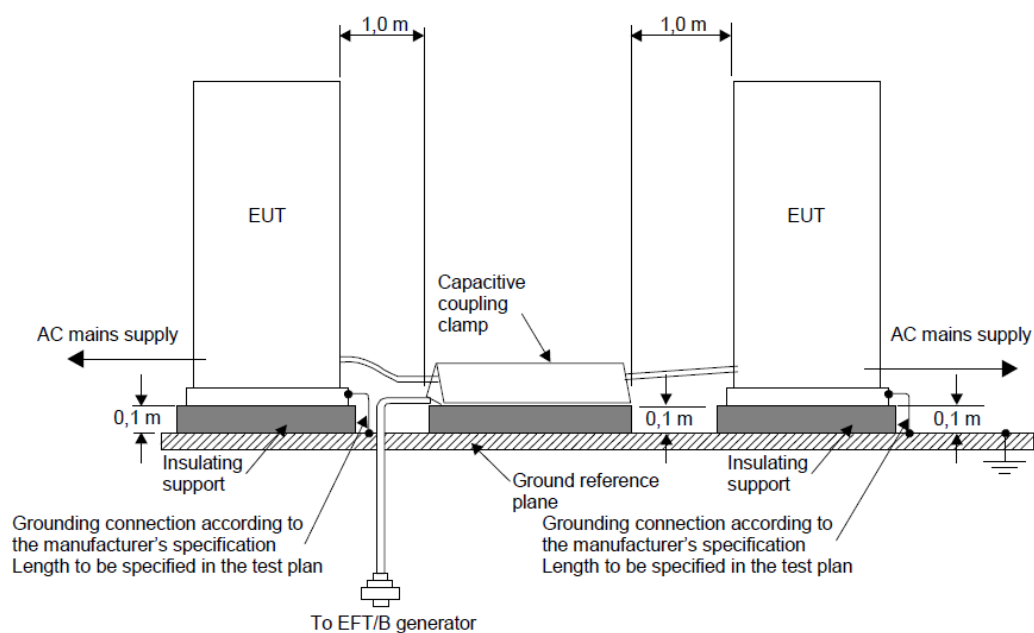
5.5.4 Deviation from Test Standard

No deviation

5.5.5 Test Setup



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



5.5.6 Test Result

Test Voltage	230Vac, 50Hz	Environmental Conditions	24°C, 52% RH
Tested by	Eddy Kao	Test Date	2017/04/17

Test Point		Test Level (kV)	Polarity (+/-)	Result
AC Power Port	L	1	+/-	A
	N	1	+/-	A
	PE	1	+/-	A
	L+N	1	+/-	A
	L+PE	1	+/-	A
	N+PE	1	+/-	A
	L+N+PE	1	+/-	A
Signal Ports Telecommunication Ports	RJ45	0.5	+/-	B(#1)

Note:

Criteria A: The EUT function was correct during the test.

Criteria B: (#1) The LAN was interrupted during the test, but could self-recover to the initial operation after the test.

5.5.7 Photographs of Test Configuration

Power



Signal



5.6 Surge Immunity Test

5.6.1 Test Specification

Standard: EN 55024

Standard	IEC/EN 61000-4-5
Wave- Shape	<p>Signal and telecommunication ports(direct to outdoor cables^(Note 1)): 10/700 μs Open Circuit Voltage 5/320 μs Short Circuit Current</p> <p>Input DC power port(direct to outdoor cables^(Note 1)): 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current</p> <p>Input AC Power ports: 1.2/50 μs Open Circuit Voltage 8 /20 μs Short Circuit Current</p>
Test Voltage	<p>Signal and telecommunication ports^(Note 2) (direct to outdoor cables^(Note 1)): w/o primary protectors: ± 1kV, with primary protectors fitted: ± 4kV</p> <p>Input DC power port(direct to outdoor cables^(Note 1)): ± 0.5kV,</p> <p>Input AC Power ports: Line to line: ± 1kV, Line to earth or ground: ± 2kV</p>
Surge Input / Output	L1-L2, L1-PE, L2-PE
Polarity	Positive/Negative
Phase Angle	0°/90°/180°/270°
Pulse Repetition Rate	1 time / min. (maximum)
Times	5 positive and 5 negative at selected points

- Note:** 1. This test is only applicable only to ports, which according to the manufacturer's specification, may connect directly to outdoor cables
2. 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.

Standard: EN 55035

Standard	IEC/EN 61000-4-5
Wave- Shape	AC Main Power Port: 1.2/50 μ s Open Circuit Voltage, 8/20 μ s Short Circuit Current DC Network Power Port ^(Note 1) : 1.2/50 μ s Open Circuit Voltage, 8/20 μ s Short Circuit Current Analogue/Digital Data Ports (unshielded symmetrical) (Direct to outdoor cables ^(Note 2, 3)): 10/700 μ s Open Circuit Voltage, 5/320 μ s Short Circuit Current Analogue/Digital Data Ports (coaxial or shielded) (Direct to outdoor cables ^(Note 2, 3)): 1.2/50 μ s Open Circuit Voltage, 8/20 μ s Short Circuit Current
Test Voltage	AC Main Power Port: line to line ± 1 kV, line to ground ± 2 kV, DC Network Power Port (cable length > 3m): line to ground ± 0.5 kV, Analogue/Digital Data Ports (unshielded symmetrical):line to ground Primary Protection: Intended ± 1 kV and ± 4 kV, Primary Protection: Not Intended ± 1 kV, Analogue/Digital Data Ports (coaxial or shielded): shielded to ground ± 0.5 kV
Surge Input / Output	L1-L2, L1-PE, L2-PE
Polarity	Positive/Negative
Phase Angle	0°/90°/180°/270°
Pulse Repetition Rate	1 time / min. (maximum)
Times	5 Positive and 5 Negative at selected points

- Note:**
1. Applicable only to port which, according to the manufacturer's specification, support cabled lengths greater than 3 m.
 2. Surges are applied with primary protection fitted. Where possible, use the actual primary protector intended to be use in the installation. Where the surge coupling network for the 10/700 (5/320) μ s wave affects the functioning of high speed data ports, the test shall be carried out using 1.2/50 (8/20) μ s wave and appropriate coupling network.
 3. Surges are applicable to ports which satisfy all the following conditions:
May connect directly to cables that leave the building structure.
Defined as an antenna port, a wired network, or a broadcast receiver tuner port.
Typical port covered include xDSL, PSTN, CATV, antenna and similar. Exclude ports are LAN and similar.

5.6.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	EMS Generator	Thermo	EMC Pro	CT-1-030	Mar. 30, 2017
2	Surge CDN	3cTest	CDN-405T8A1	CT-1-074(5)	Apr. 06, 2017
3	Measurement Software	CEWare32	Ver: 4.1	N/A	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

5.6.3 Test Procedure

The EUT is placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m minimum and 0.65mm thick minimum and projected beyond the EUT by at least 0.1m on all sides. The length of power cord between the coupling device and the EUT shall be 2m or less.

For input AC power ports:

The EUT is connected to the power mains through a coupling device that directly couples the surge interference signal.

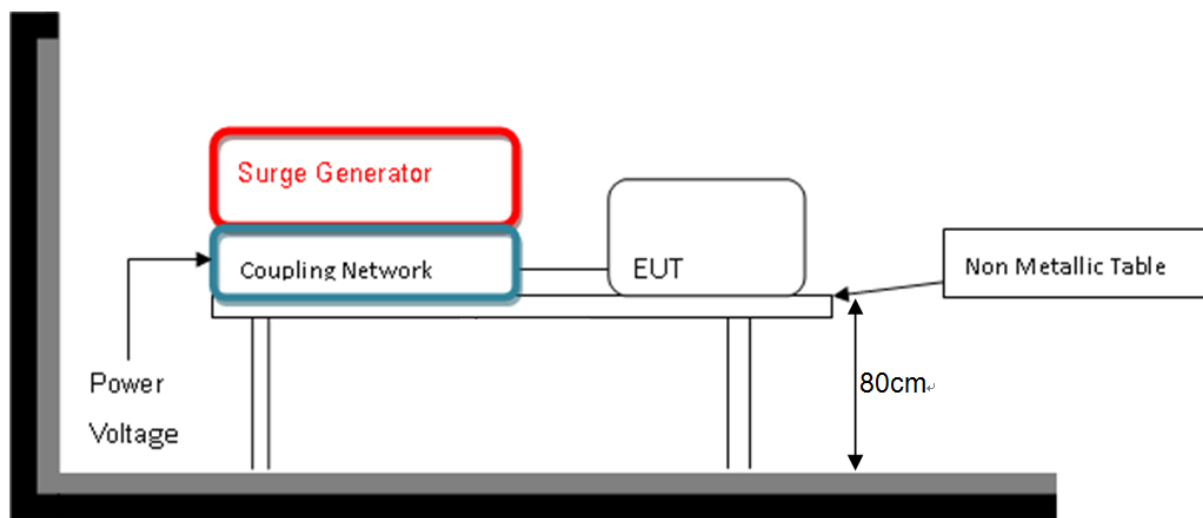
The surge noise shall be applied synchronized to the voltage phase at 0°, 90°, 180°, 270° and the peak value of the AC voltage wave. (Positive and negative)

Each of Line to Earth and Line to Line is impressed with a sequence of five surge voltages with interval of 1 minute.

5.6.4 Deviation from Test Standard

No deviation

5.6.5 Test Setup





5.6.6 Test Result

Test Voltage	230Vac, 50Hz	Environmental Conditions	24°C, 52% RH
Tested by	Eddy Kao	Test Date	2017/04/17

AC Power Port						
Test Point	Phase	Polarity (+/-)	Test Voltage (kV)			Result
			0.5	1	2	
L to N	0°	+/-	A	A	-	A
	90°	+/-	A	A	-	
	180°	+/-	A	A	-	
	270°	+/-	A	A	-	
L to PE	0°	+/-	A	A	B(#1)	B(#1)
	90°	+/-	A	A	B(#1)	
	180°	+/-	A	A	B(#1)	
	270°	+/-	A	A	B(#1)	
N to PE	0°	+/-	A	A	B(#1)	B(#1)
	90°	+/-	A	A	B(#1)	
	180°	+/-	A	A	B(#1)	
	270°	+/-	A	A	B(#1)	

Note:

Criteria A: The EUT function was correct during the test.

Criteria B: (#1) The LAN was interrupted during the test, but could self-recover to the initial operation after the test.

5.6.7 Photographs of Test Configuration



5.7 Continuous Conducted Disturbances (CS)

5.7.1 Test Specification

Standard: EN 55024

Standard	IEC/EN 61000-4-6
Frequency Range	0.15 MHz - 80 MHz
Voltage Level	3 V(rms)
Modulation	AM Modulation, 80%, 1 kHz Sine Wave
Frequency Step	1% of fundamental
Dwell Time	3 seconds

Standard: EN 55035

Standard	IEC/EN 61000-4-6
Frequency Range	0.15 ~ 10 MHz, 10 ~ 30 MHz, 30 ~ 80 MHz,
Voltage Level	3 V(rms), 3 - 1 V(rms), 1 V(rms)
Modulation	AM Modulation, 80%, 1 kHz Sine Wave
Frequency Step	1% of fundamental
Dwell Time	3 seconds

5.7.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	Coupling clamp according to IEC 6100-4-6	FRANKONIA	EMCL-20	CT-1-049	May 31, 2021
2	CDN for power supply lines	FRANKONIA	CDN M2+M3	CT-1-054	May 30, 2021
3	6 dB Attenuator	BIRD	75-A-FFN-06	CT-1-056	May 27, 2021
4	Compact Immunity Test System acc	FRANKONIA	CIT-10/75	CT-1-057	May 27, 2021
5	CDN for screened lines	FRANKONIA	RJ45S	CT-1-052(1)	May 30, 2021
6	50ohm Termination	N/A	N/A	CT-1-065-2	May 31, 2021
7	Measurement Software	HUBERT	Ver: 1.1.2	N/A	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

5.7.3 Test Procedure

The EUT is placed on 0.1m insulation table between the EUT and ground reference plane.

For input AC power ports:

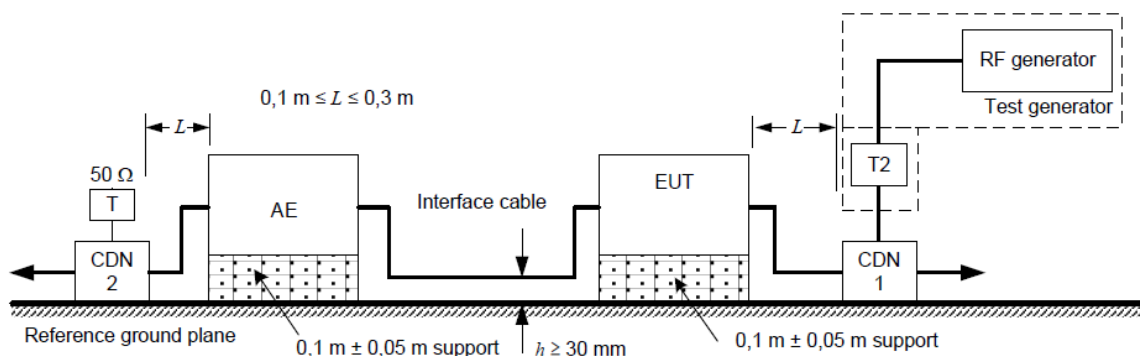
The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

Auxiliary equipment (AE) required for the defined operation of the EUT according to the specifications of the product committee.

5.7.4 Deviation from Test Standard

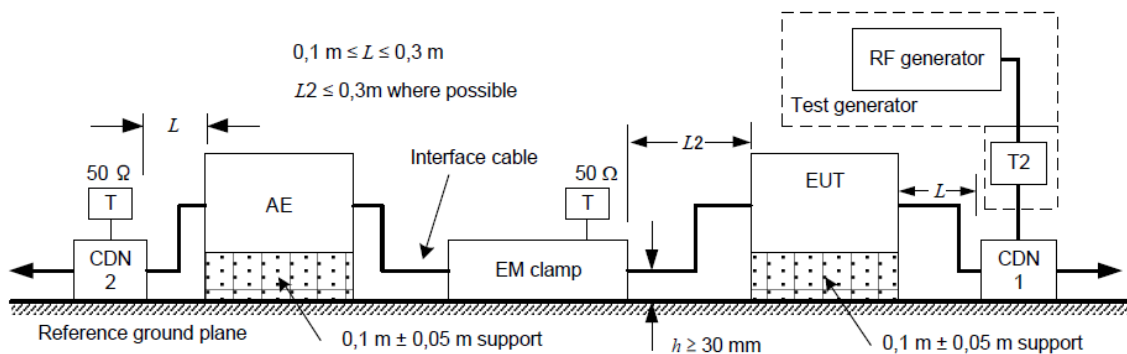
No deviation

5.7.5 Test Setup



The interface cable is set at 1 m if possible.

a) Schematic setup for a 2-port EUT connected to only 1 CDN



Note:

T: Termination 50 Ω

T2: Power attenuator (6 dB)

CDN: Coupling and decoupling network

Injection clamp: current clamp or EM clamp

5.7.6 Test Result

Standard: EN 55024

Test Voltage	230Vac, 50Hz	Environmental Conditions	25°C, 53% RH
Tested by	Eddy Kao	Test Date	2017/04/18

Frequency Range (MHz)	Tested Port	Injection Method	Test Level (V _{r.m.s.})	Modulation	Result
0.15 - 80	AC Power	CDN-M2 +M3	3	80% AM, 1kHz	A
0.15 - 80	RJ45	CLAMP	3	80% AM, 1kHz	A

Note:

Criteria A: The EUT function was correct during the test.

Standard: EN 55035

Test Voltage	230Vac, 50Hz	Environmental Conditions	22°C, 49% RH
Tested by	Guanwei Liao	Test Date	2022/01/26

Frequency Range (MHz)	Tested Port	Injection Method	Test Level (V _{r.m.s.})	Modulation	Result
0.15 - 10	AC Power	CDN-M2 +M3 (M3)	3	80% AM, 1kHz	A
10 - 30	AC Power	CDN-M2 +M3 (M3)	3 - 1	80% AM, 1kHz	A
30 - 80	AC Power	CDN-M2 +M3 (M3)	1	80% AM, 1kHz	A
0.15 - 10	RJ45	CLAMP	3	80% AM, 1kHz	A
10 - 30	RJ45	CLAMP	3 - 1	80% AM, 1kHz	A
30 - 80	RJ45	CLAMP	1	80% AM, 1kHz	A

Note:

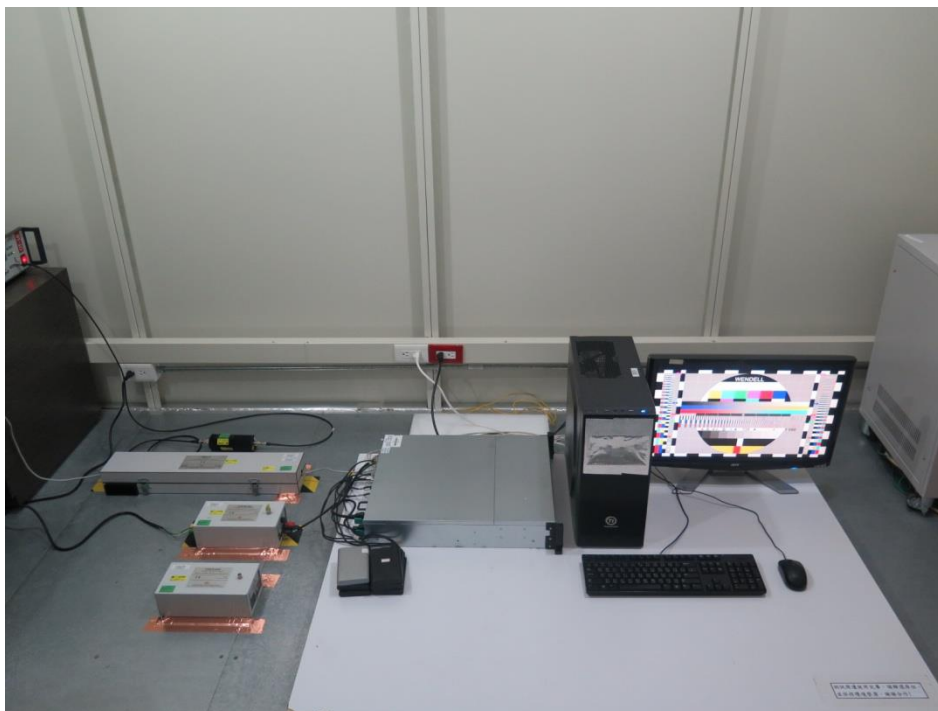
Criteria A: The EUT function was correct during the test.

5.7.7 Photographs of Test Configuration

Power



Signal



5.8 Power Frequency Magnetic Field Immunity Test

5.8.1 Test Specification

Standard	IEC/EN 61000-4-8
Frequency Range	50/60Hz
Field Strength	1 A/m
Observation Time	1 minute
Inductance Coil	Rectangular type, 1mx1m

5.8.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	PFMF	HAEFELY	MFS-100	CT-1-066	Aug. 02, 2016

Note: 1. The calibration interval of the above test instruments is 12 months.

5.8.3 Test Procedure

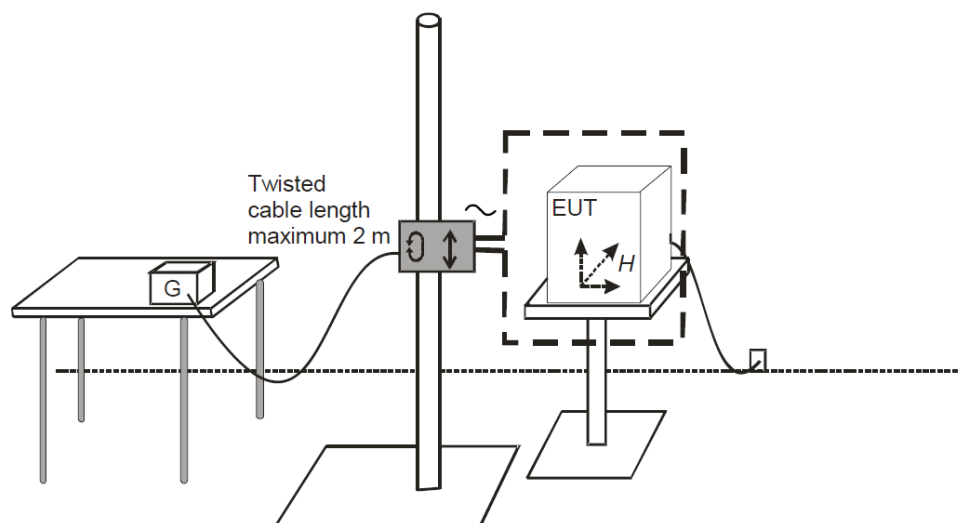
The EUT is placed on a table which is 0.8 meter above a metal ground plane measured at least 1m*1m minimum. The test magnetic field shall be placed at central of the induction coil.

The test magnetic Field shall be applied 10 minutes by the immersion method to the EUT, and the induction coil shall be rotated by 90° in order to expose the EUT to the test field with different orientation (X, Y, Z Orientations).

5.8.4 Deviation from Test Standard

No deviation

5.8.5 Test Setup



For the actual test configuration, please refer to 5.8.7.

NOTE:

TABLETOP EQUIPMENT

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

FLOOR-STANDING EQUIPMENT

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



5.8.6 Test Result

Test Voltage	230Vac, 50Hz	Environmental Conditions	29°C, 54% RH
Tested by	Vincent Lin	Test Date	2017/03/24

Test Coil Position	Frequency (Hz)	Magnetic Strength (A/m)	Result
X - Axis	50/60	1	A
Y - Axis	50/60	1	A
Z - Axis	50/60	1	A

Note:

Criteria A: The EUT function was correct during the test.

5.8.7 Photographs of Test Configuration



5.9 Voltage Dips & Short Interruptions

5.9.1 Test Specification

Basic Standard	IEC/EN 61000-4-11
Test Level	Voltage Dips: >95% reduction - 0.5 period 30% reduction - 25 period Voltage Interruptions: >95% reduction - 250 period
Test Duration Time	Minimum 3 test events in sequence
Interval between Event	Minimum 10 seconds
Phase Angle	0° / 180°
Test Cycle	3 times

5.9.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	EMS Generator	Thermo	EMC Pro	CT-1-030	Mar. 30, 2017
2	Measurement Software	CEWare32	Ver: 4.1	N/A	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.

5.9.3 Test Procedure

Before starting the test of a given EUT, a test plan shall be prepared.

The test plan should be representative of the way the system is actually used.

Systems may require a precise pre-analysis to define which system configurations must be tested to reproduce field situations.

Test cases must be explained and indicated in the Test report.

It is recommended that the test plan include the following items:

- the type designation of the EUT;
- information on possible connections (plugs, terminals, etc.) and corresponding cables, and peripherals;
- input power port of equipment to be tested;
- representative operational modes of the EUT for the test;
- performance criteria used and defined in the technical specifications;
- operational mode(s) of equipment;
- description of the test set-up.

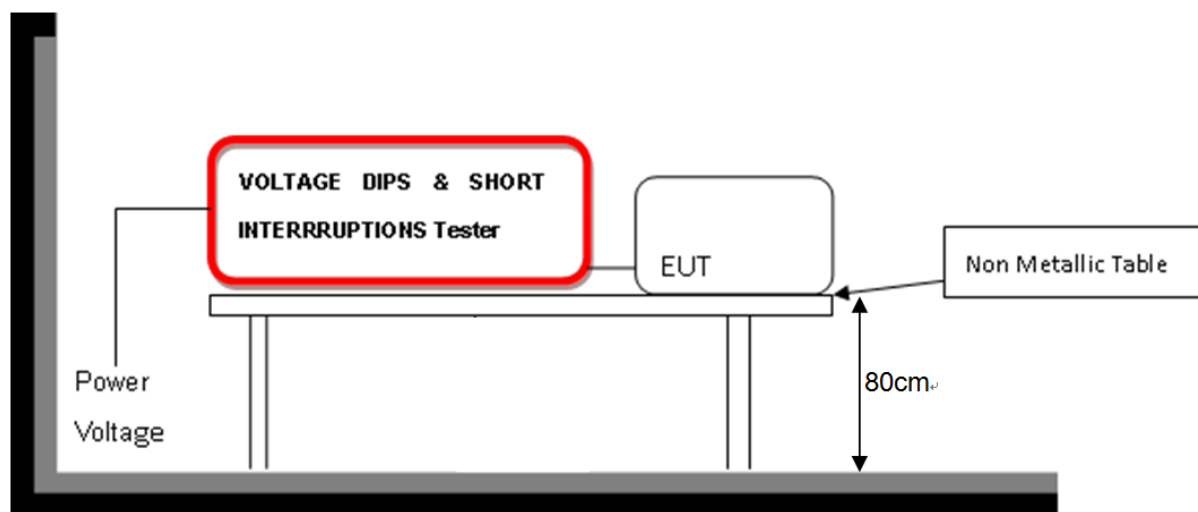
If the actual operating signal sources are not available to the EUT, they may be simulated.

For each test, any degradation of performance shall be recorded. The monitoring equipment should be capable of displaying the status of the operational mode of the EUT during and after the tests. After each group of tests, a full functional check shall be performed.

5.9.4 Deviation from Test Standard

No deviation

5.9.5 Test Setup



5.9.6 Test Result

Test Voltage	100-240Vac, 50Hz	Environmental Conditions	24°C, 52% RH
Tested by	Eddy Kao	Test Date	2017/04/17

230Vac, 50Hz			
Test Item	% Reduction	Duration (Period)	Result
Voltage Dips	>95	0.5	A
	30	25	B(#1)
Voltage interruptions	>95	250	C(#2)

240Vac, 50Hz			
Test Item	% Reduction	Duration (Period)	Result
Voltage Dips	>95	0.5	A
	30	25	B(#1)
Voltage interruptions	>95	250	C(#2)

100Vac, 50Hz			
Test Item	% Reduction	Duration (Period)	Result
Voltage Dips	>95	0.5	A
	30	25	B(#1)
Voltage interruptions	>95	250	C(#2)

Note:

Criteria A: The EUT function was correct during the test.

Criteria B: (#1) The LAN was interrupted during test. It could become normal after test stop.

Criteria C: (#2) The EUT was interrupted during test. It could become normal after hand-reboot by user.

5.9.7 Photographs of Test Configuration



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