CE EMC Test Report

Issued date: Oct. 14, 2019

Project No.: 19Q082903

Product : Ultra Short Throw Outdoor Portable LED Projector

Model : MGFU

Applicant : Elite Screens Visual & Sound Co., Ltd.

Address : 3F., No. 88, Wugong Rd., Xinzhuang Dist., New Taipei City 242, Taiwan (R.O.C.)

Report No: WD-EE-R-190581-A1

According to

EN 55032: 2015 + AC: 2016, Class B	**EN 55024: 2010 + A1: 2015**
CISPR 32: 2015	IEC 61000-4-2: 2008
EN 61000-3-2: 2014	IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010
EN 61000-3-3: 2013	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 Electrical Testing Lab.
Add: 6F/6F-1, No.188, Baoqiao Rd., Xindian Dist., 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-190581-A0	Oct. 05, 2019	Initial Issue
WD-EE-R-190581-A1	Oct. 14, 2019	Changing brand name *Cancel report no.: WD-EE-R-190581-A0, Issued Date: Oct. 05, 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-190581-A1	Oct. 14, 2019	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:	Ultra Short Throw Outdoor Portable LED Projector
Brand Name:	MosicGO™
Model:	MGFU
Applicant:	Elite Screens Visual & Sound Co., Ltd.
Tested:	Sep. 05 ~ Oct. 01, 2019
Standard:	**EN 55032: 2015 + AC: 2016, Class B** **CISPR 32: 2015** **EN 61000-3-2: 2014** **EN 61000-3-3: 2013** **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

The above equipment (Model: MGFU) has been tested by **Wendell Electrical Testing Lab.**, 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.

Please note that the measurement uncertainty are provided for informational purpose only and are not used in determining the Pass/Fail results.

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 B	Pass	Meets the requirements
	Conducted disturbance at telecommunication ports test	-	N/A	Without telecom port of the EUT
	Radiated disturbance	Class B	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 B
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 A
IEC 61000-4-5	Surges	Pass	Meets the requirements of Performance Criterion A
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 A Voltage Interruptions: ✧ >95% reduction - Performance Criterion A

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, Harmonics, Flicker, ESD, EFT, Surge, CS, PFMF and DIP Tests

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

RS Test

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

Radiated emission (9*6*6 Chamber), Conducted disturbance at mains terminals and Conducted disturbance at telecommunication ports Tests

W06: No.67-9, Shimen Rd., Tucheng Dist., New Taipei City 23654, 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 uncertainly 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.
Please note that the measurement uncertainty are provided for informational purpose only and are not used in determining the Pass/Fail results.

2.2.1 Conducted Emission test

Test Site	Measurement Freq. Range	dB (U_{cispr})	Note
W01	150 kHz ~ 30 MHz	2.43	N/A
W06	150 kHz ~ 30 MHz	2.52	N/A

2.2.2 Conducted emission at telecom port test

Test Site	Measurement Freq. Range	dB (U_{cispr})	Note
W01	150 kHz ~ 30 MHz	2.45	N/A
W06	150 kHz ~ 30 MHz	2.40	N/A

2.2.3 Radiated Emission test

Test Site	Measurement Freq. Range	Ant	dB (U_{cispr})	Note
W06	30 MHz ~ 200 MHz	V	3.16	N/A
	30 MHz ~ 200 MHz	H	2.46	N/A
	200 MHz ~ 1000 MHz	V	4.72	N/A
	200 MHz ~ 1000 MHz	H	3.01	N/A
	1 GHz ~ 6 GHz	V	5.04	N/A
	1 GHz ~ 6 GHz	H	4.92	N/A

2.2.4 Harmonics Current Measurement

Test Site	Expanded Uncertainty	
W01	Voltage	0.1 %
	Current	0.15 %

2.2.5 Voltage Fluctuation and Flicker Measurement

Test Site	Expanded Uncertainty	
W01	P_{st}	8 %

2.2.6 Immunity Test

Test Site	Item	Expanded Uncertainty		Note
W01	Electrostatic Discharge (ESD)	Voltage	1.9%	k=2
		Timing	6.9%	
	Electrical fast transients (EFT)	Voltage	10.4%	k=2
		Timing	5.1%	
	Surges	Voltage	5.6%	k=2
		Current	5.1%	
		Time	4.6%	
	Continuous conducted disturbances (CS)	CDN	1.44dB	150kHz ~ 230MHz, k=2
		EM Clamp	4.09dB	
	Power-frequency magnetic fields (PFMF)	Magnetic Field Strength	1.0%	N/A
	Voltage dips and interruptions	Voltage	5.2%	k=2
		Time	4.7%	
W05	Continuous radiated disturbances (RS)	80MHz – 1GHz	1.41dB	80MHz - 6GHz, k=2
		1GHz – 6GHz	1.44dB	

3 Generation Information

3.1 Description of EUT

Product	Ultra Short Throw Outdoor Portable LED Projector
Brand	MosicGO™
Model	MGFU
Applicant	Elite Screens Visual & Sound Co., Ltd.
Received date	Aug. 29, 2019
EUT Power Rating	19 Vdc (from adapter)
Model Differences	N/A
Operating System	N/A
Data Cable Supplied	N/A
Accessory Device	Adapter, remote control, HDMI cable and USB Type C cable
I/O Port	Please refer to the User's Manual

Note:

1. The EUT uses the follow adapter:

Adapter	
Brand	EDAC
Model	EA11013M-1900
Input Power	100-240Vac, 50-60Hz, 2.0A
Output Power	19Vdc, 6.31A
Power line	Input: 1.8m non-shielded cable without core. Output: 1m non-shielded cable with one core.

2. The EUT's highest operating frequency is more than 108MHz. Therefore the radiated emission is tested up to 6GHz.

3.2 Description of Test Modes

For conducted emission, the EUT has been pre-tested under the following test modes, and **test mode 2** was the worst case for final test.

Test Mode	Test Condition
1	Adapter + Battery, Projector on / HDMI 1 mode, BT ON
2	Adapter + Battery, Projector on / USB Type C display mode, BT ON

For radiated emission, the EUT has been pre-tested under the following test modes, and **test mode 2** was the worst case for final test.

Test Mode	Test Condition
1	Adapter + Battery, Projector on / HDMI 1 mode, BT ON
2	Adapter + Battery, Projector on / USB Type C display mode, BT ON
3	Only Battery, Projector on / HDMI 1 mode, BT ON

Test results are presented in the report as below.

Test Result	Test Condition
Conducted emission test	
-	Adapter + Battery, Projector on / USB Type C display mode, BT ON
Radiated emission 30MHz ~ 1GHz test	
-	Adapter + Battery, Projector on / USB Type C display mode, BT ON
Radiated emission above 1GHz test	
-	Adapter + Battery, Projector on / USB Type C display mode, BT ON
Harmonics, Flicker and Immunity test	
-	Adapter + Battery, Projector on / USB Type C display mode, BT ON

3.3 EUT Operating Condition

a. Placed the EUT on the test table.
b. The EUT sent voice signal to earphone.
c. The ipod nano sent audio signal to EUT via wireless cable.
d. The NB sent “Color Bar ITU-R.BT471-1” signal to EUT.
e. The EUT enabled the Bluetooth function.
f. The EUT connected to termination resistor as a dummy load.

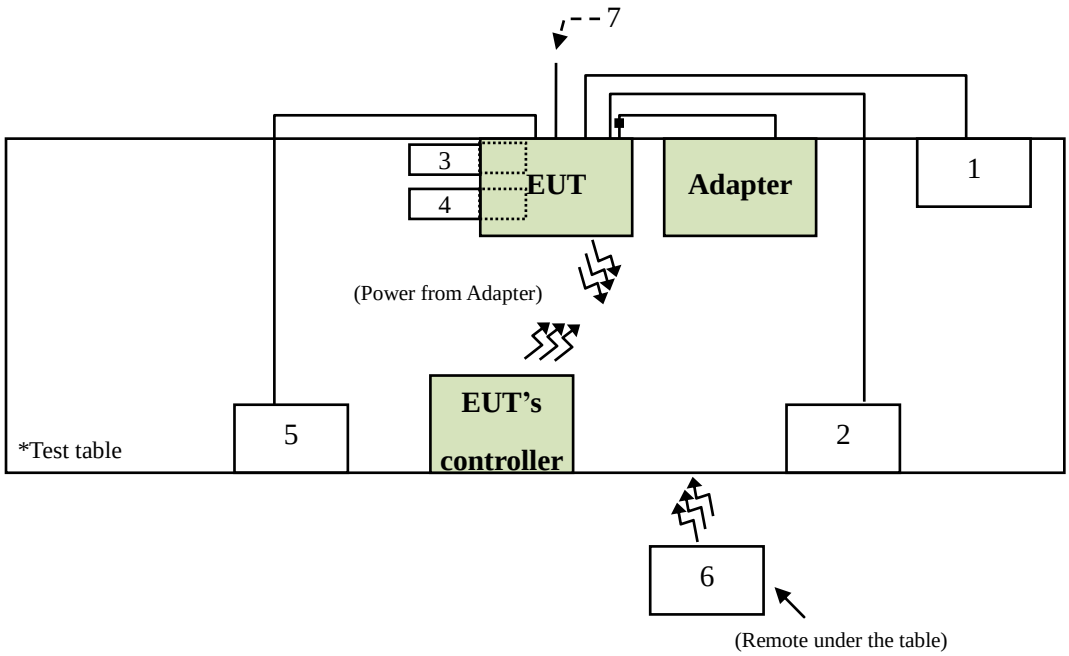
3.4 Description of Support Unit

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	Notebook	DELL	XPS 13	N/A	FCC DoC Approved	1m shielded Type C to C cable	AC: 1m non-shielded cable DC: 1m non-shielded cable with one core	-
2	Earphone & Microphone	E-books	E-EPA057	N/A	N/A	1.4m non-shielded cable	N/A	-
3	Load	N/A	N/A	N/A	N/A	N/A	N/A	Supplied by client
4	Load	N/A	N/A	N/A	N/A	N/A	N/A	Supplied by client
5	Load	N/A	N/A	N/A	N/A	0.8m shielded Type C to A cable	N/A	Supplied by client
6	iPod nano	apple	A1446	N/A	N/A	N/A	N/A	-
7	HDMI cable *2	AVIER	N/A	N/A	N/A	1.5m 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)**
	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)**
	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 + Transient Limiter (If use)
Margin Level = Measurement Value –Limit Value

4.1.2 Test Instrument

Test Site: W01-CE					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-1	Apr. 29, 2019
2	Pulse limiter	R&S®	ESH3-Z2	CT-2-015	Apr. 25, 2019
3	EMI Test Receiver	R&S	ESCI	CT-1-024	Apr. 24, 2019
4	V-LISN	Schwarzbeck	NSLK8127	CT-1-104-1	Apr. 30, 2019
5	Test Cable	Marvelous Microwave Inc	200200.400LL.500A	CT-10-048-1	Apr. 25, 2019
6	50ohm Termination	N/A	N/A	CT-1-065-1	Apr. 25, 2019
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.

Test Site: W06-CE					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-2	May 20, 2019
2	Transient Limiter	Electro Metrics	EM-7600	CT-1-026	May 16, 2019
3	EMI Test Receiver	R&S	ESR3	CT-1-103	May 16, 2019
4	V-LISN	Schwarzbeck	NSLK8127RC	CT-1-104-1RC	May 20, 2019
5	Test Cable	EMCI	EMCCFD300-BM-BM-5000	CT-1-107-2	May 16, 2019
6	50ohm Termination	HUBER+SUHNER	N/A	CT-1-109-1	May 13, 2019
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.

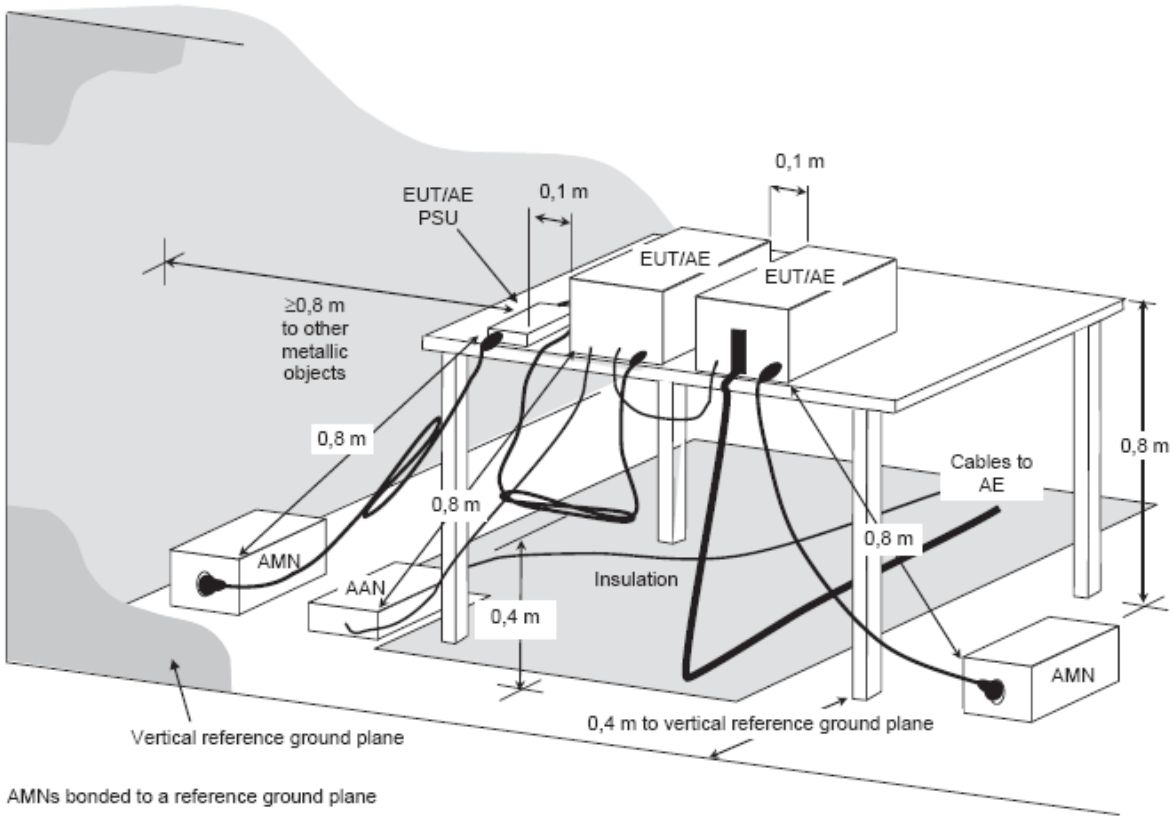
4.1.3 Test Procedure

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

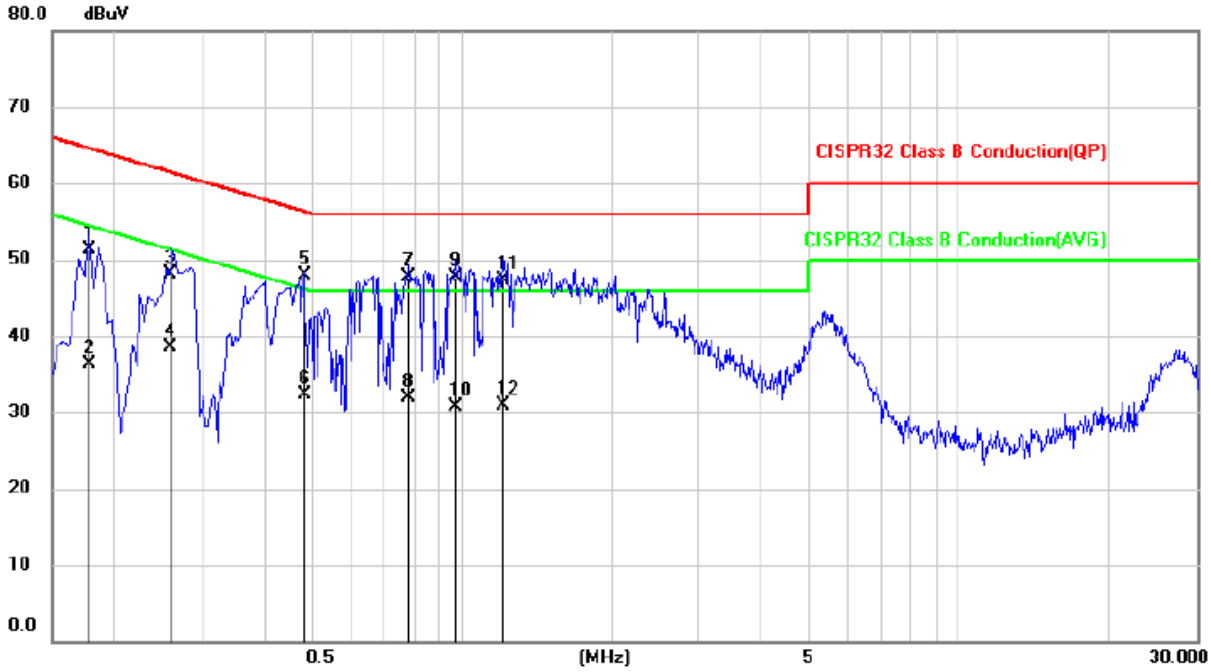
4.1.5 Test Setup



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

4.1.6 Test Result

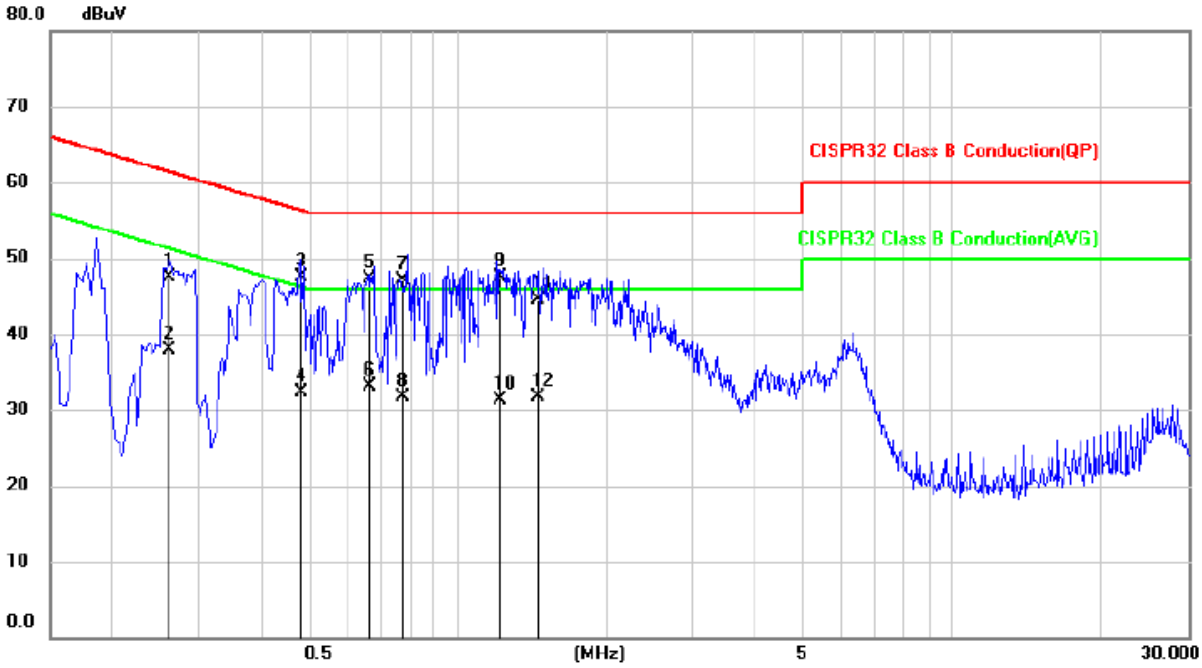
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	25℃, 56% RH	6dB Bandwidth	9 kHz
Test Date	2019/09/11	Phase	L
Tested by	Duncan Cheng	Test Site	W06



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1795	41.48	9.81	51.29	64.51	-13.22	QP
2	0.1795	26.52	9.81	36.33	54.51	-18.18	AVG
3	0.2586	38.31	9.81	48.12	61.48	-13.36	QP
4	0.2586	28.60	9.81	38.41	51.48	-13.07	AVG
5	0.4796	38.07	9.81	47.88	56.35	-8.47	QP
6	0.4796	22.44	9.81	32.25	46.35	-14.10	AVG
7	0.7858	37.78	9.83	47.61	56.00	-8.39	QP
8	0.7858	22.05	9.83	31.88	46.00	-14.12	AVG
9	0.9664	37.85	9.84	47.69	56.00	-8.31	QP
10	0.9664	20.88	9.84	30.72	46.00	-15.28	AVG
11	1.2145	37.51	9.85	47.36	56.00	-8.64	QP
12	1.2145	21.13	9.85	30.98	46.00	-15.02	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

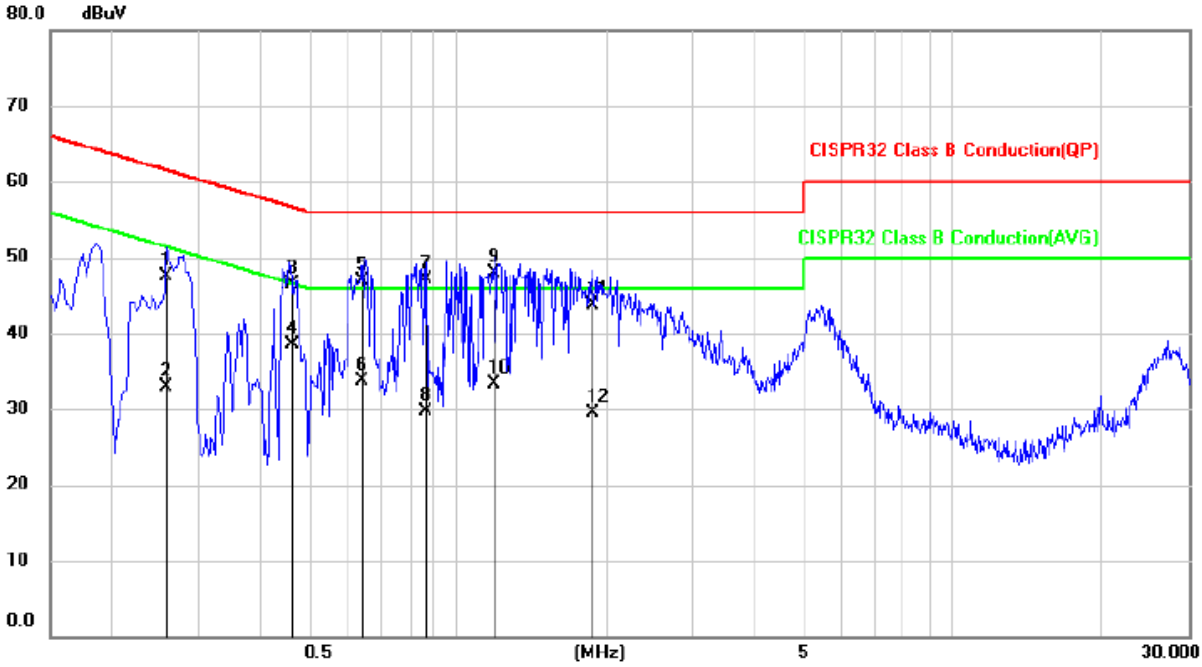
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	25℃, 56% RH	6dB Bandwidth	9 kHz
Test Date	2019/09/11	Phase	N
Tested by	Duncan Cheng	Test Site	W06



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2598	37.71	9.79	47.50	61.44	-13.94	QP
2	0.2598	28.12	9.79	37.91	51.44	-13.53	AVG
3	0.4789	37.72	9.79	47.51	56.36	-8.85	QP
4	0.4789	22.58	9.79	32.37	46.36	-13.99	AVG
5	0.6628	37.42	9.79	47.21	56.00	-8.79	QP
6	0.6628	23.39	9.79	33.18	46.00	-12.82	AVG
7	0.7807	37.36	9.81	47.17	56.00	-8.83	QP
8	0.7807	21.97	9.81	31.78	46.00	-14.22	AVG
9	1.2169	37.69	9.82	47.51	56.00	-8.49	QP
10	1.2169	21.55	9.82	31.37	46.00	-14.63	AVG
11	1.4578	34.62	9.83	44.45	56.00	-11.55	QP
12	1.4578	21.84	9.83	31.67	46.00	-14.33	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

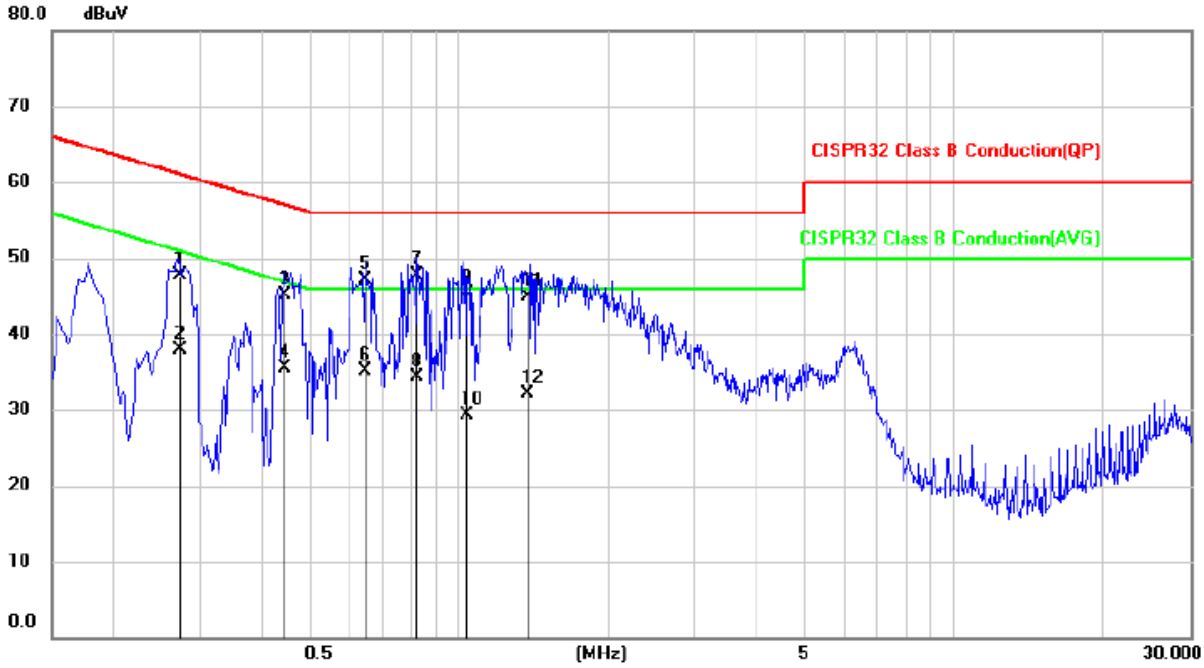
Test Voltage	110Vac, 60Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	25℃, 56% RH	**6dB Bandwidth**	9 kHz
Test Date	2019/09/11	**Phase**	L
Tested by	Duncan Cheng	**Test Site**	W06



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2569	37.71	9.81	47.52	61.53	-14.01	QP
2	0.2569	23.15	9.81	32.96	51.53	-18.57	AVG
3	0.4620	36.78	9.81	46.59	56.66	-10.07	QP
4	0.4620	28.70	9.81	38.51	46.66	-8.15	AVG
5	0.6438	37.03	9.82	46.85	56.00	-9.15	QP
6	0.6438	23.92	9.82	33.74	46.00	-12.26	AVG
7	0.8581	37.20	9.84	47.04	56.00	-8.96	QP
8	0.8581	19.84	9.84	29.68	46.00	-16.32	AVG
9	1.1921	37.98	9.85	47.83	56.00	-8.17	QP
10	1.1921	23.52	9.85	33.37	46.00	-12.63	AVG
11	1.8809	33.85	9.89	43.74	56.00	-12.26	QP
12	1.8809	19.65	9.89	29.54	46.00	-16.46	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

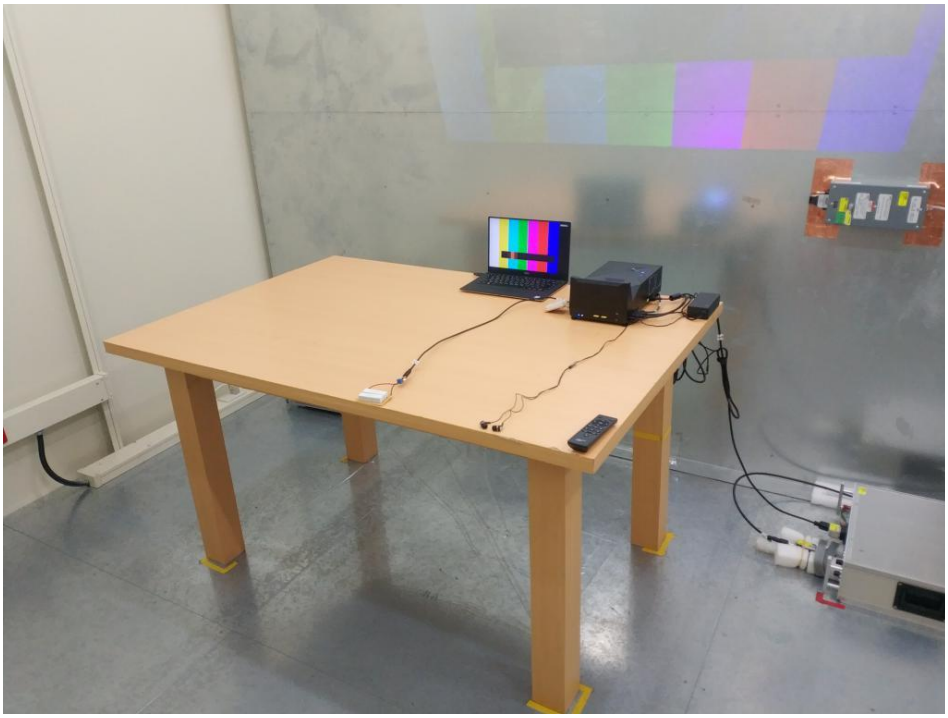
Test Voltage	110Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	25℃, 56% RH	6dB Bandwidth	9 kHz
Test Date	2019/09/11	Phase	N
Tested by	Duncan Cheng	Test Site	W06



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2727	37.87	9.79	47.66	61.04	-13.38	QP
2	0.2727	28.04	9.79	37.83	51.04	-13.21	AVG
3	0.4432	35.29	9.79	45.08	57.00	-11.92	QP
4	0.4432	25.66	9.79	35.45	47.00	-11.55	AVG
5	0.6437	37.35	9.79	47.14	56.00	-8.86	QP
6	0.6437	25.41	9.79	35.20	46.00	-10.80	AVG
7	0.8264	37.85	9.81	47.66	56.00	-8.34	QP
8	0.8264	24.52	9.81	34.33	46.00	-11.67	AVG
9	1.0345	35.46	9.81	45.27	56.00	-10.73	QP
10	1.0345	19.47	9.81	29.28	46.00	-16.72	AVG
11	1.3736	35.13	9.83	44.96	56.00	-11.04	QP
12	1.3736	22.28	9.83	32.11	46.00	-13.89	AVG

Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss + Transient Limiter (If use)
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

The test is determined no necessary for the EUT do not operate from the telecom lines or contain provisions for operation while connected to the telecom lines.

4.3 Radiated Emission Measurement

4.3.1 Limits of Radiated Emission Measurement

According to EN 55032 table1 - Required highest frequency for radiated measurement:

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

Remark:

1. Fx : highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.
2. Where Fx 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			54
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

Test Site: W06-966					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	Horn Antenna	Schwarzbeck	BBHA 9120D	CT-9-031	Oct. 09, 2018
2	Horn Antenna	Schwarzbeck	BBHA 9170	CT-9-032	Oct. 11, 2018
3	Bilog Antenna	Schwarzbeck	VULB 9168	CT-9-027-2	Oct. 19, 2018
4	EXA Signal Analyzer	Keysight	N9010A	CT-1-093	Apr. 19, 2019
5	EMI Test Receiver	Keysight	N9038A	CT-9-029	Dec. 05, 2018
6	Preamplifier	EMEC	EMC330	CT-9-024	Oct. 16, 2018
7	Preamplifier	EMCI	EMC051845SE	CT-9-012	Oct. 11, 2018
8	Preamplifier	EMCI	EMC184045SE	CT-9-013	Oct. 10, 2018
9	Test Cable	EMEC	EM-CB400	CT-9-001-1	Oct. 18, 2018
10	Test Cable	EMEC	EM-CB400	CT-9-001-2	Oct. 18, 2018
11	Test Cable	EMEC	EM-CB400	CT-9-001-3	Oct. 18, 2018
12	Test Cable	HUBER+SUHNER	SF102	CT-9-002-1	Oct. 10, 2018
13	Test Cable	EMEC	EMC102-KM-KM-600	CT-9-020	Oct. 10, 2018
14	Test Cable	EMEC	EMC102-KM-KM-3000	CT-9-021-1	Oct. 10, 2018
15	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 966 chamber 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.

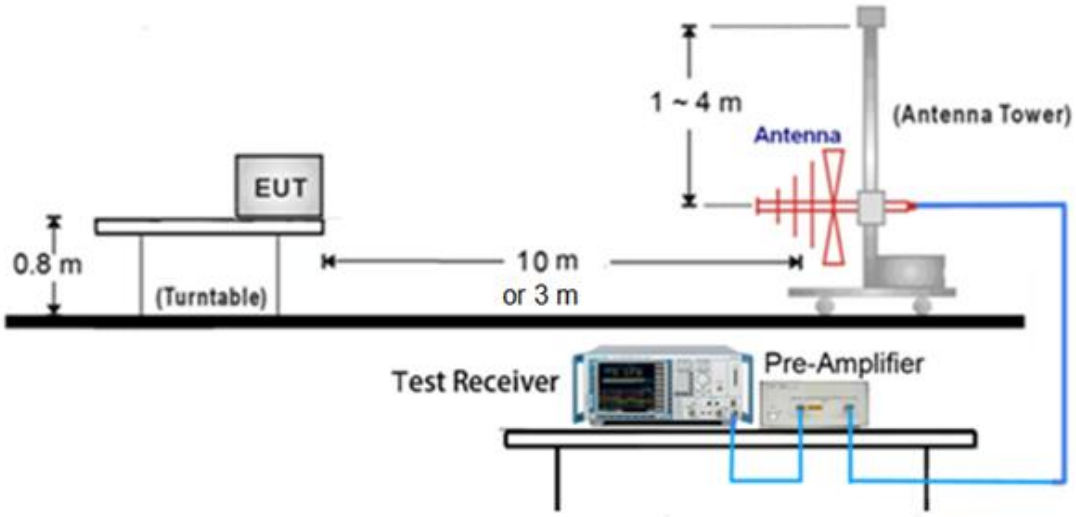
e. Emission frequency and amplitude were recorded, recording at least six highest emissions. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.3.4 Deviation from Test Standard

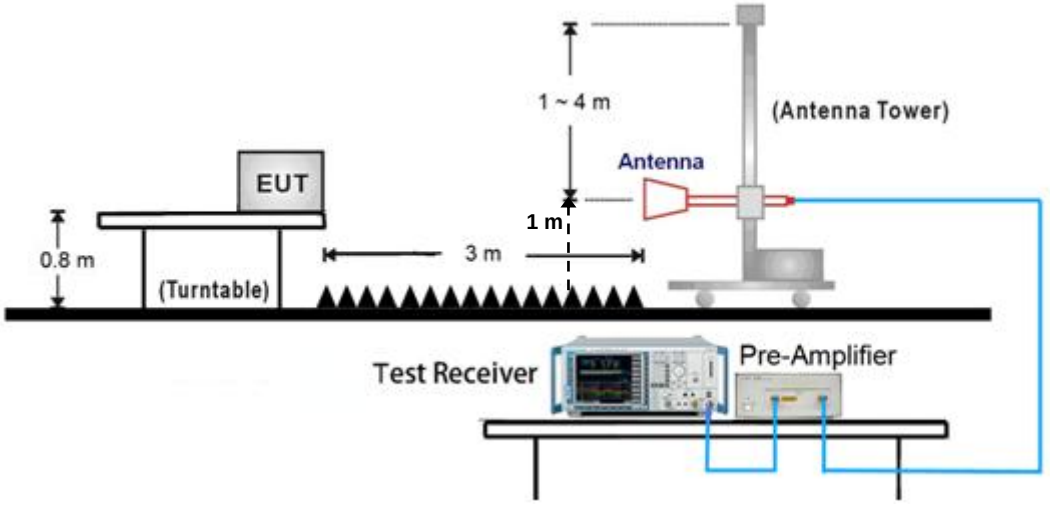
No deviation

4.3.5 Test Setup

< Radiated Emissions Frequency: 30 MHz to 1000 MHz >

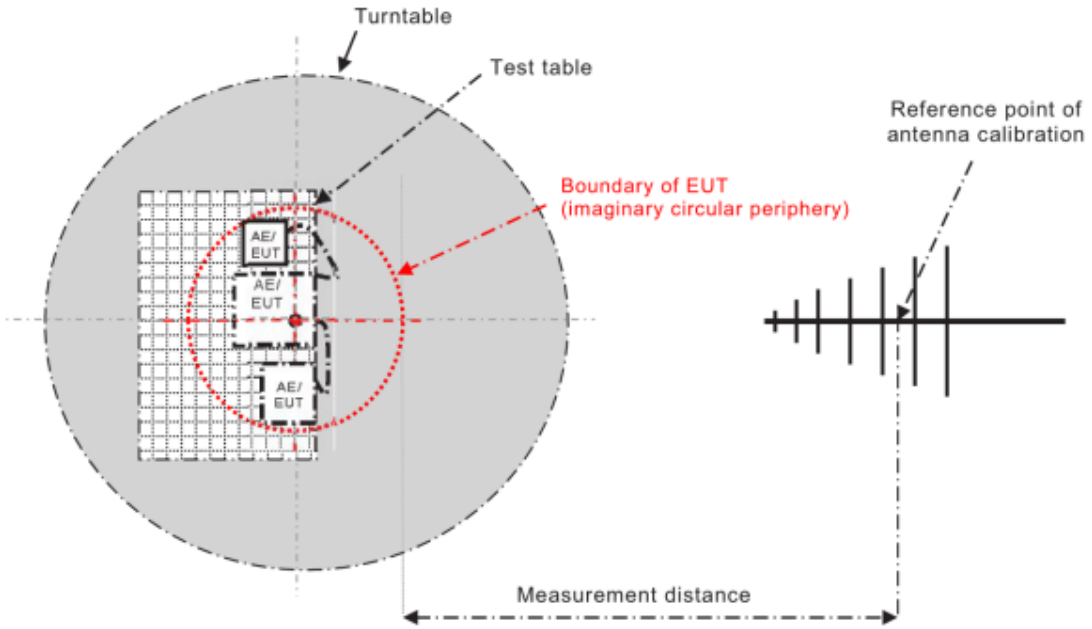


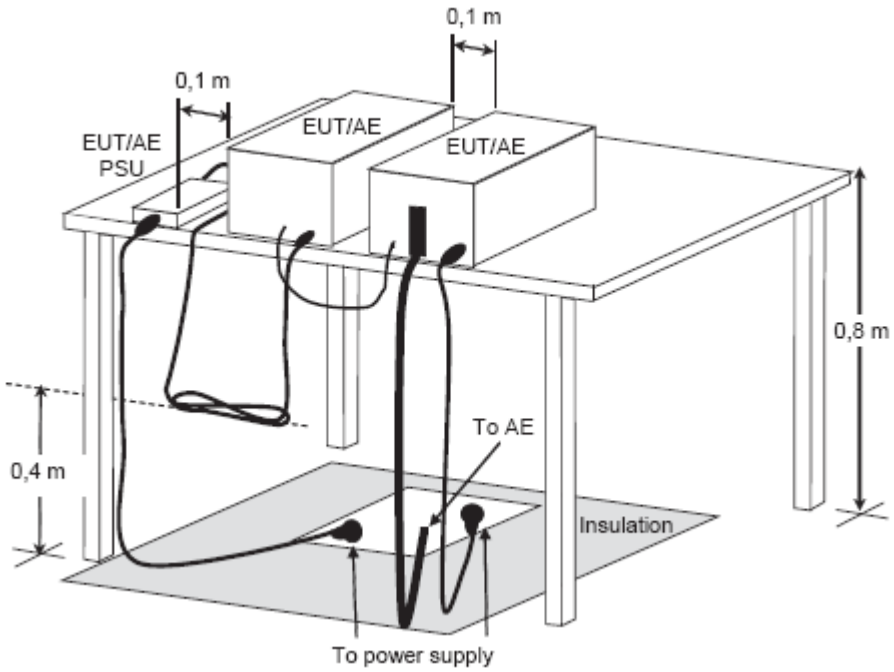
< Radiated Emissions Frequency: above 1GHz >



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

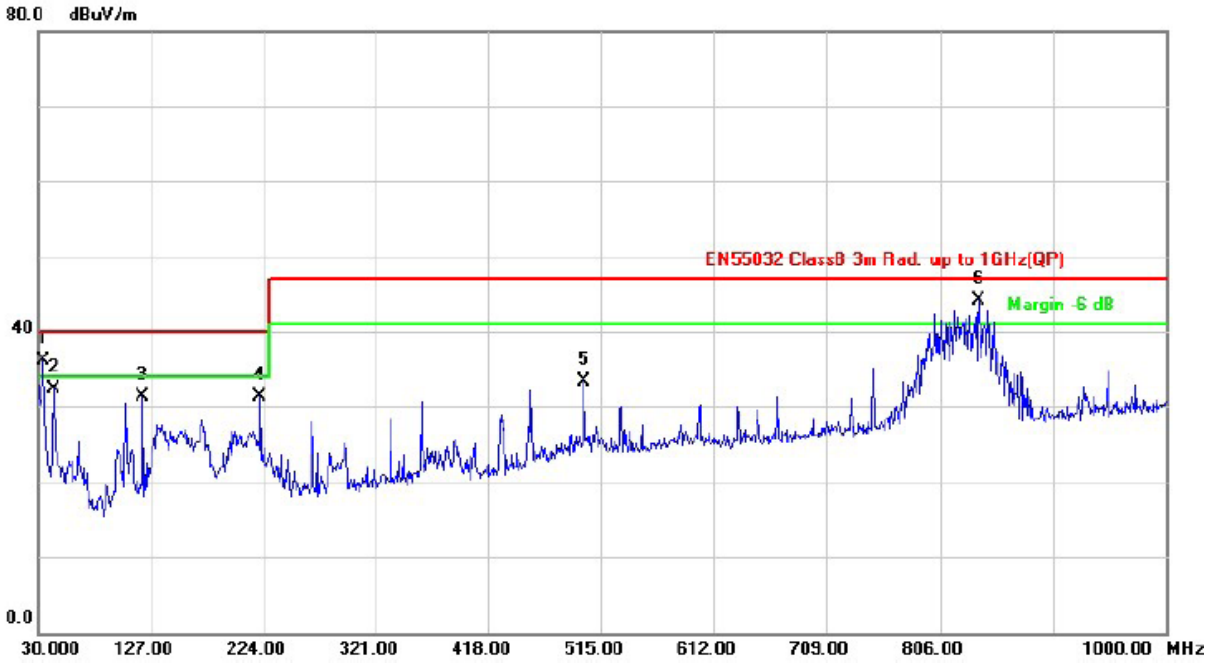
< EUT placement top view and measurement distance >





4.3.6 Test Result

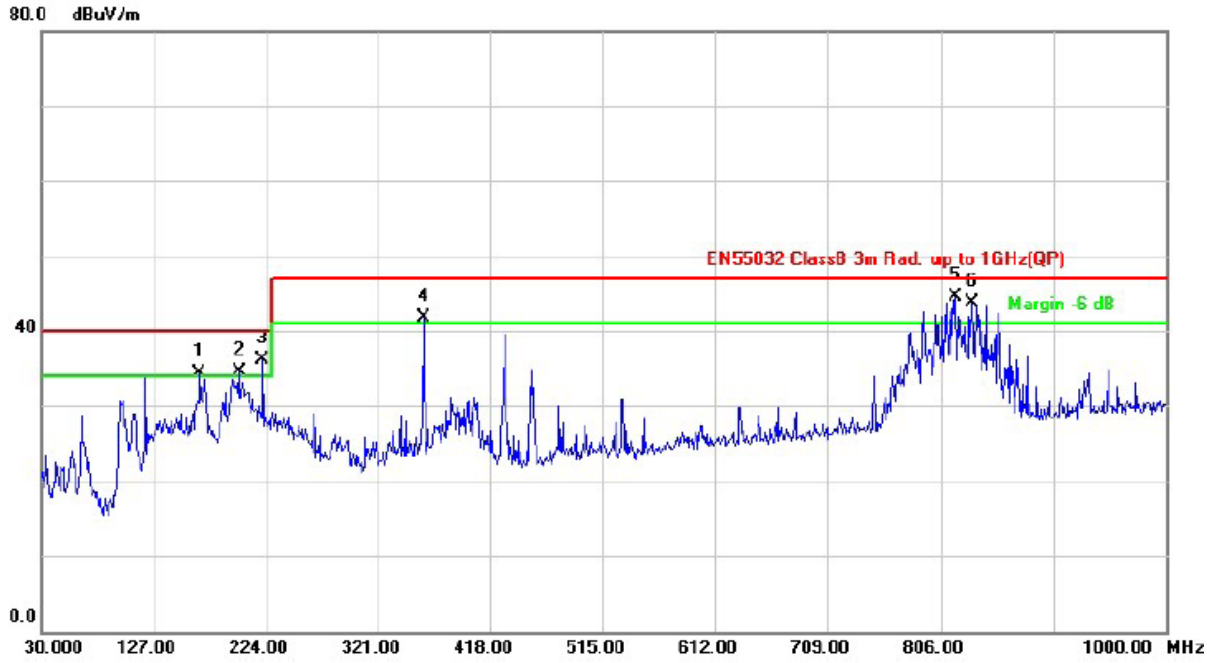
Test Voltage	230Vac, 50Hz	**Frequency Range**	30 – 1000 MHz
Environmental Conditions	28℃, 63% RH	**6dB Bandwidth**	120 kHz
Test Date	2019/09/09	**Test Distance**	3m
Tested by	Karwin Kao	**Polarization**	Vertical
Test Site	W06		



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	34.8500	46.53	-10.36	36.17	40.00	-3.83	peak	100	150
2	43.5799	41.71	-9.49	32.22	40.00	-7.78	peak	100	228
3	120.2099	43.61	-12.32	31.29	40.00	-8.71	peak	100	61
4	221.0900	43.72	-12.32	31.40	40.00	-8.60	peak	100	110
5	500.4499	37.65	-4.40	33.25	47.00	-13.75	peak	100	100
6	838.9800	42.58	1.43	44.01	47.00	-2.99	peak	200	251

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

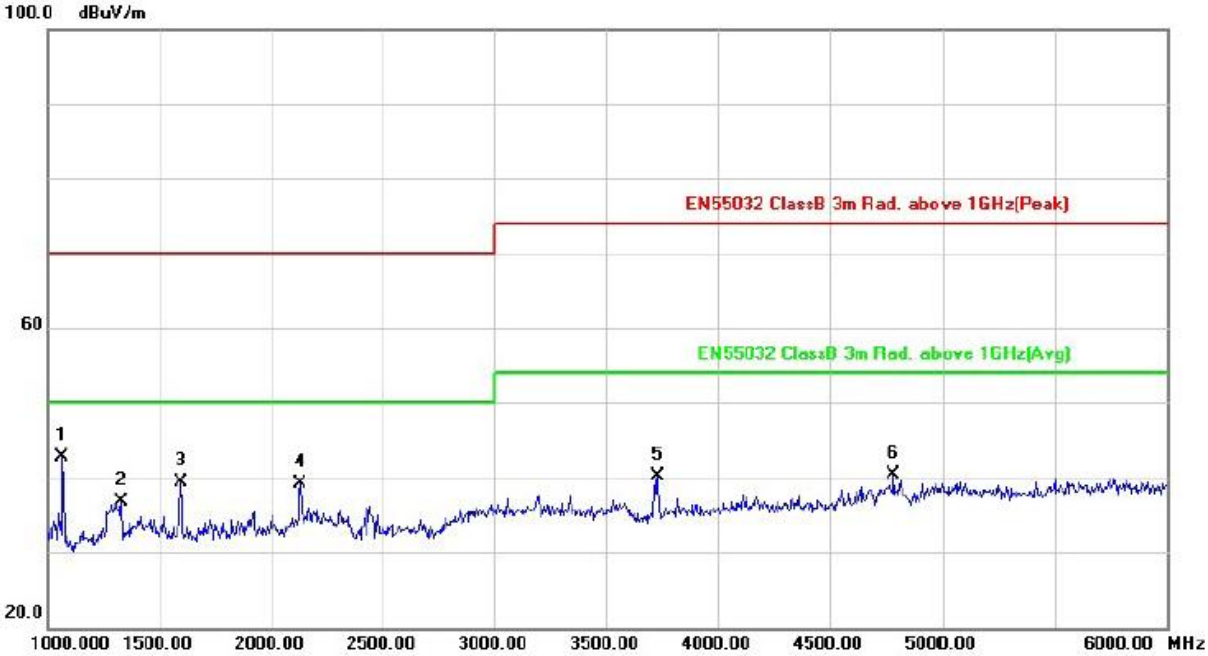
Test Voltage	230Vac, 50Hz	**Frequency Range**	30 – 1000 MHz
Environmental Conditions	28℃, 63% RH	**6dB Bandwidth**	120 kHz
Test Date	2019/09/09	**Test Distance**	3m
Tested by	Karwin Kao	**Polarization**	Horizontal
Test Site	W06		



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	166.7700	44.21	-9.86	34.35	40.00	-5.65	peak	100	113
2	200.7200	47.00	-12.52	34.48	40.00	-5.52	peak	100	231
3	221.0900	48.46	-12.32	36.14	40.00	-3.86	peak	100	260
4	359.8000	49.29	-7.63	41.66	47.00	-5.34	peak	100	231
5	818.6100	43.39	1.14	44.53	47.00	-2.47	peak	100	132
6	832.1900	42.28	1.35	43.63	47.00	-3.37	peak	100	132

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

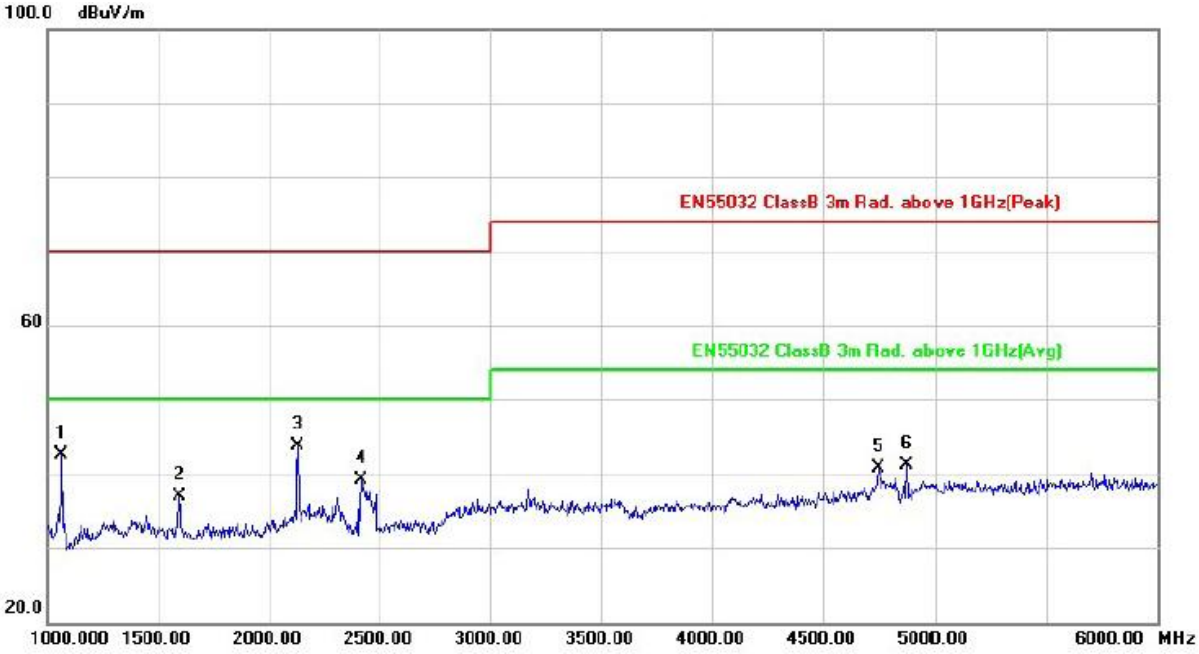
Test Voltage	230Vac, 50Hz	Frequency Range	1 – 6GHz
Environmental Conditions	28℃, 63% RH	6dB Bandwidth	1MHz
Test Date	2019/09/09	Test Distance	3m
Tested by	Karwin Kao	Polarization	Vertical
Test Site	W06		



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	1065.000	64.66	-21.86	42.80	70.00	-27.20	peak	100	360
2	1330.000	55.65	-19.03	36.62	70.00	-33.38	peak	100	53
3	1595.000	58.99	-19.78	39.21	70.00	-30.79	peak	100	220
4	2130.000	55.59	-16.49	39.10	70.00	-30.90	peak	100	328
5	3730.000	53.01	-12.89	40.12	74.00	-33.88	peak	100	92
6	4785.000	50.08	-9.83	40.25	74.00	-33.75	peak	100	230

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	28℃, 63% RH	**6dB Bandwidth**	1MHz
Test Date	2019/09/09	**Test Distance**	3m
Tested by	Karwin Kao	**Polarization**	Horizontal
Test Site	W06		

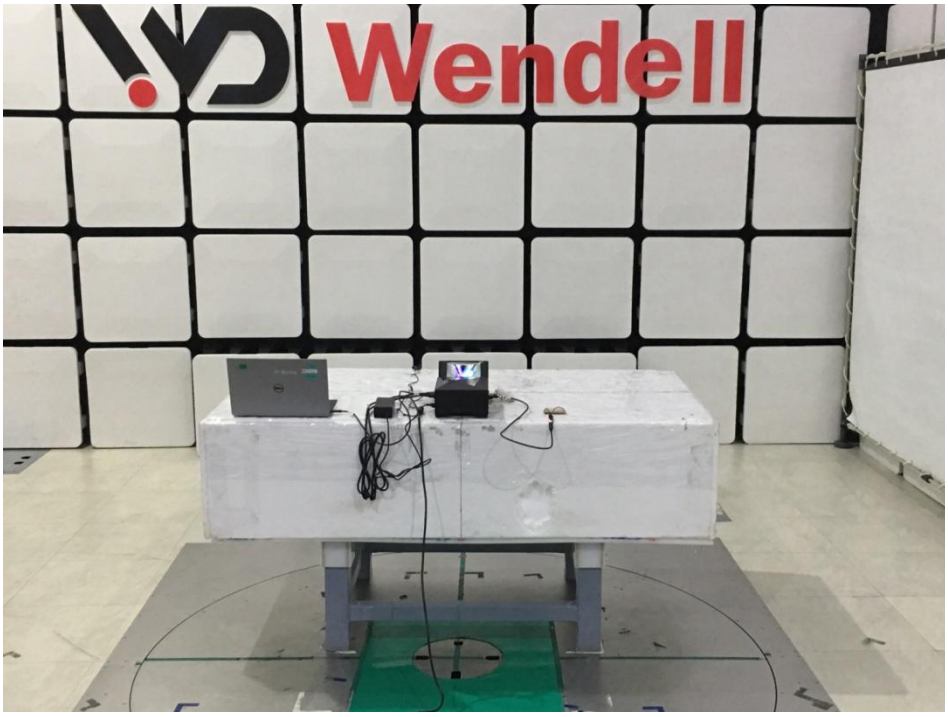


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1065.000	64.36	-21.86	42.50	70.00	-27.50	peak	100	219
2	1595.000	56.61	-19.78	36.83	70.00	-33.17	peak	100	160
3	2130.000	60.25	-16.49	43.76	70.00	-26.24	peak	100	297
4	2415.000	55.31	-16.22	39.09	70.00	-30.91	peak	100	229
5	4750.000	50.55	-9.88	40.67	74.00	-33.33	peak	100	307
6	4875.000	51.06	-9.95	41.11	74.00	-32.89	peak	100	317

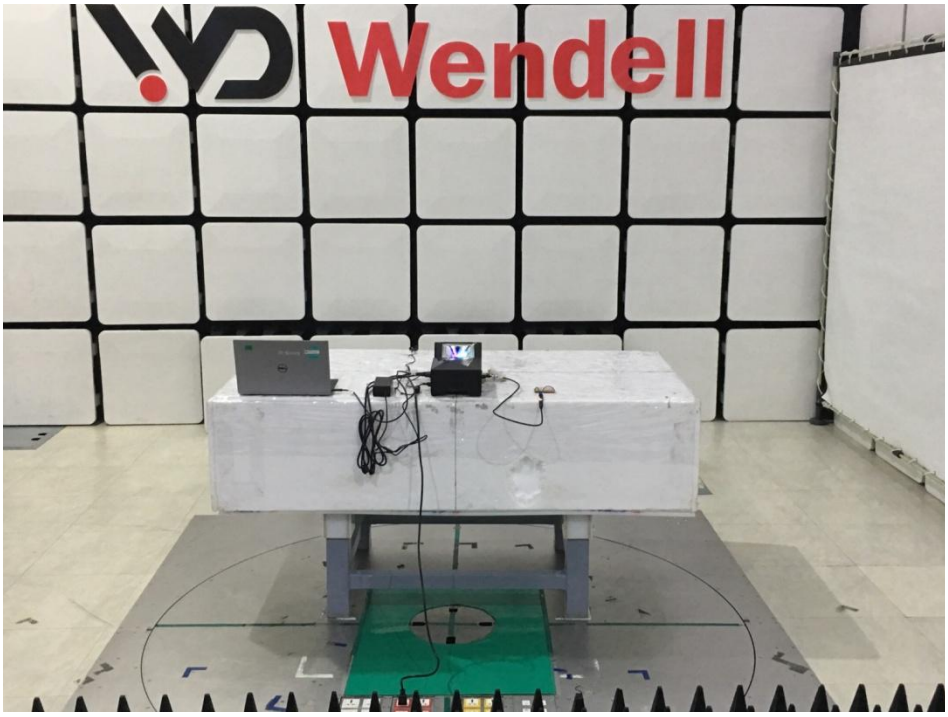
Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

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. 30, 2019
2	Power Source	EMC PARTNER	PS3-1	CT-1-090a1	Aug. 30, 2019

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;

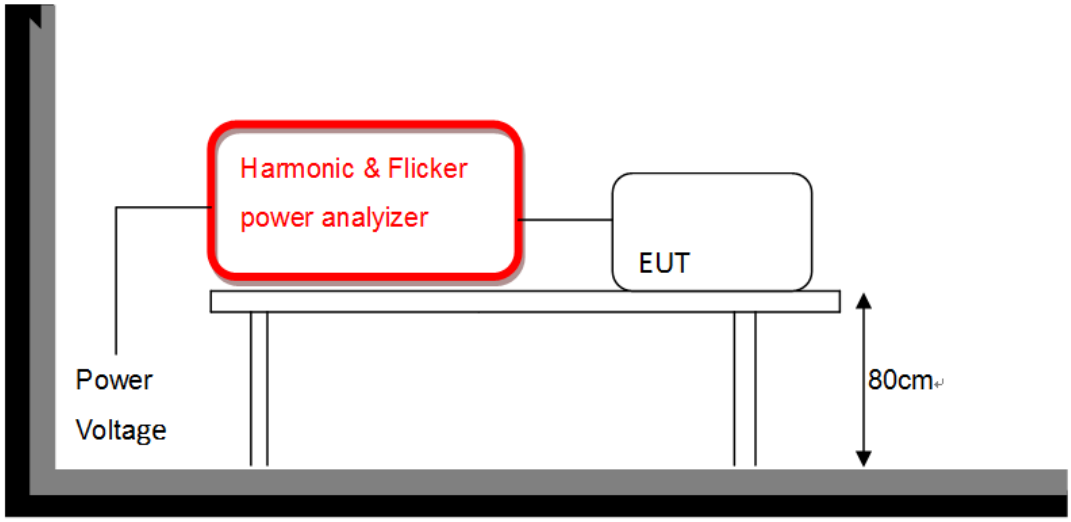
Class D:
Equipment having a specified power according to 6.2.2 less than or equal to 600W, of the following types:

- 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

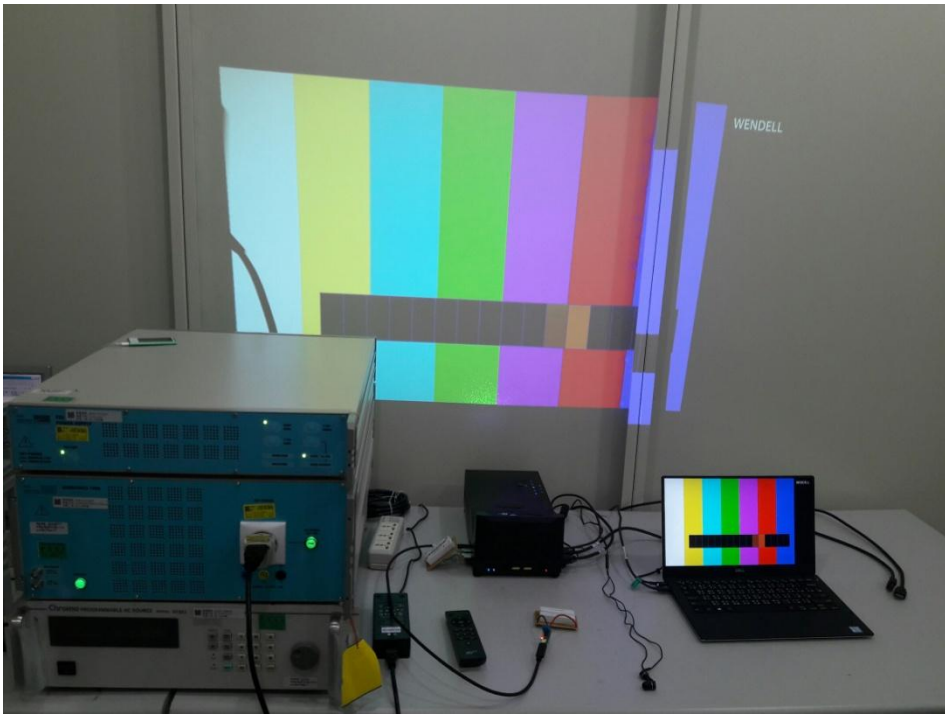
Supply Voltage / Ampere	229.5 Vrms / 0.489 Arms	**Test Date**	2019/09/05
Test Duration	5 min	**Power Consumption**	106.0W
Power Frequency	49.922Hz	**Power Factor**	0.944
Environmental Conditions	23℃, 52% RH	**Tested by**	Guanwei Liao

Order	Freq. [Hz]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax% [A]	Imax%L [A]	Limit [A]	Status	Vrms [V]
1	50	0.4659	95.235	-	0.4661	95.259	-	-	229.52	0.00
2	100	0.0051	1.0479	0.4747	0.0051	1.0479	0.4747	1.0800	0.1227	0.00
3	150	0.1479	30.240	6.4326	0.1479	30.240	4.0400	2.3000	0.0245	0.00
4	200	0.0009	0.1747	0.1987	0.0009	0.1747	0.1987	0.4300	0.0000	0.00
5	250	0.0143	2.9192	1.2528	0.0144	2.9441	1.2635	1.1400	0.0000	0.00
6	300	0.0012	0.2495	0.4069	0.0012	0.2495	0.4068	0.3000	0.0000	0.00
7	350	0.0115	2.3453	1.4902	0.0115	2.3453	1.4902	0.7700	0.0000	0.00
8	400	0.0004	0.0749	0.1592	0.0005	0.0998	0.2123	0.2300	0.0000	0.00
9	450	0.0151	3.0938	3.7842	0.0151	3.0938	3.7839	0.4000	0.0000	0.00
10	500	0.0002	0.0499	0.1327	0.0004	0.0749	0.1991	0.1840	0.0000	0.00
11	550	0.0032	0.6487	0.9618	0.0032	0.6487	0.9619	0.3300	0.0000	0.00
12	600	0.0002	0.0499	0.1592	0.0004	0.0749	0.2389	0.1533	0.0000	0.00
13	650	0.0032	0.6487	1.5113	0.0033	0.6737	1.5698	0.2100	0.0000	0.00
14	700	0.0002	0.0499	0.1858	0.0004	0.0749	0.2786	0.1314	0.0000	0.00
15	750	0.0042	0.8483	2.7669	0.0042	0.8483	2.7665	0.1500	0.0000	0.00
16	800	0.0004	0.0749	0.3184	0.0005	0.0998	0.4246	0.1150	0.0000	0.00
17	850	0.0042	0.8483	3.1359	0.0042	0.8483	3.1365	0.1324	0.0000	0.00
18	900	0.0002	0.0499	0.2388	0.0002	0.0499	0.2389	0.1022	0.0000	0.00
19	950	0.0060	1.2226	5.0510	0.0060	1.2226	5.0515	0.1184	0.0000	0.00
20	1000	0.0006	0.1248	0.6634	0.0006	0.1248	0.6631	0.0920	0.0000	0.00
21	1050	0.0037	0.7485	3.4180	0.0038	0.7735	3.5308	0.1071	0.0000	0.00
22	1100	0.0010	0.1996	1.1676	0.0010	0.1996	1.1679	0.0836	0.0000	0.00
23	1150	0.0076	1.5469	7.7365	0.0076	1.5469	7.7403	0.0978	0.0000	0.00
24	1200	0.0005	0.0998	0.6369	0.0005	0.0998	0.6369	0.0767	0.0000	0.00
25	1250	0.0049	0.9980	5.4253	0.0050	1.0230	5.5631	0.0900	0.0000	0.00
26	1300	0.0009	0.1747	1.2074	0.0010	0.1996	1.3793	0.0708	0.0000	0.00
27	1350	0.0027	0.5489	3.2227	0.0028	0.5739	3.3675	0.0833	0.0000	0.00
28	1400	0.0011	0.2246	1.6718	0.0011	0.2246	1.6729	0.0657	0.0000	0.00
29	1450	0.0050	1.0230	6.4507	0.0051	1.0479	6.6038	0.0776	0.0000	0.00
30	1500	0.0005	0.0998	0.7961	0.0005	0.0998	0.7968	0.0613	0.0000	0.00
31	1550	0.0059	1.1976	8.0729	0.0059	1.1976	8.0672	0.0726	0.0000	0.00
32	1600	0.0007	0.1497	1.2738	0.0007	0.1497	1.2739	0.0575	0.0000	0.00
33	1650	0.0013	0.2745	1.9694	0.0013	0.2745	1.9678	0.0682	0.0000	0.00
34	1700	0.0007	0.1497	1.3534	0.0009	0.1747	1.5801	0.0541	0.0000	0.00
35	1750	0.0015	0.2994	2.2786	0.0015	0.2994	2.2770	0.0643	0.0000	0.00
36	1800	0.0002	0.0499	0.4777	0.0002	0.0499	0.4773	0.0511	0.0000	0.00
37	1850	0.0032	0.6487	5.2192	0.0033	0.6737	5.4217	0.0608	0.0000	0.00
38	1900	0.0002	0.0499	0.5042	0.0002	0.0499	0.5038	0.0484	0.0000	0.00
39	1950	0.0012	0.2495	2.1159	0.0013	0.2745	2.3256	0.0577	0.0000	0.00
40	2000	0.0002	0.0499	0.5307	0.0004	0.0749	0.7958	0.0460	0.0000	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, Tp= 10 min.	Pst means short-term flicker
P lt	0.65, Tp=2 hr.	Plt means long-term flicker
Dc(%)	3.3%	dc means relative steady-state voltage change
Dmax(%)	4%	dmax means maximum relative voltage change.
Td (t)	3.3% / 500 ms	Tdt means maximum time that dt 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. 30, 2019
2	Power Source	EMC PARTNER	PS3-1	CT-1-090a1	Aug. 30, 2019

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

4.5.3 Test Procedure

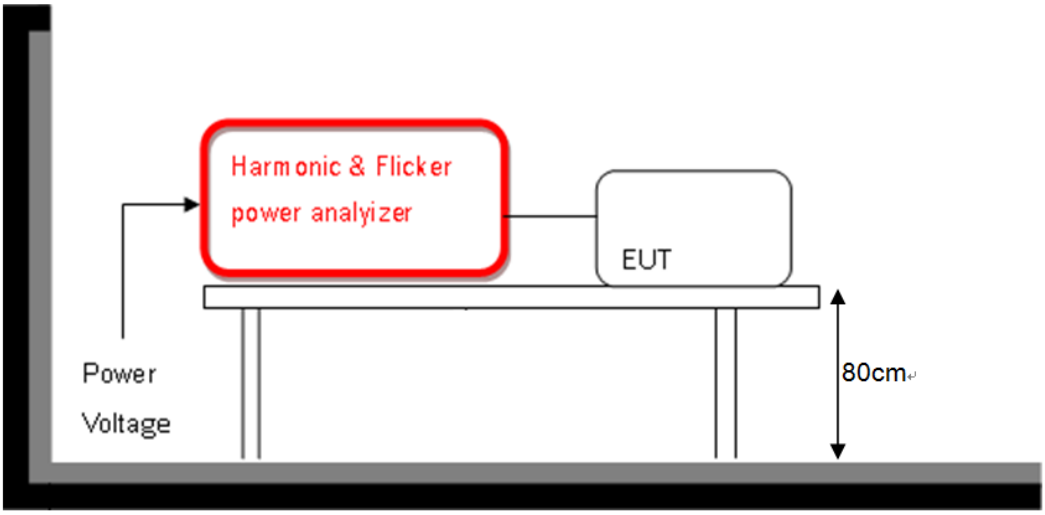
The EUT was placed on the top of a wooden table 0.8 meter above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating condition.

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



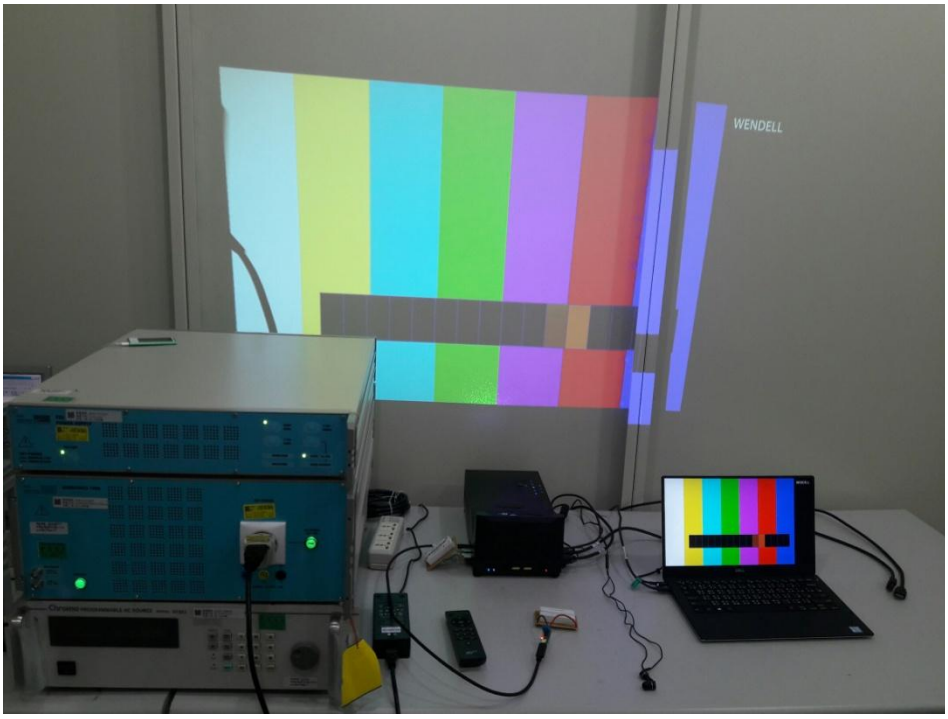
4.5.6 Test Result

Supply Voltage / Ampere	229.3 Vrms / 0.489 Arms	**Test Date**	2019/09/05
Observation (Tp)	30 min	**Environmental Conditions**	23℃, 52% RH
Power Frequency	49.922Hz	**Tested by**	Guanwei Liao

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 (%)	0.00	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

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

5.2 Performance Criteria

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	After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state if stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria 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.

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: ±2, ±4, ±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. 19, 2019
2	Digital Thermo-Hygro Meter	N/A	HTC-8	CT-2-047	Apr. 23, 2019
3	Atmosphere pressure meter	Mingle	BKT381	CT-2-091	Jul. 25, 2019

Note: 1. The calibration interval of the test instruments is 12 months.
2. The calibration interval of thermo hygrometer/ Atmosphere pressure meter is 24 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.

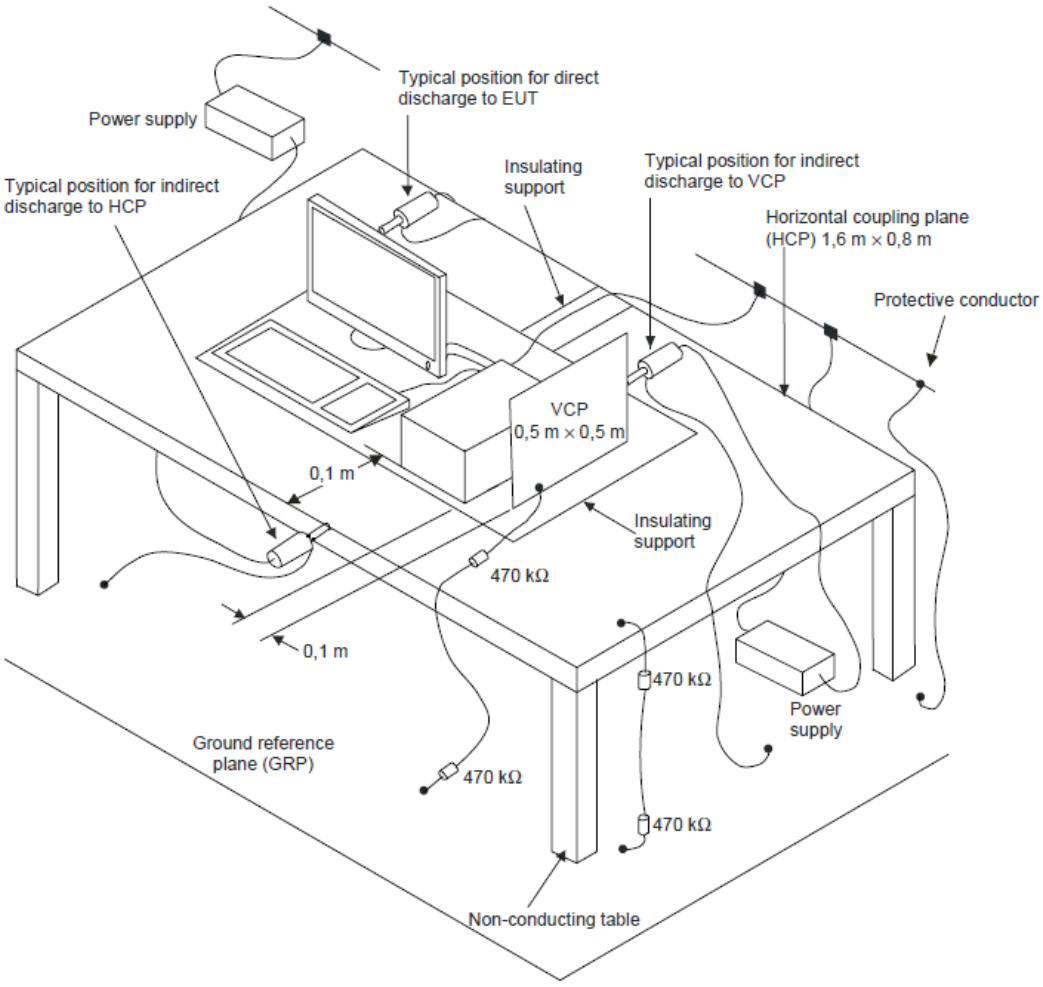
b. Air discharge at apertures and slots and insulating surface:

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**	2019/09/24
Environmental Conditions	25℃, 49% RH	**Pressure**	1009 mbar
Tested by	Evan Cheng		

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
Left	A	B(#1)	B(#1)	B
Right	A	B(#1)	B(#1)	B
Top	A	A	A	A
Bottom	A	A	A	A
Other	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	N/A	N/A
Back	N/A	N/A
Left	N/A	N/A
Right	N/A	N/A
Top	B(#1)	B
Bottom	B(#1)	B
Other	N/A	N/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

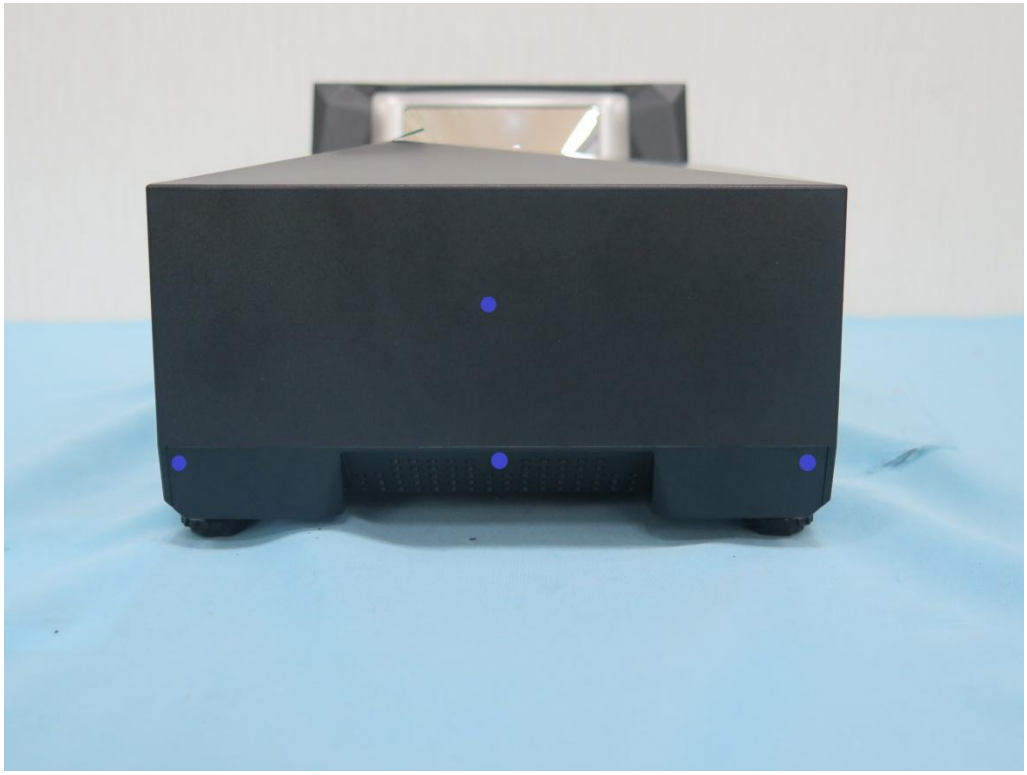
VCP Discharge		
Test Point	**Discharge Level (kV)**	**Result**
	±4	
Front	A	A
Back	A	A
Left	A	A
Right	A	A

Note:
N/A: Not applicable
Criteria A: The EUT function was correct during the test.
Criteria B: (#1) The EUT was interrupted during test. It could become normal after test stop.

Description of Test Points

Front

Back



*Red Dot - Contact Discharged
Blue Dot - Air Discharged

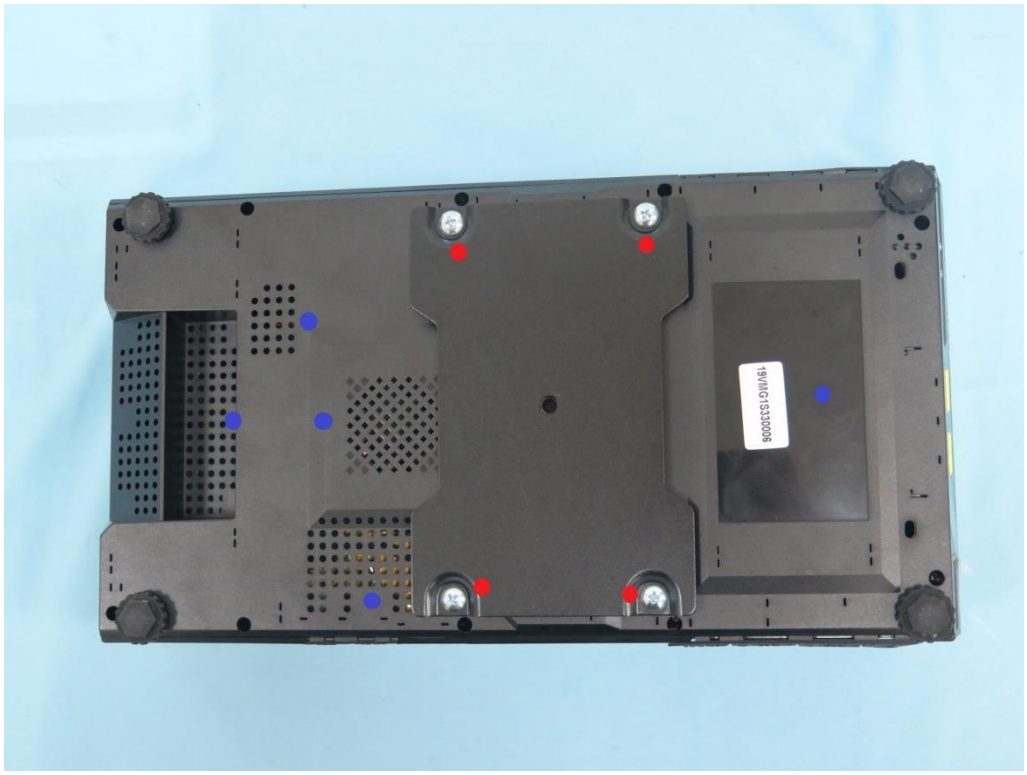
Left

Right

*Red Dot - Contact Discharged
Blue Dot - Air Discharged

Top

Bottom

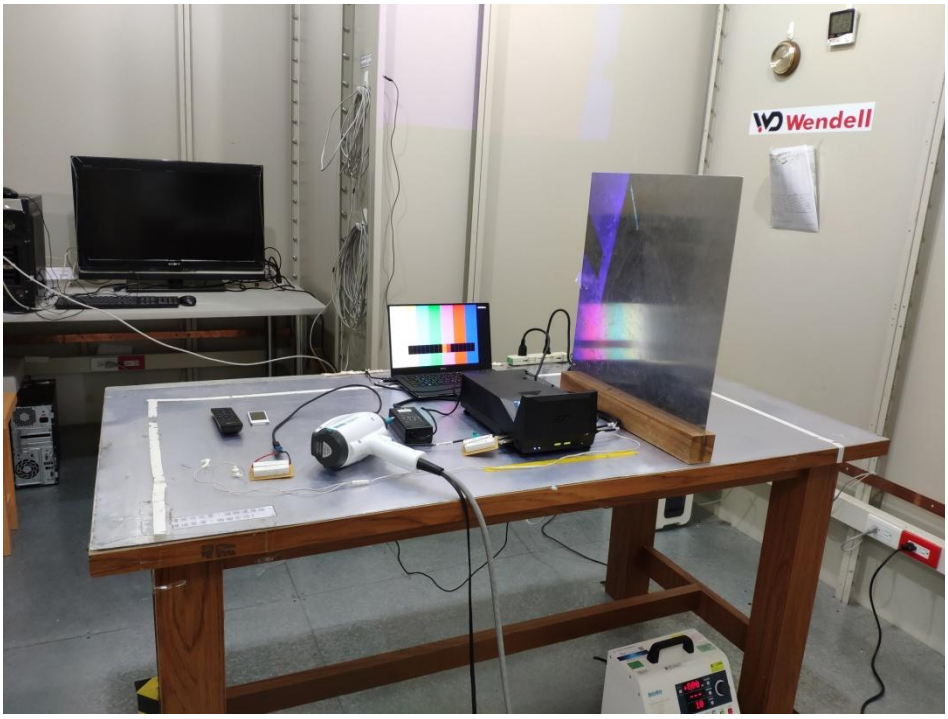


*Red Dot - Contact Discharged
Blue Dot - Air Discharged

Other

*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	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

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. 01, 2019
3	LINEAR POWER RF AMPLIFIER	OPHIR	5225	CT-1-082	No calibration request
4	LINEAR POWER RF AMPLIFIER	OPHIR	5193	CT-1-083	No calibration request
5	LINEAR POWER RF AMPLIFIER	OPHIR	5022A	CT-1-084	No calibration request
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. 01, 2019
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.

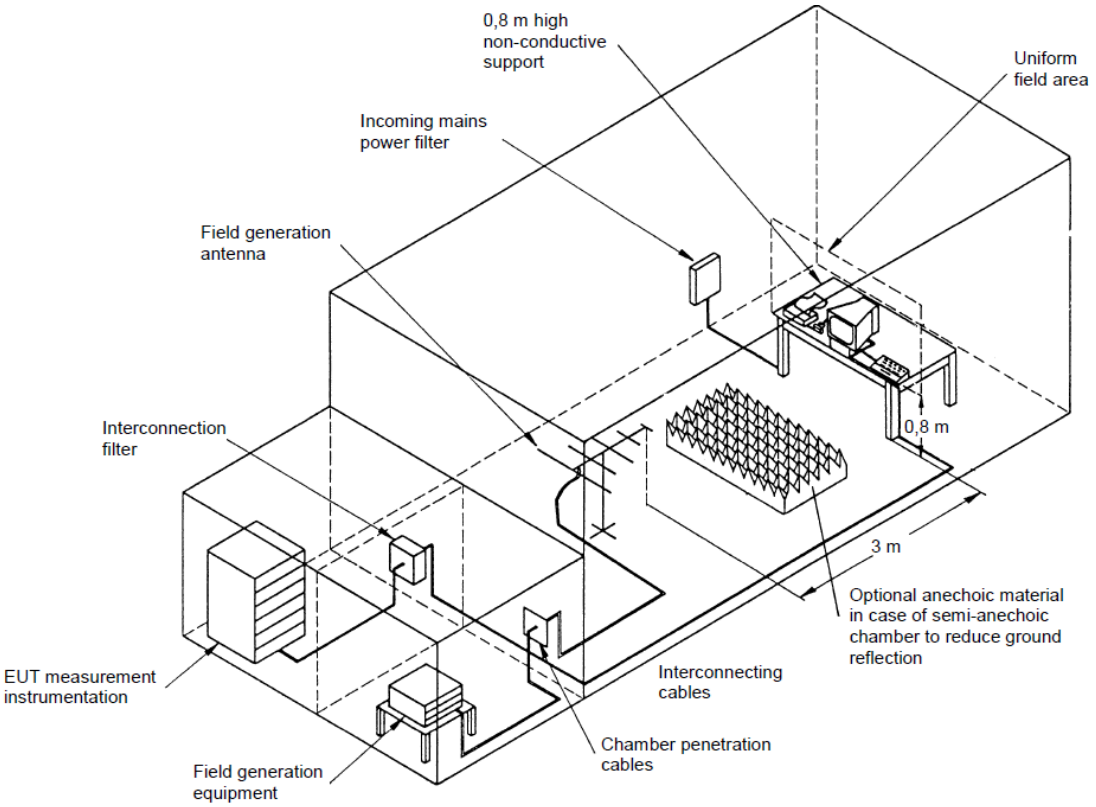
In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.
All the scanning conditions are as follows:

	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.

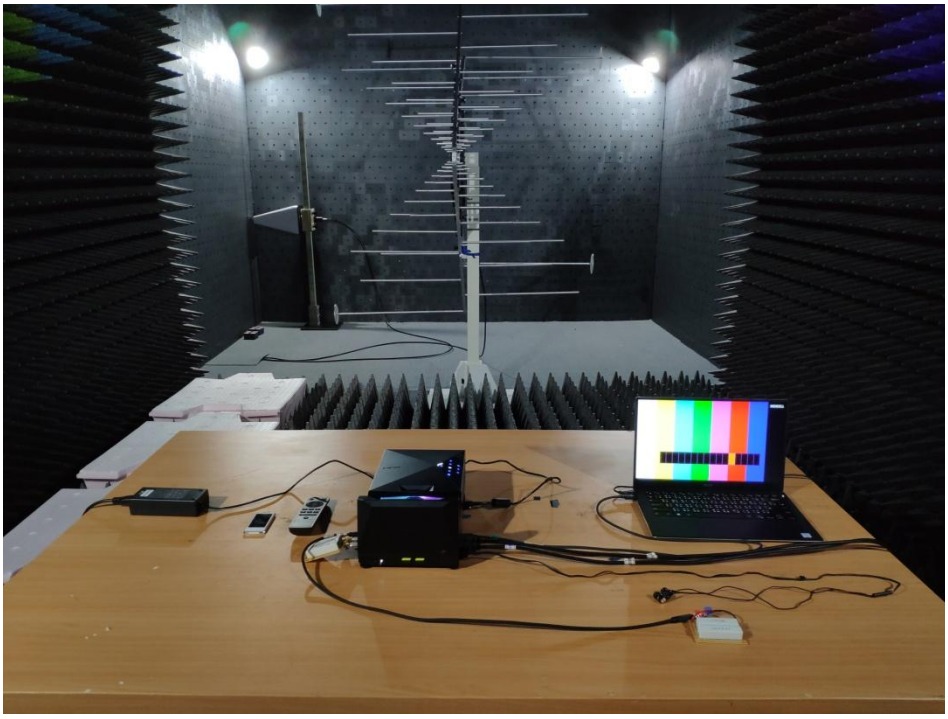
5.4.6 Test Result

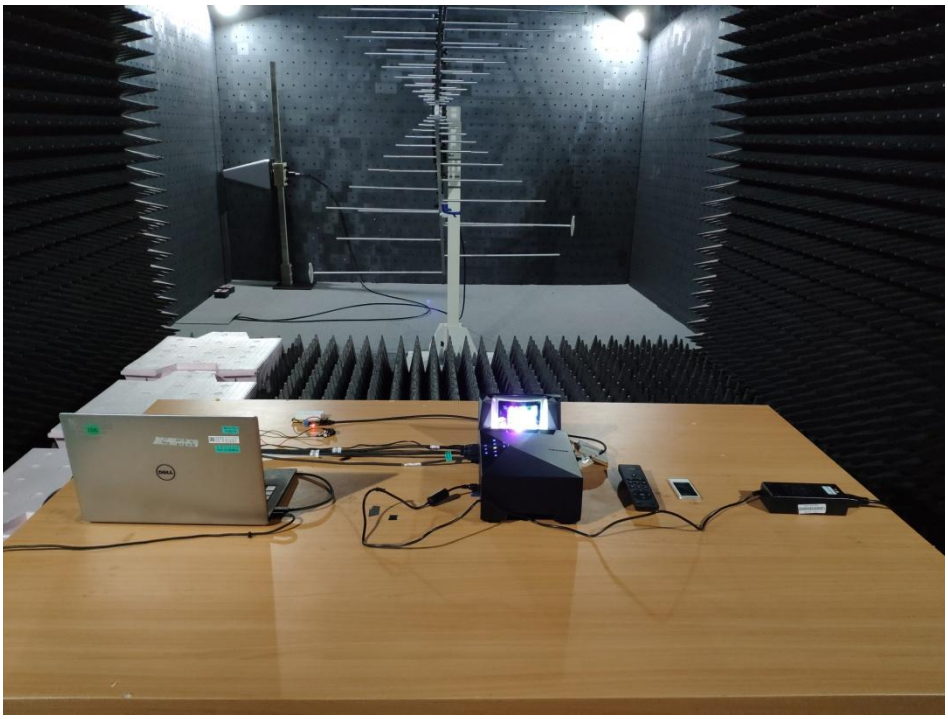
Test Voltage	230Vac, 50Hz	**Environmental Conditions**	24℃, 51% RH
Tested by	Evan Cheng	**Test Date**	2019/10/01

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.

5.4.7 Photographs of Test Configuration





5.5 Electrical Fast Transient /Burst Immunity Test (EFT)

5.5.1 Test Specification

Standard	IEC/EN 61000-4-4
Test Voltage	AC supply lines: ±1 kV DC Power Port: ±0.5 kV Signal ports and telecommunication ports: ±0.5kV
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.

5.5.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	EMS Generator	Thermo	EMC Pro	CT-1-030	Apr. 28, 2019
2	Clamp	KeyTek	CCL	CT-1-032	Apr. 28, 2019
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.

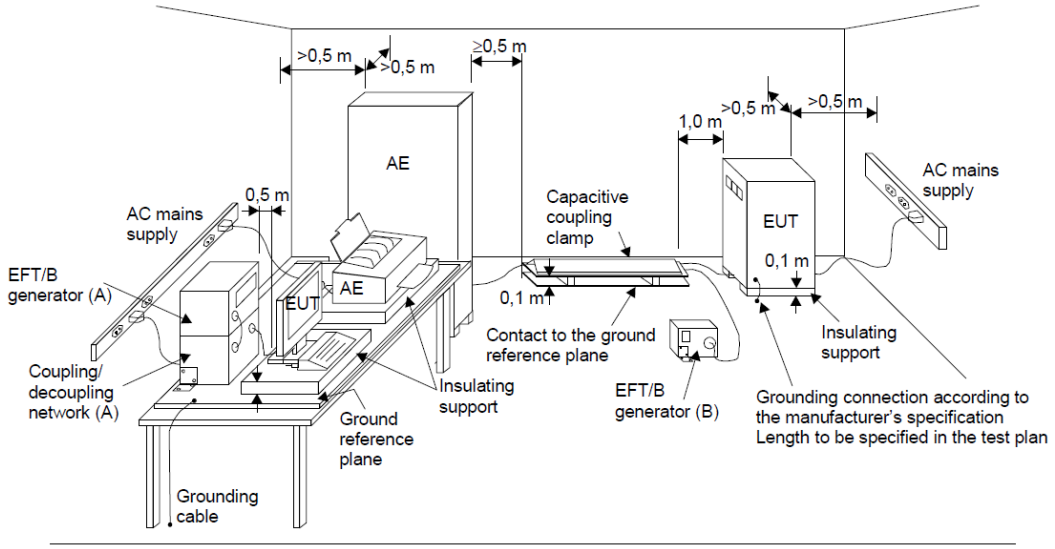
Each of the line conductors is impressed with burst noise for 1 minute.

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

5.5.4 Deviation from Test Standard

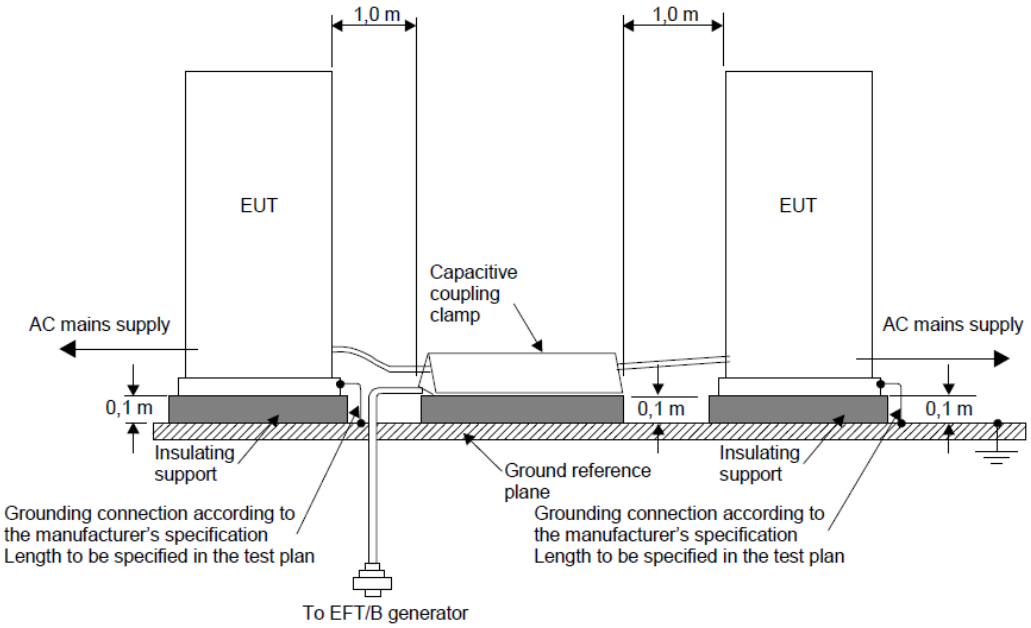
No deviation

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**	25℃, 47% RH
Tested by	Evan Cheng	**Test Date**	2019/09/12

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

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

5.5.7 Photographs of Test Configuration

5.6 Surge Immunity Test

5.6.1 Test Specification

Standard	IEC/EN 61000-4-5
Wave- Shape	Signal and telecommunication ports(direct to outdoor cables(Note 1)): 10/700 μs Open Circuit Voltage 5/320 μs Short Circuit Current Input DC power port(direct to outdoor cables(Note 1)): 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current Input AC Power ports: 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage	Signal and telecommunication ports(Note 2) (direct to outdoor cables(Note 1)): w/o primary protectors: ±1kV, with primary protectors fitted: ± 4kV Input DC power port(direct to outdoor cables(Note 1)): ±0.5kV, Input AC Power ports: Line to line: ±1kV, Line to earth or ground: ±2kV
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.

5.6.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	EMS Generator	HAEFELY	AXOS8	CT-1-059(1)	Aug. 01, 2019
2	Surge CDN	3cTest	CDN-405T8A1	CT-1-074(5)	Apr. 22, 2019

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.

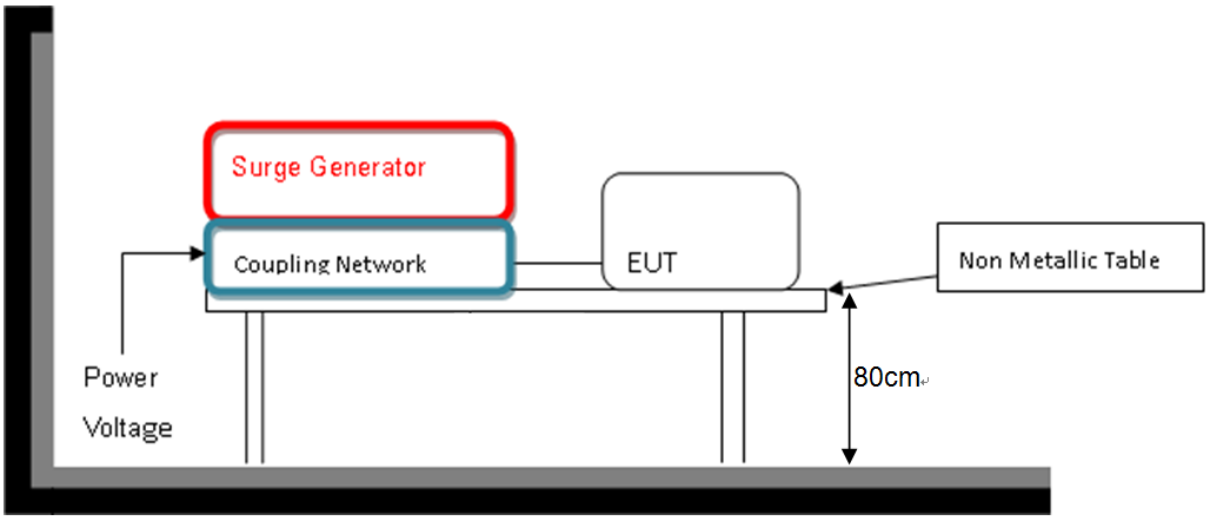
The surge noise shall be applied synchronized to the voltage phase at 0°, 90°, 180°, 270° and the peak value of the AC voltage wave. (Positive and negative)

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℃, 52% RH
Tested by	Evan Cheng	**Test Date**	2019/10/01

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	A	A
	90°	+/-	A	A	A	
	180°	+/-	A	A	A	
	270°	+/-	A	A	A	
N to PE	0°	+/-	A	A	A	A
	90°	+/-	A	A	A	
	180°	+/-	A	A	A	
	270°	+/-	A	A	A	

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

5.6.7 Photographs of Test Configuration

5.7 Continuous Conducted Disturbances (CS)

5.7.1 Test Specification

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

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	Apr. 25, 2019
2	CDN for power supply lines	FRANKONIA	CDN M2+M3	CT-1-054	Apr. 26, 2019
3	6 dB Attenuator	BIRD	75-A-FFN-06	CT-1-056	Apr. 25, 2019
4	Compact Immunity Test System acc	FRANKONIA	CIT-10/75	CT-1-057	Apr. 24, 2019
5	CDN for screened lines	FRANKONIA	RJ45S	CT-1-052(1)	May 20, 2019
6	50ohm Termination	N/A	N/A	CT-1-065-2	Apr. 25, 2019
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:

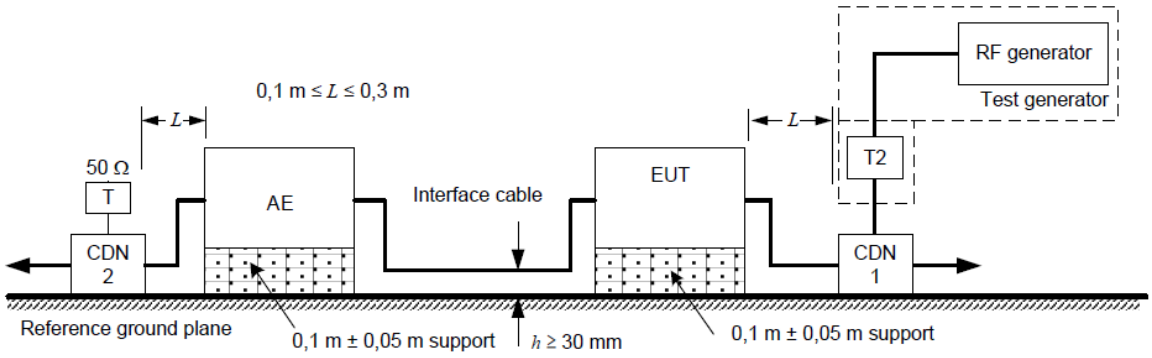
The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

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

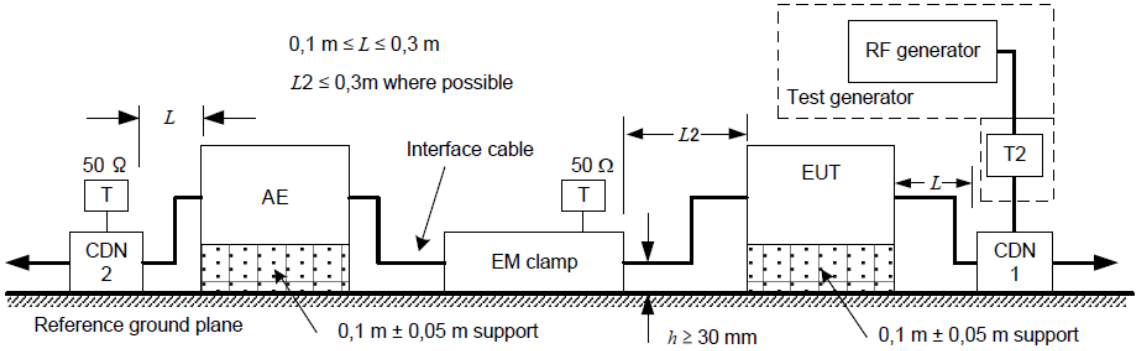
No deviation

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

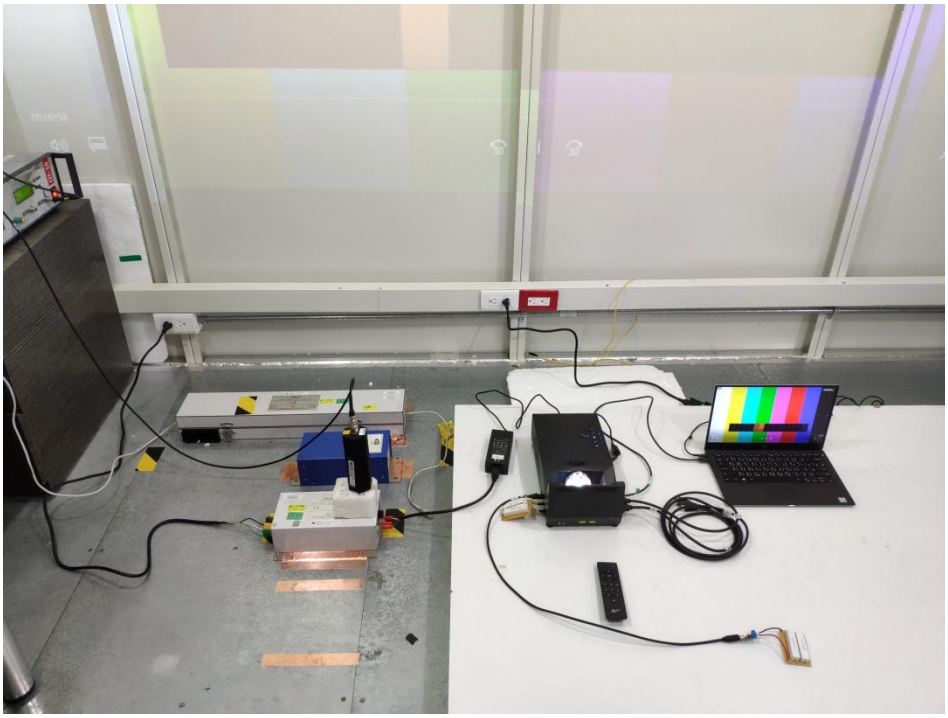
5.7.6 Test Result

Test Voltage	230Vac, 50Hz	**Environmental Conditions**	25℃, 46% RH
Tested by	Evan Cheng	**Test Date**	2019/09/29

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

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

5.7.7 Photographs of Test Configuration



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. 01, 2019

Note: 1. The calibration interval of the above test instruments is 24 months.

5.8.3 Test Procedure

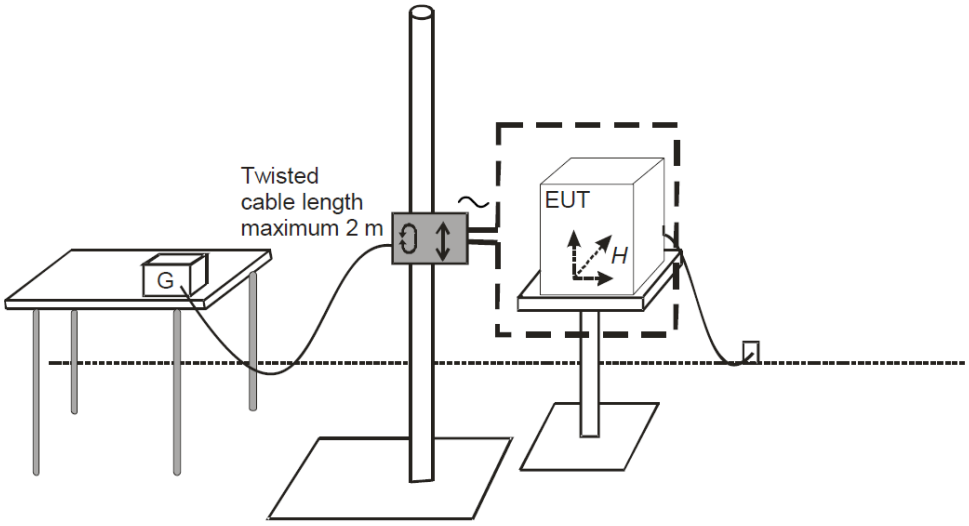
The EUT is placed on a table which is 0.8 meter above a metal ground plane measured at least 1m*1m minimum. The test magnetic field shall be placed at central of the induction coil.

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**	25℃, 46% RH
Tested by	Evan Cheng	**Test Date**	2019/10/01

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	Apr. 28, 2019
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.

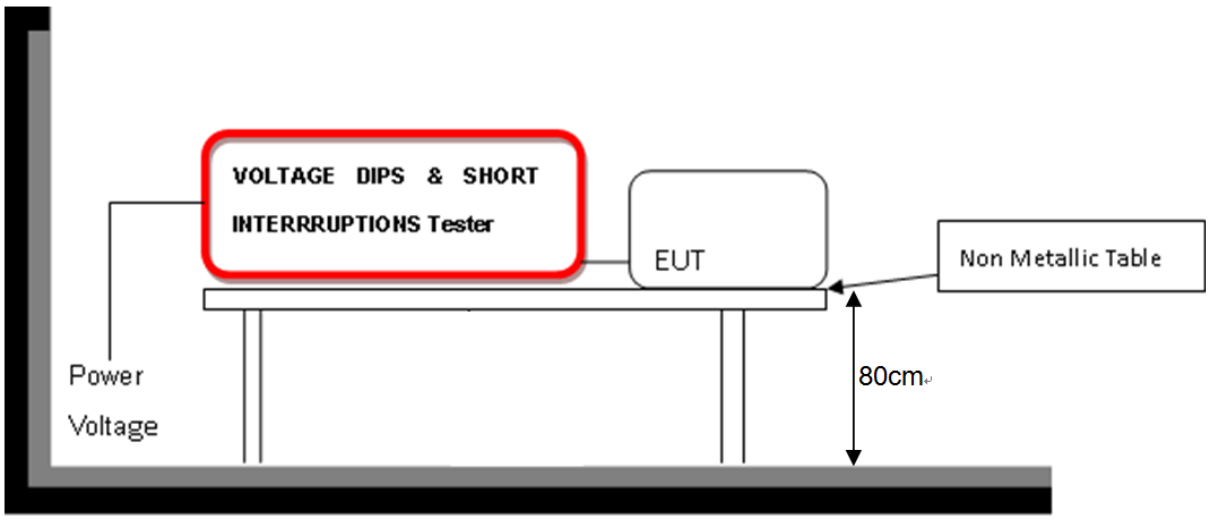
If the actual operating signal sources are not available to the EUT, they may be simulated.

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**	25℃, 50% RH
Tested by	Evan Cheng	**Test Date**	2019/09/12

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

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

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

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

5.9.7 Photographs of Test Configuration

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