CE EMC Test Report

Issued date: Apr. 19, 2018

Project No.: 17Q021602

Product : Network Camera

Model : FD8177-HT

Applicant : VIVOTEK INC.

Address : 6F, No.192, Lien-Cheng Rd., Chung-Ho, New Taipei City, 235, Taiwan, R.O.C.

Report No: WD-EE-R-180181-00

According to

EN 55032: 2015 + AC:2016, Class B	**EN 55024: 2010 + A1:2015**
AS/NZS CISPR 32: 2015	IEC 61000-4-2: 2008
CISPR 32: 2015	IEC 61000-4-3: 2006 + A1:2007 + A2:2010
EN 61000-3-2: 2014	IEC 61000-4-4: 2012
EN 61000-3-3: 2013	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-180181-00	Apr. 19, 2018	Initial Issue

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-180181-00	Apr. 19, 2018	Original report

1 Certification

Product:	Network Camera
Brand Name:	VIVOTEK
Model No:	FD8177-HT
Applicant:	VIVOTEK INC.
Tested:	Mar. 21 ~ Mar. 30, 2018
Standard:	**EN 55032: 2015 + AC:2016, Class B** **AS/NZS CISPR 32:2015** **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: FD8177-HT) 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.

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	Class B	Pass	Meets the requirements
	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 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 A
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 A Voltage Interruptions: ✧ >95% reduction - Performance Criterion B

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 Test (OATS)

W03: No.38-20, Mujiliao, Sanzhi Dist., New Taipei City 252, 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.

2.2.1 Conducted Emission test

Test Site	Measurement Freq. Range	dB (U_{cispr})	Note
W01	150 kHz ~ 30 MHz	3.19	N/A
W06	150 kHz ~ 30 MHz	2.81	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	3.16	N/A
W06	150 kHz ~ 30 MHz	4.54	N/A

2.2.3 Radiated Emission test

Test Site	Measurement Freq. Range	Ant	dB (U_{cispr})	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

Test Site	Measurement Freq. Range	Ant	dB (U_{cispr})	Note
W06	30 MHz ~ 200 MHz	V	4.38	N/A
	30 MHz ~ 200 MHz	H	4.05	N/A
	200 MHz ~ 1000 MHz	V	4.05	N/A
	200 MHz ~ 1000 MHz	H	3.91	N/A
	1 GHz ~ 6 GHz	V	5.13	N/A
	1 GHz ~ 6 GHz	H	5.03	N/A

2.2.4 Harmonics Current Measurement

Test Site	Expanded Uncertainty	
W01	Voltage	3.96 V
	Current	1.18 mA
	Power	0.15 Hz

2.2.5 Voltage Fluctuation and Flicker Measurement

Test Site	Expanded Uncertainty	
W01	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	0.86%	k=2
		Timing	6%	
	Electrical fast transients (EFT)	Voltage	7.8%	k=2
		Timing	5.1%	
	Surges	Voltage	5.6%	k=2
		Current	4.8%	
		Time	4.7%	
	Continuous conducted disturbances (CS)	CDN	1.8dB	150KHz ~ 230MHz, k=2
		EM Clamp	3.75dB	
	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 – 6GHz	3.0dB	80MHz - 6GHz, k=2

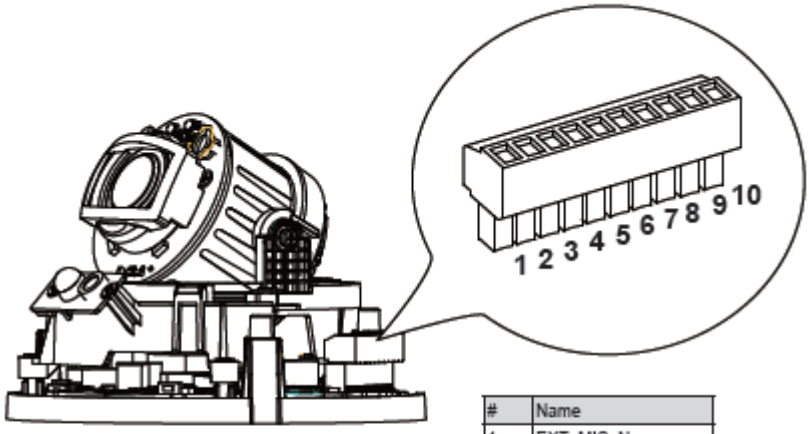
3 Generation Information

3.1 Description of EUT

Product	Network Camera
Brand	VIVOTEK
Model No.	FD8177-HT
Applicant	VIVOTEK INC.
Received date	Mar. 16, 2018
EUT Power Rating	12 Vdc (from adapter) or 48Vdc (from POE Injector)
Model Differences	N/A
Operating System	N/A
Data Cable Supplied	N/A
Accessory Device	N/A
I/O Port	Please refer to note.

Note:

1. The EUT's highest operating frequency is 1600MHz. Therefore the radiated emission is tested up to 6GHz.
2. The I/O Ports defines as follow:



#	Name
1	EXT_MIC_N
2	EXT_MIC_P
3	Audio_out-
4	Audio_out+
5	DI-
6	DI+
7	DO-
8	DO+ (5V)
9	12V DC-_IN
10	12V DC+_IN

3.2 Description of Test Modes

Test results are presented in the report as below.

Test Result	Test Condition
Conducted emission test	
-	Adapter mode
Conducted emission test at telecom port test	
A	Adapter mode, LAN(10Mbps/100Mbps)
B	POE mode, LAN(10Mbps/100Mbps)
Radiated emission 30MHz ~ 1GHz test	
A	Adapter mode
B	POE mode
Radiated emission above 1GHz test	
A	Adapter mode
B	POE mode
Harmonics, Flicker and Immunity test	
A	Adapter mode
B	POE mode

3.3 EUT Operating Condition

EMI Test Mode

Mode A:

a. Placed the EUT on the test table.
b. Prepare server PC to act as a communication partner and placed it outside of testing area.
c. The EUT was connected to the server PC with LAN cable.
d. The communication partner sent data to EUT by command "ping" via LAN.
e. The EUT write data with Micro SD card.

Mode B:

a. Prepare server PC and POE injector to act as a communication partner and placed it outside of testing area.
b. The EUT was connected to server PC via LAN and POE.
c. The communication partner sent data to EUT by command "ping" via LAN.
d. The EUT write data with Micro SD card.

EMS Test Mode

Mode A:

a. Placed the EUT on the test table.
b. Prepare server PC to act as a communication partner and placed it outside of testing area.
c. The EUT was connected to the server PC with LAN cable.
d. The communication partner sent data to EUT by command "ping" via LAN.
e. The EUT write data with Micro SD card.
f. The EUT’s I/O port makes sure function correct during the test.

Mode B:

a. Prepare server PC and POE injector to act as a communication partner and placed it outside of testing area.
b. The EUT was connected to server PC via LAN and POE.
c. The communication partner sent data to EUT by command "ping" via LAN.
d. The EUT write data with Micro SD card.
e. The EUT’s I/O port makes sure function correct during the test.

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	20m non-shielded RJ45 cable (Mode A) 1m non-shielded RJ45 cable (Mode B)	1.8m non-shielded cable	-
2	POE Injector	GeoVision	GV-PA481	N/A	N/A	20m non-shielded RJ45 cable	1.8m non-shielded cable	-
3	MicroSD Card	ADATA	16GB	N/A	N/A	N/A	N/A	-
4	Adapter	N/A	ZZU1588-150120	N/A	N/A	3m non-shielded cable	N/A	-
5	Console cable *8	N/A	N/A	N/A	N/A	40cm non-shielded cable	N/A	-

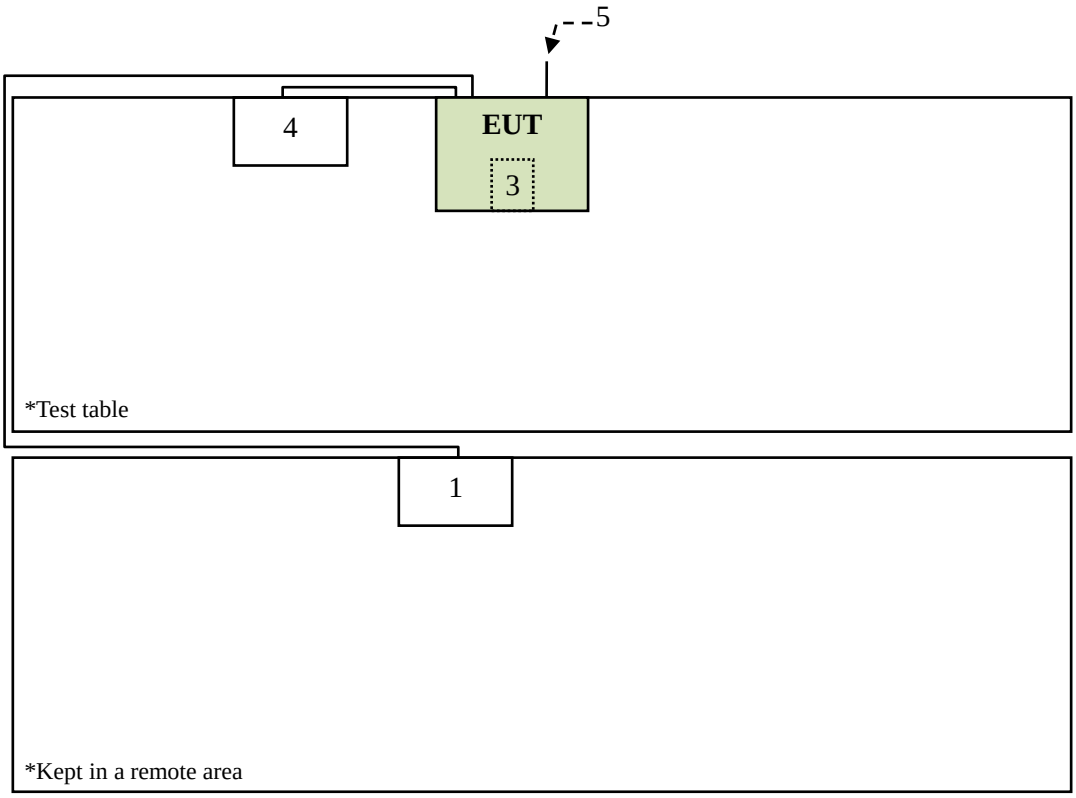
Note: 1. The core(s) is(are) originally attached to the cable(s).
2. Item 1-2 acted as communication partners to transfer data.
3. The EUT uses the follow adapter and POE Injector:

AC-DC Adapter (Support unit only)	
Model	ZZU1588-150120
Input Power	100-240Vac, 1.5A
Output Power	12Vdc, 1.5A

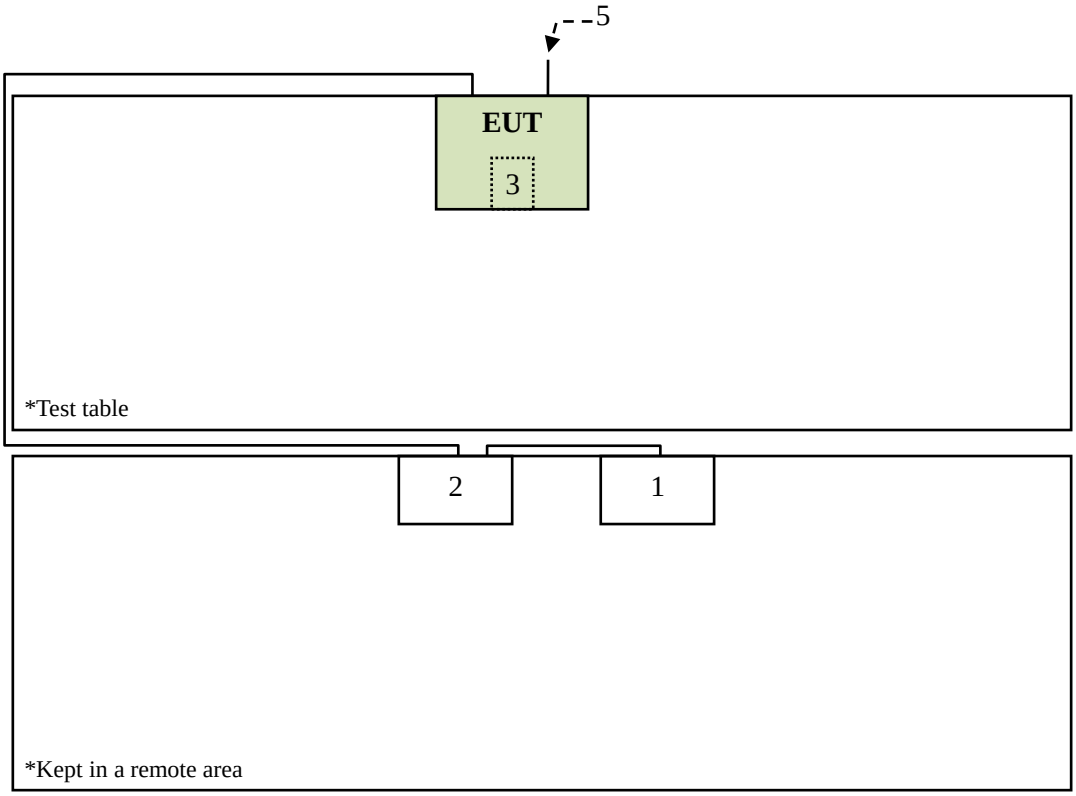
POE Injector (Support unit only)	
Brand	GeoVision
Model	GV-PA481
Input Power	100-240Vac, 2A
Output Power	48Vdc, 1A

3.5 Configuration of System Under Test

Mode A:



Mode B:



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
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. 01, 2017
2	EMI Test Receiver	R&S	ESCI	CT-01-024	Mar. 29, 2017
3	V-LISN	Schwarzbeck	NSLK8127	CT-1-104-1	Oct. 17, 2017
4	Test Cable	HANRUIN	5D-FB	CT-1-069-2	Jul. 26, 2017
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.

Test Site: W06-CE					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-2	Apr. 01, 2017
2	EMI Test Receiver	R&S	ESR3	CT-1-103	Jun. 21, 2017
3	V-LISN	Schwarzbeck	NSLK8127RC	CT-1-104-1RC	Oct. 17, 2017
4	Test Cable	EMCI	EMCCFD300-BM-BM-5000	CT-1-107-1	Oct. 25, 2017
5	50ohm Termination	HUBER+SUHNER	N/A	CT-1-109-1	Oct. 23, 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.

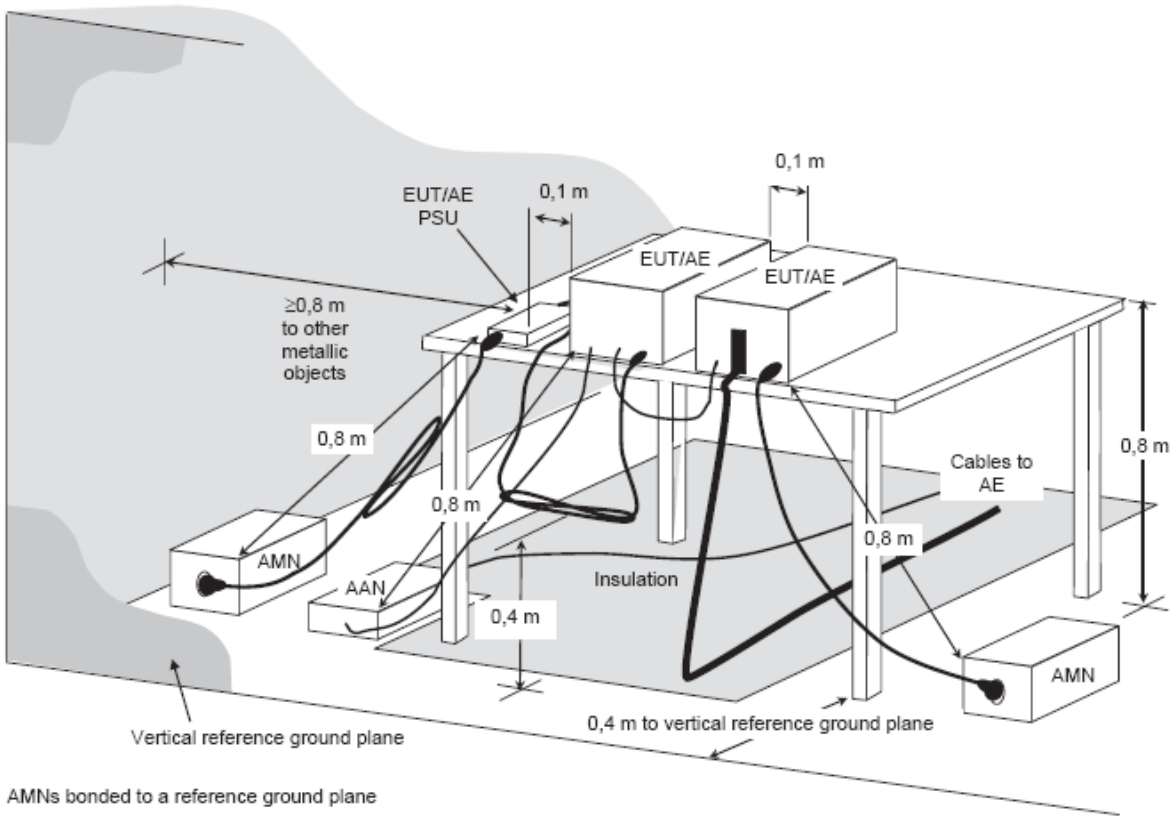
4.1.3 Test Procedure

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

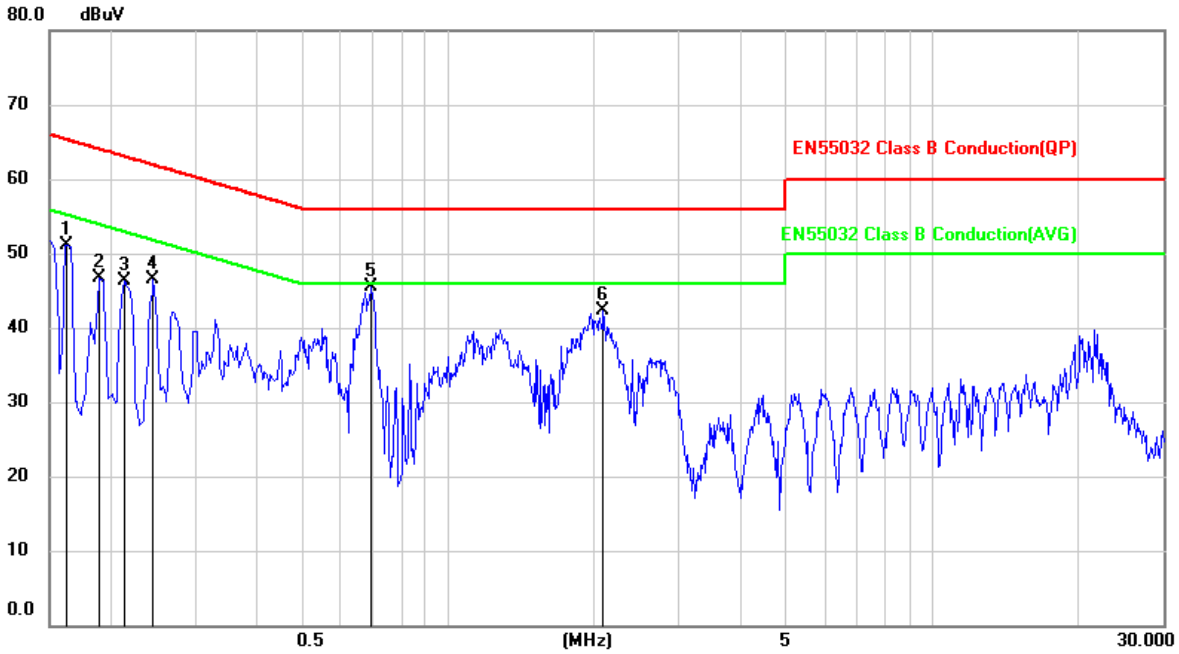
4.1.5 Test Setup



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

4.1.6 Test Result

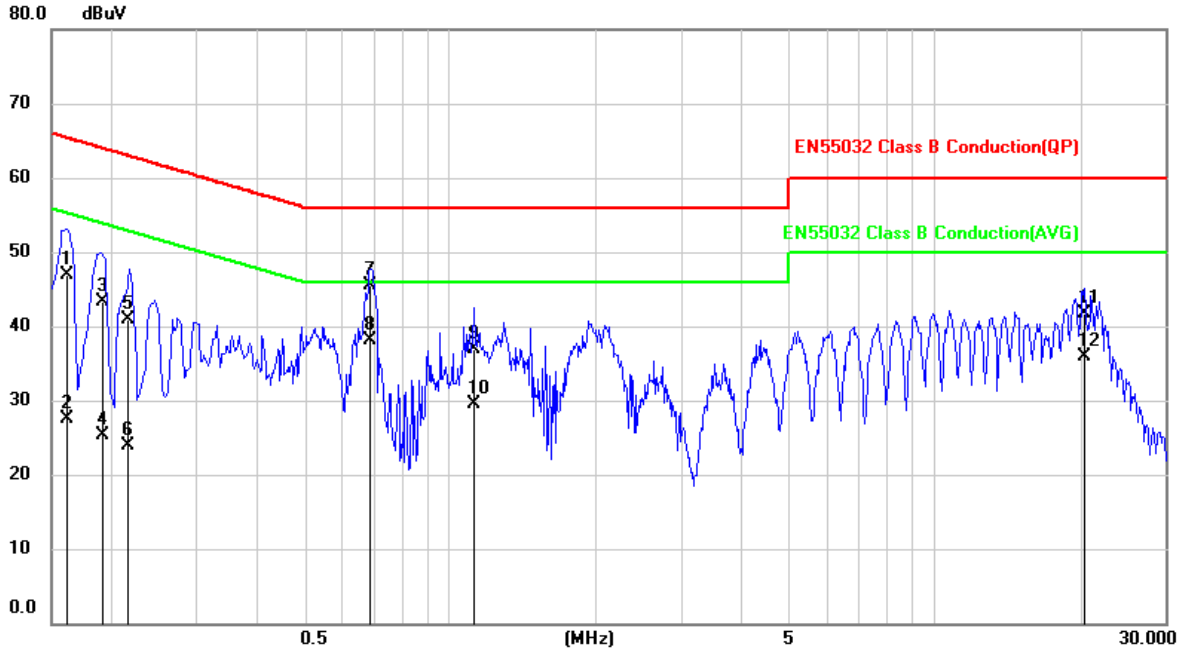
Test Voltage	230Vac, 50Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/03/23	**Phase**	L
Tested by	Justin Lee	**Test Site**	W01



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1624	41.49	9.58	51.07	65.34	-14.27	peak
2	0.1900	37.07	9.58	46.65	64.04	-17.39	peak
3	0.2140	36.77	9.58	46.35	63.05	-16.70	peak
4	0.2460	36.90	9.58	46.48	61.89	-15.41	peak
5	0.6940	35.88	9.57	45.45	56.00	-10.55	peak
6	2.0980	32.74	9.59	42.33	56.00	-13.67	peak

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

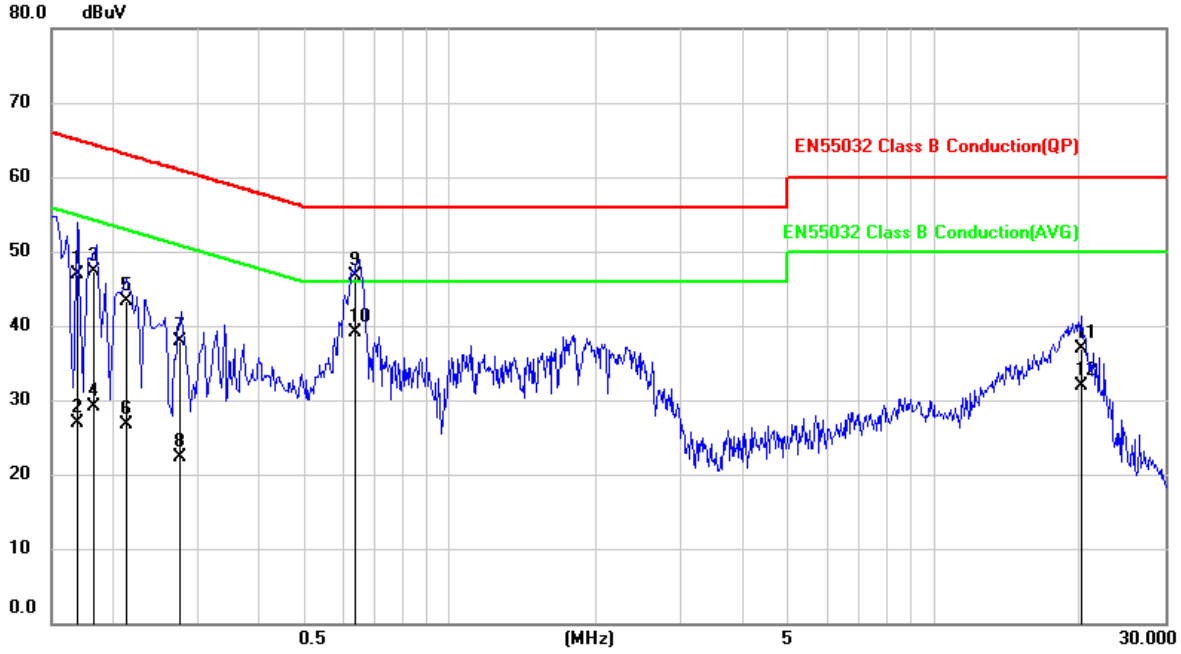
Test Voltage	230Vac, 50Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/03/23	**Phase**	N
Tested by	Justin Lee	**Test Site**	W01



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1621	37.19	9.67	46.86	65.36	-18.50	QP
2	0.1621	17.74	9.67	27.41	55.36	-27.95	AVG
3	0.1916	33.56	9.66	43.22	63.97	-20.75	QP
4	0.1916	15.58	9.66	25.24	53.97	-28.73	AVG
5	0.2159	31.28	9.66	40.94	62.98	-22.04	QP
6	0.2159	14.34	9.66	24.00	52.98	-28.98	AVG
7	0.6826	35.93	9.66	45.59	56.00	-10.41	QP
8	0.6826	28.45	9.66	38.11	46.00	-7.89	AVG
9	1.1147	27.17	9.66	36.83	56.00	-19.17	QP
10	1.1147	19.94	9.66	29.60	46.00	-16.40	AVG
11	20.3791	31.97	9.81	41.78	60.00	-18.22	QP
12	20.3791	26.00	9.81	35.81	50.00	-14.19	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

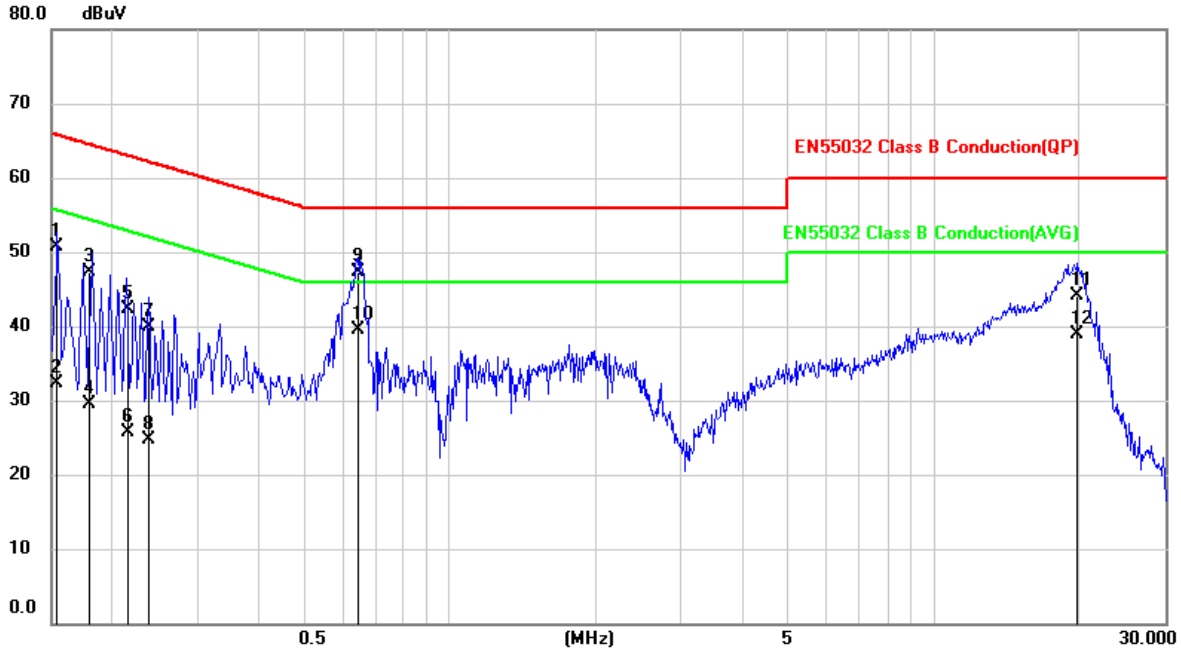
Test Voltage	110Vac, 60Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	6dB Bandwidth	9 kHz
Test Date	2018/03/23	Phase	L
Tested by	Justin Lee	Test Site	W01



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1693	37.31	9.58	46.89	64.99	-18.10	QP
2	0.1693	17.42	9.58	27.00	54.99	-27.99	AVG
3	0.1831	37.67	9.58	47.25	64.34	-17.09	QP
4	0.1831	19.54	9.58	29.12	54.34	-25.22	AVG
5	0.2140	33.69	9.58	43.27	63.05	-19.78	QP
6	0.2140	17.07	9.58	26.65	53.05	-26.40	AVG
7	0.2750	28.27	9.58	37.85	60.97	-23.12	QP
8	0.2750	12.70	9.58	22.28	50.97	-28.69	AVG
9	0.6381	37.05	9.57	46.62	56.00	-9.38	QP
10	0.6381	29.63	9.57	39.20	46.00	-6.80	AVG
11	20.2571	27.25	9.66	36.91	60.00	-23.09	QP
12	20.2571	22.21	9.66	31.87	50.00	-18.13	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

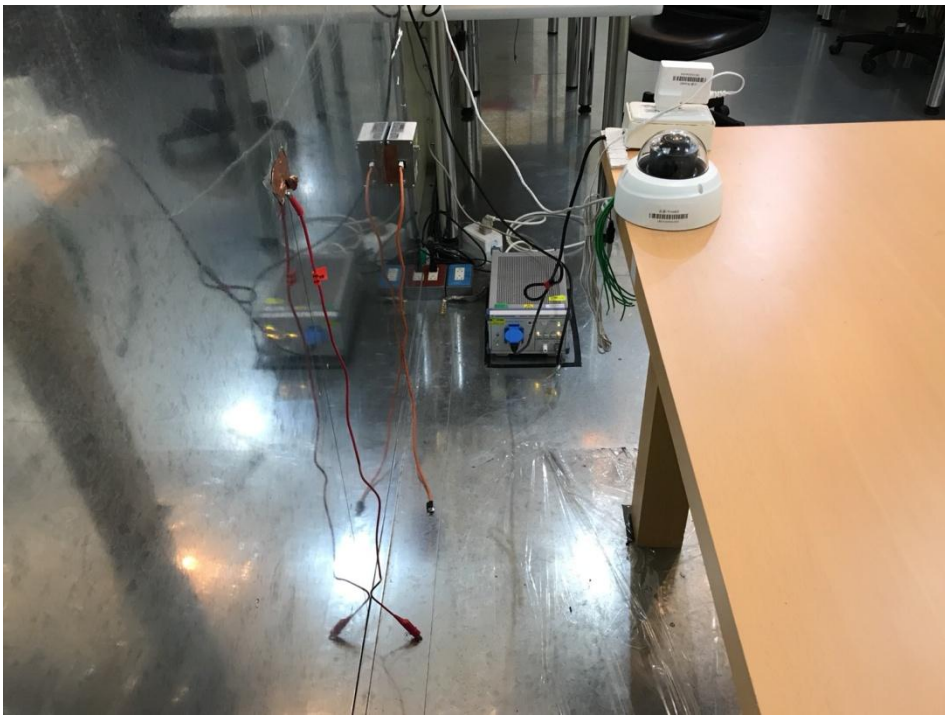
Test Voltage	110Vac, 60Hz	**Frequency Range**	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/03/23	**Phase**	N
Tested by	Justin Lee	**Test Site**	W01



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1535	41.04	9.67	50.71	65.81	-15.10	QP
2	0.1535	22.72	9.67	32.39	55.81	-23.42	AVG
3	0.1794	37.56	9.66	47.22	64.51	-17.29	QP
4	0.1794	19.79	9.66	29.45	54.51	-25.06	AVG
5	0.2151	32.69	9.66	42.35	63.01	-20.66	QP
6	0.2151	16.05	9.66	25.71	53.01	-27.30	AVG
7	0.2377	30.29	9.66	39.95	62.18	-22.23	QP
8	0.2377	14.97	9.66	24.63	52.18	-27.55	AVG
9	0.6485	37.58	9.66	47.24	56.00	-8.76	QP
10	0.6485	29.81	9.66	39.47	46.00	-6.53	AVG
11	19.8202	34.28	9.81	44.09	60.00	-15.91	QP
12	19.8202	29.06	9.81	38.87	50.00	-11.13	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)**
	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)**
	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

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. 01, 2017
2	EMI Test Receiver	R&S	ESCI	CT-01-024	Mar. 29, 2017
3	Impedance Stabilization Network	TESEQ	T8-CAT6	CT-1-105	Oct. 29, 2017
4	V-LISN	Schwarzbeck	NSLK8127	CT-1-104-1	Oct. 17, 2017
5	Test Cable	HANRUIN	5D-FB	CT-1-069-1	Jul. 26, 2017
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.

Test Site: W06-CE					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	TWO-LINE V-NETWORK	R&S	ENV216	CT-1-025-2	Apr. 01, 2017
2	EMI Test Receiver	R&S	ESR3	CT-1-103	Jun. 21, 2017
3	V-LISN	Schwarzbeck	NSLK8127RC	CT-1-104-1RC	Oct. 17, 2017
4	ISN	FCC	F-071115-1057 -1-09	CT-1-027	Apr. 05, 2017
5	Test Cable	EMCI	EMCCFD300-BM-BM-5000	CT-1-107-2	Oct. 25, 2017
6	50ohm Termination	HUBER+SUHNER	N/A	CT-1-109-2	Oct. 23, 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.

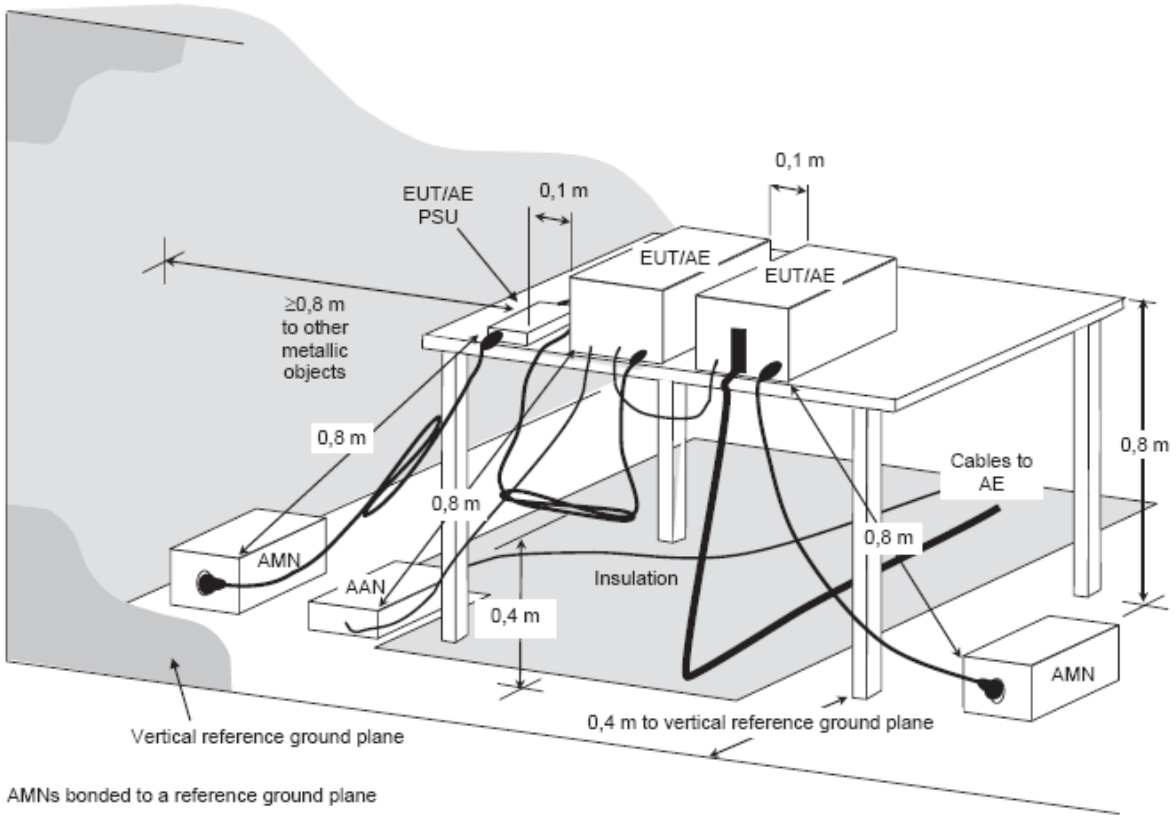
f. The receiver scanned from 150kHz to 30MHz for emissions in each of test modes. The test mode included 10Mbps, 100Mbps, 1Gbps and POE mode. Emission frequency and amplitude were recorded, recording at least six highest emissions.

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

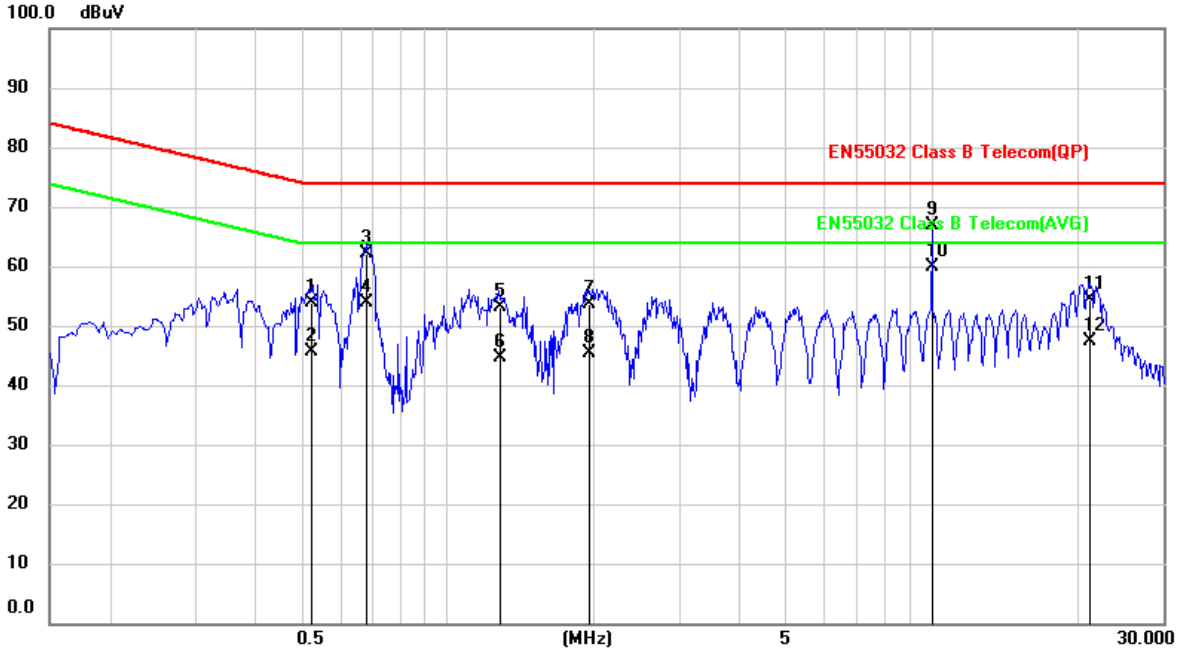
4.2.5 Test Setup



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

4.2.6 Test Result

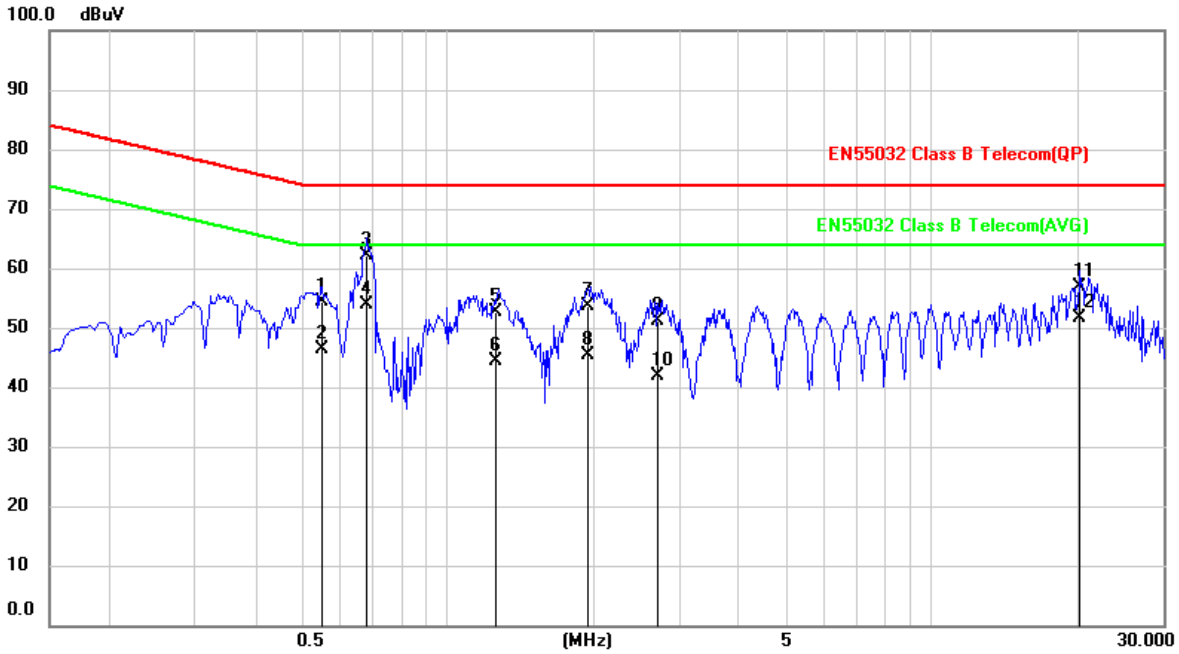
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	6dB Bandwidth	9 kHz
Test Date	2018/03/23	Test Condition	LAN port with ISN (10Mbps)
Tested by	Justin Lee	Test Site	W01
Test Mode	A		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.5200	44.27	9.66	53.93	74.00	-20.07	QP
2	0.5200	35.97	9.66	45.63	64.00	-18.37	AVG
3	0.6794	52.49	9.62	62.11	74.00	-11.89	QP
4	0.6794	44.27	9.62	53.89	64.00	-10.11	AVG
5	1.2845	43.53	9.58	53.11	74.00	-20.89	QP
6	1.2845	34.99	9.58	44.57	64.00	-19.43	AVG
7	1.9554	44.14	9.54	53.68	74.00	-20.32	QP
8	1.9554	35.84	9.54	45.38	64.00	-18.62	AVG
9	9.9996	57.23	9.56	66.79	74.00	-7.21	QP
10	9.9996	50.35	9.56	59.91	64.00	-4.09	AVG
11	21.2169	44.72	9.64	54.36	74.00	-19.64	QP
12	21.2169	37.80	9.64	47.44	64.00	-16.56	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

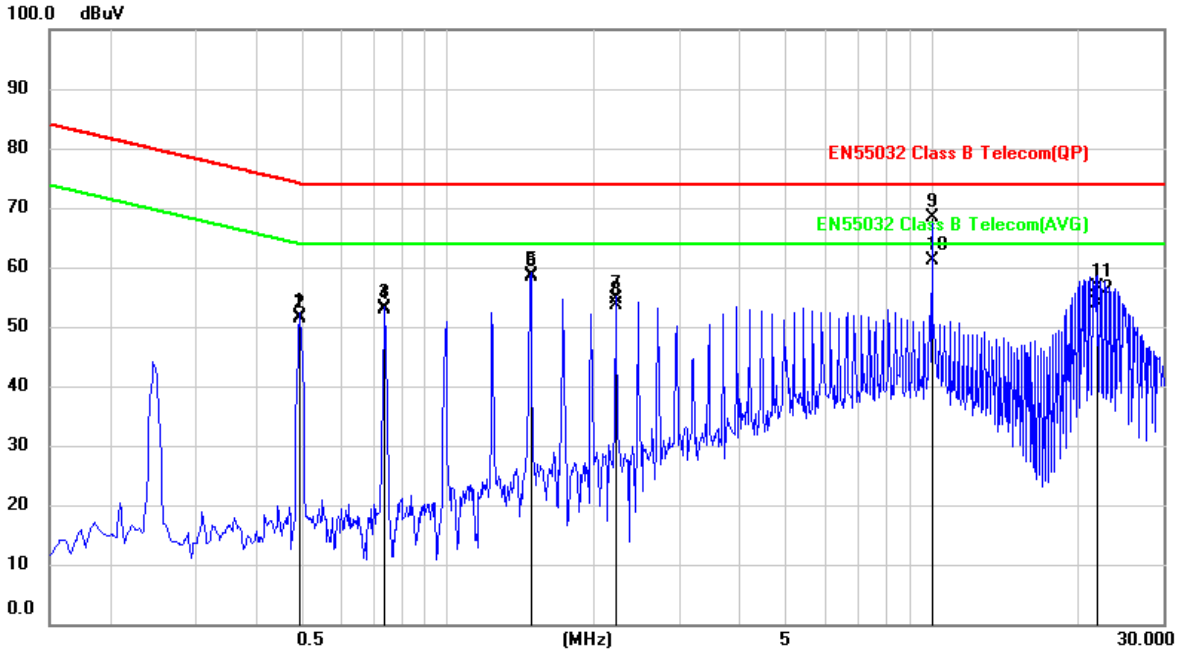
Test Voltage	230Vac, 50Hz	Frequency Range	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	6dB Bandwidth	9 kHz
Test Date	2018/03/23	Test Condition	LAN port with ISN (100Mbps)
Tested by	Justin Lee	Test Site	W01
Test Mode	A		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.5488	44.60	9.66	54.26	74.00	-19.74	QP
2	0.5488	36.79	9.66	46.45	64.00	-17.55	AVG
3	0.6783	52.49	9.62	62.11	74.00	-11.89	QP
4	0.6783	44.28	9.62	53.90	64.00	-10.10	AVG
5	1.2490	42.96	9.57	52.53	74.00	-21.47	QP
6	1.2490	34.72	9.57	44.29	64.00	-19.71	AVG
7	1.9541	44.18	9.54	53.72	74.00	-20.28	QP
8	1.9541	35.92	9.54	45.46	64.00	-18.54	AVG
9	2.7215	41.60	9.53	51.13	74.00	-22.87	QP
10	2.7215	32.46	9.53	41.99	64.00	-22.01	AVG
11	20.2576	47.34	9.63	56.97	74.00	-17.03	QP
12	20.2576	42.10	9.63	51.73	64.00	-12.27	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

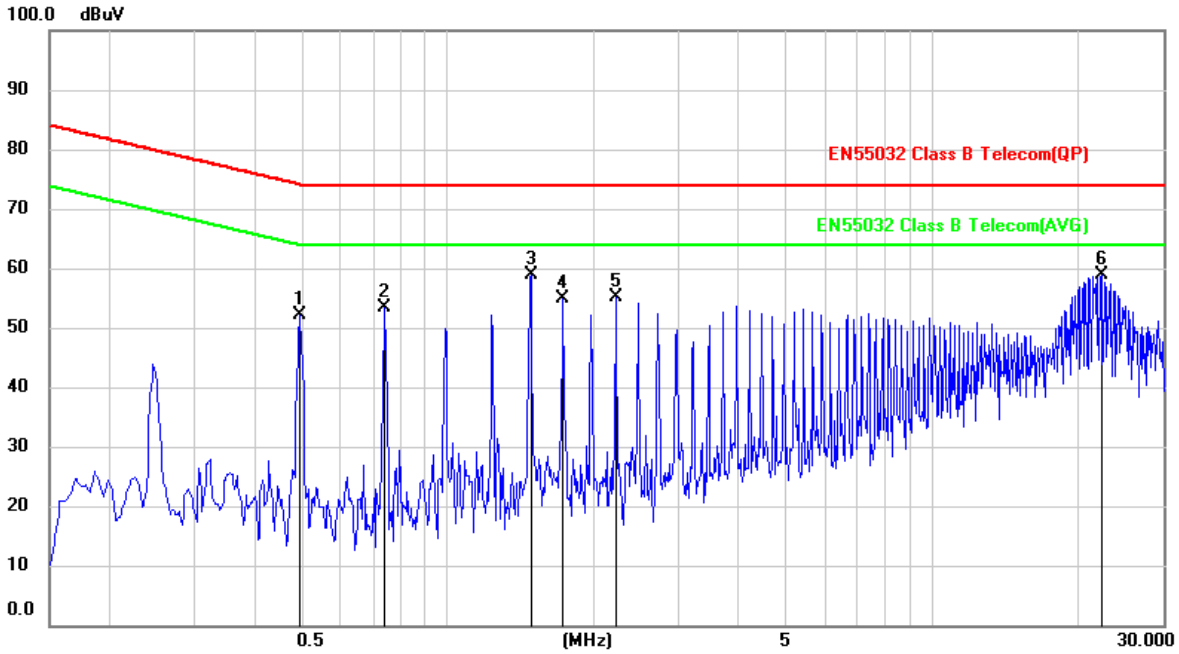
Test Voltage	48Vdc (POE Injector)	**Frequency Range**	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	**6dB Bandwidth**	9 kHz
Test Date	2018/03/23	**Test Condition**	LAN port with ISN (10Mbps)
Tested by	Justin Lee	**Test Site**	W01
Test Mode	B		



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4942	41.93	9.67	51.60	74.10	-22.50	QP
2	0.4942	41.68	9.67	51.35	64.10	-12.75	AVG
3	0.7400	43.44	9.61	53.05	74.00	-20.95	QP
4	0.7400	43.28	9.61	52.89	64.00	-11.11	AVG
5	1.4805	49.11	9.57	58.68	74.00	-15.32	QP
6	1.4805	48.80	9.57	58.37	64.00	-5.63	AVG
7	2.2217	45.04	9.53	54.57	74.00	-19.43	QP
8	2.2217	44.14	9.53	53.67	64.00	-10.33	AVG
9	9.9997	58.71	9.56	68.27	74.00	-5.73	QP
10	9.9997	51.65	9.56	61.21	64.00	-2.79	AVG
11	21.9692	46.92	9.65	56.57	74.00	-17.43	QP
12	21.9692	44.15	9.65	53.80	64.00	-10.20	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	48Vdc (POE Injector)	Frequency Range	0.15-30 MHz
Environmental Conditions	26℃, 60% RH	6dB Bandwidth	9 kHz
Test Date	2018/03/23	Test Condition	LAN port with ISN (100Mbps)
Tested by	Justin Lee	Test Site	W01
Test Mode	B		

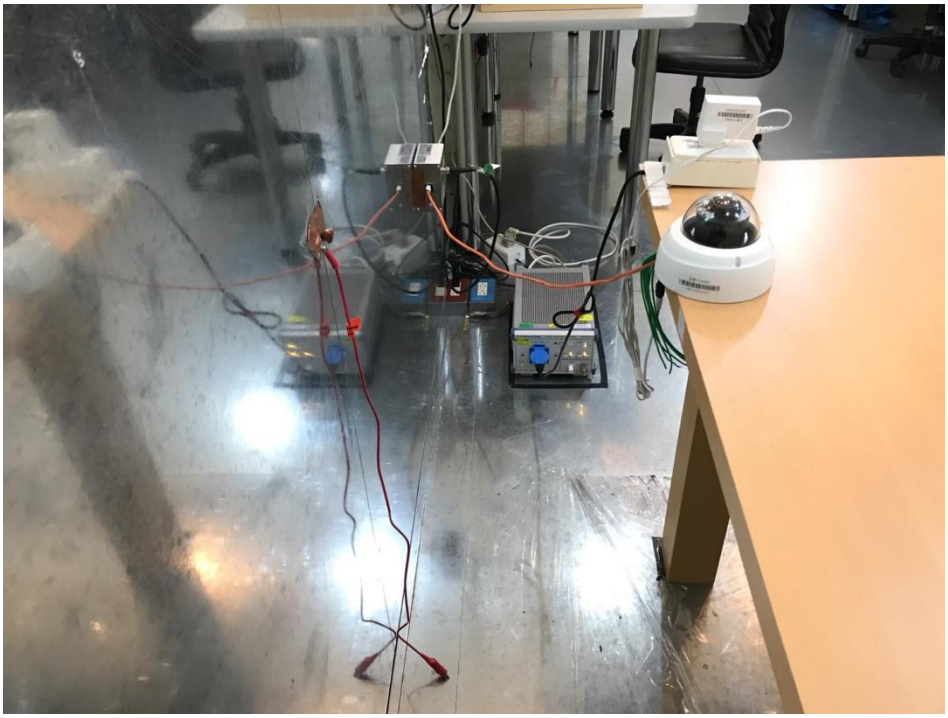


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4940	42.51	9.67	52.18	74.10	-21.92	peak
2	0.7420	43.81	9.61	53.42	74.00	-20.58	peak
3	1.4819	49.43	9.57	59.00	74.00	-15.00	peak
4	1.7260	45.27	9.55	54.82	74.00	-19.18	peak
5	2.2220	45.52	9.53	55.05	74.00	-18.95	peak
6	22.4660	49.29	9.65	58.94	74.00	-15.06	peak

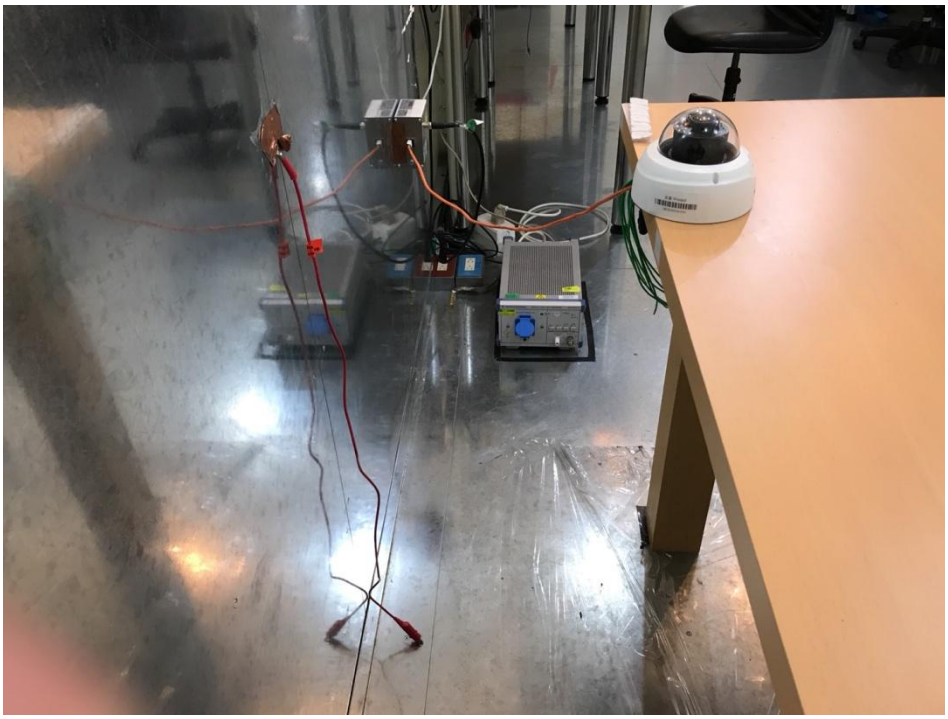
Remark: 1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of ISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value

4.2.7 Photographs of Test Configuration

Mode A



Mode B



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			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

Test Site: W03-OATS					
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	OATS cable 12m	EMCI	EMCCFD400-NM-NM-12000	CT-1-111	Aug. 15, 2017
4	OATS cable 24m	EMCI	EMCCFD400-NM-NM-24000	CT-1-112	Aug. 15, 2017
5	Preamplifier	EM Electronics Corporation	EM30265	CT-1-013	Jul. 20, 2017
6	Test Cable	HARBOUR	27478-RG400	CT-1-121	Aug. 15, 2017
7	EMI Test Receiver	Keysight	N9038A	CT-1-068(3)	Oct. 13, 2017
8	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.

Test Site: W06-966					
Item	**Equipment**	**Manufacturer**	**Model**	**Meter No.**	**Calibration Date**
1	Horn Antenna	Schwarzbeck	BBHA 9120D	CT-9-031	Oct. 26, 2017
2	Horn Antenna	Schwarzbeck	BBHA 9170	CT-9-032	Oct. 27, 2017
3	Bilog Antenna	Schwarzbeck	VULB 9168	CT-9-027-2	Nov. 02, 2017
4	Spectrum Analyzer	Keysight	N9010A	CT-1-093	Mar. 10, 2018
5	EMI Test Receiver	Keysight	N9038A	CT-9-029	Oct. 27, 2017
6	Preamplifier	EMEC	EMC330	CT-9-024	Oct. 20, 2017
7	Preamplifier	EMCI	EMC051845SE	CT-9-012	Oct. 23, 2017
8	Preamplifier	EMCI	EMC184045SE	CT-9-013	Oct. 23, 2017
9	Test Cable	EMEC	EM-CB400	CT-9-001-1	Oct. 20, 2017
10	Test Cable	EMEC	EM-CB400	CT-9-001-2	Oct. 20, 2017
11	Test Cable	EMEC	EM-CB400	CT-9-001-3	Oct. 20, 2017
12	Test Cable	HUBER+SUHNER	SF102	CT-9-002-1	Oct. 23, 2017
13	Test Cable	EMEC	EMC102-KM-KM-600	CT-9-020	Oct. 23, 2017
14	Test Cable	EMEC	EMC102-KM-KM-3000	CT-9-020-1	Oct. 23, 2017
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 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.

Blow 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.

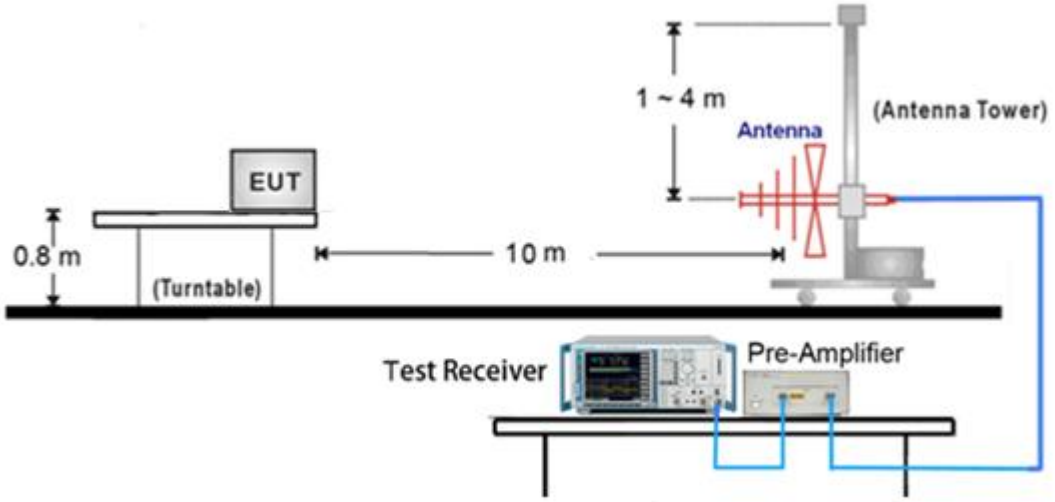
e. Emission frequency and amplitude were recorded, recording at least six highest emissions. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.3.4 Deviation from Test Standard

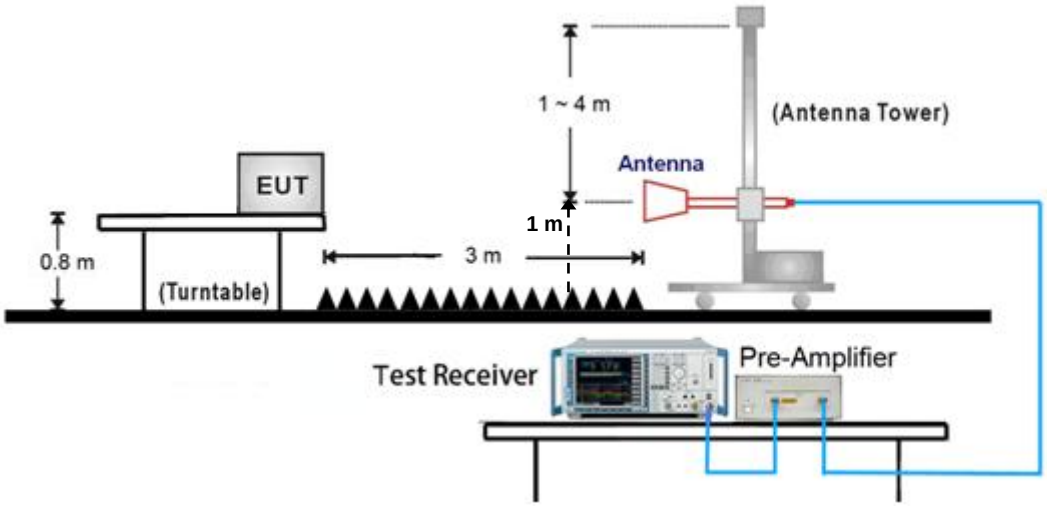
No deviation

4.3.5 Test Setup

< Radiated Emissions Frequency: 30 MHz to 1000 MHz >



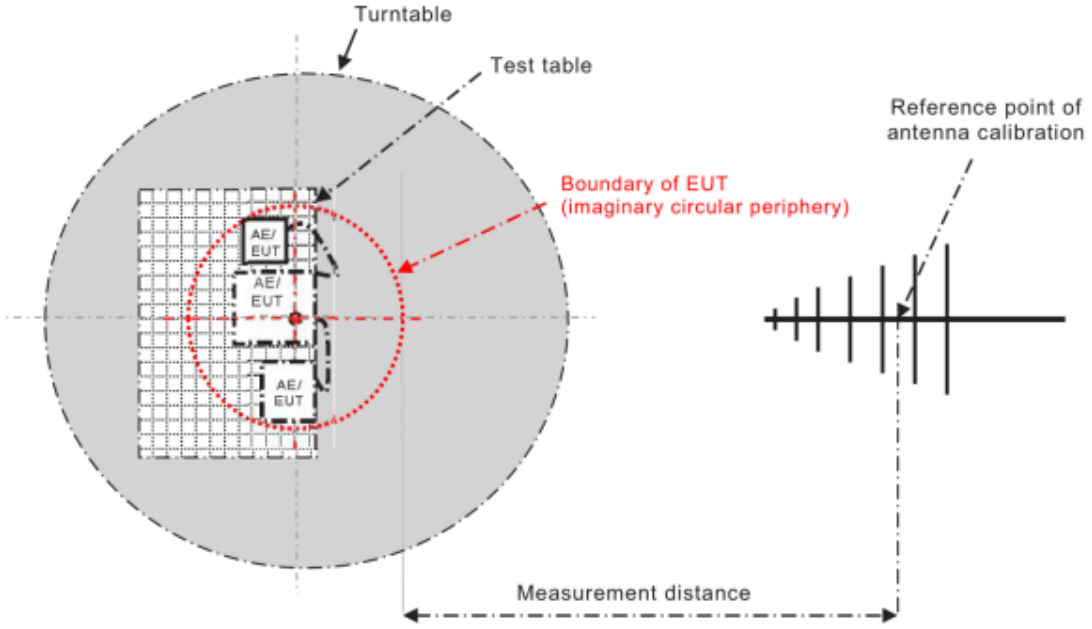
< Radiated Emissions Frequency: above 1GHz >

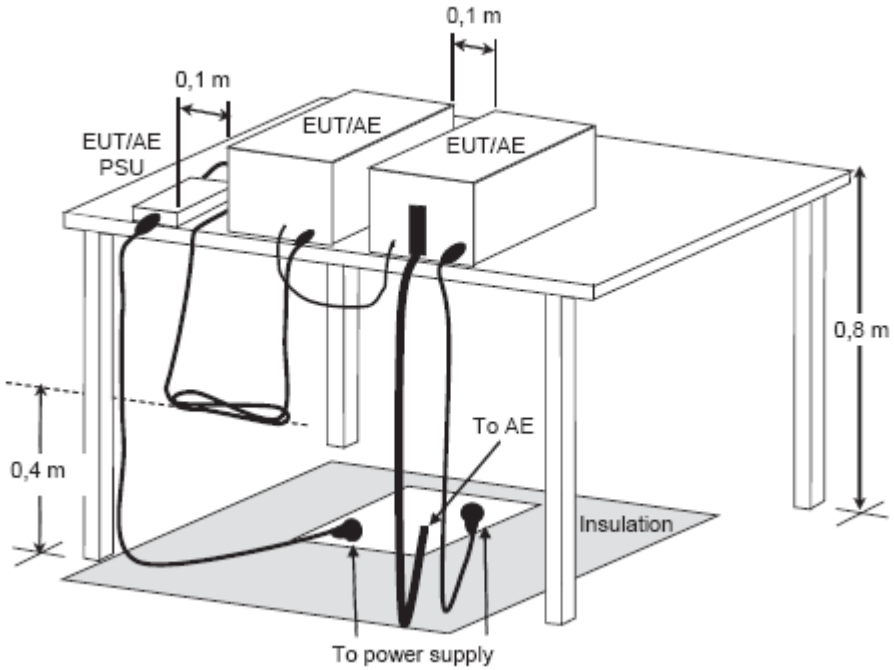


Note:

(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

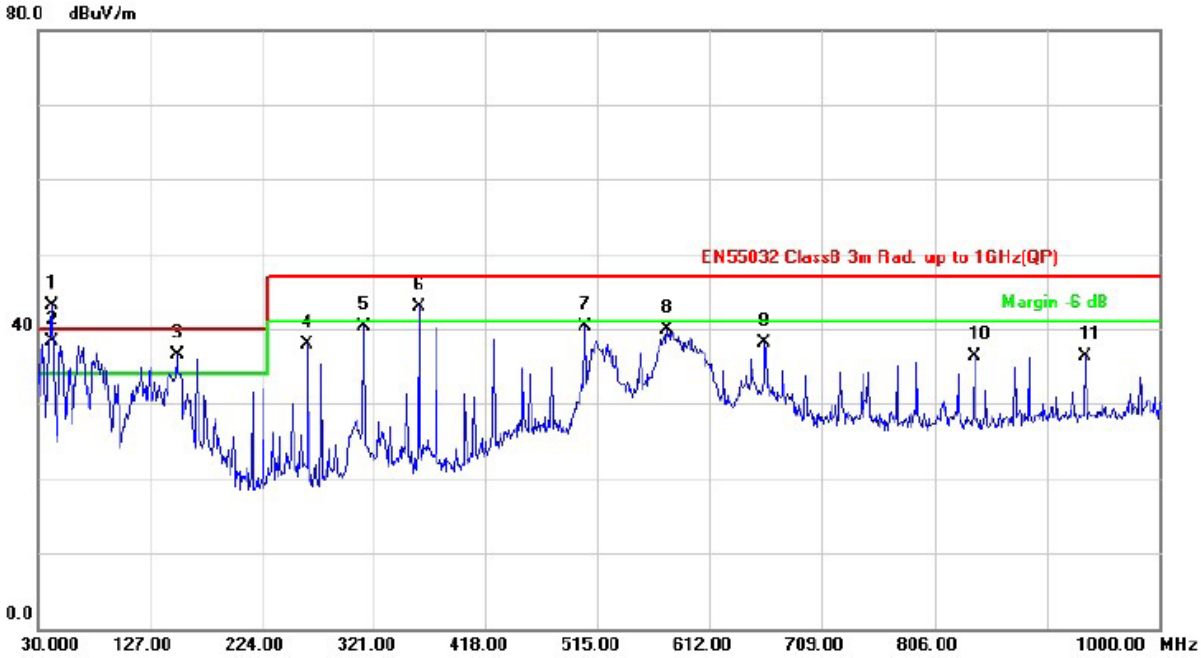
< EUT placement top view and measurement distance >





4.3.6 Test Result

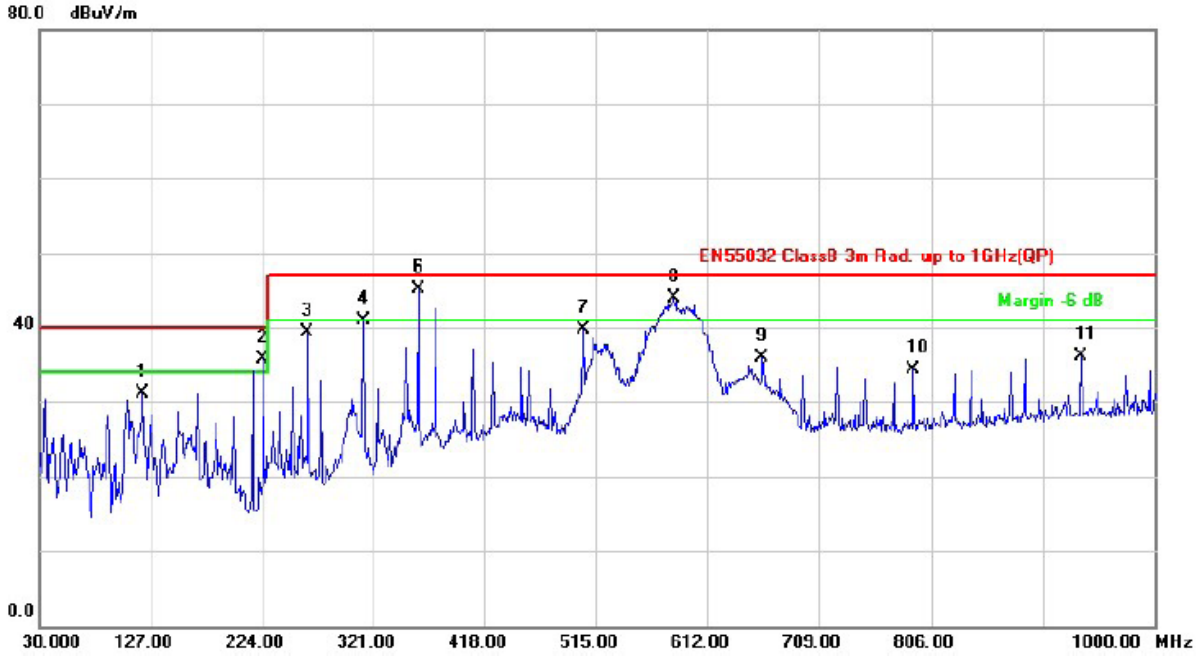
Test Voltage	230Vac, 50Hz	**Frequency Range**	30 – 1000 MHz
Environmental Conditions	20℃, 65% RH	**6dB Bandwidth**	120 kHz
Test Date	2018/03/21	**Test Distance**	3m
Tested by	Duncan Cheng	**Polarization**	Vertical
Test Site	W06	**Test Mode**	A



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	41.6400	52.58	-9.53	43.05	40.00	3.05	peak	100	352
2	41.6400	47.92	-9.53	38.39	40.00	-1.61	QP	100	352
3	150.2800	46.44	-9.86	36.58	40.00	-3.42	peak	100	198
4	263.7700	48.51	-10.65	37.86	47.00	-9.14	peak	100	294
5	312.2700	49.40	-9.14	40.26	47.00	-6.74	peak	100	120
6	359.8000	50.77	-7.87	42.90	47.00	-4.10	peak	150	211
7	504.3300	45.10	-4.71	40.39	47.00	-6.61	peak	100	188
8	575.1400	43.04	-3.19	39.85	47.00	-7.15	peak	100	110
9	659.5300	39.86	-1.85	38.01	47.00	-8.99	peak	100	52
10	839.9500	35.59	0.77	36.36	47.00	-10.64	peak	150	192
11	935.9800	34.22	2.15	36.37	47.00	-10.63	peak	100	198

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

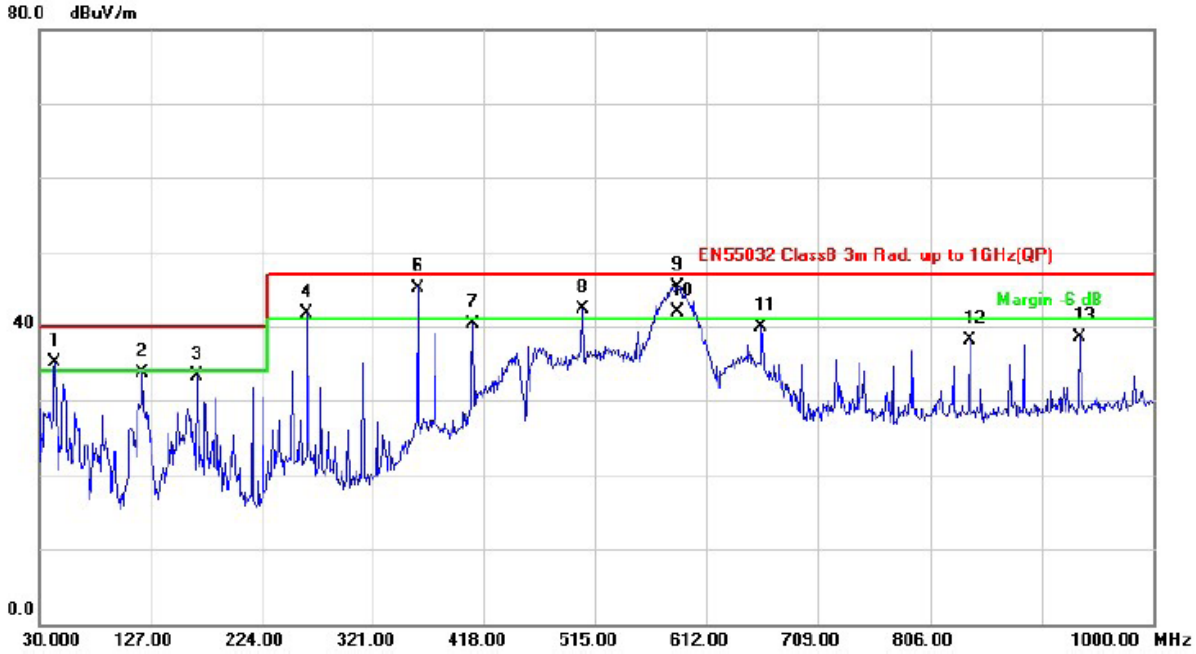
Test Voltage	230Vac, 50Hz	**Frequency Range**	30 – 1000 MHz
Environmental Conditions	20℃, 65% RH	**6dB Bandwidth**	120 kHz
Test Date	2018/03/21	**Test Distance**	3m
Tested by	Duncan Cheng	**Polarization**	Horizontal
Test Site	W06	**Test Mode**	A



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	120.2100	43.33	-12.15	31.18	40.00	-8.82	peak	254	0
2	224.9700	47.95	-12.22	35.73	40.00	-4.27	peak	150	219
3	263.7700	49.89	-10.65	39.24	47.00	-7.76	peak	100	211
4	312.2700	50.03	-9.14	40.89	47.00	-6.11	peak	100	86
5	359.8000	52.89	-7.87	45.02	47.00	-1.98	peak	100	105
6	359.8000	52.94	-7.87	45.07	47.00	-1.93	QP	100	105
7	504.3300	44.50	-4.71	39.79	47.00	-7.21	peak	100	18
8	582.9000	46.86	-2.98	43.88	47.00	-3.12	peak	100	183
9	659.5300	37.81	-1.85	35.96	47.00	-11.04	peak	150	199
10	791.4500	34.09	0.18	34.27	47.00	-12.73	peak	100	240
11	935.9800	33.90	2.15	36.05	47.00	-10.95	peak	150	161

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

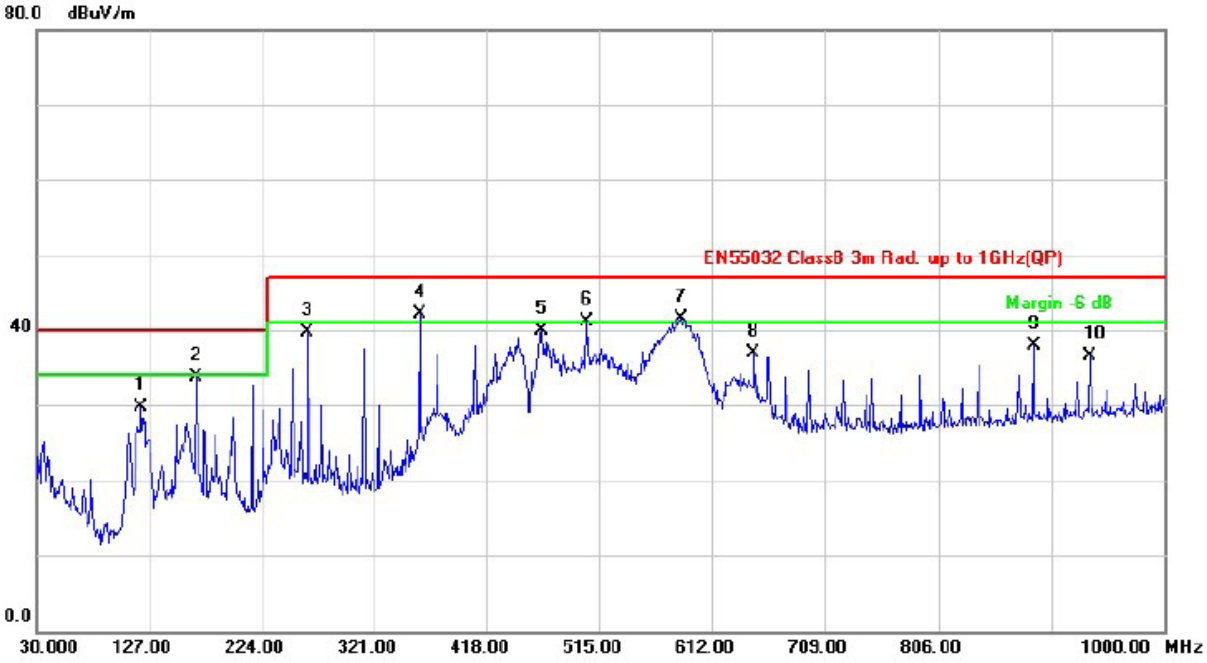
Test Voltage	48Vdc (POE Injector)	Frequency Range	30 – 1000 MHz
Environmental Conditions	20℃, 65% RH	6dB Bandwidth	120 kHz
Test Date	2018/03/21	Test Distance	3m
Tested by	Duncan Cheng	Polarization	Vertical
Test Site	W06	Test Mode	B



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	43.5800	44.58	-9.45	35.13	40.00	-4.87	peak	100	221
2	120.2100	45.82	-12.15	33.67	40.00	-6.33	peak	100	240
3	167.7400	43.40	-10.11	33.29	40.00	-6.71	peak	100	230
4	263.7700	52.32	-10.65	41.67	47.00	-5.33	peak	100	317
5	359.8000	53.07	-7.87	45.20	47.00	-1.80	peak	150	81
6	359.8000	52.98	-7.87	45.11	47.00	-1.89	QP	150	81
7	408.3000	46.99	-6.61	40.38	47.00	-6.62	peak	100	240
8	504.3300	46.94	-4.71	42.23	47.00	-4.77	peak	100	192
9	586.7800	48.17	-2.87	45.30	47.00	-1.70	peak	100	288
10	586.7800	44.85	-2.87	41.98	47.00	-5.02	QP	100	288
11	659.5300	41.83	-1.85	39.98	47.00	-7.02	peak	100	37
12	839.9500	37.38	0.77	38.15	47.00	-8.85	peak	150	186
13	935.9800	36.32	2.15	38.47	47.00	-8.53	peak	200	154

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

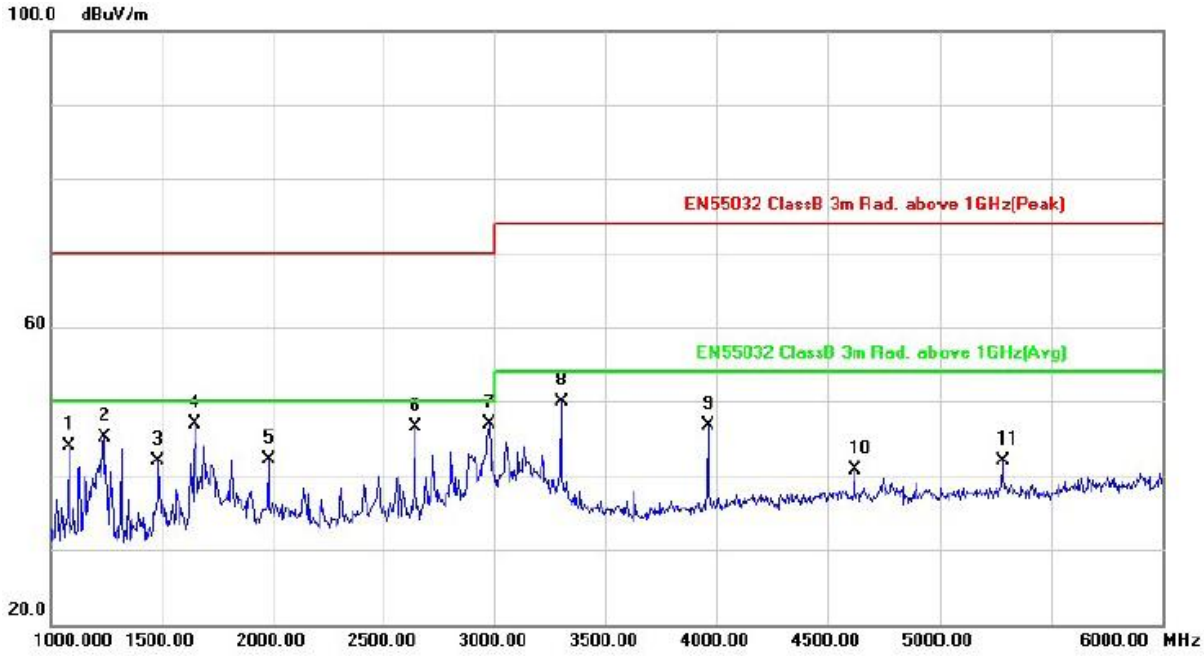
Test Voltage	48Vdc (POE Injector)	Frequency Range	30 – 1000 MHz
Environmental Conditions	20℃, 65% RH	6dB Bandwidth	120 kHz
Test Date	2018/03/21	Test Distance	3m
Tested by	Duncan Cheng	Polarization	Horizontal
Test Site	W06	Test Mode	B



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	120.2100	41.79	-12.15	29.64	40.00	-10.36	peak	200	192
2	167.7400	43.87	-10.11	33.76	40.00	-6.24	peak	200	173
3	263.7700	50.38	-10.65	39.73	47.00	-7.27	peak	100	220
4	359.8000	49.90	-7.87	42.03	47.00	-4.97	peak	100	307
5	465.5300	45.30	-5.37	39.93	47.00	-7.07	peak	200	241
6	503.3600	45.81	-4.73	41.08	47.00	-5.92	peak	200	241
7	585.8100	44.49	-2.90	41.59	47.00	-5.41	peak	150	130
8	647.8900	38.98	-2.03	36.95	47.00	-10.05	peak	150	284
9	887.4800	36.49	1.42	37.91	47.00	-9.09	peak	100	173
10	935.9800	34.29	2.15	36.44	47.00	-10.56	peak	150	158

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

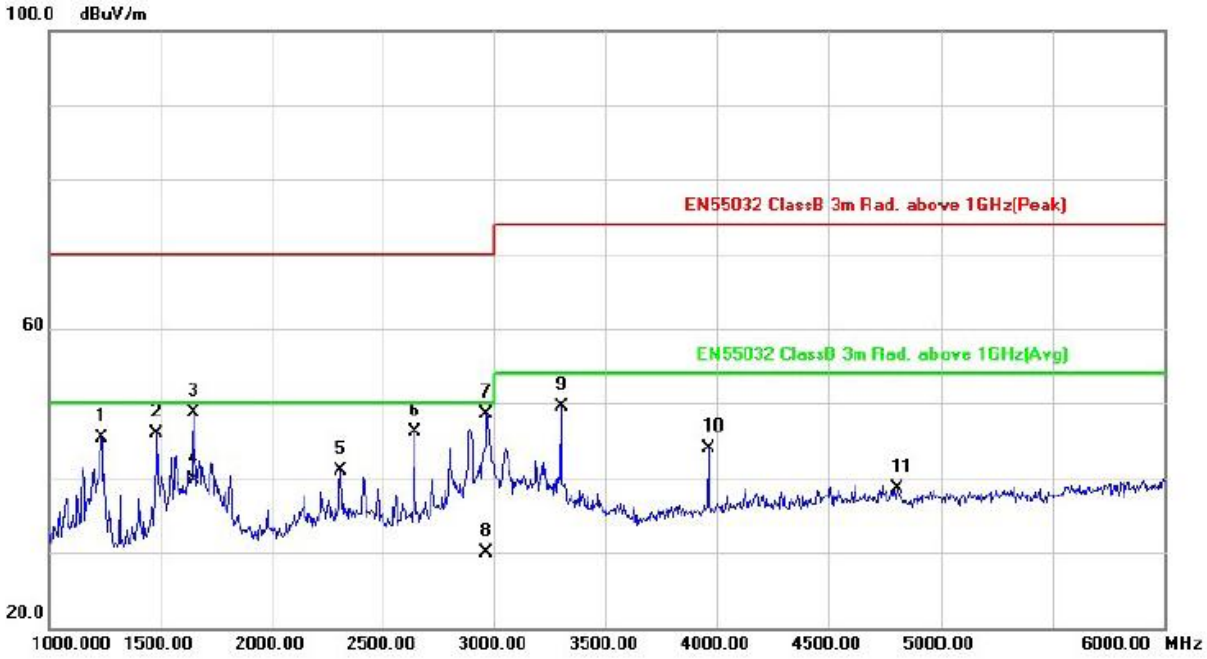
Test Voltage	230Vac, 50Hz	**Frequency Range**	1 – 6GHz
Environmental Conditions	20℃, 65% RH	**6dB Bandwidth**	1MHz
Test Date	2018/03/21	**Test Distance**	3m
Tested by	Duncan Cheng	**Polarization**	Vertical
Test Site	W06	**Test Mode**	A



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	1080.000	66.05	-22.21	43.84	70.00	-26.16	peak	100	182
2	1240.000	66.89	-21.70	45.19	70.00	-24.81	peak	100	201
3	1485.000	62.85	-20.94	41.91	70.00	-28.09	peak	100	334
4	1650.000	67.49	-20.55	46.94	70.00	-23.06	peak	100	173
5	1980.000	61.95	-19.80	42.15	70.00	-27.85	peak	100	239
6	2640.000	63.55	-16.96	46.59	70.00	-23.41	peak	100	51
7	2975.000	62.39	-15.56	46.83	70.00	-23.17	peak	100	353
8	3300.000	65.56	-15.63	49.93	74.00	-24.07	peak	100	220
9	3960.000	60.25	-13.56	46.69	74.00	-27.31	peak	100	230
10	4620.000	52.44	-11.72	40.72	74.00	-33.28	peak	100	145
11	5280.000	53.03	-11.03	42.00	74.00	-32.00	peak	100	125

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

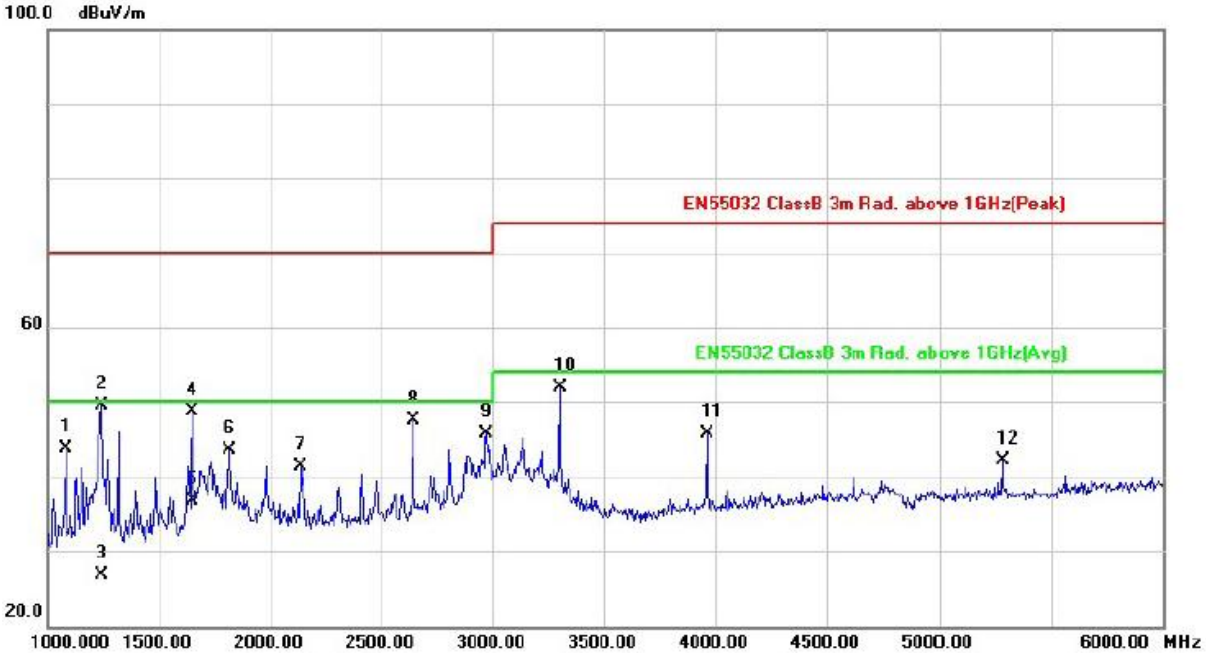
Test Voltage	230Vac, 50Hz	Frequency Range	1 – 6GHz
Environmental Conditions	20℃, 65% RH	6dB Bandwidth	1MHz
Test Date	2018/03/21	Test Distance	3m
Tested by	Duncan Cheng	Polarization	Horizontal
Test Site	W06	Test Mode	A



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	1235.000	67.03	-21.72	45.31	70.00	-24.69	peak	100	308
2	1485.000	66.75	-20.94	45.81	70.00	-24.19	peak	100	175
3	1650.000	69.23	-20.55	48.68	70.00	-21.32	peak	100	213
4	1650.000	60.28	-20.55	39.73	50.00	-10.27	AVG	100	213
5	2310.000	59.21	-18.38	40.83	70.00	-29.17	peak	100	241
6	2640.000	63.13	-16.96	46.17	70.00	-23.83	peak	100	355
7	2965.000	64.09	-15.62	48.47	70.00	-21.53	peak	100	89
8	2965.000	45.44	-15.62	29.82	50.00	-20.18	AVG	100	89
9	3300.000	65.14	-15.63	49.51	74.00	-24.49	peak	100	203
10	3960.000	57.43	-13.56	43.87	74.00	-30.13	peak	100	213
11	4810.000	50.07	-11.56	38.51	74.00	-35.49	peak	100	156

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

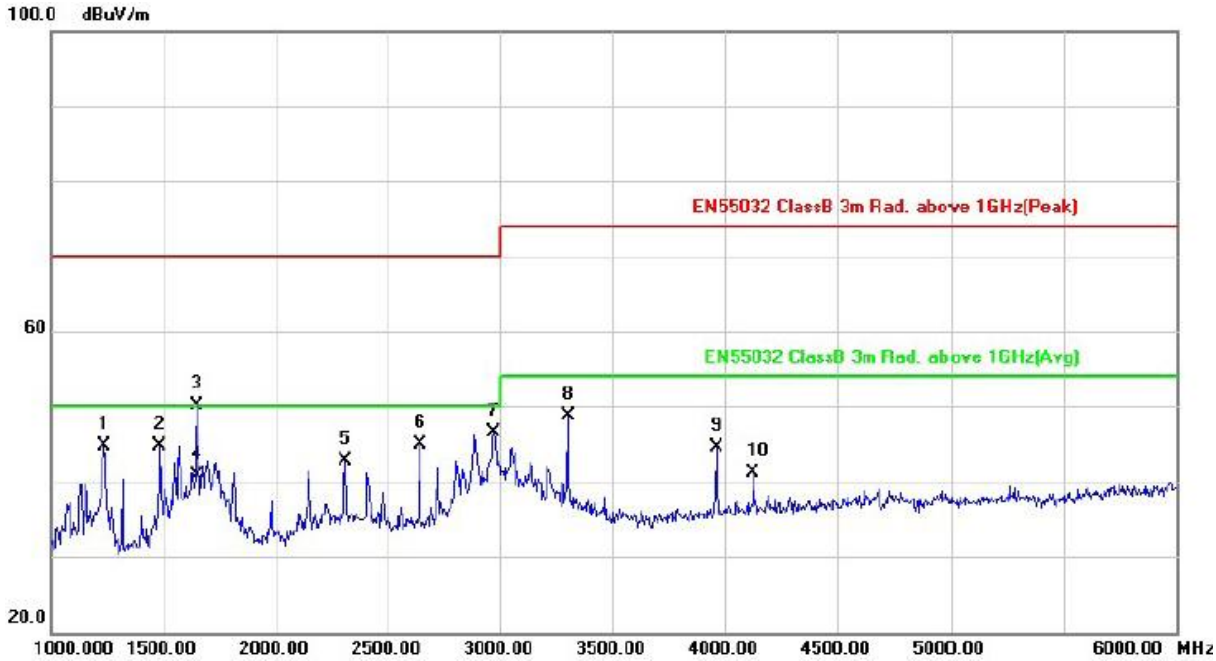
Test Voltage	48Vdc (POE Injector)	Frequency Range	1 – 6GHz
Environmental Conditions	20℃, 65% RH	6dB Bandwidth	1MHz
Test Date	2018/03/21	Test Distance	3m
Tested by	Duncan Cheng	Polarization	Vertical
Test Site	W06	Test Mode	B



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	1080.000	65.93	-22.21	43.72	70.00	-26.28	peak	100	145
2	1245.000	71.22	-21.69	49.53	70.00	-20.47	peak	100	79
3	1245.000	48.41	-21.69	26.72	50.00	-23.28	AVG	100	79
4	1650.000	69.31	-20.55	48.76	70.00	-21.24	peak	100	136
5	1650.000	57.17	-20.55	36.62	50.00	-13.38	AVG	100	136
6	1815.000	63.64	-20.19	43.45	70.00	-26.55	peak	100	126
7	2135.000	60.41	-19.16	41.25	70.00	-28.75	peak	100	212
8	2640.000	64.52	-16.96	47.56	70.00	-22.44	peak	100	51
9	2970.000	61.22	-15.59	45.63	70.00	-24.37	peak	100	355
10	3300.000	67.52	-15.63	51.89	74.00	-22.11	peak	100	221
11	3960.000	59.35	-13.56	45.79	74.00	-28.21	peak	100	260
12	5280.000	53.20	-11.03	42.17	74.00	-31.83	peak	100	203

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	48Vdc (POE Injector)	Frequency Range	1 – 6GHz
Environmental Conditions	20℃, 65% RH	6dB Bandwidth	1MHz
Test Date	2018/03/21	Test Distance	3m
Tested by	Duncan Cheng	Polarization	Horizontal
Test Site	W06	Test Mode	B



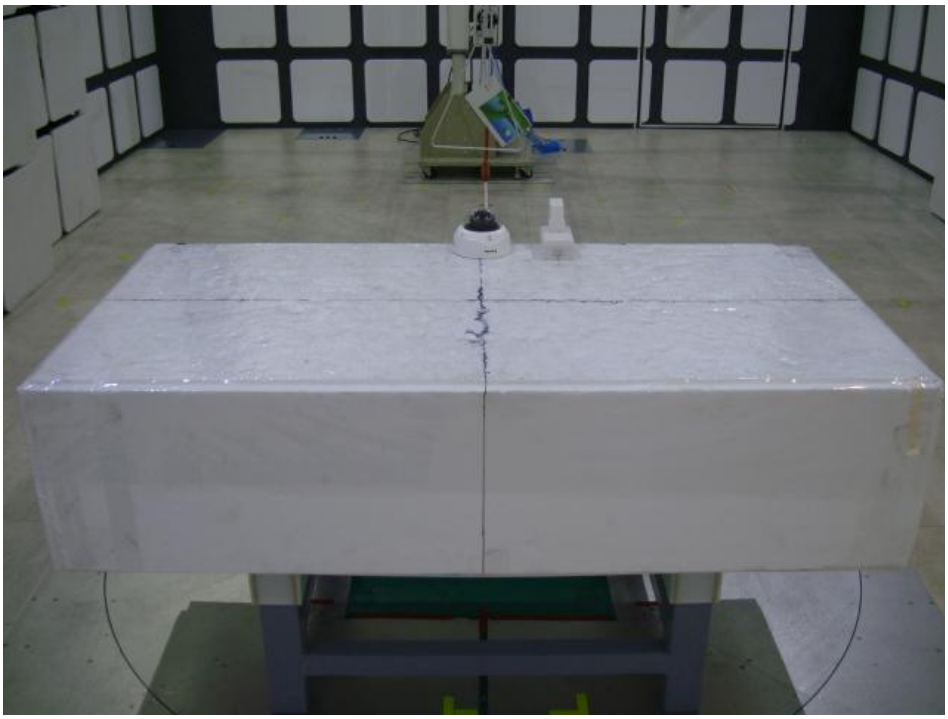
No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1235.000	66.49	-21.72	44.77	70.00	-25.23	peak	100	263
2	1485.000	65.66	-20.94	44.72	70.00	-25.28	peak	100	186
3	1650.000	70.65	-20.55	50.10	70.00	-19.90	peak	100	205
4	1650.000	61.20	-20.55	40.65	50.00	-9.35	AVG	100	205
5	2310.000	61.01	-18.38	42.63	70.00	-27.37	peak	100	235
6	2640.000	61.94	-16.96	44.98	70.00	-25.02	peak	100	349
7	2970.000	62.15	-15.59	46.56	70.00	-23.44	peak	100	100
8	3300.000	64.24	-15.63	48.61	74.00	-25.39	peak	100	205
9	3960.000	58.06	-13.56	44.50	74.00	-29.50	peak	100	215
10	4125.000	54.13	-13.00	41.13	74.00	-32.87	peak	100	215

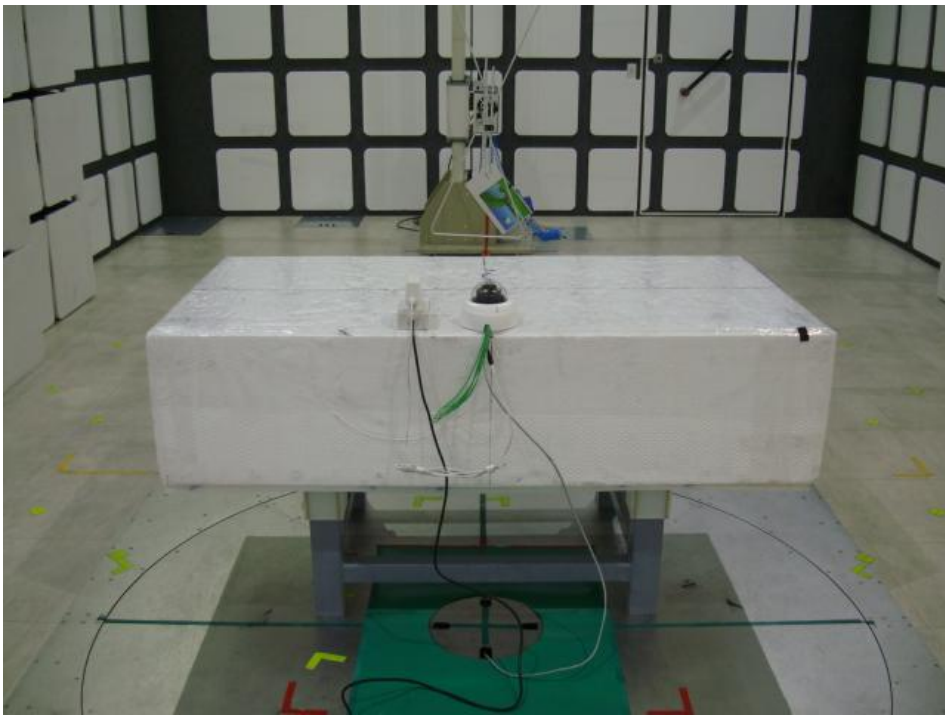
Remark: 1. peak = Peak, AVG = Average
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value

4.3.7 Photographs of Test Configuration

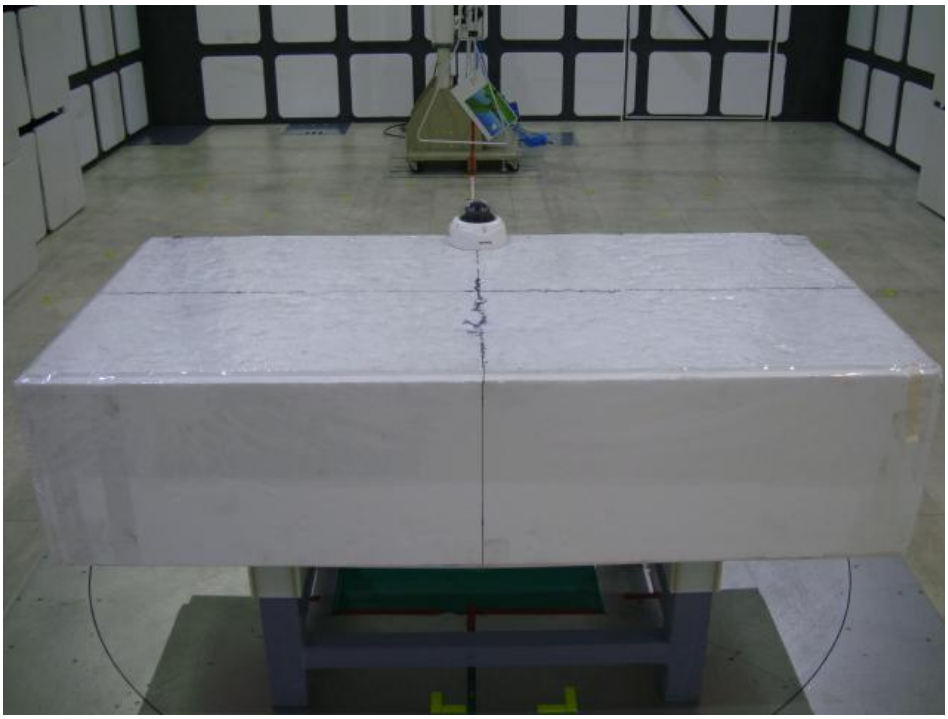
Radiated Emission Test (30MHz~1GHz)

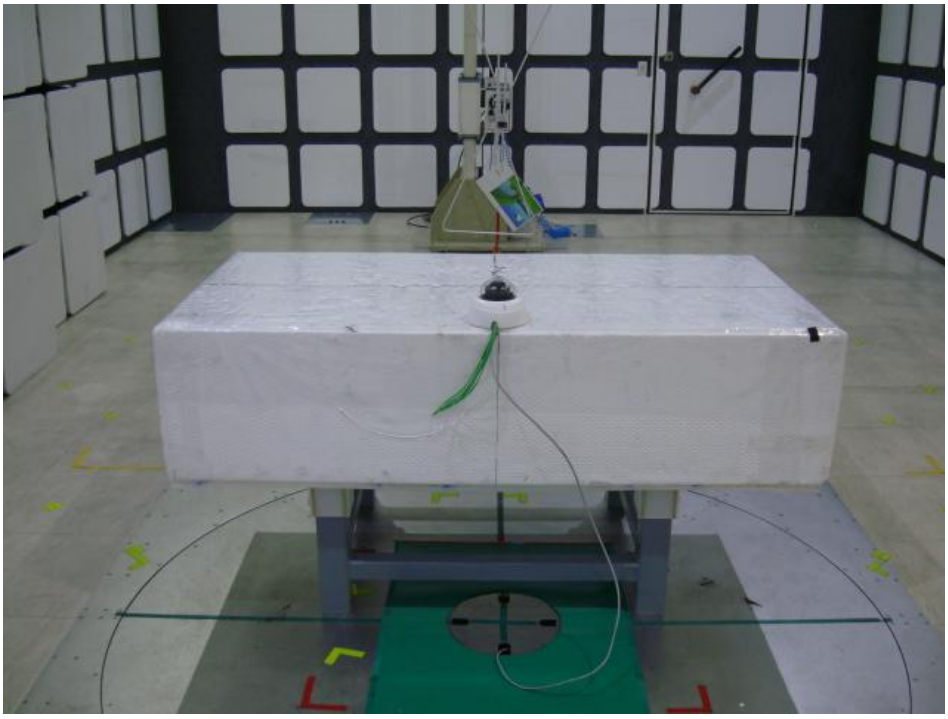
Mode A





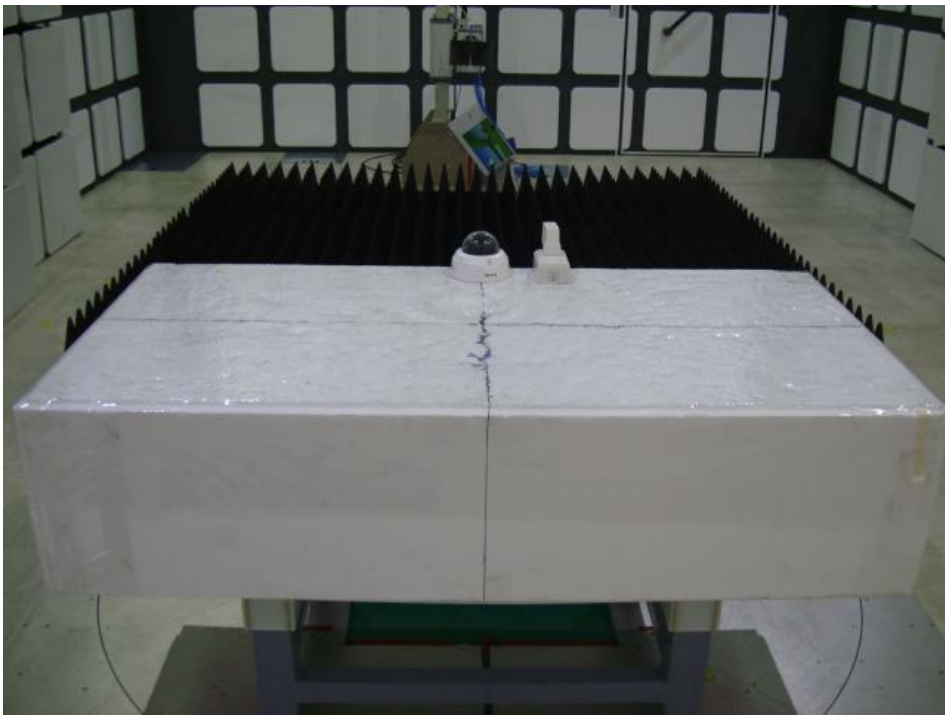
Mode B

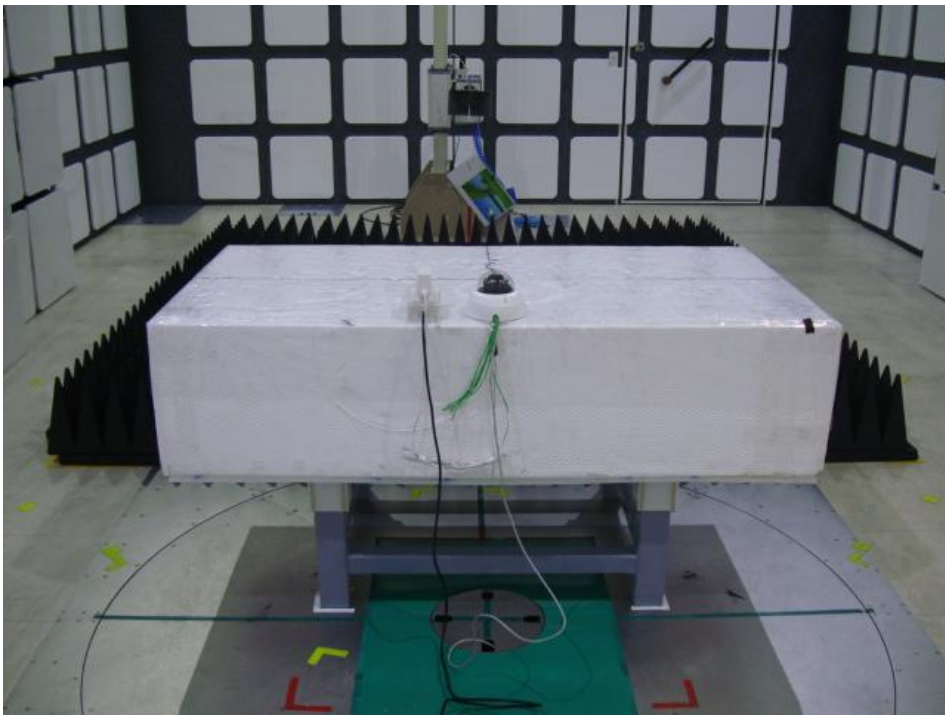




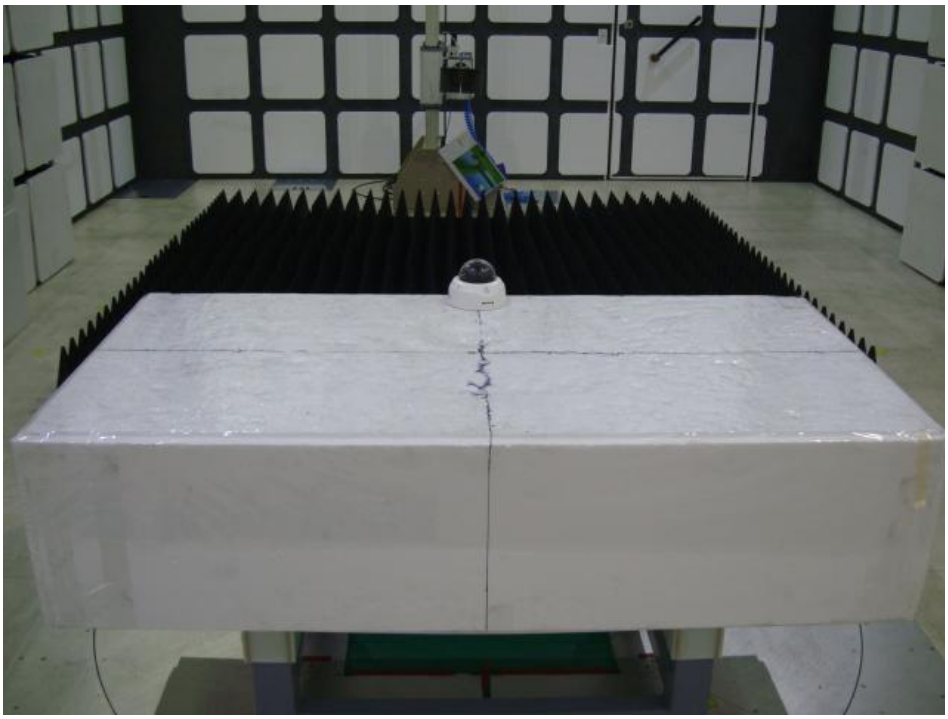
Radiated Emission Test (Above 1GHz)

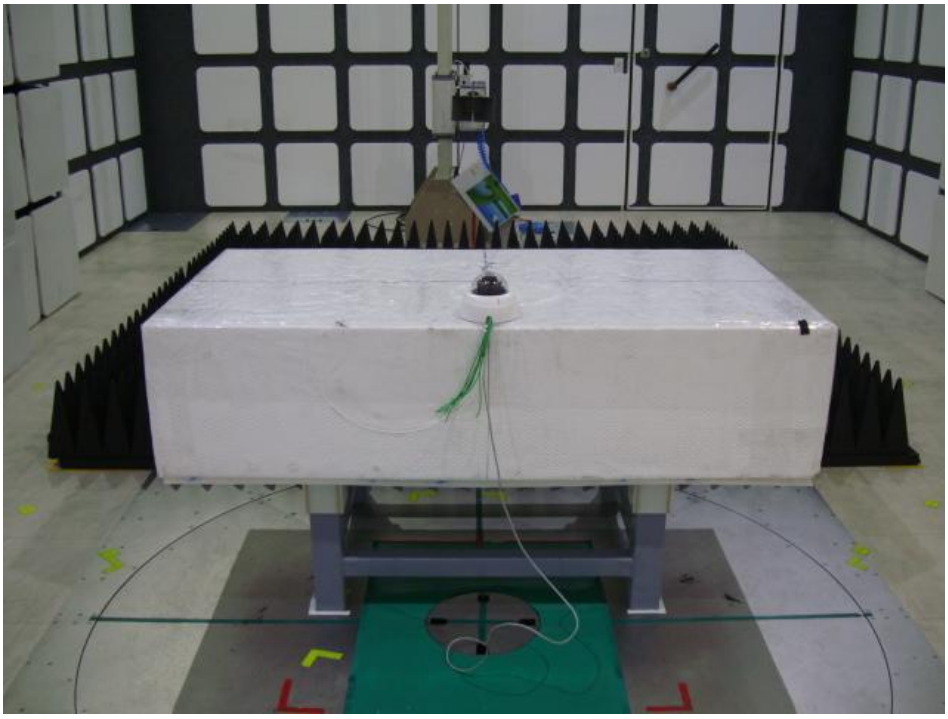
Mode A





Mode B





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)	Jul. 26, 2017
2	Power Source	EMC PARTNER	PS3-1	CT-1-090a1	Jul. 26, 2017

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;

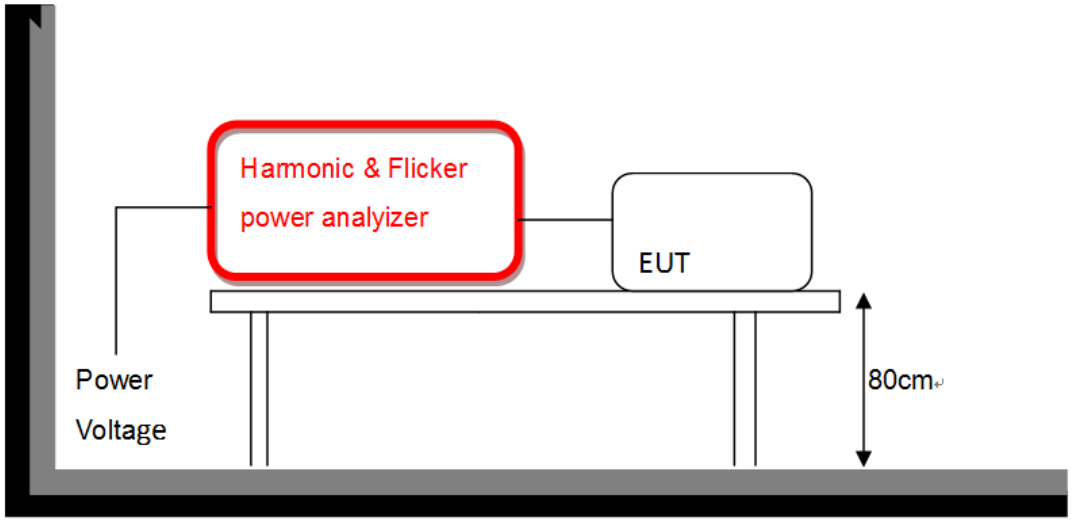
Class D:
Equipment having a specified power according to 6.2.2 less than or equal to 600W, of the following types:

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

4.4.4 Deviation from Test Standard

No deviation

4.4.5 Test Setup

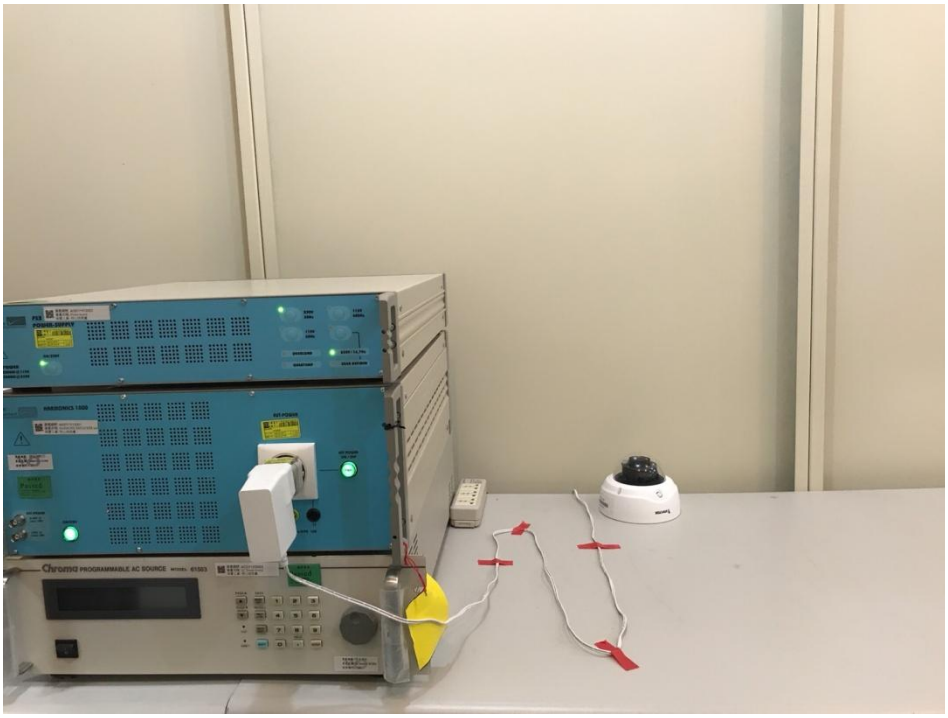


4.4.6 Test Result

Supply Voltage / Ampere	229.5 Vrms / 0.044 Arms	**Test Date**	2018/03/23
Test Duration	5 min	**Power Consumption**	3.301W
Power Frequency	49.935Hz	**Power Factor**	0.327
Environmental Conditions	23℃, 51% RH	**Tested by**	Justin Lee
Test Mode	A		

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)	Jul. 26, 2017
2	Power Source	EMC PARTNER	PS3-1	CT-1-090a1	Jul. 26, 2017

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

4.5.3 Test Procedure

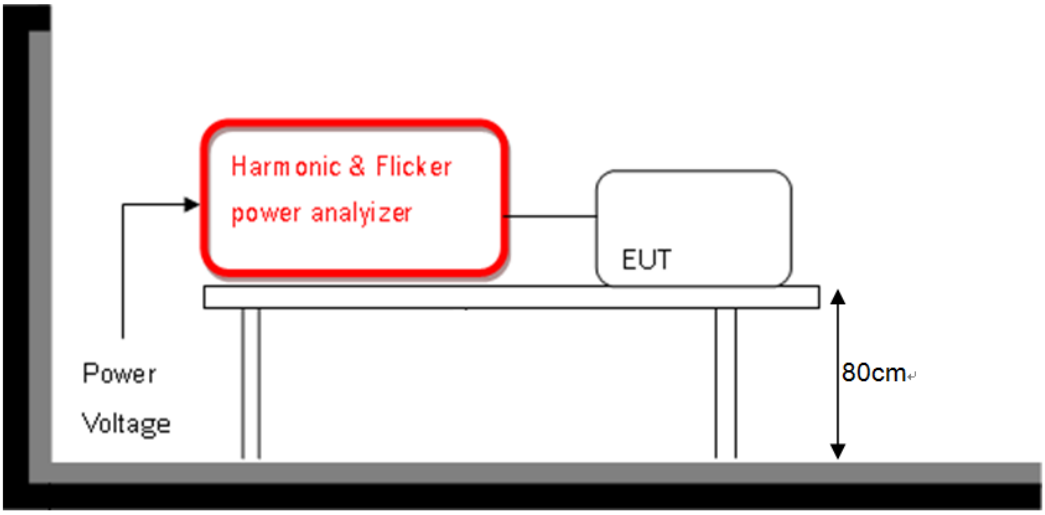
The EUT was placed on the top of a wooden table 0.8 meter above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating condition.

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



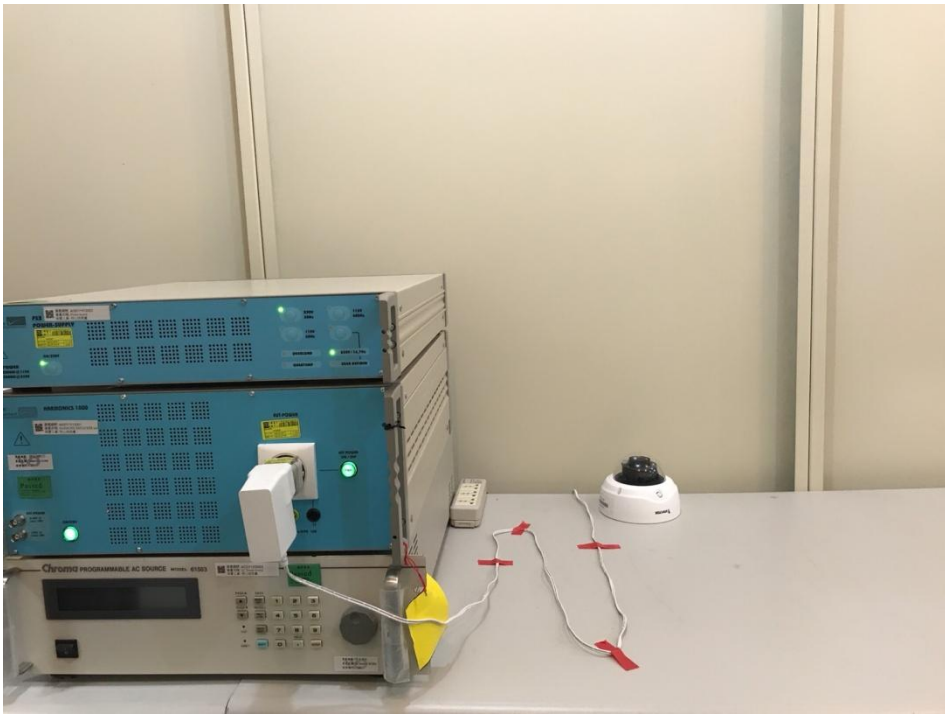
4.5.6 Test Result

Supply Voltage / Ampere	229.5 Vrms / 0.041 Arms	Test Date	2018/03/23
Observation (Tp)	30 min	Environmental Conditions	23℃, 51% RH
Power Frequency	49.935Hz	Tested by	Justin Lee
Test Mode	A		

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

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.

EUT Operating Condition

Where a relevant European product performance standard (EN) exists, which defines suitable operating condition(s) during environment or EMC tests, the operating condition(s) of the EUT, during the test conditions, shall be as defines in that standard.

Where no relevant European product performance standard (EN) exists, the operating condition(s) of the EUT, during the test conditioning, shall include at least that corresponding to main functional mode (appropriate to the being undertaken) of the system, which it form part of. (e.g. corresponding to the “set” mode, for an intruder alarm system during a radiated immunity test).

EUT Functional test

The variety and the diversity of the equipment within the scope of this standard makes it difficult to define a precise functional test for evaluation of the EUT performance:

Where a relevant European product performance standard (EN) exists, which defines suitable operating condition(s) during environment or EMC tests, the operating condition(s) of the EUT, during the test conditions, shall be as defines in that standard.

Where no relevant European product performance standard (EN) exists, the functional test shall be at least a test or measurement of the main function(s) of the equipment. The acceptance criteria for this functional test shall be that there is no change in functioning of the equipment and no signification change in any measurement (e.g. sensitivity of a detector), which shall also remain within specification.

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	Jul. 13, 2017
2	Digital Thermo-Hygro Meter	N/A	HTC-8	CT-2-047	Mar. 24, 2018
3	Atmosphere pressure meter	Mingle	BKT381	CT-2-091	Aug. 09, 2017

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.

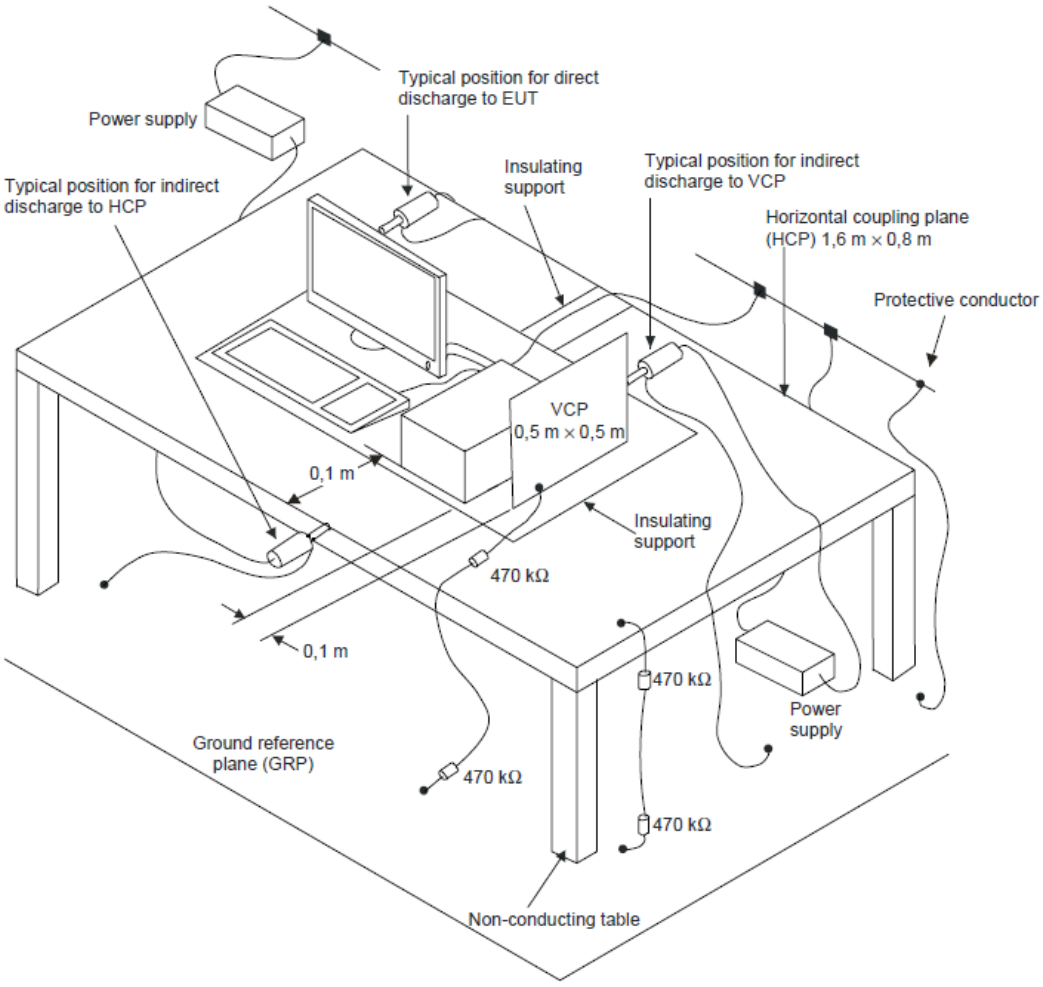
b. Air discharge at apertures and slots and insulating surface:

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 or 48Vdc	**Test Date**	2018/03/28
Environmental Conditions	23℃, 51% RH	**Pressure**	1010 mbar
Tested by	Justin Lee	**Test Mode**	A & B

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	A	A	A
Right	A	A	A	A
Top	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	
Top	A	A
Bottom	A	A
Other	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

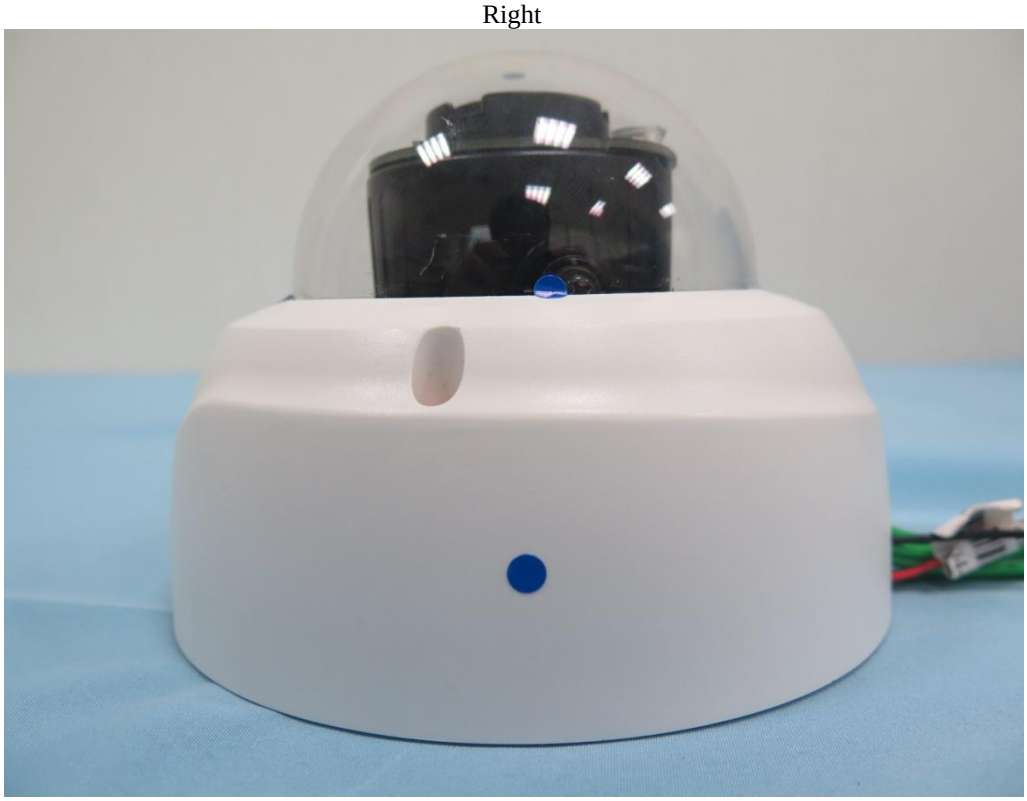
Front

Back

*Red Dot - Contact Discharged
Blue Dot - Air Discharged

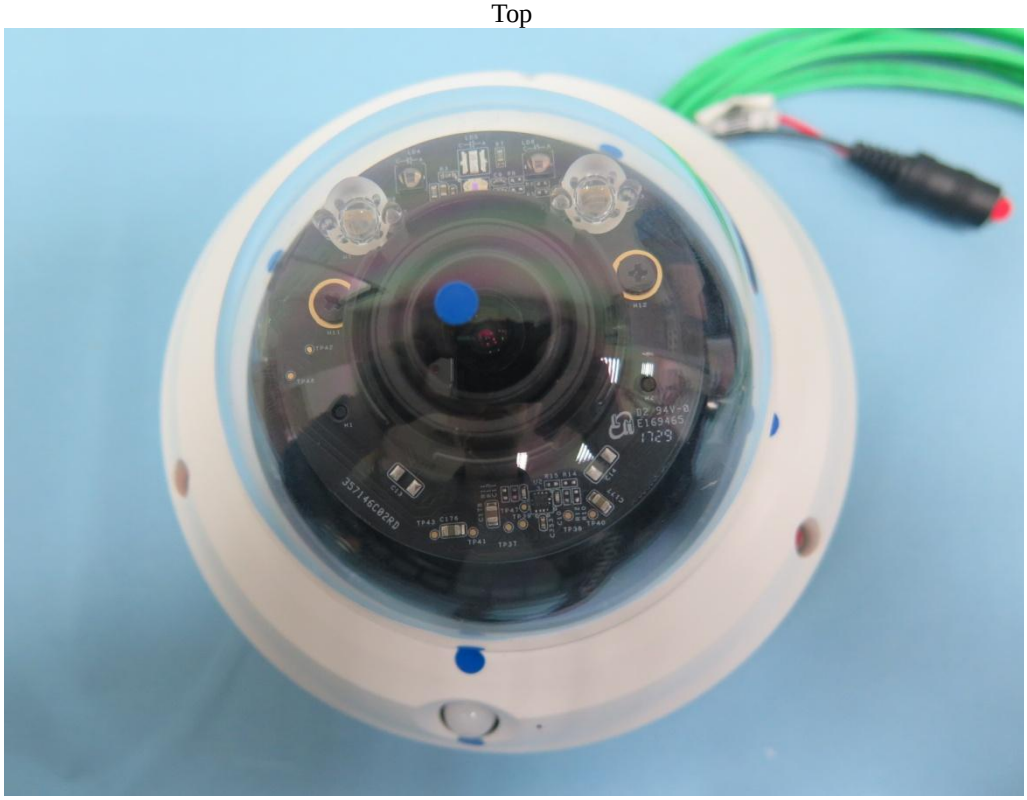
Left

Right



*Red Dot - Contact Discharged
Blue Dot - Air Discharged

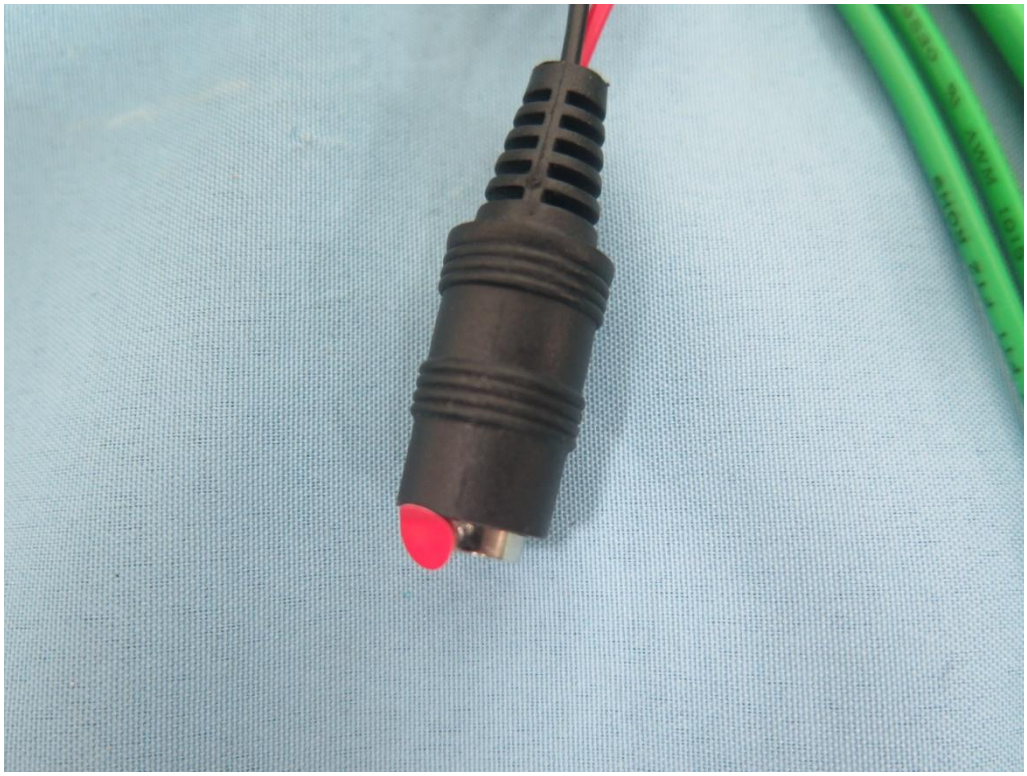
Top



Bottom

*Red Dot - Contact Discharged
Blue Dot - Air Discharged

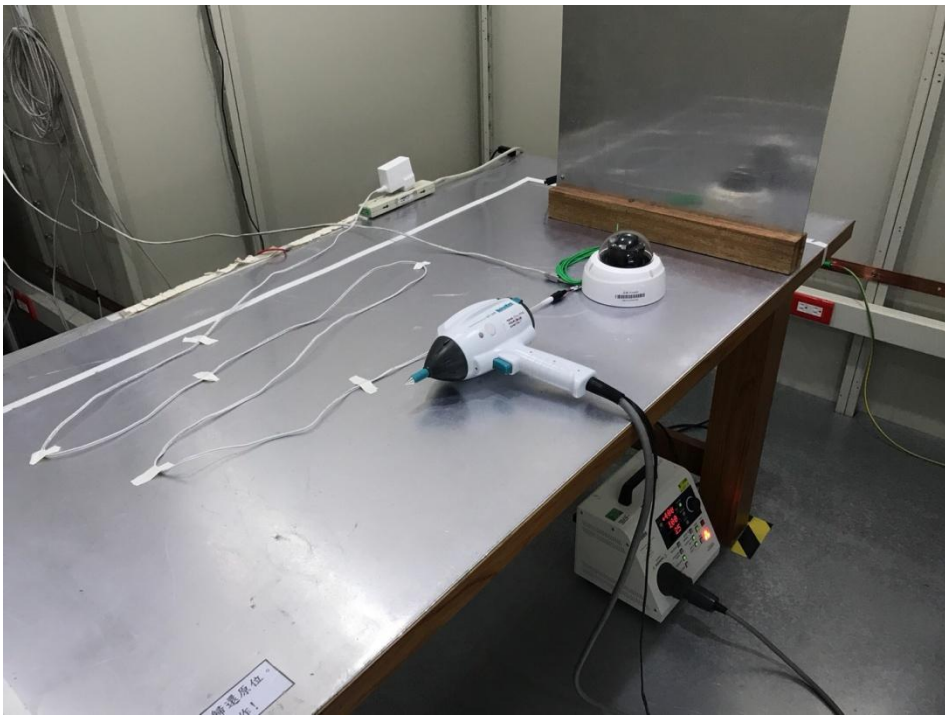
Other



*Red Dot - Contact Discharged
Blue Dot - Air Discharged

5.3.7 Photographs of Test Configuration

Mode A



Mode B

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	Jul. 27, 2017
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. 15, 2017
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.

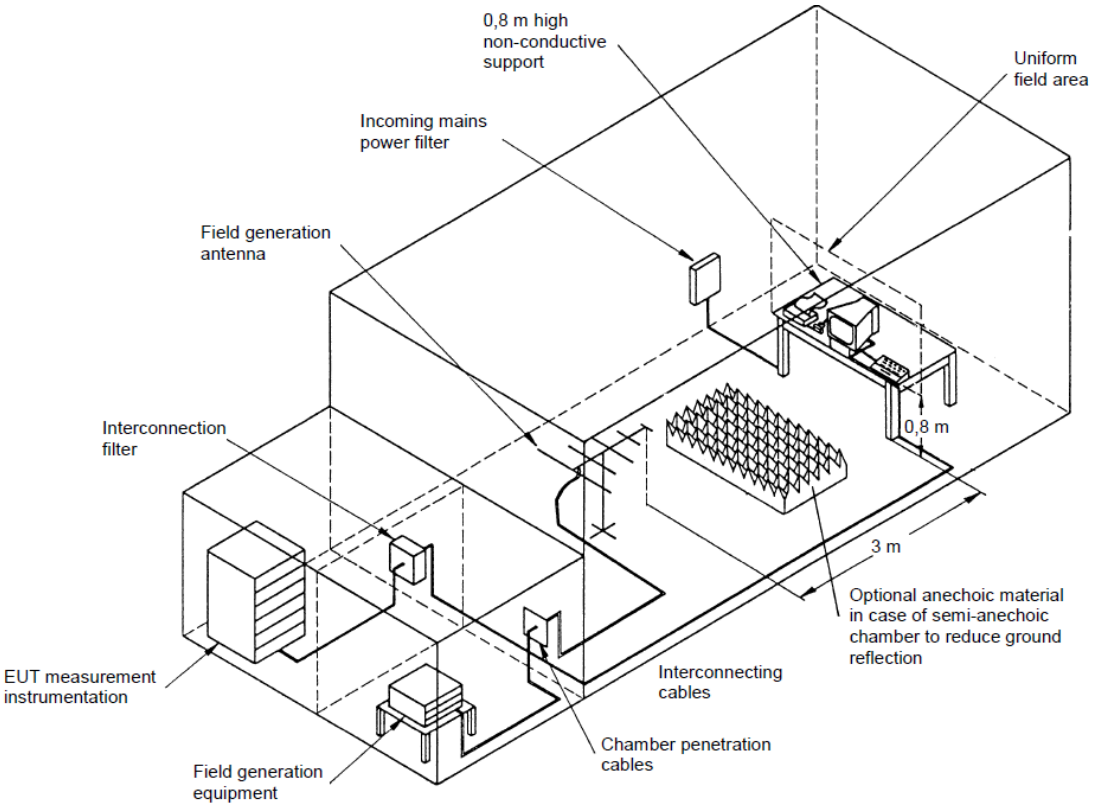
In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.
All the scanning conditions are as follows:

	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 or 48Vdc	Environmental Conditions	23℃, 51% RH
Tested by	Justin Lee	Test Date	2018/03/28
Test Mode	A & B		

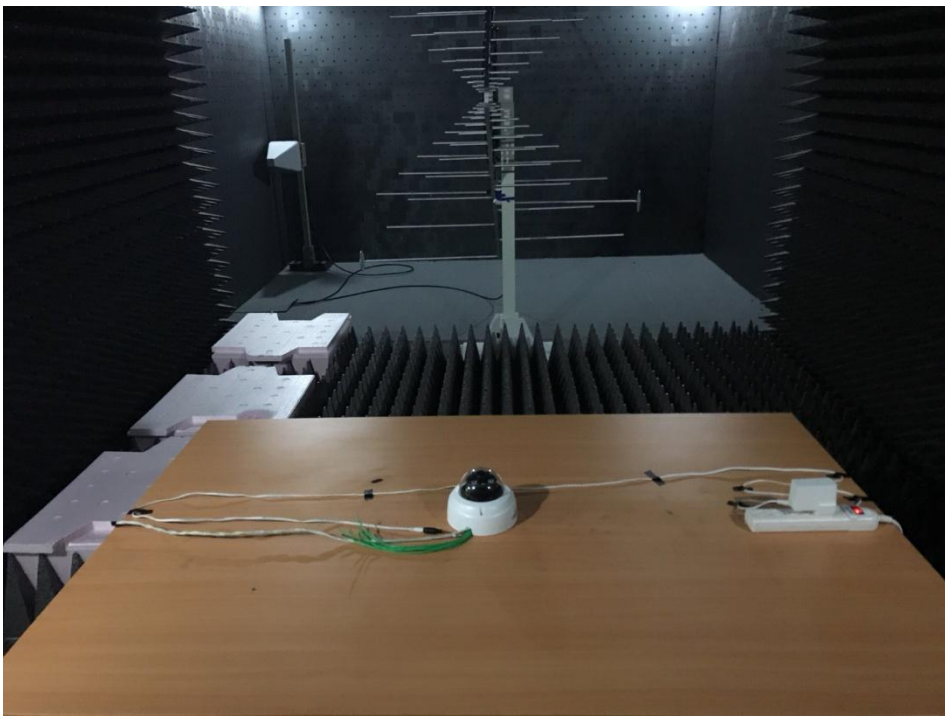
Frequency Range (MHz)	Azimuth	Polarity	Field Strength (V/m)	Modulation	Result
80-1000	0	H/V	3	80% AM (1kHz)	A
80-1000	90	H/V	3	80% AM (1kHz)	A
80-1000	180	H/V	3	80% AM (1kHz)	A
80-1000	270	H/V	3	80% AM (1kHz)	A
80-1000	Top	H/V	3	80% AM (1kHz)	A
80-1000	Bottom	H/V	3	80% AM (1kHz)	A

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

5.4.7 Photographs of Test Configuration

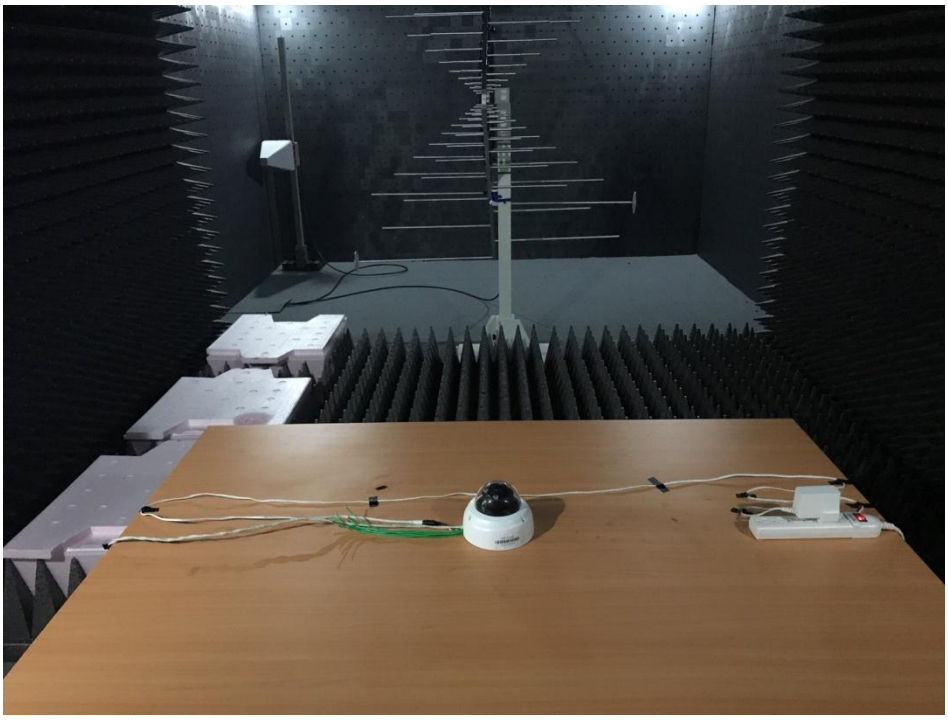
Mode A

Front

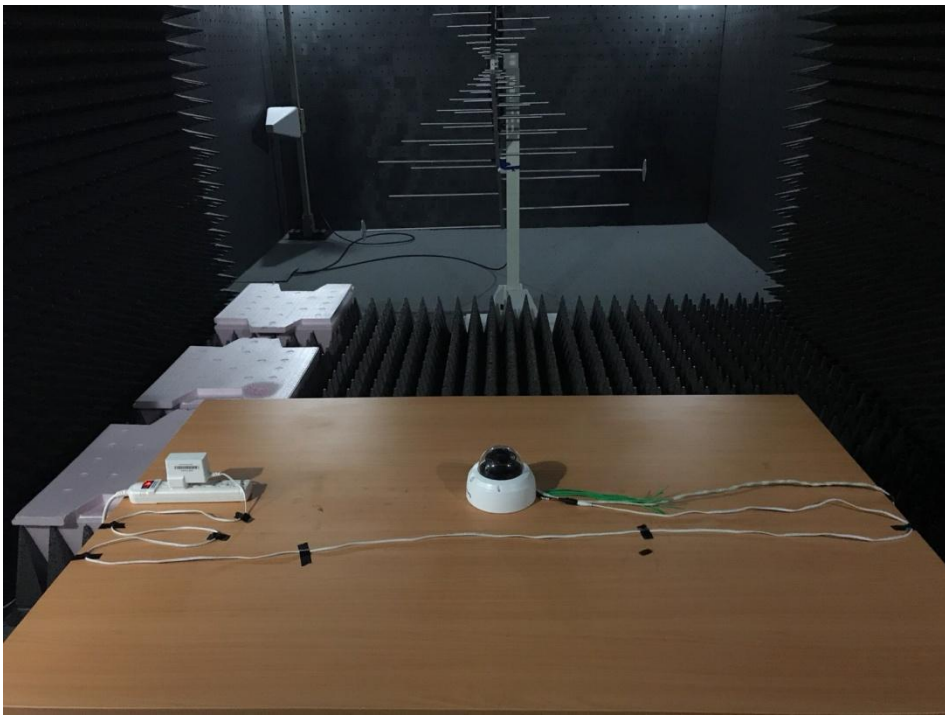


Back

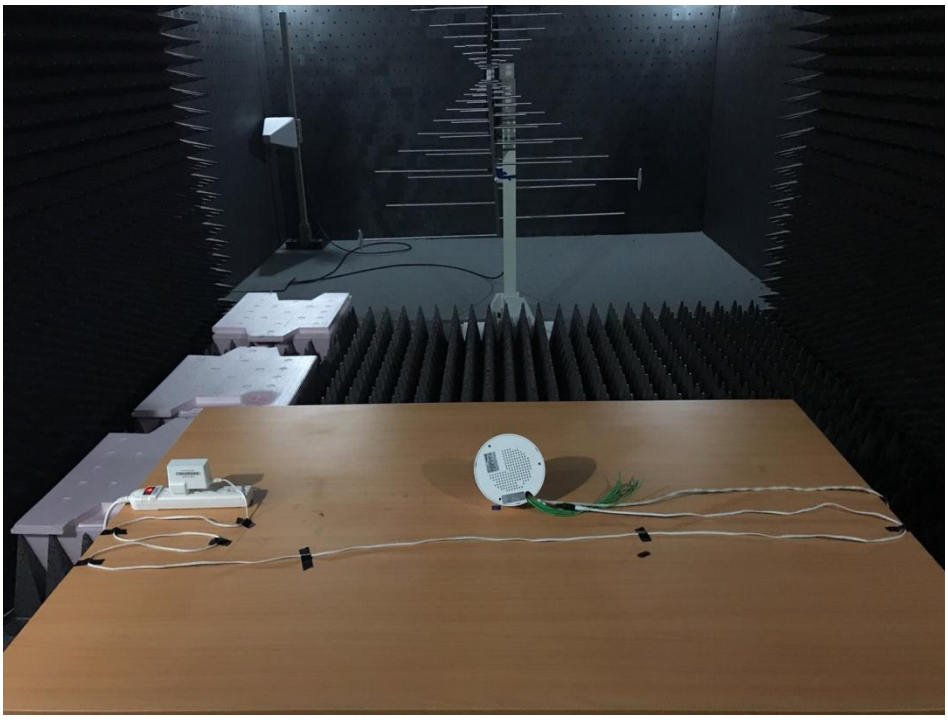
Left



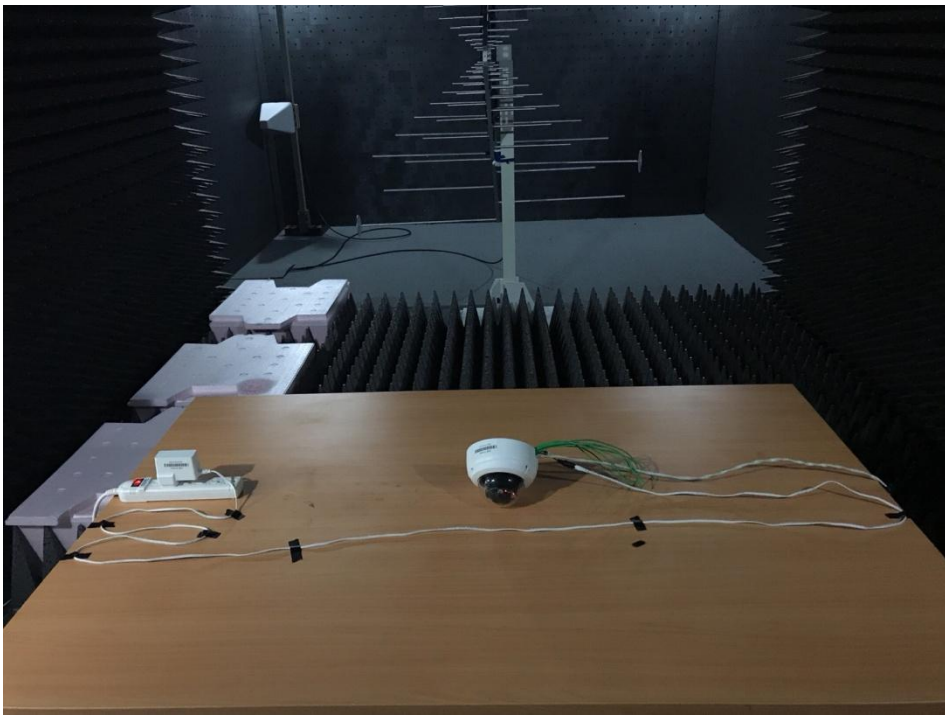
Right



Top

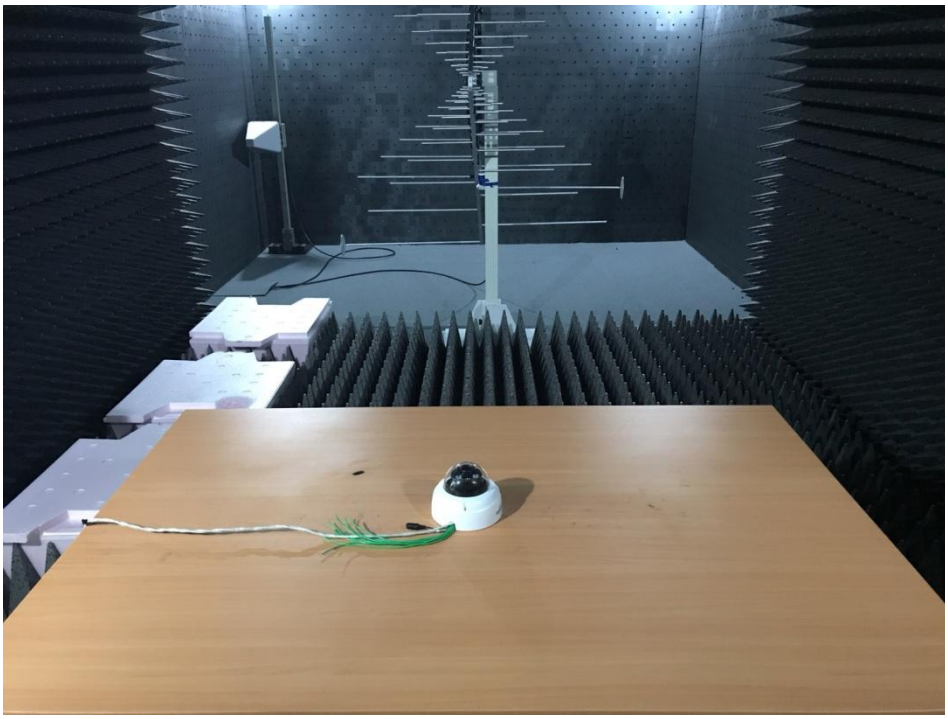


Bottom

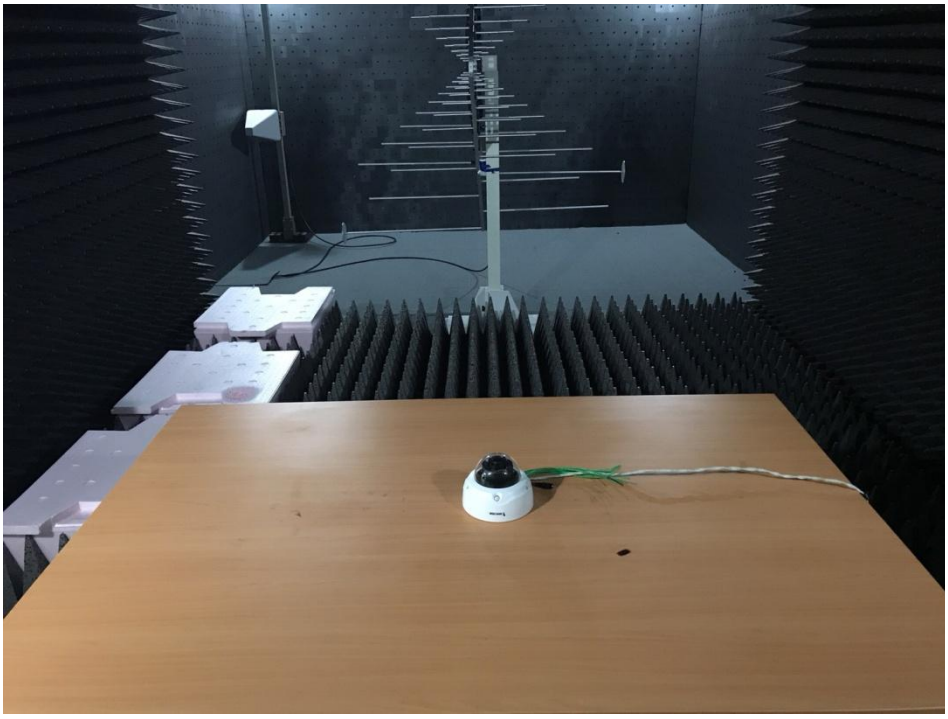


Mode B

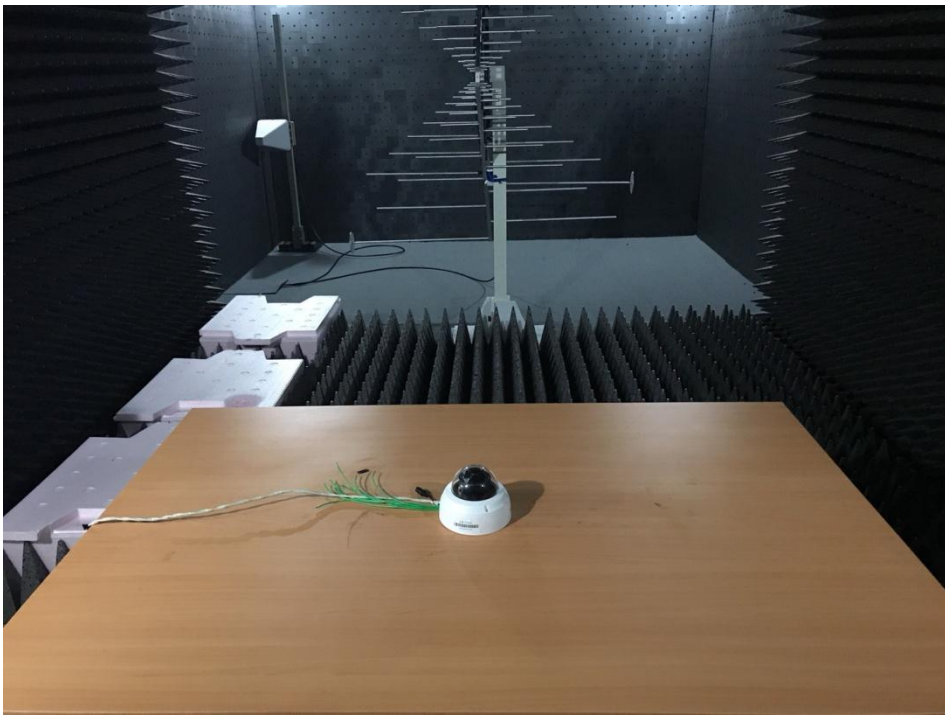
Front



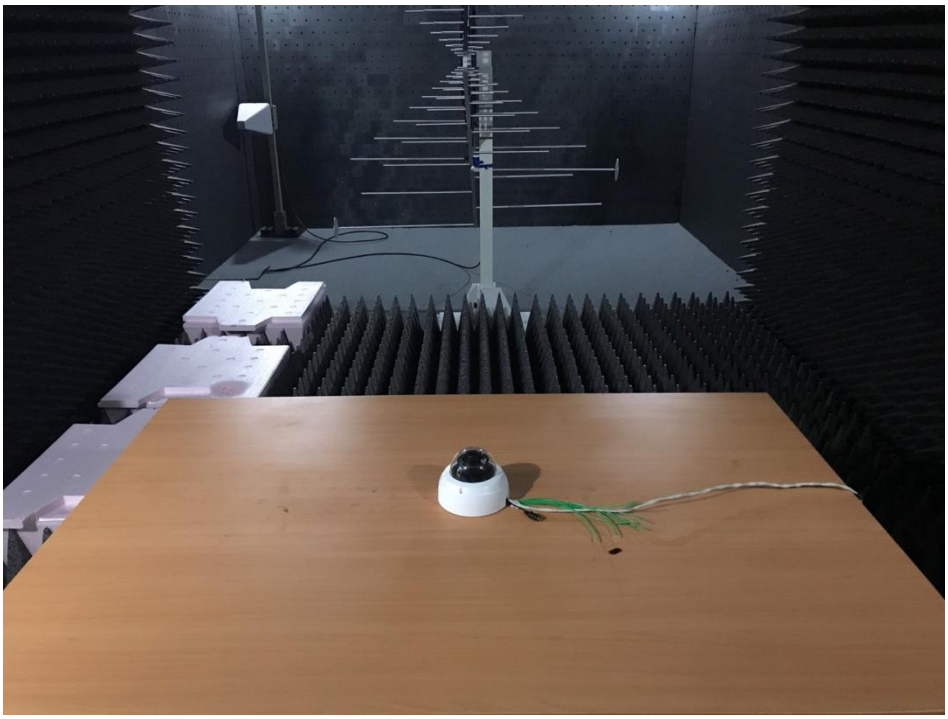
Back



Left

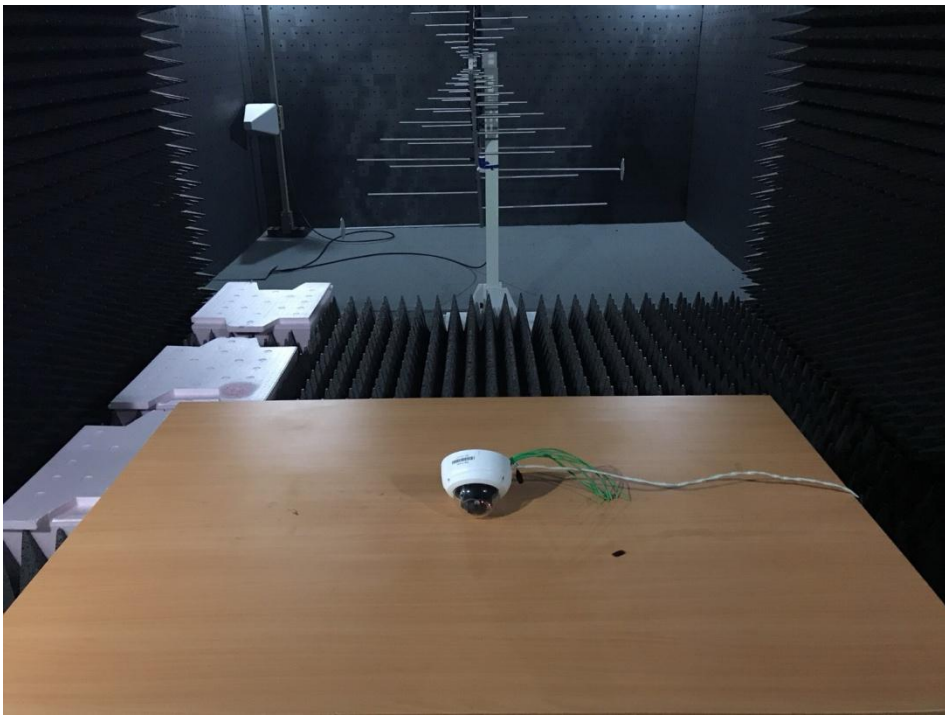


Right



Top

Bottom



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	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.

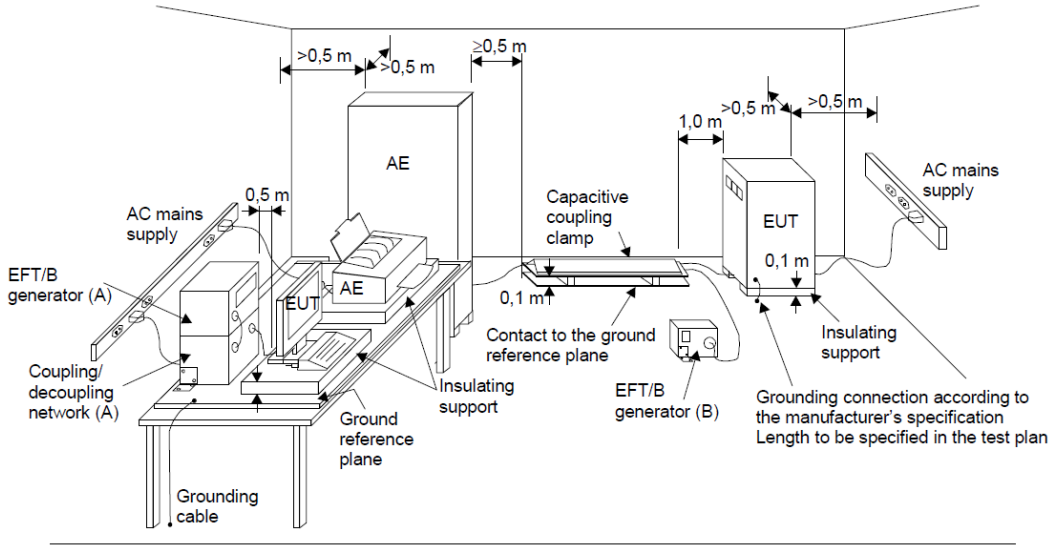
Each of the line conductors is impressed with burst noise for 1 minute.

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

5.5.4 Deviation from Test Standard

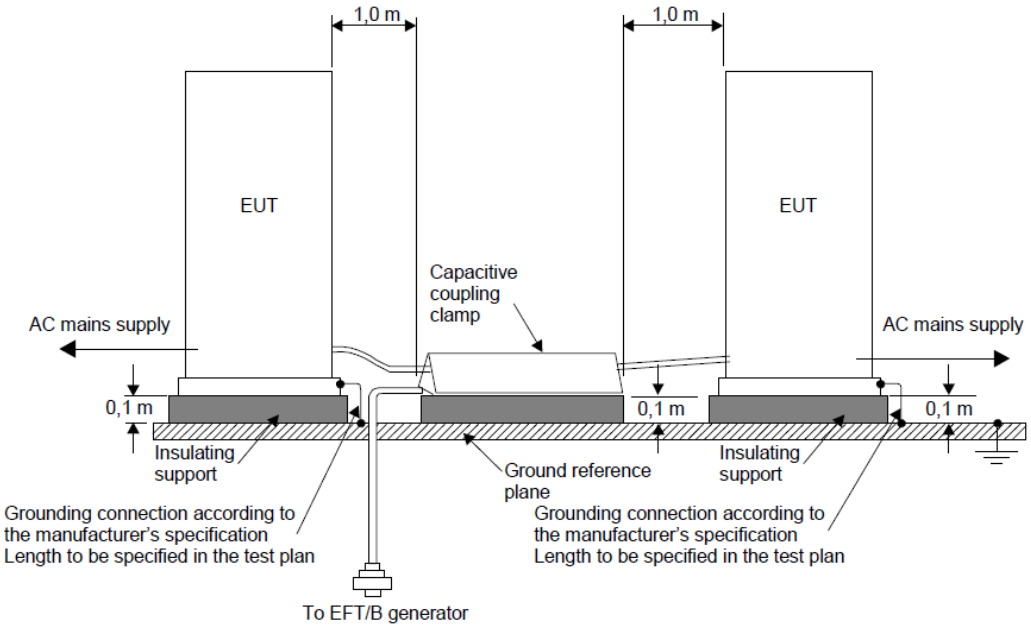
No deviation

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 or 48Vdc	**Environmental Conditions**	23℃, 51% RH
Tested by	Justin Lee	**Test Date**	2018/03/27
Test Mode	A & B		

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

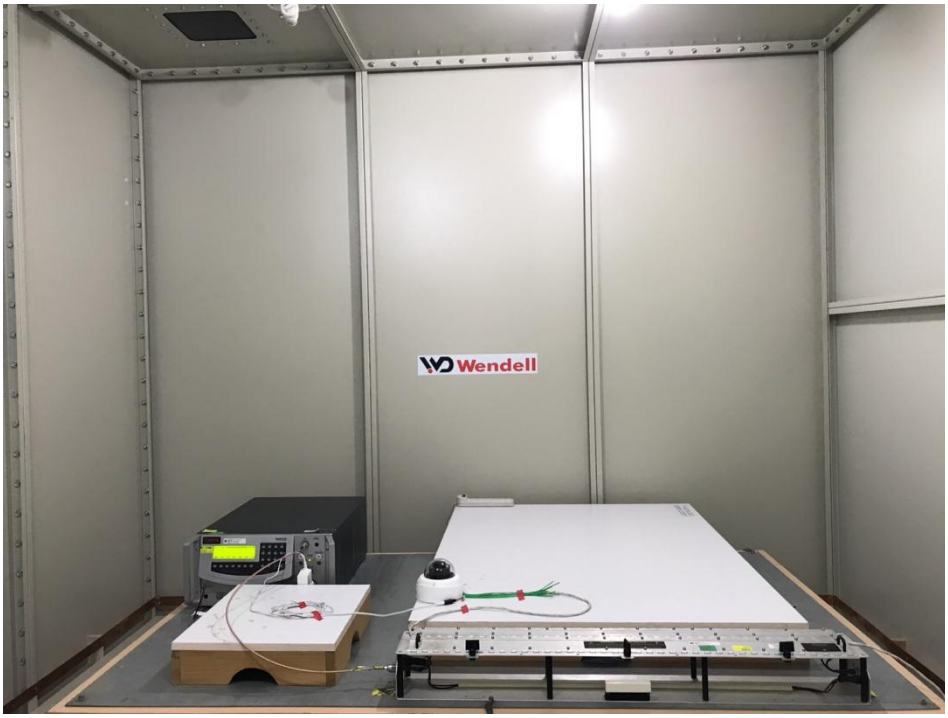
Note:
Criteria A: The EUT function was correct during the test.

5.5.7 Photographs of Test Configuration

Mode A

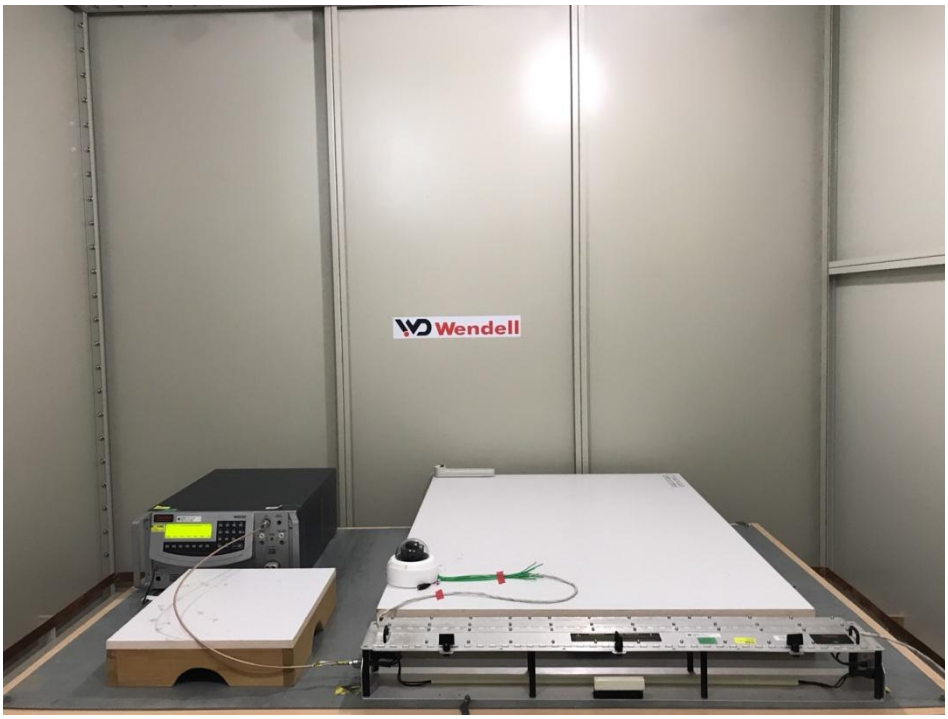
Power

Signal



Mode B

Signal



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)	Jul. 27, 2017
2	Surge CDN	3cTest	CDN-405T8A1	CT-1-074(5)	Apr. 06, 2017

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.

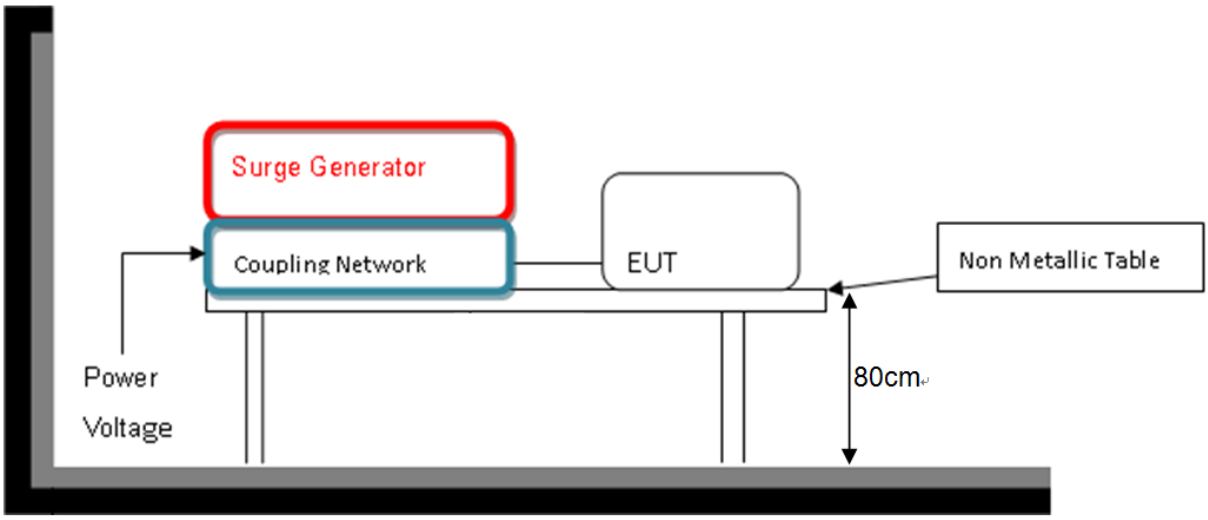
The surge noise shall be applied synchronized to the voltage phase at 0°, 90°, 180°, 270° and the peak value of the AC voltage wave. (Positive and negative)

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 or 48Vdc	**Environmental Conditions**	23℃, 51% RH
Tested by	Justin Lee	**Test Date**	2018/03/30
Test Mode	A & B		

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

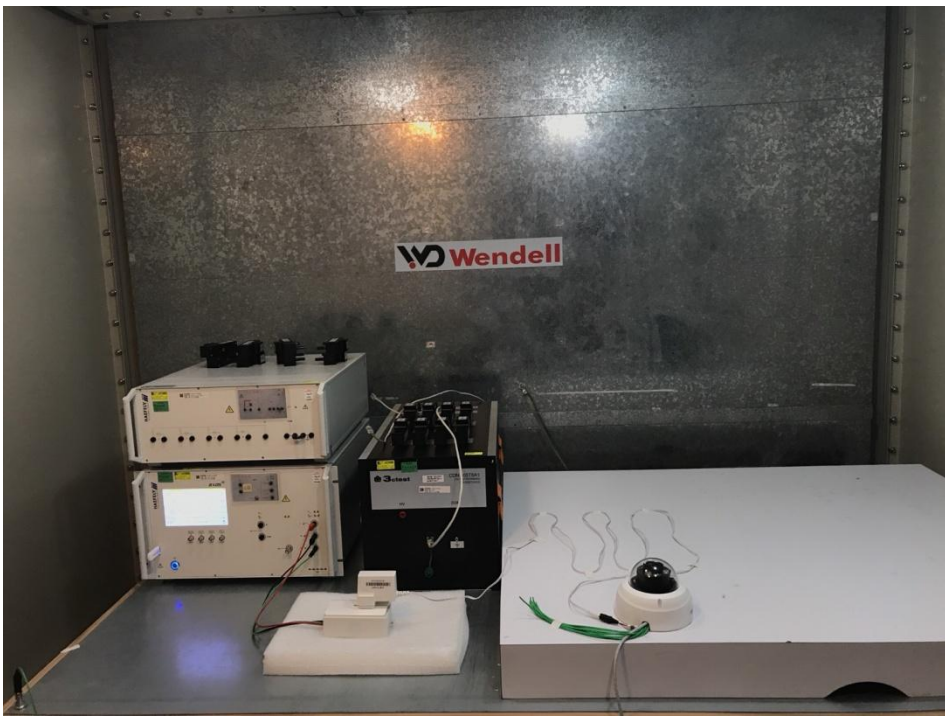
Signal Ports Telecommunication Ports (10/700 μs Wave)						
Test Point	**Polarity (+/-)**	**Test Level (kV)**				**Result**
		0.5	**1**	**2**	**4**	
RJ45 L-G	+/-	A	B(#1)	B(#1)	B(#1)	B

Note:
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.

5.6.7 Photographs of Test Configuration

Mode A

Power



Signal

Mode B

Signal

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-2	CT-1-049	Mar. 29, 2017
2	CDN for power supply lines	FRANKONIA	CDN M2+M3	CT-1-054	Apr. 03, 2017
3	6 dB Attenuator	BIRD	75-A-FFN-06	CT-1-056	Mar. 29, 2017
4	Compact Immunity Test System acc	FRANKONIA	CIT-10/75	CT-1-057	Mar. 30, 2017
5	CDN for screened lines	FRANKONIA	RJ45S	CT-1-052(1)	Apr. 01, 2017
6	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:

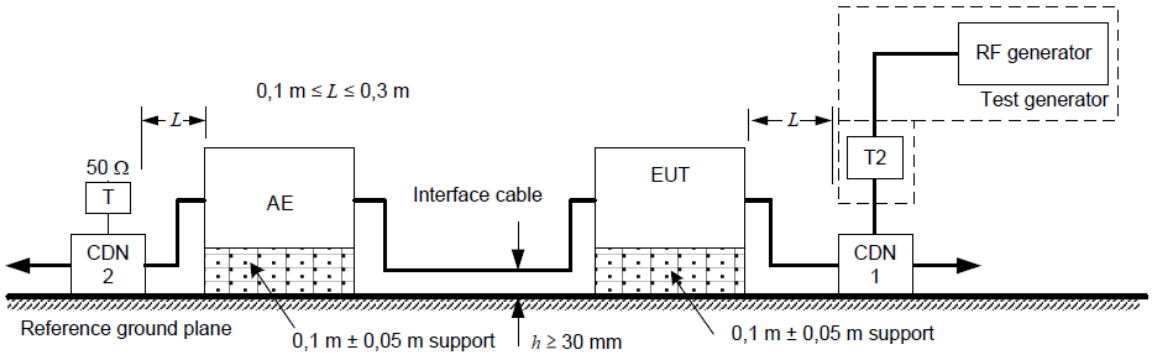
The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

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

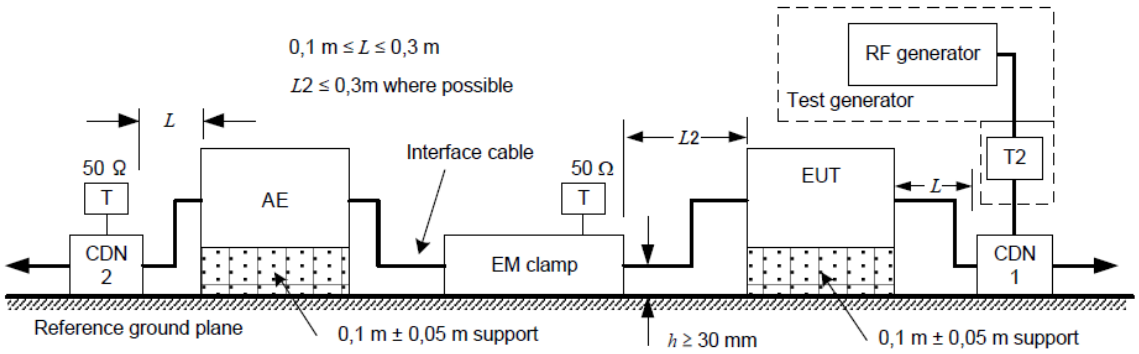
No deviation

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 or 48Vdc	**Environmental Conditions**	23℃, 48% RH
Tested by	Justin Lee	**Test Date**	2018/03/23
Test Mode	A & B		

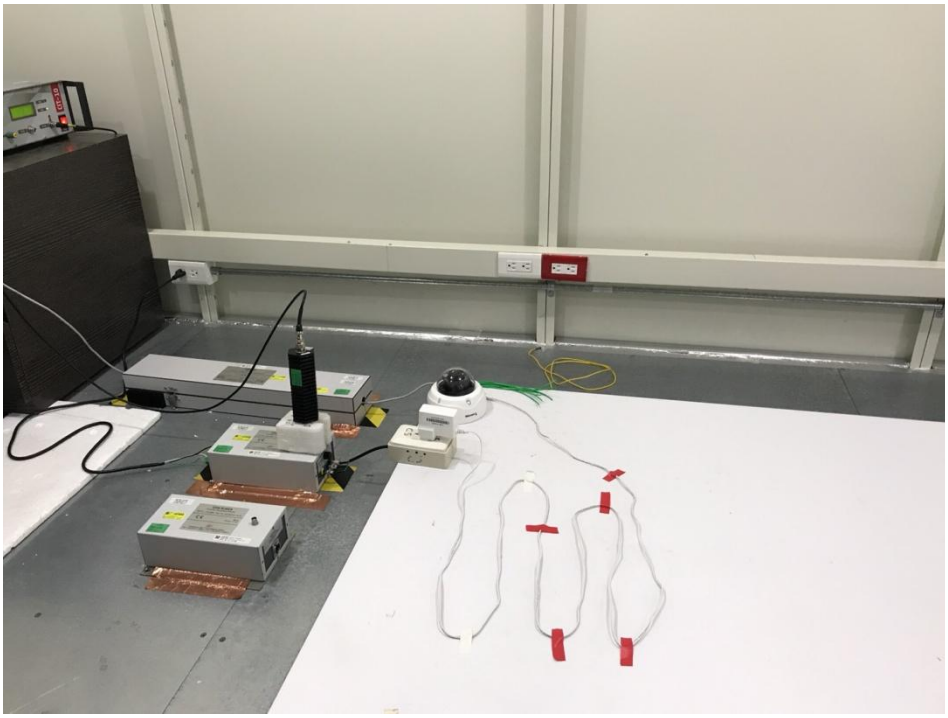
Frequency Range (MHz)	Tested Port	Injection Method	Test Level ($V_{r.m.s.}$)	Modulation	Result
0.15 - 80	AC/DC Power	CDN-M2 +M3	3	80% AM, 1kHz	A
0.15 - 80	RJ45	CLAMP	3	80% AM, 1kHz	A

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

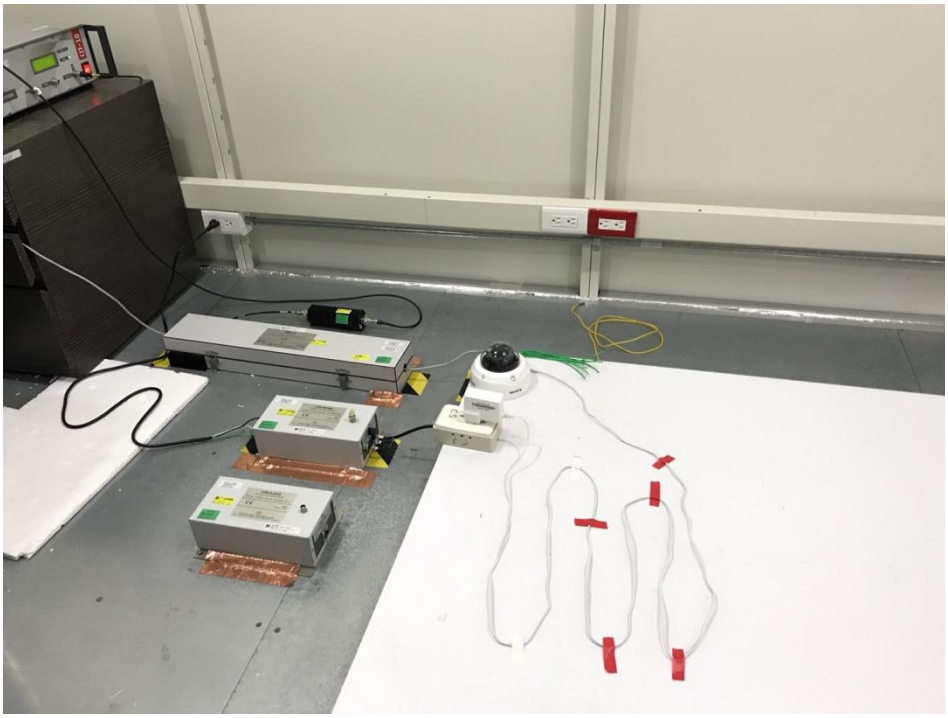
5.7.7 Photographs of Test Configuration

Mode A

Power

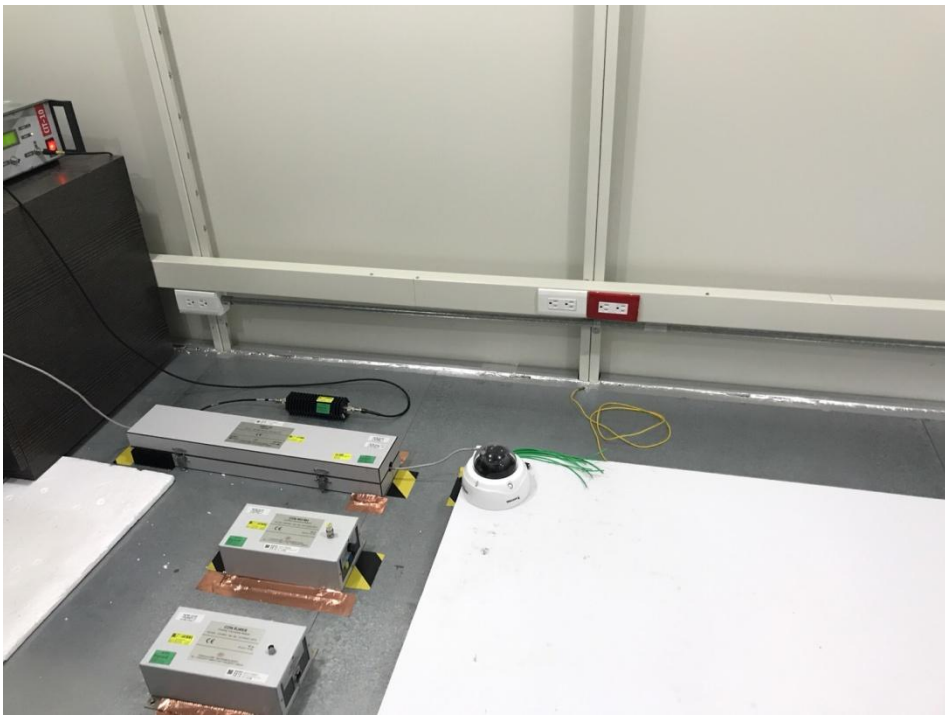


Signal



Mode B

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	Jul. 27, 2017

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

5.8.3 Test Procedure

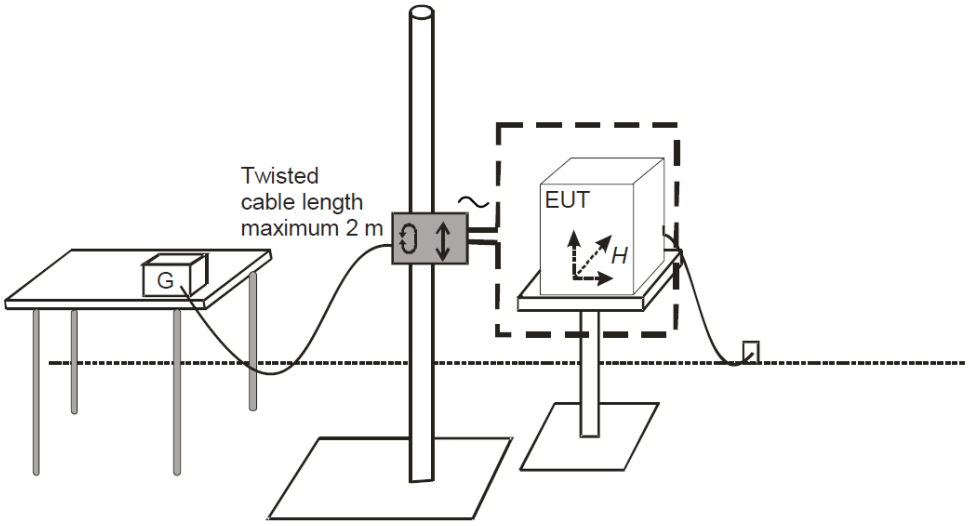
The EUT is placed on a table which is 0.8 meter above a metal ground plane measured at least 1m*1m minimum. The test magnetic field shall be placed at central of the induction coil.

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

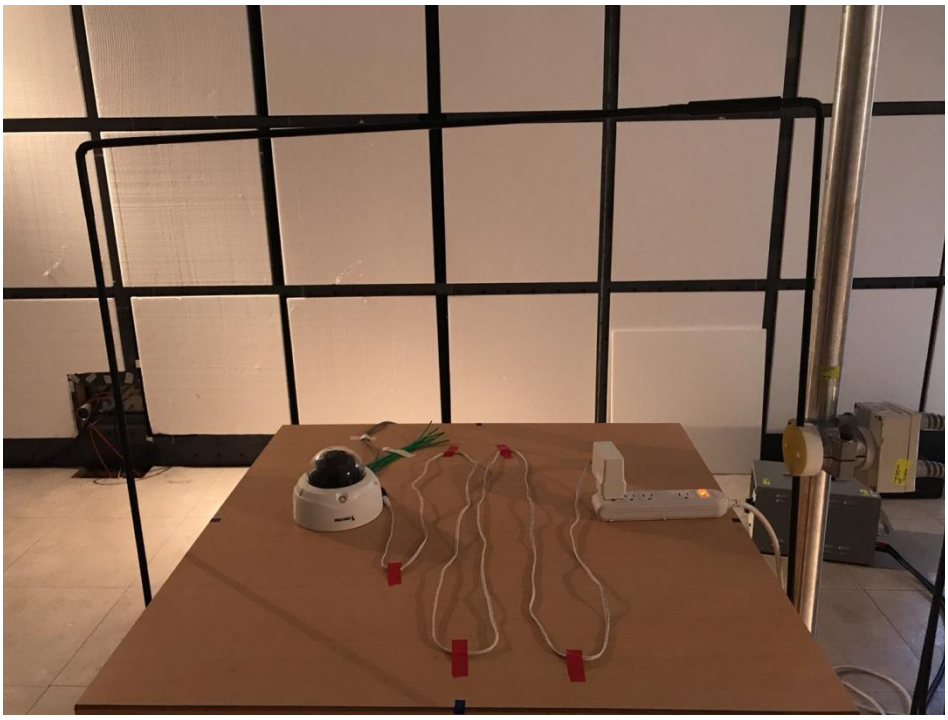
Test Voltage	230Vac, 50Hz or 48Vdc	**Environmental Conditions**	23℃, 51% RH
Tested by	Justin Lee	**Test Date**	2018/03/23
Test Mode	A & B		

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

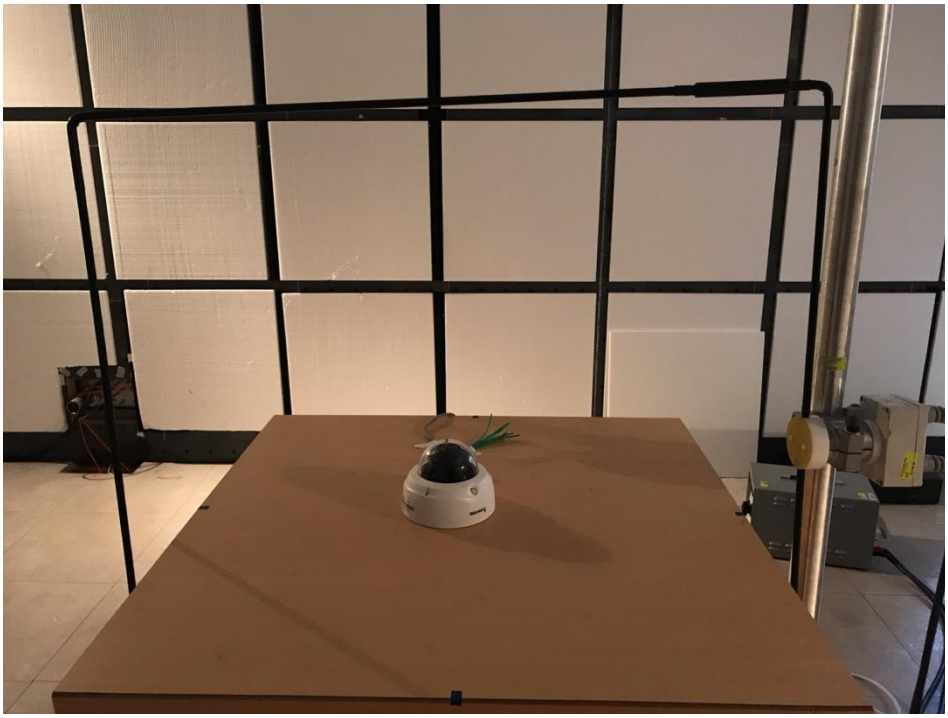
Note:
Criteria A: The EUT function was correct during the test.

5.8.7 Photographs of Test Configuration

Mode A



Mode B



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.

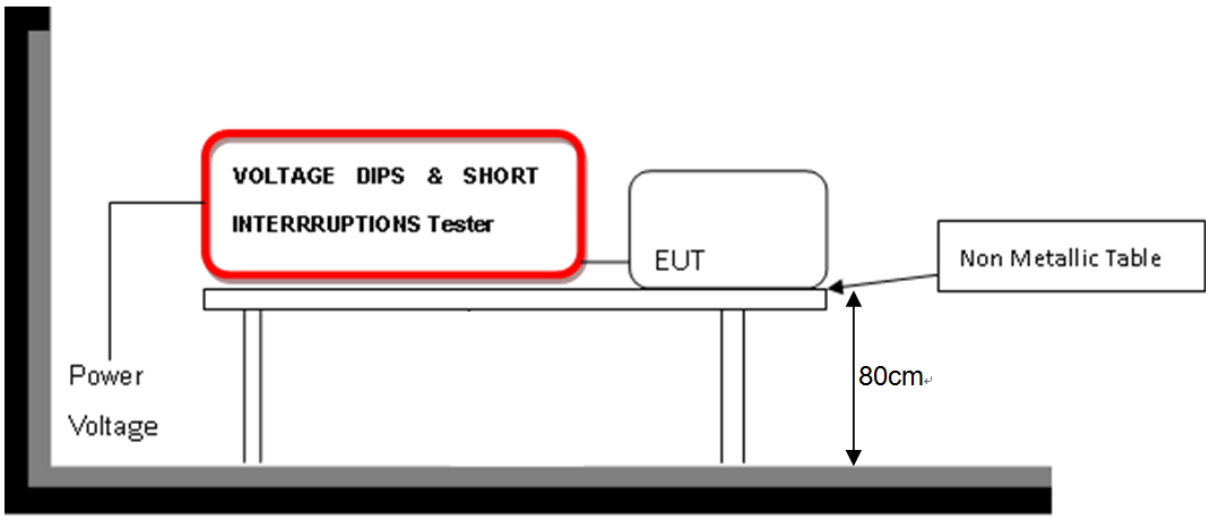
If the actual operating signal sources are not available to the EUT, they may be simulated.

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**	23℃, 51% RH
Tested by	Justin Lee	**Test Date**	2018/03/27
Test Mode	A		

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

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

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

Note:
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.

5.9.7 Photographs of Test Configuration

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