CE EMC TEST REPORT

REPORT NO.	**:**	**EC790814**
MODEL NO.	**:**	**apu4a**
RECEIVED DATE	**:**	**Sep. 11, 2017**
FINAL TESTED DATE	**:**	**Nov. 27, 2017**
ISSUED DATE	**:**	**Feb. 21, 2018**
TEST STANDARD	**:**	**EN 55032:2012/AC:2013, Class B** **EN 61000-3-2:2014** **EN 61000-3-3:2013** **EN 55024:2010/A1:2015**
APPLICANT	**:**	**PC Engines GmbH**
ADDRESS	**:**	**Flughofstrasse 58, CH-8152 Glattbrugg, Switzerland**
MANUFACTURER	**:**	**PC Engines GmbH**
ADDRESS	**:**	**Flughofstrasse 58, CH-8152 Glattbrugg, Switzerland**
ISSUED BY	**:**	**SPORTON International Inc.**
LAB ADDRESS	**:**	**No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.**

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ilac-MRA TAF Testing Laboratory 1190

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History of This Test Report

REPORT NO.	VERSION	ISSUED DATE	Description
EC790814	Rev. 01	Feb. 21, 2018	Initial issue of report

Project No: CB10610138

VERIFICATION OF COMPLIANCE

EQUIPMENT NAME	:	apu4a system board
BRAND NAME	:	PC Engines
MODEL NO.	:	apu4a
APPLICANT	:	PC Engines GmbH
ADDRESS	:	Flughofstrasse 58, CH-8152 Glattbrugg, Switzerland
FINAL TESTED DATE	:	Nov. 27, 2017
TEST STANDARD	:	EN 55032:2012/AC:2013, Class B EN 61000-3-2:2014 EN 61000-3-3:2013 EN 55024:2010/A1:2015

I **HEREBY** DECLARE THAT:

The above equipment has been tested by **SPORTON International Inc.** LAB., and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Sin Chang
SPORTON INTERNATIONAL INC.

1. Summary of Test Results

After estimating all the combination of every test mode, the result shown as below is the worst case.

The EUT has been tested according to the following specifications.

EMISSION			
Test Standard	**Test Type**	**Result**	**Remarks**
EN 55032:2012/AC:2013, Class B	AC Power Port Conducted emission test 150 kHz – 30 MHz	PASS	Meet minimum passing margin is -8.85dB at 0.2162MHz.
	Telecom Port Conducted emission test 150 kHz – 30 MHz	PASS	Meet minimum passing margin is -13.17dB at 0.3893MHz.
	Radiated emission test 30 MHz – 1,000 MHz @ 10 m 1,000 MHz – 6,000 MHz @ 3 m	PASS	Meet minimum passing margin is -3.49dB at 54.25MHz.
EN 61000-3-2:2014	Harmonic Current emission test	-	Note1
EN 61000-3-3:2013	Voltage Fluctuations and Flicker tests	PASS	Meet the requirements.

Note1:
The power consumption of EUT is lower than 75W, so the limit is not specified in EN 61000-3-2:2014.

IMMUNITY (EN 55024:2010/A1:2015)		
Test Standard	**Test Type**	**Pass Criterion**
IEC 61000-4-2:2008	**Electrostatic discharge immunity test** ± 2, 4 kV Contact Discharge ± 2, 4, 8 kV Air Discharge Standard Criterion B	**A**
IEC 61000-4-3:2006/A1:2007/A2:2010	**Radiated immunity test** Frequency Range：80 MHz to 1,000 MHz Electromagnetic field ：3 V/m (unmodulated, r.m.s) Amplitude modulated：80 % AM (1 kHz) Standard Criterion A	**A**
IEC 61000-4-4:2012	**Electrical fast transient / burst immunity test** AC ports 5/50 ns, ± 1 kV, 5 kHz Standard Criterion B	**A**
IEC 61000-4-5:2014	**Surge immunity test** AC ports (1.2/50 us)： line to line：± 0.5, 1 kV Standard Criterion B	**A** **(Note)**
IEC 61000-4-6:2013	**Conducted immunity test** Frequency Range：150 kHz to 80 MHz Electromagnetic field：3 V (unmodulated, r.m.s) Amplitude modulated：80 % AM (1 kHz) Standard Criterion A	**A**
IEC 61000-4-8:2009	**Power frequency magnetic field immunity test** 1 A/m, 50 Hz Standard Criterion A	**A**
IEC 61000-4-11:2004	**Voltage dips, short interruptions and voltage variations immunity tests** 1. >95% reduction 10 ms (0.5 cycles) – Standard Criterion B	**A**
	2. 30% reduction 500 ms (25 cycles) – Standard Criterion C	**A**
	3. Interruption >95% reduction 5,000 ms (250 cycles) – Standard Criterion C	**B**

Note: According to EN 55024 Table 2 description, the surge test of telecommunication/signal cable will be performed only when it's directly connected to outdoor cables; thus, indoor telecommunication/signal port isn't necessary to perform surge test.

2. General Description of Equipment under Test

Product Detail	
Equipment Name	apu4a system board
Model No.	apu4a
Brand Name	PC Engines
Power Supply	From Power Adapter

2.1. Feature of Equipment under Test

1. The EUT's highest operating frequency is 1,000MHz.

2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3. Test Configuration of Equipment under Test

3.1. Test Mode

The following table is a list of the test modes shown in this test report.

Conducted Emissions	
Test Mode	Description
1	EUT + USB port (up) + Adapter
2	EUT + USB port (down) + Adapter
Mode 1 generated the worst test result, so it was recorded in this report.	

Disturbances at Telecommunication Ports	
Test Mode	Description
1	EUT + USB port (up) + Adapter -LAN Port / 1000Mbps
2	EUT + USB port (down) + Adapter -LAN Port / 1000Mbps
Mode 2 generated the worst test result, so it was recorded in this report.	

Radiated Emissions	
Test Mode	Description
1	EUT + USB port (up) + Adapter
2	EUT + USB port (down) + Adapter
For Radiated Emission test below 1GHz: Mode 1 generated the worst test result, so it was recorded in this report. For Radiated Emission test above1GHz: Mode 1 generated the worst test result for Radiated emission below 1GHz test, thus the measurement for Radiated emission above 1GHz test will follow this same test configuration.	

Harmonic Current Emissions、Voltage Fluctuations and Flicker、ESD、RS、EFT、Surge、CS、PFMF and DIP	
Test Mode	Description
1	EUT + USB port (up) + Adapter
2	EUT + USB port (down) + Adapter

Note 1: The EUT can only be used at Z axis position.
Note 2: The rest configuration and test mode were written in this test report are designated by the applicant.
Note 3: The Adapter below is for measurement only, would not be marked

Support Unit	Brand	Model	FCC ID
Adapter	Seanen	KSA-24W-120200VE	DoC

3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
AP	Dlink	Des-1005D	DoC
Server	PC Engines GmbH	alix2d13	DoC
Flash disk3.0	Silicon Power	JEWEL J80	DoC
Adapter	Seanen	KSA-24W-120200VE	DoC

3.3. EUT Operation Condition

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For Conducted Emissions Teat and Radiated Emissions Test:

During the test, the following programs under WIN 7 were executed:

The remote notebook executed "Ping" to maintain the connection between the EUT and Server.

The remote notebook executed "Internet Explorer" to link with the EUT and Server to traffic packet data generated software.

The remote notebook executed "Internet Explorer", let USB read/write data from AP.

Disturbances at Telecommunication Ports

At the same time, the remote notebook executed “LAN TEST” to link with the EUT to traffic packet data generated software and keep maximum traffic load by LAN.

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During the test, the following programs under WIN 7 were executed:

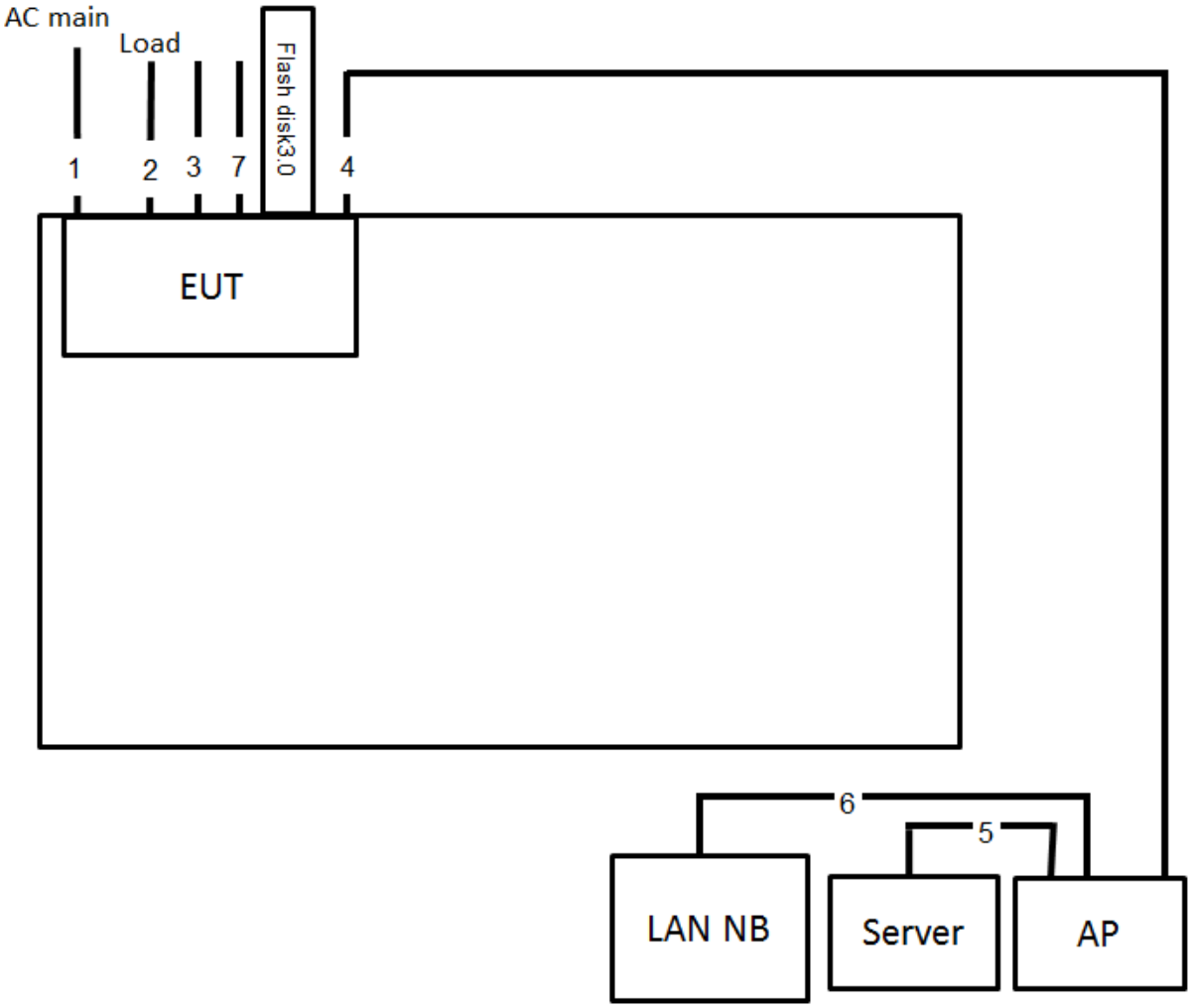
The remote notebook executed "Ping" to maintain the connection between the EUT and Server IP.

The remote notebook executed "Internet Explorer" to link with the EUT to traffic packet data generated software.

The remote notebook executed "Internet Explorer", let USB read/write data from AP.

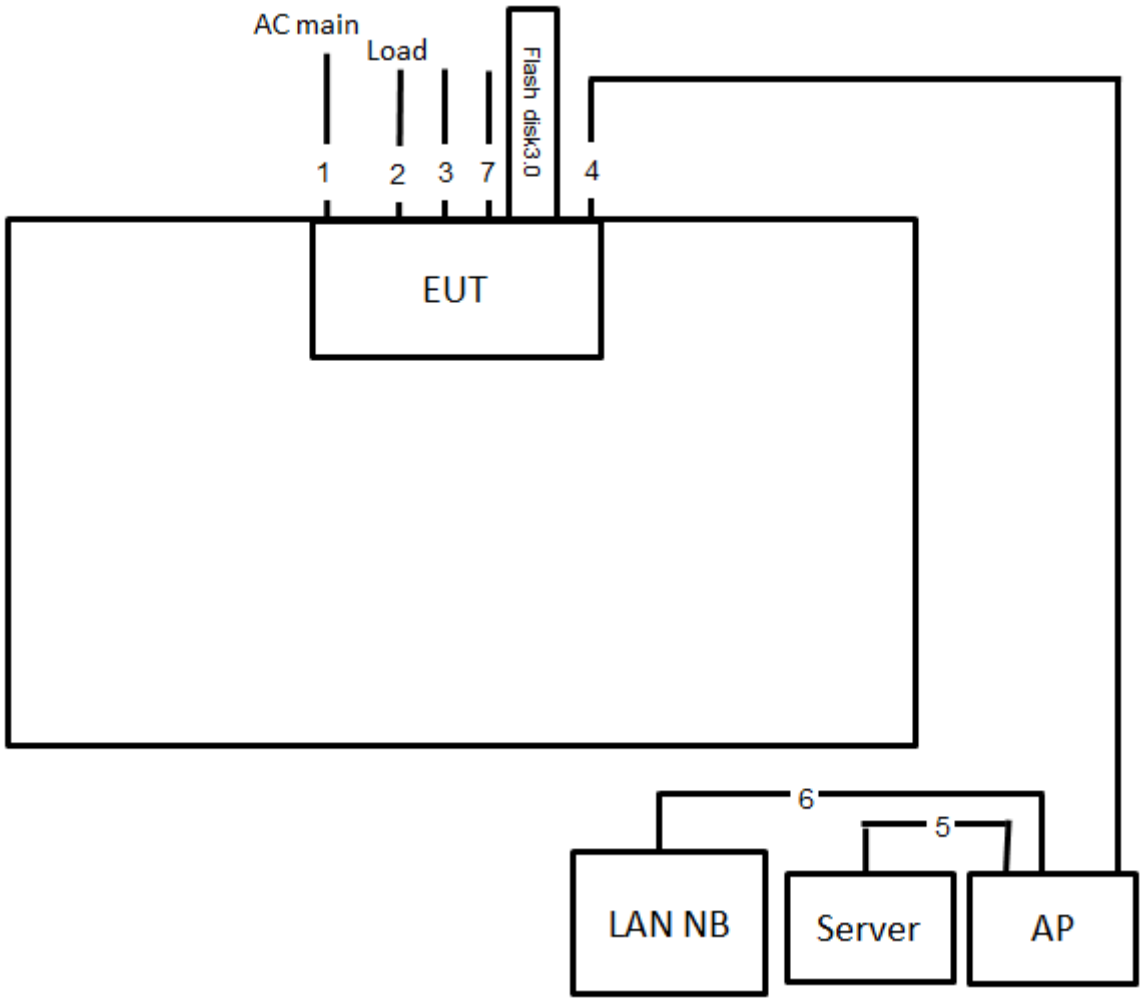
4. Connection Diagram of Test System

4.1.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable*3	No	1.5m
3	RS232 cable	Yes	1.8m
4	RJ-45 cable	No	10m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	1.5m
7	USB cable	Yes	1m

4.1.2. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable*3	No	1.5m
3	RS232 cable	Yes	1.8m
4	RJ-45 cable	No	10m
5	RJ-45 cable	No	1.5m
6	RJ-45 cable	No	1.5m
7	USB cable	Yes	1m

5. General Information of Test

5.1. Test Facility

<EMI>

Test Site Location	:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
TEL	:	886-3-656-9065
FAX	:	886-3-656-9085
Test Site No.	:	Conduction: CO01-CB Radiation: 10CH01-CB

<EMS>

Test Site Location	:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
TEL	:	886-3-656-9065
FAX	:	886-3-656-9085

5.2. Test Voltage

Power Type	Test Voltage
AC Power Supply	230 V / 50 Hz

5.3. Frequency Range Investigated

EMI Test Items	Frequency Range
Conducted emission test	150 kHz to 30 MHz
Radiated emission test	30 MHz to 6,000 MHz
EMS Test Items	**Frequency Range**
Radio frequency electromagnetic field immunity test	80 MHz to 1,000 MHz
Conducted immunity test	150 kHz to 80 MHz

5.4. Test Distance

Test Items	Test Distance
Radiated emission test below 1 GHz (30 MHz to 1,000 MHz)	10 m
Radiated emission test above 1 GHz (1,000 MHz to 6,000 MHz)	3 m
Radio frequency electromagnetic field immunity test	3 m

6. Test of Conducted Emission

6.1. Limit

6.1.1. Limit for AC power ports：

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

6.1.2. Limit for Telecommunication ports：

Frequency (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	QP	AV	QP	AV
0.15~0.5	84~74	74~64	40~30	30~20
0.5~30	74	64	30	20

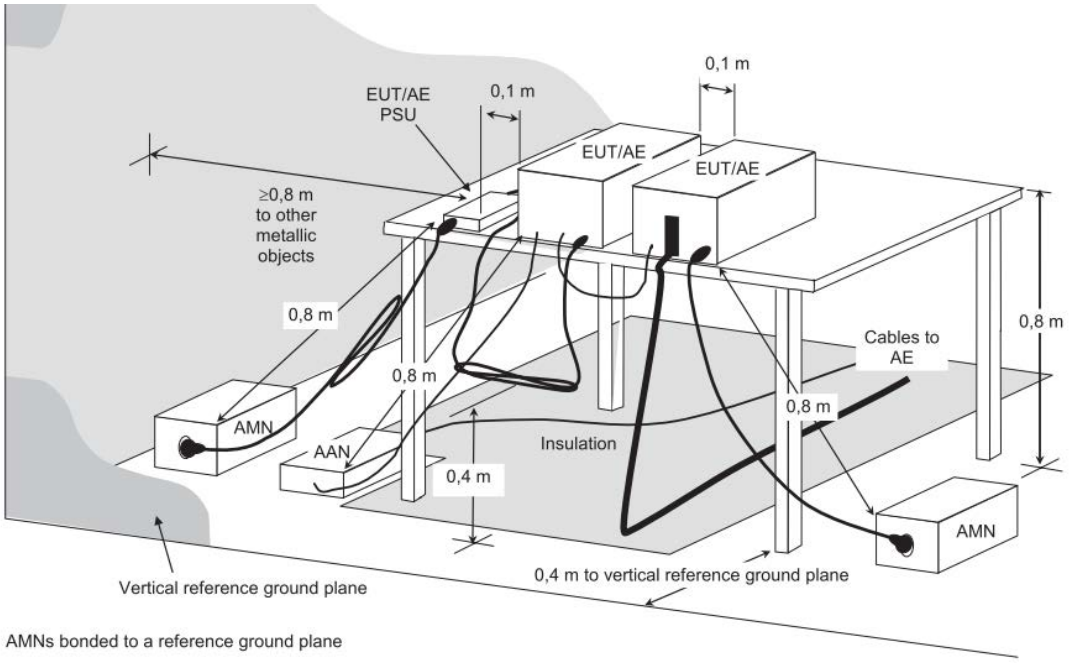
6.2. Description of Major Test Instruments

Test Receiver	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

6.3. Test Procedures

a. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. Connect Telecommunication port to ISN (Impedance Stabilization Network).
d. All the support units are connect to the other LISN.
e. The LISN provides 50 Ω coupling impedance for the measuring instrument.
f. The CISPR states that a 50 Ω, 50 uH LISN should be used.
g. Both sides of AC line were checked for maximum conducted interference.
h. The frequency range from 150 kHz to 30 MHz was searched.
i. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

6.4. Typical Test Setup Layout of Conducted Emission and disturbances at telecommunication ports

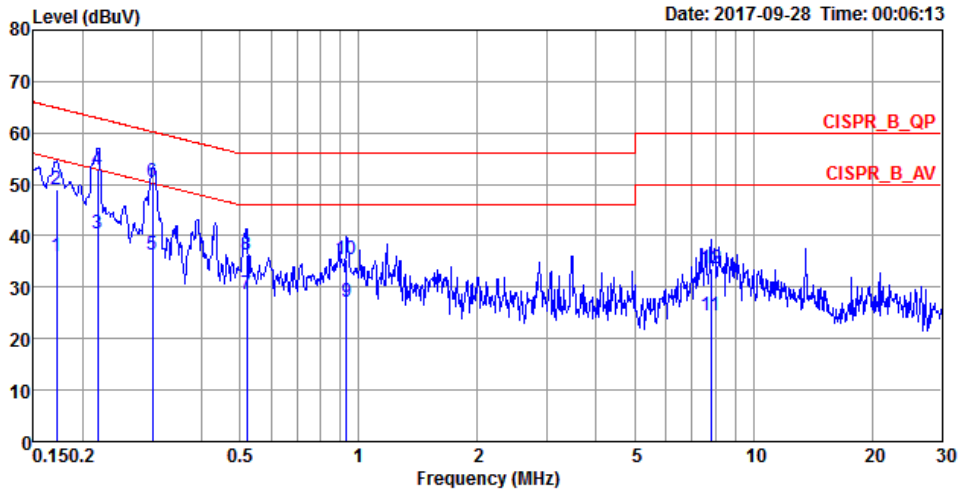


6.5. Test Result of AC Power Ports

Temperature	23℃	Humidity	60%
Test Engineer	Deven Huang	Frequency Range	0.15 MHz to 30 MHz
Test Mode	Mode 1		

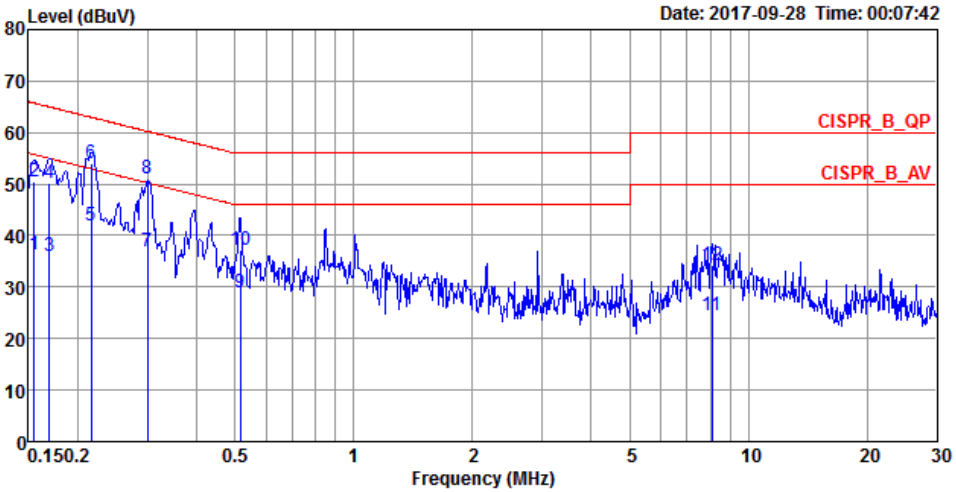
- Corrected Reading (dBuV) = LISN Factor + Cable Loss + Read Level = Level
- Margin = - Limit + (Read Level + LISN Factor + Cable Loss)
- All emissions not reported here are more than 10 dB below the prescribed limit.
- The test was passed at the minimum margin that marked by a frame in the following table

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1712	36.15	-18.75	54.90	26.00	10.00	0.15	Average	LINE
2	0.1712	49.13	-15.77	64.90	38.98	10.00	0.15	QP	LINE
3	0.2185	40.40	-12.48	52.88	30.37	9.92	0.11	Average	LINE
4	0.2185	52.83	-10.05	62.88	42.80	9.92	0.11	QP	LINE
5	0.3003	36.34	-13.90	50.24	26.35	9.93	0.06	Average	LINE
6	0.3003	50.44	-9.80	60.24	40.45	9.93	0.06	QP	LINE
7	0.5210	28.51	-17.49	46.00	18.50	9.95	0.06	Average	LINE
8	0.5210	36.28	-19.72	56.00	26.27	9.95	0.06	QP	LINE
9	0.9331	27.21	-18.79	46.00	17.07	9.96	0.18	Average	LINE
10	0.9331	35.39	-20.61	56.00	25.25	9.96	0.18	QP	LINE
11	7.8102	24.39	-25.61	50.00	14.18	10.07	0.14	Average	LINE
12	7.8102	33.77	-26.23	60.00	23.56	10.07	0.14	QP	LINE

Neutral

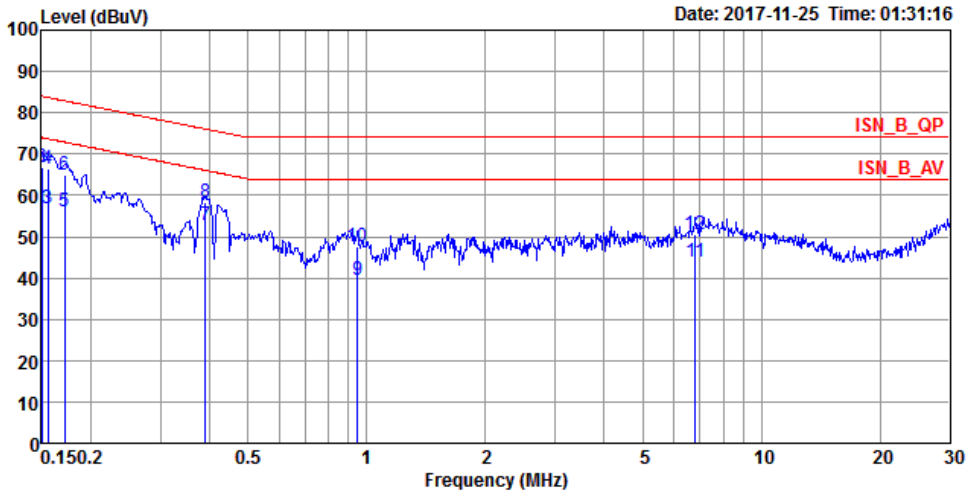


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1548	36.28	-19.46	55.74	26.02	10.10	0.16	Average	NEUTRAL
2	0.1548	50.52	-15.22	65.74	40.26	10.10	0.16	QP	NEUTRAL
3	0.1694	36.09	-18.90	54.99	25.84	10.10	0.15	Average	NEUTRAL
4	0.1694	50.09	-14.90	64.99	39.84	10.10	0.15	QP	NEUTRAL
5	0.2162	41.98	-10.98	52.96	31.81	10.05	0.12	Average	NEUTRAL
6	0.2162	54.11	-8.85	62.96	43.94	10.05	0.12	QP	NEUTRAL
7	0.3003	37.03	-13.21	50.24	26.82	10.15	0.06	Average	NEUTRAL
8	0.3003	50.94	-9.30	60.24	40.73	10.15	0.06	QP	NEUTRAL
9	0.5155	29.06	-16.94	46.00	18.78	10.22	0.06	Average	NEUTRAL
10	0.5155	37.21	-18.79	56.00	26.93	10.22	0.06	QP	NEUTRAL
11	8.1053	24.48	-25.52	50.00	14.22	10.12	0.14	Average	NEUTRAL
12	8.1053	34.19	-25.81	60.00	23.93	10.12	0.14	QP	NEUTRAL

6.6. Test Result of Telecommunication Ports

Temperature	23℃	Humidity	60%
Test Engineer	Deven Huang	Frequency Range	0.15 MHz to 30 MHz
Test Mode	Mode 2: EUT + USB port (down) + Adapter -LAN Port / 1000Mbps		

- Corrected Reading (dBuV) = LISN Factor + Cable Loss + Read Level = Level
- Margin = - Limit + (Read Level + LISN Factor + Cable Loss)
- All emissions not reported here are more than 10 dB below the prescribed limit.
- The test was passed at the minimum margin that marked by a frame in the following table



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1500	56.69	-17.31	74.00	46.43	10.10	0.16	Average	
2	0.1500	66.92	-17.08	84.00	56.66	10.10	0.16	QP	
3	0.1557	56.66	-17.03	73.69	46.42	10.08	0.16	Average	
4	0.1557	66.39	-17.30	83.69	56.15	10.08	0.16	QP	
5	0.1712	56.02	-16.88	72.90	45.85	10.02	0.15	Average	
6	0.1712	65.11	-17.79	82.90	54.94	10.02	0.15	QP	
7	0.3893	52.91	-13.17	66.08	43.17	9.73	0.01	Average	
8	0.3893	58.20	-17.88	76.08	48.46	9.73	0.01	QP	
9	0.9481	39.60	-24.40	64.00	29.82	9.60	0.18	Average	
10	0.9481	47.44	-26.56	74.00	37.66	9.60	0.18	QP	
11	6.8051	43.81	-20.19	64.00	34.21	9.47	0.13	Average	
12	6.8051	50.62	-23.38	74.00	41.02	9.47	0.13	QP	

7. Test of Radiated Emission

7.1. Limit

Radiated Emission below 1 GHz test at 10 m:

Frequency (MHz)	QP (dBuV/m)
30~230	30
230~1,000	37

Radiated Emission above 1 GHz test at 3 m:

Frequency (MHz)	PK (dBuV/m)	AV (dBuV/m)
1,000~3,000	70	50
3,000~6,000	74	54

7.2. Description of Major Test Instruments

7.2.1. 30 MHz ~ 1,000 MHz

Amplifier	Setting
RF Gain	25 dB
Signal Input	9 kHz to 1.3 GHz

Spectrum Analyzer	Setting
Start Frequency	30 MHz
Stop Frequency	1000 MHz
Resolution Bandwidth	120 kHz
Signal Input	9 kHz to 30 GHz

Test Receiver	Setting
Start Frequency	30 MHz
Stop Frequency	1000 MHz
Resolution Bandwidth	120 kHz
Signal Input	9 kHz to 3 GHz

7.2.2. Above 1 GHz

Amplifier	Setting
RF Gain	35 dB
Signal Input	1 GHz to 26.5 GHz

Spectrum Analyzer	Setting
Start Frequency	1 GHz
Stop Frequency	6 GHz
Resolution Bandwidth	1 MHz
Signal Input	9 kHz to 30 GHz

7.3. Test Procedures

<Below 1 GHz>:

a. The EUT was placed on a rotatable table top 0.8 meter above ground.

b. The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.

c. The table was rotated 360 degrees to determine the position of the highest radiation.

d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.

e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.

f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.

<Above 1 GHz>:

a. Same test set up as below 1 GHz radiated testing.

b. The EUT was set 3 meters from the interference-receiving antenna which was mounted on the top of a variable height antenna tower.

c. There should be absorber placed between the EUT and Antenna and its located size should let the test site meet CISPR16-1-4 requirement.

d. The table was rotated 360 degrees to determine the position of the highest radiation.

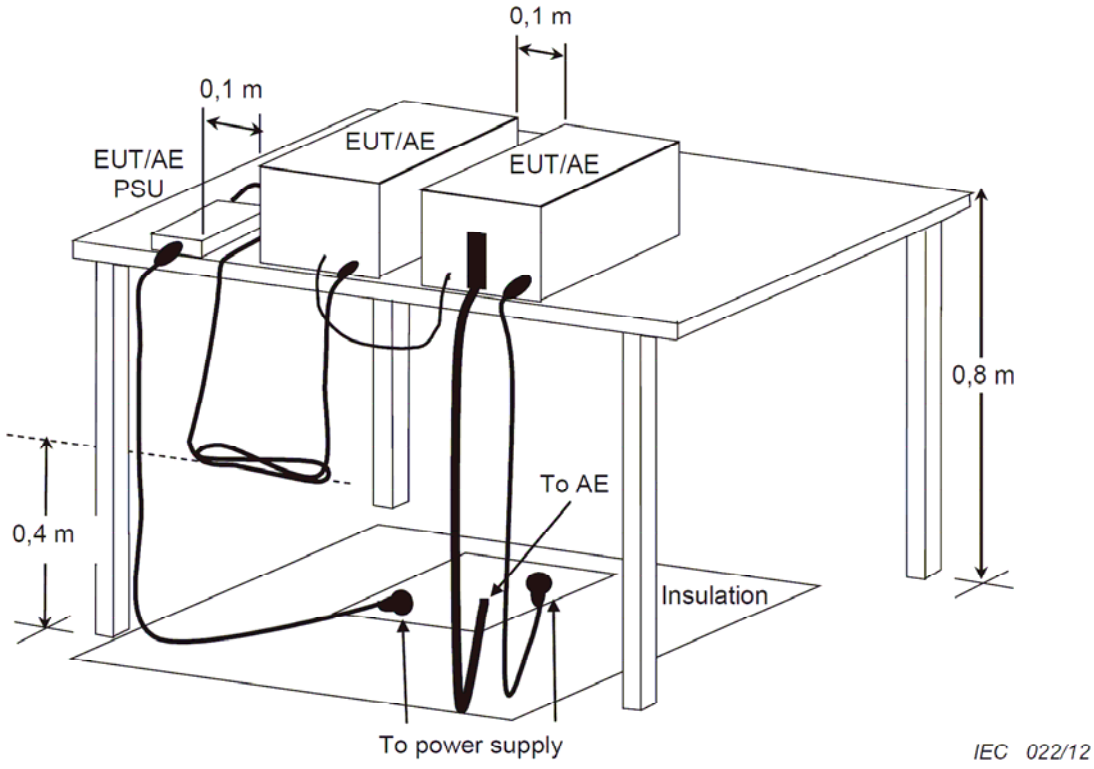
e. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

f. Set the DRG Horn Antenna at 1M height, then run the turn table to get the maximum noise reading from Horizontal and Vertical polarity separately.

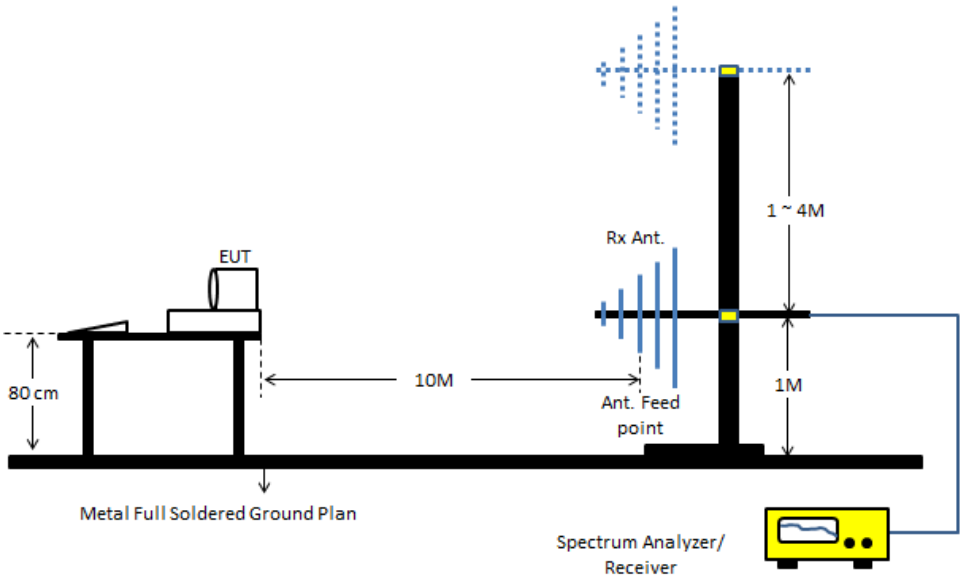
g. When EUT locating on the turn-table, and its height is over 172 cm (Antenna's 3dB beam width of 6 GHz is 27°), the DRG Horn Antenna must be raised up and descended down, then turning around the turn-table to get the maximum noise reading of the Horizontal and Vertical polarity separately. Note the maximum raise up height is same as the top of EUT.

h. If emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

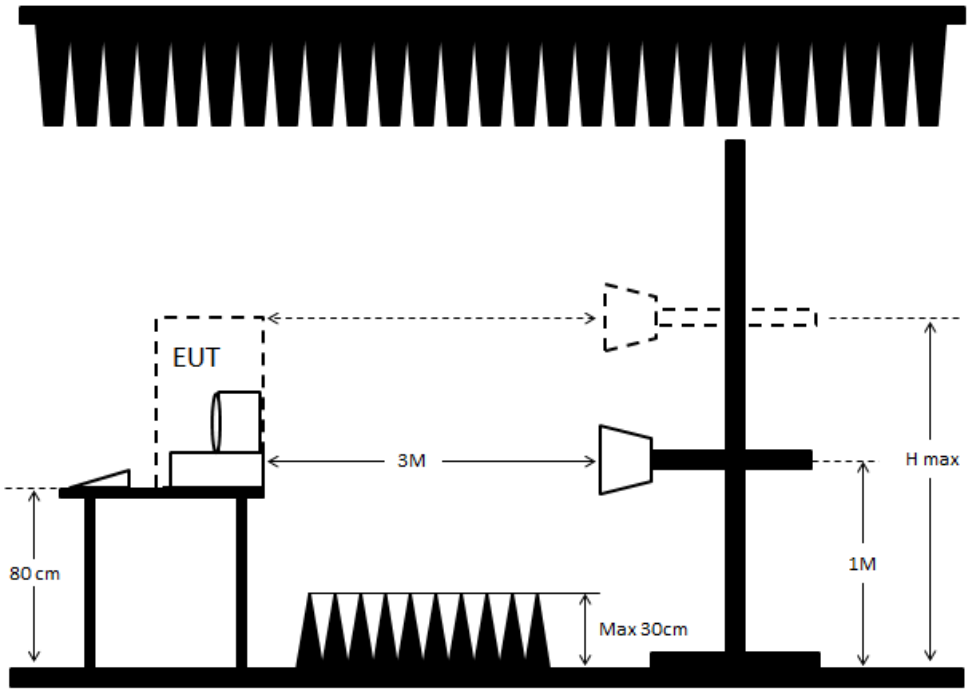
7.4. Typical Test Setup Layout of Radiated Emission



<Below 1 GHz>:



<Above 1 GHz>:



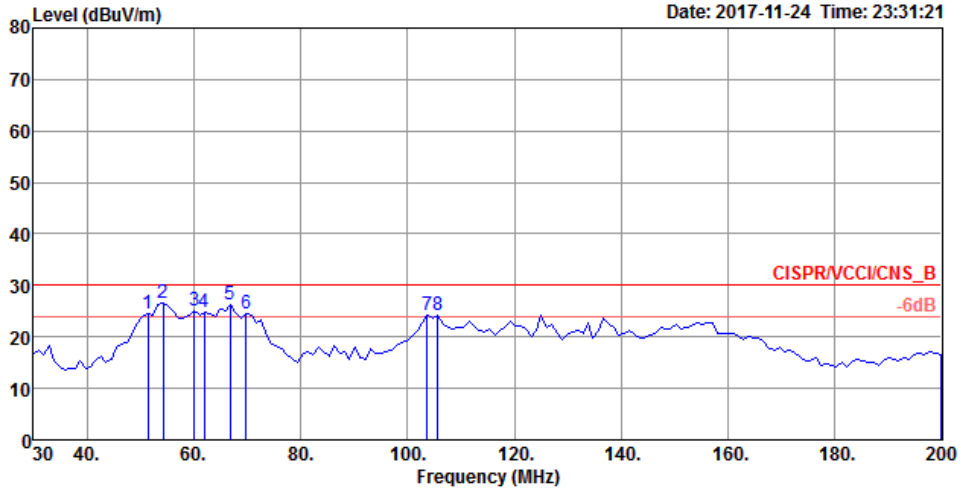
Remark : When EUT height is over 172cm , H max = Top of EUT

7.5. Test Result of Radiated Emission below 1 GHz

Temperature	23℃	Humidity	60%
Test Engineer	Deven Huang	Frequency Range	30 MHz to 1,000 MHz
Test Mode	Mode 1		

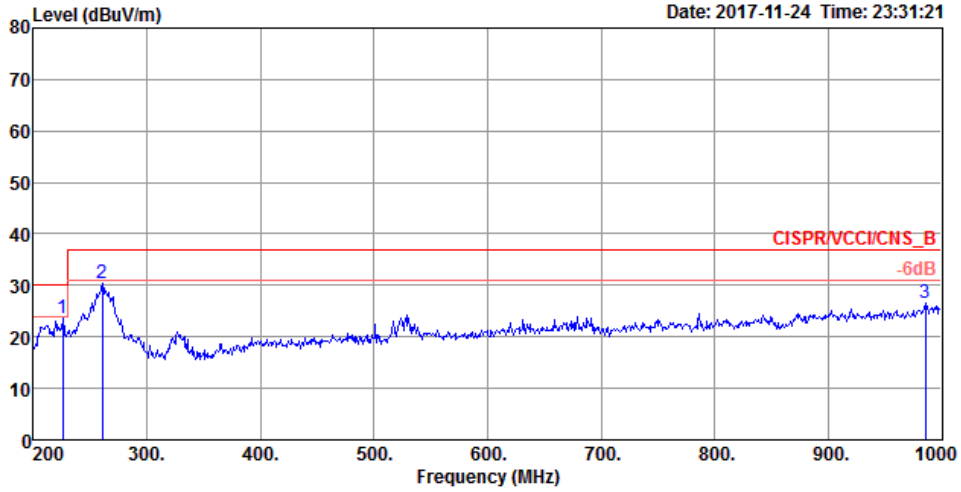
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- Margin = - Limit + (Read Level + Antenna Factor + Cable Loss - Preamp Factor)
- The test was passed at the minimum margin that marked by the frame in the following test record

Vertical 30 MHz to 200 MHz



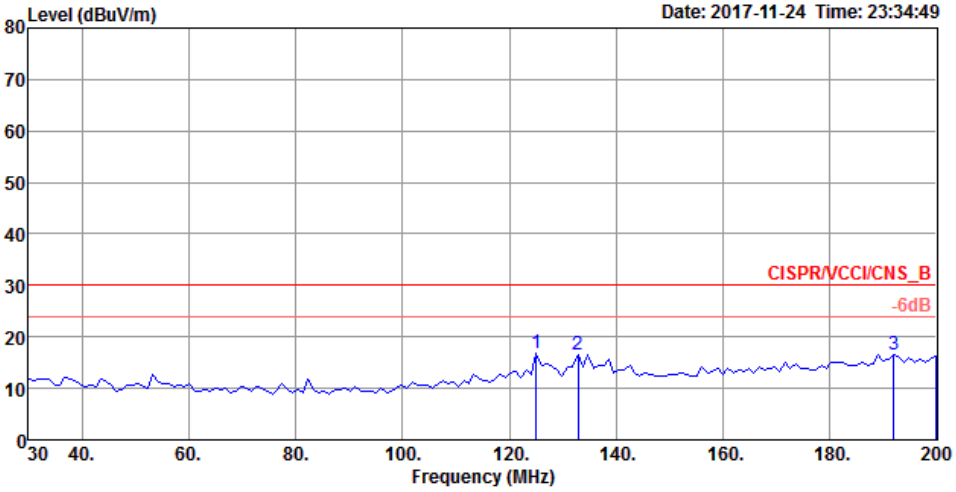
	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	51.34	24.41	30.00	-5.59	40.76	28.59	10.10	2.14	Peak	100	218	VERTICAL
2	54.25	26.51	30.00	-3.49	42.94	28.57	9.90	2.24	Peak	200	212	VERTICAL
3	60.07	25.24	30.00	-4.76	41.95	28.56	9.50	2.35	Peak	200	298	VERTICAL
4	62.01	24.77	30.00	-5.23	41.48	28.55	9.46	2.38	Peak	300	238	VERTICAL
5	66.86	26.21	30.00	-3.79	42.95	28.54	9.36	2.44	Peak	200	246	VERTICAL
6	69.77	24.61	30.00	-5.39	41.37	28.53	9.30	2.47	Peak	200	294	VERTICAL
7	103.72	24.13	30.00	-5.87	39.88	28.42	9.69	2.98	Peak	100	282	VERTICAL
8	105.66	24.16	30.00	-5.84	39.78	28.41	9.78	3.01	Peak	100	354	VERTICAL

Vertical 200 MHz to 1,000 MHz



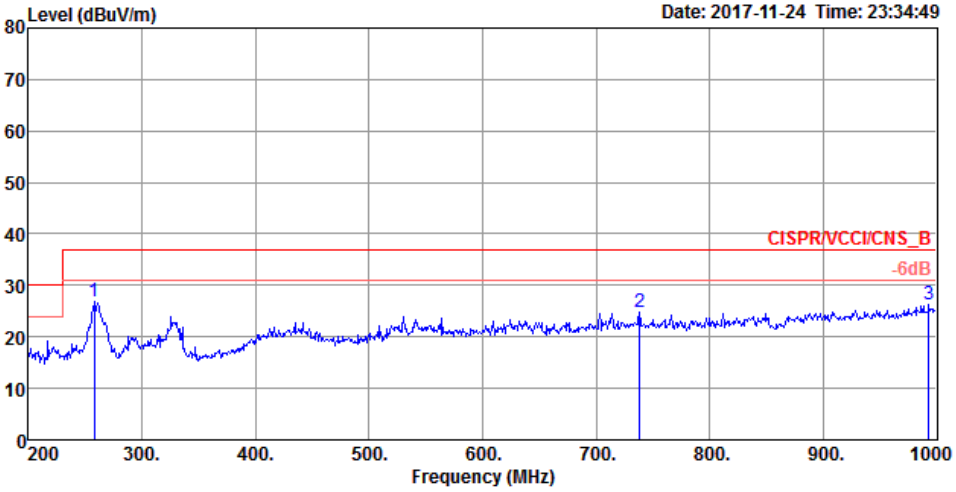
	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	225.94	23.68	30.00	-6.32	34.63	27.58	13.81	2.82	Peak	100	3	VERTICAL
2	260.86	30.36	37.00	-6.64	42.20	27.48	12.62	3.02	Peak	100	49	VERTICAL
3	985.45	26.49	37.00	-10.51	25.37	27.45	22.47	6.10	Peak	200	235	VERTICAL

Horizontal 30 MHz to 200 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	125.06	16.93	30.00	-13.07	30.91	28.32	11.05	3.29	Peak	300	173	HORIZONTAL
2	132.82	16.57	30.00	-13.43	30.06	28.28	11.39	3.40	Peak	300	198	HORIZONTAL
3	191.99	16.67	30.00	-13.33	26.42	27.99	14.08	4.16	Peak	300	230	HORIZONTAL

Horizontal 200 MHz to 1,000 MHz



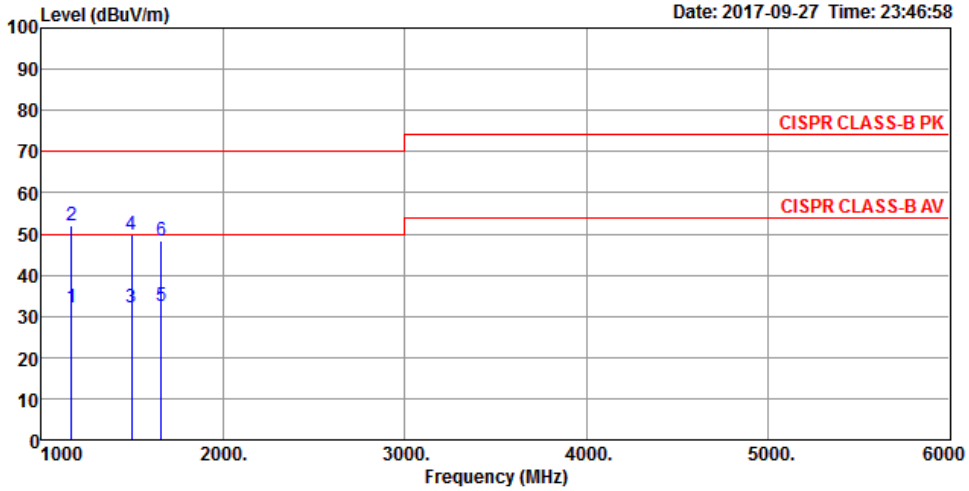
	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	257.95	26.92	37.00	-10.08	38.86	27.49	12.55	3.00	Peak	300	268	HORIZONTAL
2	738.10	24.93	37.00	-12.07	27.63	28.41	20.53	5.18	Peak	100	114	HORIZONTAL
3	993.21	26.15	37.00	-10.85	24.83	27.42	22.60	6.14	Peak	200	2	HORIZONTAL

7.6. Test Result of Radiated Emission above 1 GHz

Temperature	23℃	Humidity	60%
Test Engineer	Deven Huang	Frequency Range	1,000 MHz to 6,000 MHz
Test Mode	Mode 1		

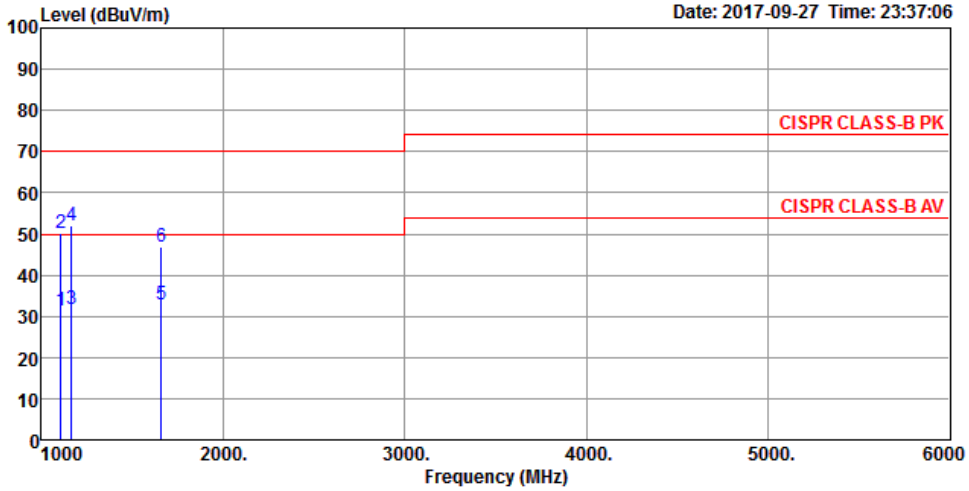
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- Margin = - Limit + (Read Level + Antenna Factor + Cable Loss - Preamp Factor)
- The test was passed at the minimum margin that marked by the frame in the following test record

Vertical 1,000 MHz to 6,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	1165.00	32.24	50.00	-17.76	30.98	36.14	27.83	9.57	Average	100	241	VERTICAL
2	1165.00	52.14	70.00	-17.86	50.88	36.14	27.83	9.57	Peak	100	241	VERTICAL
3	1495.00	32.13	50.00	-17.87	30.81	35.89	27.90	9.31	Average	100	355	VERTICAL
4	1495.00	49.95	70.00	-20.05	48.63	35.89	27.90	9.31	Peak	100	355	VERTICAL
5	1660.00	32.58	50.00	-17.42	30.15	35.83	29.00	9.26	Average	100	157	VERTICAL
6	1660.00	48.52	70.00	-21.48	46.09	35.83	29.00	9.26	Peak	100	157	VERTICAL

Horizontal 1,000 MHz to 6,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	1105.00	31.22	50.00	-18.78	30.06	36.17	27.82	9.51	Average	100	357	HORIZONTAL
2	1105.00	50.18	70.00	-19.82	49.02	36.17	27.82	9.51	Peak	100	357	HORIZONTAL
3	1165.00	31.64	50.00	-18.36	30.38	36.14	27.83	9.57	Average	100	198	HORIZONTAL
4	1165.00	52.15	70.00	-17.85	50.89	36.14	27.83	9.57	Peak	100	198	HORIZONTAL
5	1660.00	32.72	50.00	-17.28	30.29	35.83	29.00	9.26	Average	100	141	HORIZONTAL
6	1660.00	46.91	70.00	-23.09	44.48	35.83	29.00	9.26	Peak	100	141	HORIZONTAL

8. Harmonics Test

8.1. Standard

- EN 61000-3-2:2014

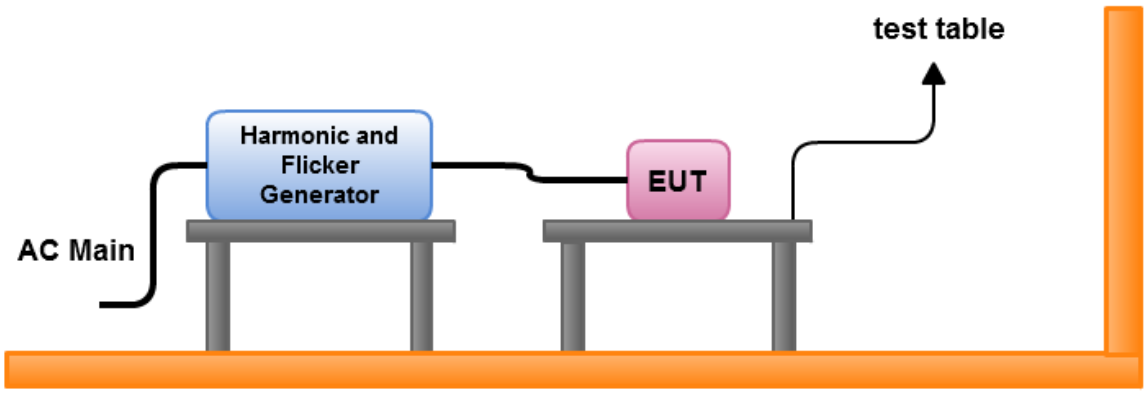
8.2. Test Procedure

The measured values of the harmonics components of the input current, including line current and neutral current, shall be compared with the limits given in Clause 7 of EN 61000-3-2.

8.3. Test Equipment Settings

Line Voltage	230 V
Line Frequency	50 Hz
Device Class	A

8.4. Test Setup



8.5. Test Result of Current Harmonics Test

Temperature	23℃	Humidity	64%
Test Engineer	GN Hou	Test Date	Sep. 27, 2017
Test Mode	Mode 1		

Highest parameter values during test:

V_RMS (Volts):	230.36	Frequency(Hz):	50.00
I_Peak (Amps):	0.459	I_RMS (Amps):	0.093
I_Fund (Amps):	0.033	Crest Factor:	5.170
Power (Watts):	7.5	Power Factor:	0.380

Note: The power consumption of EUT is lower than 75W, so the limit is not specified in EN 61000-3-2:2014.

Temperature	23℃	Humidity	64%
Test Engineer	GN Hou	Test Date	Sep. 27, 2017
Test Mode	Mode 2		

Highest parameter values during test:

V_RMS (Volts):	230.37	Frequency(Hz):	50.00
I_Peak (Amps):	0.449	I_RMS (Amps):	0.087
I_Fund (Amps):	0.033	Crest Factor:	5.180
Power (Watts):	7.5	Power Factor:	0.384

Note: The power consumption of EUT is lower than 75W, so the limit is not specified in EN 61000-3-2:2014.

9. Voltage Fluctuations and Flicker Test

9.1. Standard

- EN 61000-3-3:2013

9.2. Test Procedure

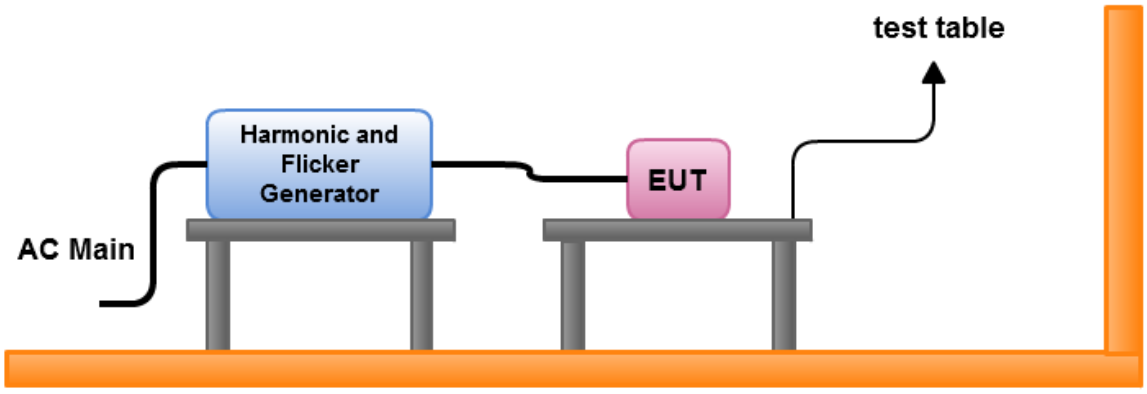
The equipment shall be tested under the conditions of **Clause 5.**

The total impedance of the test circuit, excluding the appliance under test, but including the internal impedance of the supply source, shall be equal to the reference impedance. The stability and tolerance of the reference impedance shall be adequate to ensure that the overall accuracy of ±8% is achieved during the whole assessment procedure.

9.3. Test Equipment Settings

Line Voltage	230 V
Line Frequency	50 Hz

9.4. Test Setup



9.5. Test Result of Voltage Fluctuation and Flicker Test

Temperature	23℃	Humidity	64%
Test Engineer	GN Hou	Test Date	Sep. 27, 2017
Test Mode	Mode 1	Final Test Result	Pass

Vrms at the end of test (Volt):	230.34			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
T-max (mS):	0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.03	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.213	Test limit:	1.000	Pass

Temperature	23℃	Humidity	64%
Test Engineer	GN Hou	Test Date	Sep. 27, 2017
Test Mode	Mode 2	Final Test Result	Pass

Vrms at the end of test (Volt):	230.34			
Highest dt (%):	0.00	Test limit (%):	3.30	Pass
T-max (mS):	0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.03	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.213	Test limit:	1.000	Pass

10. General Performance Criteria Description of Immunity Test

According to Clause 7.1 of EN 55024 standard, the following describes the general performance criteria.

Criterion A (Note 1)	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended.
Criterion B (Note 2)	During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention. For xDSL Terminal equipment: During the test shall not cause the system to lose the established connection or retrain. At the cessation of the test, the system shall operate in the condition established prior to the application of the test without user intervention.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Note 1：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.

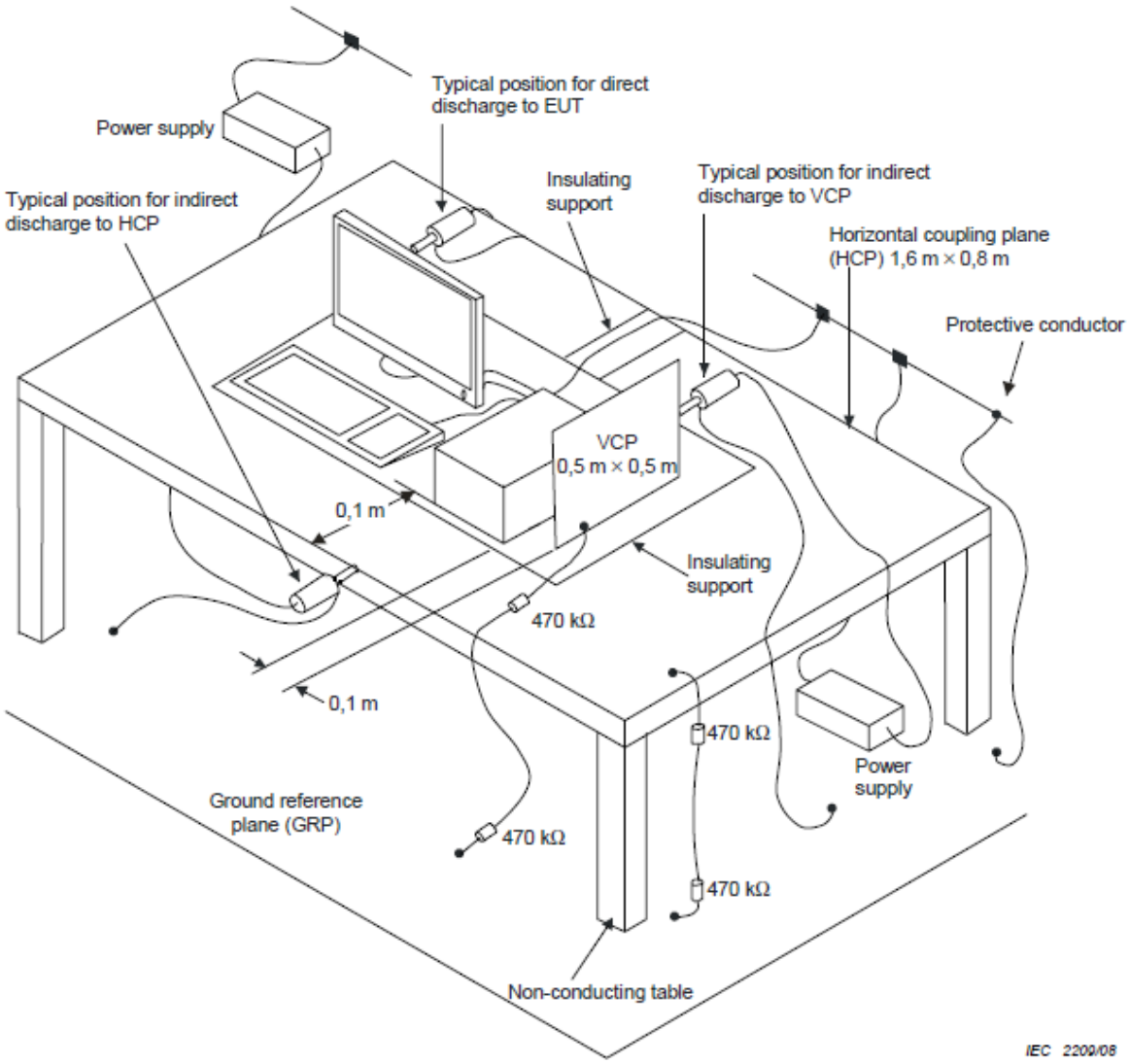
Note 2：After the application of the phenomenon below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating 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.

11. Electrostatic Discharge Immunity Test (ESD)

11.1. Test Specification

Reference Standard	IEC 61000-4-2
Discharge Impedance	330 ohm / 150 pF
Contact Discharge	± 2, 4 kV
Air Discharge	± 2, 4, 8 kV
Rise Time	0.8 ns +/-25 %
Current at 30 ns	+/- 30 %
Current at 60 ns	+/- 30 %
Polarity	Positive / Negative
Number of Discharge	Air Discharge 20 times at each test point
	Contact Discharge 50 times at each test point
Single Discharge Mode	1 discharge per 1s

11.2. Test Setup



The test setup consists of the test generator, EUT and auxiliary instrumentation necessary to perform DIRECT and INDIRECT application of discharges to the EUT as applicable, in the follow manner:
CONTACT DISCHARGE to the conductive surfaces and to coupling plane;
AIR DISCHARGE at insulating surfaces.
The preferred test method is that of type tests performed in laboratories and the only accepted method of demonstrating conformance with this standard. The EUT was arranged as closely as possible to arrangement in final installed conditions.

11.3. Test Setup for Tests Performed in Laboratory

A ground reference plane was provided on the floor of the test site. It was a metallic sheet (copper or aluminum) of 0.25 mm, minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. In the SPORTON EMC LAB., we provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system.

The EUT was arranged and connected according to its functional requirements. A distance of 1m minimum was provided between the EUT and the wall of the lab. and any other metallic structure. In cases where this length exceeds the length necessary to apply the discharges to the selected points, the excess length shall, where possible, be placed non-inductively off the ground reference plane and shall not come closer than 0.2m to other conductive parts in the test setup.

Where the EUT is installed on a metal table, the table was connected to the reference plane via a cable with a 470k ohm resister located at each end, to prevent a build-up of charge. The test setup was consist a wooden table, 0.8m high, standing on the ground reference plane. A HCP, 1.6 m x 0.8 m, was placed on the table. The EUT and cables was isolated from the HCP by an insulating support 0.5 mm thick. The VCP size, 0.5 m x 0.5 m.

11.4. ESD Test Procedure

a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
   - ambient temperature: 15°C to 35°C;
   - relative humidity : 30% to 60%;
   - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).

b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT.

   The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.

c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.

d. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

e. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

f. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted:
   - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
   - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
   - The contact discharge test shall not be applied to such surfaces.

g. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT . After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

11.5. Test Result

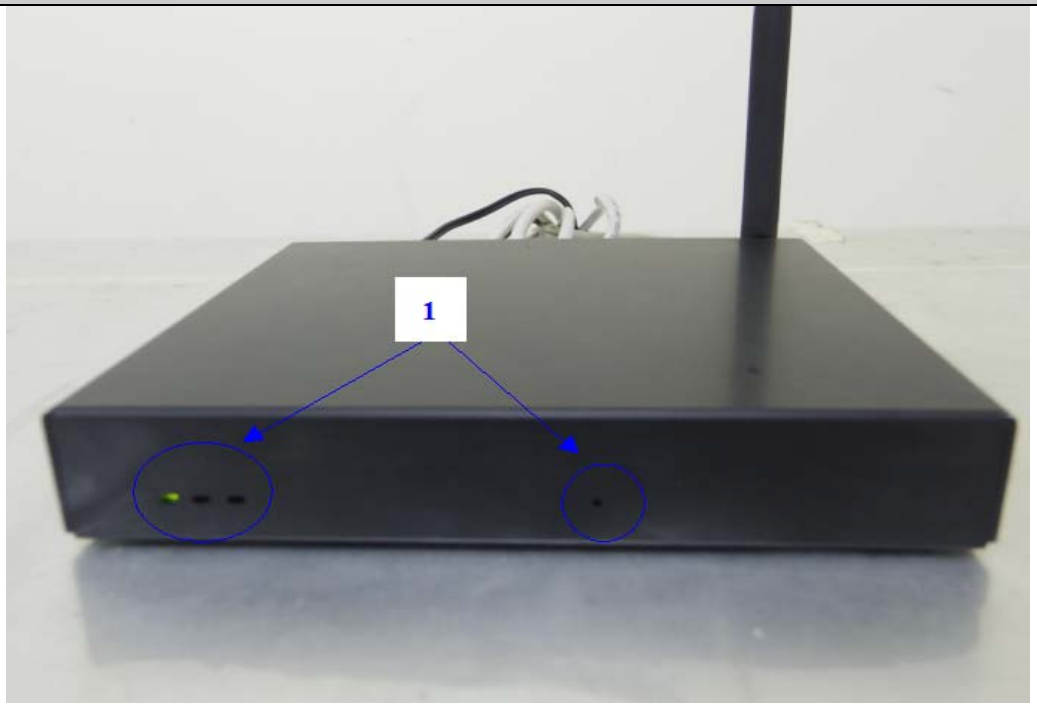
Temperature	26℃	**Humidity**	61%
Pressure	101.6 kPa	**Test Engineer**	Peter Wu
Test Mode	Mode 1~Mode 2	**Test Date**	Sep. 28, 2017
Standard	Required Criteria B		
Test Recorded	There was no abnormal situation during the test compared with initial operation.		

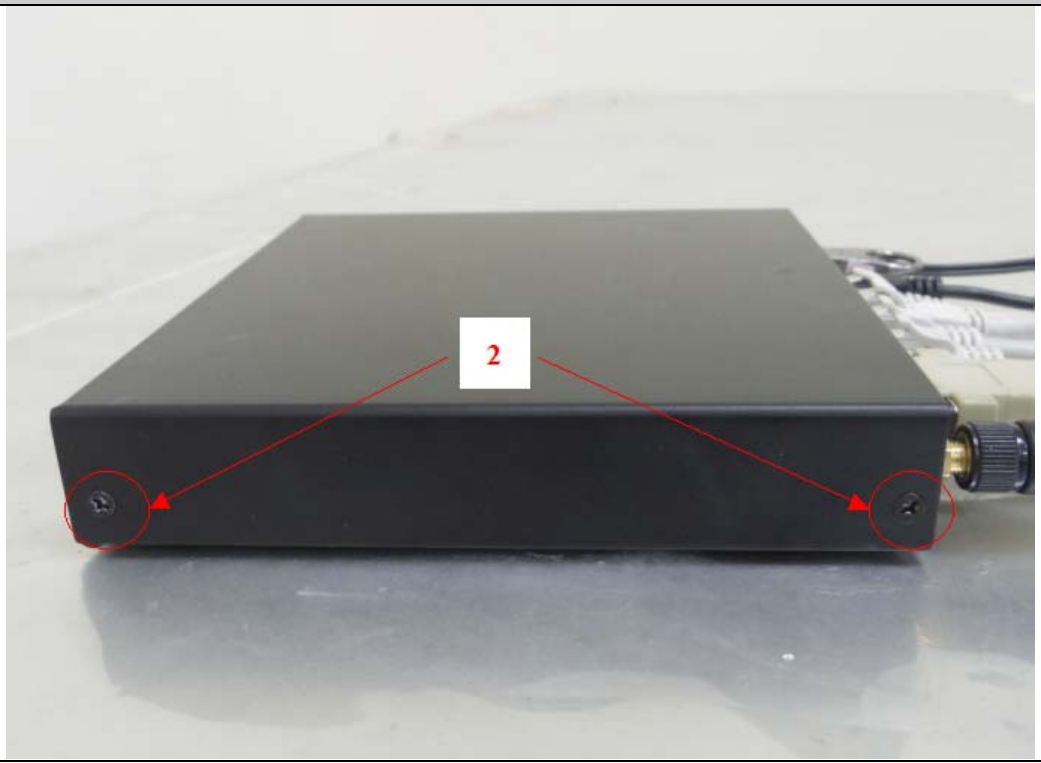
Direct Application：

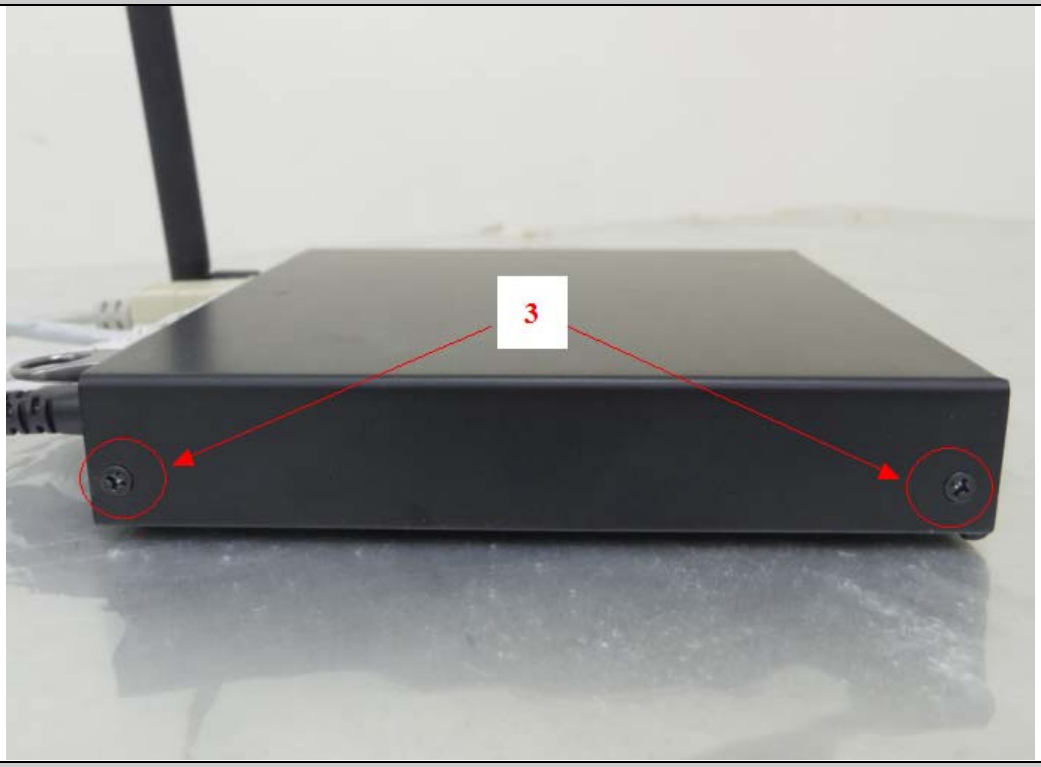
Test Point	Tested Voltage (kV)	Contact Discharge (Performance Criteria)	Air Discharge (Performance Criteria)
1	±2,4,8	-	A
2~9	±2,4	A	-
10~12	±2,4,8	-	A

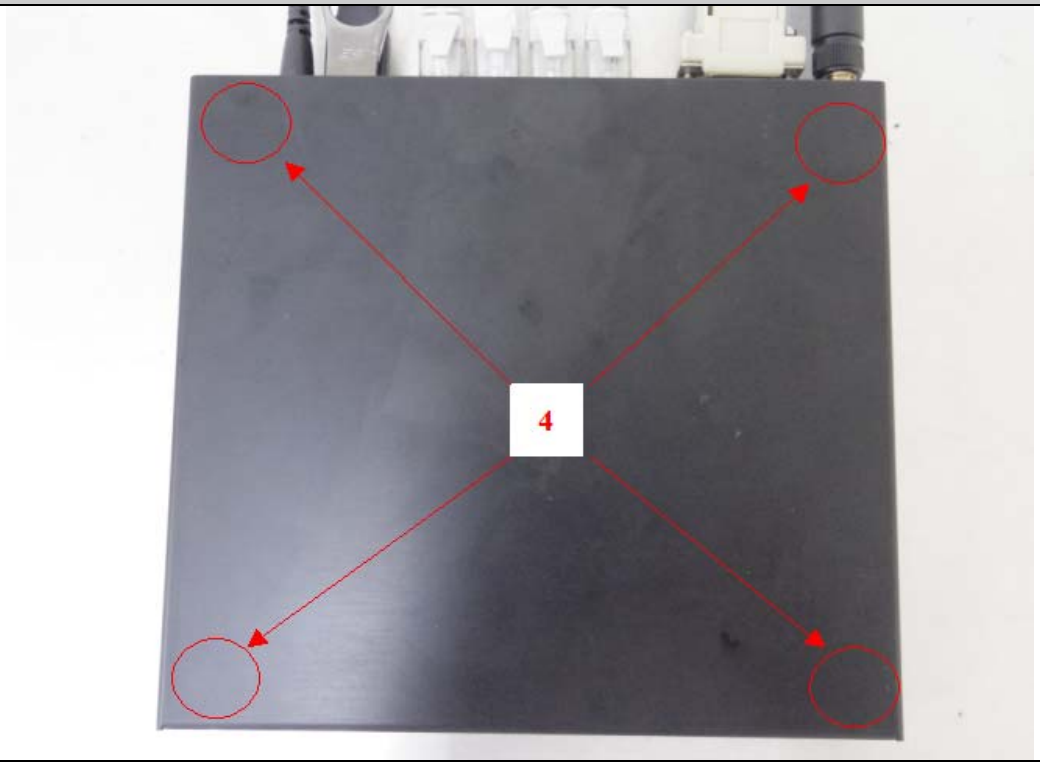
11.6. Photographs of Electrostatic Discharge Immunity Test

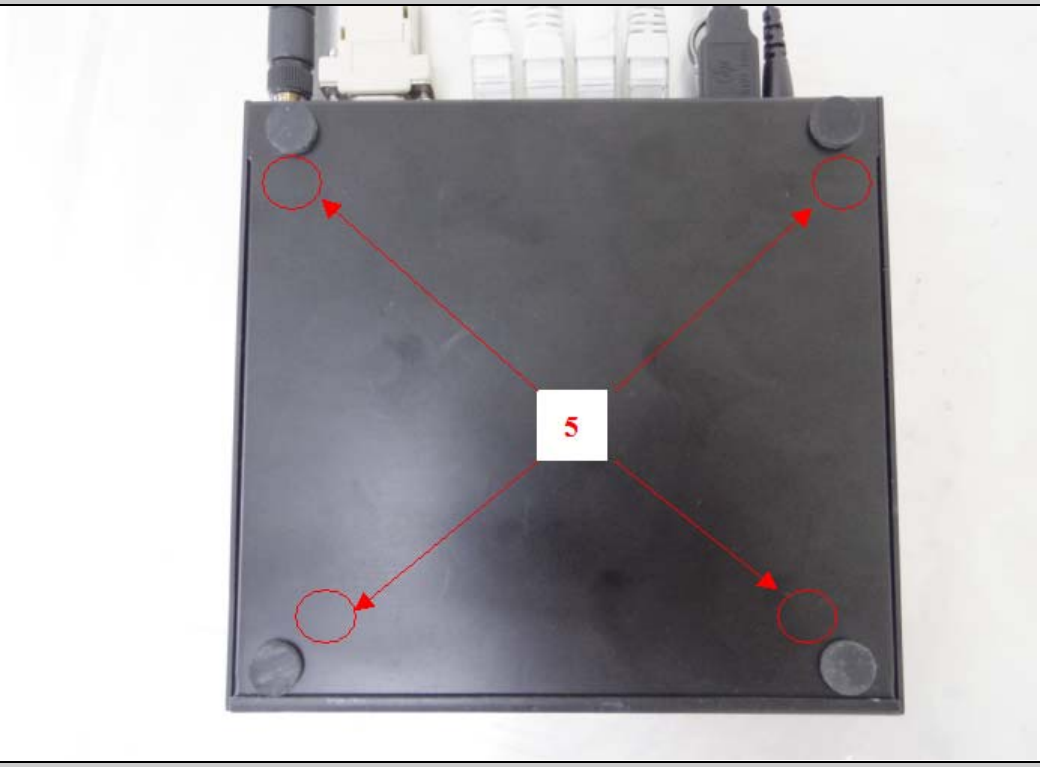
Test Mode: Mode 1

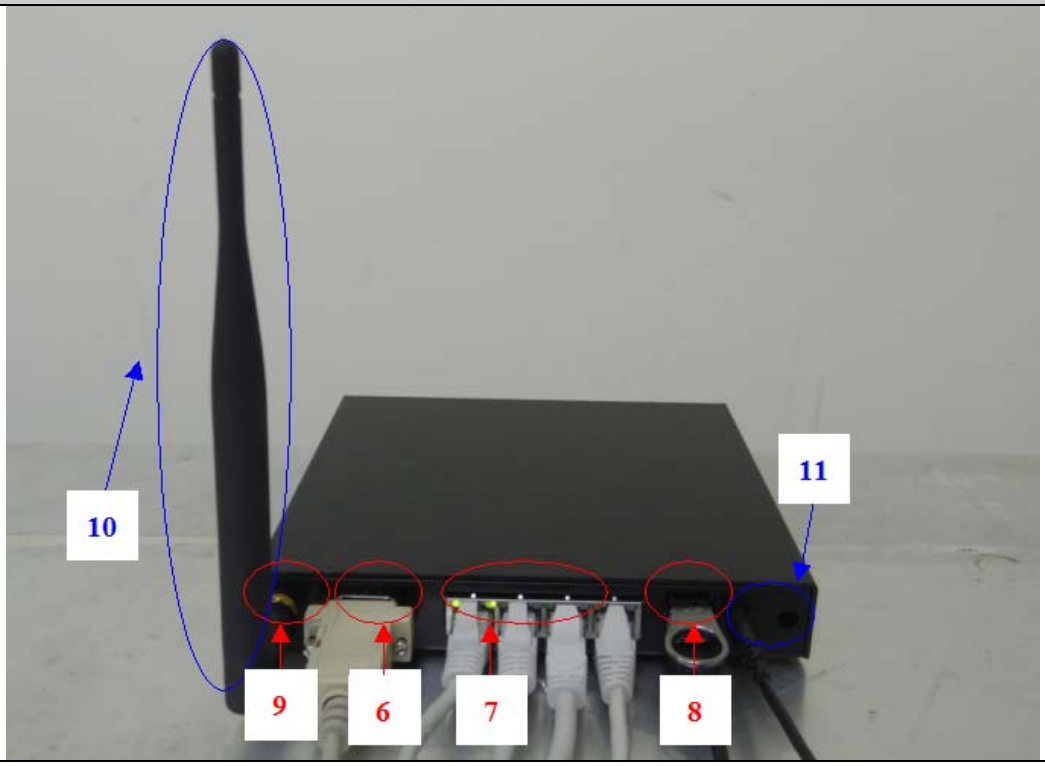
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

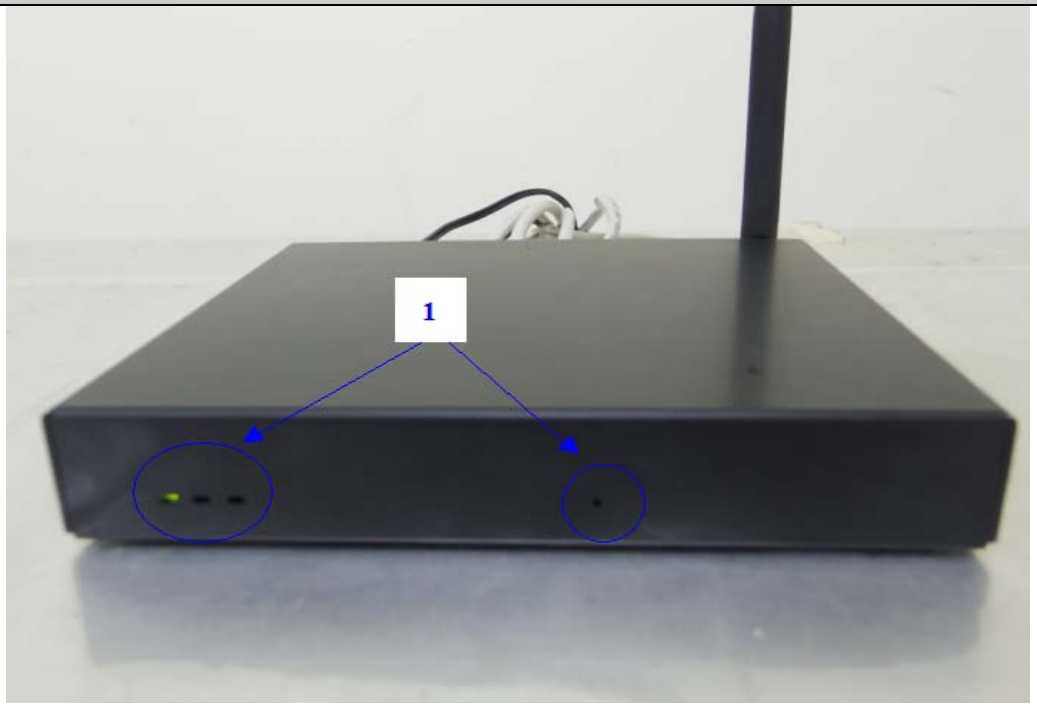
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

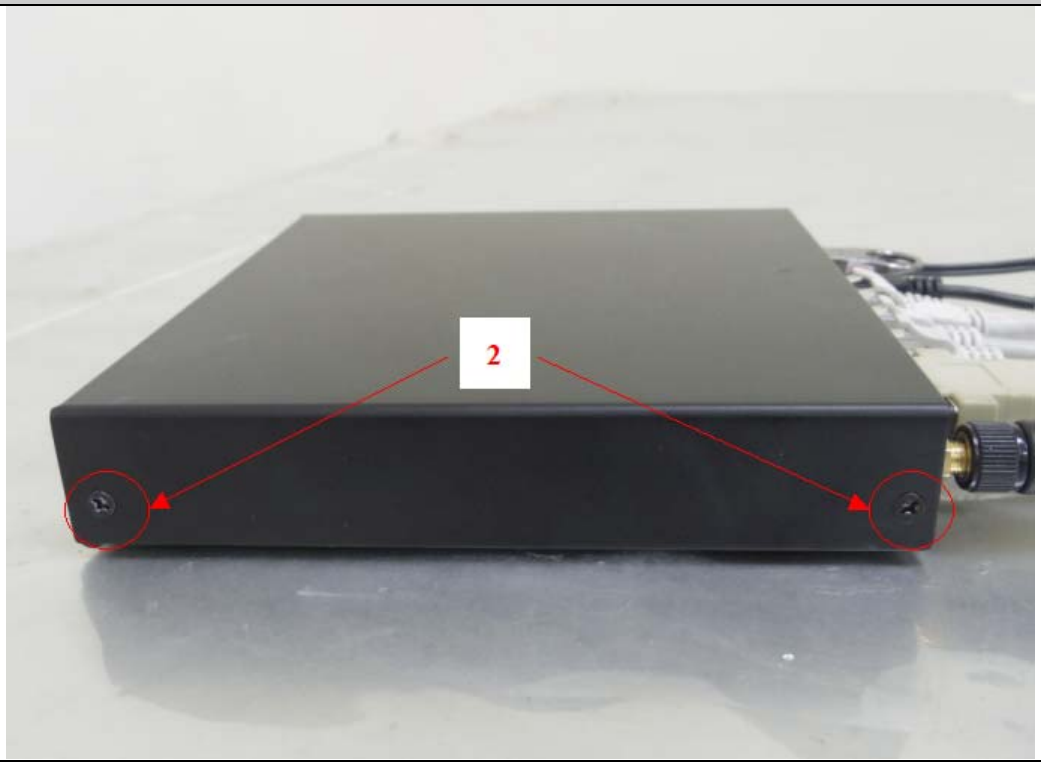
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

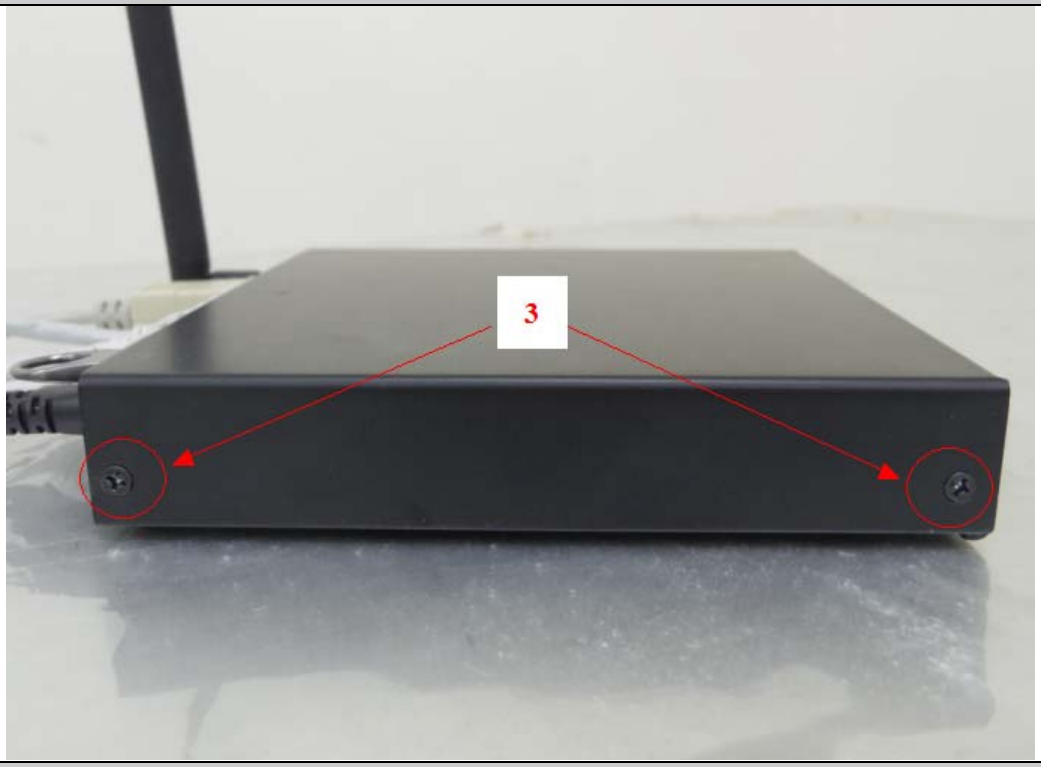
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

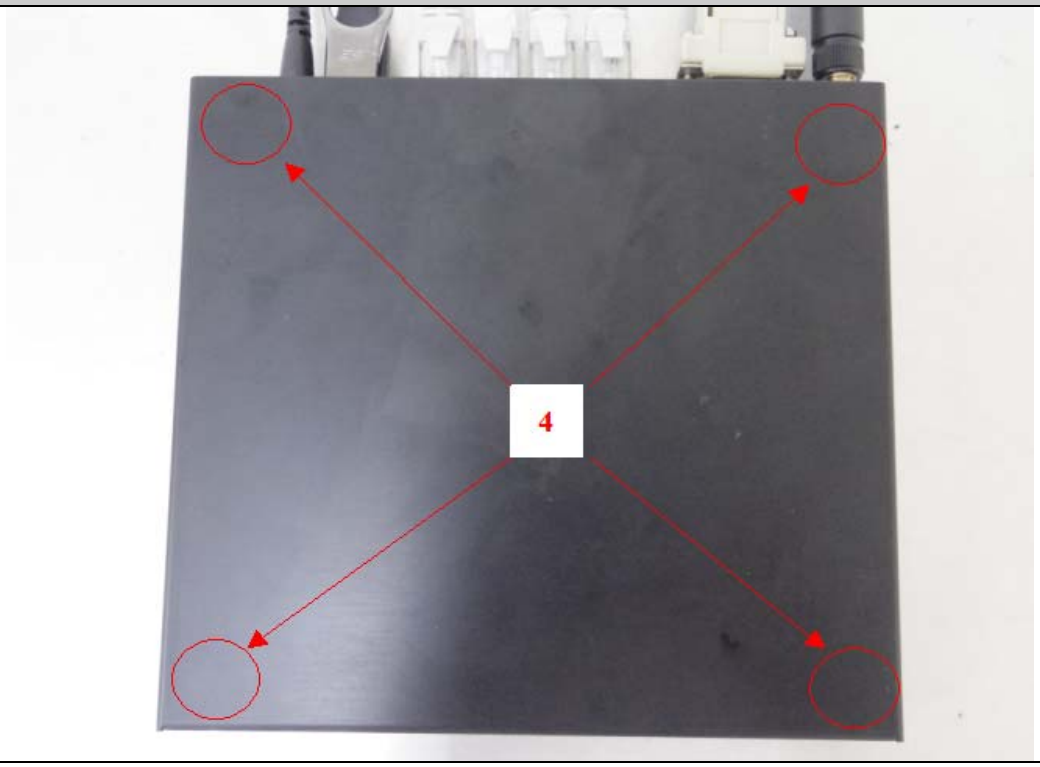
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

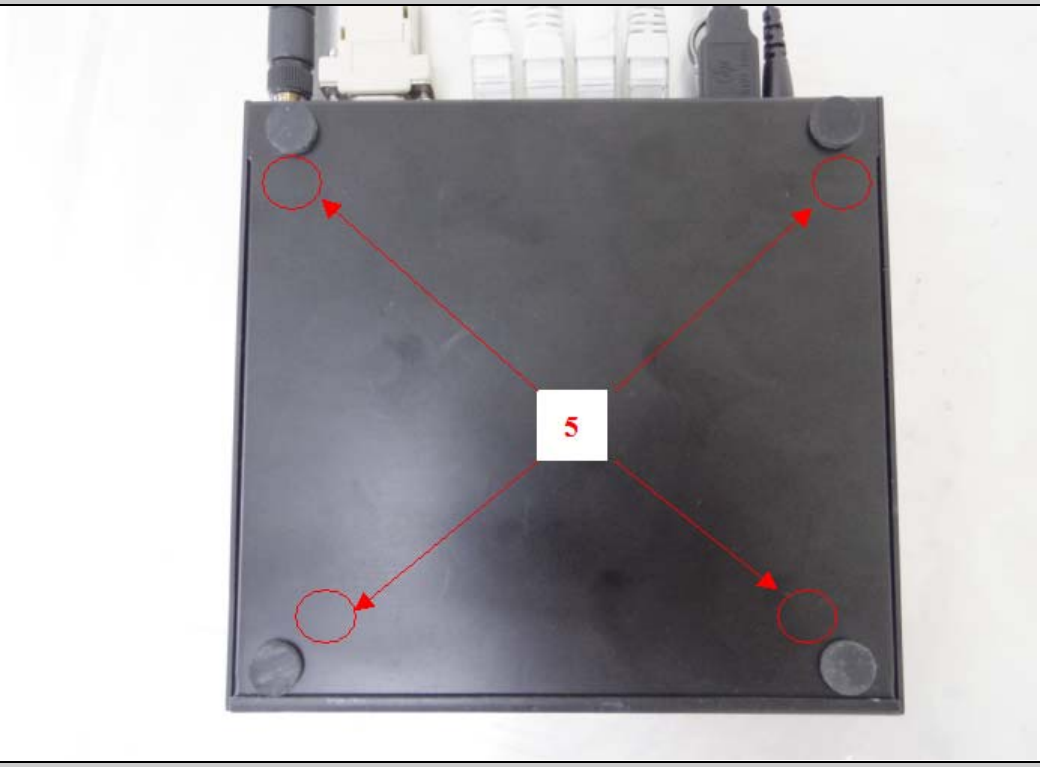
Test Mode: Mode 2

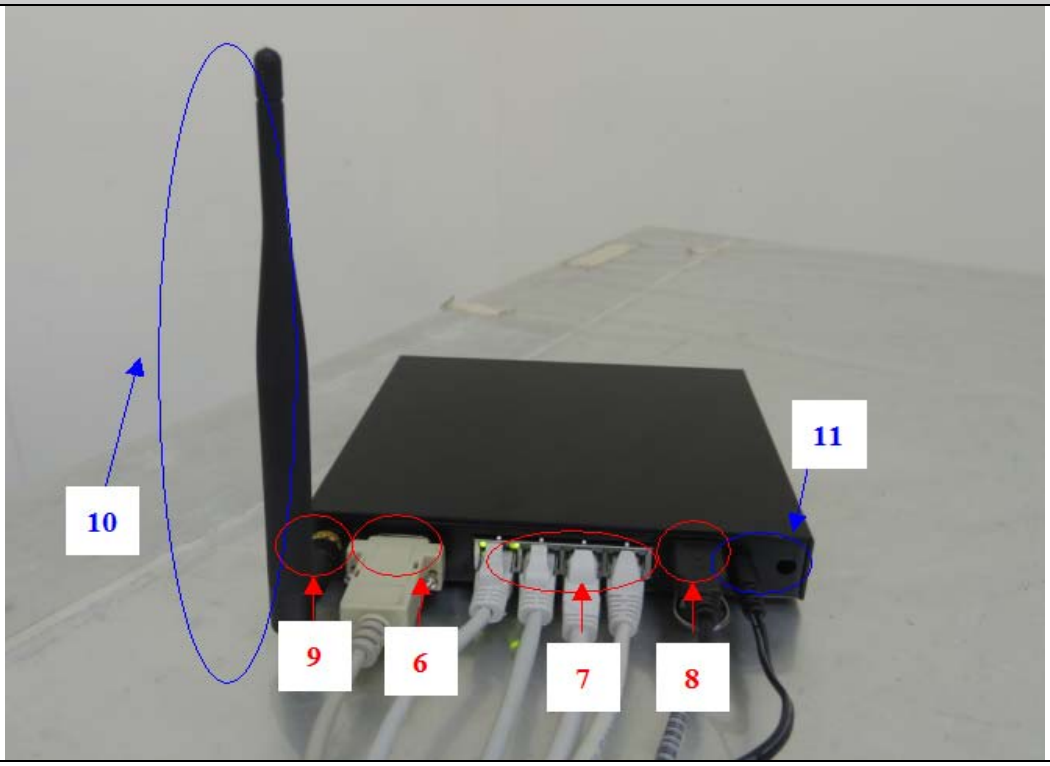
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

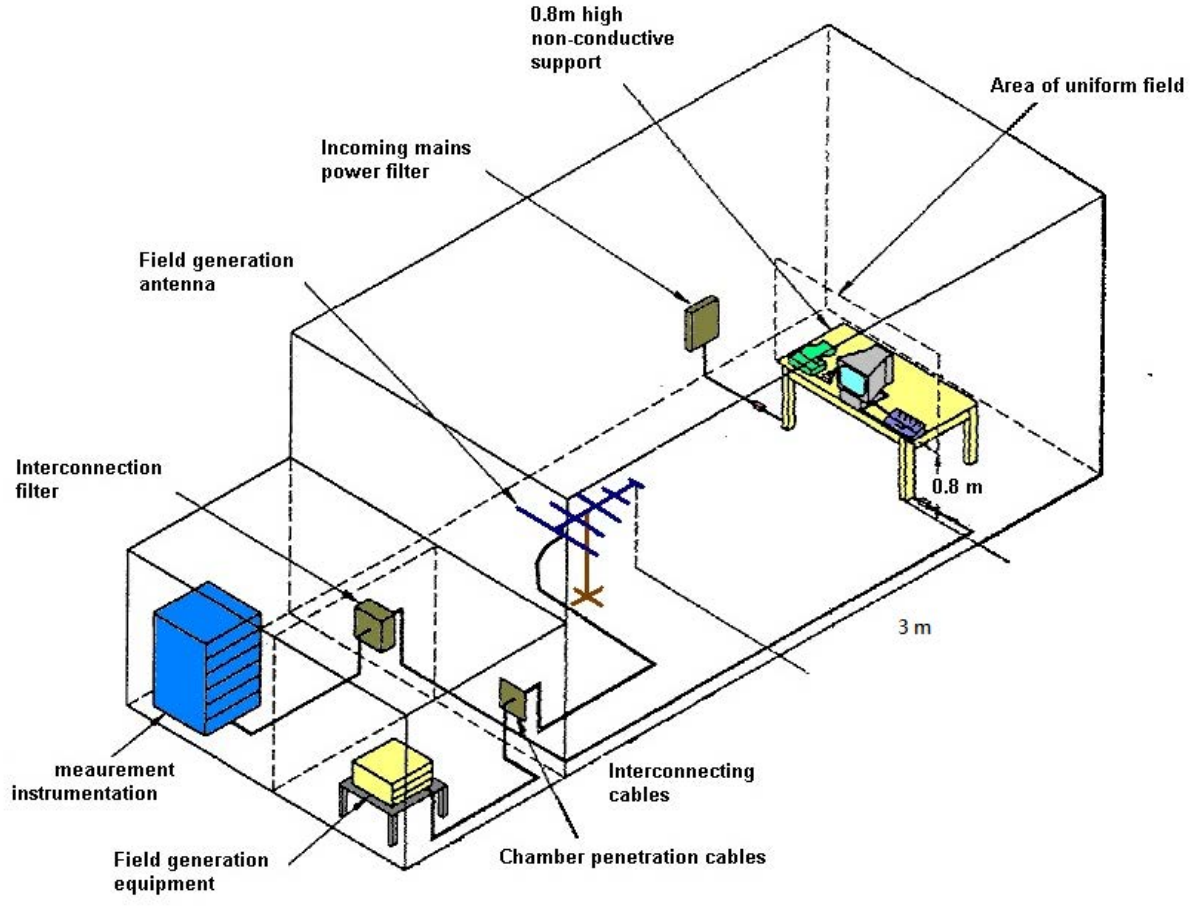
Test Points	
Air Discharge (BLUE color) Contact Discharge (RED color)	

12. Radio Frequency Electromagnetic Field Immunity Test (RS)

12.1. Test Specification

Reference Standard	IEC 61000-4-3
Frequency Range	80 MHz to 1,000 MHz
Field Strength	3 V/m (un-modulated, r.m.s) 80% AM (1 kHz)
Frequency Step	1 %
Dwell Time	2.9 sec
Antenna Polarity	Vertical / Horizontal

12.2. Test Setup



The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels.

12.3. Test Procedure

a. The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.

b. The bilog antenna which is enabling the complete frequency range of 80-1,000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.

c. The test is normally performed with the generating antenna facing each of four sides of the EUT. The polarization of the field generated by the broadband (bilog) antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.

d. At each of the above conditions, the frequency range is swept 80-1,000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of $1.5*10^{-3}$ decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

12.4. Test Result

Temperature	25℃	**Humidity**	58%
Pressure	101.6 kPa	**Test Engineer**	GN Hou
Test Mode	Mode 1~Mode 2	**Test Date**	Sep. 27, 2017
Standard	Required Criteria A		
Test Recorded	There was no abnormal situation during the test compared with initial operation.		

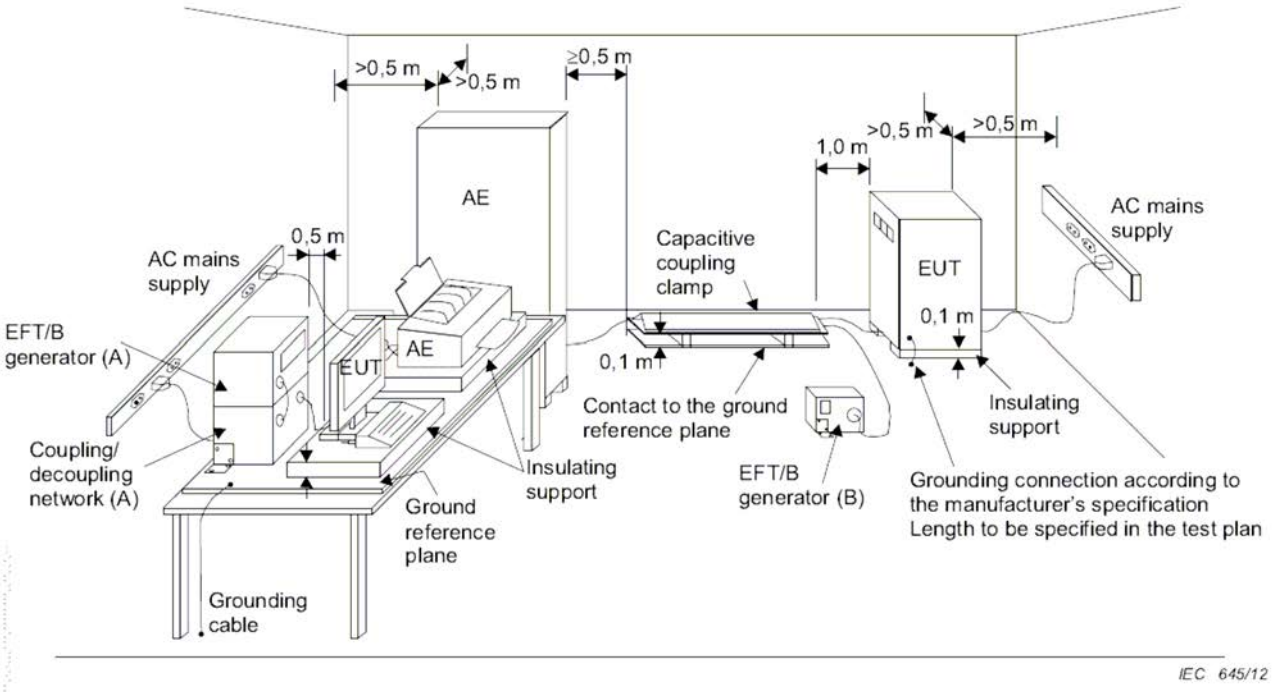
Frequency Range MHz	Field V/m	Antenna Polarization	EUT Face Exposed	Performance Criteria
80~1,000	3	Vertical	Front/Back/Right/Left	A
80~1,000	3	Horizontal	Front/Back/Right/Left	A

13. Electrical Fast Transient/Burst Immunity Test (EFT/BURST)

13.1. Test Specification

Reference Standard	IEC 61000-4-4
Test Voltage	AC Power Line: ± 1 kV
	Telecommunication/Signal Line: ± 0.5 kV
Polarity	Positive / Negative
Rise time of the pulses	5 ns
Impulse duration	50 ns
Burst duration	15 ms for 5 kHz
Burst period	300 ms
Impulse Frequency	Power: 5 kHz Telecommunication/Signal: 5 kHz (Except xDSL equipment)
Duration	1 min

13.2. Test Setup



The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1m thick. If the EUT is table-top equipment, it was located approximately 0.8 m above the GRP.. The GRP. Was a metallic sheet (copper or aluminum) of 0.25 mm ,minimum thickness; other metallic may be used but they shall have at least 0.65 mm thickness. It shall project beyond the EUT by at least 0.1 m on all sides and connected to the protective earth. In the SPORTON EMC LAB. We provided 1 mm thickness aluminum ground reference plane or 1 mm thickness stainless steel ground reference plane. The minimum size of the ground reference plane is 1 m x 1 m, the exact size depending on the dimensions of the EUT. It was connected to the protective grounding system. The EUT was arranged and connected according to its functional requirements. The minimum distance between the EUT and other conductive structures, except the GRP. Beneath the EUT, was more than 0.5 m. Using the coupling clamp, the minimum distance between the coupling plates and all other conductive structures, except the GRP. Beneath the EUT, was more than 0.5 m. The length of the signal and power lines between the coupling device and the EUT was 0.5m or less.

13.3. Test Procedure

a. In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
   - ambient temperature: 15°C to 35°C;
   - relative humidity : 45% to 75%;
   - atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).

b. In order to minimize the effect of environmental parameters on test results, the electromagnetic environment of the laboratory shall not influence the test results.

c. The variety and diversity of equipment and systems to be tested make it difficult to establish general criteria for the evaluation of the effects of fast transients/bursts on equipment and systems.

d. The test results may be classified on the basic of the operating conditions and the functional specification of the equipment under test, according to the following performance criteria :
   - Normal performance within the specification limits.
   - Temporary degradation or loss of function or performance which is self-recoverable.
   - Temporary degradation or loss of function or performance which requires operator intervention or system reset.
   - Degradation or loss of function which is not recoverable due to damage of equipment (components).

13.4. Test Result

Temperature	26℃	**Humidity**	54%
Pressure	101.6 kPa	**Test Engineer**	Peter Wu
Test Mode	Mode 1~Mode 2	**Test Date**	Nov. 27, 2017
Standard	Required Criteria B		
Test Recorded	There was no abnormal situation during the test compared with initial operation.		

AC Power Port：

AC Phase	Test Voltage (kV)
	±1 kV
L	A
N	A
L-N	A

Telecommunication Port：

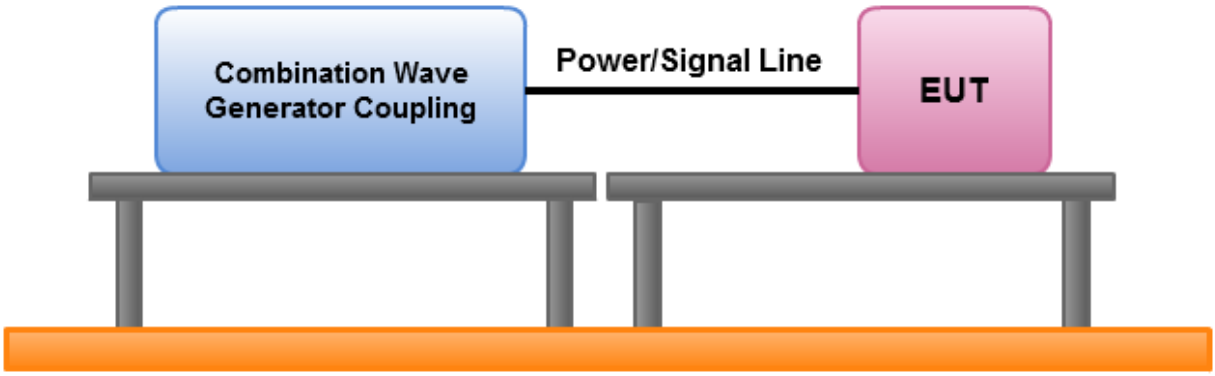
Telecommunication Port	Test Voltage (kV)
	±0.5 kV
LAN	A

14. Surge Immunity Test

14.1. Test Specification

Reference Standard	IEC 61000-4-5
Test Voltage	AC Power Port: ± 0.5, 1 kV
Polarity	Positive / Negative
Wave Shape	Power Port: 1.2/50 us Open-circuit voltage 8/20 us Short-circuit current
Phase Angle	0◦ , 90◦ , 180◦ , 270◦
Time between successive pulses	60 sec.
Number of test	5 positive and 5 negative

14.2. Test Setup



14.3. Test Procedure

a. Climatic conditions
The climatic conditions shall comply with the following requirements :
-- ambient temperature : 15 ˚C to 35 ˚C
-- relative humidity : 10 % to 75 %
-- atmospheric pressure : 86 kPa to 106 kPa (860 mbar to 1060 mbar)

b. Electromagnetic conditions
The electromagnetic environment of the laboratory shall not influence the test results.

c. The test shall be performed according the test plan that shall specify the test set-up with
-- generator and other equipment utilized;
-- test level (voltage/current);
-- generator source impedance;
-- internal or external generator trigger;
-- number of tests: at least five positive and five negative at the selected points;
-- repetition rate: maximum 1/min.
-- inputs and outputs to be tested;
-- representative operating conditions of the EUT;
-- sequence of application of the surge to the circuit;
-- phase angle in the case of a.c. power supply;
-- actual installation conditions, for example :
AC : neutral earthed,
DC : (+) or (-) earthed to simulated the actual earthing conditions.

d. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).

e. The surges have to be applied line to line and line(s) and earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

f. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan.

g. If the actual operating signal sources are not available, the may be simulated. Under no circumstances may the test level exceed the product specification. The test shall be carried out according the a test plan.

h. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied. For acceptance test a previously unstressed equipment shall be used to the protection devices shall be replaced.

14.4. Test Result

Temperature	25℃	**Humidity**	55%
Pressure	101.6 kPa	**Test Engineer**	Wei Li
Test Mode	Mode 1~Mode 2	**Test Date**	Sep. 29, 2017
Standard	Required Criteria B		
Test Recorded	There was no abnormal situation during the test compared with initial operation.		

AC Power Port:

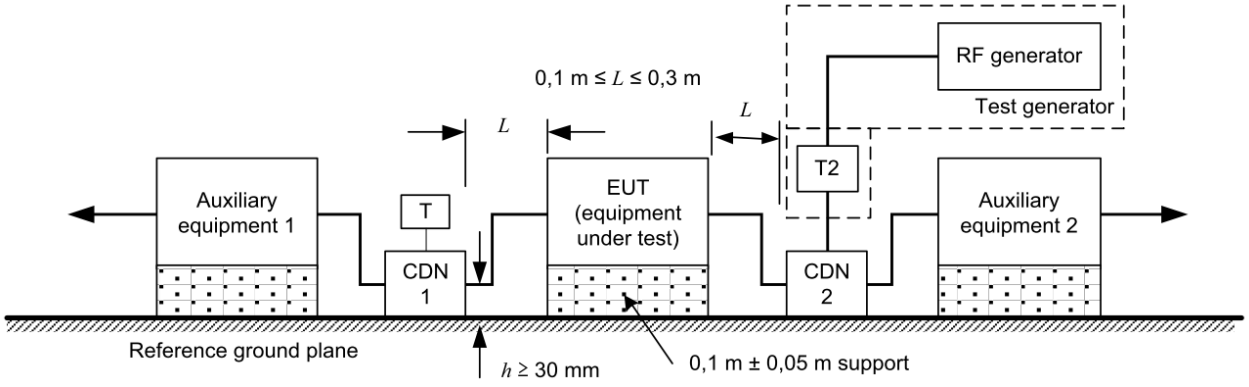
Voltage (kV)	Test Location	Polarity	Phase Angle			
			0°	90°	180°	270°
0.5, 1 kV	L - N	+	A	A	A	A
		−	A	A	A	A

15. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (CS)

15.1. Test Specification

Reference Standard	IEC 61000-4-6
Frequency Range	150 kHz~80 MHz
Field Strength	3 Vr.m.s (un-modulated, r.m.s) 80% AM (1 kHz)
Frequency Step	1 %
Dwell Time	2.9 sec
Coupling mode	CDN M016(M2), CDN T8-10

15.2. Test Setup



15.3. Test Procedure

a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.

b. This test method test can be performed without using a self-shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.

c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.

d. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1kHz sinewave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.

e. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency(ies) and harmonics or frequencies of dominant interest shall be analyzed separately.

f. In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.

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

h. The use of special exercising programs is recommended.

i. Testing shall be performed according to a Test Plan, which shall be included in the test report.

j. It may be necessary to carry out some investigatory testing in order to establish some aspects of the test plan.

15.4. Test Result

Temperature	25℃	Humidity	58%
Pressure	101.6 kPa	Test Engineer	Peter Wu
Test Mode	Mode 1~Mode 2	Test Date	Nov. 27, 2017
Standard	Required Criteria A		
Test Recorded	There was no abnormal situation during the test compared with initial operation.		

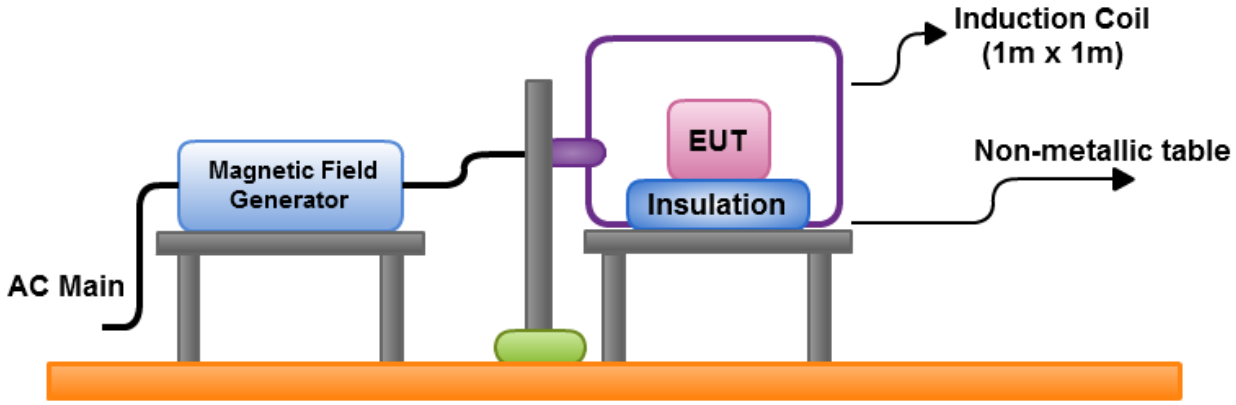
Frequency Range MHz	V (r.m.s)	CDN	Coupling port	Performance Criteria
0.15 ~ 80	3	M016(M2)	AC Power	A
0.15 ~ 80	3	T8-10	LAN_1000Mbps	A

16. Power Frequency Magnetic Field Immunity Tests

16.1. Test Specification

Reference Standard	IEC 61000-4-8
Frequency Range	50 Hz
Field Strength	1 A/m
Observation type	1 min
Inductance Coil	1 m x 1 m

16.2. Test Setup



16.3. Test Procedure

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

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

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

16.4. Test Result

Temperature	25℃	Humidity	58%
Pressure	101.6 kPa	Test Engineer	GN Hou
Test Mode	Mode 1~Mode 2	Test Date	Sep. 27, 2017
Standard	Required Criteria A		
Test Recorded	There was no abnormal situation during the test compared with initial operation.		

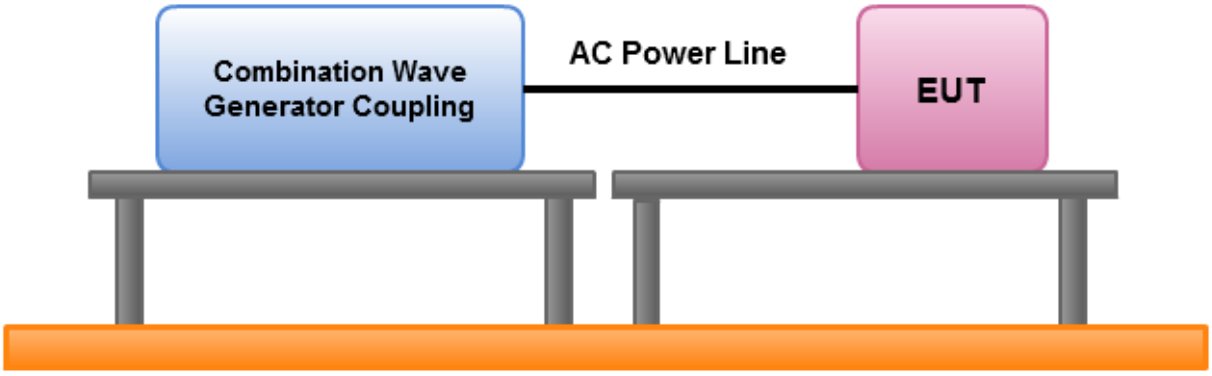
Power Frequency Magnetic Field	Testing duration	Coil Orientation	Performance Criteria
50 Hz, 1 A/m	1.0 Min	X-axis	A
50 Hz, 1 A/m	1.0 Min	Y-axis	A
50 Hz, 1 A/m	1.0 Min	Z-axis	A

17. Voltage Dips and Voltage Interruptions Immunity Tests

17.1. Test Specification

Reference Standard	IEC 61000-4-11
Test Voltage	Voltage Dip：
	1. >95%, Reduction, 0.5 period
	2. 30%, Reduction, 25 period
	Voltage interruptions
	3. >95%, Reduction, 250 period
Test Duration Time	3 times
Intervals between event	10 sec.
Test Angle	0, 180°

17.2. Test Setup



17.3. Test Conditions

1. Source voltage and frequency: 100/230/240V / 50Hz, Single phase.
2. Test of interval: 10 sec.
3. Level and duration: Sequency of 3 dips/interrupts.
4. Voltage rise (and fall) time: 1 ~ 5 μs.

17.4. Test Result

Temperature	26℃	Humidity	54%
Pressure	101.6 kPa	Test Engineer	Howard Liu
Test Mode	Mode 1~Mode 2	Test Date	Sep. 28, 2017
Standard	Required Criteria B/C/C		
Test Recorded	The EUT had "reboot" situation happened during the test, but it will automatically return to normal conditions after the test.		

Voltage Dip & Interruption :

Voltage (V)	Frequency (Hz)	% Reduction	Periods	ms	Performance Criteria
100	50	>95 %	0.5	10	A
		30 %	25	500	A
		>95%	250	5,000	B

Voltage (V)	Frequency (Hz)	% Reduction	Periods	ms	Performance Criteria
230	50	>95 %	0.5	10	A
		30 %	25	500	A
		>95%	250	5,000	B

Voltage (V)	Frequency (Hz)	% Reduction	Periods	ms	Performance Criteria
240	50	>95 %	0.5	10	A
		30 %	25	500	A
		>95%	250	5,000	B

18. List of Measuring Equipment Used

<EMI>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 23, 2017	Jan. 22, 2018	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 14, 2016	Dec. 13, 2017	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 21, 2016	Dec. 20, 2017	Conduction (CO01-CB)
Impedance Stabilization Network	Teseq	ISN T800	24557	150kHz ~ 230MHz	Nov. 22, 2017	Nov. 21, 2018	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 23, 2017	May 22, 2018	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
10m Semi Anechoic Chamber	TDK	NSA	10CH01-CB	30MHz~1GHz 10m	Mar. 18, 2017	Mar. 17, 2018	Radiation (10CH01-CB)
10m Semi Anechoic Chamber	TDK	VSWR	10CH01-CB	1GHz ~40GHz 3m	Mar. 17, 2017	Mar. 16, 2018	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10783	9kHz ~ 1.3GHz	Mar. 27, 2017	Mar. 26, 2018	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10784	9kHz ~ 1.3GHz	Mar. 13, 2017	Mar. 12, 2018	Radiation (10CH01-CB)
Low Cable	Woken	SUCOFLEX 104	-	25MHz ~ 1GHz	Nov. 30, 2016	Nov. 29, 2017	Radiation (10CH01-CB)
High Cable	Woken	SUCOFLEX 104	-	25MHz ~ 1GHz	Nov. 30, 2016	Nov. 29, 2017	Radiation (10CH01-CB)
Biconical Antenna	Schwarzbeck	VHBB 9124	324	30MHz ~ 200MHz	May 03, 2017	May 02, 2018	Radiation (10CH01-CB)
Log Antenna	Schwarzbeck	VUSLP 9111	247	200MHz ~ 1GHz	May 26, 2017	May 25, 2018	Radiation (10CH01-CB)
EMI Test Receiver	Rohde&Schwarz	ESCI	100186	9kHz ~ 3GHz	Jul. 12, 2017	Jul. 11, 2018	Radiation (10CH01-CB)
Spectrum Analyzer	Rohde&Schwarz	FSV30	101026	9kHz ~ 30GHz	Jan. 03, 2017	Jan. 02, 2018	Radiation (10CH01-CB)
Horn Antenna	ESCO	3117	00081283	1GHz ~ 18GHz	Nov. 29, 2016	Nov. 28, 2017	Radiation (10CH01-CB)
Amplifier	Agilent	8449B	3008A02660	1GHz ~ 26.5GHz	May 25, 2017	May 24, 2018	Radiation (10CH01-CB)

CABLE(1~40G)	Woken	SUCOFLEX 104	-	1GHz ~ 40GHz	Nov. 30, 2016	Nov. 29, 2017	Radiation (10CH01-CB)
Software	Audix	E3	6.120210m	-	N.C.R.	N.C.R.	Radiation (10CH01-CB)

※ Calibration Interval of instruments listed above is one year.

※ N.C.R. means Non-Calibration required.

<EMS>

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Harmonic/ Flicker	Teseq	CCN 1000-1	1306A00130	N/A	Mar. 15, 2017	Mar. 14, 2018	Harmonic/ Flicker
Software	Teseq	WIN2100V3	-	-	N.C.R.	N.C.R.	Harmonic/ Flicker
ESD Simulator	KEYTEK	MINIZAP	0408333	Air: 0 kV ~ 15 kV, Contact: 0 kV ~ 8kV	Dec. 27, 2016	Dec. 26, 2017	ESD
Integrated Measurement System	R&S	IMS	100002	9kHz ~ 3GHz	Apr. 19, 2017	Apr. 18, 2018	RS
Average Power Sensor	R&S	NRP-Z91	101117	9kHz ~ 6GHz	Apr. 07, 2017	Apr. 06, 2018	RS
RF Power Amplifier	AR	250W1000A	0323202	80MHz ~1GHz, 250W	Apr. 14, 2017	Apr. 13, 2018	RS
Log-Periodic Antenna	AR	AT1080	0323130	80MHz ~ 1GHz	N.C.R.	N.C.R.	RS
Software	R&S	EMC32	5.20.1	-	N.C.R.	N.C.R.	RS
Surge/EFT/Dip Generator	Teseq AG	NSG 3060	1534	Surge 0 ~ 6kV EFT 0 kV ~ 4.4 kV Dip 100~240V/ 50Hz /60Hz	Apr. 06, 2017	Apr. 05, 2018	Surge EFT Dip
Burst/EFT Dataline Coupling Clamp	Teseq AG	CDN 3425	1776	0.25kV~4kV	Feb. 09, 2017	Feb. 08, 2018	EFT
Software	Teseq AG	NSG3000	-	-	N.C.R.	N.C.R.	Surge/ EFT/Dip
RF-Generator	Teseq GmbH	NSG 4070B-30	035084	150kHz~230MHz	May 01, 2017	Apr. 30, 2018	CS
Coupling decoupling network	Teseq GmbH	CDN M016	34634	150kHz~80MHz	Apr. 18, 2017	Apr. 17, 2018	CS
Coupling decoupling network	Teseq GmbH	CDN T8-10	46729	150kHz~230MHz	Jul. 26, 2017	Jul. 25, 2018	CS
Software	Tesq	NSG4070	030593.V1.28	-	N.C.R.	N.C.R.	CS
Magnetic field Immunity Loop	FCC	F-1000-4-8/9/10-L-1AM	04014,04017	30A//CONTINUOUS, 100A/2Hrs, 230A/30SEC	Jul. 31, 2017	Jul. 30, 2018	Magnetic

※ Calibration Interval of instruments listed above is one year.

※ N.C.R. means Non-Calibration required.

19. Uncertainty of Test Site

Test Items	Uncertainty	Remark
Conducted Emissions	3.2 dB	Confidence levels of 95%
Radiated Emissions below 1GHz	4.3 dB	Confidence levels of 95%
Radiated Emissions above 1GHz	5.0 dB	Confidence levels of 95%

Immunity Test Measurement Uncertainty

Electrostatic Discharge Immunity (ESD)

Negative Discharge Current

From Standard					From calibration certificate					
2kV	First Peak Current	Current at 30ns	Current at 60ns		Measured First Peak Current	1st Peak Worst case **+5%**	Measured Current at 30ns	30ns Worst case **+5%**	Measured Current at 60ns	60ns Worst case **+5%**
Nominal	7.5	4.0	2.0	Positive	6.9	7.2	3.6	3.8	1.9	2.0
Min.	6.4	2.8	1.4	Negative	7.3	7.7	3.7	3.9	1.9	2.0
Max.	8.6	5.2	2.6	Min.		6.4		2.8		1.4
Tolerance in %	0.2	0.3	0.3	Max.		8.6		5.2		2.6

4kV	First Peak Current	Current at 30ns	Current at 60ns		Measured First Peak Current	1st Peak Worst case **+5%**	Measured Current at 30ns	30ns Worst case **+5%**	Measured Current at 60ns	60ns Worst case **+5%**
Nominal	15.0	8.0	4.0	Positive	14.4	15.1	7.6	7.9	3.8	4.0
Min.	12.8	5.6	2.8	Negative	14.1	14.8	7.4	7.8	4.0	4.2
Max.	17.3	10.4	5.2	Min.		12.8		5.6		2.8
Tolerance in %	0.2	0.3	0.3	Max.		17.3		10.4		5.2

6kV	First Peak Current	Current at 30ns	Current at 60ns		Measured First Peak Current	1st Peak Worst case **-5%**	Measured Current at 30ns	30ns Worst case **+5%**	Measured Current at 60ns	60ns Worst case **+5%**
Nominal	22.5	12.0	6.0	Positive	21.2	22.2	11.2	11.7	5.8	6.1
Min.	19.1	8.4	4.2	Negative	20.7	21.7	11.1	11.7	6.0	6.2
Max.	25.9	15.6	7.8	Min.		19.1		8.4		4.2
Tolerance in %	0.2	0.3	0.3	Max.		25.9		15.6		7.8

8kV	First Peak Current	Current at 30ns	Current at 60ns		Measured First Peak Current	1st Peak Worst case **-5%**	Measured Current at 30ns	30ns Worst case **+5%**	Measured Current at 60ns	60ns Worst case **+5%**
Nominal	30.0	16.0	8.0	Positive	27.8	29.1	14.7	15.4	7.6	8.0
Min.	25.5	11.2	5.6	Negative	28.4	29.8	15.0	15.7	7.8	8.1
Max.	34.5	20.8	10.4	Min.		25.5		11.2		5.6
Tolerance in %	0.2	0.3	0.3	Max.		34.5		20.8		10.4

Negative Discharge Voltage

Standard Parameters					Calculated Range		
Indicated Voltage (kV)	Polarity	Tolerance (%)	Max. (kV)	Min. (kV)	Calibration (kV)	Max. (kV)	Min. (kV)
2	Positive	15.0	2.3	1.7	2.0	2.0	2.0
	Negative	15.0	2.3	1.7	2.1	2.6	2.6
4	Positive	15.0	4.6	3.4	4.0	4.0	4.0
	Negative	15.0	4.6	3.4	4.1	4.1	4.1
6	Positive	15.0	6.9	5.1	6.0	6.0	6.0
	Negative	15.0	6.9	5.1	6.1	6.1	6.1
8	Positive	15.0	9.2	6.8	8.0	8.0	7.9
	Negative	15.0	9.2	6.8	8.1	8.1	8.1
15	Positive	15.0	17.3	12.8	15.2	15.2	15.2
	Negative	15.0	17.3	12.8	14.9	14.9	14.9

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least a 95% confidence.

Radio Frequency Electromagnetic Field Immunity (RS)
IMS

Frequency 10MHz Output Check	
Standard	Reading
10 MHz	9,999,985.8 Hz

Frequency Accuracy/offset：1.4E-07
Frequency Stability：5E-09/1.0S
Uncertainty: 4.0E-06

Gain Flatness Measurement (For 80 MHz to 1 GHz Amp.)		
Freq. (MHz)	Reading (dB)	Expected (dB)
80.0	62.6	> 54
100.0	62.4	> 54
200.0	61.6	> 54
300.0	62.0	> 54
400.0	58.8	> 54
500.0	60.4	> 54
600.0	58.4	> 54
700.0	58.8	> 54
800.0	59.3	> 54
900.0	58.3	> 54
1000.0	55.8	> 54

Gain Flatness Measurement (For 1 GHz to 3 GHz Amp.)		
Freq. (GHz)	Reading (dB)	Expected (dB)
0.8	47.6	> 40
1.0	48.0	> 40
1.5	47.9	> 40
2.0	47.8	> 40
2.5	46.4	> 40
3.0	46.3	> 40

VSWR Measurement (input port)		
Freq. (MHz)	Actual (dB)	Hige Range (dB)
80.0	1.7	< 2.00
100.0	1.5	< 2.00
200.0	1.6	< 2.00
300.0	1.5	< 2.00
400.0	1.5	< 2.00
500.0	1.4	< 2.00
600.0	1.4	< 2.00
700.0	1.4	< 2.00
800.0	1.4	< 2.00
900.0	1.5	< 2.00
1000.0	1.4	< 2.00

Power Linearly Measurement								
Freq. (MHz)	Reading (Watts)	Standard (Watts)	Freq. (MHz)	Reading (Watts)	Standard (Watts)	Freq. (MHz)	Reading (Watts)	Standard (Watts)
80.0	20.0	23.2	200.0	200.0	226.9	800.0	100.0	97.7
80.0	50.0	63.9	200.0	250.0	279.7	800.0	150.0	147.2
80.0	100.0	122.4	500.0	20.0	21.3	800.0	200.0	196.1
80.0	150.0	173.4	500.0	50.0	52.6	800.0	250.0	244.9
80.0	200.0	234.7	500.0	100.0	103.8	1000.0	20.0	16.5
80.0	250.0	302.2	500.0	150.0	155.4	1000.0	50.0	45.2
200.0	20.0	22.4	500.0	200.0	206.8	1000.0	100.0	87.3
200.0	50.0	58.3	500.0	250.0	258.1	1000.0	150.0	131.9
200.0	100.0	107.6	800.0	20.0	19.1	1000.0	200.0	175.9
200.0	150.0	166.7	800.0	50.0	48.6	1000.0	250.0	220.0

Standard Power Measurement					
For 80 MHz to 1 GHz			For 800MHz to 3 GHz		
Freq.	Expected (WATTS)	Standard (WATTS)	Freq.	Expected (WATTS)	Standard (WATTS)
80.0	> 250	348.0	0.8	> 30	30.3
100.0	> 250	335.0	1.0	> 30	34.2
200.0	> 250	340.0	1.5	> 30	39.9
300.0	> 250	329.0	2.0	> 30	36.7
400.0	> 250	324.0	2.5	> 30	34.0
500.0	> 250	282.0	3.0	> 30	34.3
600.0	> 250	318.0			
700.0	> 250	329.0			
800.0	> 250	306.0			
900.0	> 250	294.0			
1000.0	> 250	271.0			

Uncertainty: 3%

It has been demonstrated that the RS generator meets the specified requirements in the standard with at least a 95% confidence.

Electrical Fast Transient/Burst Immunity (EFT/BURST)

Voltage

Impedance	Voltage Setting(V)	Expected (V)	Actual (V)	Uncertainty (%)	T1	Uncertainty (%)	T2	Uncertainty (%)
50Ω	500	250	253	8.2	5.39	4.4	46.49	4.4
50Ω	1000	500	504	8.2	5.7	4.4	45.98	4.4
50Ω	2000	1000	971	8.2	5.57	4.4	44.89	4.4
50Ω	4000	2000	1972	8.2	5.38	4.4	46.07	4.4
50Ω	-500	-250	-248	8.2	4.66	4.4	88.31	4.4
50Ω	-1000	-500	-496	8.2	5.23	4.4	86.25	4.4
50Ω	-2000	-1000	-962	8.1	5.11	4.4	85.48	4.4
50Ω	-4000	-2000	-1960	8.2	5.04	4.4	87.83	4.4
1kΩ	500	500	476	8.2	5.81	4.4	87.87	4.4
1kΩ	1000	1000	933	8.2	5.42	4.4	88.38	4.4
1kΩ	2000	2000	1814	8.2	5.35	4.4	89.78	4.4
1kΩ	4000	4000	3674	8.2	5.98	4.4	85.91	4.4
1kΩ	-500	-500	-460	8.2	6.03	4.4	37.78	4.4
1kΩ	-1000	-1000	-918	8.2	6.24	4.4	36.86	4.4
1kΩ	-2000	-2000	-1877	8.2	6.16	4.4	37.23	4.4
1kΩ	-4000	-4000	-3599	8.2	6.42	4.4	37.53	4.4

EFT Repetition Frequency (Voltage @ 1 kV)

Setting (kHz)	Actual (kHz)	Uncertainty (%)	Tolerance (%)
5	5	4.4	20%
100	100.01	4.4	20%

Burst Duration (Voltage @ 1 kV)

Setting (ms)	Repetition Freq. (kHz)	Actual (ms)	Uncertainty (%)	Tolerance (%)
15	5	14.82	4.4	20%
0.75	100	0.74	4.5	20%

Burst Period (Voltage @ 1 kV)

Setting (ms)	Repetition Freq. (kHz)	Actual (ms)	Uncertainty (%)	Tolerance (%)
300	5	300	4.4	20%
300	100	300	4.4	20%

It has been demonstrated that the EFT/BURST generator meets the specified requirements in the standard with at least a 95% confidence.

Surge Immunity

Open Circuit Output Voltage Waveform check:

Impedance	Voltage Setting(V)	Actual (V)	Uncertainty (%)	T3	Uncertainty (%)	T4	Uncertainty (%)
L-N 2Ω	500.0	503.0	3.9	1.3	3.7	54.0	3.7
L-N 2Ω	4000.0	4020.0	3.9	1.2	3.7	51.2	3.7
L-N 2Ω	-500.0	-503.0	3.9	1.3	3.7	50.8	3.7
L-N 2Ω	-4000.0	-4068.0	3.9	1.1	3.7	50.3	3.7
L-G 2Ω	500.0	485.0	3.9	1.3	3.7	29.7	3.7
L-G 2Ω	4000.0	3948.0	3.9	1.0	3.7	28.2	3.7
L-G 2Ω	-500.0	-480.0	3.9	1.3	3.7	28.3	3.7
L-G 2Ω	-4000.0	-3900.0	3.9	1.1	3.7	28.0	3.7
N-G 2Ω	500.0	490.0	3.9	1.3	3.7	29.5	3.7
N-G 2Ω	4000.0	3900.0	3.9	1.2	3.7	27.9	3.7
N-G 2Ω	-500.0	-478.0	3.9	1.3	3.7	28.4	3.7
N-G 2Ω	-4000.0	-3900.0	3.8	1.2	3.7	28.2	3.7
Impulse	500.0	511.0	3.9	1.5	3.7	53.4	3.7
Impulse	1000.0	1041.0	3.9	1.3	3.7	51.9	3.7
Impulse	2000.0	2022.0	3.9	1.2	3.8	53.3	3.7
Impulse	4000.0	4044.0	3.9	1.3	3.6	53.3	3.7
Impulse	-500.0	-503.0	3.9	1.5	3.7	52.6	3.7
Impulse	-1000.0	-1023.0	3.9	1.3	3.7	51.9	3.7
Impulse	-2000.0	-2022.0	3.9	1.2	3.7	51.4	3.7
Impulse	-4000.0	-4044.0	3.9	1.3	3.7	51.4	3.7

Short Circuit Output Voltage Waveform check:

Impedance	Voltage Setting(V)	Actual (V)	Uncertainty (%)	T5	Uncertainty (%)	T6	Uncertainty (%)
L-N 2Ω	500.0	231.0	2.5	7.7	2.1	19.6	2.1
L-N 2Ω	4000.0	1854.0	2.5	7.4	2.1	19.9	2.1
L-N 2Ω	-500.0	-228.0	2.5	7.7	2.1	19.8	2.1
L-N 2Ω	-4000.0	-1818.0	2.5	7.6	2.1	19.9	2.1
L-G 2Ω	500.0	42.0	3.0	2.6	2.1	25.3	2.1
L-G 2Ω	4000.0	326.0	2.5	2.5	2.1	25.1	2.1
L-G 2Ω	-500.0	-42.0	2.8	2.6	2.1	25.0	2.1
L-G 2Ω	-4000.0	-337.0	2.5	2.4	2.1	25.0	2.1
N-G 2Ω	500.0	41.0	3.0	2.8	2.1	26.4	2.1
N-G 2Ω	4000.0	325.0	2.5	2.7	2.1	25.9	2.1
N-G 2Ω	-500.0	-41.0	2.7	2.9	2.1	26.1	2.1
N-G 2Ω	-4000.0	-323.0	2.5	2.6	2.1	25.8	2.1
Impulse	500.0	243.0	2.5	6.8	2.1	22.2	2.1
Impulse	1000.0	494.0	2.5	6.9	2.1	22.3	2.1
Impulse	2000.0	999.0	2.5	6.8	2.1	22.3	2.1
Impulse	4000.0	2022.0	2.5	7.1	2.1	22.3	2.1
Impulse	-500.0	-251.0	2.5	7.2	2.1	22.6	2.1
Impulse	-1000.0	-497.0	2.5	7.0	2.1	22.3	2.1
Impulse	-2000.0	-987.0	2.5	6.9	2.1	22.3	2.1
Impulse	-4000.0	-1986.0	2.5	7.0	2.1	22.4	2.1

It has been demonstrated that the Surge generator meets the specified requirements in the standard with at least a 95% confidence.

Conducted Disturbances Induced by Radio-Frequency Field Immunity (CS)

RF Frequency Measurement Check		RF Generator Second Harmonic Check
Reading	Standard	Harmonic (dBc)
9.000 kHz	8.99997282 kHz	-45.6
50.000 kHz	49.998570 kHz	-42.3
100.000 kHz	99.9997118 kHz	-43.5
1.000000 MHz	0.999997073 MHz	-45.6
5.000000 MHz	4.99998552 MHz	-47.8
10.000000 MHz	9.99997043 MHz	-48.4
50.000000 MHz	49.9998556 MHz	-47.1
100.000000 MHz	99.9997100 MHz	-46.2
500.000000 MHz	499.998548 MHz	-49.9
1000.000000 MHz	999.997093 MHz	-52.6

RF Generator AM Modulation Measurement Check (1 kHz ; 80 %)			
Frequency	Mod. Freq.	Reading	Standard
100.000 kHz	1 kHz	80.0%	81.4%
1.000000 MHz	1 kHz	80.0%	81.3%
5.000000 MHz	1 kHz	80.0%	81.2%
10.000000 MHz	1 kHz	80.0%	81.1%
50.000000 MHz	1 kHz	80.0%	81.3%
100.000000 MHz	1 kHz	80.0%	81.1%
500.000000 MHz	1 kHz	80.0%	81.5%
1000.000000 MHz	1 kHz	80.0%	80.8%

RF Generator Response and Accuracy Measurement Check		
Frequency	Reading (dBm)	Standard (dBm)
9.000 kHz	0	-43.0
50.000 kHz	0	0.0
100.000 kHz	0	-0.1
1.000000 MHz	0	0.1
5.000000 MHz	0	0.1
10.000000 MHz	0	0.1
50.000000 MHz	0	-0.2
50.000000 MHz	-10	-10.2
50.000000 MHz	-20	-20.3
50.000000 MHz	-30	-30.3
50.000000 MHz	-40	-40.3
50.000000 MHz	-50	-50.3
100.000000 MHz	0	0.1
500.000000 MHz	0	0.0
1000.000000 MHz	0	-0.3

RF Power Meter Measurement Check			
Frequency (MHz)		Standard (dBm)	Reading (dBm)
CH 1	50	10	9.7
CH 1	50	0	-0.3
CH 1	50	-10	-10.3
CH 1	50	-15	-15.3
CH 2	50	10	9.7
CH 2	50	0	-0.3
CH 2	50	-10	-10.3
CH 2	50	-15	-15.3
CH 3	50	10	9.7
CH 3	50	0	-0.4
CH 3	50	-10	-10.3
CH 3	50	-15	-15.3

Power Amplifier Gain Flatness Measurement		Power Amplifier Standard Measurement (Input: 10 dBm)		Power Amplifier Second Harmonic Measurement Check
Frequency	Reading (dB)	Result (dBm)	Spec. (dBm)	Reading (dBc)
150.000 kHz	50.1	48.1	> 44.77	-48.6
1.000000 MHz	51.2	48.3	> 44.77	-47.8
5.000000 MHz	51.2	48.4	> 44.77	-53.6
10.000000 MHz	51.1	48.4	> 44.77	-48.7
50.000000 MHz	50.4	48.4	> 44.77	-49.2
100.000000 MHz	49.6	48.2	> 44.77	-44.7
200.000000 MHz	49.4	47.0	> 44.77	-54.3
2300.000000 MHz	49.6	46.4	> 44.77	-57.5

Uncertainty: Frequency: 1.9×10^{-9}
Linear: 0.9 dB
RF Power Level: 1.2 dB
Harmonic: 2.0 dB

It has been demonstrated that the CS generator meets the specified requirements in the standard with at least a 95% confidence.

Power Frequency Magnetic Field Immunity

AC Current Accuracy Check

Freq.(Hz)	Range (A)	Standard (A)	Reading (A)	Uncertainty (%)
50	0~10	1.003	1	0.3
50	0~10	3.002	3	0.3
50	0~10	5.006	5	0.3
50	0~10	10.008	10	0.3
50	10~125	9.92	10	0.3
50	10~125	30.01	30	0.3
50	10~125	50.08	50	0.3
50	10~125	100.2	100	0.3
60	0~10	0.989	1	0.3
60	0~10	2.985	3	0.3
60	0~10	4.988	5	0.3
60	0~10	9.982	10	0.3
60	10~125	9.89	10	0.3
60	10~125	29.92	30	0.3
60	10~125	49.93	50	0.3
60	10~125	100.03	100	0.3

Magnetic Measurement Check：(@50Hz)

Range (A)	Standard (A/m)	Reading (A)	Uncertainty (%)
0~10	1	1.0	1
0~10	3	3.2	1
0~10	10	10.8	1
10~125	10	11.1	1
10~125	30	33.1	1
10~125	100	109.8	1

It has been demonstrated that the PFMF the specified requirements in the standard with at least a 95% confidence.

Voltage Dips and Voltage Interruptions Immunity

PQF Measurement: (Input Voltage: 230V/50Hz)

Level	Load	Actual (V)	Uncertainty (mV/V)	Tolerance (%)
80%	100Ω	182.5	17	184 +/- 5%
70%	100Ω	161.7	17	161 +/- 5%
40%	100Ω	93.2	17	92 +/- 5%
0%	100Ω	5.3	17	-

VAR Check: (Input Voltage: 230V/50Hz)

Level	Load	Actual (V)	Uncertainty (mV/V)	Tolerance (%)
80%	100Ω	182.5	17	184 +/- 5%
70%	100Ω	161.7	17	161 +/- 5%
40%	100Ω	93.2	17	92 +/- 5%
0%	100Ω	5.3	17	-

It has been demonstrated that the Dip generator meets the specified requirements in the standard with at least a 95% confidence.

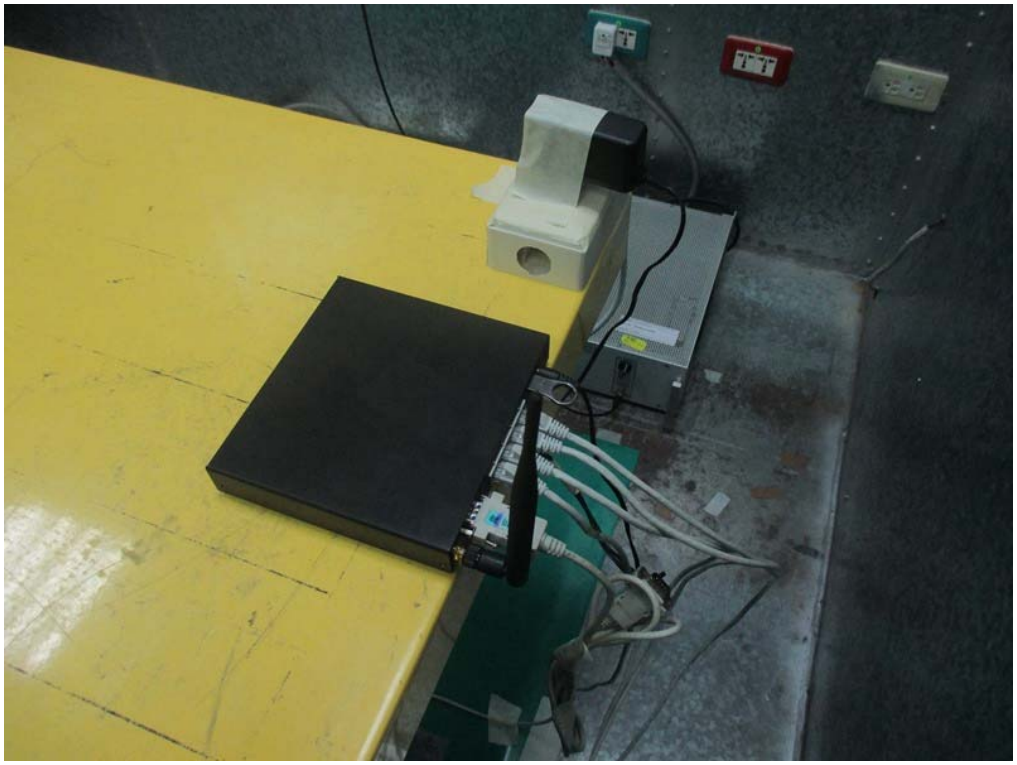
Appendix A. Test Photos

1. Photographs of Conducted Emissions Test Configuration

Test Mode: Mode 1

FRONT VIEW

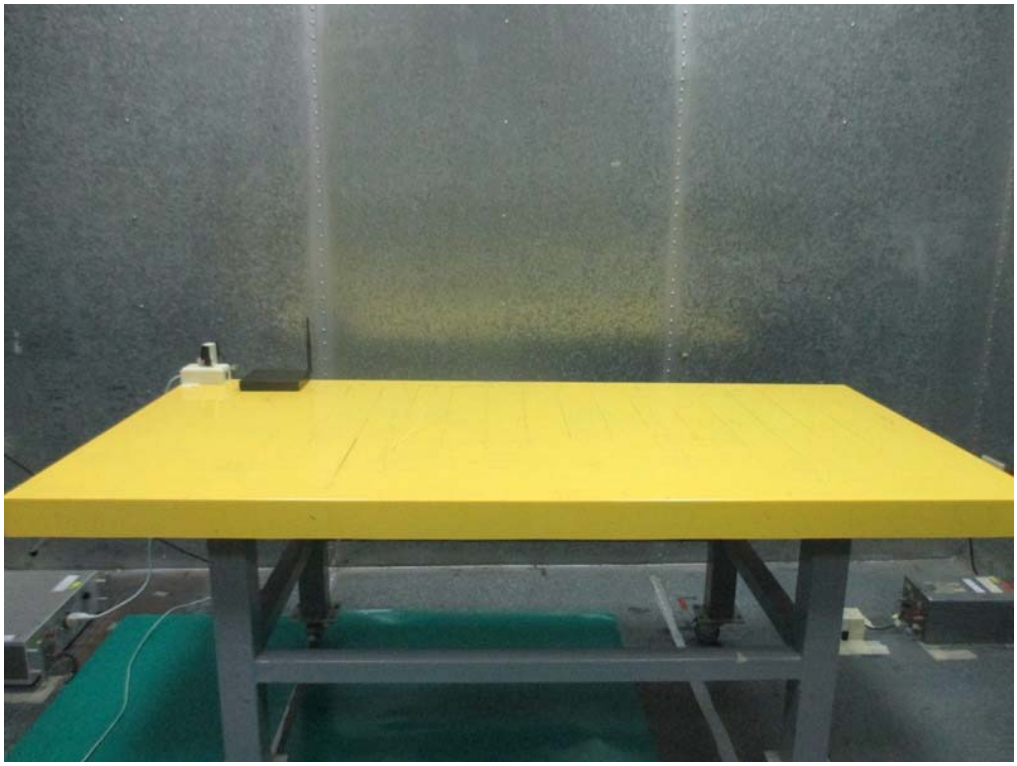
REAR VIEW



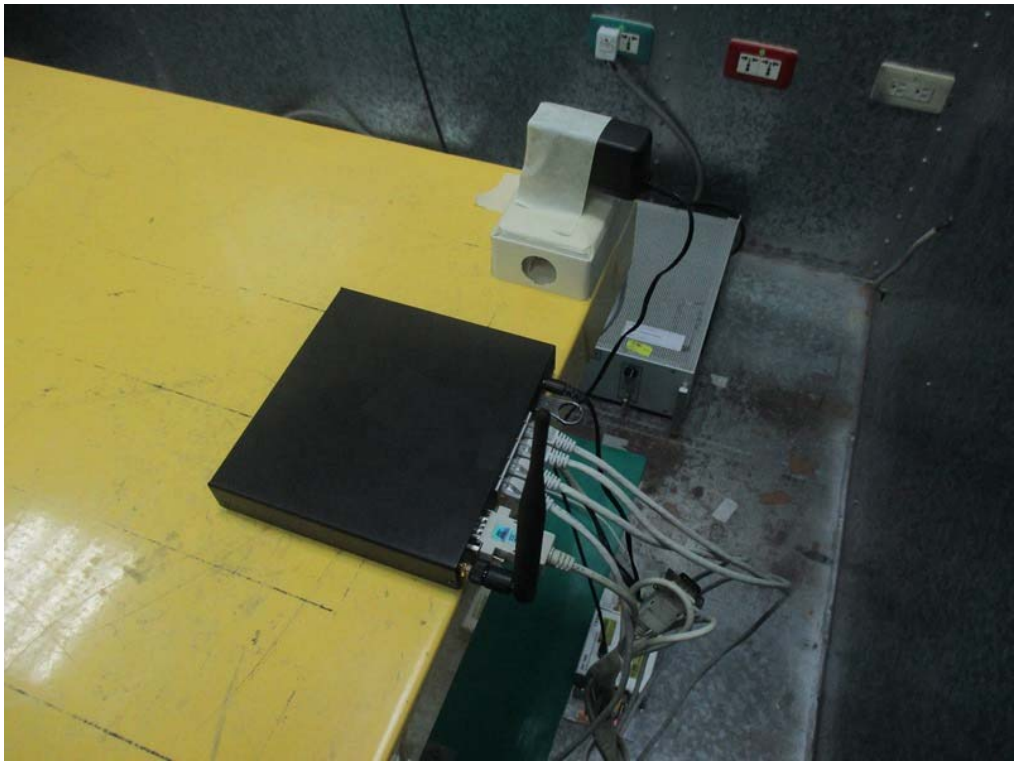
2. Photographs of Telecommunication Line Conducted Emissions Test Configuration

Test Mode: Mode 2

FRONT VIEW



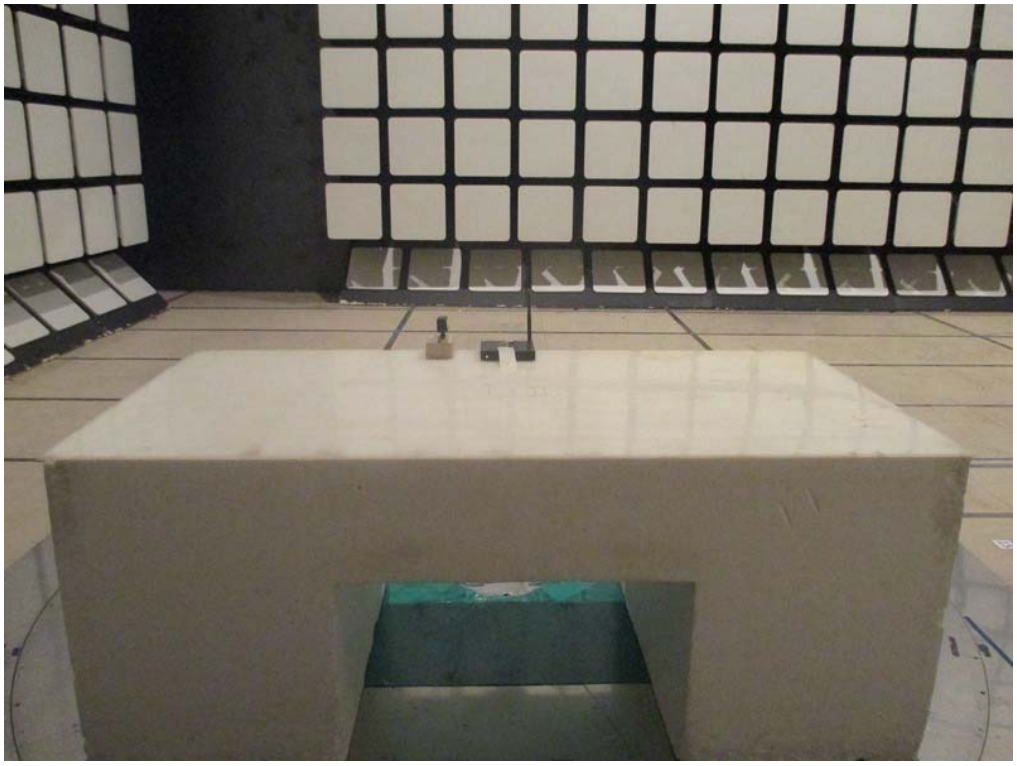
REAR VIEW



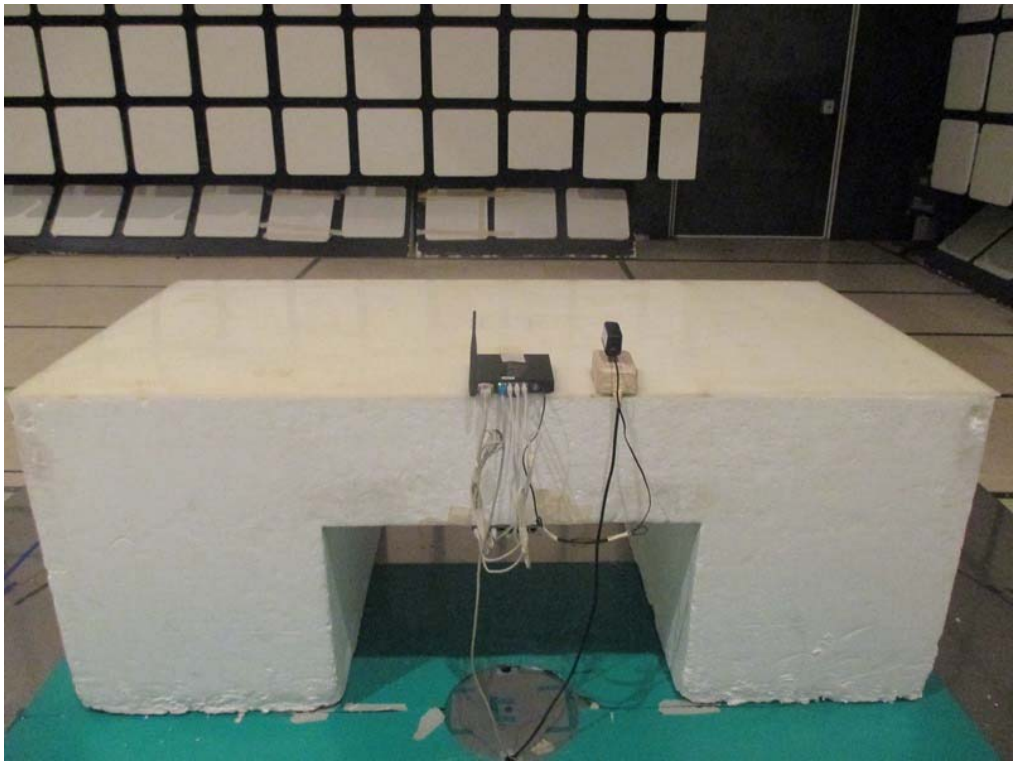
3. Photographs of Radiated Emissions Test Configuration

Test Configuration: 30MHz~1GHz / Test Mode: Mode 1

FRONT VIEW



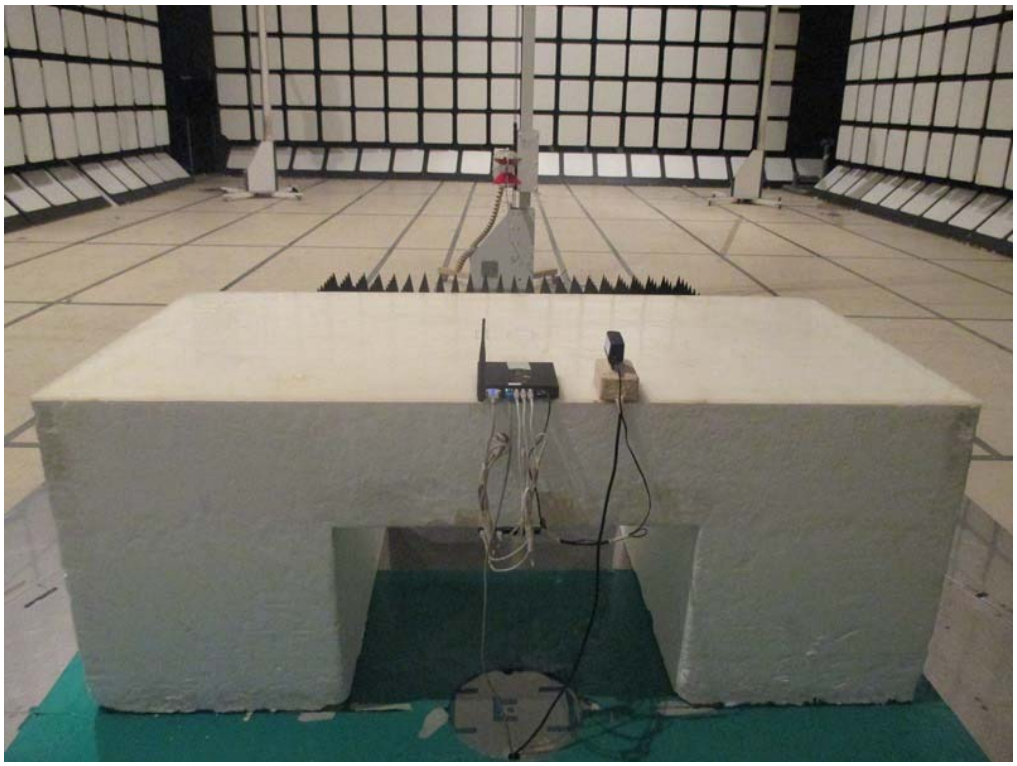
REAR VIEW



Test Configuration: Above 1GHz / Test Mode: Mode 1

FRONT VIEW

REAR VIEW



4. Photographs of Harmonic, Flicker Test Configuration

Test Mode: Mode 1

FRONT VIEW

Test Mode: Mode 2

FRONT VIEW

5. Photographs of ESD Immunity Test Configuration

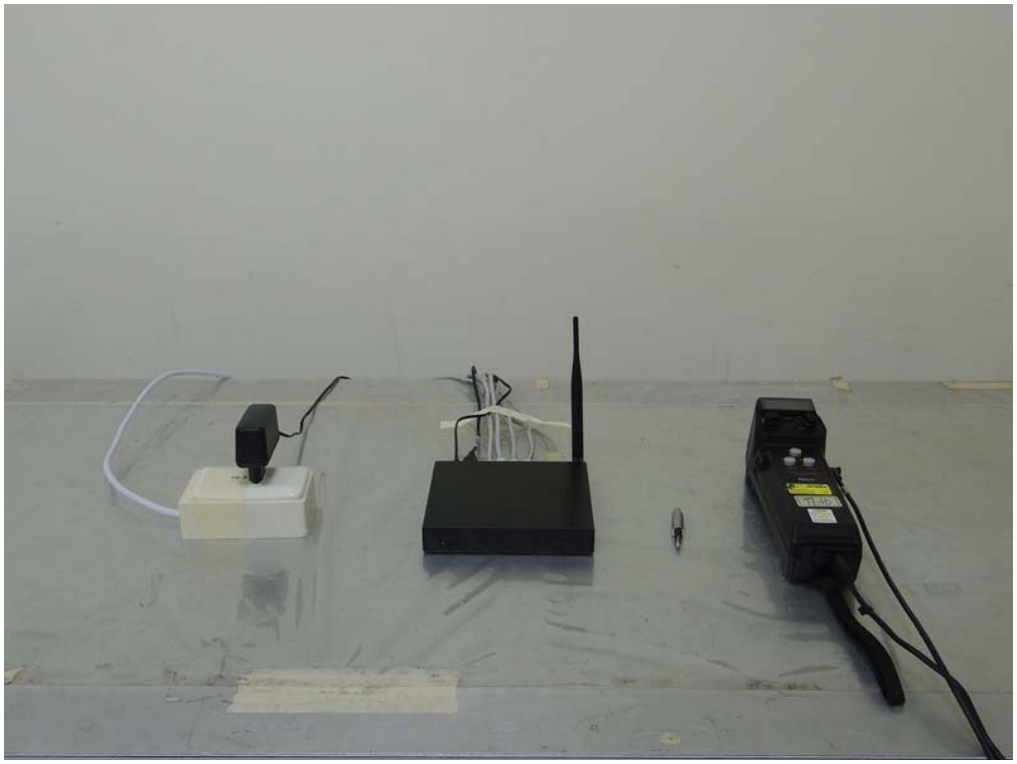
Test Mode: Mode 1

FRONT VIEW

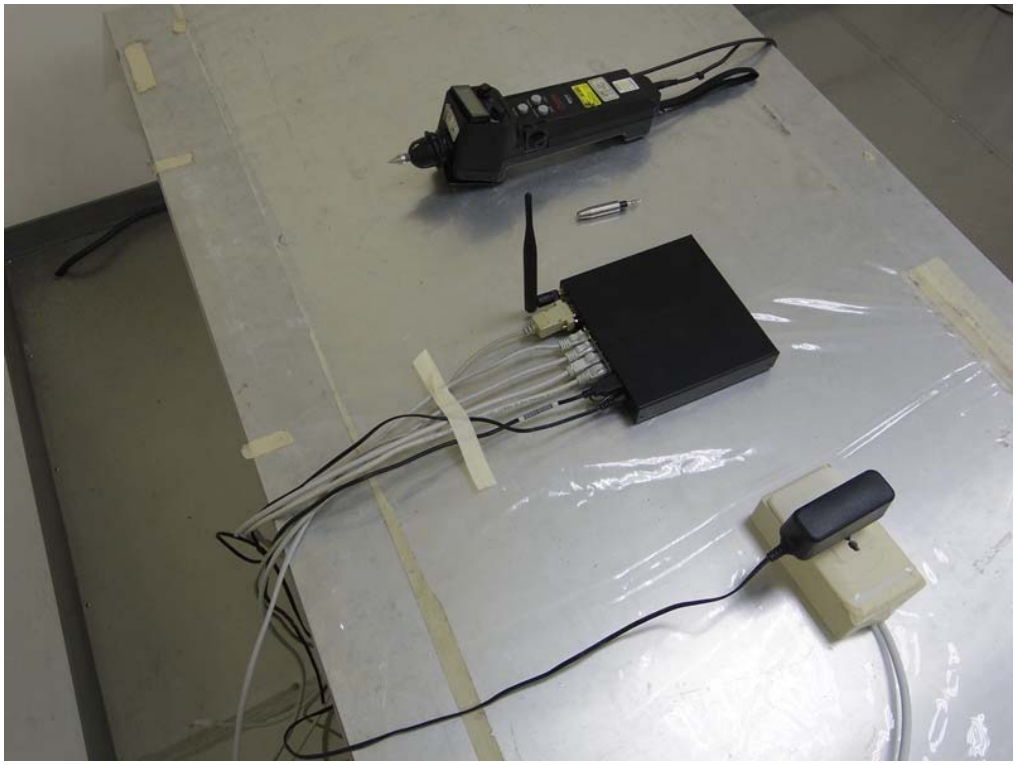
REAR VIEW

Test Mode: Mode 2

FRONT VIEW



REAR VIEW



6. Photographs of RS Immunity Test Configuration

Test Mode: Mode 1

FRONT VIEW

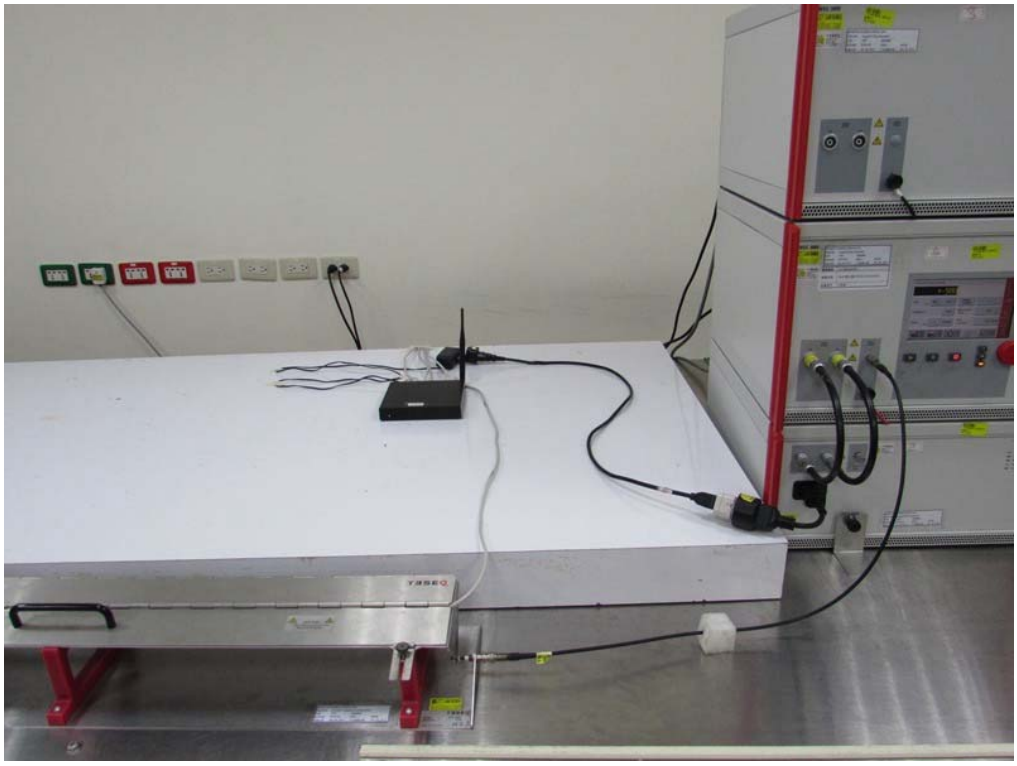
Test Mode: Mode 2

FRONT VIEW

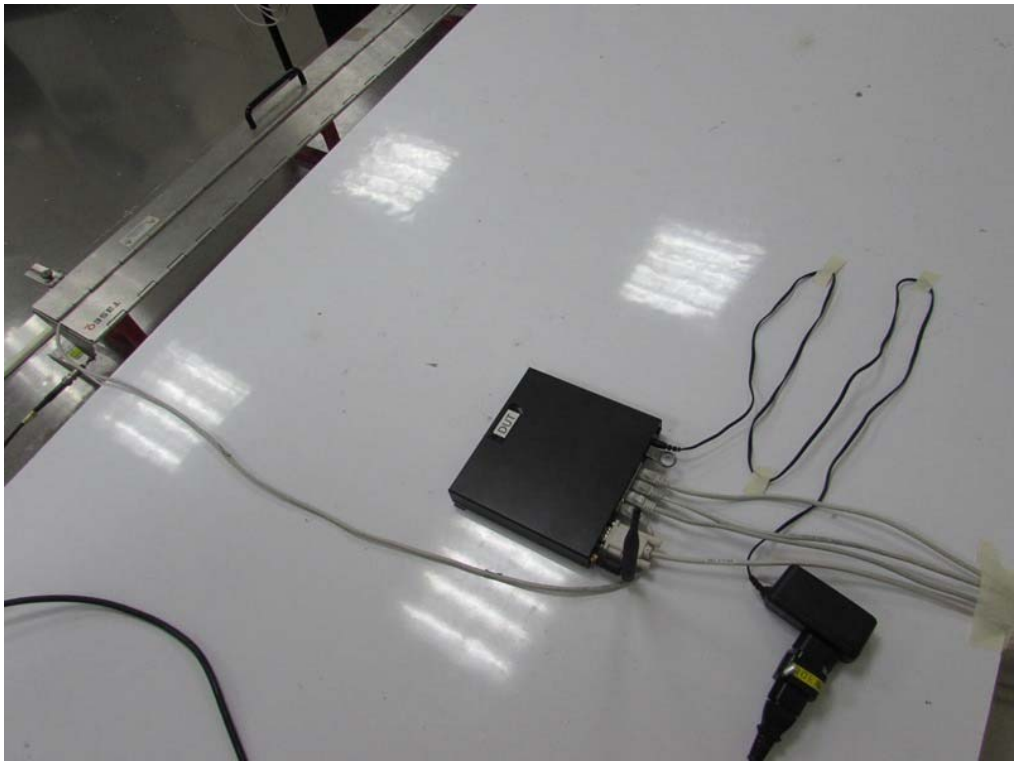
7. Photographs of EFT Test Configuration

Test Mode: Mode 1

FRONT VIEW

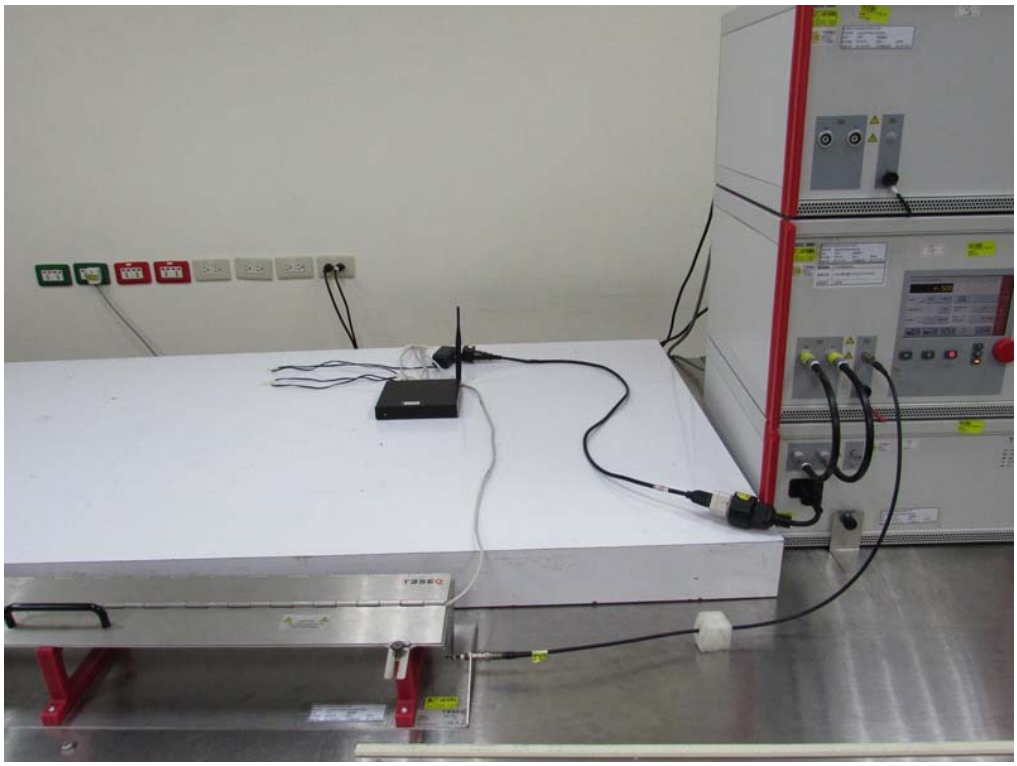


REAR VIEW

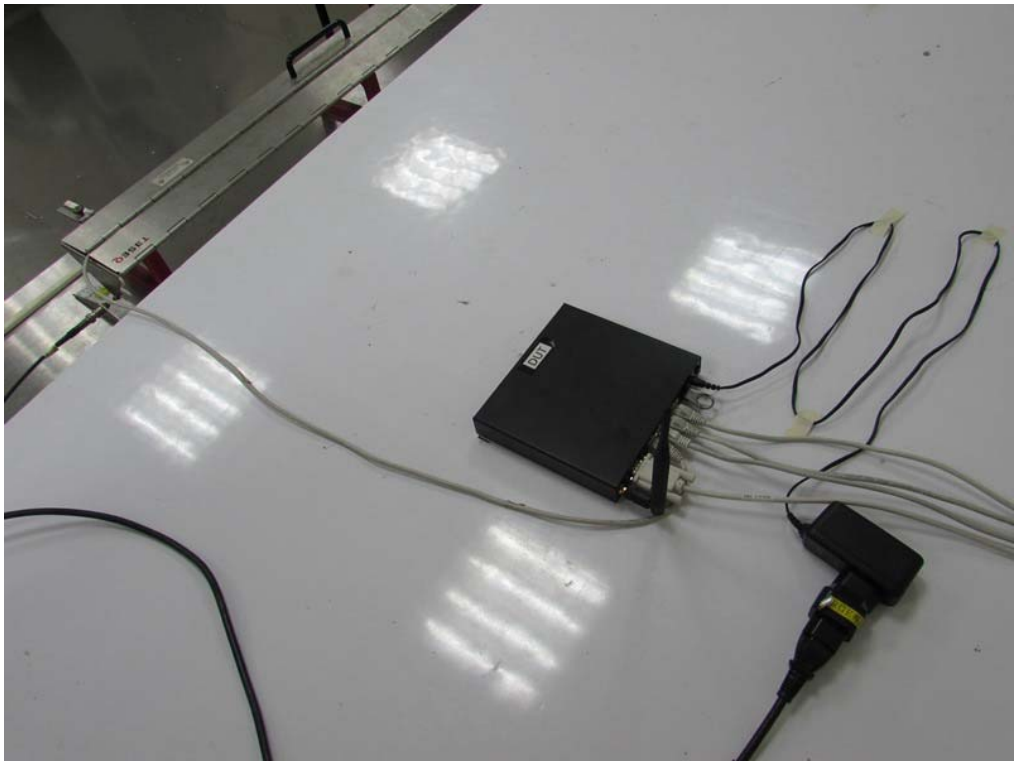


Test Mode: Mode 2

FRONT VIEW



REAR VIEW



8. Photographs of Surge Test Configuration

Test Mode: Mode 1

FRONT VIEW

Test Mode: Mode 2

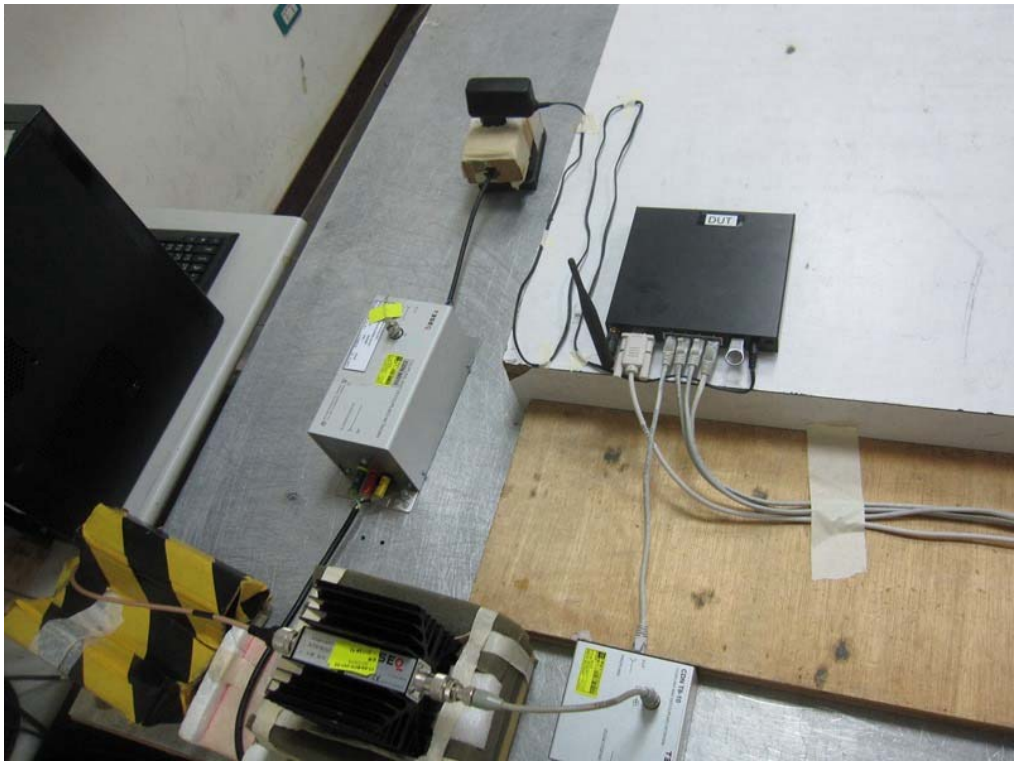
FRONT VIEW

9. Photographs of CS Immunity Test Configuration

Test Mode: Mode 1

FRONT VIEW

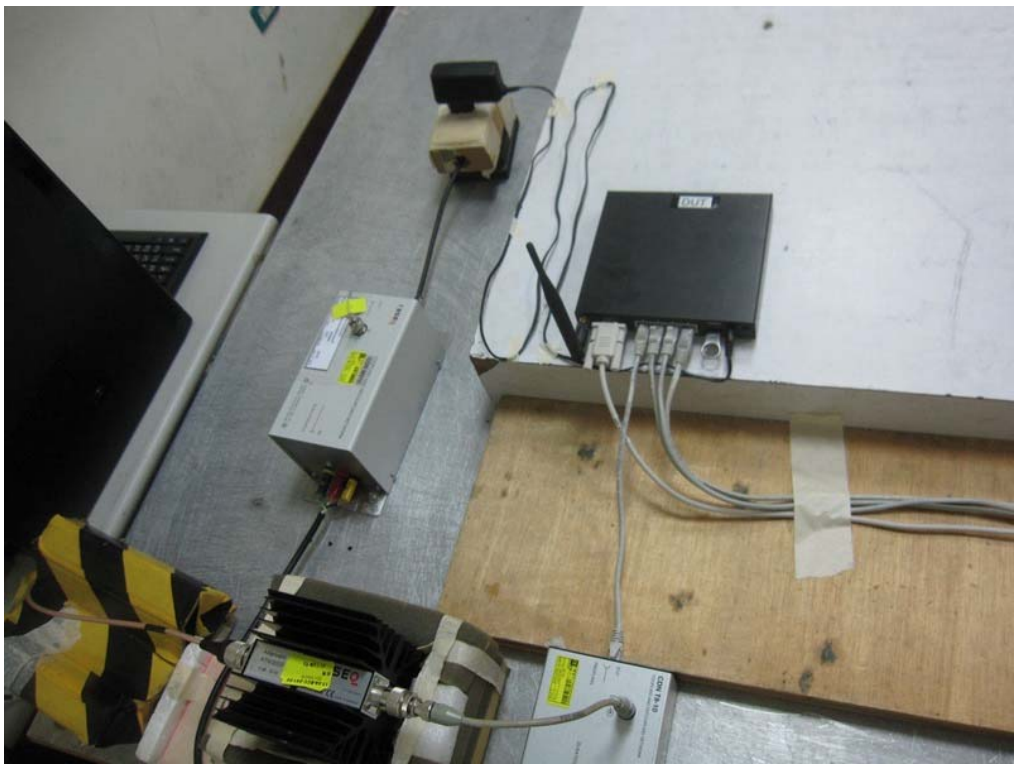
REAR VIEW



Test Mode: Mode 2

FRONT VIEW

REAR VIEW



10. Photographs of MF Immunity Test Configuration

Test Mode: Mode 1

FRONT VIEW

Test Mode: Mode 2

FRONT VIEW

11. Photographs of DIP Test Configuration

Test Mode: Mode 1

FRONT VIEW

Test Mode: Mode 2

FRONT VIEW