SPORTON LAB.

Project No : EL641509-01

VERIFICATION OF COMPLIANCE

- **Equipment : AC-DC Power Module**
  Model No. : TMF05 series:TMF 05105; TMF 05112; TMF 05115; TMF 05124
  TMF10 series:TMF 10105; TMF 10112; TMF 10115; TMF 10124
  TMF20 series:TMF 20105; TMF 20112; TMF 20115; TMF 20124
  TMF30 series:TMF 30105; TMF 30112; TMF 30115; TMF 30124
  Applicant : TRACO ELECTRONIC AG
  Sihlbruggstrasse 111, CH - 6340 Baar, Switzerland

SPORTON LAB.

I HEREBY DECLARE THAT :

The equipment is in accordance with the procedures are given in **EUROPEAN COUNCIL DIRECTIVE 93/42/EEC**. The equipment was **Passed** the test performed according to **European Standard EN 60601-1-2:2015 (EN 55011:2009+A1:2010 Group 1 Class B, EN 61000-3-2:2014, EN 61000-3-3:2013, IEC 61000-4-2:2008, IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2012, IEC 61000-4-5:2005, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004).**
The test was carried out on **Aug. 11, 2016** at **SPORTON INTERNATIONAL INC.** LAB.

Jack Deng
Engineering Manager

CE EMC TEST REPORT

according to

European Standard EN 60601-1-2:2015
(EN 55011:2009+A1:2010 Group 1 Class B, EN 61000-3-2:2014,
EN 61000-3-3:2013, IEC 61000-4-2:2008,
IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2012,
IEC 61000-4-5:2005, IEC 61000-4-6:2013,
IEC 61000-4-8:2009, IEC 61000-4-11:2004)

Equipment : **AC-DC Medical Power Module**

Model No. : **TMF05 series:TMF 05105; TMF 05112; TMF 05115; TMF 05124**
TMF10 series:TMF 10105; TMF 10112; TMF 10115; TMF 10124
TMF20 series:TMF 20105; TMF 20112; TMF 20115; TMF 20124
TMF30 series:TMF 30105; TMF 30112; TMF 30115; TMF 30124

Applicant : **TRACO ELECTRONIC AG**
Sihlbruggstrasse 111, CH - 6340 Baar, Switzerland

Statement

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
- This test report is only applicable to European Community.

SPORTON International Inc.
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Issue Date	Description
EL641509	Rev.01	Jun. 22, 2016	Initial issue of report
EL641509-01	Rev.01	Aug. 26, 2016	1.Change equipment and model 2.Update EN 60601-1-2 Standard to 2015

Verification No. : EL641509-01

VERIFICATION OF COMPLIANCE

according to

European Standard EN 60601-1-2:2015
(EN 55011:2009+A1:2010 Group 1 Class B, EN 61000-3-2:2014,
EN 61000-3-3:2013, IEC 61000-4-2:2008,
IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2012,
IEC 61000-4-5:2005, IEC 61000-4-6:2013,
IEC 61000-4-8:2009, IEC 61000-4-11:2004)

Equipment : **AC-DC Medical Power Module**

Model No. : **TMF05 series: TMF 05105; TMF 05112; TMF 05115; TMF 05124**
TMF10 series: TMF 10105; TMF 10112; TMF 10115; TMF 10124
TMF20 series: TMF 20105; TMF 20112; TMF 20115; TMF 20124
TMF30 series: TMF 30105; TMF 30112; TMF 30115; TMF 30124

Applicant : **TRACO ELECTRONIC AG**
Sihlbruggstrasse 111, CH - 6340 Baar, Switzerland

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **EUROPEAN COUNCIL DIRECTIVE 93/42/EEC.** The equipment was ***passed*** the test performed according to **European Standard EN 60601-1-2:2015 (EN 55011:2009+A1:2010 Group 1 Class B, EN 61000-3-2:2014, EN 61000-3-3:2013, IEC 61000-4-2:2008, IEC 61000-4-3:2006/A1:2007/A2:2010, IEC 61000-4-4:2012, IEC 61000-4-5:2005, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004).** The product sample received on Apr.19, 2016 and completely tested on ***Aug. 11, 2016*** at **SPORTON International Inc.** LAB.

Jack Deng / Engineering Manager

SPORTON International Inc.
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

1. Summary of the Test Result

EN 60601-1-2:2015 Emission Tests and Conformance Test Specifications				
Report Clause	**Ref. Std. Clause**	**Test Standard**	**Description of Test**	**Result (PASS/FAIL)**
6	7.1.1	EN 55011:2009+A1:2010	Conducted Emissions	PASS
7	7.1.1	EN 55011:2009+A1:2010	Radiated Emissions	PASS
8	7.2.1	EN 61000-3-2:2014	Harmonic Current Emissions	N/A
9	7.2.2	EN 61000-3-3:2013	Voltage Fluctuations and Flicker	PASS

Remark: The "N/A" is Not Applicable.

EN 60601-1-2:2015 Immunity Tests and Conformance Test Specifications				
Report Clause	**Ref. Std. Clause**	**Test Standard**	**Description of Test**	**Result (PASS/FAIL)**
11	8.9	IEC 61000-4-2:2008	Electrostatic discharge	PASS
12	8.9	IEC 61000-4-3:2006/A1:2007/A2:2010	Radiated RF EM fields	PASS
12	8.10	IEC 61000-4-3:2006/A1:2007/A2:2010	Proximity fields from RF wireless communications equipment	PASS
13	8.9	IEC 61000-4-4:2012	Electrical fast transients / bursts	PASS
14	8.9	IEC 61000-4-5:2005	Surge	PASS
15	8.9	IEC 61000-4-6:2013	Conducted disturbances induced by RF fields	PASS
16	8.9	IEC 61000-4-8:2009	RATED power frequency magnetic fields	PASS
17	8.9	IEC 61000-4-11:2004	Voltage dips and interruptions	PASS
-	8.9	ISO 7637-2	Electrical transient conduction along supply lines	N/A

Remark: The "N/A" is Not Applicable.

2. General Description of Equipment under Test

2.1. Applicant

TRACO ELECTRONIC AG

Sihlbruggstrasse 111, CH - 6340 Baar, Switzerland

2.2. Manufacturer

Same as 1.1

2.3. Basic Description of Equipment under Test

Equipment	:	AC-DC Medical Power Module
Model No.	:	TMF05 series: TMF 05105; TMF 05112; TMF 05115; TMF 05124 TMF10 series: TMF 10105; TMF 10112; TMF 10115; TMF 10124 TMF20 series: TMF 20105; TMF 20112; TMF 20115; TMF 20124 TMF30 series: TMF 30105; TMF 30112; TMF 30115; TMF 30124
Trade Name	:	TRACO
Power Supply Type	:	Switching
AC Power Cord	:	Non-Shielded, 1.5 m, 2 pin

2.4. Feature of Equipment under Test

Please refer to user manual.

3. Test Configuration of Equipment under Test

3.1. Test Manner

a. The EUT has been associated with supporting units and peripherals pursuant to European Standard EN 55011 and EN 60601-1-2.
b. The complete test system and peripherals/associated devices are given in 2.2.
c. The equipment under test were performed the following test modes:

Test Items	Description of test modes
AC Conducted Emission	Mode 1. TMF 05 Mode 2. TMF 10 Mode 3. TMF 20 Mode 4. TMF 30
Radiated Emissions	Mode 1. TMF 05 Mode 2. TMF 10 Mode 3. TMF 20 Mode 4. TMF 30
Harmonic and Flicker Emissions	Mode 1. TMF 05 Mode 2. TMF 10 Mode 3. TMF 20 Mode 4. TMF 30
EMS	Mode 1. TMF 05 Mode 2. TMF 10 Mode 3. TMF 20 Mode 4. TMF 30

d. Frequency range investigated: Conduction 150 kHz to 30 MHz, Radiation 30 MHz to 1,000 MHz.
e. Frequency range investigated immunity test: CS 150 kHz to 80 MHz, RS 80 MHz to 2,700 MHz.

3.2. Description of Test System

<EMI>

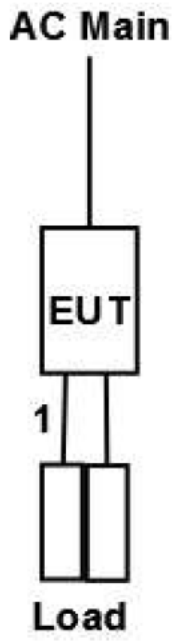
No.	Peripheral	Manufacturer	Model Number	Cable / Spec. Description
For Local				
1	Load (Mode 1 use)	[redacted]	116Ω	---
2	Load (Mode 2 use)	[redacted]	58Ω	---
3	Load (Mode 3 use)	[redacted]	29Ω	---
4	Load (Mode 4 use)	[redacted]	19.5Ω	---

< EMS >

No.	Peripheral	Manufacturer	Model Number	Cable / Spec. Description
For Local				
1	Load (Mode 1 use)	[redacted]	116Ω	---
2	Load (Mode 2 use)	[redacted]	58Ω	---
3	Load (Mode 3 use)	[redacted]	29Ω	---
4	Load (Mode 4 use)	[redacted]	19.5Ω	---
5	Multimeter	YFE	YF-303	Probe Cable,Non-Shielded,1.0m
For Remote				
-	UPS (Only for DIP test use)	SYNDOME	SZ-801	---

3.3. Connection Diagram of Test System

Test Setup Diagram



1. The wire cable was connected from EUT to the support unit 1,2,3,4.
   Note: Above support unit on behalf of the meaning, please refer to section 2.2.

4. Test Software

No test software was used during testing.

5. General Information of Test

5.1. Test Facility

<EMI>

Test Site：SPORTON INTERNATIONAL INC.

Test Site Location : No. 3, Ln. 238, Kangle St., Neihu Dist., Taipei City, Taiwan (R.O.C.)
TEL : 886-2-2631-5551
FAX : 886-2-2631-9740

Test Site No. : CO01-NH, OS02-NH

<EMS>

Test Site Location : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)
TEL : 886-3-327-3456
FAX : 886-3-327-0973

Test Site Location : No. 58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)
TEL : 886-3-327-0868

5.2. Test Voltage

AC 230V / 50Hz

5.3. Measurement Procedure

EMI Test	:	European Standard EN 55011 Group 1 Class B
Harmonics Test	:	European Standard EN 61000-3-2
Voltage Fluctuations Test	:	European Standard EN 61000-3-3
EMS Test	:	European Standard EN 60601-1-2

(ESD: IEC 61000-4-2, RS: IEC 61000-4-3, EFT: IEC 61000-4-4, SURGE: IEC 61000-4-5, CS: IEC 61000-4-6, Power Frequency Magnetic Field: IEC 61000-4-8, DIPS: IEC 61000-4-11)

5.4. Test in Compliance with

European Standard EN 60601-1-2
(The equipment operating in Professional healthcare facility environment.)

5.5. Frequency Range Investigated

a. Conducted emission test: from 150 kHz to 30 MHz
b. Radiated emission test: from 30 MHz to 1,000 MHz
c. Radio frequency electromagnetic field immunity test: from 80 MHz to 2,700 MHz

5.6. Test Distance

a. The test distance of radiated emission test from antenna to EUT is 10 m.
b. The test distance of Radiated RF EM fields immunity test from antenna to EUT is 3 m.
c. The test distance of Proximity fields from RF wireless communications equipment immunity test from antenna to EUT is 0.3 m.

6. Conducted Emissions Measurement

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz and return leads of the EUT according to the methods defined in European Standard EN 55011. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meter above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

6.1. Limits for conducted disturbance at mains terminals

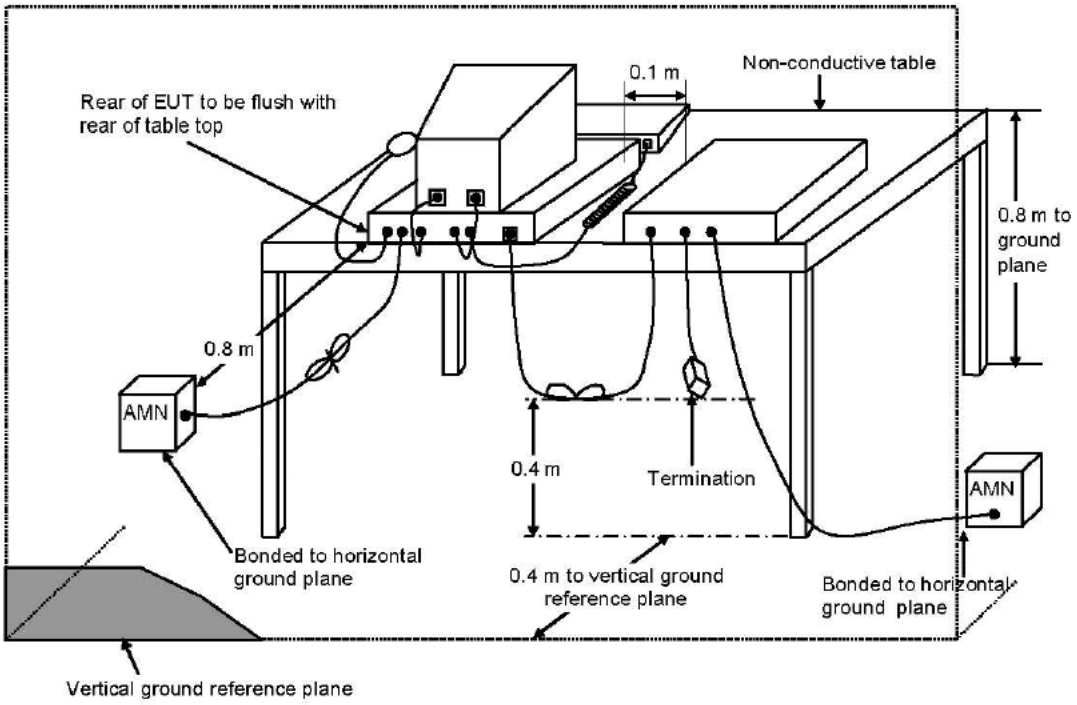
Mains terminal disturbance voltage limits for class B group 1 equipment

Frequency range (MHz)	Quasi-peak dB(μV)	Average dB(μV)
0.15 to 0.50	66 - 56	56 - 46
0.50 to 5	56	46
5 to 30	60	50
NOTE: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

6.2. Test Procedures

a. The EUT was warmed up for 15 minutes before testing started.
b. The EUT was placed on a desk 0.8 meter 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 meter from any other grounded conducting surface.
c. Connect EUT to the power mains through a line impedance stabilization network (LISN).
d. All the support units are connect to the other LISN.
e. The LISN provides 50 ohm, coupling impedance for the measuring instrument.
f. The CISPR states that a 50 ohm, 50 microhenry 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.

6.3. Typical Test Setup Layout of AC Powerline Conducted Emissions

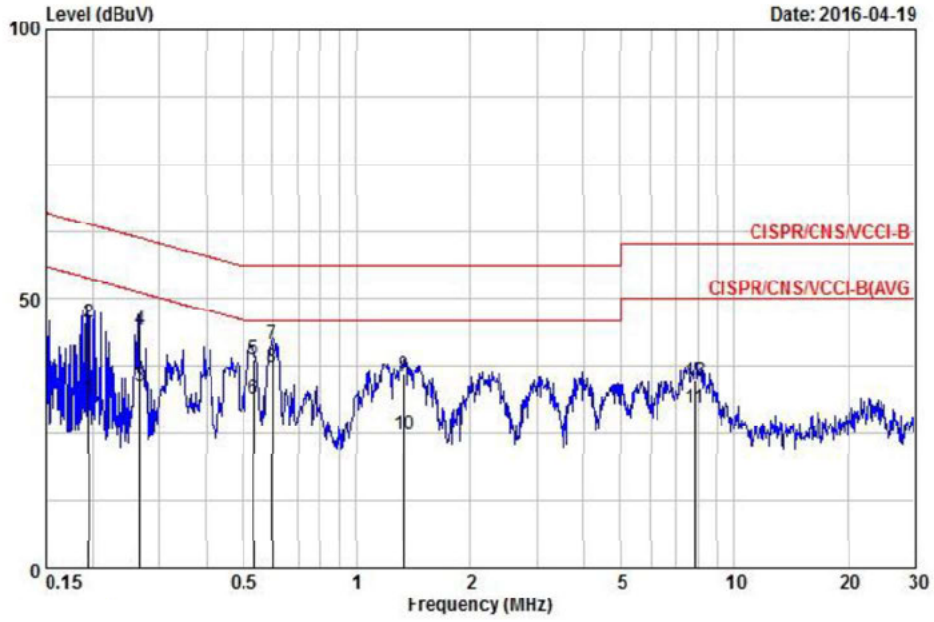


a. AMN is 80 cm from the EUT and at least 80 cm from other units and other metal planes.
b. EUT is connected to one artificial mains network (AMN).
c. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
d. Rear of EUT to be flushed with rear of table top.
e. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
f. If cables, which hang closer than 40 cm to the horizontal metal ground plane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
g. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
h. Cables of hand operated devices, such as keyboards, mice, etc. shall be placed as for normal usage.

6.4. Test Result of AC Powerline Conducted Emission

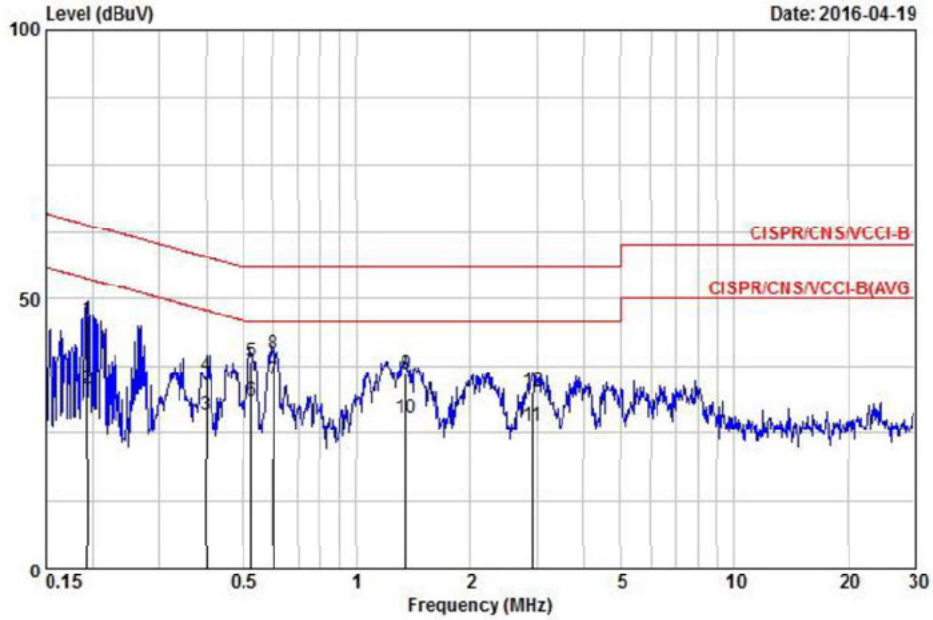
Test Mode	Mode 1	Test Site No.	CO01-NH
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	Willy
Temperature	21 ℃	Relative Humidity	52 %
Note: 1. Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level			
2. All emissions not reported here are more than 10 dB below the prescribed limit.			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.195	31.28	-22.52	53.80	21.13	10.05	0.10	AVERAGE
2	0.195	45.54	-18.26	63.80	35.39	10.05	0.10	QP
3	0.266	33.53	-17.72	51.25	23.39	10.05	0.10	AVERAGE
4	0.266	44.07	-17.18	61.25	33.93	10.05	0.10	QP
5	0.532	38.86	-17.14	56.00	28.71	10.05	0.10	QP
6	0.532	31.22	-14.78	46.00	21.07	10.05	0.10	AVERAGE
7	0.598	41.67	-14.33	56.00	31.52	10.05	0.10	QP
8 @	0.598	37.42	-8.58	46.00	27.27	10.05	0.10	AVERAGE
9	1.331	35.92	-20.08	56.00	25.76	10.06	0.10	QP
10	1.331	24.87	-21.13	46.00	14.71	10.06	0.10	AVERAGE
11	7.852	29.56	-20.44	50.00	19.17	10.18	0.20	AVERAGE
12	7.852	34.84	-25.16	60.00	24.45	10.18	0.20	QP

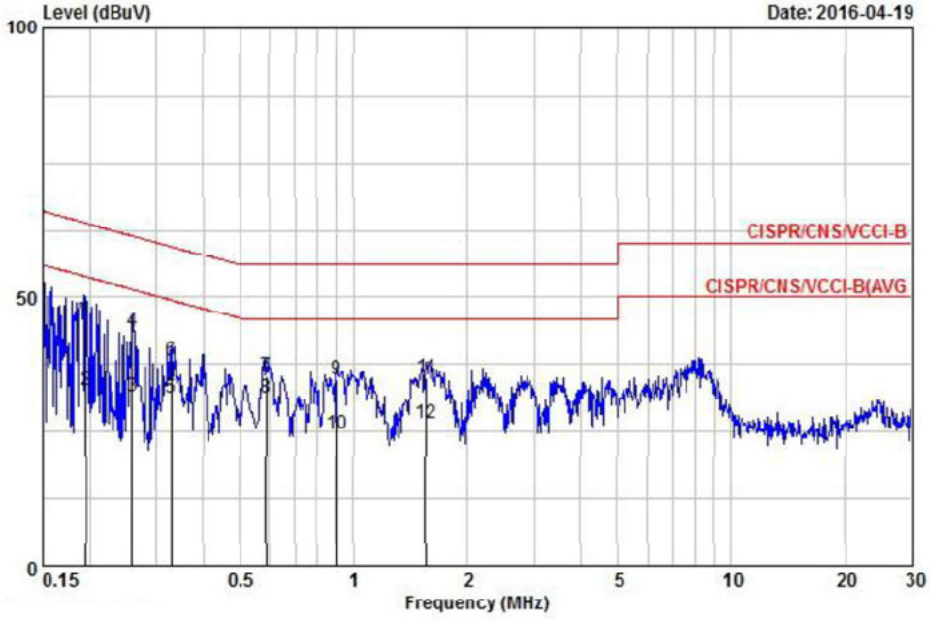
Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.193	46.03	-17.86	63.89	35.45	10.48	0.10	QP
2	0.193	33.22	-20.67	53.89	22.64	10.48	0.10	AVERAGE
3	0.400	28.53	-19.33	47.86	17.95	10.48	0.10	AVERAGE
4	0.400	35.96	-21.90	57.86	25.38	10.48	0.10	QP
5	0.527	38.36	-17.64	56.00	27.78	10.48	0.10	QP
6	0.527	30.96	-15.04	46.00	20.38	10.48	0.10	AVERAGE
7 @	0.601	35.06	-10.94	46.00	24.48	10.48	0.10	AVERAGE
8	0.601	39.79	-16.21	56.00	29.21	10.48	0.10	QP
9	1.352	36.31	-19.69	56.00	25.72	10.49	0.10	QP
10	1.352	27.88	-18.12	46.00	17.29	10.49	0.10	AVERAGE
11	2.915	26.52	-19.48	46.00	15.85	10.52	0.15	AVERAGE
12	2.915	32.87	-23.13	56.00	22.20	10.52	0.15	QP

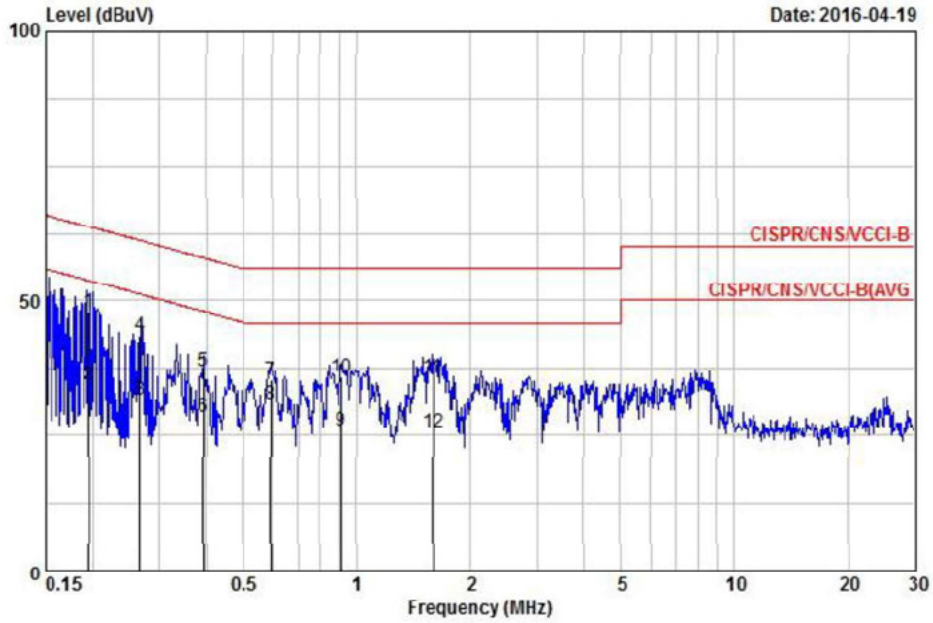
Test Mode	Mode 2	Test Site No.	CO01-NH
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	Willy
Temperature	21 ℃	Relative Humidity	52 %
Note: 1. Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level			
2. All emissions not reported here are more than 10 dB below the prescribed limit.			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.195	45.96	-17.84	63.80	35.81	10.05	0.10	QP
2	0.195	32.87	-20.93	53.80	22.72	10.05	0.10	AVERAGE
3	0.259	31.71	-19.76	51.47	21.57	10.05	0.10	AVERAGE
4	0.259	43.69	-17.78	61.47	33.55	10.05	0.10	QP
5	0.329	31.38	-18.11	49.49	21.24	10.04	0.10	AVERAGE
6	0.329	38.29	-21.20	59.49	28.15	10.04	0.10	QP
7	0.586	35.32	-20.68	56.00	25.17	10.05	0.10	QP
8	0.586	31.42	-14.58	46.00	21.27	10.05	0.10	AVERAGE
9	0.899	34.87	-21.13	56.00	24.71	10.06	0.10	QP
10	0.899	24.50	-21.50	46.00	14.34	10.06	0.10	AVERAGE
11	1.552	35.16	-20.84	56.00	24.99	10.07	0.10	QP
12	1.552	26.47	-19.53	46.00	16.30	10.07	0.10	AVERAGE

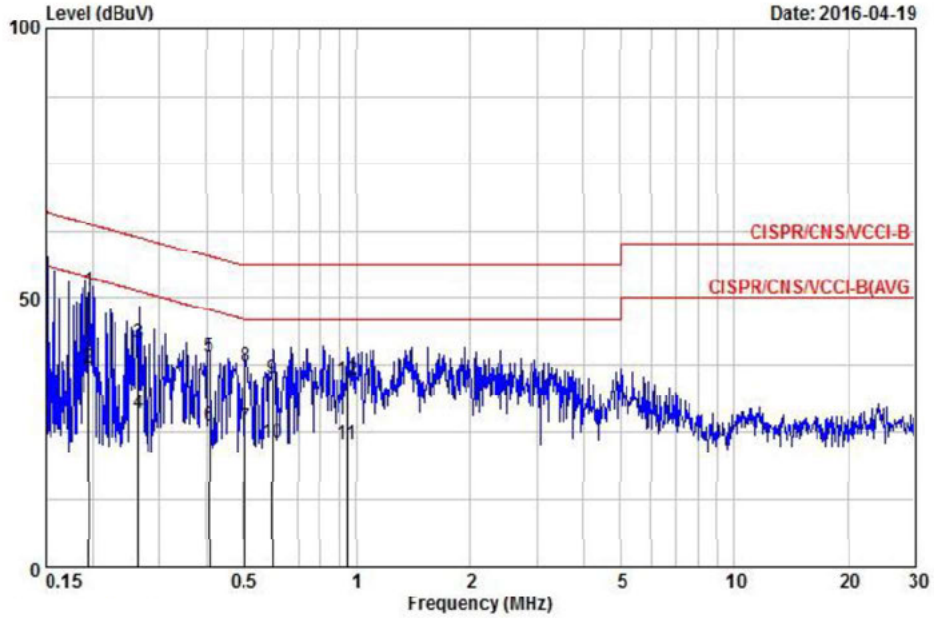
Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.195	47.94	-15.86	63.80	37.36	10.48	0.10	QP
2	0.195	34.43	-19.37	53.80	23.85	10.48	0.10	AVERAGE
3	0.266	31.58	-19.67	51.25	21.00	10.48	0.10	AVERAGE
4	0.266	43.65	-17.60	61.25	33.07	10.48	0.10	QP
5	0.391	37.00	-21.04	58.03	26.42	10.48	0.10	QP
6	0.391	28.54	-19.50	48.03	17.96	10.48	0.10	AVERAGE
7	0.592	35.31	-20.69	56.00	24.73	10.48	0.10	QP
8	0.592	30.90	-15.10	46.00	20.32	10.48	0.10	AVERAGE
9	0.909	26.05	-19.95	46.00	15.47	10.48	0.10	AVERAGE
10	0.909	35.93	-20.07	56.00	25.35	10.48	0.10	QP
11	1.593	35.80	-20.20	56.00	25.21	10.49	0.10	QP
12	1.593	25.75	-20.25	46.00	15.16	10.49	0.10	AVERAGE

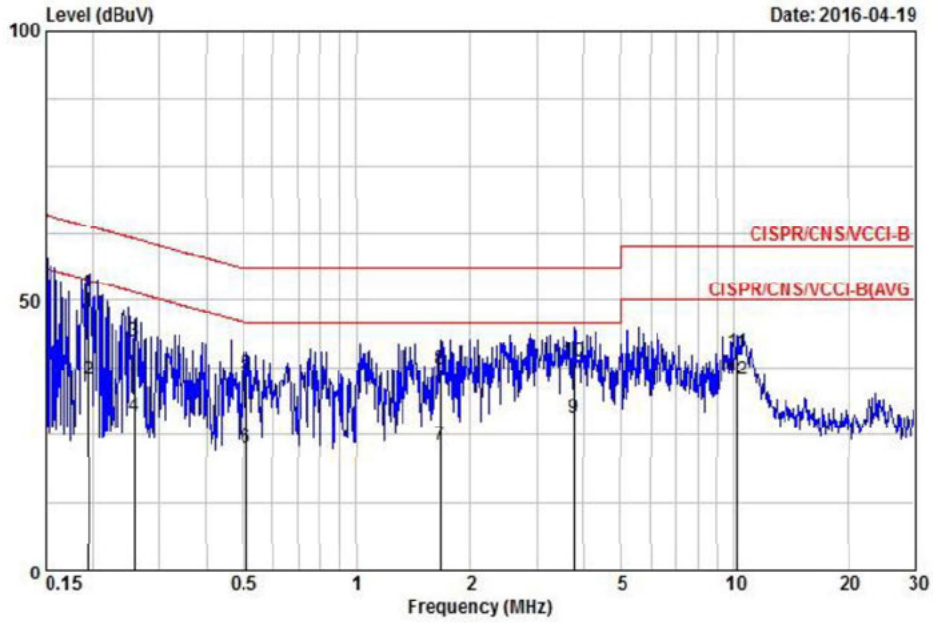
Test Mode	Mode 3	Test Site No.	CO01-NH
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	Willy
Temperature	21 ℃	Relative Humidity	52 %
Note: 1. Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level			
2. All emissions not reported here are more than 10 dB below the prescribed limit.			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.195	51.34	-12.46	63.80	41.19	10.05	0.10	QP
2	0.195	37.13	-16.67	53.80	26.98	10.05	0.10	AVERAGE
3	0.263	41.66	-19.68	61.34	31.51	10.05	0.10	QP
4	0.263	28.38	-22.96	51.34	18.23	10.05	0.10	AVERAGE
5	0.406	39.05	-18.67	57.73	28.91	10.04	0.10	QP
6	0.406	26.34	-21.38	47.73	16.20	10.04	0.10	AVERAGE
7	0.507	25.96	-20.04	46.00	15.82	10.05	0.10	AVERAGE
8	0.507	37.34	-18.66	56.00	27.20	10.05	0.10	QP
9	0.598	35.16	-20.84	56.00	25.01	10.05	0.10	QP
10	0.598	23.21	-22.79	46.00	13.06	10.05	0.10	AVERAGE
11	0.943	22.66	-23.34	46.00	12.50	10.06	0.10	AVERAGE
12	0.943	34.86	-21.14	56.00	24.70	10.06	0.10	QP

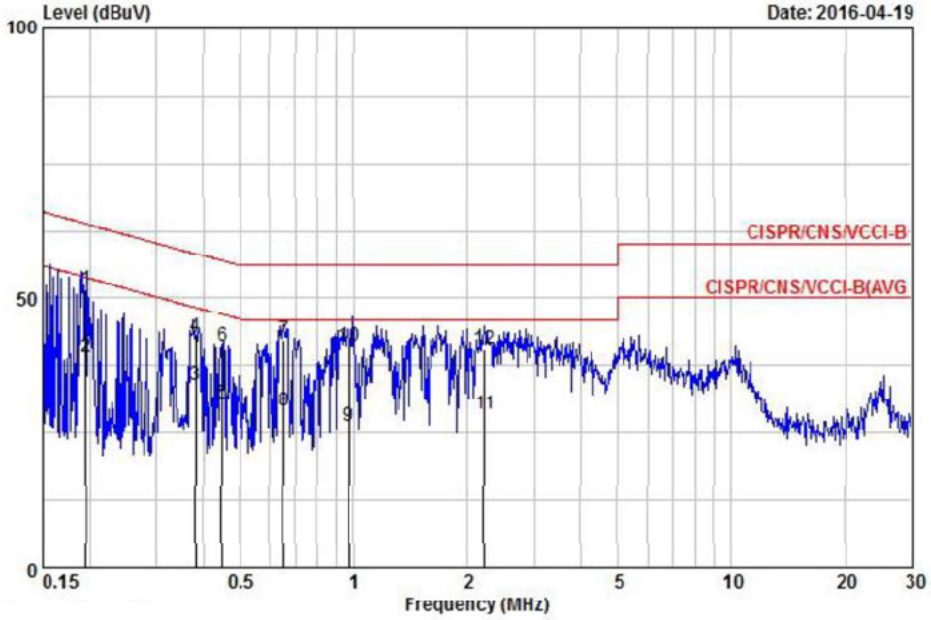
Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.195	51.53	-12.27	63.80	40.95	10.48	0.10	QP
2	0.195	35.43	-18.37	53.80	24.85	10.48	0.10	AVERAGE
3	0.258	42.54	-18.97	61.51	31.96	10.48	0.10	QP
4	0.258	28.46	-23.05	51.51	17.88	10.48	0.10	AVERAGE
5	0.510	36.45	-19.55	56.00	25.87	10.48	0.10	QP
6	0.510	22.46	-23.54	46.00	11.88	10.48	0.10	AVERAGE
7	1.671	23.02	-22.98	46.00	12.43	10.49	0.10	AVERAGE
8	1.671	37.26	-18.74	56.00	26.67	10.49	0.10	QP
9	3.759	28.20	-17.80	46.00	17.48	10.53	0.19	AVERAGE
10	3.759	38.78	-17.22	56.00	28.06	10.53	0.19	QP
11	10.179	40.54	-19.46	60.00	29.68	10.66	0.21	QP
12	10.179	35.26	-14.74	50.00	24.40	10.66	0.21	AVERAGE

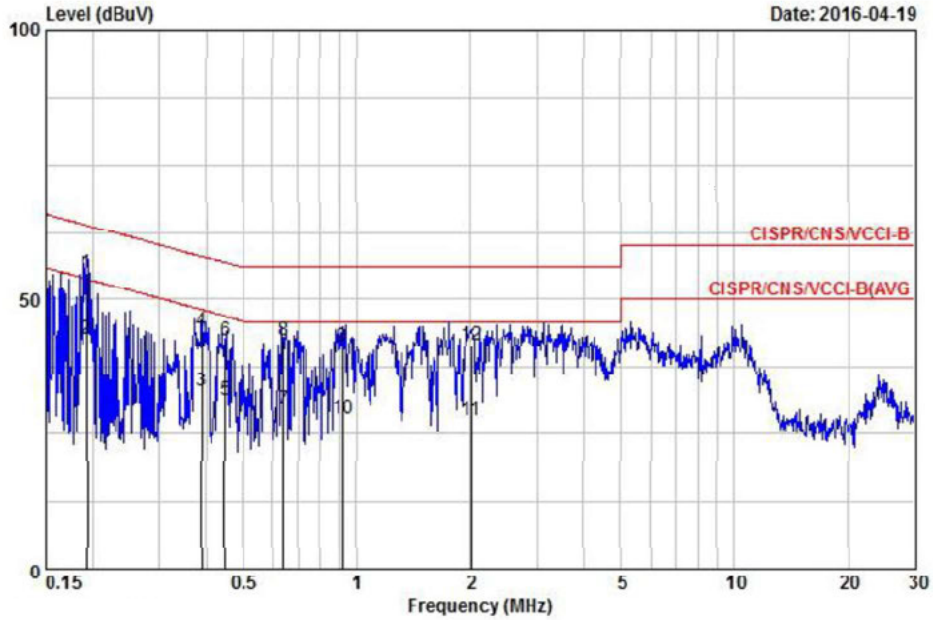
Test Mode	Mode 4	Test Site No.	CO01-NH
Test Frequency	0.15 MHz ~ 30 MHz	Test Engineer	Willy
Temperature	21 ℃	Relative Humidity	52 %
Note: 1. Corrected Reading (dBμV) = LISN Factor + Cable Loss + Read Level = Level			
2. All emissions not reported here are more than 10 dB below the prescribed limit.			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.195	51.52	-12.28	63.80	41.37	10.05	0.10	QP
2	0.195	38.93	-14.87	53.80	28.78	10.05	0.10	AVERAGE
3	0.381	33.78	-14.47	48.25	23.64	10.04	0.10	AVERAGE
4	0.381	42.61	-15.64	58.25	32.47	10.04	0.10	QP
5	0.449	30.53	-16.37	46.89	20.38	10.04	0.10	AVERAGE
6	0.449	41.17	-15.73	56.89	31.02	10.04	0.10	QP
7	0.651	42.24	-13.76	56.00	32.09	10.05	0.10	QP
8	0.651	29.19	-16.81	46.00	19.04	10.05	0.10	AVERAGE
9	0.968	26.17	-19.83	46.00	16.01	10.06	0.10	AVERAGE
10	0.968	41.11	-14.89	56.00	30.95	10.06	0.10	QP
11	2.213	28.54	-17.46	46.00	18.35	10.08	0.11	AVERAGE
12	2.213	40.52	-15.48	56.00	30.33	10.08	0.11	QP

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.192	55.06	-8.87	63.93	44.48	10.48	0.10	QP
2 @	0.192	42.69	-11.24	53.93	32.11	10.48	0.10	AVERAGE
3	0.388	33.01	-15.09	48.10	22.43	10.48	0.10	AVERAGE
4	0.388	44.15	-13.95	58.10	33.57	10.48	0.10	QP
5	0.449	31.39	-15.50	46.89	20.81	10.48	0.10	AVERAGE
6	0.449	42.39	-14.50	56.89	31.81	10.48	0.10	QP
7	0.641	29.51	-16.49	46.00	18.93	10.48	0.10	AVERAGE
8	0.641	42.50	-13.50	56.00	31.92	10.48	0.10	QP
9	0.918	41.24	-14.76	56.00	30.66	10.48	0.10	QP
10	0.918	27.79	-18.21	46.00	17.21	10.48	0.10	AVERAGE
11	2.012	27.72	-18.28	46.00	17.12	10.50	0.10	AVERAGE
12	2.012	41.46	-14.54	56.00	30.86	10.50	0.10	QP

7. Radiated Emission Measurement

Radiated emissions from 30 MHz to 1,000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in European Standard EN 55011. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

7.1. Limits for radiated disturbance

Electromagnetic radiation disturbance limits for class B group 1 equipment

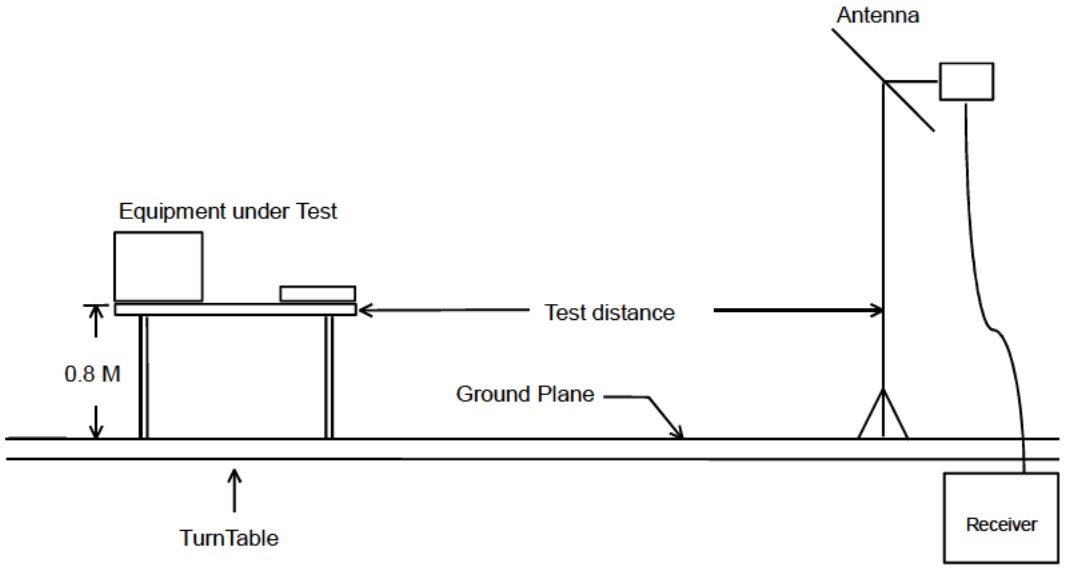
Frequency range (MHz)	10 m measuring distance	3 m measuring distance [a]
	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)
30 to 230	30	40
230 to 1000	37	47

[a] The limits specified for the 3 m separation distance apply only to small equipment meeting the size criterion defined in 3.10.

7.2. Test Procedures

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.

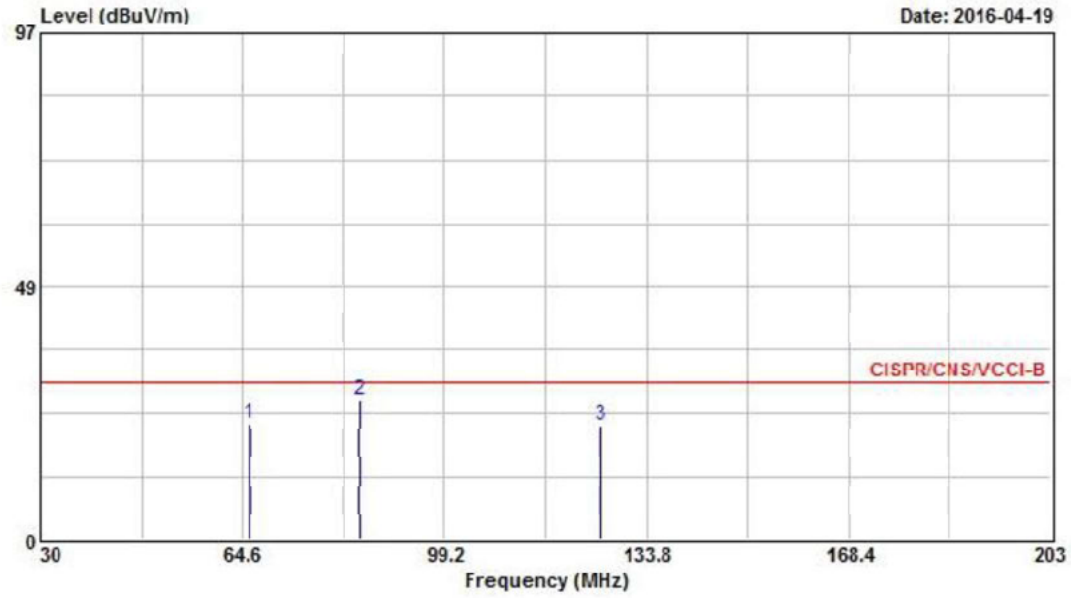
7.3. Typical Test Setup Layout of Radiated Emissions



7.4. Test Result of Radiated Emission

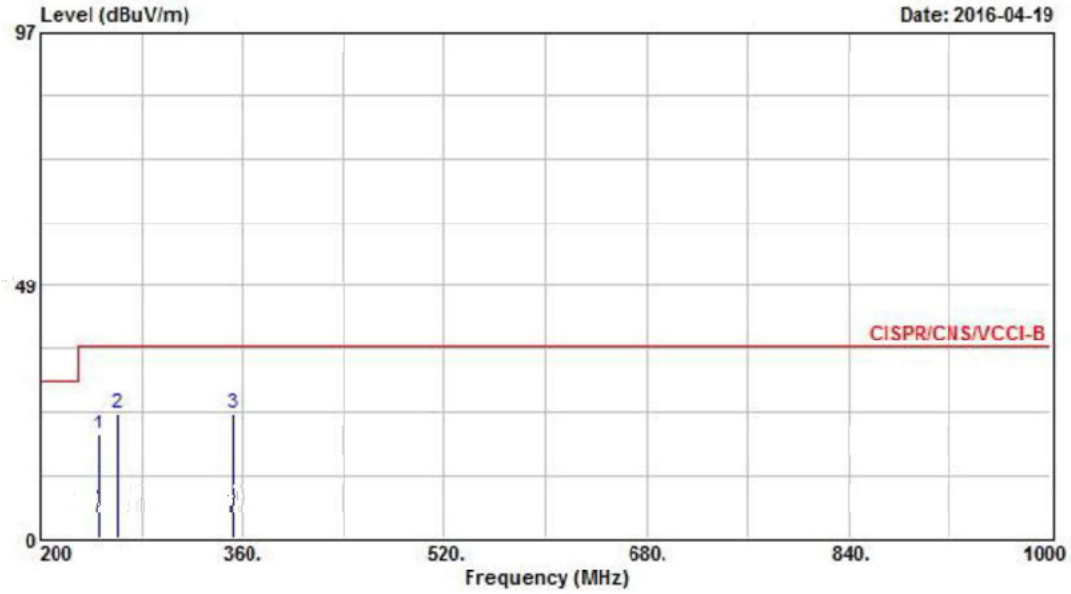
Test mode	Mode 1	Test Site No.	OS02-NH
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Chas
Temperature	25 ℃	Relative Humidity	53 %
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



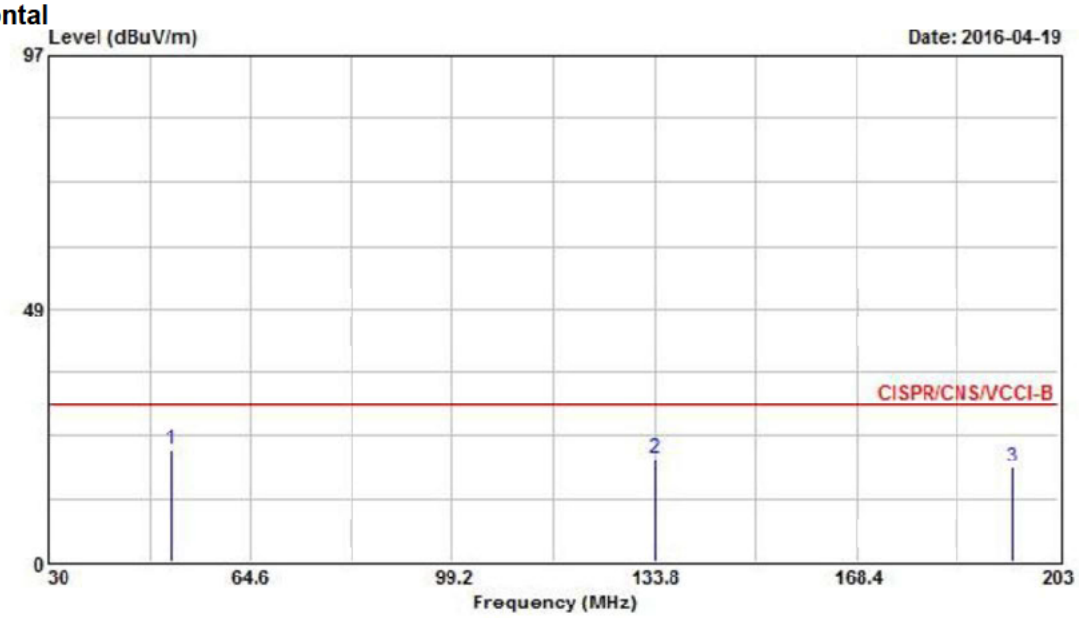
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	65.010	22.05	-7.95	30.00	41.33	11.20	1.23	31.79	Peak	---	---
2 @	84.670	26.72	-3.28	30.00	44.08	13.00	1.37	31.73	Peak	100	180
3	126.020	21.82	-8.18	30.00	34.84	16.98	1.62	31.62	Peak	---	---

Vertical



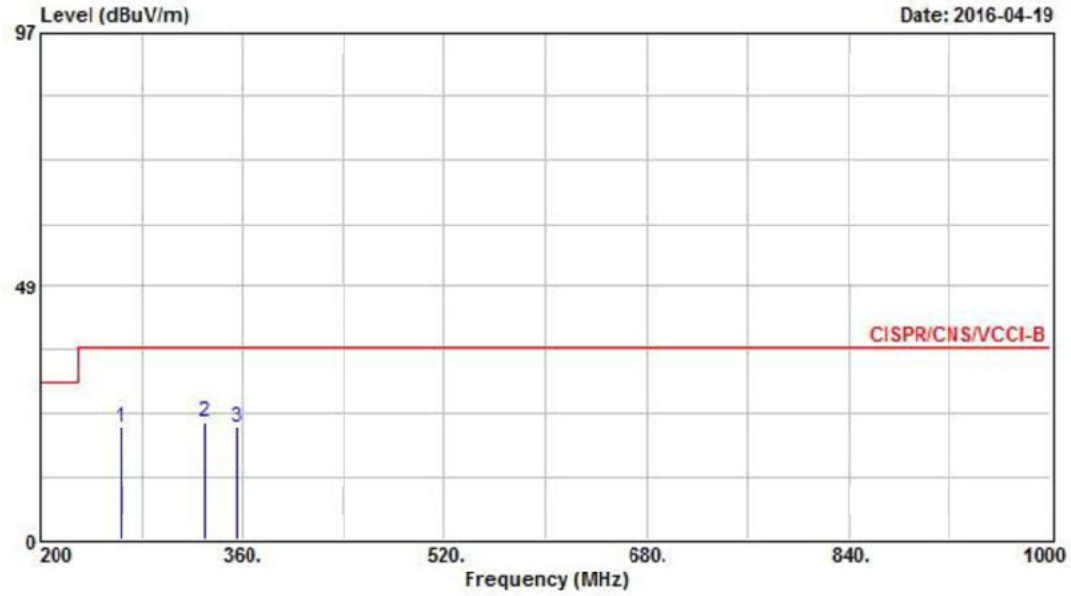
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	246.400	19.80	-17.20	37.00	31.73	17.20	2.29	31.42	Peak	---	---
2	260.800	23.82	-13.18	37.00	34.06	18.81	2.36	31.41	Peak	---	---
3	352.800	23.94	-13.06	37.00	33.06	19.48	2.77	31.37	Peak	---	---

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	51.110	21.43	-8.57	30.00	39.05	13.11	1.11	31.84	Peak	---	---
2	133.970	19.82	-10.18	30.00	33.06	16.70	1.66	31.60	Peak	---	---
3	195.040	18.05	-11.95	30.00	33.30	14.20	2.01	31.46	Peak	---	---

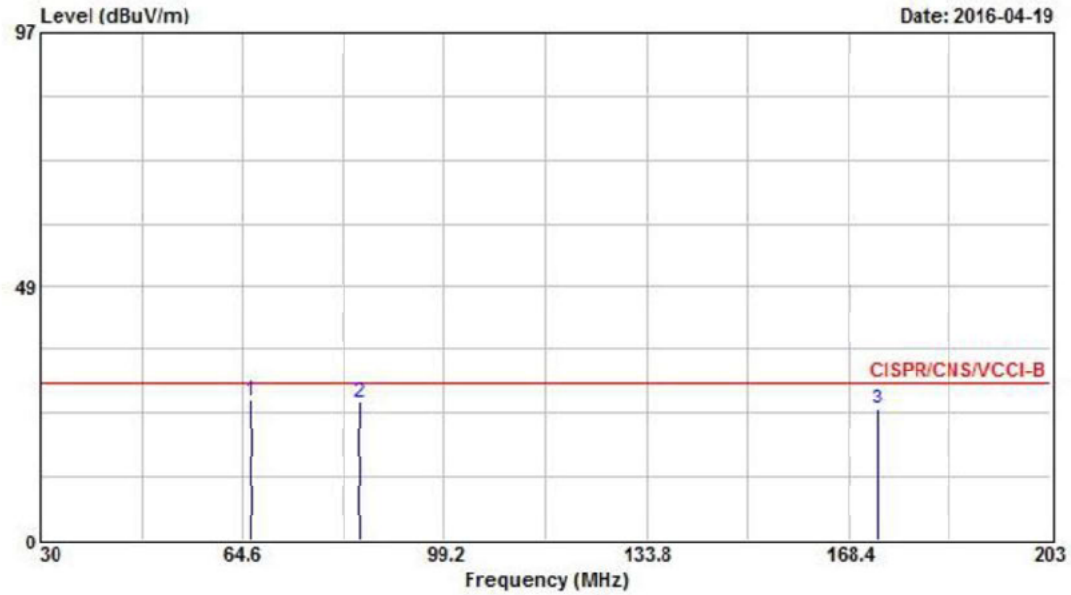
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	264.000	21.35	-15.65	37.00	31.84	18.54	2.38	31.41	Peak	---	---
2	330.400	22.53	-14.47	37.00	32.24	18.98	2.69	31.38	Peak	---	---
3	355.200	21.51	-15.49	37.00	30.56	19.54	2.78	31.37	Peak	---	---

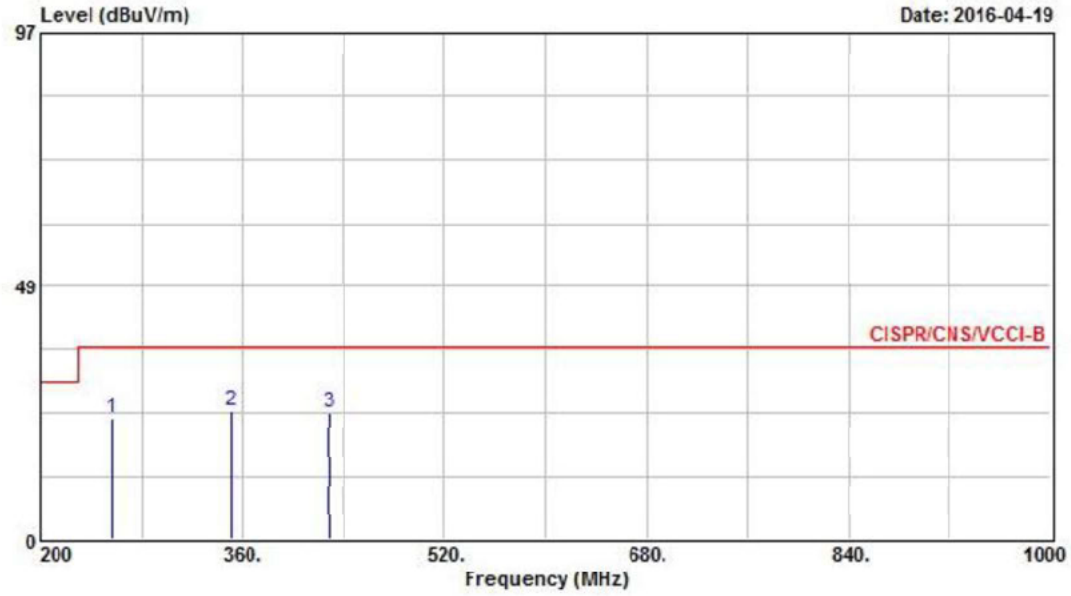
Test mode	Mode 2	Test Site No.	OS02-NH
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Chas
Temperature	25 ℃	Relative Humidity	53 %
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



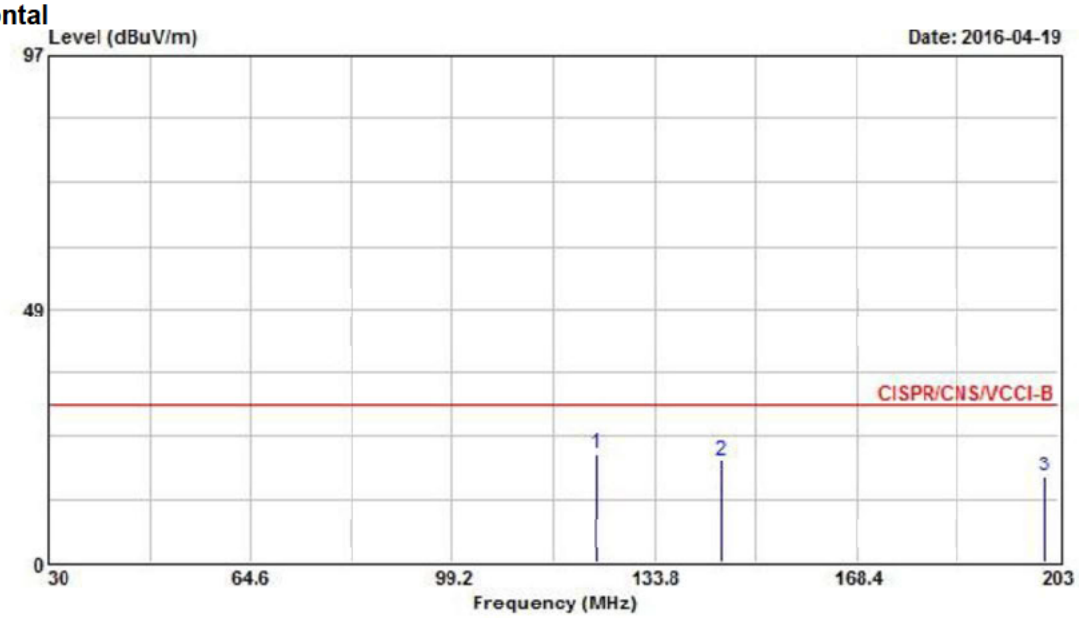
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	65.960	26.57	-3.43	30.00	45.65	11.20	1.23	31.79	Peak	100	180
2 @	84.670	26.42	-3.58	30.00	43.78	13.00	1.37	31.73	Peak	---	---
3 @	173.420	24.95	-5.05	30.00	40.05	14.52	1.89	31.51	Peak	---	---

Vertical



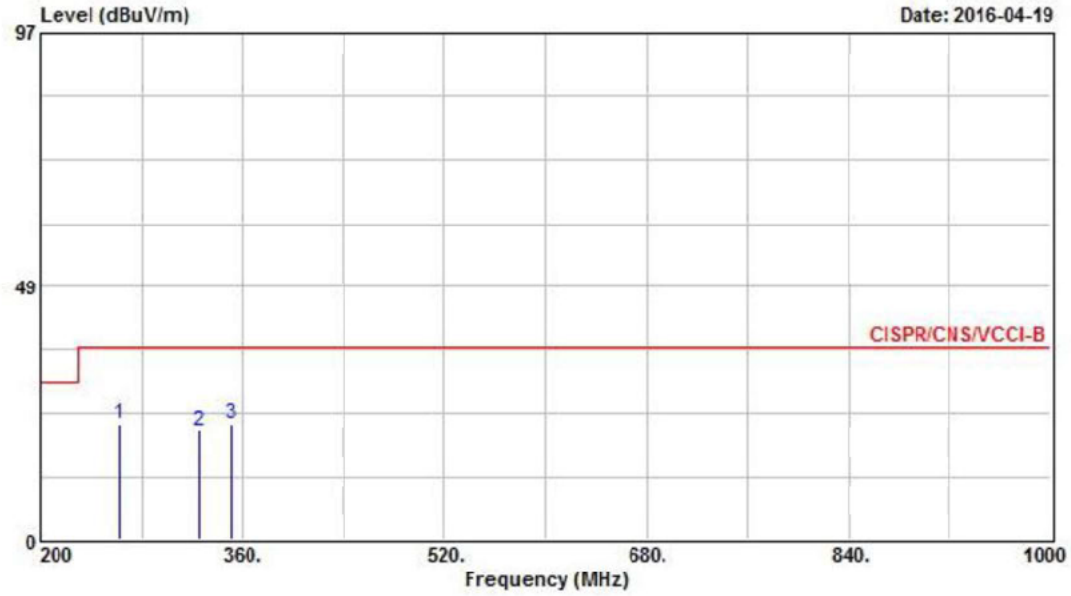
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	256.800	23.16	-13.84	37.00	33.72	18.51	2.34	31.41	Peak	---	---
2	351.200	24.75	-12.25	37.00	33.93	19.43	2.76	31.37	Peak	---	---
3	428.800	24.28	-12.72	37.00	31.08	21.38	3.18	31.36	Peak	---	---

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	123.770	20.84	-9.16	30.00	33.85	17.02	1.60	31.63	Peak	---	---
2	145.220	19.51	-10.49	30.00	33.40	15.96	1.73	31.58	Peak	---	---
3	200.580	16.35	-13.65	30.00	31.35	14.40	2.05	31.45	Peak	---	---

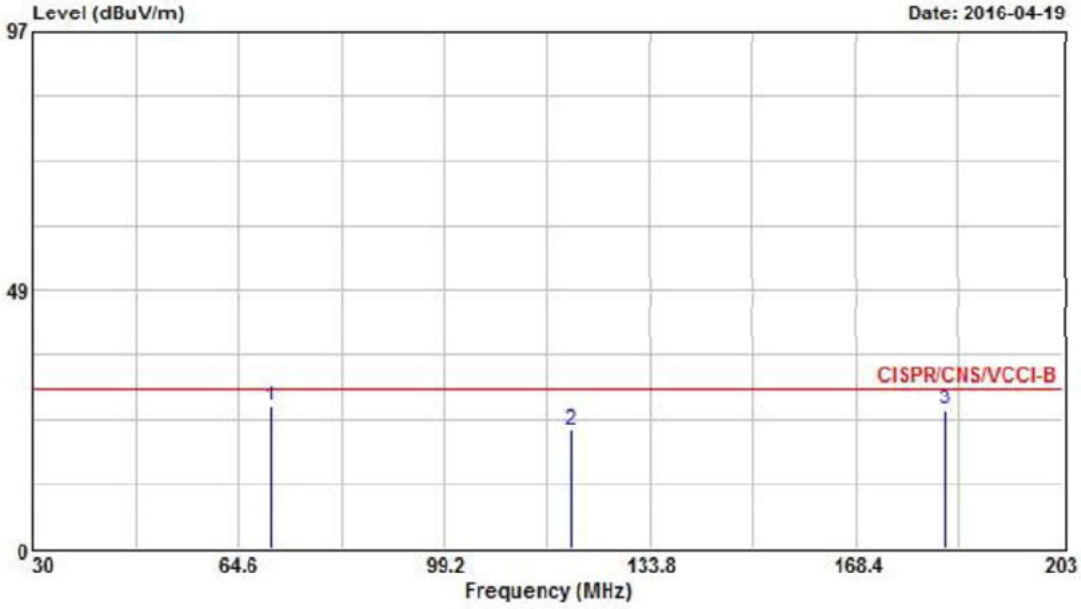
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	262.400	22.35	-14.65	37.00	32.76	18.63	2.37	31.41	Peak	---	---
2	325.600	20.72	-16.28	37.00	30.56	18.87	2.67	31.38	Peak	---	---
3	351.200	22.07	-14.93	37.00	31.25	19.43	2.76	31.37	Peak	---	---

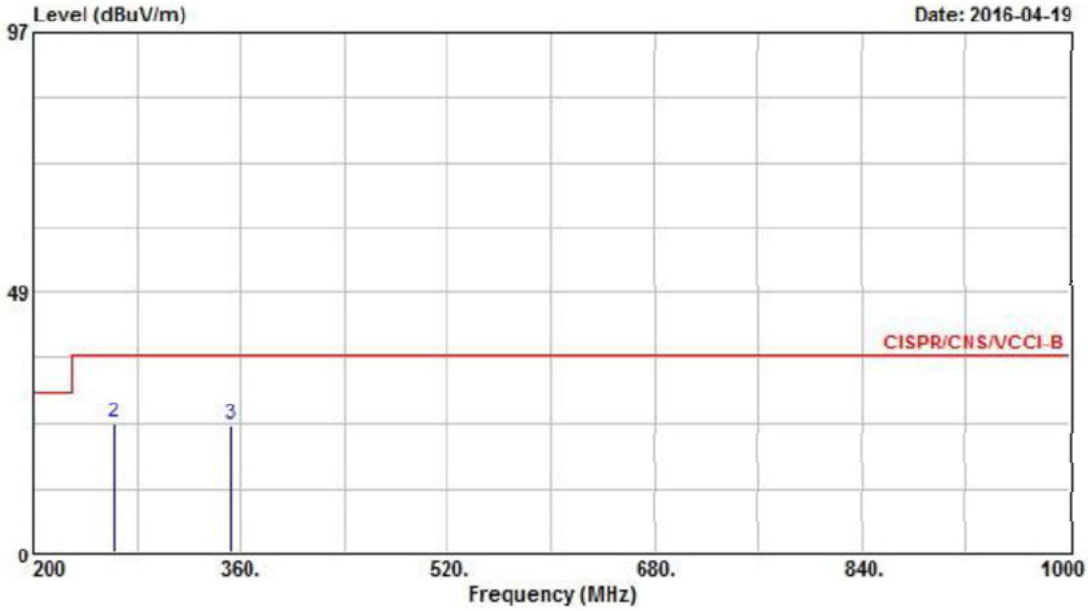
Test mode	Mode 3	Test Site No.	OS02-NH
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Chas
Temperature	25 ℃	Relative Humidity	53 %
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



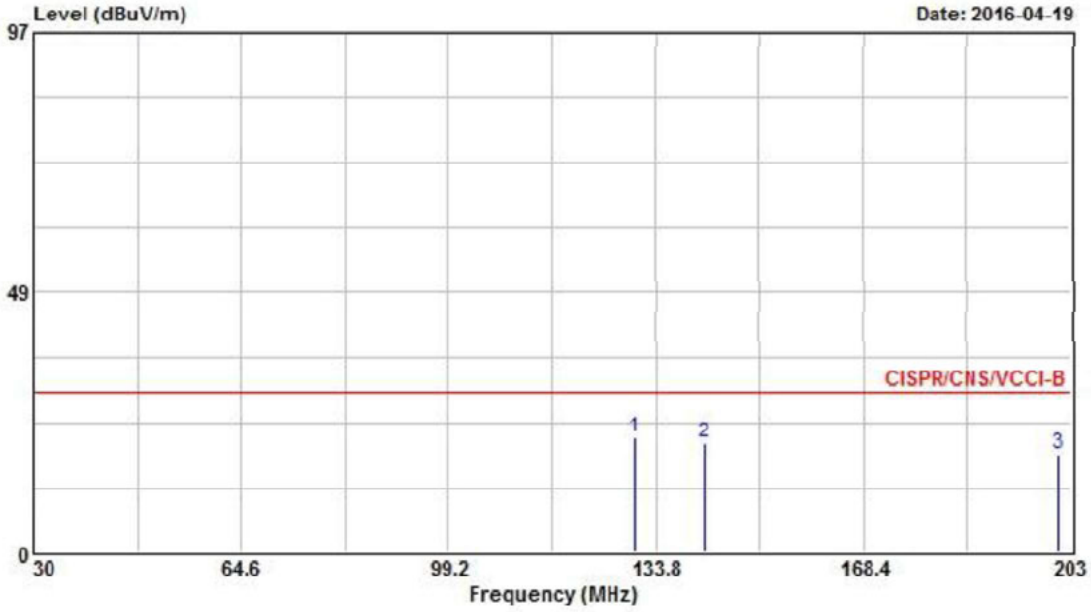
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	70.140	26.68	-3.32	30.00	46.00	11.20	1.26	31.78	QP	100	180
2	120.480	22.20	-7.80	30.00	35.15	17.10	1.58	31.63	Peak	---	---
3	183.450	25.94	-4.06	30.00	41.34	14.14	1.95	31.49	QP	---	---

Vertical



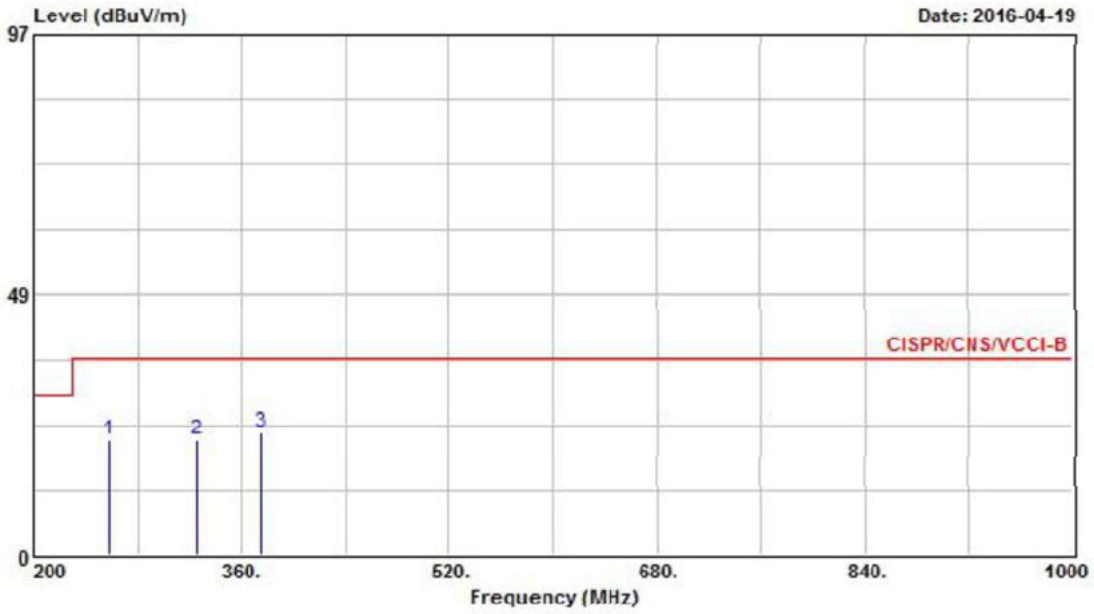
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	200.000	22.33	-7.67	30.00	37.34	14.40	2.04	31.45	Peak	---	---
2	262.400	24.13	-12.87	37.00	34.54	18.63	2.37	31.41	Peak	---	---
3	352.800	23.74	-13.26	37.00	32.86	19.48	2.77	31.37	Peak	---	---

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	130.340	21.60	-8.40	30.00	34.67	16.90	1.64	31.61	Peak	---	---
2	141.930	20.37	-9.63	30.00	34.00	16.25	1.71	31.59	Peak	---	---
3	200.920	18.28	-11.72	30.00	33.28	14.40	2.05	31.45	Peak	---	---

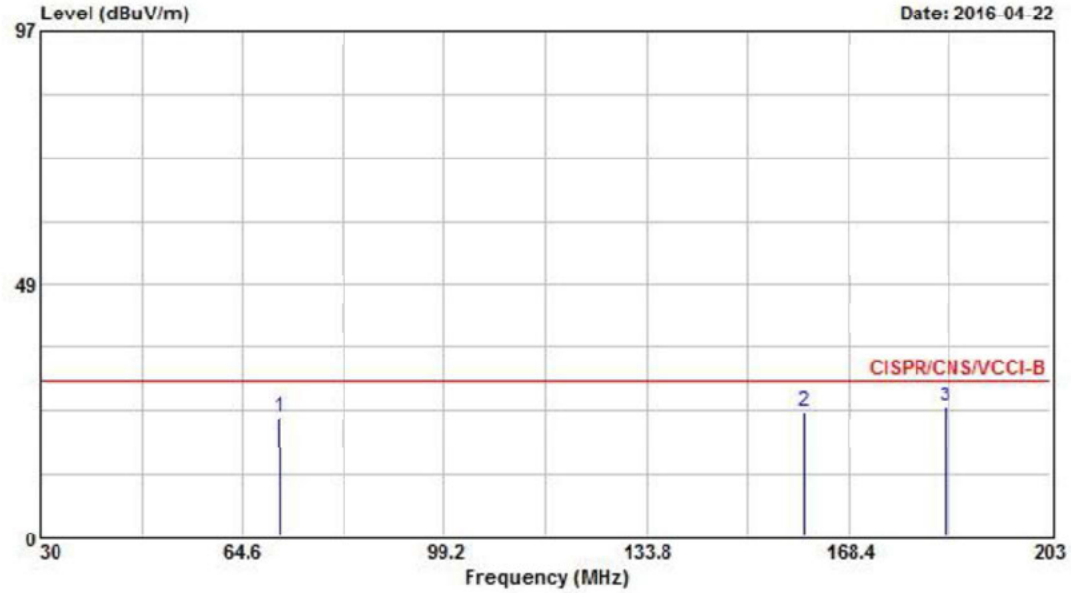
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	257.600	21.38	-15.62	37.00	31.80	18.64	2.35	31.41	Peak	---	---
2	325.600	21.66	-15.34	37.00	31.50	18.87	2.67	31.38	Peak	---	---
3	375.200	22.72	-14.28	37.00	31.07	20.11	2.91	31.37	Peak	---	---

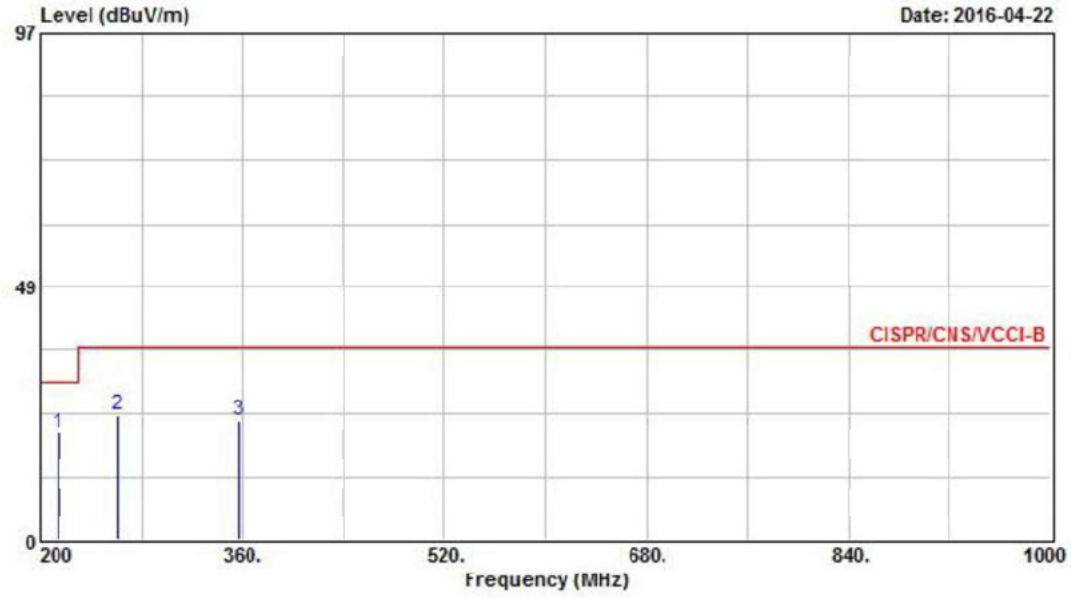
Test mode	Mode 4	Test Site No.	OS02-NH
Test frequency	30 MHz ~ 1000 MHz	Test Engineer	Chas
Temperature	25 ℃	Relative Humidity	53 %
Note: 1. Emission level (dBμV/m) = 20 log Emission level (μV/m)			
2. Corrected Reading : Antenna Factor + Cable Loss + Read Level – Preamp Factor = Level			
■ The test was passed at the minimum margin that marked by the frame in the following data			

Vertical



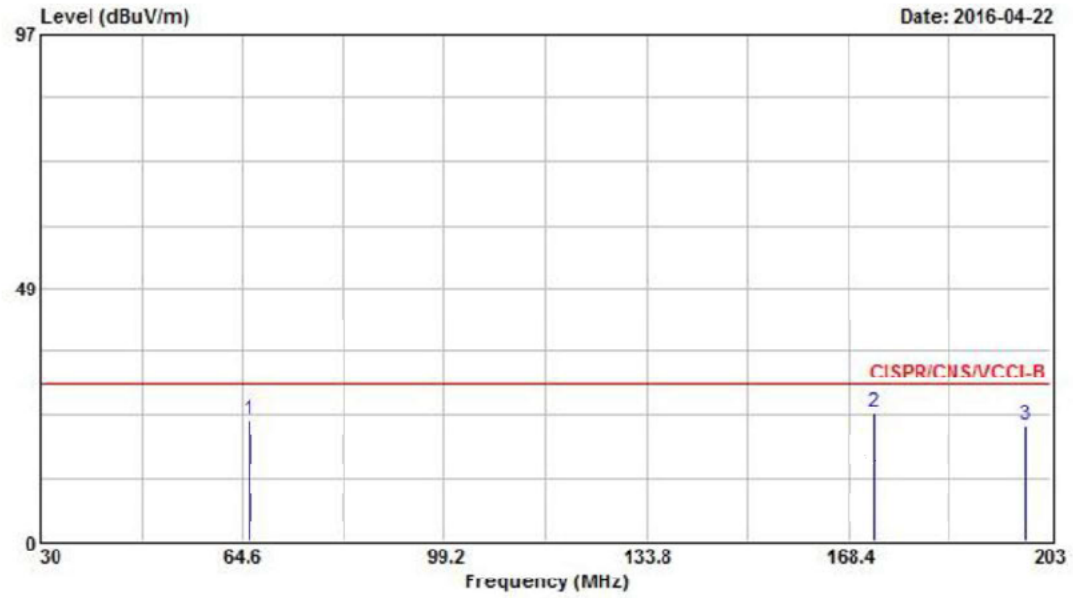
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	71.000	22.78	-7.22	30.00	41.99	11.29	1.27	31.77	Peak	---	---
2	160.790	24.02	-5.98	30.00	38.59	15.15	1.82	31.54	QP	---	---
3 @	185.010	24.91	-5.09	30.00	40.33	14.10	1.96	31.48	Peak	100	180

Vertical



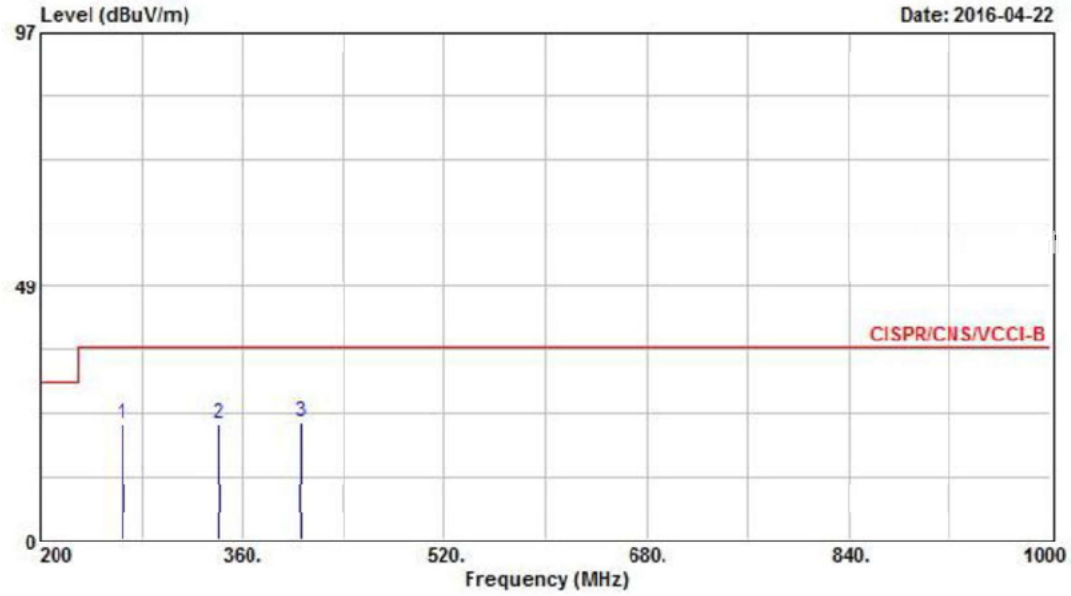
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	214.400	20.43	-9.57	30.00	35.38	14.36	2.13	31.44	Peak	---	---
2	260.800	23.80	-13.20	37.00	34.04	18.81	2.36	31.41	Peak	---	---
3	356.800	22.84	-14.16	37.00	31.83	19.59	2.79	31.37	Peak	---	---

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	65.810	23.36	-6.64	30.00	42.64	11.28	1.23	31.79	Peak	---	---
2 @	172.730	24.64	-5.36	30.00	39.70	14.56	1.89	31.51	Peak	---	---
3	198.680	22.13	-7.87	30.00	37.20	14.36	2.03	31.46	Peak	---	---

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	264.800	22.29	-14.71	37.00	32.87	18.45	2.38	31.41	Peak	---	---
2	341.600	22.16	-14.84	37.00	31.61	19.21	2.72	31.38	Peak	---	---
3	406.400	22.62	-14.38	37.00	29.97	20.93	3.09	31.37	Peak	---	---

8. Harmonic Current Emissions Measurement

8.1. Standard

- Standard : EN 61000-3-2

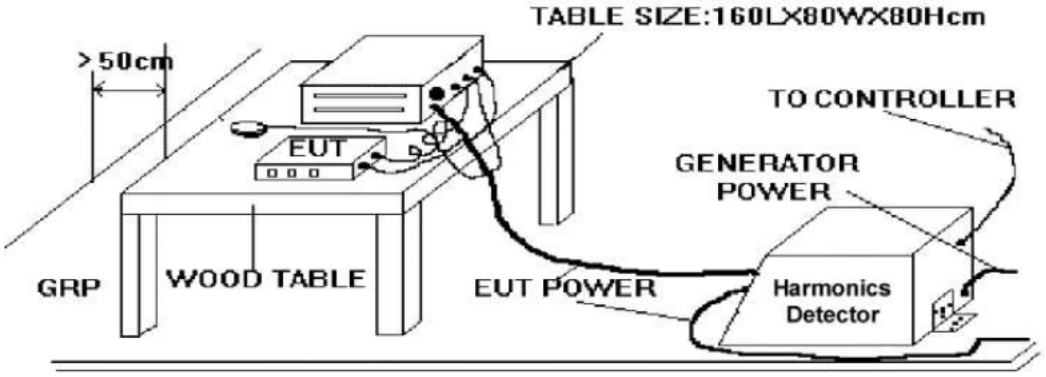
8.2. Test Procedure

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

Harmonic Parameters	Setting
Line Voltage	230 V
Line Frequency	50 Hz
Device Class	-
Current Measurement Range	High
Measurement Delay	10.0 seconds
Test Duration	10.0 minutes
Class determination Pre-test Duration	10.0 seconds

8.4. Typical Test Setup Layout of Harmonic Current Emissions



8.5. Test Result of Harmonic Current Emissions

As specified on clause 7 of EN 61000-3-2, the limits are not specified for equipment with a rated power of 75W or less.

The EUT meets the above condition, so it conforms to EN 61000-3-2.

9. Voltage Fluctuations and Flicker Measurement

9.1. Standard

- Product Standard : EN 61000-3-3

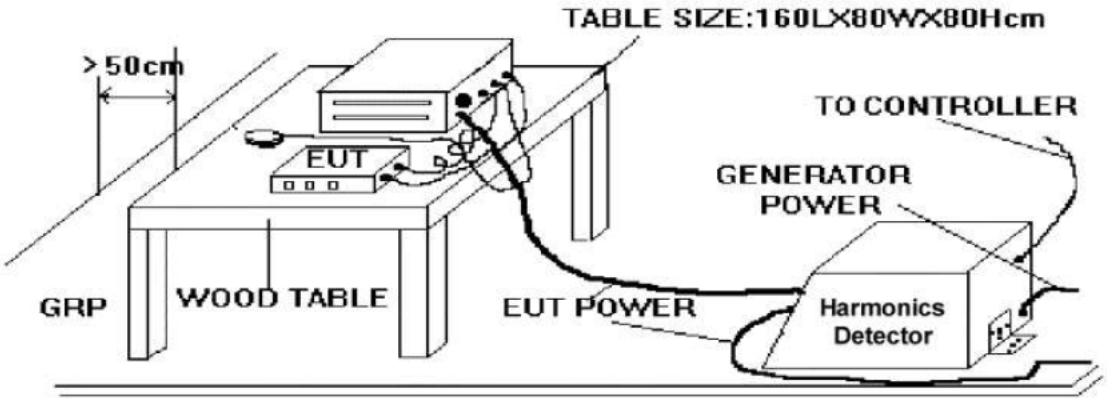
9.2. Test Procedure

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

Flicker Parameters	Setting
Line Voltage	230 V
Line Frequency	50 Hz
Measurement Delay	10.0 seconds
Pst Integration Time	10.0 minutes
Pst Integration Periods	1
Test Duration	10.0 minutes

9.4. Typical Test Setup Layout of Voltage Fluctuations and Flicker



9.5. Test Result of Voltage Fluctuation and Flicker

Test mode	Mode 1
Final Test Result	***PASS***
Temperature	24 ℃
Relative Humidity	48 %
Atmospheric Pressure	101 kPa
Test Date	Jul. 18, 2016
Test Engineer	Victor

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.43			
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):	0.252	Test limit:	1.000	Pass

Test mode	Mode 2
Final Test Result	***PASS***
Temperature	24 ℃
Relative Humidity	48 %
Atmospheric Pressure	101 kPa
Test Date	Jul. 18, 2016
Test Engineer	Victor

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.40			
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):	0.261	Test limit:	1.000	Pass

Test mode	Mode 3
Final Test Result	***PASS***
Temperature	24 ℃
Relative Humidity	48 %
Atmospheric Pressure	101 kPa
Test Date	Jul. 18, 2016
Test Engineer	Victor

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.38			
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):	0.263	Test limit:	1.000	Pass

Test mode	Mode 4
Final Test Result	***PASS***
Temperature	24 ℃
Relative Humidity	48 %
Atmospheric Pressure	101 kPa
Test Date	Jul. 18, 2016
Test Engineer	Victor

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.37			
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):	0.261	Test limit:	1.000	Pass

10. IMMUNITY pass/fail criteria examples

The following are examples that can be used to develop pass/fail criteria. For ME EQUIPMENT and ME SYSTEMS with multiple functions, the pass/fail criteria should be applied to each function, parameter and channel.

Examples of test failures:

- malfunction;
- non-operation when operation is required;
- unwanted operation when no operation is required;
- deviation from normal operation that poses an unacceptable RISK to the PATIENT or OPERATOR;
- component failures;
- change in programmable parameters;
- reset to factory defaults (MANUFACTURER's presets);
- change of operating mode;
- a FALSE POSITIVE ALARM CONDITION;
- a FALSE NEGATIVE ALARM CONDITION (failure to alarm);
- cessation or interruption of any intended operation, even if accompanied by an ALARM SIGNAL;
- initiation of any unintended operation, including unintended or uncontrolled motion, even if accompanied by an ALARM SIGNAL;
- error of a displayed numerical value sufficiently large to affect diagnosis or treatment;
- noise on a waveform in which the noise would interfere with diagnosis, treatment or monitoring;
- artefact or distortion in an image in which the artefact would interfere with diagnosis, treatment or monitoring;
- failure of automatic diagnosis or treatment ME EQUIPMENT or ME SYSTEM to diagnose or treat, even if accompanied by an ALARM SIGNAL.

Example of performance during and after the applied testing stimulus required to pass the test:

- for a mammography system, the compression full release and associated command remains fully operational;
- for ULTRASOUND DIAGNOSTIC EQUIPMENT, the probe heating, dissipative power and temperature shall remain within specifications;
- safety-related functions perform as intended;
- false operation of alarms, "fail safe" modes and similar functions do not occur.

NOTE This might require performing the test twice – once to ensure the functions occur as expected and again to ensure they do not occur falsely.

Examples of acceptable degradation:

- an imaging system displays an image that could be altered, but in a way that would not affect the diagnosis or treatment;
- a heart rate monitor displays a heart rate that could be in error, but by an amount that is not clinically significant;
- a PATIENT monitor exhibits a small amount of noise or a transient on a waveform and the noise or transient would not affect diagnosis, treatment or monitoring.

Examples of ME EQUIPMENT and ME SYSTEMS with multiple functions:

- multi-parameter monitors;
- anaesthesia system with monitors;
- ventilators with monitors;
- multiple instances of the same function (e.g. multiple invasive blood pressure sensors).

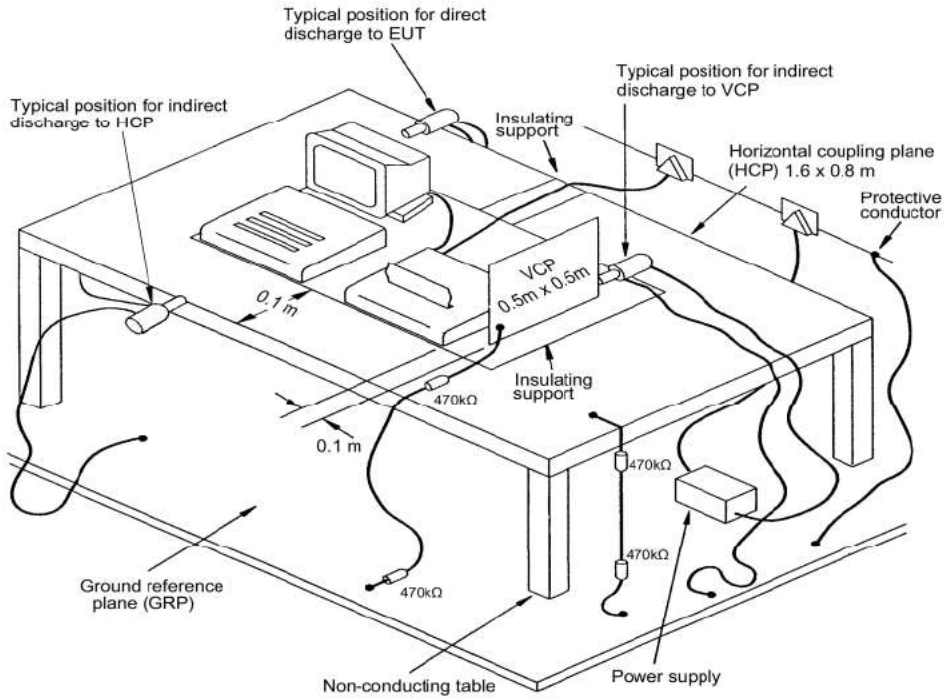
Failure of therapy equipment to terminate a treatment at the intended time can be considered cessation or interruption of an intended operation related to ESSENTIAL PERFORMANCE. If the effect of the test signal on an ME EQUIPMENT or ME SYSTEM is so brief as to be transparent to the PATIENT or OPERATOR and does not affect diagnosis, monitoring or treatment of the PATIENT, this can be considered not to be cessation or interruption of an intended operation. For example, if in response to the IMMUNITY TEST LEVEL a ventilator stops pumping for 50 ms and then resumes operation such that accuracy is within acceptable limits, this would not be considered cessation or interruption of an intended operation.

Note that it might be necessary to test the ME EQUIPMENT or ME SYSTEM multiple times, e.g. under one set of conditions to assure that it sounds an ALARM SIGNAL when it should, within the MANUFACTURER's specifications for sensitivity and response time, and under another set of conditions to assure that it does not sound an ALARM SIGNAL when it should not.

11. Electrostatic Discharge Immunity Measurement (ESD)

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-2
Product Standard	EN 60601-1-2:2015
Level	4 for air discharge
	4 for contact discharge
Test Voltage	±2 / ±4 / ±8 / ±15 kV for air discharge
	±8 kV for contact discharge
Discharge Impedance	330 ohm / 150 pF
Temperature	23 ℃
Relative Humidity	46 %
Atmospheric Pressure	101 kPa
Test Date	Aug. 11, 2016
Test Engineer	Victor
Observation	Normal.

11.1. 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:

a. CONTACT DISCHARGE to the conductive surfaces and to coupling plane;

b. 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.

11.2. 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 1 m 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 0.2 m 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, 0.8 m 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.

11.3. 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. The test shall be performed with both air discharge and contact discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on contact discharge.

e. 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.

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

g. 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.

h. 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.

11.4. Test Severity Levels

11.4.1. Contact Discharge

Level	Test Voltage (kV) of Contact discharge
1	± 2
2	± 4
3	± 6
4	± 8
X	Specified
Remark : "X" is an open level.	

11.4.2. Air Discharge

Level	Test Voltage (kV) of Air Discharge
1	± 2
2	± 4
3	± 8
4	± 15
X	Specified
Remark : "X" is an open level.	

11.5. Test Points

11.5.1. Test Result of Air Discharge

Test Method	No. of Discharges	Air Discharge/Round Tip	Test Result
Case	10	± 2, 4, 8, 15 kV	Pass (No influencing)

11.5.2. Test Result of Contact Discharge

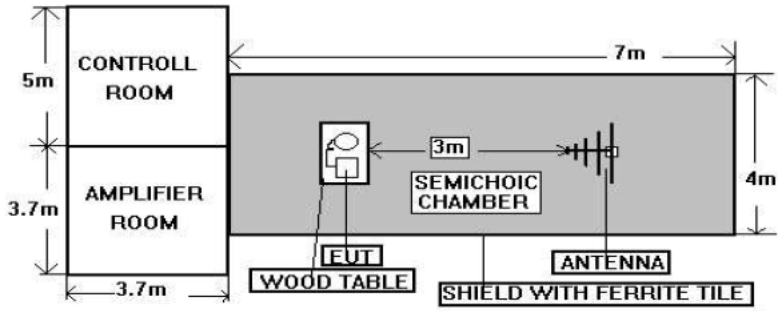
Indirect discharge to HCP and VCP

Test Method	No. of Discharges	Contact Discharge/Pointed Tip	Test Result
HCP (At Front)	10	± 8 kV	Pass (No influencing)
HCP (At Left)	10	± 8 kV	Pass (No influencing)
HCP (At Right)	10	± 8 kV	Pass (No influencing)
HCP (At Rear)	10	± 8 kV	Pass (No influencing)
VCP (At Front)	10	± 8 kV	Pass (No influencing)
VCP (At Left)	10	± 8 kV	Pass (No influencing)
VCP (At Right)	10	± 8 kV	Pass (No influencing)
VCP (At Rear)	10	± 8 kV	Pass (No influencing)

12. Radio Frequency Electromagnetic Field Immunity Measurement (RS)

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-3
Product Standard	EN 60601-1-2:2015
Level	2
Radiated RF EM fields Frequency Range	80 to 2700 MHz
Field Strength	3 V/m Modulation (AM) : 1kHz 80%
RF wireless communications equipment Frequency Range	Please refer to section 12.4.
Dwell Time	2.9 seconds
Frequency Step size	1 % of the preceding frequency value
Test Date	Jul. 13, 2016
Test Engineer	Victor
Observation	Normal.

12.1. Test Setup



NOTE : The SPORTON 7m x 4m x 4m semi-anechoic chamber is compliance with the sixteen point's uniform field requirement as stated in IEC 61000-4-3 Section 6.2.

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. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

12.2. 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 to 2700 MHz is placed 3 m 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. 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.

e. At each of the above conditions, the frequency range is swept 80 to 2700 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.

f. ENCLOSURE PORT IMMUNITY to Proximity fields from RF wireless communications equipment followed section 8.10 of EN 60601-1-2:2015.

12.3. Test Severity Levels

The following test severity levels are recommended for the Radiated RF EM fields test :

Frequency Band : 80 to 2700 MHz

Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified
Remark : "X" is an open class.	

Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment

Test frequency (MHz)	Band [a] (MHz)	Service [a]	Modulation [b]	Maximum power (W)	IMMUNITY TEST LEVEL (V/m)
385	380 –390	TETRA 400	Pulse modulation [b] 18 Hz	1.8	27
450	430 – 470	GMRS 460, FRS 460	FM [c] ± 5 kHz deviation 1 kHz sine	2	28
710	704 – 787	LTE Band 13, 17	Pulse modulation [b] 217 Hz	0.2	9
745					
780					
810	800 – 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation [b] 18 Hz	2	28
870					
930					
1720	1700 – 1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation [b] 217 Hz	2	28
1845					
1970					
2450	2400 – 2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation [b] 217 Hz	2	28
5240	5100 – 5800	WLAN 802.11 a/n	Pulse modulation [b] 217 Hz	0.2	9
5500					
5785					

NOTE: The test distance from antenna to EUT is 0.3 m.

[a] For some services, only the uplink frequencies are included.
[b] The carrier shall be modulated using a 50 % duty cycle square wave signal.
[c] As an alternative to FM modulation, 50 % pulse modulation at 18 Hz may be used because while it does not represent actual modulation, it would be worst case.

12.4. Test Record

■ **Radiated RF EM fields:** Frequency Band: 80 to 2700 MHz

Sides of the EUT have been exposed to the field	Antenna positioned	Test field strength Level	Test field strength (V/m)	Test Record
Front	Vertical	2	3	Pass (No influencing)
	Horizontally	2	3	Pass (No influencing)
Left	Vertical	2	3	Pass (No influencing)
	Horizontally	2	3	Pass (No influencing)
Back	Vertical	2	3	Pass (No influencing)
	Horizontally	2	3	Pass (No influencing)
Right	Vertical	2	3	Pass (No influencing)
	Horizontally	2	3	Pass (No influencing)

■ **Proximity fields from RF wireless communications equipment**

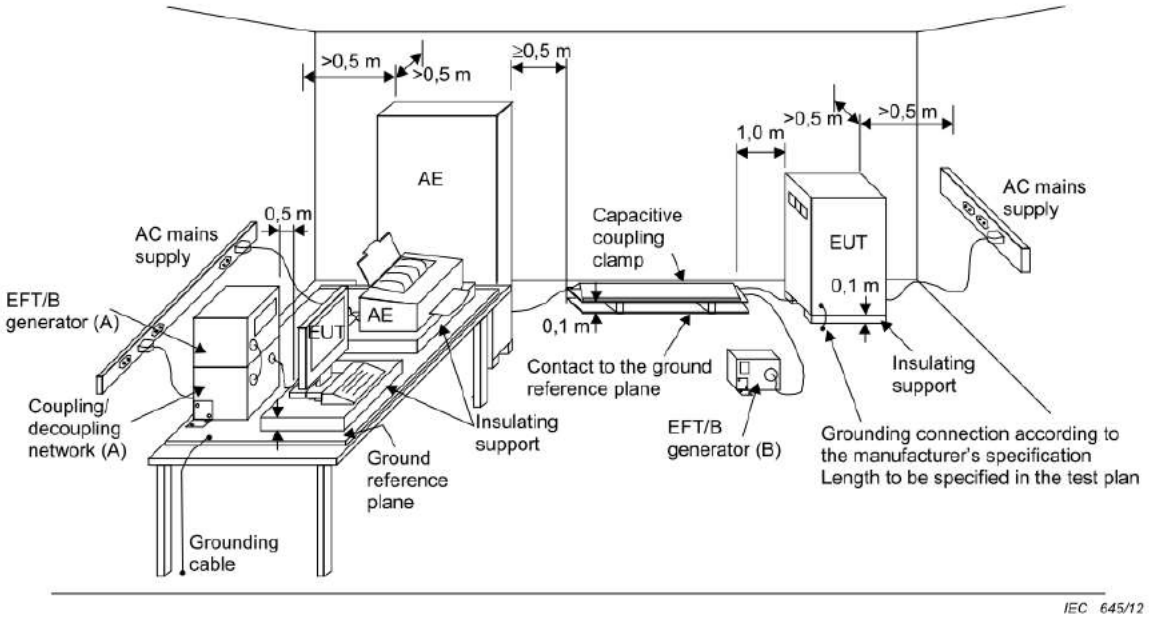
Test frequency (MHz)	Band (MHz)	Modulation	Maximum power (W)	IMMUNITY TEST LEVEL (V/m)	Test Record
385	380 –390	Pulse modulation 18 Hz	1.8	27	Pass (No influencing)
450	430 – 470	FM ± 5 kHz deviation 1 kHz sine	2	28	Pass (No influencing)
710	704 – 787	Pulse modulation 217 Hz	0.2	9	Pass (No influencing)
745					Pass (No influencing)
780					Pass (No influencing)
810	800 – 960	Pulse modulation 18 Hz	2	28	Pass (No influencing)
870					Pass (No influencing)
930					Pass (No influencing)
1720	1700 – 1990	Pulse modulation 217 Hz	2	28	Pass (No influencing)
1845					Pass (No influencing)
1970					Pass (No influencing)
2450	2400 – 2570	Pulse modulation 217 Hz	2	28	Pass (No influencing)
5240	5100 – 5800	Pulse modulation 217 Hz	0.2	9	Pass (No influencing)
5500					Pass (No influencing)
5785					Pass (No influencing)

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

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-4
Product Standard	EN 60601-1-2:2015
Level	on Input power ports -- 3 on Signal input/output parts port -- n/a
Test Voltage	on Input power ports -- ±2.0 kV on Signal input/output parts port -- n/a
Impulse wave shape	5/50 ns (Tr/Th)
Repetition frequency	100 kHz
Test Repetition Rate	1 time / minute
Test Date	Jul. 19, 2016
Test Engineer	Victor
Observation	Normal.

**The n/a means that the EUT does not have the communication port.

13.1. Test setup



(A) location for supply line coupling

(B) location for signal lines coupling

The EUT was placed on a ground reference plane and was insulated from it by an insulating support about 0.1 m 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 0.5 m or less.

13.2. Test on Power Line

a. The EFT/B-generator was located on the GRP. The length from the EFT/B-generator to the EUT as not exceeds 0.5 m.

b. The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

13.3. Test on Communication Lines

a. The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP.
b. The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

13.4. Test Procedure

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

13.5. Test Severity Levels

The following test severity levels are recommended for the fast transient/burst test :

Open circuit output test voltage ± 10%		
Level	**On Input power ports**	**On signal port and telecommunication ports**
1	0.5 kV	0.25 kV
2	1.0 kV	0.50 kV
3	2.0 kV	1.00 kV
4	4.0 kV	2.00 kV
X	Specified	Specified
Remark : " X " is an open level. The level is subject to negotiation between the user and the manufacturer or is specified by the manufacturer.		

13.6. Test Record

■ **on Input power ports:**

Test Location	Polarity	Test Level	Voltage (Peak)	Test Record
L+N	+	3	2 kV	Pass (No influencing)
	−	3	2 kV	Pass (No influencing)

14. Surge Immunity Measurement

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-5
Product Standard	EN 60601-1-2:2015
Surge wave form (Tr/Th)	1,2/50 (8/20) μs
Level	on Input power ports -- 3
	on Signal input/output parts port -- n/a
Test Voltage	on Input power ports -- ±0.5 / ±1.0 / ±2.0 kV
	on Signal input/output parts port -- n/a
Phase Angle	0°, 90°, 180°, 270°
Number of surges	5 positive and 5 negative pulses
Pulse Repetition Rate	1 time / min. (maximum)
Test Date	Jul. 19, 2016
Test Engineer	Victor
Observation	Normal.

**The n/a means that the EUT does not have the communication port.

14.1. Test Procedure

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

b. 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.

c. 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).

d. 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.

e. 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.

f. All lower levels including the selected test level shall be satisfied. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.

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 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 previously unstressed equipment shall be used to the protection devices shall be replaced.

14.2. Test Severity Levels

Level	Open-circuit test voltage, ± 10%, kV
1	0.5
2	1.0
3	2.0
4	4.0
x	Specified
Remark : " X " is an open level. This level can be specified in the product specification.	

14.3. Operating Condition

Full system

14.4. Test Record

■ **on Input power ports:**

Test Location	Voltage	Polarity	Test Result
L - N	0.5 kV, 1 kV	+	Pass (No influencing)
	−	Pass (No influencing)
L - PE	0.5 kV, 1 kV, 2 kV	+	Pass (No influencing)
	−	Pass (No influencing)
N - PE	0.5 kV, 1 kV, 2 kV	+	Pass (No influencing)
	−	Pass (No influencing)

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

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-6
Product Standard	EN 60601-1-2:2015
Level	2, x
Test Voltage	3 V 6 V in ISM bands Modulation (AM) : 1kHz 80%
Frequency Range	0.15 MHz to 80 MHz
ISM (industrial, scientific and medical) bands	6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz
Test Port	on Input Power Port on Signal input/output parts port-- n/a
Dwell time	2.9 seconds
Frequency step size	1 % of the preceding frequency value
Coupling mode (* There is one steps in this test.)	CDN-M016 SW M2 for AC power Port
Test Date	Jul. 18, 2016
Test Engineer	Victor
Observation	Normal.

**The n/a means that the EUT does not have the communication port.

15.1. 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 sell 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 sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5 x 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.

15.2. Test Severity Levels

Level	Voltage Level (EMF)
1	1 V rms
2	3 V rms
3	10 V rms
x	Specified
Remark : " X " is an open level. This level can be specified in the product specification.	

15.3. Operating Condition

Full system

15.4. Test Record

Test Port	Test field strength level	Test field strength (V rms)	Test Record
Input power port	2	3	Pass (No influencing)

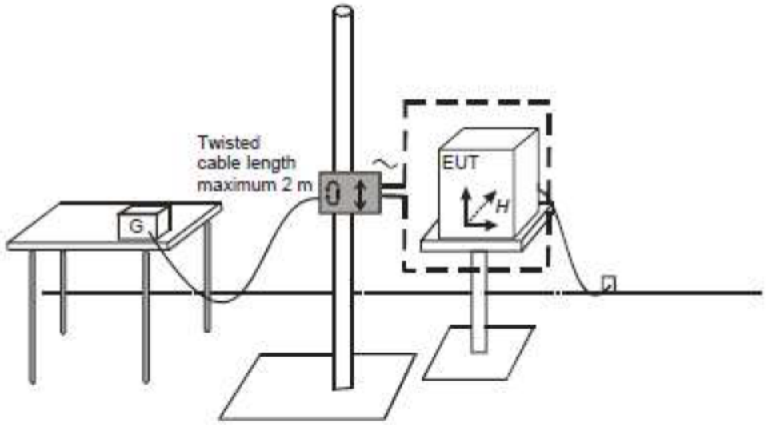
■ on ISM (industrial, scientific and medical) bands:

Test bands	Test field strength (V rms)	Test Record
6,765 MHz to 6,795 MHz	6	Pass (No influencing)
13,553 MHz to 13,567 MHz	6	Pass (No influencing)
26,957 MHz to 27,283 MHz	6	Pass (No influencing)
40,66 MHz to 40,70 MHz	6	Pass (No influencing)

16. Power Frequency Magnetic Field immunity Measurement (PFMF)

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-8
Product Standard	EN 60601-1-2:2015
Test Date	Jul. 19, 2016
Test Engineer	Victor
Observation	Normal.

16.1. Test Setup



EUT : Equipment under test G : Test Generator

16.2. Test Record

Power Frequency Magnetic Field	Testing duration	Coil Orientation	Test Record
50Hz, 30A/m	1.0 Min	X-axis	Pass (No influencing)
50Hz, 30A/m	1.0 Min	Y-axis	Pass (No influencing)
50Hz, 30A/m	1.0 Min	Z-axis	Pass (No influencing)

17. Voltage Dips and Voltage Interruptions Immunity Measurement (DIP)

Test mode	Mode 1~ Mode 4
Final Test Result	***PASS***
Basic Standard	IEC 61000-4-11
Product Standard	EN 60601-1-2:2015
Test Port	Input AC power ports
Supply Input Voltage	100Vac / 50Hz, 240Vac / 50Hz
Test Date	Jul. 19, 2016
Test Engineer	Victor

17.1. Test Record

Phenomenon	Single phase at	% U_T	Duration (cycles)	Test Record
Voltage dips	0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	0%	0.5	Pass
Voltage dips	0°	0%	1	Pass
Voltage dips	0°	70%	25	Pass
Voltage interruptions	0°	0%	250	Pass

NOTE U_T is the a.c. mains voltage prior to application of the test level.

17.2. Test Procedure

The test was based on IEC 61000-4-11.

a. The EUT is powered up to a nominal voltage of 240VAC/50Hz and 100VAC/50Hz, and then software-controlled voltage dips and interruptions are introduced.
b. Test of interval : 10 sec.
c. Voltage rise (and fall) time : 1 ~ 5 μs.
d. Level and duration : Sequency of 3 dips/interrupts.

17.3. Operating Condition

Full system

18. List of Measuring Equipment Used

< Conducted Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver	R&S	ESCS 30	100357	9 kHz - 2.75 GHz	Jan. 29, 2016	Conduction (CO01-NH)
LISN	SCHAFFNER	NNB41	06/10024	9kHz - 30MHz	Dec. 14, 2015	Conduction (CO01-NH)
Power Filter	CORCOM	MR12030	N/A	30A*2	NCR	Conduction (CO01-NH)
RF Cable-CON	Suhner Switzerland	RG223/U	CB004	9kHz - 30MHz	Dec. 10, 2015	Conduction (CO01-NH)

Note: Calibration Interval of instruments listed above is one year. NCR: No Calibration Request.

< Radiated Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Open Area Test Site	SPORTON	OATS-10	OS02-NH	30 MHz - 1 GHz 10m, 3m	Dec. 28, 2015	Radiation (OS02-NH)
Amplifier	BURGEON	BPA-530	100203	0.01 MHz - 3 GHz	May. 20, 2015	Radiation (OS02-NH)
Receiver	R&S	ESCI	100497	9 kHz – 3 GHz	May, 07, 2015	Radiation (OS02-NH)
Bilog Antenna With 5dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-05	35377 & AT-N0518	30 MHz ~ 2 GHz	Nov. 12, 2015	Radiation (OS02-NH)
Turn Table	EMCO	2080	9508-1805	0 - 360 degree	NCR	Radiation (OS02-NH)
Antenna Mast	ETS	2075-2	2385	1 m - 4 m	NCR	Radiation (OS02-NH)
RF Cable-R10m	MIYAZAKI	5DFB	CB044	30 MHz - 1 GHz	Aug. 28, 2015	Radiation (OS02-NH)

Note: Calibration Interval of instruments listed above is one year. NCR: No Calibration Request.

< EMS >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
ESD Simulator	KEYTEK	MZ-15/EC	0302234	Air: 0 ~15kV Contact: 0 ~ 8kV	Oct. 26, 2015	ESD
EFT Generator	TESEQ	FTM3425	0180	0 ~ 4kV	Jan. 18, 2016	EFT
SURGE Generator	TESEQ	CWN 3650	0429	0 ~ 6 kV/2Ω 0~ 6 kV/12Ω	Jan. 18, 2016	SURGE
Conducted Immunity Test System	TESEQ	NSG4070	34293	9kHz ~ 1GHz	Aug. 23, 2015	CS
Attenuator	BIRD	100-SA-MFB-06	0232	150kHz ~ 230MHz	Aug. 25, 2015	CS
Coupling/Decoupling Network	SCHAFFNER	CDN M016	16676	150kHz ~ 230MHz	Jul. 06, 2016	CS
Coupling/Decoupling Network	SCHAFFNER	CDN M016	16670	150kHz ~ 230MHz	Jul. 06, 2016	CS
Magnetic field Immunity Loop	FCC (KEYTEK)	F-1000-4-8-G-125A	05004	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Dec. 30, 2015	PFMF
Magnetic Generator	FCC (KEYTEK)	F-1000-4-8/9/10-L-1M	03004	30A//CONTINUOUS 100A/2Hrs 230A/30SEC	Dec. 30, 2015	PFMF
DIP Generator	TESEQ	VAR 3005-S16	0804	230VA/50Hz/60Hz 0%Open/5S 0%Short/5S 40%0.10S 70%/0.01S	Jan. 18, 2016	DIP
Harmonic/Flicker Test System	SCHAFFNER	CCN1000-1	72471	4000VA 16A PEAK	May 24, 2016	Harmonics, Flicker
AC Power Source	TESEQ	NSG 1007	1510A00144	16A PEAK	May 24, 2016	Harmonics, Flicker

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Signal Generator	R & S	SMB100A	103294HA	9kHz ~ 6GHz	Oct. 20, 2015	RS
Power Sensor	R & S	NRP-Z91	101094-UL	9kHz ~ 6GHz	Oct. 22, 2015	RS
Power Sensor	R & S	NRP-Z91	101095-KY	9kHz ~ 6GHz	Oct. 22, 2015	RS
Power Amplifier	BONN	BLWA 0810-160/100D	107972A	0.8GHz ~ 1GHz	N/A	RS
Power Amplifier	BONN	BLMA 1060-100D	107972B	1GHz ~ 6GHz	N/A	RS
Antenna	R & S	HL046E	100076-Cd	0.8GHz ~ 3GHz	N/A	RS
Antenna	SCHWARZBECK MESS-ELEKTRONIK	STLP 9149	9149-073	0.7GHz ~ 10.5GHz	N/A	RS

Note: Calibration Interval of instruments listed above is one year.

19. Uncertainty of Test Site

Emission Test Measurement Uncertainty

Test Items	Test Site No.	Uncertainty	Remark
Conducted Emissions	CO01-NH	± 2.6dB	Confidence levels of 95%
Radiated Emissions	OS02-NH	± 3.0dB	Confidence levels of 95%

Immunity Test Measurement Uncertainty

◆ **ESD Immunity (IEC 61000-4-2)**

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	2	7.48	7.85	4.2	4.41	2.01	2.11
Min	6.75	2.8	1.4		6.75		2.8		1.4
Max	8.25	5.2	2.6		8.25		5.2		2.6
Tolerance in %	10%	30%	30%						

4kV	First Peak Current	Current at 30ns	Current at 60ns	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	8	4	15.12	15.88	8.03	8.43	3.68	3.86
Min	13.5	5.6	2.8		13.5		5.6		2.8
Max	16.5	10.4	5.2		16.5		10.4		5.2
Tolerance in %	10%	30%	30%						

6kV	First Peak Current	Current at 30ns	Current at 60ns	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	6	22.78	23.92	12.37	12.99	5.45	5.72
Min	20.25	8.4	4.2		20.25		8.4		4.2
Max	24.75	15.6	7.8		24.75		15.6		7.8
Tolerance in %	10%	30%	30%						

Negative Discharge Current

From Standard				From calibration Certificate					
8kV	First Peak Current	Current at 30ns	Current at 60ns	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	16	8	30.26	31.77	16.13	16.94	7.39	7.76
Min	27	11.2	5.6		27		11.2		5.6
Max	33	20.8	10.4		33		20.8		10.4
Tolerance in %	10%	30%	30%						

Negative Discharge Voltage

Standard Parameters				Measured Values
Indicated Voltage.	Tolerance.	Max.	Min.	
kV	%	kV	kV	kV
2	10	2.20	1.80	2.05
4	10	4.40	3.60	4.027
6	10	6.60	5.40	5.955
8	10	8.80	7.20	7.916
15	10	16.50	13.50	14.839

Negative Rise Time

Standard Parameters	
T max.	1ns
T min	0.7ns

Measured Values			
Indicated Voltage.	Measured Rise Time.	Worst Case max. +6%	Worst Case min. -6%
2kV	0.851	0.902	0.799
4kV	0.780	0.827	0.733
6kV	0.750	0.795	0.705
8kV	0.772	0.818	0.726

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

◆ RF Radiated Immunity (IEC 61000-4-3)

Symbol	Source of Uncertainty	Value	Probability distribution	Divisor	$u_i(y)$
F_{SM}	Felds Strength monitor	1.5	Normal 2	2.000	0.75
FS_{AW}	Field Strength acceptability window	0.50	Rectangular	1.732	0.29
PAH	Power Amplifier Harmonics	0.50	Rectangular	1.732	0.29
R_S	Measurement System Repeatability	0.50	normal 1	1.000	0.50
R_{EUT}	Repeatability of EUT	0.00	normal 1	1.000	0.00
$u_c(F_S)$	Combined Standard Uncertainty	-	normal	-	0.83
$U(F_S)$	**Expanded Uncertainty**	-	**normal k= 2**		**1.66**

Specified Level (V/m)	Test level (V/m)
For 1 Volts	1.25
For 3 Volts	3.33
For 10 Volts	11.22

◆ EFT/BURST Immunity (IEC 61000-4-4)

Voltage Output

Standard Parameters				Measured Values
Indicated Voltage.	Tolerance.	Max.	Min.	
kV	%	kV	kV	kV
0.5	10	0.55	0.45	0.489
1	10	1.1	0.9	1.006
2	10	2.2	1.8	2.016
4	10	4.4	3.6	3.830
- 0.5	10	- 0.55	- 0.45	- 0.489
- 1	10	- 1.1	- 0.9	- 0.972
- 2	10	- 2.2	- 1.8	- 1.961
- 4	10	- 4.4	- 3.6	- 3.770

Spike frequency

Standard Parameters					Measured Values
Indicated Voltage.		Tolerance.	Max.	Min.	
kV	kHz	%	kHz	kHz	kHz
0.5	5	10	5.5	4.5	5.00
1	5	10	5.5	4.5	4.98
2	5	10	5.5	4.5	4.98
4	2.5	10	2.75	2.25	2.49
4	5	10	5.5	4.5	5.01

Burst width

Standard Parameters					Measured Values
Indicated Voltage.		Tolerance.	Max.	Min.	
kV	ms	%	ms	ms	ms
0.5	15	20	18	12	14.97
1	15	20	18	12	14.94
2	15	20	18	12	14.91
4	15	20	18	12	14.95

Burst period

Standard Parameters					Measured Values
Indicated Voltage.		Tolerance.	Max.	Min.	
kV	ms	%	ms	ms	ms
0.5	300	20	360	240	299.7
1	300	20	360	240	300.5
2	300	20	360	240	299.2
4	300	20	360	240	300.2

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

◆ Surge Immunity (IEC 61000-4-5)

Surge Voltage Output

Standard Parameters				Measured Values
Indicated Voltage.	Tolerance.	Max.	Min.	
kV	%	kV	kV	kV
0.5	10	0.55	0.45	0.488
1	10	1.1	0.9	0.964
2	10	2.2	1.8	1.984
4	10	4.4	3.6	3.94
6	10	6.6	5.4	5.91
- 0.5	10	- 0.55	- 0.45	- 0.484
- 1	10	- 1.1	- 0.9	- 0.977
- 2	10	- 2.2	- 1.8	- 1.992
- 4	10	- 4.4	- 3.6	- 3.95
- 6	10	- 6.6	- 5.4	- 5.91

Output Wave

Standard Parameters			Measured Values
+ 6 kV			
	Max.	Min.	
Rise Time	1.56 µs	0.84 µs	1.24 µs
Duration Time	60 µs	40 µs	52.83 µs
+ 6 kV			
Rise Time	1.56 µs	0.84 µs	1.30 µs
Duration Time	60 µs	40 µs	54.72 µs

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

◆ RF Conducted Immunity (IEC 61000-4-6)

Symbol	Source of Uncertainty	Value	Probability distribution	Divisor	$u_i(y)$
S_A	Spectrum Analyzer	1.50	Rectangular	1.732	0.87
C_C	Current coil Calibration	1.00	normal 2	2.000	0.50
M	Mismatch	-0.5	U-shaped	1.414	-0.35
M	Mismatch	-0.3	U-shaped	1.414	-0.35
R_S	Measurement System Repeatability	0.50	normal 1	1.000	0.50
R_{EUT}	Repeatability of EUT	0.00	normal 1	1.000	0.00
$u_c(F_S)$	Combined Standard Uncertainty	-	normal	-	1.57
$U(F_S)$	**Expanded Uncertainty**	-	**normal k= 2**		**3.14**

Specified Level (V)	Test level (V)
For 1 Volts	1.30
For 3 Volts	3.88
For 10 Volts	12.15

◆ Magnetic Field Immunity (IEC 61000-4-8)

Current output

Standard Parameters					Measured Values
Magnetic Field Strength	Output Current	Tolerance.	Max.	Min.	
A/m	A	%	A	A	A
1	6	5	6.3	3.8	6.1
3	50	5	52.5	47.5	49.0
10	180	5	189	171	188.0

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

◆ Voltage Variation Immunity (IEC 61000-4-11)

Short Dip period

Standard Parameters					Measured Values
Degree	Duration	Tolerance.	Max.	Min.	
	ms	%	ms	ms	ms
90	4	5	4.2	3.8	4.17
180	8	5	8.4	7.6	8.33
270	12	5	12.6	11.4	12.50
360	16	5	16.8	15.2	16.67

Long Dip period

Standard Parameters					Measured Values
Degree	Duration	Tolerance.	Max.	Min.	
	ms	%	ms	ms	ms
90	16	5	16.8	15.2	16.38
180	50	5	55	45	50.04
270	100	5	110	90	99.64
360	150	5	165	135	149.3

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

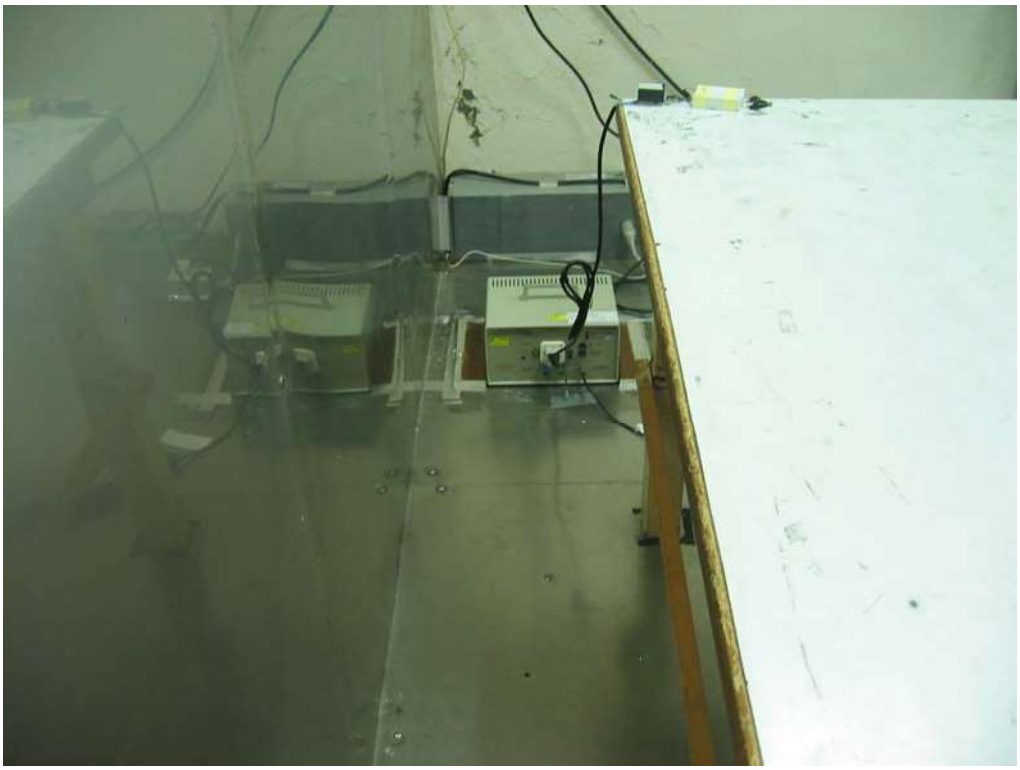
Appendix A. Test Photos

1. Photographs of Conducted Emissions Test Configuration

Mode 1

Front view

Rear view

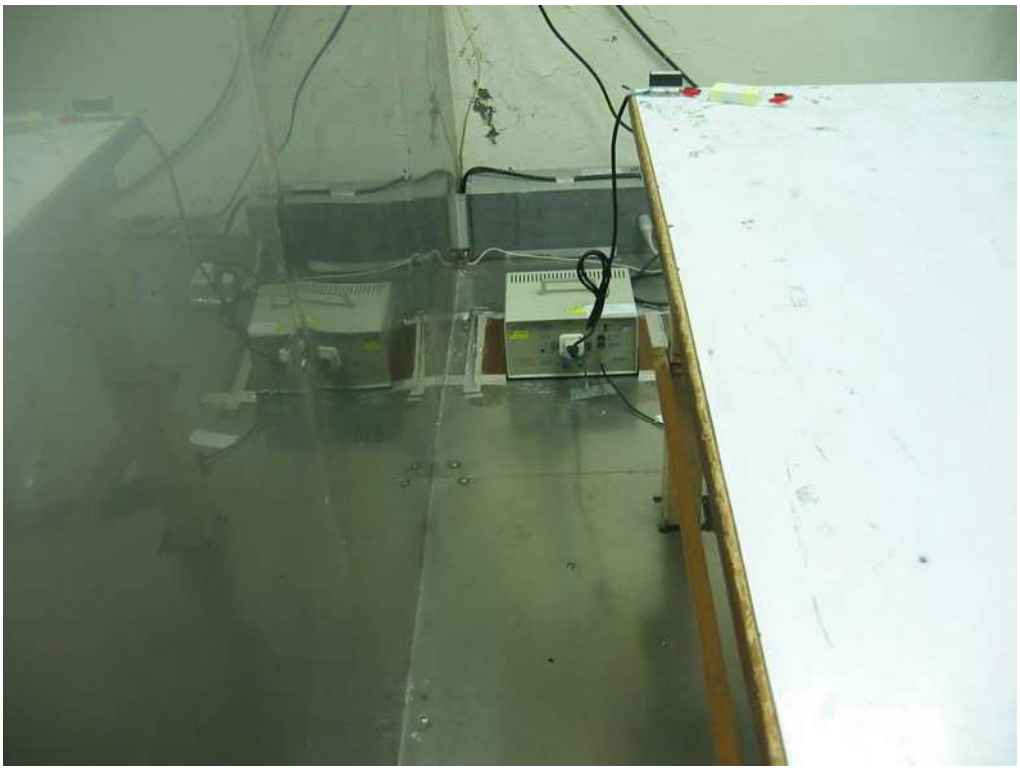


Side view

Mode 2

Front view

Rear view

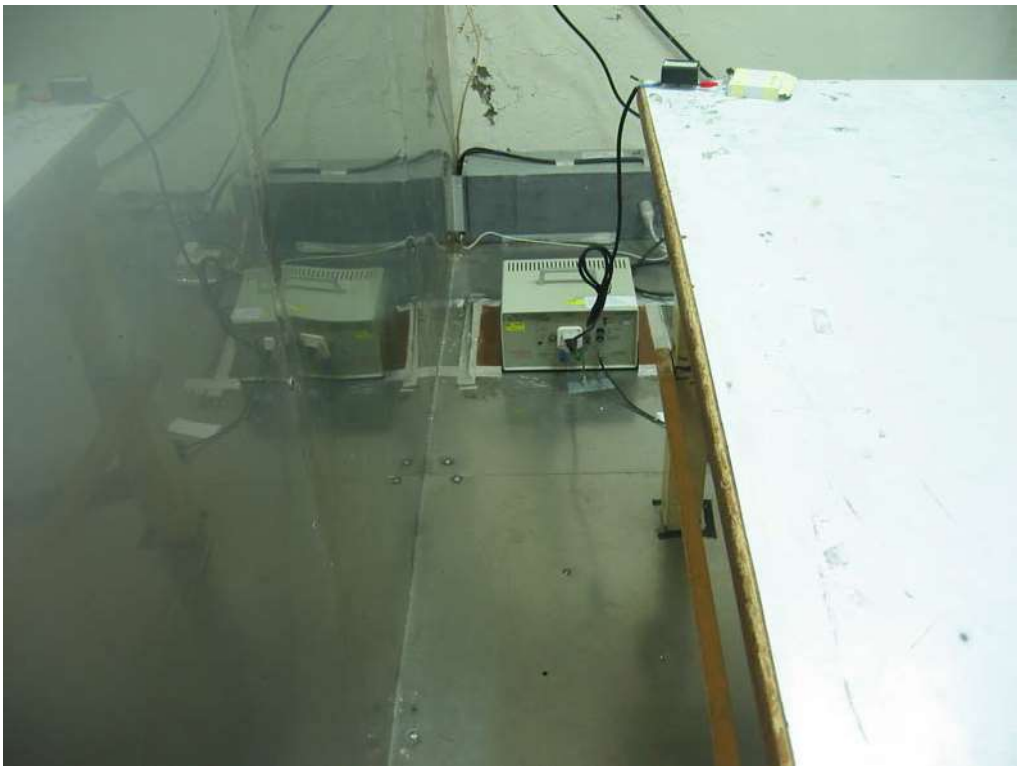


Side view

Mode 3

Front view

Rear view

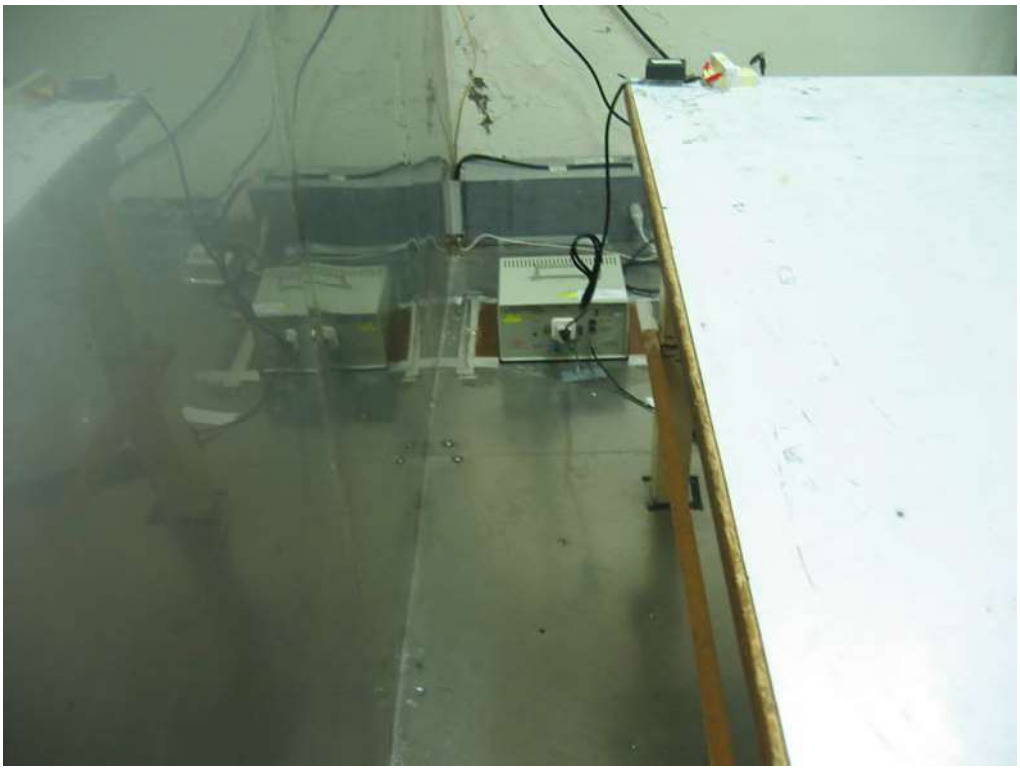


Side view

Mode 4

Front view

Rear view



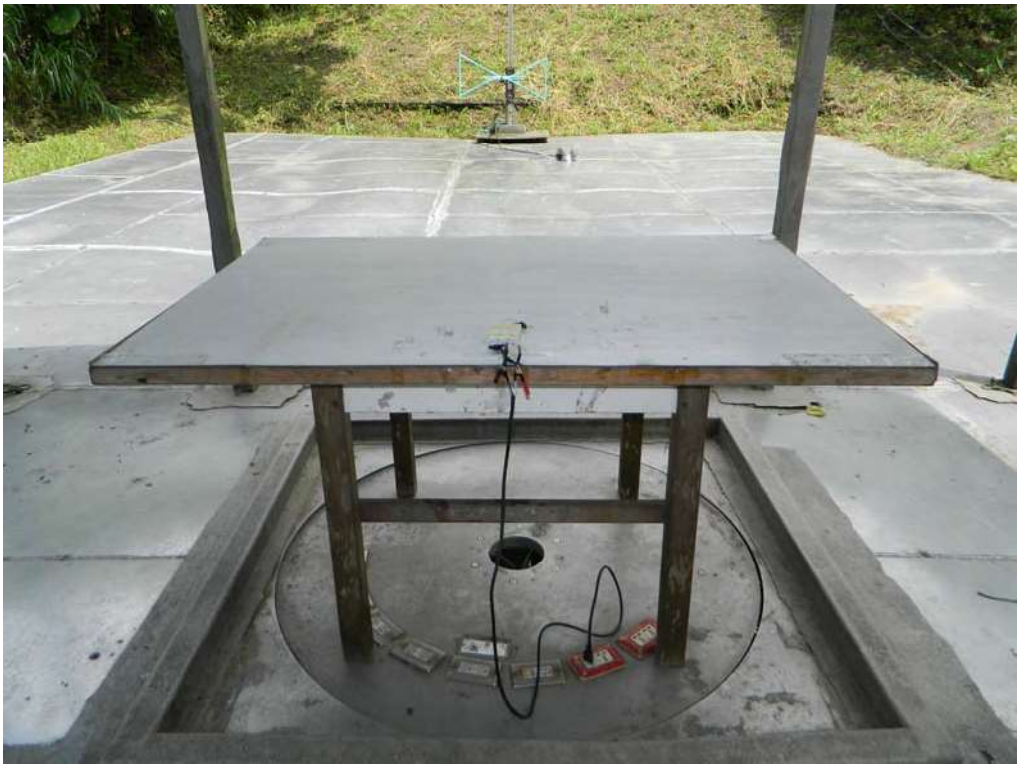
Side view

2. Photographs of Telecommunication Emissions Test Configuration

Mode 1

Front view

Rear view



Mode 2

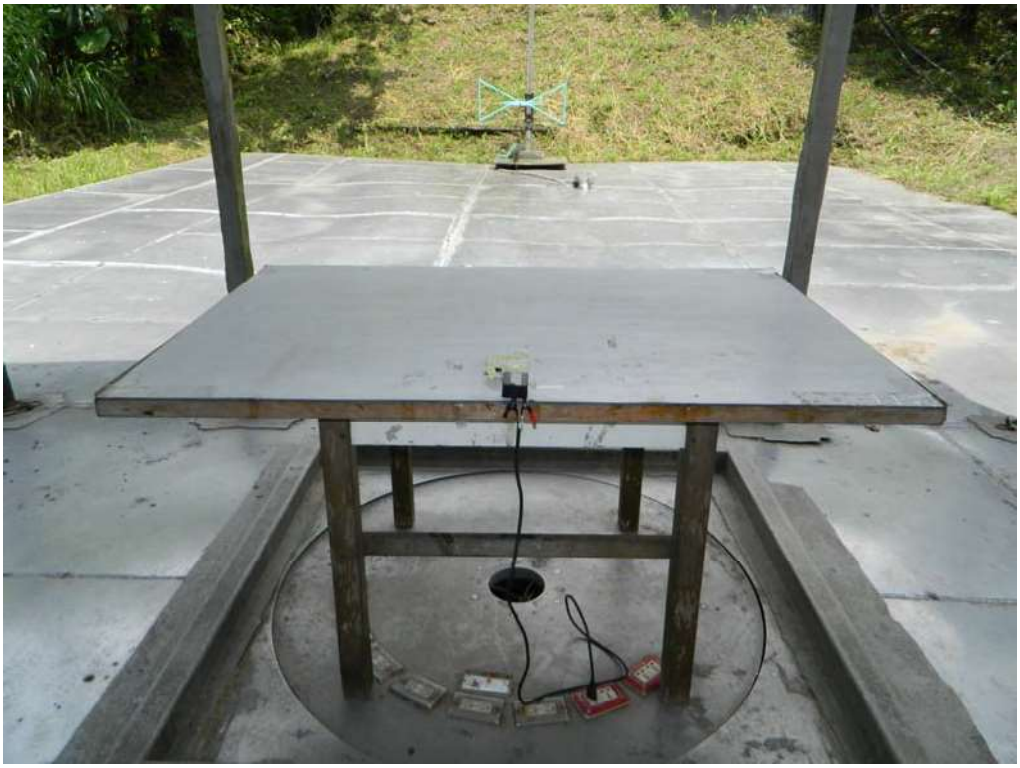
Front view

Rear view

Mode 3

Front view

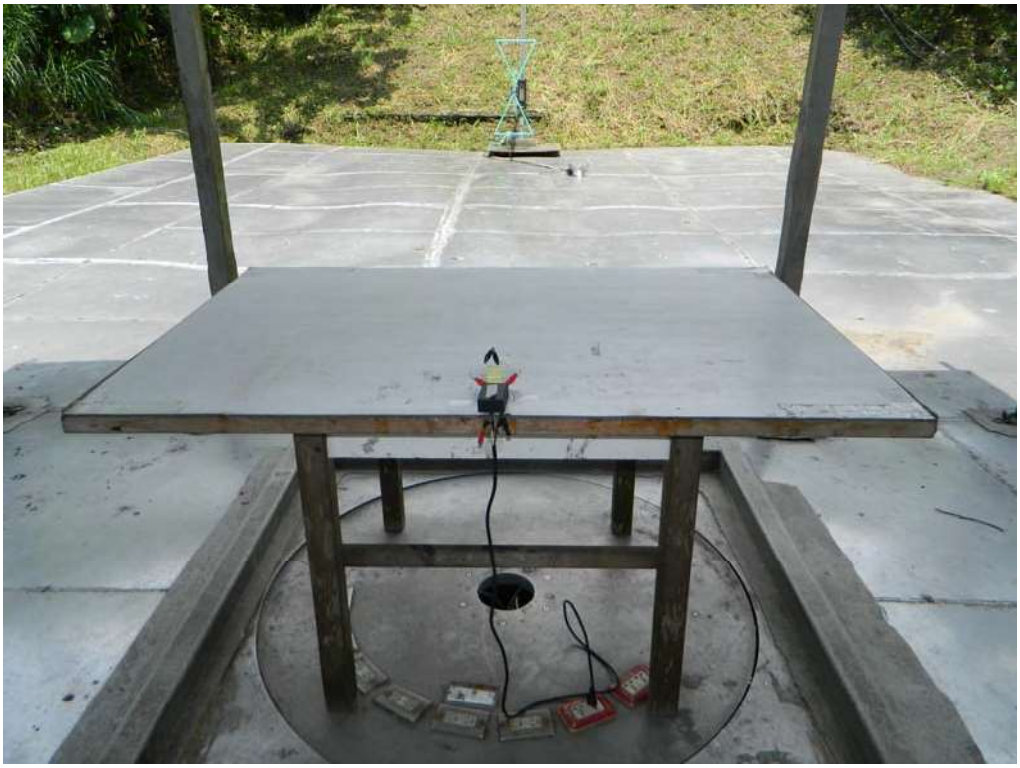
Rear view



Mode 4

Front view

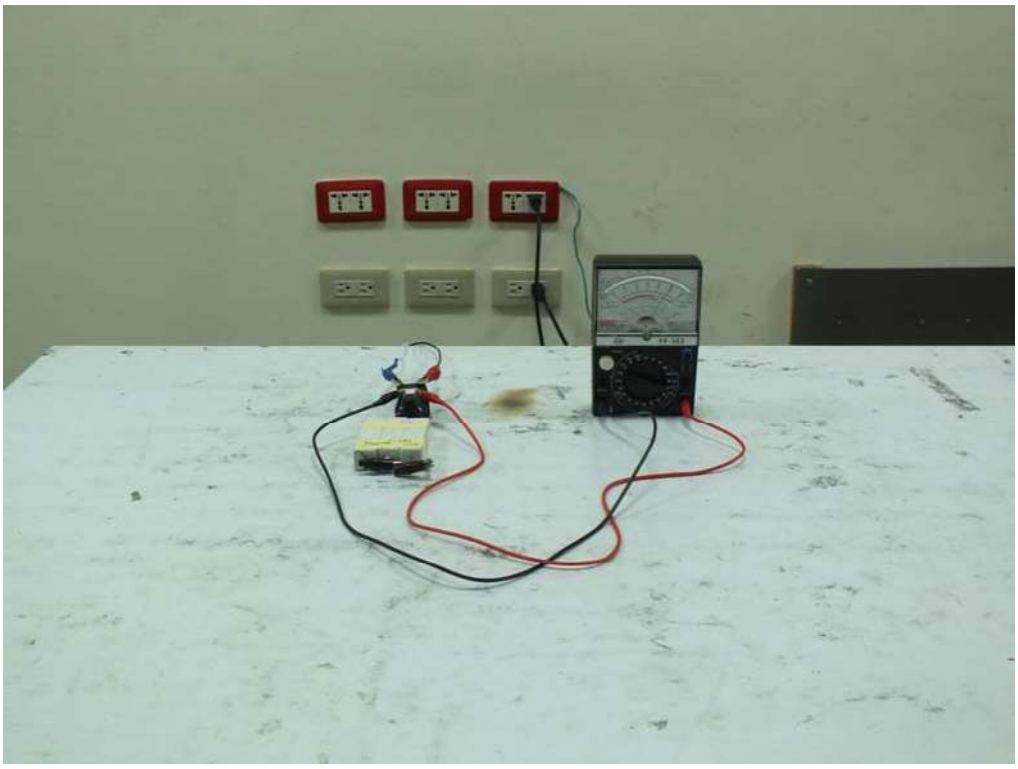
Rear view



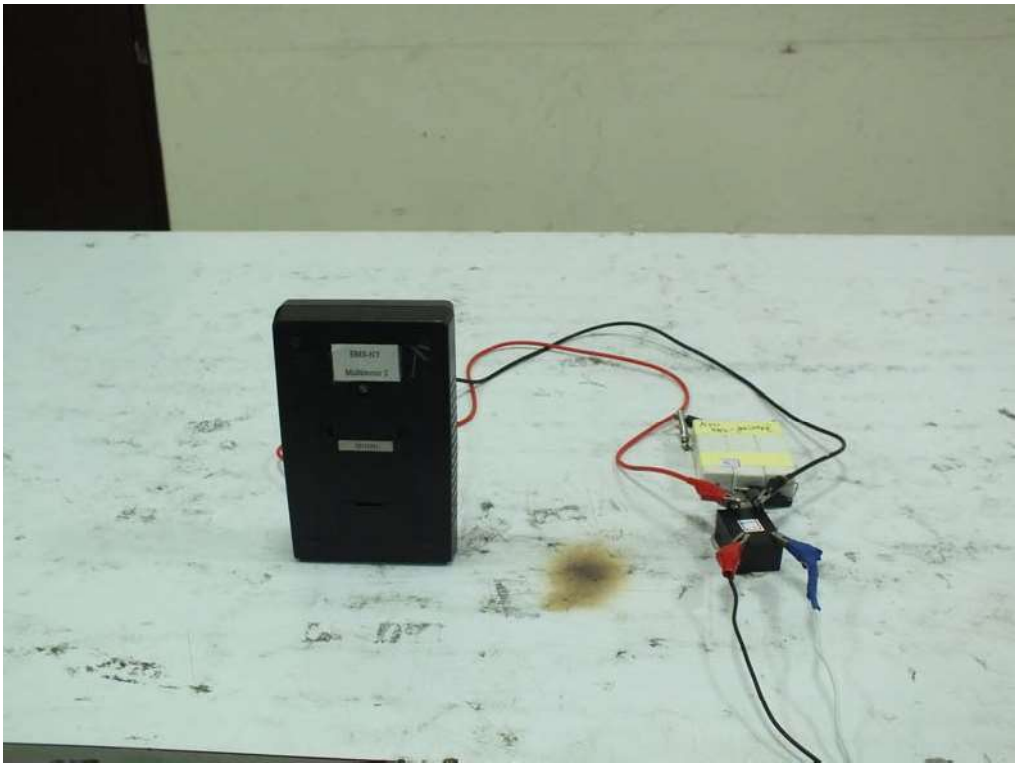
3. Photographs of Harmonic, Flicker, Surge, Dip Test Configuration

Mode 1

Front view

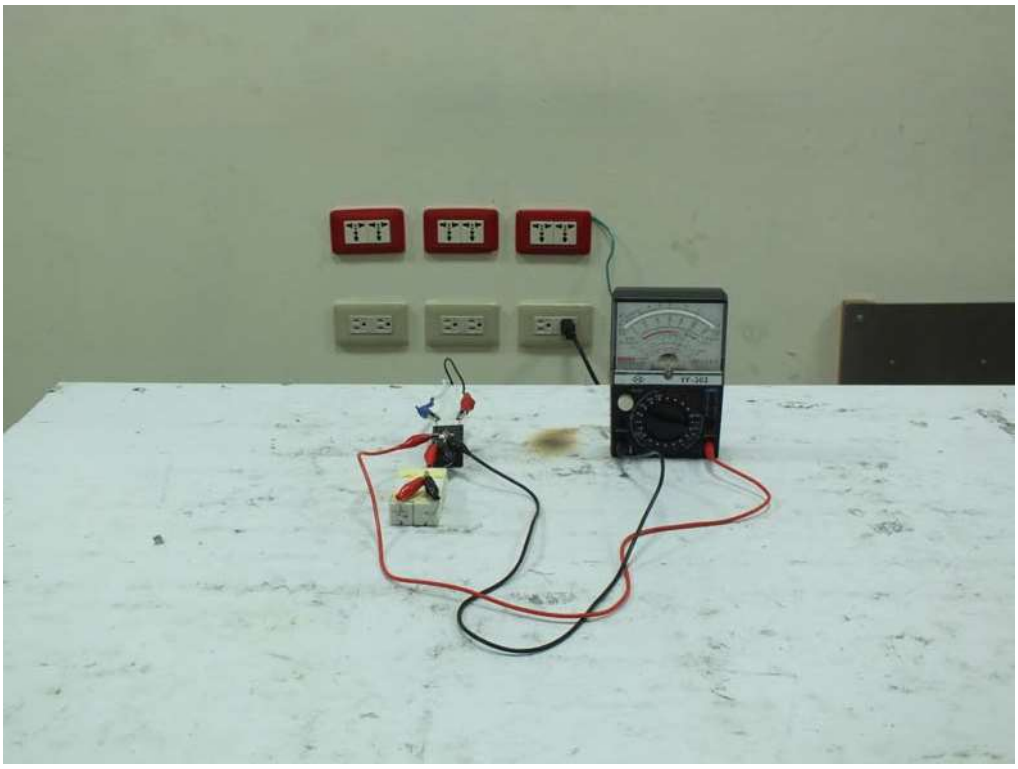


Rear view

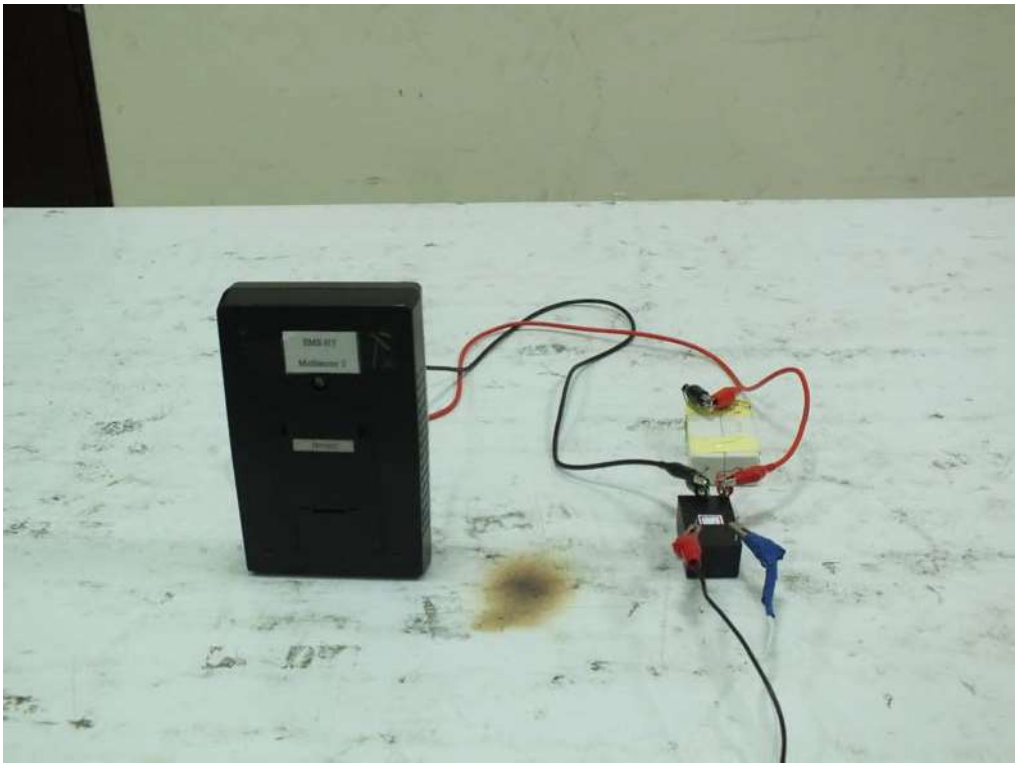


Mode 2

Front view

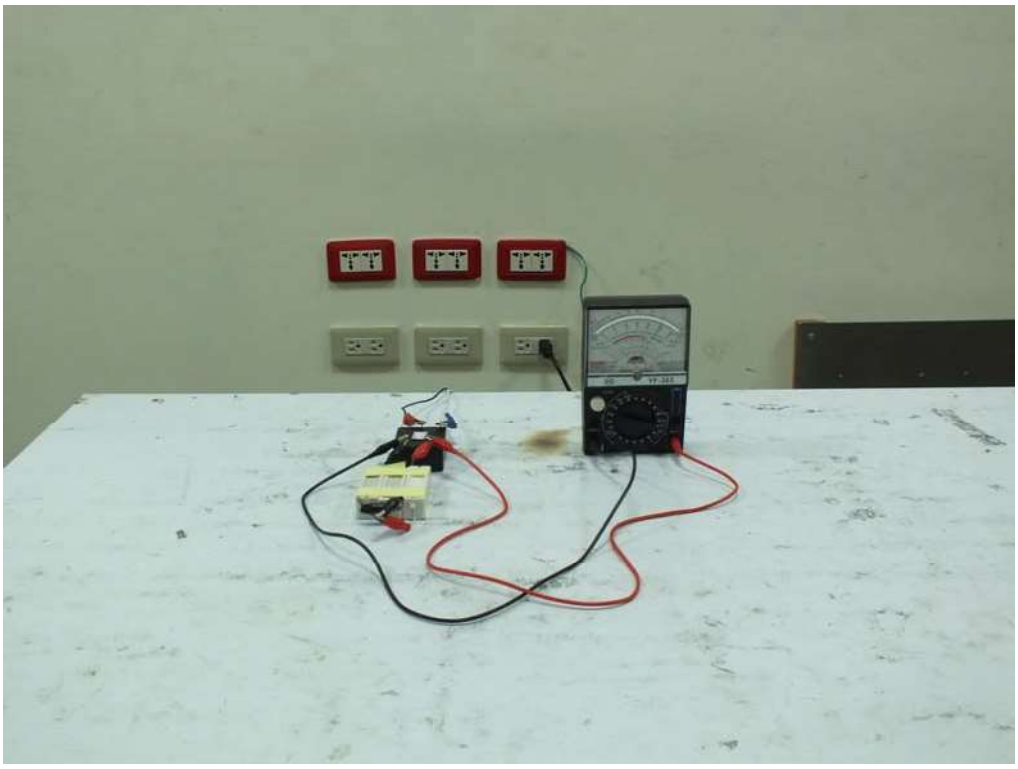


Rear view

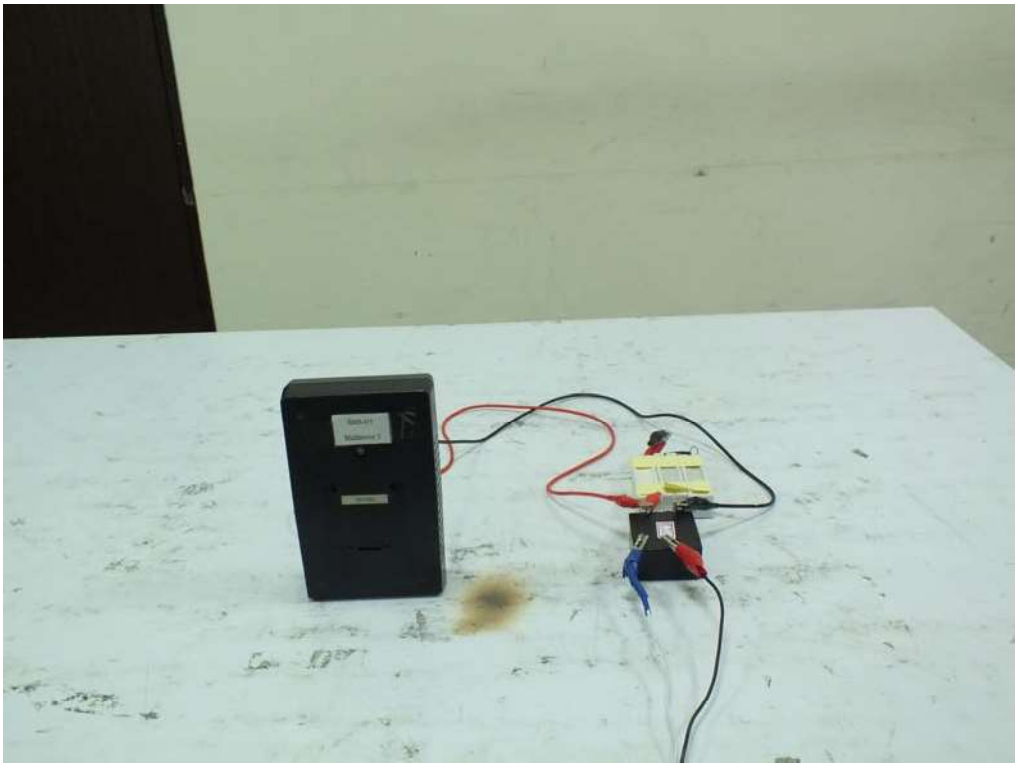


Mode 3

Front view



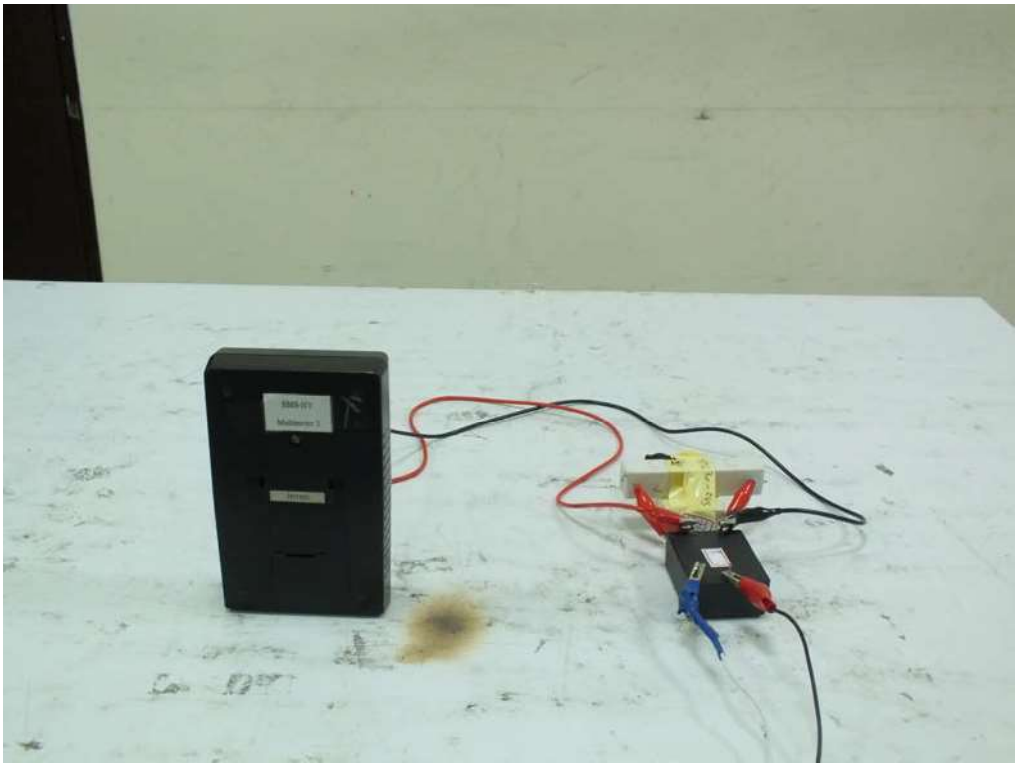
Rear view



Mode 4

Front view

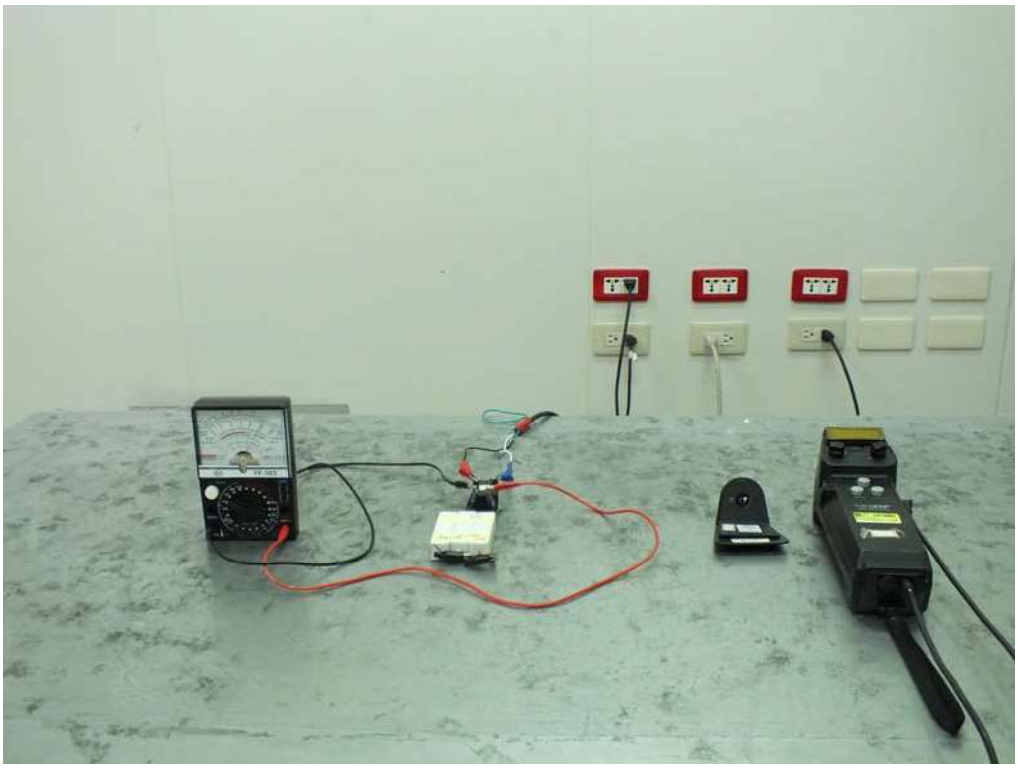
Rear view



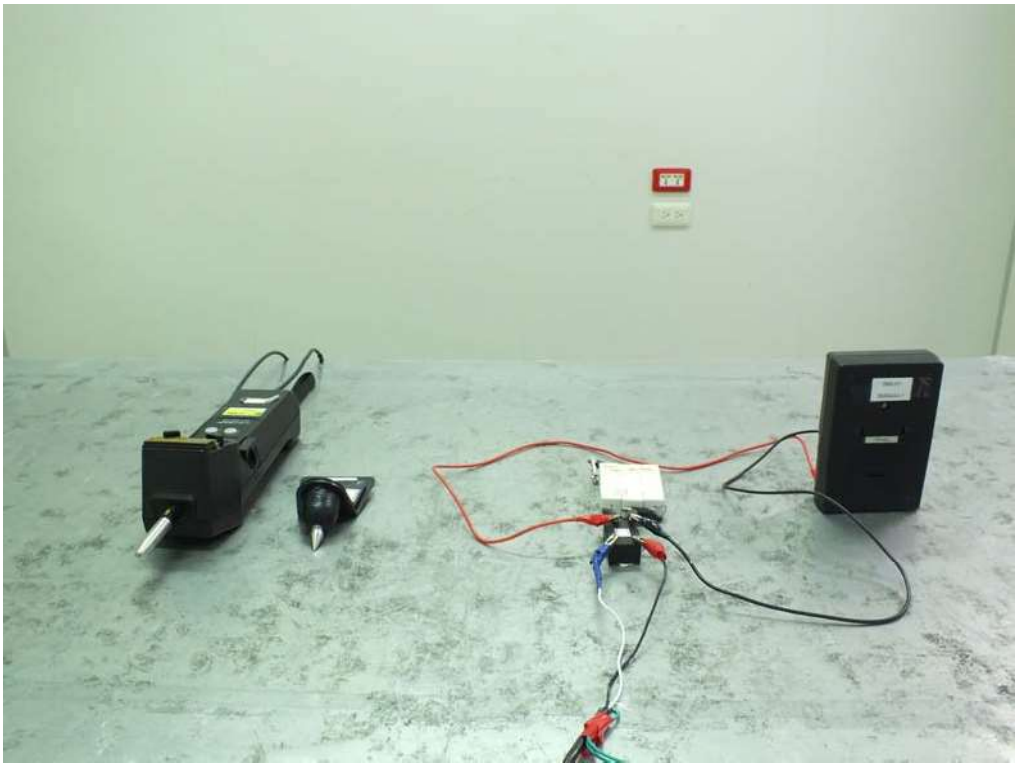
4. Photographs of ESD Immunity Test Configuration

Mode 1

Front view

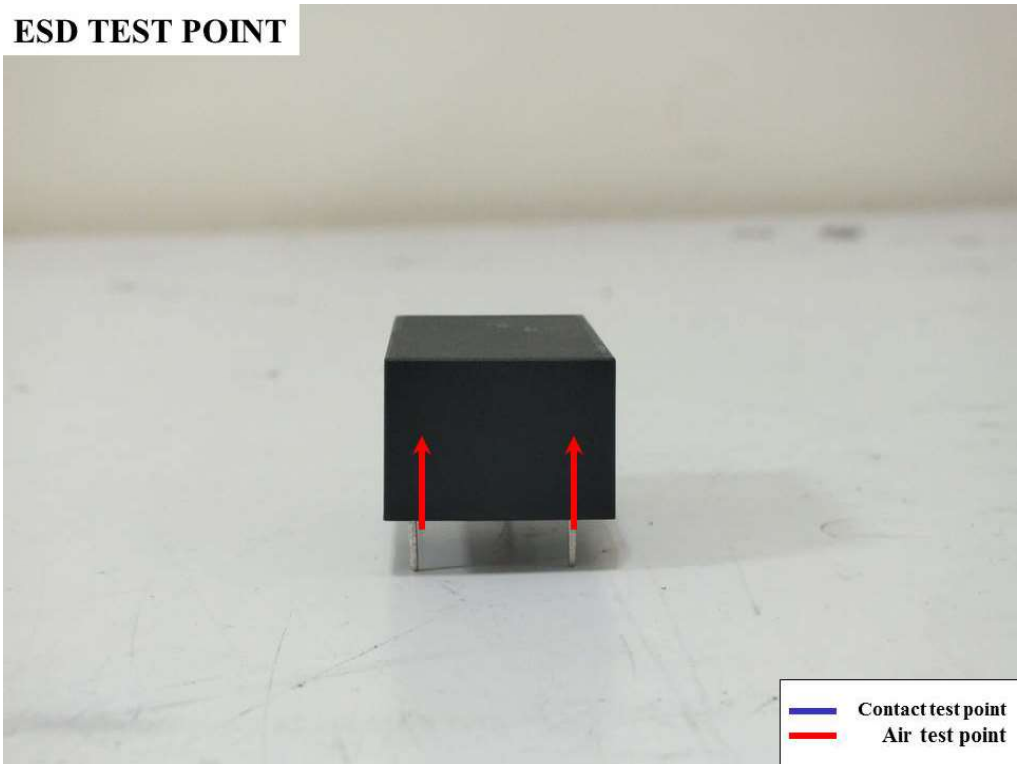


Rear view

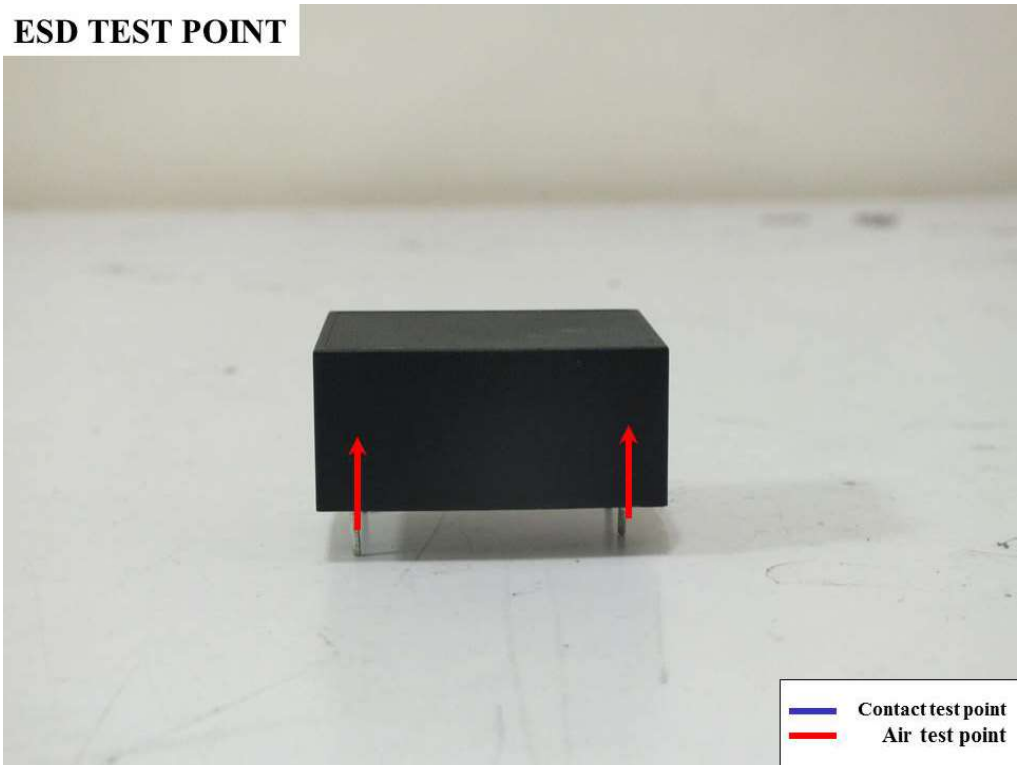


Test Points

Contact test point
Air test point

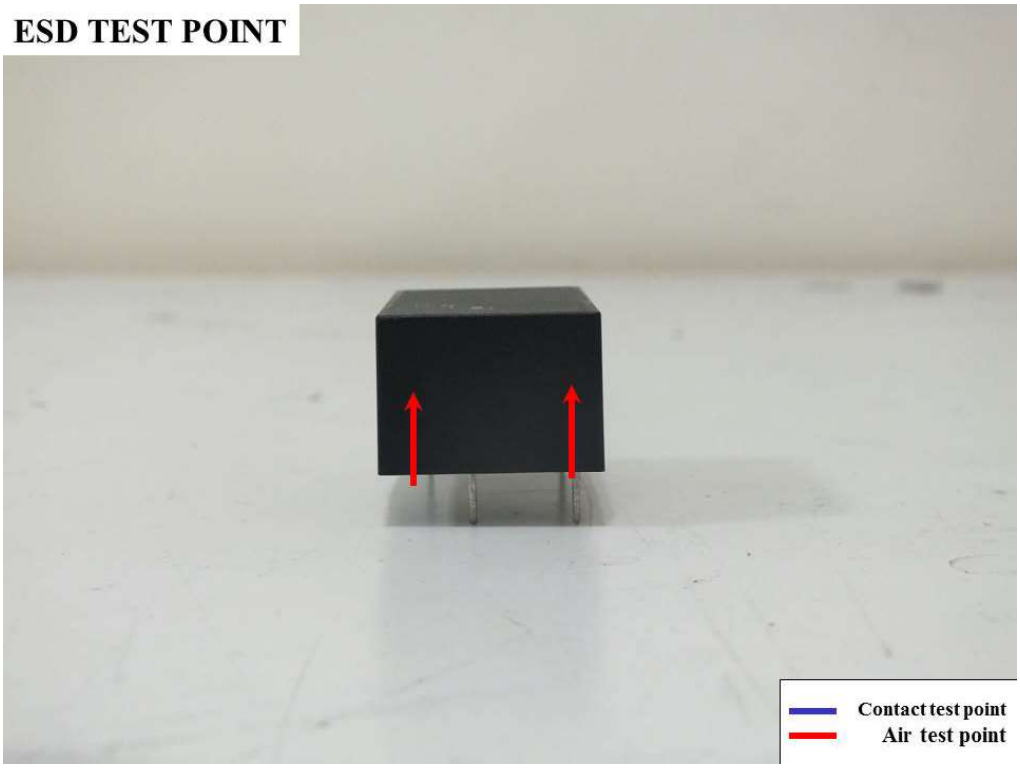


Contact test point
Air test point

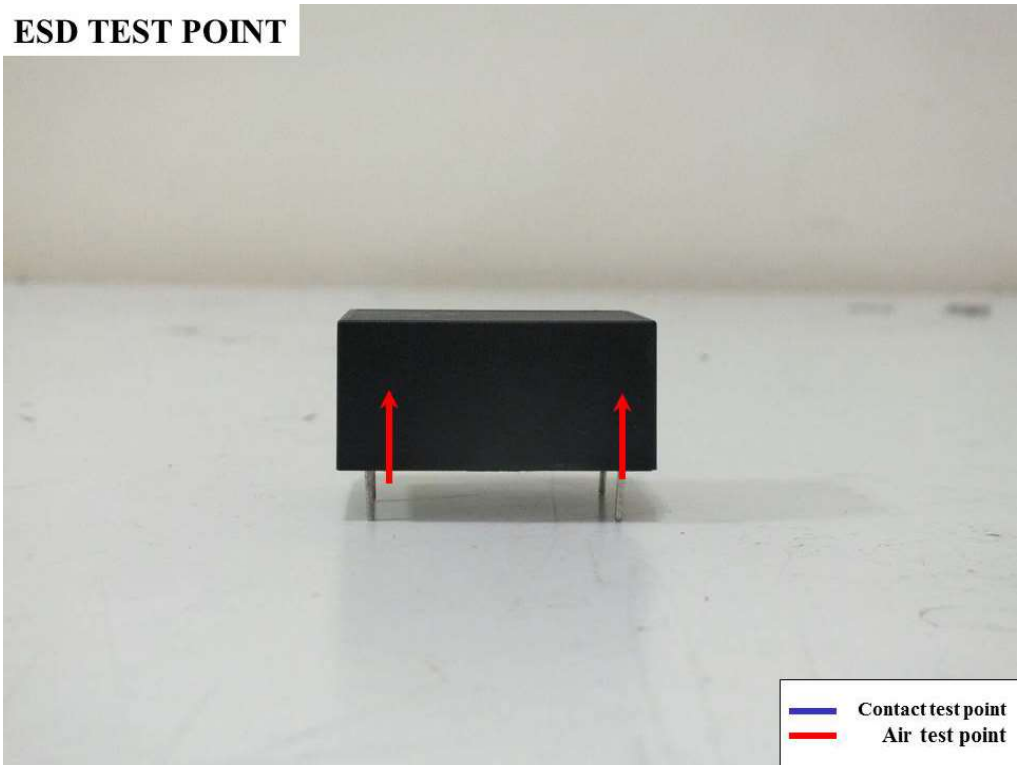


Test Points

Contact test point
Air test point

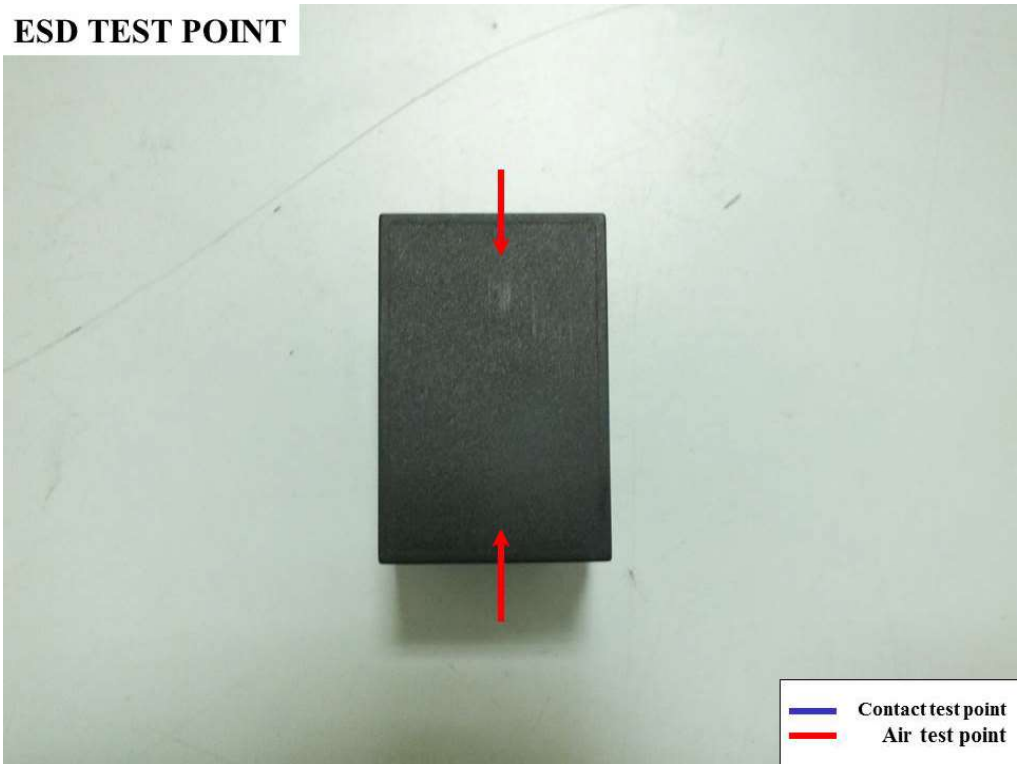


Contact test point
Air test point

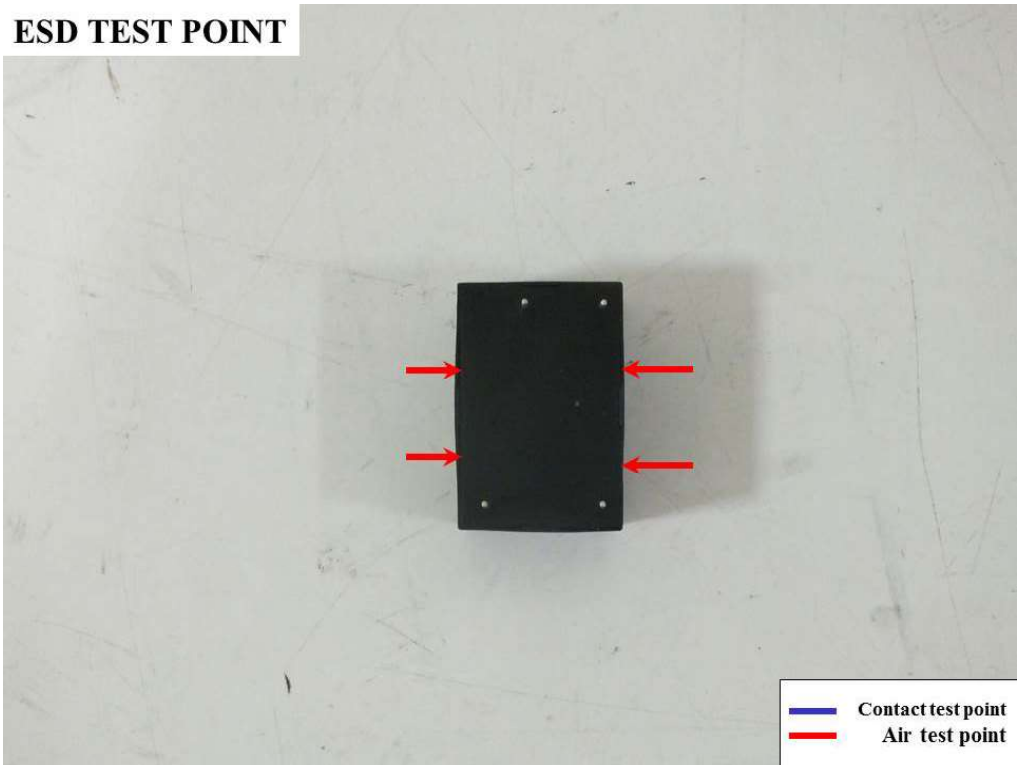


Test Points

Contact test point
Air test point

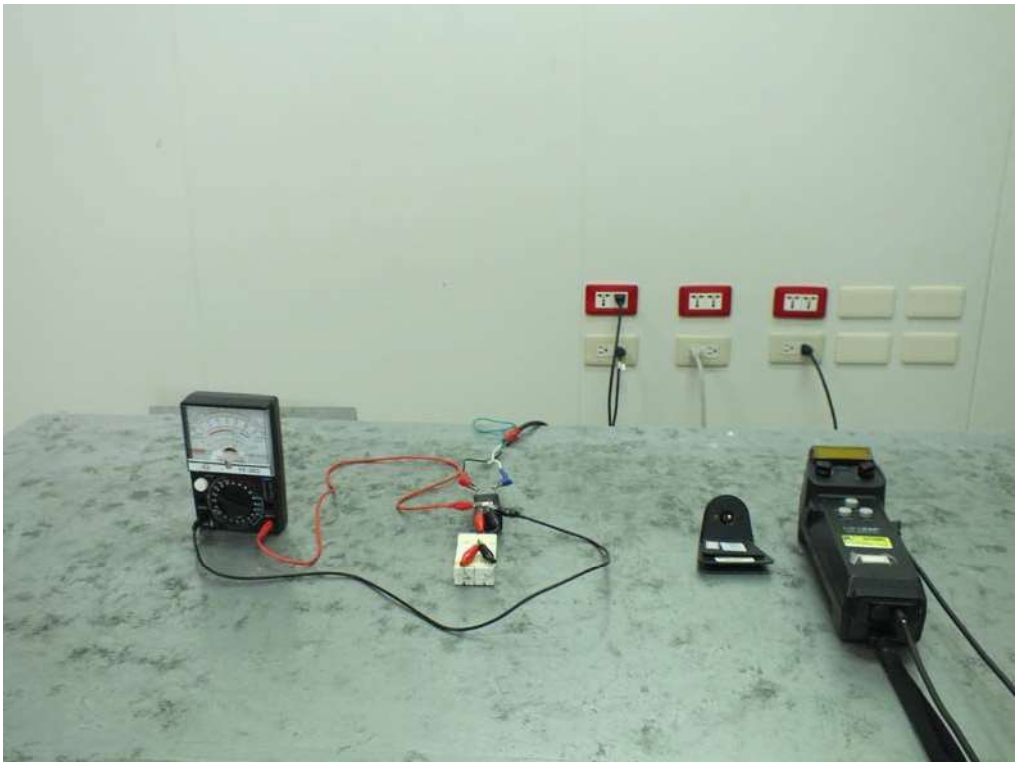


Contact test point
Air test point

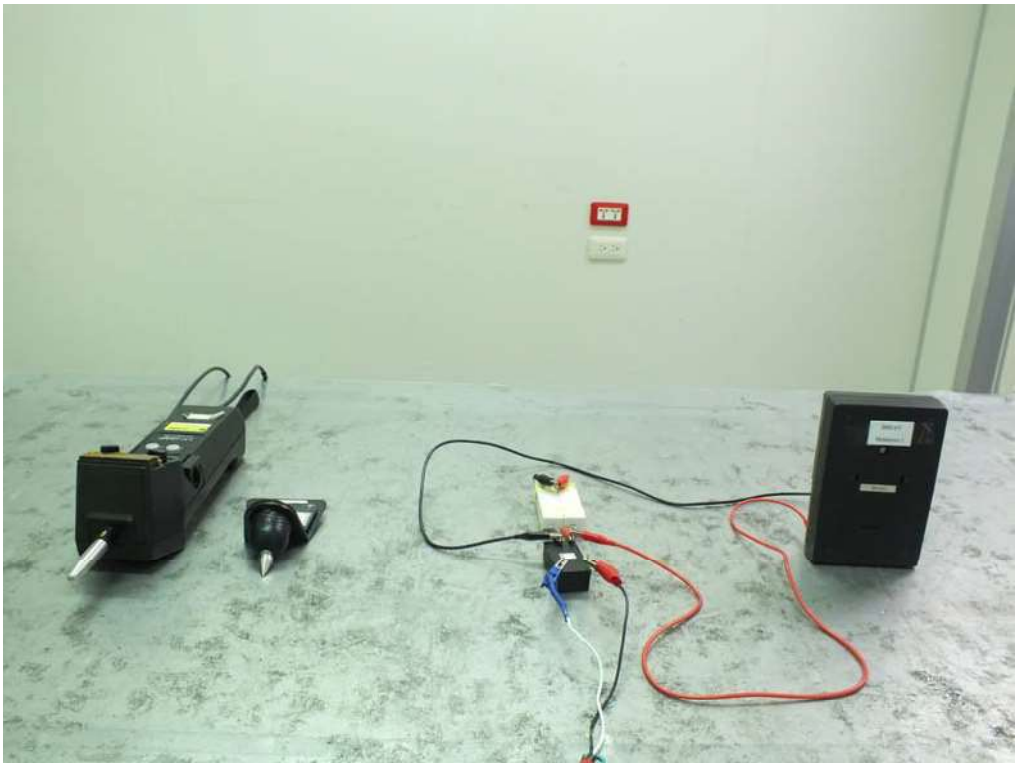


Mode 2

Front view

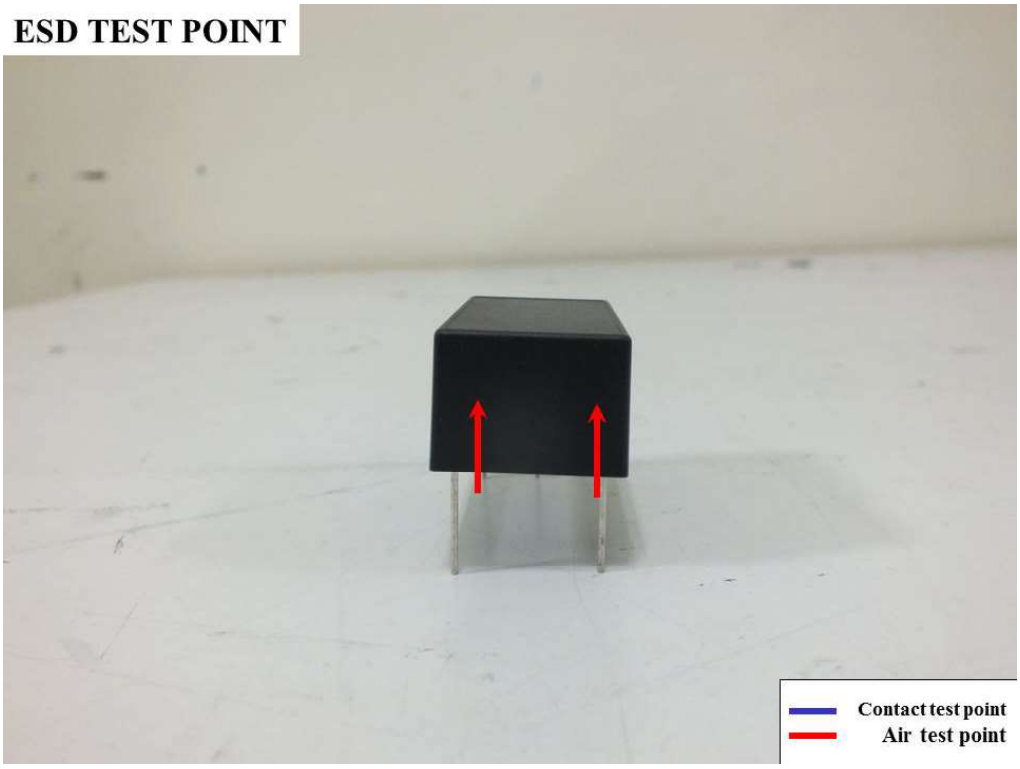


Rear view

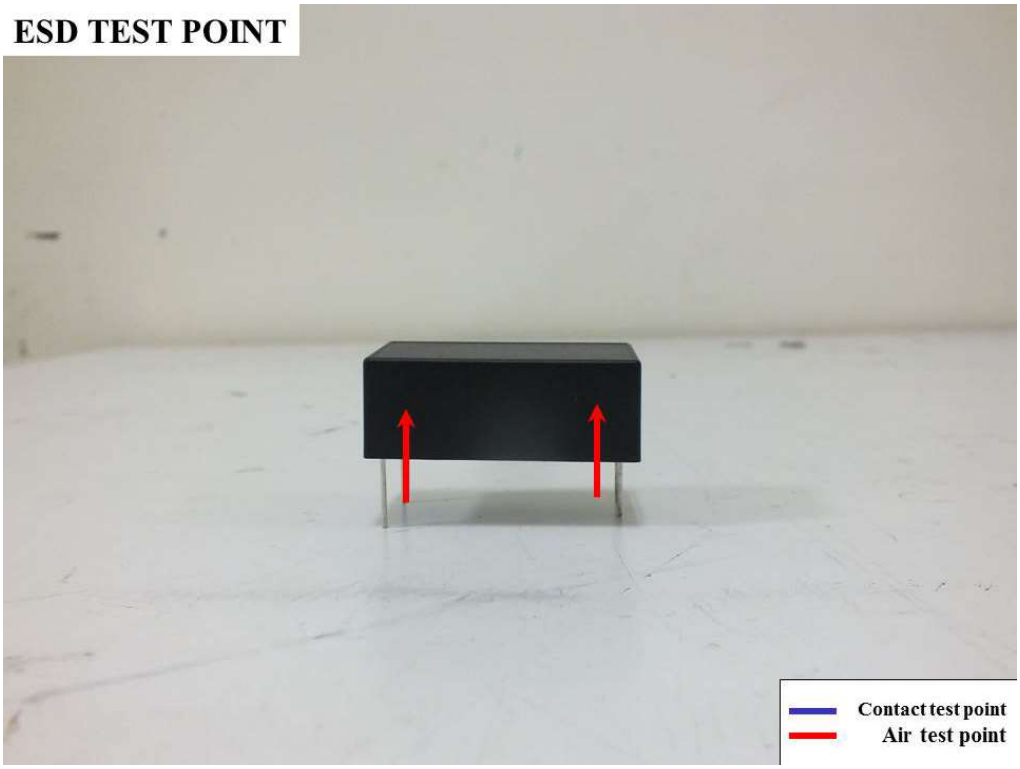


Test Points

Contact test point
Air test point

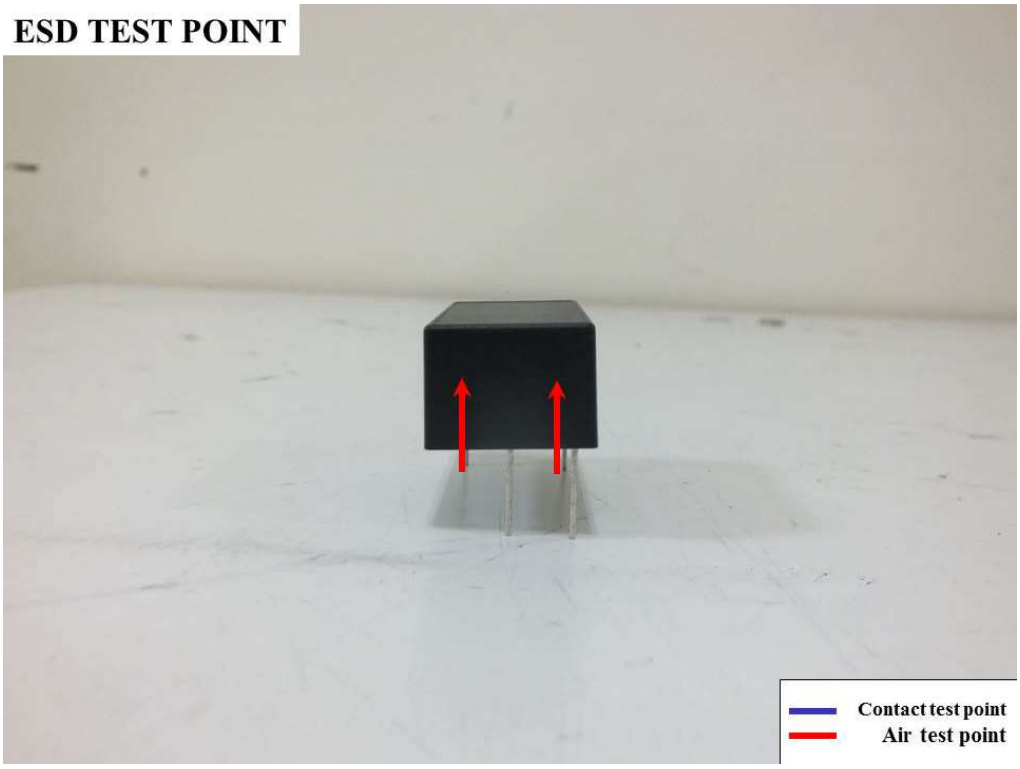


Contact test point
Air test point

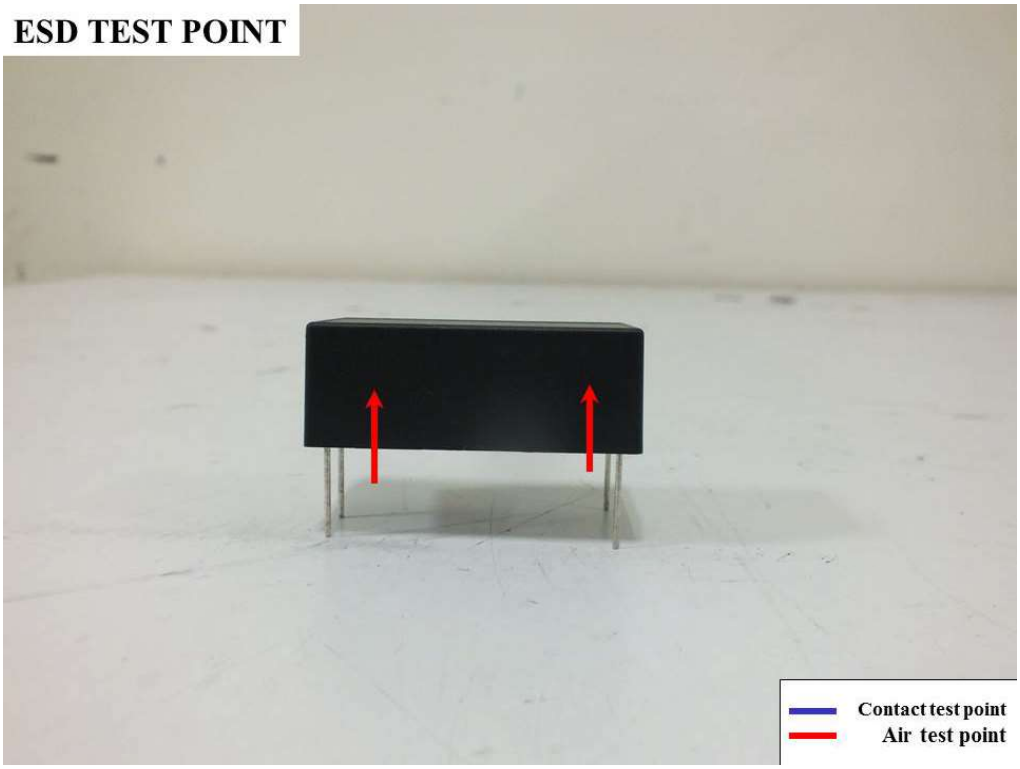


Test Points

Contact test point
Air test point

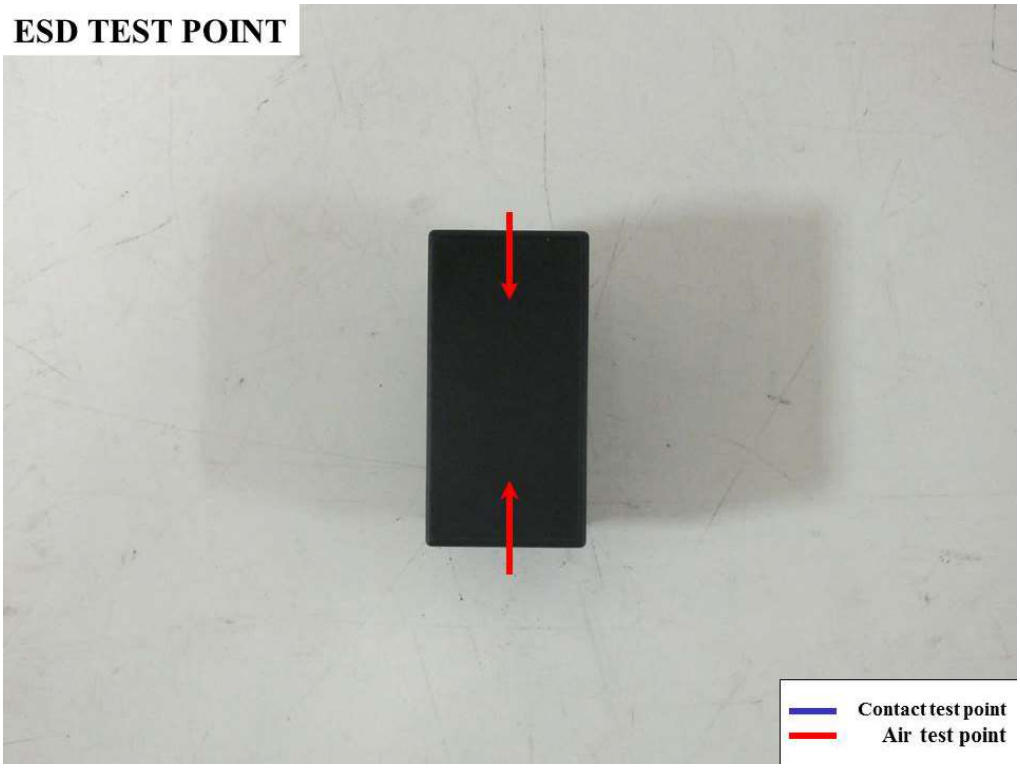


Contact test point
Air test point

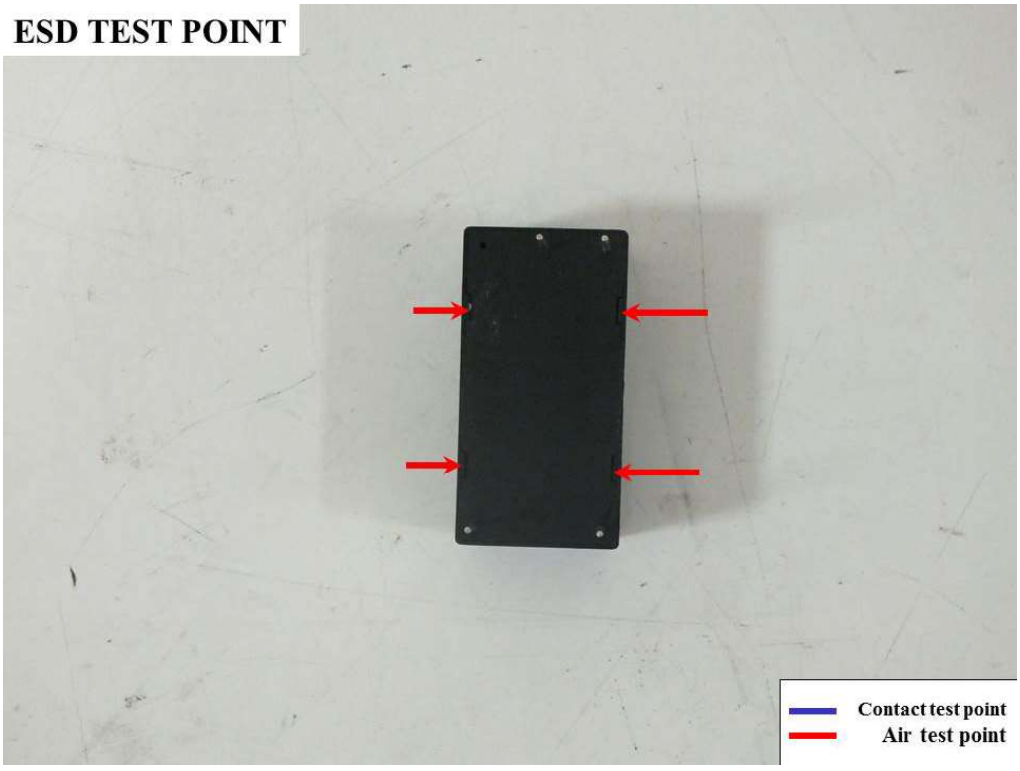


Test Points

Contact test point
Air test point

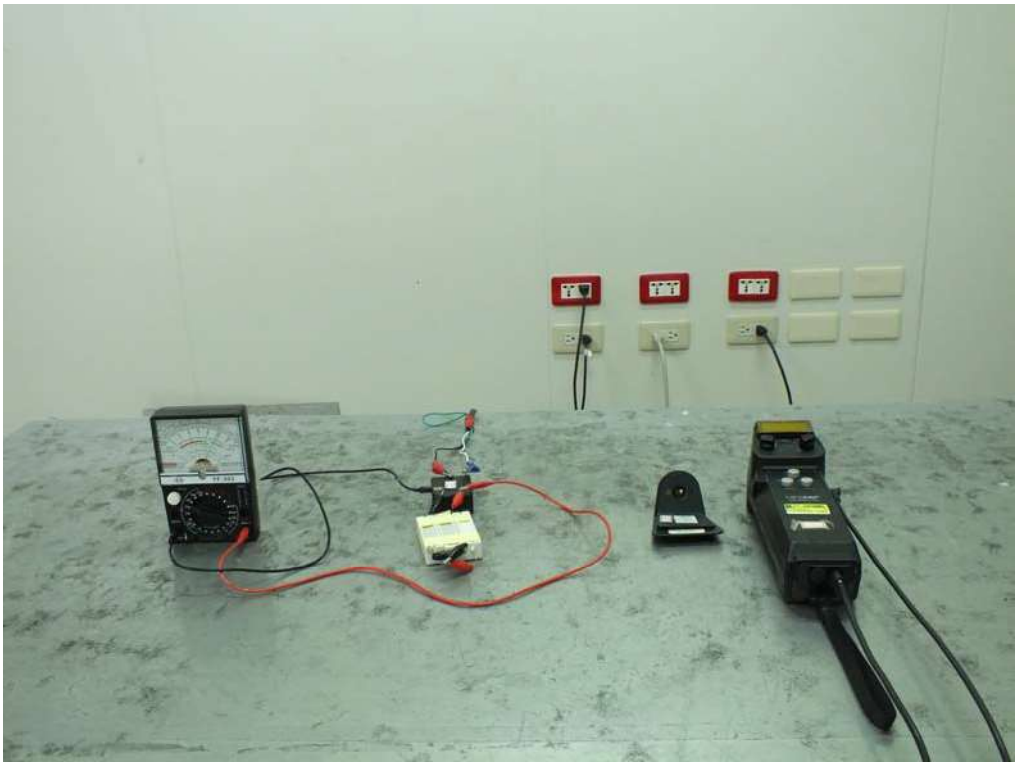


Contact test point
Air test point



Mode 3

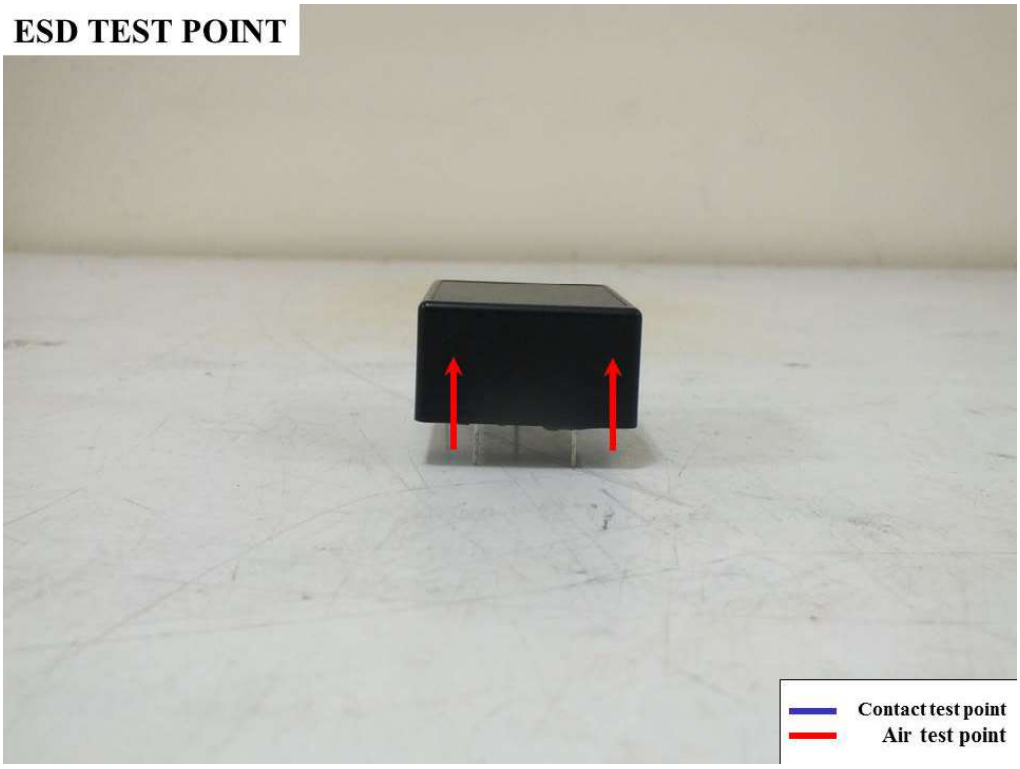
Front view



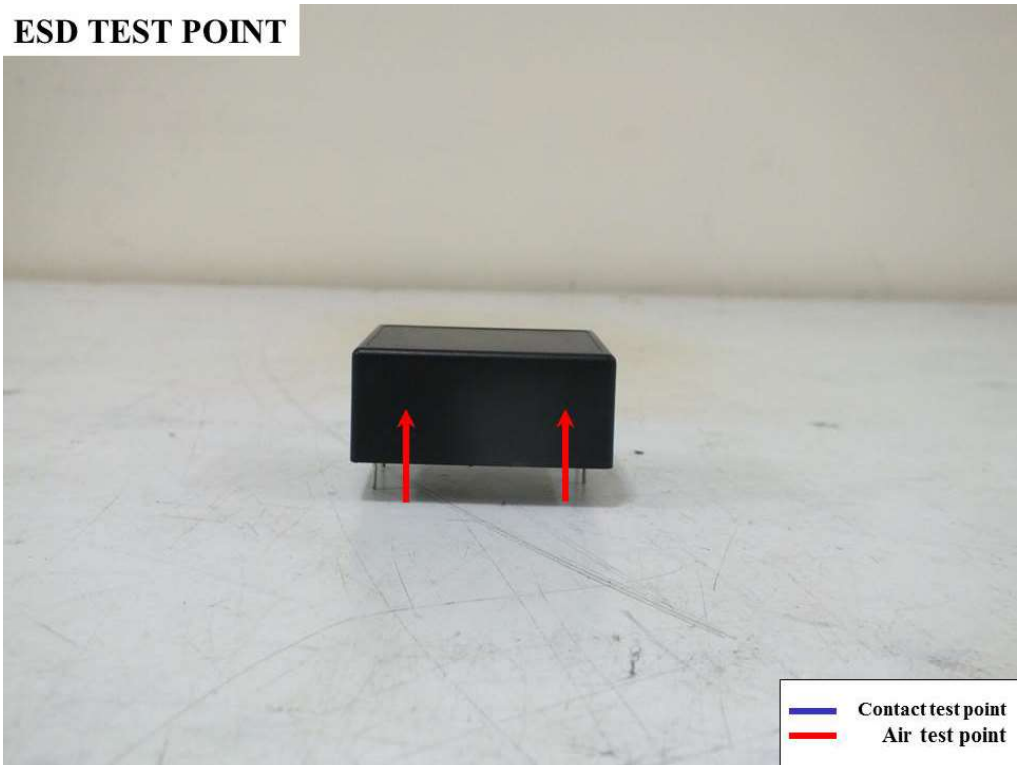
Rear view

Test Points

Contact test point
Air test point

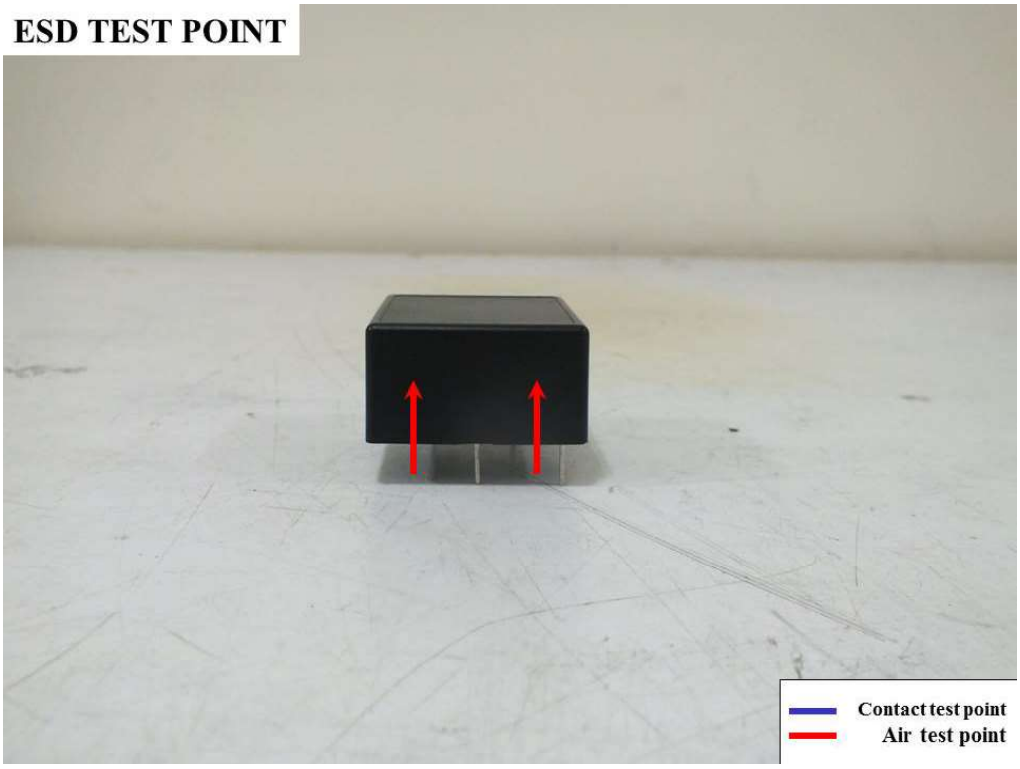


Contact test point
Air test point

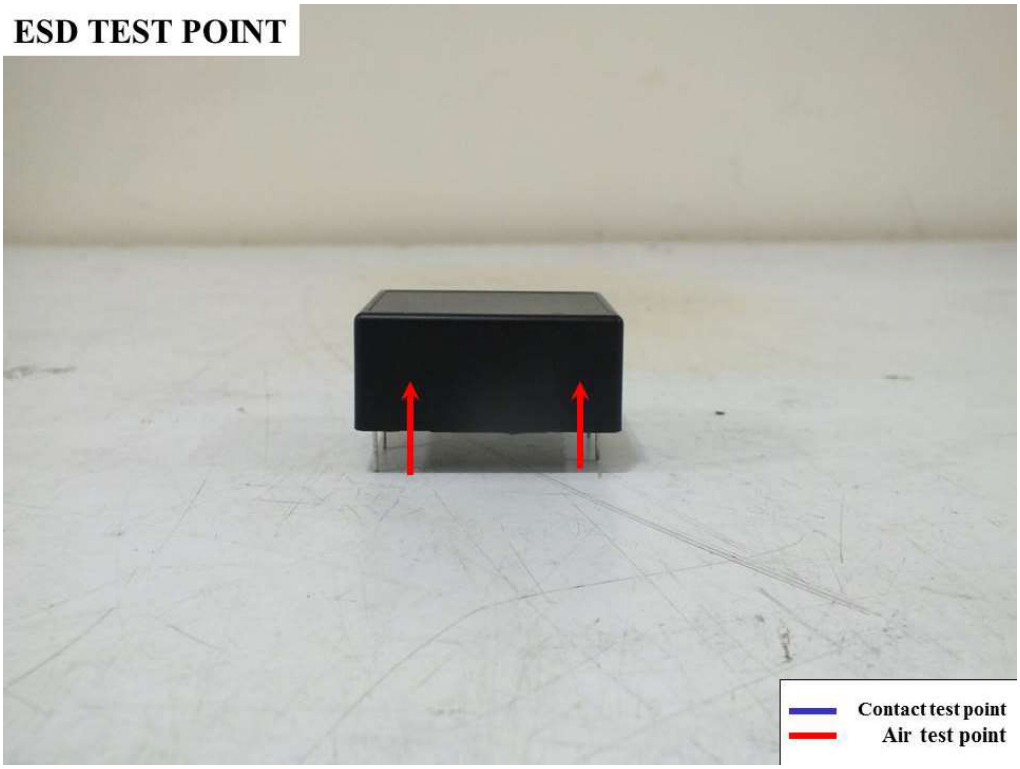


Test Points

Contact test point
Air test point

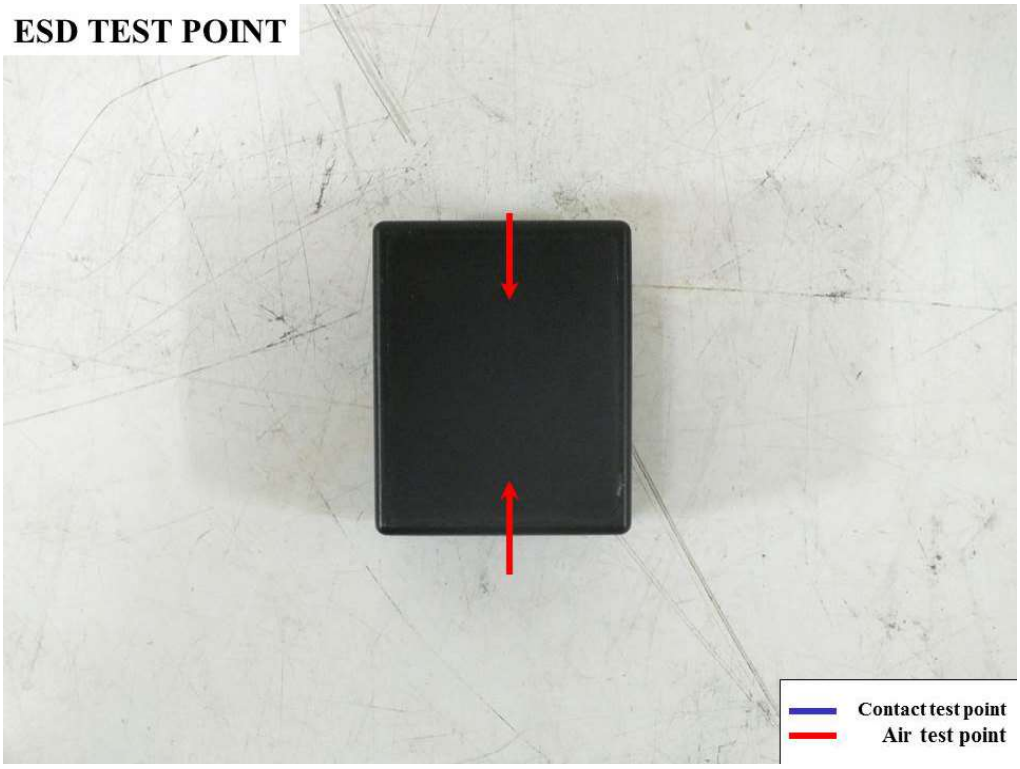


Contact test point
Air test point

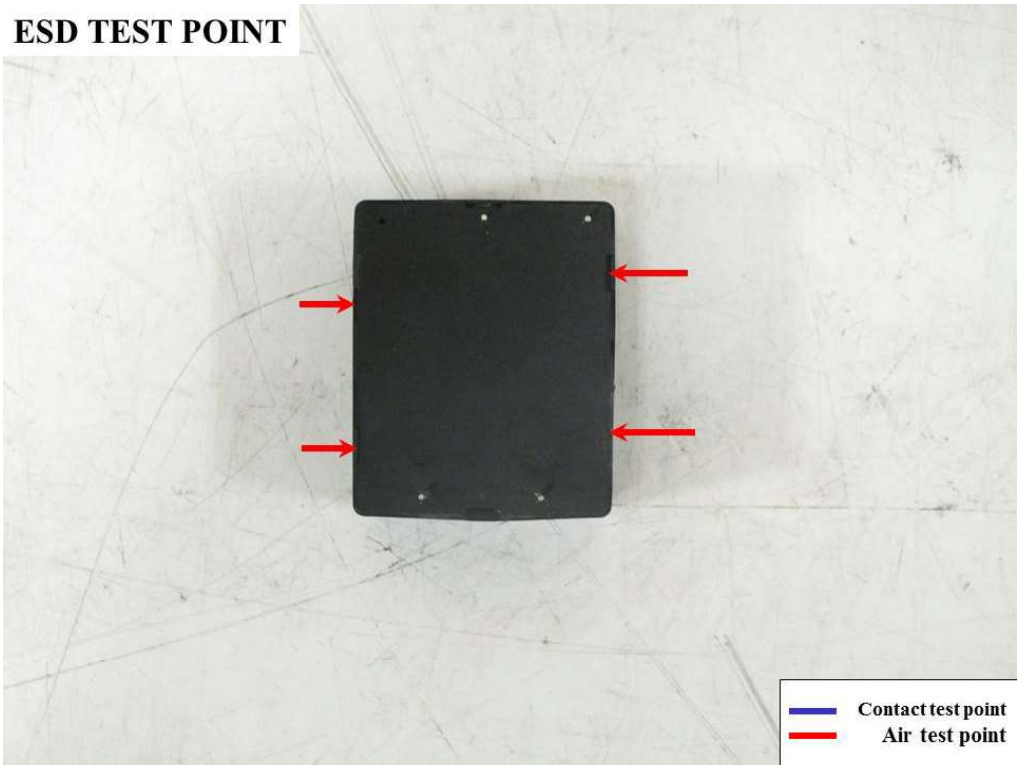


Test Points

Contact test point
Air test point

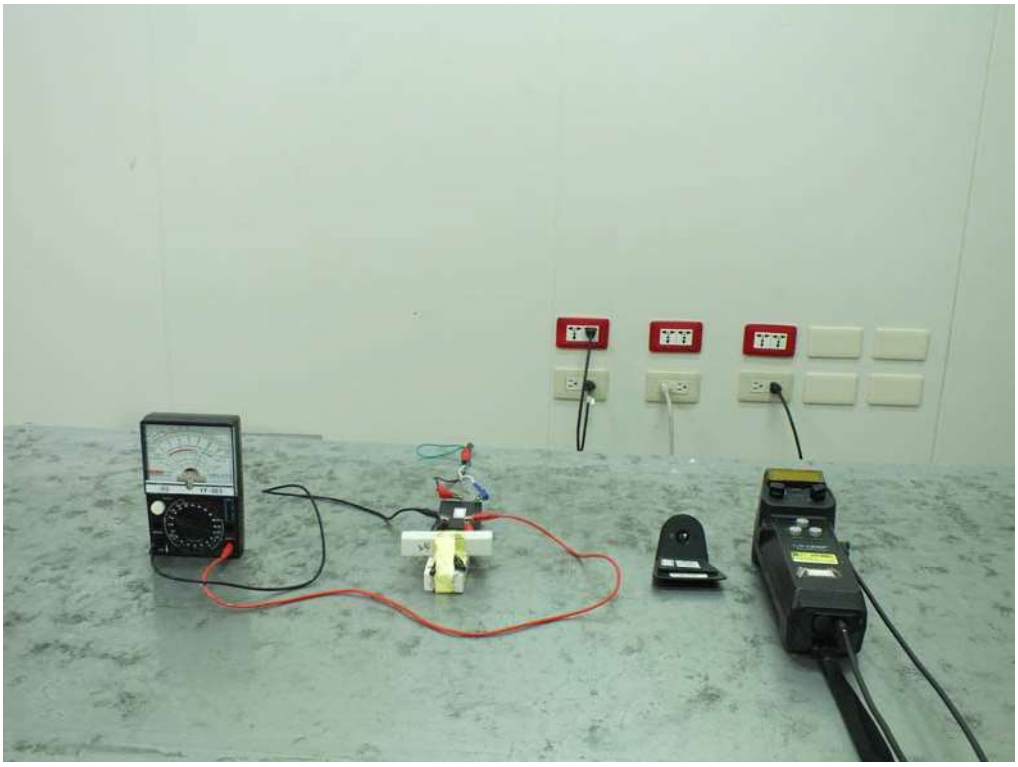


Contact test point
Air test point

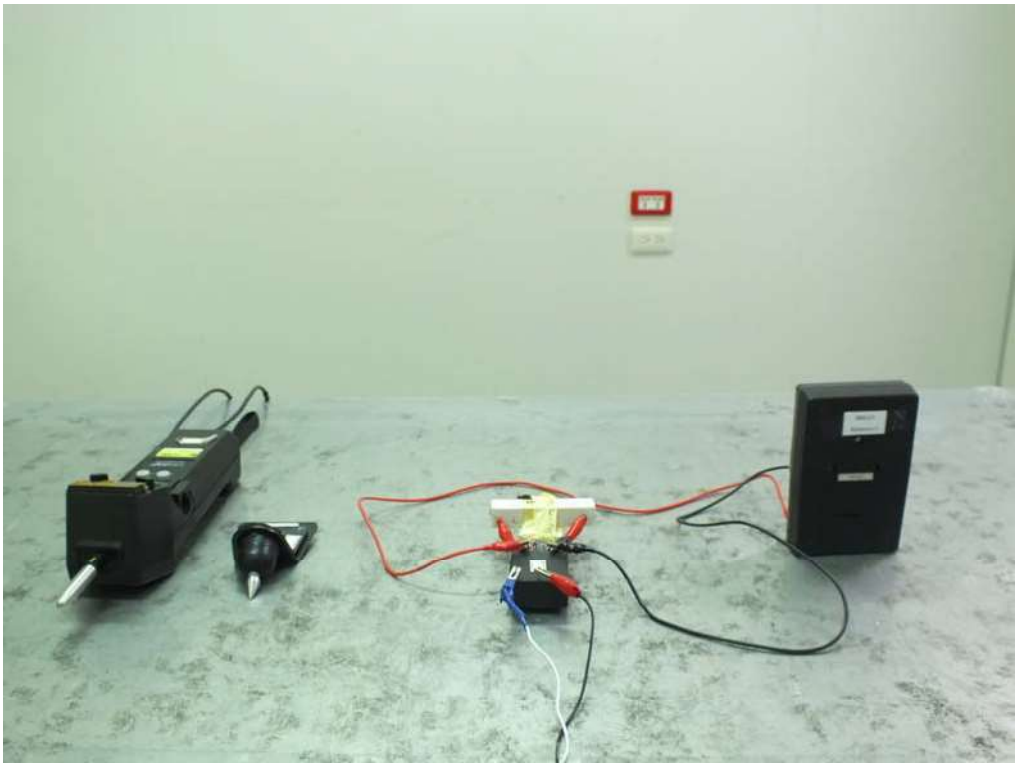


Mode 4

Front view

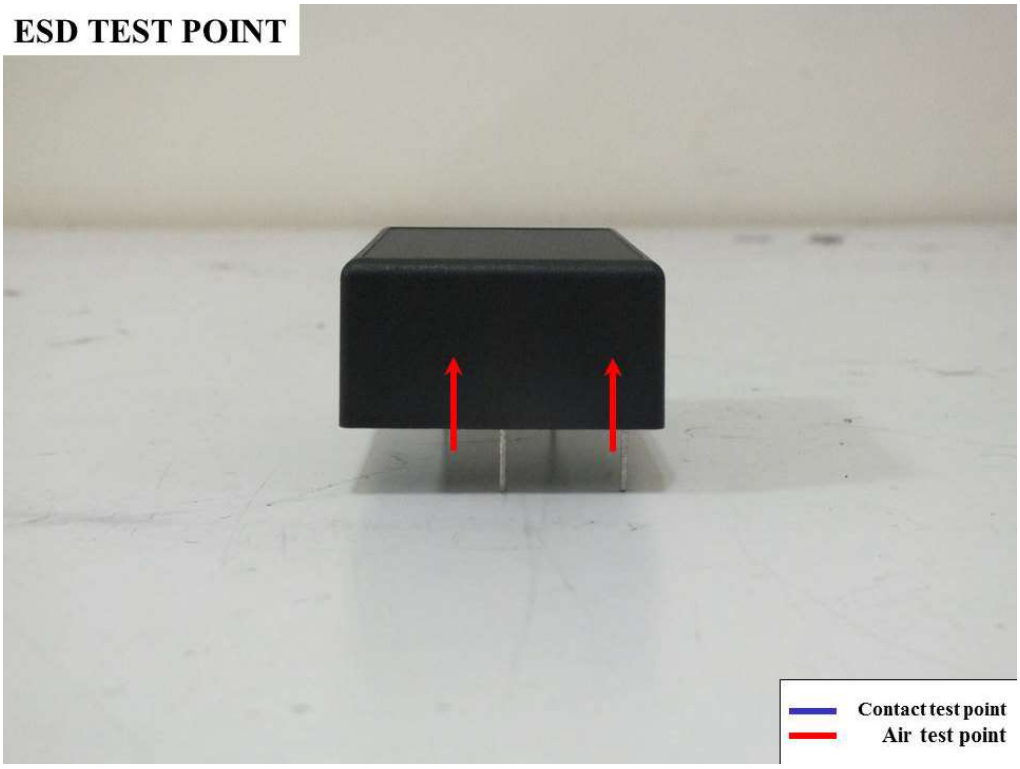


Rear view

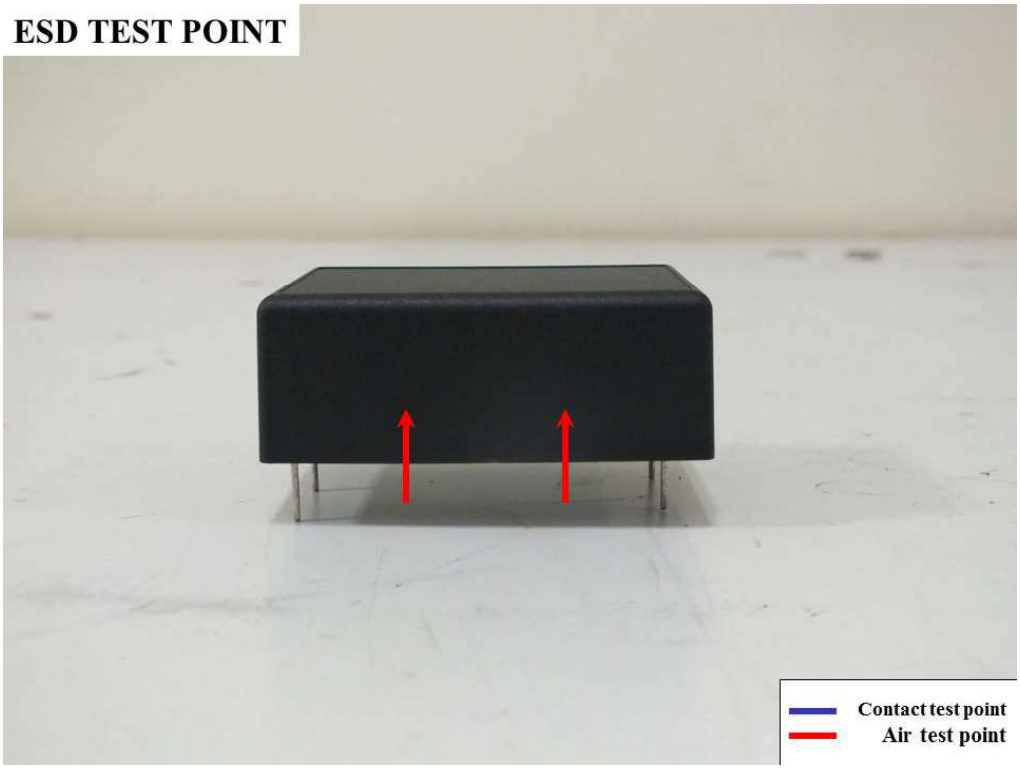


Test Points

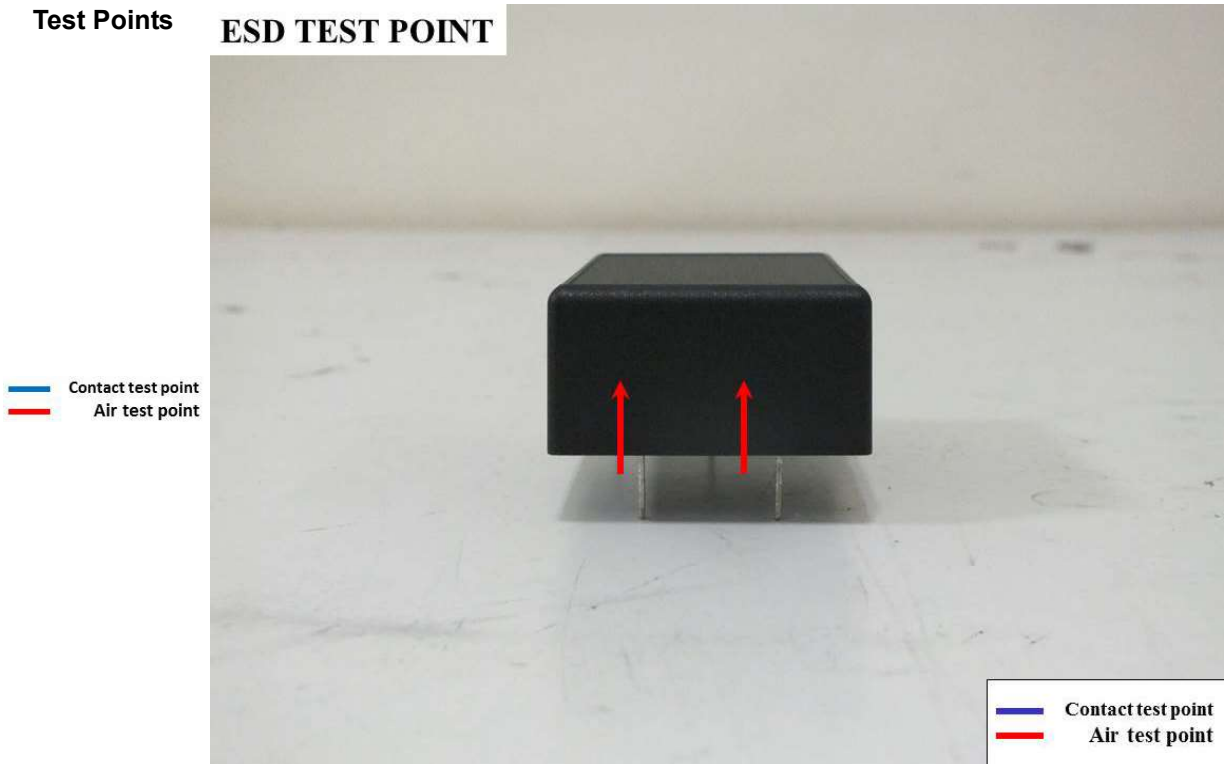
Contact test point
Air test point

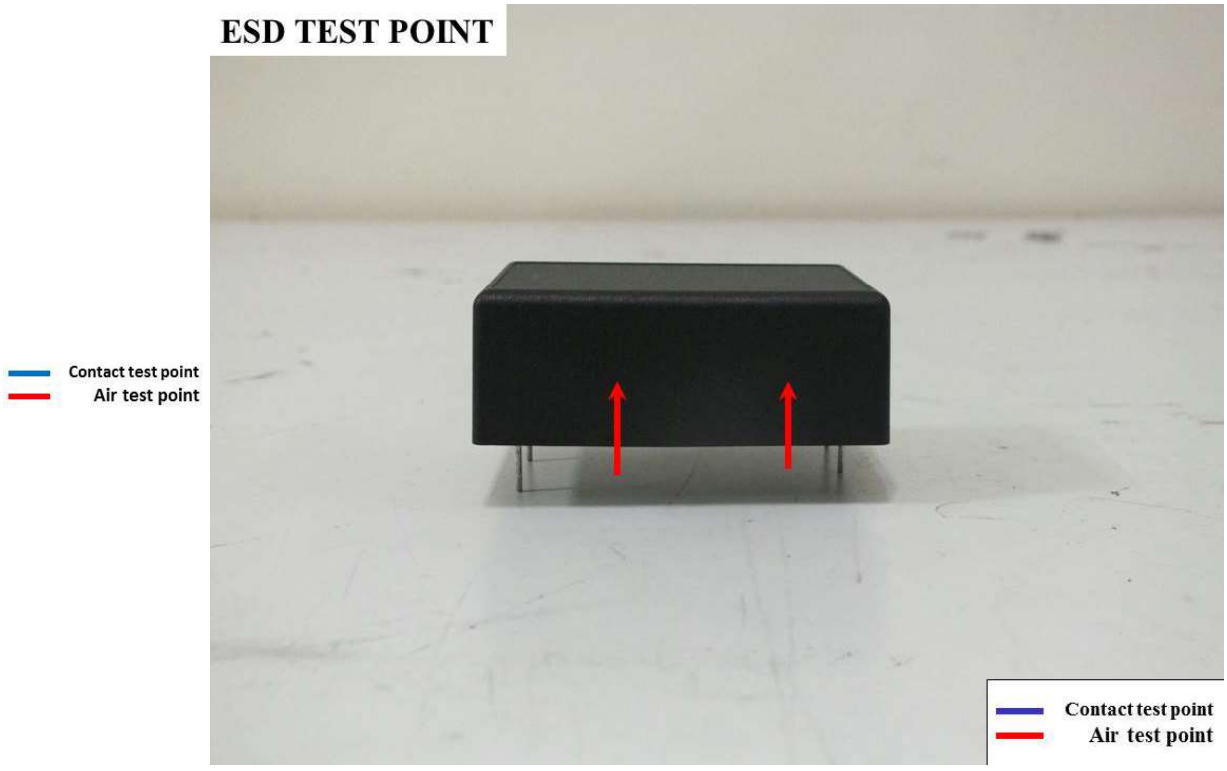


Contact test point
Air test point



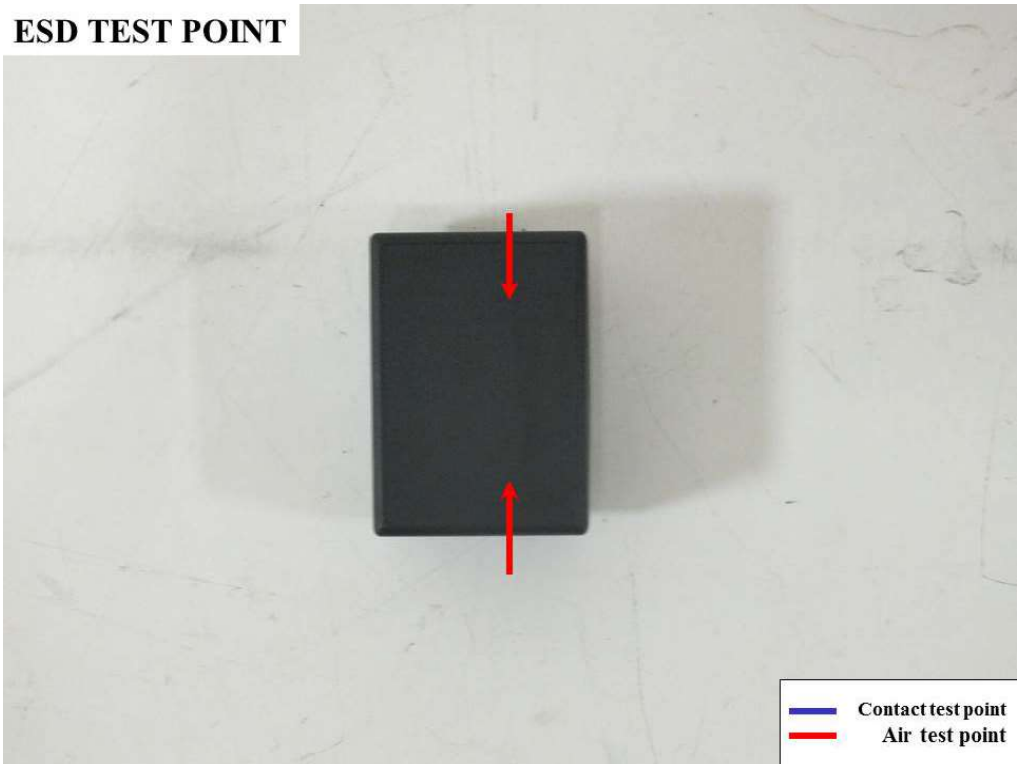
Test Points


ESD TEST POINT
Contact test point
Air test point
Contact test point
Air test point

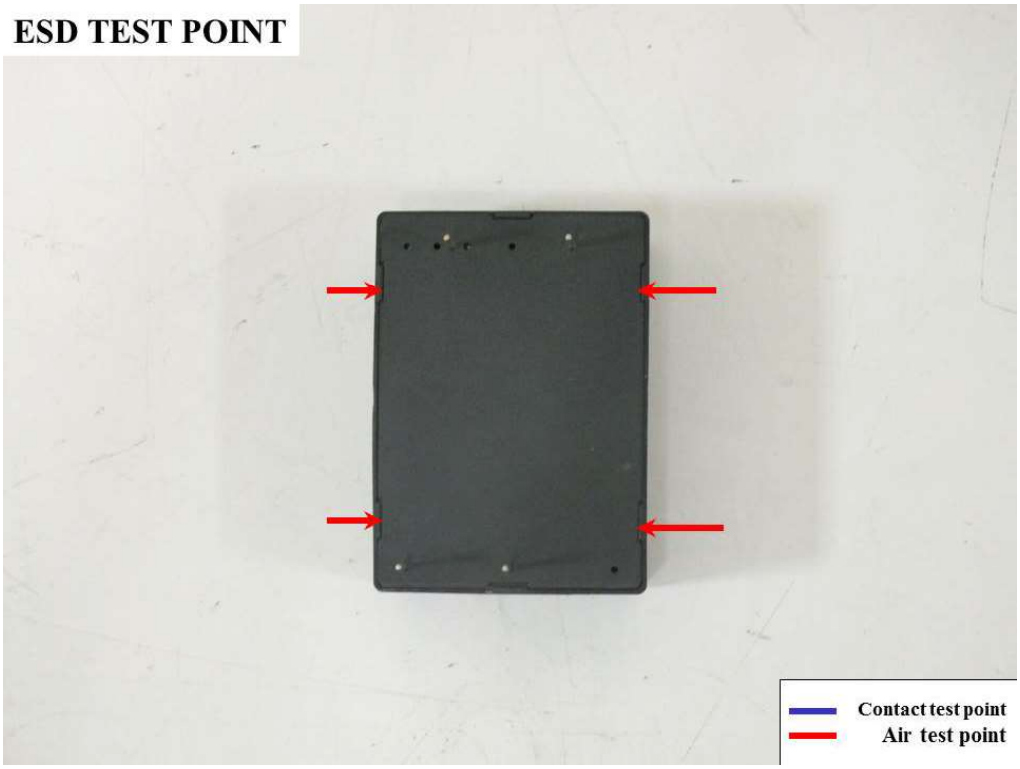

ESD TEST POINT
Contact test point
Air test point
Contact test point
Air test point

Test Points

Contact test point
Air test point



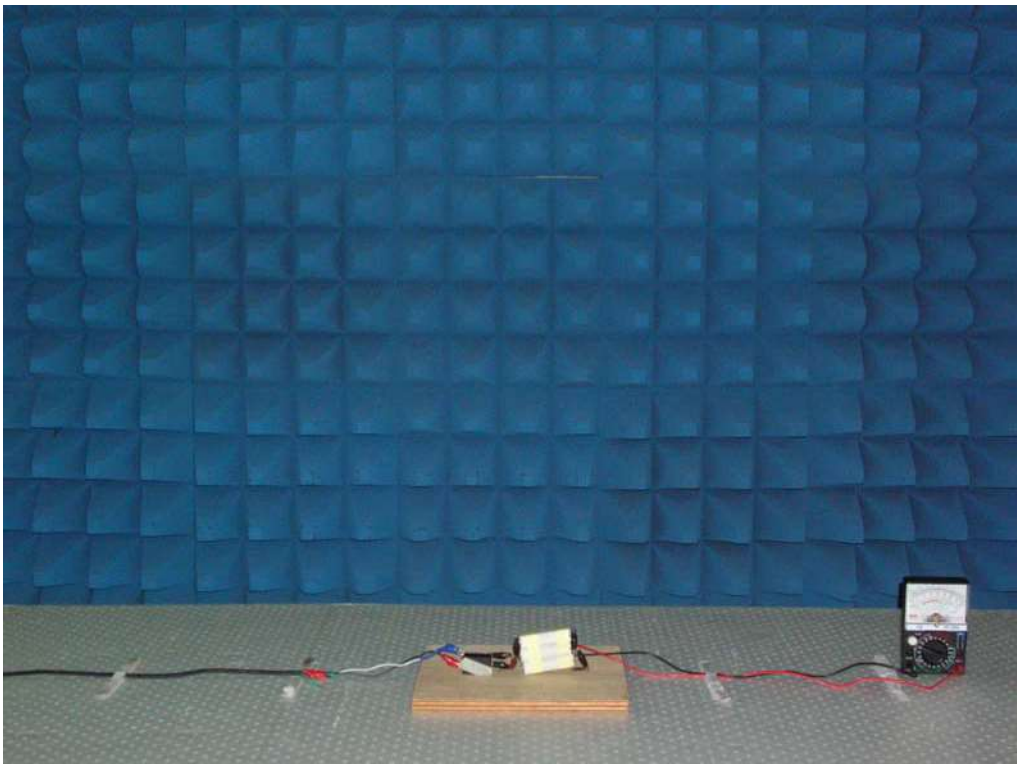
Contact test point
Air test point



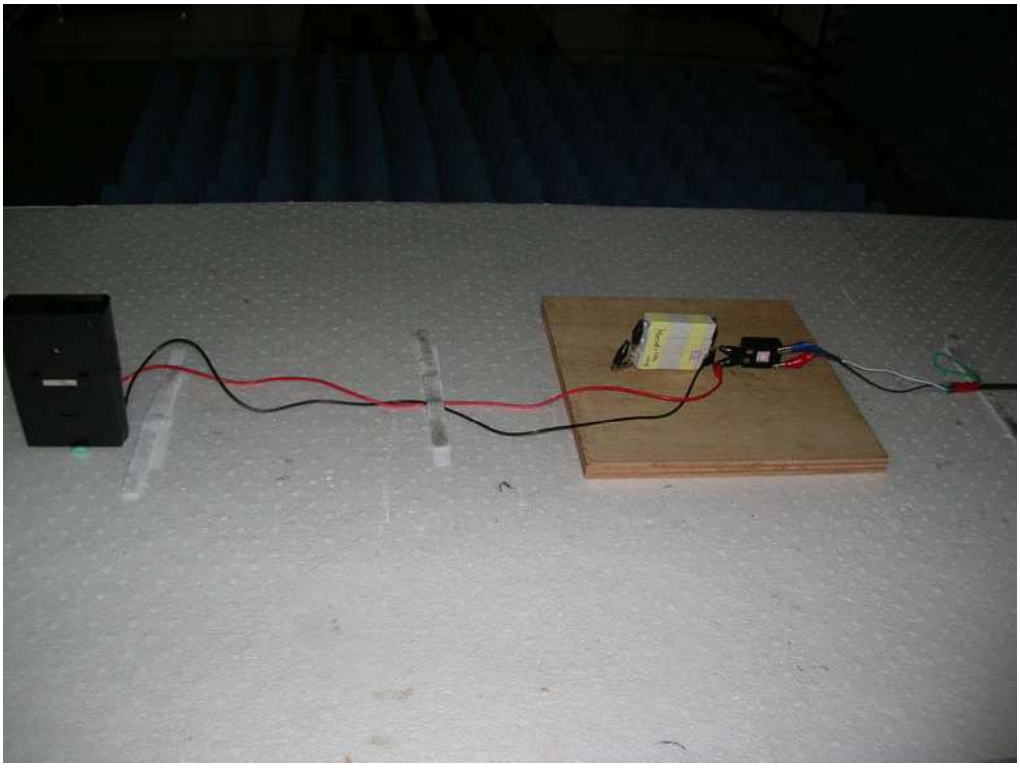
5. Photographs of RS Immunity Test Configuration

Mode 1

Front view

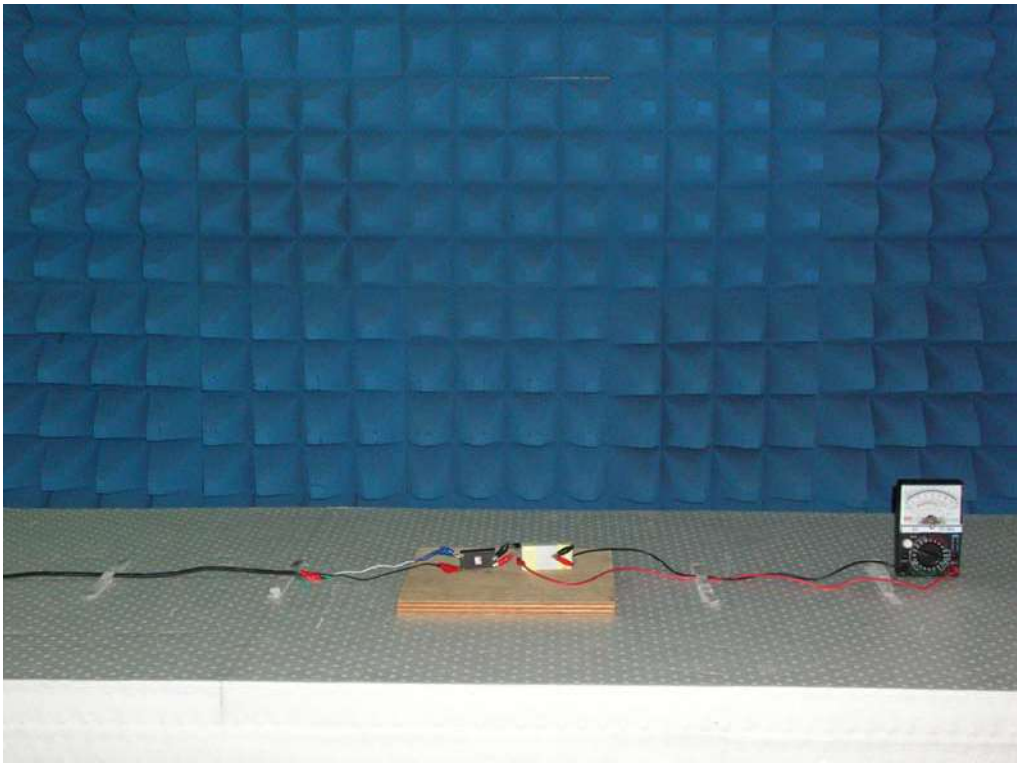


Rear view

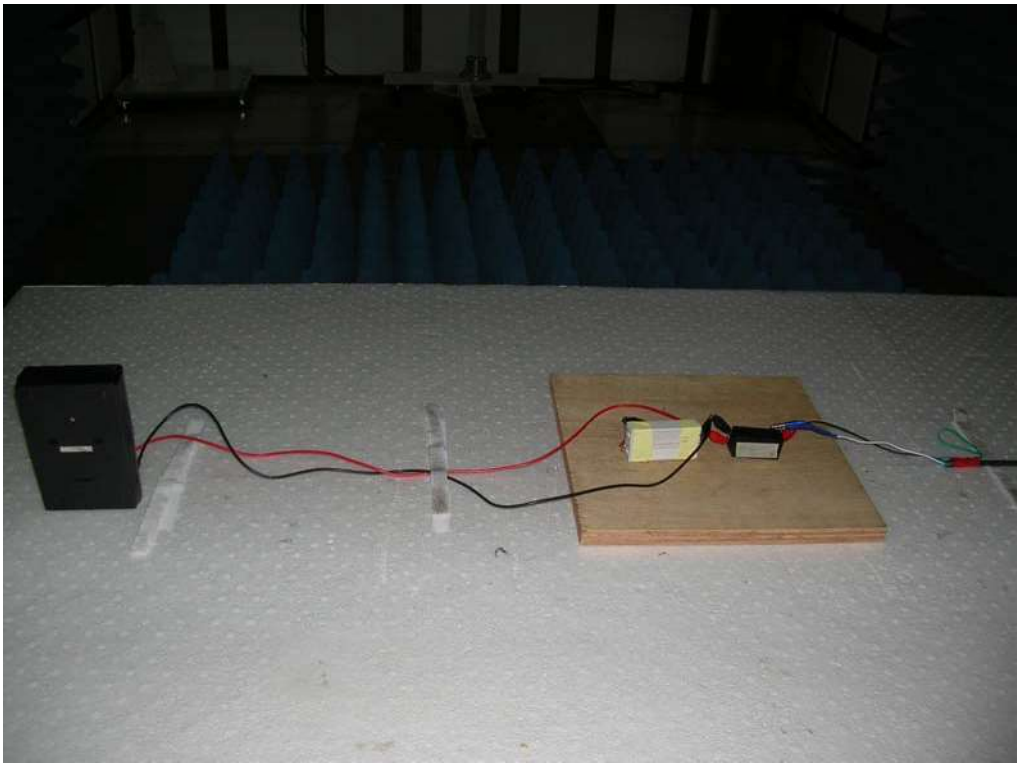


Mode 2

Front view

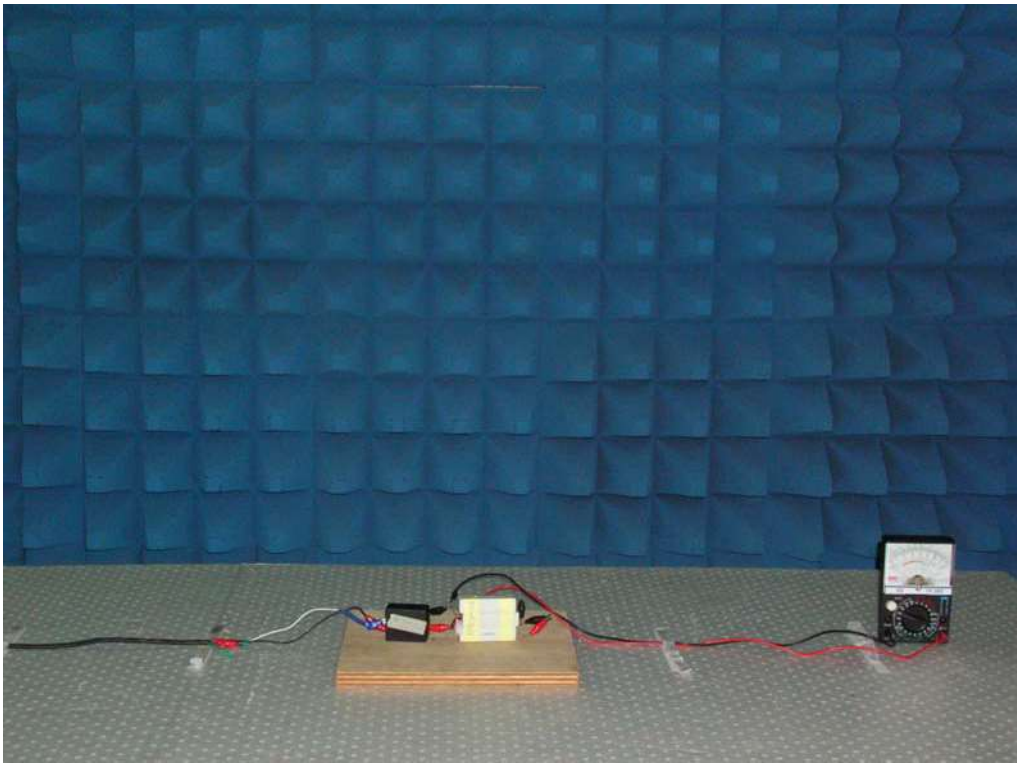


Rear view

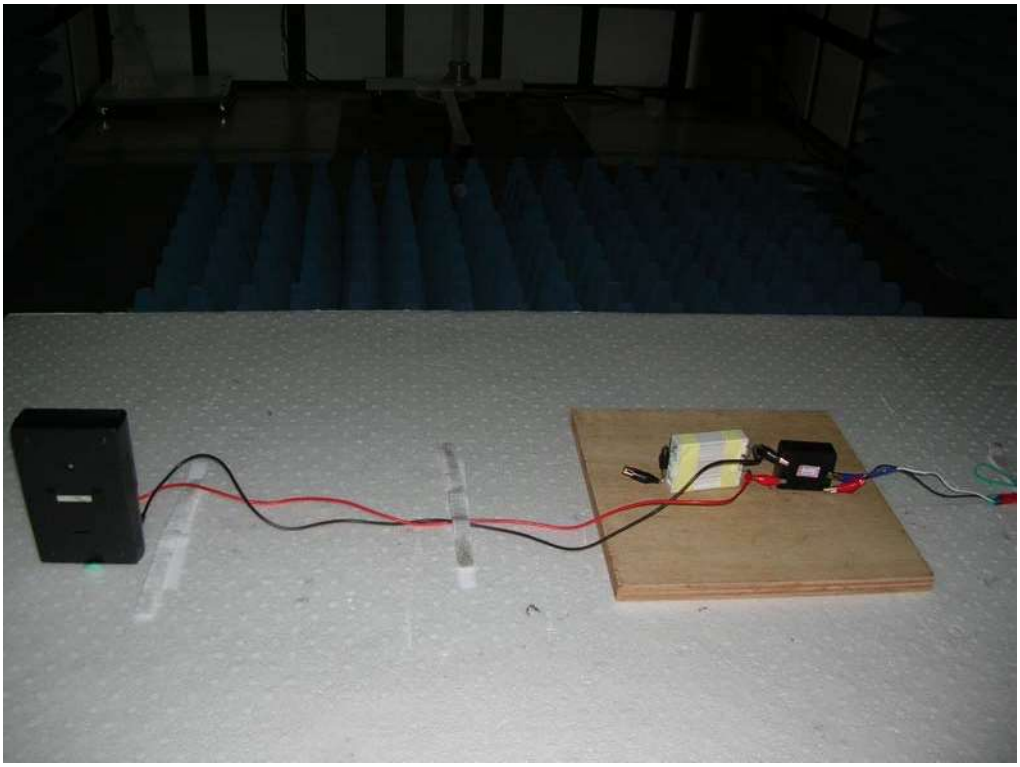


Mode 3

Front view

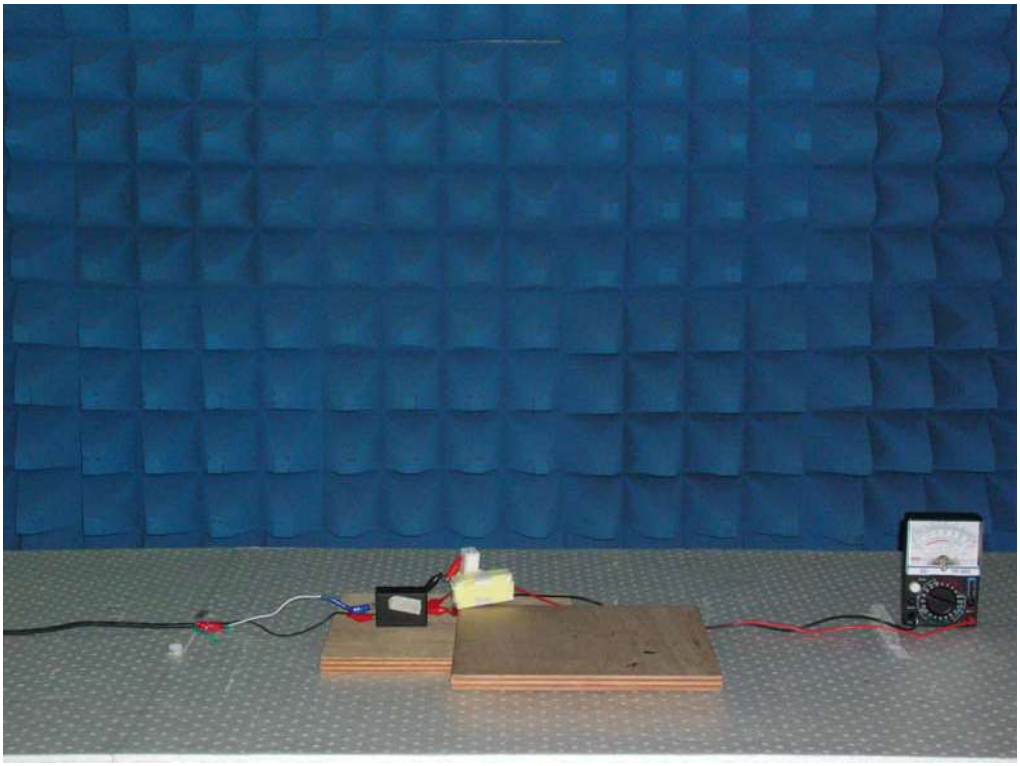


Rear view

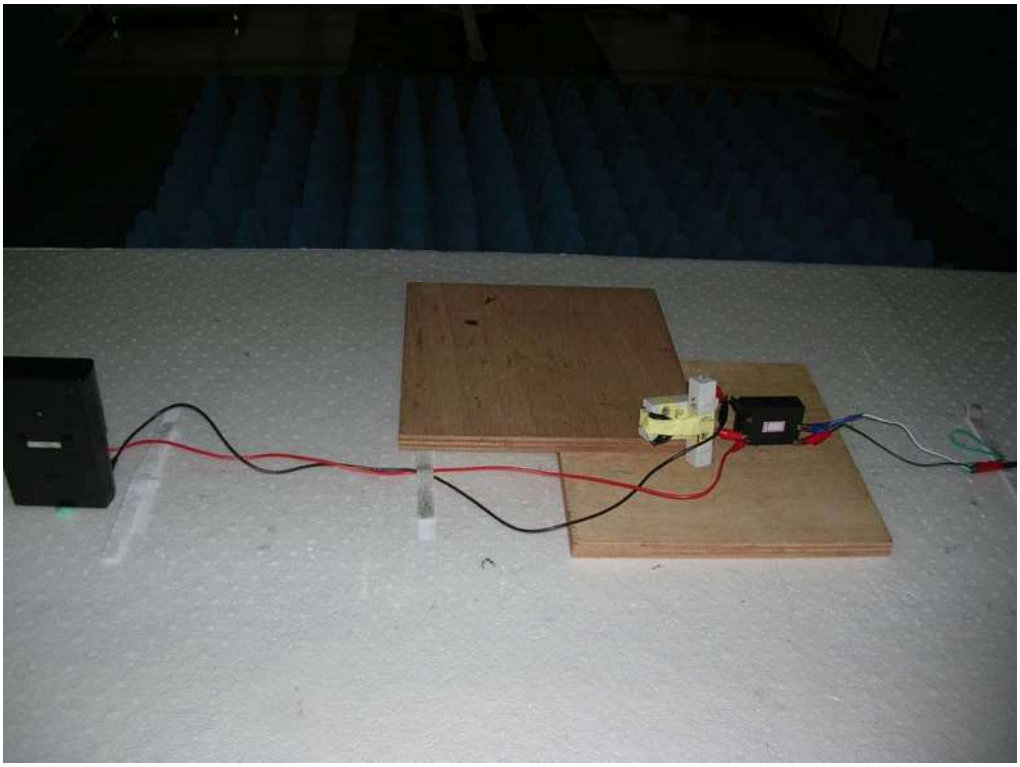


Mode 4

Front view



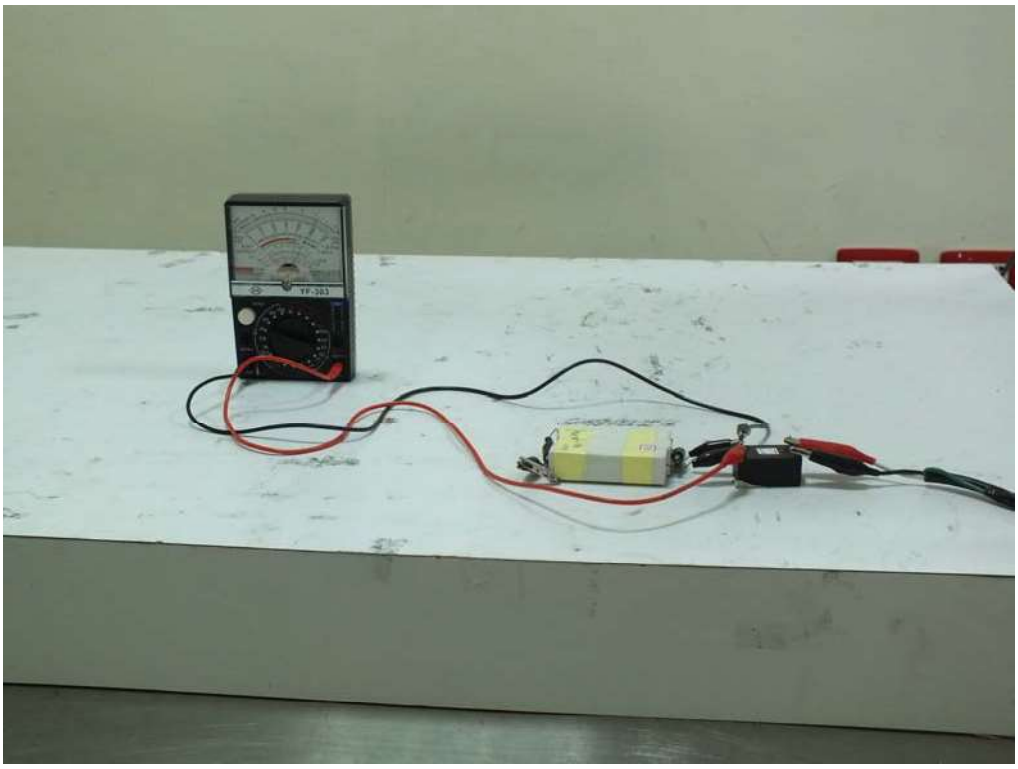
Rear view



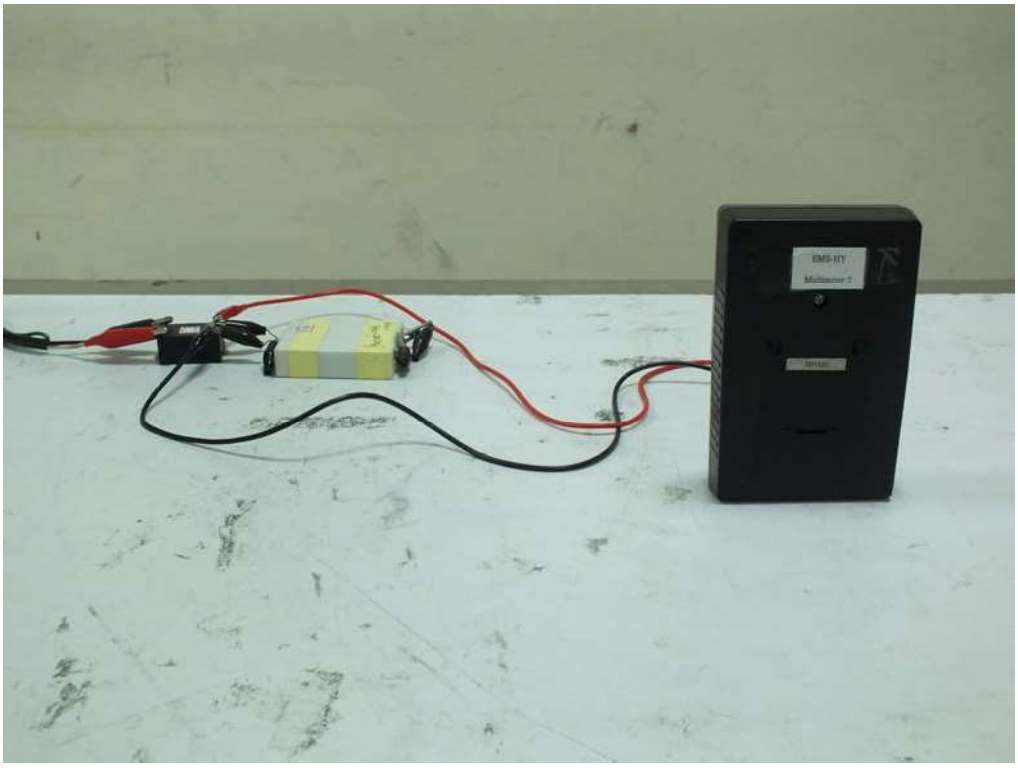
6. Photographs of EFT Test Configuration

Mode 1

Front view

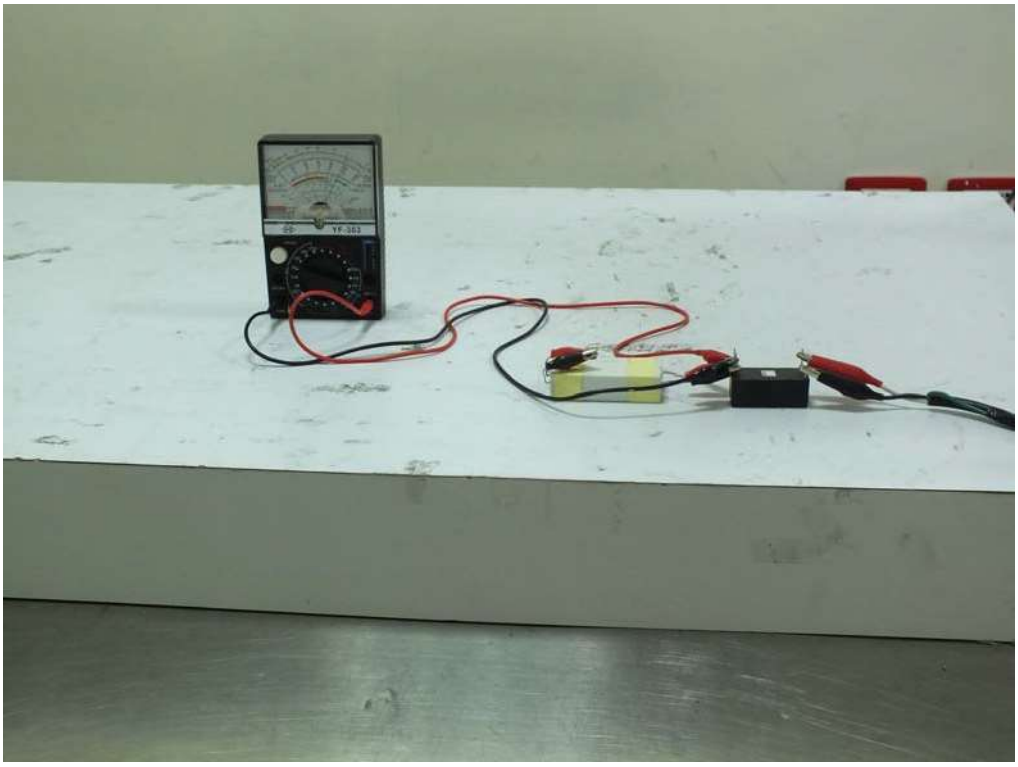


Rear view

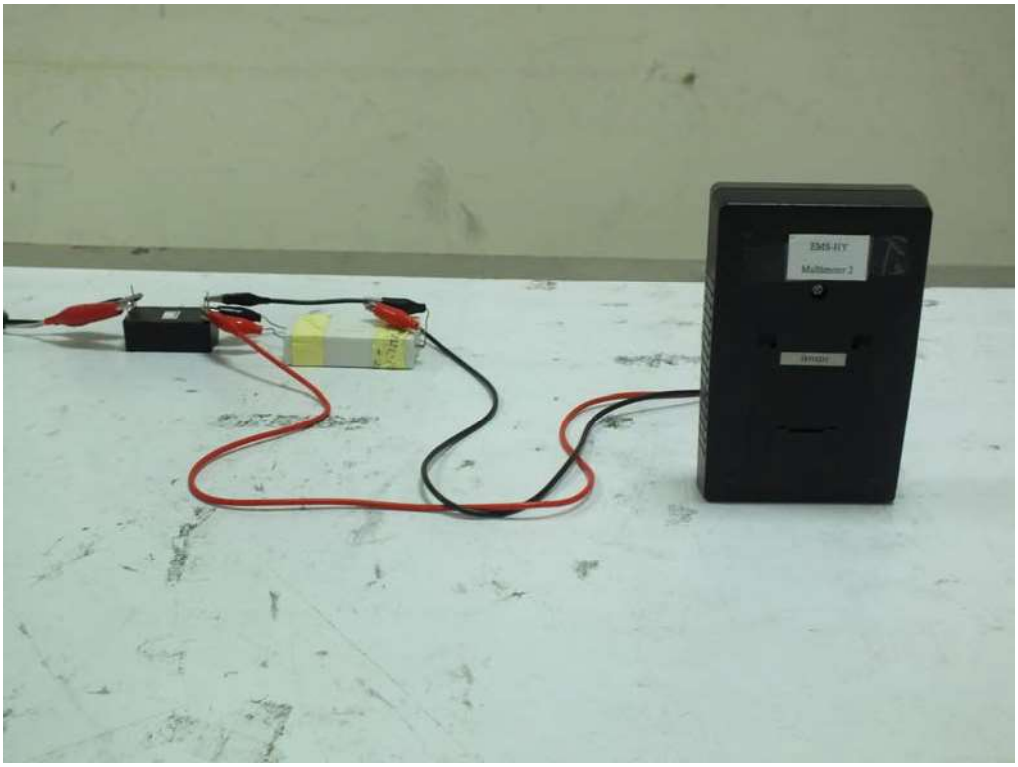


Mode 2

Front view

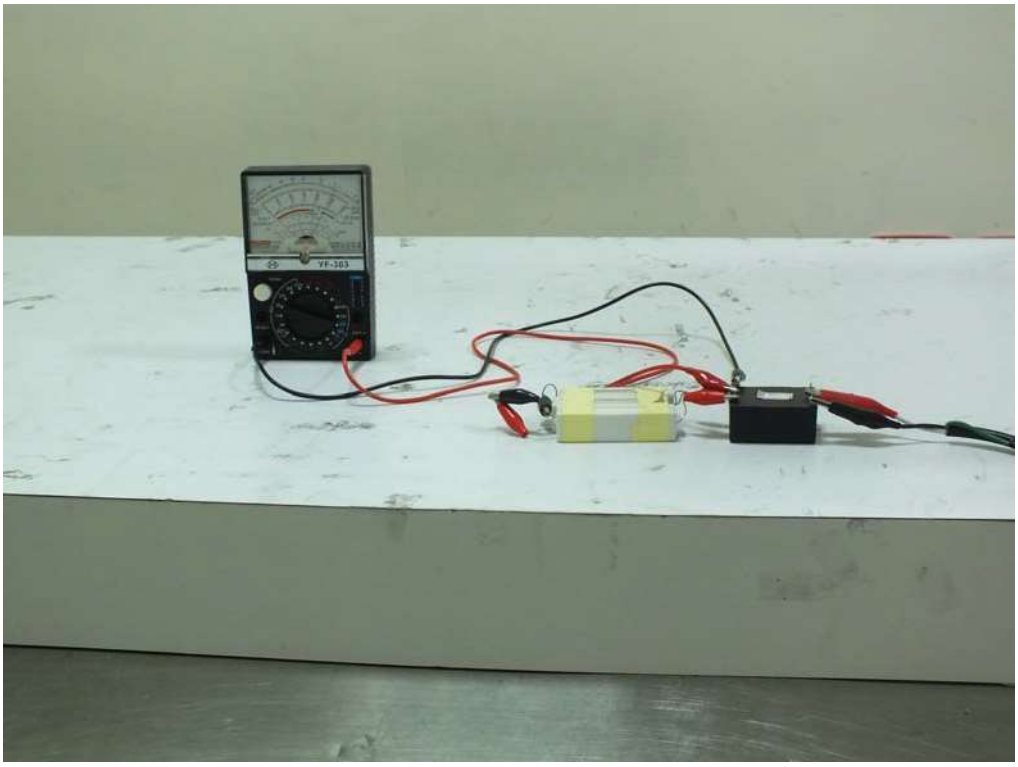


Rear view

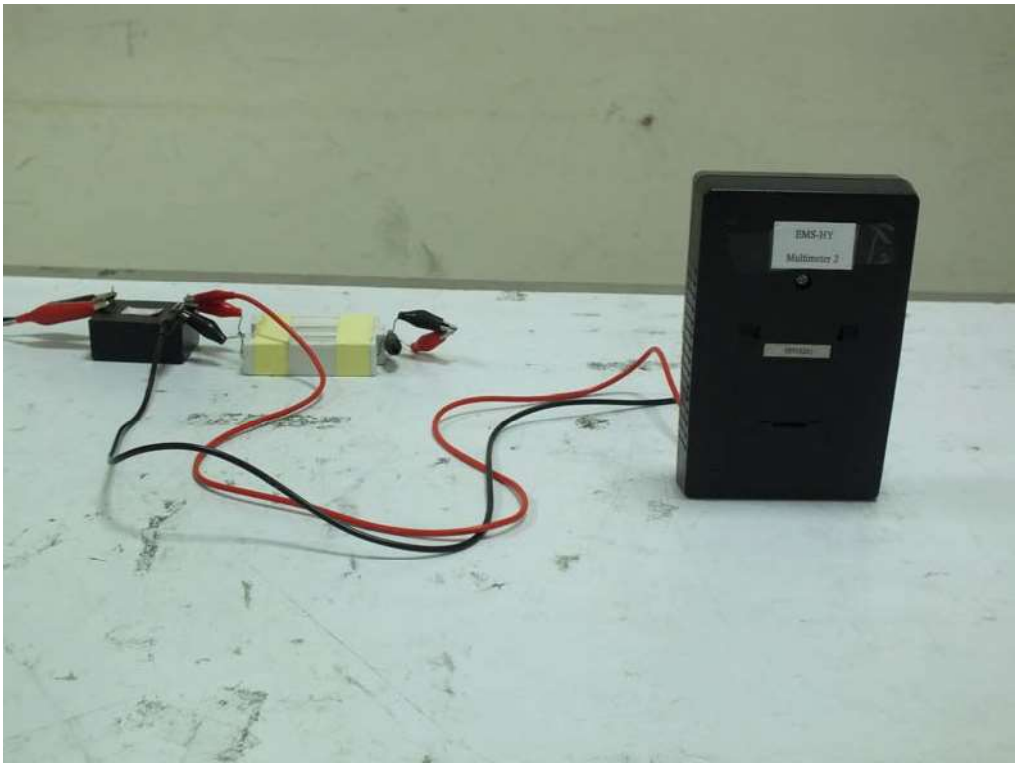


Mode 3

Front view

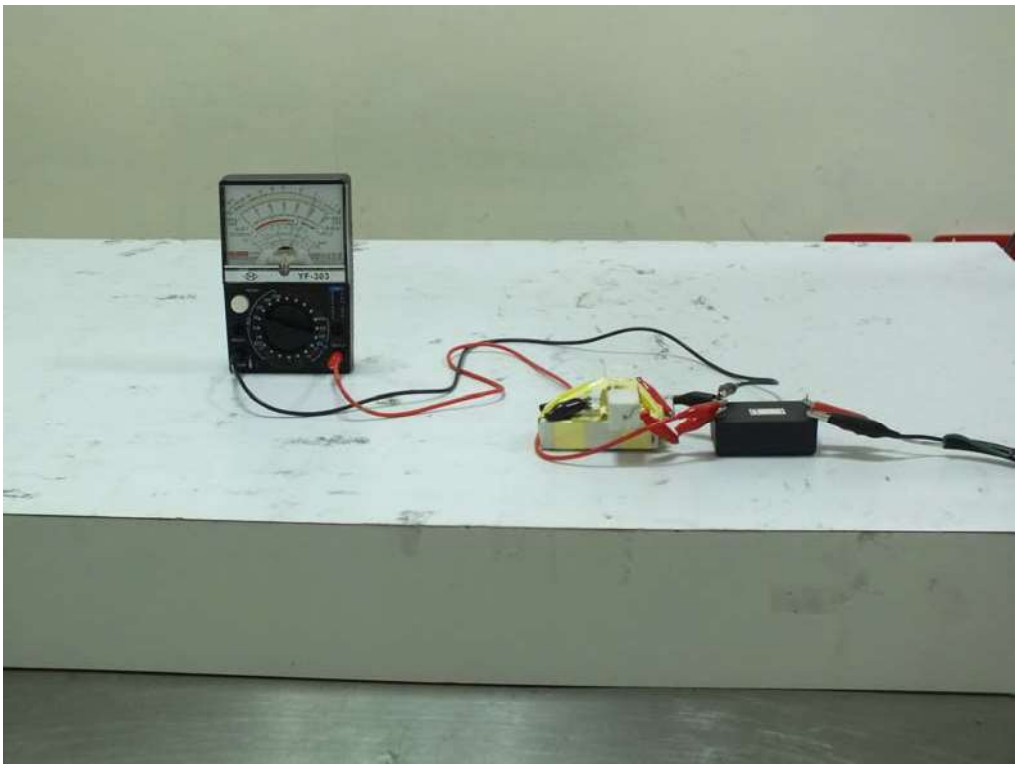


Rear view

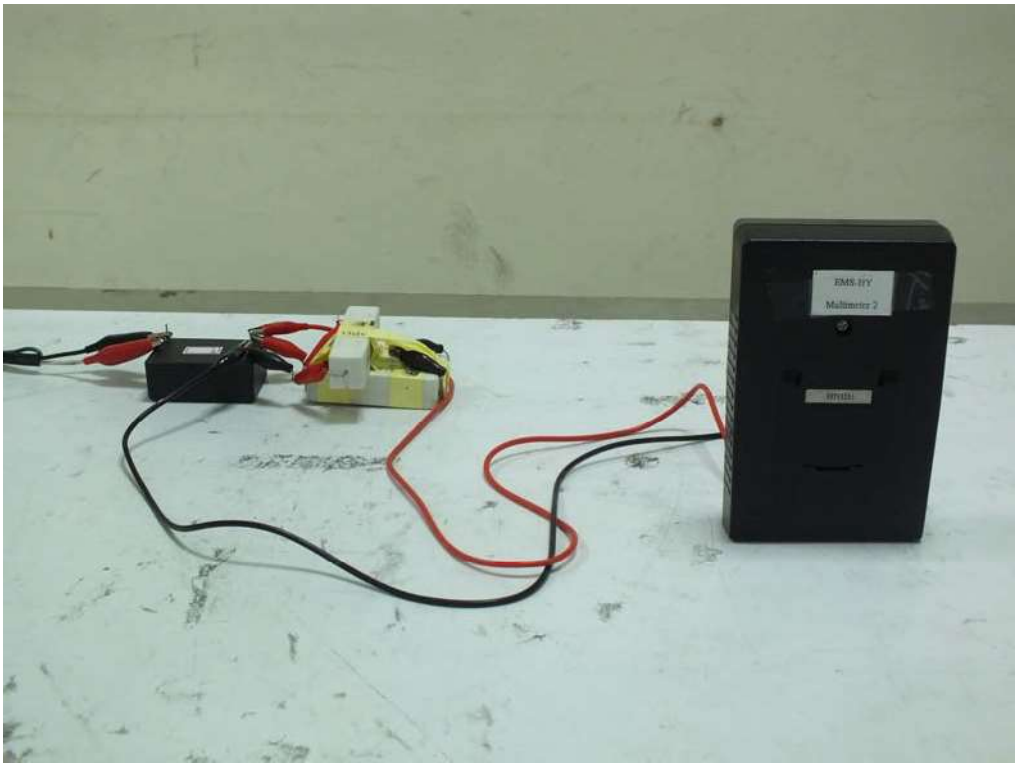


Mode 4

Front view



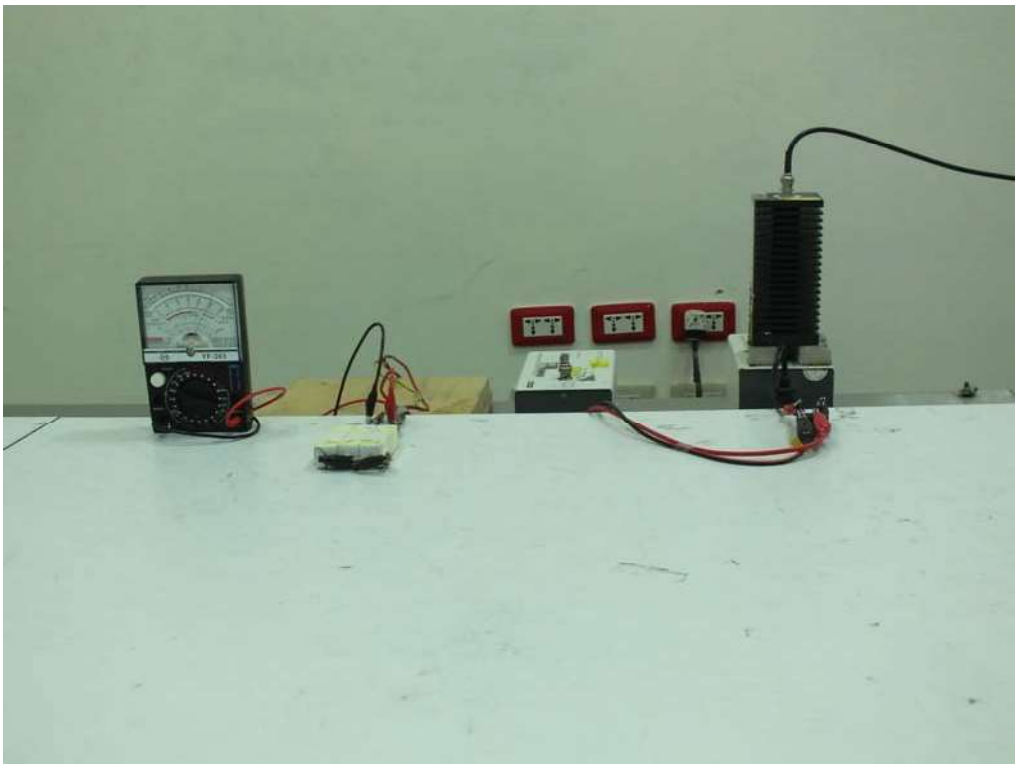
Rear view



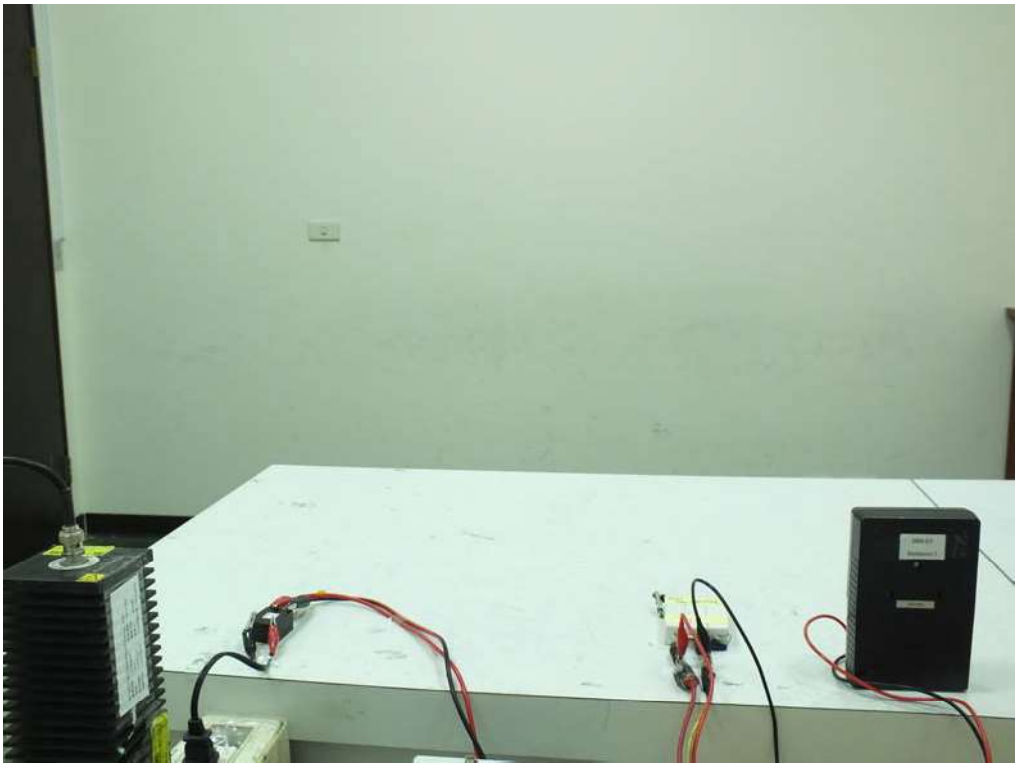
7. Photographs of CS Immunity Test Configuration

Mode 1

Front view

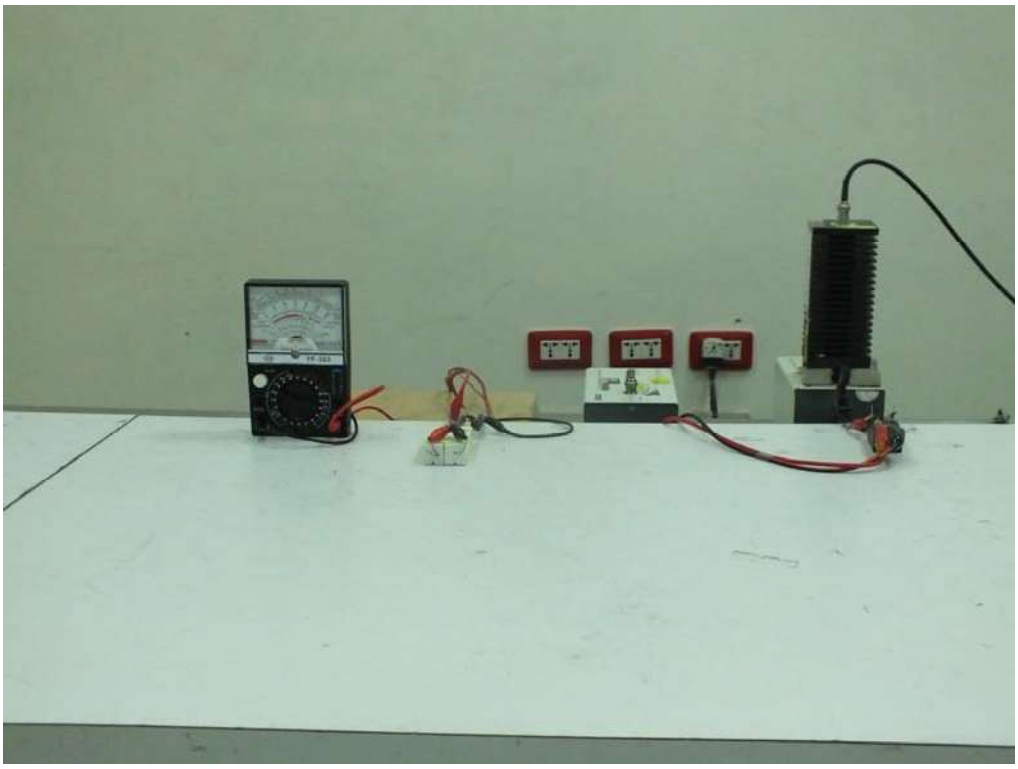


Rear view



Mode 2

Front view

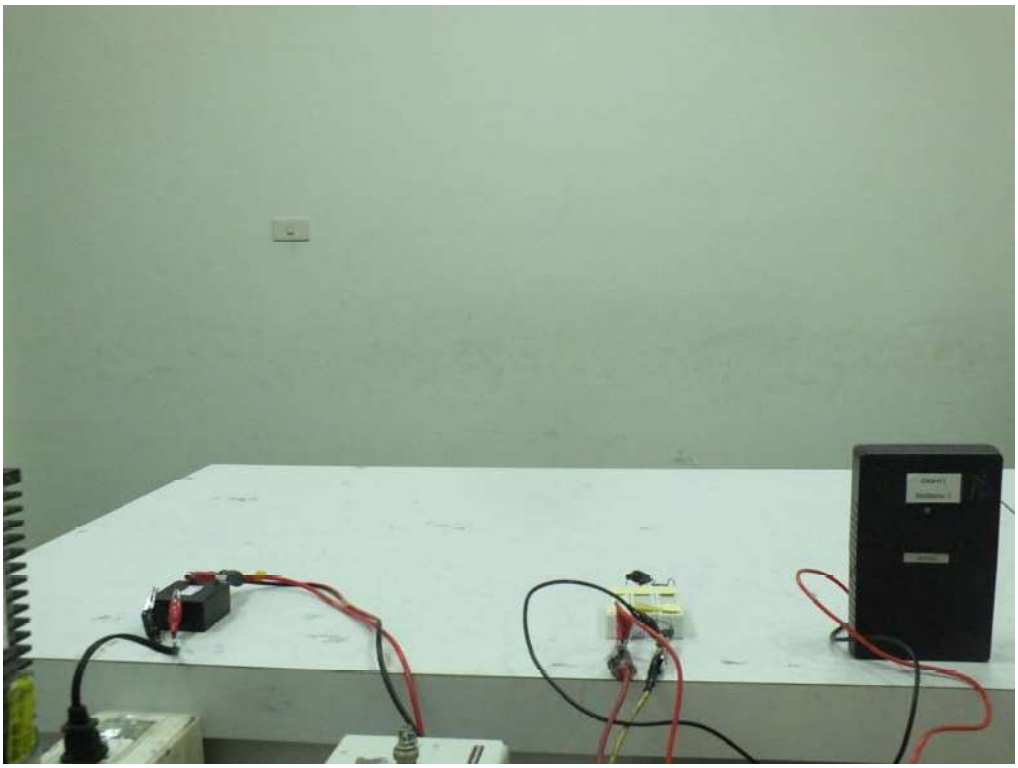


Rear view

Mode 3

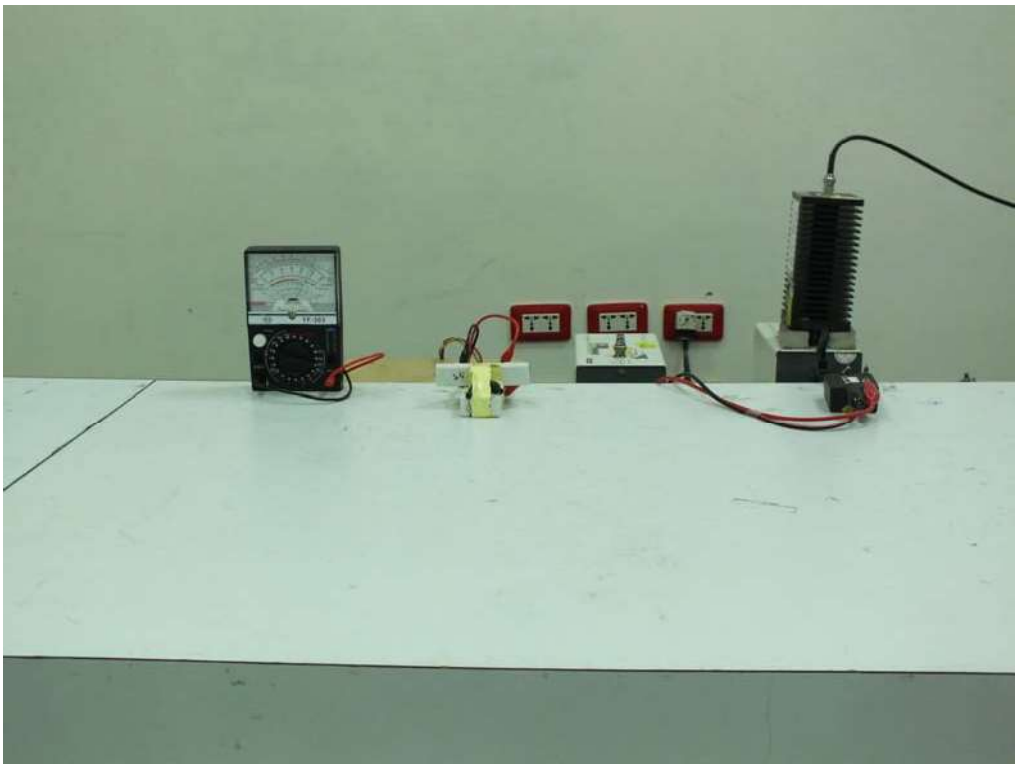
Front view

Rear view

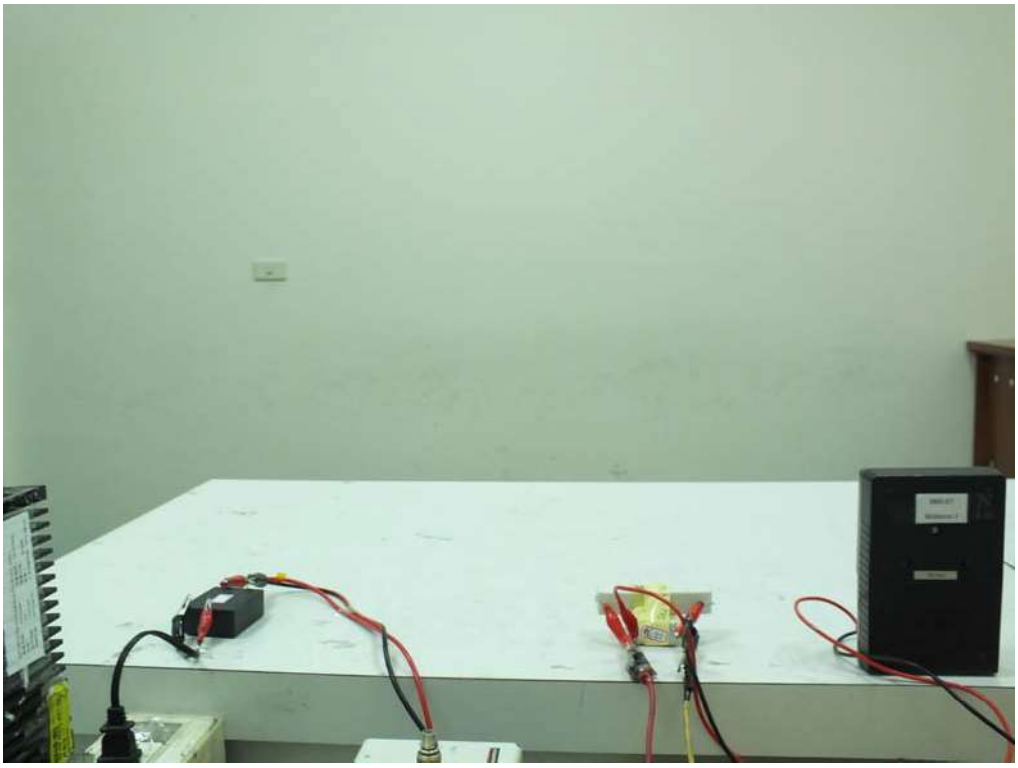


Mode 4

Front view



Rear view

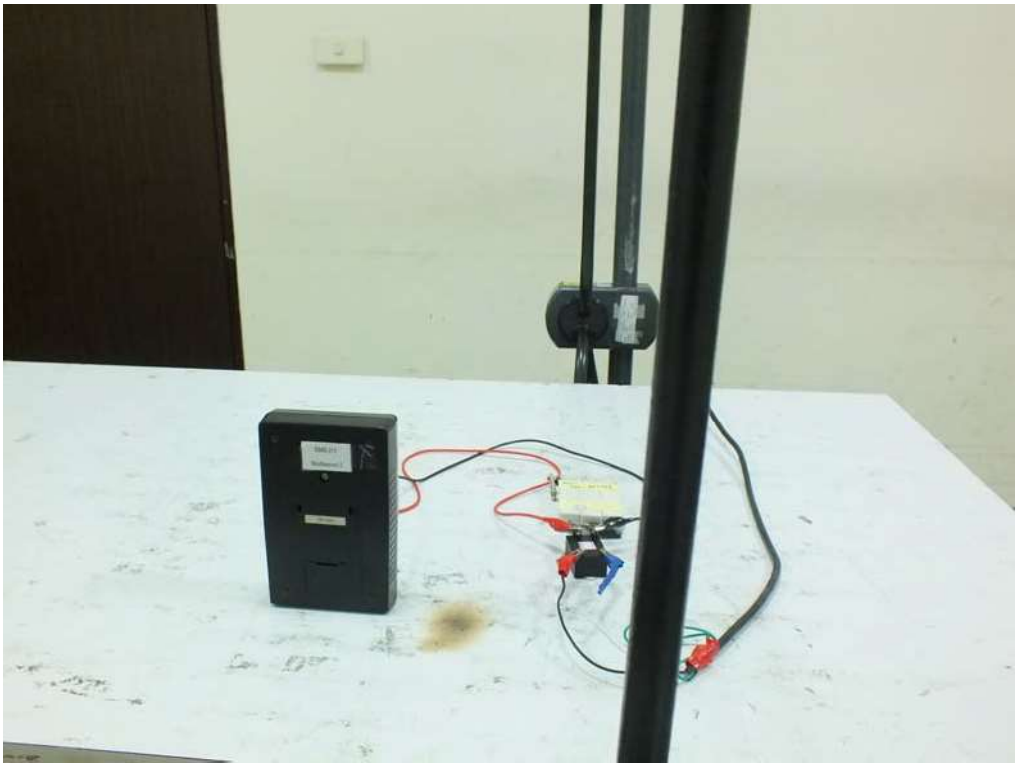


8. Power Frequency Magnetic Field immunity Measurement (PFMF)

Mode 1

Front view

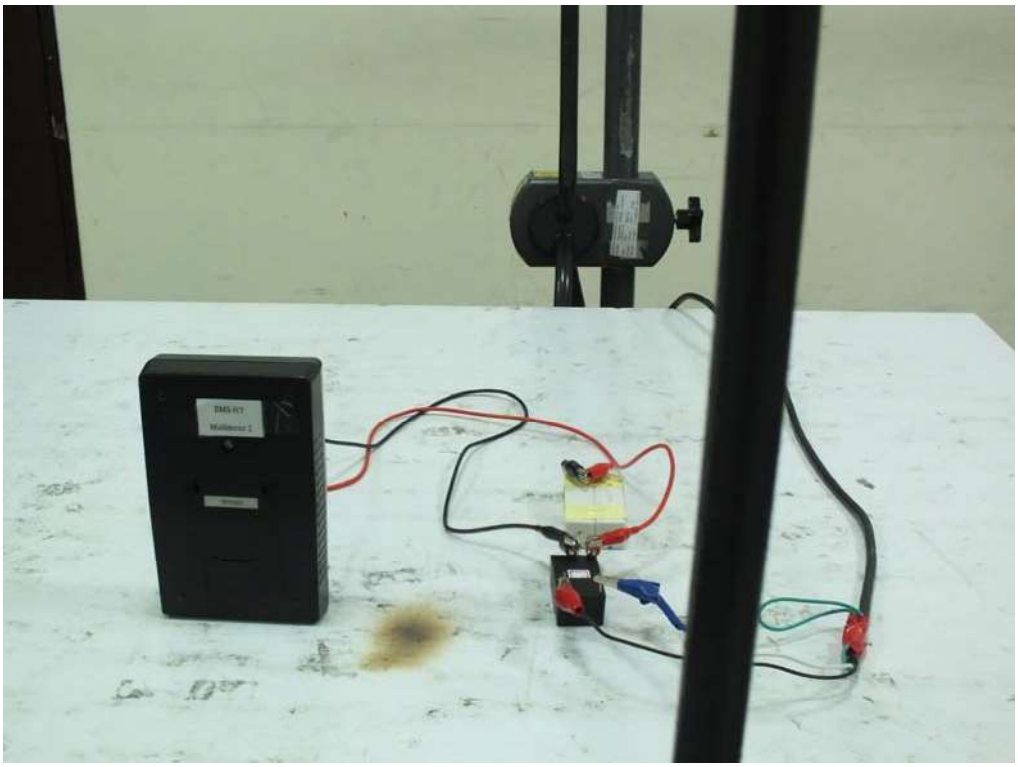
Rear view



Mode 2

Front view

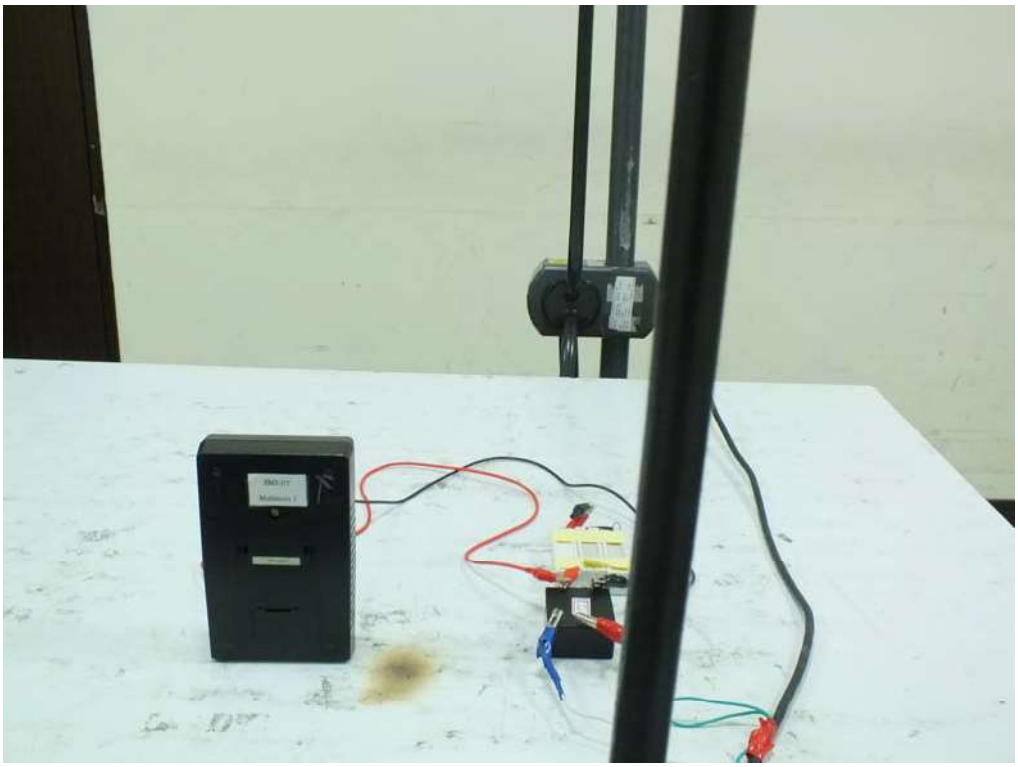
Rear view



Mode 3

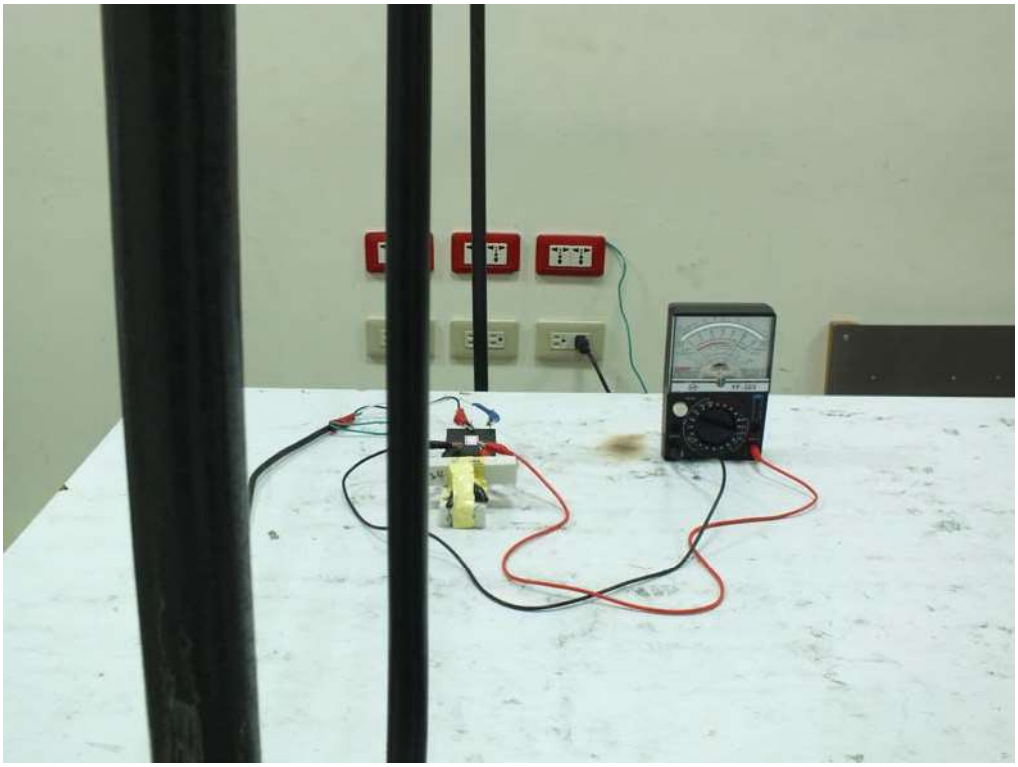
Front view

Rear view

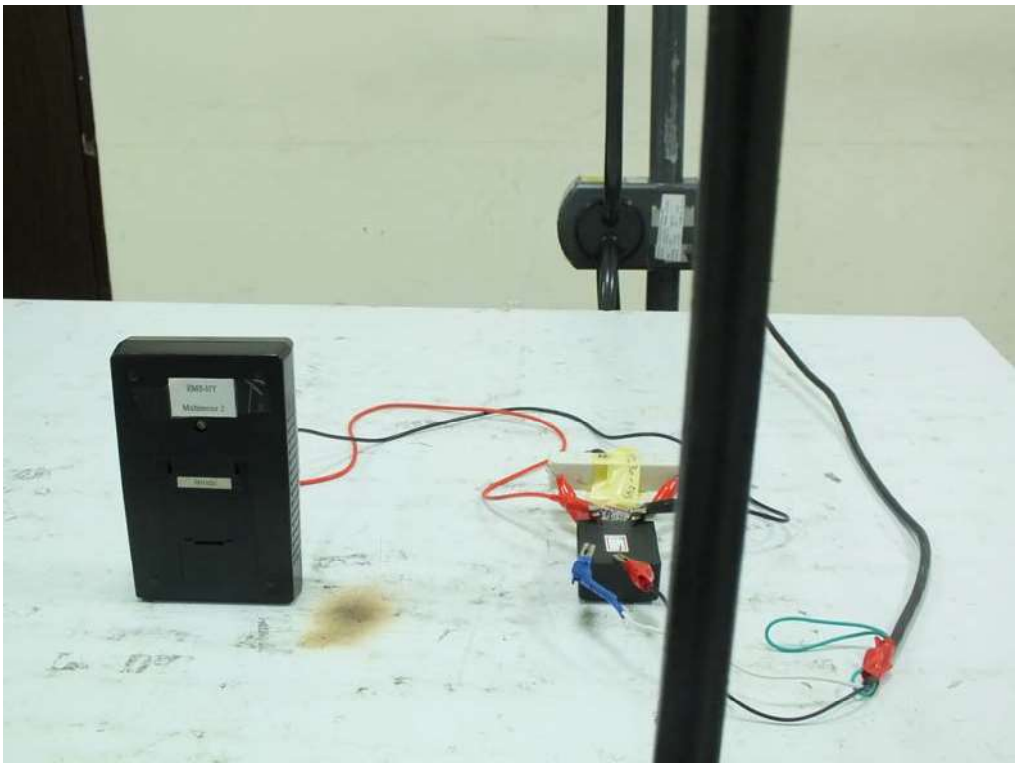


Mode 4

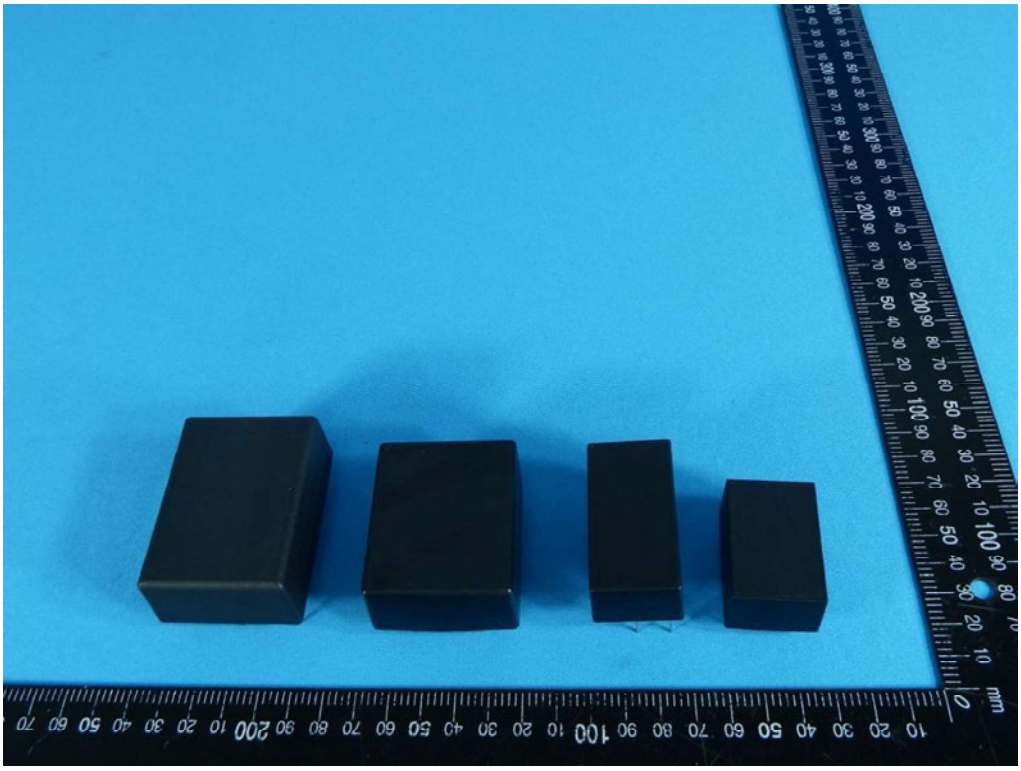
Front view

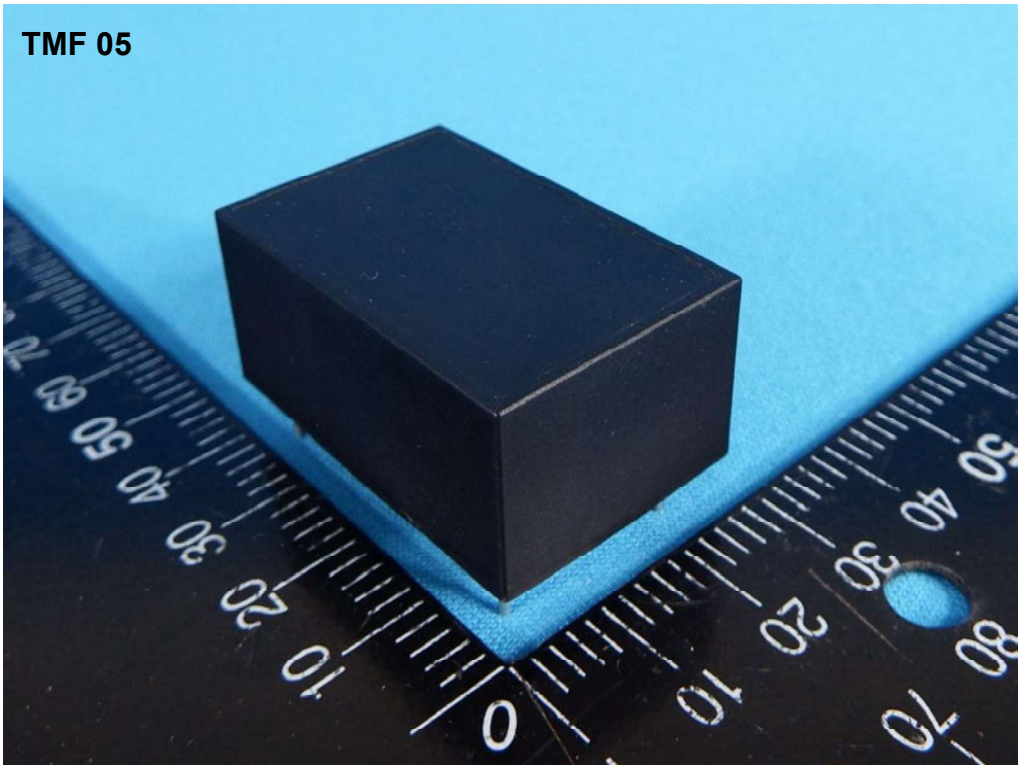


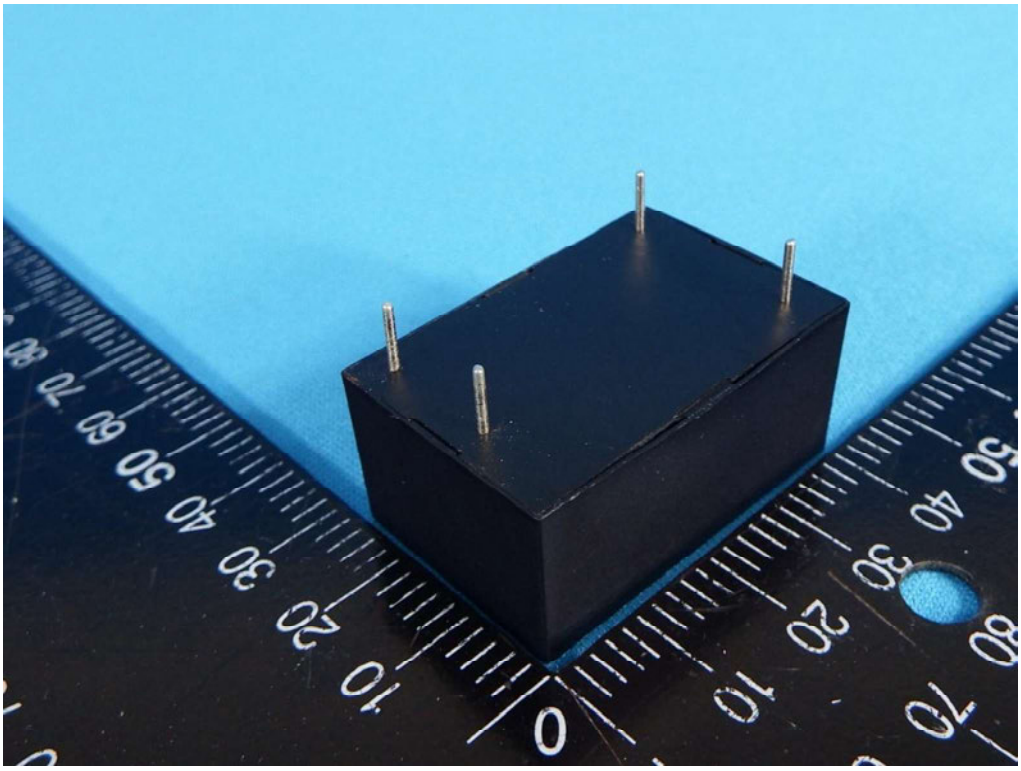
Rear view

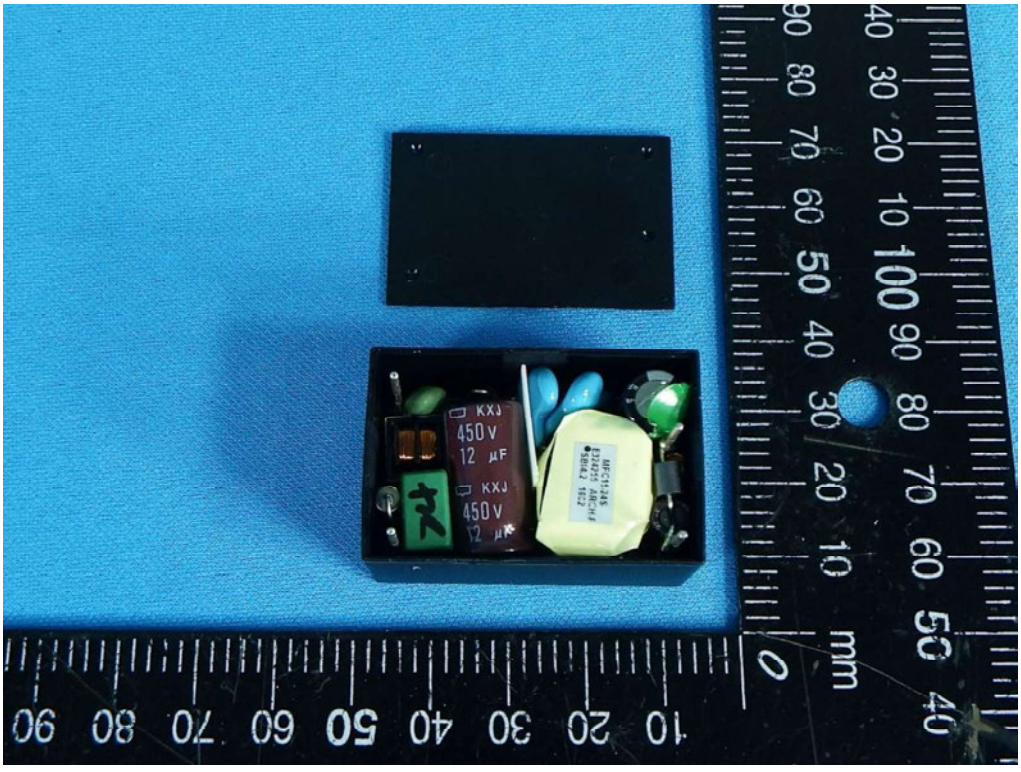


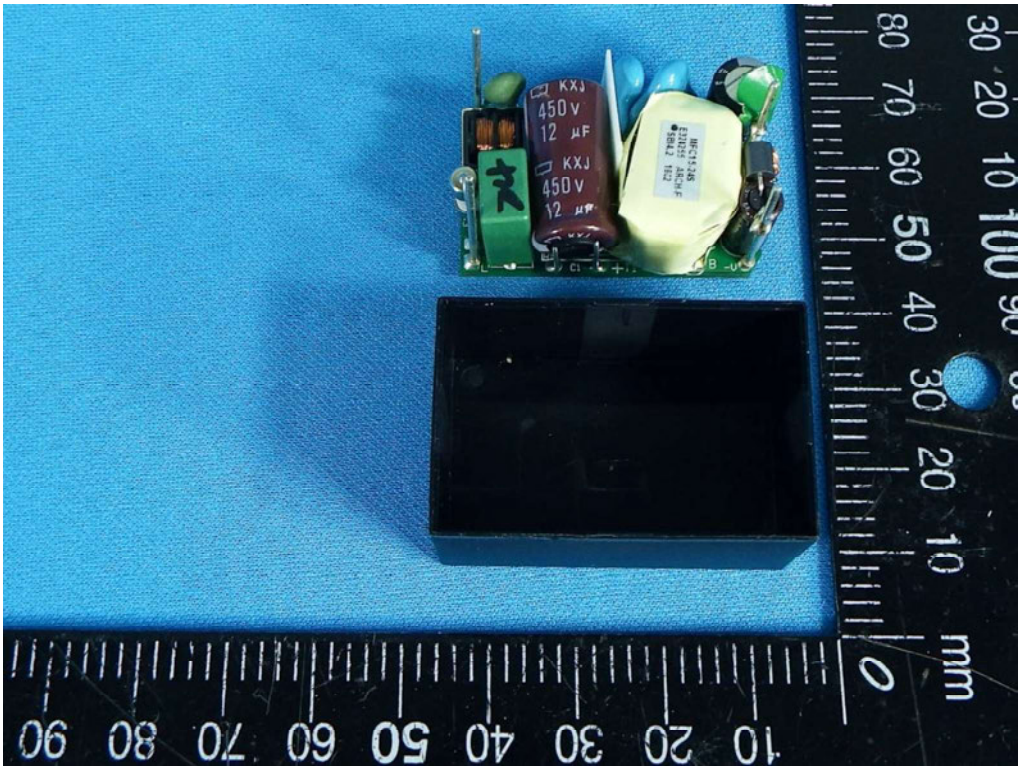
APPENDIX B. Photographs of EUT

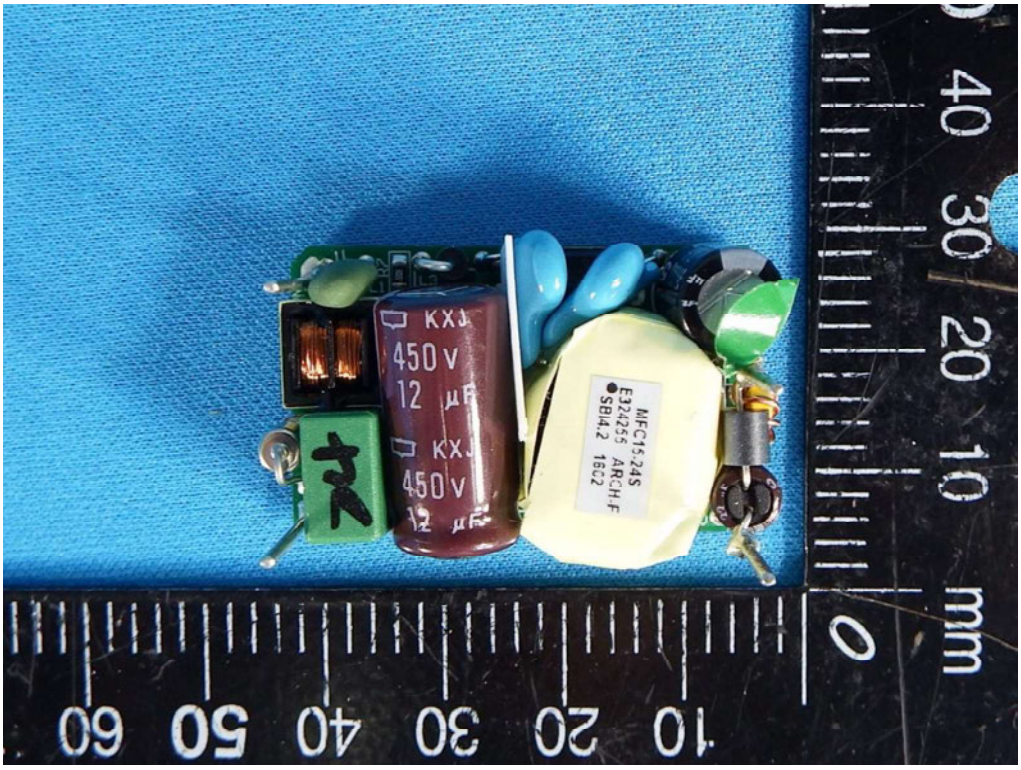




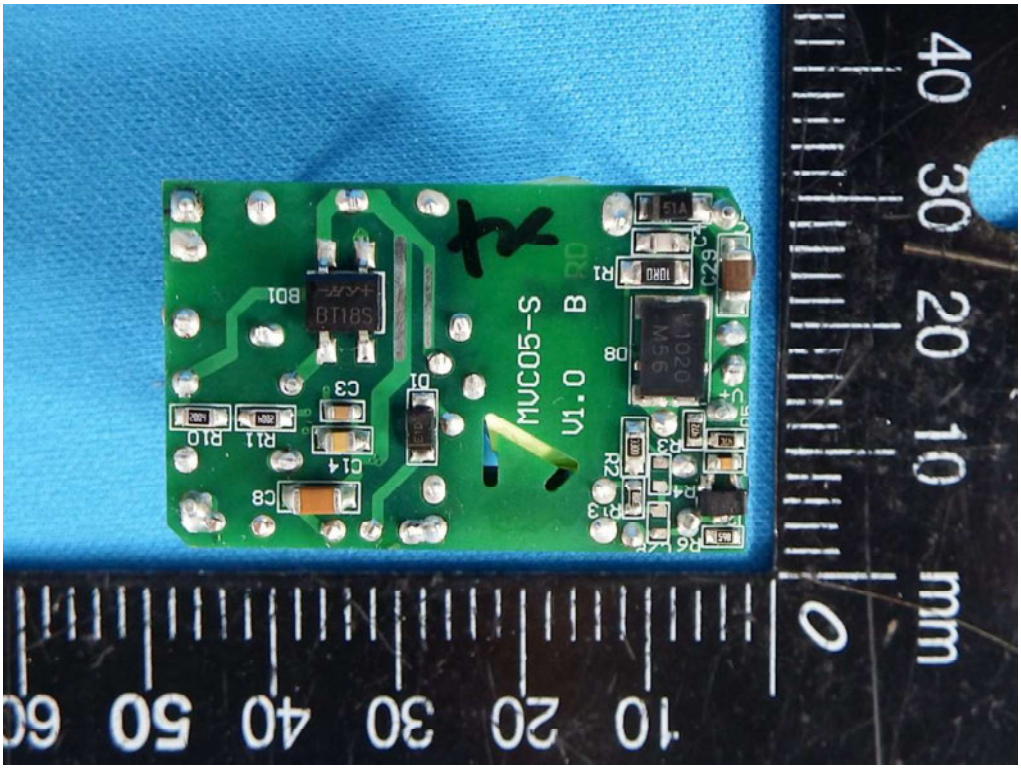



KXJ
450V
12 μF
KXJ
450V

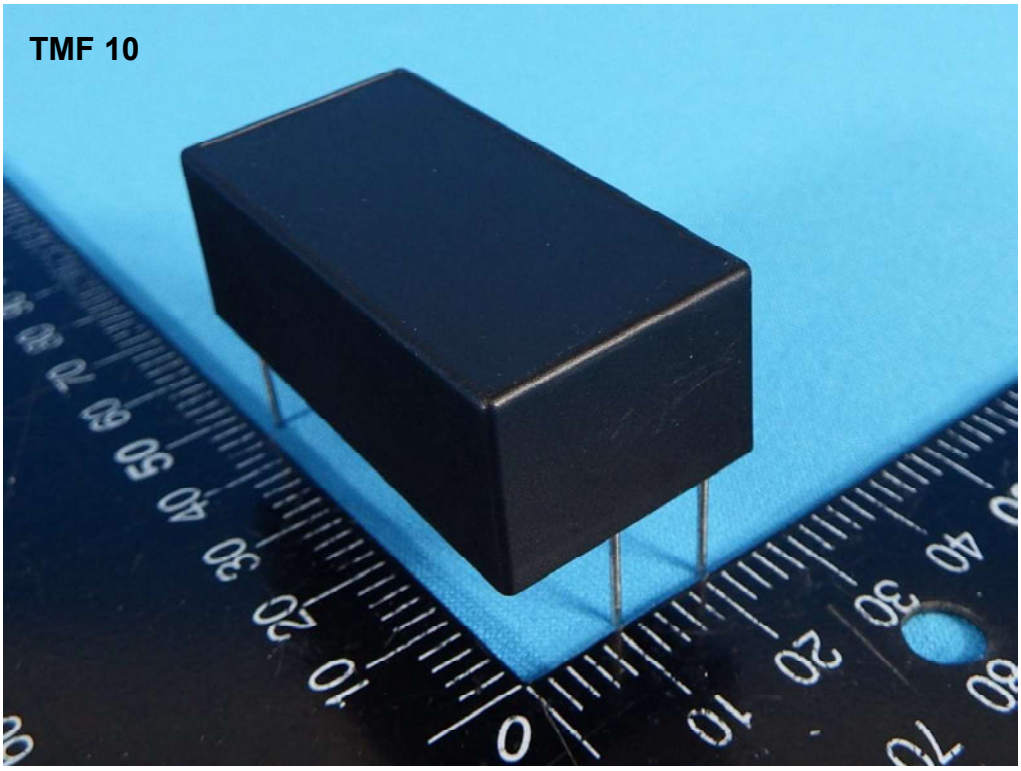

KXJ
450V
12 μF
KXJ
450V
12 μF
mm

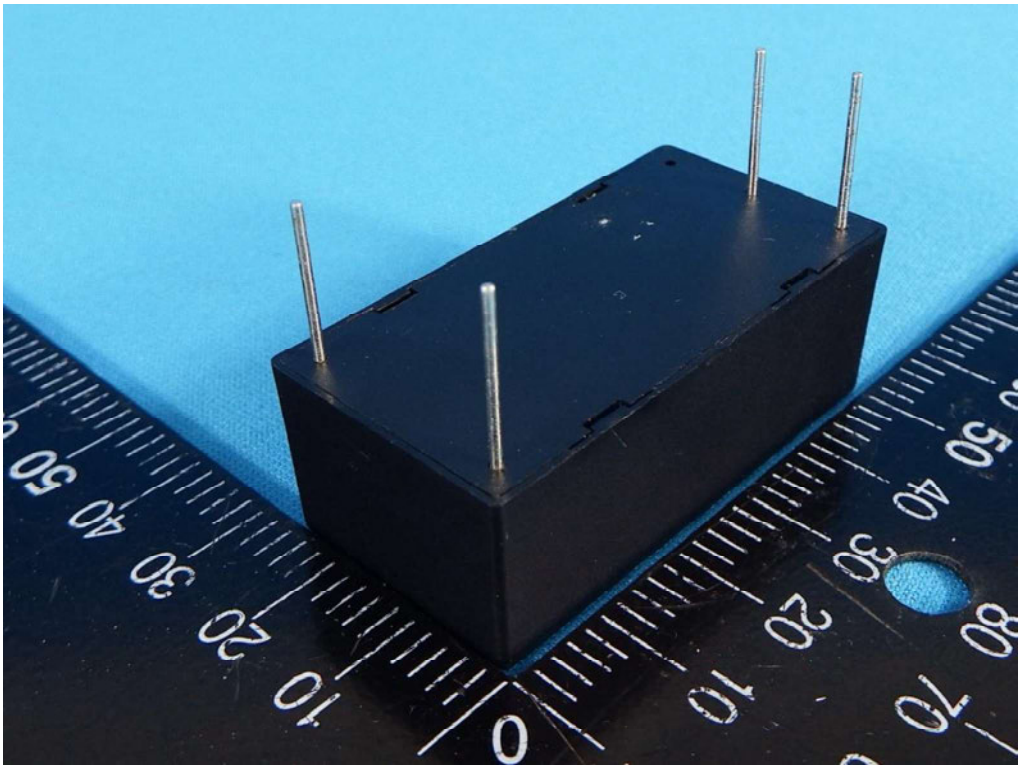

KXJ
450V
12 μF
KXJ
450V
mm

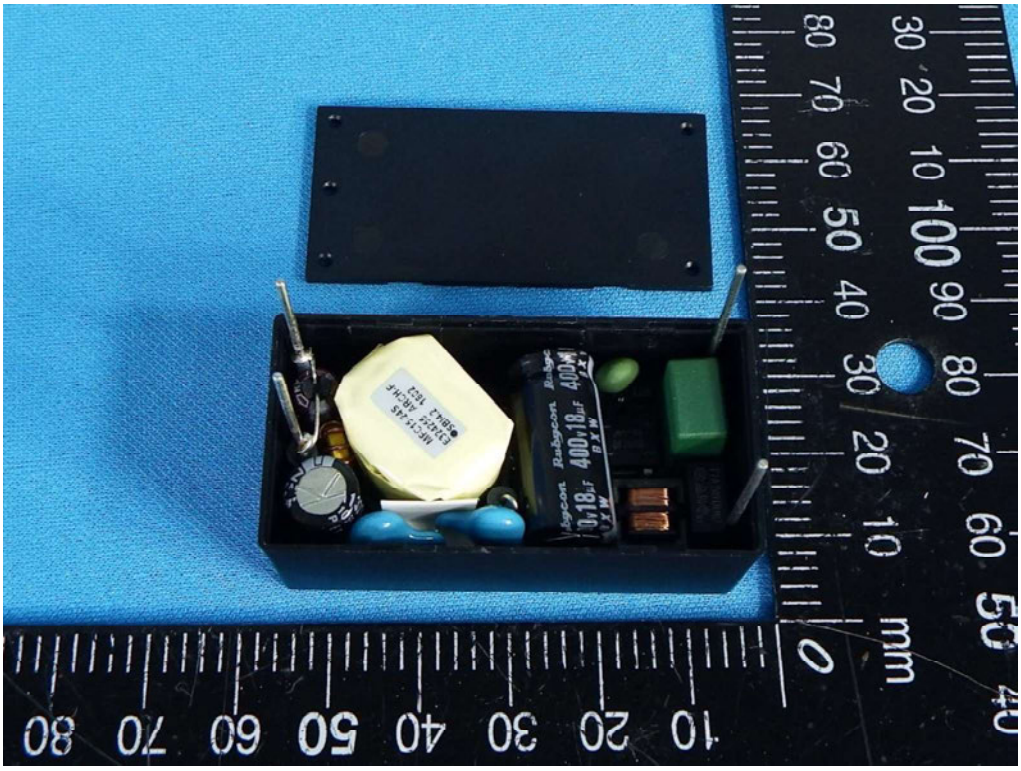

MFC15-24S
E324255 ARCH-F
SBI4.2 1602

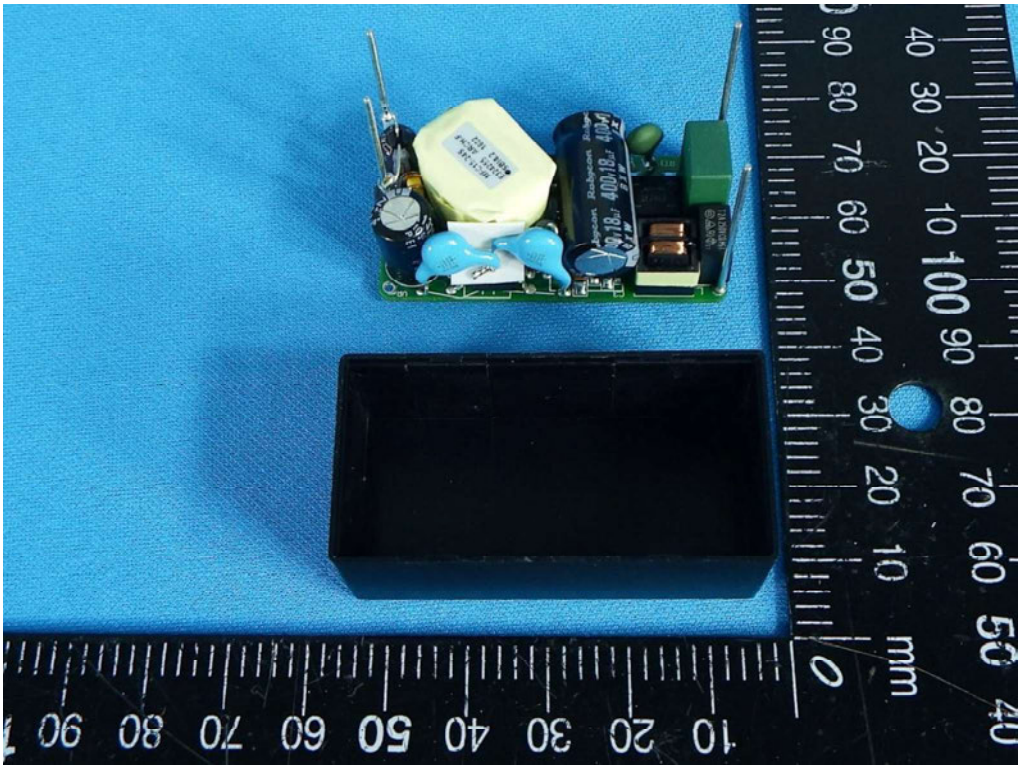

MVC05-S
V1.0 B
BD1
BT18S
C3
C14
C8
R10
R11
D1
D8
R1
R2
R3
R13
R6
C23
40
30
20
10
0
mm
10
20
30
40
50
60

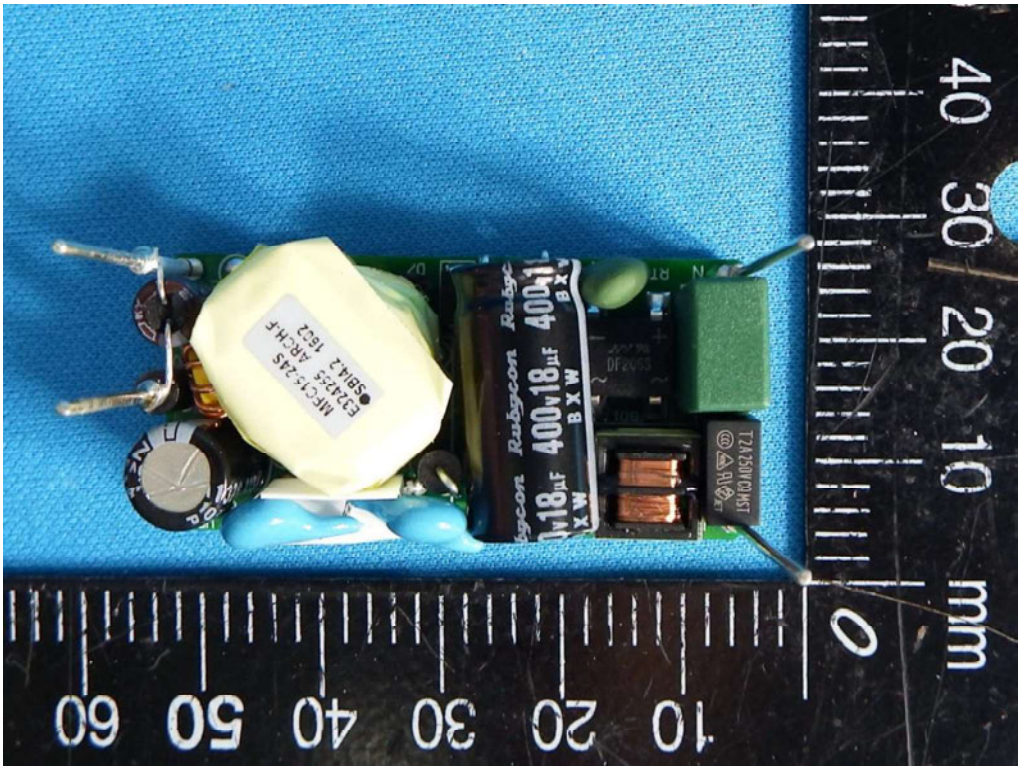
TMF 10

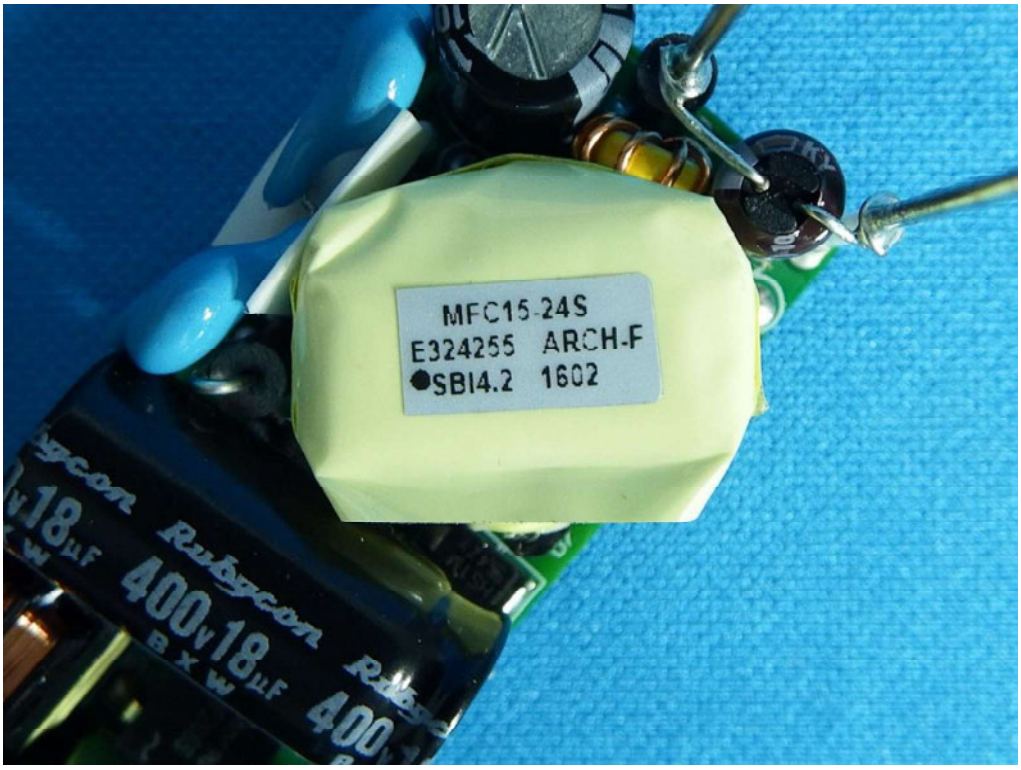


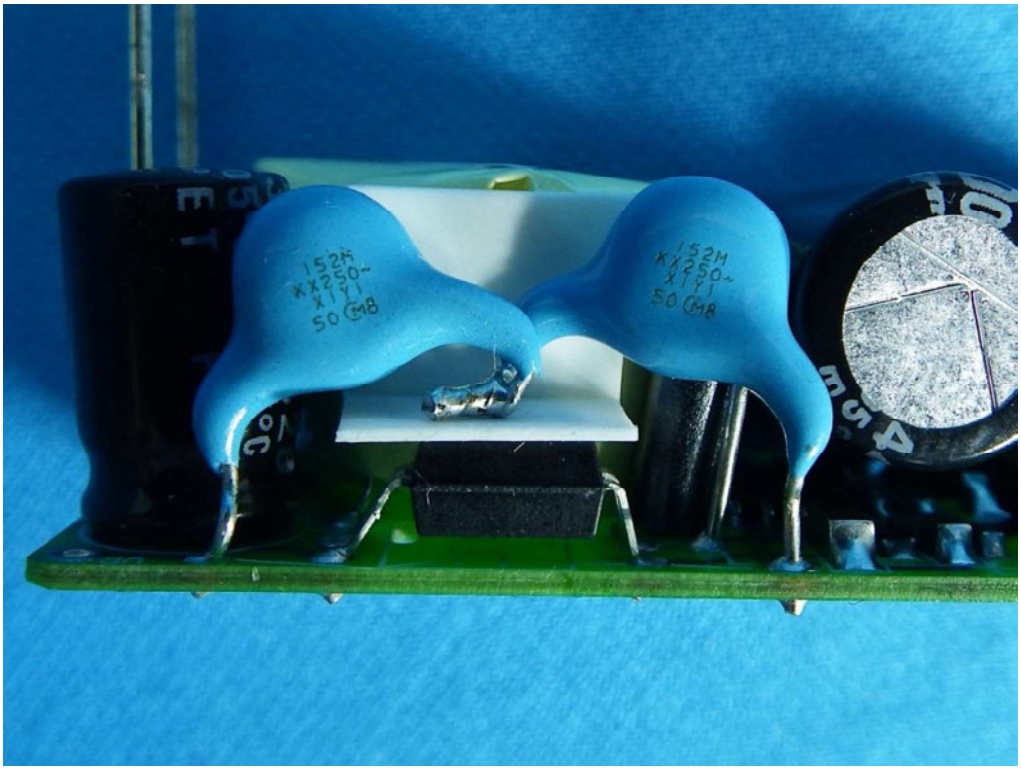


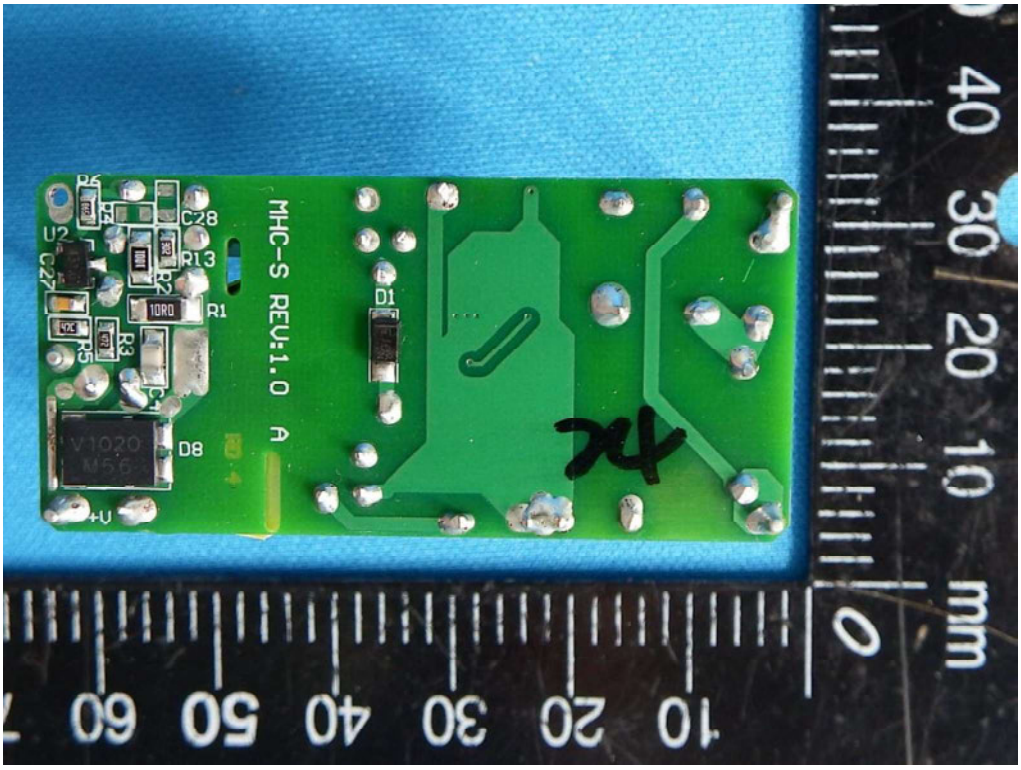

Rubycon
400V
0.18μF
mm


Rubycon
400V
0.18μF
mm

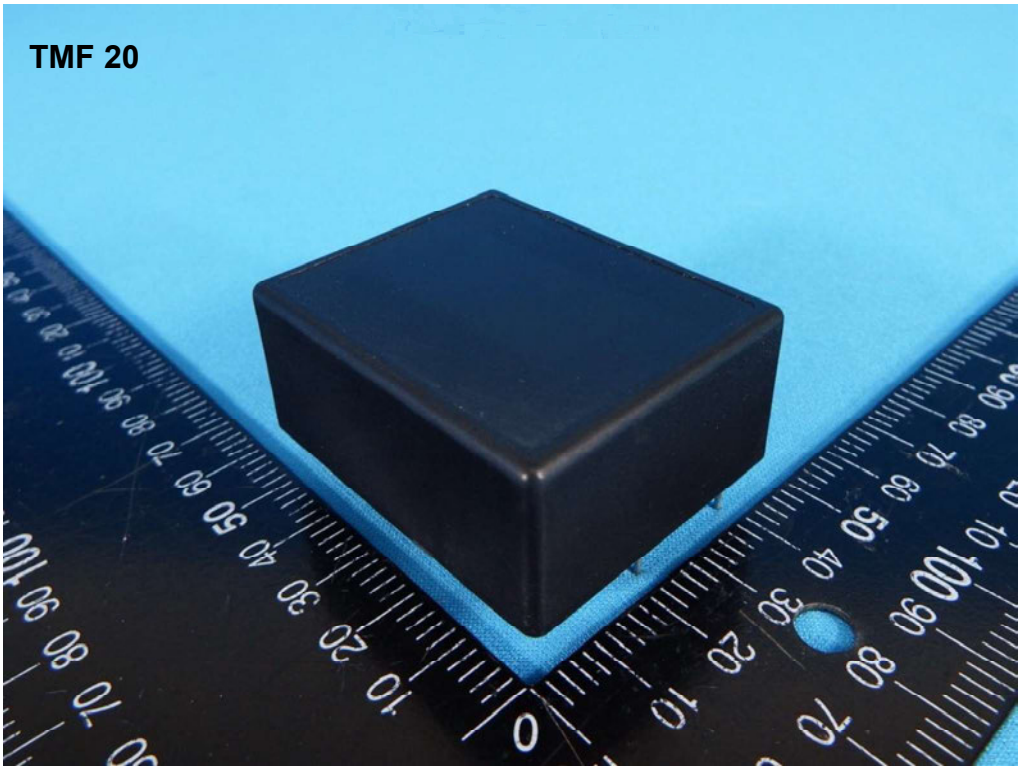

Rubycon
400V 18μF
BXW
MFC15-24S
E324255 ARCH-F
SBI4.2 1602
mm

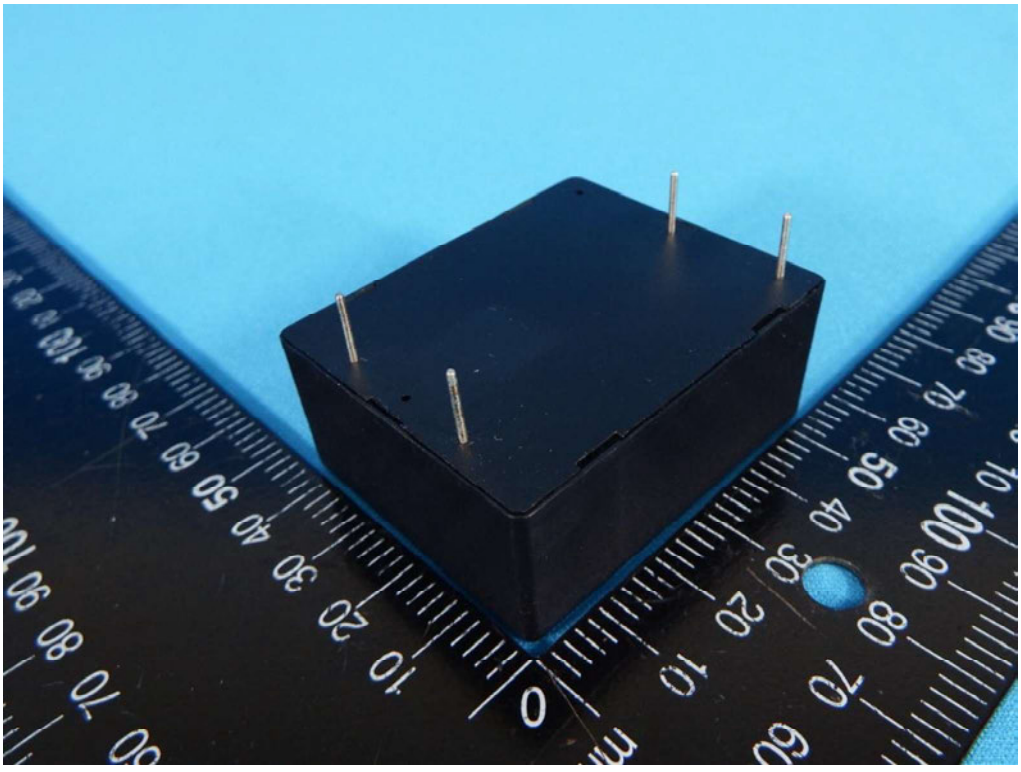

MFC15-24S
E324255 ARCH-F
SBI4.2 1602
Rubycon
400V 18μF
BXW

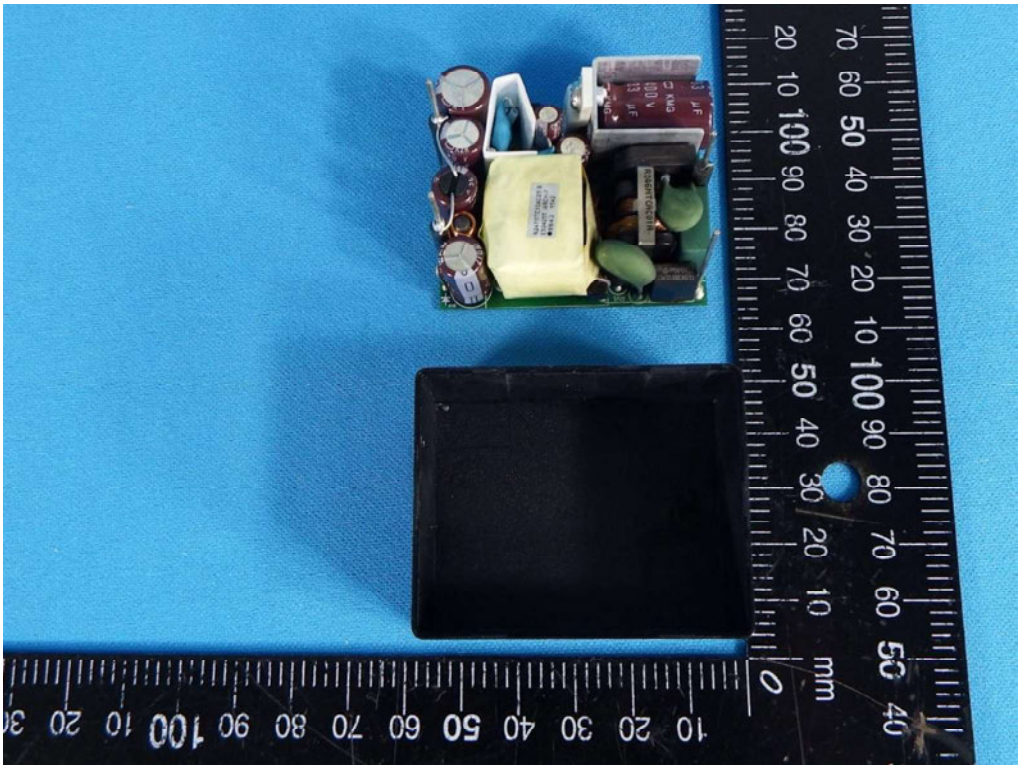

152M
X2250~
X1 I1
50 CM8
152M
X2250~
X1 I1
50 CM8

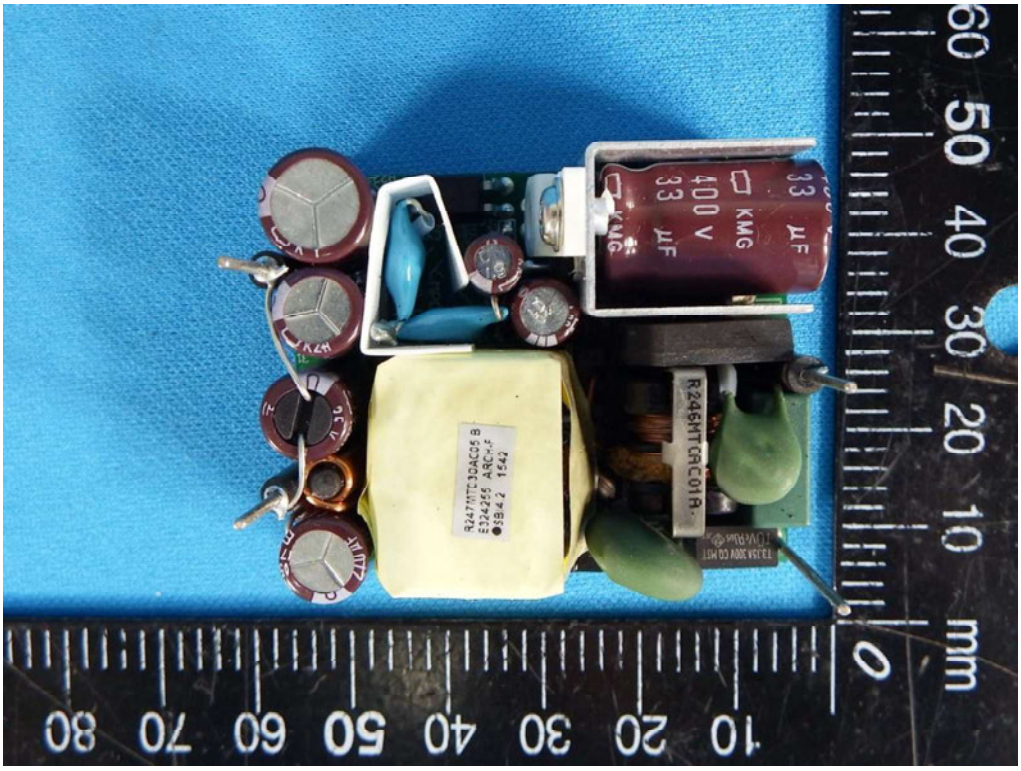

MHC-S REV:1.0 A
C28
R13
R1
D1
D8
U2
C27
R3
R5
V1020
M56
+U
74
40
30
20
10
0
mm
10
20
30
40
50
60

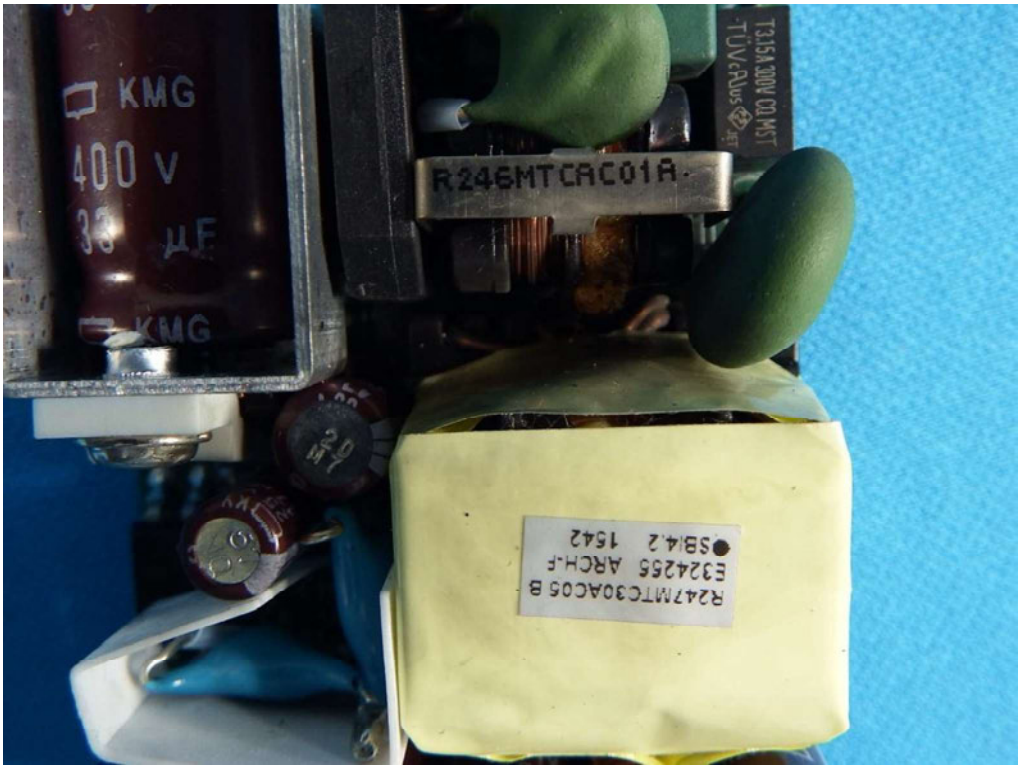
TMF 20

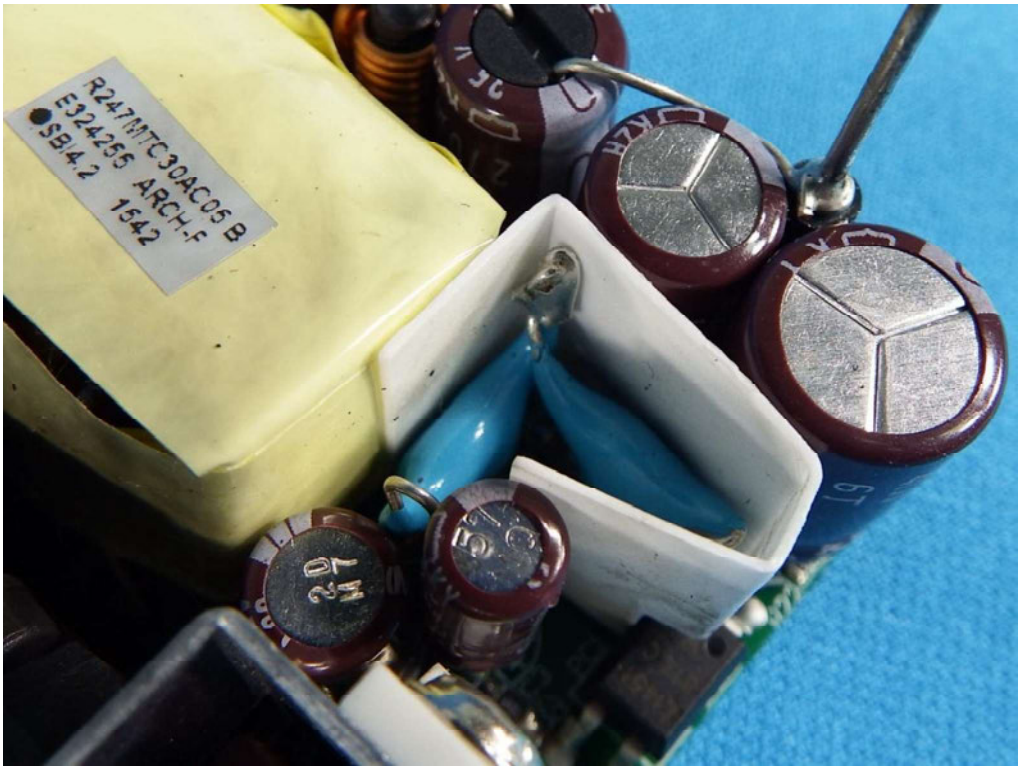


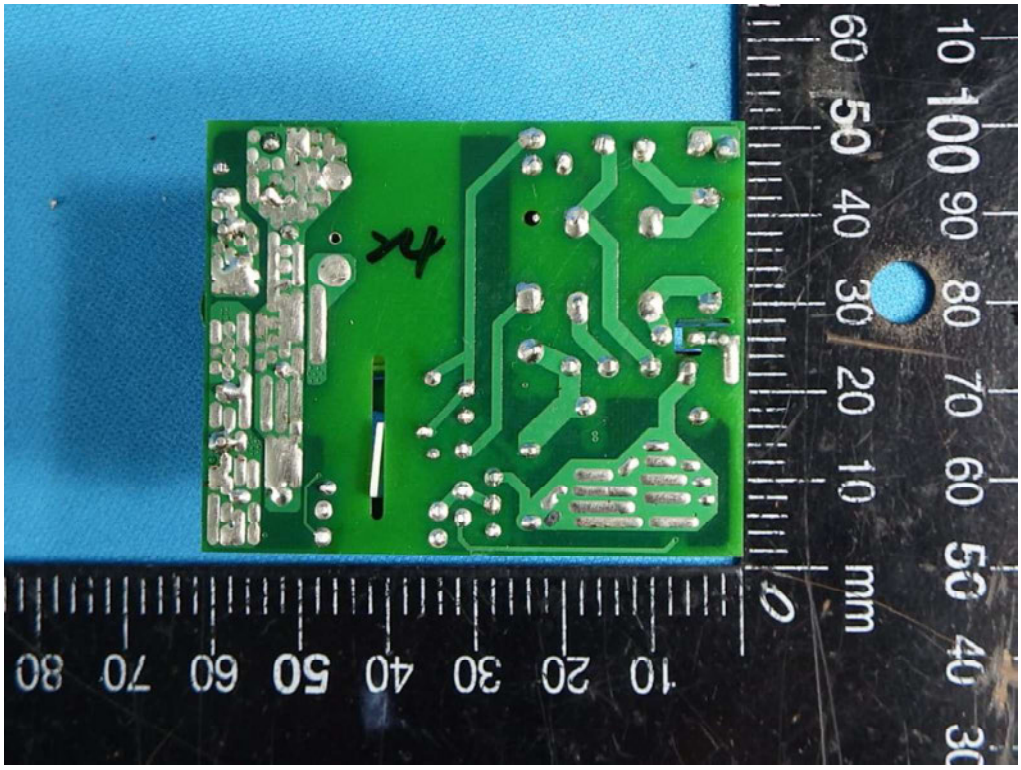




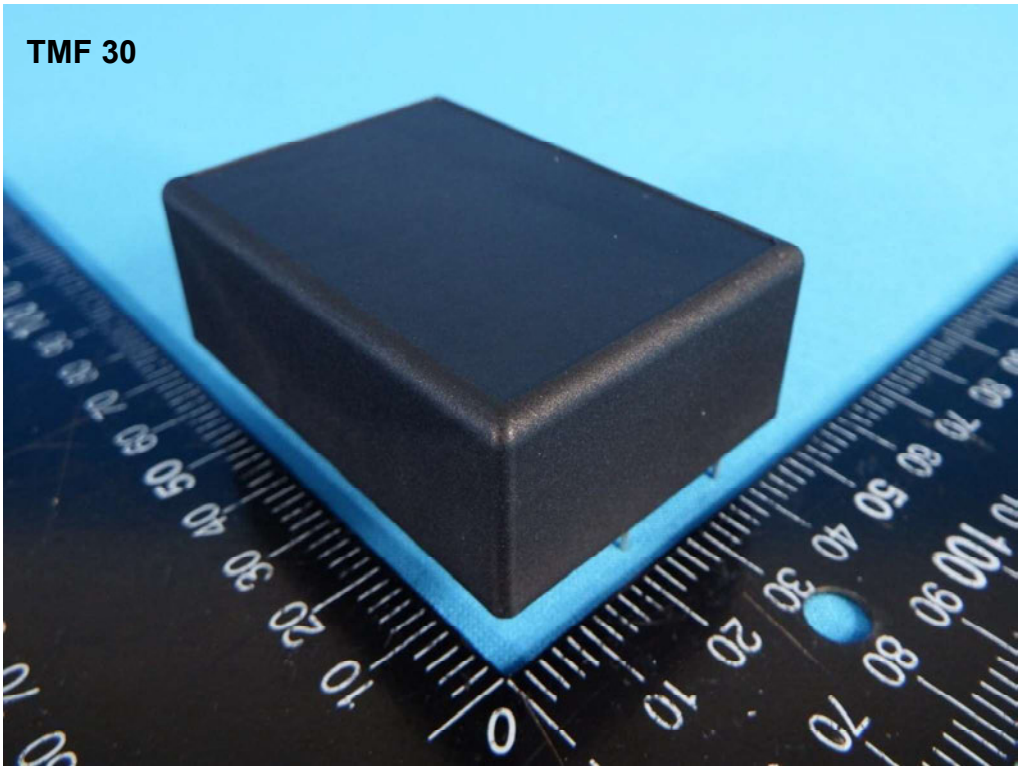

33 µF
KMG
400 V
33 µF
KMG
R246MTCAC01A
R247MTC30AC05 B
E324255 ARCH-F
SB4.2 1542
T315A 300V CO MST
TÜVRhus
60 50 40 30 20 10 mm 0
80 70 60 50 40 30 20 10

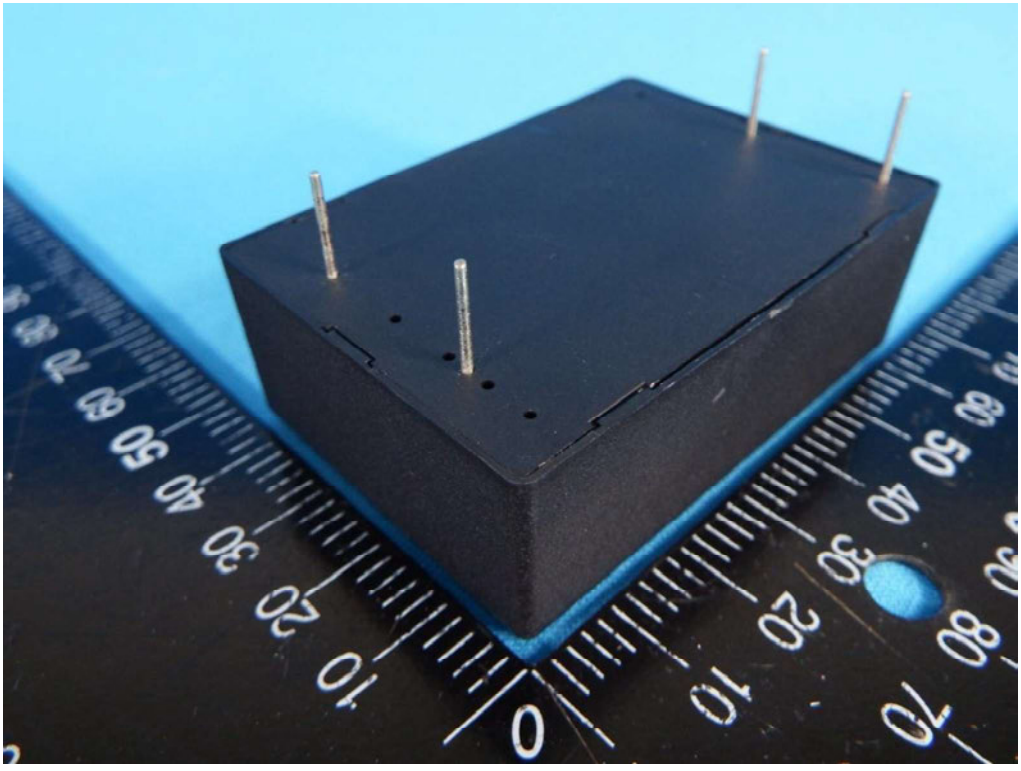

KMG
400 V
33 µF
KMG
R246MTCAC01A
T315A 300V CO MST
TÜVRhus
R247MTC30AC05 B
E324255 ARCH-F
SB4.2 1542

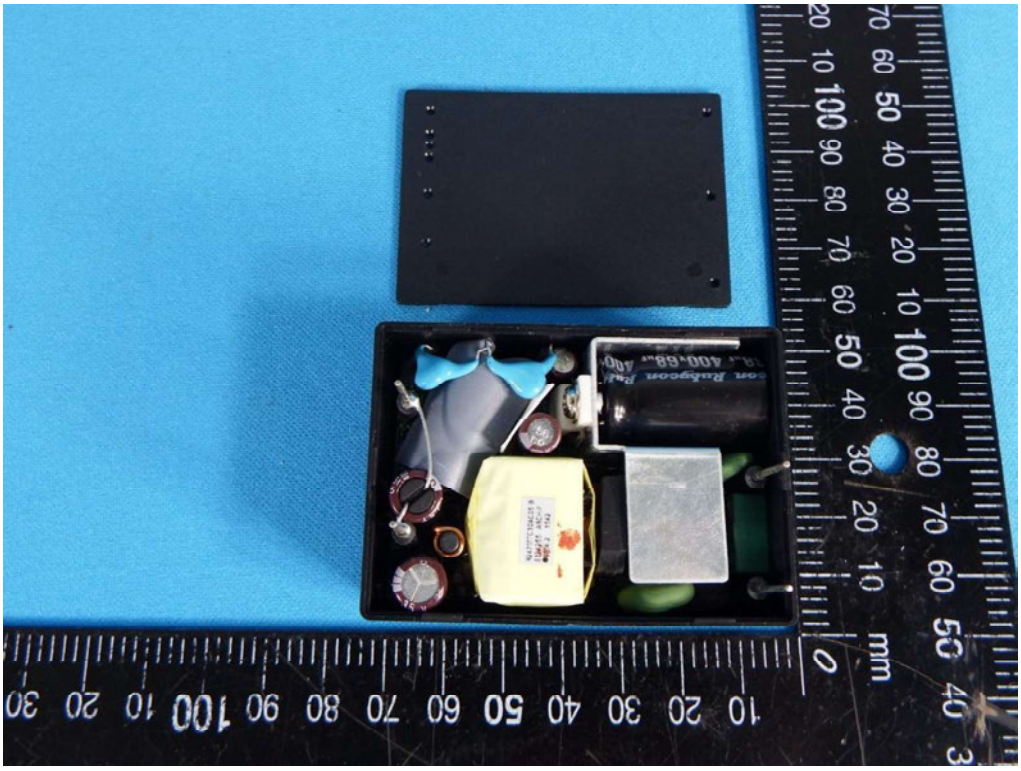

R247MTC30AC05 B
E324255 ARCH-F
SB/4.2 1542

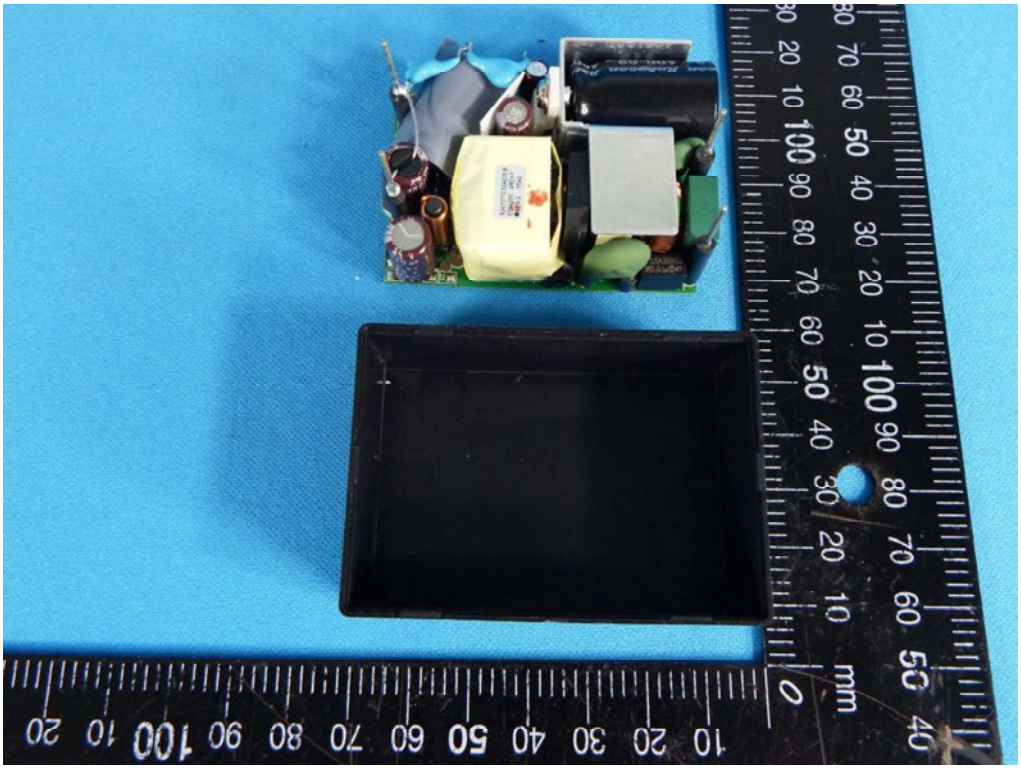

mm

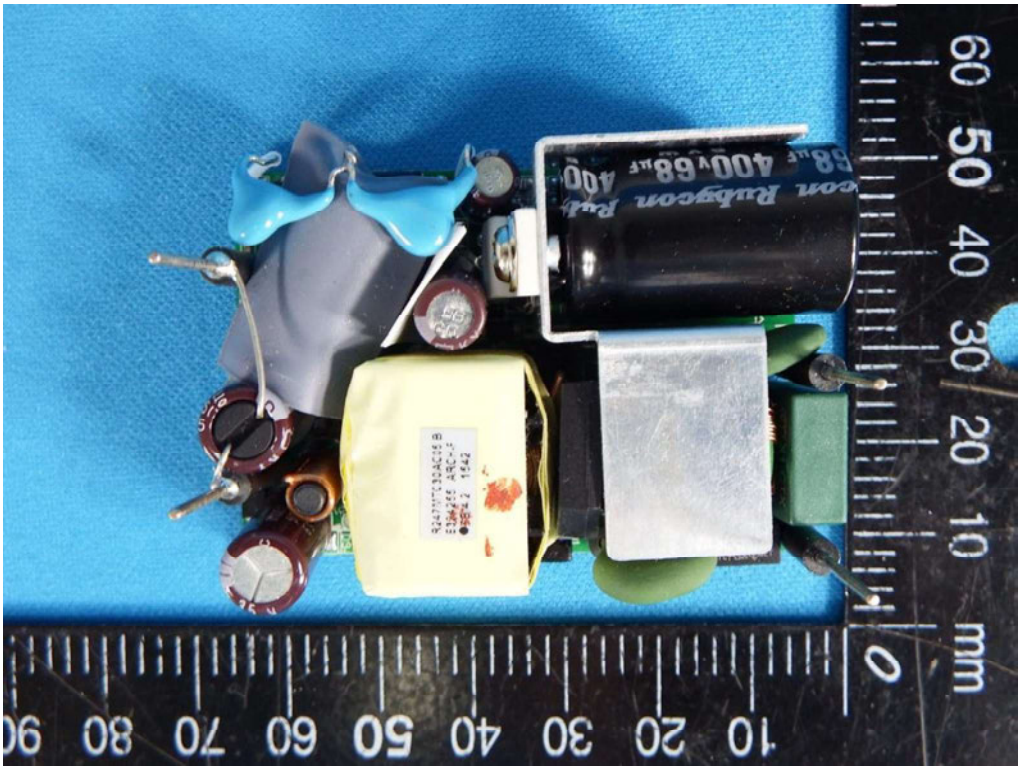
TMF 30

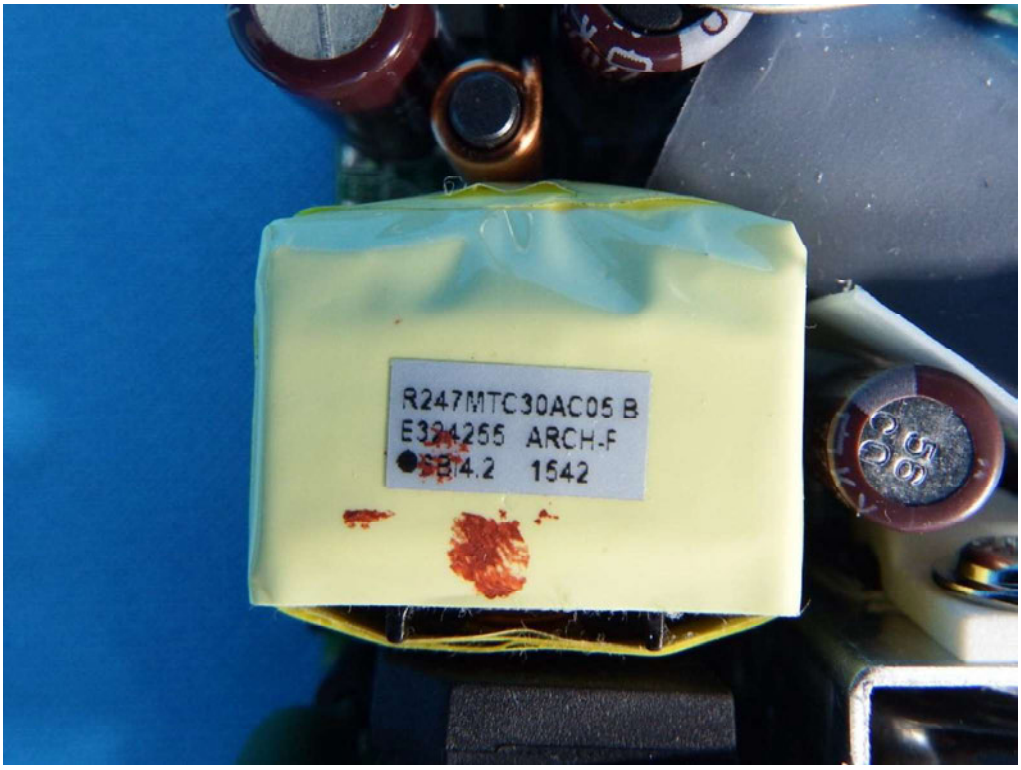


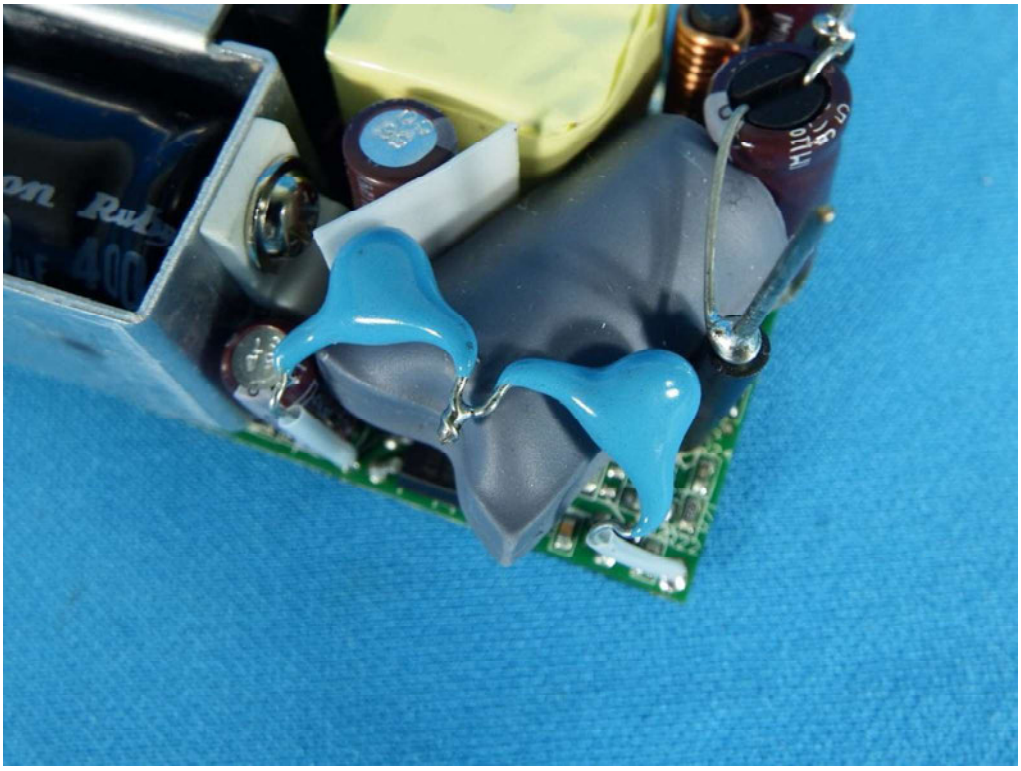


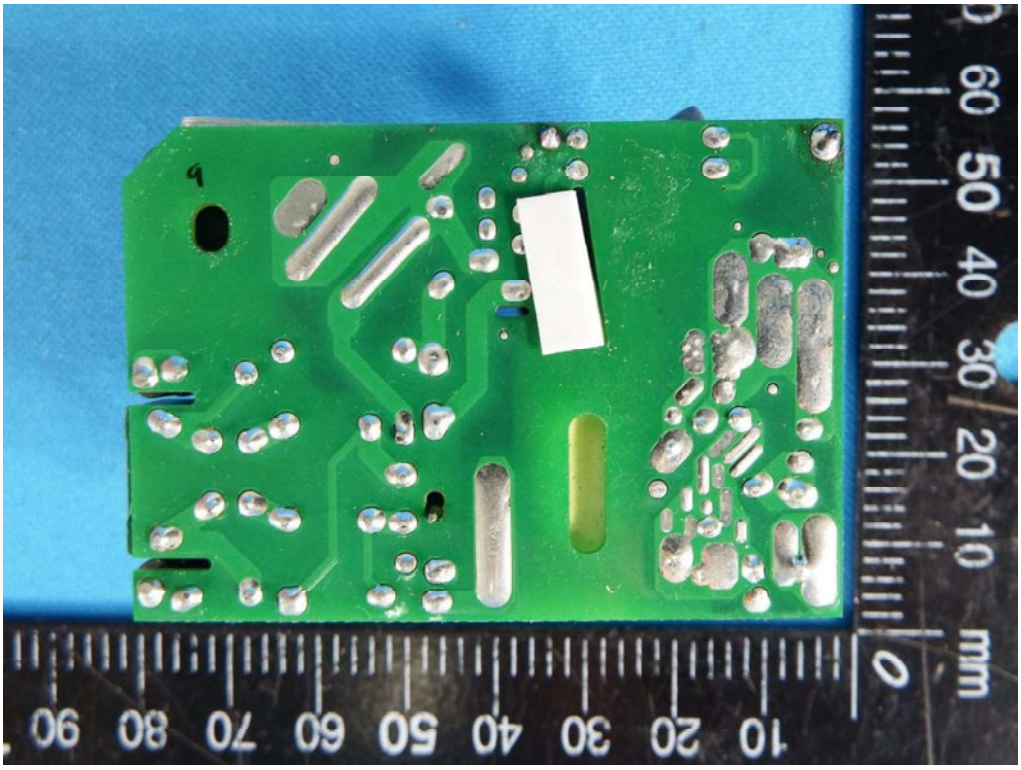





60 50 40 30 20 10 0 mm
10 20 30 40 50 60 70 80 90


R247MTC30AC05 B
E324255 ARCH-F
SB4.2 1542




60 50 40 30 20 10 mm
10 20 30 40 50 60 70 80 90