



EMC COMPLIANCE TEST REPORT

The product

Equipment Under Test	: Uninterruptible Power System
Model Number	: SC450RM11U
Product Series	: N/A
Report Number	: HA190575-CE
Issue Date	: 11-SEP-2019

is produced by

American Power Conversion Holdings Inc., Taiwan Branch
3F., No. 205, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan R.O.C.



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Release control Record

Issue No.	Description	Issued Date
HA190575-CE	Original release.	11-SEP-2019



Verification

Applicant : American Power Conversion Holdings Inc., Taiwan Branch
Manufacturer : American Power Conversion Holdings Inc., Taiwan Branch
Equipment Under Test : Uninterruptible Power System
Model Number : SC450RMI1U
Product Series : N/A
Sample Received Date : 19-JUN-2019
Test Standard :

Emission:	Immunity:
<input checked="" type="checkbox"/> EN 62040-2:2006+AC:2006 IEC 62040-2:2005 Environment : First Classification of EUT : Category C2 <input checked="" type="checkbox"/> IEC 61000-3-2:2014	<input checked="" type="checkbox"/> EN 62040-2:2006+AC:2006 IEC 62040-2:2005 Environment : First Classification of EUT : Category C2 <input checked="" type="checkbox"/> IEC 61000-4-2:2008 <input checked="" type="checkbox"/> IEC 61000-4-3:2006+A1:2007+A2:2010 <input checked="" type="checkbox"/> IEC 61000-4-4:2012 <input checked="" type="checkbox"/> IEC 61000-4-5:2014 <input checked="" type="checkbox"/> IEC 61000-4-6:2013 <input checked="" type="checkbox"/> IEC 61000-4-8:2009 <input checked="" type="checkbox"/> IEC 61000-2-2:2002

Remark:

This report details the results of the test carried out on one sample. This report shows the EUT is technically compliant with the EN 60204-2 official requirements. This report applies to the above sample only and shall not be reproduced in part without written approval of HongAn Technology Co., Ltd.

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Date: 11-SEP-2019

Cherry Chi / ADM. Dept. Staff

Tested by:

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Date: 05-SEP-2019

M.S. Shi / ENG. Dept. Staff

Approved by:

Adam Yang

Date: 11-SEP-2019

Adam Yang / SEC. Manager



Summary of Test Result - Emission

Emission			
Test Standard	Test Item	Test Result	Remark
EN 62040-2 Category C2	Conducted Emission	Pass	Highest Emission-(LINE mode) L: 2.201MHz, A.V. 43.61dBuV, Margin -16.39dB N: 2.249MHz, A.V 40.52dBuV, Margin -19.48dB
			Highest Emission-(Battery mode) L: 0.166MHz, Q.P. 49.97dBuV, Margin -29.03dB N: 6.698MHz, Q.P 42.84dBuV, Margin -30.16dB
EN 62040-2 Category C2	Radiated Emission	Pass	Highest Emission-(LINE mode) H: 153.200MHz, 33.37dBuV, Margin -6.63dB Antenna Height 399cm, Turntable Angle 62° V: 71.581MHz, 32.94dBuV, Margin -7.06dB Antenna Height 100cm, Turntable Angle 78°
			Highest Emission-(Battery mode) H: 153.200MHz, 35.27dBuV, Margin -4.73dB Antenna Height 396cm, Turntable Angle 74° V: 162.611MHz, 33.85dBuV, Margin -6.15dB Antenna Height 103cm, Turntable Angle 139°
IEC 61000-3-2	Harmonic	Pass	Refer to Page 28~29

Measurement Uncertainty

Where relevant, the following measurement uncertainty levels has been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Test Item	Expanded Uncertainty (±)	Maximum allowable uncertainty (±)
Conducted emission at AC mains power using a V-AMN, 9kHz – 150kHz	2.83dB	3.8dB (U_{Cispr})
Conducted emission at AC mains power using a V-AMN, 150kHz - 30MHz	2.93dB	3.4dB (U_{Cispr})
Conducted emission at telecommunication port using AAN, 150kHz - 30MHz	4.50dB	5.0dB (U_{Cispr})
Radiated emission, 30MHz-1GHz	4.98dB	6.3dB (U_{Cispr})
Radiated emission, 1GHz – 6GHz	4.32dB	5.2dB (U_{Cispr})

This reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95%.



Summary of Test Result – Immunity

Immunity (Environment : First / Classification of EUT : Category C2)				
Test Standard	Test Item	Performance Criteria	Observed Result Class	Test Result
IEC 61000-4-2	Electrostatic Discharge	B	A	Pass
IEC 61000-4-3	Radiated Susceptibility	A	A	Pass
IEC 61000-4-4	Electrical Fast Transient	B	A	Pass
IEC 61000-4-5	Surge	B	A	Pass
IEC 61000-4-6	Conducted Susceptibility	A	A	Pass
IEC 61000-4-8	Magnetic Field	B	A	Pass
IEC 61000-2-2	Low Frequency Signals Immunity Test	A	A	Pass



1 General Description

1.1 Description of EUT

Equipment Under Test	:	Uninterruptible Power System
Model Number	:	SC450RMI1U
Product Series	:	N/A
Applicant	:	American Power Conversion Holdings Inc., Taiwan Branch
Address of Applicant	:	3F., No. 205, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan R.O.C.
Manufacturer	:	American Power Conversion Holdings Inc., Taiwan Branch
Address of Manufacturer	:	3F., No. 205, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan R.O.C.
Power Supply	:	Input : AC 230V~, 50-60Hz, 2.5A Output : AC 230V~, 50-60Hz, 2.00A, 450VA, 280W Power Cord: <input type="checkbox"/> Shielded <input checked="" type="checkbox"/> Non-Shielded <input checked="" type="checkbox"/> Detachable, 1.5 <input type="checkbox"/> Un-Detachable <input type="checkbox"/> w Ferrite Core <input checked="" type="checkbox"/> w/o Ferrite Core
I/O Port	:	LAN*2, INPUT*1, OUTPUT*4, RS232*1
Data Cable	:	RS232 Cable <input type="checkbox"/> Shielded <input checked="" type="checkbox"/> Non-Shielded <input checked="" type="checkbox"/> Detachable, 1.2m <input type="checkbox"/> Un-Detachable <input type="checkbox"/> with Ferrite Core <input checked="" type="checkbox"/> w/o Ferrite Core
Description of EUT	:	Dimensions: 44cm (L) X 38cm (W) X 3.8cm (H) Position: <input checked="" type="checkbox"/> Table-top / <input type="checkbox"/> Floor-standing Environment: <input checked="" type="checkbox"/> First environment / <input type="checkbox"/> Second environment Category of Equipment: <input type="checkbox"/> C1 <input checked="" type="checkbox"/> C2 <input type="checkbox"/> C3 <input type="checkbox"/> C4 Intended Function: The EUT is a Uninterruptible Power System.



1.2 Test Facility

All the Conducted and Radiated Emission Tests and Immunity Tests are performed at No. 15-1, Cweishuh Keng, Cweipin Village, Linkou, New Taipei City, Taiwan, R.O.C.

1.3 Test Instruments

1.3.1 Instruments Used for Emission Measurement

Instrument Name	Manufacture	Model Number	Serial Number	Last Cal. Date	Next Cal. Date
LISN	EMCO	3810/2NM	9702-1819	11-Jul-2019	10-Jul-2020
LISN	Rolf Heine Hochfrequenz- technik	NNB-4/32T	00001	10-Mar-2019	09-Mar-2020
EMI Receiver	R&S	ESR	101970	21-Sep-2018	20-Sep-2019
EMI Receiver	R&S	ESCI 7	100931	08-Aug-2019	07-Aug-2020
Preamplifier	CHASE	CPA 9231A	0405	24-Dec-2018	23-Dec-2019
Bilog Antenna	TESEQ	CBL6111D	25769	29-Jan-2019	28-Jan-2020
Bilog Antenna	TESEQ	CBL6111D	38521	03-Oct-2018	02-Oct-2019
Software	Audix	e3	N/A	N/A	N/A
Signal conditioning unit	TESEQ	CCN 1000-1	1918A03073	08-Jul-2019	07-Jul-2020
AC Power Source	TESEQ	NSG 1007	1919A00280	08-Jul-2019	07-Jul-2020
Software	TESEQ	Win2100V4 (Version 4.23.0)	N/A	N/A	N/A

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.



1.3.2 Instruments Used for Immunity Measurement

Instrument Name	Manufacture	Model Number	Serial Number	Last Cal. Date	Next Cal. Date
Electrostatic Discharge Simulator	Noiseken	ESS-B3011	ESS1632985	16-May-2019	15-May-2020
Discharge Gun	Noiseken	GT-30R	ESS1632993	16-May-2019	15-May-2020
Power Generator, Mains Coupler/ Decoupler	ThermoFisher	EMC Pro PLUS	1507189	08-Jul-2019	07-Jul-2020
Capacitor Clamp	ThermoFisher	CCL	1507182	08-Jul-2019	07-Jul-2020
Magnetic Field Immunity Loop	FCC	F-1000-4-819/10-L-1M	9953	24-May-2019	23-May-2020
Signal Generator	R&S	SMB100A	110549	21-Sep-2018	20-Sep-2019
Wide Band Amplifier	ifi	CMX50	D019-0200	N/A	N/A
RF Power Amplifier	ar	150W1000	0343919	N/A	N/A
RF Amplifier	ar	15S1G3	306578	N/A	N/A
Double-Ridged Waveguide Horn	EMCO	3115	9912-5992	15-May-2019	14-May-2020
Bilog Antenna	TESEQ	CBL6111D	47016	08-Jul-2019	07-Jul-2020
Broadband Field Meter	Narda	NBM-520	D-0519	15-Nov-2018	14-Nov-2019
Probe	Narda	EF-0691	D-0102	15-Nov-2018	14-Nov-2019
CDN	FCC	FCC-801-M3-32A	2019	28-Jan-2019	27-Jan-2020
CDN	FCC	FCC-801-M3-32A	20116	18-Feb-2019	17-Feb-2020
Power Sensor	TESEQ	PM6003	074395	01-Aug-2019	31-Jul-2020
Power Sensor	TESEQ	PM6003	074396	01-Aug-2019	31-Jul-2020
Software	Audix	i2	N/A	N/A	N/A
Software	KeyTek	KeyTek-CEWare32	N/A	N/A	N/A

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.



1.4 Test Methodolgy

All Emission Tests were performed according to the procedures specified in EN 62040-2.

All Immunity Tests were performed according to the procedures specified in EN 62040-2.

Deviations from the test standards as below description:

Test Category is according to customer requirements.

1.5 Auxiliary Equipments

Provided by HongAn Technology Co., Ltd.

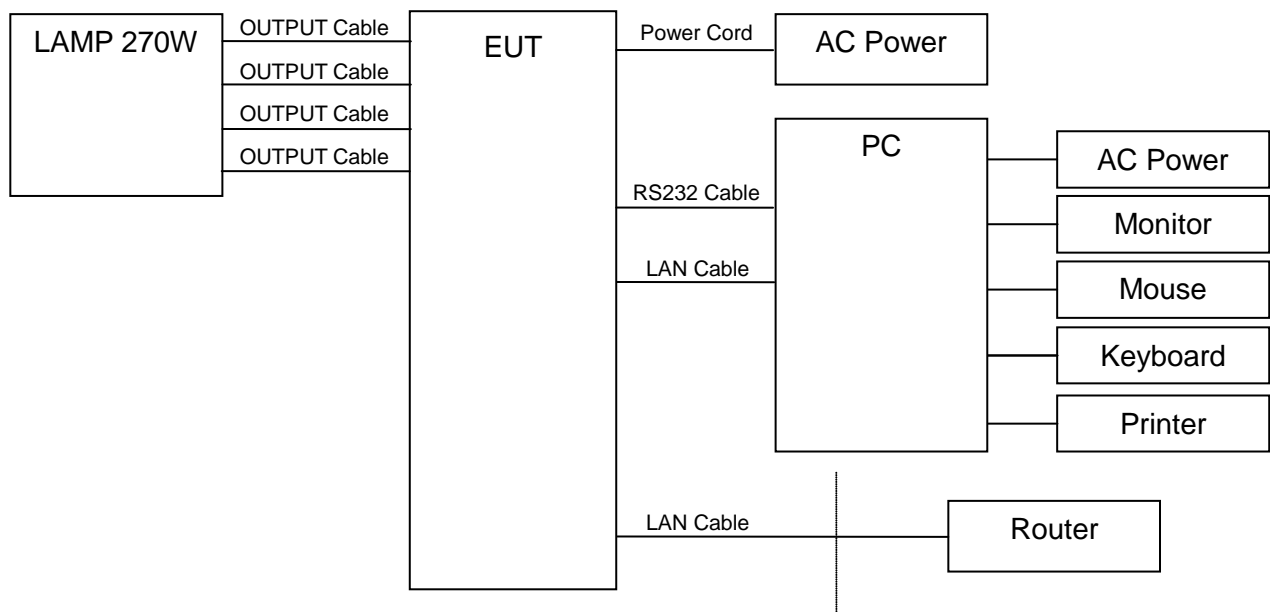
No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Description	
						Data Cable	Power Cable
1	PC	HP ProDesk 400G2 MT	SGH528TFSC	FCC DoC, BSMI ID R33001	Hewlett Packard	N/A	Unshielded *1.5m
2	Keyboard	PK110U	AUT1034004409	CE Mark, FCC DoC, BSMI ID R41108	ASUS	Shielded(Foil) *1.5m, W/O Core	N/A
3	Mouse	MO96UOB	96NO35688	CE Mark, FCC DoC, BSMI ID R41108	ASUS	Shielded(Foil) *1.8m, W/O Core	N/A
4	Monitor	E1709Wc	CN-0J672H-64 180-042-3CRH	CE Mark, FCC DoC, BSMI ID R33037	DELL	Shielded(Braid) *1.8m with EMI core*2	Unshielded *1.8m, W/O Core
5	Printer	C6464A	TH14QEBBC4	CE Mark, FCC DoC, 3892H381	Hewlett Packard	Shielded(Briad) *1.8m with EMI core*2	AC to Adapter Unshielded *1.8m, Adapter to Printer Unshielded *1.8m
6	Router	RT-AC54U	F6IT1C001338	BSMI ID D33005	ASUS	N/A	Adapter : Model:WWSU36 12U, Non-shielded, Un-detachable, 1.8m, W/O Core
7	LAMP*1	100W	N/A	N/A	N/A	N/A	N/A
8	LAMP*2	60W	N/A	N/A	N/A	N/A	N/A
9	LAMP*1	50W	N/A	N/A	N/A	N/A	N/A
10	OUTPUT Cable	N/A	N/A	N/A	N/A	N/A	Non-shielded, Detachable, 1.5m, W/O Core
11	LAN Cable	N/A	N/A	N/A	N/A	Shielded, Detachable, 10m, W/O Core	N/A
12	LAN Cable	N/A	N/A	N/A	N/A	Shielded, Detachable, 1.2m, W/O Core	N/A



Provided by the Manufacturer

No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Description	
						Data Cable	Power Cable
1	RS232 Cable	N/A	N/A	N/A	N/A	Non-shielded, Detachable, 1.2m W/O Core	N/A
2	Power Cord	N/A	N/A	N/A	N/A	N/A	Non-shielded, Detachable, 1.5m, W/O Core

1.6 Block Diagram



NOTE: The Router is placed far away from the test scene

1.7 Identifying the Final Test Mode

1. Line mode (Full load).
2. Battery mode (Full load).

Note: Therefore the Final EMC Assessment was performed for the Line mode and Battery mode.

1.8 Final Test Mode

1. For Conducted Emission: choosing LINE Mode (Full load) and Battery Mode (Full load).
2. For Radiated Emission: choosing LINE Mode (Full load) and Battery Mode (Full load).
3. For Immunity test: choosing LINE Mode.

1.9 Condition of Power Supply

AC 230V, 50Hz



1.10 EUT Configuration

1. Setup the EUT as shown in Sec.1.6 Block Diagram.
2. Turn on the power of all equipments.
3. Activate the selected Final Test Mode.

1.11 Immunity Performance Classification

Class	Class Criterion
A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.
B	After the test, the equipment shall continue to operate as intended without operator intervention.
C	Lost of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the user in accordance with the manufacturer's instructions.

1.11.1 Test Methodology

All Emission Tests were performed according to the procedures specified in EN 62040-2. Radiated Emission Test was performed at 10 m distance from antenna to EUT. All Immunity Tests were performed according to the procedures specified in EN 62040-2.

2 Conducted Emission Test

2.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

2.2 Test Arrangement and Procedure

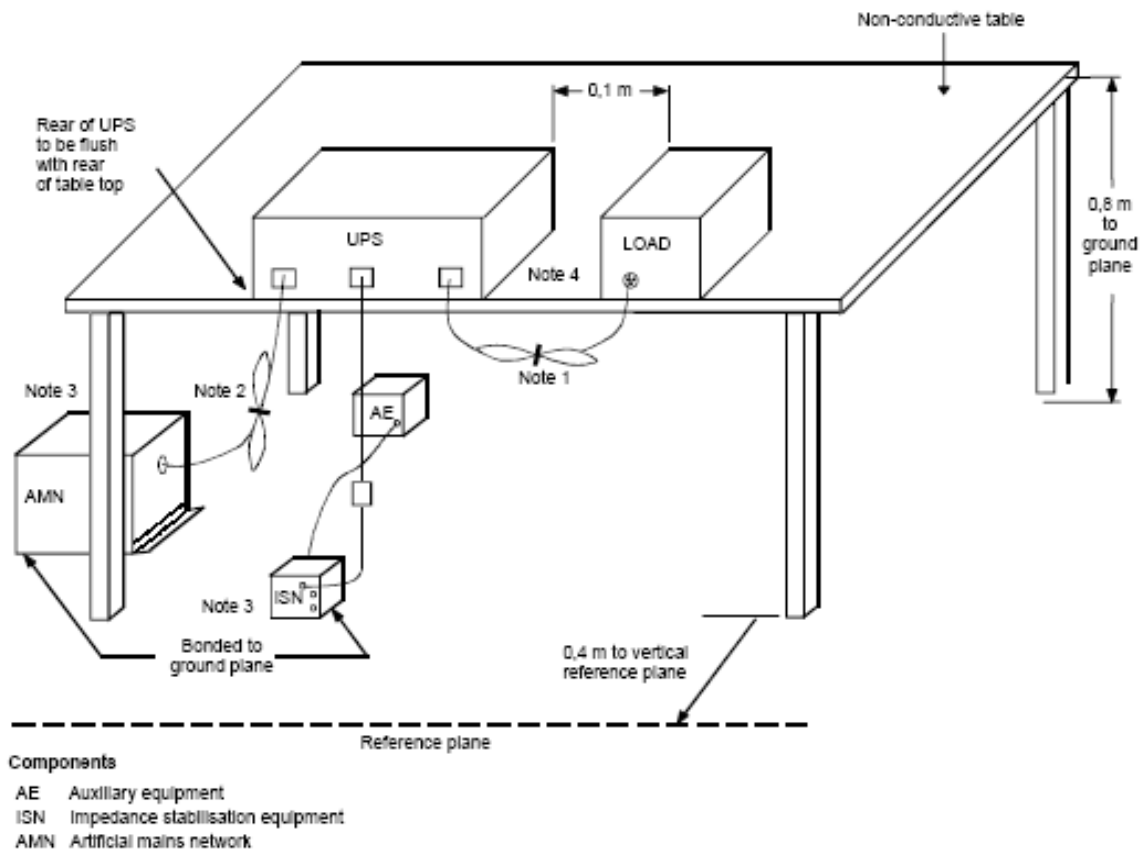


Table-top Equipment

- The EUT was placed on a non-conductive table which was 80 cm above the horizontal coupling plane. The rear of the EUT was 40 cm from the vertical coupling plane.
- The excess interface cables were folded at the cable center into a bundle no longer than 40 cm, so that the bundles were on the table.
- The EUT was connected to the main power through a L.I.S.N. This set up provided 50 ohm / 50 μ H coupling impedance for the measuring equipment.
- All auxiliary equipment received power from a second L.I.S.N.
- The conducted emissions were measured between the Line Phase and the PE ground and between the Neutral Phase and the PE ground using an EMI Receiver.
- The values were recorded.



2.3 Conducted Limit

EN 62040-2

Frequency Range (MHz)	Limits dB(μ V)			
	<input type="checkbox"/> Category C1 UPS		<input checked="" type="checkbox"/> Category C2 UPS	
	Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 to 0.50	66 to 56 ^a	56 to 46 ^a	79	66
0.50 to 5.0 ^b	56	46	73	60
5.0 to 30	60	50	73	60

a The limit decreases linearly with the logarithm of the frequency.

b The lower limit shall apply at the transition frequency.

☐ Category C3 UPS

UPS rated output current A	Frequency Range (MHz)	Limits dB(μ V)	
		Q.P. (Quasi-Peak)	A.V. (Average)
>16 - 100	0.15 to 0.50 ^b	100	90
	0.50 to 5.0 ^b	89	76
	5.0 to 30	90 to 70 ^a	80 to 60 ^a
>100	0.15 to 0.50 ^b	130	120
	0.50 to 5.0 ^b	125	115
	5.0 to 30	115	105

a The limit decreases linearly with the logarithm of the frequency.

b The lower limit shall apply at the transition frequency.

2.4 Test Result

PASS

The final test data are shown on the following page(s).

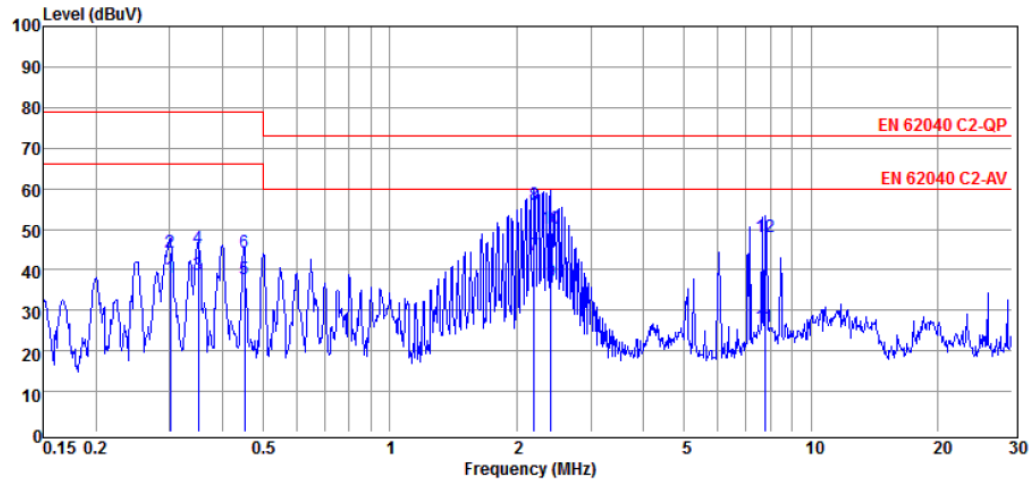
**Conducted Emission Test Data - Line mode**

Test Date : 03-SEP-2019

Power Line : Line

Temperature : 26°C

Humidity : 51%RH



No.	Freq MHz	Reading dBuV	C.F dB	Result dBuV	Limit dBuV	Margin dB	Power Line	Remark
1	0.300	37.94	0.17	38.11	66.00	-27.89	LINE	Average
2	0.300	44.06	0.17	44.23	79.00	-34.77	LINE	QP
3	0.350	38.66	0.19	38.85	66.00	-27.15	LINE	Average
4	0.350	45.02	0.19	45.21	79.00	-33.79	LINE	QP
5	0.452	37.61	0.20	37.81	66.00	-28.19	LINE	Average
6	0.452	44.15	0.20	44.35	79.00	-34.65	LINE	QP
7	2.201	43.29	0.32	43.61	60.00	-16.39	LINE	Average
8	2.201	55.71	0.32	56.03	73.00	-16.97	LINE	QP
9	2.409	36.69	0.33	37.02	60.00	-22.98	LINE	Average
10	2.409	49.73	0.33	50.06	73.00	-22.94	LINE	QP
11	7.769	25.34	0.75	26.09	60.00	-33.91	LINE	Average
12	7.769	47.26	0.75	48.01	73.00	-24.99	LINE	QP

Remark : 1. All readings are Quasi-Peak and Average values.

2. Result = Reading + C.F

3. Margin = Result – Limit

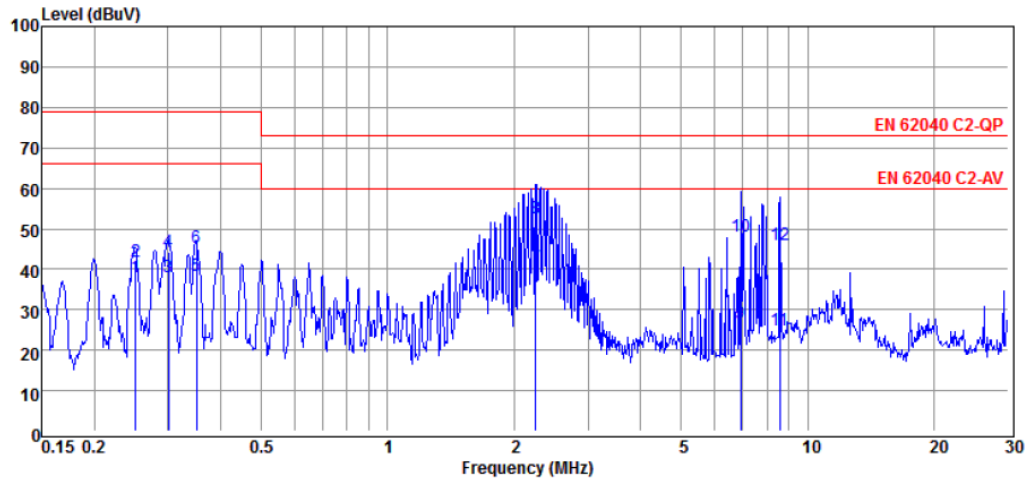
**Conducted Emission Test Data - Line mode**

Test Date : 03-SEP-2019

Power Line : Neutral

Temperature : 26°C

Humidity : 51%RH



No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV	Limit dBμV	Margin dB	Power Line	Remark
1	0.251	37.93	0.15	38.08	66.00	-27.92	NEUTRAL	Average
2	0.251	41.68	0.15	41.83	79.00	-37.17	NEUTRAL	QP
3	0.300	37.93	0.15	38.08	66.00	-27.92	NEUTRAL	Average
4	0.300	44.10	0.15	44.25	79.00	-34.75	NEUTRAL	QP
5	0.350	38.27	0.16	38.43	66.00	-27.57	NEUTRAL	Average
6	0.350	45.14	0.16	45.30	79.00	-33.70	NEUTRAL	QP
7	2.249	40.23	0.29	40.52	60.00	-19.48	NEUTRAL	Average
8	2.249	52.46	0.29	52.75	73.00	-20.25	NEUTRAL	QP
9	6.914	25.92	0.63	26.55	60.00	-33.45	NEUTRAL	Average
10	6.914	47.61	0.63	48.24	73.00	-24.76	NEUTRAL	QP
11	8.592	24.20	0.74	24.94	60.00	-35.06	NEUTRAL	Average
12	8.592	45.23	0.74	45.97	73.00	-27.03	NEUTRAL	QP

Remark : 1. All readings are Quasi-Peak and Average values.

2. Result = Reading + C.F

3. Margin = Result – Limit

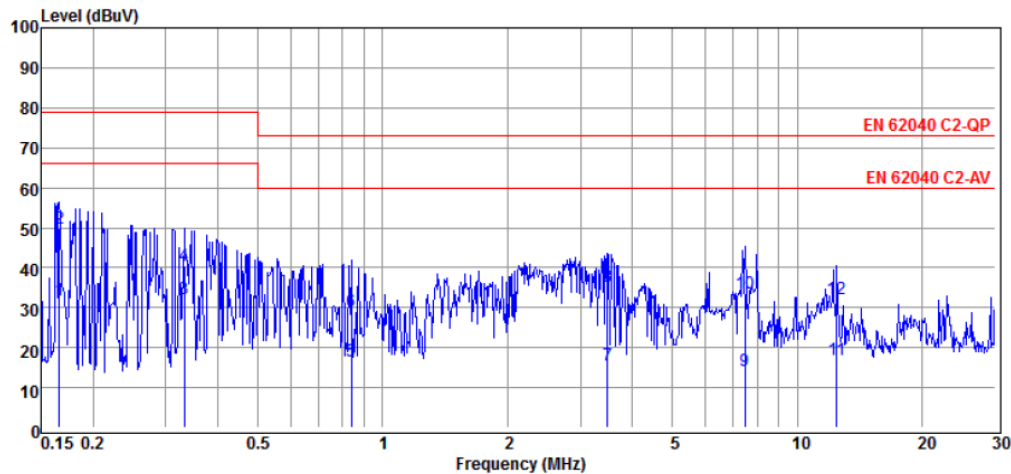
**Conducted Emission Test Data - Battery mode**

Test Date : 03-SEP-2019

Power Line : Line

Temperature : 26°C

Humidity : 51%RH



No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV	Limit dBμV	Margin dB	Power Line	Remark
1	0.166	31.61	0.16	31.77	66.00	-34.23	LINE	Average
2	0.166	49.81	0.16	49.97	79.00	-29.03	LINE	QP
3	0.332	32.09	0.17	32.26	66.00	-33.74	LINE	Average
4	0.332	40.47	0.17	40.64	79.00	-38.36	LINE	QP
5	0.839	16.21	0.23	16.44	60.00	-43.56	LINE	Average
6	0.839	28.84	0.23	29.07	73.00	-43.93	LINE	QP
7	3.491	15.31	0.40	15.71	60.00	-44.29	LINE	Average
8	3.491	34.80	0.40	35.20	73.00	-37.80	LINE	QP
9	7.486	13.58	0.74	14.32	60.00	-45.68	LINE	Average
10	7.486	32.82	0.74	33.56	73.00	-39.44	LINE	QP
11	12.449	16.14	0.98	17.12	60.00	-42.88	LINE	Average
12	12.449	31.28	0.98	32.26	73.00	-40.74	LINE	QP

Remark : 4. All readings are Quasi-Peak and Average values.

5. Result = Reading + C.F

6. Margin = Result – Limit

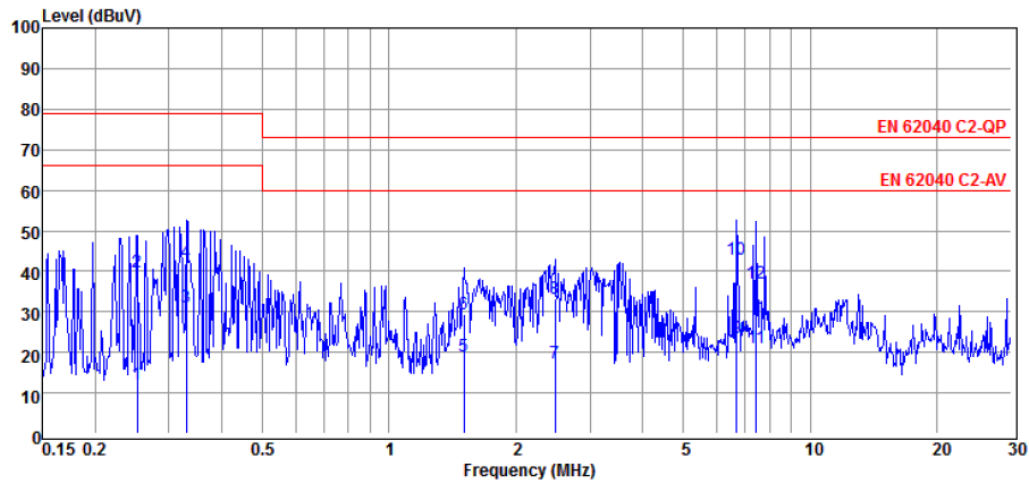
**Conducted Emission Test Data - Battery mode**

Test Date : 03-SEP-2019

Power Line : Neutral

Temperature : 26°C

Humidity : 51%RH



No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV	Limit dBμV	Margin dB	Power Line	Remark
1	0.252	11.81	0.15	11.96	66.00	-54.04	NEUTRAL	Average
2	0.252	39.61	0.15	39.76	79.00	-39.24	NEUTRAL	QP
3	0.330	30.97	0.15	31.12	66.00	-34.88	NEUTRAL	Average
4	0.330	42.20	0.15	42.35	79.00	-36.65	NEUTRAL	QP
5	1.503	18.71	0.25	18.96	60.00	-41.04	NEUTRAL	Average
6	1.503	29.26	0.25	29.51	73.00	-43.49	NEUTRAL	QP
7	2.474	17.00	0.30	17.30	60.00	-42.70	NEUTRAL	Average
8	2.474	32.86	0.30	33.16	73.00	-39.84	NEUTRAL	QP
9	6.698	22.92	0.61	23.53	60.00	-36.47	NEUTRAL	Average
10	6.698	42.23	0.61	42.84	73.00	-30.16	NEUTRAL	QP
11	7.446	20.37	0.67	21.04	60.00	-38.96	NEUTRAL	Average
12	7.446	36.41	0.67	37.08	73.00	-35.92	NEUTRAL	QP

Remark : 4. All readings are Quasi-Peak and Average values.

5. Result = Reading + C.F

6. Margin = Result – Limit



3 Radiated Emission Test

3.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

3.2 Test Arrangement and Procedure

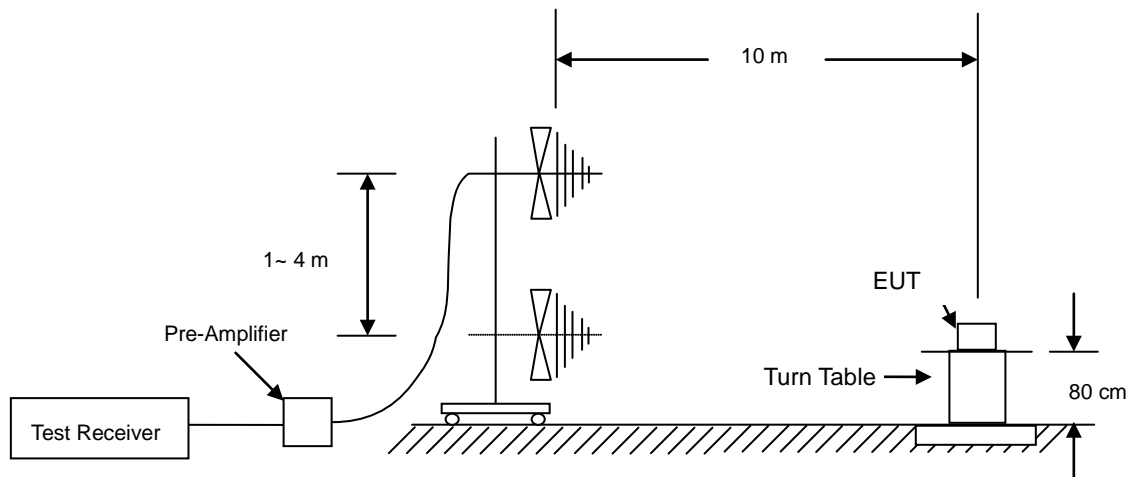


Table-top Equipment

- The EUT was placed on a non-conductive turntable which was 80 cm above the horizontal ground plane. The EUT was set 10 m away from the receiving antenna that was mounted on a non-conductive mast.
- Main cables draped to the ground plane and were routed to the mains power outlet. The mains power outlet was bonded to and did not protrude above the ground plane.
- The antenna was adjusted between 1 m and 4 m in height above the ground plane and the Antenna-to-EUT azimuth was also varied during the measurements to find the top 6 maximum meter readings within the frequency range limit as indicated in Sec 4.3.
- The radiated emissions were measured when the Antenna-to-EUT polarization was set horizontally and vertically.
- The values were recorded.



3.3 Radiated Limit

☒ EN 62040-2

Frequency Range (MHz)	Quasi-Peak dB(μ V/m)		
	<input type="checkbox"/> Category C1 UPS	<input checked="" type="checkbox"/> Category C2 UPS	<input type="checkbox"/> Category C3 UPS
30 to 230	30	40	50
230 to 1000	37	47	60

3.4 Test Result

PASS

The final test data are shown on the following page(s).

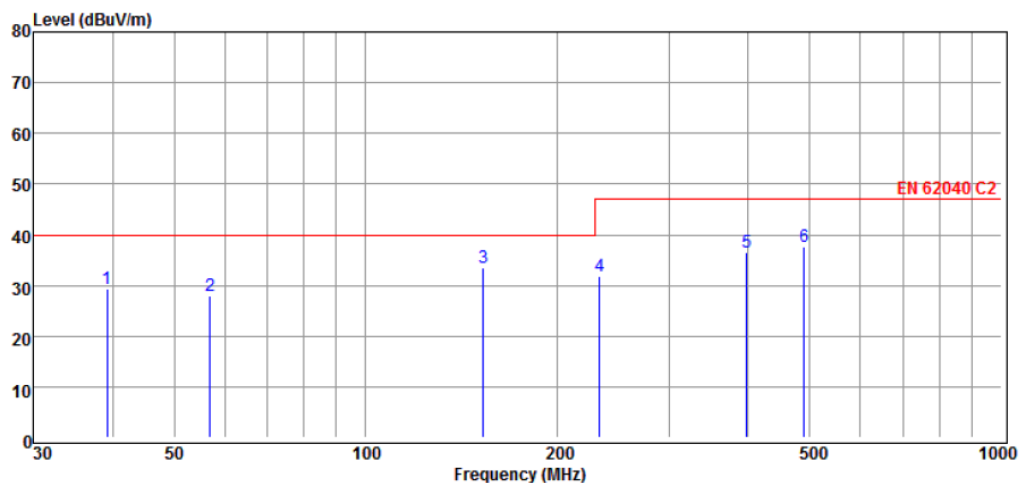
**Radiated Emission Test Data - Line mode**

Test Date : 03-SEP-2019

Polarization : Horizontal

Temperature : 26°C

Humidity : 50%RH



No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV/m	Limit dBμV/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	39.162	38.56	-9.32	29.24	40.00	-10.76	400	148	HORIZONTAL	QP
2	56.991	45.36	-17.27	28.09	40.00	-11.91	400	75	HORIZONTAL	QP
3	153.200	45.27	-11.90	33.37	40.00	-6.63	399	62	HORIZONTAL	QP
4	233.349	43.75	-11.96	31.79	47.00	-15.21	397	10	HORIZONTAL	QP
5	397.633	42.31	-5.72	36.59	47.00	-10.41	385	120	HORIZONTAL	QP
6	489.027	41.06	-3.47	37.59	47.00	-9.41	375	118	HORIZONTAL	QP

Remark : 1. All readings are Quasi-Peak values.

2. Result = Reading + C.F

3. Margin = Result – Limit

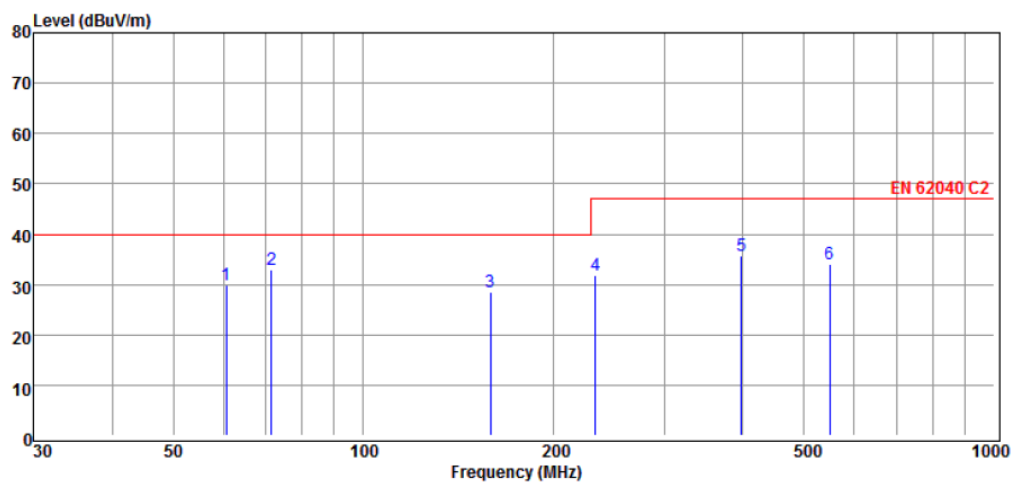
**Radiated Emission Test Data - Line mode**

Test Date : 03-SEP-2019

Polarization : Vertical

Temperature : 26°C

Humidity : 50%RH



No.	Freq MHz	Reading dBμV	C.F dB	Result dBμV/m	Limit dBμV/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	60.704	47.27	-17.44	29.83	40.00	-10.17	100	160	VERTICAL	QP
2	71.581	49.55	-16.61	32.94	40.00	-7.06	100	78	VERTICAL	QP
3	159.225	40.72	-12.17	28.55	40.00	-11.45	101	149	VERTICAL	QP
4	233.349	43.89	-11.96	31.93	47.00	-15.07	103	52	VERTICAL	QP
5	397.633	41.49	-5.72	35.77	47.00	-11.23	115	115	VERTICAL	QP
6	549.019	36.04	-1.91	34.13	47.00	-12.87	131	90	VERTICAL	QP

Remark : 1. All readings are Quasi-Peak values.

2. Result = Reading + C.F

3. Margin = Result – Limit

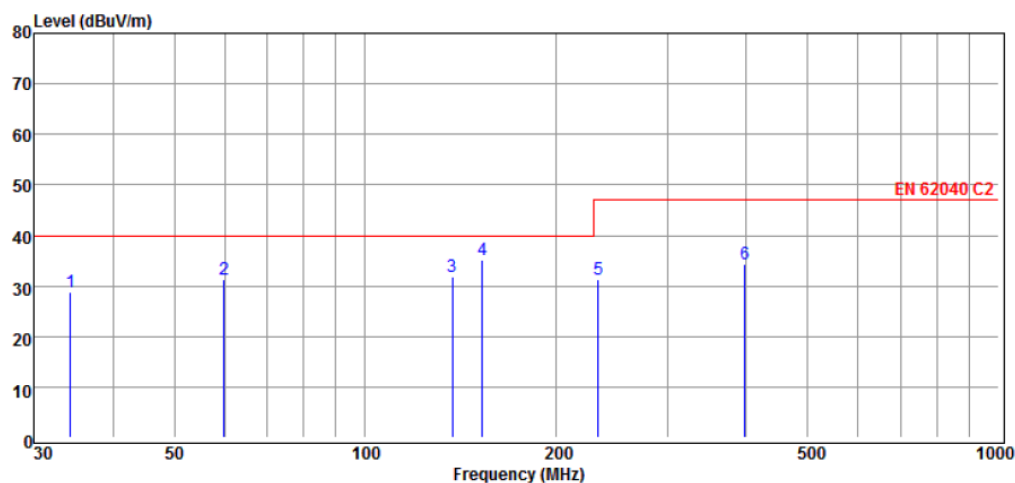
**Radiated Emission Test Data - Battery mode**

Test Date : 03-SEP-2019

Polarization : Horizontal

Temperature : 26°C

Humidity : 50%RH



No.	Freq MHz	Reading dBUV	C.F dB	Result dBUV/m	Limit dBUV/m	Margin dB	Height cm	Angle deg	Antenna Pol.	Remark
1	34.276	35.55	-6.75	28.80	40.00	-11.20	400	32	HORIZONTAL	QP
2	59.859	48.70	-17.46	31.24	40.00	-8.76	400	165	HORIZONTAL	QP
3	137.420	43.25	-11.40	31.85	40.00	-8.15	398	98	HORIZONTAL	QP
4	153.200	47.17	-11.90	35.27	40.00	-4.73	396	74	HORIZONTAL	QP
5	233.349	43.32	-11.96	31.36	47.00	-15.64	392	110	HORIZONTAL	QP
6	397.633	40.01	-5.72	34.29	47.00	-12.71	381	50	HORIZONTAL	QP

Remark : 1. All readings are Quasi-Peak values.

2. Result = Reading + C.F

3. Margin = Result – Limit

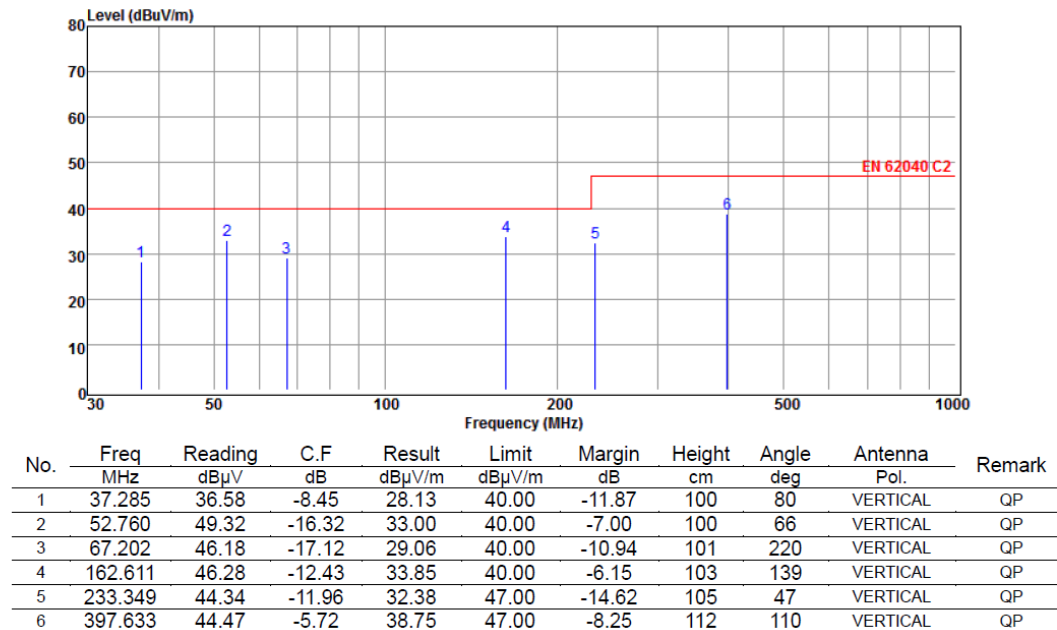
**Radiated Emission Test Data - Battery mode**

Test Date : 03-SEP-2019

Polarization : Vertical

Temperature : 26°C

Humidity : 50%RH



Remark : 1. All readings are Quasi-Peak values.

2. Result = Reading + C.F

3. Margin = Result – Limit

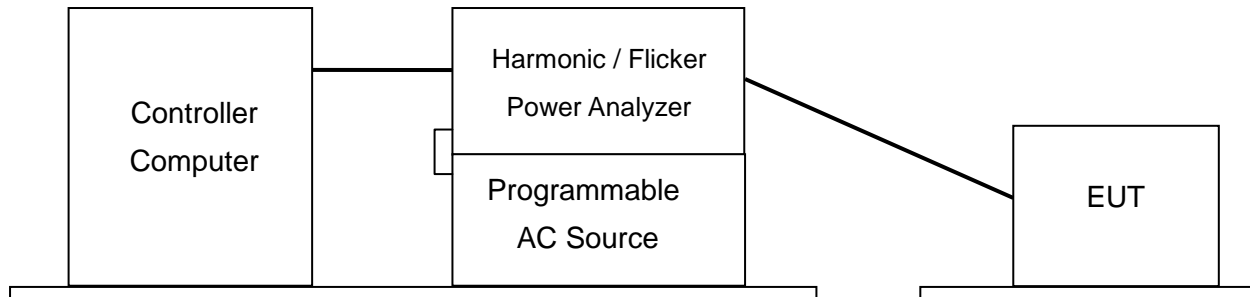


4 Harmonic Current Emission Measurement

4.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

4.2 Test Configuration and Procedure



- The EUT was set in series with the Power Analyzer through an Impedance Network for the measurement of harmonic currents.
- The supply voltage and frequency setting on the Programmable AC Source was programmed as the rated voltage and frequency of the EUT.
- Classify the EUT class in accordance with the IEC 61000-3-2 for the purpose of harmonic current limitation. The measurement was automatically performed by test software. The test result was collected and analyzed by the computer.



4.3 EUT Operation Condition

Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

4.4 Test Limit

Class A Equipment

Harmonic Order (n)	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 * 15 / n$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 * 8 / n$

4.5 Test Result

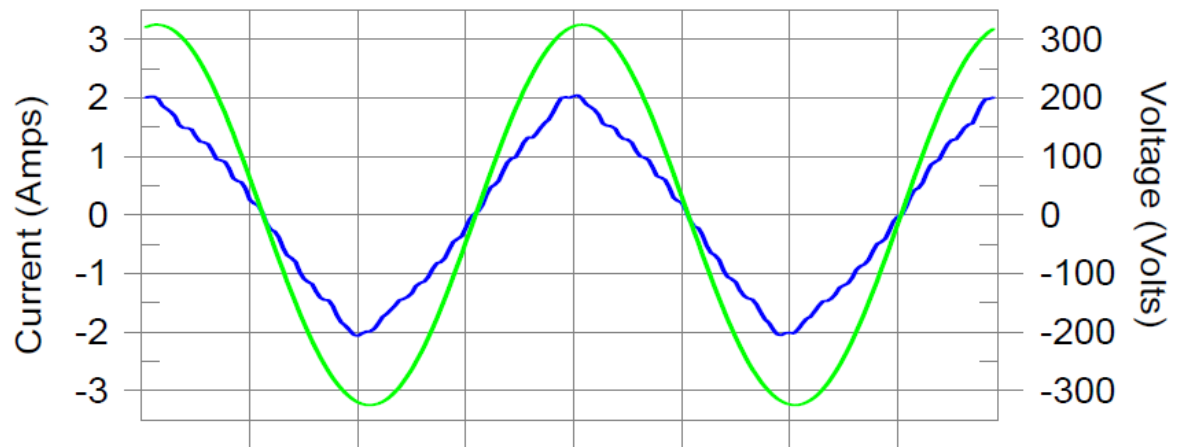
PASS

The measured result is shown on the following page(s).



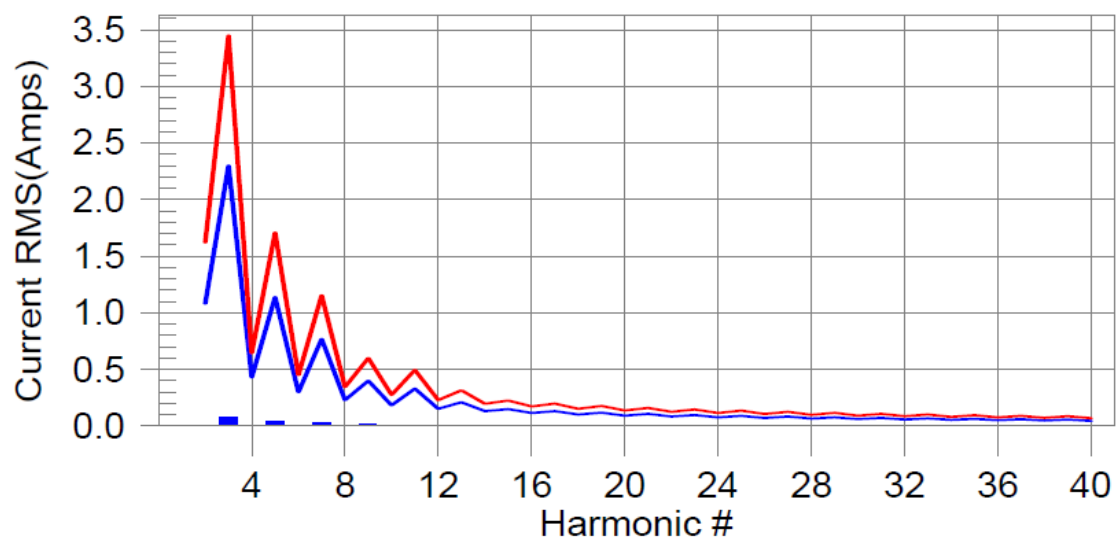
Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test result: Pass **Worst harmonics H5-2.8% of 150% limit, H5-4.1% of 100% limit**



Test Result: Pass Source qualification: Normal
 THC(A): 0.098 I-THD(%): 7.5 POHC(A): 0.004 POHC Limit(A): 0.251

Highest parameter values during test:

V_{RMS} (Volts): 229.72 Frequency(Hz): 50.00
 I_{Peak} (Amps): 2.076 I_{RMS} (Amps): 1.298
 I_{Fund} (Amps): 1.293 Crest Factor: 1.601
 Power (Watts): 296.7 Power Factor: 0.996

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.006	1.080	N/A	0.007	1.620	N/A	Pass
3	0.078	2.300	3.4	0.081	3.450	2.4	Pass
4	0.002	0.430	N/A	0.002	0.645	N/A	Pass
5	0.046	1.140	4.1	0.048	1.710	2.8	Pass
6	0.000	0.300	N/A	0.000	0.450	N/A	Pass
7	0.030	0.770	3.9	0.030	1.155	2.6	Pass
8	0.001	0.230	N/A	0.001	0.345	N/A	Pass
9	0.013	0.400	3.2	0.013	0.600	2.2	Pass
10	0.000	0.184	N/A	0.000	0.276	N/A	Pass
11	0.004	0.330	N/A	0.005	0.495	N/A	Pass
12	0.000	0.153	N/A	0.000	0.230	N/A	Pass
13	0.007	0.210	N/A	0.007	0.315	N/A	Pass
14	0.000	0.131	N/A	0.000	0.197	N/A	Pass
15	0.006	0.150	N/A	0.006	0.225	N/A	Pass
16	0.000	0.115	N/A	0.000	0.173	N/A	Pass
17	0.003	0.132	N/A	0.003	0.198	N/A	Pass
18	0.000	0.102	N/A	0.000	0.153	N/A	Pass
19	0.002	0.118	N/A	0.002	0.178	N/A	Pass
20	0.000	0.092	N/A	0.000	0.138	N/A	Pass
21	0.003	0.107	N/A	0.003	0.161	N/A	Pass
22	0.000	0.084	N/A	0.000	0.125	N/A	Pass
23	0.002	0.098	N/A	0.002	0.147	N/A	Pass
24	0.000	0.077	N/A	0.000	0.115	N/A	Pass
25	0.001	0.090	N/A	0.001	0.135	N/A	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.001	0.083	N/A	0.001	0.125	N/A	Pass
28	0.000	0.066	N/A	0.000	0.099	N/A	Pass
29	0.001	0.078	N/A	0.001	0.116	N/A	Pass
30	0.000	0.061	N/A	0.000	0.092	N/A	Pass
31	0.001	0.073	N/A	0.001	0.109	N/A	Pass
32	0.000	0.058	N/A	0.000	0.086	N/A	Pass
33	0.000	0.068	N/A	0.001	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.001	0.064	N/A	0.001	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.001	0.061	N/A	0.001	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.000	0.058	N/A	0.001	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass

※Harmonic currents less than 0,6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

5 Electrostatic Discharge Immunity Test

5.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

5.2 Test Configuration and Procedure

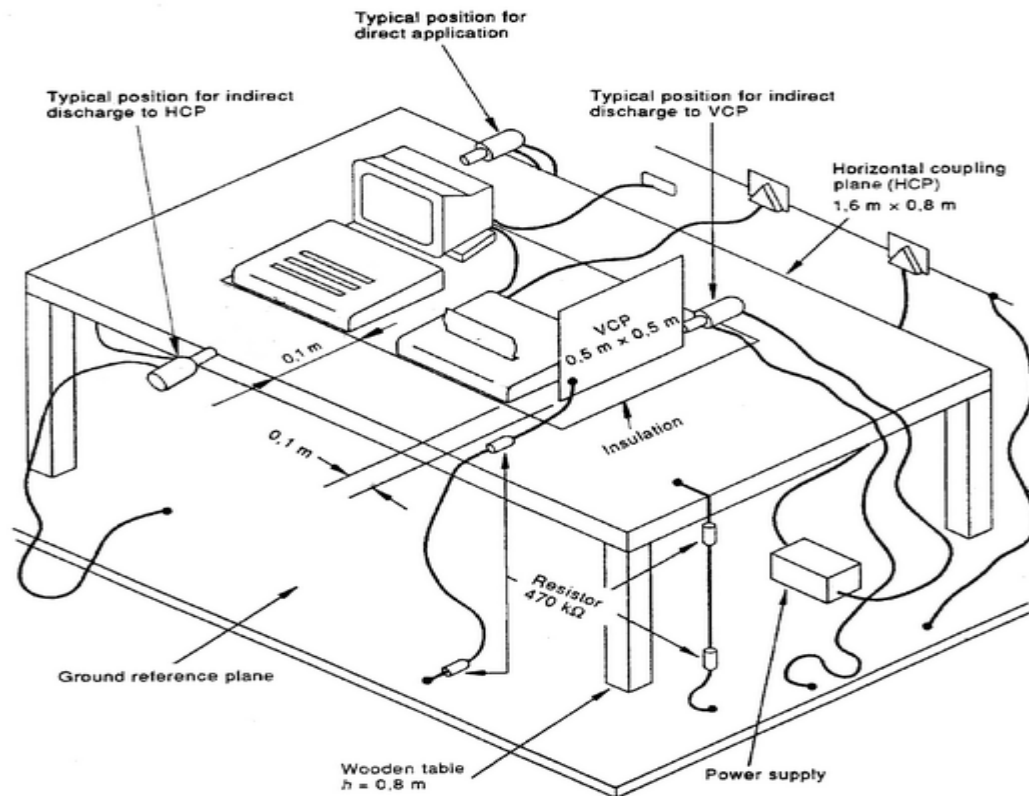


Table-top Equipment

- The EUT was located on a 0.8 m high wooden table standing on the ground reference plane with a 1.6 * 0.8 m horizontal coupling plane on the top. The EUT and cables was isolated from the coupling plane by an insulating support 0.5 mm thick.
- In Contact Discharge, the EUT was exposed to minimum 200 discharges, 100 each at negative and positive polarity on the selected test points (the selected test points were marked with red labels on the EUT)
- In Air Discharge, the EUT exposed to minimum of 10 single discharges on the selected test points.
- The result was observed and analyzed.



5.3 Test Result

5.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

5.3.2 Observation of Direct Discharge

Test Points: 1. Surface of Case. 2. Junction of Case. 3. RS232. 4. LAN.

Type of Discharge	Test Specifications				Performance Required by EN62040-2	Observed Result	Verdict
	Test Level	Polarity	Test Point	Number of Discharge			
Air Discharge	2,4,8 (kV)	±	1~2	10/ per point	B	A	Pass ¹
Contact Discharge	2,4 (kV)	±	1~4	10/ per point	B	A	Pass ¹
Remarks	1. No temporary degradation or loss of function has been observed throughout the entire time interval of air discharge.						

The Performance Requirement Class Criterion is defined in Sec. 1.11.

5.3.3 Observation of Indirect Discharge

Test Points: 1. Front Side. 2. Rear Side. 3. Left Side. 4. Right Side.

Type of Discharge	Test Specifications				Performance Required by EN62040-2	Observed Result	Verdict
	Test Level	Polarity	Test Point	Number of Discharge			
HCP Application	2,4 (kV)	±	1~4	10/ per point	B	A	Pass ¹
VCP Application	2,4 (kV)	±	1~4	10/ per point	B	A	Pass ¹
Remarks	1. No temporary degradation or loss of function has been observed throughout the entire time interval of HCP application.						

The Performance Requirement Class Criterion is defined in Sec. 1.11.

PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.

6 Radio-frequency, Electromagnetic Field Immunity Test

6.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

6.2 Test Configuration and Procedure

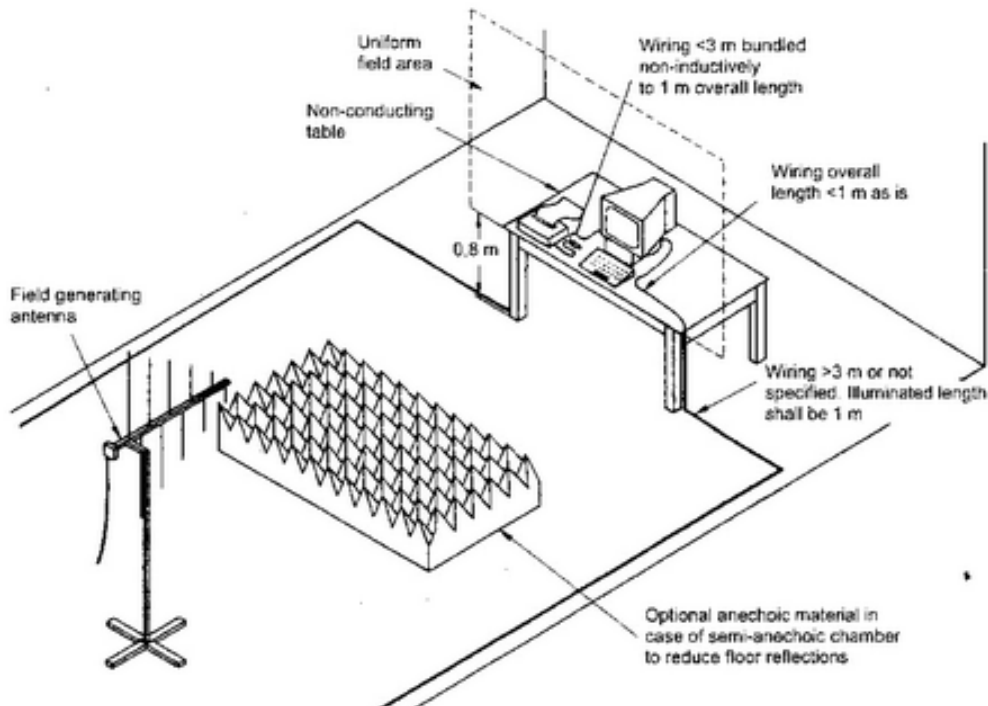


Table-top Equipment

- The field calibration was executed to create a uniform field area (UFA), 3 m away from the antenna, to ensure the validity of the test results.
- The EUT was placed on a non-conductive table 0.8 m high in the UFA.
- The EUT was then connected to power and signal wires according to relevant installation instruction.
- The EUT was positioned so that the four sides of the EUT were exposed to the electromagnetic field in sequence. In each position, the performance of the EUT was investigated and monitored by a CCD camera.



6.3 Test Result

6.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

6.3.2 Observation of Test

Type of Modulation	Test Specifications				Performance Required by EN62040-2	Observed Result	Verdict
	Field Strength	Frequency Range	Modulated	Polarity			
Amplitude Modulation	10 V/m	80 to 1000MHz	1kHz, 80% AM, Sine wave	V&H	A	A	Pass ¹
Remark	1. No temporary degradation or loss of function has been observed throughout the entire test.						
Note	The applied 0°, 90°, 180°, 270° relative to the position to the equipment under test.						

The Performance Requirement Class Criterion is defined in Sec. 1.11.

PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.

7 Electrical Fast Transient Test

7.1 Test Instrument

Refer to Sec. 1.2 Test Instruments.

7.2 Test Configuration and Procedure

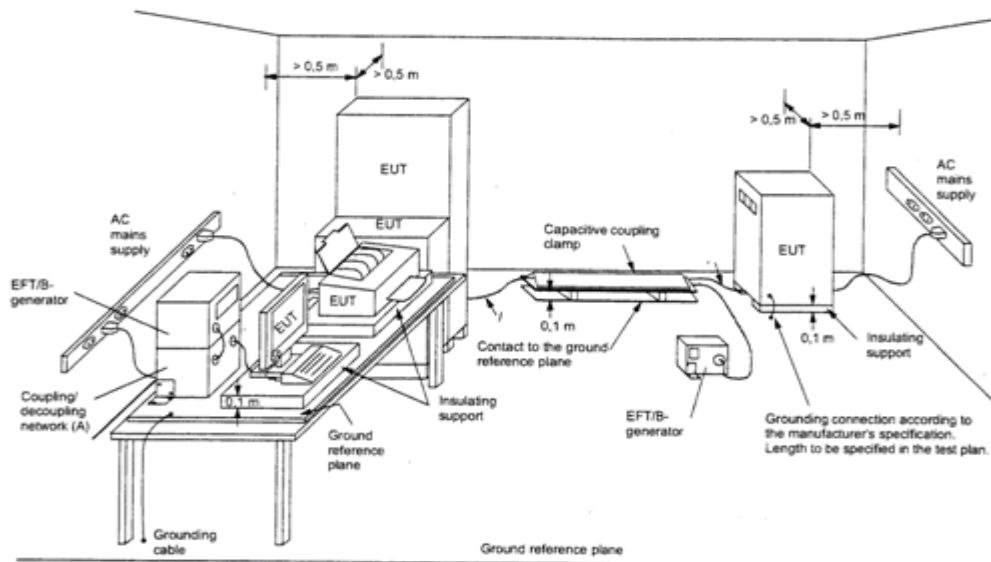


Table-top Equipment

- The EUT was placed on a table of 0.8 m height above the 1 * 1 m metallic ground reference plane, which projected beyond the EUT by at least 0.1 m on all sides.
- The ground plane was connected to the protective earth.
- The distance between the EUT and all other conductive structures, except the ground plane 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.
- All cables to the EUT were placed on the insulation support 0.1 m above the ground reference plane.
- The EUT was connected to the power mains through a coupling device that directly coupled the EFT interference signal. Each of the Line, Neutral and Protective Earth conductors was injected with burst for 1 minute. The test time was broken down into six 10 s bursts separated by a 10 s pause for avoiding synchronization. Both voltage polarities were applied for each test level.
- Operating condition was shown on the monitor and observed.



7.3 Test Result

7.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

7.3.2 Observation of Power Supply Port

Coupling Selection	Test Specifications				Performance Required by EN 62040-2	Observed Result	Verdict
	Voltage (kV)	Test Duration (Sec)	Repetition Frequency (kHz)	Tr/ Th (nS)			
L	±2	60	5	5/50	B	A	Pass ¹
N	±2	60	5	5/50	B	A	Pass ¹
PE	±2	60	5	5/50	B	A	Pass ¹
L + N	±2	60	5	5/50	B	A	Pass ¹
L + PE	±2	60	5	5/50	B	A	Pass ¹
N + PE	±2	60	5	5/50	B	A	Pass ¹
L + N +PE	±2	60	5	5/50	B	A	Pass ¹
Remark	1. No temporary degradation or loss of function has been observed throughout the entire test.						

The Performance Requirement Class Criterion is defined in Sec. 1.11.

7.3.3 Observation of Signal and control lines (Applicable only to cable length >3m)

Coupling Line	Test Specifications				Performance Required by EN 62040-2	Observed Result	Verdict
	Voltage (kV)	Test Duration (Sec)	Repetition Rate (kHz)	Tr/ Td (nS)			
LAN	±2	60	5	5/50	B	A	Pass ¹
Remark	1. No temporary degradation or loss of function has been observed throughout the entire test.						

The Performance Requirement Class Criterion is defined in Sec. 1.11.

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.

8 Surge Immunity Test

8.1 Test Instrument

Refer to Sec. 1.2 Test Instruments.

8.2 Test Configuration and Procedure

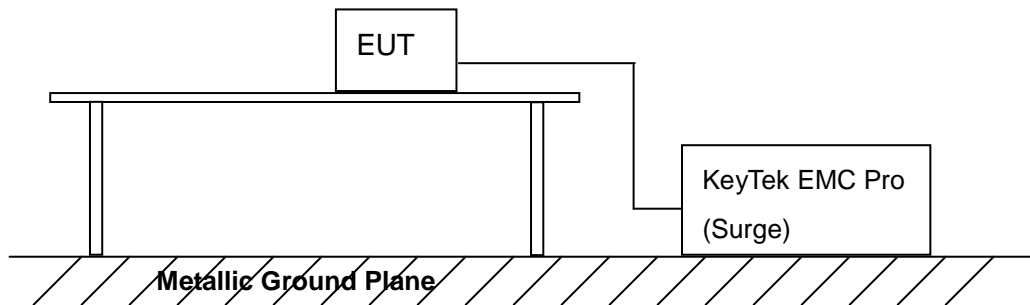


Table-top Equipment

- The EUT was placed on a table of 0.8 m height above the 1 * 1 m metallic ground reference plane, which projected beyond the EUT by at least 0.1 m on all sides.
- The ground plane was connected to the protective earth.
- The length of power cord between the coupling device and the EUT is less than 2 m (provided by the manufacturer).
- The EUT was connected to the power mains through a coupling device that directly couples the Surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.
- Operating condition was shown on the monitor and observed.



8.3 Test Result

8.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

8.3.2 Observation of Power Supply Port

Coupling Selection	Test Specifications			Performance Required by EN 62040-2	Observed Result	Verdict
	Voltage (kV)	Min. of Surge at Each Polarity	Repetition Rate (per min)			
L ► N	±0.5, 1	5	1	B	A	Pass ¹
L ► PE	±0.5, 1,2	5	1	B	A	Pass ¹
N ► PE	±0.5, 1,2	5	1	B	A	Pass ¹
Remark	1. No temporary degradation or loss of function has been observed throughout the entire test.					

The Performance Requirement Class Criterion is defined in Sec. 1.11.

8.3.3 Observation of other supply/ signal lines: (Applicable only to ports which according to the manufacturer's specification may connect directly to outdoor cables)

N/A

PASS

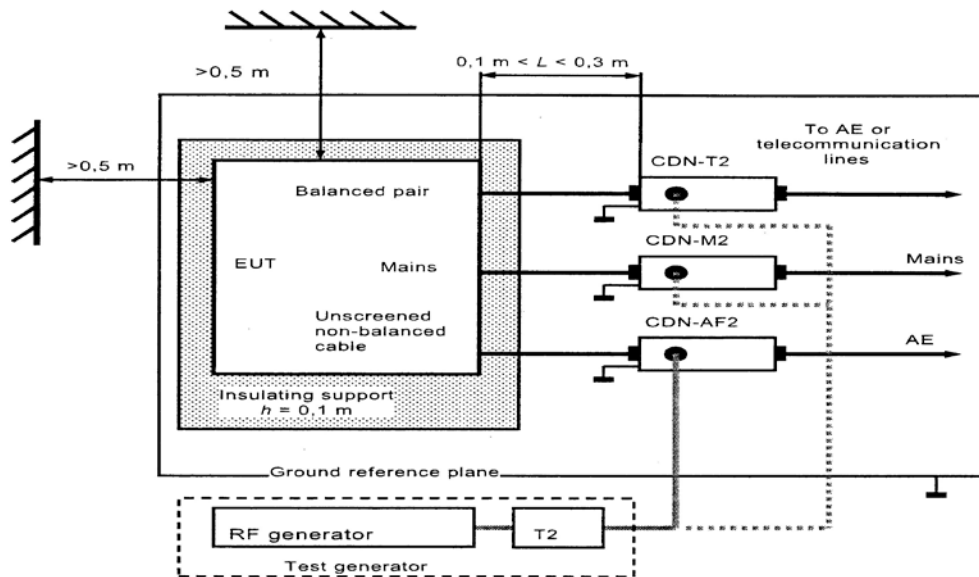
The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.

9 Radio-frequency, Conducted Disturbances Immunity Test

9.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

9.2 Test Configuration and Procedure



- The EUT was placed on an insulating support of 0.1 m height above a ground reference plane. All cables exiting the EUT was supported at a height of 30 mm above the ground reference plane.
- The EUT was connected to the power mains through a Coupling and Decoupling Networks (CDN).
- The CDN was located 0.3 m from the EUT as indicated in the diagram above.
- The test was performed with the test generator connected to each of the CDN in turn while the other non-excited RF input ports of the coupling devices were terminated by a 50Ω terminator.
- The conducted disturbance was applied on the EUT from 150 kHz to 80 MHz using the signal levels established during the setting process. .
- Operating condition was shown on the monitor and observed.



9.3 Test Result

9.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

9.3.2 Observation of Test

Type of Modulation	Test Specifications			Performance Required by EN 62040-2	Observed Result	Verdict
	Voltage Level	Frequency Range	Modulation			
Amplitude Modulation	10V / 140 dBμV	0.15 to 80MHz	80%, 1kHz, sinusoidal	A	A	Pass ¹
Remark	1. No temporary degradation or loss of function has been observed throughout the entire test.					

The Performance Requirement Class Criterion is defined in Sec. 1.11.

9.3.3 Observation of signal ports and telecommunication ports (Applicable only to cable length >3m)

Coupling Line	Test Specifications			Performance Required by EN 62040-2	Observed Result	Verdict
	Voltage Level (emf) U ₀	Frequency Range	Modulation			
LAN	10V / 140dBμV	0.15 to 80MHz	80%, 1kHz, sinusoidal	A	A	Pass ¹
Remark	1. No temporary degradation or loss of function has been observed throughout the entire test.					

The Performance Requirement Class Criterion is defined in Sec. 1.11.

PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.



10 Power Frequency Magnetic Field Immunity Test

10.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

10.2 Test Configuration and Procedure

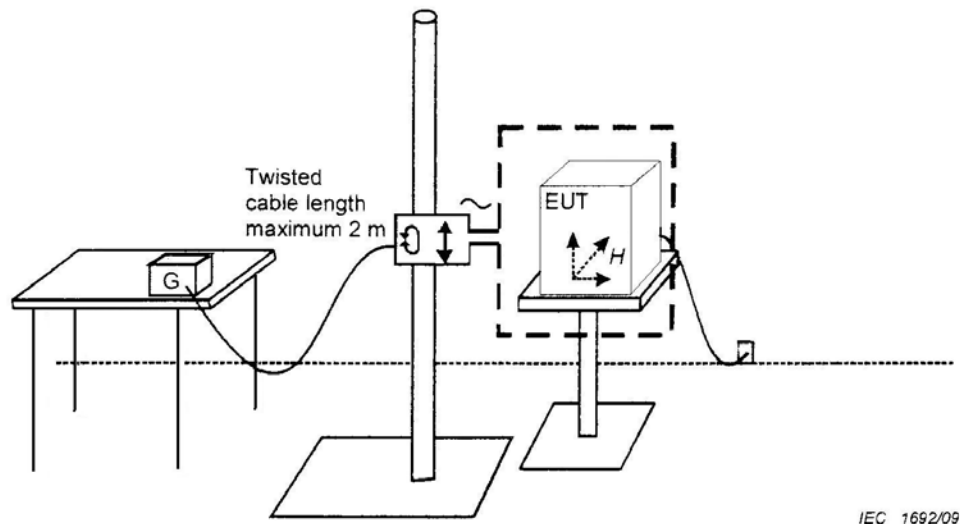


Table-top Equipment

- The EUT was placed on a non-magnetic metal ground plane of 0.25 mm thickness with the interposition of a 0.1 m thickness insulating support. The ground plane was connected to the protected earth.
- The EUT was placed at the center of the 1 * 1 m induction coil with the test generator placed within 3 m distance.
- The test was operated by moving and shifting the induction coil to expose to the test field.
- The operation condition was observed and analyzed.
- The induction coil was then rotated by 90° to expose the EUT to the test field with different orientations and the same procedure.



10.3 Test Result

10.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

10.3.2 Observation of Test

Level (A/m)	Frequency (Hz)	Performance Required by EN62040-2	Observed Result	Verdict
30	50	B	A	Pass ¹
Remark:	1. No temporary degradation or loss of function has been observed throughout the entire test.			

The Performance Requirement Class Criterion is defined in Sec. 1.11.

PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.

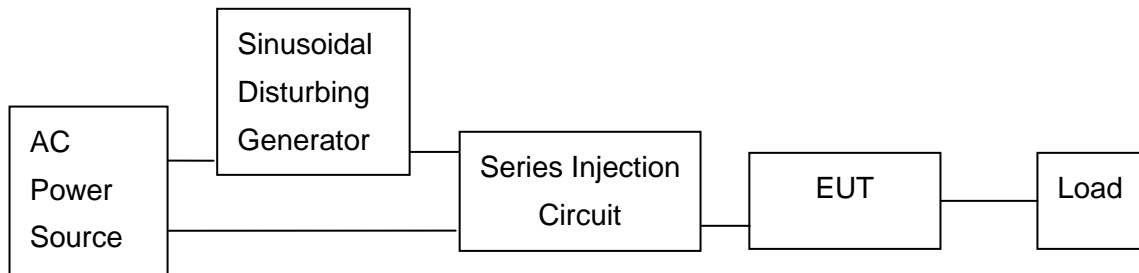


11 Low Frequency Signals Immunity Test

11.1 Test Instrument

Refer to Sec. 1.2 Test Instruments.

11.2 Test Configuration and Procedure



- Let U.P.S. to be under charging and line status
- Adjust programmable AC source to output a 10Vrms (sine wave from 140 to 360Hz) that can be induced 10Vrms to link between AC source and UPS (through the isolation transformer).
- The induced signals shall mixed in normal AC source and U.P.S. shall withstand it and no performances shall be reduced

11.3 Test Result

11.3.1 Environment Condition

Test Date	Temperature	Humidity	Atmospheric Pressure
05-SEP-2019	25°C	52%RH	1012mbar

11.3.2 Observation

Frequency Range (Hz)	Strength	Required by EN 62040-2	Observed Result	Verdict
140 to 360	10V (rms) Sinusoidal	A	A	Pass ¹
Remark: 1. No temporary degradation or loss of function has been observed throughout the entire test.				

The Performance Requirement Class Criterion is defined in Sec. 1.11.

PASS

The test result shows that the EUT is in compliance with the test performance criteria specified in EN 62040-2.



12 Photographs of Test

12.1 Power Line Conducted Test



Front View



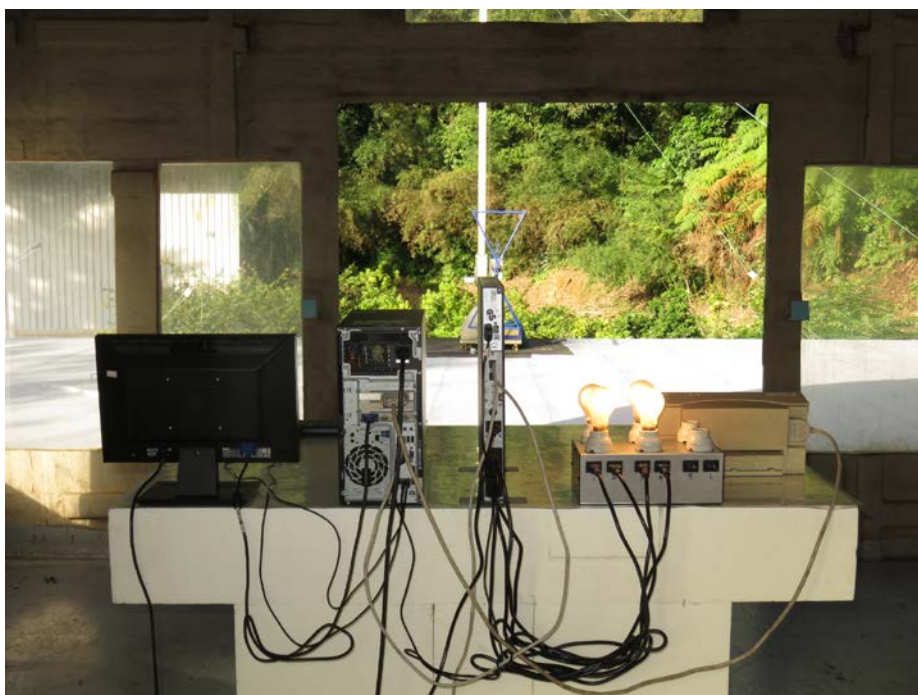
Rear View



12.2 Radiated Emission Test



Front View



Rear View



12.3 Harmonic Current & Voltage Fluctuations and Flicker Measurement

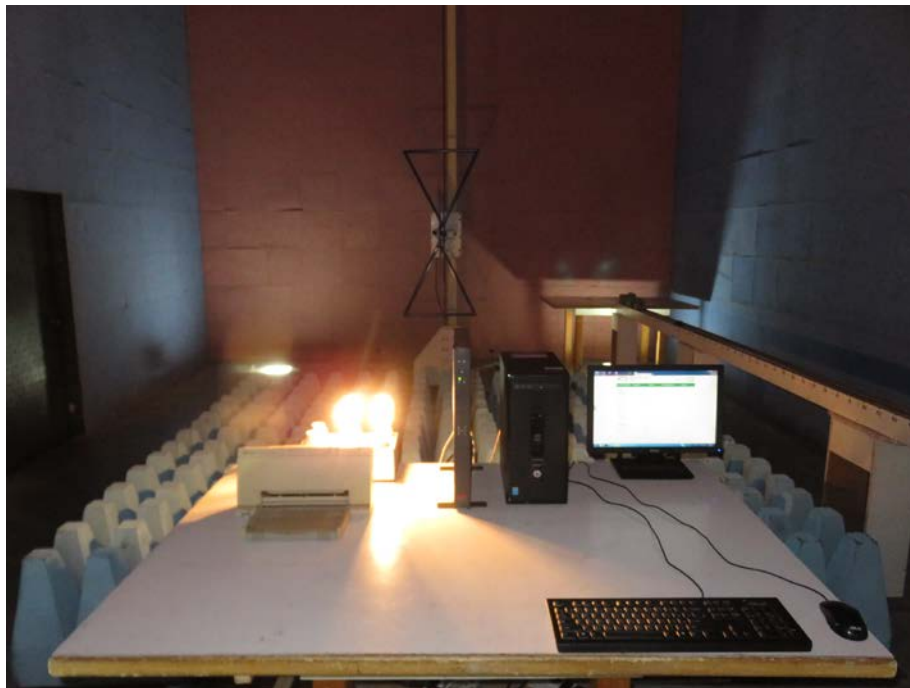


12.4 Electrostatic Discharge Immunity Test





12.5 Radio-frequency, Electromagnetic Field Immunity Test

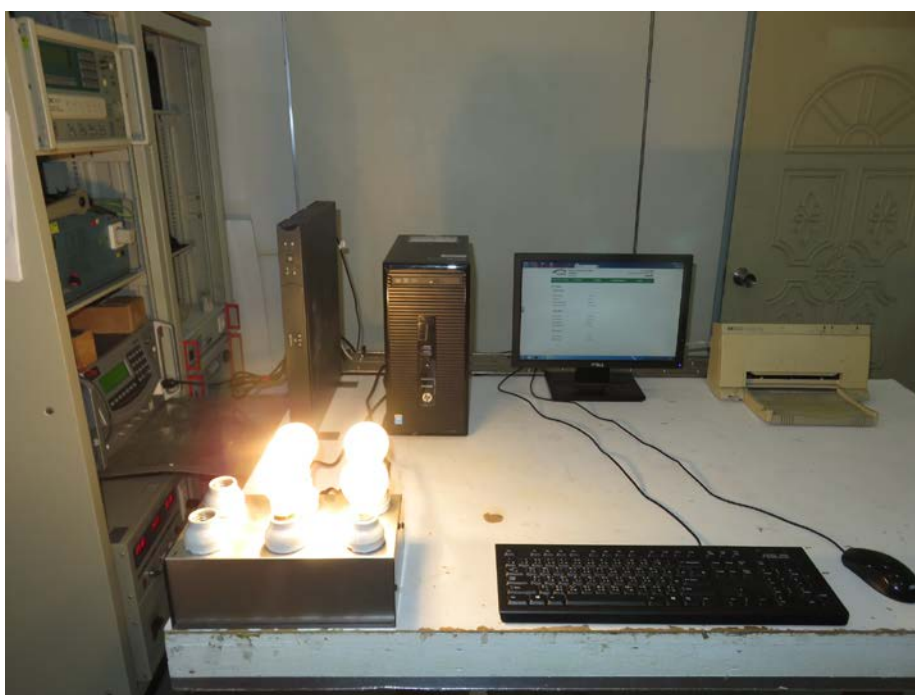


12.6 Surge Immunity Test





12.7 Electrical Fast Transient / Burst Immunity Test



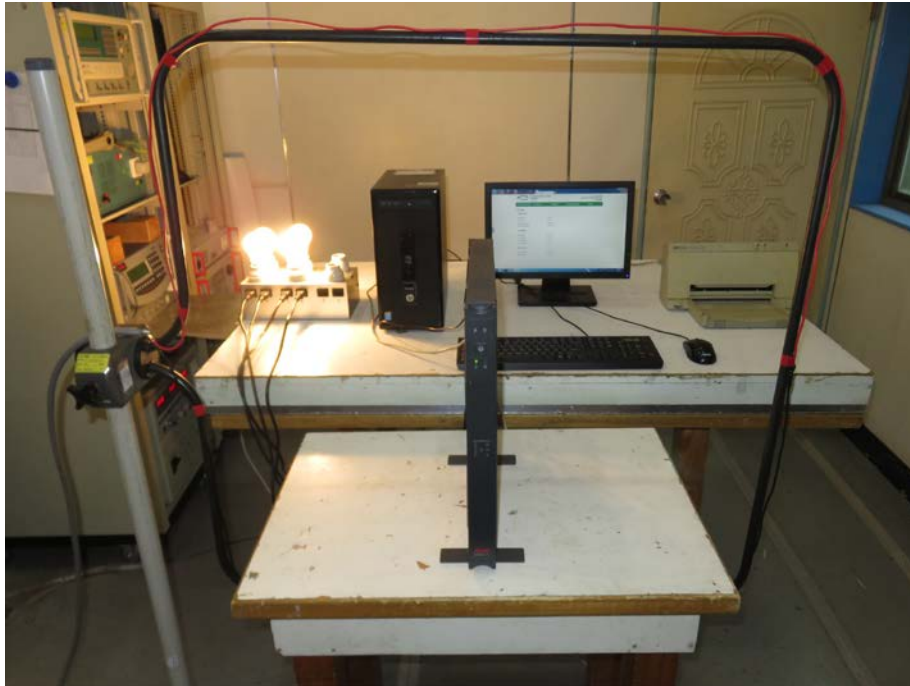


12.8 Radio-frequency, Conducted Disturbances Immunity Test





12.9 Power Frequency Magnetic Field Immunity Test



12.10 Low Frequency Signals Immunity Test





13 Photographs of EUT



Front View of the EUT



Rear View of the EUT



View of the I/O Port 1-1



View of the I/O Port 1-2



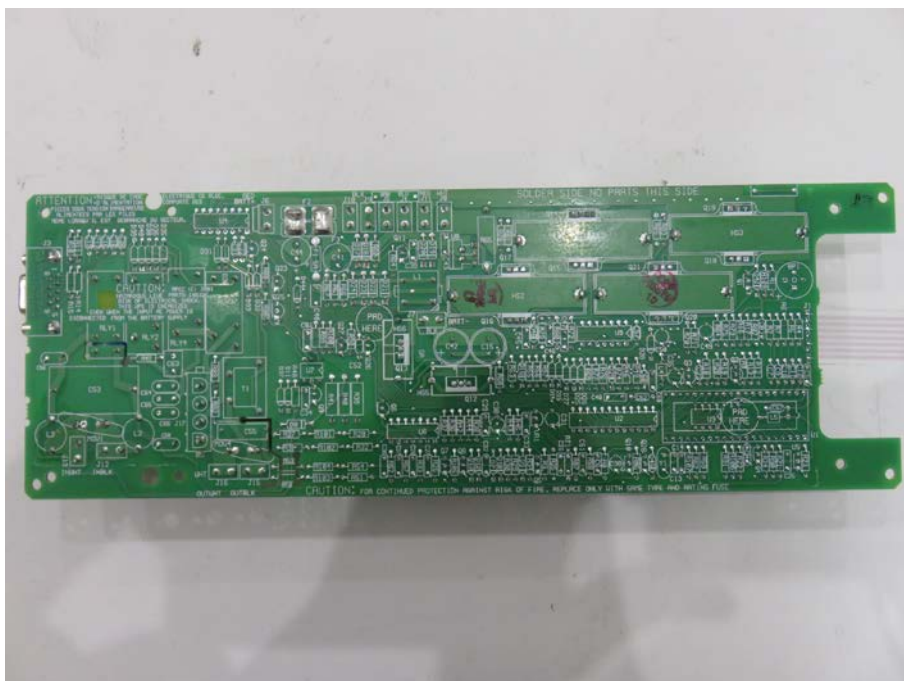
Inside View of the EUT 1-1



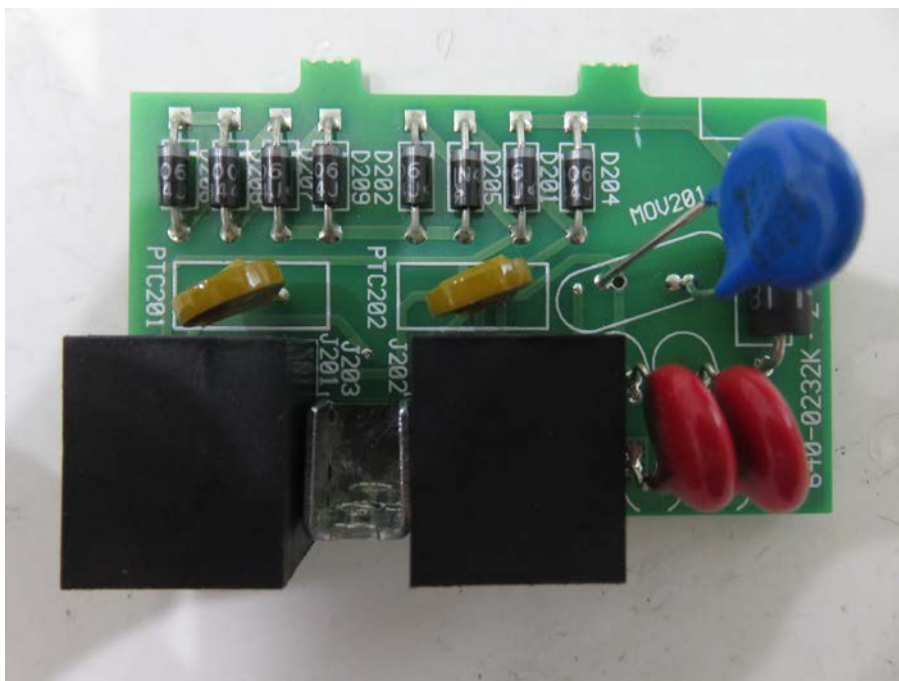
Inside View of the EUT 1-2



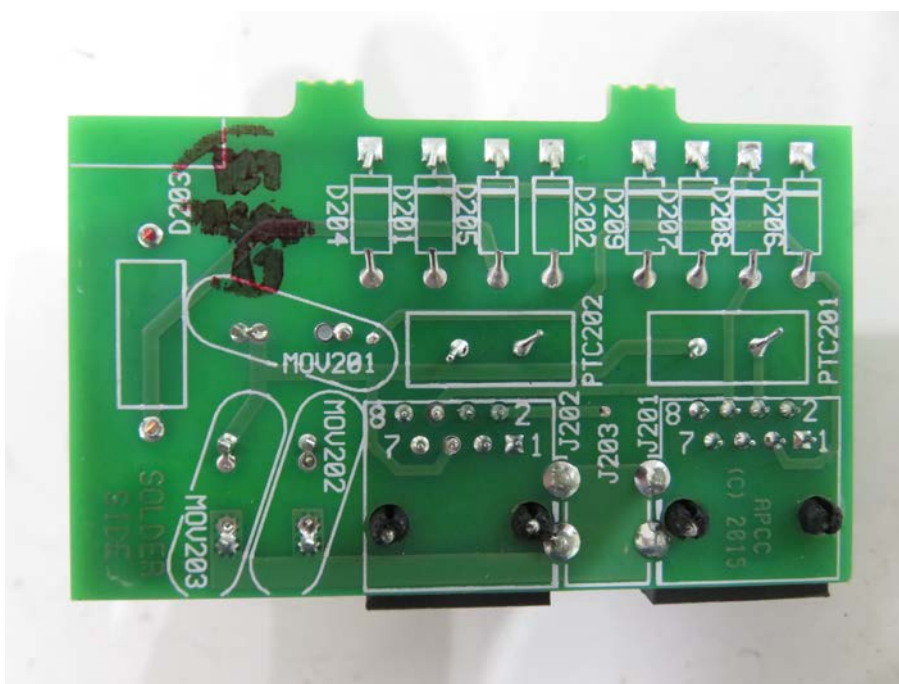
Front View of the PCB 1



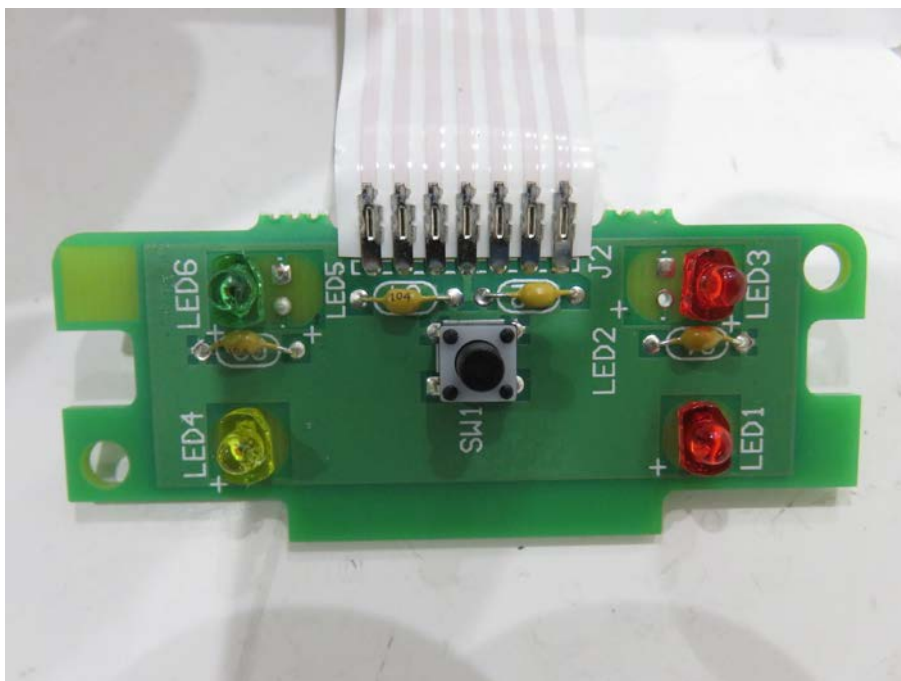
Rear View of the PCB 1



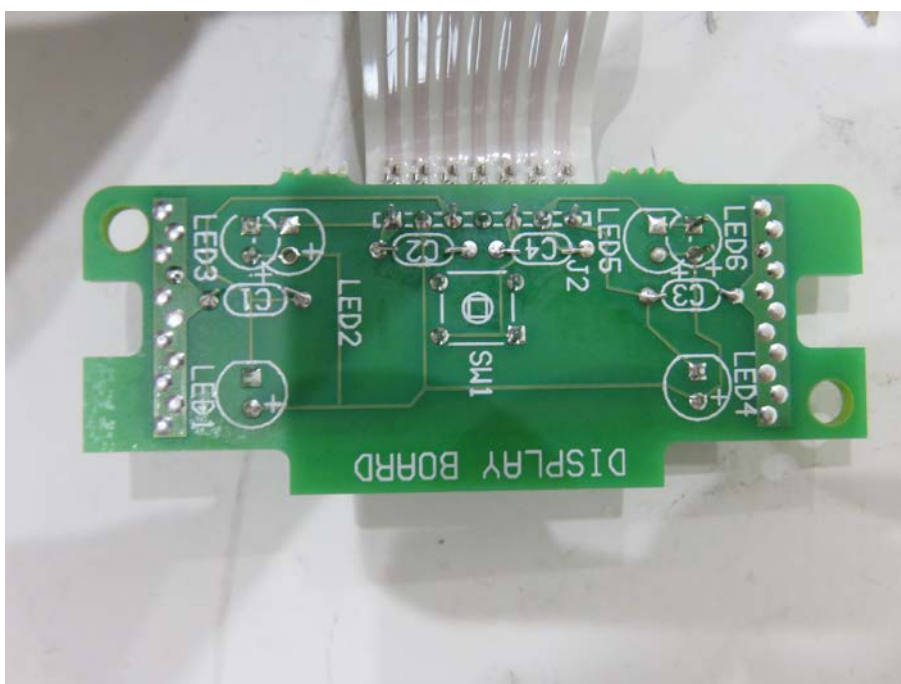
Front View of the PCB 2



Rear View of the PCB 2



Front View of the PCB 3



Rear View of the PCB 3



View of the RS232 Cable



View of the Power Cable



14 Photographs of ESD Test Points



View of ESD Test Points



View of ESD Test Points