



EMC TEST REPORT

Applicant : Sion Soar Hybrid(Shenzhen)Technology Co.,Ltd
Address : 501, Building G, Tangxi Zhigu, No. 21 Xijing Road, Gushu Community, Xixiang Street, Bao'an District, Shenzhen

Manufacturer : Sion Soar Hybrid(Shenzhen)Technology Co.,Ltd
Address : 501, Building G, Tangxi Zhigu, No. 21 Xijing Road, Gushu Community, Xixiang Street, Bao'an District, Shenzhen

Factory : Sion Soar Hybrid(Shenzhen)Technology Co.,Ltd
Address : 501, Building G, Tangxi Zhigu, No. 21 Xijing Road, Gushu Community, Xixiang Street, Bao'an District, Shenzhen

Product Name : DC-DC converter

Brand Name :  中腾微网
SINOSOAR

Model No. : SP120HCPV1, SP120HCPV4, SP60HCPV1, SP60HCPV4, SP105HCDC1, SP105HCDC4, SP120HCPV2, SP105HCDC2

Standard : IEC 61000-6-4:2018
IEC 61000-6-2:2016

Date of Receiving Samples : October 19, 2024

Date of Test : October 26, 2024 to December 19, 2024

Date of Report : December 30, 2024

This Test Report is Issued Under the Authority of :
Prepared by

Fancy

Fancy Yang / Engineer

Approved & Authorized Signer



Han Song / Authorized Signatory

This report shows that above equipment is technically compliant with the requirements of the standards above. All test results in this report apply only to the tested sample(s). Without prior written approval of Shenzhen Nore Testing Center Co., Ltd, this report shall not be reproduced except in full.

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Shenzhen, Guangdong, 518057, China

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Revision History of This Test Report

Report Number	Description	Issued Date
SZNTC2410083EV00	Initial Issue	2024-12-30
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1. SUMMARY OF TEST RESULTS

The E.U.T. has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Verdict	Remarks
IEC 61000-6-4:2018	Conducted Emission Measurement	PASS	Meets the requirements
	Radiated Emission Measurement	PASS	Meets the requirements
IEC 61000-3-12:2011 IEC 61000-3-2:2018	Harmonic current emission Measurement	N/A	See note
IEC 61000-3-11:2017 IEC 61000-3-3:2013 +A1:2017	Voltage Fluctuations & Flicker Measurement	N/A	See note

IMMUNITY (IEC 61000-6-2:2016)			
Basic Standard	Test Type	Verdict	Results (Performance Criterion)
IEC 61000-4-2:2008	Electrostatic Discharge Test	PASS	A
IEC 61000-4-3:2006+ A1:2007+A2:2010	Radio-Frequency Electromagnetic Field Test	PASS	A
IEC 61000-4-4:2012	Fast Transients Test	PASS	A
IEC 61000-4-5:2014	Surges Test	PASS	B
IEC 61000-4-6:2013	Radio-Frequency Common Mode Test	PASS	A
IEC 61000-4-8:2009	Power-Frequency Magnetic Field Test	PASS	A
IEC 61000-4-34:2005+ A1:2009 IEC 61000-4-11:2004	Voltage dips and interruptions	PASS	See note

Note: Only applicable to AC power supply devices.

2. TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Uncertainty
Conducted Emission Measurement (0.15-30MHz)	2.7dB
Radiated Emission Measurement (30-1000MHz)	4.3dB
Remark: As U_{lab} in all applicable tests listed above are less than U_{cispr} according to CISPR16-4-2, compliance is deemed to occur if no measured disturbance exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.	

3. GENERAL INFORMATION

3.1. Product Information

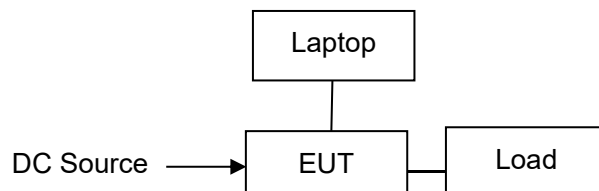
Product Name:	DC-DC converter
Model No.:	SP120HCPV1, SP120HCPV4, SP60HCPV1, SP60HCPV4, SP105HCDC1, SP105HCDC4, SP120HCPV2, SP105HCDC2
Description of model difference:	These models have the same circuitry, PCB Layout and physical construction. Only the external ports are different. According to the model difference, SP120HCPV4 tests all. SP105HCDC1 tests only conducted emission, radiation emission.
Classification of Equipment:	Industrial environments
Highest internal frequency:	Below 108 MHz (Highest internal frequency below 108MHz, radiation test frequency range 30MHz-1000MHz)
Typical arrangement:	Tabletop
Rating:	Model: SP120HCPV4 PV input: Rated power: 120kW PV input voltage range: 200V-900V PV input rated voltage: 600V MPPT voltage range: 200V-850V Starting voltage: 250V Max. PV input current: 50A+50A+50A+50A Number of MPPT input: 4 DC output: Voltage range: 500V-900V Nominal voltage: 680V Max current: 180A Model: SP105HCDC1 DC1 BAT Rated power: 105kW Battery voltage range: 200V-900V Nominal voltage: 525V Max. PV input current: 200A Number of BATTERY input: 1 DC2 Side Voltage range: 500V-900V Nominal voltage: 680V Max current: 180A
Cable:	1. The communication Cable used in test is an unshielded line, the length does not exceed 3m. Therefore, it is not necessary to test conducted emission, fast transients, radio-frequency common mode and surge.
Sample No.:	SP120HCPV4:SZNTC2410083EV00-001 SP105HCDC1:SZNTC2410083EV00-002
Remark:	All the information above is provided by the manufacturer. More detailed feature of the EUT please refers to the user manual.

3.2. Description of Support Device

No.	Equipment	Manufacturer	M/N	S/N	Remark
1.	DC Power Cable (Input and Output)	---	---	The test uses a power cable of 1m length without magnetic ring and unshielded.	Provided by the lab.
2.	RCD Load	Jinsicheng	9120-21230-00	---	Provided by the lab.
3.	Photovoltaic simulator source	ITECH	IT6018PV-1500-40	---	Provided by the lab.
4.	Laptop	Lenovo	ThinkPad E455	N/A	Provided by the lab.
5.	Communication Cable	---	---	The test uses a power cable of 2m length without magnetic ring and unshielded	Provided by the lab.
6.	Laptop	Huawei	MateBook 14	N/A	Provided by the Manufacturer.

3.3. Block Diagram of Test Setup

Working Mode:



Remark: The dashed line indicates a power-off connection.

3.4. Test Mode

No.	Test Mode	Remark
1.	Working Mode	---

3.5. Test Conditions

No.	Test Item	Test Mode	Test Voltage	Tested by	Remarks
1.	Conducted Emission - AC power input port	---	---	---	---
2.	Conducted Emission - DC power input port	1	DC 600V	Lixiaojian	See note 1
3.	Conducted Emission - Wired network port or signal/control port	---	---	---	---
4.	Radiated Emission	1	DC 600V	Lixinglin	See note 1
5.	Harmonic Current Emission	---	---	---	---
6.	Voltage Fluctuations & Flicker	---	---	---	---
7.	Electrostatic Discharges (ESD)	1	DC 600V	Chenrongbin	See note 2
8.	Radio-Frequency Electromagnetic Field	1	DC 600V	Park	See note 1
9.	Fast Transients	1	DC 600V	Chenrongbin	See note 1
10.	Surges	1	DC 600V	Chenrongbin	See note 1
11.	Radio-Frequency Common Mode	1	DC 600V	Park	See note 1
12.	Power Frequency Magnetic Field	1	DC 600V	Chenrongbin	See note 1
13.	Voltage Dips and Interruptions	---	---	---	---

Note:

1. The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35°C, 30~70%, 86~106kPa.
2. The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35°C, 30~60%, 86~106kPa.
3. Only the worst data were recorded on the report.
4. Only the most stringent limits and data were recorded on the report.

3.6. Sample Calculations

Conducted Emission						
Freq. (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.2260	11.56	12.50	24.06	66.00	-41.94	AVG
Where, Freq. = Emission frequency in MHz Reading = Spectrum Analyzer/Receiver Reading Factor = Insertion loss of LISN + Cable Loss Level = Reading + Factor Limit = Limit stated in standard Over = Level - Limit Detector = Reading for Quasi-Peak / Average / Peak						

Radiated Emission						
Freq. (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
75.9773	-17.06	59.36	42.30	49.00	-6.70	QP
Where, Freq. = Emission frequency in MHz Reading = Spectrum Analyzer/Receiver Reading Factor = Antenna Factor + Cable Loss - Pre-amplifier Level = Reading + Factor Limit = Limit stated in standard Over = Margin, which calculated by Level - Limit Detector = Reading for Quasi-Peak / Average / Peak						

3.7. Test Facility

Test Site:	Shenzhen Nore Testing Center Co., Ltd.
Accreditations and Authorizations:	The Laboratory is accredited by CNAS (ILAC Member) according to ISO/IEC 17025:2017 with registration number L11038 and valid until May 17, 2030.
Test Site Location:	South, No. 1, Building 10, Maqueling Industrial Zone, Nanshan Shenzhen, Guangdong, 518057, China
Subcontractor:	Dongguan Nore Testing Center Co.,Ltd.
Site Location:	Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China
Test Items:	Radio-Frequency Electromagnetic Field Radio-Frequency Common Mode
Remark:	The subcontractor is CNAS qualified.

3.8. Abnormalities from Standard Conditions

None

4. MEASURING DEVICES AND TEST EQUIPMENT

4.1. For Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒	Test Receiver	Rohde & Schwarz	ESCI-3	100120	Mar. 22, 2024	1 Year
☐	L.I.S.N	Rohde & Schwarz	ESH3-Z5	100157	Mar. 22, 2024	1 Year
☒	L.I.S.N	SCHWARZBECK	NNLK8129	00409	Mar. 22, 2024	1 Year
☐	AAN	Schwarzbeck	NTFM 8158	CAT6-8158-0009	Mar. 22, 2024	1 Year
☒	Test Software	EZ	EZ-EMC (Ver. CT3A11)	N/A	N/A	N/A

4.2. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒	Test Receiver	Rohde & Schwarz	ESPI-7	100006	Mar. 22, 2024	1 Year
☐	Loop Antenna	ZHINAN	ZN30900C	16036	Mar. 23, 2024	2 Year
☒	Composite logarithmic antenna	Schwarzbeck	VULB 9163	1633	Mar. 23, 2024	2 Year
☐	Horn Antenna	Schwarzbeck	BBHA 9120 D	01884	Mar. 23, 2024	2 Year
☒	Power Amplifier	HP	HP 8447D	2443A04646	Mar. 22, 2024	1 Year
☐	Power Amplifier	KSYET	PAM-118	443007	Mar. 22, 2024	1 Year
☒	Test Software	EZ	EZ-EMC (Ver. CT3A11)	N/A	N/A	N/A

4.3. For Electrostatic Discharge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒	ESD Generator	HAEFELY	ONYX16	1811981	Mar. 25, 2024	1 Year

4.4. For Radio-Frequency Electromagnetic Field Test

(Dongguan Nore Testing Center Co., Ltd.)

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Interval	Cal. Interval
☒	Signal Generator	Agilent	N5181A	MY47070160	Mar. 13, 2024	1 Year
☒	RF Switch	SKET	N/A	N/A	N/A	N/A
☒	Power Amplifier	SKET	HAP801000M_250W	201804008	N/A	N/A
☒	Power Amplifier	SKET	HAP0103G_75W	201804009	N/A	N/A
☒	Power Amplifier	SKET	HAP0306G_50W	201804010	N/A	N/A
☒	Power Meter	Agilent	E4419B	GB40201469	Mar. 13, 2024	1 Year
☒	Power Sensor	Agilent	E9304A	MY41498919	Mar. 13, 2024	1 Year
☒	Power Sensor	Agilent	E9300A	US39211259	Mar. 13, 2024	1 Year
☒	E-Field Probe	Narda	EP-601	N/A	Mar. 23, 2024	1 Year
☒	Antenna	Schwarzbeck	STLP 9129	9129071	N/A	N/A
☒	Audio Analyzer	Rohde & Schwarz	UPV	100894	Mar. 13, 2024	1 Year
☒	Test Software	SKET	SKET_RS	N/A	N/A	N/A

4.5. For Fast Transients Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒	EFT Generator	HTEC	HEFT	203601	Mar. 22, 2024	1 Year
☒	Three- phase EFT Coupling CDN	HTEC	HCOUPLER 60E	204301	Mar. 22, 2024	1 Year
☐	Coupling Clamp	HAEFELY	/	/	Mar. 22, 2024	1Year

4.6. For Surges Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒	Surge Generator	HTEC	HCWG	205301	Mar. 22, 2024	1 Year
☒	CDN	HTEC	HCOUPLER 60S	204201	Mar. 22, 2024	1 Year
☐	Network CDN	ETEST	ES-CDN-508	N/A	Mar. 22, 2024	1 Year

4.7. For Radio-Frequency Common Mode Test

(Dongguan Nore Testing Center Co., Ltd.)

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Interval	Cal. Interval
☒	Signal Generator	IFR	2023A	2023051280	Mar. 13, 2024	1 Year
☒	Power Amplifier	SCHAFFNER	CBA9425	1022	Mar. 13, 2024	1 Year
☒	6dB 50Watt Attenuator	SCHAFFNER	ATN6025	N/A	Mar. 13, 2024	1 Year
☒	CDN	Lioncel	CDN-M3-16	0170703	Mar. 13, 2024	1 Year
☒	CDN	Lioncel	CDN-M2-16	0170708	Mar. 13, 2024	1 Year
☒	CDN	CDSI	ADN-M5/AF5	8105001	Mar. 13, 2024	1 Year
☒	EM Clamp	CDSI	EMCL-22	8192007	Mar. 13, 2024	1 Year
☒	Directional Coupler	SCHAFFNER	255	19184	Mar. 13, 2024	1 Year
☒	Audio Analyzer	Rohde & Schwarz	UPV	100894	Mar. 13, 2024	1 Year
☒	Test Software	EZ	EZ_CS	N/A	N/A	N/A

4.8. For Power-Frequency Magnetic Field Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒	Magnetic Field Generator	N/A	MS-8000	N/A	Mar. 22, 2024	1 Year

5.3. Test Procedure

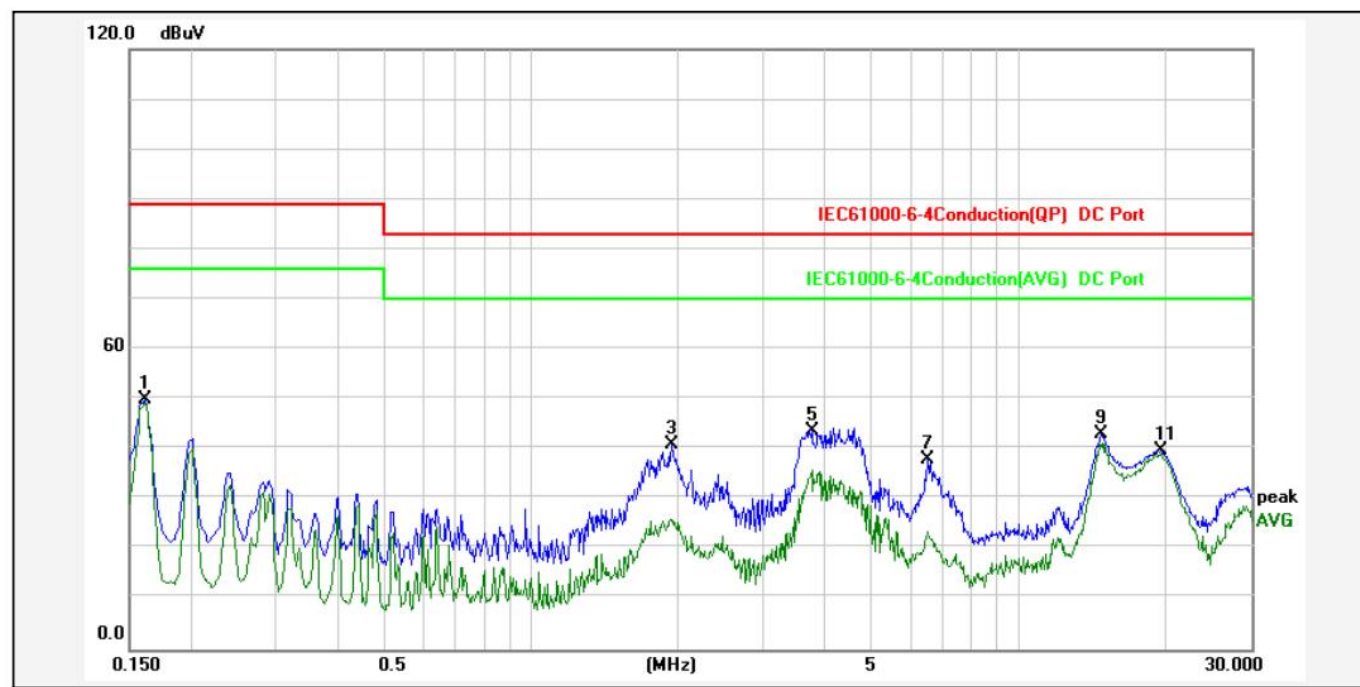
- a. The EUT was placed on a wooden table 0.8m height from the metal ground plan and 0.4m from the conducting wall of the shielding room and it was kept at 0.8m from any other grounded conducting surface.
- b. Configure the EUT and support devices as per section 5.1.
- c. All cables and support devices were positioned as per IEC 61000-6-4.
- d. Connect mains power port of the EUT to a line impedance stabilization network (LISN). Wired network port to Asymmetric Artificial Network (AAN).
- e. Connect all support devices to the other LISN and AAN, if needed.
- f. Turn on the EUT and all support devices, and make it run stably.
- g. Set the detector and measurement bandwidth of test-receiver system as per IEC 61000-6-4.
- h. Scan the frequency range from 150KHz to 30MHz at each side of AC line for conducted interference checking
- i. Repeat the above scans in each mode and record the test data.

5.4. Test Results

PASS.

Please refer to the following pages.

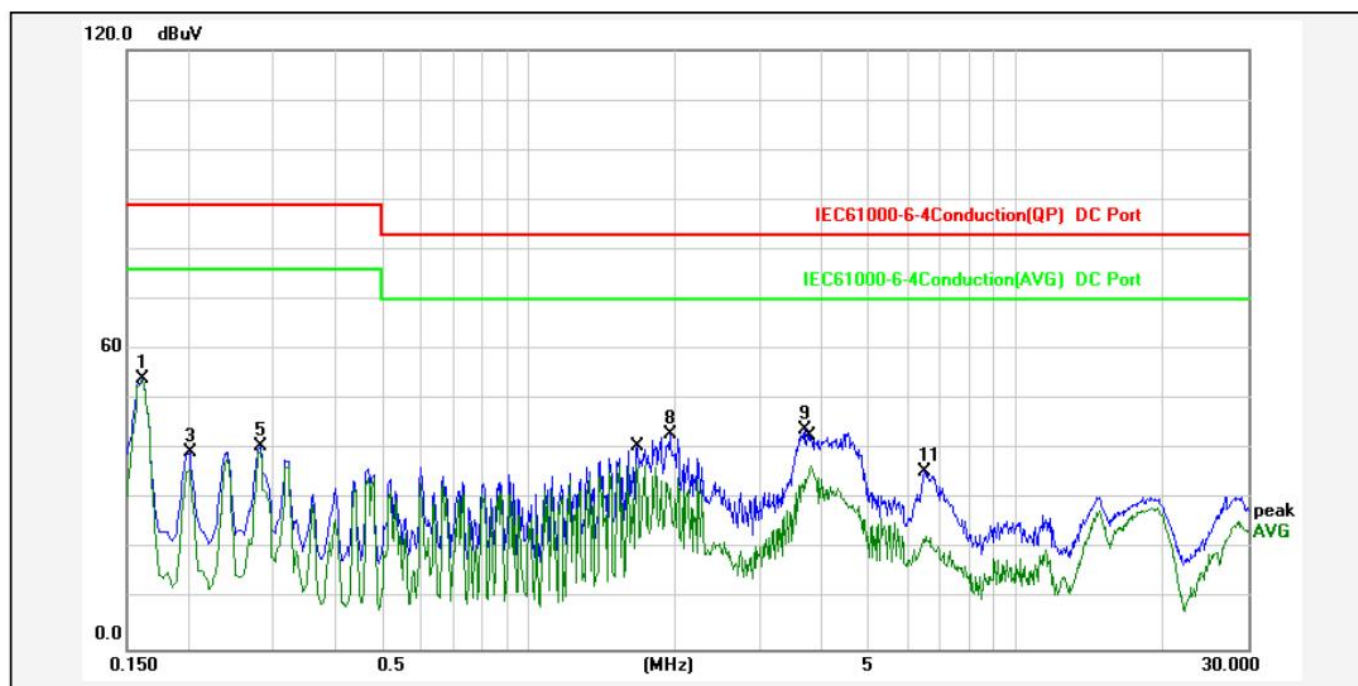
E.U.T:	DC-DC converter	Model Name:	SP120HCPV4
Temperature:	26°C	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Phase:	+
Test Date:	2024-12-19		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1620	10.45	39.49	49.94	89.00	-39.06	peak	P	
2	0.1620	10.45	39.04	49.49	76.00	-26.51	AVG	P	
3	1.9460	10.50	30.51	41.01	83.00	-41.99	peak	P	
4	1.9460	10.50	15.54	26.04	70.00	-43.96	AVG	P	
5	3.7620	10.42	33.38	43.80	83.00	-39.20	peak	P	
6	3.7620	10.42	25.35	35.77	70.00	-34.23	AVG	P	
7	6.5219	10.60	27.30	37.90	83.00	-45.10	peak	P	
8	6.5219	10.60	12.91	23.51	70.00	-46.49	AVG	P	
9	14.7979	10.80	32.19	42.99	83.00	-40.01	peak	P	
10	14.8419	10.80	30.50	41.30	70.00	-28.70	AVG	P	
11	19.5619	11.00	28.78	39.78	83.00	-43.22	peak	P	
12	19.5619	11.00	28.21	39.21	70.00	-30.79	AVG	P	

Remark: The peak value is lower than the AVG value limit, it can be judged as PASS without further testing the QP value.

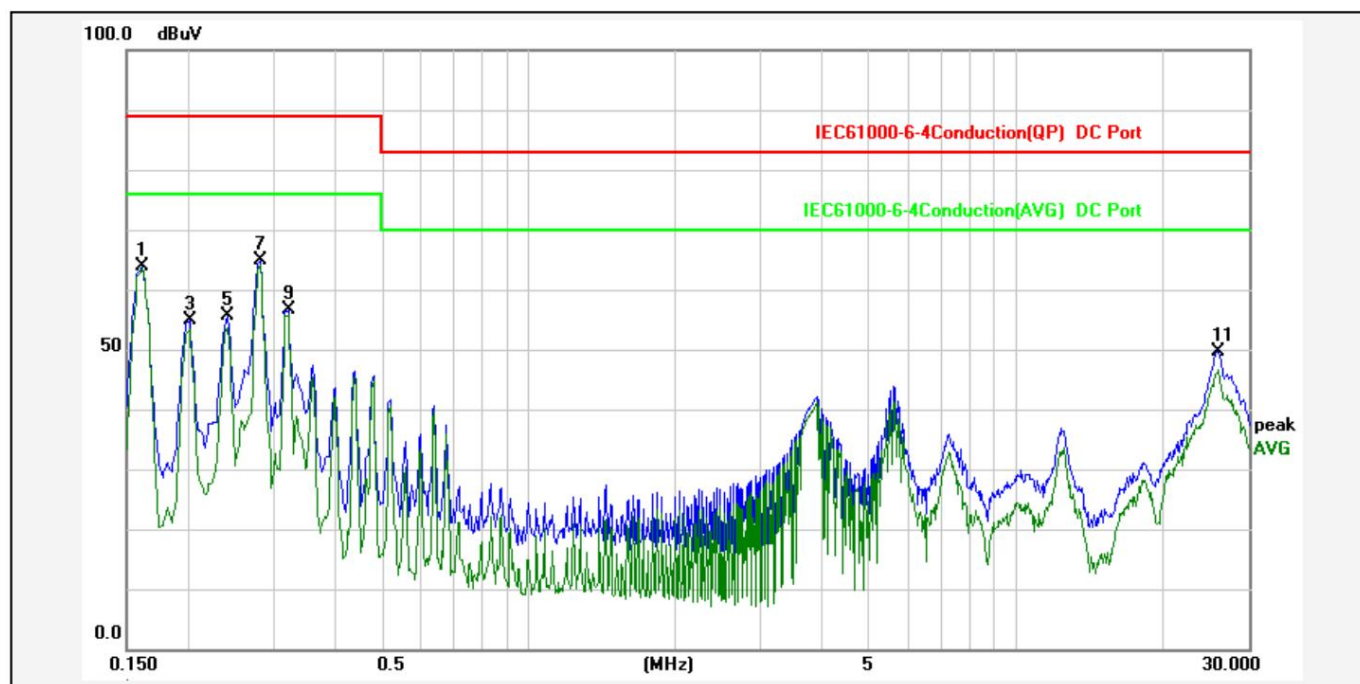
E.U.T:	DC-DC converter	Model Name:	SP120HCPV4
Temperature:	26°C	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Phase:	-
Test Date:	2024-12-19		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1620	10.45	43.73	54.18	89.00	-34.82	peak	P	
2	0.1620	10.45	43.51	53.96	76.00	-22.04	AVG	P	
3	0.2020	10.47	28.88	39.35	89.00	-49.65	peak	P	
4	0.2020	10.47	25.33	35.80	76.00	-40.20	AVG	P	
5	0.2819	10.46	30.09	40.55	89.00	-48.45	peak	P	
6	0.2819	10.46	29.35	39.81	76.00	-36.19	AVG	P	
7	1.6700	10.49	26.60	37.09	70.00	-32.91	AVG	P	
8	1.9500	10.50	32.59	43.09	83.00	-39.91	peak	P	
9	3.6820	10.40	33.55	43.95	83.00	-39.05	peak	P	
10	3.8020	10.42	26.40	36.82	70.00	-33.18	AVG	P	
11	6.4899	10.60	25.08	35.68	83.00	-47.32	peak	P	
12	6.5459	10.60	12.03	22.63	70.00	-47.37	AVG	P	

Remark: The peak value is lower than the AVG value limit, it can be judged as PASS without further testing the QP value.

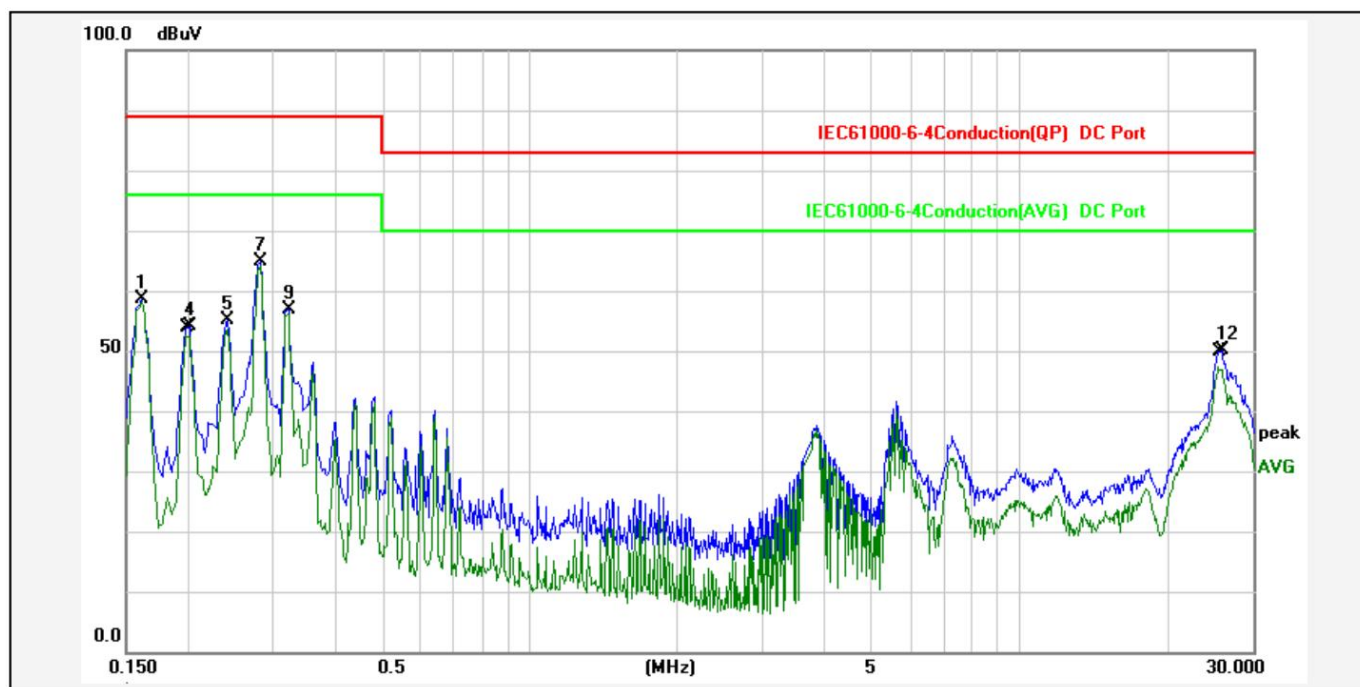
E.U.T:	DC-DC converter	Model Name:	SP105HCDC1
Temperature:	26°C	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Phase:	+
Test Date:	2024-12-13		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1620	10.45	53.44	63.89	89.00	-25.11	peak	P	
2	0.1620	10.45	53.11	63.56	76.00	-12.44	AVG	P	
3	0.2020	10.47	44.37	54.84	89.00	-34.16	peak	P	
4	0.2020	10.47	42.95	53.42	76.00	-22.58	AVG	P	
5	0.2420	10.46	45.07	55.53	89.00	-33.47	peak	P	
6	0.2420	10.46	43.29	53.75	76.00	-22.25	AVG	P	
7	0.2819	10.46	54.46	64.92	89.00	-24.08	peak	P	
8	0.2819	10.46	53.58	64.04	76.00	-11.96	AVG	P	
9	0.3220	10.41	46.20	56.61	89.00	-32.39	peak	P	
10	0.3220	10.41	45.47	55.88	76.00	-20.12	AVG	P	
11	26.0380	11.27	38.41	49.68	83.00	-33.32	peak	P	
12	26.0380	11.27	35.38	46.65	70.00	-23.35	AVG	P	

Remark: The peak value is lower than the AVG value limit, it can be judged as PASS without further testing the QP value.

E.U.T:	DC-DC converter	Model Name:	SP105HCDC1
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Phase:	-
Test Date:	2024-12-13		

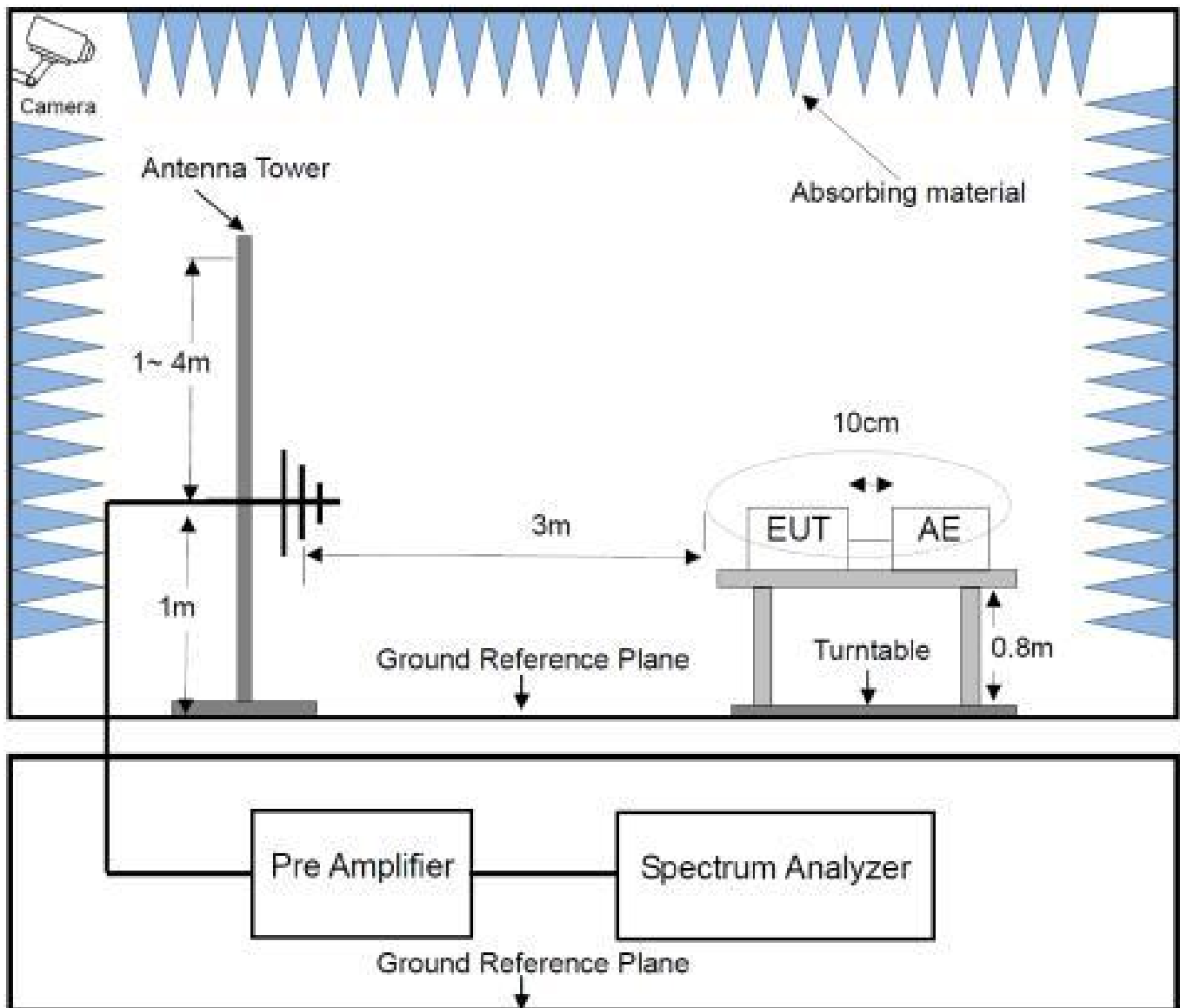


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1620	10.45	48.12	58.57	89.00	-30.43	peak	P	
2	0.1620	10.45	47.77	58.22	76.00	-17.78	AVG	P	
3	0.1980	10.47	42.08	52.55	76.00	-23.45	AVG	P	
4	0.2020	10.47	43.60	54.07	89.00	-34.93	peak	P	
5	0.2420	10.46	44.78	55.24	89.00	-33.76	peak	P	
6	0.2420	10.46	43.22	53.68	76.00	-22.32	AVG	P	
7	0.2819	10.46	54.50	64.96	89.00	-24.04	peak	P	
8	0.2819	10.46	53.73	64.19	76.00	-11.81	AVG	P	
9	0.3220	10.41	46.40	56.81	89.00	-32.19	peak	P	
10	0.3220	10.41	45.74	56.15	76.00	-19.85	AVG	P	
11	25.4780	11.24	36.01	47.25	70.00	-22.75	AVG	P	
12	25.8819	11.27	38.75	50.02	83.00	-32.98	peak	P	

Remark: The peak value is lower than the AVG value limit, it can be judged as PASS without further testing the QP value.

6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup



6.2. Limit of Radiated Emission Measurement

☒ Below 1 GHz:

Frequency range MHz	Quasi-peak limits dB(μV/m)	Distance m	Detector type / Bandwidth
30 to 230	50	3	120 KHz
230 to 1000	57	3	120 KHz
Note: The lower limit shall apply at the transition frequency.			

☐ Above 1 GHz:

Frequency range MHz	Peak limits dB(μV/m)	Average limits dB(μV/m)	Distance m	Detector type / Bandwidth
1000 to 3000	76	56	3	1MHz
3000 to 6000	80	60	3	1MHz

Required highest frequency for radiated measurement

Highest internal frequency* (F_x)	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz
Note F_x is highest fundamental frequency generated or used within the EUT or highest frequency at which it operates. - Where the F_x is not known, tests are performed up to 6 GHz.	

6.3. Test Procedure

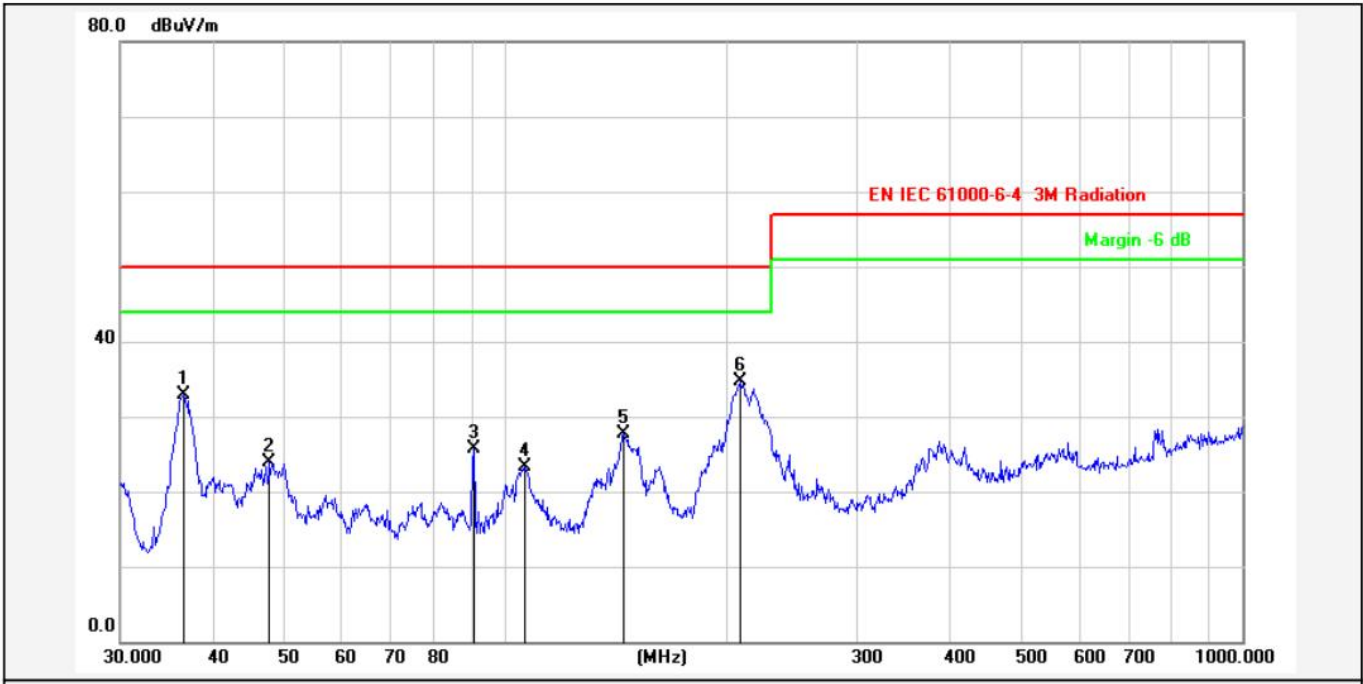
- a. The EUT was placed on a rotatable wooden table top 0.8m above ground.
- b. The EUT was set 3m away from the receiving antenna which was mounted on the top of a variable height antenna tower.
- c. Configure the EUT and support devices as per section 6.1.
- d. All cables and support devices were positioned as per IEC 61000-6-4.
- e. Connect mains power port of the EUT to the outlet socket under the turntable and connect all other support devices to other outlet socket under the turntable.
- f. Turn on the EUT and all support devices, and make it run stably.
- g. Set the detector and measurement bandwidth of test-receiver system as per IEC 61000-6-4.
- h. Scan the frequency range from 30MHz to 1000MHz for radiation emissions checking.
- i. Emissions were scanned and measured rotating the EUT from 0 to 360 degrees and positioning the antenna from 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- j. Repeat the above scans in each mode and channel and record the test data.

6.4. Test Results

PASS.

Please refer to the following pages.

E.U.T:	DC-DC converter	Model Name:	SP120HCPV4
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Polarization:	Horizontal
Test Date:	2024-12-19		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	36.6375	-11.52	44.50	32.98	50.00	-17.02	peak			P	
2	47.8260	-9.34	33.20	23.86	50.00	-26.14	peak			P	
3	90.5374	-12.43	38.07	25.64	50.00	-24.36	peak			P	
4	106.0126	-11.33	34.60	23.27	50.00	-26.73	peak			P	
5	144.3348	-13.33	40.95	27.62	50.00	-22.38	peak			P	
6	208.5803	-10.72	45.52	34.80	50.00	-15.20	peak			P	

Remark: The peak value is lower than the QP value limit, it can be judged as PASS without further testing the QP value.

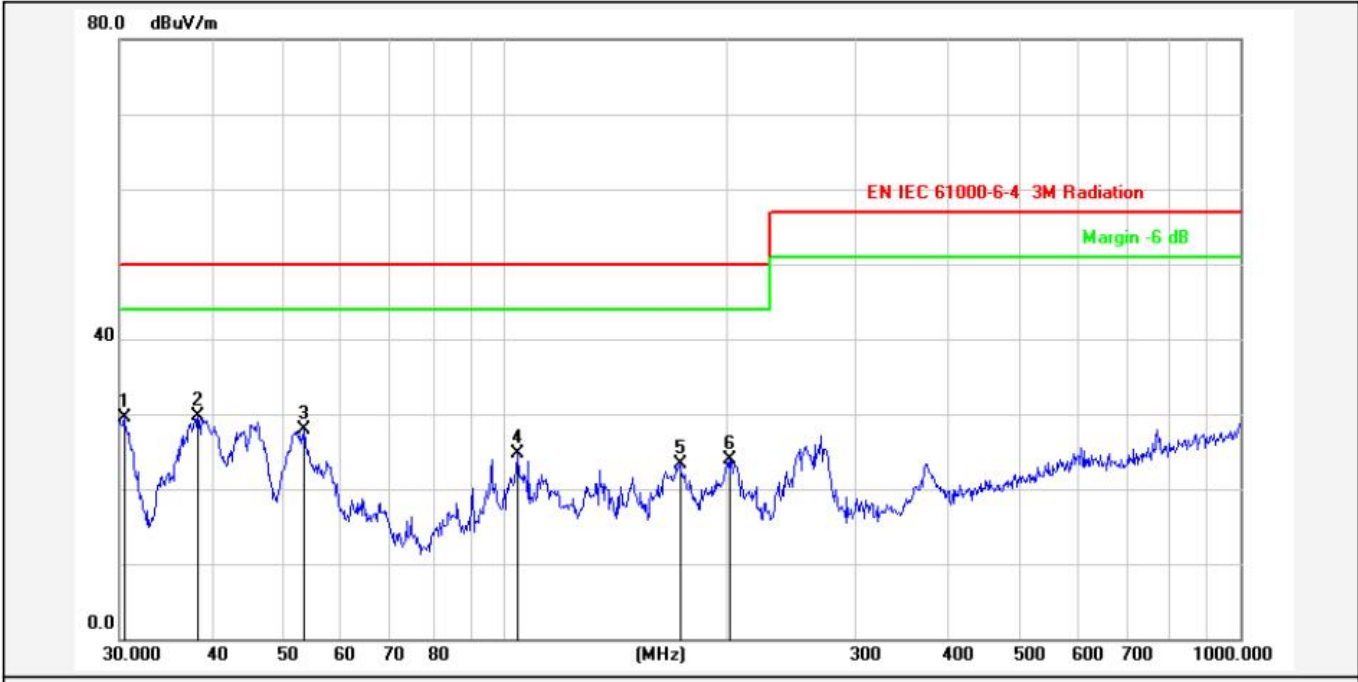
E.U.T:	DC-DC converter	Model Name:	SP120HCPV4
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Polarization:	Vertical
Test Date:	2024-12-19		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	36.1271	-11.73	51.30	39.57	50.00	-10.43	peak			P	
2	50.7636	-9.45	37.85	28.40	50.00	-21.60	peak			P	
3	56.9912	-10.16	36.86	26.70	50.00	-23.30	peak			P	
4	64.2074	-11.39	37.78	26.39	50.00	-23.61	peak			P	
5	104.1701	-11.17	37.24	26.07	50.00	-23.93	peak			P	
6	207.8501	-10.73	45.46	34.73	50.00	-15.27	peak			P	

Remark: The peak value is lower than the QP value limit, it can be judged as PASS without further testing the QP value.

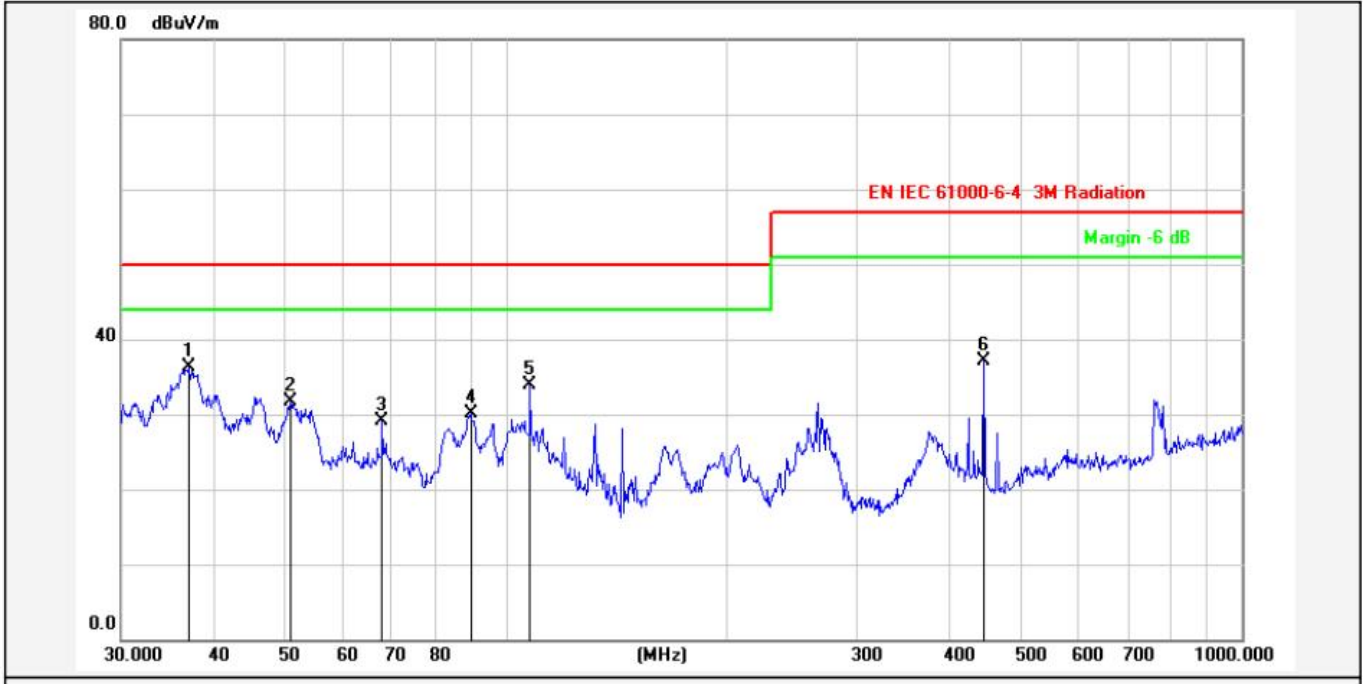
E.U.T:	DC-DC converter	Model Name:	SP105HCDC1
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Polarization:	Horizontal
Test Date:	2024-12-13		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.4237	-12.45	42.05	29.60	50.00	-20.40	peak			P	
2	38.3462	-10.90	40.68	29.78	50.00	-20.22	peak			P	
3	53.5052	-9.71	37.64	27.93	50.00	-22.07	peak			P	
4	104.1701	-11.17	35.93	24.76	50.00	-25.24	peak			P	
5	173.2050	-12.09	35.46	23.37	50.00	-26.63	peak			P	
6	202.8103	-10.87	34.86	23.99	50.00	-26.01	peak			P	

Remark: The peak value is lower than the QP value limit, it can be judged as PASS without further testing the QP value.

E.U.T:	DC-DC converter	Model Name:	SP105HCDC1
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1012 hPa	Test Voltage:	DC 600V
Test Mode:	Working Mode	Polarization:	Vertical
Test Date:	2024-12-13		



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	37.1550	-11.32	47.62	36.30	50.00	-13.70	peak			P	
2	50.9420	-9.47	41.17	31.70	50.00	-18.30	peak			P	
3	67.9129	-12.43	41.56	29.13	50.00	-20.87	peak			P	
4	89.5899	-12.66	42.69	30.03	50.00	-19.97	peak			P	
5	107.8877	-11.48	45.30	33.82	50.00	-16.18	peak			P	
6	446.4141	-4.78	41.86	37.08	57.00	-19.92	peak			P	

Remark: The peak value is lower than the QP value limit, it can be judged as PASS without further testing the QP value.

7. PERFORMANCE CRITERIA FOR IMMUNITY

The performance criteria are referred to the test standard: IEC 61000-6-2

A functional description and a definition of specific performance criteria, during or as a consequence of immunity testing of equipment under test (EUT), shall be provided by the manufacturer and noted in the test report.

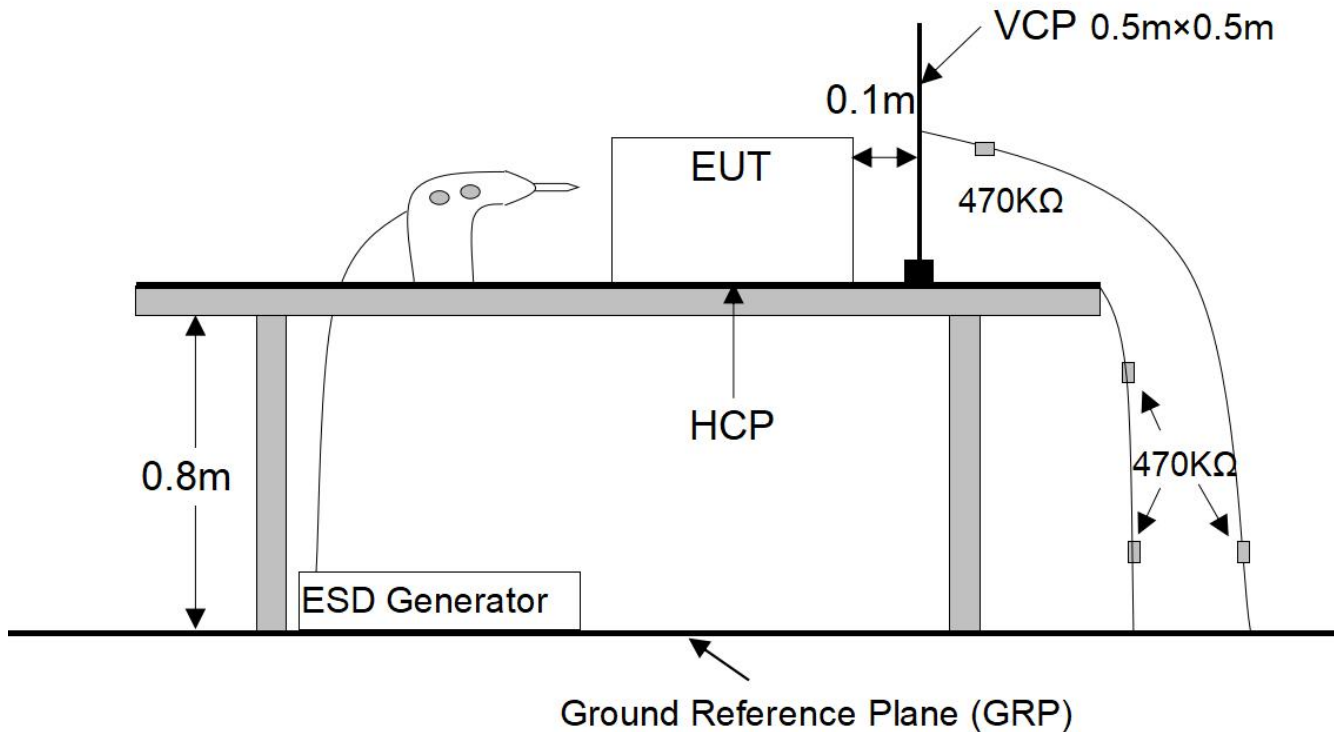
Performance criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion C: Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls. If, as a result of the application of the tests defined in this standard, the EUT becomes dangerous or unsafe, it shall be deemed to have failed the test.

8. ELECTROSTATIC DISCHARGE TEST

8.1. Block Diagram of Test Setup



8.2. Test Standard and Severity Levels

a. Test Standard:

Product standard	IEC 61000-6-2
Basic standard	IEC 61000-4-2
Performance criterion	B

b. Severity Levels:

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1.	±2	±2
2.	±4	±4
3.	±6	±8
4.	±8	±15
X	Special	Special

8.3. Test Procedure

Air Discharge:

Air discharges at slots and apertures and insulating surfaces. On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those are normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

Contact Discharge:

Contact discharges to the conductive surfaces and coupling planes. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 20 indirect discharges to the center of the front edge of the Horizontal Coupling Plane (HCP). The remaining three test points shall each receive at least 20 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

- a. The EUT was placed on a wooden table 0.8m height from the ground.
- b. The EUT was located 0.1m minimum from all side of the HCP (dimensions 1.6m x0.8m).
- c. Configure the EUT and support devices as per section 8.1.
- d. The support units were located 30cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10cm with EUT.
- e. Turn on the EUT and all support devices, and make it run stably.
- f. The time interval between two successive single discharges was at least 1 second. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- g. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- h. At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharges.

- i. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane (VCP) in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.
- j. Repeat the above steps in each mode and record the test result.

8.4. Test Results

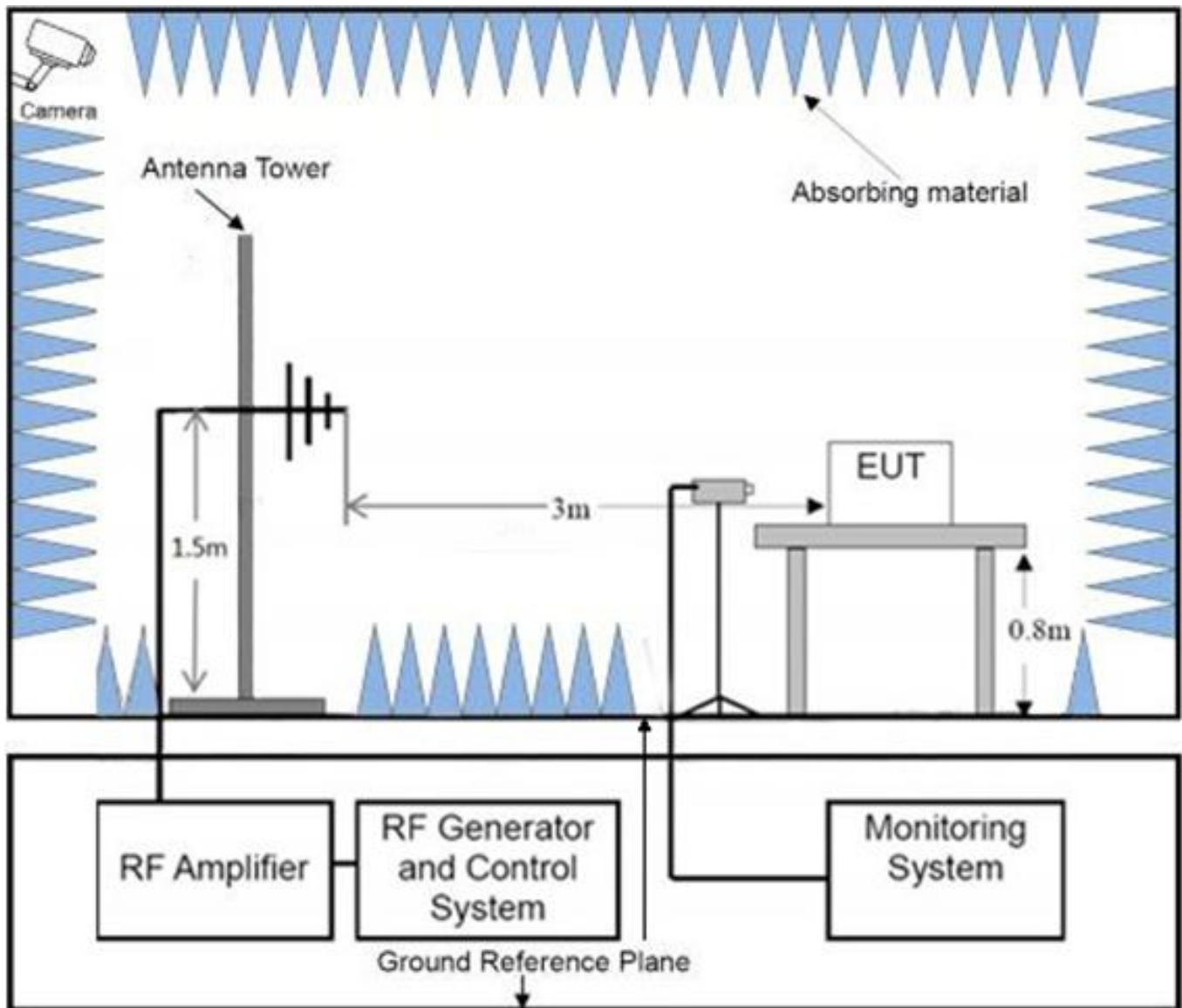
PASS.

Please refer to the following page.

Electrostatic Discharge Test Results			
Ambient Condition:	Temp.: 26.5 °C	R.H.: 46 %	Air Pressure: 101.2kPa
Test Specifications	Test level:	±2, 4KV for Contact Discharge ±2, 4, 8 KV for Air Discharge	
	Discharge impedance:	330ohm / 150pF	
	No. of discharges:	10 times at each test point for each polarity at least	
	Polarity:	Positive / Negative	
	Discharge mode:	Single	
	Interval time of discharges:	≥1s	
	Required Performance Criterion	B	
Tested Mode	1		
Test Point		Kind A-Air Discharge C-Contact Discharge	Result (Performance Criterion)
Com. Port		C	A
Metal case(Back, left, right, up and down)		C	A
Screw		C	A
Indirect Discharge (VCP)		C	A
Indirect Discharge (HCP)		C	A
Note: No performance degradation or other exceptions occurred during and after the test.			
Test Date: 2024-10-26			

9. RADIO-FREQUENCY ELECTROMAGNETIC FIELD TEST

9.1. Block Diagram of Test Setup



9.2. Test Standard and Severity Levels

a. Test Standard

Product standard	IEC 61000-6-2
Basic standard	IEC 61000-4-3
Performance criterion	A

b. Severity Levels

Level	Field Strength (V/m)
1.	1
2.	3
3.	10
4.	30
X	Special

9.3. Test Procedure

- The testing was performed in a fully anechoic chamber.
- The EUT and necessary support devices were placed on a turn table which is 0.8 meter above ground.
- EUT was set 3 meter away from the transmitting antenna which is mounted on an antenna tower.
- Configure the EUT and support devices as per section 9.1.
- Turn on the EUT and all support devices, and make it run stably.
- Set horizontal and vertical polarization of the antenna to test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.
- Repeat the above steps in each mode and record the test result.

9.4. Test Results

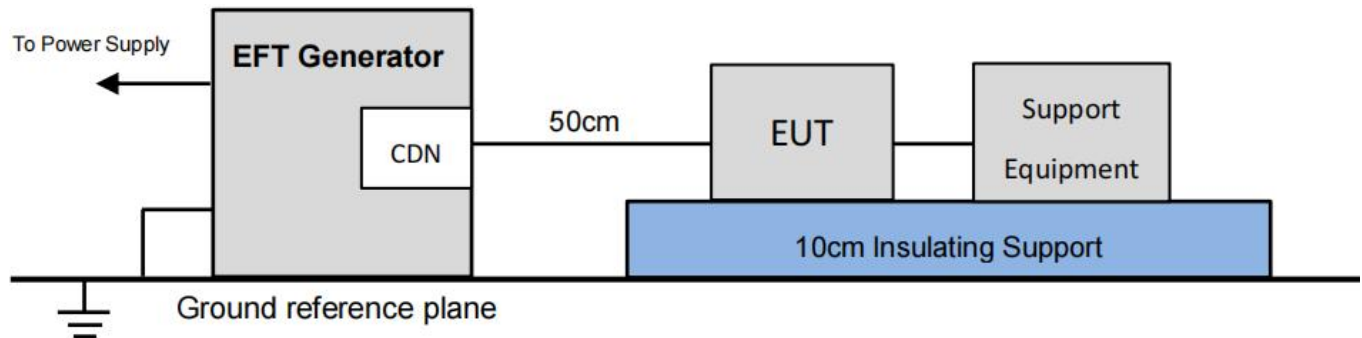
PASS.

Please refer to the following page.

Radio-Frequency Electromagnetic Field Test Results				
Ambient Condition	Temp.: 24.5 °C		R.H.: 43 %	Air Pressure: 103 kPa
Test Specifications	Fielded Strength:		10V/m, 3V/m	
	Modulation:		1kHz sine wave, 80%AM	
	Frequency Size:		1% of preceding frequency value	
	Dwell Time:		1s	
	Mode:		Swept test / Spot test	
Required Performance Criterion	A			
Tested Mode	1			
Frequency (MHz)	Level (V/m)	Antenna polarity	Side	Result (Performance Criterion)
80-1000	10	Horizontal Vertical	Front	A
			Left	A
			Right	A
			Back	A
1400-6000	3	Horizontal Vertical	Front	A
			Left	A
			Right	A
			Back	A
Note: No performance degradation or other exceptions occurred during and after the test.				
Test Date: 2024-10-29				

10. FAST TRANSIENTS TEST

10.1. Block Diagram of Test Setup



10.2. Test Standard and Severity Levels

a. Test Standard

Product standard	IEC 61000-6-2
Basic standard	IEC 61000-4-4
Performance criterion	B

b. Severity level

Open circuit output test voltage and repetition rate of the impulses				
Level	Power ports, earth port (PE)		Signal data and control ports	
	Voltage peak kV	Repetition frequency kHz	Voltage peak kV	Repetition frequency kHz
1.	0.5	5 or 100	0.25	5 or 100
2.	1.0	5 or 100	0.5	5 or 100
3.	2.0	5 or 100	1.0	5 or 100
4.	4.0	5 or 100	2.0	5 or 100
X	Special	Special	Special	Special

Note 1 The use of 5 kHz repetition rates is traditional, however, 100 kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types.

Note 2 With some products, there may be no clear distinction between power ports and signal ports, in which case it is up to product committees to make this determination for test purposes.

Note 3 "X" can be any level, above, below or in between the others. The level shall be specified in the dedicated equipment specification.

10.3. Test Procedure

- a. The EUT was placed on the insulating support 0.1m above the reference ground plane.
- b. Configure the EUT and support devices as per section 10.1.
- c. Turn on the EUT and all support devices, and make it run stably.
- d. For input and output AC power port of the EUT, the EUT was connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. The coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.
- e. For signal ports of the EUT, the EUT was connected to the power mains, and the signal line through a coupling device which couples the EUT interference signal to signal line. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.
- f. Repeat the above steps in each mode and record the test result.

10.4. Test Results

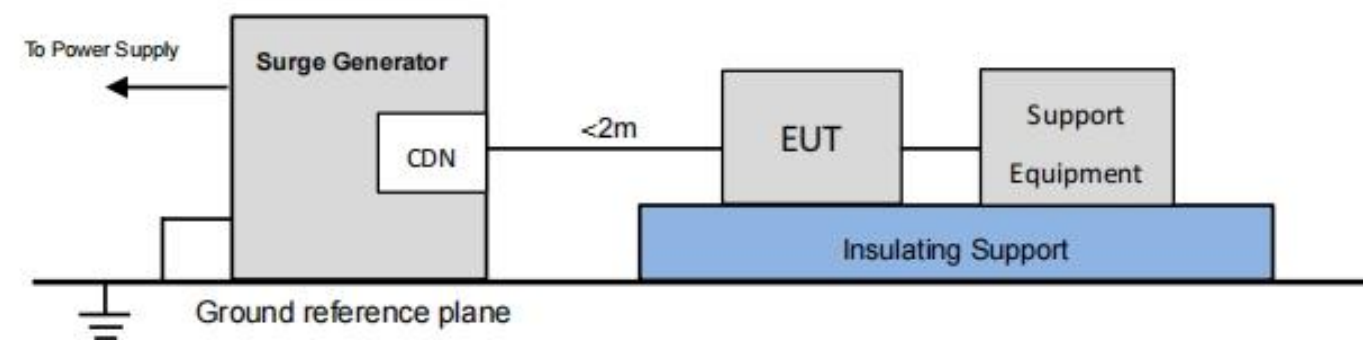
PASS.

Please refer to the following page.

Fast Transients Test Results			
Ambient Condition	Temp.: 26.8 °C	R.H.: 48 %	Air Pressure: 102.3 kPa
Test Specifications	Test Level:	±1 KV for PV Port	
	Repetition Frequency:	5kHz	
	Duration:	15ms	
	Period:	300ms	
	Impulse wave shape:	5/50ns (Tr/Th)	
	Test Duration:	2min	
Required Performance Criterion	B		
Tested Mode	1		
Coupling mode and port	☐ AC Mains ☒ DC port ☐ Signal line		
	☒ Direct Coupling ☐ Capacitive		
Test Line	Test Voltage	Result (Performance Criterion)	
PV Port	±1KV	A	
Note: No performance degradation or other exceptions occurred during and after the test.			
Test Date: 2024-10-26			

11. SURGES TEST

11.1. Block Diagram of Test Setup



11.2. Test Standard and Severity Levels

a. Test Standard

Product standard	IEC 61000-6-2
Basic standard	IEC 61000-4-5
Performance criterion	B

b. Severity level

Level	Open-Circuit Test Voltage KV
1.	0.5
2.	1.0
3.	2.0
4.	4.0
X	Special

11.3. Test Procedure

- a. The EUT was placed on the wooden table 0.1m above the ground.
- b. Configure the EUT and support devices as per section 11.1.
- c. Turn on the EUT and all support devices, and make it run stably.
- d. The Surges is applied to the EUT power supply terminals via the capacitive coupling network Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the Surges wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
- e. For test applied to unshielded un-symmetrically operated interconnection lines of EUT, the Surges was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
- f. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT, the Surges was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
- g. Five positive and five negative (polarity) pulses at specified phase angles with a 1min repetition rate are conducted during test.
- h. Repeat the above steps in each mode and record the test result.

11.4. Test Results

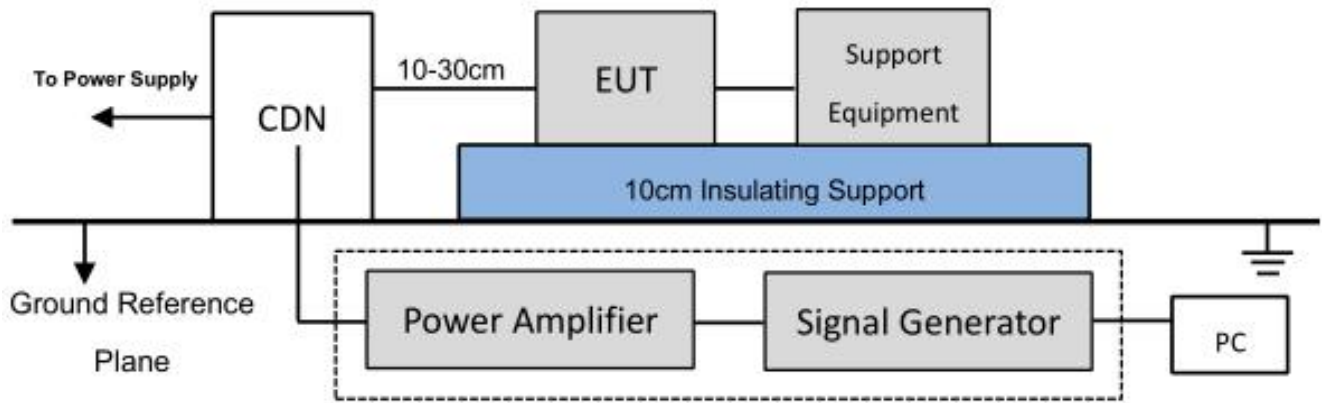
PASS.

Please refer to the following page.

Surges Test Results				
Ambient Condition		Temp.: 28.9 °C	R.H.: 52 %	Air Pressure: 102.3kPa
Test Specifications		Wave-shape:	1.2/50 us (Tr/Th) / 8/20 us (Tr/Th) for power port	
		Test Level:	±0.5KV for Positive to Negative ±1KV for Positive to Earth ±1KV for Earth to Negative	
		Phase angle:	---	
		Polarity:	Positive / Negative	
		No. of pulse:	5 positive / 5 negative	
		Pulse repetition rate:	1 time per minute / maximum	
		Generator source impedance:	2 ohm / power supply network 12 ohm / power supply network to ground	
Required Performance Criterion		B		
Tested Mode		1		
Test Line		Phase Angle	Test Voltage	Result (Performance Criterion)
PV Port	Positive to Negative	---	±0.5KV	B
	Positive to Earth	---	±1KV	B
	Earth to Negative	---	±1KV	B
Note: During the test, the EUT output voltage is reduced and can recover after the test.				
Test Date: 2024-10-26				

12. RADIO-FREQUENCY COMMON MODE TEST

12.1. Block Diagram of Test Setup



12.2. Test Standard and Severity Levels

a. Test Standard

Product standard	IEC 61000-6-2
Basic standard	IEC 61000-4-6
Performance criterion	A

b. Severity level

Level	Field Strength (V)
1.	1
2.	3
3.	10
X	Special

12.3. Test Procedure

- a. The EUT was placed on the insulating support 0.1m above the ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- b. Configure the EUT and support devices as per section 12.1.
- c. Turn on the EUT and all support devices, and make it run stably.
- d. The disturbance signal described below is injected to EUT through CDN.
- e. The frequency range is swept from 150KHz to 80 MHz using 10V, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- f. Repeat the above steps in each mode and record the test result.

12.4. Test Results

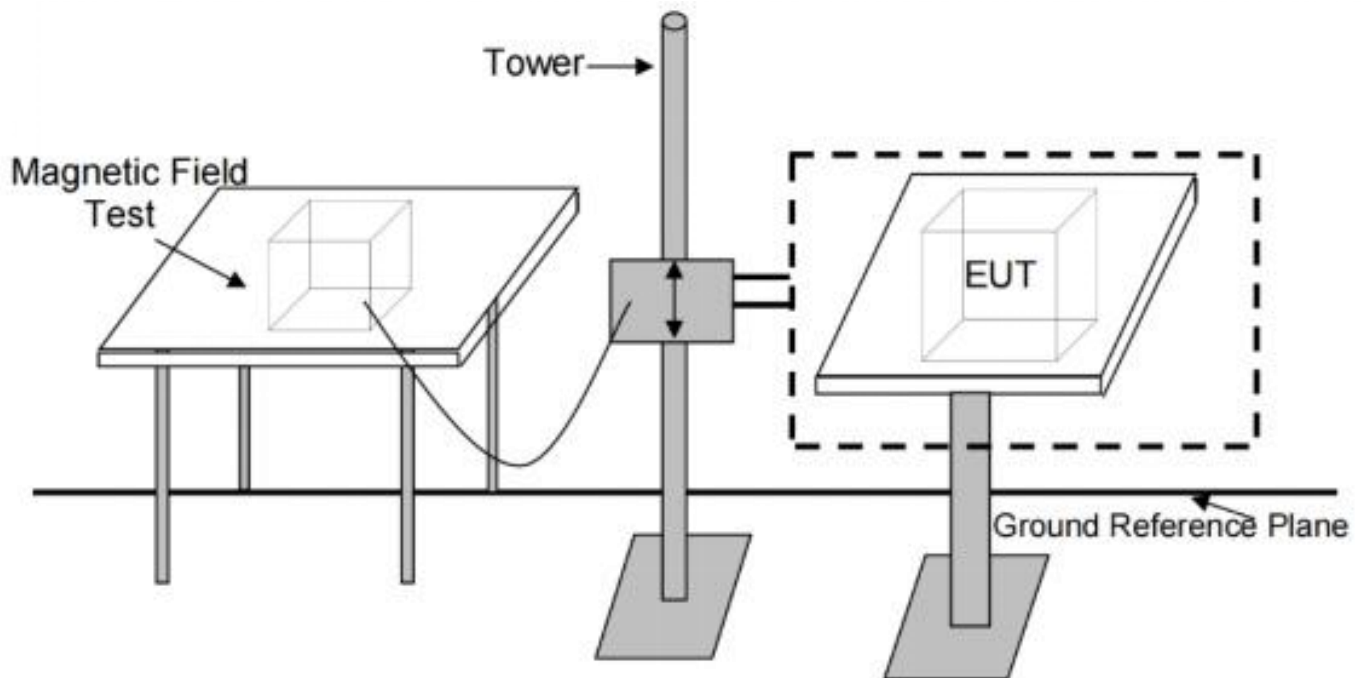
PASS.

Please refer to the following page.

Radio-Frequency Common Mode Test Results			
Ambient Condition	Temp.: 26.8 °C	R.H.: 59 %	Air Pressure: 103 kPa
Test Specifications	Test Level:	10V	
	Modulation:	1kHz sine wave, 80%AM	
	Step Size:	1% of preceding frequency value	
	Dwell Time:	1s	
	Mode:	Swept test	
Required Performance Criterion	A		
Tested Mode	1		
Test Port	Frequency (MHz)	Level(V)	Result (Performance Criterion)
PV Port	0.15 to 80	10	A
Note: No performance degradation or other exceptions occurred during and after the test.			
Test Date: 2024-10-29			

13. POWER-FREQUENCY MAGNETIC FIELD TEST

13.1. Block Diagram of Test Setup



13.2. Test Standard and Severity Levels

a. Test Standard

Product standard	IEC 61000-6-2
Basic standard	IEC 61000-4-8
Performance criterion	A

b. Severity level

Level	Magnetic Field Strength A/m
1.	1
2.	3
3.	10
4.	30
5.	100
X	Special

13.3. Test Procedure

- a. The EUT was placed on the middle of an induction coil(1*1m), under which is a 0.8m-thick insulating support.
- b. Configure the EUT and support devices as per section 13.1.
- c. All cables of the EUT were exposed to the magnetic field for 1m of their length.
- d. X, Y and Z polarization of the induction coil are set on test, so that each side of the E.U.T. is affected by the magnetic field. If not possible as the EUT size, change the position of the EUT is permitted.
- e. Repeat the above steps in each mode and record the test result.

13.4. Test Results

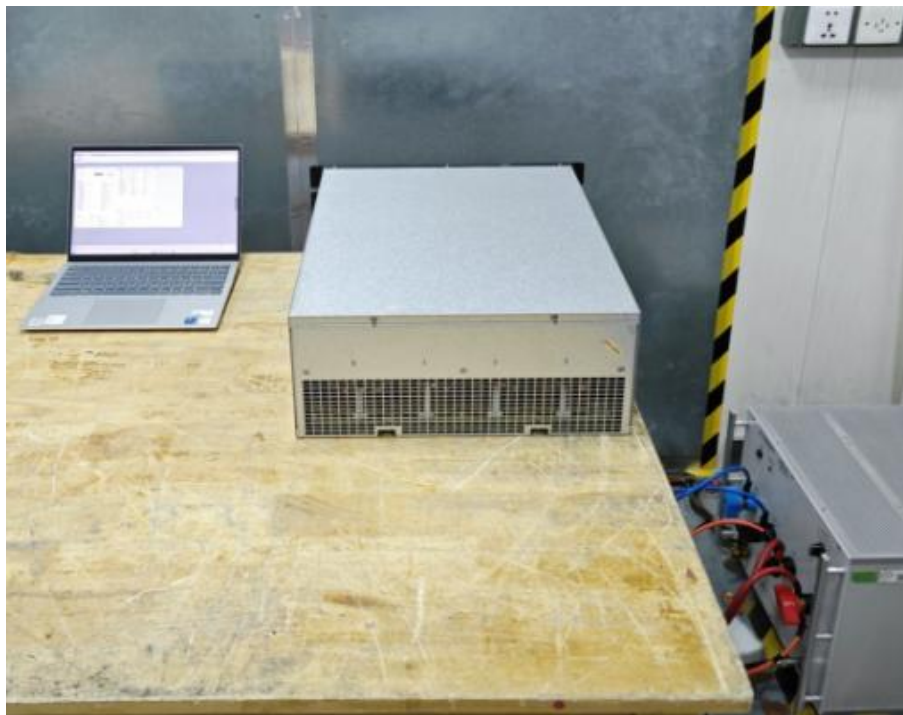
PASS.

Please refer to the following page.

Power-Frequency Magnetic Field Test Results			
Ambient Condition	Temp.: 26.2 °C	R.H.: 47 %	Air Pressure: 102.3 kPa
Test Specifications	Test Level:	30A/m	
	Time:	300s	
Required Performance Criterion	A		
Tested Mode	1		
Coil Orientation	Level (A/m)	Testing Duration	Result (Performance Criterion)
X	30	300s	A
Y	30	300s	A
Z	30	300s	A
Note: No performance degradation or other exceptions occurred during and after the test.			
Test Date: 2024-10-26			

APPENDIX I-PHOTOS OF TEST SETUP

Set-up for Conducted Emission



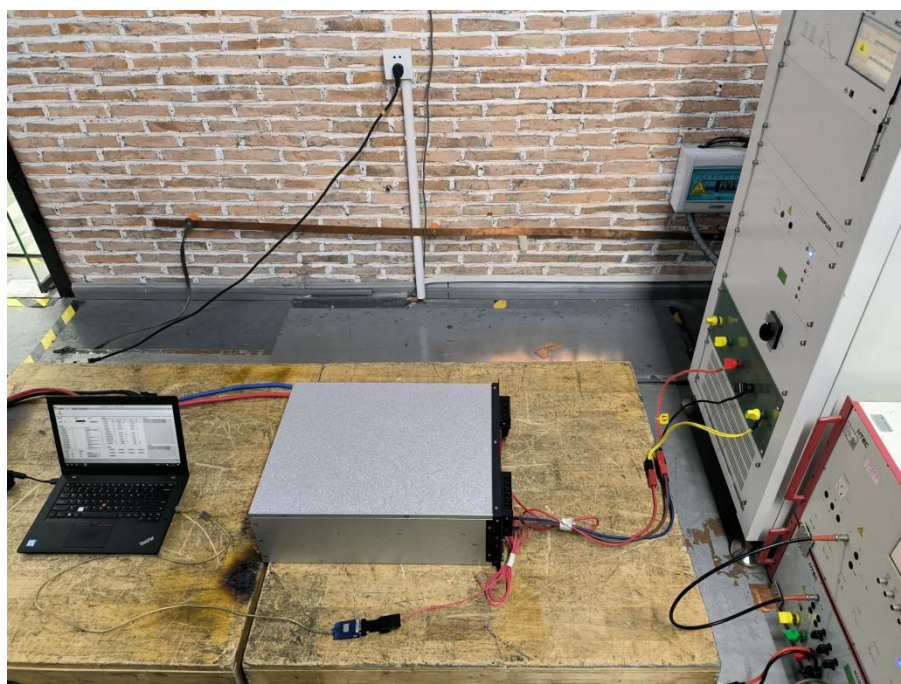
Set-up for Radiated Emission



Set-up for Electrostatic Discharge



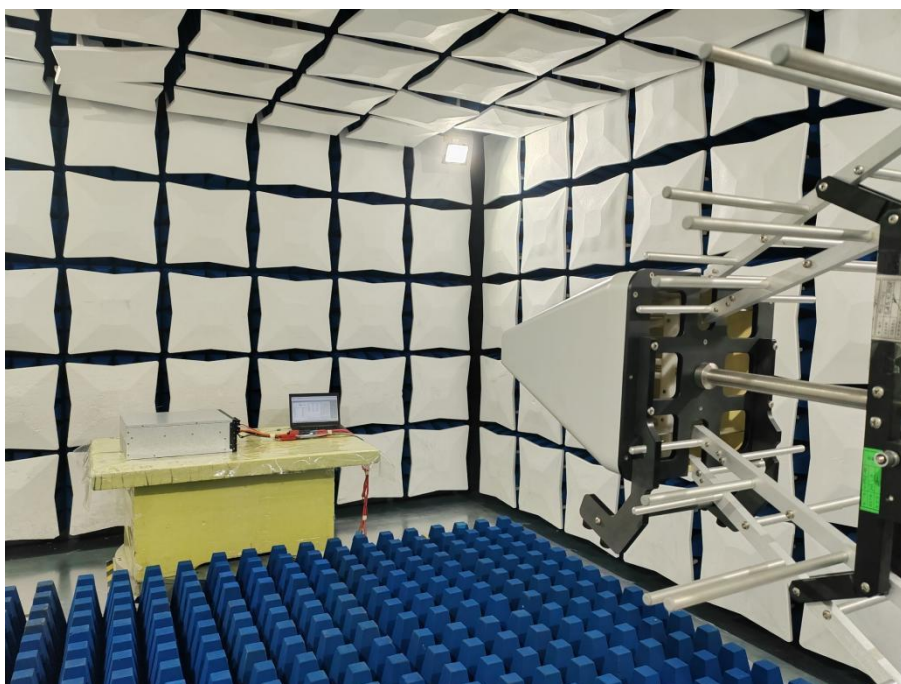
Set-up for Fast Transients Test



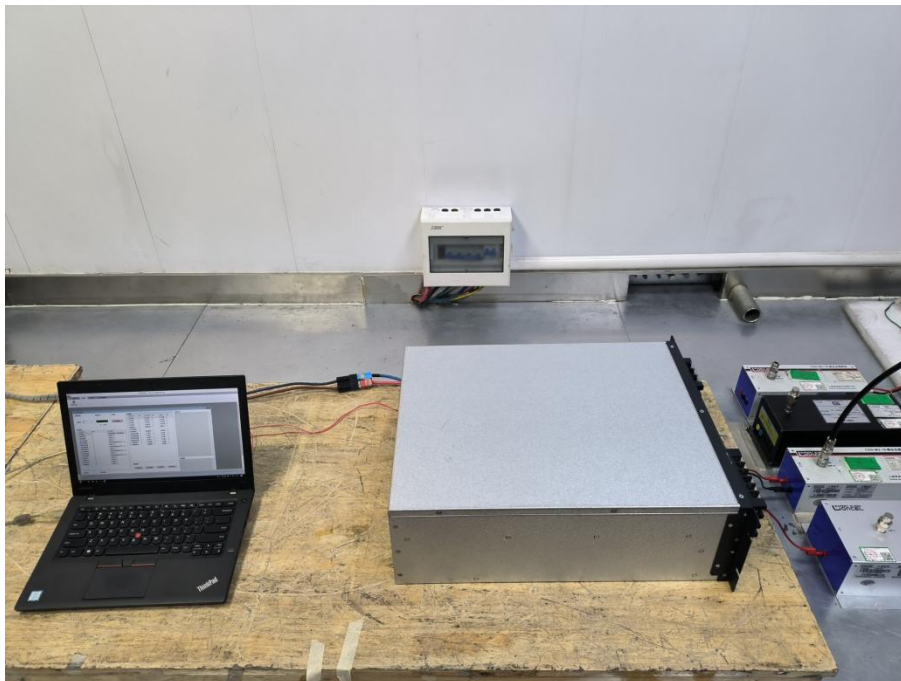
Set-up for Surges



Set-up for Radio-Frequency Electromagnetic Field



Set-up for Radio-Frequency Common Mode



Set-up for Power-Frequency Magnetic Field Test



APPENDIX II-PHOTOS OF E.U.T

Over View -1
(Model:SP120HCPV4)



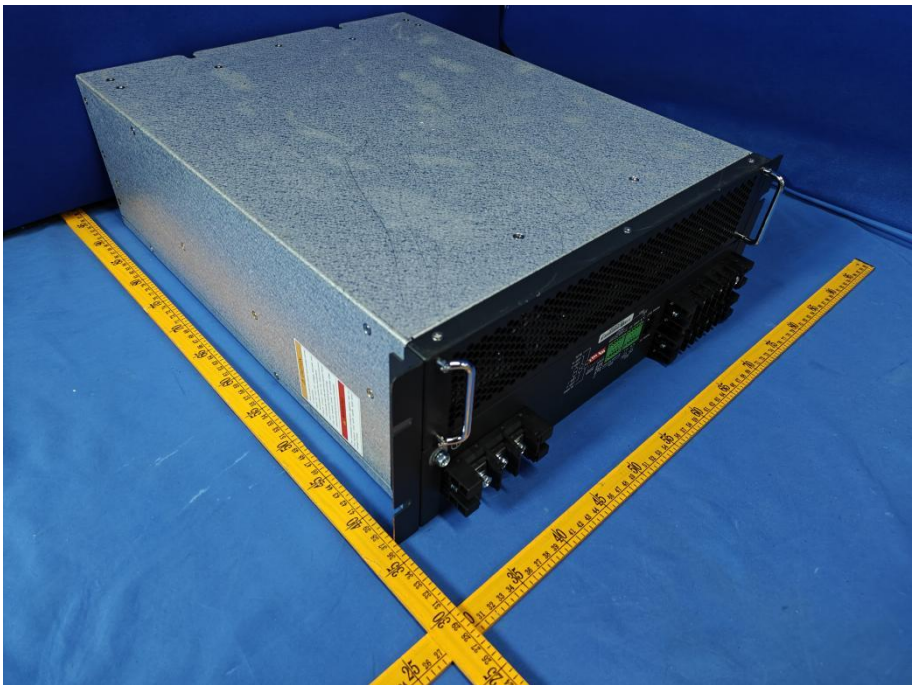
Over View -2
(Model:SP120HCPV4)



Over View -3
(Model:SP120HCPV4)



Over View -4
(Model:SP120HCPV4)



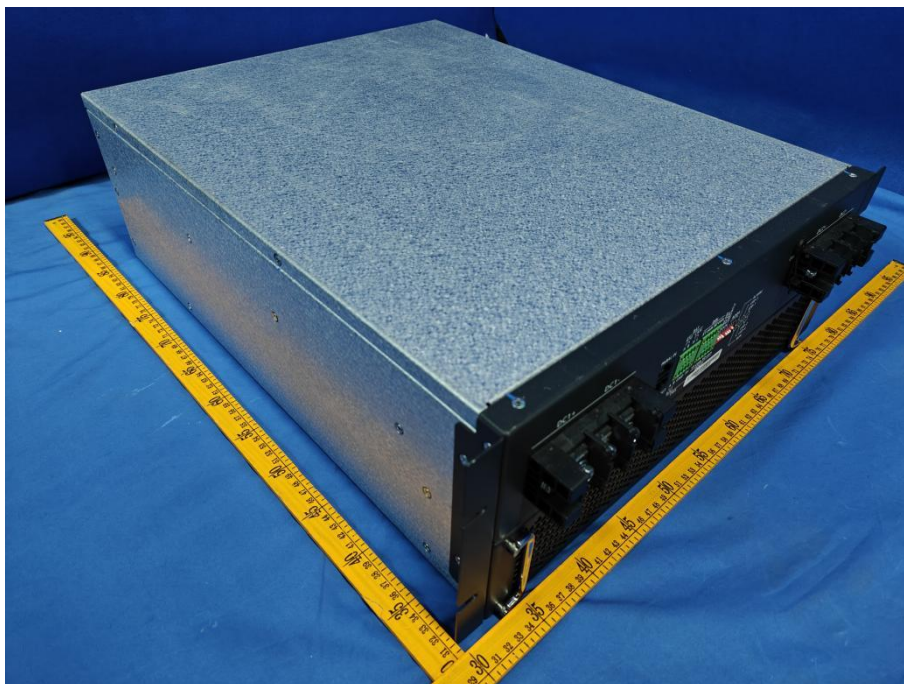
Over View -1
(Model:SP105HCDC1)



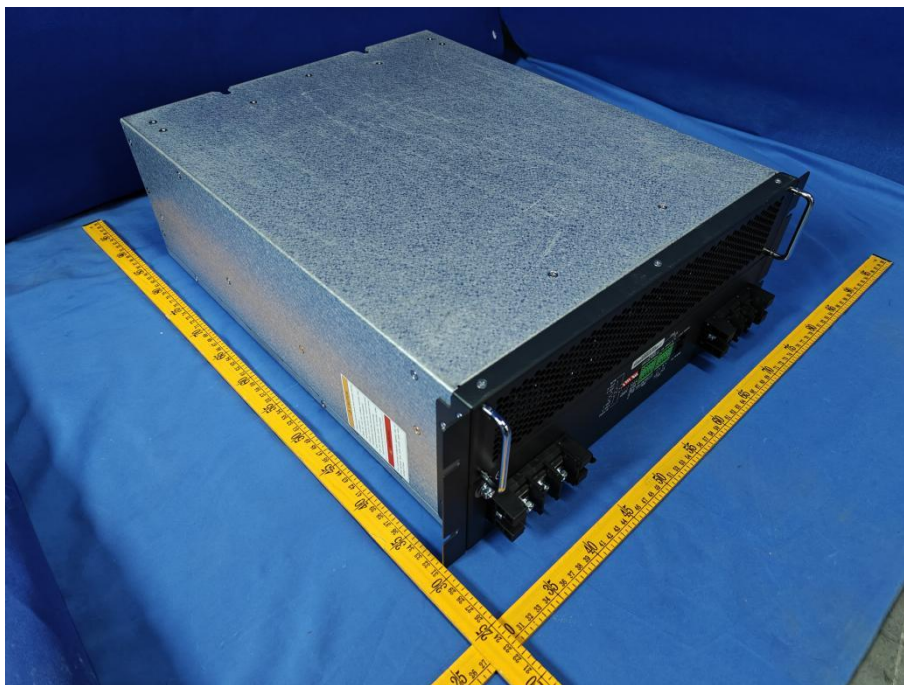
Over View -2
(Model:SP105HCDC1)



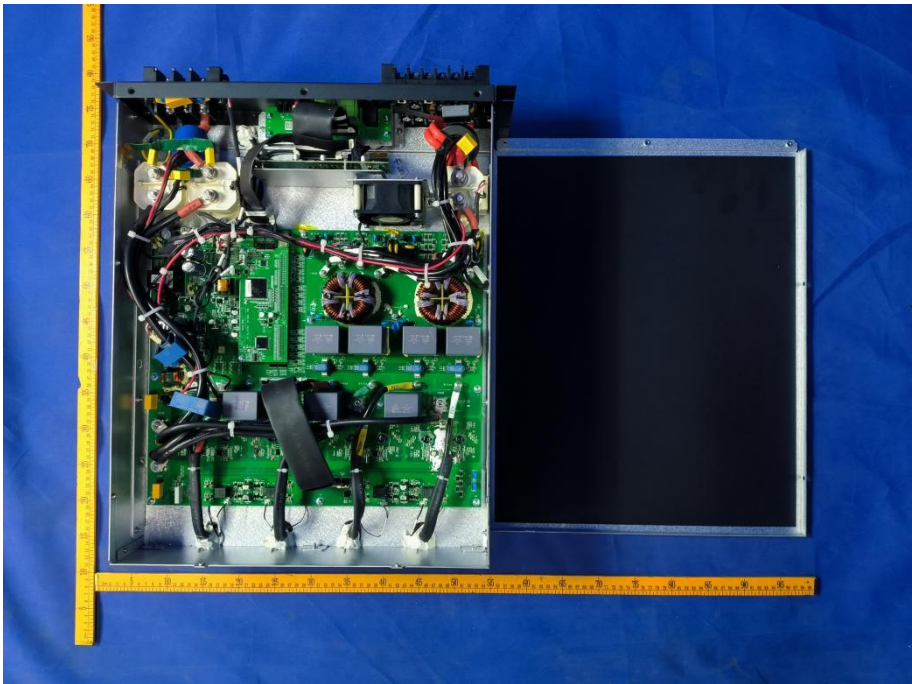
Over View -3
(Model:SP105HCDC1)



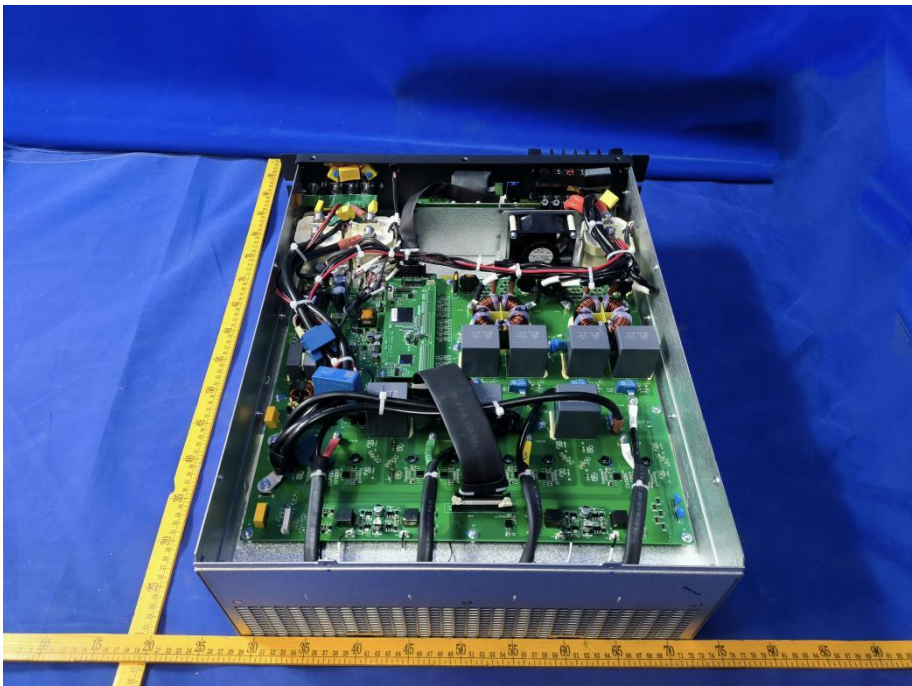
Over View -4
(Model:SP105HCDC1)



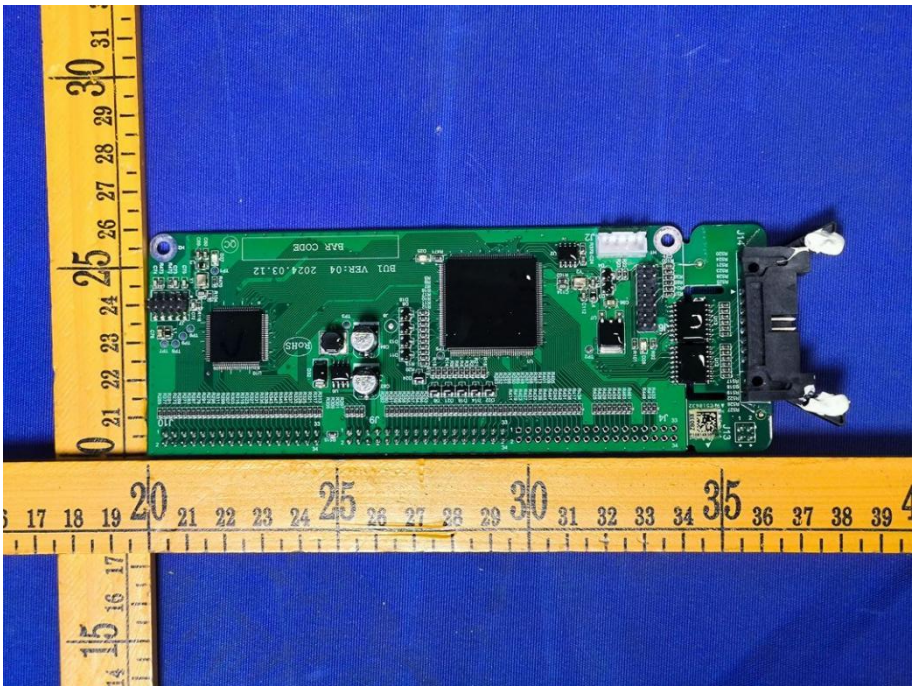
Interior View -1
(All model)



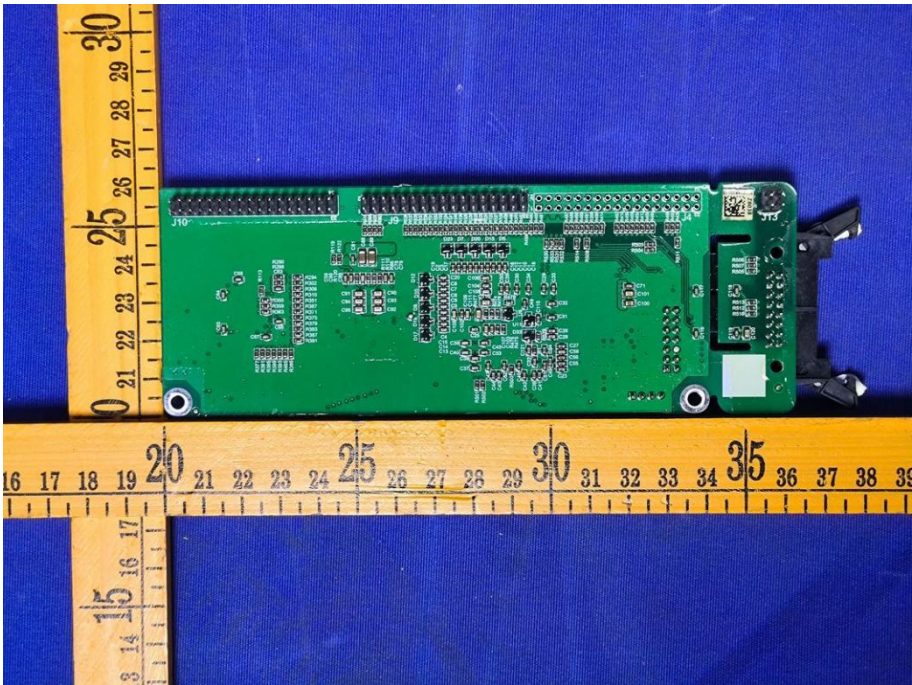
Interior View -2
(All model)



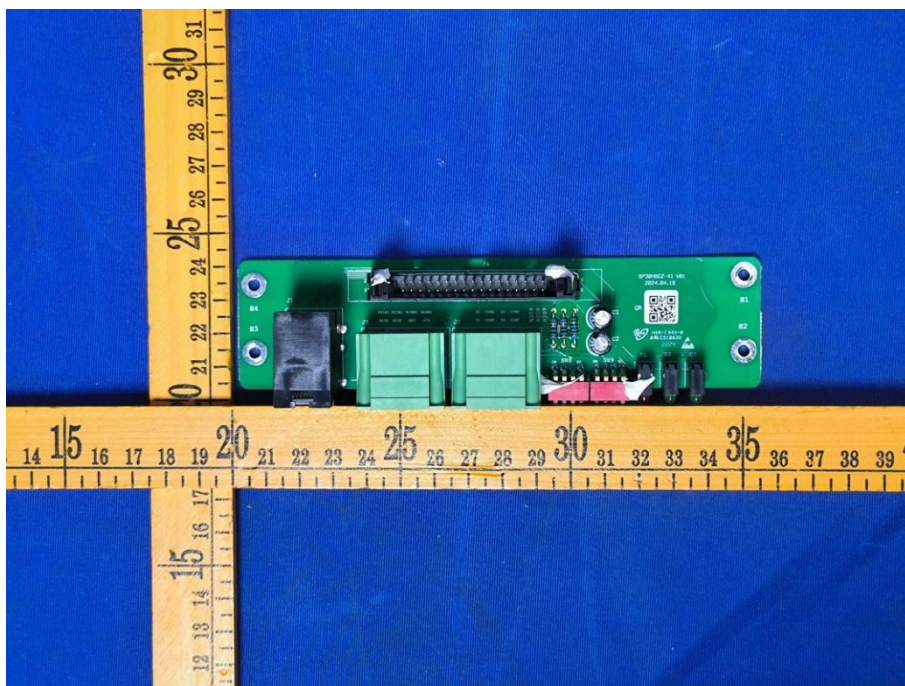
PCB View -1
(All model)



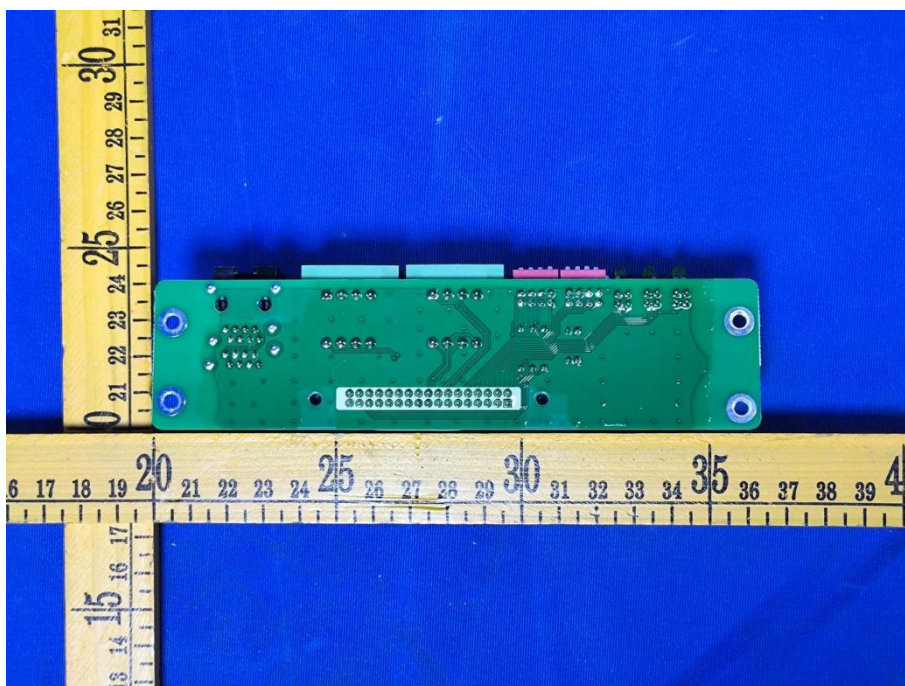
PCB View -2
(All model)



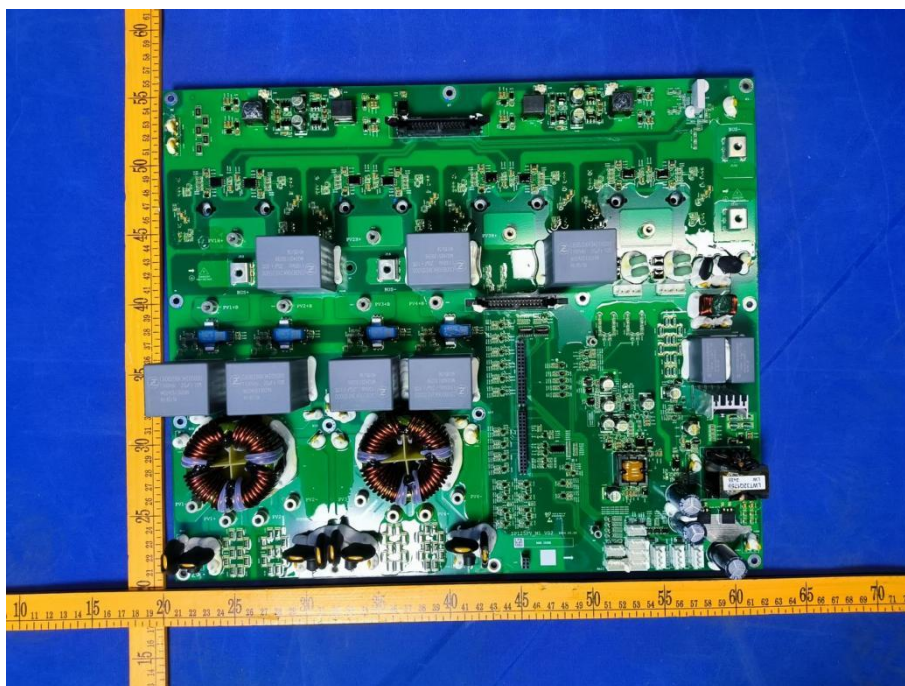
PCB View -3
(All model)



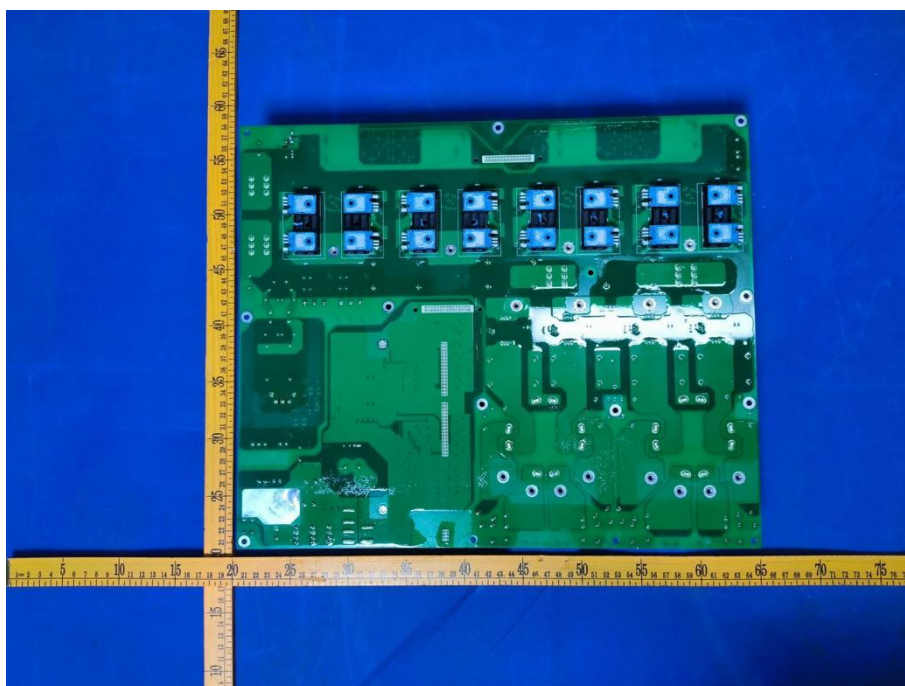
PCB View -4
(All model)



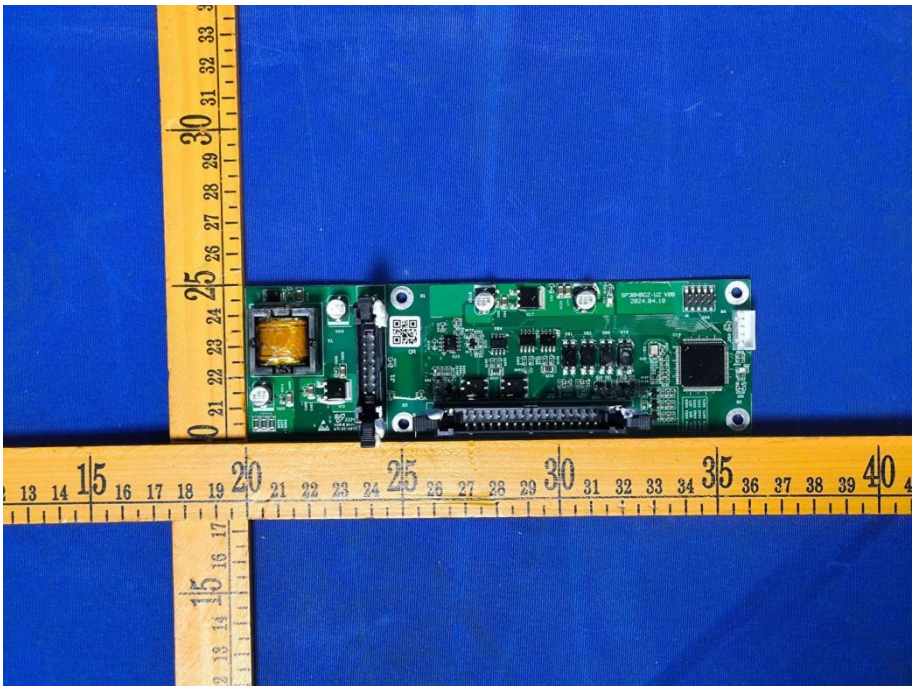
PCB View -5
(All model)



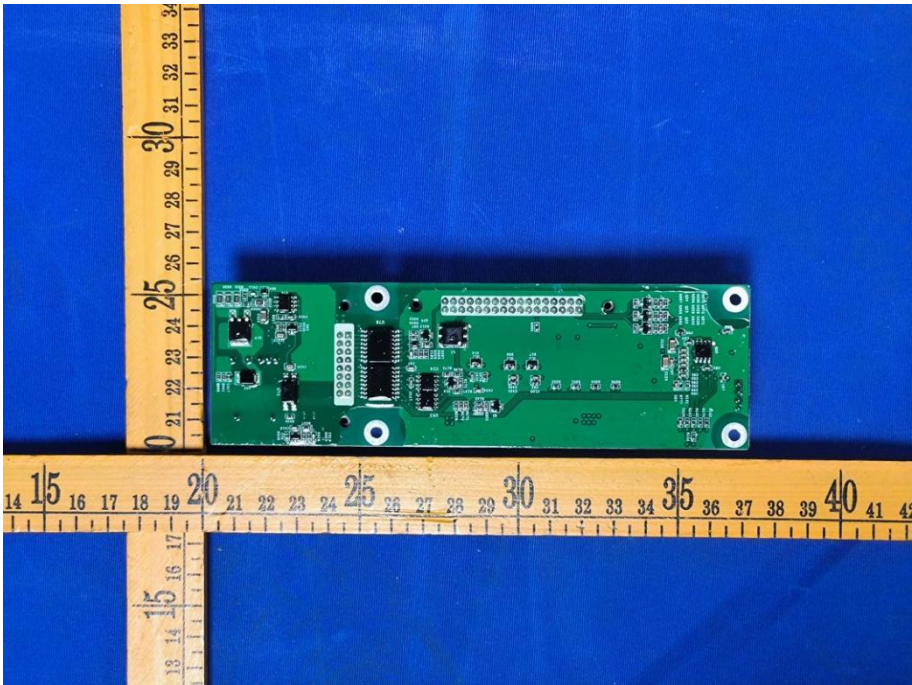
PCB View -6
(All model)



PCB View -7
(All model)



PCB View -8
(All model)



---End---