



# EMC TEST REPORT

Applicant : Ningbo AUX Solar Technology Co., Ltd.  
Address : No. 17 Fenglin Road, Cicheng Town, Jiangbei District, Ningbo City, Zhejiang Province, China

Manufacturer : Ningbo AUX Solar Technology Co., Ltd.  
Address : No. 17 Fenglin Road, Cicheng Town, Jiangbei District, Ningbo City, Zhejiang Province, China

Factory : Ningbo AUX Solar Technology Co., Ltd.  
Address : No. 17 Fenglin Road, Cicheng Town, Jiangbei District, Ningbo City, Zhejiang Province, China

E.U.T. : Hybrid solar inverter

Brand Name : **AUXSOL**

Model No. : ASG-20TL-ZH, ASG-15TL-ZH, ASG-12TL-ZH, ASG-10TL-ZH, ASG-8TL-ZH, ASG-6TL-ZH, ASG-5TL-ZH

Standard : EN IEC 61000-6-1: 2019  
EN IEC 61000-6-2: 2019  
EN IEC 61000-6-3: 2021  
EN IEC 61000-6-4: 2019  
EN 61000-3-12: 2011  
EN IEC 61000-3-11: 2019

Date of Receiving Samples : June 15, 2024

Date of Test : June 15, 2024 to June 27, 2024

Date of Report : June 29, 2024

This Test Report is Issued Under the Authority of :

Prepared by

*Jason Liu*

Jason Liu / 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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Address: South, No. 1, Building 10, Maqueling Industrial Zone, Nanshan  
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Revision History of This Test Report

Report Number	Description	Issued Date
SZNTC2406026EV00	Initial Issue	2024-06-29
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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	Result	Remarks
EN IEC 61000-6-3: 2021 EN IEC 61000-6-4: 2019	Conducted Emission Measurement	PASS	Meet the requirements of the Residential Environment Limit
	Radiated Emission Measurement	PASS	Meet the requirements of the Residential Environment Limit
EN 61000-3-12: 2011	Harmonic current emission Measurement	PASS	Meets the requirements
EN IEC 61000-3-11: 2019	Voltage Fluctuations & Flicker Measurement	PASS	Meets the requirements
IMMUNITY (EN IEC 61000-6-2: 2019)			
Basic Standard	Test Type	Result	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	Surge Test	PASS	A
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 61000-4-11: 2004 IEC 61000-4-34: 2005 +A1: 2009	Voltage dips and interruptions	PASS	B

## 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	$\pm 2.7\text{dB}$
Radiated Emission Measurement (30-1000MHz)	$\pm 4.3\text{dB}$
<p>Note: As <math>U_{\text{lab}}</math> in all applicable tests listed above are less than <math>U_{\text{CISPR}}</math> according to CISPR 16-4-2. 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.</p>	

### 3.GENERAL INFORMATION

#### 3.1.Product Information

E.U.T.:	Hybrid solar inverter
Main Model No.:	ASG-20TL-ZH
Additional Model Name:	ASG-15TL-ZH, ASG-12TL-ZH, ASG-10TL-ZH, ASG-8TL-ZH, ASG-6TL-ZH, ASG-5TL-ZH
Description of model difference:	These models have the same circuitry, PCB Layout and physical construction. Only the power is different. The maximum power model ASG-20TL-ZH was used for testing.
E.U.T Type:	Such equipment would fulfil the tighter emission requirements of the residential environment as well as the severe immunity requirements of the industrial environment.
Typical arrangement:	Tabletop
Highest Internal Frequency:	Highest internal frequency below 108MHz, radiation test frequency range 30MHz-1000MHz.
Rating:	<p><b>Model: ASG-20TL-ZH</b></p> <p><b>PV Input</b></p> <p>Max.input voltage: 1000V</p> <p>MPPT voltage range: 160-950V</p> <p>Max.input current: 36A/36A</p> <p>Max.short circuit current: 45A/45A</p> <p><b>Input Battery</b></p> <p>Battery type: Li-ion</p> <p>Battery voltage range: 180-800V</p> <p>Max.charge/discharge current: 2×30A/2×30A</p> <p><b>Output AC (Grid side)</b></p> <p>Rated output power: 20kW</p> <p>Max. apparent output power: 20kVA</p> <p>Rated grid voltage: 3/N/PE,380V/400V</p> <p>Rated grid frequency: 50/60Hz</p> <p>Max. output current: 28.9A</p> <p>Power Factor: &gt;0.99 (0.8 leading...0.8 lagging)</p> <p>THDi: &lt;3%</p> <p><b>Input AC (Grid side)</b></p> <p>Rated input power: 20kW</p> <p>Max. input power: 40kW</p> <p>Max. input current: 45.5A</p> <p>Rated input voltage: 3/N/PE,380V/400V</p> <p>Rated input frequency: 50/60Hz</p> <p><b>Output AC (Back-up)</b></p> <p>Rated output power: 20kW</p> <p>Max. output current: 28.9A</p> <p>Back-up switch time: &lt;10ms</p> <p>Rated output voltage: 380V/400V</p> <p>Rated frequency: 50/60Hz</p>
Sample No.:	SZNTC2406026EV00-001
Remark:	All the information above are provided by the manufacturer. More detailed feature of the EUT please refers to the user manual.

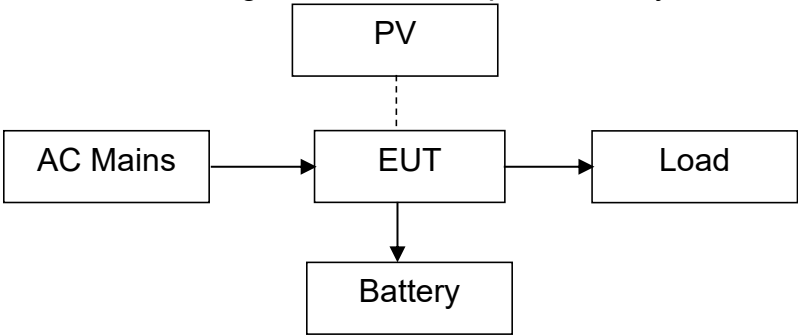
### 3.2.Description of Support Device

No.	Equipment	Manufacturer	M/N	Cable Specification	Remark
1.	Photovoltaic simulator source	ITECH	IT 6018C-1500-40	---	Provided by the applicant
2.	Incandescent lamp load	NTC	---	---	Provided by the lab
3.	AC input Cable	---	---	The test uses a 3L/N/PE power cable of approximately 1.0m length without magnetic ring and unshield.	Provided by the lab
4.	AC output Cable	---	---	The test uses a 3L/N/PE power cable of approximately 1.0m length without magnetic ring and unshield.	Provided by the lab
5.	PV Cable	---	---	The test uses a power cable of approximately 1.0m length without magnetic ring and unshield.	Provided by the lab
6.	Battery Cable	---	---	The test uses a power cable of approximately 1.0m length without magnetic ring and unshield.	Provided by the lab

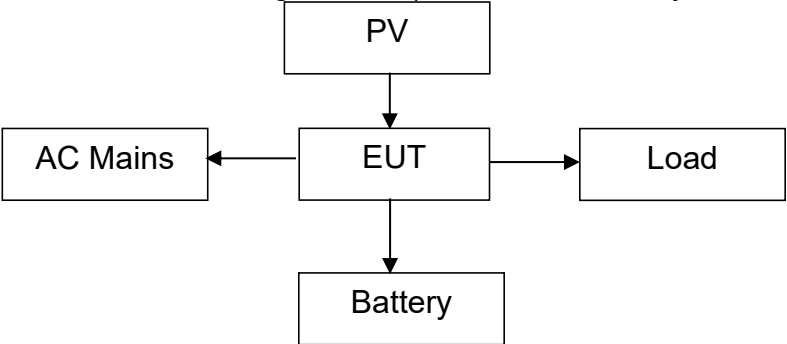


### 3.3. Block Diagram of Test Setup

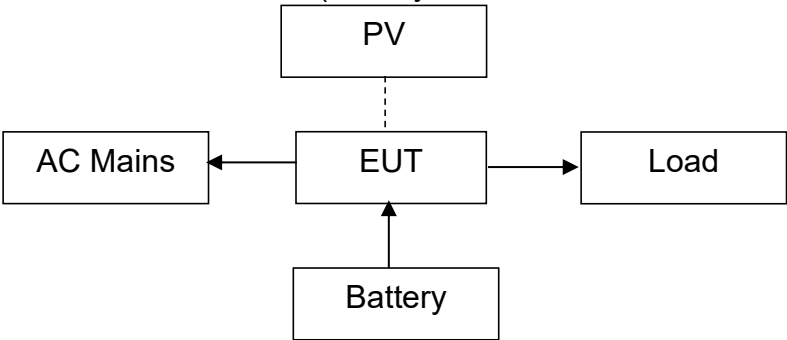
mode 1: AC Charger Mode (AC Input + Battery+Load)



mode 2: Solar Charger Mode(PV + Grid+ Battery+ Load)



mode 3: Inverter Mode(Battery+ Grid+ Load)



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

### 3.4. Test Mode

No.	Test Mode	Remark
1.	AC Charger Mode (AC Input + Battery+Load)	The mains input charges the battery, and the AC output connects to an analog load.
2.	Solar Charger Mode(PV + Grid+ Battery)	The PV input charges the battery, and the AC output connects to an analog load, and feed into AC grid.
3.	Inverter Mode(Battery+ Grid+ Load)	Battery inverter status, AC output connected to analog load, , and feed into AC grid.

### 3.5. Test Conditions

No.	Test Item	Test Mode	Test Voltage	Tested by	Remarks
1.	Conducted Emission - AC power input port	1-3	AC 400V/50Hz PV 600V/DC 500V	Lixinglin	See note 1&4
2.	Conducted Emission - DC power input port	---	AC 400V/50Hz PV 600V/DC 500V	Lixinglin	See note 1&4
3.	Conducted Disturbances - Wired network port or signal/control port	---	---	---	---
4.	Radiated Emission	1-3	AC 400V/50Hz PV 600V/DC 500V	Lixinglin	See note 1&4
5.	Harmonic Current Emission	1	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 1
6.	Voltage Fluctuations & Flicker	1	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 1
7.	Electrostatic Discharges (ESD)	1-3	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 2&3&4
8.	Radio-Frequency Electromagnetic Field	1-3	AC 400V/50Hz PV 600V/DC 500V	Chance	See note 1&3&4
9.	Fast transients test	1-3	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 1&3&4
10.	Surges	1-3	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 1&3&4
11.	Radio-Frequency Common Mode Test	1-3	AC 400V/50Hz PV 600V/DC 500V	Chance	See note 1&3&4
12.	Power Frequency Magnetic Field	1-3	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 1&3&4
13.	Voltage dips and interruptions	1-3	AC 400V/50Hz PV 600V/DC 500V	Chenrongbin	See note 1&3&4

**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 were recorded on the report.  
(This product is suitable for industrial environment, also suitable for residential environment, we use most stringent standards EN IEC 61000-6-2 and EN IEC 61000-6-3 for testing.)

### 3.6.Sample Calculations

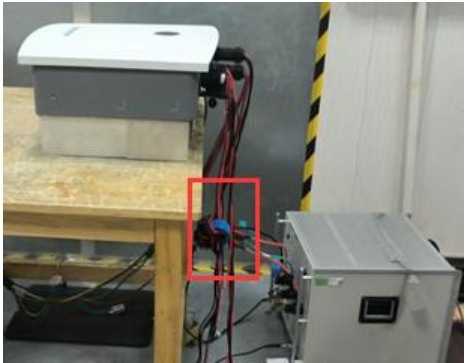
Conducted Emission						
Freq. (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.2260	11.56	12.50	24.06	66.00	-41.94	AVG
<p>Where,</p> <p>Freq. = Emission frequency in MHz</p> <p>Reading = Spectrum Analyzer/Receiver Reading</p> <p>Factor = Insertion loss of LISN + Cable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

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
<p>Where,</p> <p>Freq. = Emission frequency in MHz</p> <p>Reading = Spectrum Analyzer/Receiver Reading</p> <p>Factor = Antenna Factor + Cable Loss - Pre-amplifier</p> <p>Level = Reading + Factor</p> <p>Limit = Limit stated in standard</p> <p>Margin = Margin, which calculated by Level - Limit</p> <p>Detector = Reading for Quasi-Peak / Average / Peak</p>						

3.7.Test Facility

Test Site:	Shenzhen Nore Testing Center Co., Ltd.
Accreditations and Authorizations:	Listed by CNAS, May 18, 2024 The certificate is valid until May 17, 2030 The Laboratory has been assessed and proved to be in compliance with CNAS/CL01 The Certificate Registration Number is L11038.
Test Site Location:	South, No. 1, Building 10, Maqueling Industrial Zone, Nanshan Shenzhen, Guangdong, 518057, China
Subcontractor:	Dongguan Nore Testing Center Co.,Ltd.
Test 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 Test
Remark:	The subcontractor is CNAS qualified

3.8.Abnormalities from Standard Conditions

Countermeasures to achieve EMC Compliance:	Photos				
<p>In the conduction test, adding a magnetic ring to the PV line (30 ~ 40) cm away from EUT, and then wind the magnetic ring 2 turn, as shown in the figure.</p> <p>The following table shows the magnetic ring information</p> <table><tr><td>Manufacturer</td><td>M/N</td></tr><tr><td>Haohua</td><td>F5580010</td></tr></table>	Manufacturer	M/N	Haohua	F5580010	
Manufacturer	M/N				
Haohua	F5580010				



## 4.MEASURING DEVICES AND TEST EQUIPMENT

### 4.1.For Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Test Receiver	Rohde & Schwarz	ESCI-3	100120	Mar. 22, 2024	1 Year
<input type="checkbox"/>	L.I.S.N	Rohde & Schwarz	ESH3-Z5	100157	Mar. 22, 2024	1 Year
<input checked="" type="checkbox"/>	L.I.S.N	SCHWARZBECK	NNLK8129	00409	Mar. 22, 2024	1 Year
<input checked="" type="checkbox"/>	L.I.S.N	SCHWARZBECK	PVDC 8301	0083	Mar. 22, 2024	1 Year
<input checked="" type="checkbox"/>	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
<input checked="" type="checkbox"/>	Test Receiver	Rohde & Schwarz	ESPI-7	100006	Mar. 22, 2024	1 Year
<input type="checkbox"/>	Loop Antenna	ZHINAN	ZN30900C	16036	Mar. 23, 2024	2 Year
<input checked="" type="checkbox"/>	Composite logarithmic antenna	SCHWARZBECK	VULB 9163	1633	Mar. 23, 2024	2 Year
<input type="checkbox"/>	Horn Antenna	SCHWARZBECK	BBHA 9120 D	01884	Mar. 23, 2024	2 Year
<input checked="" type="checkbox"/>	Power Amplifier	HP	HP 8447D	2443A04646	Mar. 22, 2024	1 Year
<input type="checkbox"/>	Power Amplifier	KSYET	PAM-118	443007	Mar. 22, 2024	1 Year
<input checked="" type="checkbox"/>	Test Software	EZ	EZ-EMC (Ver. CT3A11)	N/A	N/A	N/A

### 4.3.For Harmonic Current/ Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	POWER ANALYZER	ZLG	PA600H	N/A	Sep. 28 2023	1 Year
<input checked="" type="checkbox"/>	Current probe	ZLG	ZCS200	N/A	Sep. 28 2023	1 Year
<input checked="" type="checkbox"/>	Three-phase Flicker Impedance	YANBIXIN	YX91L1-75A-T RD2110008F	N/A	Mar. 22, 2024	1 Year

### 4.4.For Electrostatic Discharge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	ESD Tester	HAEFELY	ONYX16	1811981	Mar. 25, 2024	1 Year

#### 4.5.For Radio-Frequency Electromagnetic Field Test (Dongguan Nore Testing Center Co., Ltd.)

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

#### 4.6.For Fast transients test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EFT Simulator	HTEC	HEFT	203601	Mar. 22, 2024	1 Year
<input checked="" type="checkbox"/>	Three- phase EFT Coupling CDN	HTEC	HCOUPLER 60E	204301	Mar. 22, 2024	1 Year
<input type="checkbox"/>	Coupling Clamp	HAEFELY	/	/	Mar. 22, 2024	1Year

#### 4.7.For Surge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Surge Simulator	HTEC	HCWG	205301	Mar. 22, 2024	1 Year
<input checked="" type="checkbox"/>	Three- phase Surge Coupling CDN	HTEC	HCOUPLER 60S	204201	Mar. 22, 2024	1 Year
<input type="checkbox"/>	Network Port surge Coupling CDN	ETEST	ES-CDN-508	N/A	Mar. 22, 2024	1 Year

#### 4.8.For Conducted Radio-Frequency Common Mode Test (Dongguan Nore Testing Center Co., Ltd.)

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

#### 4.9.For Power-Frequency Magnetic Field Test

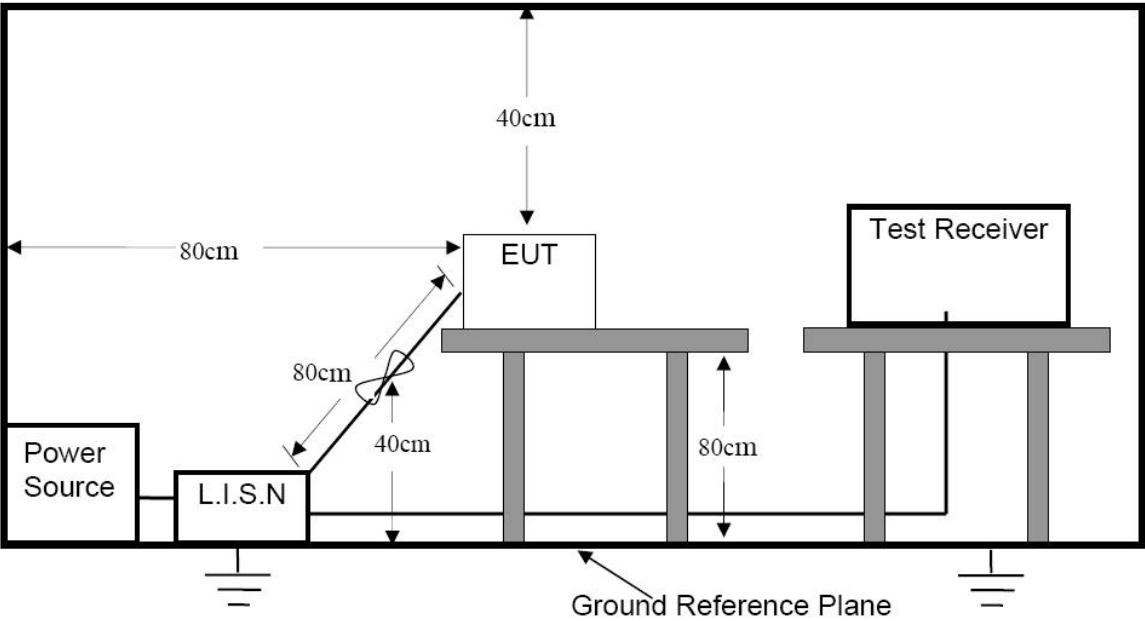
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Magnetic Field Tester	N/A	MS-8000	N/A	Mar. 22, 2024	1 Year

#### 4.10.For Voltage Dips and Interruption Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Analog power supply	Ainuo	ANBGS060TL	2209BGS021	Mar. 22, 2024	1 Year

## 5.CONDUCTED EMISSION MEASUREMENT

### 5.1.Block Diagram of Test Setup



### 5.2.Limit of Conducted Emission Measurement

#### ☒ Residential Environment Limit

Frequency range  MHz	Limits dB (μV)						Detector type / bandwidth
	☒ AC Mains Port		☒ DC Power Port		☐ Other Wire Port		
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	
0,15 to 0,50 <sup>b</sup>	66 to 56 <sup>a</sup>	56 to 46 <sup>a</sup>	84-74	74-64	84 to 74 <sup>a</sup>	74 to 64 <sup>a</sup>	9 kHz
0,50 to 5,0 <sup>b</sup>	56	46	74	64	74	64	
5,0 to 30,0	60	50					
a The limits decrease linearly with the logarithm of the frequency.							
b The lower limit shall apply at the transition frequency.							

#### ☐ Industrial Environment Limit

Frequency range  MHz	Limits dB (µV)						Detector type / bandwidth
	<input type="checkbox"/> AC Mains Port		<input type="checkbox"/> DC Power Port		<input type="checkbox"/> Other Wire Port		
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average	
0,15 to 0,50 <sup>b</sup>	79	66	89	76	97 to 87 <sup>a</sup>	84 to 74 <sup>a</sup>	9 kHz
0,50 to 30,0	73	60	83	70	87	74	
a The limits decrease linearly with the logarithm of the frequency.							
b The lower limit shall apply at the transition frequency.							



### 5.3.Test Procedure

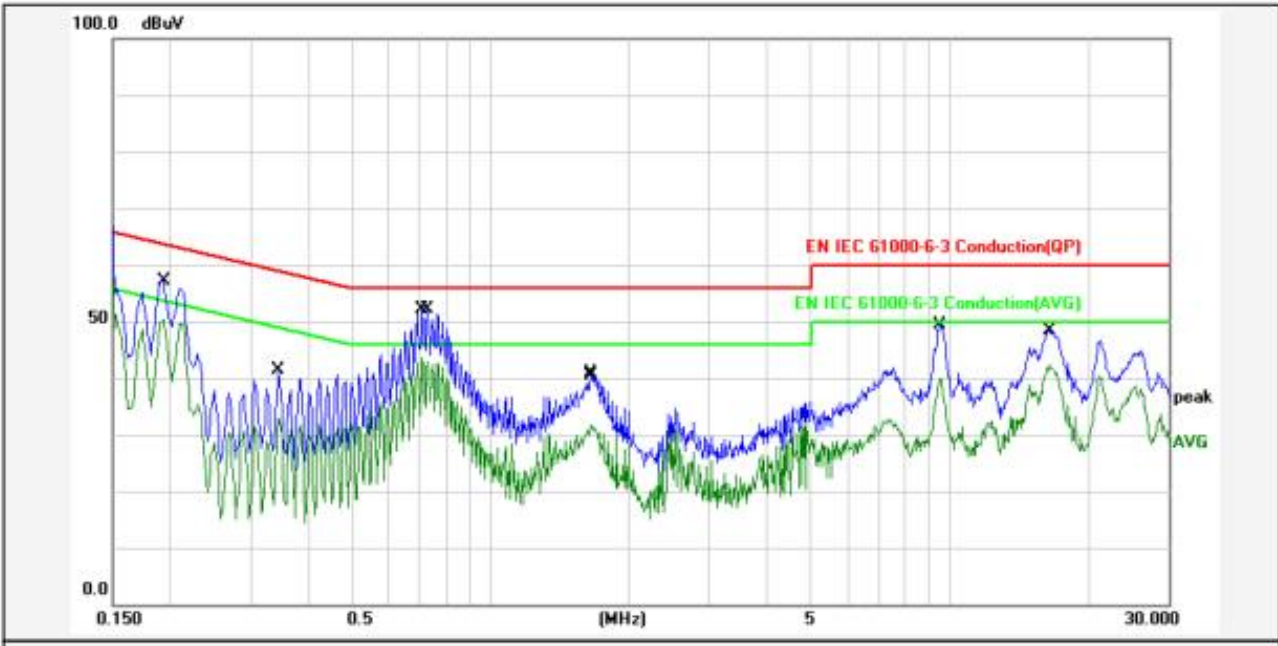
- a. The EUT was placed on a wooden table 0.8m height from the metal ground plan and 0.4m from the conducting wall of the shielding room and it was kept at 0.8m from any other grounded conducting surface.
- b. Configure the EUT and support devices as per section 5.1.
- c. All cables and support devices were positioned as per EN IEC 61000-6-3.
- 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 EN IEC 61000-6-3.
- 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.**

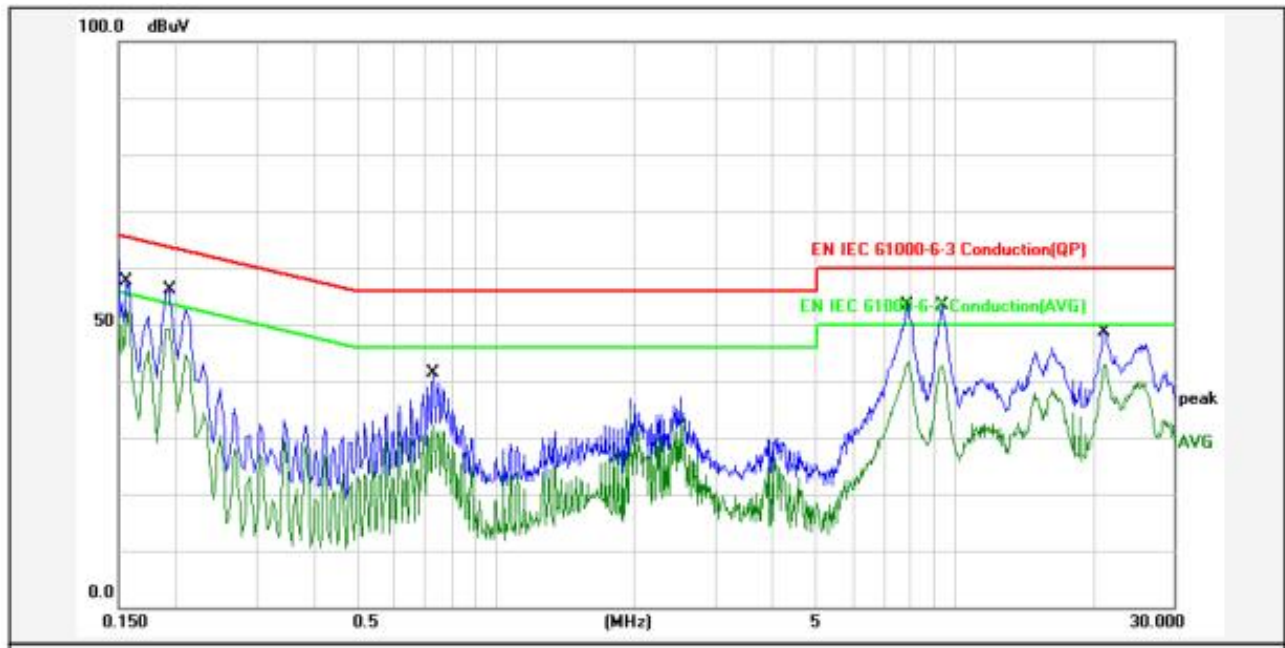
Please refer to the following pages.

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	AC 400V/50Hz
Test Mode:	AC Charger Mode	Phase:	L1
Remark:	AC Port	Test Date:	2024-06-15



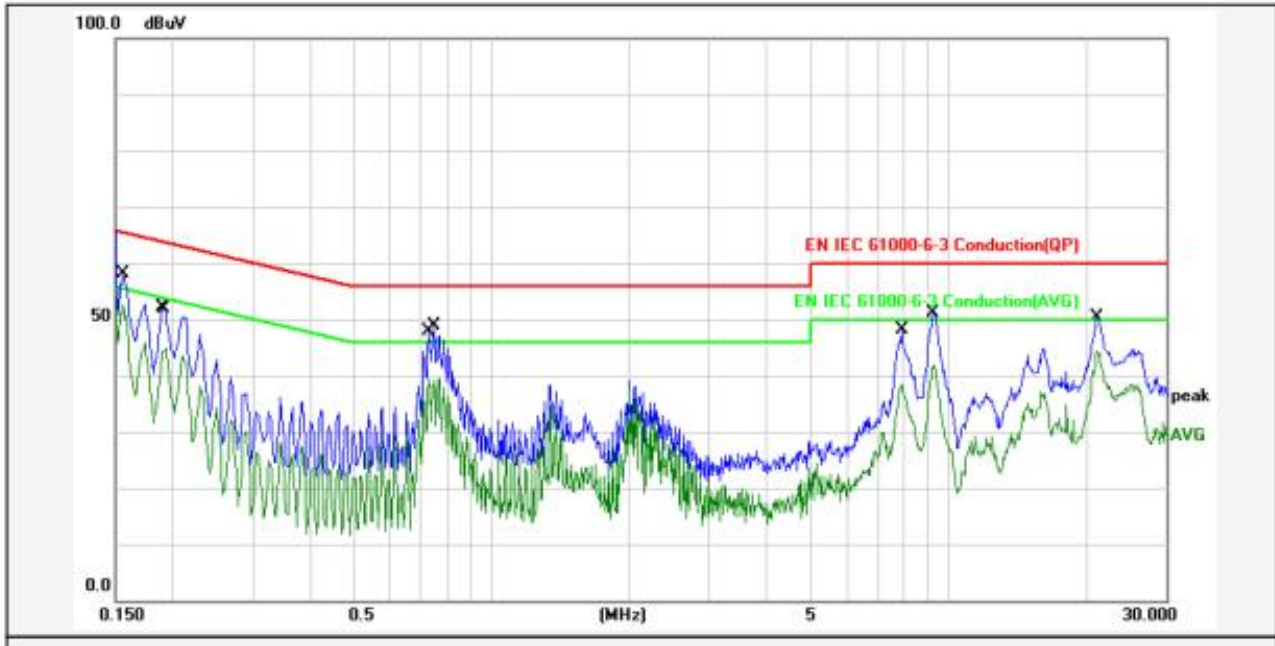
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1940	10.07	47.13	57.20	63.86	-6.66	QP	P	
2	0.1940	10.07	40.33	50.40	53.86	-3.46	AVG	P	
3	0.3460	10.07	31.33	41.40	59.06	-17.66	QP	P	
4	0.3460	10.07	22.73	32.80	49.06	-16.26	AVG	P	
5	0.7100	10.10	33.60	43.70	46.00	-2.30	AVG	P	
6	0.7300	10.10	42.00	52.10	56.00	-3.90	QP	P	
7	1.6500	10.15	30.55	40.70	56.00	-15.30	QP	P	
8	1.6660	10.15	21.35	31.50	46.00	-14.50	AVG	P	
9	9.5419	10.48	38.82	49.30	60.00	-10.70	QP	P	
10	9.6019	10.49	29.31	39.80	50.00	-10.20	AVG	P	
11	16.5138	10.68	37.72	48.40	60.00	-11.60	QP	P	
12	16.5138	10.68	31.52	42.20	50.00	-7.80	AVG	P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	AC 400V/50Hz
Test Mode:	AC Charger Mode	Phase:	L1
Remark:	AC Port	Test Date:	2024-06-15



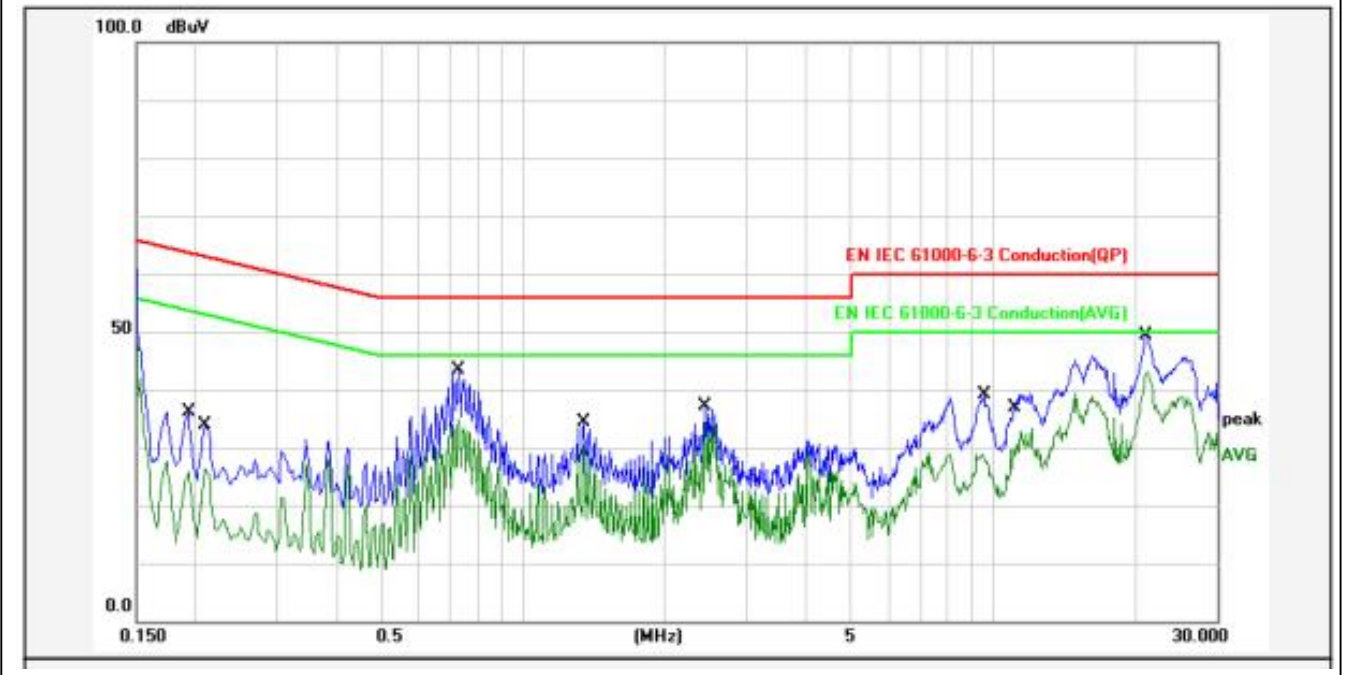
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1554	10.07	47.63	57.70	65.70	-8.00	QP	P	
2	0.1554	10.07	42.43	52.50	55.70	-3.20	AVG	P	
3	0.1940	10.07	46.03	56.10	63.86	-7.76	QP	P	
4	0.1940	10.07	39.13	49.20	53.86	-4.66	AVG	P	
5	0.7300	10.10	31.30	41.40	56.00	-14.60	QP	P	
6	0.7300	10.10	21.90	32.00	46.00	-14.00	AVG	P	
7	7.8779	10.39	42.91	53.30	60.00	-6.70	QP	P	
8	7.9219	10.40	33.00	43.40	50.00	-6.60	AVG	P	
9	9.3659	10.46	42.84	53.30	60.00	-6.70	QP	P	
10	9.3659	10.46	32.14	42.60	50.00	-7.40	AVG	P	
11	21.2380	10.75	37.85	48.60	60.00	-11.40	QP	P	
12	21.2380	10.75	32.05	42.80	50.00	-7.20	AVG	P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	AC 400V/50Hz
Test Mode:	AC Charger Mode	Phase:	L3
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1554	10.07	48.03	58.10	65.70	-7.60	QP	P	
2	0.1554	10.07	42.43	52.50	55.70	-3.20	AVG	P	
3	0.1900	10.07	41.93	52.00	64.03	-12.03	QP	P	
4	0.1940	10.07	34.83	44.90	53.86	-8.96	AVG	P	
5	0.7300	10.10	29.20	39.30	46.00	-6.70	AVG	P	
6	0.7500	10.10	38.70	48.80	56.00	-7.20	QP	P	
7	7.9019	10.40	37.60	48.00	60.00	-12.00	QP	P	
8	7.9019	10.40	27.90	38.30	50.00	-11.70	AVG	P	
9	9.2619	10.45	40.65	51.10	60.00	-8.90	QP	P	
10	9.3179	10.45	31.25	41.70	50.00	-8.30	AVG	P	
11	21.1620	10.75	39.65	50.40	60.00	-9.60	QP	P	
12	21.1620	10.75	33.65	44.40	50.00	-5.60	AVG	P	

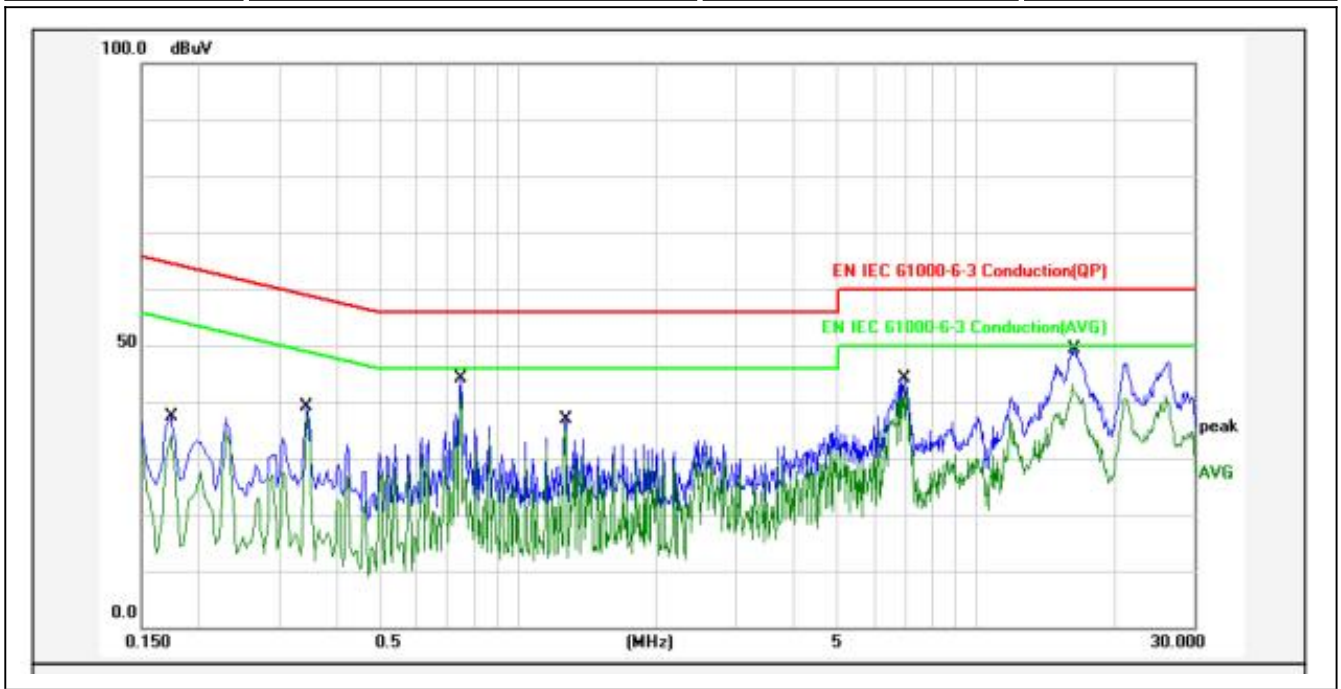
E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature :	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	AC 400V/50Hz
Test Mode:	AC Charger Mode	Phase:	Neutral
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1940	10.07	26.13	36.20	63.86	-27.66	QP	P	
2	0.2100	10.07	16.23	26.30	53.20	-26.90	AVG	P	
3	0.7300	10.10	33.30	43.40	56.00	-12.60	QP	P	
4	0.7300	10.10	24.80	34.90	46.00	-11.10	AVG	P	
5	1.3460	10.13	24.17	34.30	56.00	-21.70	QP	P	
6	1.3460	10.13	20.07	30.20	46.00	-15.80	AVG	P	
7	2.4380	10.21	26.79	37.00	56.00	-19.00	QP	P	
8	2.4380	10.21	24.49	34.70	46.00	-11.30	AVG	P	
9	9.5619	10.48	28.52	39.00	60.00	-21.00	QP	P	
10	11.0219	10.56	19.04	29.60	50.00	-20.40	AVG	P	
11	21.2380	10.75	38.65	49.40	60.00	-10.60	QP	P	
12	21.3700	10.74	32.46	43.20	50.00	-6.80	AVG	P	

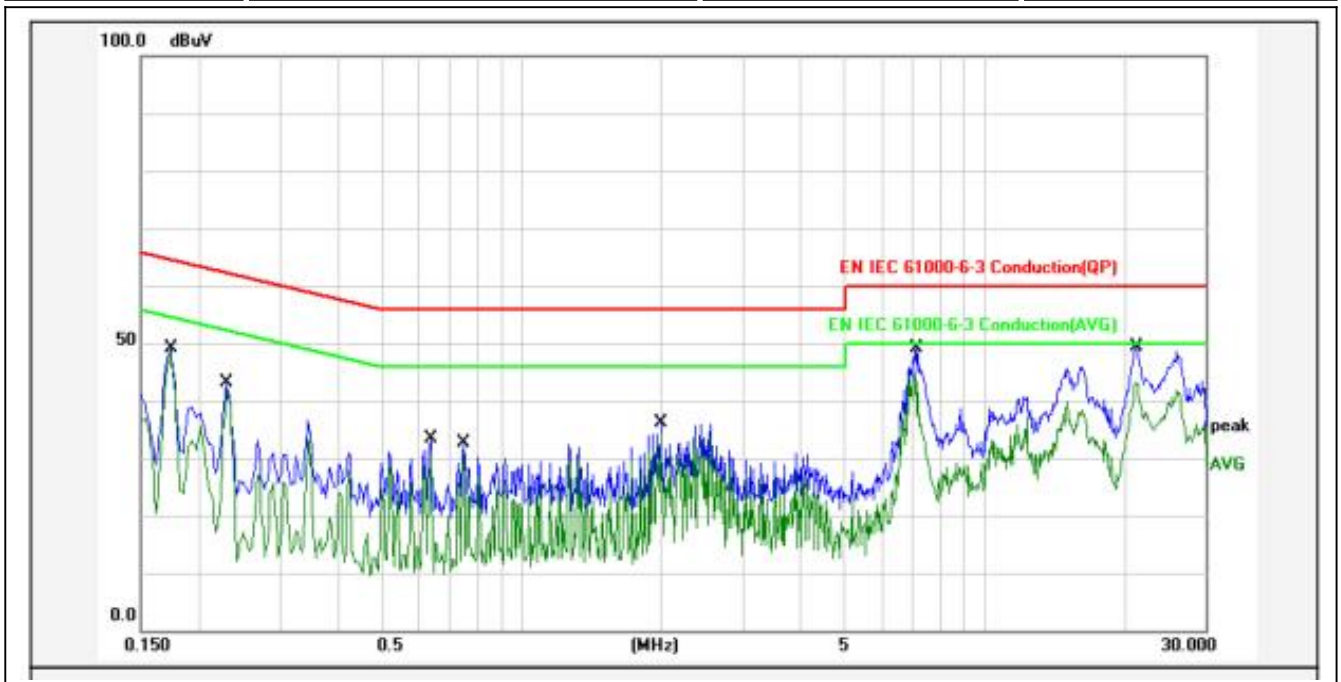


E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V AC 400V/50Hz
Test Mode:	Solar Charger Mode	Phase:	L1
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1740	10.07	27.23	37.30	64.76	-27.46	QP	P	
2	0.1740	10.07	23.93	34.00	54.76	-20.76	AVG	P	
3	0.3460	10.07	29.03	39.10	59.06	-19.96	QP	P	
4	0.3460	10.07	27.53	37.60	49.06	-11.46	AVG	P	
5	0.7500	10.10	33.90	44.00	56.00	-12.00	QP	P	
6	0.7500	10.10	31.40	41.50	46.00	-4.50	AVG	P	
7	1.2700	10.13	26.67	36.80	56.00	-19.20	QP	P	
8	1.2700	10.13	24.77	34.90	46.00	-11.10	AVG	P	
9	6.9699	10.38	33.72	44.10	60.00	-15.90	QP	P	
10	6.9699	10.38	32.52	42.90	50.00	-7.10	AVG	P	
11	16.3019	10.68	32.42	43.10	50.00	-6.90	AVG	P	
12	16.4739	10.68	38.52	49.20	60.00	-10.80	QP	P	

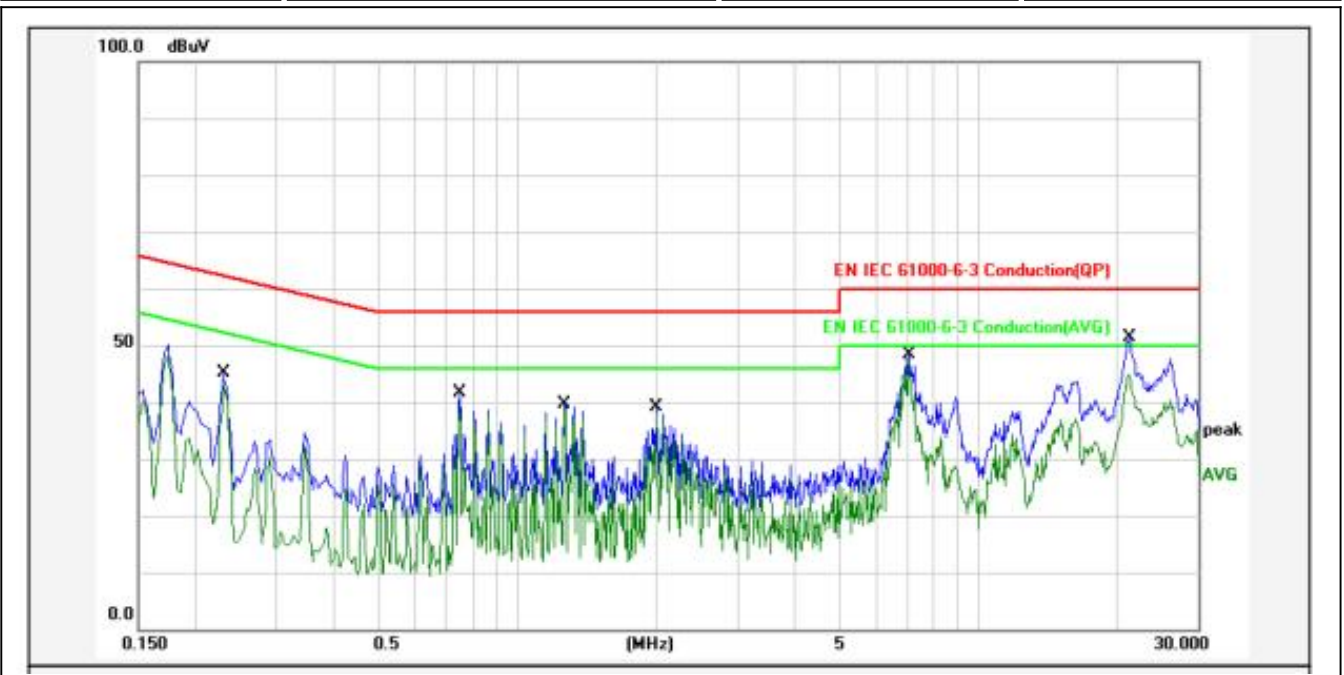
E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V AC 400V/50Hz
Test Mode:	Solar Charger Mode	Phase:	L2
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1740	10.07	39.03	49.10	64.76	-15.66	QP	P	
2	0.1740	10.07	38.13	48.20	54.76	-6.56	AVG	P	
3	0.2300	10.07	33.03	43.10	62.45	-19.35	QP	P	
4	0.2300	10.07	31.73	41.80	52.45	-10.65	AVG	P	
5	0.6340	10.10	23.40	33.50	56.00	-22.50	QP	P	
6	0.7500	10.10	20.60	30.70	46.00	-15.30	AVG	P	
7	1.9980	10.16	25.94	36.10	56.00	-19.90	QP	P	
8	1.9980	10.16	24.04	34.20	46.00	-11.80	AVG	P	
9	7.0859	10.38	34.42	44.80	50.00	-5.20	AVG	P	
10	7.1419	10.38	38.62	49.00	60.00	-11.00	QP	P	
11	21.2939	10.74	38.56	49.30	60.00	-10.70	QP	P	
12	21.3900	10.74	32.46	43.20	50.00	-6.80	AVG	P	

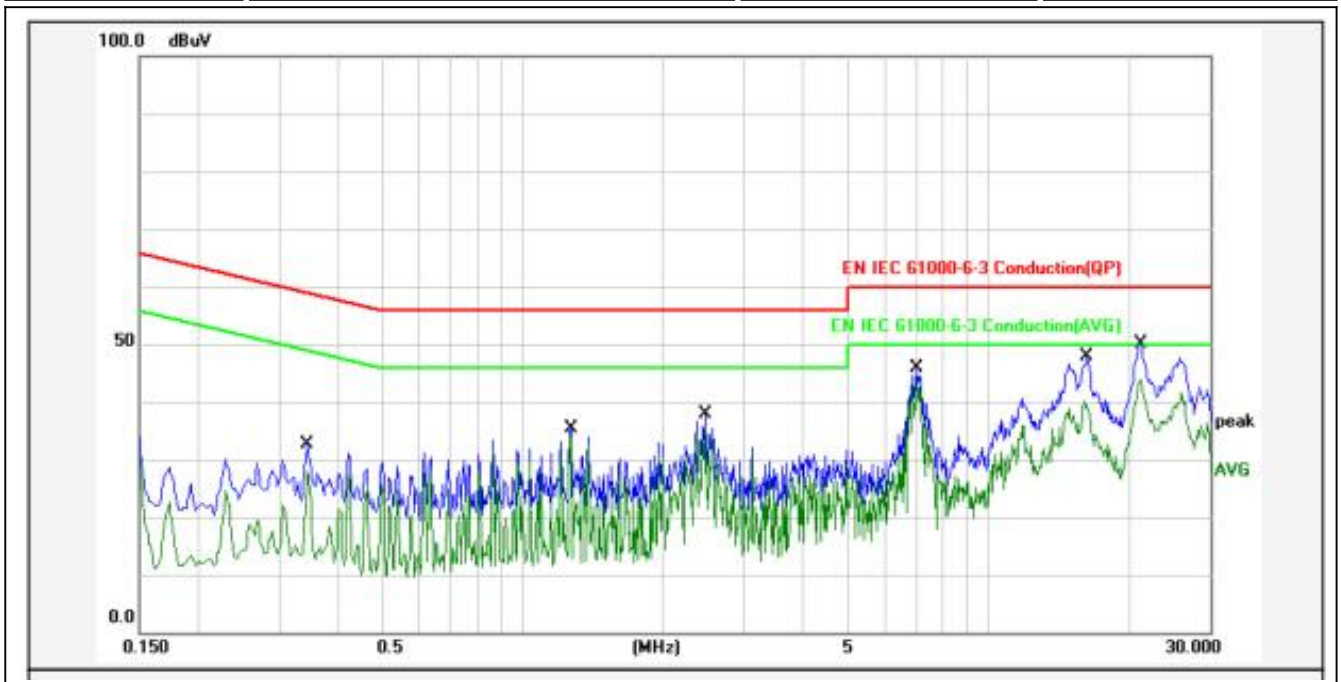


E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V AC 400V/50Hz
Test Mode:	Solar Charger Mode	Phase:	L3
Remark:	AC Port	Test Date:	2024-06-15



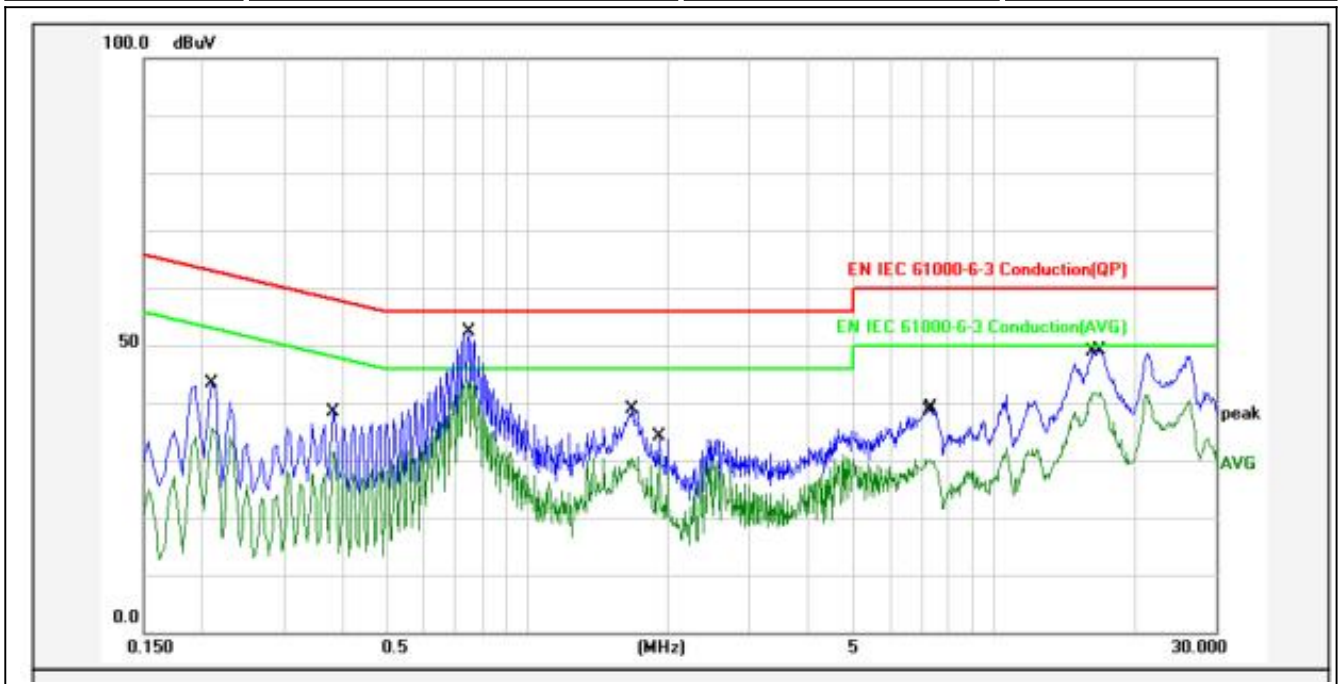
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2300	10.07	34.93	45.00	62.45	-17.45	QP	P	
2	0.2300	10.07	32.73	42.80	52.45	-9.65	AVG	P	
3	0.7500	10.10	31.40	41.50	56.00	-14.50	QP	P	
4	0.7500	10.10	29.60	39.70	46.00	-6.30	AVG	P	
5	1.2660	10.13	29.37	39.50	56.00	-16.50	QP	P	
6	1.2660	10.13	28.47	38.60	46.00	-7.40	AVG	P	
7	1.9980	10.16	28.84	39.00	56.00	-17.00	QP	P	
8	1.9980	10.16	27.74	37.90	46.00	-8.10	AVG	P	
9	6.9699	10.38	36.62	47.00	50.00	-3.00	AVG	P	
10	7.0859	10.38	37.92	48.30	60.00	-11.70	QP	P	
11	21.2180	10.75	34.05	44.80	50.00	-5.20	AVG	P	
12	21.3140	10.74	40.56	51.30	60.00	-8.70	QP	P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V AC 400V/50Hz
Test Mode:	Solar Charger Mode	Phase:	Neutral
Remark:	AC Port	Test Date:	2024-06-15



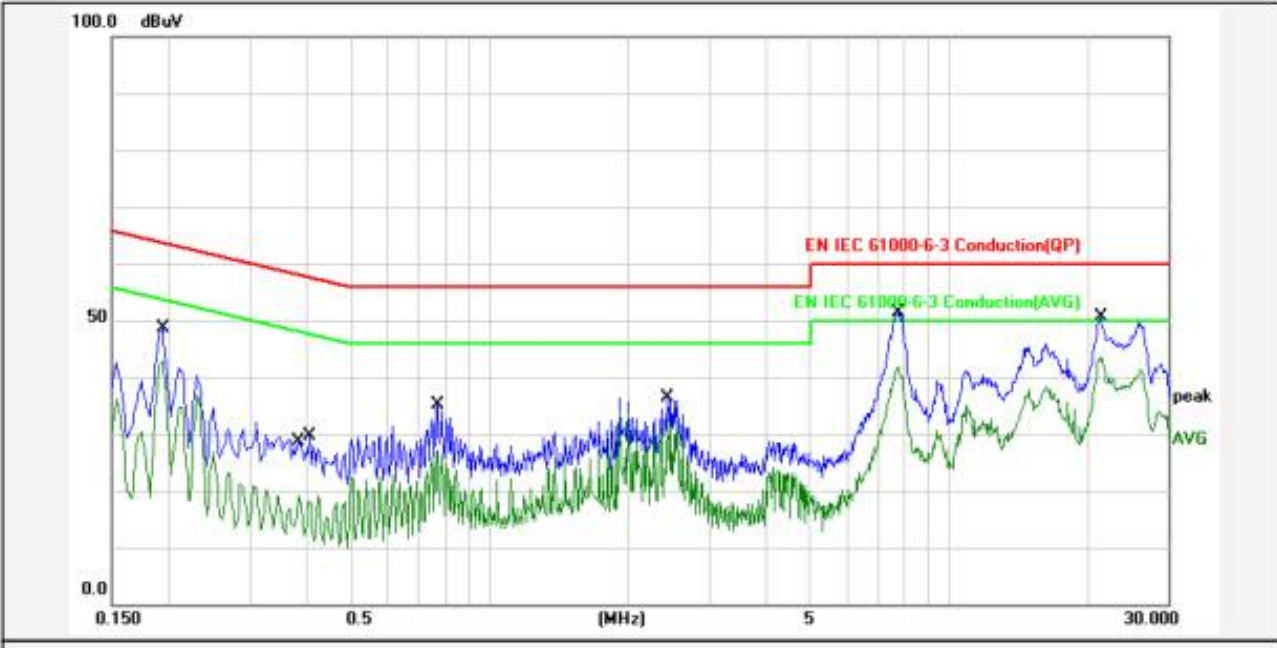
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.3460	10.07	22.43	32.50	59.06	-26.56	QP	P	
2	0.3460	10.07	17.83	27.90	49.06	-21.16	AVG	P	
3	1.2700	10.13	25.27	35.40	56.00	-20.60	QP	P	
4	1.2700	10.13	23.77	33.90	46.00	-12.10	AVG	P	
5	2.4780	10.22	27.68	37.90	56.00	-18.10	QP	P	
6	2.4780	10.22	25.38	35.60	46.00	-10.40	AVG	P	
7	7.0259	10.38	35.52	45.90	60.00	-14.10	QP	P	
8	7.0259	10.38	34.02	44.40	50.00	-5.60	AVG	P	
9	16.1299	10.66	29.44	40.10	50.00	-9.90	AVG	P	
10	16.3979	10.68	37.02	47.70	60.00	-12.30	QP	P	
11	21.2939	10.74	39.36	50.10	60.00	-9.90	QP	P	
12	21.2939	10.74	32.96	43.70	50.00	-6.30	AVG	P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	DC 500V AC 400V/50Hz
Test Mode:	Inverter Mode	Phase:	L1
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2100	10.07	33.23	43.30	63.20	-19.90	QP	P	
2	0.2100	10.07	25.53	35.60	53.20	-17.60	AVG	P	
3	0.3820	10.08	28.22	38.30	58.23	-19.93	QP	P	
4	0.3860	10.08	21.32	31.40	48.15	-16.75	AVG	P	
5	0.7460	10.10	33.70	43.80	46.00	-2.20	AVG	P	
6	0.7500	10.10	42.20	52.30	56.00	-3.70	QP	P	
7	1.6780	10.15	28.55	38.70	56.00	-17.30	QP	P	
8	1.9220	10.16	20.74	30.90	46.00	-15.10	AVG	P	
9	7.1419	10.38	19.82	30.20	50.00	-19.80	AVG	P	
10	7.3499	10.39	28.61	39.00	60.00	-21.00	QP	P	
11	16.4939	10.68	31.12	41.80	50.00	-8.20	AVG	P	
12	16.8579	10.68	38.32	49.00	60.00	-11.00	QP	P	

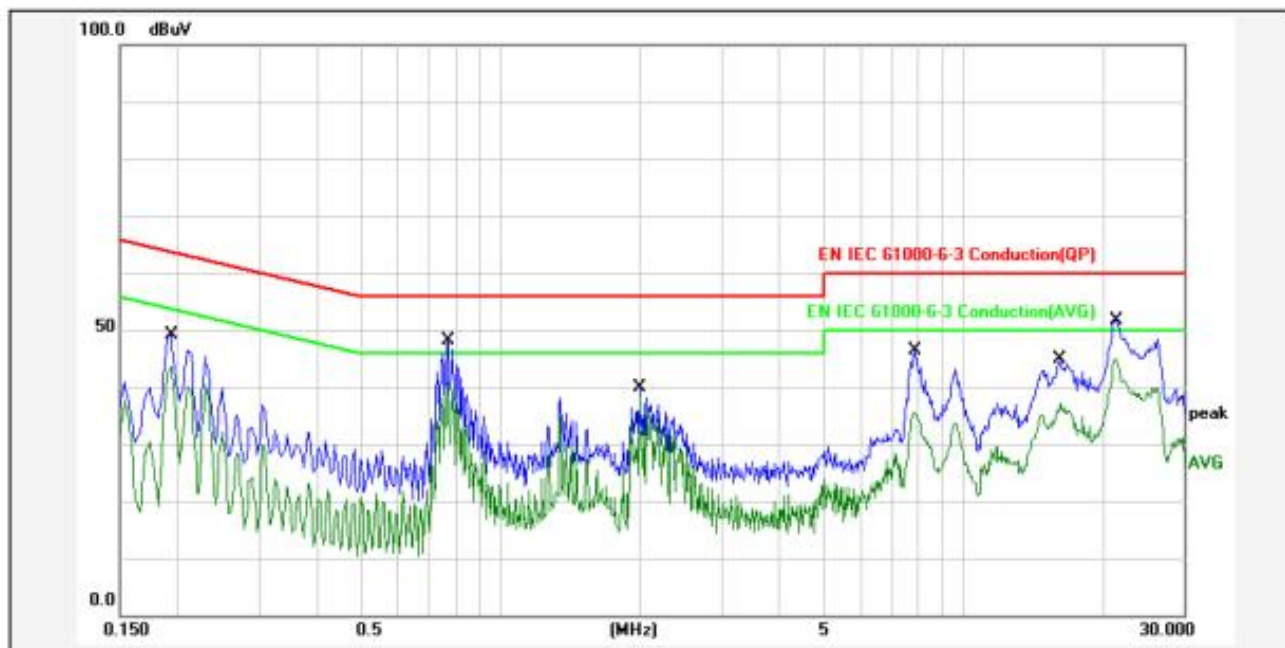
E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	DC 500V AC 400V/50Hz
Test Mode:	Inverter Mode	Phase:	L2
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1940	10.07	38.43	48.50	63.86	-15.36	QP	P	
2	0.1940	10.07	32.73	42.80	53.86	-11.06	AVG	P	
3	0.3820	10.08	9.02	19.10	48.23	-29.13	AVG	P	
4	0.4060	10.08	19.42	29.50	57.73	-28.23	QP	P	
5	0.7700	10.10	25.00	35.10	56.00	-20.90	QP	P	
6	0.7700	10.10	16.90	27.00	46.00	-19.00	AVG	P	
7	2.4380	10.21	26.09	36.30	56.00	-19.70	QP	P	
8	2.4380	10.21	22.19	32.40	46.00	-13.60	AVG	P	
9	7.7619	10.39	31.31	41.70	50.00	-8.30	AVG	P	
10	7.7899	10.39	40.81	51.20	60.00	-8.80	QP	P	
11	21.4700	10.74	39.96	50.70	60.00	-9.30	QP	P	
12	21.4700	10.74	32.86	43.60	50.00	-6.40	AVG	P	

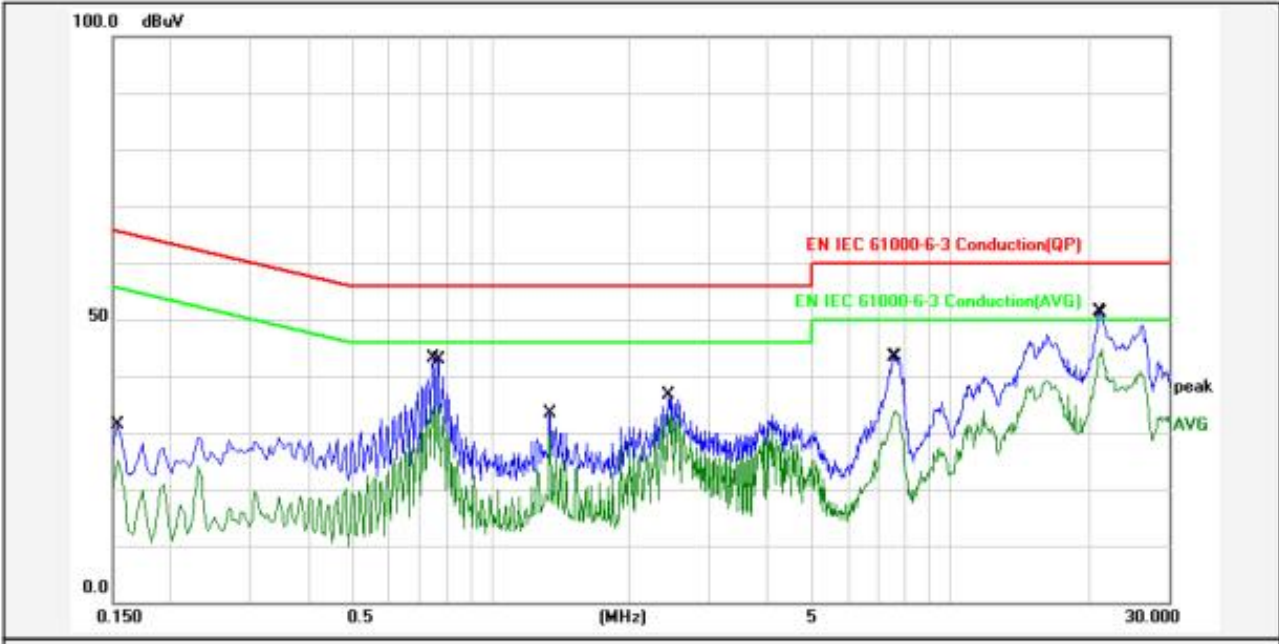


E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	DC 500V AC 400V/50Hz
Test Mode:	Inverter Mode	Phase:	L3
Remark:	AC Port	Test Date:	2024-06-15



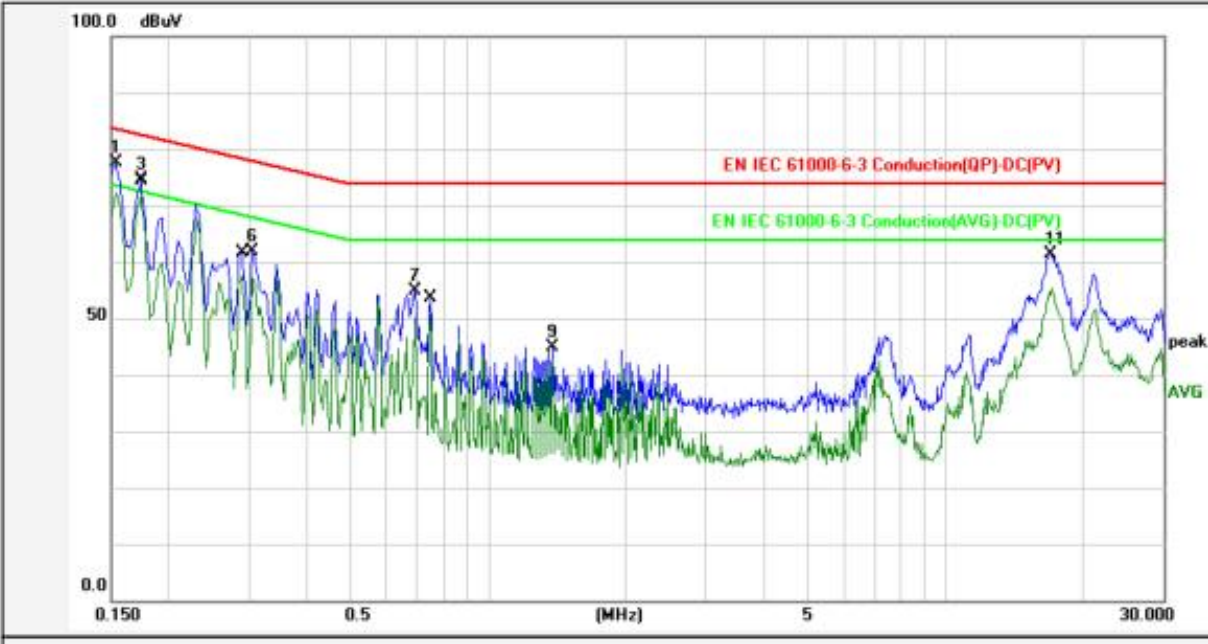
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1940	10.07	39.13	49.20	63.86	-14.66	QP	P	
2	0.1940	10.07	33.53	43.60	53.86	-10.26	AVG	P	
3	0.7700	10.10	38.00	48.10	56.00	-7.90	QP	P	
4	0.7700	10.10	30.50	40.60	46.00	-5.40	AVG	P	
5	1.9980	10.16	29.64	39.80	56.00	-16.20	QP	P	
6	1.9980	10.16	28.24	38.40	46.00	-7.60	AVG	P	
7	7.8499	10.39	25.21	35.60	50.00	-14.40	AVG	P	
8	7.8859	10.39	36.01	46.40	60.00	-13.60	QP	P	
9	16.1858	10.66	34.24	44.90	60.00	-15.10	QP	P	
10	16.2259	10.66	26.34	37.00	50.00	-13.00	AVG	P	
11	21.3740	10.74	40.96	51.70	60.00	-8.30	QP	P	
12	21.3740	10.74	34.16	44.90	50.00	-5.10	AVG	P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	DC 500V AC 400V/50Hz
Test Mode:	Inverter Mode	Phase:	Neutral
Remark:	AC Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1539	10.07	21.33	31.40	65.78	-34.38	QP	P	
2	0.1539	10.07	15.13	25.20	55.78	-30.58	AVG	P	
3	0.7500	10.10	32.90	43.00	56.00	-13.00	QP	P	
4	0.7660	10.10	25.10	35.20	46.00	-10.80	AVG	P	
5	1.3460	10.13	23.17	33.30	56.00	-22.70	QP	P	
6	1.3460	10.13	20.27	30.40	46.00	-15.60	AVG	P	
7	2.4380	10.21	26.39	36.60	56.00	-19.40	QP	P	
8	2.4380	10.21	22.99	33.20	46.00	-12.80	AVG	P	
9	7.5619	10.39	32.91	43.30	60.00	-16.70	QP	P	
10	7.6179	10.39	23.51	33.90	50.00	-16.10	AVG	P	
11	21.2540	10.74	40.56	51.30	60.00	-8.70	QP	P	
12	21.4500	10.74	34.16	44.90	50.00	-5.10	AVG	P	

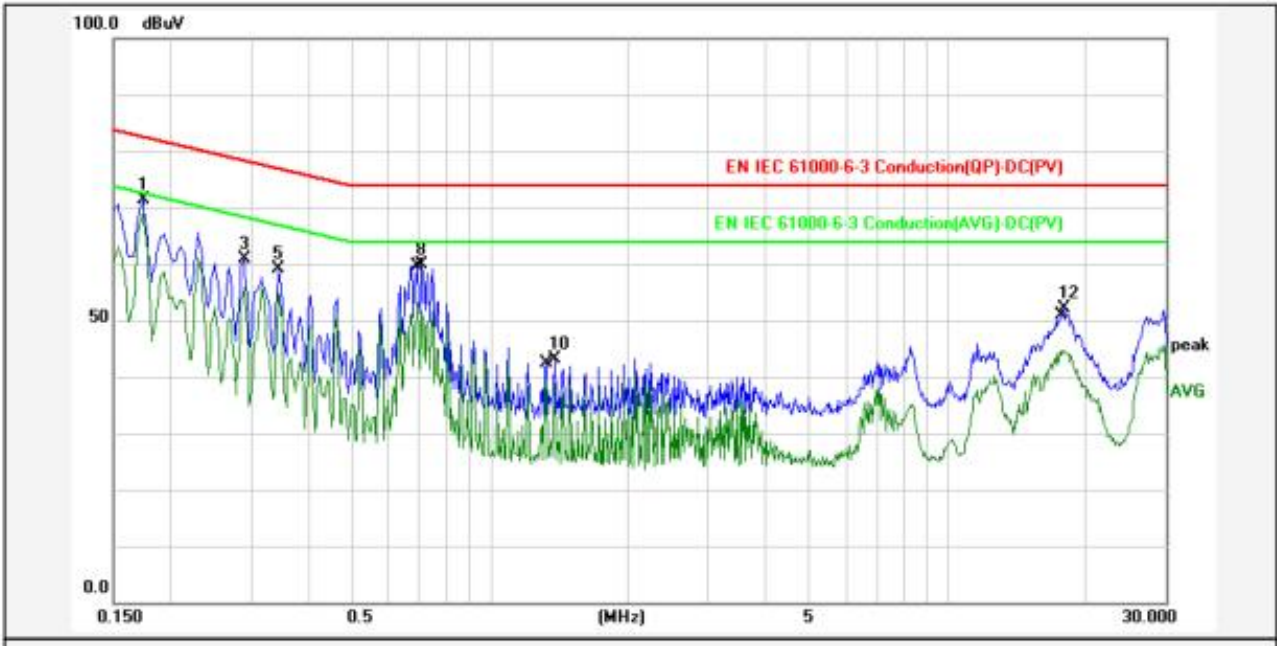
E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V
Test Mode:	Solar Charger Mode	Phase:	+
Remark:	PV Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1539	29.31	48.23	77.54	83.78	-6.24	peak	P	
2	0.1539	29.31	43.10	72.41	73.78	-1.37	AVG	P	
3	0.1740	29.07	45.68	74.75	82.76	-8.01	peak	P	
4	0.1740	29.07	43.33	72.40	72.76	-0.36	AVG	P	
5	0.2900	28.74	28.80	57.54	68.52	-10.98	AVG	P	
6	0.3060	28.73	33.26	61.99	78.08	-16.09	peak	P	
7	0.6900	28.68	26.20	54.88	74.00	-19.12	peak	P	
8	0.7500	28.68	22.02	50.70	64.00	-13.30	AVG	P	
9	1.3820	28.70	16.06	44.76	74.00	-29.24	peak	P	
10	1.3820	28.70	13.85	42.55	64.00	-21.45	AVG	P	
11	17.0340	30.28	31.05	61.33	74.00	-12.67	peak	P	
12	17.1460	30.30	25.04	55.34	64.00	-8.66	AVG	P	

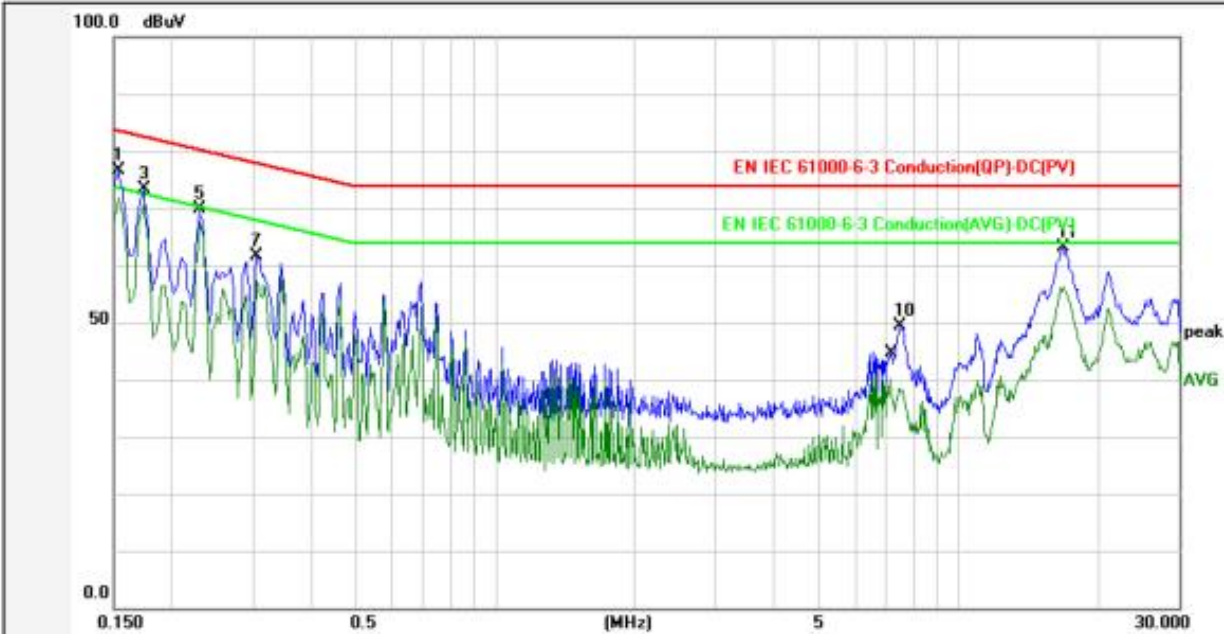


E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V
Test Mode:	Solar Charger Mode	Phase:	-
Remark:	PV Port	Test Date:	2024-06-15



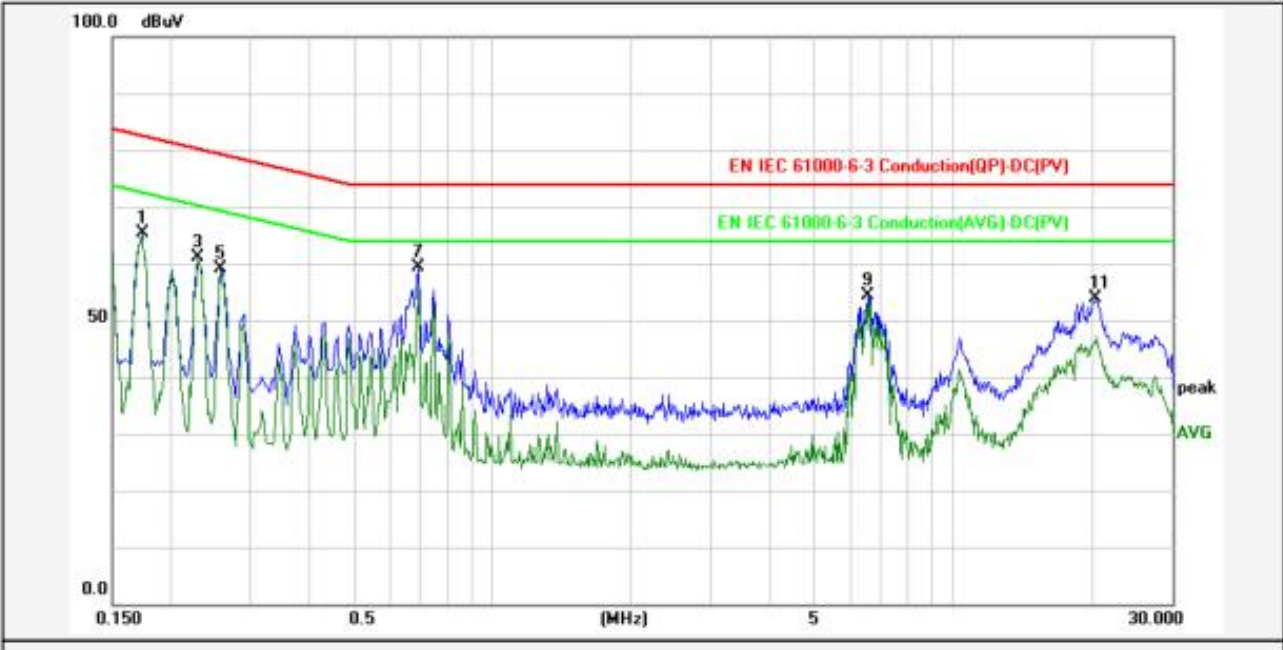
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1740	29.07	42.43	71.50	82.76	-11.26	peak	P	
2	0.1740	29.07	40.21	69.28	72.76	-3.48	AVG	P	
3	0.2900	28.74	32.17	60.91	78.52	-17.61	peak	P	
4	0.2900	28.74	27.20	55.94	68.52	-12.58	AVG	P	
5	0.3460	28.72	30.46	59.18	77.06	-17.88	peak	P	
6	0.3460	28.72	26.06	54.78	67.06	-12.28	AVG	P	
7	0.6940	28.68	24.44	53.12	64.00	-10.88	AVG	P	
8	0.7100	28.68	31.15	59.83	74.00	-14.17	peak	P	
9	1.3260	28.70	10.72	39.42	64.00	-24.58	AVG	P	
10	1.3820	28.70	14.42	43.12	74.00	-30.88	peak	P	
11	17.6259	30.36	14.33	44.69	64.00	-19.31	AVG	P	
12	18.0299	30.41	21.65	52.06	74.00	-21.94	peak	P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V
Test Mode:	Solar Charger Mode	Phase:	CM
Remark:	PV Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1539	29.31	47.31	76.62	83.78	-7.16	peak	P	
2	0.1547	29.30	41.63	70.93	73.74	-2.81	AVG	P	
3	0.1737	29.07	44.23	73.30	82.78	-9.48	peak	P	
4	0.1737	29.07	41.81	70.88	72.78	-1.90	AVG	P	
5	0.2300	28.84	41.02	69.86	80.45	-10.59	peak	P	
6	0.2300	28.84	38.75	67.59	70.45	-2.86	AVG	P	
7	0.3059	28.73	32.90	61.63	78.08	-16.45	peak	P	
8	0.3059	28.73	28.65	57.38	68.08	-10.70	AVG	P	
9	7.1139	29.12	11.04	40.16	64.00	-23.84	AVG	P	
10	7.5019	29.15	20.29	49.44	74.00	-24.56	peak	P	
11	16.8779	30.26	32.94	63.20	74.00	-10.80	peak	P	
12	16.8779	30.26	26.24	56.50	64.00	-7.50	AVG	P	

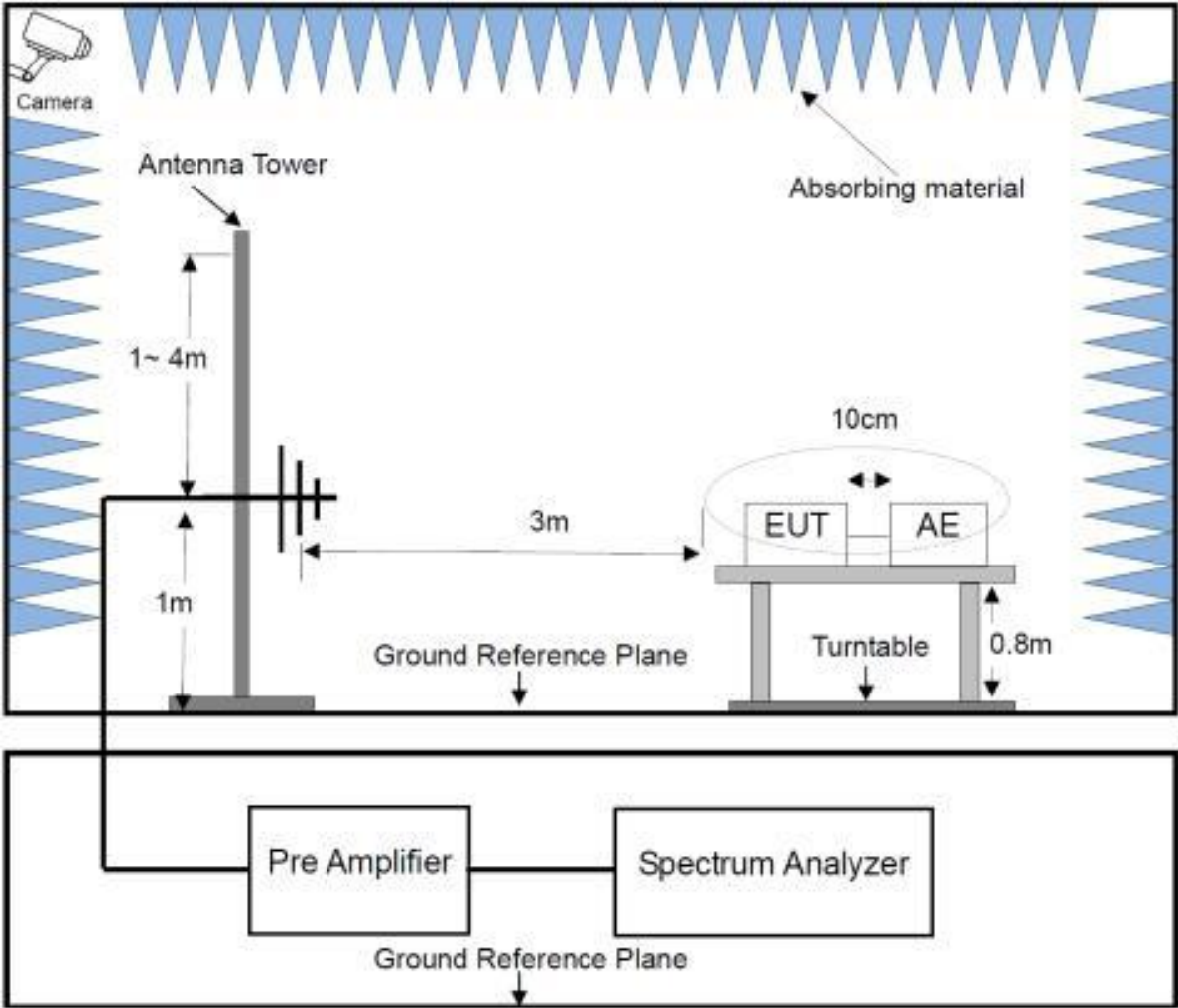
E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	26℃	Relative Humidity:	60%
Pressure:	1011hPa	Test Voltage:	PV 600V
Test Mode:	Solar Charger Mode	Phase:	DM
Remark:	PV Port	Test Date:	2024-06-15



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1737	29.07	36.20	65.27	82.78	-17.51	peak	P	
2	0.1737	29.07	36.10	65.17	72.78	-7.61	AVG	P	
3	0.2300	28.84	32.36	61.20	80.45	-19.25	peak	P	
4	0.2300	28.84	31.97	60.81	70.45	-9.64	AVG	P	
5	0.2580	28.76	30.43	59.19	79.49	-20.30	peak	P	
6	0.2580	28.76	29.77	58.53	69.49	-10.96	AVG	P	
7	0.6897	28.68	30.69	59.37	74.00	-14.63	peak	P	
8	0.6897	28.68	27.83	56.51	64.00	-7.49	AVG	P	
9	6.5377	29.07	25.33	54.40	74.00	-19.60	peak	P	
10	6.5377	29.07	24.55	53.62	64.00	-10.38	AVG	P	
11	20.4740	30.66	23.16	53.82	74.00	-20.18	peak	P	
12	20.5857	30.65	16.53	47.18	64.00	-16.82	AVG	P	

## 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
	<input checked="" type="checkbox"/> Residential Environment	<input type="checkbox"/> Industrial Environment		
30 to 230	40	50	3	120 KHz
230 to 1000	47	57	3	120 KHz

Note: The lower limit shall apply at the transition frequency.

☐ Above 1 GHz:

Frequency range MHz	<input type="checkbox"/> Residential Environment		<input type="checkbox"/> Industrial Environment		Distance m	Detector type / Bandwidth
	Peak limits	Average limits	Peak limits	Average limits		
	dB(μV/m)	dB(μV/m)	dB(μV/m)	dB(μV/m)		
1000 to 3000	76	56	70	50	3	1MHz
3000 to 6000	80	60	74	54	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
<p>Note 1. <math>F_x</math> is highest fundamental frequency generated or used within the EUT or highest frequency at which it operates.</p> <p>2. Where the <math>F_x</math> is not known, tests are performed up to 6 GHz.</p>		

### 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 EN IEC 61000-6-3.
- 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 EN IEC 61000-6-3.
- 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

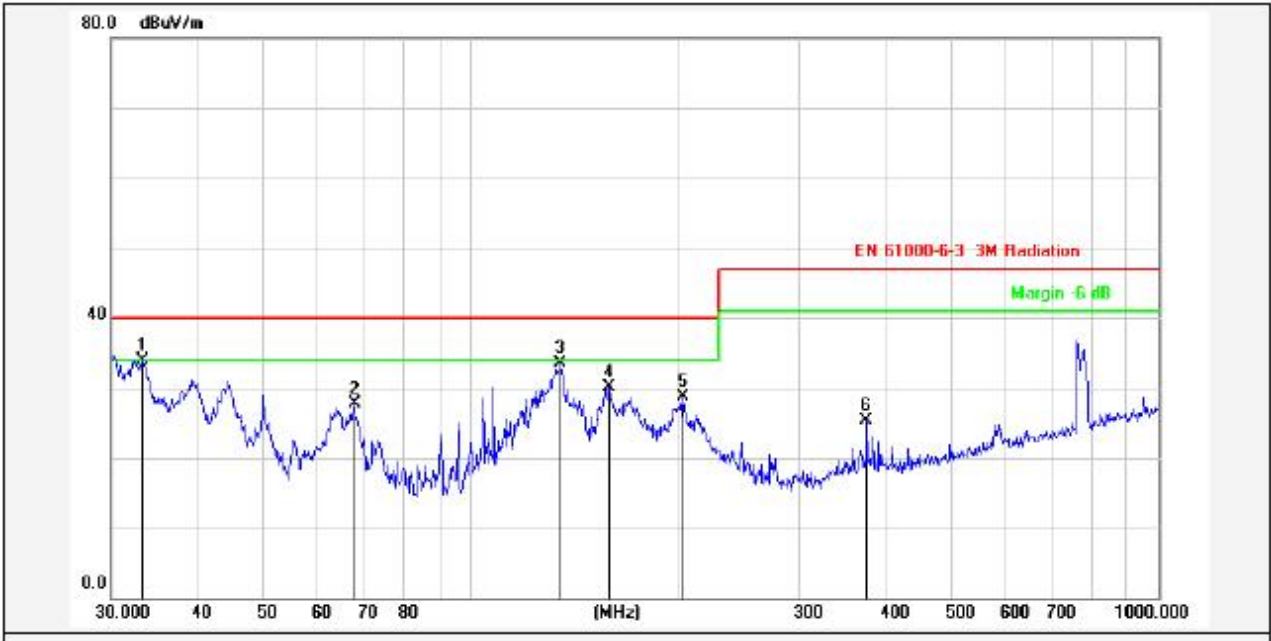
**PASS.**

Please refer to the following pages.



E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	AC 400V/50Hz
Test Mode:	AC Charger Mode	Polarization:	Vertical

Test Date: 2024-06-15

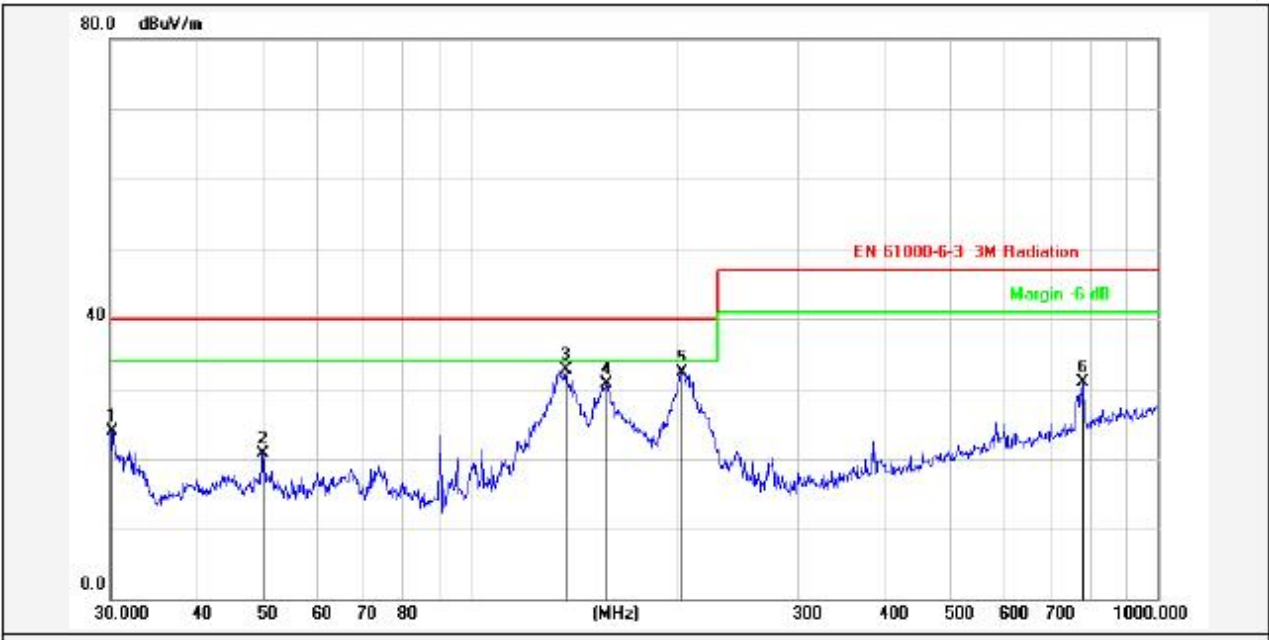


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	33.3279	-12.27	46.14	33.87	40.00	-6.13	peak			P	
2	67.6751	-12.33	40.04	27.71	40.00	-12.29	peak			P	
3	135.0319	-14.15	47.59	33.44	40.00	-6.56	peak			P	
4	158.6677	-13.86	43.95	30.09	40.00	-9.91	peak			P	
5	203.5228	-10.89	39.61	28.72	40.00	-11.28	peak			P	
6	375.9385	-6.45	31.76	25.31	47.00	-21.69	peak			P	



E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	AC 400V/50Hz
Test Mode:	AC Charger Mode	Polarization:	Horizontal

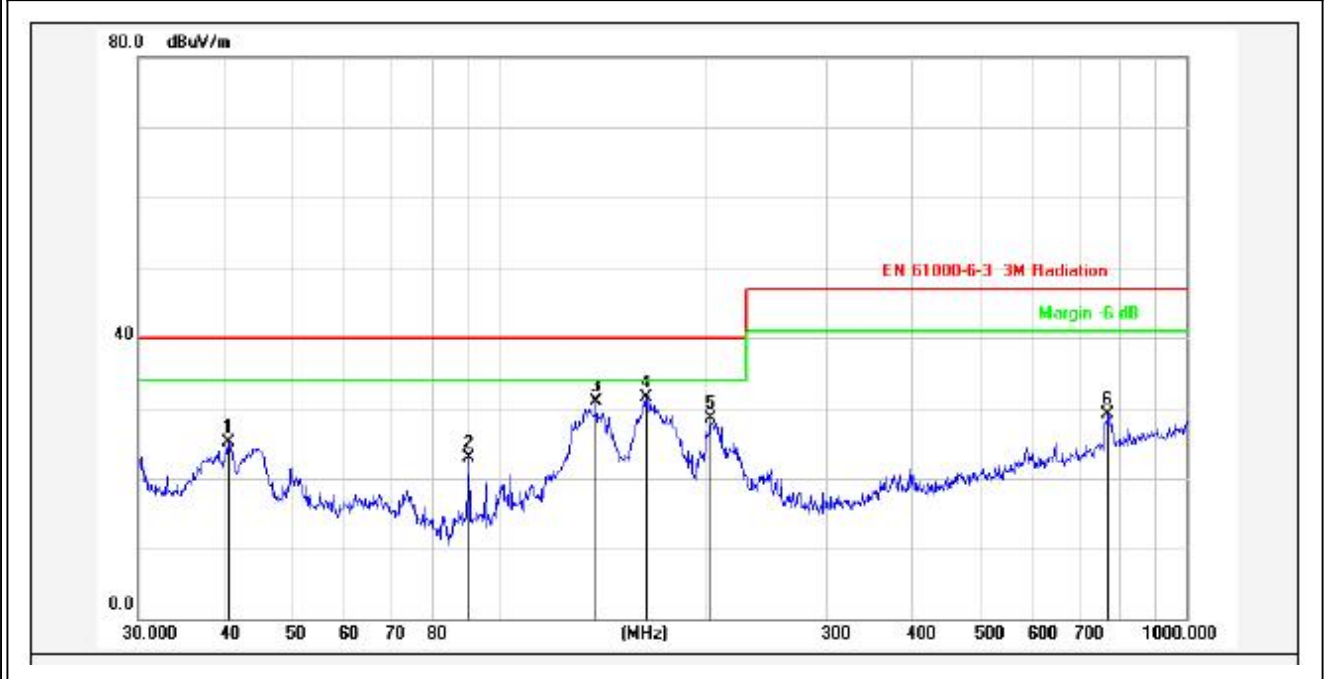
Test Date: 2024-06-15



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	30.2111	-12.47	36.38	23.91	40.00	-16.09	peak			P	
2	50.0566	-9.38	30.14	20.76	40.00	-19.24	peak			P	
3	137.9028	-14.26	46.89	32.63	40.00	-7.37	peak			P	
4	158.1123	-13.88	44.49	30.61	40.00	-9.39	peak			P	
5	203.5228	-10.89	43.14	32.25	40.00	-7.75	peak			P	
6	779.6067	0.63	30.25	30.88	47.00	-16.12	peak			P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	PV 600V AC 400V/50Hz
Test Mode:	Solar Charger Mode	Polarization:	Horizontal

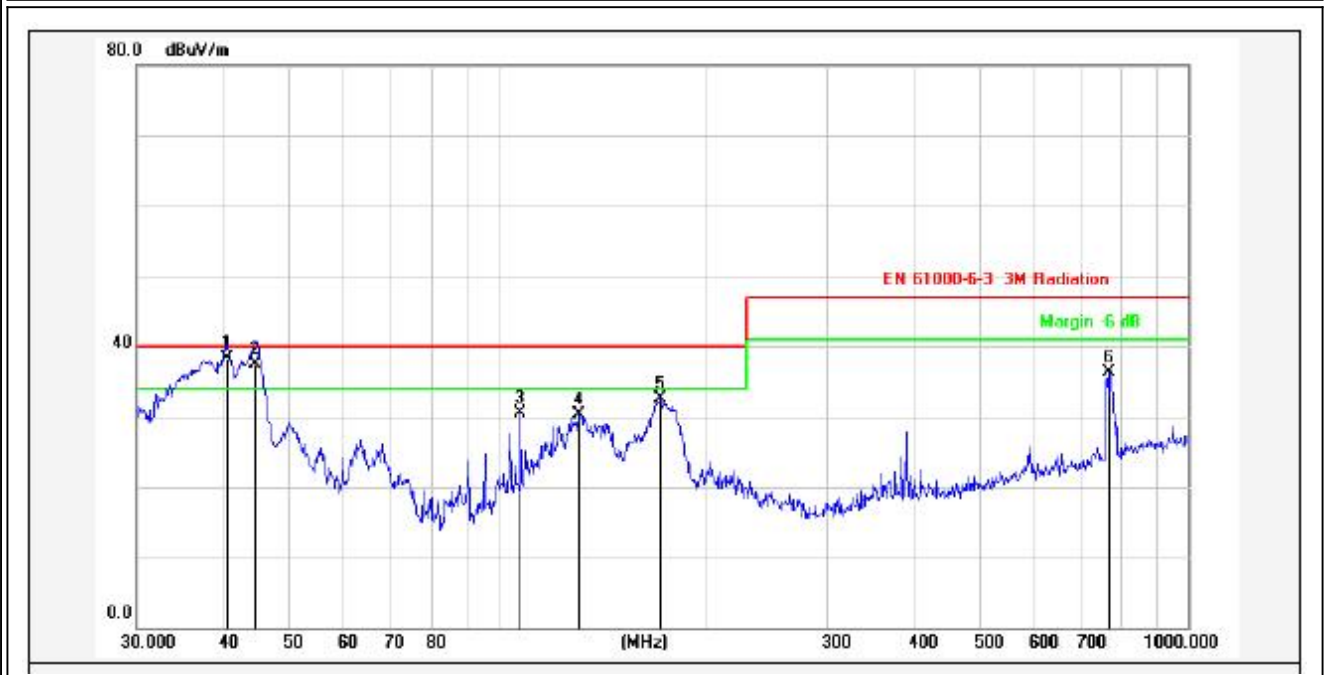
Test Date: 2024-06-15



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	40.5591	-10.37	35.48	25.11	40.00	-14.89	peak			P	
2	90.5374	-12.42	35.25	22.83	40.00	-17.17	peak			P	
3	138.8734	-14.30	45.29	30.99	40.00	-9.01	peak			P	
4	163.7549	-13.65	45.16	31.51	40.00	-8.49	peak			P	
5	203.5227	-10.89	39.38	28.49	40.00	-11.51	peak			P	
6	768.7481	0.56	28.61	29.17	47.00	-17.83	peak			P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	PV 600V AC 400V/50Hz
Test Mode:	Solar Charger Mode	Polarization:	Vertical

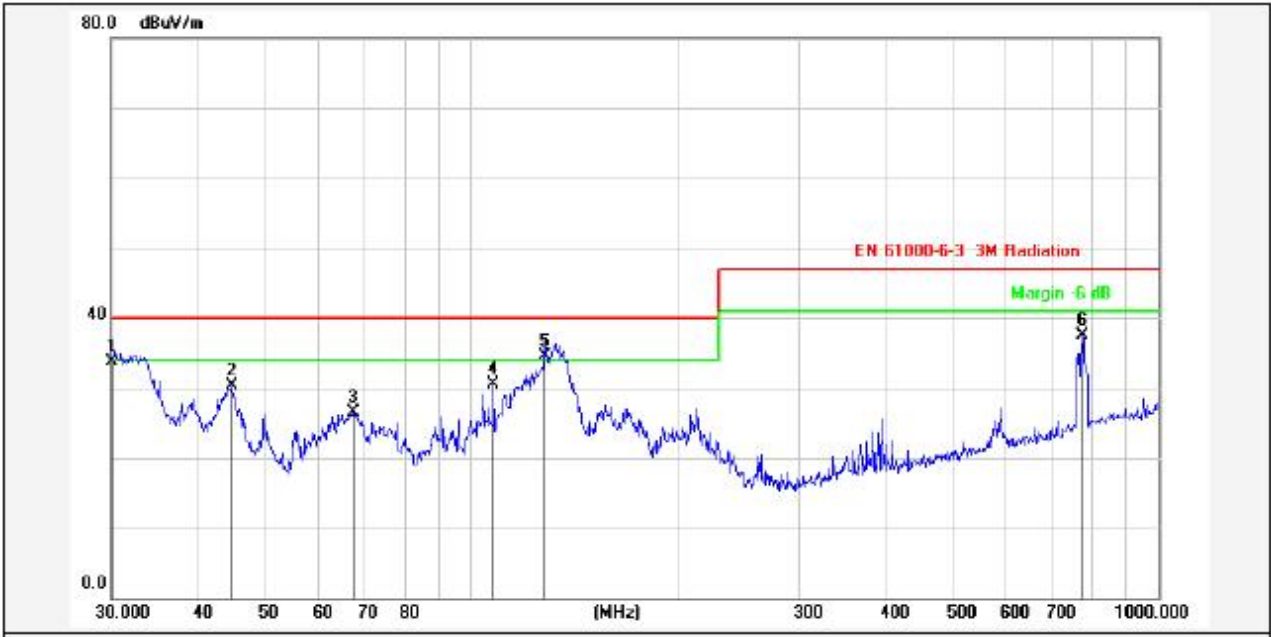
Test Date: 2024-06-15



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	40.5591	-10.37	48.77	38.40	40.00	-1.60	QP			P	
2	44.5868	-9.54	47.14	37.60	40.00	-2.40	QP			P	
3	107.8877	-10.83	41.29	30.46	40.00	-9.54	peak			P	
4	130.8369	-13.98	44.29	30.31	40.00	-9.69	peak			P	
5	171.9946	-13.30	45.72	32.42	40.00	-7.58	peak			P	
6	768.7481	0.56	35.83	36.39	47.00	-10.61	peak			P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	DC 500V AC 400V/50Hz
Test Mode:	Inverter Mode	Polarization:	Vertical

Test Date: 2024-06-15



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	30.1053	-12.48	46.18	33.70	40.00	-6.30	QP			P	
2	44.9006	-9.48	39.82	30.34	40.00	-9.66	peak			P	
3	67.4382	-12.23	38.80	26.57	40.00	-13.43	peak			P	
4	107.8877	-10.83	41.42	30.59	40.00	-9.41	peak			P	
5	128.1129	-13.80	48.40	34.60	40.00	-5.40	QP			P	
6	774.1584	0.59	37.00	37.59	47.00	-9.41	peak			P	

E.U.T:	Hybrid solar inverter	Model Name :	ASG-20TL-ZH
Temperature:	23.5℃	Relative Humidity:	58%
Pressure:	1011hPa	Test Voltage:	DC 500V AC 400V/50Hz
Test Mode:	Inverter Mode	Polarization:	Horizontal

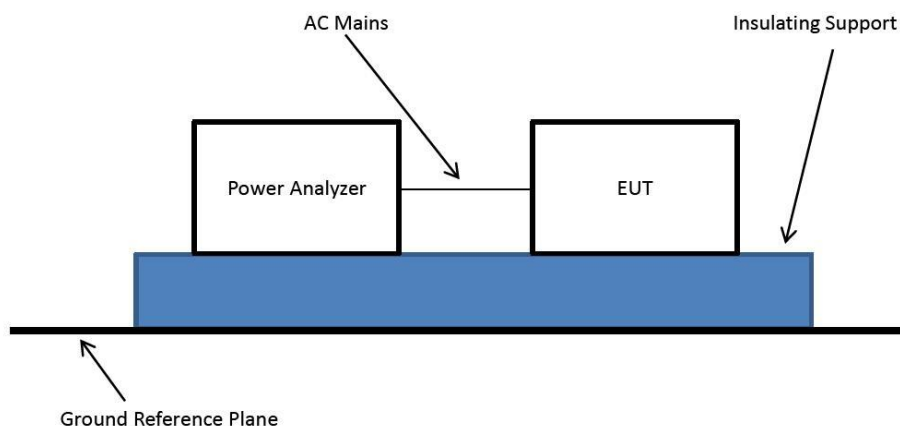
Test Date: 2024-06-15



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	30.2111	-12.47	35.27	22.80	40.00	-17.20	peak			P	
2	78.9652	-15.03	37.78	22.75	40.00	-17.25	peak			P	
3	100.2285	-10.79	35.65	24.86	40.00	-15.14	peak			P	
4	132.2205	-14.03	47.18	33.15	40.00	-6.85	peak			P	
5	204.2377	-10.88	42.91	32.03	40.00	-7.97	QP			P	
6	776.8778	0.61	29.63	30.24	47.00	-16.76	peak			P	

## 7.HARMONIC CURRENT EMISSION MEASUREMENT

### 7.1.Block Diagram of Test Setup



### 7.2.Test Limits

#### ☐ Limits for equipment other than balanced three-phase equipment

Minimal $R_{sce}$	Admissible individual harmonic current $I_h/I_{ref}^a$ %						Admissible harmonic parameters %	
	$I_3$	$I_5$	$I_7$	$I_9$	$I_{11}$	$I_{13}$	$THC/I_{ref}$	$PWHC/I_{ref}$
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
$\geq 350$	41	24	15	12	10	8	47	47

Note:  $I_{ref}$  = reference current;  $I_h$  = harmonic current component.

#### ☒ Limits for balanced three-phase equipment

Minimal $R_{sce}$	Admissible individual harmonic current $I_h/I_{ref}^a$ %				Admissible harmonic parameters %	
	$I_5$	$I_7$	$I_{11}$	$I_{13}$	$THC/I_{ref}$	$PWHC/I_{ref}$
33	10,7	7,2	3,1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
$\geq 350$	40	25	15	10	48	46

Note:  $I_{ref}$  = reference current;  $I_h$  = harmonic current component.



### 7.3.Test Procedure

- a. The EUT was placed on a wooden table 0.1m above ground.
- b. Configure the EUT and support devices as per section 7.1.
- c. Turn on the EUT and all support devices, and make it run stably.
- d. Set the EUT to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- e. Set correspondent test program and measurement time of the test system to measure the current harmonics emanated from EUT, and then record the test data.

### 7.4.Test Results

**PASS.**

Please refer to the following pages.



## Harmonic current emission Test Result

### Test Data(Phase 1)

Test duration (sec):600			Test mode: AC Charger Mode		
THC/Iref (%): 0.43	Limit (%): 13.0		PWHC/Iref (%): 2.074	PWHC Limit (%): 22.0	
Parameter values during test:					
V_RMS(Volts):	230.63		Frequency(Hz):	50	
I_RMS(A):	28.47		Power Factor:	0.980	
Power(Watts):	6434.72		Minimum Rsce:	33	
Harm#	Harms(filtered)(A)	Limit(A)	Ih/Iref%	Limit(Ih/Iref) %	Status
1	28.77				
2	0.0830	2.278	0.292	8.000	Pass
3	0.2640	N/A	0.927	N/A	N/A
4	0.0870	1.139	0.306	4.000	Pass
5	0.1210	3.046	0.425	10.700	Pass
6	0.0330	0.740	0.116	2.600	Pass
7	0.0400	2.050	0.140	7.200	Pass
8	0.0230	0.569	0.081	2.000	Pass
9	0.0400	N/A	0.140	N/A	N/A
10	0.0300	0.456	0.105	1.600	Pass
11	0.0550	0.883	0.193	3.100	Pass
12	0.0210	0.370	0.074	1.300	Pass
13	0.0480	0.569	0.169	2.000	Pass
14	0.0250	N/A		N/A	N/A
15	0.0450	N/A		N/A	N/A
16	0.0270	N/A		N/A	N/A
17	0.0380	N/A		N/A	N/A
18	0.0190	N/A		N/A	N/A
19	0.0320	N/A		N/A	N/A
20	0.0220	N/A		N/A	N/A
21	0.0230	N/A		N/A	N/A
22	0.0140	N/A		N/A	N/A
23	0.0300	N/A		N/A	N/A
24	0.0020	N/A		N/A	N/A
25	0.0380	N/A		N/A	N/A
26	0.0200	N/A		N/A	N/A
27	0.0160	N/A		N/A	N/A
28	0.0300	N/A		N/A	N/A
29	0.0220	N/A		N/A	N/A
30	0.0170	N/A		N/A	N/A
31	0.0270	N/A		N/A	N/A
32	0.0130	N/A		N/A	N/A
33	0.0180	N/A		N/A	N/A
34	0.0190	N/A		N/A	N/A
35	0.0180	N/A		N/A	N/A
36	0.0170	N/A		N/A	N/A
37	0.0160	N/A		N/A	N/A
38	0.0180	N/A		N/A	N/A
39	0.0120	N/A		N/A	N/A
40	0.0010	N/A		N/A	N/A

## Test Data(Phase 2)

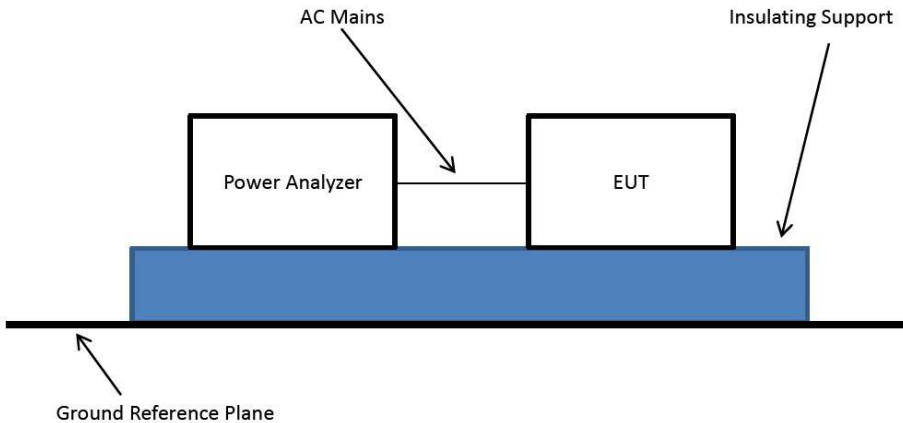
Test duration (sec):600			Test mode: AC Charger Mode		
THC/Iref (%): 1.206	Limit (%): 13.0		PWHC/Iref (%): 5.612	PWHC Limit (%): 22.0	
Parameter values during test:					
V_RMS(Volts):	230.63		Frequency(Hz):	50	
I_RMS(A):	29.28		Power Factor:	0.980	
Power(Watts):	6617.79		Minimum Rsce:	33	
Harm#	Harms(filtered)(A)	Limit (A)	Ih/Iref%	Limit(Ih/Iref) %	Status
1	29.85				
2	0.4450	2.342	1.520	8.000	Pass
3	0.2010	N/A	0.686	N/A	N/A
4	0.0890	1.171	0.304	4.000	Pass
5	0.1560	3.133	0.533	10.700	Pass
6	0.0390	0.761	0.133	2.600	Pass
7	0.0700	2.108	0.239	7.200	Pass
8	0.0360	0.586	0.123	2.000	Pass
9	0.0300	N/A	0.102	N/A	N/A
10	0.0420	0.468	0.143	1.600	Pass
11	0.0400	0.908	0.137	3.100	Pass
12	0.0400	0.381	0.137	1.300	Pass
13	0.0510	0.586	0.174	2.000	Pass
14	0.0420	N/A		N/A	N/A
15	0.0470	N/A		N/A	N/A
16	0.0320	N/A		N/A	N/A
17	0.0410	N/A		N/A	N/A
18	0.0520	N/A		N/A	N/A
19	0.0450	N/A		N/A	N/A
20	0.0490	N/A		N/A	N/A
21	0.3050	N/A		N/A	N/A
22	0.0270	N/A		N/A	N/A
23	0.0390	N/A		N/A	N/A
24	0.0390	N/A		N/A	N/A
25	0.0250	N/A		N/A	N/A
26	0.0250	N/A		N/A	N/A
27	0.0630	N/A		N/A	N/A
28	0.0400	N/A		N/A	N/A
29	0.0300	N/A		N/A	N/A
30	0.0370	N/A		N/A	N/A
31	0.0350	N/A		N/A	N/A
32	0.0200	N/A		N/A	N/A
33	0.0260	N/A		N/A	N/A
34	0.0260	N/A		N/A	N/A
35	0.0300	N/A		N/A	N/A
36	0.0100	N/A		N/A	N/A
37	0.0170	N/A		N/A	N/A
38	0.0160	N/A		N/A	N/A
39	0.0180	N/A		N/A	N/A
40	0.0130	N/A		N/A	N/A

## Test Data(Phase 3)

Test duration (sec):600			Test mode: AC Charger Mode		
THC/Iref (%): 0.537	Limit (%): 13.0		PWHC/Iref (%): 2.555	PWHC Limit (%): 22.0	
Parameter values during test:					
V_RMS(Volts):	230.63		Frequency(Hz):	50	
I_RMS(A):	29.21		Power Factor:	0.980	
Power(Watts):	6601.97		Minimum Rsce:	33	
Harm#	Harms(filtered)(A)	Limit (A)	Ih/Iref%	Limit(Ih/Iref) %	Status
1	29.77				
2	0.4010	2.337	1.373	8.000	Pass
3	0.1940	N/A	0.664	N/A	N/A
4	0.1000	1.168	0.342	4.000	Pass
5	0.1450	3.125	0.496	10.700	Pass
6	0.0520	0.759	0.178	2.600	Pass
7	0.0630	2.103	0.216	7.200	Pass
8	0.0360	0.584	0.123	2.000	Pass
9	0.0330	N/A	0.113	N/A	N/A
10	0.0350	0.467	0.120	1.600	Pass
11	0.0600	0.906	0.205	3.100	Pass
12	0.0290	0.380	0.099	1.300	Pass
13	0.0600	0.584	0.205	2.000	Pass
14	0.0520	N/A		N/A	N/A
15	0.0550	N/A		N/A	N/A
16	0.0370	N/A		N/A	N/A
17	0.0230	N/A		N/A	N/A
18	0.0530	N/A		N/A	N/A
19	0.0220	N/A		N/A	N/A
20	0.0150	N/A		N/A	N/A
21	0.0330	N/A		N/A	N/A
22	0.0370	N/A		N/A	N/A
23	0.0270	N/A		N/A	N/A
24	0.0390	N/A		N/A	N/A
25	0.0430	N/A		N/A	N/A
26	0.0230	N/A		N/A	N/A
27	0.0250	N/A		N/A	N/A
28	0.0150	N/A		N/A	N/A
29	0.0210	N/A		N/A	N/A
30	0.0240	N/A		N/A	N/A
31	0.0280	N/A		N/A	N/A
32	0.0220	N/A		N/A	N/A
33	0.0210	N/A		N/A	N/A
34	0.0230	N/A		N/A	N/A
35	0.0110	N/A		N/A	N/A
36	0.0170	N/A		N/A	N/A
37	0.0270	N/A		N/A	N/A
38	0.0130	N/A		N/A	N/A
39	0.0250	N/A		N/A	N/A
40	0.0190	N/A		N/A	N/A

## 8.VOLTAGE FLUCTUATIONS & FLICKER MEASUREMENT

### 8.1.Block Diagram of Test Setup



### 8.2.Test Limits

Test Item	Limit
$P_{st}$ (Short-term flicker indicator.)	1.0
$P_{lt}$ (Long-term flicker indicator.)	0.65
$T_{d(t)}$ (ms) ( Maximum time that $d(t)$ exceeds 3.3%)	500
$d_{max}(\%)$ (Maximum relative voltage change.)	4
$d_c(\%)$ (Relative steady-state voltage change)	3.3

### 8.3.Test Procedure

- The EUT was placed on a wooden table 0.1m above ground.
- Configure the EUT and support devices as per section 8.1.
- Turn on the EUT and all support devices, and make it run stably.
- Set the EUT to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- Set correspondent test program and measurement time of the test system to measure the most unfavorable sequence of voltage changes from EUT, and then record the test data.

### 8.4.Test Results

**PASS.**

Please refer to the following pages.

## VOLTAGE FLUCTUATIONS & FLICKER Test Result

Test Data					
Test duration (sec): 600			Test mode: AC Charger Mode		
Parameter values during test:					
V_RMS(Volts):	400.12	Frequency(Hz):	50		
I_RMS(A):	29.31	Power Factor:	0.998		
Power(Watts):	20248.03				
Result:	Phase 1	Phase 2	Phase 3	Test Limit	Status
dt (ms):	0.000	0.000	0.000	500.000	Pass
Highest dc (%):	0.265	0.300	0.255	3.300	Pass
Highest dmax (%):	2.505	2.5000	1.998	4.000	Pass
Highest Pst (10 min. period):	0.614	0.5570	0.553	1.000	Pass
Highest Plt (2 hr. period):	0.271	0.2460	0.244	0.650	Pass

## 9.PERFORMANCE CRITERIA FOR IMMUNITY

The performance criteria are referred to the test standard: EN 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.

**a)** 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.

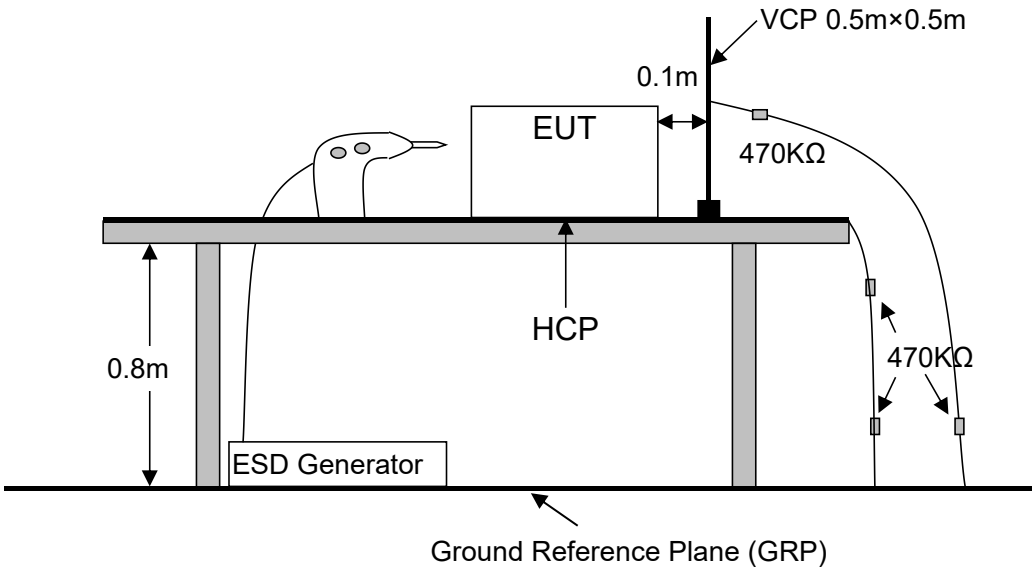
**b)** Performance criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible 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.

**c)** 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.



## 10.ELECTROSTATIC DISCHARGE TEST

### 10.1.Block Diagram of Test Setup



### 10.2.Test Standard and Severity Levels

a. Test Standard:

Product standard	EN 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

### 10.3.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 10.1.
- 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.

#### 10.4.Test Results

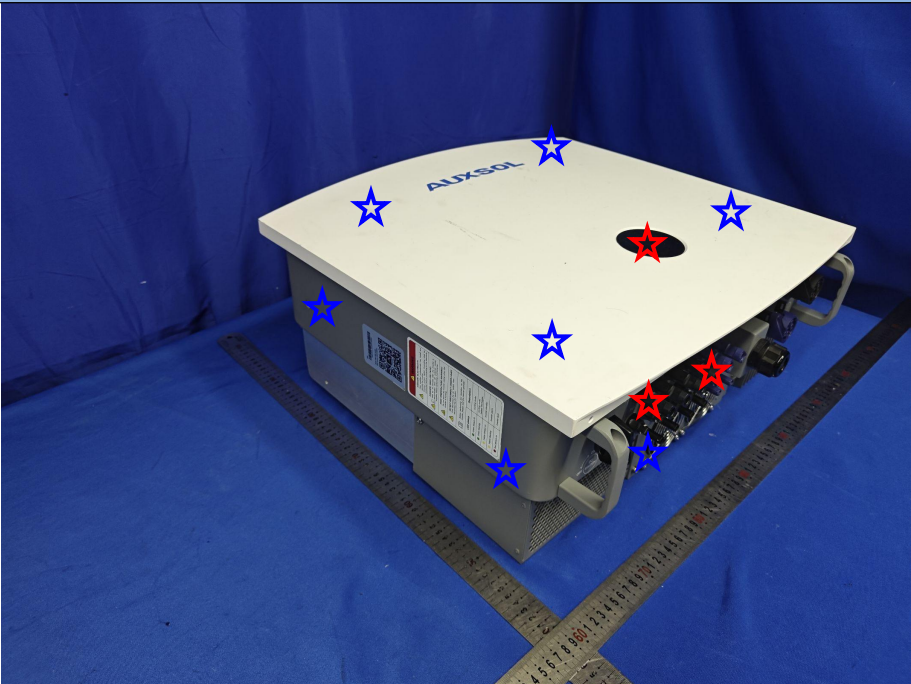
**PASS.**

Please refer to the following page.

Electrostatic Discharge Test Results			
Ambient Condition:	Temp.: 29.3°C	R.H.: 52.0%	Air Pressure : 101.2kPa
Test Specifications	Test level:	± 4 KV for Contact Discharge ± 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	1-3		
Test Point		Kind A-Air Discharge C-Contact Discharge	Result (Performance Criterion)
Photovoltaic switch/ Toggle button		A	A
Screen		A	A
Metal shell （Front, back, up, left and right）		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 Engineer : Chenrongbin		Test Date : 2024.06.20	

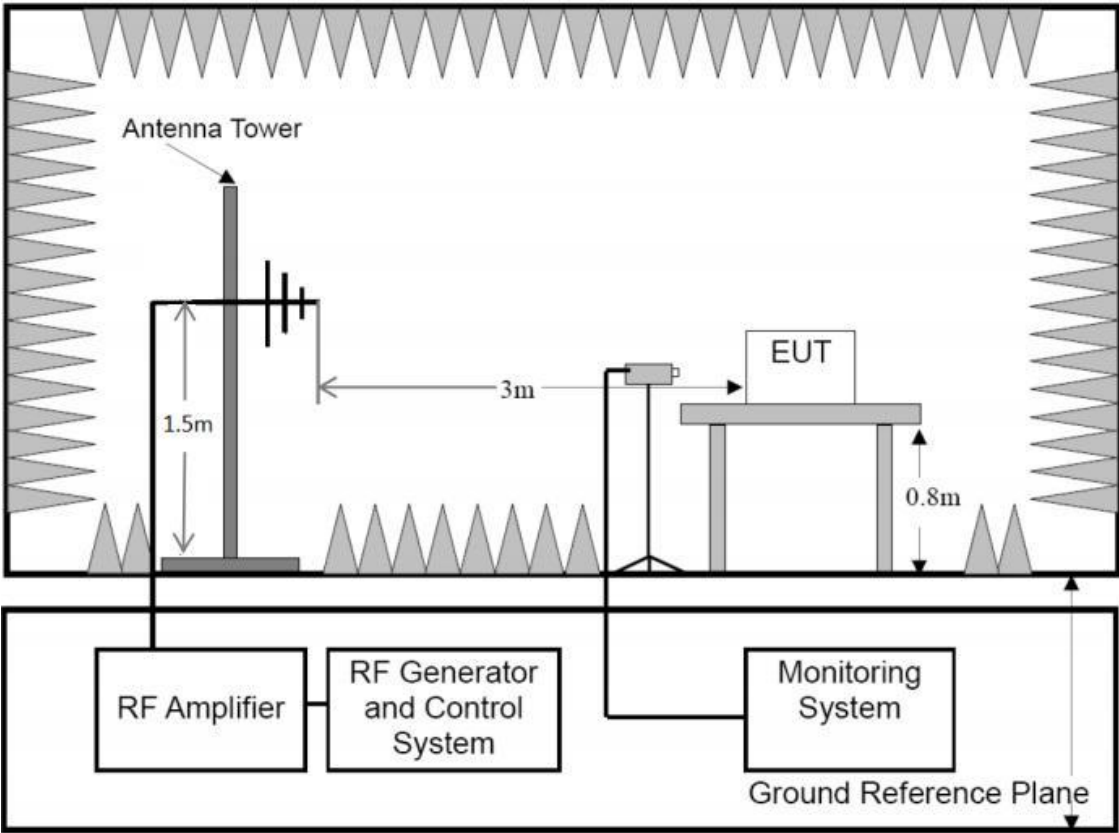
ESD TEST POINT

( ★ Air Discharge; ☆ Contact Discharge)



## 11.RADIO-FREQUENCY ELECTROMAGNETIC FIELD TEST

### 11.1.Block Diagram of Test Setup



### 11.2.Test Standard and Severity Levels

#### a. Test Standard

Product standard	EN 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



### 11.3.Test Procedure

- a. The testing was performed in a fully anechoic chamber.
- b. The EUT and necessary support devices were placed on a turn table which is 0.8 meter above ground.
- c. EUT was set 3 meter away from the transmitting antenna which is mounted on an antenna tower.
- d. Configure the EUT and support devices as per section 11.1.
- e. Turn on the EUT and all support devices, and make it run stably.
- f. 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.
- g. Repeat the above steps in each mode and record the test result.

### 11.4.Test Results

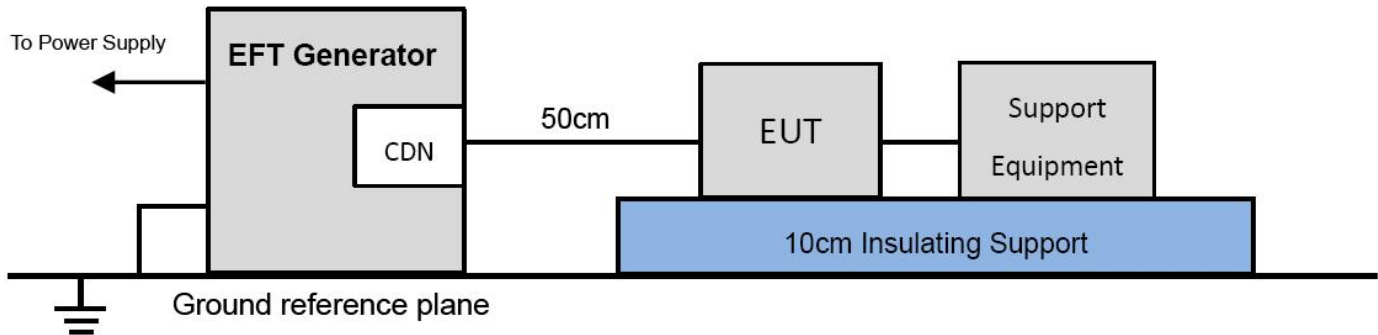
**PASS.**

Please refer to the following page.

Radio-Frequency Electromagnetic Field Test Results				
Ambient Condition	Temp.: 26.9°C		R.H.: 58.8%	Air Pressure: 101.5 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	
Required Performance Criterion	A			
Tested mode	1-3			
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 Engineer : Chance			Test Date : 2024.06.27	

## 12.FAST TRANSIENTS TEST

### 12.1.Block Diagram of Test Setup



### 12.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN 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.			

### 12.3.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 12.1.
- 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.

### 12.4.Test Result

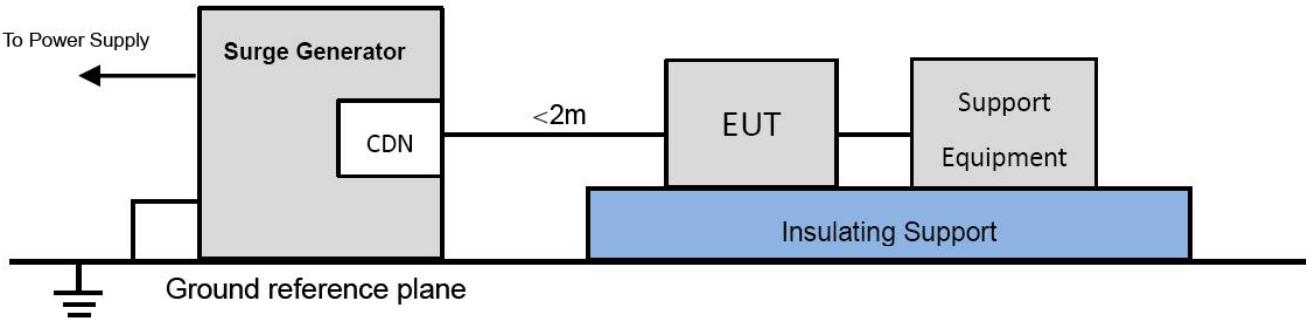
**PASS.**

Please refer to the following page.

Fast transients test Results			
Ambient Condition	Temp.: 28.8°C	R.H.:56.0%	Air Pressure: 101.2 kPa
Test Specifications	Test Level:	2kV for AC power port 1kV for PV power port	
	Repetition Frequency:	5kHz	
	Duration:	15ms	
	Period:	300ms	
	Impulse wave shape:	5/50ns (Tr/Th)	
	Test Duration:	2min	
Required Performance Criterion	B		
Test mode	1-3		
Coupling mode and port	<div><input checked="" type="checkbox"/> AC Power    <input checked="" type="checkbox"/> PV port    <input type="checkbox"/> Signal line</div> <div><input checked="" type="checkbox"/> Direct    <input type="checkbox"/> Capacitive</div>		
Test Line	Test Voltage	Result (Performance Criterion)	
AC Input Port	±2KV	A	
AC Output Port	±2KV	A	
PV Port	±1KV	A	
Note : No performance degradation or other exceptions occurred during and after the test.			
Test Engineer : Chenrongbin		Test Date : 2024.06.20	

### 13.SURGE TEST

#### 13.1.Block Diagram of Test Setup



#### 13.2.Test Standard and Severity Levels

a. Test Standard

Product standard	EN 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
*	Special



### 13.3.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 13.1.
- c. Turn on the EUT and all support devices, and make it run stably.
- d. The surge 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 surge 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 surge 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 surge 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.

### 13.4.Test Result

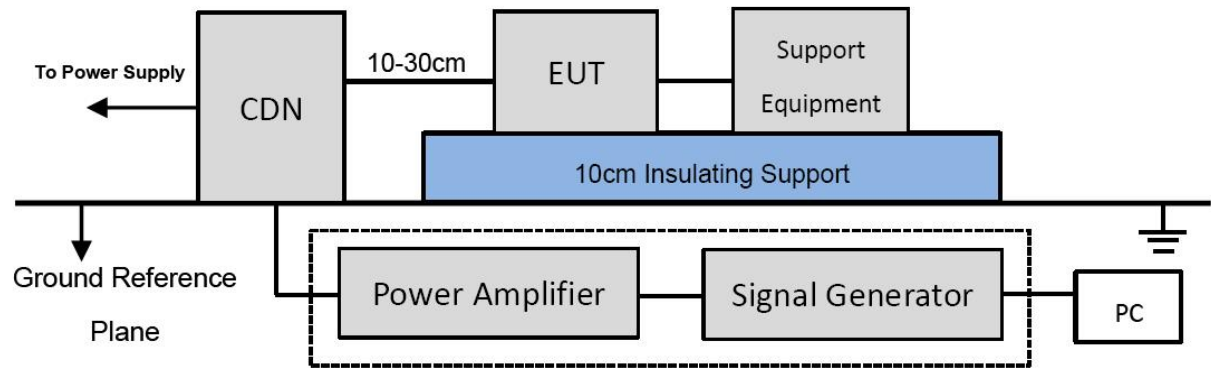
**PASS.**

Please refer to the following page.

Surge Test Results				
Ambient Condition		Temp.: 27.9°C	R.H.:56.0%	Air Pressure: 101.2 kPa
Test Specifications		Wave-shape:	1.2/50 us (Tr/Th) / 8/20 us (Tr/Th) for power port	
		Test Level:	±1.0kV for AC power port Line to Line ±2.0kV for AC power port Line to Earth ±0.5kV for DC Power port Line to Line ±1kV for DC Power port Line to Line	
		Phase angle:	0°, 90°, 180° and 270°	
		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		
Test mode		1-3		
Test Line		Phase Angle	Test Voltage	Result (Performance Criterion)
AC Input Port	DM	0° /90° /180° /270°	±1KV	A
	CM	0° /90° /180° /270°	±2KV	A
AC Ourput Port	DM	0° /90° /180° /270°	±1KV	A
	CM	0° /90° /180° /270°	±2KV	A
PV Port	DM	/	±0.5KV	A
	CM	/	±1KV	A
Note : No performance degradation or other exceptions occurred during and after the test.				
Test Engineer : Chenrongbin			Test Date : 2024.06.20	

## 14.CONDUCTED RADIO-FREQUENCY COMMON MODE TEST

### 14.1.Block Diagram of Test Setup



### 14.2.Test Standard and Severity Levels

#### a. Test Standard

Product standard	EN 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

### 14.3.Test Procedure

- a. The EUT was placed on the insulating support 0.1m above the ground reference plane. CDN (coupling and decoupling device) or EM clamp is placed on the ground plane about 0.3m from EUT. Cables between CDN or EM clamp 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 14.1.
- 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 or EM clamp.
- e. The frequency range is swept from 150 KHz to 80 MHz using 10V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep shall not exceed  $1.5 \times 10^{-3}$  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.

### 14.4.Test Result

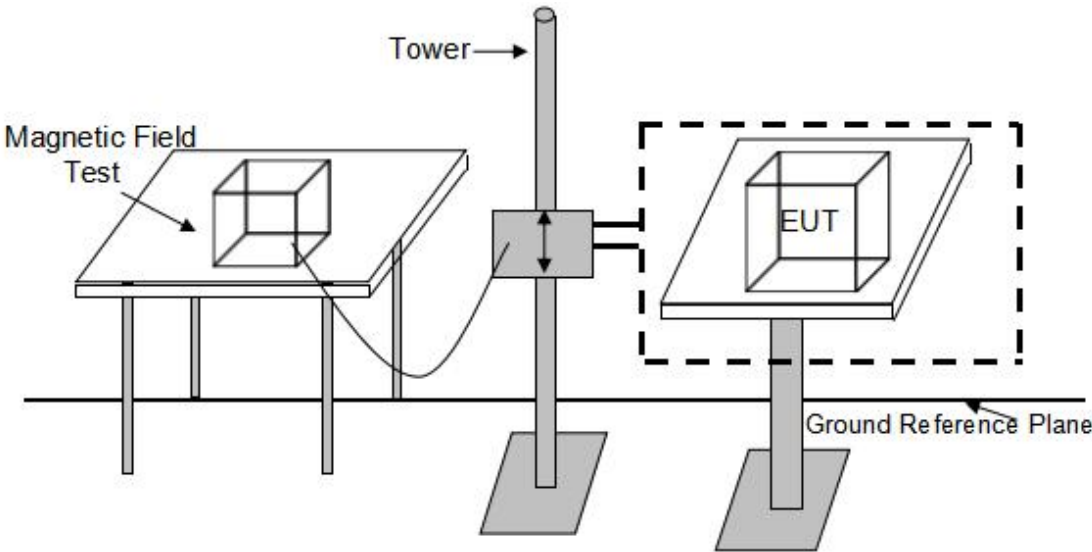
**PASS.**

Please refer to the following page.

Conducted RF Common Mode Test Results			
Ambient Condition	Temp.: 27.5°C	R.H.: 58.4%	Air Pressure:101.6 kPa
Test Specifications	Test Level:	10V (r.m.s)	
	Modulation:	1kHz sine wave, 80%AM	
	Step Size:	1% of preceding frequency value	
	Dwell Time:	1s	
	Mode:	Swept test	
Required Performance Criterion	A		
Test mode	1-3		
Test Port	Frequency (MHz)	Level(V)	Result (Performance Criterion)
AC Input Port	0.15~80	10	A
AC Output Port	0.15~80	10	A
PV Port	0.15~80	10	A
Note : No performance degradation or other exceptions occurred during and after the test.			
Test Engineer : Chance		Test Date : 2024.06.27	

## 15.POWER-FREQUENCY MAGNETIC FIELD TEST

### 15.1.Block Diagram of Test Setup



### 15.2.Test Standard and Severity Levels

#### a. Test Standard

Product standard	EN 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



### 15.3.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 15.1.
- 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.

### 15.4.Test Result

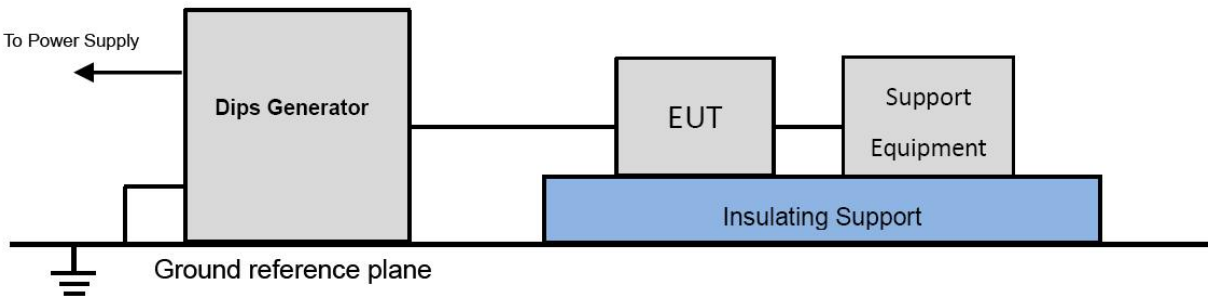
**PASS.**

Please refer to the following page.

Power-Frequency Magnetic Field Immunity Test Results			
Ambient Condition	Temp.: 28.3°C	R.H.: 53.0%	Air Pressure:101.2kPa
Test Specifications	Test Level:	30A/m	
	Time:	300s	
Required Performance Criterion	A		
Test mode	1-3		
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 Engineer : Chenrongbin		Test Date : 2024.06.20	

## 16.VOLTAGE DIPS AND INTERRUPTIONS TEST

### 16.1.Block Diagram of Test Setup



### 16.2.Test Standard and Severity Levels

#### a. Test Standard

Product standard	EN IEC 61000-6-2
Basic standard	IEC 61000-4-34
Performance criterion	B&C

#### b. Severity level

Class	Test level and durations for voltage dips ( $t_s$ )(50Hz/60Hz)				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0 % during $\frac{1}{2}$ cycle	0 % during 1 cycle	70 % during 25/30 <sup>b</sup> cycles		
Class 3	0 % during $\frac{1}{2}$ cycle	0 % during 1 cycle	40 % <sup>c</sup> during 10/12 <sup>b</sup> cycles	70 % during 25/30 <sup>b</sup> cycles	80 % during 250/300 <sup>b</sup> cycles
Class X <sup>a</sup>	X	X	X	X	X

Note: a. To be defined by product committee. For equipment connected directly or indirectly to the public network, the levels must not be less severe than Class 2.

b. "25/30 cycles" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test", "10/12 cycles" means "10 cycles for 50 Hz test" and "12 cycles for 60 Hz test" and "250/300 cycles" means "250 cycles for 50 Hz test" and "300 cycles for 60 Hz test".

c. May be replaced by product committee with a test level of 50 % for equipment that is intended primarily for 200 V or 208V nominal operation.

Class	Test level and durations for short interruptions ( $t_s$ ) (50 Hz/60 Hz)				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0 % during 250/300 <sup>b</sup> cycles				
Class 3	0 % during 250/300 <sup>b</sup> cycles				
Class X <sup>a</sup>	X	X	X	X	X
Note: a. To be defined by product committee. For equipment connected directly or indirectly to the public network, the levels must not be less severe than Class 2. b. "250/300 cycles" means "250 cycles for 50 Hz test" and "300 cycles for 60 Hz test".					

### 16.3.Test Procedure

- The EUT was placed on the wooded table 0.1m above the ground.
- Configure the EUT and support devices as per section 16.1.
- Setting the parameter of tests and then perform the test software of test simulator.
- Conditions changes to occur at 0 and 180 degree crossover point of the voltage waveform.
- Repeat the above steps in each mode and record the test result.

### 16.4.Test Result

**PASS.**

Please refer to the following page.

Voltage Dips and Interruptions Test Results			
Ambient Condition:	Temp.: 29.0°C	R.H.:52.0%	Air Pressure: 101.2 kPa
Test Specifications:	Residual voltage:	0%, 40%, 70%, 0%	
	Duration (periods):	<input type="checkbox"/> 0.5 for 50/60Hz	<input checked="" type="checkbox"/> 1 for 50/60Hz
		<input checked="" type="checkbox"/> 10 for 50Hz	<input checked="" type="checkbox"/> 12 for 60Hz
		<input checked="" type="checkbox"/> 25 for 50Hz	<input checked="" type="checkbox"/> 30 for 60Hz
		<input checked="" type="checkbox"/> 250 for 50Hz	<input checked="" type="checkbox"/> 300 for 60Hz
	Phase angle:	0° and 180°	
	Interval between tests:	10s	
	NO. of tests:	3 times	
Required Performance Criterion	B for voltage dips C for voltage dips and voltage interruptions		
Test mode:	1-3		
Test Level (% Residual voltage)	Duration (periods)		Result (Performance Criterion)
	50Hz	60Hz	
0	1P	1P	B
40	10P	12P	B
70	25P	30P	B
0	250P	300P	B
Note : During the test, the EUT stops the grid feed and recovers itself after the test.			
Test Engineer : Chenrongbin		Test Date : 2024.06.20	

# APPENDIX I (Photos of Test Setup)



## Photos of Test Setup

### Set-up for Conducted Emission



### Set-up for Radiated Emission



### Set-up for Harmonic Current & Flicker

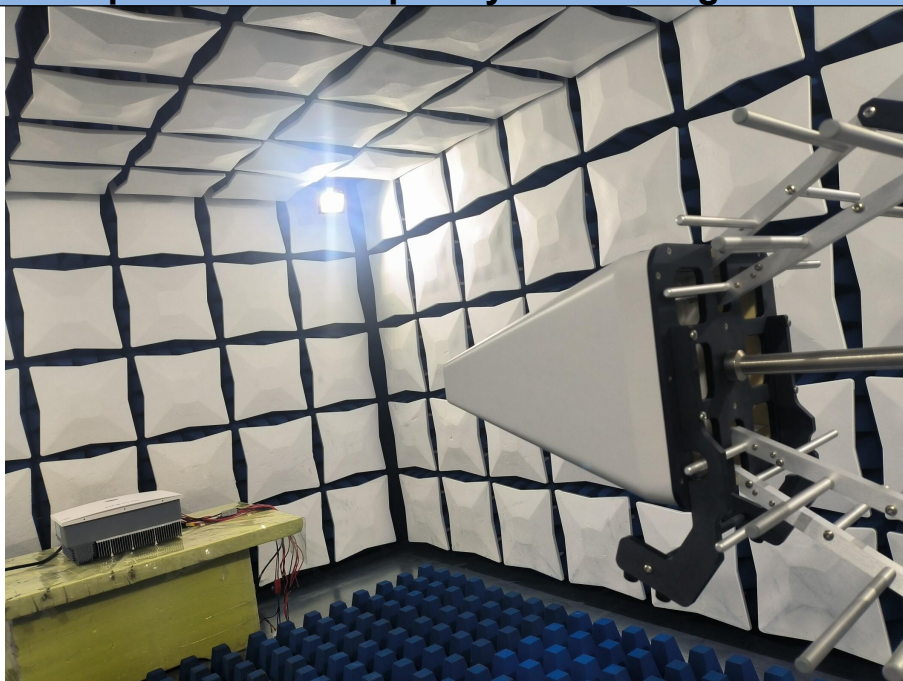


### Set-up for Electrostatic Discharge

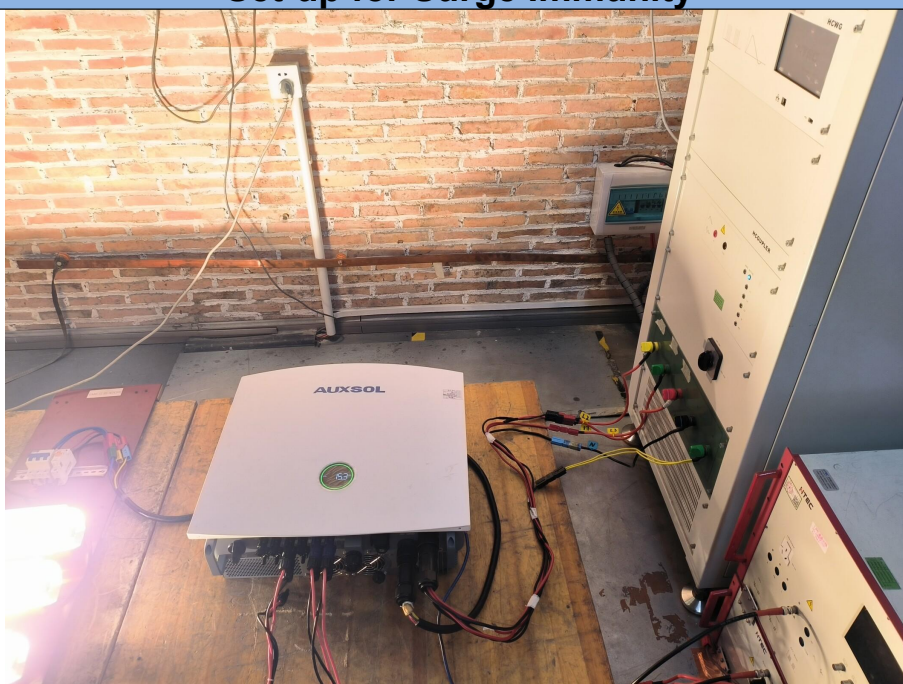




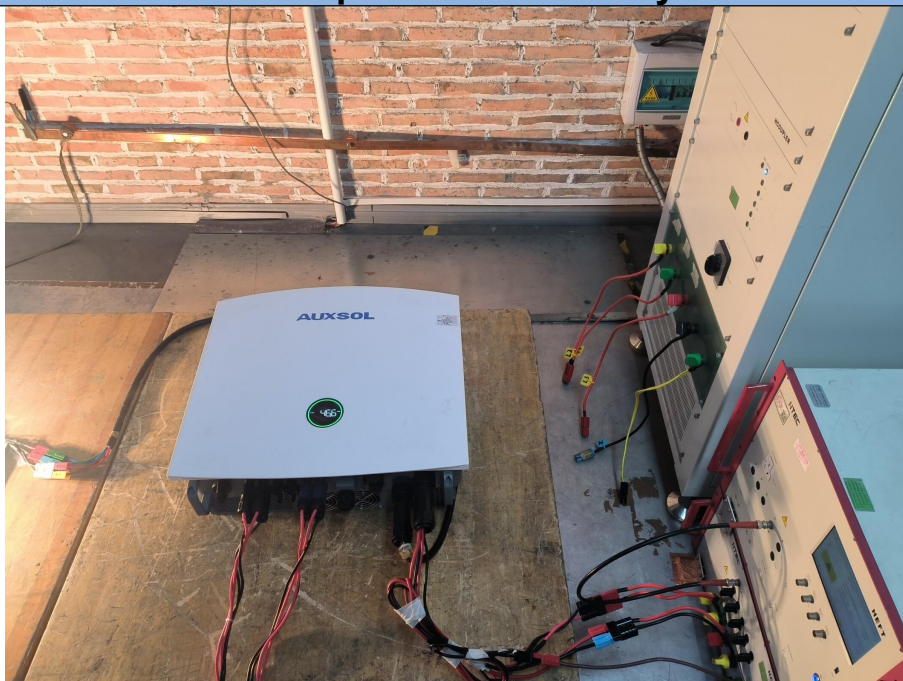
### Set-up for Radio-Frequency Electromagnetic Field



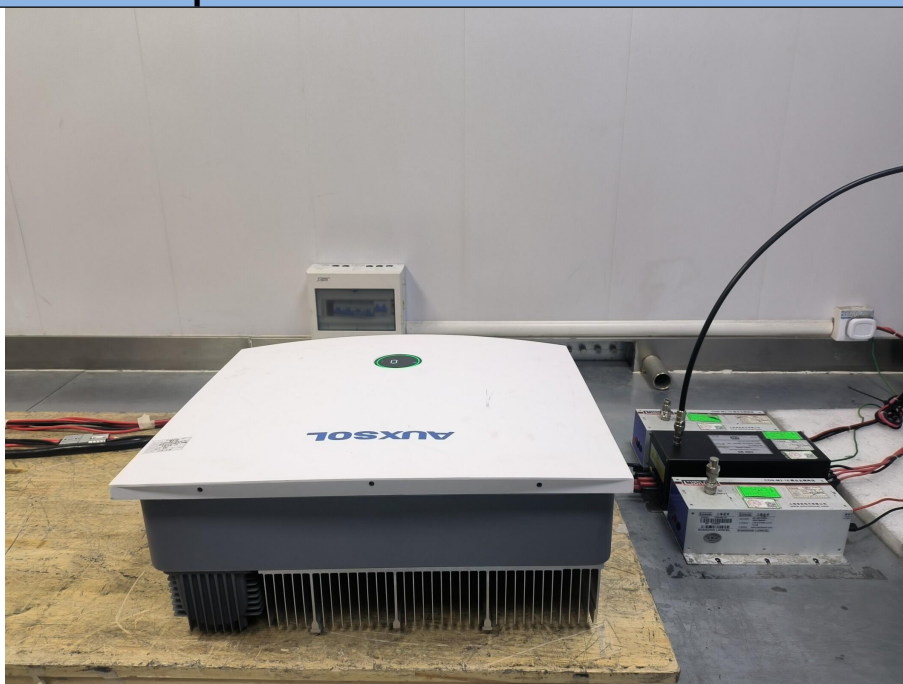
### Set-up for Surge Immunity



### Set-up for EFT Immunity



### Set-up for Conducted RF Common Mode





Set-up for Power-Frequency Magnetic Field Test



Set-up for Voltage dips and interruptions

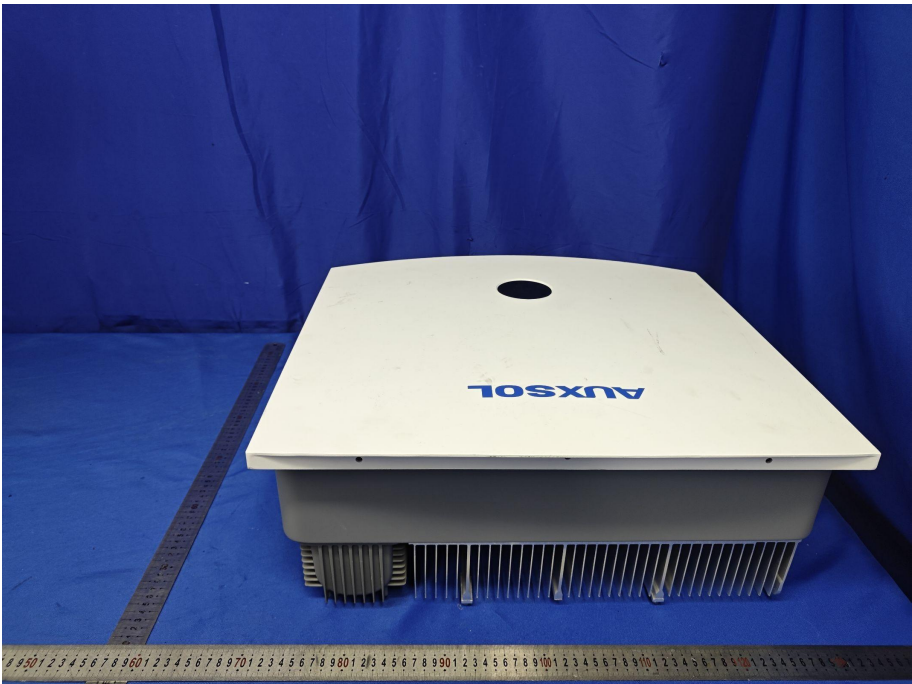


## APPENDIX II (Photos of E.U.T)

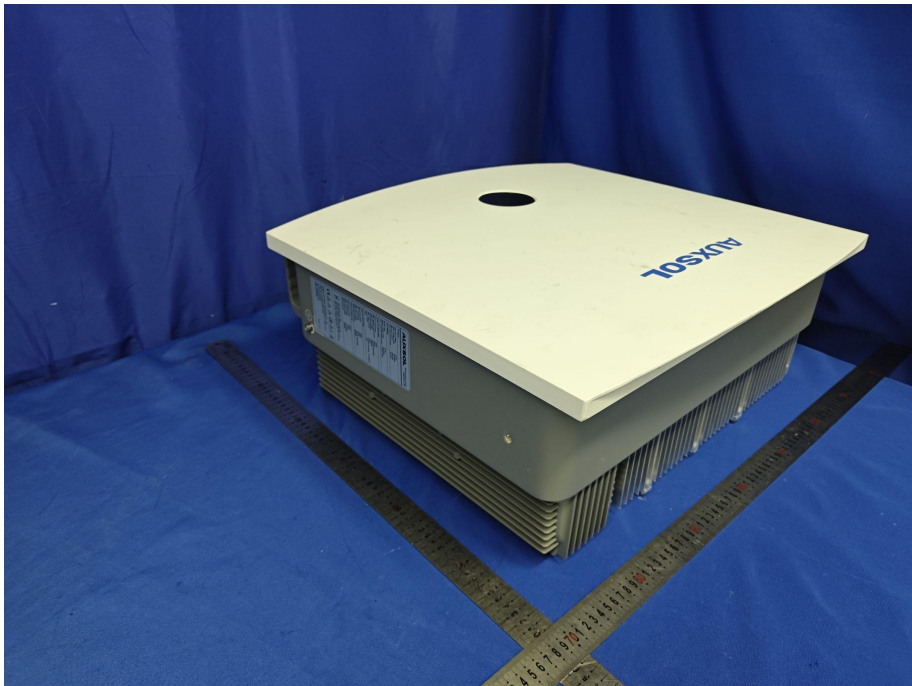


# Photos of the EUT

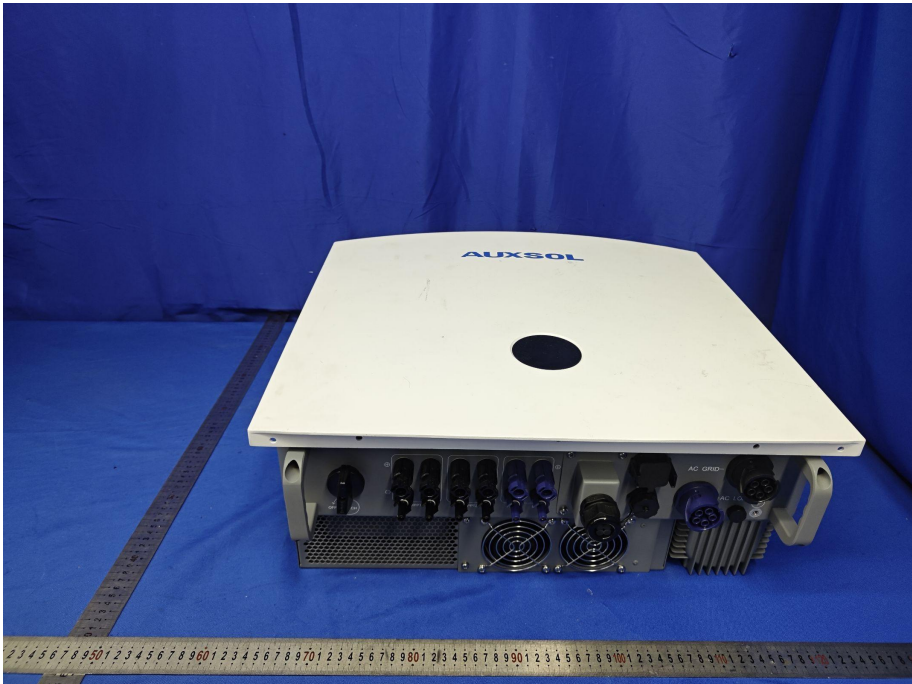
Over View -1



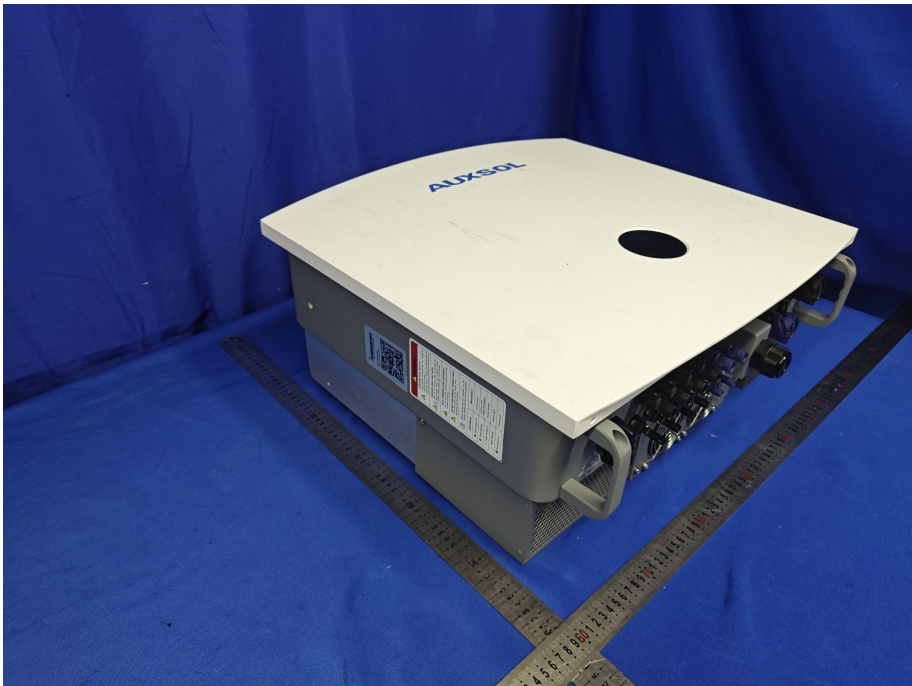
Over View -2



Over View -3



Over View -4





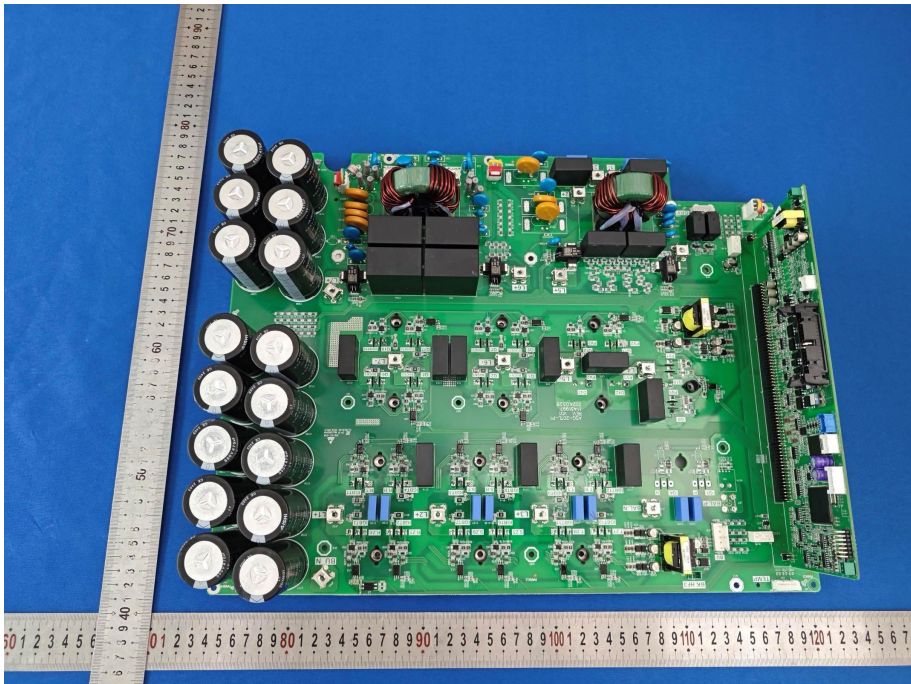
Over View -5



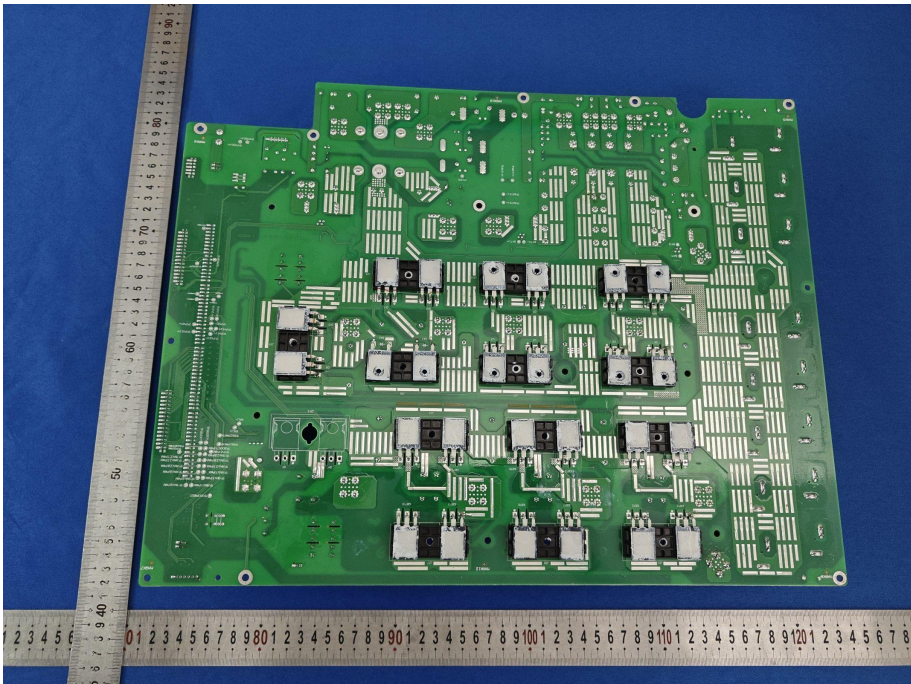
Internal View -1



PCB View -1

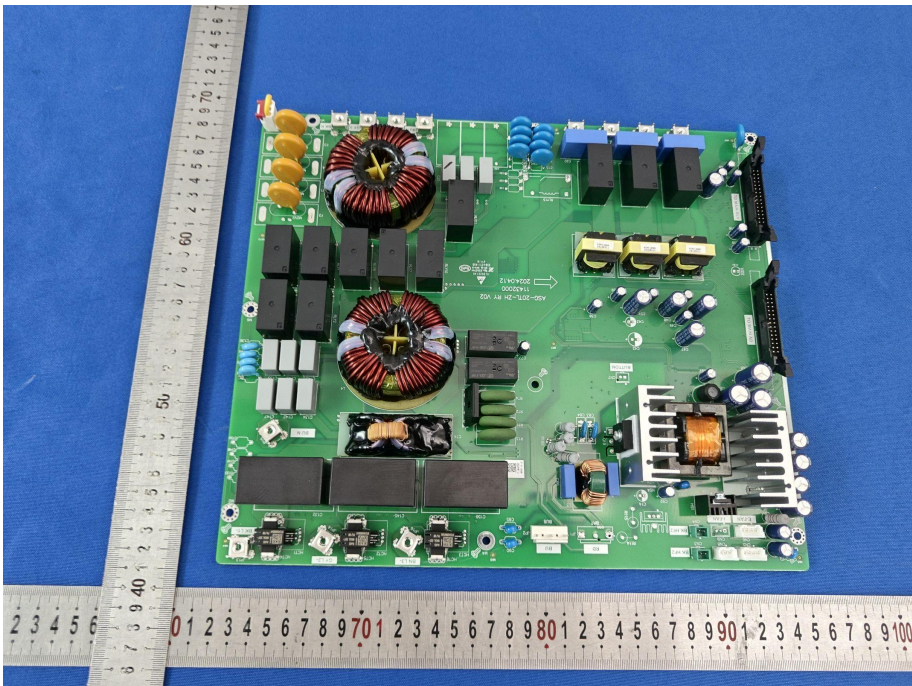


PCB View -2

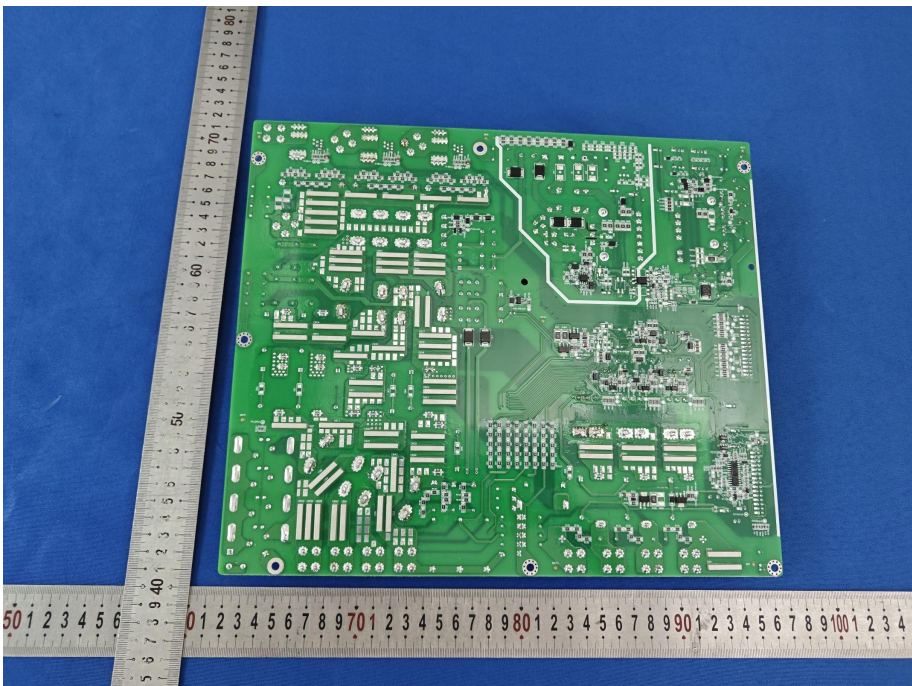




PCB View -3

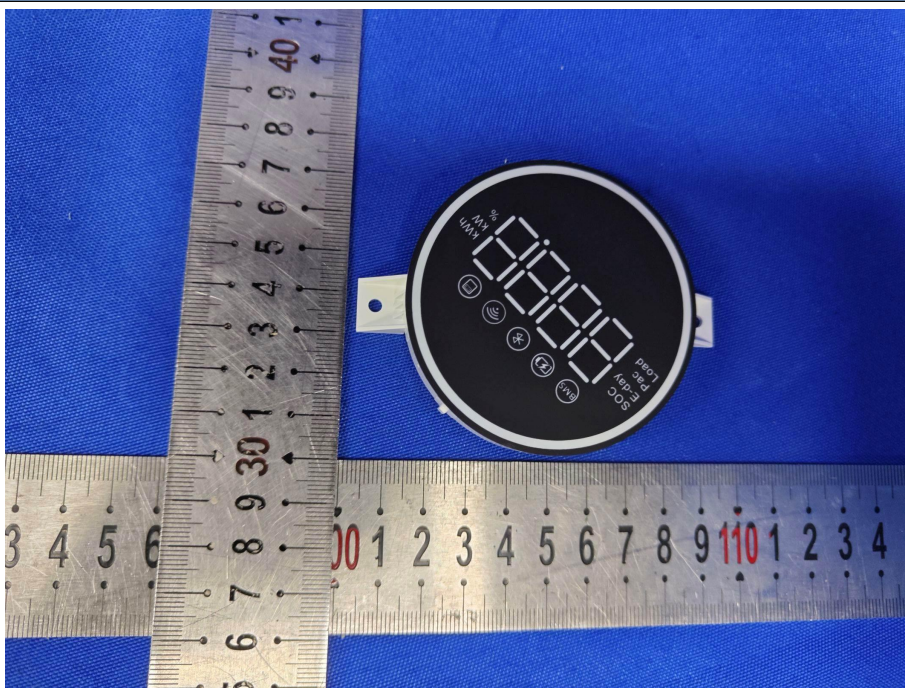


PCB View -4

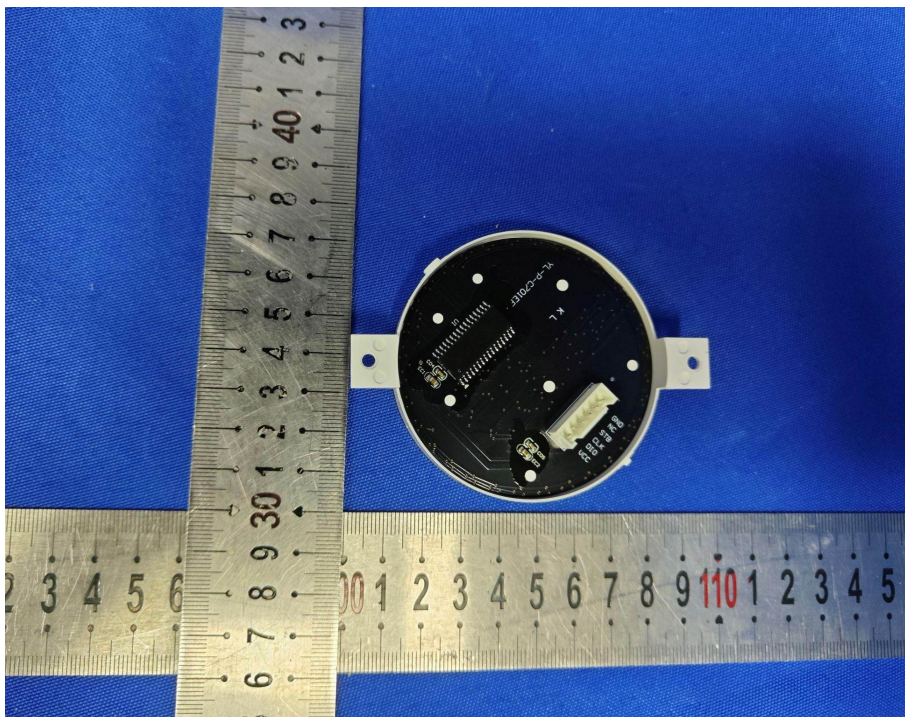




PCB View -5



PCB View -6



--- End of the report ---