

# Afore New Energy Technology (Shanghai) Co., Ltd

# TEST REPORT

## SCOPE OF WORK:

EN 61000-6-3 (2014/30/EU) – EMC report

### Model:

HNS3000TL, HNS3600TL-1, HNS3600TL,  
HNS4000TL, HNS5000TL, HNS6000TL,  
HNS7000TL, HNS8000TL, HNS9000TL,  
HNS10000TL

### REPORT NUMBER

210400879SHA-001

### ISSUE DATE

December 06, 2021

### DOCUMENT CONTROL NUMBER

TTRF61000-6-3\_V1  
© 2018 Intertek



**Applicant** : **Afore New Energy Technology (Shanghai) Co., Ltd**  
**Build No.7, 333 Wanfang Road, Minhang District, Shanghai. China.**  
**201112**

**Manufacturer** : **Afore New Energy Technology (Shanghai) Co., Ltd**  
**Build No.7, 333 Wanfang Road, Minhang District, Shanghai. China.**  
**201112**

**Manufacturing site** : **Afore New Energy Technology (Shanghai) Co., Ltd**  
**Build No.7, 333 Wanfang Road, Minhang District, Shanghai. China.**  
**201112**

### Summary

The equipment complies with the requirements according to the following standard(s) or Specification:

**EN IEC 61000-6-1:2019** : Electromagnetic compatibility (EMC) - General standards – Immunity for residential, commercial and light-industrial environment

**EN 61000-6-3:2007/+A1:2011** : General standards – Emission standard for residential, commercial and light-industrial environment

**PREPARED BY:**

**REVIEWED BY:**



John Jiang

Project Engineer



Star Guo

Reviewer

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

## Contents

<b>REVISION HISTORY</b> .....	<b>5</b>
<b>MEASUREMENT RESULT SUMMARY</b> .....	<b>6</b>
<b>1 GENERAL INFORMATION</b> .....	<b>7</b>
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....	7
1.2 DESCRIPTION OF TEST FACILITY .....	10
<b>2 TEST SPECIFICATIONS</b> .....	<b>11</b>
2.1 NORMATIVE REFERENCES .....	11
2.2 MODE OF OPERATION DURING THE TEST .....	11
2.3 TEST PERIPHERALS USED .....	11
2.4 RECORD OF CLIMATIC CONDITIONS .....	12
2.5 INSTRUMENT LIST .....	13
2.6 MEASUREMENT UNCERTAINTY .....	15
<b>3 MAINS TERMINAL DISTURBANCE VOLTAGE</b> .....	<b>16</b>
3.1 LIMITS.....	16
3.1.1 <i>Limits at the AC mains ports</i> .....	16
3.1.2 <i>Limits at the DC mains ports</i> .....	16
3.2 TEST SETUP .....	17
3.3 TEST PROCEDURE .....	18
3.4 TEST RESULT.....	19
<b>4 RADIATED EMISSION</b> .....	<b>23</b>
4.1 LIMITS.....	23
4.2 BLOCK DIAGRAM OF TEST SET UP .....	23
4.3 TEST PROCEDURE .....	24
4.4 TEST RESULT.....	25
<b>5 HARMONIC CURRENT EMISSION</b> .....	<b>27</b>
5.1 TEST SETUP.....	27
5.2 TEST PROCEDURE .....	27
5.3 TEST LIMIT .....	27
5.3.1 <i>Limits for equipment with input current <math>\leq 16A</math> per phase</i> .....	28
5.3.2 <i>Limits for equipment with input current <math>&gt; 16A</math> and <math>\leq 75A</math> per phase</i> .....	28
5.4 TEST RESULT.....	29
<b>6 VOLTAGE FLUCTUATIONS AND FLICKER</b> .....	<b>30</b>
6.1 TEST SETUP.....	30
6.2 TEST PROCEDURE .....	30
6.2.1 <i>Definition</i> .....	30
6.2.2 <i>Test condition</i> .....	30
6.2.3 <i>Test protocol</i> .....	30
6.3 TEST RESULT.....	31
<b>IMMUNITY TEST</b> .....	<b>32</b>
<b>7 ELECTROSTATIC DISCHARGE (ESD)</b> .....	<b>33</b>
7.1 SEVERITY LEVEL AND PERFORMANCE CRITERION.....	33
7.1.1 <i>Test level</i> .....	33
7.1.2 <i>Performance Criterion</i> .....	33

**TEST REPORT**

- 7.2 TEST SETUP..... 34
- 7.3 TEST PROCEDURE..... 35
- 7.4 TEST RESULT..... 36
- 8 RADIO FREQUENCY ELECTROMAGNETIC FIELD ..... 37**
  - 8.1 SEVERITY LEVEL AND PERFORMANCE CRITERION..... 37
    - 8.1.1 *Test level* ..... 37
    - 8.1.2 *Performance Criterion*..... 37
  - 8.2 TEST SETUP..... 38
  - 8.3 TEST PROCEDURE..... 39
  - 8.4 TEST RESULT..... 40
- 9 FAST TRANSIENTS, COMMON MODE ..... 41**
  - 9.1 SEVERITY LEVEL AND PERFORMANCE CRITERION..... 41
    - 9.1.1 *Test level* ..... 41
    - 9.1.2 *Performance Criterion*..... 41
  - 9.2 TEST SETUP..... 42
  - 9.3 TEST PROCEDURE..... 42
  - 9.4 TEST RESULT..... 43
- 10 SURGES..... 44**
  - 10.1 SEVERITY LEVEL AND PERFORMANCE CRITERION ..... 44
    - 10.1.1 *Test level*..... 44
    - 10.1.2 *Performance Criterion*..... 44
  - 10.2 TEST SETUP ..... 45
  - 10.3 TEST PROCEDURE ..... 45
  - 10.4 TEST RESULT..... 46
- 11 RADIO FREQUENCY, COMMON MODE ..... 47**
  - 11.1 SEVERITY LEVEL AND PERFORMANCE CRITERION ..... 47
    - 11.1.1 *Test level*..... 47
    - 11.1.2 *Performance Criterion*..... 47
  - 11.2 BLOCK DIAGRAM OF TEST SETUP ..... 48
  - 11.3 TEST PROCEDURE ..... 48
  - 11.4 TEST RESULT..... 49
- 12 VOLTAGE DIPS..... 50**
  - 12.1 SEVERITY LEVEL AND PERFORMANCE CRITERION ..... 50
    - 12.1.1 *Test level*..... 50
  - 12.2 TEST SETUP ..... 51
  - 12.3 TEST PROCEDURE ..... 51
  - 12.4 TEST RESULT..... 52
- 13 POWER FREQUENCY MAGNETIC FIELD..... 53**
  - 13.1 SEVERITY LEVEL AND PERFORMANCE CRITERION ..... 53
    - 13.1.1 *Test level*..... 53
    - 13.1.2 *Performance Criterion*..... 53
  - 13.2 DIAGRAM OF TEST SETUP..... 54
  - 13.3 TEST SETUP AND TEST PROCEDURE ..... 55
  - 13.4 TEST PROTOCOL ..... 55
- APPENDIX II: PHOTOGRAPH OF EQUIPMENT UNDER TEST ..... 56**

**Revision History**

<b>Report No.</b>	<b>Version</b>	<b>Description</b>	<b>Issued Date</b>
210400879SHA-001	Rev. 01	Initial issue of report	December 06, 2021

## Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Conducted disturbance voltage at mains terminals	Pass	
Electromagnetic radiation disturbance	Pass	
Harmonic current	NA	
Voltage fluctuations and flicker	NA	
Electrostatic discharge	Pass	
Radio frequency electromagnetic field	Pass	
Fast transients	Pass	
Surges	Pass	
Radio frequency, common mode	Pass	
Voltage dips	Pass	
Power frequency magnetic field	Pass	

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

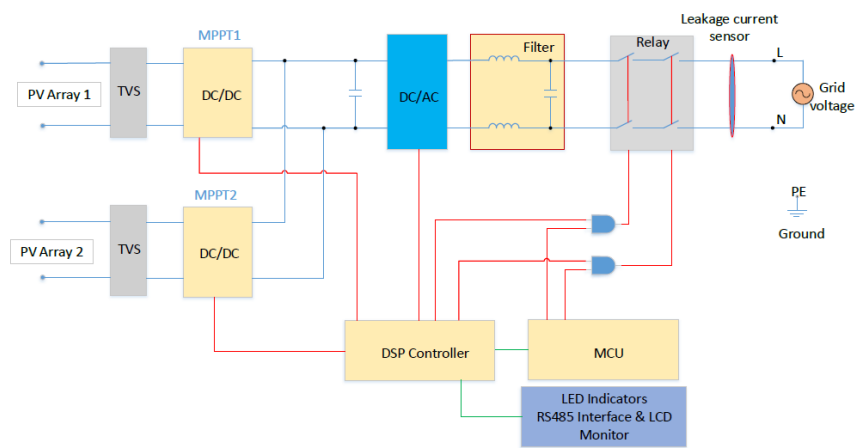
**1 GENERAL INFORMATION**

**1.1 Description of Equipment Under Test (EUT)**

Product name : PV Grid interactive inverter

Type/Model : HNS3000TL, HNS3600TL-1, HNS3600TL, HNS4000TL, HNS5000TL, HNS6000TL, HNS7000TL, HNS8000TL, HNS9000TL, HNS10000TL

Description of EUT : The testing unit is a Class I grid-interactive PV inverter for outdoor installation (IP65).  
The unit is providing EMC filtering at the output toward mains.  
The unit does not provide galvanic separation from input to output (transformerless).  
The output is switched off redundant by the high power switching bridge and two relays. This assures that the opening of the output circuit will also operate in case of one is error.



**Model difference:**

All models have same circuit diagram, PWB layout and software. Only different enclosure and fan. And different power devices and ratings. HNS3000TL, HNS3600TL-1, HNS3600TL, HNS4000TL, HNS5000TL have same enclosure, heatsink, circuit diagram and PWB layout. And with AC connector.

HNS6000TL, HNS7000TL, HNS8000TL, HNS9000TL, HNS10000TL have same enclosure, heatsink, circuit diagram and PWB layout. And with AC terminal, outlet bushing.

HNS6000TL, HNS7000TL, HNS8000TL have internal fan, HNS9000TL, HNS10000TL with internal and external fan.

After technical evaluation, HNS10000TL was tested as typical model and listed the worst test data as representative in report.

Rating : See below specifications table

<b>Specifications table</b>					
<b>Model</b>	HNS3000TL	HNS3600TL-1	HNS3600TL	HNS4000TL	HNS5000TL
<b>Input:</b>					
Vmax PV (Vdc)	600	600	600	600	600
Isc PV (absolute Max.) (A)	18 x 2	18	18 x 2	18 x 2	18 x 2
Number MPP trackers	2	1	2	2	2
Number input strings	1/1	1	1/1	1/1	1/1
Max. PV input current(A)	14 x 2	14	14 x 2	14 x 2	14 x 2
MPPT voltage range (Vdc)	70-550	70-550	70-550	70-550	70-550
Vdc range @ full power (Vdc)	110-550	265-550	130-550	145-550	180-550
<b>Output</b>					
Normal Voltage(V)	L/N/PE, 220Vac, 230Vac, 240Vac				
Frequency (Hz)	50 / 60				
Current (normal) (A)	13.1	15.7	15.7	17.4	21.8
Current (Max. continuous) (A)	15	17.5	17.5	20	24
Power rating (W)	3000	3600	3600	4000	5000
Power Rating (VA)	3000	3600	3600	4000	5000
Power factor /rated	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)
<b>others</b>					
Protective class	Class I				
Ingress protection (IP)	IP 65				
Temperature (°C)	-25°C to +60°C (up 45°C derating)				
Inverter Isolation	Non-isolated				
Overvoltage category	OVC III (AC Main), OVC II (PV)				
Weight (kg)	10				
Dimensions (WxHxD) (mm)	358x360x142				



Specifications table					
Model	HNS6000TL	HNS7000TL	HNS8000TL	HNS9000TL	HNS10000TL
<b>Input:</b>					
Vmax PV (Vdc)	600	600	600	600	600
Isc PV (absolute Max.) (A)	18 x 2	18+35	18+35	35 x 2	35 x 2
Number MPP trackers	2	2	2	2	2
Number input strings	1/1	1/2	1/2	2/2	2/2
Max. PV input current(A)	14 x 2	14+26	14+26	26 x 2	26 x 2
MPPT voltage range (Vdc)	70-550	70-550	70-550	70-550	70-550
Vdc range @ full power (Vdc)	220-550	220-550	220-550	220-550	220-550
<b>Output</b>					
Normal Voltage(V)	L/N/PE, 220Vac, 230Vac, 240Vac				
Frequency (Hz)	50 / 60				
Current (normal) (A)	26.1	30.5	34.8	39.2	43.5
Current (Max. continuous) (A)	28.7	33.6	38.3	45	50
Power rating (W)	6000	7000	8000	9000	10000
Power Rating (VA)	6000	7000	8000	9000	10000
Power factor /rated	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)
<b>others</b>					
Protective class	Class I				
Ingress protection (IP)	IP 65				
Temperature (°C)	-25°C to +60°C (up 45°C derating)				
Inverter Isolation	Non-isolated				
Overvoltage category	OVC III (AC Main), OVC II (PV)				
Weight (kg)	17			18	
Dimensions (WxHxD) (mm)	510 x 370 x 192			535x370x192	

Trade Mark : Afore

EUT type :  Table-top  
 Floor standing

Sample received date : 2021-09-15

Sample identification : NA  
number

Date of test : 2021-09-15 ~ 2021-11-20

## 1.2 Description of Test Facility

Name : Intertek Testing Services Shanghai

Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R.  
China

Telephone : 86 21 61278200

Telefax : 86 21 54262353

The test facility is recognized, certified, or accredited by these organizations :

- CNAS Accreditation Lab  
Registration No. CNAS L0139
- FCC Accredited Lab  
Designation Number: CN0175
- IC Registration Lab  
CAB identifier.: CN0051
- VCCI Registration Lab  
Registration No.: R-14243, G-10845, C-14723, T-12252
- A2LA Accreditation Lab  
Certificate Number: 3309.02



Name : Hongyue Testing Technology (Shanghai) Co., Ltd.

Address : Room 102, 202, No. 12, Lane 1288, Luoning Road, Shanghai, P.R. China

Telephone : 13331816953

## 2 TEST SPECIFICATIONS

### 2.1 Normative references

EN IEC 61000-6-1: 2019: Electromagnetic compatibility (EMC) – General standards- Immunity for residential, commercial and light-industrial environment.

EN 61000-6-3: 2007/+A1: 2011: General standards – Emission standard for residential, commercial and light-industrial environment

### 2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

### 2.3 Test peripherals used

Item No	Description	Brand and Model	S/No
-	-	-	-

**2.4 Record of climatic conditions**

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Mains terminal disturbance voltage	24	37	NA
Electromagnetic radiation disturbance	24	37	NA
Harmonic current	NA	NA	NA
Voltage fluctuations and flicker	NA	NA	NA
Electrostatic discharge	24	37	101
Radio frequency electromagnetic field	24	37	NA
Fast transients	24	37	NA
Surges	24	37	NA
Radio frequency, common mode	24	37	NA
Voltage dips	24	37	NA
Power frequency magnetic field	24	37	NA

Notes: NA =Not Applicable

2.5 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2022-07-14
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2022-11-29
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2022-09-11
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2022-06-09
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	ESD generator	TESEQ	NSG 437	EC 4792-4	2022-03-21
EFT/Surge Voltage Dips					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Conduct immunity system	EM TEST	UCS 500M6B	EC 2958	2022-04-06
<input checked="" type="checkbox"/>	Automatic transformer	EM TEST	MV2616	EC 2957	2022-04-06
Conducted Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Signal generator	R&S	SML 01	EC 2338	2022-09-09
<input checked="" type="checkbox"/>	Power amplifier	AR	75A250	EC 3043-1	2022-07-14
<input checked="" type="checkbox"/>	Attenuator	EM TEST	ATT6/75	EC 3043-3	2022-02-04
<input checked="" type="checkbox"/>	CDN	Frankonia	CDN M2M316	EC 5969	2022-03-14
Radiated Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Signal generator	R&S	SMR 20	EC 3044-1	2022-01-29
<input checked="" type="checkbox"/>	Power amplifier	AR	250W1000B	EC 5818-2	2022-04-18

<input checked="" type="checkbox"/>	Power amplifier	BONN	BLMA1060-100	EC 5818-4	2022-04-18
<input checked="" type="checkbox"/>	Log-period antenna	AR	AT 1080	EC 3044-7	2022-01-03
<input checked="" type="checkbox"/>	Horn antenna	Schwarzbeck	STLP 9149	EC5881	2022-06-18
<input checked="" type="checkbox"/>	Field meter	AR	FL17000	EC 5818-1	2022-05-20
<input checked="" type="checkbox"/>	Power sensor	Keysight	N1914A	EC 5818-3	2022-04-18
<b>Test Site</b>					
<b>Used</b>	<b>Equipment</b>	<b>Manufacturer</b>	<b>Type</b>	<b>Internal no.</b>	<b>Due date</b>
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2022-01-14
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2022-01-14
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2022-07-30
<input checked="" type="checkbox"/>	Fully-anechoic chamber	Albatross project	-	EC 3047	2022-07-30
<b>Additional instrument</b>					
<b>Used</b>	<b>Equipment</b>	<b>Manufacturer</b>	<b>Type</b>	<b>Internal no.</b>	<b>Due date</b>
<input checked="" type="checkbox"/>	Spectrum analyzer	Agilent	E7402A	EC 2254	2022-07-14
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2022-02-27
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 2122	2022-03-10
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2022-01-18
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2022-03-27
<input checked="" type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2022-06-30

## 2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.71 dB
	150kHz ~ 30MHz	3.31 dB
Continuous disturbance measurements using a VP	0.09MHz ~ 30MHz	2.75dB
Continuous disturbance voltage at telecom ports with AAN	150kHz ~ 30MHz	4.10 dB
Continuous disturbance current at telecom ports	150kHz ~ 30MHz	2.73 dB
Continuous disturbance power	30MHz ~ 300MHz	4.42 dB
Discontinuous disturbance voltage/click	150kHz ~ 30MHz	3.87dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.04 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.97 dB
	6GHz ~ 18GHz	5.29 dB
Harmonic current emission	-	3.90%
Voltage fluctuations and flicker	-	10.34%
ESD	-	6.65%
Radiated susceptibility	80MHz ~ 1000MHz	2.38%
EFT test at main terminal	-	11.57%
EFT test at signal/telecom terminal	-	11.62%
Surge test at main terminal	-	11.57%
Surge test at signal/telecom line	-	11.89%
Injected current test at main terminal	-	1.88 dB
Injected current test at unshielded signal terminal	-	3.41 dB
Injected current test at shielded signal terminal	-	3.30dB
Voltage dips and interruption	-	6.05%

### 3 Mains terminal disturbance voltage

Test result: **PASS**

#### 3.1 Limits

##### 3.1.1 Limits at the AC mains ports

Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66-56*	56-46*
0.5 ~ 5	56	46
5 ~ 30	60	50

Note: 1. \* means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz  
 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

##### 3.1.2 Limits at the DC mains ports

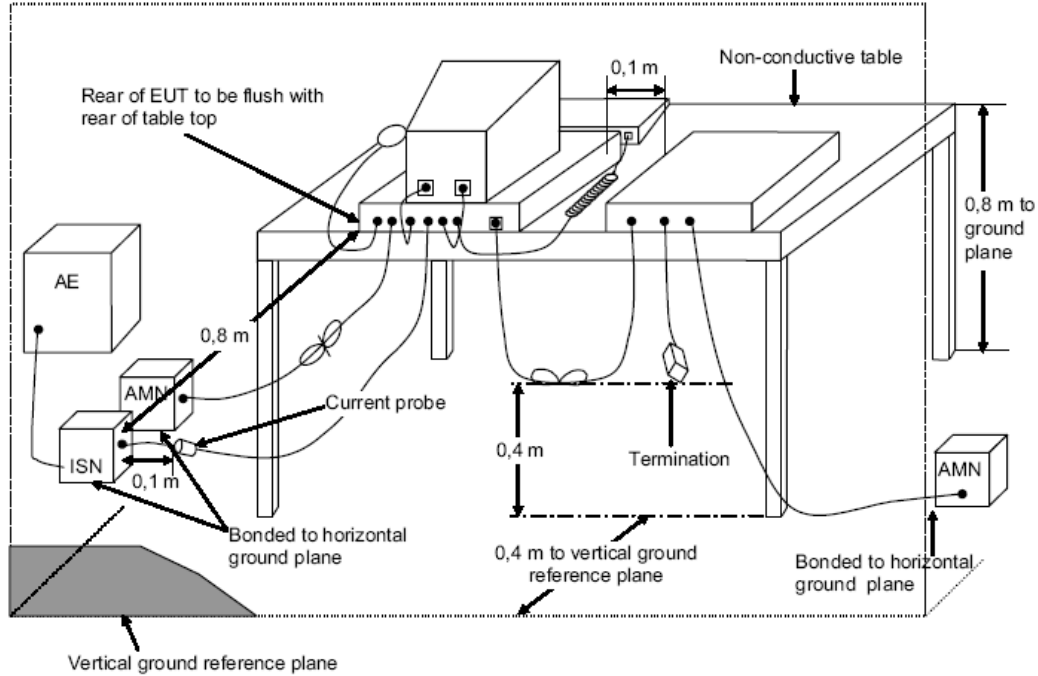
Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Note: 1. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

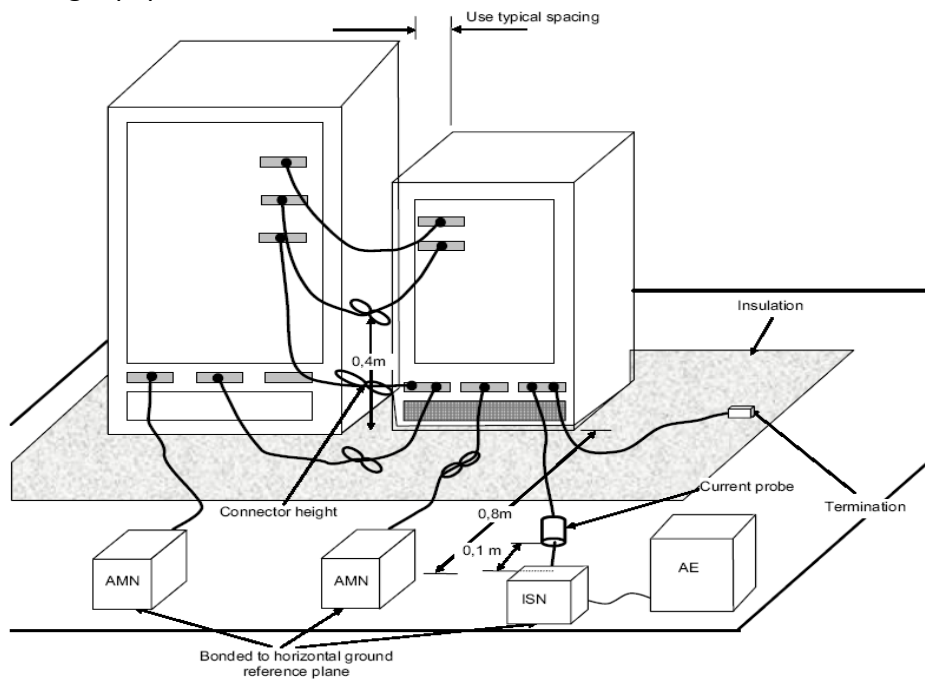


## 3.2 Test setup

### For table top equipment



### For floor standing equipment



### **3.3 Test Procedure**

Measurement was performed in shielded room, and instruments used were following CISPR 16-1-2 clause 4.3.

Detailed test procedure was following CISPR 16-2-1 clause 7.4

EUT arrangement and operation conditions were according to CISPR 16-2-1 clause 7.4.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

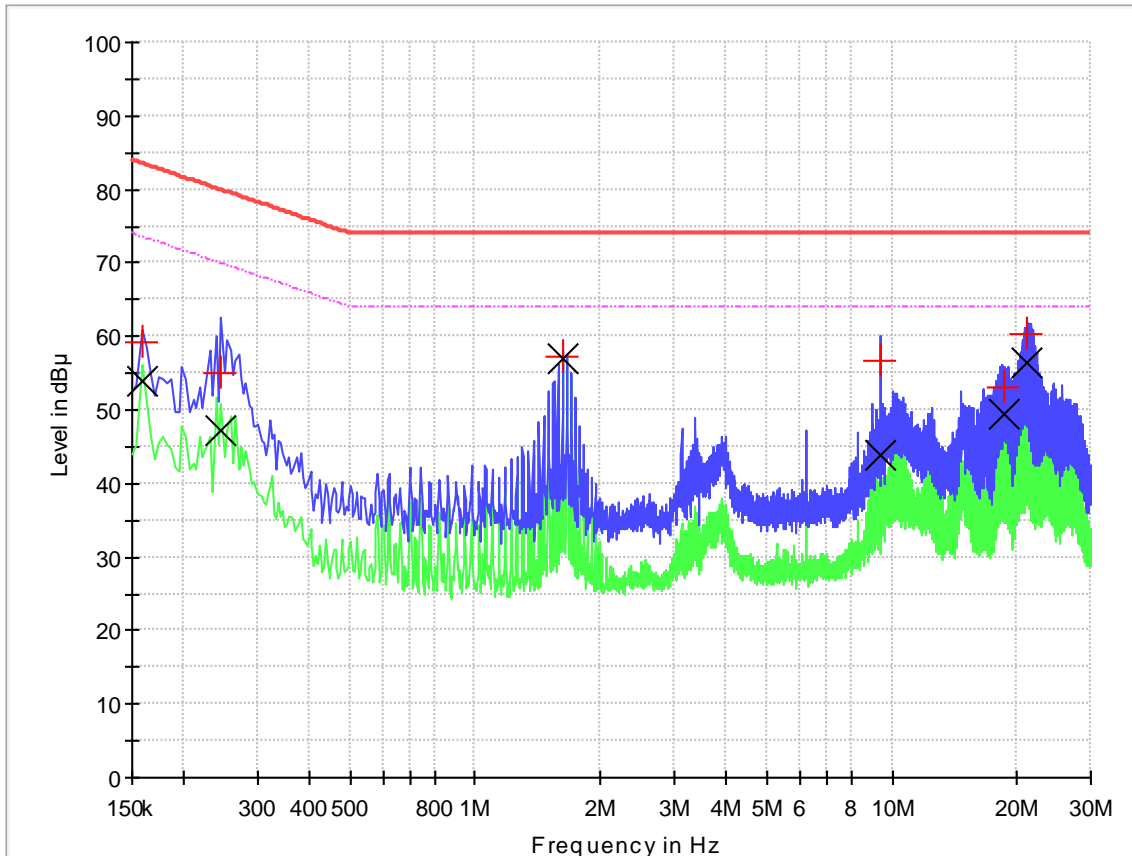
### 3.4 Test Result

TEST RESULT: PASS

PV input 600V

Positive:

Test Curve:



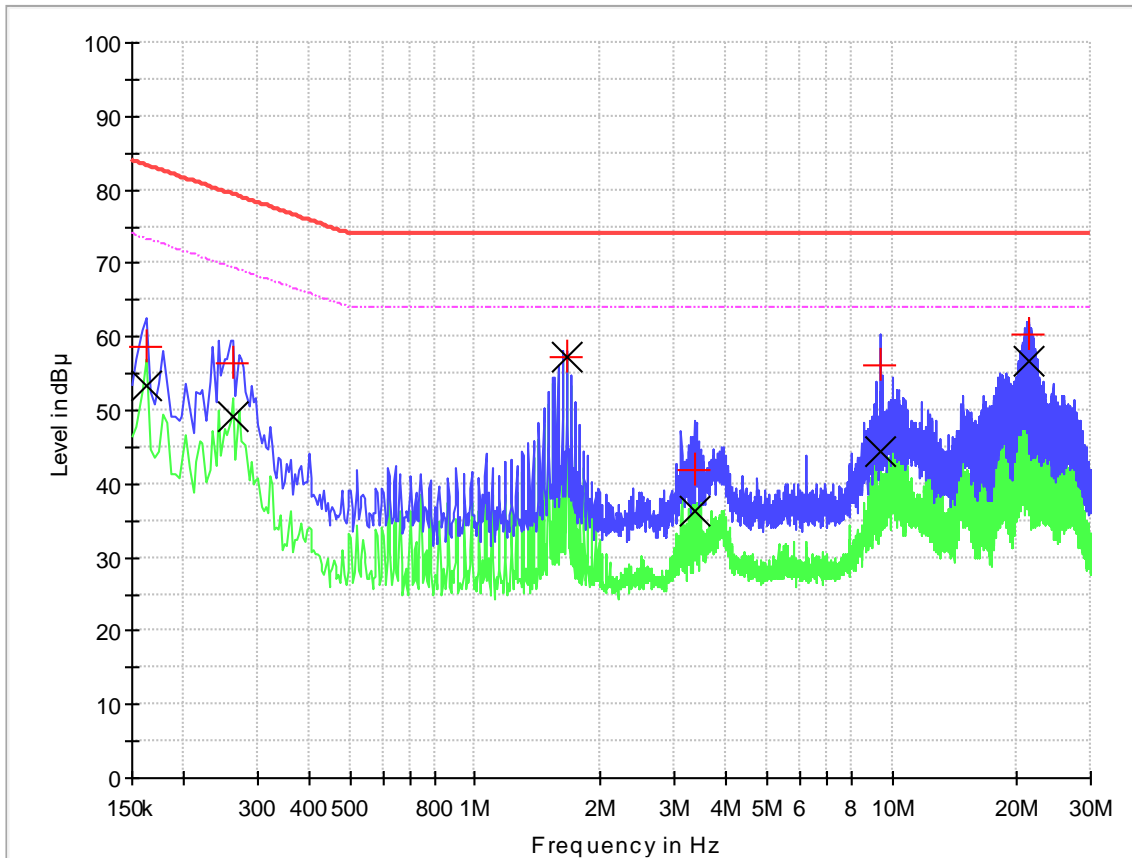
#### Test Data:

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB $\mu$ V)	Margin - CAV (dB)	Limit - CAV (dB $\mu$ V)
0.158000	59.1	53.9	9.000	40.7	19.9	79.0	12.1	66.0
0.246000	55.1	47.1	9.000	40.0	23.9	79.0	18.9	66.0
1.622000	57.2	56.9	9.000	39.5	15.8	73.0	3.1	60.0
9.374000	56.8	43.7	9.000	39.5	16.2	73.0	16.3	60.0
18.682000	53.1	49.4	9.000	39.5	19.9	73.0	10.6	60.0
21.182000	60.3	56.4	9.000	39.5	12.7	73.0	3.6	60.0

PV input 600V

Negative:

Test Curve:



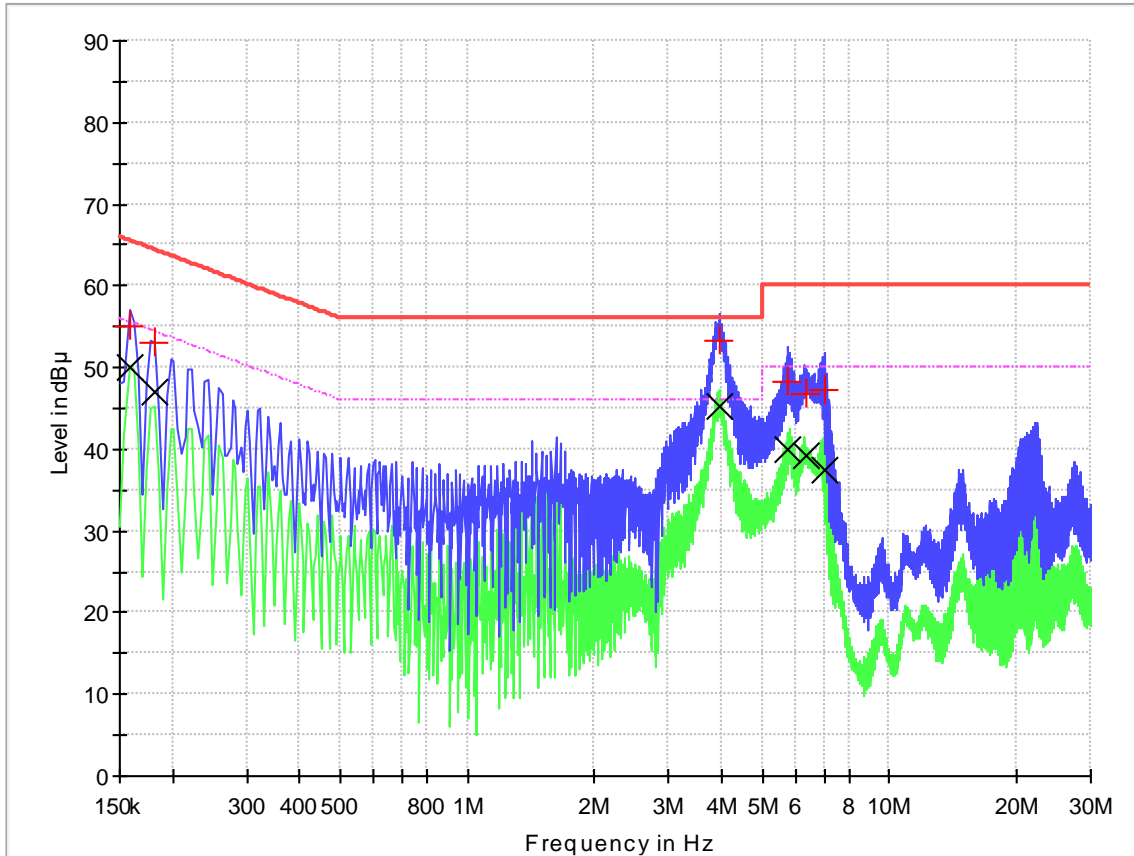
Test Data:

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.162000	58.6	53.4	9.000	40.6	20.4	79.0	12.6	66.0
0.262000	56.4	49.1	9.000	40.0	22.6	79.0	16.9	66.0
1.662000	57.4	57.3	9.000	39.5	15.6	73.0	2.7	60.0
3.350000	41.8	36.2	9.000	39.5	31.2	73.0	23.8	60.0
9.378000	56.1	44.4	9.000	39.5	16.9	73.0	15.6	60.0
21.302000	60.4	56.6	9.000	39.5	12.6	73.0	3.4	60.0

**PV output 230V**

**L line:**

**Test Curve:**



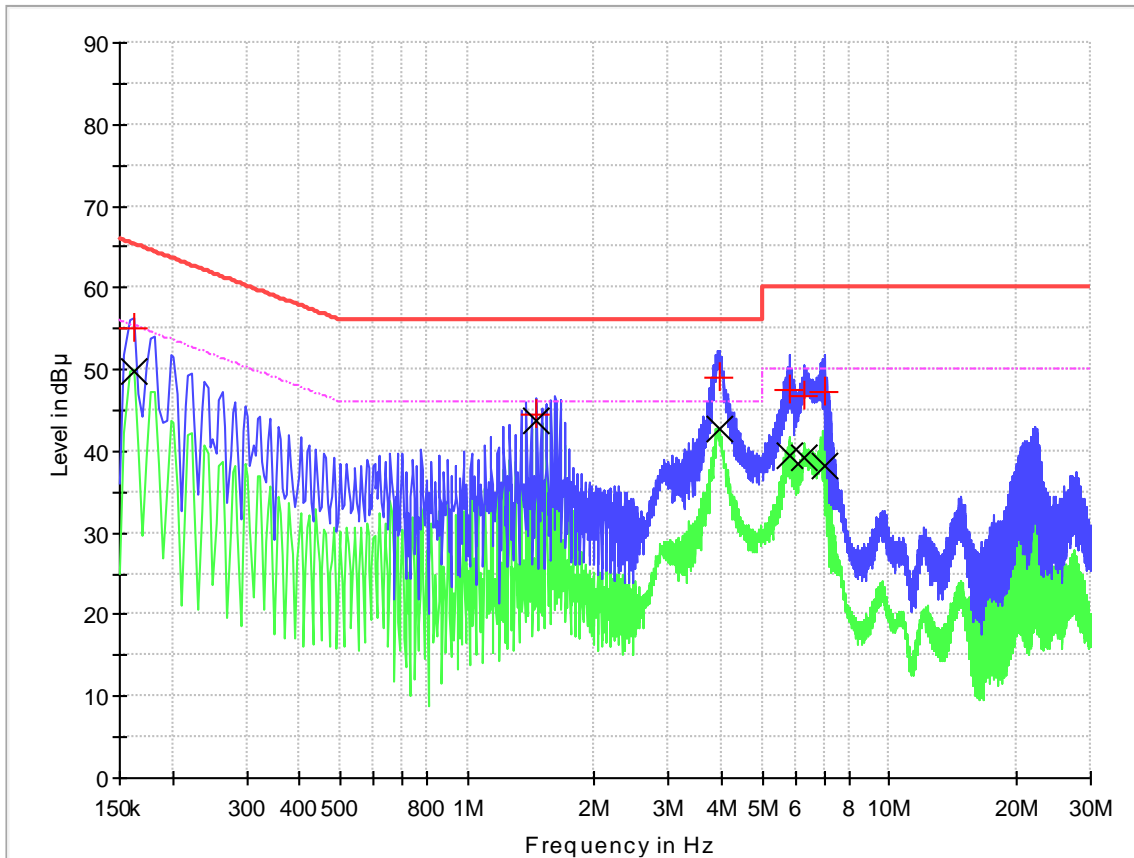
**Test Data:**

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.158000	55.1	50.0	9.000	9.9	10.5	65.6	5.6	55.6
0.182000	53.0	47.1	9.000	9.9	11.4	64.4	7.3	54.4
3.950000	53.4	45.3	9.000	10.1	2.6	56.0	0.7	46.0
5.770000	48.2	39.9	9.000	10.1	11.8	60.0	10.1	50.0
6.370000	46.8	39.3	9.000	10.1	13.2	60.0	10.7	50.0
7.030000	47.2	37.5	9.000	10.2	12.8	60.0	12.5	50.0

**PV output 230V**

**N line:**

**Test Curve:**



**Test Data:**

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.162000	54.9	49.8	9.000	9.9	10.5	65.4	5.6	55.4
1.462000	44.6	43.7	9.000	10.0	11.4	56.0	2.3	46.0
3.942000	49.0	42.6	9.000	10.1	7.0	56.0	3.4	46.0
5.810000	47.6	39.5	9.000	10.1	12.4	60.0	10.5	50.0
6.310000	46.8	39.2	9.000	10.2	13.2	60.0	10.8	50.0
7.022000	47.4	38.3	9.000	10.2	12.6	60.0	11.7	50.0

**4 Radiated emission**

**Test result: PASS**

**4.1 Limits**

Frequency range (MHz)	Limit in dBuV/m (Quasi-peak) Of measurement distance 3m	Limit in dBuV/m (Quasi-peak) Of measurement distance 10m
30-230	40	30
230-1000	47	37

Note:

- for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.
- The gray rows are selected items.
- If the internal emission source is operating at a frequency below 9kHz then measurements need only to be performed up to 230MHz.

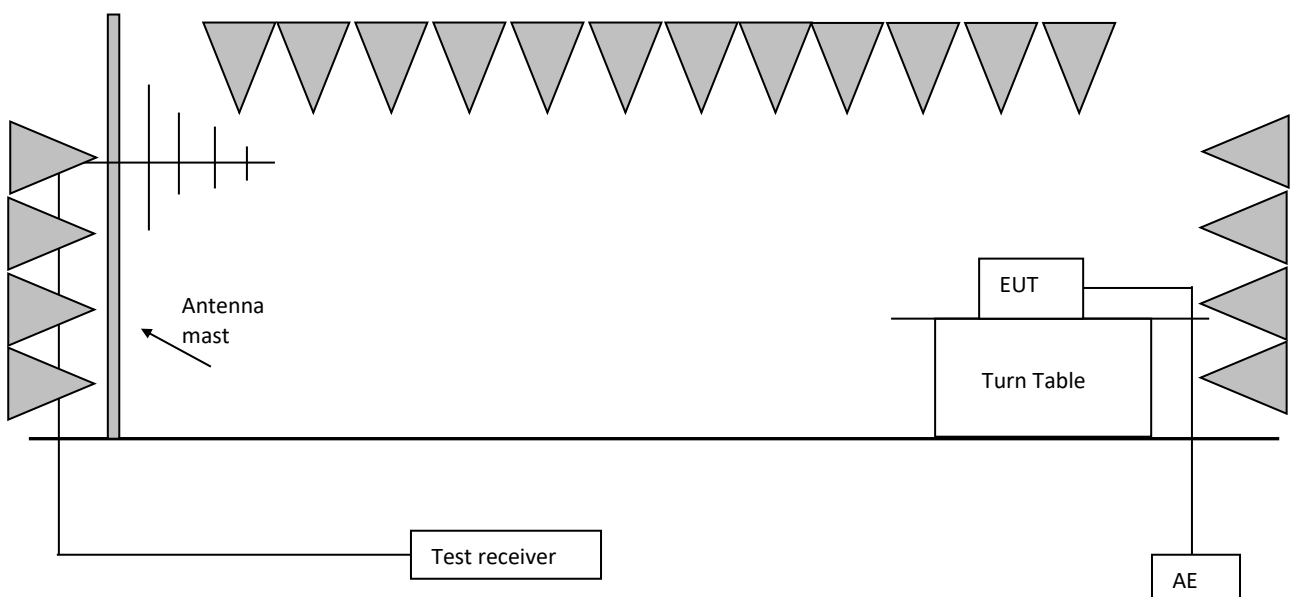
1-6GHz:

Frequency range (GHz)	Average limit in dBuV/m Of measurement distance 3m	Peak limit in dBuV/m Of measurement distance 3m
1-3	50	70
3-6	54	74

Note:

- for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

**4.2 Block diagram of test set up**



### **4.3 Test Procedure**

The measurement was applied in a semi-anechoic chamber.

Measurement was performed according to CISPR 16-2-3.

Setting of EUT is according to CISPR 16-2-3.

The bandwidth setting on R&S Test Receiver ESI26 was 120 kHz.

The frequency range from 30MHz to 1000MHz was checked.

The bandwidth setting on R&S Test Receiver ESI26 was 1MHz.

The frequency range from 1000MHz to 6000MHz was checked.

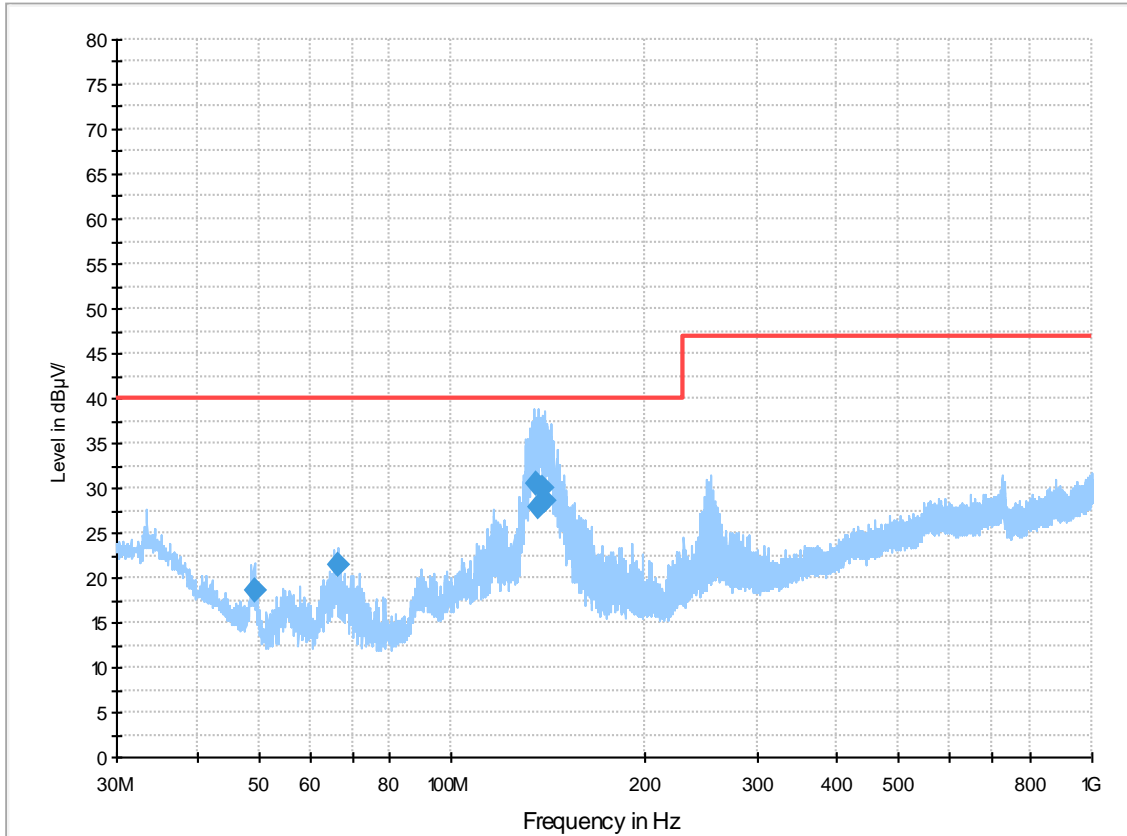


**4.4 Test Result**

**Operation mode: working with full load**

**Test Curve:**

Horizontal polarization



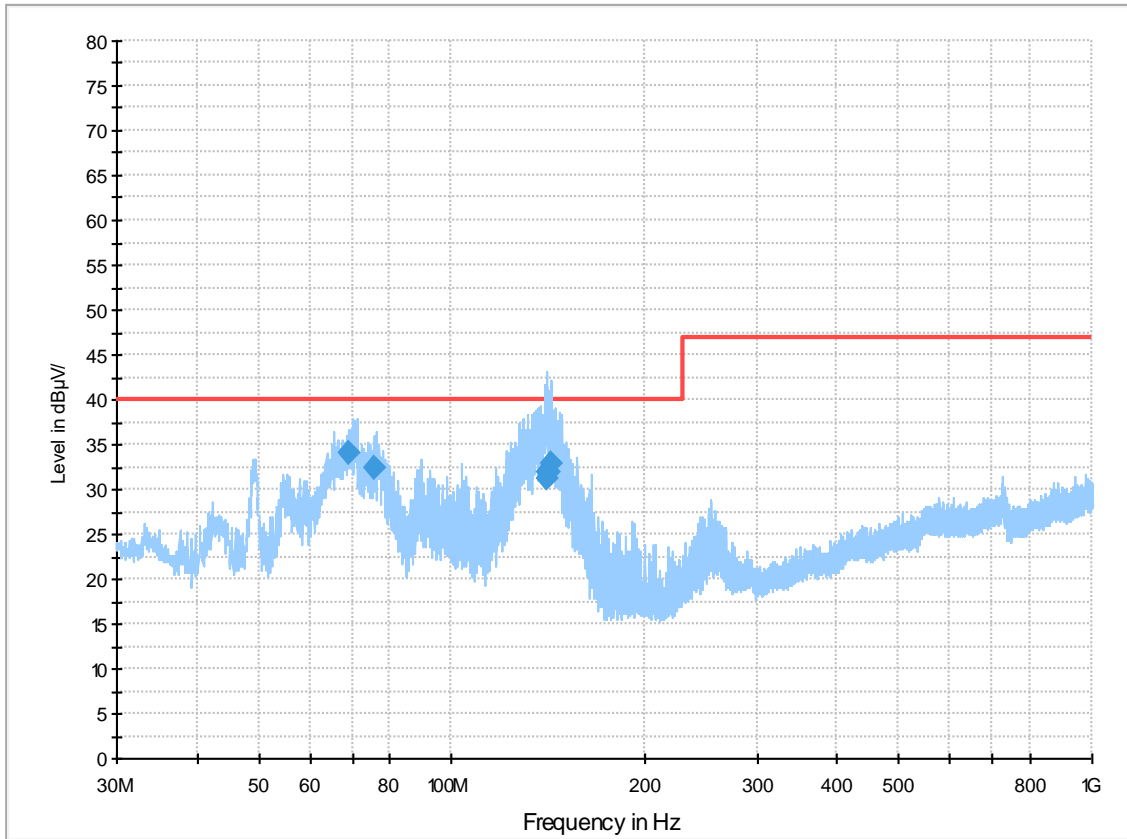
**Test Data:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
49.160000	18.6	120.000	210.0	150.0	12.0	21.4	40.0
66.560000	21.5	120.000	150.0	89.0	12.0	18.5	40.0
135.240000	30.4	120.000	172.0	135.0	12.0	9.6	40.0
136.840000	27.9	120.000	121.9	0.0	11.9	12.1	40.0
138.560000	30.0	120.000	184.0	118.0	11.8	10.0	40.0
139.920000	28.6	120.000	350.0	109.0	11.7	11.4	40.0

**Operation mode: working with full load**

**Test Curve:**

Vertical polarization



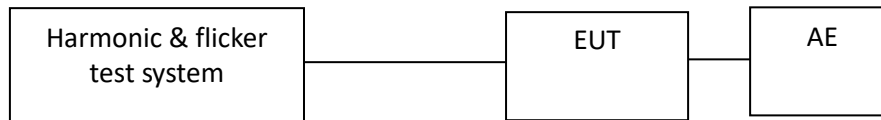
**Test Data:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
69.300000	34.0	120.000	126.0	144.0	11.4	6.0	40.0
75.600000	32.3	120.000	140.0	98.0	11.5	7.7	40.0
141.200000	31.2	120.000	150.0	225.0	11.6	8.8	40.0
141.240000	32.0	120.000	150.1	172.0	11.6	8.0	40.0
141.920000	31.8	120.000	150.1	225.0	11.5	8.2	40.0
142.520000	32.9	120.000	150.0	144.0	11.5	7.1	40.0

## 5 Harmonic current emission

Test result: NA

### 5.1 Test Setup



### 5.2 Test Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyzer which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions.

- Measuring instrumentation according to IEC 61000-4-7:2002+A1:2008
- This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit applies according to EN 61000-3-2
- The EUT is kitchen machines as listed in the scope of IEC 60335-2-14, therefore, is deemed to conform to the harmonic current limits of this standard without further testing.

### 5.3 Test limit

5.3.1 Limits for equipment with input current  $\leq 16A$  per phase

Harmonic order n	Maximum permissible harmonic current A
<b>Odd harmonics</b>	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \leq n \leq 39$	$0,15 \frac{15}{n}$
<b>Even harmonics</b>	
2	1,08
4	0,43
6	0,30
$8 \leq n \leq 40$	$0,23 \frac{8}{n}$

5.3.2 Limits for equipment with input current  $> 16A$  and  $\leq 75A$  per phase

Current emission limits for professional equipment with  $I_{1max} \leq 75 A$  other than balanced three-phase equipment

Minimal $R_{sce}$	Admissible individual harmonic current $I_n/I_1^a$						Admissible harmonic current distortion factors	
	%						%	
	$I_3$	$I_5$	$I_7$	$I_9$	$I_{11}$	$I_{13}$	<i>THD</i>	<i>PWHD</i>
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 1 The relative values of even harmonics up to order 12 must not exceed $16/n$ %. Even harmonics above order 12 are taken into account in <i>THD</i> and <i>PWHD</i> in the same way as odd order harmonics.								
NOTE 2 Linear interpolation between successive $R_{sce}$ values are permitted.								
<sup>a</sup> $I_1$ = reference fundamental current; $I_n$ = harmonic current component.								

Current emission limits for professional balanced three-phase equipment with  $I_{1max} \leq 75$  A

Minimal $R_{scc}$	Admissible individual harmonic current $I_n/I_1$ <sup>a</sup>				Admissible harmonic current distortion factors	
	%				%	
	$I_5$	$I_7$	$I_{11}$	$I_{13}$	<i>THD</i>	<i>PWHD</i>
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 1 The relative values of even harmonics up to order 12 must not exceed 16/n %. Even harmonics above order 12 are taken into account in <i>THD</i> and <i>PWHD</i> in the same way as odd order harmonics.						
NOTE 2 Linear interpolation between successive $R_{scc}$ values are permitted.						
<sup>a</sup> $I_1$ = reference fundamental current; $I_n$ = harmonic current component.						

Current emission limits for professional balanced three-phase equipment with  $I_{1max} \leq 75$  A under specified conditions

Minimal $R_{scc}$	Admissible individual harmonic current $I_n/I_1$ <sup>a</sup>				Admissible harmonic current distortion factors	
	%				%	
	$I_5$	$I_7$	$I_{11}$	$I_{13}$	<i>THD</i>	<i>PWHD</i>
33	10,7	7,2	3,1	2	13	22
$\geq 120$	40	25	15	10	48	46
NOTE 1 The relative values of even harmonics up to order 12 must not exceed 16/n %. Even harmonics above order 12 are taken into account in <i>THD</i> and <i>PWHD</i> in the same way as odd order harmonics.						
NOTE 2 Linear interpolation between successive $R_{scc}$ values are permitted.						
<sup>a</sup> $I_1$ = reference fundamental current; $I_n$ = harmonic current component.						

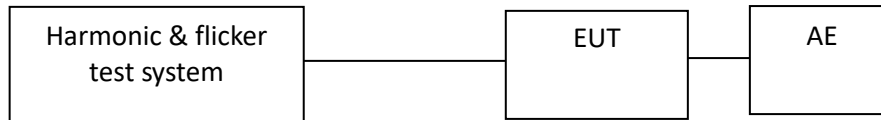
#### 5.4 Test Result

None.

## 6 Voltage fluctuations and flicker

**Test result:** NA

### 6.1 Test Setup



### 6.2 Test Procedure

#### 6.2.1 Definition

- Flicker:** impression of unsteadiness of visual sensation induced by a lighting stimulus whose luminance or spectral distribution fluctuates with time.
- Pst:** Short-term flicker indicator the flicker severity evaluated over a short period (in minutes); Pst=1 is the conventional threshold of irritability
- Plt:** long-term flicker indicator; the flicker severity evaluated over a long period (a few hours) using successive Pst values.
- dc:** the relative steady-state voltage change
- dmax:** the maximum relative voltage change
- d(t):** the value during a voltage change

#### 6.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes according to Clause A.15 of IEC61000-3-3: 2013.

#### 6.2.3 Test protocol

The tested object operated under the operating condition specified in IEC 61000-3-3: 1994+A1:2001

The following limits apply

- "Plt" shall not exceed 0.65.
- "Pst" shall not exceed 1.0.
- "dc" shall not exceed 3.3%.
- "dmax" shall not exceed 4/6/7%\*
- "d(t)" shall not exceed 3.3% for more than 500ms.

Notes:

- \* means for 4% limit, without additional conditions
  - 6% limit, switched manually or automatically more than twice per day
  - 7% limit, switched automatically for no more than twice per day or attended while in use.

**6.3 Test Result**

None

## Immunity Test

### Performance criteria

**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.

**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.

**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.



## 7 Electrostatic Discharge (ESD)

Test result **PASS**

### 7.1 Severity Level and Performance Criterion

#### 7.1.1 Test level

Contact discharge		Air discharge	
Level	Test voltage (kV)	Level	Test voltage (Kv)
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special

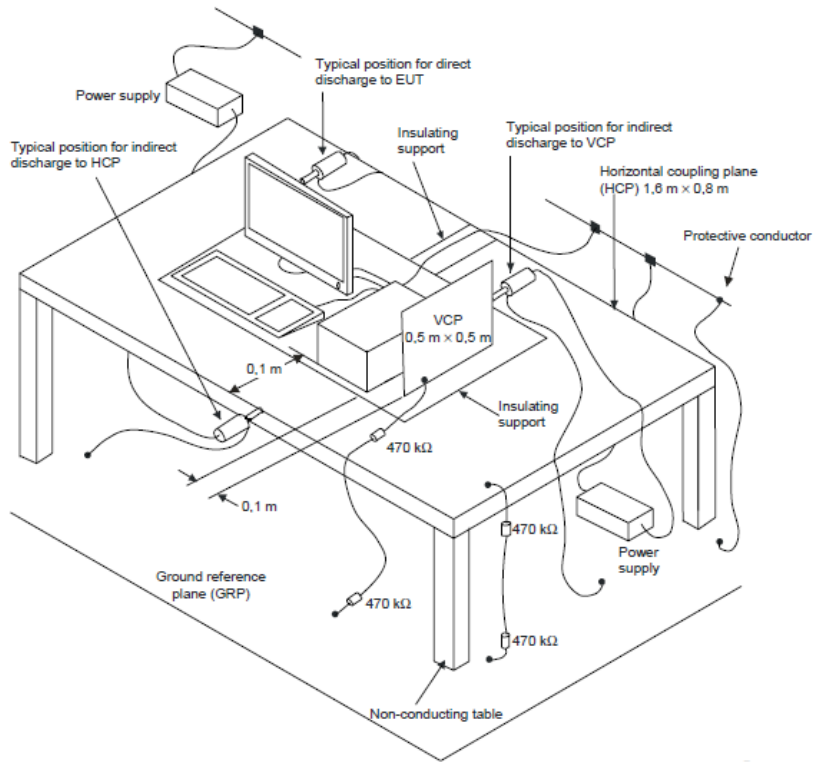
Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification.  
 If higher voltages than those shown are specified, special test equipment may be needed.  
 2. The gray rows were the selected test level.

#### 7.1.2 Performance Criterion

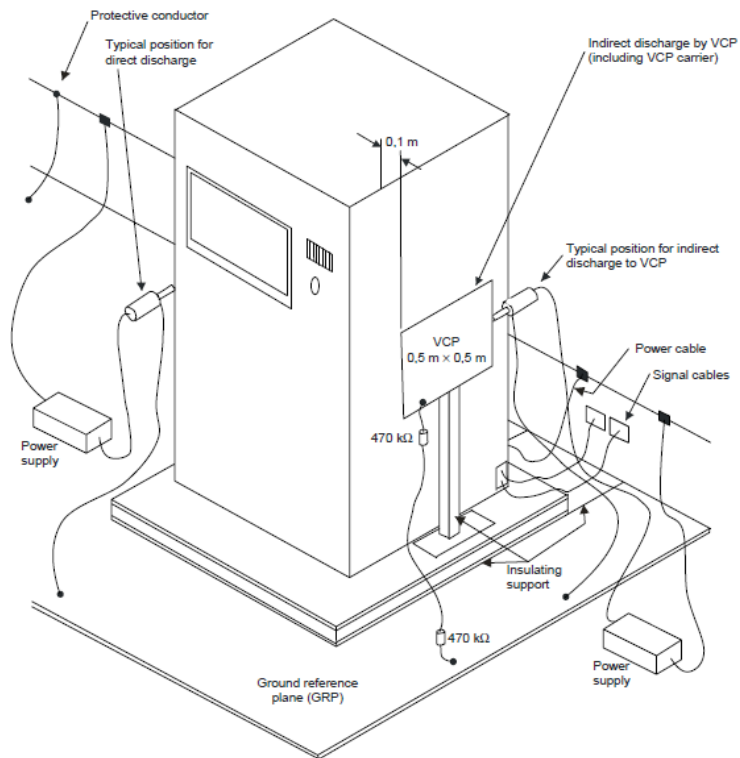
Criterion B

**7.2 Test Setup**

For table-top equipment



For floor standing equipment



### **7.3 Test Procedure**

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-2 clause 8.

The test method and equipment was specified by EN 61000-4-2.

### 7.4 Test Result

Direct discharges were applied at the following selected points:

Test level [kV]	Air/Contact	Polarity (+/-)	Pass/Fail/NA	Comment
2/4	Contact	+/-	Pass	Accessible metal parts of the EUT
2/4	Contact	+/-	Pass	All touchable screws of enclosure
2/4/8	Air	+/-	Pass	Air gaps of the switch, button, connectors, fans
2/4/8	Air	+/-	Pass	Slots around the EUT, LED panel,

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

For table-top equipment

Position	Description	Point	Pass/Fail/NA
HCP front	0,1m from the front of the EUT	Edge of centre on HCP	Pass
HCP back	0,1m from the back of the EUT	Edge of centre on HCP	Pass
HCP right	0,1m from the right side of the EUT	Edge of centre on HCP	Pass
HCP left	0,1m from the left side of the EUT	Edge of centre on HCP	Pass
VCP front	0,1m from the front of the EUT	Edge of centre on VCP	Pass
VCP back	0,1m from the back of the EUT	Edge of centre on VCP	Pass
VCP right	0,1m from the right of the EUT	Edge of centre on VCP	Pass
VCP left	0,1m from the left of the EUT	Edge of centre on VCP	Pass

For floor standing equipment

Position	Description	Point	Pass/Fail/NA
CP front	0,1m from the front of the EUT	Edge of centre on VCP	NA
CP back	0,1m from the back of the EUT	Edge of centre on VCP	NA
CP right	0,1m from the right of the EUT	Edge of centre on VCP	NA
CP left	0,1m from the left of the EUT	Edge of centre on VCP	NA

**Observation:** All the functions were operated as normal after the test.

**Conclusion:** The EUT can meet the requirement of Performance Criterion B.

## 8 Radio frequency electromagnetic field

Test result **PASS**

### 8.1 Severity Level and Performance Criterion

#### 8.1.1 Test level

Level	Test field strength V/m
1	1
2	3
3	10
X	Special

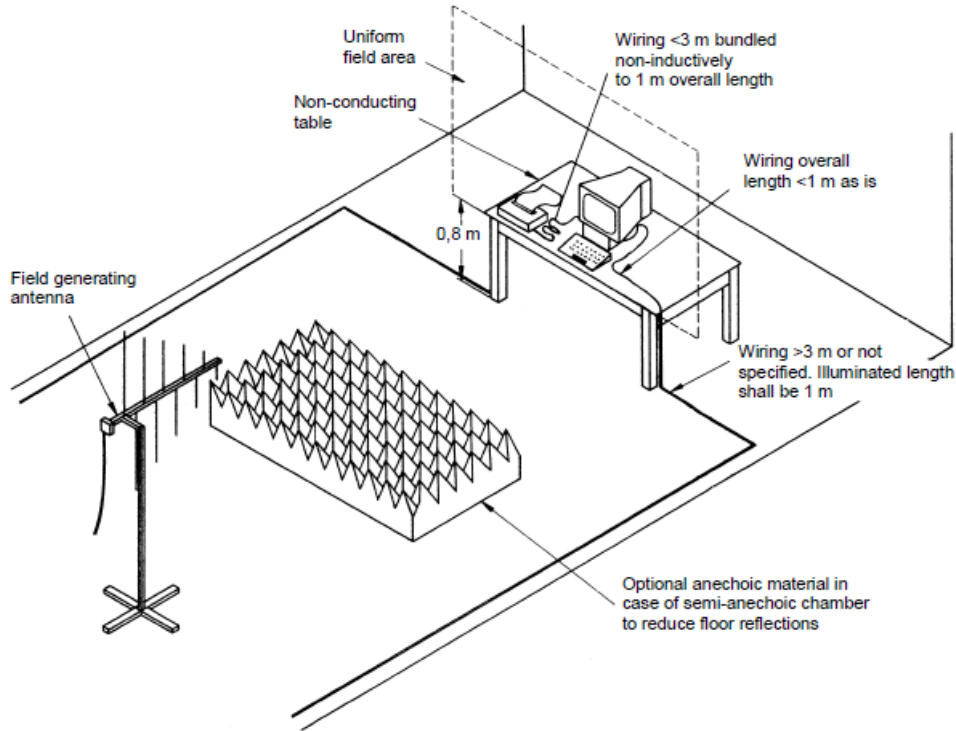
Note: 1. X is an open test level. This level may be given in the product specification.  
2. The gray row is the selected test level.

#### 8.1.2 Performance Criterion

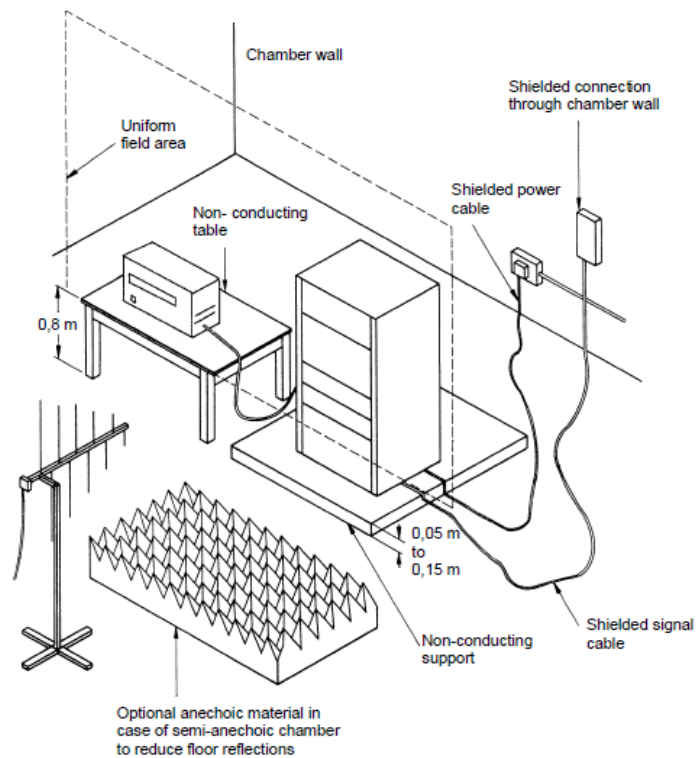
Criterion A

**8.2 Test Setup**

For table-top equipment



For floor standing equipment



### **8.3 Test Procedure**

Measurement was performed in full-anechoic chamber.

Measurement procedure was applied according to EN 61000-4-3 clause 8.

The test method and equipment was specified by EN 61000-4-3.

#### 8.4 Test Result

Test no.	Frequency (MHz)	Polarization	Test level (V/m)	Modulation	Exposed location	Pass/Fail/NA
1	80-1000	H & V	3	1 kHz, 80% AM 1 % increment	All sides	Pass
2	1400-6000	H & V	3	1 kHz, 80% AM 1 % increment	All sides	Pass

**Observation:** All the functions were operated as normal during and after test.

**Conclusion:** The EUT can meet the requirement of Performance Criterion A



## 9 Fast transients, common mode

Test result **PASS**

### 9.1 Severity Level and Performance Criterion

#### 9.1.1 Test level

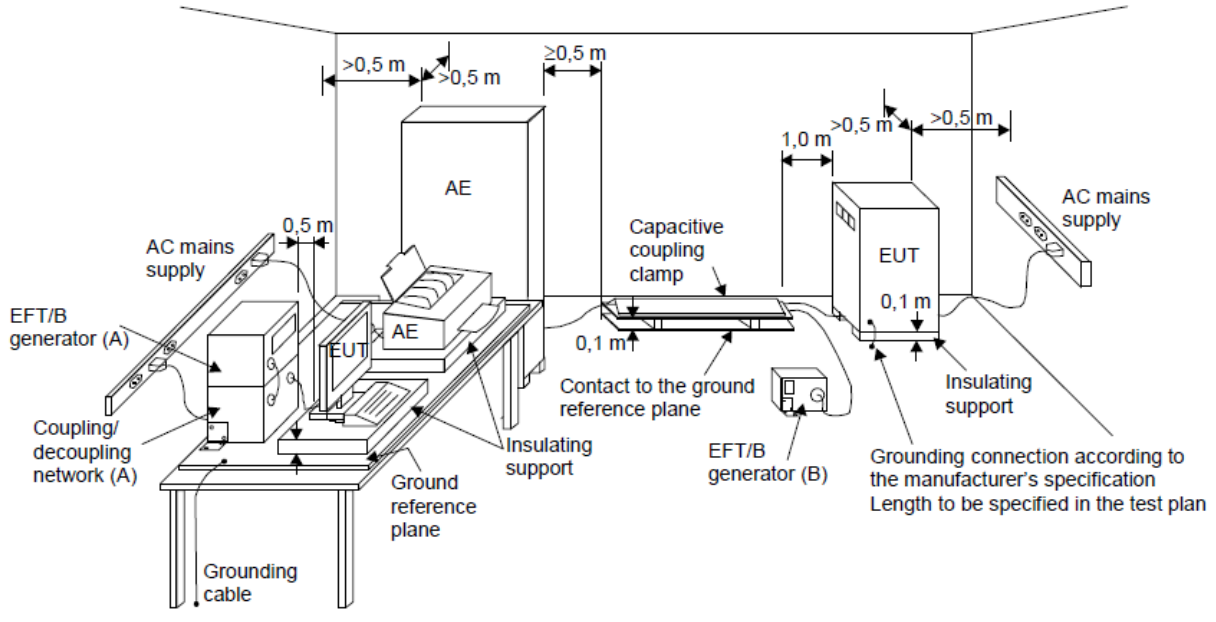
Open circuit output test voltage and repetition rate of the impulses				
Level	AC mains power input ports		Signal ports, DC power ports	
	Voltage peak (kV)	Repetition rate (kHz)	Voltage peak (kV)	Repetition rate (kHz)
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	2.5 or 100	2	5 or 100
X	Special	Special	Special	Special

Notes: 1. "X" is an open level. The level has to be specified in the dedicated equipment specification.  
2. The grey rows were the selected test level.

#### 9.1.2 Performance Criterion

Criterion B

**9.2 Test Setup**



- (A) location for supply line coupling
- (B) location for signal lines coupling

**9.3 Test Procedure**

Measurement was performed in shielded room.  
 Measurement procedure was applied according to EN 61000-4-4 clause 8.  
 The test method and equipment was specified by EN 61000-4-4.

#### 9.4 Test Result

Test No.	Level (kV)	Polarity (+/-)	Line for test	Pass/Fail/NA
1	1	+/-	AC power ports	Pass
2	0.5	+/-	Signal ports	NA
3	0.5	+/-	DC power ports	Pass

**Observation:** All the functions were operated as normal during and after test.

**Conclusion:** The EUT can meet the requirement of Performance Criterion B

## 10 Surges

Test result **PASS**

### 10.1 Severity Level and Performance Criterion

#### 10.1.1 Test level

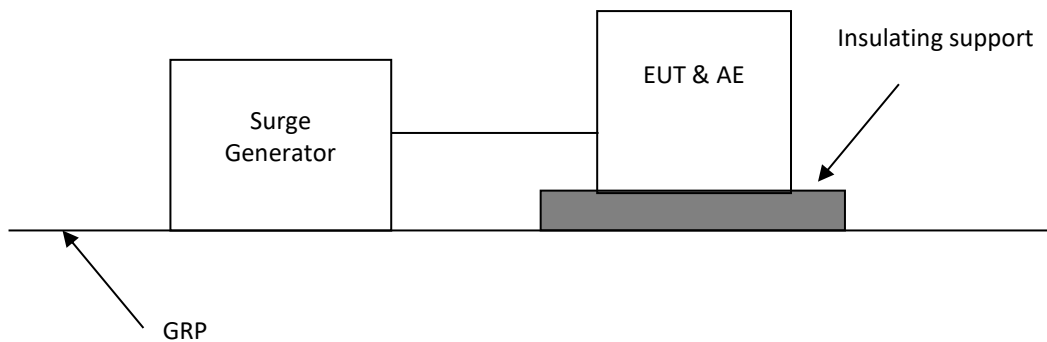
Level	Open-circuit test voltage (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special

Notes: 1. "X" is an open class. This level can be specified in the product specification  
 2. The gray rows are the selected level.

#### 10.1.2 Performance Criterion

Criterion B

## 10.2 Test Setup



## 10.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-5 clause 8.

The test method and equipment was specified by EN 61000-4-5.

**10.4 Test Result**

Test No.	Level [kV]	Polarity +/-	Line for test	Pass/Fail/NA
1	0.5/1	+/-	AC mains power input port (line to line)	Pass
2	0.5/1/2	+/-	AC mains power input port (line to earth)	Pass
3	0.5/1	+/-	DC power ports	Pass

**Observation:** All the functions were operated as normal during and after test.

**Conclusion:** The EUT can meet the requirement of Performance Criterion B

## 11 Radio frequency, common mode

Test result **PASS**

### 11.1 Severity Level and Performance Criterion

#### 11.1.1 Test level

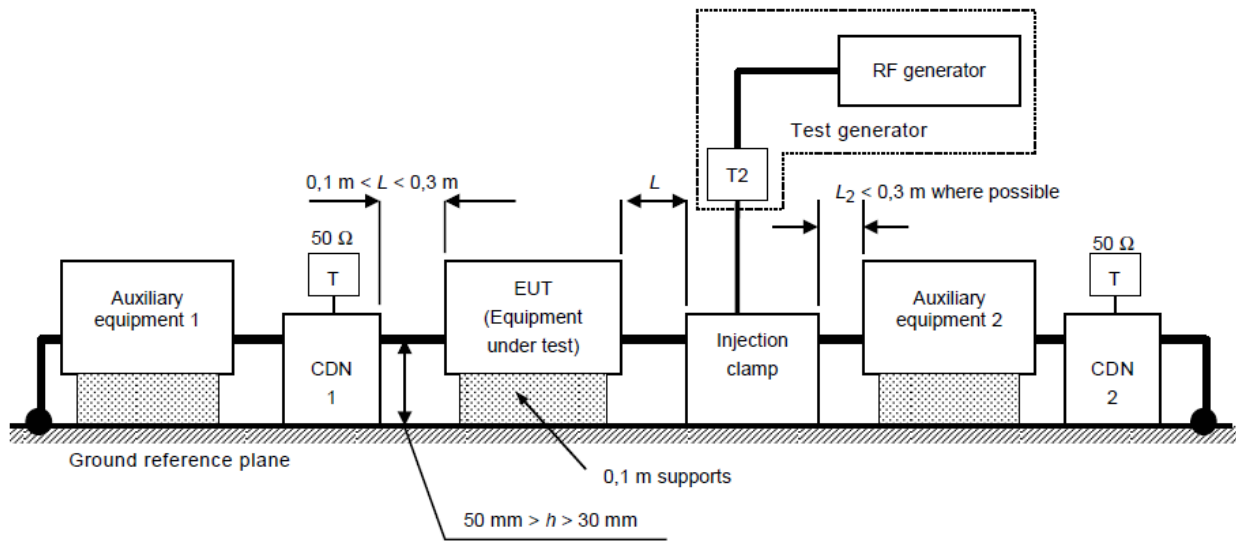
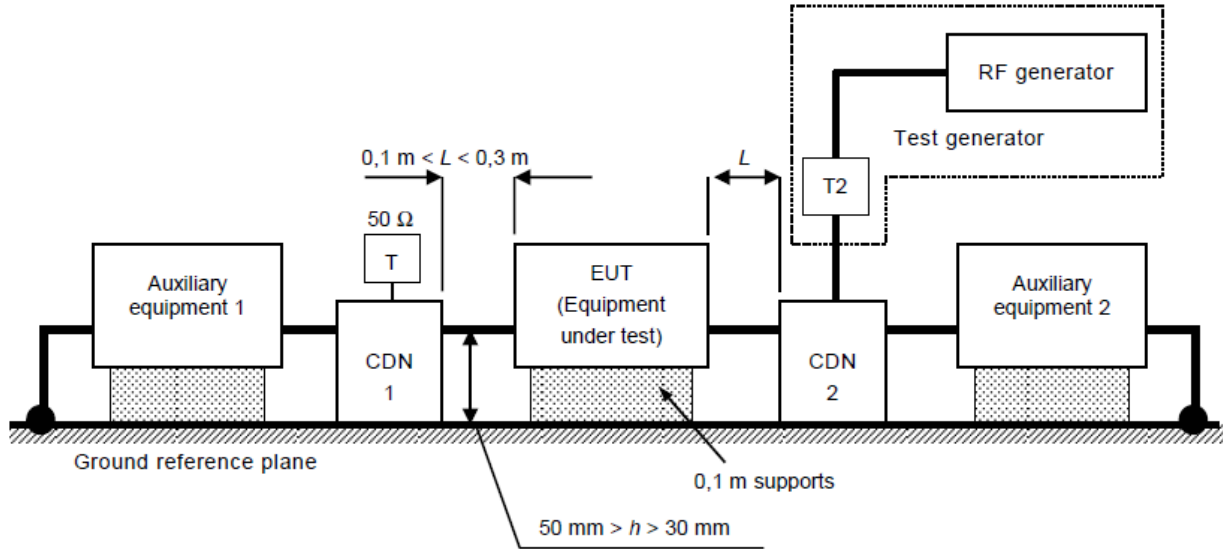
Frequency range 150kHz – 80MHz		
Level	Voltage level	
	U <sub>0</sub> (dBuV)	U <sub>0</sub> (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

Notes: 1. "X" is an open level  
2. The gray row is the selected test level.

#### 11.1.2 Performance Criterion

Criterion A

**11.2 Block Diagram of Test Setup**



- T      termination 50 Ω
- T2     power attenuator (6 dB)
- CDN    coupling and decoupling network

**11.3 Test Procedure**

Measurement procedure was applied according to EN 61000-4-6 clause 8.  
 The test method and equipment was specified by EN 61000-4-6.



### 11.4 Test Result

Test No.	Frequency (MHz)	Level (V)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3	80%, 1 kHz, AM	AC power port	Pass
2	0.15~80	3	80%, 1 kHz, AM	signal ports	NA
3	0.15~80	3	80%, 1 kHz, AM	DC power ports	Pass

**Observation:** All the functions were operated as normal during and after test.

**Conclusion:** The EUT can meet the requirement of Performance Criterion A

## 12 Voltage dips

Test result **PASS**

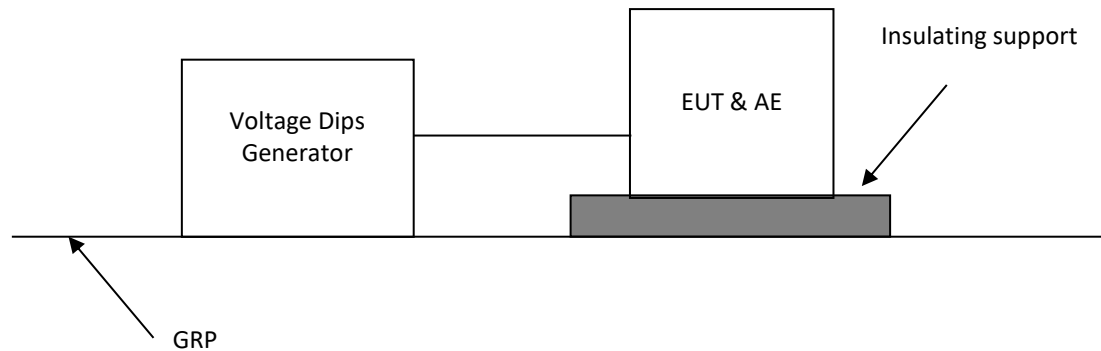
### 12.1 Severity Level and Performance Criterion

#### 12.1.1 Test level

Test level Reduction (%)	Voltage level in % of rated Ut	Duration (cycles)	Performance criterion
100	0	0.5	B
		1	B
		250 (at 50Hz) 300 (at 60Hz)	C
30	70	25 (at 50Hz) 30 (at 60Hz)	C

Notes: The gray rows are selected test level.

## 12.2 Test Setup



## 12.3 Test Procedure

Measurement was performed in shielded room.

Measurement procedure was applied according to EN 61000-4-11 clause 8.

The test method and equipment was specified by EN 61000-4-11.

### 12.4 Test Result

Test no.	Test level % U <sub>T</sub>	Voltage dip and short interruptions % U <sub>T</sub>	Duration (in periods)	Pass/Fail
1	70	30%	25 cycles at 50Hz	Pass
			30 cycles at 60Hz	Pass
2	0	100%	0.5 cycle	Pass
3	0	100%	1 cycle	Pass
4	0	100%	250 cycles at 50Hz	Pass
			300 cycles at 60Hz	Pass

**Observation:** At test level of 0%, the EUT worked interrupted during a short time. Once the interference is removed, it recovered its normal mode at once

**Conclusion:** The EUT met the requirements of Performance Criterion B and C.

**13 Power Frequency Magnetic field**

**Test result: PASS**

**13.1 Severity Level and Performance Criterion**

13.1.1 Test level

Level	Magnetic field strength A/m
1	1
2	3
3	10
4	30
5	100
X	Special

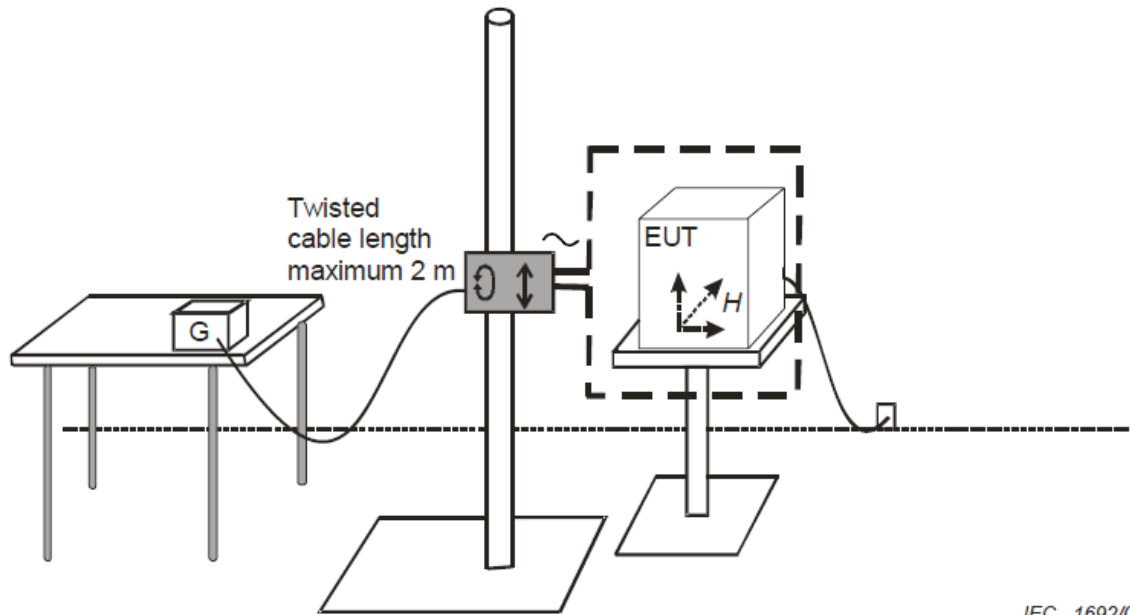
Note: 1. X is an open test level; this level may be given in the product specification.  
 2. The gray row is the selected test level.

13.1.2 Performance Criterion

Performance criterion A

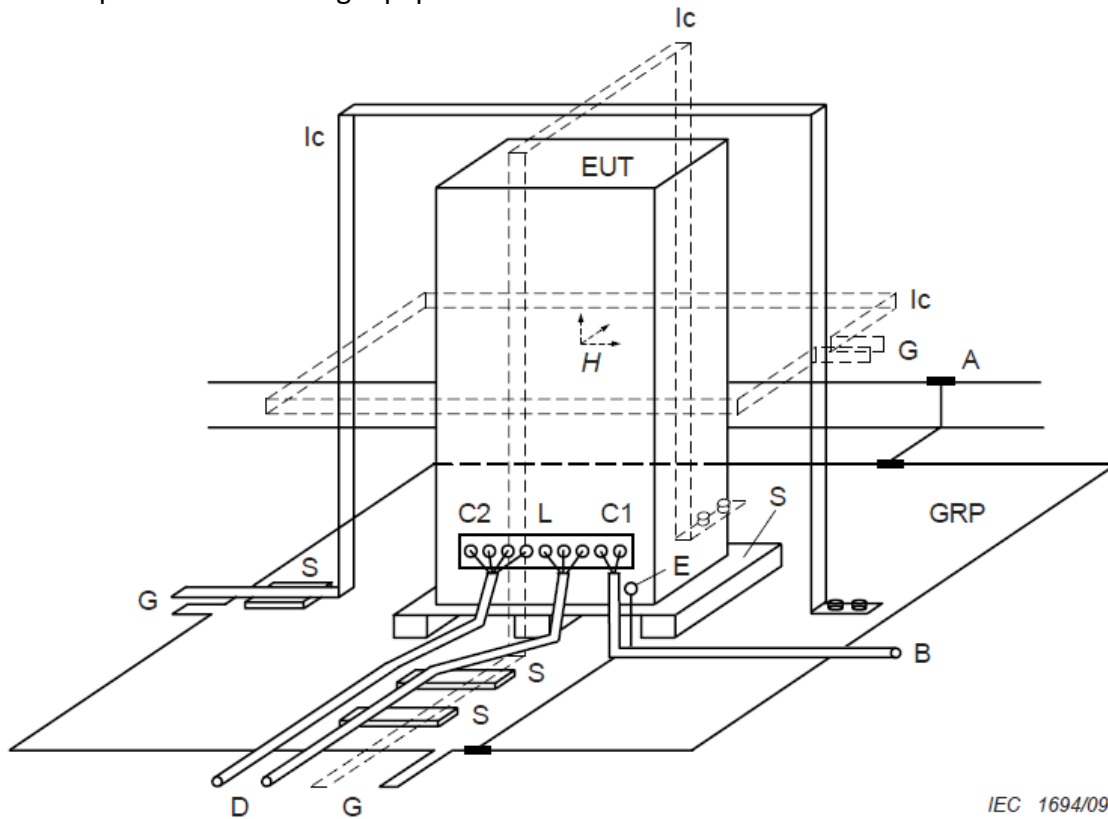
**13.2 Diagram of Test Setup**

Test set-up for table-top equipment



IEC 1692/09

Test set-up for floor-standing equipment



IEC 1694/09

### 13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to clause 7 of IEC 61000-4-8.

The test method and equipment was specified by IEC 61000-4-8 with the modifications by clause 8 of EN 61000-6-1.

### 13.4 Test Protocol

Test No.	Level A/m	Axis	Result
1	3	X	PASS
2	3	Y	PASS
3	3	Z	PASS

**Observation:** All the functions were operated as normal during and after test.

**Conclusion:** The EUT can meet the requirement of Performance Criterion A

**Appendix II: Photograph of equipment under test**

Overview-HNS5000TL



Overview-HNS5000TL





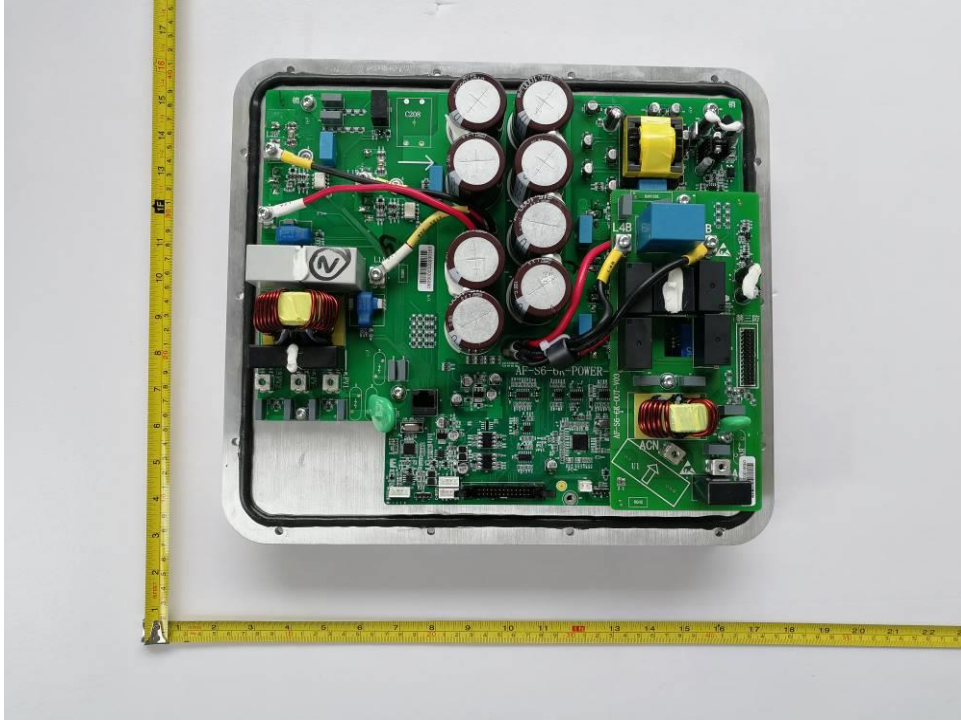
Overview-HNS5000TL



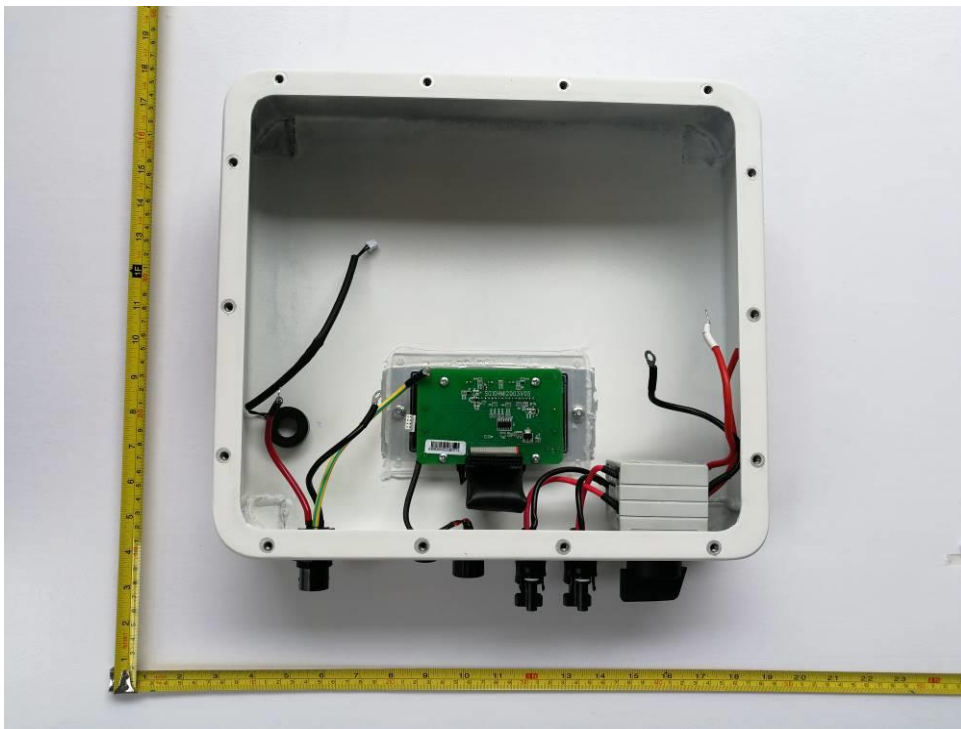
Internal View- HNS5000TL



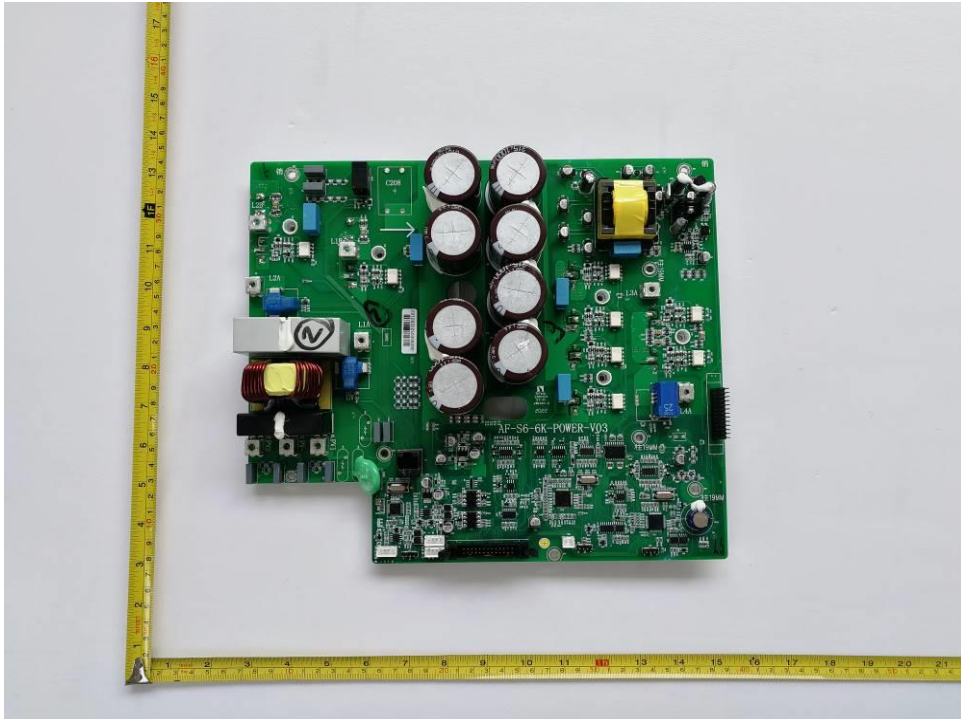
Internal View-HNS5000TL



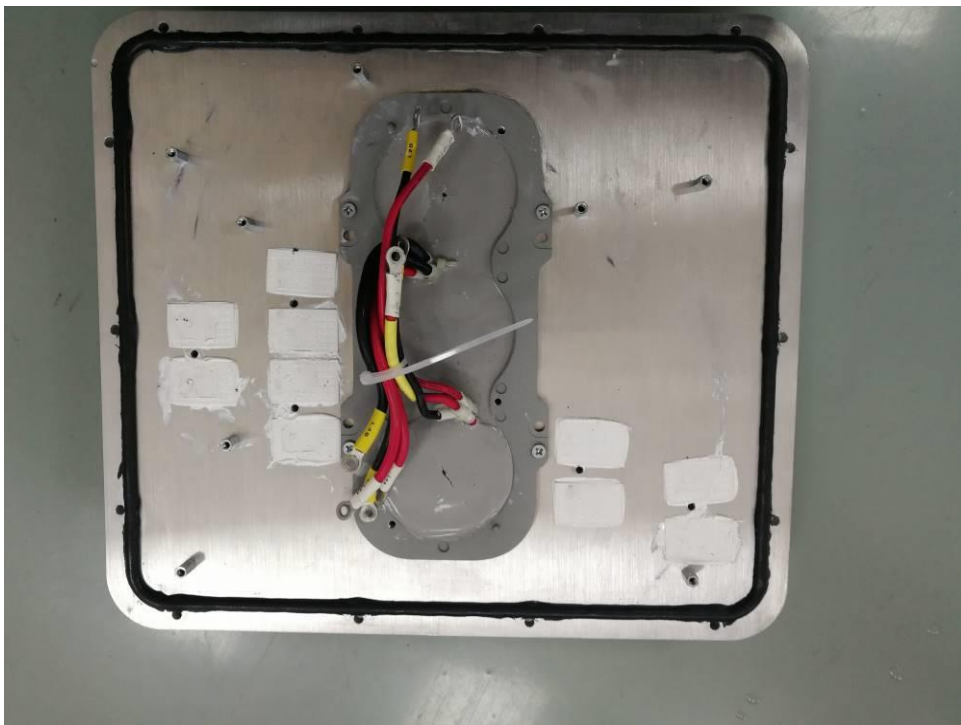
Internal View-HNS5000TL



Internal View-HNS5000TL



Internal View-HNS5000TL



Overview-HNS8000TL



Overview-HNS8000TL



Overview-HNS8000TL



Overview-HNS8000TL



Overview-HNS8000TL- Secondary grounding



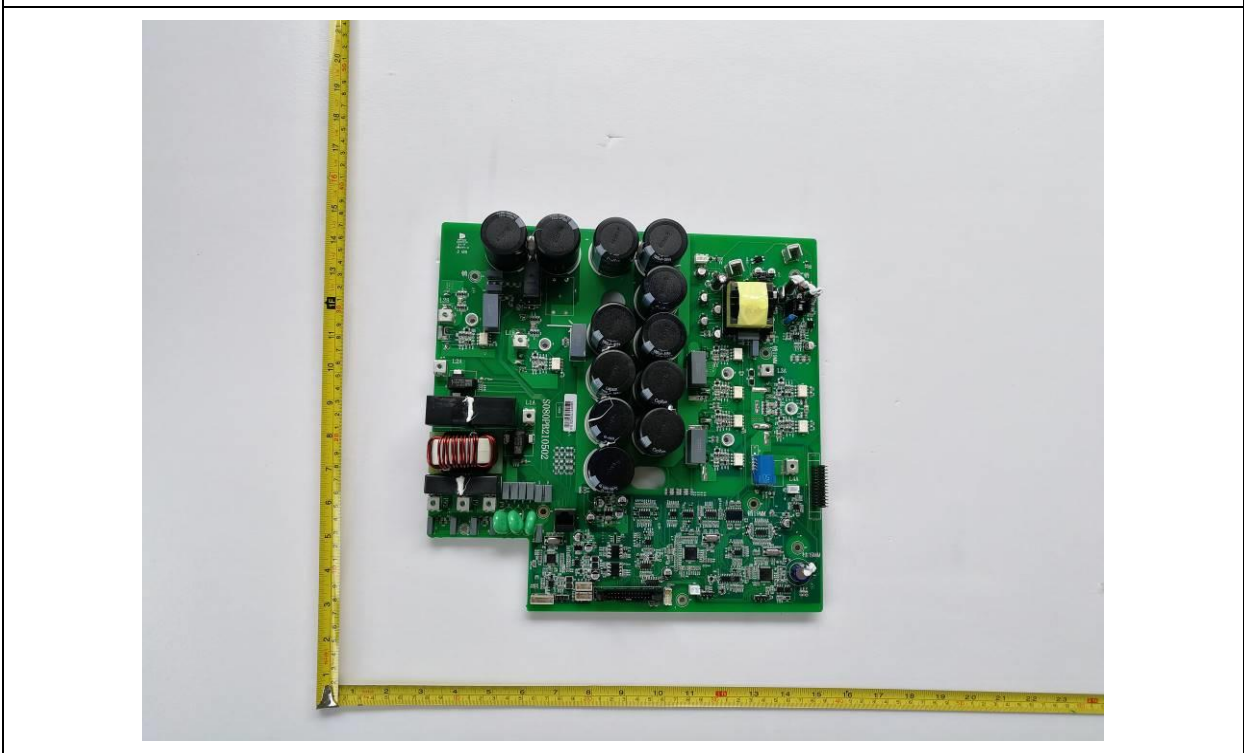
Internal View-grounding



Internal View-HNS8000TL



Internal View-HNS8000TL



Internal View-HNS8000TL



Overview-HNS10000TL





Overview-HNS10000TL



Overview-HNS10000TL



Overview-HNS1000TL



Overview-HNS5000TL



Overview-HNS1000TL- Secondary grounding



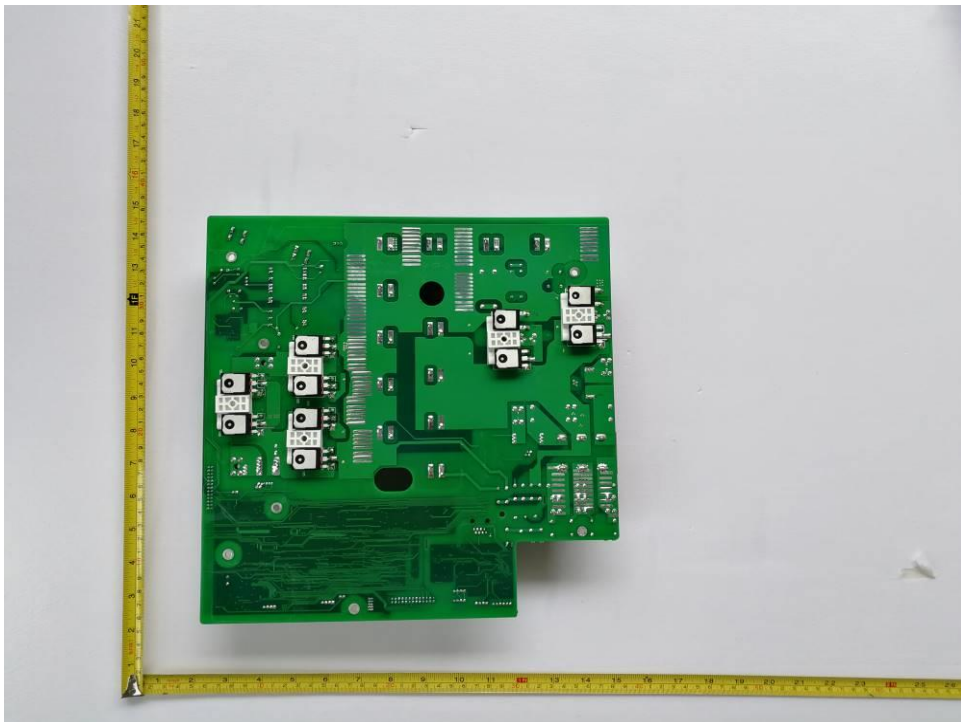
Internal View-grounding



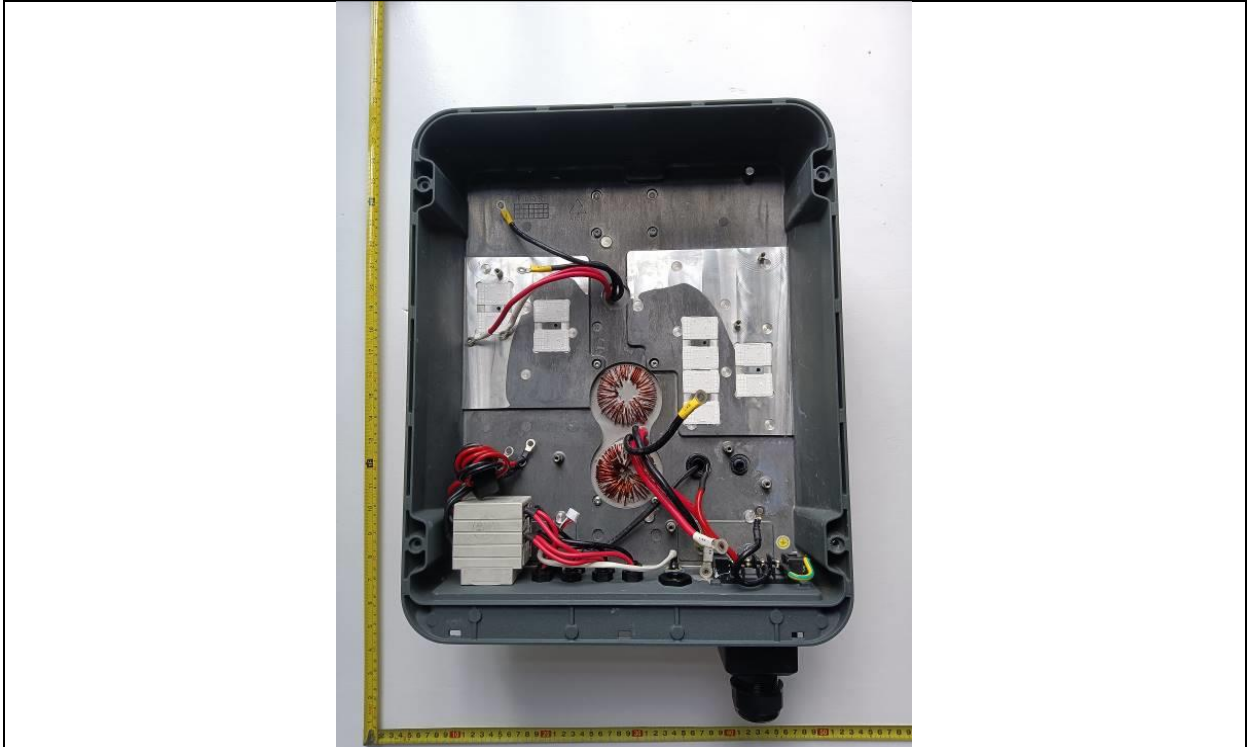
Internal View-HNS10000TL



Internal View-HNS10000TL



Internal View-HNS10000TL



\*\*\* END OF REPORT \*\*\*