Test Report No.: CE2012WDG0371

TEST REPORT

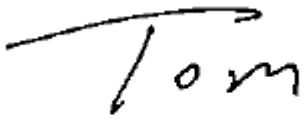
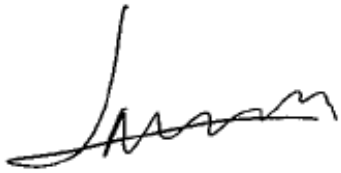
Applicant	Huawei Technologies Co., Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

Manufacturer or Supplier	Huawei Technologies Co., Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product	SOLAR INVERTER
Brand Name	Huawei
Model	SUN2000-60KTL-M0
Additional Model & Model Difference	SUN2000-50KTL-M0; See item 2.1
Date of tests	Aug. 09, 2018 ~ Sep. 04, 2018 Jul. 20, 2019 ~ Jul. 22, 2019 Aug. 17, 2020 ~ Dec. 25, 2020

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

☒ **EN 62920:2017**	☒ **IEC 62920:2017**	☒ **EN 55011:2016 + A11:2020 (Group 1)**
☒ **CISPR11:2015 + A1:2016 + A2:2019 (Group 1)**		☒ **EN 61000-6-3:2007 + A1:2011**
☒ **IEC 61000-6-3:2006 + A1:2010**	☒ **EN IEC 61000-6-4:2019**	☒ **IEC 61000-6-4:2018**
☒ **EN 61000-3-12:2011**	☒ **IEC 61000-3-12:2011**	☒ **EN IEC 61000-3-11:2019**
☒ **EN IEC 61000-6-1:2019**	☒ **IEC 61000-6-1:2016**	☒ **IEC 61000-3-11:2017**
☒ **EN IEC 61000-6-2:2019**	☒ **IEC 61000-6-2:2016**	

CONCLUSION: The submitted sample was found to <u>COMPLY</u> with the test requirement

Tested by Tom Chen Project Engineer / EMC Department	Approved by Madison Luo Supervisor / EMC Department
	 Date: Jan. 05, 2021

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
CE180827N015	Original release	Sep. 26, 2018
CE190729N045	Based on the original report CE180827N015 changed PCB board and interior structure and cord location and cord quantity, but it need to be retest conducted emission, radiated emission (Below 1GHz) and all immunity tests after engineer evaluated.	Aug. 02, 2019
CE200107N052-1	Original release	Mar. 04, 2020
CE2012WDG0371	Based on the original report CE190729N045 and CE200107N052-1 changed power board (additional two capacitance) and additional core and update standard versions, but it need to be retest conducted emission, radiated emission (Below 1GHz) and surge immunity tests after engineer evaluated.	Jan. 05, 2021

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	**Test Type**	**Result**	**Remarks**
EN 61000-6-3:2006 + A1:2010 (*) EN IEC 61000-6-4:2019(*) IEC 61000-6-3:2006 + A1:2010(*) IEC 61000-6-4:2018(*) EN 55011:2016 + A11:2020 (Group 1) CISPR11:2015+A1:2016+ A2:2019(Group 1) EN 62920:2017 IEC 62920:2017	Conducted Test (AC Main Port)	PASS	Meets Requirement Limit Minimum passing margin is 7.4dB at 3.610358MHz
	Radiated Test (30MHz~1GHz)	PASS	Meets Limits Minimum passing margin is 5.1dB at 111.404MHz
	Radiated Test (1GHz~6GHz)	PASS	Meets Limits Minimum passing margin is 27.9dB at 2333.110000MHz
EN 61000-6-3:2006 + A1:2010 IEC 61000-6-3:2006 + A1:2010 EN IEC 61000-6-4:2019 IEC 61000-6-4:2018 EN 62920:2017 IEC 62920:2017	Conducted Test (Telecom port)	PASS	Meets Requirement Limit Minimum passing margin is 14.2dB at 25.196970MHz
EN 55011:2016 + A11:2020 (Group 1) CISPR11:2015+A1:2016+ A2:2019(Group 1) EN 62920:2017 IEC 62920:2017	Conducted Test (DC Main Port)	PASS	Meets Requirement Limit Minimum passing margin is 3.8dB at 7.076122MHz
EN 61000-3-12:2011 IEC 61000-3-12:2011	Harmonic current emissions	PASS	Meets the requirements.
EN IEC 61000-3-11:2019 IEC 61000-3-11:2017	Voltage fluctuations & flicker	PASS	Meets the requirements.

"* " The MBUS communication mode or AC 480V power supply mode of Solar Inverter is not apply to this standard.

IMMUNITY (EN IEC 61000-6-2:2019, IEC 61000-6-2:2016, IEC 61000-6-1:2016, EN IEC 61000-6-1:2019)			
Standard	**Test Type**	**Result**	**Remarks**
IEC 61000-4-2:2008	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 6kV Contact discharge, Performance Criterion A
IEC 61000-4-3:2006 + A1:2007 +A2:2010	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 10V/m, 80% AM (1kHz), 1400-6000 MHz, 10V/m, 80% AM (1kHz) Performance Criterion A
IEC 61000-4-4:2012	Electrical fast transient / burst immunity test.	PASS	Electrical Fast Transient/Burst - EFT AC Power line: 2kV, DC Power line: 2kV, Signal line: 1kV Performance Criterion A
IEC 61000-4-5:2014 + A1:2017	Surge immunity test	PASS	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, 10/700 us Open Circuit Voltage, 5 /320 us Short Circuit Current, AC Power Line: line to line 1 kV, 6kV (Client requirement) line to earth 2kV , 6kV (Client requirement) DC Power Line: line to line 1 kV, 4kV (Client requirement) line to earth 2kV, 4kV (Client requirement) Signal Line: 1kV, 2kV, 4kV, 6kV (Client requirement) Performance Criterion B

IEC 61000-4-6:2013	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
IEC 61000-4-8:2009	Power frequency magnetic field immunity test.	PASS	Power Frequency Magnetic Field Test, 50 Hz , 30A/m, Performance Criterion A

Remark: The Emission Requirements Of IEC 61000-6-3:2006 + A1:2010, EN 61000-6-3:2007+A1:2011 And Immunity Requirements Of IEC 61000-6-2:2016, EN IEC 61000-6-2:2019 Are Stricter Than That Of IEC 61000-6-4:2018, EN IEC 61000-6-4:2019 And Of IEC 61000-6-1:2016, EN IEC 61000-6-1:2019 Respectively, So The EMI Tests Were Performed According To IEC 61000-6-3:2006 + A1:2010, EN 61000-6-3:2007 + A1:2011 And EMS Tests Were Performed According To IEC 61000-6-2:2016, EN IEC 61000-6-2:2019.

IMMUNITY (EN 62920:2017; IEC 62920:2017)			
Standard	**Test Type**	**Result**	**Remarks**
IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 6kV Contact discharge, Performance Criterion A
IEC 61000-4-3:2010 ED. 3.2	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 10V/m, 80% AM (1kHz), 1400-6000 MHz, 3V/m, 80% AM (1kHz) Performance Criterion A
IEC 61000-4-4:2012 ED. 3.0	Electrical fast transient / burst immunity test.	PASS	Electrical Fast Transient/Burst - EFT AC Power line: 2kV, DC Power line: 2kV, Signal line: 1kV Performance Criterion A

IEC 61000-4-5:2017 ED. 3.1	Surge immunity test	PASS	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, AC Power Line: line to line 1 kV, 6kV (Client requirement) line to earth 2kV , 6kV (Client requirement) DC Power Line: line to line 1 kV, 4kV (Client requirement) line to earth 2kV, 4kV (Client requirement) Signal Line: 1kV, 2kV, 4kV, 6kV (Client requirement) Performance Criterion B
IEC 61000-4-6:2013 ED. 4.0	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
IEC 61000-4-34:2009 ED. 1.1	Voltage dips, short interruptions and voltage variations immunity tests	PASS	Meets the requirements of Voltage dips and interruption: 0% U_T – 0.5 period, Performance Criterion A 40% U_T – 10 period, Performance Criterion A 70% U_T – 25 period, B Voltage Interruptions: 0% residual – Performance Criterion B

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT 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.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions at AC Main Port (Shanghai Huawei)	0.15MHz ~ 30MHz	+ /-2.40 dB
Conducted emissions at DC Power Port (Shanghai Huawei)	0.15MHz ~ 30MHz	+ /-3.70 dB
Conducted Test at Telecom port (Shanghai Huawei)	0.15MHz ~ 30MHz	+ /-2.40 dB
Radiated emissions(Shanghai Huawei)	30MHz ~ 1000MHz	+ /-5.60 dB
Radiated emissions(Shanghai Huawei)	1GHz ~ 6GHz	+ /-4.20 dB

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	SOLAR INVERTER
MODEL NO.	SUN2000-60KTL-M0
ADDITIONAL MODEL	SUN2000-50KTL-M0;
POWER SUPPLY	SUN2000-60KTL-M0: Input: DC 200-1000V, Output: 220Vac/380Vac，230Vac/400Vac，3(N)W+PE; 277Vac/480Vac ; 3W+PE, 50/60Hz; SUN2000-50KTL-M0: Input: DC 200-1000V, Output: 220Vac/380Vac, 230Vac/400Vac, 240Vac/415Vac, 3(N)W+PE, 50/60Hz;
SOFTWARE VERSION	V300R001
HARDWARE VERSION	V300R001
THE HIGHEST OPERATING FREQUENCY	266MHz
DATA CABLE SUPPLIED	N/A

Note:

1. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.
2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
3. Product support two kinds of communication mode, RS485 and MBUS. MBUS communication use the CISPR 11/EN 55011 standard Class A limit. RS485 communication use the IEC/EN 61000-6-3 standard limit and CISPR 11/EN 55011 standard Class B limit.
4. Additional model SUN2000-50KTL-M0 is identical with the test model SUN2000-60KTL-M0 except model number and Max. output power for marketing purpose. the difference has been considered during this test, full test was performed for the model SUN2000-60KTL-M0.
5. Please refer to the EUT photo document (Reference No.:2012WDG0371) for detailed product photo.
6. Model List:

Parameter	SUN2000-60KTL- M0	SUN2000-50KTL-M0
MPPT Input	DC 200-1000V, 22A*6 67400W	DC 200-1000V, 22A*6 56200W
Output	220Vac/380Vac，230Vac/400Vac，3(N)W+PE 277Vac/480Vac ; 3W+PE, 50/60Hz, 60kW	220Vac/380Vac, 230Vac/400Vac, 240Vac/415Vac, 3(N)W+PE, 50/60Hz, 50kW
Max	100A for 380Vac，95.3A for 400Vac，79.4A for 480Vac, 66kVA	83.6A for 380Vac，79.4A for 400Vac，76.6A for 415Vac, 55kVA
Power	60kW	50kW
RS485	Support	Support
MBUS	Support	Support
USB Smart Dongle	Support	Support

2.2 DESCRIPTION OF TEST MODES

The EUT was tested under the following modes' the final worst mode were marked in boldface and recorded in this report.

◆ For Conducted Emission Test (AC Mains)

Test Mode	TEST VOLTAGE	Remark	Model
Grid Mode(Full Load) + RS485 Data Acquisition	**DC 520V; AC 400V**	**Class B**	**SUN2000-60KTL-M0**
Grid Mode(Full Load) + RS485 Data Acquisition	DC 600V; AC 400V		
Grid Mode(Full Load) + RS485 Data Acquisition	DC 800V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 200V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 600V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 1000V; AC 400V		
Standby + RS 485	DC 0V; AC 400V		
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**DC 520V; AC 480V**	**Class A**	
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 600V; AC 480V		
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 800V; AC 480V		
Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 200V; AC 480V		
Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 600V; AC 480V		

Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 1000V; AC 480V		
Standby + MBUS	DC 0V; AC 480V		

◆ For Conducted Emission Test (DC Mains)

Test Mode	TEST VOLTAGE	Remark	Model
Grid Mode(Full Load) + RS485 Data Acquisition	**DC 520V; AC 400V**	**Class B**	**SUN2000-60KTL-M0**
Grid Mode(Full Load) + RS485 Data Acquisition	DC 600V; AC 400V		
Grid Mode(Full Load) + RS485 Data Acquisition	DC 800V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 200V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 600V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 1000V; AC 400V		
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**DC 520V; AC 480V**	**Class A**	
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 600V; AC 480V		
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 800V; AC 480V		
Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 200V; AC 480V		
Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 600V; AC 480V		

Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 1000V; AC 480V		

◆ Conducted Emissions At Telecom Port Test

Test Mode	TEST VOLTAGE	Remark	Model
Grid Mode(Full Load) + RS485 Data Acquisition	**DC 520V; AC 400V**	**Class B**	**SUN2000-60KTL-M0**
Grid Mode(Full Load) + RS485 Data Acquisition	DC 650V; AC 400V		
Grid Mode(Full Load) + RS485 Data Acquisition	DC 800V; AC 400V		
RS485 Data Acquisition	DC 0V; AC 400V		

◆ For Radiated Emission Test (30~1000MHz)

Test Mode	TEST VOLTAGE	Remark	Model
Grid Mode(Full Load) + RS485 Data Acquisition	**DC 520V; AC 400V**	**Class B**	**SUN2000-60KTL-M0**
Grid Mode(Full Load) + RS485 Data Acquisition	DC 650V; AC 400V		
Grid Mode(Full Load) + RS485 Data Acquisition	DC 800V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 200V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 600V; AC 400V		
Grid Mode(10% Load) + RS485 Data Acquisition	DC 1000V; AC 400V		
RS485 Data Acquisition	DC 0V; AC 400V		
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**DC 520V; AC 480V**	**Class A**	
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 600V; AC 480V		
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 800V; AC 480V		
Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 1000V; AC 480V		
Grid Mode(10% Load) + MBUS Data Acquisition + USB Smart Dongle	DC 200V; AC 480V		
MBUS Data Acquisition + USB Smart Dongle	DC 0V; AC 480V		

◆ For Radiated Emission Test (1000~6000MHz)

Test Mode	TEST VOLTAGE	Model
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 720V; AC 480V	SUN2000-60KTL-M0

◆ For H/F Emission Tests

Test Mode	TEST VOLTAGE	Model
Grid Mode(Full Load) + RS485 Data Acquisition	DC 625V; AC 400V	SUN2000-60KTL-M0
Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	DC 620V; AC 480V	

◆ For Surge Immunity Tests

Test Mode	TEST VOLTAGE	Model
Grid Mode(10% Load) + RS485 Data Acquisition	DC 600V; AC 400V	SUN2000-60KTL-M0
Grid Mode(10% Load) + MBUS Power On + USB Smart Dongle	DC 600V; AC 400V	

◆ For Other Immunity Tests

Test Mode	TEST VOLTAGE	Model
Grid Mode(10% Load) + RS485 Data Acquisition	DC 400V; AC 400V	SUN2000-60KTL-M0
Grid Mode(10% Load) + MBUS Power On + USB Smart Dongle	DC 400V; AC 400V	

2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT has been tested and complied with the requirements of the following standards:

EN 55011:2016 + A11:2020 (Group 1)
CISPR11:2015 + A1:2016 + A2:2019 (Group 1)
EN 62920:2017
IEC 62920:2017
EN 61000-6-3:2007 + A1:2011(*)
EN IEC 61000-6-4:2019(*)
IEC 61000-6-3:2006 + A1:2010(*)
IEC 61000-6-4:2018(*)
EN 61000-3-12:2011
IEC 61000-3-12:2011
EN IEC 61000-3-11:2019
IEC 61000-3-11:2017
EN IEC61000-6-1:2019
EN IEC 61000-6-2:2019
IEC 61000-6-1:2016
IEC 61000-6-2:2016
IEC 61000-4-2:2008
IEC 61000-4-3:2006 + A1:2007 + A2:2010
IEC 61000-4-4:2012
IEC 61000-4-5:2014 + A1:2017
IEC 61000-4-6:2013
IEC 61000-4-8:2009
IEC 61000-4-34:2009 ED. 1.1

Notes: 1. All applicable tests have been performed and recorded as per the above standards.

2. * The MBUS communication mode or AC 480V power supply mode of Solar Inverter is not apply to this standard.

2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an dependent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Personal Computer	HP	HP8200	4C1345N8L	N/A
2	Smart Logger	HUAWEI	SmartLogger2000-10	2102311HJB10FB000072	N/A
3	Transformer	Jiang Xi QiYuan Manufrcture Co.,LTD	SGL_100	DT0357	N/A
4	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17102216	N/A
5	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17072163	N/A
6	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE16161451	N/A
7	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17122260	N/A
8	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17072159	N/A
9	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17082183	N/A
10	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17072173	N/A
11	Programmable DC Power Supply	KEYSIGHT	N8957APV	DE17072175	N/A
12	USB Smart Dongle	HUAWEI	SDongleA-02-CN	2102312DHC10J6000116	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 1.8m; DC Line: Unshielded, Undetachable 1.5m.
2	MBUS Cable: Unshielded, Detachable 10m; RJ45 Cable: Shielded or Unshielded, Detachable 10m; RS485 Cable: Shielded, Detachable 10m.
3	N/A
4-11	AC Line: Unshielded, Detachable 1.8m; DC Line: Unshielded, Detachable 1.5m
12	N/A

Remarks: Personal Computer, Smart Logger Unit and Programmable DC Power Supply is distal support units.

3 EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

EN 61000-6-3, EN IEC 61000-6-4

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note: (1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Disturbance voltage limits for class A equipment measured on a test site (a.c. mains power port)

Frequency range MHz	**Rated power of ≤ 20 kVA**		**Rated power of > 20 kVA** [a]		**High power electronic systems and equipment, rated power of > 75 kVA** [b]	
	Quasi-peak dB(μV)	**Average** dB(μV)	**Quasi-peak** dB(μV)	**Average** dB(μV)	**Quasi-peak** dB(μV)	**Average** dB(μV)
0,15 to 0,50	79	66	100	90	130	120
0,50 to 5	73	60	86	76	125	115
5 to 30	73	60	90 to 73 (Decreasing linearly with logarithm of frequency)	80 to 60 (Decreasing linearly with logarithm of frequency)	115	105

At the transition frequency, the more stringent limit shall apply.

For class A PCE intended to be connected solely to isolated neutral or high impedance earthed (IT) industrial power distribution networks (see IEC 60364-1), the limits for equipment with a rated power > 75 kVA can be applied.

Limits only apply to low voltage AC mains power ports.

Selection of the appropriate set of limits shall be based on the rated AC power stated by the manufacturer.

[a] These limits apply to equipment with a rated power > 20 kVA and intended to be connected to a dedicated power transformer or generator, and which is not connected to low voltage (LV) overhead power lines. For PCE not intended to be connected to a user specific power transformer, the limits for ≤ 20 kVA apply. The manufacturer, and/or supplier shall provide information on installation measures that can be used to reduce emissions from the installed PCE. In particular it shall be indicated that this PCE is intended to be connected to a dedicated power transformer or generator and not to LV overhead power lines.

[b] These limits apply only to high power electronic systems and equipment with a rated power greater than 75 kVA when intended to be installed as follows:

- installation is supplied from a dedicated power transformer or generator, and which is not connected to LV overhead power lines;
- installation is physically separated from residential environments by distance greater than 30 m or by a structure which acts as a barrier to radiated phenomena;
- the manufacturer and/or supplier shall indicate that this equipment meets the disturbance voltage limits for high power electronic systems and equipment of rated input power > 75 kVA and provide information on installation measures to be applied by the installer. In particular, it shall be indicated that this PCE is intended to be used in an installation which is powered by a dedicated power transformer or generator and not by LV overhead power lines.

NOTE: (1) The lower limit shall apply at the transition frequencies

Disturbance voltage limits for class B equipment measured on a test site (a.c. mains power port)

Frequency range MHz	**Quasi-peak** dB(μV)	**Average** dB(μV)
0,15 to 0,50	66 Decreasing linearly with logarithm of frequency to 56	56 Decreasing linearly with logarithm of frequency to 46
0,50 to 5	56	46
5 to 30	60	50
At the transition frequency, the more stringent limit shall apply.		

Limits for conducted disturbances of class A equipment measured on a test site (d.c. power port)

Frequency range MHz	Rated power of ≤ 20 kVA		Rated power of > 20 kVA to ≤ 75 kVA		Rated power of > 75 kVA	
	Voltage limits		Voltage limits		Voltage limits	
	QP dB(μV)	AV dB(μV)	QP dB(μV)	AV dB(μV)	QP dB(μV)	AV dB(μV)
0,15 to 5	97 to 89	84 to 76	116 to 106	106 to 96	132 to 122	122 to 112
5 to 30	89	76	106 to 89	96 to 76	122 to 105	112 to 92
In certain frequency ranges, the limits in this table decrease linearly with logarithm of frequency. Selection of the appropriate set of limits shall be based on the rated AC power stated by the manufacturer.						

Limits for conducted disturbances of class B equipment measured on a test site (d.c. power port

Frequency range MHz	Quasi-peak dB(μV)	Average dB(μV)
0,15 to 0,50	84 Decreasing linearly with logarithm of frequency to 74	74 Decreasing linearly with logarithm of frequency to 64
0,50 to 30	74	64
The limits in this table may be subject to change in the next edition of this document when further experience has been gathered and investigations in modelling are concluded.		

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI3	101019	2020/07/03	2021/07/02
Artificial Mains Network	Rohde&Schwarz	ENV4200	100141	2020/02/26	2021/02/25
DC Artificial Network	SCHWARZBECK	PVDC 8301 RC	01000	2020/02/26	2021/02/25
DC Artificial Network	SCHWARZBECK	PVDC 8301	8301-37	2020/08/29	2021/08/28
DC Artificial Network	SCHWARZBECK	PVDC 8301	8301-35	2020/04/10	2021/04/09
100Ω Resistance	LUTHI	100Ω Resistance	370	2020/04/28	2021/04/27
Current probe	FCC	F-52	111659	2020/05/13	2021/05/12

NOTE: 1. The test was performed by witness in conducted shielding room of Shanghai Testing & Inspection Institute for Electrical Equipment
2. The test was performed in Conducted shielding room.

3.1.3 TEST PROCEDURE

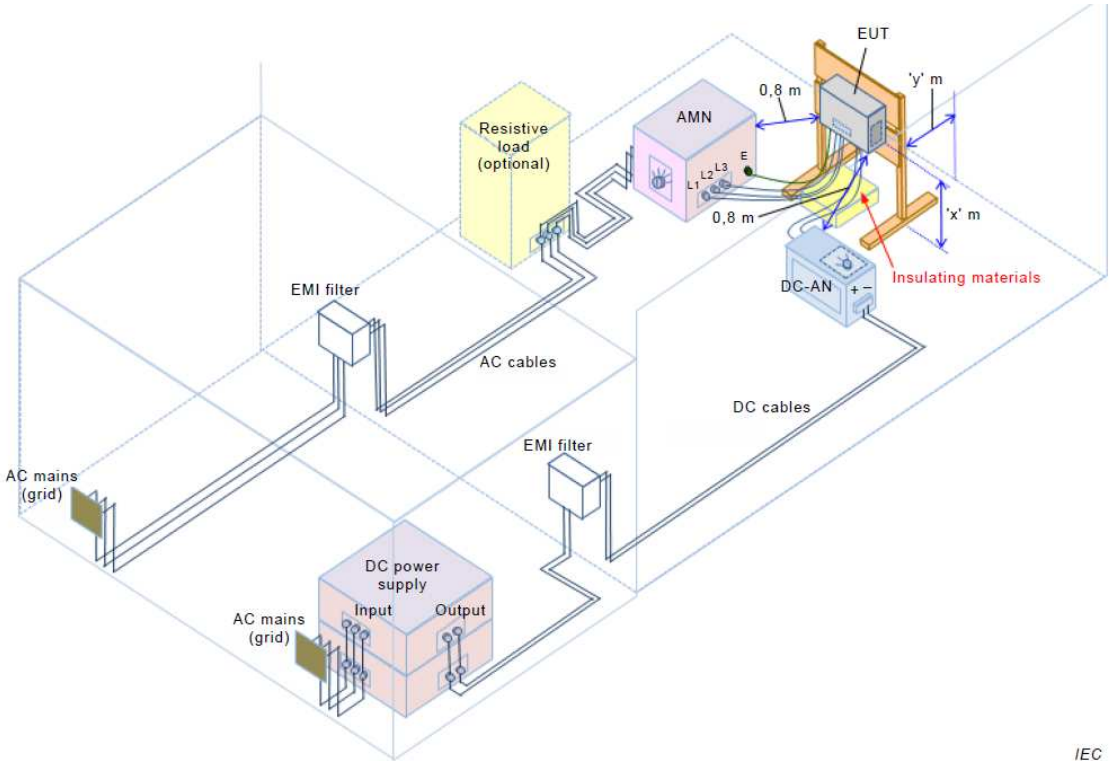
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. The artificial network for the assessment of disturbance voltages at d.c. power ports (DC-AN) provides a defined common mode (CM) 150 Ω termination impedance for the d.c. power port of the power converter under test during measurements of conducted RF disturbances at standardized test sites. It is constructed to provide, in the intended frequency range from 150 kHz to 30 MHz, well defined termination impedances for symmetric (or differential mode – DM) as well as asymmetric (or common mode – CM) disturbance components.

c. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
d. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) were not recorded.

3.1.4 DEVIATION FROM TEST STANDARD

No deviation

3.1.5 TEST SETUP



3.1.6 EUT OPERATING CONDITIONS

a. Turned on the power of all equipment.

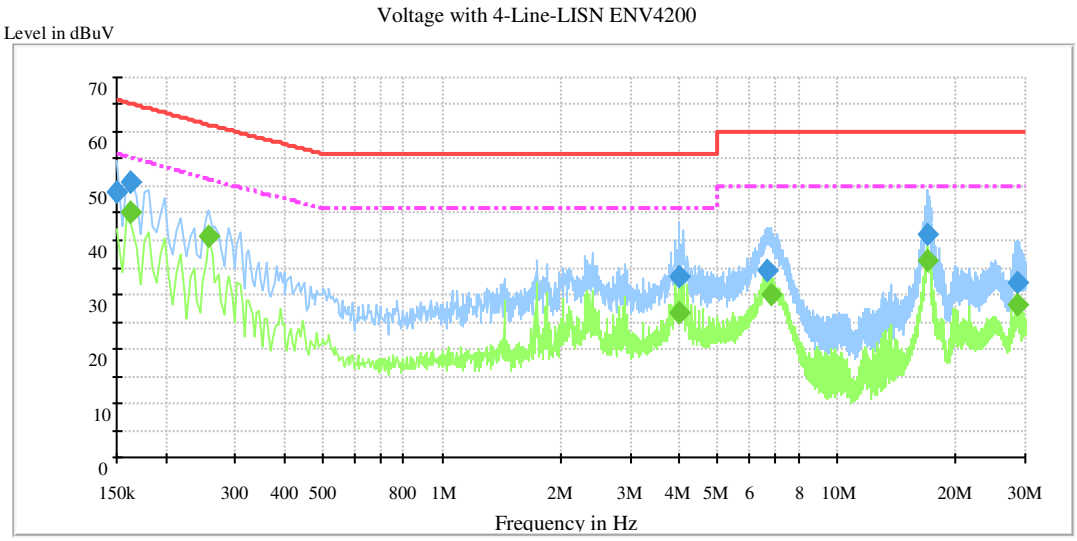
b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

3.1.7 TEST RESULTS

AC Mains

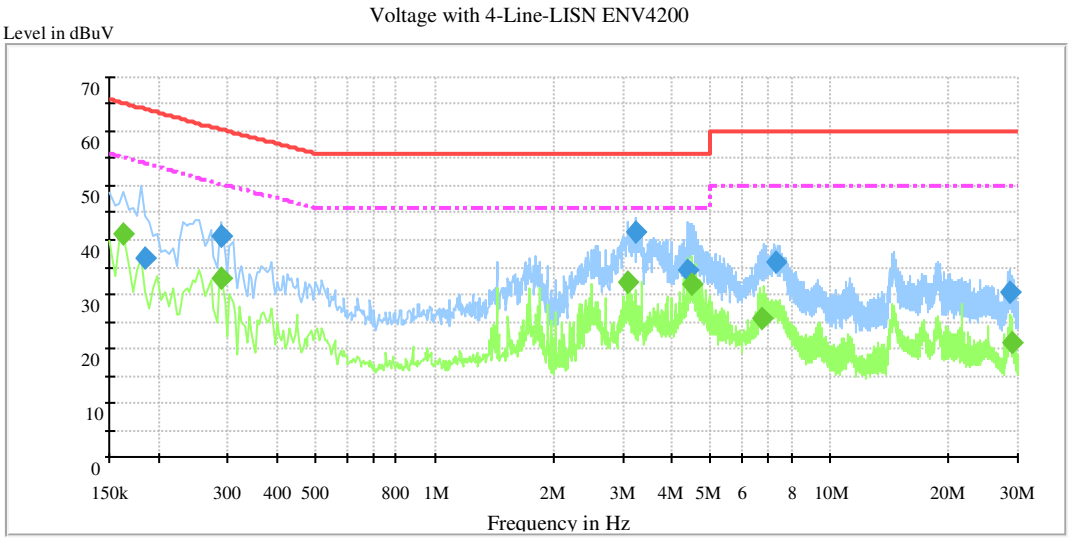
TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	Line (L1)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.150000	48.7	1000.0	9.000	GND	L1	21.2	17.3	66.0	
0.163500	50.7	1000.0	9.000	GND	L1	21.2	14.5	65.2	
3.986490	33.5	1000.0	9.000	GND	L1	21.1	22.5	56.0	
6.632805	34.4	1000.0	9.000	GND	L1	21.2	25.6	60.0	
16.949190	41.0	1000.0	9.000	GND	L1	21.4	19.0	60.0	
28.712212	32.1	1000.0	9.000	GND	L1	21.7	27.9	60.0	
Frequency (MHz)	**Average (dBµ V)**	**Meas. Time (ms)**	**Bandwidth (kHz)**	**PE**	**Line**	**Corr. (dB)**	**Margin (dB)**	**Limit (dBµ V)**	**Comment**
0.163500	45.0	1000.0	9.000	GND	L1	21.2	10.2	55.2	
0.258000	40.8	1000.0	9.000	GND	L1	21.1	10.5	51.3	
4.004490	26.8	1000.0	9.000	GND	L1	21.1	19.2	46.0	
6.789720	29.9	1000.0	9.000	GND	L1	21.2	20.1	50.0	
17.030235	36.2	1000.0	9.000	GND	L1	21.4	13.8	50.0	
28.797038	28.3	1000.0	9.000	GND	L1	21.7	21.7	50.0	



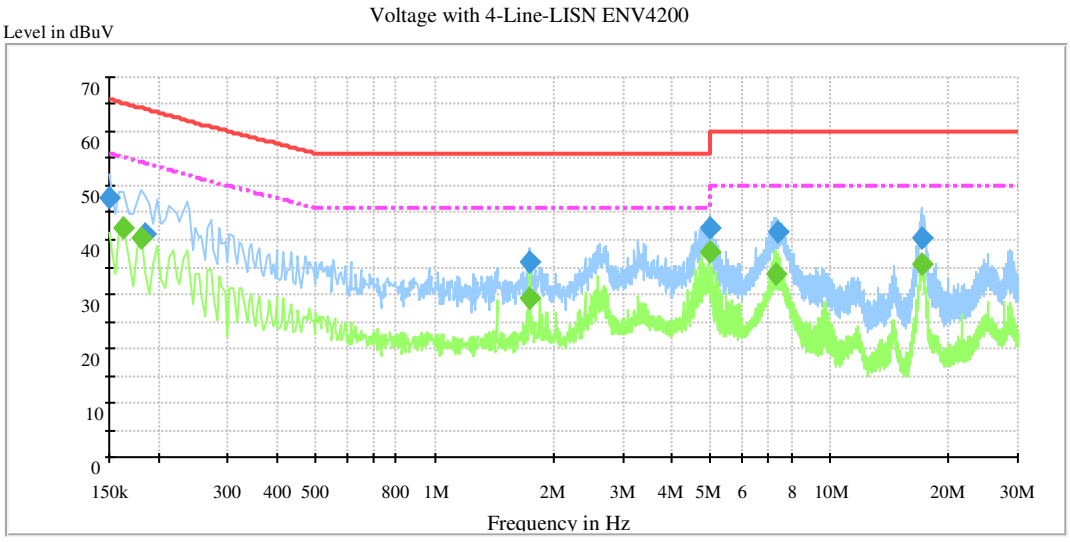
TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	Line (L2)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.186000	36.6	1000.0	9.000	GND	L2	21.2	27.5	64.1	
0.289500	40.7	1000.0	9.000	GND	L2	21.1	19.6	60.3	
3.220905	41.5	1000.0	9.000	GND	L2	21.2	14.5	56.0	
4.367078	34.5	1000.0	9.000	GND	L2	21.2	21.5	56.0	
7.268678	35.8	1000.0	9.000	GND	L2	21.2	24.2	60.0	
28.658708	30.5	1000.0	9.000	GND	L2	21.6	29.5	60.0	
Frequency (MHz)	**Average (dBµ V)**	**Meas. Time (ms)**	**Bandwidth (kHz)**	**PE**	**Line**	**Corr. (dB)**	**Margin (dB)**	**Limit (dBµ V)**	**Comment**
0.163500	41.2	1000.0	9.000	GND	L2	21.2	14.1	55.2	
0.289500	33.1	1000.0	9.000	GND	L2	21.1	17.2	50.3	
3.091058	32.1	1000.0	9.000	GND	L2	21.2	13.9	46.0	
4.479082	31.9	1000.0	9.000	GND	L2	21.2	14.1	46.0	
6.704558	25.5	1000.0	9.000	GND	L2	21.2	24.5	50.0	
28.806015	21.0	1000.0	9.000	GND	L2	21.5	29.0	50.0	



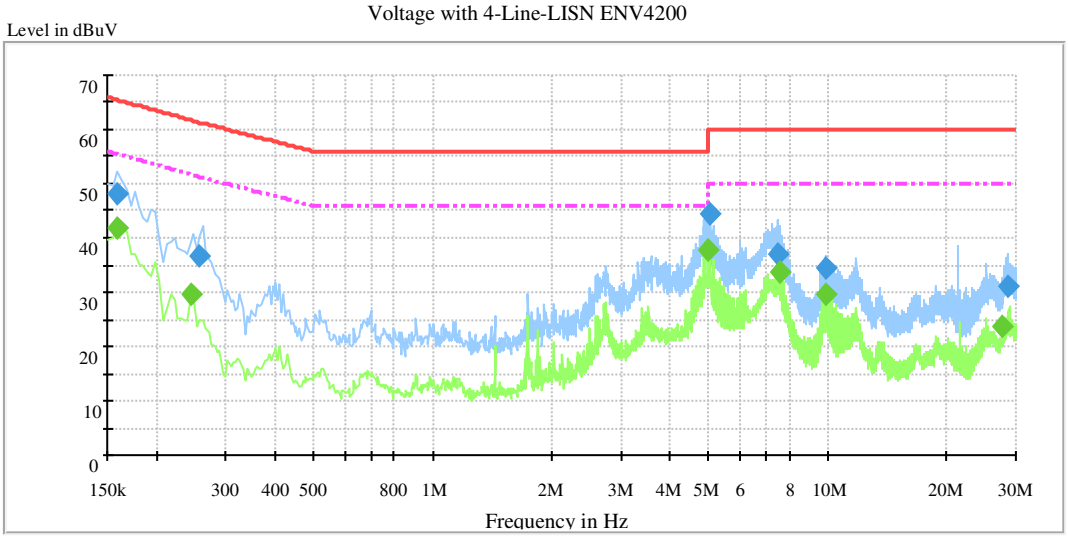
TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	Line (L3)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.150000	47.8	1000.0	9.000	GND	L3	21.2	18.2	66.0	
0.186000	41.0	1000.0	9.000	GND	L3	21.2	23.1	64.1	
1.743285	36.0	1000.0	9.000	GND	L3	21.1	20.0	56.0	
4.962698	42.1	1000.0	9.000	GND	L3	21.1	13.9	56.0	
7.362772	41.4	1000.0	9.000	GND	L3	21.2	18.6	60.0	
17.142038	40.4	1000.0	9.000	GND	L3	21.5	19.6	60.0	
Frequency (MHz)	**Average (dBµ V)**	**Meas. Time (ms)**	**Bandwidth (kHz)**	**PE**	**Line**	**Corr. (dB)**	**Margin (dB)**	**Limit (dBµ V)**	**Comment**
0.163500	42.4	1000.0	9.000	GND	L3	21.2	12.8	55.2	
0.181500	40.4	1000.0	9.000	GND	L3	21.2	13.9	54.3	
1.743285	29.3	1000.0	9.000	GND	L3	21.1	16.7	46.0	
4.944765	37.8	1000.0	9.000	GND	L3	21.1	8.2	46.0	
7.268655	33.6	1000.0	9.000	GND	L3	21.2	16.4	50.0	
17.222542	35.5	1000.0	9.000	GND	L3	21.5	14.5	50.0	



TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	NEUTRAL (N)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.159000	48.3	1000.0	9.000	GND	N	21.1	17.2	65.5	
0.258000	36.7	1000.0	9.000	GND	N	21.1	24.6	61.3	
5.056792	44.5	1000.0	9.000	GND	N	21.2	15.5	60.0	
7.474620	37.1	1000.0	9.000	GND	N	21.2	22.9	60.0	
9.923880	34.6	1000.0	9.000	GND	N	21.2	25.4	60.0	
28.554712	31.3	1000.0	9.000	GND	N	21.7	28.7	60.0	
Frequency (MHz)	**Average (dBµ V)**	**Meas. Time (ms)**	**Bandwidth (kHz)**	**PE**	**Line**	**Corr. (dB)**	**Margin (dB)**	**Limit (dBµ V)**	**Comment**
0.159000	41.8	1000.0	9.000	GND	N	21.1	13.7	55.5	
0.244500	29.7	1000.0	9.000	GND	N	21.1	22.0	51.7	
4.962765	37.6	1000.0	9.000	GND	N	21.1	8.4	46.0	
7.555148	33.7	1000.0	9.000	GND	N	21.2	16.4	50.0	
9.905880	29.5	1000.0	9.000	GND	N	21.2	20.5	50.0	
27.597000	23.9	1000.0	9.000	GND	N	21.7	26.1	50.0	

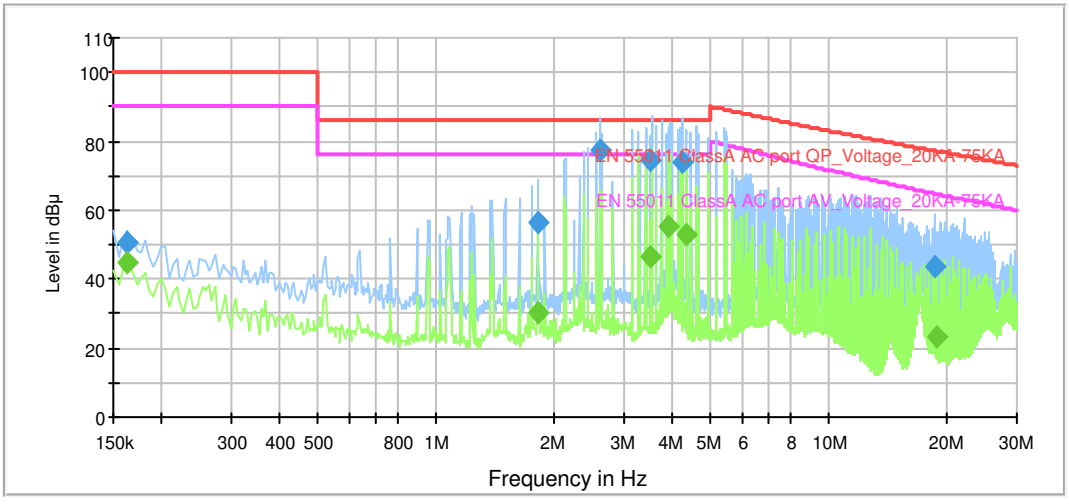


TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 480V	**PHASE**	Line (L1)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	50.4	1000.0	9.000	GND	L1	21.2	49.6	100.0	
1.801448	56.4	1000.0	9.000	GND	L1	21.1	29.6	86.0	
2.611920	77.2	1000.0	9.000	GND	L1	21.1	8.8	86.0	
3.502898	74.5	1000.0	9.000	GND	L1	21.1	11.5	86.0	
4.210500	73.7	1000.0	9.000	GND	L1	21.1	12.3	86.0	
18.525338	43.9	1000.0	9.000	GND	L1	21.4	33.3	77.2	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	44.6	1000.0	9.000	GND	L1	21.2	45.4	90.0	
1.819448	30.5	1000.0	9.000	GND	L1	21.1	45.5	76.0	
3.502898	46.6	1000.0	9.000	GND	L1	21.1	29.4	76.0	
3.905918	55.3	1000.0	9.000	GND	L1	21.1	20.7	76.0	
4.304370	53.2	1000.0	9.000	GND	L1	21.1	22.8	76.0	
18.668955	23.4	1000.0	9.000	GND	L1	21.4	41.4	64.7	

Voltage with 4-Line-LISN ENV4200

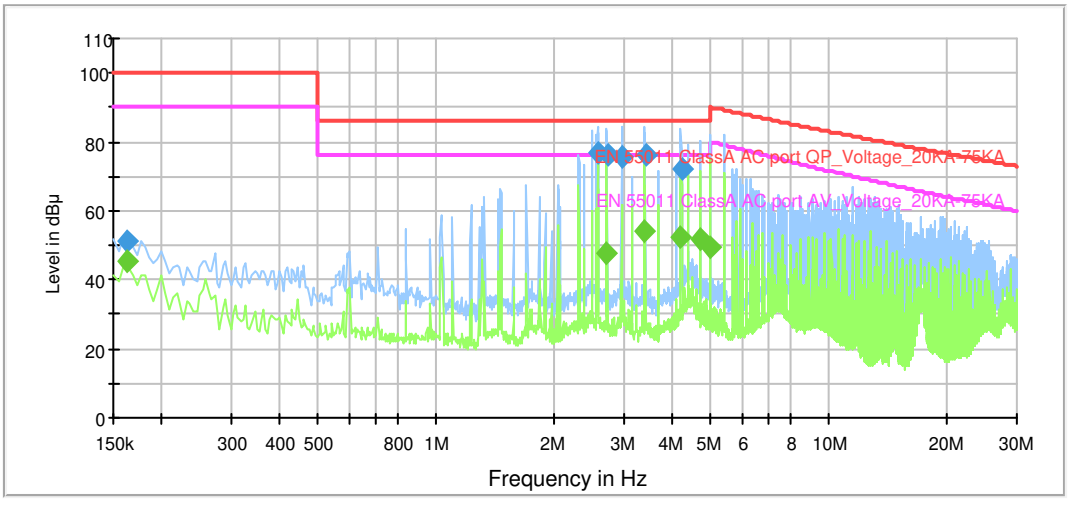


TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 520V AC 480V	PHASE	Line (L2)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	TESTED BY: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	51.1	1000.0	9.000	GND	L2	21.2	48.9	100.0	
2.562690	77.1	1000.0	9.000	GND	L2	21.1	8.9	86.0	
2.714948	76.3	1000.0	9.000	GND	L2	21.1	9.7	86.0	
2.961232	75.4	1000.0	9.000	GND	L2	21.1	10.6	86.0	
3.400050	76.4	1000.0	9.000	GND	L2	21.1	9.6	86.0	
4.210545	72.3	1000.0	9.000	GND	L2	21.1	13.7	86.0	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	45.7	1000.0	9.000	GND	L2	21.2	44.3	90.0	
2.701448	47.5	1000.0	9.000	GND	L2	21.1	28.5	76.0	
3.373095	54.0	1000.0	9.000	GND	L2	21.1	22.0	76.0	
4.192545	52.6	1000.0	9.000	GND	L2	21.1	23.4	76.0	
4.671660	51.8	1000.0	9.000	GND	L2	21.1	24.2	76.0	
4.962608	49.3	1000.0	9.000	GND	L2	21.1	26.7	76.0	

Voltage with 4-Line-LISN ENV4200

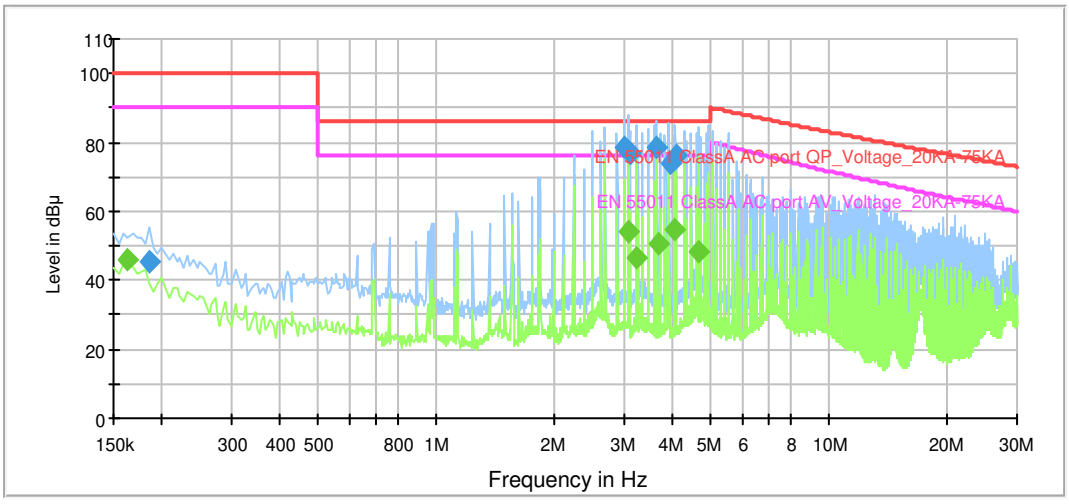


TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 480V	**PHASE**	Line (L3)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.186000	45.2	1000.0	9.000	GND	L3	21.1	54.8	100.0	
3.005985	78.5	1000.0	9.000	GND	L3	21.1	7.5	86.0	
3.094898	76.7	1000.0	9.000	GND	L3	21.1	9.3	86.0	
3.610358	78.6	1000.0	9.000	GND	L3	21.1	7.4	86.0	
3.914985	74.0	1000.0	9.000	GND	L3	21.1	12.0	86.0	
4.049288	76.0	1000.0	9.000	GND	L3	21.1	10.0	86.0	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	45.9	1000.0	9.000	GND	L3	21.2	44.1	90.0	
3.073102	54.4	1000.0	9.000	GND	L3	21.1	21.6	76.0	
3.234338	46.3	1000.0	9.000	GND	L3	21.1	29.7	76.0	
3.646643	50.9	1000.0	9.000	GND	L3	21.1	25.1	76.0	
4.026788	54.4	1000.0	9.000	GND	L3	21.1	21.6	76.0	
4.655160	48.6	1000.0	9.000	GND	L3	21.1	27.4	76.0	

Voltage with 4-Line-LISN ENV4200

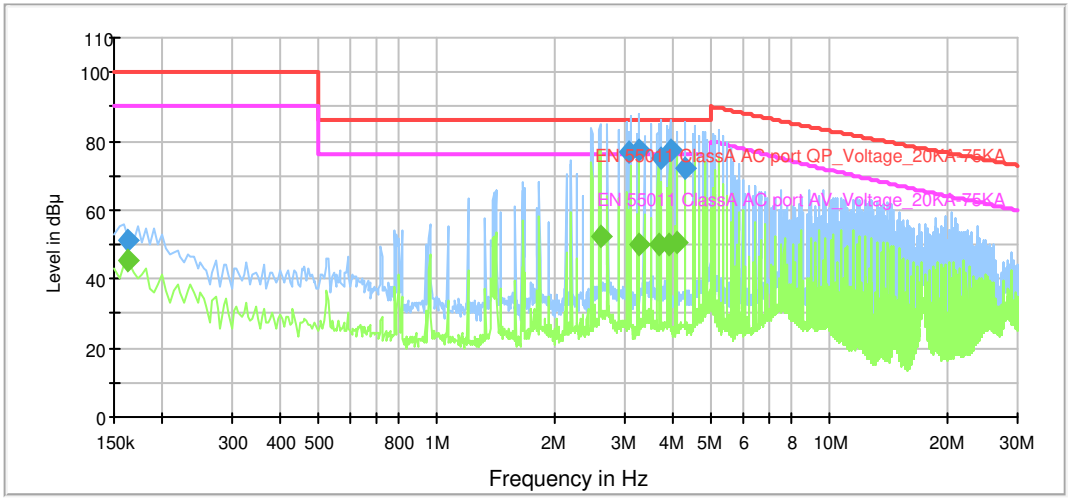


TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 480V	**PHASE**	NEUTRAL (N)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	51.2	1000.0	9.000	GND	N	21.2	48.8	100.0	
3.082012	76.7	1000.0	9.000	GND	N	21.1	9.3	86.0	
3.266753	77.5	1000.0	9.000	GND	N	21.1	8.5	86.0	
3.726952	74.9	1000.0	9.000	GND	N	21.1	11.1	86.0	
3.931560	77.2	1000.0	9.000	GND	N	21.1	8.8	86.0	
4.286618	72.1	1000.0	9.000	GND	N	21.1	13.9	86.0	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.163500	45.1	1000.0	9.000	GND	N	21.2	44.9	90.0	
2.594055	52.3	1000.0	9.000	GND	N	21.1	23.7	76.0	
3.266753	50.0	1000.0	9.000	GND	N	21.1	26.0	76.0	
3.650768	50.2	1000.0	9.000	GND	N	21.1	25.8	76.0	
3.892440	50.2	1000.0	9.000	GND	N	21.1	25.8	76.0	
4.067175	50.5	1000.0	9.000	GND	N	21.1	25.5	76.0	

Voltage with 4-Line-LISN ENV4200



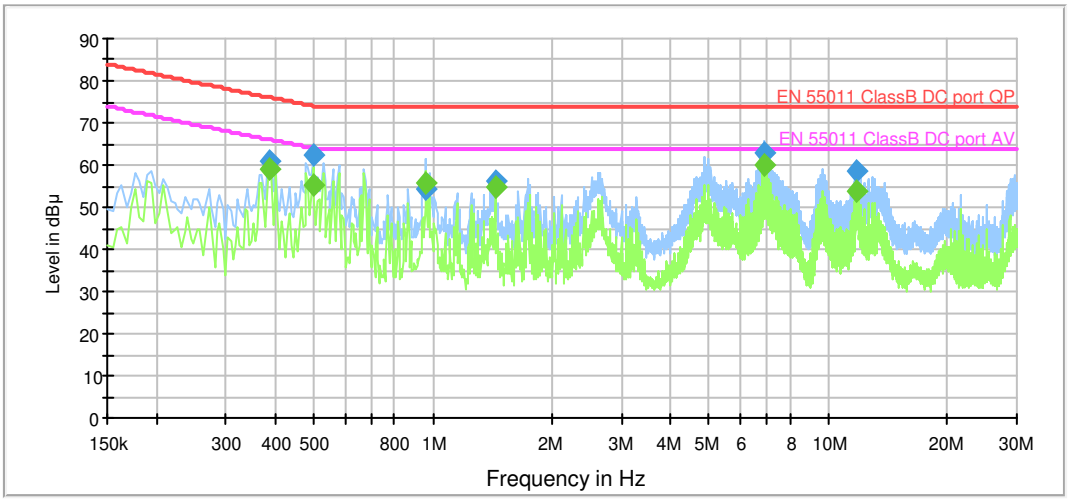
DC Mains

TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	Line (+)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.384000	60.8	1000.0	9.000	Off	+	40.4	23.6	81.7	
0.496499	62.3	1000.0	9.000	Off	+	38.9	13.6	74.0	
0.959700	54.4	1000.0	9.000	Off	+	39.2	18.4	74.0	
1.438792	56.4	1000.0	9.000	Off	+	39.2	17.8	74.0	
6.883590	63.0	1000.0	9.000	Off	+	39.2	16.6	74.0	
11.844862	58.8	1000.0	9.000	Off	+	39.4	17.0	74.0	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.384000	59.1	1000.0	9.000	Off	+	28.9	7.0	66.1	
0.496499	55.3	1000.0	9.000	Off	+	28.8	8.7	64.1	
0.959700	55.8	1000.0	9.000	Off	+	28.8	8.2	64.0	
1.438792	55.0	1000.0	9.000	Off	+	28.8	9.0	64.0	
6.883590	59.8	1000.0	9.000	Off	+	29.0	4.2	64.0	
11.844772	53.9	1000.0	9.000	Off	+	29.3	10.1	64.0	

Voltage with 2-Line-LISN PVDC8301

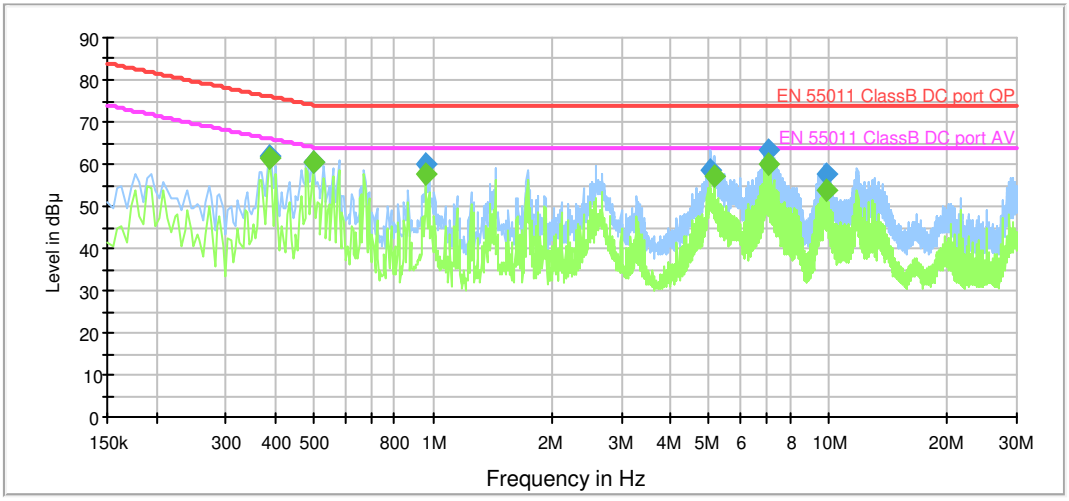


TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	Line (-)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.384000	61.9	1000.0	9.000	Off	-	28.9	14.2	76.1	
0.496499	60.5	1000.0	9.000	Off	-	28.8	13.5	74.1	
0.959700	59.9	1000.0	9.000	Off	-	28.8	14.1	74.0	
5.038702	58.4	1000.0	9.000	Off	-	29.1	15.6	74.0	
7.076122	63.4	1000.0	9.000	Off	-	29.0	10.6	74.0	
9.905970	57.7	1000.0	9.000	Off	-	29.0	16.3	74.0	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.384000	61.2	1000.0	9.000	Off	-	28.9	4.9	66.1	
0.496499	60.3	1000.0	9.000	Off	-	28.8	3.8	64.1	
0.959700	57.7	1000.0	9.000	Off	-	28.8	6.3	64.0	
5.155320	57.2	1000.0	9.000	Off	-	29.1	6.8	64.0	
7.076122	60.2	1000.0	9.000	Off	-	29.0	3.8	64.0	
9.955530	53.6	1000.0	9.000	Off	-	29.0	10.4	64.0	

Voltage with 2-Line-LISN PVDC8301

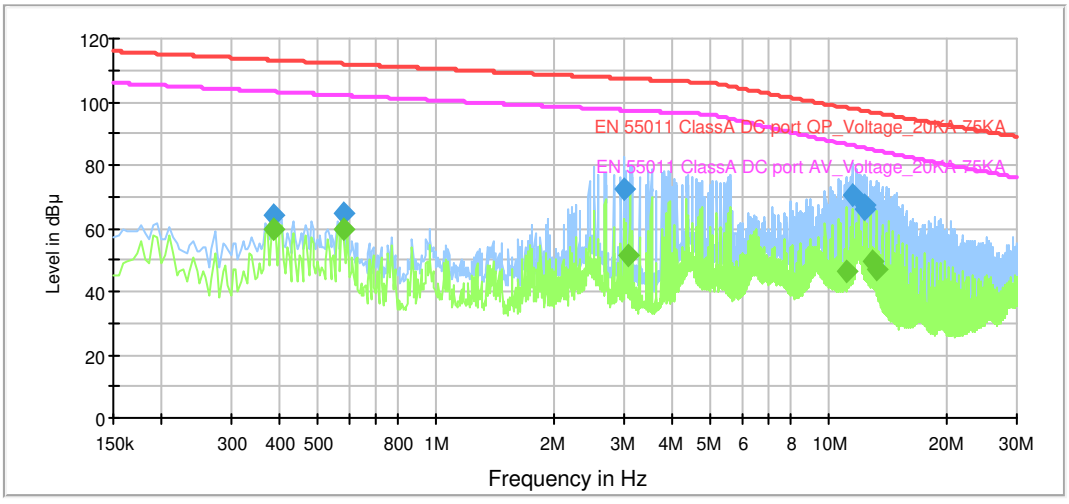


TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 480V	**PHASE**	Line (+)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.384000	64.2	1000.0	9.000	Off	+	28.9	49.0	113.2	
0.577500	64.6	1000.0	9.000	Off	+	28.8	47.4	112.0	
3.001485	72.4	1000.0	9.000	Off	+	29.0	35.0	107.4	
11.405978	70.4	1000.0	9.000	Off	+	29.2	27.4	97.8	
12.247680	66.2	1000.0	9.000	Off	+	29.3	31.0	97.1	
12.350708	67.1	1000.0	9.000	Off	+	29.3	30.0	97.0	

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.384000	59.4	1000.0	9.000	Off	+	28.9	43.8	103.2	
0.577500	59.9	1000.0	9.000	Off	+	28.8	42.1	102.0	
3.086512	51.3	1000.0	9.000	Off	+	29.1	46.0	97.3	
11.088210	46.3	1000.0	9.000	Off	+	29.2	40.2	86.5	
12.816615	49.4	1000.0	9.000	Off	+	29.4	35.5	84.9	
13.219455	47.0	1000.0	9.000	Off	+	29.4	37.6	84.6	

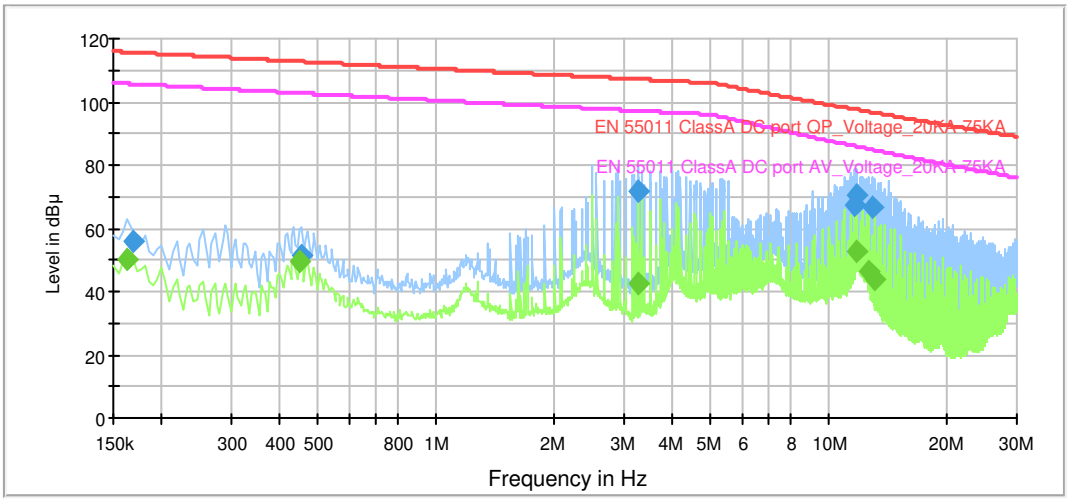
Voltage with 2-Line-LISN PVDC8301



TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**6dB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 520V AC 480V	**PHASE**	Line (-)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.168000	55.6	1000.0	9.000	Off	-	30.5	60.1	115.7	
0.451500	51.6	1000.0	9.000	Off	-	28.8	61.2	112.8	
3.247770	72.0	1000.0	9.000	Off	-	29.1	35.2	107.2	
11.638808	67.2	1000.0	9.000	Off	-	29.3	30.4	97.6	
11.669902	70.3	1000.0	9.000	Off	-	29.3	27.3	97.6	
12.937530	66.7	1000.0	9.000	Off	-	29.4	29.9	96.6	
Frequency (MHz)	**Average (dBµ V)**	**Meas. Time (ms)**	**Bandwidth (kHz)**	**PE**	**Line**	**Corr. (dB)**	**Margin (dB)**	**Limit (dBµ V)**	**Comment**
0.163500	50.4	1000.0	9.000	Off	-	30.6	55.3	105.7	
0.447000	49.6	1000.0	9.000	Off	-	28.8	53.2	102.8	
3.261270	42.7	1000.0	9.000	Off	-	29.1	54.5	97.2	
11.674402	52.5	1000.0	9.000	Off	-	29.3	33.5	86.0	
12.561105	46.6	1000.0	9.000	Off	-	29.4	38.5	85.1	
12.999945	43.9	1000.0	9.000	Off	-	29.4	40.9	84.8	

Voltage with 2-Line-LISN PVDC8301



3.2 CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS

3.2.1 LIMIT OF CONDUCTED COMMON MODE DISTURBANCE AT TELECOMMUNICATION PORTS

TEST STANDARD: EN 61000-6-3, EN IEC 61000-6-4, EN 62920

FOR CLASS A EQUIPMENT

FREQUENCY (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 – 87	84 - 74	53 – 43	40 – 30
0.5 - 30.0	87	74	43	30

FOR CLASS B EQUIPMENT

FREQUENCY (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74	74 - 64	40 – 30	30 – 20
0.5 - 30.0	74	64	30	20

NOTE: (1)The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI3	101019	2020/07/03	2021/07/02
Artificial Mains Network	Rohde&Schwarz	ENV4200	100141	2020/02/26	2021/02/25
DC Artificial Network	SCHWARZBECK	PVDC 8301 RC	01000	2020/02/26	2021/02/25
DC Artificial Network	SCHWARZBECK	PVDC 8301	8301-37	2020/08/29	2021/08/28
DC Artificial Network	SCHWARZBECK	PVDC 8301	8301-35	2020/04/10	2021/04/09
100Ω Resistance	LUTHI	100Ω Resistance	370	2020/04/28	2021/04/27
Current probe	FCC	F-52	111659	2020/05/13	2021/05/12

NOTE: 1. The test was performed by witness in conducted shielding room of Shanghai Testing & Inspection Institute for Electrical Equipment.
2. The test was performed in Conducted shielding room.

3.2.3 TEST PROCEDURE

For using ISN:

a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to ISN directly to reference ground plane.

b. If voltage measurement is used, measure voltage at the measurement port of the ISN, correct the reading by adding the ISN voltage division factor, and compare to the voltage limit.

c. If current measurement is used, measure current with the current probe and compare to the current limit.

d. It is not necessary to apply the voltage and the current limit if the ISN is used. A 50 Ω load has to be connected to the measurement port of the ISN during the current measurement.

e. The disturbance levels and the frequencies of at least six highest disturbances are recorded from be measured each telecommunication port, which comprises the EUT.

For using a 150 Ω load to the outside surface of the shield cable:

a. Break the insulation and connect a 150 Ω resistor from the outside surface of the shield cable to ground, and apply a ferrite tube or clamp between 150Ω connection and AE.

b. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AE with the shield cable.

c. Measure current with a current probe and compare to the current limit. The common mode impedance towards the right of the 150Ω resistor.

d. The disturbance levels and the frequencies of at least six highest disturbances are recorded from be measured each telecommunication port, which comprises the EUT.

For using a combination of current probe and capacitive voltage probe:

a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AE with a cable. The cable contains more than four balanced pairs or to unbalanced cable.

b. Measure current with a current probe and compare to the current limit.

c. Measure voltage with a capacitive probe and adjust the measured voltage as follows:

d. – current margin ≤ 6 dB – subtract the actual current margin from measured voltage;

e. – current margin > 6 dB – subtract 6 dB from measured voltage.

f. Compare adjusted voltage with the applicable voltage limit.

g. Both the measured current and the adjusted voltage shall be below the applicable current and voltage limits.

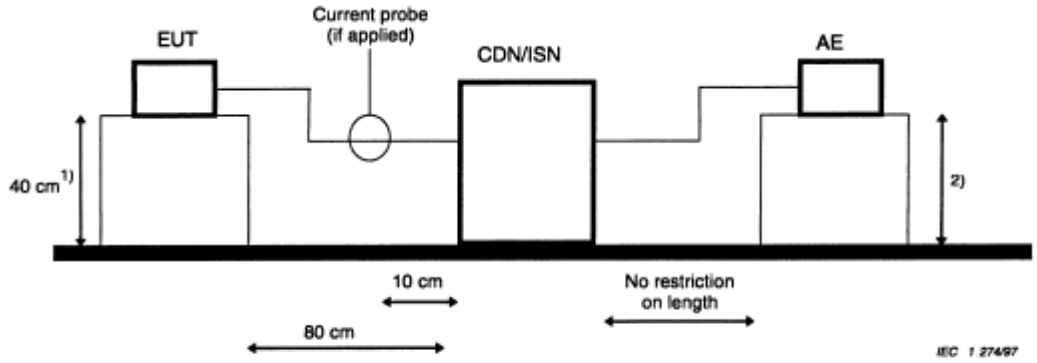
h. The disturbance levels and the frequencies of at least six highest disturbances are recorded from be measured each telecommunication port, which comprises the EUT.

3.2.4 DEVIATION FROM TEST STANDARD

No deviation

3.2.5 TEST SETUP

For using ISN:

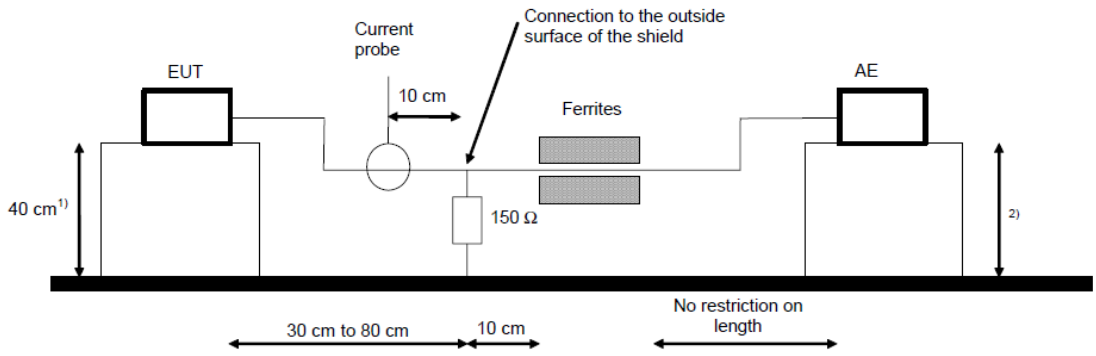


AE = Associated equipment
EUT = Equipment under test

1) Distance to the reference groundplane (vertical or horizontal).

2) Distance to the reference groundplane is not critical.

For using a 150 Ω load to the outside surface of the shield cable:

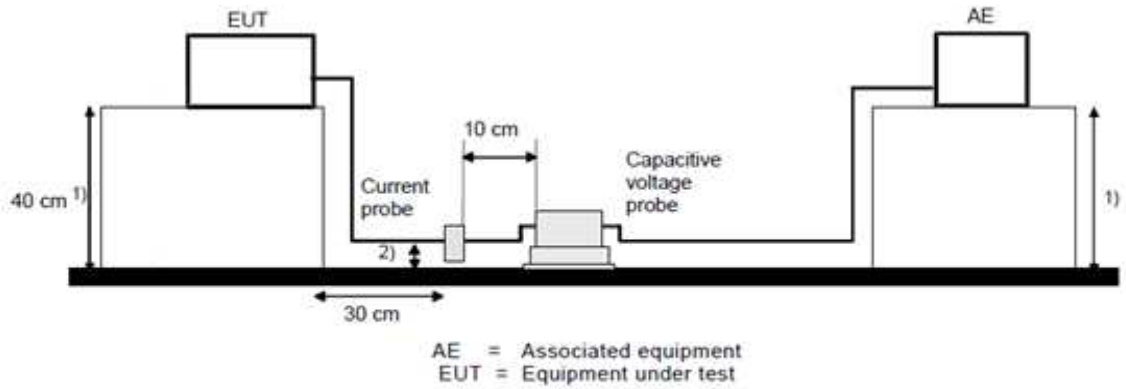


AE = Associated equipment
EUT = Equipment under test

1) Distance to the reference groundplane (vertical or horizontal).

2) Distance to the reference groundplane is not critical.

For using a combination of current probe and capacitive voltage probe:



1) Distance to the reference groundplane (vertical or horizontal)

2) Distance 4 ± 1 cm from the reference groundplane

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

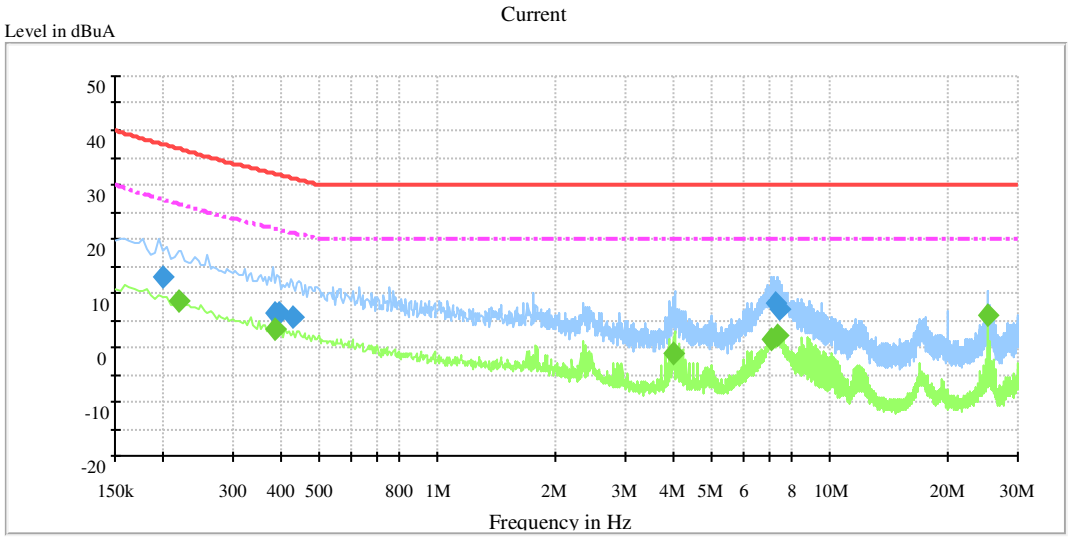
3.2.6 EUT OPERATING CONDITIONS

Same as item 3.1.6

3.2.7 TEST RESULTS

TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**6dB BANDWIDTH**	9kHz
TEST VOLTAGE	DC 520V AC 400V	**PHASE**	RS485 PORT (RJ45 Cable)
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	**TEST BY**	Wang Jia

Frequency (MHz)	Quasi-Peak (dBµ A)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin (dB)	Limit (dBµ A)	Comment
0.199500	13.0	1000.0	9.000	12.1	24.3	37.4	
0.383999	6.4	1000.0	9.000	7.4	25.5	32.0	
0.392999	6.2	1000.0	9.000	7.3	25.6	31.8	
0.424500	5.7	1000.0	9.000	6.8	25.5	31.2	
7.219560	8.2	1000.0	9.000	-5.0	21.8	30.0	
7.385205	6.9	1000.0	9.000	-5.1	23.1	30.0	
Frequency (MHz)	**Average (dBµ A)**	**Meas. Time (ms)**	**Bandwidth (kHz)**	**Corr. (dB)**	**Margin (dB)**	**Limit (dBµ A)**	**Comment**
0.217500	8.4	1000.0	9.000	11.5	18.1	26.5	
0.383999	3.4	1000.0	9.000	7.4	18.5	21.9	
3.999990	-1.3	1000.0	9.000	-3.2	21.3	20.0	
7.089465	1.6	1000.0	9.000	-5.0	18.4	20.0	
7.313520	2.3	1000.0	9.000	-5.0	17.7	20.0	
25.196970	5.8	1000.0	9.000	-7.1	14.2	20.0	



3.3 RADIATED EMISSION MEASUREMENT

3.3.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: EN 61000-6-3, EN 61000-6-4 FOR FREQUENCY BELOW 1000 MHz

FREQUENCY (MHz)	Class A (at 10m) Quasi-Peak (dBuV/m)	Class B (at 10m) Quasi-Peak (dBuV/m)
30 – 230	40	30
230 – 1000	47	37

EN 55011, EN 62920

Electromagnetic radiation disturbance limits for Class A:

Frequency range MHz	10 m measuring distance rated power of ≤ 20 kVA [c] Quasi-peak dB(μV/m)	10 m measuring distance rated power of > 20 kVA [a, c] Quasi-peak dB(μV/m)	3 m measuring distance [b] rated power of ≤ 20 kVA [c] Quasi-peak dB(μV/m)	3 m measuring distance [b] rated power of > 20 kVA [a, c] Quasi-peak dB(μV/m)
30 to 230	40	50	50	60
230 to 1 000	47	50	57	60

On a test site, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.16. In case of measurements at a separation distance of 30 m, an inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

At the transition frequency, the more stringent limit shall apply.

[a] These limits apply to equipment with a rated power of > 20 kVA and intended to be used at locations where there is a distance greater than 30 m between the equipment and third party sensitive radio communications. The manufacturer shall indicate in the technical documentation that this equipment is intended to be used at locations where the separation distance to third party sensitive radio services is > 30 m. If these conditions are not met, then the limits for ≤ 20 kVA apply.

[b] The 3 m separation distance applies only to small equipment meeting the size criterion defined in 3.16.

[c] Selection of the appropriate set of limits shall be based on the rated AC power stated by the manufacturer.

Electromagnetic radiation disturbance limits for Class B:

Frequency range MHz	10 m measuring distance Quasi-peak dB(μV/m)	3 m measuring distance [a] Quasi-peak dB(μV/m)
30 to 230	30	40
230 to 1 000	37	47

On a test site, class B equipment can be measured at a nominal distance of 3 m or 10 m.

At the transition frequency, the more stringent limit shall apply.

[a] The 3 m separation distance applies only to small equipment meeting the size criterion defined in 3.16.

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1 to 3	76	56	70	50
3 to 6	80	60	74	54

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Receiver	Agilent	N9038A	MY51210233	2020/04/27	2021/04/26
Spectrum Analyzer	Agilent	E4447A	MY52090002	2020/08/28	2021/08/27
Bilog antenna(30M-1G)	SCHWARZBECK	VULB 9163	548	2020/08/29	2021/08/28
Bilog antenna(30M-1G)	SCHWARZBECK	VULB 9163	549	2020/06/30	2021/06/29

NOTE: 1.The test was performed by witness in 10m chamber of Reliability Laboratory of Huawei Technologies Co., Ltd.
2. The test was performed in 10m Chamber.

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test receiver	R&S	ESU40	100303	2018/5/2	2019/5/1
Horn antenna	SCHWARZBECK	BBHA9120D	878	2017/5/20	2019/5/19
MICROWAVE POWER AMPLIFIER	RongXiang	PAP-1G18G	7616	2018/7/23	2019/7/22
switch	R&S	OSP120	100306	N/A	N/A

NOTE: 1.The test was performed by witness in 10m chamber of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in 3m Chamber.

3.3.3 TEST PROCEDURE

<Frequency Range below 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier)
4. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier)
5. Margin value = Emission level – Limit value..

<Frequency Range above 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna can be varied from one meter-to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above
1 GHz.

NOTE:

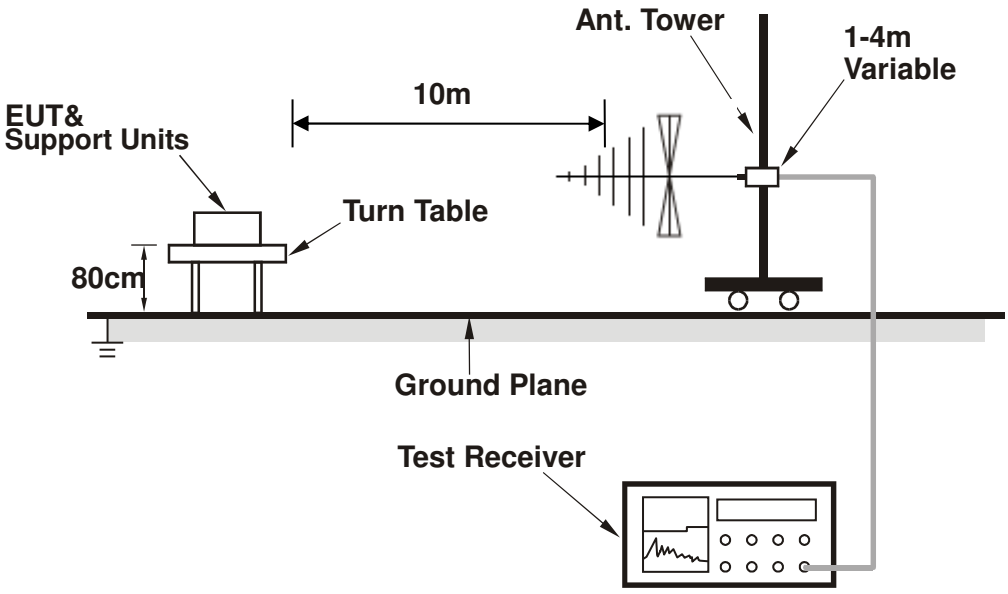
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
3. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier)
5. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier)
6. Margin value = Emission level – Limit value.

3.3.4 DEVIATION FROM TEST STANDARD

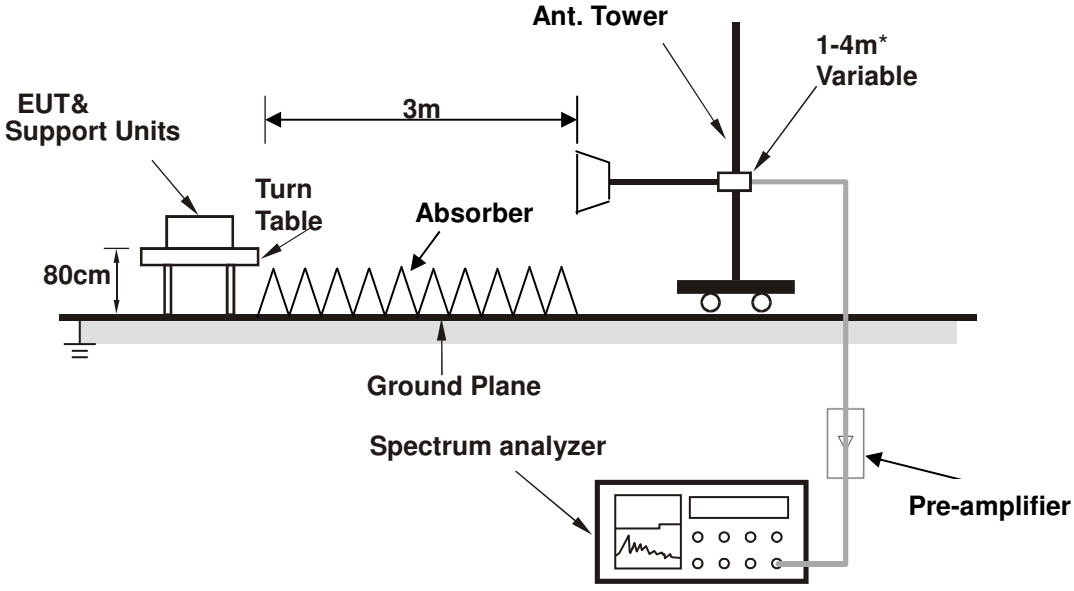
No deviation

3.3.5 TEST SETUP

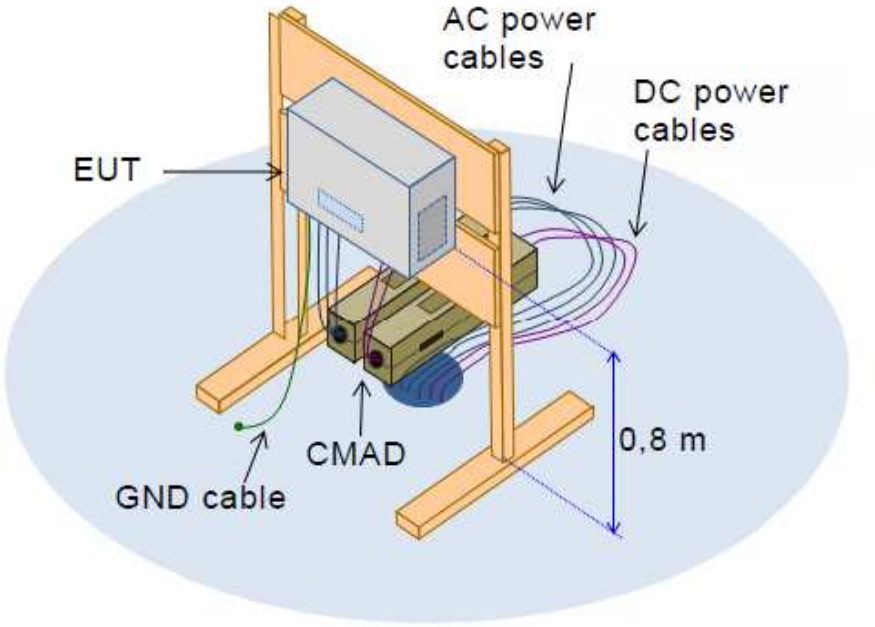
<Frequency Range below 1GHz>

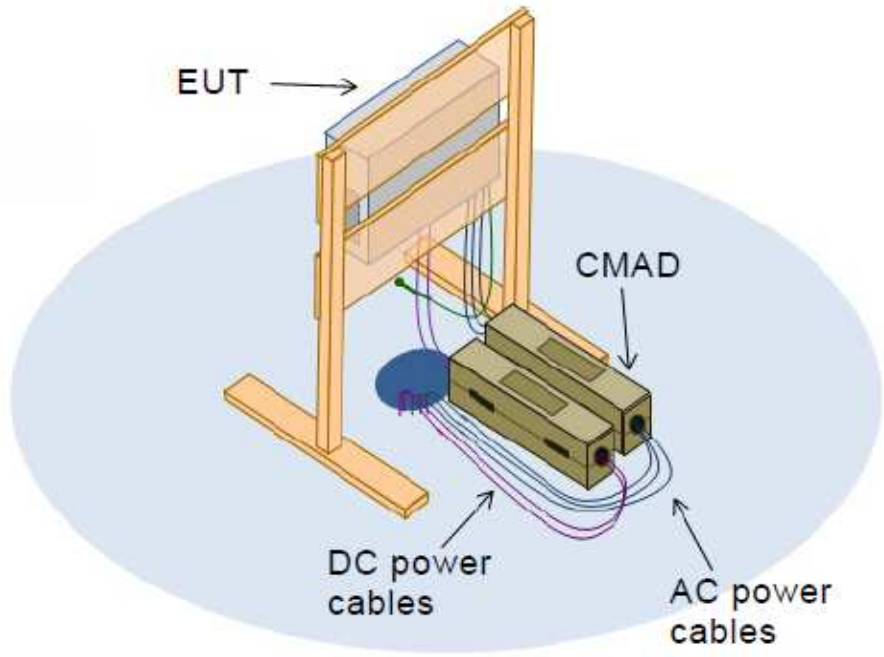


<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.





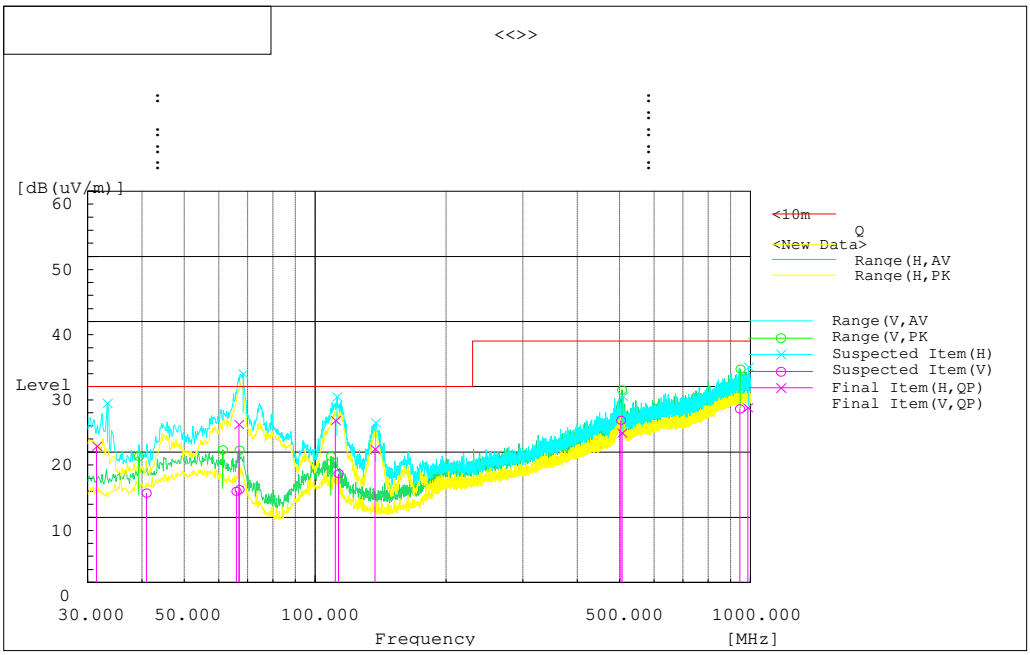
3.3.6 EUT OPERATING CONDITIONS

Same as item 3.1.6

3.3.7 TEST RESULTS

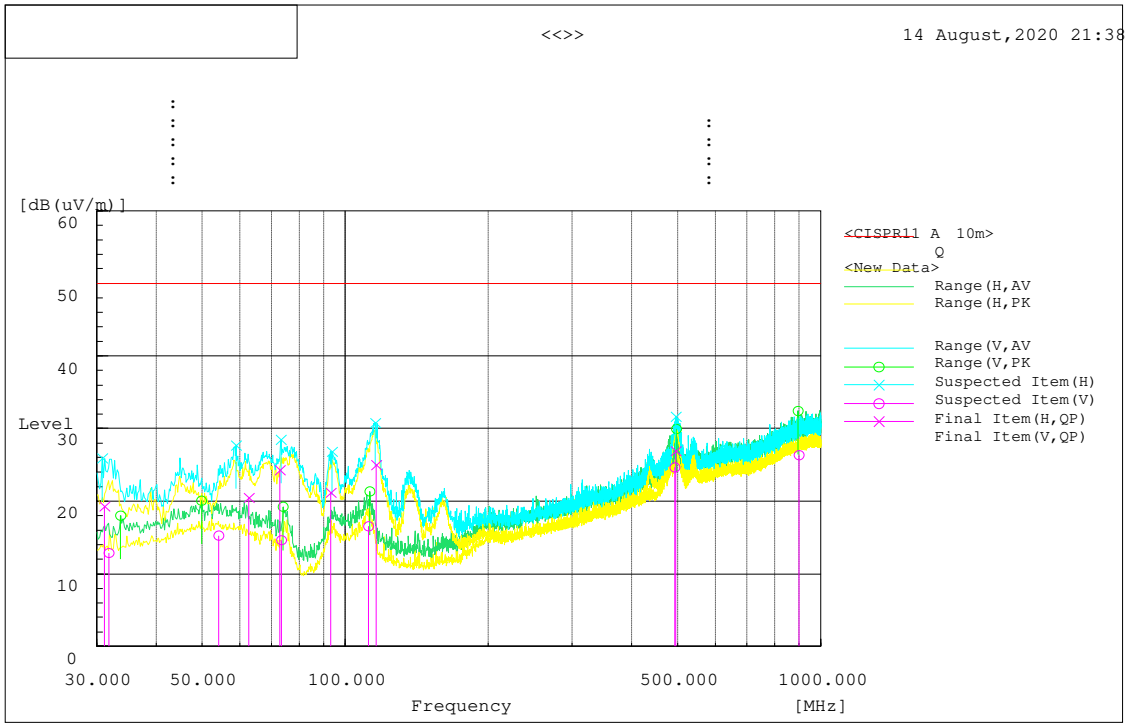
TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + RS485 Data Acquisition	**FREQUENCY RANGE**	30-1000 MHz
TEST VOLTAGE	DC 520V AC 400V	**DETECTOR FUNCTION & BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 48% RH	**TESTED BY**: Wang Jia	

Frequency MHz	Level (dBuV/m) QP	Transd (dB)	Limit (dBuV/m) QP	Margin (d B) QP	Height cm	Angle deg	Polarization
31.447	20.9	-18.5	30.0	9.1	100.0	191.0	V
40.918	13.7	-17.2	30.0	16.3	215.0	0.0	H
65.902	14.0	-17.6	30.0	16.0	100.0	256.0	H
66.767	24.2	-17.9	30.0	5.8	128.0	0.0	V
66.990	14.3	-18.0	30.0	15.7	154.0	227.0	H
111.404	24.9	-18.3	30.0	5.1	103.0	314.0	V
113.183	16.7	-18.5	30.0	13.3	215.0	205.0	H
137.206	20.5	-20.8	30.0	9.5	103.0	8.0	V
503.952	24.9	-9.8	37.0	12.1	215.0	14.0	H
506.668	23.0	-9.7	37.0	14.0	100.0	63.0	V
944.731	26.6	-3.1	37.0	10.4	194.0	212.0	H
986.261	26.8	-2.9	37.0	10.2	169.0	119.0	V



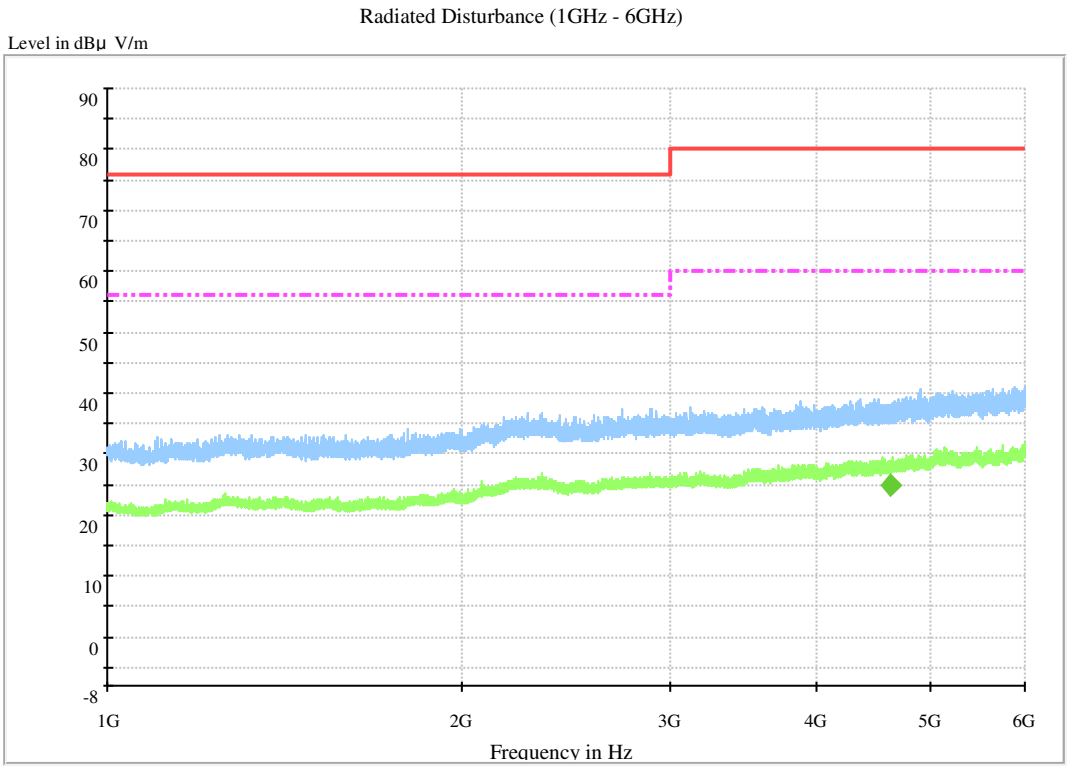
TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle	**FREQUENCY RANGE**	30-1000 MHz
TEST VOLTAGE	DC 520V AC 480V	**DETECTOR FUNCTION & BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 48% RH	**TESTED BY**: Wang Jia	

Frequency MHz	Level (dBuV/m) QP	Transd (dB)	Limit (dBuV/m) QP	Margin (d B) QP	Height cm	Angle deg	Polarization
31.169	19.3	-18.5	50.0	30.7	114.0	199.0	V
62.703	20.5	-16.9	50.0	29.5	103.0	8.0	V
72.781	24.3	-20.3	50.0	25.7	216.0	200.0	V
93.192	21.2	-18.4	50.0	28.8	154.0	227.0	V
116.179	25.0	-19.0	50.0	25.0	100.0	95.0	V
496.135	26.9	-10.0	50.0	23.1	101.0	44.0	V
31.837	12.9	-18.5	50.0	37.1	216.0	246.0	H
54.170	15.3	-15.6	50.0	34.7	114.0	8.0	H
73.310	14.6	-20.5	50.0	35.4	215.0	335.0	H
111.864	16.5	-18.3	50.0	33.5	168.0	197.0	H
493.383	24.7	-10.1	50.0	25.3	194.0	69.0	H
900.942	26.3	-3.3	50.0	23.7	181.0	208.0	H



TEST MODE	SUN2000-60KTL-M0 Grid Mode(Full Load) + MBUS Data Acquisition + USB Smart Dongle		
TEST VOLTAGE	DC 520V AC 480V	**FREQUENCY RANGE**	1000-6000 MHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 48% RH	**TESTED BY**: Wang Jia	

Frequency (MHz)	Average (dBμ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμ V/m)
4610.800000	25.0	1000.0	1000.000	100.0	H	103.0	-6.4	33.9	56.0



3.4 HARMONICS CURRENT MEASUREMENT (>16A)

3.4.1 TEST INSTRUMENTS

TEST STANDARD: EN 61000-3-12

Description	Manufacturer	Model no.	Serial No.	Last Cal.	Next Cal.
Power Analyzer	YOKOGAWA	WT3000	91J902079	2019/02/19	2020/02/18
Power Analyzer	HIOKI	PW6001	170200696	2019/02/21	2020/02/20
Programmable DC source	Keysight	N8957APV	DE16391780	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16391779	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16391778	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321623	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321622	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341673	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341669	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341674	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341675	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341670	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341672	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321625	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321626	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321627	2018/12/20	2019/12/19
AC Source	Ametek	RS90-3PI	1515A00638	2019/04/07	2020/04/06
AC Source	Ametek	RS90-3PI	1623A00088	2018/12/20	2019/12/19
Oscillographic recorder	YOKOGAWA	DL850	91LA25621	2019/04/04	2020/04/03
Oscillographic recorder	Tektronix	DPO7054	C010429	2019/04/07	2020/04/06
Electric current transducer	HIOKI	CT6863	140201351	2019/02/24	2020/02/23

Electric current transducer	HIOKI	CT6863	140201344	2019/02/24	2020/02/23
Electric current transducer	HIOKI	CT6863	140201347	2019/02/24	2020/02/23

NOTE: 1.The test was performed by witness in H/F Room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in Harmonics Room.

3.4.2 CURRENT EMISSION LIMITS FOR EQUIPMENT 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}	THD	$PWHD$
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
≥ 350	41	24	15	12	10	8	47	47
The relative values of even harmonics up to order 12 shall not exceed $16/n$ %. Even harmonics above order 12 are taken into account in THD and $PWHD$ in the same way as odd order harmonics. NOTE Linear interpolation between successive R_{sce} values is permitted. See also Annex B.								
[a] I_1 = reference fundamental current; I_n = harmonic current component.								

3.4.3 CURRENT EMISSION LIMITS FOR BALANCED THREE-PHASE EQUIPMENT

Minimal R_{sce}	Admissible individual harmonic current I_n/I_1 [a] %				Admissible harmonic current distortion factors %	
	I_5	I_7	I_{11}	I_{13}	*THD*	*PWHD*
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
≥350	40	25	15	10	48	46
The relative values of even harmonics up to order 12 shall not exceed 16/*n* %. Even harmonics above order 12 are taken into account in *THD* and *PWHD* in the same way as odd order harmonics. NOTE Linear interpolation between successive R_{sce} values is permitted. See also Annex B.						
[a] I_1 = reference fundamental current; I_n = harmonic current component.						

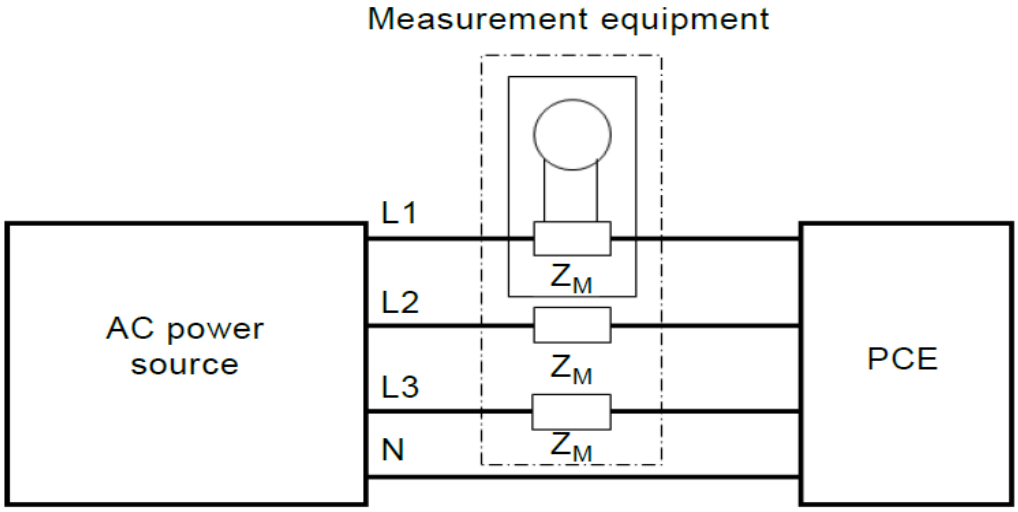
3.4.4 CURRENT EMISSION LIMITS FOR BALANCED THREE-PHASE EQUIPMENT UNDER SPECIFIED CONDITIONS

Minimal R_{sce}	Admissible individual harmonic current I_n/I_1 [a] %				Admissible harmonic current distortion factors %	
	I_5	I_7	I_{11}	I_{13}	*THD*	*PWHD*
33	10,7	7,2	3,1	2	13	22
≥120	40	25	15	10	48	46
The relative values of even harmonics up to order 12 shall not exceed 16/*n* %. Even harmonics above order 12 are taken into account in *THD* and *PWHD* in the same way as odd order harmonics. NOTE Linear interpolation between successive R_{sce} values is permitted. See also Annex B.						
[a] I_1 = reference fundamental current; I_n = harmonic current component.						

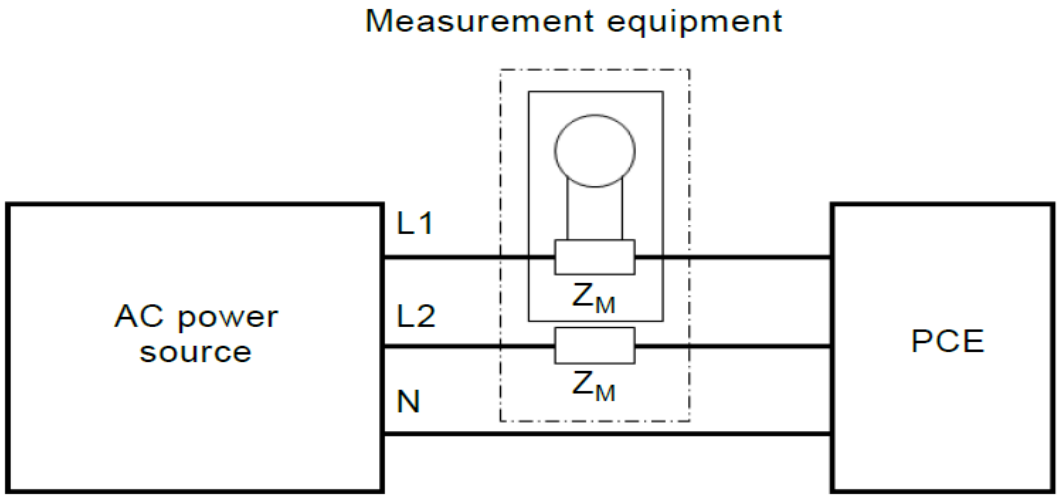
3.4.5 DEVIATION FROM TEST STANDARD

No deviation

3.4.6 TEST SETUP



IEC



IEC

3.4.7 EUT OPERATING CONDITIONS

Same as item 3.1.6

3.4.8 TEST RESULTS

SUN2000-60KTL-M0

Regulation	:	IEC61000-3-12	Ed2.0
		IEC61000-4-7	Ed2.0 A1
MeasureTime	:	300sec	
Model	:	YOKOGAWA WT3000	
Wiring	:	3P4W(3P:three-phase)	
Element	:	1	
Range	:	600V/100.0A	
Rating Voltage	:	400 V	
Iequ	:	86.7000 A	
Z Impedance	:	0.0800 ohm	
Iref	:	86.5555 A	
Set Iref	:	---------	
Power Rsce	:	33.296	
Max Rsce	:	33.000	

PASS

Ssc	:	1982228.16
Min Rsce	:	33.0000
Apply Limit	:	Table3-Balanced 3-phase
Circumstance a	:	0.14% (Pass)
Term a(I5)	:	0.81% (Pass)
Term a(I7)	:	0.24% (Pass)
Term c	:	14.82 - 20.86deg (Fail)
Term d(I5)	:	0.81% (Pass)
Term d(I7)	:	0.24% (Pass)
Term f	:	14.82 - 20.86deg (Fail)

[Average]

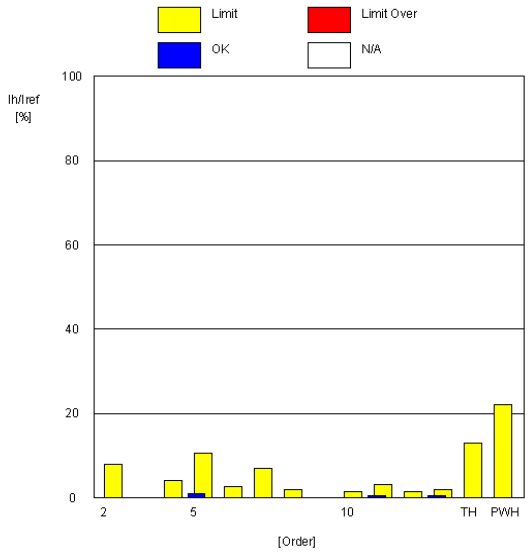
Voltage(rms)	:	232.48 V
Current(rms)	:	86.56 A
Frequency	:	50.00 Hz
Power Factor	:	1.00
Sigma W	:	60224.62 W
THC	:	1.11 A
V THD	:	0.56 %
A THD	:	1.28 %
P THD	:	0.00 %

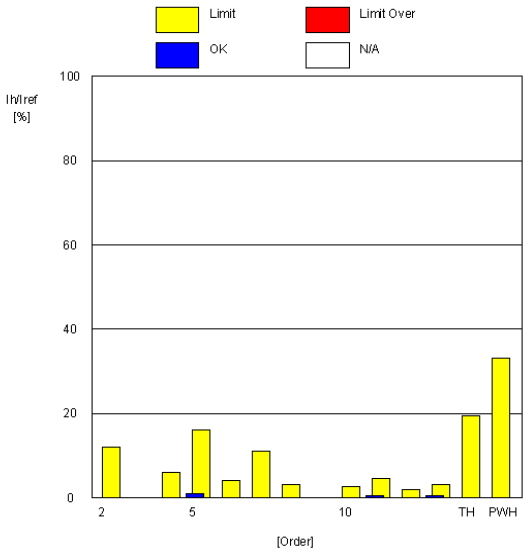
[Maximum]

Voltage(rms)	:	232.50 V
Current(rms)	:	86.62 A
Frequency	:	50.04 Hz
Power Factor	:	1.00
Sigma W	:	60263.69 W
THC	:	1.13 A
V THD	:	0.57 %
A THD	:	1.34 %
P THD	:	0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0267	8.0000	99.7
3	0.1151	-------	-------
4	0.0719	4.0000	98.2
5	0.7864	10.7000	92.7
6	0.0576	2.6667	97.8
7	0.2240	7.2000	96.9
8	0.0243	2.0000	98.8
9	0.0611	-------	-------
10	0.0311	1.6000	98.1
11	0.3784	3.1000	87.8
12	0.0345	1.3333	97.4
13	0.4220	2.0000	78.9
TH	0.0000	13.0000	100.0
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0441	12.0000	99.6
3	0.1389	-------	-------
4	0.0850	6.0000	98.6
5	0.8100	16.0500	95.0
6	0.0634	4.0000	98.4
7	0.2397	10.8000	97.8
8	0.0306	3.0000	99.0
9	0.0677	-------	-------
10	0.0359	2.4000	98.5
11	0.4192	4.6500	91.0
12	0.0390	2.0000	98.0
13	0.4536	3.0000	84.9
TH	0.0000	19.5000	100.0
PWH	0.0000	33.0000	100.0





Regulation	:	IEC61000-3-12	Ed2.0
		IEC61000-4-7	Ed2.0 A1
MeasureTime	:	300sec	
Model	:	YOKOGAWA WT3000	
Wiring	:	3P4W(3P:three-phase)	
Element	:	2	
Range	:	600V/100.0A	
Rating Voltage	:	400 V	
Iequ	:	86.7000 A	
Z Impedance	:	0.0800 ohm	
Iref	:	86.4334 A	
Set Iref	:	---------	
Power Rsce	:	33.296	
Max Rsce	:	33.000	

PASS

Ssc	:	1982228.16
Min Rsce	:	33.0000
Apply Limit	:	Table3-Balanced 3-phase
Circumstance a	:	0.11% (Pass)
Term a(I5)	:	0.73% (Pass)
Term a(I7)	:	0.24% (Pass)
Term c	:	14.01 - 20.19deg (Fail)
Term d(I5)	:	0.73% (Pass)
Term d(I7)	:	0.24% (Pass)
Term f	:	14.01 - 20.19deg (Fail)

[Average]

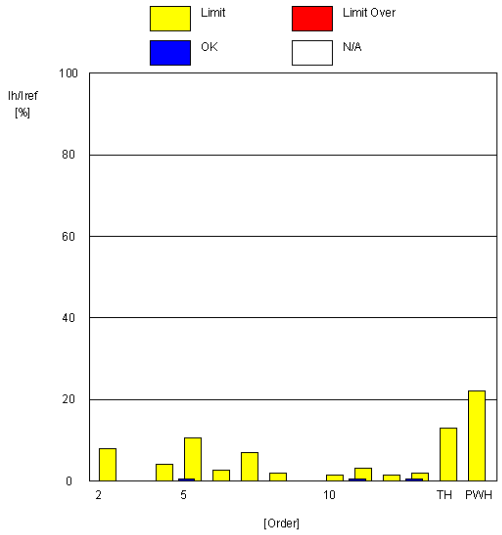
Voltage(rms)	:	232.03 V
Current(rms)	:	86.43 A
Frequency	:	50.00 Hz
Power Factor	:	1.00
Sigma W	:	60224.62 W
THC	:	1.09 A
V THD	:	0.61 %
A THD	:	1.26 %
P THD	:	0.00 %

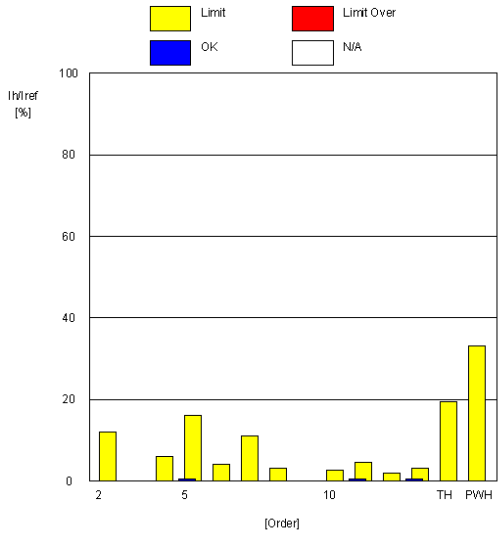
[Maximum]

Voltage(rms)	:	232.06 V
Current(rms)	:	86.49 A
Frequency	:	50.04 Hz
Power Factor	:	1.00
Sigma W	:	60263.69 W
THC	:	1.10 A
V THD	:	0.62 %
A THD	:	1.31 %
P THD	:	0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0424	8.0000	99.5
3	0.0824	-------	-------
4	0.0437	4.0000	98.9
5	0.7103	10.7000	93.4
6	0.0337	2.6667	98.7
7	0.2191	7.2000	97.0
8	0.0316	2.0000	98.4
9	0.0795	-------	-------
10	0.0275	1.6000	98.3
11	0.3726	3.1000	88.0
12	0.0308	1.3333	97.7
13	0.4282	2.0000	78.6
TH	0.0000	13.0000	100.0
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0570	12.0000	99.5
3	0.1061	-------	-------
4	0.0567	6.0000	99.1
5	0.7286	16.0500	95.5
6	0.0436	4.0000	98.9
7	0.2387	10.8000	97.8
8	0.0396	3.0000	98.7
9	0.0852	-------	-------
10	0.0323	2.4000	98.7
11	0.4101	4.6500	91.2
12	0.0395	2.0000	98.0
13	0.4611	3.0000	84.6
TH	0.0000	19.5000	100.0
PWH	0.0000	33.0000	100.0





Regulation	:	IEC61000-3-12	Ed2.0
		IEC61000-4-7	Ed2.0 A1
MeasureTime	:	300sec	
Model	:	YOKOGAWA WT3000	
Wiring	:	3P4W(3P:three-phase)	
Element	:	3	
Range	:	600V/100.0A	
Rating Voltage	:	400 V	
Iequ	:	86.7000 A	
Z Impedance	:	0.0800 ohm	
Iref	:	86.2879 A	
Set Iref	:	--------	
Power Rsce	:	33.296	
Max Rsce	:	33.000	

PASS

Ssc	:	1982228.16
Min Rsce	:	33.0000
Apply Limit	:	Table3-Balanced 3-phase
Circumstance a	:	0.08% (Pass)
Term a(I5)	:	0.78% (Pass)
Term a(I7)	:	0.25% (Pass)
Term c	:	8.60 - 16.10deg (Fail)
Term d(I5)	:	0.78% (Pass)
Term d(I7)	:	0.25% (Pass)
Term f	:	8.60 - 16.10deg (Fail)

[Average]

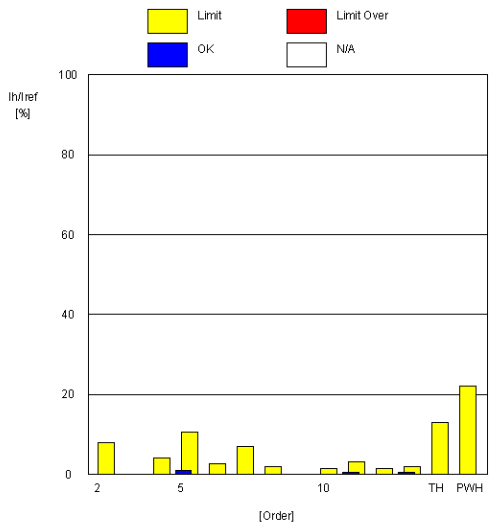
Voltage(rms)	:	232.39 V
Current(rms)	:	86.29 A
Frequency	:	50.00 Hz
Power Factor	:	1.00
Sigma W	:	60224.62 W
THC	:	1.11 A
V THD	:	0.57 %
A THD	:	1.28 %
P THD	:	0.00 %

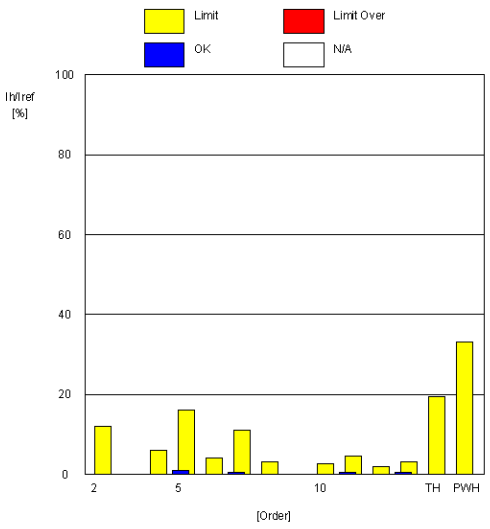
[Maximum]

Voltage(rms)	:	232.41 V
Current(rms)	:	86.35 A
Frequency	:	50.04 Hz
Power Factor	:	1.00
Sigma W	:	60263.69 W
THC	:	1.12 A
V THD	:	0.58 %
A THD	:	1.36 %
P THD	:	0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0333	8.0000	99.6
3	0.0520	-------	-------
4	0.0557	4.0000	98.6
5	0.7540	10.7000	93.0
6	0.0367	2.6667	98.6
7	0.2332	7.2000	96.8
8	0.0293	2.0000	98.5
9	0.0370	-------	-------
10	0.0290	1.6000	98.2
11	0.4038	3.1000	87.0
12	0.0276	1.3333	97.9
13	0.4059	2.0000	79.7
TH	0.0000	13.0000	100.0
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0521	12.0000	99.6
3	0.0775	-------	-------
4	0.0745	6.0000	98.8
5	0.7786	16.0500	95.1
6	0.0484	4.0000	98.8
7	0.2502	10.8000	97.7
8	0.0407	3.0000	98.6
9	0.0442	-------	-------
10	0.0358	2.4000	98.5
11	0.4435	4.6500	90.5
12	0.0349	2.0000	98.3
13	0.4326	3.0000	85.6
TH	0.0000	19.5000	100.0
PWH	0.0000	33.0000	100.0





SUN2000-60KTL-M0

Regulation	:	IEC61000-3-12	Ed2.0
		IEC61000-4-7	Ed2.0 A1
MeasureTime	:	300sec	
Model	:	YOKOGAWA WT3000	
Wiring	:	3P4W(3P:three-phase)	
Element	:	1	
Range	:	600V/100.0A	
Rating Voltage	:	480 V	
Iequ	:	72.0000 A	
Z Impedance	:	0.1000 ohm	
Iref	:	71.8503 A	
Set Iref	:	---------	
Power Rsce	:	38.490	
Max Rsce	:	33.000	

PASS

Ssc	:	1975369.31
Min Rsce	:	33.0000
Apply Limit	:	Table3-Balanced 3-phase
Circumstance a	:	0.17% (Pass)
Term a(I5)	:	0.70% (Pass)
Term a(I7)	:	0.38% (Pass)
Term c	:	33.06 - 55.04deg (Fail)
Term d(I5)	:	0.70% (Pass)
Term d(I7)	:	0.38% (Pass)
Term f	:	33.06 - 55.04deg (Fail)

[Average]

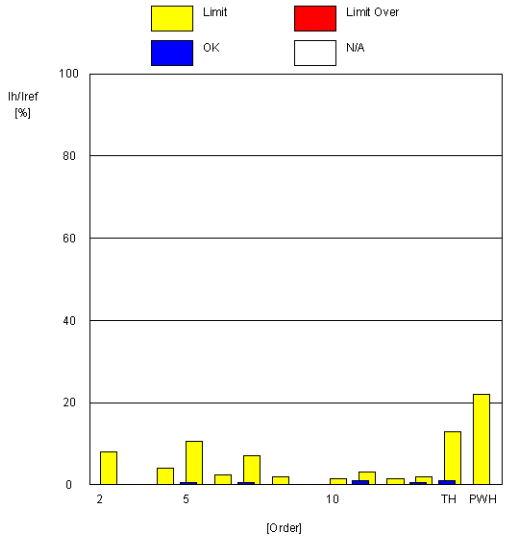
Voltage(rms)	:	279.11 V
Current(rms)	:	71.85 A
Frequency	:	50.00 Hz
Power Factor	:	1.00
Sigma W	:	60023.64 W
THC	:	1.24 A
V THD	:	0.50 %
A THD	:	1.73 %
P THD	:	0.00 %

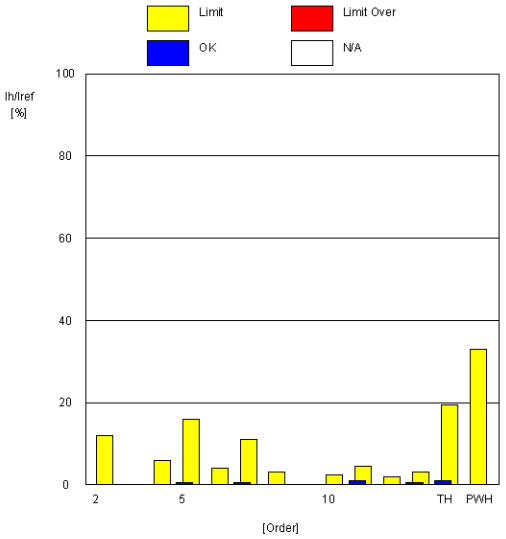
[Maximum]

Voltage(rms)	:	279.13 V
Current(rms)	:	71.88 A
Frequency	:	50.05 Hz
Power Factor	:	1.00
Sigma W	:	60047.42 W
THC	:	1.26 A
V THD	:	0.50 %
A THD	:	1.80 %
P THD	:	0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0368	8.0000	99.5
3	0.1463	-------	-------
4	0.0362	4.0000	99.1
5	0.6733	10.7000	93.7
6	0.0637	2.6667	97.6
7	0.3657	7.2000	94.9
8	0.0421	2.0000	97.9
9	0.0470	-------	-------
10	0.0394	1.6000	97.5
11	1.0254	3.1000	66.9
12	0.0328	1.3333	97.5
13	0.5254	2.0000	73.7
TH	1.0254	13.0000	92.1
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0542	12.0000	99.5
3	0.1658	-------	-------
4	0.0488	6.0000	99.2
5	0.7016	16.0500	95.6
6	0.0715	4.0000	98.2
7	0.3832	10.8000	96.5
8	0.0506	3.0000	98.3
9	0.0543	-------	-------
10	0.0445	2.4000	98.1
11	1.0585	4.6500	77.2
12	0.0386	2.0000	98.1
13	0.6121	3.0000	79.6
TH	1.0585	19.5000	94.6
PWH	0.0000	33.0000	100.0





Regulation	:	IEC61000-3-12	Ed2.0
		IEC61000-4-7	Ed2.0 A1
MeasureTime	:	300sec	
Model	:	YOKOGAWA WT3000	
Wiring	:	3P4W(3P:three-phase)	
Element	:	2	
Range	:	600V/100.0A	
Rating Voltage	:	480 V	
Iequ	:	72.0000 A	
Z Impedance	:	0.1000 ohm	
Iref	:	71.7538 A	
Set Iref	:	---------	
Power Rsce	:	38.490	
Max Rsce	:	33.000	

PASS

Ssc	:	1975369.31
Min Rsce	:	33.0000
Apply Limit	:	Table3-Balanced 3-phase
Circumstance a	:	0.15% (Pass)
Term a(I5)	:	0.64% (Pass)
Term a(I7)	:	0.35% (Pass)
Term c	:	32.45 - 56.04deg (Fail)
Term d(I5)	:	0.64% (Pass)
Term d(I7)	:	0.35% (Pass)
Term f	:	32.45 - 56.04deg (Fail)

[Average]

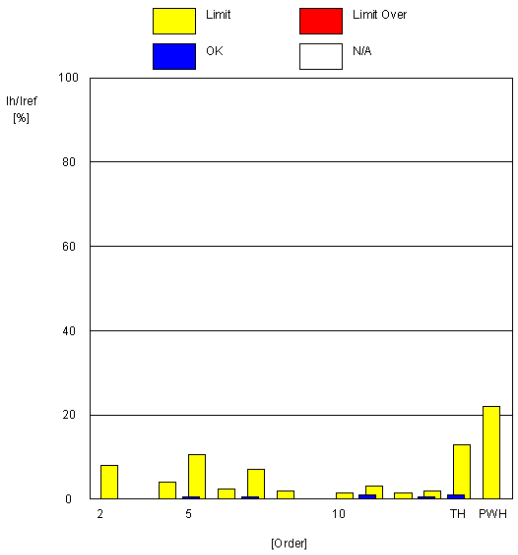
Voltage(rms)	:	278.65 V
Current(rms)	:	71.75 A
Frequency	:	50.00 Hz
Power Factor	:	1.00
Sigma W	:	60023.64 W
THC	:	1.23 A
V THD	:	0.53 %
A THD	:	1.72 %
P THD	:	0.00 %

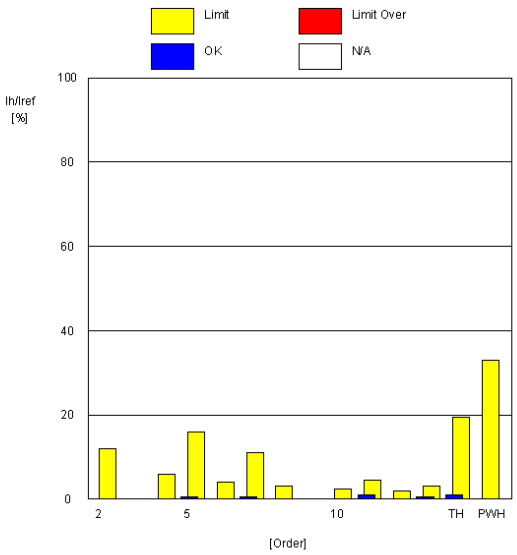
[Maximum]

Voltage(rms)	:	278.67 V
Current(rms)	:	71.78 A
Frequency	:	50.05 Hz
Power Factor	:	1.00
Sigma W	:	60047.42 W
THC	:	1.25 A
V THD	:	0.53 %
A THD	:	1.78 %
P THD	:	0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0390	8.0000	99.5
3	0.1215	--------	--------
4	0.0342	4.0000	99.1
5	0.6122	10.7000	94.3
6	0.0390	2.6667	98.5
7	0.3381	7.2000	95.3
8	0.0335	2.0000	98.3
9	0.0550	--------	--------
10	0.0335	1.6000	97.9
11	1.0188	3.1000	67.1
12	0.0359	1.3333	97.3
13	0.5325	2.0000	73.4
TH	1.0188	13.0000	92.2
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0564	12.0000	99.5
3	0.1497	--------	--------
4	0.0464	6.0000	99.2
5	0.6398	16.0500	96.0
6	0.0480	4.0000	98.8
7	0.3545	10.8000	96.7
8	0.0399	3.0000	98.7
9	0.0807	--------	--------
10	0.0388	2.4000	98.4
11	1.0540	4.6500	77.3
12	0.0427	2.0000	97.9
13	0.6220	3.0000	79.3
TH	1.0540	19.5000	94.6
PWH	0.0000	33.0000	100.0





Regulation	:	IEC61000-3-12	Ed2.0
		IEC61000-4-7	Ed2.0 A1
MeasureTime	:	300sec	
Model	:	YOKOGAWA WT3000	
Wiring	:	3P4W(3P:three-phase)	
Element	:	3	
Range	:	600V/100.0A	
Rating Voltage	:	480 V	
Iequ	:	72.0000 A	
Z Impedance	:	0.1000 ohm	
Iref	:	71.6198 A	
Set Iref	:	---------	
Power Rsce	:	38.490	
Max Rsce	:	33.000	

PASS

Ssc	:	1975369.31
Min Rsce	:	33.0000
Apply Limit	:	Table3-Balanced 3-phase
Circumstance a	:	0.08% (Pass)
Term a(I5)	:	0.67% (Pass)
Term a(I7)	:	0.38% (Pass)
Term c	:	28.04 - 49.95deg (Fail)
Term d(I5)	:	0.67% (Pass)
Term d(I7)	:	0.38% (Pass)
Term f	:	28.04 - 49.95deg (Fail)

[Average]

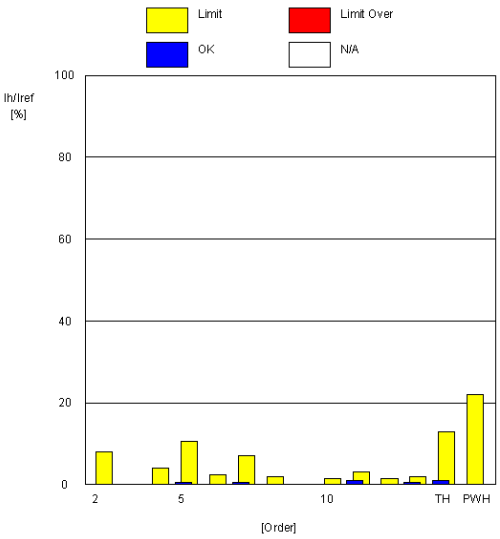
Voltage(rms)	:	279.05 V
Current(rms)	:	71.62 A
Frequency	:	50.00 Hz
Power Factor	:	1.00
Sigma W	:	60023.64 W
THC	:	1.24 A
V THD	:	0.50 %
A THD	:	1.73 %
P THD	:	0.00 %

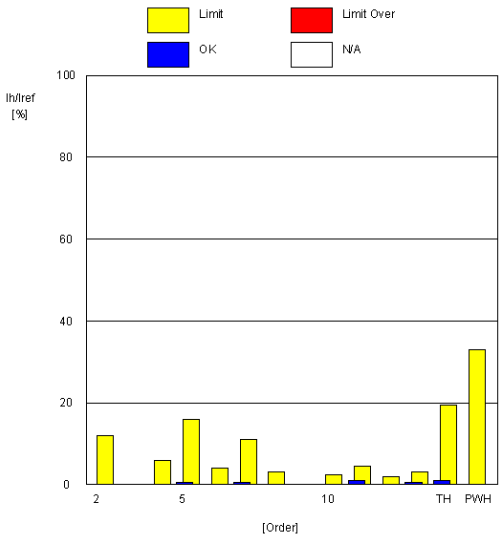
[Maximum]

Voltage(rms)	:	279.07 V
Current(rms)	:	71.65 A
Frequency	:	50.05 Hz
Power Factor	:	1.00
Sigma W	:	60047.42 W
THC	:	1.25 A
V THD	:	0.51 %
A THD	:	1.80 %
P THD	:	0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0295	8.0000	99.6
3	0.0582	-------	-------
4	0.0380	4.0000	99.1
5	0.6402	10.7000	94.0
6	0.0412	2.6667	98.5
7	0.3705	7.2000	94.9
8	0.0368	2.0000	98.2
9	0.0744	-------	-------
10	0.0359	1.6000	97.8
11	1.0322	3.1000	66.7
12	0.0365	1.3333	97.3
13	0.5266	2.0000	73.7
TH	1.0322	13.0000	92.1
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.0487	12.0000	99.6
3	0.0838	-------	-------
4	0.0493	6.0000	99.2
5	0.6710	16.0500	95.8
6	0.0502	4.0000	98.7
7	0.3830	10.8000	96.5
8	0.0430	3.0000	98.6
9	0.0895	-------	-------
10	0.0408	2.4000	98.3
11	1.0629	4.6500	77.1
12	0.0414	2.0000	97.9
13	0.6215	3.0000	79.3
TH	1.0629	19.5000	94.5
PWH	0.0000	33.0000	100.0





3.5 VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

3.5.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST STANDARD: EN 61000-3-11

TEST ITEM	LIMIT	NOTE
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
$T_{d(t)}$ (ms)	500	$T_{d(t)}$ means maximum time that d(t) exceeds 3.3%.
d_{max} (%)	4	dmax means maximum relative voltage change.
dc (%)	3.3	dc means relative steady-state voltage change

TEST STANDARD: EN 61000-3-11

The test conditions specified in Annex A of EN 61000-3-3 shall be applicable to equipment rated ≤16A

The test impedance Z_{test} may be lower than Z_{ref}, particularly for equipment having a rated input current >16 A. To find the optimal test impedance, two conditions shall be met.

– firstly, the voltage drop, ΔU, caused by the equipment shall be within the range 3 % to 5 % of the test supply voltage;

– secondly, the ratio of inductive to resistive components of Z_{test} given by X_{test} / R_{test} shall be within the range 0,5 to 0,75 (i.e. similar to the ratio of the components of Z_{ref}).

NOTE The 3 % to 5 % condition ensures that the relative current changes of the equipment in the real network situation will be nearly the same as those during the test.

The test shall be made with the test circuit specified in Figure 1, except that the impedance Z_{ref} is replaced with Z_{test}. Four values $d_{c\ test}$, $d_{max\ test}$, $P_{st\ test}$ and $P_{lt\ test}$ shall be measured. The definitions of d_c, d_{max}, P_{st}, and P_{lt} are given in IEC 61000-3-3.

3.5.2 TEST INSTRUMENTS

Description	Manufacturer	Model no.	Serial No.	Last Cal.	Next Cal.
Power Analyzer	YOKOGAWA	WT3000	91J902079	2019/02/19	2020/02/18
Power Analyzer	HIOKI	PW6001	170200696	2019/02/21	2020/02/20
Programmable DC source	Keysight	N8957APV	DE16391780	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16391779	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16391778	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321623	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321622	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341673	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341669	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341674	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341675	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341670	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16341672	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321625	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321626	2018/12/20	2019/12/19
Programmable DC source	Keysight	N8957APV	DE16321627	2018/12/20	2019/12/19
AC Source	Ametek	RS90-3PI	1515A00638	2019/04/07	2020/04/06
AC Source	Ametek	RS90-3PI	1623A00088	2018/12/20	2019/12/19
Oscillographic recorder	YOKOGAWA	DL850	91LA25621	2019/04/04	2020/04/03
Oscillographic recorder	Tektronix	DPO7054	C010429	2019/04/07	2020/04/06
Electric current transducer	HIOKI	CT6863	140201351	2019/02/24	2020/02/23
Electric current transducer	HIOKI	CT6863	140201344	2019/02/24	2020/02/23
Electric current transducer	HIOKI	CT6863	140201347	2019/02/24	2020/02/23

NOTE: 1.The test was performed by witness in H/F Room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in Harmonics Room.

3.5.3 TEST PROCEDURE

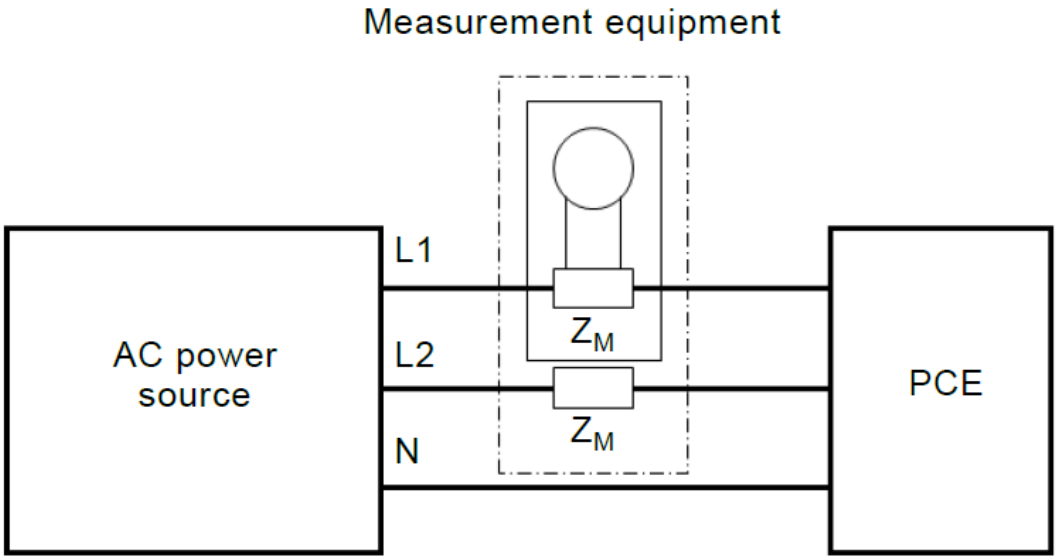
a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under Normal Operating conditions.

b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 120 minutes

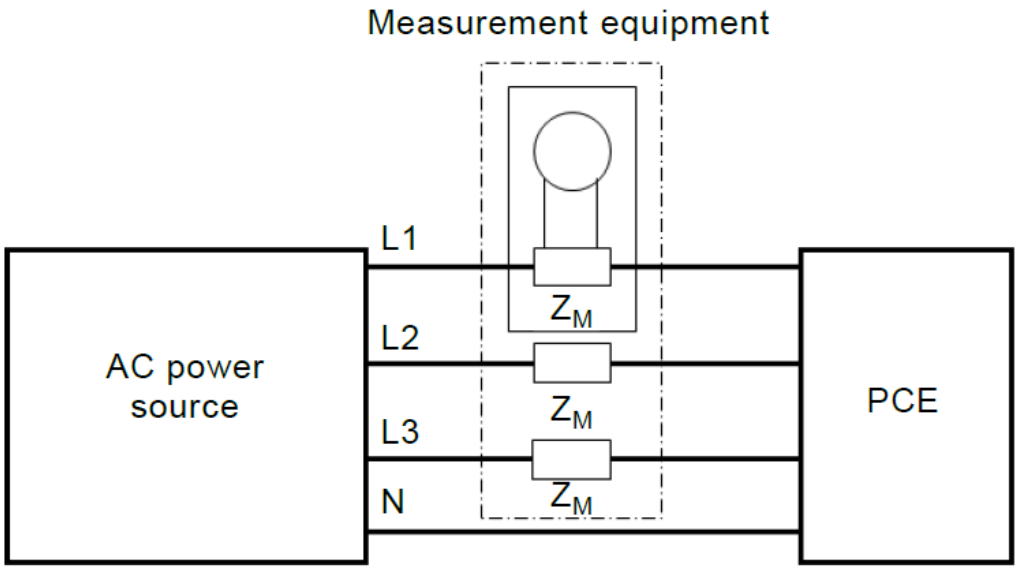
3.5.4 DEVIATION FROM TEST STANDARD

No deviation

3.5.5 TEST SETUP



IEC



3.5.6 EUT OPERATING CONDITIONS

Same as item 3.1.6.

3.5.7 TEST RESULTS

SUN2000-60KTL-M0

Regulation	:	IEC61000-3-11	Ed1.0
		IEC61000-4-15	Ed2.0
Interval	:	10Min0Sec	
Model	:	YOKOGAWA WT3000	
Impedance	:	0.24+j0.15	
Wiring	:	three-phase 4wire	
Voltage Range	:	600.00V	
Set Voltage	:	230V	
Set Frequency	:	50Hz	
Voltage U1	:	289.08V	
Frequency U1	:	50.001Hz	
Element	:	1	
dmin	:	0.20%	

PASS (Under dmin)

Compatibility Condition		: Compliance with IEC61000-3-3(Ztest)
Element1		: Pass(Under dmin)
dc	(3.30%)	: Pass
dmax	(4.00%)	: Pass
d(t)	(500ms)	: -----
Pst	(1.00)	: Pass
Plt	(0.65)	: Pass

No.	dc[%]	dmax[%]	d(t)[ms]	Pst
1	0.04	0.05	-----	0.14
2	0.46	0.50	-----	0.19
3	0.26	0.81	-----	0.23
4	0.48	0.49	-----	0.25
5	0.45	0.47	-----	0.28
6	0.37	0.45	-----	0.28
7	0.41	0.50	-----	0.28
8	0.43	0.47	-----	0.28
9	0.42	0.46	-----	0.28
10	0.39	0.42	-----	0.29
11	0.00	0.00	-----	0.28
12	0.00	0.00	-----	0.28

Plt
0.26

Regulation	:	IEC61000-3-11	Ed1.0
		IEC61000-4-15	Ed2.0
Interval	:	10Min0Sec	
Model	:	YOKOGAWA WT3000	
Impedance	:	0.24+j0.15	
Wiring	:	three-phase 4wire	
Voltage Range	:	600.00V	
Set Voltage	:	230V	
Set Frequency	:	50Hz	
Voltage U2	:	292.82V	
Frequency U2	:	50.001Hz	
Element	:	2	
dmin	:	0.20%	

PASS (Under dmin)

Compatibility Condition		: Compliance with IEC61000-3-3(Ztest)
Element2		: Pass(Under dmin)
dc	(3.30%)	: Pass
dmax	(4.00%)	: Pass
d(t)	(500ms)	: -----
Pst	(1.00)	: Pass
Plt	(0.65)	: Pass

No.	dc[%]	dmax[%]	d(t)[ms]	Pst
1	0.00	0.00	-----	0.16
2	0.47	0.51	-----	0.20
3	0.20	0.22	-----	0.22
4	0.54	0.57	-----	0.24
5	0.47	0.49	-----	0.26
6	0.40	0.44	-----	0.27
7	0.40	0.45	-----	0.26
8	0.40	0.45	-----	0.27
9	0.36	0.40	-----	0.28
10	0.27	0.33	-----	0.30
11	0.00	0.00	-----	0.30
12	0.00	0.00	-----	0.31

Plt
0.26

Regulation	:	IEC61000-3-11	Ed1.0
		IEC61000-4-15	Ed2.0
Interval	:	10Min0Sec	
Model	:	YOKOGAWA WT3000	
Impedance	:	0.24+j0.15	
Wiring	:	three-phase 4wire	
Voltage Range	:	600.00V	
Set Voltage	:	230V	
Set Frequency	:	50Hz	
Voltage U3	:	288.57V	
Frequency U3	:	Error	
Element	:	3	
dmin	:	0.20%	

PASS (Under dmin)

Compatibility Condition		: Compliance with IEC61000-3-3(Ztest)
Element3		: Pass(Under dmin)
dc	(3.30%)	: Pass
dmax	(4.00%)	: Pass
d(t)	(500ms)	: -----
Pst	(1.00)	: Pass
Plt	(0.65)	: Pass

No.	dc[%]	dmax[%]	d(t)[ms]	Pst
1	0.01	0.23	-----	0.18
2	0.50	0.50	-----	0.20
3	0.35	0.73	-----	0.23
4	0.42	0.52	-----	0.23
5	0.38	0.47	-----	0.26
6	0.44	0.51	-----	0.26
7	0.42	0.47	-----	0.26
8	0.37	0.50	-----	0.26
9	0.38	0.45	-----	0.27
10	0.40	0.50	-----	0.31
11	0.00	0.00	-----	0.32
12	0.00	0.00	-----	0.32

Plt
0.27

4 IMMUNITY TEST

4.1 GENERAL DESCRIPTION

4.1.1 GENERAL DESCRIPTION

Product Standard:	**EN IEC 61000-6-2:2019, EN IEC 61000-6-1:2019**	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 6kV Contact discharge, 8kV air discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 10V/m, 80% AM (1kHz), 1400-6000 MHz, 10V/m, 80% AM (1kHz) Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT AC Power line: 2kV, DC Power line: 2kV Signal line: 1kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, AC Power Line: line to line 1 kV, line to earth 2kV DC Power Line: line to line 0.5kV line to earth 0.5kV Signal line: 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power Frequency Magnetic Field Test, 50 Hz, 30A/m, Performance Criterion A

Product Standard:	**EN 62920:2017**	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 6kV Contact discharge,8kV air discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 10V/m, 80% AM (1kHz), 1400-6000 MHz, 3V/m, 80% AM (1kHz) Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT AC Power line: 2kV, Signal Line: 1kV DC Power line 1kV, Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, AC Power Line: line to line 1 kV, line to earth 2 kV, DC Power Line: line to line 0.5kV line to earth 1kV Signal line: 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-34	Meets the requirements of Voltage dips and interruption: 0% U_T – 0.5 period, Performance Criterion B 40% U_T – 10 period, Performance Criterion C 70% U_T – 25 period, C Voltage Interruptions: 0% residual – Performance Criterion C

4.1.2 PERFORMANCE CRITERIA

According to Clause 4 of EN IEC 61000-6-2:2019 standard, the following describes the general performance criteria.

CRITERION A	The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. 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 apparatus if used as intended.
CRITERION B	The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of 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 apparatus if used as intended.
CRITERION C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

According to Clause 7.2 of EN 62920:2017 standard, A precise description and definition of performance criterion shall be provided by the manufacturer and noted in the test report based on the following criteria.

Item	Criterion A	Criterion B	Criterion C
Operating status	No noticeable change of the operating status. Operating as intended.	Noticeable changes of the operating characteristic. Self-recoverable	Shutdown, changes in operating status. Triggering of protective devices. Not self-recoverable
Power output	Power output permitted to vary only within ±25 %.	Power output permitted to temporarily vary outside ±25 % Self-recoverable	Loss of power output. Not self-recoverable
External and internal indications and metering	No noticeable change of the operating status.	Changes only during test	Shutdown, triggering of protective devices. Not self-recoverable
Control signal to external devices	Undisturbed communication and data exchange to external devices	Temporarily disturbed communication, but no error reports of the internal or external devices which could cause shut-down	Errors in communication, loss of data and information. No loss of stored program, no loss of user program. Not self-recoverable

4.1.3 EUT OPERATING CONDITION

Same as item 3.1.6

4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD) (EN IEC 61000-6-2 & EN 62920)

4.2.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 6kV , 8 kV (Direct) Contact Discharge: 4 kV, 8kV (Indirect)
Polarity:	Positive & Negative
Number of Discharge:	20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
ESD simulator	Teseq	NSG 437	398	2019/2/13	2020/2/12

NOTE: 1.The test was performed by witness in BF-61 room of ShangHai Huawei Technology Co., Ltd.
2.The test was performed in BF-61 Room.

4.2.3 TEST PROCEDURE

The basic test procedure was in accordance with IEC 61000-4-2:

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The discharge return cable of the generator shall be kept at a distance of at least 0.2 m from the EUT whilst the discharge is being applied and should not be held by the operator.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. 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.

g. At least ten single discharges (in the most sensitive polarity) were applied to the **H**orizontal **C**oupling **P**lane at points on each side of the EUT. The ESD generator was positioned horizontal at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP.**

h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane 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.

4.2.4 DEVIATION FROM TEST STANDARD

No Deviation

4.2.5 TEST SETUP

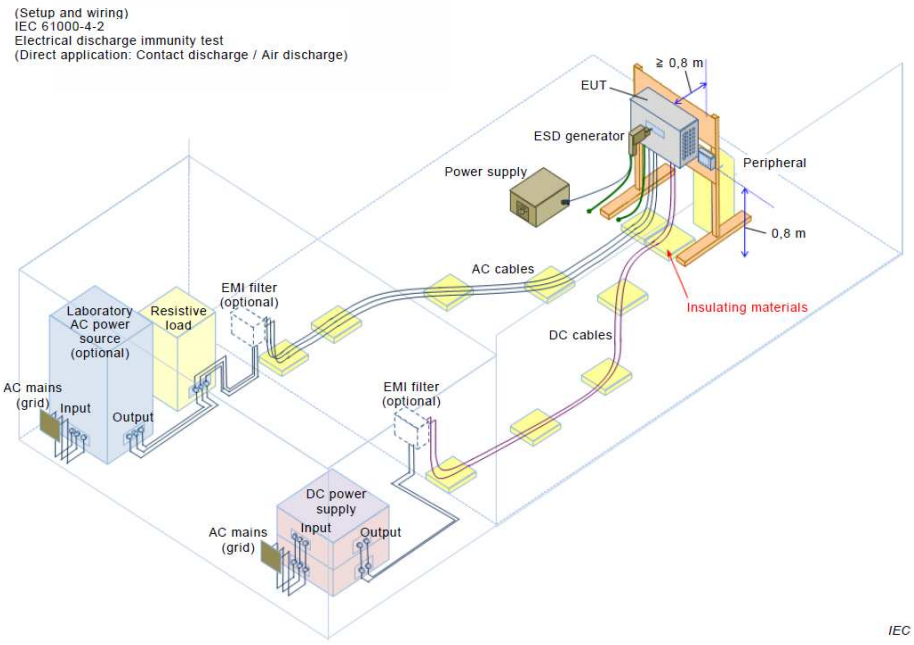


Figure A.1 – Example of a test setup for direct application of discharges to PCE

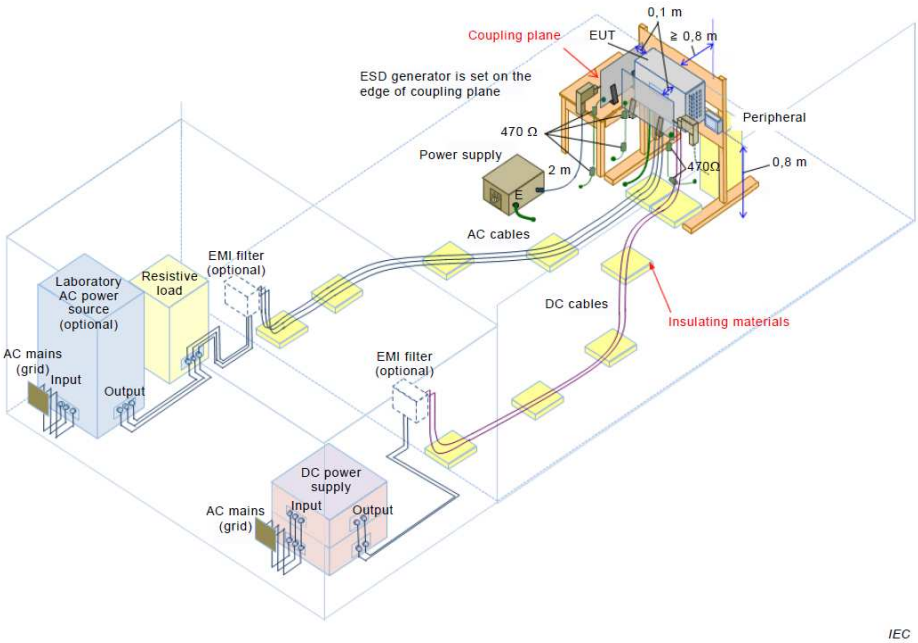
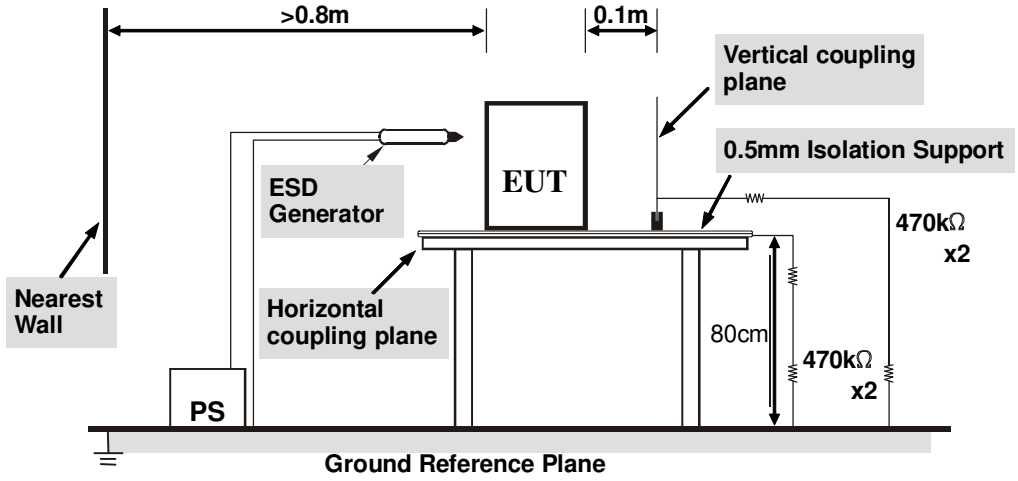


Figure A.2 – Example of a test setup for indirect application of discharges to PCE



NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 0.8-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.2.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 400V AC 400V;
ENVIRONMENTAL CONDITIONS	21deg. C, 50% RH 101.00kPa	**TESTED BY**: Wang Jia	

Direct Discharge Application				
Test Level (kV)	Polarity	Test Point	Test Result of Contact Discharge	Test Result of Air Discharge
4, 8	+/-	All Metal Part	A	N/A
6, 8	+/-	All Non-metal Part	N/A	A

Indirect Discharge Application				
Discharge Level (kV)	Polarity	Test Point	Test Result of HCP	Test Result of VCP
4, 8	+/-	VCP	A	A

NOTE: A: There was no change compared with initial operation during the test.

ESD TEST POINT

(⊖ Direct Contact Discharge; ✦-Air Discharge)

4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) (EN IEC 61000-6-2 & EN 62920)

4.3.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80-1000MHz, 1400-6000MHz
Field Strength:	10V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	at least 3 seconds

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	AR	SG6000	327339	2019/1/21	2020/1/20
Amplifier	AR	500W1000A	337312	2019/4/23	2020/4/22
Amplifier	AR	175S1G4M3	340318	2019/4/23	2020/4/22
Amplifier	rflight	NTWPAS-4060100	16089043	2019/1/8	2020/1/7
Log-periodic antenna	SCHWARZBECK	STLP 9128D	9128D036	N/A	N/A
Log-periodic antenna	SCHWARZBECK	STLP 9149	9149-121	N/A	N/A
RF TEST SYS CTRLR	AR	SC1000	337402	N/A	N/A

NOTE: 1.The test was performed by witness in 3m Chamber of ShangHai Huawei Technology Co., Ltd.
2.The test was performed in 3m Chamber.

4.3.3 TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3

a. The testing was performed in a fully-anechoic chamber.

b. The frequency range is swept from 80 MHz to 1000 MHz, 1400MHz to 6000MHz, with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5s.

d. The field strength levels were 10V/m.

e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.3.4 DEVIATION FROM TEST STANDARD

No Deviation

4.3.5 TEST SETUP

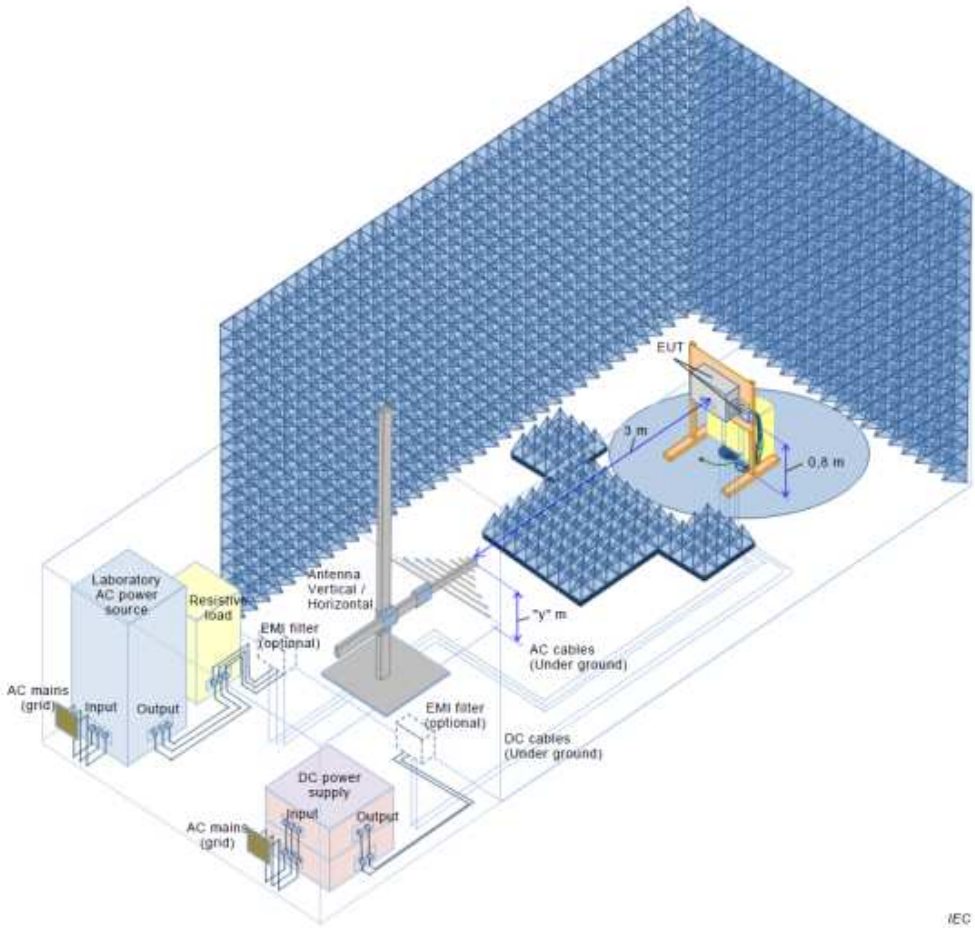


Figure A.3 – Example of a test setup for wall-mounted PCE

NOTE:

TABLETOP EQUIPMENT
The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT
The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

4.3.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 400V AC 400V;
ENVIRONMENTAL CONDITIONS	21deg. C, 58% RH	**TESTED BY**: Wang Jia	

Field Strength (V/m)	Test Frequency Note#1 (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
10	80 - 1000	H&V	3	A	N/A
10	1400 - 6000	H&V	3	A	N/A

Note#1: Tested Israel SII Frequencies 89,100,107,144,163,196,244,315,434,460,600,825,845, 880 MHz

NOTE: A: There was no change compared with initial operation during the test.

4.4 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT) (EN IEC 61000-6-2 & EN 62920)

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	Power Line: 2kV Signal Line: 2kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz & 100 kHz
Impulse Waveshape :	5/50 ns
Burst Duration:	15 ms & 0.75 ms
Burst Period:	300 ms
Test Duration:	1 min.

4.4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Fast Transient Burt Simulator	SANKI	SKS-0404GB	0382-0150	2019/7/15	2020/7/14
Coupling Decoupling Network	Teseq	CDN163	0445-0848	2019/7/15	2020/7/14
Coupling clamp	Teseq	CDN8014	0382-0151	2019/7/1	2020/6/30

NOTE: 1. The test was performed by witness in BF-65 room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in BF-65 Room.

4.4.3 TEST PROCEDURE

a. Both positive and negative polarity discharges were applied.

b. The distance between any coupling devices and the EUT should be (0.5 – 0/+0.1) m for table-top equipment testing, and (1.0 ± 0.1) m for floor standing equipment.

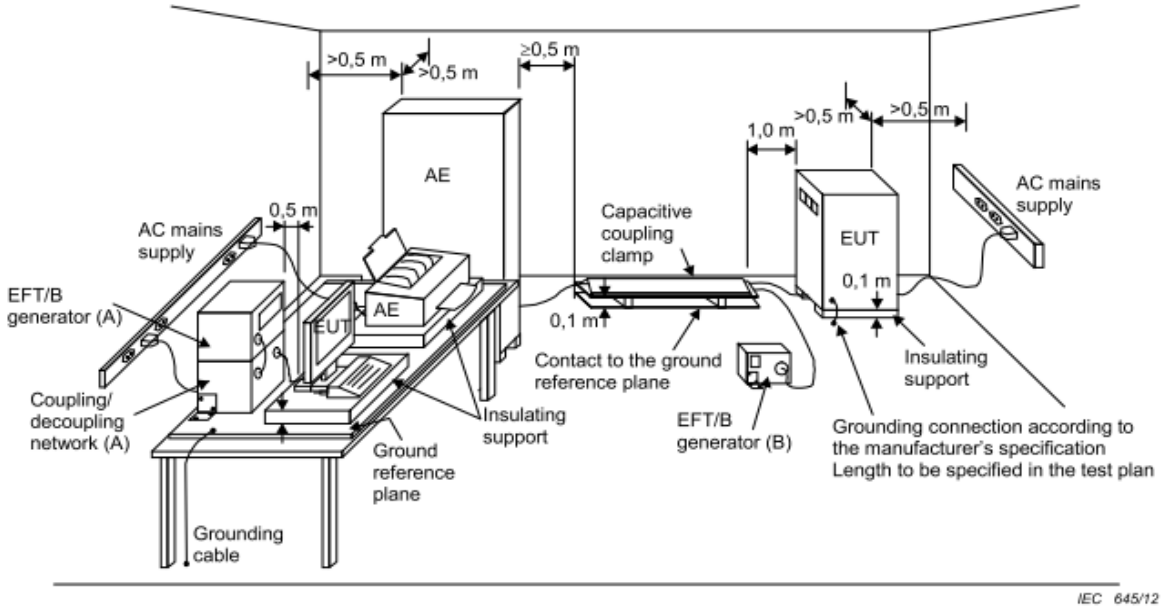
c. The duration time of each test sequential was 1 minute.

d. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP



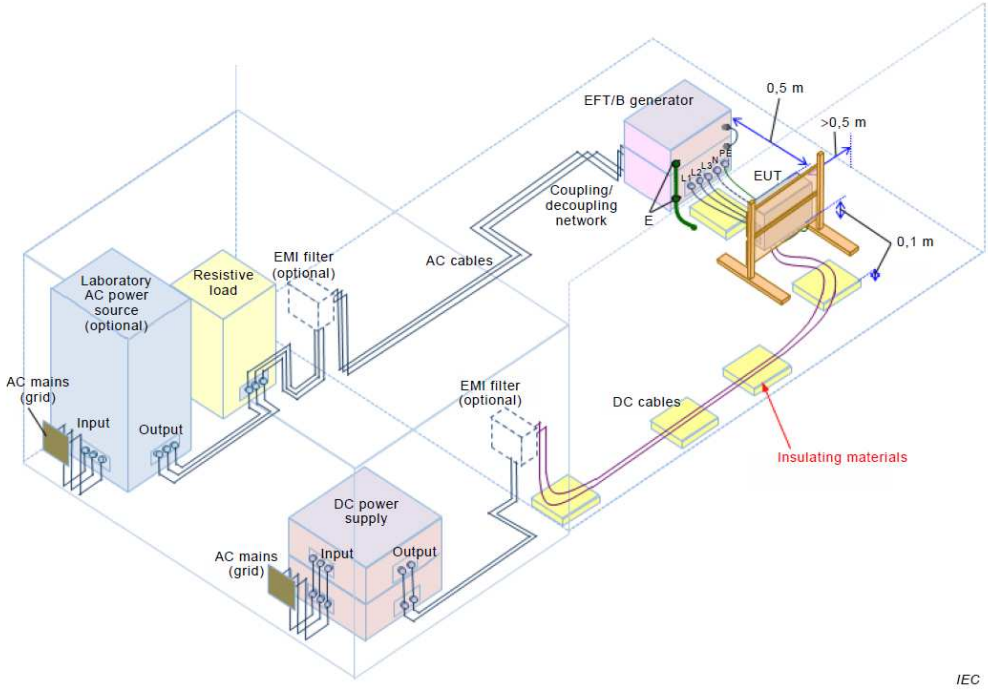


Figure A.4 – Example of a test setup for direct coupling of the test voltage to AC mains power ports

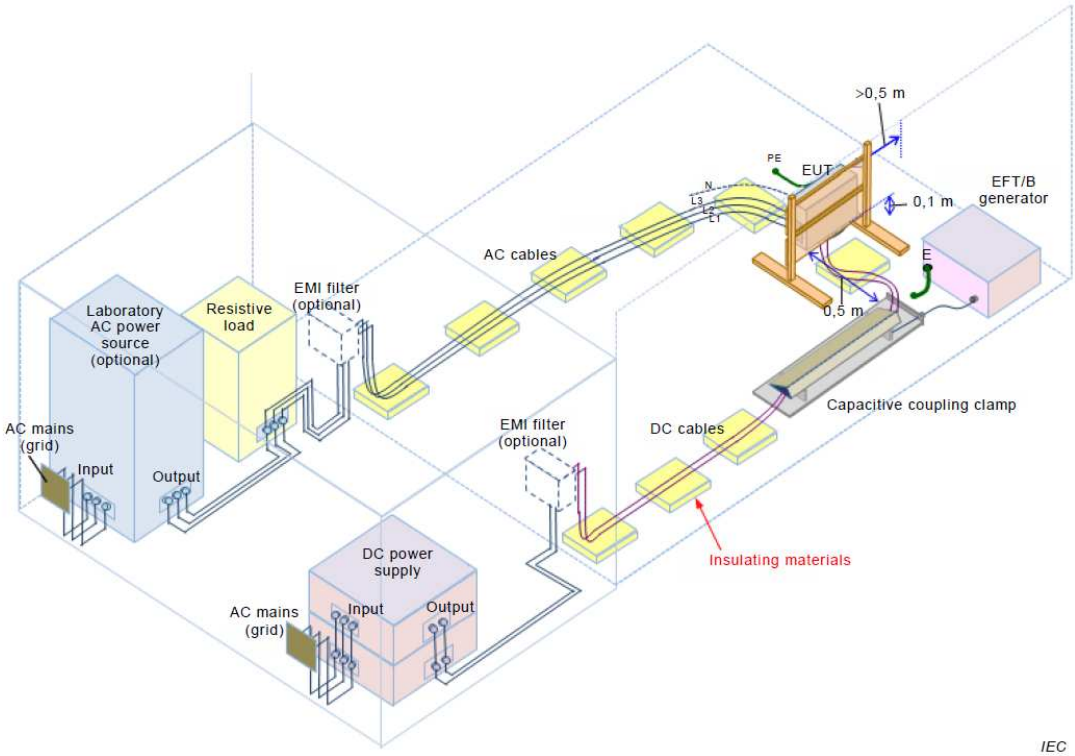


Figure A.5 – Example of a test setup for application of the test voltage with a capacitive coupling clamp

NOTE:

(A) location for supply line coupling

(B) location for signal lines coupling

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration

4.4.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 400V AC 400V
ENVIRONMENTAL CONDITIONS	21 deg. C, 55% RH	TESTED BY: Wang Jia	

Pulse Voltage	__ kV		2 kV		___ kV		___ kV	
Pulse Polarity	+	-	+	-	+	-	+	-
L1+L2+L3 + PE	/	/	A	A	/	/	/	/
L1+L2+L3	/	/	A	A	/	/	/	/
N	/	/	A	A	/	/	/	/
PE	/	/	A	A	/	/	/	/
L1+L2+L3+N+ PE	/	/	A	A	/	/	/	/
PV+, PV-, PE	/	/	A	A	/	/	/	/
485 Port	/	/	A	A	/	/	/	/
MBUS Port (L1+L2+L3 +N+PE)	/	/	A	A	/	/	/	/
MBUS Port L1+L2+L3	/	/	A	A	/	/	/	/
MBUS Port N	/	/	A	A	/	/	/	/
MBUS Port PE	/	/	A	A	/	/	/	/

NOTE: A: There was no change compared with initial operation during the test.

4.5 SURGE IMMUNITY TEST (EN IEC 61000-6-2 & EN 62920)

4.5.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current; 10/700 us Open Circuit Voltage, 5/320 us Short Circuit Current
Test Voltage:	AC Power Line: Line to Line:1kV, 6kV (Client requirement) Line to PE:2kV, 6kV (Client requirement) DC Power Line: Line to Line:1kV, 4kV (Client requirement) Line to PE:2kV, 4kV (Client requirement) Signal Line:1kV, 2kV, 4kV, 6kV (Client requirement)
Surge Input/Output:	L1-L2-L3&L-PE,N-PE, L1-L2-L3-N, RS 485, DC Port
Polarity:	Positive/Negative
Phase Angle:	0° /90°/180°/270°
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 positive and 5 negative at selected points

*This test are applicable to RJ45 port and all signal ports, which according to the manufacturer's specification, may connect directly to outdoor cables

4.5.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
High Energy Pulse Generator	3cTEST	CWS 1000G	ES3521701	2020/08/27	2021/08/26
Coupling Decoupling Network	3cTEST	SPN1550T	ES4221701	2020/08/27	2021/08/26
Coupling Decoupling Network	3cTEST	SPN1550T	ES4221702	2020/08/27	2021/08/26
Coupling Decoupling Network	EMTEST	CNV504N3.3	V1121109607	2020/04/27	2021/04/26

NOTE: 1. The test was performed by witness in BF-65 room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in BF-65 Room.

4.5.3 TEST PROCEDURE

a. For EUT power supply:

The surge is to be 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 shall be 2 meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

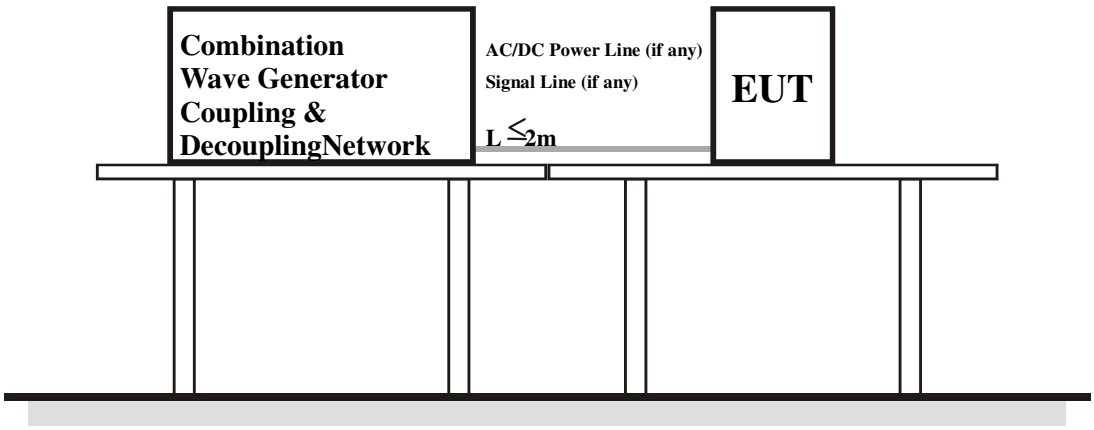
c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

4.5.5 TEST SETUP



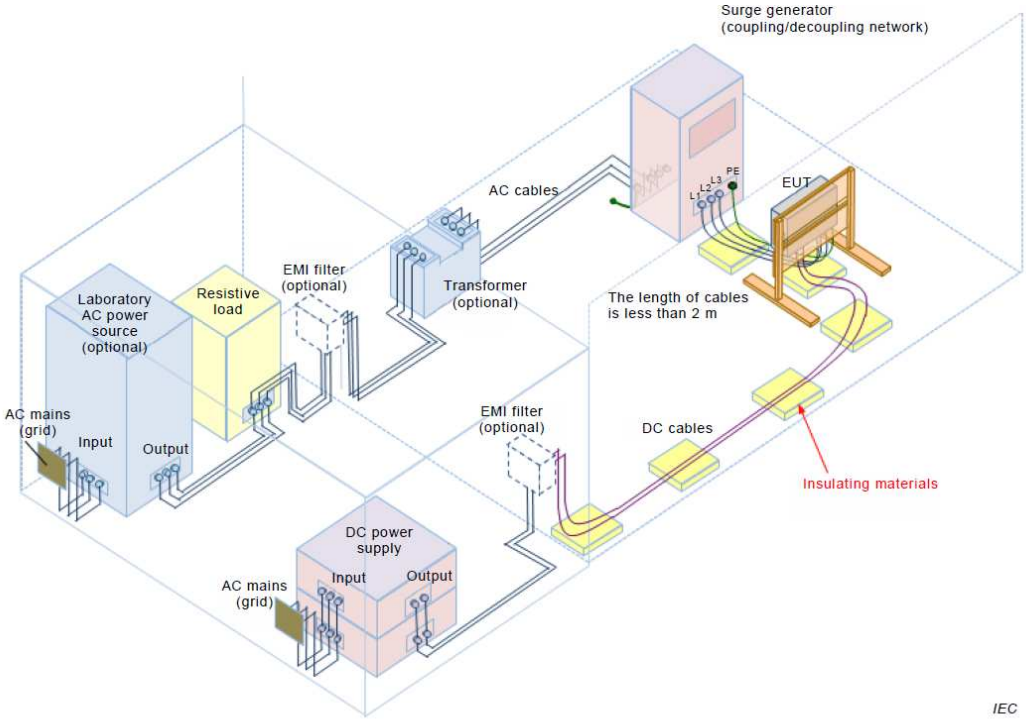


Figure A.6 – Example of a test setup for AC mains power ports

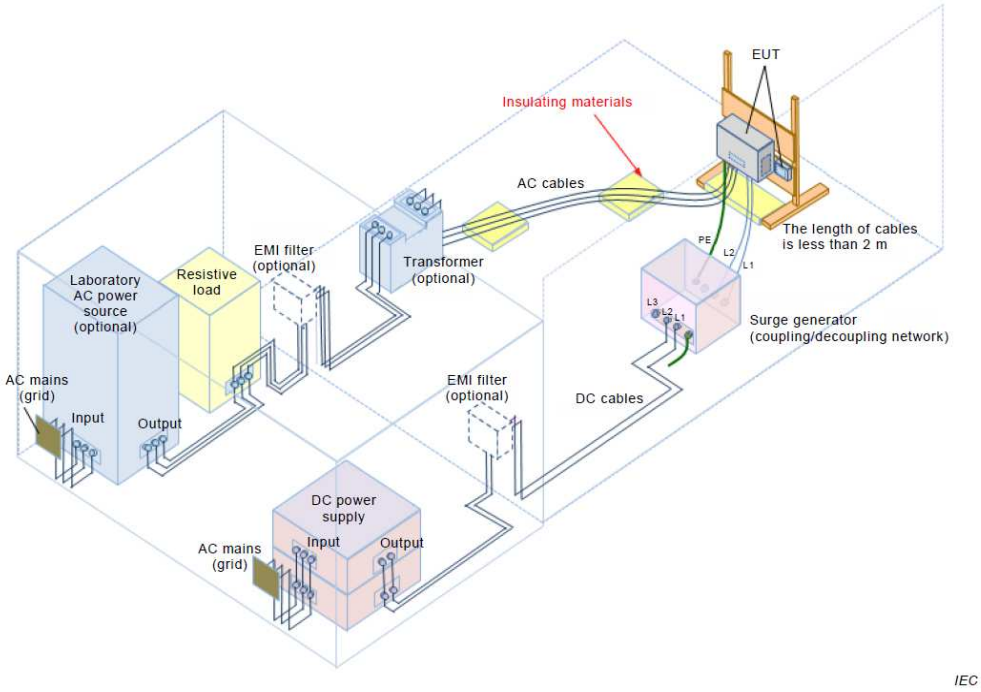


Figure A.7 – Example of a test setup for DC power ports

4.5.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 600V AC 400V
ENVIRONMENTAL CONDITIONS	21deg. C, 55% RH	TESTED BY: Wang Jia	

AC/DC Power port：

\Phase angle \ Test result \Voltage (kV) \ Test point\ Polarity			0°	90°	180°	270°	Test point	DC Power Port
1	L1-L2	+	A	A	A	A	PV+ - PV-	A
		-	A	A	A	A		A
1	L1-L3	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
1	L2-L3	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
1	L1-L2-L3-N	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
2	N-PE	+	A	A	A	A	PV+ - PE	A
		-	A	A	A	A		A
2	L1-PE	+	A	A	A	A	PV- - PE	A
		-	A	A	A	A		A
2	L2-PE	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
2	L3-PE	+	A	A	A	A	/	/
		-	A	A	A	A	/	/
4	/	+/-	/	/	/	/	PV+ - PV-	B
4	/	+/-	/	/	/	/	PV+ - PE	B
4	/	+/-	/	/	/	/	PV- - PE	B
6	L1-L2 L1-L3 L2-L3 L1-L2-L3-N	+	B	B	B	B	/	/
		-	B	B	B	B	/	/
6	N-PE L1-PE L2-PE L3-PE	+	B	B	B	B	/	/
		-	B	B	B	B	/	/

Signal ports and telecommunication ports：

Voltage (kV)	Test Point	Polarity	Test result	Voltage (kV)	Test Point	Polarity	Test result
1, 2	RS 485 Port	+ /-	A	4, 6	RS 485 Port	+ /-	A

NOTE: A: There was no change compared with initial operation during the test.
B: During the test, The EUT reset, and it will return to normal after the test.
The test Voltage 4kV and 6kV required by client.

4.6 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS) (EN IEC 61000-6-2 & EN 62920)

4.6.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	$10V_{r.m.s}$
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains & DC Power Line & Signal Line
Coupling Device:	Current Probe & Direct injection & CDN-M1

4.6.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	R&S	SMC100A	1411.4002k02-102618-Yb	2019/1/21	2020/1/20
Amplifier	R&S	BBA100	5354.9000k50-100984-Ut	2019/1/18	2020/1/17
6dB Attenuator	Bird	75-A-FFN-06	1180092	2019/1/18	2020/1/17
Coupling Decoupling Network	Teseq	CDNST08A	51382	2019/1/22	2020/1/21
Coupling Decoupling Network	FCC	FCC-801-M1-50A	111651	2019/4/25	2020/4/24
RF Inject Clamp	FCC	F-120-9A	111657	2019/1/17	2020/1/16

NOTE: 1. The test was performed by witness in CS Shielding room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in CS Shielding Room.

4.6.3 TEST PROCEDURE

a. The EUT shall be tested within its intended operating and climatic conditions.

b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.

c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

d. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.

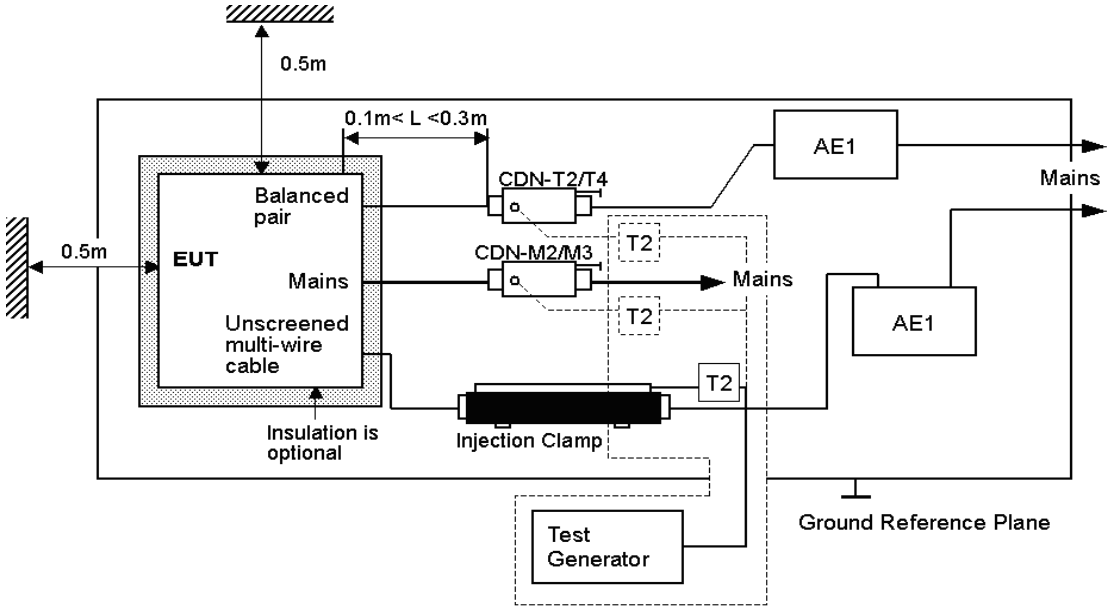
e. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5 s. The sensitive frequencies (e.g. clock frequencies) shall be analyzed separately.

f. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

4.6.5 TEST SETUP



NOTE: The EUT clearance from any metallic obstacles shall be at least 0.5m.
All non-excited input ports of the CDNs shall be terminated by 50Ω loads.

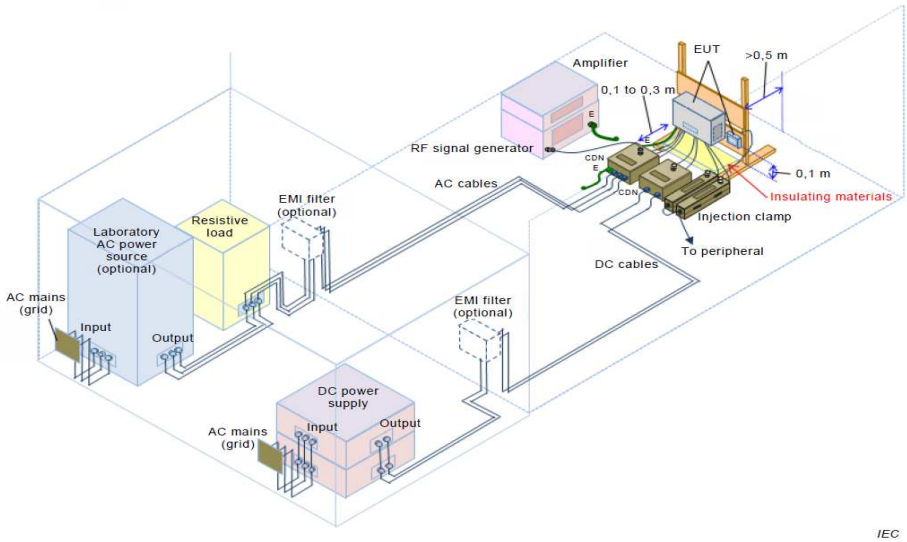


Figure A.8 – Example of a setup of conducted disturbances immunity test applied for wall-mounted PCE

NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.6.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 400V AC 400V;
ENVIRONMENTAL CONDITIONS	21deg. C, 54% RH	TESTED BY: Wang Jia	

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 – 80	AC line	Current Probe	A	RS485
10	0.15 – 80	DC line	Current Probe	A	RS485
10	0.15 – 80	RS485 Cable	Direct injection	A	RS485
10	0.15 – 80	PE line	CDN-M1	A	RS485
10	0.15 – 80	AC	Current Probe	A	MBUS
10	0.15 – 80	DC line	Current Probe	A	MBUS
10	0.15 – 80	PE line	CDN-M1	A	MBUS

Note#1: Tested Israel SII Frequencies 0.2,0.53,1,1.5,7.1,13.56,21,27.12,40.68,65,68 MHz

NOTE: A: There was no change compared with initial operation during the test.

4.7 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST (EN IEC 61000-6-2)

4.7.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	30A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1.5mx1.5m

4.7.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power source	EMTEST	NET Wave 7	V1129110285	2018/7/23	2019/7/22
Helmholtz coil	EMTEST	HHS 5215-100	5215-100 102	2018/7/23	2019/7/22

NOTE: 1. The test was performed by witness in BF-59 room of ShangHai Huawei Technology Co., Ltd.
2. The test was performed in BF-59 Room.

4.7.3 TEST PROCEDURE

a. The equipment is configured and connected to satisfy its functional requirements.

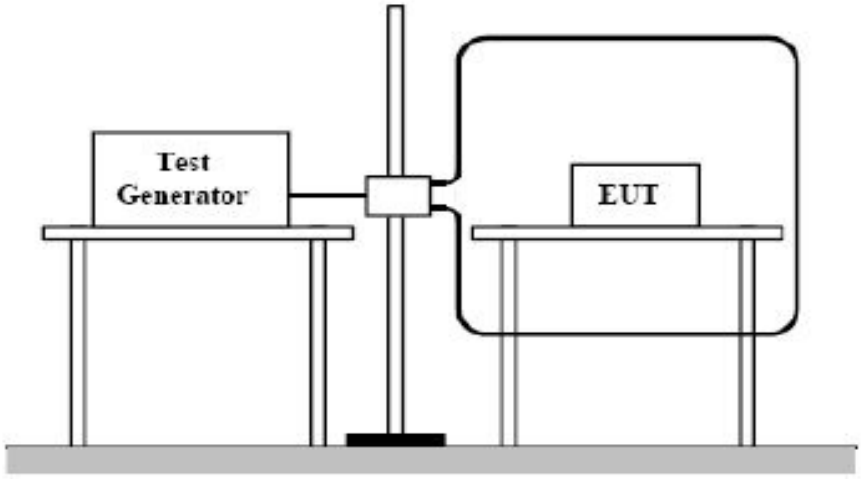
b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

c. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

4.7.4 DEVIATION FROM TEST STANDARD

No Deviation

4.7.5 TEST SETUP



NOTE:

TABLETOP EQUIPMENT
The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT
The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

4.7.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 400V AC 400V;
ENVIRONMENTAL CONDITIONS	21deg. C, 55% RH	**TESTED BY**: Wang Jia	

MAGNETIC FIELD DIRECTION	TESTING RESULT	REMARK
X - Axis	A	30A/ m
Y - Axis	A	30A/ m
Z - Axis	A	30A/ m

NOTE: A: There is no change compared with the initial operation during the test.

4.8 VOLTAGE DIP/SHORT INTERRUPTIONS/VOLTAGE VARIATIONS (DIP) IMMUNITY TEST (EN62920)

4.8.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-34
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0° / 180°
Test Cycle:	3 times

4.8.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
AC DIP simulator	EMTEST	PFS 503N32	0382-0371	2019/7/5	2020/7/4
Power Source	EMTEST	NET Wave 30	0352-0049	2019/8/1	2020/7/31

NOTE: 1. The test was performed by witness in Shanghai Testing & Inspection Institute for Electrical Equipment.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.8.3 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation.

4.8.5 TEST SETUP

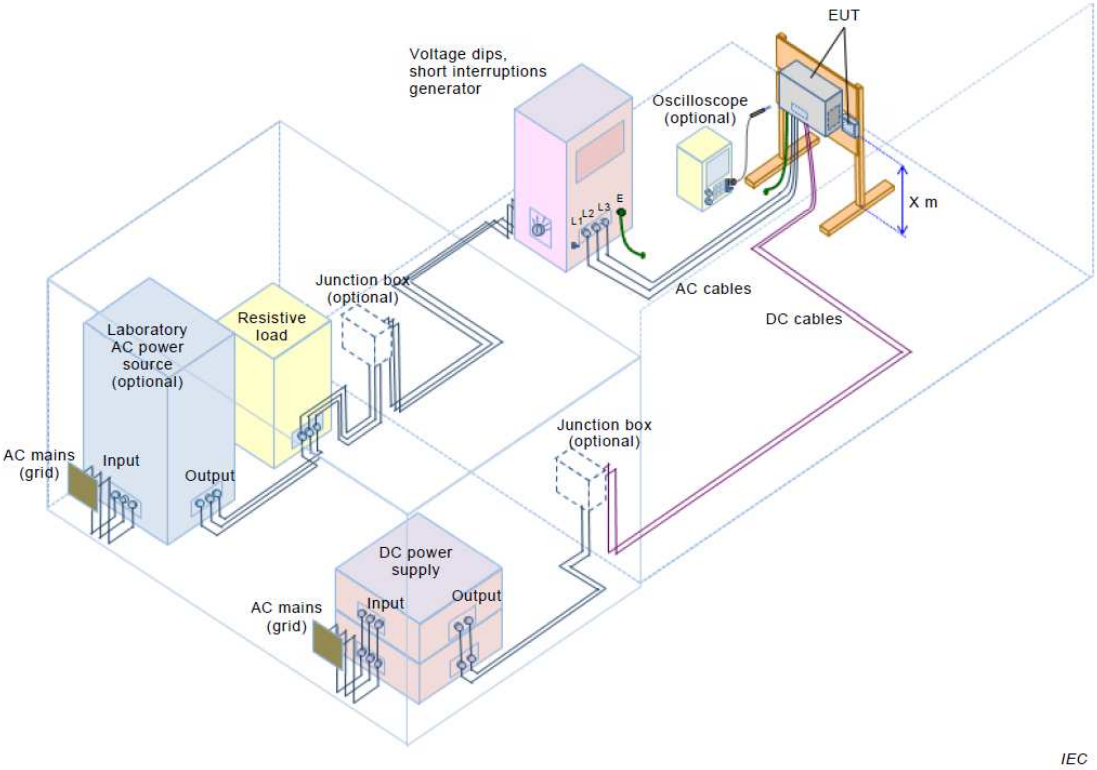


Figure A.9 – Example of a test setup using a generator for voltage dips and short interruptions

4.8.6 TEST RESULTS

TEST VOLTAGE	DC 400V AC 380V	ENVIRONMENTAL CONDITIONS	21deg. C, 55% RH
TESTED BY	Wang Jia		

Ut : 380 Vac 50 Hz	Durations		Event interval (sec)	Total events (time)	Test result
Voltage dips (%)	(period)	(ms)			
0	1	20	10	3	A
40	10	200	10	3	A
70	25	500	10	3	A
0	250	5000	10	3	B

NOTE: A: There was no change compared with initial operation during the test.

B: The EUT stopped operation when at the 100% voltage interruption, but it can recover by itself

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST (AC Power Port)

CONDUCTED EMISSION TEST (DC Power Port)

CONDUCTED EMISSION TEST (Telecom port-RS485)

Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province. 523942. People's Republic of China

Tel: +86 769 998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com

CONDUCTED EMISSION TEST (MBUS-CVP)

Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province. 523942. People's Republic of China

Tel: +86 769 998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com

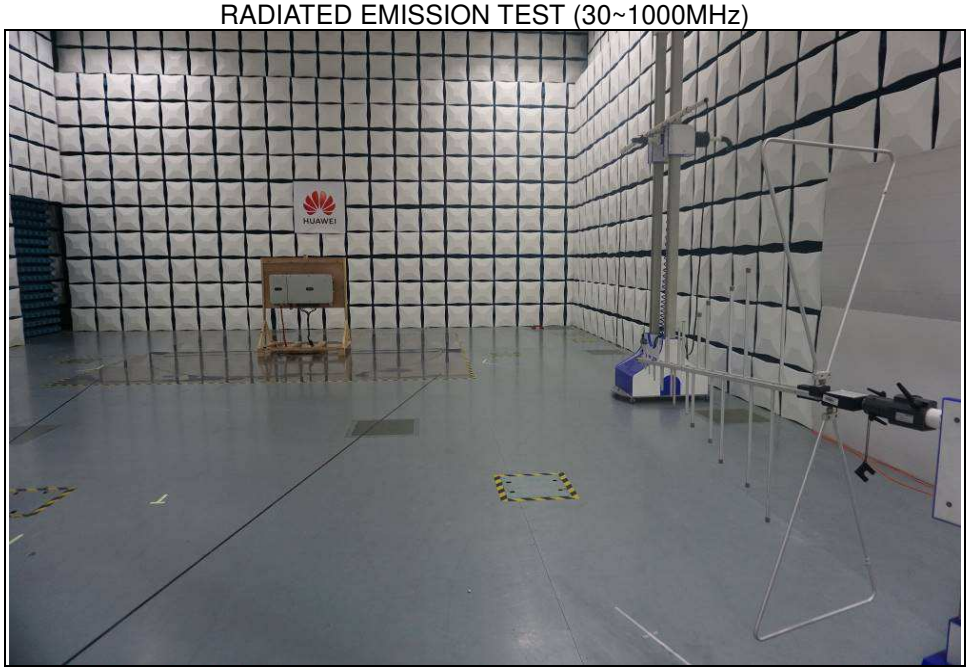
CONDUCTED EMISSION TEST (MBUS-Current)

Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

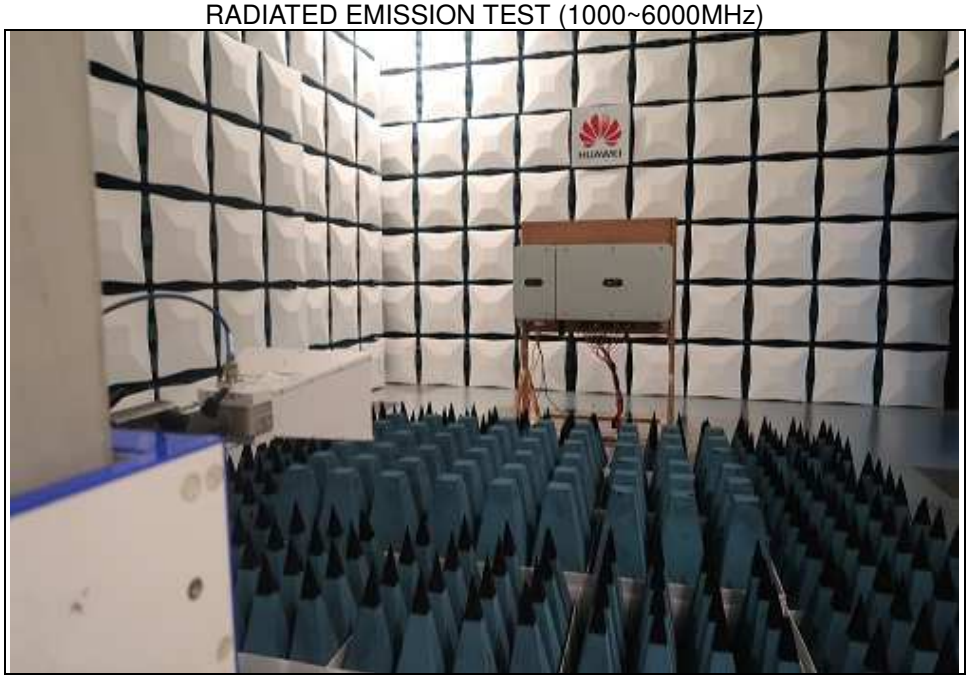
No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province. 523942. People's Republic of China

Tel: +86 769 998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com

RADIATED EMISSION TEST (30~1000MHz)



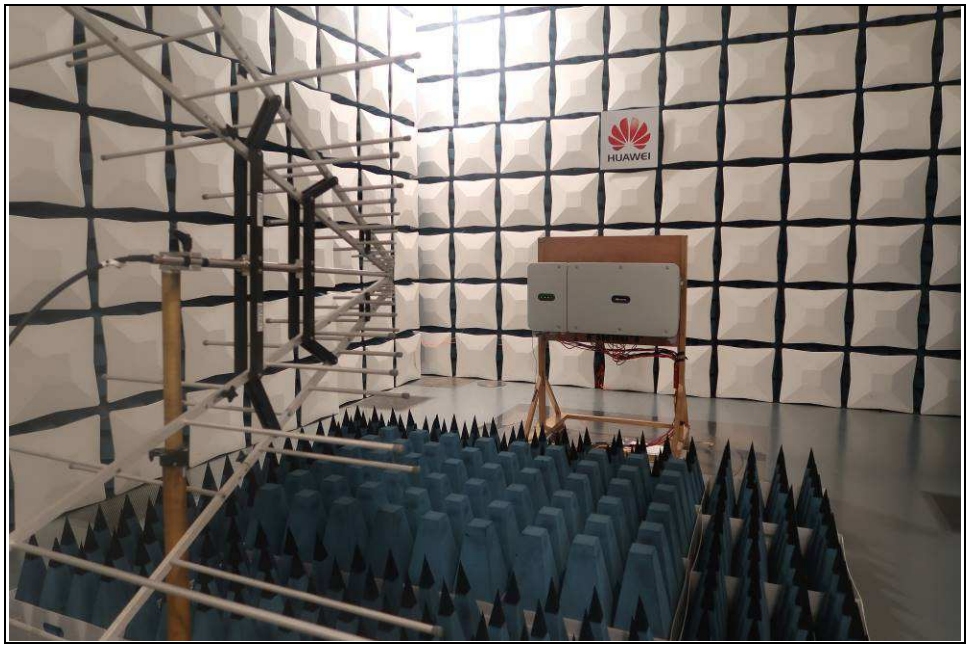
RADIATED EMISSION TEST (1000~6000MHz)

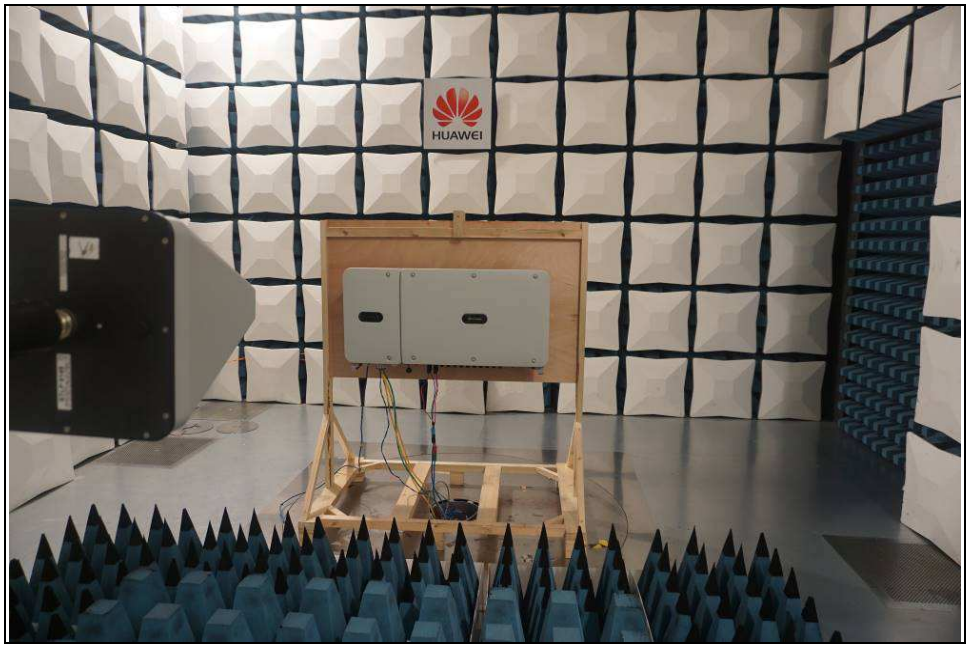


HARMONICS EMISSION TEST &
VOLTAGE FLUCTUATIONS AND FLICKER TEST

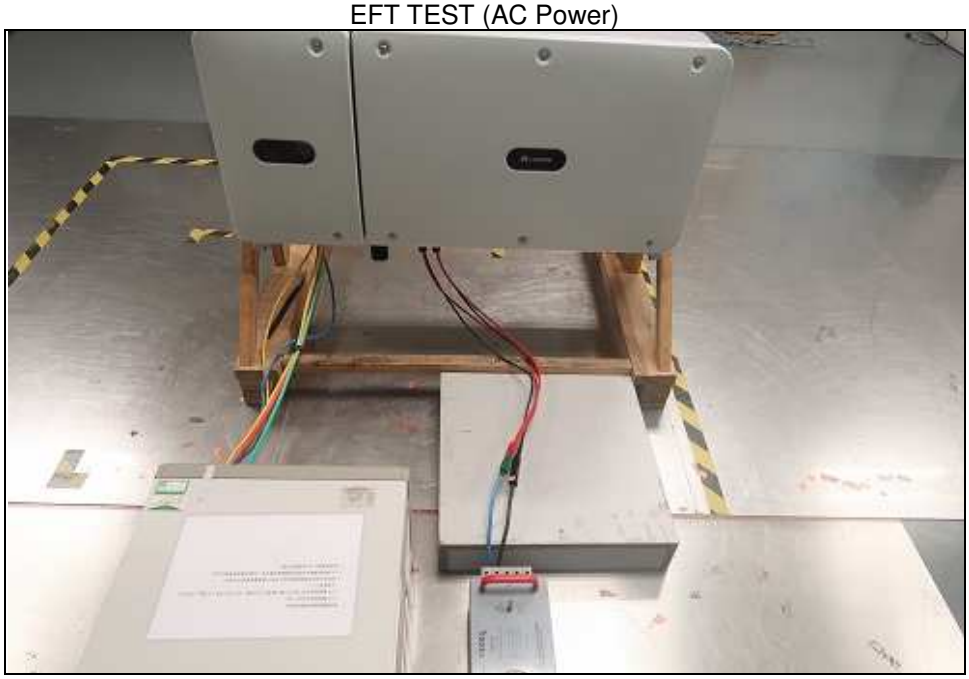
ESD TEST

RS TEST

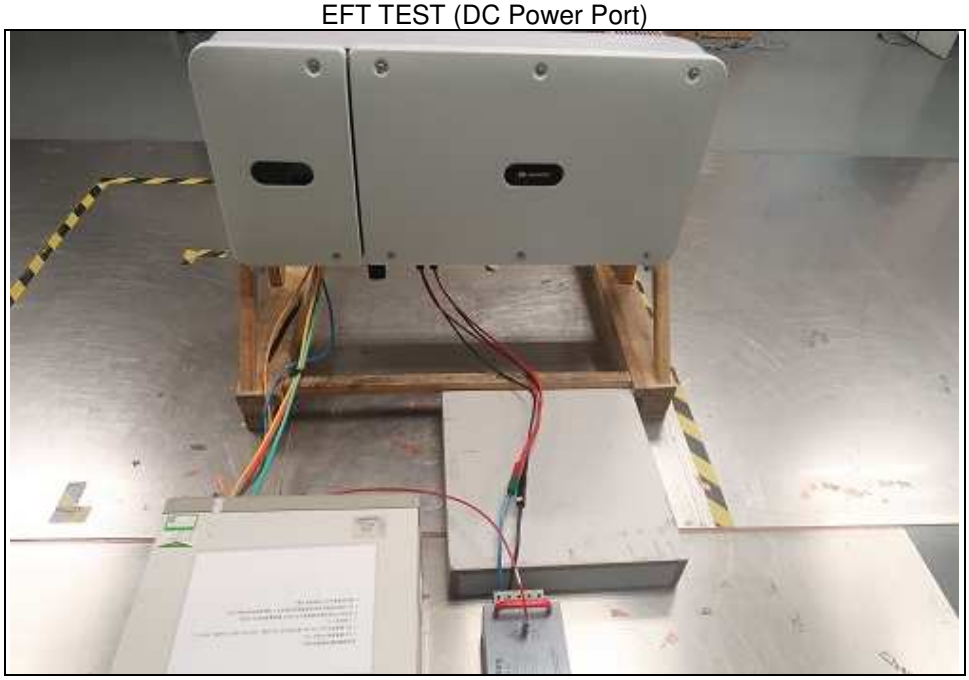




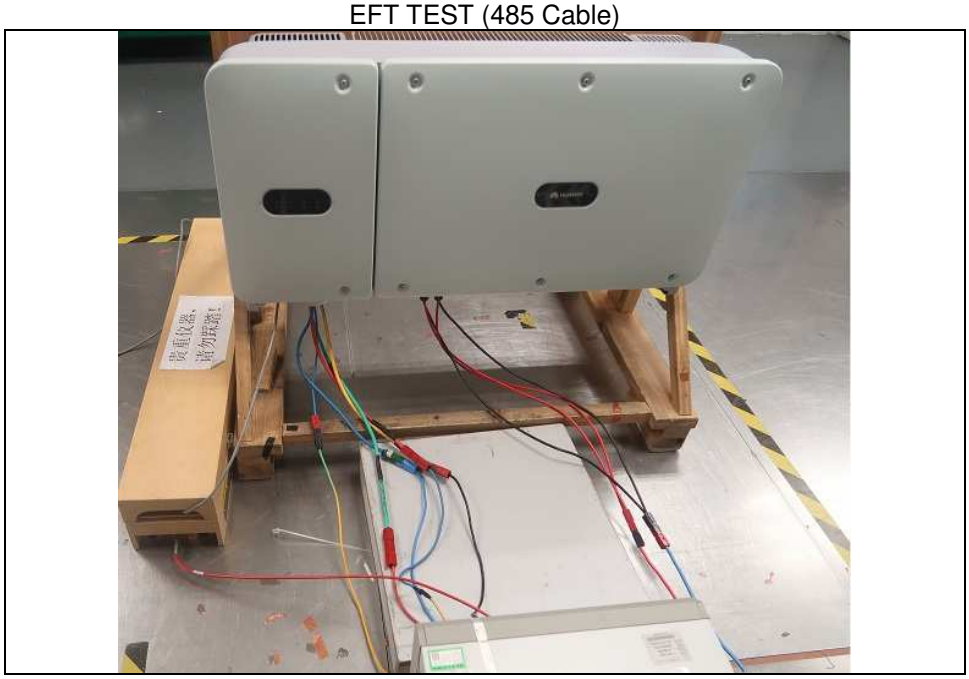
EFT TEST (AC Power)



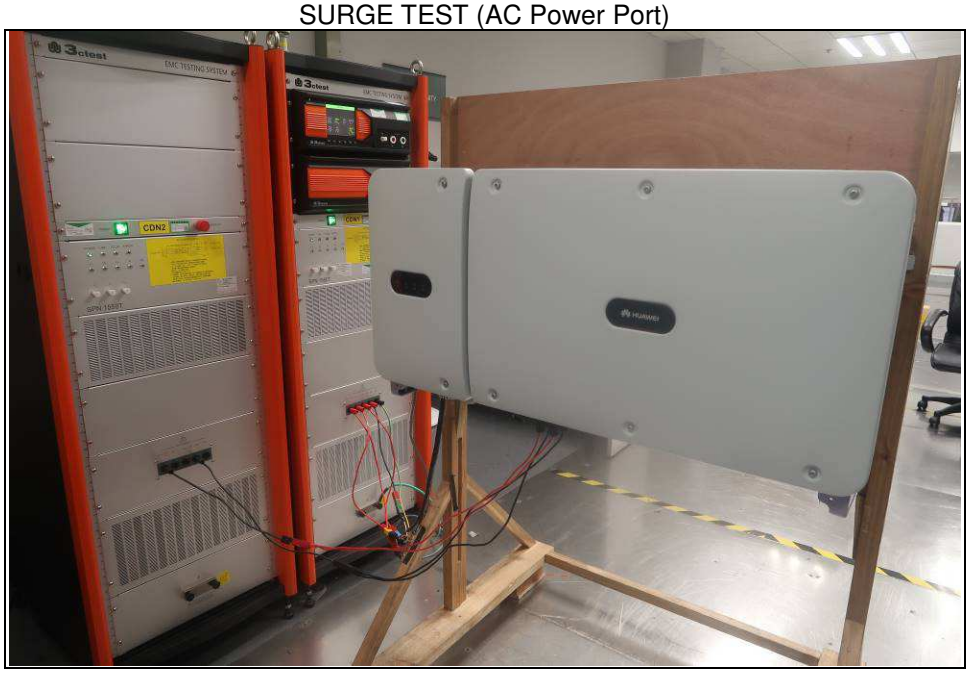
EFT TEST (DC Power Port)



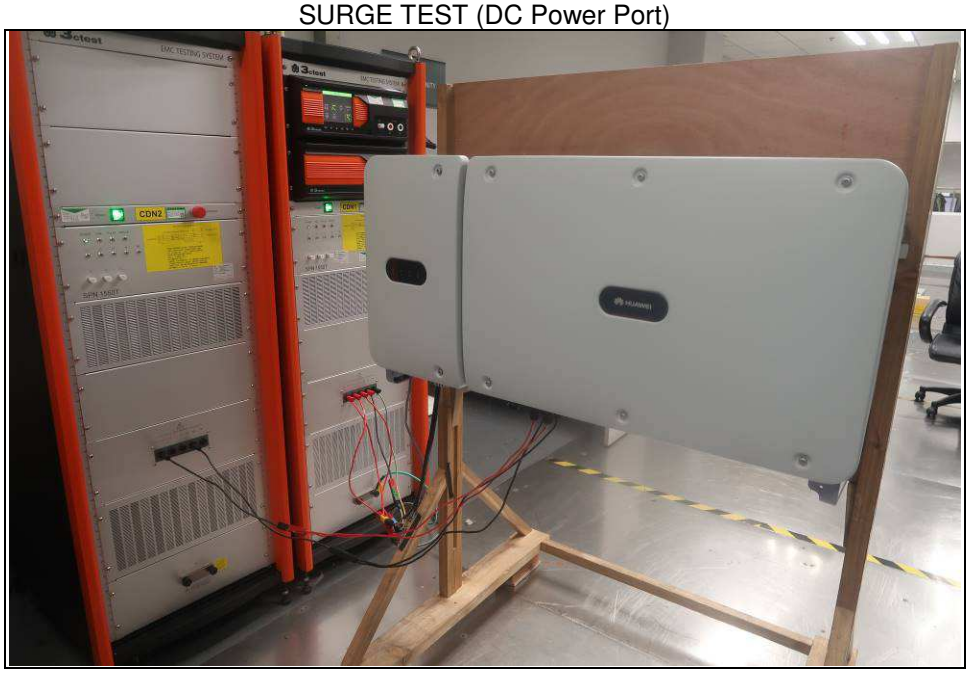
EFT TEST (485 Cable)



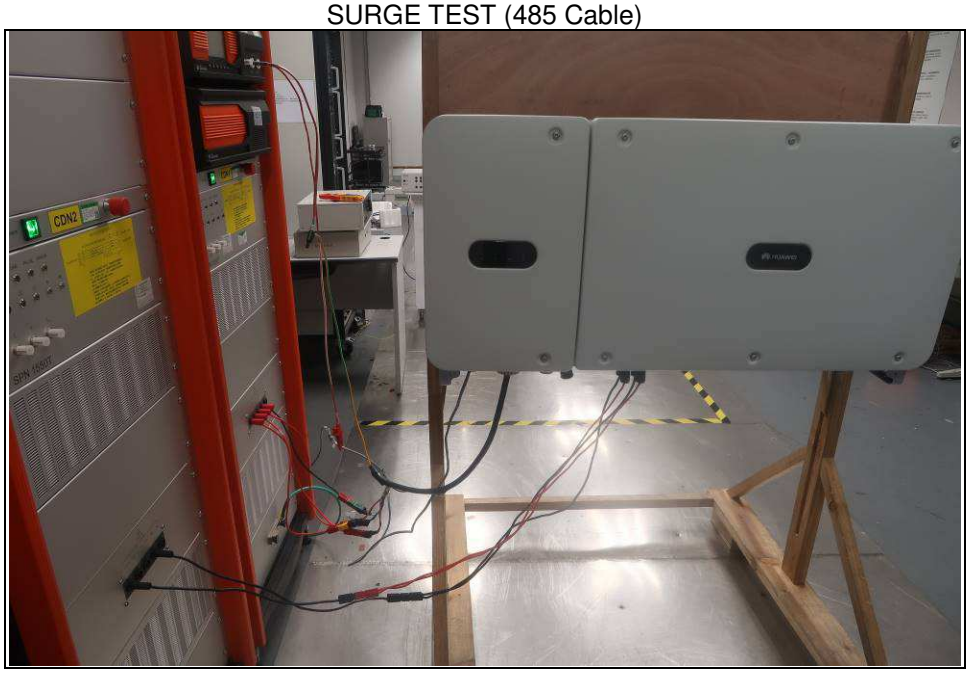
SURGE TEST (AC Power Port)



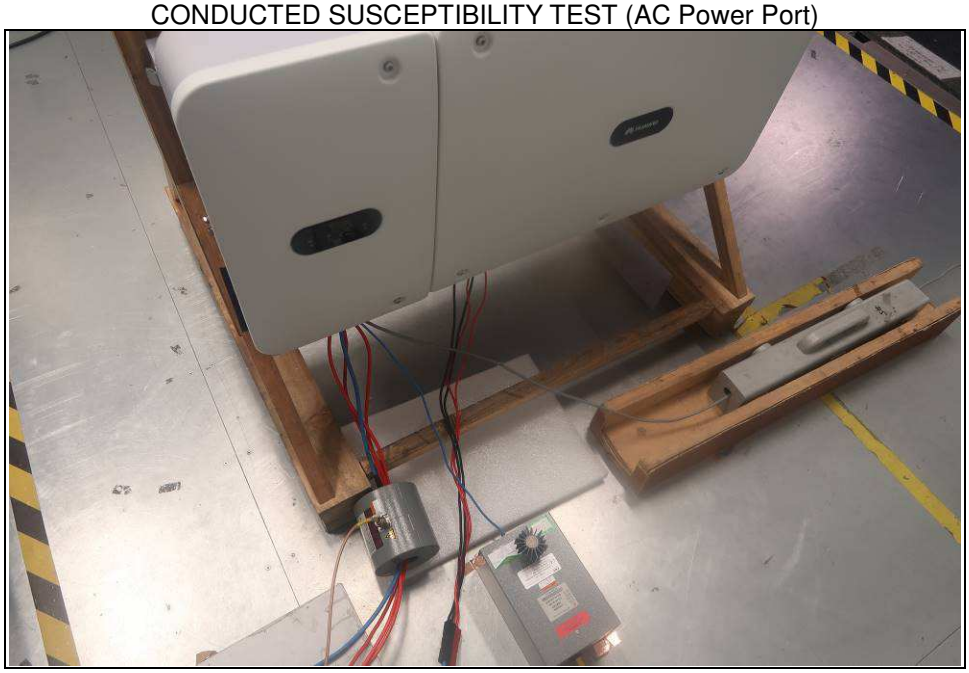
SURGE TEST (DC Power Port)



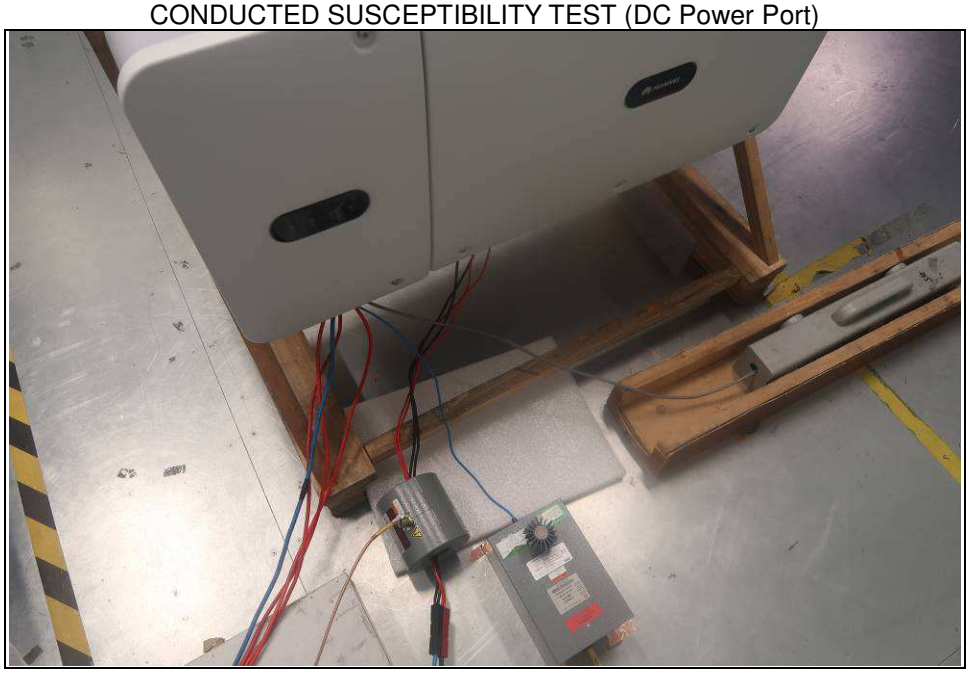
SURGE TEST (485 Cable)



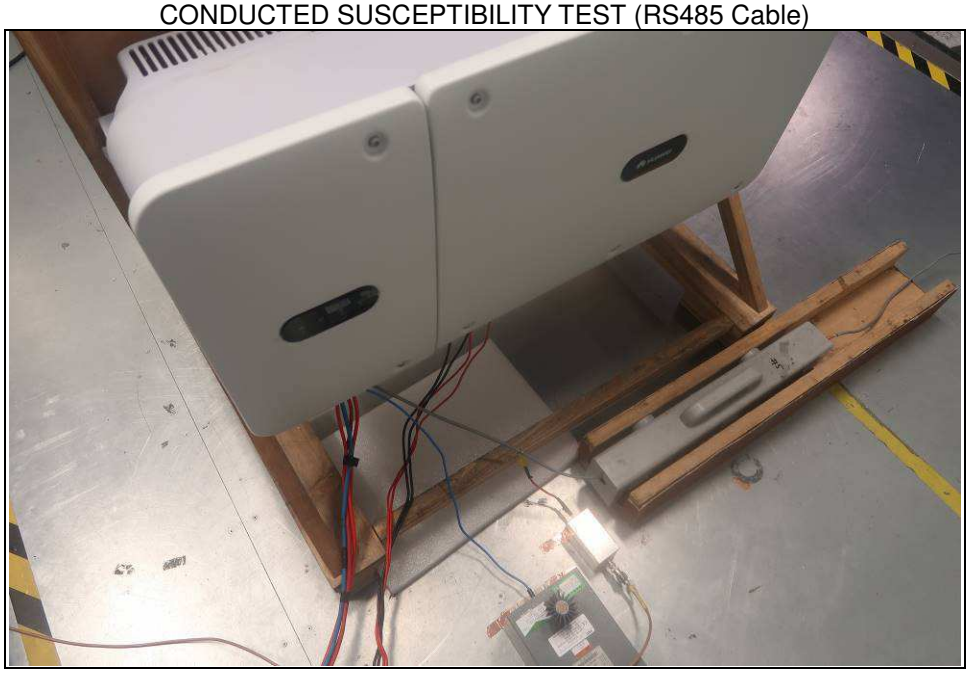
CONDUCTED SUSCEPTIBILITY TEST (AC Power Port)



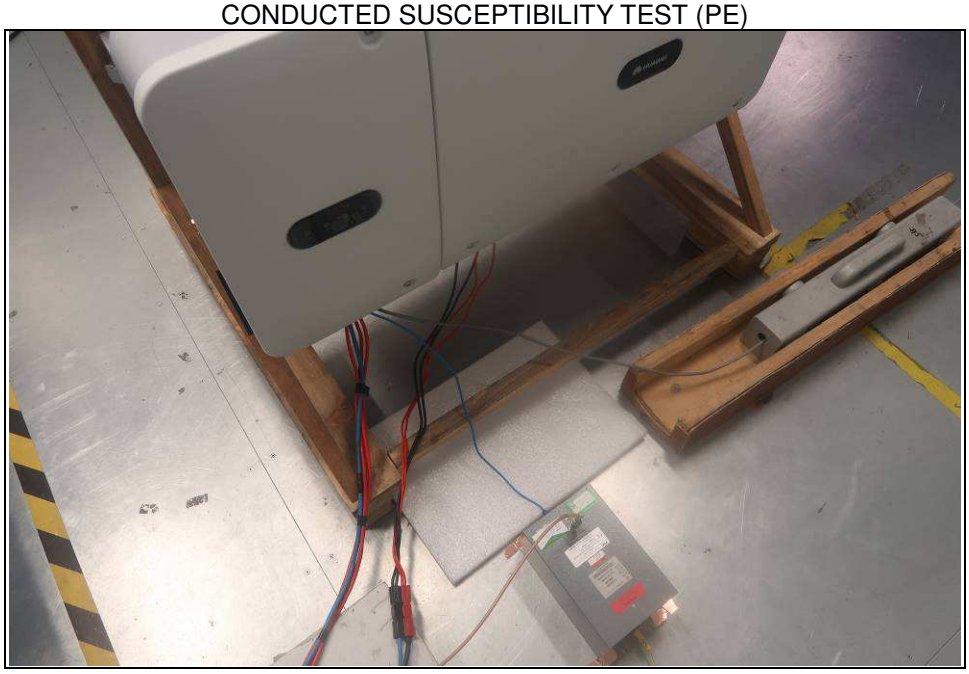
CONDUCTED SUSCEPTIBILITY TEST (DC Power Port)



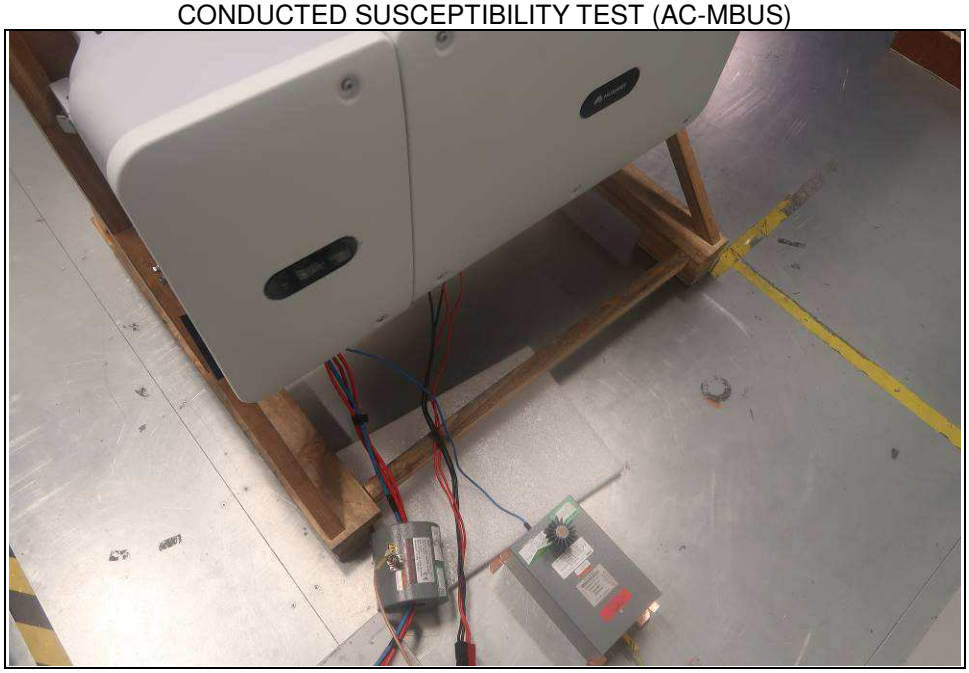
CONDUCTED SUSCEPTIBILITY TEST (RS485 Cable)



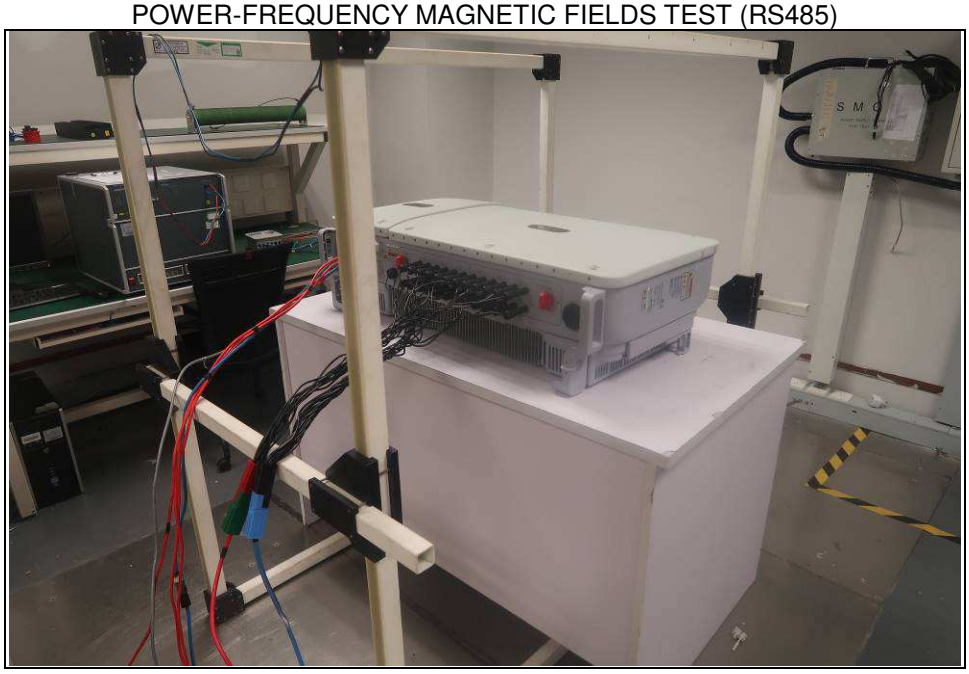
CONDUCTED SUSCEPTIBILITY TEST (PE)



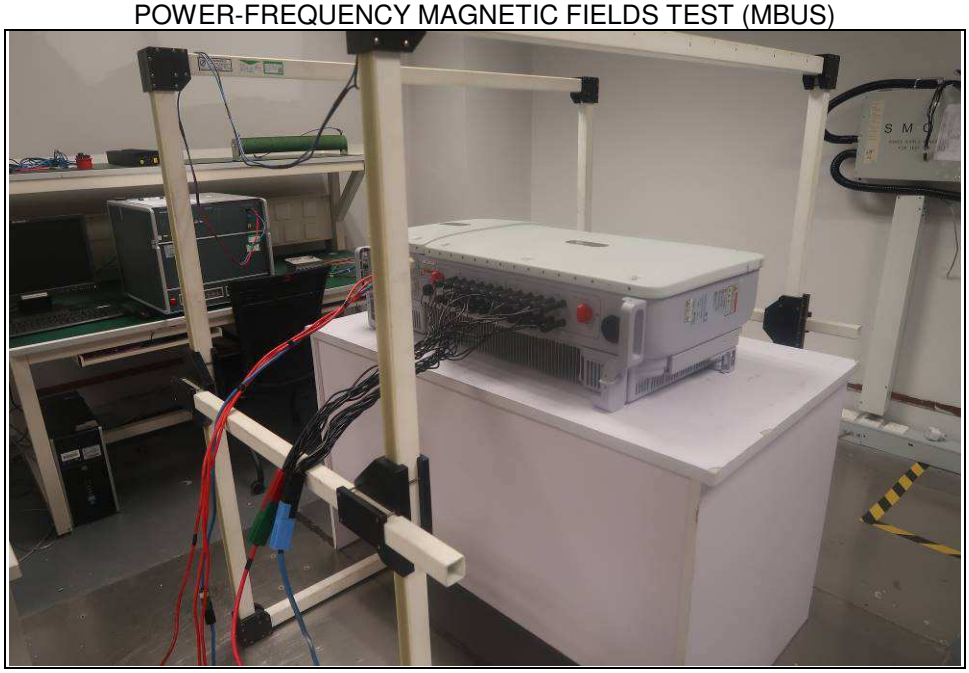
CONDUCTED SUSCEPTIBILITY TEST (AC-MBUS)



POWER-FREQUENCY MAGNETIC FIELDS TEST (RS485)



POWER-FREQUENCY MAGNETIC FIELDS TEST (MBUS)



DIPS TEST

6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---