

# TEST REPORT

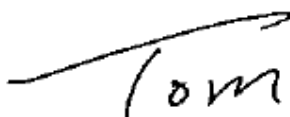

Applicant	Huawei Technologies Co., Ltd
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

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	SUN2000-36KTL	
Additional Model & Model Difference	SUN2000-33KTL-A, See item 2.1	
Date of tests	Mar. 29, 2017 ~ Apr. 06, 2017	

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

<input checked="" type="checkbox"/> EN 61000-6-3:2007 + A1:2011	<input checked="" type="checkbox"/> IEC 61000-6-3:2006 + A1:2010
<input checked="" type="checkbox"/> EN 61000-6-4:2007 + A1:2011	<input checked="" type="checkbox"/> IEC 61000-6-4:2006 + A1:2010
<input checked="" type="checkbox"/> EN 61000-3-12:2011	<input checked="" type="checkbox"/> IEC 61000-3-12:2011
<input checked="" type="checkbox"/> EN 61000-3-11:2000	<input checked="" type="checkbox"/> IEC 61000-3-11:2000
<input checked="" type="checkbox"/> EN 61000-6-1:2007	<input checked="" type="checkbox"/> IEC 61000-6-1:2005
<input checked="" type="checkbox"/> EN 61000-6-2:2005	<input checked="" type="checkbox"/> IEC 61000-6-2:2005

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

Tested by Tom Chen Project Engineer / EMC Department	Approved by Madison Luo Supervisor / EMC Department
	
	Date: May 02, 2017

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification

## Table of Contents

RELEASE CONTROL RECORD .....	5
1 SUMMARY OF TEST RESULTS .....	6
1.1 MEASUREMENT UNCERTAINTY .....	8
2 GENERAL INFORMATION .....	9
2.1 GENERAL DESCRIPTION OF EUT .....	9
2.2 DESCRIPTION OF TEST MODES .....	11
2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS .....	13
2.4 DESCRIPTION OF SUPPORT UNITS .....	14
3 EMISSION TEST .....	15
3.1 CONDUCTED EMISSION MEASUREMENT .....	15
3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT .....	15
3.1.2 TEST INSTRUMENTS .....	15
3.1.3 TEST PROCEDURE .....	16
3.1.4 DEVIATION FROM TEST STANDARD .....	16
3.1.5 TEST SETUP .....	16
3.1.6 EUT OPERATING CONDITIONS .....	16
3.1.7 TEST RESULTS .....	17
3.2 CONDUCTED EMISSION MEASUREMENT AT TELECOMMUNICATION PORTS .....	21
3.2.1 LIMIT OF CONDUCTED COMMON MODE DISTURBANCE AT TELECOMMUNICATION PORTS .....	21
3.2.2 TEST INSTRUMENTS .....	21
3.2.3 TEST PROCEDURE .....	22
3.2.4 DEVIATION FROM TEST STANDARD .....	23
3.2.5 TEST SETUP .....	24
3.2.6 EUT OPERATING CONDITIONS .....	25
3.2.7 TEST RESULTS .....	26
3.3 RADIATED EMISSION MEASUREMENT .....	29
3.3.1 LIMITS OF RADIATED EMISSION MEASUREMENT .....	29
3.3.2 TEST INSTRUMENTS .....	30
3.3.3 TEST PROCEDURE .....	31
3.3.4 DEVIATION FROM TEST STANDARD .....	32
3.3.5 TEST SETUP .....	33
3.3.6 EUT OPERATING CONDITIONS .....	33
3.3.7 TEST RESULTS .....	34
3.4 HARMONICS CURRENT MEASUREMENT (>16A) .....	38
3.4.1 TEST INSTRUMENTS .....	38
3.4.2 CURRENT EMISSION LIMITS FOR EQUIPMENT OTHER THAN BALANCED THREE-PHASE EQUIPMENT .....	38
3.4.3 CURRENT EMISSION LIMITS FOR BALANCED THREE-PHASE EQUIPMENT .....	39
3.4.4 CURRENT EMISSION LIMITS FOR BALANCED THREE-PHASE EQUIPMENT UNDER SPECIFIED CONDITIONS .....	39



3.4.5	DEVIATION FROM TEST STANDARD.....	40
3.4.6	TEST SETUP.....	40
3.4.7	EUT OPERATING CONDITIONS .....	40
3.4.8	TEST RESULTS .....	41
3.5	VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT.....	44
3.5.1	LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT .....	44
3.5.2	TEST INSTRUMENTS.....	45
3.5.3	TEST PROCEDURE.....	45
3.5.4	DEVIATION FROM TEST STANDARD.....	45
3.5.5	TEST SETUP.....	45
3.5.6	EUT OPERATING CONDITIONS .....	45
3.5.7	TEST RESULTS .....	46
4	IMMUNITY TEST .....	48
4.1	GENERAL DESCRIPTION .....	48
4.1.1	GENERAL DESCRIPTION OF EN 61000-6-2 .....	48
4.1.2	PERFORMANCE CRITERIA .....	49
4.1.3	EUT OPERATING CONDITION.....	49
4.2	ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD).....	50
4.2.1	TEST SPECIFICATION .....	50
4.2.2	TEST INSTRUMENTS.....	50
4.2.3	TEST PROCEDURE.....	51
4.2.4	DEVIATION FROM TEST STANDARD.....	51
4.2.5	TEST SETUP.....	52
4.2.6	TEST RESULTS .....	53
4.3	RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD.....	54
	IMMUNITY TEST (RS) .....	54
4.3.1	TEST SPECIFICATION .....	54
4.3.2	TEST INSTRUMENTS.....	54
4.3.3	TEST PROCEDURE.....	55
4.3.4	DEVIATION FROM TEST STANDARD.....	55
4.3.5	TEST SETUP.....	56
4.3.6	TEST RESULTS .....	57
4.4	ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT) .....	58
4.4.1	TEST SPECIFICATION .....	58
4.4.2	TEST INSTRUMENTS.....	58
4.4.3	TEST PROCEDURE.....	58
4.4.4	DEVIATION FROM TEST STANDARD.....	59
4.4.5	TEST SETUP.....	59
4.4.6	TEST RESULTS .....	60
4.5	SURGE IMMUNITY TEST .....	61
4.5.1	TEST SPECIFICATION .....	61
4.5.2	TEST INSTRUMENTS.....	61
4.5.3	TEST PROCEDURE.....	62
4.5.4	DEVIATION FROM TEST STANDARD.....	62
4.5.5	TEST SETUP.....	62
4.5.6	TEST RESULTS .....	63
4.6	IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF .....	64
	FIELDS (CS).....	64



Test Report No.: CE161219N048R1

4.6.1	TEST SPECIFICATION .....	64
4.6.2	TEST INSTRUMENTS .....	64
4.6.3	TEST PROCEDURE .....	65
4.6.4	DEVIATION FROM TEST STANDARD .....	65
4.6.5	TEST SETUP .....	66
4.6.6	TEST RESULTS .....	67
4.7	POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST .....	68
4.7.1	TEST SPECIFICATION .....	68
4.7.2	TEST INSTRUMENTS .....	68
4.7.3	TEST PROCEDURE .....	68
4.7.4	DEVIATION FROM TEST STANDARD .....	68
4.7.5	TEST SETUP .....	69
4.7.6	TEST RESULTS .....	70
5	PHOTOGRAPHS OF THE TEST CONFIGURATION .....	71
6	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB .....	81



Test Report No.: CE161219N048R1

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
CE161219N048	Original release	Apr. 07, 2017
CE161219N048R1	Based on the original report CE161219N048 change flicker test data.	May 02, 2017

**Bureau Veritas Shenzhen Co., Ltd.**  
**Dongguan Branch**

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Result	Remarks
EN61000-6-3:2007 + A1:2011(*)	Conducted Test	PASS	Meets Requirement Limit Minimum passing margin is -5.0dB at 0.388500MHz
EN 61000-6-4:2007 + A1:2011	Conducted Test (Telecom port)	PASS	Meets Requirement Limit Minimum passing margin is -6.4dB at 5.370000MHz
IEC 61000-6-3:2006 + A1:2010(*)			
IEC 61000-6-4:2006 + A1:2010	Radiated Test (30MHz~1GHz)	PASS	Meets Limits Minimum passing margin is -6.6dB at 47.269MHz
EN 61000-3-12:2011 IEC 61000-3-12:2011	Harmonic current emissions	PASS	Meets the requirements.
EN 61000-3-11:2000 IEC 61000-3-11:2000	Voltage fluctuations & flicker	PASS	Meets the requirements.

\* The PLC communication mode of Solar Inverter is not apply to this standard.

<b>IMMUNITY (EN 61000-6-2:2005, IEC 61000-6-2:2005, IEC 61000-6-1:2005, EN 61000-6-1:2007)</b>			
<b>Standard</b>	<b>Test Type</b>	<b>Result</b>	<b>Remarks</b>
IEC 61000-4-2:2008	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 4kV 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), 1400-2000 MHz, 10V/m, 80% AM (1kHz) 2000-2700 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	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, line to earth 2kV , DC Power Line: line to line 0.5 kV line to earth 0.5kV Signal Line: 1kV Performance Criterion A
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

## 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(DongGuan Huawei)	0.15MHz ~ 30MHz	+ /-2.55 dB
Radiated emissions(DongGuan Huawei)	30MHz ~ 1000MHz	+ /-4.59 dB



## 2 GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	SOLAR INVERTER
<b>MODEL NO.</b>	SUN2000-36KTL
<b>ADDITIONAL MODEL</b>	SUN2000-33KTL-A
<b>POWER SUPPLY</b>	SUN2000-33KTL-A: Input: DC 480V - 800V, 30.6kW Output: AC 400V, 50/60Hz(optional) SUN2000-36KTL: Input: DC 480V - 850V, 40.8kW Output: AC380V/ 400V, 50/60Hz
<b>SOFTWARE VERSION</b>	V200R002
<b>HARDWARE VERSION</b>	V200R002
<b>THE HIGHEST OPERATING FREQUENCY</b>	Below 108MHz
<b>DATA CABLE SUPPLIED</b>	N/A

#### NOTE:

1. This report CE161219N048R1 supersedes the previous one with the report number CE161219N048 dated on Apr. 07, 2017.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.
3. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
4. Product support two kinds of communication mode, RS485 and PLC. PLC communication use the IEC/EN 61000-6-4 standard limit. RS485 communication use the IEC/EN 61000-6-3 standard limit.

5. This is a series of PV Inverter with the same PCB layout, Models SUN2000-36KTL, SUN2000-33KTL-A, Hardware all the same, different output power、 power components parameters, communication port and DC input port number. the difference has been considered during this test, full test was performed for the model SUN2000-36KTL.

Parameter	SUN2000-33KTL- A	SUN2000-36KTL
MPPT Input	DC 480-800V, 30.6kW 22A*4	DC 480-850V, 40.8kW 22A*4
Output	3×230V /400V+N+PE, 50Hz/60Hz(optional), 30kW	3×220V/380V+N+PE, 3×230V /400V+N+PE, 50/60Hz, 36kW
Max	48.0A 30kW	60.8A 40kW
Power	33000VA	40000VA
RS485	Support	Support
PLC	Support	Support (optional)

## 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

Test Mode	TEST VOLTAGE	Model
<b>Grid Mode(Full Load) + RS485 Data Acquisition</b>	<b>DC 480V; AC 400V</b>	<b>SUN2000-36KTL</b>
Grid Mode(Full Load) + RS485 Data Acquisition	DC 620V; AC 400V	SUN2000-36KTL
Grid Mode(Full Load) + RS485 Data Acquisition	DC 850V; AC 400V	SUN2000-36KTL

◆ Conducted Emissions At Telecom Port Test

Test Mode	TEST VOLTAGE	Model
<b>Grid Mode(Full Load) + RS485 Data Acquisition</b>	<b>DC 480V; AC 400V</b>	<b>SUN2000-36KTL</b>
<b>Grid Mode(Full Load) + RS485 Data Acquisition</b>	DC 620V; AC 400V	
<b>Grid Mode(Full Load) + RS485 Data Acquisition</b>	DC 850V; AC 400V	
<b>Grid Mode(Full Load) + PLC Power On</b>	<b>DC 480V; AC 400V</b>	

◆ For Radiated Emission Test

Test Mode	TEST VOLTAGE	Model
<b>Grid Mode(Full Load) + RS485 Data Acquisition</b>	<b>DC 480V; AC 400V</b>	<b>SUN2000-36KTL</b>
Grid Mode(Full Load) + RS485 Data Acquisition	DC 620V; AC 400V	SUN2000-36KTL
Grid Mode(Full Load) + RS485 Data Acquisition	DC 850V; AC 400V	SUN2000-36KTL
<b>Grid Mode(Full Load) + PLC Power On</b>	<b>DC 480V; AC 400V</b>	<b>SUN2000-36KTL</b>

◆ For H/F Emission Test

Test Mode	TEST VOLTAGE	Model
Grid Mode(Full Load) + PLC power on	DC 620V; AC 400V	SUN2000-36KTL
<b>Grid Mode(Full Load) + RS485 Data Acquisition</b>	<b>DC 480V; AC 400V</b>	<b>SUN2000-36KTL</b>

◆ For Surge Test

Test Mode	TEST VOLTAGE	Model
<b>Grid Mode(1/10 Load) + RS485 Data Acquisition</b>	<b>DC 400V; AC 400V</b>	<b>SUN2000-36KTL</b>
<b>Grid Mode(1/10 Load) + PLC Power on</b>	<b>DC 400V; AC 400V</b>	<b>SUN2000-36KTL</b>

◆ For Other Immunity Tests

Test Mode	TEST VOLTAGE	Model
<b>Grid Mode(1/10 Load) + RS485 Data Acquisition</b>	<b>DC 520V; AC 400V</b>	<b>SUN2000-36KTL</b>
<b>Grid Mode(1/10 Load) + PLC Power on</b>	<b>DC 520V; AC 400V</b>	<b>SUN2000-36KTL</b>

## 2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

**EN 61000-6-3:2007 + A1:2011(\*)**

**EN 61000-6-4:2007 + A1:2011**

**IEC 61000-6-3:2006 + A1:2010(\*)**

**IEC 61000-6-4:2006 + A1:2010**

**EN 61000-3-12:2011**

**IEC 61000-3-12:2011**

**EN 61000-3-11:2000**

**IEC 61000-3-11:2000**

**EN 61000-6-1:2007**

**EN 61000-6-2:2005**

**IEC 61000-6-1:2005**

**IEC 61000-6-2:2005**

**IEC 61000-4-2:2008**

**IEC 61000-4-3:2006 + A1:2007 + A2:2010**

**IEC 61000-4-4:2012**

**IEC 61000-4-5:2014**

**IEC 61000-4-6:2013**

**IEC 61000-4-8:2009**

**IEC 61000-4-11:2004**

**Notes:** The above IEC basic standards are applied with latest version if customer has no special requirement.

\* The PLC communication 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	SmartLogger	HUAWEI	SmartLogger2000 -10-B	2102311HJBBTG5 001122	N/A
2	SmartLogger	HUAWEI	SmartLogger2000 -10-B	2102311NAL10G6 000017	N/A
3	SmartLogger	HUAWEI	SmartLogger1000-1 0-C	2102311rtd10gd000 006	N/A
4	Programmable DC Power Supply	CHROMA	62150H -1000S	62150EF01035	N/A
5	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF00420	N/A
6	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF01074	N/A
7	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF01369	N/A
8	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF01367	N/A
9	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF00419	N/A
10	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF00334	N/A
11	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF00267	N/A
12	Programmable DC Power Supply	CHROMA	62150H-1000S	62150EF00315	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1-3	PLC Cable: Unshielded, Detachable 10m; RS485 Cable: Shielded, Detachable 10m.
4-12	AC Line: Unshielded, Detachable 1.8m; DC Line: Unshielded, Detachable 1.5m.

**Remarks:** SmartLogger 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

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.

##### 3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	R&S	ESCI3	101323	2017/2/21	2018/2/20
Artificial Mains Network	R&S	ENV4200	100001	2016/11/21	2017/11/20
RF Current probe	AH	BCP-511	858	2017/3/6	2018/3/5
Capacitive Voltage Probe	Teseq	CVP2200A	29992	2016/11/28	2017/11/27
100Ω Resistance	LUTHI	CR100A	645	2017/3/6	2018/3/5

**NOTE:** 1. The test was performed by witness in conducted shielding room of Dongguan Huawei Technology Co., Ltd.

2. The test was performed in Conducted shielding room.

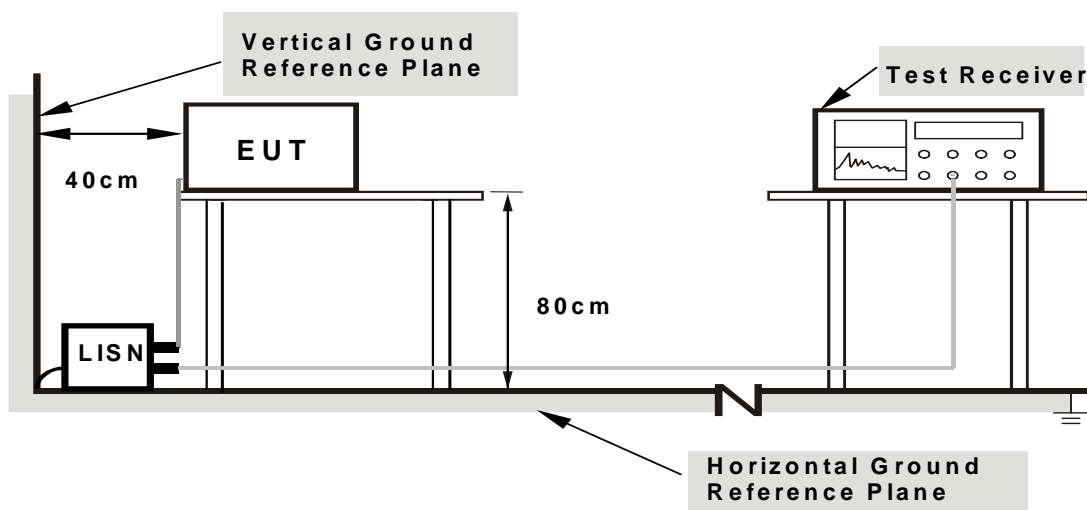
### 3.1.3 TEST PROCEDURE

- 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.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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



**Note:** 1.Support units were connected to second LISN.  
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

### 3.1.6 EUT OPERATING CONDITIONS

- Turned on the power of all equipment.
- EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



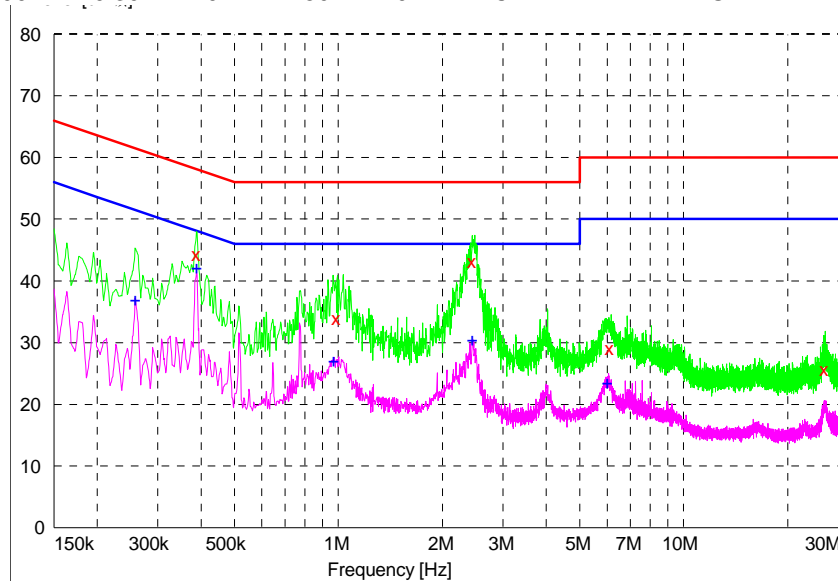
### 3.1.7 TEST RESULTS

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9 kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	Line (L1)
<b>ENVIRONMENTAL CONDITIONS</b>	22 deg. C, 55% RH	<b>TESTED BY:</b> Liu lubin	

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.388500	44.40	19.8	58	13.7	QP	L1	GND
0.987000	34.00	19.7	56	22.0	QP	L1	GND
2.445000	43.20	19.7	56	12.8	QP	L1	GND
6.108000	29.10	19.8	60	30.9	QP	L1	GND
25.561500	25.60	20.0	60	34.4	QP	L1	GND

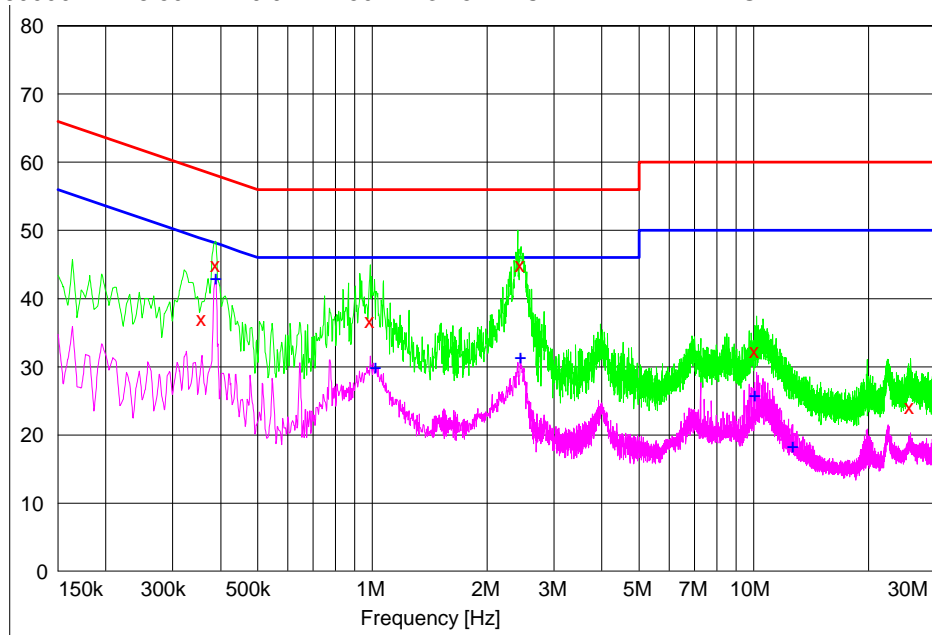
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.258000	37.00	19.9	52	14.5	CAV	L1	GND
0.388500	42.20	19.8	48	5.9	CAV	L1	GND
0.969000	27.10	19.7	46	18.9	CAV	L1	GND
2.440500	30.60	19.7	46	15.4	CAV	L1	GND
6.013500	23.70	19.7	50	26.3	CAV	L1	GND
29.436000	20.30	20.1	50	29.7	CAV	L1	GND



<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9 kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	Line (L2)
<b>ENVIRONMENTAL CONDITIONS</b>	22 deg. C, 55% RH	<b>TESTED BY:</b> Liu lubin	

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.357000	37.10	19.8	59	21.7	QP	L2	GND
0.388500	45.00	19.8	58	13.1	QP	L2	GND
0.987000	36.80	19.7	56	19.2	QP	L2	GND
2.440500	45.00	19.7	56	11.0	QP	L2	GND
10.072500	32.40	19.8	60	27.6	QP	L2	GND
25.647000	24.20	20.0	60	35.8	QP	L2	GND

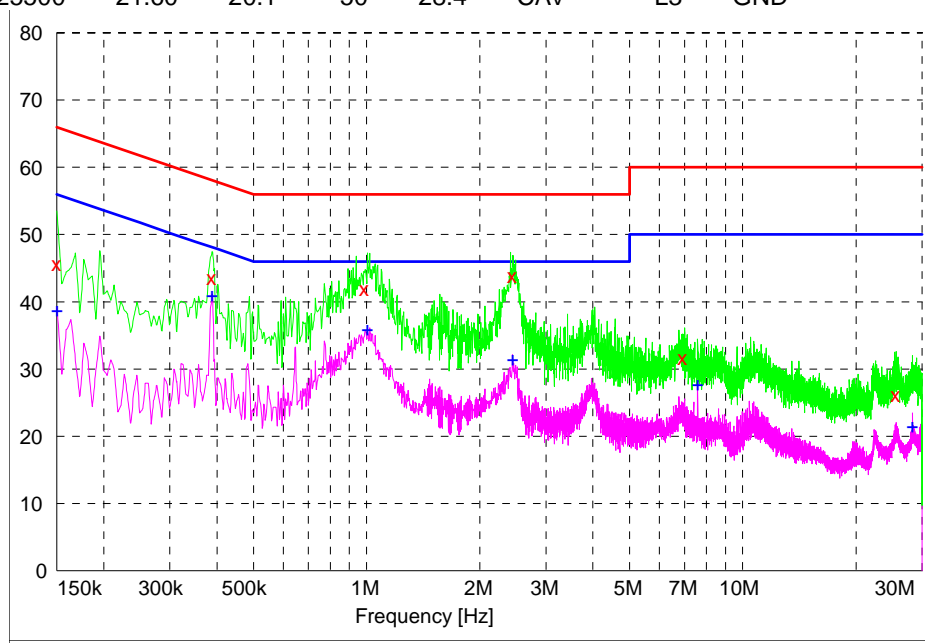
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.388500	43.10	19.8	48	5.0	CAV	L2	GND
1.018500	30.10	19.7	46	15.9	CAV	L2	GND
2.445000	31.50	19.7	46	14.5	CAV	L2	GND
10.072500	25.90	19.8	50	24.1	CAV	L2	GND
12.669000	18.50	19.9	50	31.5	CAV	L2	GND



<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9 kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	Line (L3)
<b>ENVIRONMENTAL CONDITIONS</b>	22 deg. C, 55% RH	<b>TESTED BY:</b> Liu lubin	

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	45.70	20.1	66	20.3	QP	L3	GND
0.388500	43.60	19.8	58	14.5	QP	L3	GND
0.987000	41.90	19.7	56	14.1	QP	L3	GND
2.440500	43.90	19.7	56	12.1	QP	L3	GND
6.936000	31.80	19.8	60	28.2	QP	L3	GND
25.606500	26.20	20.0	60	33.8	QP	L3	GND

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	38.90	20.1	56	17.1	CAV	L3	GND
0.388500	41.10	19.8	48	7.0	CAV	L3	GND
1.005000	36.00	19.7	46	10.0	CAV	L3	GND
2.445000	31.50	19.7	46	14.5	CAV	L3	GND
7.579500	27.90	19.8	50	22.1	CAV	L3	GND
28.225500	21.60	20.1	50	28.4	CAV	L3	GND





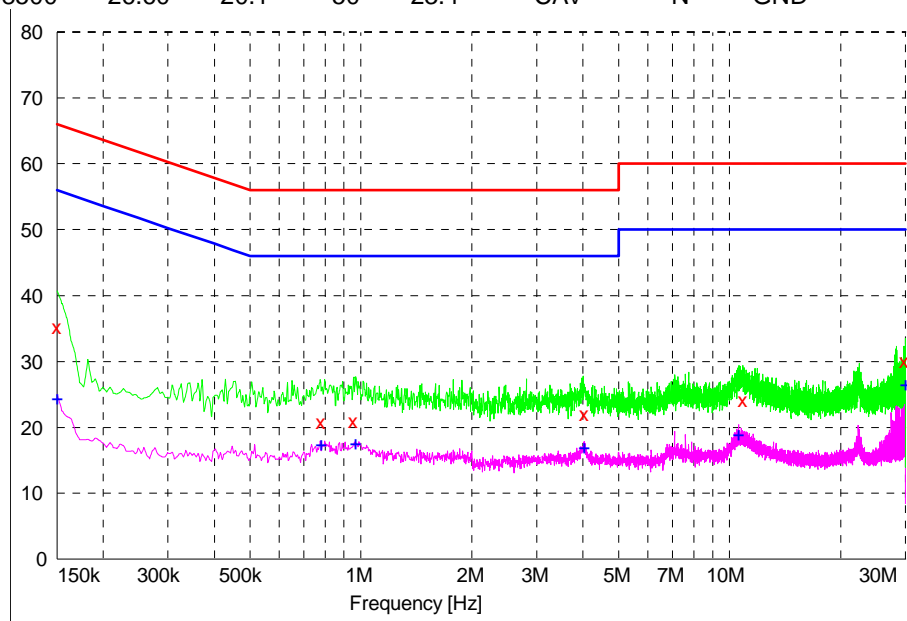
**BUREAU  
VERITAS**

**Test Report No.: CE161219N048R1**

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9 kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	Line (N)
<b>ENVIRONMENTAL CONDITIONS</b>	22 deg. C, 55% RH	<b>TESTED BY:</b> Liu lubin	

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	35.20	20.1	66	30.8	QP	N	GND
0.780000	20.70	19.7	56	35.3	QP	N	GND
0.955500	20.90	19.7	56	35.1	QP	N	GND
4.038000	22.00	19.8	56	34.0	QP	N	GND
10.882500	24.20	19.8	60	35.8	QP	N	GND
29.836500	30.10	20.1	60	29.9	QP	N	GND

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	24.40	20.1	56	31.6	CAV	N	GND
0.780000	17.50	19.7	46	28.5	CAV	N	GND
0.969000	17.60	19.7	46	28.4	CAV	N	GND
4.033500	17.00	19.8	46	29.0	CAV	N	GND
10.572000	19.00	19.8	50	31.0	CAV	N	GND
29.998500	26.60	20.1	50	23.4	CAV	N	GND



**Bureau Veritas Shenzhen Co., Ltd.**  
**Dongguan Branch**

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

### 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 61000-6-4  
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

4	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
	EMI Test Receiver	R&S	ESCI3	101323	2017/2/21	2018/2/20
	Artificial Mains Network	R&S	ENV4200	100001	2016/11/21	2017/11/20
	RF Current probe	AH	BCP-511	858	2017/3/6	2018/3/5
	Capacitive Voltage Probe	Teseq	CVP2200A	29992	2016/11/28	2017/11/27
	100Ω Resistance	LUTHI	CR100A	645	2017/3/6	2018/3/5

**NOTE:** 1. The test was performed by witness in conducted shielding room of Dongguan Huawei Technology Co., Ltd.  
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  $50\ \Omega$  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 $150\ \Omega$ load to the outside surface of the shield cable:

- a. Break the insulation and connect a  $150\ \Omega$  resistor from the outside surface of the shield cable to ground, and apply a ferrite tube or clamp between  $150\ \Omega$  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  $150\ \Omega$  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:**

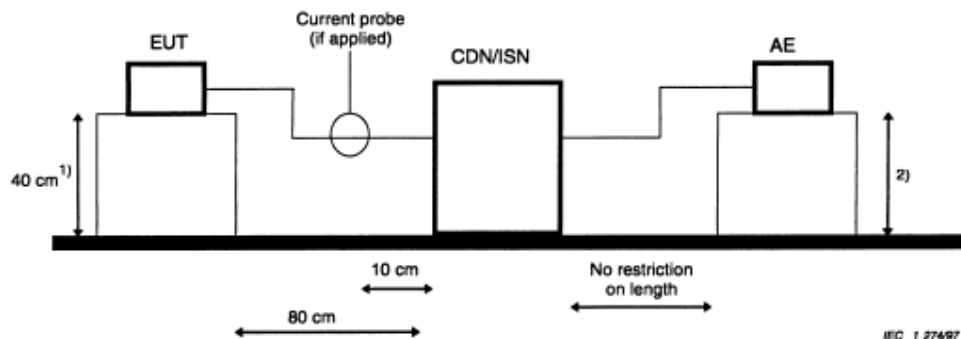
- a. The EUT is placed 0.4 meters from the conducting wall of the shielded room and connected to AE with a cable. The cable contains more than four balanced pairs or to unbalanced cable.
- b. Measure current with a current probe and compare to the current limit.
- c. Measure voltage with a capacitive probe and adjust the measured voltage as follows:
- d. – current margin  $\leq 6$  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:

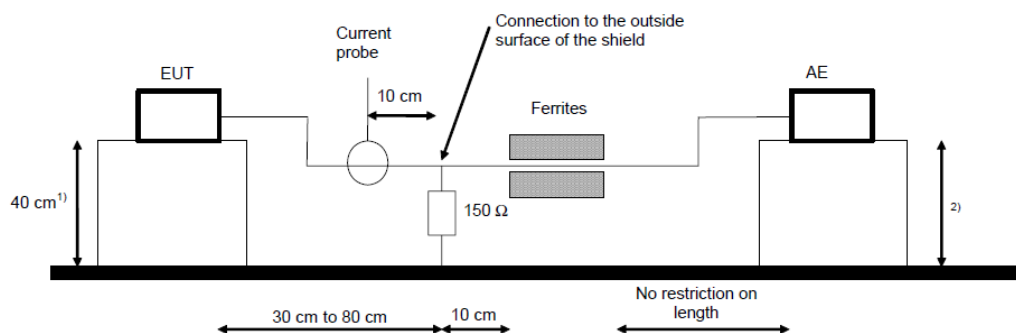


AE = Associated equipment  
EUT = Equipment under test

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

2) Distance to the reference groundplane is not critical.

For using a 150  $\Omega$  load to the outside surface of the shield cable:



AE = Associated equipment

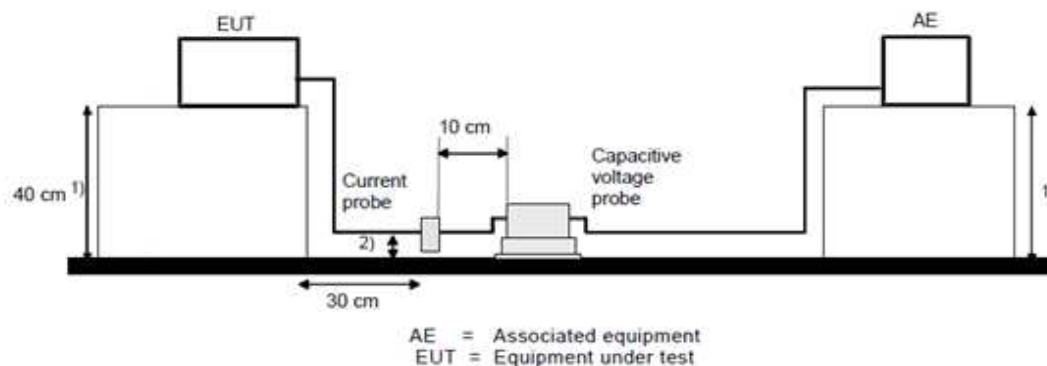
EUT = Equipment under test

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:**



<sup>1)</sup> Distance to the reference groundplane (vertical or horizontal)

<sup>2)</sup> Distance  $4 \pm 1$  cm from the reference groundplane.

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

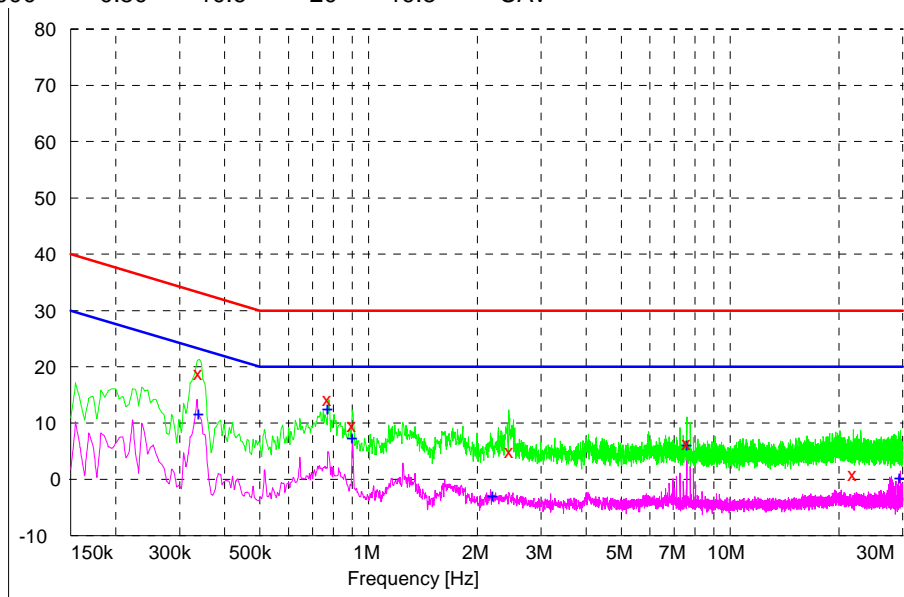
### 3.2.6 EUT OPERATING CONDITIONS

Same as item 3.1.6

### 3.2.7 TEST RESULTS

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	RS485 PORT (RJ45 Cable)
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 50% RH	<b>TEST BY</b>	Tu Junjie

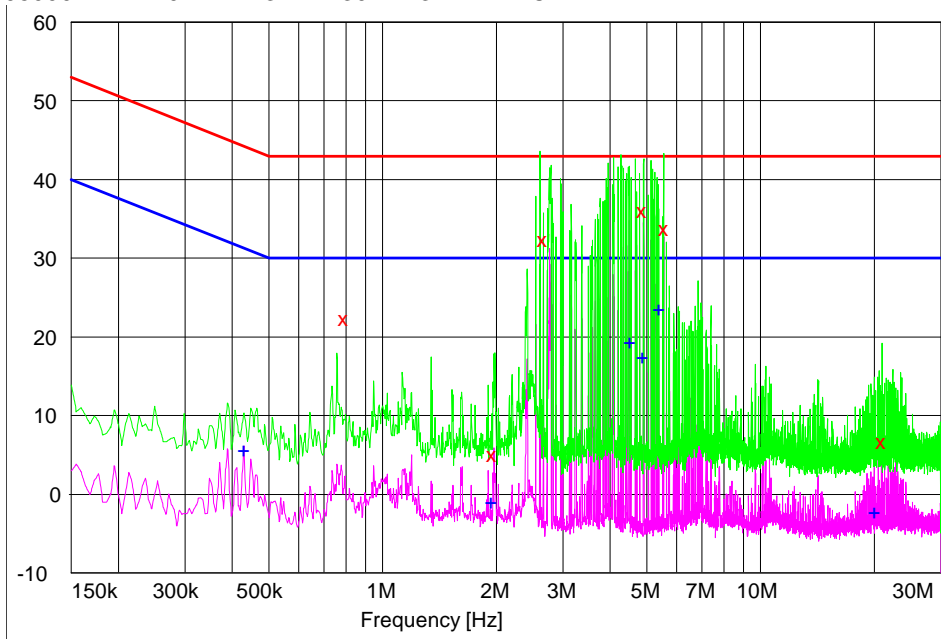
Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Detector
0.339000	19.00	10.4	33	14.2	QP
0.771000	14.30	10.1	30	15.7	QP
0.901500	9.60	10.1	30	20.4	QP
2.454000	5.20	10.0	30	24.8	QP
7.584000	6.50	10.1	30	23.5	QP
21.876000	1.00	11.2	30	29.0	QP
Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Detector
0.339000	11.70	10.4	23	11.5	CAV
0.771000	12.80	10.1	20	7.2	CAV
0.901500	7.50	10.1	20	12.5	CAV
2.202000	-2.80	10.0	20	22.8	CAV
7.579500	6.40	10.1	20	13.6	CAV
29.436000	0.50	10.6	20	19.5	CAV



<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	PLC PORT
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 50% RH	<b>TEST BY</b>	Tu Junjie

Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Detector
0.789000	22.40	10.1	43	20.6	QP
1.945500	5.10	10.0	43	37.9	QP
2.647500	32.40	10.0	43	10.6	QP
4.861500	36.10	10.1	43	6.9	QP
5.545500	33.90	10.1	43	9.1	QP
20.805000	6.80	11.3	43	36.2	QP

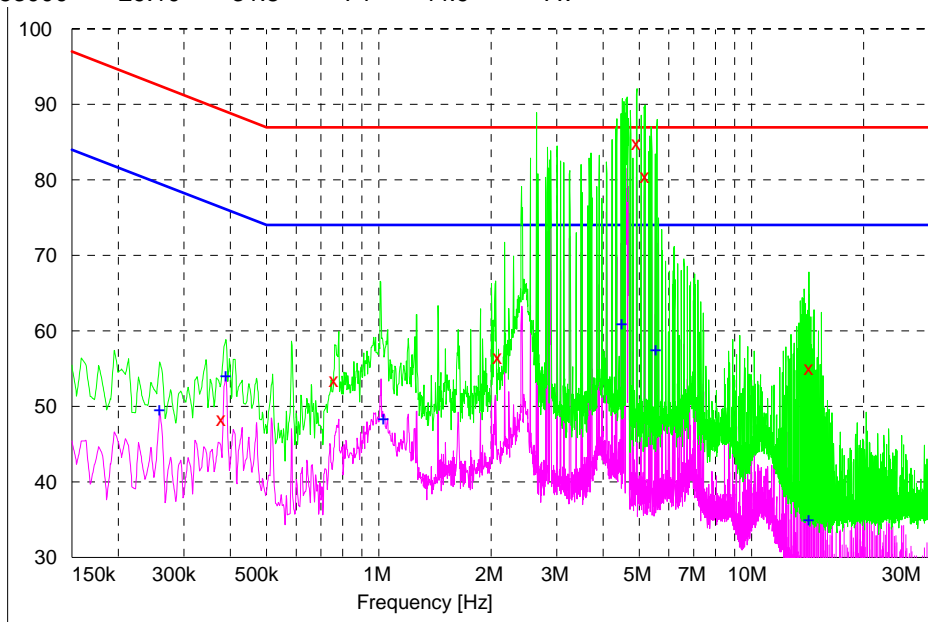
Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Detector
0.429000	5.80	10.3	31	25.5	CAV
1.936500	-0.90	10.0	30	30.9	CAV
4.497000	19.50	10.1	30	10.5	CAV
4.866000	17.50	10.1	30	12.5	CAV
5.370000	23.60	10.1	30	6.4	CAV
19.995000	-2.20	11.3	30	32.2	CAV



<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>6dB BANDWIDTH</b>	9kHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>PHASE</b>	PLC PORT
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 50% RH	<b>TEST BY</b>	Tu Junjie

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.379500	42.40	31.3	89	46.9	QP
0.762000	47.60	31.2	87	39.4	QP
2.085000	50.50	31.4	87	36.5	QP
4.929000	78.90	31.7	87	8.1	QP
5.190000	74.60	31.7	87	12.4	QP
14.289000	49.10	31.8	87	37.9	QP

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.258000	43.70	31.4	80	35.8	AV
0.388500	48.20	31.3	76	27.9	AV
1.027500	42.50	31.2	74	31.5	AV
4.492500	55.10	31.7	74	18.9	AV
5.536500	51.70	31.7	74	22.3	AV
14.253000	29.10	31.8	74	44.9	AV



### 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 B (at 3m)	Class B (at 10m)
	Quasi-Peak (dBuV/m)	Quasi-Peak (dBuV/m)
30 – 230	40	30
230 – 1000	47	37

#### 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.



Test Report No.: CE161219N048R1

### 3.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Receiver	Agilent	N9038A	MY51210189	2016/5/12	2017/5/11
EMI Receiver	R&S	ESU26	100329	2017/2/21	2018/2/20
Bilog antenna(30M-1G)	TESEQ	CBL6112D	30995	2016/5/4	2017/5/3
Bilog antenna(30M-1G)	TESEQ	CBL6112D	30994	2016/5/4	2017/5/3
Preamplifier(30M-1G)	R&S	SCIU-01	10060	2017/2/21	2018/2/20
Preamplifier(30M-1G)	R&S	SCIU-01	10061	2017/2/21	2018/2/20

**NOTE:** 1.The test was performed by witness in 10m chamber of Dongguan Huawei Technology Co., Ltd.  
2.The test was performed in 10m 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.  $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
3.  $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$  (if the raw value not contains the amplifier)
4.  $\text{Correction Factor (dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$  (if the raw value contains the amplifier)
5.  $\text{Margin value} = \text{Emission level} - \text{Limit value..}$

### <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.  $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
4.  $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$  (if the raw value not contains the amplifier)
5.  $\text{Correction Factor (dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$  (if the raw value contains the amplifier)
6.  $\text{Margin value} = \text{Emission level} - \text{Limit value}$ .

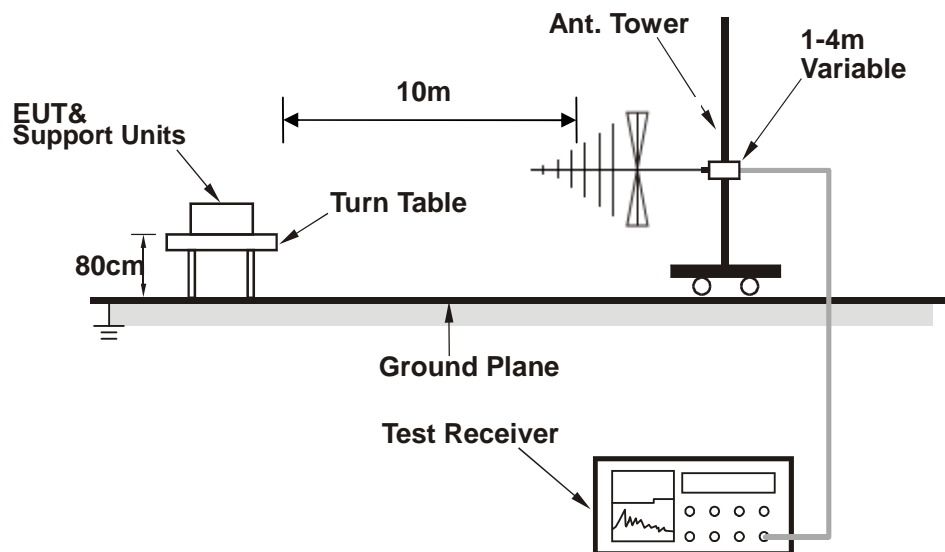
### 3.3.4 DEVIATION FROM TEST STANDARD

No deviation

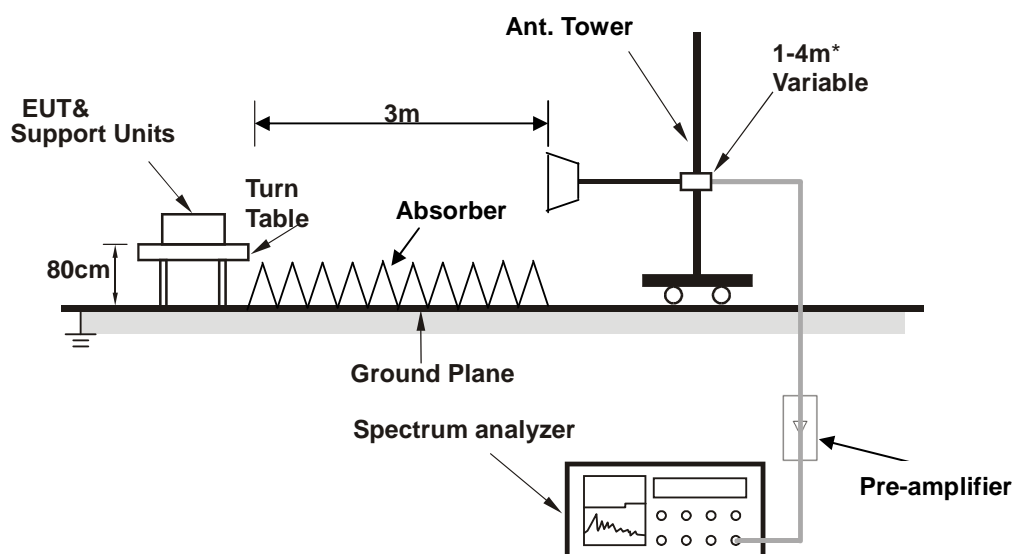


### 3.3.5 TEST SETUP

<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

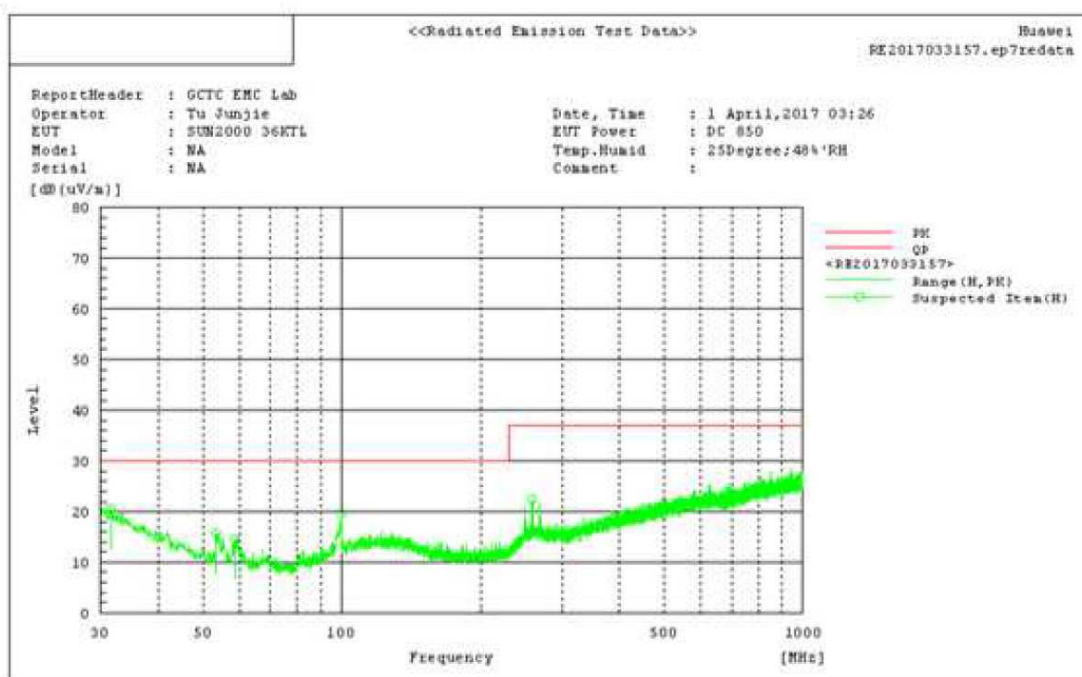


**BUREAU  
VERITAS**

Test Report No.: CE161219N048R1

### 3.3.7 TEST RESULTS

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 48% RH	<b>TESTED BY:</b>	Tu Junjie



Spectrum Selection

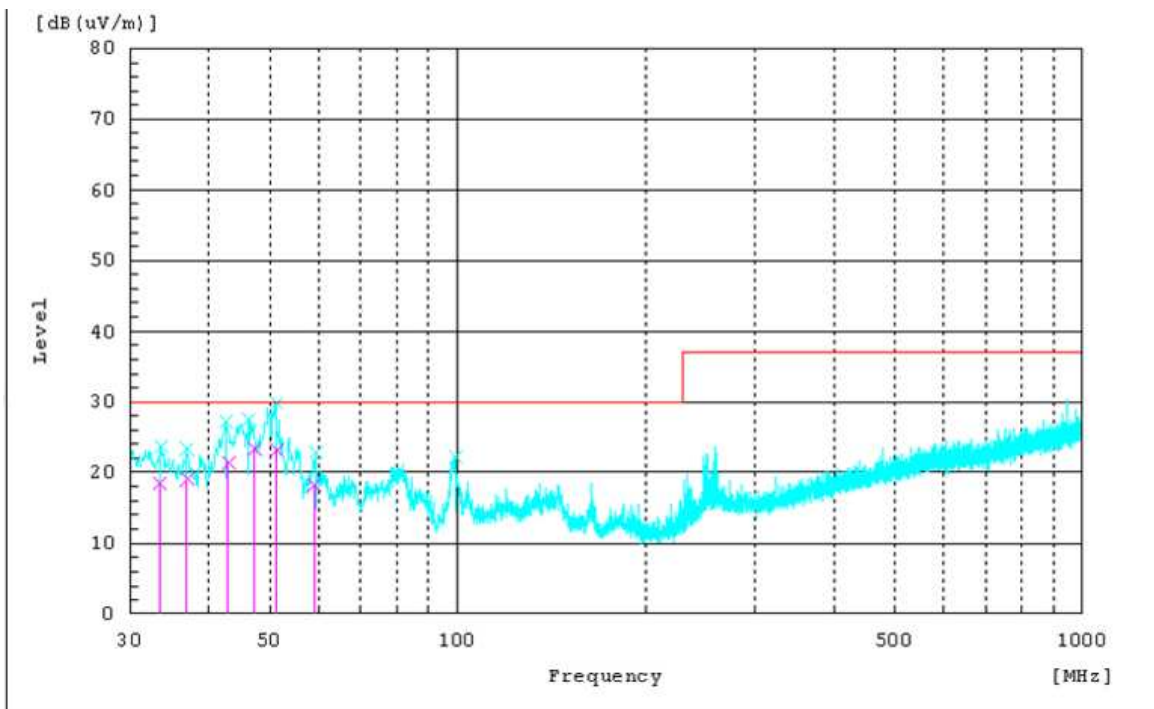
No.	Frequency (F)	Reading	c.f	Result	Limit	Margin	Height	Angle
	[MHz]	[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]
1	31.552	H	39.5	-19.0	20.5	30.0	9.5	100.0
2	53.377	H	45.2	-29.6	15.6	30.0	14.4	100.0
3	58.615	H	45.2	-30.6	14.6	30.0	15.4	100.0
4	99.549	H	45.1	-25.5	19.6	30.0	10.4	400.0
5	258.532	H	43.7	-21.2	22.5	37.0	14.5	400.0

Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + RS485 Data Acquisition	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 48% RH	<b>TESTED BY:</b>	Tu Junjie



Final Result

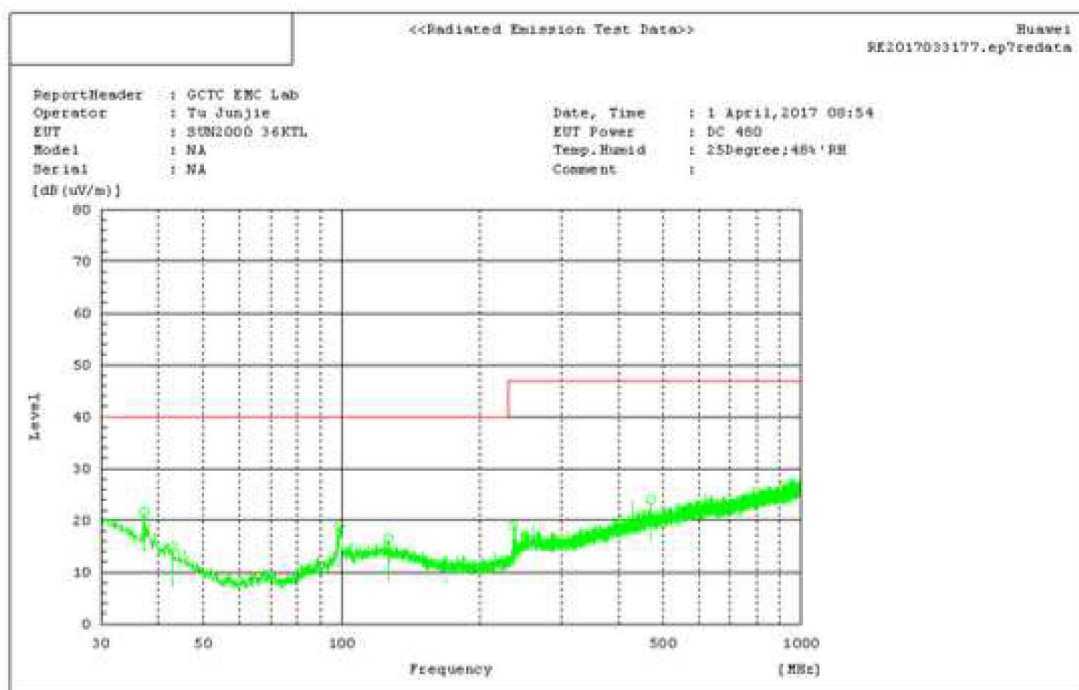
No.	Frequency [MHz]	(P)	Reading QP [dB (uV)]	c.f [dB (1/m)]	Result QP [dB (uV/m)]	Limit QP [dB (uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	51.378	V	52.2	-29.0	23.2	30.0	6.8	188.0	127.0
2	42.928	V	46.7	-25.3	21.4	30.0	8.6	100.0	222.0
3	58.880	V	48.8	-30.6	18.2	30.0	11.8	237.0	199.0
4	33.413	V	38.6	-20.1	18.5	30.0	11.5	118.0	160.0
5	47.269	V	50.7	-27.3	23.4	30.0	6.6	189.0	206.0
6	36.852	V	41.3	-22.1	19.2	30.0	10.8	115.0	237.0



**BUREAU  
VERITAS**

Test Report No.: CE161219N048R1

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + PLC Power On	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 48% RH	<b>TESTED BY:</b>	Tu Junjie



#### Spectrum Selection

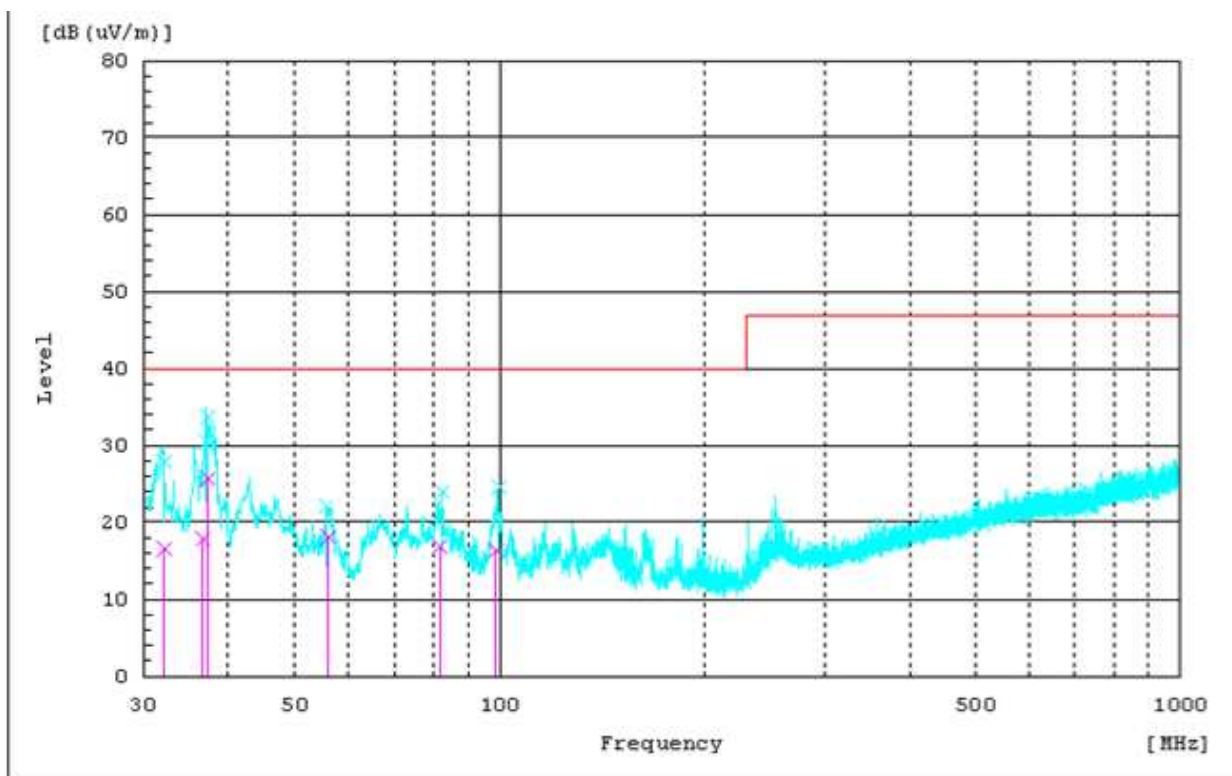
No.	Frequency (P)	Reading	c.f	Result	Limit	Margin	Height	Angle
	[MHz]	QP		QP	QP	QP		
		[dB (uV)]	[dB (1/m)]	[dB (uV/m)]	[dB (uV/m)]	[dB]	[cm]	[deg]
1	37.275	H 44.0	-22.3	21.7	40.0	18.3	100.0	133.0
2	42.804	H 40.1	-25.2	14.9	40.0	25.1	400.0	2.0
3	98.773	H 44.5	-25.6	18.9	40.0	21.1	400.0	171.0
4	126.127	H 40.5	-24.0	16.5	40.0	23.5	100.0	140.0
5	236.416	H 43.6	-24.5	19.1	47.0	27.9	400.0	5.0
6	470.962	H 40.8	-16.8	24.0	47.0	23.0	100.0	277.0

**Bureau Veritas Shenzhen Co., Ltd.**  
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

<b>TEST MODE</b>	SUN2000-36KTL Grid Mode(Full Load) + PLC Power On	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>TEST VOLTAGE</b>	DC 480V AC 400V	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 48% RH	<b>TESTED BY:</b>	Tu Junjie



**Final Result**

No.	Frequency [MHz]	(P)	Reading QP [dB (uV) ]	c.f [dB (1/m) ]	Result QP [dB (uV/m) ]	Limit QP [dB (uV/m) ]	Margin QP [dB]	Height [cm]	Angle [deg]
1	32.214	V	37.4	-20.8	16.6	40.0	23.4	155.0	161.0
2	36.594	V	41.2	-23.2	18.0	40.0	22.0	189.0	252.0
3	37.290	V	47.9	-22.3	25.6	40.0	14.4	141.0	73.0
4	56.056	V	48.0	-29.9	18.1	40.0	21.9	205.0	335.0
5	81.610	V	45.7	-28.8	16.9	40.0	23.1	189.0	208.0
6	98.739	V	42.6	-26.2	16.4	40.0	23.6	146.0	27.0

### 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	2017/02/13	2018/02/12
AC Source	Ametek	MX45-3Pi-400-411-HV-LF-SNK	1137A03445	2016/05/06	2017/05/05

**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 $I_n/I_1$ <sup>a</sup> %						Admissible harmonic current distortion factors %	
	$I_3$	$I_5$	$I_7$	$I_9$	$I_{11}$	$I_{13}$	<i>THD</i>	<i>PWHD</i>
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥ 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 <i>THD</i> and <i>PWHD</i> in the same way as odd order harmonics. NOTE Linear interpolation between successive $R_{sce}$ values is permitted. See also Annex B.								
<sup>a</sup> $I_1$ = 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
$\geq 350$	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.						
<sup>a</sup> $I_1$ = 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
$\geq 120$	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.						
<sup>a</sup> $I_1$ = reference fundamental current; $I_n$ = harmonic current component.						

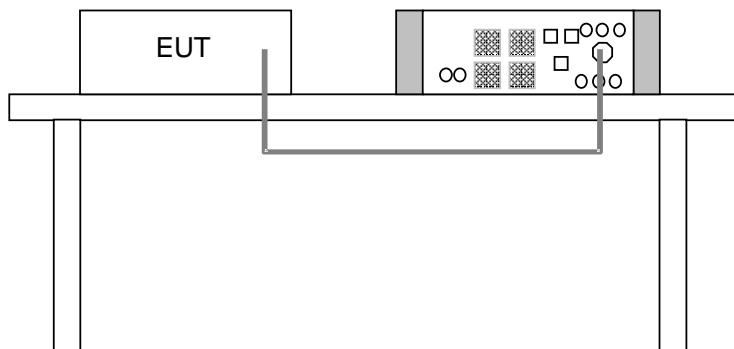


Test Report No.: CE161219N048R1

### 3.4.5 DEVIATION FROM TEST STANDARD

No deviation

### 3.4.6 TEST SETUP



### 3.4.7 EUT OPERATING CONDITIONS

Same as item 3.1.6



## 3.4.8 TEST RESULTS

### SUN2000-36KTL

Regulation : IEC61000-3-12 Ed2.0  
IEC61000-4-7 Ed2.0 A1  
MeasureTime : 180sec  
Model : YOKOGAWA WT3000  
Wiring : 3P4W(3P:three-phase)  
Element : 1  
Range : 300V/100.0A  
Rating Voltage : 230 V  
I<sub>eq</sub> : 15.0000 A  
Z Impedance : 0.1200 ohm  
I<sub>ref</sub> : 52.0815 A  
Set I<sub>ref</sub> : -----  
Power Rsce : 73.773  
Max Rsce : 33.000

### PASS

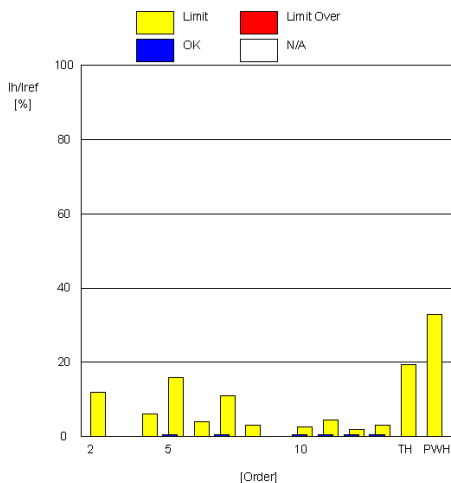
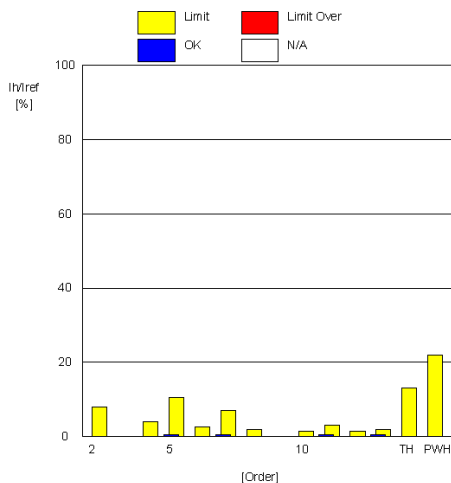
Ssc : 197193.98  
Min Rsce : 33.0000  
Apply Limit : Table3-Balanced 3-phase  
Circumstance a : 0.16% (Pass)  
Term a(I5) : 0.67% (Pass)  
Term a(I7) : 0.40% (Pass)  
Term c : 70.73 - 170.99deg (Fail)  
Term d(I5) : 0.67% (Pass)  
Term d(I7) : 0.40% (Pass)  
Term f : 70.73 - 170.99deg (Fail)

[Average]  
Voltage(rms) : 230.53 V  
Current(rms) : 52.08 A  
Frequency : 50.00 Hz  
Power Factor : 1.00  
Sigma W : 36016.72 W  
THC : 0.69 A  
V THD : 0.47 %  
A THD : 1.34 %  
P THD : 0.00 %

[Maximum]  
Voltage(rms) : 230.54 V  
Current(rms) : 52.12 A  
Frequency : 50.10 Hz  
Power Factor : 1.00  
Sigma W : 36046.00 W  
THC : 0.75 A  
V THD : 0.49 %  
A THD : 1.51 %  
P THD : 0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.1756	8.0000	97.8
3	0.1138	-----	-----
4	0.0850	4.0000	97.9
5	0.5248	10.7000	95.1
6	0.0610	2.6667	97.7
7	0.2783	7.2000	96.1
8	0.1102	2.0000	94.5
9	0.0740	-----	-----
10	0.1864	1.6000	88.4
11	0.4946	3.1000	84.0
12	0.1454	1.3333	89.1
13	0.4786	2.0000	76.1
TH	0.0000	13.0000	100.0
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.2184	12.0000	98.2
3	0.1591	-----	-----
4	0.1102	6.0000	98.2
5	0.6681	16.0500	95.8
6	0.0897	4.0000	97.8
7	0.4005	10.8000	96.3
8	0.1263	3.0000	95.8
9	0.0943	-----	-----
10	0.3012	2.4000	87.4
11	0.5663	4.6500	87.8
12	0.2663	2.0000	86.7
13	0.5981	3.0000	80.1
TH	0.0000	19.5000	100.0
PWH	0.0000	33.0000	100.0



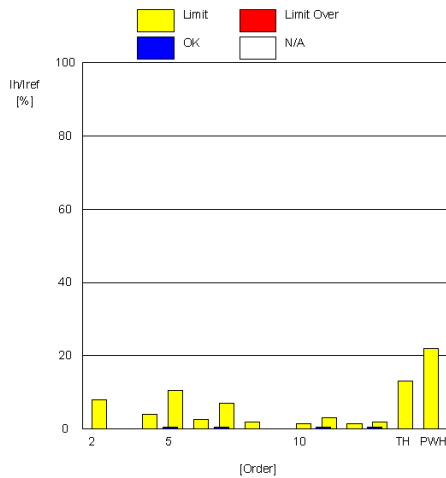


# Test Report No.: CE161219N048R1

Regulation : IEC61000-3-12 Ed2.0  
IEC61000-4-7 Ed2.0 A1  
MeasureTime : 180sec  
Model : YOKOGAWA WT3000  
Wiring : 3P4W(3P three-phase)  
Element : 2  
Range : 300V/100.0A  
Rating Voltage : 230 V  
Ieq : 15.0000 A  
Z Impedance : 0.1200 ohm  
Iref : 52.0873 A  
Set Iref : -----  
Power Rsce : 73.773  
Max Rsce : 33.000

[Average]  
Voltage(rms) : 230.39 V  
Current(rms) : 52.09 A  
Frequency : 50.00 Hz  
Power Factor : 1.00  
Sigma W : 36016.72 W  
THC : 0.69 A  
V THD : 0.50 %  
A THD : 1.34 %  
P THD : 0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.2336	8.0000	97.1
3	0.1668	-----	-----
4	0.0926	4.0000	97.7
5	0.5340	10.7000	95.0
6	0.0636	2.6667	97.6
7	0.3042	7.2000	95.8
8	0.1180	2.0000	94.1
9	0.0623	-----	-----
10	0.1945	1.6000	88.5
11	0.4856	3.1000	84.3
12	0.1518	1.3333	88.6
13	0.4754	2.0000	76.2
TH	0.0000	13.0000	100.0
PWH	0.0000	22.0000	100.0



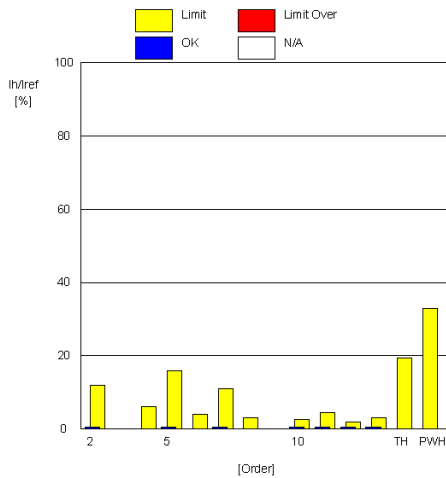
## PASS

Ssc : 197193.98  
Min Rsce : 33.0000

Apply Limit : Table3-Balanced 3-phase  
Circumstance a : 0.22% (Pass)  
Term a(I5) : 0.69% (Pass)  
Term a(I7) : 0.45% (Pass)  
Term c : 75.01 - 170.95deg (Fail)  
Term d(I5) : 0.69% (Pass)  
Term d(I7) : 0.45% (Pass)  
Term f : 75.01 - 170.95deg (Fail)

[Maximum]  
Voltage(rms) : 230.40 V  
Current(rms) : 52.13 A  
Frequency : 50.10 Hz  
Power Factor : 1.00  
Sigma W : 36046.00 W  
THC : 0.75 A  
V THD : 0.51 %  
A THD : 1.51 %  
P THD : 0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.2672	12.0000	97.8
3	0.2241	-----	-----
4	0.1260	6.0000	97.9
5	0.6929	16.0500	95.7
6	0.0963	4.0000	97.6
7	0.4481	10.8000	95.9
8	0.1313	3.0000	95.6
9	0.0791	-----	-----
10	0.2897	2.4000	87.9
11	0.5651	4.6500	87.8
12	0.2650	2.0000	86.8
13	0.5966	3.0000	80.1
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 : 180sec  
Model : YOKOGAWA WT3000  
Wiring : 3P4W(3P three-phase)  
Element : 3  
Range : 300V/100.0A  
Rating Voltage : 230 V  
Ieq : 15.0000 A  
Z Impedance : 0.1200 ohm  
Iref : 52.1402 A  
Set Iref :  
Power Rsce : 73.773  
Max Rsce : 33.000

## PASS

Ssc : 197193.98  
Min Rsce : 33.0000  
Apply Limit : Table3-Balanced 3-phase  
Circumstance a : 0.24% (Pass)  
Term a(15) : 0.69% (Pass)  
Term a(17) : 0.38% (Pass)  
Term c : 77.67 - 172.80deg (Fail)  
Term d(15) : 0.69% (Pass)  
Term d(17) : 0.38% (Pass)  
Term f : 77.67 - 172.80deg (Fail)

### [Average]

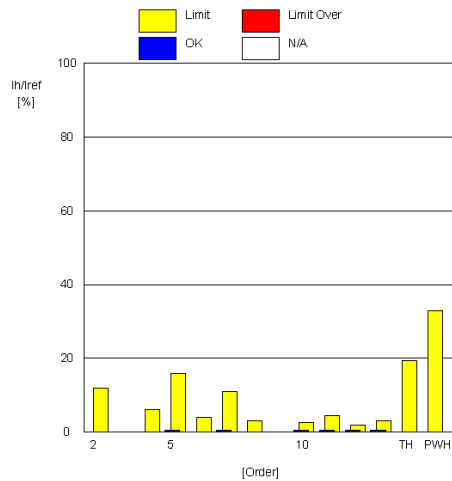
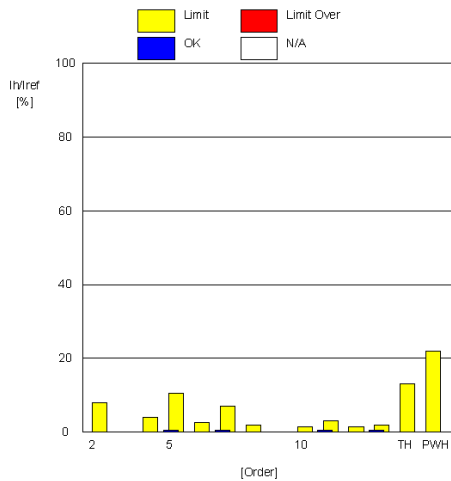
Voltage(rms) : 230.43 V  
Current(rms) : 52.14 A  
Frequency : 50.00 Hz  
Power Factor : 1.00  
Sigma W : 36016.72 W  
THC : 0.70 A  
V THD : 0.44 %  
A THD : 1.35 %  
P THD : 0.00 %

### [Maximum]

Voltage(rms) : 230.45 V  
Current(rms) : 52.18 A  
Frequency : 50.10 Hz  
Power Factor : 1.00  
Sigma W : 36046.00 W  
THC : 0.75 A  
V THD : 0.45 %  
A THD : 1.57 %  
P THD : 0.00 %

Order	Measure[%]	Limit[%]	Margin[%]
2	0.1993	8.0000	97.5
3	0.1779	-----	-----
4	0.1016	4.0000	97.5
5	0.5395	10.7000	95.0
6	0.0646	2.6667	97.6
7	0.2692	7.2000	96.3
8	0.1033	2.0000	94.8
9	0.0857	-----	-----
10	0.1917	1.6000	88.0
11	0.5099	3.1000	83.6
12	0.1447	1.3333	89.2
13	0.4899	2.0000	75.6
TH	0.0000	13.0000	100.0
PWH	0.0000	22.0000	100.0

Order	Measure[%]	Limit[%]	Margin[%]
2	0.2440	12.0000	98.0
3	0.2351	-----	-----
4	0.1336	6.0000	97.8
5	0.6852	16.0500	95.7
6	0.0870	4.0000	97.8
7	0.3808	10.8000	96.5
8	0.1205	3.0000	96.0
9	0.0874	-----	-----
10	0.2939	2.4000	87.8
11	0.5892	4.6500	87.3
12	0.2621	2.0000	86.9
13	0.5986	3.0000	80.0
TH	0.0000	19.5000	100.0
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 61000-3-3

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	$d_{max}$ 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  $\leq 16A$

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,  $\Delta U$ , 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  $d_{c \text{ test}}$ ,  $d_{max \text{ test}}$ ,  $P_{st \text{ test}}$  and  $P_{lt \text{ test}}$  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	2017/02/13	2018/02/12
AC Source	Ametek	MX45-3Pi-400-411-HV-LF-SNK	1137A03445	2016/05/06	2017/05/05

**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.

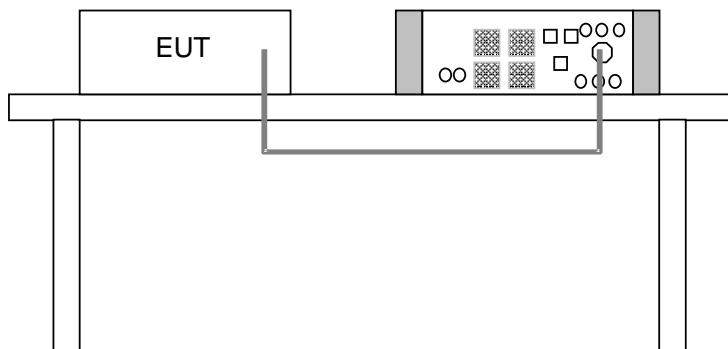
### 3.5.3 TEST PROCEDURE

- 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.
- 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



### 3.5.6 EUT OPERATING CONDITIONS

Same as item 3.1.6.



Test Report No.: CE161219N048R1

## 3.5.7 TEST RESULTS

SUN2000-36KTL

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 : 232.13V  
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	0.08	0.25	----	0.08
2	0.62	0.72	----	0.11
3	0.62	0.64	----	0.11
4	0.62	0.74	----	0.11
5	0.61	0.72	----	0.11
6	0.58	0.61	----	0.11
7	0.61	0.63	----	0.11
8	0.63	0.63	----	0.10
9	0.53	0.66	----	0.10
10	0.54	0.61	----	0.10
11	0.00	0.00	----	0.10
12	0.00	0.00	----	0.18

Plt  
0.12

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 : 232.22V  
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	----	0.08
2	0.56	0.61	----	0.11
3	0.53	0.67	----	0.11
4	0.59	0.65	----	0.11
5	0.59	0.66	----	0.11
6	0.58	0.65	----	0.11
7	0.58	0.72	----	0.11
8	0.59	0.61	----	0.11
9	0.57	0.62	----	0.10
10	0.55	0.64	----	0.10
11	0.00	0.00	----	0.09
12	0.00	0.00	----	0.13

Plt  
0.11

Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)



## Test Report No.: CE161219N048R1

Regulation : IEC61000-3-11 Ed1.0  
IEC61000-4-15 Ed2.0  
Interval : 10Min05Sec  
Model : YOKOGAWA WT3000  
Impedance :  $0.24+j0.15$   
Wiring : three-phase 4wire  
Voltage Range : 600.00V  
Set Voltage : 230V  
Set Frequency : 50Hz  
Voltage U3 : 231.73V  
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	0.00	0.00	-----	0.08
2	0.64	0.70	-----	0.11
3	0.65	0.69	-----	0.11
4	0.62	0.68	-----	0.11
5	0.59	0.68	-----	0.11
6	0.60	0.62	-----	0.11
7	0.38	0.52	-----	0.11
8	0.56	0.65	-----	0.11
9	0.57	0.62	-----	0.10
10	0.55	0.60	-----	0.10
11	0.08	0.24	-----	0.09
12	0.00	0.00	-----	0.16

Plt  
0.11





## 4.1.2 PERFORMANCE CRITERIA

According to Clause 4 of EN 61000-6-2:2005, EN 61000-6-1:2007 standard, the following describes the general performance criteria.

<b>CRITERION A</b>	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.
<b>CRITERION B</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.
<b>CRITERION C</b>	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

## 4.1.3 EUT OPERATING CONDITION

Same as item 3.1.6

## 4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

### 4.2.1 TEST SPECIFICATION

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

### 4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
ESD simulator	Teseq	NSG 437	398	2017/1/22	2018/1/21

**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

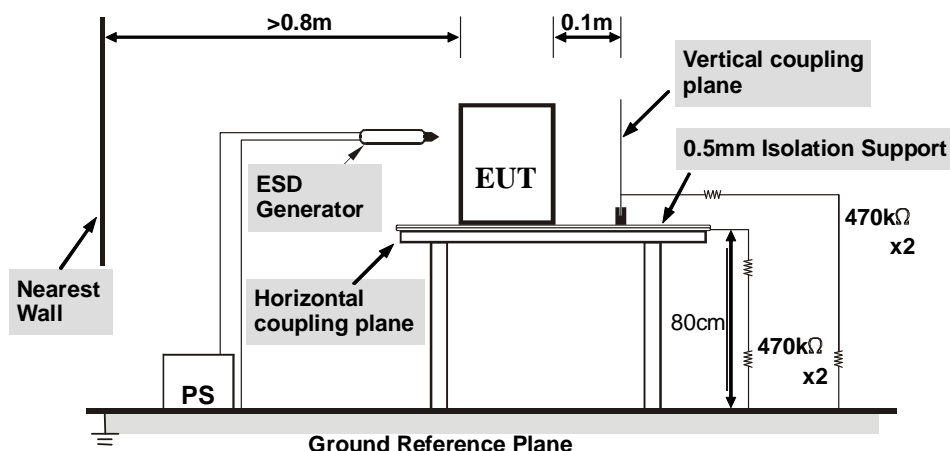
The basic test procedure was in accordance with IEC 61000-4-2:

- 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 **Horizontal Coupling Plane** 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 **Vertical Coupling Plane** 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



### NOTE:

#### TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. 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 **Horizontal Coupling Plane** (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

<b>TEST MODE</b>	See item 2.2	<b>TEST VOLTAGE</b>	DC 520V AC 400V
<b>ENVIRONMENTAL CONDITIONS</b>	21deg. C, 50% RH 101.00kPa	<b>TESTED BY:</b> Zhou Xueqiang	

Direct Discharge Application				
Test Level (kV)	Polarity	Test Point	Test Result of Contact Discharge	Test Result of Air Discharge
6	+/-	All Metal Part	A	N/A
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
6	+/-	HCP&VCP	A	A

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

## 4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

### 4.3.1 TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-3
<b>Frequency Range:</b>	80-1000MHz, 1400-2000MHz, 2000-2700MHz
<b>Field Strength:</b>	10V/m
<b>Modulation:</b>	1kHz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of fundamental
<b>Polarity of Antenna:</b>	Horizontal and Vertical
<b>Antenna Height:</b>	1.5m
<b>Dwell Time:</b>	at least 3 seconds

### 4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	AR	SG6000	327339	2017/1/21	2018/1/20
Power Meter	AR	PM2003	339736	2017/1/21	2018/1/20
Amplifier	AR	500W1000A	337312	2017/1/21	2018/1/20
Amplifier	AR	175S1G4M3	340318	2017/1/21	2018/1/20
Directional Coupler	AR	DC6180A	311186	2017/1/21	2018/1/20
Directional Coupler	AR	DC7144A	336840	2017/1/21	2018/1/20
Power Probe	AR	PH2000	339751	N/A	N/A
Power Probe	AR	PH2000	339752	N/A	N/A
RF TEST SYS CTRLR	AR	SC1000	337402	N/A	N/A
Log-periodic antenna	SCHWARZBECK	STLP 9128D	9128D036	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

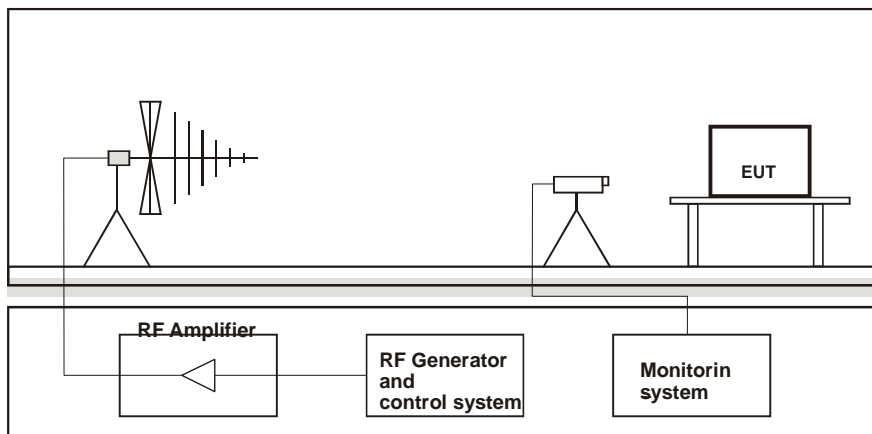
The test procedure was in accordance with IEC 61000-4-3

- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 1000 MHz, 1400MHz to 2000MHz, 2000MHz to 2700MHz 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



### 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

<b>TEST MODE</b>	See item 2.2	<b>TEST VOLTAGE</b>	DC 520V AC 400V
<b>ENVIRONMENTAL CONDITIONS</b>	21deg. C, 58% RH	<b>TESTED BY:</b> 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 - 2000	H&V	3	A	N/A
10	2000 - 2700	H&V	3	A	N/A

Note<sup>#1</sup>: 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)

### 4.4.1 TEST SPECIFICATION

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

### 4.4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Fast Transient Burt Simulator	Teseq	NSG2025	32075	2017/1/21	2018/1/20
Coupling clamp	Teseq	CDN8014	31839	2017/1/21	2018/1/20
Coupling Decoupling Network	Teseq	CDN163	160	2017/1/21	2018/1/20

**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.

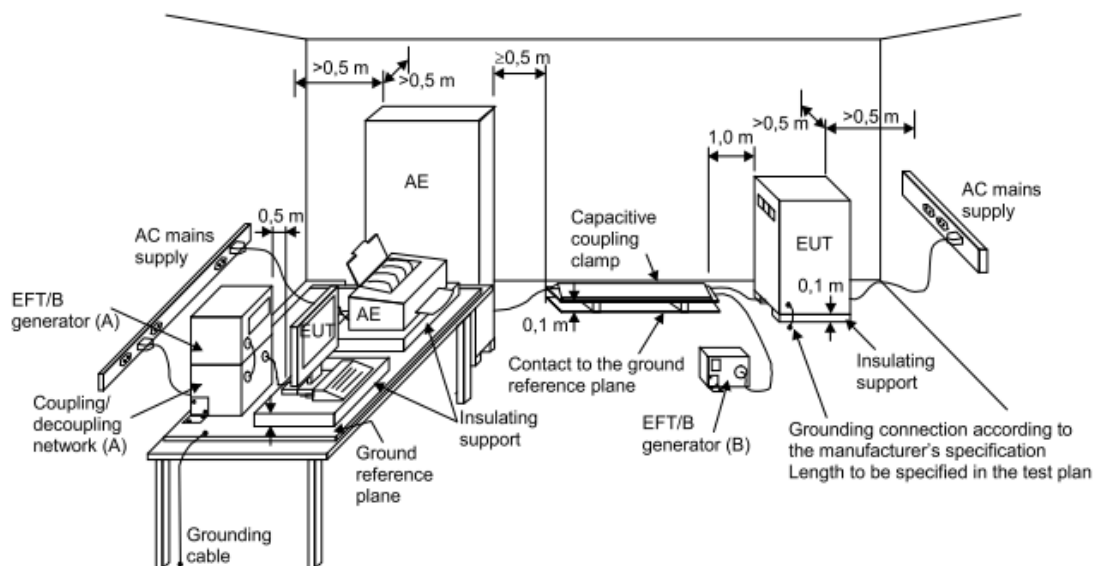
### 4.4.3 TEST PROCEDURE

- Both positive and negative polarity discharges were applied.
- 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.
- The duration time of each test sequential was 1 minute.
- 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



IEC 645/12

#### 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

<b>TEST MODE</b>	See item 2.2	<b>TEST VOLTAGE</b>	DC 520V AC 400V
<b>ENVIRONMENTAL CONDITIONS</b>	21 deg. C, 55% RH	<b>TESTED BY:</b>	Wang Jia

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

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

## 4.5 SURGE IMMUNITY TEST

### 4.5.1 TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-5
<b>Wave-Shape:</b>	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
<b>Test Voltage:</b>	DC/AC Power Line: Line to Line:1kV Line to PE:2kV Signal Line: 1kV
<b>Surge Input/Output:</b>	L-N&L-PE&N-PE
<b>Polarity:</b>	Positive/Negative
<b>Phase Angle:</b>	0° /90°/180°/270°
<b>Pulse Repetition Rate:</b>	1 time / 60 sec.
<b>Number of Tests:</b>	5 positive and 5 negative at selected points

### 4.5.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
High Energy Pulse Generator	EMTEST	VCS500 10T	V1121109603	2017/1/21	2018/1/20
Coupling Decoupling Network	EMTEST	CNV 503S10	V1121109604	2016/7/25	2017/7/24
Coupling Decoupling Network	EMTEST	CNV 503S12	V1231113305	2016/7/25	2017/7/24

**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).

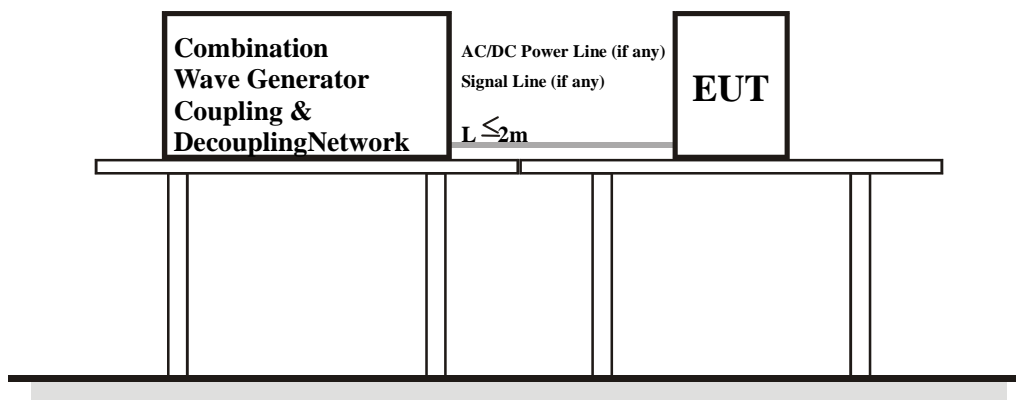
c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

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



## 4.5.6 TEST RESULTS

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

### AC/DC and PLC Power port:

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

### Signal ports and telecommunication ports:

Voltage (kV)	Test Point	Polarity	Test result	Voltage (kV)	Test Point	Polarity	Test result
2	485 Port	+/-	A	/	/	+/-	/

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

## 4.6 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS)

### 4.6.1 TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-6
<b>Frequency Range:</b>	0.15 MHz - 80 MHz
<b>Field Strength:</b>	10V <sub>r.m.s</sub>
<b>Modulation:</b>	1kHz Sine Wave, 80%, AM Modulation
<b>Frequency Step:</b>	1 % of fundamental
<b>Coupled Cable:</b>	Power Mains & DC Power Line
<b>Coupling Device:</b>	CDN-M1 & Clamp & 100Ω Resistance

### 4.6.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal generator	R&S	SMC100A	1411.4002k02-102618-Yb	2017/1/21	2018/1/20
Amplifier	R&S	BBA100	5354.9000k50-100984-Ut	2017/1/21	2018/1/20
6dB Attenuator	Bird	75-A-FFN-06	1136	2017/1/21	2018/1/20
Power Meter	R&S	NRVD	857.8008.02	2017/1/21	2018/1/20
Coupling Decoupling Network	FCC	FCC-801-M1-50A	111651	2017/1/21	2018/1/20
RF Inject Clamp	FCC	F-120-9A	111657	2017/1/21	2018/1/20
100Ω Resistance	Luthi	CR100A	370	2017/1/21	2018/1/20

**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.



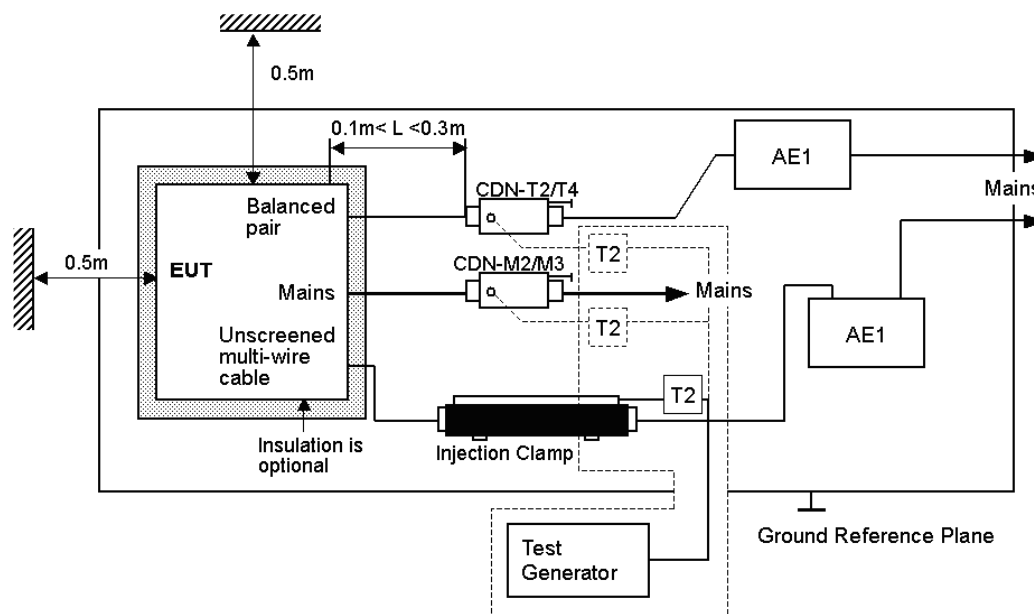
### 4.6.3 TEST PROCEDURE

- 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  $50\Omega$  loads.

### 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

<b>TEST MODE</b>	See item 2.2	<b>TEST VOLTAGE</b>	DC 520V AC 400V
<b>ENVIRONMENTAL CONDITIONS</b>	21deg. C, 54% RH	<b>TESTED BY:</b> Wang Jia	

Voltage (V)	Test Frequency Note <sup>#1</sup> (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 – 80	AC line	Current Probe	A	N/A
10	0.15 – 80	DC line	Current Probe	A	N/A
10	0.15 – 80	485 Cable	Direct injection	A	N/A
10	0.15 – 80	PE line	CDN-M1	A	N/A
10	0.15 – 80	AC(PLC)	Current Probe	A	N/A

Note<sup>#1</sup>: 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

### 4.7.1 TEST SPECIFICATION

<b>Basic Standard:</b>	IEC 61000-4-8
<b>Frequency Range:</b>	50Hz
<b>Field Strength:</b>	30A/m
<b>Observation Time:</b>	1 minute
<b>Inductance Coil:</b>	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	2016/7/25	2017/7/24
Helmholtz coil	EMTEST	HHS 5215-100	5215-100 102	2016/7/25	2017/7/24

**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.

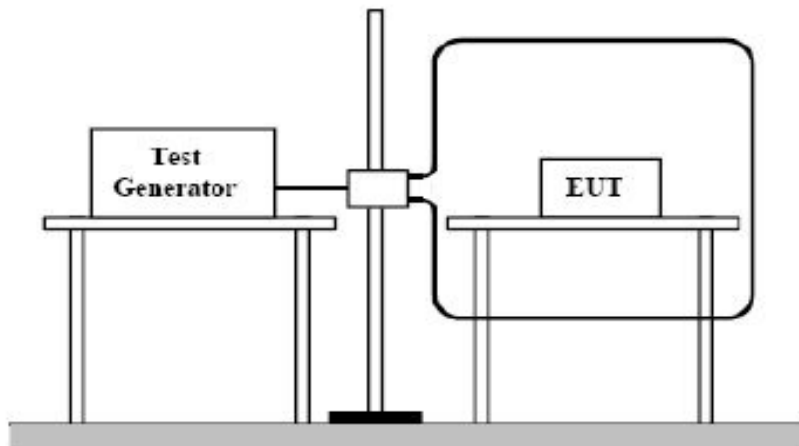
### 4.7.3 TEST PROCEDURE

- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- 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

<b>TEST MODE</b>	See item 2.2	<b>TEST VOLTAGE</b>	DC 520V AC 400V
<b>ENVIRONMENTAL CONDITIONS</b>	21deg. C, 55% RH	<b>TESTED BY:</b> Wang Jia	

<b>MAGNETIC FIELD DIRECTION</b>	<b>TESTING RESULT</b>	<b>REMARK</b>
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.

## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

### CONDUCTED EMISSION TEST



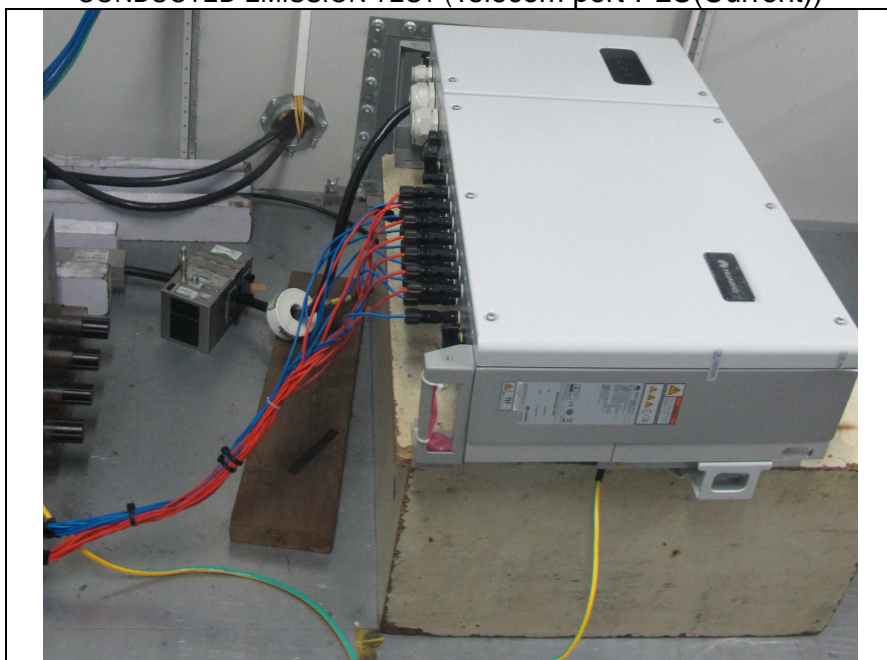
### CONDUCTED EMISSION TEST (Telecom port-RS485)



CONDUCTED EMISSION TEST (Telecom port-PLC(Voltage))



CONDUCTED EMISSION TEST (Telecom port-PLC(Current))







**BUREAU  
VERITAS**

**Test Report No.: CE161219N048R1**

### RADIATED EMISSION TEST



**Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch**

No. 34, Chenwulu Section, Guantai Rd., Houjie  
Town, Dongguan City,  
Guangdong 523942, China

Tel: +86 769 8593 5656  
Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

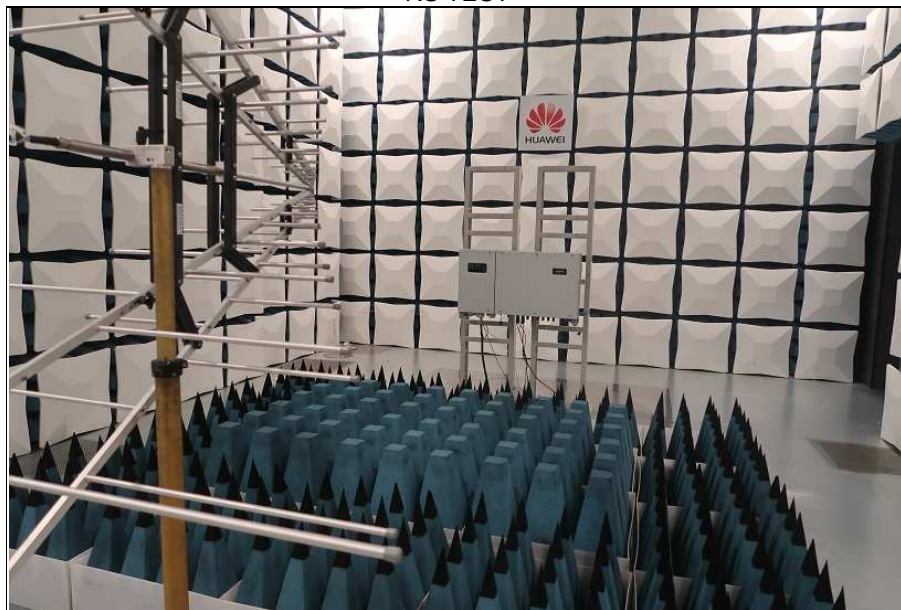
HARMONICS EMISSION TEST &  
VOLTAGE FLUCTUATIONS AND FLICKER TEST



ESD TEST



RS TEST



EFT TEST (AC Main)



EFT TEST (DC Main)



EFT TEST (485 Cable)





SURGE TEST(AC Main)



SURGE TEST(DC Main)



SURGE TEST(485 Cable)



CONDUCTED SUSCEPTIBILITY TEST (AC Main)



CONDUCTED SUSCEPTIBILITY TEST (DC Main)



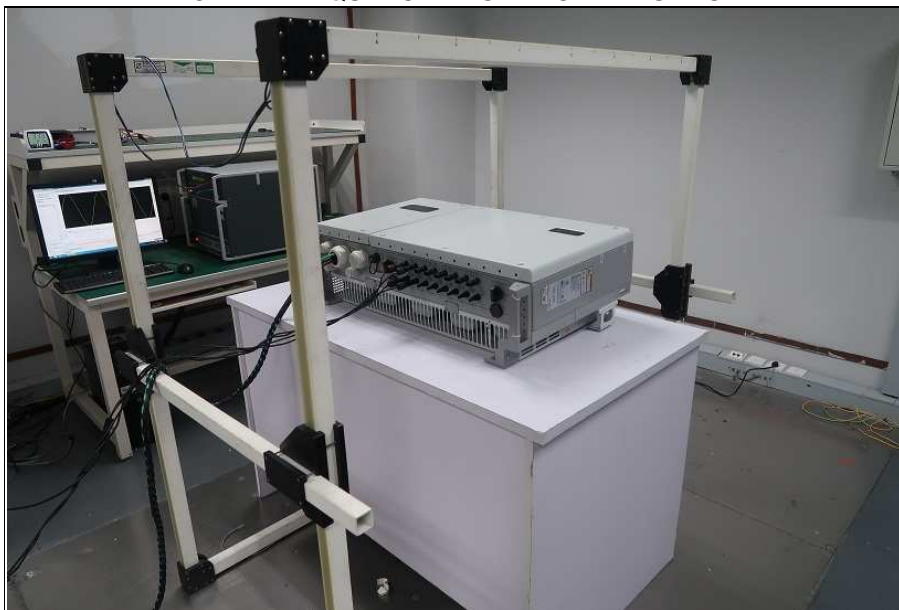
CONDUCTED SUSCEPTIBILITY TEST (PE Cable)



### CONDUCTED SUSCEPTIBILITY TEST (485 Cable)



### POWER-FREQUENCY MAGNETIC FIELDS TEST







**BUREAU VERITAS** Test Report No.: CE161219N048R1

## **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---